PETRO-CANADA
MONKMAN COAL PROJECT

PEACE RIVER LAND DISTRICT
NTS 93I/15

COAL LICENCES:	3226	3239	3246
	3227	3242	3949
	3233	3245	

Lat. 54°46'30" N - 54°48'30" N

Long. 120°43' W - 120°47' W

WORK DONE: March 1982
REPORT DATE: June 1982
BY: Eric Panchy
Geologist
Petro-Canada

AMENDED AND RE-SUBMITTED
BY: J.Y. Wright, P. Geol.
Petro-Canada
July 1986

TABLE OF CONTENTS

1982 EXPLORATION PROGRAM

TABLE OF CONTENTS

1982 EXPLORATION PROGRAM

FIGURES

TABLES

APPENDICES

(At end of this volume)

A. Seam Details for MRC 82-02, MRC 82-05 and MRC 82-06

B. Core Logs for MRC 82-02, MRC 82-05 and MRC 82-06

C. Cost Breakdown and Application of Credits

(In separate file pockets)

D. MAP 1 Geological Map, Sheet 0 24

MAP 2 Geological Map, Sheet P 24

MAP 3 Isopach Map, Gething Upper Seam

MAP 4 Isopach Map, Gething Upper Seam

MAP 5 Structure Contour Map, Upper Seam

MAP 6 Structure Contour Map, Lower Seam

MAP 7 Structure Contour Map, Base Seam B1 (Gates), Duke Area

MAP 8 Structure Contour Map, Base Seam B1 (Gates), Honeymoon Area

CROSS-SECTIONS	15,000 N	16,500 N	18,000 N
	15,500 N	17,000 N	18,500 N
	16,000 N	17,500 N	19,000 N

E. DOWNHOLE LOGS

Hole No.	Coal Quality	Seam Thickness	Coal Lith.	Neutron-Neutron	Sonic
MDH 82-1	x	x	x	x	x
MRC 82-2	x	x	x	x	
MDH 82-3			x	x	
MDH 82-4	x	x	x	x	
MRC 82-5	x	x	x		
MRC 82-6	x	x	x	x	
MRC 82-7	x	x	x	x	
MPW 82-1	x	x	x		x
MPW 82-2	x	x	x	x	x
MPW 82-3			x	x	
MOW 82-2 ✓	x	x	x		
MOW 82-3 ✓	x	x	x		x
MOW 82-4	x	x	x		x
MOW 82-5	x	x	x	x	
MOW 82-6			x	x	
MOW 82-7			x	x	

PETRO-CANADA

MONKMAN PASS DRILL HOLE PROGRAM

SPRING 1982

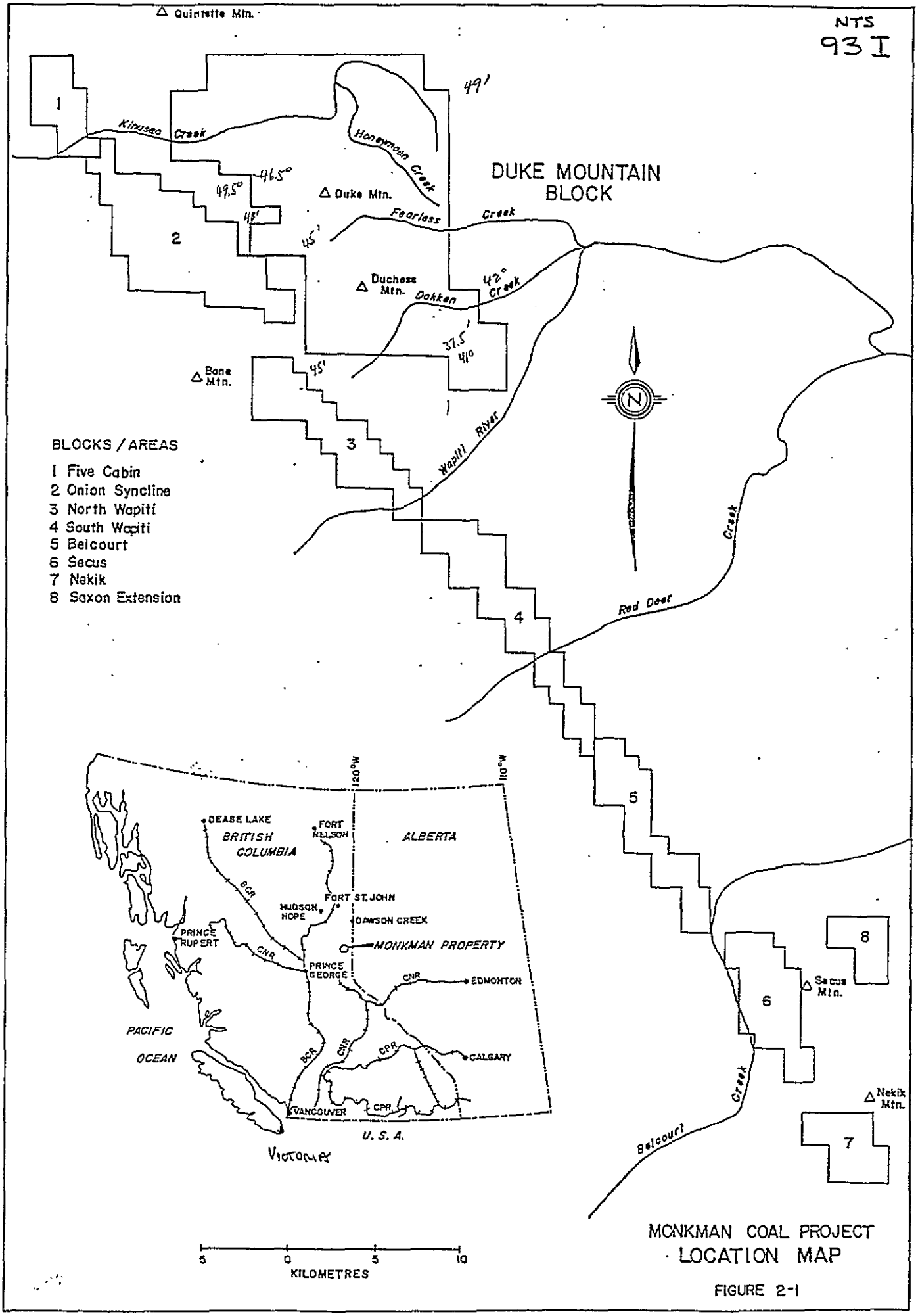
DRILL HOLE	TAG	U.T.M. CO-ORDINATES NORTHING	EASTING	ELEVATIONS	TD
MOB-82-03 ✓	575	6074907.09	644298.03	940.47	
MOW-82-06 ✓	576	6075284.24	643245.60	933.40	100 m
MOB-82-04 ✓	577	6075485.32	642881.83	934,98	
MOW-82-07 ✓	578	6074762.00	646158,88	996.43	30 m
MP -82-03 ✓	579	6074793.39	646169.32	994.78	30m
MOW-82-04 ✓	580	6074681.36	645220.70	978.30	254.5
MP -82-02 ✓	581	6074690.97	645223.65	978,78	251
MOW-82-05 ✓	582	6074698.74	645194.46	978.55	251m
MOB-82-01 ✓	583	6074715.87	645231.44	978.46	
MOB-82-02 ✓	584	6074313.36	646261.37	1000.95	
MOB-82-06	585	6073099.76	645491.85	1020.31	
MOB-82-05 ✓	586	6073604.29	645100.52	1006.71	
MRC-82-05 ✓	587	6073553.63	644462.91	1031.87	157
MDH-82-04 ✓	588	6073551.03	644462.49	1031.69	248
MDH-82-03 ✓	589	6073781.11	644028.97	1020.24	148
MRC-82-06 ✓	590	6073137.79	644663.21	1036.72	141.8
MP -82-01 ✓	591	6072448.35	645107.57	1120.08	153
MOW-82-02 ✓	592	6072441.79	645100.33	1120.46	147m
MOW-82-03 ✓	593	6072433.78	645119.51	1120.27	154m
MRC-82-02 ✓	594	6072463.09	644520.15	1159.65	140m
MDH-82-01 ✓	595	6072461.72	644519.30	1159.85	224.7m
MRC-82-07 ✓	2327	6075304.70	644560.92	997.81	122

1. SUMMARY

The Monkman Coal Project is a joint venture of Canadian Superior Exploration Ltd., McIntyre Mines Ltd. and the operator, Petro-Canada Exploration Inc. Since 1975, annual exploration has been carried out mainly on the Duke Mountain Block where medium volatile bituminous coal has been demonstrated to exist in substantial quantity.

The exploratory drilling program in March 1982 tested the Gething potential of an area in which a waste dump is to be located. The area was found to be structurally simple but the seam thicknesses are inconsistent as a result of being associated with a sandstone environment.

In addition, a program of geotechnical drilling in the proposed pit areas supplied geological information which was incorporated into the geological maps.



MONKMAN COAL PROJECT
LOCATION MAP

FIGURE 2-1

2. INTRODUCTION

2.1 Location and Means of Access

The Monkman Property is located in the southern part of the Peace River Coalfield, approximately 630 km northeast of Vancouver, British Columbia (Fig. 2-1).

The property is more or less equidistant, by all-weather loose surface roads, from Beaverlodge, Alberta and Tupper, British Columbia, both of which are situated on Highway No. 2 which connects Grande Prairie and Dawson Creek. The camp is 11 km west of Stony Lake on the Kinuseo Falls road and is approximately 125 km from pavement. A third route, the Fellers Heights road from Dawson Creek, is also passable most of the year. The Quasar airstrip near Thunder Mountain permits year-around access by light plane. This airstrip is 16 km from the camp.

2.2 History of Land Tenure

In 1970, McIntyre Mines Ltd. acquired 134 coal licences from the Government of British Columbia. In 1975,

Canadian Superior Exploration Ltd. acquired a 66 2/3% interest in the property, which was reduced to 119 licences. Pacific Petroleums Ltd. entered into an option agreement with McIntyre and Canadian Superior in 1976 and by the end of 1978 had earned a 50% interest in the property, the shares of the partners being reduced to 16 2/3% and 33 1/3% respectively. In 1978, 31 licences were added to the property and a further 12 licences were added in 1979, bringing the total to 162 and the area to 37,492 hectares.

Three licences (899 hectares) were added to the Duke Mountain Block in 1980 and four (1196 hectares) were added in 1981. The total area of the Monkman Property as of December 31, 1981 was 39,587 hectares of which 20,745 hectares were contained within the Duke Mountain Block.

2.3 Topography

The Monkman Property is situated within the Inner Foothills of the Rocky Mountains in an area of rugged topography. The property is approximately 80 km long, extending from the southern slopes of Quintette Mountain in the northwest to the Narraway River south of Nekik Mountain in the southeast. The property is situated on a dissected belt of highlands which rises from a valley floor elevation of 950 m at Kinuseo Creek

to a maximum of 2250 m on Secus Mountain. The highlands are cut by seven water courses which are, from north to south, Kinuseo Creek, Fearless Creek, Dokken Creek, the Wapiti River, Red Deer Creek, Belcourt Creek and the Narraway River.

The Duke Mountain Block, 17 km in length and 10 km in width, includes Kinuseo, Fearless and Dokken Creeks and Duke and Duchess Mountains. Its southerly limit is the Wapiti River and the highest point is 1791 m, on Duchess Mountain. The valleys and lower slopes are heavily forested with spruce and jackpine up to the treeline which is 1400 m above sea level.

2.4 Exploration History

1968 Regional Mapping by D.F. Stott, G.S.C.

1970 Initial licences acquired by McIntyre Mines

1973 Geological reconnaissance, trenching

1975 Canadian Superior drilled three diamond holes

1976 Pacific Petroleums drilled twelve diamond holes, mapped

1977 Pacific drilled eight diamond holes, mapped

1978 Pacific drilled 24 diamond holes, 22 hammer holes and drove two adits on the Duke Mountain Block and drilled six diamond holes elsewhere

1979 Pacific drilled 18 diamond holes, 35 hammer holes and drove four adits on Duke Mountain Block

1980 Petro-Canada drilled 11 diamond holes and 77 hammer/rotary core holes and drove three adits - all on Duke Mountain Block

1981 Petro-Canada drilled 17 diamond holes and 8 hammer/rotary core holes on the Duke Mountain Block and 2 diamond holes on the Nekik Block.

In addition to drilling, mapping was carried out on the Duke Mountain, Five Cabin, Onion Syncline Blocks and Wapiti Dip Slope areas.

3. 1982 EXPLORATION PROGRAM

3.1 Objectives

The overall objective of the program was to aid Petro-Canada's engineers in fulfilling the requirements of the Government's Stage II Approval, by testing potential Gething coal in an area adjacent to the Duke Pit where a waste dump was planned.

3.2 Field Camp and Services

The crew was based in the permanent camp established in 1979. Access roads to the drillsites were bulldozed from the existing roads and drilling commenced March 4th with Alberta Southern's TH60 Sanderson Cyclone rig.

3.3 Rotary Drilling

Six rotary holes were drilled to test the Gething Formation. Of the 1053 m of drilling completed, 19.29 m was cored, using a 3 m Christensen split-tube core barrel. In addition, one Gates test was drilled

and nine holes for hydrogeological purposes. This additional drilling amounted to 1503 m. The hole locations are shown in Figure 3-1.

3.4 Geophysical Logging

Downhole logging was done on all the holes by BPB (Instruments) Ltd. A listing of the specific logs run is to be found in the Table of Contents (Appendices).

