PR - PINE PASS 79(1)A

"PINE PASS COAL PROPERTY 1979"

C.L. NOS 1147[illegible]

OPEN FILED

586

Province of British Columbia

Ministry of Energy, Mines and Petroleum Resources

MEMORANDUM

PR-Pine Pass 79(1)A.

To: Alec Matheson
Coal Geologist
Geological Division

Date: January 15, 1980

Our File:

Re: Coal Licence Nos. 4476 to 4500, 4503 & 4504
Pine Pass Coal Property
Shell Canada Resources Limited

Enclosed is a report on the Pine Pass coal project which has been submitted by Shell Canada Resources Limited. The report is submitted in accordance with Section 12(2) of the Coal Act.

As Shell inadvertently allowed the subject licences to forfeit they have submitted an application for coal licences which covers the same general area. You will be receiving their plan of operations shortly.

Paul Hagen
Acting Administrator for Coal

Enclosure
/df

GEOLOGICAL BRANCH
ASSESSMENT REPORT

00 586

OPEN FILE

PR-PINE PASS 79(1)A

Crows Nest Resources LIMITED
Shell Centre, 400 - 4th Avenue S.W., Calgary, Alberta (403) 232-4355
P.O. Box 2699 Stn. M, Calgary, Alberta T2P 2M7 Telex 038-24792

December 21, 1979

MINISTRY OF MINES AND PETROLEUM RESOURCES
JAN 10 1980
MINERAL TITLES FILE ROOM

Mr. A.C. Corner
Administrator for Coal
Ministry of Energy, Mines
& Petroleum Resources
Government of British Columbia
Victoria, B.C.

365

Dear Mr. Corner:

Re: B.C. Coal Licences 4476 to 4500 incl. and 4503;
B.C. Coal Licences 4483 and 4504
Pine Pass Coal Property, Peace River Land District; Submission of Technical Report

Enclosed herewith is our report entitled "Pine Pass Coal Property, Noman Creek Area", accounting for work performed on the above Licences in their first term.

We trust you will find everything in order.

Yours very truly,

J.J. Crabb
Manager - Exploration

REFERRED TO		DATE	INITIALS
C.G.C.			
D.C.G.C.		80.01.11	
G.C.			
F.M.C.	Enclosure		
M.T.D.R.			
P.L.C.R.		✓	
C.O.A.L.		✓	
	pursuant to Sec 12(2) CA. Coal Licences forfeited.		
FILE NO.			
FILING CLERK			

PROFESSIONAL VERIFICATION OF REPORT

Entitled: Pine Pass Coal Property
Peace River Land District, B.C. 1979
B.C. Coal Licences Nos. 4476-4504 Incl.

Mr. Eric G. Panchy planned and carried out the 1979 geological field program on Pine Pass B.C. Coal Licences held by Shell Canada Resources Limited and operated by Crows Nest Resources Limited. He also prepared this report. Mr. Frank Martonhegyi supervised activity of this program under the general direction of the undersigned.

Eric Panchy, B.Sc., graduated in Geology from the University of Manitoba, in 1979. Prior to his graduation Mr. Panchy worked as a field assistant for a major oil company in Alberta.

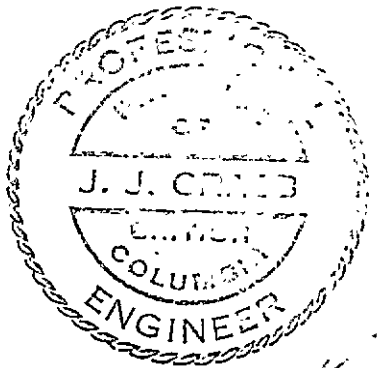
Frank Martonhegyi, M.E., graduated in Mining Geological Engineering from the University of the Heavy Industry, Hungary, in 1962; and received post-graduate training at the University of Saskatchewan, Saskatoon, in 1969-1971. His experience in Western Canadian coal exploration since 1971 includes positions with:

- CanPac Minerals Ltd., Calgary, Alberta
- Shell Canada Resources Limited, Calgary, Alberta
- Crows Nest Resources Limited, Calgary, Alberta

His prior experience includes underground coal mining geology, geotechnical engineering and geochemistry in Hungary, Austria and Canada.

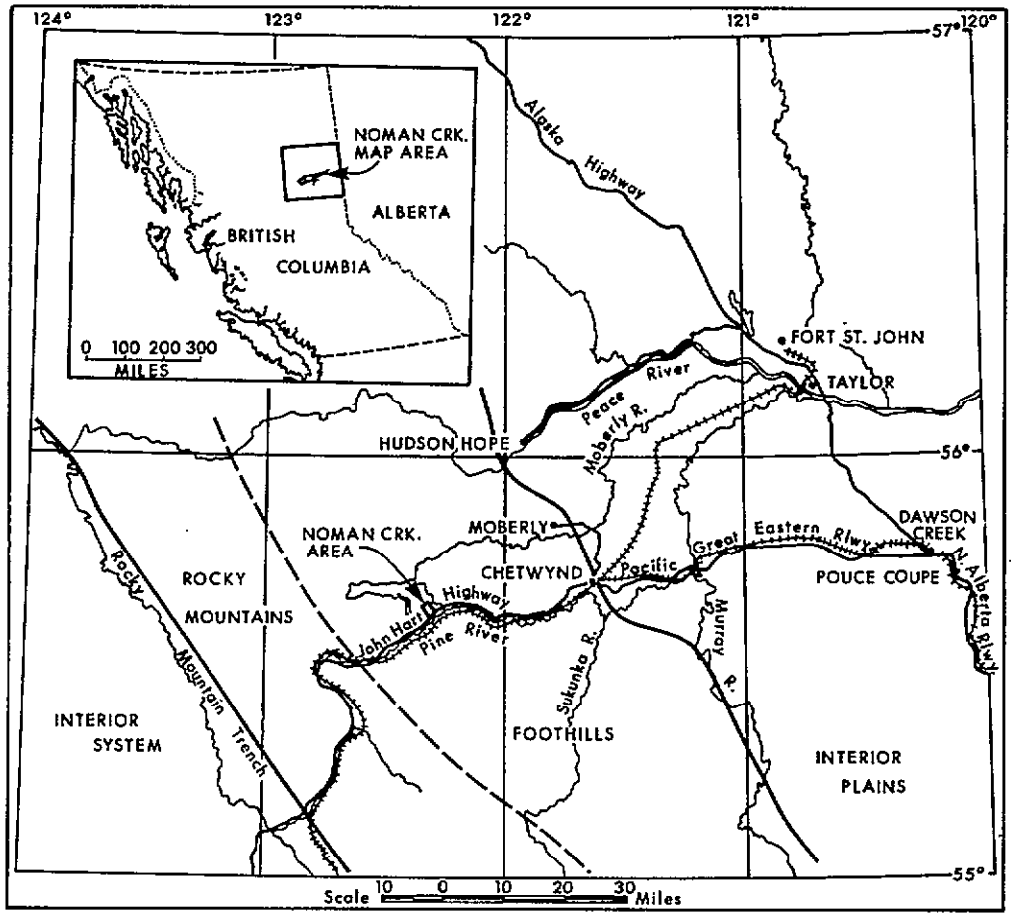
He currently holds the position of Senior Staff Geologist for Crows Nest Resources Ltd. supervising coal exploration in British Columbia.

I consider both the aforementioned geologists to be well qualified to undertake responsibilities they were assigned on this project. I am satisfied that the attached report dated Dec. 28, 1979 has been competently prepared and justly represents the information obtained from this project.



J. J. Crabb, P. Eng.

PR- PINE PASS 79(1)A.



LOCATION MAP

REPORT ON COAL LICENCES 4476 TO 4500 INCLUSIVE, & 4503, 4504
PEACE RIVER LAND DISTRICT, BRITISH COLUMBIA DEC. 29, 1979

ON WORK DONE IN PERIOD JUNE 22, 1979 TO DECEMBER 28, 1979

HELD BY: SHELL CANADA RESOURCES LIMITED
OPERATED BY: CROWS NEST RESOURCES LIMITED

LAT. 55° 32′ TO 55° 40′ NTS 93-O-9 LONG. 122° 07′ TO 122° 22′

Crows Nest Resources Limited
EXPLORATION

PINE PASS
NE BRITISH COLUMBIA

PINE PASS COAL PROPERTY
NOMAN CREEK AREA

AUTHOR: E. PANCHY	SCALE:	ENCLOSURE No:
DATE: DEC 1979	REVISED:	DRAWING No: HE-41E
To Accompany		

TABLE OF CONTENTS

1.0 LIST OF ENCLOSURES

2.0 SUMMARY

The Pine Pass Coal Property covers 7911 hectares in 27 B.C. Coal Licences,

held by Shell Canada Resources Limited

operated by its wholly owned subsidiary

Crows Nest Resources Limited,

located in the Peace River Land District, northeastern British Columbia at,

North Latitude 55° 37' and West Longitude 122° 20'

on Map Sheet N.T.S. 93-0-9.

The property is approximately half way between Pine Pass in the Rocky Mountains and the town of Chetwynd 70 kilometers to the east. The property extends on both sides of John Hart Highway, the only existing railway in N.E. British Columbia runs through the property along Pine River at the confluences of Pine River and Beaudette and Fisher Creeks. Lower Cretaceous Gething Formation sequences include workable coal seams in the area at the top, middle and lower parts of this succession.

