~~Bowser River, High Hat,~~
~~Rocky Creek, Trutch Gulf~~

PINE PASS (GULF CANADA)
(M. SUSKA)

Goodrich, Lossan, etc

93-0-8

CORRESPONDENCE
AND SUMMARIES

807

4.3 Geologic Structure of the Goodrich and Lossan Blocks:

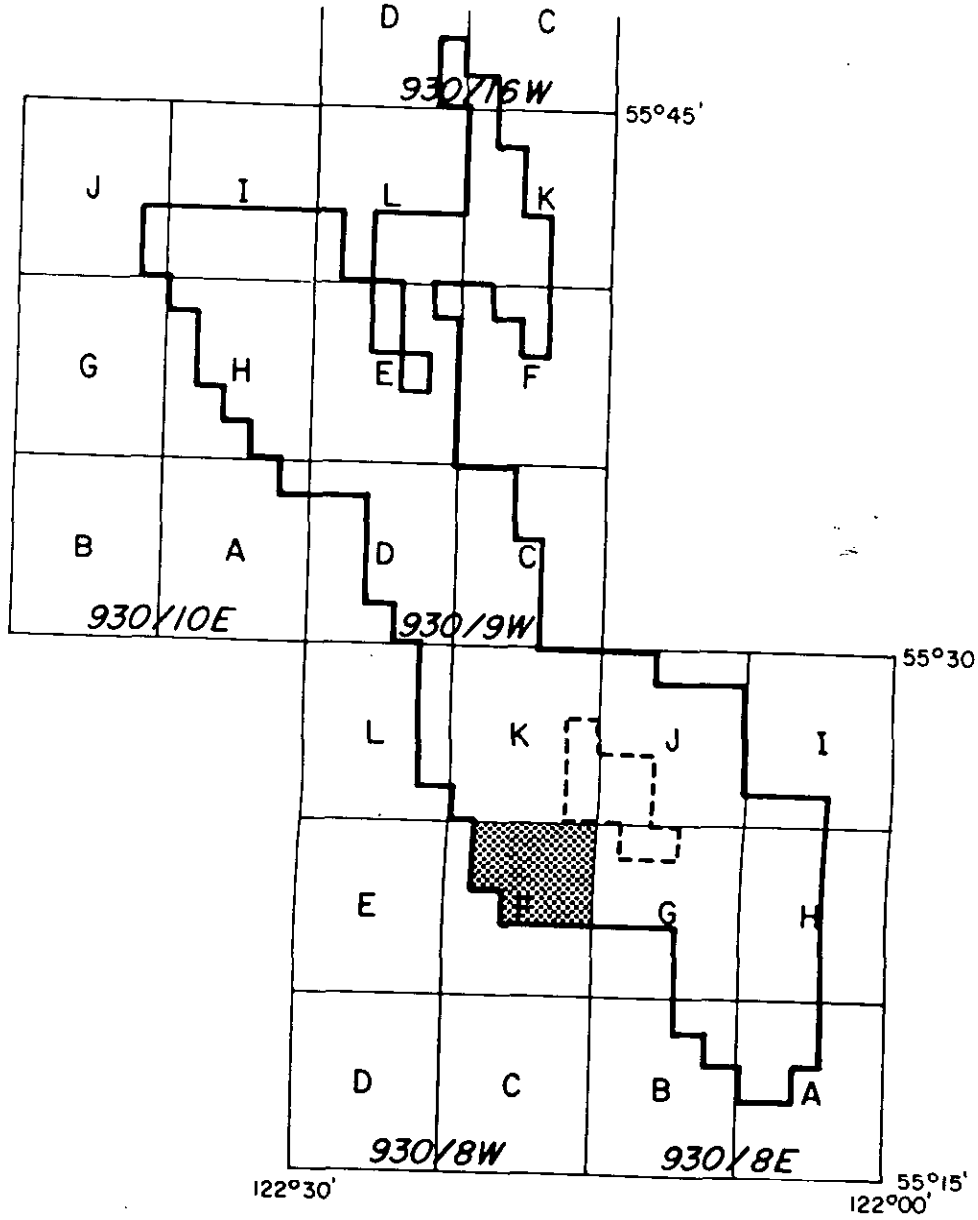
The geologic structure of the Goodrich and Lossan Blocks consists of a large northwesterly-trending synclinorium flanked on the east by a major anticline, and truncated to the west by a major thrust fault which dips steeply to the west. The axis of the synclinorium trends along the centre of these blocks to Pine Pass and beyond, as well as to Burnt River to the south. The plunge of the synclinorium is shallow at about 7^{o} in a southerly direction from Pine Pass to Brazion Creek. At Goodrich Peak, the plunge of the synclinorium is shallow in a northerly direction. The plunge steepens rapidly to about 30^{o} at Mt. Gilliland until the plunge reversal at Brazion Creek is encountered. Figure X is a cross-section illustrating the structure in the vicinity of Goodrich Peak.

Adjacent to the thrust fault to the west, the beds of the synclinorium dip very steeply, and are in fact overturned along most of the trend. The smaller-scale folds which are parasitic to the synclinorium within the Lossan Block are often strongly asymmetrical, usually including one very steeply dipping limb and very abrupt fold hinge regions. The pattern of the geological structure is interrupted in at least one locality near Brazion Creek where cross-trending folds and thrust faults are present.

The general pattern of the geological structure of the Goodrich and Lossan Blocks indicates that the strata in these areas have been subjected to a very intense level of tectonic deformation. Rotary and diamond core drilling to date, which has been concentrated in the Brazion Creek area of the Goodrich and Lossan Blocks, has located a deposit of coal which warrants a concentrated amount of exploration to determine its mineability. Consequently, the geolocial structure of that area is discussed in some detail below.

Drilling data and mapping traverses along the spur trending east from Mt. Gilliland and along the creeks and roads within the Lossan Block have improved the definition of the structure of this area. South of Brazion

SCALE : 1:10,000



GOODRICH

INDEX MAP

PR-Goodrich 80(2)A

GULF CANADA RESOURCES INC.

Coal Division

CALGARY ALBERTA

930/8W F

GOODRICH COAL PROJECT

Creek, a series of very tight chevron-style anticlines and synclines have disturbed the Gething Formation strata. The amplitude of these folds appears to be as great as 300 metres, and the half-wavelength is usually on the order of 400 metres. Similar structures are knows to exist within the central portion of the Lossan Block. A major cross-trending thrust fault is believed to follow Brazion Creek east of the Lossan Block, thus having a west-northwesterly trend in that area. In the vicinity of the Brazion Creek road, the trend of this structure turns to a northwesterly direction, to become coincident with the regional structural trend. This structure may be responsible for the extreme tectonic thickening of coal near the Brazion Creek road. A cross-section illustrating one interpretation of the geological structure along trhe Brazion Creek Road in this area is included as Figure XI. Geological Maps No. 930/8E/J and 930/8E/G, included in the map box further illustrate the structure of this area.

5.1 Stratigraphy of the North Moberly Block:

The North Moberly Block is part of the northern extension of Gulf Canada's coal licences, located between the Pine and Moberly Rivers.

These licences cover coal-bearing strata of the Gething Formation and Minnes Group, which form the northern extension of the regional geological trend of the Goodrich Block. The location of the North Moberly Block is shown on Figure XII.

Geological mapping and hand trenching were carried out on the North Moberly Block during 1980. Three diamond drill holes were drilled in the North Moberly Block during Phase II, and the information from these holes is contained in Appendix C. The geology of this block is described in the following section of this report.

8.1 Coal Quality:

Coal core samples from 18 diamond drill holes were shipped to Loring Laboratories in Calgary, for analysis. Results of the raw analysis are shown on the coal seam data sheets in Appendix C.

8.1.1 Goodrich Lossan Block

These blocks contain the majority of the diamond drill holes, fifteen in total. The holes are concentrated in the central portions of these blocks.

Drill hole 80-33 attained the greatest depth, sampling coal to a depth of 370 metres. A considerable variety of coal quality is indicated by these drill holes.

The metallurgical coals range from medium volatile to high volatile bituminous, with generally good F.S.I.s, ranging from 4.5 to 9. The low F.S.I.s are likely indicative of higher ash in the sample rather than poor coking characteristics. The sulphur content of the metallurgical coal indicates the presence of two distinct domains. There is a high sulphur zone, ranging from 2% to 0.8%, mainly associated with the medium volatile coal. The high volatile metallurgical coals show a much reduced sulphur content, in the 0.6% to 0.2% range.

The thermal coals range from low volatile to medium volatile bituminous. Heat values range from 14 800 to 15 600 BTU/lb. Sulphur content is generally low, ranging from 0.2% to 0.4%, with the occasional high value of up to 0.9%.

The ash in both the metallurgical and thermal coals is generally low, except where rock bands are included in the samples. Inherent ash ranges from a low of 3.9% to about 16%. Values higher than 16% include rock partings in the samples.

8.1.2 North Moberly Block

Two holes, 80-31 and 80-35 are located within this block. Hole 80-35 intersected one relatively shallow seam at a depth of 66.7 to 67.6 metres. This sample was determined to be low volatile, bituminous thermal coal with a calorific value of approximately 15 500 BTU/lb. The sulphur content is approximately 0.65% and ash content at 2.9% is very low.

The second hole, 80-31, intersected several coal seams with the lowermost lying at a depth of about 30 metres. The samples were analysed as medium volatile, bituminous metallurgical coals near the top of the hole. F.S.I.s range from 4 to 9 and the sulphur ranges from 0.77 to 1.05 percent.

The lower seams were low volatile, bituminous thermal coals with calorific values up to approximately 15 500 BTU/lb. Sulphur in these coals ranged from 0.46 to 0.79 percent.

Ash was low in both the metallurgical and thermal coals, ranging from about 5 to 25 percent. The higher value likely indicates an inclusion of rock partings in the sample rather than reflecting the inherent ash of the coal sample.

8.1.3 Coal Quality of East Moberly Block

The Crassier coals are medium to low volatile bituminous, of low ash and sulphur, and high calorific value - ideal steam coals for the most part.

Records of the Coal Investigation do not specify coking characteristics of coals from the Cleveland, Narod, and Noman localities. For the Willow area on the same trend of the Pine River anticline south of the Pine River, Gething coals are reported to range from good, moderate, to poor coking, and a minority agglomerating to non-coking (McKechnie 1955).

The results of coking tests on No. 76 Seam from the Noman locality are not available (B.C. Dept. Mines, 1958,9: Pine Pass Coal Company, and Brameda 1968,9): the coal was said to qualify for metallurgical use.

8.1.4 Whiterabbit Block

Only one drill hole, 80-32, is located within this block. Core recovery in this hole is poor, amounting to about 7% of the coal intersection. The analysis indicates the coal to be medium volatile bituminous metallurgical coal with an F.S.I. of 8.5. The sulphur at 0.7% is relatively high and ash at 13.04% is at a low to medium range.

8.1 Coal Quality:

Coal core samples from 18 diamond drill holes were shipped to Loring Laboratories in Calgary, for analysis. Results of the raw analysis are shown on the coal seam data sheets in Appendix C.

8.1.1 Goodrich Lossan Block

These blocks contain the majority of the diamond drill holes, fifteen in total. The holes are concentrated in the central portions of these blocks.

Drill hole 80-33 attained the greatest depth, sampling coal to a depth of 370 metres. A considerable variety of coal quality is indicated by these drill holes.

The metallurgical coals range from medium volatile to high volatile bituminous, with generally good F.S.I.s, ranging from 4.5 to 9. The low F.S.I.s are likely indicative of higher ash in the sample rather than poor coking characteristics. The sulphur content of the metallurgical coal indicates the presence of two distinct domains. There is a high sulphur zone, ranging from 2% to 0.8%, mainly associated with the medium volatile coal. The high volatile metallurgical coals show a much reduced sulphur content, in the 0.6% to 0.2% range.

The thermal coals range from low volatile to medium volatile bituminous. Heat values range from 14 800 to 15 600 BTU/lb. Sulphur content is generally low, ranging from 0.2% to 0.4%, with the occasional high value of up to 0.9%.

The ash in both the metallurgical and thermal coals is generally low, except where rock bands are included in the samples. Inherent ash ranges from a low of 3.9% to about 16%. Values higher than 16% include rock partings in the samples.

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22. I 85

Att^n Mr. R. OCKERT

Please find enclosed

Xerox copies +
logs with a list.

Kind regards

M. Suska.

TABLE 1.1.1

MINING QUANTITY SUMMARY SEAMI ONLY

Production Period	south of Line 6000N only: 3.0 Million Tonnes/Yr Raw Coal t x 10^3	Waste B.C.M. x 10^3	Strip Ratio	south of Line 3000 N only: 1.0 Million Tonnes/Yr Raw Coal t x 10^3	Waste B.C.M. x 10^3	Strip Ratio
Preprod		3 500	N.A.		1 000	N.A.
Yr 1	3 972	20 520	5.17	1 325	6 045	4.56
Yr 2	4 013	25 788	6.43	1 325	8 141	6.14
Yr 3	3 980	33 079	8.31	1 325	8 139	6.14
Yr 4	3 952	38 686	9.79	1 325	8 867	6.69
Yr 5	3 985	46 377	11.64	1 325	9 209	6.95
Yrs 6-10	19 872	288 057	14.50	6 625	51 561	7.78
Yrs 11-15	19 871	247 349	12.45	6 625	75 350	11.37
Yrs 16-20	19 838	110 306	5.56	6 625	71 042	10.72
Total	**79 483**	**813 662**	**10.24**	**26 500**	**239 354**	**9.03**

Please:
See note 3-30
page 3-5.

TABLE C-1 (continued)
GOODRICH COAL PROJECT
COAL SEAM MINING SECTIONS FROM
1980 & 1981 DIAMOND DRILLHOLES

Section	DDH	Seam	Drilled Interval (m)	BCA (avg.)	Coal/Coal & Rock (m) True Thickness	REC %	Proximate Sample I.D. #	Composite Sample I.D. #
N0000	80-22 (Vert.)	**	35.60 - 39.33	12.07	0.78 / 0.78	72	00426-00427	6
		**	169.51 - 170.99	30.00	0.53 / 0.74	53	00430	
		**	174.25 - 175.57	36.76	0.64 / 0.79	66	00431-00434	
		**	303.99 - 305.49	34.06	0.72 / 0.84	84	00441-00442	7
		**	318.17 - 320.10	35.84	1.05 / 1.13	84	00443-00444	8
		**	348.22 - 349.89	35.93	0.86 / 0.98	71	00445-00448	9
		**	358.05 - 359.61	30.43	0.69 / 0.79	42	00449-00451	
N3250	80-23 (Vert.)	2	90.90 - 93.49	27.35	1.19 / 1.19	29	00503-00504	
N6250	80-24 (Vert.)	**	12.13 - 14.57	49.67	1.53 / 1.86	37	00472-00474	
		3	119.86 - 121.64	60.55	1.36 / 1.55	50	00478-00480	
		**	217.74 - 218.90	51.40	0.79 / 0.91	70	00487-00489	
N6500	80-25 (55°SW)	2	48.47 - 49.72	59.17	1.00 / 1.07	78	00552	
		5	187.47 - 193.53	42.84	3.74 / 4.12	53	00556-00560	
		6	231.44 - 233.45	42.50	1.03 / 1.36	65	00561-00563	
		6	239.82 - 241.08	30.47	0.64 / 0.64	13	00587	
N1500	80-26 (Vert.)	2	54.02 - 55.29	38.68	0.79 / 0.80	81	00576	
		3	125.07 - 126.13	55.00	0.87 / 0.87			
		4	152.66 - 153.49	53.98	0.67 / 0.67	51	00578	
N1500	80-27 (Vert.)	3	178.70 - 182.22	18.00	1.09 / 1.09	76	00584	10

TABLE (continued)

GOODRIDGE COAL PROJECT

COAL SEAM MINING SECTIONS FROM

1980 & 1981 DIAMOND DRILLHOLES

Section	DDH	Seam	Drilled Interval (m)	BCA (avg.)	Coal/Coal & Rock (m) True Thickness	REC %	Proximate Sample I.D. #	Composite Sample I.D. #
N9000	80-40 (Vert.)	?3?	27.78 - 29.57	58.73	1.02/1.53	87	00709-00711	
		**	39.25 - 40.85	46.99	0.96 / 1.17	49	00714-00715	
		**	281.58 - 283.90	54.13	1.66 / 1.88	20	00721-00723	
		**	290.32 - 291.79	58.25	1.16 / 1.25	93	00724	
		**	329.92 - 333.13	61.09	1.79 / 2.81	79	00729-00733	
N7500	80-41 (Vert.)	2	73.27 - 75.25	34.80	0.77 / 1.13	50	00760-00761	
		5	188.81 - 192.82	16.96	1.17 / 1.17	26	00762	
		5	199.92 - 218.46	17.58	4.90 / 5.60	77	00763-00766	
					6.77			
N4250	80-42	1	53.75 - 66.89	26.49	4.91 / 5.86	45	00768-00778	
		3	167.76 - 170.52	72.34	1.93 / 2.63	51	00779-00782	
N0500	80-43 (Vert.)	5	138.31 - 139.54	36.99	0.74 / 0.74	00	-	
		**	198.26 - 200.10	39.00	1.16 / 1.16	00	-	
		**	257.98 - 259.91	32.25	1.03 / 1.03	00	-	
		**	274.19 - 277.33	36.55	1.87 / 1.87	31	00735	
		**	307.94 - 310.29	32.71	1.08 / 1.27	19	00734	
GDR East	80-44 (Vert.)	BGS	28.50 - 31.29	71.13	2.64 / 2.64	64	00751	
		**	34.55 - 35.20	69.79	0.61 / 0.61	100	00753	
		**	85.23 - 86.40	66.50	0.75 / 1.07	63	-	
N3250	81-01 (63°NE)	1	323.25 - 329.44	69.29	5.17 / 5.79	89	00001 - 00007	01, 02
		1	333.64 - 338.88	73.34	3.63 / 5.02	97	00008-00012	03,04
					10.81			
N4250	81-02 (Vert.)	1	305.52 - 319.51	56.01	8.59 / 11.60	90	00038-00047	05,06
		1	323.00 - 327.03	56.10	2.82 / 3.32	62	00049-00050	07
		1	328.71 - 330.07	28.55	0.54 / 0.65		00052	
					15.57			
					11.41 / 14.92			

TABLE C-1 (continued)
GOODW[illegible]H COAL PROJECT
COAL SEAM MINING SECTIONS FROM
1980 & 1981 DIAMOND DRILLHOLES

Section	DDH	Seam	Drilled Interval (m)	BCA (avg.)	Coal/Coal & Rock (m) True Thickness	REC %	Proximate Sample I.D. #	Composite Sample I.D. #
N3250	81-03 (Vert.)	1	426.25 - 438.61	71.63	10.94 / 11.73	99	00028-00036	08, 09
N3250	81-04 (Vert.)		No Mining Section					
N3250	81-05 (64°NE)	1	166.50 - 177.22	54.34	7.33 / 8.71	76	00083-00087	10, 11, 12
		3	305.08 - 306.33	57.00	0.71 / 1.05	20	-	
		6	378.90 - 382.79	27.07	1.49 / 1.77	75	00088-00090	13
N4250	81-06 (Vert.)	1	186.99 - 192.19	28.61	2.22 / 2.49	87	00093-00095	14
		1	193.39 - 199.99	25.29	2.72 / 2.82	69	00097-00100	15
		1	201.95 - 206.08	36.21	2.25 / 2.44	98	00102	16
					7.75			
		2	244.16 - 245.51	45.93	0.87 / 0.97	71	00104-00105	
		2	251.55 - 252.95	42.18	0.91 / 0.94	77	00107	
		2	274.23 - 275.68	32.08	0.77 / 0.77	84	00111	
GDR Central	81-07 (Vert.)	**	185.62 - 190.30	27.07	2.02 / 2.13	67	00091	17
		**	195.96 - 197.50	45.00	1.09 / 1.09	56	-	
		**	212.92 - 215.26	39.00	0.91 / 1.47	46	-	
N4250	81-08 (70°NE)	**	163.97 - 166.17	80.53	2.17 / 2.17	100	00117	
GDR Central	81-09 (63°SW)	**	52.79 - 55.22	54.57	1.98 / 1.98	20		
		**	128.31 - 130.74	37.82	1.49 / 1.49	38		
N5500	81-10 (Vert.)	1	121.00 - 122.76	50.60	1.03 / 1.36	96	00114	18
		1	126.00 - 129.37	51.57	2.43 / 2.64	25	00115	
					4.00			
		2	188.19 - 189.35	37.74	0.69 / 0.71	94	00116	

TABLE C-1 (continued)
GOODRICH COAL PROJECT
COAL SEAM MINING SECTIONS FROM
1980 & 1981 DIAMOND DRILLHOLES

Section	DDH	Seam	Drilled Interval (m)	BCA (avg.)	Coal/Coal & Rock (m) True Thickness	REC %	Proximate Sample I.D. #	Composite Sample I.D. #
N8000	81-11 (Vert.)	2	35.65 - 37.85	40.89	1.21 / 1.44	24	00118	
		2	44.05 - 46.90	24.02	1.04 / 1.16	58	00119-00121	19
		2	69.30 - 70.52	42.50	0.64 / 0.82	63	-	
		5	186.87 - 188.67	40.96	1.12 / 1.18	80	00122	20
		**	310.61 - 313.39	49.06	2.10 / 2.10	100	00123	
Moberly	81-12 (Vert.)	**	9.79 - 12.79	87.32	2.62 / 3.00	70	00124-00126	21
		?**	50.58 - 52.33	76.00	1.70 / 1.70	93	-	
N5250	81-13 (65°NE)	?1	50.19 - 51.34	54.82	0.66 / 0.94	73		
		1	54.41 - 56.18	57.94	1.11 / 1.50 / 2.44	45		
		2	118.55 - 120.01	66.61	1.20 / 1.34	80		
N4250	81-14 (Vert.)	3	91.20 - 94.60	26.56	0.99 / 1.52	47	00131-00132	
		5	208.20 - 210.50	38.13.	1.19 / 1.42	80	00133-00135	22
N7500	81-15 (65°NE)	2	14.93 - 16.97	69.44	1.59 / 1.91	76	00130	24
		5	90.65 - 91.47	85.00	0.65 / 0.82	100		
		5	93.68 - 97.83	85.00	3.82 / 4.13	86	00127-00129	23
		6	125.70 - 128.02	82.00	1.45 / 2.30	100	-	
		6	132.94 - 134.09	83	0.81 / 1.14	92	-	
N5750	81-16 (Vert.)	2	137.98 - 139.33	45.93	0.92 / 0.97	81	00150	25
		?3 (These are Lower Seams)	209.05 - 210.42	61.15	0.89 / 1.20	60	00151-000153	
	? X	?5	254.98 - 255.95	68.10	0.90 / 0.90	51	00154	
N6500	81-17 (Vert.)	?1	134.22 - 135.70	50.38	0.87 / 1.14	27	00141	
		2	214.57 - 215.28	44.77	0.50 / 0.50	72	00142	
		5	312.76 - 316.96	55.47	2.80 / 3.46	55	00144-00146	26
		6	348.88 - 350.70	52.03	1.27 / 1.49	95	00147-00149	27

× The character of these seams (high-FSI, thickness, etc.) correlates these seams with lower Bethlehem (or "Dresser") seams present north of [illegible]

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Attn MR OCKERT.

16. April 85

Dear Mr. Ockert,
Please find brief comments on my review of some of the Gulf drilling data (after our meeting).

Regards to you.

Madeleine Suska

Also mailed:
Copies to John Horgan.

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Consulting Geologist
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Calgary, Alberta, Canada T2S 2K2

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Cable: Suska, Calgary

16. April 85

Dear Mr. Horgan,
Please find enclosed comments — as discussed on the telephone.

Best Regards to you.
M. Suska

P.S.
Copies also sent to G. Ockert.
M.S.

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LOSSAN MINE AREA

COMMENTS ON COAL RESERVES NORTH OF SECTION 5000:

Following discussions with Esso Resources, drillhole data in Lossan area north of Section N5000 were reviewed by the writer. The conclusions are given below:

Seam correlations in the area and the structural interpretations in the Gulf Report are hypothetical. Correlations are uncertain due to scarce drillhole control and lack of continuous markers. (The Bluesky sandstone was not penetrated anywhere north of section 5500). Possibilities of thrust-faulting, minor faulting and other structural complications are present and could result in repetition of seams and/or the occurrence of older seams close to the surface. Depositional-erosional factors at the top of and within the Gething formation itself may complicate correlations.

LOSSAN SEAM No. 1:

North of section N5500 correlations of Seam No. 1 in the Gulf Report appear speculative:

The northernmost drillhole No. 81-10 which penetrated Seam No. 1 lies along N5500. The seam is 4 meters thick (true thickness).

The next drillhole to the south No. 81-13 penetrated the Number 1 Seam along N5250. The seam is 2.44m thick.

North of these drillholes Seam Number 1 was not penetrated at all. According to Gulf geological map, all drillholes further north were drilled on flanks of synclines and did not penetrate either Moosebar formation or Bluesky sandstone, nor Seam Number 1.

Thus, the northernmost true thickness of Seam Number 1 is 4 m (at 81-10).

(At the drillhole 81-16 along N5750 correlations are uncertain. The top of the Bluesky is projected - it is probable that Seam Number 1 is eroded off - or that one is dealing with a lower section of the Gething formation due to faulting.)

LOSSAN SEAM NO. 5

The seam designated as No. 5 in one part of Gulf's Report is referred to as No. 3 in another part of the same report (both 1982), The correlations in the area north of section N5500 appear speculative due to lack of reference markers. At some locations the seam designated as No. 5 resembles Seam No. 1 in character (see Drillholes 80-21 and 80-25).

Following is a list of drill-holes which penetrated Seam No. 5 in Lossan mine area.

