PR-MONKMAN 79 (1) A

Petro-Canada

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GEOLOGICAL BRANCH
ASSESSMENT REPORT

00 545

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

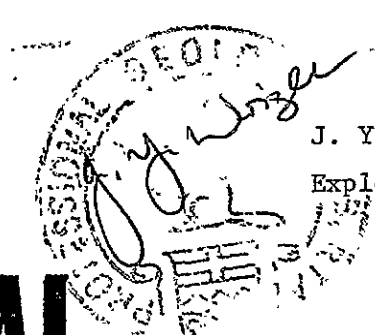
1979

NTS 93I/7, 8, 10 and 15

COAL LICENCES:

3131 - 3135	3177 - 3184
3138 - 3139	3187 - 3190
3141 - 3149	3193
3151 - 3155	3195 - 3207
3157 - 3164	3209 - 3264
3166 - 3168	3936 - 3960
3170 - 3174	4518 - 4523
	5159 - 5170

Submitted March, 1980



J. Y. Wright, P. Geol.
Exploration Manager

MONKMAN COAL PROJECT

1979 EXPLORATION REPORT

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SUMMARY

The Monkman Coal Project is operated by Petro-Canada Exploration Inc. on behalf of itself and its partners, Canadian Superior Exploration and McIntyre Mines. Each year since 1975 exploration has been carried out, the main emphasis being on the Duke Mountain Block at the north end of the string of licences, where medium volatile bituminous coal has been demonstrated to exist in substantial quantity.

Within the Duke Mountain Block the most recent work has been concentrated on potential open pit areas where ample reserves have been outlined to supply 3 million tonnes per year of clean coal over a 15 year period.

Concurrently with the geological and engineering work, environmental considerations have been studied and some of the requirements of Stage II have been met.

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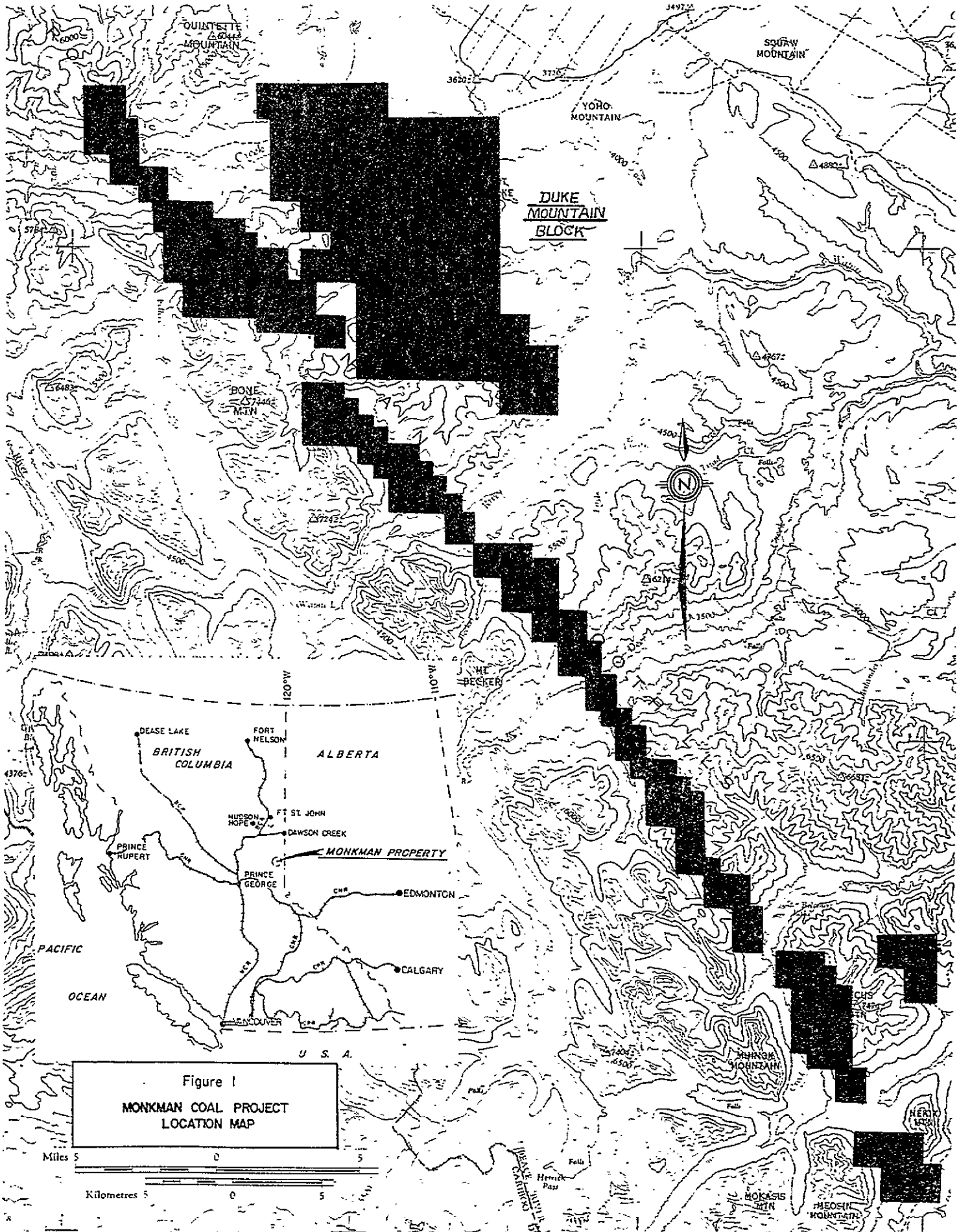


Figure 1

MONKMAN COAL PROJECT
LOCATION MAP

INTRODUCTION

Location and Means of Access

The Monkman Coal Project is located in the southern part of the Peace River Coalfield, approximately 630 km by air north-northeast of Vancouver, British Columbia. (Figure 1)

The property is more or less equidistant by all-weather dirt roads from Beaverlodge, Alberta and Tupper, B.C. which are situated on the major highway connecting Grande Prairie and Dawson Creek. The distance from pavement is approximately 125 km to the campsite on the Kinuseo Falls road, 11 km west of Stony Lake. A third route, from Dawson Creek, the Fellers Heights road, is also passable most of the year. The Quasar airstrip at Thunder Mountain is paved and permits year-round access by light plane. The airstrip is approximately 22 km from Petro-Canada's campsite.

History of Land Tenure

In 1970, McIntyre Mines Ltd. acquired 134 coal licences from the Government of British Columbia. In 1975, Canadian Superior Oil 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 34,410 ha. The Duke Mountain Block, on which activity is currently focused, comprises 18,650 ha of this total.

Licence Groupings

Concurrently with this report, applications to re-group are being filed. The proposed new groupings are listed in Table 1 and shown on the Licence Map (Figure 2). The uniform date for submission of assessment work on the previously grouped licences is December 16th. The Administrator for Coal kindly granted a three-month extension of time for the preparation of this report.

Topography

The Monkman property is situated in the inner foothills of the Rocky Mountains, in an area of rugged topography. The property is approximately 80 km long, stretching from the southern slopes of Quintette Mountain in the northwest to the Narraway River south of Nekik Mountain in the southeast (see Figure 1). 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 streams 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 wide includes the valleys of Kinuseo, Fearless and Dokken Creeks and Duke and Duchess Mountains. Its southerly limit is the major river of the area, the Wapiti. The highest point is 1791 m, on Duchess Mountain. The valleys and lower slopes are heavily forested with black spruce and jackpine. Treeline is at 1400 m above sea level.

TABLE 1

MONKMAN COAL PROJECT

1980 COAL LICENCE GROUPS

Group	Licences	Work Hectares
A	3233, 3234, 3245, 3248, 3947, 3949, 3955, 5160-5163 incl., 5165-5167	3889
B	3238, 3240, 3241, 3243, 3244, 3246, 3247, 3249-3251 incl., 5168-5170 incl.	2620
C	3228-3232 incl., 3948, 3953, 3954, 3956-3960 incl.	2679
D	3226, 3227, 3940-3946 incl., 3950-3952 incl., 4521-4523 incl.	4044
E	3254-3257 incl.	528
F	3214-3217 incl., 3219-3222 incl., 3252, 5164	2691
66	3154, 3155, 3157-3164 incl.	2262
67	3145, 3148, 3149	906
68	3139, 3141-3144 incl., 3146, 3147, 3151-3153 incl.	2116
69	3132-3135 incl., 3138	910
163	3239, 3242, 3258-3264 incl.	1945
168	3213, 3217, 3218, 3223-3225 incl., 3235-3237 incl., 3253	2095
169	3199, 3200, 3202-3205 incl., 3209-3212 incl.	2096
170	3183, 3184, 3187-3190 incl., 3198, 3201, 3206, 3207	2098
171	3177-3182 incl., 3193, 3195, 3196, 3197	2848
172	3131, 3166-3168 incl., 3170-3174 incl.	2034
Ungrouped	3936-3939 incl., 4518-4520 incl., 5159	1732

FIVE CABIN
ONION SYNCLINE
DUKE MOUNTAIN
NORTH WAPITI
SOUTH WAPITI
BELCOURT
SAXON EXTENSION
SECUS
NEKIK
Quintette Mt.
Kinuseo Falls Road
Kinuseo Creek
Honeymoon Creek
McIntyre Road
Duke Mountain
Duchess Mountain
Bone Mt.
Onion Lake
Wapiti River
Wapiti Lake
Mount Becker
Red Deer Creek
Mount Belcourt
Belcourt Lake
Belcourt Creek
Secus Mountain
Muinok Mountain
Nekik Mountain
Narraway River
Ptarmigan Mountain
Omega Hill
Petro-Canada
MINING DEPARTMENT
MONKMAN COAL PROJECT
COAL LICENCES
AND
GROUPINGS
AS OF MARCH 1,1980
Date
BASE Revised DEC. 31,1978
Author
Drafted
scale 1:100000 approx.
FIGURE 2

Exploration History

1968: Regional mapping by Stott, G.S.C.

1970: Initial licences acquired by McIntyre Mines

1973: Geological reconnaissance, trenching

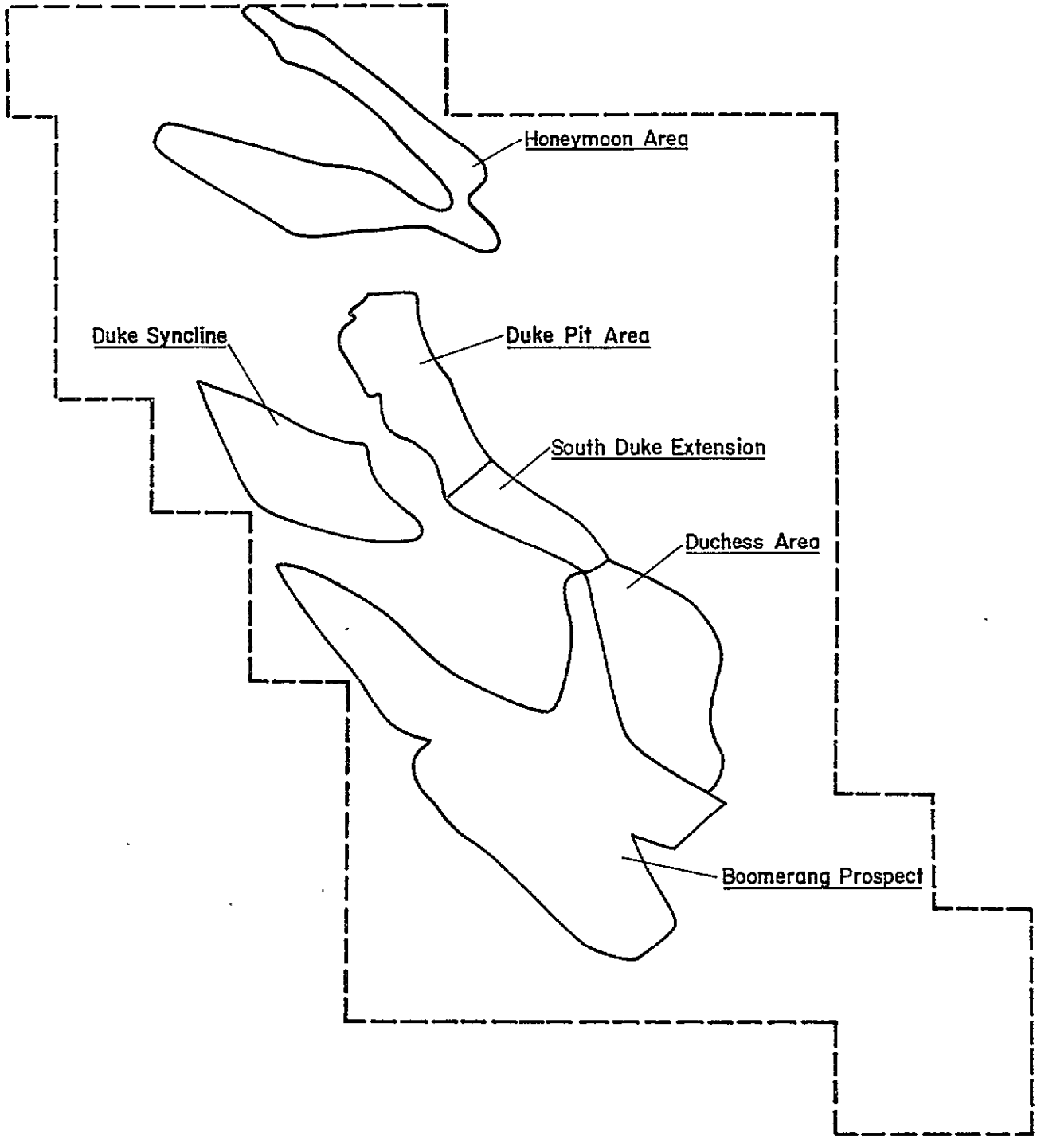
1975: Canadian Superior drilled three diamond holes

1976: Pacific Petroleums drilled twelve diamond holes, mapped

1977: Pacific drilled eight diamond holes, mapped

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

1979: 18 diamond holes, 35 hammer holes and four adits on Duke Mountain Block



Petro-Canada
MINING DEPARTMENT

MONKMAN COAL PROJECT

STRUCTURAL AREAS
DUKE MOUNTAIN BLOCK

Date February 1980
Revised
Author J. Wright
Drafted Jody
Scale 1:100,000

FIGURE 3

1979 EXPLORATION PROGRAM

Objectives

1) To evaluate by rotary drilling the potential of the Honeymoon (formerly Quintette), Duke Syncline and Boomerang prospects outlined by the 1978 program.

2) To evaluate the quality, washability and coking characteristics of the Gates seams and to provide sufficient geological detail by diamond drilling to enable the preparation of a feasibility report on the Duke and Honeymoon pit areas.

3) To acquire bulk samples from seams B1, B4, B5 and B9 for carbonization tests.

4) To carry out environmental and geotechnical studies with a view to partial satisfaction of the British Columbia Government Stage II requirements.

5) To map geologically the new ground acquired in the Nekik area and to re-study areas of Minnes outcrop elsewhere.

Field Camp and Services

The 1979 program commenced on March 5th. An eight trailer 32 man unitized camp (subsequently expanded to a ten-trailer 40 man camp) was installed on a permanent steel pile foundation. Permanent sewage facilities installed in 1978 and the 1978 water well were re-used. The camp remained on site throughout the remainder of 1979 with shut down (caretaker basis) for break up, May 1 - June 5 and for winter from November 5th.

Table 2 lists the permament and temporary staff who worked on the project in the field and office. A total of 20 technical and support staff were involved. A list of contractors and suppliers is shown in Table 3.

Improvements in communication between the field camp and head office were made possible by a telephone/radio patch system, working on the same VHF system used for on-site communications. The telephone/radio patch was located in Grande Prairie and the radio repeater station was on top of Duke Mountain. A conventional radio-telephone base station was also maintained at the camp.

Four wheel-drive, 3/4 ton pickups were used for personnel transportation and for light duty hauling work around the property. A six-wheel-drive all terrain vehicle, equipped with an 8 tonne-metre crane was used for heavy hauling and lifting around the site.

A Bell 206B helicopter was used to transport mapping parties into remote locations and for light lifting duty in remote sites.

Road Construction

All drillsites used during the 1979 program were provided with road access. Approximately 32 km of existing exploration road was reopened and 12.7 km of new exploration road was constructed. A new all weather road across the N.E. flank of Duke Mountain was constructed to give access to drilling locations down to Fearless Creek. The main road was built with a 25 m right-of-way and a 6 m road surface. In addition to the new main road, 2.8 km of existing road was upgraded to the same standards. The main roads on the property are shown in Figure 4.

Improved road quality on the property reduced the cost of moving and servicing drills and provided much quicker access to remote locations than was previously possible.

Surveying

The 1978 survey control was expanded and filled in during the early part of 1979 by contract surveyors. A Petro-Canada staff survey crew completed all the detail surveys required to locate drill holes and adits.

Geological Mapping

Approximately 30 km of geological traverses were run in the Nekik at the southern end of the Monkman licences. The mapping was helicopter-supported from the Monkman camp, a distance of approximately 75 km. Approximately two weeks was spent on the area.

Rotary Drilling

The rotary drilling program was carried out by Alberta Southern Exploration Drilling. A sister company, Interior Water Wells, drilled the first two holes of the 35-hole program. The drill used was a TH60 Sanderson Cyclone truck-mounted rig equipped with casing hammer and downhole hammer. The maximum depth reached in this program was 306 metres. Short cores were taken of the strata adjacent to the coal seams for the purpose of obtaining dip information, but no cores were taken from the coal seams themselves. The cost of this program was $42.20 per metre. The program lasted from March 8th to May 3rd, by which time break-up was well advanced. Total metrage was 5822 m.

The rotary drilling program was concentrated on the Honeymoon area in the north of the Duke Mountain Block. Some was directed towards plantsite testing, some towards adit location on Duke Mountain; four holes tested the Duke Syncline and one the Boomerang Prospect.

Diamond Drilling

D. W. Coates Enterprises operated a Longyear Super 38 drill from June 11th to September 26th, producing HQ wireline core. The average core recovery in coal was 87%. Eighteen vertical holes were drilled for a total of 5298 metres.

The diamond drilling program was split between evaluation of the Honeymoon area and extension of information on the Duke Pit.

Bulk Sampling

Four adits were driven on the Duke Mountain Block, three in the Honeymoon area and one on Duke Mountain. The contractor was Target Tunnelling Ltd. The bulk samples, averaging 11 tonnes each, were trucked to Birtley Coal and Minerals Testing in Calgary in garbage containers.

Trenching

Four backhoe trenches were dug in search of Seam B5 subcrop on Duke Mountains. All were unsuccessful. They are reported upon in the separate reclamation report by IEC.

Coal Quality Studies

All coal cores obtained from the diamond drill were analysed at Loring Laboratories and many samples were subjected to petrographic analysis at Cascade Coal Petrography. The bulk samples were washed at Birtley Coal and Minerals Testing and clean coal samples shipped to CANMET in Ottawa for carbonization tests. Each clean coal sample comprised six drums.

Cost Breakdown and Application of Work Credits

Table 6 gives the costs applicable to each licence group.

Reclamation

The reclamation work was carried out under the supervision of International Environmental Consultants Ltd. Their report, entitled, "A Report on Reclamation of Coal Exploration on the Duke Mountain Block of the Monkman Coal Project in 1979," is presented as a separate volume.

TABLE 2

LIST OF PERSONNEL EMPLOYED

Office Staff

J. Y. Wright	Exploration Manager
L. A. Smith	Senior Geologist
A. E. Bienia	Geologist
P. J. Proudlock	Geologist
J. L. Reid	Geologist
F. De Nys	Geologist
A. G. Speed	Engineering Manager
E. J. Allen	Engineering Supervisor
W. T. Nyysola	Geological Technologist
D. C. Kinton	Senior Landman
C. M. E. Kassam	Clerk
E. E. Topacio	Draftsman
M. A. Yancie	Secretary

Field Staff

Permanent

A. E. Bienia	Geologist
P. J. Proudlock	Geologist (Camp Manager)
J. L. Reid	Geologist
E. J. Allen	Engineering Supervisor
W. Nyysola	Geological Technologist

TABLE 2 (cont'd.)

Temporary

W. Proudlock	Geologist
M. Carr	Geological Assistant
P. George	Geological Assistant
L. Pudsey	Geological Assistant
K. Samson	Geological Assistant
J. Solomon	Field Clerk
P. Shankel	Engineering Assistant
R. Tupper	Engineering Assistant
E. Soprovich	Geological Assistant
D. Thomas	Geological Assistant
B. Gregoire	Field Assistant

TABLE 3

LIST OF CONTRACTORS AND SERVICES

Adit Driveage

Target Tunnelling	Calgary

Aircraft Charter

Quasar Aviation	Richmond
Associated Helicopters	Edmonton
Highland Helicopters	Chetwynd
Pacific Petroleums Ltd.	Calgary
Okanagan Helicopters	Kelowna
Wapiti Aviation	Grande Prairie

Camp and Catering

L. I. Adam Contractors	Calgary
Via Delle Camp Catering	Hythe
Custom Structures	Calgary

Coal Quality Studies

Birtley Coal and Minerals Testing	Calgary
Cascade Coal Petrography	Calgary
Energy, Mines and Resources	Ottawa
Loring Laboratories	Calgary

TABLE 3 (cont'd.)

Consultants	
Intermin Consultants Ltd.	Calgary
IEC Ltd.	Richmond
Golder Associates	Calgary
Norwest Resource Consultants	Calgary
Downhole Logging	
Roke Oil Enterprises	Calgary
Drilling	
D. W. Coates Enterprises	Richmond
Interior Water Wells	Prince George
Alberta Southern Exploration Drilling Ltd.	Calgary
Mapping Services	
R. M. Hardy and Associates	Calgary
Hosford, Impey & Welter Ltd.	Grande Prairie
Miscellaneous Services	
Osborne Oilfield Services Ltd.	Grande Prairie
Beaver General I.G.A.	Beaverlodge
E. G. Whalley & Sons	Vancouver
Foster's Feed and Seed	Beaverlodge
Lodge Lumber	Beaverlodge
Kinnear Drafting	Calgary
Northern Metallic	Grande Prairie
Silljer Enterprises	Grande Prairie
Fleet Maintenance	Grande Prairie
Western Propane	Grande Prairie
Lodge Propane	Beaverlodge
Revelstoke	Grande Prairie

TABLE 3 (cont'd.)

Rental Vehicles

Rentway Ltd.	Grande Prairie
Hillbrand Industries	Edmonton

Road Construction and Maintenance

Wilf Johnson Construction	Prince George
Quasar Petroleums Ltd.	Dawson Creek
Grizzly Valley Contractors	Grande Prairie
D. Ray Excavating	Beaverlodge
Hackwell Constructions	Grande Prairie
L. I. Adam Contractors	Grande Prairie
Tompkins Contractors	Fort St. John
Interior Water Wells	Prince George
J-Del Logging Ltd.	Elmsworth
D. & J Isley & Sons	Elmsworth

Trucking

Dakota Contracting	Grande Prairie
Edgar and Cissell	Grande Prairie
L. I. Adam Contractors	Grande Prairie
Canadian Freightways	Grande Prairie

TABLE 4

SUMMARY OF ROTARY DRILL HOLE DATA

Hole No.	Location (N.T.S.)	Licence	Elevation (m)	Depth (m)	Hole Size (mm)	Overburden (m)	Casing Left (m)	Geophysical logging Program (interval in m) Cal./Dens.	F.E.I.	G.R.N.	Deviation	Reclamation Program
MDH 79-01	93-I-15, d-79-B	3233	976.46.	177.55	152	15.85	16.50	0-174.9	16.5-173.9	0-175.0	run	1,2,3
MDH 79-02	93-I-15, d-79-B	3233	993.26	155.45	152	61.87	62.0	0-148.0	60.5-148.8	0-150.4	run	1,2,3
MDH 79-03	93-I-15, c-70-B	3233	975.94	153.01	152	21.34	21.34	0-151.3	21.0-151.5	0-152.0	run	1,2,3
MDH 79-04	93-I-15, a-68-B	3232	1007.74	226.47	152	14.00	14.00	0-267.4	14.0-223.8	0-224.0	run	1,2,3
MDH 79-05	93-I-15, a-61-C	3245	947.03	268.55	152	17.98	18.00	0-268.10	17.5-267.5	0-268.10	run	1,2,3,4
MDH 79-06	93-I-15, d-79-B	3233	993.10	195.20	152	44.80	46.00	0-185.5	46.0-186.0	0-186.10	run	1,2,3
MDH 79-07	93-I-15, b-70-B	3233	974.75	298.90	152	40.20	40.20	0-297.5	40.5-297.0	0-297.9	run	1,2,3,4
MDH 79-08	93-I-15, c-22-C	3239	1458.06	214.40	152	2.13	4.50	0-	4.5-	0-212.2	run	1,2,3
MDH 79-09	93-I-15, d-59-B	3227	999.68	273.28	152	38.61	39.00	0-263.6	39.0-263.6	0-224.9	run	1,2,3
MDH 79-10	93-I-15, a-23-C	3240	1463.06	196.73	152	-	5.00	0-195.9	113.0-195.4	0-195.9	run	1,2,3
MDH 79-11	93-I-15, b-22-C	3239	1432.52	236.07	152	2.74	6.00	0-234.7	47.5-234.6	0-235.5	run	1,2,3
MDH 79-12	93-I-15, a-11-C	3235	1628.53	231.80 reduce to 133.4 @ 92.35 m	152	-	6.10	-	-	0-231.8	not determined	1,2,3
MDH 79-13	93-I-15, d-10-B	3225	1642.34	238.81	152	-	7.5	0-235.3	44.5-236.3	0-238.3	run	1,2,3
MDH 79-14	93-I-15, b-29-B	3226	1310.26	51.82	152	6.10	6.10	0- 50.30	38.0- 50.3	0-50.8	run	1,2,3
MDH 79-15	93-I-15, b-29-B	3226	1321.00	36.58	152	20.73	21.00	0- 34.80	-	0- 35.4	run	1,2,3
MDH 79-16	93-I-15, a-29-B	3226	1273.30	109.73	152	9.75	10.00	0-107.9	14.5-107.9	0-108.7	run	1,2,3
MDH 79-17	93-I-15, a-29-B	3226	1278.56	60.96	152	21.34	21.50	0- 58.9	21.5- 59.0	0-59.6	run	1,2,3
MDH 79-18	93-I-15, d-29-B	3226	1242.89	12.19	152	12.19	12.19	-	-	-	-	1,2,3

TABLE 4

SUMMARY OF ROTARY DRILL HOLE DATA

Page 2

Hole No.	Location (N.T.S.)	Licence	Elevation (m)	Depth (m)	Hole Size (mm)	Overburden (m)	Casing Left (m)	Geophysical logging Program (interval in m) Cal./Dens.	F.B.I.	G.R.N.	Deviation	Reclamation Program
MDH 79-19	93-I-15, a-29-B	3226	1256.99	86.26	152	5.18	5.50	0-84.7	24.5-84.7	0-85.3	run	1,2,3
MDH 79-20	93-I-15, a-29-B	3226	1265.52	134.72	152	6.10	6.10	0-133.7	22.5-133.7	0-134.5	run	1,2,3
MDH 79-21	93-I-15, d-29-B	3226	1224.38	266.88	152	14.33	14.50	0-265.4	15.0-265.4	0-266.0	run	1,2,3
MDH 79-22	93-I-15, b-90-B	3227	1037.96	213.3	152	4.57	6.00	0-212.5	17.1-213.0	0-213.0	run	1,2,3
MDH 79-23	93-I-15, a-90-B	3234	987.71	162.15	152	20.42	20.30	0-191.0	7.2-191.0	0-191.0	run	1,2,3
MDH 79-24	93-I-15, d-67-B	3232	1015.45	228.60	152	17.98	18.30	0-226.0	18.3-226.0	0-227.0	run	1,2,3
MDH 79-25	93-I-15, d-91-K	3217	1475.17	274.32	152	0.91	-		45.0-273.5	0-274.0	run	1,2,3
				reduce to 130 @ 142.34 m								
MDH 79-26	93-I-15, b-75-C	3246	959.16	134.87	152	29.57	29.6	0-132.0	4.9-132.0	0-133.0	run	1,2,3,4
MDH 79-27	93-I-15, b-71-C	3245	983.90	256.60	152	3.96	4.75	0-254.8	4.5-255.5	0-256.10	run	1,2,3,4
				reduce to 123 @ 182.88								
MDH 79-28	93-I-15, b-71-C	3245	987.34	154.53	152	0.46	1.00	0-153.0	7.0-153.6	0-153.9	run	1,2,3
MDH 79-29	93-I-15, b-91-C	3248	1079.18	93.03	152	-	4.57	0- 91.5	4.0- 92.0	0- 92.0	run	1,2,3,4
				reduce to 133.4 @ ? m								
MDH 79-30	93-I-15, b-91-C	3248	1078.10	19.81	152	1.50	2.40	0- 18.4	02.0-17.0	0- 19.0	run	1,2,3
				drilled hole of 133.4 dia								
MDH 79-31	93-I-15, c-55-B	3229	1072.00	304.80	152	1.83	2.5	0-303.4	24.5-303.6	0-304.0	run	1,2,3
				reduce to 130 @ 245.79 m								
MDH 79-32	93-I-15, d-46-B	3948	1056.46	305.90	152	4.27	5.0	0-304.2	5.0-304.2	0-305.4	run	1,2,3
				reduce to 130 @ 195.99 reduce to 127 @ 249.94								
MDH 79-33	93-I-15, d-56-B	3948	1068.72	1.83	-	1.83	Pulled	-	-	-	-	1,2,3
MDH 79-34	93-I-15, c-55-B	3229	1076.52	1.83	-	1.83	Pulled	-	-	-	-	1,2,3
MDH 79-35	93-I-15, d-56-B	3948	1044.72	5.49	203	4.57	Pulled	-	-	-	-	1,2,3

Reclamation Program: 1-Litter removed; 2-trees slashed and site levelled; 3-access road cross ditched, site and road seeded and fertilized; 4-grout plug installed.

TABLE 5

SUMMARY OF DIAMOND DRILL HOLE DATA

Hole No.	Location (N.T.S.)	Licence	Elevation (m)	Depth (m)	Over-Burden (m)	Casing Left (m)	Geophysical logging Program				Completion Program	Reclamation Program
							Cal./Dens. (m)	F.B.I. (m)	G.R.N. (m)	Deviation (°@m)		
MDD-79-01	93-I-15, f-49-B	3227	1009.69	280.78	42.46	21.3	0-279.7	42.0-279.8	0-280.0	1.19@20.0	2	1,2,3
MDD-79-02	93-I-15, e-39-B	3226	1042.50	302.26	13.82	13.40	0-300.0	13.4-300.6	0-283.7	2.10@302.26	2,5	1,2,3
MDD-79-03	93-I-15, b-39-B	3226	1120.70	422.73	3.05	3.41	0-416.9	6.5-417.3	0-417.7	3.71@415.0	2	1,2,3
MDD-79-04	93-I-15, g-18-B	3947	1416.64	257.26	1.83	3.05	0-249.0	10.0-251.2	253.7	1.85@1.66	2	1,2,3
MDD-79-05	93-I-15, d-18-B	3946	1518.17	361.50	9.37	0	0-360.3	10.0-360.3	0-361.0	-	1	1,2,3
MDD-79-06	93-I-15, f-6-B	3945	1353.16	434.65	12.19	0	0-433.3	12.0-433.5	0-434.1	-	1	1,2,3
MDD-79-07	93-I-15, a-6-B	3945	1285.91	385.88	15.46	0	0-384.8	15.0-384.8	0-385.4	5.74@382	1	1,2,3
MDD-79-08	93-I-15, b-67-B	3232	1000.34	319.43	6.10	6.10	0-317.9	11.0-317.9	0-318.7	1.17@217	2	1,2,3
MDD-79-09	93-I-15, h-51-C	3242	958.31	100.58	100.58+	0	-	-	-	-	1	1,2,3
MDD-79-10	93-I-15, a-92-C	3248	1087.09	248.72	3.05	3.05	0-247.1	11.0-247.3	0-247.8	3.47@245	2	1,2,3
MDD-79-11	93-I-15, a-90-B	3234	991.03	297.68	15.00	16.44	0-296.0	15.0-296.2	0-296.8	6.03@275	2	1,2,3
MDD-79-12	93-I-15, a-79-B	3233	991.76	135.94	9.46	0	0-134.7	11.0-134.7	0-135.1	1.47@132	1	1,2,3
MDD-79-13	93-I-15, c-78-B	3232	990.53	385.88	7.28	8.0	0-380.0	8.0-370.0	0-385.0	9.34@370	1	1,2,3
MDD-79-14	93-I-15, c-70-B	3227	964.72	385.88	67.82	66.0	0-384.0	68.0-384.0	0-384.9	7.33@382	1	1,2,3
MDD-79-15	93-I-15, e-61-C	3245	N/A	260.41	24.79	0	0-259.8	24.5-260.0	0-260.20	6.44@257	1,4	1,2,3
MDD-79-16	93-I-15, a-40-B	3226	1136.29	203.00	3.05	3.05	0-201.7	3.0-202.1	0-202.4	1.69@199	2,5	1,2,3
MDD-79-17	93-I-15, a-71-C	3246	941.59	221.59	0	11.5	0-220.0	56.0-221.0	0-221.0	3.49@205	2,4	1,2,3
MDD-79-18	93-I-15, a-72-C	3245	970.43	282.25	6.71	6.71	0-281.0	7.0-281.0	0-282.0	4.26@280	2	1,2,3

NOTE: All of the above diamond drill holes were drilled vertical (-90°) using HQ rods.

Completion Program: 1-Casing pulled; 2-casing left in hole; 3-bit, corebarrel and rods left in hole; 4-Grout plug installed, 5-Piezometer installed.

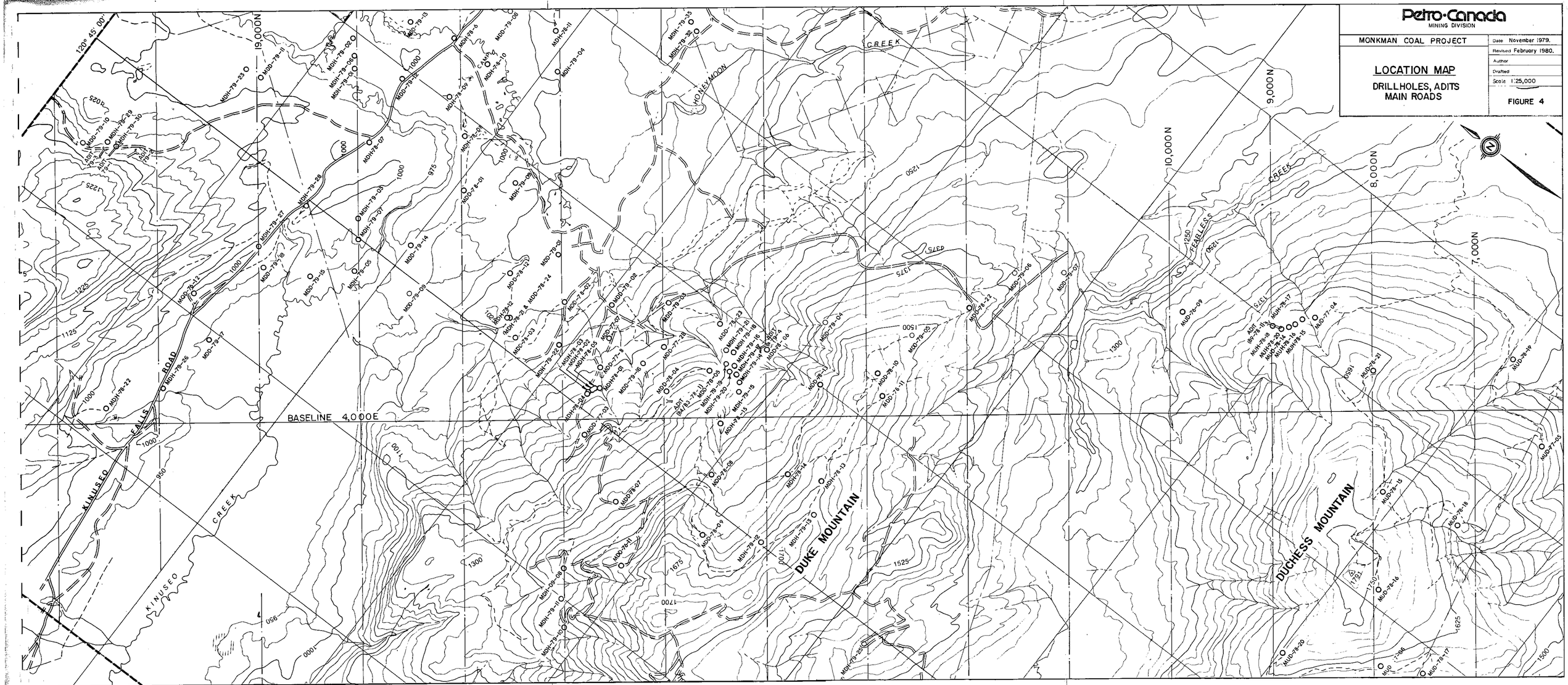
Reclamation Program: 1-Litter removed; 2-Trees slashed and site levelled; 3-access road cross ditched, site and road seeded and fertilized.

TABLE 6

HONKHAN COAL PROJECT

APPLICATION OF WORK CREDITS, 1979

	Survey	Location Costs	Downhole Logging	Camp	Outside Labour	Assaying	Drilling	Adits	Consulting	Consumables	Miscellaneous	Aircraft Charter	Company Labour	Auto, Travel	Freight	Rental Equipment	Communication	Reclamation	Administration	1979 Totals	Work Hectares	1979 Credit $/ha
A	3,065	117,290	31,245	70,280	26,627	45,305	204,717	85,637	48,920	6,595	2,835	5,205	31,146	6,942	24,317	33,434	6,120	66,414	40,940	857,034	3,889	220.37
B	1,115	5,062	6,823	25,944	9,732	5,664	44,705	--	17,879	2,410	1,035	1,900	10,749	2,537	8,888	12,585	2,237	6,245	8,326	173,836	2,620	66.35
C	1,533	22,577	13,646	38,860	14,575	11,327	89,400	--	26,779	3,610	1,555	2,850	16,597	3,800	12,316	18,850	3,350	19,259	15,144	316,028	2,679	117.96
D	2,229	169,124	35,565	56,535	21,207	56,631	233,020	28,546	37,965	5,253	2,260	4,145	25,605	5,529	19,369	27,426	4,875	67,665	40,197	843,146	4,044	208.49
E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	528	NIL
F	--	--	--	19,500	7,315	--	--	--	14,440	1,812	780	1,430	11,830	1,907	7,685	10,460	1,690	--	3,642	82,491	2,691	30.65
163	975	5,164	4,089	24,585	9,223	5,663	26,790	--	16,940	2,284	981	1,805	11,134	2,404	8,423	11,926	2,130	5,205	6,986	146,707	1,945	75.43
168	1,951	7,087	4,305	49,255	18,476	--	28,208	--	33,940	4,576	1,968	3,615	22,308	4,817	16,875	23,895	4,257	13,010	11,927	250,470	2,095	119.56
5159	--	--	--	3,020	868	--	--	--	1,598	215	95	169	1,047	226	795	1,124	200	--	433	9,790	300	32.63
4518-20	2,064	--	--	925	347	--	--	--	637	86	37	7,068	4,242	90	317	448	80	--	817	17,158	607	28.27
	12,932	326,304	95,673	288,904	108,370	124,590	626,840	114,183	199,098	26,841	11,546	28,187	134,658	28,252	98,985	140,148	24,939	177,798	128,412	2,696,660		


Petro-Canada
MINING DIVISION
MONKMAN COAL PROJECT
Date November 1979.
Revised February 1980.
Author
Drafted
Scale 1:25,000
LOCATION MAP
DRILLHOLES, ADITS
MAIN ROADS
FIGURE 4
BASELINE 4,000E
10,000N
9,000N
8,000N
7,000N
KINUSEO FALLS ROAD
KINUSEO CREEK
HONEYMOON CREEK
FEARLESS CREEK
DUKE MOUNTAIN
DUCHESS MOUNTAIN
120° 45' 00"

GEOLOGY

The regional geology was fully described in our 1978 report: "Monkman Coal Project, 1978, Volume 1 - Exploration, Geology and Reserves" by Pacific Petroleums Ltd., likewise the general stratigraphy of the property. These items will not be further discussed here. What follows is an update on the 1978 information.

1) DUKE MOUNTAIN BLOCK

Revisions to Geology

The 1979 program resulted in various minor adjustments to assumed geological contacts in the Honeymoon area and some reappraisal of fault attitudes. The profile of the Honeymoon (previously Quintette) Anticline was refined. The fault block on the lower slopes of Duke Mountain was demonstrated by diamond drill hole 79-1 to be considerably shallower than previously thought. A revised set of sections is presented Appendix "A" covering these areas and also the Duke Syncline and the Boomerang Prospect.

The four hammer holes drilled in the Duke Syncline area, MDH 79-8, MDH 79-10, MDH 79-11 and MDH 79-12, resulted in only minor adjustments to the formational boundaries.

One hole, MDH 79-25, on the north end of the Boomerang Prospect, failed to intersect Gates measures, and the configuration of the syncline has been revised. This hole is recorded on Section 13000N.

Coal Seam Stratigraphy and Quality Variation

The coal seams of the Gates Member are numbered B1 to B13 stratigraphically from the base of the section. The vast majority of the work carried out in 1979 was on the Duke Mountain Block, particularly on the north slopes of Duke Mountain and the Kinuseo Creek valley, described herein as the Honeymoon area, and the comments which follow concern these areas.

The internal characteristics of the individual seams are illustrated in the seam profiles which accompany this report as separate volumes.

Seam B1

Seam B1 occurs very consistently throughout the property immediately above the basal "Torrens Member" sandstone. The seam is generally about 3 metres thick both on Duke Mountain and in the Honeymoon area, but the ash content decreases significantly northwards as the partings become thinner and disappear. The variation is from 24.5% ash on Duke Mountain to 10% ash in the Honeymoon area, on in-situ raw coal.

Seam B2

Seam B2 is of no economic significance in the Duke Mountain Block. It is discontinuous and rarely exceeds one metre in thickness.

Seam B3

Seam B3 is one of the major seams of the area. It occurs consistently in the drill holes. The maximum thickness intersected to date is 12.69 metres on Duke Mountain, but the seam is normally close to 4.0 metres thick in that area and 3.8 metres in the Honeymoon area. As with Seam B1, Seam B3 improves in quality northwards. The ash content in the Honeymoon area averages 13.7% compared with 22.5% on Duke Mountain. The low ash content reflects a virtual absence of partings.

Seam B4

Seam B4 is another major seam. It is lithologically more variable than Seam B3 and Seam B1. South of Section 13,750 N the seam is split into two more or less equally thick leaves totalling between 5 and 6 metres of coal with a separation of about 1.5 metres. The upper leaf is banded and dirty while the lower is clean. North of that line, on Duke Mountain, the lowest one-third of the seam is more less solid coal while the remainder is characterized by alternating narrow bands of rock and coal. In this area the seam is about 8.5 metres thick. In the Honeymoon area the bottom six metres of the seam is generally more or less clean coal. In some intersections this 6 metres is the whole seam, in others there is a further 2 to 3 metres reminiscent of the top of the seam as it occurs on Duke Mountain, and, towards the nose of the Honeymoon Anticline, in holes 79-8, 79-13 and 79-14 the uppermost 3 metres is separated from the main body of the seam by 2 to 4 metres of interbedded shale and coal.

The average ash content of the seam in the Duke Mountain area is 23.7%. In the Honeymoon area the consistent basal portion of the seam averages 13.7% ash and the dirtier upper section 23.0% ash.

Seam B5

Seam B5 is usually poorly developed and is known to be discontinuous. The seam is generally dirty and is characterized by partings throughout. The potentially mineable coal is merely part of a coaly zone with wide gradational roof and floor contacts. On Duke Mountain the seam ranges from 1.63 metres to 3.22 metres in thickness, and in the Honeymoon area it is considered to be mineable on the east flank of the anticline with a width of somewhat less than 2 metres. A bulk sample from this area contained 30% ash, which compares closely with the average for Duke Mountain which is 27.3% ash.

Seams B6 and B7

The coal zones designated Seam B6 and Seam B7 comprise several narrow bands, commonly in two pairs. The width of an individual band is generally in the 0.5 to 1.5 metre range and the zones are uneconomic.

Seam B8

Seam B8 in the Duke Mountain area is less than one metre in thickness and is used as a stratigraphic marker only. In the Honeymoon area the seam expands to the 1.5 metre to 3.0 metre range with an ash content of around 24%.

Seam B9

Seam B9 is a strongly developed, continuous seam characterized by a virtual absence of partings. On Duke Mountain it averages 3.5 metres in thickness and contains 19% ash. The seam thins gradually Duchess Mountain northwards to the Honeymoon area where it averages 1.6 metres containing 14% ash.

Upper Seams

Seams B10 to B13 are simply stratigraphic markers and are not considered at present to have any economic interest.

2) Nekik Block

The Nekik Block comprises seven licences with an area of 8,301 ha. It occupies the relatively low ground between Nekik Mountain on the east and Meosin Mountain on the west. The Narraway River cuts the southeastern corner.

Geologically the Nekik Block is a broad synclinal structure in Lower Cretaceous rocks, whose axis strikes roughly northwest - southeast and plunges gently to the northwest (see map and sections in Appendix). The Cadomin Formation forms a prominent rim to the syncline on the east and south.

The western rim of the syncline is truncated by a major overthrust of Paleozoic rocks and is characterized by sharp folding. The centre of the syncline is presumed to be occupied by Gates Member strata but the area is virtually devoid of outcrop. Coal measures of uncertain stratigraphic position were observed immediately below the major thrust on the west side of the block. A measured section covering 50 m of strata included eight coaly zones but nothing of commercial significance. Since folding is severe and it was not determined whether the section was overturned or not, the stratigraphic position of these measures may be Minnes, Gething, Gates or Boulder Creek. It is suspected that they belong to the Boulder Creek Member.

The eastern limb of the syncline forms the west-facing dip-slope of Nekik Mountain. Near the base of the mountain a small hill is formed by conglomerate which was previously interpreted as Gething Formation but is now considered to be a thrust repeat of Cadomin.

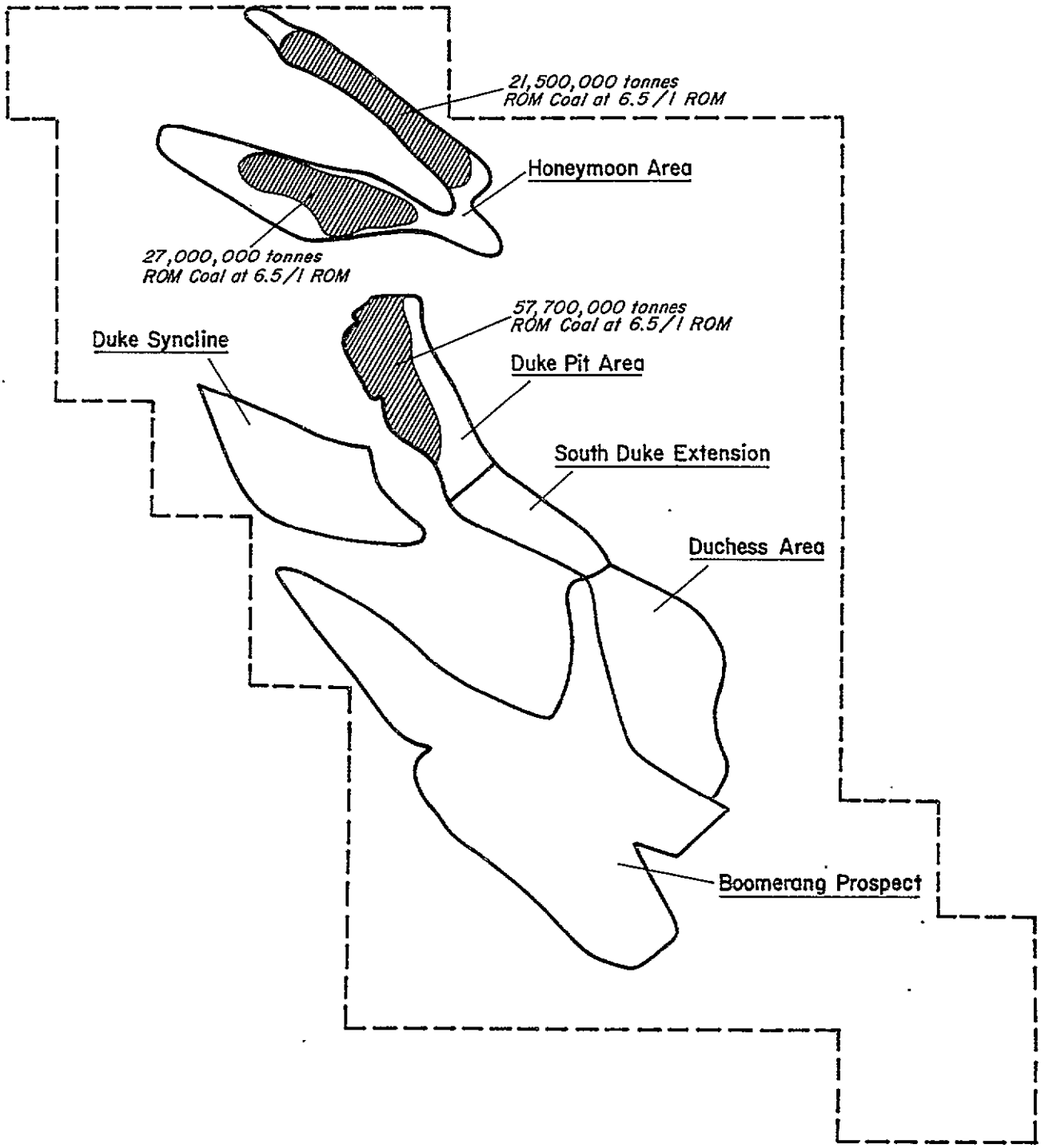
Further resolution of the geological picture in the Nekik Block will depend on drilling.

RESERVES

The 1979 program was concentrated on the Duke and Honeymoon pit areas and no fresh calculations were done on any of the other structural areas reported upon last year.

As a basis for determining strip mineable reserves an average clean coal strip ratio of 10:1 (m^3/tonne) was selected. This is approximately equivalent to 6.5:1 R.O.M. Using these parameters, the Duke Pit Area will produce 57.7 million tonnes of R.O.M. coal and the Honeymoon Pit area 48.5 million tonnes. The pit outlines are shown in Figure 5.

A feasibility study was undertaken with the objective of designing a mine to produce 45 million tonnes of clean coal over a 15-year period. This study indicated that this production could most economically be obtained by extracting 37 million tonnes from the Duke Pit and 33 million tonnes from two pits in the Honeymoon area.



Petro-Canada
MINING DEPARTMENT

MONKMAN COAL PROJECT

STRIPPABLE RESERVES
DUKE AND HONEYMOON PITS

Date February 1980
Revised
Author J. Wright
Drafted edy
Scale 1:100,000

FIGURE 5

COAL QUALITY

Drill Core Testing

The purpose of the drill core sampling program was to establish the overall quality of the coalfield and to provide assurance that the bulk samples were representative of the deposit.

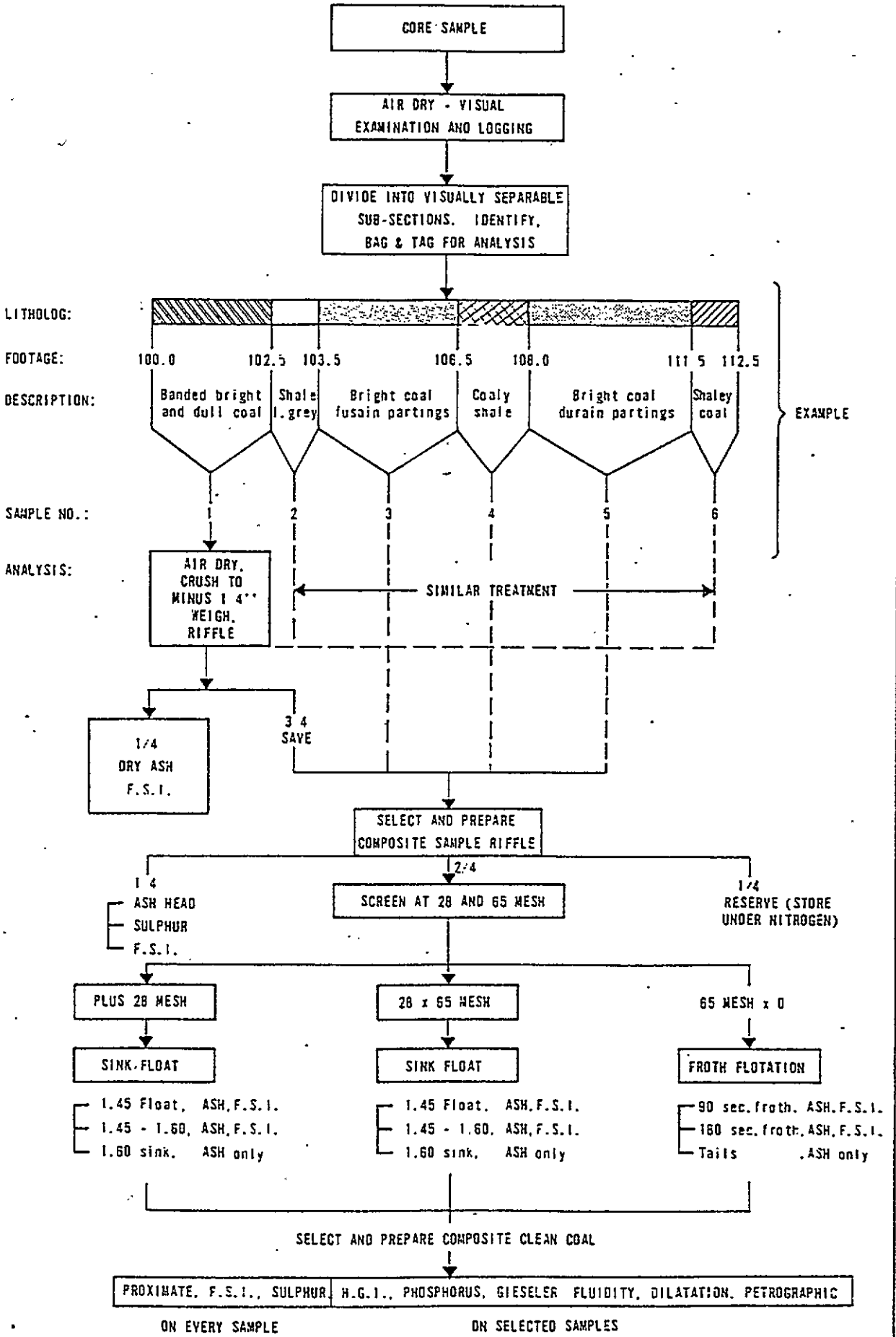
Sampling was carried out in the field on a lithological basis, with a limit of 1.5 m on the length of any core sample. Where the upper or lower contact of a seam was difficult to ascertain because of the presence of minor partings (in the 15 cm-30 cm range) interbedded with coal bands of similar thickness, samples were generally taken over shorter lengths. In these cases a coal band would be sampled along with the parting which separated it from the main body of the seam.

Sampling was done as soon as possible after receipt of the core at the core shack, and the samples were stored under cover in sealed plastic bags. Deliveries to the laboratory were made weekly.

The individual samples were analyzed for ash and F.S.I., and the components of the composite seam samples selected at head office. The laboratory made up the composites according to sample width. The test procedures applied to the core samples are outlined in Figure 6. A concise summary of the results obtained appears on pp. 40 to 65.

FIGURE 6

TESTING PROCEDURES DRILL CORE SAMPLES



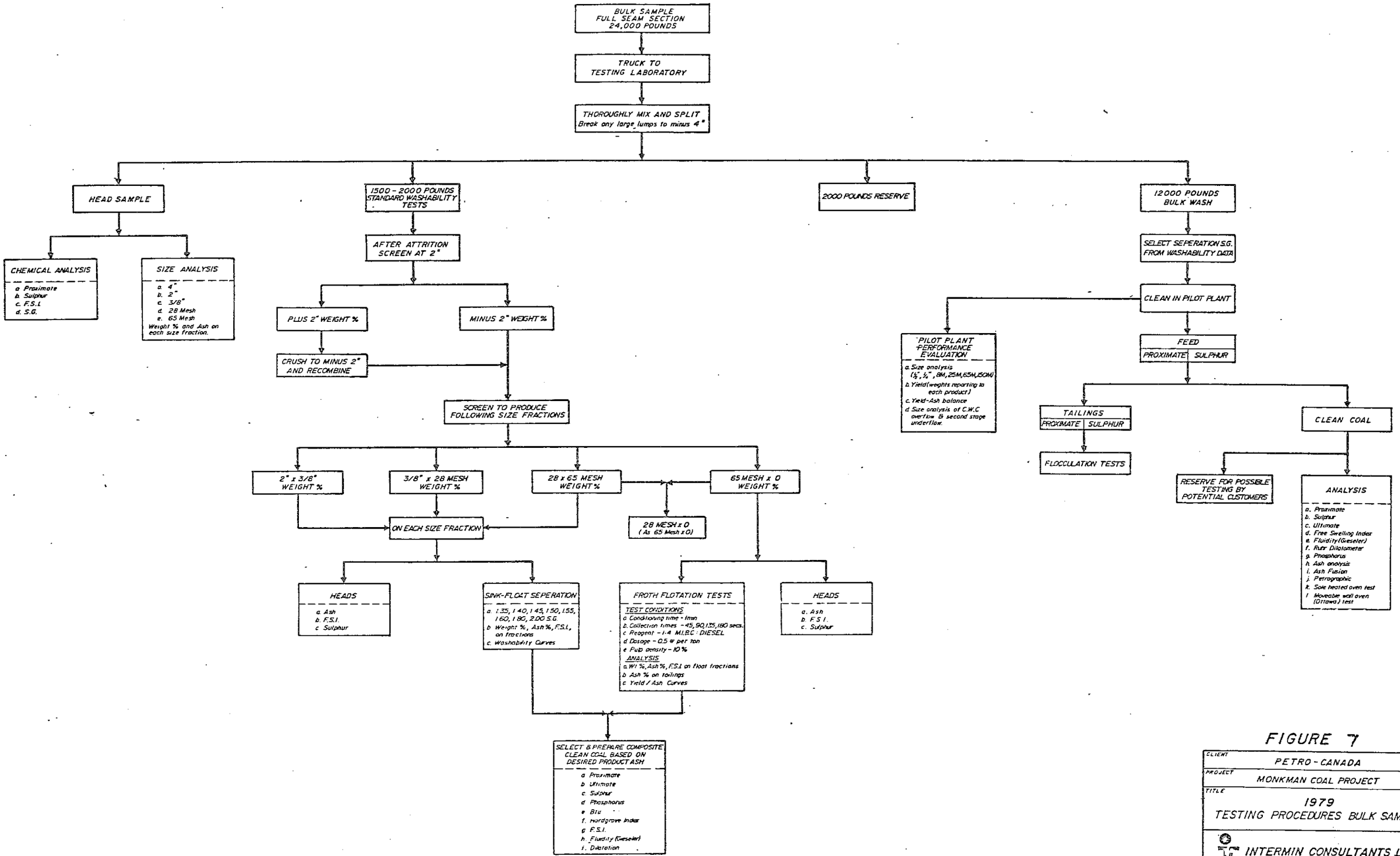


FIGURE 7

CLIENT	PETRO-CANADA
PROJECT	MONKMAN COAL PROJECT
TITLE	1979 TESTING PROCEDURES BULK SAMPLE
	INTERMIN CONSULTANTS LTD.

DRAWN BY	APPROVED BY	DATE	JOB No.
J-B	A. CRAVEN	FEBRUARY 1980	P.D.S.A

Bulk Sampling Procedures

The objective of the bulk sampling program was to produce 10-tonne representative samples from the selected seams so that sufficient clean coal could be prepared for coking tests.

The testing procedures are shown on the chart (Figure 7).

Four adits were driven in the 1979 program, providing bulk samples from Seams B1, B4, B5 and B9. The details of these adits are illustrated in Figures 8 to 11 (in pocket).

Once the adit was judged by the geologist on the basis of FSI determination to have reached unoxidized coal, the hanging wall and footwall were exposed by cross-cutting, a channel sample was taken, the FSI checked and bulk sampling proceeded. The cross-cut was carefully squared up and cleaned out, plywood flooring was laid and the sample extracted ply by ply using an air pick. The sample was removed from the adit by chain conveyor and transferred to large bins by means of a front-end loader. The loaded bins were winched on to a highboy truck and transported immediately to Calgary for washing and testing. At the less accessible sites the conveyor fed into 45-gallon drums which were transported to camp and dumped into the bins.

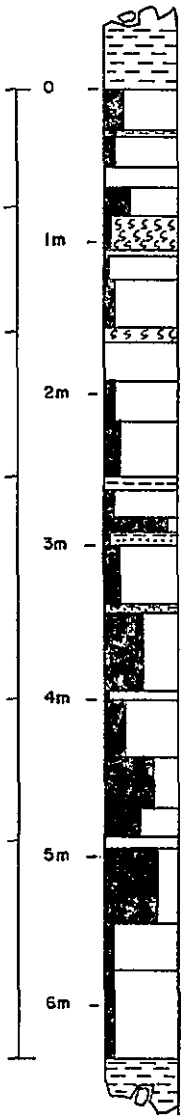
Channel Samples

Channel samples were taken ply by ply at the face of each adit, using a geological hammer to cut a shallow (3 cm) channel across the thickness of the seam.

Columnar sections illustrating the results obtained appear as Figures 12 to 15.

CHANNEL SAMPLE

Dry Ash	FSI	Sample No.
19.0 %	1 ½	1351
9.9 %	8	1352
15.9 %	6	1353
4.6 %	7	1354
9.3 %	3 ½	1355
5.1 %	8 ½	1356



LITHOLOGY

H.W. Mudstone: carbonaceous, with minor sheared surfaces

.25 Coal: dull banded, (20% vitreous)
.06 Mudstone: coaly, soft
.19 Coal: dull, hard, (10% vitreous)
.02 Coal: soft, dull, dirty
.13 Coal: dull, hard, earthy lustre
.17 Coal: dull banded, hard, (30% vitreous)
.26 Coal: soft, dull, sheared
.04 Coal: dull, dirty, soft
.16 Coal: dull, soft
.27 Coal: dull, hard, (10% vitreous)
.10 Coal: dirty, soft, sheared, mudstone lenses
.26 Coal: mush
.31 Coal: dull banded, soft, (10% vitreous)
.32 Coal: hard, dull banded, (20% vitreous)
.07 Coal: dirty, mudstone lenses
.19 Coal: hard, dull banded, (10% vitreous)
.09 Coal: soft, bright banded, (80% vitreous)
.08 Coal: dull, hard, grading to bone
.39 Coal: hard, dull banded, (20% vitreous) metallic lustre
.06 Coal: hard, metallic lustre nearing bone
.50 Coal: hard, bright banded, (50% vitreous)
.06 Coal: soft, dull
.38 Coal: hard, dull banded, (30% vitreous)
.31 Coal: hard, bright banded, (60% vitreous)
.21 Coal: dull banded, soft (30%-40% vitreous)
.07 Coal: bone, hard, dirty
.51 Coal: hard, bright banded, (60-70% vitreous)
.29 Coal: hard, dull banded, (10% vitreous)
.59 Coal: dull, soft, minor shears, (10% vitreous)
F.W. Mudstone: carbonaceous

Sampled by: Target Tunnelling Ltd.
Logged by: A. Bienia
August 18, 1979

Petro-Canada
MINING DEPARTMENT

MONKMAN COAL PROJECT

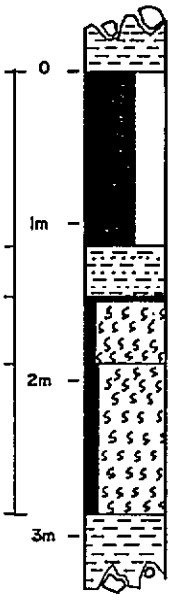
ADIT 79-1, SEAM B4
Sampled Intervals

Date Nov. 14, 1979
Revised
Author A. Bienia
Drafted edy
Scale 1:50

FIGURE 12

CHANNEL SAMPLE

Dry	FSI	Sample No.
3.8 %	8 1/2	1357
23.9 %	9	1358
44.2 %	5 1/2	1359
5.7 %	9	1360



LITHOLOGY

H.W. Mudstone : hard carbonaceous

1.13 Coal : hard , bright banded , (60% vitreous) pyrite lenses

.32 Coal : moderately hard , dirty to bone coal
.02 Mudstone : carbonaceous

.39 Coal : soft , dull , sheared

1.00 Coal : moderately hard, dullbanded, sheared, (10% vitreous)

F.W. Mudstone : carbonaceous

Sampled by: Target Tunnelling Ltd.
Logged by : A. Bienia
August 27, 1979

Petro-Canada
MINING DEPARTMENT

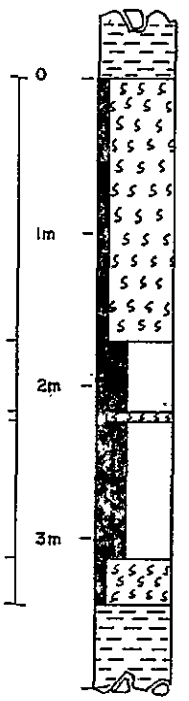
MONKMAN COAL PROJECT

ADIT 79-2, SEAM B1
Sampled Intervals

Date Nov. 14, 1979
Revised
Author A. Bienia
Drafted edy
Scale 1:50

FIGURE 13

CHANNEL SAMPLE			
Dry Ash	FSI	Sample No.	LITHOLOGY
		0	H.W. Mudstone : hard , carbonaceous
21.1 %	7 ½	1361	1.70 Coal: soft , dull , sheared , dirty
		1m	
37.7%	1	1362	.45 Coal : hard , metallic lustre , dull bright
		2m	
17.2%	1	1363	.11 Coal : soft , sheared
19.4%	2	1364	.87 Coal : dull bright , moderately hard
		3m	
51.5%	1 ½	1365	.30 Coal: very soft , dull , dirty
			F.W. Mudstone : hard, carbonaceous



Sampled by: Target Tunnelling Ltd.
Logged by: W. Nyysola
September 30, 1979

Petro-Canada
Mining Department

MONKMAN COAL PROJECT

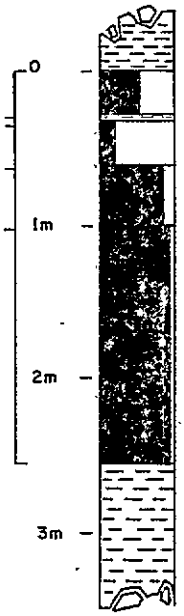
ADIT 79-3, SEAM B5
Sampled Intervals

Date Nov. 14, 1979
Revised
Author W. Nyysola
Drafted edy
Scale 1:50

FIGURE 14

CHANNEL SAMPLE

Dry Ash	FSI	Sample No.
18.9 %	2	1366
23.5 %	1/2	1367
4.1 %	5	1368
19.4 %	4	1369



LITHOLOGY

H.W. Mudstone : carbonaceous , hard

.27 Coal : bright banded , hard (50% vitreous)
.05 Mudstone : carbonaceous
.28 Coal : metallic lustre , vitrain lenses

.41 Coal : bright banded , sheared , (80% vitreous)

1.54 Coal : bright , heavily sheared soft

F.W. Mudstone : carbonaceous

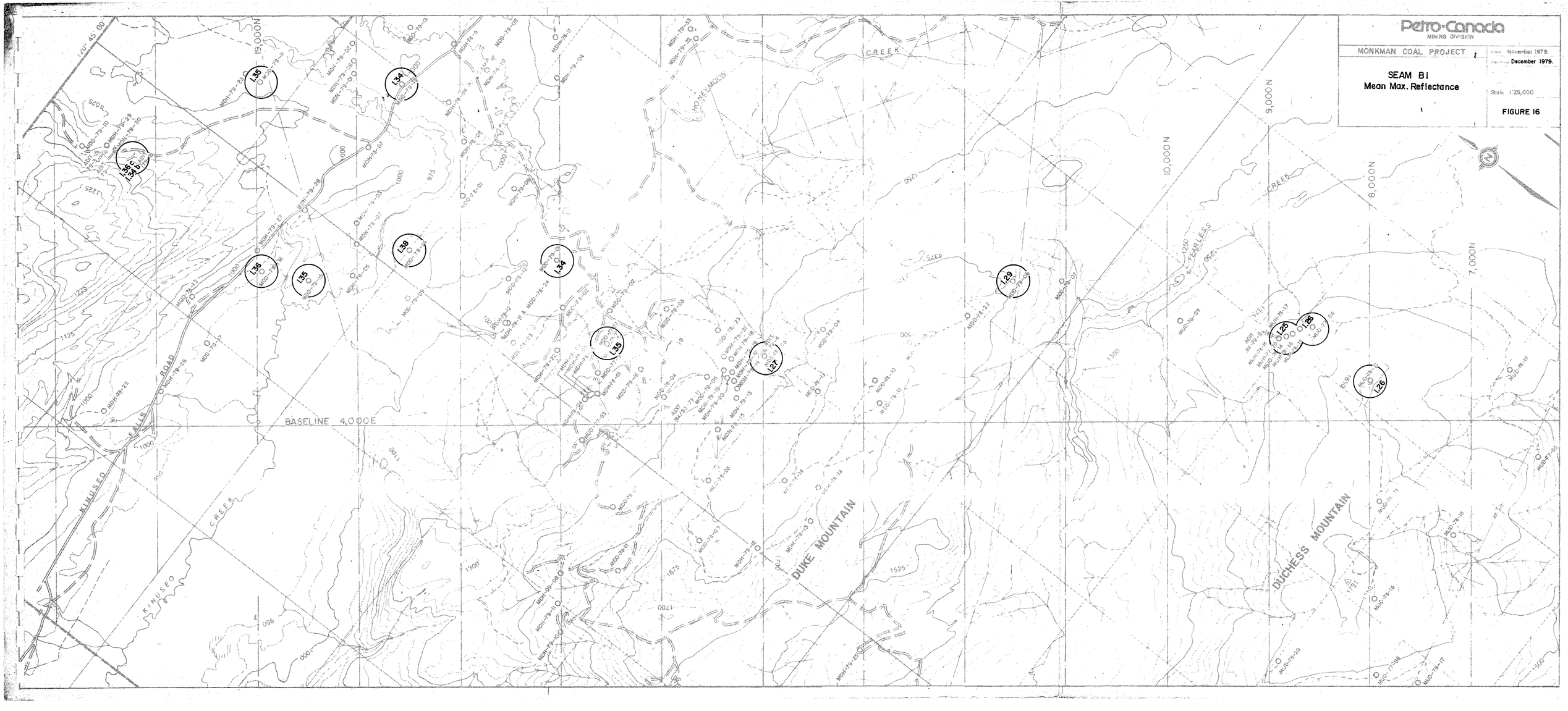
Sampled by : Target Tunnelling Ltd.
Logged by : W. Nyysola
September 30, 1979

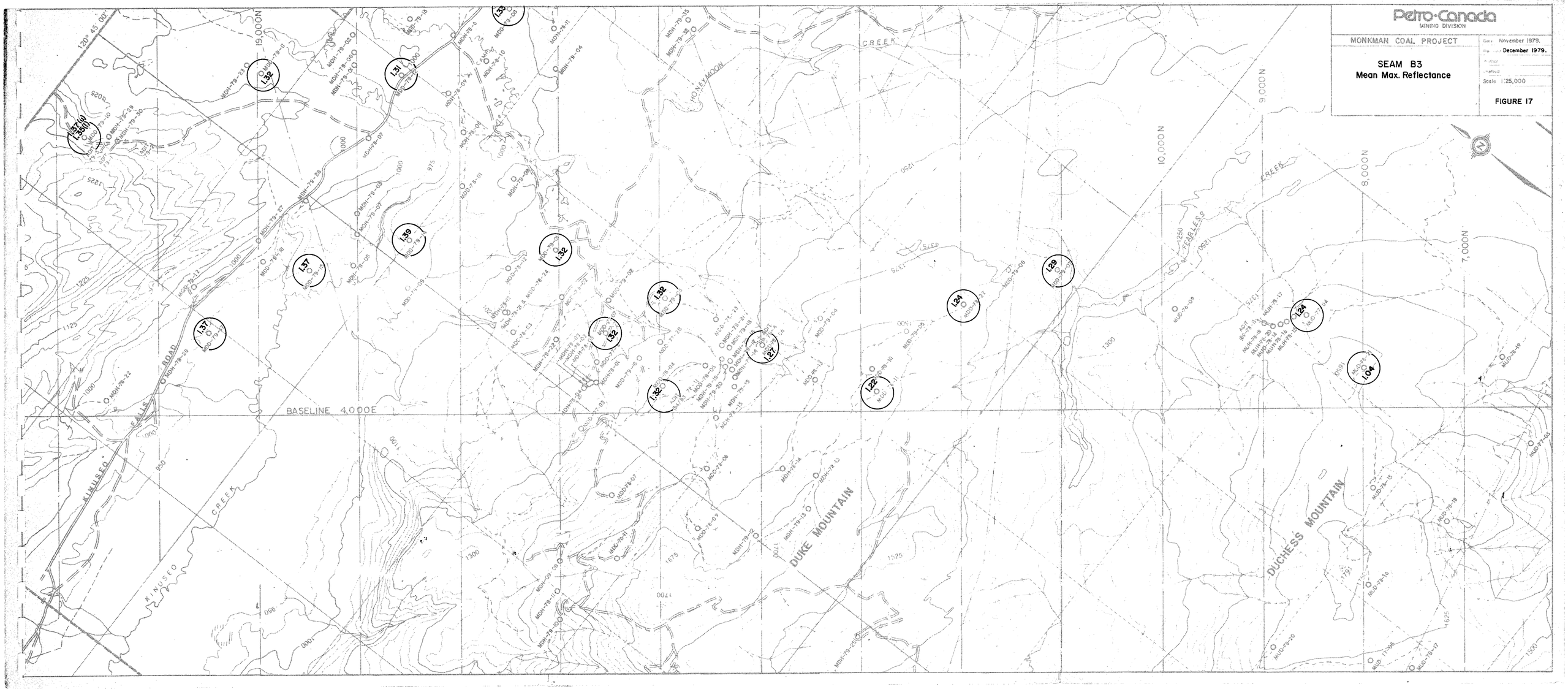
Petro-Canada MINING DEPARTMENT	
MONKMAN COAL PROJECT	Date Nov. 14, 1979
	Revised
	Author W. Nyysola
ADIT 79-4, SEAM B9 Sampled Intervals	Drafted edy
	Scale 1:50
	FIGURE 15

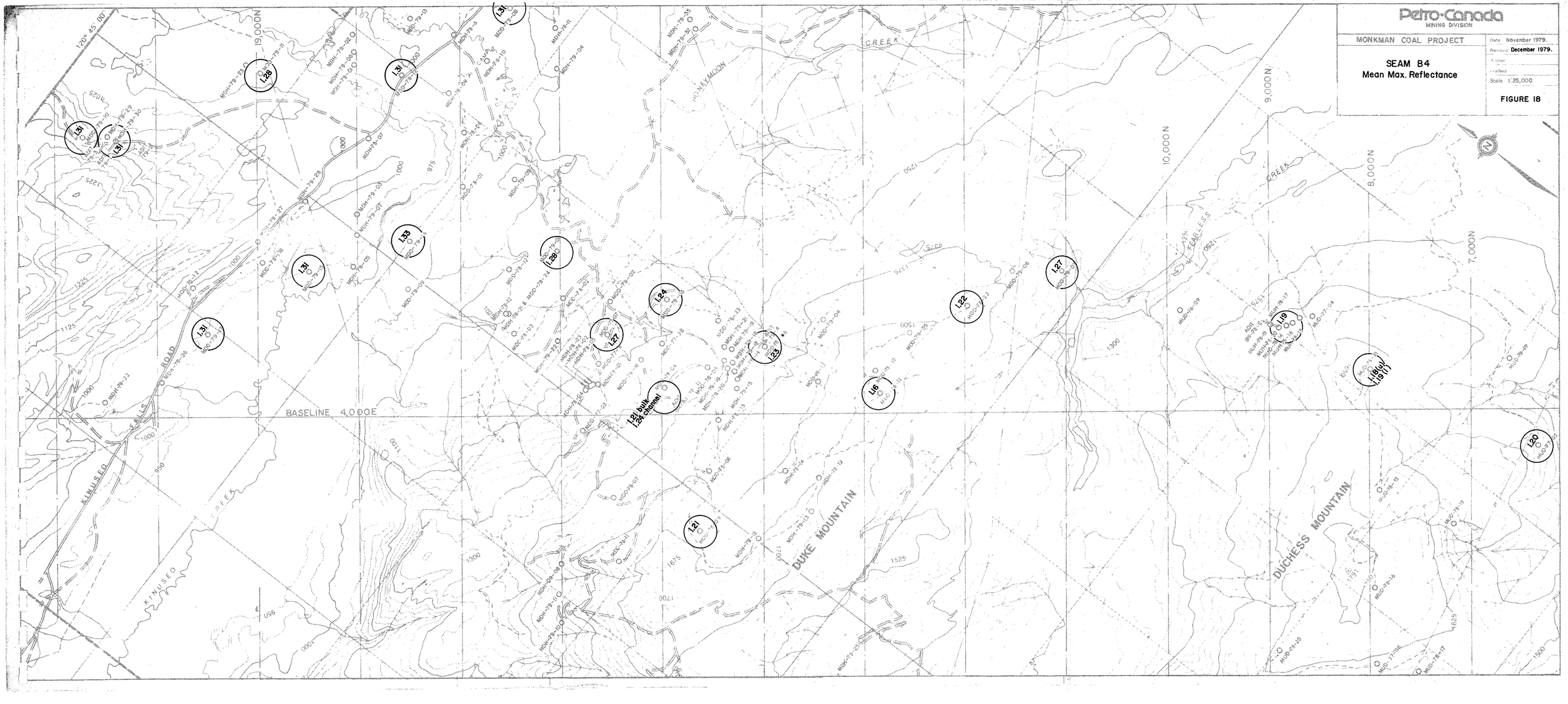
CONCLUSION

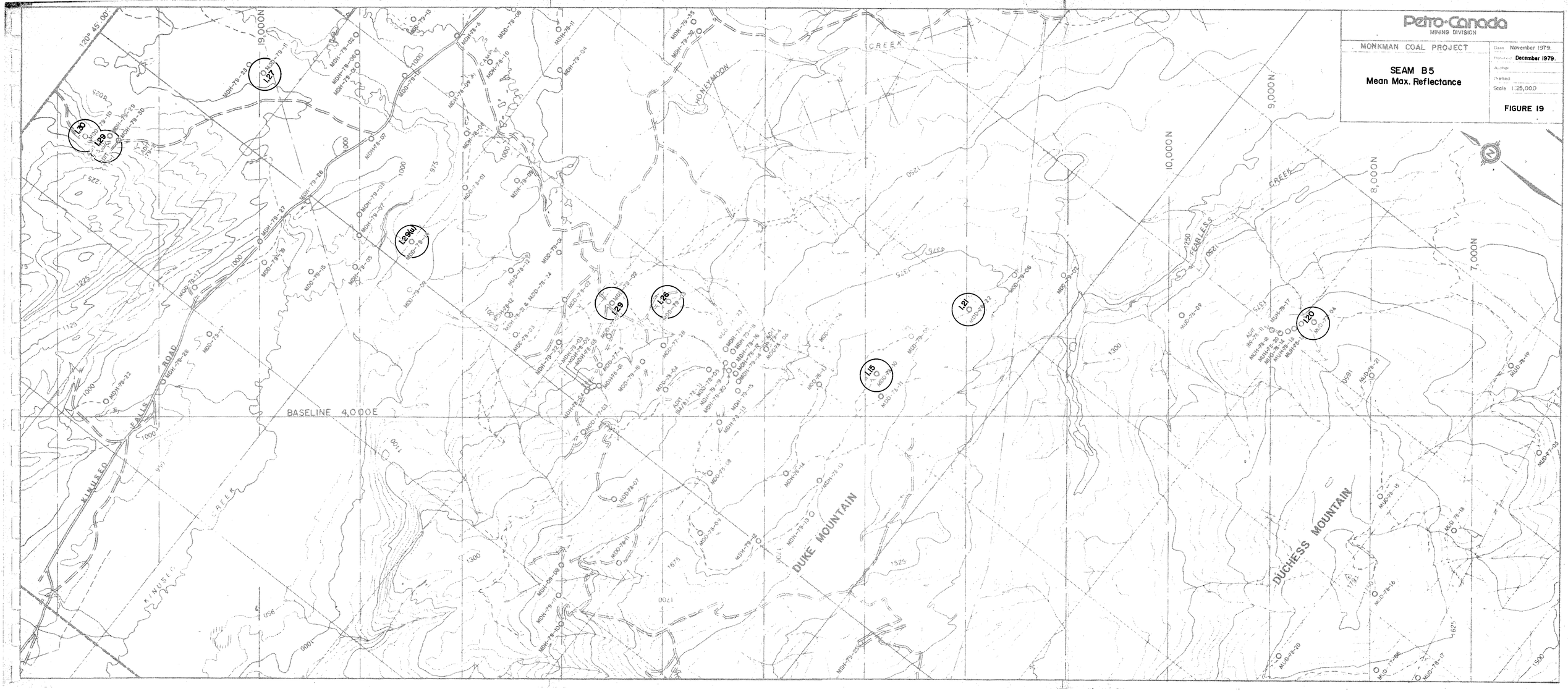
The potential for a 15 year, 3 million tonnes per year operation based on the Duke and Honeymoon Pits is apparent. Further resources are available in various parts of the Duke Mountain Block for later expansion. There is also good potential for thermal coal development on Duchess Mountain where Seam B9 is somewhat undesirable metallurgically. The substantial resources of the remainder of the property remain to be adequately evaluated.

