IMPERIAL OIL LTD.

MERRITT COAL FIELD

PRELIMINARY EVALUATION

SEPTEMBER, 1977

BY

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760(1)

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SUMMARY AND RECOMMENDATIONS

Summary

1) Very good quality thermal coal desposit
2) Infrastructure excellent as well as transportation facilities to any market
3) Reserves are mainly underground with 180 MM short tons speculative of which an unknown quantity (10 MM short tons plus) may be surface mineable
4) Imperial Metals & Power Ltd. controls 1200 acres of the prime area of the field.

Recommendations

1) That mine plans be obtained and studied with a view to delineating surface mineable reserves to the west of Imperial Metals coal rights.
2) That a brief 3 day geological reconnaissance can be carried out to define any surface mineable coal in the west.
3) Negotiations with Imperial Metals & Power Ltd. over conditions of a yearly rental for exploration purpose could be carried out after 1) and 2) are completed.
4) In the case of a positive negotiation exploration drilling could follow with 11 drill holes
5) A land search should be carried out over acreages adjoining Imperial Metals (presently in progress).

The area holds great potential for an underground mining prospect with good quality seams of the proper thickness and low dips.

In addition, surface mineable reserves are a distinct possibility and efforts should be made to prove or dispprove the existence of such. In the case of a 20 MM ton reserve of surface mineable coal (which wouldn't be hard to arrive at over short areas with the large seam thickness), a surface mine & U/G mine could be developed together or a surface mine first, shifting to U/G later.

INTRODUCTION

Purpose and Scope

The purpose of this study is as follows:

(A) To evaluate the reserve potential of Imperial Metals and Power Ltd.'s property

(B) To construct a preliminary geologic map of the entire coal field from all available information

(C) To determine which areas apart from Imperial Metals leases may also contain reserves of coal of economic value.

(D) To evaluate the development prospects of the entire field and devise an exploration guideline.

Location and Access

The Merritt coal field is located in the Intermontane Tectonic Belt of south central British Columbia (Figure 1).

The transportation system is excellent with one railway running east west through the field and a branch line running south. Distances to Vancouver is 230 miles, to Calgary 502 miles, and to Seattle 302 miles. Access is excellent throughout the area and the Town of Merritt is adjoining the coal field (Figure 2).

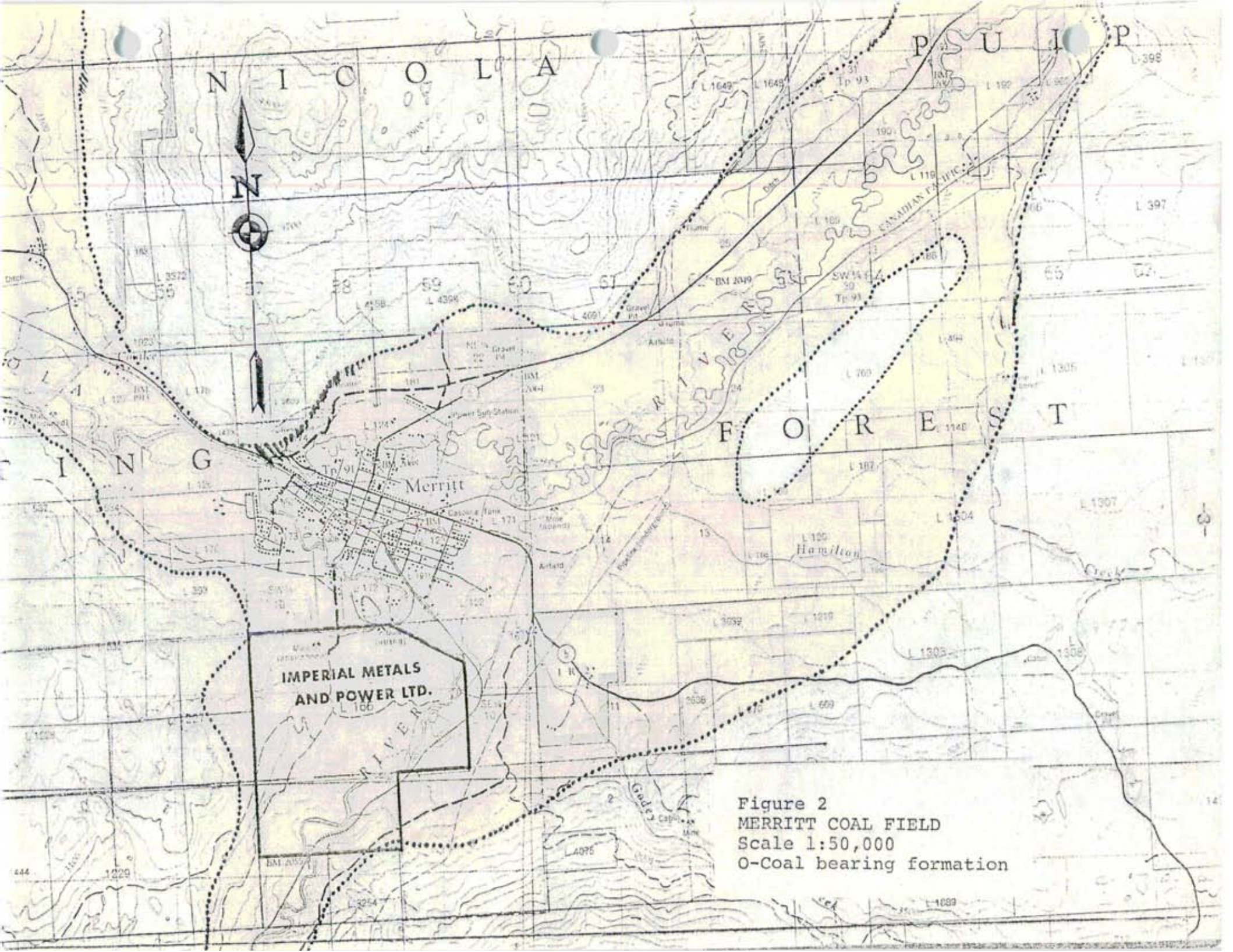


Figure 2
MERRITT COAL FIELD
Scale 1:50,000
O-Coal bearing formation

Geography

Elevations at Merritt range from 3100 feet in the west to 2000 feet a.s.l. throughout the eastern and central portions of the field. Two main rivers, the Coldwater and Nicola Rivers flow west through the field and have formed a broad flat river valley.

Land Status

Imperial Metals and Power Company Ltd. holds by Crown Grant the coal rights previously held by Middlesboro Collieries which consists of Lot 166 as well as the northern half of Section 4, Township 91, Kamloops Land District.

The status of the lands to the west and northeast of this acreage is unknown. It is known however, that no coal licenses have been approved in the Merritt field so the land would have to be under Crown Grant.

Presently, the Land Department of Imperial Oil is looking into the status of the Crown Grants around Imperial Metals property to see if I.O.L. could gain a foothold on any open Crown Land which may be available. The results should be forthcoming by the end of October.

Markets

The quality of this coal is excellent for high B.T.U. thermal coal. It has been stated in past reports that it could be used for blending to produce coking coal and that parts of some seams are even of coking grade.

Markets for this thermal coal would of course, include Japan, with short rail haul to Vancouver; Ontario Hydro, since Merritt is on a rail line to the east and possibly as an alternative B.C. Hydro or Seattle Power Companies.

In summary, there is a diversification of markets available and its geographical location is favourable for putting this field in competition with other thermal coal producing areas.

GEOLOGY

Glacial - Fluvial Cover

Most of the Nicola Valley is covered by a heavy mantle of till cover. This cover averages 150 feet in thickness but may go up to 600 feet such as was encountered in a drill hole at the junction of the Nicola and Coldwater Rivers.

Outcrops of bedrock do occur in the Coldwater - Coal Gully Hills area in the western portions of the field as well as in the area of the N.W. ¼ of Section 14, Township 91.

Another area of thick fluvial deposits is between Coldwater and Coal Gully Hills where an old buried river channel is in evidence through drilling. Thickness of till in this area reaches 120 feet.

Stratigraphy

Rocks in the Merritt coal field area are divisible into two groups, these being sedimentary and volcanic in nature.

The volcanics are of Triassic age consisting in large part of diabase, porphyrite, rhyolite, andesite, felsite, and agglomerate. These volcanics underly and surround the sedimentary coal bearing rocks in the Merritt field. In places they display a schistose structure, owing to crustal

movements which have affected the sedimentary rocks and coal and produced faults of considerable extent.

The term "Nicola Group" was given by Dawson to these volcanic rocks.

The younger sedimentary rocks of Tertiary age are termed the Coldwater Beds (Map 1). the sediments comprise sandstone, conglomerate, grit, shale and coal beds. The coal was laid down in peat bogs in an interior basinal type of environment allowing for the variations in thickness and number of coal seams.

Coal Measures

The coal is contained in at least seven seams as follows:

Top ↑

Seam No.	Thickness (ft.)
2	6.0
3	2.5
6	6.0
8	8.0
4	25.0
5	5.0
1	26.0

These thicknesses and the number of seams do not remain constant throughout the field and intervals between seams may change by as much as 100 feet from place to place.

The 4 seam and 1 seam are the thickest in the western portions of the field where they average 26 feet each. To the east as far as can be ascertained from limited drilling. The 1 seam decreases in thickness to about 4 feet and the 4 seam to about 7.5 feet, but the five seam increases from 5 feet in the west to up to 10 feet in thickness in the east.

Moving towards the southern portions of the basin the seams also thin out as found in drill hole 4S, the 4 seam decreases to 5.5 feet, the one seam to 4.0 feet but the 5 seam increases to 7.0 feet or more.

Drilling to the north was not to great enough depth to define the northward extent or seam thicknesses of the coal basin.

It must also be noted that seam identification is extremely difficult with the existing information and a drilling program of rotary holes making use of electric logging techniques would be useful in this respect.

Structure

The structural geology is not too well known throughout the area because of the thick till cover and limited drilling.

Deformation appears to be greatest in the west as seen on the geological map (Map 1) and cross-sections 1 to 3 (Appendix II). Folding and faulting has been identified

by drilling in the west, but mine plans and geological mapping would be extremely useful in verification. The coal appears to dip into a gentle syncline throughout the central portions of the field with dips of 10^{o} or less which would be beneficial to underground mining. It is belived that the depth to the coal in the trough of the syncline would be about 1500 feet to the basal (lseam). Although this hasn't as yet been verified by drilling.

The coal is brought closer to the surface in the east on an anticlinal feature probably associated with high angle faulting.

The western portions of the lease holds surface mineable potential because of the deformation, thicker seams and the shallower depth of these seams, whereas the central and eastern areas hold underground potential because of shallower dips and the less disturbed nature of the beds.

The geologic map and cross-sections were drawn from all existing information, but until some geologic mapping has been done as well as a study of mine records and drilling, the geology must be classified as speculative at best.

Quality

The average quality as computed in the 1970 Sumicol Report was taken from 11 drill core samples after washing at a specific gravity of 1.4 to yield the following results:

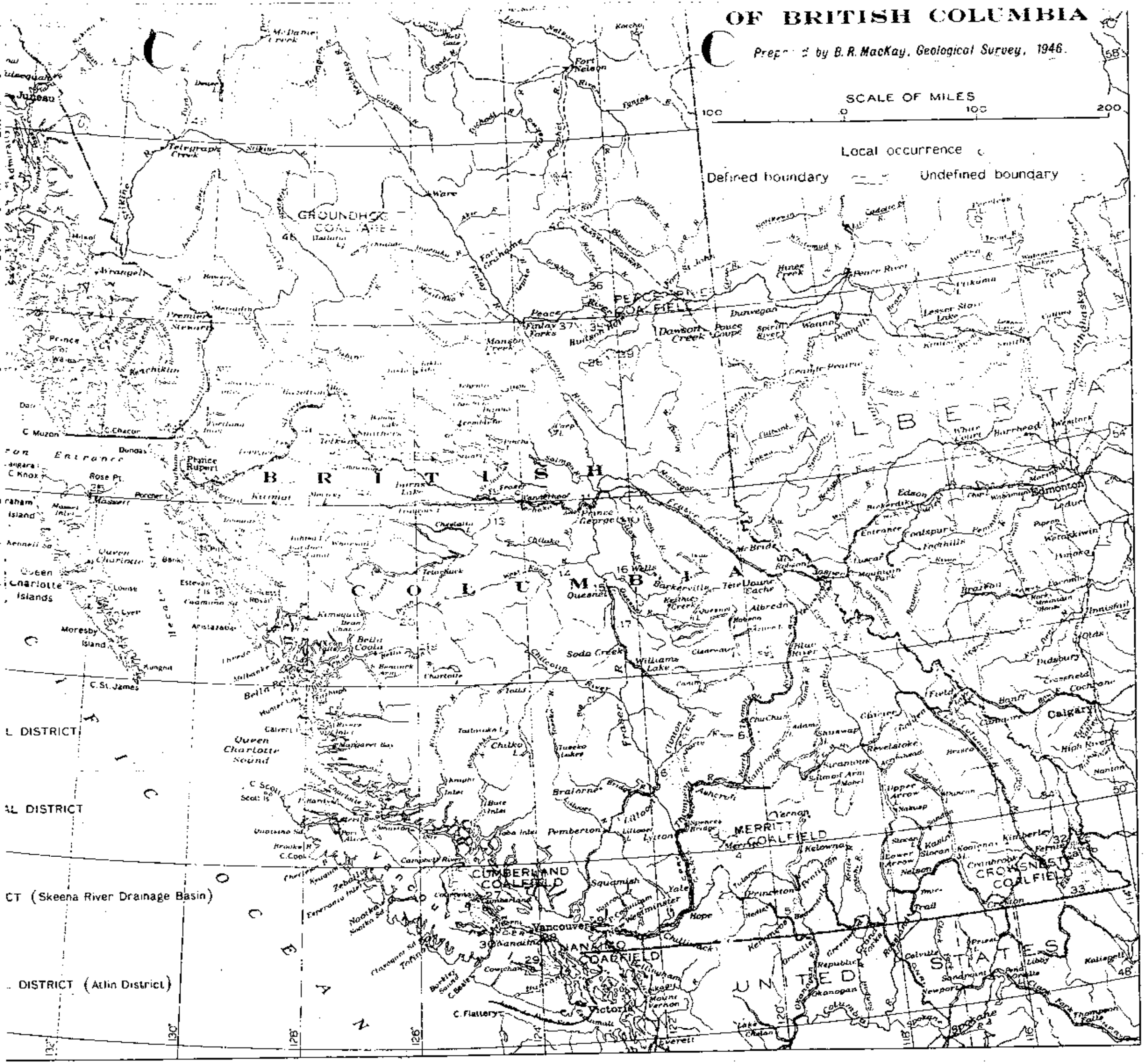
Moisture	= 2.96%
Ash	= 7.54%
V.M.	=37.30%
F.C.	=52.20%
S	= 0.66%

Calorific Value = 7,450 Kcal./Kg. 13409 BTU/lb.

