PR-Saxon 74(4)A

CONFIDENTIAL

GEOLOGICAL BRANCH
ASSESSMENT REPORT

00 626

COAL QUALITY

The raw coal mined from the Saxon property is expected to have a raw ash content between 10 and 20%. All indications are that this coal will clean readily to a product with 7-8% ash at a recovery in the order of 70 to 80%.

If initial production is from the Narraway River Block, Seams A and B will provide clean coal of approximately the following quality. (Cut point 1.49 to 1.51).

	Seam A	Seam B
Ash	7.46	7.34
Volatile Matter	21.14	20.56
Total Moisture	0.81	0.65
Fixed Carbon	71.38	71.47
Sulphur	0.27	0.35
Free Swelling Index	7	6½-7

A general average of all the analytical data obtained to date indicates that the expected product from the property as a whole will approximate:-

Ash	7.42
Volatile Matter	20.94
Total Moisture	0.75
Fixed Carbon	71.40
Sulphur	0.30-0.50
Free Swelling Index	6½-7½

The adit samples were set to the Metals Reduction and Energy Centre at Ottawa for more specific tests of coal quality as it relates to coking performance. The following results were obtained:-

Average Fluidity	37.5 dd/m
Average Ruhr Dilation	31.8 per cent
Average Maximum Reflectance	1.35 per cent
Mean Predicted Stability Factor	58.6

APPENDIX II

SAXON PROPERTY

DATA SUMMARY

APPENDIX II

SAXON PROPERTY

DATA SUMMARY

Property:

53 square miles (137.3 square kilometers)

Location:

In Peace River District, Province of British Columbia.
100 miles (161 km) from Grande Prairie, Alberta.
68 miles (109 km) from Rail, Bend, British Columbia.
612 miles (984 km) from Rail to Roberts Bank, Vancouver.
554 miles (891 km) from Rail to Port of Prince Rupert.
513 miles (825 km) from Rail to Port of Squamish

Reserves:
(Inferred on basis of 4 adits, 9 drill holes and geological mapping)

(a) Raw coal in place.

264 million short tons in seams greater than 10 feet (3.05 m) thick to a depth of 1,500 feet (457 m).
40 million additional short tons in seams 5 to 10 feet (1.5 to 3.05 m) thick.
20 million additional short tons of estimated stripping coal (Saxon south).

(b) Net clean coal.

37.8 million short tons from 4 proposed mine entries in the Narraway River Block which provide access to 86.5 million tons of indicated reserves in place which are included in the total 101 million tons of overall reserves in the Block. (44% recovery of the 86.5 million tons).
52.7 million short tons estimated clean coal available from the remaining 176.5 million tons of coal in place (assumes 30% recovery).

Coal Quality:

Average clean product:

Ash	7.42
Volatile Matter	20.94
Total Moisture	0.75
Fixed Carbon	71.40
Sulphur	0.30-0.50
F.S.I.	7-7½

In addition to the above, which is based on a combination of test results from diamond drill core samples, analyses of the adit samples only in Ottawa gave the following results:-

Average Fluidity (Geissler)	37.5 dd/m
Average Ruhr Dilation	31.8 per cent
Average Maximum Reflectance	1.35 per cent
Mean Predicted Stability Factor	58.6

Coke Quality*

Summary of key carbonization data for Saxon coals.

	Saxon No. 1	Saxon No. 2	Saxon No. 3	Saxon No. 4
Charge Composition.....%	100	100	100	100
Stability Factor.....	59.5	63.0	60.0	57.4
Hardness Factor.....	74.7	71.7	73.8	69.6
JIS 15mm Value.....%	NA	95.0	93.7	94.8
Coke Yield.....%	79.3	77.8	78.2	77.9
Max. Wall Pressure...lb/in^2	0.50	3.02	0.75	8.00
Coke Breeze (-½in).....%	3.5	3.7	3.4	3.5

Summary of key carbonization data from the Saxon blend tests.

	Percentages in Charges					
Reference lv Coal		30				
Reference hv Coal	100	70	70	70	70	70
Saxon No. 1			30			
Saxon No. 2				30		
Saxon No. 3					30	
Saxon No. 4						30
Stability Factor.....	39.6	53.7	50.4	52.2	50.6	54.3
Hardness Factor.....	64.6	69.7	64.6	67.0	64.2	69.9
JIS 15mm Value.....%	87.2	91.6	92.0	91.9	92.2	NA
Coke Yield.....%	68.1	72.4	72.9	71.6	71.6	73.0
Max. Wall Pressure.....lb/in^2	0.10	0.60	0.25	0.23	0.27	0.27
Coke Breeze (-½in).....%	3.5	3.4	3.9	3.7	3.9	3.0

* From report by: Metals Reduction and Energy Centre, Mines Branch, Department of Energy, Mines and Resources, Ottawa.

Seam A — Examples of Clean Coal Analysis (from the drill hole intersections and adit information in areas where reserves have been defined).

	Ash	Volatile	Residual Moisture	Fixed Carbon	F.S.I.	Sulphur	Comments
Block I							
D-7003	7.31	21.29	N.A.	70.94	3½	.33	
D-7201	7.11	20.11	1.02	71.76	8	.24	
Block II							
D-7101	6.92	18.62	.93	73.53	8½	.24	
Block III							
D-7103**	7.32	20.26	.56	71.86	5½	.27	8' upper
	7.53	20.68	.89	70.90	8	.25	11.5' middle
	7.60	20.71	1.00	70.69	8	.27	12.0' lower
Narraway							
D-7004	6.96	21.62	N.A.	71.09	7	.32	
D-7102	6.92	20.89	.54	71.61	7	.23	
Adit 1	6.97	21.78	.54	70.7;	8	.27	

N.A. - Not Analyzed. ** -28 mesh only.

Drill core recoveries range from about 40% to 85%, while the adit sample, which was taken very carefully under the supervision of a geologist represents 100% of the measured section. Wash recoveries on the drill core ranged from a low of 38.48% on a sample with only 40% core recovery to 82.22% on a sample with 85% core recovery, while the clean coal recovered from the adit was in excess of 90%. The variations in clean coal recovery are almost certainly due to the loss of soft, clean coal in the drill coring procedure as the density logs indicate that Seam A usually has a consistantly low ash content. The average clean coal recovery for Seam A is expected to exceed 75% where it is mined.

Seam B

Examples of Clean Coal Analysis (from the drill hole intersections and adit information in areas where reserves have been defined).

	Ash	Volatile	Residual Moisture	Fixed Carbon	F.S.I.	Sulphur	Comments
Block I							Not in reserve area.
Block II							
D-7101	6.71	20.42	.87	72.00	8	.36	
Block III							
D-7103**	7.41	21.28	.58	70.73	8	.55	Upper bench -Shale-
	7.33	20.58	.51	71.58	8	.41	Lower bench
Narraway							
D-7004							N.A. core lost
D-7103**	8.10	19.37	.96	71.57	7	.17	Upper 5.3'
	7.40	21.29	1.03	70.28	8½	.23	Lower 9.5'
Adit 2	6.99	21.35	.62	71.04	8	.28	

N.A. - Not analyzed. ** =28 mesh only.

Seam D — Examples of Clean Coal Analysis (from drill hole intersections and adit information in areas where reserves have been defined).

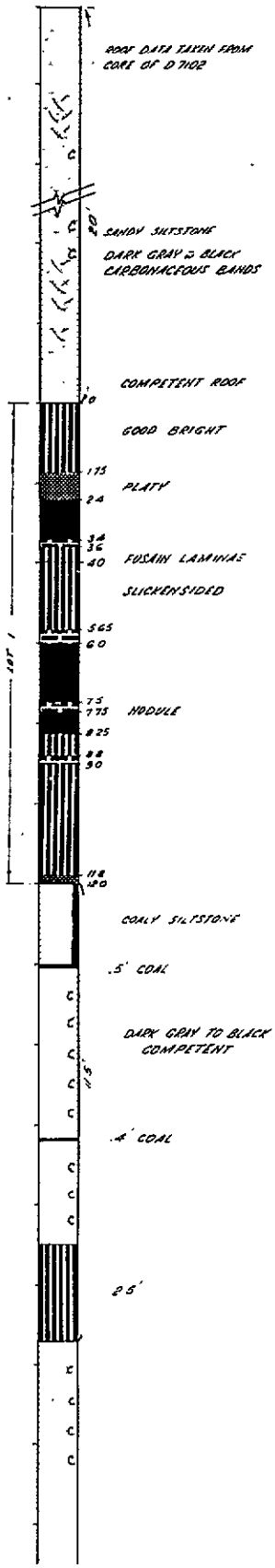
	Ash	Volatile	Residual Moisture	Fixed Carbon	F.S.I.	Sulphur	Comments
Blocks II & III							
D-7101	7.51	19.12	1.02	72.35	6½	.46	
(D-7102)*	6.96	20.15	.69	72.20	7	.43	
D-7001	4.29	25.26	N.A.	70.06	8	.30	

N..A. - Not Analyzed. *Drill hole adjacent to reserve area.

Seam D appears to be developed to a sufficient thickness to support mining in only two blocks and unfortunately the core recoveries and analytical data is not sufficient to draw conclusions regarding seam washability or consistency. It does appear, however, that at 7% ash, that Seam D will have similar characteristics to the other seams although volatiles may be more variable (20% to 24%). Sulphur appears to be slightly higher (0.3 to 0.5) but it is still quite low. In Adit 3 in the Narraway Block, Seam D is only 7.25 feet thick and consequently it is not considered to be in the presently mineable reserves. The clean coal recovery for a sample for this adit was in excess of 85%. The clean coal assayed 5.42% ash, 22.75% volatile, 71.43 fixed carbon, 0.46% sulphur and the free swelling index was 7½.

SEAM SECTION

SCALE : 1" = 2'



ROOF SECTION TAKEN AT D 7102
SEAM SECTION TAKEN AT 107' ADIT 1
FLOOR SECTION TAKEN AT D 7102

LEGEND

- VITRAIN
- CLARAIN
- CLARODURAIN
- DURAIN
- FUSAIN
- BONY COAL
- SANDSTONE
- SILTSTONE
- SHALE
- MUDSTONE
- CONGLOMERATE

MITSUI SYSTEM
(Estimated coal ash)

- CA 0 - 10 %
- CB 11 - 20 %
- CC 21 - 30 %
- CD 29 - 35 %

ADIT INFORMATION

ADIT LENGTH 107 G'
STARTED 2 DEC 71
COMPLETED 8 DEC 71
SAMPLED 21 DEC 71

CROSSCUTS

LOCATION	LENGTH
107 G'	11.8'

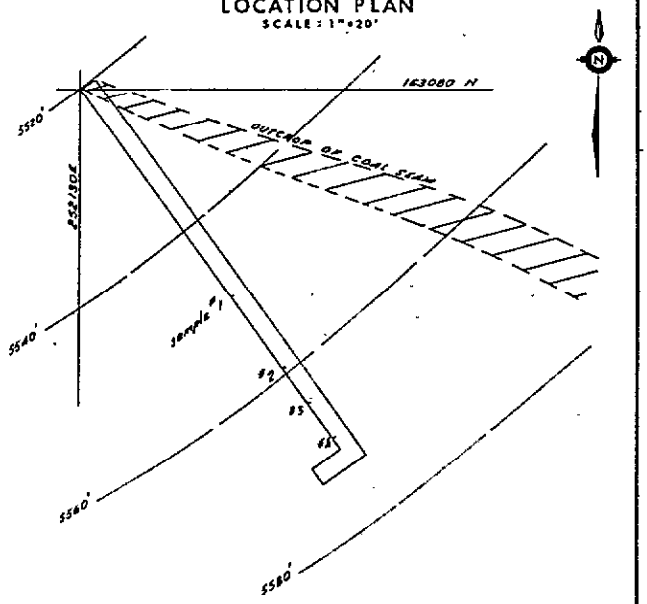
SAMPLES

No.	FSI	ASH
1	5½	
2	40	
3	6½	
4	7	

ADIT DIP 43° S
ADIT BEARING 142°
MISCELLANEOUS SAMPLE COVER 50'

LOCATION PLAN

SCALE : 1" = 20'



