

YUKON COAL INVENTORY
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Whitehorse, Yukon Territory
Y1A 2C6

By: J.A. HUNT, M.Sc., P.Geo.
AURUM GEOLOGICAL CONSULTANTS INC.
205-100 Main Street
P.O. Box 4367
Whitehorse, Y.T.
Y1A 3T5

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CONTENTS

	page
1. Introduction	1
Coal mining and exploration	1
Presentation of Data	2
Acknowledgements	2
General References to Coal in the Yukon	3
2. Coal occurrences in the Yukon Territory	4
(i) Kluane Area	4
- Burwash Basin	6
- Bates Lake Basin	13
- White River	16
- References	18
(ii) Whitehorse Trough	21
- Whitehorse Area	21
- Braeburn Area	27
- Carmacks Area	33
- Big Salmon/Laberge Area	53
- Yukon/Pelly River Area	58
- References	61
(iii) Tintina Trench	69
- Dawson Area	70
- Pelly River Area	89
- Ross River Area	92
- Watson Lake Region	98
- References	104
(iv) Indian River Area	109
- References	116
(v) Rock River	118
- References	123
(vi) Bonnet Plume Area	125
- Bonnet Plume Basin	125
- Individual deposits within the southern Bonnet Plume Basin	133
- Coal showings in the northern Bonnet Plume Basin	140
- References	145
(vii) Northern Yukon	149
- Mackenzie Delta Area	165
- References	167

List of Figures

Figure 1: Yukon Coal Inventory Map; 1:2,000,000 In pocket

1. INTRODUCTION

Coal is found in Mississippian, Jurassic, Cretaceous and Tertiary non-marine sequences which underlie as much as 37,000 km² of the Yukon Territory (Long, 1985). However, very little of this vast area of potential coal-bearing rocks has been examined in any detail and the extent of coal deposits is largely unknown.

Coal occurrences are known in seven areas: 1) in the Paleogene Amphitheatre Formation in the Kluane area; 2) within Jura-Cretaceous sedimentary rocks of the Laberge Group and Tantalus Formation deposited in the Whitehorse trough in the Carmacks, Braeburn and Whitehorse areas; 3) in Tertiary sedimentary rocks in the Dawson, Pelly River, Ross River and Watson Lake areas located in the Tintina trench; 4) within Late Cretaceous sedimentary rocks in the Indian River area; 5) in Eocene sedimentary rocks of the Rock River basin; 6) within the mid Cretaceous to Tertiary strata of the Bonnet Plume basin; and 7) in Mississippian sedimentary rocks of the Kayak Formation in northern Yukon.

Minor coal is also known to exist in Mississippian map unit Mo. (Norris, 1982) in the Snake River area; in the Neocomian "coal-bearing division" (Jeletzky, 1961; Norris, 1981) in the northern Richardson Mountains; in the Upper Cretaceous Moose Channel Formation in the northern most Yukon; and within the Paleocene Reindeer Formation in the Mackenzie Delta area.

The Mississippian Mattson Formation, which hosts coal in the Northwest Territories, is known to occur in south eastern Yukon, however no coal occurrences, of any significance, have been noted in the Yukon portion.

COAL MINING AND EXPLORATION

Coal has been mined in the Carmacks and Dawson areas of the Yukon since the turn of the century. This coal was used locally for domestic heating, to power paddle steamers and dry concentrate at United Keno Hill's mine in Keno. More recently coal from the Ross River and Carmacks areas was used to dry concentrate at the Faro Mine.

At present there are no operating coal mines in the Yukon, there is, however, ongoing coal exploration in several areas. Potential mineable coal deposits occur in the Bonnet Plume, Braeburn and Rock River areas. Reserves remain in the Carmacks and Ross River regions. A recently discovered, as yet unexplored, deposit occurs near Hoidahl Dome in northern Yukon.

To date (March, 1994), there are 21 valid coal exploration licences in the Yukon: 6 in the Whitehorse mining district, 9 in the Mayo mining district, 4 in the Watson Lake mining district and 2 in the Dawson mining district. There are 10 valid coal mining leases: 3 in the Whitehorse area, 4 in Carmacks and 3 in the Ross River area (figure 1).

For information on obtaining Coal Exploration Licences or Coal Mining Leases see the Territorial Coal Regulations, Chapter 1522 of the Territorial Lands Act, available from the office of the Mining Recorder in Whitehorse. This information is not included here as changes are planned to the regulations in the near future.

PRESENTATION OF DATA

This paper is written to assemble in a single report information from scattered references. The compiled information is presented as a catalogue; listing all general areas where coal is known to have been found and all recorded individual coal occurrences, and a map of the Yukon Territory showing the location of these occurrences (figure 1).

The remainder of this paper describes briefly each of the 103 known coal occurrences, divided into seven geographic subdivisions. Each section has a short introduction, describing the coal-bearing sediments in that area, followed by descriptions of individual occurrences.

[Coal quality analyses use the following abbreviations: M = moisture, vol. = volatiles, FC = fixed carbon, CV = calorific value, S = Sulphur, Ro = vitrinite reflectance]

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2. COAL OCCURRENCES IN THE YUKON TERRITORY

(i) KLUANE AREA

Introduction

The coal-bearing, Paleogene Amphitheatre Formation occurs within the Kluane Area and forms a narrow, discontinuous belt approximately 350 km long, following the southwest side of the Shakwak-Dalton fault (Campbell and Dodds, 1982a and b). The Amphitheatre Formation, generally considered to be an overlap assemblage (Ridgeway et al., 1992), consists of 350-1100 m of conglomerate, sandstone, shale and coal (Read and Monger, 1976) that occur in two discrete basins: the northern Burwash basin and the southern Bates Lake basin (Ridgeway et al., 1992). Studies by Ridgeway et al. (1992) and observations recorded by Eisbacher and Hopkins (1977) suggest that Amphitheatre sedimentation was coeval with movement on the Denali fault system. In addition, later folding and faulting of the Amphitheatre Formation indicates post-Amphitheatre deformation along the strike-slip system (Ridgeway et al., 1992).

Sedimentological data indicate that the Amphitheatre Formation is characterized by: 1) abrupt and localized facies changes both laterally and vertically; 2) markedly different lithostratigraphies within the Burwash basin, suggesting the existence of small (10's km), discrete, fault controlled depocentres; 3) abrupt changes in local paleocurrent direction within fault controlled depocentres; and 4) ample evidence of syndepositional tectonism, including intraformational unconformities, syndepositional faults, angular scree deposits and boulder conglomerates (Ridgeway et al., 1989; Eisbacher and Hopkins, 1977).

Burwash basin

The Burwash basin is about 35 km long and 5 km wide; it can be differentiated into three depocentres which are defined by unique lithostratigraphies and distinctive depositional sequences (Ridgeway et al., 1989, 1992). The unique stratigraphies representing individual depocentres cannot be correlated across major faults within the basin and are best exposed at Mount Hoge, Amphitheatre Mountain and Cement Creek (Ridgeway et al., 1989).

At Mount Hoge, the Amphitheatre Formation consists of sheet-like packages of clast supported conglomerate 30-40 m thick, separated by 8-10 m thick units of interbedded sandstone and coal (Ridgeway et al., 1992). At Amphitheatre Mountain the basin fill consists of lenticular conglomerate packages 40 m thick, separated by well developed sandstone, mudstone and coal packages ranging in thickness from 30 to 40 m (Ridgeway et al., 1992). Cement Creek, the northern most depocentre in the Burwash basin, consists of fining upward sequences of conglomerate and sandstone (Ridgeway et al., 1992).

The fault controlled depocentres allowed several different types of depositional environments to exist in close proximity to each other within individual basins. Braided stream, wet alluvial fan, fan-delta, lacustrine and meandering stream deposits all occur within the Burwash basin (Ridgeway et al., 1989, 1992).

Palynological and coal petrography studies document diachronous filling of the Burwash basin, spanning the Eocene-Oligocene boundary, with the sediment packages becoming younger toward the basin centre (Ridgeway et al., 1989). This suggests that the Burwash basin closely resembles the pull-apart model of strike-slip basin development (Ridgeway et al., 1992). The pull-apart model constrains the oldest sediment to the perimeter of the basin, with sedimentation becoming progressively younger toward the centre of the basin owing to structural enlargement of the basin with time (Ridgeway et al., 1992).

Bates Lake basin

Initial work in the Bates Lake basin indicates that these sediments are characterized by abrupt changes in facies (Ridgeway et al., 1992). However, confinement of depositional systems to specific depocentres, as is typical of the Burwash basin, has not been documented to date. Outcrops along the eastern basin margin consist of 1,000 m of coarse, proximal alluvial-fan deposits which form an overall fining upward sequence (Ridgeway et al., 1992). Along the southwest side of the basin outcrops consist predominantly of lenticular sandstones encased in mudstone and siltstone (Ridgeway et al., 1992).

COAL IN THE AMPHITHEATRE FORMATION

Lignite seams were discovered by early placer miners within Tertiary sedimentary rocks in the Kluane area. Two small areas of lignite-bearing beds, occurring respectively on Sheep Creek and on Kimberley and Telluride Creeks in Kluane Mining district were described briefly by McConnell (1905, p. 7A & 18A). Cairnes (1915) reports that the lignite bearing beds which occur along the upper portion of Sheep Creek include several seams of good quality, one of which is at least 1.8 m thick. A coal seam, about 1 m thick, was noted in Tertiary deposits south of Cement Creek (Muller, 1967).

Cairns (1915) discovered a coal field with a "number of valuable seams of lignite of good quality" which he designated the 'Duke River Coal area'. The beds of the Duke River area are developed throughout a belt 1.5 to 8 km wide that extends for 24 km from the Duke River to the Donjek. A small tributary of the Duke River has cut a huge amphitheatre about 300 m deep into these beds exposing a section 360 to 450 m thick that contains, in aggregate, at least 9 m and probably 15 m of good quality lignite.

In the northwest corner of Kluane map area, along the upper portion of McLelland Creek (Coal Creek) and along the upper part of a small stream 4.8 km to the north, which drains to the west, Tertiary beds occur that contain a considerable amount of fossil wood and several thin seams of lignite, less than 5 cm thick (Cairnes, 1915b).

BURWASH BASIN

1. NIAMODLAOC MOUNTAIN

OTHER NAMES: WINDGAP; Yukon Minfile 115G/ 09; Campbell (1967) # 37; Ricketts (1985) # 40.

LOCATION AND ACCESS

Latitude: 61°15'46"N, Longitude: 139°07'09"W in NTS 115G/6, at the head of Ptarmigan and Halfbreed Creeks (Campbell, 1967, p. 18). Historically accessible by roads from the Alaska Highway up Ptarmigan and Halfbreed Creeks, the later road leaves the highway at mile 1088 (Craig and Laporte, 1972).

HISTORY

Muller (1967) describes three coal seams 0.3, 0.91 and 1.83 m thick within a 7 m thick section of shale, siltstone and sandstone exposed on the east tributary of Ptarmigan Creek.

Acquired by N.H. Ursel Associates Limited in 1970 as coal licenses #14, 18 and 19. Prospecting, mapping and trenching were carried out in 1970-71 in the Niamodlaoc Mountain and Amphitheatre Mountain areas (Speelman, 1971 a, b & c). Mineable coal, particularly "lump resiniferous coal" was sought. A semi-bulk sample was taken for the purpose of extracting a resin separate for analysis and testing (Speelman, 1971b).

DESCRIPTION

Thin lenses of banded black coal are widespread, larger lenses up to 2 m thick are present (Speelman, 1971b). All the coal seams in the district contain pale yellow to orange lump resin. The coal measures are generally flat lying to moderately (< 30°) dipping.

West side of Niamodlaoc Mountain

The northwest location (described by Muller, 1967; location A of Speelman, 1970) consists of two seams 0.9 and 1.8 m thick separated by 4 m of shale (the 0.3 m thick seam observed in this location by Muller (1967) is not mentioned by Speelman). Float occurrences (locations AA and B of Speelman, 1970) suggest that as many as four seams may be present. Sampling (Speelman, 1970) indicates both seams are non-coking, sub-bituminous C coals.

A similar section consisting of three seams aggregating 4.0 m in a 15 m interval was measured 4 km to the south at approximately the same stratigraphic level (locality C of

Speelman, 1970). Another 4.3 m thick seam (locality D of Speelman, 1970; sample 70-5) with claystone interbeds occurs about 238 m lower in the section, and is intruded by a 1 m thick porphyritic sill (Craig and Laporte, 1972; Read and Monger, 1976). The coal has been altered to natural coke on either side of the sill. Sampling indicates this coal is non-coking, sub-bituminous A.

The third area situated about 3.2 km southeast of the first (location A) consists of two seams 2.0 and 0.8 m thick located about 600 m apart at approximately the same stratigraphic level.

East side of Niamodlaoc Mountain

(locality A of Speelman, 1971) - Lenses of coal are exposed in a cut bank on the south side of a tributary of Halfbreed Creek. The largest lens is 2 m thick and 4.6 m wide.

(locality B of Speelman, 1971, about 1 km south of locality A) - Contains three coal lenses: west, middle and east. The west lens is 0.5 m thick (samples 71-4,5 & 6). The middle and east lenses occur 4.4 m stratigraphically below the west lens and are 1.8 m long by 0.25 m thick and 0.9 long by 0.4 m thick respectively.

Coal rank (and hardness) increase progressively down section from sub-bituminous A to C (Speelman, 1970, 1971c).

COAL QUALITY

Speelman (1971c) reports the results of analyses for two channel samples of freshly exposed coal from a trench cutting the upper Amphitheatre Formation (dry basis; fixed carbon by difference): Sample 70-1 - Ash 18.4%, vol. 57.3%, FC 24.3%, CV 9290 BTU/lb, S 0.1%; Sample 70-2 - Ash 7.7%, vol. 46.1%, FC 46.2%, CV 11160 BTU/lb, S 0.1%. The coal consists principally of vitrinite with many resinous inclusions and is low in mineral matter; the rank appears to be too low for coking coal (Speelman, 1971c).

Samples 70-4 and 70-5 are freshly exposed channel samples taken from the lower part of the upper Amphitheatre Formation, results (dry basis; FC by difference) are as follows: Sample 70-4 - Ash 10.12%, vol. 42.51%, FC 47.37%, CV 12,032 BTU/lb, S 0.42; Sample 70-5 - Ash 10.74%, vol. 42.25%, FC 46.98%, CV 11,100 BTU/lb, S 0.1.

Resin from the same stratigraphic horizons as coal samples 70-1 and 70-2, in the upper part of the upper Amphitheatre Formation, was analyzed and yielded the following results: 1.76% Ash, Solubility 59.9%, Melting Point Range 325-375 °C. The abundance of lump resin varies with stratigraphic position in a seam, and may be as high as 10% (Speelman, 1971c).

RESERVES

Presently unknown.

POTENTIAL FOR DEVELOPMENT

Muller (1967) states that it is doubtful if these deposits could be of more than local use. The deposits occur in folded strata in high areas with much relief making strip mining unlikely (Muller, 1967). Speelman states that strip mining may be possible using hydraulic giants, as has been done at the Healy Creek operation in Nenana coal field in Alaska (Barnes, 1964, p. 93). Underground mining does not appear to be feasible on an extensive scale as the sediments that host the coal deposits are soft, partly frozen sands and gravels (Muller, 1967).

The lump resin present in the coal seams may be suitable for the manufacture of printing ink (Speelman, 1971c).

Any development of this prospect is unlikely as it lies within Kluane National Park.

Advantages

- 1) Close to established infrastructure (Alaska Highway, village of Burwash)
- 2) Good quality, low sulphur coal

Disadvantages

- 1) Lack of information
- 2) Unconsolidated nature of the host sediments is a deterrent to underground mining but may make hydraulic strip mining possible
- 3) Steep slopes make the possibility of strip mining difficult
- 4) Lies inside Kluane National Park

RECOMMENDATIONS FOR FURTHER WORK

- 1) Mapping is required to accurately locate surface exposures of coal; measurement of stratigraphic sections would provide stratigraphic control of coal occurrences.
- 2) Further exploration including trenching and/or drilling is required to determine seam continuity and thickness.
- 3) Continued analyses of coal and resin to determine quality.

2. SHEEP CREEK

OTHER NAMES: STOVE; Yukon Minfile 115G/ 02; Campbell (1967) # 35.

LOCATION AND ACCESS

Latitude: 61°03'43"N, Longitude: 138°42'08"W in NTS 115G/2, on Sheep Creek, upstream from Kluane Lake (Campbell, 1967, p. 17).

HISTORY

The first coal lease (1008) was staked in November, 1903 by A.R. Gordon at placer claim 20 above discovery, about 3.2 km from Slims River. This claim was probably staked on an occurrence of float because later maps position the showing about 8 km further upstream. The coal was reportedly used in camp stoves by local placer miners. F. Hart explored with bulldozer stripping in 1969-70.

DESCRIPTION

Several seams up to 1.8 m thick occur in the Paleogene Amphitheatre Formation in the upper portion of Sheep Creek (McConnell, 1905; Cairnes, 1915; Bostock, 1952; Muller, 1967; Milner and Craig, 1973; Read and Monger, 1976). Campbell (1967) and Milner and Craig (1973) describe the sedimentary rocks as steeply dipping (85°) and occurring in a faulted basin 10 km² in extent.

COAL QUALITY

A sample taken by Cairnes (1915) across a 0.91 m thick seam yielded the following results: M 10.9%, Ash 9.6%, vol. 41.0%, FC 38.5%. Muller (1967) reported the following results for a sample from a 1.83 m thick seam collected west of the west fork of Sheep Creek: M 21.8%, Ash 7.8%, vol. 36.7%, FC 33.7%. The coal is classified as sub-bituminous C and B and has a gross calorific value of 11,500 to 13,000 BTU/lb (Campbell, 1967, p. 17).

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to lack of information and proximity to Kluane National Park.

3. GRANITE CREEK

OTHER NAMES: HOGE; Yukon Minfile 115G/ 11; Campbell (1967) # 38; Ricketts (1988) # 91.

LOCATION AND ACCESS

Latitude: 61°17'10"N, Longitude: 139°22'50"W in NTS 115G/6, at the headwaters of Granite Creek (Campbell, 1967, p. 18).

HISTORY

A coal lease was staked in 1948 by Paul Birckel on Granite Creek, a tributary of Duke River. A coal lease on a strip of land straddling Granite Creek was taken in 1950 by a group of Whitehorse businessmen. No development was done, as efforts to obtain government assistance to build a road into the area failed (Muller, 1967).

DESCRIPTION

Three seams of sub-bituminous C coal between 0.9 and 1.5 m thick occur in a 5.7 m section of highly folded Paleocene to Oligocene Amphitheatre Formation (Bostock, 1952).

A study by Ridgway et al. (1992), indicates that the coal at Mount Hodge was deposited at the margin of a small strike slip basin along the Duke River Fault, and was derived from a temperate Late Eocene deciduous forest.

COAL QUALITY

Analyses of three samples collected by Muller in 1950 (reported in Bostock, 1952) yielded the following results (dry basis): Ash 13.0-34.7%, vol. 34.9-46.6%, FC 30.4-40.7%, CV 7,245-10,415 BTU/lb, S Trace to 0.1%. Read and Monger (1976) describe the coal at Granite Creek as sub-bituminous C.

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to lack of information, structural complexity and proximity to Kluane National Park.

4. AMPHITHEATRE

OTHER NAMES: Yukon Minfile 115G/ 12; Campbell (1967) # 38; Ricketts (1985) # 39.

LOCATION AND ACCESS

Latitude: 61°18'28"N, Longitude: 139°21'52"W in NTS 115G/6.

HISTORY

Discovered about 1914, the coal was used by placer miners to heat their cabins and small quantities were packed out on horses to Burwash Landing for use in a blacksmiths forge (Bostock, 1952). This area was included in a coal lease staked by a group of Whitehorse business men in 1950 on Granite Creek. Staked as CHM claims (YA59646) in March, 1981 by F. Green.

DESCRIPTION

At least 12 seams of coal, ranging in thickness from 0.3 to 4.9 m and aggregating 9 to 15 m, occur in highly-folded sandstone and conglomerate of the Amphitheatre Formation (Cairnes, 1915; Bostock, 1952; Muller, 1967; Campbell, 1967, p. 18; Milner and Craig, 1973; Read and Monger, 1976). Muller (1967) believed this aggregate thickness to be too high because much of the coal is shaley.

A study by Ridgeway et al. (1992) indicates that the coal at Amphitheatre Mountain was deposited near the centre of a small pull-apart basin along the Duke River Fault. Pollen and coal macerals indicate that the coal was derived from coniferous forest of Early Oligocene age.

A study by Cameron and Birmingham (1970) on radioactivity in western Canadian coals indicates that levels in the Amphitheatre Mountain area are low.

COAL QUALITY

Three outcrop samples of coal collected by Cairnes (1915) yielded the following results: Sample A - 1.37 m thick seam, M 10.2%, Ash 9.1%, vol. 42.0%, FC 38.7%; Sample B - 1.35 m thick seam, M 11.2%, Ash 5.4%, vol. 40.9%, FC 42.5%; Sample C - 0.91 m thick seam, M 9.8%, Ash 1.6%, vol. 43.9%, FC 44.7%. The following results are from a sample, reported by Bostock (1952), collected from a 4.3 m thick seam on the south side of Badlands Creek: M 10.7%, Ash 3.2%, vol. 39.4%, FC 46.7%.

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to lack of information, structural complexity and proximity to Kluane National Park.

5. CEMENT

OTHER NAMES: STEELE; Yukon Minfile 115G/ 28; Ricketts (1985) # 38.

LOCATION AND ACCESS

Latitude: 61°22'08"N, Longitude: 139°46'54"W in NTS 115G/5 (Campbell, 1967, p. 18). Coal occurs in cliffs on the west wall of the Donjek River valley below the mouth of the Steele valley, south of Cement Creek (Milner and Craig, 1973).

HISTORY

Noted by the Geological Survey of Canada (McConnell, 1906) but apparently never staked.

DESCRIPTION

Several thin coal seams occur in sandstone and mudstone of the Paleocene to Oligocene Amphitheatre Formation (McConnell, 1906; Muller, 1967; Milner and Craig, 1973; Read and Monger, 1976). Muller (1967) reported a "coal seam several feet thick" in the Amphitheatre Formation south of Cement Creek. Coal seams up to 1.2 m thick associated with folded and faulted sandstone and conglomerate, with dips up to 60°, were described by Campbell (1967, p. 18) and Ricketts (1985).

A study by Ridgeway et al. (1992) indicates that the coal at Cement Creek was deposited at the margin of a small strike-slip basin along the Duke River Fault, and was derived from a temperate Late Eocene deciduous forest.

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to thin nature of coal seams, lack of information and proximity to Kluane National Park.

BATES LAKE BASIN

6. TELLURIDE

OTHER NAMES: Yukon Minfile - 115B/ 08; Ricketts (1985) # 36.

LOCATION AND ACCESS

Latitude: 60°53'18"N, Longitude: 138°18'18"W in NTS 115B/16, on Telluride Creek.

HISTORY

Coal has been known in Telluride Creek since 1904 (McConnell, 1905; Cairnes, 1915). In 1970 diamond drilling of a geophysical anomaly intersected thin coal seams (Read and Monger, 1976). This property has been examined mainly for its Cu, Zn, Ni and Pb content.

DESCRIPTION

Thin coal seams are overlain by greywacke, sandstone and shale (McConnell, 1905; Cairnes, 1915; Milner and Craig, 1973). These sedimentary rocks were previously thought by Kindle (1952) to be part of the Jura-Cretaceous Dezadeash Group. It is now known that they are part of the Paleogene Amphitheatre Formation (Read and Monger, 1976).

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to the thin nature of coal seams, lack of information and proximity to Kluane National Park.

7. SUGDEN

OTHER NAMES: Yukon Minfile 115A/ 38; Campbell (1967) # 34; Ricketts (1985) # 35.

LOCATION AND ACCESS

Latitude: 60°41'57"N, Longitude: 137°51'24"W in NTS 115A/12, east of Sugden Creek near the junction of the Alsek and Dusty Rivers (Campbell, 1967, p. 17).

HISTORY

Noted by the Geological Survey of Canada and apparently never investigated (Kindle, 1952).

DESCRIPTION

Lenticular lignite seams up to 15 cm thick, most of which are crushed and sheared, occur in basal conglomerate and in overlying argillite, slate and shale of the Eocene-Oligocene Amphitheatre Formation (Kindle, 1952; Campbell, 1967, p. 18; Read and Monger, 1976; Milner and Craig, 1973). These sedimentary rocks were previously thought by Kindle (1952) to be part of the Jura-Cretaceous Dezadeash Group.

A study by Cameron and Birmingham (1970) on radioactivity in western Canadian coals indicates that levels in the Sugden Creek area are low.

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to thin, lenticular nature of the seams and location within Kluane National Park.

8. KIMBERLEY

OTHER NAMES: Yukon Minfile 115B/ 03; Campbell (1967) # 35; Ricketts (1985) # 36.

LOCATION AND ACCESS

Latitude: 60°49'58"N, Longitude: 138°00'56"W in NTS 115B/16, on Kimberly Creek.

HISTORY

As early as 1904 coal was known in Kimberly Creek. McConnell (1905) mapped Tertiary lignite beds in Kimberly Creek but Kindle (1952) mistakenly placed these at the base of the Early Cretaceous Dezadeash Formation (Read and Monger, 1976). The coal bearing strata belong to the Eocene Amphitheatre Formation.

DESCRIPTION

Lignite seams from 0.6 to 5 cm thick (Kindle, 1952) occur in Paleogene Amphitheatre

Formation conglomerate, which has been preserved as a sliver in the Dalton Fault Zone (Read and Monger, 1976).

A study by Cameron and Birmingham (1970) on radioactivity in western Canadian coals indicates that levels in the Kimberly Creek area are low.

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to the thin nature of the seams and proximity to Kluane National Park.

9. BRYSON

OTHER NAMES: Yukon Minfile 115B/ 11

LOCATION AND ACCESS

Latitude: 60°52'27"N, Longitude: 138°05'06"W in NTS 115B/16.

HISTORY

Noted by the Geological Survey of Canada (McConnell, 1905).

DESCRIPTION

Thin lignite seams occur in Paleogene Amphitheatre Formation sedimentary rocks.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to lack of information and proximity to Kluane National Park.

WHITE RIVER

10. MEMOIR

OTHER NAMES: Yukon Minfile 115F/ 54

LOCATION AND ACCESS

Latitude: 61°53'20"N, Longitude: 140°59'16"W in NTS 115F/15.

HISTORY

Staked as coal lease 27397 in October, 1911 by H.E. Morgan.

DESCRIPTION

Several seams of lignite, less than 5 cm thick, occur in the Paleogene Amphitheatre Formation which is intruded by younger volcanic rocks (Cairnes, 1915b).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to the thin nature of coal seams and proximity to the Klwane Game reserve.

11. MCLELLAN

OTHER NAMES: Yukon Minfile 115F/ 55

LOCATION AND ACCESS

Latitude: 61°51'54"N, Longitude: 140°54'43"W in NTS 115F/15. Ricketts (1985, # 37) describes a location on Mclellan Creek and gives the location as 61°46'N; 140°50'W.

HISTORY

Noted by the Geological Survey of Canada (Cairnes, 1915b).

DESCRIPTION

Seams of lignite up to 5 cm thick occur in the Paleogene Amphitheatre Formation, which is intruded by younger volcanic rocks (Cairnes, 1915b). Ricketts (1985) describes thin seams associated with sandstone that contains abundant fossilized wood.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited by the thin nature of coal seams and proximity to the Kluane Game reserve.

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(ii) WHITEHORSE TROUGH

INTRODUCTION

Whitehorse Trough is described as a mid Mesozoic backarc or forearc basin. Basin fill includes volcanic and sedimentary rocks of the Triassic Lewes River and Jurassic Laberge Groups. The trough evolved into a successor basin by Late Jurassic to Early Cretaceous time, indicated by the deposition of the Tantalus Formation (and equivalent strata; Lowey, 1984). The successor basin subsequently evolved into a series of restricted, nonmarine basins by Late Cretaceous to Paleogene time.

The upper Laberge Group and the Tantalus Formation are coal-bearing. Coal occurs dominantly in three areas: Whitehorse, Braeburn and Carmacks. Coal has been mined in the Carmacks area since the turn of the century when it provided fuel to river boats, and was used for domestic heating locally and in Dawson.

WHITEHORSE AREA

12. WHITEHORSE COAL DEPOSIT

OTHER NAMES: BLACK DIAMOND (includes Fish Lake, Luscar, Ptarmigan, Coal Ridge and Beresford locations); Yukon Minfile occurrences 105D-42,105,106,107,108,109; Campbell (1967) # 24; Ricketts (1985) # 22; Ricketts (1988) # 22a, 85, 86.

LOCATION AND ACCESS

NTS 105D/6, 11; Latitude 60° 29' N, Longitude 135° 16' W. The Whitehorse Coal Deposit is located approximately 30 km southwest of Whitehorse. Access is by dirt road off the Whitehorse Copper Road.

HISTORY

The first published report of coal in the Whitehorse area documented the presence of a high ash anthracite seam (McConnell, 1901). In 1901, the area around the Whitehorse Coal Deposit was surveyed and labelled the 'Black Diamond Coal Land'. By 1906, three seams 0.75 m, 3.15 m and 2.95 m thick were known in this area and an 18 m adit has been driven on the upper seam (Cairnes, 1908). Cairnes (1912) stated that the coal measures could be followed for over 8 km to the northwest of Coal Lake and were believed to continue in that direction for another 11 km. Cairnes also noted that coal measures outcropped to the east of Coal Lake.