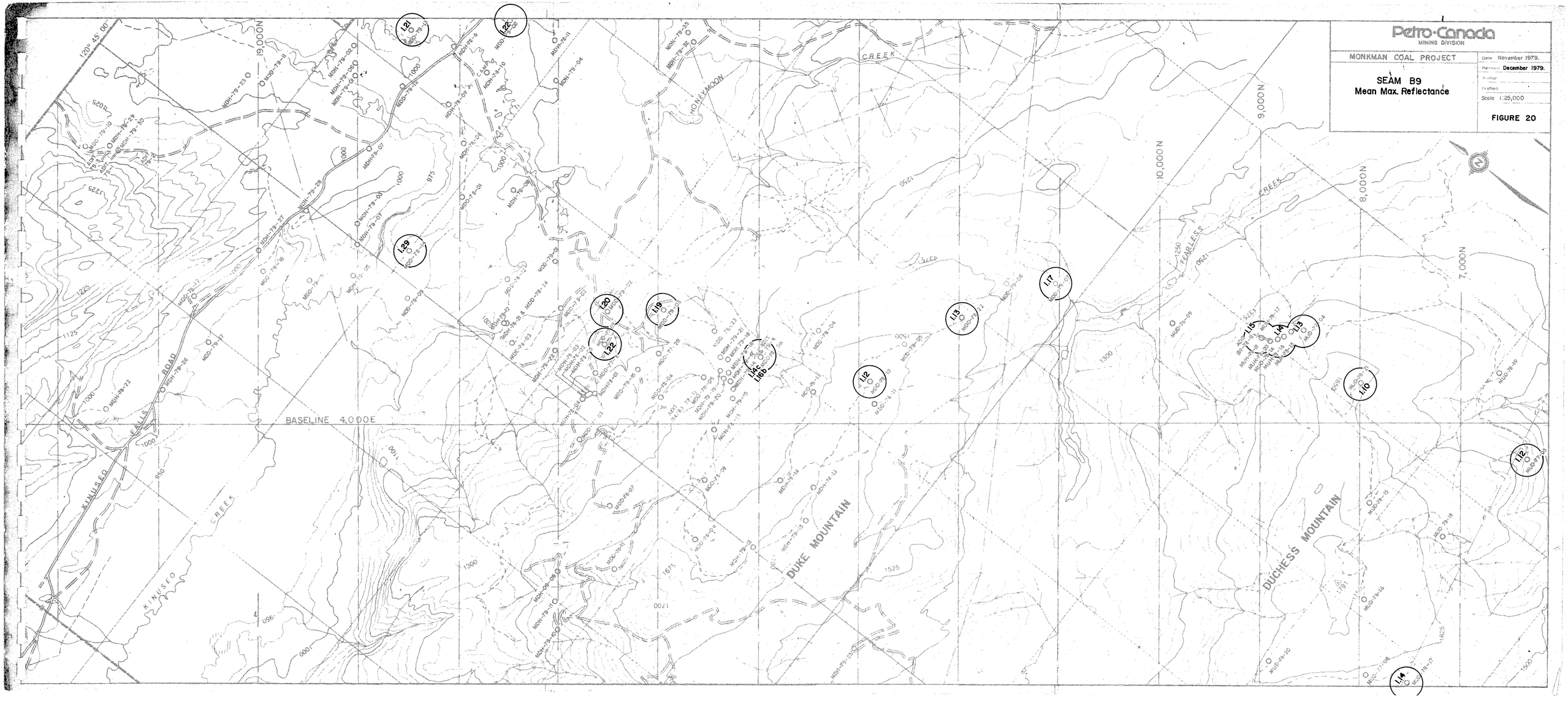
For the immediate future, further refinement of the geological interpretation in the pit areas is required.


Petro-Canada
MINING DIVISION
MONKMAN COAL PROJECT
Date: November 1979.
Revised: December 1979.
SEAM B1
Mean Max. Reflectance
Scale 1:25,000
FIGURE 16
BASELINE 4,000E
19,000N
10,000N
9,000N
8,000N
7,000N
KINUSEO FALLS ROAD
KINUSEO CREEK
HORSEMOUTH CREEK
FEARLESS CREEK
DUKE MOUNTAIN
DUCHESS MOUNTAIN
1.35
1.34
1.36
1.38
1.29
1.28
1.26
1.27


Petro-Canada
MINING DIVISION
MONKMAN COAL PROJECT
SEAM B3
Mean Max. Reflectance
Date: November 1979.
File: December 1979.
Author:
Checked:
Scale 1:25,000
FIGURE 17
BASELINE 4,000E
19,000N
10,000N
9,000N
8,000N
7,000N
KINUSEO CREEK
KINUSEO FALLS ROAD
HONEYMOON CREEK
FEARLESS CREEK
DUKE MOUNTAIN
DUCHESS MOUNTAIN


Petro-Canada
MINING DIVISION
MONKMAN COAL PROJECT
SEAM B4
Mean Max. Reflectance
Date November 1979.
Revised December 1979.
Scale 1:25,000
FIGURE 18
BASELINE 4,000E
10,000N
9,000N
8,000N
7,000N
DUKE MOUNTAIN
DUCHESS MOUNTAIN
KINUSEO FALLS ROAD
KINUSEO CREEK
HUNKEMOON CREEK
FEARLESS CREEK
1.31
1.28
1.33
1.27
1.24
1.23
1.22
1.21
1.19
1.18(w)
1.18(n)
1.16
1.20
1.31 bulk
1.24 channel


Petro-Canada
MINING DIVISION
MONKMAN COAL PROJECT
SEAM B5
Mean Max. Reflectance
Date November 1979.
Revised December 1979.
Drafted
Scale 1:25,000
FIGURE 19
1.30
1.29
1.27
1.29(a)
1.29
1.26
1.21
1.15
1.20
BASELINE 4,000E
9,000N
10,000N
8,000N
7,000N
DUKE MOUNTAIN
DUCHESS MOUNTAIN
KINUSEO CREEK
HONEYMOON CREEK
FEARLESS CREEK
ROAD


Petro-Canada
MINING DIVISION
MONKMAN COAL PROJECT
SEAM B9
Mean Max. Reflectance
Date November 1979.
Plan No. December 1979.
Author
Drafted
Scale 1:25,000
FIGURE 20
BASELINE 4,000E
9,000N
10,000N
8,000N
7,000N
DUKE MOUNTAIN
DUCHESS MOUNTAIN
KINUSEO CREEK
KINUSEO FALLS ROAD
HONEYMOON CREEK
FEARLESS CREEK
CAMP CREEK

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Petro-Canada

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MONKMAN COAL PROJECT

SEAM PROFILES

1979

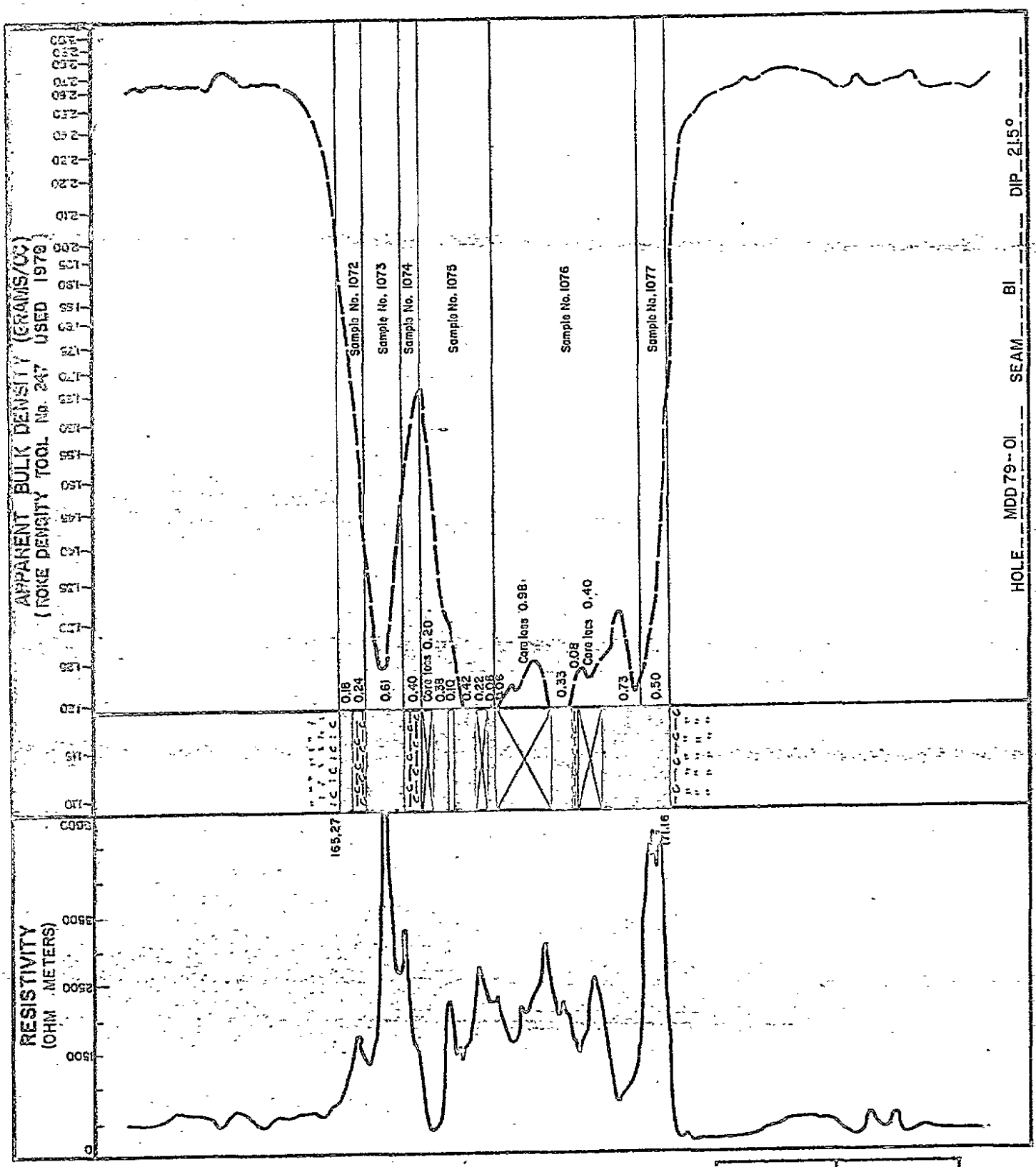
BOOK 1

APPENDIX C

P/C

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT



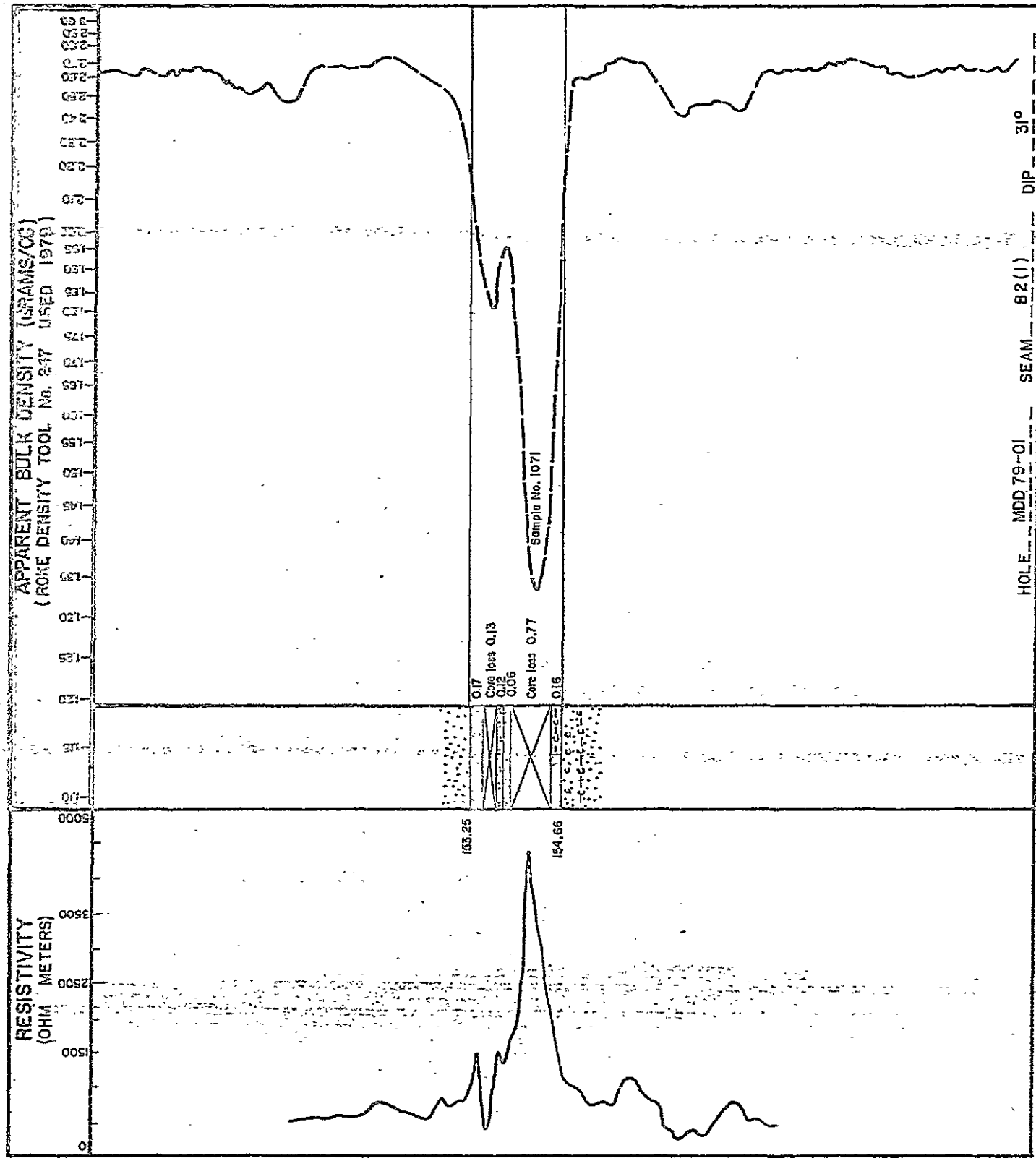
SEAM PROFILE

HOLE	SEAM
MDD79-01	B1

P/C

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

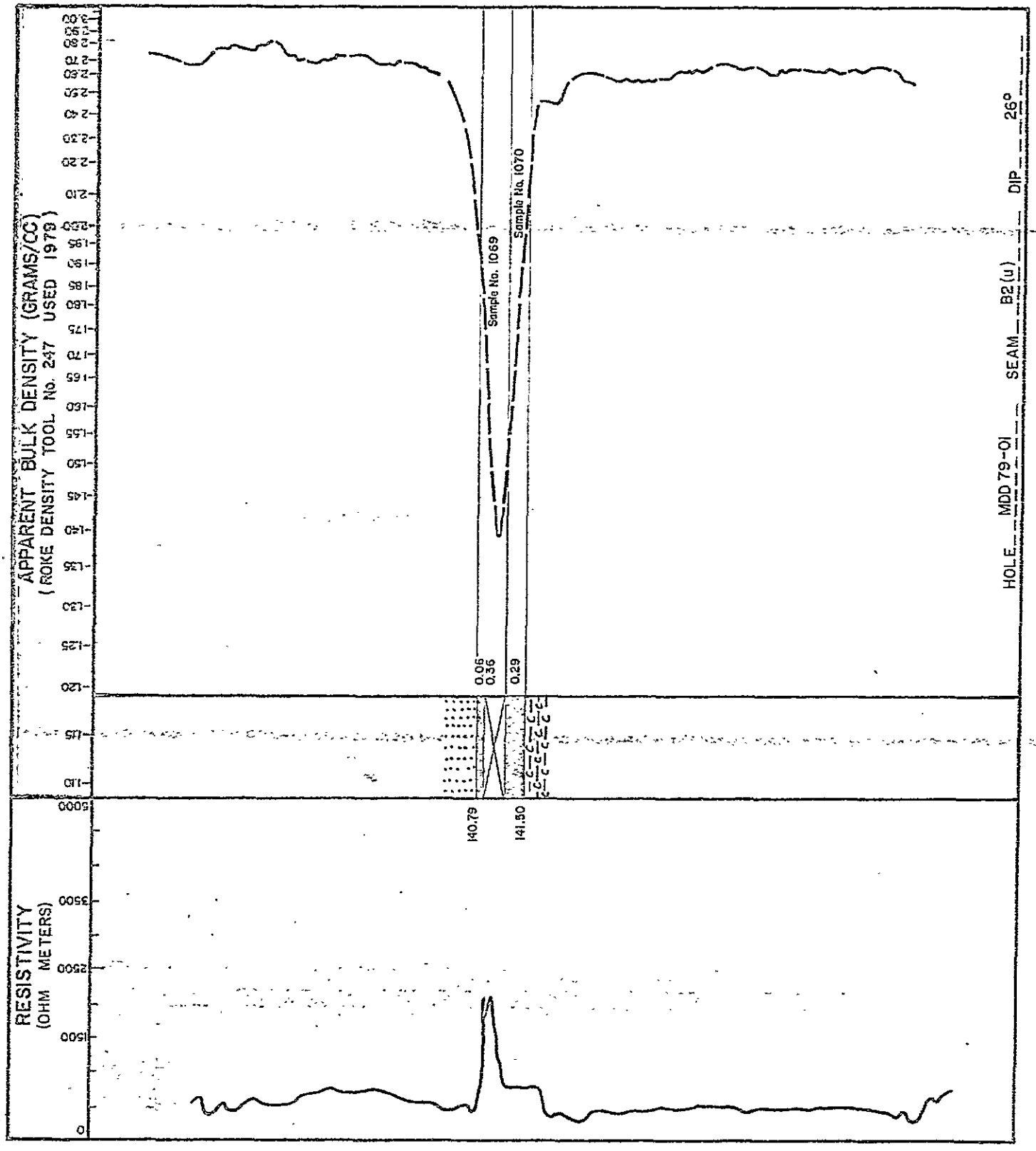


SEAM PROFILE

HOLE	SEAM
MDD 79-01	B2(1)

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

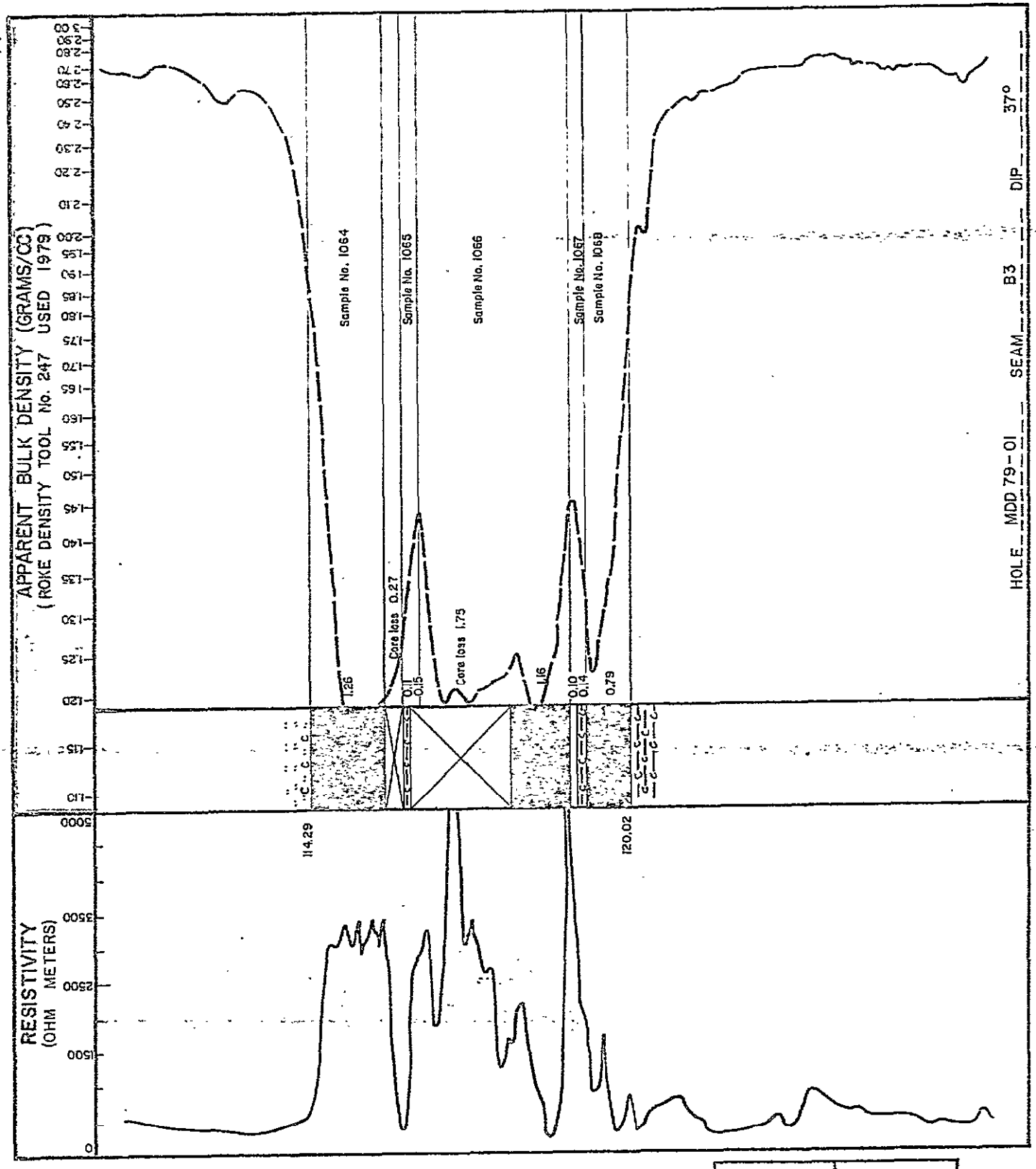


SEAM PROFILE

HOLE	SEAM
MDD 79-01	B2(u)

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

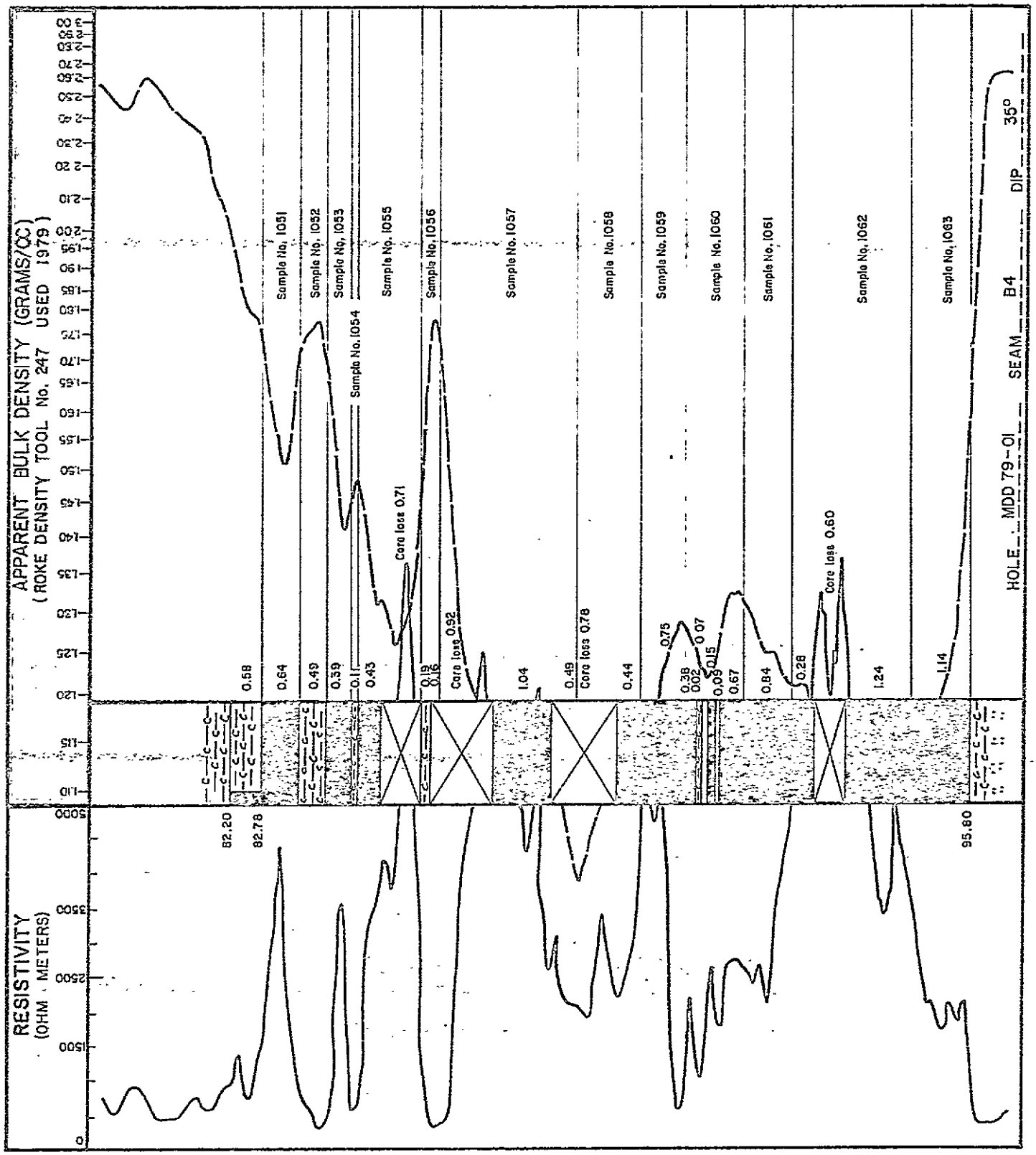


HOLE	SEAM
MDD 79-01	B3

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

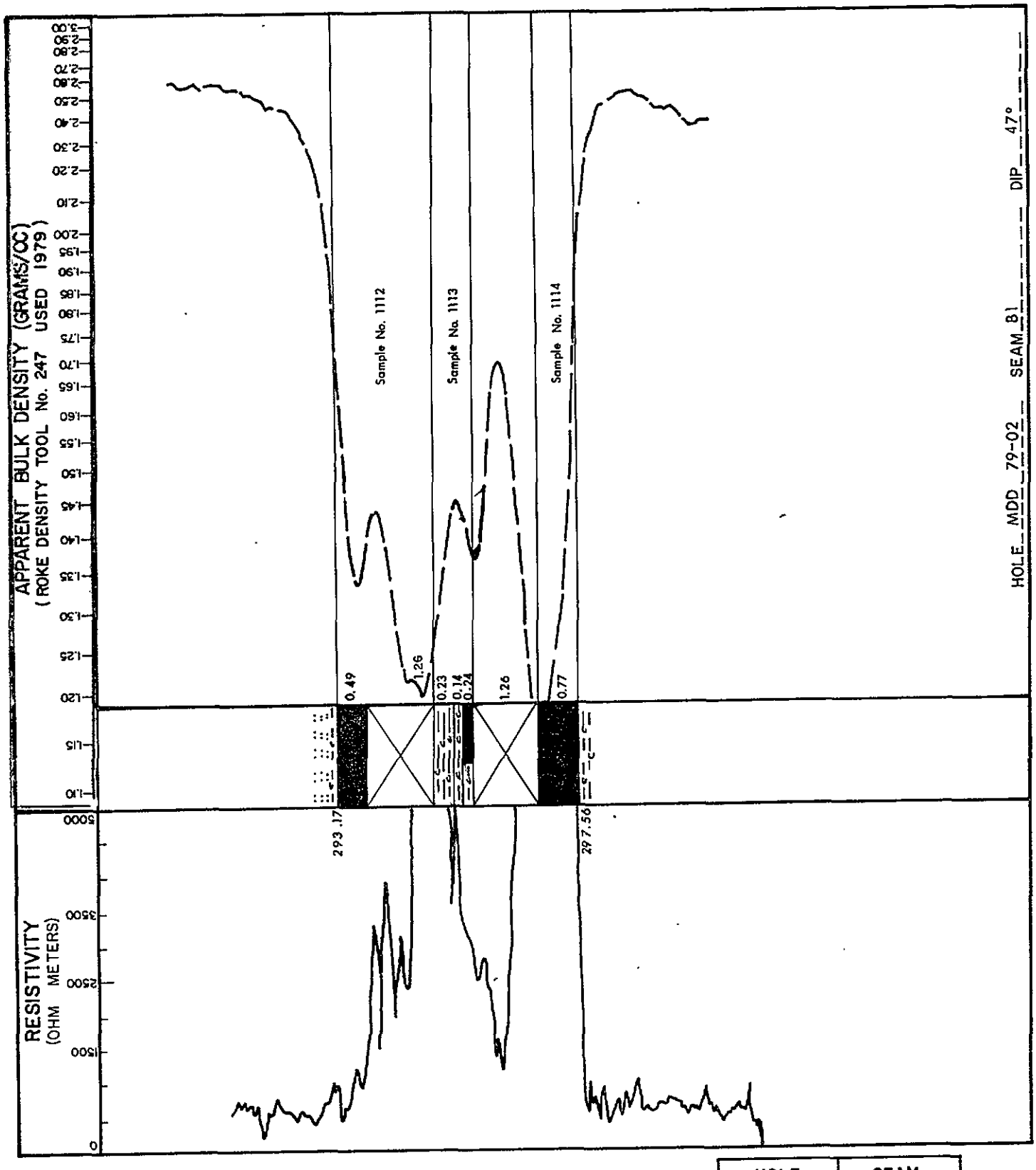


HOLE	SEAM
MDD 79-01	B4

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

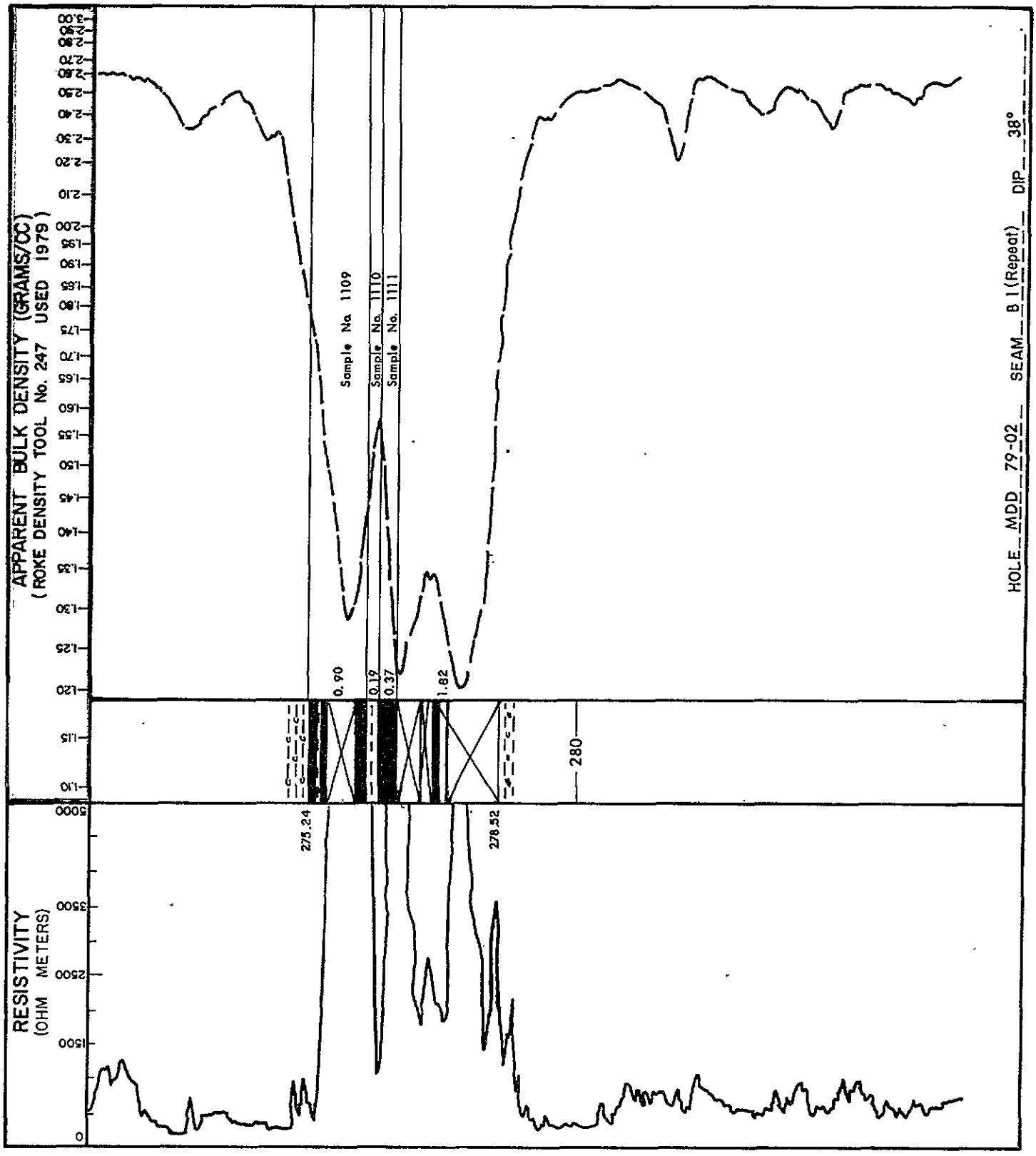


HOLE	SEAM
MDD 79-02	B1

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

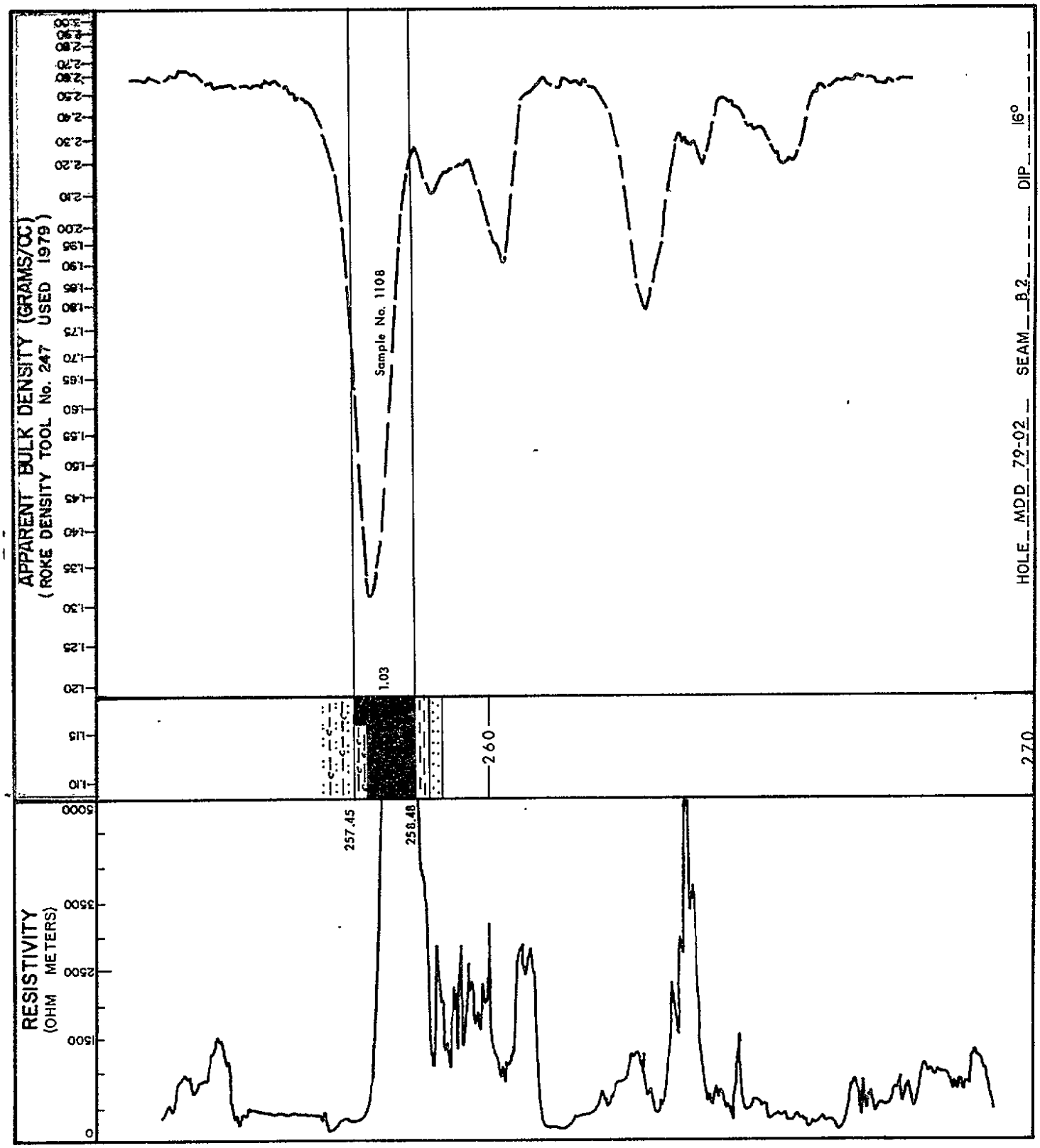


SEAM PROFILE

HOLE	SEAM
MDD 79-02	B1 Repeat

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

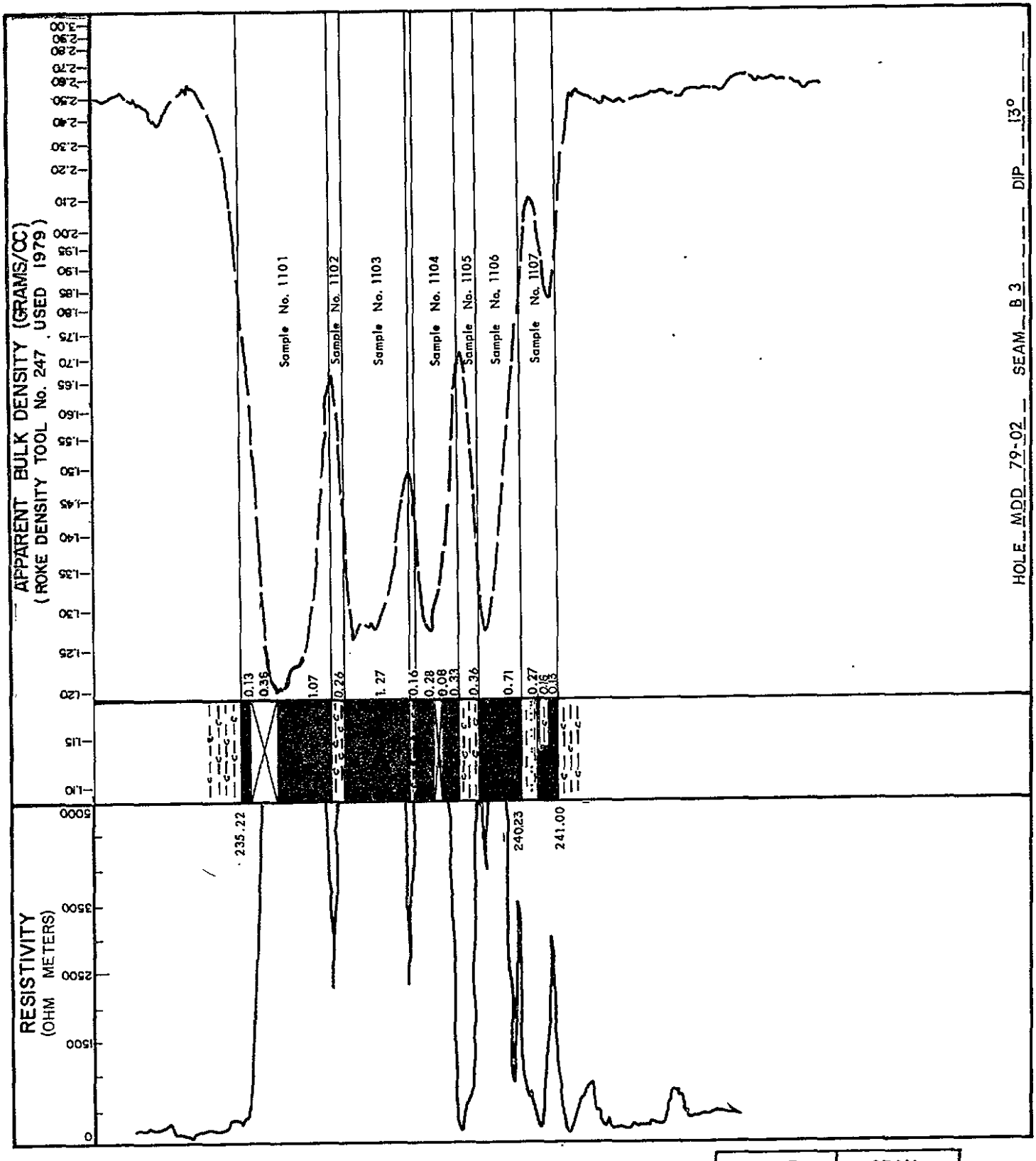


SEAM PROFILE

HOLE	SEAM
MDD 79-02	B2

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

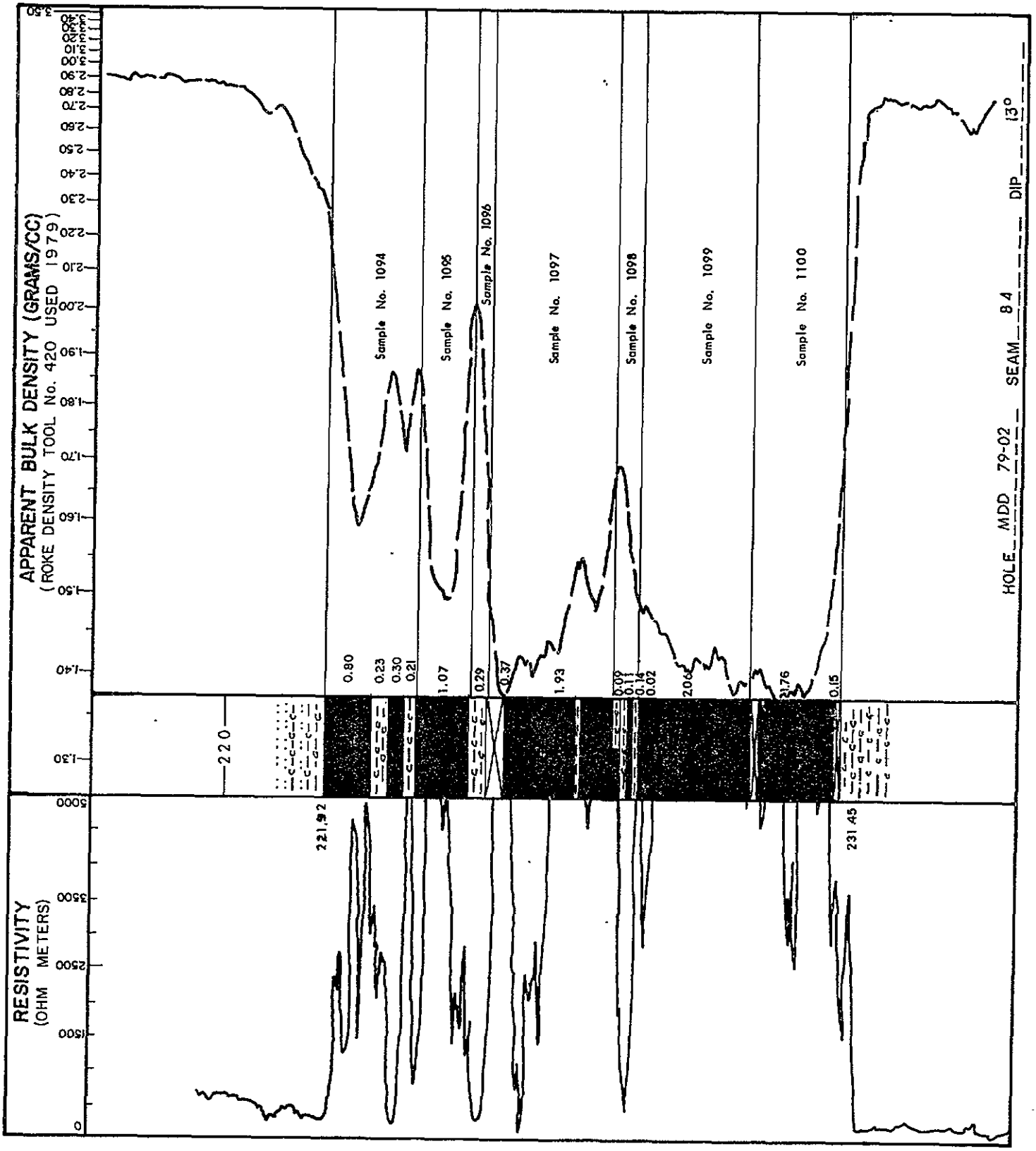


HOLE	SEAM
MDD 79-02	B 3

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

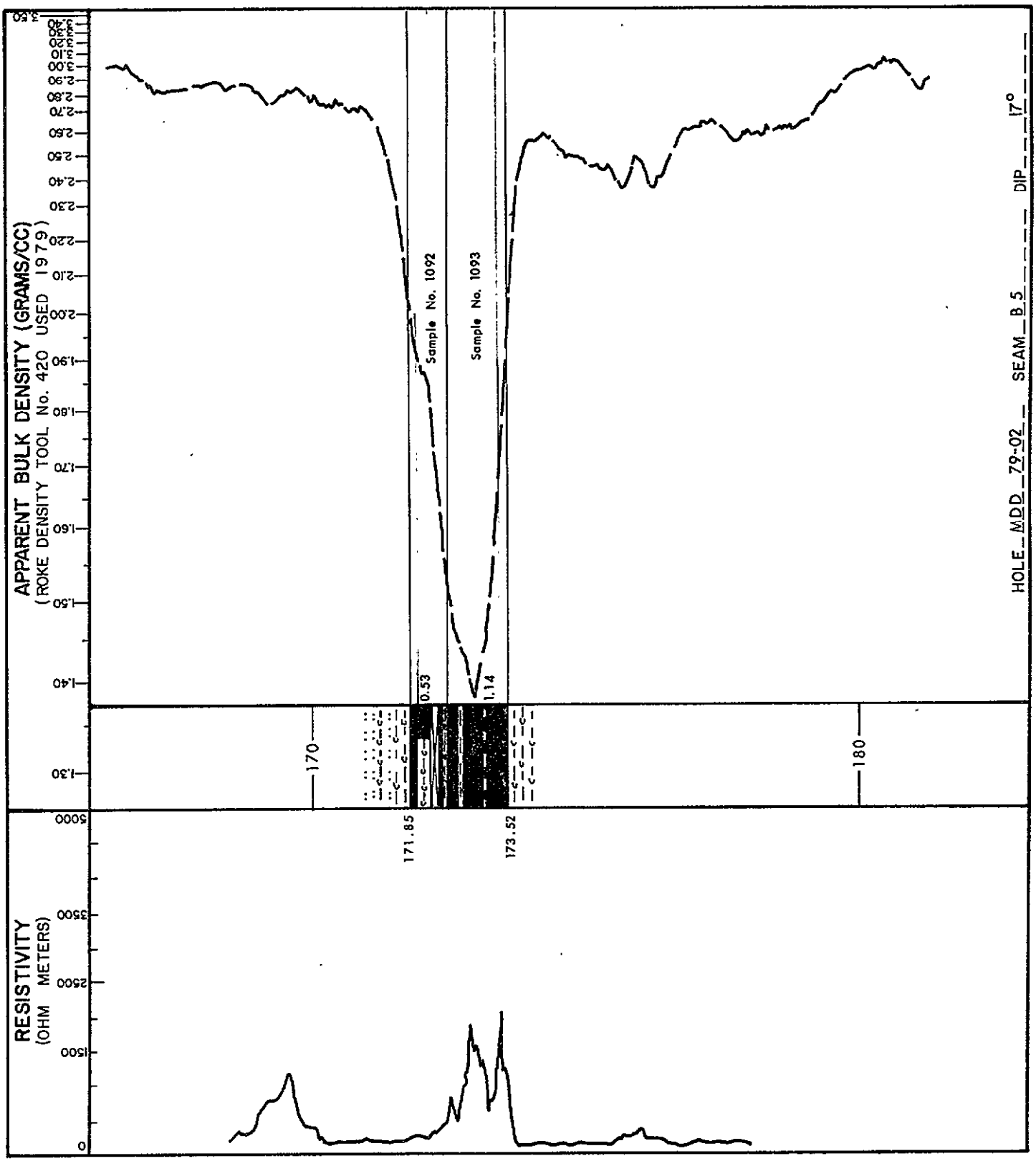


SEAM PROFILE

HOLE	SEAM
MDD 79-02	B 4

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

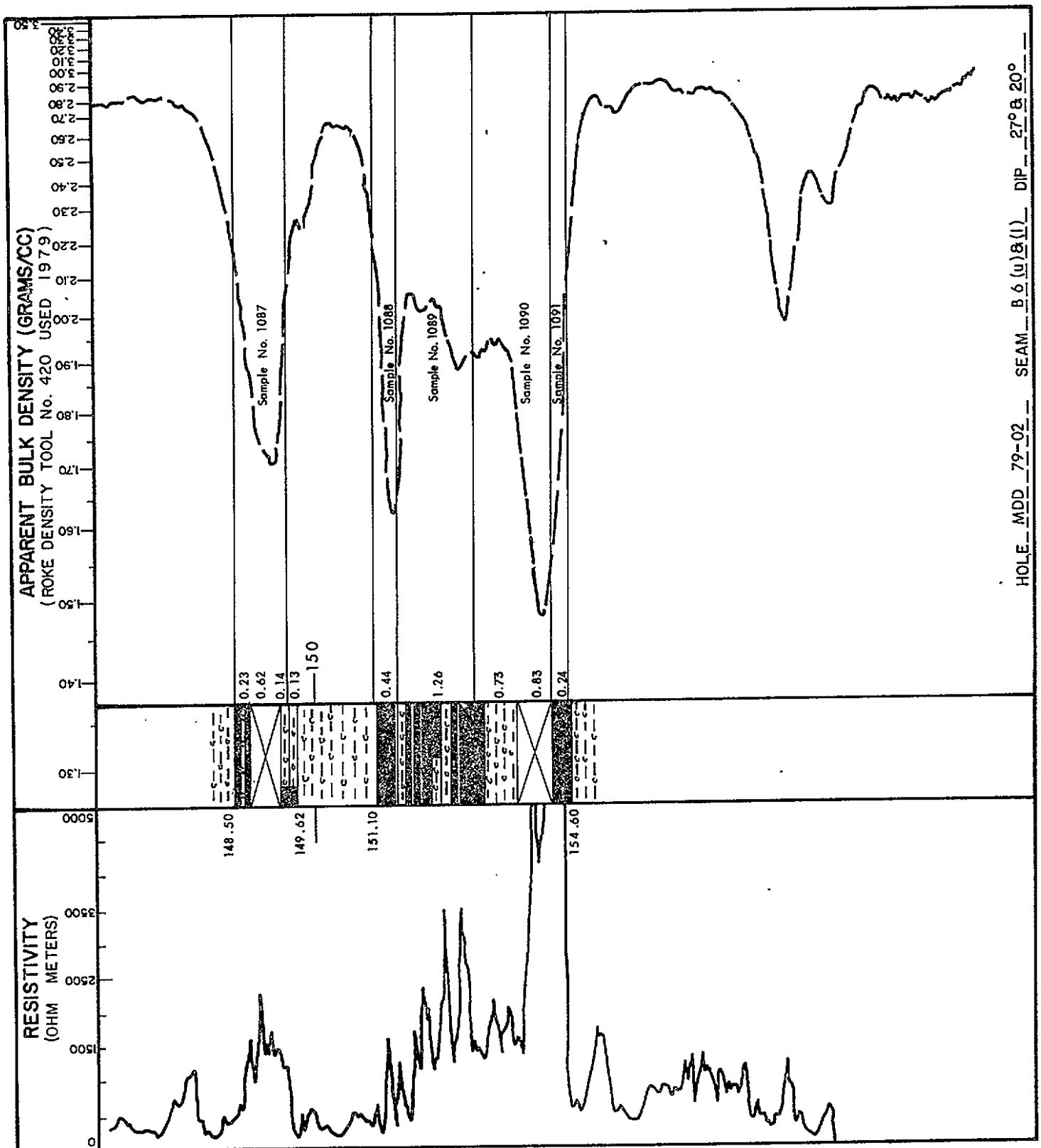


HOLE	SEAM
MDD 79-02	B 5

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

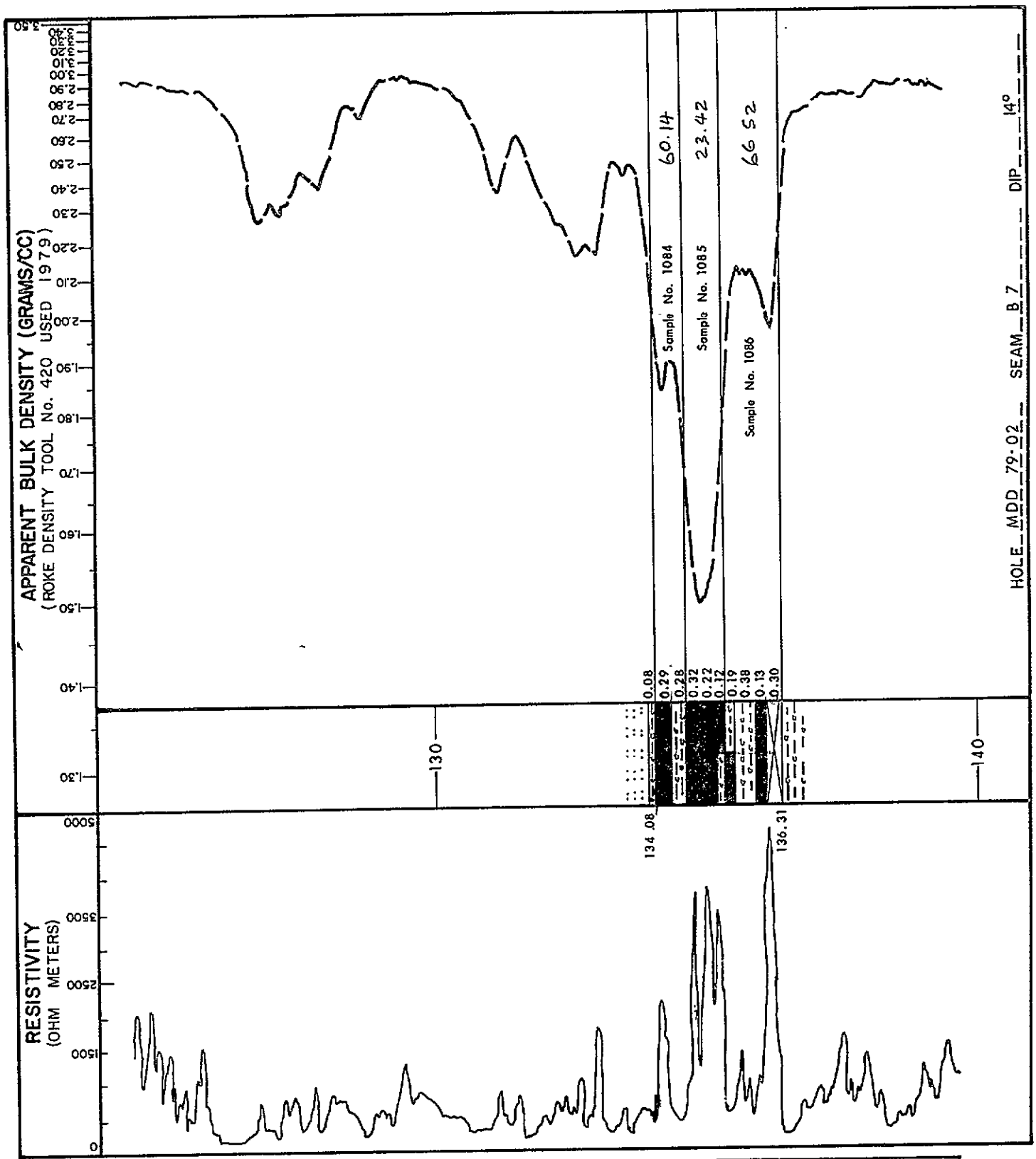


SEAM PROFILE

HOLE	SEAM
MDD 79-02	B 6

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

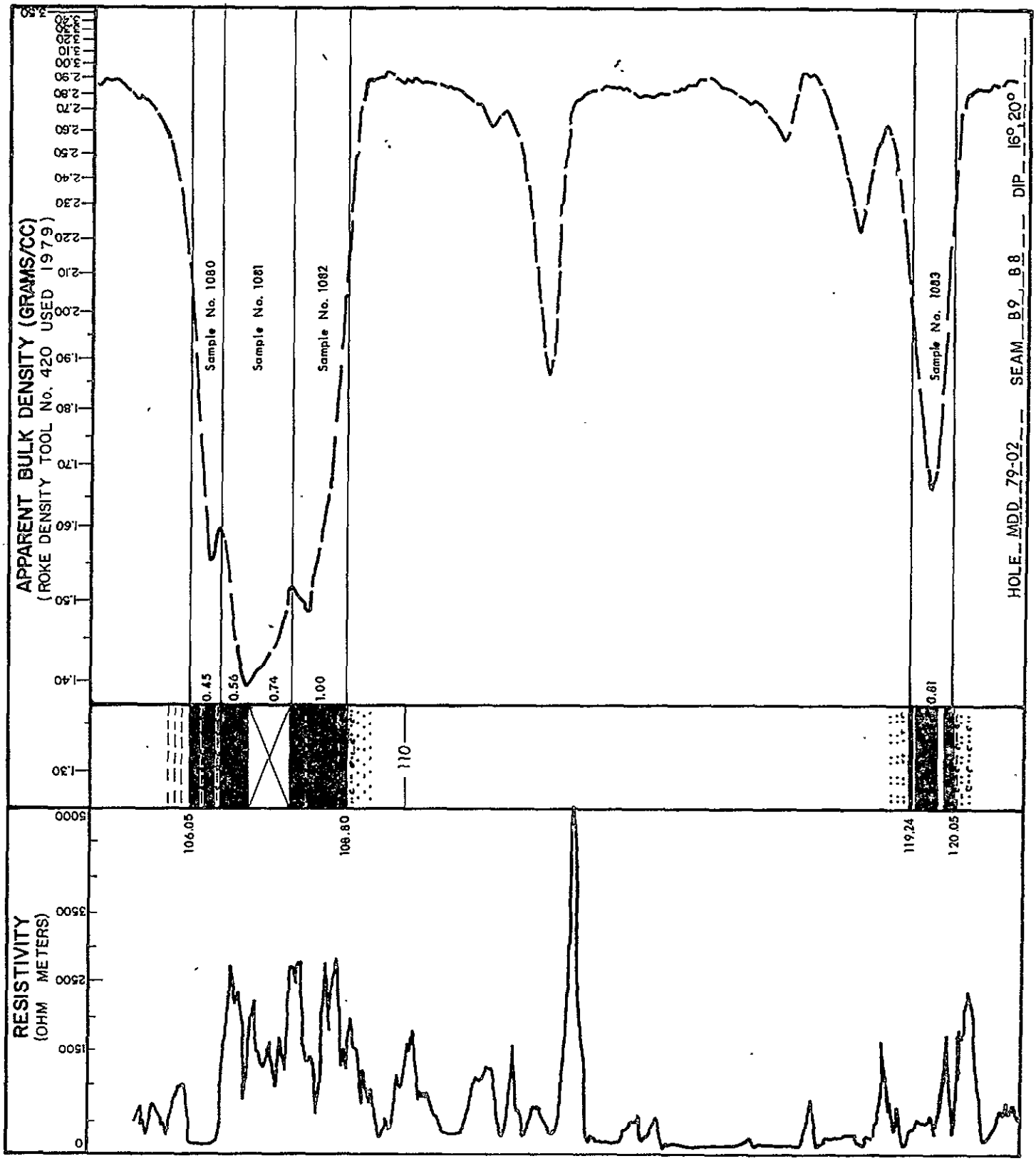


HOLE	SEAM
MDD 79-02	B 7

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

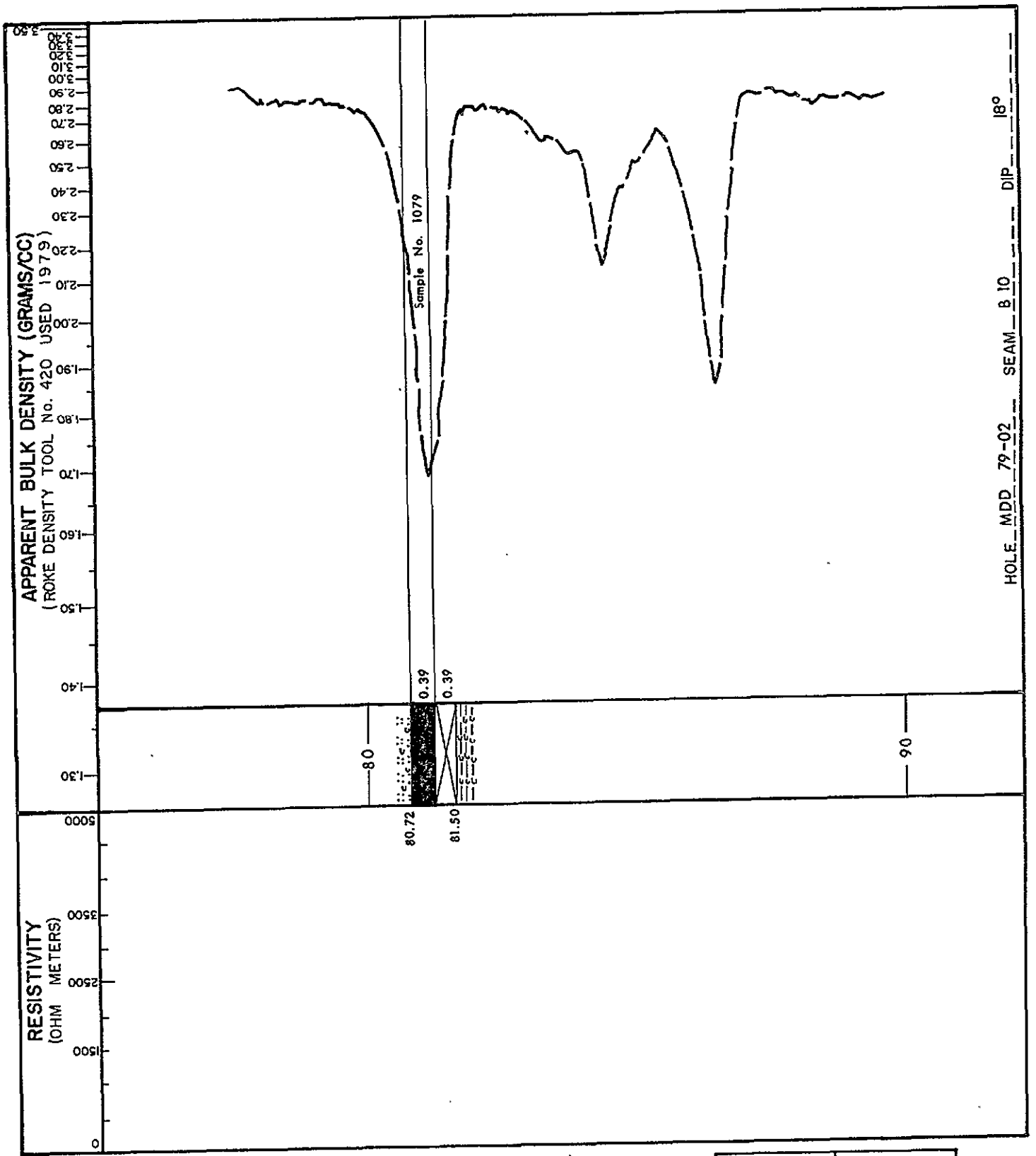


SEAM PROFILE

HOLE	SEAM
MDD 79-02	B9, B8

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

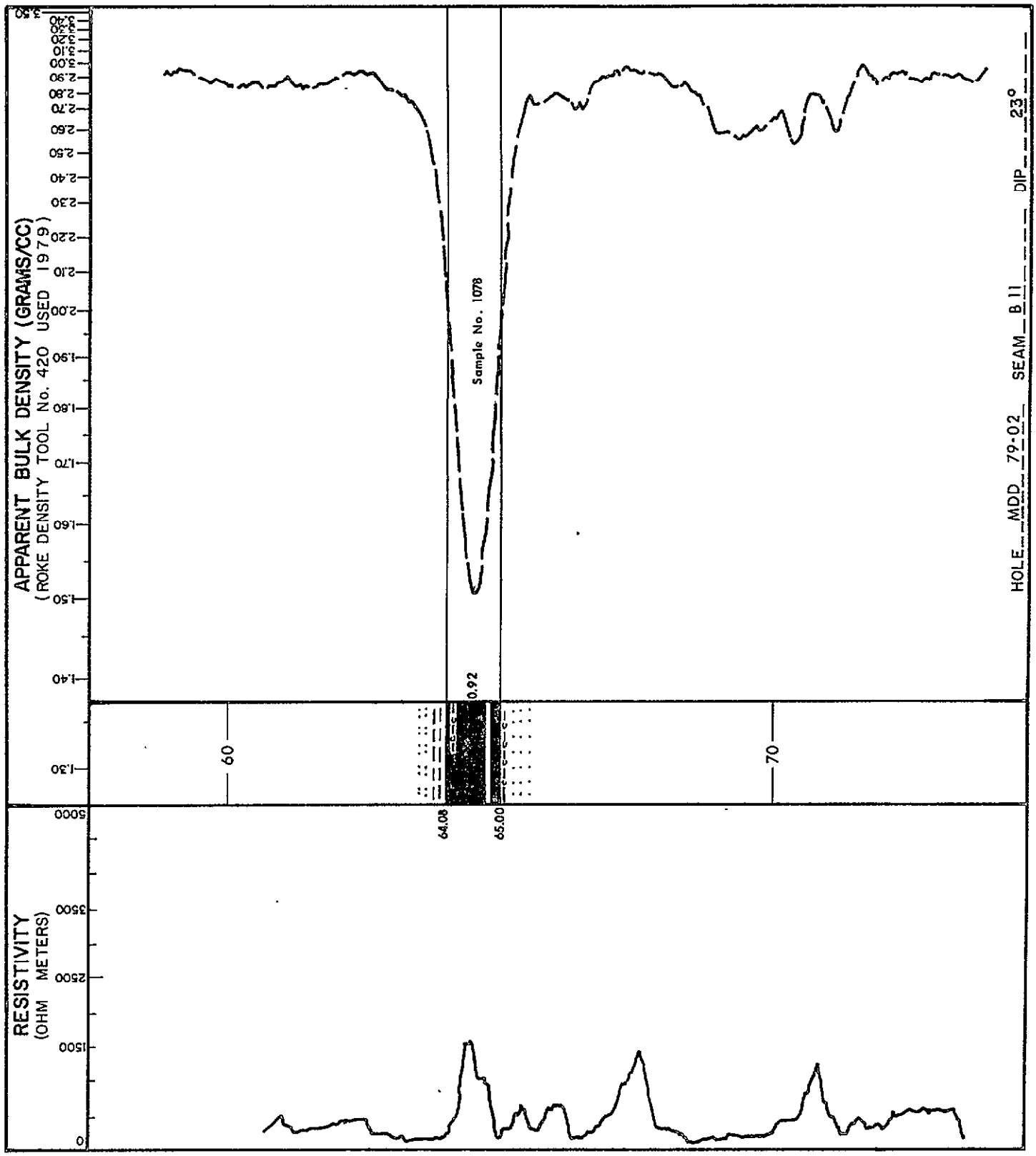


SEAM PROFILE

HOLE	SEAM
MDD 79-02	B 10

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

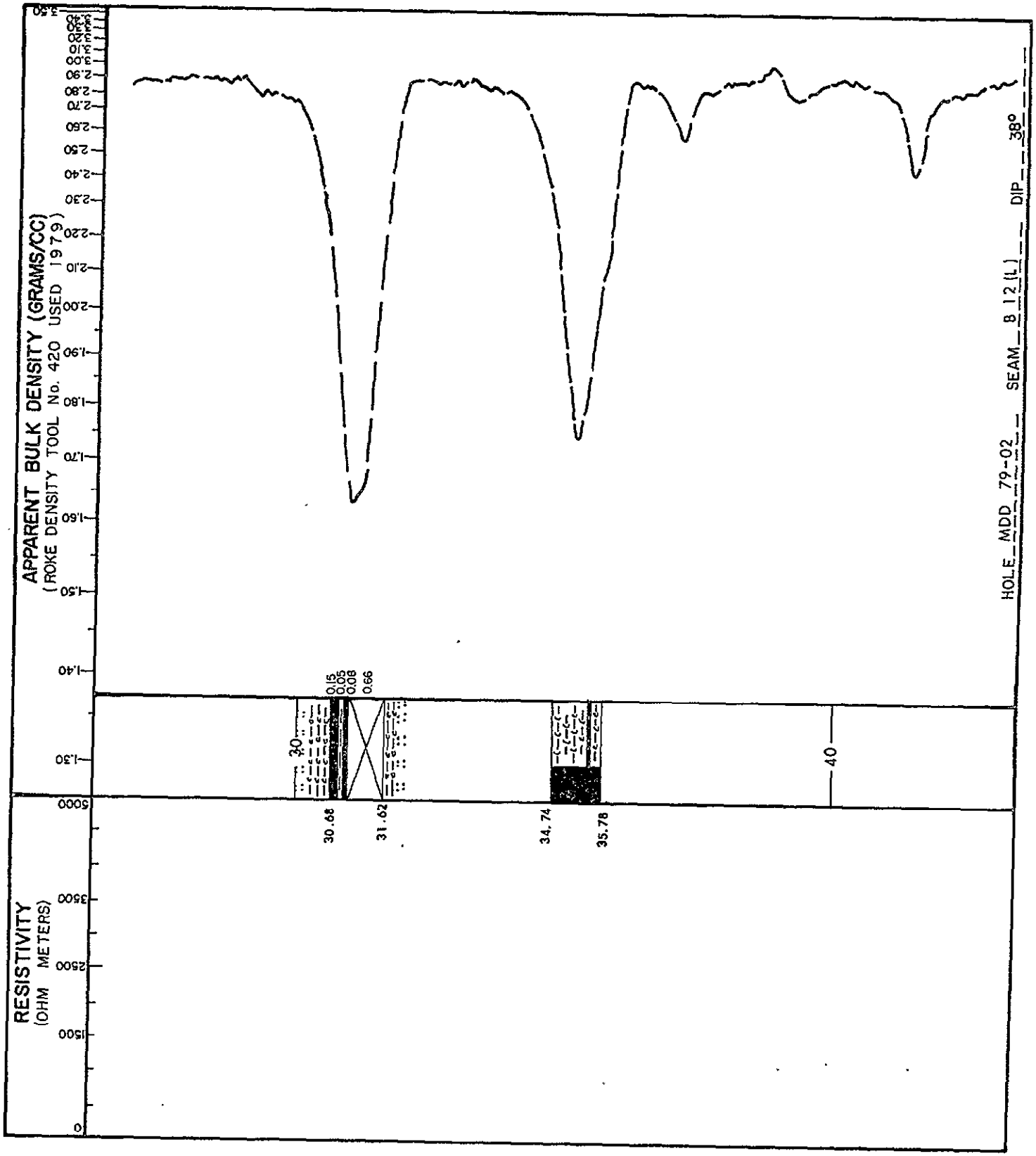


HOLE	SEAM
MDD 79-02	B 11

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

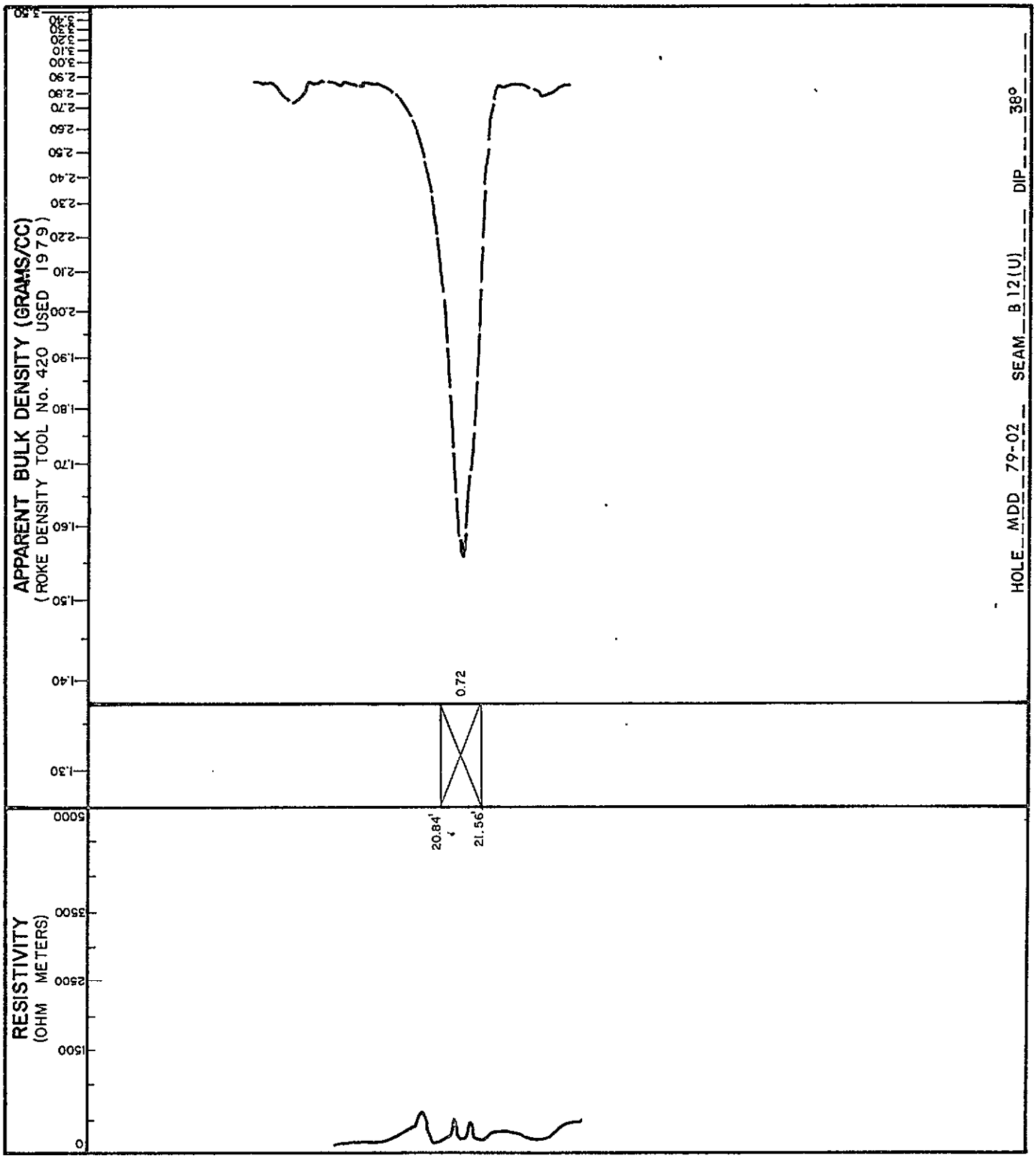


SEAM PROFILE

HOLE	SEAM
MDD 79-02	B 12 (L)