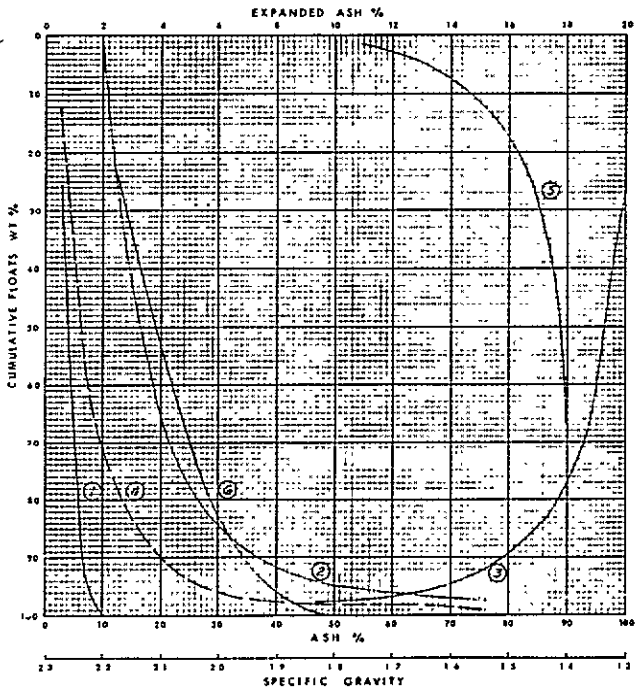
PRODUCT QUALITY ANALYSIS

	SAMPLES				FROTH FLOATATION	
	LOT 1 (100 MESH)	LOT 1*	LOT 3	LOT 4	28*100 MESH (LOT 3)	*100 MESH (LOT 3)
RESIDUAL MOISTURE	1.57 %	0.54%			0.35%	0.62%
ASH %	7.00 %	6.97%			5.80%	7.32%
VOLATILE MATTER	20.70 %	21.78%			21.65%	20.59%
FIXED CARBON	71.73 %	70.71 %			72.20%	71.47%
FSI	8	8			8½	8
SULPHUR	0.27 %	0.27%			0.29%	0.37%
PERCENTAGE OF SAMPLE	34.39%				10.64%	5.41 %
Sp Gr OF SEPARATION	1.51					
NEAR GRAVITY MATERIAL	11.09 %					
YIELD	90.00 %	~ 90%			91.76 %	97.16 %
BTU PER POUND		14,350				

* CRUSHED TO -¼" AND WASHED IN COMPOSITE WATER CYCLONE, HM AND FLOATATION CELL CIRCUIT ACTUAL PRODUCT

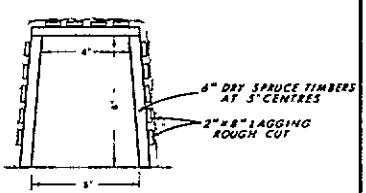
WASHABILITY CURVES

① FLOATS ② SINKS ③ SPECIFIC GRAVITY ④ ELEMENTARY ASH ⑤ NEAR GRAVITY MATERIAL ⑥ EXPANDED FLOATS



TYPICAL ADIT SUPPORTS

SCALE : 1" = 4'



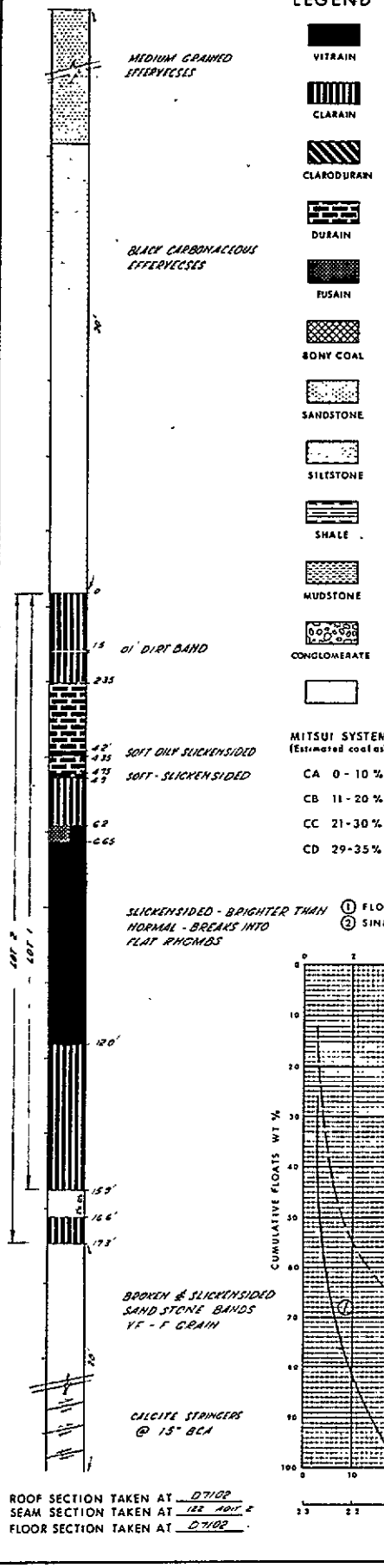
DENISON MINES LIMITED (COAL DIVISION)
CALGARY ALBERTA

SEAM "A"
DATA SUMMARY SHEET
ADIT Nº : 1 SAXON

DRAWN	E. FOSTER	DATE	Apr '72
APPROVED		DRAWING No.	SAXON 72-0293-R01

SEAM SECTION

SCALE : 1"=2'



LEGEND

- VITRAIN
- CLARAIN
- CLARODURAIN
- DURAIN
- FUSAIN
- BONY COAL
- SANDSTONE
- SILTSTONE
- SHALE
- MUDSTONE
- CONGLOMERATE

MITSUI SYSTEM (Estimated coal ash)

- CA 0 - 10 %
- CB 11 - 20 %
- CC 21 - 30 %
- CD 29 - 35 %

ADIT INFORMATION

ADIT LENGTH 123 FT
STARTED 11 DEC '71
COMPLETED 22 DEC '71
SAMPLED 28 DEC '71

CROSSCUTS

LOCATION	LENGTH
22'-26'	20' HOR

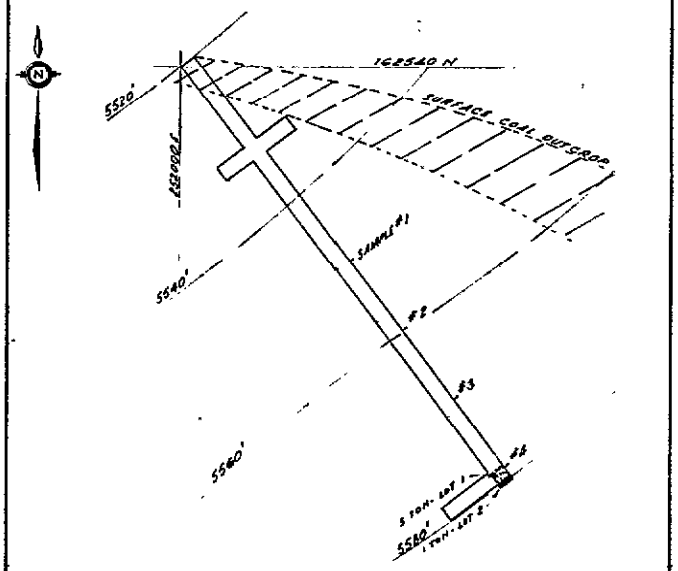
SAMPLES

No.	FSI	ASH
1	2½	
2	5	
3	4	
4	7	

ADIT DIP 45°S
ADIT BEARING 140°
MISCELLANEOUS
SAMPLE COVER 60 FT

LOCATION PLAN

SCALE : 1"=20'



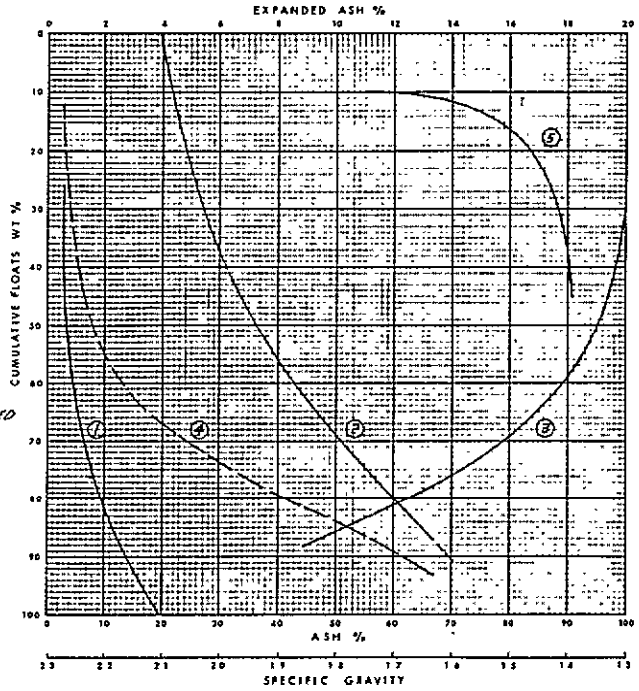
PRODUCT QUALITY ANALYSIS

	SAMPLES				FROTH FLOATATION	
	LOT 1 -100 MESH	LOT 1*	LOT 2	LOT 4	28+100 MESH (LOT 1)	-100 MESH (LOT 1)
RESIDUAL MOISTURE	0.50 %	0.62 %	0.73 %		0.03 %	0.59 %
ASH %	7.00 %	6.99 %	30.00 %		6.38 %	8.74 %
VOLATILE MATTER	21.12 %	21.35 %	16.90 %		21.82 %	20.53 %
FIXED CARBON	71.38 %	71.04 %	52.19 %		71.17 %	70.08 %
FSI	8½	8	5		9	8½
SULPHUR	0.28 %	0.28 %			0.38 %	0.36 %
PERCENTAGE OF SAMPLE	95.84 %				18.35 %	4.16 %
Sp Gr OF SEPARATION	1.55 %					
NEAR GRAVITY MATERIAL	14.00 %					
YIELD	73.00 %	68.00 %			63.86 %	78.92 %
BTU PER POUND	14,280	14,280				

* CRUSHED TO -14" AND WASHED IN COMPOSITE WATER CYCLONE, HM AND FLOATATION CELL CIRCUIT ACTUAL PRODUCT

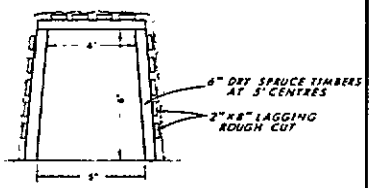
WASHABILITY CURVES

(1) FLOATS (2) SINKS (3) SPECIFIC GRAVITY (4) ELEMENTARY ASH (5) NEAR GRAVITY MATERIAL (6) EXPANDED FLOATS



TYPICAL ADIT SUPPORTS

SCALE : 1"=4'



ROOF SECTION TAKEN AT D7/102
SEAM SECTION TAKEN AT 122 ADIT E
FLOOR SECTION TAKEN AT D7/102

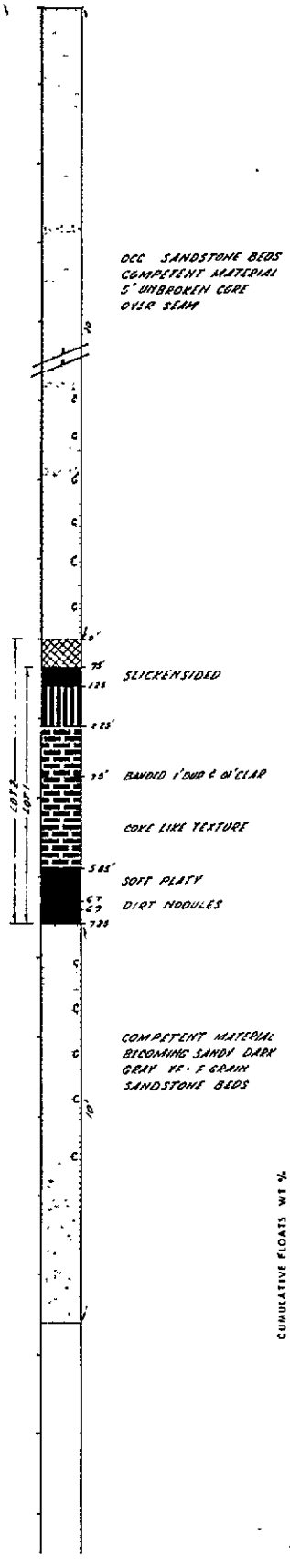
DENISON MINES LIMITED (COAL DIVISION)
CALGARY ALBERTA

SEAM "B"
DATA SUMMARY SHEET
ADIT NO : 2 SAXON

DRAWN E. FOSTER	DATE Apr '72	SCALE ———
APPROVED	DRAWING SAXON 72-0293-A61	

SEAM SECTION

SCALE : 1" = 2'



LEGEND

- VITRAIN
- CLARAIN
- CLARODURAIN
- DURAIN
- FUSAIN
- BONY COAL
- SANDSTONE
- SILTSTONE
- SHALE
- MUDSTONE
- CONGLOMERATE

MITSUI SYSTEM (Estimated coal ash)

- CA 0 - 10 %
- CB 11 - 20 %
- CC 21 - 30 %
- CD 29 - 35 %

ADIT INFORMATION

ADIT LENGTH 108'
STARTED 29 DEC '71
COMPLETED 7 JAN '71
SAMPLED

CROSSCUTS

LOCATION	LENGTH

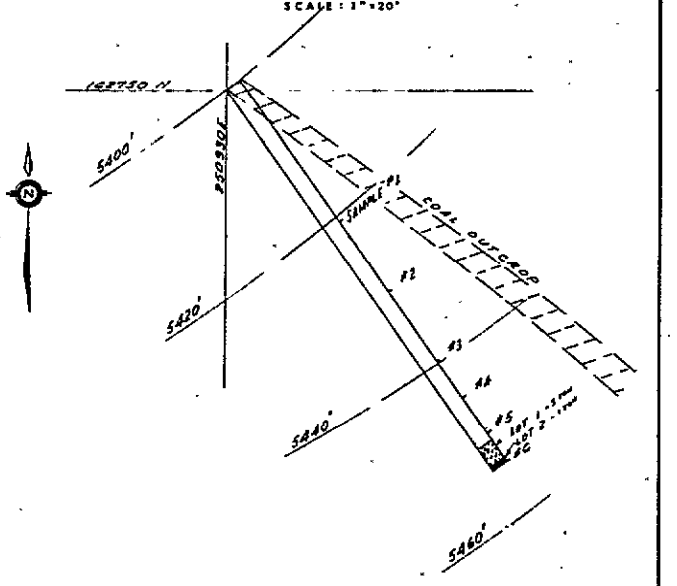
SAMPLES

No.	FSI	ASH
1	1	
2	2	
3	2½	
4	3	
5	4½	
6	7	

ADIT DIP 45° S
ADIT BEARING 143°
MISCELLANEOUS

LOCATION PLAN

SCALE : 1" = 20'



