Cyprus Anvil Min · Corporation Inte ice Correspondence

To J. F. Olk

Date December 2, 1975

From N. G. Cornish

Subject Cost and Availability of Coal for the Grum Project

I have reviewed all available literature in an attempt to determine possible cost and availability of coal for the Grum project. The conclusions reached are as follows:

1. There should be sufficient coal above the main entry of the Tantalus Butte mine to supply Cyprus Anvil for the known life of the mine based on proven ore reserves.
2. The northern extension of the main entry may not be the most economic coal available.
3. The main entry and counter levels should be advanced at a steady rate to develop more reserves and determine the economics of extraction from this zone.
4. There is sufficient information to be reasonably assured that an additional 20 year supply of coal at 160 tons per day can be proven from the following locations:
   a.) Tantalus seam south of Carmacks
   b.) Tantalus Butte seam north of present workings, and
   c.) Tantalus Butte seam below present workings.
5. The cost of producing this coal cannot be determined until more information as to location, seam thickness, and altitude of seam has been obtained by further exploration.
6. The cost of production should be less than $40 per ton of coal which is a price which should be competitive with present oil costs.
7. The necessary exploration program to prove this reserve could be started in March and completed during the 1976 summer season.
8. Some coal could be available for the Grum project for the winter of 1976-1977, but probably only at a tonnage somewhat below the 160 tons per day.
9. There is a reasonably good chance of being able to prove up a much larger tonnage than that required by the Grum project.

The Tantalus seam south of Carmacks has the greater potential for larger tonnage.

During August of 1966, a small bulldozing program supervised by R. J. Cathro of Archer, Cathro and Associates Limited, Consulting Geological Engineers, proved the existance of a coal seam at the boundary of Lot 26, Lease 2954. See attached report "Estimated Exploration Costs, Carmacks Coal District".

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Cathro states in this report, 'Coal is present on both limbs of a syncline and is probably present in the trough of the syncline as well'. See drawing number 2 of this report.

Bulldozer trenching and percussion drilling exposed the strike length of this seam at 600 foot intervals for 3,000 feet to the south east and intersected the seam 100 feet down the dip with 5 percussion drill holes. See attached preliminary calculations from M. O. Hampton to J. F. Olk, February 20, 1968. The average thickness of the explored seam was 19 feet and calculated reserves were 228,000 tons above the drill intersections.

The discovery bulldozer trench is approximately 5,500 feet south east and over 800 feet above the old Tantalus mine portal.

A report titled "Report on the Tantalus Butte Coal Mine, Y.T.", by W. J. Dick dated August 2, 1947 reports:

'c.) Tantalus Mine

> Some time was spent in the company of Dr. B. C. MacKay of the Department of Mines in making an examination of this coal area, but here again no examination could be made of the underground workings due to caving. The surface plant had also been destroyed by fire. The coal is on fire, but whether this extends to the old workings is difficult to say . . . The coal was mined by a tunnel from those parts of the seam above river level. At 2,500 feet from the portal a fault was encountered which cut the seams off and beyond which they have not yet been found'.

The fire in this mine should not extend past the fault, therefore, the area between the fault and the discovery trench, 3,000 feet of strike length, can be considered as geologically infered coal reserves. One of the assumed seams as shown on drawing number 2 of the R. J. Cathro report over a strike length of 6,000 feet and an average thickness of 15 feet would contain 18,000,000 tons of coal. Additional potential exists for this seam extension to the south and the possibility of another seam.

This Tantalus seam should be explored from the discovery trench at the claim boundary to the north by bulldozer trenches on, say, 300 foot intervals until the seam terminates, probably against the fault cutting off the seam in the old Tantalus mine. The downward extension of the seam would then be explored down dip of the surface trenches by percussion drill holes to a depth of 200 feet or to the 2,000 foot elevation.

This seam would then be developed by driving an adit at the 2,000 foot elevation to the south on the coal seam. There is a good probability of developing the required 160 tons per day for 20 years of coal above this adit.