Rank: High Volatile Bituminous B

The recovery used by Imperial Metals at the 1.4 specific gravity was on 65% but this could be raised by washing at S.G. of 1.5 to 1.6 and probably the ash would still remain at 10% ± 2% and heat content probably wouldn't change considerably.

At any rate, the coal is very good quality thermal grade which has coking properties in some areas as earlier government tests indicate.


OF BRITISH COLUMBIA
Prep... by B. R. MacKay, Geological Survey, 1946.
SCALE OF MILES
100 0 100 200
Local occurrence
Defined boundary
Undefined boundary
GROUNDHOG COAL AREA
PEACE RIVER COAL FIELD
B R I T I S H
C O L U M B I A
A L B E R T A
MERRITT COALFIELD
CUMBERLAND COALFIELD
NANAIMO COALFIELD
CROWSNEST COALFIELD
U N I T E D S T A T E S
P A C I F I C O C E A N
Queen Charlotte Islands
Queen Charlotte Sound
Prince Rupert
Prince George
Vancouver
Victoria
Edmonton
Calgary
L DISTRICT
AL DISTRICT
CT (Skeena River Drainage Basin)
DISTRICT (Atlin District)

Province	BRITISH COLUMBIA (SOUTH)
Area	**Merritt (Nicola Valley)**
Operator	MERRITT COAL MINES LTD. (1)
Mine	DIAMOND VALE No. 4
Trade name	**DIAMOND VALE**
Output ..... approx. tons/annum	5-10,000
Location of Mine	Two miles East of Merritt
Seam and Formation	Tertiary.
Size	Slack
Screen limits at mine ..... in.	
No. of samples	3
CHEMICAL PROPERTIES—	
Proximate Analysis (As received)—	
Moisture ..... %	8·0
Ash ..... %	15·8
Volatile matter ..... %	30·9
Fixed carbon ..... %	45·3
Calorific value (As received) ..... B.t.u./lb.	10,970
Ash softening temperature ..... °F.	2670
Caking Properties—	
Volatile matter residue—950°C	Agglomerate
Caking index (Gray)	
Swelling Properties—	
Swelling index (A.S.T.M.)	0
Swelling index (F.R.L.)	Negative
Ultimate Analysis (As received)—	
Carbon ..... %	
Hydrogen ..... %	
Nitrogen ..... %	
Sulphur ..... %	0·6
Oxygen ..... %	
Analyses for Classification—	
Capacity moisture ..... %	
B.t.u./lb. ..... (capacity moisture basis)	
Classification by Rank—	
A.S.T.M.	High volatile B bituminous
S.V.I.	149—Subbituminous
PHYSICAL PROPERTIES—	
Bulk density ..... lb./cu. ft.	
cu. ft./ton	
Grindability index	

REMARKS—

(1) Closed since 1946.

BRITISH COLUMBIA (SOUTH)				BRITISH COLUMBIA (SOUTH)
Merritt (Nicola Valley)				**Princeton**
MIDDLESBORO COLLIERIES LTD. (1)				GENERAL
No. 3 NORTH AND No. 2 SOUTH				(3)
MIDDLESBORO				—
—				5-15,000 (4)
Merritt				In vicinity of Princeton.
No. 3 Seam and No. 2 Seam—Tertiary				Tertiary.
Rly. Mine Run (2)	Lump	Nut Pea	Slack	Mine Run and Lump
½ rd. x 8 bar	+ 2½, 8 bar		0 x ½ rd.	
4	10	2	2	26
8·0	8·0	8·3	9·0	18·0
19·3	14·8	15·0	16·6	8·4
32·4	33·9	33·6	30·5	31·0
40·3	43·3	41·3	43·9	42·6
10,250	11,020	10,920	10,585	9,725
2850+	2850+	2850+	2850+	2155
Agglomerate				Non-agglomerate
				0
0				0
Negative				Negative
	61·8			55·7
	4·5			3·6
	1·5			1·6
0·5	0·5	0·5	0·5	0·6
	8·9			12·1
8·3	8·3	8·3	8·3	20·0
10,170	10,935	10,920	10,620	9,490
High volatile B bituminous				Subbituminous B
140—Subbituminous				119—Lignitic
56·3			48·5	
35·5			41·3	
57·0			58·7	39-45

ANALYSES OF ASH— (Middlesboro)

	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	MnO	Na_2O	K_2O	P_2O_5	TiO_2	SO_3
%	54·1	31·8	5·9	2·4	1·2	0·05	1·2	1·2	0·5	0·9	1·1

REMARKS—

(1) Closed since 1944.

(2) Analysis calculated on basis of equal quantities of No. 2 and No. 3 seams in the comm product. As mined No. 2 seam contained about 14·8% ash (dry basis), whereas No. 3 contained 23·0% ash.

(3) Most of the mines represented in the above analysis have been abandoned. In 1952 were the following two operations: Taylor-Burson Coal Co. Ltd.—Jackson mine—4 m of Princeton. Wukelich, J. P.—Old Princeton Colliery—Princeton (Closed in 1953).

(4) Output in 1952 under 5,000 tons.

Nicola Area

	Partly developed deposit about 2 miles up Coldwater River from its confluence with Nicola River	Middlesboro Collieries, Limited, (Middlesboro) Merritt							
		No. 1 seam		Merritt Mines; a new (probably No. 2) seam		No. 2 seam; run-of-mine sizes		No. 2 seam	
Sample No.	27029	N 7		3763		3930		4059	
Moisture condition	As rec'd	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry
Proximate Analysis—									
Moisture.....per cent	3·8	5·1	....	6·2	....	8·4	....	8·8	....
Ash..... "	7·5	8·1	8·5	11·1	11·8	13·6	14·8	6·2	6·8
Volatile matter..... "	37·2	37·6	39·6	34·4	36·7	35·3	38·6	36·2	39·7
Fixed carbon..... "	51·5	49·2	51·9	48·3	51·5	42·7	46·6	48·8	53·5
Ultimate Analysis—									
Carbon.....per cent	....	69·8	73·6	65·9	70·3	....	....	....	....
Hydrogen..... "	....	5·5	5·2	5·0	4·5	....	....	....	....
Ash..... "	7·5	8·1	8·5	11·1	11·8	13·6	14·8	6·2	6·8
Sulphur..... "	....	0·8	0·8	0·4	0·4	0·6	0·5	0·5	0·5
Nitrogen..... "	....	1·3	1·4	....	....	....	....	....	....
Oxygen..... "	....	14·5	10·5	....	....	....	....	....	....
Calorific Value—									
B.t.u. per lb., gross	....	12,460	13,130	11,660	12,420	11,100	12,120	12,300	13,500
Fuel ratio	1·40	1·30		1·40		1·20		1·35	
Caking properties	Fair	Poor to fair		....		....		Poor	
Pyritic sulphur.....*per cent	....	3·7		....		....		....	
Taken by	Private individual	Mine operators		Submitted by Board of Railway Commissioners		B. R. MacKay, Geological Survey		Provincial mine inspector	
Date	Summer of 1945	Spring of 1925		July 1926		September 18, 1926		January 12, 1927	

*Per cent of total sulphur.

aFor previous publication, sample No. 3763 was assumed to have come from Middlesboro Collieries.

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Nicola Area—Continued

	Middlesboro Collieries, Limited, about 1 mile south of Merritt									
	Upper No. 2 seam		Lower No. 2 seam		Approx. ½- to 5-inch size; 300-pound shipment		No. 2 North mine, No. 2, 8-foot seam		No. 3 mine, No. 3, 5- to 6-foot seam	
							Run-of-mine sizes; representative of average outputs; large shipments			
Sample No.	4170		4171		17789		23178		23288	
Moisture condition	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry
Proximate Analysis—										
Moisture.....per cent	4·4	....	4·5	....	6·7	....	7·4	....	5·3	....
Ash..... "	9·0	9·4	7·9	8·3	11·3	12·1	13·7	14·8a	22·0	23·2a
Volatile matter..... "	32·5	34·0	32·7	34·2	37·1	39·7	34·2	36·9	32·3	34·1
Fixed carbon..... "	54·1	56·6	54·9	57·5	44·9	48·2	44·7	48·3	40·4	42·7
Ultimate Analysis—										
Carbon.....per cent	....	....	....	....	....	....	63·3	68·4	58·2	61·5
Hydrogen..... "	....	....	....	....	....	....	5·4	4·0	5·0	4·6
Ash..... "	9·0	9·4	7·9	8·3	11·3	12·1	13·7	14·8	22·0	23·2
Sulphur..... "	0·4	0·4	0·5	0·5	0·5	0·6	0·5	0·5	0·6	0·6
Nitrogen..... "	....	....	....	....	....	....	1·4	1·5	1·3	1·4
Oxygen..... "	....	....	....	....	....	....	15·7	9·9	12·9	8·7
Calorific Value—										
B.t.u. per lb., gross	12,930	13,520	13,040	13,650	....	....	11,090	11,980	10,240	10,810
Fuel ratio	1·65		1·70		1·20		1·39		1·25	
Caking properties	Poor to fair		Poor to fair		....		Poor		Poor	
Ash softening temperature.....°F.	....		....		....		2800		Above 2850	
Caking index	....		....		....		1		3	
Capacity moisture.....per cent	....		....		....		9·0 (on 4-inch)		7·6	
Rank classification	....		....		....		High volatile C bituminous		High volatile B bituminous †	
Hardgrove grindability index	....		....		....		55·5		59	
Taken by	Fire Inspector, Board of Railway Commissioners.				Mine operators		E. Swartzman, Fuel Research Laboratories.			
Date	May 1927				August 10, 1937		August 1941			

a Ash analysis in Appendix.

† The above analysis indicates a border-line coal, just inside the B group. The very high ash value of sample No. 23288 might, possibly, affect the somewhat empirical calculation of mineral-matter-free B.t.u., and thus cause a slight displacement in rank classification.

Nicola Area—Concluded

	Middlesboro Collieries, Limited, (Middlesboro) Merritt						Merritt Coal Mines, Limited, Diamond Vale mine, (east of) Merritt; No. 3, 4½-foot seam; large shipment, presumably of small sizes		Outcrop at Normandale, near Nicola	
	No. 2 or No. 3 seam									
	On 8-inch bar screen		1- to 2½-inch (round) size		0- to ½-inch size		No. 4 seam			
Sample No.	23714		23716		23718		N 8		25569		3937	
Moisture condition	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry
Proximate Analysis—												
Moisture.....per cent	7·4	....	6·5	....	7·5	....	4·3	....	5·4	....	13·2	....
Ash..... "	7·6	8·2	14·0	15·0	16·2	17·5	6·6	6·9	14·5	15·3	6·9	8·0
Volatile matter..... "	36·6	39·5	34·7	37·1	33·3	36·0	38·0	39·7	31·9	33·7	31·8	36·6
Fixed carbon..... "	48·4	52·3	44·8	47·9	43·0	46·5	51·1	53·4	48·2	51·0	48·1	55·4
Ultimate Analysis—												
Carbon.....per cent	....	....	....	....	....	....	72·4	75·7	....	....	....	....
Hydrogen..... "	....	....	....	....	....	....	5·6	5·3	....	....	....	....
Ash..... "	7·6	8·2	14·0	15·0	16·2	17·5	6·6	6·9	14·5	15·3	6·9	8·0
Sulphur..... "	0·5	0·5	0·5	0·6	0·5	0·5	0·6	0·6	0·5	0·6	0·5	0·6
Nitrogen..... "	....	....	....	....	....	....	1·7	1·8	....	....	....	....
Oxygen..... "	....	....	....	....	....	....	13·1	9·7	....	....	....	....
Calorific Value—												
B.t.u. per lb., gross.....	12,310	13,290	11,360	12,150	10,500	11,670	12,040	13,530	11,830	12,500	9,370	10,800
Fuel ratio.....	1·30		1·30		1·30		1·35		1·50		1·50	
Caking properties.....	Poor		Poor		....		Poor to fair		Fair		Non-agglomerating	
Ash softening temperature.....°F.	Above 2850		Above 2850		Above 2850		....		2300		....	
Pyritic sulphur.....*per cent	....		....		....		5·1		....		....	
Caking index.....	....		....		....		....		45		....	
Capacity moisture.....per cent	....		....		....		....		4·4		....	
Rank classification.....	....		....		....		....		High volatile A bituminous		....	
Taken by.....	E. Swartzman, Fuel Research Laboratories						Mine operators		Commercial plant operators, Vancouver.		B. R. MacKay, Geological Survey.	
Date.....	August 1941						Spring of 1925		January 1944		September 20, 1926	

* Per cent of total sulphur.