	Section	DDH	Drilled Coal Interval m	Coal/Interval True Thickness m	Ash %	Vol/M %	FSI
*	8000	81-11	2.3	1.42	12.68	23.86	8.5
	8000	80-37	3.3	1.82	9.24	20.54	7.0
*	7500	80-41	18.5	6.77	(2.3 to (10.7	(19.5 to (24.6	(0.5 to (7)
					(see Log enclosed)		
*	7500	80-21	6.6	5.14	(3.2 to (12.6	(19.9 to (26.6	(0-1.5)
					(see Log enclosed)		
*	6500	80-25	6.6	4.12	(4.7 to (11.3	(20.4 to (23.9	(1.5 to (6.3
					(see log enclosed)		
	6500	80-18	4.45	3.30	13.8 3.74	17.9 19.16	2 0
					(correlations uncertain)		
	5750	80-39	2.6	1.89	4.9 5.4 3.4	20.42 22.03 19.6	1 3.5 1.0
					(correlations uncertain)		
	4250	81-14	2.3	1.42	3.87 15.67	26.20 21.81	8.5 6.5

* Photocopy enclosed

LOSSAN SEAM NO. 5 - VOLATILE MATTER VALUES

The results of proximate analyses of Seam designated as No. 5 (by Gulf) are indicated above and/or included as photocopies. The results suggest generally, a medium volatile coal. Discrepancies between values suggest that one may be dealing with different seams. The average figure of 21% of Volatile Matter for Seam No. 5 suggested by Gulf is not justified.

High Volatile values of the major part of Seam designated as No. 5 at drillhole 80-21 and drillhole 80-25 are particularly encouraging: True coal thicknesses there are 5.14 m and 4.1 m respectively and Volatile Matter percent for the major part of each of these intervals are 22.44 and 23.9 respectively.

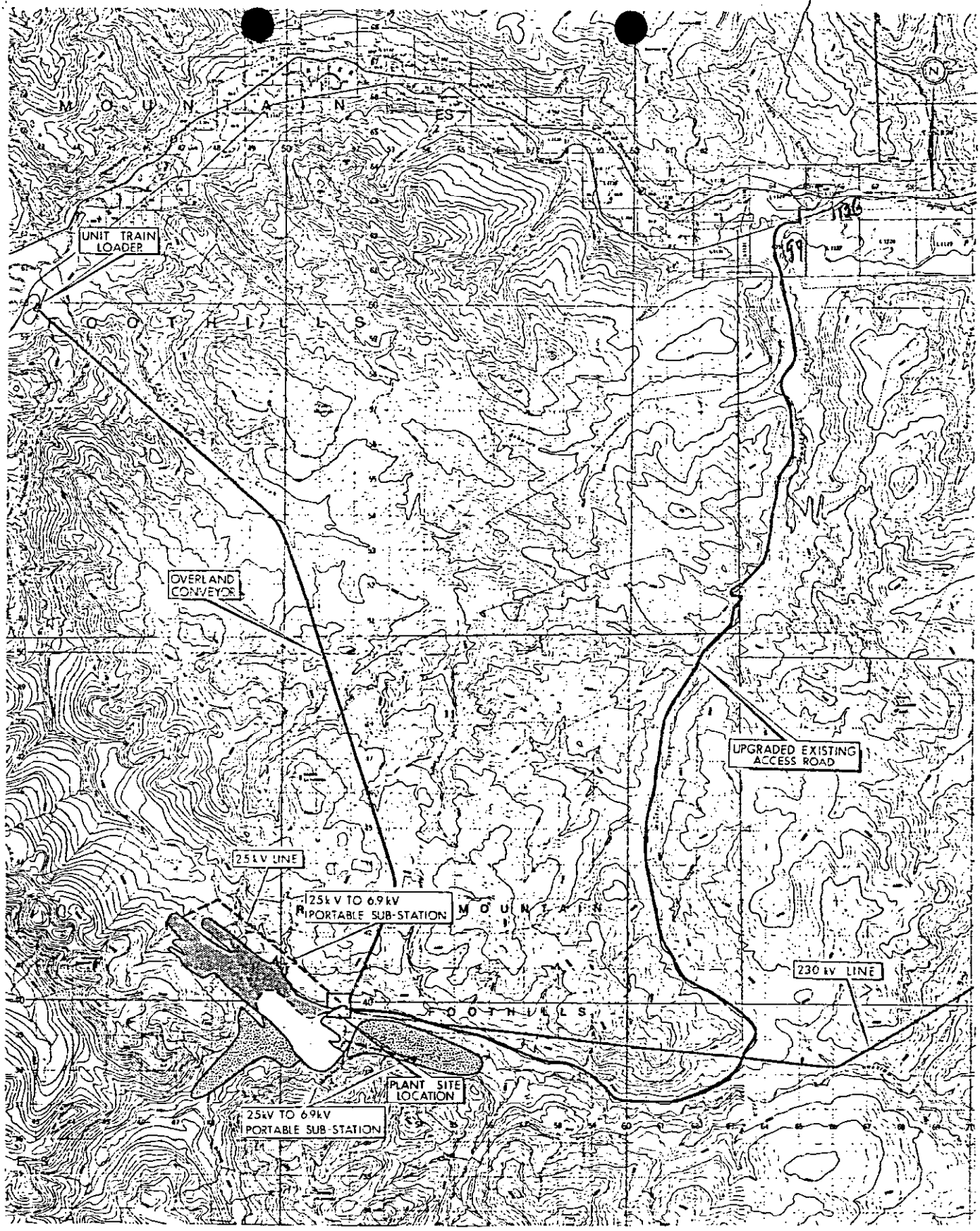
Additional Lossan No. 1 Seam Reserves:

Axis Pit: Between Section N. 2750 and N. 3100, and south of section N.2250 it is doubtful that the overburden in this area is as thick consistently as shown on NorWest cross-sections.

North of N. 5000: although Seam No. 1 is thinner in this area according to Gulf corolations, the reserves are present at shallow depth. Please observe an Eastern syncline trending north/northwest between section N. 6500 and N.8000.

Additional Lossan No. 5 Seam Reserves:

North of N. 5000: the reserves of Seam No. 5 are considerable at shallow depth. According to Gulf the seam is between 3 and 5 meters thick and very clean.



LEGEND

- COAL CONVEYOR
- ROAD ACCESS
- POWER LINE
- MINE POWER DISTRIBUTION
- CREEK DIVERSION
- 1 MILLION TONNES/YEAR PIT
- 3 MILLION TONNES/YEAR PIT
- WASTE DUMPS

ORIGINAL SCALE 1:50,000

MILES
METRES

2-3

GULF CANADA RESOURCES INC.
CALGARY ALBERTA

GOODRICH COAL PROJECT

GENERAL ARRANGEMENT
SITE AND FACILITIES

NOVATEST

COAL SEAM DATA SHEET

GULF CANADA RESOURCES INC.
COAL DIVISION

SEH - #5 : 23.15 — 33.33 m

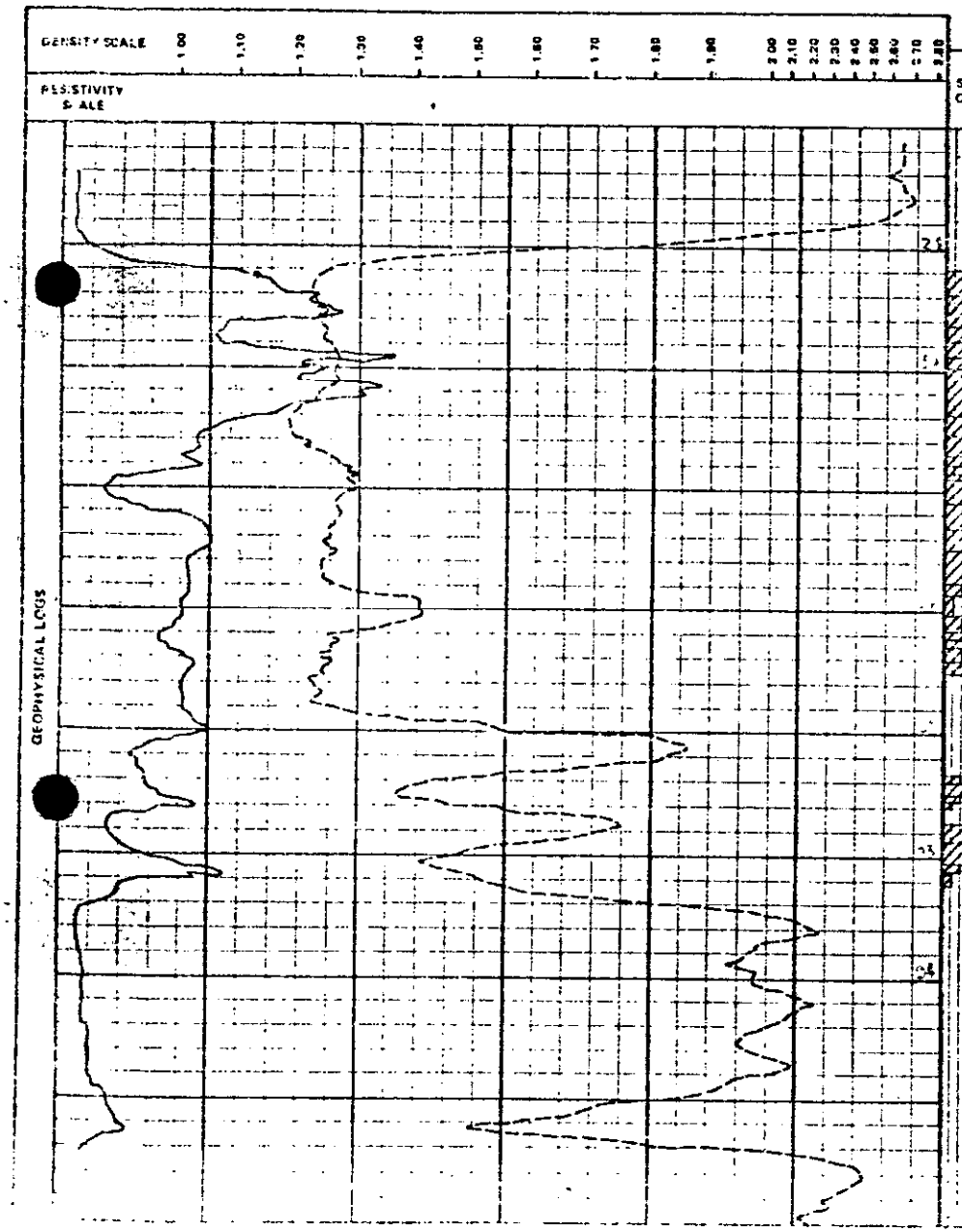
80-21

DENSITY ——— RESISTIVITY ———

APPARENT THICKNESS

DRILL NO. GDR-80H-80-21 SEAM _____ SEAM INTERVAL 27.98 - 33.33 m.

SCALE 1:40



SEAM COMP	DEPTH	COAL SEAM TOC	INTERVAL ROCK	INTERVAL COAL	% REC.	SAMPLE NUMBER	SAMPLE COMPOS	PROXIMATE ANALYSIS AL. ST	ASH	VM	FC	S	BTU	FSI
	27.98			(0.17)										
				2.73		00456		.55	3.17	22.14	74.14	.16	14,767	1.5
	30.88													
	31.04			0.16		00457		.43	12.58	26.58	60.41	.35	12,574	0
				0.51										
				(0.47)		00458		.57	3.49	19.93	76.01	.38	14,698	.5
	32.02													
	32.19		(0.17)	(0.21)		00459		.79	67.83	11.12	20.26	.44	4,151	.5
				0.29		00460		.53	17.85	21.66	59.94	.41	12,179	4.5
	32.66													
	32.81		0.15			00461		.73	72.54	10.12	16.61	.15	2,995	0
			0.02	0.51		00462		.63	24.39	21.79	53.19	.43	11,389	7
	33.33													

SEAM #5: 187.47 – 193.53 m

COAL SEAM DATA SHEET

GULF CANADA RESOURCES INC.
COAL DIVISION

DENSITY ——— RESISTIVITY ———

DRILL NO. GDR-DDH-80-25 SEAM _____ SEAM INTERVAL APPARENT THICKNESS 187.47 - 193.53 m

SCALE 1:40

DENSITY SCALE 1.00 1.10 1.20 1.30 1.40 1.50 1.60 1.70 1.80 1.90 2.00 2.10 2.20 2.30 2.40 2.50 2.60 2.70 2.80

RESISTIVITY SCALE

PHYSICAL LOGS

SEAM COMP.	DEPTH	COAL SEAM LOG	INTERVAL ROCK	INTERVAL COAL	% REC.	SAMPLE NUMBER	SAMPLE COMPOS.	PROXIMATE ANALYSIS MOIST	ASH	VM	FC	S	BTU	FSI
	187.47			1.68 (2.08)		E 00556		0.69	4.70	23.89	70.72	0.53	14,172	4
	191.23		0.06 (0.29)			F 00557		1.09	79.06	9.80	10.75	0.03	2,174	0
	191.58			1.35 (0.34)		G 00558		0.66	11.29	20.43	67.82	0.34	13,479	1.5
	192.77		0.11 (0.10)			H 00559		0.88	87.12	7.60	4.40	0.09	1,087	0
	192.98			0.50 (0.05)		I 00560		0.69	5.82	23.90	69.59	0.46	14,271	6.5
	193.53													

GULF CANADA RESOURCES INC. - COAL DIVISION

23/NOV/82 HEAD ANALYSIS SUMMARY PAGE 11

PROJ - GDR ANALYSIS BASIS TYPE - AD NAME OF STANDARD - ASTM

DATA SOURCE	SSID	SEAM	SAMPLE ID	INHERENT MOISTURE%	ASH%	FIXED CARBON%	VOLATILE MATTER%	TOTAL SULPHUR%	GROSS CALORIFIC VALUE (MJ-KG)	SPG	FSI
DDH 011											
	HD1	GETHING NO.2	19	0.60	8.72	71.10	19.58	0.36	32.21	1.36	1.50
	HD1	GETHING NO.5	20	0.69	12.68	62.77	23.86	0.46	31.20	1.33	6.50
	HD1	GETHING NO.2	116	0.44	7.13	72.66	19.77	0.57	33.04	1.35	1.50
	HD1	GETHING NO.2	119	0.60	8.72	71.10	19.58	0.36	32.21	1.36	1.50
	HD1	GETHING NO.2	120	1.07	76.86	12.30	9.75	0.16	5.90	2.22	0.00
	HD1	GETHING NO.2	121	0.64	11.96	67.75	19.65	0.61	31.52	1.34	5.00
	HD1	GETHING NO.5	122	0.69	12.68	62.77	23.86	0.46	31.20	1.33	6.50
	HD1		123	0.44	6.01	75.41	18.14	0.76	33.14	1.34	1.00

SEAM #5 : 188.81 — 218.46m

COAL SEAM DATA SHEET

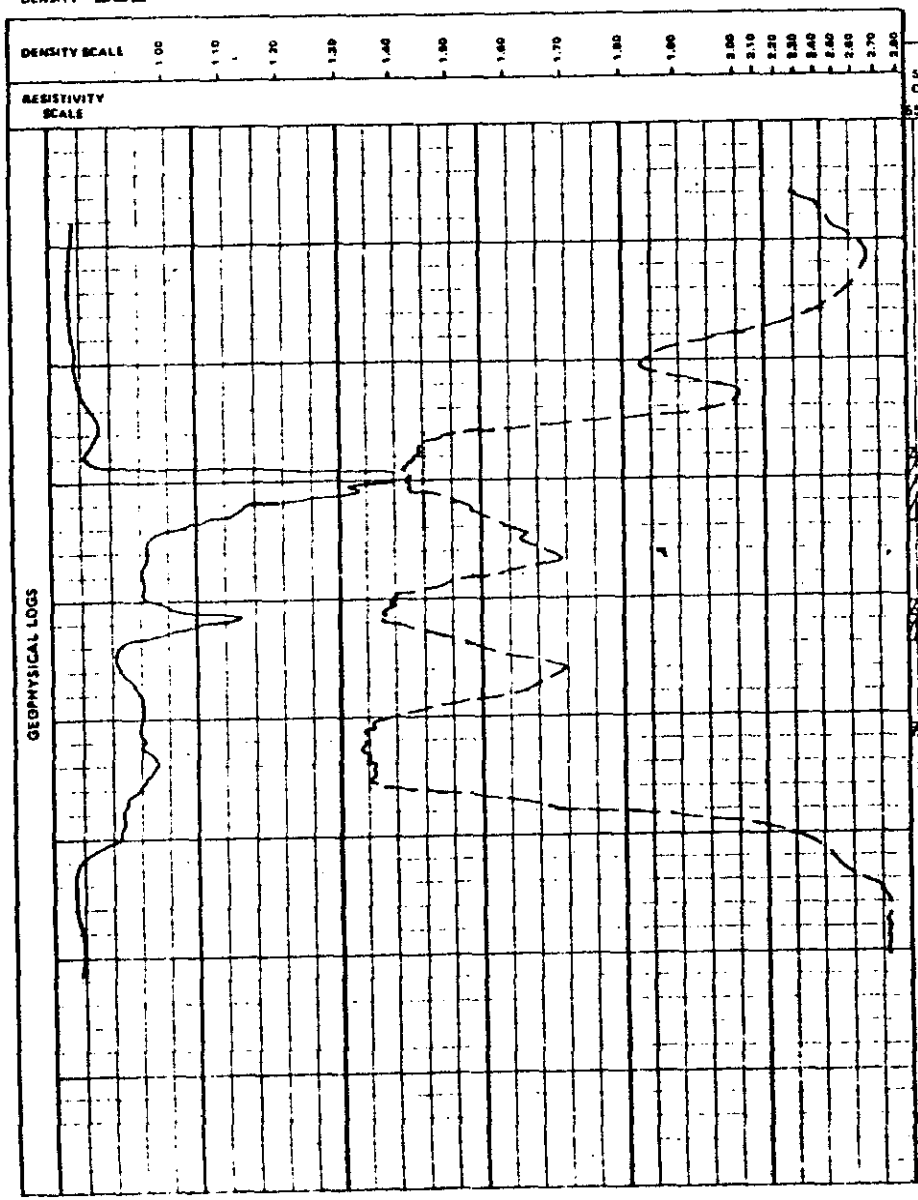
GULF CANADA RESOURCES INC
COAL DIVISION

Coal / Coal + Rock (True Thkns)
117 / 117

DENSITY ——— RESISTIVITY ———

DRILL NO GDR-DDH-80-41 SEAM 3 SEAM INTERVAL 188.81 - 192.82 m

SCALE 1:40



SEAM COMP	DEPTH	COAL SEAM LOG	INTERVAL ROCK	INTERVAL COAL	% REC. (15 Flush)	SAMPLE NUMBER	SAMPLE COMPOS	PROXIMATE ANALYSIS MOIST	ASH	VM	FC	S	BTU (MJ/KG)	FSI
654321	188.81			(0.95)										
				0.08										
				0.41	35									
	190.23			0.12	75.60	00762		0.54	7.54	19.54	72.38	0.82	14,159 (28.32)	1.5
				(0.68)										
				0.09										
				0.04										
				0.06										
				0.12										
	191.33			(0.73)										
				0.10										
				(0.66)										
	192.82													

41 3 of 8

COAL SEAM DATA SHEET

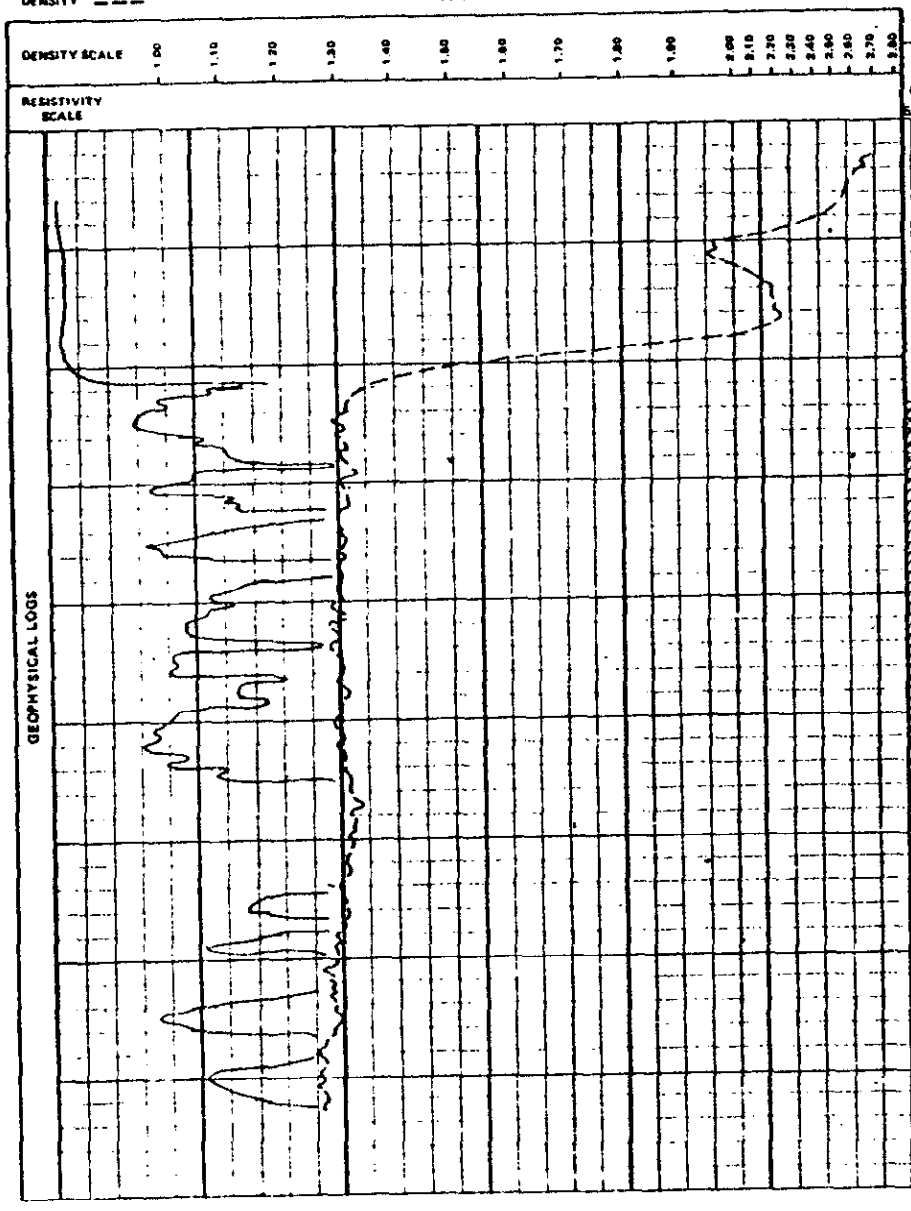
GULF CANADA RESOURCES INC.
COAL DIVISION

Coal / Coal + Rock (True Thk(m))
4.90 / 5.60

DENSITY ——— RESISTIVITY ———

DRILL NO. GDR - DDH - 80-41 SEAM 3 SEAM INTERVAL 199.92 - 218.46 m

SCALE 1:40



SEAM COMP	DEPTH	COAL SEAM LOG	INTERVAL ROCK	INTERVAL COAL	% REC (5' Float)	SAMPLE NUMBER	SAMPLE COMPOS.	PROXIMATE ANALYSIS MOIST	ASH	VM	FC	S	BTU (MJ/KG)	FSI
554321	199.92			(0.51)										
				0.15										
				0.22										
				0.06										
			0.03	0.04										
				0.10										
				0.04										
				0.07										
				0.13										
				0.88										
	202.09			0.04	86	54771	00763							
				1.03				0.92	2.34	21.42	78.32	0.38	14,864 (29.73)	1.5
	203.46			0.04										
				0.11										
				0.10										
				1.64										
	205.5			0.23										
				(0.50)										
				0.80										
	206.38													

