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ROSS RIVER COAL PROJECT

Report on 1981 Field Work

Coal Lease Numbers 2984, 2985 and 2986

Whitehorse Mining District

N.T.S. 105 F 15, 16

Latitude: 61° 58' N

Longitude: 132° 30' W

By:

T. J. Adamson

CYPRUS ANVIL MINING CORPORATION

November, 1981

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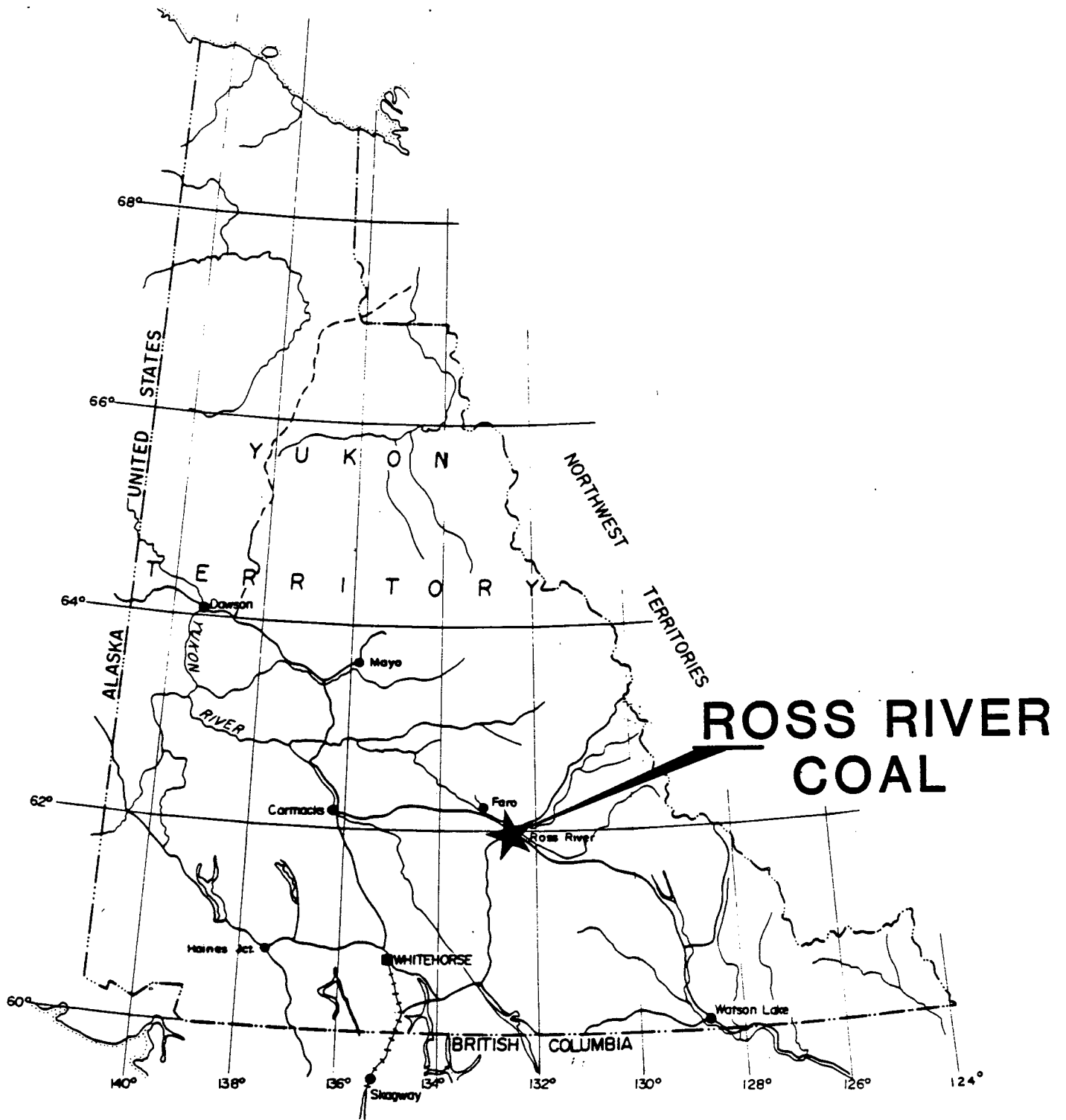


FIGURE 1
CYPRUS ANVIL MINING CORPORATION
LOCATION MAP
ROSS RIVER COAL PROJECT

YUKON
 SCALE: 1" = 100 MILES

INTRODUCTION:

Strata of Tertiary age containing coal seams have been known, for many years, to occur in a small fault bounded block just southwest of the settlement of Ross River, Yukon.