3.5 Surveying

All of the holes locations were surveyed by Hosford, Impey, Welter and Associates of Grande Prairie, Alberta.

3.6 Coal Sampling

The drillholes intersected two coal seams and several stringers of Gething age. In three of the holes (designated MRC) the seams were cored and the cores carefully compared with the geophysical logs in order to determine lost core intervals. Rock splits with a true thickness of 0.5 m or greater were sampled separately.

3.7 Coal Quality

All the coals samples were shipped to Loring Laboratories in Calgary for analysis.

3.8 Reclamation

The reclamation report is supplied as a separate submission.

3.9 Cost Breakdown and Application of Work Credits

The credits applied for are summarized in Appendix C.

FIGURE 3.1

MONKMAN COAL PROJECT

DRILLHOLE LOCATION MAP WITH
1982 HOLES HIGHLIGHTED

SCALE: 1:25,000

NTS 93I/15

0 500 1000 1500
metres

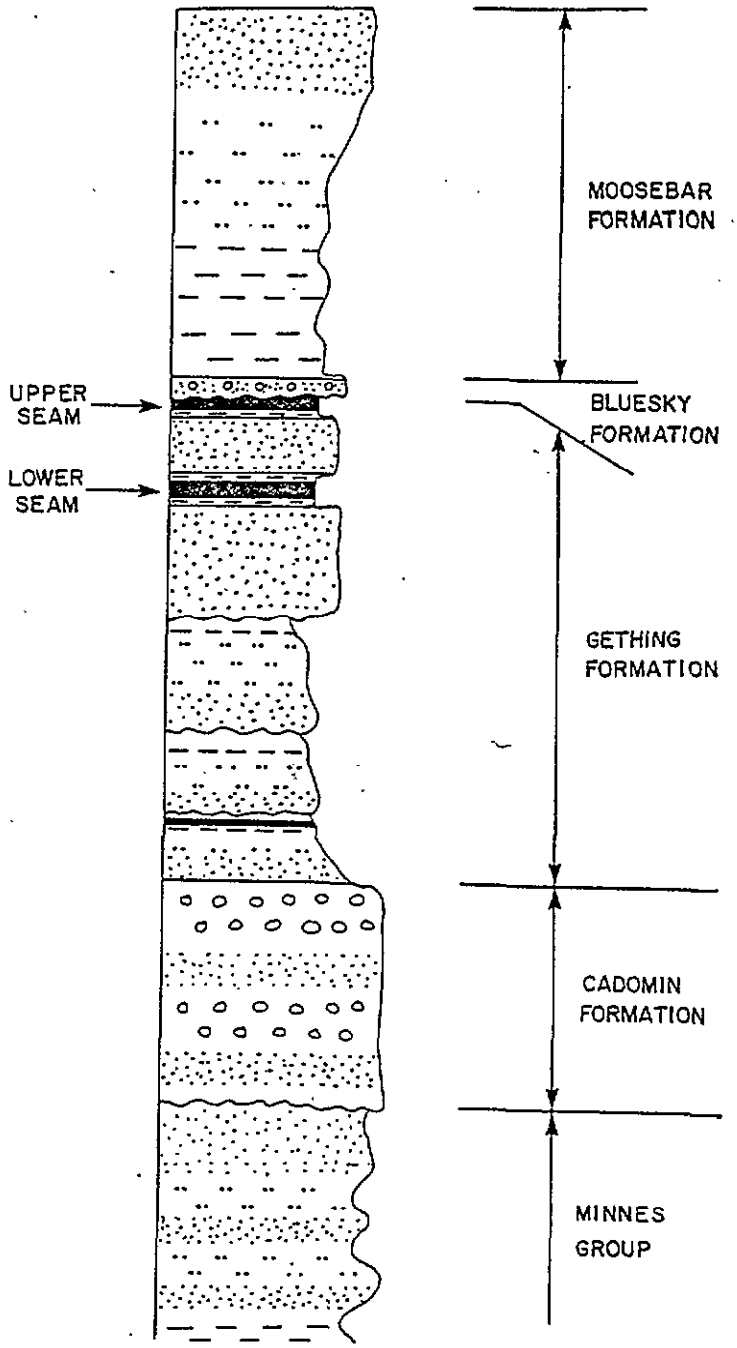
4. GEOLOGY

4.1 Gething Stratigraphy

The Gething Formation outcrops to the west of the Duke pit (Fig. 3.1 and Map 2). It is conformably overlain by the shallow-water, glauconitic sandstones and beach conglomerates of the Bluesky Formation which range from one to five metres in thickness in this area. The Bluesky Formation is overlain by the marine claystones of the Moosebar Formation which averages 100 metres in thickness. Underlying the Gething Formation are the continental clastics of the Cadomin Formation which are composed of 50 to 70 metres of coarse-grained sandstone and conglomerate. These formations as well as the Gates Formation belong to the Fort St. John Group of Lower Cretaceous age (Fig. 4.1).

The Gething Formation reaches a maximum thickness of 155 m in the Honeymoon area and gradually thins southward. It averages 125 m in thickness adjacent to Duke Pit and can be divided into upper and lower parts. The upper part, dominated by sandstone, is 65 m thick and contains two coal seams. The lower part consists

FIGURE 4.1



PETRO-CANADA COAL DIVISION	MONKMAN COAL PROJECT
DATE MAY, 1982	GENERALIZED STRATIGRAPHIC COLUMN
REVISED	AREA WEST OF DUKE PIT
AUTHOR E. P.	
DRAFTED S. K.	
SCALE 1:2000	

of a cyclic succession of fine-grained sandstone, siltstone and claystone containing two or three thin coal bands.

Both of the coal seams in the upper part are directly overlain by sandstone and the contact is erosional, resulting in erratic coal widths. In MDH 82-01 the upper seam is 3.3 m thick while in MDD 77-03, 300 m to the south, it has been completely eroded. The same phenomenon is illustrated more dramatically in MDH 82-01 and MRC 82-02, only four metres apart, where a 4.4 metre seam in the one hole can be matched with 0.6 metres of coal in the other, the remainder being replaced by sandstone. The sandstones are thought to belong to channel systems and prediction of coal continuity in such circumstances becomes very difficult.

Both seams are underlain by a few metres of thinly-interbedded siltstone and claystone. The remainder of the section in the upper 65 m of the Gething is occupied by medium- to coarse-grained sandstone.

4.2 Coal Seam Description

Upper Coal Seam

This coal seam occurs directly below the sandstone whichmarks the upper boundary of the Gething Formation. Drilling and geophysical logging information indicates the seam averages 2.5 metres in the study area. This includes numerous rock partings in its upper half (Fig. 4-2).

The sulphur content is high - usually in excess of two percent. These values are due to the thin Bluesky sandstone between the coal seam and the overlying marine claystones of the Moosebar Formation. The Bluesky, where it is thicker, apparently formed a barrier which limited the reducing influences of the Moosebar sea. In hole MRC 82-06 the true thickness of the seam is 3.12 metres of which 2.3 metres is coal. The immediate floor is composed of claystone which became friable when exposed to air for a short period.

Lower Coal Seam

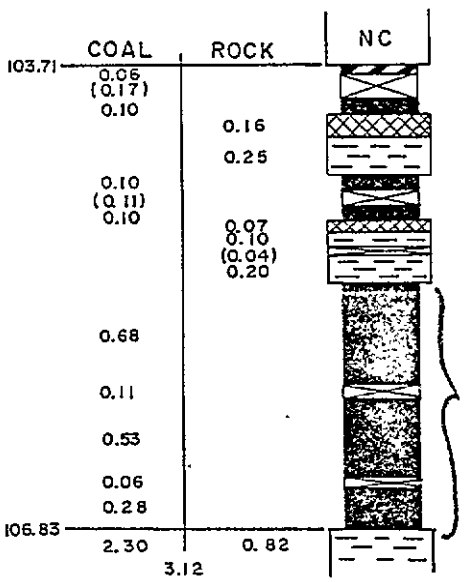
This seam is the more consistent of the two in the upper part of the Gething. It generally averages 4.1 metres in thickness and tends to have several rock

splits in its lower half (Fig. 4-2). Raw ash values are in the order of 22 percent. The floor consists of several metres of claystone. The seam reached a maximum of 4.69 metres in thickness in hole MDD 76-03, while in hole MRC 82-06 the seam reached a true thickness of 4.18 metres of which 3.49 metres are coal.

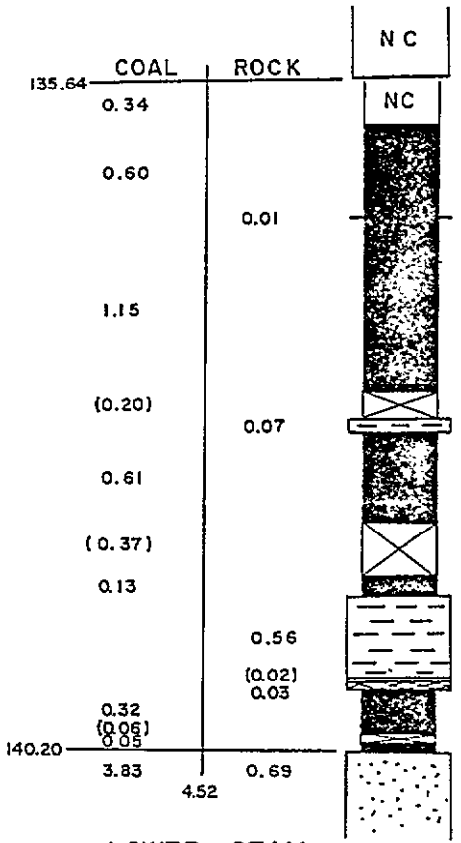
4.3 Structure

The overall structure adjacent to the Duke pit is fairly simple for the most part. The structure is comprised of a box anticline with a broad top dipping 15° - 20° to the east. East of the eastern hinge zone the strata steepen to 25°-30°. The northern part of the fold is transected by four east-west, high angle thrust faults with associated disturbed zones. The faults cause some crenulations along the limb of the fold. The box configuration changes to a conical shape in a southerly direction where it eventually dissipates before reaching the Duchess area. The fold changes plunge direction from a southerly direction north of section 16,000 N to a northerly direction north of 15,500 N (Fig. 4.3). Structure contours for both seams have been generated.