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

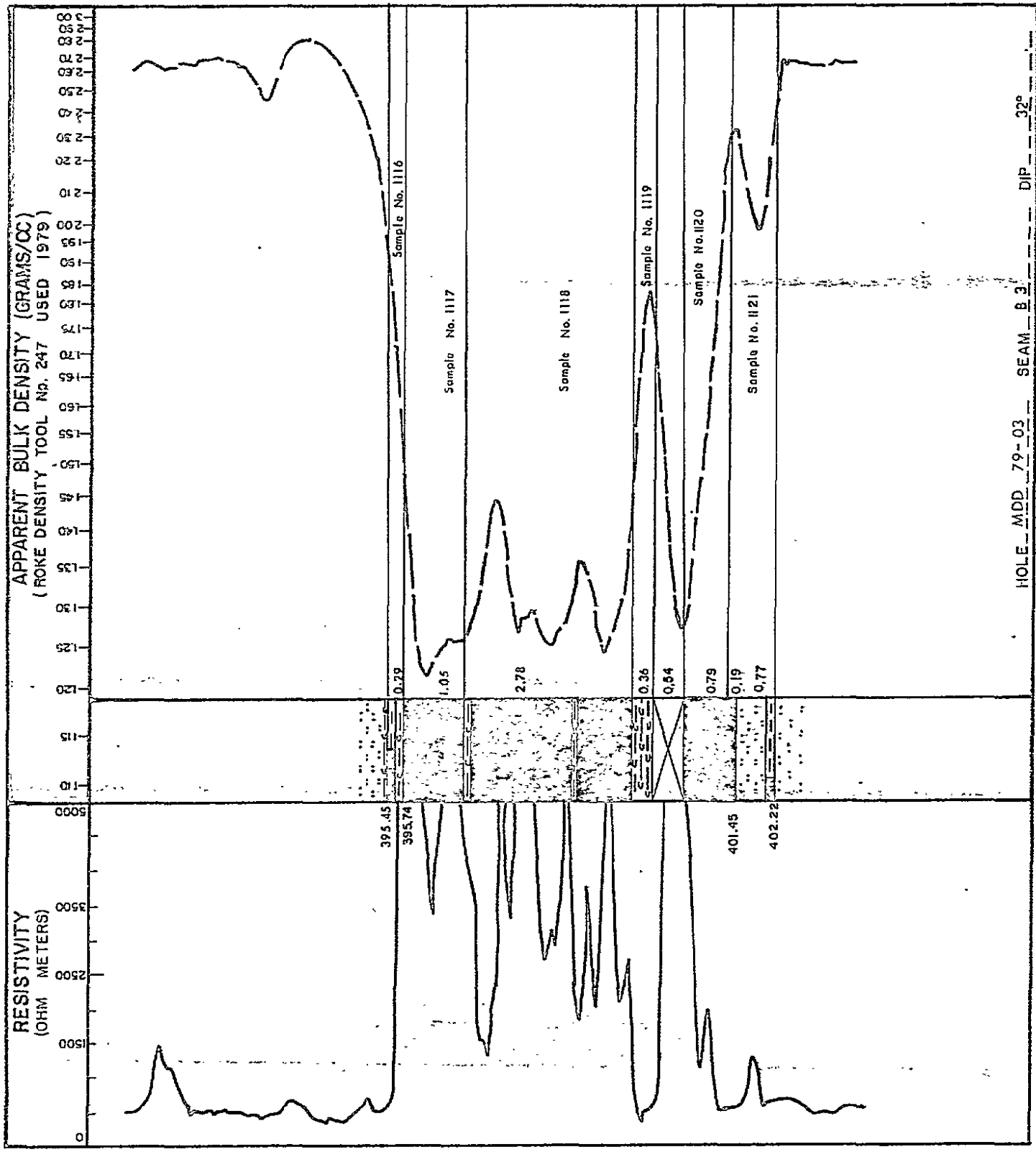


SEAM PROFILE

HOLE	SEAM
MDD 79-02	B12 (U)

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

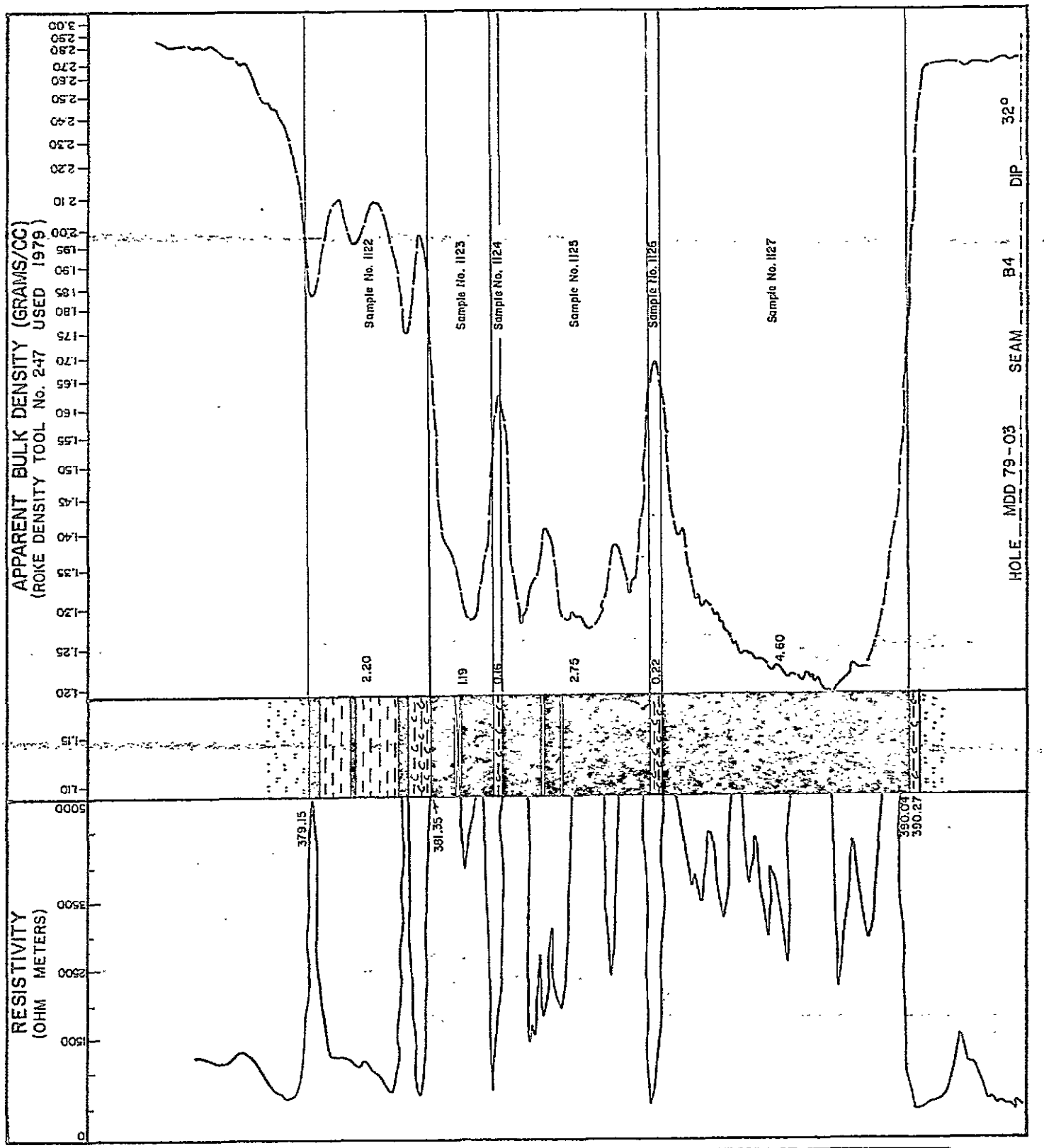


HOLE	SEAM
MDD 79-03	B3

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

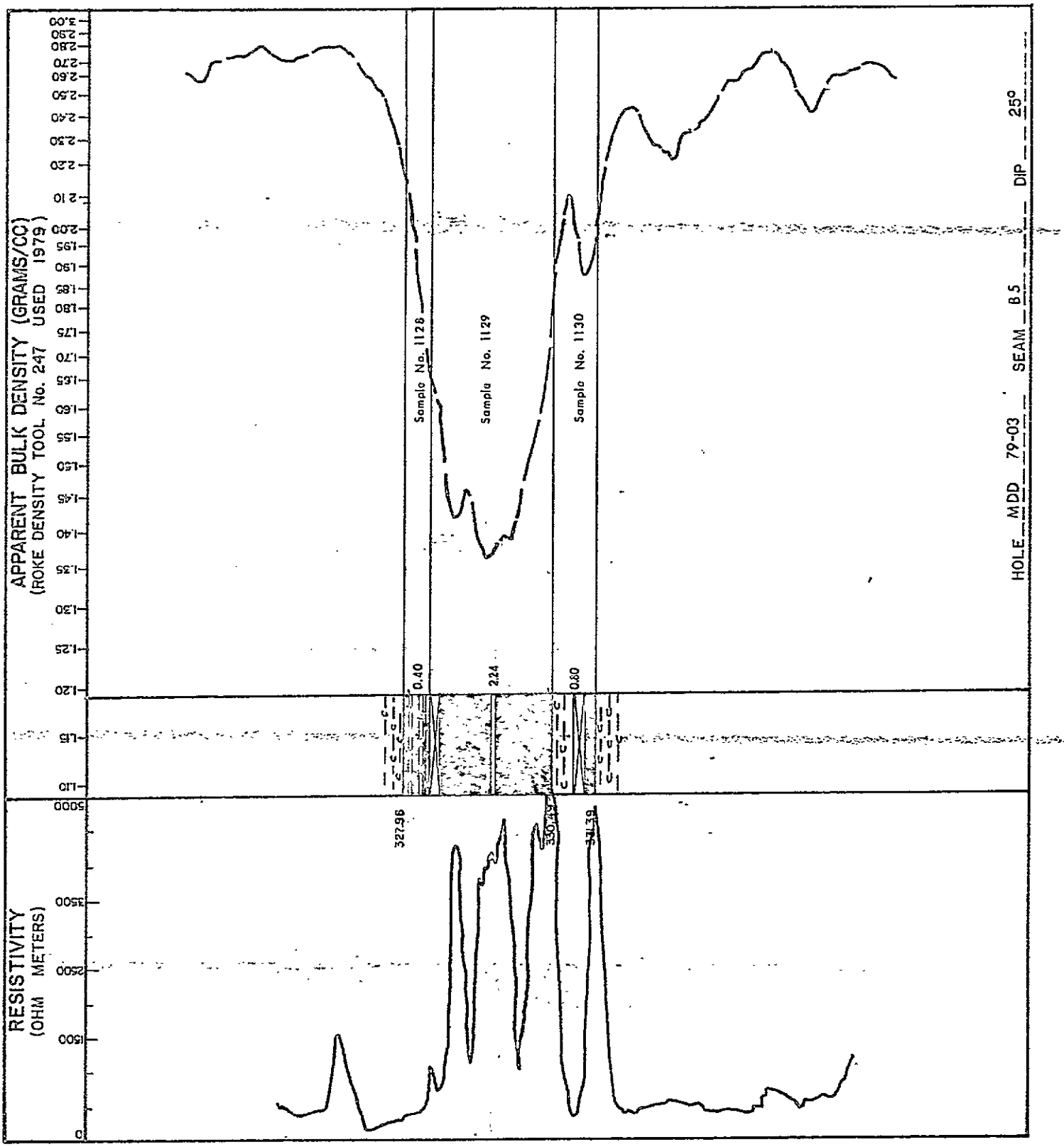


HOLE	SEAM
MDD 79-03	B4

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

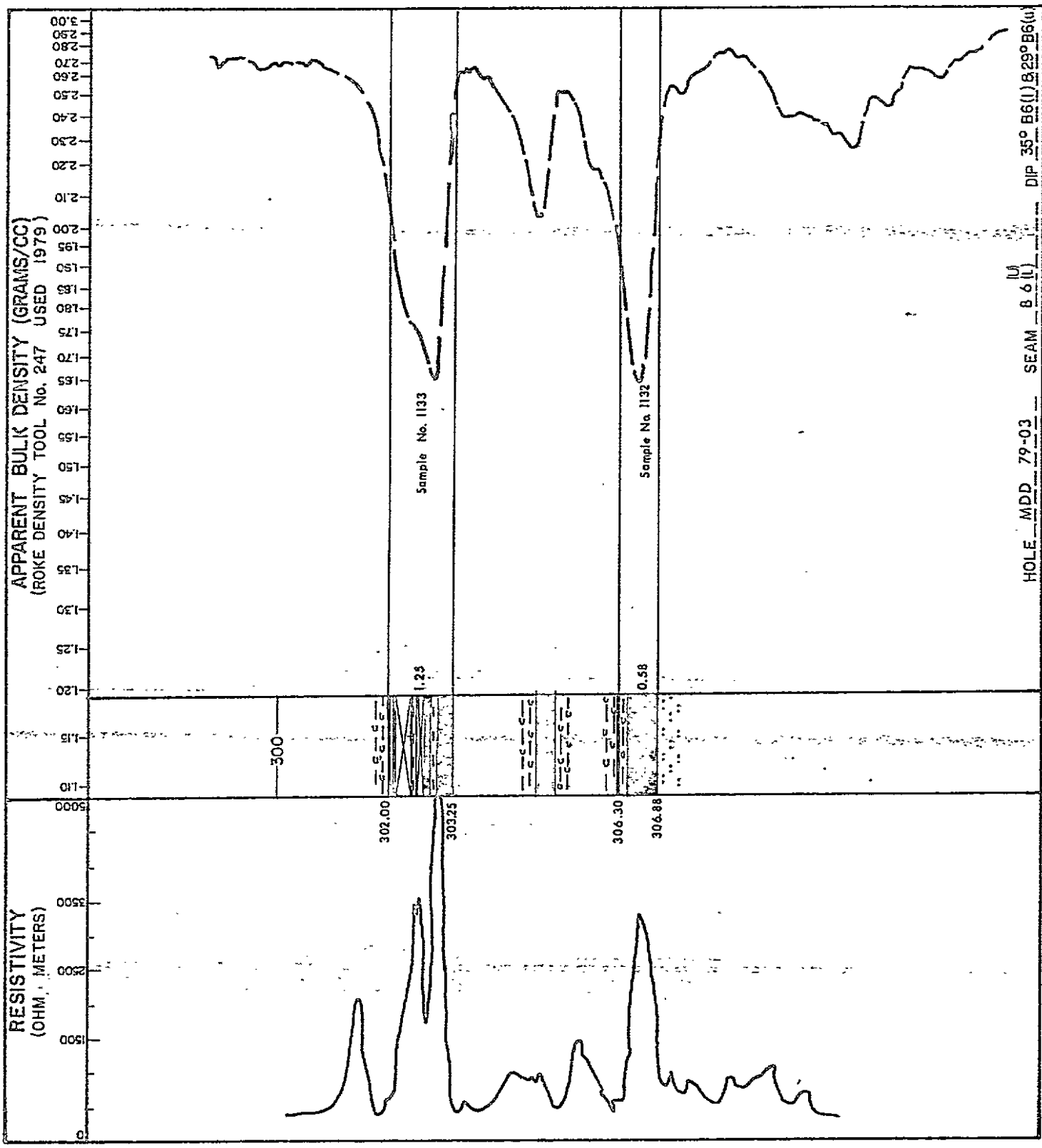


SEAM PROFILE

HOLE	SEAM
MDD 79-03	B5

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

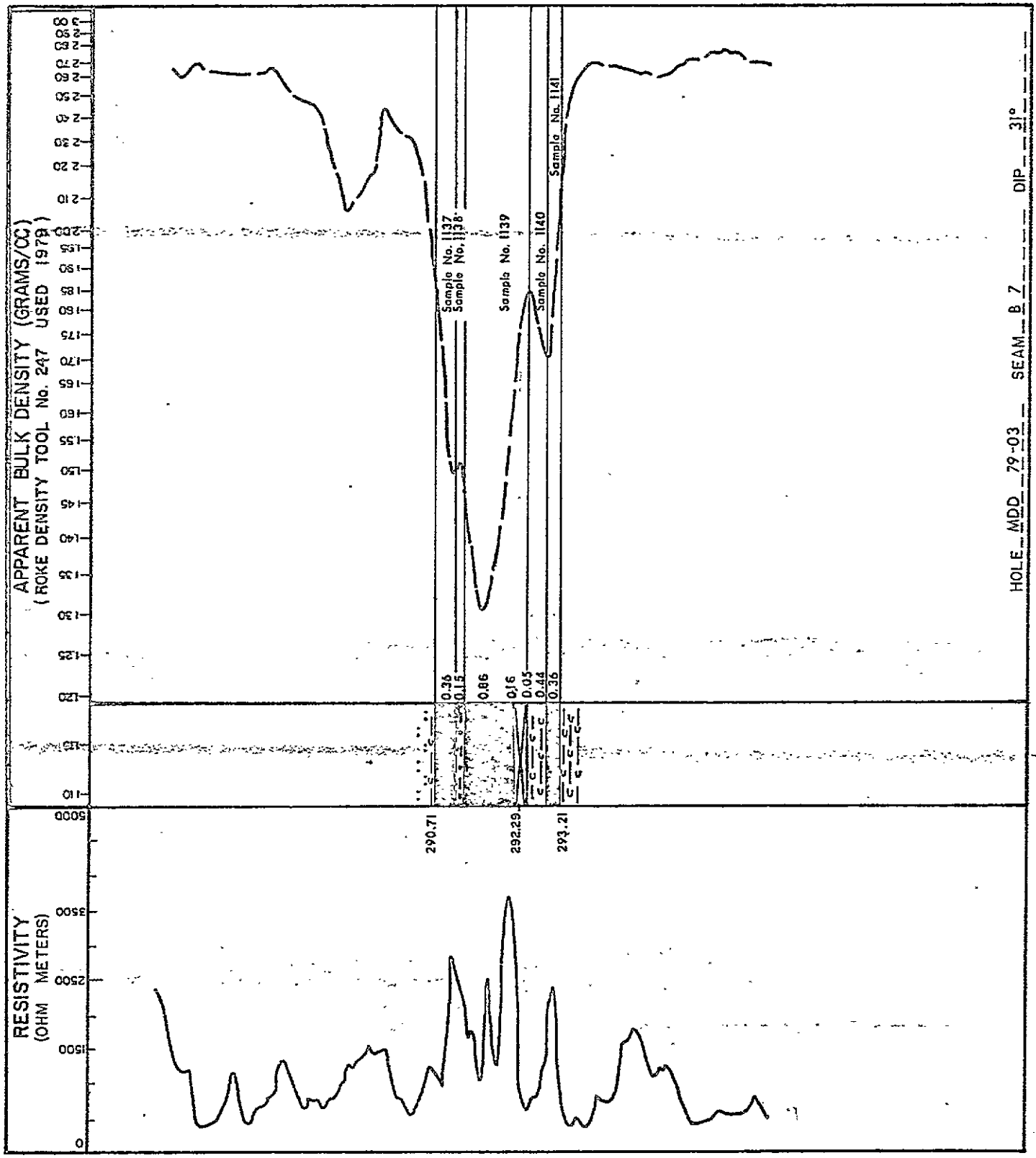


HOLE	SEAM
MDD 79-03	B6 (U) (L)

SEAM PROFILE

PETRO - CANADA - EXPLORATION INC.

MONKMAN COAL PROJECT

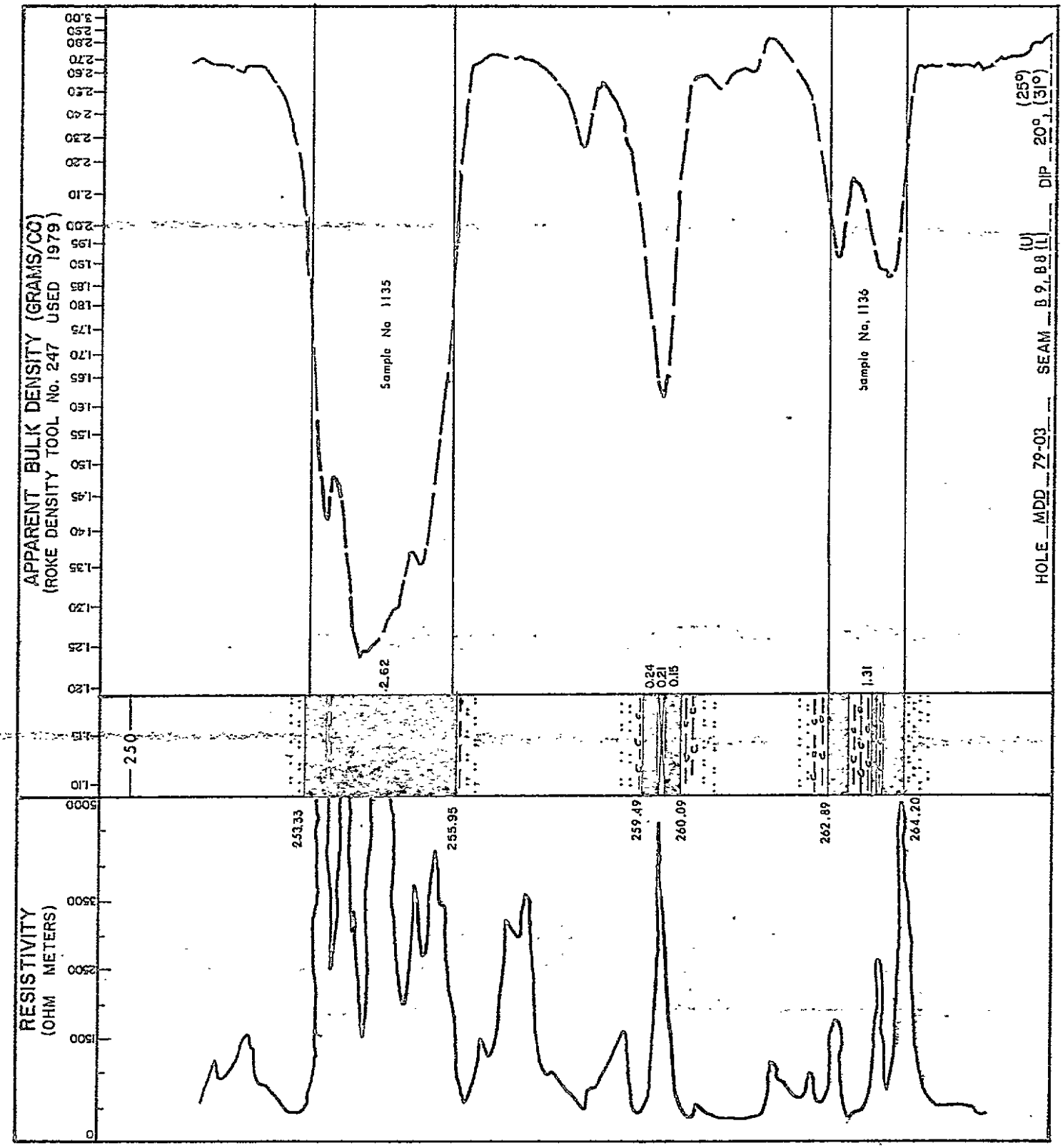


SEAM PROFILE

HOLE	SEAM
MDD 79-03	B7

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

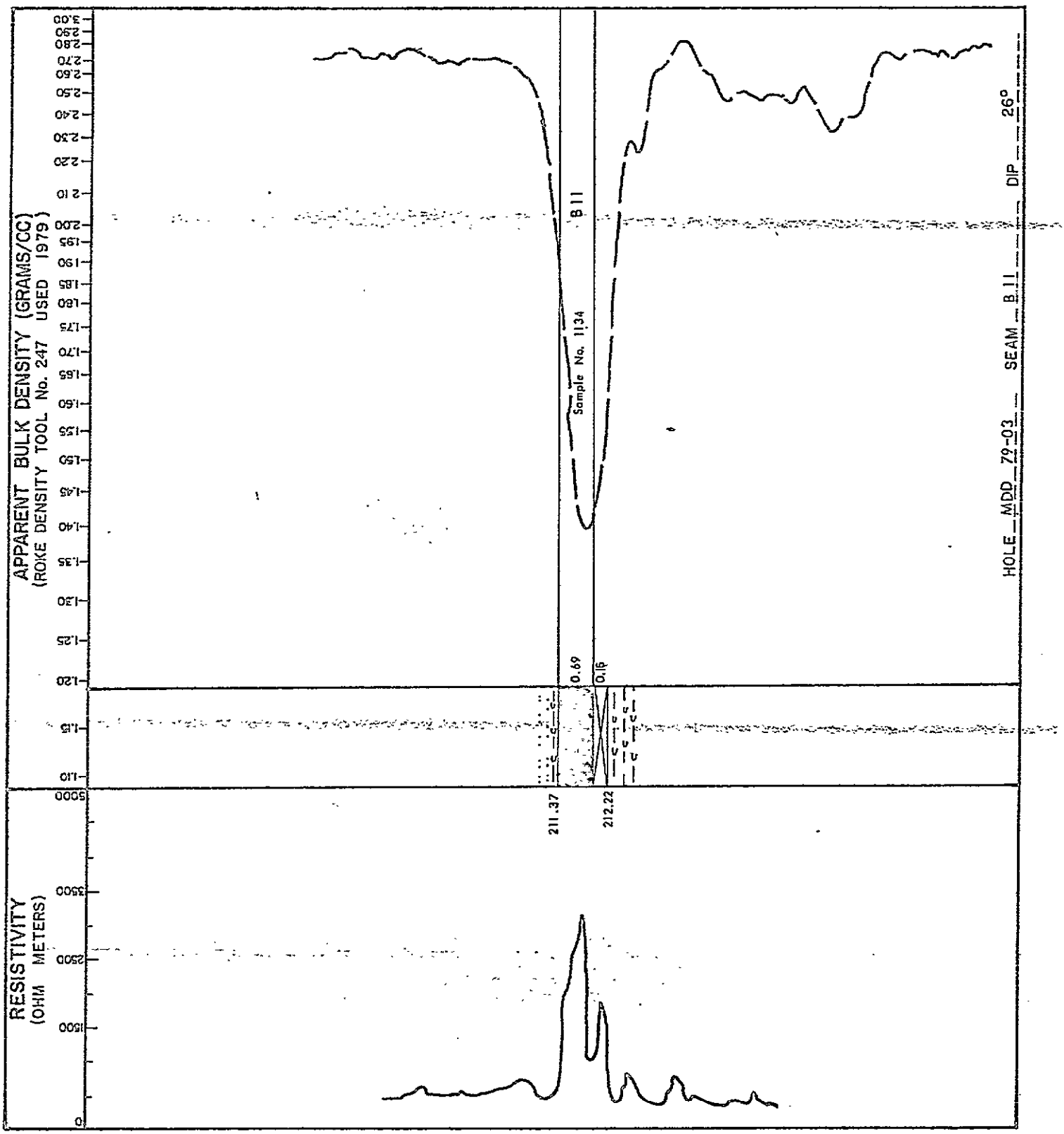


SEAM PROFILE

HOLE	SEAM
MDD 79-03	B9 B 8 (U) (L)

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

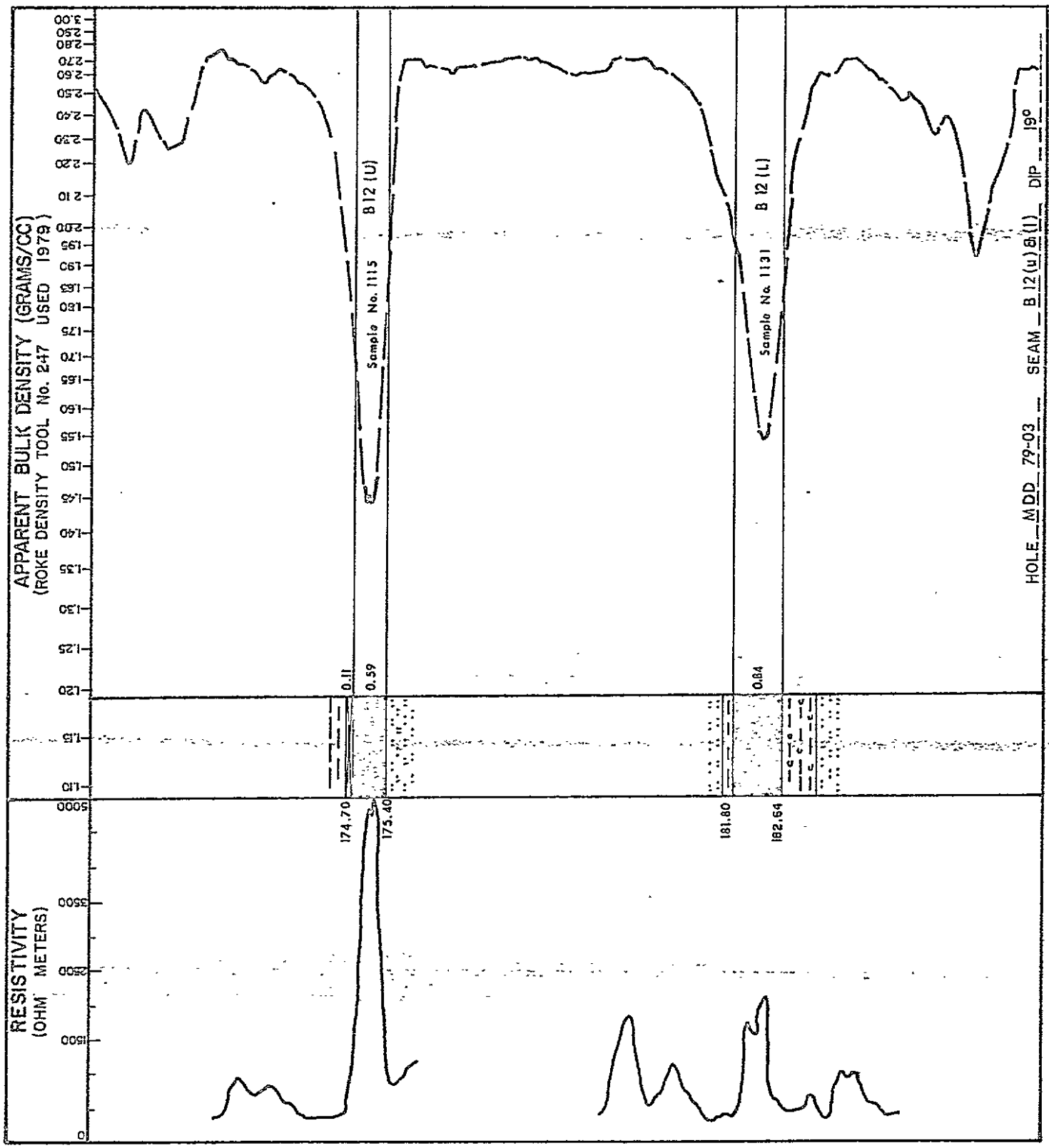


SEAM PROFILE

HOLE	SEAM
MDD 79-03	B11

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

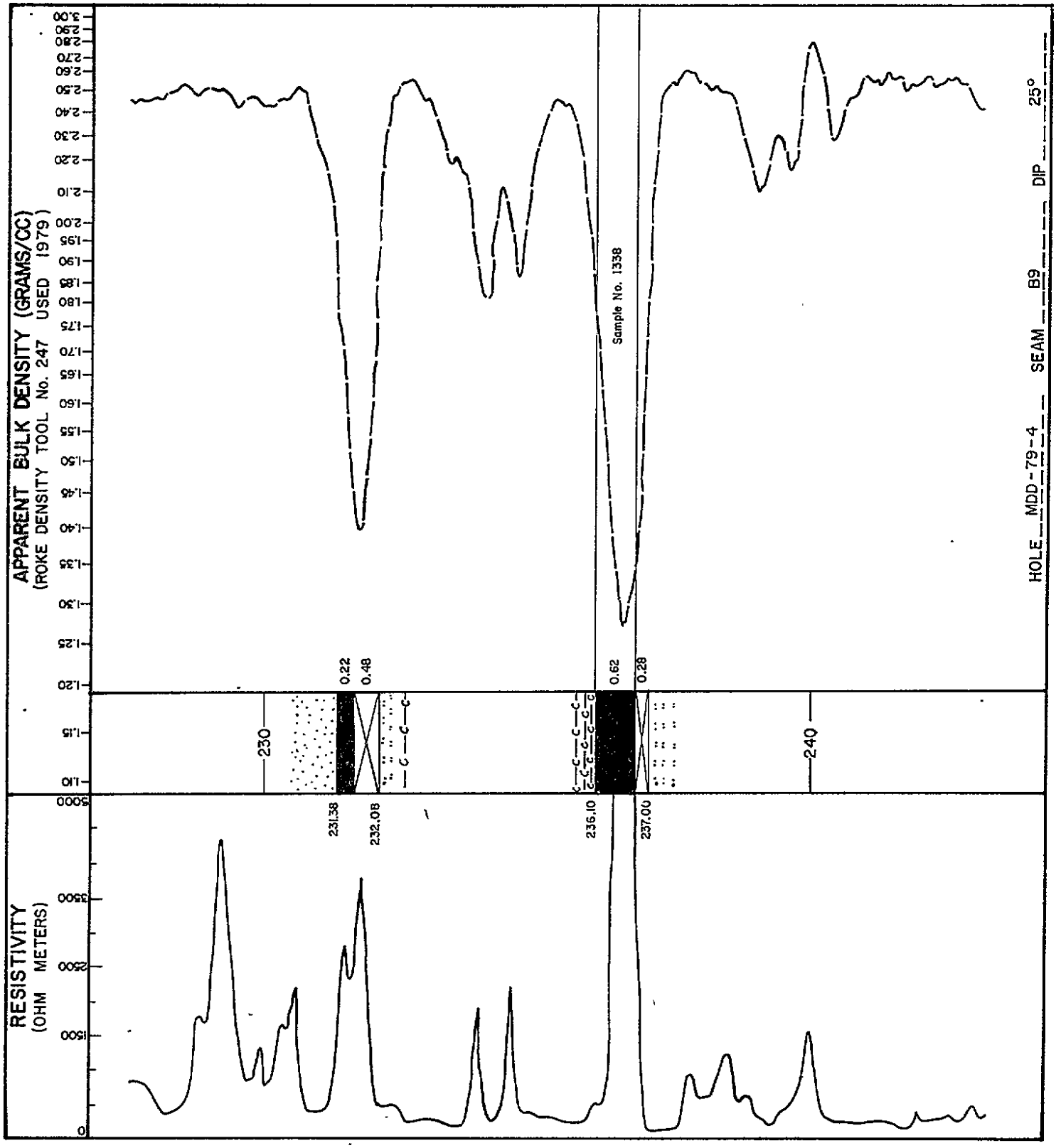


SEAM PROFILE

HOLE	SEAM
MDD 79-03	B12 (u) & (l)

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

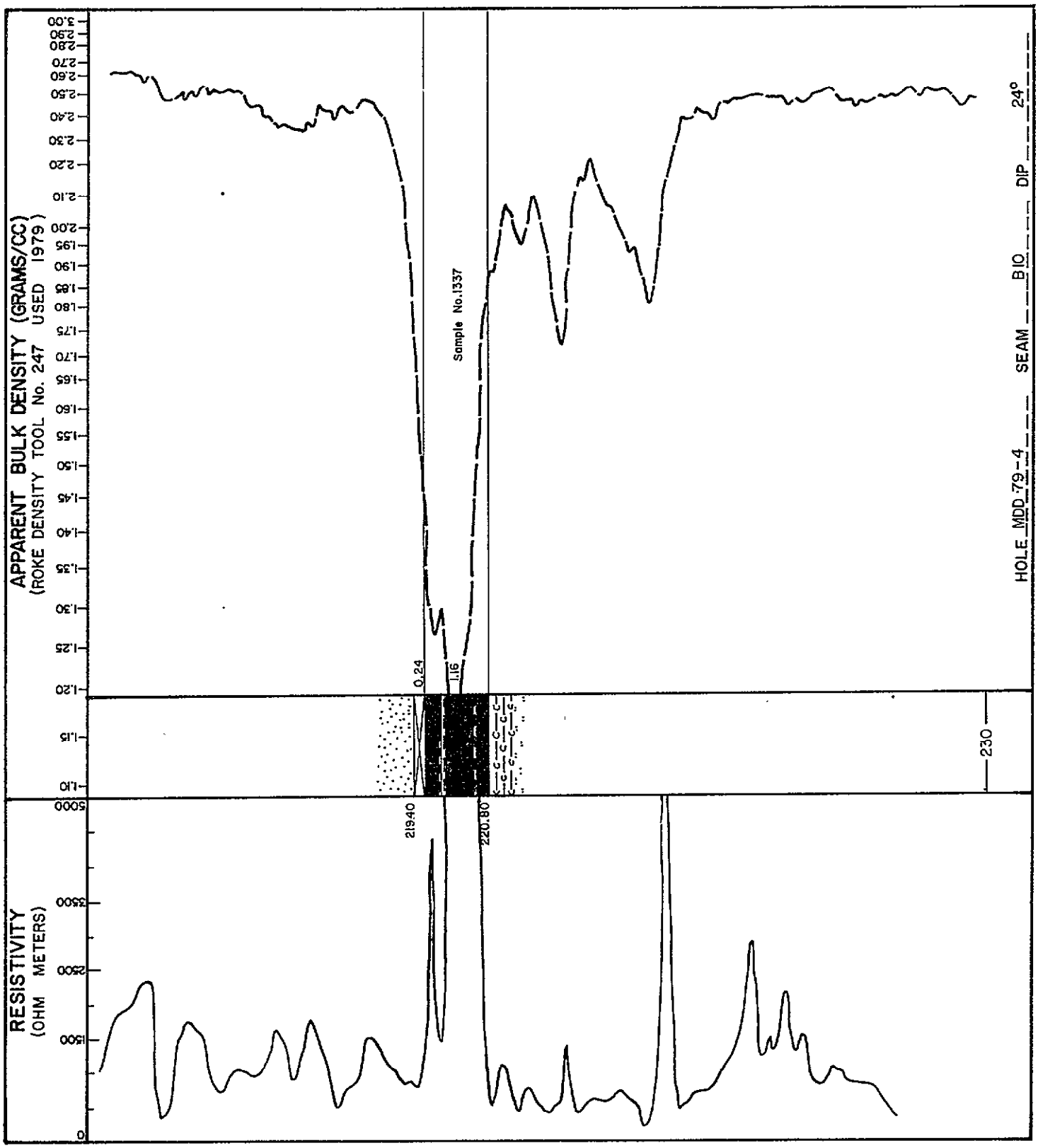


SEAM PROFILE

HOLE	SEAM
MDD 79-4	B9

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

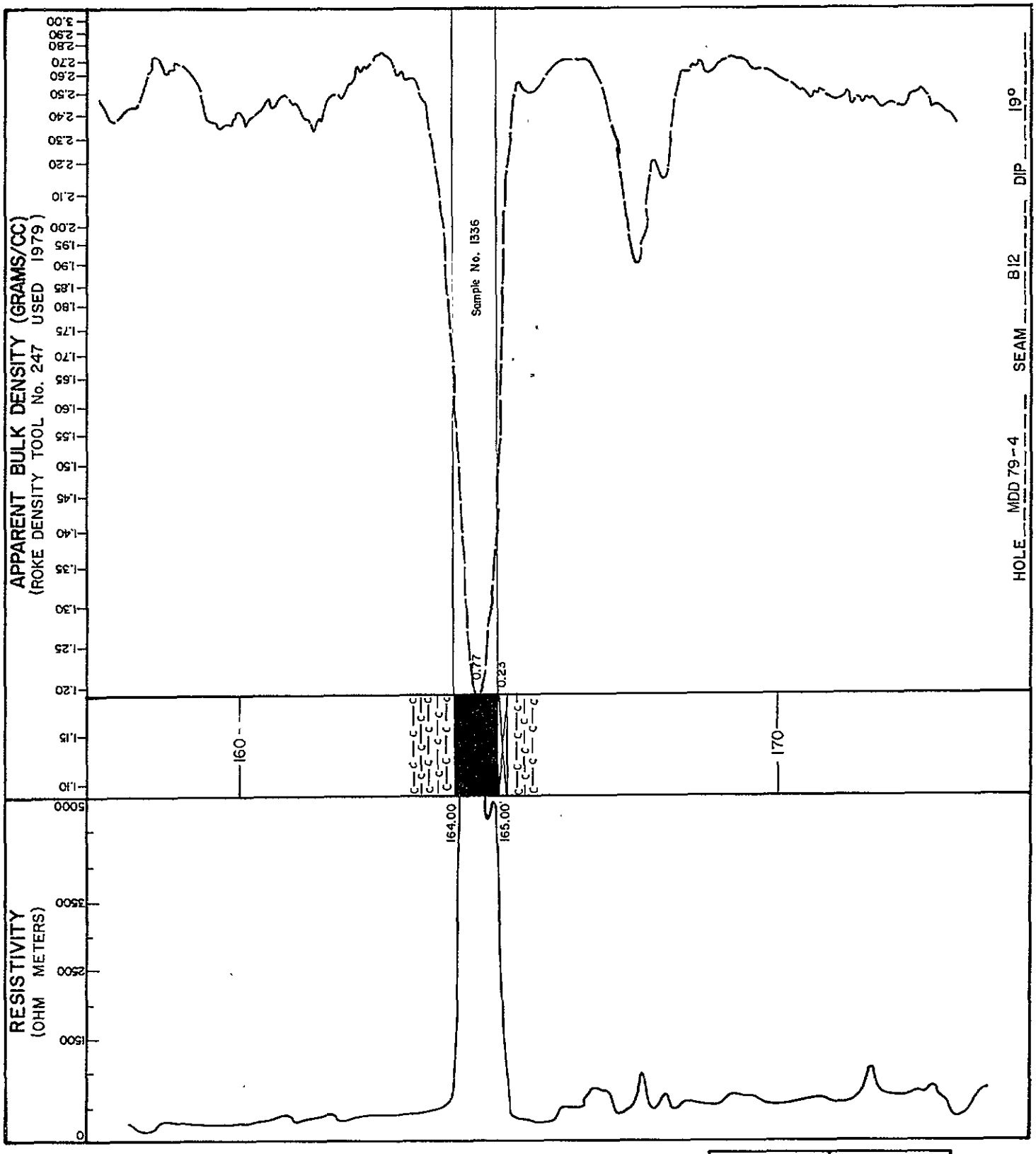


HOLE	SEAM
MDD 79-4	BIO

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

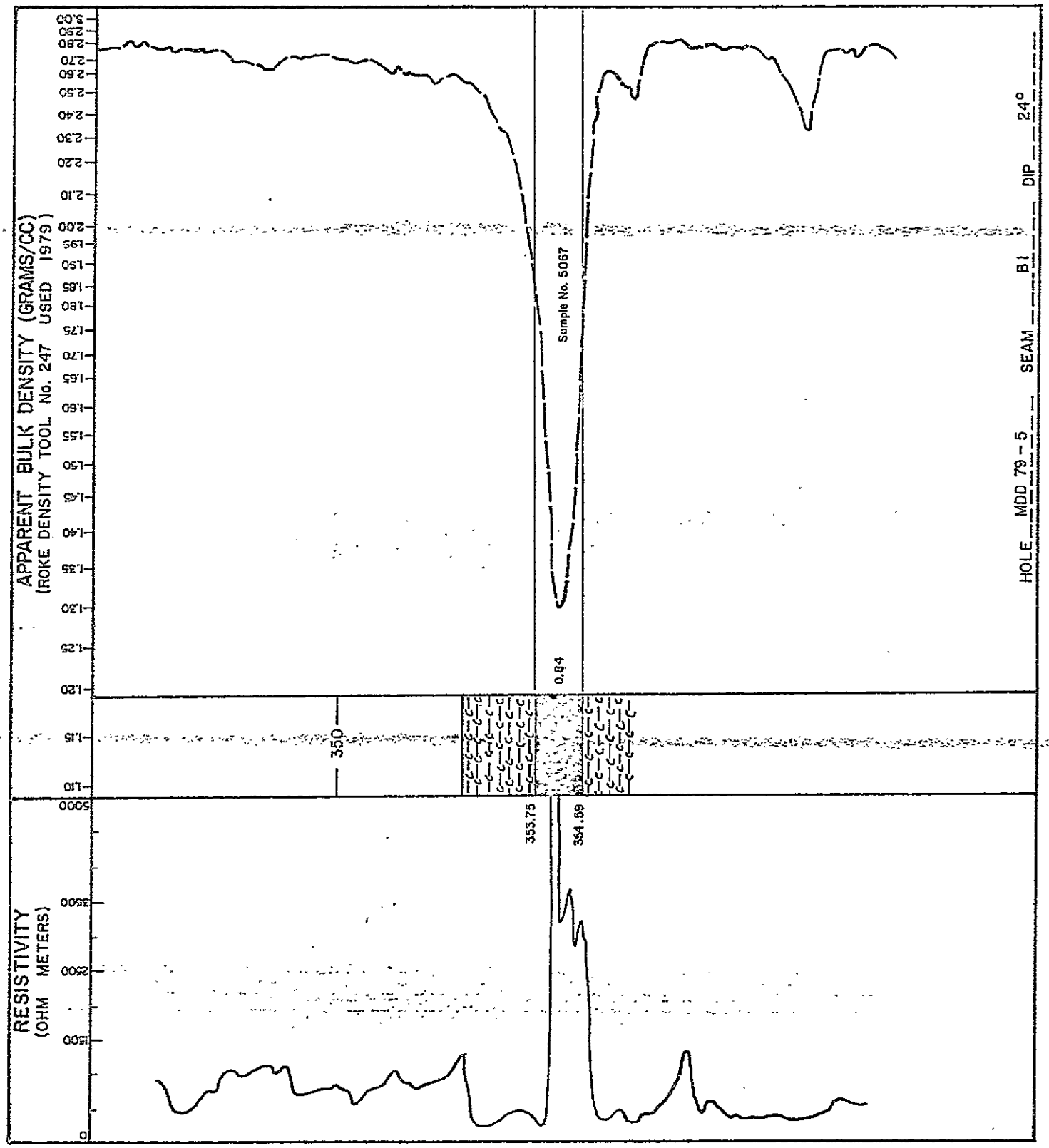


SEAM PROFILE

HOLE	SEAM
MDD 79-4	B12

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

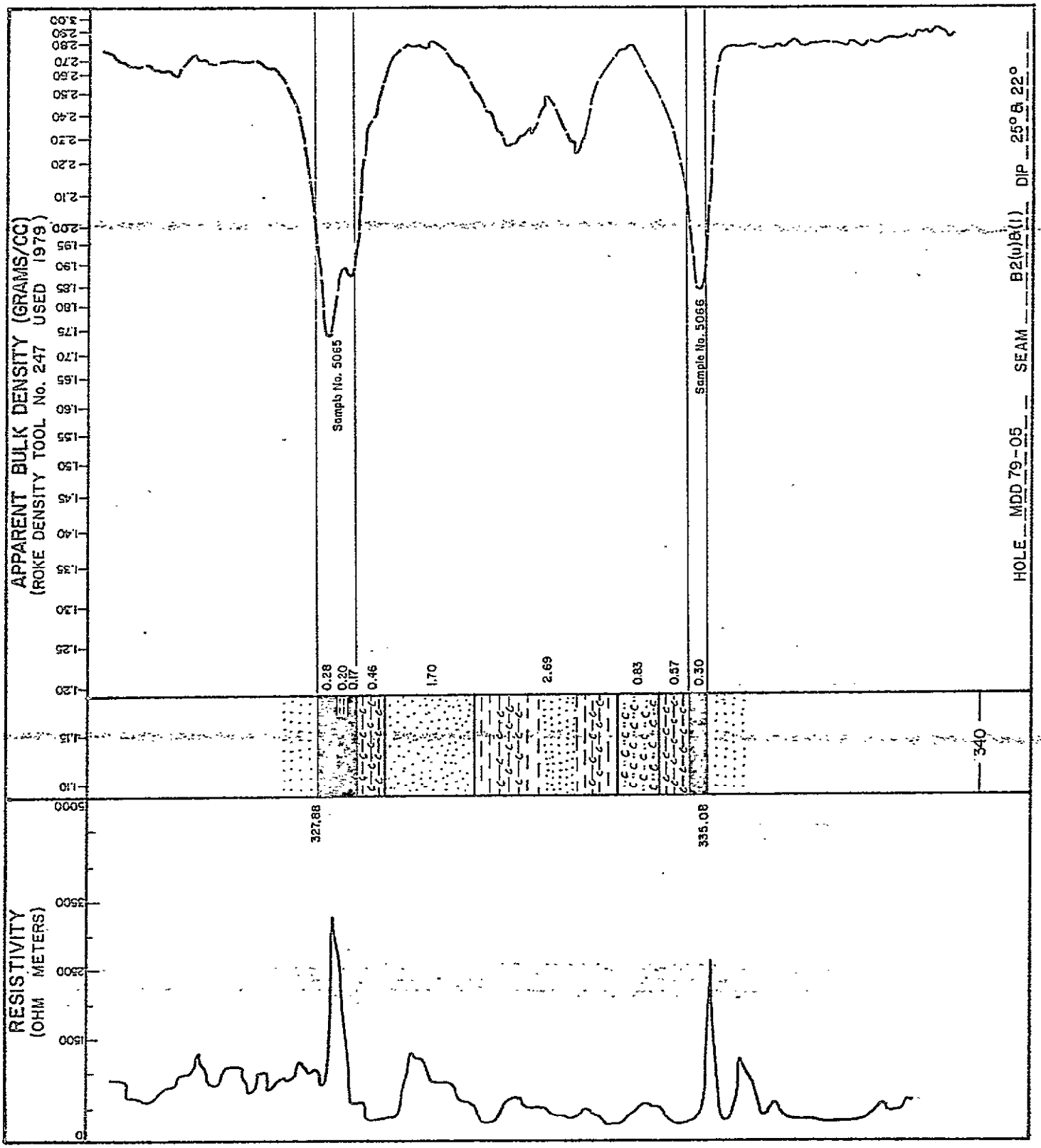


HOLE	SEAM
MDD 79-5	B1

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

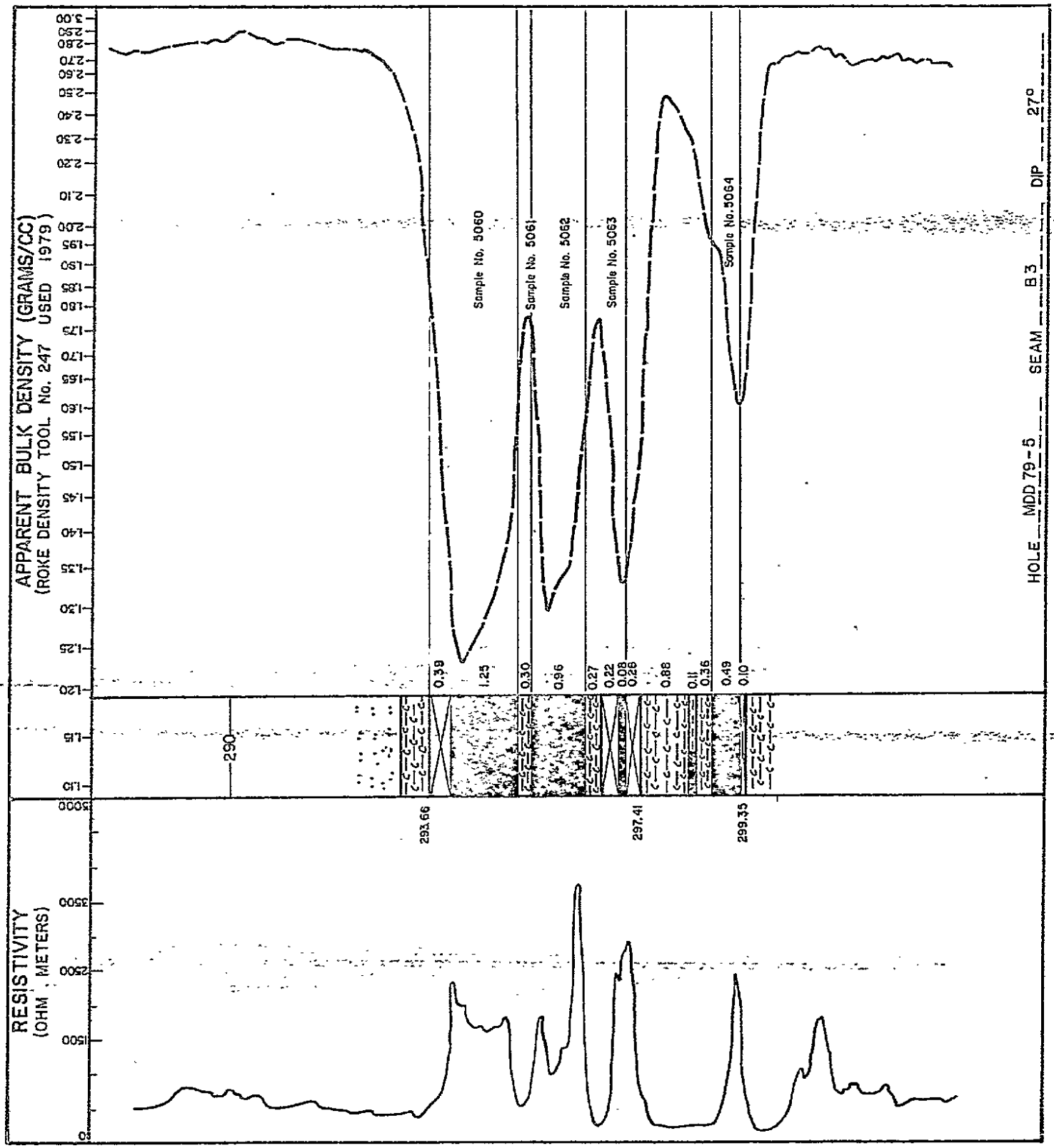


HOLE	SEAM
MDD 79-5	B2(u)&(l)

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

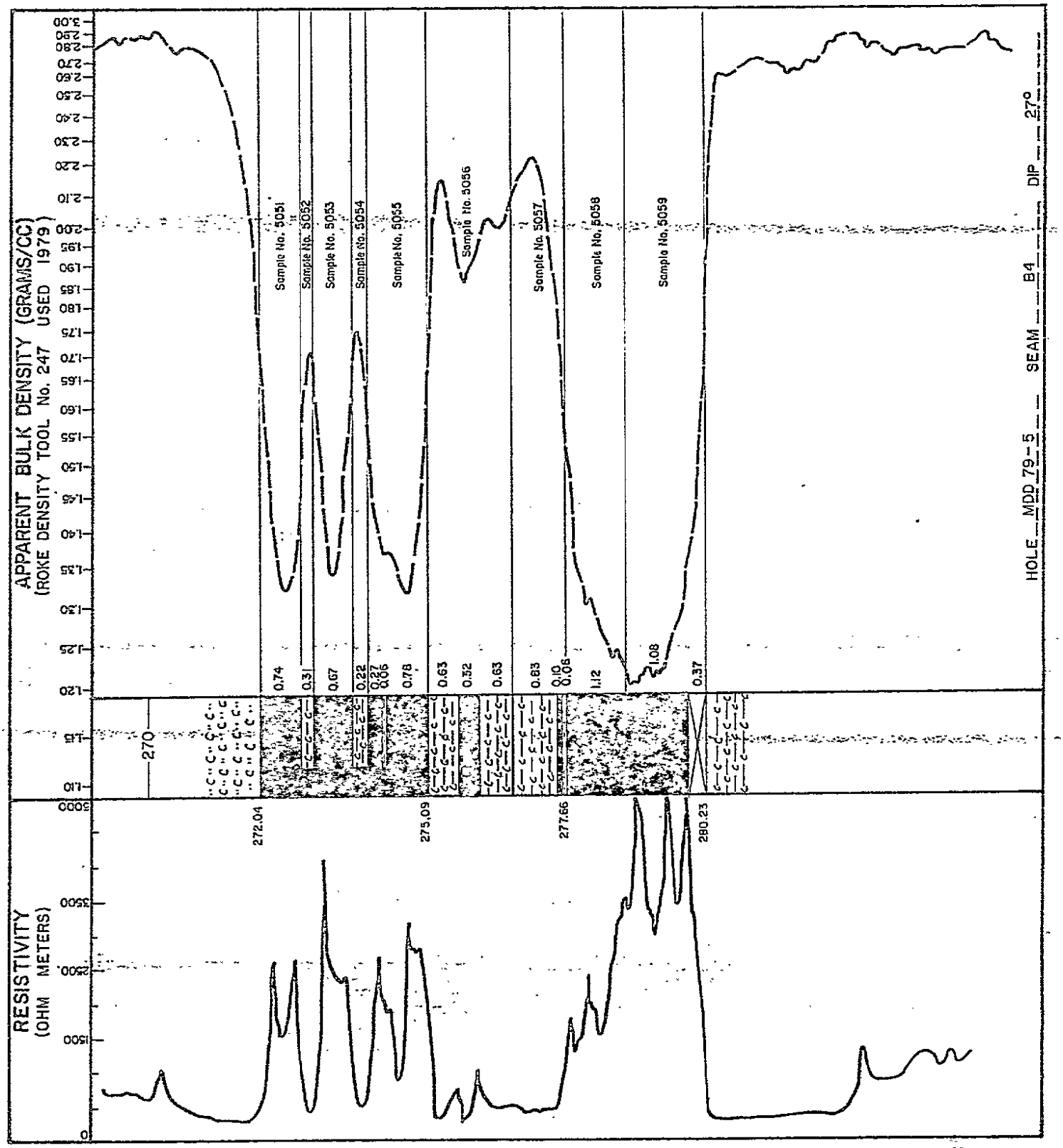


SEAM PROFILE

HOLE	SEAM
MDD 79-5	B3

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

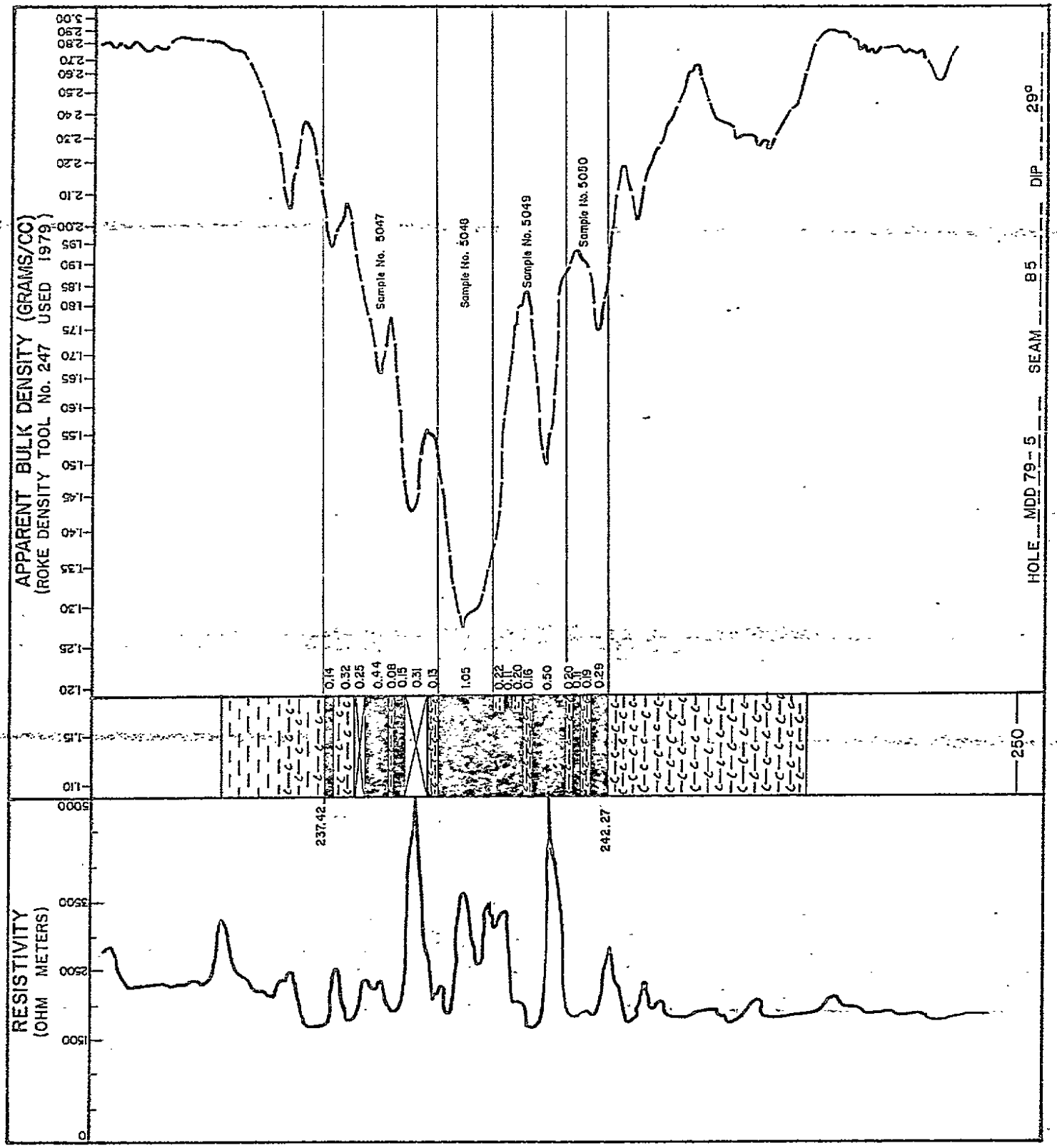


SEAM PROFILE

HOLE	SEAM
MDD 79-5	B4

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

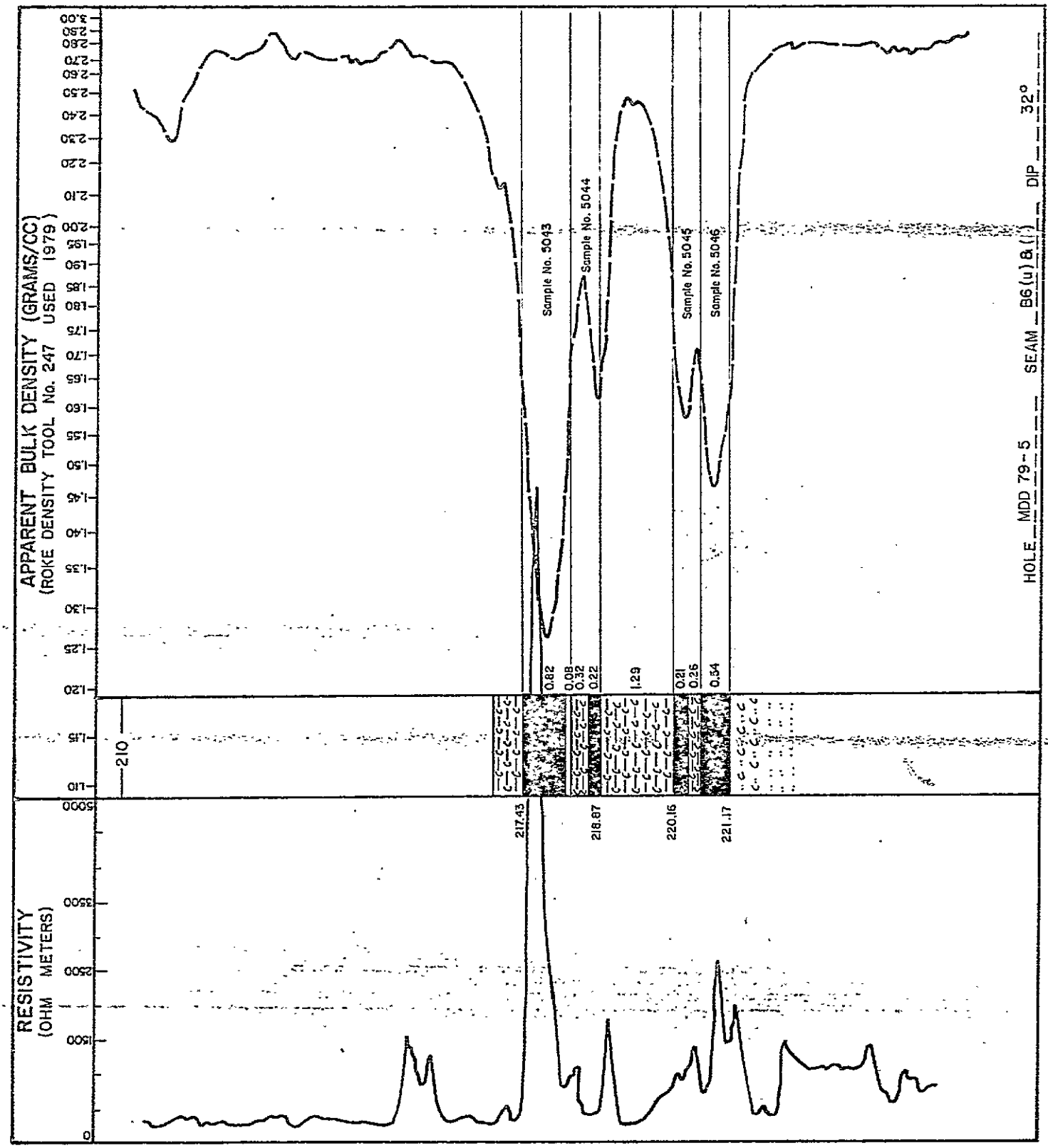


SEAM PROFILE

HOLE	SEAM
MDD 79-5	B5

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

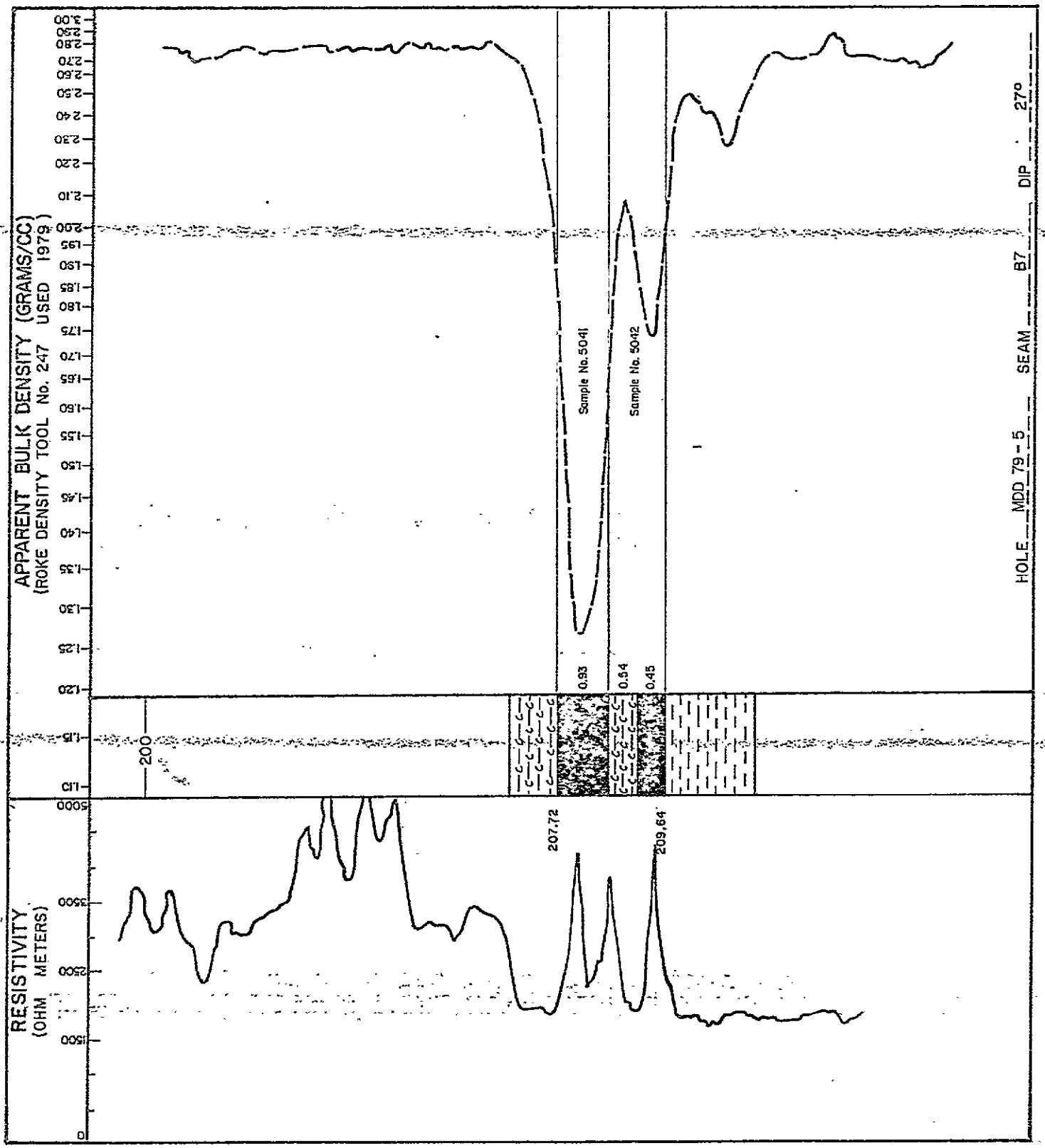


SEAM PROFILE

HOLE	SEAM
MDD 79-5	B6(u)&(l)