During 1980 three coal leases covering the known extent of the coal basin were acquired by Cyprus Anvil Mining Corporation. In June 1980 a rotary drilling program, totalling 974.3 m in 13 holes, was carried out to investigate the full stratigraphic thickness of the basin. Some minor bulldozer trenching further explored the known surface coal occurrences. Proximate, heating value, and sulphur analyses were carried out on coal samples from both drill holes and trenches.

Two relatively thick seams of good quality thermal coal were intersected in 1980 drill hole 80-RR-08. In hole 80-RR-02, along strike to the northeast, it appeared that these two seams had thinned drastically. However, the correlation between these two holes was very tentative and ambiguous, with the possibility that the seams in hole 80-RR-02 were stratigraphically below the seams in hole 80-RR-08. During August, 1981, a bulldozer trenching program was carried out in this area to resolve the above ambiguity, and, if the thick seams were continuous to and beyond hole 80-RR-02, to define the reserve of surface minable coal in this area for utilization at Faro.

LOCATION AND ACCESS:

Coal lease numbers 2984, 2985 and 2986 are centered approximately 3 km southwest of the settlement of Ross River, Yukon. The leases straddle the boundary between N.T.S. map sheets 105-F-15 and 105-F-16.

The Robert Campbell Highway traverses the coal leases in an east-west direction and is paralleled about 0.5 km to the north by a power line right-of-way. A number of old bulldozer trails between the highway and the power line provide good access to most of the area of interest.

The road distance to Whitehorse, Yukon from the property is approximately 358 km and the road distance to Faro, Yukon is approximately 67 km.

BULLDOZER TRENCHING:

During August, 1981, ten bulldozer trenches, totalling 557 lineal metres, were excavated. The bulldozing was carried out by Midnight Sun Drilling Company Limited of Whitehorse, Yukon, utilizing a D6C bulldozer.

Trench locations are plotted on Map No. 1.

Field work was carried out under Land Use Permit YA1D935.

On completion of the trenching program, all trenches were backfilled and the ground surface restored to original contours. A slashing crew

satisfactorily disposed of all disturbed brush and timber. A final land use clearance was granted on October 5, 1981.

GEOLOGY:

The regional scale geology of coal leases 2984, 2985 and 2986 is described in "Ross River Coal Project - Report on 1980 Field Work" by T. J. Adamson, February, 1980.

A Table of Geologic Units occurring in the coal lease area follows on Table 1. All 1981 trenching was in the stratigraphic interval of unit Ts_4 immediately underlying the Ts_5 conglomerates. Trench geology is plotted on Map No. 1.

Trenches 81-1 and 81-2 exposed the lower of the two thickest coal seams intersected in 1980 drill holes 80-RR-08 (drill hole intersection 27.4-29.1 m). Trenches 81-3 through 81-9 exposed both coal seams.

As trenching progressed to the northeast, along strike across the coal seams, from the area of drill hole 80-RR-08 to the area of drill hole 80-RR-02, it became evident that hole 80-RR-02 was collared stratigraphically below the seams of interest and the correlation between these holes suggested in the 1980 report was incorrect.

TABLE OF GEOLOGIC FORMATIONS

Table I

<u>Age</u>	<u>Symbol</u>	<u>Thickness</u>	<u>Lithology</u>
Tertiary Paleocene-Eocene?	Ts	570 m +	Sandstone, shale, conglomerate, <u>coal</u>
	Ts ₅	120 m +	Conglomerate, conglomeratic sandstone, coarse grained sandstone, very minor mudstone.
	Ts ₄	130 m	Sandstone, conglomeratic sandstone, mudstone, <u>coal</u> , minor conglomerate. (11 coal seams .2 - 1.7 m thick, distributed throughout section).
	Ts ₃	140 m	Mudstone, siltstone, very fine-grained sandstone, minor conglomerate, very minor thin <u>coal</u> . (3 seams .3 - .5 m thick)
	Ts ₂	60 m +	Dark brown to grey to black mudstone, siltstone.
	Ts ₁	120 m +	Top 40 m + thinly interbedded mudstone, very fine-grained, light grey sandstone, dirty coal seams; middle 20 m fine-grained very clean quartzose sandstone; lower 60 m + light grey to pink clean siliceous siltstone to very fine-grained clean sandstone.
Carboniferous or Permian	Pc		Recrystallized crinoidal limestone.
	CPv		Basalt, tuff, minor augite porphyry.
Age Unknown	P1Pk		Phyllite, greywacke, marble.