FIGURE 4.2
MRC 82-06



UPPER SEAM

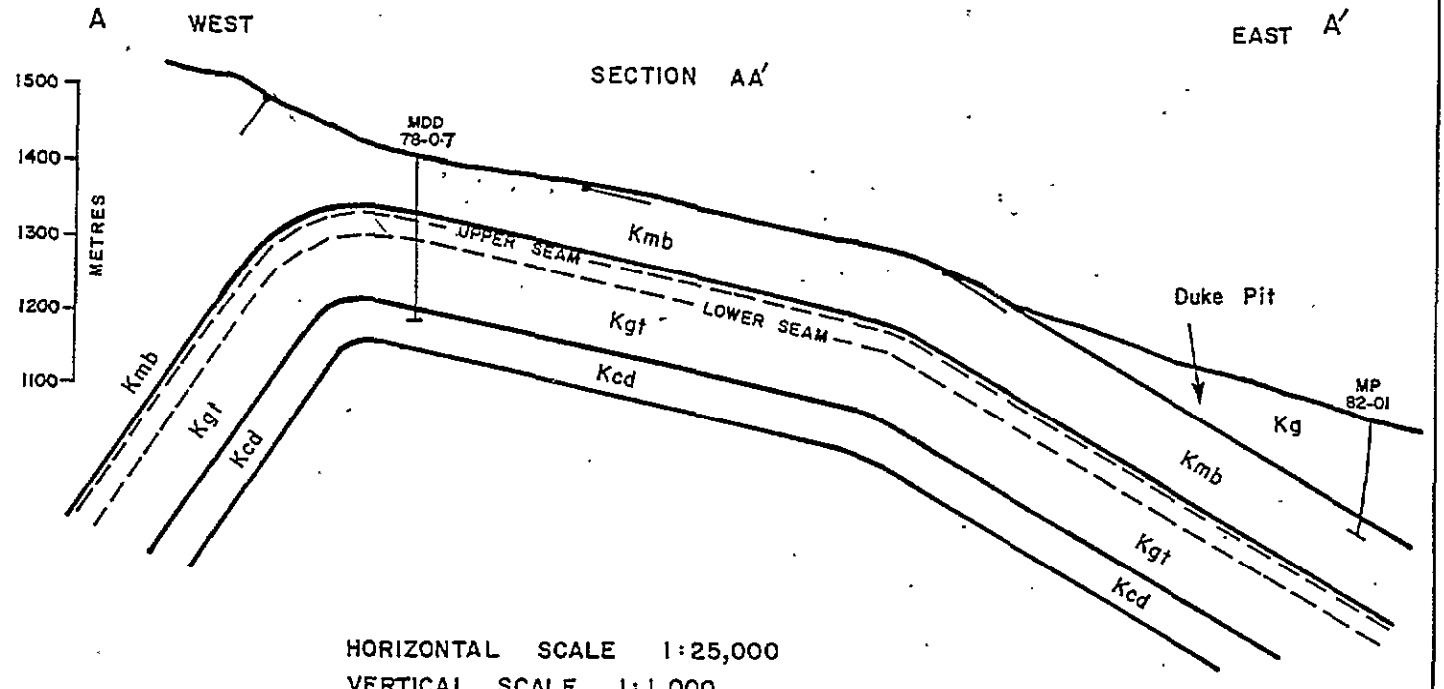


LOWER SEAM

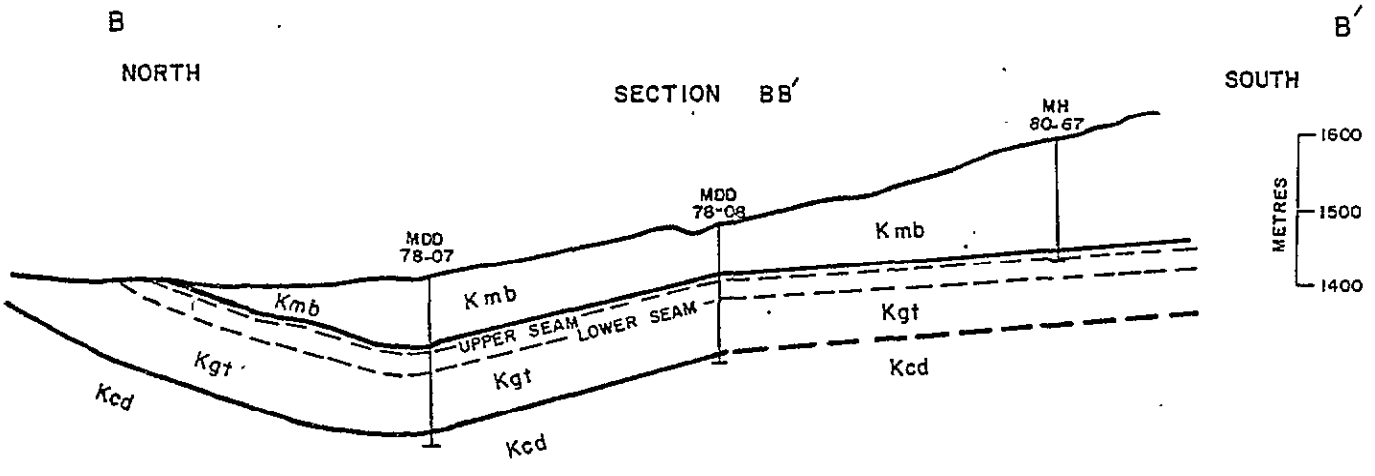
PETRO-CANADA COAL DIVISION	
DATE	JUNE, 1982
REVISED	
AUTHOR	
DRAFTED	S.K.
SCALE	1:50

TYPICAL SEAM DETAIL OF UPPER AND LOWER SEAMS WITH COAL/ROCK RATIO

FIGURE 4.3



HORIZONTAL SCALE 1:25,000
VERTICAL SCALE 1:1,000



HORIZONTAL SCALE 1:25,000
VERTICAL SCALE 1:1,000

See Figure 3.1 for section locations.

PETRO-CANADA COAL DIVISION	MONKMAN COAL PROJECT
DATE MAY, 1982	GENERALIZED SECTIONS OF DUKE BOX ANTICLINE
REVISED	
AUTHOR E. P.	
DRAFTED S. K.	
SCALE	

5. COAL QUALITY

5.1 Sampling and Analysis

Samples of the upper and lower seams of the Gething Formation were obtained from drill holes 82-02, 82-05 and 82-06. Subdivision of the coal seam into separate ply samples was made on the basis of seam lithology. Each ply sample was crushed to below 1/4" and analyzed for proximate, free swelling index, (F.S.I.), and sulphur. On the basis of these results appropriate composite samples were prepared and screened at 0.5 mm and 0.15 mm. The plus 0.5 mm and 0.5-0.15 mm fractions were subjected to sink/float separation at 1.45 and 1.60 specific gravities.

Simulated clean coal composites were made up from individual specific gravity fractions to correspond with a cut-point of 1.60 s.g. They were analyzed for proximate, free swelling index, calorific value and sulphur. The results were summarized in Table 1 (Upper Seam) and Table II (Lower Seam).

The washability characteristics were examined in more detail for the samples from hole #82-6, additional separations being effected at 1.35, 1.40, 1.50 and 1.80

specific gravities in both the plus 0.5 mm and the 0.50 to 0.15 mm size fractions. The results are summarized in Table III.

Froth flotation tests were carried out on the 0.15 mm x 0 size fraction from all composite samples. Froth concentrates were collected at 90 and 180 second intervals. The results are shown in Tables IV and V.

5.2 Discussion of Results

Upper Seam

Table I shows the raw coal quality alongside the analyses after cleaning by sink/float separation. The most significant characteristic of the upper seam is the relatively high sulphur content in the raw coal which, although lower in the clean coal, is still high by Western Canada standards. This suggests the seam may be a correlative of the Bird seam which occurs in the Mount Spieker and Sukunka areas and exhibits a high sulphur content.

The rest of the values are typical of a Rocky Mountain prime coking coal. The upper split is banded coal and

shale with an aggregate ash content over 50%, of which the washing yield is about 30%, and the clean coal ash is high at 18%. The lower split is much cleaner, with a raw coal ash of 17% and a theoretical yield of about 85% and 10% ash. The sulphur in this horizon is also lower at 0.70% which could be tolerated as a blend component.

Lower Seam

The lower seam is generally very clean with a distinct shale parting between the upper and lower splits. The free swelling index is generally low, averaging about 2 1/2, at which level it would not be acceptable as a single coal. However, it could still be acceptable together with the Gates seams. Run-of-mine ash contents would be a little over 20 percent, and plant yields would be in the order of 70 percent. Sulphur content is very low.

5.3 Washability Characteristics

The detailed sink/float analyses (Table III) of samples from both the upper and lower seams from hole #82-06 are typical of Rocky Mountain coals. They are difficult to clean at cut-points below 1.60 and specification ash contents much below nine percent

would be achieved only at intolerable yield losses. An efficient process, e.g. dense medium, would have to be employed in order to control product quality.

5.4 Froth Flotation Characteristics

The results shown in Table IV and V show clearly the extreme readiness of the coal to respond to froth flotation. The generally high ash contents of the clean coal coupled with high yields indicate the floatability of even very high ash particles. Froth concentrate ashes from a cleaning plant should be able to be maintained in the 10-11% range with no difficulty, at yields in excess of 75 percent.

6. CONCLUSIONS

The Gething Formation west of the Duke pit is structurally simple for the most part except for the area adjacent to the north end of the pit. The broad top, low plunge and relatively shallow dips of the limb are indicators of a good mining prospect, however the irregular nature of the coal seam demonstrated by the few test holes drilled and the likelihood of considerable structural deformation adjacent to the north end of Duke pit are strong negative features. The indicated coal quality and the potential reserves suggest that the area is not worthy of the detailed drilling program that would be required to explore it thoroughly.

7. AMENDMENTS TO 1980 GEOLOGY[1]

7.1 Honeymoon Area

During the course of the joint engineering/exploration winter drilling program, minor errors to the 1980 geological interpretation became apparent with information gained from the new drilling. In addition to the holes drilled for the Gething study other holes were drilled in conjunction with pit area hydrogeological tests. These holes, designated MPW and MOW, were drilled in both the Honeymoon West and Duke pits. The drilling in the Honeymoon West pit showed the seams to be slightly deeper than anticipated and re-interpretation of the area resulted in a slight steepening of the east limb of the Honeymoon syncline. Structure contours were lowered by 30 metres between holds MDD 79-14 and MRC 80-44 along section 17,500 N. These changes occur outside the highwall of the west pit. Hole MP 82-02 also showed that Seams B5 and B4 coalesce between sections 17,00 N and 17,500 N. It was previously believed that Seam B5 had "shaled out" and Seam B4 thickened west of 17,500 N. This new

interpretation will add a small amount of reserves to the pit in this area because it was believed Seam B5 had thinned from 5.8 metres in thickness in hole MRC 80-42 to zero in hole MDD 79-14. It is now confirmed that Seam B5 does not thin but instead coalesces with Seam B4.

7.2 Duke Area

Drill hole MDH 82-03 penetrated the lower Gething Formation where the Moosebar Formation was anticipated. This caused an eastward shifting of the formation contacts along the western limb of the Honeymoon Syncline. The shifting of the formations also caused a shift in the structure contours of the seams along the western limb of the syncline between sections 16,500 N and 19,000 N. This did not affect the pits in any way. These sections have been updated and are provided in this report.

The drilling of holes MDH 82-01 and MRC 82-06 has confirmed the existence of a small synclinal fold in the Gething Formation adjacent to the northern end of the Duke pit.

Drill hole MDH 82-04 intersected a predicted fault at 242 metres and the fault trace was adjusted on the cross-sections and geology maps accordingly. This was

one of the several faults which trend from the pit area west into the Gething Formation.

Although hole MDH 82-01 was drilled outside the Duke pit boundary on section 16,000 N, it has forced changes on sections 15,500 N and 16,000 N. The hole penetrated the Moosebar-Gething Formation contact about 25 metres lower than expected. After reviewing the dipmeter results, it was realized a small fold was present along the west side of the pit within the Moosebar Formation. In order to accommodate the fold and run the B1 seam trace through the B1 adit, a steepening of the sections was required. Projecting hole MP 82-02 on to section 15,500 N plus taking into account the new seam traces on section 16,000 N has also caused a steepening of the seams from 23° to 27° on section 15,000 N. The overall effect of hole MDH 82-01 has been a shift of seam traces and a small decrease in reserves on section 15,500 N and 16,000 N.

In conjunction with changes discussed above, a review of the structure of the north end of the Duke pit was undertaken. For the most part the previous interpretation is reasonable based on the present information. The re-evaluation of the structure in this area resulted in changing of the southernmost high angle fault to north-dipping. The remaining three

faults were left south-dipping. It cannot be over-emphasized however, that without more drilling or shallow seismic the structure and fault orientations in detail can only be conjecture.

In order to handle the re-interpretation involved with the southernmost fault, it was necessary to add a second north-dipping fault. This additional fault was required in order to provide the needed displacement to make the new interpretation fit.

The following have been updated to incorporate the new data:

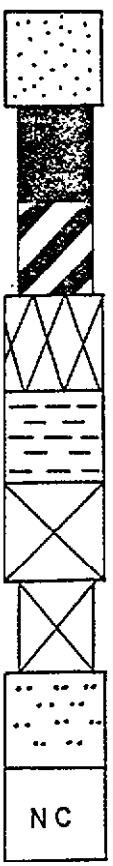
Sections 15,500 N to 19,000 N

Seam B1 structure contour maps (Maps 7 and and 8 in Appendix D)

Honeymoon and Duke 1:5000 geology maps (Maps 1 and 2 in Appendix D)

[1]Petro-Canada, Monkman Coal Project 1980; Exploration Report.

LEGEND



SANDSTONE

COAL

BONEY COAL

STONEY COAL

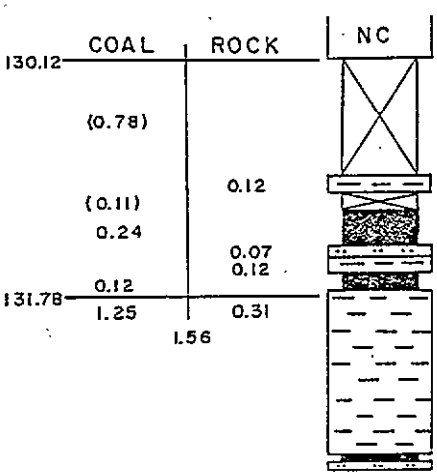
CLAYSTONE

ROCK LOSS

COAL LOSS

SILTSTONE

NOT CORED

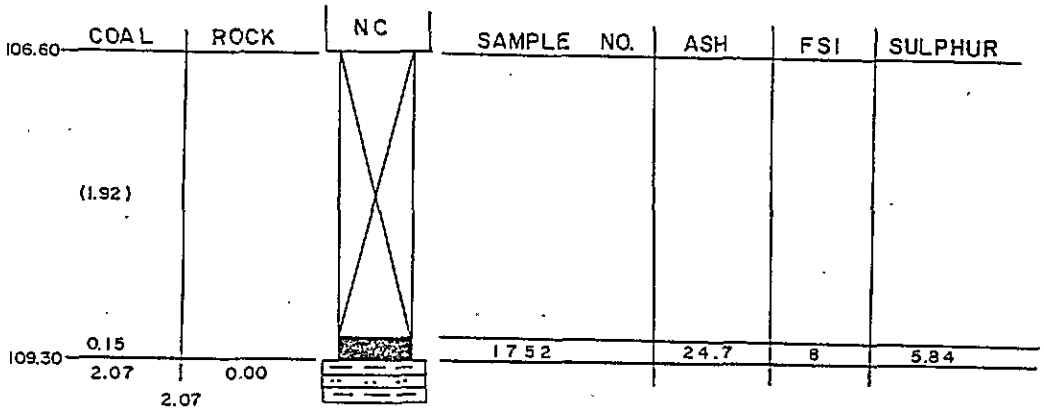


SAMPLE NO.	ASH	FSI	SULPHUR
1751	13.8	2	—

PETRO CANADA
COAL DIVISION

DATE	JUNE, 1982
REVISED	
AUTHOR	J. HINDS
DRAWN	S. K.
SCALE	1:50

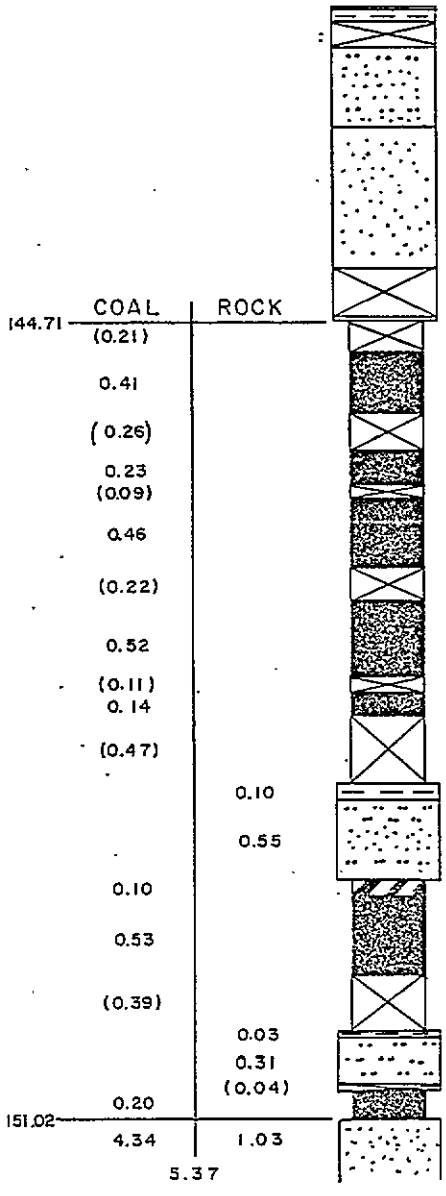
SEAM DETAIL
HOLE : MRC 82-02
GETHING FORMATION
LOWER SEAM



