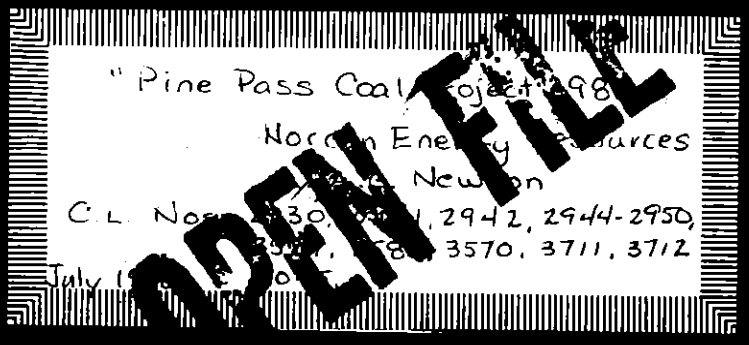
PR-Pine Pass 80(1)A



PR-Pine Pass 80(1)A

PINE PASS COAL PROJECT

1980

N.E. BRITISH COLUMBIA

CONFIDENTIAL
OPEN FILE

NORCEN ENERGY RESOURCES LTD.
COAL EXPLORATION DEPARTMENT
JULY, 1980

A. C. NEWSON, P. GEOL.

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SUMMARY

The Pine Pass 1980 Report is to be considered in conjunction with the Pine Pass 1979 Report.

The drilling in 1980 was carried out in February and March. Three NQ3 diamond drill holes were completed giving a total meterage of 1235 m.

The results of the drilling confirmed that the most potential lies in the E seam, 45 - 90 m beneath the top of the Gething. This seam is least disturbed in the Northern part of the property around Johnson Creek. In the holes drilled in this area (Figure 1), it ranges from 2.00 to 4.86 m thick at a depth of 81 to 369 m below the surface.

The reserves are to be considered inferred underground reserves and would appear to be between 27 and 60 million tonnes in place. Further drilling to the S.W. of the 1980 program would be aimed at finding surface coal and proving these reserve figures.

The coal has suitable thermal characteristics with less than 6% raw ash, 14 to 15,000 B.T.U. and sulphur generally less than 0.5%.

As mentioned in Pine Pass 1979, some potential for a small strip operation lies around the old mine site and drill holes 79-6, 79-7, 77-1, 77-2 and 75-9. This coal is very disturbed and could only really be considered as being economical if a mine was developed in the area on other coal reserves.

RECOMMENDATIONS

Coal Licences: (Figure 4)

1) By December 15th, 1980 the work requirement should be fulfilled and the licence fees paid to keep the following licences in good standing until December 15th, 1981.

2950	3580
2949	3579
2948	2942
2947	2941
2946	3712
2945	3711
2944	3570
6045	2930

The following licences should be allowed to lapse:

2929	2921
2928	2918
2927	2917
2926	2916
2925	2912
2924	2911
2923	2910
2922	

Geological Assessment:

The aim of any further drilling in the Pine Pass property will be to establish continuity of E seam between 75-8 and the area around 75-10, 80-1, 80-2 and 80-3. As the strata in these holes appears to be dipping to the

northeast some potential for shallow strip coal may lie to the southwest of them.

EXPLORATION - 1980

Aim:

The aims of the 1980 drilling program were set out as:

1) Improve the assessment of the reserve potential for seams E and F between 79-1 and 75-10. Special emphasis should be placed on the area of least cover around 75-10.

2) Assess the continuity between the seams in 75-8 and the area outlined in 1) above. On the basis of the reserve's possibility in this area, coal licence numbers 3579, 2946 and 2950 should be either dropped or kept in good standing.

3) Investigate the possible reserve potential of seam G and H within the area of most mining potential. (Pine Pass Coal Project - 1979, page 5).

Results:

See Appendix I and Appendix II for details. Drill hole 80-1 (Figure 1) was spudded in the Moosebar formation. It cored 260 m of Moosebar shale before entering the Gething formation. Seams E and F were encountered 90 m below the top of the Gething formation after going through an overthickened and faulted sequence. Seam D and C were encountered before the hole finished at 430.7 m.

Drill hole 80-2 (Figure 1) cored 215 m of Moosebar formation before entering the Gething formation. After encountering some faulting, seam G was intersected 50 m

below the top of the Gething formation. Seam E was found 70 m below the top of the Gething. From here to the end of the hole, a full sequence of seams A,B,C and D were drilled with considerable faulting between seams. The hole ended at 435 m.

The last hole, 80-3 (Figure 1) was also spudded in the Moosebar formation and cored 150 m before reaching the top of the Gething formation. Seams G and F were encountered before intersecting seam E, 75 m below the top of the Gething formation. Some faulting was also noted above seam E. Seams A,B,C and D were also intersected before the hole ended at 370 m.

These three drill holes fulfilled the first and third aim of the program. They established that the only seam with lateral persistency and some economic potential, between 79-1 and 75-10 (Figure 2), is seam E.

Summary of Seam E In All Drill Holes In The Northern End of the Property

	Depth to Seam E	True Thickness of Seam E	DIP
H1	109 m	3.37 m	20° SW
H4	Hole Not Deep Enough		
75-8	81 m	3.09 m	45° NE
75-10	163 m	4.86 m	35° NE
80-1	369 m	2.00 m	47° NE
80-2	308 m	2.90 m	20° NE
80-3	251 m	3.34 m	30° NE
79-1	133 m	1.18 m	15° SW

The reserve potential of seams G and H are considered negligible as they are either not of economic thickness or are not laterally continuous.

No holes were drilled between 75-8 and 75-10 so the continuity of any of the seams in this area could not be proved.

GEOLOGY

Stratigraphy:

The stratigraphic sequence outlined in the Pine Pass Coal Report - 1979 is still considered valid for this report.

	GROUP	FORMATION	MEMBER	DESCRIPTION
Lower Cretaceous	Fort St. John	Commotion Formation	Boulder Creek Member (122-140 m)	Fine grained, well sorted sandstone, massive conglomerate, non-marine sandstone & mudstone
			Hulcross Member (75-145 m)	Dark grey marine shales with sideritic concretion
			Gates Member (100-145 m)	Fine grained, marine & non-marine sandstone, conglomerate, coal, shale & mudstone
		Moosebar (120-300 m)		Dark grey marine shale, glauconite, sandstone & pebbles at base
	Bullhead	Gething (450 m+)		Fine - coarse grained, brown, calcareous, carbonaceous, sandstone, coal, carbonaceous, shale and conglomerate
		Cadomin Formation (45+)		Massive conglomerate containing chert & quartzite pebbles

Structure:

All three of the holes intersected faulting in both the Moosebar and Gething formations. Probably the most serious result of the faulting is seen by the overthickening of the Upper Gething between the Bluesky formation and seam E. This interval can be found to increase from 45 m in an undisturbed drill hole (H1) to 90 m in the most disturbed drill hole (80-3), (Figure 3).

It seems likely that this overthickening is a result of one or more thrust faults in the Upper Gething. It can only be assumed at this stage that this thrusting will intersect the coal seams at some point to the west of the drill holes (Figure 1 and 2).

RESERVES

Without further information on the areal extent of the coal, especially in the southern direction toward drill hole 75-8, no reliable new reserve calculation can be made. The three most recent holes have defined the northeast side of a block three kilometers long with a seam at least 2 m thick. This seam reaches a maximum thickness of 4.86 m at 75-10.

The third dimension of this reserve block is, as yet, unproved but should be somewhere over a kilometer in length. As a rough estimate, the following figure could be calculated.

If it is assumed we have a block of nine square kilometers, defined by 80-1, 80-2 and 75-8, and a seam thickness of 2 m, we could arrive at a pessimistic reserve figure of 27 million tonnes of coal in place.

A more optimistic figure could be calculated using a seam thickness of 3 m, and by extending the reserve area to the Northwest. This would give a block of land of 13.5 square kilometers. A reserve figure calculated on this figure would give 60 million tonnes of coal in place.

COAL QUALITY

All the seams intersected were analysed extensively. The results are tabulated with the detail seam section in Appendix I.

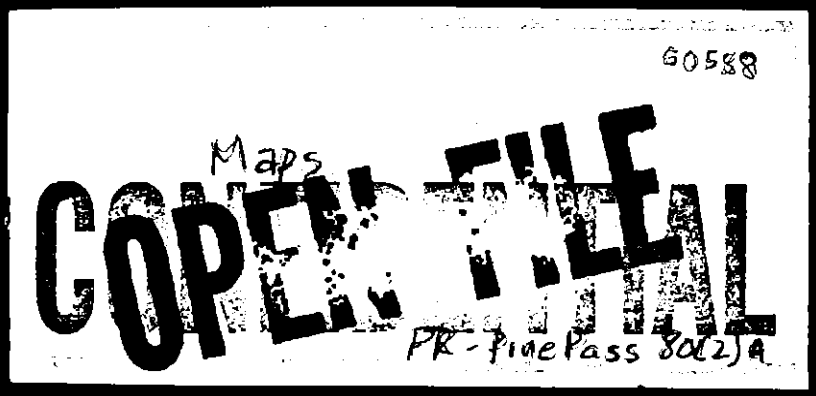
As the E seam appears to be the most favourable, the results of its analysis in the holes around the potential reserve area are listed below.

Hole #	% Core Recov.	% Recov. At 1.60 s.g.	Ash %	F.S.I.	B.T.U.	V.M.	Seam Thick
H1		Not Sampled					3.37 m
H4		Hole Not Deep Enough					-
75-8	70%	93	6.0	1 1/2	-	-	3.09 m
75-10	78%	98	5.0	1 1/2	-	-	4.90 m
80-1	100%	75	4.9	2 1/2	14669	19.4	2.00 m
80-2	52%	Core Recovery too Low - Analysis Invalid					2.90 m
80-3	101%	98	4.4	2	14701	18.7	3.34 m

The sulphur generally runs about 0.50% and the ash fusion temperature in excess of 2000° F.

In summary, therefore, the coal in seam E is a low volatile bituminous coal with very low ash. It is not considered suitable as a metallurgical coal but would be suitable as a thermal coal.

PR - Pine Pass 80(2)A



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H1 Approx 2 Km NW

D'

C'

B'

A'

Approximate Location of Winter Road

JOHNSEN CREEK

FRASER RIVER

MINK CREEK

80-1 (65°)

75-10 (65°)

80-3 (70°)

80-2

79-1

79-6 (70°)

76-1 (65°)

79-7 (60°)

79-2

77-1

75-8 (60°)

75-9 (60°)

79-3

79-4

79-5

77-2

79-8

6,156,000 N

6,155,000 N

6,154,000 N

6,153,000 N

6,152,000 N

6,151,000 N

6,150,000 N

6,149,000 N

6,148,000 N

6,147,000 N

6,146,000 N

6,145,000 N

6,144,000 N

6,143,000 N

6,142,000 N

555,000 E

557,000 E

559,000 E

561,000 E

562,000 E

563,000 E

564,000 E

565,000 E

566,000 E

567,000 E

568,000 E

570,000 E

571,000 E

572,000 E

573,000 E

0 1,000 2,000 3,000 Meters

LEGEND

- AIR PHOTO DIP & STRIKE
- 135° MEASURED DIP & STRIKE
- VERTICAL BEDS
- HORIZONTAL BEDS
- ANTICLINE WITH PLUNGE
- SINCLINE WITH PLUNGE
- FORMATION OR MEMBER BOUNDARY
- INFERRED FORMATION OR MEMBER BOUNDARY
- MAJOR THRUST WITH DIP DIRECTION
- MINOR THRUST WITH DIP DIRECTION
- TRENCH
- SEISMIC LINES
- ROAD
- H4 or 79-10 VERTICAL DRILL HOLE
- 79-10(61°) ANGLE DRILL HOLE, DIP OF HOLE FROM HORIZONTAL, IN BRACKETS.
- OLD MINE SITE
- CROSS SECTION LINES

FORMATION KEY

- 6 BOULDER CREEK MEMBER
- 5 HULCROSS MEMBER
- 4 GATES MEMBER
- COMMOTION FORMATION
- 3 MOOSEBAR FORMATION, UPPER & LOWER
- FORT ST. JOHN GROUP
- 2 GETHING FORMATION
- 1 CADOMIN FORMATION AND OLDER
- BULLHEAD GROUP

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FIGURE - 1

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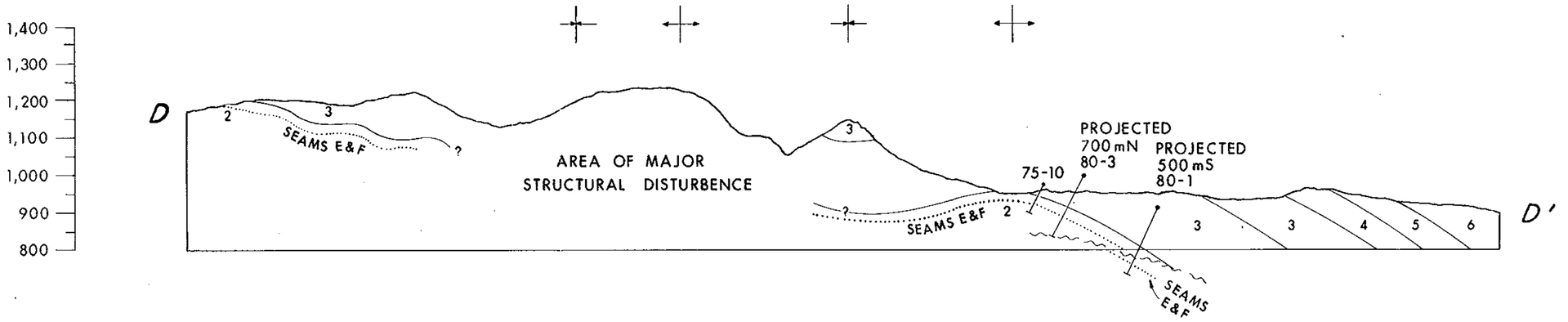
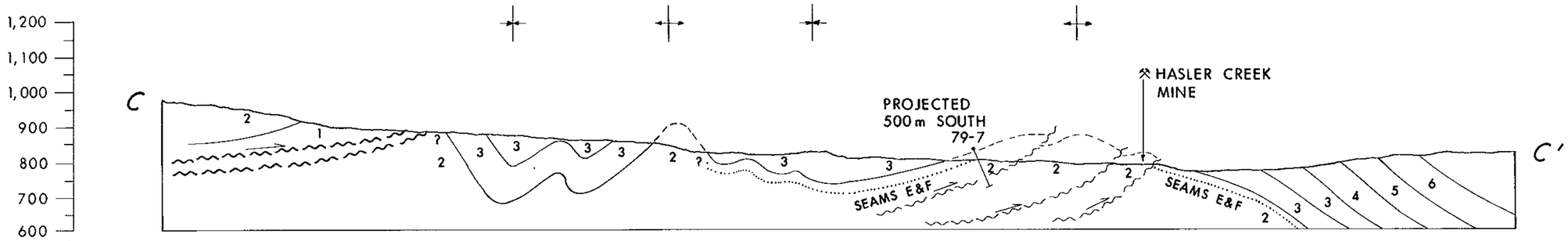
PINE PASS PROJECT - 1980

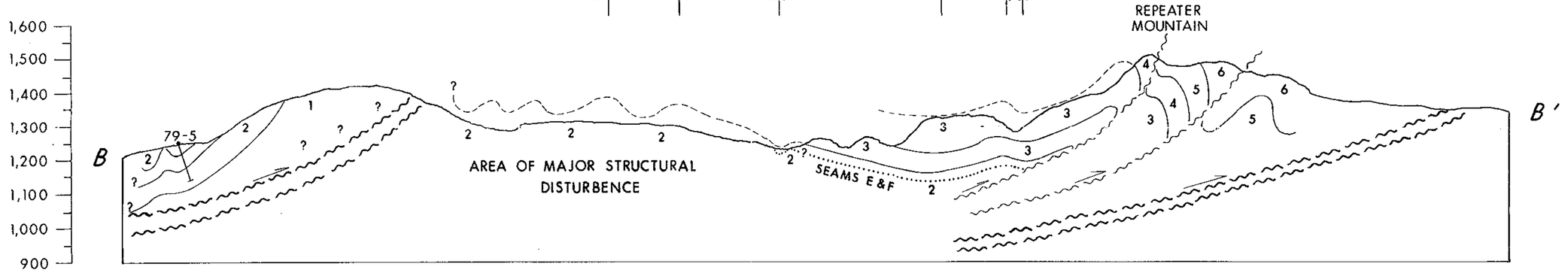
SURFACE GEOLOGY MAP

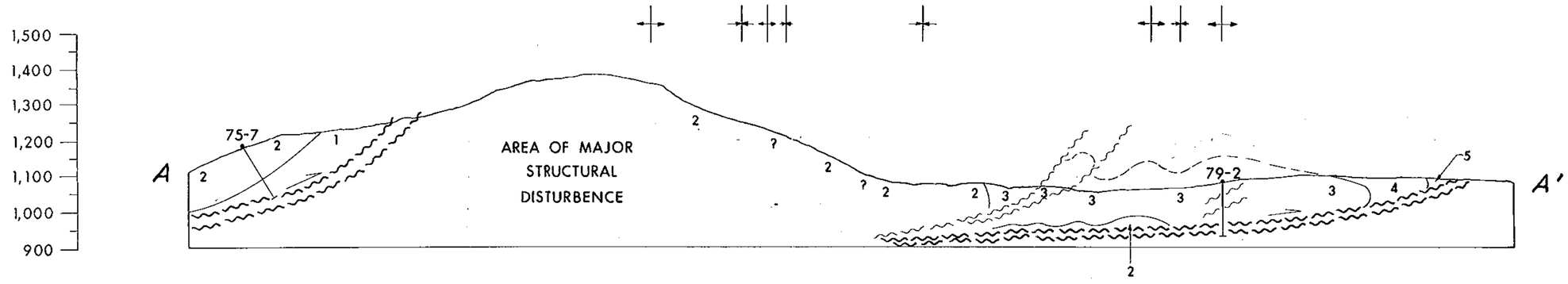
PR-PINE PASS 80(3)A

Scale: 1:20,000	Contour Interval: 50 metres	
Date: JUNE 21, 1980	Interpreted by: A.C. NEWSON	
Map of	File Number: 26-D-3	K.B.H.









Thickness (m) *FORMATION KEY*

Thickness (m)				
122 - 140 m	6	BOULDER CREEK MEMBER	COMMOTION FORMATION	FORT ST. JOHN GROUP
75 - 145 m	5	HULCROSS MEMBER		
100 - 145 m	4	GATES MEMBER		
120 - 300 m	3	MOOSEBAR FORMATION, UPPER & LOWER		
450 + m	2	GETHING FORMATION		BULLHEAD GROUP
45 + m	1	CADOMIN FORMATION AND OLDER		

0 1,000 2,000 3,000
Meters

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FIGURE - 2

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PINE PASS PROJECT - 1980

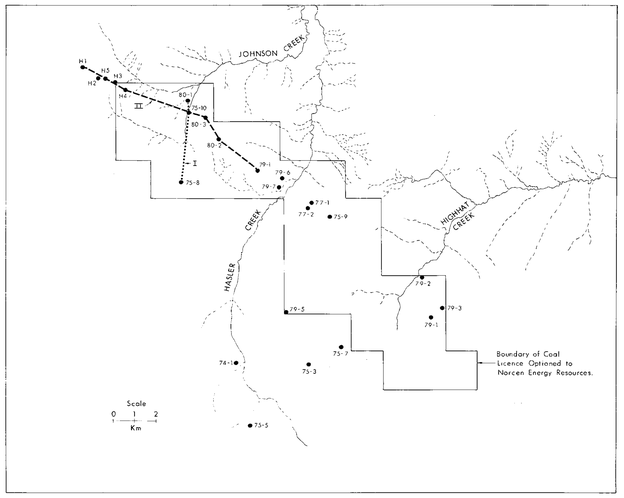
CROSS SECTIONS A, B, C AND D

PR - Pine Pass 80(3)A

Scale: 1:20,000 Contour Interval:
Date: 06/80 Interpreted by: A.C. NEWSON
Map of File Number: 26 - D - 3 KBH

CORRELATION SECTION I

CORRELATION SECTION II



NORTH

SOUTH

NORTH WEST

SOUTH EAST

FORT ST. JOHN GROUP, MOOSEBAR FORMATION

BULL HEAD GROUP, GETHING FORMATION

80-1

GAMMA • NEUTRON DENSITY • BULK DENSITY •

75-10

GAMMA • NEUTRON DENSITY • BULK DENSITY •

75-8

GAMMA • NEUTRON DENSITY • BULK DENSITY •

H 1

GAMMA • NEUTRON DENSITY • BULK DENSITY •

H 4

GAMMA • NEUTRON DENSITY • BULK DENSITY •

75-10

GAMMA • NEUTRON DENSITY • BULK DENSITY •

80-3

GAMMA • BULK DENSITY • FOCUSED BEAM •

80-2

GAMMA • NEUTRON DENSITY • BULK DENSITY •

79-1

GAMMA • NEUTRON DENSITY • BULK DENSITY •

#3

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FIGURE - 3

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CORRELATION SECTIONS I & II

PINE PASS COAL PROJECT 1980

PR-Pine Pass 80(2)A

Scale:	Contour Interval:	
Date: JUNE 21, 1980	Interpreted by: A.C. NEWSON	
Map of	File Number: 28-8-4	KGH

H1 Approx 2 Km NW

Approximate Location of Winter Road

LEGEND

- SEISMIC LINES
- ROAD
- H4 or 79-10 — VERTICAL DRILL HOLE
- 79-10(61°) — ANGLE DRILL HOLE, DIP OF HOLE FROM THE HORIZONTAL, IN BRACKETS
- OLD MINE SITE
- 2950 — COAL LICENCE NO.
- COAL LICENCE BOUNDARY & CORNER

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FIGURE - 4

KEY

- COAL LICENCE TO DROP
- COAL LICENCE TO ACQUIRE

Meters

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PINE PASS PROJECT - 1980

COAL LICENCE MAP

PR-Pine Pass 80(2)A

Scale: 1:20,000	Contour Interval: 50 metres
Date: 06/80	Interpreted by: A.C. NEWSON
Map of	File Number: 26-D-3

PR- Pine Pass 80(3)A

CONFIDENTIAL

PR- Pine Pass 80(3)A

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PR-Pine Pass 80(3)A

GEOLOGICAL BRANCH
ASSESSMENT REPORT

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COPEN FILE

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-1 SHEET NO.: 1 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
	-		9.4	-		-	Overburden	
			11.4			15°	Sandstone very fine grained, calcareous, Well developed	
							Small cross bedding. Some Vertical 1c.m. diameter vertical	
							burrows. Interbedded silty shale convoluted and disturbed,	
							abrupt boundaries between the two with some shale clasts	
							in sandstone. 50:50 sandstone appears slightly more calcar-	
							eous than shale. Transitional below	
1			12.3				Shale silty, disturbed by Penecontemporaneous.	
							Slumping and Bioturbation. Small horizontal pin prick	
							burrows 1.0 m., in diam. Transitional below.	
2			12.9			10°	Sandstone, very fine grained, calcareous. Well developed	
							small scale cross bedding. Some large vertical burrows	
							Minor shale interbeds with with sharp boundaries.	
							Transitional below.	
5			23.1				Shale silty, Top 0.6m show transition from above with very	
							fine grained sandstone interbeds. Becomes Argillaceous	
							beneath this zone. Still with some sign of disturbance	
							but not so distinct as material generally homogeneous.	
							One calcite filled fracture at 14.4'. Transitional below.	
5			24.3				Shale as above but with an increase of Arenaceous material	
							giving better defined structures. Calcareous poorly	
							defined boundaries.	
9			34.6				Shale silty interzones, calcareous, shows disturbance	
							from burrowing and penecontemp. deformation. Numerous	
							small, Imm Rad.; Burrows horizontal, Some variation in	
							Argillaceous Arenaceous content. Occasional 3-4 c.m. zones	
							of intense burrowing (small scale). Occasional vertical	
							burrow 5-10 m.m in size.	