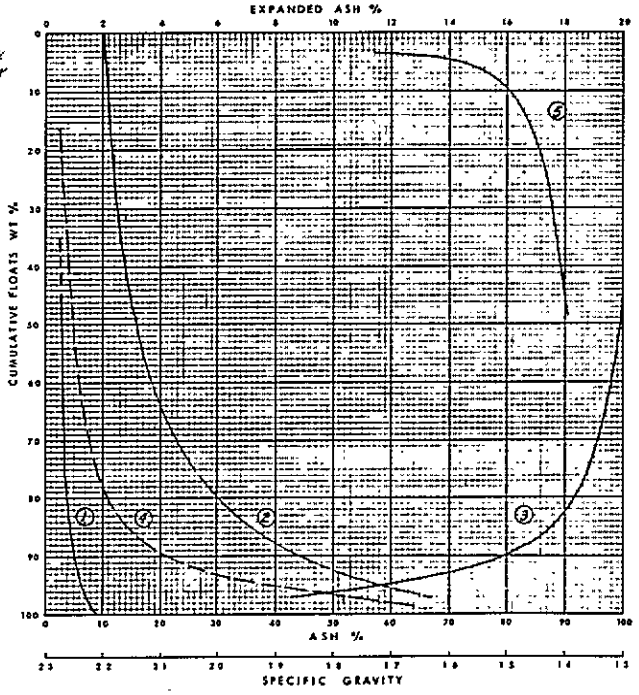
PRODUCT QUALITY ANALYSIS

	SAMPLES				FROTH FLOATATION	
	LOT 1 -100 MESH	LOT 1*	LOT 2	LOT 4	28 +100 MESH (LOT 1)	-100 MESH (LOT 1)
RESIDUAL MOISTURE	0.68%	0.40%	0.67%		0.53%	0.65%
ASH %	7.00%	5.48%	27.67%		5.02%	5.62%
VOLATILE MATTER	22.13%	22.75%	18.58%		23.20%	23.15%
FIXED CARBON	70.19%	71.43%	53.18%		71.25%	70.58%
FSI	7½	7½	4½		8½	7½
SULPHUR		0.46%			0.35	0.35
PERCENTAGE OF SAMPLE	95.28%				11.33%	4.72%
Sp Gr OF SEPARATION	1.80%					
NEAR GRAVITY MATERIAL	3.00%					
YIELD	96.00%	85.00%			83.17%	94.22%
BTU PER POUND		14,680				

* CRUSHED TO -3/4" AND WASHED IN COMPOSITE WATER CYCLONE, H M AND FLOATATION CELL CIRCUIT ACTUAL PRODUCT

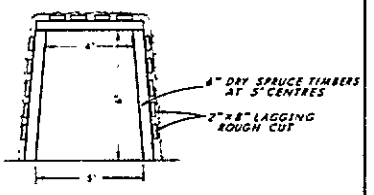
WASHABILITY CURVES

① FLOATS ② SINKS ③ SPECIFIC GRAVITY ④ ELEMENTARY ASH ⑤ NEAR GRAVITY MATERIAL ⑥ EXPANDED FLOATS



TYPICAL ADIT SUPPORTS

SCALE : 1" = 4'



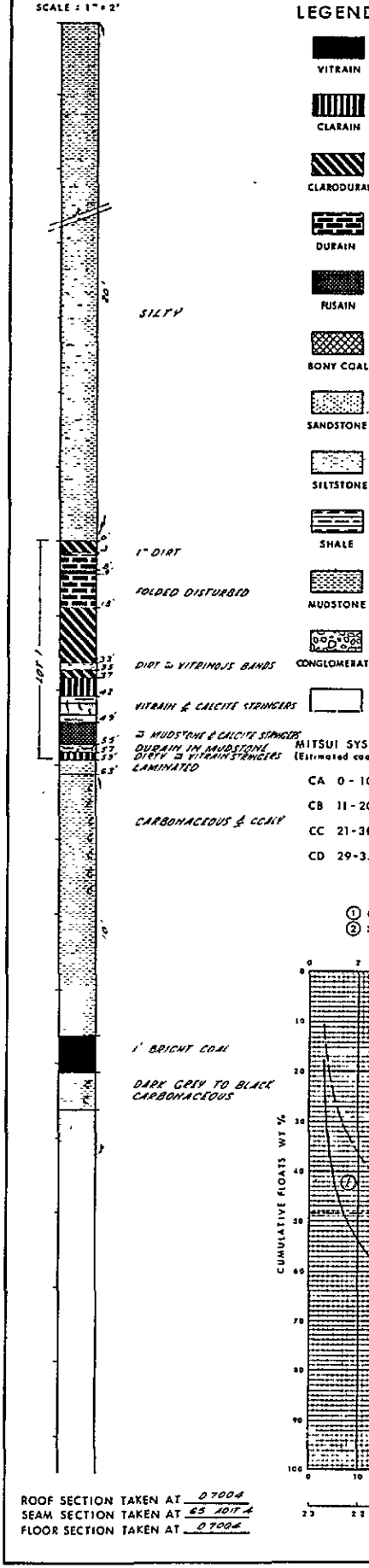
ROOF SECTION TAKEN AT 07102
SEAM SECTION TAKEN AT 107 ADIT 3
FLOOR SECTION TAKEN AT 07102

DENISON MINES LIMITED (COAL DIVISION) CALGARY ALBERTA

SEAM "D"
DATA SUMMARY SHEET
ADIT № : 3 SAXON

DRAWN C T S T N	DATE Apr '72	SCALE	
APPROVED	DRAWING No SXON 72 - 0293 - R01		

SEAM SECTION
SCALE : 1" = 2'



LEGEND

- VITRAIN
- CLARAIN
- CLARODURAIN
- DURAIN
- FUSAIN
- BONY COAL
- SANDSTONE
- SILTSTONE
- SHALE
- MUDSTONE
- CONGLOMERATE

MITSUI SYSTEM (Estimated coal ash)

- CA 0 - 10 %
- CB 11 - 20 %
- CC 21 - 30 %
- CD 29 - 35 %

ADIT INFORMATION

ADIT LENGTH 65'
STARTED 29 JAN '72
COMPLETED 4 FEB '72
SAMPLED 5 FEB '72

CROSSCUTS

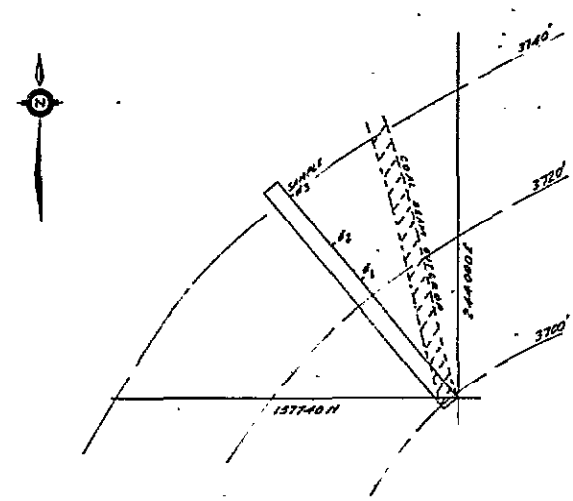
LOCATION	LENGTH

SAMPLES

No.	FSI	ASH
1	9	
2	9	
3	9	

ADIT DIP 45° S
ADIT BEARING 142°
MISCELLANEOUS COVER AT SAMPLE POINT 40

LOCATION PLAN
SCALE : 1" = 20'

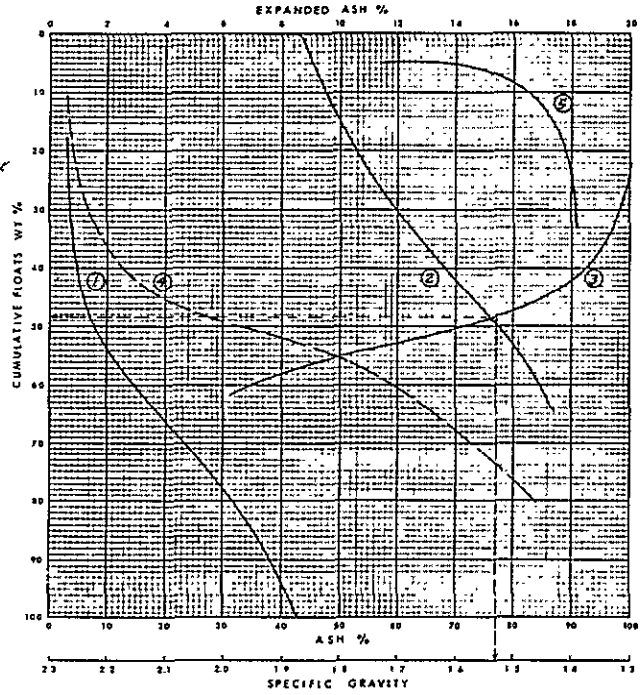


PRODUCT QUALITY ANALYSIS

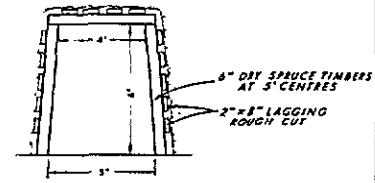
	SAMPLES				FROTH FLOATATION	
	LOT 1 +100 MESH	LOT 2	LOT 3	LOT 4	28 x 100 MESH (LOT 5)	-100 MESH (LOT 6)
RESIDUAL MOISTURE	0.72%				0.63%	0.61%
ASH %	7.00%				7.30%	8.50%
VOLATILE MATTER	22.90%				22.34%	23.01%
FIXED CARBON	69.38%				69.73%	67.88%
FSI	9+				9+	9+
SULPHUR					0.30%	0.99%
PERCENTAGE OF SAMPLE	96.98%				8.76%	3.02%
Sp Gr OF SEPARATION	1.53%					
NEAR GRAVITY MATERIAL	7.00%					
YIELD	48.00%				62.16%	76.31%
BTU PER POUND						

WASHABILITY CURVES

① FLOATS ② SINKS ③ SPECIFIC GRAVITY ④ ELEMENTARY ASH ⑤ NEAR GRAVITY MATERIAL ⑥ EXPANDED FLOATS



TYPICAL ADIT SUPPORTS
SCALE : 1" = 4'



ORIGINALLY MAPPED AS SEAM "B", BUT IS PROBABLY SEAM "C"

ROOF SECTION TAKEN AT D7004
SEAM SECTION TAKEN AT 65 ADIT #4
FLOOR SECTION TAKEN AT D7004

DENISON MINES LIMITED (COAL DIVISION)
CALGARY ALBERTA

DATA SUMMARY SHEET
ADIT Nº : 4 SAXON

DRAWN E.T.G.T.F.	DATE Apr '72	SCALE
APPROVED	DRAWING No. SK-A-72-0293-RC1	

SAXON COAL LIMITED

1975 EXPLORATION REPORT

PR-SAXON 75(1)A.

Geoff Jordan
January, 1976

TABLE OF CONTENTS

LIST OF TABLES AND APPENDICES

LIST OF MAPS AND TEXT FIGURES

INTRODUCTION

This report summarizes exploration work undertaken on the Saxon property during the 1975 field season and incorporates the results of previous exploration, where necessary, to allow reserve calculations to be made. A comprehensive discussion of aspects of the stratigraphy and structure of this property is included in the text.

The exploration program for 1975 consisted of six weeks detailed geological mapping carried out by three geological parties. As a result, it has been possible to prepare a more detailed revision of the Saxon geology, summarized here as Drawing No. SXON 75-0590-R01 and to review and modify the stratigraphic correlation (Drawing No. SXON 72-0295-R04).

By incorporating this data with the drill hole programs and adit sampling program of 1970 and 1971, an update of the coal reserves within the Saxon property has been made. For a discussion of these reserves, Figure No. 3 divides the property into three blocks: Saxon East; Saxon South; and Saxon West. The three areas are discussed in detail in the Reserves section.

In summary:

(a) The coal reserves previously calculated for Saxon East have been confirmed;

(b) The stratigraphy and structure, and some of the coal seam thicknesses in Saxon South have been established. This has allowed a reserves estimate to be made;

(c) The coal bearing Gates Member has been mapped in Saxon West allowing an exploration potential for this area to be assigned.

The remaining sections of the report focus on the three aspects of the Saxon property briefly mentioned above.