PETRO CANADA
COAL DIVISION

DATE	JUNE , 1982
REVISED	
AUTHOR	J. HINDS
DRAFTED	S. K.
SCALE	1:50

SEAM DETAIL
HOLE : MRC 82-05
GETHING FORMATION
UPPER SEAM



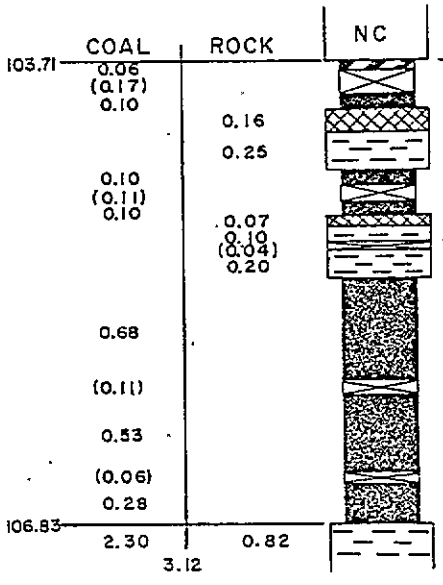
COAL	ROCK
144.71	
(0.21)	
0.41	
(0.26)	
0.23	
(0.09)	
0.46	
(0.22)	
0.52	
(0.11)	
0.14	
(0.47)	
	0.10
	0.55
0.10	
0.53	
(0.39)	
	0.03
	0.31
	(0.04)
0.20	
151.02	
4.34	1.03
5.37	

SAMPLE NO.	ASH	FSI	SULPHUR
1753	8.0	2	0.29
1754	94.9	0	—
1755	7.0	6 1/2	0.37

PETRO CANADA
COAL DIVISION

DATE	JUNE, 1982
REVISED	
AUTHOR	J. HINDS
DRAFTED	S.K.
SCALE	1:50

SEAM DETAIL
HOLE : MRC 82-05
GETHING FORMATION
LOWER SEAM

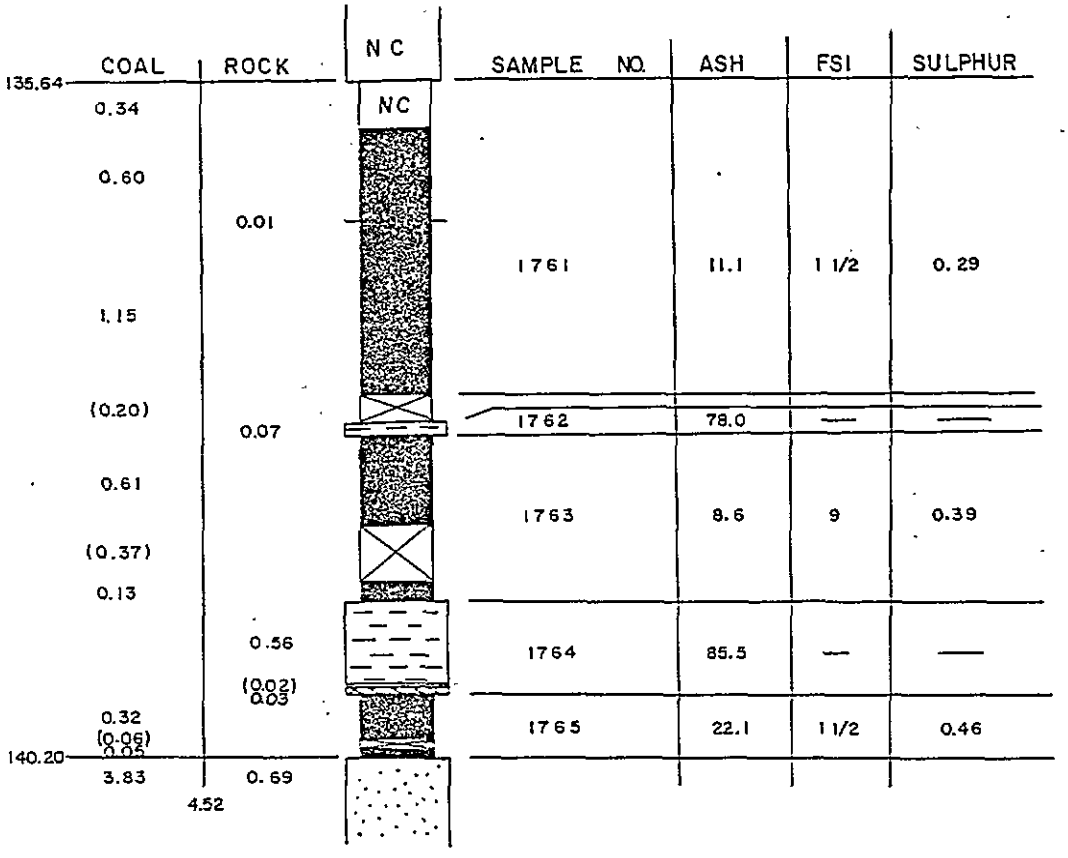


SAMPLE NO.	ASH	FSI	SULPHUR
1756	25.6	3	6.14
1757	78.1	—	—
1758	24.4	5	3.43
1759	75.8	—	—
1760	16.9	5	1.40

PETRO-CANADA
COAL DIVISION

DATE	JUNE , 1982
REVISED	
AUTHOR	J. HINDS
DRAFTED	S. K.
SCALE	1:50

SEAM DETAIL
HOLE : MRC 82-06
GETHING FORMATION
UPPER SEAM



PETRO CANADA
COAL DIVISION

DATE	JUNE, 1982
REVISED	
AUTHOR	J. HINDS
DRAFTED	S. K.
SCALE	1:50

SEAM DETAIL
HOLE : MRC 82-06
GETHING FORMATION
LOWER SEAM

PETRO-CANADA

CORE LOG - COAL DIVISION

HOLE NUMBER	SHEET
MRC 82-02	1 OF 1

DATE BEGUN: March 2/82	DATE FINISHED: March 3/82	MINE GRID: N E	UTM: 6072463.09 N 644520.15 E
ELEV. COLLAR: 1159.65	BEARING: --	HOLE ANGLE: 90	TOTAL DEPTH: 140m
COAL LICENCE:	CONTRACTOR: Alberta Southern	LOGGED BY:	CORE SIZE:

B.C.A.	UNIT FROM	UNIT TO	UNIT THICKNESS APP.	UNIT THICKNESS TRUE	SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY m	RECOVERY %
							Lower Seam -- Box 1 of 1		
	130.12	130.95	.83	0.78			Core Loss - Coal		
	130.95	131.08	.13	0.12			Core Loss - Claystone		
	131.08	131.20	.12	0.11			Core Loss - Coal		
	131.20	131.46	.26	0.24	1751		Coal - dull metallic lustre, 10% vitrain, fusain lenses, - upper 10 cm, heavily broken, basal 16 cm slightly broken	.26	
70°	131.46	131.53	.07	0.07			Siltstone - medium grey, slightly carbonaceous, listric surface at top and basal contacts, fractured at top with calcite	.07	
	131.35	131.65	.13	0.12			Claystone - dark grey, slightly silty at top, carbonaceous, listric surface at basal contact	.13	
	131.65	131.78	.13	0.12			Coal - pulverized and sheared, 10% vitrain	.13	
70°	131.78	132.78	1.18	1.11			Claystone - dark grey, carbonaceous solid	1.18	
	132.96	133.00	.04	0.04			Coal - dull with 5 - 10% vitrain, solid	.08	
	133.00	133.06	.06	0.06			Siltstone - medium grey, solid	.06	

474-8010

HOLE NUMBER MRC 82-02

PETRO-CANADA

CORE LOG - COAL DIVISION

HOLE NUMBER	SHEET
MRC 82-5	1 OF 5

DATE BEGUN: March 14/82	DATE FINISHED: March 16/82	MINE GRID N / E	UTM: 6073553.63 N 644462.91 E
ELEV. COLLAR: 1031.87	BEARING: --	HOLE ANGLE: 90°	TOTAL DEPTH: 157m
COAL LICENCE:	CONTRACTOR: Alberta Southern	LOGGED BY:	CORE SIZE:

B.C.A.	UNIT FROM	UNIT TO	UNIT THICKNESS APP.	UNIT THICKNESS TRUE	SAMPLE NUMBER	MARKER	Upper Seam DESCRIPTION	RECOVERY m	RECOVERY %
						106.69	BOX #1		
	106.60	109.10	2.50	1.92			Core Loss - Coal	2.50	
					↑				
	109.10	109.30	0.20	0.15	1752		Coal - Dull, heavily broken sheared, calcite film on some	0.20	
					↓		surfaces, metallic lustre		
	109.30	109.43	0.13	0.10			Claystone - broken, slightly sheared, calcite on shear planes,	0.13	
							some pyritization, SSD's, dark grey		
50°	109.43	109.55	0.12	0.09			Siltstone - Light to medium grey, interbedded with minor	0.12	
							claystone, some pyrite nodules		
	109.55	109.67	0.12	0.09			Claystone - grey, carbonaceous (plant fragments)	0.12	
					3601/	109.74			

474-8010

HOLE NUMBER MRC 82-5

PETRO-CANADA

CORE LOG, COAL DIVISION - CONTINUATION SHEET

HOLE NUMBER	SHEET
MRC 82-5	2 OF 5

B.C.A.	UNIT FROM	UNIT TO	UNIT THICKNESS APP.	UNIT THICKNESS TRUE	SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY m	RECOVERY %
							BOX #2		
	141.97	142.00	0.03	0.02			SST - medium gray, medium grained	0.03	
	142.00	142.12	0.12	0.08			CLST - dark gray, coaly, middle is badly broken	0.12	
	142.12	142.37	0.25	0.17			Core Loss - CLST	0.25	
42°	142.37	143.19	0.82	0.55			SLTS/V.F. SST - gray, coaly flakes at top, SSD's	0.82	
							BOX #3		
57°	143.19	144.29	1.10	0.92			SST - u.f.g., grey, minor coal stringers, base is shrd, calcite on shr planes, laminated in lower half, core is slightly broken, BCA 52 - 62°	1.10	
	144.29	144.69	0.40	0.34			Core Loss - u.f.s.	0.40	
						145.41			
							BOX #4		
	144.69	144.71	0.02	0.02			SST - u.f.g. broken, S.A.A.	0.02	
	144.71	144.96	0.25	0.21			Core Loss - Coal	0.25	
	144.96	145.34	0.38	0.33			Coal - dull, metallic lustre, slightly broken at top, hard, minor vitrinite; < 5%, calcite crystals throughout	0.38	

474A-8106

HOLE NUMBER
MRC 82-5

PETRO-CANADA

CORE LOG, COAL DIVISION - CONTINUATION SHEET

HOLE NUMBER MRC 82-5 | SHEET 3 OF 5

B.C.A.	UNIT FROM	UNIT TO	UNIT THICKNESS APP.	UNIT THICKNESS TRUE	SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY m	RECOVERY %
	145.34	145.43	0.09	0.08			Coal - S.A.A., sheared	0.09	
	145.43	145.73	0.30	0.26			Core Loss Coal	0.30	
	145.73	145.99	0.26	0.23			Coal - S.A.A.	0.26	
							BOX #5		
	145.99	146.09	0.10	0.09			Core Loss Coal	0.10	
	146.09	146.54	0.45	0.40	1753		Coal - dull metallic lustre, hard minor vitrain; <10%, minor calcite throughout, slightly broken	0.45	
	146.54	146.61	0.07	0.06			Coal - S.A.A., broken	0.07	
	146.61	146.86	0.25	0.22			Core Loss, Coal	0.25	
	146.86	147.44	0.58	0.52			Coal - S.A.A.	0.58	
	147.44	147.56	0.12	0.11			Core Loss Coal	0.12	
	147.56	147.72	0.16	0.14			Coal - mainly dull with bright bands, broken, vi trinite; 30-40%	0.16	
	147.72	148.24	0.52	0.47			Core Loss, Coal	0.52	
66°	148.24	148.35	0.11	0.10			CLST - grey, coal stringers	0.11	
						148.45			