The most explored area, Noman Creek Syncline, has several thick coal seams amenable for open pit mining. Two middle Gething seams occur here 20 to 30 meters apart with an aggregated thickness of approximately 10 meters. Preliminary estimates indicate 5 to 10 million metric tonnes open pit geological in place coal reserves at a 5:1 to 10:1 overburden ratio range.

The Noman Creek Syncline is a tight southerly plunging fold containing 300-400 meters of Gething Formation strata. The fold strikes north-south and the south end of the fold is cut-off by alluvial deposits while the northern end extends a minimum of 3,000 meters.

The 1979 field program included field mapping of the Noman Creek area at a scale of 1:5000 and hand trenching of coal seams.

3.0 RECOMMENDATIONS

a) Application to be made for seven additional licences.

- extending the Noman Creek Project (1 lic.)
- securing the location of possible plant site (1 lic.)
- acquiring outcrop area of top Gething coals in the Willow Creek area (5 lics.)

Detailed legal description of this land being applied for is shown on Enclosure 3: B.C. Coal Licences Tenure Standing. There is no reference in this report to Licences 4501, 4502 being surrendered on December 29, 1979.

b) Further detailed mapping and a five to ten hole program of rotary drilling with coal coring to prove present and additional reserves on the northern part of the project area.

c) Reconnaissance mapping to be carried out covering parts of the property south of the Pine River.

4.0 LOCATION

Enclosure No. 1 on the Cover

The Pine Pass Coal Property is located in the Peace River Land District, northeastern British Columbia on both sides of the Pine River near the mouths of Beaudette and Fisher Creeks. It is approximately half-way between Pine Pass in the Rocky Mountains and the town of Chetwynd to the east. It is in the vicinity of coordinates:

N. Latitude 55^{o} 37'
W. Longitude 122^{o} 20'

On Map Sheet N.T.S. 93-O-9.

5.0 ACCESS

Enclosure 2

The only highway and railway (BCR) line across the Rocky Mountains in northeastern British Columbia traverses the property. On these transportation routes the town of Chetwynd is 70 km eastbound, the ports of both the Vancouver area and Prince Rupert are approximately 1200 km westbound.

The Noman Creek Project is immediately north of the main transportation lines and is accessible on good quality dirt roads as a result of previous exploration and high voltage power line construction.

There is a reasonably good dirt road on the east edge of the licences along Willow Creek. Most of the property on the south side of Pine River is accessible by helicopter only, however.

6.0 TENURE

Enclosures 3 and 4

The Pine Pass Coal Property,

held by Shell Canada Resources Limited

operated by Crows Nest Resources Limited

covers 7,911 hectares in 27 B.C. Coal Licences Nos. 4476 to 4500 incl. and 4503, 4504 issued on December 29, 1978. Enclosures above show the coal rights tenure standing in a tabulated form and on a Land Map.

7.0 EXPLORATION

7.1 Work Done 1979

Enclosures 8 and 10

Geological field mapping covered the Noman Creek Project area during the summer of a 1979. This mapping was carried out at a scale of 1:5,000 using traditional methods of tape and compass. It was restricted to creeks and roads mainly due to dense forestation and thick overburden. Mapping was difficult due to rugged terrain, a rainy summer and the persistant annoyance of black flies. Lack of continuous outcrops and an unstable depositional environment make correlation of coal seams and strata difficult. Snowfall in June on the northern end of the property also hampered mapping exercises. The weather conditions of the region are very unstable and change constantly. (Enclosure 10) Hand trenching of several coal seams was undertaken. Trenching frequency was determined by the availability of coal seam outcrop, thickness and continuity. Channel samples from the trenches were sent for analysis to Crows Nest Resources' Lab in Fernie, B.C. Analyses were not available at the time of compiling this report.

7.2 Work Done Before 1979

Brameda Resources - 1969

Brameda Resources carried out a drill program in the Noman Creek area during 1968-69. They drilled a total of 23 cored drill holes totalling 15,701 feet. Trenching was carried out in association with road construction. Trench descriptions are missing but core descriptions are available. Field mapping was done at a scale of 1:4,800.

Pine Pass Coal Company - 1968

Largely based on work done by N.D. McKechnie in 1955, Pine Pass Coal Company drove an adit into a thick coal seam in the Noman Creek

Syncline. The adit was driven 120' along strike and a cross-cut was made at this point. A bulk sample was taken an analyzed by Warnock Hersey. (Enclosure 12)

Hughes, J.E. - 1967

Regional geological mapping of the Pine Pass area at a scale of 1:63,360. (B.C. Dept. of Mines and Petroleum Res., Bulletin No. 52)

Hughes, J.E. - 1964

Reconnaissance geological mapping and description of the Jurassic-Cretaceous succession in the Pine Pass area. (B.C. Dept. of Mines and Petroleum Res., Bulletin No. 51)

McKechnie, N.D. - 1955

Working for the B.C. Dept. of Mines, McKechnie carried out field mapping and a diamond drilling program of 26 cored holes between 1948 and 1951. A total of 15,835 feet of drilling was done in the Noman Creek area. Field mapping was carried out at a scale of 1:4,800. Proximate analyses were done on the coal intersections. Enclosure 11 is a summary of the results. (Enclosure 11) (B.C. Dept. of Mines, Bulletin No. 36)

8.0 REGIONAL STRATIGRAPHY

Enclosure 6: Table of Formations

The upper part of the Bullhead Group called Gething Formation is a main coal bearing sequence in northeastern British Columbia. This formation is an accumulation of up to 540 metres of deltaic sediments, mostly sandstones with a decreasing grain-size upwards. This rock - stratigraphic sequence is a separate mappable unit in northeastern British Columbia from the Kakwa River northwards for over 400 km to the Muskwa River. It overlies the Cadomin Formation conformably and is difficult to distinguish conglomerates of these formations. Top Minnes Group rocks, include coal increasing to workable thickness at places according to some operators.

Marine shales of the Moosebar Formation overlie disconformably the Gething succession. It is followed upwards by the Gates Member of the Commotion Formation which is the main coal bearing sequence further to the south. North of the Sukunka River, however, including the Pine River area, coal seams in the Gates succession thin below economic consideration.

8.1 Cadomin Formation

Cadomin sediments are typified by massive, chert conglomerates, coarse-grained sandstones with a few thin shale beds. The Cadomin varies in thickness from 0 to 230 meters and where exposed makes an easily recognizable marker. The horizon of Cadomin conglomerates is a good marker throughout the Canadian Rockies to the Prophet River on the north. It is generally found along the flanks of broad anticlines and serves to outline major structures in northeastern B.C.

8.2 Gething Formation

Gething assemblages can be subdivided into two main facies:

1. coarse sediments of alluvial and upper delta plains,
2. finer sediments of the lower delta plains.

The coarser sediments consist of conglomerates and coarse sands which grade laterally into siltstones and mudstones which resemble modern flood plain sediments. Grain size usually decreases upwards as the whole Gething depositional regime was, intermittent, but in general regressive. The coarse sands and conglomerates represent a channel system in the basal section of the Gething Formation while the finer upper sands represent the flood plain sediments deposited after the channel system was abandoned. This fining upward sequence indicates flood-plains taking over near some marshes. Also included in the Gething Formation are alternating beds of coal, dark siltstones and shales characteristic of marsh and interdistibutary areas.

8.3 Moosebar Formation

The Gething Formation is disconformably overlain by the Moosebar Formation. A thin chert pebble bed marks the contact usually. The Moosebar Formation consists of rubbly, dark gray mudstones and shales with minor sandstone beds very similar to rocks of the Fernie Formation in Southeastern B.C. The Moosebar Formation is easily recognizable as a dark gray, massive mudstone but due to its recessive nature is usually only seen in road cuts or cliff faces. The formation averages 300 metres in thickness and represents a transgressive sea in Albian time.

9.0 REGIONAL STRUCTURE

Enclosure 7

The Gething Formation is located in the Rocky Mountains Inner Foothills of northeastern B.C.. The Inner Foothills in the Pine River area are a surface expression of a large anticlinorium. This structure includes quasi-parallel, northwesterly trending folds. The northern ends of the folds are generally terminated by faults which trend more northerly than the fold axes. The southern ends of the folds usually terminate in smaller, complex folds. Large thrust faults are common in this region. Smaller reverse faults attributed to the large thrusts have an en-echelon pattern throughout this region. Deformation decreases eastward and successively youngers beds outcrop eastward from the front ranges.

The Outer Foothills are comprised of a broad synclinorium with major synclines having an en-echelon pattern striking northwestward.

As a general rule more competent rocks such as sandstones tend to be more faulted, less competent ones such as shales are more folded. As a result of this flat beds of sandstones can be misleading. Anticlines are usually tighter and more broken up than synclines.

10.0 NOMAN CREEK AREA

10.1 Stratigraphy and Coal Geology

This area lies immediately north of the John Hart Highway between Cleveland and Fisher Creeks. The area extends approximately eight kilometers north from the highway. The target horizon is the Gething Formation sediments exposed in this area. The true thickness of the Gething Formation in this area is believed to be 300 meters but no full section is exposed or penetrated by drilling to make an accurate measurement.