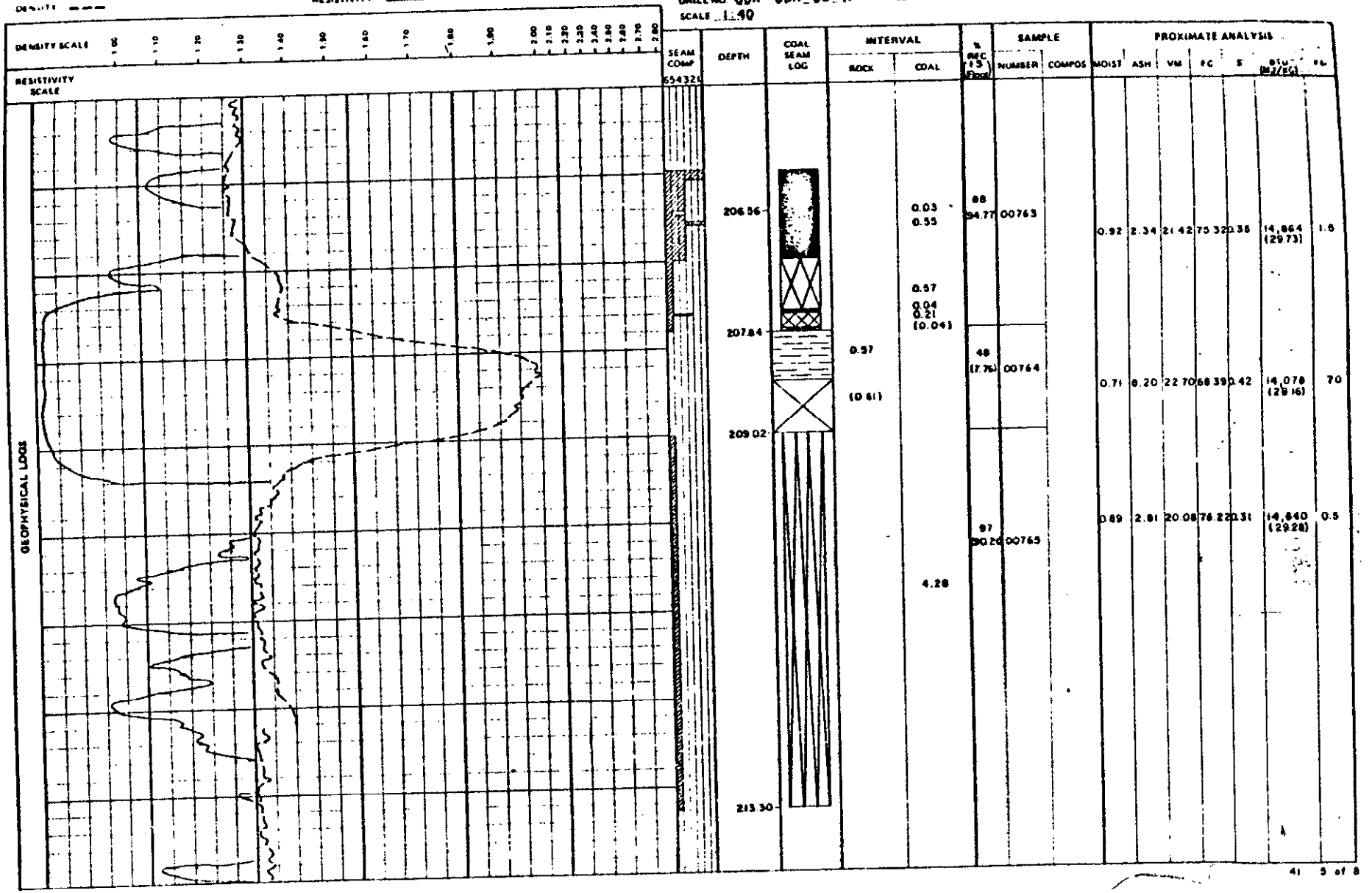
COAL SEAM DATA SHEET

GULF CANADA RESOURCES INC
COAL DIVISION

DENSITY ——— RESISTIVITY ———

DRILL NO. GDR - ODH - 80-41 SEAM 3 SEAM INTERVAL 199.92 - 218.46 m

SCALE 1:40



INTERVAL ROCK	INTERVAL COAL	% REC (FROM)	SAMPLE NUMBER	SAMPLE COMPOS
	0.03	88		
	0.55	94.77	00763	
	0.57			
	0.04			
	0.21			
	(0.04)			
0.57		48		
	(0.61)	(7.7%)	00764	
		97		
	4.28	90.2%	00765	

PROXIMATE ANALYSIS MOIST	ASH	VM	FC	S	BTU (MJ/KG)	FSI
0.92	2.34	21.42	75.32	0.35	14,864 (29.73)	1.5
0.71	8.20	22.70	68.39	0.42	14,078 (29.16)	7.0
0.89	2.81	20.08	76.22	0.31	14,840 (29.28)	0.5

P-367 (12 80)

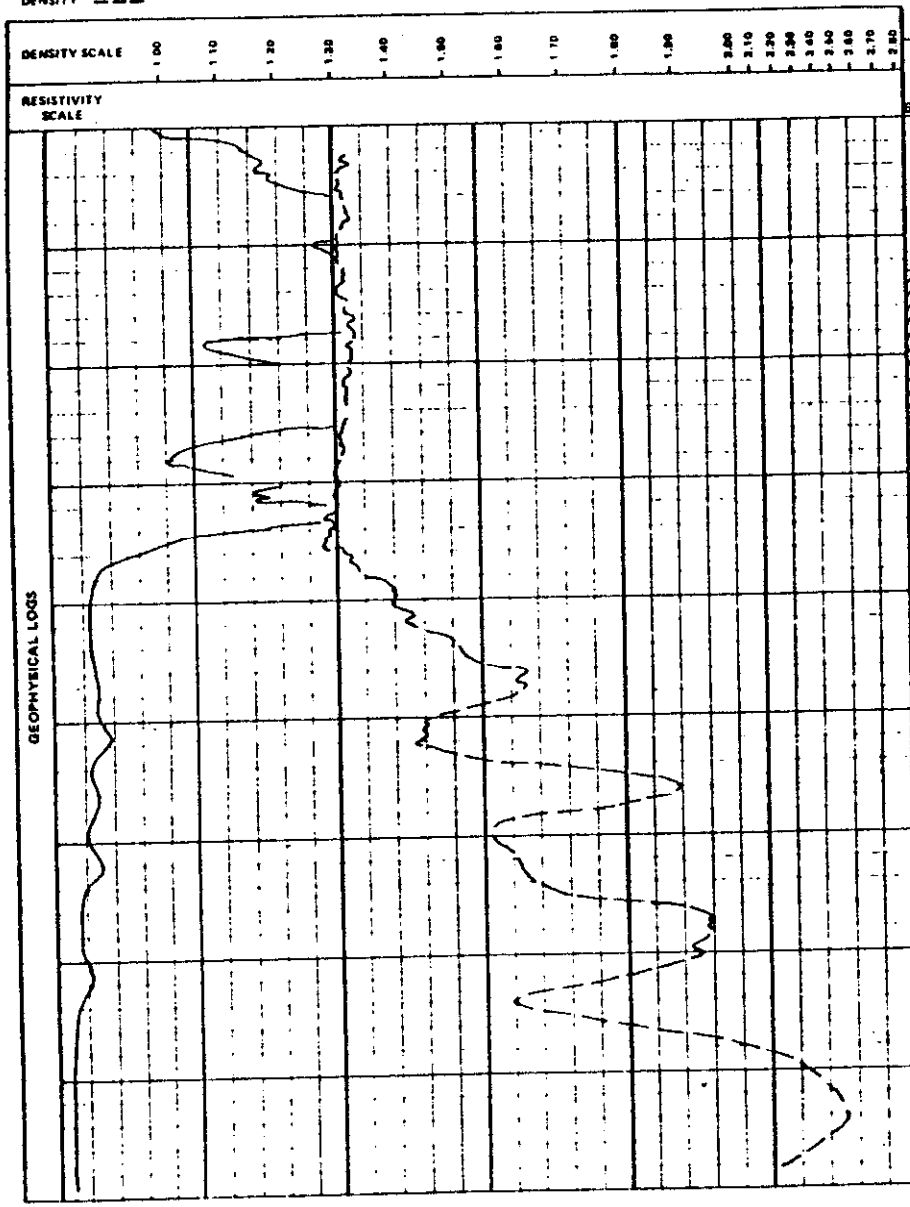
COAL SEAM DATA SHEET

GULF CANADA RESOURCES INC
COAL DIVISION

DENSITY ——— RESISTIVITY ———

DRILL NO. GDR-DDH-80-41 SEAM 3 SEAM INTERVAL 199.92 - 218.46 m

SCALE 1:40



SEAM COMP.	DEPTH	COAL SEAM LOG	INTERVAL ROCK	INTERVAL COAL	% REC (15 Floor)	SAMPLE NUMBER	SAMPLE COMPOS	PROXIMATE ANALYSIS MOIST	ASH	VM	FC	S	BTU (MJ/KG)	FSI
654321	213.30													
				2.78	97 (90.21)	00765		0.89	2.81	20.08	76.22	0.31	14,640 (29.28)	05
	216.08			(0.19)										
			(0.66)											
				(0.46)										
			(0.45)		14 (50.68)	00766		0.76	10.75	22.30	66.19	0.37	13,636 (27.27)	40
	217.84			(0.09)										
				0.47										
	218.45			(0.06)										
			(0.79)											
				(0.44)										
	219.69													

Whiterabbit Resources Ltd.
4009 Elbow Drive
Calgary, Alberta, Canada T2S 2K2

Phone: (403) 243-6816
Telex: 03-825583
Cable: Suska, Calgary

17-1-85

Dear Greg

Will send more detail
data if find anything interesting

Regards

Madelaine S.

MEMORANDUM

1984 05 18

TO: D.C.D. Parker

FROM: G.J. Ockert

SUBJECT: Gulf-Suska Interest N.E. B.C.

In response to the request to establish if Gulf surrendered all of M. Suska's holdings in N.E. B.C., the following information has been gathered:

A) In early 1980, M. Suska (consulting geologist) offered her 2 blocks of license holdings in Northeast B.C. to Esso Resources. The blocks were referred to as North Moberly (north of the Pine River) and Beaudette Creek (Lossan Exploration--south of the Pine River). Due to high exploration and preproduction commitments, interest was declined.

B) A short time later, Gulf took up the option on both areas, as their land acquisitions on the trend were along the same strike trend.

C) The southerly block, referred to as the Goodrich-Lossan area, saw active exploration for 2 years including several drill holes and an adit bulk sample.

D) The northerly block, referred to as the Goodrich-White Rabbit area, was not of prime interest and exploration work conducted by Gulf was minimal in nature (probably merely satisfied the work commitments of the agreement).

E) Both areas have been recently surrendered back to Suska with work commitments to the B.C. Government apparently satisfied on the Lossan Block until 1987.

F) Looking at the terms of option on the North Moberly Block, we can probably infer that similar conditions were imposed on Gulf:

Jan 1980 - Initial consideration of 140 k$ and 2 year option with work commitment to the satisfaction of B.C. Government.

Jan 1981 - Option payment 75 k$.

.../2

(2)

Sept 1981 - Notice of continued work or surrender. Continued work to the satisfaction of B.C. Government work commitment and annual option payments of 75 k$ until Jan 1, 1984.

Jan 1985 - Royalty structure (preproduction or production). Minimally this sum is 75 k$ annually.

G) It appears that the unmarketable nature of the Gething coals, coupled with the high cost of land retnetion (pre-production royalty), led Gulf to drop their interest.

GJO/cyg

cc: J. Horgan
L.E. Klatzel Mudry

Jan 1983
Alice Creek
Gulf.

Axis Syncline appears relatively free of thrust faulting.

4.3.3 Coal Occurrences

Six separate coal zones have been identified within the Gething Formation in the Lossan Mine Area. The majority of these coal seams lie within the upper half of the Gething Formation. Surface data and occasional drill hole intersections of the lower half of the Gething Formation indicate that several additional coal seams are present in the Gething; however, drilling will be required before a definitive correlation can be made. The six coal seams or zones are described briefly below (see Figure 4.3.2.2).

4.3.3.1 Gething No. 1 Seam

The Gething No. 1 Seam is the uppermost seam within the Gething Formation and is located 40 metres below the Gething - Bluesky contact. Generally the geological mining section averages 8.6 metres within the mine area but faulting associated with folding has thickened the No. 1 Seam to as much as 35 metres (true thickness).

The No. 1 Seam is easily identifiable on geophysical logs (see correlation charts - Appendix A, Part 2). Within the mine area, the No. 1 Seam is

there is no page 61

overlain by a distinctive zone of regularly interbedded siltstone and mudstone and underlain by a relatively clean medium-grained sandstone. The seam itself contains at least one tuffaceous band which aids in correlation of drill core or trench data. Within the mine area the No. 1 Seam thins in a northerly direction.

4.3.3.2 Gething No. 2 Coal Zone

The second coal zone within the Gething Formation has been designated the No. 2 Coal Zone, which lies approximately 40 to 50 metres below the No. 1 Seam. This zone is generally one to two metres thick and consists of coal, carbonaceous mudstones, and shale. The individual coal plys within this zone are generally in the order of one metre in thickness.

4.3.3.3 Gething No. 3 and No. 4 Seams

The Gething No. 3 and No. 4 Seams lie 90 and 100 metres respectively below the No. 1 Seam. The average thickness of these seams is in the order of one metre. Further drilling will be required in order to confirm the continuity of these seams within the Lossan Mine Area.

4.3.3.4 Gething No. 5 Seam

The Gething No. 5 Seam (previously correlated as the No. 3 Seam) lies some 120 metres below the No. 1 Seam. The average thickness of the No. 5 Seam is approximately 3 to 5 metres as indicated by several trenches and drill hole intersections.

Current calculations indicate that there are approximately 61.5 million tonnes of in-situ coal based on the No. 5 Seam. The bulk of these reserves lie in the northern end of the mine area (Sections N6000 to N9500). These reserves have not been included in the preliminary feasibility study as they are inferred reserves. Preliminary drilling, however, indicates that this area could provide additional tonnages to the current estimates of possible production from the mine area.

4.3.3.5 Gething No. 6 Seam

The Gething No. 6 Seam lies some 180 metres below the No. 1 Seam. The average seam thickness of this seam is approximately 2.5 to 3 metres.

All current coal seam correlations from previous exploration programs are presented in Appendix A, Part 2 of this report.

5.0 COAL RESOURCES

5.1 Summary

Exploration on the Lossan and Whiterabbit Properties to date has identified in-situ coal resources conservatively estimated to be approximately 431 million tonnes within the Gething Formation. Table 5.1.1 summarizes the results of resource calculations based on drill hole coal intersections and/or coal trench measurements.

Table 5.1.1
SUMMARY OF IN-SITU REGIONAL COAL RESOURCES
OF THE GETHING FORMATION
(million tonnes)

	True Seam Thickness (Metres)				
	0.5 -1.0	1.0 -2.0	2.0 -3.0	>3.0	Sub-Total
Lossan	-	52	49	197	298
Whiterabbit	-	89	44	-	133
		Total			431

Note to GREG: we only deal with Lossan ←

Resources were calculated by the geological cross-section method to a vertical depth of 500 metres and along strike lengths assigned to each cross-section after taking all geological data into consideration. A specific gravity of 1.5 tonnes/m^3 was used for the tonnage calculations.

5.2 In-Situ Reserves of the Lossan Mine Area

In-situ coal resources of the Lossan Mine Area have been calculated based on the correlation of six seams totalling 20 metres within the Gething Formation. The in-situ resources are conservatively estimated to be approximately 298 million tonnes[1], located within synclinal structures. Table 5.2.1 summarizes the results of resource calculations of the Lossan Mine Area.

Of the 298 million tonnes of in-situ coal resources, 174 million tonnes have been identified as in-situ reserves from the Gething No. 1 and Gething No. 5 Seams. Table 5.2.1 shows the distribution of in-situ reserves (No. 1 and No. 5 Seams) in the mine area.

The in-situ reserve calculations are based on calculated true thickness intervals of coal seam sections.

The minimum true thickness used was:

a) 0.5 metres, where the bedding to core angle (BCA) of the seam measures between 30° and 90° (90° represents flat-lying strata);

---

1. Presently this figure includes oxidized coal. Oxidized coal tonnage will be calculated when oxidization limits have been determined.

Table 5.2.1
LOSSAN MINE AREA
SUMMARY OF IN-SITU COAL RESERVES

Seam No.	Formation	Reserves (million tonnes)
1	Gething	112
5	Gething	62
2, 3, 4, 6	Gething	124
	TOTAL	298

3. MINING QUANTITIES

3.1 GENERAL PROCEDURES

The quantity calculations for the two production levels, 3.0 and 1.0 million clean tonnes annually, were done on geological cross-sections spaced at 250 metre intervals along the length of the pit. The geological sections were digitized and replotted to a scale of 1:2500 showing only the Gething No. 1 coal seam, the structural features, and the topography. The mine design was then taken from the incremental plans and plotted onto the same cross-sections. The incremental quantities of coal and waste for years 1, 2, 3, 4, 5, 6 to 10, 11 to 15 and 16 to 20 were calculated from these sections using computerized techniques and criteria outlined in Section 6. Table 3.1.1 shows the mining quantities for the 3.0 million tonne production level and Table 3.1.2 shows the same data for the 1.0 million tonne production level. The cross-sections for the 3.0 million tonne production level are included as Volume 6 Appendix.

TABLE 3.1.1

MINING QUANTITIES 3.0 MMt/YR

Source	Raw Coal ($t \times 10^3$)	Waste ($BCM \times 10^3$)	Strip Ratio
Axis Pit	19 789	183 694	9.28
Lossan Pit	49 565	485 573	9.80
West Pit	10 129	98 318	9.71
Ramp Development	-	46 077	-
TOTAL	**79 483**	**813 662**	**10.24**

Notes:

1. The coal tonnages shown in the table reflect the following:
   a) 10% mining loss by weight;
   b) 5% dilution by weight; and
   c) a raw coal specific gravity of 1.64 at 6% moisture.
2. Development waste includes volumes for ramp construction and the Brazion Creek diversion.

TABLE 3.1.2

MINING QUANTITIES 1.0 MMt/YR

Source	Raw Coal ($t \times 10^3$)	Waste ($BCM \times 10^3$)	Strip Ratio
Axis Pit	1 623	6 616	4.08
Lossan Pit	20 355	159 804	7.85
West Pit	4 522	50 184	11.10
Ramp Development	-	22 750	-
TOTAL	**26 500**	**239 354**	**9.03**

Notes:

1. The coal tonnages shown in the table reflect the following:

   a) 10% mining loss by weight;
   b) 5% dilution by weight; and
   c) a raw coal specific gravity of 1.64 at 6% moisture.

2. Development waste includes volumes for ramp construction and the Brazion Creek diversion.

Both the waste and coal quantities, generated by the computer technique, were adjusted to account for situations where the section outline does not apply to the full 250 m interval. Pit end section and ramp configurations created this condition; however, these adjustments were less than 1% of the total quantities.

3.2 COAL TONNAGE

The mineable coal tonnage within the pit limits was calculated using the criteria as established for determining the geological reserve which is detailed in Appendix C of Volume 2 (Geology). This represents the geological in situ reserve within the pit limits.

However, to translate the geological in situ reserve to mining quantities, the following items must be considered:

	Weight (Tonnes)	Volume (cu. m)
In situ coal @ 6% moisture	1.6185	1.0000
Less Mining loss (10% of weight)	.1619	.1000
Recovered coal	1.4566	0.9000
Plus dilution (5% by weight)	0.0809	0.0385
TOTAL DELIVERED	1.5375	0.9385

The specific gravity of the delivered coal is thus calculated to be:

1.5375/0.9385 = 1.6383 or 1.64

This specific gravity value is used for the run-of-mine coal, (i.e. delivered to the plant).

The volume recovered as coal is 93.85% of the in situ computed volume.

Using the volume recovery of 93.85% and the specific gravity of 1.64 the mineable reserves are computed as followws:

in situ computed volume x 1.64 x .9385 = mineable reserve

The technique described above for calculating coal tonnages was used for both the 1.0 and 3.0 million clean tonne annual production levels.

3.3 WASTE QUANTITIES AND STRIP RATIO

Waste computations for both production levels were made as described in Section 3.1. The material from the Brazion Creek diversion and from the footwall ramps is included in the total waste and is therefore reflected in the strip ratio.

The strip ratio is expressed as the number of bank cubic metres of waste that are excavated to obtain a tonne of raw coal. Unless otherwise noted, the strip ratio in this volume of the report refers to raw or delivered coal.

APPENDIX C

RESERVE CALCULATIONS FOR THE LOSSAN MINE AREA

A summary of the mining sections used in the reserve calculations is presented in Tables C-1and C-2.

In situ reserves were calculated for the Gething No. 1 Seam using the cross-section method. The topography of the mine area was digitized and reproduced at a scale of 1:2500. Digitized cross-sections were then constructed at the same scale.

Cross-sections N0500 to N6500 were used in the calculation. The volume of coal for each cross-section was calculated using the following formula:

$$\text{volume} = MS \times SL \times STL$$

where:

MS	=	mining section thickness
SL	=	seam length
STL	=	strike length

The seam thicknesses were based on the 1:5000 isopach maps and the drillhole influence map (Figure C-1) for the No. 1 Seam. A strike length influence of 250 m (125 m on each side of the cross-section) was used. The seam length was measured from each cross-section.

To convert the calculated volumes of coal to tonnages, a specific gravity of 1.53 was used. An average specific gravity of 1.53 was determined from the washability data of the No. 1 Seam at a predicted in situ ash content of 27.2%.

Reserve Calculations - Gething No. 5 Seam

The cross-section method was also used in calculating the reserves for the Gething No. 5 Seam. Seam lengths were measured from the 1:5000-scale cross-sections. A length of 125 m on each side of each cross-section was used to calculate

Reserve Calculations - Gething No. 1 Seam

The reserve calculations were based on calculated true thicknesses for mineable seam sections. The criteria for determining a mineable section were as follows:

1. the mining section should consist of at least 60% coal; exceptions are noted in Tables C-1 and C-2;
2. the minimum true thickness accepted as a mining section was:

    a) 0.5 m where the true dip of the seam was less than 30^{o};
    b) 1.0 m where the true dip was greater than 30^{o}.

3. rock partings were included if:

    a) they comprised less than 40% of a mineable coal interval;
    b) a rock split did not exceed a true thickness of 0.5 m or 1.0 m (where rock partings constituted a true thickness interval equivalent to a mining section, they were considered as interburden waste and added to the overburden volume);
    c) the true rock interval thickness was not greater than either the true thickness of the overlying or underlying coal interval.

Calculations of true thicknesses were based on the following parameters:

1. where a coal seam was intersected by a diamond drillhole, the bedding-core angle measurement (BCA) was used to calculate the true thickness interval; and
2. where a rotary drillhole intersected a coal seam, true thickness was estimated from dips measured in nearby diamond drillholes or at nearby surface outcrops.

To: BRUCE VINCENT

Re: ECONOMIC EVALUATION OF GULF + LOSSAN THERMAL COAL PROSPECTS 1/2 1985 02 26

INTRODUCTION:

ESSO IS LOOKING AT THE POSSIBILITY OF OPTIONING THE LOSSAN LEASES WHICH ARE LOCATED NEAR CHETWYND, B.C. THE BRITISH COLUMBIA RAILWAY IS 12 KM TO THE NORTH AND THE TOTAL DISTANCE FROM THE LOSSAN MINE SITE TO PRINCE RUPERT IS 941 KM (SEE ATTACHED LOCATION MAP).

RESERVES:

THE TOTAL RESERVES FOR ONE SEAM (SEAM NO. 1) TOTALS 112 MILLION TONNES OF COAL. THIS QUOTED NUMBER PRIMARILY INCLUDES COAL FROM THE LEASES OF GULF CANADA RESOURCES. THE SEAM NO. 1 IS A BITUMINOUS COAL WITH BOTH COKING AND THERMAL PROPERTIES. ESSO IS ASSESSING THESE PROSPECTS ON THE BASIS OF A THERMAL PRODUCT ONLY. THE SEAM HAS A MEDIUM TO HIGH VOLATILE MATTER CONTENT WITH A FUEL RATIO OF 2.3. THE AS-SHIPPED CALORIFIC VALUE OF THE COAL BASED ON A PRELIMINARY PRODUCT SPECIFICATION IS 6400 cal/gm WITH A TOTAL MOISTURE OF 8%.

ECONOMIC EVALUATION

ATTACHED ARE CAPITAL AND OPERATING EXPENDITURES SUMMARY FOR TWO PRODUCTION CASES. COSTS ARE IN 4Q 1982 CANADIAN DOLLARS. THE CASH FLOW CRITERIA ARE:

- "Decision to Proceed" - JAN 1, 1983
- OPERATION MINE AND PLANT - JAN. 1986
- TWO PRODUCTION LEVELS 3.0 & 1.0 Mt/a
- RAIL COST TO RIDLEY $18.50/t
- PORT HANDLING $3.70/t
- NO WORKING CAPITAL ALLOWED FOR PLANT STARTUP

- CONTINGENCY -

MINING EQUIPMENT - 5% OF EQUIPMENT COSTS INC. REPLACEMENT CAPITAL.

OTHER CAPITAL - 10% OF ALL OTHER CAPITAL COSTS EXCLUDING PREPRODUCTION ENGINEERING & MANAGEMENT FEES AND CONSTRUCTION CAMP OPERATING COSTS.