RESERVES

The reserves in the Merritt coal field have been divided into three reserve areas (Figure 3). This is because Imperial Metals has only calculated reserves for Area A and a better understanding of the reserve potential of the entire field is required. A breakdown of the reserves is as follows:

Area A

Here, Imperial Metals has calculated reserves on the east limb of an anticline. Dips are in the order of 16° to the east and four seams were used in their calculations (No.'s 8, 4, 5 and 1). The seams are considered to extend beneath the 428 acres which this area covers.

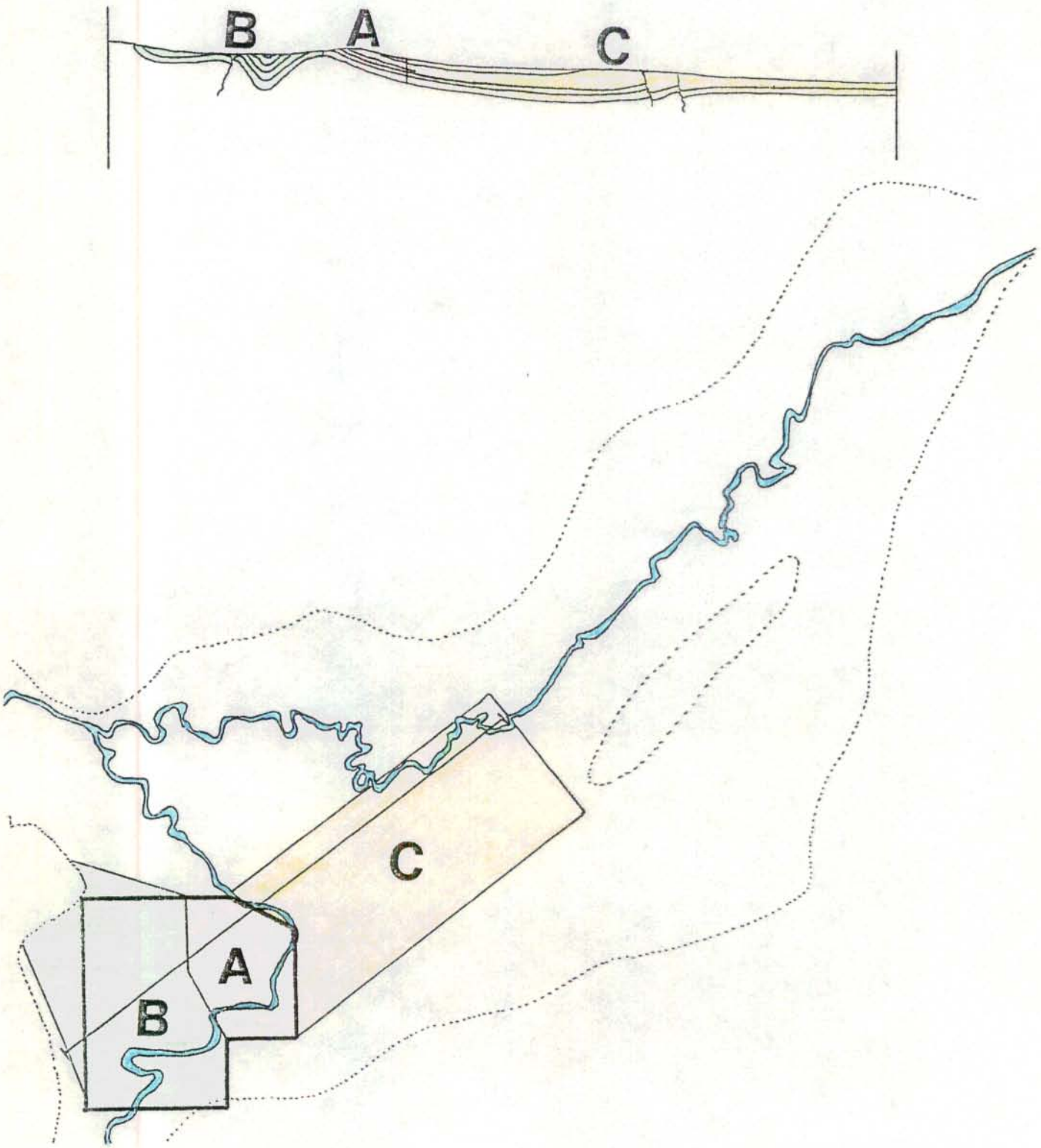
All the reserves are considered underground mineable to the 1000 foot elevation above seam level and are as follows:

Raw (in place)	Net clean (recoverable)
29.5 MM short tons	7.8 MM short tons

The net clean coal has been calculated on the basis on an 80% geological confidence factor, a 50% mining recovery factor for underground mining and a 66.5% preparation plant recovery factor giving a 26.6% overall mining recovery.

FIGURE 3

MERRITT
Reserve Areas



Since their mining recoveries and plant recoveries (at 1.4 float) are quite low, it is conceivable that the overall mining recovery could be raised. This could be accomplished by drilling more holes and increasing your geological confidence factor to 100%, increasing the mining recovery to 70% and, since their plant recoveries were at 1.4 float with an ash of 8% you could conceivably raise the plant recovery to 70 - 75% by floating at 1.6. This would produce a clean recoverable coal reserve of 14 MM short tons.

Since they are basing their reserves in this area on 3 drill holes the reserve is only speculative at the present time. Therefore, it would be best to say that the speculative reserve of raw in place underground mineable coal is around 30 MM short tons in Area A.

Area B

Part of this area was considered unmineable by Imperial Metals because of the steep dips associated with the synclinal feature. To date there are only two drill holes in this syncline and it has not been property dilineated. The thicker basal seams occur throughout this trend although its extent north and south is unknown. Further west from this syncline no work at all has been carried out except

in the northern portions where underground mining has taken place. The seams are much thicker in the west and a surface mineable reserve is feasible.

A speculative reserve of 70 MM short tons of raw in place coal could be attached to this area. As to how much is surface mineable is questionable, but it is definitely of interest. Faulting and folding has brought this coal quite near the surface. The extend of Area A is probably about 1000 acres.

Area C

This is the eastward underground extension of Imperial Metal's Area A (Figure 3). Using only 15 feet of coal in two seams there is a possible speculative reserve of 80 MM short tons of in place underground mineable coal. This coal would be at a maximum about 1500 feet in depth to the basal seam.

In summary, guesstimates have been made in the past as to the amount of coal in the Merritt coal field. To date, limited drilling and thick till cover which hampers geologic mapping has not improved the confidence of reserve figures. It can be said however, that there is probably a speculative reserve of up to 180 MM short tons of raw in place coal of which an amount of 10 MM +

could possibly be surface mineable.

Previous Exploration

This coal field has been an area of coal mining since the late 1800's. Since that time numerous mines have opened and closed down and drilling has been carried out to a small extent in conjunction with these ventures.

From 1907 to 1949, seven underground coal mines were operated in the field mining a total of 2,610,062 long tons of coal. It may be noted that an appreciable amount of this coal was taken from the thinner upper seams in the series.

Holes were drilled in 1892 - 1904 by Middesboro Collieries and other companies. Approximate locations and logs of these holes are found in Appendix I in the drill hole summaries.

In 1945 - 46 the Provincial Government drilled six diamond core holes for a total of 4,508 feet. These holes were drilled in the eastern portions of the field and their information has been used in this report.

In 1960 Imperial Metals and Power Co. Ltd. drilled 16 drill holes on Lot 166(Middlesboro Collieries old leases) and an engineering report was published in 1962.

Again, in 1969 Imperial Metals and Power Ltd. drilled a further 4 core holes just south of the 1960 drilling and published the Sumicol Report of 1970, based on this information.

In the following 8 years no drilling or exploratory work of any kind has been carried out on the Merritt Coal Field.

As can be seen on (Map 1), the drill hole locations concentrate on Imperial Metals lease and in the far east, but the central and western portions of the field have been ommitted.

Since the geology is sketchy and drill holes are concentrated in small portions of the field there is still much to be known about the full potential of this field, especially in the west where surface mineable reserves may possibly exist.

Proposed Exploration

A drilling program of eleven holes with a total maximum footage of 11,000 feet has been proposed. This it may be noted would only be a very preliminary program but it would help identify the number, thickness and continuity of the seams across the whole field along Section 2 (see Map 1). It is hoped that it would also identify the possibility of surface mineable coal at the western end of the field where no exploration work has been done.

It is suggested that the following procedures be followed prior to drilling in the proposed locations:

1) That copies of the mine plans for the western portions of the field be obtained to give a better idea as to the structure in that area. It is understood, from a 1948 Evaluation Report that Coal Hill Syndicate has mined 500,000 tons in the area immediately west of Imperial Metals lease. These plans would be invaluable as they lie in the area of probable surface mineable reserves, where the structure is more complex. Unfortunately, these plans can only be obtained by a personal trip to the Department of Mines and Minerals in Victoria, B.C. as they do not have the staff to find them for us.

2) A brief field trip to the area would also prove invaluable. This would verify outcrop location and since a geologic map of this western portion does not exist, three days of geological mapping would help in determining possible location of the surface mineable areas in the west.

After these two stages of reconnaissance the drill hole locations may be moved to yield better information if necessary.

The drilling itself may be done prior to decisions regarding dealing with Imperial Metals or after, depending on Imperial Oil's decision. Regardless, the first two steps should be carried through to provide more in put as to the potential of this area.

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MERRITT GEOLOGICAL CROSS-SECTIONS

Legend


Igneous rocks


Glacial till and fluvial deposits


Fault

Hole Number


Coal Interval

Coal Seam and Seam Number

Note: Coal thicknesses are only approximations and are not true thicknesses

DRILL HOLE SUMMARY SHEETS

Years 1892 to 1969

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DRILL HOLE SUMMARY SHEET

PAGE: 1

HOLE NO.	Incl. deg.	AZ. DEG.	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	D	R	N	S	C	DATE	DEPTH	D/L	TILL (FT.)	H_2O level	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	Thickness (ft)	CORE DATA run	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (Ins.)	R_w	RIG rot.	RIG dia.	FLUID air	FLUID wtr.	FLUID mud	COMMENTS
1M	90		North Bank		1996	600							1891		x	55.0		2	190.0	193.8	3.8					1806				x				Diamond Drill Core
			ColdwaterR															2	194.2	195.6	1.4									x				Core Log
			Lot 123															2	196.2	169.9	0.7									x				
																		2	212.3	213.8	1.5					1784				x				
			Old Hole 1																269.0	269.8	0.8									x				
																			338.7	340.0	1.3					1657				x				
																			497.7	450.2	0.5									x				
																			456.0	456.5	0.5									x				
2M	90		On NW ¼			562							1893		x	800			137.5	138.0	0.5									x				Diamond Drill Core
			Sec. 14 Twp. 91																139.3	138.8	0.5									x				Core Log
																		2	140.1	144.5	4.4					1850				x				
			Old Hole 2															2	166.6	168.5	1.9									x				
																			219.0	219.5	0.5									x				
																		3?	334.5	335.0	0.5					165.5				x				
3M	90		From Map			778							1906					2	535.0	538.6	3.6					1465				x				No Core Log Taken
			Old Hole 7															3	764.0	768.1	4.1					1236				x				From Map
																															o			
4M	90		From Map																															
			Old Hole 8										1906					2	70.0	73.2	3.2					1930				x				No Core Log
																		3	222.0	225.2	3.2					1778				x				Taken from Map
																		6	293.0	294.5	1.5					1707				x				
5M			Centre of		1976	758							1909		x	97.0		8	304.0	305.8	1.8					1672				x				Core Log
			NW¼ & up90															4	460.8	464.8	4.0					1515				x				
			Old Hole 11															4	467.5	471.1	3.6									x				@177' dip 20°
																		4	474.3	475.1	0.8									x				@205' dip 47°
																		4	477.0	477.5	0.5									x				@ 280' dip 14°
																		4	478.2	497.7	1.5									x				@ 330' dip 15°

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DRILL HOLE SUMMARY SHEET

HOLE NO.	Incl. deg.	AZ. DEG.	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	D	R	N	S	C	DATE	DEPTH	O/L	TILL (FT.)	H_2O level	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	Thickness (ft)	CORE DATA run	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (Ins.)	R_w	RIG rot.	RIG dia.	FLUID air	FLUID wtr.	FLUID mud	COMMENTS
5M																		str	482.9	483.6	0.7												@427' dip 15°
ctd																		5	610.4	623.5	13.1					1366				x			@447' dip 25°
																		5	627.0	630.6	3.6												@485' dip 20°
																		str	657.8	658.7	0.9												@590' dip 25°
																		1	706.7	709.4	2.7					1269							@610' dip 18°
6M	90		1400' NE of										1909																				
			Drillhole 5M																														Results indetermin-
			Old Hole 12																														Faulted Ground
7M	90															from the old map plas, this hole encountered																	located on map
			Old Hole 14													the same seams as hole 5M and therefore																	small x-section
																contains 4, 5, and 1																	shows it intersected
																																	same seams as 5M
8M	90		Old Hole 1			201							1904						No Coal														No core desc.
9M	90		Old Hole 2			200							1904			200			No Coal														No core log
10M	90		Old Hole 3			280							1904						No Coal														No core log
11M	90		NW¼ Sec. 14	1986	995								1945		x	102		4	461.5	464.7	3.2					1524.5								Drill Core
			Twp. 91,	378'														4	466.6	474.3	7.7												@100' = 0°
			North of 5M															5	550.4	555.3	4.9					1436							@213' dip 15°
			@ 35° east															5	556.5	561.0	4.5												@364' dip 14°
			Old Hole 1															1	646.5	650.5	4.0					1339.5							@550' dip 18°
																			950' pillowed lavas														@700' dip 10°
																																	@940' dip 23°