474A-8106

HOLE NUMBER MRC 82-5

PETRO-CANADA

CORE LOG, COAL DIVISION - CONTINUATION SHEET

HOLE NUMBER MCR 82-5 | SHEET 4 OF 5

B.C.A.	UNIT FROM	UNIT TO	UNIT THICKNESS APP.	UNIT THICKNESS TRUE	SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY m	RECOVERY %
					1754		BOX #6		
49°	148.35	149.08	0.73	0.55			v.f.sst/slts - grey, minor coal stringers, minor shearing with calcite on shear planes, BCA 44°-54°	0.73	
	149.08	149.21	0.13	0.10			Coal - boney, dull, sheared, minor calcite on shear planes	0.13	
	149.21	149.34	0.13	0.10			Coal - bright with dull bands, solid	0.13	
	149.34	149.42	0.08	0.06			Coal - mainly dull with bright bands, solid, vitrinite; 10-15%	0.08	
					1755				
							BOX #7		
	149.42	149.48	0.06	0.05			Coal - interbanded dull and bright, vitrinite; 50% solid	0.06	
	149.48	149.75	0.27	0.22			Coal - bright, solid	0.27	
	149.75	149.87	0.12	0.10			Coal - dull, sheared, heavily broken	0.12	
	149.87	150.34	0.47	0.39			Core Loss - coal	0.47	
	150.34	150.37	0.03	0.03			Clst - dark grey, coal stringers	0.03	
58°	150.37	150.74	0.37	0.31			SLTS - minor coaly laminations in top half, grey, slightly broken	0.37	
	150.74	150.79	0.05	0.04			Core Loss - SLTS	0.05	

474A-8106

PETRO-CANADA

CORE LOG, COAL DIVISION - CONTINUATION SHEET

HOLE NUMBER: MRC 82-5 | SHEET: 5 OF 5

B.C.A.	UNIT FROM	UNIT TO	UNIT THICKNESS APP.	UNIT THICKNESS TRUE	SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY m	RECOVERY %
	150.79	150.86	0.07	0.06			Coal - mainly dull with bright bands, solid, vitrinite; 35%	0.07	
	150.86	150.95	0.09	0.08			Coal - dull, vitrinite 10%, sand grains are noticeable at the base	0.09	
	150.95	151.02	0.07	0.06			Coal - dull, interbedded with medium grained SST, solid	0.07	
	151.02	151.27	0.25	0.21			SST - medium grey, carbonaceous, coal stringers, salt and pepper appearance, calcite present at base, fine grained.	0.25	
						151.50			

474A-8106

HOLE NUMBER: MRC 82-5

PETRO-CANADA

CORE LOG - COAL DIVISION

HOLE NUMBER	SHEET
MRC 82-6	1 OF 5

DATE BEGUN: March 3, 1982	DATE FINISHED: March 18, 1982	MINE GRID N / E	UTM 6073137.79 N 644663.21 E
ELEV. COLLAR: 1036.72	BEARING	HOLE ANGLE: Vertical	TOTAL DEPTH: 141.8m
COAL LICENCE	CONTRACTOR: Alberta Southern	LOGGED BY	CORE SIZE: 3 inch

B.C.A.	UNIT FROM	UNIT TO	UNIT THICKNESS APP.	UNIT THICKNESS TRUE	SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY m	RECOVERY %
							UPPER SEAM		
							BOX #1		
						103.64			
	103.64	103.77	0.06	0.06			Coal - boney, minor vitrain bands; <5%, badly broken	0.06	
	103.77	103.94	0.17	0.17	1756		Core Loss - Coal	0.17	
	103.94	104.04	0.10	0.10			Coal - dull, vitrain; 5%, pyritization, broken	0.10	
	104.04	104.20	0.16	0.16			Coal - stoney, broken, vitrain: 10%	0.16	
					1757				
90°	104.20	104.45	0.25	0.25			CLST - grey, carbonaceous, some coal stringers, broken	0.25	
	104.45	104.55	0.10	0.10			Coal - mainly dull with bright bands, vitrain; 20%, minor pyrite, broken	0.10	
	104.55	104.66	0.11	0.11	1758		Core Loss Coal	0.11	
	104.66	104.76	0.10	0.10			Coal - dull, metallic lustre, broken, pyrite	0.10	
	104.76	104.83	0.07	0.07			Coal - stoney, sheared, vitrain stringers <10%	0.07	
	104.83	104.93	0.10	0.10	1759		CLST - dark grey, interbedded with coal ~10%, shrd	0.10	

474-8010

HOLE NUMBER MRC 82-6

PETRO-CANADA

CORE LOG, COAL DIVISION - CONTINUATION SHEET

HOLE NUMBER: MRC 82-6 | SHEET: 2 OF 5

B.C.A.	UNIT FROM	UNIT TO	UNIT THICKNESS APP.	UNIT THICKNESS TRUE	SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY m	RECOVERY %
	104.93	104.97	0.04	0.04			Core Loss CLST	0.04	
	104.97	105.17	0.20	0.20			CLST - dark grey, shreaded	0.20	
	105.17	105.28	0.11	0.11			Coal - mainly dull with bright bands, vitrain; 30%	0.11	
							BOX #2		
	105.28	105.33	0.05	0.05			Coal - S.A.A., broken, shreaded	0.05	
	105.33	105.54	0.21	0.21			Coal - dull, metallic lustre, vitrain <10%, broken, shrd	0.21	
	105.54	105.65	0.11	0.11	1760		Coal - pulverized, heavy pyritization	0.11	
	105.65	105.74	0.09	0.09			Coal - dull, metallic lustre	0.09	
	105.74	105.84	0.11	0.11			Coal - badly broken to pulverized	0.11	
	105.85	105.96	0.11	0.11			Core Loss Coal	0.11	
	105.96	106.02	0.06	0.06			Coal - dull, metallic lustre, vitrain <5%, minor fusain, solid	0.06	
	106.02	106.04	0.02	0.02			Coal - bright, solid	0.02	
	106.04	106.49	0.45	0.45			Coal - dull, metallic lustre, vitrain <10%, broken	0.45	
	106.49	106.55	0.06	0.06			Core Loss Coal	0.06	

PETRO-CANADA

CORE LOG, COAL DIVISION - CONTINUATION SHEET

HOLE NUMBER: MRC 82 - 6 | SHEET: 3 OF 5

B.C.A.	UNIT FROM	UNIT TO	UNIT THICKNESS APP.	UNIT THICKNESS TRUE	SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY m	RECOVERY %
	106.55	106.83	0.28	0.28			Coal - shreaded, vitrain; 30%	0.28	
						106.54			
							BOX #3		
	106.83	107.02	0.19	0.19			CLST - dark grey, carbonaceous, coal stringer, shrd, broken	0.19	
88°	107.02	107.35	0.33	0.33			CLST - dark grey	0.33	
						107.15			
							LOWER SEAM -- BOX #4		
						135.65			
	135.98	136.59	0.61	0.60			Coal - dull metallic lustre, vitrain; <10%, solid	0.61	
	136.59	136.60	0.01	0.01			SLTS - Light grey, carbonaceous	0.01	
	136.60	136.96	0.36	0.35			Coal - dull, metallic lustre, vitrain <10%, solid	0.36	
	136.96	137.05	0.09	0.09			Coal - mainly dull with bright bands, vitrain; 30%, solid	0.09	
	137.05	137.12	0.07	0.07	1761		Coal - dull, metallic lustre, vitrain 10%, solid	0.07	
							BOX #5		
	137.12	137.77	0.65	0.64			Coal - S.A.A., slightly broken	0.65	
	137.77	137.97	0.20	0.20			Core Loss, coal	0.20	

474A-8106

HOLE NUMBER: MRC 82-6

PETRO CANADA

CORE LOG, COAL DIVISION - CONTINUATION SHEET

HOLE NUMBER: MRC 82-6 | SHEET: 4 OF 5

B.C.A.	UNIT FROM	UNIT TO	UNIT THICKNESS APP.	UNIT THICKNESS TRUE	SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY m	RECOVERY %
80°	137.97	138.04	0.07	0.07	1762		CLST - dark grey, carbonaceous, coal stringers	0.07	
	138.04	138.17	0.13	0.13			Coal - mainly dull with bright bands, vitrain; 30%, broken at top	0.13	
	138.17	138.66	0.49	0.48			Coal - dull, metallic lustre, vitrain <10%, slightly broken	0.49	
	138.66	139.03	0.37	0.37			Core loss Coal	0.37	
						138.70			
					1763		BOX #6		
	139.03	139.16	0.13	0.13			Coal - interbanded dull and bright, vitrain; 45%	0.13	
							BOX #7		
	139.16	139.72	0.56	0.56			CLST - dark grey, carbonaceous, coaly in top and bottom 3cm	0.56	
					1764		slightly broken		
	139.72	139.74	0.02	0.02			Core Loss CLST	0.02	
	139.74	139.77	0.03	0.03			Coal - stoney	0.03	
	139.77	139.90	0.13	0.13			Coal - mainly dull with bright bands, vitrain; 30%, solid	0.13	
	139.90	139.99	0.09	0.09			Coal - dull, metallic lustre, vitrain <10%, solid	0.09	
			.09		1765				

474A-8106

HOLE NUMBER MRC 82-6

PETRO CANADA

CORE LOG, COAL DIVISION - CONTINUATION SHEET

HOLE NUMBER MRC 82 - 6 | SHEET 5 OF 5

B.C.A.	UNIT FROM	UNIT TO	UNIT THICKNESS APP.	UNIT THICKNESS TRUE	SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY m	RECOVERY %
	139.99	140.09	0.10	0.10			Coal - Mainly dull with bright bands, vitrain; 30%, mostly solid	0.10	
							slightly shrd.		
	140.09	140.15	0.06	0.06			Core Loss; Coal	0.06	
86°	140.15	140.20	0.05	0.05			Coal - interbedded with light gray, f.g. SST (10%, mostly at base)	0.05	
	140.20	140.68	0.48	0.48			SST - f.g., salt and pepper appearance, carbonaceous, coaly	0.48	
							stringers in top 10 cm.		
							BOX #8		
81°	140.68	142.06	1.38	1.36			SST - f.g., salt and pepper, minor shearing, small diameter worm	1.38	
							burrows, horizontal, visible for up to 3 cm.		
						141.75			

474A-8106

HOLE NUMBER MRC 82- 6

APPENDIX C

Cost Breakdown and

Application of Work Credits

Group No.	Area	Geological Mapping	Surveys	Road Construction	Drilling	Logging, Sampling, Testing	Reclamation	Other Work	Off Property Costs	Total
66	Belcourt	10,000.00						163,574.00	165,926.00	339,500.00
67	Saxon Extension	10,000.00						64,367.00	61,867.00	136,234.00
68	Secus	10,000.00						140,254.00	167,532.00	317,786.00
69	Nekik	10,000.00						61,754.00	64,875.00	136,629.00
163	Five Cabin & 2 Duke Lic.	10,714.88	8,264.98	10,000.00	55,109.24	4,877.90	10,000.00			98,967.00
168	Onion and Boomerang	10,510.53		10,000.00	78,773.91	7,662.56				106,947.00
169	S. Onion and Duchess	15,000.00	10,000.00		70,677.20	9,755.80				105,433.00
170S	North Wapiti	22,000.00	7,500.00		15,000.00	2,500.00	4,000.00	52,298.00	58,838.00	162,136.00
171	South Wapiti	20,000.00			10,000.00	1,000.00		49,689.00	62,011.00	142,700.00
172	Red Deer Creek	10,000.00						126,741.00	168,688.00	305,429.00
220	Nekik	10,000.00						37,554.00	44,634.00	92,188.00
269	Duke		6,605.98	51,984.46	113,319.14	13,572.28	15,632.14			201,114.00
**270	Five Cabin		10,870.00	17,378.60	61,418.28	7,423.19	8,822.83	9,159.55	9,159.55	124,232.00**
271	Duke			26,793.93	94,756.38	9,327.84	8,230.85			139,109.00
272	Duke and Duchess		10,000.00	6,000.00	158,397.29	14,633.40	17,753.31			206,784.00
273	North Onion	17,000.00	10,000.00	5,000.00			10,000.00	15,026.00	22,581.00	79,607.00
274	Onion	34,000.00	16,000.00		10,000.00	5,000.00	12,122.00	26,864.00	30,927.00	134,913.00
Ungrouped:										
6865	N.E. Honeymoon			3,103.04	10,691.07	1,152.93	1,030.46			15,977.50
6864	N.E. Honeymoon			3,103.03	10,691.08	1,152.93	1,030.46			15,977.50
6865	N.E. Honeymoon		526.21	4,015.54	8,730.77	1,061.42	1,767.06			16,101.00
7295	Duke		3,532.50	5,655.35	19,959.53	2,412.36	2,867.22	2,976.65	2,976.64	40,380.25
7296	Duke		3,532.50	5,655.35	19,959.53	2,412.36	2,867.22	2,976.65	2,976.64	40,380.25
7297	Duke		3,532.50	5,655.35	19,959.53	2,412.37	2,867.21	2,976.64	2,976.65	40,380.25
7298	Duke		3,532.50	5,655.35	19,959.52	2,412.37	2,867.22	2,976.64	2,976.65	40,380.25
Orphans: **										
5168	Five Cabin		500.00		3,958.50	500.00	1,250.00			6,208.50
5169	Five Cabin		500.00		3,958.50	500.00	1,250.00			6,208.50
		189,225.41	94,897.17	160,000.00	785,319.47	89,769.71	104,357.98	759,187.13	868,945.13	3,051,702.00