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

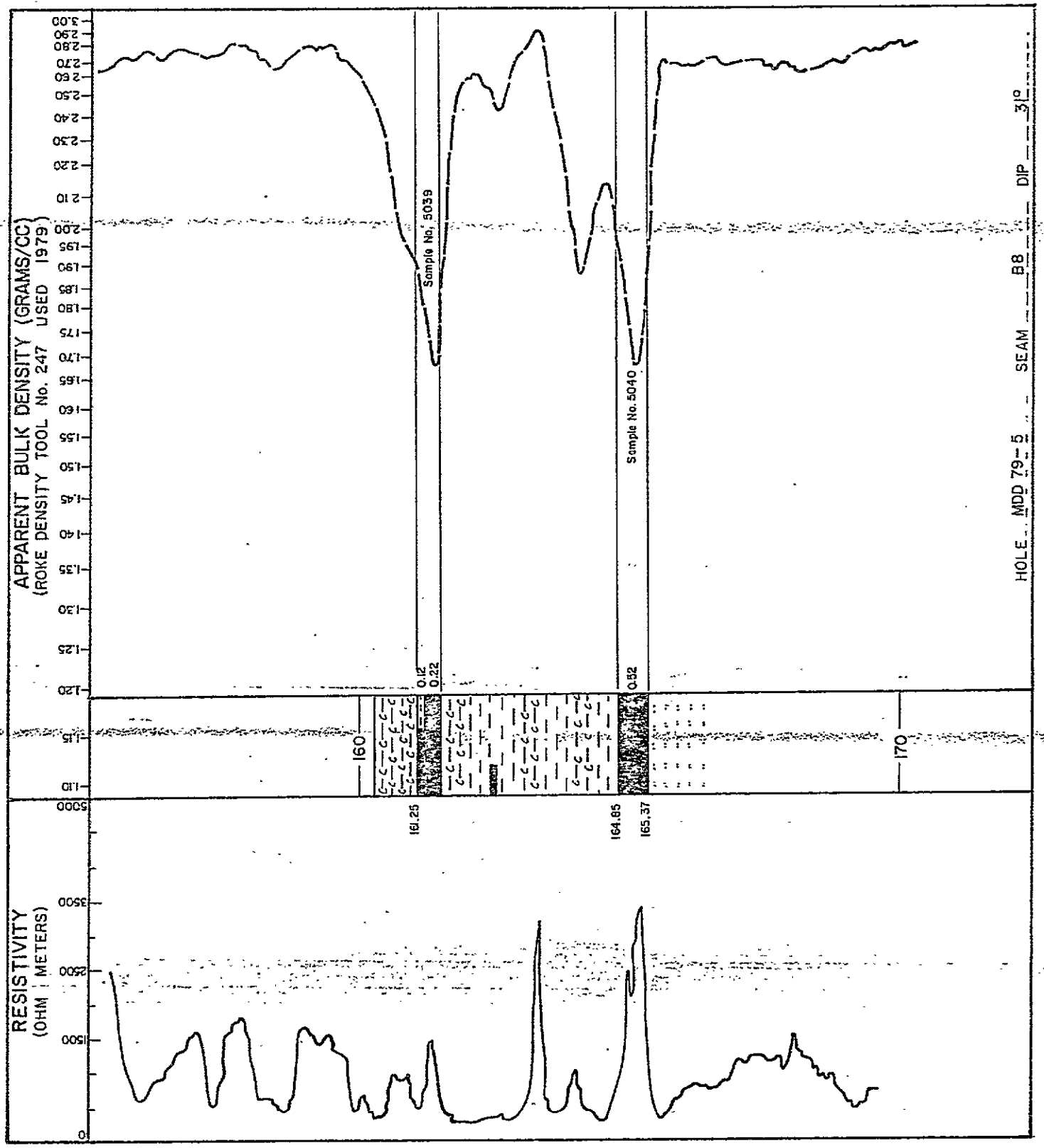


SEAM PROFILE

HOLE	SEAM
MDD 79-5	B7

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

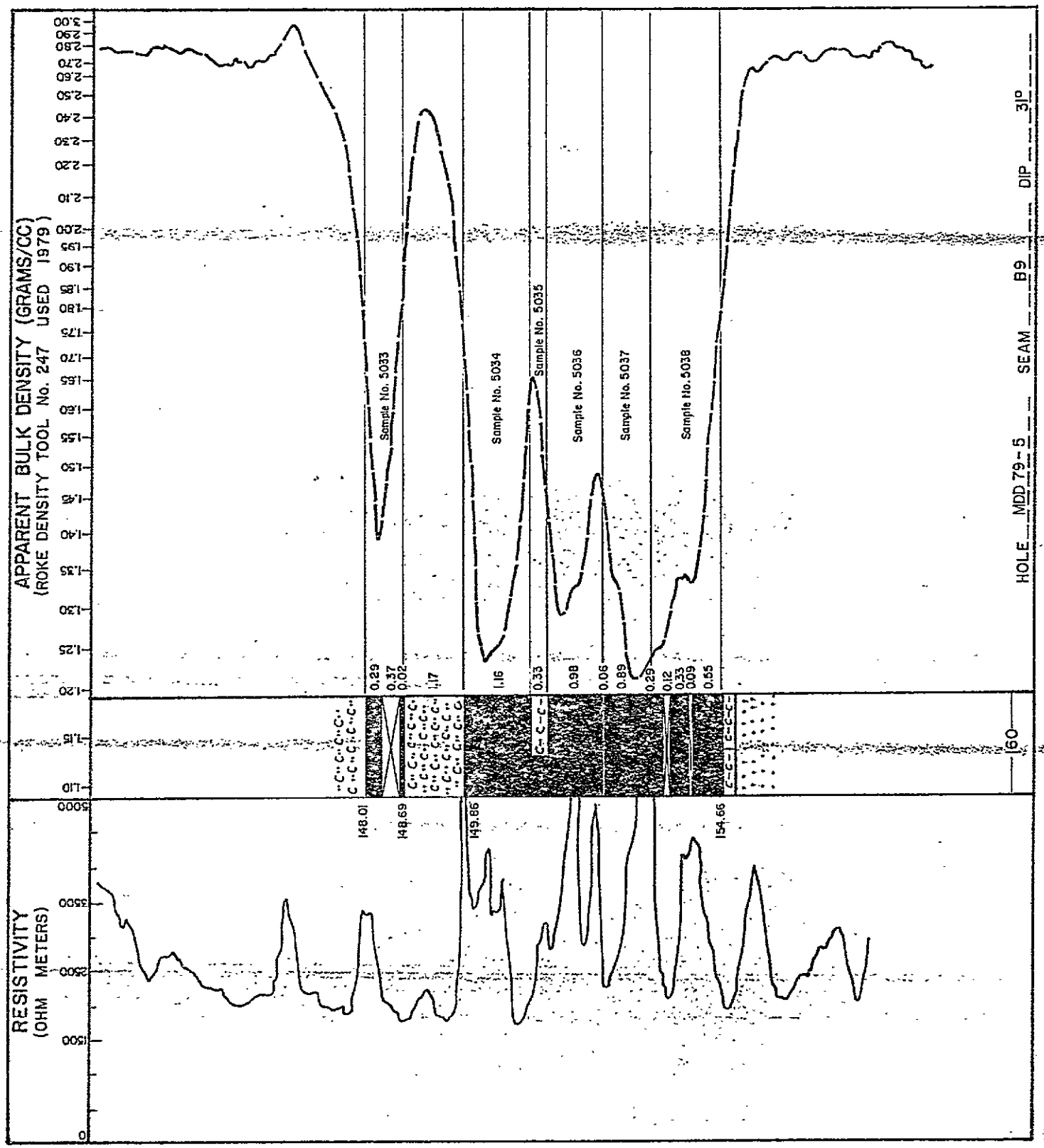


HOLE	SEAM
MDD 79-5	B8

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

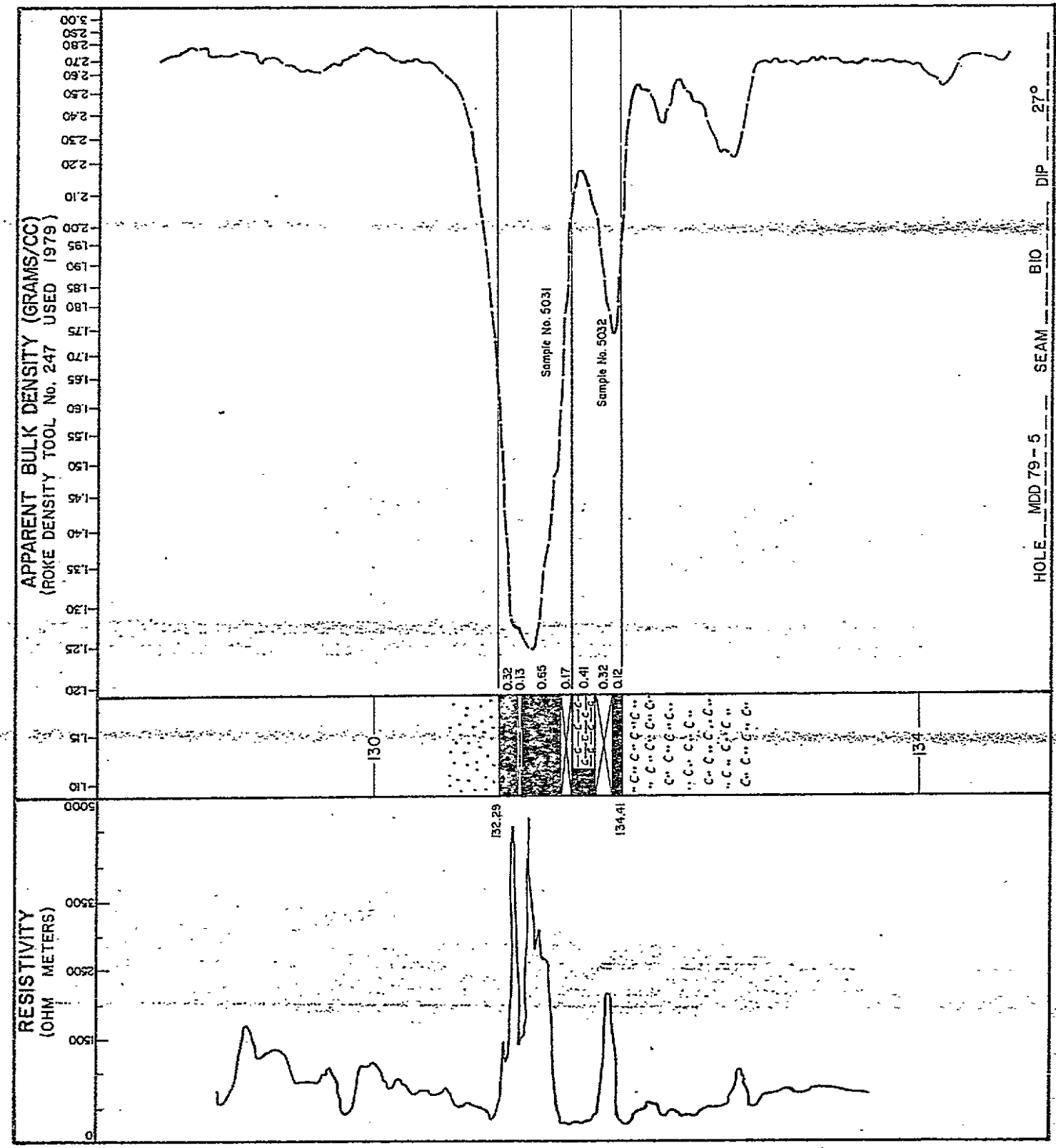


SEAM PROFILE

HOLE	SEAM
MDD 79-5	B9

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

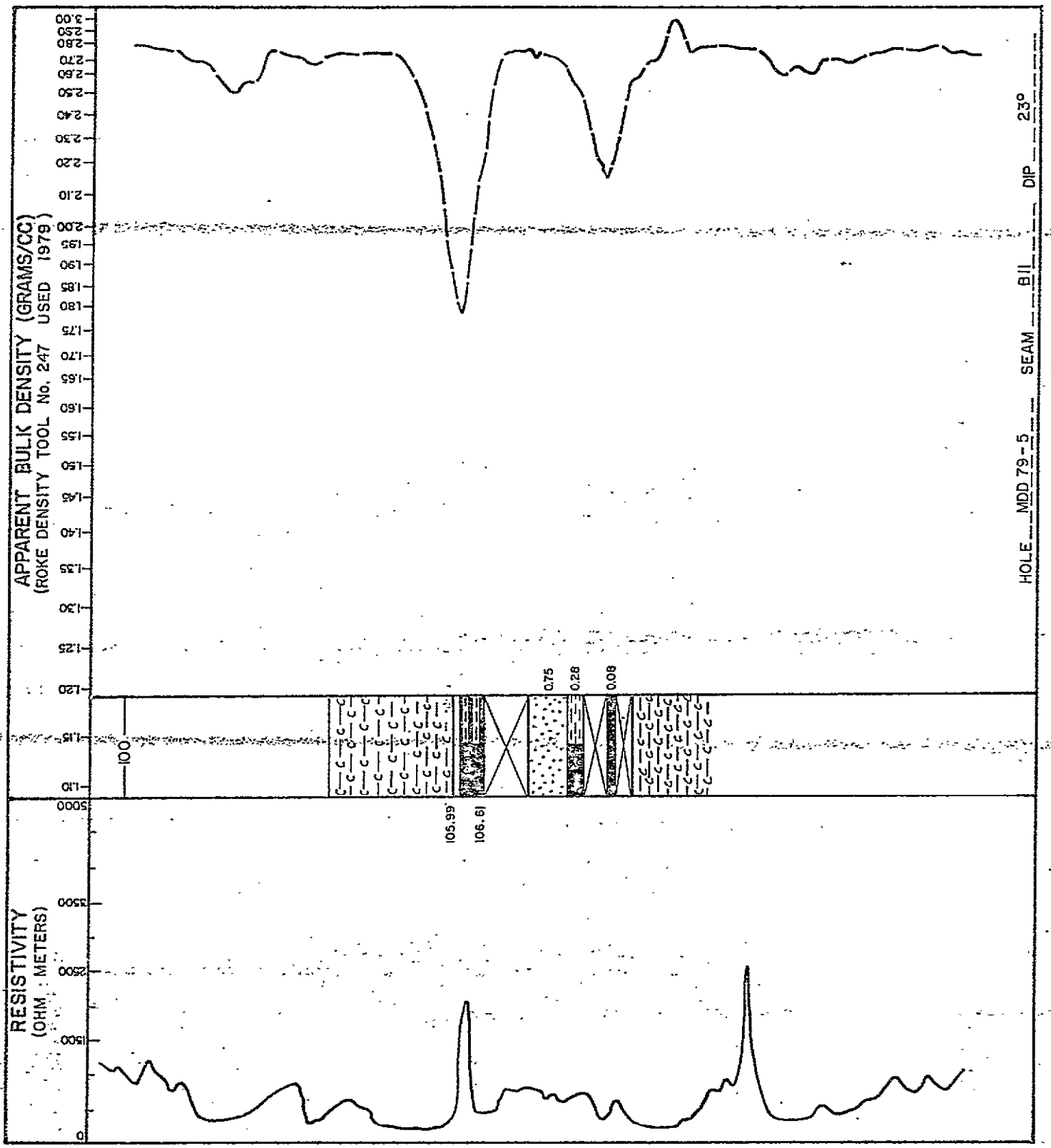


HOLE	SEAM
MDD 79-5	BIO

SEAM PROFILE

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

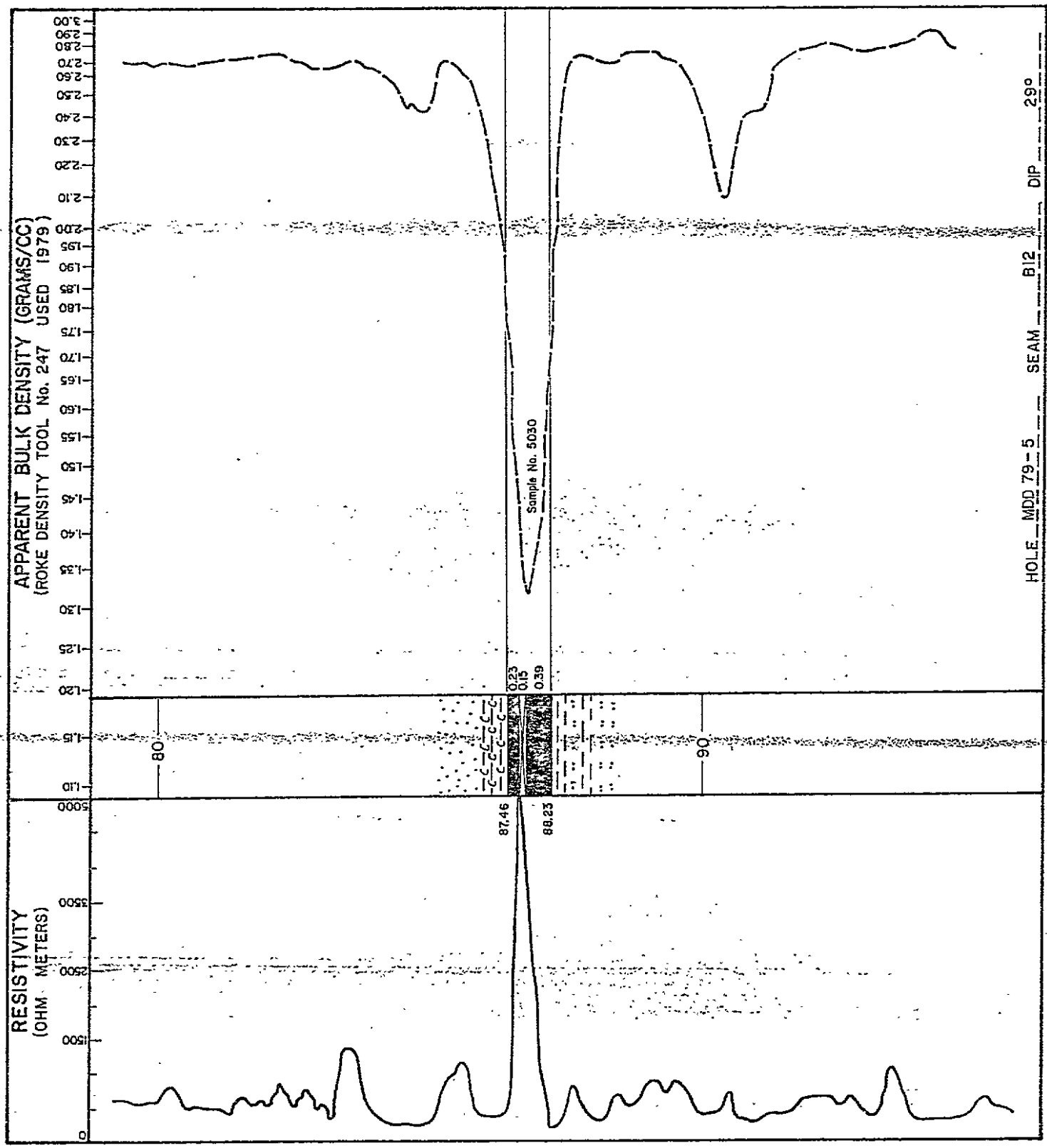


HOLE	SEAM
MDD 79-5	B II

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

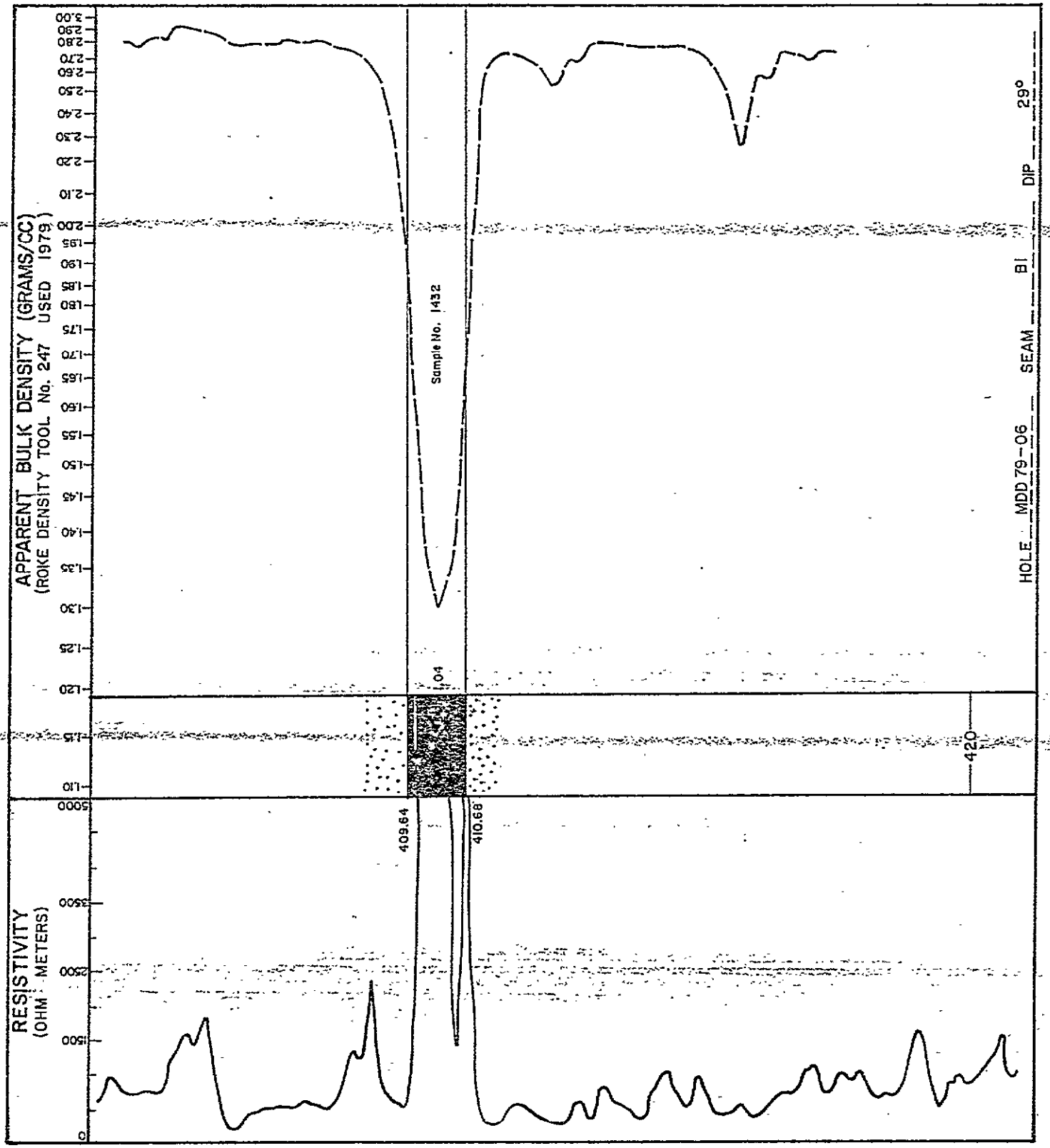


SEAM PROFILE

HOLE	SEAM
MDD 79-5	B12

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

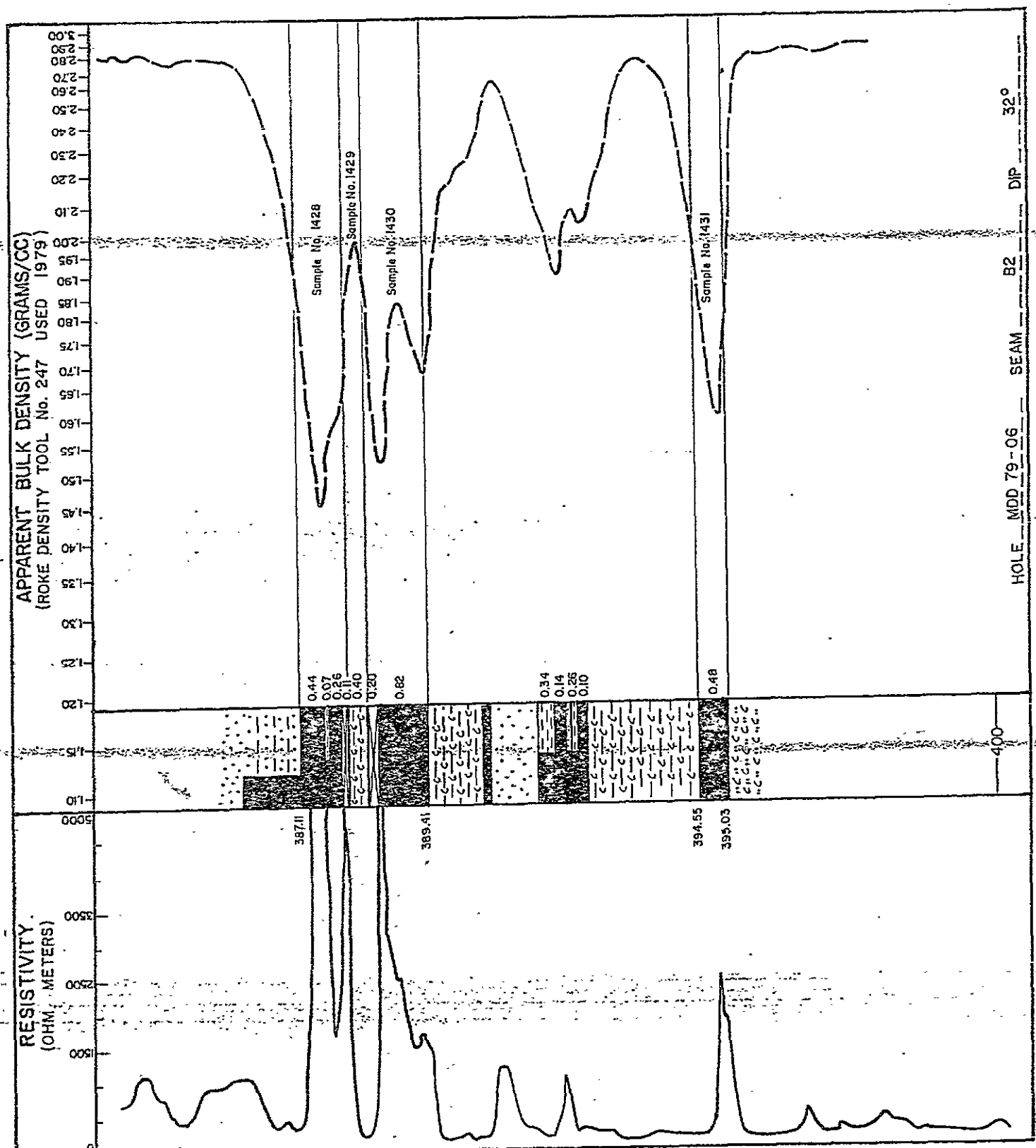


HOLE	SEAM
MDD 79-06	B1

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

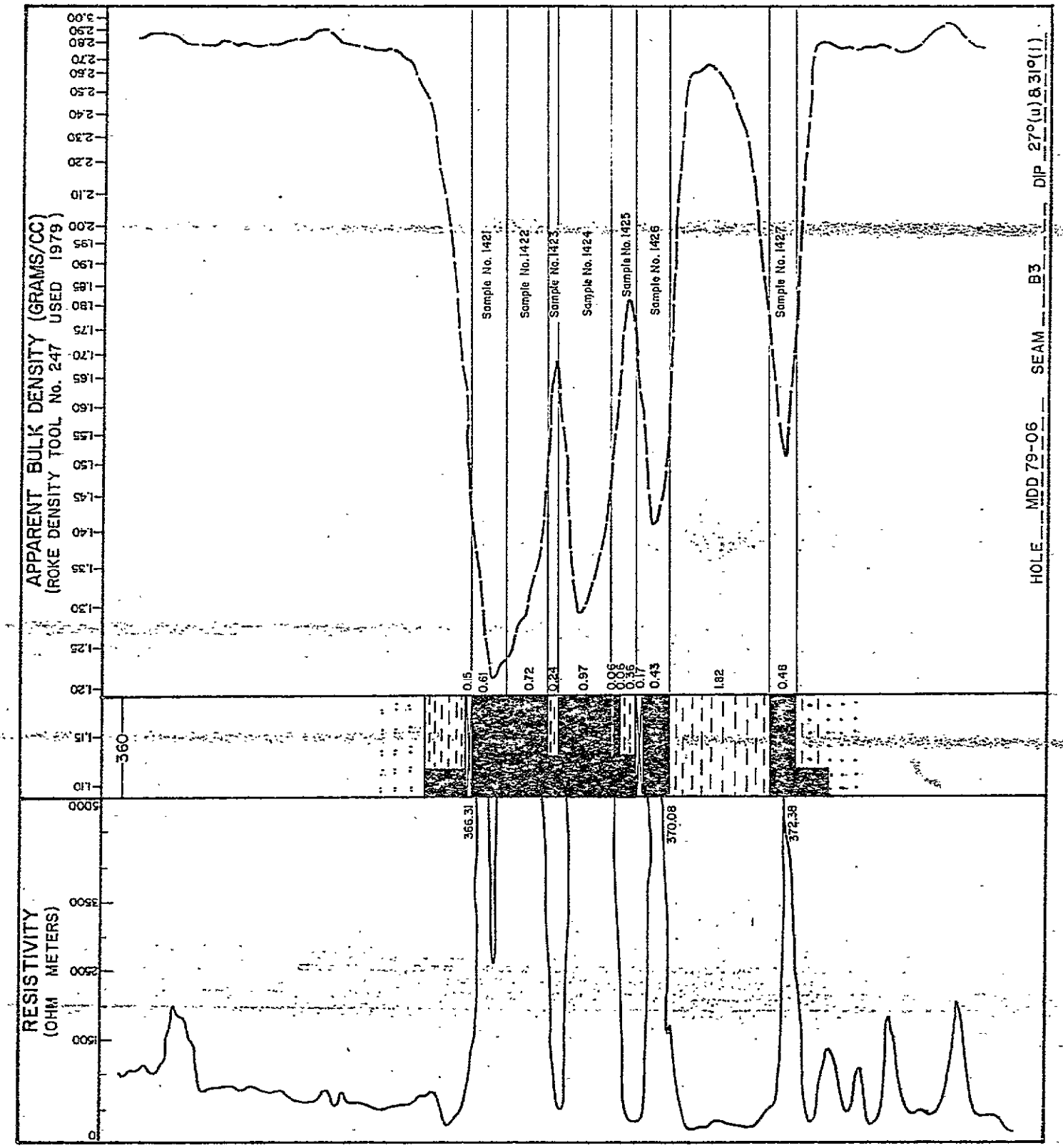


HOLE	SEAM
MDD 79-06	B2

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

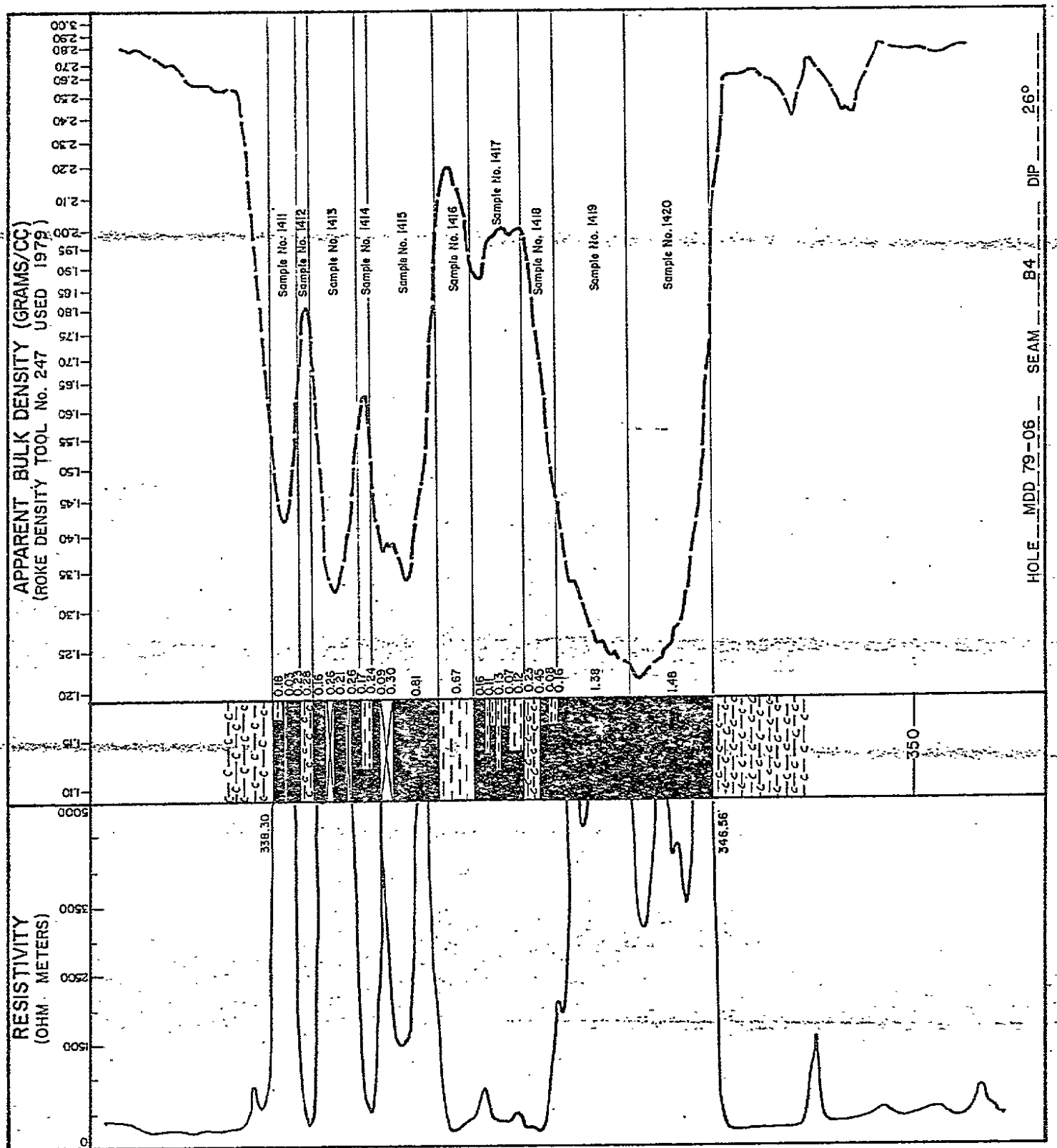


SEAM PROFILE

HOLE	SEAM
MDD 79-06	B3

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

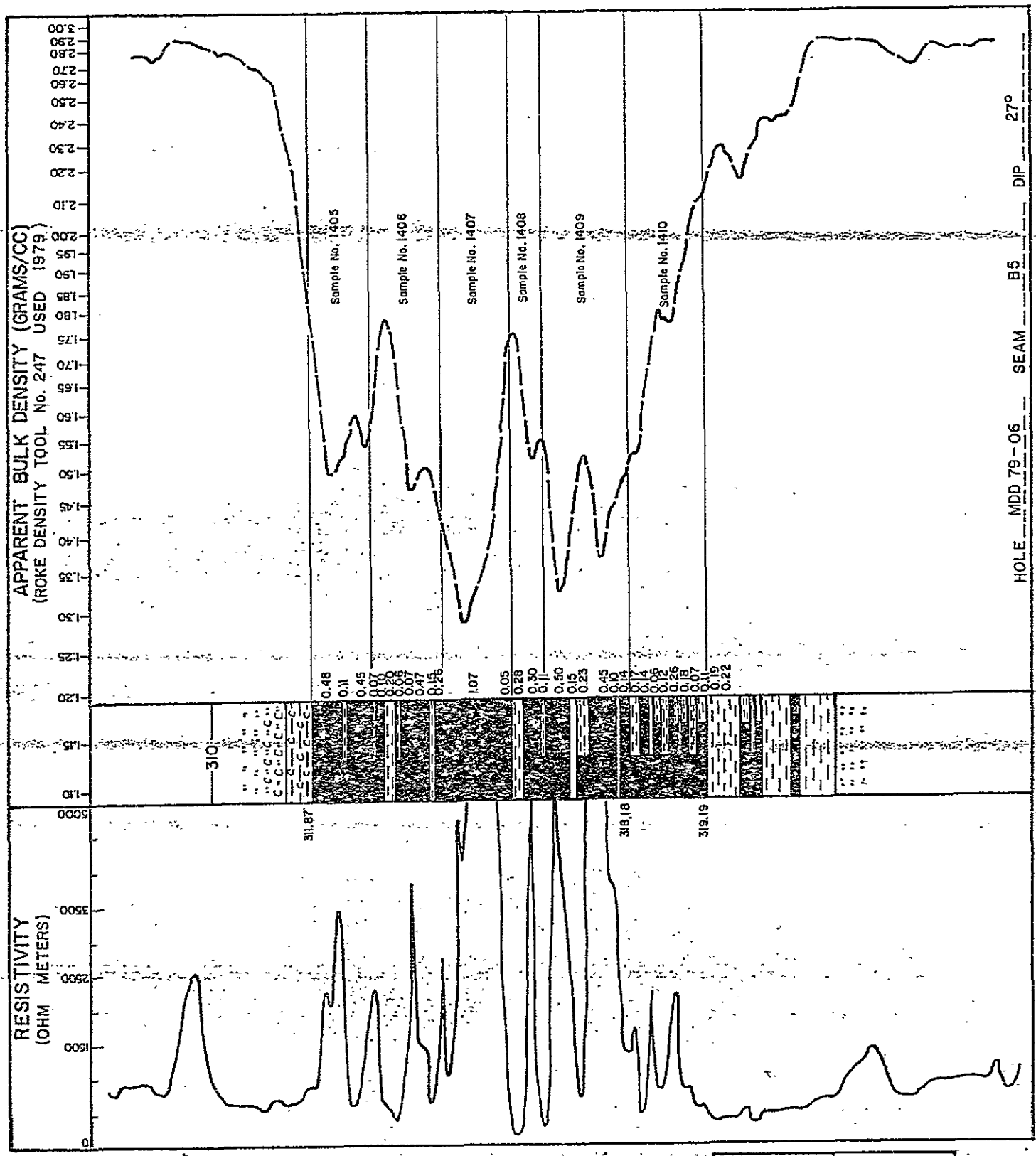


HOLE	SEAM
MDD 79-06	B4

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

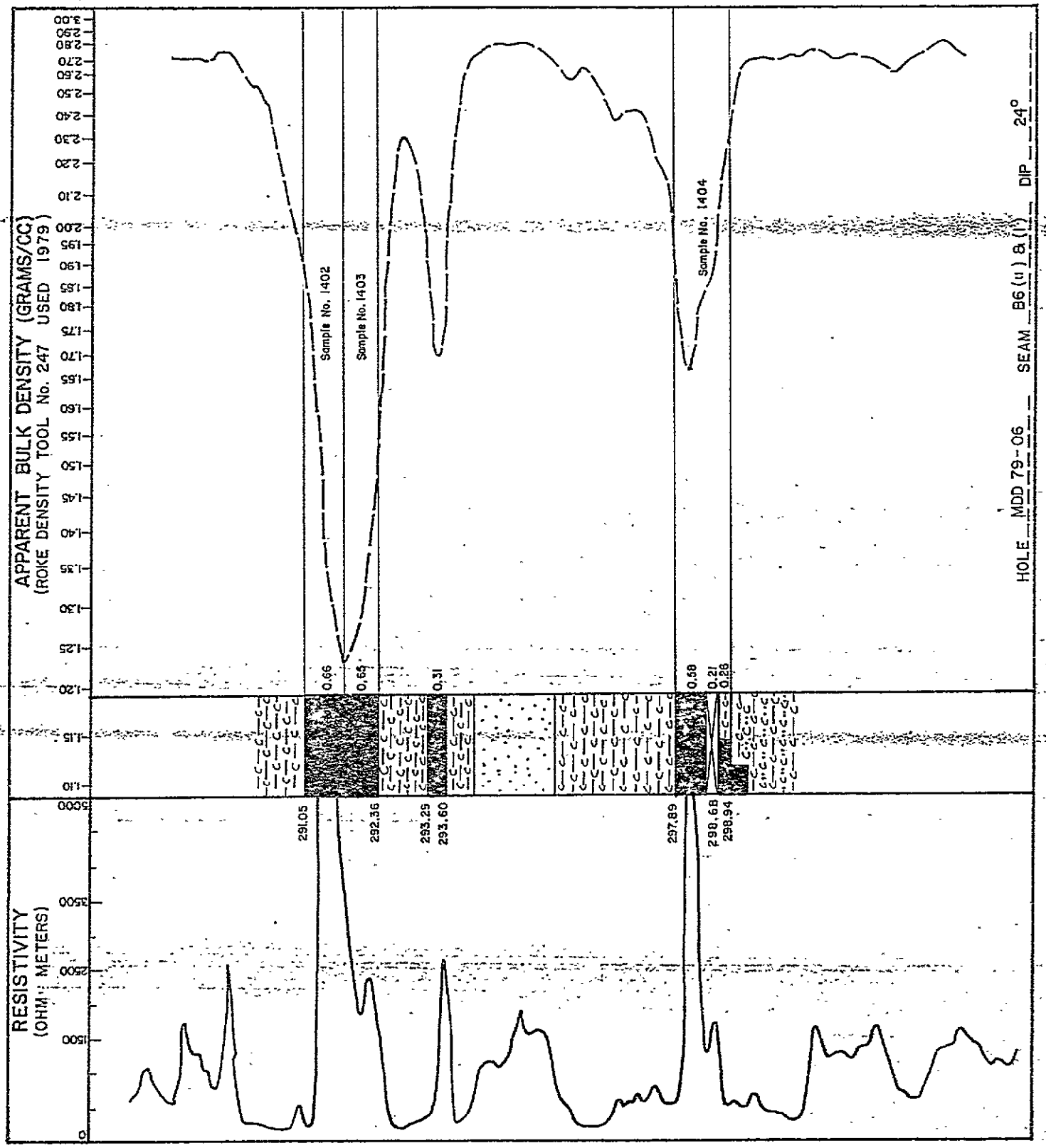


HOLE	SEAM
MDD 79-06	B5

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

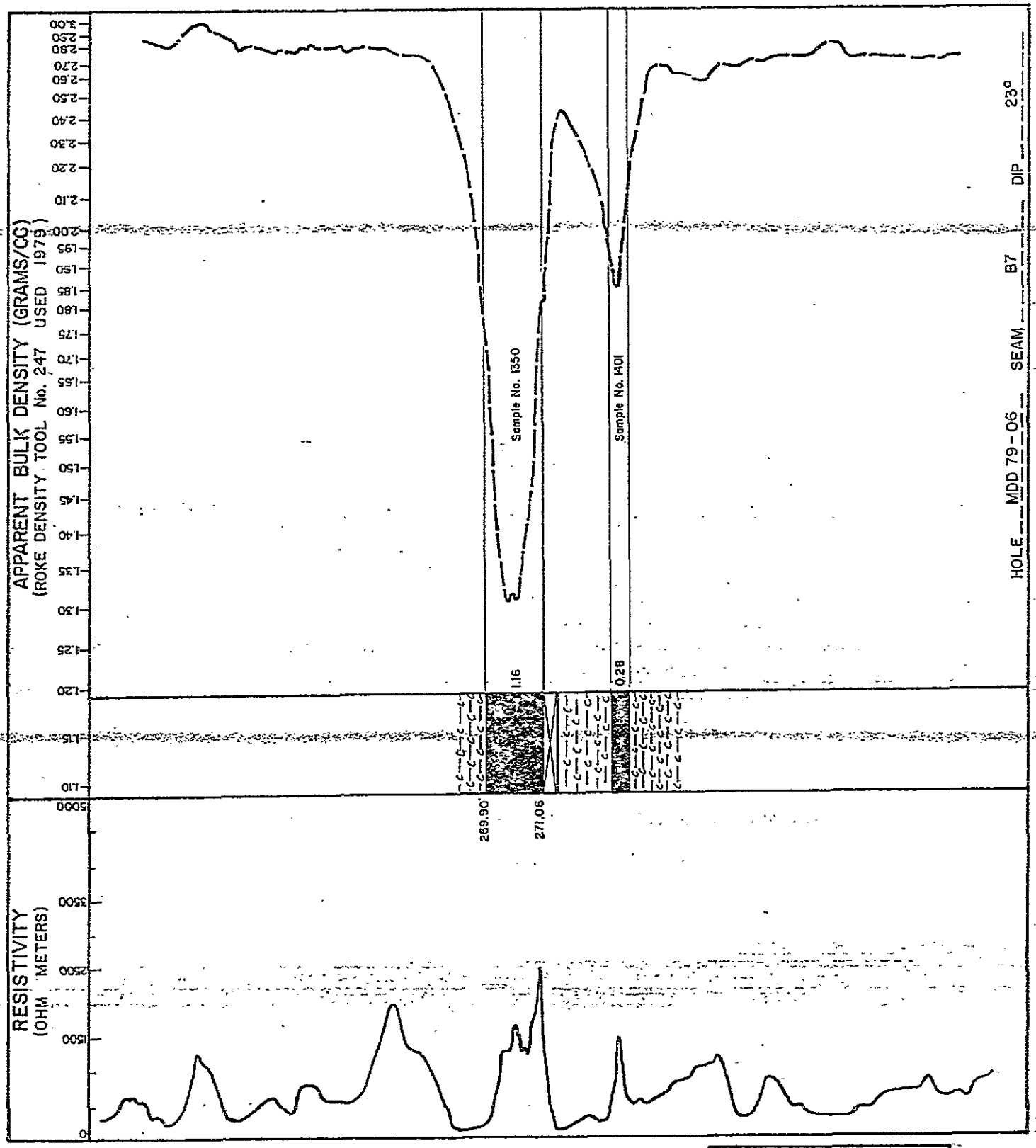


HOLE	SEAM
MDD 79-06	B6(u) & (l)

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

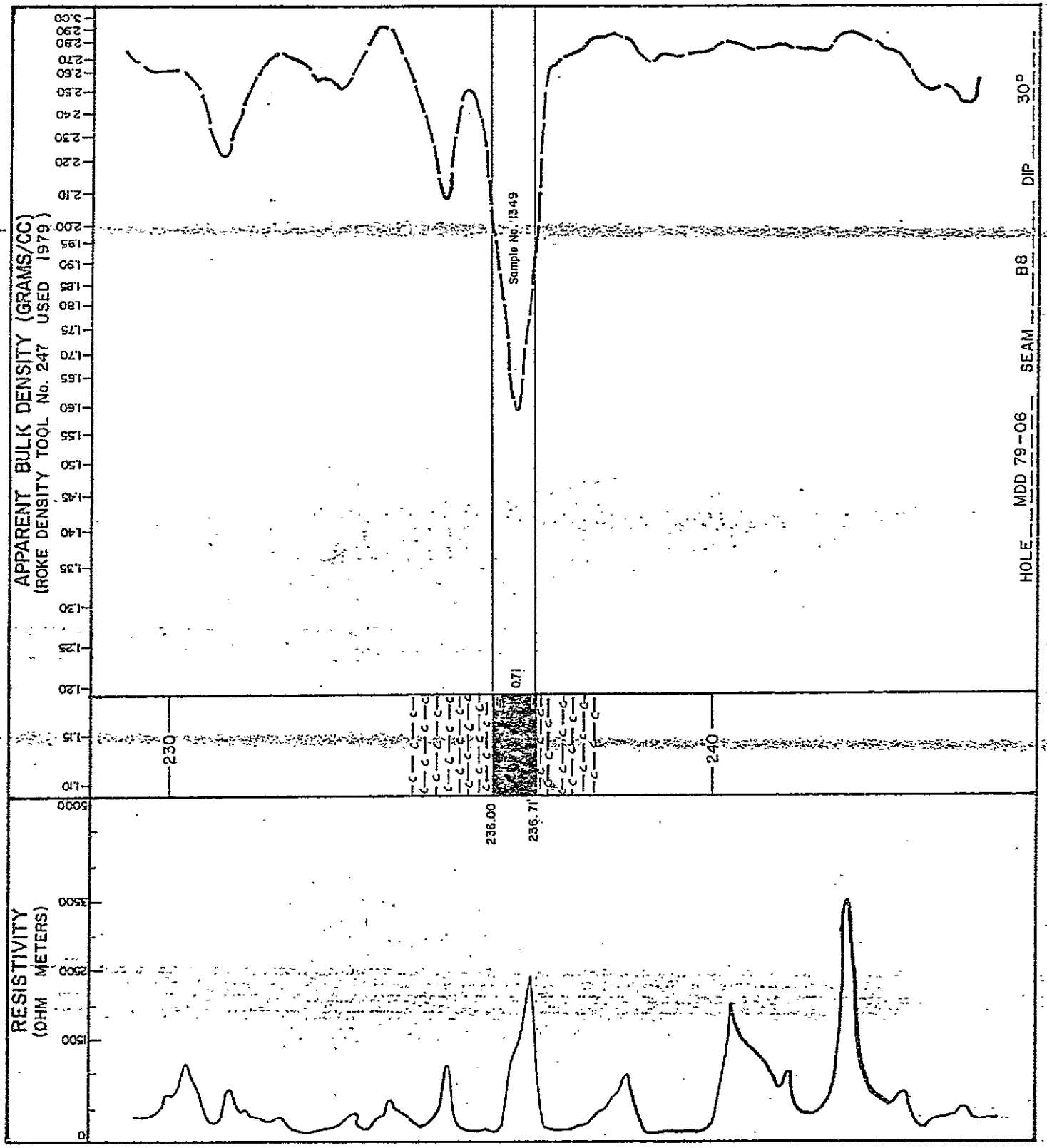


HOLE	SEAM
MDD 79-06	B7

SEAM PROFILE

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

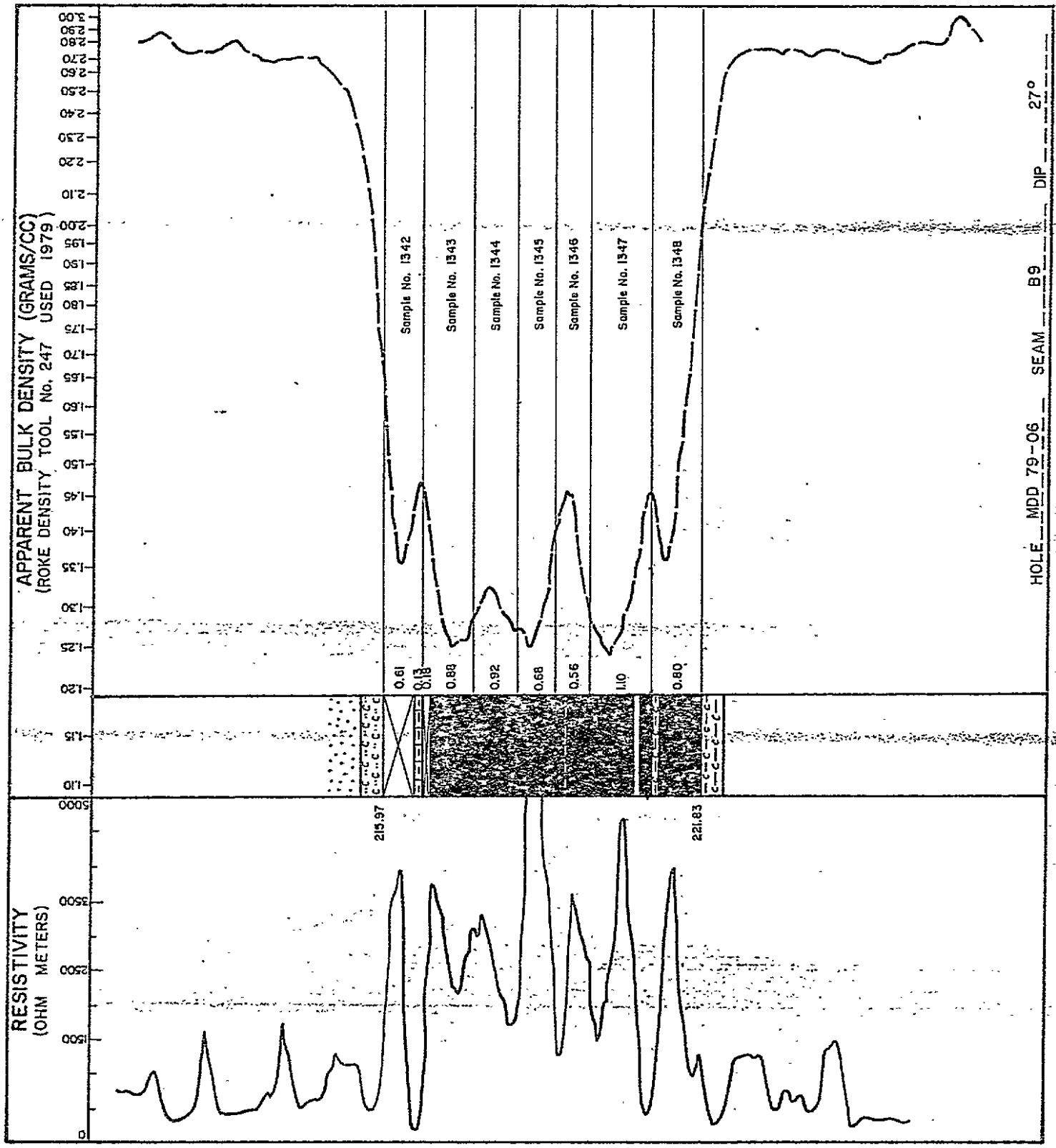


HOLE	SEAM
MDD 79-06	B8

SEAM PROFILE

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

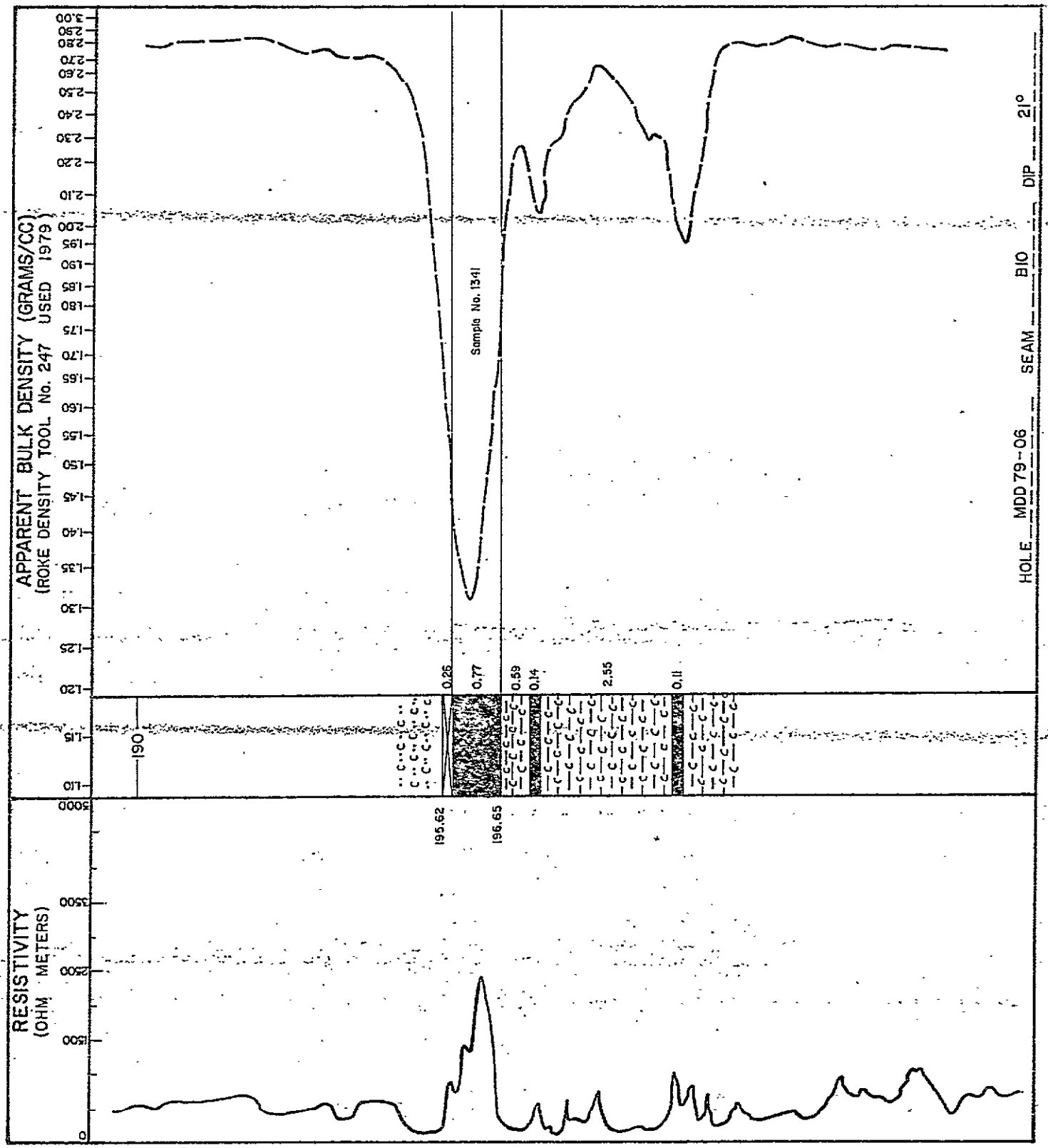


SEAM PROFILE

HOLE	SEAM
MDD 79-06	B9

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

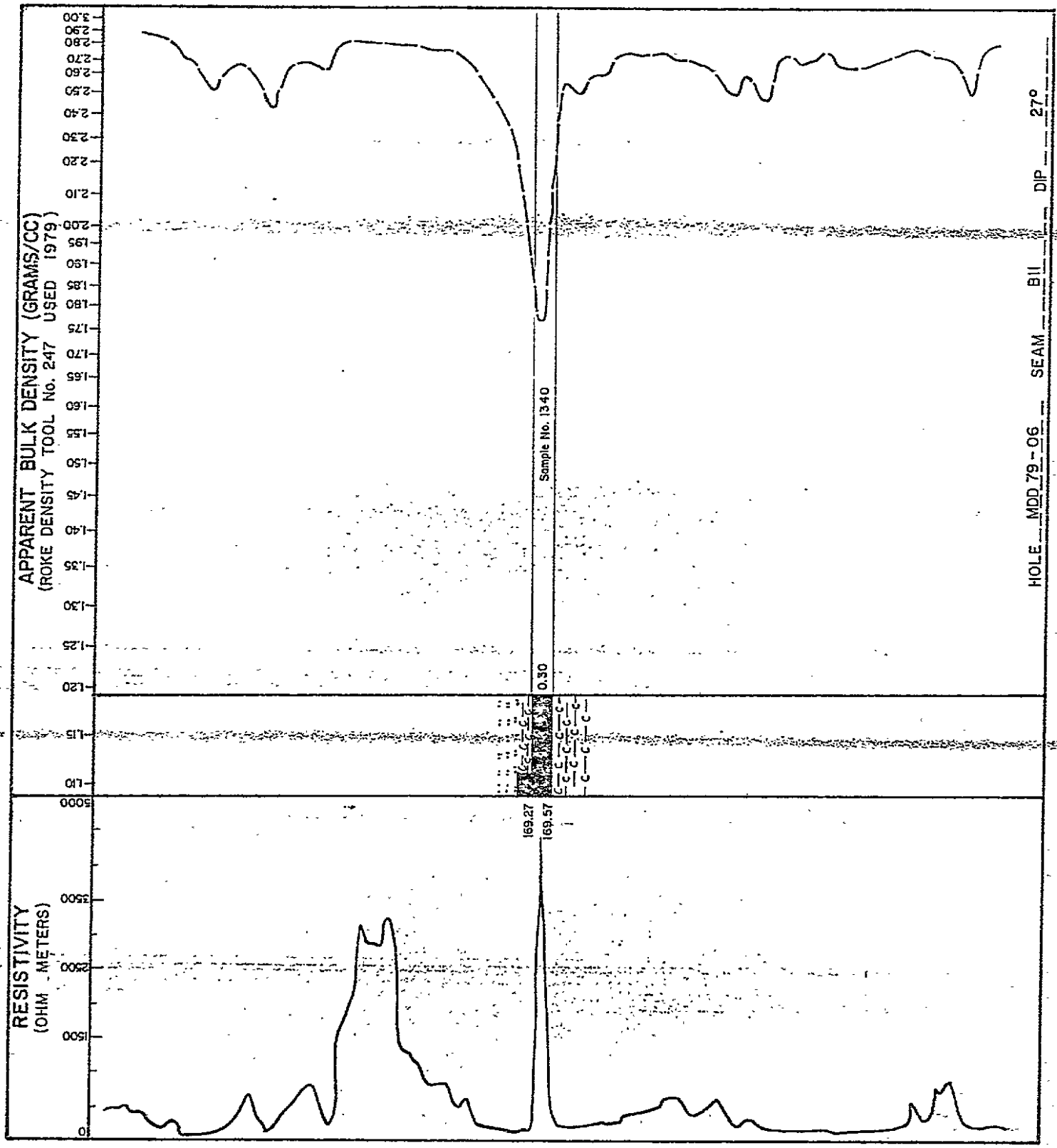


SEAM PROFILE

HOLE	SEAM
MDD 79-06	BIO

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

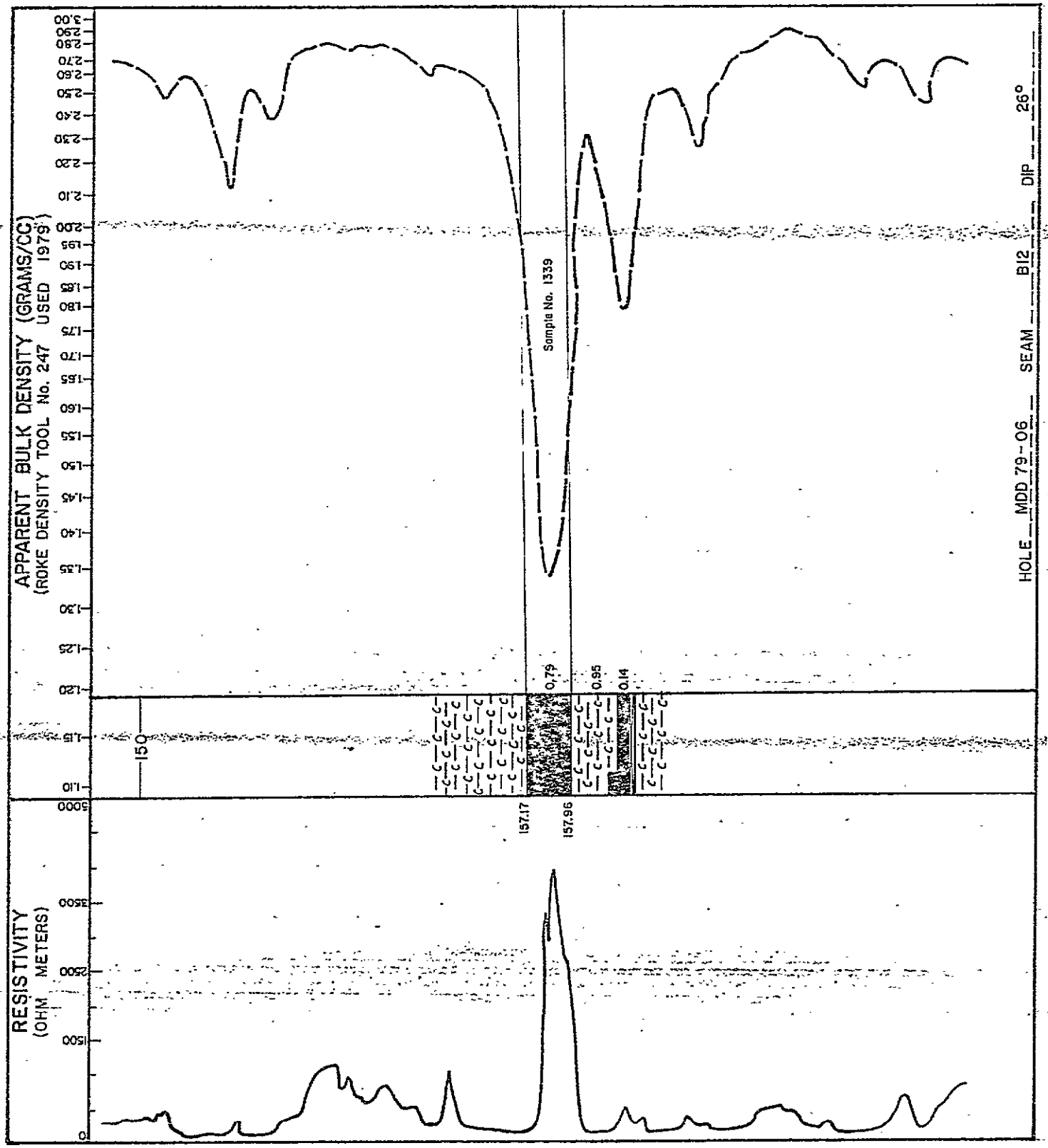


SEAM PROFILE

HOLE	SEAM
MDD 79-06	BII

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

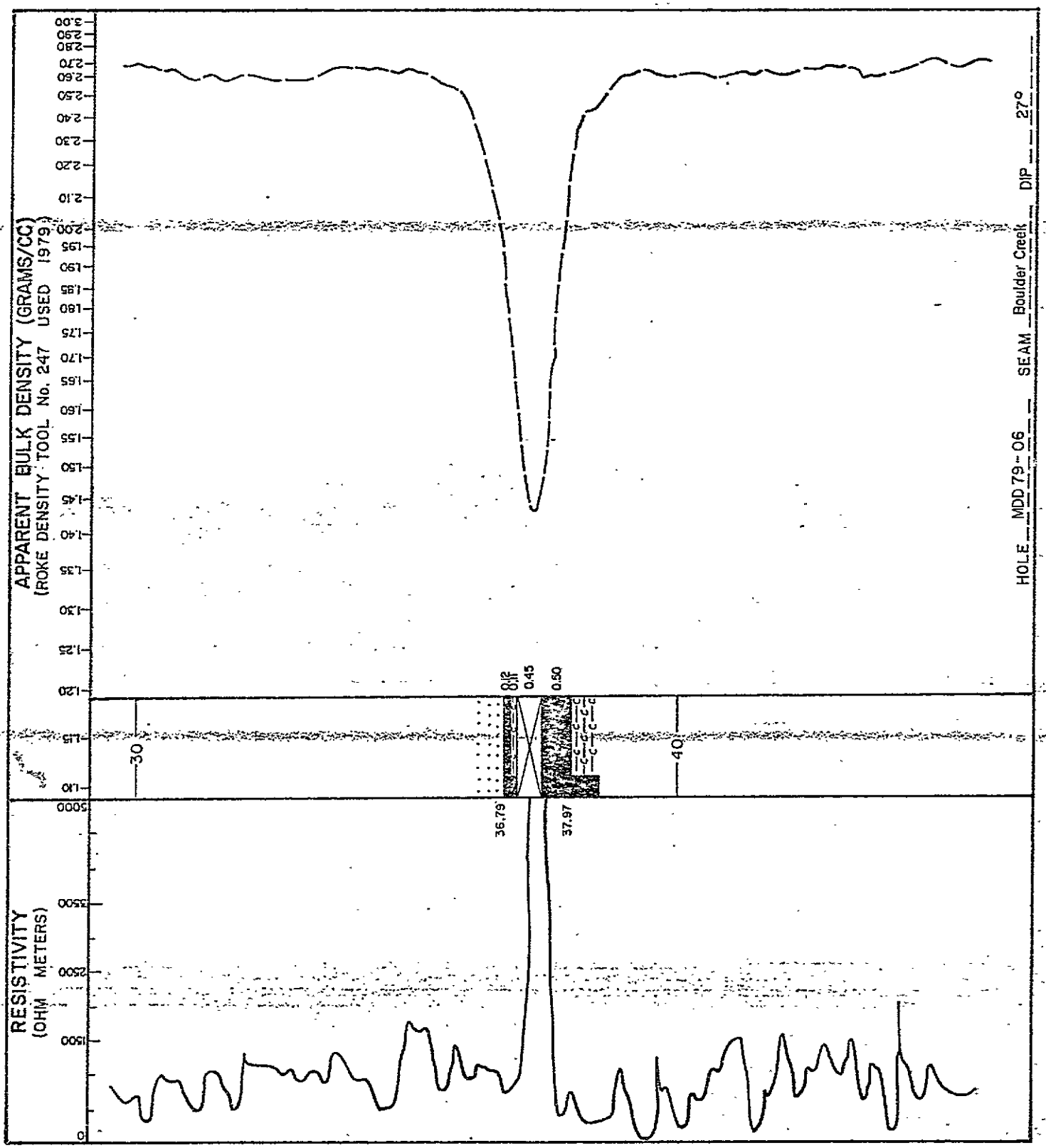


SEAM PROFILE

HOLE	SEAM
MDD 79-06	B12

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

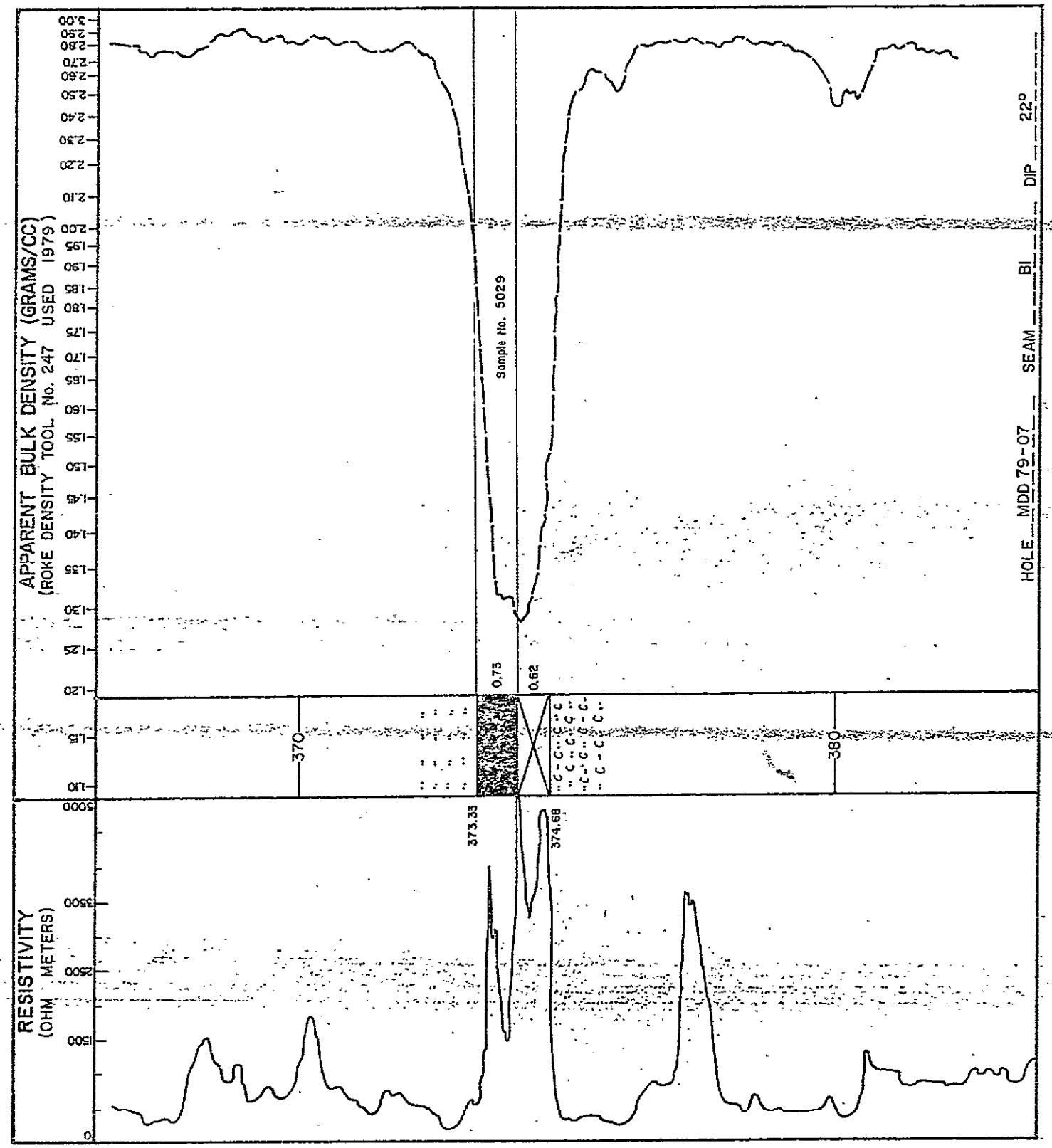


SEAM PROFILE

HOLE	SEAM
MDD 79-06	Boulder Creek

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

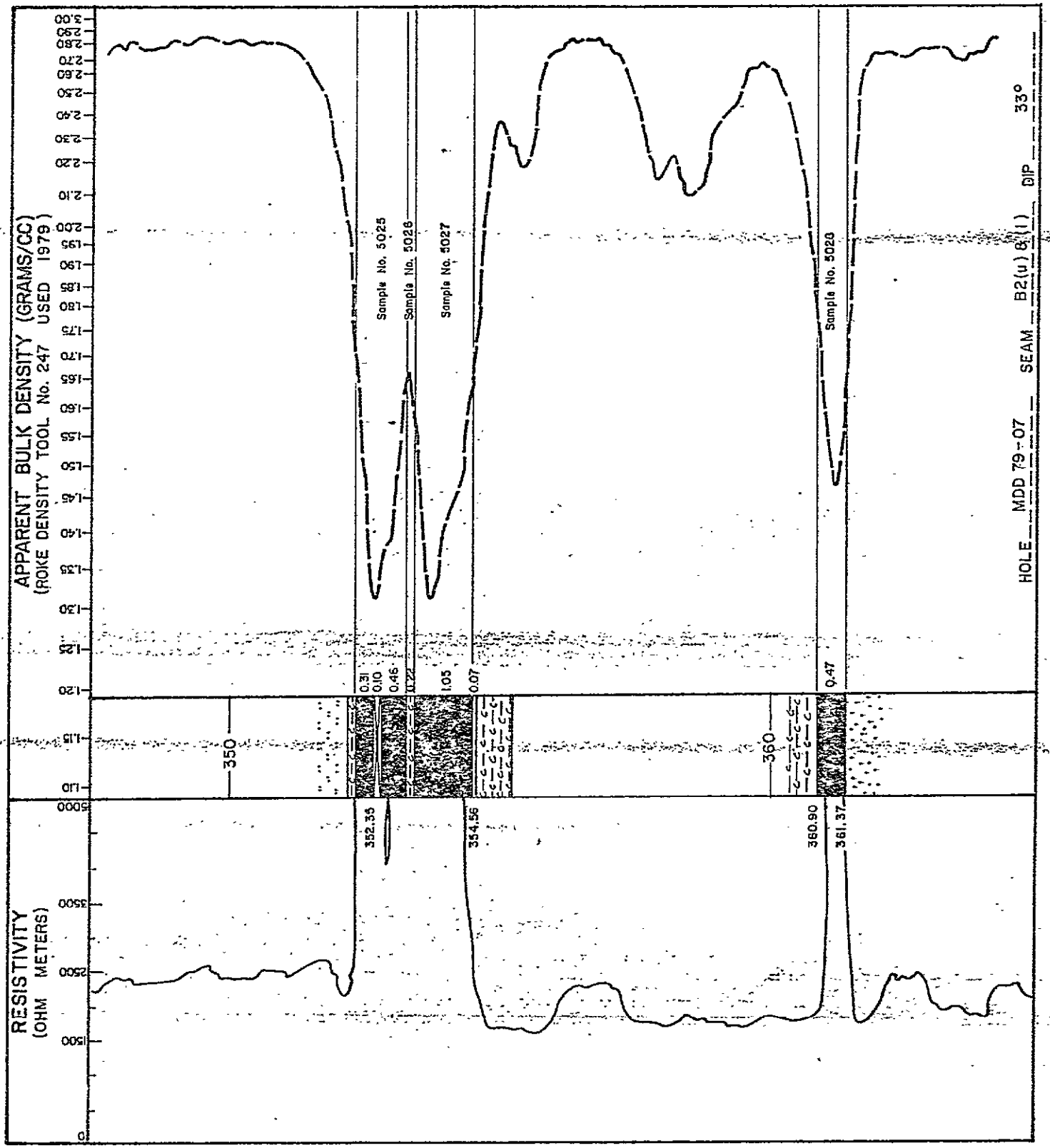


HOLE	SEAM
MDD 79-07	BI

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

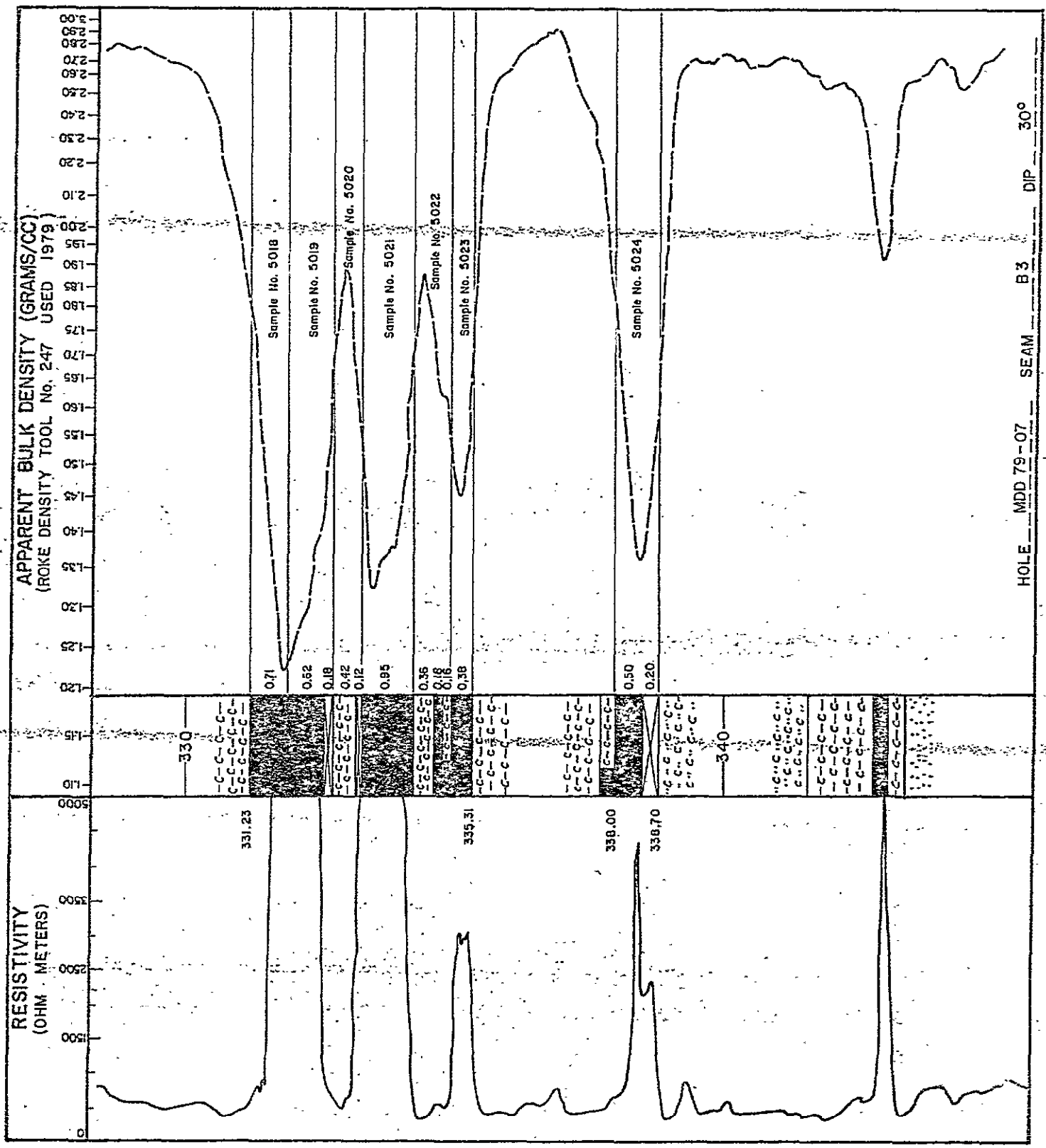


SEAM PROFILE

HOLE	SEAM
MDD 79-07	B2(u) & (l)

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

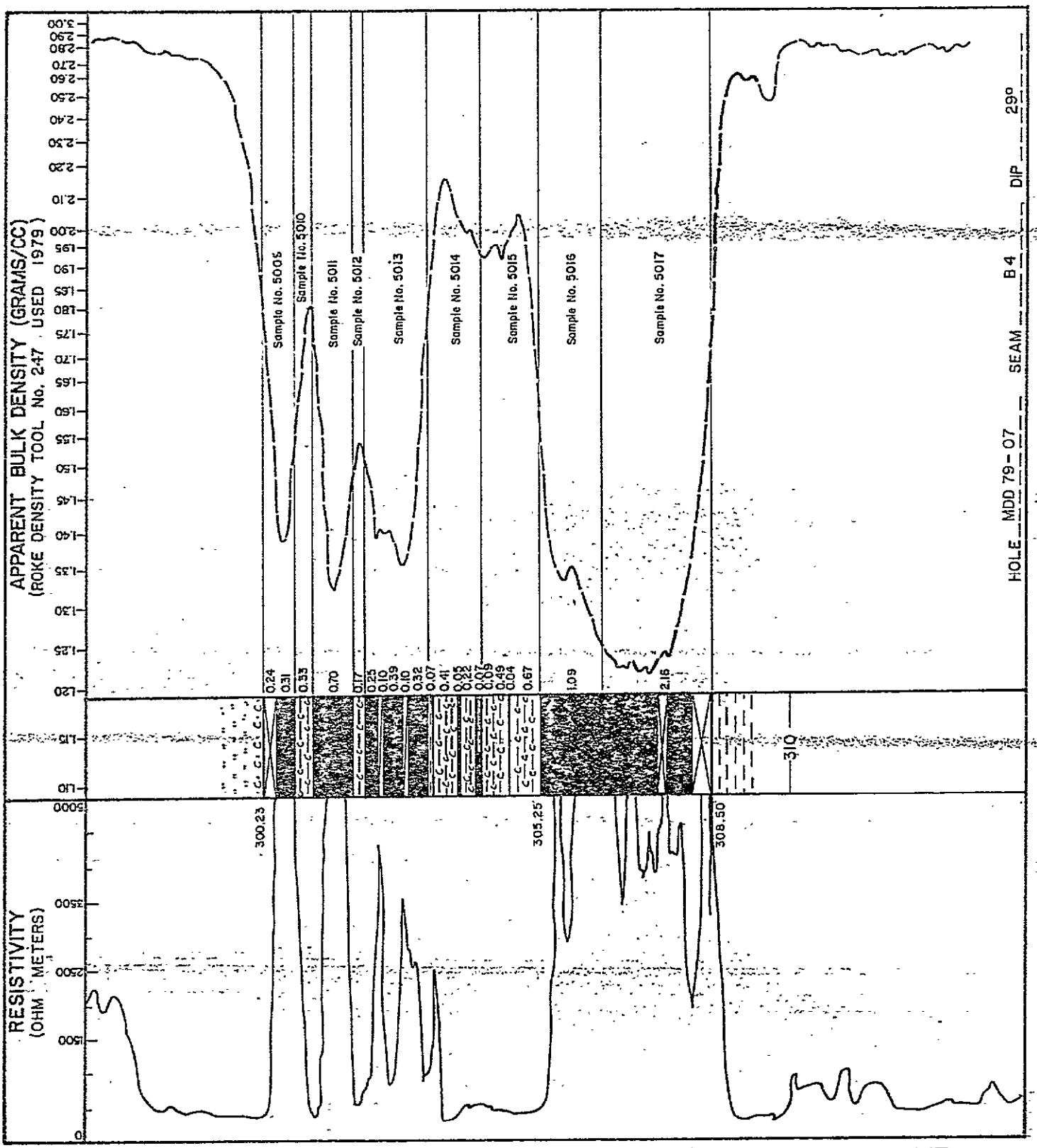


SEAM PROFILE

HOLE	SEAM
MDD 79-07	B3

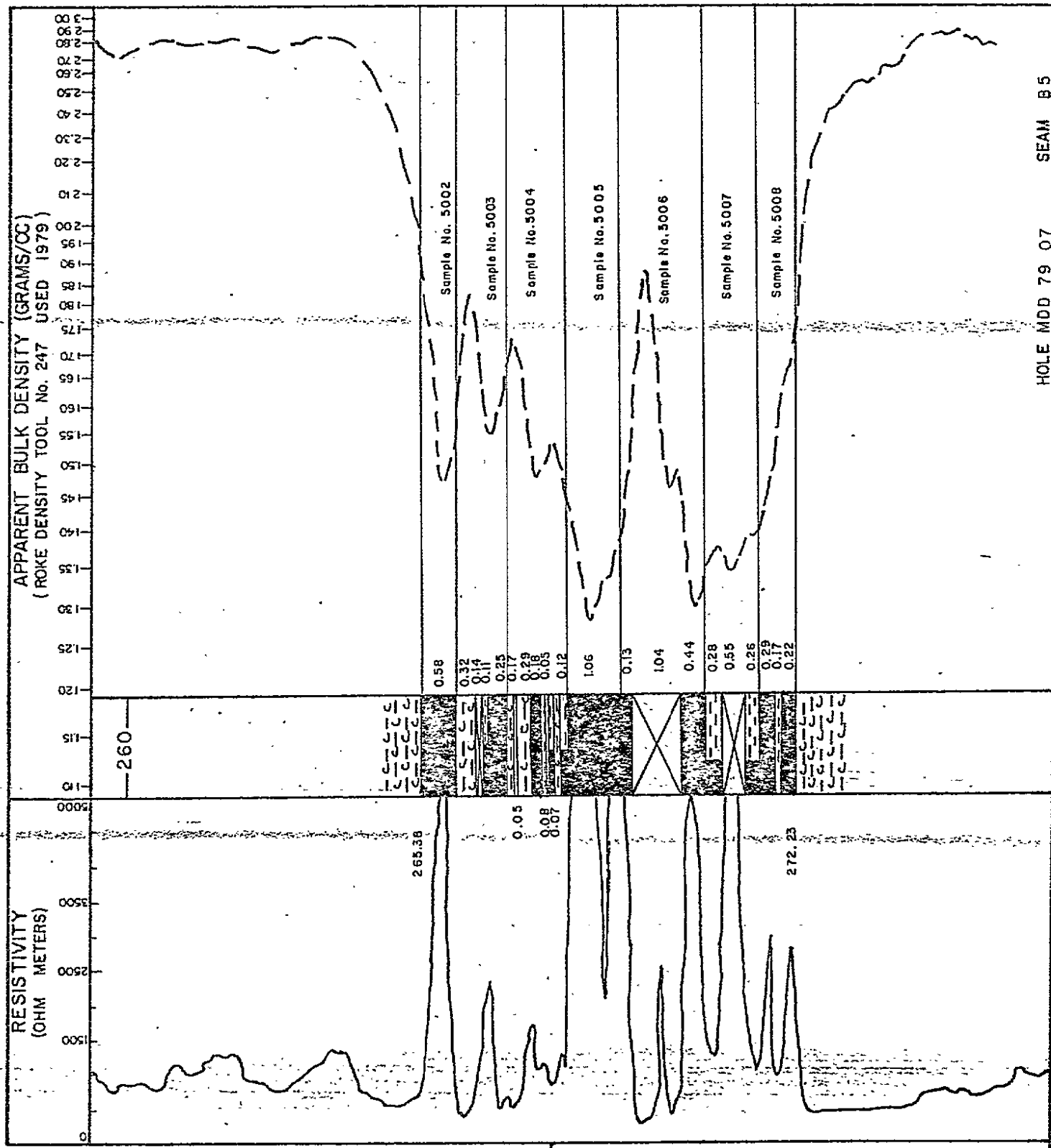
PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT



SEAM PROFILE

HOLE	SEAM
MDD-79-07	B4

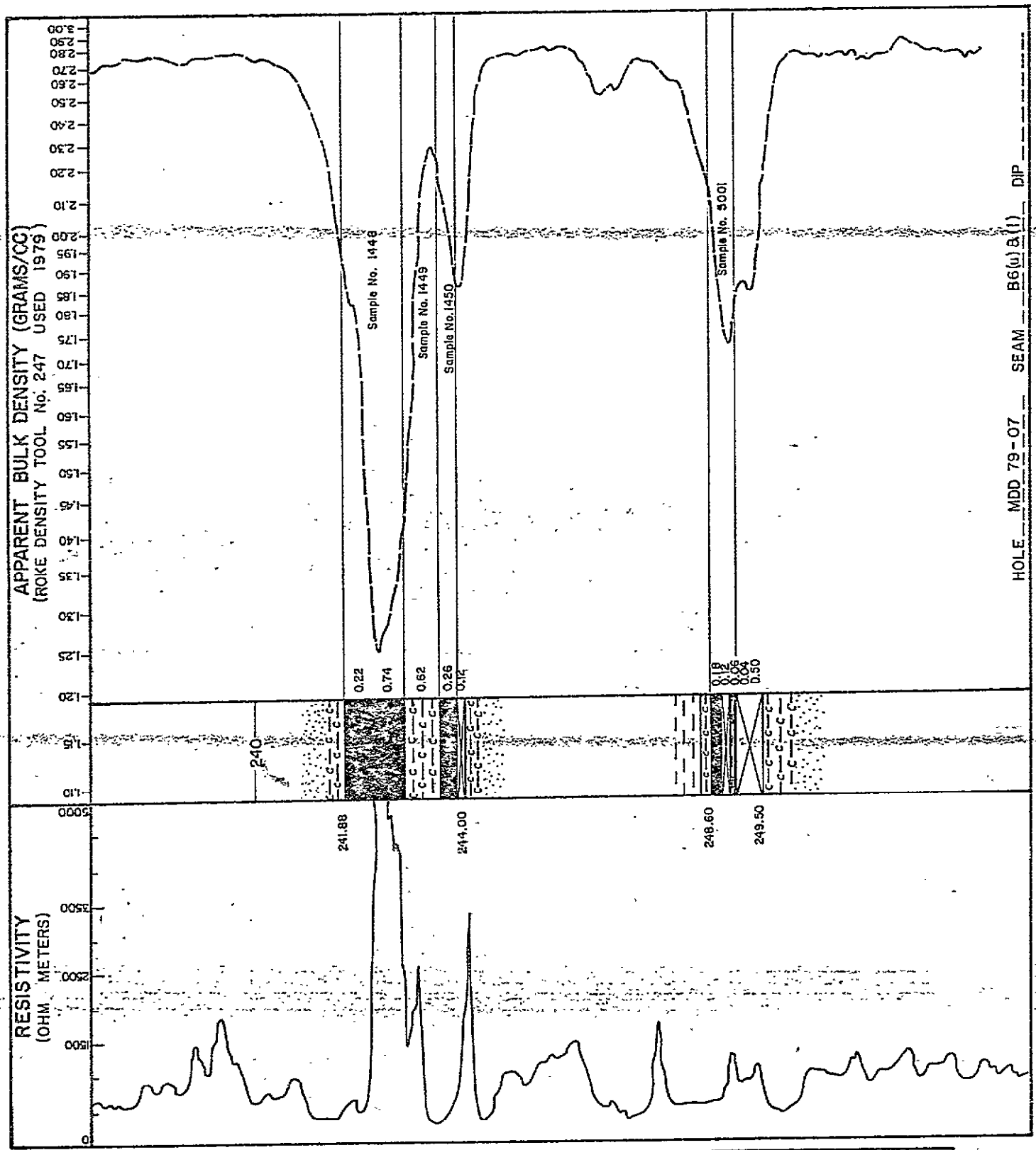


PETRO – CANADA
MINING DEPARTMENT
MONKMAN COAL PROJECT

SEAM PROFILE: B5
HOLE: MDD-79-07
DIP: 29°

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

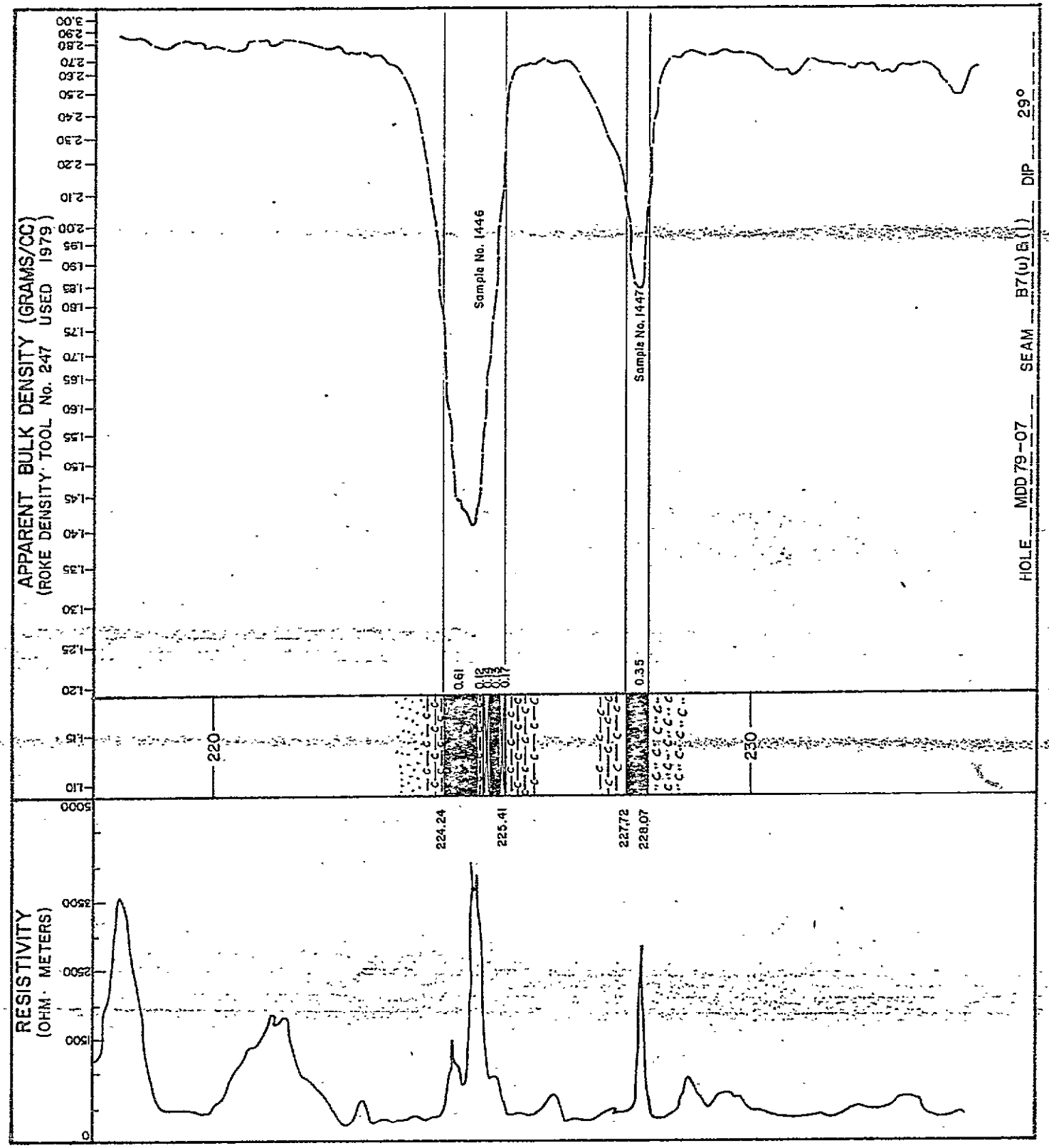


HOLE	SEAM
MDD 79-07	B6(u) & (l)

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

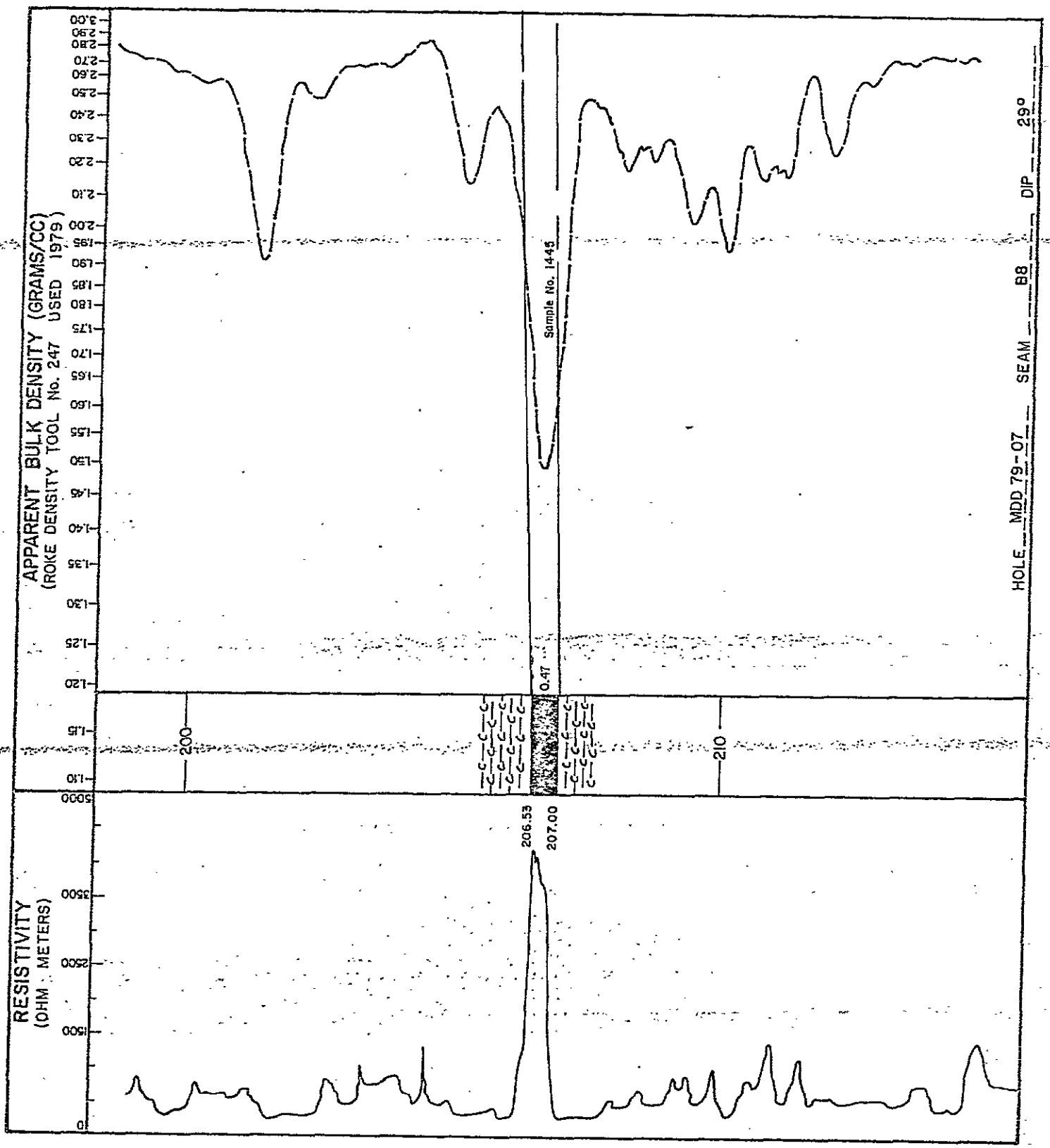


SEAM PROFILE

HOLE	SEAM
MDD 79-07	B7(u)&(l)

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

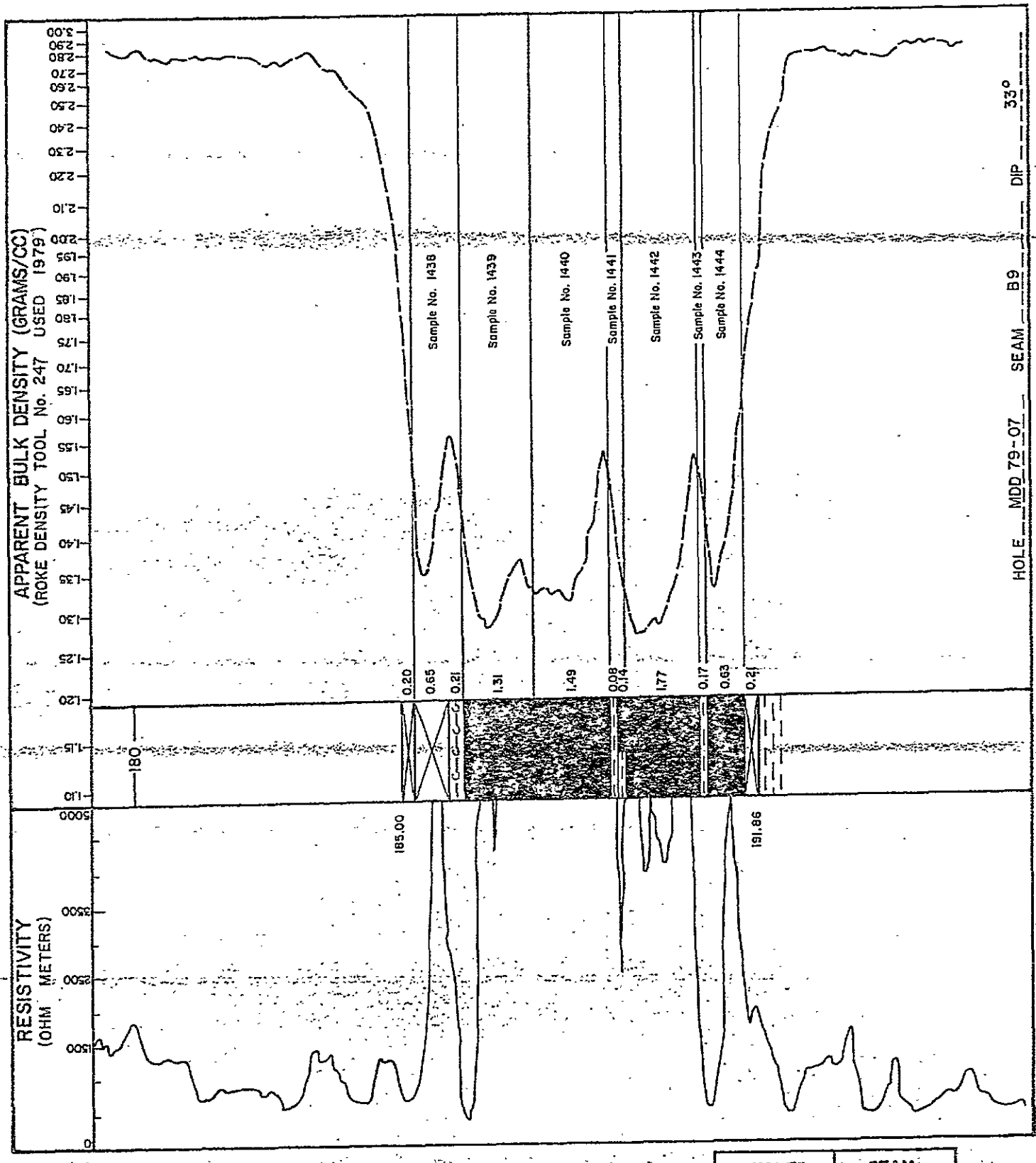


SEAM PROFILE

HOLE	SEAM
MDD 79-07	B8

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

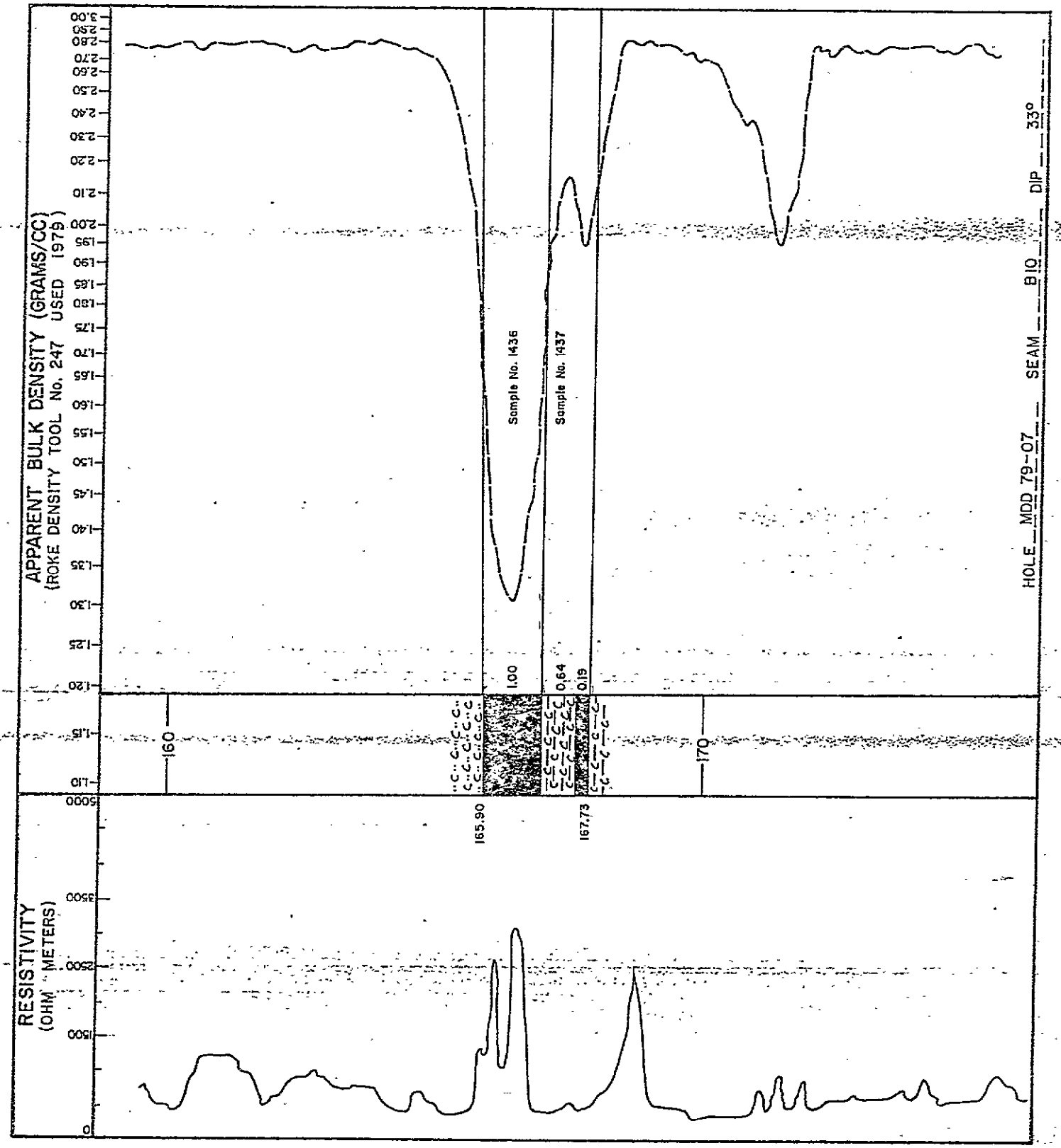


HOLE	SEAM
MDD 79-07	B9

SEAM PROFILE

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

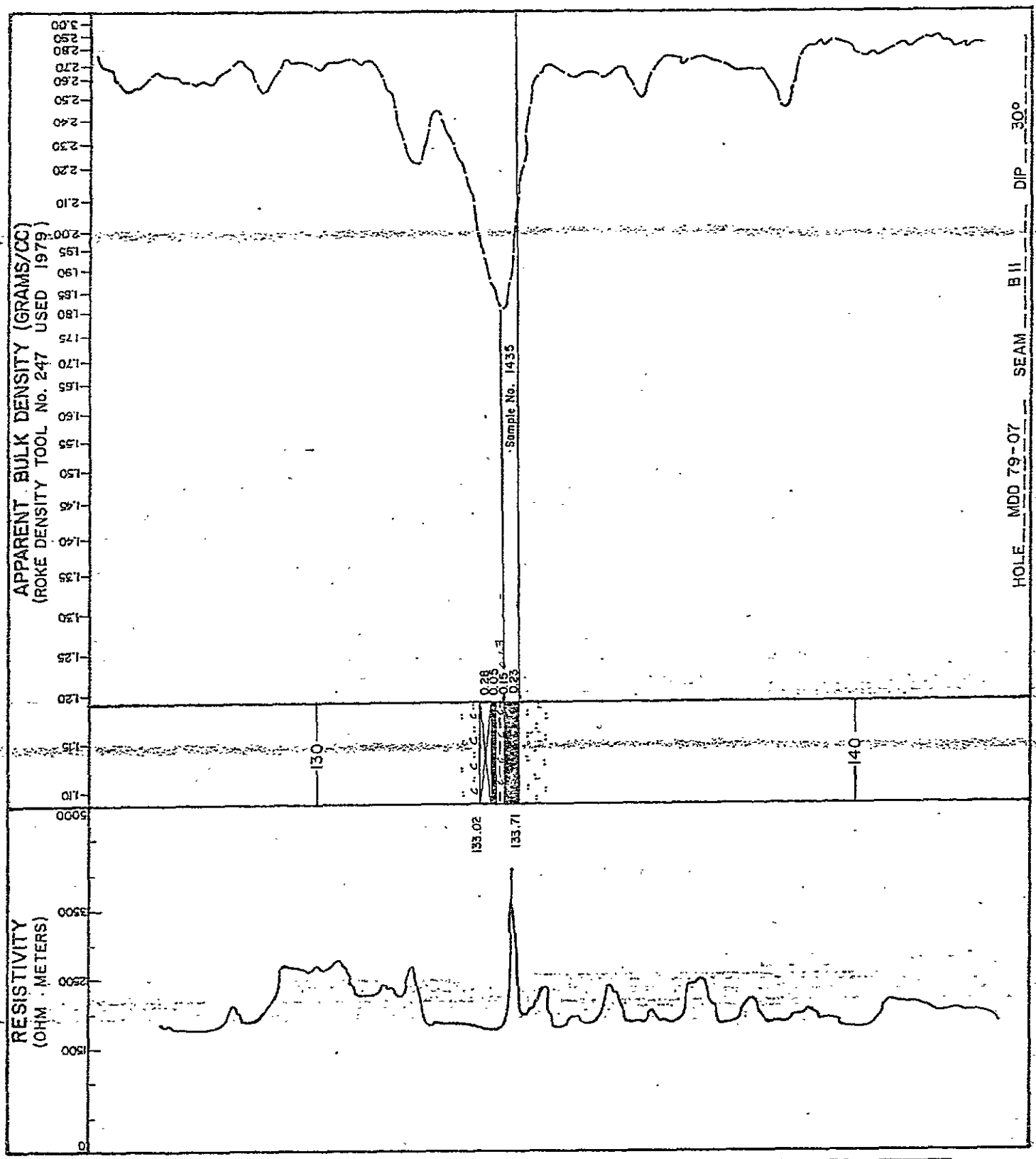


SEAM PROFILE

HOLE	SEAM
MDD 79-07	BIO

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

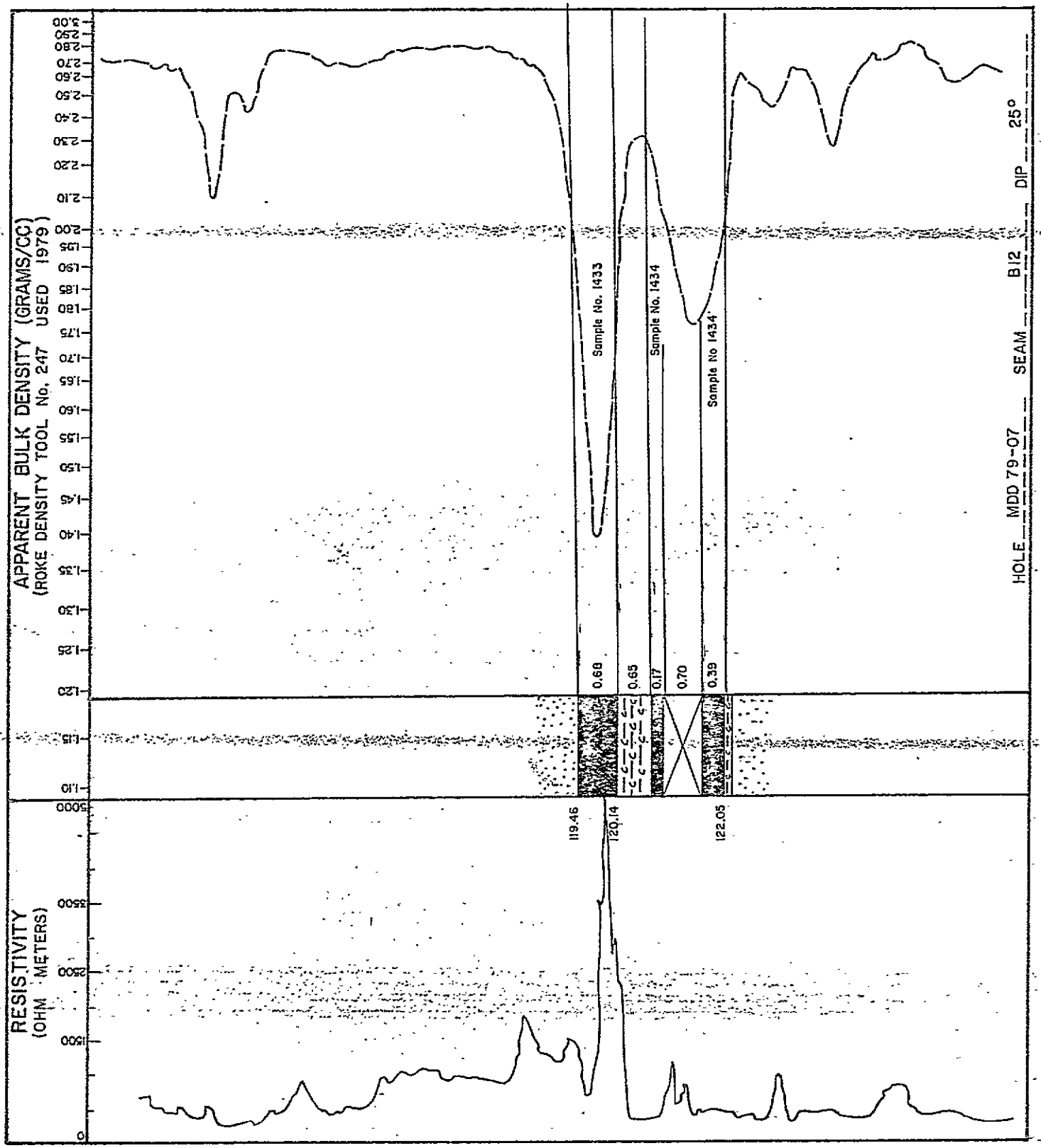


SEAM PROFILE

HOLE	SEAM
MDD 79-07	B II

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

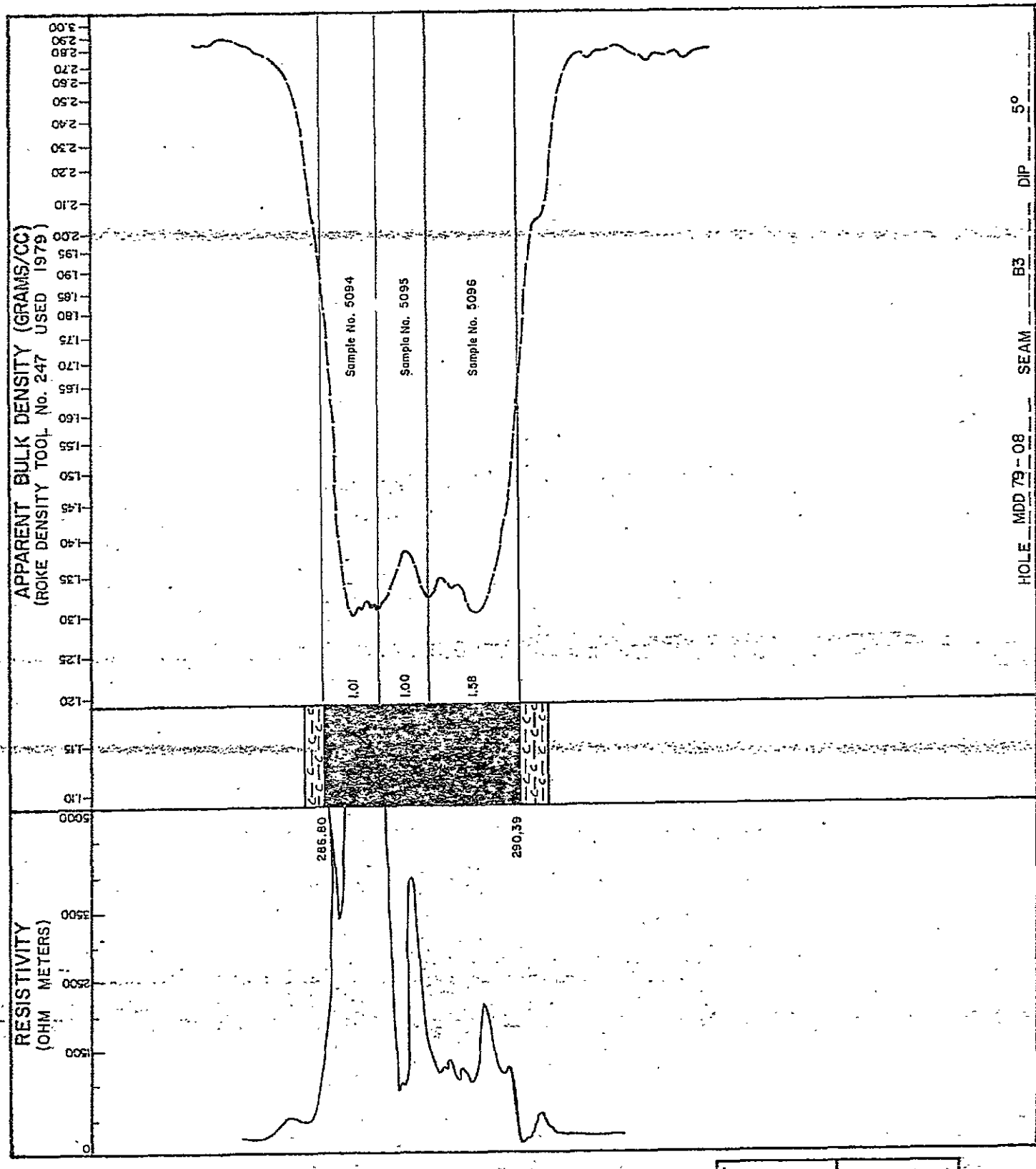


SEAM PROFILE

HOLE	SEAM
MDD 79-07	B12

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

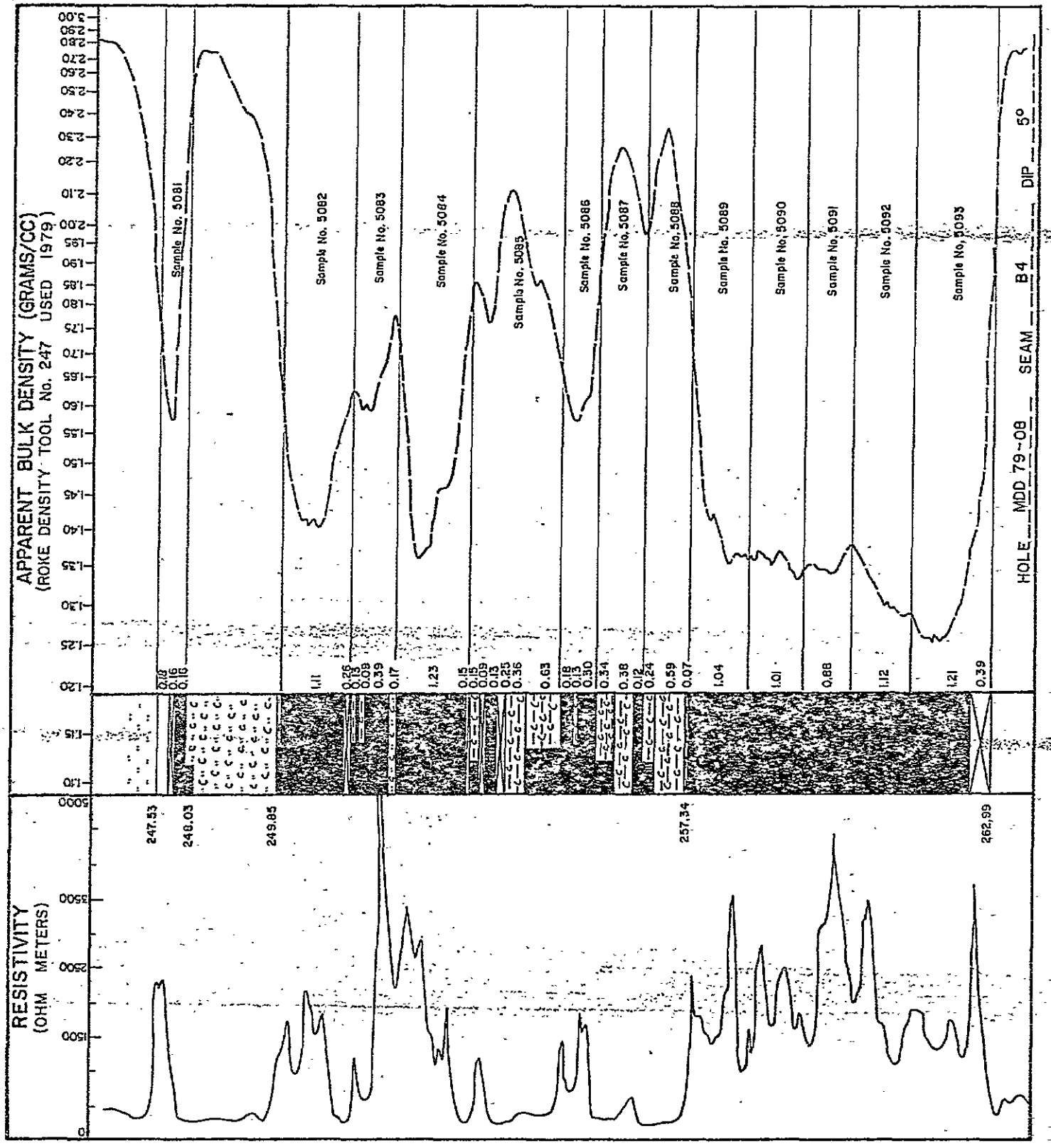


SEAM PROFILE

HOLE	SEAM
MDD 79-08	B3

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

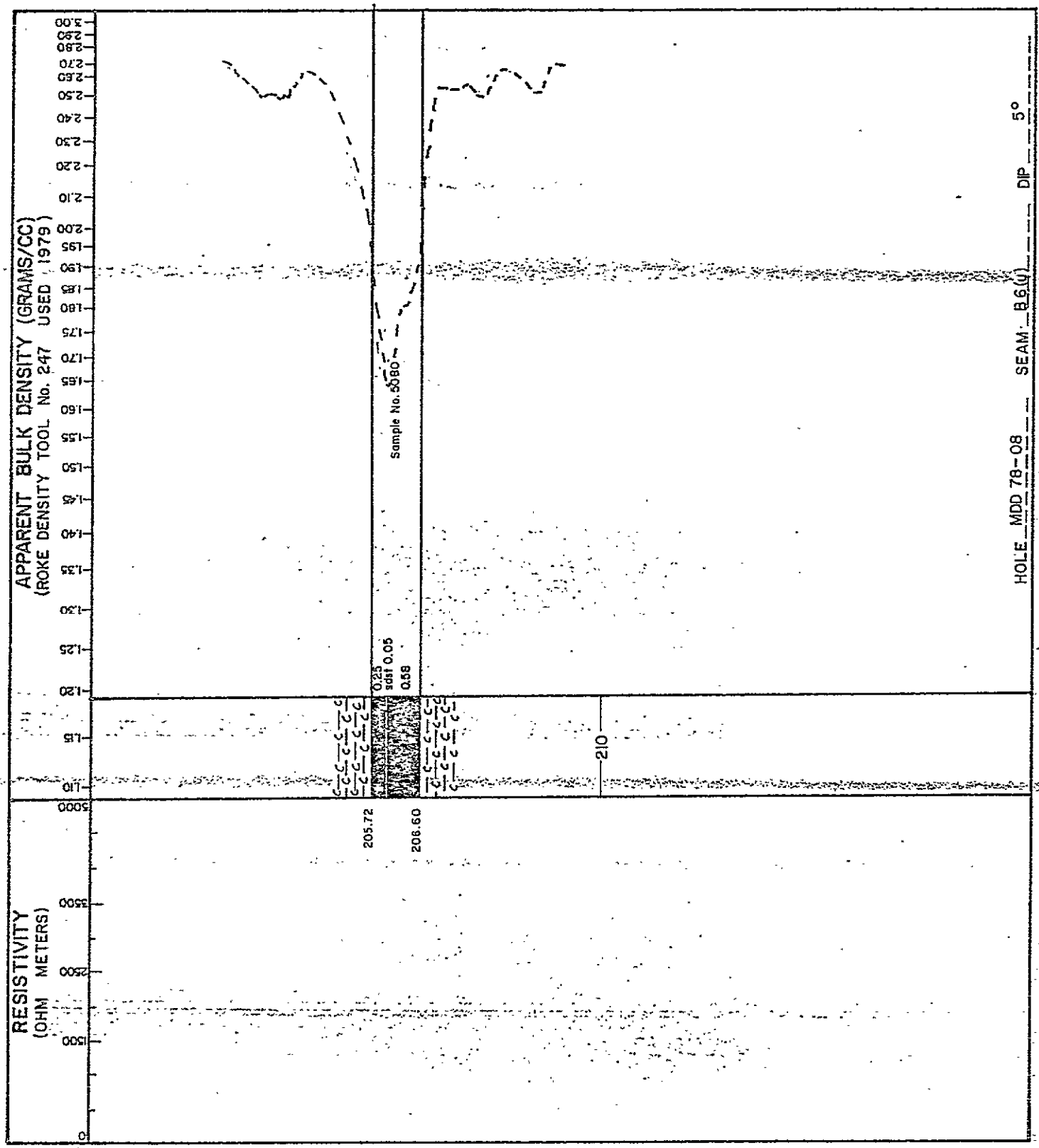


SEAM PROFILE

HOLE	SEAM
MDD 79-08	B4

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

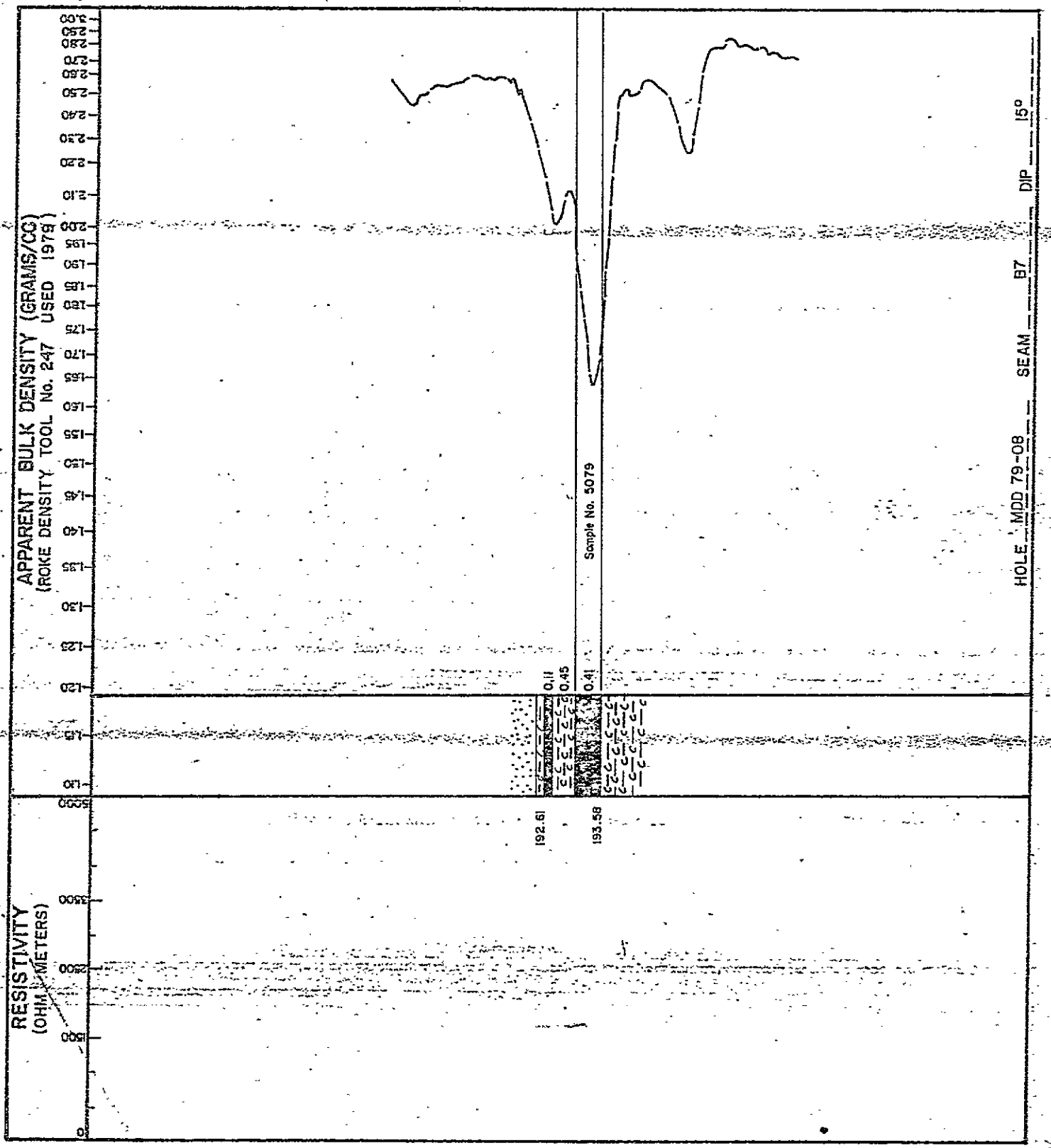


HOLE	SEAM
MDD 79-08	B6(u)

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

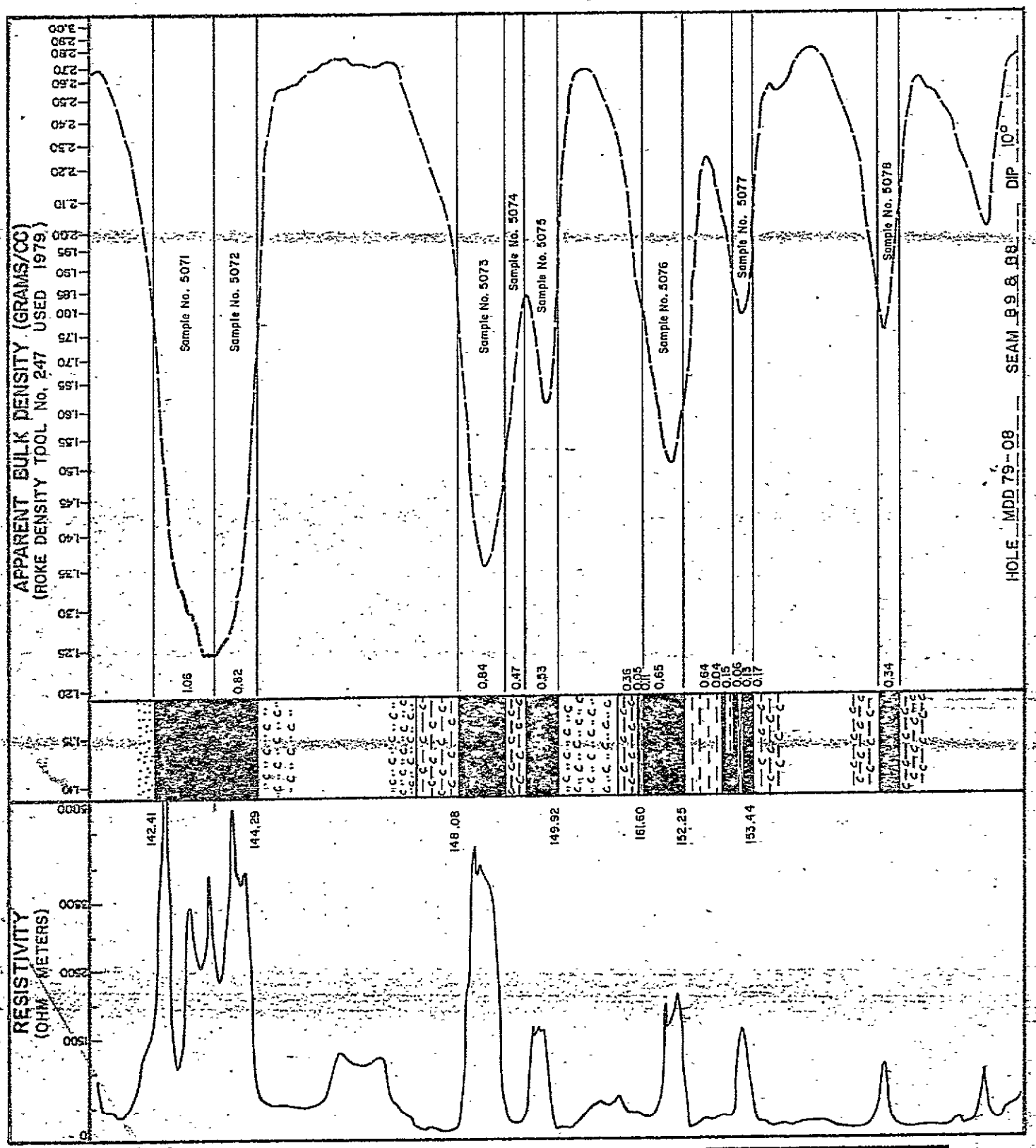


SEAM PROFILE

HOLE	SEAM
MDD 79-08	B7

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

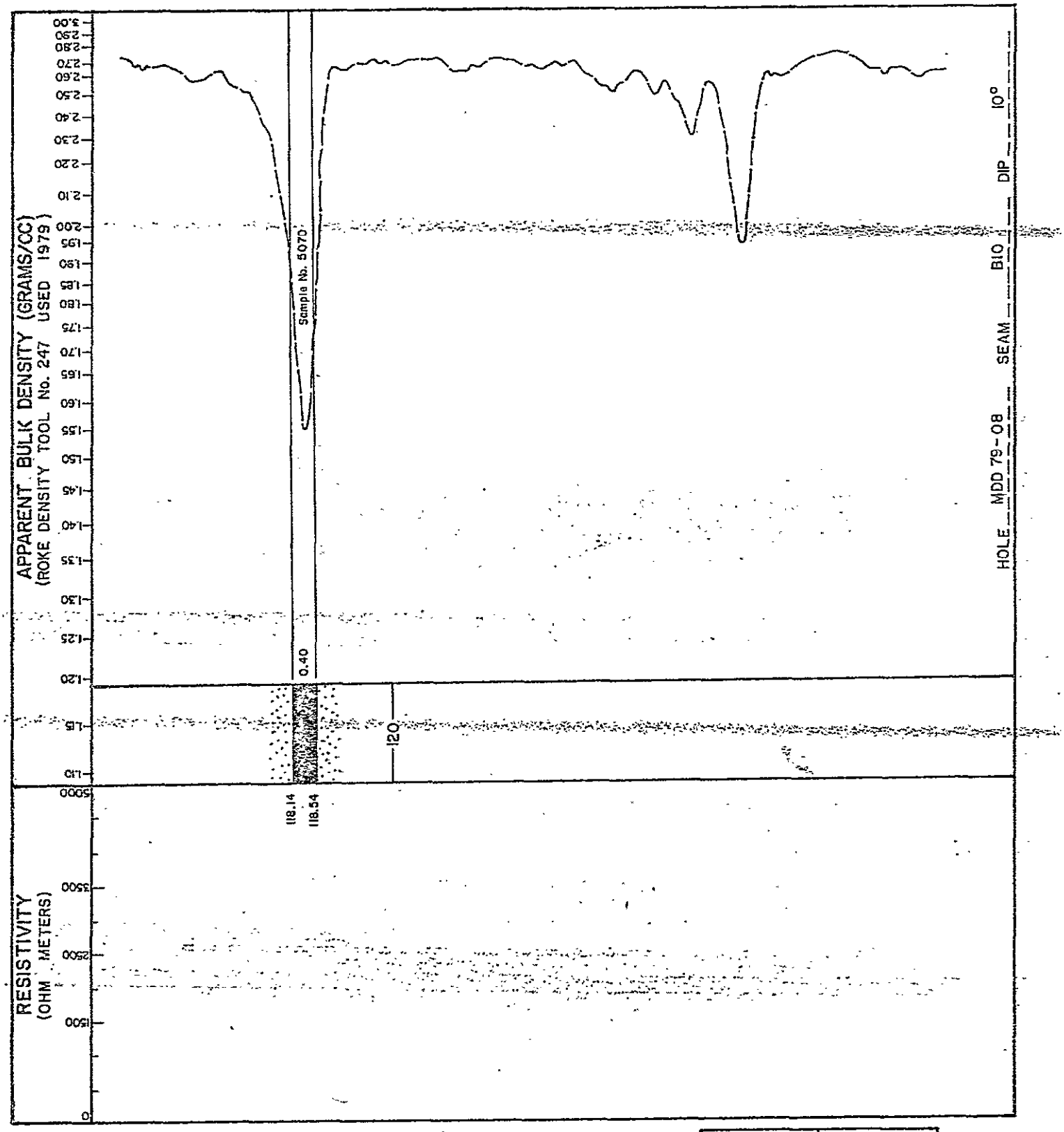


HOLE	SEAM
MDD 79-08	B9&B8

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

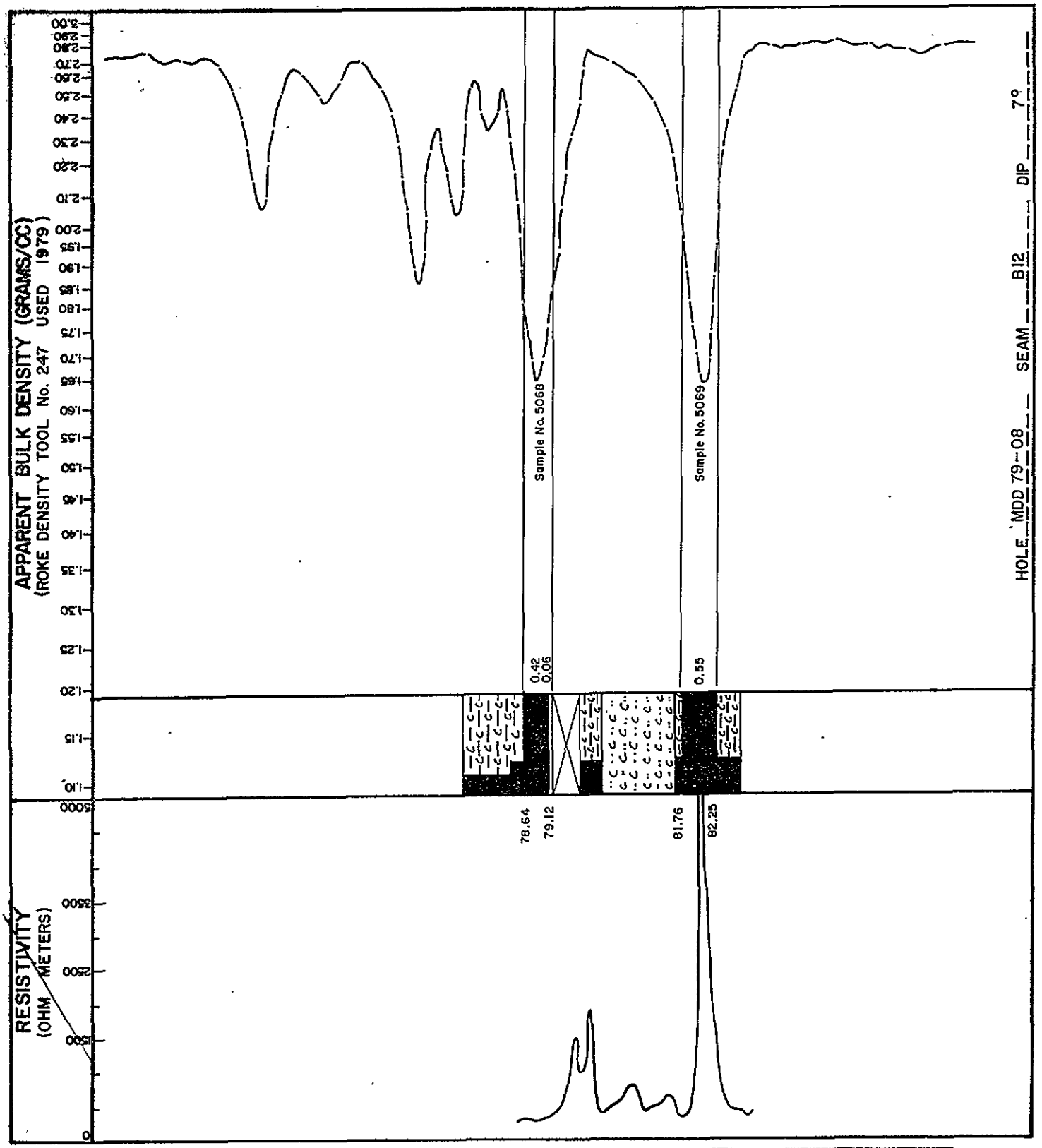


HOLE	SEAM
MDD.79-08	BIO

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

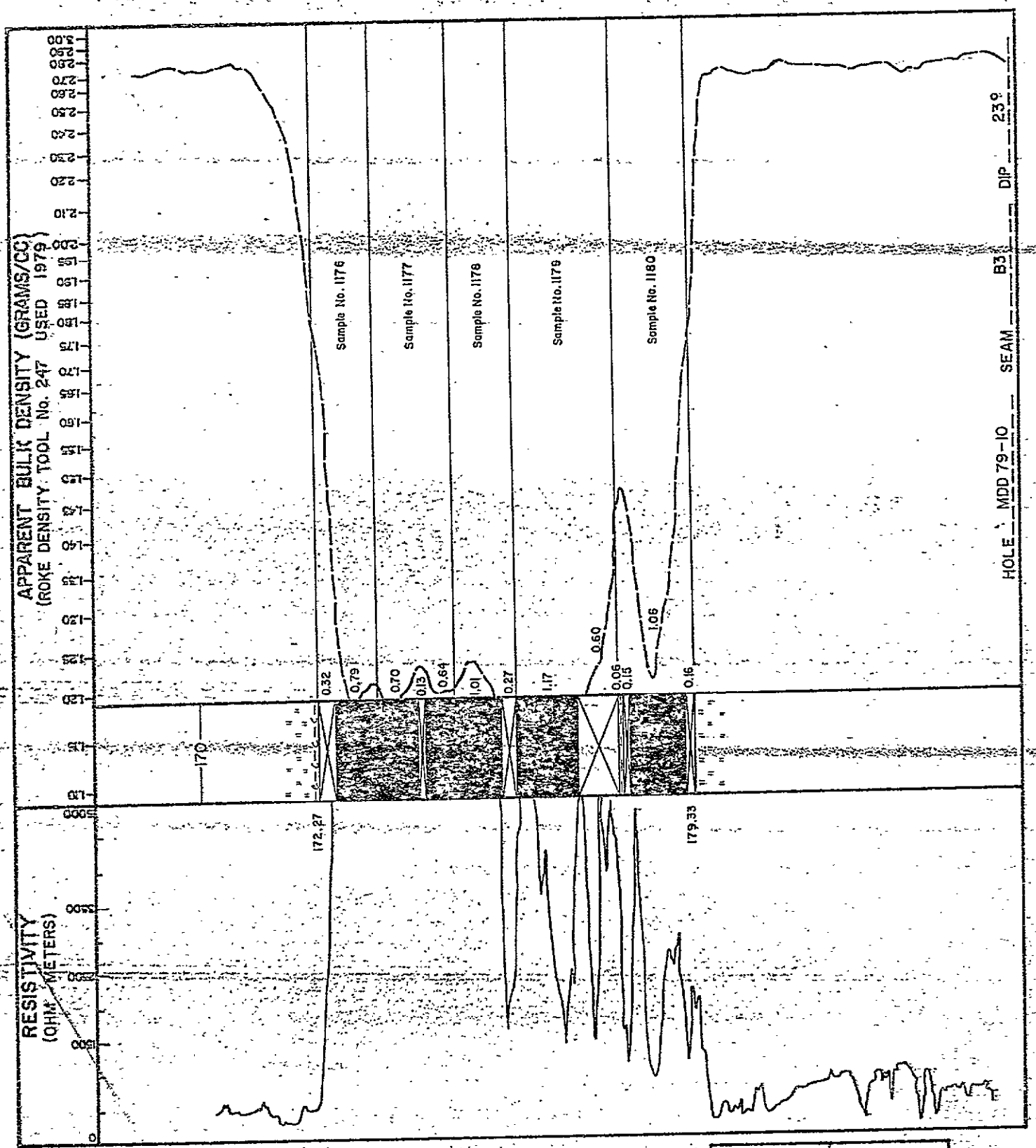


HOLE	SEAM
MDD 79-08	B12

SEAM PROFILE

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

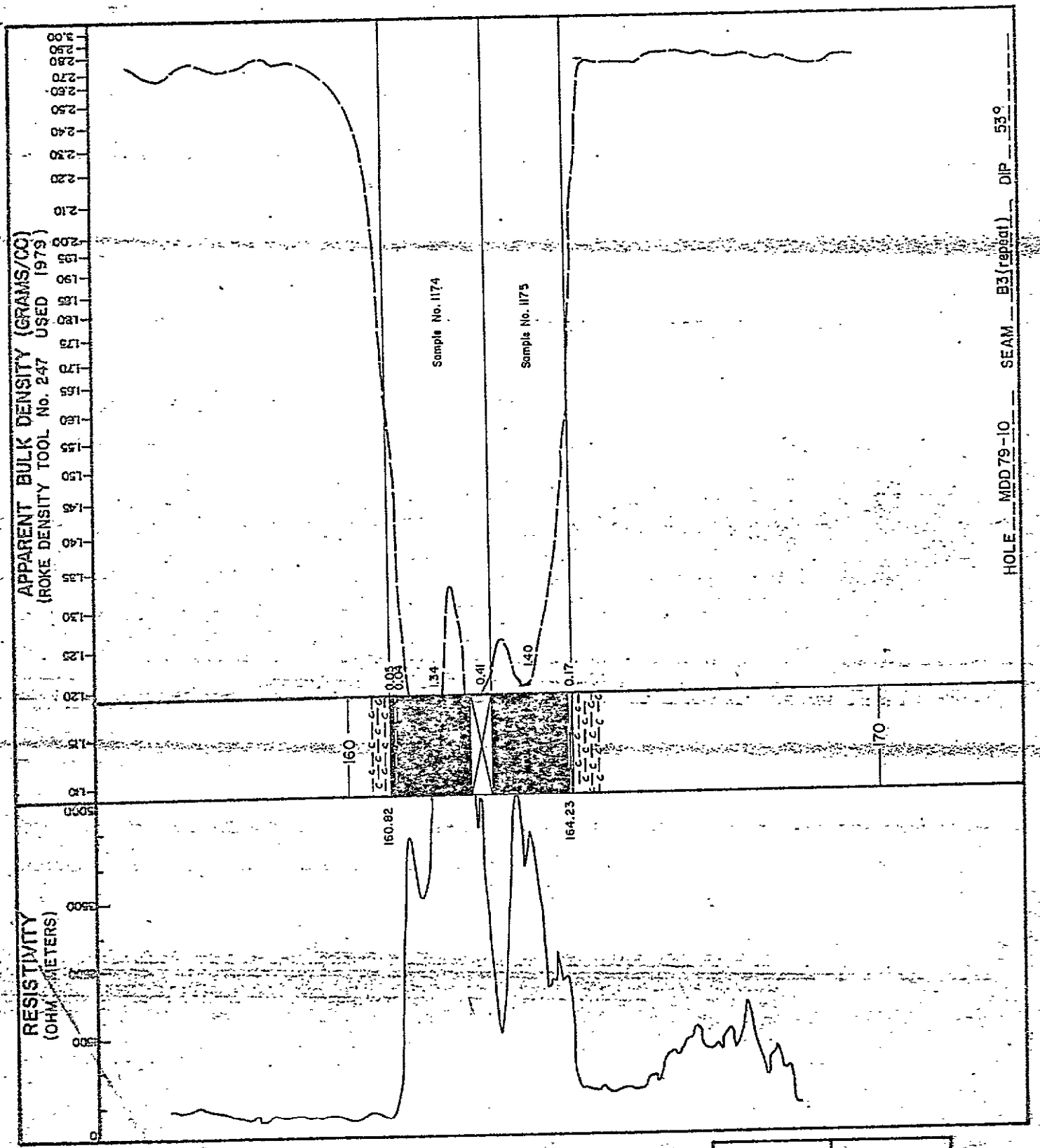


HOLE	SEAM
MDD 79-10	B3

SEAM PROFILE

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

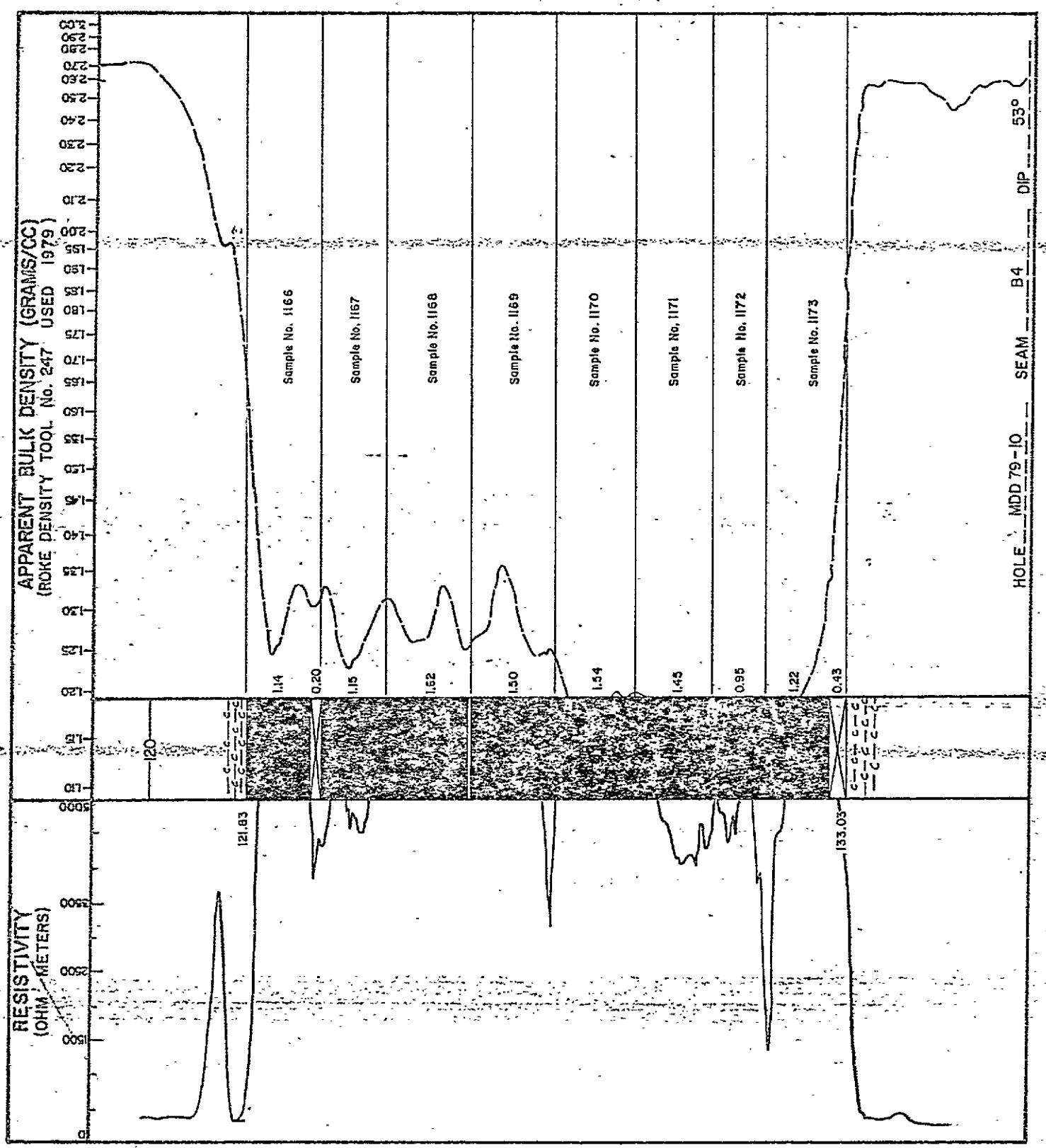


HOLE	SEAM
MDD 79-10	B3(repeat)

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

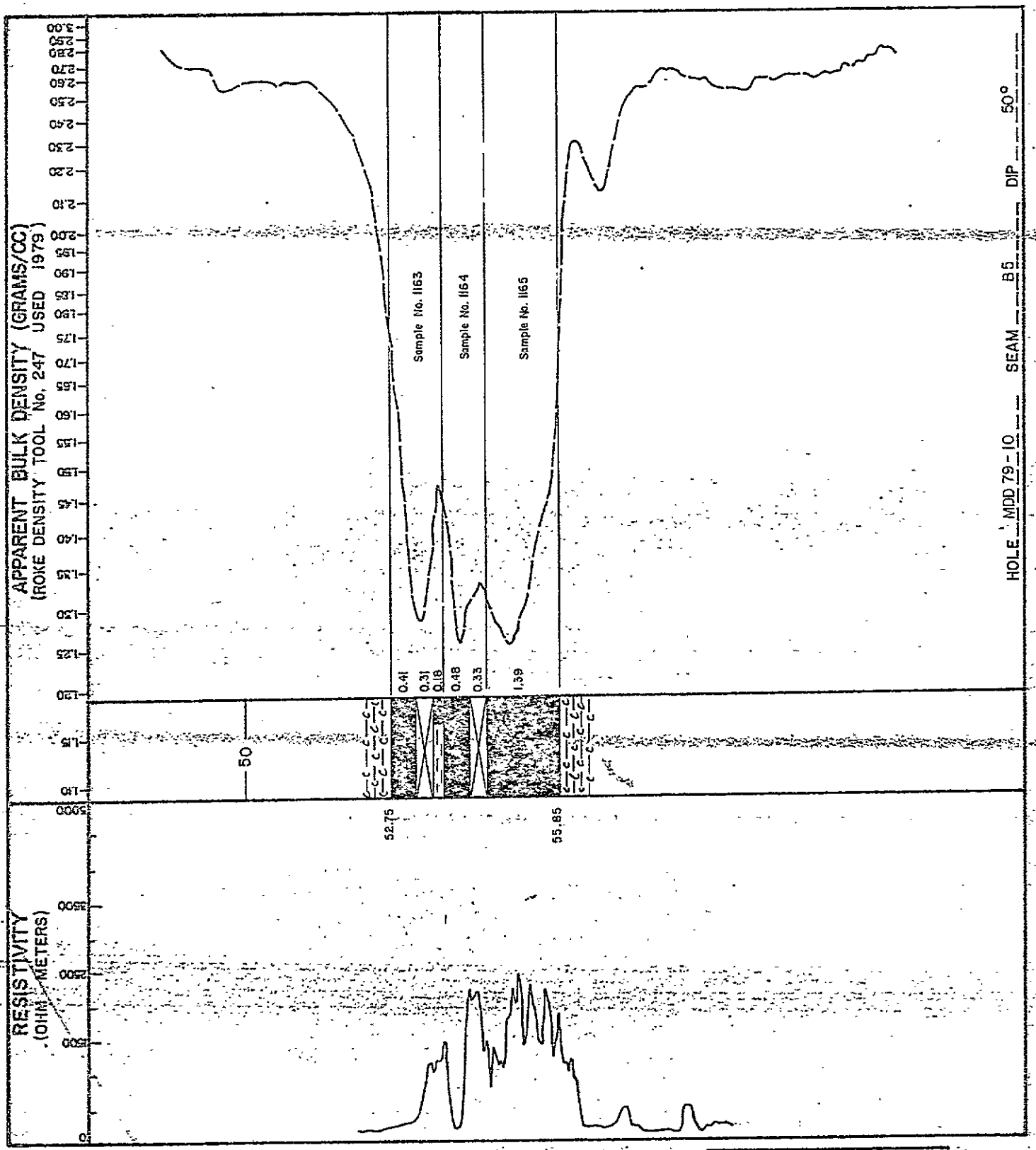


SEAM PROFILE

HOLE	SEAM
MDD 79-10	B4

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

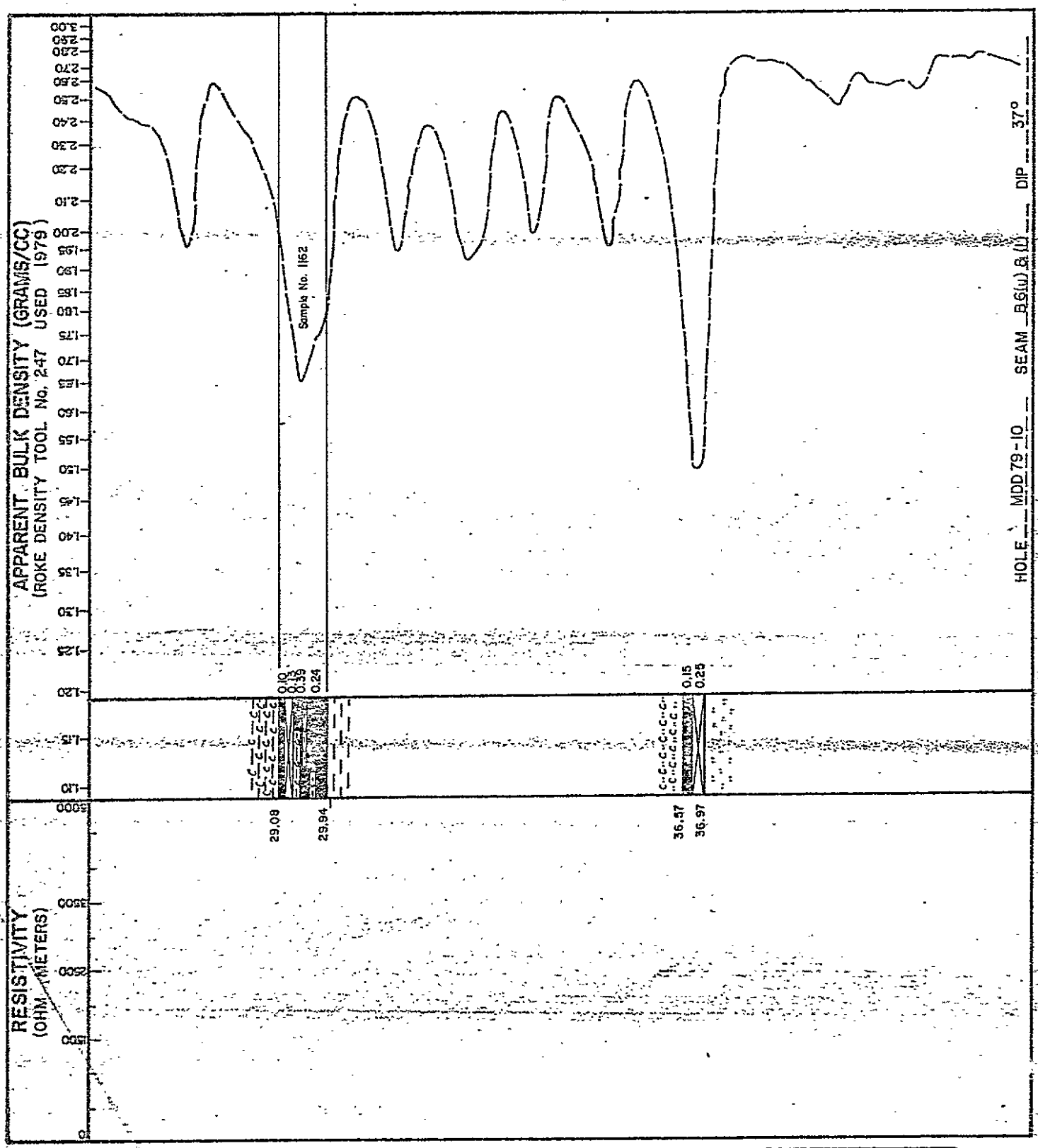


SEAM PROFILE

HOLE	SEAM
MDD 79-10	B5

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

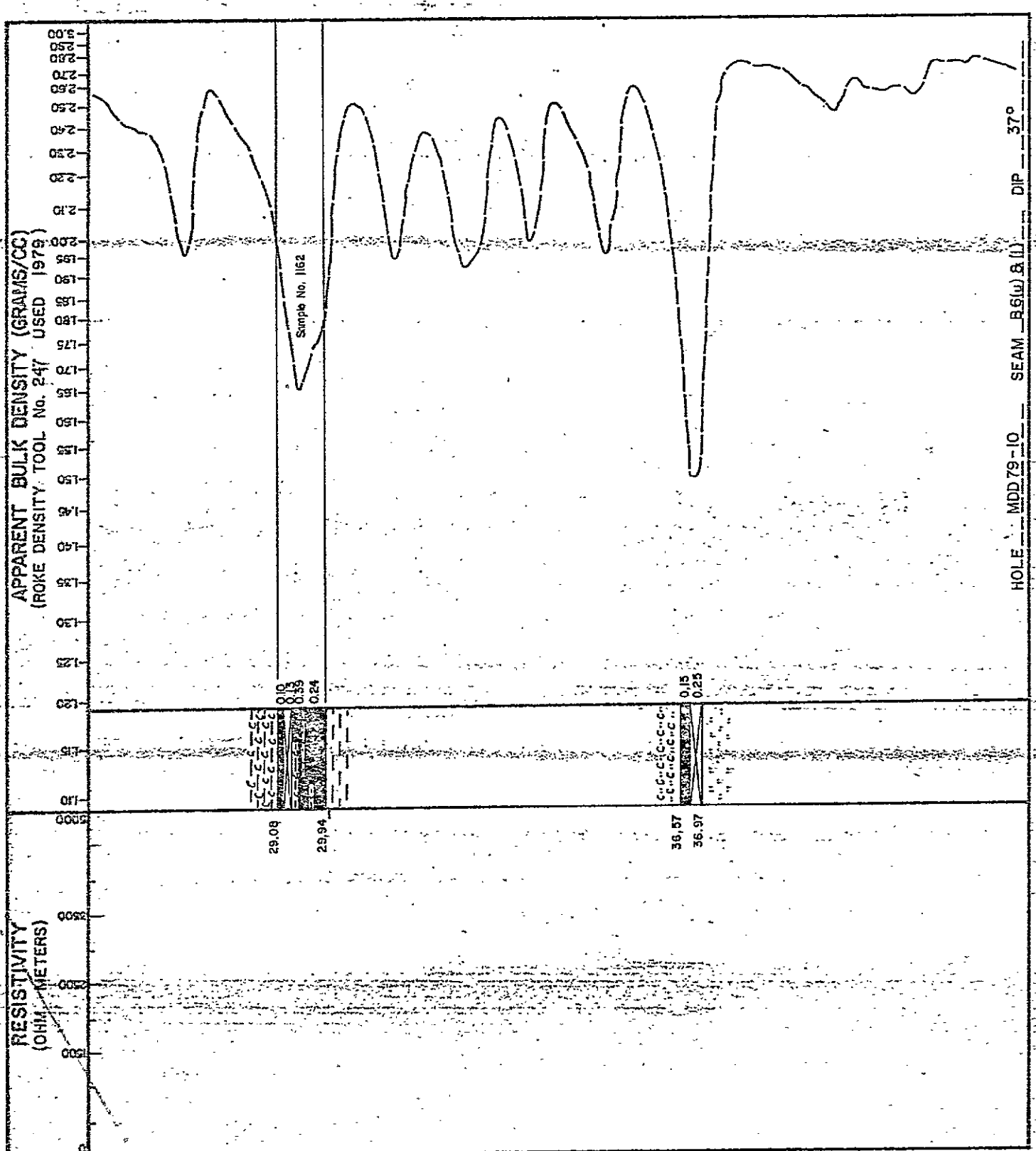


SEAM PROFILE

HOLE	SEAM
MDD 79-10	B6(u)&(l)

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

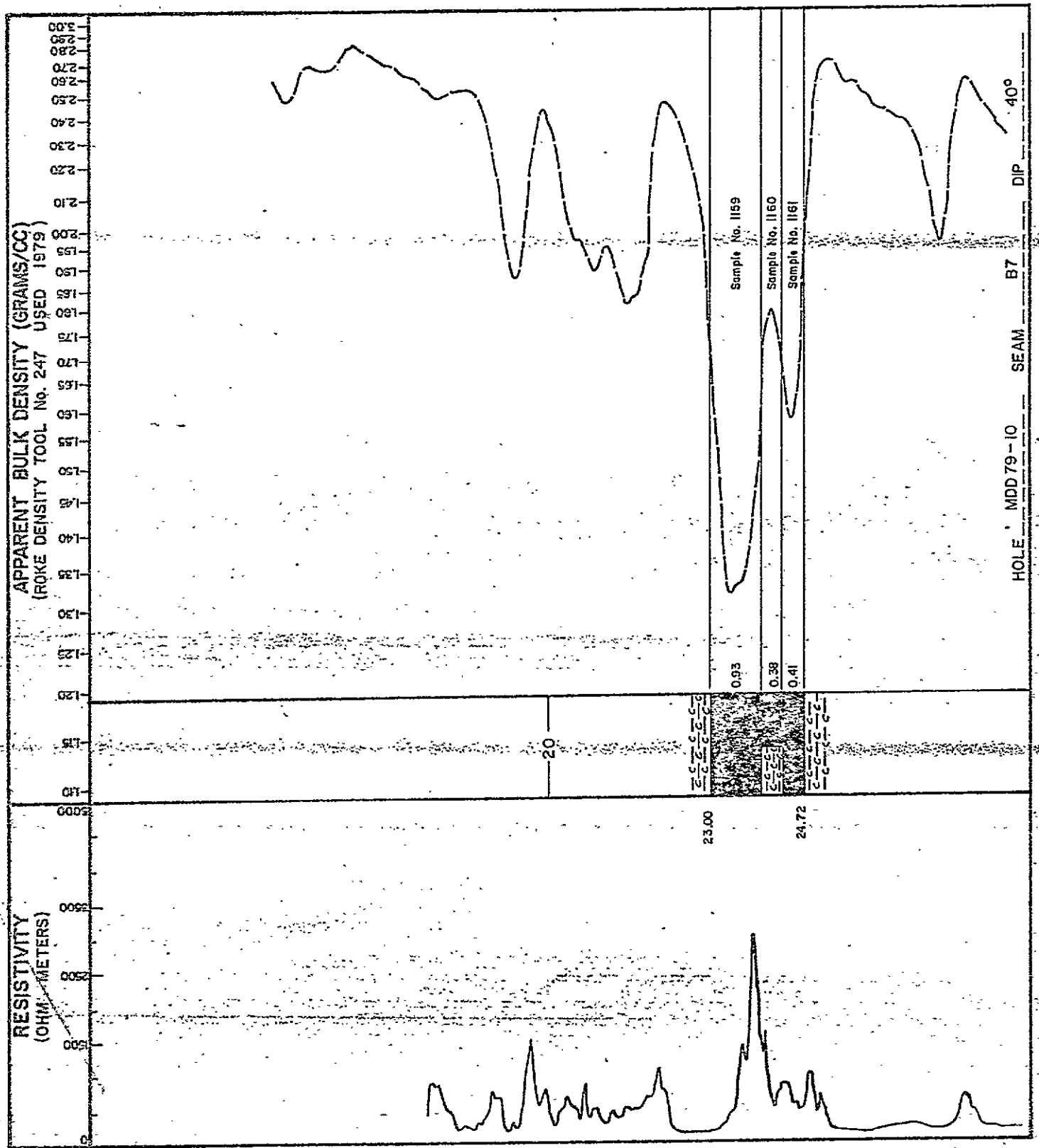


SEAM PROFILE

HOLE	SEAM
MDD 79-10	B6(u)B(l)