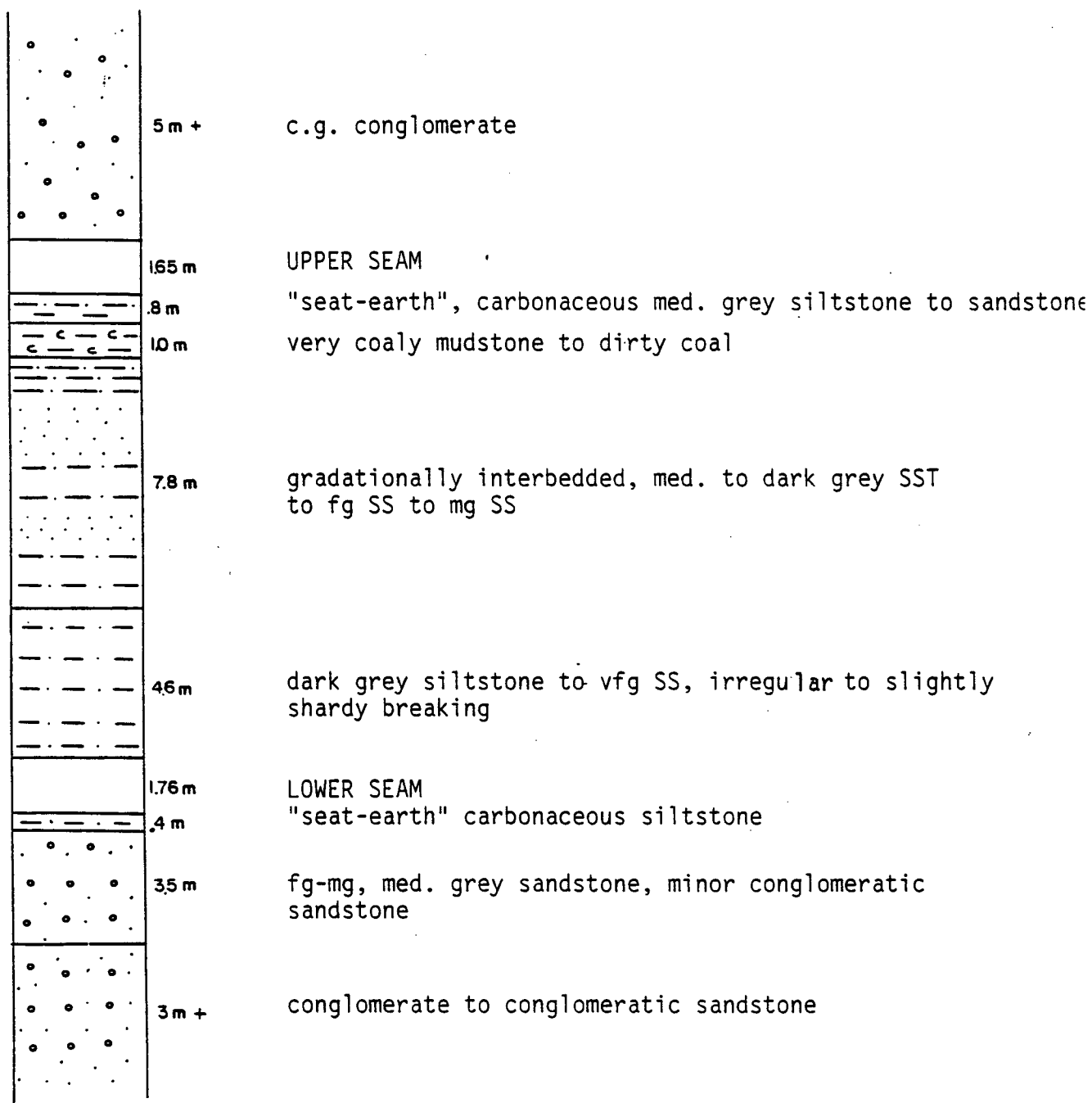
The two coal seams, designated the Lower Seam (L.S.) and Upper Seam (U.S.), maintained a relatively constant thickness and stratigraphic separation throughout the full trenched strike distance, as tabulated below.