** Note: Licences 5168 and 5169 had previously been in Group 270, but have been taken out and left as Orphans.

TABLE 1

GETHING EXPLORATION
COAL QUALITY SUMMARY

UPPER SEAM

PARAMETER	82 - 5	HOLE # 82 - 5 Upper Split	82 - 5 Lower Split
Raw Coal			
Ash %	24.67	58.02	17.01
Volatile %	20.94	12.49	19.22
Fixed Carbon %	54.39	29.49	63.77
Sulphur %	5.84	2.25	1.41
F.S.I.	8	1	5
Clean Coal			
Cutpoint (S.G.)	-	1.60	1.6
Yield (wt.%)		31.1	84.6
Ash %		18.10	10.24
Volatile %		20.39	20.37
Fixed Carbon %	ND	61.51	69.39
Sulphur %		2.08	0.70
F.S.I.		6½	6½
Calorific Value KJ/kg		29308	32683
Hardgrove Index		76	ND
Samples No. (s)	1752	1756 1757 1758 1759	1760

TABLE 11

GETHING EXPLORATION
COAL QUALITY SUMMARY

LOWER SEAM

PARAMETER	HOLE # 82 - 02	82 - 05 Upper Split	82 - 05 Lower Split	82 - 06 Upper Split	82 - 06 Lower Split
Raw Coal					
Ash %	13.8	8.0	7.0	12.78	22.26
Volatile %	17.7	N.D.	N.D.	18.79	17.11
Fixed Carbon %	68.5	N.D.	N.D.	68.43	60.63
Sulphur %	N.D.	0.29	0.37	0.36	0.46
F.S.I.	2	2	6½	2½	1½
Calorific Value	N.D.	N.D.	N.D.	31981	27603
Clean Coal					
Cutpoint (S.G.)		1.60	1.60	1.60	1.60
Yield (wt. %)		100.0	100.0	92.0	83.3
Ash %				8.91	17.17
Volatile %				20.11	17.75
Fixed Carbon %				70.98	65.08
Sulphur %	N.D.	N.D.	N.D.	0.36	0.50
F.S.I.				2½	2
Calorific Value				32754	29352
Hardgrove Index				N.D.	72
Samples No. (s)	1751	1753	1755	1761 1762 1763	1765

TABLE 111

GETHING EXPLORATION
SUMMARY OF WASHABILITY DATA

HOLE # 82 - 6

Lower seam (sample numbers 1761, 1762 & 1763)

Specific Gravity		Plus 0.5 mm			0.5 mm X 0.15 mm		
Sink	Float	Cum wt. %	Cum Ash %	FSI	Cum wt. %	Cum Ash %	FSI
	1.35	47.57	2.91	8	72.48	2.75	8
1.35	1.40	61.56	4.23	2	81.82	3.49	1½
1.40	1.45	76.37	5.31	1	89.31	4.22	1½
1.45	1.50	86.65	7.12	1	93.61	4.74	1
1.50	1.60	91.73	8.20	1	96.00	5.27	1
1.60	1.80	94.30	9.11	1	97.75	5.83	1
1.80		100.00	13.08	-	100.00	7.34	-

Upper seam (sample number 1760)

	1.35	46.02	5.06	8	65.58	3.10	8
1.35	1.40	64.78	6.51	3	78.61	4.14	2
1.40	1.45	72.92	7.54	2	84.05	4.83	1
1.45	1.50	79.98	8.72	1½	87.96	5.49	1
1.50	1.60	86.39	10.33	1½	90.59	6.16	1
1.60	1.80	91.22	11.74	1½	92.96	6.97	1
1.80		100.00	16.79	-	100.00	11.66	-

TABLE IV

GETHING EXPLORATION

SUMMARY OF FROTH FLOTATION TESTS

HOLE # 82 - 6

UPPER SEAM

Upper Split (samples 1756 - 1759 inclusive)

Collection time (secs.)	Cumulative wt. %	Cumulative Ash %	Elementary F.S.I.
90	91.78	34.78	7½
180	93.62	35.81	2½
Tails	100.00	39.15	-

Lower Split (sample number 1760)

Collection time (secs.)	Cumulative wt. %	Cumulative Ash %	F.S.I.
90	98.50	13.27	6
180	99.07	13.58	1
Tails	100.00	14.19	-

TABLE V

GETHING EXPLORATION
SUMMARY OF FROTH FLOTATION TESTS
LOWER SEAM

HOLE # 82 - 6

Upper Split (samples 1761 - 1763 inclusive)

Collection Time (secs.)	Cumulative wt. %	Cumulative Ash %	Elementary F.S.I.
90	96.72	7.71	6½
180	98.41	8.21	1
Tails	100.00	9.01	-

Lower Split (sample 1765)

Collection Time (secs.)	Cumulative wt. %	Cumulative Ash %	Elementary F.S.I.
90	96.18	15.95	6
180	98.23	17.04	½
Tails	100.00	18.29	-

PETRO-CANADA EXPLORATION, INC.

MINING DIVISION

MONKMAN COAL PROJECT

DUKE MOUNTAIN BLOCK

HONEYMOON/DUKE GEOLOGY MAP

464

MAP 1

024

Date	OCT. 1980
Revised	MAY, 1982
Author	W.P.
Drafted	
Scale	1:5,000

R.M. HARDY & ASSOCIATES LTD.

GEOLOGIC LEGEND

LOWER CRETACEOUS

Ksh	SHAFTESBURY FORMATION	FORT ST. JOHN GROUP
Kb	BOULDER CREEK FORMATION	
Kh	HULCROSS FORMATION	
Kg	GATES FORMATION	
Kmb	MOOSEBAR FORMATION	
Kgt	GETHING FORMATION	BULLHEAD GROUP
Kcd	CADOMIN FORMATION	

JURASSIC – CRETACEOUS

JKmi	MINNES GROUP (undivided)

AREA OF 20m. + OVERBURDEN

- * COAL SEAM
- * GEOLOGIC CONTACT
- * THRUST FAULT
- SYNCLINE / ANTICLINE (overturned)
- STRIKE AND DIP (overturned) 20 / 15
- HOLE LOCATION (diamond, hammer)
- TRENCH LOCATION
- ADIT LOCATION
- CONGLOMERATE
- SANDSTONE
- SILTSTONE
- CLAYSTONE
- COAL

* Approximate except where defined by outcrop

LEGEND

Improved road
Secondary road
Track or trail
Cut line
Tree area
River
Steam
Intermittent stream
Swamp
Contours 1300
Horizontal control △ 390
Vertical control ○ V 1372
Spot elevation 1247.9
Iron Pin ◇ IP

CONTOUR INTERVAL: 5 METRES
DATE OF PHOTOGRAPHY: SEPTEMBER 1975
DATE OF SURVEY: 1977 - 1978
DATE OF MAPPING: 1977 - 1978

SURVEY NOTE

The Horizontal and Vertical Co-ordinates were established by D. W. Watson B.C.L.S. using conventional and E.D.M. survey equipment. Horizontal and vertical co-ordinates and elevations are derived from Trig. Stations Quintette E., Quintette S.W., Mamie, Hawk, Marcia, Kinuseo. All co-ordinates referred to Universal Traverse Mercator Grid Zone 10. Elevations are above Mean Sea Level were established by trig. levelling, vertical angles being read at both ends of each course simultaneously.

KEY MAP

T S R Q P O N M L K J I H G F E
25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9
54°50' 54°40' 54°30' 54°20'
121°00' 120°45' 120°30' 120°15'

120°58'
54°48'
120°45'
54°48'
46°30'
18,000N.
17,500N.
17,000N.
16,500N.
16,000N.
15,500N.
15,000N.
47°00'
6,074,000 N
6,073,000 N
6,072,000 N
6,071,000 N
42,000 E
43,000 E
44,000 E
74,000 N
73,000 N
72,000 N
71,000 N
54°46'
120°48'
120°45'

KINUSEO CREEK

Jkmi
JKmi
Kcd
Kgt
Kmb
Kh
Kb
Kg

B9 SEAM
B8 SEAM
B4 SEAM
B3 SEAM
B1 SEAM
B7(U)
B7(L)
B6(U)
B6(L)
B5
B4
B3
B2
B1
LOWER SEAM
UPPER SEAM

BASELINE 4,000 E

MH 80-12
MH 80-15
MDD-79-09
MDH 82-03
MRC 82-05
MDH 82-0
MRC 82-06
MRC 82-02
MDH 82-01
MDD-77-03
MDD-78-07
MDD-78-11
MDH-79-08
MDH-79-11
MDH-79-10
MD 80-11
Trench 80-2

TORRENS

LEGEND

- Improved road
- Secondary road
- Track or trail
- Cut line
- Tree area
- River
- Steam
- Intermittent stream
- Swamp
- Contours 1300
- Horizontal control △ 390
- Vertical control ○ V 1372
- Spot elevation 1247.9
- Iron Pin ◇ IP

CONTOUR INTERVAL 5 METRES
DATE OF PHOTOGRAPHY SEPTEMBER 1975
DATE OF SURVEY APRIL 1977
DATE OF MAPPING MAY 1977

SURVEY NOTE

The Horizontal and Vertical Co-ordinates were established by D. W. Watson B.C.L.S. using conventional and E.D.M. survey equipment. Horizontal and vertical co-ordinates and elevations are derived from Trig. Stations Quintette E, Quintette S.W., Mamie, Hawk, Marcia, Kinuseo. All co-ordinates referred to Universal Traverse Mercator Grid Zone 10. Elevations are above Mean Sea Level were established by trig. levelling, vertical angles being read at both ends of each course simultaneously.

464

309

100 0 100 200 300 METRES

121°00 T S R Q P O N 54°50
25
24
23
22
21 54°40
6,075,000N
6,065,000N
630,000E
640,000E
650,000E
M 120 36
120°45

KEY MAP
SCALE 1:250,000

PETRO-CANADA EXPLORATION, INC.

MINING DIVISION

MONKMAN COAL PROJECT

GEOLOGY MAP

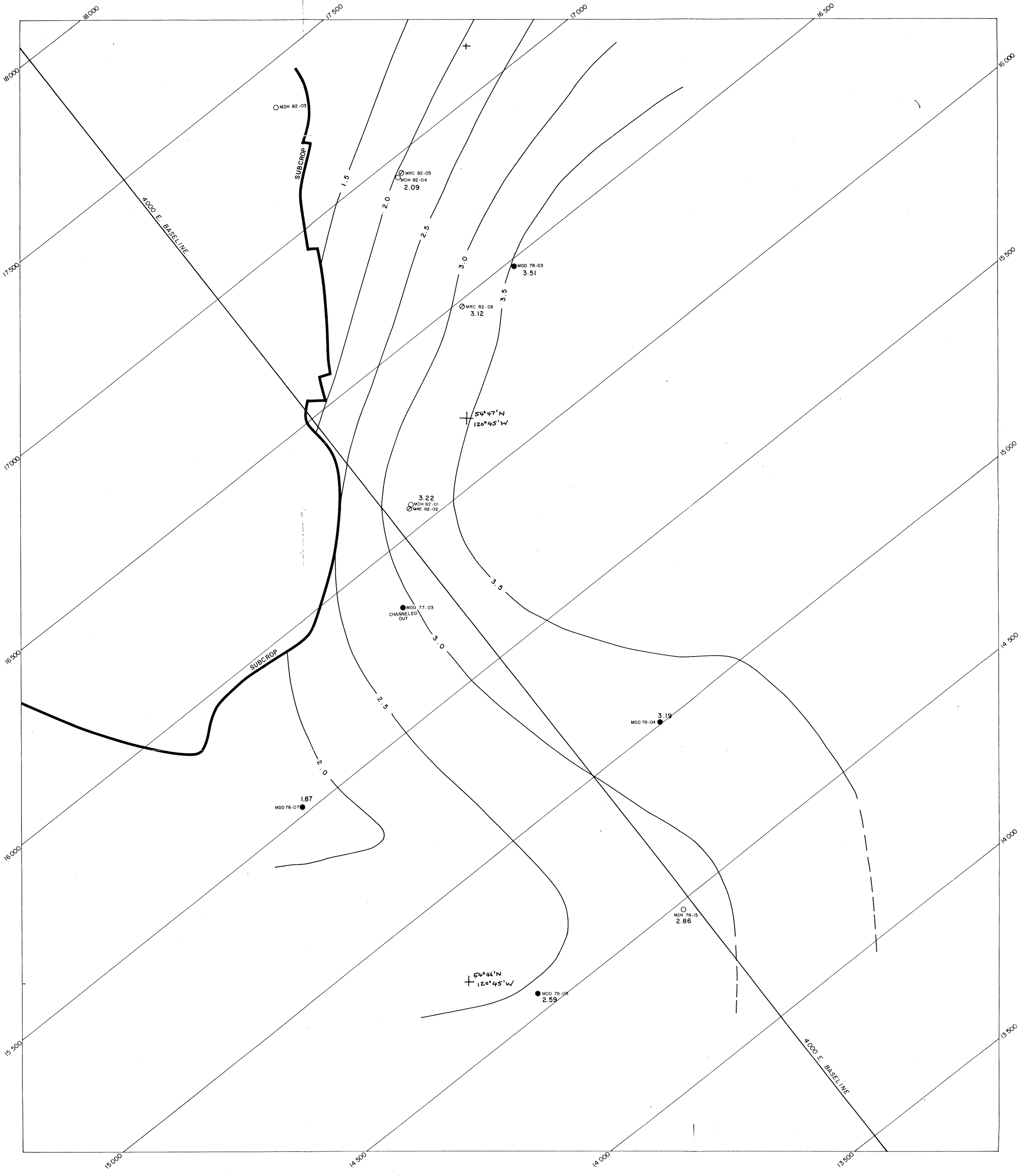
DUKE MTN.
DUKE SYNCLINE

Date	MAY 1982
Revised	JAN '86
Author	E. P.
Drafted	S. K.
Scale	1:5,000

MAP 2

P 24

R.M. HARDY & ASSOCIATES LTD.