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

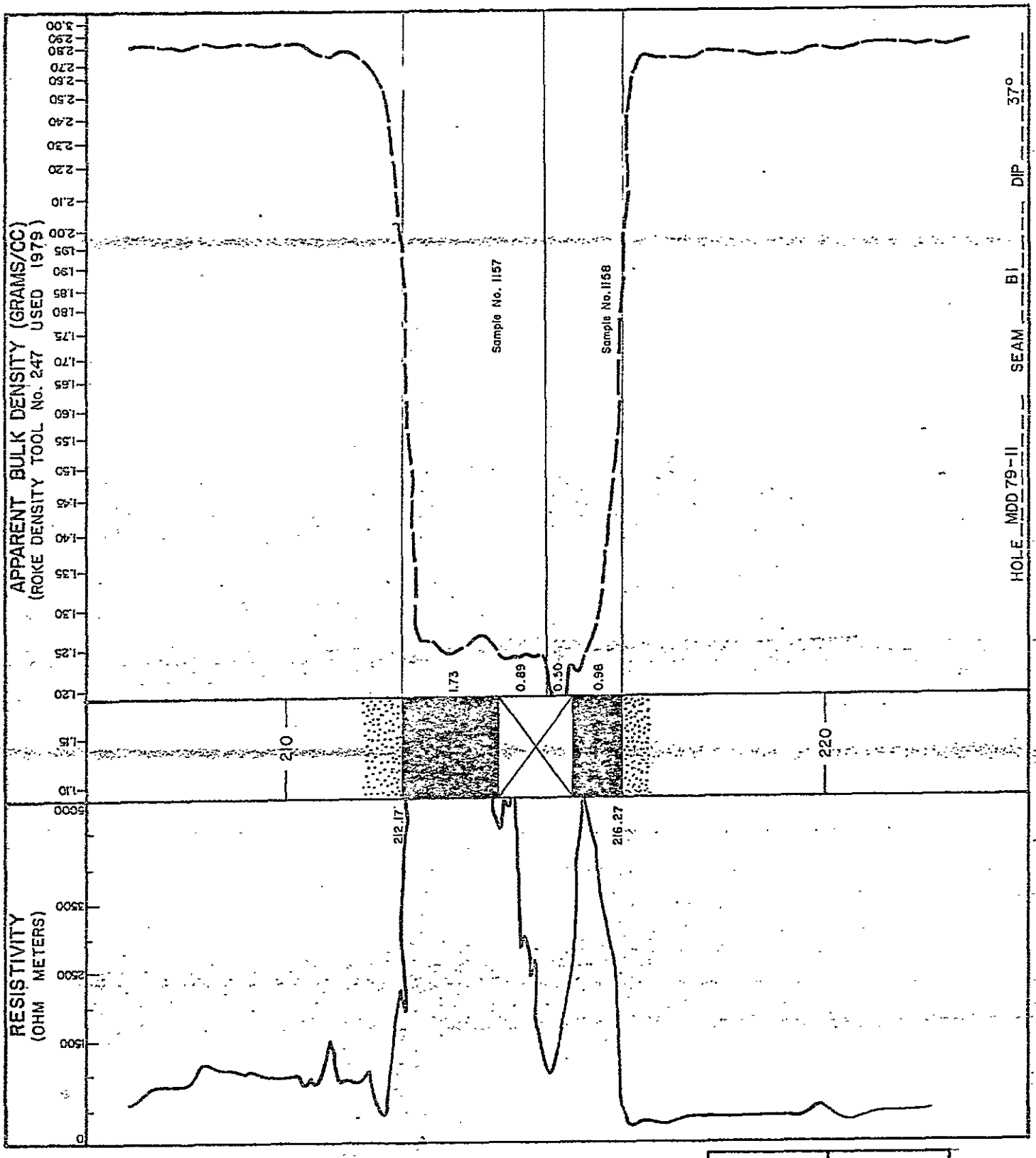


SEAM PROFILE

HOLE	SEAM
MDD 79-10	B7

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

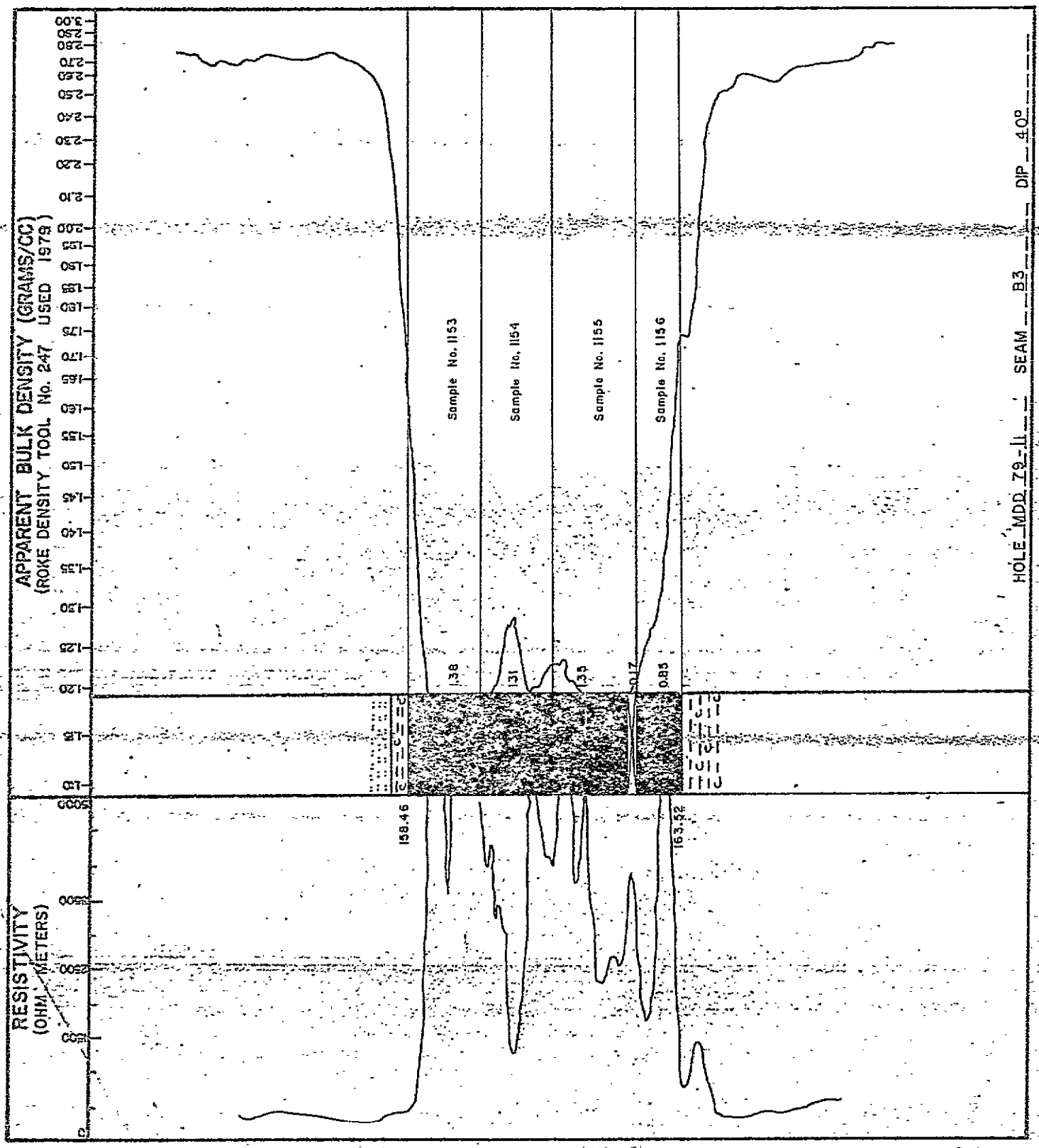


HOLE	SEAM
MDD 79-11	BI

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

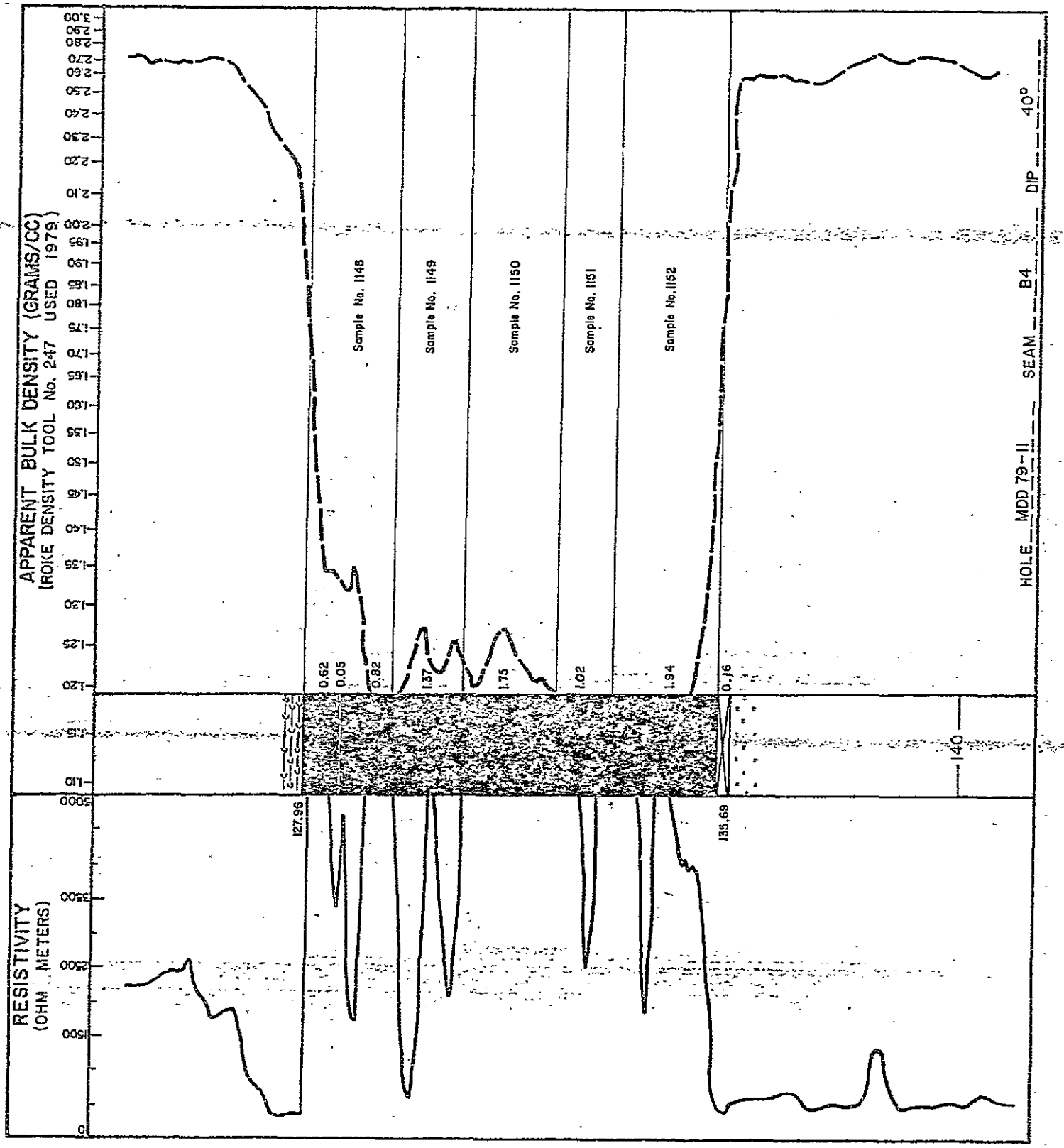


SEAM PROFILE

HOLE	SEAM
MDD 79-11	B3

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

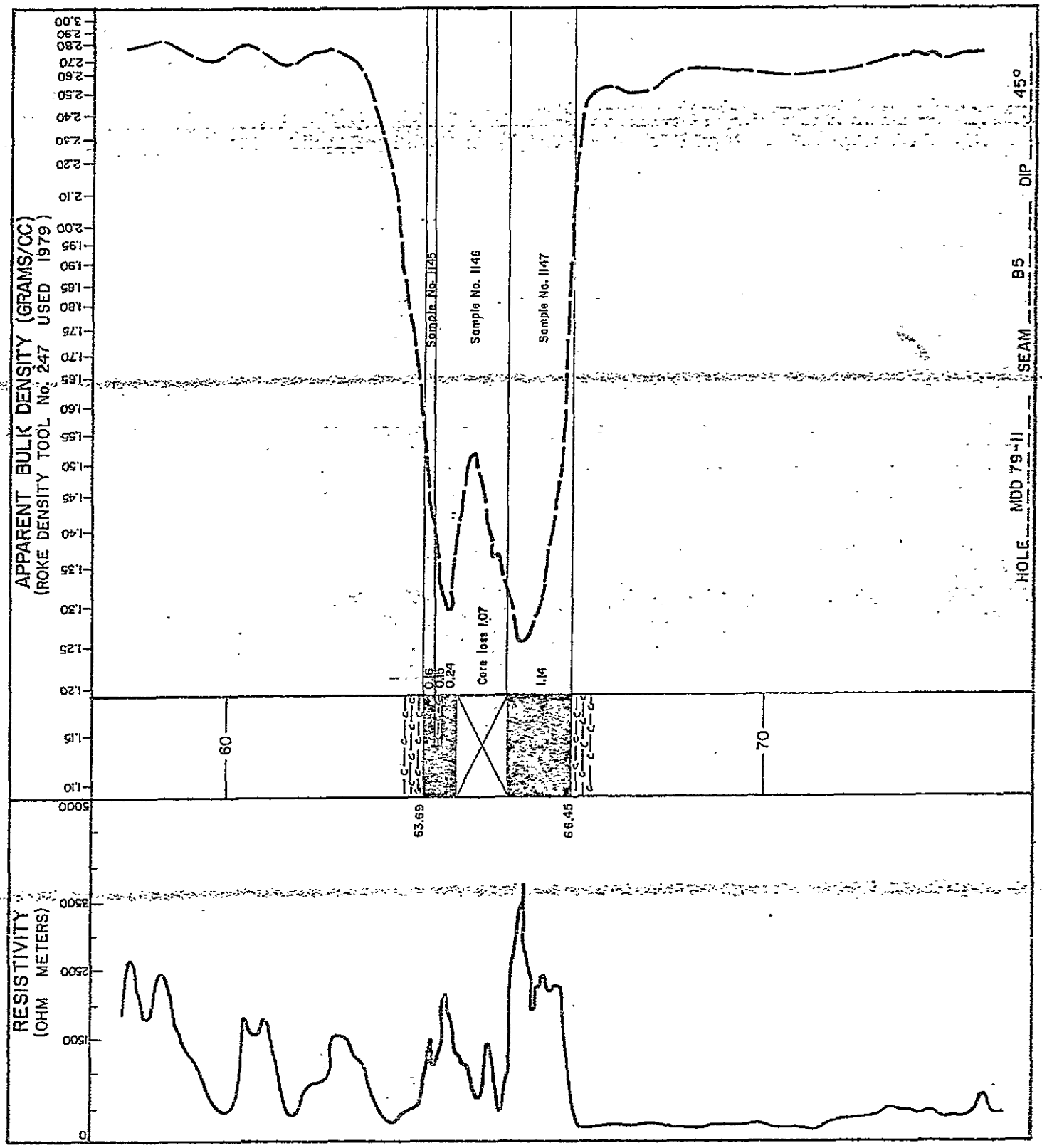


SEAM PROFILE

HOLE	SEAM
MDD 79-11	B4

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

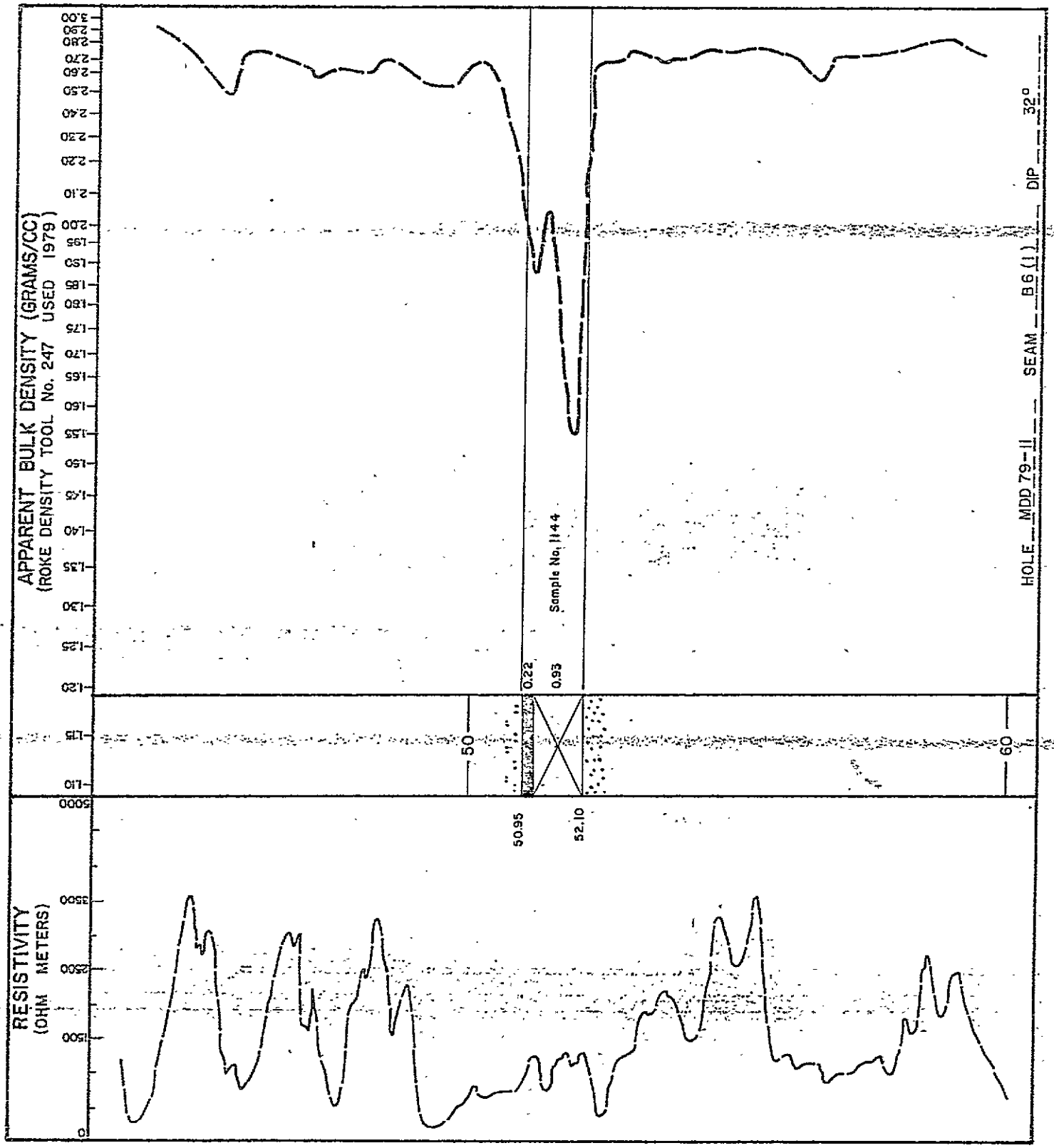


SEAM PROFILE

HOLE	SEAM
MDD 79-11	B5

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

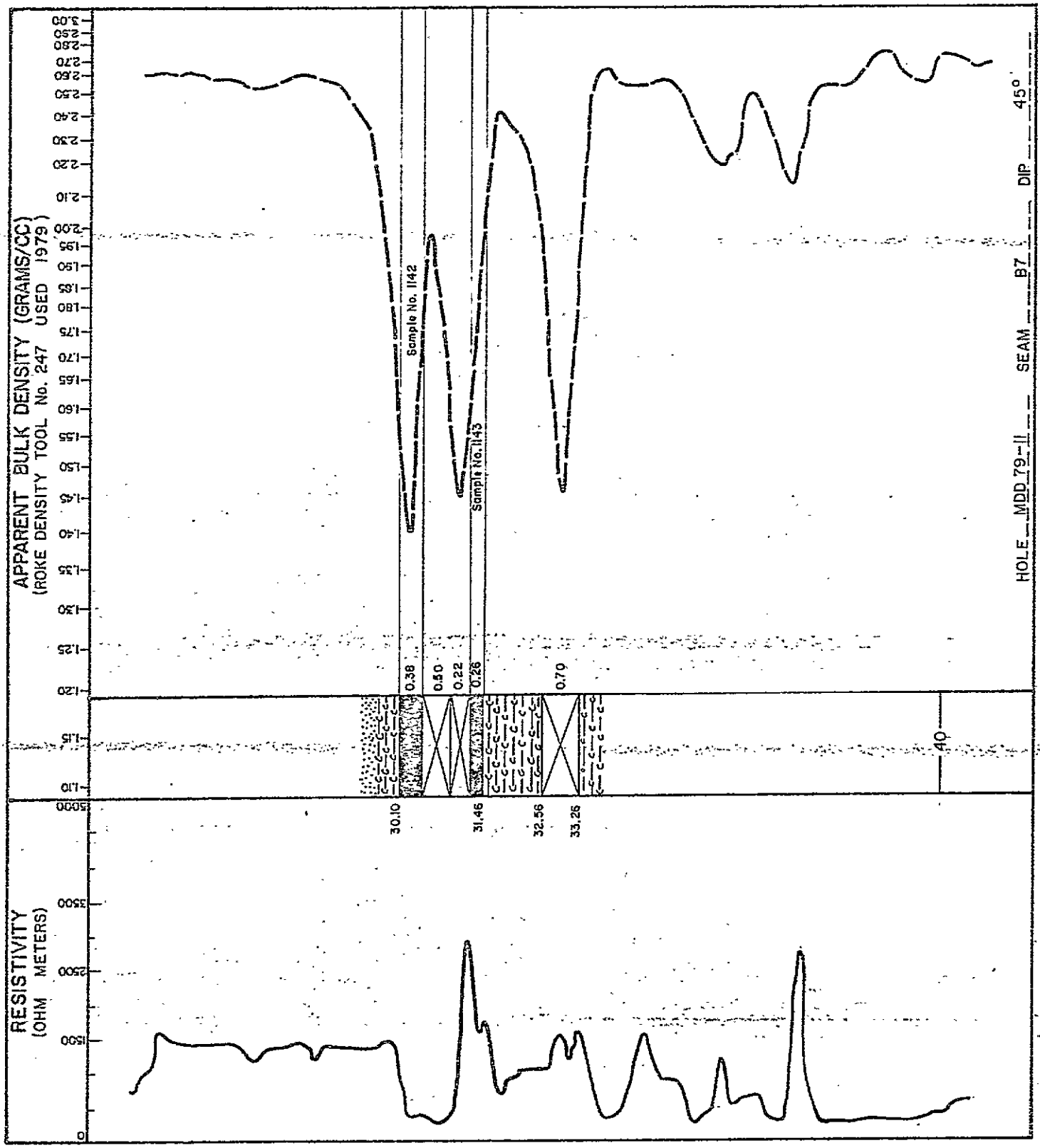


HOLE	SEAM
MDD 79-II	B6(1)

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

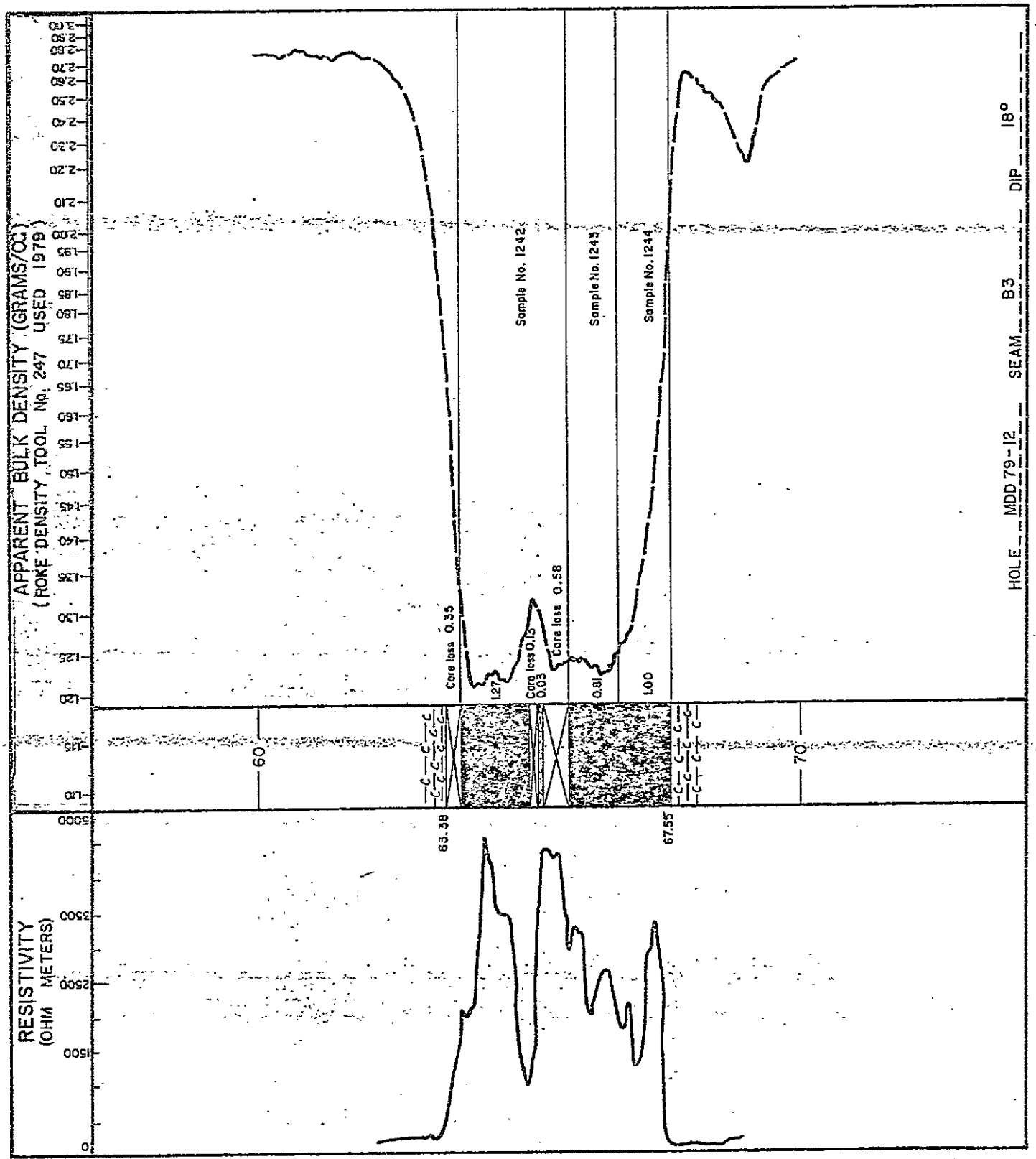


HOLE	SEAM
MDD 79-11	B7

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

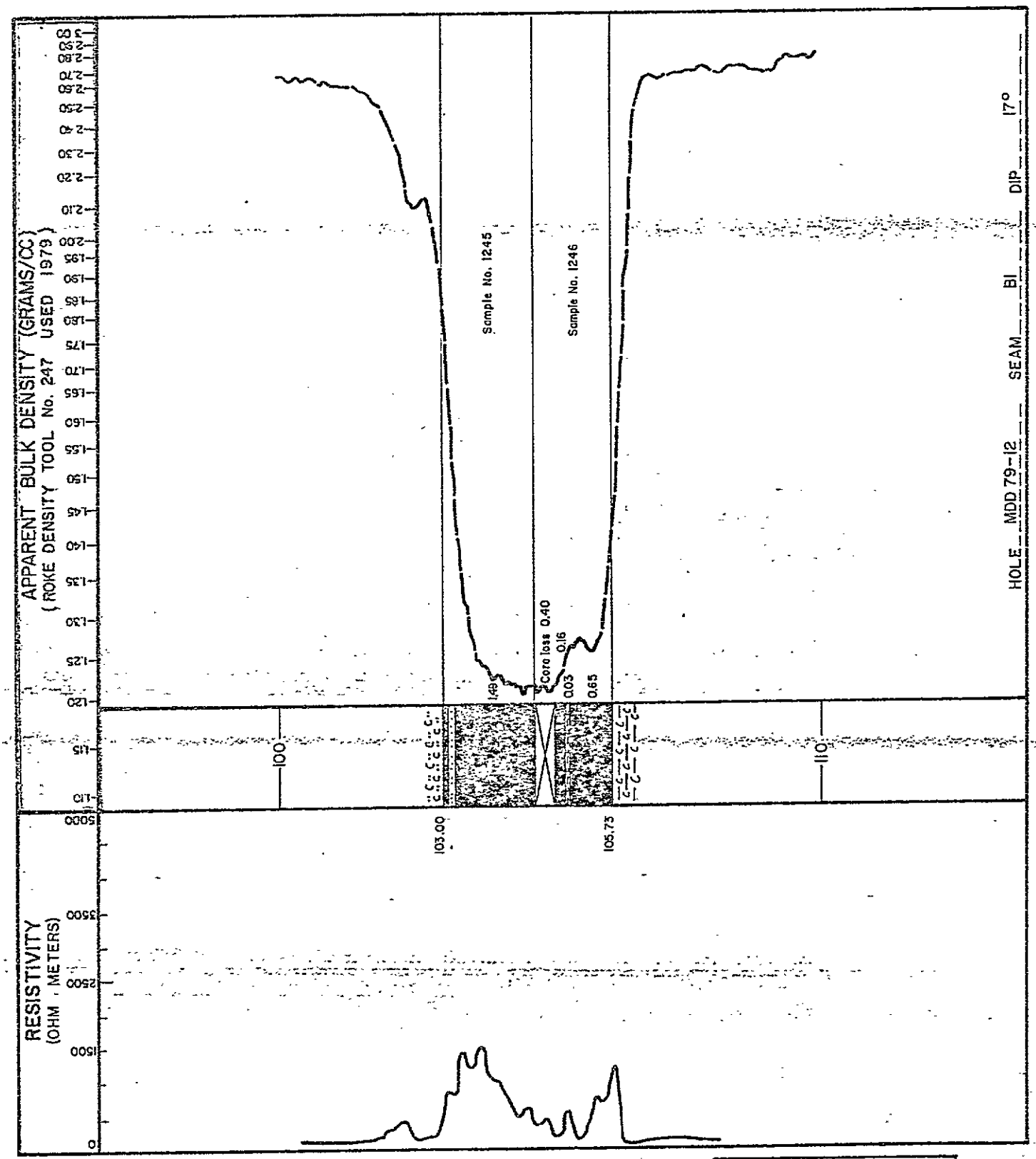


HOLE	SEAM
MDD 79-12	B3

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

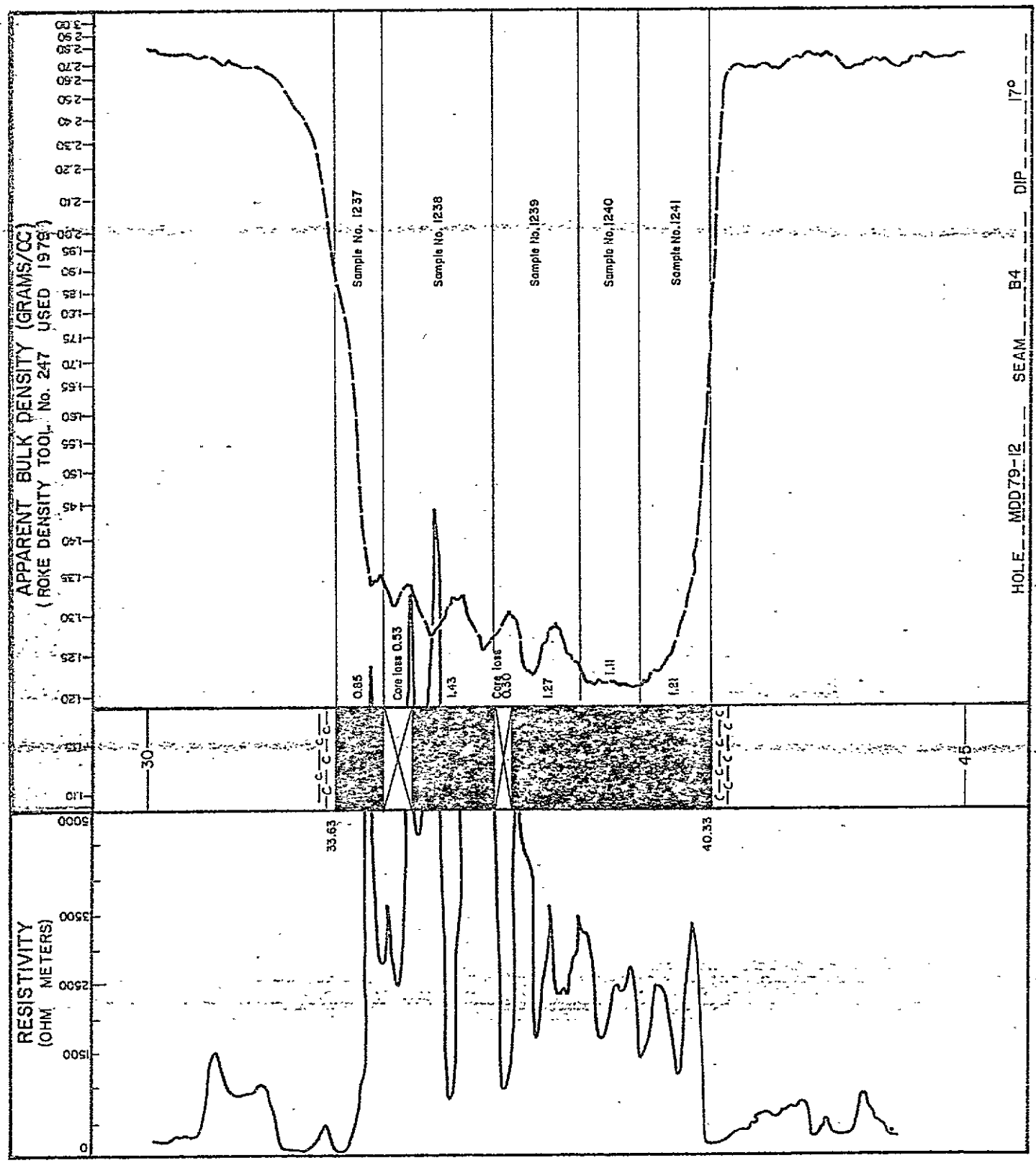


SEAM PROFILE

HOLE	SEAM
MDD 79-12	BI

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

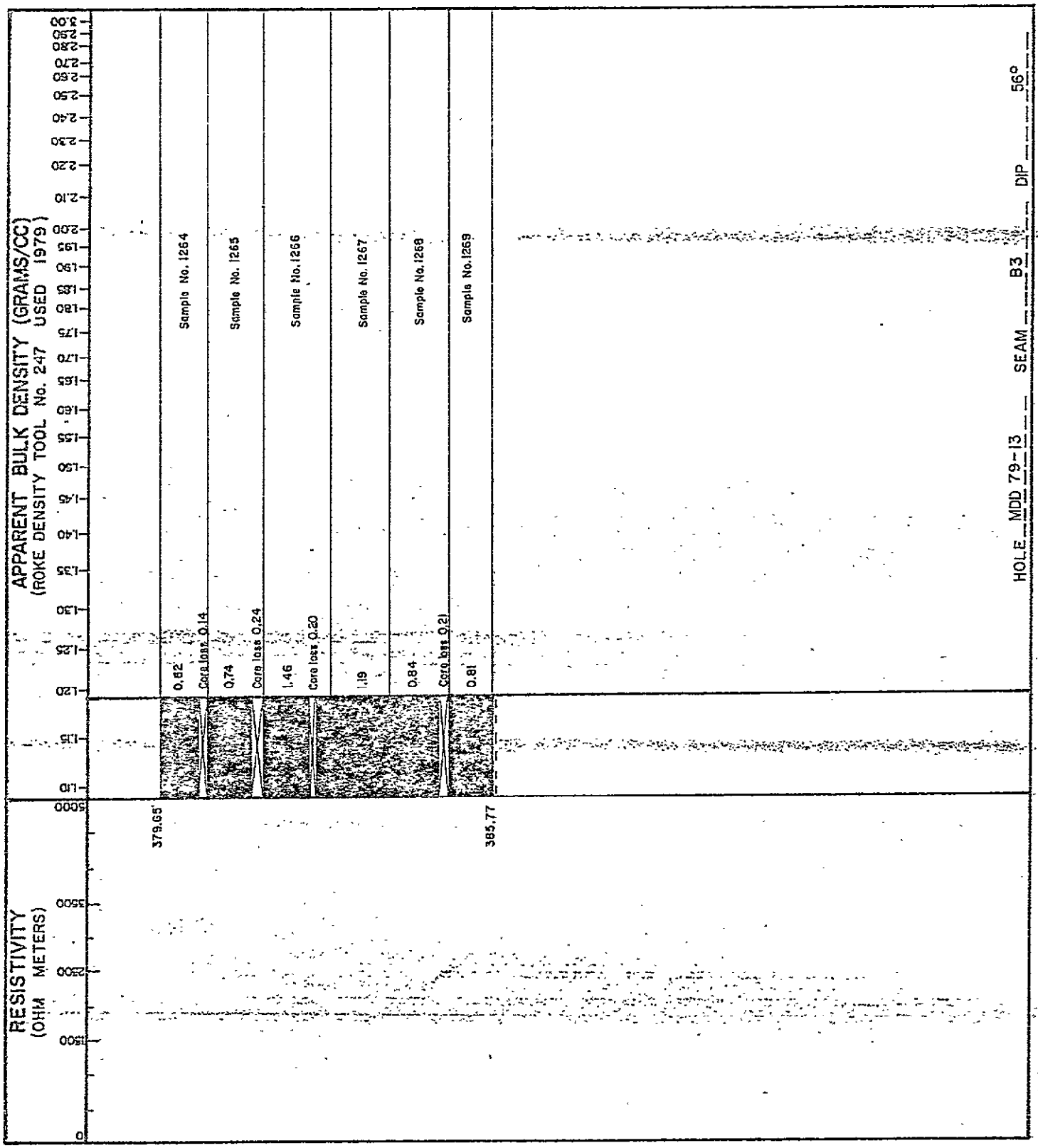


SEAM PROFILE

HOLE	SEAM
MDD 79-12	B4

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

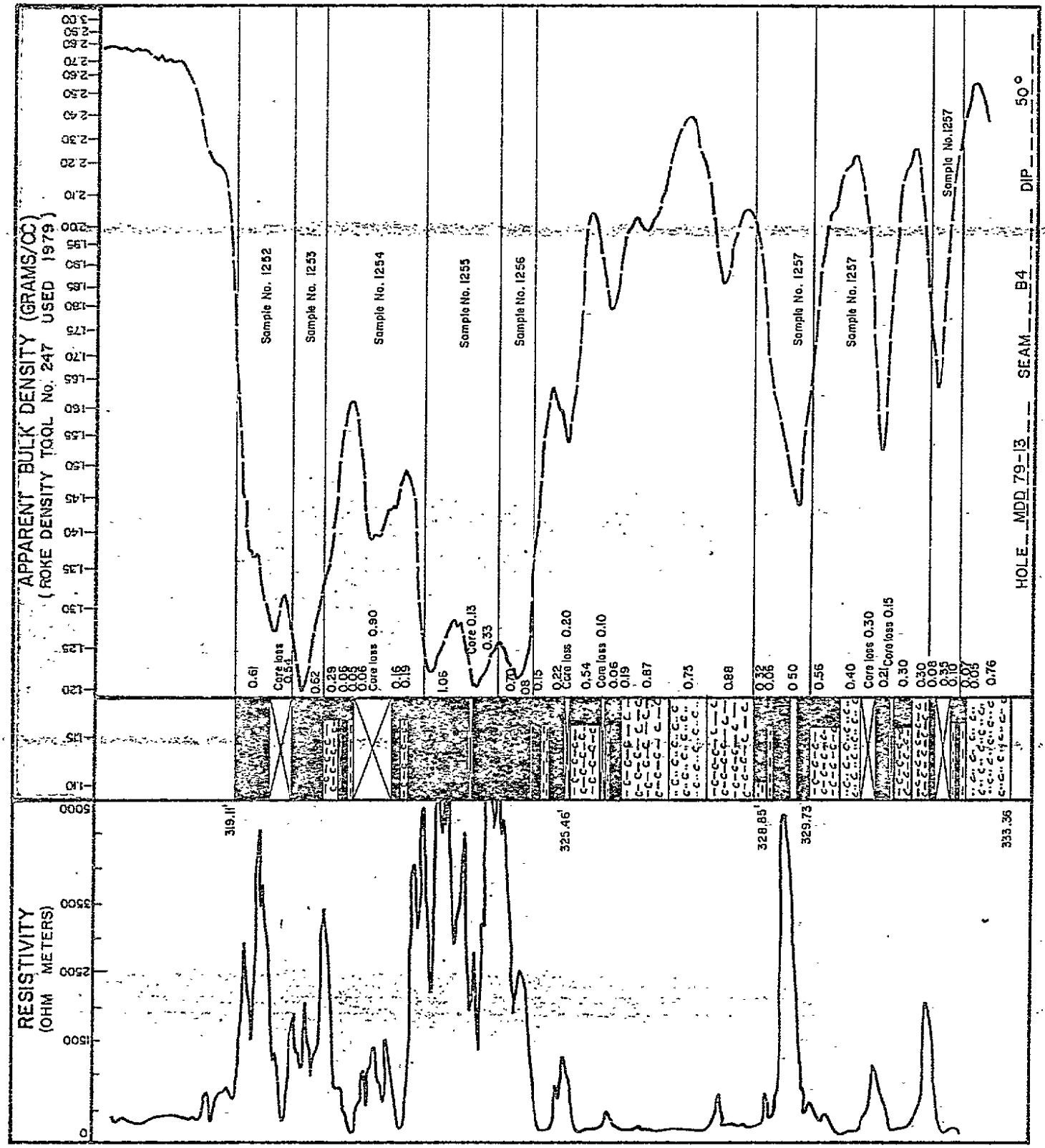


HOLE	SEAM
MDD 79-13	B3

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

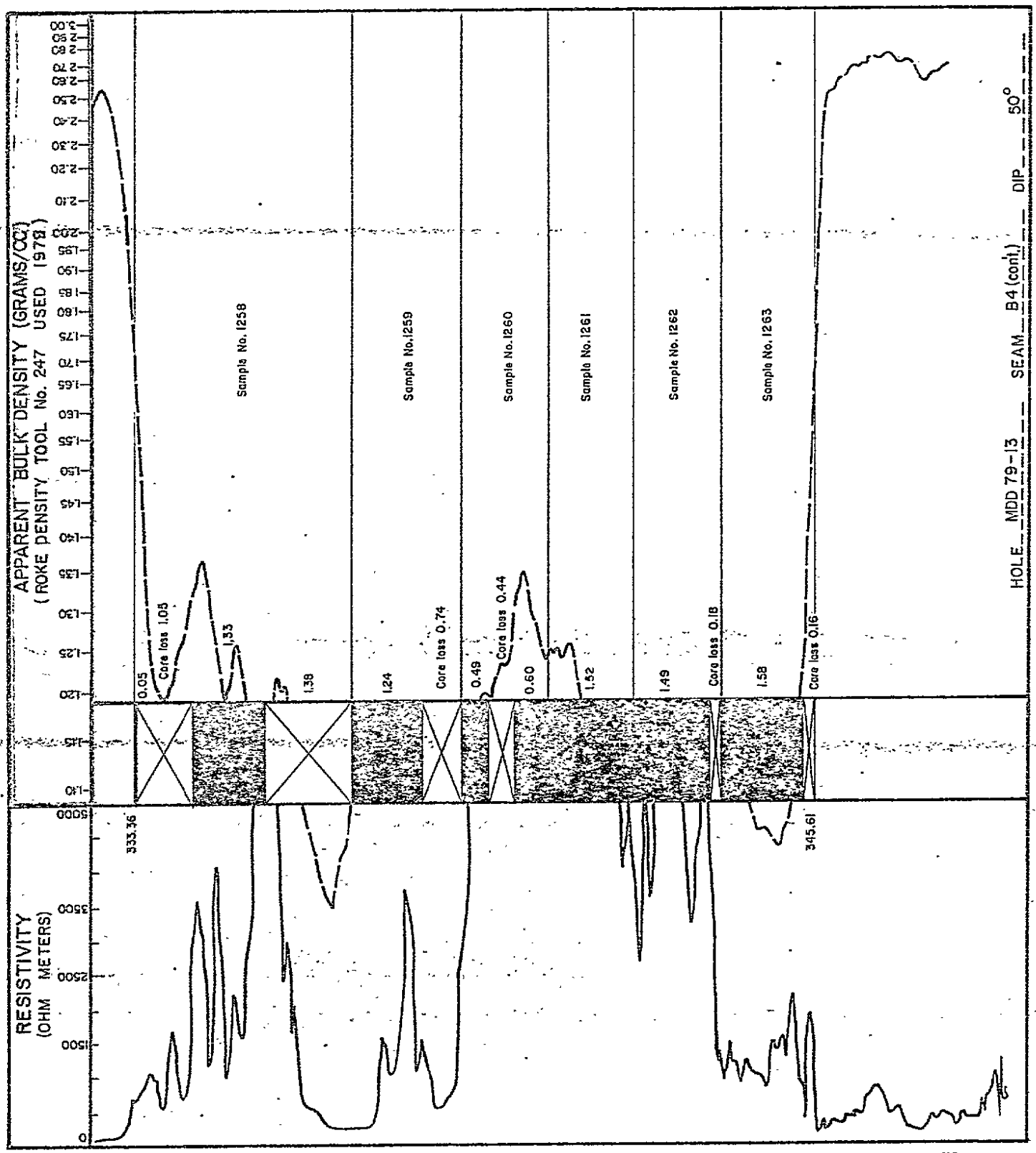


SEAM PROFILE

HOLE	SEAM
MDD 79-13	B4

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

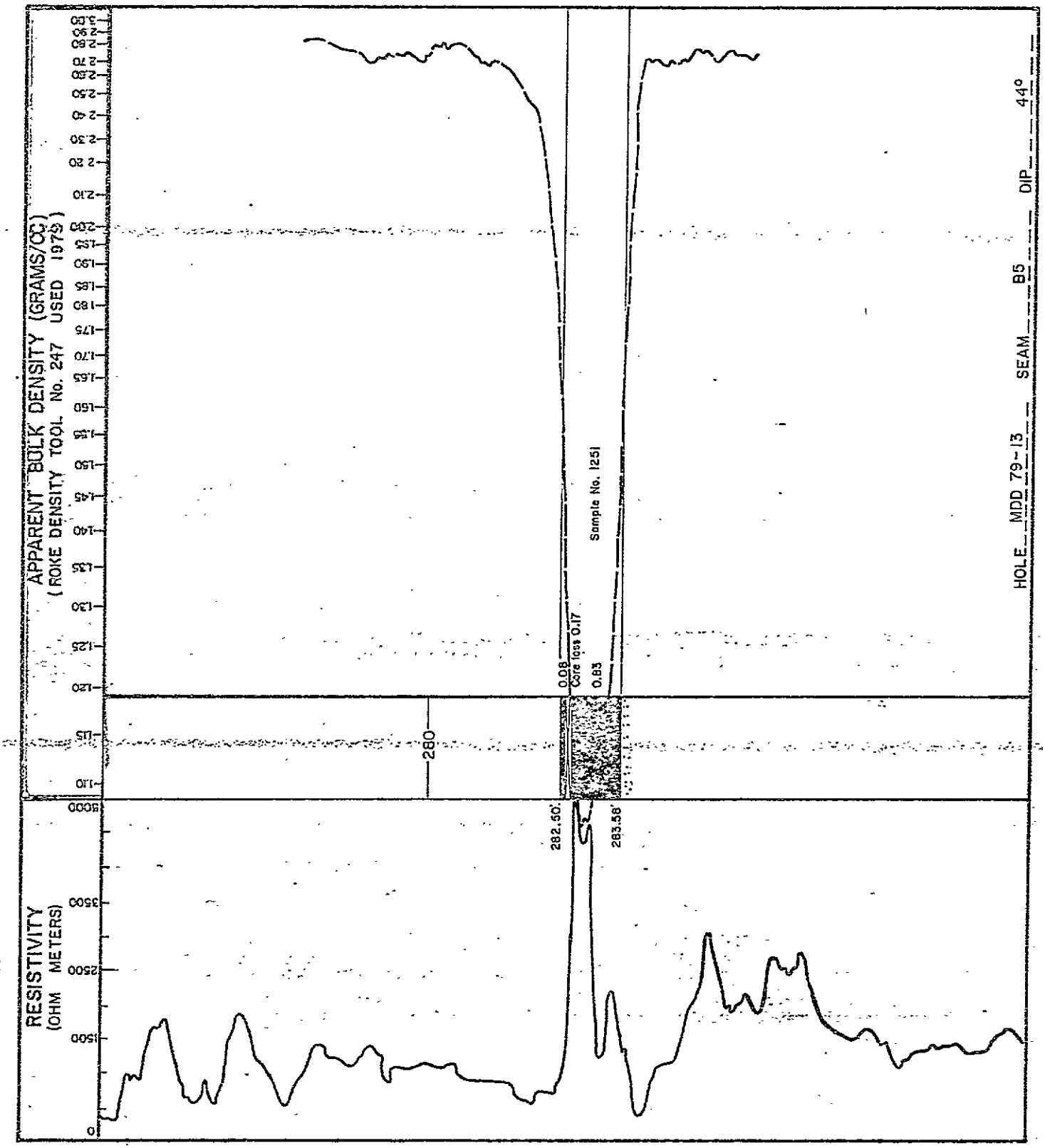


HOLE	SEAM
MDD 79-13	B4(con't)

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

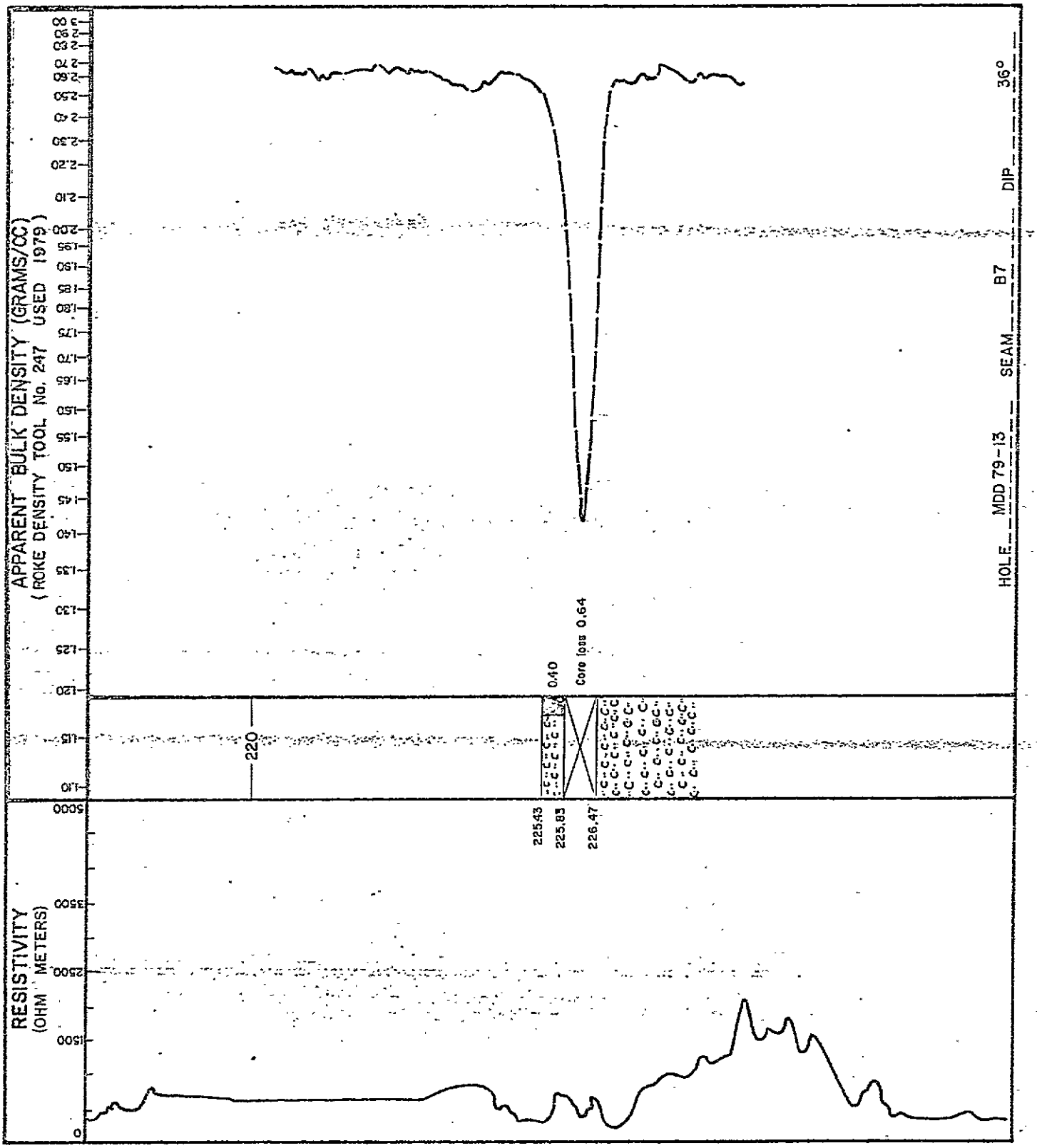


SEAM PROFILE

HOLE	SEAM
MDD79-13	B5

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

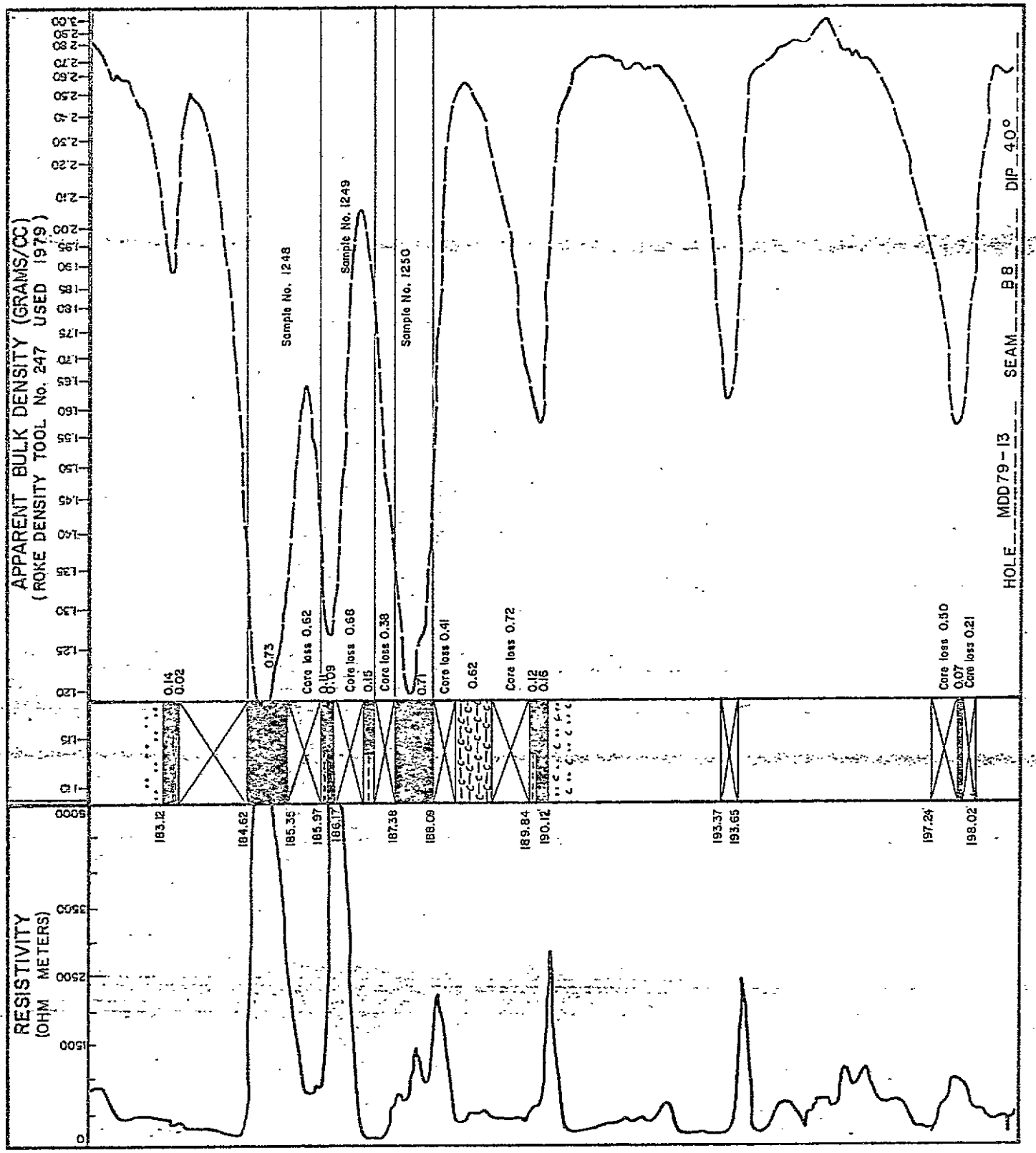


HOLE	SEAM
MDD 79-13	B7

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

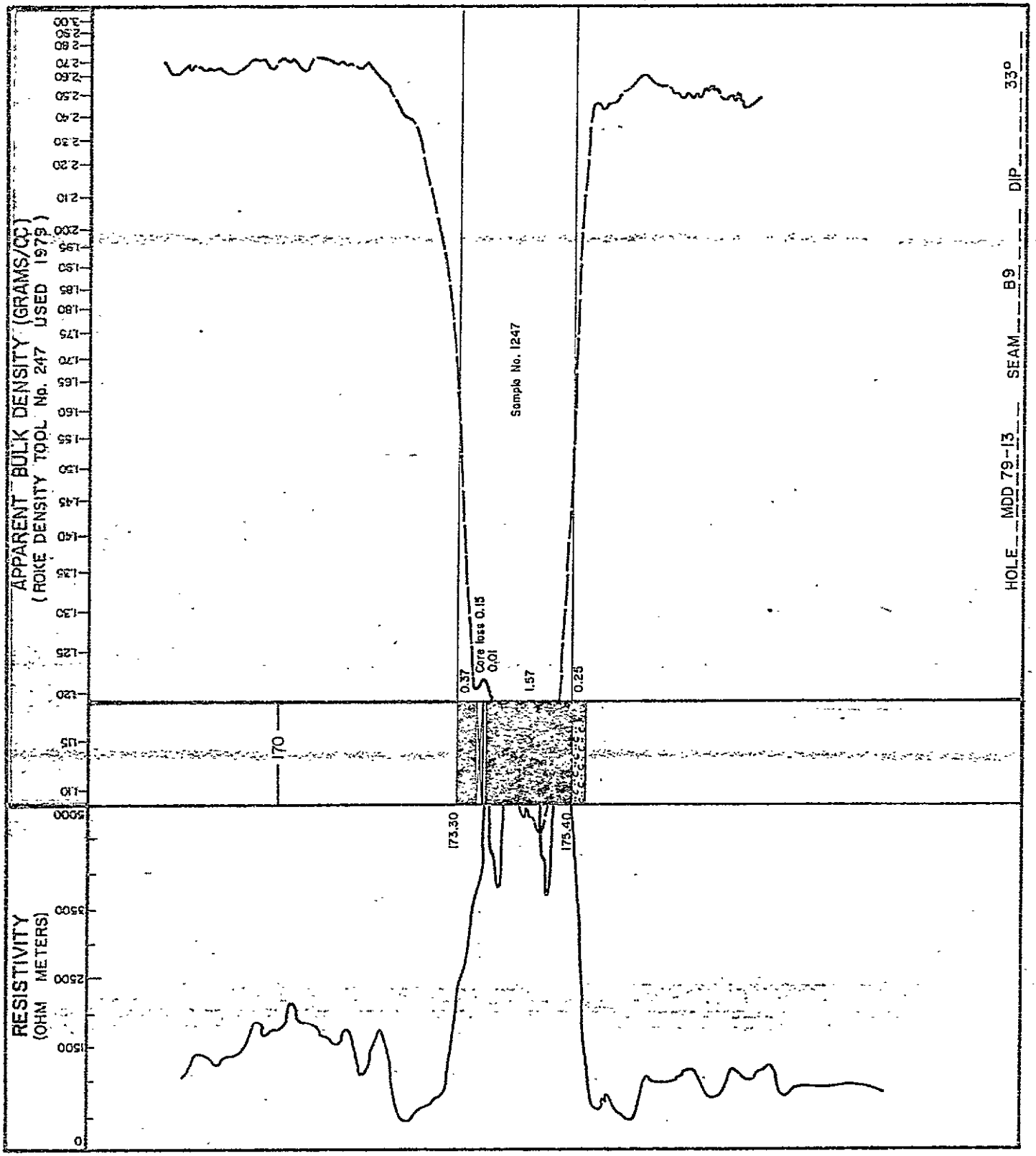


SEAM PROFILE

HOLE	SEAM
MDD 79-13	B 8

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

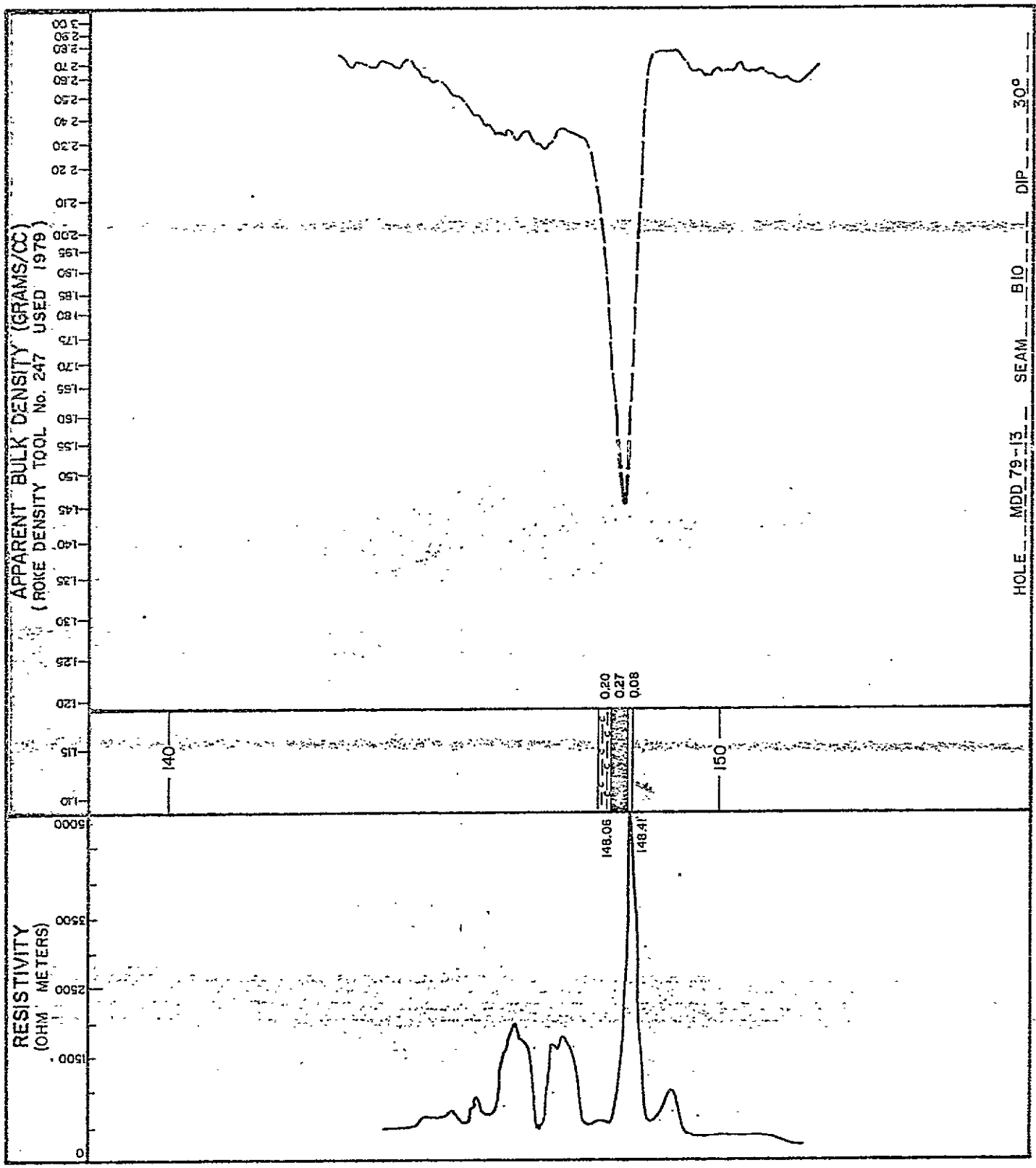


SEAM PROFILE

HOLE	SEAM
MDD79-13	B9

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

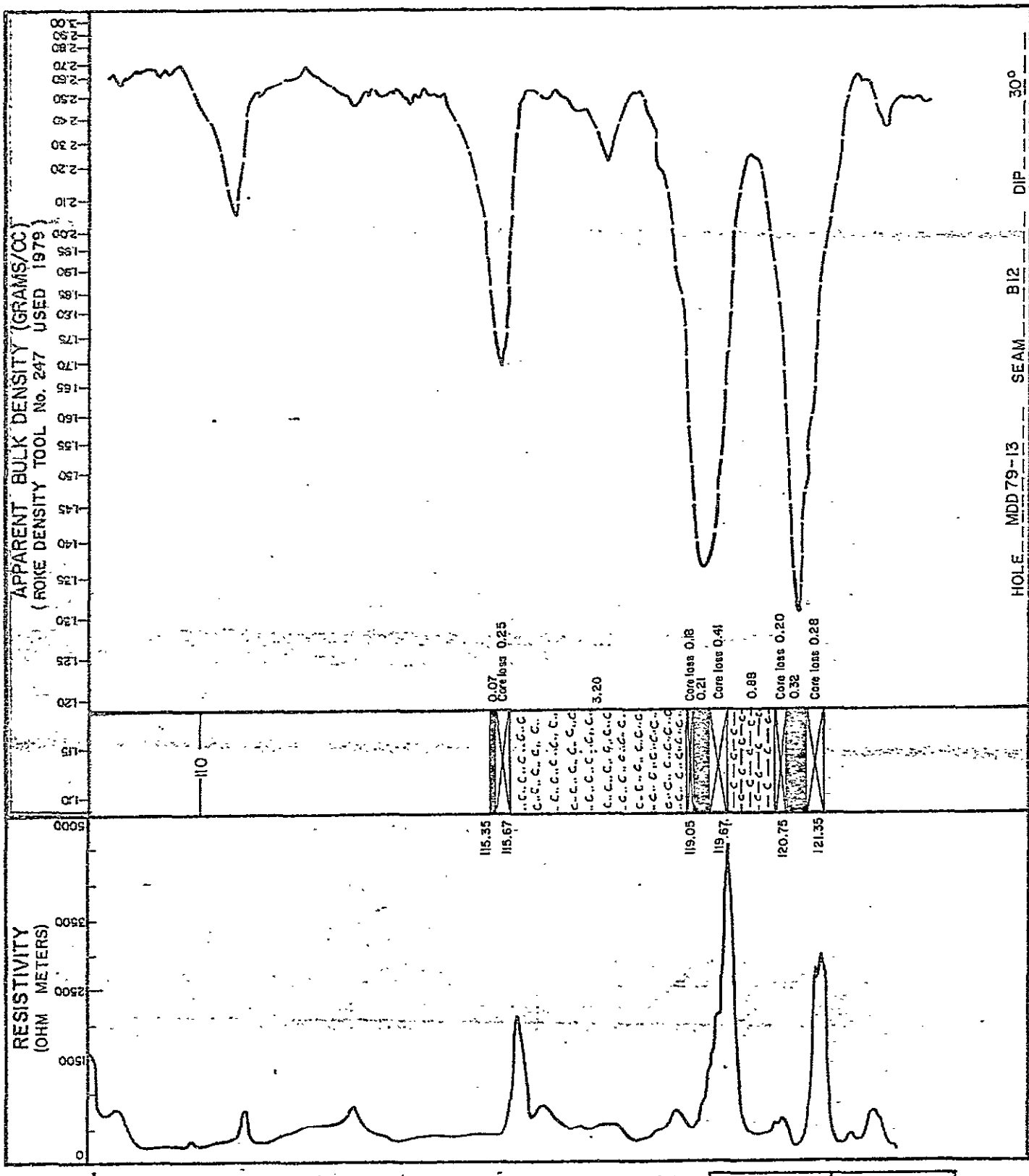


SEAM PROFILE

HOLE	SEAM
MDD 79-13	B10

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

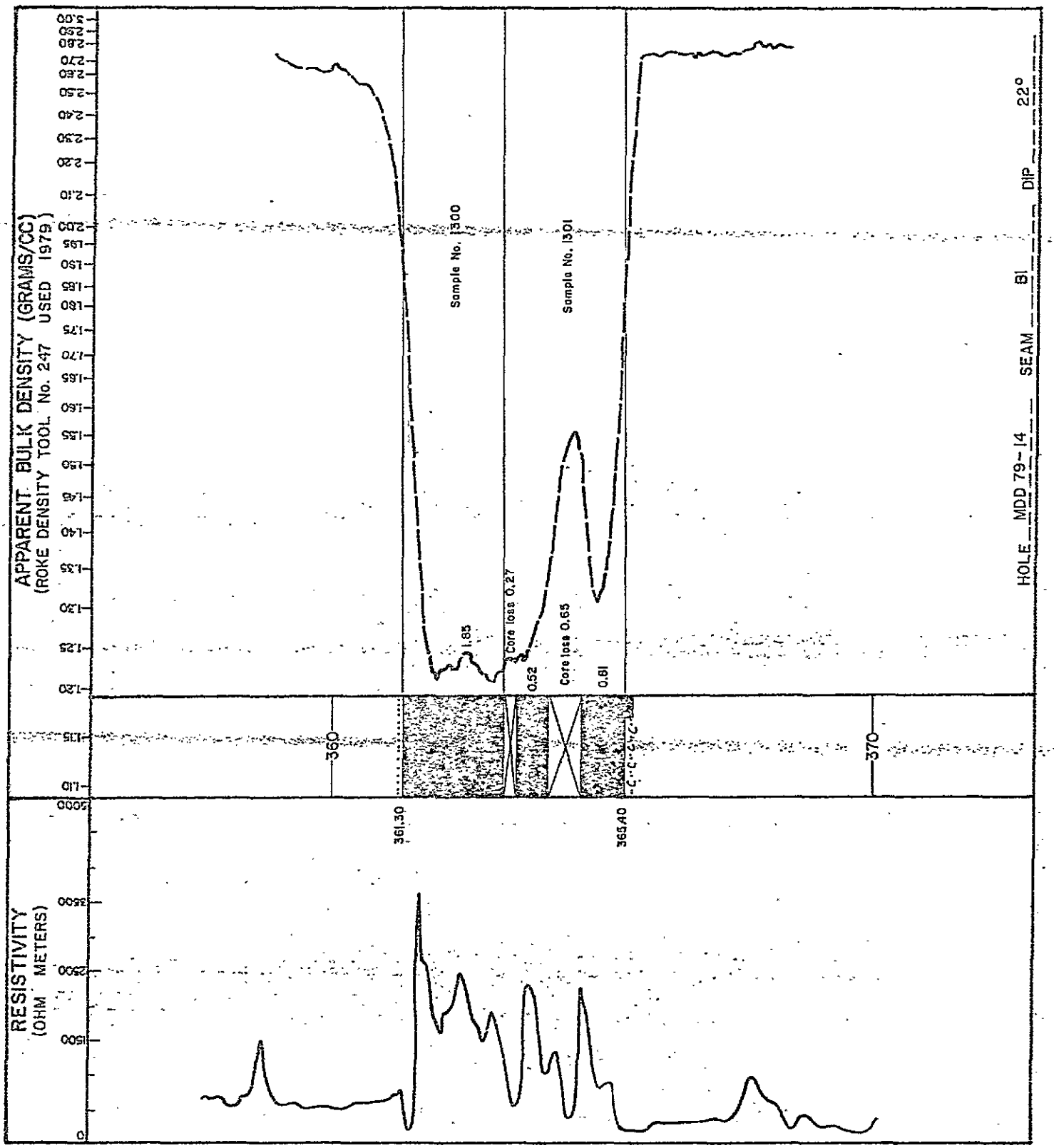


SEAM PROFILE

HOLE	SEAM
MDD79-13	B12

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

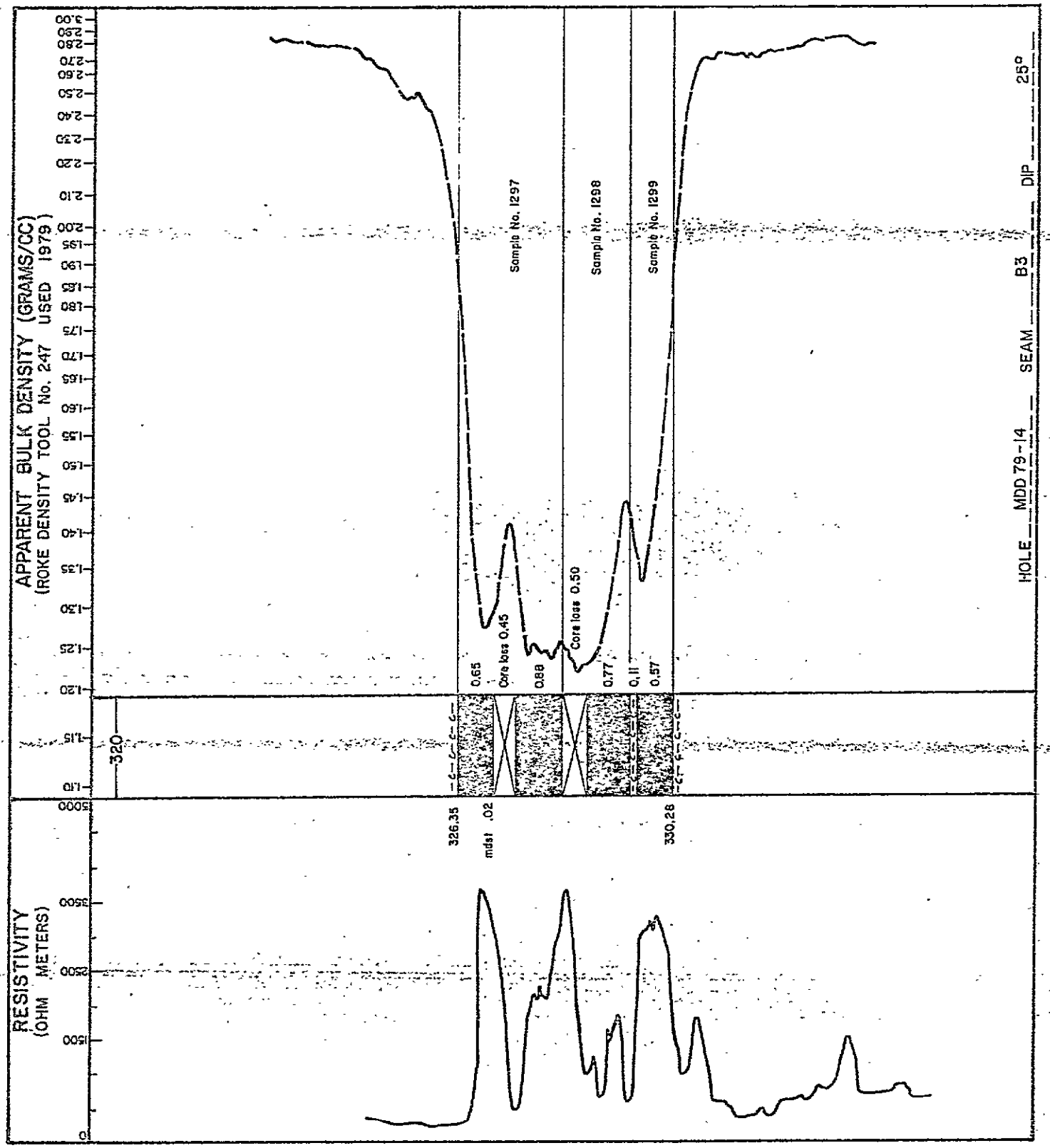


SEAM PROFILE

HOLE	SEAM
MDD 79-14	B1

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

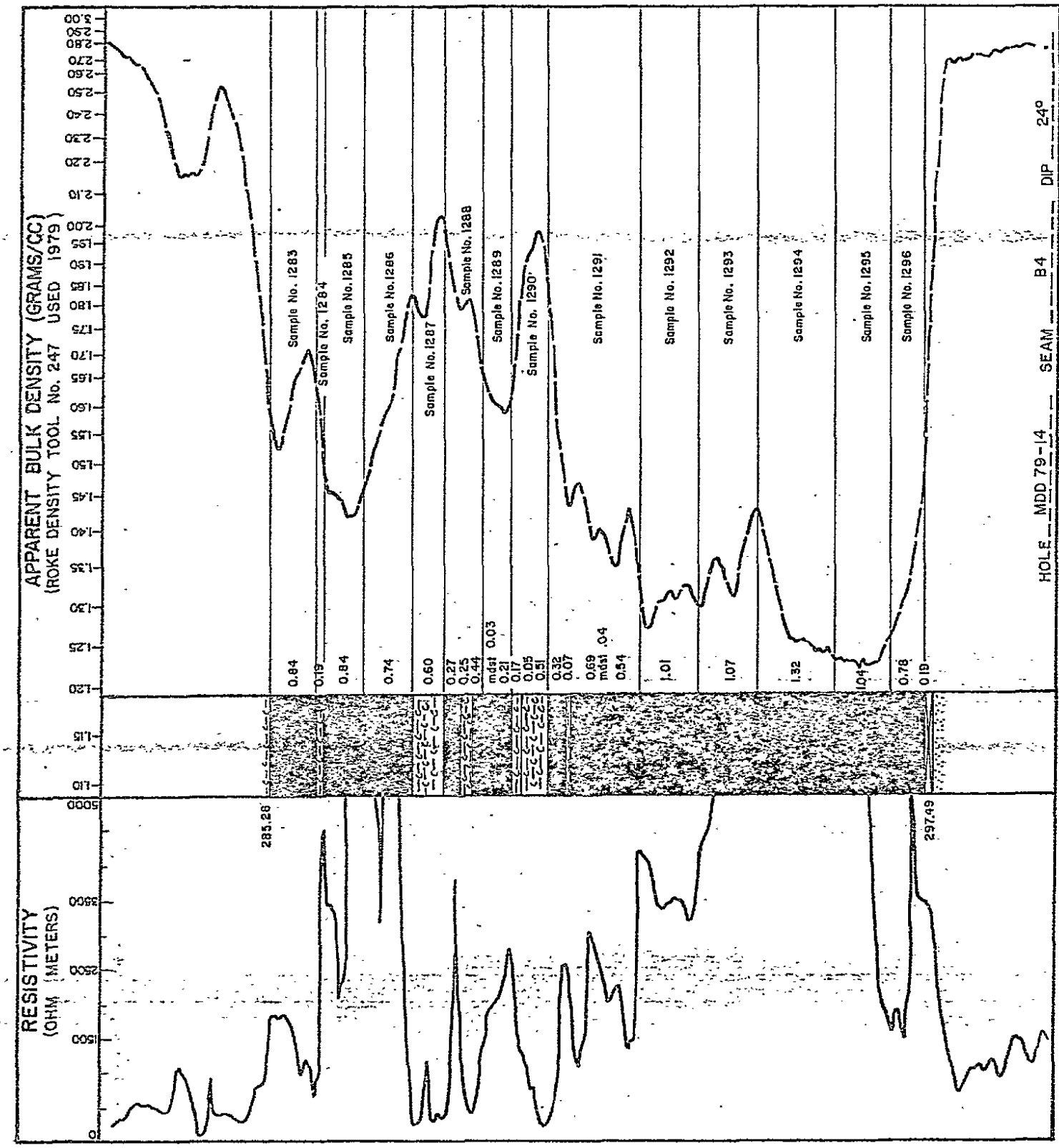


SEAM PROFILE

HOLE	SEAM
MDD 79-14	B3

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

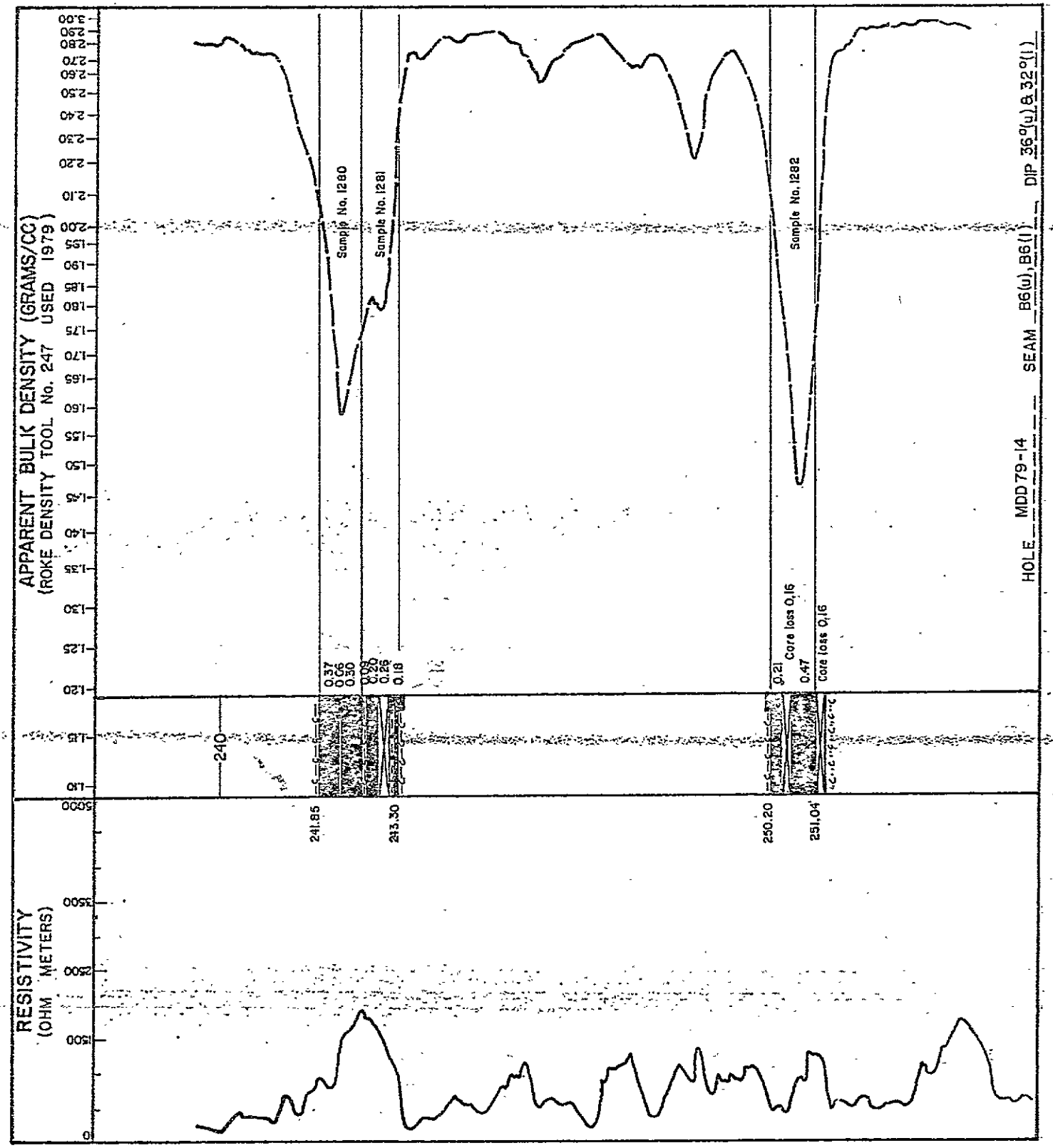


SEAM PROFILE

HOLE	SEAM
MDD 79-14	B4

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

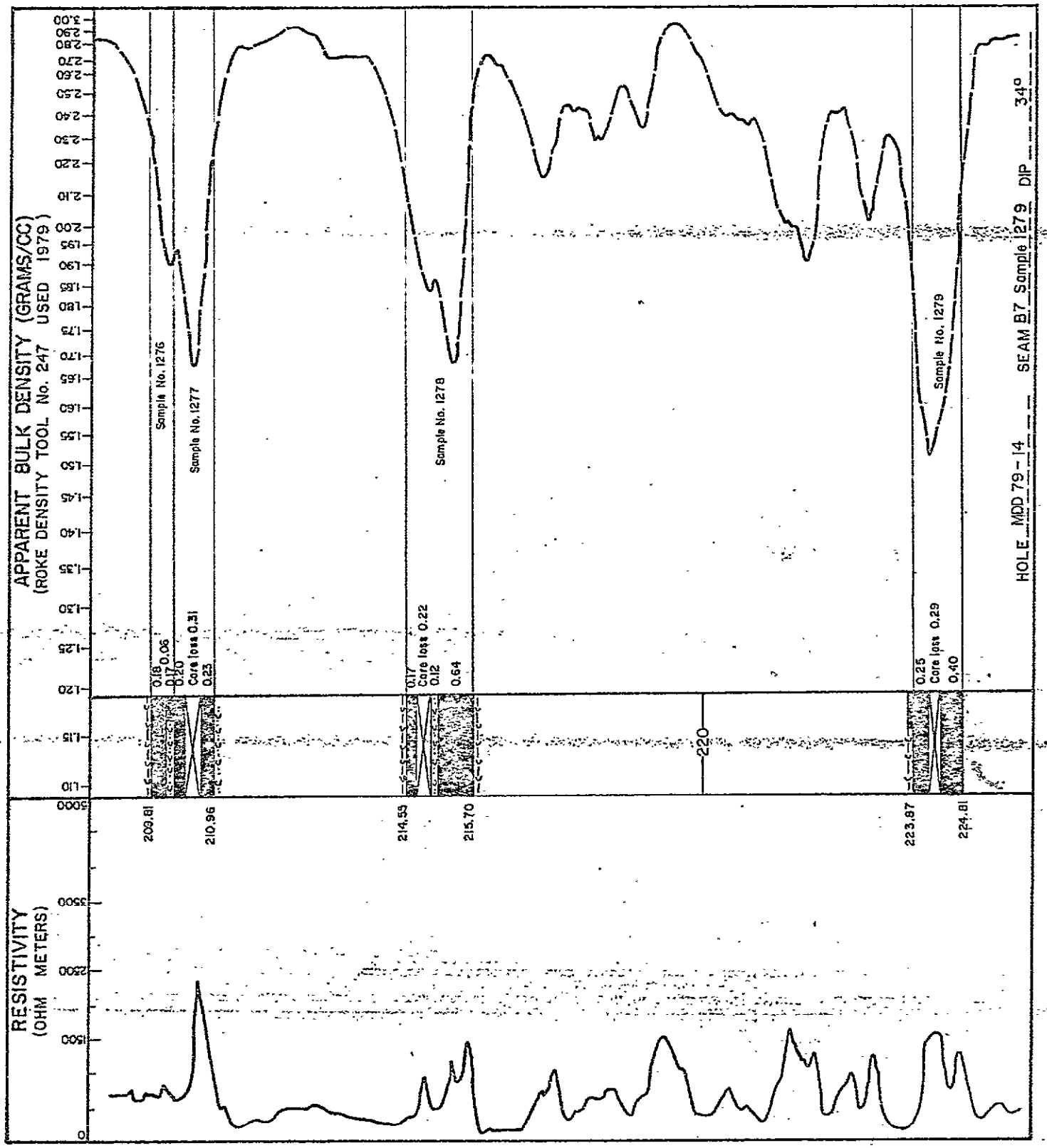


SEAM PROFILE

HOLE	SEAM
MDD79-14	B6(u),(l)