No further work on the Whitehorse coal property was recorded until Spence Taylor and Associates Ltd. (1969) reported the presence of numerous test pits and trenches indicating that past prospecting work was more widespread than the literature suggests. In 1942, the U.S. Army Corps of Engineers examined the Whitehorse Coal Deposit, but there is no written record of this work (Johnny Johns pers. comm. in Spence Taylor and Associates Ltd., 1969).

In 1969, Coal Exploration Licences 3, 4 and 5 were granted to Luscar Ltd. covering about 142,045 acres (approx. 57,485 hectares). Luscar Limited were able to trace the coal members, discontinuously, for 12 km: 9.6 km northwest of Coal Lake and 2.4 km southeast of the lake (Spence Taylor and Associates, 1969; Mineral Industry Report, 1969-70). More than 2,386,125 tonnes of recoverable coal, based on the underground mining of a 1.83 m seam, were estimated to lie above the level of the valley floor (Spence Taylor and Associates Ltd., 1969).

Savage (1976) carried out a prospecting and short-drilling programme in the Whitehorse coal area. However, no core was obtained from the drilling due to the highly fractured nature of the coal seams.

In 1982 the Whitehorse Coal Corporation was formed and construction began on an access road to the Whitehorse Coal deposit; a trenching programme was also initiated (Hill, 1983). Combustion tests, carried out on three samples, indicated that the coals were meta-anthracites with an average 3.5% moisture, 38.2% ash and 8,500 BTU/pound (19,765 Kj/Kg) heating value (Hill, 1983; Bremner, 1988). Further work was carried out in 1983 and potential in situ reserves of 85 million tonnes were estimated assuming a thickness of 3.05 m, a strike length of 10 km and a down dip extent of 500 metres (JHP Coal-Ex. Consulting Ltd., 1984).

In 1985, six vertical drill holes were drilled along a strike length of 335 m. Good correlation between five of the six drill holes was shown by down-hole Gamma-neutron, density, resistivity and caliper logs (Carlyle, 1985). Eight coal seams were found interbedded with conglomerate and shale. Some of the cleaner coal bands contained as little as 15% ash (Carlyle, 1985). Drill indicated reserves of 200,837 tons were calculated by Carlyle (1985).

Exploration during 1986 consisted of test mining and bulk sampling (JHP Coal-Ex Consulting Ltd, 1987). Only minor work has continued to the present.

INAC (1988) reports the production of 2,721 tonnes; 36 tonnes of which were sold to Yukon College for use in their furnace.

The Whitehorse Coal Corporation currently holds a coal exploration licence (Y454; valid until 27 September, 1996) and three coal mining leases (2989 & 2990, valid until 4 February, 2003; & 2991, valid until 3 May, 2003) covering the area of the Whitehorse Coal Deposit.

DESCRIPTION

Southwest of Whitehorse, exposures of the Jura-Cretaceous Tantalus Formation form a 30 km long, crescent shaped, fault-bounded wedge which extends along the eastern slopes of the Ibex River to south of Double Mountain (Wheeler, 1961; Hart and Pelletier, 1989; Hart and Radloff 1990). The northeast margin of the wedge is marked by the westerly verging Ibex thrust fault which juxtaposes Whitehorse Trough strata south over the Tantalus Formation (Hart and Radloff, 1990). The southwest margin of the Tantalus wedge abuts Lewes River Group volcanic strata along an unnamed fault in the Ibex River valley (Hart and Radloff, 1990). A series of late northeast-trending cross faults, with variable but minor offsets, cut the Tantalus wedge into small blocks.

The Whitehorse Coal deposit is located within this fault bounded wedge; mapping, trenching and rotary drilling by the Whitehorse Coal Corporation has defined at least eight coal seams within the deposit (Carlyle, 1985; Bremner, 1988). Bremner (1988) reports two continuous seams exposed at surface. The lower seam exposed in trenches is a minimum of 3.3 m thick and continuous for at least 1 km. The upper seam is 1.8 m thick and exposed almost continuously in trenches and pits for a strike length of 2 km. In outcrop, the coal is typically massive, black and lustrous with highly varying fissility.

Petrographically, the coal shows little variation in composition. Most samples examined were composed of structureless vitrinite and minor amounts of inertinite (Hunt, 1989). Pyrite was evident in a number of samples and most samples show a melting texture indicating rapid heating, possibly due to the contact metamorphic effects of local sills and dykes (Hunt, 1989; Goodarzi and Jerzykiewicz, 1989).

COAL QUALITY AND RANK

Analytical results indicate that coal at the Whitehorse Coal deposit is moderate to high-ash anthracite. Results from samples taken during drilling are consistently better than those for surface samples and range from: 16.66-25.96% Ash; 5.85-9.61% Volatile Matter; 66.99-77.06% Fixed Carbon; 0.42-0.68% Sulphur; and 10,450-12,005 BTU/lb Calorific Value (Carlyle, 1985). The best results are from the 4.3 m thick B coal zone. Although ash contents of individual seams range from approximately 17-26%, a 14 tonne bulk sample taken from the main coal pit had a head grade of 46.28% ash (dry basis; JHP Coal-Ex Consulting, 1987).

Vitrinite reflectance measurements carried out on 30 outcrop samples of Tantalus Formation coal collected from the Whitehorse Coal deposit and surrounding area range from 1.68 to 3.45% $R_{o_{rand}}$, corresponding to a variation in rank from low volatile bituminous coal (LVB) to anthracite (see Hunt, 1989 for all data). The coal is dominantly semi-anthracite to anthracite. Higher R_{o} values (3.81% $R_{o_{rand}}$) were found adjacent (5 cm away) to a narrow rhyolite sill and decreased progressively, with distance, away from the sill (Hunt, 1989; Goodarzi and Jerzykiewicz, 1989). The sill had a contact metamorphic effect on the coal causing liquefaction and the production of a cohesive coke (Goodarzi and Jerzykiewicz,

1989).

Based on mean maximum vitrinite reflectance three coal samples examined by R.M. Bustin (in Hill, 1983 and JHP Coal-Ex Consulting Ltd, 1984) would be classified as meta-anthracites. Two of these three samples have a coke like micro-structure suggesting they may have been heated for short durations at high temperatures possibly as a result of igneous intrusion or frictional heating (R.M. Bustin in Hill, 1983).

Samples of coal examined by Goodarzi and Jerzykiewicz (1989) indicate that coal at the Whitehorse Coal deposit has undergone both regional and contact metamorphism. Regional metamorphism probably elevated the rank of the coal while contact metamorphism resulted in coking of the coal (Goodarzi and Jerzykiewicz, 1989). Coal that has been subjected to contact metamorphism by a felsic sill has been coked at a temperature of 600 °C and at a rate of heating of > 60°C/min (Goodarzi and Jerzykiewicz, 1989). Based on the coking behaviour of the altered coal the rank of the unaltered coal is estimated to be in the range of medium to low volatile bituminous.

Petrographic analysis (R.M. Bustin, in Hill, 1983) indicates that much of the ash is finely disseminated in the organic fraction and would be difficult to remove without fine crushing. The use of a dense medium cyclone would probably be required to produce acceptable clean coal yields (R.M. Bustin in Hill, 1983 and JHP Coal-Ex Consulting Ltd, 1984). Because of the high ash content of the coal it can be expected that any amount of cleaning will markedly increase the value of the product for heating.

RESERVES

Potential in situ coal resources at the Whitehorse Coal deposit are 26 million tons with a dry ash content of 40% (JHP Coal-Ex Consulting Ltd, 1984). This estimate is for coal zone A only and does not include any additional tonnages available from other coal zones. Current drill indicated reserves are in excess of 200,800 tons and open in all directions (Carlyle, 1985).

POTENTIAL FOR DEVELOPMENT

The Whitehorse Coal Deposit is well situated with regard to infrastructural requirements to support the exploitation of this coal. There is potential for a mine-mouth power generation station using the fluidized-bed combustion process (JHP Coal-Ex Consulting Ltd, 1984) and opportunities exist locally for domestic and industrial heating.

Advantages

- 1) Close to Whitehorse transportation routes and domestic market
- 2) Seams of mineable thickness present: 0.6-13 m
- 3) Low sulphur content

Disadvantages

- 1) Relatively high ash content
- 2) Small known deposit size

RECOMMENDATIONS FOR FURTHER WORK

- 1) Continued testing of the bulk sample, including washability tests
- 2) Geological mapping around the main pit with emphasis on structural geology
- 3) Further drilling to confirm reserves
- 4) Evaluation of coal zones other than zone A
- 5) Detailed geological mapping of areas away from the main pit, followed up by trenching and drilling.

13. MOUNT BUSH

OTHER NAMES: Yukon Minfile 105D-39; Campbell (1967) # 23; Ricketts (1985) # 21.

LOCATION AND ACCESS

Latitude: 60°19'00"N, Longitude: 135°04'00"W in NTS 105D/6. The Mount Bush prospect is located 45 km south of Whitehorse midway between the summits of Mount Bush and Idaho Hill. The prospect is at an elevation of 5900' on the ridge-crest of Mount Bush.

HISTORY

Cairnes (1908; in Bostock, 1957) discovered coal showings during reconnaissance mapping in the summer of 1906, and returned in July, 1909 to partly uncover three seams: 0.46 m, 1.8+ m and 0.9+ m thick (Cairnes, 1910, in Bostock, 1957).

Restaked as coal leases #2933 by C. McConnell and 2934 by J. Johns in November, 1942. Messrs. Foster and Kerry acquired leases adjoining one owned by C. McConnell in 1946.

Acquired as part of coal exploration license #20 by N.H. Ursel and Associates Ltd. in March, 1971. Ursel found coal float in windgaps indicating the presence of several seams. Four of six trenches, excavated by hand, contained coal. Trenches 1 and 6 did not reach bed rock. Trench 2 contained 6 coal seams, 2.6 m, 0.4 m, 0.18 m, 0.04 m and 0.05 m thick, two channel samples were taken (8-6-71-1 & 8-7-71-1). Trench 3 was about 4 m long and consisted entirely of coal intruded by feldspar porphyry dykes. Trench 4 contained one seam 0.4 to 0.48 m thick intruded by a sill, one channel sample was taken (8-6-71-2). Trench 5 contained one seam 3.96 m thick, two channel samples were taken (8-1-71-1 & 7-31-71-1).

This property was explored with mapping, shallow drilling and hand trenching in

1975, and staked as BS mineral claims (YA4138) in December, 1975 by R. Schumacher, etc. The surrounding area was acquired as coal exploration license #33 by A.T. Savage in November, 1975.

DESCRIPTION

The coal occurs in a small patch of badly faulted Tantalus Formation, 3.2 km long and less than 0.8 km wide.

COAL QUALITY

A sample from the 1.8+ m thick seam discovered by Cairnes (1912) yielded the following results: M 4.78%, Ash 30.10%, vol. 8.62%, FC 56.50%, indicating the coal is high ash semi-anthracite.

Channel samples taken by Speelman (1971a) yielded the following results (dry basis): Sample 8-7-71-1 (Trench 2, 0.4 m thick seam), Ash 48.0%, vol. 9.0%, FC 43.0%, CV 5900 BTU/lb, S 0.1%; Sample 8-6-71-1 (Trench 2, 2.6 m thick seam), Ash 50.8%, vol. 8.4%, FC 40.8%, CV 5690 BTU/lb, S 0.2%; Sample 8-6-71-2 (Trench 4, 0.48 m thick seam), Ash 68.1%, vol. 8.9%, FC 23.0%, CV 3360 BTU/lb, S 0.1%; Sample 8-1-71-1 (Trench 5, 3.96 m thick seam), Ash 58.1%, vol. 8.0%, FC 33.9%, CV 4420 BTU/lb, S 0.2%. On the basis of preliminary reflectance studies and the above results from proximate analyses Speelman (1971a) classified the coals as graphitic anthracites.

Savage (1976) reports the following results for proximate analyses for coal in the Mount Bush area: Sample 6, M 1.72%, Ash 13.54%, vol. 32.33%, FC 52.52%, CV 10,924 BTU/lb, S 0.36%; Sample 7, M 2.65%, Ash 16.15%, vol. 31.94%, FC 49.26%, CV 10,084 BTU/lb, S 0.32%. The location of these samples is not clear and it is possible that they are from closer to the Whitehorse Coal deposit as the results are more similar to those from samples taken in the Mount Granger area.

Washability tests performed on two of the channel samples indicate washability is poor due to the high specific gravity of the carbonaceous material (Speelman, 1971a).

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to structural complexity.

BRAEBURN AREA

14. BRAEBURN

OTHER NAMES: NORDENSKIOLD, DIVISION MOUNTAIN, includes VOWEL (Red Ridge); includes Yukon Minfile occurrences 115H/ 012 & 013; Ricketts (1985) # 41, (1988) # 41a.

LOCATION AND ACCESS

N.T.S. 105 E/5 and 115 H/8; 61°21'N, 135°57'W. Located about 90 km northwest of Whitehorse and about 20 km southwest of Braeburn Lake. Road access is from Braeburn Lodge on the Klondike Highway via a 31 km four-wheel drive all weather road that follows the old Whitehorse-Dawson wagon road to Division Mountain.

HISTORY

Coal was first discovered on Division Mountain by John Quinn and H.E. Porter, who staked coal leases 8176 and 8177 in July 1903. Cairnes examined the area in some detail in 1908, and prepared a geological map at a scale of 2 miles to the inch. Part of this area was re-mapped by Lees in 1929-30 at 4 miles to the inch as part of Laberge map-area, and part by Tempelman-Kluit in 1970-72, at the same scale, as part of Aishihik Lake map-area.

In April 1970 Arjay Kirker Resources, apparently acting on behalf of Teslin Exploration Ltd., acquired three coal exploration licences covering the Mount Vowels - Division Mountain area (C.E.L. No. 10 - 115 H/8, SE ; No. 11 - 115 H/8, NE ; No. 12 - 105 E/5, SW). In 1970-72 they carried out an exploration programme consisting of geological mapping, bulldozer trenching, a trial induced polarization survey, and 1,047 m of diamond drilling in six holes. In December 1973 the company staked two coal mining leases (C.M.L. 2960 and 2962) covering the thickest coal seam outcrops on Division Mountain and one lease (2961) covering an exposure on Red Ridge, and relinquished the remainder of their licence area. These three leases were transferred to Braeburn Coal Ltd. in 1976.

In September 1970 Norman H. Ursel & Associates acquired one coal exploration licence covering the Cub Mountain area (C.E.L. No. 13 - 105 E/5, NW) and carried out geological mapping, but apparently failed to locate any more coal seams. This area was re-examined by Resoursex Ltd. in 1975 (C.E.L. No. 35), apparently also without result.

These occurrences were visited in August 1977 by R. Hill for Cyprus Anvil Mining Corp. and again in August 1978 for Utah Mines; several coal samples were collected for analysis.

Manalta Coal Ltd. acquired two coal exploration licences in 1978 (C.E.L. No. 99 -

115 H/8, NE and No. 100 - 115 H/8, SE), but apparently failed to locate any additional coal seams.

All-North Resources Ltd. restaked this area as coal leases (Y416 & Y417) in April, 1989. The W4 Joint Venture restaked the area in April, 1990, and transferred to Cash Resources Ltd. in August, 1992. W4 Joint Venture carried out minor excavator trenching in 1992. In 1993 Archer, Cathro & Associates, on behalf of Cash Resources, carried out VLF, magnetic and EM-31 geophysical surveys and 2,857 m of diamond drilling in 22 holes; minor regional mapping, prospecting and hand trenching were also performed.

Archer, Cathro & Associates (1981) Ltd. currently holds coal exploration licences covering this area (Y452 & Y453; valid until 17 April, 1996) and the area to the north (Y457-459; valid until 17 November, 1996).

DESCRIPTION

Coal seams occur on Red Ridge and Division Mountain. They are reported to occur within the uppermost beds of the Laberge Group, and are believed to be of middle Jurassic age (Tempelman-Kluit, 1974). The Laberge Group rocks are disconformably overlain by Lower Cretaceous Tantalus Formation conglomerate. Tantalus and Laberge strata have been folded into an isoclinal syncline, the axis of which bisects Division Mountain and Red Ridge (Wengzynowski and Carne, 1993).

The Red Ridge exposure occurs in a gully at about 685 m (2,250 ft) elevation on the steep, eastern flank of the ridge. The coal dips west, and lies between 200 and 240 m below the base of the overlying Tantalus Formation. This coal should reappear in the projected west limb of a syncline on the more gentle west slope of the ridge, but trenching carried out here in 1972 failed to locate any coal. A well-exposed section along strike on the northeast face of Mount Vowels apparently contains no coal.

Several coal seams are exposed along a creek on the north slope of Division Mountain. Cairnes (1909, 1910) described one 2.1 m thick seam, one 1.2 m thick seam and several thinner seams. The work carried out by Teslin Exploration (Kirker, 1970) revealed eight seams with an aggregate thickness of 19 m over a stratigraphic interval of 65.5 m; these seams were reported to lie about 450 m below the base of the Tantalus, and may belong to a different coal horizon from that described by Cairnes. Seam thicknesses were reported as 0.9 m, 2.4 m, 0.6 m, 3.0 m, 4.4 m, 4.0 m, 3.2 m and 1.3 m, with the three thickest seams separated by only 1.1 m and 0.7 m of sandstone. The coal seams strike about 320° and dip from 65° west to vertical, thin rapidly with depth and laterally along strike, are cut by minor faults, and are cut and locally metamorphosed by andesite sills and dykes. They have been traced over a strike length of about 6 km.

Recent drilling by Archer, Cathro & Associates (Wengzynowski and Carne, 1993) indicates there are three relatively continuous seams in the Division Mountain area; at least 25 additional seams, greater than 0.5 m thick, were intersected during drilling. The three

main seams are termed seam 1, seam 2 and seam 3, with seam three being the youngest. Diamond drilling in the 1993 field season defined the coal seams for a strike length of 1200 m with an average, composite, true thickness of 11.4 m.

Seam 3 consists of one bench that ranges in thickness from 0.8 to 1.8 m, with an average true thickness of 1.3 m.

Seam 2 (referred to as the Cairnes seam in previous reports) is located about 40 m stratigraphically below seam 3 and consists of one to three benches separated by narrow argillaceous sandstone partings. The average, composite, true width of seam 2 is 8.7 m, however, seam thickness is highly variable.

Seam 1 (referred to as the footwall seam in earlier reports) occurs 13 m stratigraphically below seam 2 and is made up of one bench with an average true thickness of 1.3 m, this is the least continuous of the three seams.

COAL QUALITY

Cairnes gave two proximate analyses as follows:

Sample:	2.1 m Seam	0.5 m Seam
Moisture (%)	12.02	8.98
Ash (%)	11.14	13.10
Volatiles (%)	34.28	29.62
Fixed Carbon (%)	42.56	48.30

The samples analyzed by Teslin Exploration had an average raw calorific value of about 21,860 J/g (about 9,400 BTU/lb).

Oxidized outcrop samples collected by R. Hill (1977, 1978d) from the three thickest seams yielded the following results:

Sample Number	DM1	DM2	DM3
Moisture (%)	9.83	7.97	7.20
Ash (%)	19.73	19.54	29.90
Volatiles (%)	28.43	29.96	27.53
Fixed Carbon (%)	41.96	42.53	35.37
Sulphur	0.28	----	0.27
Calorific Value (BTU/lb)	8,100	8,500	7,390
Calorific Value (J/g)	18,840	19,770	17,190
Free Swelling Index	0	0	0
Vitrinite Reflectance (R _o max %)	0.59	0.59	0.64
Total "reactives" (%)	39	23	10

The vitrinite reflectance values indicate that the ASTM rank of this coal is on the borderline between High Volatile B and C bituminous. The low proportions of "total reactives" (vitrinite + exinite) indicate that this coal has no potential for use as metallurgical coal or for conversion to liquid or gaseous fuels. It can therefore be characterized as a high-ash, low-sulphur thermal coal.

Core samples submitted by Archer, Cathro & Associates (Wengzynowski and Carne, 1993) yielded the following average results for proximate analyses: residual moisture 2.86%, Ash 26.99%, vol. 25.05%, CV 5,326 cal/g (9,528 BTU/lb), S 0.47%.

RESERVES

Teslin Exploration calculated drill-indicated reserves of about 2.5 Mt in the three thickest seams on Division Mountain.

Archer, Cathro & Associates (Wengzynowski and Carne, 1993) calculated the following reserves:

- Open pit reserves measured to a mining depth of 150 m = 2,566,370 tonnes with an average incremental stripping ratio of ten bank cubic metres per tonne.
- Underground reserves, measured and indicated = 8,573,550 tonnes.
- The total in situ reserves are estimated at 11, 139,920 tonnes based on a maximum depth of 600 m.

POTENTIAL FOR DEVELOPMENT

This occurrence is readily accessible and relatively close to potential markets. However, the scale of any mining development will be limited by the apparent small size of the deposit, by the lenticular shape and steep dips of the coal seams, and the high ash content. The potential for a small-scale operation supplying local markets with coal for domestic, commercial and industrial heating is considered quite good.

This occurrence could also provide coal for a small-scale thermal power plant located close by. Exploration to date by Cash Resources Ltd., has been directed towards determining reserves sufficient to feed a 10 to 20 megawatt thermal electrical generation plant.

Advantages

- 1) Coal seams of mineable thickness present
- 2) Relatively accessible - only about 25 km from a major highway
- 3) Relatively close to potential markets - about 90 km from Whitehorse and about 22 km from existing power grid
- 4) In situ reserves of 11.1 Mt present, with probable continuity along strike for a total of 15 km

Disadvantages

- 1) Coal relatively high in ash
- 2) Coal seams apparently lenticular and discontinuous
- 3) Coal seams steeply-dipping to vertical - high stripping ratio
- 4) Limited size of deposit

RECOMMENDATIONS FOR FURTHER WORK

- 1) Further geological work to determine whether the coal occurs within the Tantalus Formation or in the underlying Laberge Group.
- 2) Further drilling and trenching required to prove up existing drill-indicated reserves and to extend reserve area;
- 3) Further analytical work required, particularly washability testing;
- 4) Preliminary engineering studies required in order to determine the technical feasibility of mining the coal, open pit design etc.;
- 5) Preliminary economic feasibility study required in order to obtain a first estimate of coal cost.
- 6) Base line environmental studies.

REFERENCES

Cairnes (1909;1910); Bostock and Lees (1938); Bell (1956); Campbell (1967); Hlavay (1970); Kirker (1970); Speelman (1970); Craig and Laporte (1972); Phillips (1973); Milner and Craig (1973); Tempelman-Kluit (1974); Allen (1975); Craig and Milner (1975); Russell (1978); Hill (1978b), Tempelman-Kluit et al. (1981); Yukon Exploration and Geology (1981, 1986); Wengzynowski and Carne (1993).

15. CORDUROY

OTHER NAMES: Yukon Minfile - 105E/22; Ricketts (1985) # 23.

LOCATION AND ACCESS

Latitude: 61°18'00"N, Longitude: 135°55'00"W in NTS 105E/5, 8 km north of Kingston Mountain and 5 km east of Klusha Creek.

HISTORY

The Geological Survey of Canada reported that coal occurs in gopher holes on the south of Corduroy Mountain. The area was explored in 1970, while it was held as coal exploration licence 12 by Teslin Exploration Ltd., nothing of interest was found (Milner and Craig, 1973).

DESCRIPTION

The area is underlain by Tantalus Formation conglomerate, sandstone and shale (Tempelman-Kluit, 1984; Tempelman-Kluit et al., 1981).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown

16. KLUSHA

OTHER NAMES: Yukon Minfile - 105E/ 28

LOCATION AND ACCESS

Latitude: 61°22'00"N, Longitude: 135°59'00"W in NTS 105E/5.

HISTORY

Discovered during a geological mapping and prospecting programme in 1975 by Resourcecex Ltd. on coal exploration licence 35, issued in January, 1975. This area was previously held under licence 13, issued in September, 1970 to N.H. Ursel and Associates Ltd.

DESCRIPTION

Coal float was found in gopher holes in an area underlain by Jura-Cretaceous Tantalus Formation clastic rocks (Cairnes, 1910 ; Milner and Craig, 1973; Allen, 1975).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown

CARMACKS AREA

17. LONE PINE MOUNTAIN

OTHER NAMES: LOSCH; Yukon Minfile occurrence 115H/01; Ricketts (1985) # 43.

LOCATION AND ACCESS

Latitude: 61°56'N, Longitude: 136°10'W in NTS 115H/16. Located on the west side

of Lone Pine Mountain, adjacent to the Klondike Highway, about 22 km south of Carmacks.

HISTORY

Originally staked as coal lease 4096 in January 1902 by H.E. Porter. The geology of the area was first mapped by Cairnes in 1906-08 at a scale of 2 miles to the inch. The area was re-mapped at 1:250,000 by Tempelman-Kluit in 1971-73 as part of Aishihik Lake Map-area.

The occurrence was re-staked in September 1958 by D. Jennings and A. Roy, who drove a 4.6 m adit the following year. Norman H. Ursel and Associates examined the area in 1970, and Milner and Craig examined the locality in 1973. Resource Ltd. acquired Coal Exploration Licence No. 36 (115 H/16, NE) in 1975 and did surface mapping that year. R. Hill examined the locality in 1977 for Cyprus Anvil and again the following year for Utah Mines.

DESCRIPTION

The coal outcropping beside the Highway is apparently within the Tantalus Formation of Upper Jurassic to Lower Cretaceous age. There are very few exposures within the area. Cairnes observed that seam thicknesses could not be measured because of the cover of superficial deposits. At the site of the old portal one seam about 2.1 m thick is faulted against chert-pebble conglomerate and is intruded by an irregular mass of feldspar porphyry. Coaly shale is also exposed in the power-line cut below and to the north of the portal. No trenching or drilling has ever been done in the area, hence there is no information on the number, thickness or lateral extent of coal seams.

COAL QUALITY

A sample collected by Hill (1977) was found on petrographic analysis to be thermally altered, i.e. it was a natural "coke" - it contained small spherical vesicles and a very fine-grained anisotropic mosaic structure which suggest that the original coal was of rather low rank.

RESERVES

No reserve calculations have ever been made for this area.

POTENTIAL FOR DEVELOPMENT

No serious exploration work has ever been done in this area, largely because of the apparent lack of any significant reserve potential and the metamorphosed character of the coal at the only known outcrop. Thus the potential for development would appear to be severely limited.

Advantages

- 1) Readily accessible and close to established infrastructure (Klondike Highway, village of Carmacks, power grid)
- 2) Relatively close to potential markets (about 160 km from Whitehorse)

Disadvantages

- 1) Apparent small size of deposit - lack of reserve potential
- 2) Metamorphosed character of coal - probably poor quality

RECOMMENDATIONS FOR FURTHER WORK

In view of the lack of outcrop and the paucity of data on the area a small diamond drill program in order to obtain information on the number, thickness and lateral extent of coal seams and the extent of the thermal metamorphism is probably justified.

REFERENCES

Cairnes (1910); Speelman (1970); Craig and Laporte (1972); Milner and Craig (1973); Tempelman-Kluit (1974); Allen (1975); Russell (1978); Hill (1978b).

18. PORTER'S COAL

OTHER NAMES: ANDESITE; Yukon Minfile - 115H/ 02; Ricketts (1985) # 42.

LOCATION

Approximate location Latitude: 61°53'N, Longitude 136°07'W in NTS 115H/16. Located on coal creek on the south side of Porter Mountain, about 400 m east of the Klondike Highway and about 29 km south of Carmacks.

HISTORY

Staked as coal lease 1447 in October 1900 by H.E. Porter, and reportedly surrounded by at least twenty others shortly afterward. The geology of the area was first mapped by Cairnes in 1906-08 at a scale of 2 miles to the inch. The area was re-mapped at 1:250,000 by Tempelman-Kluit in 1971-73 as part of Aishihik Lake Map-area. P.F. Guder staked the May mineral claims over the occurrence in April 1970, apparently unaware that mineral claims do not convey coal rights. Norman H. Ursel and Associates did some trenching in 1970 and revealed several thin coal seams. This occurrence was included within the area explored by Resoursex Ltd. in 1975 under coal exploration licence No. 36 (115 H/16, NE). The area was examined by R. Hill in 1977 for Cyprus Anvil and again in 1978 for Utah

Mines.

This area was leased (2988) in February, 1981 by Fargo O Corp. The Greek claims (YA74993) were staked one km to the south in August, 1982 by Uranerz Exploration and Mining Ltd. in a joint venture with Central Electricity Generating Board of London, England and explored with radiometric surveys.

DESCRIPTION

Cairnes reported finding coal seams up to 40 cm thick within the Tantalus Formation of Upper Jurassic to Lower Cretaceous age. These beds were described as folded and distorted by the intrusion of a syenite porphyry body. Norman H. Ussel and Associates reported finding a few seams less than 1.5 m in thickness in apparently different horizons.

The Tantalus Formation outcrop containing the coal seams appear to be a small roof pendent of sedimentary rock within the feldspar porphyry. The outcrop presently exposed reveals about 15 m of interbedded sandstones, shales and coal seams, with beds of each up to 15 cm thick. The beds are a little contorted, but average dip is about 37° to the north. The contact with the syenite porphyry is not exposed, but a line dividing porphyry and chert-pebble conglomerate fragments can be readily observed in the soil.

Bulldozing exposed coal on the east side of the Klondike Highway at mileposts 85.5 and 88.0 (Teslin Exploration Ltd., 1971). The Greek claims were staked to cover low grade uranium associated with clay altered shear zones.

COAL QUALITY

Cairnes gave the following analysis: M 4.68%, Ash 7.47%, vol. 15.59%, FC 72.26%, which indicated a rank of anthracite.