The estimated costs to explore this zone would be:

1.	10 bulldozer trenches @ $1,500 per trench	$ 15,000
2.	10 Air Trac drill holes @120 feet per hole @ $5 per foot	$ 6,000
3.	10 Air Trac drill holes @ 250 feet per hole @ $10 per foot	$ 25,000
	Contingencies	$ 4,000
	Total	$ 50,000

The Tantalus Butte seam below the present workings and above the Yukon River probably contains 750,000 tons of coal. Mineable reserves below the river level would depend on water conditions.

The present adit conditions and the necessary extended tramming distance would make it impractical to provide an additional 160 tons per day of coal from the area to the north and above present workings.

Mining costs of the above mentioned potential reserves would be dependent on ground conditions, attitude of seam, mining rate, etc., but should be sufficiently below the estimated market value of $40 to produce a satisfactory rate of return on invested capital if a reliable market can be established.

N. G. Cornish
Production Manager Metallurgy

/peg

Cyprus Anvil Mining Corporation — Interoffice Correspondence

To J. Bruk, R. E.G. Davis, J.G. Simpson, T.J. Adamson, U. Jansons — Date December 2, 1975

From D. S. Jennings

Subject Coal Reserves - Carmacks Leases

Please find attached a summary report on above subject.

D. S. Jennings

DSJ/mp
Attch.

CYPRUS ANVIL

COAL RESERVES
CYPRUS ANVIL MINING CORPORATION COAL LEASES
CARMACKS, Y.T.

GENERAL

This report attempts to summarize coal reserve data on the Cyprus Anvil leases in the Carmacks area. It is based on fragmentary information presently available in the Vancouver Office and may differ from a similar report in preparation by N. G. Cornish at Faro. Reserves and analyses are tabulated for two land packages:

(1) Tantalus Butte area covering Leases 2950, 2952, 2955, 2956, 2959 and Lots 23 and 24 (Figure 1);

(2) Tantalus mine area covering Leases 2949, 2951, 2953, 2954 and Lots 10, 11, 25 and 25 (Figure 1).

Areas of potential reserves on these land parcels are discussed.

TANTALUS BUTTE AREA

Data in this area are insufficient to generate proven coal reserves. Geologically inferred reserves are estimated by Jennings (1973 a,b) at 1.55×10^6 short tons on part of the main coal bed at the Tantalus Butte mine. This figure includes 1.47×10^6 short tons in a panel defined on two sides from 14,350N to 18,350N between the main entry level and surface and 7.9×10^4 short tons below the main entry level between the south cross cut and main slope. These figures are the most recent reserve estimates superseding various reported figures extant at time of purchase of the Tantalus Butte mine. Possible reserves from 11,350N to 14,350N between the main entry and surface (active mining area) are judged small to non-existent. No operational data are presently available to confirm this suspicion.