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HOLE NO.	Incl. deg.	AZ. DEG.	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	D	R	N	S	C	DATE	DEPTH	D/L	TILL (FT.)	H_2O level	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	Thickness (ft)	CORE DATA run	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (Ins.)	R_w	RIG rot.	RIG dia.	FLUID air	FLUID wtr.	FLUID mud	COMMENTS
12M	90		Old Hole 2		2022	944							1946		x	203		4	651.5	657.0	5.5					1370.5								@220' dip 15°
			NE¼ sec.14		Twp.	91													930'-lavas															@300' dip 20°
			1223' north		88°																												@390' dip 18°
			from hole 11M																														@400' fault planes
																																	at 45°
																																	@480' dip 8°
																																	@550' dip 10°
																																	@630' dip 10°
																																	@853' dip 23°
																																	@900' dip 30°
																																	@930' dip 25°
13M	90		Old Hole 4		1975	572							1946		x	181		5	366.3	367.3	1.0					1609			x				@200' dip 14°
			NE¼ sec.14															5	367.3	368.5	1.2												@280' dip 10°
			675' north		18°													5	368.5	377.0	7.5												@350' dip 13°
			from 11M																														@430' dip 10°
																																	@550' dip 5°
14M			471 feet		1975	555							1946		x	178		4	413.5	421.0	7.5					1561.5							@180' dip 10°
			North 28°W																														@261' dip 10°
			from 11M																														@305' dip 30°
			Old Hole 5																														@362' dip 10°
																																	@413' dip 13°
																																	@513' dip 25°
15M	90		680' bearing		1985	460							1946		x	210			No Coal														@230' dip 18°
			42°East from																														
			Hole 13M																														
			Old Hole 6																														

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DRILL HOLE SUMMARY SHEET

HOLE NO.	Incl. deg.	AZ. DEG.	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	D	R	N	S	C	DATE	DEPTH	D/L	TILL (FT.)	H_2O level	SEAM NO.	SEAM DESCRIPTION DEPTH TOP	DEPTH BOTTOM	Thickness (ft)	CORE DATA run	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (ins.)	R_w	RIG rot.	RIG dia.	FLUID air	FLUID wtr.	FLUID mud	COMMENTS
16M90			Drilled on		2440	1270							1946		x	7.0			No Coal														Gd. core descrip.
			Lot 120 on																														40' dip 20°
			Hamilton																														375 dip 15°
			Creek																														850' dip 10°
			Old Hole 3																														1000' dip 10°
																																	1265' dip 15°
17M90			located on			710.0							1906			119			161.0	162.5	1.5												
			I.R. 2from																287.0	288.0	1.0												Diamond Core
			Old Map																541.0	542.7	1.7												descrip. avail.
			Old Hole No. XI																544.0	545.2	1.2												
																			550.0	551.0	1.0												
18M90			Old Hole B-1			184.0										10		4	113.0	128.0	15.0		Coal			2092								
			from Old Map															4	128.0	145.0	17.0		Coal and Shale											Log of Blair Shaft
			Middlesboro																145.0	153.0	8.0		Coal, mud and shale											and diamond drill
			Collieries																														hole from 135.0
19M50?			Middlesboro			338.0									x	48		2	64.0	66.0	2.0												Diamond Drill Core
			Collieries Hole															2	72.0	74.0	2.0												descrip. available
			1. location M-1															2	78.0	79.0	1.0												
																		3	137.0	139.0	2.0												
																		6	168.0	171.1	3.1												
																		8	415.0	416.0	1.0												
																		4	550.5	557.5	7.0												
																		4	559.0	567.2	8.2												
																		5	679.0	682.0	3.0												
																		1	827.0	829.0	2.0												
																		1	830.0	832.0	2.0												

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HOLE NO.	incl. deg.	AZ. DEG.	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	D	R	N	S	C	DATE	DEPTH	D/L	TILL (FT.)	H_2O level	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	Thickness (ft)	CORE DATA run	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (ins.)	R_w	RIG rot.	RIG dia.	FLUID air	FLUID wtr.	FLUID mud	COMMENTS
20M			junction of Nicola and Coldwater Rivers		2000	600							1904		X	600			No	Coal													600 feet of till

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HOLE NO.	Incl. deg.	AZ. DEG.	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	D	R	N	S	C	DATE	DEPTH	D/L	TILL (FT.)	H_2O level	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	Thick-ness (ft)	CORE DATA run	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (ins.)	R_w	RIG rot.	RIG dia.	FLUID air	FLUID wtr.	FLUID mud	COMMENTS
1	90°				2112	238										145		4	192.0	205	13.0					1920								Diamond Drill
																192																	Core Log
2	90°				2149	842										10.0		2	122.0	124.0	2.0					2021								Diamond Drill
																		2	140.0	140.5	0.5		Coal or grey ash											Core Log
																		3	209.0	212.0	3.0					1940								
																		6	338.0	342.0	4.0		Coal, bone, coal			1811								
																		8	625.0	628.5	3.5					1524								
																		?	830.0	831.0	1.0													
3	90°				2213	139.0										0.0		3	100.0	102.5	2.5					2113.0								Diamond Drill
																		3	109.0	110.0	1.0													Core Log
																		3	113.0	113.5	0.5													
4	90°				2232	180.0										4.0		3	141.0	143.0	2.0					2091								Diamond Drill
																		3	144.0	147.0	3.0													Core Log
																		3	162.0	163.0	1.0		Coal and Shale											
5	90°				2210	140.0										2.0		3	43.5	47.0	3.5					2167.0								Diamond Drill
																		3	56.0	58.0	2.0													Core Log
																		6	119.0	122.0	3.0					2091								
6	90°				2158	260.0										4.0		2	40.0	41.0	1.0					2118								Diamond Drill
																		3	144.5	147.0	2.5					2013.5								Core Log
																		3	147.5	148.5	1.0													
																		3	155.0	157.0	2.0													
																		?	183.0	184.0	1.0					1975								
																		6	226.5	229.5	3.0					1931.5								

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HOLE NO.	Incl. dep.	AZ. DEG.	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	D	R	N	S	C	DATE	DEPTH	D/L	TILL (FT.)	H_2O level	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	Thick-ness (ft)	CORE DATA run	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (Ins.)	R_w	RIG rot.	RIG dia.	FLUID air	FLUID wtr.	FLUID mud	COMMENTS
7	90				2158	20										20			N/C															Diamond Drill Core Log Same location as Hole 6
8	90				2020	250										107.0		1	201.0	229.0	28.0					1819								Diamond Drill Core Log 4" shale @ 215' 3" sandstone@219'
9	90				2076	280.0										20.0		4	96.0	124.0	28.0					1980								Diamond Drill Core Log
																		4	129.0	133.0	4.0													
																		5	?	280.0	?													
10	90°				2095	270.0										270.0			N/C															Diamond Drill Core Log
11	90°				2125.0	200.0										60.0		4	160.5	181.5	13.0		Old Workings			1956.5								Diamond Drill Core Log
																		4	187.0	193.5	6.5													
12	90°				2045	260.0										260.0			N/C															Diamond Drill Core Log
13	90°				2035.0	90.0										90.0			N/C															Diamond Drill Core Log
14	90°				2227.0	170.0										70.0			N/C															Diamond Drill Core Log
15	90°				2116	105										105			N/C															Diamond Drill Core Log

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DRILL HOLE SUMMARY SHEET

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HOLE NO.	Incl. deg.	AZ. DEG.	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	D	R	N	S	C	DATE	DEPTH	O/L	TILL (FT.)	H_2O level	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	Thickness (ft)	CORE DATA run	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (ins.)	R_w	RIG rot.	RIG dia.	FLUID air	FLUID wtr.	FLUID mud	COMMENTS
1690	0				2080						-		1962			0		1	246.5	257.5	11.5					1833.5								Diamond Drill Hole
																		1	271.0	306.0	35.0													Log
																			309.5	323.0	13.5		Bone	Coal										240 Pitch 30°

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HOLE NO.	Incl. deg.	AZ. DEG.	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	D	R	N	S	C	DATE	DEPTH	D/L	TILL (FT.)	H_2O level	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	Thickness (ft)	CORE DATA run	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (Ins.)	R_w	RIG rot.	RIG dia.	FLUID air	FLUID wtr.	FLUID mud	COMMENTS
15	60	045			2205	848.0										44.0		4	226.6	232.2	5.4					1978								Diamond Drill
																										1909								Core Log
																										1889								
																		R2	319.0	321.7	2.7													
																		R2	330.6	332.9	2.3													
																		5	383.3	387.0	2.7					1822								
																		str	447.0	448.1	1.1					1758								
																		1	623.4	630.0	6.6					1582								
25	90°				216.0	592.0										88.0		4	128.0	135.0	7.0					2032								Diamond Drill
																		R2	201.5	202.5	1.0					1959								Core Log
																		5	399.5	405.0	5.0					1760								
																		1	543.5	556.5	13.0					1616.5								
																		1	557.5	562.5	5.0													
																		1	571.0	571.0	4.0													
36	90°				2215.0	691.0										144		8	199.0	202.0	3.0					2016								
																		4	335.0	352.0	17.0					1880								
																		R2	389.0	393.0	4.0					1826								
																		5	490.0	491.0	1.0	Coaly Shale				1725								
																		5	491.0	500.0	9.0					1618.5								
																		1	596.5	597.0	0.5													
																		1	598.0	603.0	5.0													
																		1	603.0	604.0	1.0	Coal Shale												
																		1	604.0	606.5	1.5													
																		1	607.0	611.0	1.0													
																		1	612.5	626.0	13.5													
																		?	671.0	680.0	9.0					1544								

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HOLE NO.	Incl. deg.	AZ. DEG.	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	D	R	N	S	C	DATE	DEPTH	D/L	TILL (FT.)	H_2O level	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	Thick-ness (ft)	CORE DATA run	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (ins.)	R_W	RIG rot.	RIG dia.	FLUID air	FLUID wtr.	FLUID mud	COMMENTS
46	90°				2025											164.0		8	185.0	186.0	1.0					1840								Diamond Drill
																			194.0	194.5	0.5					1831								Core Log
																		4	278.5	284.0	5.5					1746.5								Seams names are
																		R2	339.0	340.0	1.0					1683.5								those assigned by
																		R2	341.5	343.0	1.5					1563.0								Sumicol
																		5	462.0	466.0	4.0													
																			466.0	468.0	2.0		Coaly Shale											
																		5	468.0	471.0	3.0													
																		1	552.0	556.0	4.0					1473								

MAP 1
MERRITT COAL FIELD

Geological Map

Legend

- Merritt Townsite
- River
- Mine Location
- UG Mine Workings
- Formation Contact
- 6m Drill Hole (position approx)
- 6s Drill Hole (position known)
- Dip, Dip Direction
- Anticline, Syncline
- High Angle Fault
- Assumed Coal Outcrop
- Tertiary Valley Basalt
- Tertiary Coldwater Beds
- Triassic Nicola Group
- Imperial Metals and Power Ltd.
- 1000' proposed drill hole & depth

N

scale 0 1000

SUNSHINE MINE

NORMANDALE MINE

NICOLA RIVER

COLDWATER RIVER

BASELINE

Section 1

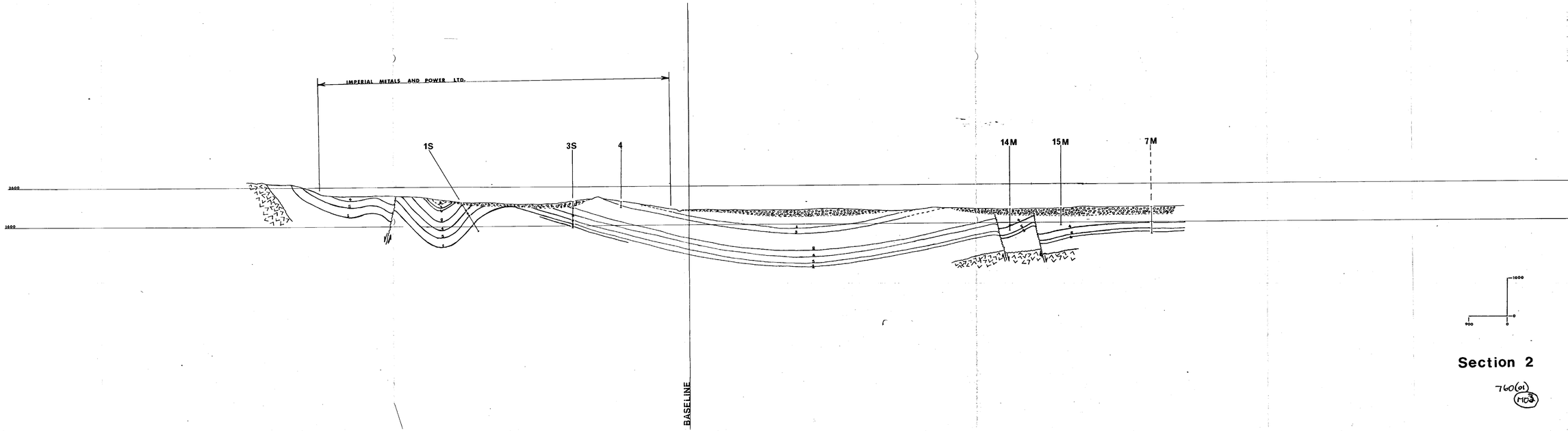
Section 2

Section 3

0076061 (M01)