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DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-1 SHEET NO.: 2 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	%REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
10			38.0			10°	Sandstone, very fine grained, with shaley interbeds.	
							Well defined small scale cross bedding. Abrupt between	
							zones. Transitional below some disturbance with minor	
							large scale 5-10 m.m. vertical burrows.	
11			41.6				Shale silty interzone typical of the shales described	
							above. Some large burrows but dominated by small scale	
							burrowing in scattered groups or in intense clusters.	
							Transitional below.	
13			47.1				Sandstone, very fine grained with interzones of silty shale	
							Again the structure is typified by small scale X bedding.	
							Numerous large burrows in the coarser zones with fine scale	
							burrowing in the finer units. Frequently well defined	
							boundaries between zones showing some disturbance.	
							Transitional below. Calcareous especially in the coarser	
							members. Some Pyritization of the large scale burrows.	
16			55.16				Shale with poorly defined zones of silty material 80:20	
							Some disturbance by burrowing and P.C. erosion. Typically	
							small burrows. Occasional clasts of coarser grained	
							material. Transitional below.	
19			64.8			15°	Sandstone, fine fine grained. With interzones of shale	
							moderately well defined boundaries throughout. Several	
							large vertical burrows, small scale cross bedding 60:40.	
							Transitional below.	
20			66.6				Shale silty, some minor coarse grained zones intensely	
							burrowed by small scale horizontal burrows.	
21			73.6				Sandstone, very fine grained with minor shaley interzones	
							Well defined bedding. Some D.C. erosion and minor large	
							scale burrowing. Transitional below. Calcareous.	

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DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-1 SHEET NO.: 3 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	%REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
23			74.8				Shale silty interzones, typically poorly defined sturcture but intense in places, Numerous small burrows horizontal.	
26			84.5			15°-20°	Sandstone fine grained. Very fine grained well bedded with some slightly large scale X bedding than normal. Shale clasts (2 mim - 15 m.m. in size) and semi angular limestone clasts. Shaley zones with sharp boundaries and numerous small scale burrows. Transitional below. Typically coarse material, calcareous.	
30			94.2				Shale silty, relatively Homogeneous throughout, numerous small burrows abrupt below.	
33			105.2			10°	Sandstone, very fine grained. Shaley with interbedded shales. 60:40. Sands well bedded with some small scale cross bedding. Shales typically disturbed with large and small scale burrows. Shaley units abrupt above and transitional to sands below. Some calcite filled fracs at 93.3 m. Sands more calcareous than shales. Transitional below.	
36			111.6				Shale with minor silty interbeds, poorly defined structures some Bioturbation and small scale burrows. Some calcite filled joints at 107.40.	
36			112.5				Shale as above very broken, considerable calcite filled joints. Some slicks, Trace clay gouge?	
39			120.9				Sandstone typically as above 103.8-110.1. Some calcite veins at top. Occasional limestone clasts in sands. Transitional below.	
43			129.9				Shale as above 110.6-112.5. Abrupt below	
48			146.1			15°-20°	Sandstone very fine grained, shaley interbeds 70:30. Sandstone bedded with some small scale X bedding occasionally disturbed by large burrows. The shaley units typically	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-1 SHEET NO.: 4 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL	
48									
Cont'd...							transitional below, Abrupt above with some rolling and		
							P.C. disturbance. Also occasionally showing zones on intense		
							small scale burrowing. 129.9-130.8. Some broken and slicks		
							with considerable calcite filled joints. Also at 145.5m.		
							Transitional below.		
49			152.1				Shale silty 8:20, Little structure evident. Some silty zones		
							with some zones of small scale burrowing. Transitional below.		
80			239.1				Shale very homogenous, black, no structure apparent.		
							185.1-189.3 Numerous Pyritized worm burrows		
							197.1-197.4 Minor calcite filled fracts		
							204.6-204.9 Minor calcite fracts with slices		
							209.7-210.0 Broken some calcite fracts		
						20°?	229.8-229.95 Bentonite Band White - Light Grey		
							Becomes less calcareous to base		
							240.3-240.4 Bentonite Band White -Grey		
							240.6-240.9 Clay soft dark grey		
							256.8 Calcite filled joint well developed.		
							Small crysts - nearly "vuggy" ib character.		
90			264.3				Shale - Glauconitic and carbonaceous Transitional above		
							abrupt below. Glauconitic sand sized.		
91			268.7			10°	Coarsening upward unit. 265.2' 50:50 sand shale top very		
							fine grained sand and internedded shale. Sands typically		
							moderately developed bedding with some cross bedding (small		
							scale) P.C. disturbance increasing down. Some large		
							pyritized burrows. Lower half dominant shale with small		
							burrows becoming more homogenous with depth Abrupt below		

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DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-1 SHEET NO.: 5 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
			269.0				Conglomerate 10-15 m.m. Pebble size, sandy Matrix coarse - Fine grained abrupt below.	
			269.9				Sandstone light Grey poorly bedded, carbonaceous abrupt below. Medium-coarse grained. Slightly calcareous.	
93			269.91				Coal Stringer	
			270.9				Shale coarsening down to very fine sand/shaley poorly developed bedding in sand unit. Not interbedded. Abrupt below.	
			271.5				Shale, sandy interzones but several pyritized worm burrows necklace structures. Transitional below.	
94			273.9				Shale, silty interzones. 80:20 But no structure abrupt below.	
			274.0				Coal	
94			275.4				Shale silty and fine sands shows a couple of large P.C. disturbances. Transitional below.	
			276.6			15°	Sandstone shaley 50:50. Homogeneous but developing some poor bedding to base. Transitional below.	
			276.9				Shale sandy 60:40. Some coaly and carbonaceous layers. Some calcite filled joints but no movement. Shows large scale penecontemp. rolling. Abrupt below Structures poorly defined.	
			278.4				Sandstone medium-fine grained dirty with occasional shale interbeds. Some bedding lamina but no X bedding Transitional below.	
96			280.8				Shale, silty with minor coaly stringers. Carbonaceous with some poorly defined P.C. def. structure. Transitional below. P.C. calcite filled partings.	
97			282.0				As above but sandier giving better developed bedding and coarse bedding. P.C. disturbance structures show up well. Some large burrows infilled with sand. Transitional below to shale.	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-1 SHEET NO.: 6 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	%REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
97			283.35				Shale as 278.4-280.8. Numerous calcite filled P.C. fine stringers? Replacement of organic material No movement. Abrupt below.	
98			285.6			20°	Sandstone fine grained poorly defined bedding and cross bedding Carbonaceous veins, abrupt below.	
100			290				Shale sandy interzones 80:20. Sandier zones showing some disturbance with some Bioturbation, Carbonaceous in part.	
101			293.25				Shale, Homogeneous, Uniformly carbonaceous through out.	
					0.11		Coal bright stick	
					0.12		Coal dull with bright stick	
					0.10		Coal shaley	
					0.56		Shale carbonaceous, coaly stringers Some minor slicks.	
					0.15		Coal bright stick	
					0.08		Shale carbonaceous	
					0.05		Shale	
101			294.34				Shale	
			294.37				Coal Broken	
103			300.9				Shale silty zones. Scattered carbonaceous fragments. Abrupt below.	
			306.3			25°	Sandstone, medium grained shaley, carbonaceous stringers Poorly defined bedding, Some large 5-7 m.m vertical wotm burrows. Abrupt below.	
107			310.5				Shale, occasional silty interzones, some carbonaceous and coaly particles. Transitional below.	
107			314.1				Sandstone, very fine grained shaley interbeds. Some poorly defined bedding with disturbance. Transitional below.	
109			320.8				Sandstone, medium grained. No apparent bedding general homogeneous and massive. Transitional below.	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-1 SHEET NO.: 7 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	%REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
109			321.00				Sandstone as above with numerous shaley interclasts. Abrupt below.	
115			338.9			15°-20°	Shale silty with sandy interzones, showing moderately defined bedding and some cross bedding, some large scale vertical burrows. Sands zones have transitional boundaries above and below. Shales carby in part with calcite replacement of carby fracs. Transitional below.	
							Sandy zones: 327.5-328.1	
							329.03-329.2	
							338.0-338.9	
							Calcite Fracs: 334.4-335	
118			348.4				Shale homogeneous. Occasional trace planty frags. Abrupt below.	
							341.2 - 346.0 Broken core with calcite Fracs and slicks. Main Zone 344.4	
119			350.2				Sandstone, medium grained, shaley, very poorly bedded, trace small scale X bedding. Abrupt below with some shale pebbles at base. Some P.C. disturbance. Carby in part.	
122			359.0				Shale homogeneous with some planty fragments replaced by calcite. Broken 351.7 - 354.2. Transitional below.	
122			360	360			Shale carbonaceous coaly stringers broken becoming coaly to base.	
	360							
					0.38		Shale carbonaceous broken stick	
					0.16		Coal Dull stick	
					0.05		Coal Bright Stick	
					0.36		Coal dull with bright stick	
					0.10		Siltstone stick	
					0.13		Coal bright stick	
					0.09		Coal dull with bright stick	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-1 SHEET NO.: 8 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
					0.05		Coal Shaley stick	
					0.23		Coal, Bright broken - Broken stick	
	361.8							
					0.13		Coal dull with bright stick	
					0.08		Coal dull stick	
					0.03		Shale coaly stick	
	362.1							
					0.06		Shale Coaly Brown	
					0.19		Coal dull with bright broken stick	
					0.05		Small Coaly broken stick	
					0.09		Coal Bright Broken stick	
123					0.08		Coal shaley broken stick	
					0.15		Shale coaly broken stick	
					0.20		Coal dull broken stick	
					0.04		Shale coaly broken stick	
					0.10		Coal dull and bright broken stick	
					0.15		Shale Shale stick	
					0.05		Coal dull and bright broken stick	
					0.88	20^{o}-25^{o}	Shale carbonaceous sandy in part porrly bedded	
					0.20		Coal dull with bright stick	
124								
	364.8							
					0.29		Coal dull with bright stick	
					0.14		Coal bright broken stick,	
					0.10		Coal dull broken stick	
					0.25		Coal dull stick	
					0.25		Coal dull and bright stick	
					1.56		Shale silty some fine grained sandstone interbeds. Poorly bedded stick.	

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DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-1 SHEET NO.: 9 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	%REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
125	367.9				1.82		Shale as above shaley and carbonaceous stick	
					0.06		Shsle coaly carbonaceous stick	
					0.08		Coal dull stick	
					0.10		Coal dull with bright stick	
					0.07		Coal dull stick	
					0.12		Coal dull and bright stick	
					0.26		Coal dull stick	
	370.9							
					0.80		Coal dull stick	
					0.14		Coal bright stick	
					0.17		Coal bright broken	
					0.03		Shale coaly	
					0.14		Coal bright broken	
					0.13		Coal shaley stick	
					0.07		Shale coaly broken stick	
					0.20		Coal bright broken	
					1.16	25°	Shale silty sandy interbedded carbonaceous	
127	374.0							
			381.6				Shale generally homogeneous silty zones	
							carbonaceous Transitional below.	
							Patchily calcareous	
			392.9				Sandstone medium - Fine grained, shaley interbeds.	
							Sands typically calcareous. Moderately bedded with some	
							small scale X bedding often carbonaceous trace burrowing in	
							part. Shaley inter clasts at base of each unit abrupt	
							below. Shales silty moderately disturbed by P.C. deformation	
							Coaly stringers.	
							Sand Units 383.1 - 385.1	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-1 SHEET NO.: 10 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	%REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
							Sand Units continued....	
							" " 385.4 - 385.9	
							" " 390.4 - 390.8 -	
							" " 391.2 - 392.9	
							All coarse on down with shale clasts and abrupt below.	
			400.0				Shale carbonaceous carby in part.	
136	400							
					0.05		Shale carbonaceous	
					0.06		Coal dull stick	
					0.05		Sandstone stick	
					0.15		Coal dull stick	
					0.12		Coal bright stick - Broken	
					0.13		Coal dull with bright stick	
					0.22		Coal dull stick	
					0.42		Coal bright stick	
					0.28		Coal dull - brpken stick	
					0.18		Coal dull - shaley broken stick	
					0.22		Coal dull broken	
137	402.3							
					0.17		Coal bright with dull broken	
					0.22		Coal dull broken - powdery	
					0.18		Coal dull broken - powdery	
					0.24		Coal dull broken	
					0.25		Coal dull broken	
137	404.8							
					1.25		Shale silty carby with coal stringers	
138	407.5							
			410.6				Shale carby with interbedded dull coal and coaly shale.	
			426.7			10o	Shale/sand interbeds, sandy interzones Disturbed and shaley	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-1 SHEET NO.: 11 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL	
							Frequent coaly stringers and zones. Zones transitional		
							above and below. Shale typically Homogeneous		
							carby/w trace		
							Coaly Zone: 414.4 - 414.5		
							" " 419.7 - 419.9		
							Sandstone 413.9 - 414.2		
							" 417.4 - 418.0		
							" 421.2 - 423.4		
144			427.4		0.70		Coal dull with bright stick		
145			427.95				Sandstone fine graind carby with coaly stringers faulted		
							and broken calcite filled fracs		
			430.7				Shale silty with very fine sandstone interzones carby and		
							disturbed in part.		
							Total Depth: 430.7		

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DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-2 SHEET NO.: 1 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
		0	24.4				Overburden, Cased.	
2			41				Shale Dark Grey, Homogeneous, some slicks and calcite fracts at 36m. Abrupt below.	
8			51			10°	Sandstone medium - fine grained with shaley interbed sands well bedded. Some small scale X bedding, shaley zones typical Bioturated and silty mainly large horizontal burrows. Some indication of abrupt sand over shale fining up. Becomes shalier and less well bedded to base. Transitional below.	
13			54				Shale Dark Grey Homogeneous. Transitional below.	
16			65				Shale silty and sandy zones disturbed and Bioturbated with small scale horizontal burrows. Some sandier zones but general difuse and dis	
19			73				Sandstone fine grained shaley 60:40. Some moderately well bedded units with well defined boundaries at top becoming more difuse towards base. Burrowed with trace large 10-15 m m wide vertical burrows 10 c.m long. Some small scale burrowing scattered. Units ofton 2-3 c.m thick. Transitional below.	
22			80			10°	Shale sandy 60:40. As above. Transitional below.	
23			85				Sand very fine grained. Well bedded with some cross bedding Minor shale stringer. Abrupt below.	
25			89				Shale sand very fine grained zones 80:20. Bioturbated and disturbed small scale horizontal burrows.	
25			91				Sand fairly well bedded with some small scale cross bedding shale in part with some large 10-15 m m. Wide vertical burrows - isolated. Transitional below.	
30			103				Shale sandy and silty 50:50. Occasional well bedded sandy zones but typically mixed and disturbed numerous small	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-2 SHEET NO.: 2 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	%REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
							burrows and some large vertical burrows. Transitional	
							below.	
33			113				Sandstone very fine - medium grained, generally well	
							bedded with small scale cross bedding some rip up structures	
							on contacts with minor shaley interzones disturbed and	
							bioturbated in shaley zones. Transitional below. 112.5	
							calcite filled fracts. Occasional large horizontal burrows	
							in sand.	
36			121				Shale snady very fine grained in part some bioturbated	
							zones with small scale horizontal burrows. Transitional	
							below.	
40			133				Sandstone very fine grained moderately bedded with some	
							cross bedding becoming fine grained in places with suggest-	
							ion of carby material. Shales disturbed and bioturbated	
							with small scale burrows. Sands typically not bioturbated.	
							Transitional below. 131-131.5 fract with calcite infilling.	
							Tension break.	
44			143				Shale sandy very fine grained 90:10 Disturbed and bio-	
							turbated. Numerous small scale horizontal burrows.	
							Occasional large vertical burrows. Transitional below.	
							Minor calcite filled fracts at 136 m.	
			238				Shale homogeneous	
							Pyritized burrows 173-173.5 m	
							Faulting 177 m Very slicked with calc. veins.	
							0.2 Zone	
							Bentonite 198 m 0.2 m	
							206 m 0.2 m	
							215 m 0.1 m	
							216 m 0.1 m	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-2 SHEET NO.: 3 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
							Fault Zone 224 Some slicks some calcite veins	
77			238.85				Shale Sandy fine grained, carby with green tinge	
							Homogeneous Pyritic (reversed coal). Abrupt below	
77			242				Shale with interbedded very fine sands regular	
							alternating bands 2-3 c.m. Thick, P.C. disturbance with	
							some bioturbation. Some large horizontal pyrite filled	
							burrows. Transitional below.	
77			245			15°	Shale with minor sands interzones. Abrupt below.	
							Top 0.2 m very broken but no slicks of calcite.	
78			246.4			20°?	Sandstone medium grained porrly bedded with some shaley	
							zone. Medium to fine grained hard. Carby. Fault contact	
							below.	
79			248.7				Shale homogeneous minor coal veinlets top 0.2 m.3 good	
							fault surfaces, slicks and some infilling of calcite not very	
							broken but probably major movement.	
81			252			25°	Shale with fine sandstone interzones 70:30. Some burrowing	
							and P.C. disturbance. Coal veinlets. Calcite filled. Tension	
							crack at 250.	
82			256.6				Shale coaly with coaly stringers.	
			258.2				Shale with sandy zones showing some large 3-4 c.m P.C.	
							disturbance. Generally difuse boundaries. Calcite filled	
							Tension crack at 257.9. Abrupt below.	
83			261.1				Shale carbonaceous Plant Fragments. Some silty zones.	
							Transitional below.	
84			262.7			20°	Shale sandy very fine grained. Small scale X bedding in	
							sandier units. Some disturbance. Carby in part.	
85			262.8			25°?	Coal shaley. Calcite filled vein cross cutting.	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-2 SHEET NO.: 4 DATE : 4 LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
			265.8				Shale silty poorly bedded. P.C. disturbance in part.	
							Carby with coal stringer. Transitional below.	
86			268.8			10°	Sand very fine grained Shaley 50:50. Carby with calcite	
							infilling of coaly material. Disturbed in part with trace	
							burrowing. Large and vertical. Sandy units show some	
							small scale X bedding.	
87			273.4				Shale homogeneous generally silty zones ocassionally and some	
							zones of carby material becoming more carby to base.	
							Transitional below.	
88			274.0				Small coal stringers broken with some slicks Coal lumps and	
							fragments in	
89			278.7				Sandstone fine grained shaley 60:40 Cross bedded in sandier	
							units some large scale 4-5 c.m. P.C. disturbances. Some	
							bioturbation. Transitional below.	
			287.76				Shale homogeneous Carbonaceous in part. Abrupt below.	
			288.34		0.58		Coal dull with bright bands, stick	
	288.34							
					0.12		Shale sheared and slicked Broken stick	
					0.06		Shale carbonaceous; slicked broken	
					0.03		Coal dull broken	
			288.61		0.06		Shale coaly stringers. Broken stick	
			292.00				Sandstone very fine grained shaley, with shaley interzones	
							Some small scale cross bedding. P.C. disturbed in part.	
							Transitional below.	
			293.19				Shale homogeneous and carbonaceous. Abrupt below.	
					0.19		Coal bright and dull stick	
					0.02		Shale carby stick	
					0.19		Coal bright stick	
					0.08		Siltstone stick	
					0.03		Coal dull stick.	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-2 SHEET NO.: 5 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
					0.05		Shale carbonaceous and coaly stringers stick	
					0.11		Coal bright broken stick	
					0.13		Sandstone very fine grained	
					0.11		Shale very carbonaceous with coaly stringers	
							Slicked in part - Broken stick	
			294.40		0.27		Coal dull and bright broken	
95	294.40							
					0.06		Coal bright broken	
					0.22		Coal bright	
					2.67	20°	Shale with silty interzones . Some P.C. disturbance	
							and burrowing.	
			297.5		0.18		Coal dull with bright stick	
96	297.5							
					0.06		Coal dull stick	
					0.02		Siltstone	
					0.09		Coal bright stick	
					0.20		Coal dull stick	
			311.3		13.63		Shale very homogeneous Slicks in part becoming carbonaceous	
							with small coaly stringers to base.	
					0.24		Coal bright and dull stick	
					0.09		Coal dull stick	
					0.03		Shale carby stick	
					0.07		Coal dull stick	
					0.08		Shale stick	
100	311.81							
					0.49		Coal dull broken	
					0.19		Coal dull with bright stick	
					0.32		Coal dull and bright stick.	
					0.12		Shale stick	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-2 SHEET NO.: 6 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	%REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
					0.16		Coal dull - broken	
			313.94		0.05		Shale stick	
	313.94							
			314.07		0.13		Coal dull broken	
105			326.29				Shale silty carbonaceous in part. Occasional silty zones	
							giving some structure. Abrupt below.	
108			334.36			25°	Sandstone medium grained well bedded with shaley intraclasts	
							carbonaceous and coaly stringers increasing interbeds of	
							shale to base. Abrupt margins between beds. Abrupt below.	
			334.37				Shale homogeneous carby. Transitional below.	
109			337.57				Shale sandy interzones giving some structure and poor bedding	
							P.C. disturbance. Becoming sandier to base with moderate	
							bedding. Faulted below with slicks.	
			339.7				Shale homogeneous coaly stringers. Transitional below.	
111			343.2			20°	Sandstone fine grained shaley carbonaceous. Moderate bedding	
							Some disturbance and P.C. rolling and intraclasts. Slicks	
							and some calcite infilling. Transitional below.	
113			349.6			20°	Siltstone shaley. Some moderate bedding with occasional cross	
							bedding carbonaceous. Abrupt below.	
			356.46				Shale homogeneous coaly stringers. Faulted and slicks to base.	
					0.20		Coal bright very broken.	
					0.10		Shale and coal mixed broken	
115	358.14							
			367.28				Shale with silty interzones. Moderate bedding with some small	
							scale cross bedding becoming sandy to base. Some large 1-2 c.m.	
							Tension crack. Abrupt below.	
121			372.47				Shale homogeneous Carby. Transitional below.	
			372.87			20°	Sandstone very fine grained shaley some cross bedding.	
							Moderately bedded. Abrupt below.	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-2 SHEET NO.: 7 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
123			380.69				Shale with silty zones and carby zones in part. Broken core	
							in part but little veining.	
124			383.44				Sandstone fine grained poorly bedded with some trace cross	
							bedding. Numerous calcite veins.	
			386.64			20°	As above but becoming shalier and more carby to base.	
							Transitional below.	
127			390.14				Shale with silty interzones, giving poor bedding and showing	
							some disturbance.	
128			393.38				Shale homogeneous carby to base.	
					0.25		Coal dull broken	
			395.32		0.31		Coal dull broken and sheared.	
	395.32							
					0.16		Coal dull broken and sheared	
					0.24		Shale sheared.	
			396.55		0.23		Shale stick	
	396.55		398.37		0.22		Coal sheared.	
129	398.37							
					0.13		Coal dull broken	
			399.59		0.15		Shale broken with slicks	
	399.59							
			401.42		0.32		Shale carby slicks broken.	
	401.42							
			402.95				Shale silty in part. Transitional below, Carbonaceous	
							with zones of small (less than 1 c.m)	
							coaly stringers.	
134			414.22			30°	Shale as above	
			416.81				Shale silty very poorly bedded disturbed and rolled.	
							Transitional below. Some calcite veining.	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-2 SHEET NO.: 8 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	%REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
135			421.54			35°	Sandstone fine grained shaley, moderately well bedded	
							some cross bedding and some P.C. rolling. Calcite and	
							slicks especially at 417.3 - 417.9	
			425.54		4.00		Shale homogeneous carbonaceous	
			425.62		0.08		Coal dull stick	
			425.81		0.19		Shale carbonaceous	
137	425.81							
			428.08				Shale carbonaceous coaly with some slicks broken	
					0.50		Coal dull stick	
					0.20		Coal dull broken	
					0.05		Shale silty and carbonaceous stick	
					0.04		Coal broken - powdery	
			429.77		0.32		Shale Shale broken	
139	429.77							
					0.13		Coal dull broken	
					0.20		Coal bright with dull broken - powdery	
					0.10		Coal dull broken	
					0.13		Coal bright with dull broken	
			431.90					
	431.90							
					0.10		Coal dull broken	
					0.11		Siltstone shaley stick	
					0.09		Shale very carbonaceous broken	
					0.03		Coal stick	
			433.43		0.03		Shale coaly interbeds stick	
	433.43							
			434.49		0.42		As above broken	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-2 SHEET NO.: 9 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
	434.49							
					0.29		Coal dull and bright very broken and rounded	
			435.41		0.32		Shale coaly stringers broken	
140	435.41							
			443.48			30°	Shale silty moderately bedded with some small scaley bedding	
							and P.C. disturbance structures. Carbonaceous with occasional	
							small coal stringers.	
							0.35 coal at 441.35	
							Transitional below	
143			444.96				Sandstone fine grained moderately homogeneous carby with	
							soom poorly developed bedding. Abrupt below.	
144			447.14				Shale, homogeneous, except when coaly stringers occur.	
							Total Depth: 447.14	