Samples taken by Teslin Exploration Ltd from three localities ranged from 8.0-19.3% water, 11.8-50.9% Ash, 11.2-14.7% volatiles, 23.9-66.5% fixed carbon and 0.5-0.6% sulphur. Rank ranged from sub-bituminous A to sub-bituminous C and dry calorific value from 4750 to 10,340 BTU/lb.

Two small samples, one of very bright, hard coal from float and the other of rather dull, weathered coal from outcrop, were collected by R. Hill in 1977. Petrographic analysis showed that they had very different compositions; vitrinite + exinite (ash-free basis) was 84% for the bright coal but only 21% for the dull coal. However both had very high vitrinite reflectance values, 3.10 and 2.79% respectively, which confirms the rank as anthracite. The coal has therefore been baked by the syenite intrusion.

RESERVES

No reserve calculations have ever been calculated for this area. It is extremely

unlikely that significant reserves are present.

POTENTIAL FOR DEVELOPMENT

This occurrence is evidently very restricted in area and the coal has been altered and deformed by the intrusion of the syenite porphyry. It is therefore considered that there is no potential for development of this coal.

RECOMMENDATIONS FOR FURTHER WORK

No further work is recommended in this area.

REFERENCES

Cairnes (1910); Speelman (1970); Craig and Laporte (1972); Milner and Craig (1973); Tempelman-Kluit (1974); Allen (1975); Russell (1978); Hill (1978b); Yukon Exploration and Geology (1982).

19. GUDER'S COAL

OTHER NAMES:

LOCATION AND ACCESS

Approximate location Latitude: 61°55'N, Longitude: 136°07'W in NTS 115 H/16. Located on the east side of the Klondike Highway about 1 km south of Porter's Coal and about 30 km south of Carmacks.

HISTORY

The geology of the area was first mapped by Cairnes in 1906-08 at a scale of 2 miles to the inch. The area was re-mapped at 1:250,000 by Tempelman-Kluit in 1971-73 as part of Aishihik Lake Map-area. This occurrence is believed to have been discovered by P.F. Guder in 1970, who dug a small hand trench in a coal seam beside the road. Later that year Norman H. Ursel and Associates did some bulldozer trenching. This area was also examined in 1975 by Resoursex Ltd. under coal exploration licence No. 36 (115 H/16, NE). R. Hill examined the locality in 1977 for Cyprus Anvil and again in 1978 for Utah Mines.

DESCRIPTION

The rocks exposed by trenching consist of contorted and faulted interbedded sandstone and thin coal seams which are close to vertical and strike approximately north-

south. They could be in either the Laberge Group (Lower to Middle Jurassic) or in the Tantalus Formation (Upper Jurassic to Lower Cretaceous). The remains of a small adit were found close by - the origin of this is uncertain.

COAL QUALITY

A sample collected by the R. Hill for petrographic analysis contained only 3% vitrinite - the principal component was found to be semi-fusinite (90%). Reflectance of vitrinite was 2.71%, which indicates an ASTM rank of anthracite, hence the coal has apparently been altered by nearby intrusions.

RESERVES

No reserve calculations have been performed for this area.

POTENTIAL FOR DEVELOPMENT

No serious exploration work has ever been done in this area, largely because of the apparent lack of any significant reserve potential and the metamorphosed character of the coal at the only known outcrop. The potential for development would appear to be severely limited.

Advantages

- 1) Readily accessible and close to established infrastructure (Klondike Highway, village of Carmacks, power grid)
- 2) Relatively close to potential markets (about 160 km from Whitehorse)

Disadvantages

- 1) Apparent small size of deposit - lack of reserve potential
- 2) Metamorphosed character of coal - probably poor quality

RECOMMENDATIONS FOR FURTHER WORK

In view of the lack of outcrop and the paucity of data on the area a small diamond drill program in order to obtain information on the number, thickness and lateral extent of coal seams and the extent of the thermal metamorphism is probably justified.

REFERENCES

Speelman (1970); Craig and Laporte (1972); Milner and Craig (1973); Tempelman-Kluit (1974); Allen (1975); Russell (1978); Hill (1978b).

20. FIVE FINGERS

OTHER NAMES: MILLERS; Yukon Minfile 115I/ 04; Campbell (1967) # 31; Ricketts (1985) # 48.

LOCATION AND ACCESS

Latitude: 62°12'10"N, Longitude: 136°20'18"W in NTS 115I/01. Ricketts (1985, # 47) describes an additional location at 62°12'N; 136°19'W, 12.9 km north of Carmacks and south of the "old Five Fingers Mine".

HISTORY

Coal was first noted here in 1887 by G.M. Dawson and first staked as coal lease 214 in March, 1898 by W.T. Edmonds. Restaked as leases 256 and 258 in November, 1899 by J. Cameron and C.E. Miller, who mined several hundred tonnes by 1904. George K. Milton acquired the property in 1905 and formed the Five Fingers Coal Company Ltd., which attempted unsuccessfully to diamond drill and then drove two declines (a total of 345 m of development) by 1907. Only a few hundred tonnes were mined and the mine was abandoned in 1908 in favour of seams at the Tantalus Mine.

The original leases were acquired by Yukon Coal Corporation Ltd. and transferred in 1966 to Anvil Mining Corporation Ltd. The surrounding area was acquired in September, 1970 as coal exploration licence 16 by Teslin Exploration Ltd., which performed mapping, drilled one hole (53.7 m) about 1220 m south of the mine in 1971, and staked a coal lease (2964) in November, 1973. The original leases were transferred in 1975 to Cyprus Anvil Mining Corporation, which explored with mapping in 1977.

DESCRIPTION

Two seams 1.1 and 1.4 m thick, separated by 7.6 m of rock, strike north and dip 16°. The coal occurs within the Lower Jurassic Laberge Formation.

COAL QUALITY

A sample analyzed by the Department of Mines in 1908 returned the following results: M 5.29%, Ash 18.45%, vol. 36.14%, FC 40.12%, CV 12,100 - 13,600 BTU/lb.

A surface sample taken by Teslin Exploration Ltd. from the 1.1 m seam in 1970 yielded the following results: M 8.4%, Ash 16.7%, vol. 32.8%, FC 42.1%, CV 10,740 BTU/lb, S 0.2%. The coal was found to be non-coking and to have a high volatile C rank.

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unclear due to the lack of information.

Advantages

- 1) low sulphur coal
- 2) seams of mineable thickness
- 3) close to major highway and the town of Carmacks

Disadvantages

- 1) lack of information
- 2) moderately high ash content
- 3) close proximity to Yukon River

RECOMMENDATIONS FOR FURTHER WORK

Mapping to delineate the extent of coal seams at surface plus a small drilling programme to provide information on the thickness and structure of the coal seams.

REFERENCES

Dawson (1887); Cairnes (1908,1910); Bostock (1936a); Campbell (1967); Speelman (1971b); Milner and Craig (1973); Marchand et al. (1979).

21. CARMACKS SOUTH COAL AREA

OTHER NAMES: TANTALUS MINE; Yukon Minfile - 115I/ 01, 02; Campbell (1967) # 29; Ricketts (1985) # 44, 45, 49; Ricketts (1988) # 45a.

LOCATION AND ACCESS

Latitude: 62°05'N, Longitude: 136°15'W in NTS 115I/1. Located immediately southwest of the village of Carmacks, adjacent to the Klondike Highway. Remains of the old Tantalus Mine can be seen along the south bank of the Yukon River just to the east of the highway bridge.

HISTORY

Originally staked in June 1903 by C.E. Miller as coal lease No. 7623. The geology of the area was first mapped by Cairnes between 1906 and 1908 at a scale of 2 miles to the inch. The area was re-mapped by Bostock in 1931-43 at 4 miles to the inch as part of Carmacks map-area. Bostock's map was re-interpreted by Tempelman-Kluit in 1974 following extensive fieldwork in adjacent areas.

Five Fingers Coal Company began underground development at the Tantalus Mine in 1904, and production was reported as approx. 2,700 t in 1905, 4,700 t in 1906 and 9,000 t in 1907. Much of this early production was used by the river steamers, but because of difficulty in distributing the coal to fuelling points up and down the river they soon reverted to wood fuel. The mine continued to produce a few thousand tons per year for domestic heating in Dawson until 1918, after which production dropped to a few hundred tons per year. The underground workings had reached a fault beyond which the coal could not be located, and in 1922 the mine was closed in favour of development of the Tantalus Butte Mine 5 km to the north.

Yukon Coal Company acquired the property along with the other assets of Five Fingers Coal Company in 1947. The coal is reported to be burning underground in the old mine workings, apparently ignited by a forest fire in the 1950's. In December 1965 Anvil Mining Corporation staked four coal mining leases (Nos. 2949, 2951, 2953 and 2954) around the Yukon Coal property, and in 1966-67 they carried out an exploration program consisting of geological mapping, trenching and shallow "airtrac" rotary drilling in an area to the southeast of the old Tantalus mine. Anvil later acquired the Yukon Coal property. In 1970 Norman Ursel and Associates briefly examined the area and sampled the coal in one of Anvil's trenches. In September 1970 Teslin Exploration acquired three coal exploration licences in the area (No. 15 - 115 I/1, NE ; No. 16 - east half of 115 I/1, NW ; and No. 17 - 115 I/1, SE). In 1971 they drilled one diamond drill-hole about 4 km southeast of the old Tantalus mine and encountered coal with coking characteristics. In 1972 they prepared a geological map based upon aerial photograph interpretation, and in 1973 they drilled a second hole parallel to the first in order to obtain further samples for analysis. In November 1973 Teslin Exploration staked four coal mining leases (Nos. 2965 and 2967-69) south and east of the Anvil property.

In March 1976 Cyprus Anvil staked a further six coal mining leases (Nos. 2969-74) south and east of the Teslin leases, and in June of that year they acquired an option on the Teslin leases. In 1976-77 Cyprus Anvil carried out an exploration program consisting of geological mapping, trenching, 1,280 m of diamond drilling in seven holes, sample analysis, induced polarization, gravity, resistivity and electromagnetic surveys. This was followed up in 1979-80 with 3,365 m of rotary-percussion drilling in 32 holes, trenching and sample analysis.

DESCRIPTION

Coal seams occur at several horizons within the Tantalus Formation of Upper Jurassic to Lower Cretaceous age. The Tantalus consists predominantly of quartz- and chert-pebble conglomerate with minor sandstone, siltstone, mudstone and coal horizons, and is at least 730 m thick in this area.

In the Tantalus Mine workings Cairnes described three closely-spaced seams dipping 24 to 40° to the east, with average thicknesses as follows: Upper seam - 0.9 m; Sandstone - 2.1 m; Middle Seam - 2.0 m; Sandstone - 1.2 m; Lower Seam - 2.3 m.

The coal exposed in trenches and diamond drill-holes to the southeast of the old Tantalus Mine averages about 6 m in thickness and has an average dip of about 70° to the northeast. It does not consist of a single seam, but is made up of a number of seams, each one being lenticular and impersistent with rapid lateral variations in thickness. The coal seams intersected in most of the rotary drill-holes are apparently rather thin and of poor quality. None of the seams exposed in trenches and drill-holes belong to the same horizon as that formerly mined at the Tantalus or Tantalus Butte Mines.

COAL QUALITY

In 1908 Cairnes provided the following analyses for samples from within the underground workings:

SEAM:	Bottom	Middle	Top
Moisture (%)	0.75	0.76	0.82
Ash (%)	20.43	15.9	8.03
Volatiles (%)	23.61	24.74	25.12
Fixed Carbon (%)	55.21	58.60	66.03

In 1972 Hacquebard used petrographic analysis to show that the lower and middle seams were together equivalent to the Main Seam at Tantalus Butte (Carmacks North coal area). The coal consists of 7 to 44% vitrinite and apparently lacks coking characteristics. However the Tantalus seam is higher in rank than the Main Seam at Tantalus Butte - Medium Volatile Bituminous as opposed to High Volatile B Bituminous - and this difference is attributed to the presence of about 300 m of strata belonging to the Carmacks Volcanics overlying the coal measures on Carmacks South but absent on Carmacks North.

Coal samples from Teslin Exploration's 1971 diamond drill-hole gave the following results:

Sample Number	1	2	3	4
Moisture (%)	0.48	0.51	0.29	0.54
Ash (%)	37.06	35.24	1.51	11.64
Volatiles (%)	19.37	20.60	28.71	26.49
Fixed Carbon (%)	43.09	43.65	69.78	61.67
Free Swelling Index	5.5	9	6.5	9
Vitrinite Reflectance (R_o max %)	0.96	1.10	1.06	0.98

These samples were found on petrographic analysis to consist of about 98% vitrinite (ash-free basis), hence there was some doubt that the samples were fully representative of the coal seams. Additional samples were obtained from a second hole drilled in 1973, and the floats at S.G. 1.5 gave the following results:

Sample Number	1	2
Moisture (%)	0.79	0.63
Ash (%)	15.66	13.53
Volatiles (%)	28.40	29.50
Fixed Carbon (%)	55.15	56.28
Sulfur (%)	0.67	0.58
Vitrinite (%) (ash free)	87	92
Vitrinite Reflectance (R_o max %)	0.96	0.97

These results indicate a rank of High Volatile A to Medium Volatile Bituminous. It was concluded that this coal would not form a good coke on its own, but when washed could be blended with other western Canadian coals to produce a metallurgical quality coke.

During the 1976 exploration program coal was sampled from selected drill-hole intersections; five-foot core samples were combined as "seam composites" in order to give a representative analysis of the full coal seam intersection. In addition the composites were float-sunk to yield 8% ash in the floats in order to simulate washing the coal. Some of the

results were as follows (air-dried basis):

Composite Number	A-3	T-5	T-7	T-8	T-9	T-10
Moisture (%)	0.49	0.81	0.93	0.54	0.46	0.58
Ash (%)	27.02	23.06	21.91	29.00	40.35	51.13
Volatiles (%)	21.26	21.46	21.84	22.12	18.04	16.55
Fixed Carbon (%)	51.23	54.67	55.32	48.34	41.15	31.74
Sulphur (%)	---	0.63	0.53	0.69	0.74	0.65
Calorific Value (BTU/lb)	10,710	11,040	11,420	10,270	8,310	6,290
Calorific Value (J/g)	24,910	25,680	26,560	23,890	19,330	14,630
Free Swelling Index	6.5	0.5	6	6.5	4	0.5
Yield at 8% ash (%)	---	55	52	39	30	14

It was determined by petrographic analysis that the vitrinite content of selected samples was between 42 and 66%, and that the lower FSI values observed in some composites was due to the oxidation of the vitrinite. Thus this coal horizon can be characterized as a high-ash coking coal.

During the 1979-80 exploration program rotary cuttings were sampled from selected coal seam intersections. Most such intersections proved to be very high in ash (28 to 65%, dry basis, although these values are not directly comparable with values obtained from diamond drill core). The coal was found to range in rank from Low Volatile Bituminous to Meta-anthracite. The high rank of the anthracite and meta-anthracite coal seams was attributed to thermal alteration associated with felsic volcanics and/or sills locally present within the sequence.

Thus the coal quality data obtained to date indicate that the coal present on Carmacks South varies widely in composition, rank and quality. Vitrinite content ranges from 7 to 92%, and hence both coking and non-coking coals are present. Rank varies from High Volatile B Bituminous to meta-anthracite, and ash content ranges from 1.5 to 65%.

RESERVES

In 1976 Cyprus Anvil estimated inferred recoverable reserves of about 780,000 t in one small area where thick coal seams were exposed in trenches. No reserve calculations have been made for the remainder of the property.

POTENTIAL FOR DEVELOPMENT

Substantial quantities of both coking and non-coking coal are present within Carmacks South coal area, however the high ash contents of much of the coal, and consequent low yields on washing, indicate that large-scale mining to produce coking coal is unlikely to be economic within the foreseeable future. Large-scale mining to produce thermal coal could become economic in the future if users are equipped to burn high-ash coal (e.g. a small-scale power plant with fluidized bed combustion equipment). There is probably some potential for a small-scale mining operation supplying coal locally for domestic and commercial purposes. The high vitrinite content of much of the coal indicates this area could be suitable for *in-situ* gasification.

Advantages

- 1) Readily accessible and close to established infrastructure (village of Carmacks, Klondike and Campbell Highways, power grid)
- 2) Relatively close to potential markets (180 km to both Whitehorse and Faro)
- 3) Coking coal present - could be blended with other coals from western Canada to produce metallurgical grade coke

Disadvantages

- 1) High to very high ash content of much of the coal
- 2) Further exploration work required to define reserves suitable for mining
- 3) Limited size of deposit area - limited reserve potential

RECOMMENDATIONS FOR FURTHER WORK

- 1) Further trenching, drilling and quality testing would be required to define reserves for mining either by open pit or underground
- 2) Preliminary engineering studies would be required to determine the technical feasibility of mining and to determine mining methods
- 3) Preliminary economic studies required to determine a first estimate of coal cost
- 4) Base line environmental studies

REFERENCES

Cairnes (1906, 1908a, 1908b, 1910); Cairnes et al. (1913); Bostock (1936); Bell (1956); Campbell (1967); Speelman (1970); Hacquebard (1972); Nandi and Montgomery (1972, 1974); Milner and Craig (1973); Craig and Laporte (1972); Tempelman-Kluit (1974b); Craig and Milner (1975); Sinclair and Gilbert (1975); Russell (1977); Hill (1977, 1978a); Morin et al. (1977, 1980); Marchand et al. (1979); Adamson (1980); Tempelman-Kluit et al. (1981); Yukon Exploration and Geology (1981,1983,1984).

22. CARMACKS NORTH COAL AREA

OTHER NAMES: TANTALUS BUTTE MINE; Yukon Minfile - 115I/ 03; Campbell (1967) # 30; Ricketts (1985) # 46.

LOCATION AND ACCESS

Latitude: 62°05'N, Longitude: 136°15'W in NTS 115I/1. Located at Tantalus Butte, approximately 6 km northeast of Carmacks near the junction of the Klondike and Campbell Highways.

HISTORY

Originally staked in October 1905 as coal lease No. 16536 by C.E. Miller, with an additional lease (No. 19203) staked in August 1906 by Miss E. Eisenbeiser. The geology of the area was first mapped by Cairnes between 1906 and 1908 at a scale of 2 miles to the inch. The area was re-mapped by Bostock in 1931-34 at 4 miles to the inch as part of Carmacks map-area. Bostock's map was re-interpreted by Tempelman-Kluit in 1974 following extensive fieldwork in adjacent map-areas.

The Tantalus Butte Mine was opened in 1922 by Five Fingers Coal Company. The mine is reported to have produced from 300 to 900 tons per year from 1923 to 1938, most of which was used for domestic heating in Dawson. In 1947 Yukon Coal Company was incorporated as a wholly-owned subsidiary of Territorial Supply Company (itself a subsidiary of United Keno Hill Mines Ltd.), acquired all the assets of Five Fingers Coal Company, and reopened the Tantalus Butte Mine in order to supply coal to silver mines at Elsa and Calumet. In 1964 Yukon Coal staked one coal mining lease (No. 2941, renumbered No. 2959 in 1969) north of their crown-granted lots. In December 1965 Anvil Mining Corporation Ltd. staked four coal mining leases (Nos. 2950, 2952, 2955, 2956) surrounding the Yukon Coal property. In 1967 the boilers at Elsa were converted to oil firing, and on January 1, 1968 the coal mine was closed. From 1948 to 1967 inclusive the mine produced about 129,000 t of coal, most of which was used at Elsa and Calumet. Some shipments were also made to the Cassiar Asbestos mine during the 1950's, and small shipments were made to Dawson and Whitehorse for domestic heating purposes.

Late in 1968 negotiations began between Anvil Mining Corporation and United Keno Hill for the supply of coal to the Faro operation, and the Tantalus Butte Mine was reopened in 1969. The assets of Yukon Coal Company were transferred to Anvil on January 11, 1972.

In September 1970 Teslin Exploration Ltd. acquired three coal exploration licences in the area (No. 15 - 115 I/1, NE ; No. 16 - east half of 115 I/1, NW ; No. 17 - 115 I/1, SE). In September 1973 they drilled two holes approximately 5 km north of the Tantalus Butte Mine, but encountered only thin coaly partings. In December of that year they staked

two coal mining leases (Nos. 2963 and 2966) north of the Anvil property and relinquished their licences.

During 1971-73 Anvil carried out a surface and underground exploration program, including an electromagnetic survey, surface and underground geological mapping, trenching, a cross-cut and 294 m of underground diamond drilling in 6 holes. This work resulted in the discovery of a greatly thickened coal seam at outcrop about 2 km north of the underground portal, and in 1975 a small open pit was started in this area. About 20,000 t were mined from this pit each year by a contractor during the summer. In 1976 Cyprus Anvil acquired an option on the Teslin leases, and during 1976-77 carried out extensive exploration of the entire property including geological mapping, trenching, 15 short "airtrac" rotary holes, 1,789 m of diamond drilling in nine holes, a lease survey, aerial photography and photogrammetry, trial induced polarization, gravity, resistivity and electromagnetic surveys, 3,477 m of rotary drilling in 42 holes, and sample analysis. Early in 1978 a fire started by spontaneous combustion in an old part of the underground mine, and the workings were abandoned and sealed off. All subsequent production was from the open pit. From 1969 to 1981 inclusive total mine production was approximately 370,000 t of coal, nearly all of which was used for plant heating and concentrate drying at the Anvil Mine.

DESCRIPTION

Coal seams occur at several horizons within the Tantalus Formation of Upper Jurassic to Lower Cretaceous age. The Tantalus consists predominantly of quartz- and chert-pebble conglomerate with minor sandstone, siltstone, mudstone and coal horizons, and is at least 300 m in thickness in this area. Cairnes described three seams 2.6 m, 3.0 m and 2.1 m thick on the south face of Tantalus Butte, referred to by mine personnel as hangingwall seam, main seam and footwall seam respectively. A fourth seam was discovered in 1976 at the top of the Butte. Other seams were found by trenching and drilling to the east of the open pit, but it is not known for certain if these are new seams or are folded and/or faulted repetitions of the previously known seams.

So far only the "Main Seam" has proved to be of mineable thickness and quality and to demonstrate lateral persistence, and this seam has been mined extensively underground and in the open pit. In the underground workings the main seam varies from 2.1 to 4.3 m in thickness, dips 45 to 60° to the west, and is locally displaced by minor faults. In the open pit area the rocks are strongly deformed, having been affected by tight folds and associated faulting, and the coal is greatly thickened in fold cores and attenuated on fold limbs.

COAL QUALITY

Cairnes (1910b) provided the following analyses from outcrop samples of the three seams on Tantalus Butte (as received basis);

SEAM:	Hangingwall	Main	Footwall
Moisture (%)	13.64	16.32	12.87
Ash (%)	2.69	9.83	5.90
Volatiles (%)	31.83	31.72	31.72
Fixed Carbon (%)	51.84	42.13	49.51

Bostock (1936) provided the following analysis from the Main Seam in the underground workings:

	As Received	Dry Basis
Moisture (%)	6.1	---
Ash (%)	8.9	9.5
Volatiles (%)	31.2	33.2
Fixed Carbon (%)	53.8	57.3
Calorific Value (BTU/lb)	11,800	12,500
Calorific Value (J/g)	27,800	29,080
Sulphur	0.4	0.4

During the 1976 exploration program coal was sampled from selected drill-hole intersections and from the open pit. Five foot core samples were combined as seam "composites" in order to give a representative analysis of individual seams. In addition the composites were float-sunk to yield 8% ash in the floats in order to simulate washing the coal. Some of the results were as follows:

New Seam (composite No. T-6):

M 10.37%; Ash 35.74%; vol. 26.94%; FC 26.95%; S 0.48%; CV 12,444 J/g (5,350 BTU/lb);
Yield at 8% ash - nil.

Hangingwall Seam

Composite Number	T-1	A-1	A-2
Moisture (%)	4.87	1.81	1.95
Ash (%)	11.90	12.86	30.43
Volatiles (%)	33.02	32.57	28.87
Fixed Carbon (%)	50.21	52.76	38.75
Sulphur (%)	0.66	---	---
Calorific Value (BTU/lb)	11,250	12,350	9,500
Calorific Value (J/g)	26,168	28,723	22,097
Free Swelling Index	0	---	---
Yield at 8% ash (%)	93	---	---

Main Seam

Composite Number	T-2	T-4	T-11	C-1*
Moisture (%)	1.50	1.68	1.28	2.31
Ash (%)	14.69	16.70	16.77	8.65
Volatiles (%)	28.35	29.23	31.59	30.21
Fixed Carbon (%)	55.46	52.39	50.26	58.83
Sulphur (%)	0.52	0.45	0.62	0.50
Calorific Value (BTU/lb)	12,220	11,380	11,380	12,570
Calorific Value (J/g)	28,424	26,470	26,470	29,238
Free Swelling Index	1	0.5	1	0.5
Yield at 8% ash (%)	83	74	65	100

* Sample from open pit.

These results suggest an ASTM rank of Sub-bituminous C for the new seam, although indications were that the coal was oxidized, hence unoxidized coal could be rather higher in rank. Results from the hangingwall and main seams indicate a coal rank between High Volatile A and C Bituminous, with most samples being High Volatile B Bituminous. These two seams contain fairly good quality thermal coal with low sulphur and moderate ash

content, which can be burned as mined for many applications (i.e. preparation plant facilities should not be required).

RESERVES

In 1976 Cyprus Anvil calculated reserves of about 57,300 t in the open pit area, most of which has since been mined. In addition there were measured reserves of about 27,000 t of developed coal in the underground workings and indicated recoverable reserves of about 254,000 t between the main entry and river level which were lost when the workings caught fire and were abandoned. Because of structural complexity and lack of data on the number and continuity of seams no reserve figures are available for the remainder of the property. Substantial quantities of coal remain in the ground at Carmacks North, but further exploration work would be required to outline reserves for mining by either underground or surface methods.

POTENTIAL FOR DEVELOPMENT

Because of structural complexity, variations in the number, thickness, lateral extent and quality of the coal seams, and the apparent limited size of the deposit, any future development would likely be limited to a small-scale operation supplying local markets for domestic, commercial and industrial use. This occurrence could also supply coal for a small-scale power station located close by.

Advantages

- 1) Readily accessible and close to established infrastructure (village of Carmacks, Klondike and Campbell Highways, power grid)
- 2) Relatively close to potential markets (180 km to both Whitehorse and Faro)
- 3) Relatively good thermal coal - low sulphur and moderate ash - can be burned as mined for many applications

Disadvantages

- 1) Cheapest and most accessible coal already mined out
- 2) Additional exploration work required to define additional reserves
- 3) Limited size of deposit area - limited reserve potential

RECOMMENDATIONS FOR FURTHER WORK

- 1) Further trenching, drilling and quality testing would be required to define additional reserves
- 2) Preliminary engineering studies would be required to determine the technical feasibility of mining and to determine mining methods
- 3) Preliminary economic studies required to determine a first estimate of coal cost
- 4) Base line environmental studies

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Cairnes (1906, 1908a, 1908b, 1910); Cairnes et. al. (1913); Bostock (1936, 1938, 1939, 1941); Bell (1956); Skinner (1961, 1962); Green and Godwin (1963, 1964); Green (1965, 1966); Campbell (1967); Findlay (1967, 1968, 1969); Hacquebard (1970); Craig and Laporte (1972); Milner and Craig (1973), Tempelman-Kluit (1974b); Craig and Milner (1975); Sinclair and Gilbert (1975); Sinclair et al. (1975, 1976); Hill (1977, 1978a); Morin et al. (1977); Marchand et al. (1979, 1980); Debicki (1982); Tempelman-Kluit et al.(1981); Yukon Exploration and Geology (1981).

23. RINK

OTHER NAMES: Yukon Minfile - 115I/92;

LOCATION AND ACCESS

Latitude: 62°19'00"N, Longitude: 136°22'25"W in NTS 115I/8.

HISTORY

Reported by the Geological Survey of Canada (McConnell, 1901) but apparently never investigated.

DESCRIPTION

Coaly soil is present in an area underlain by Jurassic Laberge Group sedimentary rocks (Tempelman-Kluit, 1984).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown

24. HLAVAY

OTHER NAMES: Yukon Minfile - 115I/98

LOCATION AND ACCESS

Latitude: 62°10'11"N, Longitude: 136°14'51"W in NTS 115I/1.

HISTORY

The areas northeast and northwest of the Tantalus Butte Mine were acquired in September, 1970 as coal exploration licences 15 and 16 respectively by Teslin Exploration Ltd. Teslin carried out mapping and conducted test geophysics in 1970-72 and drilled two holes (84 m) in 1973. Two coal leases (2963 and 1966) were staked by Teslin in November, 1973.

The Cliffside Agate claim (YA86840) was staked 2 km west in June, 1985 by Whitehorse Gem and Minerals Club. F. Dorward staked the Coal Agate claim (YB6928) 2 km south of the 1985 claim in August, 1987. Dorward carried out prospecting and hand trenching on both claims in 1987-88.

DESCRIPTION

The drill holes cut steep, westerly dipping strata of the Tantalus Formation on the west limb of a tight anticline (Tempelman-Kluit, 1984). The Tantalus strata contain narrow coal bands up to 9 cm thick. The coal showings gave a slight EM-16 response but were not detectable with IP (Sinclair and Gilbert, 1975, p. 120-121).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to narrow coal seams.

BIG SALMON/LABERGE AREA

25. JUMPOUT

OTHER NAMES: Yukon Minfile - 105L/ 13

LOCATION AND ACCESS

Latitude: 62°00'12"N, Longitude: 134°55'42"W in NTS 105L/2.