Strata in this area consist of numerous coal seams, siltstones, shales and fine-grained sandstones in rhythmic recurrence. The middle and upper sequence of the Gething Formation is exposed in this area.

There are three target zones in the Gething Formation for workable thick coal seams. The first zone is generally within 30-40 meters below the Moosebar-Gething contact. Equivalent known seams are the Superior-Trojan and Skeeter-Chamberlain zones in the Peace River and Sukunka River areas to the north and south respectively. The second horizon is the middle coal zone which is approximately 150 meters below the first zone. The third zone is the lower coal zone which is approximately 100 meters below zone two.

In the Noman Creek area, two and possibly a third workable seams were observed along with numerous other thin seams. The major seams in the area are:

SEAM	DEPTH BELOW MOOSEBAR-GETHING CONTACT	INTERVAL	THICKNESS (meters)
60	50-75 meters		0-1.6 m
		115-125 m	
78	165-175 meters		1-4 m
		25-35 m	
76	200 meters		4-6 m
		40 m	
40	240 meters		0-1 m
		35 m	
39	275 meters		0-1.5 m

Seam 60 is possibly the equivalent of the Superior or Skeeter coal zones. This seam varied considerably in its thickness and continuity in the area. When observed it was dirty, dull coal.

(Enclosure 11) Seam 78 and 76 are believed to be in the middle coal zone. McKechnie reports their depths to be 165 to 200 meters below the Moosebar-Gething contact. Seam 78 has a tendency to vary in thickness from one to four meters. The seam also has breaks in continuity. It may be the result of miscorrelation, however. This seam was fairly clean with an average ash of seven percent and a volatile of 25.8 percent (taken from McKechnie - 1955) on an air-dried basis.

Seam 76 is 25-30 meters below seam 78. This seam appeared to be both the thickest seam, averaging four to six meters, and of the greatest continuity. The Pine Pass Coal Company drove an adit into this seam and the results on an air-dried basis are; on a 76 percent yield, an average ash of five percent, volatile of 23 percent and an F.S.I. of eight. (Enclosure 12) The quality results look very encouraging, but need confirmation.

Seams 39 and 40, possibly equivalent to the lower coal zone, are too thin, discontinuous, and deep to be of any significance.

10.2 Structure

The structure of the Noman Creek area is complex with abundant small scale folds and faults. The Noman Creek syncline, Noman Creek anticline and Fisher Creek syncline are the three main folds. There are several shear zones and two reverse faults in the Noman Creek area.

The Noman Creek syncline is assymetrical in shape having dips on the west limb from 45° to almost vertical, where those on the east limb are from 30° to 70°. The axis of the syncline strikes 325° and plunges approximately 10° to the south. Adjacent to the west limb there

is a shear zone, which strikes 325°, with a vertical fault plane seen at the outcrop.

The east limb of the syncline is cut by the Noman Creek reverse fault. This fault strikes 327° and dips 60° southwestward. About 700 meters north from the John Hart Highway, the strike of the fault changes to 320°, possibly deflected by a thick sandstone on the crest of the Noman Creek anticline. The fault is traceable for 1.3 kilometers north from the John Hart Highway where it is lost due to lack of information. There is a 170-meter displacement along the fault indicated by McKechnie's drilling in 1955.

To the east of the Noman Creek fault occurs the Eastern Reverse Fault which strikes 310° and dips 65° northeastward. This fault outcrops east of the Noman Creek anticlinal axis and has moved the northeast limb, up-dip 135 meters, making an observable repetition of the Moosebar-Gething contact. The Noman Creek fault and Eastern fault strike towards each other therefore, either join or cross, but no evidence was observed in outcrop. The net result of the movements along these two reverse faults of opposite dips is a down-dropped middle block causing an apparent graben structure.

McKechnie (1955) reports drilling seam 76 in this graben block in drill holes P.R. 7, 8, 23 but no thick coal outcrops in this area to confirm this.

East of the Noman Creek anticline is the Fisher Creek syncline. Dips on the west limb are about 30° while the east limb averages 50°. The syncline is entirely of Moosebar Formation from the Hart Highway north for five kilometers where Gething Formation outcrops on the west limb.

East of the Fisher Creek syncline is a large reverse fault bringing to surface pre Cadomin strata including some coal up to five feet thick but with steep bedding attitudes.

10.3 Conclusion and Recommendations

The Noman Creek area is the most explored part of the B.C. Coal Licences operated by Crows Nest Resources Limited. The licences to the east and south of the Noman Creek area were not mapped due to insufficient time.

The Noman Creek area exposes Gething Formation sediments. It includes several workable coal seams observed on the surface and intersected by previous drilling. The two main seams, /8 and 76, are the two thickest and continuous seams in this area. They have an aggregate thickness of ten meters enclosed within 40 meters of section. These coal seams are exposed in a quasi-dip slope situation amenable to open pit mining. Preliminary estimates indicate 5 to 10 million tonnes open pit mineable geological in place reserves at 5:1 to 10:1 overburden ratio range. The major seam, 76, exhibits F.S.I. values of seven and may be of metallurgical grade.

Power for a prospective mine is available from the Williston substation transmission line about two kilometers to the north. The only existing railway in northeastern B.C. passes directly through the property. The ports of Vancouver and Prince Rupert are 1200 kilometers west along existing BC rail routes. The town of Chetwynd is /0 kilometers east of the property along an all-weather paved road and could house the miners.

The Noman Creek area appears to be a good property and preliminary results warrant further mapping and drilling to establish accurate reserves and overburden ratios.

The results of prior and 1979 exploration in the Noman Creek area are modestly encouraging and warrant further detailed mapping, drilling and analyses in search of more reserves and for better determination of

reserves, overburden ratio, foreseeable mining conditions and coal quality.

Additional detailed geological field mapping is essential in further delineating the structure and stratigraphy of the Noman Creek area. Mapping would also assist in determining the northern extension of the syncline.

A five to ten hole program of rotary drilling with coal coring is also recommended to determine the existence of seam 78 and /6 on the northern parts of the property and to determine coal quality of the seams over the total area. Drilling is also needed for more accurate reserve definition.

Acquisition of two additional B.C. Coal Licences is recommended:

93-0-9-F-69,70,79,80 - covering the possible northern extension of the reserve area

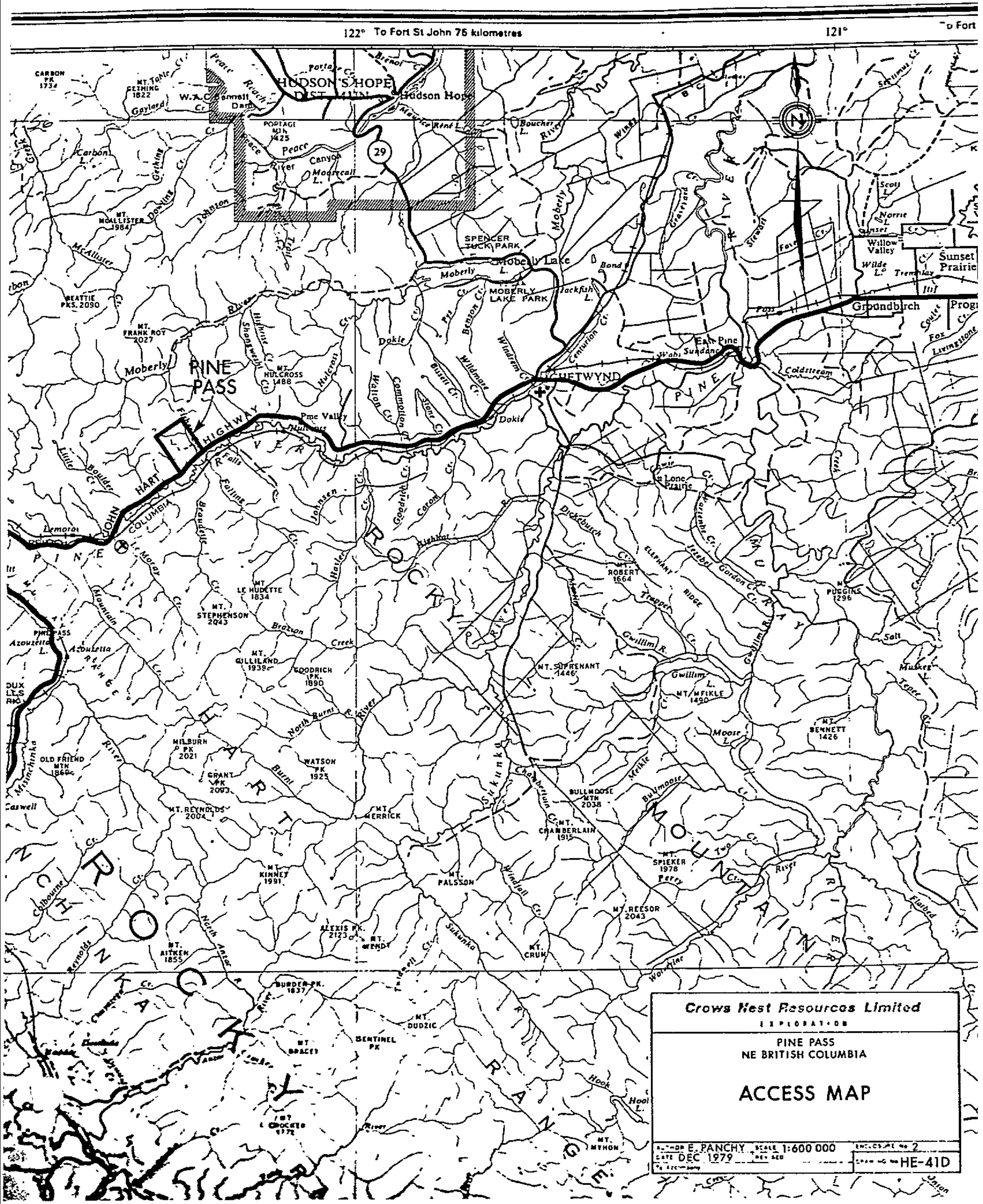
93-0-9-F-23,24,33,34 - covering the area if possible plant site along the railway