<u>Trench</u>	<u>L.S. Thickness</u>		<u>U.S. Thickness</u>		<u>Strat. Separation</u>	
	<u>(m)</u>	<u>Dip</u>	<u>(m)</u>	<u>Dip</u>	<u>(m)</u>	
TR-A (1980)	1.7	30 ⁰				
81-1	1.5	25 ⁰				
81-2	1.8	25 ⁰				
81-3	1.7	30 ⁰	1.8	30 ⁰	16.0	
81-4	1.7	30 ⁰	1.5	30 ⁰	16.5	
81-5	1.9	32 ⁰	1.7	30 ⁰	16.5	
81-6	1.7	32 ⁰	1.6	31 ⁰	13.0	
81-7	1.8	35 ⁰	1.6	36 ⁰	12.0	
81-8	1.8	34 ⁰	1.7	34 ⁰	13.0	
81-9	1.7	43 ⁰			14.0	
average	1.76 m		average	1.65 m	average	14.4 m

Although variable in detail along strike, a generalized stratigraphic section through the Lower seam - Upper seam interval is as shown in Figure 3.

A northeast trending steep fault intersects trench 81-9. This fault appears to have horizontally offset the coal seams by about 100 m to the northeast. There are no coal outcrops to the east of the fault. Although the coal seams were not exposed by trenching to the east of the fault, an area of coaly soil is believed to identify the subcrop of the upper seam in this area. Along the inferred strike of the two seams, to the east of the fault, the seams dip into a rising topographic slope presenting a less attractive surface mining situation than the trenched interval.

Figure 3



1:200
Ross River Coal
Generalized Stratigraphic between
Lower Seam - Upper Seam Interval

COAL QUALITY:

Coal samples for analyses were collected from coal seam exposures in the 1981 bulldozer trenches. Analytical work was carried out by Birtley Coal and Minerals Testing Limited of Calgary, Alberta. Samples were subjected to proximate, sulphur, and heating value determinations. The Birtley Lab report is included as Table 2 of this report.

The rank (A.S.T.M.) of both seams, consistent for all samples, lies very close to the medium volatile bituminous-low volatile bituminous boundary, with the dry, mineral-matter-free fixed carbon percentages falling in the narrow range of 73.7% to 79.4%. The A.S.T.M. rank boundary between medium and low volatile bituminous coal is at a D.M.M.F. fixed carbon percentage of 78.0%.

The fuel ratio (F.C./vol.) of the 1981 trench samples ranges from 2.9 to 3.7.

On an air-dried basis, the average analysis of each seam is as follows:

	<u>Moisture</u> (%)	<u>Ash</u> (%)	<u>cal/gm</u>	<u>Btu/lb</u>
Upper Seam	3.6	6.5	6,971	12,547
Lower Seam	3.9	8.1	6,737	12,127

PROJECT: COAL SAMPLES Received August 24,1981

RAW COAL ANALYSIS , air dried basis

LAB NO	SAMPLE I.D.	ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	C.V. Cal/gm	EQUIL. MOIST%
8967	TR3 US	5.4	2.7	9.8	19.4	68.1	0.21	6876	5.7
8968	TR4 US	3.3	2.9	5.5	19.8	71.8	0.22	7239	6.4
8969	TR5 US	5.5	2.7	4.3	20.6	72.4	0.18	7329	6.3
8970	TR6 US	6.2	2.7	3.8	20.7	72.8	0.18	7233	8.2
8971	TR7 US	11.5	2.4	8.7	21.8	67.1	0.21	6703	6.6
8972	TR8 US	8.0	8.0	6.9	21.6	63.5	0.17	6444	5.8
8973	TR2 LS	3.0	4.0	7.4	20.2	68.4	0.20	7014	12.0
8974	TR3 LS	9.6	6.1	10.1	22.8	61.0	0.15	6143	12.3
8975	TR5 LS	5.9	3.8	8.3	21.7	66.2	0.18	6617	8.8
8976	TR6 LS	7.5	3.9	8.6	21.9	65.6	0.17	6467	8.1
8977	TR8 LS	6.7	3.2	8.3	19.1	69.4	0.20	6914	6.1
8978	TR9 LS	5.9	2.4	5.7	19.4	72.5	0.19	7267	5.0

PETROGRAPHIC SAMPLES PREPARED:

<u>No.</u>	<u>D.M.M.F.</u>	<u>F.C.%</u>	<u>RANK</u>
8967	78.7		m-1vb
68	78.9		m-1vb
69	78.2		m-1vb
8970	78.2		m-1vb
71	76.3		m vb
72	75.2		m vb
73	77.9		m vb
74	73.7		m vb
75	76.0		m vb
76	75.8		m vb
77	79.1		1vb
78	79.4		1vb

Birtley Coal
& Minerals Testing

A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

DISCUSSION:

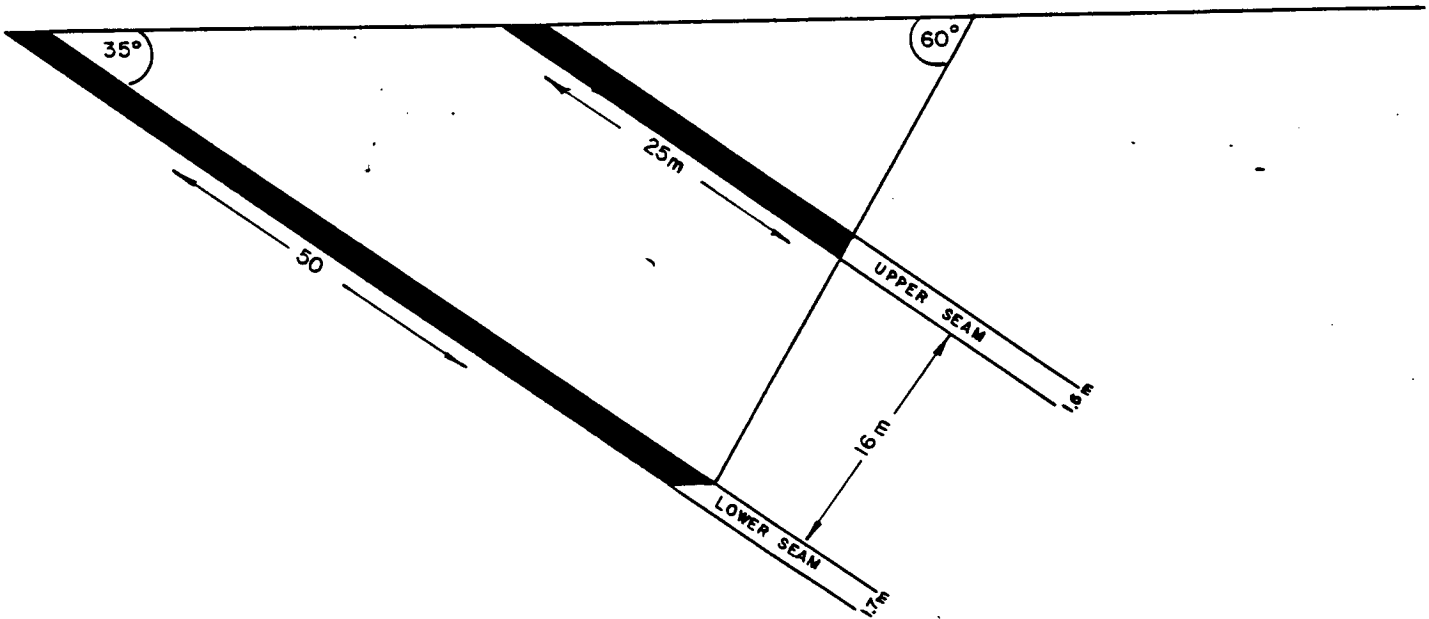
It is expected that an unwashed, carefully mined coal product from the Ross River upper seam and lower seam combined would have about 10% total moisture, 10% ash, and a heating value in the order of 6,000 cal/grm (10,800 Btu/lb). Although of a significantly higher rank (and resulting higher fuel ratio) than the Carmacks coal currently being utilized, it is thought that the Ross River coals will still be compatible with the spreader stocker with vibrating grate furnaces in the mill heating plant at Faro.

Until such time as a suitable topographic map is compiled, no detailed reserve estimates or mining plans can be prepared.

The coal seam strike trace from trench 1980-A, adjoining the highway, to trench 81-3, climbs a steep, grassy slope which immediately overlooks the highway and Whiskers Lake. The proximity and visibility of this area from the lake and highway, and the obvious problem of disposing of waste rock from any mining operation in the area, will lead to environmental constraints which will probably preclude operating in this area.

The coal seam strike interval from trench 81-3 northeast to the fault break in trench 81-9, however, presents an attractive surface mining situation in an area of low environmental sensitivity. A "first-pass"

mining reserve estimate, in this area, to a stripping ratio that would provide coal competitive with current Carmacks' costs, is shown below. The approximation of a flat topographic surface will not lead to a large overall error (trench 81-3 to 81-6, low angle positive slope; trench 81-6 to 81-8, low angle negative slope; trench 81-8 to 81-9, level).