077-A-79

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-3 SHEET NO.: 1 DATE : _____ LOGGED BY A.C.N. CORE SIZE: _____

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
1		0	26.2				Casing	
3			35.97			10°	Sandstone very fine grained shaley interzones.	
							Sands well bedded with well developed cross bedding. Some	
							bioturbation (1 c.m horizontal). Some P.C. disturbance	
							in shaley zonee. Abrupt below. Becomes shalier to base	
6			45.42				Shale silty generally homogeneous with occasional silty	
							beds. Some indication of small scale horizontal burrows.	
11			60.04			15°	Sandstone very fine grained with shaley interzones 50:50	
							Sands well bedded with cross bedding forming homogeneous	
							units. Some signs of P.C. disturbance - Load structure	
							Shaley units also P.C. disturbance with numerous small scale	
							horizontal burrows. General relationship shows transitional	
							from shales to sands with abrupt sand contact at top with	
							shale. Calcite filled fracture with slicks at 56.08 m.	
							Abrupt below.	
12			64.00				Shale silty interzones generally homogeneous with silty	
							beds. Abrupt below.	
12			64.50				Sandstone very fine grained moderately defined bedding.	
							Generally homogeneous. Calcite filled fractures with good	
							slicks 64.25.	
13			67.36				Shale silty with some P.C. disturbance. Biothurbation	
							with 1 c.m horizontal burrows in silty units. Abrupt below.	
48			167.3				Shale dark grey. Very homogeneous	
							101.80 Slicks on Fracture surfaces	
							132.59 Bentonite	
							143.56 "	
							144.32 "	
49			170.0			25°	Shale with silty interbeds forming small units 1-2 c.m. Thick	
							With fairly well defined margins Disturbed and bioturbated	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-3 SHEET NO.: 2 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
							in part. Some trace slicks. Transitional below.	
51			175.1				Shale homogeneous. Faulted below. Some minor calcite fracts	
							but well developed slicks.	
51			175.25				Sandstone medium grained shaley . Some shaley intraclasts.	
51			175.86				Sandstone medium - coarse grained homogeneous. No bedding	
							Transitional below.	
			175.91				Conslomerate medium well rounded pebbles with sandy material	
							Abrupt below.	
51			175.94				Coal bright broken stick	
			180.44			15°.	Shale silty interzones some disturbance and bioturbation.	
			180.54				Coal broken	
53			181.66				Sandstone medium - fine grained shaley. Disturbed.	
							Abrupt below.	
58			194.46				Shale with carbonaceous remain throughout. Minor coaly	
							atringers occasional silty interzones. Transitional below.	
58			197.21				Sandstone medium - fine grained. Trace shaley interzones	
							carbonaceous trace, interclasts of shale. Abrupt below.	
							Poorly bedded. Numerous calcite filled veins with some slicks.	
			197.82				Shale dark grey - black homogeneous with carbonaceous materia	
							throughout. Transitional below.	
60			199.95			35°	Shale silty moderately well bedded with shale interbeds	
							giving abrupt contacts above and below. Carbonaceous.	
62			204.83				Shale generally homogeneous inconsistently but with much	
							scattered carbonaceous and coaly material.	
							Coaly stringer 0.01 m at 203.91	
62			206.65				Shale silty poorly defined bedding. Transitional above and	
							below.	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-3 SHEET NO.: 3 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
65			218.54				Shale carbonaceous with numerous coaly stringers. Some	
							replacement of woody material with calcite. Frequent slicks	
							of bedding planes. Occasional very broken and nearly clay	
							like. Transitional below.	
							214.58 0.15 coal	
							214.88 0.10 "	
							215.49 0.10 "	
							216.71 0.10 "	
							217.32 0.10 " and clay mixed.	
68			227.08				Shale silty interzones with carbonaceous material throughout.	
							Transitional below.	
			228.6			17°	Shale with siltstone and very fine sandstone interbeds	
							Some sign of P.C. disturbance with poorly defined bedding	
							Transitional above and below.	
69			235.5				Shale carbonaceous with with coaly stringers. Some slicks	
							broken and clayey.	
							Coal 0.1 m 229.51 and 235.3	
							Sandstone 230.58 0.1 m. Fine grained carbonaceous	
72			239.6			20°	Shale silty carbonaceous with planty fragments. Poorly bedded	
							Some fine grained sand interbeds. Occasional burrows vertical	
							Transitional below.	
74			243.80				Shale carbonaceous. Homogeneous. Occasional silty zones.	
							Coaly stringers increasing to base. Abrupt below with some	
							slicks	
					0.04		Coal slicks	
74	243.84							
					0.09		Coal bright broken stick	
					0.08		Coal bright and dull broken.	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-3 SHEET NO.: 4 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
					0.055		Coal dull broken	
					0.03		Coal bright broken	
					0.04		Coal dull broken stick	
					0.06		Coal bright broken stick	
					0.05		Coal dull sheared and broken	
					0.15		Coal bright broken - powdery	
					0.04		Shale broken stick	
					0.06		Coal bright sheared broken stick	
					0.02		Shale stick	
					0.085		Coal dull stick	
	245.06							
					0.02		Shale stick	
					0.05		Coal dull with bright broken	
					0.22		Coal dull stick	
					0.11		Shale sandy stick	
					0.55		Coal bright broken	
					0.11		Coal shaley broken	
75					1.68	35°	Shale silty with poor bedding. Carbonaceous. Calcite	
							replacement of carby material at base.	
	247.80							
					0.035		Shale with bright coal stringers	
					0.105		Coal bright broken stick	
					0.120		Coal dull with bright	
					0.13		Shale very coaly broken	
					0.05		Coal dull and bright broken stick.	
	248.72							
					0.035		Shale coaly broken stick	
					0.035		Coal bright stick	
					0.100		Shale coaly broken stick.	

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DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-3 SHEET NO.: 5 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
					0.06		Shale coaly broken	
					0.100		Shale coal stringers broken	
					0.02		Coal dull stick	
					0.02		Shale stick	
					0.08		Coal dull stick	
					0.08		Coal dull and bright broken stick	
					0.05		Shale coaly broken stick	
					0.085		Shale sheared broken stick	
					0.035		Coal shaley broken stick	
					0.06		Shale coaly	
					0.52		Shale stick carby sandy interzones.	
					0.065		Shale coaly broken stick	
					0.780		Shale sandy - Medium grained stick	
					0.015	35°	Coal bright stick	
					0.01		Sandstone medium grained stick	
					0.11		Coal dull	
					0.06		Coal dull with bright stick	
					0.275		Coal dull	
76	251.92							
					0.115		Coal dull	
					0.04		Coal dull with bright stick	
					1.21		Coal dull with bright stick	
					0.26		Coal dull and bright stick	
					1.27		Coal dull and bright stick	
	255.12							
					0.25		Coal dull with bright stick	
					0.21		Coal bright stick	
78			257.29		1.35		Shale sandy interbeds and zones moderately bedded, carbonaceous with cross cutting Rootley traces.	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-3 SHEET NO.: 6 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
			262.59				Shale very carbonaceous with interbedded coals. Slicked and broken.	
					0.19		Coal bright and dull stick	
					0.13		Shale very carbonaceous and coaly.	
		263.04	264.57				Shale silty homogeneous. Transitional below.	
					0.28		Sandstone fine grained, Shaley. Abrupt below.	
					0.22		Shale carbonaceous. Abrupt below.	
					0.15	23°	Sandstone medium grained shaley moderate bedding. Abrupt below.	
					0.76		Shale silty carbonaceous. Transitional below.	
					1.32	22°	Sandstone medium-fine grained. Good-moderate bedding. Some	
							Some shaley zones with disturbance. Some small scale cross	
							bedding. Abrupt below.	
81-85		267.30	278.89				Shale homogeneous with coals at 272.24 coal 0.17. Generally	
							trace carbonaceous material becoming silty after 274.02 to	
							base. Transitional below.	
			280.42				Sandstone medium - fine grained shaley but homogeneous.	
							Poorly bedded. Slicks 278.89) No calcite veins but well	
							" 277.06) developed slicks.	
							Transitional below.	
			281.79			22°	Sandstone coarse gained carbonaceous with some shaley material.	
							Numerous shale interclasts. Abrupt below.	
87			284.38				Sandstone medium-fine grained shaley carbonaceous. Moderate	
							bedding. Abrupt below.	
			287.12				Shale carbonaceous with coaly stringers. Some slicks on faces.	
							Transitional below.	
			291.99			20°	Sandstone fine grained shaley disturbed by P.C. rolling and by	
							bioturbation. Large scale horizontal becomes coarser grained	
							to base. Abrupt below.	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-3 SHEET NO.: 7 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
					0.95		Coal	
93								
			300.53				Shale carbonaceous with occasional coaly stringers 1 c.m. thick.	
							Also becoming silty in zones. Transitional below.	
94			304.49			17°	Sandstone very fine grained with shaley interbeds and zones.	
							Moderately bedded trace of bioturbation. Transitional below.	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-3 SHEET NO.: 8 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	%REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
			306.32				Shale silty interzones. Trace Bioturbation. Abrupt Below.	
			306.93			17°	Sandstone fine grained - very finely bedded. Abrupt below.	
							Perfect parallel bedding.	
					0.73		Shale carbonaceous and silty homogeneous.	
					0.07		Coal bright broken stick	
					0.26		Shale coaly stick	
					0.04		Coal dull broken stick	
					0.07		Coal bright broken stick	
					0.15		Shale coaly broken stick	
	308.46							
		308.46	312.42				Shale carbonaceous and silty homogeneous. Abrupt below.	
					0.13		Coal bright broken stick	
					0.13		Coal dull stick	
97	312.88				0.04		Coal dull stick	
					0.07		Coal bright stick	
					0.08		Coal dull stick	
					0.62		Shale carbonaceous stick	
	313.64							
					0.10		Coal dull stick	
					0.10		Coal dull with bright stick	
					0.26		Coal dull and bright stick	
					0.32		Coal dull stick	
					0.22		Coal bright broken stick	
					0.78		Shale silty carbonaceous	
		315.77	316.38			22°	Sandstone shaley medium grained moderate bedding. Abrupt below.	
98					0.10		Shale carbonaceous stick	
					0.085		Coal dull stick	
					0.10		Coal dull and bright stick	
					0.09		Coal bright broken stick.	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-3 SHEET NO.: 9 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	%REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
					0.12		Coal dull stick	
					0.17		Shale carbonaceous	
99-104		316.99	334.67			20°	Shale very silty and carbonaceous. Poorly bedded some disturbance with occasional bioturbation. Becoming silty-sandier in minor zones, with moderate bedding and some cross bedding. Transitional below.	
107			339.24				Sandstone medium - fine grained. Shaley interbeds Moderately bedded with some disturbance. Cross bedded in part. Abrupt below.	
109			348.84				As 316.99 - 334.67 above.	
					0.08		Shale	
					0.05		Coal	
					0.04		Shale	
					0.135		Shale	
					0.21		Coal	
	349.6							
					0.05		Coal	
					0.025		Shale	
					0.025		Coal	
					0.035		Shale	
					0.32		Coal	
					0.675		Coal	
					0.31		Shale	
					0.18		Coal	
					0.64		Shale	
					0.16		Coal	
					0.39		Shale	
					0.14		Coal	
					0.305		Shale	

DIAMOND DRILL CORE LOG

(ALL ANGLES MEASURED FROM HORIZONTAL)

HOLE NO.: 80-3 SHEET NO.: 10 DATE : _____ LOGGED BY A.C.N. CORE SIZE: N.Q.

BOX #	MARKER BLOCKS	FROM	TO	% REC	UNIT THICKNESS	BEDDING ANGLE	LITHOLOGY : ROCK TYPE, COLOUR, GRAIN SIZE	SAMPLE # INTERVAL
					0.285		Coal	
					0.22		Coal	
111		354.25	355.07		0.82		Shale silty carbonaceous stick	
			355.40		0.33		As above	
112								
		355.40	357.04		1.64	15°	Sandstone fine - medium grained shaley carbonaceous. P.C.	
							disturbed moderate bedding. Transitional below.	
			358.09				Shaley carbonaceous homogeneous	
			358.75		0.66		Coal bright and dull	
	358.75							
			360.55		1.80		Shale silty carbonaceous	
			361.80			10°	Sandstone very find grained.Shaley moderately finely bedded.	
							Abrupt below.	
			362.90		1.105		Shale carbonaceous homogeneous	
			364.01		1.110		Coal	
115			365.45				Shale silty poorly bedded P.C. disturbance. Transitional	
							below.	
			370.64				Shale carbonaceous with coaly stringers.	
							Sandy at 368.20 - 0.2 m. Very fine bedding and cross	
							bedding.	
							Total Depth: 370.64	

ROKE

OIL ENTERPRISES LTD. CALGARY, ALBERTA

SIDEWALL DENSILOG

PR-Pine Pass 80(3)A 80-1

FILE NO.	
COMPANY	NORCEN ENERGY RESOURCES LTD.
WELL	80-1
LOCATION	
FIELD	PINE PASS
PROVINCE	BRITISH COLUMBIA
LSD / SEC / TWP / RGE / W.	M
Permanent Datum	GROUND LEVEL
Log Measured from	RIG FLOOR .5 M Above Perm. Datum
Well Depths Measured from	
Other Services	GRN
K.B. / CSG / G.L.	

Run No.	ONE
Date	15 MAR 80
First Reading	423
Last Reading	00
Footage Logged	423
Depth Reached	424
Depth Driller	429
Casing Driller	
Casing Roke	
Fluid Type	WATER
Liquid Level	FLOWING
Min. Diam.	N.Q.
Operating Time	2 HRS
Truck No.	35
Recorded By	SIM
Witnessed By	NEWSON

588

GENERAL				GAMMA RAY				SIDEWALL DENSILOG			
RUN NO.	DEPTHS FROM	DEPTHS TO	SPEED M/MIN	T.C. SEC.	SENS SETTINGS	ZERO DIV.L OR R	API G.R. UNITS PER LOG DIV.	T.C. SEC.	SENS SETTINGS	ZERO DIV.L OR R	CPS/DIV
ONE	0	423	6					0.2	1K	1.95R	112.92

REMARKS LOGGED THROUGH NQ DRILL RODS 63° ANGLE

DEPTHS

BULK DENSITY (GRAMS/CC)

ROKE

OIL ENTERPRISES LTD. CALGARY, ALBERTA

GAMMA RAY NEUTRON LOG

PR-Pine Pass 80(3)A 80-1

FILE NO.	
COMPANY	NORCEN ENERGY RESOURCES LTD.
WELL	80-1
LOCATION	
FIELD	PINE PASS
PROVINCE	BRITISH COLUMBIA
LSD / SEC / TWP / RGE / W__M	
Permanent Datum	GROUND LEVEL Elev.
Log Measured from	RIG FLOOR 5 M Above Perm. Datum
Well Depths Measured from	
Other Services	
D.F. / K.B. / CSG / G.L.	

Run. No.	ONE
Date	15 MAR 80
First Reading	424
Last Reading	00
Footage Logged	424
Depth Reached	424.3
Depth Driller	429
Casing Roke	
Casing Driller	
Fluid Type	WATE
Liquid Level	FLOWING
Min. Diam.	N Q
Rm @	
Operating Time	3 HRS
Truck No.	35
Recorded By	SIM
Witnessed By	NEWSON

588

EQUIPMENT DATA

GAMMA RAY		NEUTRON	
RUN NO.	ONE	RUN NO.	ONE
TOOL MODEL NO.		LOG TYPE	NEUTRON/NEUTRON
DIAMETER	32 MM	TOOL MODEL NO.	
DETECTOR MODEL NO.		DIAMETER	32 MM
TYPE	SCINTILLATION	DETECTOR MODEL NO.	
LENGTH	10 CM	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	2 M	LENGTH	15 CM
GENERAL		SOURCE MODEL NO.	MRC-N-SS-W
HOIST TRUCK NO.		SERIAL NO.	171
INSTRUMENT TRUCK NO.		SPACING	43 CM
TOOL SERIAL NO.		TYPE	AmBe
		STRENGTH	3 CURIES

LOGGING DATA

GENERAL				GAMMA RAY				NEUTRON			
RUN NO.	DEPTHS FROM	DEPTHS TO	SPEED M/MIN	T.C. SEC.	SENS SETTINGS	ZERO DIV. L OR R	API G. R. UNITS PER LOG DIV.	T.C. SEC.	SENS SETTINGS	ZERO DIV. L OR R	API N. UNITS PER LOG DIV.
ONE	0	424	4	4	100	0L	13 API	3	1K	0L	140 API

REMARKS LOGGED THROUGH NQ DRILL RODS 65° ANGLE

80-1

STRATIGRAPHIC LOG

PR-Pine Pass 80(3)A

588

DRILL HOLE 80-1 AREA PINE PASS COAL PROJECT 1980

COMPANY NORCEN ENERGY RESOURCES LTD.

COORDINATES 6155320(M) N 558590(M) E

GROUND ELEVATION 905(M) TOTAL DEPTH 424(M)

GEOPHYSICAL LOGS RUN SIDEWALL DENSILOG, GAMMA RAY NEUTRON LOG

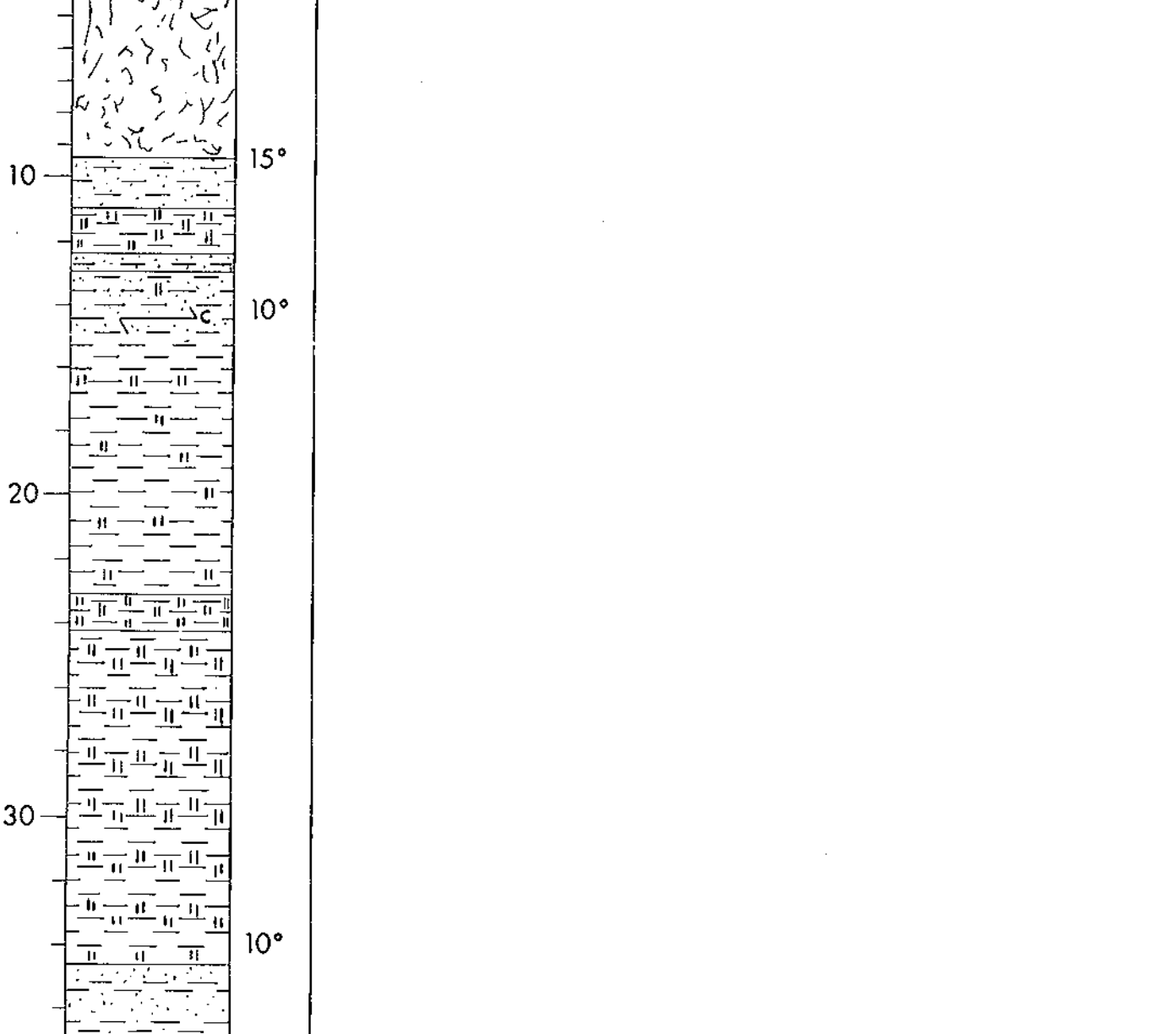
DRILLING METHOD DIAMOND DRILLING NQ3

HOLE SIZE 7.57 cm. DATE OF COMPLETION 15 MARCH 1980

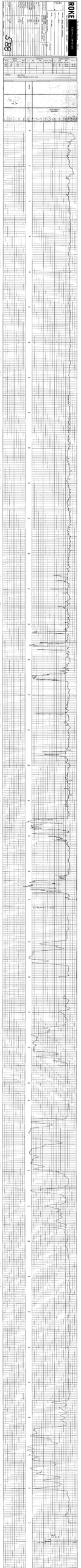
LOGGED BY ROKE OIL ENTERPRISES LTD. CALGARY

REMARKS ANGLE HOLE 65° Az, 215° SW

LITHOLOGIC SYMBOLS




FORMATION
DEPTH METERS 1:200
LITHOLOGY
ANGLE OF BEDDING RELATIVE TO BORE HOLE AXIS
DESCRIPTION
FORT ST. JOHN GROUP — MOOSEBAR FORMATION
BULLHEAD GROUP — GETHING FORMATION
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
310
320
330
340
350
360
370
380
390
400
410
420
430
430.7
15°
10°
10°
15°
15-20°
10°
FAULTING
15-20°
FAULTING
FAULTING
Pyritised Worm Burrows
FAULTING
Bentonite
20°
Bentonite
Water Zone
Glauconite — TOP BLUESKY FORMATION
10°
TOP GETHING FORMATION
15°
20°
G Equivalent
25°
15-20°
FAULTING
SEAM F Sample # 301, 302 & 303
20-25°
SEAM E Sample # 304 & 305
25°
SEAM D Sample # 306
10°
SEAM C Sample # 307
T.D.