11.0 BIBLIOGRAPHY

J. E. Hughes - B.C. Dept. of Mines and Petroleum Resources
Bull. No. 51 - 1964
Bull. No. 52 - 1967

N.A. McKechnie - B.C. Dept. of Mines
Bull. No. 36 - 1955

D.F. Stott - Geological Survey of Canada
Bull. No. 152 - 1968
Bull. No. 219 - 1973



122° To Fort St John 76 kilometres
121°
HUDSON'S HOPE
Hudson Hope
W.A.C. Bennett Dam
Peace Reach
Peace River Canyon
29
SPENCER TUCK PARK
Moberly Lake
MOBERLY LAKE PARK
Sunset Prairie
Willow Valley
Groundbirch
East Pine
CHETWYND
PINE PASS
HART HIGHWAY
JOHN HART
Pine Valley
PINE RIVER
ROCKY MOUNTAIN
HART RANGE
MURRAY RIVER
MT. MCALLISTER 1984
BEATTIE PKS. 2090
MT. FRANK ROY 2027
MT. HULCROSS 1488
MT. LE HUDETTE 1834
MT. STEPHENSON 2043
MT. GILLILAND 1939
GOODRICH PK. 1890
MILBURN PK 2021
GRANT PK 2093
WATSON PK 1925
MT. REYNOLDS 2004
MT. MERRICK
OLD FRIEND MTN 1869
MT. ROBERT 1664
MT. SUPRENANT 1446
MT. MEIKLE 1490
MT. PUGGINS 1296
MT. BENNETT 1426
BULLMOOSE MTN 2038
MT. CHAMBERLAIN 1915
MT. SPIEKER 1978
MT. KINNEY 1991
MT. PALSSON
MT. REESOR 2043
ALEXIS PK. 2123
MT. WENDT
MT. CRUK
MT. AITKEN 1855
BURDEN PK. 1837
MT. DUDZIC
SENTINEL PK
MT. BRACEY
MT. CROCKER 1772
MT. MYHON
Crows Nest Resources Limited
EXPLORATION
PINE PASS
NE BRITISH COLUMBIA
ACCESS MAP
AUTHOR E. PANCHY
SCALE 1:600 000
DATE DEC 1979
ENCLOSURE No 2
DRAWING No HE-41D

CROWS NEST RESOURCES LIMITED
EXPLORATION

B. C. COAL LICENCES
TENURE STANDING

BLOCK: PINE PASS | PROJECT: PINE PASS | YEAR: 79-80
GROUP: NOT GROUPED | DATE: DEC. 17, 79

PROJECT NAME	PROJECT LICS. TOTAL NO.	PROJECT AREA TOTAL AC/HA	BLOCK NAME	BLOCK LIC. TOTAL NO.	BLOCK AREA TOTAL AC/HA	GROUP NO.	GROUP LICS. TOTAL NO.	GROUP AREA TOTAL AC/HA	GROUP YEAR	LICENCE NO.	LICENCE LEGAL DESCRIPTION N.T.S.	LICENCE AREA TOTAL AC/HA	ACQ/ADM FEES YEAR	ACQ/ADM FEES $	RENTALS ANNUAL $	RENTALS TOTAL TO NEXT ANN $10^3	REQUIREMENT WORK EXPIRED $10^3	REQUIREMENT WORK CURRENT YEAR LIC. YEAR	REQUIREMENT WORK CURRENT YEAR $	REQUIREMENT WORK PRE-FULFILMENT YEAR	REQUIREMENT WORK PRE-FULFILMENT $	REQUIREMENT WORK ANNIVERSARY DATE	BUDGET CURRENT YEAR AFE	BUDGET CURRENT YEAR $10^3	EXP TOTAL $10^3	POTL SHELL CLASS	COMMITMENTS, J. V. OTHER THAN B.C. GOV'T DESCRIPTION	REMARKS
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										4478	47,48,57,58	293																
										4479	49,50,59,60	293																
										4480	63,64,73,74	293																
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										4487	61,62,71,72	293																
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										4489	83,84,93,94	293																
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										4491	93-O-9-F 3,4,13,14	293																
										4492	5,6,15,16	293																
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										4496	29,30,39,40	293																
										4497	45,46,55,56	293																
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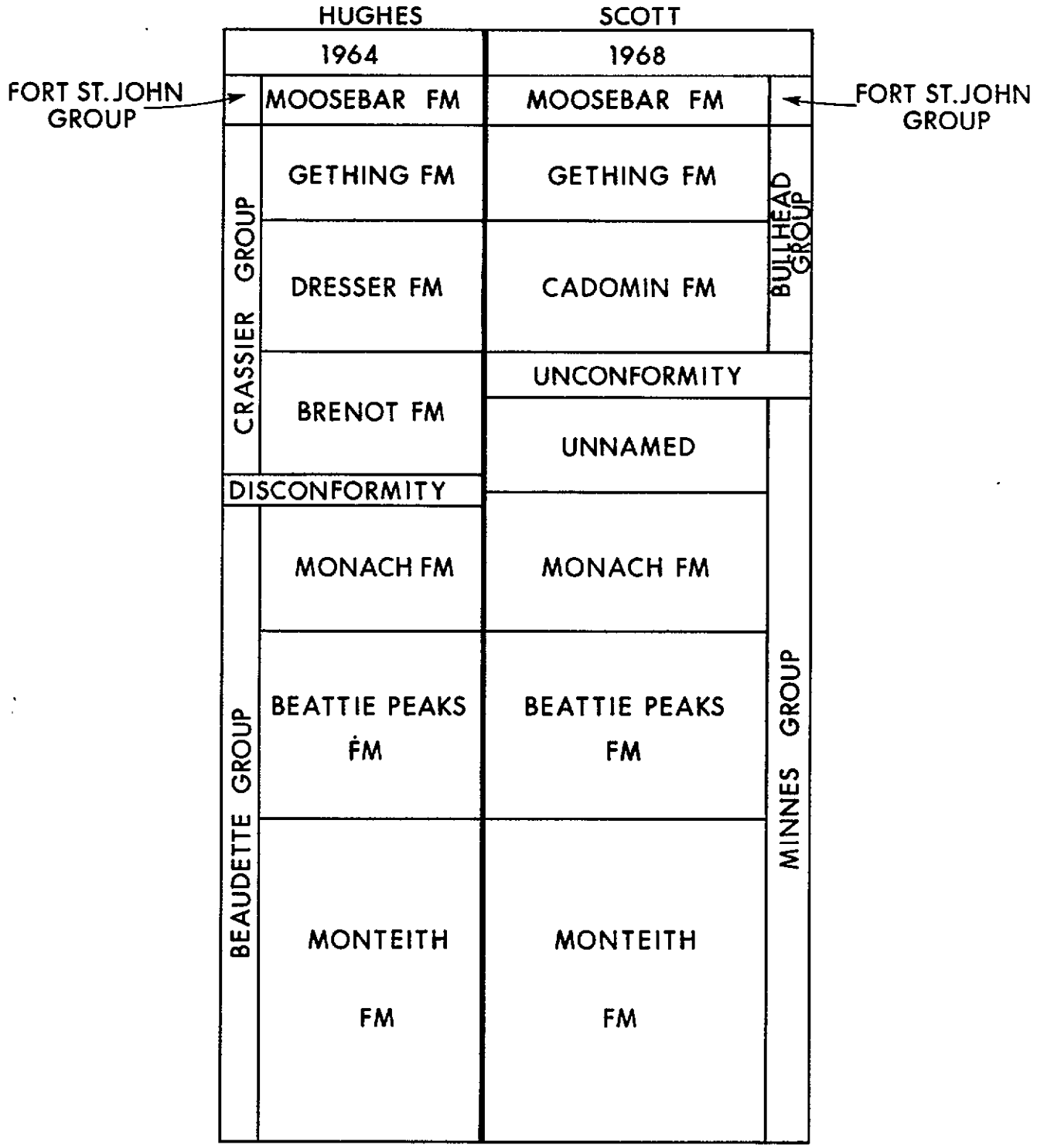
										4499	49,50,59,60	293																
										4500	67,68,77,78	293																
										4503	89,90,99,100	293																
										4483	93-O-9-B 81,82,91,92	293																
										4504	93-O-9-G 3,4,13,14	293																
			PINE PASS (APPLICATION)	1	2,051								80	70	10,255	10	—	—	—										
										APP	93-O-9-B 61,62,71,72	293																
										"	63,64,73,74	293																
										"	83,84,93,94	293																
										"	85,86,95,96	293																
										"	93-O-9-G 7,8,17,18	293																
										"	93-O-9-F 23,24,33,34	293																
										"	69,70,79,80	293																