PLEASE RUN THE ECONOMICS FOR THE 2 CASES BASED ON 100% EQUITY SO WE CAN COMPARE THE RESULTS WITH THE GULF FEASIBILITY STUDY. RUN ALSO A SENSITIVITY BASED ON:

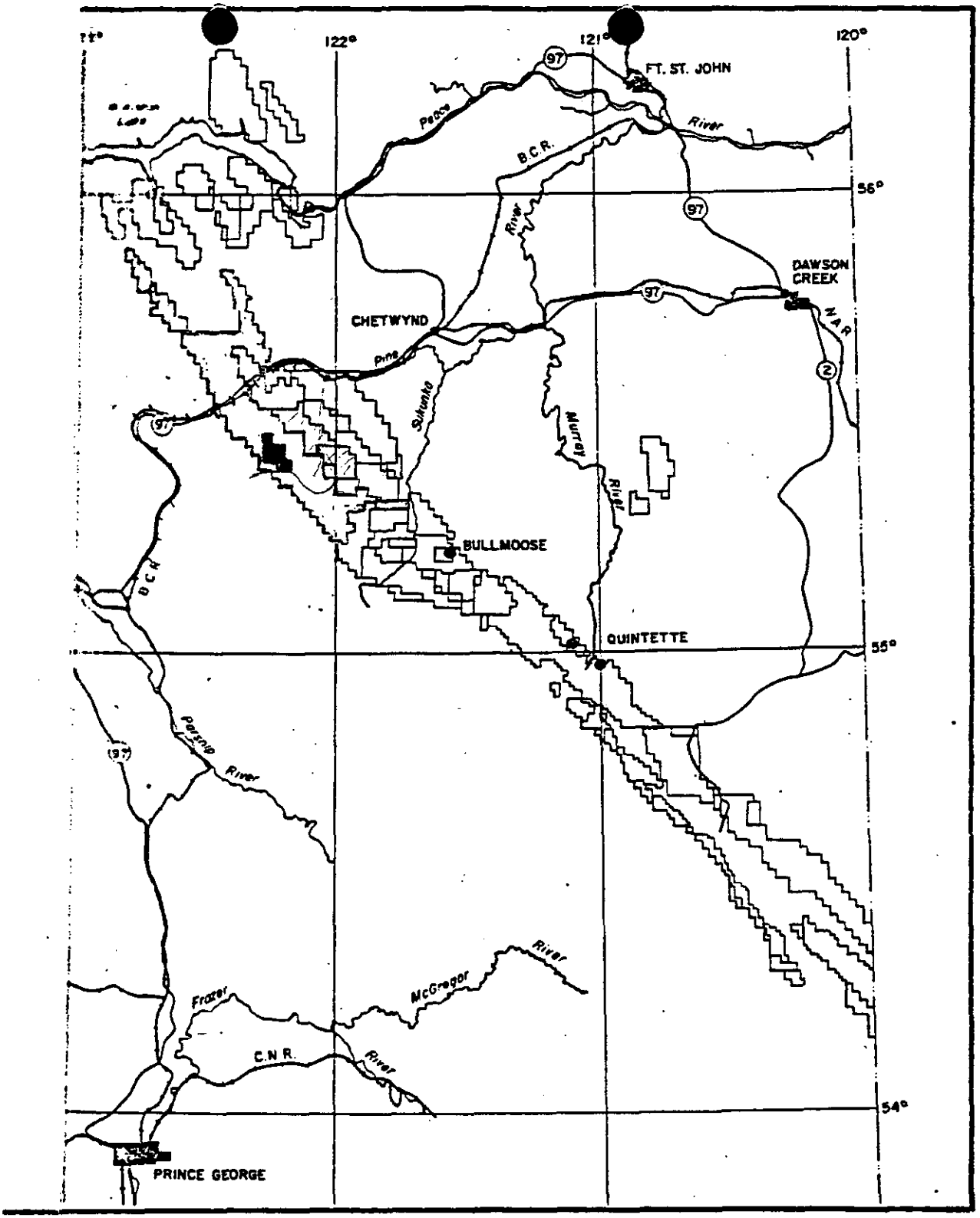
CAPITAL COST	+ 30%
	+ 20 %
	+ 10 %
	- 10 %
OPERATING COST (EXC. RAIL, PORT)	+ 10 %
	- 10 %
COAL PRICE	+ $ 10/t
	+ $ 5/t
	- $ 5/t
	- $ 10/t

TIMING

RESOURCES WOULD LIKE TO GIVE LUSSAN EXPLORATION LTD AN INDICATION OF ESSO'S INTEREST ON THEIR PROPERTY BY THIS WEEK. CAN WE REQUEST THE RESULTS OF ECONOMICS BY WEDNESDAY AFTERNOON?

NORY NARCISO

cc: N. KRAAN
G. OCKERT
J. HORGAN



LOSSAN MINE AREA

PEACE RIVER COALFIELD

COAL MINES (UNDER CONSTRUCTION)

FIGURE 2

LOSSAN COAL PROPERTY

PEACE RIVER COALFIELD
(Modified After Gulf Map)

GULF + CROWS NEST THERMAL COAL PROSPECTS

CAPITAL AND OPERATING EXPENDITURES SUMMARY

PRODUCTION RATE - 3.0 Mct/a

CAN $ 000's (4Q 1982)

ITEMS	1983 -3 1	1984 -2 2	1985 -1 3	1986 1 4	1987 2 5	1988 3 6	1989 4 7	1990 5 8	1991 6 9	1992 7 10	1993 8 11	1994 9 12	1995 10 13	1996 11 14	1997 12 15	1998 13 16	1999 14 17	2000 15 18	2001 16 19	2002 17 20	2003 18 21	2004 19 22	2005 20 23	TOTAL
CANADIAN EXPLORATION EXPENSE																								
ACCESS ROAD		1847	4253																					5600
TOWNSITE	4000	4000	4000																					12000
ENGINEERING AND MINING FEES	3000	6000	6000																					15000
CAMP AND CONSTRUCTION COSTS	247	8175	6786																					15228
PRE-PRODUCTION			8252																					8252
CAPITAL (MINING CLASS 28)																								
COAL PREPARATION PLANT	7272	14505	20665																					42482
OVERLAND COAL CONVEYOR		29100	22100																					44200
POWER SUPPLY	13927	1912	1986																					17425
SHOPS AND OFFICES		6765	9287																					16052
SERVICES	2789	1918	991																					5698
MINING EQUIPMENT		6615	31498																					38113
WASTE CONVEYOR																								
RAILROAD			3150																					3150
TOTAL INITIAL CAPITAL	31155	73807	124948																					229910
MINING CLASS 10.....																								
NEW EQUIPMENT AFTER 1985					2865	7166	17330	11740	13092	10246														88269
MINING EQUIPMENT REPLACEMENT						81	65	284	2908	2564	2103	1876	757	6916	2940	1068	1551	1588	3676	1147	508	40		30617
POWER SUPPLY						1200																		1200
WASTE CONVEYOR					4117	12394					9364			9360										41195
PRE-PRODUCTION					765																			765
SUB-TOTAL					7747	22504	29795	12024	17157	12790	11467	13876	757	6916	8300	1068	1551	1588	3676	1147	508	40		162042
TOTAL					7747	22504	29739	12024	17157	12790	11467	13876	757	6916	8300	1068	1551	1588	3676	1147	508	40		391.082
CLEAN COAL PRODUCTION, TONNES					3000																			69,000
TOTAL OPERATING COSTS, $					129056	130532	145245	163000	187053	208390				192002					154229					3555393
$/ct					46.38	47.08	52.41	54.53	62.35	69.80				64.21					58.41					59.76
LESS: RAIL HAULAGE $					58500																			8.50
$/ct					19.50																			
PORT HANDLING CHARGES $					11100																			3.70
$/ct					3.70																			
TOTAL COSTS (EXC. RAIL + PORT) $					129456	130452	146645	97000	120453	136190				129002					87629					1223393
$/ct					24.15	15.48	32.22	32.33	40.16	45.40				43.000					29.21					37.06
CONTINGENCY																								
MINING EQUIPMENT	5% OF EQUIPMENT COSTS INCLUDING REPLACEMENT CAPITAL																							
OTHER CAPITAL	10% OF ALL OTHER CAPITAL COSTS EXCLUDING PRE-PRODUCTION ENGINEERING & MANAGEMENT FEES AND CONSTRUCTION CAMP OPERATING COSTS																							

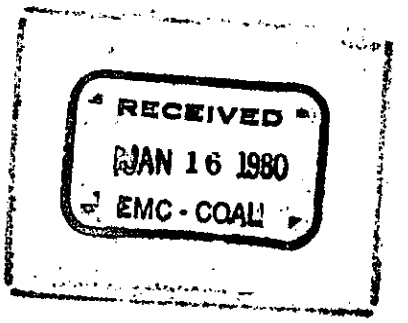
85 02 25

GULF + LOSSAN THERMAL COAL PROSPECTS
CAPITAL AND OPERATING EXPENDITURES SUMMARY
PRODUCTION RATE — 1.0 Mt/a
@ IN $ 000's — 4 Q 1982

ITEMS	1983 -3 1	1984 -2 2	1985 -1 3	1986 1 4	1987 2 5	1988 3 6	1989 4 7	1990 5 8	1991 6 9	1992 7 10	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	13 TOTAL
CANADIAN EXPLORATION EXPENSE																								
ACCESS ROAD		1341	4253																					5600
TOWNSITE	2000	1000	2000																					6000
ENGINEERING AND MANAGE. FEES	1000	3000	3000																					7000
CAMP AND CONSTRUCTION COSTS	447	4859	4015																					9,141
PRE PRODUCTION			3484																					3484
CAPITAL (MINING CLASS 28)																								
COAL PREPARATION PLANT	2456	9852	6399																					29707
OVERLAND COAL CONVEYOR																								
POWER SUPPLY	13810	1032	1033																					15875
SHOPS AND OFFICES		2409	3927																					6336
SERVICES	2438	1740	833																					5011
MINING EQUIPMENT		5653	12687																					18340
WASTE CONVEYOR																								
RAILROAD			3150																					3150
TOTAL INITIAL CAPITAL	23971	30957	50721																					109649
MINING CLASS 10																								
NEW EQUIPMENT AFTER 1995				7843	914	1536	3401	9029	4006				1200											27929
MINING EQUIPMENT REPLACEMENT					15	85	263	2775	1270	1465	82	217	4300	760										11232
SHOPS AND OFFICES, SERVICES AFTER 1995				567	567	517																		1651
SUB-TOTAL				8410	2496	2138	3664	11804	5276	1465	82	217	5500	760										40712
TOTAL	23971	30957	50721	8410	2496	2138	3664	11804	5276	1465	82	217	5500	760										150361
CLEAN COAL PRODUCTION, Tonnes				1000																				10000
TOTAL OPERATING COSTS	$			6309	5803	5926	6476	6582	7442					→ 7502	→ 7525		→ 8006		→ 7846					140311 85
	$/t			5.51	5.08	5.03	6.48	6.58	7.44					→ 7.50	→ 7.53		→ 8.01		→ 7.85					70.16
TOTAL COSTS (Exc. Rail, Port)	$			2909	3283	3426	3876	4582	4942					→ 5282	→ 5325		→ 5246		→ 5346					95911 85
	$/t			2.91	3.28	3.43	3.88	4.58	4.94					→ 5.28	→ 5.33		→ 5.25		→ 5.35					47.96
CONTINGENCY																								
MINING EQUIPMENT	5% OF EQUIPMENT COSTS INCLUDING REPLACEMENT CAPITAL																							
OTHER CAPITAL	10% OF ALL OTHER CAPITAL COSTS EXCLUDING PREPRODUCTION, ENGINEERING & MANAGEMENT FEES AND CONSTRUCTION CAMP OPERATING COSTS.																							

M. M. Suska P. Eng.
Consulting Geologist
009 Elbow Drive
algary, Alberta, Canada T2S 2K2

Phones: (403) 243-6816, 269-3080
Telex: 610 821 6473 Canada
Cable: Suska, Calgary



Beaudette Creek

January 10, 1980

Copies of pages containing
Top 1
Top 2
Double 5 sample analyses
put into North Moberly file

Mr. Hugh Jones,
Exploration Manager
Esso Resources
505-3rd Street S.W.
Calgary, Alberta

Dear Mr. Jones:

On behalf of our group I am enclosing additional certificates of coal testing from our recent trip into the area. These are as follows:

Lossan seam (the thick seam in the Brazion Creak area)

analysis 79-3 and 79-4 (from two thin seams, along uppermost Beaudette Creek)

and three additional analysis (from seams examined on the recent trip) two of them not seen before in the North Moberly area

These results are encouraging particularly as they represent the surface samples of somewhat weathered coal. Our very best wishes for the New Year, happiness and prosperity for you and Mr. Vincent.

Sincerely,

M. Suska.

M.M. Suska

encl:

M. Suska

BRAZION CREEK

LORING LABORATORIES LTD

CERTIFICATE of COAL TESTING

FILE NO.: 18378

Page # 1 DATE: December 13, 1979

SAMPLE NO.	IDENTIFICATION	SAMPLE TYPE	% RECOVERY SINK	% RECOVERY FLOAT		REC'D % H_2O	% H_2O	% VCL MATTER	% ASH	% FIXED CARBON	% S	BTU / LB.	F.S.I.
1 + 1 Coarse 1st 6'6" thick Interval	South end Losson Seam	Raw Coal Channell sample			Air Dried	-	1.58	23.52	5.78	69.12			½
					Dry Basis	-	-	23.90	5.87	70.23			
1 + 1 Fine 1st 6'-6" thick Interval	Losson "	Raw Coal Channel sample			Air Dried	-	1.63	22.94	15.28	60.15			½
					Dry Basis	-	-	23.32	15.53	61.15			
#2 2nd 3'-3" thick Interval	Losson "	Raw Coal Channel Sample			Air Dried	-	1.06	27.72	16.26	54.96			1
					Dry Basis	-	-	28.02	16.43	55.55			
#3 3d interval 3'-3" thick	Losson "	Raw Coal Channel Sample			Air Dried	-	.87	25.51	7.40	66.22			1
					Dry Basis	-	-	25.73	7.46	66.81			
#4 only ~~1 foot of~~ 4th interval 3'3" thick	Losson "	Raw Coal Channel Sample			Air Dried	-	.81	28.12	16.62	54.45			1½
					Dry Basis	-	-	28.35	16.76	54.89			
#5 Last 3 feet of 5th Interval 3'3" thick	Losson " North end	Raw Coal Channel Sample			Air Dried	-	.59	25.02	5.14	69.25			1
					Dry Basis	-	-	25.17	5.17	69.66			

All one seam: consecutive intervals channeled at surface

SAMPLES taken at surface and represent probably weathered coal

edmonton

M. Suska N. Moberly Area

LORING LABORATORIES LTD

CERTIFICATE of COAL TESTING

FILE NO.: 18378

DATE: December 13, 1979

SAMPLE NO.	IDENTIFICATION	SAMPLE TYPE	% RECOVERY SINK	% RECOVERY FLOAT		REC'D % H_2O	% H_2O	% VCL MATTER	% ASH	% FIXED CARBON	% S	BTU /LB.	F.S.I.	
Top 1	Composite seam only upper 3' sheared	Raw Coal			Air Dried	-	1.18	21.88	9.75	67.19			1	
					Dry Basis	-	-	22.14	9.87	67.99				
Top 2	Composite seam only upper 3' sheared	Raw Coal			Air Dried	-	1.64	21.63	2.07	74.66			$\frac{1}{2}$	
					Dry Basis	-	-	21.99	2.10	75.91				

Somewhat Weathered (at surface)

ed McIsaac

M. Suska Upper moose Beaudette

CHLORINE LABORATORIES LTD

Creek

CERTIFICATE of COAL TESTING

FILE NO.: 18378

DATE: December 13, 1979

SAMPLE NO.	IDENTIFICATION	SAMPLE TYPE	% RECOVERY			REC'D % H_2O	% H_2O	% VCL MATTER	% ASH	% FIXED CARBON	% S	BTU / LB.	F.S.I.	
			SINK	FLOAT										
79-3	Location 1	Raw Coal 2' channel			Air Dried	-	.51	20.63	7.68	71.18			7	
					Dry Basis	-	-	20.74	7.72	71.54				
79-4	" 2	Raw Coal 2' channel			Air Dried	-	.57	24.86	6.95	67.62			5½	
					Dry Basis	-	-	25.00	6.99	68.01				

Fast eroding surface

a Lmeshaae

M. Suska N. Hornby Area

LORING LABORATORIES LTD

CERTIFICATE of COAL TESTING

FILE NO.: 18378

DATE: December 13, 1979

SAMPLE NO.	IDENTIFICATION	SAMPLE TYPE	% RECOVERY SINK	% RECOVERY FLOAT		REC'D % H_2O	% H_2O	% VCL MATTER	% ASH	% FIXED CARBON	% S	BTU /LB.	F.S.I.	
Double 5	Two 2 foot seams	Raw Coal channel			Air Dried	-	.76	20.82	5.03	73.39			1	
					Dry Basis	-	-	20.98	5.07	73.95				

Somewhat Weathered (surface)

A. McAdam

Notes, Photographs:

Lossan's

Coal Area

Northeastern

B.C.

Kindly xerox and return at

M. M. Suska P. Eng.
Consulting Geologist
4009 Elbow Drive
Calgary, Alberta, Canada T2S 2K2

Phones: (403) 243-6816, 269-3080
Telex: 610 821 6473 Canada
Cable: Suska, Calgary

N79-294

6.600 acres
Licences owned
about Sept/79

12. Dec 79.

Mr. L.K. Walton
Supervisor Special Projects
Esso Resources Ltd.
Calgary.

Dear Sir,

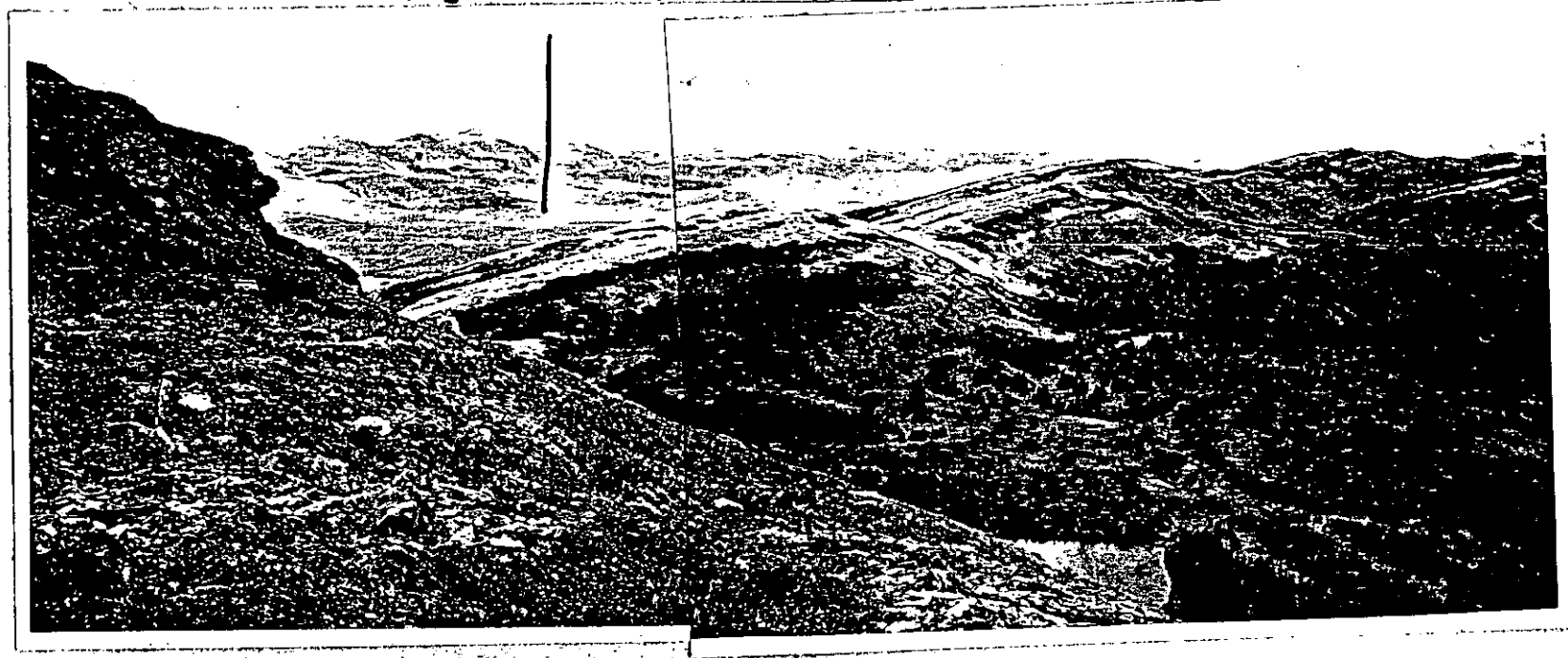
We were instructed by
Mr. H. Jones & Mr. B. Vincent
to send these data to you.
The data refer to Lossan's
Exploration Ltd. Coal licences.
We thank you for the
opportunity to submit this
information to you.

Yours V. truly
M. Suska (President Lossan Expl. Ltd.)

M. M. Suska P. Eng.
Consulting Geologist
4009 Elbow Drive
Calgary, Alberta, Canada T2S 2K2

Phones: (403) 243-6816, 269-3080
Telex: 610 821 6473 Canada
Cable: Suska, Calgary

The Valley of Lossan's Leases Looking North



Dip slopes

northeastern edge of the valley.

M. M. Suska P. Eng.
Consulting Geologist
4009 Elbow Drive
Calgary, Alberta, Canada T2S 2K2

Phones: (403) 243-6816, 269-3085
Telex: 610 821 6473 Canada
Cable: Suska, Calgary

NOTES ON LOSSAN EXPLORATION LTD. COAL AREA
Beaudette Creek - Brazion Creek area - Northeastern British Columbia
(Approx 6,600 Acres.)

Report on the brief reconaissance has not been prepared. Access from south into the area is by a good gravel road along Brazion Creek and north up the tributary for over one mile. Access to bare ridges which extend along the northeastern boundary of the area of the leases was by helicopter. The leases area is 8.4 miles southwest of Pacific Great Eastern Railroad which joins Prince George and Dawson Creek.

OBSERVATIONS

Excellent dip-slopes extend along major part of the northeastern area discussed (See photographs). Dip-slopes are also present in the southwestern area but that area was not examined as extensively.

Cadomin Conglomerate outcrops along northeastern ridges and probably also along the southwestern ridges.

The overlying Gething beds mainly are inside the synclinal area of the leases. Subsidiary folding and faulting(?) is present within the synclinal area, (as is common to most Gething beds in the region).

Coal: Numerous coal outcrops were observed within the area discussed. The most significant are as follows:

The "Big Seam": (Dip to the S W) Net coal STRAT THICKNESS 18 feet+ap

Mudstone Ss., Sh.	13½ feet Coal - Clean* with one 2 inch ss break	Approx. 2½' Sh.carb.	Coal 4½ feet Clean*	Sh&SS Mudst.

35 feet below the "Big Seam" are coal indications in a draw with a concealed section.

Further on in northly direction up the creek and down section are;

100 feet concealed;
24 feet Sandstone yellow-weathering thick-bedded;
3 feet Mudstone grey;
3 feet Coal and Shale;
1 foot Shale;
5 feet Coal - last 2 feet shaly - (Sample collected);
10 feet Shale carbonaceous;
Sandstone etc. Section continues on with minor coals.
Further up the creek the "Big Seam" appears to be present along the east bank with northeasterly dips.

Southern area along the road: coal shows are abundant.

Northeastern boundaries and Beaudette Creek in northern leases area: many coal outcrops were observed.

*Channnel samples collected

Photo. I

"The Big Seam"

(shiny coal exposed)

Dip Av. 60° SW.

fairly uniform

(photograph this distorts x of dip

Down section from 'Big Seam'

Draw with coal

Dip SW

5½ foot Coal Seam

Dip SW.

Dip: NE

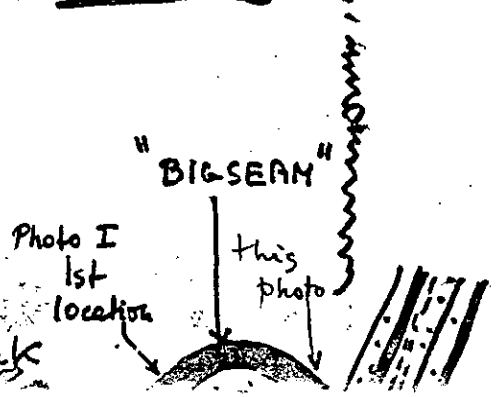
Dip: SW

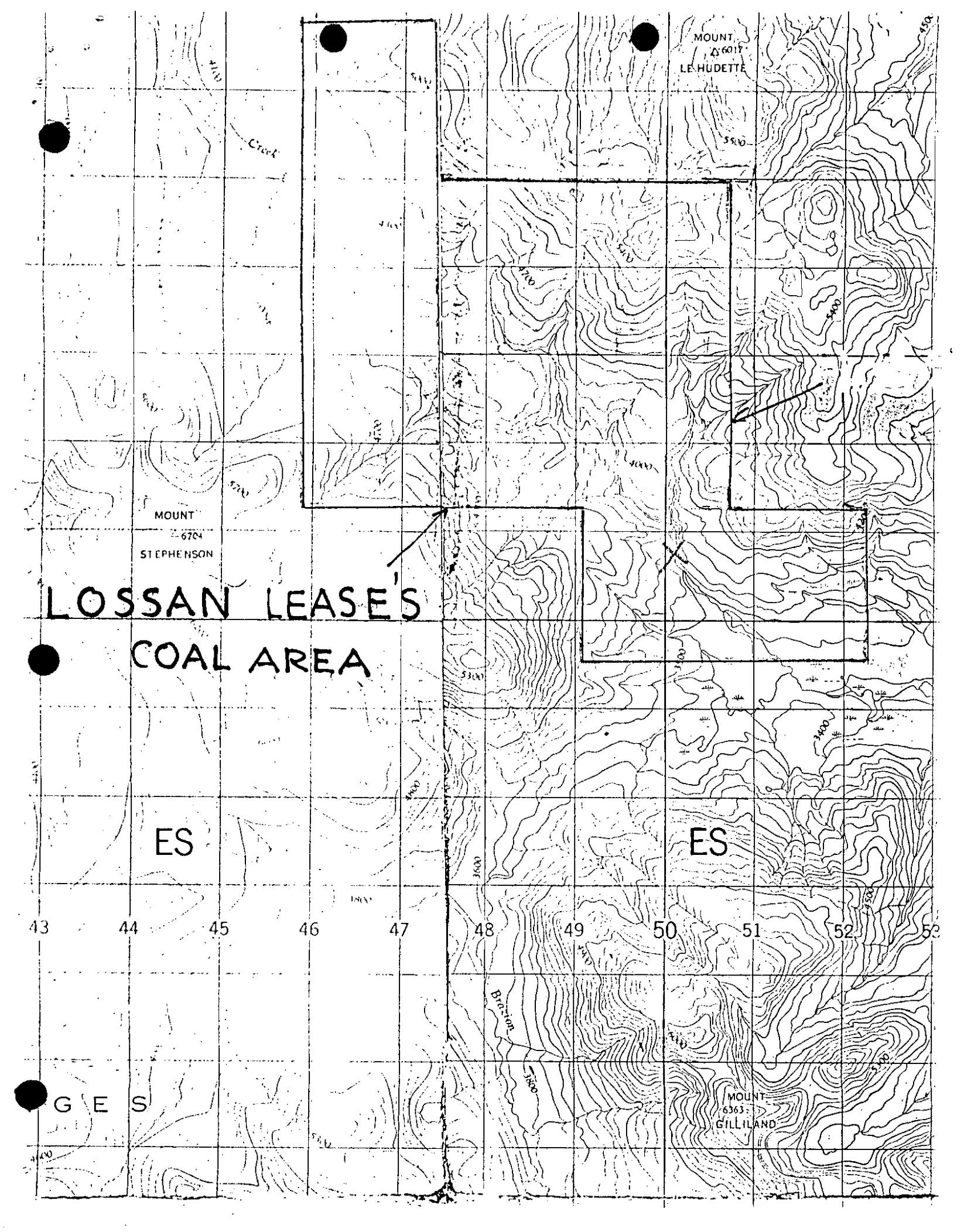
Photo. II

UP BRAZION TRIBUTARY from the main section of the "Big Seam".