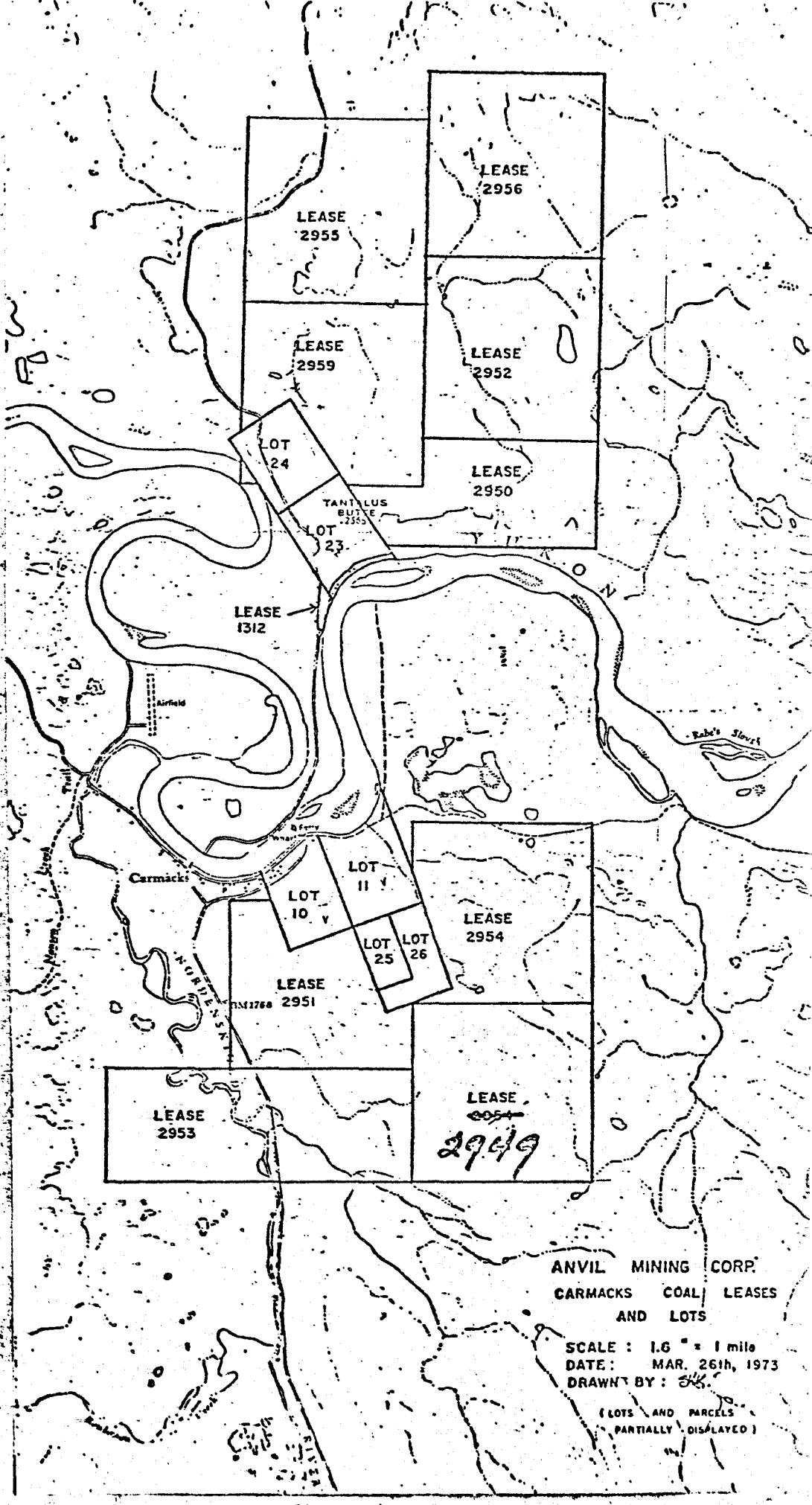
LEASE 2956
LEASE 2955
LEASE 2959
LEASE 2952
LOT 24
LEASE 2950
TANTALUS BUTTE 2565
LOT 23
LEASE 1312
Airfield
Rabbit Slough
Carmacks
LOT 11
LOT 10
LOT 25
LOT 26
LEASE 2954
LEASE 2951
TM 1768
LEASE 2953
LEASE 2949
ANVIL MINING CORP.
CARMACKS COAL LEASES AND LOTS
SCALE : 1.6 " = 1 mile
DATE : MAR. 26th, 1973
DRAWN BY :
(LOTS AND PARCELS PARTIALLY DISPLAYED)

Figure 1

Numerous analyses of the three known Tantalus formation coals at Tantalus Butte are summarized in Table 2. From these analyses, the main coal is classed as high volatile, bituminous B or C (A.S.T.M., 1916).