ROKE

OIL ENTERPRISES LTD. CALGARY, ALBERTA

GAMMA RAY NEUTRON LOG

588

EQUIPMENT DATA

	GAMMA RAY	NEUTRON
RUN NO.	ONE	ONE
TOOL MODEL NO.		NEUTRON/NEUTRON
DIAMETER	43 MM	43 MM
DETECTOR MODEL NO.		
TYPE	SCINTILLATION	PROPORTIONAL
LENGTH	102 MM	152 MM
DISTANCE TO N. SOURCE	2.1 M	
SOURCE MODEL NO.		MNC-N-85W
SERIAL NO.		167
SPACING		43 CM
TYPE		AmBe
STRENGTH		3 CURIES

GENERAL

HOIST/TRUCK NO.	38
INSTRUMENT TRUCK NO.	38
SERIAL NO.	190-010

LOGGING DATA

GAMMA RAY — GAMMA RAY INCREASES

NEUTRON — NEUTRON INCREASES

STRATIGRAPHIC LOG

80-2

PR-Pine Pass 80(3)A

DRILL HOLE 80-2 AREA PINE PASS COAL PROJECT 1980

COMPANY NORCEN ENERGY RESOURCES LTD.

588

COORDINATES 6155320 (M) N 558590 (M)E

GROUND ELEVATION 1102 (M) TOTAL DEPTH 435 (M)

GEOPHYSICAL LOGS RUN SIDEWALL DENSILOG, GAMMA RAY NEUTRON LOG

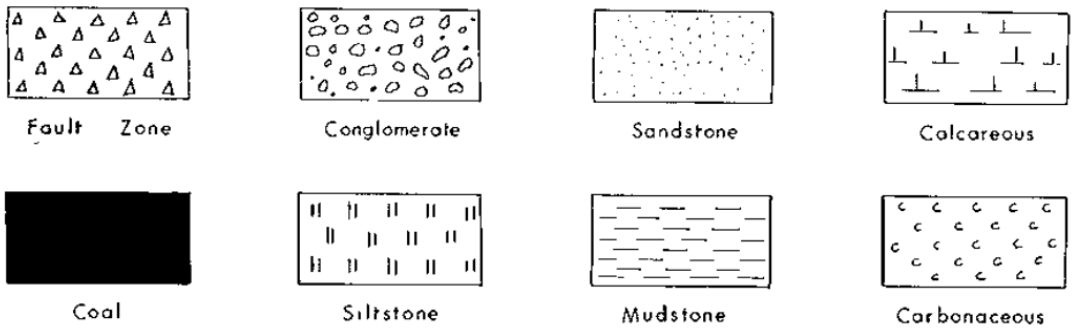
DRILLING METHOD DIAMOND DRILLING NQ 3

HOLE SIZE 7.57 cm. DATE OF COMPLETION 26 MARCH 1980

LOGGED BY ROKE OIL ENTERPRISES LTD. CALGARY

REMARKS VERTICAL

LITHOLOGIC SYMBOLS



Brocken Rock

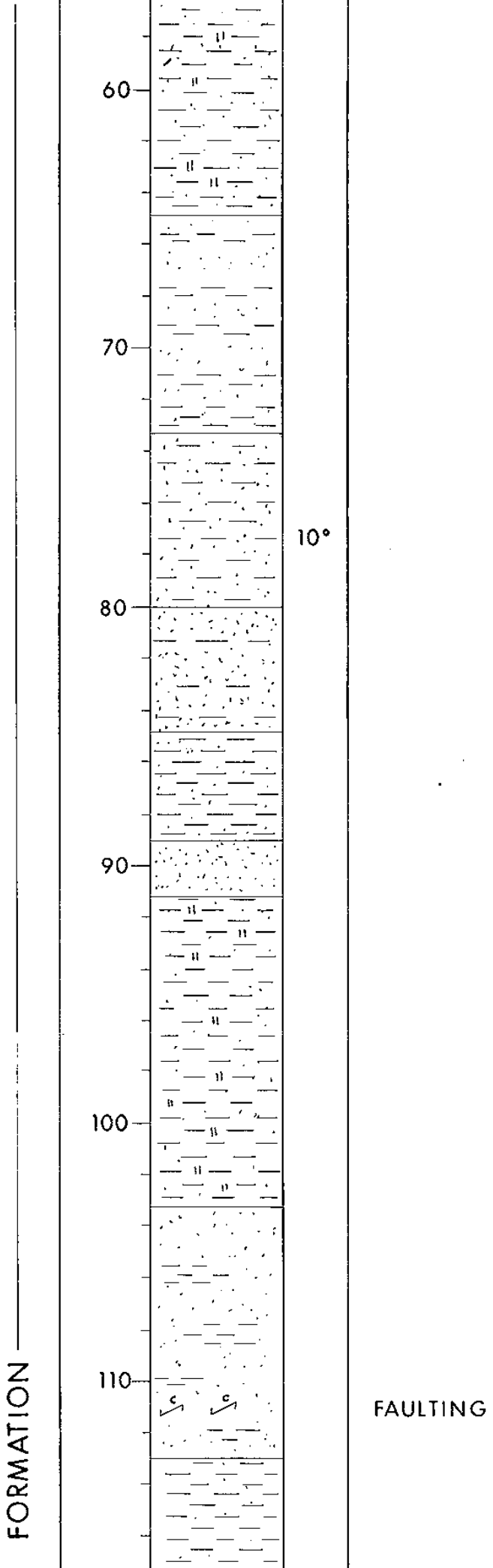
C Calcite Infilled

S Slicks on Rock

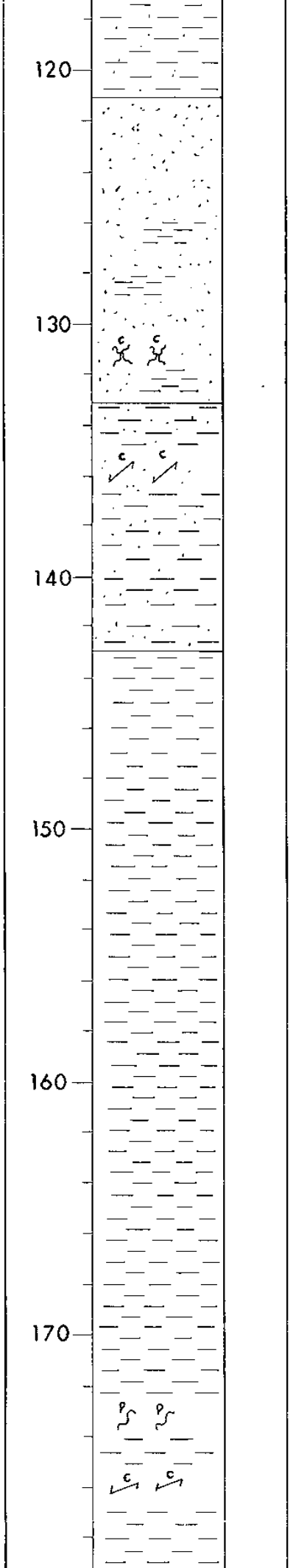
Fractured Rock

/ Joints

FORMATION	DEPTH METERS 1:200	LITHOLOGY	ANGLE OF BEDDING RELATIVE TO BORE HOLE AXIS	DESCRIPTION
	0			
	10			
	20			
	30			
	40			
	50		10°	


60
70
80
90
100
110
10°
FORMATION
FAULTING

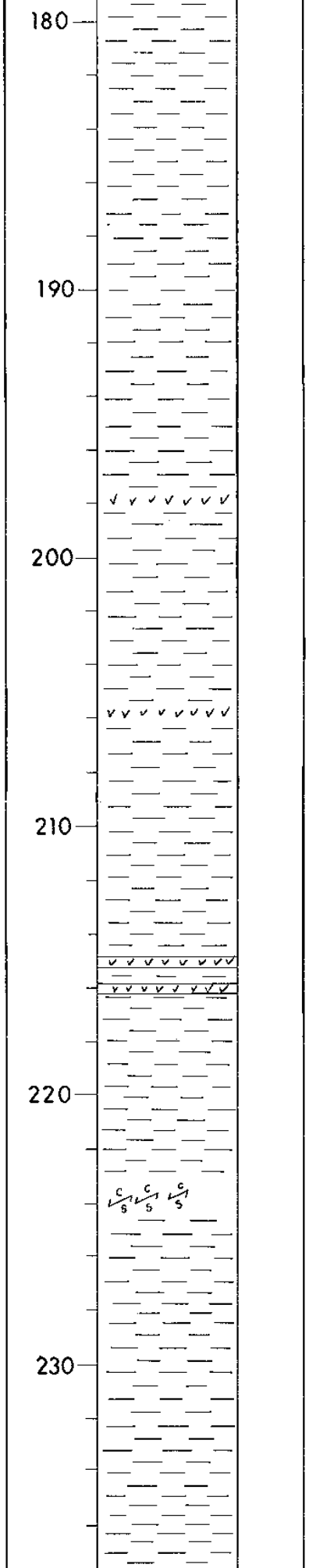
FORT ST. JOHN GROUP — MOOSEBAR



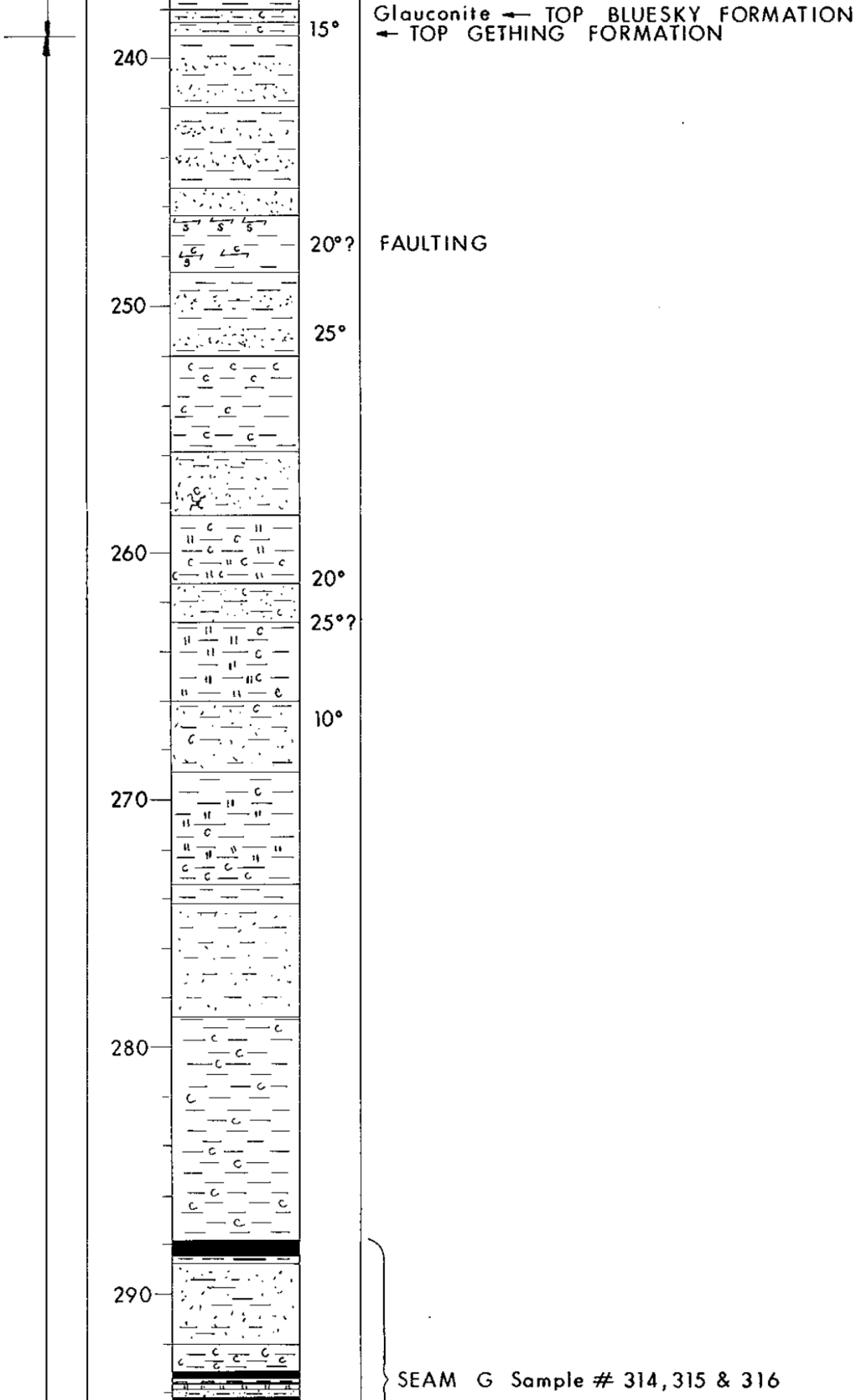
FAULTING

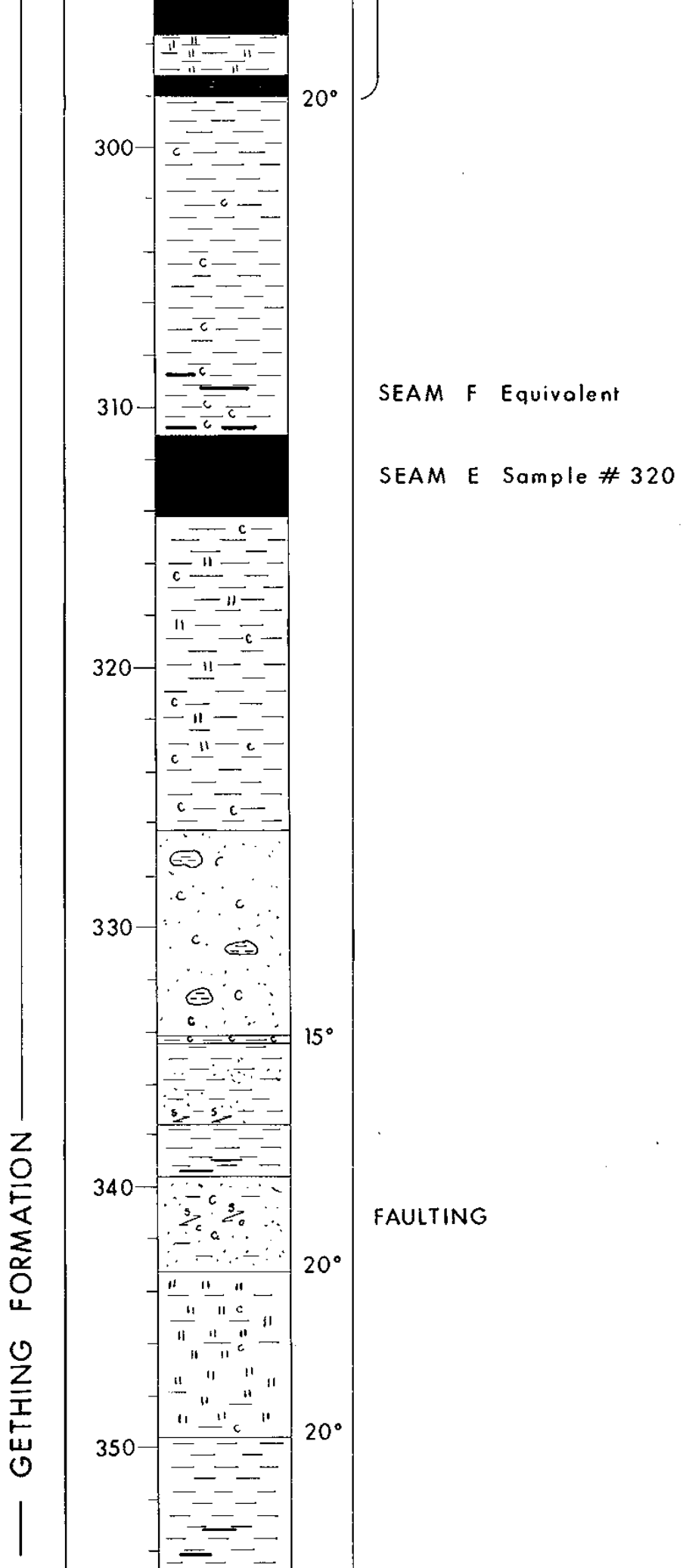
Pyritised Burrows

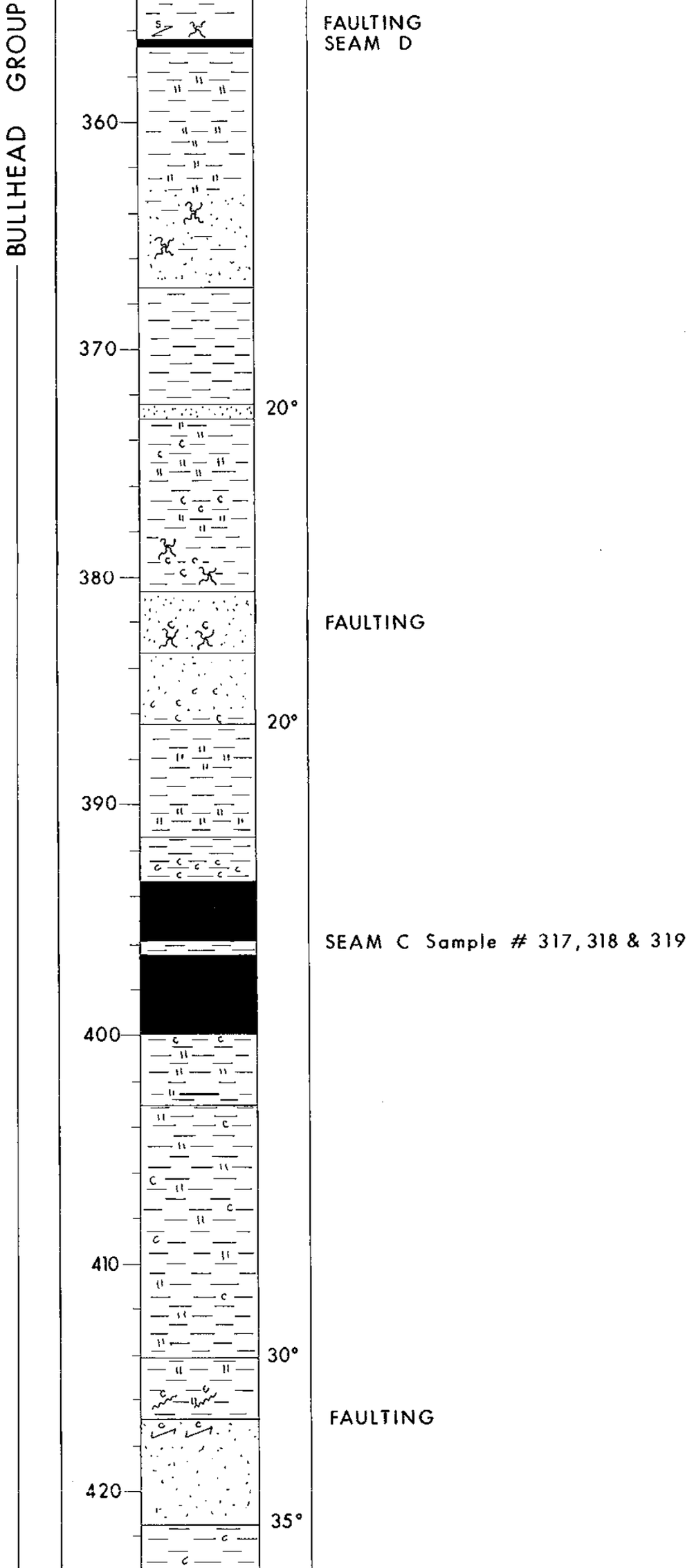
FAULTING

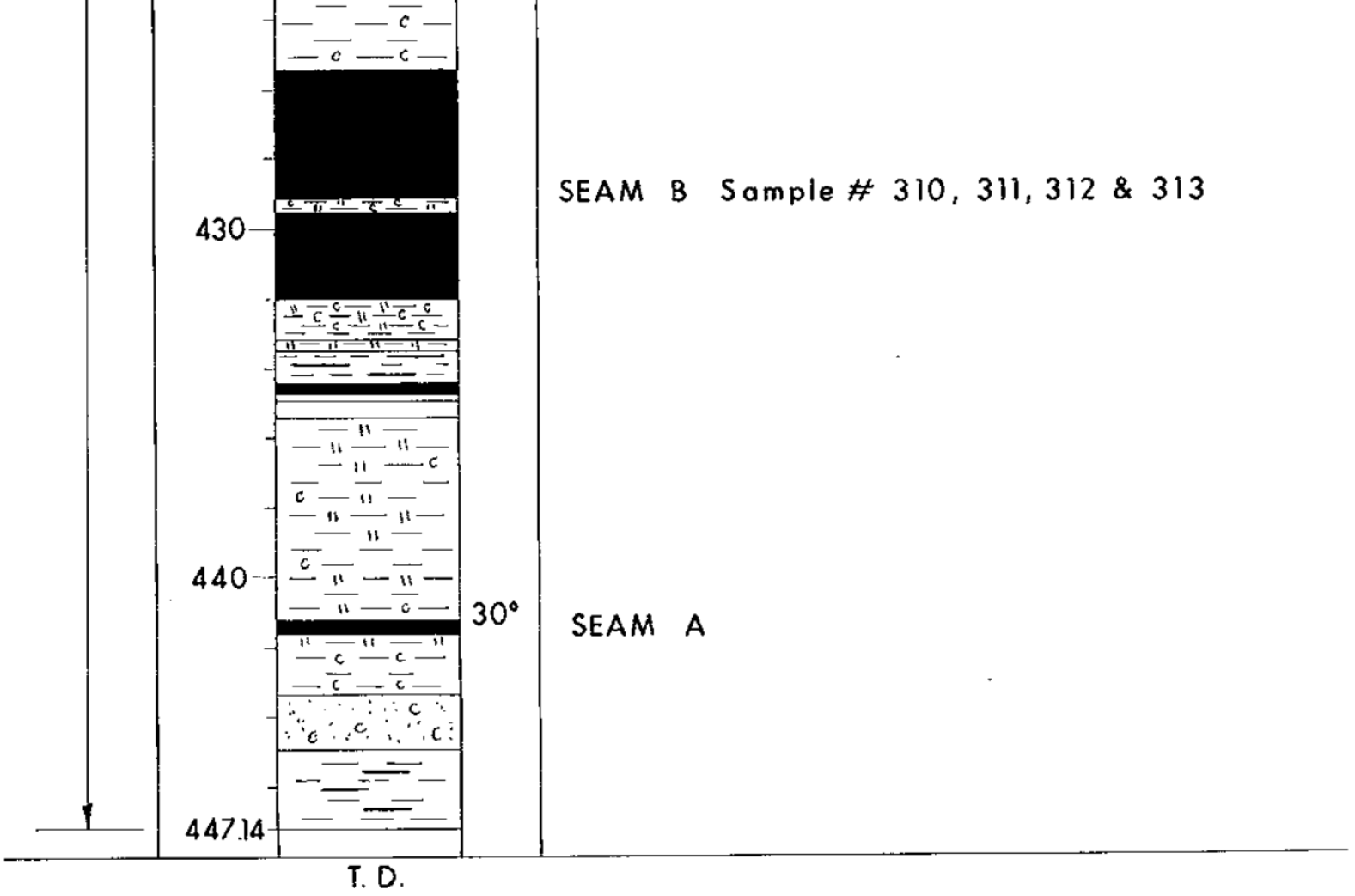


FAULTING


Glauconite ← TOP BLUESKY FORMATION
← TOP GETHING FORMATION
15°
240
20°? FAULTING
250
25°
260
20°
25°?
10°
270
280
290
SEAM G Sample # 314, 315 & 316


GETHING FORMATION
300
310
320
330
340
350
20°
15°
20°
20°
SEAM F Equivalent
SEAM E Sample # 320
FAULTING


BULLHEAD GROUP
360
370
380
390
400
410
420
FAULTING
SEAM D
20°
FAULTING
20°
SEAM C Sample # 317, 318 & 319
30°
FAULTING
35°


SEAM B Sample # 310, 311, 312 & 313
430
440
30°
SEAM A
447.14
T. D.