HISTORY

Atlas Exploration Limited acquired coal exploration licences in this area in 1969 (# 59) and conducted a mapping programme in 1970.

DESCRIPTION

Coal seams up to 5 cm thick were found in float and outcrop. The seams occur intercalated with siltstone in either the Laberge of Tantalus Formation (Craig and Laporte, 1972, p. 156; Marchand et al., 1979).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to thin coal seams

26. CLAIRE

OTHER NAMES: Yukon Minfile - 105E/ 11; Ricketts (1985) # 27.

LOCATION AND ACCESS

Latitude: 61°56'00"N, Longitude: 135°20'00" W in NTS 105E/14. An isolated outcrop

along Claire Creek, 6-8 km northwest of Claire lake (Ricketts, 1985).

HISTORY

Reported by the Geological Survey of Canada (Bostock and Lees, 1938) but apparently never investigated.

DESCRIPTION

Coal is reported to outcrop in Upper Jurassic Tantalus Formation rocks in the Claire Creek area (Bostock and Lees, 1938; Milner and Craig, 1973; Tempelman-Kluit, 1978).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

27. WALSH

OTHER NAMES: Yukon Minfile - 105E/ 12; Ricketts (1985) # 24.

LOCATION AND ACCESS

Latitude: 61°58'00"N, Longitude: 134°47'00"W in NTS 105E/15.

HISTORY

Coal float was reported in Walsh Creek prior to 1938 (Bostock and Lees, 1938). Limited prospecting was carried out in the area by Anvil Mining Corporation Ltd. in 1966. Coal exploration licence 6 was issued to Atlas Exploration Ltd. in 1969, and prospecting was carried out in 1970 (George, 1970).

A coal exploration licence was issued to Kerr Addison Mines Ltd and Canadian Natural Resources in 19 ?, followed by mapping and electro magnetic geophysical surveys (Ricketts, 1985).

DESCRIPTION

Anvil Mining located several seams of poor grade shaley coal less than 0.6 m thick. Coal float was found by Atlas Exploration for a further 6.4 km upstream, but the source was not located (Marchand et al., 1979).

Tempelman-Kluit (1978) reports shaley coal that contains Upper Cretaceous - Tertiary palynomorphs, therefore this occurrence may lie within sediments at the base of the Carmacks Group.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to thin, poor quality coal seams.

28. MASON

OTHER NAMES: Yukon Minfile - 105E/ 17;

LOCATION AND ACCESS

Latitude: 61°27'00"N, Longitude: 134°41'00"W in NTS 105E/7. The location is given as the south side of Hootalinqua (Teslin) River, about 27.4 km from its mouth and 6.4 km from Mason Landing.

HISTORY

Staked as coal lease 2731 in July, 1901 by Eugene Larose.

DESCRIPTION

The area is underlain by Tantalus Formation (unit IKt) and/or Carmacks Group (unit ETcg; Tempelman-Kluit, 1978).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

29. HOOTALINQUA

OTHER NAMES: Yukon Minfile - 105E/23; Ricketts (1985) # 25.

LOCATION AND ACCESS

Latitude: 61°36'00", Longitude: 134°51'00"W in NTS 105E/10.

HISTORY

Coal was reported in this area about 1900-1910.

DESCRIPTION

The coal bearing Jurassic Laberge Group and the Jura-Cretaceous Tantalus Formation have been mapped in this area (Allen, 1975). Tempelman-Kluit (1978) maps this area as Tantalus Formation and/or Carmacks Group (units lKt and/or ETcg).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

30. MILNER

OTHER NAMES: Yukon Minfile - 105E/ 57; Ricketts (1985) # 26.

LOCATION AND ACCESS

Latitude: 61°25'00"N, Longitude: 134°30'00"W in NTS 105E/7.

HISTORY

Reported in Milner and Craig (1973).

DESCRIPTION

An isolated outcrop of coal is reported in a poorly exposed area mapped as resistant, massive dark green basalt flows and or basalt derived greywacke and agglomerate of the Laberge Group (Tempelman-Kluit, 1978).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

31. EUGENE

OTHER NAMES: Yukon Minfile - 105L/ 4

LOCATION AND ACCESS

Latitude: 62°04'10"N, Longitude: 135°54'29"W in NTS 105L/4. The location is given as the " right limit of Lewes (Yukon) River opposite Eagle Rock, 17.6 km below Little Salmon".

HISTORY

Staked as coal lease 12370 in August, 1904 by Eugene K. Mack and as 13998 in April, 1905 by Cortland P. Mack.

DESCRIPTION

The area is underlain by sedimentary rocks of the Jurassic Laberge Group (Campbell, 1967b).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information

YUKON/PELLY RIVER AREA

32. GRENIER

OTHER NAMES: Yukon Minfile - 115I/ 25; Ricketts (1985) # 50.

LOCATION AND ACCESS

Latitude: 62°44'11"N, Longitude: 137°18'23"W in NTS 115I/11. Ricketts (1985) gives the location as 62°43'N, 137°18W, 8 km upstream from Selkirk on the west bank of the Yukon River.

HISTORY

Staked as coal lease 26391 in April, 1910 by G. Minchin and as lease 27418 in December, 1911 by G. Grenier. Grenier explored with a 9 m shaft and a short adit. Shown on old river charts as Greniers' Coal Mine. Reported by Cairnes (1913) and Bostock (1936).

DESCRIPTION

Cairnes (1913) reported " bituminous coal of good quality has recently been discovered ... in rocks apparently of Jura-Cretaceous age, underlying the basalt flows". However, only low grade shaley coal is present on dumps and caved workings (Bostock, 1936). Intrusive and volcanic rocks outcrop nearby.

COAL QUALITY

Unknown, but probably low as only shaley coal was found in the mine dumps and workings.

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown but probably limited due to low quality coal.

33. MEYERS

OTHER NAMES: Yukon Minfile - 115I/83

LOCATION AND ACCESS

Latitude: 62°04'N, Longitude: 136°04'W in NTS 115I/1.

HISTORY

Coal lease 7923 was staked in this general vicinity in June, 1903 by J.C. Chute and restaked as lease 11905 in June, 1904 by S. Meyers. The location for the coal leases was given as 6 to 18 km above Tantalus (Carmacks) and opposite Meyers wood camp.

This location was staked as the PEL claims (YA97105) in March, 1987 by Dominion Exploration Inc. (Landmark Corp.). Dominion carried out geochemical sampling in 1987.

DESCRIPTION

This area is underlain by Jurassic Laberge Group sedimentary rocks.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

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(iii) TINTINA TRENCH

INTRODUCTION

[The following introduction is summarized from Hughes and Long (1980) unless otherwise referenced]

Early Tertiary (Paleocene-Eocene) coal-bearing strata, including sandstones, conglomerates and mudstone of alluvial and lacustrine origin, occur within Tintina Trench in southern and central Yukon Territory (McConnell, 1901, 1903, 1906; Bostock, 1938, 1941, 1942; Green and Roddick, 1962; Green, 1972, 1977; Milner and Craig, 1973; Hopkins et al., 1975; Milner, 1978; Hughes and Long, 1980). Tintina Trench is a major linear structural feature along which late Cretaceous right-lateral movement on the order of 450 km has been postulated (Roddick, 1967; Tempelman-Kluit, 1970, 1977a, 1979). The late Cretaceous strike-slip displacement along with associated or subsequent dip-slip movement created a series of fault-bounded elongate basins within which clastic detritus and coal were deposited during early Tertiary time (Hughes and Long, 1980). Subsequent dip- and/or strike-slip movement deformed these sediments and resulted in the present physiographic expression of the Trench.

Although Tertiary sedimentary rocks may be present beneath surficial cover along a substantial portion of the Trench, areas of present exposure and potential coal resources are restricted mainly to the Watson Lake, Ross River and Dawson segments.

In Watson Lake map-area, exposures of early Tertiary strata are confined mainly to cutbanks along Liard and Frances Rivers, although these strata may be present over a much larger area beneath surficial deposits covering Liard Plain. Coal-bearing strata are exposed in adjacent McDame map-area along Tatsino Creek, about 50 km southeast of Watson Lake and along Rapid River, 100 km south of Watson Lake (Gabrielse, 1963a).

Near Ross River, coal-bearing sequences are well exposed on Lapie River and along Canol Road, 3 km southwest of the townsite, where they occur within tilted but relatively undeformed blocks bounded by steeply dipping faults.

In the Dawson area, between south Klondike and Chandindu Rivers slumped Tertiary deposits are covered by extensive glacial outwash and colluvium (Vernon and Hughes, 1966; Green, 1972). Exposures include a deformed sequence of siltstone, sandstone and conglomerate and thin coal seams which outcrop along a drainage ditch between North and South Klondike Rivers and a small exposure including a thin coal seam at Gates Mine on Coal Creek.

Between Chandindu River and the Alaska border surficial cover is relatively thin away from the floodplain of Yukon River. The Trench is between 2 and 5 km wide along

this segment and sparse exposures of early Tertiary rocks occur within slump scarps, along ridge crests and in stream valleys. This segment has not been affected by glaciation and comprises the largest area in the Canadian part of the Tintina Trench that is known to be underlain by Tertiary strata at shallow depth.

In Alaska, the Tertiary outcrop belt widens to between 3 and 22 km and extends along the Trench for 135 km to Woodchopper Creek. Several coal occurrences have been reported along this segment and Tertiary strata are in general more completely exposed than in the Canadian part.

Coals from each area have a distinctive rank. Watson Lake coals are of lignite A and B ranks according to the ASTM classification. Dawson coals cover the range lignite A to sub-bituminous B according to proximate analyses and from high volatile A bituminous to semi-anthracite according to vitrinite reflectance measurements. The anomalously high rank of the bituminous to semi-anthracite coals near Ross River probably relates to thermal upgrading by nearby intrusions.

Coal resource potential is limited by structural complexity, lateral variability and restricted extent of coal-bearing strata within the Trench. Limited exposure prevents useful resource estimates, however small, potentially mineable deposits are indicated near Dawson and Ross River. The structural complexity and generally low rank of the coals suggests that exploitation by current underground mining methods would be impractical. Surface mining would have to be restricted to small-scale operations and, in the Watson Lake area, economics may be adversely affected by the thick surficial deposits covering bedrock.

DAWSON AREA

The Dawson segment of the Tintina Trench, between South Klondike River and the Alaska border, is the largest part known to contain early Tertiary sedimentary rocks. This area contains the thickest coal seams observed within the Trench.

The total thickness of Tertiary strata within the Dawson segment is not known specifically; however, studies along the nearby Sixtymile River in Alaska indicate the Tertiary succession there is approximately 900 m thick, and equally divided into an argillaceous, sandy and lignitic lower portion and an upper conglomeratic portion (Prindle, 1913). Hughes and Long (1980) calculated a minimum thickness of 500 to 700 m for Tertiary sedimentary rocks in the Dawson area. Palynological data indicates the sediments are probably Eocene in age (Collier, 1903; Hollick, 1936; Green, 1972; Hopkins et al., 1975).

Dawson coals cover the range lignite A to sub-bituminous A and vitrinite reflectance values range from 0.35 to 0.45%; exceptions occur in the Coal Creek and Cape locations where the values are 0.5 and 0.74% respectively (Hughes and Long, 1980).

Between South Klondike and Chandindu Rivers, the north side of the Trench is poorly defined and the floor is mantled by extensively slumped Tertiary and/or Quaternary deposits (Hughes and Long, 1980). Bedrock exposures are rare. Northwest of Chandindu River the Trench is well-defined and varies between 2 and 5 km in width. Surficial cover is relatively thin and early Tertiary sedimentary rocks are sparsely exposed over a wide area (Hughes and Long, 1980).

In small areas at least, conditions for preservation of vegetation in peat swamps were ideal, and hence the potential for the discovery of additional thick seams, within the recessive strata along Cliff and Coal Creeks and within equivalent strata concealed elsewhere in the Trench, is good (Hughes and Long, 1980). The steep dips and structural complexity of some of these seams, however, limits the volume of near surface coal and suggests mineable deposits at any one location will be small (Hughes and Long, 1980).

Hughes and Long (1980) divided the Dawson area into four sections: 1) South Klondike River to Chandindu River, 2) Chandindu River to Fifteenmile River, 3) Fifteenmile River to Cliff Creek and 4) Cliff Creek to the U.S. border; individual coal deposits and occurrences within these areas are described below.

1) SOUTH KLONDIKE RIVER TO CHANDINDU RIVER

34. ROCK CREEK MINE

OTHER NAMES: GATES MINE, COAL CREEK, COLLIERY; Yukon Minfile - 116B/05; Campbell (1967) # 47; Ricketts (1985) # 56.

LOCATION AND ACCESS

Latitude: 64°08'02"N, Longitude: 138°56'27"W in NTS 116B/2. The mine is located on Coal Creek, a tributary of Rock Creek, and is about 11 km from the Klondike River (McConnell, 1901; Bostock, 1938).

HISTORY

Staked as coal lease 209 in August, 1898 by Mimosa J. Gates, which triggered a small staking rush. Development was commenced by the Alaska Exploration Company Ltd. about 1899. This company operated the mine until 1903 (Campbell, 1967; Milner and Craig, 1973). Workings consisted of a 122 m decline and a short drift from the 69 m point. The mine operated for about four years and supplied coal for domestic heating in Dawson City and the Klondike District. The Eureka quartz claim (12535) was staked nearby in October, 1915.

In 1937, J.D. Simpson and associates reopened the mine and drove some short exploratory workings. The property was idle in 1938 but was worked in late 1939 and 1949 by D.W. Ballentine, who sold a few tonnes of coal in Dawson (Bostock, 1941).

Larry Carlyle currently holds coal exploration licences (Y-455, Y-456) covering this area; valid until 27 September, 1996.

DESCRIPTION

Lignite seams occur within micaceous, Tertiary sandstone in the bank of a low, rounded hill (McConnell, 1901). Two seams are present, an upper seam 0.6-0.9 m thick separated by 0.1 m of claystone from a lower seam 0.9 m thick (McConnell, 1901; Campbell, 1967; Hughes and Long, 1980). The seams dip to the northeast in the drift at angles from 3-10° (McConnell, 1901). A 20 cm thick seam of sub-bituminous C coal occurs nearby and was exposed by trenching in 1978 (Hughes and Long, 1980).

COAL QUALITY

McConnell (1901) reports results from two samples: upper seam: M 18.31%, Ash 5.85%, vol. 34.96%, FC 40.88%; lower Seam: M 19.37%, Ash 9.33%, vol. 33.85%, FC 37.45%. Bostock (1938) reports results from analyses of six samples, 4 from the lower seam and 2 from the upper, as follows (dry basis): upper seam - Ash 17.9-19.0%, vol. 36.9-37.4%, FC 44.1-44.7%; lower seam - Ash 12.8-16.1%, vol. 38.5-40.5%, FC 44.1-48.7%, CV 10,510-10,880 BTU/lb, S 0.7-0.8%. Campbell (1967) gives the following results for coal from this mine (as received basis): M 30.7%, Ash 9.6%, vol. 28.1%, FC 31.6% and a gross CV of 7,540 BTU/lb (daf 12,630 BTU/lb).

Hughes and Long (1980) report the following results for a sample from the Gates Mine (20 cm thick seam?): Ash 16.8%, vol. 31.5%, FC 26.8%, CV 16.49 MJ/kg, S 0.55%. This sample had a vitrinite reflectance of 0.40% and is classified as sub-bituminous C (Hughes and Long, 1980).

RESERVES

Unkown.

POTENTIAL FOR DEVELOPMENT

It is unclear how much coal remains at the Rock Creek Mine. Green (1972) states that the deposit is unlikely to be economic again.

Advantages

- 1) Presence of seams of mineable thickness
- 2) Fairly close to Alaska Highway and the town of Dawson

Disadvantages

- 1) Limited information
- 2) Distance to markets (other than local)

RECOMMENDATIONS FOR FURTHER WORK

- 1) Surficial and underground (if possible) geological mapping to delineate the extent of the coal seams.
- 2) Trenching and/or drilling on targets defined by mapping in order to determine seam thickness, number and continuity.

35. MORRISON

OTHER NAMES: Yukon Minfile - 116B/ 88

LOCATION AND ACCESS

Latitude: 64°01'25"N, Longitude: 138°41'51"W in NTS 116B/2.

HISTORY

Four coal leases owned by F.W. Morrison, for which the staking records have not been found, were surveyed at this location in September, 1909.

DESCRIPTION

No outcrop has been mapped near the claims but a power supply ditch near the south edge reportedly exposed lignite bearing conglomerate and shale of Eocene age (Bostock, 1942).

Mortensen (1988) maps the area around this locality as unit PEst = Paleocene - Eocene fossiliferous siltstone, sandstone and conglomerate deposited in the Tintina fault zone.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

36. GIBSON

OTHER NAMES: Yukon Minfile - 116B/ 155

LOCATION AND ACCESS

Latitude: 64°08'00"N, Longitude: 139°03'00"W in NTS 116B/3.

HISTORY

Staked as coal claims in April, 1901 by J. Gibson, W.R. Melville and J.P. Snyder.

DESCRIPTION

The claims occur in an overburden covered area near the Tintina Fault and are underlain by coal-bearing Tertiary sedimentary rocks.

Mortensen (1988) maps the area around this locality as unit PEst = Paleocene - Eocene fossiliferous siltstone, sandstone and conglomerate deposited in the Tintina fault zone.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

2) CHANDINDU RIVER TO FIFTEENMILE RIVER

37. FIF

OTHER NAMES: Yukon Minfile - 116B/ 32; Campbell (1967) # 48; Ricketts (1985) # 57.

LOCATION AND ACCESS

Latitude: 64°24'18"N, Longitude: 139°51'49"W in NTS 116B/5. Locality 2 of Hughes and Long (1980).

HISTORY

Staked as coal lease 225 in October, 1898 by C. Brown and W. Johnston. Later staking in the same vicinity included lease 21465 by a Mr. McErlane in June, 1907 near the junction of McDonald Creek and Fifteenmile River and lease 16612 by Dan MacDonald in November, 1907.

DESCRIPTION

A 200 m thick section of Tertiary, coal-bearing conglomerate and sandstone is exposed in a slump scarp along the east bank of the Fifteenmile River (McConnell, 1901, 1903; MacKay, 1947; Hughes and Long, 1980, p. 9). Six coal seams ranging from 5 to 40 cm thick occur in the lower 125 m of the sequence (Hughes and Long, 1980, p.15).

Mortensen (1988) maps the area around this locality as unit PEst = Paleocene - Eocene fossiliferous siltstone, sandstone and conglomerate deposited in the Tintina fault zone.

COAL QUALITY

Three seams of coal were analyzed and yielded the following results: Ash 6.5-11.2%, vol. 25.7-34.5%, FC 24.4-32.3%, CV 13.11-18.05 Mj/kg (5635-7760 BTU/lb), S 0.24-0.29% (Hughes and Long, 1980, p. 15). Vitrinite reflectance values range from 0.42-0.58% and the coals are classified as sub-bituminous C and A (Hughes and Long, 1980, p. 15).

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to thin coal seams.

38. THANE

OTHER NAMES: Yukon Minfile - 116B/ 79; Ricketts (1988) # 81.

LOCATION AND ACCESS

Latitude: 64°17'14"N, Longitude: 139°38'37"W in NTS 116B/5.

HISTORY

Staked as coal lease 21273 in May, 1907 by J. MacDonald.

DESCRIPTION

Hughes and Long (1980, p. 8) describe a small exposure of rooted, plant-bearing claystone and siltstone along lower Thane Creek.

Mortensen (1988) maps the area around this locality as unit PEst = Paleocene - Eocene fossiliferous siltstone, sandstone and conglomerate deposited in the Tintina fault zone.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

39. CHANDINDU

OTHER NAMES: Yukon Minfile - 116B/ 66

LOCATION AND ACCESS

Latitude: 64°17'26"N, Longitude: 139°31'18"W in NTS 116B/5.

HISTORY

Staked as two coal claims in August, 1897, on a showing found earlier by J.J. Healy (for North American Transportation and Trading Ltd.) and S.J. Wilson. The claims were surveyed in March, 1900 as lots 26 and 27, Group 1.

DESCRIPTION

Mortensen (1988) maps the area around this locality as unit PEst = Paleocene - Eocene fossiliferous siltstone, sandstone and conglomerate deposited in the Tintina fault zone.

COAL QUALITY

A 1.8 m thick coal seam reportedly contains 8% ash and 50% free carbon.

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

40. JEROME

OTHER NAMES: Yukon Minfile - 116B/ 69; Ricketts (1988) # 78.

LOCATION AND ACCESS

Latitude: 64°15'23"N, Longitude: 139°31'55"W in NTS 116B/5, on a tributary of Chandindu River, 3 km east of Yukon River.

HISTORY

Staked as coal lease 227 in August, 1897 by J.J. Healey. Restaked as the Ball claim (YB4593) in December, 1987 by Homestake MI Development Company. Homestake carried out mapping and geochemical sampling in 1988 but no evidence of mineralization was found.

DESCRIPTION

Mortensen (1988) maps the area around this locality as unit PEst = Paleocene -

Eocene fossiliferous siltstone, sandstone and conglomerate deposited in the Tintina fault zone.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

41. BARETTE

OTHER NAMES: Yukon Minfile - 116B/ 78; Ricketts (1988) # 80.

LOCATION AND ACCESS

Latitude: 64°18'45"N, Longitude: 139°40'07"W in NTS 116B/5, on a tributary 4 km north of Chandindu River.

HISTORY

Staked as coal lease 17667 in February, 1906 by J. Barette.

DESCRIPTION

Mortensen (1988) maps the area around this locality as unit PEst = Paleocene - Eocene fossiliferous siltstone, sandstone and conglomerate deposited in the Tintina fault zone.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

3) FIFTEENMILE RIVER TO CLIFF CREEK

42. COAL CREEK

OTHER NAMES: SOURDOUGH MINE; Yukon Minfile - 116C/ 31; Campbell (1967) # 49; Ricketts (1985) # 58.

LOCATION AND ACCESS

Latitude: 64°27'34"N, Longitude: 140°07'02"W in NTS 116C/8. Located on the south fork of Coal Creek about 18.8 km from the Yukon River (Campbell, 1967). The mouth of Coal Creek is 9.6 km downstream from Fortymile and 80 km downstream from Dawson (McConnell, 1904; Green, 1972).

HISTORY

Coal float was discovered by William Ogilvie at the mouth of Coal Creek in 1887 and the source was located by J. McAuley in 1888. In March, 1896, Ogilvie staked the showing together with C. Constantine and C.H. Hamilton on behalf of North American Trading and Transportation Ltd. The mine was opened in 1903 and operated by Coal Creek Mining Company (Limited) until the fall of 1906 when it was sold to the Sourdough Coal Company. Development in 1903 consisted of a 19.3 km railway from the Yukon River and a 149.4 m inclined shaft (McConnell, 1904).

The coal was initially used in river boats and for domestic heating in Dawson City. By 1907, a steam generating plant had been constructed at the mine and was supplying electricity to power dredges in the Klondike and to Dawson via an overland transmission line (Green, 1972, 1977). The mine operated until at least 1913, when the generating plant was owned by Northern Light, Power and Coal Company Ltd.

In 1968 the coal rights to this area (lots 13, 16 & 22) were held by the North American Transportation and Trading Company (Milner and Craig, 1973).

Ten coal grants were later transferred to B. Levielle.

DESCRIPTION

Tertiary strata in the Coal Creek area occupy a 3 km wide belt in the Tintina Trench (Hughes and Long, 1980). Four Upper Eocene coal seams are exposed along the creek

within 800 m of the southwest side of the belt.

The seam nearest to the southwest limit of the Trench includes at least 3.0 m of coal with three thin claystone partings, exposed along the northwest side of the creek below the old mine workings (Hughes and Long, 1980). About 100 m upstream, 8.5 m of coal are exposed over a 10.5 m interval. Fourteen claystone partings, 2 to 80 cm thick, occur within this seam, and resin nodules up to 1 cm in diameter occur singly and in places form up to 60% of discontinuous, 1 to 2 cm thick layers (Collier, 1903; Hughes and Long, 1980). A minor coal seam 0.11 m thick occurs 200 m upstream within a section of poorly lithified sediments (Hughes and Long, 1980). A further 150 m upstream at least 0.6 m of coal is exposed (Hughes and Long, 1980). About 1 km upstream from this point a seam at least 1.2 m thick, split by a 20 cm claystone parting, was exposed by trenching (Hughes and Long, 1980).

Dips exposed in surface exposures are moderate; however steeper dips and folding were encountered at depth in the old workings (McConnell, 1904; Hughes and Long, 1980).

Stratigraphic relationships between the coal seams are uncertain. However, the widely separated nature of the coal exposures and the presence of coal float along the creek between the upper and lower showings and in the adjacent creek valley 3 km to the northwest suggests that coal may occur over a relatively thick stratigraphic interval in this area (Hughes and Long, 1980).

COAL QUALITY

Collier (1903) reports the following results for samples from this mine: a sample taken near the footwall of the seam - M 10.58%, Ash 19.46%, vol. 38.42%, FC 31.54%, S 0.80%; a sample taken from the middle of the seam - M 12.57%, Ash 5.91%, vol. 39.54%, FC 41.98%.

The Geological Survey of Canada (Hughes and Long, 1980) analyzed one sample from each of the four coal seams and produced the following results:

Seam Thickness (m)	3.0	8.5	0.6	1.25
Ash (%)	8.3	19.6	10.9	26.9
Volatiles (%)	35.8	29.8	26.2	26.1
Fixed Carbon (%)	36.4	32.4	31.9	26.2
Calorific Value (mJ/kg)	17.60	18.24	17.20	14.59
Sulphur (%)	1.47	0.56	0.48	0.57
Sub-bituminous Rank	A	B	B	A

RESERVES

Total production figures are lacking but the company is reported to have shipped 2000 tons of coal to Dawson in 1906 (Canadian Government, 1907; Green, 1972). Milner and Craig (1973) report that the Sourdough Mine produced 10,000 tons in 1907, but did not operate in 1909 or 1910, and in 1911 mining was resumed to provide coal for a thermal power plant.

POTENTIAL FOR DEVELOPMENT

No estimates of coal resources have been made due to the structural complexity of this area, although a small resource is probably present.

RECOMMENDATIONS FOR FURTHER WORK

The lack of exposure in this area would require the use of considerable subsurface exploration to define the extent of any coal seams.

43. CHAIN

OTHER NAMES: Yukon Minfile - 116C/ 91; Ricketts (1988) # 82.

LOCATION AND ACCESS

Latitude: 64°29'00"N, Longitude: 140°12'00"W in NTS 116C/8, on a tributary of Coal Creek, 12 km west of Yukon River.

HISTORY

Staked as coal lease 245 by C.H. Hamilton, C. Constantine and W. Ogilvie, who surveyed it in March, 1899. Ogilvie had discovered coal float at the mouth of the creek, 24 km downstream in 1887.

DESCRIPTION

Mortensen (1988) maps the area around this locality as unit PEst = Paleocene - Eocene fossiliferous siltstone, sandstone and conglomerate deposited in the Tintina fault zone.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

44. LONG

OTHER NAMES: Yukon Minfile - 116C/ 138

LOCATION AND ACCESS

Latitude: 64°28'17"N, Longitude: 140°08'52"W in NTS 116C/8.

HISTORY

Coal float was reported at this locality by the Geological Survey of Canada (Hughes and Long, 1980).

DESCRIPTION

Mortensen (1988) maps the area around this locality as unit PEst = Paleocene - Eocene fossiliferous siltstone, sandstone and conglomerate deposited in the Tintina fault zone.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

45. CLIFF CREEK MINE

OTHER NAMES: Yukon Minfile - 116C/ 30; Campbell (1967) # 50; Ricketts (1985) # 59.

LOCATION AND ACCESS

Latitude: 64°32'51"N, Longitude: 140°27'21"W in NTS 116C/9, about 88 km below Dawson on Cliff Creek, a tributary to the Yukon River (McConnell, 1901; Campbell, 1967).

HISTORY

Staked as coal lease 215 by W.F. Cornell in September, 1895 and developed by the North American Trading and Transportation Co. with two adits and a number of drifts and raises by 1900. The coal was transported to the Yukon River on a short rail road and was used for domestic heating in Dawson and on river boats until the mine closed in 1903. The surrounding area was acquired as coal exploration licence 1 in 1968 by Selwyn Exploration Ltd., Selwyn did not carry out any work on this property.

As of 1982 North American Trading still held four leases on the main property plus a fifth 2.4 km to the northwest.

DESCRIPTION

Coal seams in the Cliff Creek area are found within a 4 km wide belt of Tertiary, probably Eocene, strata (Hopkins et al., 1975; Mortensen, 1988). Three seams are exposed along the creek banks within moderately to steeply dipping sedimentary rocks. Two of the seams have been explored by underground workings (McConnell, 1901).

The lower adit, on the west bank of Cliff Creek, intersected 7.2 m of coal with three thin claystone partings that appear to dip 40° to the north (McConnell, 1901, 1904; Milner and Craig, 1973; Hughes and Long, 1980).

The upper adit, located 500 m upstream on the east bank, intersected a 12 m thick coal zone that dips steeply westward. In a section measured within a trench across this zone 12.9 m of coal was recorded over an 18.4 m stratigraphic interval (Hughes and Long, 1980).

McConnell (1901) states that " the dip of the beds in the lower workings is much less than in the upper, and in places they are almost horizontal".

The third seam is exposed in a steep creek bank 400 m downstream from the lower adit on the east side of the creek (Milner and Craig, 1973; Hughes and Long, 1980). The third seam is a 3 m thick coal zone that dips steeply to the southeast (Hughes and Long, 1980).