Several areas of tonnage potential can be defined in this land package. From the portal (11,350N) to the present working face (14,800N), a length of 3,450 ft. along the main bed, approximately 470,000 tons may be present between the highway level and the level of the main entry, assuming a 400 ft. dip extent and 8 ft. average thickness. This is a minimum estimate that would require testing. This portion of the main bed presents the most attractive situation for further underground development because of its proximity to the portal/highway facility, short haulage distance and absence of shaft requirements. Additional coal reserves may be sought in the northward continuation of the main bed on Lease 2955 beyond 18,800N, the present limit of testing. Since the Tantalus Butte coal measures occur on the west limb of a north-trending anticline on Leases 2955 and 2959, the crestal region and eastern limb of this fold may occur on Leases 2950, 2952 and 2956 (Figure 1). Relatively flat-lying coal horizons in the crestal regions of such folds present an attractive local as well as regional exploration target. It should be noted that even though the footwall and hangingwall coal beds at Tantalus Butte do not appear to be of commercial quality in the immediate mine area, they may become commercial elsewhere on the leased package.

TANTALUS MINE AREA

As in the case of the Tantalus Butte area, no proven coal reserves are defined on the Cyprus Anvil leases in the vicinity of the old Tantalus Mine. Birch (1943) estimates 2.3×10^5 short tons of coal available over a 2000 ft. strike

TABLE I: Summary of Analyses - Tantalus Butte Coals
(As Received Basis)

Unit	% Water†	% Volatile Combustible matter	% Fixed Carbon	% Ash	% S	B.T.U./lb.	Reference
H/W	13.64*	31.83*	51.84*	2.69*	-	-	Cairnes, D.D. (1910) p.53
Main	16.32*	31.72*	42.13*	9.83*	-	-	" " " "
	6.1	31.2	53.8	8.9	-	11,800	Bostock, H.S. (1936) p.61-62
	5.4	30.7	53.4	10.5	-	11,950	" " " "
	4.5	30.9	53.1	11.5	-	11,990	" " " "
	3.7	32.9	54.3	9.1	-	12,490	" " " "
	5.6	33.7	49.4	11.5	-	11,840	" " " "
	4.2	32.8	53.0	10.0	-	12,250	" " " "
	4.4	32.9	51.2	11.5	-	12,000	" " " "
	4.4	33.4	52.2	10.0	-	12,260	" " " "
	3.4	34.2	52.4	10.0	-	12,050	Birch, D.C. (1943) appendix
	6.6	31.3	51.2	10.9	0.4	10,940	Dick, W.J. (1947) p. 9-9a
	4.2	29.9	47.2	18.7	0.3	10,510	" " " "
	4.9	29.3	45.1	20.7	0.3	10,040	" " " "
	3.8	32.0	53.2	11.0	0.3	11,980	" " " "
	4.2	30.1	52.3	13.4	0.3	11,330	" " " "
	4.7	31.5	52.9	10.9	0.3	11,630	" " " "
	3.5	31.0	55.7	9.8	0.5	12,250	" " " "
	6.2	29.9	47.2	16.7	0.4	10,520	" " " "
Lower	12.87*	31.72*	49.51*	5.90*	-	-	Cairnes, D.D. (1910) p.53
Average non-slaked main coal bed	4.7	31.6	51.6	12.1	0.4	11,637	

† - values in weight percent

* - sample slaked

length of the middle seam from river level to a vertical depth of 300 ft. (450 ft. dip extent at 40^{o}E) assuming an average 6 ft. thickness. The obvious disadvantage with this possible area of reserves is its requirement for a shaft or decline based operation.

Based on work done by Cathro (1967) and Hampton (1968), on leased ground south of the Tantalus mine, 4.4×10^{5} short tons of coal are indicated over a 5000 ft. strike length to a vertical depth of 100 ft. (115 ft. dip extent at 45^{o}E) assuming an 18 ft. average thickness. (Note reports by Cathro (1967) and Hampton (1968) not available at time of writing, figures supplied by M.O. Hampton, personal communication.) This figure is similar to an estimate given by Olk (1967) for a hypothetical 20 ft. thick seam over a 6,500 ft. strike length with the same dip extent. This area south of the old Tantalus Mine is a possible open pit operation (Olk, 1967) similar to that proposed for a thickened portion of the main bed at Tantalus Butte (Jennings, 1973 c).