PR-Pine Pass 80(3)6 80-03

ROKE

GAMMA RAY
SIDEWALL DENSILOG
CALIPER

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.
COMPANY: NORCEN ENERGY RESOURCES LIMITED
WELL: 80-03
LOCATION
FIELD: PINE PASS
PROVINCE: BRITISH COLUMBIA
Permanent Datum: GROUND LEVEL
Log Measured From: RIG FLOOR
Drill Measured From: RIG FLOOR
Other Services
K.B.
D.F.
G.L.

Run No.: ONE
Date: 6 MAR 80
First Reading: 369.5
Last Reading: 00
Footage Logged: 369.5
Depth Reached: 370.0
Depth-Driller: 370.0
Casing-Roke: 29.4
Casing-Driller
Type Fluid: MUD/WATER
Fluid Level: M/L
Max. Temp.
Operating Time
Truck No.: 38
Recorded By: KAUCIN
Witnessed By: BENSON

5788

GENERAL				GAMMA RAY				S DEWALL DENSILOG			
RUN NO	DEPTHS FROM	TO	SPEED m/MIN	T.C. SEC	SENS SETTINGS	ZERO DIV. L OR R	API UNITS PER LOG DIV.	T.C. SEC.	SENS SETTINGS	ZERO DIV. L OR R	CPS/DIV
ONE	00	369.5	6	3	100	0L	15				
	00	28.3	6					3.2	5K	2.42 R	69.26
	28.3	369.5	6					3.2	5K	1.70 R	159.19

REMARKS: ANGLE HOLE - 70°
DENS. 0554A
GR. 0176
CAL. 0776

GAMMA RAY API

DEPTHS

CALIPER DIAMETER - CENTIMETERS

BULK DENSITY (GRAMS/CC)


ROKE
588

80-03

STRATIGRAPHIC LOG

PR - Pine Pass 80(3)A

DRILL HOLE 80-3 AREA PINE PASS COAL PROJECT 1980

COMPANY NORCEN ENERGY RESOURCES LTD.

588

COORDINATES 6154300 (M) N 559300 (M) E

GROUND ELEVATION 990 (M) TOTAL DEPTH 370 (M)

GEOPHYSICAL LOGS RUN SIDEWALL DENSILOG, GAMMA RAY NEUTRON LOG

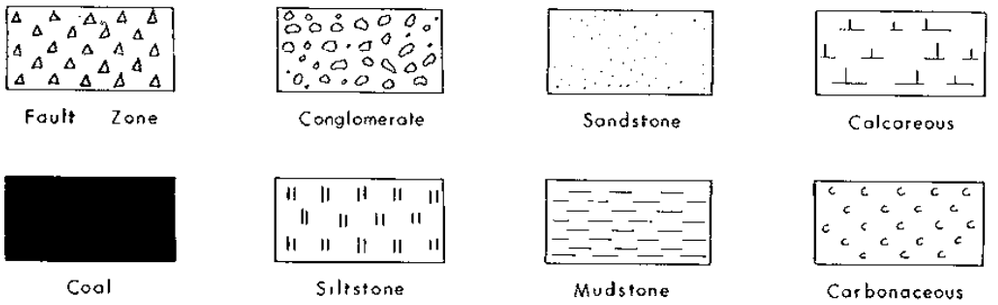
DRILLING METHOD DIAMOND DRILLING NQ 3

HOLE SIZE 7.57 cm. DATE OF COMPLETION 6 MARCH 1980

LOGGED BY ROKE OIL ENTERPRISES LTD. CALGARY

REMARKS ANGLE HOLE 70° Az 215° SW

LITHOLOGIC SYMBOLS



Brocken Rock

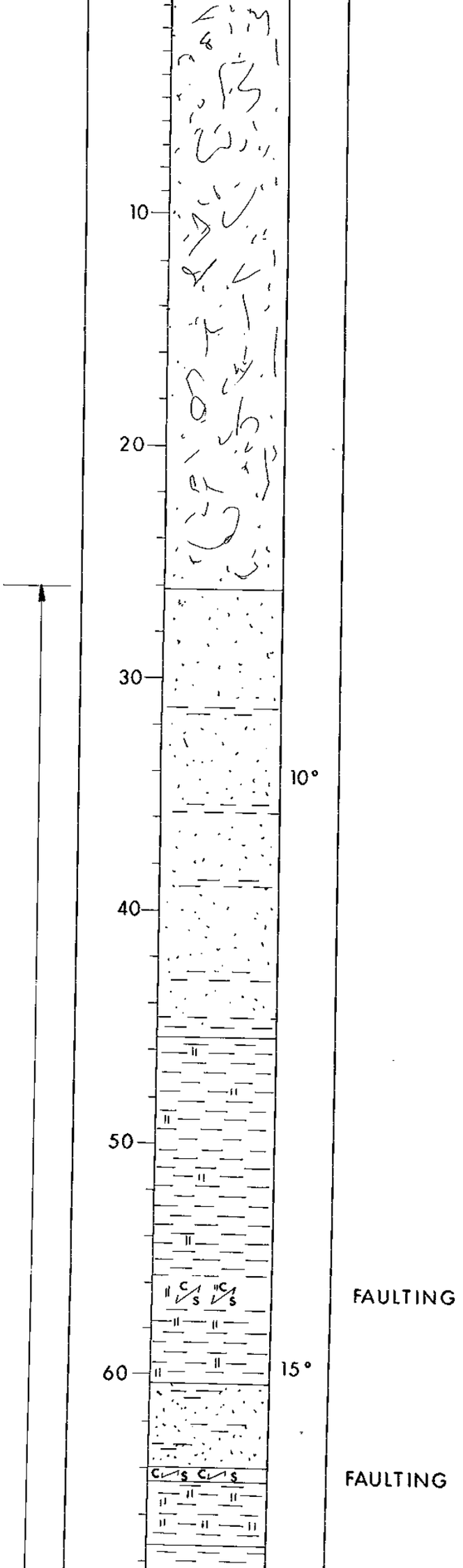
C Calcite Infilled

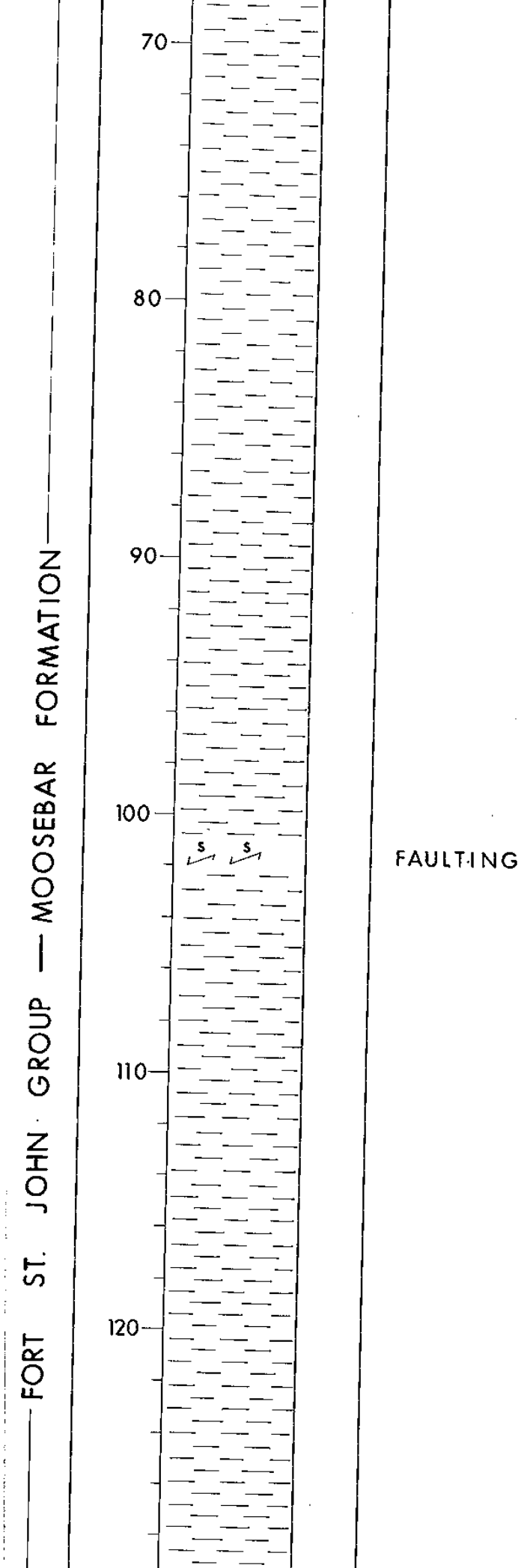
S Slicks on Rock

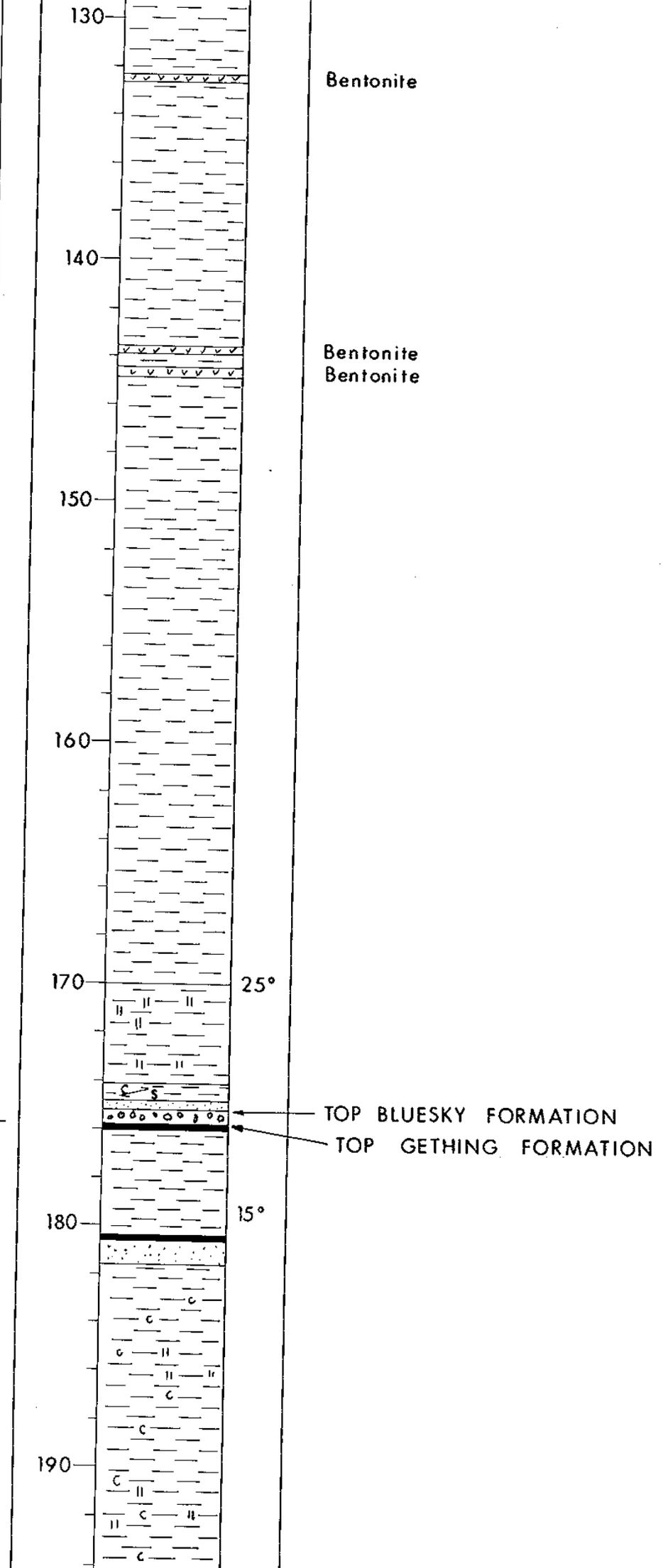
Fractured Rock

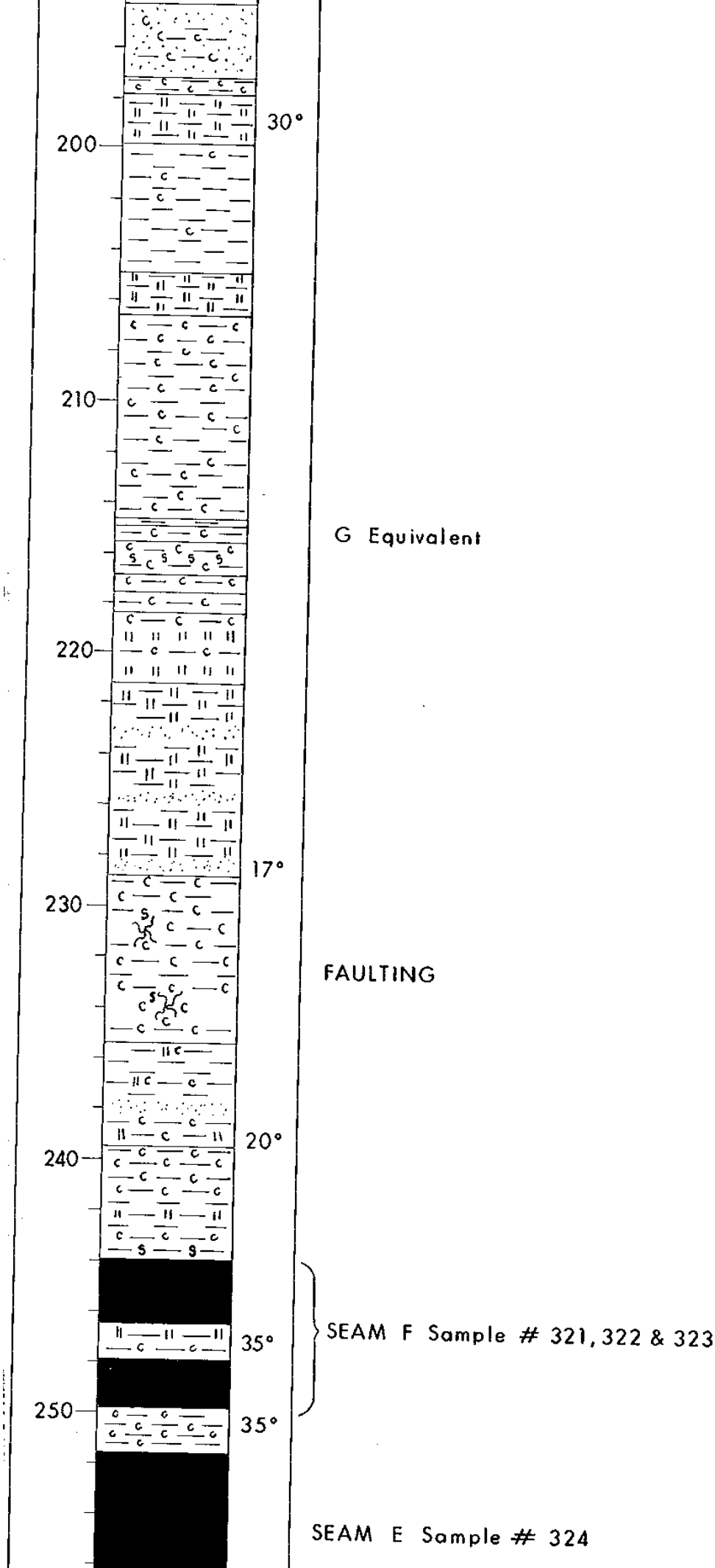
/ Joints

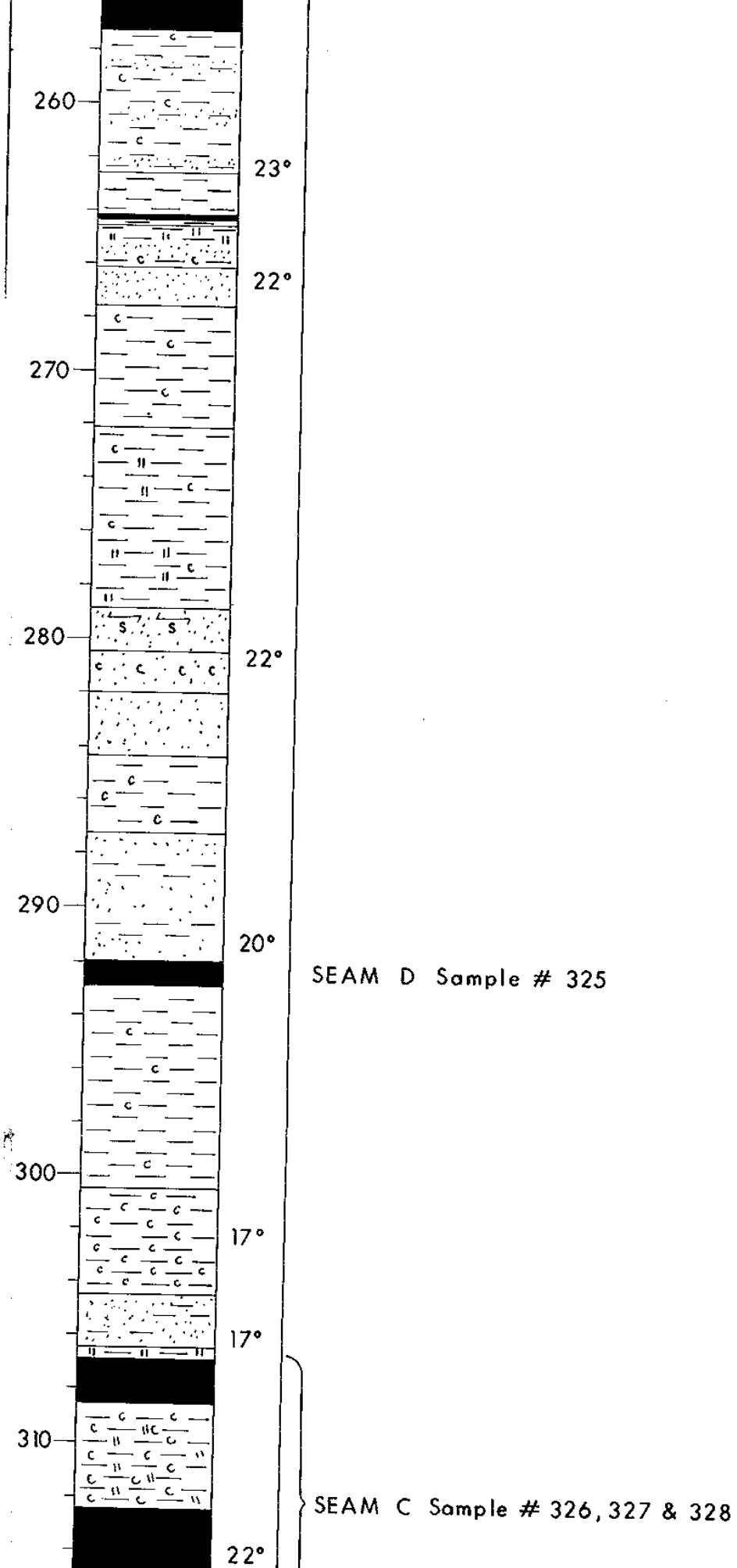
FORMATION	DEPTH METERS 1:200	LITHOLOGY	ANGLE OF BEDDING RELATIVE TO BORE HOLE AXIS	DESCRIPTION
	0			

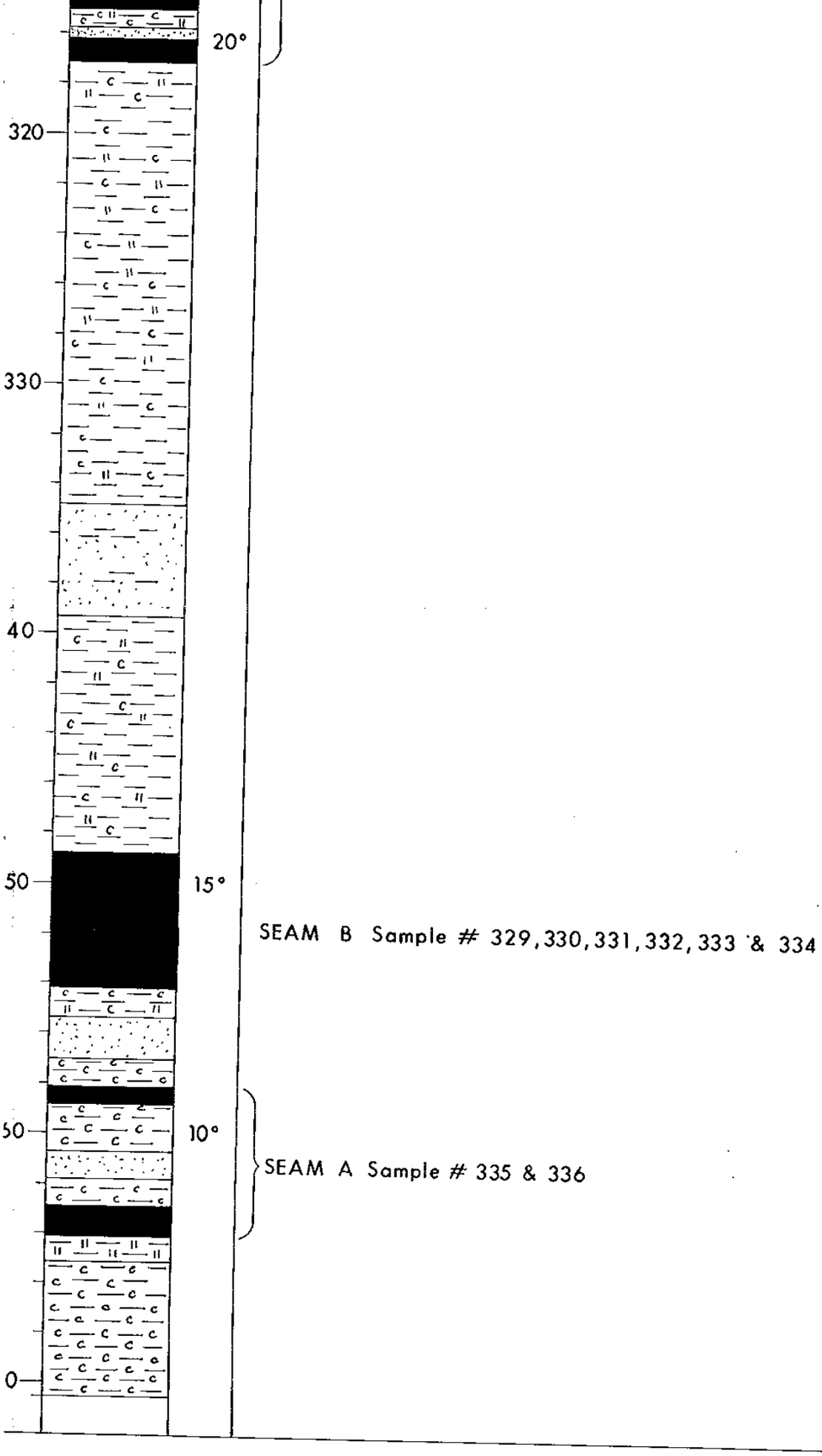

10
20
30
10°
40
50
FAULTING
60
15°
FAULTING


FORT ST. JOHN GROUP — MOOSEBAR FORMATION
70
80
90
100
110
120
S
S
FAULTING


130
Bentonite
140
Bentonite
Bentonite
150
160
170
25°
TOP BLUESKY FORMATION
TOP GETHING FORMATION
180
15°
190


200
30°
210
G Equivalent
220
17°
230
FAULTING
20°
240
35°
SEAM F Sample # 321, 322 & 323
250
35°
SEAM E Sample # 324


260
23°
22°
270
280
22°
290
20°
SEAM D Sample # 325
300
17°
17°
310
SEAM C Sample # 326, 327 & 328
22°


20°
320
330
40
50
15°
SEAM B Sample # 329,330,331,332,333 & 334
50
10°
SEAM A Sample # 335 & 336
0

PR-Pine Pass 80(4)A

Coal Analysis Data
Coal Seam Data

PR-Pine Pass 80(4)A

GEOLOGICAL SURVEY
ASSESSMENT

OG 588

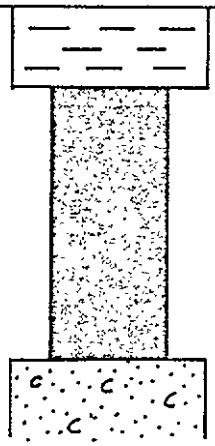
OPEN-FILE

PINE PASS COAL PROJECT - 1980

Hole # : 80-1
Scale 1:20

Seam : C

Hole Orientation : 65° Az. 215° S.W.
Seam Orientation : 3° - 47° Az. 125° N.E.