Within this report System International (S.I.) weights and measures have been used throughout. British standards together with S.I. units have been stated in some instances for comparative purposes. Similarly, all maps and diagrams are prepared according to S.I. standards.

STATEMENT OF QUALIFICATIONS

I, Geoffrey Robert Jordan, having completed a science degree course, majoring in geology, at the University of New South Wales, Sydney, Australia, at the beginning of 1971, have been engaged in coal exploration from that time to the present.

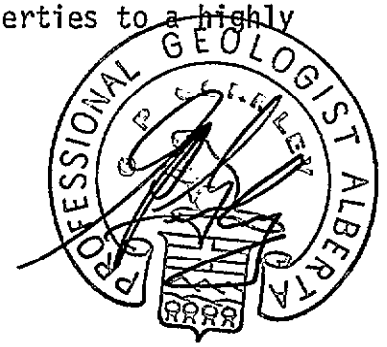
During this period I have carried out these investigations in Canada, Asia and Australia for several mining and geological consulting companies. This work has involved exploration on coal properties in British Columbia during the 1971, 1972, 1973 and 1975 field seasons and has included various forms of data collection, interpretation, project supervision and reporting to several private and governmental bodies.

I have been employed as a project geologist by the Coal Division of Denison Mines Limited since March of 1975, principally responsible for exploration activities carried out on the Saxon and Belcourt coal properties.

The exploration project carried out by Denison Mines (BC) Limited on the Saxon property during the summer program of 1975 undertaken in the field, and the interpretation of data made off the property, came under my direct supervision.

Geoff Jordan
Project Geologist

I, Gordon Gormley have known Geoff Jordan since 1972. Mr. Jordan has worked for Denison Mines (B.C.) Limited for one year and he has successfully completed the exploration programmes in both the Saxon and Belcourt properties to a highly professional standard.



Gordon P. Gormley

SUMMARY

Denison Mines Limited's Saxon property is located in the Province of British Columbia along the Rocky Mountain foothills coal belt. The property consists of 52.5 square miles (135.9 square kilometers) of coal licences situated just west of the border between the provinces of British Columbia and Alberta. A major water course, the Narraway River, cuts through the centre of the property, providing a potential transportation corridor as well as access to the coal reserves and potential surface plant sites. The property is located approximately 134 kilometers from the Canadian National Railway at Bend, B.C. and about 131 kilometers from Grand Prairie, Alberta.

A program of geological mapping undertaken by three teams of geologists was carried out during the 1975 summer field season. As a result of this program, the knowledge of the stratigraphy and structure of the property was expanded. These aspects are fully described within the text of this report.

The data collected during the current field season, combined with existing information, has allowed the following reserves to be outlined:

RESERVES IN PLACE (Millions Metric Tons)

	SAXON EAST	SAXON SOUTH
Indicated in Place (above drainage)	127	
Inferred in Place (includes Saxon East portion below drainage)	117	119
ESTIMATED TOTAL	(244)	(119)

In addition to the above inferred and indicated reserves, the Saxon West area is considered to have an exploration potential of about 250 million tons of coal in place.

The Saxon East reserves, contained within seams greater than 3 metres thick and extending to a depth of 500 metres are accessible for the most part by underground methods. The Saxon South reserves are more suitable for surface mining since the metric overburden ratio has been calculated to be 5.10/1 (equivalent to a ratio of 6.78/1 in the English system).

Based on analyses to date, the average quality of the clean coal from the Saxon property is expected to be:

Ash	7.42%
Volatile Matter	20.94%
Total Moisture	0.75%
Fixed Carbon	71.40%
Sulphur	0.30-0.50%
F.S.I.	7-7½%


YUKON
NORTHWEST TERRITORIES
BRITISH COLUMBIA
ALBERTA
PACIFIC OCEAN
UNITED STATES OF AMERICA
JUNEAU
FORT NELSON
LAKE CLAIRE
LAKE ATHABASCA
FORT McMURRAY
WILLISTON LAKE
FORT ST JOHN
CHETWYND
DAWSON CREEK
LESSER SLAVE LAKE
GRANDE PRAIRIE
PRINCE RUPERT
SAXON
153 km
WHITECOURT
731 km
PRINCE GEORGE
154 km
182 km
EDMONTON
LLOYDMINSTER
BRÛLÉ
RED PASS
JASPER
RED DEER
370 km
699 km
GOLDEN
BANFF
CALGARY
REVELSTOKE
MEDICINE HAT
418 km
KAMLOOPS
LETHBRIDGE
FORT MACLEOD
FERNIE
BRITANNIA BEACH
50 km
HOPE
VANCOUVER
VICTORIA
LEGEND
PROVINCIAL BOUNDARY
INTERNATIONAL BOUNDARY
GEOGRAPHICAL LOCATIONS
CAPITAL CITIES
RAILWAY LINES
67 107 km
MILEAGES BETWEEN POINTS
KILOMETERS BETWEEN POINTS
kilometers
50 0 50 100 150 200 250
miles
50 0 50 100 150
DENISON MINES LIMITED
CALGARY ALBERTA
Location Map

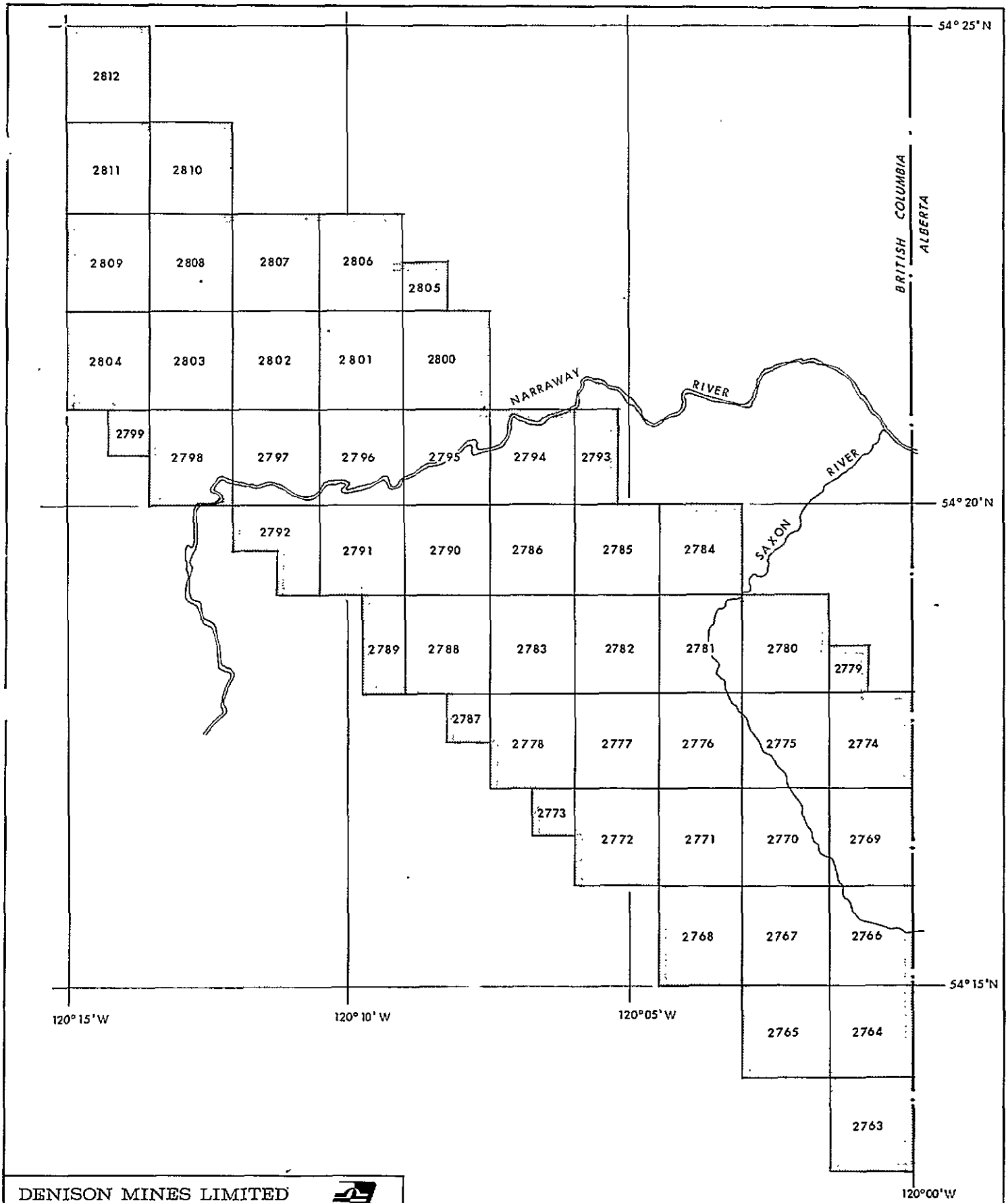
PROPERTY, LOCATION AND ACCESS

The current Saxon property coal licences, covering an area of (approximately) 33,585 acres (13,592 hectares), are shown on Figure No. 2 and described in the attached schedule included as Appendix III.

The Eastern boundary of the property is coincident with the British Columbia/Alberta boundary, about 80 km. northwest of Grande Cache, Alberta. The property was located to cover exposures of the Upper Cretaceous Commotion and Gething Formation, which are the main coal bearing horizons in this part of the Rocky Mountain foothills coal belt.

The centre of the Saxon property is transected by the broad valley of the Narraway River. This valley forms the main transportation corridor for potential routes going both east and west from the property. To the west, the headwaters of the Narraway River meet those of Jarvis Creek, the McGregor River Valley, and Walker Creek, to Bend, B.C. is moderately good for rail construction, but Gray Pass itself forms a significant obstacle that would require some 24 km. of extra rail construction, compared to a pipeline route. Other rail and pipeline routes, both east and southeast, have been considered but they result in much longer total transportation routes than the western route.

The pipeline distance from the property to the rail head (Bend, B.C.) is 109 km. From there, there are three alternative routes to the Pacific Coast: by Canadian National Railway to Vancouver (970 km.); by Canadian National Railway to Prince Rupert (905 km.) or by Canadian National Railway to Prince George, B.C., then by British Columbia Railway to Britannia Beach, B.C. (853 km.). These routes are shown on the map on the preceding page.



DENISON MINES LIMITED
(COAL DIVISION)
CALGARY ALBERTA

SAXON COAL LICENSES

1 0 1 2 MILES

DRAWN BY J.W.K.	DATE: OCT., 75	SCALE: 1" 100,000
APPROVED BY.	DRAWING NO: SXON 75-0587-R01	

DESCRIPTION OF EXPLORATION METHODS

The exploration work carried out from October 1974 to October 14th 1975 on the Saxon property centred around a program of detailed geological mapping. Methods employed to complete this program are described in detail as follows:

(a) Base Maps

A series of base maps at a scale of 1/5000 were prepared to allow detailed geological mapping to be undertaken and to achieve a metric standard as soon as possible on this property.

These metric maps were prepared by rescribing existing English standard base maps with a contour spacing of 5 metres and establishing a 500 metre grid. This aspect of the exploration program was carried out by Burnett Resource Surveys of Calgary under the supervision of Mr. J. Kende. A report by him explaining the map preparation methods used on the Saxon property is included as Appendix No. II.

While this work satisfactorily fulfilled the immediate need for base maps to allow the geological mapping program to proceed, the maps are poorly controlled and, in places, subject to errors in excess of 30 vertical feet. Such errors are not acceptable for detailed mine and preparation plan design as well as for the final preparation of detailed geological maps and cross sections. Hence an air-photo survey of the area, as well as a topographic survey to establish control points, was undertaken so that a series of controlled 1/5000 scale base maps could be prepared. This work was also undertaken by Burnett Resource Surveys and is described in detail in the accompanying Appendix No. II. The control points from the topographic survey are shown on the included survey traverse map.

(b) Geological Mapping Procedures and Personnel

The field mapping program was carried out by three mapping teams, each consisting of a geologist and field assistant.

Data collection was undertaken at a scale of 1/2500 and this information was later transferred to the 1/5000 scale base maps.

Control of the traverse lines was achieved using chain and compass, with corrections for slope variation being incorporated. Points such as creek confluences, or survey control points shown on the base maps, were used to locate the beginning and end of each traverse.

The personnel listed below undertook the field mapping. Traverses completed by these teams are shown on the accompanying traverse map, Drawing No. 75-0612-R01.

Team No. 1	C. Mankowski	- Geologist
	J. Myers	- Assistant
Team No. 2	D. Thacker Leader	- Geologist
	P. Meima	- Assistant
Team No. 3	G. Jordan	- Project Geologist
	T. Mankowski	- Assistant

Compilation of the geology maps, preparation of cross sections and the interpretation of results was undertaken by G. Jordan and C. Mankowski.

Drafting of the various accompanying maps was carried out by Mr. E. Toth and Mr. J. Kinnear.

Reserve calculations were made and compiled by G. Jordan. A complete description of the method of reserve calculation is included in a following section of this report.

During the year, Mr. A. Johnson, Chief Coal Geologist, provided advice and assistance related to various technical and administrative problems.

(c) Field Camp

During the planning period for the 1975 program, it was considered unnecessary to establish a large base camp on the Saxon property involving the construction of exploration roads. The use of an existing camp, combined with helicopter support for the geological traverses, was considered preferable.