Analyses of coal samples from the Tantalus Mine and leases south of the Yukon River (Table 2) characterize these coals as high volatile, bituminous B or C rank (A.S.T.M., 1916). This is not surprising, in light of Hacquebard's correlation of the middle and lower Tantalus and Tantalus Butte main seams (Hacquebard, 1972).

Various workers report areas of tonnage potential within and south of the Cyprus Anvil land package around the Tantalus Mine. Specific locations cannot be cited at this writing because of the absence of key reports (Archer, Cathro (1966), Cathro (1967), Hampton (1968)). Crestal regions of megascopic folds in the Laberge formation again provide the

TABLE 2: Summary of Analyses - Tantalus Mine Area Coals
(As Received Basis)

Unit	% Water	% Volatile Combustible matter	% Fixed Carbon	% Ash	% S	B.T.U./lb.	Reference
Upper	.82	25.12	66.03	8.03	-	-	Cairnes, D.D. (1910) p.52
	.9	25.0	58.0	17.0	.5	12,060	Cairnes, D.D. (1910) p.63
Middle	.76	24.74	58.60	15.90	-	-	Cairnes, D.D. (1910) p.52
	.7	26.7	54.1	19.2	.5	11,358	Cairnes, D.D. (1910) p.63
Lower	.75	23.61	55.21	20.43	-	-	Cairnes, D.D. (1910) p.52
	.7	27.8	56.0	16.2	.5	12,222	Cairnes D.D. (1910) p.63
	.9	21.9	48.8	28.4	.3	10,230	Birch (1943)
Trench No. 5	7.9*	23.7*	35.5*	32.9*	.4*	6,730*	Montgomery (1968)
AT-1	.5	20.9	45.6	33.0	.4	9,360	Montgomery (1968)
Average Non-slaked	.8	24.5	55.3	19.8	.4	11,046	

* - sample slaked

most attractive local and regional exploration targets. Other workers in the Carmacks area (R. J. Kirker Resources, Teslin Explorations, Norman H. Ursel Associates) should be consulted as to their recent exploration work around our Carmacks lease holdings. In addition, the status of the reported underground fire in the Tantalus mine will have to be investigated.

CONCLUSION

A total of approximately 2.7×10^6 short tons of high volatile, bituminous B/C coal reserves are indicated and/or assumed within the Cyprus Anvil lease package in the Carmacks area. This figure is calculated as follows:

Tantalus Butte Area:	1,550,000	tons defined 2 sides
	470,000	tons assumed
	2,020,000	tons
Tantalus Mine Area:	230,000	tons assumed
	440,000	tons trenched and partially drill indicated
	670,000	tons
	2,690,000 tons	$\approx 2.7 \times 10^6$ tons

It is emphasized that essentially none of these so-called "reserves" are drill defined, therefore, requiring confirmation.

D. S. Jennings,

DSJ/mp

REFERENCES

Archer, A.R. and Cathro, R.J. (1966) Coal Occurrences in the Yukon Territory*; private report for Anvil Mining Corp. Ltd. September, 1966.

A.S.T.M. (1916) Classification of Coal by Rank; Book of A.S.T.M. Standards, Part 19, A.S.T.M. Designation: D 388-66, pp. 73-78.

Birch, D. C. (1943) Report on Carmacks Area Coal Potential*; private report for J. Gordon Turnbill and Sverdrup and Parcel Ltd., February, 1943.

Bostock, H. S. (1936) Carmacks District, Yukon Territory: Geol. Surv. Can. Mem. 189, 67 p.

Cairnes, D. D. (1910) Lewes and Nordenskiold Rivers Coal District, Yukon Territory; Geol. Surv. Can., Mem. 5, 70 p.

Cathro, R. J. (1967) Report on Trenching Program, Tantalus Mine Area*; private report for Anvil Mining Corp. Ltd., September, 1967.

Dick, W. J. (1947) Report on the Tantalus Butte Coal Mine, Y.T.; private report for unkown firm, 2 August, 1947.

Hampton, M. O. (1968) Report on Drilling Program, Tantalus Mine Area*; private report for Anvil Mining Corp. Ltd., February, 1968.