DEPTH (m)	TRUE THICKNESS (cm) ROCK	TRUE THICKNESS (cm) COAL	DESCRIPTION	QUALITY INFORMATION RECOVERY	QUALITY INFORMATION SAMPLE #
426.70			Shale		
		69	Coal	100%	307
		69	Sandstone, Carby		

0.69 (m)

LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4941	307	49.1	1/2

CLIENT : NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5135 SAMPLE NO. 307

SIZE & RAW ANALYSIS , a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	88.9	51.0	6996	88.9	51.0
28M x 100M	7.6	34.3	9849	96.5	49.7
100M x 0	3.5	35.4	9676	100.0	49.2

SINK-FLOAT ANALYSIS, a.d.b. : 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	5.5	2.4	15266	8	5.5	2.4
1.30 - 1.35	12.1	5.4	14578	2	17.6	4.5
1.35 - 1.40	11.3	10.4	13888	1 1/2	28.9	6.8
1.40 - 1.45	1.6	17.4	12648	1 1/2	30.5	7.3
1.45 - 1.50	1.5	21.8	11899	1 1/2	32.0	8.0
1.50 - 1.55	1.4	27.1	10989	1 1/2	33.4	8.8
1.55 - 1.60	1.3	32.7	10046	1 1/2	34.7	9.7
+1.60 -	65.3	69.6	-	1	100.0	48.8

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.5	9.6	16.5	73.4	1.09	13879	1 1/2	a.d.b.
	9.6	16.6	73.8	1.10	13949	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2600	2700	2720 -	2750
REDUCING	2600	2650	2680	2720

Birtley Coal
& Minerals Testing

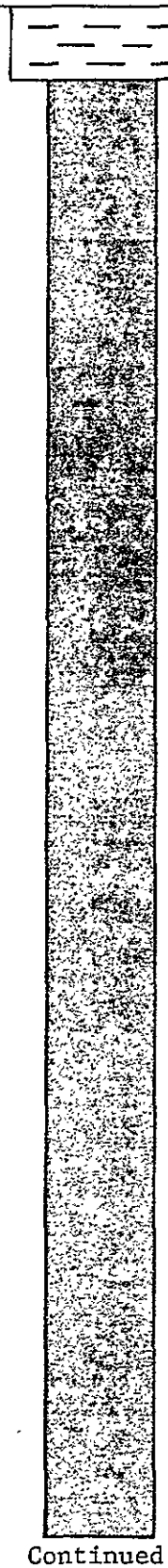
PINE PASS COAL PROJECT - 1980

Hole # : 80-1
Scale 1:20

Seam : D
1 of 2

Hole Orientation : 65° Az. 215° S.W.,
Seam Orientation : 3° - 47° Az. 125° N.E.,

DEPTH (m)	TRUE THICKNESS (cm) ROCK	TRUE THICKNESS (cm) COAL	DESCRIPTION	QUALITY INFORMATION RECOVERY	QUALITY INFORMATION SAMPLE #
399.20			Shale Carby in part		
		539	Coal	52%	306



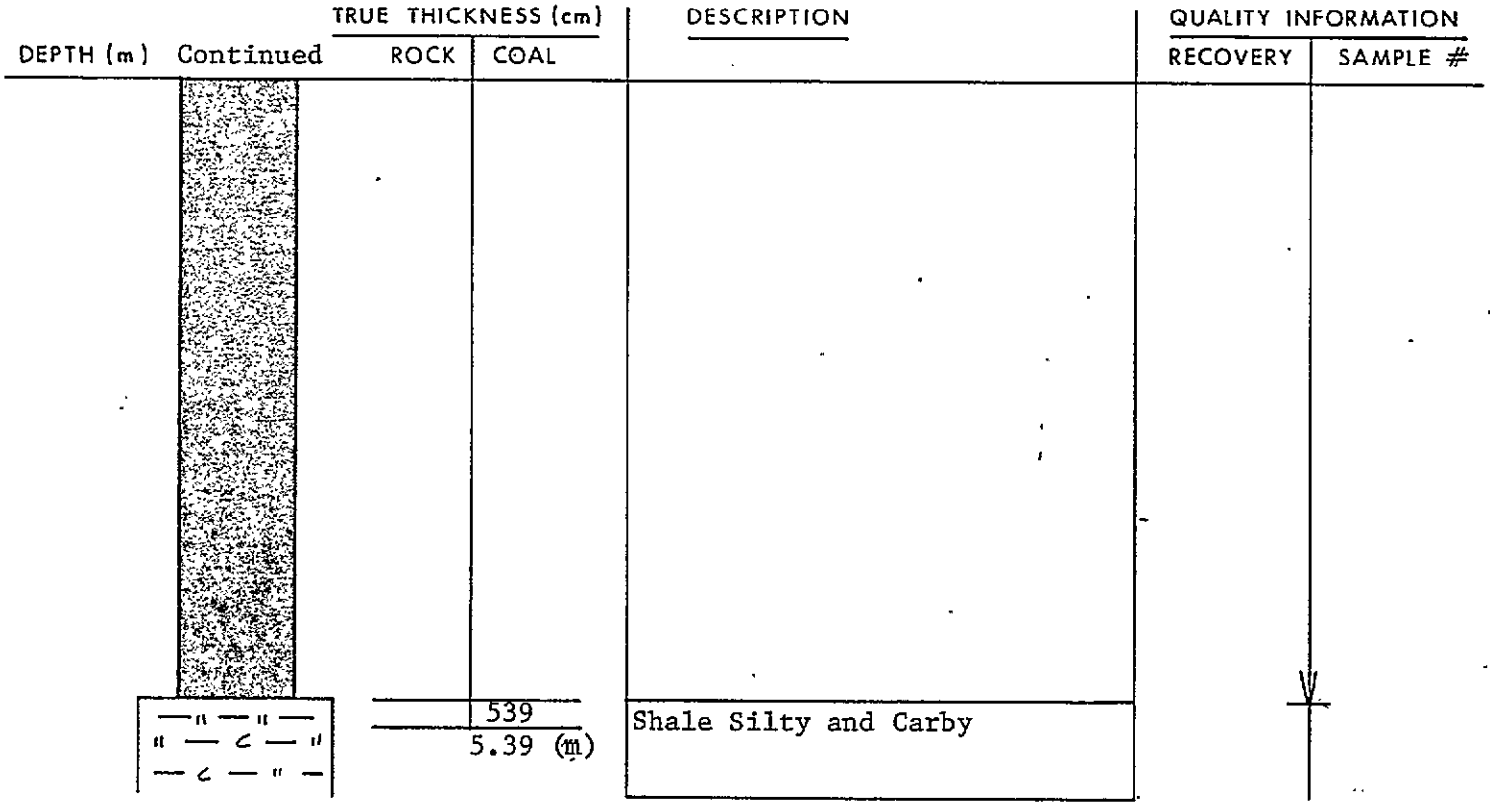
Continued

PINE PASS COAL PROJECT - 1980

Hole # : 80-1
Scale 1:20

Seam : D
2 of 2

Hole Orientation : 65° Az. 215° S.W.,
Seam Orientation : 3° - 47° Az. 125° N.E.



LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4940	306	21.3	1

CLIENT : NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5134 SAMPLE NO. 306

SIZE & RAW ANALYSIS , a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	83.8	22.6	11386	83.8	22.6
28M x 100M	11.2	13.9	12978	95.0	21.6
100M x 0	5.0	13.6	12992	100.0	21.2

SINK-FLOAT ANALYSIS, a.d.b.: 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	42.2	1.8	15203	3	42.2	1.8
1.30 - 1.35	12.8	5.8	14442	2	55.0	2.7
1.35 - 1.40	5.6	10.9	13508	1	60.6	3.5
1.40 - 1.45	3.7	16.9	12461	1	64.3	4.3
1.45 - 1.50	2.1	21.6	11614	1	66.4	4.8
1.50 - 1.55	2.5	26.0	10789	1	68.9	5.6
1.55 - 1.60	1.9	30.6	9955	1	70.8	6.2
+1.60 -	29.2	56.9	-	N.A.	100.0	21.0

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

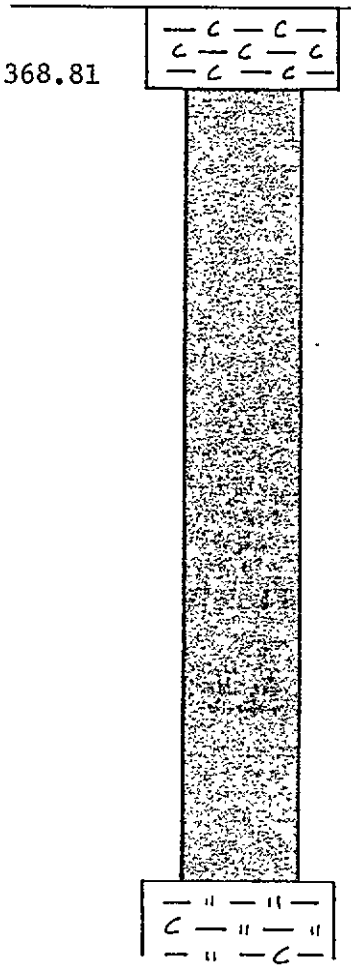
R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.8	6.3	19.1	75.4	0.49	14370	2 1/2	a.d.b.
	6.4	19.3	74.3	0.49	14486	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2250	2370	2400	2450
REDUCING	2030	2120	2170	2280

Birtley Coal
& Minerals Testing

PINE PASS COAL PROJECT - 1980

Hole # : 80-1 Seam : E Hole Orientation : 65° Az. 215° S.W.,
Scale 1:20 Seam Orientation : 3° - 47° Az. 125° N.E.



DEPTH (m)	TRUE THICKNESS (cm) ROCK	TRUE THICKNESS (cm) COAL	DESCRIPTION	QUALITY INFORMATION RECOVERY	QUALITY INFORMATION SAMPLE #
368.81			Shale Carbonaceous and Carby		
		170	Coal	101%	304
		36	Coal 50% Shale Interbeds	100%	305
		206	Shale Silty and Carbonaceous		
		2.06 (m)			

LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4938	304	9.2	2
4939	305	55.3	1/2

CLIENT : NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5133 SAMPLE NO. 304 and 305 Composite

SIZE & RAW ANALYSIS., a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	88.1	21.7	11810	88.1	21.7
28M x 100M	9.1	15.9	12794	97.2	21.2
100M x 0	2.8	14.8	13002	100.0	21.0

SINK-FLOAT ANALYSIS, a.d.b.: 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	50.6	1.8	15206	3 1/2	50.6	1.8
1.30 - 1.35	12.1	5.5	14527	2	62.7	2.5
1.35 - 1.40	5.4	9.9	13849	1 1/2	68.1	3.1
1.40 - 1.45	2.1	14.7	12787	1 1/2	70.2	3.4
1.45 - 1.50	1.9	20.2	12112	1	72.1	3.9
1.50 - 1.55	2.1	24.6	11176	1	74.2	4.5
1.55 - 1.60	1.2	29.8	10287	1	75.4	4.9
+1.60 -	24.6	69.7	-	N.A.	100.0	20.8

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.8	4.9	19.4	74.9	0.52	14669	2 1/2	a.d.b.
	4.9	19.6	75.5	0.52	14787	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2360	2480	2500	2530
REDUCING	2030	2260	2330	2410

ULTIMATE ANALYSIS

H2O	C	H	N	S	ASH	O by difference
0.80	85.10	4.47	1.06	0.52	4.87	3.18

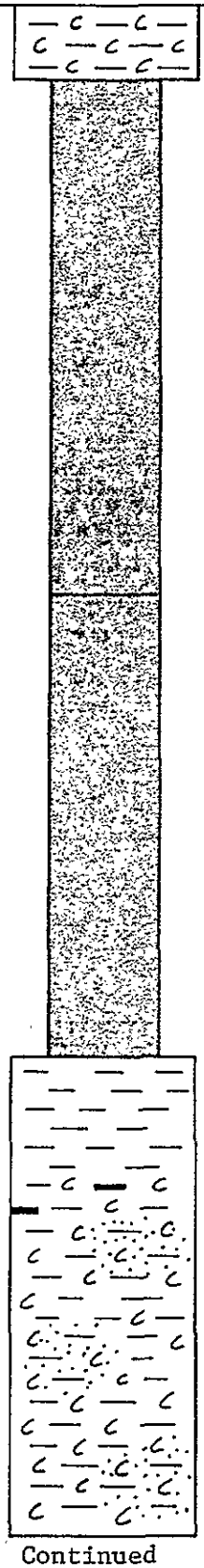
Birtley Coal-
& Minerals Testing

PINE PASS COAL PROJECT - 1980

Hole # : 80-1
Scale 1:20

Seam : F
1 of 2

Hole Orientation : 65° Az. 215° S.W.,
Seam Orientation : 3° - 47° Az. 125° N.E.

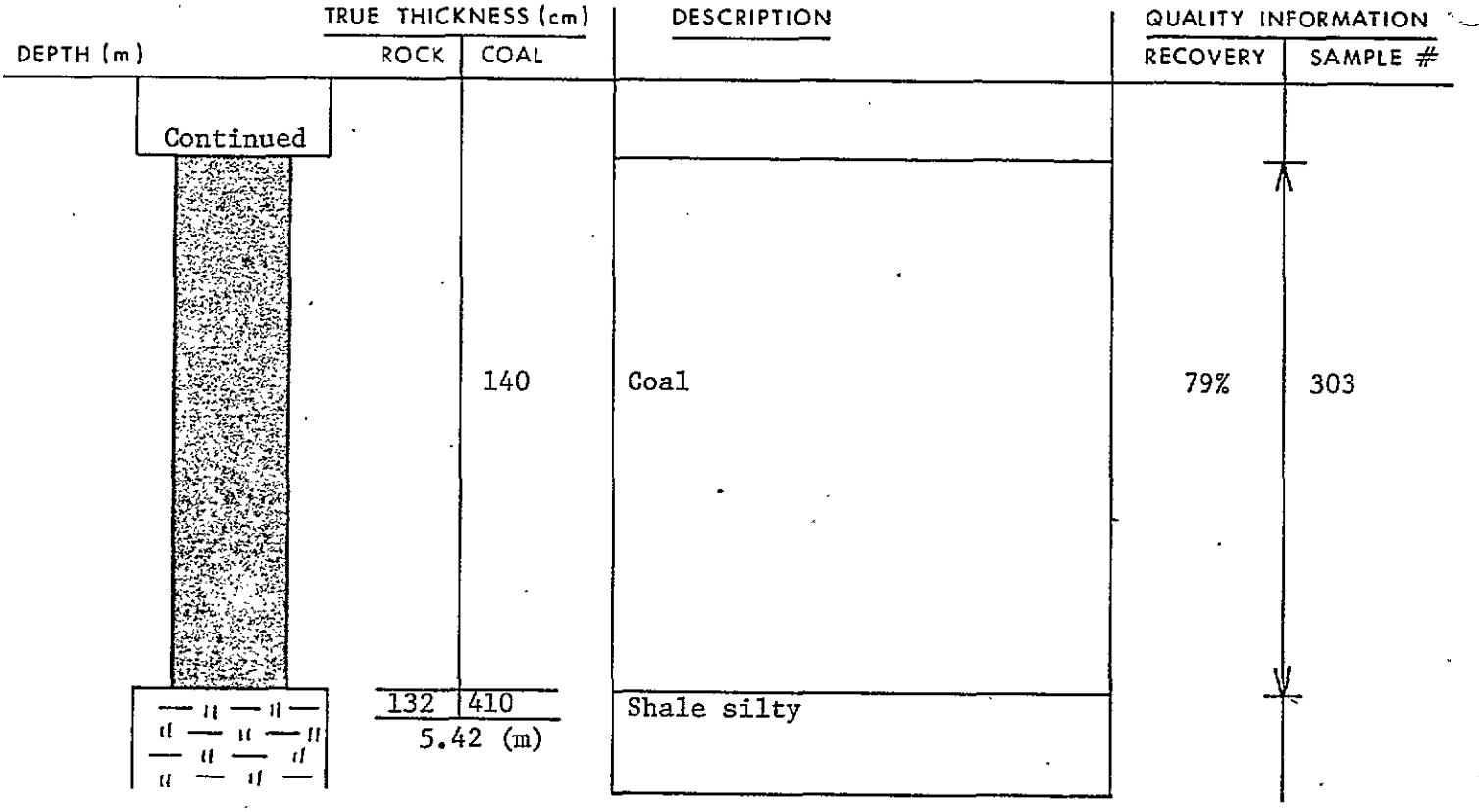


DEPTH (m)	TRUE THICKNESS (cm) ROCK	TRUE THICKNESS (cm) COAL	DESCRIPTION	QUALITY INFORMATION RECOVERY	QUALITY INFORMATION SAMPLE #
359.33			Shale Carbonaceous		
		143	Coal	87%	301
		127	Coal 30% Shale Interbeds	73%	302
			Shale		
			Small Coal		
	132		Shale Carbonaceous Sandy		

Continued

PINE PASS COAL PROJECT - 1980

Hole # : 80-1 Seam : F Hole Orientation : 65° Az. 215° S.W.
Scale 1:20 2 of 2 Seam Orientation : 3° - 47° Az. 125° N.E.



LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4935	301	29.7	2 1/2
4936	302	60.0	1 1/2
4937	303	8.9	3 1/2

CLIENT.: NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5132 SAMPLE NO. 301 - 303 Composite

SIZE & RAW ANALYSIS, a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	87.6	35.9	9516	87.6	35.9
28M x 100M	9.2	22.1	11842	96.8	34.6
100M x 0	3.2	24.3	11500	100.0	34.3

SINK-FLOAT ANALYSIS, a.d.b.: 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	32.2	2.9	15407	7	32.2	2.9
1.30 - 1.35	10.8	5.9	14690	2	43.0	3.7
1.35 - 1.40	4.5	12.4	13476	2	47.5	4.5
1.40 - 1.45	2.9	18.4	12442	2	50.4	5.3
1.45 - 1.50	2.6	24.8	11449	1 1/2	53.0	6.2
1.50 - 1.55	2.8	29.7	10589	1 1/2	55.8	7.4
1.55 - 1.60	2.6	35.6	9652	1	58.4	8.7
+1.60 -	41.6	71.3	-	1/2	100.0	34.7

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.6	8.7	18.9	71.8	0.52	14275	4	a.d.b.
	8.8	19.0	72.2	0.52	14361	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2670	2800+	-	
REDUCING	2610	2720	2760	2800+

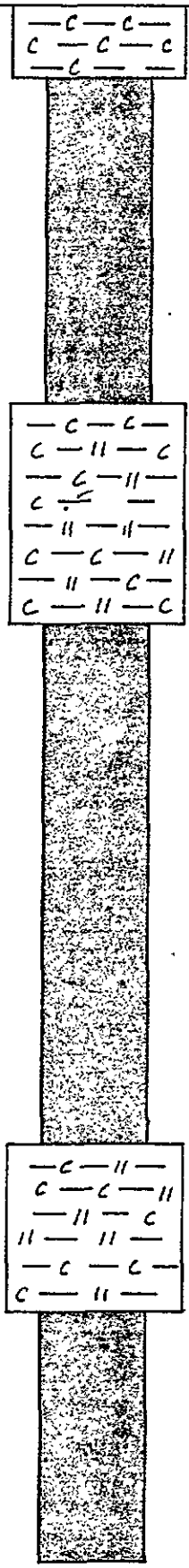
ULTIMATE ANALYSIS

H2O	C	H	N	S	ASH	O by difference
0.61	80.97	4.31	1.06	0.52	8.66	3.87

Birtley Coal-
& Minerals Testing

PINE PASS COAL PROJECT - 1980

Hole # : 80-2 Seam : B Hole Orientation : Vertical
Scale 1:20 1 of 2 Seam Orientation : 35° Az 125° E or W.



DEPTH (m)	TRUE THICKNESS (cm) ROCK	TRUE THICKNESS (cm) COAL	DESCRIPTION	QUALITY INFORMATION RECOVERY	QUALITY INFORMATION SAMPLE #
425.04			Shale. Carbonaceous & Coaly		
		95	Coal	52%	313
	63		Shale silty and Carbonaceous	52%	312
		150	Coal	52%	311
	48		Shale and Siltstone, Carbonaceous		
		80	Coal	52%	310

(Continued)

PINE PASS COAL PROJECT - 1980

Hole # : 80-2 · Seam : B 2 of 2 Hole Orientation : Vertical
Scale 1:20 Seam Orientation : 35° Az, 125° E. or W.