Section 1

760(01)
M02



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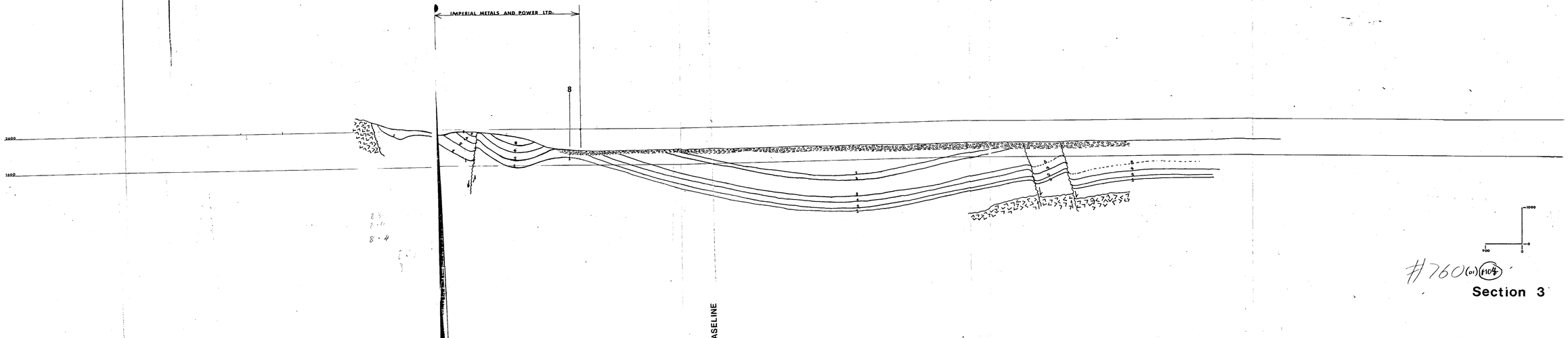
760(01)
M104



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Section 3

IMPERIAL OIL LTD.

MERRITT COAL FIELD

PRELIMINARY EVALUATION

SEPTEMBER, 1977

BY

RON SWAREN

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SUMMARY AND RECOMMENDATIONS

Summary

1) Very good quality thermal coal desposit
2) Infrastructure excellent as well as transportation facilities to any market
3) Reserves are mainly underground with 180 MM short tons speculative of which an unknown quantity (10 MM short tons plus) may be surface mineable
4) Imperial Metals & Power Ltd. controls 1200 acres of the prime area of the field.

Recommendations

1) That mine plans be obtained and studied with a view to delineating surface mineable reserves to the west of Imperial Metals coal rights.
2) That a brief 3 day geological reconnaissance can be carried out to define any surface mineable coal in the west.
3) Negotiations with Imperial Metals & Power Ltd. over conditions of a yearly rental for exploration purpose could be carried out after 1) and 2) are completed.
4) In the case of a positive negotiation exploration drilling could follow with 11 drill holes
5) A land search should be carried out over acreages adjoining Imperial Metals (presently in progress).

The area holds great potential for an underground mining prospect with good quality seams of the proper thickness and low dips.

In addition, surface mineable reserves are a distinct possibility and efforts should be made to prove or dispprove the existence of such. In the case of a 20 MM ton reserve of surface mineable coal (which wouldn't be hard to arrive at over short areas with the large seam thickness), a surface mine & U/G mine could be developed together or a surface mine first, shifting to U/G later.

INTRODUCTION

Purpose and Scope

The purpose of this study is as follows:

(A) To evaluate the reserve potential of Imperial Metals and Power Ltd.'s property

(B) To construct a preliminary geologic map of the entire coal field from all available information

(C) To determine which areas apart from Imperial Metals leases may also contain reserves of coal of economic value.

(D) To evaluate the development prospects of the entire field and devise an exploration guideline.

Location and Access

The Merritt coal field is located in the Intermontane Tectonic Belt of south central British Columbia (Figure 1).

The transportation system is excellent with one railway running east west through the field and a branch line running south. Distances to Vancouver is 230 miles, to Calgary 502 miles, and to Seattle 302 miles. Access is excellent throughout the area and the Town of Merritt is adjoining the coal field (Figure 2).

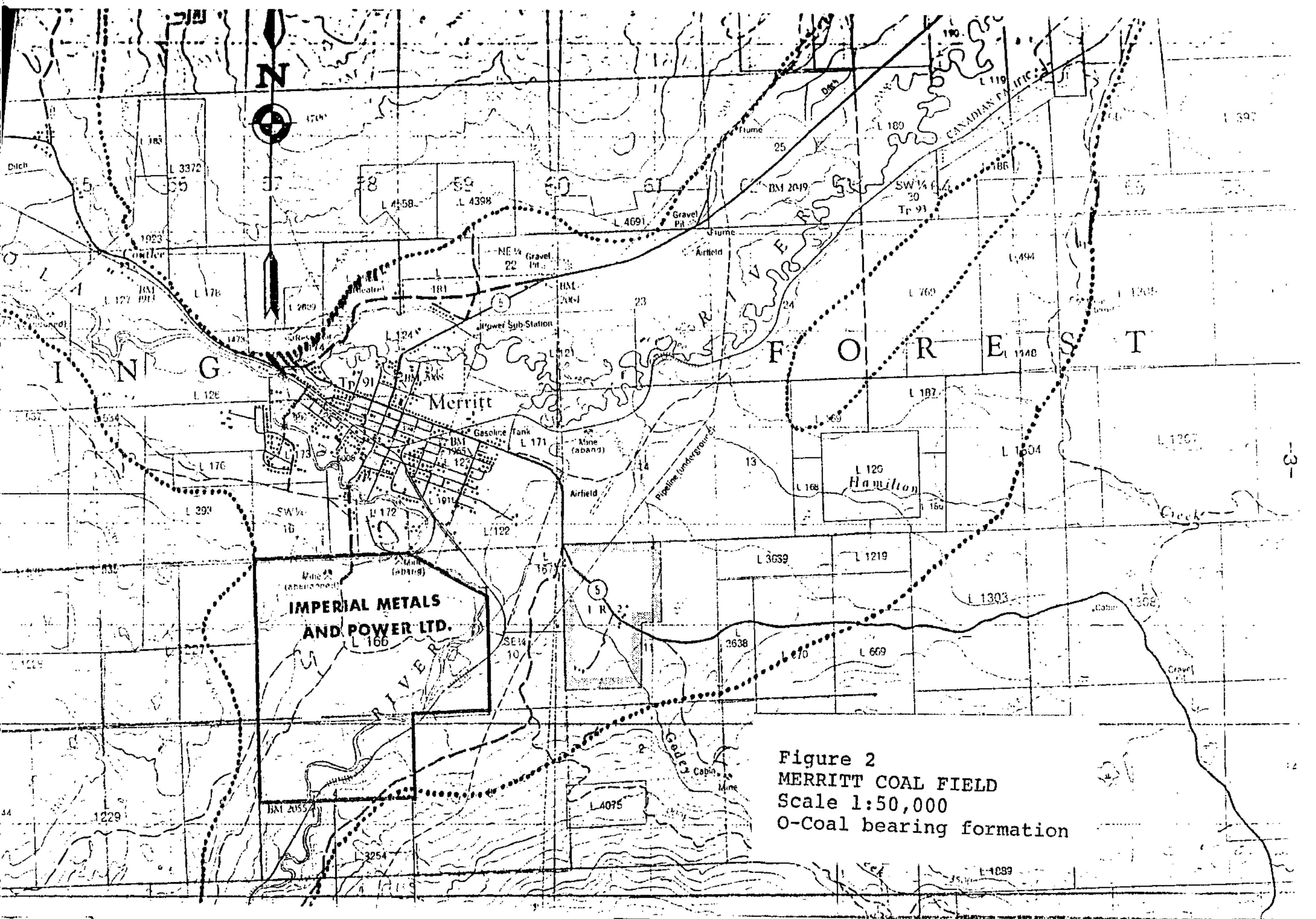


Figure 2
MERRITT COAL FIELD
Scale 1:50,000
O-Coal bearing formation

Geography

Elevations at Merritt range from 3100 feet in the west to 2000 feet a.s.l. throughout the eastern and central portions of the field. Two main rivers, the Coldwater and Nicola Rivers flow west through the field and have formed a broad flat river valley.

Land Status

Imperial Metals and Power Company Ltd. holds by Crown Grant the coal rights previously held by Middlesboro Collieries which consists of Lot 166 as well as the northern half of Section 4, Township 91, Kamloops Land District.

The status of the lands to the west and northeast of this acreage is unknown. It is known however, that no coal licenses have been approved in the Merritt field so the land would have to be under Crown Grant.

Presently, the Land Department of Imperial Oil is looking into the status of the Crown Grants around Imperial Metals property to see if I.O.L. could gain a foothold on any open Crown Land which may be available. The results should be forthcoming by the end of October.

Markets

The quality of this coal is excellent for high B.T.U. thermal coal. It has been stated in past reports that it could be used for blending to produce coking coal and that parts of some seams are even of coking grade.

Markets for this thermal coal would of course, include Japan, with short rail haul to Vancouver; Ontario Hydro, since Merritt is on a rail line to the east and possibly as an alternative B.C. Hydro or Seattle Power Companies.

In summary, there is a diversification of markets available and its geographical location is favourable for putting this field in competition with other thermal coal producing areas.

GEOLOGY

Glacial - Fluvial Cover

Most of the Nicola Valley is covered by a heavy mantle of till cover. This cover averages 150 feet in thickness but may go up to 600 feet such as was encountered in a drill hole at the junction of the Nicola and Coldwater Rivers.

Outcrops of bedrock do occur in the Coldwater - Coal Gully Hills area in the western portions of the field as well as in the area of the N.W. ¼ of Section 14, Township 91.

Another area of thick fluvial deposits is between Coldwater and Coal Gully Hills where an old buried river channel is in evidence through drilling. Thickness of till in this area reaches 120 feet.

Stratigraphy

Rocks in the Merritt coal field area are divisible into two groups, these being sedimentary and volcanic in nature.

The volcanics are of Triassic age consisting in large part of diabase, porphyrite, rhyolite, andesite, felsite, and conglomerate. These volcanics underly and surround the sedimentary coal bearing rocks in the Merritt field. In places they display a schistose structure, owing to crustal

movements which have affected the sedimentary rocks and coal and produced faults of considerable extent.

The term "Nicola Group" was given by Dawson to these volcanic rocks.

The younger sedimentary rocks of Tertiary age are termed the Coldwater Beds (Map 1). the sediments comprise sandstone, conglomerate, grit, shale and coal beds. The coal was laid down in peat bogs in an interior basinal type of environment allowing for the variations in thickness and number of coal seams.

Coal Measures

The coal is contained in at least seven seams as follows:

Top ↑	Seam No.	Thickness (ft.)	
	2 3 2	6.0	1.8
	3 1	2.5	0.76
	6 3 3	6.0	1.8
	8 4	8.0	2.44
	4 5	25.0	7.6
	5 2	5.0	1.5
	1 0	26.0	7.9

These thicknesses and the number of seams do not remain constant throughout the field and intervals between seams may change by as much as 100 feet from place to place.

The 4 seam and 1 seam are the thickest in the western portions of the field where they average 26 feet each. To the east as far as can be ascertained from limited drilling. The 1 seam decreases in thickness to about 4 feet and the 4 seam to about 7.5 feet, but the five seam increases from 5 feet in the west to up to 10 feet in thickness in the east.

Moving towards the southern portions of the basin the seams also thin out as found in drill hole 4S, the 4 seam decreases to 5.5 feet, the one seam to 4.0 feet but the 5 seam increases to 7.0 feet or more.

Drilling to the north was not to great enough depth to define the northward extent or seam thicknesses of the coal basin.

It must also be noted that seam identification is extremely difficult with the existing information and a drilling program of rotary holes making use of electric logging techniques would be useful in this respect.

Structure

The structural geology is not too well known throughout the area because of the thick till cover and limited drilling.

Deformation appears to be greatest in the west as seen on the geological map (Map 1) and cross-sections 1 to 3 (Appendix II). Folding and faulting has been identified

by drilling in the west, but mine plans and geological mapping would be extremely useful in verification. The coal appears to dip into a gentle syncline throughout the central portions of the field with dips of 10^{o} or less which would be beneficial to underground mining. It is belived that the depth to the coal in the trough of the syncline would be about 1500 feet to the basal (lseam). Although this hasn't as yet been verified by drilling.

The coal is brought closer to the surface in the east on an anticlinal feature probably associated with high angle faulting.

The western portions of the lease holds surface mineable potential because of the deformation, thicker seams and the shallower depth of these seams, whereas the central and eastern areas hold underground potential because of shallower dips and the less disturbed nature of the beds.