LEGEND

- ● DIAMOND DRILL HOLE
- ⊘ ROTARY CORE HOLE
- ○ ROTARY DRILL HOLE

PR-MONKMAN 82(2)A *(1)

PETRO CANADA
COAL DIVISION

DATE	MAY, 1982
REVISED	
AUTHOR	E P
DRAFTED	S K
SCALE	1 5000
C.I. = .50 m	

MONKMAN COAL PROJECT

DUKE MOUNTAIN BLOCK
GETHING FORMATION
WEST OF DUKE PIT

ISOPACH OF
UPPER SEAM

464

MAP 3

18 000
17 500
17 000
16 500
16 000
15 500
15 000
14 500
14 000
13 500

MDH 82-03

SUBCROP

4.43
MRC 82-05
MDH 82-04

4.69
MDD 78-03

4.52
MRC 82-06

4.5

54°47'N
120°45'W

4.44
MDH 82-01
MRC 82-02

4.0

3.77
MDD 77-03

SUBCROP

3.22
MDD 78-04

3.0

3.5

MDD 78-07
2.69

2.5

3.0

MDH 78-15
2.86

2.5

54°46'N
120°45'W

MDD 78-08
3.10

4 000 E. BASELINE

4 000 E. BASELINE

0 100 200 300 400 500
metres

PR-MONKMAN 82(2)A *(1)

LEGEND

- DIAMOND DRILL HOLE
- ROTARY CORE HOLE
- ROTARY DRILL HOLE

PETRO CANADA
COAL DIVISION

MONKMAN COAL PROJECT

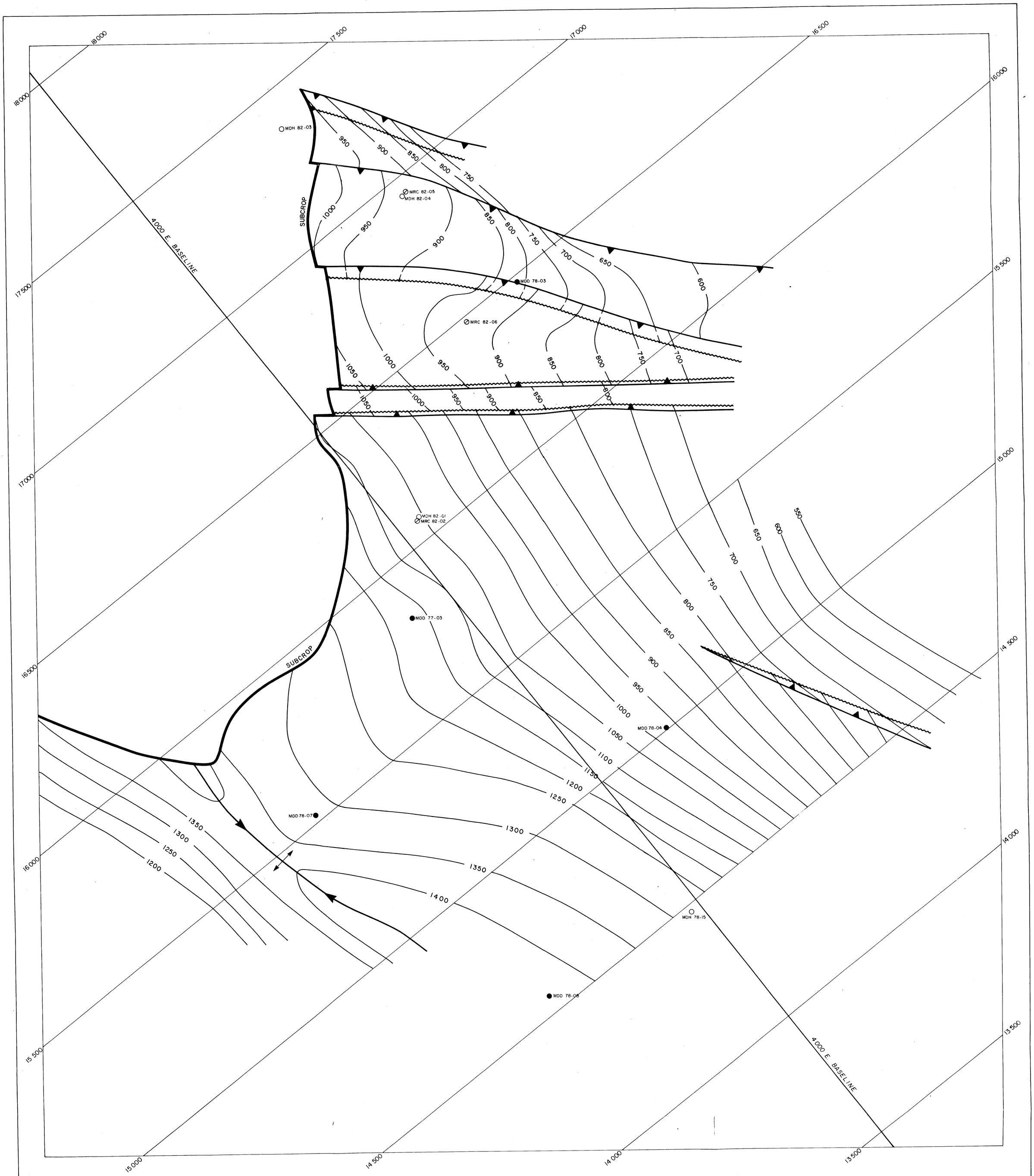
DUKE MOUNTAIN BLOCK
GETHING FORMATION
WEST OF DUKE PIT

ISOPACH OF
LOWER SEAM

DATE	MAY, 1982
REVISED	
AUTHOR	E P
DRAFTED	S K
SCALE	1 5000
C.I. =	.50 m

464

MAP 4



LEGEND

- ● DIAMOND DRILL HOLE
- ⊘ ROTARY CORE HOLE
- ○ ROTARY DRILL HOLE

PETRO CANADA
COAL DIVISION

PR - MONKMAN 82(2)A *(1)

MONKMAN COAL PROJECT

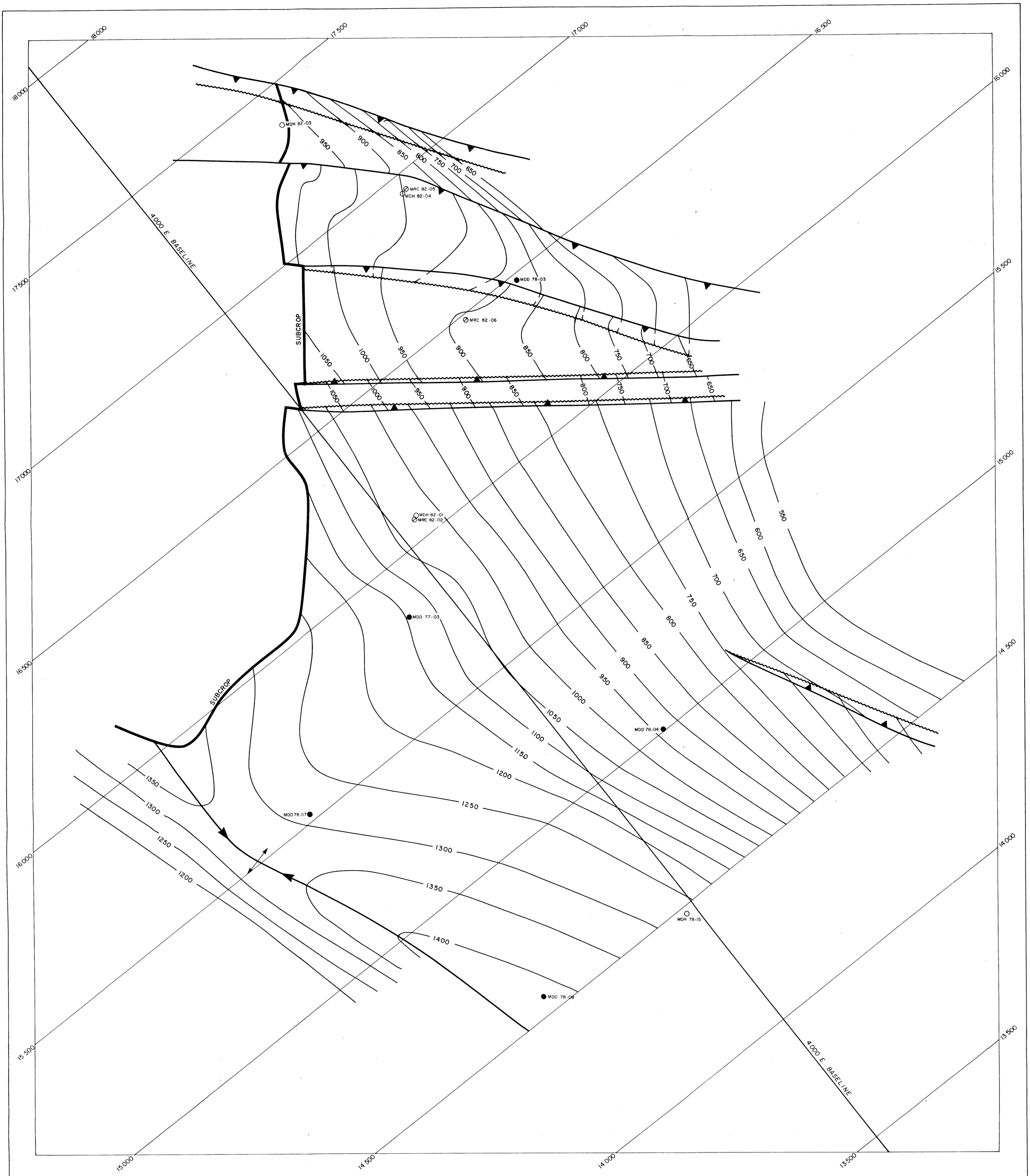
DUKE MOUNTAIN BLOCK
GETHING FORMATION
WEST OF DUKE PIT

STRUCTURE CONTOUR
BASE OF UPPER SEAM

DATE	MAY, 1982
REVISED	
AUTHOR	E. P. / J. M.
DRAFTED	S. K.
SCALE	1 5000
C. I. = 50 m	

464

MAP 5



LEGEND

- ● DIAMOND DRILL HOLE
- ⊘ ROTARY CORE HOLE
- ○ ROTARY DRILL HOLE

464

PR-Monkman 82(2)*A *(1)