It is possible that a thick soft blackish section along the bank

Looking N.N.W.




MOUNT
6019
LE HUDETTE
MOUNT
6704
STEPHENSON
LOSSAN LEASE'S
COAL AREA
ES
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43
44
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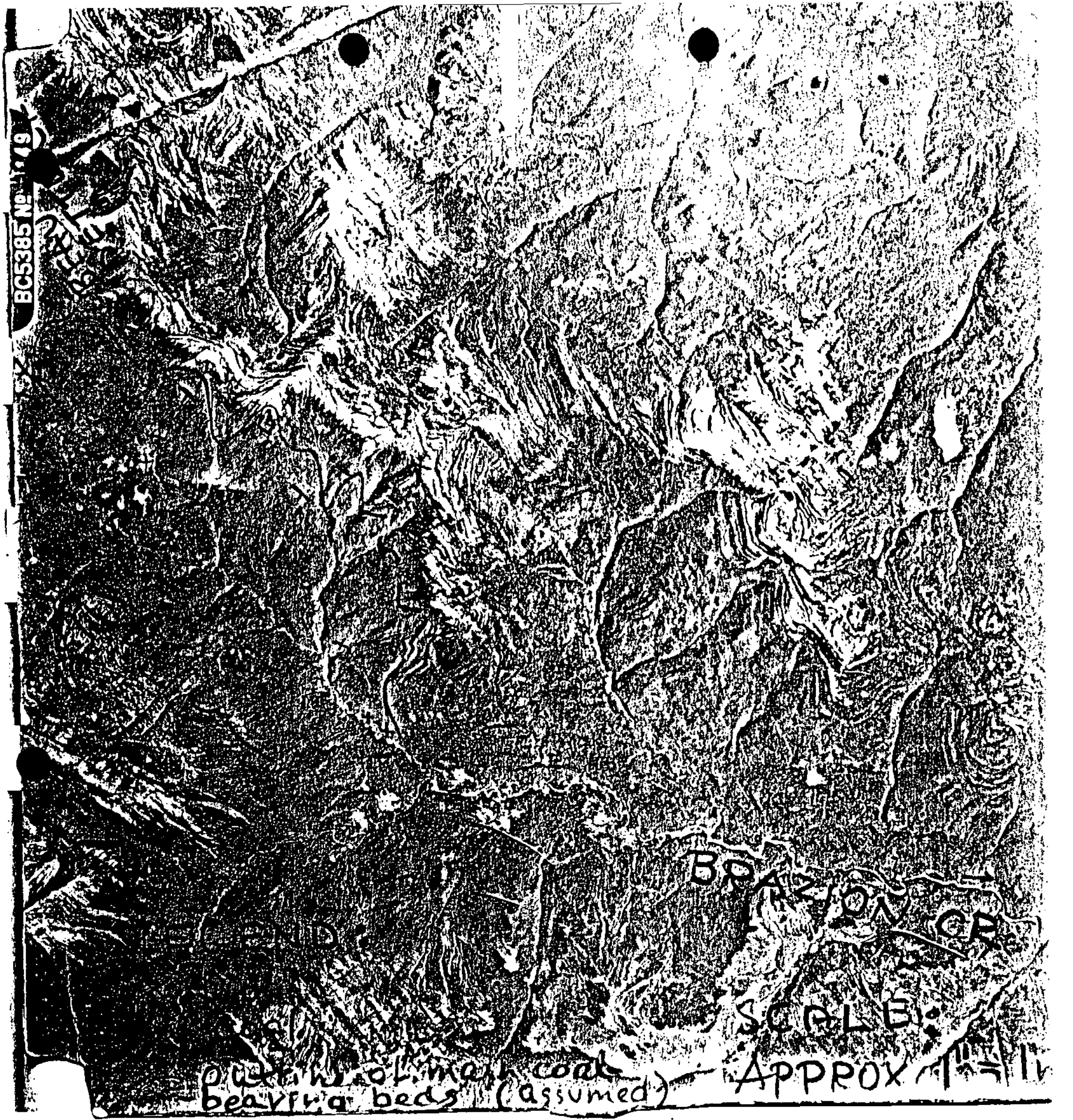
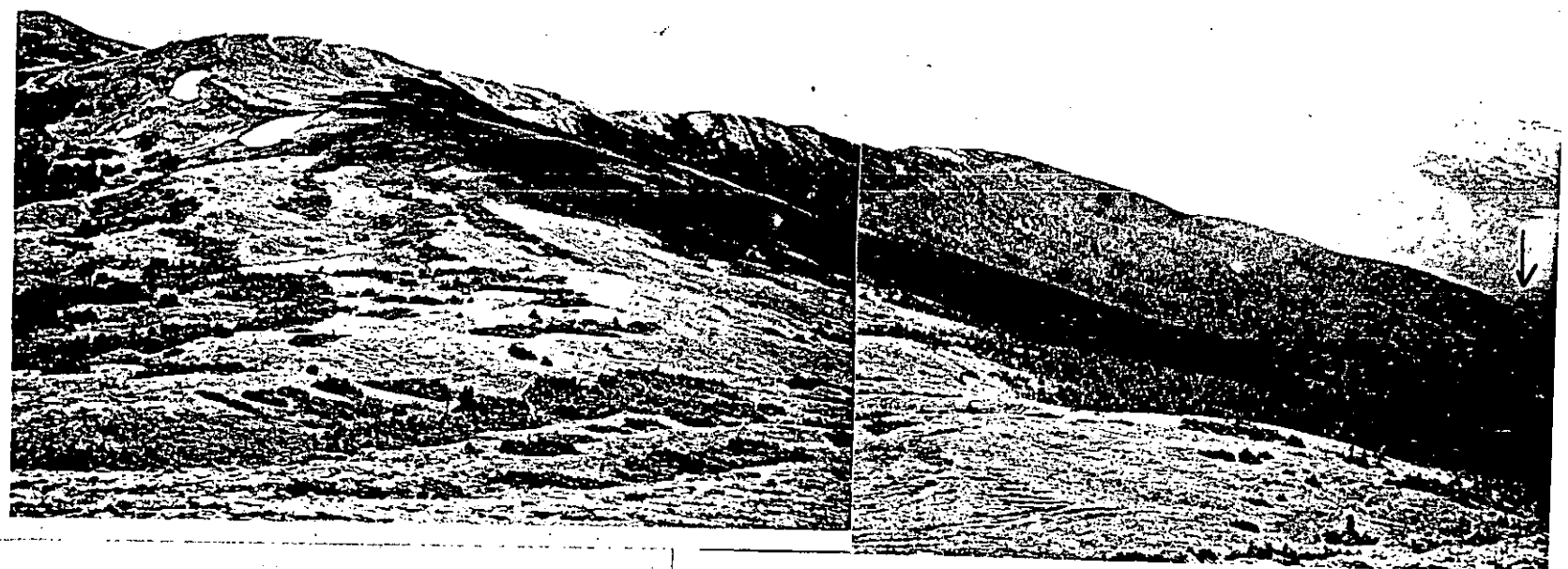
51
52
G E S
MOUNT
6363
GILLILAND
Brazion

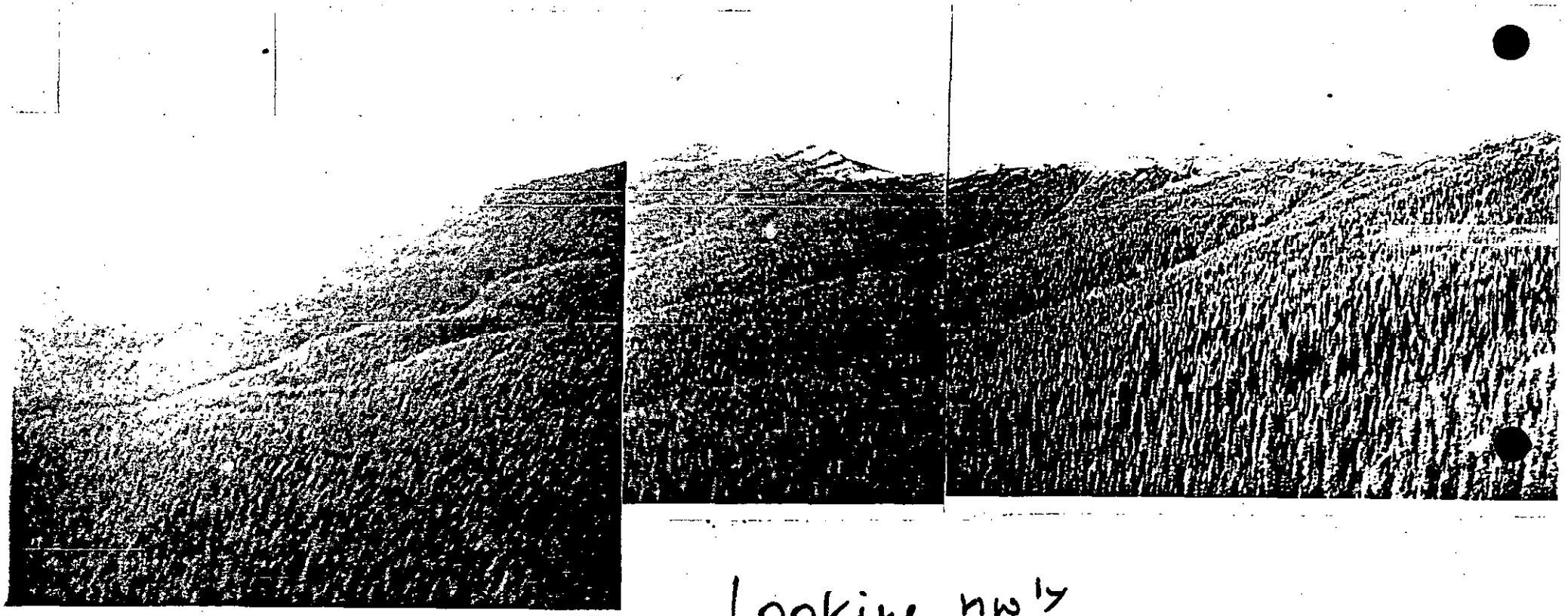


BC5385 No.
BRAZION CR
SCALE:
APPROX
outline of main coal
bearing beds (assumed)

Brazion Creek



Looking SSE^{ly} on the east^{n} limb of the syncline

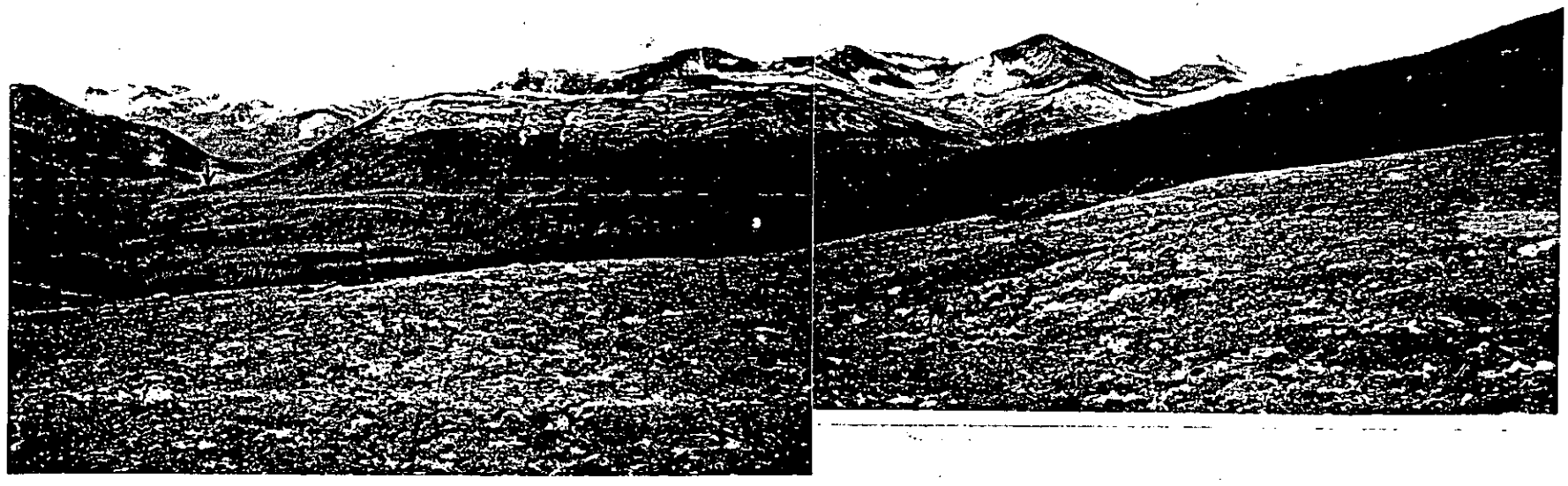


Looking nw'ly
dip slopes along the
eastern limb of syncline
in the northern area

The Cadomin Conglomerate near the top of northeastern ridges of Lossan coal Leases.

Brazion Creek

Looking south-west



Southwestern slopes of the valley.

southwestern dip-slopes
central part of northeastern
ridge.

Conglomerate at top

SLOPES OF SW edge of valley

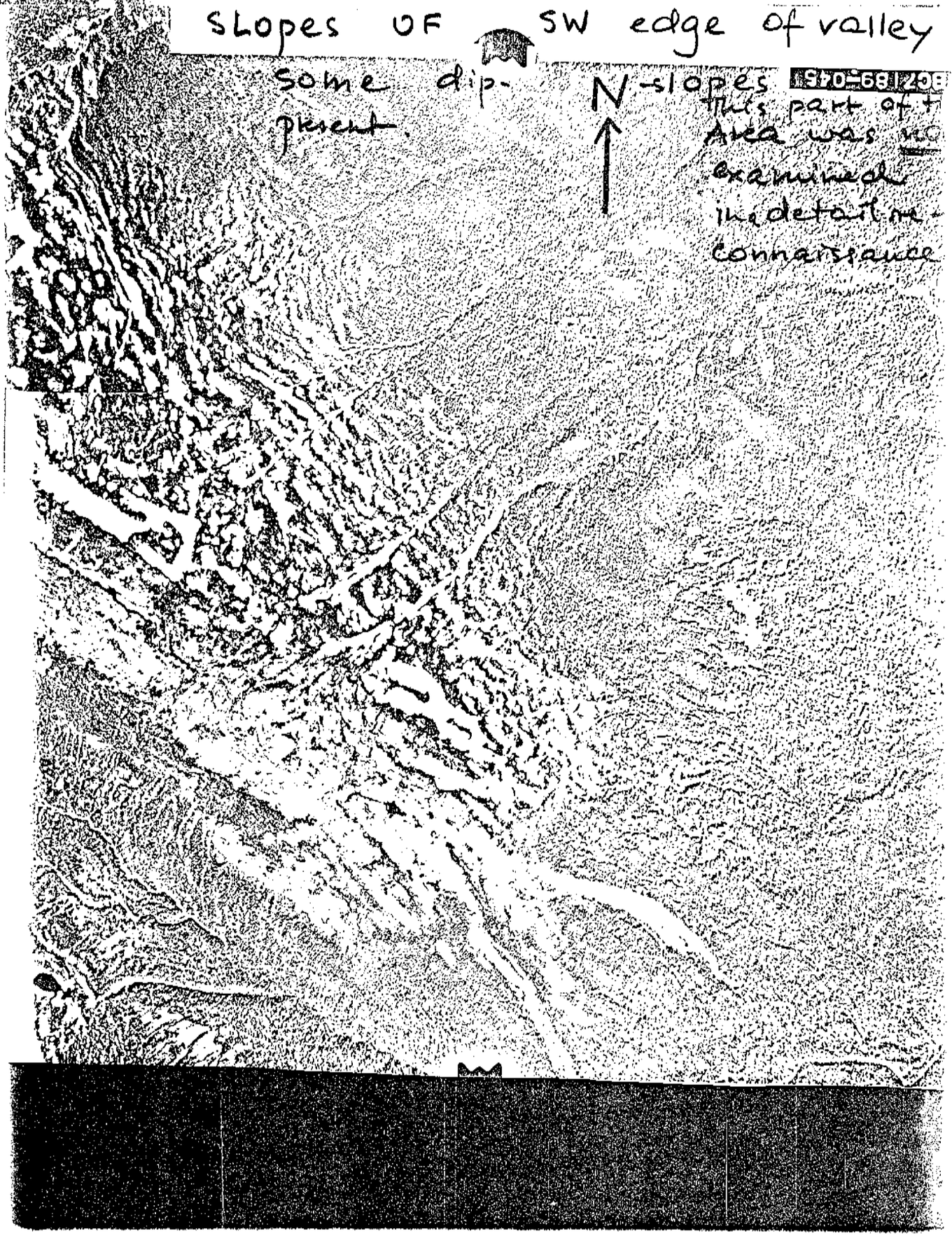
some dip-

present.

N

-slopes

This part of t
Area was no
examined
in detail re-
connaissance



ESSO MINERALS CANADA

Coal Department

500 SIXTH AVENUE SOUTHWEST, CALGARY, CANADA
(403) 267-1110 T2P 0S1

80 02 11

M. M. Suska
4009 Elbow Drive
CALGARY, Alberta
T2S 2K2

Dear Mrs. Suska:

Esso Minerals Canada is unable to option either your North Moberly or Lossan coal prospects of northeastern British Columbia due to the many, high commitments which you require. With this letter, we are enclosing your original submissions.

Thank you for allowing us to consider your property and if your requirements change or if you acquire other property in the future, please contact us.

Yours truly,

Bruce D. Vincent, P. Geol.

BDV/cyg

Encls.

File: 93-O-15 North Moberly
93-O-8 Beaudette Creek

ESSO MINERALS CANADA

Coal Department
500 SIXTH AVENUE SOUTHWEST, CALGARY, CANADA
(403) 267-1110 T2P 0S1

80 02 06

M. M. Suska
4009 Elbow Drive
CALGARY, Alberta
T2S 2K2

Dear Mrs. Suska:

Thank you for bringing to our attention the preliminary geological map of the Pine Pass area published by the G.S.C. We are returning your copy as we have ordered a copy for our files.

Yours truly,

Bruce D. Vincent, P. Geol.

BDV/cyg

Encl.

File: V93-0-10

M. M. Suska
4009 Elbow Drive
Calgary, Alberta, Canada T2S 2K2

Phones: (403) 243-6816, 269-3080
Telex: 610 821 6473 Canada
Cable: Suska, Calgary

7. Feb. 80,

Dear Mr. Jones,

Please find enclosed my only copy of a preliminary publication by G.S.C. which we talked about.

Part of GSC Open File 286 - available from Riley's Datashare

I apologize for the state it is in. The geology is not correct entirely but some structures are.

I would appreciate to have these papers back when you finish with them.

over.

930/10 -

MEMORANDUM

ESSO MINERALS CANADA

COAL DEPARTMENT

79 12 14

TO: Mr. L. K. Walton

FROM: B. D. Vincent

SUBJECT: Submission for Lossan's Coal Area, Northeastern B.C.

Please find enclosed the original copy of a submission given to us yesterday. Bruce Vincent and Hugh Jones have not read this submission but are aware of its arrival and have limited knowledge of the geology involved.

Please follow the normal procedure on our behalf and then return the original submission to us.

Thank you.

Bruce D. Vincent

BDV/cyg

File: B.C. General

MEMORANDUM

85 04 12

TO: File

FROM: J. Horgan

SUBJECT: Lossan Coal Licences - Meeting held between:
M.M. Suska, Consultant — N. Narsciso Esso.
L.A. Smith, Consultant — G. Ockert "
J. Horgan "

The meeting was convened on April 3 at the request of M.M. Suska who wished to show some new data pertaining to her licences.

The data consisted of tonnage calculations generated by L.A. Smith (see attachment). The premise for his calculations was to reduce the stripping ratio. The result of this being an unavoidable reduction in tonnage. He was able to demonstrate that 25.6 Mt of raw coal could be present within the subcrop at a stripping ratio of 5.0:1 BCM/raw tonne, 18-19 mt of this reserve captured within the Lossan Licence Block. This might result in 13.5 Mt of clean coal at a stripping ratio of 6.7:1 BCM/clean tonne from the Lossan Block.

To calculate these reserves he had placed highwalls on the cross-sections at a cutoff ratio of 10:1 by volume. The average seam thickness used was 8 m thus the highwall generated is 80 m (placed at 45 degrees).

There followed a discussion in general terms of the possibilities for increased tonnages. These included:

Tectonic overthickening of the number 1 seam.

Other mineable seams such as 5 seam and the contact seam.

Other mineable structures such as the North East Syncline and the Eastern Dipslope (seams 5 and contact).

A key consideration in seeking additional tonnages from seams other than seam one is coal quality. We have evidence from our marketing group and other sources that seam one is a very saleable product with ash of 16% and volatiles of 25.5%. Seam five has lower ash at 14% and also much lower volatiles at 21%. Seams stratigraphically lower than five are probably even higher in rank with correspondingly lower volatiles.

AXIS PIT

Section	Coal (T)	Waste (BCM)	Strip Ratio
N 5250	517	4035	
5000	908	7238	
4750	891	5453	
4500	974	7635	
4250	400	2000	
4000	400	2500	
2750	300	1500	
2500	300	1600	
2250	300	1600	
750	1357	3429	
Axis Pit Total	6347	36990	5.8

TOTAL QUANTITIES

Lossan Pit	13,994	58,674	
West Pit	5,323	31,458	
Axis Pit	6,347	36,990	
TOTAL	25,664 (raw)	127,122	5.0 (raw)
	19,248 (clean)		6.7 (clean)

PRELIMINARY CALCULATIONS FOR LOSSAN No. 1 SEAM

by L.A. Smith

LOSSAN PIT

	Section	Coal	Waste	Strip Ratio
N	0500	1565	3033	
	0750	1867	5675	
	1000	1911	6609	
	1250	1907	7704	
	1500	1874	10920	
	1750	300	1953	
	2000	255	1330	
	2250	240	1650	
	2500	300	1600	
	2750	300	1600	
	3000	300	1600	
	3250	300	1600	
	3500	300	1500	
	3750	300	1500	
	4000	300	1500	
	4250	300	1100	
	4500	300	1500	
	4750	300	1500	
	5000	400	1500	
	5250	450	1800	
	5500	225	900	
Lossan Pit Total up to N 5500		13994	58674	4.2

WEST PIT

N	0500	996	5500)	
	0750	300	1500)	
	1000	300	1200)	7.61
	1250	300	1500)	
	1500	0	0)	
	5000	1364	9878)	
	5250	1214	6421)	5.3
	5500	452	3152)	
	5750	397	2307)	
West Pit Total		5323	31458	5.9

High-grading of the number one seam and marketing without beneficiation was suggested as a method for cutting costs.

M. Suska also brought to our attention that the Canfor Logging Road has been upgraded as far as the Lossan Licenses and that a large portion of the licenses themselves have been cleared of timber.

The road is now rated for 50 tonne units and there is a load-out for sulphur from the Hasler Creek Gas Plant at the Hasler Creek BCR Railroad Crossing.

The exploration costs asigned by Gulf to the Lossan Licenses consist of:

$2.7M	Drilling
0.5	Audit
0.3	Off Property
$3.5M	TOTAL

Little new information useful to Engineering was forthcoming. Resources will therefore take all the data now available and make recommendations which are to be covered in a following memorandum.

JH:jlb
6393K
Attachment
xc: Attendees

MEMORANDUM

1985 04 01

TO: File

FROM: J. Horgan

SUBJECT: THE LOSSAN COAL LICENCES NORTHEAST B.C.

Introduction

The Lossan coal licences (comprising 2,643.32 ha) are situated on the west side of the Peace River coalfield south of the Pine River. The closest town of Chetwynd is some 60 km. distant by road.

The prospective coals underlying the property are found in the Gething formation of Lower Cretaceous age and are laterally equivalent to the coals on Esso's Falling Creek property. They are medium volatile bituminous in rank with some coking propensity though a high grade thermal product could also be realized.

The coals are contained in tight synclinal structures along a valley floor. Due to the steeply inclined strata surface mining must be carried out at relatively high stripping ratios.

The thickest most continuous seam is found close to the top of the Gething formation where it averages 8 m in thickness in the southern portion of the licences. The seam thins rapidly, however, to less than 2 m thick in the north.

.../2

Historical

November 15, 1979	Licences issued to Lossan Exploration Ltd. (M.M. Suska and partners)
December 13, 1979	Submission for option of Lossan coal licences to Esso Resources by M.M. Suska
February 11, 1980	Esso Resources declines option of Lossan (and North Moberly) Licenses
May 8, 1980	Gulf Canada Resources acquires option of Lossan block
1980 - 1982	Gulf Canada Resources carries out extensive exploration including an adit construction
May 8, 1984	The licenses reverted back to Lossan Exploration Ltd. after Gulf declined further interest
December 8, 1984	Sumitomo Corporation suggests possible market for the Lossan coal and encourages Esso's involvement on the licences
January 1984	Geological data acquired from M.M. Suska and property re-evaluation

The option on these licences was originally declined largely because of the many high commitments required. The annual option payment was to be 75 k$ and a 2% royalty on any production prior to deduction of Crown royalties. Initial consideration 140 k$.