Coal (tonnes) / metre strike length =

thickness (m) x strike (1 m) x dip length (m) x density

Lower Seam 1.7 x 1 x 50 x 1.4 = 119

Upper Seam 1.6 x 1 x 25 x 1.4 = 56

175 tonnes

For 515 m strike length, total reserve = 175 x 515 m = 90,125 tonnes

Waste Stripping/metre of strike length : 785 m³

Stripping Ratio $\frac{785 \text{ m}^3}{175 \text{ tonnes}} = 4.5 \text{ m}^3/\text{tonne}$

Mining Life $\frac{90,000 \text{ tonnes}}{18,000 \text{ tonnes/year}} = 5 \text{ year Faro coal supply}$

CONCLUSIONS:

The coal reserve defined by the 1981 bulldozer trenching program on the Ross River coal leases may be able to satisfy Cyprus Anvil's short term coal requirement, at Faro, at a cost more competitive than other alternatives. Mining and transportation costs should be investigated in detail.

Respectfully submitted,

T. J. Adamson
Senior Geologist
Coal Projects

November 18, 1981

Ross River Coal, Preliminary Mining and Transportation Cost Estimate

Assume : 90,000 tonnes coal
 : 46,350 m³ till stripping
 : 404,275 m³ waste rock
 : 200,000 m³ waste rock will require drilling and blasting
 : unit mining costs derived from 1981 Carmacks mining contract +10%

Direct Mining Cost

- Till 1.5 m x 60 m x 515 m = 46,350 m ³ x 4.78/m ³	\$ 221,553
- Waste rock 404,275 m ³ x 7.64/m ³	3,088,661
- Coal 90,000 tonnes x 8.36/tonne	752,400
- Drilling and blasting 200,000 m ³ x 6.41/m ³	<u>1,282,000</u>
	\$ 5,344,614
	÷ 90,000 tonnes = 59.38/tonne

Plus: Engineering and Supervision, say \$100,000 1.11/tonne

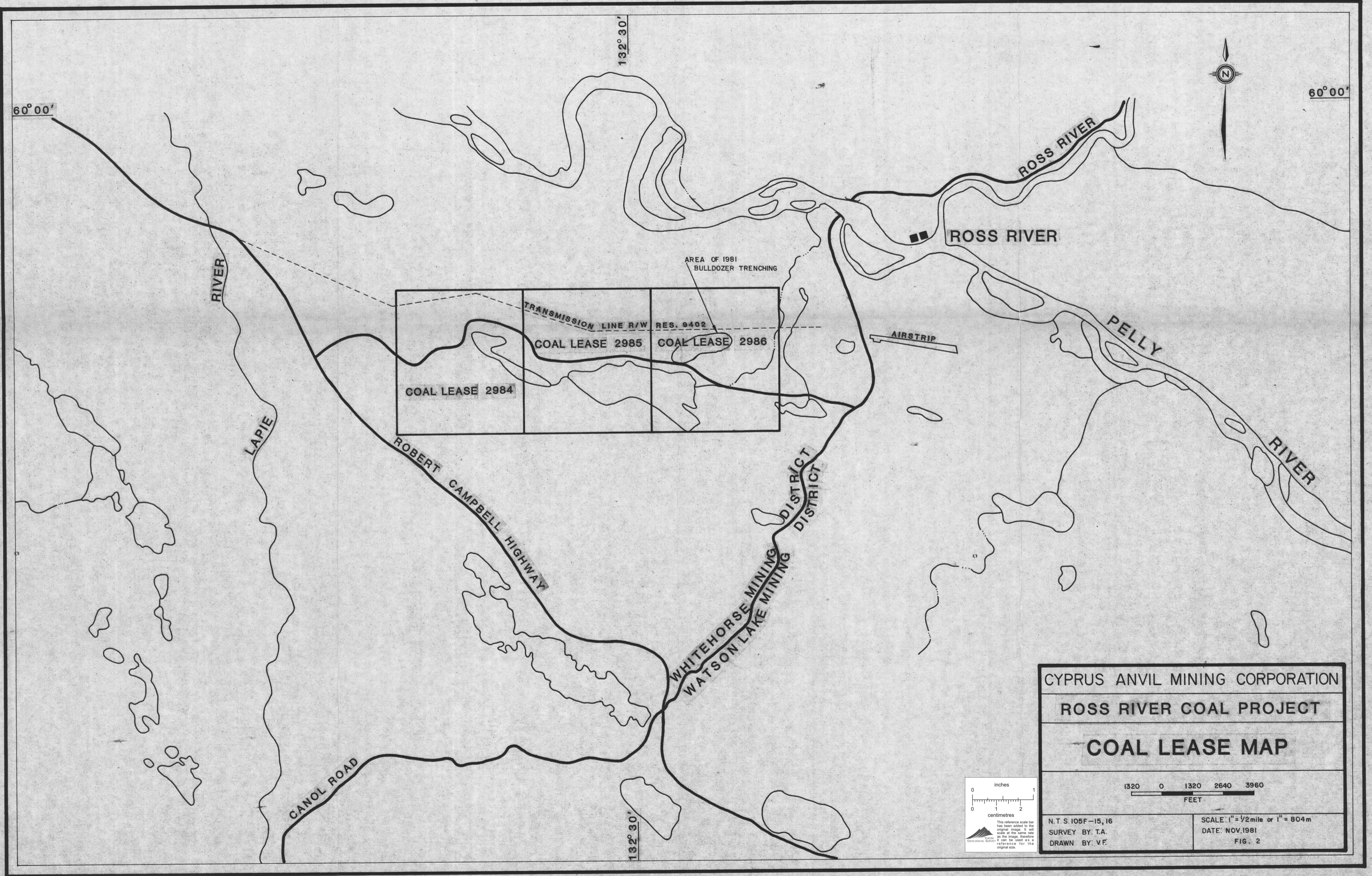
Plus: Annual Trucking cost, Ross River to Faro