An established logging camp is located at nearby Sherman Meadows, and arrangements were made with the operators, Canfor Ltd., to share some of the existing facilities. These facilities were complemented by the purchase of metal frame tents and the rental of trailer space to provide suitable office and drafting areas, as well as additional accommodation.

The establishment of field camp facilities was organized by Mr. L. Scorgie in the latter part of July 1975.

Field operations commenced at the beginning of August and continued until the middle of September.

Transport from the field camp to each traverse and return was achieved by helicopter, since the area is located in rugged, isolated terrain through which few roads have been constructed.

The helicopter facilities were contracted from Terr-Air Ltd., with Mr. E. Maas and Mr. L. Self providing pilot services through the program.

STRATIGRAPHY

Within the Saxon property, sediments of the Minnes Group (Nikanassin Formation) form the base of the geological section, and a portion of the Shaftsbury Formation lies at the top of the sequence.

The intervening sediments are a continuous and complete sequence from Cadomin Formation at the base to Commotion Formation at the top, with an overall thickness of some 762 metres. This stratigraphic sequence is illustrated on Table No. 1. A more detailed description of each formation and member shown on this table constitutes the following discussion:

Minnes Group (Nikanassin Formation)

Although the Minnes Group is a coal bearing sequence of strata, very little exploration work has been carried out to define the nature of this stratigraphic unit on the Saxon property. The numerous coal seams within the unit are presently considered too thin to be of economic significance. In addition, the rather monotonous nature of the group as a whole appears to mask the presence of marker beds which would assist in defining geologic structures.

The group as a whole consists of thin bedded, medium grained, brown sandstones, interlayered with dark grey to brown coloured shales and mudstones. Numerous coal seams, usually less than 1 metre in thickness, appear to be present throughout the group. The group has a more arenaceous nature towards the centre where several thick massive sandstone units are observed.

An incomplete section of the Minnes Group is located on the Saxon property since this stratigraphic unit is considered to lie beyond the area of economic interest. Thus, its presence has been used to establish the boundary of the licence area.

TABLE OF FORMATIONS

Series	Group	Formation		Lithology	Unit Thickness (metres)
Lower Cretaceous	Fort St. John	Shaftsbury		Dark grey marine shales, sideritic concretions, some sandstone grading to silty dark grey marine shale, sideritic concretions, siltstone and sandstone in lower part, minor conglomerate.	+450
		Commotion	Boulder Creek	Fine grained, well sorted, non-marine sandstone, mudstone and carbonaceous shale, conglomerate, few thin coal seams.	190
			Hulcross	Dark grey marine shale with sideritic concretions.	15
			Gates	Fine grained marine and non-marine sandstones; conglomerate, coal, shale and mudstone	365
		Moosebar		Dark grey marine shale with sideritic concretions, glauconitic sandstones and pebbles at base	67
	Bullhead	Gething		Fine to coarse brown calcareous Sandstone coal, carbonaceous shale, and conglomerate.	70
		Cadomin		Massive conglomerate containing chert and quartite pebbles.	55
	Minnes Group	Nikanassin		Thin bedded grey and brown shales and brown sandstone containing numerous thin coal seams	

Cadomin Formation

The non-marine Cadomin Formation unconformably overlies the Minnes Group. The thickness of this formation is extremely variable in the foothills region surrounding and including the Saxon property. An example of this variation is shown by comparing Cadomin Formation thicknesses from Mount Torrens, lying within the property in the southeast, and from Mount Belcourt, located nearby in a northerly direction. At Mount Torrens, Stott, in G.S.C. Bulletin No. 152 (1968), has reported a thickness of 9.5 metres for the Cadomin Formation thickness, while a thickness of 161.5 metres has been reported at Mount Belcourt.

The current exploration program on the Saxon property has established a thickness of 80 metres for the Cadomin Formation north of the Narraway River and 30 metres south of that point, giving an average value of 55 metres.

Conglomerate, varying from granule to boulder, and coarse grained sandstone constitute this formation. The conglomerate grains consist largely of multicoloured and well rounded fragments of chert and quartzite contained within a matrix of sand size material which appears to have a similar lithology. The coarse grained sandstone phases within the Cadomin Formation appear to consist of the same material as that which forms the conglomerate matrix.

The Cadomin Formation is a distinct marker bed which has been extensively mapped to define the geologic structure at that stratigraphic level.

Gething Formation

Sediments of the Gething Formation conformably overlie the Cadomin Formation. This essentially non-marine unit consists of brown coloured calcareous lithic sandstone ranging from fine to coarse grain size interbedded with conglomerate, carbonaceous shale and coal seams. Along the foothills north of the Saxon property, the coal seams of the Gething Formation have attracted the attention of commercial interests. However, on the Saxon property no coal seams of economic significance have been located on the surface or in drill core.

The Gething Formation has an average thickness of 70 metres on the Saxon property.

Moosebar Formation

On the Saxon property, the Moosebar Formation consists of a monotonous sequence of dark grey marine shale containing numerous sideritic concretions. The formation appears to conformably overlie the Gething Formation, although a thin glauconitic pebble conglomerate is located at the base.

As in most other parts of the foothills, the boundary between the top of the marine Moosebar Formation and the overlying, predominantly non-marine, Gates Member of the Commotion Formation is indistinct. A gradual increase in the sandstone interbeds is observed.

The top of the Moosebar Formation is taken to be the appearance of the first prominent sandstone unit which has a thickness of approximately 1 metre on the property.

The average thickness of the Moosebar Formation on the Saxon property is 67 metres. This distinct unit has greatly assisted the definition of the structure of the property.

Commotion Formation

The commotion Formation is subdivided into three members: the Gates Member, the Hulcross Member and the Boulder Creek Member. The stratigraphy of each of these units will be discussed individually as follows:

Gates Member

The section of the stratigraphy with the greatest economic potential in the Saxon property is the Gates Member of the Commotion Formation.

This mainly non-marine unit, consisting of sandstones, conglomerates, coal, shale and mudstone, has an average thickness of 365 metres within the Saxon property. The drill and adit programs have shown that the average coal thickness in the Gates Member is 18 metres, contained within 5 seams. These seams are labelled A to E, as is shown on the Saxon correlation diagram (Drawing No. SXON 72-0295-R04). Three of these seams: A, B, and D, form the bulk of this coaly section and are the only seams included at present in potentially mineable reserves.

Coal seam thicknesses ranging from 12 metres to 24 metres have been drilled on the coal prospect adjacent to the south, and similar Gates Member seam thicknesses are known to exist within a prospect on Secus Mountain lying northwest of the Saxon property. These sections, in addition to sections within the Saxon property, show that the average thickness of the Gates Member coaly section is 18 metres.

Details of the Gates stratigraphy of Saxon East are illustrated on the Saxon correlation chart. This chart shows that five principal coal seams have been developed. On the chart these are labelled A to E inclusive, from the base of the section.

A and B seams have been shown to be stratigraphically continuous from the north to the south end of the property, while seams C, D and E lens out or split within the property.

The seam thickness variation are also illustrated on the chart and it can be seen that seams A and B achieve their thickest development towards the centre of the East Block and D seam is thickest at the southern end of the property.

A correlation of the seams included in reserve in Saxon South has not been positively established, but the 4 metre and 9 metre seams are believed to be equivalent to E and D seams in Saxon East respectively.

Hulcross Member

The major stratigraphic problem in the Saxon property concerns the identification of marker horizons which allow precise coal seam correlation.

Within the Rocky Mountain foothills, the dark grey marine siltstones and shales of the Hulcross Member and the marine dark shales of the Moosebar Formation are usually readily identifiable and clearly establish the top and base of the Gates Member respectively. These markers assist in the interpretation of geological structures and seam correlations. However, on the Saxon property, while the Moosebar Formation has always been readily observed, the development of the Hulcross Member has been retarded to such

an extent that this unit has often remained unobserved or been miscorrelated with similar thin shaley units. Therefore, for practical correlation purposes the Hulcross Member has been defined as that shaley unit, some 15 metres thick, characterized by an abundance of shelly fossils and lying approximately 365 metres above the top of the Moosebar Formation. This correlation is shown on the Saxon stratigraphic correlation (Drawing No. SXON 72-0295-R04).

The Hullcross Member conformably overlies the Gates Member and is similarly overlain by the Boulder Creek Member.

Boulder Creek Member

The Boulder Creek Member consists of fine to medium grained, well sorted, non-marine sandstone, containing phases and interbeds of mudstone, carbonaceous shale and conglomerate. A few thin and discontinuous coal seams were intersected in this unit; however, these seams have proven to be of no economic significance.

The Boulder Creek strata are considerably more resistant to erosion than the overlying beds of the Shaftsbury Formation. Thus, these older strata are largely responsible for the development of the series of ridges trending along the eastern side of the Saxon property.

The Boulder Creek Member has a thickness of 190 metres on the Saxon property.

Shaftsbury Formation

The youngest stratigraphic unit on the Saxon property, conformably overlying the Boulder Creek Member, is the Shaftsbury Formation.

The Shaftsbury Formation consists of dark grey marine shale containing sideritic concretions and some sandstone phases. These lithologies grade in the lower half to silty dark grey marine shale and siltstone, with sandstone and minor conglomerate near the base.

Erosion has left only an incomplete section of this formation near the south central part of the Saxon property. In this area, a section containing 450 metres of the Shaftsbury Formation can be observed.

STRUCTURE

On a macroscopic scale the structure of the Saxon property appears to be that of a large and complex syncline trending northwest and plunging from both the southern and northern ends to the centre of the property. The central portion of the property is thus a folded series of the youngest Lower Cretaceous and possibly Upper Cretaceous sediments being surrounded by older Lower Cretaceous sediment within the margins of the property. The included geology map and cross sections, drawing nos. SXON 75-0590-R01 and SXON 75-0589-R01, show the overall style. A series of thrust faults has removed portions of the western limb of the principal syncline placing non-economic Jurassic sediments over the Lower Cretaceous formations.

Folding and faulting on a smaller scale complicates the structure bringing the coal bearing sediments of the Gates Member towards the surface in the centre of the property. This is most apparent in the northern half of the property where Gates Member sediments have been mapped at the surface in Saxon West. This distribution of the strata occurs as a result of a change in trend of a thrust fault combined with an increase in the amount of displacement along this structure as it is traced in a southerly direction. The thrust fault produces a repetition of the coal bearing strata in the eastern half of the Saxon property, north of the Narraway River. In this region the strike of the fault lies parallel to the northwest - southeast strike of bedding. Immediately south of the Narraway River the strike of the fault trends more northerly until the central lowlands of the Saxon property are crossed. From this point the fault again changes strike to the northwest - southeast direction, with a significant increase in the amount of displacement of beds on either side of the fault.

The Saxon property can thus be considered to form two structural blocks: the northwestern block containing folded Commotion Formation strata at the centre of the syncline and the southeastern block containing folded, younger Shaftsbury Formation strata.

In addition to the above mentioned fault repeated strata in the northern part of the Saxon property, similar fault repeats have been reported and mapped in the eastern part of the property south of the Narraway River. In general, the fault repeats in this part of the property are located in the older Lower Cretaceous strata and usually affect only the Cadomin and Gething Formations. At the end of the property, however, adjacent to the British Columbia - Alberta provincial boundary, one of these structures is of sufficient magnitude to thrust strata of the Gething Formation over Gates Member.

With a few exceptions, the nature of the thrust faulting can be described according to a single pattern. The faults are commonly encountered in the well exposed eastern ridge and in this area they are steeply dipping from 50^{0} to approximately 70^{0}. It has also been observed that the bedding in this area dips in the order of 35^{0} to 50^{0}. The angular relationship between the faults and bedding is thus in the range of 10^{0} to 20^{0}. It should be noted that in many areas of flat dipping strata within the Rocky Mountain foothills north of the Saxon property, a similar relationship between thrust faulting and bedding is observed. In these areas, of course, the thrust faults have a shallow overall dip. At this time it is not known whether the attitude of the thrust faults has been caused by their generation at a high angle or whether folding of the strata postdated faulting.

Further work will be required to resolve this question since the anticipated fault orientation may affect the further approach to exploration within Saxon West.

One of the exceptions to the above mentioned pattern of faulting lies within Saxon East, south of the Narraway River. A loss of the stratigraphic section was observed in drill hole 7001. Small scale structures in the drill core indicated that this loss of section was due to thrust faulting. Investigation of this surface data and the loss of section suggest that thrust faulting must have taken place at a lower dip angle than the dip of the strata. Although this interpretation is illustrated on section S.E. 3, it is not found to be totally satisfactory and additional work is being carried out to review the structure in this area.

The internal folding and faulting of the Saxon syncline has generated the various potential mining districts; the imbricate thrust sheets of the Gates Member in Saxon East have generated areas suitable for mining by hydraulic methods with additional potential for surface mining operations. In addition, folding and faulting has generated a broad anticline of exposed Gates Member in Saxon South where coal seams near the surface may be mined by surface methods.

Extensive exploration will be required to clearly define the structure of the property for mining purposes and to resolve the problems outlined above.