Re-Evaluation

The re-evaluation has involved two visits to M.M. Suska where we were able to view and make notes from the 1980, 81 and 82 Gulf exploration reports that covered large licence holdings which include the Lossan block. Also available was a feasibility study completed by Norwest Consultants. The feasibility study was conducted on an area referred to as the Lossan Pit. Roughly 65% of the Lossan Pit falls within the Lossan Licence block and 35% lies outside on licences held by Gulf.

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Lossan Block Outside Pit Limits

The thickest most prospective seam occurs towards the top of the Gething formation. The seam averages 8 m thick in the pit but thins rapidly in the northern 1/3 of the Lossan Block to less than 2 m. The northern 1/3 of the Block was examined using sections 6000 N to 8250 N. (Fig 1) It was assumed that No. 1 seam averaged 2 m over the whole area. A rough 10:1 highwall was placed on the sections calculated simply thus.

$$2 \text{ m} \times 1.6 \text{ S.G.} \times 10 = 32 \text{ m} \ @ \ 45^{0}$$

The folding is more open at this end of the property, but because of the seam thining a recoverable in situ reserve of only 2.3 Mt resulted. In fact, Norwest considered the No. 1 seam uneconomic north of section line 6000 N.

A lower seam the No. 5 seam reaches mineable thicknesses but it was seldom intersected by drilling and was not considered. Gulf quotes 62 Mt for the in situ tonnage of No. 5 seam, but this is based on very little data.

It is therefore concluded that this portion of the Lossan block has little mining potential.

The Lossan Pit

The coal reserves are captured in three synclines which run roughly parallel in a northwest, southeast orientation. The synclines are doubly plunging which means they are roughly canoe-shaped with the coal subcrop forming closures at their southeast and northwest ends. The intervening anticlines are thrust faulted and eroded.

The mine area is thus subdivided into three pits which follow each syncline and which share their names; starting in the west with West Syncline, Lossan in the centre and Axis to the east.

The Lossan syncline contains the bulk of the reserve (62%) and would be mined to full depth between sections 0500 and 6250 N. Early years of mining will start at the south end where, due to the plunge, coal can be recovered at relatively low stripping ratios.

The pit will mine both limbs of the syncline which gives rise to high stripping ratios at the outset with the best ratios being found towards the base of the syncline. As an example on section line 1750 N the average stripping ratio is 7.3:1. The stripping ratio associated with the lower 140 m or 58% of the pit is 3.4:1 while the remainder is mined at 20.9:1.

.../4

The maximum depth reached in the Lossan syncline will be roughly 400 m. This will decrease northwards again to give lower stripping ratios in the later stages of mining.

The Axis Syncline has more steeply dipping limbs and is disturbed by a number of faults. The number 1 seam in the core of the syncline is overthickened reaching a true thickness of 35 m towards the south end of the pit. Despite this the coal has to be mined at an average ratio of 13:1. This is necessary to augment the reserve base at the lowest incremental ratio and in addition the excavation provides a conveyor location when the northern portion of the mine is developed. The pit will be mined to the base of the syncline from section line 0750 to 2250 N. Only the west limb is mined between 2500 and 3750N. From section line 4000-5500 N the area is again mined to full depth. Twenty-five percent of the reserves is contained in this pit.

The West Syncline is truncated along most of its western limb by a thrust fault and which truncates the #1 seam at depth. Thus, the #1 seam does not subcrop along the central portion of the western limb. It contains only 13% of the mineable reserves. It is mined to full depth between sections 0500 and 0750 N. Between sections 1000 and 2500 N the anticlinal portion shared with the Lossan syncline is mined. No mining is carried out northwards until section line 4750 N. From here it is mined as two small pits as far as section line 5750 N.

It has been assumed that only 5% of the waste removed will be glacial till. It is worth noting that the southern sections 0750 through 1250 which intersect the length of the Brazion Creek Valley show no till or fluvial deposits. These should be compared with section 1500 which has good drill control and shows till depths up to 30 m. The glacio-fluvial material is likely to increase into the Brazion Creek Valley floor and should perhaps be thickest on Section 1000 N. This would certainly have a negative impact on the low stripping ratio mining predicted in the early life of the mine.

Lossan Pit and Norwest Feasibility Study

Reserves:

On the second visit attention focused on the feasibility study. Table 1 represents the in situ reserves for the mine area measured between section lines 0250 N and 6750 N.

.../5

TABLE 1

Lossan Mine-Area
Summary In Situ Coal Reserves

Seam	Million Tonnes
1	112
5	62
2 3 4 6	124
TOTAL	298

Reserve Calculation Criteria

The reserve calculations were based on calculated true thicknesses for mineable seam sections. The criteria for determining a mineable section were as follows:

1. The mining section should consist of at least 60% coal.

2. The minimum true thickness accepted as a mining section was:

    a) 0.5 m where the true dip of the seam was less than 30^{o}
    b) 1.0 m where the true dip was greater than 30^{o}

3. Rock partings were included if:

    a) They comprised less than 40% of a mineable coal interval

    b) A rock split did not exceed a true thickness of 0.5 m or 1.0 m (where true dip was greater than 30^{o})* (Where rock partings constituted a true thickness interval equivalent to a mining section, they were considered as interburden waste and added to the overburden volume).

    c) The true rock interval thickness was not greater than either the true thickness of the overlying or underlying coal interval.

* Note added by author

.../6

See appendix I for a complete list of mining sections from each drillhole.

The study considered two mining scenarios one mining one million tonnes a year for twenty years and the other 3 Mt a year over the same period.

TABLE 2

Mining Quantities 1 Mt/yr X 10^3

Source	Raw Coal/t	Waste BCM	S/R BCM/t
Axis	1,623	6,616	4.08
Lossan	20,355	159,804	7.85
West	4,522	50,184	11.10
Ramp Development	-	22,750	-
TOTAL	26,500	239,354	9.03

TABLE 3

Mining Quantities 3.0 Mt/yr X 10^3

Source	Raw Coal/t	Waste BCM	S/R BCM/t Ratio
Axis Pit	19,789	183,694	9.28
Lossan Pit	49,565	485,573	9.80
West Pit	10,129	98,318	9.71
Ramp Development	-	46 077	
TOTAL	79 483	813 662	10.24

Notes:

1. The coal tonnages shown in the table reflect the following:

   a) 10% mining loss by weight
   b) 5% dilution by weight
   c) raw coal S.G. of 1.64 @ 6% moisture

2. Development waste includes volumes for ramp construction and the Brazion Creek diversion.

(See Appendix II for a sample calculation showing how the mining reserve is computed from the geological in situ volume.)

An economic evaluation using EMC criteria has been run using the mining quantities for the 3.0 Mt/yr. Table 4 shows the mining quantities and yearly production schedule.

TABLE 4

3.0 Mt/yr Mine (Unit X 10^3)

Production Period	Raw Coal t	Waste BCM	Stripping Ratio
Preproduction		3,500	N/A
Yr 1	3 972	20,520	5.17
Yr 2	4 013	25,788	6.43
Yr 3	3 980	33 079	8.31
Yr 4	3 952	38 686	9.79
Yr 5	3 985	46 377	11.64
Yr 6-10	19 872	288 057	14.50
Yr 11-15	19 871	247 349	12.45
Yr 16-20	19 838	110 306	5.56
TOTAL	79 483	813 662	10.24

13·56

The evaluation is attached and is summarized as follows:

1 Mt/year case — DCFR - No positive return

3 Mt/year case — DCFR - 7.9% with escalation

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Comments

To calculate how much of the Lossan Pit reserves are contained within the Lossan Block would require some detailed work, but a reasonable estimate can be derived by simply calculating land area which is approximately 65% Lossan and 35% Gulf. Thus it can be assumed that 51.66 MMt of mineable in situ coal are present in the No. 1 seam on the Lossan Block.

Due to the rapid plunge of the synclines in a northwesterly direction some of the best strip ratio coal is found in the southeast closures of the folds, south of Brazion Creek. This area is outside the Lossan Block. Thus for the 3 Mt/year mine plan, the first two years of production would be lost and the first ten years of production would be adversely affected. In addition, most of the waste material dumping areas are outside the licenses.

Quality

The quality of the number 1 seam looks attractive according to Sumitomo who indicated that a Utility in the U.S.A. would be very interested in buying a thermal product with the Lossan specifications. A Burn Test conducted by Canmet on a sample of thermal coal from the Lossan Pit Adit also gave favourable results (Appendix III burn test conclusions).

The coal from the No. 1 seam is a medium volatile bituminous coal. The seam has both thermal and metallurgical characteristics and is very similar in this regard to the correlative Brenda seam on Esso's Falling Creek property. The coal with coking propensity is found in the lower part of the seam and could possibly be selectively mined (see appendix IV).

The available proportions of the two products is not fully defined and since an attractive thermal coal can be produced by mining the entire seam both Gulf and Esso's evaluations are made on this basis.

Gulf worked to a target product with 14% Ash to meet market specifications and this would result in a relatively high yield (76%).

TABLE 5

Preliminary Specs NO. 1 seam Thermal Only Wt% A.d.b. Total Mositure (As shipped) 8.0%		Canmet Coal Analyses Lossan Bulk (Adit) Sample Dry Basis Wt % Moisture as Received 4%	
*Proximate Analysis		Proximate Analysis	
Inherent Moisture	0.94		
Ash	16.00	Ash	12.61
V.M.	25.50	V.M.	24.18
F.C.	59.40	F.C.	63.21
C.V. cal/gm	6900	C.V.	7325
S	0.3	S	0.32
FSI	1-2 1/2	FSI	1

* This table copied from Gulf's report contains an error. The proximate analysis adds to 101.84%.

The fuel ratio for this coal is 2.3:1 fixed carbon to volatile matter.

Mining Section

As mentioned above the seam appears to have two basic components a metallurgical lower portion and a thermal upper portion. These differences will be due largely to maceral constituents which in turn are controlled by the original environment of deposition and the finer details of swamp configuration. These controls are hard to predict and when added to the structural complexity found on the property they make for a very variable mining section.

It is therefore supposed that production of two products by selective mining would be complicated and costly.

TABLE 6

Petrographic Results Summary (Pearson)

Mining Section	ADIT 82-1 Channel Samples		
	ROMAX	REACTIVES	INERTS
Upper (Average)	1.12	45-77	54.23
Lower (Average)	1.00	73.27	26.73

.../10

In general, the seam appears to have an upper bench with three to six partings and a lower bench which is generally cleaner. The two benches are often separated by a major parting up to five meters in thickness.

With the minor folding and faulting associated with th steeply dipping beds this mining section is very variable indeed. The total interval ranges in thickness from less than a meter to 35 meters. The configuration of coal beds and parting material within the interval is correspondingly variable.

Conclusions

1) The property is small

2) The reserves are small

3) The structure is complicated

4) A large amount of exploration at considerable cost will be required to bring the reserve to a measured category

5) This exploration effort can be more fruitfully applied elsewhere

Recommendations

1) We should contact M.M. Suska and inform her that we are not interested in an option on her licences at this time.

Economic Evaluation (From notes supplied by Business Development)

The economic evaluation was run using the following assumption many of them are the same as those used by Gulf to provide a more direct comparison.

1) Calorific value at 8% as shipped Moisture 6790 cal/gm

2) All costs calculated in 1982 dollars for direct comparison with the evaluation conducted by Norwest consultants on the Gulf mine plan.

3) Project cost run as though it started in 1982 and commenced production in 1986.

4) Rail Costs $18.50/t in 1982 $
Port Costs $ 3.70/t in 1982 $
as supplied by Gulf

5) Contingencies 5-10% on Capital
0% on operating
same as Gulf

The study used 1984 reference coal price and 1984 corporate plan escalation.

Case 1 1 mt/year mine
DCFR - no positive return

Case 2 3 mt/year mine
DCFR - 7.9%

If the contingencies imposed by Gulf are removed and the operating and capital costs lowered the return can change as follows:

Costs Capital & Operating	DCFR
-15%	14%
-20%	16%
-25%	19%

Appendix Ib

MINING SECTIONS FROM #1 SEAM

SECTION	DDH	SEAM	DRILLED INTERVAL (m)	BCA Avg.	COAL/COAL & ROCK (m) TRUE THICKNESS
1500	80-19	1	182.05-196.52	22	2.06/5.42
	Vert.	1	196.52-214.19	20.68	5.61/6.24
		1	220.40-242.92	11.22	2.94/4.38
		1	244.93-253.35	44.96	5.63/5.95
		1	256.70-269.78	46.90	9.21/9.55
		1	275.93-277.08	44.78	0.81/0.81
		1	278-59-280.75	45.10	1.53/1.53
		1	284.70-286.40	44.90	1.20/1.20
					35.08
6500	80-25 (55^{o} SW)	1	48.47- 49.72	59.17	1.00/1.07
2000	80-28	1	239.29-240.89	70.69	1.04/1.51
	(Vert.)	1	248.20-256.34	65.38	5.29/7.40
		1	258.16-266.52	40.96	5.15/5.48
		1	268.27-273.29	30.13	2.24/2.52
		1	276.39-286.46	47.13	6.57/7.38
					24.29
1750	80-29	1	82.97- 85.78	35.96	1.65/1.65
	(Vert.)	1	93.13- 96.00	34.61	1.63/1.63
					3.28
3250	80-30 (72^{o} NE)	1	158.33-159.83	33.14	0.75/0.82
2750	80-33	1	12.96- 17.54	28.00	1.94/2.15
	Vert.		19.00- 26.21	18.27	1.96/2.26
					4.41
	8	1	87.30- 93.16	30.34	2.53/2.96
		1	101.25-103.56	35.15	1.02/1.33
		1	104.93-108.78	34.85	2.09/2.20
					3.53
		1	356.21-367.72	40.93	5.81/7.54

Appendix Ib
(continued)

MINING SECTIONS FROM #1 SEAM

SECTION	DDH	SEAM	DRILLED INTERVAL (m)	BCA Avg.	COAL/COAL & ROCK (m) TRUE THICKNESS
2750	80-36	1	319.56-326.75	63.06	5.29/6.41
	(Vert.)	1	331.18-335.32	60.41	3.41/3.60
					10.01
3250	80-38	1	208.73-214.66	46.48	3.87/4.30
	(Vert.)	1	249.53-260.04	44.99	6.67/7.43
		1	267.40-270.12	58.53	2.32/2.32
					9.75
7500	80-41	1	73.27- 75.25	34.80	0.77/1.13
	(Vert.)				
4250	80-42	1	53.75- 66.89	26.49	4.91/5.86
		1	167.76-170.52	72.34	1.93/2.63
3250	81-01	1	323.25-329.44	69.29	5.17/5.79
	(63^{o} NE)	1	333.64-338.88	73.34	3.63/5.02
					10.81
4250	81-02	1	305.52-319.51	56.01	8.59/11.60
	(Vert.)	1	323.00-327.03	56.10	2.82/3.32
		1	328.71-330.07	28.55	0.54/0.65
					15.57
3250	81-03	1	426.25-438.61	71.63	10.94/11.73
	(Vert.)				
3250	81-05	1	166.50-177.22	54.34	7.33/8.71
	(64^{o} NE)				
4250	81-06	1	186.99-192.19	28.61	2.22/2.49
	(Vert.)	1	193.39-199.99	25.29	2.72/2.82
		1	201.95-206.08	36.21	2.25/2.44
					7.75

Appendix Ib
(continued)

MINING SECTIONS FROM #1 SEAM

SECTION	DDH	SEAM	DRILLED INTERVAL (m)	BCA Avg.	COAL/COAL & ROCK (m) TRUE THICKNESS
5250	81-10	1	121.00-122.76	50.60	1.03/1.36
	(Vert.)	1	126.00-129.37	51.57	2.43/2.64
					4.00
5250	81-13	1	59.19-51.34	54.82	0.66/0.94
	65° NE	1	54.41-56.18	57.94	1.11/1.50
					2.44
7500	81-15	1	14.93- 16.97	69.44	1.59/1.91
	65° NE				
5750	81-16	1	137.98-139.33	45.93	0.92/0.97
	Vert.				
6500	81-17	1	134.22-135.70	50.38	0.87/1.14
	Vert.				
2750	81-18	1	45.70- 68.98	14.96	5.20/6.01
	65° E	1	70.90- 75.00	14.84	0.85/1.05
		1	78.96- 83.15	14.94	1.08/1.08
					8.14
		1	337.05-344.80	50.38	4.77/5.97
		1	347.65-349.93	46.36	1.45/1.65
					7.62
2000	81-20	1	215.91-220.19	59.03	3.53/3.67
	(65° E)	1	221.72-225.12	56.85	1.97/2.91
					6.58
2000	81.21	1	151.34-155.86	50.00	1.82/3.46
	(65° W)	1	170.39-174.16	50.52	2.05/2.91
		1	176.27-177.17	45.32	0.64/0.64
					7.01

Appendix Ib
(continued)

MINING SECTIONS FROM #1 SEAM

SECTION	DDH	SEAM	DRILLED INTERVAL (m)	BCA Avg.	COAL/COAL & ROCK (m) TRUE THICKNESS
3500	81-22 (65° E)	1	233.59-238.86	32.22	2.07.2.81
		1	245.49-246.52	43.58	0.71/0.71
		1	262.53-264.65	26.32	0.78/0.94
					4.46
		1	281.34-282.14	58.21	0.68/0.68
		1	296.03-298.43	43.10	1.39/1.64
		1	303.45-305.07	55.81	1.09/1.34
					3.66
1750	80-51	1	179.45-180.66	45	0.86/0.86
		1	181.42-184.25	44	0.86/2.00
		1	185.21-187.66	45	1.52/1.73
		1	188.03-198.58	45	7.11/7.46
					12.05
1500	80-08	1	96.50-114.00	40	7.58/11.25
1750	80-11	1	120.20-121.70	45	1.06/1.06
		1	133.60-139.00	45	3.82/3.82
		1	148.80-152.30	45	2.33/2.47
					7.35
1500	80-53	1	54.50- 60.75	13	0.96/1.41 Top of seam eroded
2000	80-54	1	102.35-105.19	7	0.35/0.35 Logging tool did not reach
		1	106.30-111.50	7	0.63/0.63 Base of seam
2250	80-56	1	305.20-309.03	84	3.61/3.81
		1	309.91-313.91	84	3.98/3.98
					7.79

Appendix Ib
(continued)

MINING SECTIONS FROM #1 SEAM

SECTION	DDH	SEAM	DRILLED INTERVAL (m)	BCA Avg.	COAL/COAL & ROCK (m) TRUE THICKNESS
2750	80-59	1	143.56-149.68	51	4.37/4.76
		1	152.21-157.25	51	3.92/3.92
					8.68
1500	81-06	1	167.20-173.65	27	1.63/2.93 Logged thru drill rods
		1	179.50-202.00	27	? /10.20
		1	206.50-210.50	27	? /1.82
					14.95

Appendix II

Sample calculation showing how the mining reserve is computed from the geological in situ volume.

S.G. - Air Dried Basis

A linear regression of an Ash versus S.G. matrix gives the following relationship.

$$\% \text{ Ash (adb)} = 98.62 \text{ S.G.} - 124.431$$

Substitute in situ ash of 27.17% and S.G. = 1.5367. Air dried moisture is assumed to be 1.0%.

S.G. Delivered Moisture

Next the S.G. is calculated at 6% total moisture.

1 m^3 of coal @ 1% moisture weighs = 1.5367 tonnes
1 m^3 of dry coal weighs 0.99 X 1.5367 = 1.5214 tonnes
1 m^3 of coal @ 6% moisture weighs $\frac{1.5214}{0.94}$ = 1.6185 tonnes

Thus coal with a 6% total moisture has S.G. 1.6185

Loss and Dilution

	Weight	Volume (Cu m)
In Situ @ 6% Moisture	1.6185	1.0000
Less mining loss(10% of Wt.)	0.1619	0.1000
Recovered Coal	1.4566	0.9000
Plus Dilution (5% by Wt.)	0.0809	0.0385
Total Delivered	1.5375	0.9385

Thus the S.G. of delivered coal is calculated.

$$1.5375/0.9385 - 1.6383 \text{ or } 1.64$$

This S.G. is used for run-of-mine coal (ie. delivered to plant).

Volume recovered as coal is 93.85% of the in situ computed volume.

Using the volume recovery of 98.85 and S.G. of 1.64 the mineable reserves are computed as follows:

In situ computed Volume X 1.64 X 0.9385 = Mineable Reserve

Canadian Centre for Mineral and Energy Technology

Conclusions extracted from a "Pilot-Scale Combustion Trials on Goodrich Coal", G.N. Banks, J.K. Wong and H. Whaley, Division Report, ERP/ERL 84-2 (CF).

Although the Goodrich coal flowed readily with acceptable ignition, flame stability and combustion characteristics, it was difficult to maintain a constant feed size input, without frequent adjustment to the pulverizing unit. It was surmised that this variability was due to an unusually high fluctuation in the inherent grindability of the coal.

The combustion efficiency achieved with this coal was in excess of 99% for all trials and in the boiler configuration with the longest residence time the average combustible content of the fly ash was 2%, which compared favourably with the reference coal.

The sulphur dioxide emission rates were well within the current Canadian national emission guidelines, but to obtain nitrogen oxide emission rates within these recommended guidelines a properly designed combustion system to lower the maximum flame temperature and the volume of excess combustion air would have to be utilized.

The tendency of the coal ash to slag on high temperature refractory surfaces is quite evident and is not consistent with the low to medium slagging propensity predicted from the analytical data on the original coal sample. However, the tendency for the coal ash to produce superheater fouling problems is low, which is consistent with the analytical data and should be effectively controlled by routine soot-blowing.

Appendix V

Washability Summary No. 1 Seam

Ash	Vols. dmmf	S	FSI
6.5%	27-30%	0.3	4 - 6

Max Fluidity 40-300 ddpm dilation 30-100%

Mean Ro 1.15 Range 1.07-1.28

Total Reactives average 64.04%

Upper 2/3 rds No. 1	FSI 2.6 S.G. 1.65	FSI 3.2 S.G. 1.4
Lower 1/3 rd No. 7	FSI 4 S.G. 1.65	FSI 5.7 S.G. 1.4

Three samples from lower portion tested at maximum fluidity
2721, 1578 and 1365 ddpm

Goodrich Bulk Sample Tests

Coal Quality Summary

	B2 Sample (Entire Seam Mined) a.d.b.			B3 Selectively Mined a.d.b.		
	Thermal 14% Ash	Met 9.5% Ash	Met 6.5% Ash	Includes Rejects Thermal 14% Ash	Met 6.5 Ash	Thermal 14% Ash
A.d. Moist	5.9	5.5	7.4	7.4	4.8	6.0
Prox. Analy						
Residual M	1.8	0.8	0.8	1.5	0.9	0.6
Ash	13.3	9.3	6.3	13.8	6.3	12.7
Vol	23.7	24.4	24.9	23.1	29.1	23.3
			Vdmmf	26.22	30.9	25.92
FC	62.2	65.5	68.0	61.6	63.7	63.4
S	0.32	0.34	0.32	0.3	0.32	0.30
FSI	2	2	2.5	2	7	1
Fuel Ratio	2.62	-	2.73	2.7	-	2.72
CV	7245	7589	7867	7146	7954	7286
HGI	62	65	61	62	69	60
S.G.	1.36	1.37	1.33	1.39		1.40
P in Ash	0.08	0.08	0.027	0.09		0.09
Cl	0.02	-	-	0.01		0.04
N	0.95	0.92	1.02	0.81		
Dilation						
Soft Temp.	no test	404°C	407°C	no test	383	no test
Max. Temp.		-	-		461	
Contr Temp.		20% @ 500°C	19% @ 491°C		22% @ 431°C	
Max. Dil.		-	-		32	
G. Factor		-	-		1.017	
Fluidity						
Start Temp.		1 ddpm @ 440°C 2 ddpm @ 460°C 0 ddpm @ 491°C	1 ddpm @ 448°C 2 ddpm @ 460°C 0 ddpm @ 488°C	no test	1 ddpm @ 427°C 333 ddpm @ 462°C 0 ddpm @ 495°C	no test
Clean Coal Yield	86.7	78.3	66.7	82.2	21.7	100%

Bl Sample Entire Seam Oxidized

a.d.b.

Sample ID	3617
PROX	
Residual Moist	3.8
Ash	13.4
V.M.	28.0
F.C.	54.8
S	0.24
CV	5882
Fuel Ratio	1.96
H.G.I.	98
S.G.	1.49
Clean Coal Yield	44.6

Appendix VII

Petrographic Results Summary (Pearson)
ADIT 82-1 Channel Samples

Stations Taken At Intervals Along Adit		Reflectance RO Max.	Reactions %	Inerts %
CS-00	Upper	1.13	49.3	50.7
	Lower	0.98	80.4	19.6
CS11	Upper	1.10	42.9	57.1
	Lower	1.01	69.8	30.2
CS28	Upper	1.12	45.1	54.9
	Lower	1.02	69.6	30.4
AV	Upper	1.12	45.77	54.23
	Lower	1.00	73.27	26.73

Statement of Costs

Salaries ↓	~~5 x 370~~ / ~~3 x 390~~	2960
Travel		40
Interdepartment Charges		200
Office Overhead @ 20%		640
TOTAL		3840

SUMMARY REPORT

LOSSAN COAL MINE AREA
PEACE RIVER COALFIELD
BRITISH COLUMBIA
CANADA

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LOOKING SOUTH-SOUTHWEST
AT THE
LOSSAN MINE AREA

SUMMARY STATEMENT

Lossan Mine area contains In-situ reserves of more than 225 million tonnes of coal concentrated in an area of approximately 2,500 hectares. The coal is in the Gething formation of Lower Cretaceous age.

The mineable coal from No. 1 Seam alone in southern two-thirds of the property is estimated by drilling at more than 50 million tonnes. The mineable coal from No. 1 Seam in the remaining one-third of the property is yet to be estimated. The mineable coal from other seams, and particularly from No. 5 Seam in the entire Lossan property is also to be estimated. The coal has been identified by Gulf as a high quality medium to high volatile bituminous thermal coal - although part of the coal could be mined as metalurgical coal.