Lack of coarse clastic sedimentary rocks in association with the coal suggest it was deposited in relatively quiet, swampy environments (Hopkins et al., 1975).

COAL QUALITY

McConnell (1901) reports the following results: Upper working - M 8.57%, Ash 3.62%, vol. 42.04%, FC 45.77%; Lower working - M 10.58%, Ash 2.58%, vol. 40.10%, FC 46.74% (also in Collier, 1903).

Results of proximate analyses carried out by the Geological Survey of Canada are as follows (Hughes and Long, 1980):

Sample	Lower Adit	Upper Adit	Third Seam
Ash (%)	3.6	11.4	6.6
Volatiles (%)	32.6	31.4	31.7
Fixed Carbon (%)	34.4	29.7	30.3
Calorific Value (mJ/kg)	18.27	15.45	16.76
Sulphur (%)	0.69	0.65	1.13
Vitrinite Reflectance (R _o max %)	0.46	0.36	0.38
Rank	Sub-bituminous	Lignite	Lignite

Coal from the lower adit has a vitrinite reflectance value of 0.46% and is described as sub-bituminous; the upper adit and third seam have reflectance value of 0.36% and 0.38% respectively and are classified as lignites (Hughes and Long, 1980).

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

The steep dips of the coal seams, rugged topography of the area and relatively low rank of the coals suggest that economic potential of the area is limited. Extent of the area of deposition is, however, not indicated by the limited exposures.

RECOMMENDATIONS FOR FURTHER WORK

Considerable subsurface exploration would be required to define the extent of known coal seams and for the discovery of additional reserves.

46. LEDUC

OTHER NAMES: Yukon Minfile - 116C/ 77; Ricketts (1988) # 79.

LOCATION AND ACCESS

Latitude: 64°32'39"N, Longitude: 140°20'53"W in NTS 116C/9.

HISTORY

Staked as coal lease 3792 in December, 1901 by L. Leduc. Ten other leases were staked nearby soon afterward.

DESCRIPTION

Mortensen (1988) maps the area around this locality as unit PEst = Paleocene - Eocene fossiliferous siltstone, sandstone and conglomerate deposited in the Tintina fault zone.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

47. JEPHSON

OTHER NAMES: Yukon Minfile - 116C/ 93; Ricketts (1985) # 83.

LOCATION AND ACCESS

Latitude: 64°33'15"N, Longitude: 140°29'14"W in NTS 116C/9, 3 km northwest of Yukon River.

HISTORY

Incomplete records from the government files indicate that T.C. Healy surveyed a coal lease at this location in June, 1899. The staking records and work history have been lost.

DESCRIPTION

Mortensen (1988) maps the area around this locality as unit PEst = Paleocene - Eocene fossiliferous siltstone, sandstone and conglomerate deposited in the Tintina fault zone.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

4) CLIFF CREEK TO U.S. BORDER

48. CAPE

OTHER NAMES: Yukon Minfile - 116C/ 39; Ricketts (1985) # 60.

LOCATION AND ACCESS

Latitude: 64°34'40"N, Longitude: 140°34'43"W in NTS 116C/10, on a small tributary just north of the Yukon River and 13 km northwest of the Yukon - Coal Creek junction. Locality 3 of Hughes and Long (1980).

HISTORY

Coal was reported at this locality by the Geological Survey of Canada (Hughes and Long, 1980, p. 10).

DESCRIPTION

A partially exposed, moderately dipping (13 to 40°) sequence of Tertiary conglomerate and sandstone about 200 m thick contains a one metre thick coaly horizon. The coal seam has three claystone partings totalling 30 cm and occurs near the middle of the section (Hughes and Long, 1980).

Mortensen (1988) maps the area around this locality as unit PEst = Paleocene - Eocene fossiliferous siltstone, sandstone and conglomerate deposited in the Tintina fault zone.

COAL QUALITY

Proximate analysis of the coal yielded the following results: Ash 14.9%, vol. 30.7%, FC 35.4%, CV 17.91 MJ/kg (7649 BTU/lb), S 0.53% (Hughes and Long, 1980). It has a vitrinite reflectance value of 0.74% and is classified as high volatile bituminous B (Hughes and Long, 1980).

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited by thin coal seams.

49. ST PAUL

OTHER NAMES: Yukon Minfile - 116C/ 10; Ricketts (1985) # 61.

LOCATION AND ACCESS

Latitude: 64°38'13"N, Longitude: 140°44'24"W in NTS 116C/10, on a small tributary north of the Yukon and 23 km northwest of the Yukon - Coal Creek junction. Locality 6 of Hughes and Long (1980, p. 11).

HISTORY

Coal was reported at this locality by the Geological Survey of Canada in 1979 (Hughes and Long, 1980).

DESCRIPTION

A thin coal seam is contained in Lower Tertiary sandstones and conglomerates at least 300 m thick (Hughes and Long, 1980, p. 11). The seam comprises 35 cm of coal and carbonaceous claystone and occurs within a recessive interval near the middle of the section.

Mortensen (1988) maps the area around this locality as unit PEst = Paleocene - Eocene fossiliferous siltstone, sandstone and conglomerate deposited in the Tintina fault zone.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited by thin coal seams.

5) BLACKSTONE RIVER

50. THORNBACK

OTHER NAMES: Yukon Minfile - 116B/ 62; Ricketts (1988) # 77.

LOCATION AND ACCESS

Latitude: 64°50'28"N, Longitude: 138°25'20"W in NTS 116B/16.

HISTORY

There are early reports by natives of coal float in this vicinity. Described by C. Thornback of the RCMP in his 1914-15 diary as follows: " Indians named the Blackstone (River) because of the deep, extensive seams of coal on both sides of the canyon. It looked like the land had split, forming a long gorge and deep river bed between high vertical walls 30 m apart. Lying upon the river ice were many large lumps of coal recently split away from the cliffs, evidently by frost expansion."

DESCRIPTION

The Blackstone River cuts an extensive sequence of middle Devonian to Carboniferous sedimentary rocks that include black shale, argillite and slate, black platy limestone and chert with minor chert pebble conglomerate (Green and Roddick, 1962; Green, 1972). The coal reported by Thornback is probably carbonaceous shale.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

PELLEY RIVER AREA51. NEEDLEROCK

OTHER NAMES: Yukon Minfile - 115I/ 18; Campbell (1967) # 44; Ricketts (1985) # 52.

LOCATION AND ACCESS

Latitude: 62°49'29"N, Longitude: 136°12'26"W in NTS 115I/16, near Needlerock Creek and Granite Canyon, east of Pelly River.

HISTORY

Described by the Geological Survey of Canada in 1902 but apparently never investigated (McConnell, 1903, p. 38).

DESCRIPTION

Impure lignite occurs in Tertiary (Bostock, 1936) sedimentary rocks near the mouth of Granite Canyon on the Pelly River (McConnell, 1903, p. 38).

Tempelman-Kluit (1984) maps the area around this locality as Carmacks Group.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

52. TOWHATA

OTHER NAMES: Yukon Minfile - 115I/ 17; Campbell (1967) # 43; Ricketts (1985) # 51.

LOCATION AND ACCESS

Latitude: 62°44'34"N, Longitude: 136°26'15"W in NTS 115I/9. Located on an easterly branch (Ptarmigan Creek) of Mica Creek about 13 km from Pelly (McConnell, 1903; Bostock, 1936). Ricketts (1985) gives the location as 62°43'N, 136°16'W.

HISTORY

Explored by shafting by Mica Creek Mines, prior to 1902 (McConnell, 1903, p. 38).

DESCRIPTION

Lignite float was reported in Mica Creek and a shaft is reported to have intersected several seams of lignite (McConnell, 1938, p. 38). Bostock failed to locate the shaft in 1934 and suggested that the coal may have been in glacial drift (Bostock, 1936, p. 63-64). The nearest outcrops are more than 5 km away and are composed of Paleozoic (?) metamorphic rocks.

Tempelman-Kluit (1984) maps the area around this locality as glacial drift.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

53. FISHHOOK RAPIDS

OTHER NAMES: Yukon Minfile - 105L/ 35; Campbell (1967) # 42.

LOCATION AND ACCESS

Latitude: 62°28'46"N, Longitude: 134°09'26"W in NTS 105L/8.

HISTORY

Coal lease 4386 was staked in April, 1902 by A.M. Capwell on the Pelly River 0.4 km downstream from the mouth of Glenlyon River.

DESCRIPTION

Coal has been mapped in this area by Bostock (1950) and Mackay (1947) in conglomerates in the Tintina Trench. It is however believed to be Mesozoic (Campbell, 1954; Milner and Craig, 1973).

Nearby outcrops are composed of Paleozoic metasedimentary rocks (Campbell, 1967b).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

54. DUO

OTHER NAMES: Yukon Minfile - 105L/ 36; Campbell (1967) # 45; Ricketts (1988) # 88.

LOCATION AND ACCESS

Latitude: 62°53'04"N, Longitude: 135°24'33"W in NTS 105L/14, on Macmillan River, 5 km east of the confluence with Kalzas River.

HISTORY

Coal is reported to occur at this locality but no claims have ever been recorded.

DESCRIPTION

Located in an area of overburden; nearby outcrops consist of Mississippian or later Anvil Range Group strata, including carbonaceous shale (Campbell, 1967b).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

ROSS RIVER AREA

In the Ross River area coal-bearing rocks are exposed along Lapie River and near Ross River townsite. They occur within two fault bounded blocks referred to as the Lapie River and Ross River blocks (Hughes and Long, 1980). The geometry of these fault blocks is uncertain owing to extensive surficial cover, hence other areas underlain by early Tertiary strata may be present in this vicinity.

Strata in the Lapie and Ross River blocks show gross coarsening upward trends, from shale at the base to conglomerate at the top, and are of comparable thickness (Hughes and Long, 1980). However, the absence of marker horizons and specific playnological age data precludes direct correlation of the two sections.

Coal rank, as determined from vitrinite reflectance, is markedly higher in the Ross River area than within equivalent lithologies elsewhere in the Trench. The elevated rank is probably due to local heating related to intrusions emplaced at relatively shallow depths (Hughes and Long, 1980).

55. LAPIE RIVER BLOCK

OTHER NAMES: TRENCH; Yukon Minfile - 105F/ 47; Campbell (1967) # 41; Ricketts (1985) # 28; Ricketts (1988) # 28a.

LOCATION AND ACCESS

Latitude: 61°57'20"N, Longitude: 132°35'33"W in NTS 105F/15 (Campbell, 1967).

HISTORY

Discovered by the Geological Survey of Canada in 1945 and staked as the Bill claims (Y3593) in March, 1966 by J. Mullen. The south side was restaked as the Grand claims (YA81848) in May, 1984 by Hudson Bay Mining who carried out mapping and geochemical sampling in 1984 and 1985 and a magnetics survey in 1986.

In 1987, the claims were sold to a joint venture between Noranda, Brenda Minerals Ltd. and Golden Nevada Resources Inc. They conducted geochemical and airborne geophysical surveys later in 1987. Prime Capital Corp. staked the Ran claims (YB9169) to the northeast and southwest in November, 1987 and optioned them to Argo Development Corp. who carried out mapping, soil sampling and airborne geophysical and ground magnetic surveys in 1988.

The 1984 and 1987 staking was directed towards a possible strike extension of Tertiary sedimentary and volcanic rocks associated with the Grew Creek occurrence (Yukon Minfile occurrence - 105K/ 09). Most of the Ran claims are underlain by Paleocene glacial till which covers Paleozoic limestone and phyllite.

DESCRIPTION

Coal occurs in a partially exposed 400 m thick section of Paleocene or Eocene sedimentary rocks along the Lapie River. The section, which is in fault contact with older rocks, is an erosional remnant in the floor of the Tintina Trench (Kindle, 1946). Overall the section coarsens upwards, dips southwest at 25-30° and is composed of sandstone, shale and conglomerate.

The lowermost 120 m of the section is dominated by laminated claystone and siltstone and contains two, thin lenticular coal seams with a maximum thickness of 0.3 m (Hughes and Long, 1980). Towards the top of the section is a thin, 0.1 m thick, coal seam.

COAL QUALITY

Hughes and Long (1980) report the results of proximate analyses, for a sample collected from a 0.3 m thick seam in the Lapie River block, as follows: Ash 10.4%, vol. 28.4%, FC 57.5%, CV 29.66 MJ/kg, S 0.8%. This sample has a vitrinite reflectance value

of 1.06% and is classified as high volatile bituminous A, this is significantly higher than elsewhere in the Tintina Trench (Hughes and Long, 1980).

The maceral content of a sample from the 0.3 m thick seam is: 100% Vitrinite-Huminite (Hughes and Long, 1980).

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to thin, lenticular coal seams.

56. ROSS RIVER BLOCK

OTHER NAMES: WHISKEY LAKE; Yukon Minfile - 105F/ 48; Campbell (1967) # 41; Ricketts (1985) # 28; Ricketts (1988) # 28a.

LOCATION AND ACCESS

Latitude: 61°58'30"N, Longitude: 132°31'50"W in NTS 105F/15.

HISTORY

Discovered during the construction of the highway in 1964 and staked in January, 1966 as the Coal claims (98412) by G. Harris and I.L. Foster (Findlay, 1967; Milner, 1973). The showing was sampled in 1966 by H.S. Bostock for Atlas Exploration Ltd. The coal rights were acquired as coal exploration licences 2984-2986 in April, 1980 by Cyprus Anvil Mining Corporation, who drilled 13 percussion holes (1520 m) later that year.

In 1986, Nadahini Mining Corporation opened a small pit mine to supply coal for drying concentrate at the Curragh Resources mill at Faro. Production totalled about 17,000 tonnes in 1986 and 20,000 tonnes in 1987. Nadahini carried out over 730 m of reverse circulation drilling in 1987 to increase reserves and over 15,240 m in 1988 (INAC, 1989). Production of 10,000 tonnes was recorded for 1988 (INAC, 1989) and about 40,000 tonnes were mined in 1989 (INAC, 1990).

Partly overstaked as the HWY claims (YB13226) in April, 1988 by Noranda Exploration Ltd.

Nadahini Mining Corporation presently holds coal mining leases (2984, 2985, 2986)

for this area; valid until 17 April, 2001.

DESCRIPTION

Coal is exposed in two road cuts (west and east) about 2 km apart and occurs in a fault-bounded erosional remnant of Eocene (Hopkins, 1979) sedimentary rocks flanked by much older rocks (Hughes and Long, 1980). The sedimentary rocks dips southwest at 10 to 30°, are at least 400 m thick, and are composed of sandstone, shale and conglomerate (Hughes and Long, 1980).

Two coal seams 3.0 and 1.2 m thick are exposed at the west locality; five seams 0.3 to 2.65 m thick are exposed at the east locality (Hughes and Long, 1980). The 1980 drilling indicated that better widths are present.

COAL QUALITY

An analysis by the Department of Mines in 1966 gave a calorific value of 12,920 BTU/lb.

Hughes and Long (1980) report the results from proximate analyses of 7 samples from the Ross River block, 4 from the east part and 3 from the west, as follows: East - Ash 11.1-31.9%, vol. 18.4-25.6%, FC 28.6-58.1%, CV 13.28-25.94 MJ/kg, S 0.23-0.33%; West - Ash 10.6-25.7%, vol. 20.0-22.9%, FC 38.2-58.0%, CV 17.83-26.30 MJ/kg, S 0.31-0.55%. In the west part the samples were collected from seams ranging in thickness from 1.20 to 3.02 m; in the east the seams are 0.65 to 2.65 m thick (Hughes and Long, 1980).

Vitrinite reflectance values for coals in the east of the Ross River block range from 1.51-1.70%; in the west reflectance values are 1.86-2.03 (Hughes and Long, 1980). Coal rank ranges from low volatile bituminous to semi-anthracite, this is markedly higher than elsewhere in the Tintina Trench (Hughes and Long, 1980; DIAND, 1987).

The maceral content of coals in the Ross River block was studied by Hughes and Long (1980) and reported as follows: West (3 m thick seam) - 59.8% Vitrinite-Huminite, 30.6% Semi-Inertinite, 9.6% Inertinite; East (2.65 m thick seam) - 75.4% Vitrinite-Huminite, 11.7% Semi-Inertinite, 12.9% Inertinite.

RESERVES

Hughes and Long (1980) calculated the following geological resource using the 2.7 m thick coal seam exposed in the east section of the Ross River block (Canol Road), a dip of 30°, and a continuity of 1 km:

Depth of cover:	0-50 m	Inferred Resources:	370,000 tons
	0-100 m		740,000 tons
	0-150 m		1,100,000 tons

DIAND (1987) describe the reserves as "a few hundred thousand tonnes".

POTENTIAL FOR DEVELOPMENT

Small, potentially mineable coal deposits are present in the Ross River area. The coal has a high calorific value, moderate ash level and few partings making it a suitable fuel for thermal-electric generation (Hughes and Long, 1980).

The east section of the Ross River block (Canol Road) is the most promising area as it contains a 2.7 m thick seam of bituminous coal (Hughes and Long, 1980). Additional resources are possible at the west section of the Ross River block, however, the deformed nature of the seams at the surface prevents a meaningful resource estimate (Hughes and Long, 1980). Some potential exists for the discovery of coal seams within covered parts of the Lapie River section; however, the extensive surficial cover away from the river suggests potential resources for surface mining are limited (Hughes and Long, 1980).

Advantages

- 1) Good quality, low sulphur, bituminous coal
- 2) Close to existing infrastructure and local markets
- 3) Thin surficial cover will make surface mining feasible

Disadvantages

- 1) Small size of deposit
- 2) Distance from markets (other than local)

RECOMMENDATIONS FOR FURTHER WORK

Geological mapping, plus trenching and/or drilling to delineate reserves more accurately and define the extent of the known seams.

57. CAMPBELL CREEK

OTHER NAMES:

LOCATION AND ACCESS

Latitude: 61°42'N, Longitude: 131°W in NTS 105G/10.11 (Campbell, 1967).

HISTORY

Keele (1910) reports "quantities of drift lignite ... along the lower part of Campbell Creek but the seams ... not found".

DESCRIPTION

This coal occurrence is located in an area mapped as alluvium (Wheeler et al., 1960; Tempelman-Kluit, 1977b). Outcrops nearby are mapped as Devonian and Mississippian chert pebble conglomerate with minor interbedded black slate that grades into graphitic, siliceous phyllonite (Templeman Kluit, 1977b).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

58. CAROLYN

OTHER NAMES: Ricketts (1988) # 87.

LOCATION AND ACCESS

Latitude: 62°02'N, Longitude: 131°47'W in NTS 105J/4, on a small tributary of the Ross River.

HISTORY

Reported by the Geological Survey of Canada (Gordey and Irwin, 1987).

DESCRIPTION

The area around this locality is mapped as glacial and alluvial deposits (Roddick and Green, 1961; Gordey and Irwin, 1987; Gordey and Irwin, 1987). Gordey and Irwin (1987) indicate a coal showing (# 16) at this location.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

WATSON LAKE REGION

Watson Lake lies near the centre of Liard Plain, a southeast trending intermontane basin of low relief some 175 km long and 50 km wide (Hughes and Long, 1980). Glacial and lacustrine deposits up to 60 m thick cover most of the area (Klassen, 1978). Alluvial deposits adjacent to major rivers are up to 100 m in thickness (Klassen, 1978). Exposures of underlying bedrock are limited to cutbanks along Liard and Frances Rivers and to exploration trenches west of Liard River. Some bedrock exposures are highly deformed by tectonic and glacial processes, and those along river cutbanks are commonly slumped (Hughes and Long, 1980).

Paleocene (?) or Eocene (?) sedimentary rocks containing lignite occur in an elongate, northwest-southeast, trough along the Liard River (Morin et al., 1980). The trough is approximately 50 km long and 20 km wide. Airborne geophysical data indicates that the thickest portion of the trough is located around Dodo Lakes and Upper Liard (Borovic, 1977).

The sediments are composed of classical fining upward sequences of unconsolidated material deposited in fluvial environments (Jenkins, 1979). The sequences average 5 to 15 m thick for a total thickness of at least 180 m (Jenkins, 1979). Texturally the sediments range from boulder gravels to silty clays and organic clays and coals (Jenkins, 1979).

The fining and thinning upward sequences exposed in the Watson Lake area are atypical of strata exposed within the Trench, *sensu stricto* (Hughes and Long, 1980). They resemble point bar sequences produced by Meandering streams, or could possibly have a point bar origin (Hughes and Long, 1980). Frequent flood events are indicated by the high ash content of some of the Watson Lake coals, and by the abundance of mudrocks.

Preliminary palynological data indicates the strata in the trough are Upper Paleocene or possibly lowest Eocene (W.S. Hopkins in Borovic, 1978).

Coal-bearing strata are extensively deformed by tectonic and glacial processes in surface exposures. Results from drilling indicate flat lying strata at depth. However, due to the difficulty in recognizing bedding in the core these indications could be in error and deformation in the subsurface could be more like that seen in surface exposures. If moderate to high subsurface deformation prevails, variable and steep dips will restrict the

volume of near surface coal at any one locality and delineation of mineable deposits will require extensive close-spaced drilling.

59a,b,c,d,e WATSON LAKE

OTHER NAMES: Includes : MIDDLE CANYON, DODO, ALBERT, SAWMILL, CAROL; includes Yukon Minfile Occurrences 105A/ 07, 08, 09, 36, 37; Campbell (1967) page 14; Ricketts (1985) # 20.

LOCATION AND ACCESS

The area covers NTS 105A/2,3 and 6 and includes coal exploration licences 61, 62 and 66 to 71 (now expired). Licences 66 to 71 extend to 60°00' to the south, 60°17.5' to the north, 129°30' to the west and 129°00' to the east. Licences 61 and 62 extend to 60°00' south, 60°7.5' north, 129°00' west and 128°30' east.

The area is traversed by the Alaska and Campbell highways. A main logging road passes through the coal basin and the town of Watson Lake is in the centre.

HISTORY

The presence of coal was first noted in 1887 by G.M. Dawson (Dawson, 1888, 1898; Lord, 1944) who reported impure and laminated lignite beds up to 0.9 m thick. Part of the area on 105A/2 was first staked as the Sun claims (Y27513) in May, 1968 by R. Kirk. Mr. Peters held part of the area on 105A/3 under lease 2948 in the late 1960's. C. Sporer staked the Carol claims (Y27509) in May, 1968 over part of the area covered by licence 61.

Coal exploration licences 61 and 62 were acquired by Canex Placer Limited in October, 1976; licences 66 to 71 were acquired in October, 1977. Canex carried out mapping and trenching in 1977, drilled 3 holes (416 m) in 1978 (Morin et al., 1980), and 7 holes (923.6 m) in 1979. All holes were electrically logged. In 1979 Barringer Magenta Limited, on behalf of Placer, carried out a surface geochemical sampling programme to test for volatile hydrocarbons, produced by underlying coal seams, trapped in soils (Jenkins, 1980).

Coal exploration licence 61 was reissued as 113 in October, 1979 to Placer Development.

DESCRIPTION

Coal is known to occur in 6 areas around Watson Lake:

Area 1)

The thickest exposure of coal-bearing rocks occurs on the east side of the Liard River

2 km below its junction with Rancheria River (Yukon Minfile 105A/ 09; locality 1 of Hughes and Long, 1980, p.4). Eighty metres of poorly indurated claystone, siltstone, sandstone and minor pebble conglomerate are exposed at this locality (Hughes and Long, 1980). Dips steepen southward within this section from 9 to 82°. These rocks are sharply truncated and overlain by horizontally stratified gravels of possible fluvo-glacial origin (Hughes and Long, 1980). Five coal seams between 0.4 and 2.1 m thick and several thinner coaly beds are present at locality 1. Canex Placer carried out mapping and sampling of this area in 1977-78 (Borovic, 1977, 1978).

Area 2)

North of area 1, two bedrock exposures and coal float occur along the east side of Frances River 10 km above its junction with Liard River (Yukon Minfile 105A/ 37; Locality 2 of Hughes and Long, 1980, p. 5). Very little bedrock is exposed here and the outcrops may be within slump blocks; observed dips are less than 10° (Hughes and Long, 1980). A 0.34 m thick woody coal seam occurs at the northern end of this area; at the southern end there is a 0.30 m thick seam (Hughes and Long, 1980). This area is contained within coal exploration licence 70 acquired by Placer Development in 1977, and mapped and sampled in 1977 and 1978 (Borovic, 1977, 1978).

Area 3)

Located on the west bank of Liard River 2 km south of the Alaska highway bridge (Yukon Minfile 105A/ 08; Locality 3 of Hughes and Long, 1980, p. 5). A deformed 2 m thick coal seam is exposed. This seam may have been structurally thickened by ice movement and/or tectonism (Hughes and Long, 1980). A coal seam at least 0.30 m thick occurs 1 km to the southeast where it is exposed in a roadcut (Hughes and Long, 1980). This area was acquired by Canex Placer in 1976 as licence 61 (later renewed as licence 113) and explored with mapping and trenching and drilling between 1977 and 1979 (Borovic, 1977, 1978; Jenkins, 1979, 1980).

Drill data indicates the coal seams range in thickness up to approximately 15 m including all splits and dirty coal. The best drill hole (LC-2) had an aggregate thickness of coal seams (> 1 m thick) of about 17 m, contained within a 48 m thick stratigraphic section (Jenkins, 1979 and 1980). The top of this interval lies 56 m below the surface. The coal beds are lenticular in cross section and persistence of a single bed or sequence of beds throughout the basin is not to be expected (Jenkins, 1979).

Based on the correlation of coal seams between drill holes, the structure of the sedimentary rocks is flat with a maximum dip of 2-5° northeast (Jenkins, 1979).

Area 4)

Located 6 km east of area 3 on the north bank of the Liard River (Yukon Minfile 105A/ 07; Locality 4 of Hughes and Long, 1980, p. 5). A 1.5 m thick seam has been exposed by trenching. The seam dips 35° north, but may have been rotated due to slumping (Hughes and Long, 1980). This area was acquired as part of licence 61 in 1976 by Canex Placer who trenched, and drilled one hole in 1977 (Borovic, 1977, 1978).

Areas 5) and 6)

Located west of the Liard River south of its junction with Rancheria River (Yukon Minfile 105A/ 36; Localities 5 and 6 of Hughes and Long, 1980, p. 5). At area 5) a seam 0.5 m thick is exposed in a trench within a sequence of complexly deformed sedimentary rocks (Hughes and Long, 1980). Three coal seams 0.1 to 0.45 m thick are exposed in a trench at area 6), 2 km southeast of area 5). These beds dip east at 20°, overlying strata are complexly deformed, possibly by ice movement (Hughes and Long, 1980). Placer Development carried out trenching at these localities in 1977, along with mapping and sampling in 1977 and 1978 (Borovic, 1977, 1978).

COAL QUALITY

Area 1)

The coal is of lignite rank, resin nodules up to 1 cm in diameter occur singly and in lenticular layers up to 2 cm thick within some seams (Hughes and Long, 1980, p. 4). Four samples from locality 1 (Hughes and Long, 1980) yielded the following results: Ash 7.5-41.5%, vol. 18.1-32.1%, FC 8.5-21.2%, CV 5.81-12.72%, S 0.45-1.40%. Vitrinite reflectance values range from 0.26-0.32%. Results from a sample collected from a 0.20 m thick coal seam, 1 km north of locality 1 (Hughes and Long, 1980, p. 14) are: Ash 29.3%, vol. 27.5%, FC 14.5%, CV 9.78 MJ/kg, S 0.59%, with a vitrinite reflectance value of 0.28%.

Area 2)

The coal is of lignite rank with vitrinite reflectance values of 0.23-0.30%. The maceral content of a sample from this area indicates the following composition: 89% Vitrinite-Huminite, 10% Exinite, 0.2% Semi-Inertinite and 0.8% Inertinite (Hughes and Long, 1980). Proximate analyses of two samples from this area gave the following results: Ash 7-13.8%, vol. 28.2-39.6%, FC 19.2-25.8%, CV 12.24-17.44 MJ/kg, S 0.37-0.54% (Hughes and Long, 1980).

Area 3)

Physically the coal consists of dark brown to black, very finely divided organic matrix; varying amounts of wood chips, charcoal and grass or leaf fragments comprise the remainder of the carbonaceous material (Jenkins, 1979).

Three diamond drill holes completed in 1977 intersected coal. Hole 1 intersected 7.7 m of coal and clay which yielded the following results (dry basis): Ash 53.26%, vol. 41.77%, FC 4.97%, CV 4987 BTU/lb, S 0.58% (Borovic, 1978). Density and gamma ray logs indicate the lower 3 m of this seam have decreased ash content. Hole 2 intersected a 16.6 m thick seam with 7 partings from 0.2 to 1.1 m thick, plus five other seams 1.2 to 2.2 m thick. Within the 16.6 m thick seam results from proximate analyses (dry basis) range from: Ash 8.62-40.76, vol. 34.13-51.68, FC 25.11-40.13, CV 6562-10,706 BTU/lb, S 0.17-0.31 (Borovic, 1978). Hole 3 intersected three seams 2.1, 1.2 and 6.9 m thick (Borovic, 1978). Results from proximate analyses of the 6.9 m seam range from (dry basis): Ash 16.61-69.55, vol. 23.07-50.6, FC 7.38-34.45, CV 3647-10,222 BTU/lb, S 0.1-0.39.

Hughes and Long (1980) report the following results for proximate analyses of two samples from area 3: Ash 5.7-6.2%, vol. 27.2-30.2%, FC 17.3-20.1%, CV 11.04-15.01 MJ/kg, S 0.15-0.16; vitrinite reflectance values are 0.13-0.21 and the samples are classified as peat.