RESERVES

The following table summarized coal reserves on the Saxon property. For underground mining, seams in excess of 3 metres thickness are included to a depth of 500 metres of cover. For strip mining, only two seams in the Saxon South area have been included.

UNDERGROUND MINING METHODS

TABLE NO. 2

		MILLIONS METRIC TONS (IN PLACE)
SAXON EAST	Inferred Reserves (below drainage) (in place)	117
	Indicated Reserves (above drainage) (in place)	127
	TOTAL	(244)

SURFACE MINING METHODS

SAXON SOUTH	Inferred Reserves (in place)	(119)

Stripping ratio estimated at 5.10 cubic metres/metric ton or 6.78 cu. yd./long ton. This approximate stripping ratio includes oxidized coal but also does not include other smaller seams above D seam.

In addition to the above inferred and indicated reserves, the Saxon West area is considered to have an exploration potential of about 250 million tons of coal in place.

The property has been divided into three parts for ease of discussion within this report (see Figure No. 3).

DENISON MINES LIMITED
(COAL DIVISION)
CALGARY ALBERTA

SAXON RESERVE AREAS

1 0 1 2 MILES

DRAWN BY J W K	DATE OCT , 75	SCALE 1" 100,000
APPROVED BY	DRAWING NO SXON 75-0588-R01	

Saxon East: That area bordered in the east and south by the property boundary and the British Columbia/Alberta provincial boundary respectively. This area encompasses the northwest, southeast third of the property.

Saxon West: That area bordered to the east and west by Saxon East and the property's western boundary respectively excluding the southwestern sector of the property. This area encompasses most of the remaining two thirds of the property.

Saxon South: The remaining southernmost portion of the property bounded on the north and east by Saxon West, and on the south and west by the property boundaries.

Method of Calculation

Since the amount and type of information varies from one area to another, a number of rules were applied to the reserve calculations and these are explained as follows:

In Saxon East, 9 drill holes and 4 adits are available from which seam thicknesses and quality have been calculated. An analysis of the drill hole data was made first to establish true seam thicknesses from cored intersections and radiation logs and then to determine the seam intersections which have an acceptable wash yield. A summary of this analysis is given in Appendix V.

The seam thicknesses included in the reserve calculation are taken only from seams A, B and D where the thickness is in excess of 3 metres and where expected seam wash yields could be shown to be in excess of 70% at 7% ash. In some instances where poor core recoveries were encountered, the yield was recalculated assuming the lost core to be mostly coal. This is usually found to be valid: if the top quality coal in the Rocky Mountain foothills strata is sheared or very friable it is often ground and flushed away in the drilling process.

For the seam intersections included in reserve, the coal tonnages were calculated by section, each of which is included within Drawing No. SXON 75-0589-R01. The overburden limit to underground reserves was taken to be 500 metres of vertical cover and a conservative specific gravity of 1.5 was applied to the coal volume, since analysis shows the average raw coal specific gravity to be greater than 1.6.

The method used to calculate the reserves in Saxon East was by section. Although this method is more rapid, it is considered to be less precise than that used for the Saxon South Block where a contouring method was applied. The results by section were compared with results from a preliminary calculation by contouring. A more detailed calculation of the reserves in Saxon East using this method will be included in the final Saxon report for 1975. It is anticipated that a variation of as much as 5% could be found between the results of the two calculation methods.

In Saxon South, seam data is less precisely known. Geological mapping established the presence of several seams, two of which are 9 metres and 4 metres thick respectively at several localities. Only the surface mining potential of this area has been considered at this time. To estimate these reserves, structure contour maps of the two seams were prepared and seam volumes determined by planimetry assuming constant seam thickness. Allowance was also made for seam dip. The overburden values were calculated by planimetry of successive topographic and structure contour areas.

The reserves in Saxon South are placed in an inferred category.

In the Saxon West area, only an exploration potential has been assigned on the basis of the mapped surface outcrop area of the coal bearing Gates Member and from a regional knowledge of total Gates coal thicknesses in several adjacent localities.

The precise calculations for Saxon East and Saxon South are included in Appendix IV.

INDUSTRIAL CONFIDENTIAL

Appendix I

PHOTOGRAPHS OF SELECTED COKE SPECIMENS
DENISON MINES LIMITED
SAXON PROPERTY

Project 03-3-1/6-2

May, 1973.

LIST OF FIGURES

PHOTOGRAPHS OF SELECTED COKE SPECIMENS
DENISON MINES LIMITED
SAXON PROPERTY

Project 03-3-1/6-2

by

R.C. Guenette* and J.G. Jorgensen**

The photographs included in this report represent selected coke specimens from coals from the Saxon property relating to Project No. 03-3-1/6-2. All the specimens were carbonized in the Mines Branch 12-inch movable-wall technical scale coke oven.

The photographs were taken in the laboratory employing a Polaroid MP-3 Industrial camera.

*Coal Technologist, **Head, Petrography and Laboratory Services, Metals Reduction and Energy Centre, Mines Branch, Department of Energy, Mines and Resources, Ottawa, Canada.