DEPTH (m) (Continued)	TRUE THICKNESS (cm) ROCK	TRUE THICKNESS (cm) COAL	DESCRIPTION	QUALITY INFORMATION RECOVERY	QUALITY INFORMATION SAMPLE #
	37		Shale Silty		
		26	Coal		
	52		Shale Silty		
		28	Coal		
	200	379	Shale Silty		
	5.79 (m)				

LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4942	310	62.2	1/2
4943	311	19.8	1 1/2
4944	312	64.8	1/2
4945	313	10.8	1 1/2

CLIENT : NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5136

SAMPLE NO. 310 to 313 Composite

SIZE & RAW ANALYSIS , a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	88.4	47.7	7579	88.4	47.7
28M x 100M	8.2	32.7	10009	96.6	46.4
100M x 0	3.4	37.3	9207	100.0	46.1

SINK-FLOAT ANALYSIS, a.d.b.: 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	12.8	2.4	14819	2 1/2	12.8	2.4
1.30 - 1.35	12.4	4.2	14606	1	25.2	3.3
1.35 - 1.40	4.5	11.4	13555	1	29.7	4.5
1.40 - 1.45	4.5	18.0	12192	1	34.2	6.3
1.45 - 1.50	4.3	22.6	11704	1	38.5	8.1
1.50 - 1.55	2.9	27.4	10919	1	41.4	9.5
1.55 - 1.60	2.4	31.6	10139	1	43.8	10.7
+1.60 -	56.2	74.7	-	N.A.	100.0	46.7

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

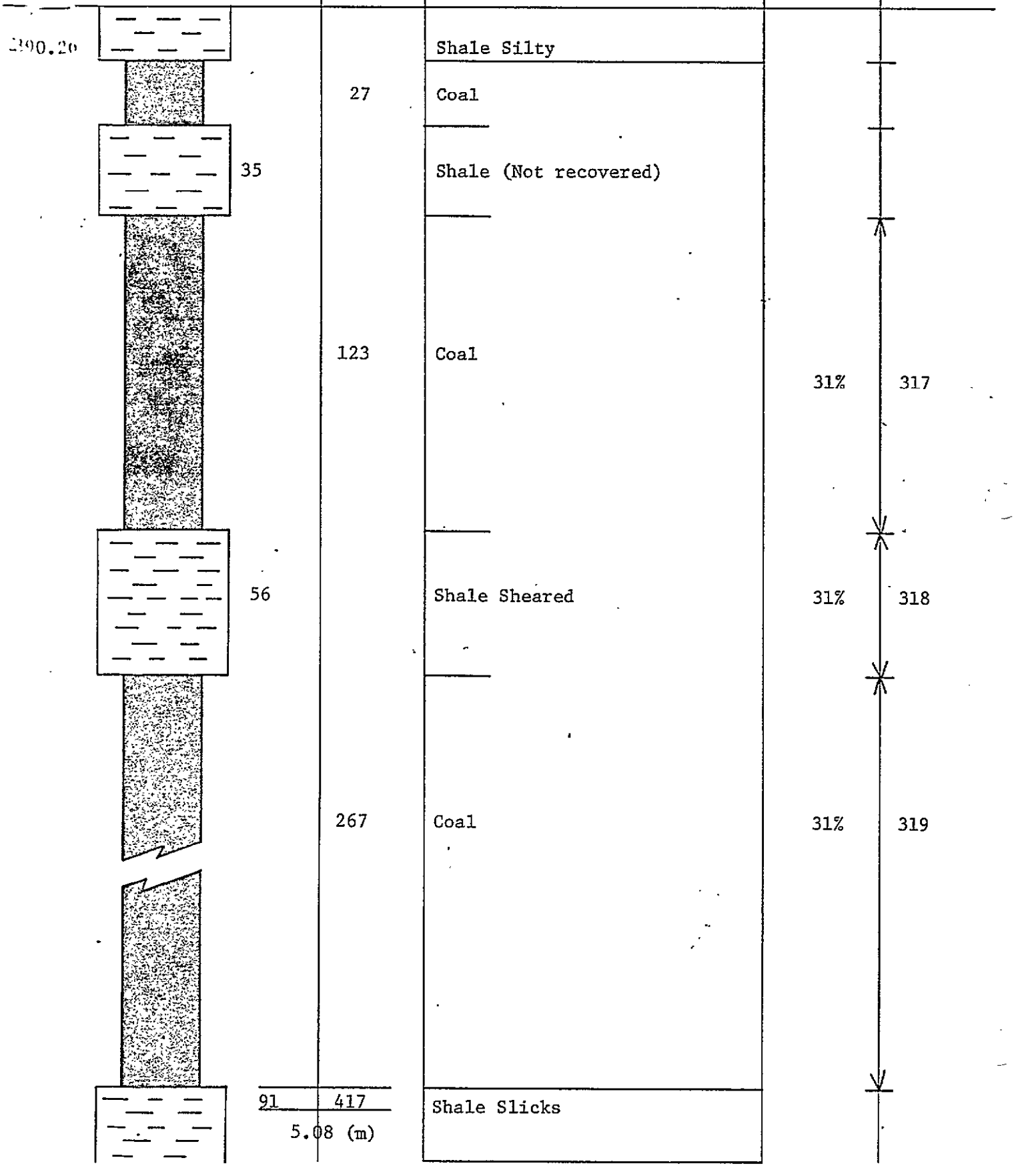
R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.5	10.8	17.2	71.5	0.52	13592	1 1/2	a.d.b.
	10.9	17.3	71.8	0.52	13660		d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2800	2800+		
REDUCING	2760	2800+		

Birtley Coal
& Minerals Testing

PINE PASS COAL PROJECT - 1980

Hole # : 80-2 Seam : C Hole Orientation : Vertical
Scale 1:20 Seam Orientation : 25° Az. 125° E. or W.



LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4949	317	29.2	2
4950	318	76.2	1/2
4951	319	16.1	1

CLIENT : NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5140

SAMPLE NO. 317 to 319 Composite

SIZE & RAW ANALYSIS, a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	90.4	46.0	7851	90.4	46.0
28M x 100M	7.3	25.7	11274	97.7	44.5
100M x 0	2.3	29.9	10513	100.0	44.1

SINK-FLOAT ANALYSIS, a.d.b.: 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	20.9	2.0	15334	5 1/2	20.9	2.0
1.30 - 1.35	13.0	4.1	14949	1 1/2	33.9	2.8
1.35 - 1.40	5.0	10.4	13776	1 1/2	38.9	3.8
1.40 - 1.45	1.7	16.0	12821	1	40.6	4.3
1.45 - 1.50	1.1	22.2	11685	1	41.7	4.8
1.50 - 1.55	0.9	30.4	10476	1	42.6	5.3
1.55 - 1.60	0.8	35.8	9336	1	43.4	5.9
+1.60 -	56.6	73.5	-	N.A.	100.0	44.1

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

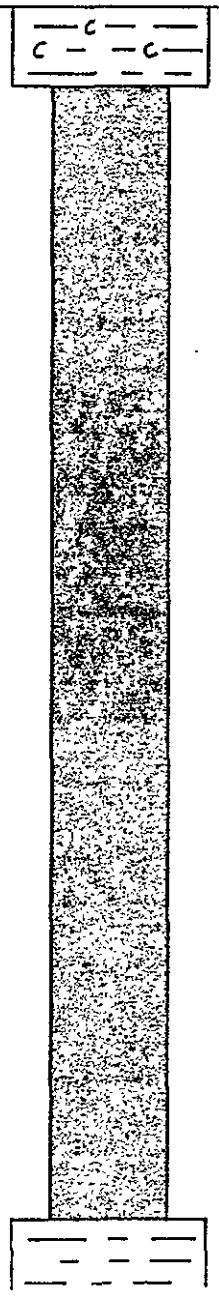
R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.6	5.9	18.4	75.1	0.60	14623	2 1/2	a.d.b.
	5.9	18.5	75.6	0.60	14711	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2330	2460	2600	2660
REDUCING	2150	2360	2410	2650

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WESTERN INDUSTRIES LTD

PINE PASS COAL PROJECT - 1980

Hole # : 80-2 Seam : E Hole Orientation : Vertical
Scale 1:20 Seam Orientation : 20° Az. 125° E. or W.



DEPTH (m)	TRUE THICKNESS (cm) ROCK	TRUE THICKNESS (cm) COAL	DESCRIPTION	QUALITY INFORMATION RECOVERY	QUALITY INFORMATION SAMPLE #
307.56			Shale Carbonaceous		
		75	Coal Shaley		
				52%	320
		217	Coal		
	0	292	Shale		
	2.92 (m)				

LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4952	320	26.3	1

CLIENT : NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5141 SAMPLE NO. 320

SIZE & RAW ANALYSIS., a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	90.8	27.6	10943	90.8	27.6
28M x 100M	6.9	18.0	12501	97.7	26.9
100M x 0	2.3	16.5	12779	100.0	26.7

SINK-FLOAT ANALYSIS., a.d.b.: 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	38.8	5.2	14692	2 1/2	38.8	5.2
1.30 - 1.35	5.1	5.6	14588	1 1/2	43.9	5.2
1.35 - 1.40	7.9	10.7	13801	1 1/2	51.8	6.1
1.40 - 1.45	8.9	14.6	13031	1 1/2	60.7	7.3
1.45 - 1.50	4.8	19.9	12197	1	65.5	8.2
1.50 - 1.55	1.9	28.0	10725	1	67.4	8.8
1.55 - 1.60	1.7	34.1	9654	1	69.1	9.4
+1.60 -	30.9	64.3	-	1	100.0	26.4

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.6	9.5	18.4	71.5	0.40	13938	1 1/2	a.d.b.
	9.6	18.5	71.9	0.40	14022	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2460	2610	2800+	
REDUCING	2350	2580	2730	2800+

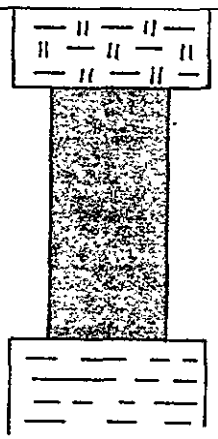
ULTIMATE ANALYSIS

H2O	C	H	N	S	ASH	O by difference
0.60	82.33	4.03	1.10	0.40	9.46	2.08

Birtley Coal-
& Minerals Testing

PINE PASS COAL PROJECT - 1980

Hole # : 80-2 Seam : G Hole Orientation : Vertical
Scale 1:20 Seam Orientation : 20° Az. 123° E or W.



DEPTH (m)	TRUE THICKNESS (cm) ROCK	TRUE THICKNESS (cm) COAL	DESCRIPTION	QUALITY INFORMATION RECOVERY	QUALITY INFORMATION SAMPLE #
293.70			Shale Silty		
		66	Coal	79%	314
	0	66	Shale, Slicks		
	0.66 (m)				

LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4946	314	44.9	1

CLIENT : NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5137 SAMPLE NO. 314

SIZE & RAW ANALYSIS , a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	88.4	45.6	7930	88.4	45.6
28M x 100M	8.5	33.1	9985	96.9	44.5
100M x 0	3.1	28.6	10711	100.0	44.0

SINK-FLOAT ANALYSIS, a.d.b.: 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	16.8	2.6	15190	6	16.8	2.6
1.30 - 1.35	8.6	4.7	14859	1 1/2	25.4	3.3
1.35 - 1.40	2.8	15.8	12902	2 1/2	28.2	4.6
1.40 - 1.45	2.6	21.9	11882	4 1/2	30.8	6.0
1.45 - 1.50	3.2	25.9	11156	1 1/2	34.0	7.9
1.50 - 1.55	3.1	30.9	10254	1 1/2	37.1	9.8
1.55 - 1.60	2.0	33.8	9902	1 1/2	39.1	11.0
+1.60 -	60.9	66.0	-	1/2	100.0	44.5

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

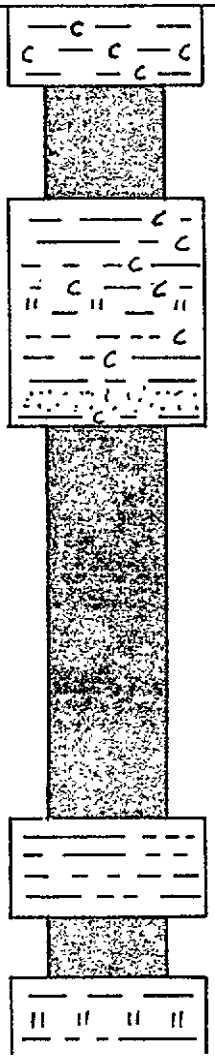
R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.6	11.0	18.8	69.6	0.51	13732	3 1/2	a.d.b.
	11.1	18.9	70.0	0.51	13815	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2800+			
REDUCING	2750	2800+		

Birtley Coal
& Minerals Testing

PINE PASS COAL PROJECT - 1980

Hole # : 80-2 Seam : G Hole Orientation : Vertical
Scale 1:20 Seam Orientation : 20° Az. 123° E or W.



DEPTH (m)	TRUE THICKNESS (cm) ROCK	TRUE THICKNESS (cm) COAL	DESCRIPTION	QUALITY INFORMATION RECOVERY	QUALITY INFORMATION SAMPLE #
290.0			Shale Homogeneous & Carbonaceous		
		29	Coal		
	57		Shale with interbed coals and occasional silty and sandy intervals.		
				60%	315
		105	Coal		
	23		Shale coaly		
		14	Coal		
	80	148	Shale Silty Interbeds		
	2.28 (m)				

LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4947	315	42.9	4 1/2

CLIENT : NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5138 SAMPLE NO. 315

SIZE & RAW ANALYSIS , a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	88.8	44.0	8189	88.8	44.0
28M x 100M	7.9	27.6	10775	96.7	42.7
100M x 0	3.3	34.4	9743	100.0	42.4

SINK-FLOAT ANALYSIS, a.d.b.: 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	25.3	3.0	14774	9	25.3	3.0
1.30 - 1.35	7.8	8.0	14020	8	33.1	4.2
1.35 - 1.40	4.7	12.3	13570	3	37.8	5.2
1.40 - 1.45	3.9	17.2	12602	1 1/2	41.7	6.3
1.45 - 1.50	2.4	23.2	11657	1 1/2	44.1	7.2
1.50 - 1.55	2.5	30.2	10412	1 1/2	46.6	8.5
1.55 - 1.60	2.4	34.9	9705	1	49.0	9.8
+1.60 -	51.0	72.5	-	N.A.	100.0	41.8

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

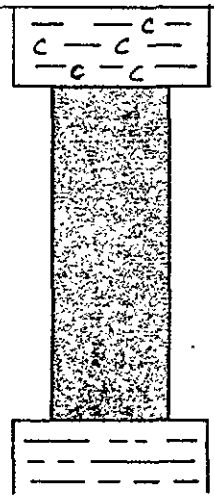
R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.6	9.8	21.1	68.5	0.60	13792	9	a.d.b.
	9.9	21.2	68.9	0.60	13875	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2800+			
REDUCING	2800+			

Birtley Coal
& Minerals Testing

PINE PASS COAL PROJECT - 1980

Hole # : 80-2 Seam : G Hole Orientation : Vertical
Scale 1:20 Seam Orientation : 20° Az. 123° E. or W.



DEPTH (m)	TRUE THICKNESS (cm) ROCK	TRUE THICKNESS (cm) COAL	DESCRIPTION	QUALITY INFORMATION RECOVERY	QUALITY INFORMATION SAMPLE #
283.50			Shale, Homogeneous Carbonaceous		
		81	Coal	67%	316
		81	Shale sheared and slicked.		
		0.81 (m)			

LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4948	316	8.0	3.1/2

CLIENT : NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5139 SAMPLE NO. 316

SIZE & RAW ANALYSIS , a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	89.1	8.2	14114	89.1	8.2
28M x 100M	8.6	6.5	14588	97.7	8.1
100M x 0	2.3	7.7	14190	100.0	8.0

SINK-FLOAT ANALYSIS, a.d.b.: 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	68.7	2.7	15076	4	68.7	2.7
1.30 - 1.35	17.4	5.2	14492	1 1/2	86.1	3.2
1.35 - 1.40	4.5	11.1	13591	1 1/2	90.6	3.6
1.40 - 1.60	2.4	20.9	11787	1 1/2	93.0	4.0
+1.60	7.0	66.6	-	1	100.0	8.4

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

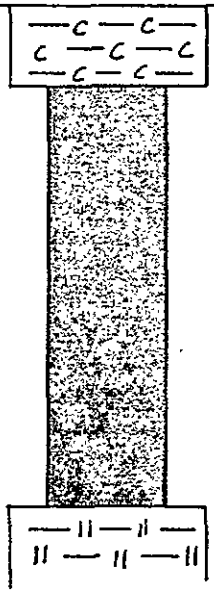
R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.6	4.0	20.1	75.3	0.82	14856	4	a.d.b.
	4.0	20.2	75.8	0.82	14946	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2510	2800+		
REDUCING	2500	2800+		

Birtley Coal
& Minerals Testing

PINE PASS COAL PROJECT - 1980

Hole # : 80-3 Seam : A Hole Orientation : 70° Az. 215° S.W.,
Scale 1:20 Seam Orientation : 25° or 0° Az. 125° E.



DEPTH (m)	TRUE THICKNESS (cm) ROCK	TRUE THICKNESS (cm) COAL	DESCRIPTION	QUALITY INFORMATION RECOVERY	QUALITY INFORMATION SAMPLE #
362.59			Shale Carbonaceous		
		100	Coal	100%	336
		100	Shale Carbonaceous		
		1.00 (m)			

LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4968	336	10.4	2

CLIENT : NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE.SAMPLES
LAB NO.: 5150 SAMPLE NO. 336

SIZE & RAW ANALYSIS , a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	91.3	10.9	13629	91.3	10.9
28M x 100M	6.7	8.6	14087	98.0	10.7
100M x 0	2.0	9.9	13904	100.0	10.7

SINK-FLOAT ANALYSIS, a.d.b. : 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	35.9	2.4	15160	2	35.9	2.4
1.30 - 1.35	38.3	4.3	14801	1 1/2	74.2	3.4
1.35 - 1.40	6.2	10.0	13792	1 1/2	80.4	3.9
1.40 - 1.45	2.2	17.0	12666	1/2	82.6	4.2
1.45 - 1.50	3.1	21.3	11901	1/2	85.7	4.9
1.50 - 1.55	3.8	26.3	11064	1/2	89.5	5.8
1.55 - 1.60	2.9	31.8	10196	1/2	92.4	6.6
+1.60 -	7.6	58.8	5659	1/2	100.0	10.6

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

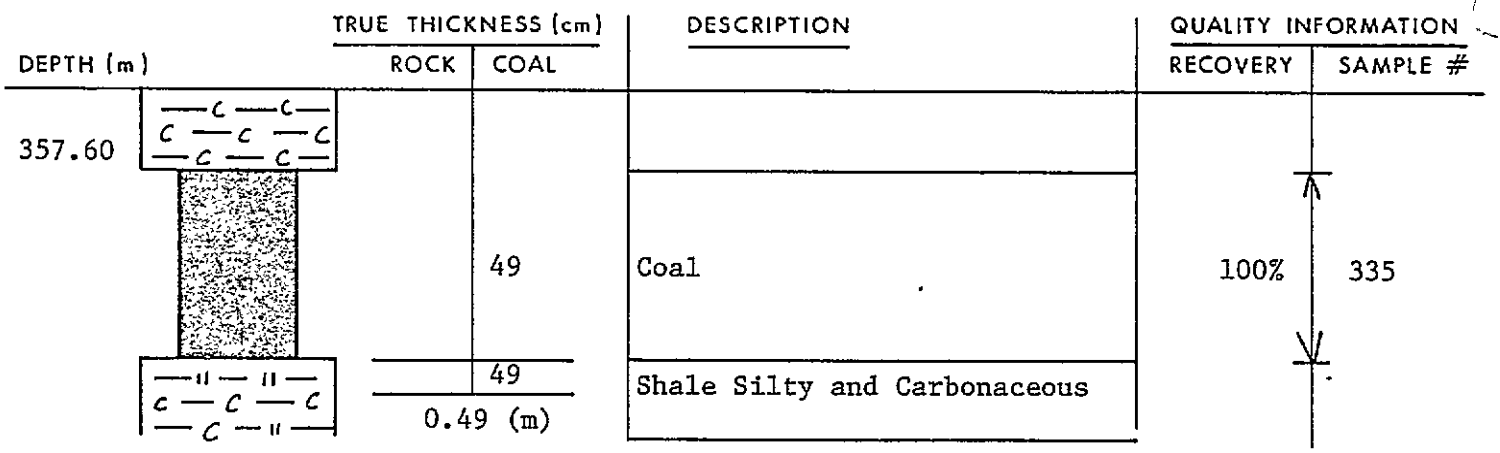
R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.7	6.6	15.0	77.7	0.81	14363	1 1/2	a.d.b.
	6.6	15.1	78.3	0.82	14464	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2670	2780	2800+	
REDUCING	2650	2770	2800+	

Birtley Coal
& Minerals Testing

PINE PASS COAL PROJECT - 1980

Hole # : 80-3 Seam : A Hole Orientation : 70° Az. 215° S.W.
Scale 1:20 Seam Orientation : 25° or 0° Az. 125° E.



LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4967	335	29.7	3

CLIENT : NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5149 SAMPLE NO. 335

SIZE & RAW ANALYSIS , a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	90.4	29.8	10588	90.4	29.8
28M x 100M	7.3	20.8	12109	97.7	29.1
100M x 0	2.3	22.7	11801	100.0	29.0

SINK-FLOAT ANALYSIS, a.d.b. : 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	15.1	3.4	15002	8 1/2	15.1	3.4
1.30 - 1.35	10.0	9.5	13984	3 1/2	25.1	5.8
1.35 - 1.40	14.9	13.3	13321	1 1/2	40.0	8.6
1.40 - 1.45	6.9	18.5	12549	3	46.9	10.1
1.45 - 1.50	5.2	25.1	11386	3	52.1	11.6
1.50 - 1.55	6.4	29.7	10648	3	58.5	13.6
1.55 - 1.60	7.5	34.6	9710	2 1/2	66.0	15.9
+1.60 -	34.0	53.4	6567	1	100.0	28.7

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.6	16.1	17.0	66.3	1.32	12907	4 1/2	a.d.b.
	16.2	17.1	66.7	1.33	12985	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2730	2800+	-	
REDUCING	2610	2800+		

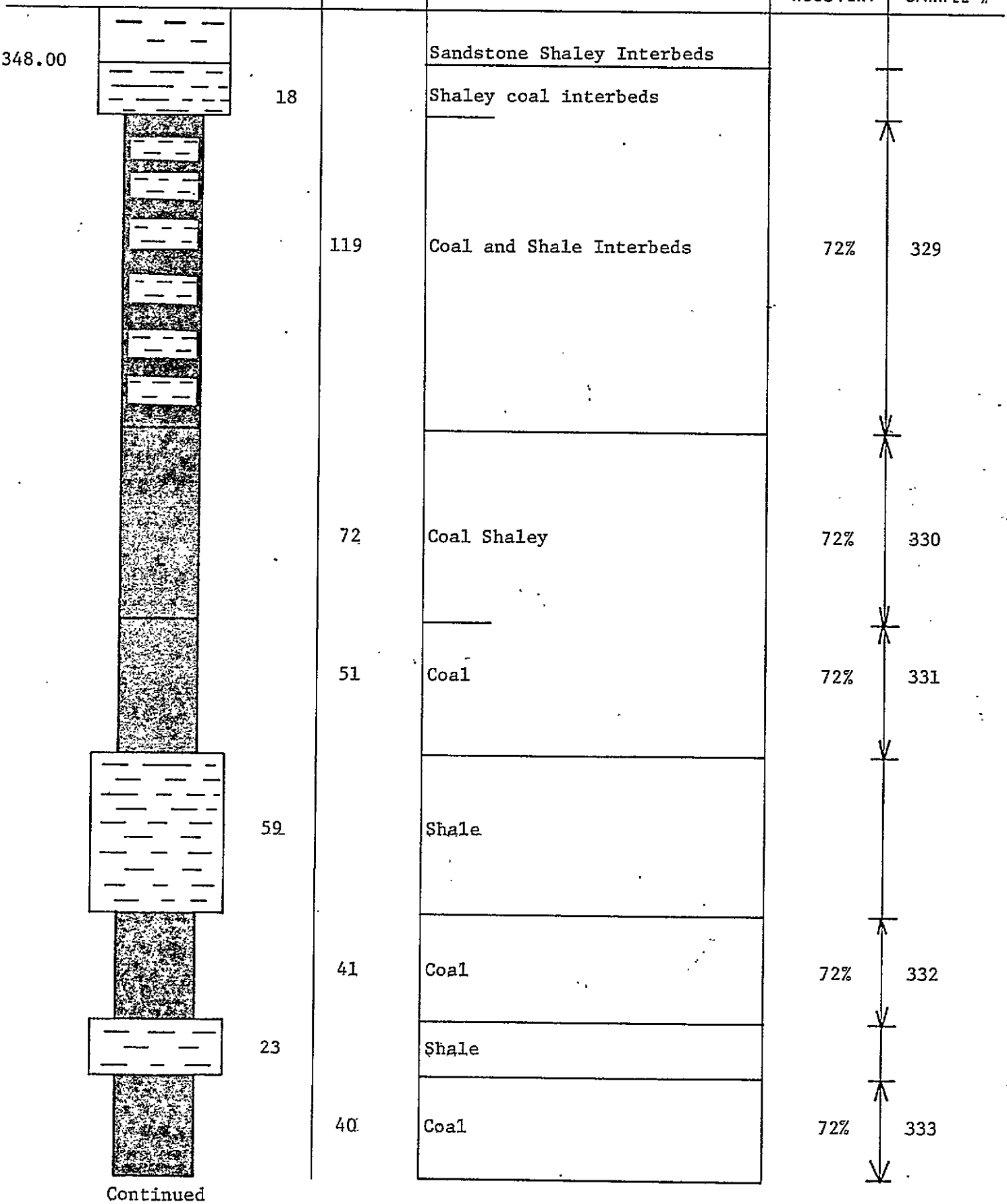
Birtley Coal
& Minerals Testing

PINE PASS COAL PROJECT - 1980

Hole # : 80-3
Scale 1:20

Seam : B
1 of 2.

Hole Orientation : 70° Az. 215° S.W.,
Seam Orientation : 25° 010° Az. 125° E.



PINE PASS COAL PROJECT - 1980

Hole # : 80-3 Seam : B
Scale 1:20 2 of 2

Hole Orientation : 70° Az. 215° S.W.,
Seam Orientation : 25° or 0° Az. 125° E.