GENERAL REMARKS: FILL NECESSARY LINES AND COLUMNS ONLY; COAL DEVELOPMENT POTENTIAL IS "Y" (PRIME) UNLESS OTHERWISE STATED, LICENCES HELD BY SHELL CANADA RESOURCES LTD.- CNRL IS THE OPERATOR



Crows Nest Resources Limited
EXPLORATION

PINE PASS
NE BRITISH COLUMBIA

TABLE OF FORMATIONS
PINE PASS REGION

AUTHOR: F. PANCHY	SCALE:	ENCLOSURE No: 6
DATE: DEC 1979	REVISED:	DRAWING No: HE-41C
To Accompany		

ENCLOSURE 10

NOMAN CREEK AREA

HAND TRENCH RECORD

TRENCH NO.	LENGTH	DEPTH	DESCRIPTION
1	10.0 m	0.75 m	- +2.0 meters siltstone, dark gray - 0.6 m shale, carbonaceous - footwall of coal seam 76, 325°/50°E, 5.11 meters thick coal - 0.43 meters shale, carbonaceous - +1.6 meters, siltstone, slightly carbonaceous
2	7.0 m	0.80 m	- +0.65 meters siltstone - 1.2 meters shale, carbonaceous - footwall of coal seam 78, 335°/65° E - 3.72 meters thick coal - 1.2 meters shale, carbonaceous
3	7.0 m	0.70 m	- +1.1 meters shale, carbonaceous - hanging wall of coal seam 78, 330°/55° W - 3.90 meters thick coal - 1.0 meter shale, carbonaceous
4	9.0 m	1.0 m	- +1.0 meter siltstone - 0.60 meters shale, carbonaceous - hanging wall of coal seam 76, 330°/65° W - 6.40 meters thick coal - 0.43 meters shale, coaly - +1.3 meters siltstone, dark gray
5	1.5 m	0.3 m	- +1.0 meter sandstone - fine grained - 335°/60° W
6	6.0 m	0.5 m	- +0.5 meters shale, carbonaceous - footwall of coal seam 78, 325°/50°E - 4.70 m

TRENCH NO.	LENGTH	DEPTH	DESCRIPTION
8	7.0 m	0.40 m	- +0.5 meters of shale, carbonaceous - footwall of coal seam 76, 338°/65° E - 5.9 meters thick coal - 1.0 meter of sandstone, fine grain
9	6.0 m	0.40 m	- +0.6 meters shale - footwall of coal seam, 330°/56°E - 3.8 meters thick coal - 1.0 meters siltstone-sandstone
10	7.0 m	0.4 m	- +0.7 meters shale, silty - footwall of coal seam, 330°/47°E - 5.0 meters thick coal - 1.2 meters shale, carbonaceous - +1.0 meters siltstone

*ENCLOSURE 11

ANALYSES OF DRILL CORE COAL SAMPLES
BY McKECHNIE (1955) OF NOMAN CREEK AREA

HOLE NO.	THICKNESS	RECOV.	ASH	V.M.	F.C.	S	HEAT VALUE
"Seam 78"	Feet	%	%	%	%	%	BTU/lb.
P.R. 7	1	58	3.8	26.5	69.7	0.9	15,030
P.R. 8	2	37	15.5	22.3	62.2	1.0	13,110
P.R. 14	2	55	1.5	22.2	76.0	0.7	15,200
P.R. 19	3	33	7.2	29.9	62.9	0.8	14,270
P.R. 21	4	32	6.8	27.5	65.7	0.7	14,230
P.R. 22	10	43	7.6	26.9	65.5	0.5	14,010
"Seam 76"							
P.R. 14	5	26	6.3	20.9	72.8	0.7	14,420
P.R. 16	10	44	2.5	23.1	74.4	0.4	15,070
P.R. 17	15	41	2.4	25.2	75.1	0.4	15,080
P.R. 18	22	22	5.0	20.5	74.5	0.7	14,810
P.R. 19	6	100	9.8	26.9	63.5	0.4	13,590
P.R. 20	21	31	11.9	20.8	60.1	0.5	13,070
P.R. 22	10	35	3.3	22.4	74.3	0.4	14,930
P.R. 23	2	33	13.3	28.0	58.7	0.6	12,720

* taken from B.C. Dept. of Mines, Bulletin No. 36 - p. 28

ENCLOSURE 12

PINE PASS COAL CO. - BULK SAMPLE - SEAM 76

	TOP 8 FEET		BOTTOM 8 FEET		COMPOSIT
	As Rec'd %	Air Dried %	As Rec'd %	Air Dried %	AIR DRIED %
Moisture					
Total	5.4		4.7		
Inherent	0.71	0.74	0.64	0.67	0.70
Surface	4.70		4.10		
Ash	15.34	16.10	19.27	20.09	18.07
Volatile	19.73	20.70	17.37	18.11	19.30
Fixed Carbon	59.52	62.46	58.62	61.13	61.93
Sulpher	0.63	0.66	0.57	0.59	0.63
BTU/LB	12,721	13,348	12,202	12,724	13,024
F.S.I.	-	6 1/2	-	7	7

SINK FLOAT TEST AT 1.50 S.G.

	TOP 8 FEET	BOTTOM 8 FEET
Yield	72.28	79.75
Ash	5.30	4.60
Volatile	22.01	24.18
F.S.I.	8.00	8.00

DEPARTMENT OF MINES AND PETROLEUM RESOURCES

Coal Act (Sec. 19)

APPLICATION TO EXTEND TERM OF LICENCE

1. I, BOLTON AGNEW (Name) agent for SHELL CANADA RESOURCES LIMITED (Name)

400 - 4th Avenue S.W. (Address)
Calgary, Alberta T2P 0J4

400 - 4th Avenue S.W. (Address)
Calgary, Alberta T2P 0J4

Valid FMC No. 171929

hereby apply to the Minister to extend the term of Coal Licences No(s). 4476 to 4500 and 4503, Twenty-five licences covering 7,325 hectares in the Peace River Land District, Pine Pass Property for a further period of one year.

2. I have performed, or caused to be performed, during the period December 29, 1978 to December 21, 1979, work to the value of at least $ 37,719 on the location of coal licences as follows:

CATEGORY OF WORK	Licence No(s).	Apportioned Cost
Geological mapping	4494 to 4500 incl. and 4503	$24,099
Surveys: Geophysical		—
Geochemical		—
Other photogrammetric	4476 to 4500 and 4503	7,500
Road construction		—
Surface work	4494, 4495, 4497, 4498	6,120
Underground work		—
Drilling		—
Logging, sampling, and testing		—
Reclamation		—
Other work (specify)		—

3. I wish to apply $ 37,719 of this value of work on Coal Licence(s)*

4. I wish to pay cash in lieu of work in the amount of $ 17,219 on Coal Licence(s) No(s).

N/A 5. I wish to apply $ — of this value of work to claim a refund of cash in lieu of work in the amount of $ which was paid to extend the term of Coal Licence(s) No(s). from to , 19 . Mining Receipt No. for prior payment of cash in lieu of work *is attached* for adjustment.

6. The work performed on the location(s) is detailed in the attached report entitled Pine Pass Coal Property, Norman Creek Area

1979-12-21 (Date)

Land Supervisor (Signature and position)

* Applications to group licences may be filed to apportion costs on a maximum of 10 licences.

(FORMS TO BE SUBMITTED IN DUPLICATE)

FOR DEPARTMENTAL USE ONLY

Value of work reported $ Value of work applied on licences $

Value of work approved $ Value of credit remaining $

Work performed. Yes [X] No [ ]

The program of operations detailed hereunder was carried out during the period from December 29, 1978 to December 21, 19 79. Total costs are $ 37,719, an average of $ 5.20 per ~~acre~~ hectare (7,325 hectares)

GEOLOGICAL MAPPING Yes [X] No [ ] Cost $ 24,099

	Area (Access) hectares	Scale	Time
Reconnaissance	2,500	1:10,000	38 man-days
Detail: Surface			+ consultant
Underground			
Other (specify)			

GEOPHYSICAL OR GEOCHEMICAL SURVEYS Yes [ ] No [X] Cost $ -

Method Line miles

OTHER SURVEYS Yes [X] No [ ] Cost $ 7,500

Grid Topographic photogrammetric Other

ROAD CONSTRUCTION Yes [ ] No [X] Cost $ -

Length: On Licences Access (off licences)

SURFACE WORK Yes [ ] No [X] Cost $ 6,120

	Length	Licence Number(s)
Trenching	by hand, 10, approx. 80 m	4494, 4495, 4497, 4498
Seam tracing		
Crosscutting		
Other		

UNDERGROUND WORK Yes [ ] No [X] Cost $ -

Test adits: Number Average length Total footage

Other workings: Area Total footage

DRILLING Yes [ ] No [X] Cost $ -

	Hole Size	Number of Holes	Total Footage
Core: Diamond [ ] Wireline [ ]			
Rotary: Conventional [ ]			
Reverse circulation [ ]			
Other			

Contractor Where core stored

LOGGING, SAMPLING, AND TESTING (check) Yes [X] No [ ] Cost $ -

Lithology: Drill samples [ ] Core samples [ ] Bulk samples (Trench) [X] Will be reported in the subsequent term.