The geologic map and cross-sections were drawn from all existing information, but until some geologic mapping has been done as well as a study of mine records and drilling, the geology must be classified as speculative at best.

Quality

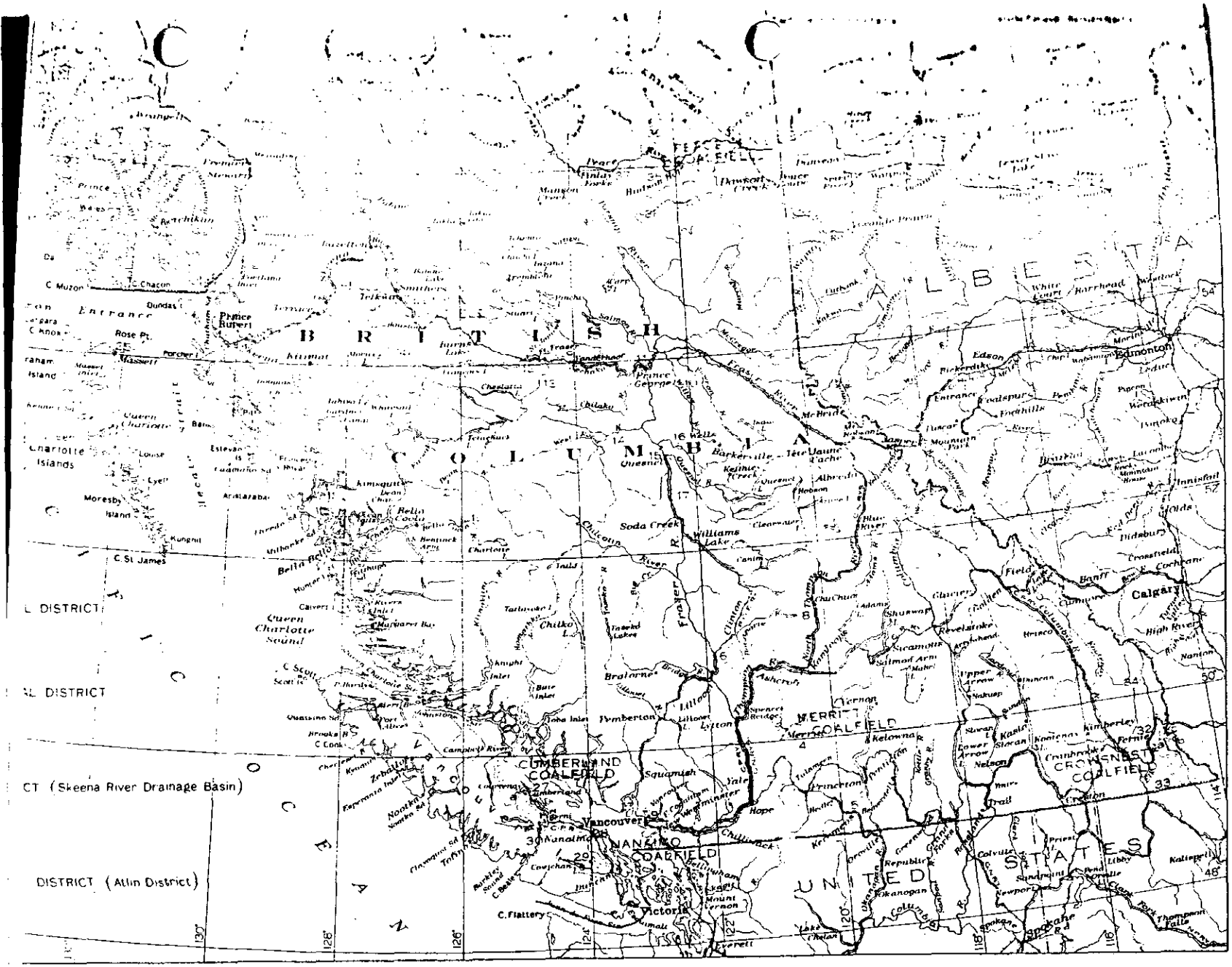
The average quality as computed in the 1970 Sumicol Report was taken from 11 drill core samples after washing at a specific gravity of 1.4 to yield the following results:

Moisture	= 2.96%
Ash	= 7.54%
V.M.	=37.30%
F.C.	=52.20%
S	= 0.66%

Calorific Value = 7,450 Kcal./Kg. 13409 BTU/lb.
Rank: High Volatile Bituminous B

The recovery used by Imperial Metals at the 1.4 specific gravity was on 65% but this could be raised by washing at S.G. of 1.5 to 1.6 and probably the ash would still remain at 10% ± 2% and heat content probably wouldn't change considerably.

At any rate, the coal is very good quality thermal grade which has coking properties in some areas as earlier government tests indicate.



APP. I APPENDIX I APPENDIX PROP. EXP PREV. EXPL. RESERVES

RESERVES

The reserves in the Merritt coal field have been divided into three reserve areas (Figure 3). This is because Imperial Metals has only calculated reserves for Area A and a better understanding of the reserve potential of the entire field is required. A breakdown of the reserves is as follows:

Area A

Here, Imperial Metals has calculated reserves on the east limb of an anticline. Dips are in the order of 16° to the [illegible]t and four seams were used in their calculations (No.'s 8, 4, 5 and 1). The seams are considered to extend beneath the 428 acres which this area covers.

All the reserves are considered underground mineable to the 1000 foot elevation above seam level and are as follows:

Raw (in place)	Net clean (recoverable)
29.5 MM short tons	7.8 MM short tons

The net clean coal has been calculated on the basis on an 80% geological confidence factor, a 50% mining recovery factor for underground mining and a 66.5% preparation plant recovery factor giving a 26.6% overall mining recovery.

[illegible] Seam and Formation	[illegible] — Tertiary	Merritt — No. [illegible] Seam and No. [illegible] Seam—Tertiary				[illegible] — Tert[illegible]
Size	Slack	Rly. Mine Run (2)	Lump	Nut Pea	Slack	Mine Run and Lump
Screen limits at mine ... in.		¾ rd. x 8 bar	+ 2½, 8 bar		0 x ¾ rd.	
No. of samples	3	4	10	2	2	26
Chemical Properties—						
Proximate Analysis (As received)—						
Moisture ... %	8·0	8·0	8·0	8·3	9·0	18·0
Ash ... %	15·8	19·3	14·8	15·0	16·6	8·4
Volatile matter ... %	30·9	32·4	33·9	33·6	30·5	31·0
Fixed carbon ... %	45·3	40·3	43·3	41·3	43·9	42·6
Calorific value (As received) ... B.t.u./lb.	10,970	10,250	11,020	10,920	10,585	9,725
Ash softening temperature ... °F.	2670	2850+	2850+	2850+	2850+	2155
Caking Properties—						
Volatile matter residue—950°C.	Agglomerate	Agglomerate				Non-agglomerate
Caking index (Gray)						0
Swelling Properties—						
Swelling index (A.S.T.M.)	0	0				0
Swelling index (F.R.L.)	Negative	Negative				Negative
Ultimate Analysis (As received)—						
Carbon ... %			61·8			55·7
Hydrogen ... %			4·5			3·6
Nitrogen ... %			1·5			1·5
Sulphur ... %	0·6	0·5	0·5	0·5	0·5	0·8
Oxygen ... %			8·9			12·4
Analyses for Classification—						
Capacity moisture ... %		8·3	8·3	8·3	8·3	20·0
B.t.u./lb. ... (capacity moisture basis)		10,170	10,935	10,920	10,020	9,400
Classification by Rank—						
A.S.T.M.	High volatile B bituminous	High volatile B bituminous				Subbituminous B
S.V.I.	149—Subbituminous	140—Subbituminous				119—Lignitic
Physical Properties—						
Bulk density ... lb./cu. ft.		56·3			48·5	
cu. ft./ton		35·5			41·3	
Grindability index		57·0			58·7	39-45

Analyses of Ash— (Middlesboro)

	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	MnO	Na_2O	K_2O	P_2O_5	TiO_2	SO_3
%	54·1	31·8	5·9	2·4	1·2	0·05	1·2	1·2	0·5	0·9	1·1

Remarks—

(1) Closed since 1946.

Remarks—

(1) Closed since 1944.

(2) Analysis calculated on basis of equal quantities of No. 2 and No. 3 seams in the comm[illegible] product. As mined No. 2 seam contained about 14·8% ash (dry basis), whereas No. 3 contained 23·0% ash.

(3) Most of the mines represented in the above analysis have been abandoned. In 1952 were the following two operations: Taylor-Burson Coal Co. Ltd.—Jackson mine—4 [illegible] of Princeton. Wukelich, J. P.—Old Princeton Colliery—Princeton (Closed in 1953).

(4) Output in 1952 under 5,000 tons.

Nicola Area

	Partly developed deposit about 2 miles up Coldwater River from its confluence with Nicola River	Middlesboro Collieries, Limited, (Middlesboro) Merritt							
		No. 1 seam		Merritt Mines; a new (probably No. 2) seam		No. 2 seam; run-of-mine sizes		No. 2 seam	
	27029	N 7		3763		3936		4059	
	As rec'd	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry
per cent	3·8	5·1	....	6·2	....	8·4	....	8·8	....
"	7·5	8·1	8·5	11·1	11·8	13·6	14·8	6·2	6·8
"	37·2	37·6	39·6	34·4	36·7	35·3	38·6	36·2	39·7
"	51·5	49·2	51·9	48·3	51·5	42·7	46·6	48·8	53·5
per cent	....	69·8	73·6	65·9	70·3	....	....	....	....
"	....	5·5	5·2	5·0	4·5	....	....	....	....
"	7·5	8·1	8·5	11·1	11·8	13·6	14·8	6·2	6·8
"	....	0·8	0·8	0·4	0·4	0·5	0·5	0·5	0·5
"	....	1·3	1·4	....	....	....	....	....	....
"	....	14·5	10·5	....	....	....	....	....	....
....	....	12,460	13,130	11,660	12,420	11,100	12,120	12,300	13,500
....	1·40	1·30		1·40		1·20		1·35	

	Fair	Poor to fair	....	....	Poor
*per cent	....	3·7	....	....	....
	Private individual	Mine operators	Submitted by Board of Railway Commissioners	B. R. MacKay, Geological Survey	Provincial mine inspector
	Summer of 1945	Spring of 1925	July 1926	September 18, 1925	January 12, 1927

*otal sulphur.
publication, sample No. 3763 was assumed to have come from Middlesboro Collieries.

Nicola Area—Continued

	Middlesboro Collieries, Limited, about 1 mile south of Merritt									
	Upper No. 2 seam		Lower No. 2 seam		Approx. 4- to 5-inch size; 300-pound shipment		No. 2 North mine, No. 2, 8-foot seam		No. 3 mine, No. 3, 5- to 0-foot seam	
							Run-of-mine sizes; representative of average outputs; large shipments			
	4170		4171		17789		23178		23288	
	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry
per cent	4·4	....	4·5	....	6·7	....	7·4	....	5·3	....
"	9·0	9·4	7·9	8·3	11·3	12·1	13·7	14·8a	22·0	23·2a
"	32·5	34·0	32·7	34·2	37·1	39·7	34·2	36·9	32·3	34·1
"	54·1	56·6	54·9	57·5	44·9	48·2	44·7	48·3	40·4	42·7
per cent	....	....	....	....	....	....	63·3	68·4	58·2	61·5
"	....	....	....	....	....	....	5·4	4·0	5·0	4·6
"	9·0	9·4	7·9	8·3	11·3	12·1	13·7	14·8	22·0	23·2
"	0·4	0·4	0·5	0·5	0·5	0·6	0·5	0·5	0·6	0·6
"	....	....	....	....	....	....	1·4	1·5	1·3	1·4
"	....	....	....	....	....	....	15·7	9·9	12·9	8·7
	12,030	13,520	13,040	13,650	....	....	11,090	11,980	10,240	10,810
	1·65		1·70		1·20		1·30		1·25	
°F.	Poor to fair		Poor to fair		....		Poor		Poor	
	....		....		....		2800		Above 2850	
per cent	....		....		....		1		3	
	....		....		....		0·0 (on 4-inch)		7·6	
	....		....		....		High volatile C bituminous		High volatile B bituminous †	
	....		....		....		55·5		59	
	Fire Inspector, Board of Railway Commissioners.				Mine operators		E. Swartzman, Fuel Research Laboratories.			
	May 1927				August 10, 1937		August 1941			

a In Appendix.

† Analysis indicates a border-line coal, just inside the B group. The very high ash value of sample No. 23288 might, possibly, affect the final calculation of mineral-matter-free B.t.u., and thus cause a slight displacement in rank classification.