Assume 20,000 tonnes of coal per year, for five years, will be trucked from Ross River to Faro in a 38 tonne B-train configuration coal hauler owned and operated by C.A.M.C. The driver will be a C.A.M.C. employee and will be housed in Ross River or Faro. Truck haulage will be carried out 197 days per year on a single shift basis, and 33 days per year, with an additional driver, on a two shift basis.

38 tonnes/load x 2 loads/shift x 263 shifts/year 19,988 tonnes/year

Trucking Cost:

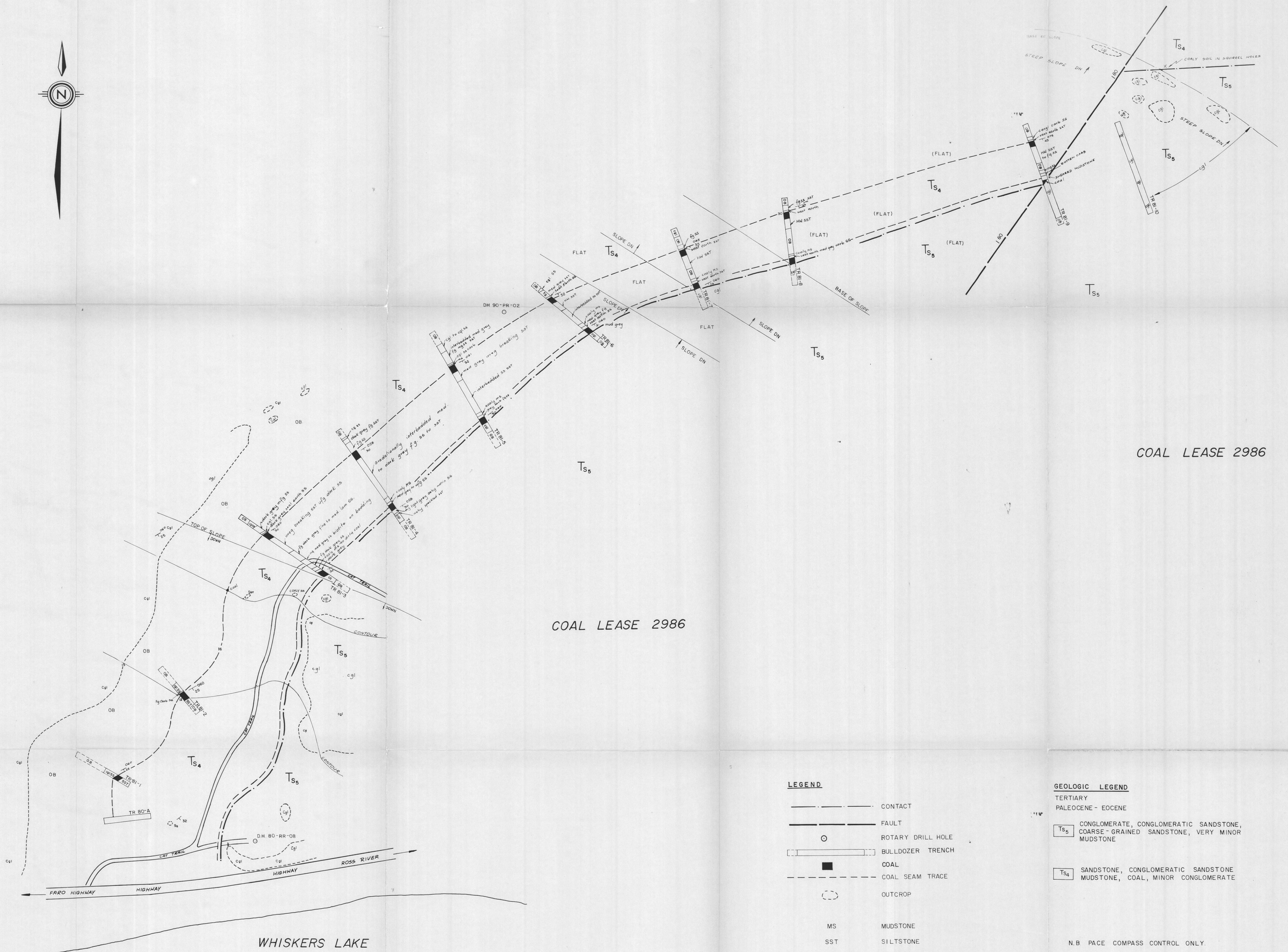
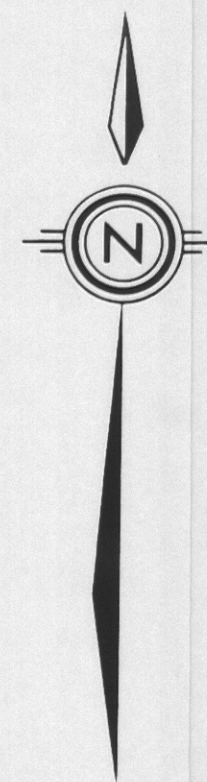
Ownership component: purchase price - 30% salvage value ÷ 5 years	\$ 21,000
: interest at 18% on declining balance	16,200
Salaries, benefits; 1 driver full time, 1 driver 33 days	75,000
Housing costs, Ross River or Faro per year, say	20,000
Insurance, permits, license, other fixed costs	5,000
Direct operating cost (fuel, oil, maintenance, tires, repairs)	
\$2.50/running mile	<u>139,390</u>
	\$ 276,590
	÷ 19,988 tonnes/year
Total cost Ross River coal, delivered to Faro	\$13.84/tonne
	\$74.33/tonne