The British Columbia Railway is 12 kilometres to the north and the total distance from the Lossan Mine site to Prince Rupert is 1,018 kilometres. A major power transmission line is also 12 kilometres to the north. The town of Chetwynd is within commuting distance from the mine site.

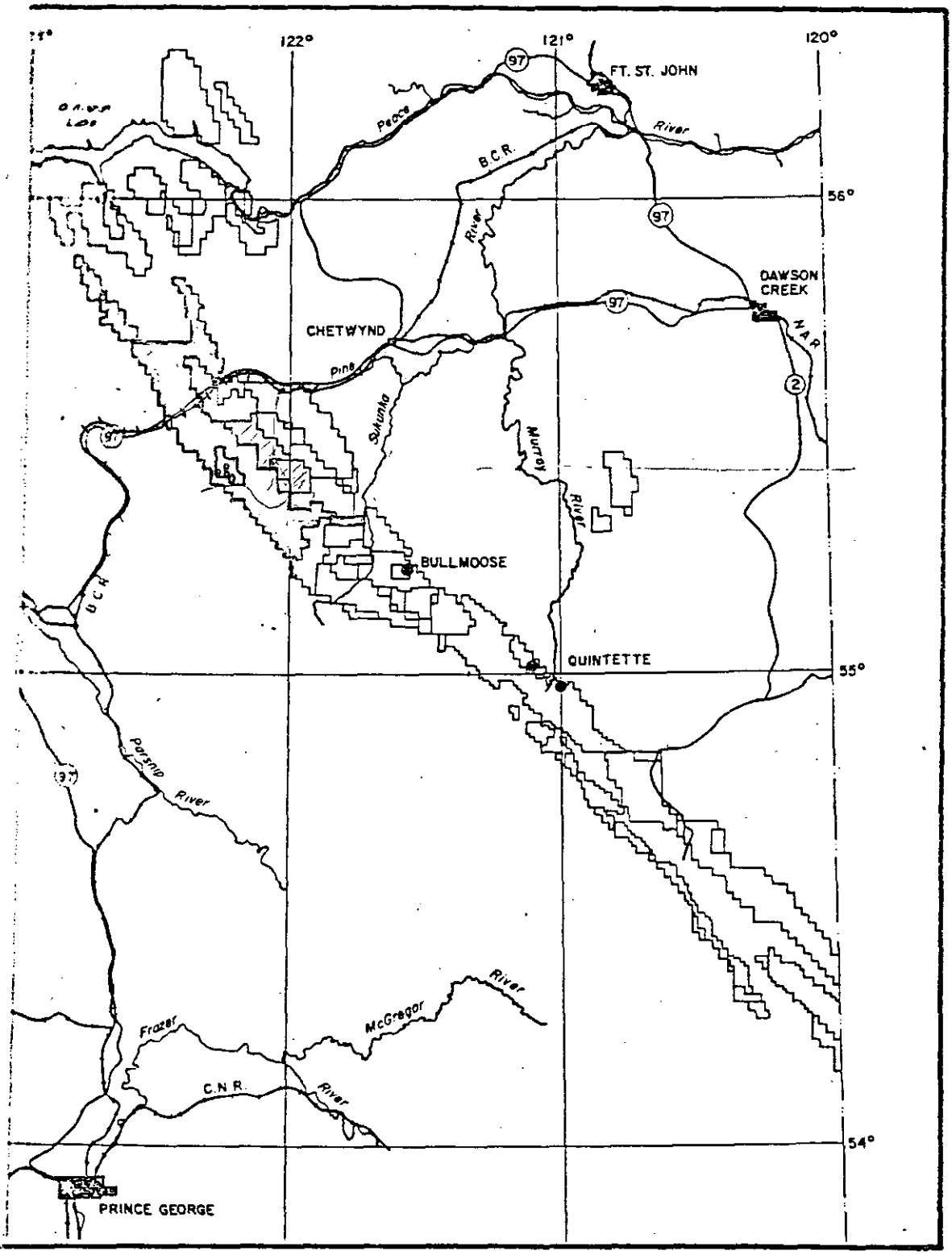
The Lossan Coal Licences are controlled 100% by Lossan Exploration Ltd., a private company incorporated in British Columbia.

The Summary Report which follows is based on reconnaissance survey in the field by the writer (1979) and on work by Gulf Canada Resources Inc. (data from 1980 to 1983).

M. Suska

Calgary, September, 1984. M.M. SUSKA, P.GEOL.

NOTE: Pages taken directly from Gulf Study (1982) are indicated with the letter "G" in the upper right hand corner.



LOSSAN MINE AREA

PEACE RIVER COALFIELD

COAL MINES (UNDER CONSTRUCTION)

FIGURE 2

LOSSAN COAL PROPERTY

PEACE RIVER COALFIELD
(Modified After Gulf Map)

WORK TO DATE AND WORK COMMITMENTS

The Lossan area was reconnaissance mapped by M.M. Suska over the period of May to July, 1979, when it was established by M.M. Suska that coal-bearing Gething strata outcrop in the area (previously mapped as Minnis group by GSC). Subsequently during 1980 to 1982, Gulf Canada Resources Inc. conducted extensive mapping and drilling, particularly of the southern Lossan area and the immediate vicinity (see Fig. 7-2). A total of approximately 8,000 metres were diamond drilled and 6,000 metres were rotary drilled; an adit was completed; bulk samples were taken and a combustion test was run. A preliminary feasibility study pertaining mainly to the southern part of the Lossan Mine area was completed in November, 1982. The combustion test results were received in May, 1984. Complete data on this work is held by Lossan Exploration Ltd.

The work commitments to the British Columbia Ministry of Energy, Mines and Petroleum Resources are satisfied until November 15, 1987. Subsequent work commitments are approximately Rental 6,600.00 $132,300.00 a year, unless a Holding Lease is applied for. If granted, these commitments would be postponed for the period of the Lease.

HISTORY

Lossan coal licences were applied for at the British Columbia Ministry of Energy, Mines and Petroleum Resources on May 18 and May 23, 1979, by M.M. Suska on behalf of Lossan Exploration Ltd. and were issued on November 15, 1979, to Lossan Exploration Ltd. The licences were optioned to Gulf Canada Resources Inc. on May 8, 1980. The option expired on May 8, 1984, and the licences reverted back to Lossan Exploration Ltd. in their entirety.

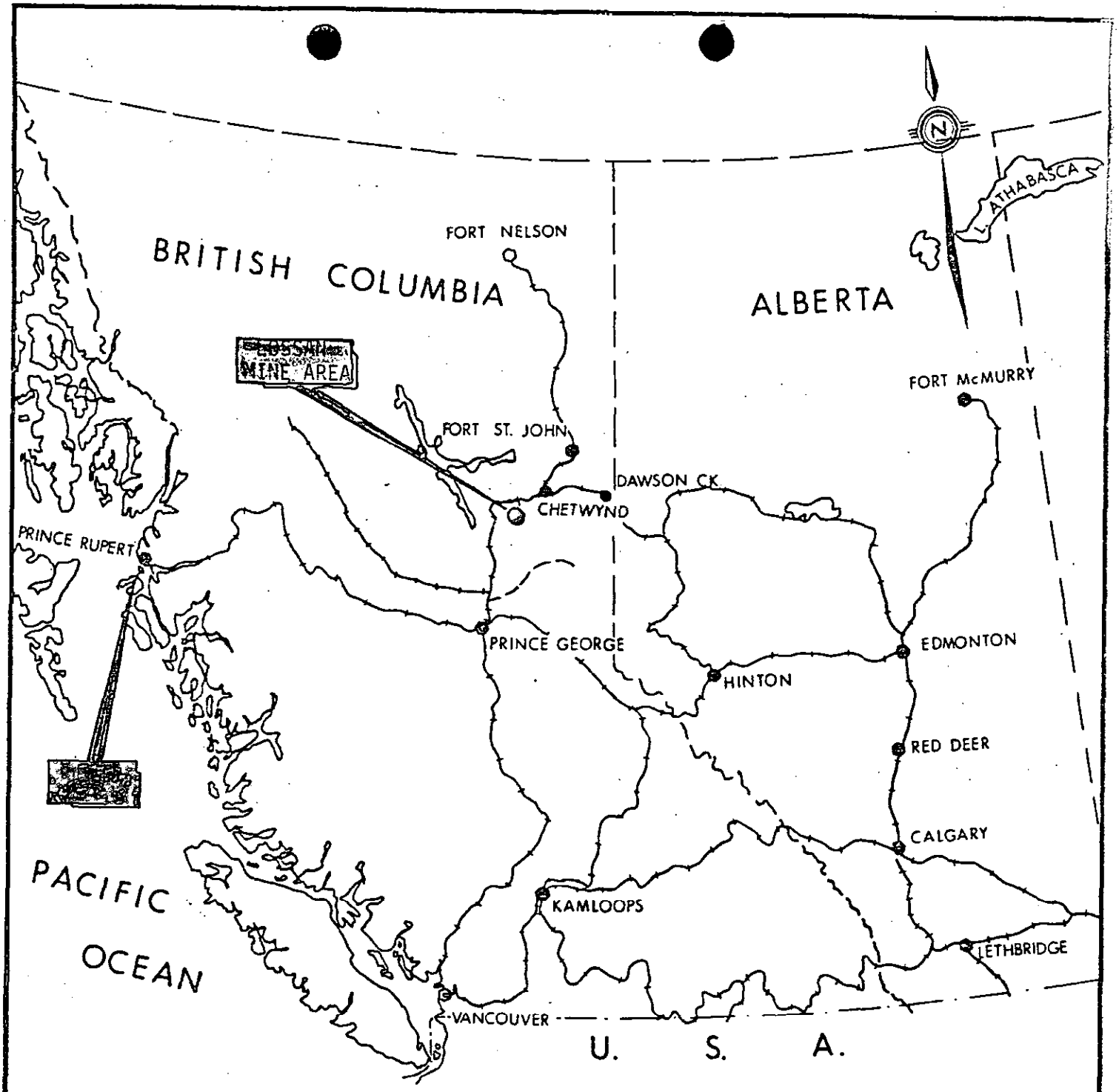
AREA AND ACCESSIBILITY

The Lossan Mine area contains nine Coal Licences, Numbers 5870 to 5878 inclusive, a total of 2,643.32 hectares. The main Mine area is a valley with average elevation of 4,000 feet.

The Lossan Mine area is situated 48 kilometres southwest of the town of Chetwynd in the Peace River Coalfield of Northeastern British Columbia, Canada.

The Lossan area lies 12 kilometres south of the British Columbia Railway and of the John Hart Highway (see Fig. 2). Present access is by 44 kilometres of excellent, somewhat "round-about", all-weather forestry road. In the future, present access could be shortened and upgraded, or a new, shorter access could be developed. Logging roads and roads built by Gulf Canada Resources Inc. traverse the south part of the Lossan valley area. A major power transmission line parallels the railway.

All-weather primary and secondary roads link the area to the established community of Chetwynd which eliminates the need for construction of a new town to house mine personnel.



REGIONAL LOCATION MAP

FIGURE 1

Modified After Nowwest

GEOLOGY

Regionally, the Lossan Mine area lies along a northwest-southeast trending synclinal belt, many miles long, which extends as far northwest as the Peace River valley. The synclinal belt contains mainly Lower Cretaceous sediments. The coal-bearing beds of the Gething formation outcrop repeatedly along the axis of the belt. (First reported by M.M. Suska in the Northern Miner, September, 1979. The area was previously mapped as marine Minnis formation by GSC.). Regionally, the synclinal belt has undulating plunge along the strike - resulting in repeated "basin and dome" structures complicated by subsidiary folding and faulting - mainly along this strike.

The geology of the Lossan "basin", as interpreted by Gulf, is illustrated on Figure 6-3. The Lossan Mine area contains four major synclinal trends complicated by faulting in the central valley area and where → dip-slopes along the northeastern slopes area. The coal-bearing Gething formation is involved in these structures (see Geologic Map and Cross-Sections). The ridges that bound the valley further along the northeast are made of impressive series of Bullhead Conglomerates (see aerial photo-mosaic) - referred to as the Dresser formation by Gulf geologists. The stratigraphic column adopted by Gulf geologists describing the sediments present in the Lossan Mine area is shown on the page with Geological Cross-Sections.

COAL SEAM STRATIGRAPHY

Lossan No. 1 Seam

The Lossan No. 1 Seam, located 40 m below the contact between the Gething and Bluesky Formations (Cross-Sec), is the only seam that is being considered for mining in the Lossan mine area at present. Generally, the thickness of the mining section averages 8.66 m, but faulting has thickened the No. 1 Seam to as much as 35.08 m in some places. The No. 1 Seam includes approximately 86% coal on the average.

Depositional and/or structural thinning of the No. 1 Seam occurred along the eastern limb of the Lossan Syncline towards the northern end of the pit area; this is shown by drillhole DDH 81-10, in which the total seam thickness is only 4 m. The stratigraphic and structural correlation of the No.1 Seam within the Lossan Syncline is reliable but further drilling is required in the areas north of DDH 81-10 and south of Brazion Creek.

Outside Lossan Block

Lossan No. 2 Coal Zone

The second coal zone within the Gething Formation has been designated the No. 2 coal zone, which lies approximately 40 to 50 metres below the No. 1 Seam. This zone is generally one to two metres thick and has not been included in the reserve calculations

Lossan No. 3 Seam and No. 4 Seam

The Lossan No. 3 and No. 4 Seams lie 90 and 100 metres respectively below the No. 1 Seam. The average thickness of these seams is in the order of 1 metre and they have not been included in the reserve calculations (Section on p. 7). Further drilling will be required to confirm the continuity of these seams within the Lossan Mine area.

Lossan No. 5 Seam

The Lossan No. 5 Seam lies within the middle Gething strata some 120 m below the No. 1 Seam. The average thickness of the No. 5 Seam is approximately 3.6 m based on several trenches and drillhole intersections.

The No. 5 Seam approaches the surface in the northern part of the mine are due to the plunge of the synclinal structures in which the seam lies. A structure contour map of the No. 5 Seam is presented in Gulf Study. Additional drilling is necessary to evaluate the potential of the No. 5 Seam in areas outside those which were previously drilled. Reserves of the No. 5 Seam are discussed on p.7.

Lossan No. 6 Seam

The Lossan No. 6 Seam lies approximately 50 to 60 m below the No.5 Seam. The No. 6 Seam is generally less than 3 m thick and has not been included in reserve calculations

Lower Seams*

Coal seams of significant thickness are also present within and above the conglomeratic sequence (referred to as the Dresser formation by Gulf) along the upper dip-slopes of the northeastern-most Lossan area.

* Comment by M.M. Suska

IN SITU RESERVES OF THE LOSSAN MINE AREA

Total in situ resources in the Lossan No. 1 and No. 5 Seams are estimated to be 174 million tonnes in the Lossan mine area. Of these resources, approximately 112 million tonnes in the No. 1 Seam have been identified as in situ mineable reserves; the reserves of the No. 5 Seam requires further exploration and have not been included in this preliminary feasibility study due to their inferred level of geological confidence. Table 7.2 summarizes the in situ mineable reserve of the No. 1 Seam.

The reserves of the Lossan mine area lie in three synclines: The Lossan Syncline, which forms the largest reserve block, contains about 54 million tonnes of coal in place (Table 7.2). The Axis Syncline is estimated to contain 31 million tonnes. An additional 27 million tonnes of coal may be available in the Third Syncline, but these reserves have a lower level of confidence at present and must be confirmed by future exploration drilling aimed at testing seam thicknesses and the faulting of the western limb.

A significant factor to be considered is the potential for the discovery of yet undetected pods of fault-repeated coal during future exploration. These would increase the economically mineable resource-base of the Lossan area. The west limb of the Axis Syncline (cross-section 3250) is considered to be a probable location for undiscovered pods.

The No. 1 Seam is considered to have a mineable strike-length of about 5750 m at present. This may change should future drilling determine a different rate of plunge than the current interpretation.

The reserves of the No. 5 Seam lie a short distance northwest of the No. 1 Seam reserve area (Figure 6.5). Approximately 61 million tonnes of coal in situ may be present in that area within the No. 5 Seam, but further drilling is needed to confirm seam thicknesses and the depth of the structure. This area of No. 5 Seam reserves might constitute a separate open-pit mining area (cross-sections N6000 to N9500).

RESERVE CALCULATION METHODS FOR THE LOSSAN MINE AREA

The geological reserve was calculated following the compilation and interpretation of the geological data. All data collected during 1980 and 1981 were incorporated. Cross-sections at a scale of 1:5000 were drawn at 250 m intervals through the mine area, perpendicular to the baseline and the regional strike. A total of 39 cross-sections were constructed to cover the entire Lossan mine area (Figure 7.2);

TABLE 7.2
SUMMARY OF IN SITU COAL RESERVES
OF THE
LOSSAN MINE AREA

Includes Portions outside Lossan Block

LOSSAN NO. 1 SEAM

Section Line numbers ?

SYNCLINE (from east to west:)	CROSS-SECTIONS		VOLUME (m^3)	S.G 1.55 TONNES
Axis	0750N - 5500N	Synclines run // to each other	20 000 000	31 000 000
Lossan	0500N - 6500N		35 000 000	54 000 000
Third	0500N - 5750N		18 000 000	27 000 000
TOTAL			73 000 000	112 000 000
LOSSAN No. 5 Seam	0500N - 9000N			61 000 000
LOSSAN Seams 2, 3, 4 and 6 Seam	0500N - 9000N		124 000 000	
TOTAL				298 000 000

*Additional substantial coal reserves of Lossan No. 1 Seam and No. 5 Seam (and other seams) are probably present along the west limb of Axis Syncline (see previous paragraph); along the narrow Fourth Syncline, to the northeast of the Axis Syncline; and along the dip-slope areas in the northeast. These regions have not been drilled to date.

Additional possible coal reserves exist also in the lower sediments mentioned on Page 6 .

*Comment by M.M. Suska.

COAL QUALITY

COAL QUALITY SPECIFICATIONS - LOSSAN NO. 1 SEAM

The Lossan No. 1 Seam is a bituminous coal with both coking and thermal properties. Review of all available coal quality data, and subsequent computer case-studies of the washability characteristics, indicate that both a metallurgical and thermal coal product could be obtained from the No. 1 Lossan Seam.

Specifications for several possible products are compared in Table 8.1. These include preparing two products from the seam (Cases A and B), or preparing a thermal product only (Case C). The Case C option is examined in detail in Volume 4 of this preliminary feasibility study. Product qualities are compared in Table 8.2.

Thermal coal produced from the No. 1 Seam would be of high quality and meets the Japanese Coal Development specifications (Table 8.3). The No. 1 Seam has a medium to high volatile matter content, with a low fuel ratio of 2.3. For a product with a low ash content of 14%, the calorific value would be approximately 7100 cal/g. The ash fusion temperatures exceed the required initial deformation and fluid temperatures in an oxidizing atmosphere (Table 8.2).

The washability data indicate that a metallurgical coal could also be produced from the lower portion of the No. 1 Seam. Its quality would be good: low ash (6.5%); medium volatile 27 to 30% dmmf basis); low sulphur (less than 0.3%); free swelling index (FSI) of $\sim$ 6; maximum fluidity of 40 to 300 ddpm; and dilatation of 30 to 100% (Table 8.2).

Petrographic studies of 14 Goodrich coal samples indicate that the lower portion of the No. 1 Seam would produce a strong metallurgical coke. The mean maximum reflectance values average 1.15 and range from 1.07 to 1.28; the total reactives content averages 64.04%.

The Lossan No. 1 Seam has a Hardgrove Index of 64, which indicates that it is relatively harder than most other Canadian coking coals, and thus would produce less fine material during handling.

TABLE 8.1

POTENTIAL YIELD OPTIONS
(On a dry, mineral matter free basis)

	Ash	Yield
Met and Thermal Product (Case A)		
Metallurgical	@ 6.5%	18%
Thermal	@ 14%	55%
TOTAL		73%
Met and Thermal Product (Case B)		
Metallurgical	@ 6.5%	18%
Thermal	@ 16%	59%
TOTAL		77%
Thermal Product Only (Case C)	@ 14%	76%

PRODUCT SELECTION

Although either a thermal product, or a thermal and metallurgical coal combination, can be produced from the Gething No. 1 Seam, the available proportions of these products have not yet been fully defined. Since the entire seam will produce a good quality thermal product, it was decided to use a single thermal coal product as the basis for this study.

Recent market evaluations have demonstrated that 14% product ash (adb) thermal coal is marketable. A very efficient plant yield can be achieved at this product ash value; therefore, a 14% product ash was adopted as the target specification for this study.

* Another alternative should be considered of mining the Lossan coal as raw thermal product, or as upgraded raw thermal product. This is in view of the high calorific value and high quality of Lossan Seam No.1 coal as indicated by core data and particularly by bulk samples data and by just recently received combustion test results. *

* Comment by M.M. Suska.

TABLE 8.2

PRELIMINARY SPECIFICATIONS OF COAL QUALITY FOR THE LOSSAN NO. 1 SEAM
(air dried basis)

Items	Coking and Thermal		Thermal Only
	Coking	Thermal	
Total Moisture (As Shipped %)	8.0	8.0	8.0
Proximate Analysis			
Inherent Moisture (%)	0.94	0.94	0.94
Ash (%)	6.50	14.00	16.00
Volatile Matter (%)	29.00	25.50	25.50
Fixed Carbon (%)	63.50	59.49	59.40
Calorific Value (cal/g)	7800	7100	6900
Total Sulphur (%)	0.3	0.3	0.3
Fuel Ratio	2.3	2.3	2.3
Free Swelling Index	4 - 8	1 - 2½	1 - 2½
Maximum Fluidity (ddpm)	40 - 300		
Total Dilatation	30 - 100		
Ash Fusion Temperature			
Softening Temp. (°C)		1350	1350
Fluid Temp. (°C)		1450	1450
Nitrogen (%)		1.28	1.28
Na_2O in Ash (%)		0.91	0.91
Base/Acid in Ash		0.27	0.27
Hardgrove Index		64	64
Volatile Matter (dmmf) (%)	31.0	30.0	30.0

COAL QUALITY SPECIFICATIONS - LOSSAN NO. 5 SEAM

The Lossan No. 5 Seam is a low volatile bituminous coal. The volatile content ranges from 20 to 26% on a dry mineral matter free basis. The coal quality presented in Table 8.3 is based on the average of three data points only.

The average FSI was only 1.73 at a 5% ash level. Further studies will be required to test the possibility of using this coal as a blend with other coals or as a source of formed coke material.

TABLE 8.3

QUALITY OF THE LOSSAN NO. 5 SEAM AS A THERMAL COAL

		JCD Specifications
Total Moisture	8.0%	Maximum 10%
Inherent Moisture	1.4%	
Ash	14%	Maximum 20%
Volatile Matter	21%	
Fuel Ratio	3.1	Maximum 2.5
Calorific value (Cal/g)	7100	Minimum 6200
Total Sulphur	0.45%	Maximum 1.0%
Ash Fusion Temperature		
S.T.	1270	Minimum 1200°C
F.T.	1350	Minimum 1300°C
Na_2O in Ash	1%	0.1 - 3%
Base/Acid in Ash	0.44%	
Hardgrove Index		Minimum 45
Chlorine in Coal	0.049%	Maximum 0.05%

MINING QUANTITIES

Preliminary calculations within the southern two-thirds of the Lossan Licences area and limited to Lossan No. 1 Seam only, utilizing cross-sections submitted by Gulf, were done by L.A. Smith of L.A. Smith and Associates Ltd. These calculations indicate a quantity of over 20 Million tonnes of raw coal mineable at strip-ratios of less than 5:1 (waste BCM x 10^3 to raw coal t x 10^3). It is anticipated that this quantity and the strip-ratios can be considerably improved by incorporating the reserves of the remaining northern one-third of Lossan's area; incorporating the reserves of other outcropping seams - and particularly of Lossan No. 5 Seam; and by incorporating other "pods" of coal, as yet not fully explored, as mentioned in the Gulf report and in the comments of M.M. Suska.

(The calculations for the strip-mine plans submitted in the Gulf Study of 1982 are applicable only to portions of the Lossan Coal Licences area:

Eg. The mine plan for 26 million tonnes of coal over 20 years "extracts only a portion of the reserve"* from the southern most one-sixth of the Lossan Mine area, ie. south of Section N3000. (See Fig 6-3 & 7-2).

Another mine plan for 79 million tonnes of coal over 20 years extends over two-thirds of the Lossan area only, ie. south of Section N6250. Both plans utilize Lossan No. 1 Seam only.)

* p 1-1, Vol. 3, Gulf Study 1982

To date the Lossan Mine area is the only area of the Goodrich property where sufficient exploration has been conducted to place coal into the category of reserves.