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

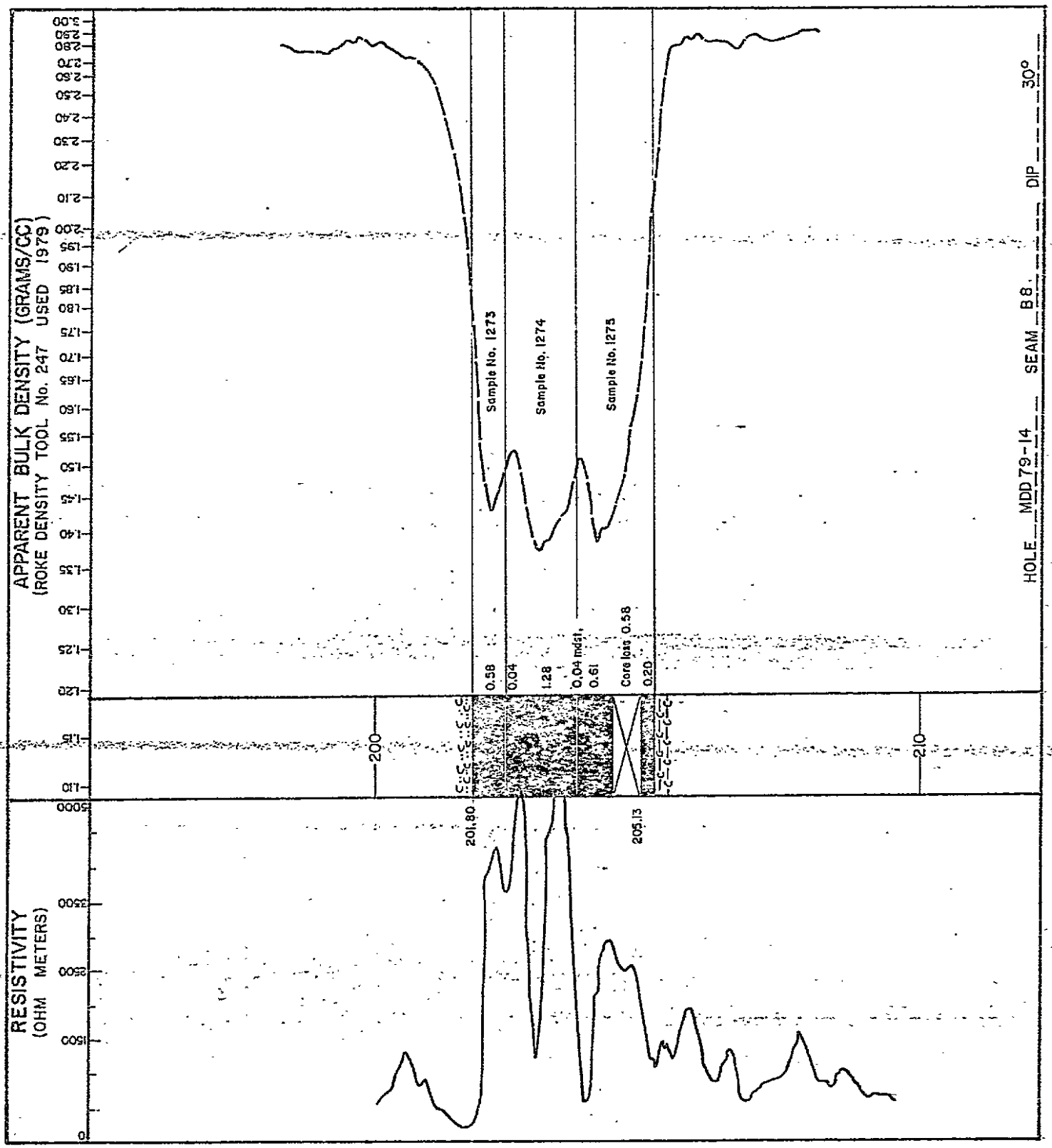


HOLE	SEAM
MDD 79-14	B7 S.No.1279

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

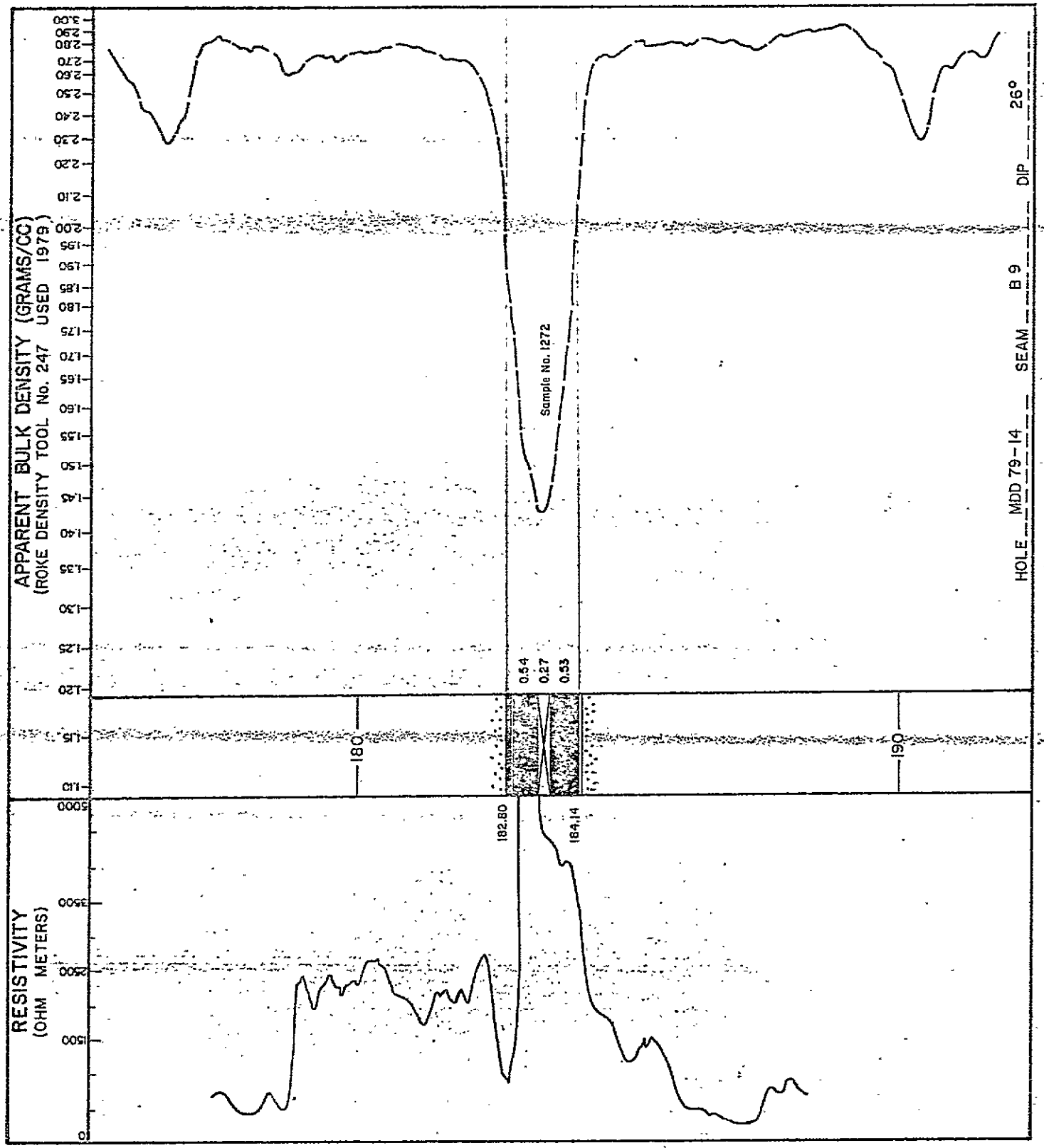


HOLE	SEAM
MDD79-14	B8

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

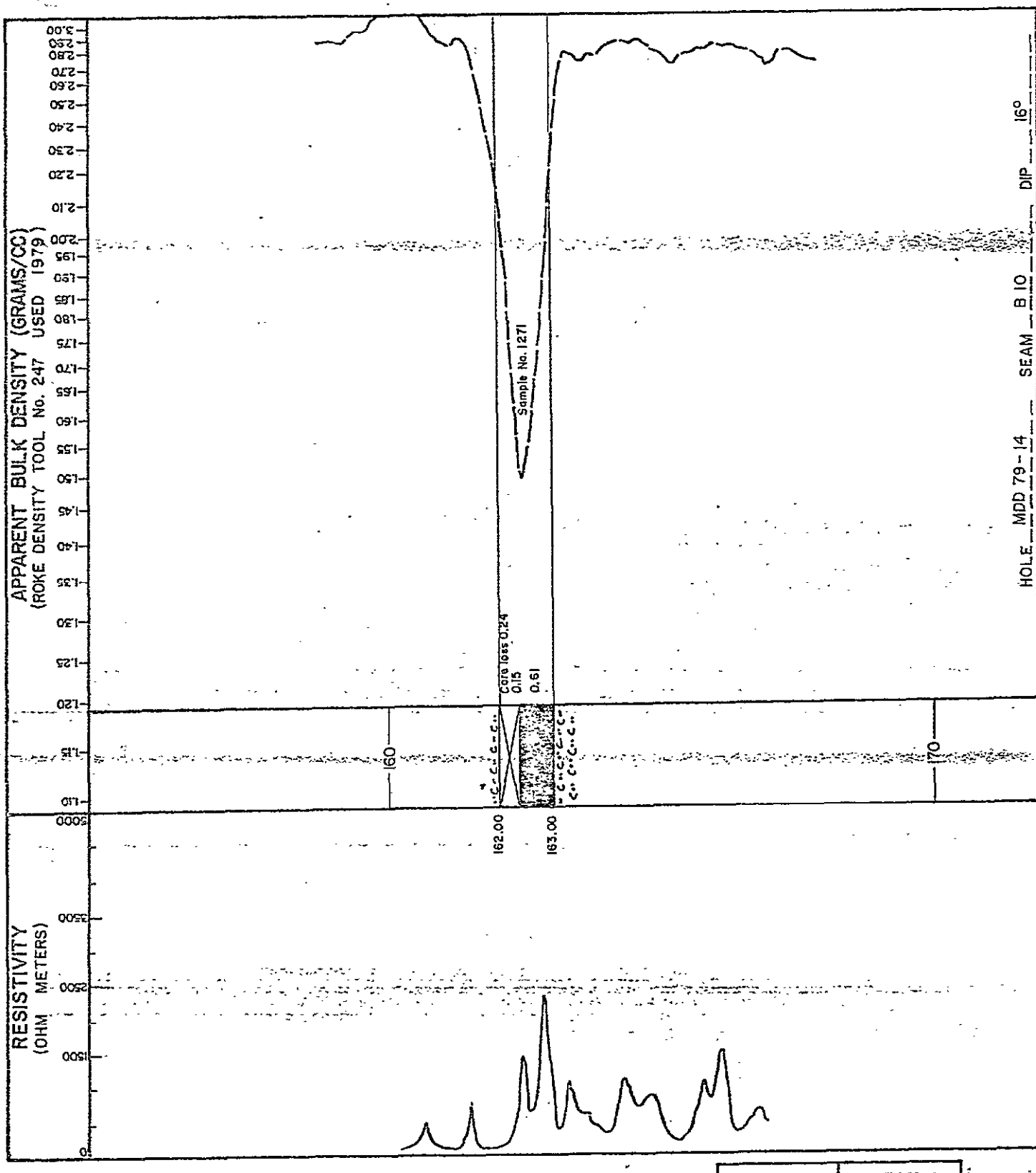


SEAM PROFILE

HOLE	SEAM
MDD 79-14	B 9

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

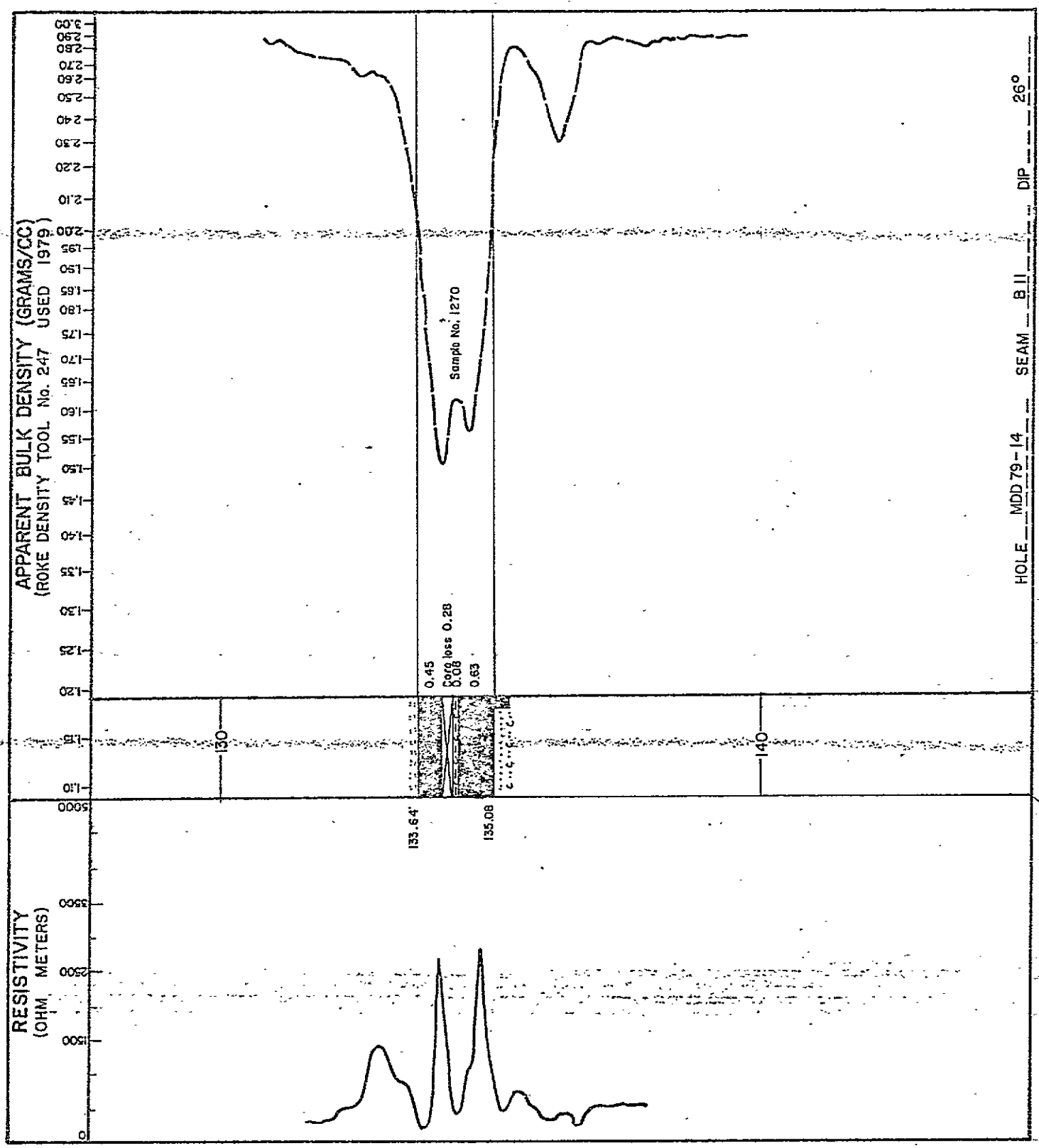


SEAM PROFILE

HOLE	SEAM
MDD 79-14	B 10

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

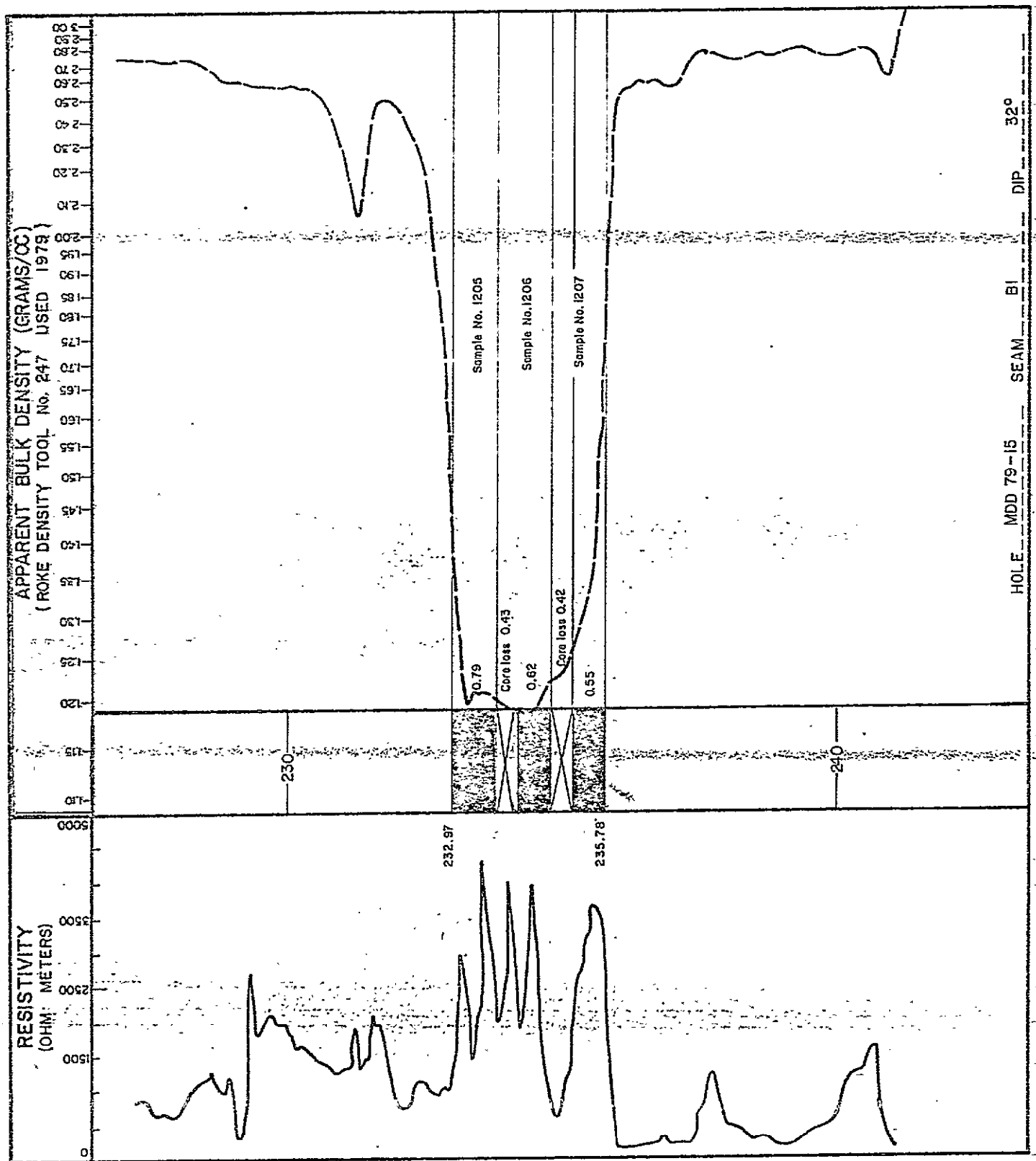


SEAM PROFILE

HOLE	SEAM
MDD 79-14	B II

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

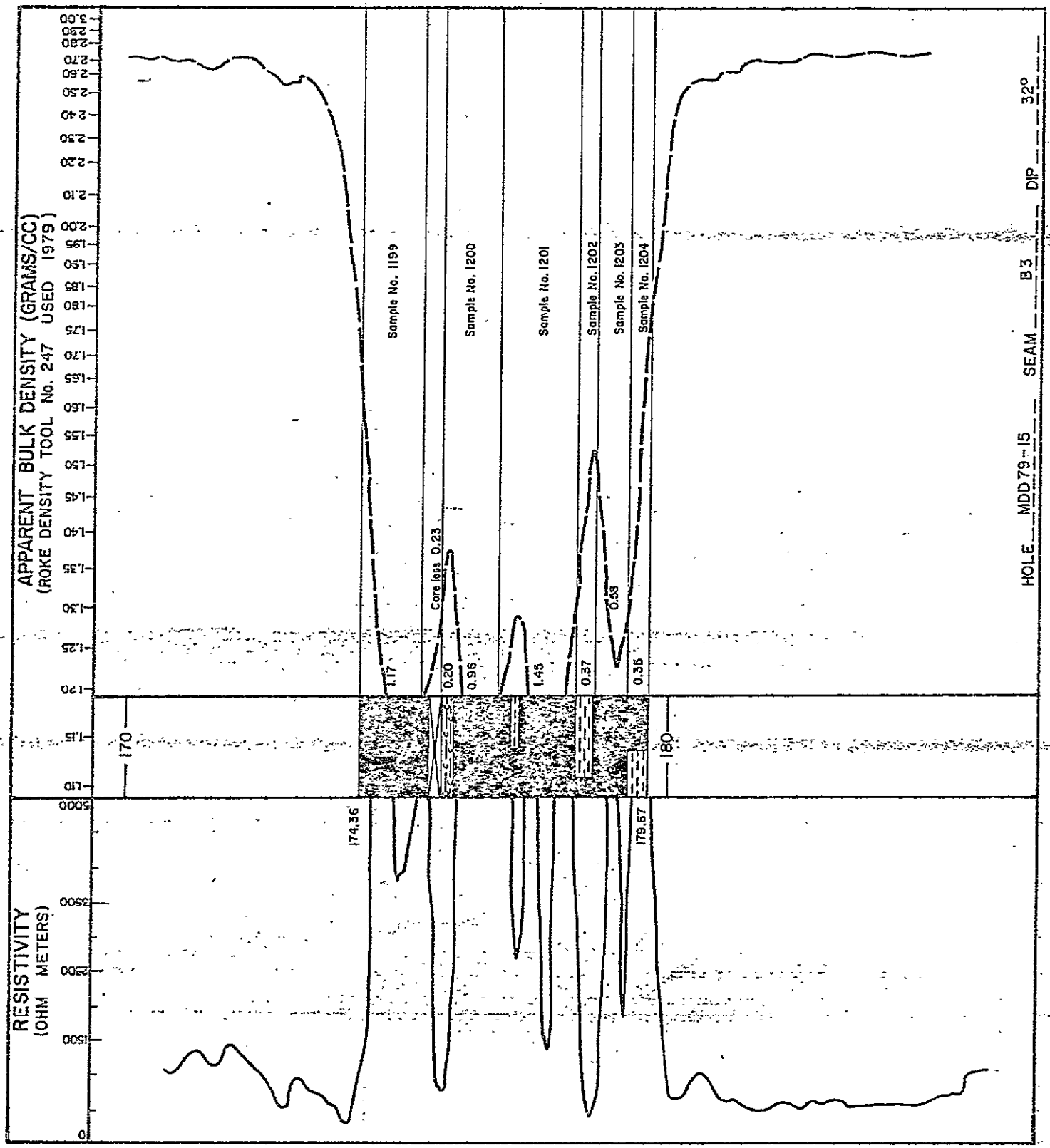


SEAM PROFILE

HOLE	SEAM
MDD 79-15	B1

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

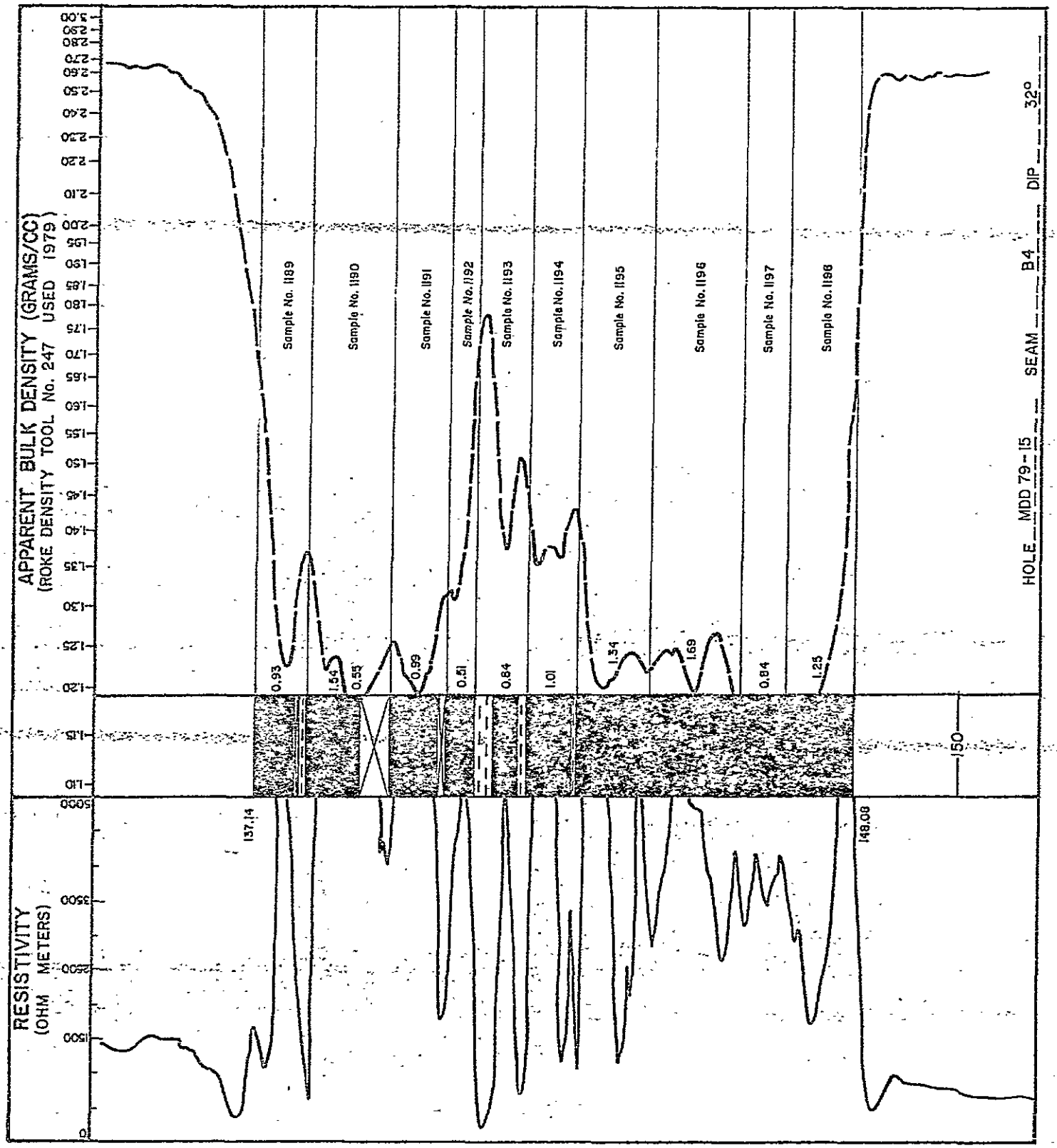


SEAM PROFILE

HOLE	SEAM
MDD 79-15	B3

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

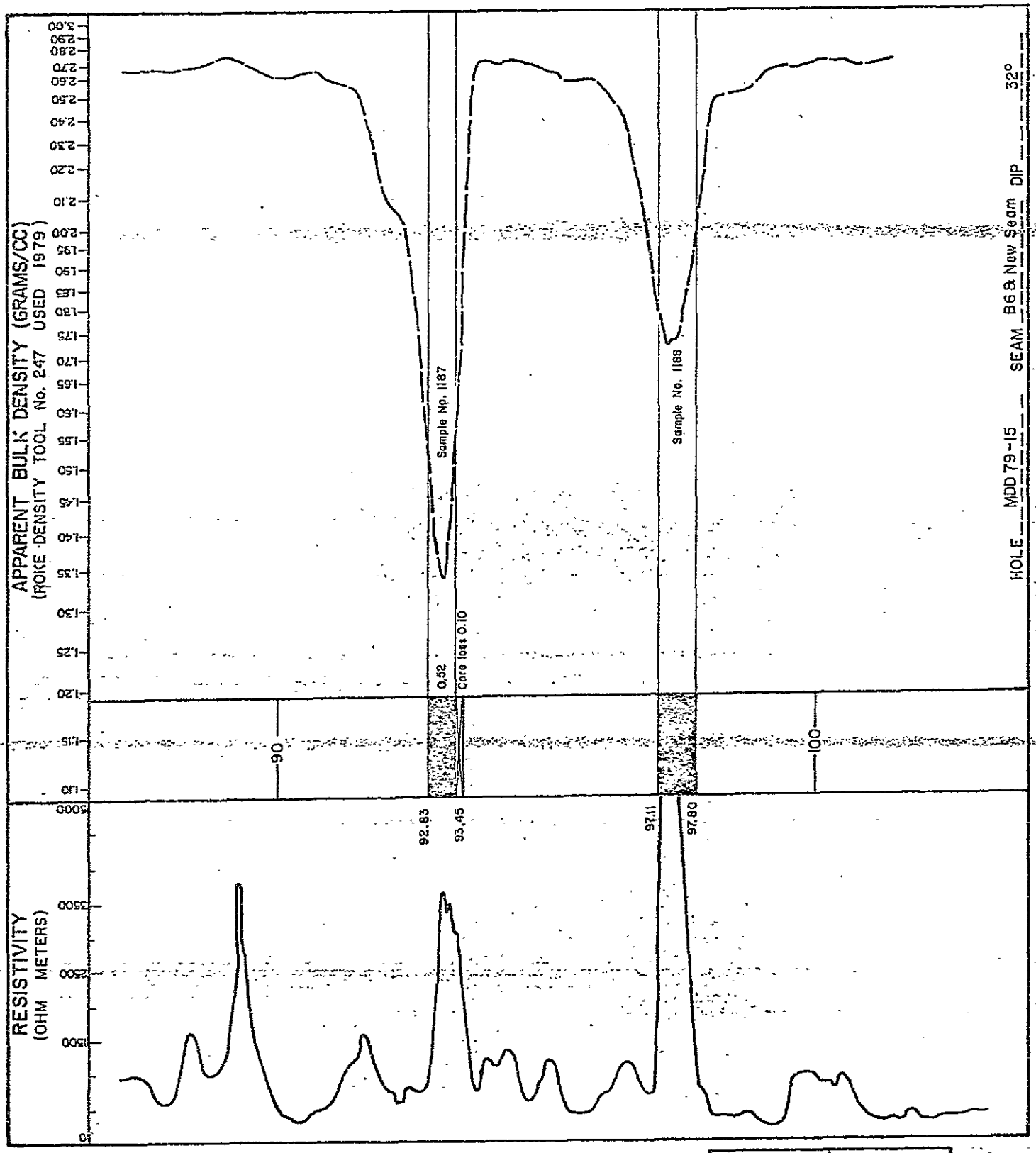


SEAM PROFILE

HOLE	SEAM
MDD 79-15	B4

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

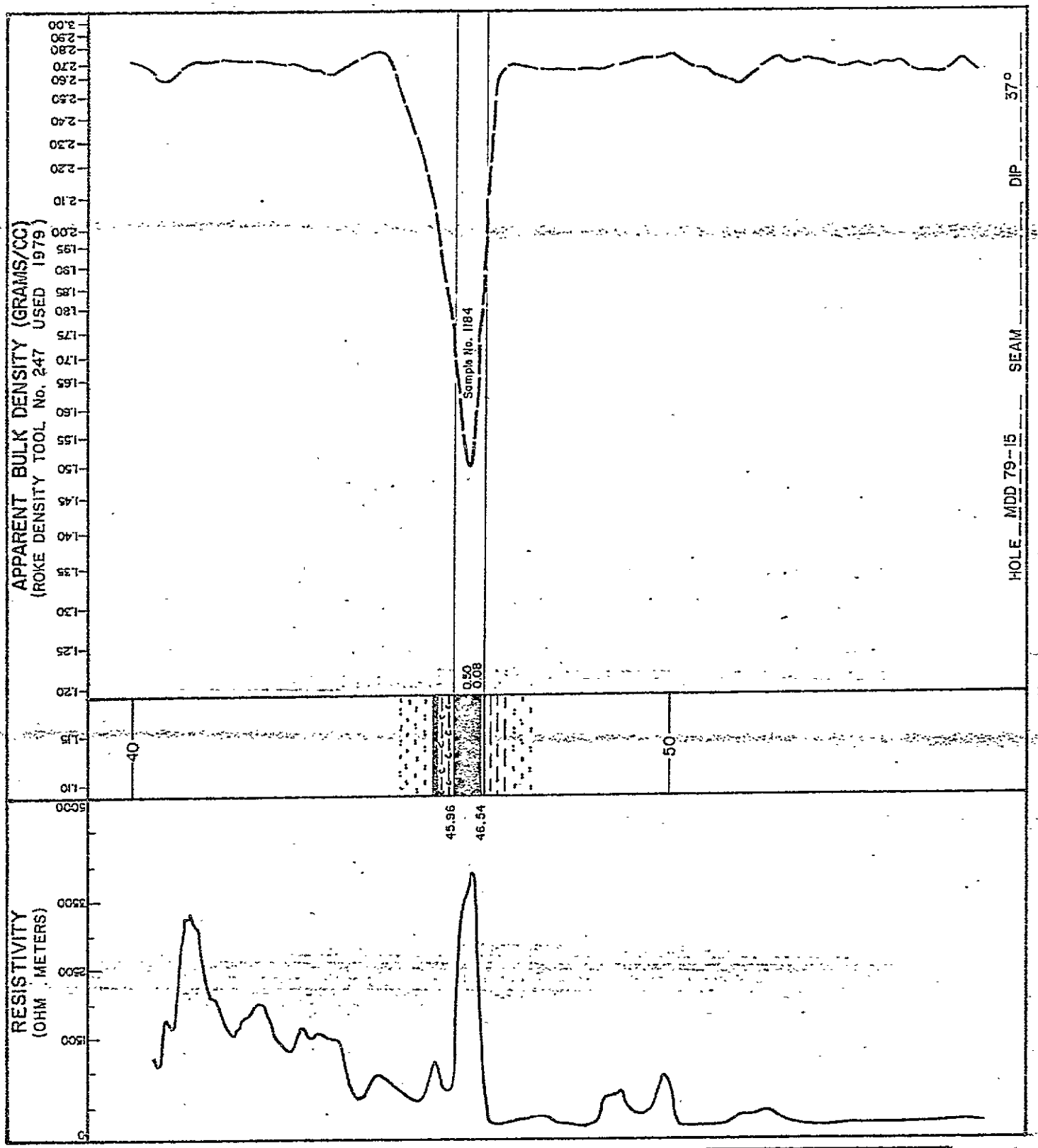


SEAM PROFILE

HOLE	SEAM
MDD 79-15	B6 & NEW SEAM

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

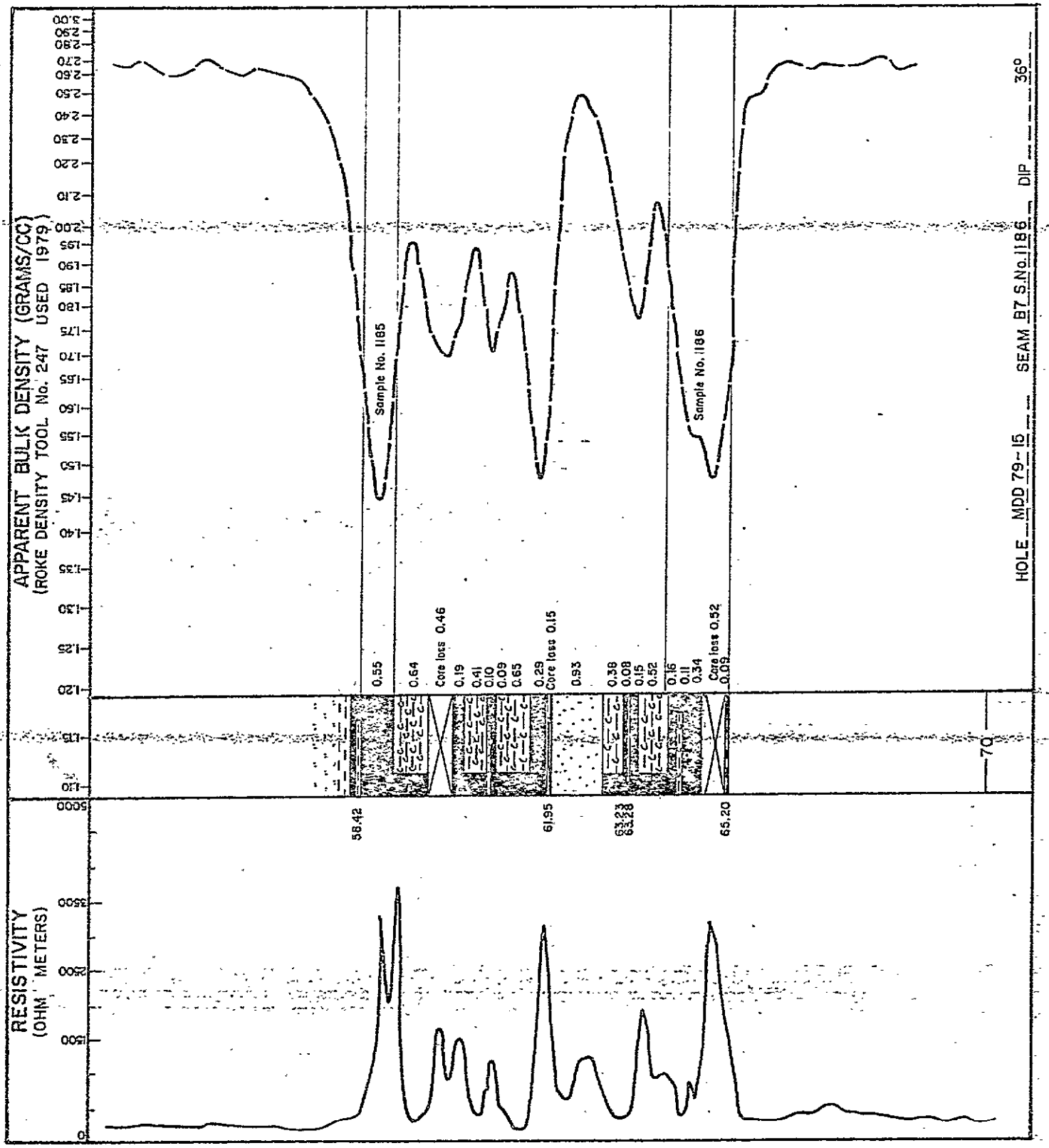


SEAM PROFILE

HOLE	SEAM
MDD 79-15	

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

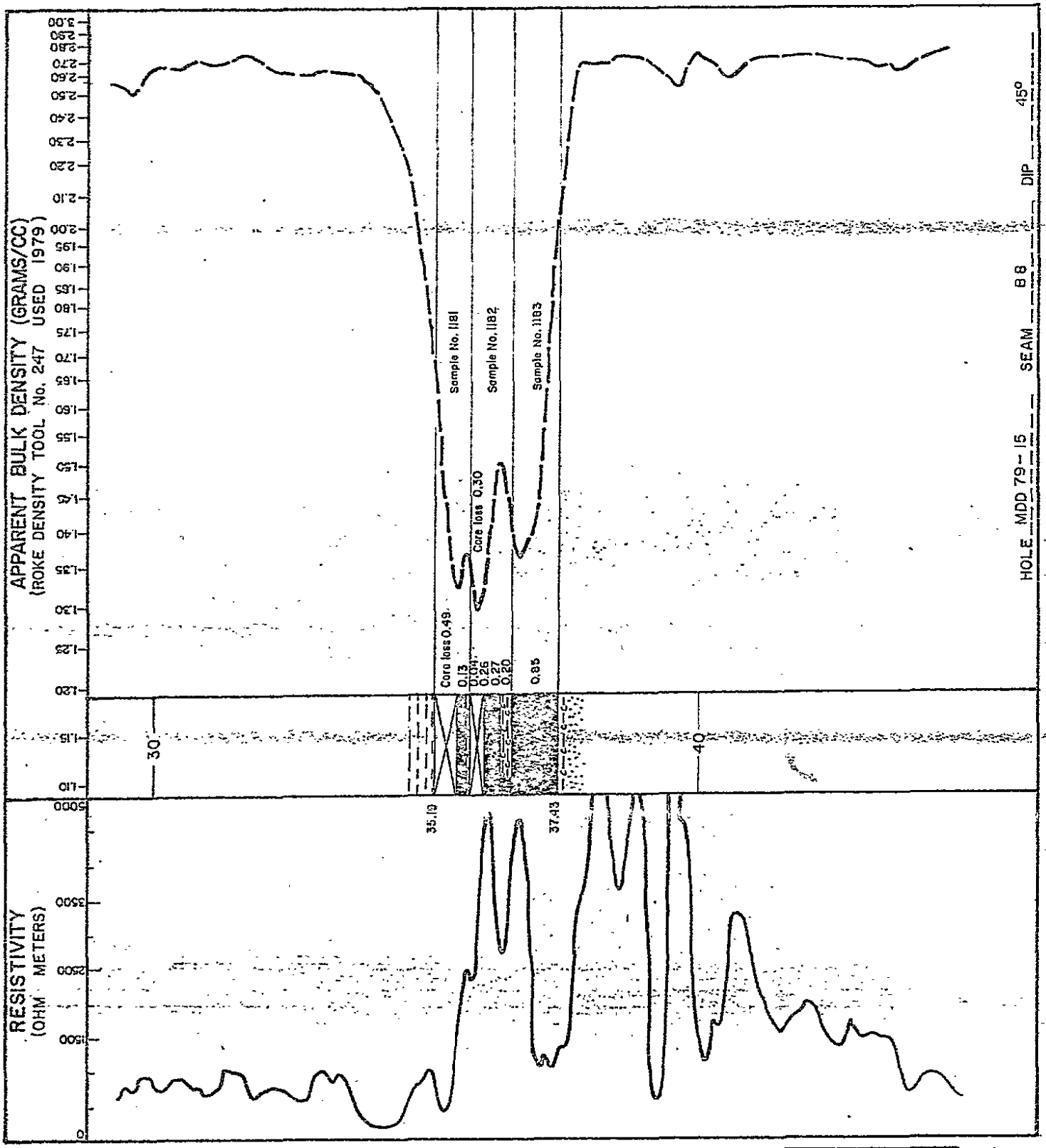


HOLE	SEAM
MDD 79-15	B7 S.No.1186

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

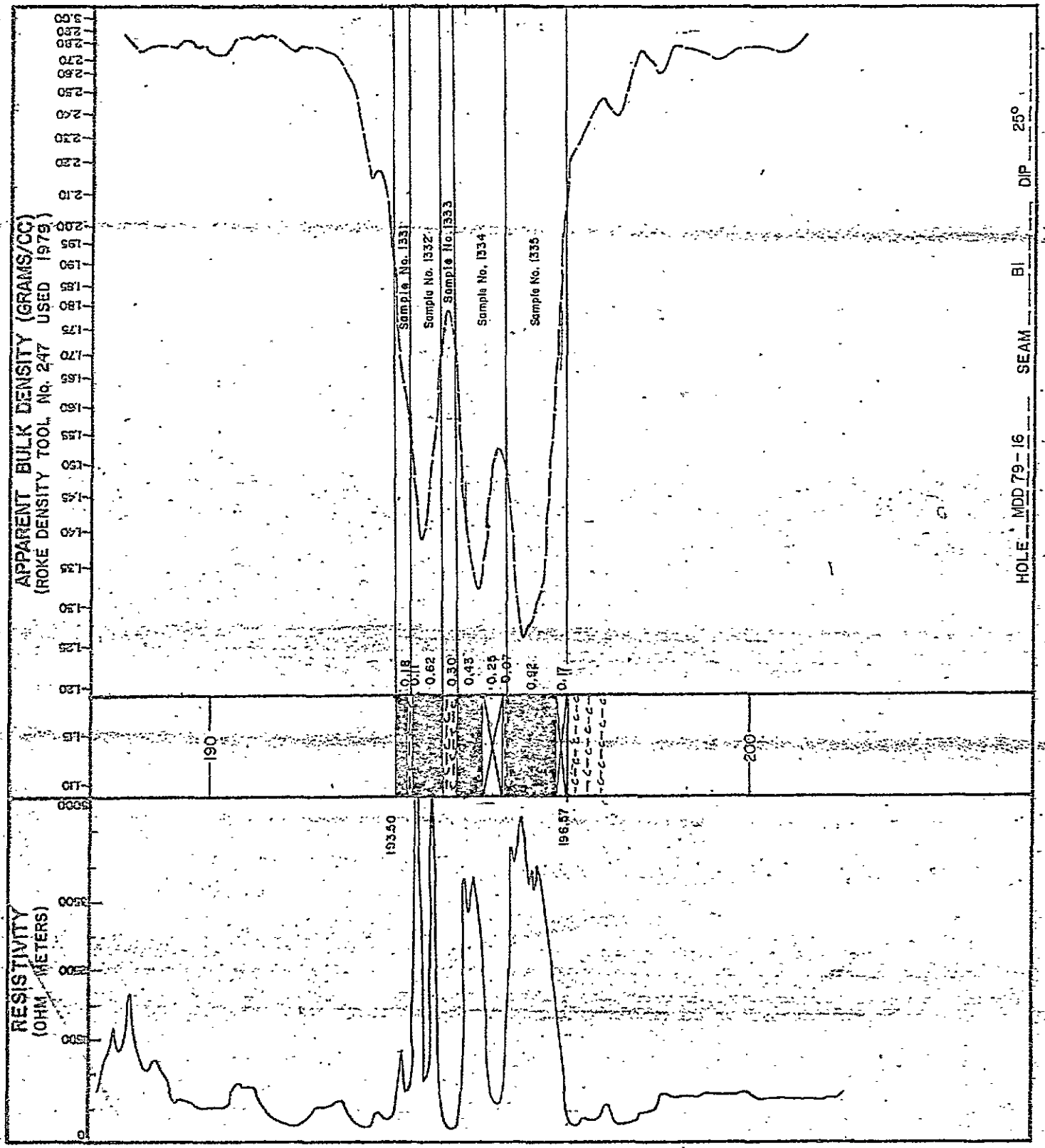


SEAM PROFILE

HOLE	SEAM
MDD 79-15	B8

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

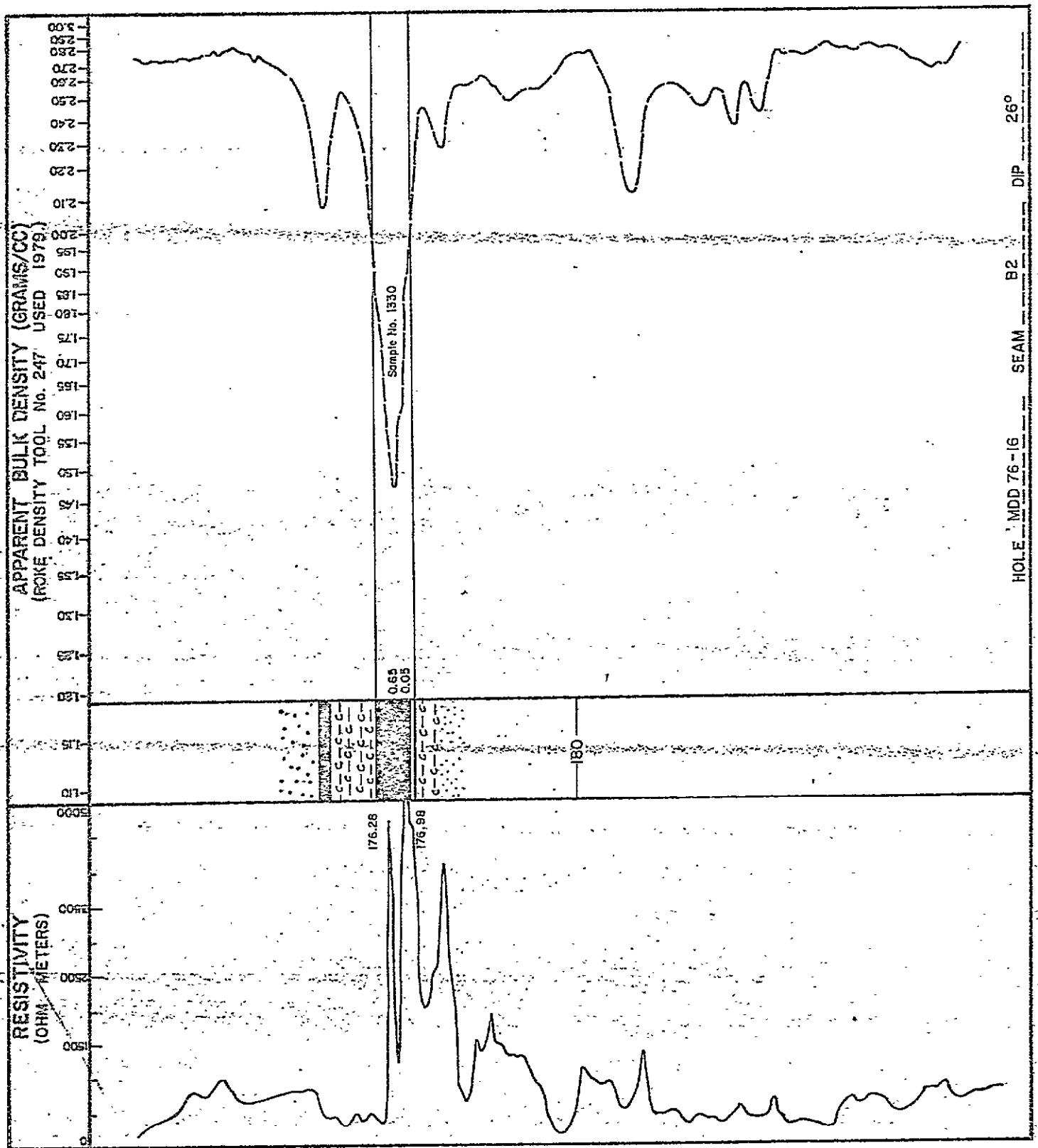


SEAM PROFILE

HOLE	SEAM
MDD 79-16	B1

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

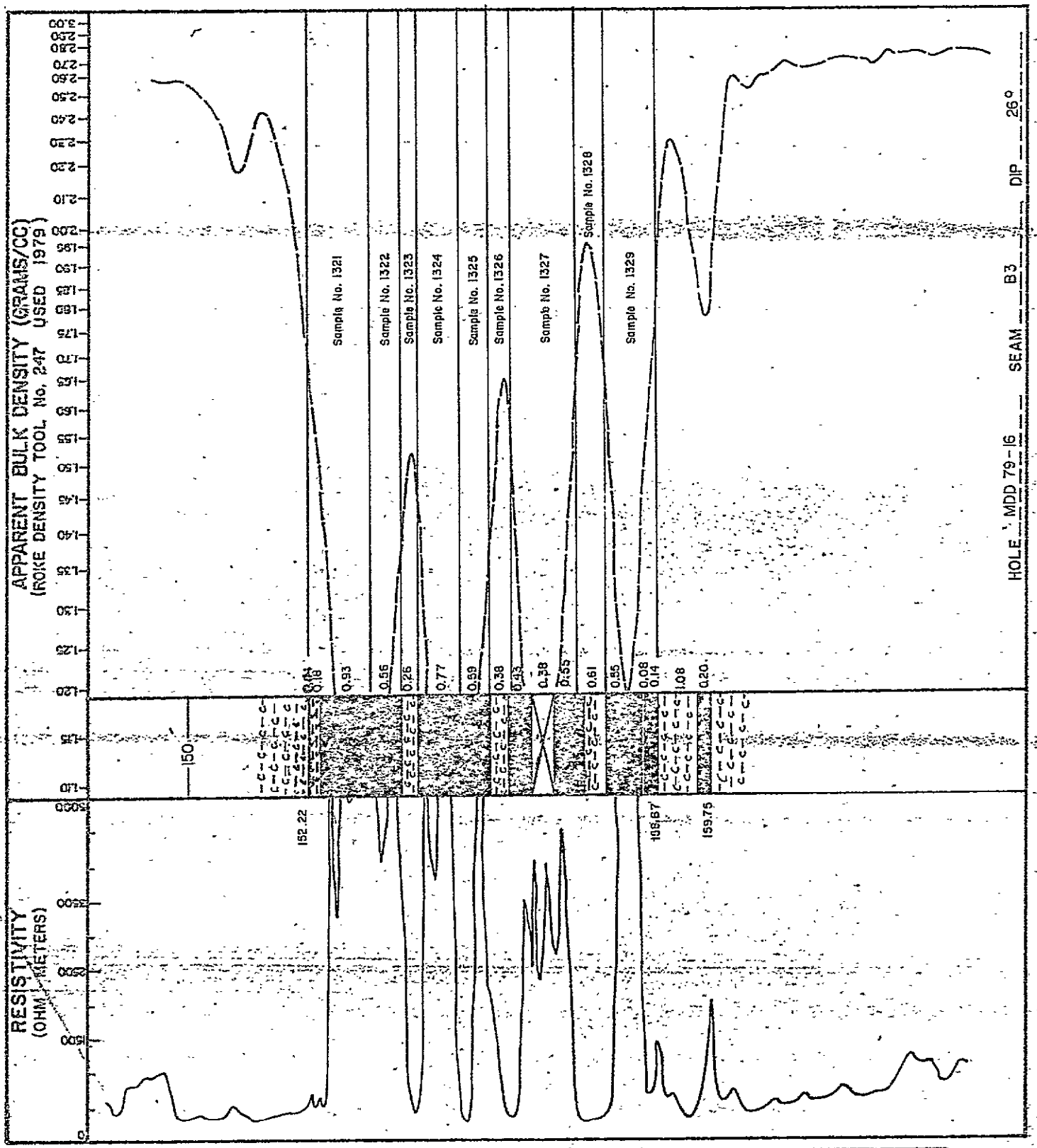


HOLE	SEAM
MDD 79-16	B2

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

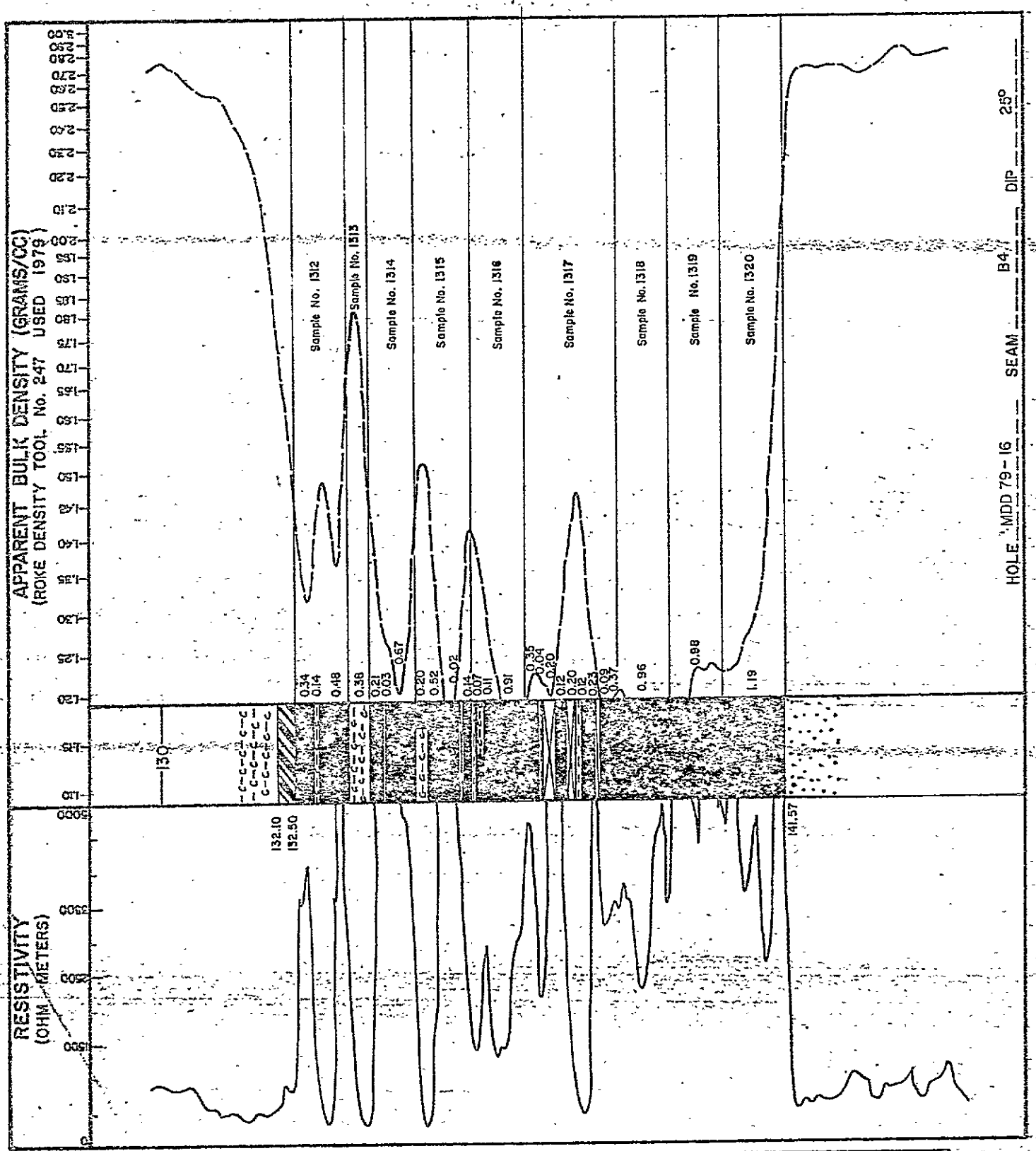


SEAM PROFILE

HOLE	SEAM
MDD79-16	B3

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

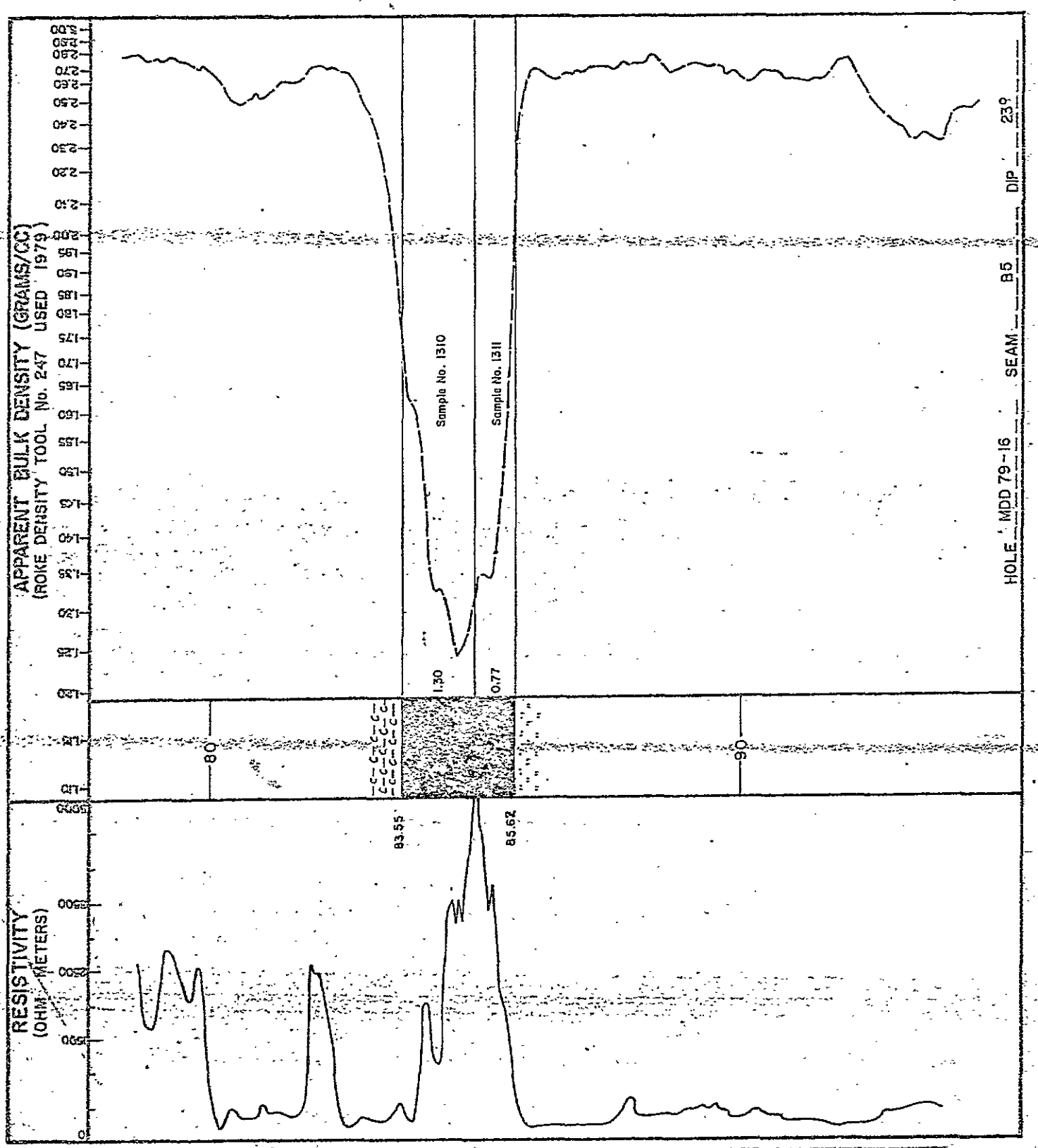


SEAM PROFILE

HOLE	SEAM
MDD 79-16	B4

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

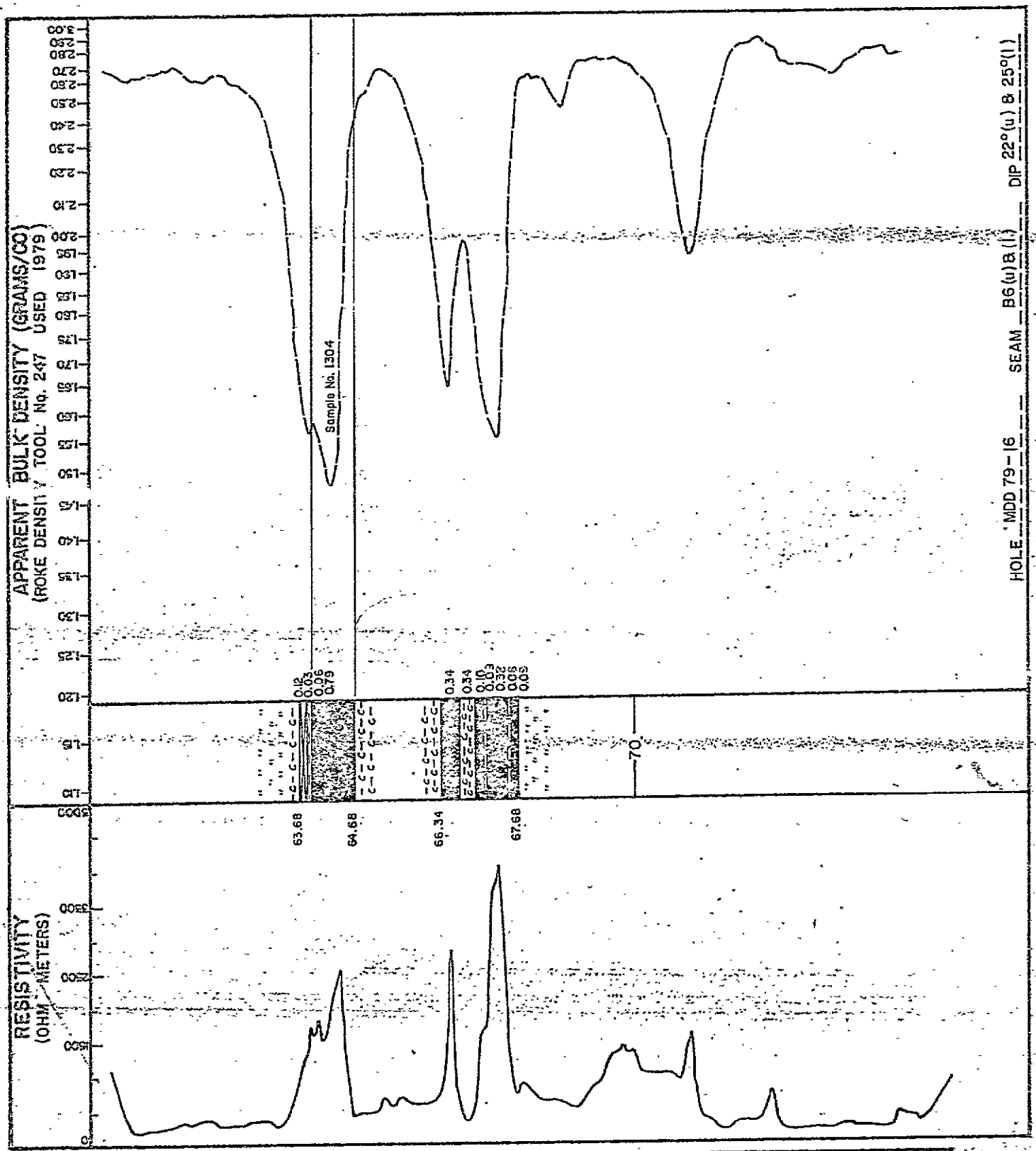


SEAM PROFILE

HOLE	SEAM
MDD 79-16	B5

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

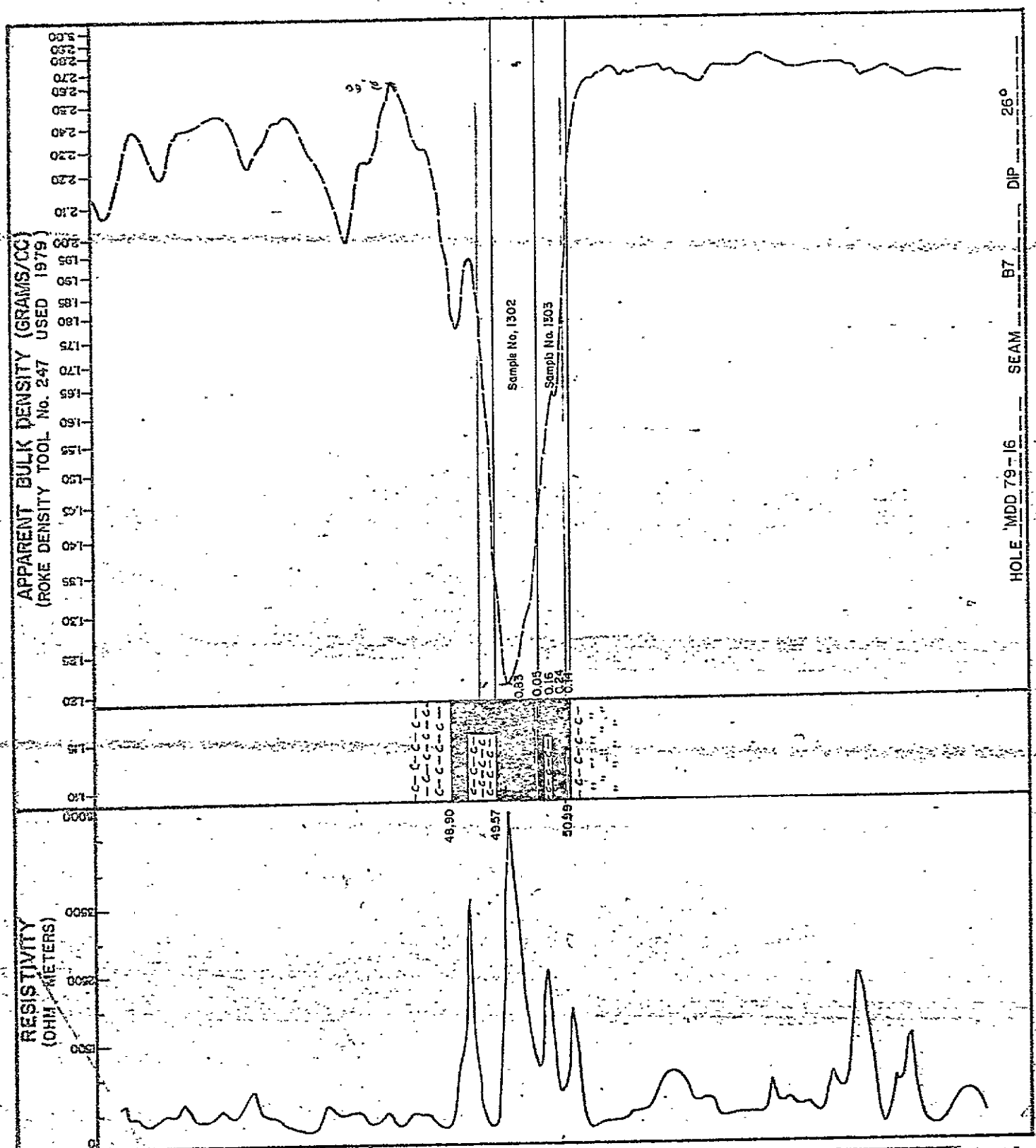


HOLE	SEAM
MDD 79-16	B6(u)&(l)