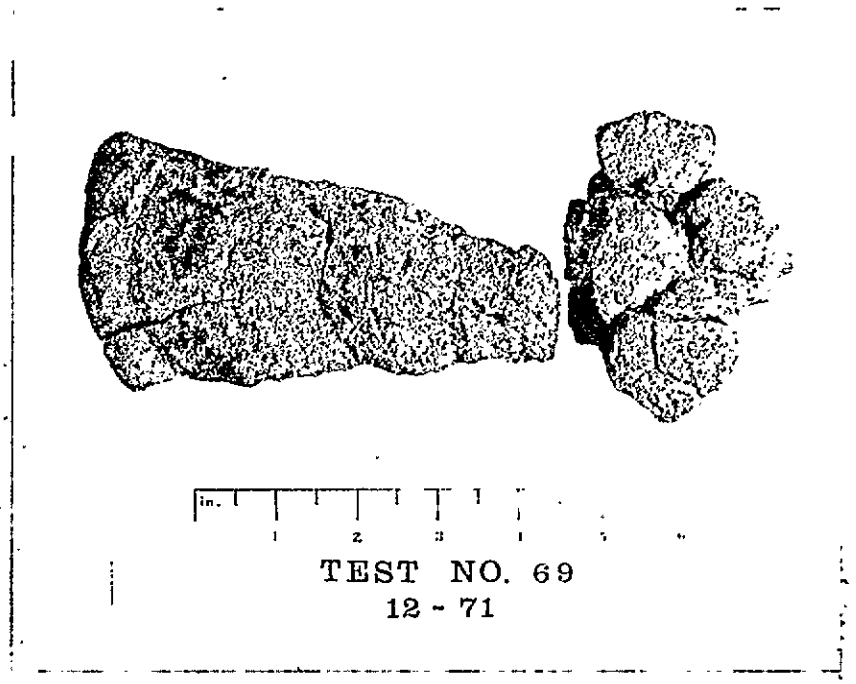


Figure 1 - 100% Saxon No. 1

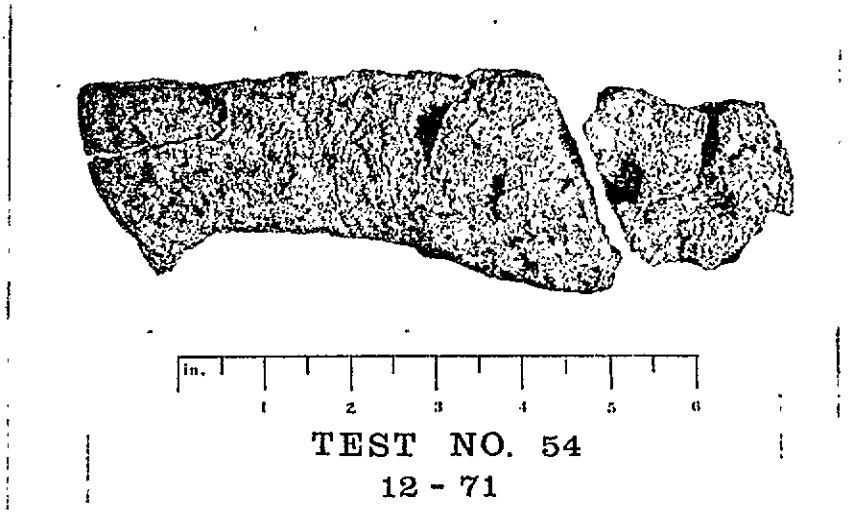


Figure 2 - 100% Saxon No. 2

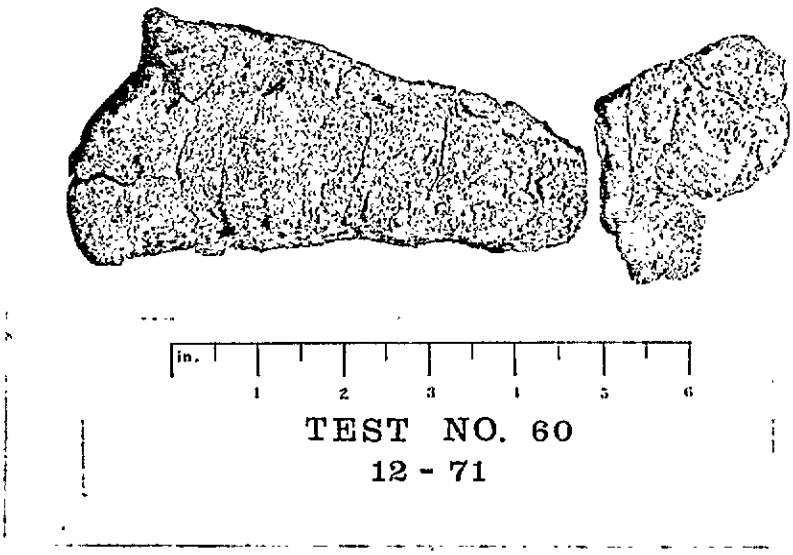


Figure 3 - 100% Saxon No. 3

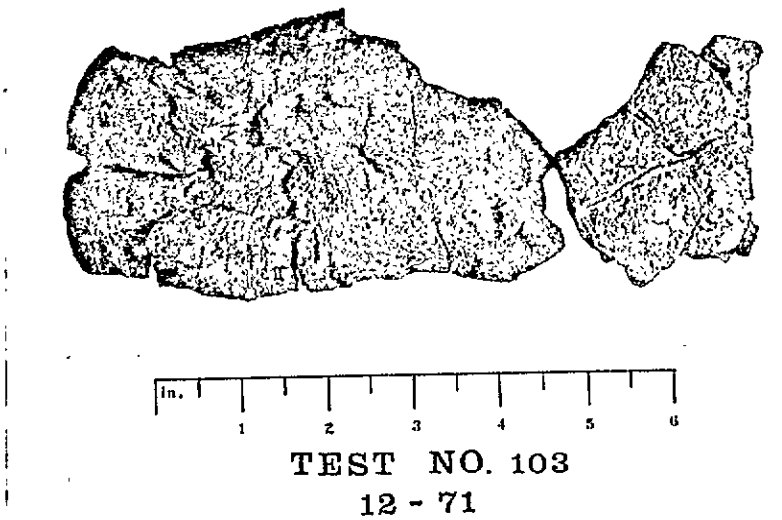


Figure 4 - 100% Saxon No. 4

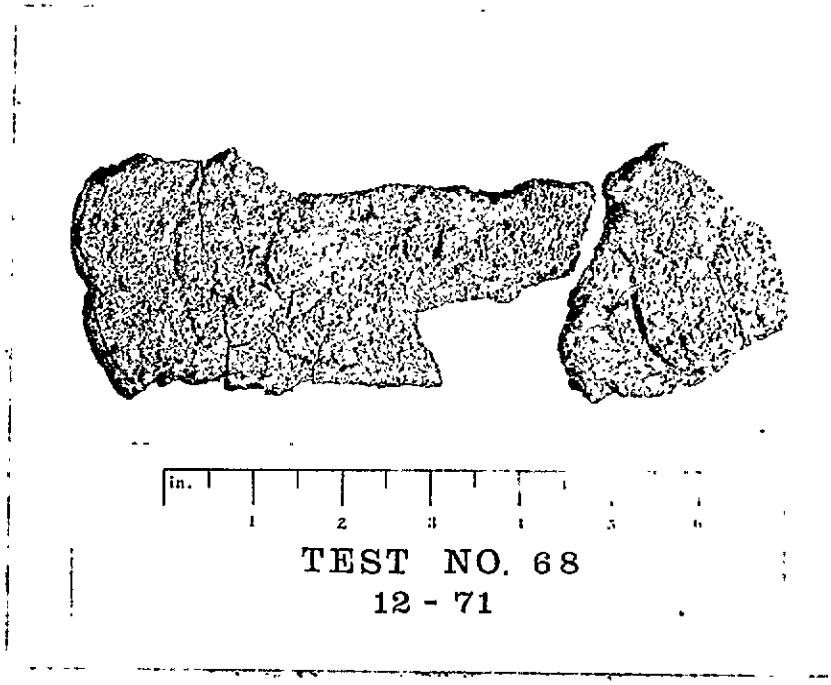


Figure 5 - 30% Saxon No. 1
+70% Reference H.V. Coal

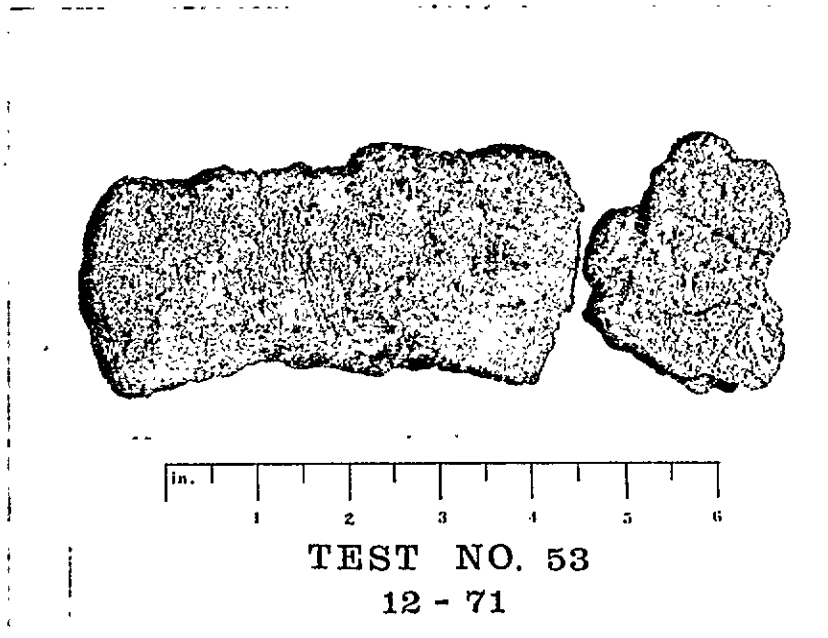


Figure 6 - 30% Saxon No. 2
+70% Reference H.V. Coal

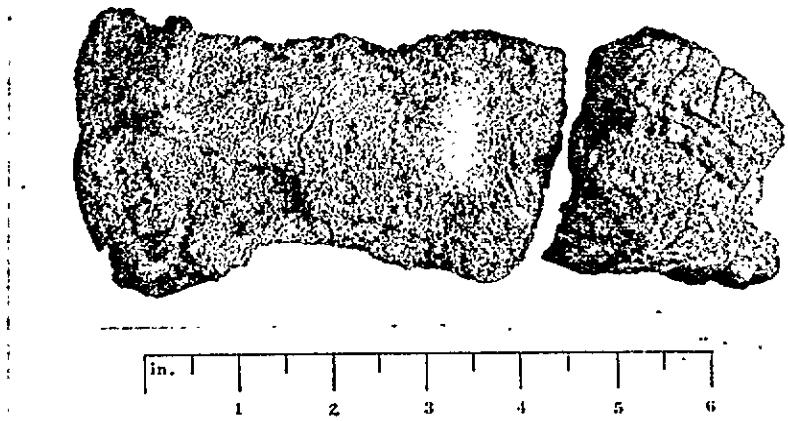


Figure 7 - 30% Saxon No. 3
+70% Reference H.V. Coal

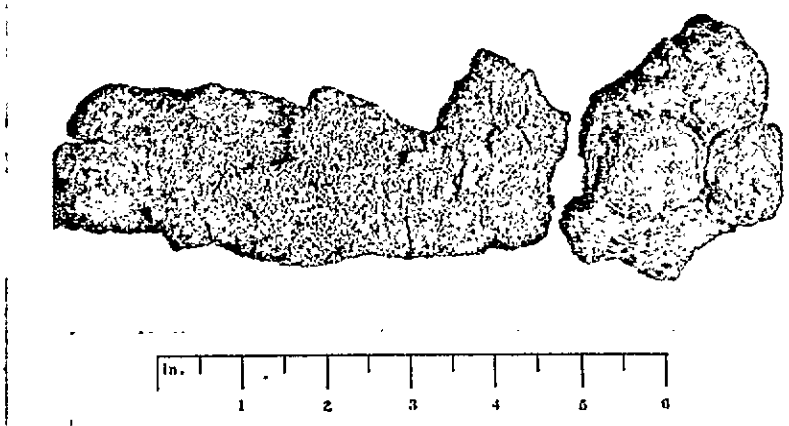


Figure 8 - 30% Saxon No. 4
+70% Reference H.V. Coal

APPENDIX II

BURNETT RESOURCE SURVEYS LTD.

METHODS AND PROCEDURES OF AERIAL PHOTO SURVEY, CONTROL SURVEY AND MAPPING CARRIED OUT DURING 1975 ON BEHALF OF DENISON MINES (BC) LIMITED

METHODS AND PROCEDURES OF AERIAL PHOTO SURVEY, CONTROL SURVEY AND MAPPING CARRIED OUT DURING 1975 ON BEHALF OF DENISON MINES (BC) LIMITED

J. Kende

Burnett Resource Surveys Ltd.

At the request of Denison Mines (BC) Limited, Burnett Resource Surveys Ltd. undertook a program of aerial photography aimed at assisting exploration on the Quintette, Saxon and Belcourt coal properties.

This program was designed to achieve the following results:

1) A semi-controlled mosaic which included the three coal properties could be prepared;

2) Utilization of this photography to carry out photogrammetric mapping at various scales and contour intervals;

3) The aerial photography survey could be used to assist intensive environmental surveys;

4) Photo geological studies could be carried out;

5) Transportation routes such as rail or pipeline could be detailed and refined;

6) Assistance could be given to solving various problems concerning plant site, pit design and infrastructure.

Keeping all the above in mind we designed the following program:

1) High level photography to cover approximately 250 sq. miles of area at the approximate scale of 1:32,000.

2) High level photography to cover approximately 800 sq. miles at 1:25,000.

3) Medium level photography to cover approximately 455 sq. miles at 1:15,000 approximate scale.

4) Low level photography to cover approximately 50 sq. miles at the approximate scale of 1:10,000.

   Note: All above photography was black/white photography on panchromatic film.

5) Colour photography at the approximate scale of 1:12,000 covering approximately 100 sq. miles.

Colour photography utilized an aero-colour film 2445 and 2448.

The various photo scales were selected in such a manner as to be suitable for various purposes, especially compilation of metric photogrammetric maps.

The photography was carried out in the months of August and September of 1975, at a time when much of the ground work was completed. Thus, diamond drill holes, road locations and targets could be documented.

Several sets of prints were dispatched, immediately after photography, to Denison Mines (BC) Limited, so that these could be utilized in the field by the geologist as well as the survey crews for the remainder of the season.

Control Survey:

During the summer, ground crews undertook survey control work on the coal properties. In early spring, targets of different sizes for various photo scales were laid on the ground. This work required a helicopter to provide transport to points of difficult access. In all, approximately 200 targets were set to control the topographic mapping. The ground parties surveyed the location of targets, drill-holes and base lines, adits, etc.

The surveyors employed the most modern electronic survey equipment, in addition to conventional equipment.

All surveys are now based on U.T.M. coordinates (geodetic datum).

All coordinates are tabulated in the metric system.

Photogrammetric Mapping:

In the first quarter of 1975, Burnett Resource Surveys Ltd. undertook photogrammetric mapping of the coal properties, based on existing data. The scale chosen was 1:5,000, with 5 metre contour interval. Belcourt map sheets were designed in such a manner that each sheet consisted of four coal licenses. All maps were produced to the highest standards with regard to photogrammetry and carthography as could be gained from the existing data (Belcourt: existing NTS maps; Saxon and Quintette: existing 1" = 400', 20' contour topograph). The maps were then utilized by the field geologist during the summer program. These maps covered the Belcourt and Saxon properties and the localized Little Windy, Big Windy and Roman Mountain areas. Additional mapping was carried out at the scale of 1" = 400' with 20 ft. contour interval to cover the fringe areas of Wolverine, Babcock and Five Cabin areas (utilizing existing Denison control).

During 1975, Burnett Resource Surveys produced 6 - 1:25,000 preliminary maps with 20 metre interpolated contours, described above, to cover Babcock, Five Cabin and Wolverine areas. The map sheets are based on coal license areas, and the sheet layout is designed to suit future projects of detailed metric mapping. Cartography of these maps is designed in such a way that it can accommodate the geological data and still assure clarity.

A similar program of 1:25,000 scale preliminary map preparation was carried out to cover Saxon property (1 map sheet) and Belcourt property (3 map sheets); the only difference being that the contour interval is 25 metres. The difference in contour interval is due to the fact that

some survey data and existing photogrammetric mapping was available to cover part of the 6 map sheets for the Wolverine, Babcock and Five Cabin areas, but no ground control survey or mapping was available for the Belcourt or Saxon properties.

To facilitate environmental studies, colour as well as the black/white photography was provided.

As indicated, all photography and survey control carried out in 1975 was designed to fully "metrify" the Denison properties. Further survey control will be required to replace the preliminary maps with regional and detailed metric maps.

APPENDIX III

CURRENT SCHEDULE OF COAL LICENCES

SAXON PROPERTY

SAXON

Licence No.	Date Issued	Acres	Land Description		
			Series	Block	Units
2763	Oct 16/74	748	93-I-1	I	61, 62, 71, 72
2764	"	748	93-I-1	I	81, 82, 91, 92
2765	"	748	93-I-1	I	83, 84, 93, 94
2766	"	747	93-I-8	A	1, 2, 11, 12
2767	"	747	93-I-8	A	3, 4, 13, 14
2768	"	747	93-I-8	A	5, 6, 15, 16
2769	"	747	93-I-8	A	21, 22, 31, 32
2770	"	747	93-I-8	A	23, 24, 33, 34
2771	"	747	93-I-8	A	25, 26, 35, 36
2772	"	747	93-I-8	A	27, 28, 37, 38
2773	"	187	93-I-8	A	39
2774	"	747	93-I-8	A	41, 42, 51, 52
2775	"	747	93-I-8	A	43, 44, 53, 54
2776	"	747	93-I-8	A	45, 46, 55, 56
2777	"	747	93-I-8	A	47, 48, 57, 58
2778	"	747	93-I-8	A	49, 50, 59, 60
2779	"	187	93-I-8	A	62
2780	"	746	93-I-8	A	63, 64, 73, 74
2781	"	746	93-I-8	A	65, 66, 75, 76
2782	"	746	93-I-8	A	67, 68, 77, 78
2783	"	746	93-I-8	A	69, 70, 79, 80
2784	"	746	93-I-8	A	85, 86, 95, 96
2785	"	746	93-I-8	A	87, 88, 97, 98
2786	"	746	93-I-8	A	89, 90, 99, 100
2787	"	187	93-I-8	B	51
2788	"	746	93-I-8	B	61, 62, 71, 72
2789	"	373	93-I-8	B	63, 73
2790	"	746	93-I-8	B	81, 82, 91, 92
2791	"	746	93-I-8	B	83, 84, 93, 94
2792	"	560	93-I-8	B	85, 95, 96
2793	"	373	93-I-8	H	8, 18
2794	"	746	93-I-8	H	9, 10, 19, 20
2795	"	746	93-I-8	G	1, 2, 11, 12
2796	"	746	93-I-8	G	3, 4, 13, 14

Licence No.	Date Issued	Acres	Land Description		
			Series	Block	Units
2797	Oct 16/74	746	93-I-8	G	5, 6, 15, 16
2798	"	746	93-I-8	G	7, 8, 17, 18
2799	"	187	93-I-8	G	19
2800	"	746	93-I-8	G	21, 22, 31, 32
2801	"	746	93-I-8	G	23, 24, 33, 34
2802	"	746	93-I-8	G	25, 26, 35, 36
2803	"	746	93-I-8	G	27, 28, 37, 38
2804	"	746	93-I-8	G	29, 30, 39, 40
2805	"	187	93-I-8	G	42
2806	"	745	93-I-8	G	43, 44, 53, 54
2807	"	745	93-I-8	G	45, 46, 55, 56
2808	"	745	93-I-8	G	47, 48, 57, 58
2809	"	745	93-I-8	G	49, 50, 59, 60
2810	"	745	93-I-8	G	67, 68, 77, 78
2811	"	745	93-I-8	G	69, 70, 79, 80
2812	"	746	93-I-8	G	89, 90, 99, 100
		33,585			