Logs: Gamma-Neutron [ ] Density [ ] Other [ ]

Testing: Prox. analysis [X] FSI [ ] Washability [ ]

Carbonization [ ] Petrographic [ ] Plasticity [ ] Other [ ]

OTHER WORK (specify details) Cost $ -

REPORTS:

Reclamation work (Permit No.) Detail of work*

Cost $ -

OPERATIONS:

Work was supervised by Eric Panchy Frank Hartonhegyi Position Geologist Senior Staff Geologist

Is this person a registered or licensed Professional Engineer in British Columbia? Yes [ ] No [X]

NOTE—Where the licensee intends to perform, during the extended term of his licence, work not set out in the plan of operations filed under section 15 (2) (c), a supplemental plan of operations is to be attached.

* If reclamation work reported in separate report give details of report identification.

VALUATION OF WORK: COST STATEMENT
(Sec. 27, B.C. Reg. 436/75)

ON-PROPERTY COSTS: For period from December 29, 1978 to December 21, 1979

1. OPERATOR'S FEES, SALARIES, AND WAGES:

	Average Number of Employees	Average Rate	Average Number of Days	Amount
Professional and technical	2	125	29	7,250
Machine operators and support				
Miners				
Other				

Total operator's costs $ 7,250

2. CONTRACTORS AND CONSULTANTS:

Name	Service	Contract Amount
P. Dyson Consulting & Holdings	Geol. Consulting	6,875

Total contractor and consultant costs $ 6,875

3. EQUIPMENT AND INSTRUMENTS USED: Owned X Rented

Type	Rented From	Amount
Geological field equipment	-	200

Total equipment and instrument rentals $ 200

4. FIELD CAMP COSTS:

		Amount
Food	in travel expenditures	-
Accommodation		1,450
Fuel	lubricant and vehicle service	1,000
Other		

Total field camp costs $ 2,450

5. SAMPLING, ANALYSIS, AND TESTING:

Service	Performed by	Amount
Will be reported		
in the subsequent term		

Totals, samplings, analysis, and testing $ -

6. SUPPLIES AND MATERIALS COSTS:

	Amount
Process supplies	
Operating and maintenance supplies	
Office and technical supplies	110
Other supplies and materials	

Total, supplies and materials $ 110

7. TRANSPORTATION COSTS (Ground transportation details):

Vehicles	Owner	Rental Rate	Amount
one four-whell drive	Rentrite	$1,500/month	1,700

Air support details:

Aircraft Type	Owner	Charter
Helicopter		
206-B	Maple Leaf Helicopters	2,895

Total transportation costs $ 4,595

8. RECLAMATION WORK:

$ -

9. TRAVEL EXPENDITURES (operator's costs only) including all meals in the field

Number of Personnel	Number of Trips	Amount
3	6	2,370

Total travel expenditures $ 2,370

Total costs $ 23,850

(Secs. 28 and 29, B.C. Reg. 436/75)

OFF-PROPERTY COSTS: Period from December 29, 1978 to December 21, 19 79

		Amount
(a)	Logistics and field support	$
(b)	Technical and feasibility studies photogrammetric mapping (topo) RM Hardy	7,500
	photogeology-Sproule	1,369
(c)	Preparation of reports	5,000
(d)	Supplies and services	
(e)	Mobilization and demobilization of equipment	
(f)	Travelling expenses (Itemize)	

Total $ 13,869

Supporting Cost Statements Attached

Amount

Total supporting costs $ -

SUMMARY

On-property costs $ 23,850

Off-property costs $ 13,869

Total costs $ 37,719

Statement of costs verified by

1979-12-21 (Date)

R Lacey for W. S. Kowalski (Signature and position)

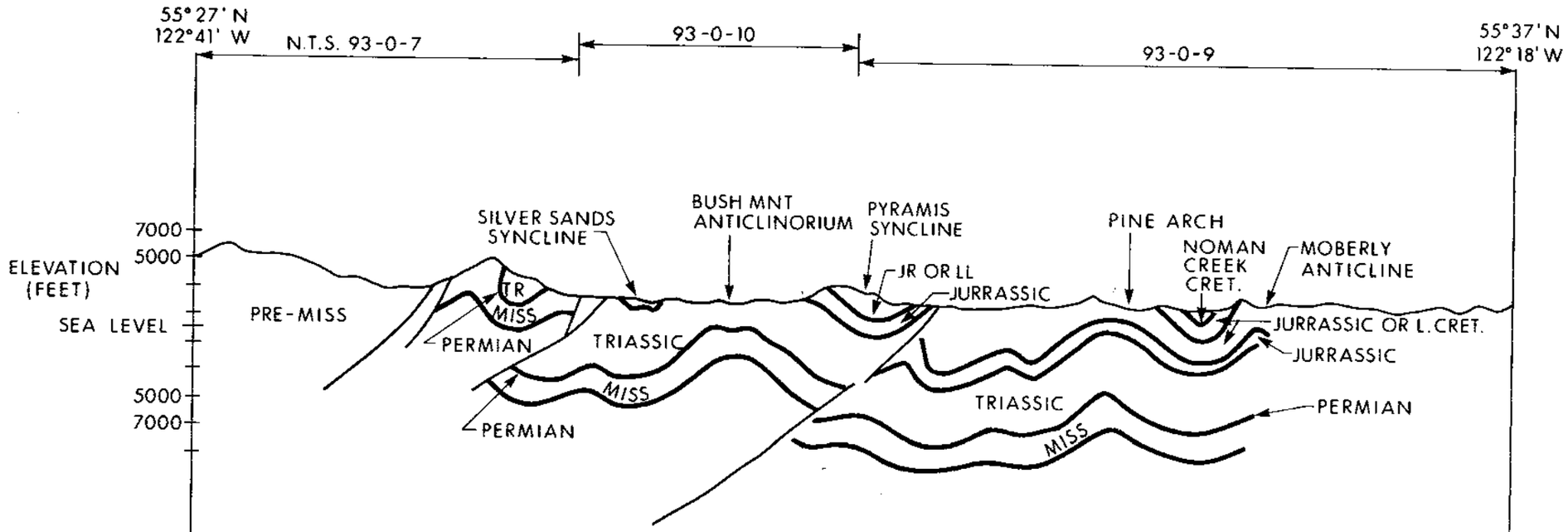
CHIEF ACCOUNTANT

2M-675-8196

PR- PINE PASS 79(2)A

CO 586
CO APS
CO OPEN FILE

586



586

PR-PINE PASS 79(2)A

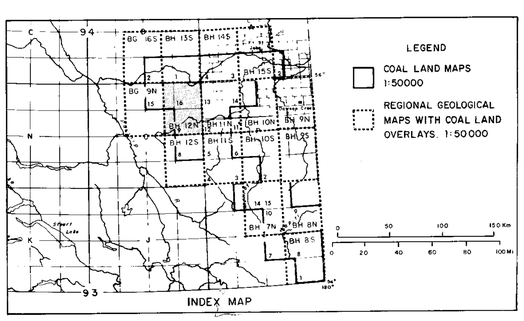
Crows Nest Resources Limited
EXPLORATION

PINE PASS
NE BRITISH COLUMBIA

REGIONAL STRUCTURAL CROSS SECTION

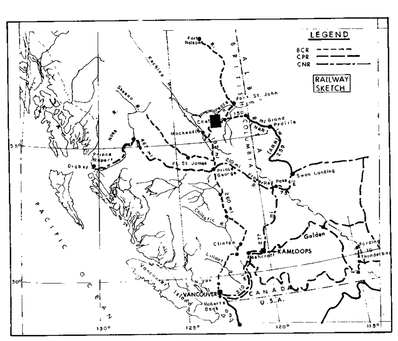
AUTHOR E. PANCHY	SCALE:	ENCLOSURE No. 7
DATE DEC 1979	REVISED	DRAWING No: HE-41B
To Accompany		