Hacquebard, P. A. (1972) Petrographic correlation of the Tantalus and Tantalus Butte Coal Seams of Carmacks, Y.T.; Geol. Surv. Can., Tech. Rpt. No. 115-I-1-3.

Jennings, D. S. (1973a) 1973 Trenching Program at Tantalus Butte; private report for Anvil Mining Corp. Ltd., 21 November, 1973.

_____(1973b) Underground Exploration Drilling Program at Tantalus Butte; private report for Anvil Mining Corp. Ltd., 18 December, 1973.

_____(1973c) Preliminary Open Pit Considerations, Main Coal Bed, Tantalus Butte Mine, Carmacks, Y.T.; private report for Anvil Mining Corp. Ltd., 2 November, 1973.

Montgomery, D. S. (1968) Report on Analyses, Tantalus Mine Area coals in letter to M. O. Hampton, 6 May, 1968 for Anvil Mining Corp. Ltd.

Olk, J. F. (1967) Carmacks Coal District - Anvil Leases; private report for Anvil Mining Corp. Ltd., 26 September, 1967.

* Assumed title as report either untitled or missing

To Mr. R.E. Gordon Davis
Mr. J.F. Olk
Mr. Glen Simpson

Date 15 January 1976

From John Bruk

Subject Coal - Carmacks Area

Recently, NCPC announced substantial increase for the cost of power for the Yukon consumers, including our Company. The proposed new rates would result in approximately $1 million increase per year over the present rates. Accordingly, we will have to consider looking at a feasibility of generating our own power, using coal from the Carmacks mine. To that end, and because both thermo and metco coal are becoming more valuable, it is desirable that we fully investigate the potential of our leases, and for that matter, the potential for coal in the Carmacks and other areas of Yukon, where coal is known to occur.

Attached are memos of N.G. Cornish and Dave Jennings, which have been prepared in pursuance of our investigation of coal potential near Carmacks.

I would suggest that the three of you discuss this matter and develop a program for the exploration and, if necessary, acquisition of coal properties near Carmacks and other areas in the Yukon. Our first priority is the Carmacks area, at least, for the time being. In addition, we should consider the feasibility of generating power through a coal-fired thermo plant, both for our use and for the potential use of the Grum deposit.

You may wish to involve both Newt Cornish and Dave Jennings, as well as Murray Hampton, all of whom are familiar with the subject matter.

I would appreciate it very much if you could hold a meeting early in February, and then advise me accordingly.

Thank you.

John Bruk:jdw

Cyprus Anvil Mining Corporation — Interoffice Correspondence

To: R.E.G. Davis, J. F. Olk, J. Bruk

Date: January 27th, 1976

From: J. G. Simpson

Subject: Coal reserves and potential - Carmacks Area

Some confusion exists as to the reserves and potential of the Carmacks coal leases held by the Company. The following, together with enclosed maps and sections, should help to clarify the situation somewhat.

The two lease areas are situated north and south of the Yukon River valley at Carmacks and cover the better part of two outliers of the Jurassic-Cretaceous age, coal-bearing Tantalus Formation. Neither area is particularly well exposed and no detailed geological map is available for either area. Two adit entrance mines have been driven for coal extraction. On the lease north of the river, the Tantalus Butte mine is currently being worked by the Company at 80 t.p.d. and on the south side of the river the old Tantalus Mine is now abandoned, and reportedly the seam is either on fire or burnt out to a known fault zone.

Tantalus Butte

The Tantalus Butte mine seam is 8-10 ft. thick and strikes northerly, dipping to the west fairly steeply at about 45°, and outcropping along a ridge at 2,550 to 2,600 ft. elevation. Some 6,500 ft. of strike length has been indicated on this seam by underground work and surface trenching, and a further potential of 3,500 may exist as a northerly extension.

If the one mineable seam persists along 6,500 ft. of strike and averages 9 ft. in thickness, this would provide approximately 2.2 m.s.t. in place, downdip to river level at 1,950 ft. Of this, some 0.4 m.s.t. could be amenable to strip mining to a vertical depth of 200 ft. The limits on stripping are set by the fact that the seam dips into the side of the hill along its outcrop length (see Section AA).