Area 4)

Hughes and Long (1980) report the following results for proximate analysis of one sample: Ash 4.7%, vol. 31.6%, FC 20.6%, CV 12.94 MJ/kg, S 0.17%; with a vitrinite reflectance of 0.11%, this sample is classified as peat.

Areas 5) and 6)

The results for one sample were reported by Hughes and Long (1980) from locality 6: Ash 12.7%, vol. 32.7, FC 22.4%, CV 14.69 MJ/kg, S 1.25%; with a vitrinite reflectance value of 0.30%, the coal is classified as lignite.

Proximate analyses for samples from 12 coal outcrops throughout the coal area indicate that the rank of Liard coal ranges from lignite to sub-bituminous B, results range from (dry basis): Ash 8.21-56.61%, vol. 30.84-55.92%, FC 12.55-39.91%, CV 4130-10,052 BTU/lb. S 0.19-1.09% (Borovic, 1977).

Arithmetic means of analytical data for 17 samples from drill holes 79-3, 79-4 and 79-5 yielded the following results (as received basis): M 28.64%, Ash 19.15%, CV 5348 BTU/lb, S 0.2% (Jenkins, 1979).

RESERVES

Using a maximum cut off of 25% and a minimum width of one metre, all holes except LC-2 have overburden to coal ratios exceeding 10:1 (Jenkins, 1980). LC-2 has a ratio of 5:1 at a minimum depth of 56 m. However, the area within which this coal is potentially mineable is restricted by facies changes, the presence of the Alaska Highway and a river channel (Jenkins, 1980). The tonnage of coal potentially available from the area of LC-2 is 5 to 10 million tonnes (Jenkins, 1980).

POTENTIAL FOR DEVELOPMENT

Several factors limit the size of potential coal deposits in the Watson Lake area. These include structural complexity, surficial cover and coal quality and geometry (Hughes and Long, 1980).

Glacial and alluvial cover is thick and widespread in many parts of Liard Plain and unless very thick seams are defined, unfavourable strip ratios will restrict surface mining to areas where surficial cover is thin (Hughes and Long, 1980).

Coal seams are of lignite rank; their low heating value coupled with high ash in some seams will limit practical mining depths and strip ratios. The depositional setting of the coals suggests individual seams will prove to be lenticular and laterally restricted (Hughes

and Long, 1980).

Potential mining of the coal is limited by facies changes, the presence of the Alaska Highway and river channels. The unconsolidated nature of the sediments would allow easy removal however, the low bearing strength of unconsolidated material increases the quantity of overburden to be removed due to the requisite flat pit wall slopes (Jenkins, 1980). The problem is compounded by the presence of groundwater with a high hydrostatic head (Jenkins, 1980).

The high ash content and low calorific value indicate that the coal is an inefficient fuel for a power station (Jenkins, 1980). However, the presence of thick, higher quality coal in the drill holes lends credence to the expectation that significant tonnages of higher quality coal will be encountered elsewhere in the basin (Jenkins, 1980).

Advantages

- 1) Close to transportation routes
- 2) Unconsolidated nature of sedimentary rocks would allow easy removal
- 3) Presence of coal seams of mineable thickness

Disadvantages

- 1) Lenticular, discontinuous coal seams
- 2) Unconsolidated nature of sedimentary rocks will require flatter pit walls
- 3) High ash content of coal
- 4) High moisture content - reduces the effective calorific value of the coal, due to latent heat loss (Jenkins, 1980).
- 5) High stripping ratio (> 10:1) of most of the coal

RECOMMENDATIONS FOR FURTHER WORK

For a deposit to be mineable, favourable conditions of low dip, thick seams and thin surficial cover must be met. The prospects of such conditions occurring over large enough areas to define major deposits in the Watson Lake area are not good. Much subsurface exploration will be required to delineate mineable deposits (Hughes and Long, 1980).

Reconnaissance mapping and drilling are needed elsewhere in the basin to define sufficient reserves of higher quality coal than are now indicated.

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(iv) INDIAN RIVER AREA

Tertiary (?) strata are exposed south of Tintina Trench along Indian River and its tributaries, Ruby and McKinnon Creeks, and further west along Yukon and Sixtymile Rivers (Green, 1972; Bostock, 1942; Tempelman-Kluit, 1974; Milner, 1978; Hughes and Long, 1980).

These strata are lithologically similar to the Trench fill, and include moderately to well-indurated conglomerates, sandstones and thin coal seams intercalated with and overlain by volcanic rocks (Hughes and Long, 1980). These sedimentary rocks and overlying volcanic rocks of the Carmacks Group are nearly flat-lying, with dips of 10° or less (Milner, 1978; Hughes and Long, 1980).

It is not clear whether or not these sedimentary rocks are related to those in the Tintina Trench. Although sedimentary rocks in the Indian River area are lithologically similar to the Tertiary sedimentary rocks in the Tintina Trench, Green (1972) suggests that they are "... restricted both in source area and sedimentation to the topographic depression along Tintina Trench".

A study by Lowey (1984) of sedimentary rocks south of the Tintina Trench in the Indian River area, defined the Indian River and Sixtymile Formations. The Indian River Formation consists of 500 m of conglomerate, sandstone, shale and minor (2%) coal deposited in a marginal marine basin by a southward prograding fan-delta complex. The coal is black, sub-bituminous and occurs in very thin and very thick beds. Palynological information indicates the Indian River Formation was deposited during the middle Albian; and is thus chronostratigraphically equivalent to the upper part of the Tantalus Formation (Lowey, 1984).

The Late Maastrichtian to Early Paleocene Sixtymile Formation consists of 200 m of interbedded conglomerate, sandstone and shale with minor tuff and limestone, and intercalated basalt flows (Lowey, 1984).

The formation was deposited in a restricted, nonmarine basin by a northward flowing braided-meandering river system and a southward prograding alluvial fan complex. Lowey (1984) assigned this formation to the lower part of the Carmacks Group.

Lowey (1984) suggests that the Tantalus and Indian River Formations were deposited in a successor basin to the Whitehorse trough in the Late Jurassic - Early Cretaceous. This successor basin subsequently evolved into a series of restricted nonmarine basins by Late Cretaceous to Paleogene time (Sixtymile Formation and unnamed strata).

Tempelman-Kluit (1974) describes sandstone, shale and conglomerate (unit eTCcg) in which "thin shale partings and local lignite seams" are common. These clastic strata underlie and are intercalated with volcanic rocks of the Carmacks Group. Lowey (1984) describes the Sixtymile Formation as being the same as unit eTCcg of Tempelman-Kluit

(1974) however, no mention of coal is made. It is unclear whether Tempelman-Kluit included the rocks defined as the Indian River Formation by Lowey (1984) in his definition of unit eTCcg.

From the above it would appear that the coal in the Indian River area is part of the middle Albian Indian River Formation and is thus time equivalent to the upper Tantalus Formation and is not related to the Tertiary deposits of the Tintina Trench.

The predominance of coarse sedimentary rocks in exposures observed in the Indian River area suggests that associated coal seams are likely to be lenticular and restricted in extent, hence the presence of significant coal reserves is unlikely (Hughes and Long, 1980).

The known coal occurrences in the Indian River area are described below.

60. RUBY CREEK

OTHER NAMES: HAYSTACK MINE, NIGGERHEAD; Yukon Minfile - 1150/ 53; Ricketts (1985) # 54 and 55.

LOCATION AND ACCESS

Latitude: 63°40'00"N, Longitude: 139°14'04"W. Located 40 km south-southwest of Dawson, coal exploration license #101 occupied the northeast quarter of NTS 1150/11. The old mine site is located on Ruby Creek, a tributary of Indian River (MacLean, 1914; Campbell, 1967; Hughes and Long, 1980).

Access to the area is by helicopter or by four-wheel drive vehicle from Dawson (Adamson, 1980).

HISTORY

Staked as coal lease 1212 in October, 1900 by S. Cord, who drove a short adit which was caved when visited by the Geological Survey of Canada in 1903 (McConnell, 1904; Milner and Craig, 1973). Restaked as coal lease 9466 in September, 1903 by D. McKinnon, who surveyed it in 1913. The coal rights were reacquired as coal exploration license # 101 in March, 1978 by Yukon Revenue Mines Limited and optioned to Cyprus Anvil Mining Corporation. In 1980 Cyprus Anvil completed three diamond drill holes, totalling 316 m. Proximate analyses were carried out on the only significant coal seam intersected.

DESCRIPTION

Early prospectors traced a coal seam in pits for a length of about 1 km and exposed a thickness of 2 m in one pit (MacLean, 1914).

Hughes and Long (1980) report that at the old mine site a 1.05 m thick coal seam underlain by claystone is exposed. Milner (1978) traced this seam for 0.8 km and reported a northwest dip of 10°. Drilling by Cyprus Anvil intersected one coal seam 1.5 m thick within about 100 m of sedimentary rocks. The seam is cut by diabase dykes, that locally metamorphose the coal.

Drilling indicates the sedimentary sequence consists of thinly interbedded mudstone, sandstone and minor conglomerate, overlain by Carmacks Group andesitic volcanics and underlain by porphyritic felsic volcanics (Adamson, 1980). The sediments are characterised by rapid, lateral facies changes.

COAL QUALITY

Adamson (1980) reported the following results for proximate analysis of the coal seam intersected during drilling (dry basis): Ash 45.0%, vol. 7.7%, FC 47.3%, CV 6,922 BTU/lb, S 0.41%.

Vitrinite reflectance measurements (3%) indicate the coal is anthracite indicating extreme thermal upgrading probably caused by a nearby dyke which fed the overlying flows (Hughes and Long, 1980).

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

The presence of only one seam, rapid lateral facies changes and the predominance of coarse sediment suggests this area has limited potential (Adamson, 1980; Hughes and Long, 1980).

61. MCKINNON CREEK

OTHER NAMES: BRITANNIA.

LOCATION AND ACCESS

Latitude: 63°42'N, Longitude: 139°06'W in NTS 1150/11 on McKinnon Creek, a tributary of Indian River (Granger, 1975). Haystack Mountain is three miles to the south.

HISTORY

The Britannia Claim was located in 1899 by Donald McKinnon and his brother

(Granger, 1975) who dug shafts and adits on what was to become the Britannia Crown Grant claim. This area has been examined for its gold potential by a number of companies.

In 1975, Yukon Revenue Mines Limited carried out a drilling programme on the property (Kin Claims) and encountered a coal seam in one of the drill holes (Granger, 1975).

DESCRIPTION

Eocene (?) sediments underlie Tertiary flows of the Carmacks Group (Granger, 1975). The upper portion of the sediments is composed of sandy, poorly consolidated rock with at least one coal seam 3 to 4.6 m thick (Granger, 1975; Milner, 1978; Hughes and Long, 1980). The lower portion of the sediments is comprised of conglomerate. Granger (1975) describes the base of the conglomerate as roughly horizontal.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown, but probably limited due to the predominance of coarse sediments.

62. HUNGRY

OTHER NAMES: Yukon Minfile - 116C/ 18;

LOCATION AND ACCESS

Latitude: 64°02'16"N, Longitude: 140°45'57"W in NTS 116C/2.

HISTORY

Coal was reportedly found by placer miners at this locality in the early 1900's but no staking records have been found. This area has been examined mainly for its gold potential.

DESCRIPTION

Mortensen (1988) describes lignite at this locality in unit 1Kst.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

63. CRUIKSHANK

OTHER NAMES: Yukon Minfile - 115O/ 84; Ricketts (1988) # 89.

LOCATION AND ACCESS

Latitude: 63°33'16"N, Longitude: 139°45'53"W in NTS 115O/12. The location is given as the first rock bluff on the west side of the Yukon River upstream from Sixtymile River.

HISTORY

Staked as coal exploration licence 28159 in July, 1912 by L.C. Cruikshank.

DESCRIPTION

Nearby outcrops have been mapped as schist (Bostock, 1942) but a small erosional remnant of coal-bearing Carmacks Group conglomerate may be present in this area.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

64. SVENN

OTHER NAMES: Yukon Minfile - 115N/ 28.

LOCATION AND ACCESS

Latitude: 63°32'56"N, Longitude: 140°27'08"W in NTS 115N/9.

HISTORY

Found during placer operations in Matson Creek (Cockfield, 1921, p. 52).

DESCRIPTION

Lignite float was reportedly found in Matson Creek and some of its tributaries (Cockfield, 1921, p. 52). The area surrounding this locality is mapped as Carmacks Group (Tempelman-Kluit, 1973); therefore, the coal was probably derived from a sedimentary horizon at the base of the Carmacks volcanics.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

65. SIXTYMILE

OTHER NAMES: Ricketts (1985) # 53.

LOCATION AND ACCESS

Latitude: 63°45'N, Longitude: 140°10"W in NTS 116C/2, along Sixtymile River, 5-15 km south of the junction with Fiftymile Creek.

HISTORY

Reported by the Geological Survey of Canada (Ricketts, 1985).

DESCRIPTION

Mapped as sandstone and conglomerate with minor thin, lignite seams that underlie and interfinger with Carmacks Group volcanics (Tempelman-Kluit, 1974). These sediments are probably correlative with non-marine clastic and volcanic rocks along Indian River (Lowey, 1981).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

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(v) ROCK RIVER AREA

66. ROCK RIVER

OTHER NAMES: SULPETRO; Yukon Minfile 095D/ 26; Ricketts (1985) # 5; Ricketts (1988) # 5a.

LOCATION AND ACCESS

Latitude: 60°42'00"N, Longitude: 127°13'00"W in NTS 095D/11. Located about 110 km northeast of Watson Lake in the Rock River valley. Access to the area is by helicopter. Quartz Lake, 40 km to the southwest, may be suitable for fixed wing operations.

HISTORY

There is no record of coal exploration in this area prior to 1980.

In July 1980 employees of Saint Joseph Exploration Limited discovered coal float and 9 m coal exposure in a tributary of the Rock River. Subsequently Saint Joseph, which changed its name to Sulpetro Minerals Limited in May 1981, acquired coal exploration licences 115 to 122 at the end of July, 1980. Coal licences 115, 116, 119 and 120 were relinquished in August, 1981; licences 117, 118, 121 and 122 were retained. Sulpetro conducted mapping and carried out preliminary analyses of coal in 1980. In 1981 Sulpetro completed 5 diamond drill holes totalling 717.81 m, on a spacing of 0.9 to 1.5 km. Geophysical logging (density, gamma ray and neutron) and coal analyses were carried out on all holes (DIAND, 1985). Significant coal was intersected in drill holes 1 and 2, only minor coal was intersected in other holes (Miller, 1982). Sulpetro conducted a geophysical (gravity) survey in 1982 which revealed several anomalous areas (Wright, 1982; DIAND, 1983, 1985; Wright and Miller, 1985). Coal Licence 118 was reissued in July, 1983 as licence 353.

Breakwater Resources Ltd. currently holds coal exploration licences (Y437-Y439) in this area; valid until 28 July, 1995.

DESCRIPTION

Coal occurs within Tertiary sedimentary rocks, confined in a north-south elliptical basin about 50 km long and up to 10 km wide (defined by a gravity survey), bounded on all sides by Paleozoic rocks (Miller, 1982; Wright and Miller, 1985; Long, 1985). Most of the coal outcrop is concealed by a mantle of clay, gravel and sand, locally up to 30.5 m thick (Cholach in Miller and Harrison, 1981). Exposures of Tertiary strata are very rare, and are limited to a few outcrops of mudrock along Rock River, and a 5 m outcrop of lignite on one of its tributaries (Long, 1985).

The bulk of the Tertiary sequence encountered in the five drill holes is dark to light grey mudstone, with minor sandstone and some thick lenses of coal. All strata are fluvial in origin and can be related to specific depositional settings (table 1 in Long, 1985). The coals appear to have accumulated in association with a stable channel fluvial system (Long, 1985).

The coal occurs as a number of thick seams (up to 4.7 m thick) separated by unlithified clay beds and a few beds of silt and sand. The coal outcrop located on licence 118 (Miller, 1982) has an apparent westward dip of 15° and is overlain by 24 m of clay, sand and gravel.

COAL QUALITY

Three samples collected from the Rock River area yielded the following results (air dried basis; Miller and Harrison, 1981): Sample 1 - Moisture 9.66%, Ash 11.65%, vol. 42.08%, FC 36.61%, CV 9,129 BTU/lb, S 0.79%; Sample 2 - Moisture 6.98%, Ash 8.91%, vol. 47.04%, FC 37.07%, CV 9,461 BTU/lb, S 0.81%; Sample 3 - Moisture 5.62%, Ash 10.14%, vol. 48.77%, FC 35.77%, CV 9,801 BTU/lb, S 1.03%.

Average results for the drill holes are (dry basis; Miller and Harrison, 1981): hole #1 - Ash 33.56%, vol. 34.98%, FC 31.44%, CV 7777 BTU/lb, S 1.90%; hole #2 - Ash 39.41%, vol. 32.74%, FC 27.85%, CV 7017 BTU/lb, S 2.51%; hole #3 Ash 42.23%, vol. 32.28%, FC 25.49%, CV 6650 BTU/lb, S 1.59%; hole #4 Ash 52.88%, vol. 25.82%, FC 21.3%, CV 5316 BTU/lb, S 2.74%.

Long (1985) describes the majority of coal samples as "bright woody coal" which generally forms in forest swamp environments where sustained water levels have inhibited oxidation. Dull coal associated with marsh and swamp environments was reported from holes 3 and 4; in hole 5 dull coal was deposited on top of a splay sequence (Long, 1985).

Miller (1981) describes the coal as mainly dull, dark brown to black with minor resinous black material. It contains about 3% amber pellets in the lower part.

RESERVES

Based on the upper portions of drill holes 1 and 2, coal reserves within 80 m of surface are approximately 60 million tonnes with a thermal content of 6645 BTU/lb (15.45 Mj/kg) at an equilibrium moisture (26.3%), with 17.6% Ash, and 1.09% Sulphur, classified as lignite A to sub-bituminous C (Miller, 1982; Wright and Miller, 1985).

The gravity survey outlined six anomalous areas and two partially defined weak anomalies, these geophysical results indicate a potential for up to 1.5 Billion tonnes.

POTENTIAL FOR DEVELOPMENT

This coal would be amenable to surface mining with a stripping ratio of

approximately 2:1, waste:coal, by volume (Miller, 1982). The coal found to date is suitable for a mine-mouth coal fired electric power plant (Miller, 1982). Sufficient reserves are indicated to sustain a 200 megawatt power plant for about 40 years (Miller, 1982).

This coal is suitable for the following uses: electrical power generation, thermal uses, chemical uses, and production of synthetic fuel (Wright and Miller, 1985).

Advantages

- 1) Significant tonnage
- 2) Suitability for mine-mouth coal fired power plant
- 3) Fairly close proximity to the town of Watson Lake

Disadvantages

- 1) High sulphur content
- 2) High ash content
- 3) Lack of nearby infrastructure

RECOMMENDATIONS FOR FURTHER WORK

- 1) Extension of the gravity survey to better delimit the anomalous areas
- 2) Mapping, to check for any other surface outcrops of coal
- 3) Drilling of any anomalous areas found
- 4) Continued coal analyses to better determine quality

The high rate of lateral facies changes associated with stable channel - high constructive fluvial systems will necessitate an extensive programme of closely spaced drill holes to prove the coal reserves of this basin (Long, 1985).

67. NORTH ROCK RIVER

OTHER NAMES: Ricketts (1985) # 4.

LOCATION AND ACCESS

Latitude: 60°50'N, Longitude: 127°05"W in NTS 95D/11,14.

HISTORY

Part of Sulpetro's leases. Reported by Ricketts (1985).

DESCRIPTION

Possible lignites in alluvium mapped as Pleistocene, flanking ridges underlain by Paleozoic strata (Gabrielse and Blusson, 1969; Tempelman-Kluit et al., 1981).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

68. TRANZ

OTHER NAMES: Ricketts (1988) # 75.

LOCATION AND ACCESS

Latitude: 60°29'N, Longitude: 125°56'W in NTS 95C/5 on Beaver River.

HISTORY

The Tranz claims were staked in 1982 by ZX Joint Venture to cover a 1.5 km long strip of tufa and ferricrete gossans anomalous in zinc, nickel and cobalt (Cathro, 1982).

DESCRIPTION

This area is partly underlain by Ordovician to Devonian Road River Formation graptolitic shale, cherty shale, dolomitic siltstone, silty limestone and minor coaly beds (DIAND, 1985).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

69. MARS

OTHER NAMES: Ricketts (1988) # 76

LOCATION AND ACCESS

Latitude: 60°49'N, Longitude: 125°47'W in NTS 95C/13 near the Northwest Territories border, approx. 180 km northeast of Watson Lake.

HISTORY

Reported by Ricketts (1988).

DESCRIPTION

This area is partly underlain by Ordovician to Devonian Road River Formation graptolitic shale, cherty shale, dolomitic siltstone, silty limestone and minor coaly beds (DIAND, 1985).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to limited information

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(vi) BONNET PLUME AREA

Coal in the Bonnet Plume Basin occurs in the Upper Cretaceous - Tertiary Bonnet Plume Formation. The Upper Cretaceous, lower Bonnet Plume Formation hosts High Volatile Bituminous C coal and is exposed in the southern part of the basin. The Tertiary, upper Bonnet Plume Formation contains lignite and is exposed in the northern part of the basin.

The Bonnet Plume Basin hosts the largest coal deposit known in the Yukon with 660 million tonnes of High Volatile Bituminous C coal, present in the lower Bonnet Plume Formation.

BONNET PLUME BASIN

70-84. BONNET PLUME BASIN

OTHER NAMES: Includes MARATHON (Airstrip), CHAPPIE, BASIN, WIND CITY, SAINVILLE, LOPSTICK, POLE (Wernecke), GARLIC RING, MOUNTJOY, ILLTYD (Bonnet Plume Coal), PAN OCEAN (West Iltyd), WIND RIVER (Deslaurier), SPACESHIP, COAL AREA 10 (Cullingham); Includes Yukon Minfile occurrences 106E/13, 14, 15, 16, 17, 18, 21, 32, 33, 35, 36, 37, 38, 39; Campbell (1967) # 57; Ricketts (1985) # 30; Ricketts (1988) # 30a.

LOCATION AND ACCESS

The Bonnet Plume Basin, the centre of which is located at 65°30'N latitude, 135°00' W longitude, covers much of the central part of the Wind River map sheet (NTS106/E), northern Yukon Territory.

The Basin is a physiographic and structural depression, about 200 square miles in area, surrounded by upland terrain. It lies at the southern end of the Richardson Mountains, and is bounded on the west and south by the Wernecke Mountains and on the east by the Trevor and Knorr Ranges of the Mackenzie Mountains. The Basin is underlain by sedimentary rocks of Tertiary age containing lignitic coals (Upper Bonnet Plume Formation) in the north, and sedimentary rocks of Cretaceous age containing bituminous coals (Lower Bonnet Plume Formation) in the south.

Access is presently only by plane or helicopter. There is an airstrip near the Kiwi Lake Camp used by Pan Ocean Oil Ltd. and several lakes throughout the basin are of sufficient size and depth to allow float plane access. In the past there has been a 165 km winter road from the Keno Hill area onto the west side of the property, along the Wind River Valley. The Dempster Highway lies 130 km to the west of the property.

HISTORY

Coal-bearing rocks along the banks of the Peel, Bonnet Plume and Wind Rivers were first reported in 1893 by Count V.E. de Sainville (in Camsell, 1906). However, the first detailed description of the loosely consolidated siltstones, sandstones and coal seams was given by Camsell himself (1906). He described the section along the south bank of the Peel River between the mouths of the Wind and Bonnet Plume Rivers and noted particularly the presence of thick (ca. 13m) coal seams, one of which was burning.

In 1946 MacKay (1947) visited the known lignite occurrences along the Peel River as part of a larger programme to document the coal resources of Canada and in 1949 Bostock (1950) visited the area to study the coal resources as part of a programme to assess the mineral resource potential of the Yukon Territory.

The geology of part of the Bonnet Plume Basin has been studied by Bostock (1961), Hume (1954), Douglas and MacLearn (1963) and Norris et al.,(1963); however, the most comprehensive report on the geology of the Bonnet Plume Basin is provided by Norris and Hopkins (1977). The stratigraphy and sedimentation of the basin has been studied by Mountjoy (1967) and Long (1978) with palynological support provided by Rouse and Srivastava (1972) and Sweet (1978,1979,1980). Mountjoy (1967) gave the name Bonnet Plume Formation to the sequence and suggested that as much as 1,525 m of sediment and coal are present, consisting mainly of sandstones, with minor amounts of siltstone, conglomerate, and lignite; including three lignite seams more than five feet thick in the upper Bonnet Plume Formation on Peel River.

Norris et al. (1963) produced a geological map of NTS 106E which included the entire area of the Bonnet Plume Basin. They divided the Bonnet Plume Formation into an Upper Tertiary age portion and a Lower Cretaceous age portion. Geological mapping at a scale of 1:250,000 was published in 1975 (Norris, 1975).

Interest in the area for economic potential commenced during World War II when Stelk mapped the Bonnet Plume Basin for Imperial Oil; the area was part of the Canol project to identify possible sources of oil for use by the U.S. military. Since then the area has been explored by several oil companies interested in the oil potential. Exploration consisted of geological mapping, gravity surveys and one seismic survey across the width of the Bonnet Plume Basin. No wells have been drilled in the licence area, however, one well was drilled along the Peel River 2,000 m east of the eastern boundary of Coal Licence no. 97.

Cyprus Anvil acquired two coal exploration licences, in 1976, covering the lignite occurrences along the Peel River and carried out a reconnaissance study on the licences in 1977 (Hill, 1978). Canadian Aran Petroleum Ltd. (formerly Aran Oil and Gas Ltd.) acquired three coal exploration licences in the northwestern central portion of the basin (CL nos. 72,73,and 93).

Following the discovery of coal seams within the Lower Bonnet Plume Formation along the Wind River and Illtyd Creek and its tributaries during the 1977 field season (McKinney, 1978) Pan Ocean Oil Ltd. acquired 21 coal licences (nos. 77-92 and 94-98) covering 339,144 hectares (838, 014 acres). In 1978 reconnaissance mapping by Pan Ocean, concentrated on the Cretaceous strata of the Lower Bonnet Plume Formation in the southern portion of the basin, established twelve coal areas within the basin (McKinney, 1979). Two of the areas were drill tested and established indicated and inferred in situ coal resources of greater than 96 million tons. Four diamond drill holes were drilled for a total of 457 m (1,500 feet). In November 1978 three licences held by Aran Oil and Gas were transferred to Pan Ocean Oil Ltd. increasing Pan Ocean's control to 24 licences encompassing 387,308 hectares (957,024 acres). In 1979 a programme of follow up mapping, further reconnaissance mapping and drill testing of five of the coal areas was carried out by Pan Ocean.

Pan Ocean Oil Ltd initiated a 1980 programme to: 1) locate and define sufficient coal resources to make available 10 to 15 million tonnes per annum for export and to support a mine-mouth power plant of 210 megawatt capacity over a period of 20 to 30 years; and 2) to establish the limits of the Lower Bonnet Plume Formation so that no areas of potential coal resources would be omitted in the event that exploration licences were converted to leases.

In 1980 all twelve coal areas, defined by Pan Ocean in 1978, were drill tested. Seven of the twelve areas contain what are considered to be potential mineable resources (Pan Ocean Oil, 1981). Mapping during the 1980 programme located a new coal area containing abundant coal float and a coal showing in a tributary off and to the south of Beaver Creek in Coal Exploration Licence 150 (formerly Licence 94). This coal area (no. 13) has also been drill tested.

Nutter (1979) of Pan Ocean Oil Ltd., prepared a report on "Economic, Environmental and Socio-Economic Considerations" for the Bonnet Plume coal project.

In 1980 five environmental programs were undertaken, one short term project and four longer term ones, as follows:

a) LGL Limited (Taylor, 1981), an environmental consultant, completed an initial overview of the fisheries, wildlife and vegetation of the property which included recommendations for a variety of future studies;

b) The Yukon Territorial Government began a three year study of the caribou of the Wernecke Mountains, and included the Bonnet Plume licence area within their study region;

c) The Department of Indian Affairs and Northern Development installed a recording water level meter on Illtyd Creek;

d) Pan Ocean set up a weather station at Kiwi Lake;

e) Pan Ocean started a water quality sampling programme on Illtyd Creek and the Wind and Peel Rivers.

The first project was completed in 1980. Projects b and c were continued during

1981 and the other two continued with some modifications. The weather station was moved in 1981 and modified for better winter operation and the sampling programme modified for greater representation of sites near the Illyd Creek coal deposit.

Russell and Farnell (1981) of the Yukon Wildlife Branch produced a report for Pan Ocean Oil Ltd. on the caribou of the Wernecke Mountains. In 1982 Brown and Stephen produced a report summarizing environmental programmes completed in 1981, and outlining projects planned for 1982. Aberford Resources Ltd (Brown, 1982) produced a report summarizing the results of the water chemistry programme. This programme was established to provide baseline pre-development data describing seasonal variations in the natural constituents of the water bodies of the projected area. In 1983 Aberford Resources Ltd (Brown, 1983) produced a report summarizing environmental programmes conducted in 1982, including studies of: wildlife, weather station, stream hydrology, water chemistry, precipitation, acidity and limnology; plus projected programmes for 1983.

In 1978 the "Yukon Thermal Power Generating Study" was prepared by Monenco Consultants Limited for Pan Ocean Oil Ltd. This study provides an order of magnitude cost estimate of generated power associated with a proposed thermal plant in the Bonnet Plume area. The capital, operating and maintenance costs are estimated for a mine mouth 3 x 70 MW (net) coal fired generating station including two possible routes and two transmission line voltages to transmit power from the site to Carmacks.