APPENDIX 4

RESERVE CALCULATIONS

SAXON EAST AND SAXON SOUTH

RESERVE CALCULATIONS

SAXON EAST

SECTION	SEAM	SEAM THICKNESS	DRILL HOLE OR ADIT	DIP LENGTH	DIP	STRIKE LENGTH	TOTAL IN SITU RESERVE
SN 10 to north property boundary	A	uneconomic	7003	645	54°	280	uneconomic
	B	uneconomic	7003	580	54°	250	uneconomic
	D	3.26	7202	180	54°	261/0	210617
SN 8 to SN 10	A	uneconomic	7003	1360	46°	2000	uneconomic
	B	uneconomic	7003	1645	46°	2000	uneconomic
	D	3.26	7202	1890	46°	2000	18499225
SN 6 to SN 8	A	uneconomic	7003	1545	47°	2000	uneconomic
	B	uneconomic	7003	1765	47°	2000	uneconomic
	D	3.26	7202	1359	47°	2000	13291038
SN 4 to SN 6	A	3.57	7201	2295	39°	2000	24579482
	B	uneconomic	7201	2210	39°	2000	uneconomic
	D	uneconomic	7201	-	39°	2000	uneconomic
SN 3 to SN 4	A	3.57	7201	1745	43°	1000	9344487
	B	uneconomic	7201	1630	43°	1000	uneconomic
	D	uneconomic	7201	1495	43°	1000	uneconomic
SN 1 to SN 3	A	10.36	7004	860	38°	2000	26722321
	A west fault block	7.31	7103	900	38°	2000	19736812
	B	uneconomic	7103	1673	38°	2000	uneconomic
	D	uneconomic	7103	1380	38°	2000	uneconomic
SE 5 to SN 1	A	5.12	7102	825	37°	2000	12672016
	B	4.85	ADIT 2	870	37°	2000	12658516
	D	3.35	7102	975	37°	2000	9798763
SE 4 to SE 5	A	3.66	ADIT 1	915	45°	2000	10046713
	B	4.85	ADIT 2	910	45°	2000	13240518
	D	3.35	7102	930	45°	2000	9346512

SECTION	SEAM	SEAM THICKNESS	DRILL HOLE OR ADIT	DIP LENGTH	DIP	STRIKE LENGTH	TOTAL IN SITU RESERVE
SE 3 to SE 4	A	3.66	ADIT 1	363	48^{o}	2000	3985745
	B	4.85	ADIT 2	355	48^{o}	2000	5165257
	D	7.62	7001	385	48^{o}	2000	8801112
SE 2 to SE 3	A	1.89	7101	840	41^{o}	2000	uneconomic
	B	1.62	7101	850	41^{o}	2000	uneconomic
	D	7.62	7101	800	41^{o}	2000	18288024
SE 1 to SE 2	A	1.89	7101	680	49^{o}	2000	uneconomic
	B	1.62	7101	675	49^{o}	2000	uneconomic
	D	7.62	7101	720	49^{o}	2000	16459221
South boundary to SE 1	A	1.89	7101	681	49^{o}	970/1400	uneconomic
	B	1.62	7101	675	49^{o}	1020/1470	uneconomic
	D	7.62	7101	720	49^{o}	1070/1530	10871086
						TOTAL	243717465
							243.7×10^{6}

SAXON SOUTH - RESERVE CALCULATION

The following formulas have been used to calculate coal tonnages and overburden ratios:

$$\text{overburden rock volume + coal volume} = \frac{\text{25 metre contour planimeter areas}}{\text{planimeter function}} \times \text{map scale}^2 \times 25 \text{ metres (result in cu. metres)}$$

$$\text{seam volume} = \frac{\text{planimeter areas}}{\text{planimeter function}} \times \text{map scale}^2 \times \text{dip secant} \times \text{seam thickness (result in cu. metres)}$$

Sample analysis from Saxon East indicates an average S.G. for the raw coal between 1.6 and 1.7, hence 1.5 is considered to be a conservative estimate for the raw coal S.G.

The overburden ratio has been calculated as follows:

$$\frac{\text{volume of rock \& coal} - \text{volume of coal}}{\text{tonnage of coal}}$$

The results for three blocks in Saxon South having 2 seams, 9 and 4 metres thick, are tabulated below:

	SEAM D COAL TONNAGE (M. metric tons)	SEAM E COAL TONNAGE (M. metric tons)	ROCK AND COAL VOLUME (M. cu.metres)	METRIC RATIO (cu.metre/ metric ton)	ENGLISH SYSTEM RATIO (cu.yds/ long ton)
BLOCK 1	31.9	12.8	363	7.45/1	9.91/1
BLOCK 2	26.6	8.9	182	4.46/1	5.92/1
BLOCK 3	31.8	7.1	143	3.00/1	3.99/1

Total Inferred Reserves in Seams D & D = 119.2 x 10^6 metric tons

Overburden Ratio: $\frac{688 \times 10^6 - 79.5 \times 10^6}{119.2 \times 10^6} = 5.10/1$ metric or 6.78/1 English

For comparison with other West Canadian mining operations which are not yet using international system (S.I.) units, it may be interesting to note that the equivalent stripping ratio for 5.2 cu. m./metric ton is 6.9 cu. yds./long ton.

SAXON SOUTH RESERVES

Planimeter Function

1080 = 100 cm^2
∴ 0.00108 = 1 m^2 at 1/10000 scale on ground

BLOCK 1

D SEAM

AREA A

$$\text{Coal Volume} = \frac{\text{Planimeter area}}{\text{Planimeter function}} \times \text{dip secant} \times \text{seam thickness}$$

$$= \frac{1238}{0.00108} \times 1.0664 \times 9$$

= 11,001,694 cubic metres

Assume S.G. 1.5 = 16,502,541 metric tons

AREA B

$$\text{Coal Volume} = \frac{0416}{0.00108} \times 1.0148 \times 9$$

= 3,517,973 cubic metres

(S.G. = 1.5) = 5,276,960 metric tons

AREA C

$$\text{Coal Volume} = \frac{0720}{0.00108} \times 1.1218 \times 9$$

= 6,730,800 cubic metres

(S.G. = 1.5) = 10,096,200 metric tons

E SEAM

AREA A

$$\text{Coal Volume} = \frac{1178}{0.00108} \times 1.0664 \times 9$$

$$= 4{,}652{,}664 \text{ cubic metres}$$

$$(\text{S.G.} = 1.5) = 6{,}978{,}995 \text{ metric tons}$$

AREA B

$$\text{Coal Volume} = \frac{0355}{0.00108} \times 1.0148 \times 4$$

$$= 1{,}334{,}274 \text{ cubic metres}$$

$$(\text{S.G.} = 1.5) = 2{,}001{,}411 \text{ metric tons}$$

AREA C

$$\text{Coal Volume} = \frac{0618}{0.00108} \times 1.1218 \times 4$$

$$= 2{,}567{,}676 \text{ cubic metres}$$

$$= 3{,}851{,}513 \text{ metric tons}$$

BLOCK 2

D SEAM

$$\text{Coal Volume} = \frac{1893}{0.00108} \times 1.1238 \times 9$$

$$= 17{,}727{,}945 \text{ cubic metres}$$

$$(\text{S.G.} = 1.5) = 26{,}591{,}918 \text{ metric tons}$$

E SEAM

$$\text{Coal Volume} = \frac{1423}{0.00108} \times 1.1238 \times 4$$

$$= 5{,}922{,}842 \text{ cubic metres}$$

$$(\text{S.G.} = 1.5) = 8{,}884{,}264 \text{ metric tons}$$

BLOCK 3

D SEAM

AREA A

$$\text{Coal Volume} = \frac{1172}{0.00108} \times 1.7037 \times 9$$

$$= 16{,}739{,}470 \text{ cubic metres}$$

$$(\text{S.G.} = 1.5) = 24{,}959{,}205 \text{ metric tons}$$

AREA B

$$\text{Coal Volume} = \frac{0487}{0.00108} \times 1.1259 \times 9$$

$$= 4{,}569{,}278 \text{ cubic metres}$$

$$= 6{,}853{,}916 \text{ metric tons}$$

E SEAM

AREA A

$$\text{Coal Volume} = \frac{0546}{0.00108} \times 1.7037 \times 4$$

$$= 3{,}445{,}260 \text{ cubic metres}$$

$$(\text{S.G.} = 2.5) = 5{,}167{,}890 \text{ metric tons}$$

AREA B

$$\text{Coal Volume} = \frac{0315}{0.00108} \times 1.1259 \times 4$$

$$= 1{,}313{,}550 \text{ cubic metres}$$

$$(\text{S.G.} = 1.5) = 1{,}970{,}325 \text{ metric tons}$$

TOTAL SEAM D

BLOCK 1	AREA A	16,502,541
	AREA B	5,276,960
	AREA C	10,096,200
BLOCK 2	AREA A	26,591,918
BLOCK 3	AREA A	24,959,205
	AREA B	6,853,916
		90,280,740

$= 90.3 \times 10^6$ metric tons

		TOTAL SEAM E
BLOCK 1	AREA A	6,978,995
	AREA B	2,001,411
	AREA C	3,851,518
BLOCK 2	AREA A	8,884,264
BLOCK 3	AREA A	5,167,890
	AREA B	1,970,325
		28,854,403

$= 28.9 \times 10^6$ metric tons

TOTAL SEAM D = 90.3

SEAM E = 28.9

119.2 x 10^6 metric tons

OVERBURDEN VOLUMES

BLOCK 1

Overburden rock volume + coal volume =

$$\frac{\text{25 metre contour planimeter areas}}{\text{planimeter function}} \times \text{contour interval} \times \text{map scale}^2$$

$$= \frac{1568}{10800} \times 10000^2 \times 25$$

$$= 363 \times 10^6 \text{ cubic metres}$$

OVERBURDEN RATIO

$$\text{Ratio} = \frac{\text{Volume of rock + coal} - \text{volume of coal}}{\text{tonnage of coal}}$$

$$= \frac{363 \times 10^6 - 29.8 \times 10^6}{44.7 \times 10^6}$$

$$= 7.45/1 \text{ metric} \quad \text{or } 9.91/1 \text{ English}$$

BLOCK 2

OVERBURDEN VOLUME

$$= \frac{786}{10800} \times 10000^2 \times 25$$

$$= 182 \times 10^6 \text{ cubic metres}$$

OVERBURDEN RATIO

$$= \frac{182 \times 10^6 - 23.7 \times 10^6}{35.5 \times 10^6}$$

$$= 4.46/1 \text{ metric} \quad \text{or } 5.92/1 \text{ English}$$

BLOCK 3

OVERBURDEN VOLUME

$$= \frac{618}{10800} \times 10000^2 \times 25$$

$$= 143 \times 10^6 \text{ cubic metres}$$

OVERBURDEN RATIO

$$= \frac{143 \times 10^6 - 26.0 \times 10^6}{39.0 \times 10^6}$$

= 3.0/1 metric or 3.99/1 English

TOTAL OVERBURDEN RATIO

$$= \frac{688 \times 10^6 - 79.5 \times 10^6}{119.2 \times 10^6}$$

= 5.10/1 metric or 6.78/1 English

REFERENCES

1. Eddinger, R. Tracy and Mitchell, John, "Pilot-Scale Coke Ovens - Development and Operation; Proc. of Blast Furnace, Coke Oven and Raw Materials Committee", AIME, 15, 148-163 (1956).

2. ASTM Designation: D388-66, "Classification of Coals by Rank".

3. ASTM Designation: D720-67, "Test for Free Swelling Index of Coal".

4. ASTM Designation: D2639-71, "Test of Plastic Properties of Coal by the Constant-Torque Gieseler Plastometer." (Constant torque plastometer used with a torque of 40 gram-inch; start, 1 dd/m; fusion, 5 dd/m; final, 1 dd/m; solidification, no movement; range-temp., between start and final temperatures).

5. Burrough, E.J., "Specific Volatile Index", Fuels Division Memorandum 97/58-CG, Fuels and Mining Practice Division, Mines Branch, Dept. of M. and T.S., Ottawa, Canada (1958).

6. ASTM Designation: D409-71, "Grindability of Coal by the Hardgrove-Machine Method".

7. ASTM "Proposed Method of Test for Measuring the Coking Pressures of Coals by a Movable-Wall Slot Oven" (presently under consideration for adoption as a standard method of test by Sub-Committee XV of ASTM Committee D-5).

8. ASTM Designation: D291-60, "Cubic Foot Weight of Crushed Bituminous Coal" Procedure A - Procedure for Uncompacted Cubic Foot Weight).

9. ASTM Designation: D293-69, "Test for Sieve Analysis of Coke".

10. ASTM Designation: D294-64, "Tumbler Test for Coke".

11. Japanese Drum Test for Coke, Designated as J.I.S. (Japanese Industrial Standard) K 2151-1972, pp. 12-16).

12. Burrough, E.J., Strong, R.A. and Swartzman, E., "Report of Investigation on the Method Now in Use at the Fuel Research Laboratories for Determination of the Apparent Specific Gravity of Coke", R.I. C.S. 35, Division of Fuel Testing, Department of Mines, Ottawa, August 24, 1934.

13. ASTM Designation: D2014-71, "Expansion or Contraction of Coal by the Sole-Heated Oven".

14. German Industrial Specification No. DIN 51739/March 1951.

15. ASTM Designation: D-2797-72, "Preparing Coal Samples for Microscopical Analysis by Reflected Light".

16. ASTM Designation: Designation: D-2798-72, "Determining Microscopically the Reflectance of the Organic Components in a Polished Specimen of Coal".

17. ASTM Designation: D-2799-72, "Microscopical Determination of Volume Percent of Physical Components of Coal".

18. Schapiro, N., Gray, R.J., "Petrographic Classification Applicable to Coals of all Ranks", Proc. Ill, Min. Inst., 1960, 68, 83-97.

19. H. Hoffmann, and K. Hoehne, Brenstoff Chemie, 35, (1954), pp 202, 236, 269 and 298.

20. Fisher, A.D., "Metallurgical Coals for the Future", CIM Bulletin, Volume 65, No. 721, May 1972, pp 25-36.