Tantalus

Less is known about the Tantalus seam or seams on the south side of the river. However, the main seam exposed by trenching is about 20 ft. thick, strikes slightly west of north, and has been traced by underground and sporadic surface work for about 9,000 ft., of which the most northerly 2,500 ft. has been mined underground and is either on fire or burnt out.

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A fault at the 2,500 ft. adit point should effectively seal off the effects of this combustion from the southerly strike extent. An additional 4,000 ft. potential strike length remains to be tested to the lease limit, which may also coincide closely with the limits of coal seams in this particular outlier of Tantalus Formation.

Because of a possible synclinal structure preserved on the south side of the river (see Section BB) and the apparent thickness of the seam, a larger tonnage potential exists in this block than in the Tantalus Butte section. However, it should be noted that no detailed geological map is available nor has it been proven that the seams do extend from E. to W. through a syncline. It is debatable whether the seam exposed by trenching is an up-faulted portion of the adit seam or a younger unit as indicated on the cross section. Any estimates made on this model are extremely speculative and would not be inferred as reserves by any standards.

Assuming 20 ft. thickness, 12,000 ft. strike and the synclinal structure inferred, the trench seam could provide a potential as high as 30 m.s.t., but would be reduced to 7 or 8 m.s.t. to river level if the sequence continues to dip at -45° to the east. There are possibilities in this block for more than one mineable seam but, on present information, one mine seam would form the most likely reserve. In a similar open pit strip configuration to that proposed at Tantalus Butte some 2 m.s.t. might be available to 200 ft. vertical depth at a stripping ratio of 7:1 (b.c. yds. to s.t. coal).

Reserves and Potential

Guestimates on reserves and potential are as follows:

	Open Strip S.T.	Underground to River Level	Maximum Potential	Percent Recovery Underground
Tantalus Butte	400,000	1,800,000	3,000,000	50%
Tantalus	2,000,000	7,000,000	30,000,000*	50%
Totals	2,400,000	8,800,000	33,000,000	50%

* Variable figure depending entirely on structural continuity of syncline.

Mining

Because of the steep dips, the opencast work would essentially be a strip mine and would presumably be subject to some objections from Land Use and other Federal departments. However, it would appear to be the least expensive method available at a price per ton at road side of about $12 to $13.

The steep dips at 45^{o} do not render the known seams amenable to longwall methods and the more expensive room and pillar systems with recoveries from 50-60 percent, would probably be the extraction method best suited.

Requirements

Assuming potential customers for coal at both Minto and AEX for similar purposes now employed at Faro, a daily production of 200 to 300 t.p.d. or 80,000 to 110,000 s.t. per year may be required. In this case, the open pit potential of 2.4 million s.t. would provide a 20 year supply.

A 30,000 k.s. thermal plant at Faro to supply both Faro and AEX with electrical power would require an additional 120,000 s.t. per year which could, without too much doubt, be supplied over a 20 year life by a combination of open pit and underground extraction, assuming a minimum underground reserve of 2 million s.t.

Conclusions

Because of the minimal and diverse nature of the data available on the coal potential of the Carmacks leases, any estimate of reserves over and above the immediate open pit potential of minimal strike lengths is subject to gross error. However, it appears likely that sufficient tonnage potential is indicated for the purposes required, to proceed with a limited program of exploration based on careful mapping and trenching of seam outcrops and sub-outcrops, with rotary drilling to at least indicate the 4 m.s.t. required to serve potential outlets.

J. G. Simpson,

JGS/mp

Peter Taggart

April 27, 1976

Tom Adamson

1976 Carmacks Coal Exploration Project

Glen has asked me to answer your telex of April 23rd re the 1976 Carmacks Coal exploration project.