MAP BH-12n, FILE HF-19C



LEGEND

18. MASTER EXPLORATIONS LTD. (MANALTA COAL LTD.)
19. SHELL CANADA RESOURCES LIMITED – CROWS NEST RESOURCES LIMITED (OPERATOR)
22. DENISON COAL LTD. AND/OR DENISON MINES LTD.
23. BRAMEDA RESOURCES LTD.
23A. BRAMEDA RESOURCES LTD. OPTIONED TO RANGER OIL (CANADA) LIMITED (30% CARRIED INTEREST TO BRAMEDA RESOURCES LTD.) – MOUNT SPIEKER PROPERTY AND RANGER OIL (CANADA) LIMITED
23B. BRAMEDA RESOURCES LTD. – BURNT RIVER PROPERTY
24. BRAMEDA RESOURCES LTD. & TECK CORPORATION LTD.
25. MCINTYRE MINES LIMITED
25A. MCINTYRE MINES LIMITED & CANADIAN SUPERIOR EXPLORATION LIMITED OPTIONED TO PACIFIC PETROLEUMS LTD.
26. CINNABAR PEAK MINES LTD.
28. UTAH MINES LTD.
28B. UTAH MINES LTD. – BRI PROPERTY
29. BELCOURT COAL LIMITED (DENISON COAL LTD. 60%, GULF OIL CANADA LIMITED - 40%)
30. QUINTETTE COAL LIMITED (DENISON COAL LTD. - 38⅓%, WITH PARTNERS MITSUI MINING CO. – 22⅓%, TOKYO BOEKI LTD. – 22½%, AND IMPERIAL OIL LIMITED - 16 3/4%)
31. SAXON COAL LIMITED (DENISON COAL LTD. WITH PARTNERS RUHRKOHLE AG, MITSUI AND CO. LTD., UNION SIDERURGIQUE DU NORD ET DE L'EST SA DE LA FRANCE)
33. DENTHERM COAL LIMITED (DENISON COAL LTD.)
44A. BP EXPLORATION CANADA LIMITED
44B. BP EXPLORATION CANADA LIMITED (BP CANADA LIMITED AND BP CANADIAN HOLDINGS LTD.; GETHING COAL MEASURES, BRAMEDA RESOURCES LTD. GATES COAL MEASURES) – BULLMOOSE PROPERTY
44C. BP EXPLORATION CANADA LIMITED – CHAMBERLAIN PROPERTY
47. NORCEN ENERGY RESOURCES LTD.
49. GULF OIL CANADA LIMITED
53. DUPONT OF CANADA EXPLORATION LTD.
60. PAN OCEAN OIL LTD.
60A. PAN OCEAN OIL LTD. OPTIONED TO NORCEN ENERGY RESOURCES LTD.
69. PACIFIC PETROLEUMS LTD.
78. J.W. MACLEOD
80. IMPERIAL OIL LIMITED/ESSO RESOURCES LTD.
101. BP EXPLORATION LIMITED, BP CANADIAN HOLDINGS LTD., BRASCAN RESOURCES LIMITED (12½%), AND COALITION MINING LTD.
107. BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
107A. BRITISH COLUMBIA HYDRO AND POWER AUTHORITY & AYLARD, GETHING AND GREEN



Crows Nest Resources Limited
EXPLORATION

N.E. BRITISH COLUMBIA

REGIONAL GEOLOGICAL MAPS WITH COAL LAND OVERLAYS

BH-12N

SHELL CANADA PROJECTS
PINE PASS – DAMSITE

NTS 930/9 10E 15E 16

AUTHOR: MARTONHEGYI	SCALE: 1:50 000	ENCLOSURE No:
DATE: DEC 1979	REVISED:	DRAWING No: HF-19C
To Accompany		

Re- PINE PASS 79(2)A

586

6,171,000 N

6,170,000 N

6,169,000 N

6,168,000 N

6,167,000 N

6,166,000 N

6,165,000 N

6,164,000 N

6,163,000 N

6,162,000 N

6,161,000 N

NELSON

(MIDDLE BULLHEAD GROUP)

COAL 1.2m THICK

COAL 1m THICK

BASAL MOOSEBAR CONTACT

COAL BLOOM

COAL 0.20m THICK

COAL 0.15m THICK

COAL/SH 2.2m THICK

COAL 1.0m THICK

COAL 1.9m THICK

COAL 1.7m THICK

COAL 4.4m THICK

COAL 0.40m THICK

COAL 1.2m THICK

COAL 3.9m THICK

COAL 1.1m THICK

COAL 0.7m COAL/SH

COAL 3.4m THICK

COAL 1.2m THICK

COAL 1.0m THICK

COAL BLOOMS (2.4m)

COAL 2.7m THICK

COAL 2.0m THICK

COAL 1.2m THICK

COAL 1.0m THICK

COAL 4.2m THICK

COAL 3.0m THICK

COAL ? THICK

COAL 3.4m THICK

COAL 4.7m THICK

COAL 4.9m THICK

COAL 3.7m THICK

COAL 4.8m THICK

COAL 9.8m THICK

COAL 5.1m THICK

COAL BLOOM

COAL 6.4m THICK

COAL 3.9m THICK

COAL 3.72m THICK

COAL 5.11m THICK (ADIT SITE)