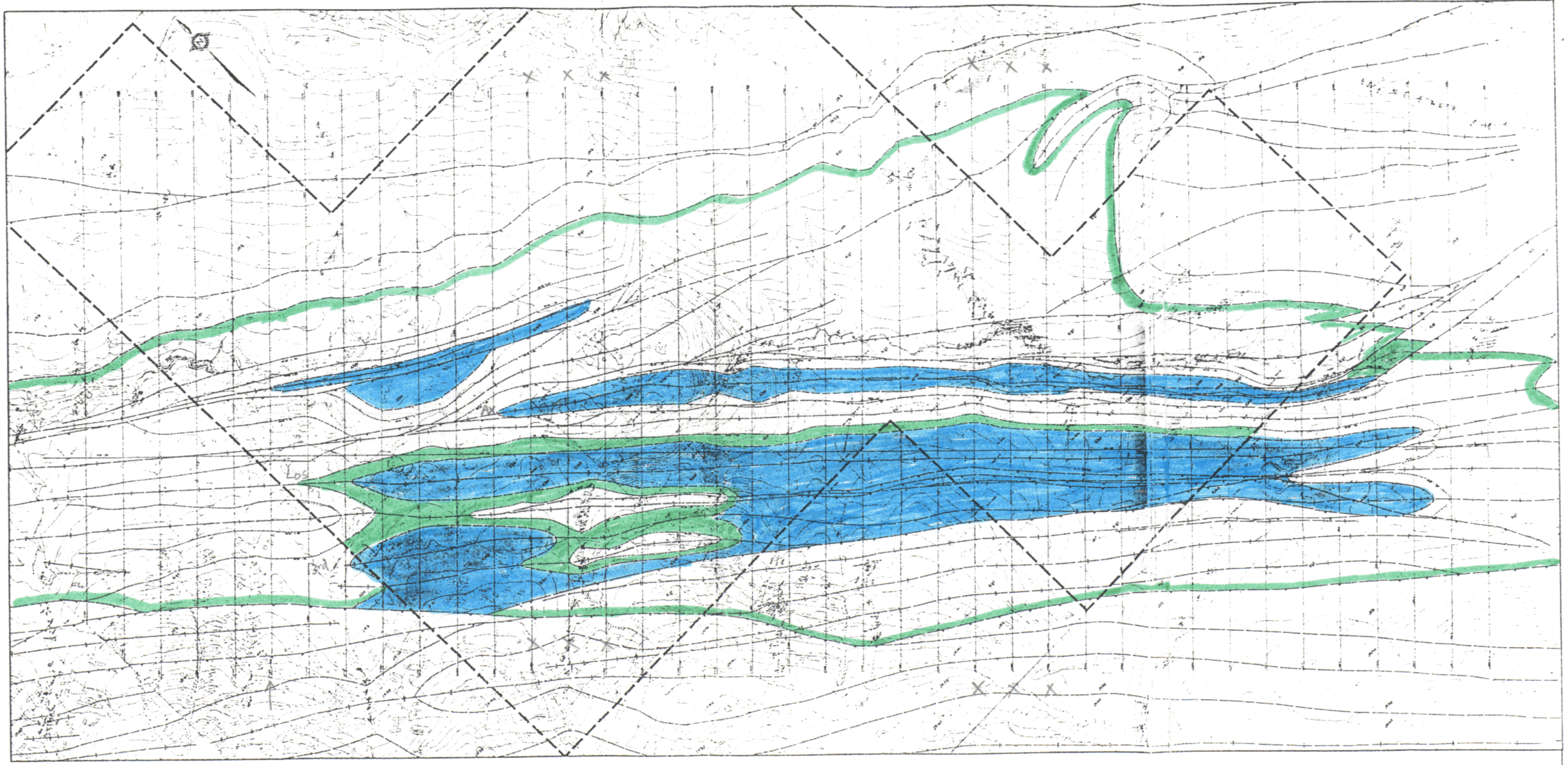
SUMMARY OF THE RESERVES OF THE GOODRICH COAL PROPERTY

Lossan Mine Area :	Reserves
Total In-situ Resources	298 million tonnes
South of Section N6000 - Seam No. 1 Only:	
Portion of the Resources in the Mine Plan	112 million tonnes
Mined Raw Coal	80 million tonnes
Clean Coal Produced	60 million tonnes

Quality Summary

Coal from the Gething No. 1 Seam in the Lossan Mine area has been identified as a medium to high volatile bituminous coal. A high quality thermal coal can be produced from this property.

N 8000 N 7000 N 6000 N 5000 N 4000 N 3000 N 2000 N 1000



0 500 1000 1500m

TABLE OF FORMATIONS

Kmb	MOOSEBAR FORMATION	JKb	BRENOT FORMATION
Kbs	BLUESKY	JKmc	MONACH FORMATION
Kgt	GETHING FORMATION	JKbp	BEATTIE PEAKS FORMATION
Kdr	DRESSER FORMATION	JKmt	MONTEITH FORMATION

BASE OF COAL SEAM (Subcrop Projection to Surface) — — — —

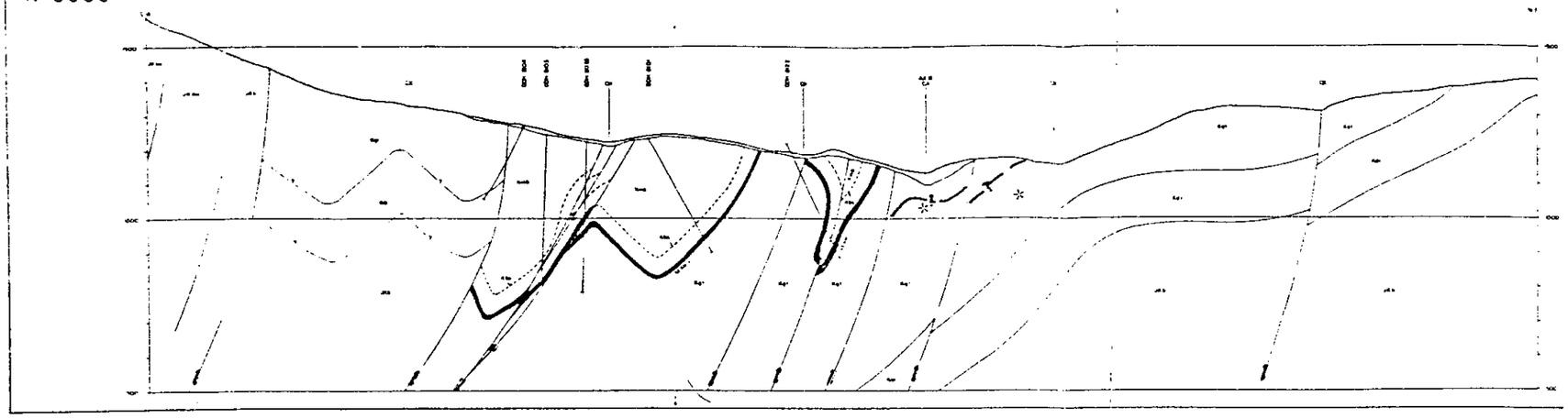
INDEX MAP

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

FIGURE 6.3
GOODRICH COAL PROPERTY
GEOLOGIC MAP OF THE MINE AREA

PREPARED BY:	SCALE AS SHOWN
APPROVED BY: DATE: OCT./82	DRAWING No.

N 3500



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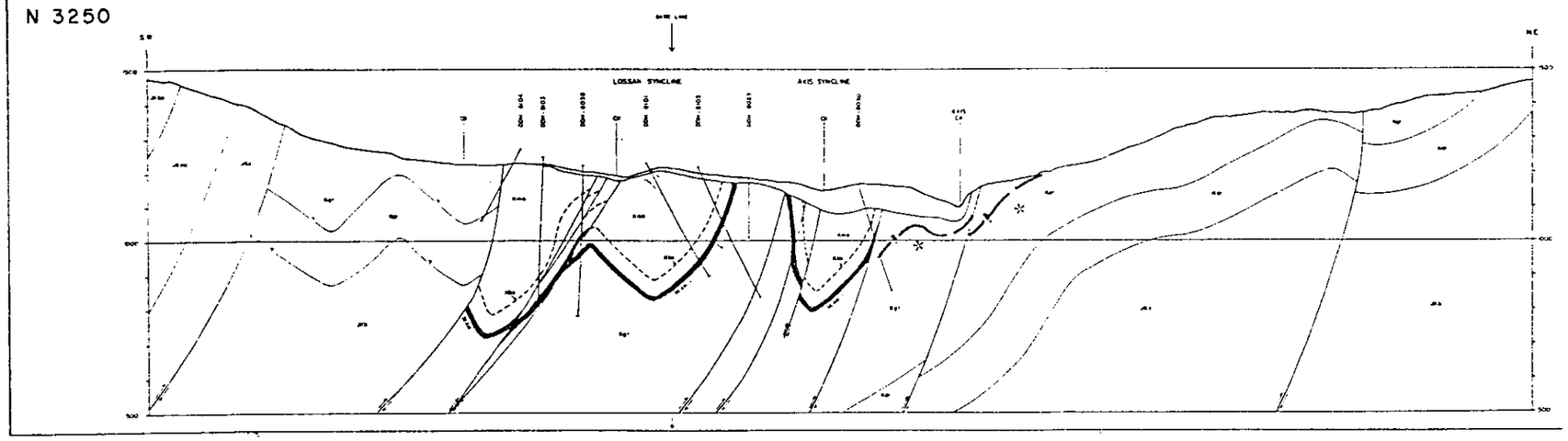
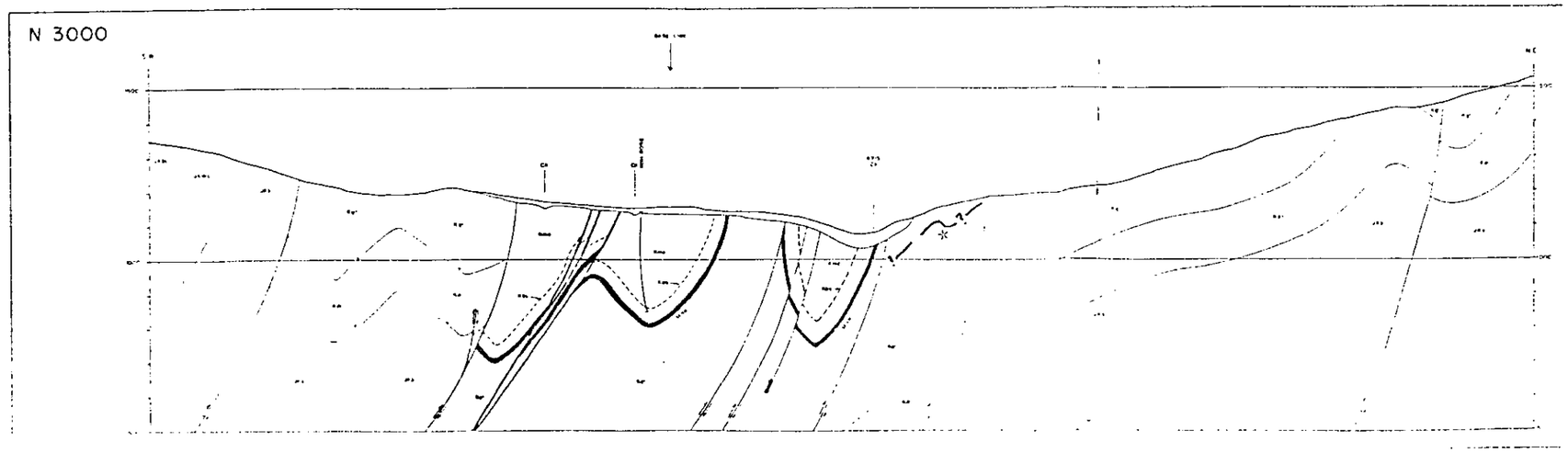


N 3000



LEGEND

	Q	QUATERNARY Glacial deposits & alluvium
LOWER CRETACEOUS — CRASSIER GROUP	KCm	COMMOTION FORMATION Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member & conglomerates
	Kmb	MOOSEBAR FORMATION Mudstones, minor siltstones, marine
	Kbs	BLUESKY Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
	Kgt	GETHING FORMATION Cyclothems; dark gray mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tufts in upper unit, COAL
	Kdr	DRESSER FORMATION Incomplete cyclothems, discontinuous coal measures in varying thicknesses, medium to very coarse grained sandstones, grits and conglomerates
	JKb	BRENOT FORMATION Lithic "salt & pepper" sandstones, siltstones, mudstones, carbonaceous mudstones; COAL
JURASSIC — TRANSITIONAL — BEAUDETTE GROUP	JKmc	MONACH FORMATION Marine lithic & quartzose sandstone with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones & sandstones with occasional thin conglomerates
	JKbp	BEATTIE PEAKS FORMATION Buff to brownish sandstones, fine to medium grained; thinly bedded black & dark grey shales, silty shales, siltstones, thin sandstones with ironstone banding
	JKmt	MONTIETH FORMATION Grey & brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone & sandstone partings, occasional thin conglomerates
	Jf	FERNIE FORMATION Dark grey & black shales, mudstones, sandstones, siltstones, marine

BASELINE LOCATION

COAL SEAM NO 1

NOTE Section number indicates distances in metres along baseline from south to north to include all 1980 and 1981 drill holes.

0 200 400 600 800 metres

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

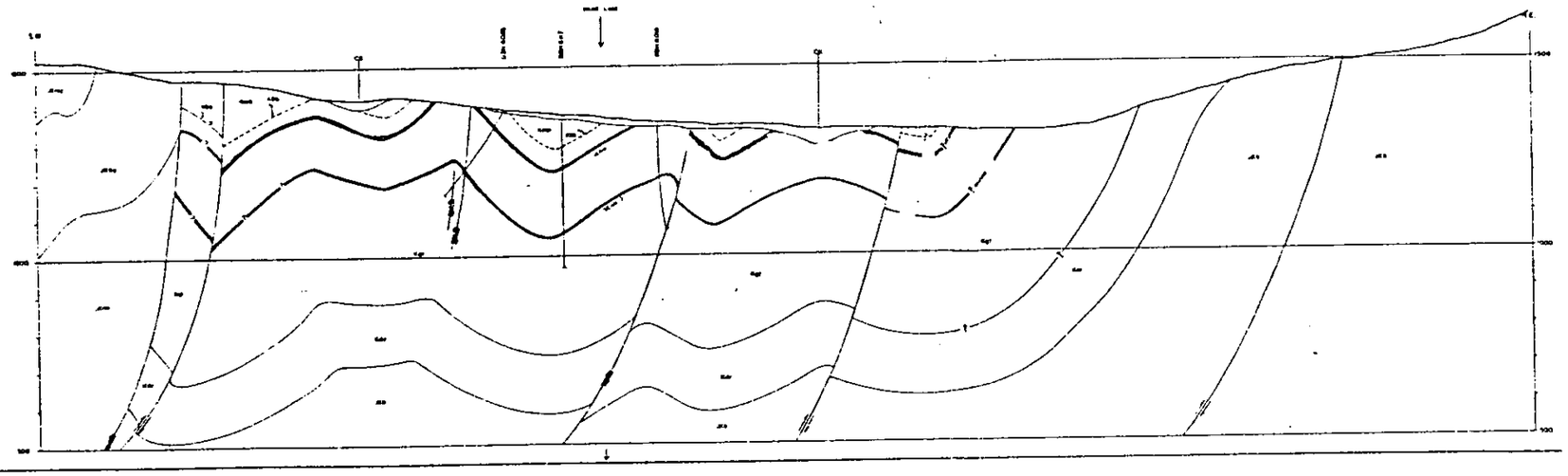
GOODRICH 1981

GEOLOGICAL CROSS-SECTIONS N 3000 – N 3500

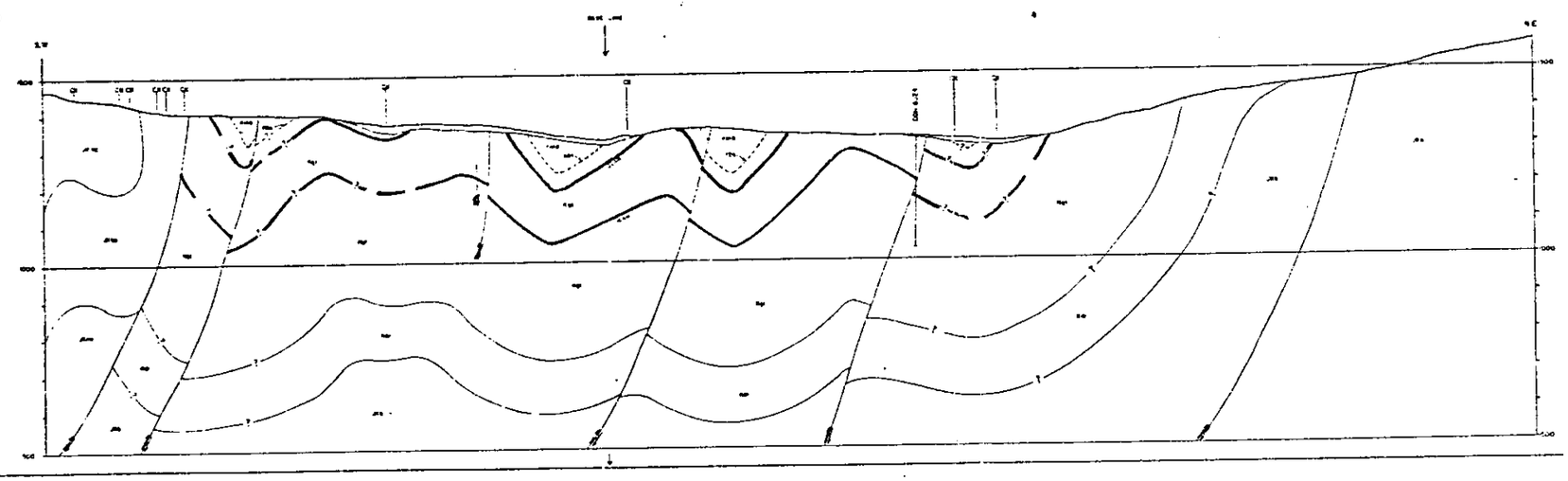
PREPARED BY	C.W.		SCALE
APPROVED BY	H.D.Z.	DATE MAR 82	DRAWING No

not included in reserve calculation

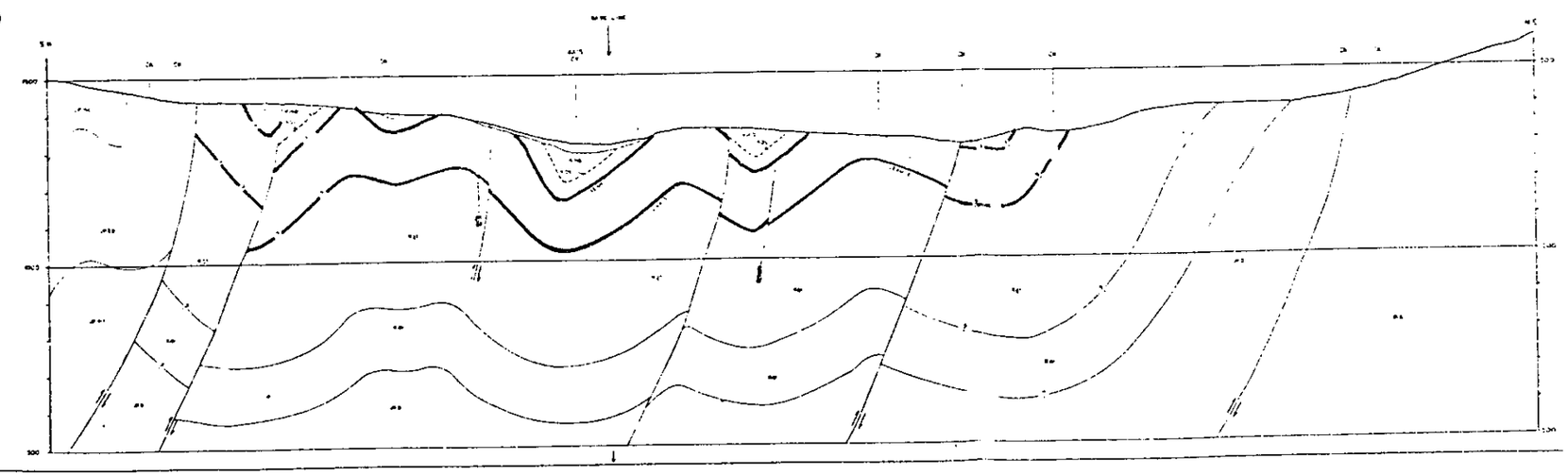
N 6500



N 6250



N 6000



LEGEND

- Q — *QUATERNARY*
  Glacial deposits & alluvium
- KCm — *COMMOTION FORMATION*
  Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member & conglomerates
- Kmb — *MOOSEBAR FORMATION*
  Mudstones, minor siltstones, marine
- Kbs — *BLUESKY*
  Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
- Kgt — *GETHING FORMATION*
  Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones, coalified plant debris, minor bentonite, black shales, and occasional minor tufts in upper unit; COAL
- Kdr — *DRESSER FORMATION*
  Incomplete cyclothems, discontinuous coal measures in varying thicknesses, medium to very coarse grained sandstones, grits and conglomerates
- JKb — *BRENOT FORMATION*
  Lithic "salt & pepper" sandstones, siltstones, mudstones, carbonaceous mudstones; COAL
- JKmc — *MONACH FORMATION*
  Marine lithic & quartzose sandstone with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones & sandstones with occasional thin conglomerates
- JKbp — *BEATTIE PEAKS FORMATION*
  Buff to brownish sandstones, fine to medium grained; thinly bedded black & dark grey shales, silty shales, siltstones, thin sandstones with ironstone banding
- JKmt — *MONTIETH FORMATION*
  Grey & brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone & sandstone partings, occasional thin conglomerates
- Jf — *FERNIE FORMATION*
  Dark grey & black shales, mudstones, sandstones, siltstones, marine

LOWER CRETACEOUS — TRANSITIONAL — JURASSIC

CRASSIER GROUP — BEAUDETTE GROUP

BASELINE LOCATION

COAL SEAM

NOTE : Section number indicates distances in metres along baseline from south to north to include all 1980 and 1981 drill holes.

0 200 400 600 800 metres

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

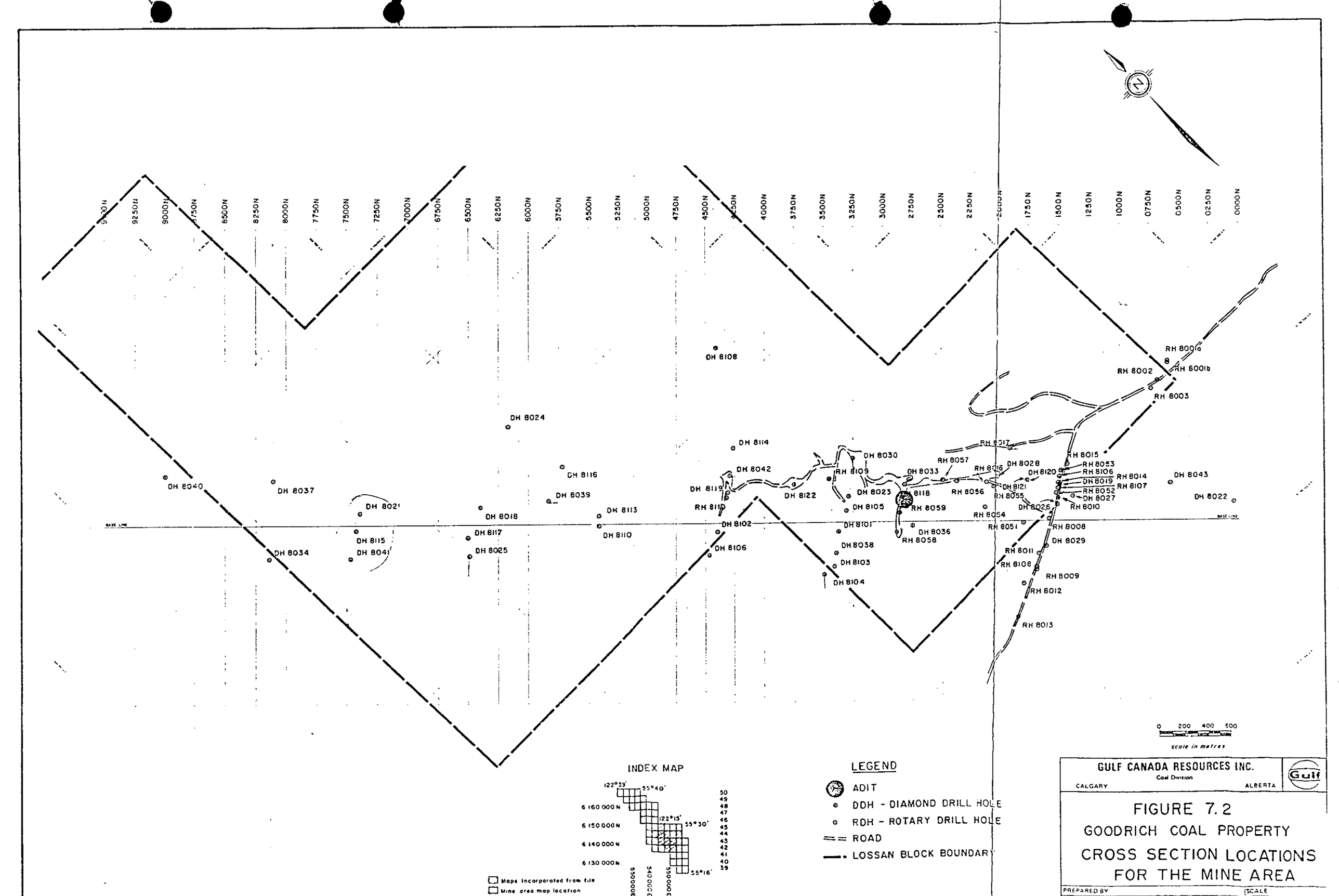
Gulf

GOODRICH 1981

GEOLOGICAL CROSS-SECTIONS
N 6000 – N 6500

PREPARED BY C.W.	SCALE
APPROVED BY H.D.Z. DATE MAR 82	DRAWING No

*Inferred - not included in reserve calculations



INDEX MAP

LEGEND

- ADIT
- DDH - DIAMOND DRILL HOLE
- RDH - ROTARY DRILL HOLE
- ROAD
- LOSSAN BLOCK BOUNDARY

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

FIGURE 7.2
GOODRICH COAL PROPERTY
CROSS SECTION LOCATIONS FOR THE MINE AREA

PREPARED BY | SCALE
APPROVED BY | DATE OCT./82 | DRAWING No.

AERIAL PHOTO-MOSAIC
LOSSAN MINE AREA