PETRO CANADA
COAL DIVISION

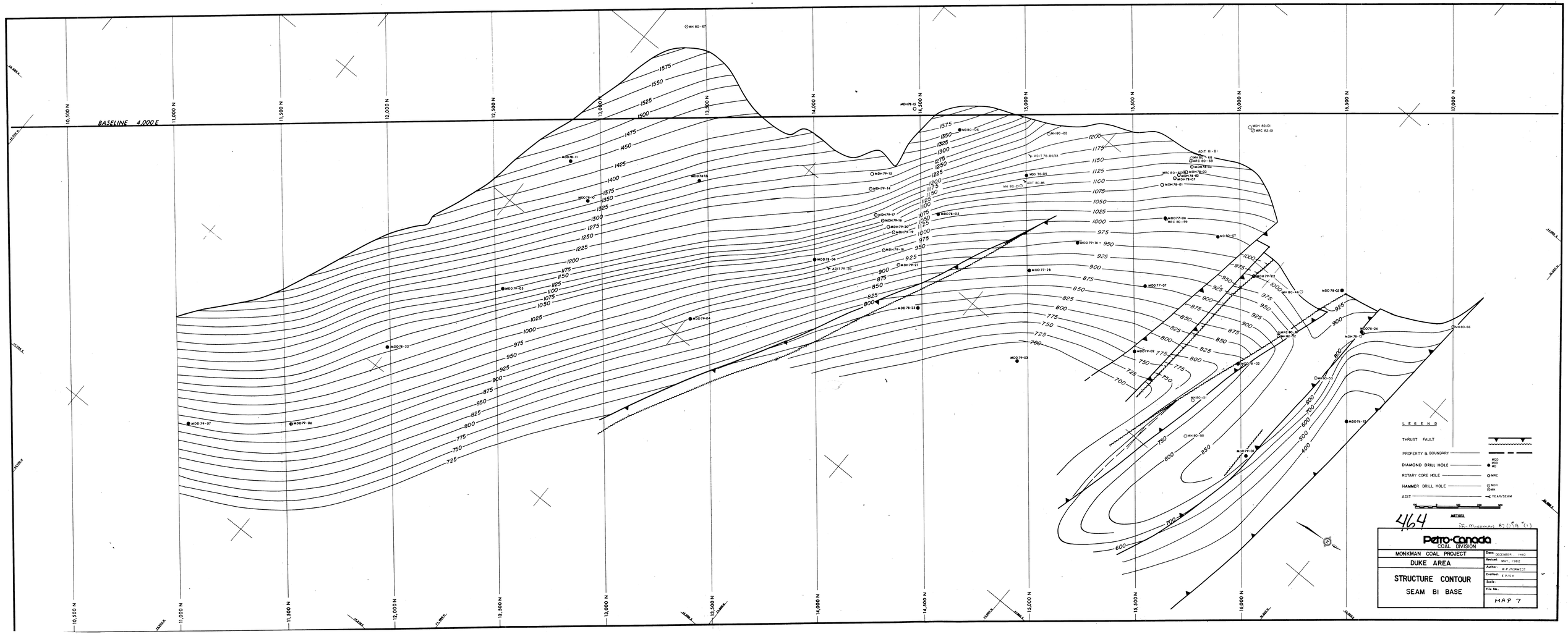
MONKMAN COAL PROJECT

DUKE MOUNTAIN BLOCK
GETHING FORMATION
WEST OF DUKE PIT

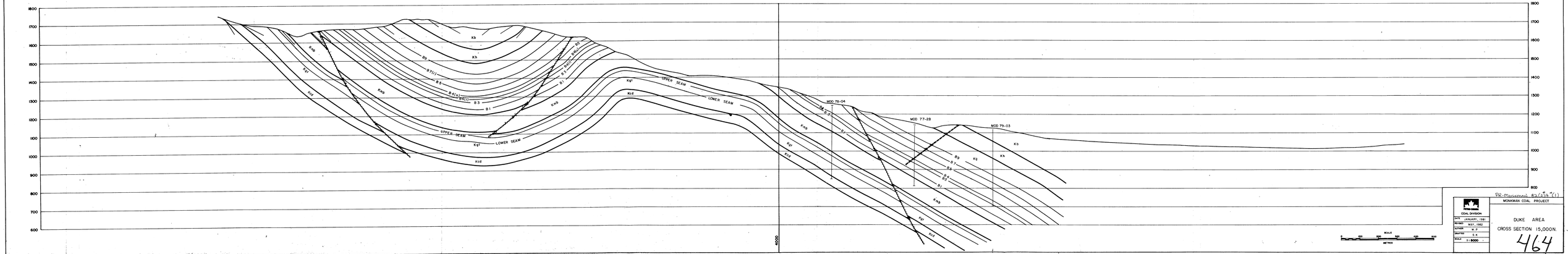
STRUCTURE CONTOUR
BASE OF LOWER SEAM

DATE	MAY, 1982
REVISED	
AUTHOR	E P / J.M.
DRAFTED	S K
SCALE	1 5000
C.I. = 50 m	

MAP 6


BASELINE 4,000 E
10,500 N
11,000 N
11,500 N
12,000 N
12,500 N
13,000 N
13,500 N
14,000 N
14,500 N
15,000 N
15,500 N
16,000 N
16,500 N
17,000 N
LEGEND
THRUST FAULT
PROPERTY & BOUNDARY
DIAMOND DRILL HOLE
ROTARY CORE HOLE
HAMMER DRILL HOLE
ADIT
YEAR/SEAM
METRES
464
Petro-Canada
COAL DIVISION
MONKMAN COAL PROJECT
DUKE AREA
STRUCTURE CONTOUR
SEAM BI BASE
MAP 7
Date: DECEMBER, 1980
Revised: MAY, 1982
Author: W.P./NORWEST
Drafted: E.P./S.K.
Scale:
File No.:


22 500 N
22 000 N
21 500 N
21 000 N
20 500 N
20 000 N
19 500 N
19 000 N
18 500 N
18 000 N
17 500 N
17 000 N
16 500 N
16 000 N
15 500 N
BASELINE 6000 E
BASELINE 4000 E
PROPERTY BOUNDARY
LEGEND
THRUST FAULT
PROPERTY & BOUNDARY
DIAMOND DRILL HOLE
MQD
MDD
MD
ROTARY CORE HOLE
MRC
HAMMER DRILL HOLE
MDH
MH
ADIT
YEAR/SEAM
100
0
100
200
300
METRES
464
PR-Monkman 82 (2)*A *(1)
Petro·Canada
COAL DIVISION
MONKMAN COAL PROJECT
HONEYMOON AREA
STRUCTURE CONTOUR
SEAM BI BASE
Date:
Revised APRIL, 1982
Author E.P./W.P.
Drafted S. KLOTZ
Scale:
File No
MAP 8



PR-Monkman 83/214-1(1)

COAL DIVISION

DATE	JANUARY, 1981
REVISED	MAY, 1982
AUTHOR	W. P.
DRAFTED	S. K.
SCALE	1:5000

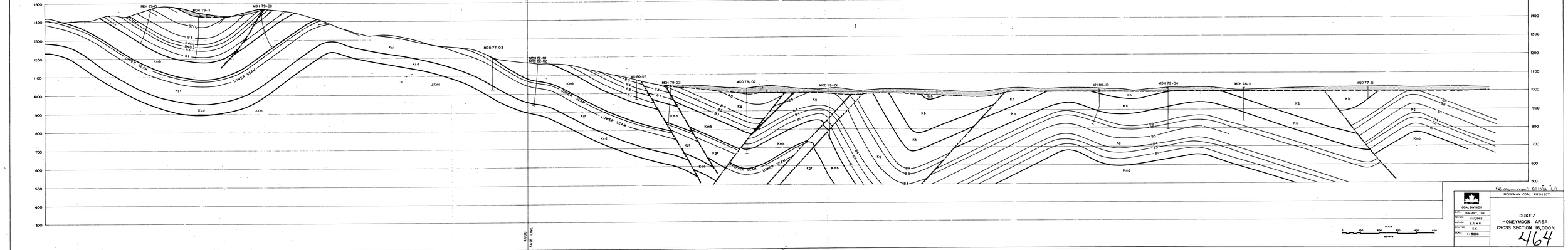
MONKMAN COAL PROJECT

DUKE AREA

CROSS SECTION 15,000N.

464


1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
MDD 76-11
MDD 78-07
MP 82-01
MDD 77-07
MDD 79-02
JKmi
Kmb
Kgt
Kcd
Kh
Kg
Kb
Ksh
UPPER SEAM
LOWER SEAM
B9
B7
B5
B4
B3
B1
4000
METRES
PR-Monkman 82(2)*A*(1)
PETRO-CANADA
COAL DIVISION
MONKMAN COAL PROJECT
DATE JANUARY, 1981
REVISED MAY, 1982
AUTHOR E.P, W.P.
DRAFTED S.K.
SCALE 1 : 5000
DUKE/
HONEYMOON AREA
CROSS SECTION 15,500N.
464



Qe Mountain Coals (1)

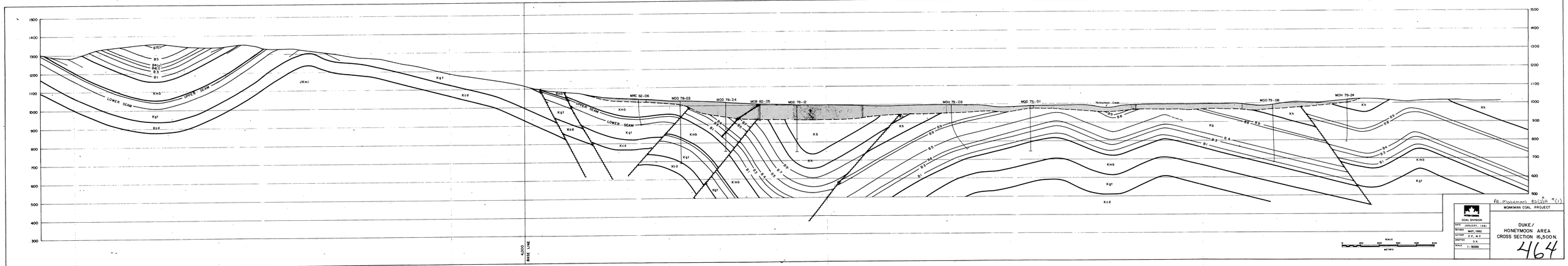
MONKMAN COAL PROJECT

COAL DIVISION

DATE	JANUARY, 1981
REVISED	MAY, 1982
DRAWN	E.P./R.P.
CHARTED	D.K.
SCALE	1 : 5000

DUKE / HONEYMOON AREA CROSS SECTION 16,000N.

464



Re-movement Region "(1)

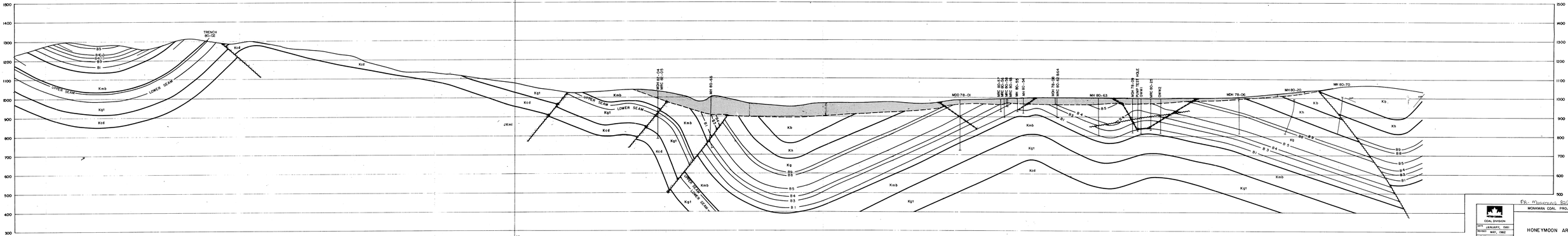
COAL DIVISION

DATE	JANUARY, 1983
REVISED	MAY, 1982
AUTHOR	C.F., M.P.
DRAFTED	S.K.
SCALE	1 : 5000

MONKMAN COAL PROJECT

DUKE/
HONEYMOON AREA
CROSS SECTION 16,500N

464



P.R. Mukherji Sept '81

MONKMAN COAL PROJECT

COAL DIVISION

DATE	JANUARY, 1981
REVISED	MAY, 1982
AUTHOR	S.R., W.P.
DRAWN BY	S. K.
SCALE	1 : 5000

HONEYMOON AREA

CROSS SECTION 17,000 N.

464

PR-Monkman 82(2)*A *(1)

MONKMAN COAL PROJECT

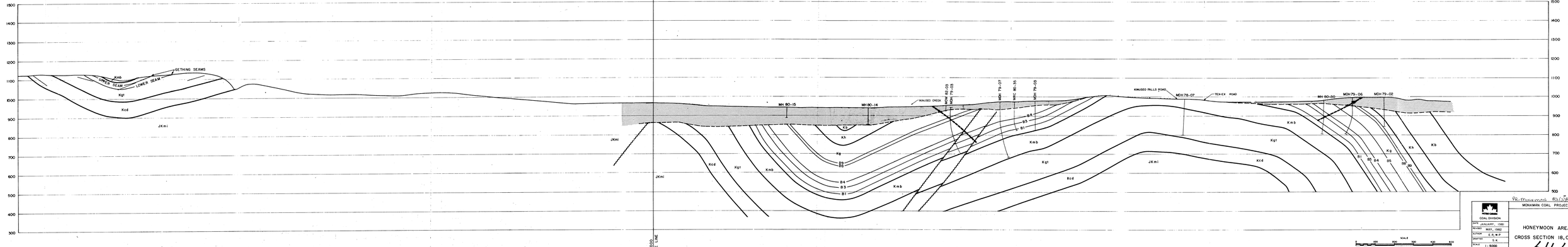
PETRO CANADA
COAL DIVISION

DATE	JANUARY, 1981
REVISED	JANUARY, 1982
AUTHOR	E.P., W.P.
DRAFTED	S.K.
SCALE	1 : 5000

HONEYMOON AREA

CROSS SECTION 17,500 N.

464



PETROMIN
COAL DIVISION

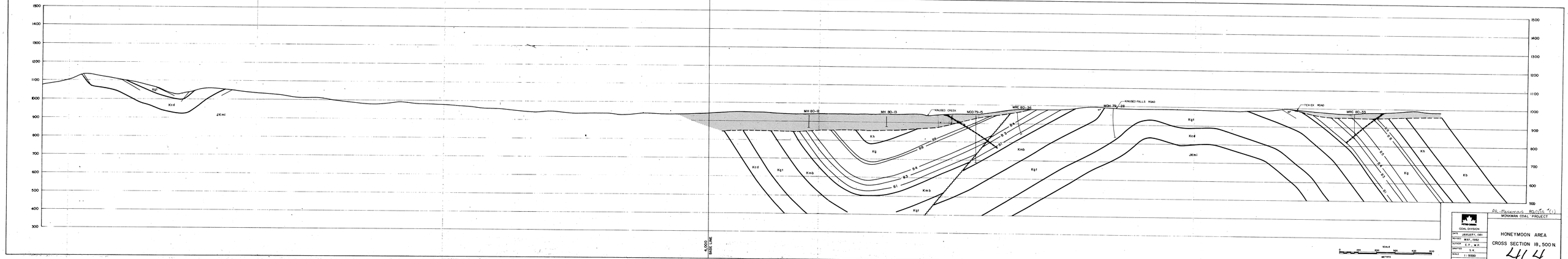
DATE	JANUARY, 1981
REVISED	MAY, 1982
AUTHOR	E.E.M.P.
DRAFTED	S.K.
SCALE	1:5000

MONKMAN COAL PROJECT

HONEYMOON AREA

CROSS SECTION 18,000 N.

464



PETRO-CANADA
COAL DIVISION

DATE	JANUARY, 1981
REVISED	MAY, 1982
AUTHOR	E.F., W.P.
DRAFTED	S.K.
SCALE	1:5000

MONKMAN COAL PROJECT

HONEYMOON AREA

CROSS SECTION 18,500 N.

464

PR-Monkman Reports (1)

PR-MONKMAN 82(2)A #(1)

PETRO-CANADA

COAL DIVISION

DATE	JANUARY, 1981
REVISED	MAY, 1982
AUTHOR	E.P., W.P.
DRAFTED	S.K.
SCALE	1:5000

MONKMAN COAL PROJECT

HONEYMOON AREA

CROSS SECTION 19,000N.

464