EASTERN FAULT

NOMAN CREEK FAULT

FISHER CREEK

CLEARLAND CREEK

CRUDE OIL PIPE LINE

NATURAL GAS PIPE LINE

PINE RIVER

L380

L382

L381

L384

TR1

TR2

TR5

TR7

TR8

TR9

TR10

Crows Nest Resources Limited

EXPLORATION

PINE PASS
NE BRITISH COLUMBIA

586

GEOLOGICAL MAP

Re- PINE PASS 79(2)A

AUTHOR: E. PANCHY	SCALE: 1:10 000	ENCLOSURE No:
DATE: DEC 1979	REVISED:	DRAWING No: HE-41F
To Accompany		

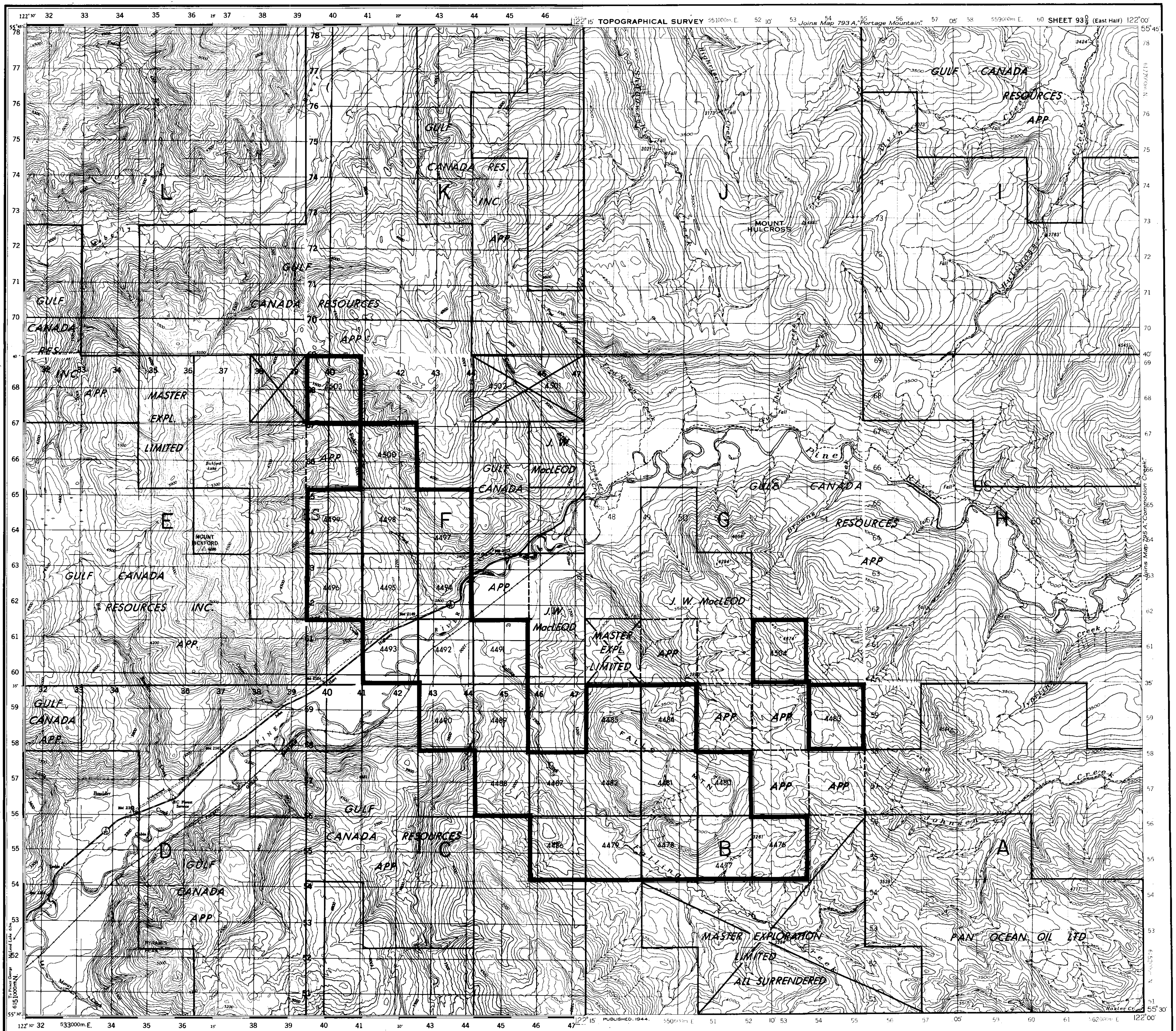
NATIONAL TOPOGRAPHIC SYSTEM 1:50,000

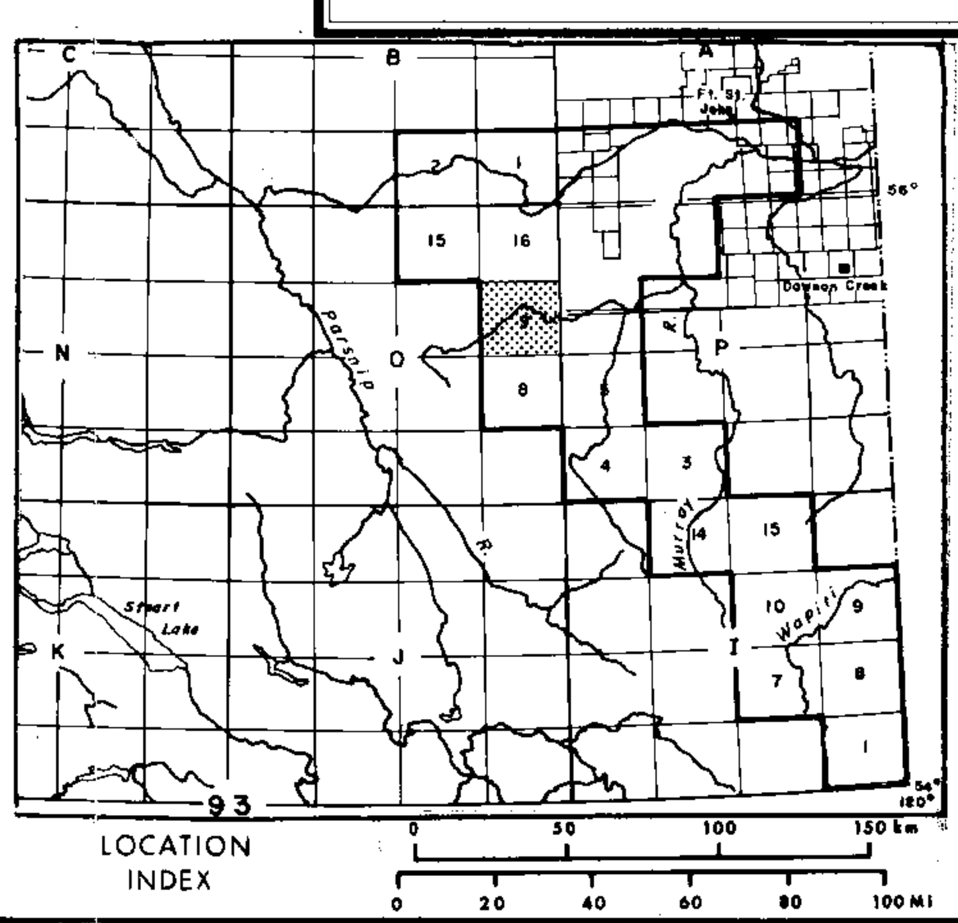
CANADA

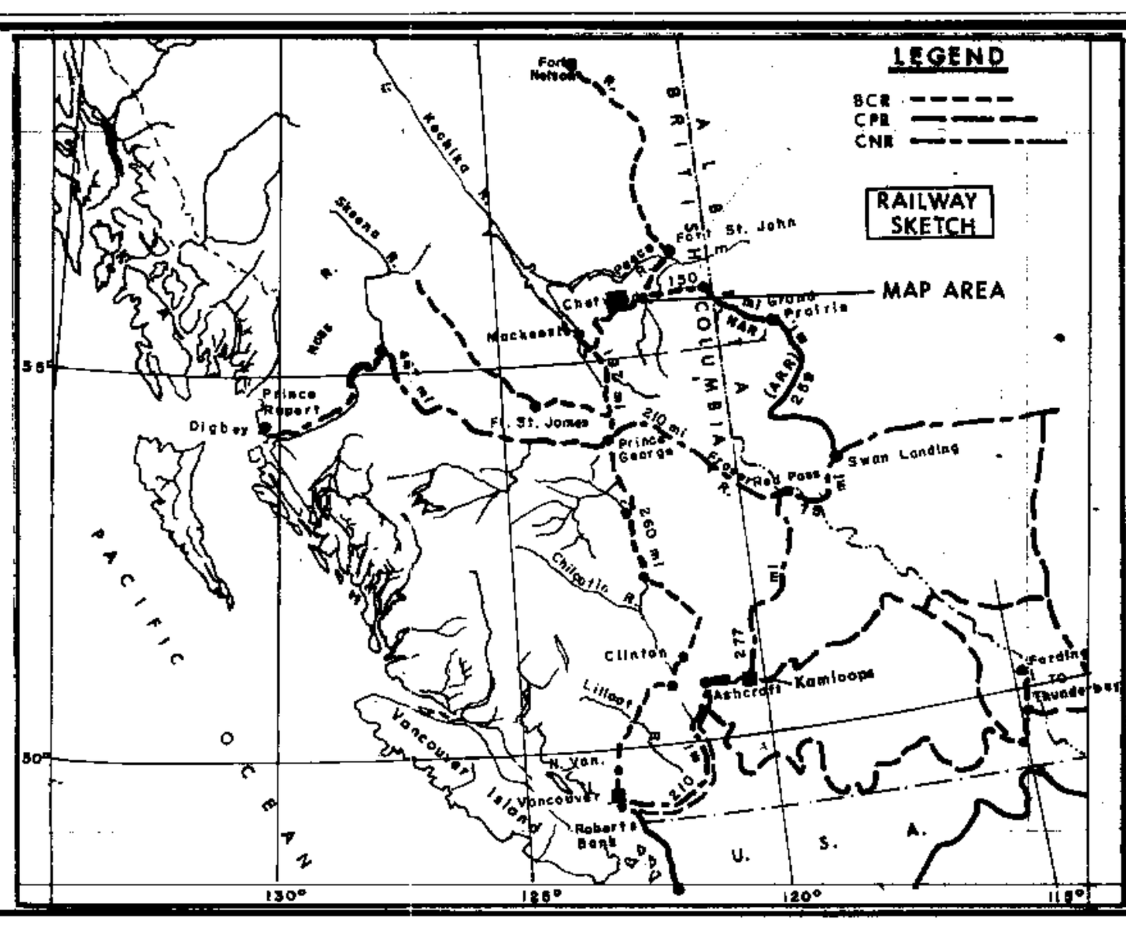
SECOND EDITION

DEPARTMENT OF MINES AND RESOURCES
MINES AND GEOLOGY BRANCH
BUREAU OF GEOLOGY AND TOPOGRAPHY

PROVISIONAL MAP



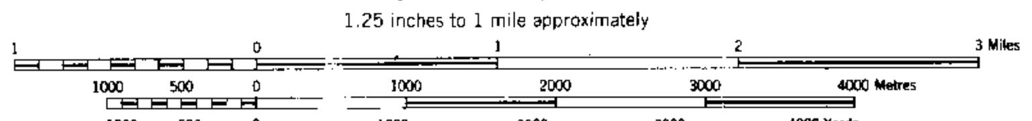




MOUNT HULCROSS

PEACE RIVER DISTRICT
BRITISH COLUMBIA

SCALE 1:50,000
1.25 inches to 1 mile approximately



Approximate magnetic declination, 29°32′ East.

Copies may be obtained from the Map Distribution Office, Department of Mines and Technical Surveys, Ottawa.

INDEX TO ADJOINING SHEETS

93 O/15 CARBON CREEK	93 O/16 PORTAGE MOUNTAIN	93 P/13 MOBERLY LAKE
93 O/10 CALLAZON CREEK	MOUNT HULCROSS	93 P/12 COMMOTION CREEK
93 O/7 AZOUZETTA LAKE	93 O/8 LE MORAY CREEK	93 P/5 BURNT RIVER

93 O/9 WEST

Crows Nest Resources Limited

EXPLORATION

MOUNT HULCROSS

NORTHEASTERN B.C.
PEACE RIVER LAND DISTRICT

586

COAL LAND DISPOSITION MAP

SHELL - CNRL. LICENCES : PINE PASS
NTS 93-0-9 BLK B,C,F,G
MAP 1 of 1

NTS 930/9

AUTHOR: OLSON-MARTONHEGYI	SCALE: 1:50 000	ENCLOSURE No:
DATE: FEB. 1979	REVISED: Dec. 1979	DRAWING No: HF-18B
To Accompany		

PR - PINE PASS 79(2)A.

Re: PINE PASS 79(2)A 586

STRATIGRAPHIC SECTION

DESIGNATION:

PART 1 OF 1

PROJECT: PINE PASS COAL PROPERTY

AUTHOR: E. PANCHY

DATE: 1979

AREA: NOMAN CREEK AREA

SOURCE OF DATA: McKECHNIE - 1955, FIELD MAPPING

LOCATION: REPRESENTATIVE SECTION

SCALE	CONTROL POINT	INTERVAL	LITHOLOGY	STRIKE & DIP	DESCRIPTION MAIN	DESCRIPTION AMPLIFIED	SAMPLE
(m)							
0							
10						- Overburden	
20						- Siltstone, dark grey	
30		Seam 60				- Shale, silty - Coal, depth and thickness varies from 0 to 1 meter, dull, dirty	
40						- Shale, carbonaceous	
50						- Shale, silty	
60						- Shale - Shale and Bone Coal	
70						- Sandstone, fine grained	
80						- Siltstone	
90						- Siltstone and Shale	
100							
110						- Siltstone	
120						- Sandstone, fine grained	
130						- Siltstone	
140						- Shale, carbonaceous	
150		Seam 78				- Coal, thickness 1 to 4 meters - Shale	
160							
170						- Siltstone	
180							
190							
200						- Shale, carbonaceous	
210		Seam 76				- Coal, thickness 4 to 6 meters - Siltstone, very fine grained	
220						- Siltstone	
230							
240		Seam 40				- Shale - Coal, thickness 0 to 1.5 meters - Shale, silty - Siltstone - Coal stringer	
250						- Shale - Siltstone - Coal stringer	
260						- Siltstone - Coal stringer - Siltstone	
270		Seam 39				- Coal, thickness 0 to 1.0 meter - Siltstone	
280							
290							