BRITISH COLUMBIA COAL DEPOSITS—Continued

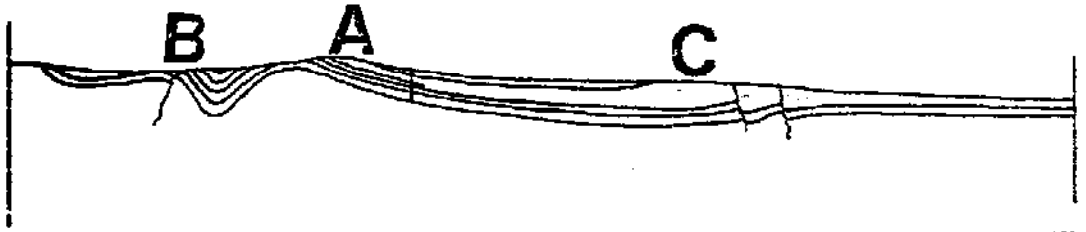
Nicola Area—Concluded

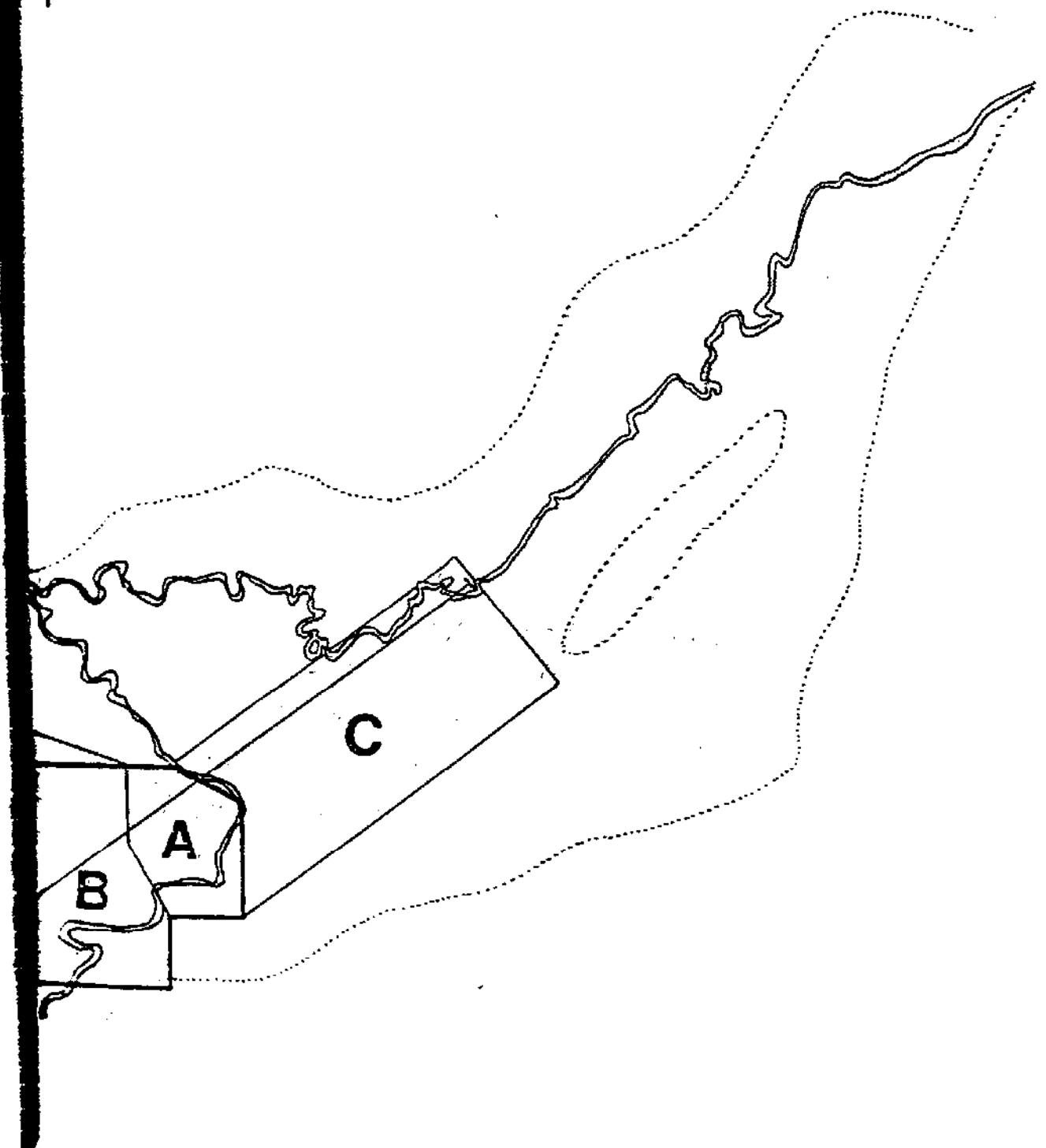
	Middlesboro Collieries, Limited, (Middlesboro) Merritt								Merritt Coal Mines, Limited, Diamond Vale mine, (east of) Merritt; No. 3, 4½-foot seam; large shipment, presumably of small sizes		Outcrop at Normandale, near Nicola	
	No. 2 or No. 3 seam						No. 4 seam					
	On 8-inch bar screen		1- to 2½-inch (round) size		0- to ½-inch size							
	23714		23716		23718		N 8		25560		3937	
	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry
per cent	7·4	....	6·5	....	7·5	....	4·3	....	5·4	....	13·2	....
"	7·6	8·2	14·0	15·0	16·2	17·5	6·6	6·9	14·5	15·3	6·9	8·0
"	36·6	39·5	34·7	37·1	33·3	36·0	38·0	39·7	31·9	33·7	31·8	36·6
"	48·4	52·3	44·8	47·9	43·0	46·5	51·1	53·4	48·2	51·0	48·1	55·4
per cent	....	....	....	....	....	....	72·4	75·7	....	....	....	....
"	....	....	....	....	....	....	5·6	5·3	....	....	....	....
"	7·6	8·2	14·0	15·0	16·2	17·5	6·6	6·9	14·5	15·3	6·9	8·0
"	0·5	0·5	0·5	0·6	0·5	0·5	0·6	0·6	0·5	0·6	0·5	0·6
"	....	....	....	....	....	....	1·7	1·8	....	....	....	....
"	....	....	....	....	....	....	13·1	9·7	....	....	....	....
	12,310	13,200	11,360	12,150	10,800	11,670	12,940	13,530	11,830	12,500	9,370	10,800
	1·30		1·30		1·30		1·35		1·50		1·50	
	Poor		Poor		....		Poor to fair		Fair		Non-agglomerating	
°F.	Above 2850		Above 2850		Above 2850		....		2300		....	
per cent	....		....		....		5·1		....		....	
	....		....		....		....		45		....	
per cent	....		....		....		....		4·4		....	
	....		....		....		....		High volatile A bituminous		....	
	E. Swartzman, Fuel Research Laboratories						Mine operators		Commercial plant operators, Vancouver.		D. R. MacKay, Geological Survey.	
	August 1941						Spring of 1925		January 1944		September 20, 1926	

† total sulphur.

FIGURE 3

MERRITT
Reserve Areas





Since their mining recoveries and plant recoveries (at 1.4 float) are quite low, it is conceivable that the overall mining recovery could be raised. This could be accomplished by drilling more holes and increasing your geological confidence factor to 100%, increasing the mining recovery to 70% and, since their plant recoveries were at 1.4 float with an ash of 8% you could conceivably raise the plant recovery to 70 - 75% by floating at 1.6. This would produce a clean recoverable coal reserve of 14 MM short tons.

Since they are basing their reserves in this area on 3 drill holes the reserve is only speculative at the present time. Therefore, it would be best to say that the speculative reserve of raw in place underground mineable coal is around 30 MM short tons in Area A.

Area B

Part of this area was considered unmineable by Imperial Metals because of the steep dips associated with the synclinal feature. To date there are only two drill holes in this syncline and it has not been property dilineated. The thicker basal seams occur throughout this trend although its extent north and south is unknown. Further west from this syncline no work at all has been carried out except

in the northern portions where underground mining has taken place. The seams are much thicker in the west and a surface mineable reserve is feasible.

A speculative reserve of 70 MM short tons of raw in place coal could be attached to this area. As to how much is surface mineable is questionable, but it is definitely of interest. Faulting and folding has brought this coal quite near the surface. The extend of Area A is probably about 1000 acres.

Area C

This is the eastward underground extension of Imperial Metal's Area A (Figure 3). Using only 15 feet of coal in two seams there is a possible speculative reserve of 80 MM short tons of in place underground mineable coal. This coal would be at a maximum about 1500 feet in depth to the basal seam.

In summary, guesstimates have been made in the past as to the amount of coal in the Merritt coal field. To date, limited drilling and thick till cover which hampers geologic mapping has not improved the confidence of reserve figures. It can be said however, that there is probably a speculative reserve of up to 180 MM short tons of raw in place coal of which an amount of 10 MM +

could possibly be surface mineable.

Previous Exploration

This coal field has been an area of coal mining since the late 1800's. Since that time numerous mines have opened and closed down and drilling has been carried out to a small extent in conjunction with these ventures.

From 1907 to 1949, seven underground coal mines were operated in the field mining a total of 2,610,062 long tons of coal. It may be noted that an appreciable amount of this coal was taken from the thinner upper seams in the series.

Holes were drilled in 1892 - 1904 by Middesboro Collieries and other companies. Approximate locations and logs of these holes are found in Appendix I in the drill hole summaries.

In 1945 - 46 the Provincial Government drilled six diamond core holes for a total of 4,508 feet. These holes were drilled in the eastern portions of the field and their information has been used in this report.

In 1960 Imperial Metals and Power Co. Ltd. drilled 16 drill holes on Lot 166(Middlesboro Collieries old leases) and an engineering report was published in 1962.

Again, in 1969 Imperial Metals and Power Ltd. drilled a further 4 core holes just south of the 1960 drilling and published the Sumicol Report of 1970, based on this information.

In the following 8 years no drilling or exploratory work of any kind has been carried out on the Merritt Coal Field.

As can be seen on (Map 1), the drill hole locations concentrate on Imperial Metals lease and in the far east, but the central and western portions of the field have been ommitted.

Since the geology is sketchy and drill holes are concentrated in small portions of the field there is still much to be known about the full potential of this field, especially in the west where surface mineable reserves may possibly exist.

Proposed Exploration

A drilling program of eleven holes with a total maximum footage of 11,000 feet has been proposed. This it may be noted would only be a very preliminary program but it would help identify the number, thickness and continuity of the seams across the whole field along Section 2 (see Map 1). It is hoped that it would also identify the possibility of surface mineable coal at the western end of the field where no exploration work has been done.

It is suggested that the following procedures be followed prior to drilling in the proposed locations:

1) That copies of the mine plans for the western portions of the field be obtained to give a better idea as to the structure in that area. It is understood, from a 1948 Evaluation Report that Coal Hill Syndicate has mined 500,000 tons in the area immediately west of Imperial Metals lease. These plans would be invaluable as they lie in the area of probable surface mineable reserves, where the structure is more complex. Unfortunately, these plans can only be obtained by a personal trip to the Department of Mines and Minerals in Victoria, B.C. as they do not have the staff to find them for us.

2) A brief field trip to the area would also prove invaluable. This would verify outcrop location and since a geologic map of this western portion does not exist, three days of geological mapping would help in determining possible location of the surface mineable areas in the west.

After these two stages of reconnaissance the drill hole locations may be moved to yield better information if necessary.

The drilling itself may be done prior to decisions regarding dealing with Imperial Metals or after, depending on Imperial Oil's decision. Regardless, the first two steps should be carried through to provide more in put as to the potential of this area.

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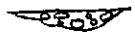
Merritt Coal, Sunicol Report, Imperial Metals and Power Ltd., April, 1970.

MERRITT GEOLOGICAL CROSS-SECTIONS

Legend

Igneous rocks

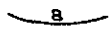


Glacial till and fluvial deposits

Fault

Hole Number

Coal Interval



Coal Seam and Seam Number

Note: Coal thicknesses are only approximations and are not true thicknesses

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DRILL HOLE SUMMARY SHEET

HOLE NO.	Incl. deg	AZ. DEG.	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	D	R	N	S	C	DATE	DEPTH	O/A	TILL (FT.)	H_2O level	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	Thickness (ft)	CORE DATA Run	Depth Top	CUT	REC	Elevation Top of coal zone	Hole Dia. (ins.)	R_w	RIG treat.	RIG hole	FLUID air	FLUID wtr.	FLUID mud	COMMENTS
1M	90		North Bank		1996	600							1891		x	55.0		2	190.0	193.8	3.8									x				Diamond Drill Core
			ColdwaterR															2	194.2	195.6	1.4									x				Core Log
			Lot 123															2	196.2	169.9	0.7									x				
																		2	212.3	213.8	1.5					1784				x				
			Old Hole 1															3	269.0	269.8	0.8									x				
																			338.7	340.0	1.3					1657				x				
																			497.7	450.2	0.5									x				
																			456.0	456.5	0.5									x				
2M	90		On NW ¼			562							1893		x	800			137.5	138.0	0.5									x				Diamond Drill Core
			Sec. 14 Twp. 91																139.3	138.8	0.5									x				Core Log
																		2	140.1	144.5	4.4	5-3	#2			1850				x				
			Old Hole 2															2	166.6	168.5	1.9									x				
																			219.0	219.5	0.5									x				
																		3?	334.5	335.0	0.5	0-5	#3			165.5				x				
3M	90		From Map			778							1906					2	535.0	538.6	3.6					1465				x				No Core Log Taken
			Old Hole 7															3	764.0	768.1	4.1					1236				x		o		From Map
4M	90		From Map																															
			Old Hole 8										1906					2	70.0	73.2	3.2					1930				x				No Core Log
																		3	222.0	225.2	3.2					1778				x				Taken from Map
																		6	293.0	294.5	1.5					1707				x				
5M			Centre of		1976	758							1909		x	97.0		8	304.0	305.8	1.8					1672				x				Core Log
			NW¼ & up90															4	460.8	464.8	4.0					1515				x				
			Old Hole 11															4	467.5	471.1	3.6									x				@177' dip 20°
																		4	474.3	475.1	0.8									x				@205' dip 47°
																		4	477.0	477.5	0.5									x				@ 280' dip 14°
																		4	478.2	497.7	1.5									x				@ 330' dip 15°