A Preliminary Feasibility Mining Study was produced by Wright Engineers Limited (1981) for the Illyd Creek Deposit in the Bonnet Plume Coalfield (Project 1098), outlining a 30 year mining plan, requiring approx. 180 to 230 persons depending on the amount of coal mined.

CSA Management and Goldcorp Inc. currently hold nine coal exploration licences (Y443-Y451) covering the southern portion of the Bonnet Plume Basin; these licences are valid until 16 November, 1995.

DESCRIPTION

The Bonnet Plume Formation is a thick (1500 m+), predominantly clastic sequence, of Cretaceous and Tertiary ages, which occupies a structural depression known as the Bonnet Plume Basin (Norris and Hopkins, 1977). The basin forms a single broad northerly trending syncline, the structure of which is dominated by a series of, still active, north-northwest trending faults (Hill, 1978).

Palynological evidence indicates that there are three well-defined palynomorph assemblage zones: the lowest is mid-late Albian, zone two is Maastrichtian and zone three is Paleocene (Rouse and Srivastava, 1972). The Lower Bonnet Plume Formation rests unconformably on Permian or older age rocks within the basin. The Upper Bonnet Plume Formation appears to be separated from the Lower Bonnet Plume Formation by a structural unconformity (McKinney, 1979).

Lignite deposits occur in intimate association with conglomeratic rocks of alluvial fan and braided stream facies in both the upper (Paleocene) and lower (Albian) parts of the Bonnet Plume Formation. Conglomerate and associated coal (4-11 m thick seams) in the Paleocene part of the formation may be correlated tentatively over 15 km, between the type section on Wind River and exposures on the south bank of the Peel River (Long, 1978). Cyprus Anvil documented three thick seams of lignite in section 106-E-17, and a 25' thick seam in section 106-E-18 (Hill, 1978). Within the Lower Bonnet Plume Formation inter-related zones of siltstone, mudstone, shale and coal form recessive outcrop zones having little or no surface rock outcrop except in incised stream channels.

Pan Ocean Oil Ltd. located twelve coal areas during the 1977 field season within the Lower Bonnet Plume Formation (McKinney, 1978,1979) as follows:

- (1) Wernecke (Reserve Block A; Yukon Minfile 106E/ 21) - coal float was found in frost boils, and coal seams outcrop under a thick conglomerate in the creek;
- (2) Spaceship Creek (Yukon Minfile 106E/ 38) - a coal seam at least three meters thick outcrops above a conglomerate; 50 m north, coal float occurs in a cut-bank suggesting the presence of a second, stratigraphically higher, seam;
- (3) Illyd Creek Southwest - float in frost boils indicates the presence of four coal seams occurring stratigraphically below those in areas 1 and 5;
- (4) Illyd Creek Northwest - two coal seams, one three meters thick and the other one meter thick, were located in outcrop along the banks of Illyd Creek; coal also occurs in frost boils throughout this area;
- (5) Illyd Creek East (Reserve Block B) - this area has the same stratigraphic sequence as area 1; two coal seams outcrop at the base of a cliff in Illyd Creek;
- (6) Koubasa Lake - coal float was noted in some scattered frost boils;
- (7) Garlic Ring Lakes (Yukon Minfile 106E/ 32) - an outcrop of coal at least three meters thick occurs at the base of a conglomerate bed; coal float in a gulley suggests a lower seam;
- (8) Wind River (Yukon Minfile 106E/ 37) - a series of coal outcrops occur below a sandstone cap, with seam thicknesses ranging from 2 to 4 m;
- (9) Wind River Southeast - one surface occurrence of burnt coal was found;
- (10) Wind River Northeast - possible coal float was seen in frost boils;
- (11) Upper Wind River - a possible coal seam was noted from the air;
- (12) Lower Illyd Creek - coal seams occur along the west side of the creek.

The presence of at least 5 coal horizons, occurring in a 250 m interval within the middle unit of the Lower Bonnet Plume Formation, is indicated from drilling. All are considered to have economic potential. The coal horizons are numbered in sequence from youngest to oldest reflecting the order in which they were encountered by drilling.

No. 1 seam: occurs throughout the southern end of the basin. The horizon varies from a maximum thickness of 8.0 m in the Wernecke deposit to 2.0 m in the Garlic Ring Deposit. The horizon contains several shale and carbonaceous shale partings which collectively result in a weighted average (tonnage) raw ash content of 36.5%. Much of the ash results from adventitious material and is easily separated by gravity washing.

No. 2 seam horizon: lies from 10 to 40 m below the no. 1 seam horizon and is persistent throughout the southern end of the basin. This horizon varies in thickness from a maximum of 10 m in the Spaceship Deposit to 2.0 m in the Garlic Ring Deposit. In the Wernecke, Spaceship and southern end of the Illtyd Deposit the horizon splits into two seams - seam 2A (upper) and 2B (lower), 2B shales out rapidly north of hole BP-79-14 in the Illtyd Deposit. Only a single seam occurs in the Garlic Ring Deposit. The horizon contains few shale and carbonaceous shale partings which collectively result in a weighted average (tonnage) raw ash content of 24%. Most of the ash is caused by adventitious material and is easily separated by gravity washing.

No. 3 seam horizon: correlation of the horizon throughout the property is difficult; however, a persistent coal horizon below the No. 2 seam is present in several of the deposit areas. The no. 3 seam horizon lies from 10 to 50 m below the no. 2. seam horizon and varies in thickness and character. In the Wernecke, West Illtyd and Spaceship deposits the horizon consists of two seams having thicknesses averaging 2.85 m (upper) and 2.17 m (lower), separated by an average of 5.46 m of mudstone. In the Airstrip and Wind River deposits the horizon consists of one seam with an average thickness of 5.5 m. In the Illtyd deposit the horizon consists of one seam with an average thickness of 2.4 m. The horizon is not present in the Garlic Ring Deposit.

No. 4 Seam horizon: correlation of the no. 4 seam horizon throughout the property is dubious; however, a persistent horizon is present between the no. 3 and no. 5 seam horizons in all deposit areas except the Garlic Ring Deposit. The no. 4 seam horizon varies in thickness and character, attaining maximum development (5.45 m) in the Airstrip, Wind River and Spaceship deposits. The horizon appears to shale out in the northern part of the Illtyd Deposit.

No. 5 seam horizon: is persistent through the Wind River, Wernecke, West Illtyd and Spaceship deposits. Sufficient section has not been intersected by drilling in the Illtyd, Airstrip and Garlic Ring deposits to show whether or nor this horizon also occurs in these deposits. Correlation of the horizon is facilitated by the presence of a volcanic ash band within the horizon. The horizon varies in thickness from a maximum of 9.0 m in the Wind River Deposit to 2.3 m in the West Illtyd deposit.

COAL QUALITY

The coal is a high quality thermal coal ranked as high volatile C bituminous. A weighted average (tonnage basis) proximate analysis of the coal on a clean coal basis (reconstituted sample of 1/4" x 28 mesh fraction at -1.90 s.g. and the 28 mesh x 0 size fraction on a raw basis) is: Yield 76.9%, M 5.2%, Ash 14.3%, vol. 33.0%, FC 47.4%, CV 10,016 BTU/lb (23.3 MJ/kg), S 0.33%.

Ash - the coal can be cleaned and blended to produce a product having a 15% ash content.

Calorific Value - The BTU's per pound are variable but by blending, the heat value can be maintained at 9700 BTU/lb.

Ash Fusion - temperatures are variable, however, the ash is considered high-melting. Initial deformation temperature under reducing conditions generally is greater than 2200°F and averages 2450°F.

Grindability - the grindability of the coal as defined by the Hardgrove Index varies from 36-55 with an average of 42.

Alkalinity - from limited analysis the sodium content of the Bonnet Plume coal generally is less than 0.9%. The base to acid ratio (B/A) is a rough indication of slagging potential; the B/A ratio = 0.19. A B/A ratio less than 0.5 indicates that the probability of slagging is remote.

Nitrogen Content - ultimate analysis indicates that the nitrogen content is less than 0.8% and therefore meets most utility companies specifications.

Sulphur - sulphur content of the Bonnet Plume coal is low at 0.33%. In rare cases sulphur exceeds 1% over narrow intervals within the seams.

Fuel Ratio - the fuel ratio of the Bonnet Plume coal is good at a maximum of 1.60 and an average of 1.43.

RESERVES

Exploration programme by Pan Ocean Oil Ltd. indicate that the Bonnet Plume Basin contains a coalfield of major proportions with measured, indicated and inferred in situ resources in excess of 650 million tonnes located in seven widely separated areas (Pan Ocean Oil, 1981). Sufficient coal is available to provide 10 to 15 million tonnes per year for export in addition to the support of a proposed mine-mouth thermal power plant of 210 megawatts capacity.

Reserves have been calculated for seven of the coal areas in the Bonnet Plume Basin as follows (in millions of tonnes):

Illtyd - measured 120.93, Indicated 29.21, Inferred 33.50, Total = 183.64

Wernecke - Indicated 104.65, Inferred 28.93, Total = 133.58

Airstrip - Inferred 18.40

Wind - Indicated 60.83, Inferred 43.80, Total = 104.63

West Illtyd - Inferred 47.56

Garlic Ring - Indicated 8.69, Inferred 5.55, Total = 14.15

Spaceship - Inferred 157.95;

to give a total of 660 million tonnes.

POTENTIAL FOR DEVELOPMENT

Even though substantial quantities of coal are present, this area is relatively inaccessible and is remote from potential markets. Developing this coal area would likely be very costly, hence the potential for future development is unlikely unless the coal were to be used locally. These coals have a high ash content generally due to discrete bentonite bands. It is possible that a simple washing technique could be designed to separate the coal and bentonite to produce relatively clean coal with a calorific value of approximately 9,000 BTU/lb (Hill, 1978). Such a product should be suitable for a mine-mouth generating station or for conversion to clean gaseous liquid fuels.

Advantages

- 1) Large reserve potential
- 2) Seams of mineable thickness are present
- 3) Low sulphur content
- 4) Proximity to Wernecke breccia deposits
- 5) Ideally situated to provide coal derived electric power south to the present day load centres, north to the Mackenzie delta, west to provide pumping power to any Dempster pipeline and southeast to supply potential new mines in the Yukon and Northwest Territories
- 6) Sufficient reserves are on hand, at least, to support any power generating station up to 2000 megawatts in size
- 7) Possibility to generate a large amount of power for export into the British Columbia and/or Alaska grids
- 8) Possibility to export 10 to 15 million tonnes per year
- 9) Ecologically attractive since the coal is clean burning

Disadvantages

- 1) High ash content
- 2) Remote from markets - high transportation costs
- 3) High costs for development work
- 4) Presence of frozen overburden - render mining activity difficult.

RECOMMENDATIONS FOR FURTHER WORK

- 1) More drilling would be required to provide definitive information on reserves within the various deposits
- 2) Preliminary economic feasibility studies would be required in order to obtain a first estimate of coal cost.
- 3) Continued environmental impact studies.

INDIVIDUAL DEPOSITS WITHIN THE SOUTHERN BONNET PLUME BASIN

70. ILLTYD CREEK (Yukon Minfile 106E/ 35)

LOCATION AND ACCESS

Latitude: 65°16'02"N, Longitude: 135°00'10"W in NTS 106E/6. The Illytd Creek deposit is an area extending along the east side of Illytd Creek for a distance of 5,000 m. The area is bounded on the west by Illytd Creek, which coincides with the subcrop traces of the coal seams; to the south by a northeast - southwest striking fault; to the east by an arbitrary down dip cut off of a depth of 300 m to the base of the no. 1 coal seam horizon and to the north by an arbitrary line 250 m north of the furthest north drill hole (BP-79-21).

HISTORY

Discovered in 1977 by Pan Ocean Oil Ltd., the mineral rights were acquired as Colt claims (YA37930) in August, 1978 and Coal Licenses #83 and #88 were acquired in November, 1977. The area was relicensed as #140 and #145 in November, 1980 and as #372 and #377 in November 1983. Pan Ocean explored with three holes (341 m) in 1978 and 16 holes (3121 m) in 1979, plus stratigraphic, metallurgical and feasibility studies.

Following 1978 field work, Pan Ocean Oil Ltd. initiated a major drilling programme, in 1979, in the Illytd Creek area of the Bonnet Plume Basin. This programme further established the potential of the basin and delineated sufficient reserves in Illytd Creek to support a mine-mouth power development (Cullingham, 1981).

Investigations to date (Cullingham, 1981) show the Bonnet Plume Basin to contain a coalfield of major proportions containing high quality thermal coal in sufficient quantities to supply a viable electric power base in the Yukon for its immediate needs and future growth for many years to come. Measured, indicated and inferred in situ reserves in excess of 380 million tonnes have been established in four deposit areas. Speculative reserves conceivably could increase these reserves to greater than 1 billion tonnes in situ.

DESCRIPTION

The structure of the Illytd Creek deposit consists of a broad syncline plunging to the east. The structure of the deposit is illustrated by a series of cross-sections drawn by Pan Ocean personnel (Cullingham, 1980). A thick (90 to 110 m) conglomerate unit forms a prominent ridge that can be traced along the length of the deposit. Nineteen diamond drill holes, for a total of 3,462 m, drilled in the deposit area establish the continuity of three coal horizons and provide adequate geological control in order to establish measured and indicated reserves. Deeper seams are known from intersection in three holes, however, continuity of these seams has been established only over limited areal extent which precludes them from being used in reserve calculations at this time (Cullingham, 1980). The

deposit is cut off by a fault to the south.

The no. 1 seam has an average thickness of 6.85 m; proximate analysis for clean coal is as follows: M 5.2%, Ash 19.8%, vol. 32.8%, FC 42.2%, CV 9,067 BTU/lb, S 0.35%. The no. 2 seam lies 10 to 40 m below the no. 1 seam and has an average thickness of 3.66 m; proximate analysis for clean coal (produced by washing the +28M fraction at 1.90 specific gravity) is as follows: M 5.5%, Ash 13.8%, vol. 34.2%, FC 46.5%, CV 9,910 BTU/lb, S 0.33%. The no. 3 seam lies from 10 to 20 m below the no. 2 seam and has an average thickness of 2.40 m; proximate analysis of clean coal is as follows: M 5.1%, Ash 20.1%, vol. 32.3%, FC 42.3%, CV 9,041 BTU/lb, S 0.35%. A fourth coal horizon was found 20 to 40 m below seam no. 3, this horizon contains two benches of coal with a combined thickness of 3 to 4 m; proximate analysis of clean coal within this horizon is as follows: M 4.3%, Ash 11.0%, vol. 35.9%, FC 48.9%, CV 10,531 BTU/lb, S 0.22%.

RESERVES

Illtyd Creek - based on seams 1, 2 and 3:
measured in situ reserves - 121 million tonnes
indicated in situ reserves - 29 million tonnes
inferred in-situ reserves - 33 million tonnes.

The owners consider these reserves to be adequate for 30 years of mine-mouth electric power generation (Pan Ocean Oil Ltd., 1981). Measured saleable reserves were calculated for two different mining methods:

- strip mining to a maximum cut-off ratio of 10:1 - 37.7 million tonnes (Cullingham and Hope, 1979).

- underground mining to a depth of 300 m - 35.3 million tonnes (Cullingham and Hope, 1979).

71. WEST ILLTYD CREEK DEPOSIT (Yukon Minfile 106E/ 36)

LOCATION AND ACCESS

Latitude: 65°14'24"N, Longitude: 135°00'50"W in NTS 106E/3. The West Illtyd Deposit is located on the western side of Illtyd Creek and is structurally a continuation of the Illtyd deposit. At the southern end it is separated from the Wernecke Deposit by a ridge of Cambrian carbonates. This deposit may tie to the Wernecke Deposit to the southwest. To the west rocks of Cretaceous age are probably in unconformable contact with Paleozoic carbonates forming the Illtyd Range.

HISTORY

Acquired as Coal Licence #78 in November, 1977 by Pan Ocean Oil Ltd., and relicensed as #135 in November, 1980. Pan Ocean also staked the mineral rights as Illtyd claims (YA30809) in June, 1978. The area was mapped and two holes were drilled (555 m) in 1980.

DESCRIPTION

The structure of the West Illtyd Deposit area is divided into two parts. The northern part is a broad syncline plunging to the east and is a down section continuation of the structure of the Illtyd deposit. The southern part is a tight syncline plunging to the east. The two structures seemingly are connected by a tight, probably faulted, anticline around a Cambrian carbonate high.

Two diamond drill holes (WI-80-16 & WI-80-19) have been drilled into the West Illtyd Creek Deposit. Hole WI-80-16 tested the northern structure and intersected the nos. 4 and 5 seam horizons; hole WI-80-19 tested the southern structure and intersected the nos. 3, 4 and 5 seam horizons.

RESERVES

Inferred in-situ reserves are 48 million tonnes of high volatile bituminous C non-coking coal (Pan ocean Oil Ltd., 1981).

72. WERNECKE (POLE) DEPOSIT (Yukon Minfile 106E/ 021)

LOCATION AND ACCESS

Latitude: 65°12'26"N, Longitude: 135°01'25"W in NTS 106E/3. The Wernecke deposit area occurs on the north flank of the Wernecke Mountains between Illtyd Creek to the east and the Wind River to the west.

HISTORY

Acquired as Coal License #77 in November, 1977 by Pan Ocean Oil Ltd., and relicensed as #134 in November, 1980 and #366 in November, 1983. The mineral rights were staked as Pole claims (YA30733) in June, 1978. Pan Ocean carried out mapping and drilled one hole (117 m) in 1978 and two holes (660 m) in 1980.

DESCRIPTION

The basic structure of the deposit is a monocline dipping south. The deposit has a

well defined strike length of 4,500 m and a partially obscured strike length of a further 2,500 m. The area is bounded to the south by over-riding Proterozoic age strata along the Wernecke Thrust and to the north by a splay of the Deslauriers Fault.

Three coal seams were found in the Wernecke Deposit and are believed to correlate with seams 1 to 3 of the Iltyd Deposit (Cullingham, 1980). The no. 1 seam has a mineable thickness of 5.65 m; proximate analysis of clean coal is as follows: M 3.9%, Ash 12.9%, vol. 36.1%, FC 47.3%, CV 10,547 BTU/lb. The no. 2 seam is 9.51 m thick and occurs 30 m below the no. 1 seam horizon; proximate analysis of clean coal is as follows: M 5.0%, Ash 10.3%, vol. 36.0%, FC 48.9%, CV 10,810 BTU/lb. The no. 3 seam was found only in weathered outcrop.

Drilling in 1980 (Pan Ocean Oil, 1981) confirmed the presence of all 5 coal seam horizons in the Wernecke Deposit. Seam no. 3 averages 3.43 m thick and proximate analysis carried out on clean coal yielded the following results: M 6.7%, Ash 16.2%, vol. 32.2%, FC 45.1%, CV 9622 BTU/lb, S 0.33. Seam no. 4 was an average of 2.92 m thick, results from proximate analysis on clean coal are: M 7.3%, Ash 9.6%, vol. 33.9%, FC 49.3, CV 10,592, S 0.33. The average thickness of seam no. 5 is 2.72 m, Proximate analysis of clean coal gave the following: M 6.5%, Ash 16.5%, vol. 29.5%, FC 48.5%, CV 9723 BTU/lb, S 0.27.

RESERVES

Using seams 1 to 5 the following reserves of high volatile bituminous C, non-coking coal were calculated:

Indicated in situ reserves - 105 million tonnes

Inferred in situ reserves - 29 million tonnes

73. AIRSTRIP (MARATHON) DEPOSIT (Yukon Minfile 106E/ 13)

LOCATION

NTS 106E; 65°13'05" N, 135°16'34" W. Coal Licence 368. The Airstrip deposit is located west of the Wind River, approx. 6 km due east of the Wernecke Deposit. The deposit is bounded to the north and east by the Wind River, and to the south and west by the projected outcrop trace of the no. 5 seam horizon (Pan Ocean Oil, 1981).

HISTORY

Coal float was noted on bars of the Wind River, about 15 km downstream, by the Geological Survey of Canada in 1905. This property was acquired as Coal Exploration

Licence no. 79 in November 1977 by Pan Ocean Oil Ltd., the area was relicensed as no. 136 in November 1980 and as no. 368 in November 1983. Pan Ocean mapped and drilled one hole (111 m) in 1979 and one hole (276 m) in 1980.

DESCRIPTION

The basic structure of the Airstrip Deposit is a west-northwest trending syncline with an apparent length of 5,500 m and a width of 1,500 m (Cullingham, 1980). Based on palynological analysis two outcrops of coal on the north limb of the syncline are interpreted to be the nos. 3 and 4 seam horizons. Three coal seams outcrop along the Wind River, on the southern limb of the syncline, and have been correlated to the no. 2, no. 3 and no. 4 seam horizons of the Iltyd Creek Deposit (Pan Ocean Oil, 1981). The no. 3 seam horizon has a thickness of 5.5 m; proximate analysis of a clean coal is: M 4.4%, Ash 18.6%, vol. 32.2%, FC 44.8%, CV 9,380 BTU/lb, S 0.39%. The no. 4 seam horizon has a thickness of 4.89 m and occurs 58 m below the no. 3 seam horizon; proximate analysis of clean coal is: M 5.2%, Ash 18.8%, vol. 30.3%, FC 45.8%, CV 9,499 BTU/lb, S 0.34%. Seam no. 2 was not intersected by drilling.

A coal occurrence traced along the Wind River for a distance of 2,500 m may be the no. 5 seam horizon (Pan Ocean Oil, 1981). Thin seams within predominantly mudstone horizons below the no. 5 seam occur approximately 4,000 m west of the Wind River.

RESERVES

Inferred in situ reserves calculated using only the no. 3 and 4 seam horizons - 18 million tonnes of high volatile, bituminous C non-coking coal (Pan Ocean Oil, 1981).

74. WIND RIVER DEPOSIT (DESLAURIER; Yukon Minfile 106E/ 37)

LOCATION AND ACCESS

Latitude: 65°26'12"N, Longitude: 135°26'00"W in NTS 106E/6. The Wind River Deposit occurs on the west bank of the Wind River about 27 km north of the Airstrip Deposit and 5,500 m south of the confluence with Iltyd Creek. The deposit area occurs as a hill with a local relief of 180 m, extending along the river for a distance of about 6,000 m (Cullingham, 1980; Pan Ocean Oil, 1981).

HISTORY

Acquired as coal license #82 in November, 1977 by Pan Ocean Oil Ltd., and relicensed as #139 in November, 1980 and as #371 in November, 1983. Pan Ocean mapped and drilled two holes (281 m) in 1979 and one hole (331 m) in 1980.

DESCRIPTION

The basic structure of the deposit is a monocline which dips gently to the northeast and east. The area is divided into two blocks by an east-west fault, with the northern block displaced downwards relative to the southern block. The Wind River Deposit area is delimited in areal extent by the interpreted subcrop traces of coal seams, by the Wind River and to the north by a break in topographic expression. Several coal occurrences adjacent to the north of the outlined area indicate increased potential in that direction.

Three coal seams were discovered at the Wind River Deposit; and are believed to correlate with seams no. 3, no. 4 and no. 5 at the Illtyd Creek Deposit. One drill hole (W-79-6) intersected two other seams between the nos. 4 and 5 seam horizons which are considered local developments of limited areal extent (Pan Ocean Oil, 1981). Seam no. 3 is 8.0 m thick; proximate analysis for clean coal is: M 4.4%, Ash 18.1%, vol. 31.0%, FC 45.6%, CV 9,743 BTU/lb, S 0.40%. The no. 4 seam horizon is 4.75 m thick; proximate analysis of clean coal is: M 4.7%, Ash 14.3%, vol. 32.6%, FC 48.3%, CV 10,167 BTU/lb, S 0.40%. The no. 5 seam horizon has a thickness of 9.19 m; proximate analysis of clean coal is as follows: M 4.5%, Ash 11.6%, vol. 31.9%, FC 51.9%, CV 10,556 BTU/lb, S 0.47%.

The upper of the two seams between seams 4 and 5 has a mineable thickness of 2.41 m; proximate analysis on clean coal is: M 3.2%, Ash 13.1%, vol. 33.3%, FC 50.4%, CV 10,568 BTU/lb, S 0.51%. The lower of the two seams between no. 4 and no. 5 seam horizons is 1.39 m thick; proximate analysis of clean coal is: M 2.9%, Ash 12.4%, vol. 33.0%, FC 51.7%, CV 10,630 BTU/lb, S 0.48%.

RESERVES

Using seams 3, 4 and 5 the following reserves of high volatile bituminous C, non-coking coal were calculated:

Indicated in situ reserves - 60.83 million tonnes
Inferred in situ reserves - 43.8 million tonnes

75. SPACESHIP DEPOSIT (Yukon Minfile 106E/ 38)

LOCATION AND ACCESS

Latitude: 65°13'16"N, Longitude: 134°54'59"W in NTS 106E/2. The Spaceship Deposit is located on the east side of Illtyd Creek to the southeast of the Illtyd Deposit.

HISTORY

Acquired as Coal License #77 in November, 1977 by Pan Ocean Oil Ltd., and

relicensed as #134 in November, 1980. Pan Ocean explored with mapping and two drill holes (689 m) in 1980.

DESCRIPTION

The structure of the Spaceship Deposit is poorly defined and is interpreted to be a west plunging syncline. The trend of the axis of the syncline coincides with the trend of the syncline axis in the southern part of the West Iltyd Deposit.

All 5 coal seam horizons are present in the Spaceship Deposit and are among the best developed on the property (Pan Ocean Oil, 1981). Hole SC-80-25 intersected an aggregate thickness of 30 m of coal in seams greater than 1.5 m within a section of 230 m. Seam no 1 averages 6.42 m thick, proximate analysis for clean coal is: M 4.5%, Ash 14.9%, vol. 34.4%, FC 46.2%, CV 10,052 BTU/lb, S 0.32%. Seam no. 2 averages 8.49 m thick, proximate analysis for clean coal is: M 5.2%, Ash 12.4%, vol. 34.5%, FC 48.2%, CV 10,316 BTU/lb, S 0.31. Seam no. 3 is 7.12 m combined, proximate analysis for clean coal is: M 4.7%, Ash 13.3%, vol. 33.3%, FC 48.7%, CV 10,2223 BTU/lb, S 0.30. Seam no. 4 is 5.45 m thick on average, proximate analysis for clean coal is: M 4.7%, Ash 12.6%, vol. 32.8%, FC 49.6%, CV 10,452 BTU/lb, S 0.24. Seam no. 5 averages 1.93 m thick and proximate analysis for clean coal yielded the following results: M 4.9%, Ash 11.8%, vol. 30.5%, FC 52.8%, CV 10,506 BTU/lb, S 0.28.

RESERVES

By projecting from drill holes and assuming a syncline structure, resources are inferred for an area of approx. 400 hectares (Pan Ocean Oil, 1981). Inferred in-situ reserves are 158 million tonnes of high volatile bituminous C non-coking coal (Pan Ocean Oil Ltd., 1981).

76. GARLIC RING DEPOSIT (Yukon Minfile 106E/ 32)

LOCATION AND ACCESS

Latitude: 65°20'29"N, Longitude: 134°50'57"W in Nts 106E/7. The Garlic Ring Deposit is located about 8 km northeast of the Iltyd Deposit, midway between Iltyd Creek and the Bonnet Plume River, in a low, flat hill.

HISTORY

Acquired as Coal Licence #88 in November, 1987 by Pan Ocean Oil Ltd. and relicensed as #145 in November, 1980. Pan Ocean mapped and drilled two holes (484 m) in 1980.

DESCRIPTION

The basic structure of the deposit is a northwest dipping monocline (Pan Ocean Oil, 1981). Coal seam horizons nos. 1 and 2 were intersected in the Garlic Ring Deposit with an average thickness of 2.6 m and 3.4 m respectively. No other coal horizons were intersected and it appears that the lower seams have shaled out.

RESERVES

In situ reserves are 9 million tonnes indicated and 6 million tonnes inferred of high volatile, Bituminous C non-coking coal.

77. COAL AREA 10 (CULLINGHAM; Yukon Minfile 106E/ 39)

LOCATION AND ACCESS

Latitude: 65°25'22"N, Longitude: 135°21'10"W in NTS 106E/6.

HISTORY

Acquired as coal license #82 in November, 1977 by Pan Ocean Oil Ltd., and relicensed as #139 in November, 1980 and as #371 in November, 1983. Pan Ocean drilled four holes (463 m) in 1979.

DESCRIPTION

The structure of the area is an anticline with the axis trending northwest.

Abundant coal wash and float found in two gullies was traced to the surface exposure of a significant coal horizon (Pan Ocean Oil, 1981). Two drill holes were drilled to test this horizon (W-79-3 & W-79-5). The horizon is 4.58 m thick in hole W-79-5, in hole W-79-3 the horizon consists of coaly shale and is of no economic importance. The areal extent of the horizon could be local since one hole drilled 1.5 km to the east and two holes drilled 2 and 3 km to the south failed to locate coal. Proximate analysis for clean coal from hole W-79-5 is: M 3.0%, Ash 15.4%, vol. 35.8%, FC 45.9%, CV 10,426 BTU/lb, S 0.69%.

COAL SHOWINGS IN THE NORTHERN BONNET PLUME BASIN

78. MOUNTJOY (Yukon Minfile 106E/ 33)

LOCATION AND ACCESS

Latitude: 65°50'59"N, Longitude: 135°10'20"W in NTS 106E/14.

HISTORY

Noted by the Geological Survey of Canada in 1962. Acquired by Cyprus Anvil Mining Corp. in July, 1976 as coal exploration license #46 and mapped and sampled in 1977.