DEPTH (m)	TRUE THICKNESS (cm) ROCK	TRUE THICKNESS (cm) COAL	DESCRIPTION	QUALITY INFORMATION RECOVERY	QUALITY INFORMATION SAMPLE #
Continued					
	23		Shale		
		76	Coal	72%	334
	123	399	Shale. Carbonaceous		
	5.22				

LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4961	329	39.5	5
4962	330	17.6	1 1/2
4963	331	50.8	1/2
4964	332	4.9	8
4965	333	46.1	2 1/2
4966	334	26.1	4

CLIENT : NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5148

SAMPLE NO. 329 to 334 Composite

SIZE & RAW ANALYSIS , a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	90.4	31.2	10356	90.4	31.2
28M x 100M	7.6	19.7	12282	98.0	30.3
100M x 0	2.0	26.8	10910	100.0	30.2

SINK-FLOAT ANALYSIS, a.d.b. : 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	31.2	2.7	15192	6 1/2	31.2	2.7
1.30 - 1.35	10.9	7.3	14384	3	42.1	3.9
1.35 - 1.40	8.6	11.9	13589	1 1/2	50.7	5.2
1.40 - 1.45	8.5	18.6	12454	1 1/2	59.2	7.2
1.45 - 1.50	3.5	23.4	11647	1	62.7	8.1
1.50 - 1.55	3.2	29.0	10602	1	65.9	9.1
1.55 - 1.60	2.4	33.1	10012	1	68.3	9.9
+1.60 -	31.7	71.6	-	N.A.	100.0	29.5

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

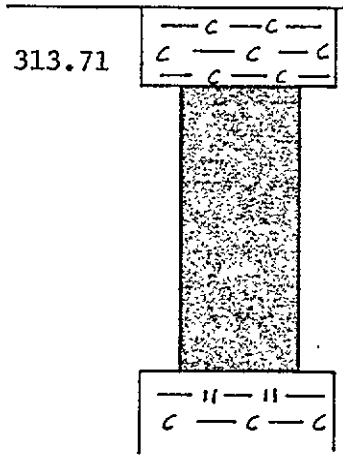
R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.6	10.0	17.2	72.2	0.79	13883	4	a.d.b.
	10.1	17.3	72.6	0.79	13967	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2760	2800+		
REDUCING	2660	2800+		

Birtley Coal
& Minerals Testing

PINE PASS COAL PROJECT - 1980

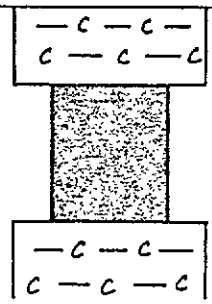
Hole # : 80-3 Seam : C Hole Orientation : 70° Az. 215° S.W.,
Scale 1:20 Seam Orientation : 25° or 0° Az. 125° E.



DEPTH (m)	TRUE THICKNESS (cm) ROCK	TRUE THICKNESS (cm) COAL	DESCRIPTION	QUALITY INFORMATION RECOVERY	QUALITY INFORMATION SAMPLE #
313.71			Shale Carbonaceous		
		74	Coal	100%	327
		74	Shale Silty Carbonaceous		
	0.74				

PINE PASS COAL PROJECT - 1980

Hole # : 80-3 Seam : C Hole Orientation : 70° Az. 125° S.W.,
Scale 1:20 Seam Orientation : 25° or 0° Az. 125° E



DEPTH (m)	TRUE THICKNESS (cm) ROCK	TRUE THICKNESS (cm) COAL	DESCRIPTION	QUALITY INFORMATION RECOVERY	QUALITY INFORMATION SAMPLE #
316.18			Shale Carbonaceous		
		35	Coal	100%	328
		35	Shale Carbonaceous		
		0.35 (m)			

LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4959	327	18.7	1 1/2
4960	328	26.3	3

CLIENT : NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5147 SAMPLE NO. 327 and 328 Composite

SIZE & RAW ANALYSIS , a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	90.5	22.6	11774	90.5	22.6
28M x 100M	7.5	14.4	13191	98.0	22.0
100M x 0	2.0	16.1	12922	100.0	21.9

SINK-FLOAT ANALYSIS, a.d.b. : 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	37.2	2.4	15267	4 1/2	37.2	2.4
1.30 - 1.35	21.1	6.2	14594	1 1/2	58.3	3.8
1.35 - 1.40	9.4	11.5	13697	1 1/2	67.7	4.8
1.40 - 1.45	4.2	18.3	12567	1 1/2	71.9	5.6
1.45 - 1.50	1.8	23.6	11617	1	73.7	6.1
1.50 - 1.55	1.1	28.6	10804	1	74.8	6.4
1.55 - 1.60	1.0	33.4	9991	1	75.8	6.8
+1.60 -	24.2	68.6	--	N.A.	100.0	21.7

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

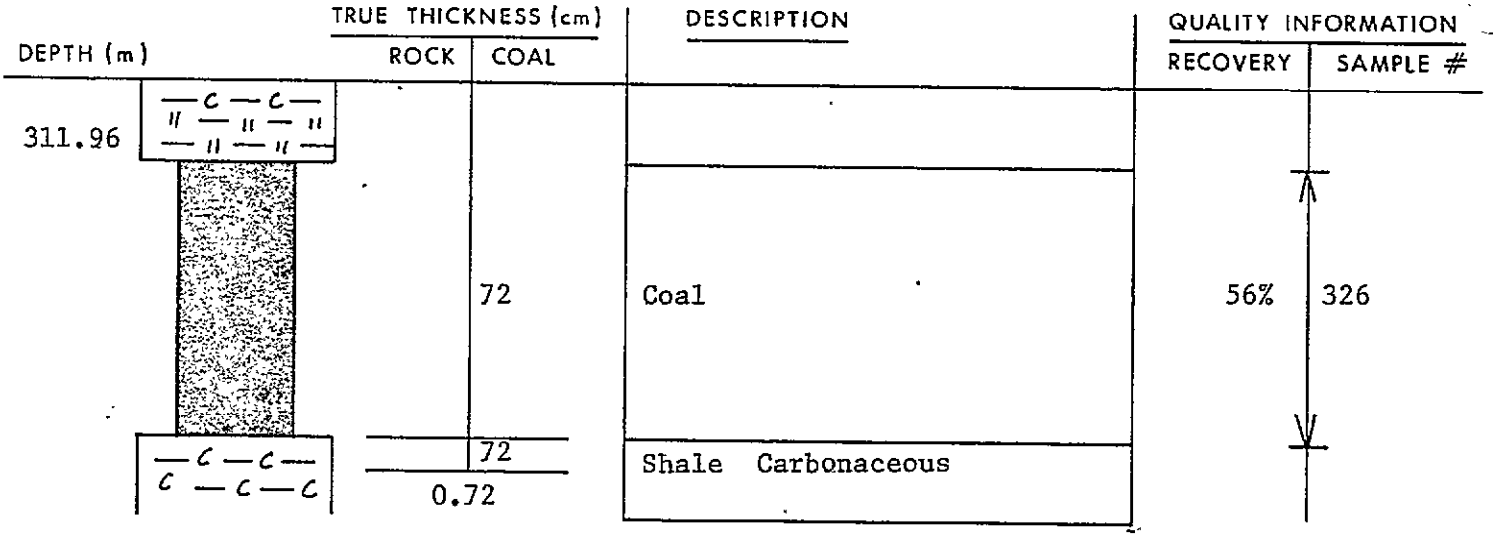
R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.5	6.7	17.0	75.8	0.92	14536	3	a.d.b.
	6.7	17.1	76.2	0.92	14609	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2800+			
REDUCING	2500	2800+		

Birtley Coal
& Minerals Testing

PINE PASS COAL PROJECT - 1980

Hole # : 80-3 Seam : C Hole Orientation : 70° Az. 215° S.W.
Scale 1:20 Seam Orientation : 25° or 0° Az. 125° E



LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4958	326	12.4	3 1/2

CLIENT : NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5146 SAMPLE NO. 326

SIZE & RAW ANALYSIS , a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	90.4	13.3	13287	90.4	13.3
28M x 100M	7.4	9.3	14043	97.8	13.0
100M x 0	2.2	12.4	13479	100.0	13.0

SINK-FLOAT ANALYSIS, a.d.b.: 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	40.9	3.2	15165	5 1/2	40.9	3.2
1.30 - 1.35	20.4	7.3	14401	1 1/2	61.3	4.6
1.35 - 1.40	7.6	11.8	13599	1 1/2	68.9	5.4
1.40 - 1.45	11.1	17.3	12717	1	80.0	7.0
1.45 - 1.50	6.7	21.4	11832	1	86.7	8.1
1.50 - 1.55	3.1	27.7	10792	1	89.8	8.8
1.55 - 1.60	1.9	32.3	10125	1	91.7	9.3
+1.60 -	8.3	50.9	7071	1/2	100.0	12.7

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

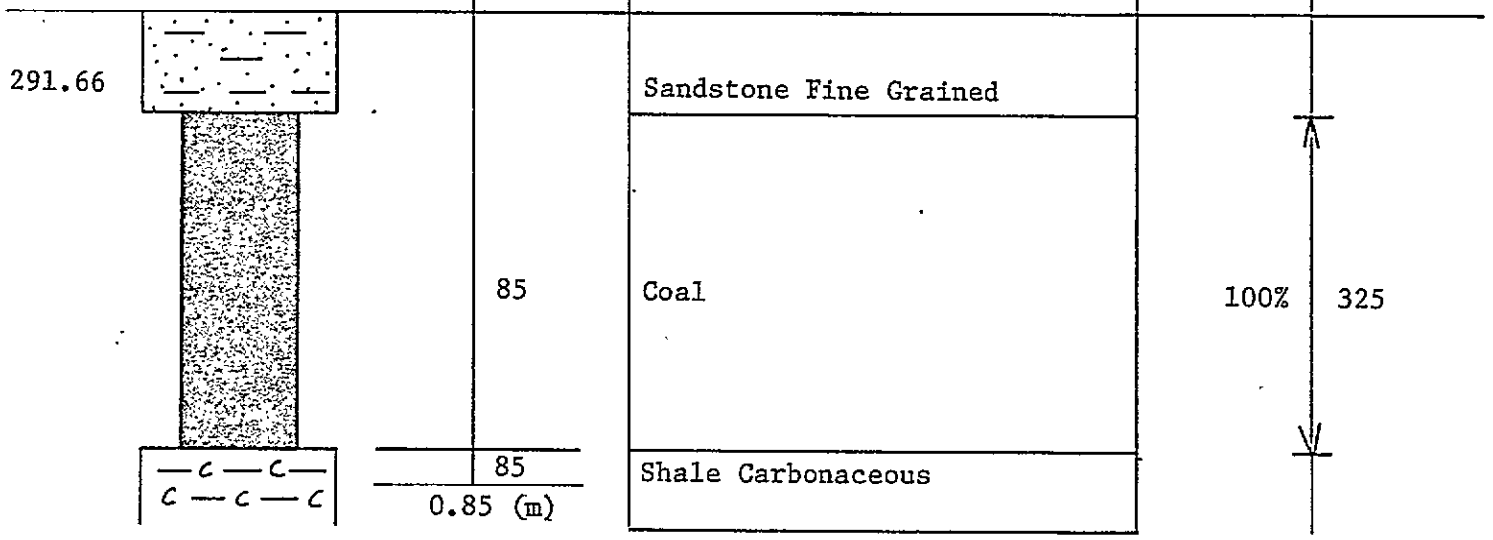
R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.5	9.3	16.9	73.3	0.85	14049	3	a.d.b.
	9.3	17.0	73.7	0.85	14120	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2780	2800+	-	
REDUCING	2690	2800+		

Birtley Coal
& Minerals Testing

PINE PASS COAL PROJECT - 1980

Hole # : 80-3 Seam : D Hole Orientation : 70° Az. 215° S.W.,
Scale 1:20 Seam Orientation : 25° or 0° Az. 125° E.



LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4957	325	3.9	5

CLIENT : NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5145 SAMPLE NO. 325

SIZE & RAW ANALYSIS, a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	91.4	3.4	15037	91.4	3.4
28M x 100M	6.9	3.7	14991	98.3	3.4
100M x 0	1.7	8.2	14267	100.0	3.5

SINK-FLOAT ANALYSIS, a.d.b.: 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	81.4	1.4	15301	6	81.4	1.4
1.30 - 1.35	11.6	3.2	15019	1 1/2	93.0	1.6
1.35 - 1.40	2.4	12.1	13617	2 1/2	95.4	1.9
1.40 - 1.45	2.2	21.3	12269	4 1/2	97.6	2.3
+1.45	2.4	57.9	5819	1	100.0	3.7

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.5	3.4	18.6	77.5	1.11	15052	4 1/2	a.d.b.
	3.4	18.7	77.9	1.12	15128	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2660	2800	2800+	
REDUCING	2550	2720	2790	2800+

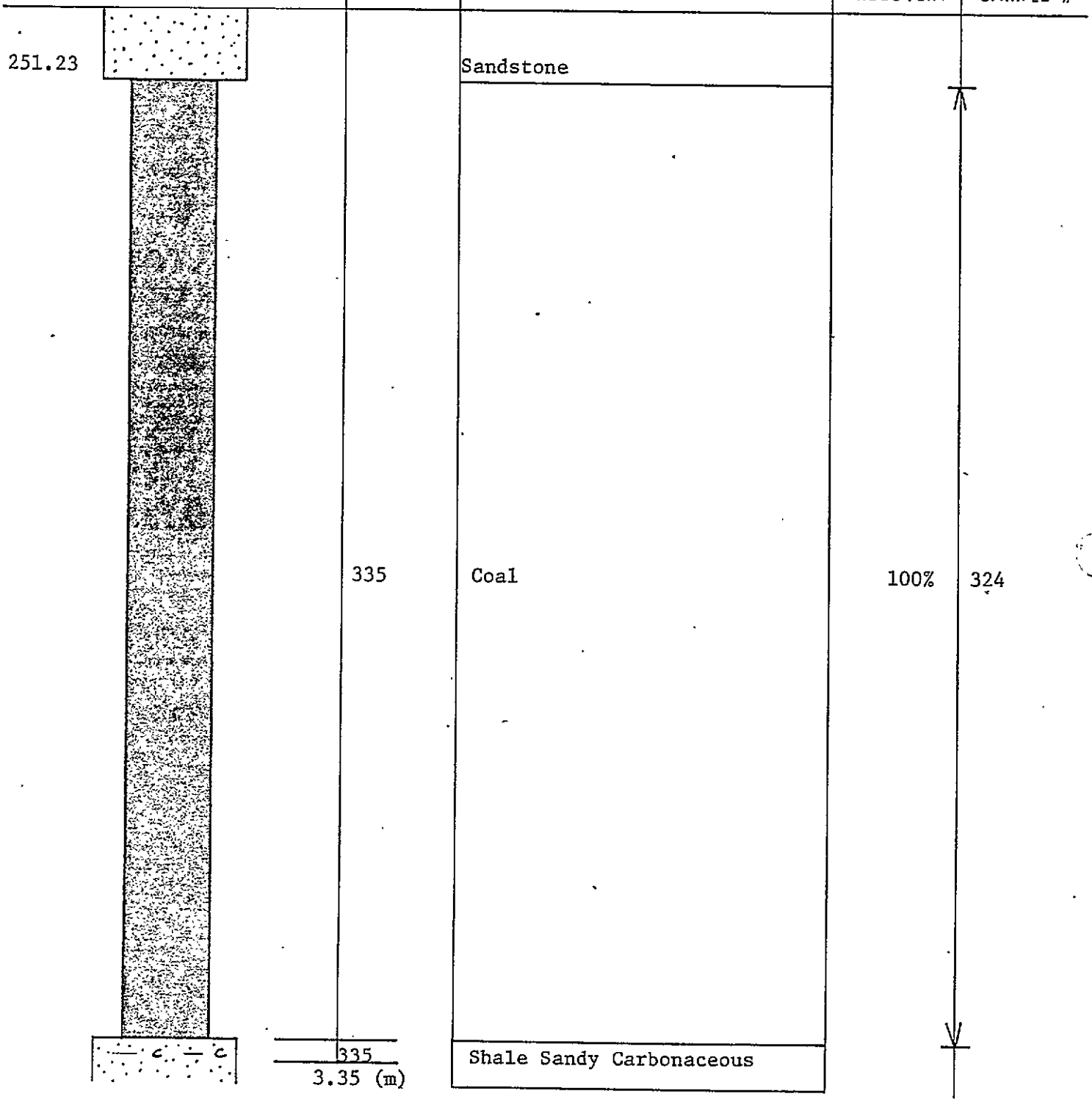
Birtley Coal
& Minerals Testing

PINE PASS COAL PROJECT - 1980

Hole # : 80-3
Scale 1:20

Seam : E

Hole Orientation : 70° Az. 215° S.W.,
Seam Orientation : 30° - 5° Az. 125° E.



LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4956	324	5.2	2

CLIENT.: NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5144 SAMPLE NO. 324

SIZE & RAW ANALYSIS , a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	88.5	5.6	14633	88.5	5.6
28M x 100M	8.6	4.5	14749	97.1	5.5
100M x 0	2.9	6.2	14482	100.0	5.5

SINK-FLOAT ANALYSIS , a.d.b. : 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	64.3	1.9	15119	2 1/2	64.3	1.9
1.30 - 1.35	19.9	4.6	14722	1 1/2	84.2	2.5
1.35 - 1.40	6.0	10.3	13801	1	90.2	3.1
1.40 - 1.45	3.2	16.3	12789	1	93.4	3.5
1.45 - 1.50	2.2	20.8	12019	1	95.6	3.9
1.50 - 1.55	1.1	26.5	11064	1	96.7	4.2
1.55 - 1.60	0.8	31.0	10228	1	97.5	4.4
+1.60 -	2.5	44.7	8027	N.A.	100.0	5.4

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
1.1	4.4	18.7	75.8	0.51	14701	2	a.d.b.
	4.4	18.9	76.7	0.52	14865	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2470	2550	2680	2800+
REDUCING	2380	2460	2540	2800

ULTIMATE ANALYSIS

H2O	C	H	N	S	ASH	O by difference
1.05	84.37	4.23	1.03	0.51	4.41	4.40

Birtley Coal-
& Minerals Testing

LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4955	323	52.6	2

CLIENT : NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5143 SAMPLE NO. 323

SIZE & RAW ANALYSIS , a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	90.2	54.1	6462	90.2	54.1
28M x 100M	7.3	36.2	9683	97.5	52.8
100M x 0	2.5	33.3	9969	100.0	52.3

SINK-FLOAT ANALYSIS, a.d.b.: 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	10.9	3.8	14846	9	10.9	3.8
1.30 - 1.35	5.7	8.6	14195	8	16.6	5.4
1.35 - 1.40	3.7	15.0	13065	4	20.3	7.2
1.40 - 1.45	3.5	20.1	12314	3	23.8	9.1
1.45 - 1.50	2.7	25.3	11296	3	26.5	10.7
1.50 - 1.55	2.2	33.3	10187	3	28.7	12.5
1.55 - 1.60	2.0	37.8	9191	2 1/2	30.7	14.1
+1.60 -	69.3	69.3	-	1	100.0	52.4

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

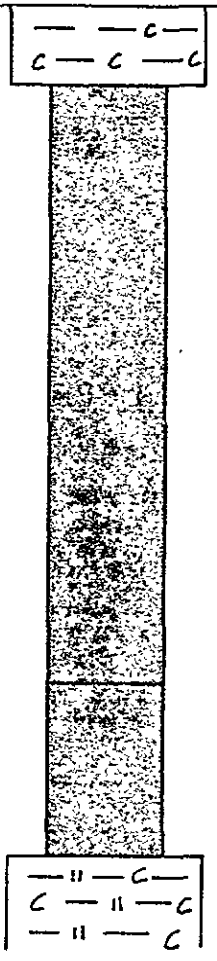
R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.6	14.2	18.6	66.6	0.82	13277	7 1/2	a.d.b.
	14.3	18.7	67.0	0.82	13357	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2740	2800+	-	
REDUCING	2650	2790	2800+	

Birtley Coal
& Minerals Testing

PINE PASS COAL PROJECT - 1980

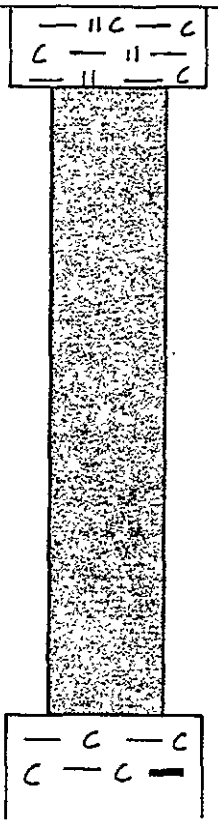
Hole # : 80-3 Seam : F Hole Orientation : 70° Az. 215° S.W.,
Scale 1:20 Seam Orientation : 25° or 0° Az. 125° E.



DEPTH (m)	TRUE THICKNESS (cm) ROCK	TRUE THICKNESS (cm) COAL	DESCRIPTION	QUALITY INFORMATION RECOVERY	QUALITY INFORMATION SAMPLE #
243.60			Shale Carbonaceous, Slicks		
		154	Coal Shaley	80%	321
		44	Coaly with Shaley Interbeds	80%	322
		198	Shale Silty and Carbonaceous		
		1.98 (m)			

PINE PASS COAL PROJECT - 1980

Hole # : 80-3 Seam : F Hole Orientation : 70° Az. 215° S.W.,
Scale 1:20 Seam Orientation : 25° or 0° Az. 125° E.



DEPTH (m)	TRUE THICKNESS (cm) ROCK	TRUE THICKNESS (cm) COAL	DESCRIPTION	QUALITY INFORMATION RECOVERY	QUALITY INFORMATION SAMPLE #
247.72			Shale Silty and Carbonaceous		
		159	Coal becoming very Shaley to Base.	54%	323
		159	Shale Coaly		
		1.59 (m)			

LAB NO.	SAMPLE NO.	ASH %	F.S.I.
4953	321	27.1	5 1/2
4954	322	63.1	1

CLIENT : NORCEN ENERGY RESOUCES LIMITED
PROJECT: PINE PASS CORE SAMPLES
LAB NO.: 5142

SAMPLE NO. 321 and 322 Composite

SIZE & RAW ANALYSIS , a.d.b.					
				CUMULATIVE	
SIZE FRACTION	WT%	ASH%	BTU/LB	WT%	ASH%
1/4" x 28M	88.6	38.0	9008	88.6	38.0
28M x 100M	8.0	23.6	11442	96.6	36.8
100M x 0	3.4	30.7	10279	100.0	36.6

SINK-FLOAT ANALYSIS, a.d.b.: 1/4" x 100M						
					CUMULATIVE	
S.G. FRACTION	WT%	ASH%	BTU/LB	F.S.I.	WT%	ASH%
- 1.30	36.5	3.0	15126	9	36.5	3.0
1.30 - 1.35	7.8	6.6	14482	5 1/2	44.3	3.6
1.35 - 1.40	2.6	14.0	13318	5	46.9	4.2
1.40 - 1.45	2.0	20.5	12111	5	48.9	4.9
1.45 - 1.50	2.0	25.9	11303	3 1/2	50.9	5.7
1.50 - 1.55	1.7	30.6	10432	3	52.6	6.5
1.55 - 1.60	1.5	35.8	9502	2	54.1	7.3
+1.60 -	45.9	70.1	-	1/2	100.0	36.1

ANALYSIS OF 1/4"x100M COMPOSITE FLOAT @1.60S.G.

R.M.%	ASH%	V.M.%	F.C.%	S%	BTU/LB	F.S.I.	CALC. BASIS
0.6	7.3	20.1	72.0	0.55	14352	8 1/2	a.d.b.
	7.3	20.2	72.5	0.55	14439	-	d.b.

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2770	2800+	-	
REDUCING	2660	2790	2800+	

Birtley Coal
& Minerals Testing