CYPRUS ANVIL MINING CORPORATION	
ROSS RIVER COAL PROJECT	
COAL LEASE MAP	
N.T.S. 105F-15, 16 SURVEY BY: T.A. DRAWN BY: V.F.	SCALE: 1" = 1/2 mile or 1" = 804m DATE: NOV. 1981 FIG. 2

0 1 2 inches
 0 1 2 centimetres
This reference scale bar has been added to the original image. It will scale at the same rate as the image. Therefore, the same can be used as a reference for the original size.

COAL LEASE 2995
COAL LEASE 2986



COAL LEASE 2986

COAL LEASE 2986

WHISKERS LAKE

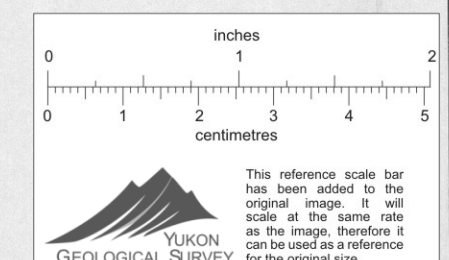
LEGEND

- CONTACT
- FAULT
- ROTARY DRILL HOLE
- ▭ BULLDOZER TRENCH
- COAL
- - - COAL SEAM TRACE
- OUTCROP
- MS MUDSTONE
- SST SILTSTONE
- SS SANDSTONE
- Congl ss CONGLOMERATIC SANDSTONE
- Cgl CONGLOMERATE

GEOLOGIC LEGEND

- TERTIARY
- PALEOCENE - EOCENE
- Ts5 CONGLOMERATE, CONGLOMERATIC SANDSTONE, COARSE-GRAINED SANDSTONE, VERY MINOR MUDSTONE
- Ts4 SANDSTONE, CONGLOMERATIC SANDSTONE, MUDSTONE, COAL, MINOR CONGLOMERATE

N.B. PACE COMPASS CONTROL ONLY.



CYPRUS ANVIL MINING CORPORATION
ROSS RIVER COAL PROJECT
YUKON TERRITORY
COAL LEASE 2986-1981 BULLDOZER TRENCH
GEOLOGY

1:1000

NTS 105-1516
SURVEY BY: TA
DRAWN BY: []
DATE: NOV 1981
MAP 1