Our program will initially concentrate on careful mapping of the north and south lease blocks to accurately define the limits of the Tantalus Formation. Bulldozer trenching will probably be required along the main seam to the north of Jennings' 1973 trenching,on the north end of the Butte to search for additional thickened sections of the seam which may be amenable to surface mining. Trenching will also continue to the south of Hampton's 1968 trenching on the south leases and will also probably be necessary to expose the coal bearing horizon along the east limb of the synclinal structure postulated along the east margin of the south lease block. Any drilling will be contingent upon mapping and trenching results.

We have recently (March 1976) staked five additional coal leases covering Tantalus Formation to the south of the Teslin Exploration leases that adjoin our original south block leases. We hope to have some arrangement worked out with Teslin Exploration that will allow us to include their leases in the summer program.

We have virtually no data on the trenching, drilling and mapping done by M. O. Hampton on the south leases in 1968. Dave Jennings was unable to find a report on this work in Faro. If you can dig up any report on this work, it would be greatly appreciated.

Enclosed, for your information, are the following:

- 1976 Carmacks Coal Project A.F.E.
- Memo by J. G. Simpson re Carmacks Reserve Potential (optimistic), January 1976.
- Memo by J. Bruk, January 1976.
- Map of new coal leases.
- Archer and Cathro reports, 1966.

T. J. ADAMSON

TJA/cb
Attach.

Cyprus Anvil Mining Corporation — Interoffice Correspondence

To: Murray Hampton

Date: February 10, 1977

From: Rod Hill

Subject: Quality of Carmacks Coal

I would like to obtain some data concerning the design of grates for coal-fired boilers, with respect to coal quality. What I have in mind is to construct a plot of ash content x calorific value with ranges of "acceptable" ash and "acceptable" B.T.U./lb. This would give me an area in the middle we can call "acceptable" (i.e. marketable) thermal coal.

The reasons for this are as follows:

1. Washing samples from Carmacks North to 8% ash did not significantly improve B.T.U. values, therefore I am working on the assumption that this coal can be burned as mined, i.e. preparation facilities will not be required. These samples have a range of ash-contents between 8.7 and 16.8%, therefore I would like to know whether suitable grates could be designed to handle this ash-range.

2. Carmacks South samples have much higher ash (20 - 40%) and lower B.T.U. values, and some have coking chracteristics and others not. Washing to 8% ash significantly improved calorific values (from 11,000 to 14,000 B.T.U./lb.), but with very low yields. If a thermal coal with (say) 15% ash is marketable, then washing Carmacks South non-coking coal to 15% ash rather than 8% ash would significantly improve yields.

3. We could also consider washing Carmacks South coking coal into two fractions. For example, a met coal with (say) 5% ash could be floated, and then the sinks re-floated to yield a middling at (say) 15% ash for thermal use. Again, this would significantly improve yields on washing.

This information would assist me in revising the specifications for analytical work and testing for this year's drilling, and also enable me to calculate reserve figures of both thermal and coking coal for Carmacks South.

If you or any of your colleagues in the Engineering Department have access to such information, I would be grateful if you could forward it to me.

R. P. Hill

RPH/cb

CYPRUS ANVIL

Cyprus Anvil Mining Corporation | Interoffice Correspondence

To: Rod Hill

Date: February 24, 1977

From: Murray Hampton

Subject: COAL FIRED BOILER DATA

I am afraid we can't produce much helpful data from here. The furnace designers were given the information on the coal and the specifications of the burners are for the handling of this coal, i.e. 15% ash.

Some opinion says 20% is likely to be the maximum these burners could handle, but others working with the furnaces won't even guess. The limiting factor is the point at which the bed of coal in the fire box becomes too thick, or the ash reacts in such a way as to restrict the flow of combustion air below the critical amount needed to maintain the required combustion rate.

Other than the physical characteristics of the ash in the burner, the problem is primarily one of materials handling, i.e. feeding extra amounts of material to provide desired BTU and removing and disposing of extra ash.

If the ash has the right characteristics, the fluidized bed burner systems now being tested can accommodate a tremendous amount of ash, as they require inert material for the bed to operate.

Sorry I can't be of more help.

M. O. Hampton
Senior Engineer - Coal Project

MOH/mm