DRILL HOLE SUMMARY SHEET

HOLE NO.	INCL DEG	AZ DEG	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	G	D	R	N	S	C	ELECTRIC LOGS DATE	ELECTRIC LOGS DEPTH	D/L	FILL (F.T.)	H_2O level	NO.	DEPTH TOP	DEPTH BOTTOM	Thickness (ft)	(m)	CORE DATA Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (ins.)	H_w	RIG rot.	RIG dia.	FLUID air	FLUID wtr.	FLUID mud	COMMENTS
																		str	482.9	483.6	0.7									x				@427' dip 15°
5M																		5	610.4	623.5	13.1					1366				x				@447' dip 25°
ctd																		5	627.0	630.6	3.6													@485' dip 20°
																		str	657.8	658.7	0.9													@590' dip 25°
																		1	706.7	709.4	2.7					1269								@610' dip 18°
6M	90		1400' NE of Drillhole 5M Old Hole 12										1909																					Results indeterm- Faulted Ground
7M	90		Old Hole 14													from the old map plas, this hole encountered the same seams as hole 5M and therefore contains 4, 5, and 1																		located on map small x-section shows it intersected same seams as 5M
8M	90		Old Hole 1			201							1904						No	Coal														No core desc.
9M	90		Old Hole 2			200							1904			200			No	Coal														No core log
10M	90		Old Hole 3			280							1904						No	Coal														No core log
11M	90		NW¼ Sec.14		1986	995							1945		x	102		4	461.5	464.7	3.2					1524.5								Drill Core @100' = 0°
			Twp 91, 878'															4	466.6	474.3	7.7													@213' dip 15°
			North of 5M															5	550.4	555.3	4.9					1436								@364' dip 14°
			@ 35° east															5	556.5	561.0	4.5													@550' dip 18°
			Old Hole 1															1	646.5	650.5	4.0					1339.5								@700' dip 10°
																			950' pillowed lavas															@940' dip 23°

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DRILL HOLE SUMMARY SHEET

HOLE NO.	Incl deg.	AZ. DEG.	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	O	R	N	S	C	DATE	DEPTH	D/L	TILL (FT.)	H_2O level	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	Thickness (ft)	CORE DATA run	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (ins.)	R_w	RIG Prot.	RIG Idle.	FLUID Air	FLUID Invt.	FLUID Mud	COMMENTS
12M	90		Old Hole 2		2022	944							1946		x	203		4	651.5	657.0	5.5					1370.5								@220' dip 15°
			NE¼ sec.14		Twp.	91													930'-lavas															@300' dip 20°
			1223'	north	88°																												@390' dip 18°
			from hole 11M																														@400' fault planes
																																	at 45°
																																	@480' dip 0°
																																	@550' dip 10°
																																	@630' dip 10°
																																	@853' dip 23°
																																	@900' dip 30°
																																	@930' dip 25°
13M	90		Old Hole 4		1975	572							1946		x	181		5	366.3	367.3	1.0					1609			x					@200' dip 14°
			NE¼ sec.14															5	367.3	368.5	1.2												@280' dip 10°
			675'	north	18°													5	368.5	377.0	7.5												@350' dip 13°
			from 11M																														@430' dip 10°
																																	@550' dip 5°
14M			471 feet		1975	555							1946		x	178		4	413,5	421.0	7.5					1561.5								@180' dip 10°
			North 28°W																														@261' dip 10°
			from 11M																														@305' dip 30°
			Old Hole 5																														@362' dip 10°
																																	@413' dip 13°
																																	@513' dip 25°
15M	90		680' bearing		1985	460							1946		x	210			No Coal														@230' dip 18°
			42°East from																														
			Hole 13M																														
			Old Hole 6																														

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DRILL HOLE SUMMARY SHEET

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HOLE NO.	Incl. deg.	AZ. DEG.	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS Q	D	R	N	S	C	DATE	DEPTH	D/L	TILL (FT.)	H_2O level	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	Thickness (ft)	CORE DATA run	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (ins.)	R_W	RIG rot.	RIG dia.	FLUID air	FLUID wtr.	FLUID mud	COMMENTS
16N90			Drilled on		2440	1270							1946		x	7.0			No Coal														Gd. core descrip.
			Lot 120 on																														40° dip 20°
			Hamilton																														375 dip 15°
			Creek																														850' dip 10°
			Old Hole 3																														1000' dip 10°
																																	1265' dip 15°
17N90			located on			710.0							1906			11.9			161.0	162.5	1.5												Diamond Core
			I.R. 2from																287.0	288.0	1.0												descrip. avail.
			Old Map																541.0	542.7	1.7												
			Old Hole No. XI																544.0	545.2	1.2												
																			550.0	551.0	1.0												
18N90			Old Hole B-1			184.0										10		4	113.0	128.0	15.0		Coal			2092							Log of Blair Shaf
			from Old Map															4	128.0	145.0	17.0		Coal and Shale										and diamond drill
			Middlesboro																145.0	153.0	8.0		Coal, mud and shale										hole from 135.0
			Collieries																														
19N50°?			Middlesboro			838.0									x	48		2	64.0	66.0	2.0												Diamond Drill Core
			Collieries Hole															2	72.0	74.0	2.0												descrip. available
			1. location M-2															2	78.0	79.0	1.0		58'										
																		3	137.0	139.0	2.0		29'										
																		6	168.0	171.1	3.1												
																		8	415.0	416.0	1.0												
																		4	550.5	557.5	7.0												
																		4	559.0	567.2	8.2												
																		5	679.0	682.0	3.0												
																		1	827.0	829.0	2.0												
																		1	830.0	832.0	2.0												

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DRILL HOLE SUMMARY SHEET

HOLE NO.	INC	AZ	COORDINATES SOUTH	COORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	D	H	N	S	C	DATE	DEPTH	O/L	TILL (FT)	H_2O level	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	Thickness (ft)	CORE DATA run	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (ins.)	R_w	RIG rot.	dia.	FLUID air	wtr.	mud	COMMENTS
20M			junction of		2000	600							1904		x	600			No	Coal														600 feet of till
			Nicola and																															
			Coldwater Rivers																															

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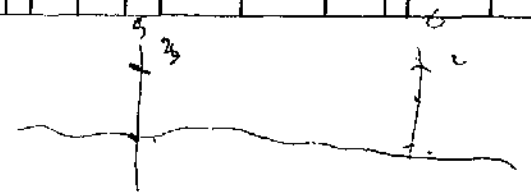
DRILL HOLE SUMMARY SHEET

PAGE

HOLE NO.	Incl deg	Az DEG	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	D	R	N	S	C	DATE	DEPTH	DY L.	FILL (FT.)	H2O level	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	Thick-ness (ft)	CORE DATA Run	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (ins.)	Rw	RIG Rot.	RIG Dia.	FLUID Air	FLUID Wtr.	FLUID Mud	COMMENTS
1	90°				2112	238										145	pr	4	192.0	205	13.0					1920								Diamond Drill
																192																		Core Log
2	90°				2149	842										10.0		2	122.0	124.0	2.0					2021								Diamond Drill
																		2	140.0	140.5	0.5		Coal or grey ash											Core Log
																200'		3	209.0	212.0	3.0					1940								
																	126	6	330.0	342.0	4.0		Coal, bone, coal			1811								
																		8	625.0	628.5	3.5					1524								
																	282	7	830.0	831.0	1.0													
3	90°				2213	139.0										0.0		3	100.0	102.5	2.5					2113.0								Diamond Drill
																		3	109.0	110.0	1.0													Core Log
																		3	113.0	113.5	0.5													
4	90°				2232	180.0									KT	4.0		3	141.0	143.0	2.0		Hole			2091								Diamond Drill
																		3	144.0	147.0	3.0		22'											Core Log
																		3	162.0	163.0	1.0		Coal and Shale											
5	90°				2210	140.0										2.0		3	43.5	47.0	3.5					2167.0								Diamond Drill
																116	61	3	56.0	58.0	2.0													Core Log
																		6	119.0	122.0	3.0					2091								
6	90°				2158	260.0										4.0		2	40.0	41.0	1.0					2118								Diamond Drill
																		3	144.5	147.0	2.5					2013.5								Core Log
																	40'	3	147.5	148.5	1.0		41											
																		3	155.0	157.0	2.0													
																152		7	183.0	184.0	1.0					1975								
																		6	226.5	229.5	3.0					1931.5								



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DRILL HOLE SUMMARY SHEET

HOLE NO.	Incl. deg.	AZ. DEG.	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	D	R	N	S	C	DATE	DEPTH	D/L	TN.L. (FT.)	H_2O level	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	THICKNESS (ft)	CORE DATA Run	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (ins.)	R_w	RIG rot.	RIG sta.	FLUID air	FLUID wtr.	FLUID mud	COMMENTS
7	90				2158	20										20			N/C															Diamond Drill Core Log Same location as Hole 6
8	90				2020	250										107.0		1	201.0	229.0	28.0					1819								Diamond Drill Core Log 4" shale @ 215' 3" sandstone@219'
9	90				2076	280.0										20.0		4	96.0	124.0	28.0					1980								Diamond Drill Core Log
																		4	129.0	133.0	4.0													
																		5	?	280.0	?													
10	90°				2095	270.0										270.0			N/C															Diamond Drill Core Log
11	90°				2125.0	200.0										60.0		4	160.5	181.5	13.0		Old Workings			1956.5								Diamond Drill Core Log
																		4	187.0	193.5	6.5													
12	90°				2045	260.0										260.0			N/C															Diamond Drill Core Log
13	90°				2035.0	90.0										90.0			N/C															Diamond Drill Core Log
14	90°				2227.0	170.0										70.0			N/C															Diamond Drill Core Log
15	90°				2116	105										105			N/C															Diamond Drill Core Log

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DRILL HOLE SUMMARY SHEET

HOLE NO.	Incl deg.	AZ. DEG.	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	D	R	N	S	C	DATE	DEPTH	D/L	TILL (FT.)	H_2O level	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	Thickness (ft)	CORE DATA Run	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (ins.)	R_w	RIG rot.	RIG cus.	FLUID air	FLUID wtr.	FLUID mud	COMMENTS
1690					2080								1962			0		1	246.5	257.5	11.5					1833.5								Diamond Drill Hole
																		1	271.0	306.0	35.0												Log
																			309.5	323.0	13.5		Bone	Coal									240 Pitch 30°

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DRILL HOLE SUMMARY SHEET

HOLE NO.	Incl. deg.	AZ. DEG.	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	D	R	N	S	C	DATE	DEPTH	D/L	TILL (FT.)	H_2O level	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	Thickness (ft)	CORE DATA Run	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (ins.)	R_w	RIG rot.	RIG dia.	FLUID air	FLUID wtr.	FLUID mud	COMMENTS
1S	60	045			2205	848.0										44.0		4	226.6	232.2	5.4					1978								Diamond Drill
																										1909								Core Log
																										1889								
																		R2	319.0	321.7	2.7													
																		R2	330.6	332.9	2.3													
																		5	383.3	387.0	2.7					1822								
																		str	447.0	448.1	1.1					1758								
																		1	623.4	630.0	6.6					1582								
2S	90°				216.0	592.0										88.0		4	128.0	135.0	7.0					2032								Diamond Drill
																		R2	201.5	202.5	1.0					1959								Core Log
																		5	399.5	405.0	5.0					1760								
																		1	543.5	556.5	13.0					1616.5								
																		1	557.5	562.5	5.0													
																		1	571.0	571.0	4.0													
3S	90°				2215.0	691.0										144		8	199.0	202.0	3.0					2016								
																		4	335.0	352.0	17.0					1880								
																		R2	389.0	393.0	4.0					1826								
																		5	490.0	491.0	1.0	Coaly Shale				1725								
																		5	491.0	500.0	9.0					1618.5								
																		1	596.5	597.0	0.5													
																		1	598.0	603.0	5.0													
																		1	603.0	604.0	1.0	Coal Shale												
																		1	604.0	606.5	1.5													
																		1	607.0	611.0	1.0													
																		1	612.5	626.0	13.5													
																		?	671.0	680.0	9.0					1544								

PROJECT Moffitt

DRILL HOLE SUMMARY SHEET

HOLE NO.	INCL deg	AZ DEG	CO-ORDINATES SOUTH	CO-ORDINATES WEST	TRUE ELEV.	TOTAL DEPTH	ELECTRIC LOGS G	D	R	N	S	C	DATE	DEPTH	O/L	FILL (FT.)	H_2O (level)	SEAM DESCRIPTION NO.	DEPTH TOP	DEPTH BOTTOM	Thickness (ft)	CORE DATA (run)	Depth top	CUT	REC	Elevation Top of coal zone	Hole Dia. (Ins.)	R_w	RIG rot.	dia.	FLUID air	wtr.	mud	COMMENTS
45	909				2025											64.0		8	185.0	186.0	1.0					1840								Diamond Drill
																			194.0	194.5	0.5					1831								Core Log
																		4	278.5	284.0	5.5					1746.5								Seams names are
																		R2	339.0	340.0	1.0					1683.5								those assigned by
																		R2	341.5	343.0	1.5					1563.0								Sumicol
																		5	462.0	466.0	4.0													
																			466.0	468.0	2.0		Coaly Shale											
																		5	468.0	471.0	3.0													
																		1	552.0	556.0	4.0					1473								