DESCRIPTION

Two coal seams are present in sandstone within the Upper Paleocene section of the Bonnet Plume Formation (Mountjoy, 1967; Norris and Hopkins, 1977; Long, 1978; Norris, 1980). The lower seam is 3.7 m thick and consists of thin bedded lignite with abundant wood and other plant fragments. The upper seam is only 30 cm thick.

79. BASIN (Yukon Minfile 106E/ 15)LOCATION AND ACCESS

Latitude: 65°46'58"N, Longitude: 135°11'17" in NTS 106E/14.

HISTORY

Noted in 1905 and 1962 by the Geological Survey of Canada. Acquired by Cyprus Anvil Mining Corp. in July, 1976 as coal exploration license #46. Mapped and sampled by the Geological Survey of Canada in 1977.

DESCRIPTION

Eight seams of lignite, varying in thickness from 1 to 10 cm occur in a 15 m thick sandstone layer within the Upper Paleocene section of the Bonnet Plume Formation (Camsell, 1906; Mountjoy, 1967; Norris and Hopkins, 1977; Long, 1978; Norris, 1980).

80. CHAPPIE (Yukon Minfile 106E/ 14)LOCATION AND ACCESS

Latitude: 65°43'32"N, Longitude: 135°07'16"W in NTS 106E/11.

HISTORY

Noted by the Geological Survey of Canada in 1905. Acquired by Aran Oil and Gas Ltd., in November, 1977 as coal exploration license #93. The leases were optioned by Pan Ocean Oil Ltd. and relicensed as #129 in September, 1980.

DESCRIPTION

A 1.8 m lignite seam occurs with clay and sandstone within the Upper Paleocene section of the Bonnet Plume Formation (Camsell, 1906; Norris and Hopkins, 1977; Long, 1978; Norris, 1980). The lignite contains twigs, leaves and blebs of resin. Another section of coal exposed 3.2 km downstream overlies a bed of clay and soft sandstone.

81. WIND CITY (Yukon Minfile 106E/ 16)

LOCATION AND ACCESS

Latitude:65°48'53"N, Longitude:135°19'41"W in NTS 106E/14.

HISTORY

A block of 40 claims was staked here (Valerie etc. (7738)) by H.F. Waugh et al., in September, 1907.

DESCRIPTION

The claims were staked around a narrow gorge in which sandstone of the Paleocene or Late Cretaceous Bonnet Plume Formation lies unconformably on gently dipping argillite of the Ordovician to Lower Devonian Road River Formation. Coal has been noted nearby (Camsell, 1906; Whitehorse Star, 1907).

82. SAINVILLE (Yukon Minfile 106E/ 17)

LOCATION AND ACCESS

Latitude:63°28'33"N, Longitude:135°04'08"W in NTS 106E/14.

HISTORY

First noted by Count de Sainville in 1893 and examined by the Geological Survey of Canada in 1905 and 1962. Acquired by Cyprus Anvil Mining Corp. in July, 1976 as coal

exploration license #47. Cyprus Anvil and the Geological Survey of Canada conducted detailed mapping and sampling in 1977.

DESCRIPTION

Tertiary lignite has been burning at this location since it was first seen in 1893 (Camsell, 1906). Thick beds of soft sandstone with some thin seams of lignite are overlain by more sandstone, containing pebbles with clay and some thick beds of lignite (Mountjoy, 1967; Norris and Hopkins, 1977; Long, 1978; Norris, 1980). The whole series has been gently folded. The thickest seam noted is 9 m thick and occurs in two exposures 6.4 km apart on either limb of a shallow syncline. A second seam 2.4 m thick occurs below the main seam. The outcrops have been extensively burned and slumped. The coal occurs within the Upper Paleocene section of the Bonnet Plume Formation.

83. LOPSTICK (Yukon Minfile 106E/ 18)

LOCATION AND ACCESS

Latitude: 65°57'37"N, Longitude: 134°39'21"W in NTS 106E/15.

HISTORY

Noted by the Geological Survey of Canada in 1905.

DESCRIPTION

A "fissure vein" of bituminous coal 0.9 m wide cuts sandstone and shale of the Upper Devonian Canol Formation. No analyses are available but the coal is light and soft, burns readily and leaves little ash. The Geological Survey of Canada speculated that it was derived from bitumen that occurs in the wall rocks (Camsell, 1906).

84. RICKETTS (Yukon Minfile 106F/ 12)

LOCATION AND ACCESS

Latitude: 65°33'26"N, Longitude: 133°50'21"W in NTS 106F/12.

HISTORY

Recognized by the Geological Survey of Canada in 1982 but never investigated.

DESCRIPTION

A 1 to 10 cm thick coal seam occurs in sandstone and shale of lower Carboniferous age (Norris, 1975b; Ricketts, 1985; Cameron et al., 1986)

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(vii) NORTHERN YUKON

Coal is known to occur in the Kayak Formation, the "coal-bearing division", the Moose Channel Formation and the Reindeer Formation (GSC and DIAND, 1981). Anthracite is present in the Mississippian Kayak Formation in the Barn and Romanzof uplifts (Norris, 1972). The Lower Cretaceous "coal-bearing division" is widespread but known to contain coal only in northern Richardson Mountains, on the northwest flank of the Aklavik Arch Complex, in the Bell River drainage (Norris, 1974). The Upper Cretaceous Moose Channel Formation contains thin coal seams in the Mackenzie Delta area. Coal in the Lower Tertiary Reindeer Formation is confined to the lowermost lithostratigraphic assemblage, the Aklak Member, where relatively thick and numerous seams occur (Young, 1975). Onshore the Aklak Member is restricted to the northwest flank of the MacKenzie Delta in the immediate area of the border between Yukon and Northwest Territories, and to near the mouth of Babbage River (GSC and DIAND, 1981). Coal in the Moose Channel and Reindeer Formations is dominantly high volatile bituminous A to C with a trend of increasing reflectance from east to west reflecting the gradual increase in paleotemperatures and tectonic deformation toward the Blow River (Young, 1975).

Norris (in GSC and DIAND, 1981) states that " ... only the Kayak Formation (Mississippian) and Reindeer Formation (Tertiary) are considered to have potential (moderate), mainly because of their relatively undeformed nature. ... Although coal in both Kayak and Reindeer measures is suitable for thermal electric power generation, and local heating use, the remoteness of the region and the lack of significant identified resources would appear to make major economic developments unlikely."

INDIVIDUAL OCCURRENCES WITHIN THE NORTHERN YUKON85. CARIBOU BORN

OTHER NAMES: Yukon Minfile - 106K/ 06; Campbell (1967) # 56; Ricketts (1988) # 84.

LOCATION AND ACCESS

Latitude: 66°28'00"N, Longitude: 133°59'00"W in NTS 106K/5, on the Peel River about 15 km west of the Northwest Territories border.

HISTORY

Coal float was noted at this location by Camsell (1906), " Six miles above Cariboo Creek [on the bank of the Peel River] is a small exposure of reddened clay shale ... immediately below this some lignite float was found on a bar, though the bed from which

it was derived was not noticed", but apparently was never investigated further.

DESCRIPTION

The float, described as lignite, lies within an area mapped as Lower Cretaceous Arctic Red Formation (Norris, 1975). This formation consists of dominantly marine shale and sandstone that includes patches of moraine and glaciofluvial deposits (Douglas and Maclean, 1963; Bamber et al., 1963; Norris, 1975).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

86. SITDOWN

OTHER NAMES: Yukon Minfile - 116F/ 08; Campbell (1967) # 58; Ricketts (1985) # 62.

LOCATION AND ACCESS

Latitude: 65°42'48"N, Longitude: 140°27'56"W in NTS 116F/9.

HISTORY

Coal was discovered at this location in 1970 by the Geological Survey of Canada but has apparently never been investigated. Norris (1980) measured section 116F14 at the headwaters of the Kandik River.

DESCRIPTION

Small pods and 2.5 to 30 cm thick interbeds of anthracite were noted throughout a clastic sequence, known as the mid-Lower Cretaceous coaly clastics, exposed near the headwaters of the Kandik River (Gibson, 1971; Milner and Craig, 1973; Norris, 1976, 1980, 1981a). The high rank of this coal suggests deep initial burial and/or thermal metamorphism of Cretaceous and older sediments in the Kandik thrust belt (Norris, 1976).

A point 12.8 km to the northwest was incorrectly shown as a coal occurrence in Campbell (1967) because part of a topographic name on figure 1B of Bostock (1957) was confused with a coal occurrence symbol.

COAL QUALITY

Norris (1976) collected a sample of coal from a measured section at the headwaters of Kandik River, this coal is reported to be anthracite.

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to thin, discontinuous coal seams.

87. LORD CREEK

OTHER NAMES: Yukon Minfile - 116N/ 77; Ricketts (1985) # 63.

LOCATION AND ACCESS

Latitude: 67°02'05"N, Longitude: 140°05'26"W in NTS 116N/1.

HISTORY

The GSC measured sections in the vicinity of the headwaters of Bluefish and Lord creeks (Ricketts, 1985).

DESCRIPTION

The Lower Cretaceous Lower Sandstone Division contains thin bedded carbonaceous sandstone that hosts 2 to 10 cm pods of impure coal (Jeletzky, 1974).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to poor coal quality and thin discontinuous seams.

88. TACK

OTHER NAMES: Yukon Minfile - 116O/ 14

LOCATION AND ACCESS

Latitude: 67°34'35"N, Longitude: 139°36'33"W in NTS 116O/12.

HISTORY

Noted by McConnell (1891) and apparently never explored.

DESCRIPTION

A thin bed of shaley lignite is exposed on the bank of the Porcupine River 9.6 km above the Old Crow River. Outcrops in this vicinity are sandstone and concretionary shale of Upper Cretaceous age which occur at the south margin of the Kaltag Fault (Norris, 1976b, 1979b, 1980).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited due to poor coal quality and thin seams.

89. PATTULLO

OTHER NAMES: Yukon Minfile - 116O/ 79; Ricketts (1985) # 66.

LOCATION AND ACCESS

Latitude: 68°00'10"N, Longitude: 139°30'43"W in NTS 116O/13.

HISTORY

Reported by the Geological Survey of Canada (Ricketts, 1985).

DESCRIPTION

Locally lignite seams occur in poorly indurated sand, clay and conglomerate of probable Tertiary age. The coal is intermittently exposed in the banks of the Porcupine River for about 65 km (Ricketts, 1985).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

90. MT MCGUIRE

OTHER NAMES: Yukon Minfile - 116P/ 78; Ricketts (1985) # 64.

LOCATION AND ACCESS

Latitude: 68°00'00"N, Longitude: 137°28'00"W in NTS 116P/14.

HISTORY

Reported by the Geological Survey of Canada (Jeletzky, 1961; Ricketts, 1985). Jeletzky (1961) measured section 5, on a ridge between the headwaters of Bell River and Johnson Creek, at 68°N, 137°20'W in the Coaly Quartzite Division.

DESCRIPTION

Coal occurs in small nests, thin layers and seams up to 10 cm thick within the early to mid-Hauterivian Coaly Quartzite Division (Jeletzky, 1961). This location lies within map unit Kwc of Norris (1975).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited by thin coal seams.

91. NORRIS

OTHER NAMES: Yukon Minfile - 116P/ 32; Ricketts (1985) # 65; GSC and DIAND (1981) # 17.

LOCATION AND ACCESS

Latitude: 67°55'30"N, Longitude: 136°57'00"W in NTS 116P/15, the Bell River map area.

HISTORY

First noted by the Geological Survey of Canada (Norris, 1974) and apparently never investigated.

DESCRIPTION

Anthracite coal was discovered on the north bank of a tributary of Bell River. The coal occurs in seams up to 0.30 m thick as interbeds in tightly folded sandstone (Norris, 1974; 1980, 1981b; GSC and DIAND, 1981).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited by thin coal seams and structural complexity.

92. ANNETT

OTHER NAMES: Yukon Minfile - 117A/ 22; Ricketts (1985) # 69.

LOCATION AND ACCESS

Latitude: 68°37'00"N, Longitude: 137°53'00"W in NTS 117A/10 on Annett Creek.

HISTORY

Discovered by Lord and Anthony in 1931 in a sequence of sandstone, conglomerate and shale (Norris, 1976). Staked as Annett claims (79050) in October 1961 by W. Strong and K. Garlund. Reported by the Geological Survey of Canada (Ricketts, 1985).

DESCRIPTION

The coal occurs in thin seams within Lower Cretaceous shale and sandstone (Norris, 1980); map unit Kbr of Norris (1976b).

COAL QUALITY

Low volatile bituminous to semi-anthracite coal contains: M 2%, Ash 2%, vol. 9.5 to 14%, FC 82 to 86.4%, CV (dmm free basis) 14,270 to 14,380 BTU/lb (Ricketts, 1985).

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited by thin coal seams.

93. WELCOME

OTHER NAMES: Yukon Minfile - 117A/ 23; GSC and DIAND (1981) # 8.

LOCATION AND ACCESS

Latitude: 68°38'00"N, Longitude: 138°37'00"W in NTS 117A/11.

HISTORY

Coal was reportedly found by A. Hoidahl about 16 km west of Hoidahl Hill prior to 1952 (Gabrielse, 1957, p. 10; Bostock, 1957, p. 26).

DESCRIPTION

The coal probably occurs in the Jura-Cretaceous Kingak Formation (Norris, 1980; GSC and DIAND, 1981).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

94. SHINGLE

OTHER NAMES: Yukon Minfile - 117A/ 31; Ricketts (1985) # 70; GSC and DIAND (1981) # 4.

LOCATION AND ACCESS

Latitude: 68°53'09"N, Longitude: 138°01'31"W in NTS 117A/14 at the headwaters of Conglomerate and Deep creeks.

HISTORY

First noted by the Geological Survey of Canada (Norris, 1972) and apparently never

investigated.

DESCRIPTION

This location lies within an area mapped as Campanian - ? Maastrichtian Moose Channel Formation (Norris, 1972, 1974, 1980). Thin seams of coal are interbedded with sandstone, conglomerate and shale, and deformed into a doubly plunging syncline with a north trending axial plane, cut by numerous faults (Ricketts, 1985).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited by thin coal seams.

95. BLOW

OTHER NAMES: Yukon Minfile - 117A/ 67; Campbell (1967) # 61; GSC and DIAND (1981) # 13.

LOCATION AND ACCESS

Latitude: 68°20'00"N, Longitude: 137°57'00"W in NTS 117A/7. Campbell (1967, # 61) and Milner and Craig (1973) give the location as 68°17'N 137°45'W at the headwaters of the Blow River, some 11 km north of Bonny Lake.

HISTORY

The presence of coal bearing beds was noted by Jeletzky (1960).

DESCRIPTION

Jeletzky (1960) reports an outcrop of " thick lowermost Jurassic or (?) uppermost Triassic coal-bearing beds and conglomerate".

Yukon Minfile (117A/ 67) reports "one seam of anthracite about 1 m thick was located in Mississippian Kayak Formation clastic sedimentary rocks", but gives no

appropriate reference.

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

96. HOIDAHL DOME

OTHER NAMES: Yukon Minfile - 117A/ 73

LOCATION AND ACCESS

Latitude: 68°17'00"N, Longitude: 137°52'00"W in NTS 117A/7, 80 km south of Shingle Point.

HISTORY

Discovered by the Geological Survey of Canada in 1985 and revisited in 1987 (Cameron et al., 1986 and 1988). Station 1 of Cameron et al. (1986), located southeast of Barn Mountains. The coal discovered in 1985 is exposed in a shallow gully on the divide between the headwaters of the Blow River and Johnson Creek. In 1987 additional coal outcrops were found in several localities over a distance of about 4 km (Cameron et al., 1988). The outcrops are found in stream gullies on the south flank of Hoidahl Dome, approximately 80 km south of Shingle Point on the Arctic coast and 118 km west of Aklavik, NWT.

DESCRIPTION

In 1985 a 5.53 m thick seam of semi-anthracite coal was found within the Mississippian Kayak Formation (Cameron et al., 1986). Results from 1987 fieldwork indicate there may be one or more seams in addition to this 5.53 m thick seam. Cameron et al. (1988) correlate the coal seam of 1985 with a seam found at station 2 in 1987, over a distance of 1.75 km. The new samples confirm the presence of high rank coal with favourable ash and sulphur values.

A total of 41 samples were collected by Cameron et al. (1988). The coals are little affected by weathering and some are moderately to highly sheared indicating localized structural deformation (Cameron et al., 1988). In general the Kayak Formation dips gently southward off the flank of Hoidahl Dome.

COAL QUALITY

Cameron et al. (1986) report the results for 12 samples collected from the 5.53 m thick seam. Average values for the seam are (dry basis): Ash 7.2%, vol. 11.3%, FC 79.9%, S 0.50%; with an average reflectance value of 2.95% (Romax) (Cameron et al., 1988). Average maceral content for the seam is: 60.6% Vitrinite, 39.4% Inertinite (Cameron et al., 1986).

Average results for a 6 m thick seam at station 1 (Cameron et al., 1988) are: Ash 6.2%, vol. 9.1%, FC 82%, S 0.6%; with an average reflectance value of 2.89 (Romax). Average maceral content is: 57.7% vitrinite, 42.3% Inertinite.

Average results for a 2.10 m thick seam at station 2 (Cameron et al., 1988) are: Ash 5.5%, vol. 8.3%, FC 82.3%, S 0.57%; with an average reflectance of 3.27% (Romax). Average maceral content is: 59.4% Vitrinite, 40.6% Inertinite.

Average results for a 1.3 m thick seam at station 3 (Cameron et al., 1988) are: Ash 13.6%, vol. 9.3%, FC 74.4%, S 1.24%; with an average reflectance of 3.21% (Romax). Average maceral content is: 66.9% Vitrinite, 33.1% Inertinite.

Average results for a 1.55 m thick seam at station 4 (Cameron et al., 1988) are: Ash 5.5%, vol. 8.1%, FC 83.0%, S 0.59%; with an average reflectance value of 3.19% (Romax). Average maceral content is 65.1% Vitrinite, 34.9% Inertinite.

The 1987 samples have slightly higher reflectance values than those from 1985 indicating coal ranks close to the semi-anthracite/anthracite boundary.

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Development potential is limited only by the remote location of this occurrence, it is however only 80 km south of Shingle Point, Mackenzie Bay.

Advantages

- 1) Seams of mineable thickness
- 2) Low ash and sulphur content

3) Stratigraphic continuity/ correlatability of seams

Disadvantages

- 1) Remote location

RECOMMENDATIONS FOR FURTHER WORK

- 1) Regional mapping and prospecting to define the extent of coal seams
- 2) Further analysis of coal to confirm quality
- 3) Trenching and/or drilling of any favourable targets found.
- 4) Geophysical survey to delineate the extent of subsurface coal

97. JOHNSON CREEK

OTHER NAMES: Yukon Minfile - 117A/ 80; Ricketts (1985) # 67.

LOCATION AND ACCESS

Latitude: 68°03'03"N, Longitude: 138°32'46"W in NTS 117A/2 in Old Crow Plain along Johnson Creek. Ricketts (1985) gives the location as 68°06'N 138°20'W.

HISTORY

Reported by the Geological Survey of Canada (Ricketts, 1985).

DESCRIPTION

Lignite coal seams are associated with tuffaceous sands of possible Oligocene age (Ricketts, 1985).

Nearby, Hopkins and Norris (1974) report unconsolidated Late Eocene sediments exposed on the bank of Johnson Creek at 68°06.3'N, 138°18.8'W. These sediments include brown peat interbedded with unconsolidated conglomeratic muds and pale orange silty and sandy clay (Hopkins and Norris, 1974).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

98. ANTHRACITE

OTHER NAMES: Yukon Minfile - 117C/ 74

LOCATION AND ACCESS

Latitude: 69°16'20"N, Longitude: 140°04'20"W in NTS 117C/8.

HISTORY

First noted by the Geological Survey of Canada in 1985, but never investigated (Cameron et al., 1986, Station 3).

DESCRIPTION

A single sample of coaly fragments and clastics were collected from a shallow depression on a hillside; no coal was found in place (Cameron et al., 1986). This area is underlain by the Mississippian Kayak Formation.

COAL QUALITY

The coal has a vitrinite reflectance value of 3.55% (Romax; Cameron et al., 1986).

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

99. KAYAK

OTHER NAMES: Yukon Minfile - 117C/ 75

LOCATION AND ACCESS

Latitude: 69°16'25"N, Longitude: 140°42'45"W in NTS 117C/8.

HISTORY

First noted by the Geological Survey of Canada in 1985, but never investigated (Cameron et al., 1986, Station 5).

DESCRIPTION

Two seams of anthracite coal occur interbedded with shales in the Mississippian Kayak Formation (Cameron et al., 1986). One seam is 0.3 m thick, the other is stratigraphically higher but was found only in float.

COAL QUALITY

Results from proximate analyses of the two coal seams are: 0.3 m thick seam - Ash 41.44%, S 0.26%; coal float - Ash 13.78%, S 0.41% (Cameron et al., 1986). Maceral composition for the seam and the float are: Vitrinite 61.7%, 57.7%, Inertinite 38.3%, 42.3% respectively; vitrinite reflectance values are 4.03% and 3.94% respectively (Cameron et al., 1986).

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Limited by thin coal seams and varying coal quality.

100. NORTHWESTERN

OTHER NAMES: Yukon Minfile - 117C/ 76; Ricketts (1985) # 74.

LOCATION AND ACCESS

Latitude: 69°20'48"N, Longitude: 140°41'31"W in NTS 117C/8, 4 km north of Malcolm River.

HISTORY

Reported by the Geological Survey of Canada (Ricketts, 1985).

DESCRIPTION

Anthracite seams occur in a sequence of Lower Carboniferous shale and limestone of the Kayak Formation (Norris, 1976b; Ricketts, 1985).

COAL QUALITY

The coal has a vitrinite reflectance of 2.88% and contains: M 1.8%, Ash 6.4%, vol. 10.0%, FC 81.9%.

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

101. BABBAGE

OTHER NAMES: Yukon Minfile - 117D/ 25; GSC and DIAND (1981) # 3.

LOCATION AND ACCESS

Latitude: 69°04'26"N, Longitude: 138°17'30"W in NTS 117D/3.

HISTORY

Lignite float was noted in the vicinity of Babbage River by Sir John Franklin in 1826 (Franklin, 1828).

DESCRIPTION

The coal float (Bostock, (1957) says outcrop) is probably within the Cretaceous (?) Moose Channel Formation (Norris, 1980).

COAL QUALITY

Unknown

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

102. ANKER

OTHER NAMES: Ricketts (1985) # 73.

LOCATION AND ACCESS

Latitude: 68°34'N, Longitude: 138°25'W in NTS 117B/9, at the headwaters of Anker Creek.

HISTORY

Reported by the Geological Survey of Canada (Ricketts, 1985).

DESCRIPTION

Seams of anthracite occur within a sequence of Lower Carboniferous shale and limestone of the Kayak Formation (Norris, 1976b; Ricketts, 1985). Fragments of *Lepidodendron* are common.

COAL QUALITY

Ricketts (1985) reports the following results for two samples: M 1.12, 1.62%, Ash 4.6, 16.2%, vol. 9.7, 9.2%, FC 84.6, 73.1%, with vitrinite reflectance values of 2.57%.

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

Unknown due to lack of information.

COAL OCCURRENCES IN THE MACKENZIE DELTA AREA

103. MOOSE CHANNEL MINE

OTHER NAMES: MOOSE RIVER MINE, SHALLOW; Yukon Minfile - 117A/ 30; Campbell (1967) # 63; Ricketts (1985) # 72; GSC and DIAND (1981) # 5.

LOCATION AND ACCESS

Latitude: 68°45'00"N, Longitude: 136°35'00"W in NTS 117A/9 on the western bank on Mackenzie Delta (Young, 1975).

HISTORY

This mine supplied coal for domestic use in the Aklavik area until 1956 when the mine was abandoned (Mackay, 1946; Young, 1975).

Bostock (1957) reports that " lignite has been mined from ... Moose River, close to the northwest tip of the Mackenzie Delta and a few miles west of the Yukon-Northwest Territories boundary.

DESCRIPTION

Coal was mined from vertical beds of the Aklak Member of the Tertiary Reindeer Formation (Young, 1975; Norris, 1980). On Aklak Creek, which flows into Coal Mine Lake where the mine was located, two coal beds outcrop. The lower bed is 7 m thick and the upper, 76 m stratigraphically above, is 3.7 m thick (Young, 1975). Both coal beds contain about 30% coaly mudstone interbeds.

Coal seams up to 0.9 m thick were also noted on nearby Eagle Creek (Young, 1975, section 7).

COAL QUALITY

Coal samples from this mine were classified as sub-bituminous A to high volatile C bituminous and determined to have a calorific value of 11, 080 BTU/lb (Mines Branch, Fuel Research Lab Report 2926-55, in Young, 1975).

RESERVES

Unknown

POTENTIAL FOR DEVELOPMENT

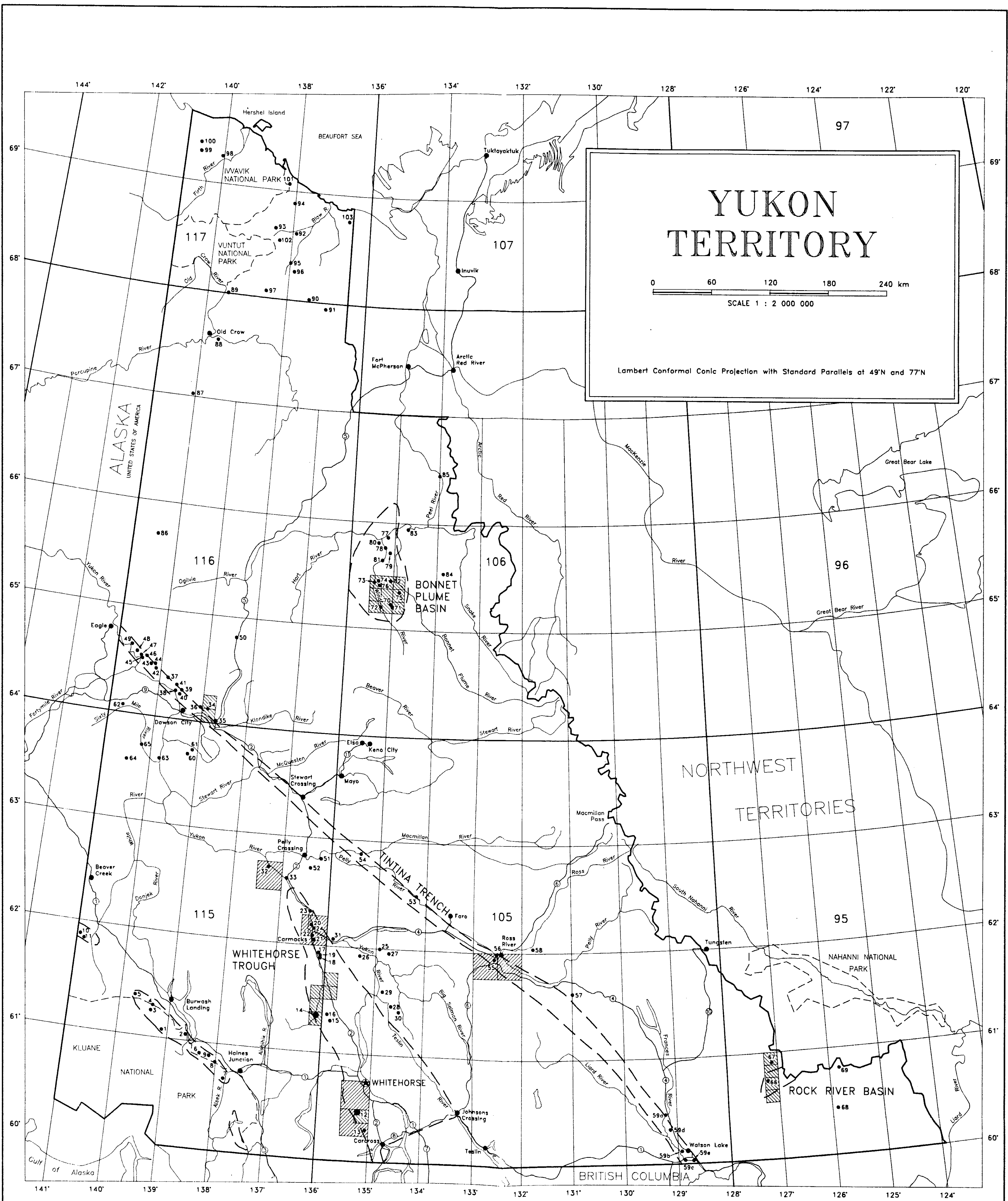
Faults cause difficulties in determining the areal extent of the seams. Young (1975) estimates that at least 2,750 hectares (6,800 acres) must be underlain by substantial coal seams, from the surface to a depth of less than 460 m.

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YUKON TERRITORY

0 60 120 180 240 km
SCALE 1 : 2 000 000

Lambert Conformal Conic Projection with Standard Parallels at 49°N and 77°N

56-1120-011502-200

LEGEND	YUKON COAL INVENTORY 1994
Coal Occurrence ● 94	Prepared For: Energy and Mines Branch Economic Development Yukon Territorial Government By: J.A. HUNT, M.Sc., P.Geo. AURUM GEOLOGICAL CONSULTANTS INC.
Coal Exploration Licence [diagonal lines]	
Coal Exploration Lease [diagonal lines]	
Area underlain by coal bearing strata [dashed line]	
National Park Boundary [dashed line]	
Territorial Highway [line with '2']	SCALE: 1:2 000 000
Populated Places ● Dawson City	DATE: Mar. 31, 1994
	DRAWN: Geological Drafting Services
	FIGURE 1