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

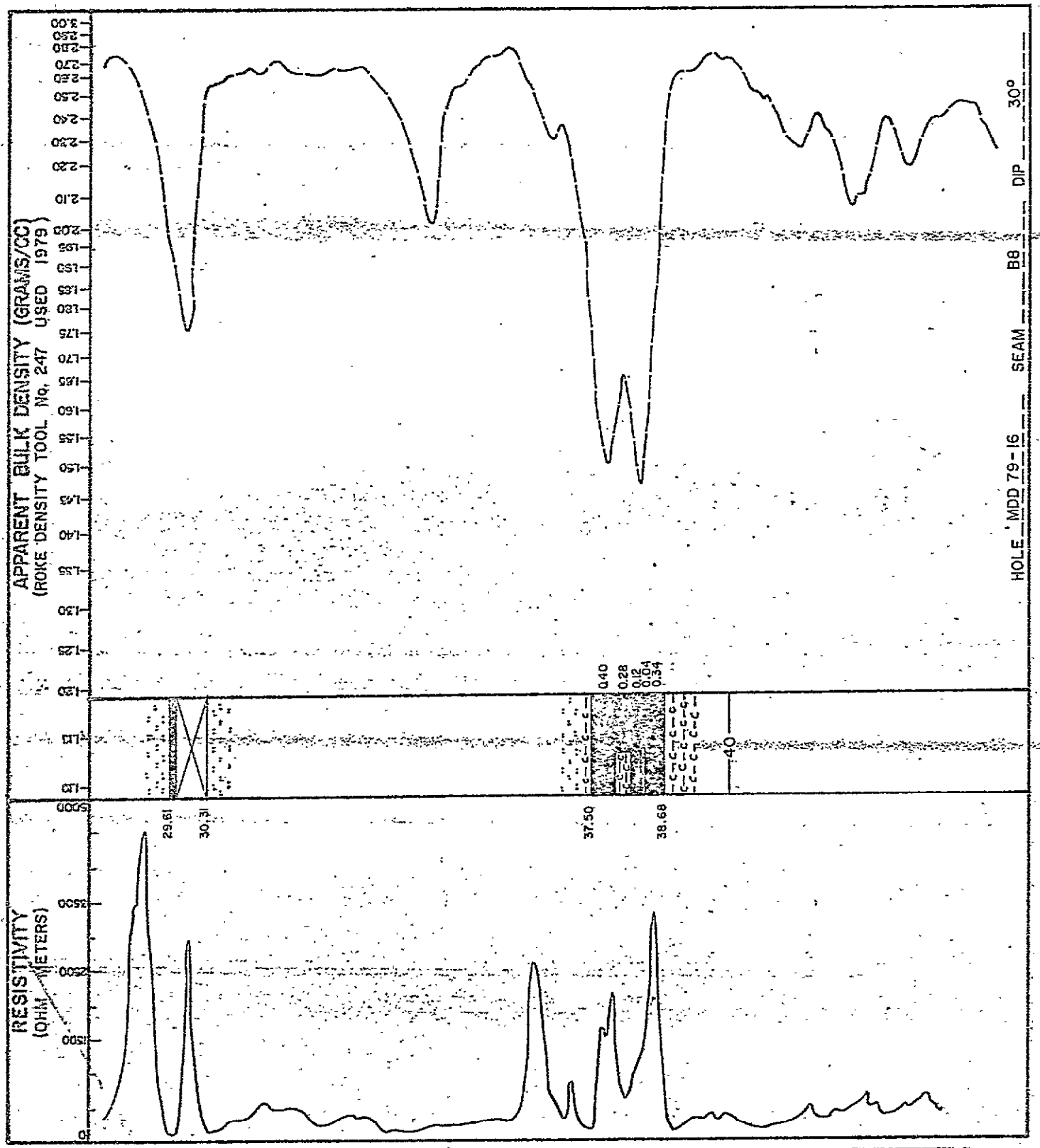


SEAM PROFILE

HOLE	SEAM
MDD 79-16	B7

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

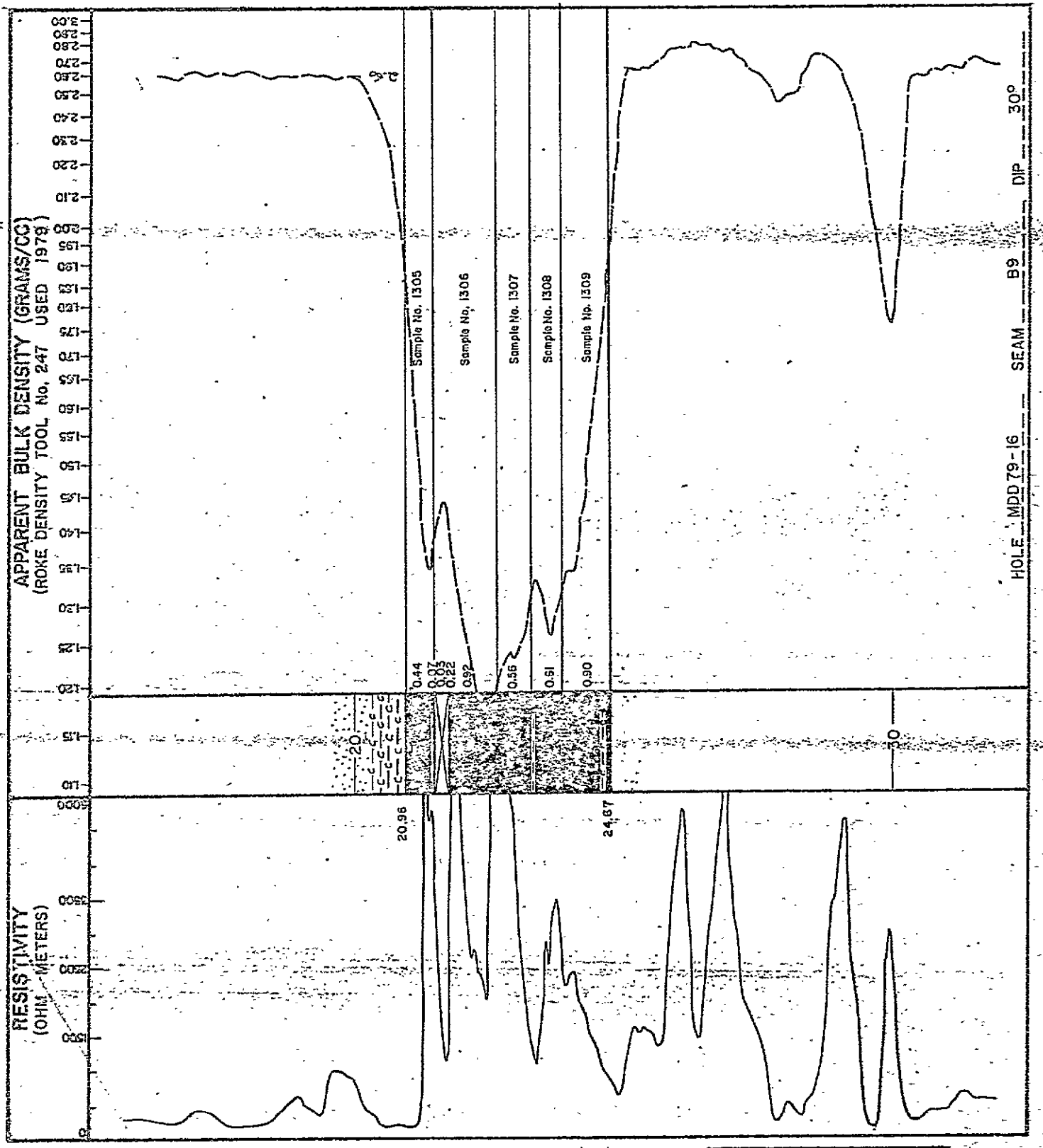


HOLE	SEAM
MDD 79-16	B8

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

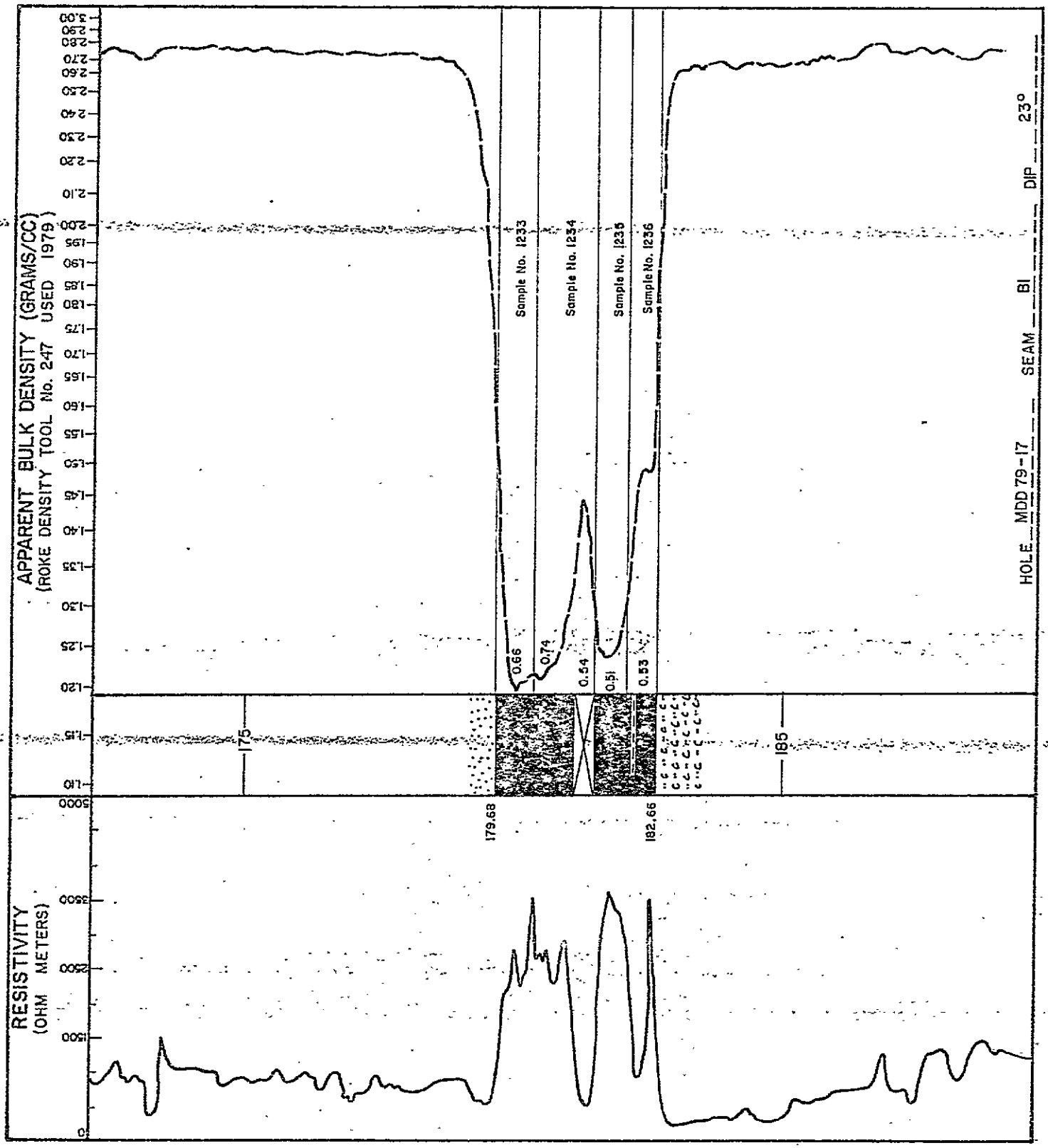


HOLE	SEAM
MDD 79-16	B9

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

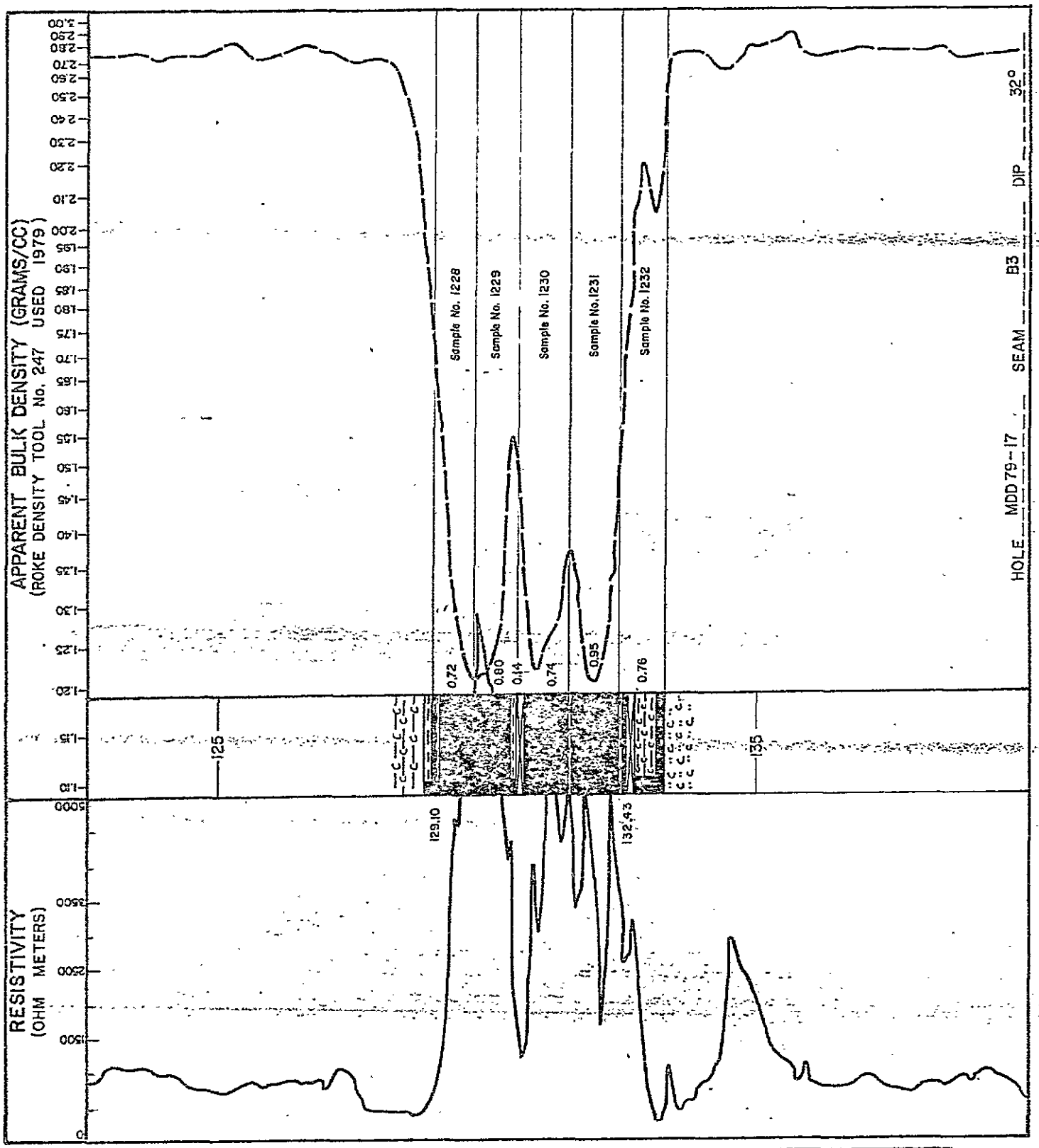


SEAM PROFILE

HOLE	SEAM
MDD 79-17	BI

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

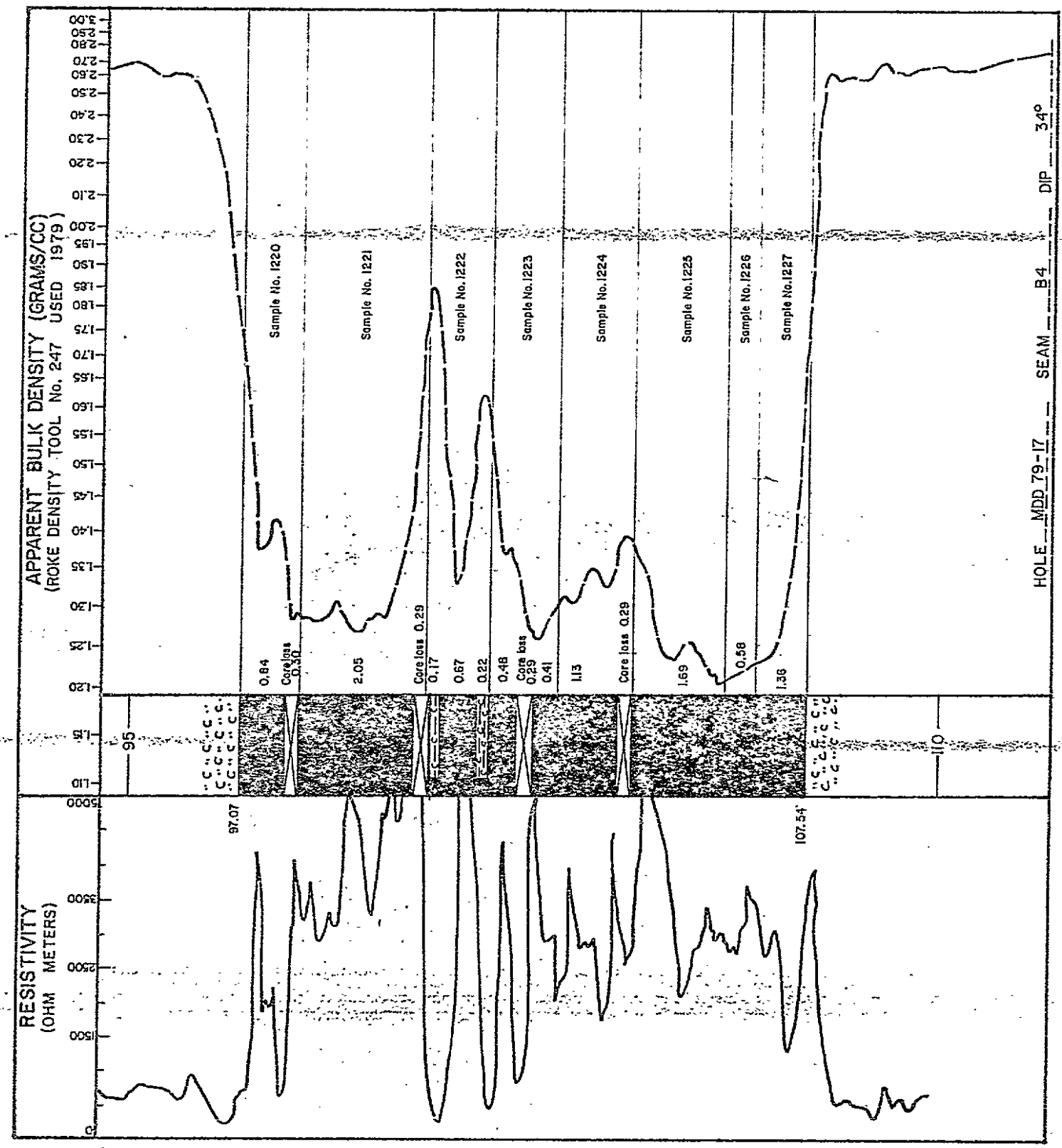


HOLE	SEAM
MDD 79-17	B3

SEAM PROFILE

PETRO - CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

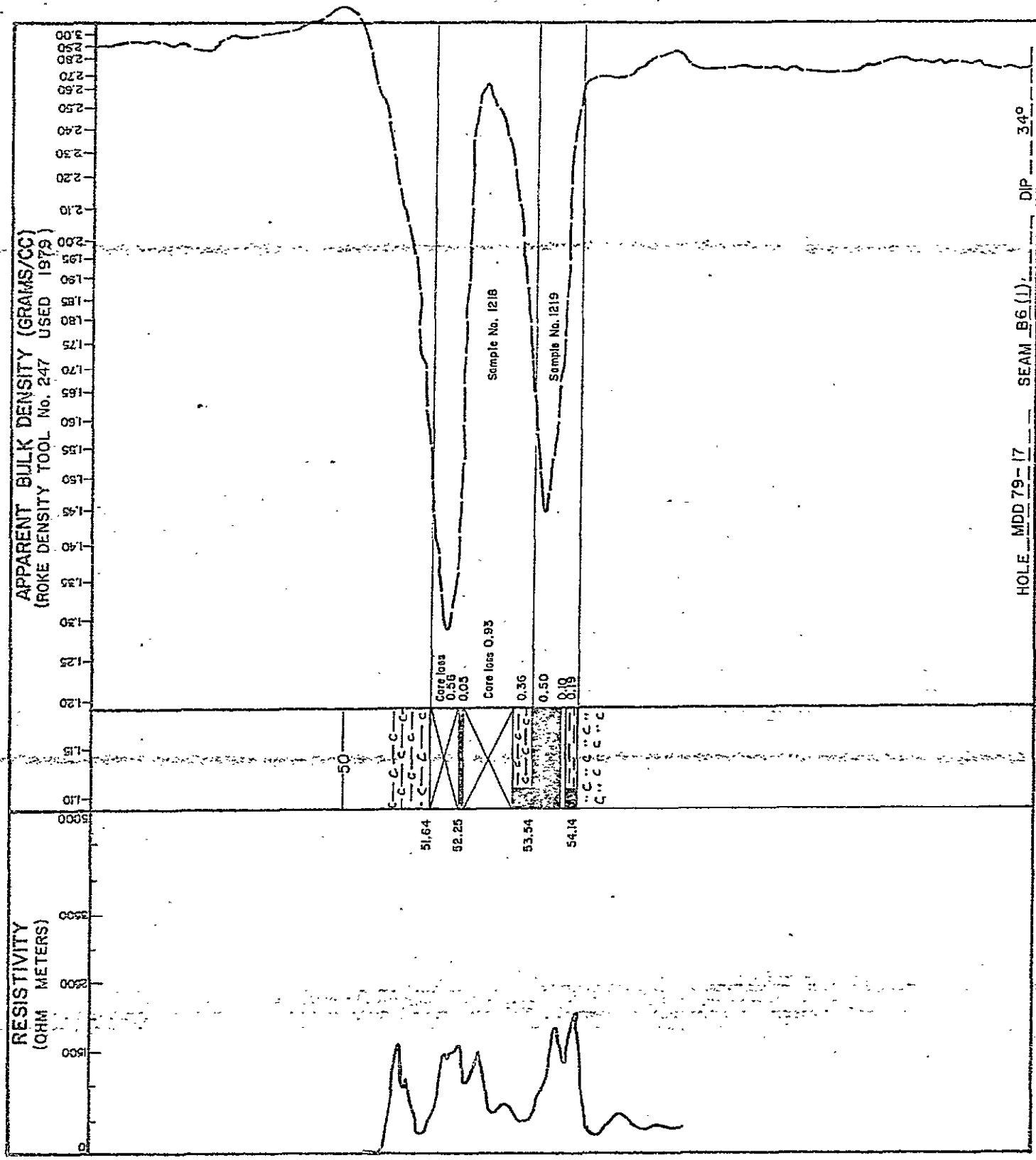


SEAM PROFILE

HOLE	SEAM
MDD 79-17	B4

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

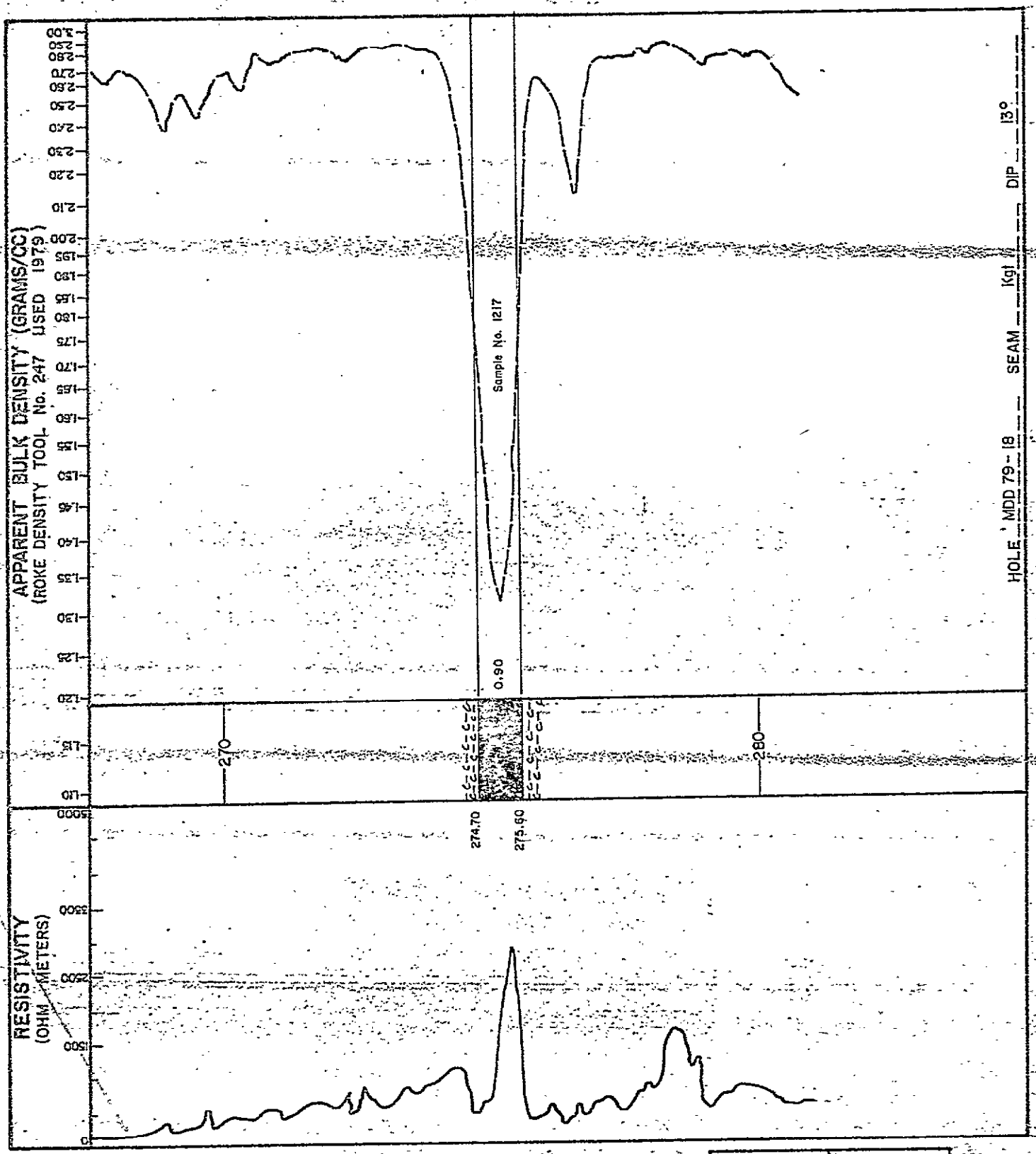


HOLE	SEAM
MDD 79-17	B 6 (1)

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

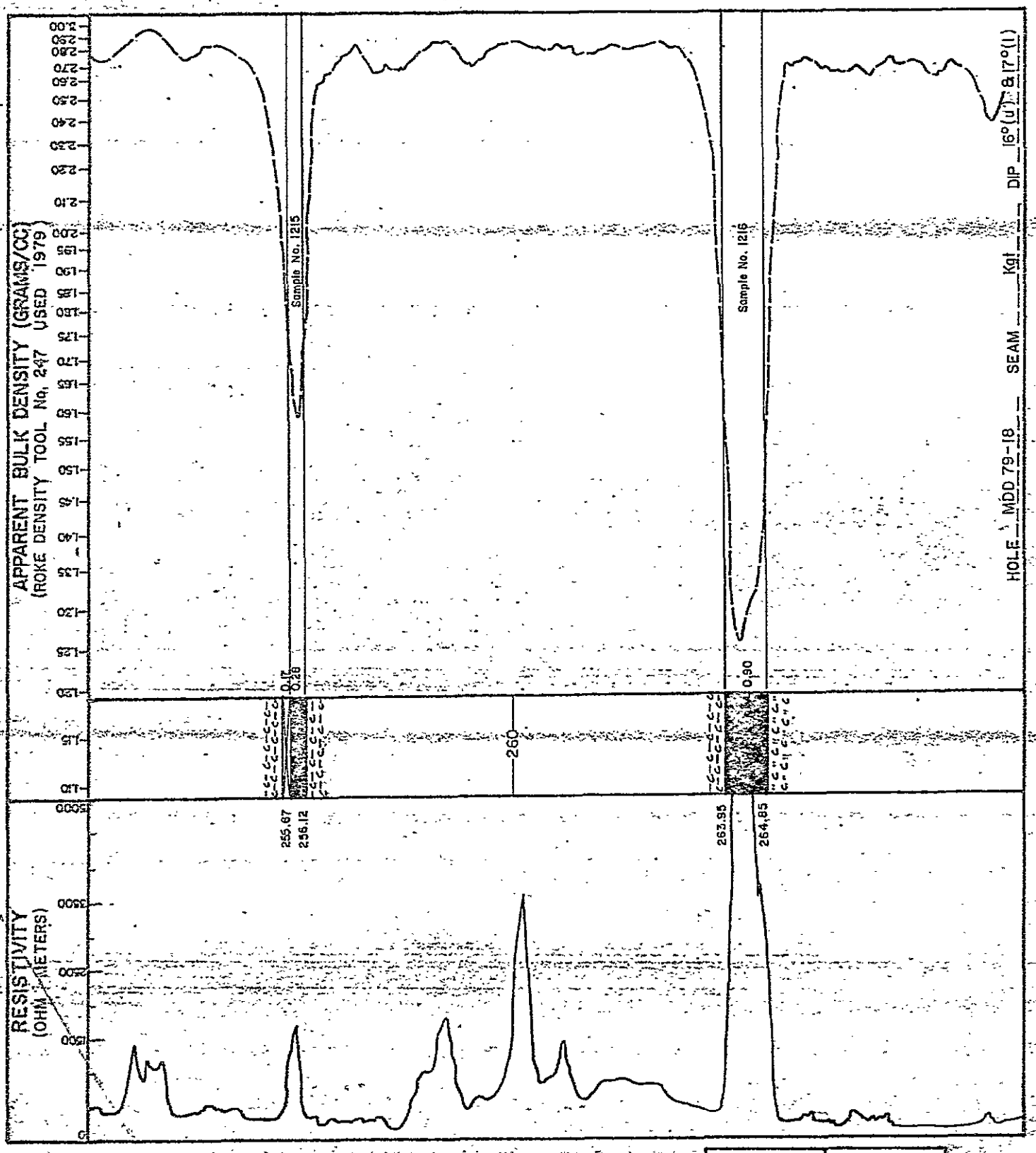


SEAM PROFILE

HOLE	SEAM
MDD 79-18.	Kgt

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

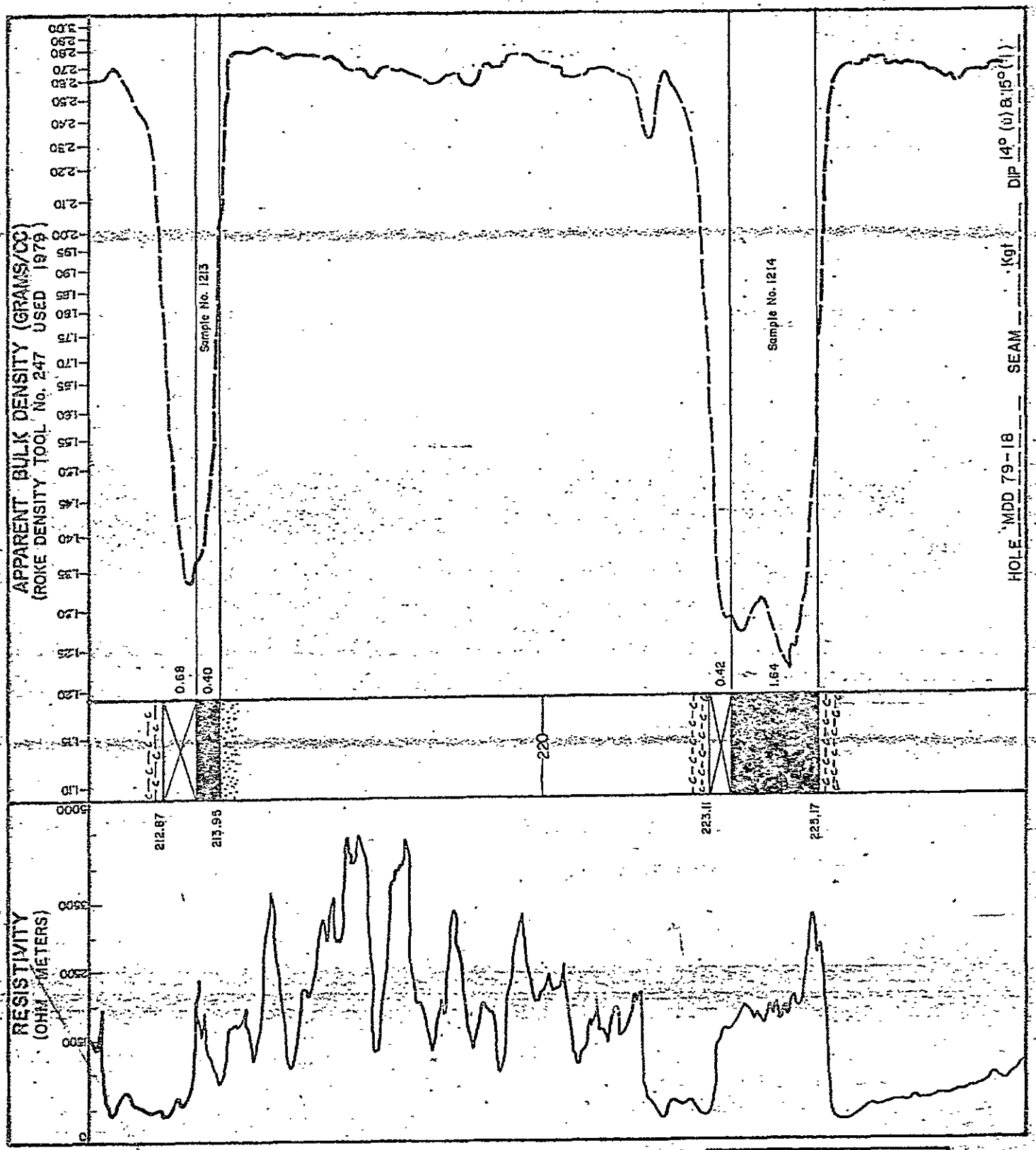


HOLE	SEAM
MDD 79-18	Kgf

SEAM PROFILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

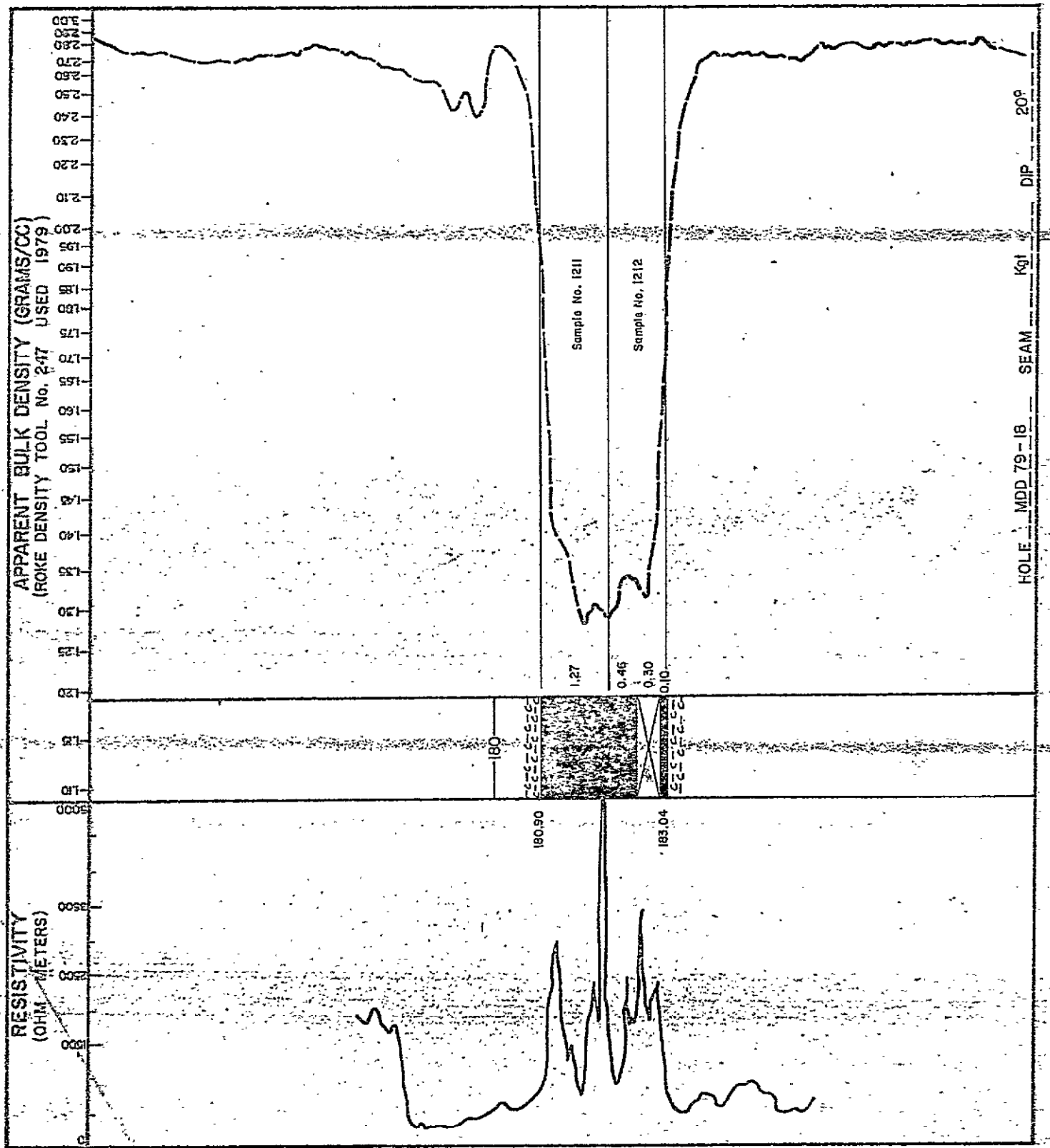


SEAM PROFILE

HOLE	SEAM
MDD 79-18	Kgt

PETRO – CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

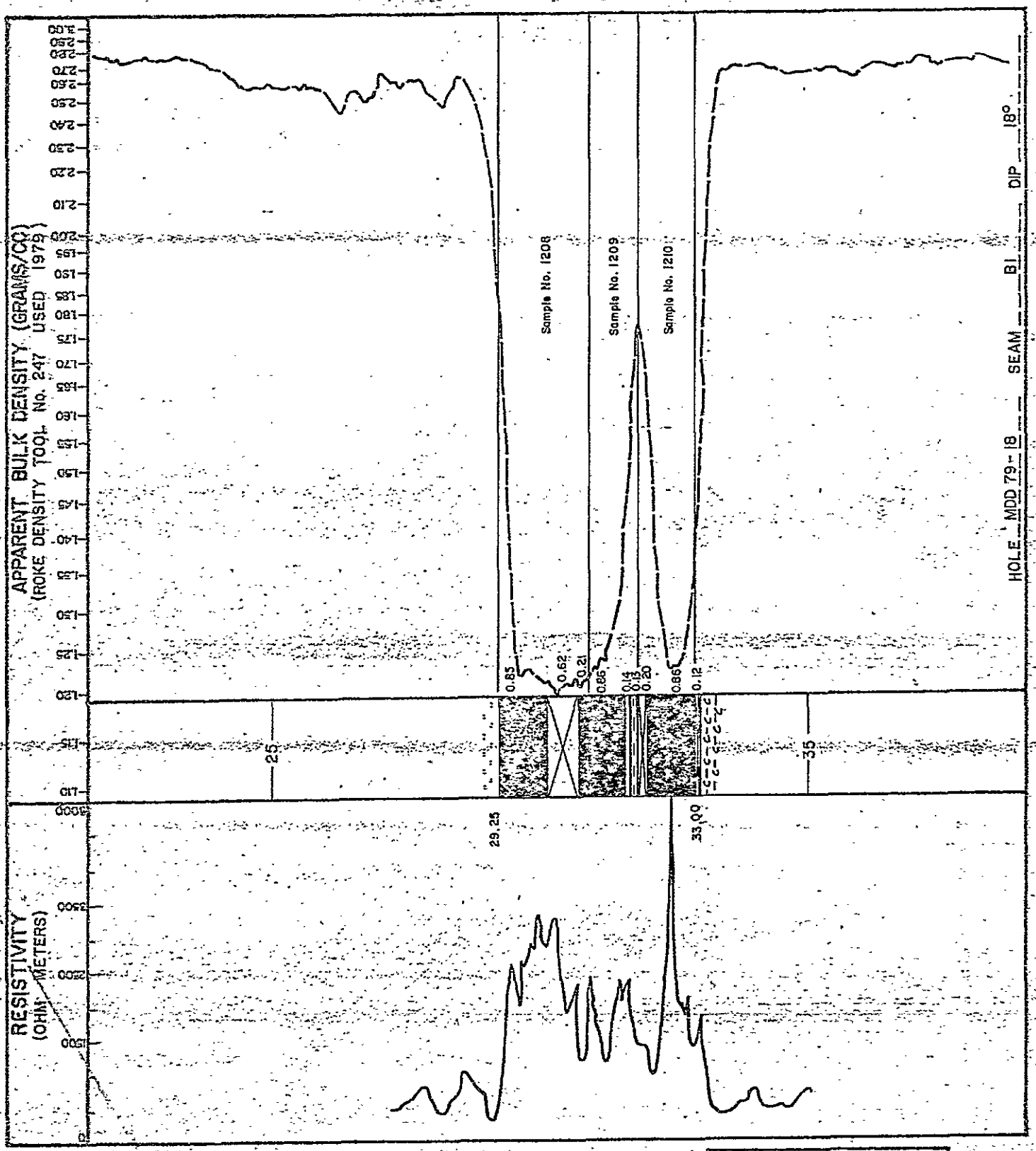


SEAM PROFILE

HOLE	SEAM
MDD-78-18	Kgl

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT



HOLE	SEAM
MDD 79-18	BI

SEAM PROFILE

PR-MONKMAN 79(2)A

OPEN FILE

PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT

1979

APPENDIX A

CROSS-SECTIONS AND MAPS

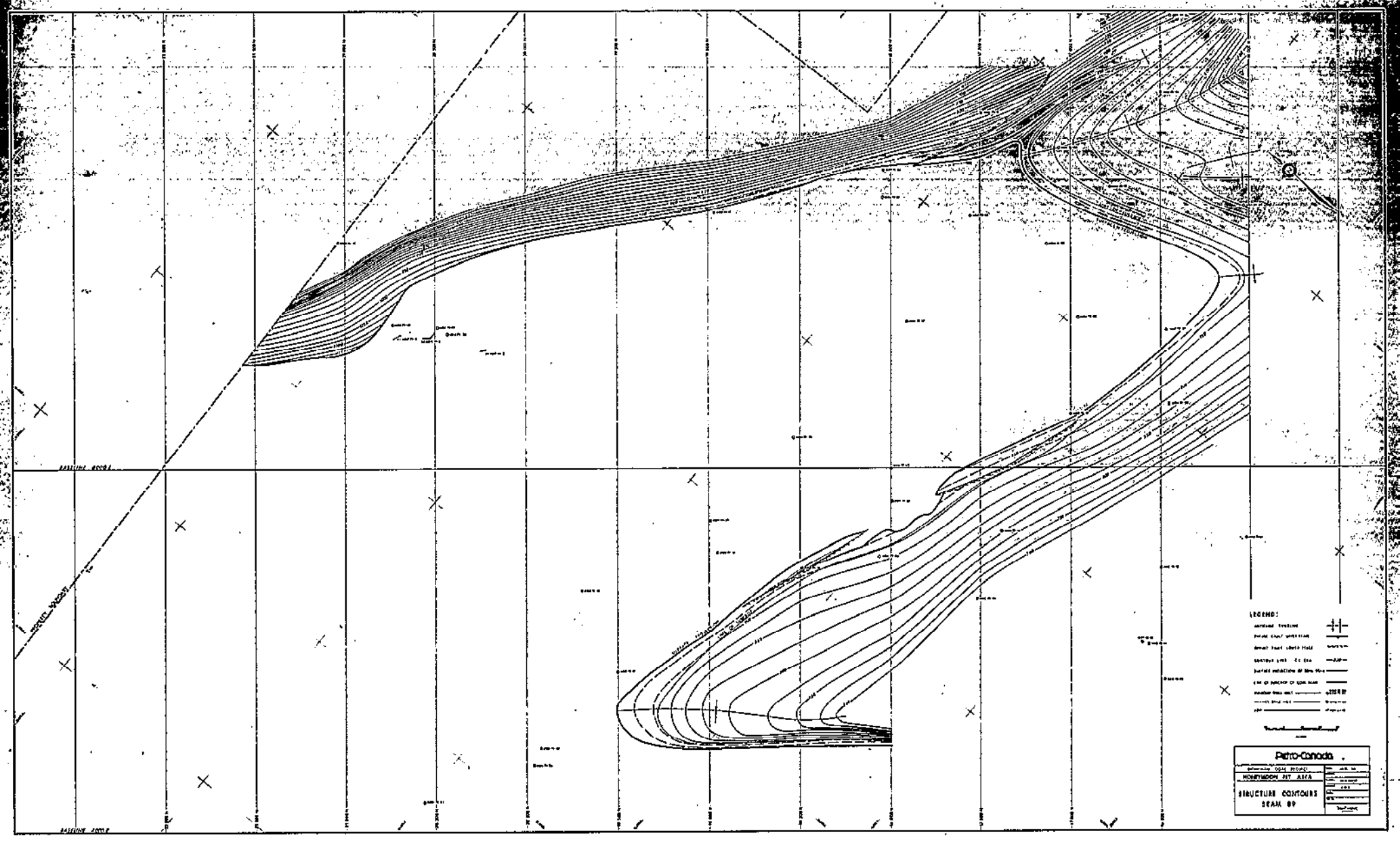
PETRO-CANADA EXPLORATION INC.

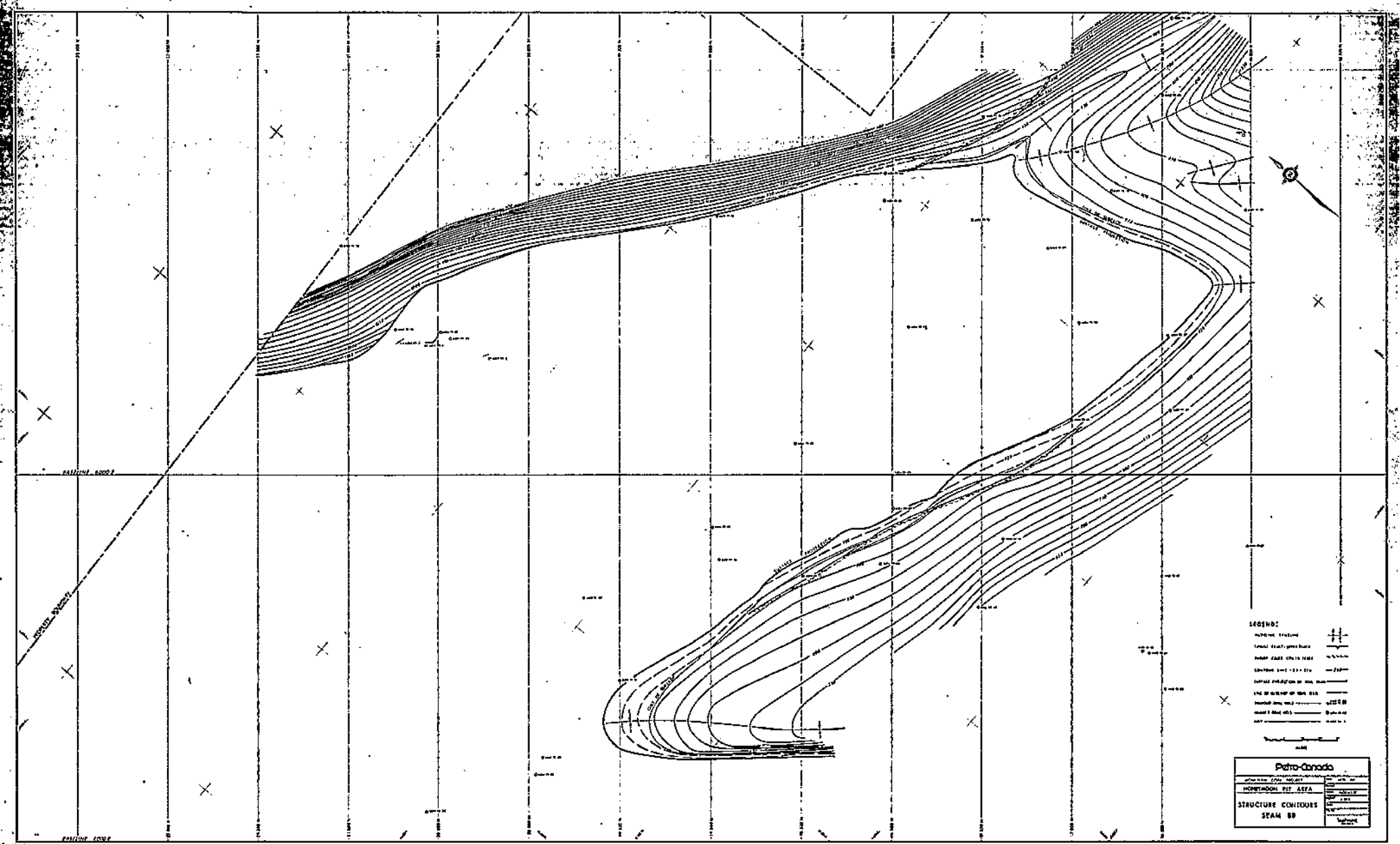
MONKMAN COAL PROJECT

1979

APPENDIX A

CROSS-SECTIONS AND MAPS


LEGEND:
Petro-Canada
MONEYMAKER PIT AREA
STRUCTURE CONTOURS
SEAM 89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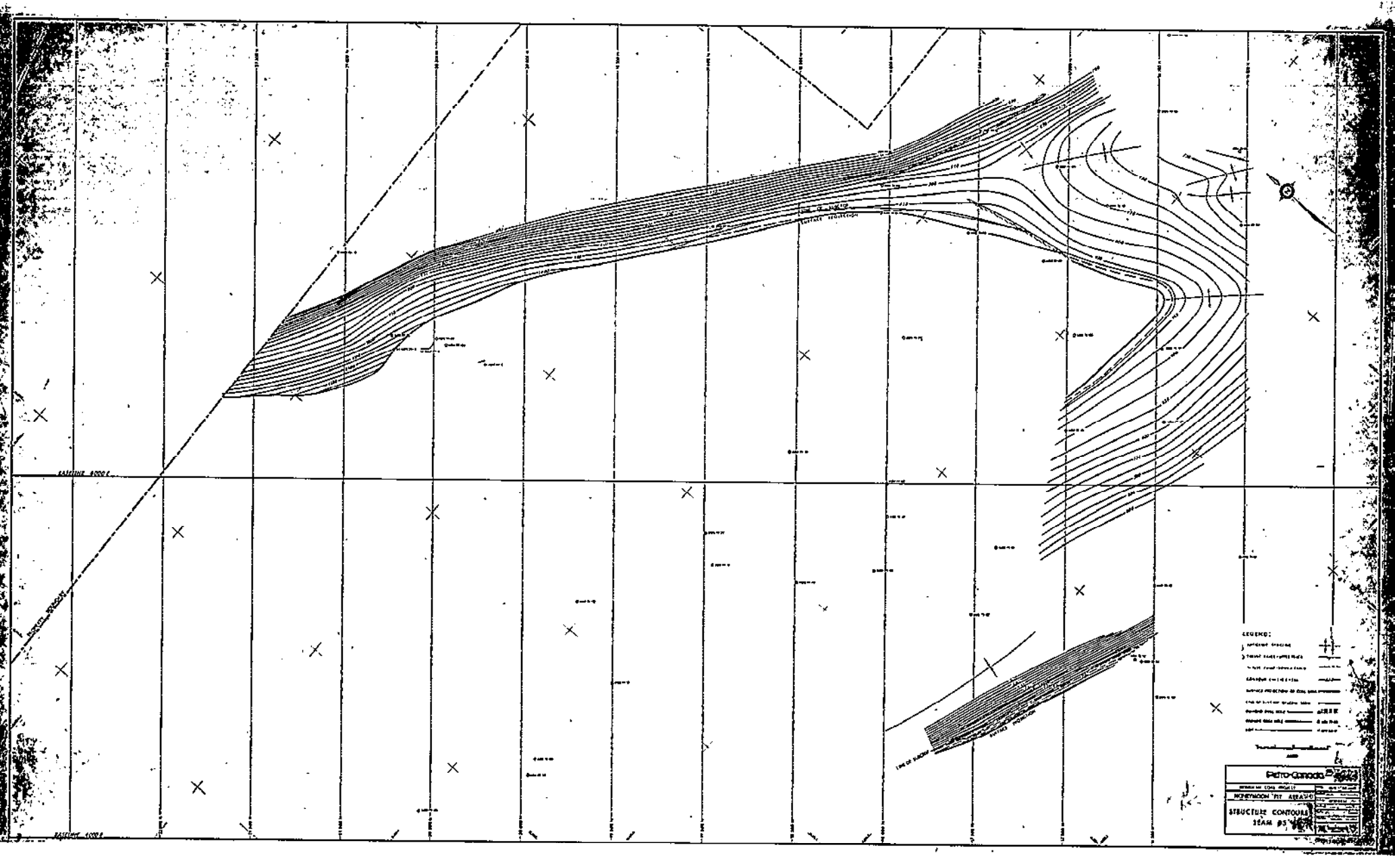
Petro-Canada
HOMETHOON PIT AREA
STRUCTURE CONTOURS
SEAM 80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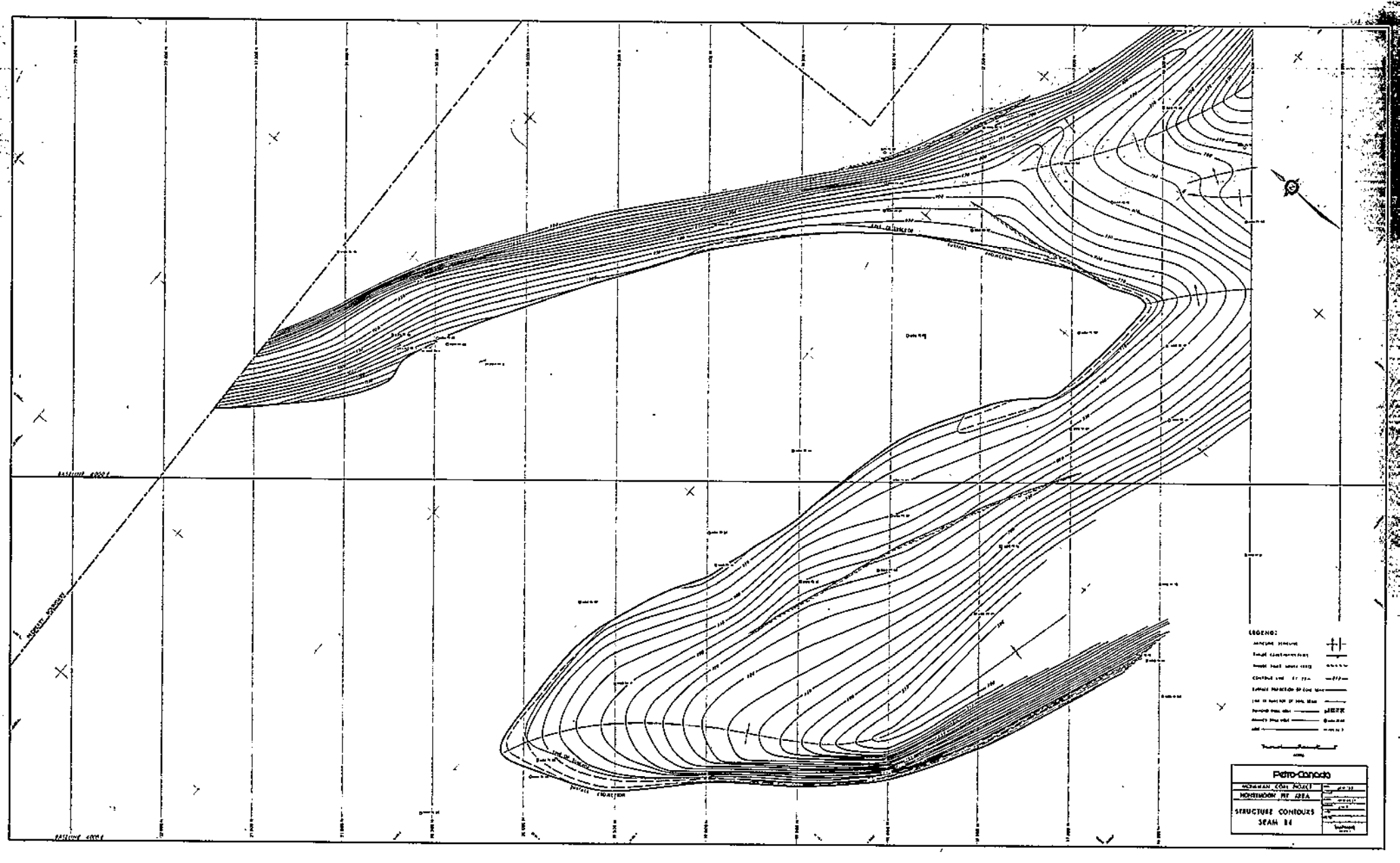
STRUCTURE CONTOURS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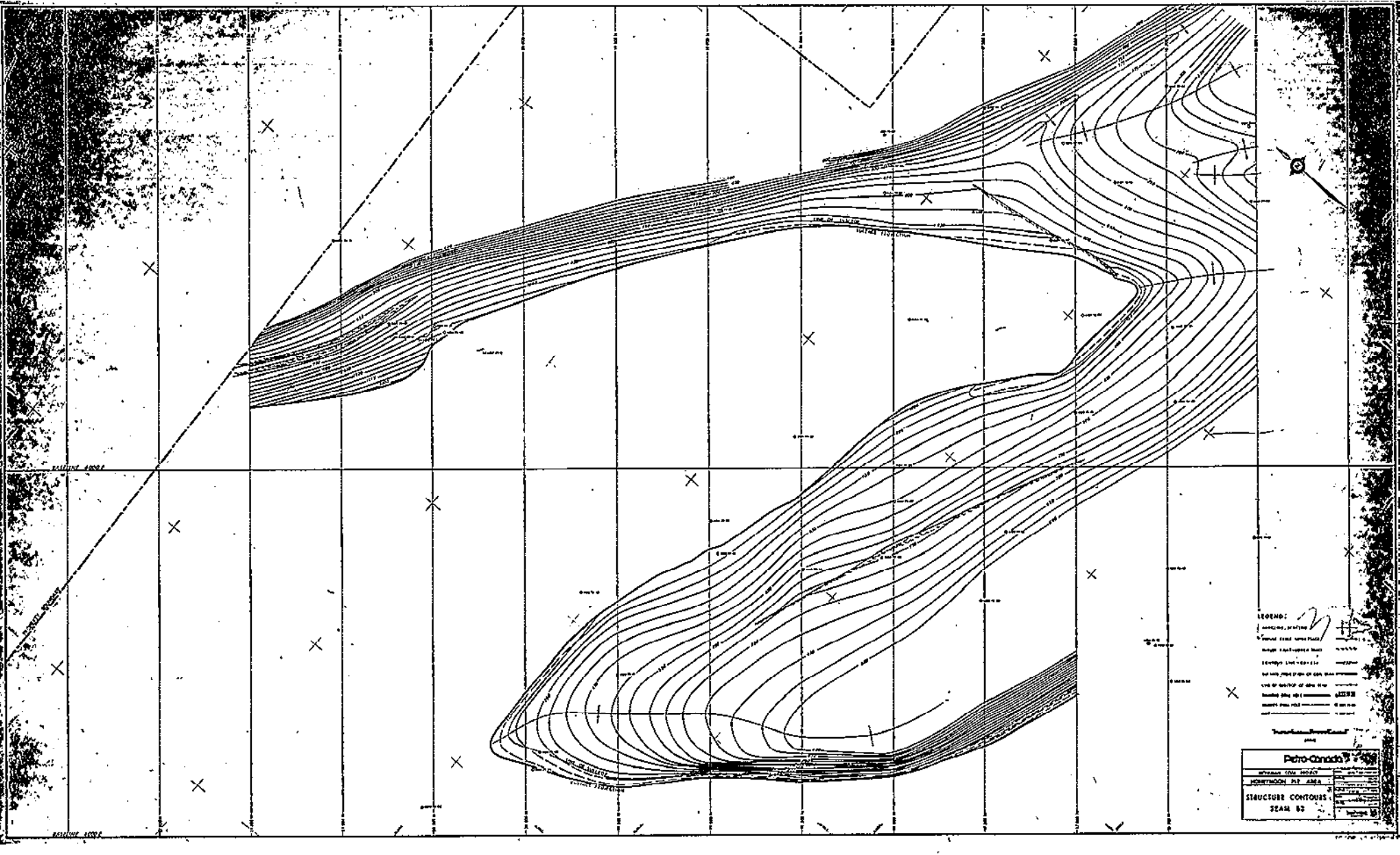
Petro-Canada
NORMAN COAL PROJECT
NORTHDOWN PIT AREA
STRUCTURE CONTOURS
SEAM B4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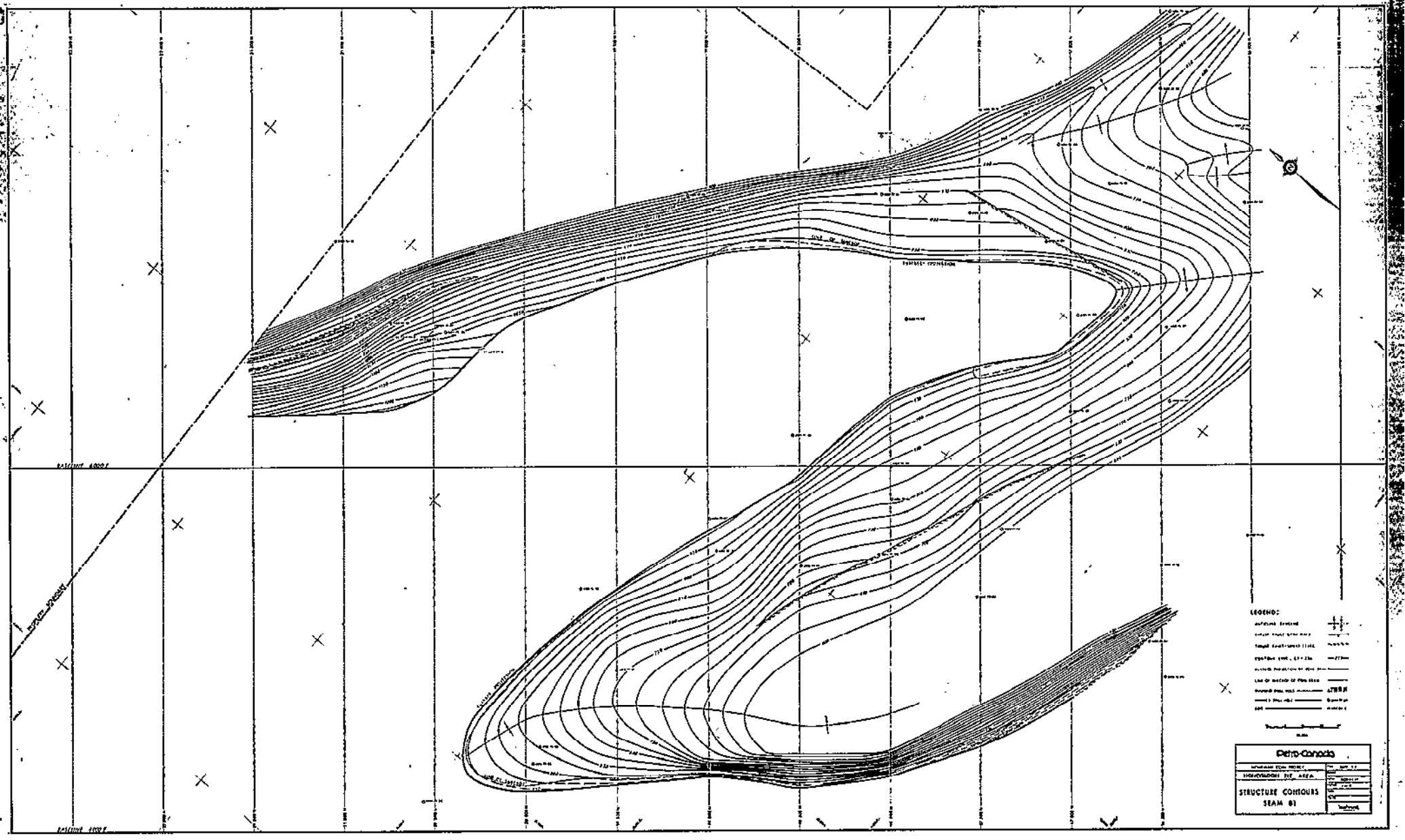
Petro-Canada
MONTMAGNY PIT AREA
STRUCTURE CONTOURS
SEAM 63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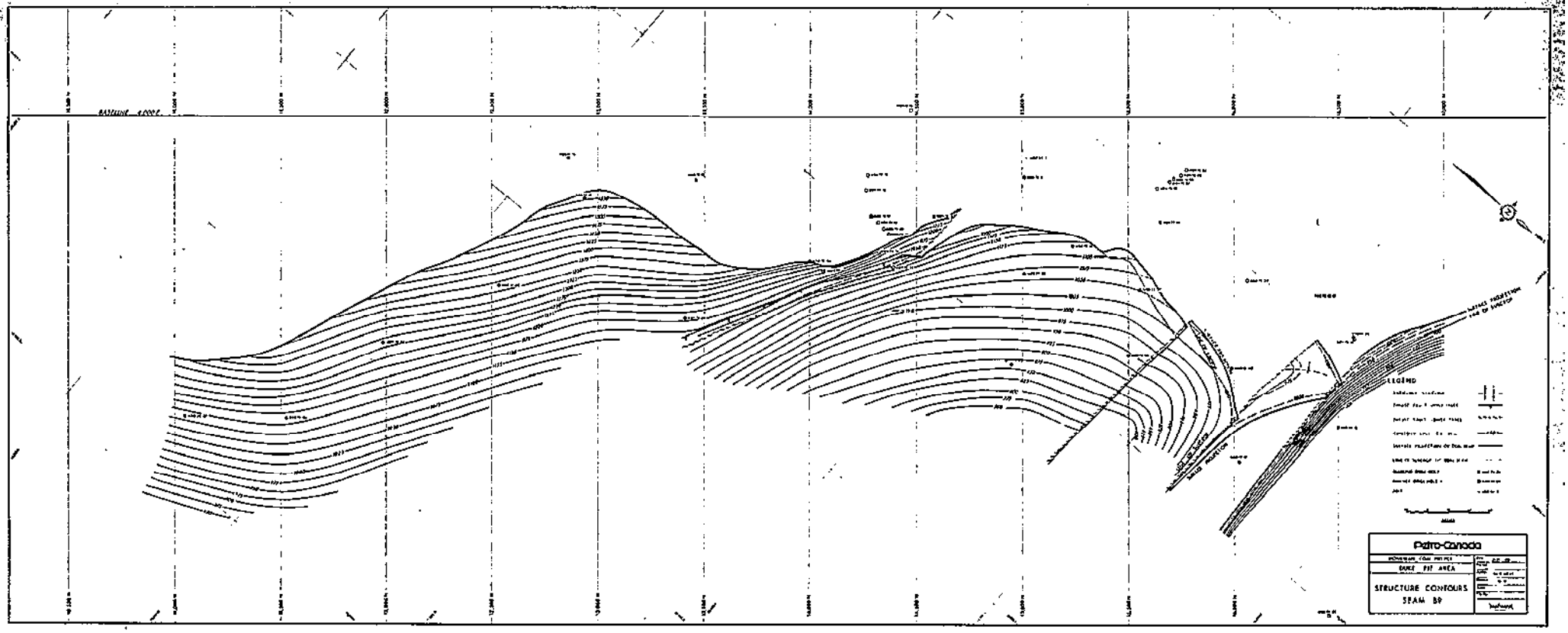
Petro-Canada
STRUCTURE CONTOURS
SEAM 01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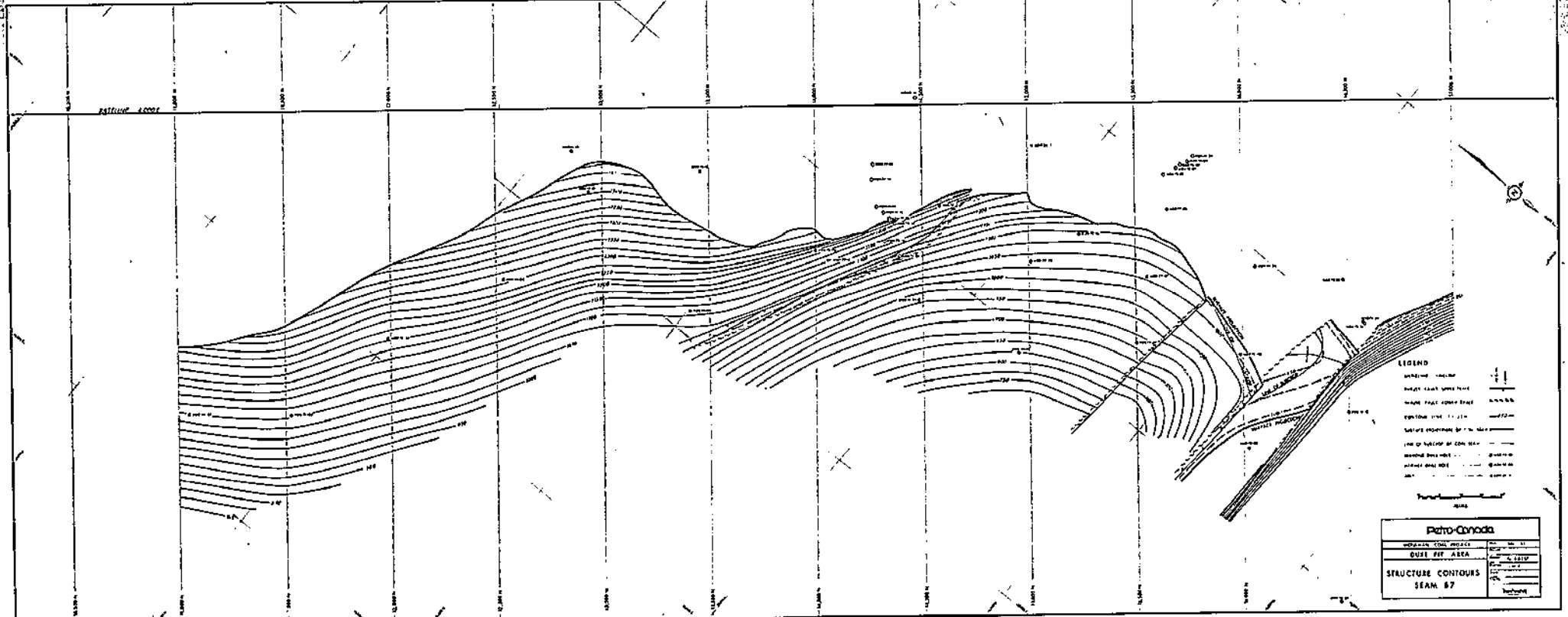
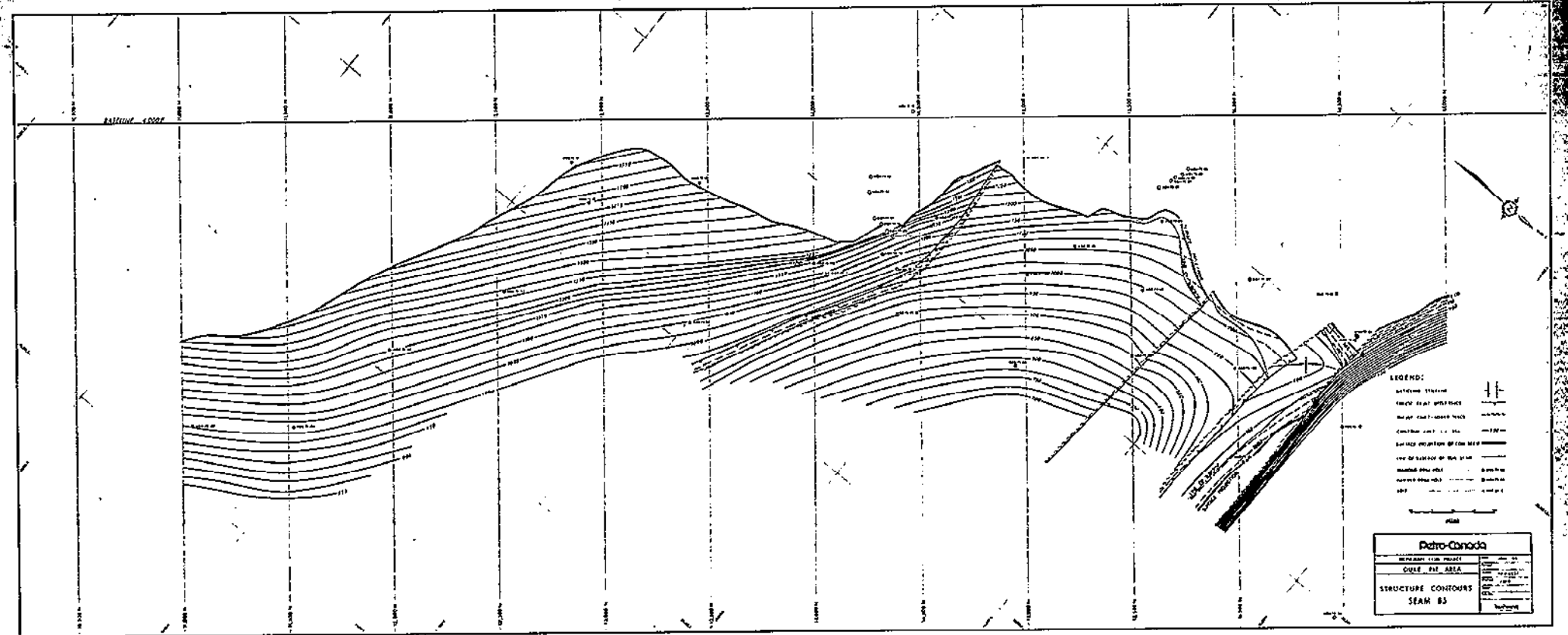
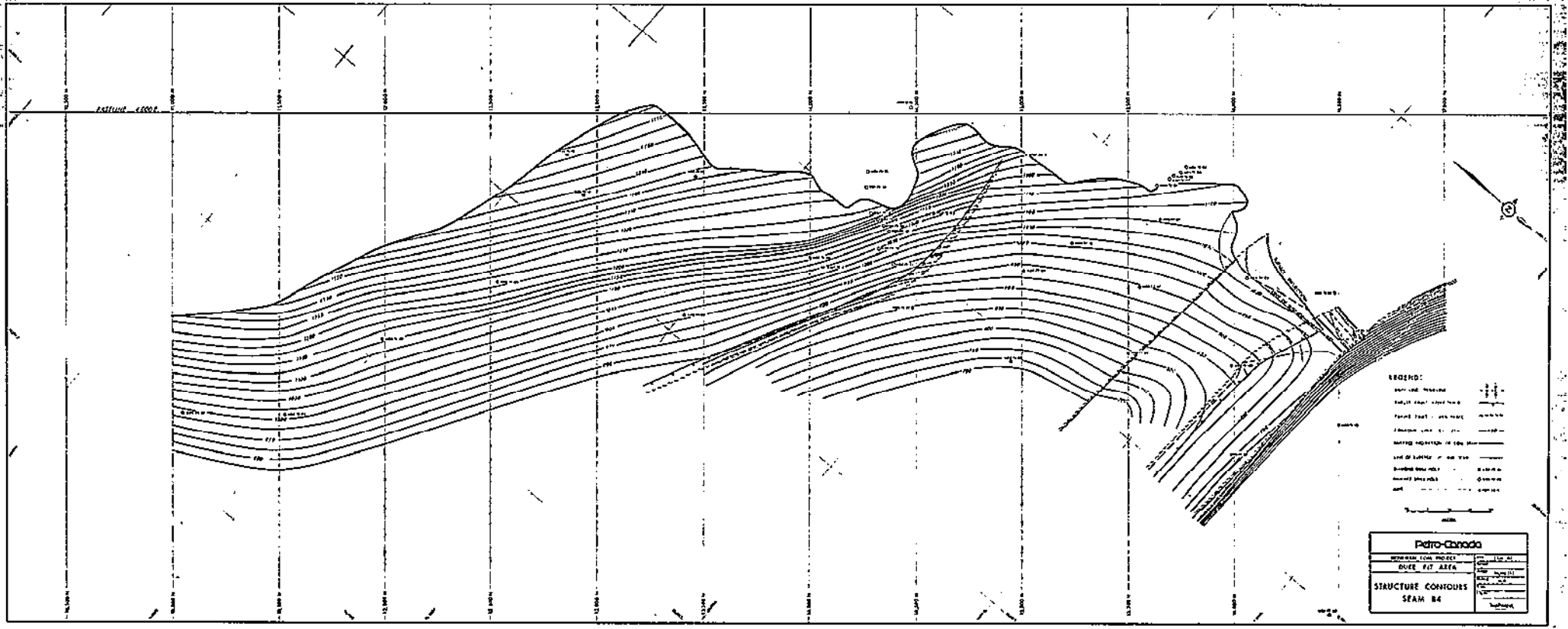
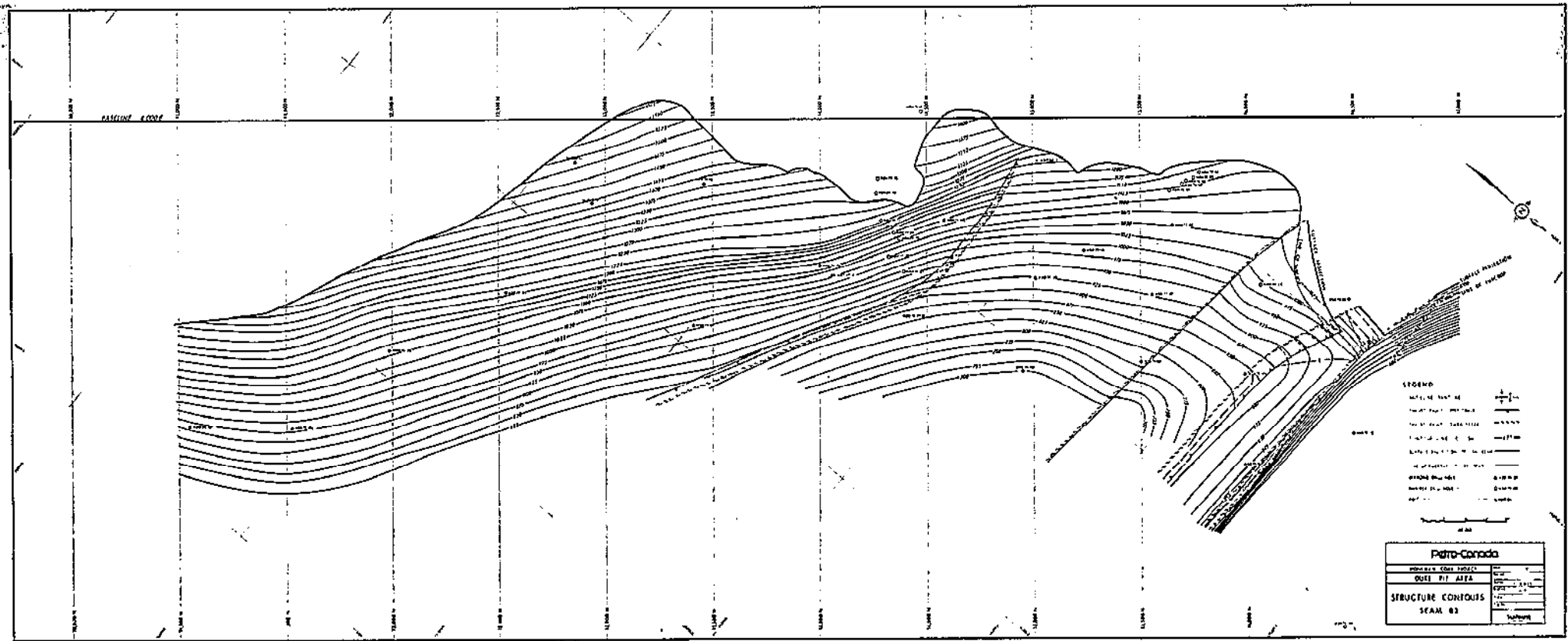
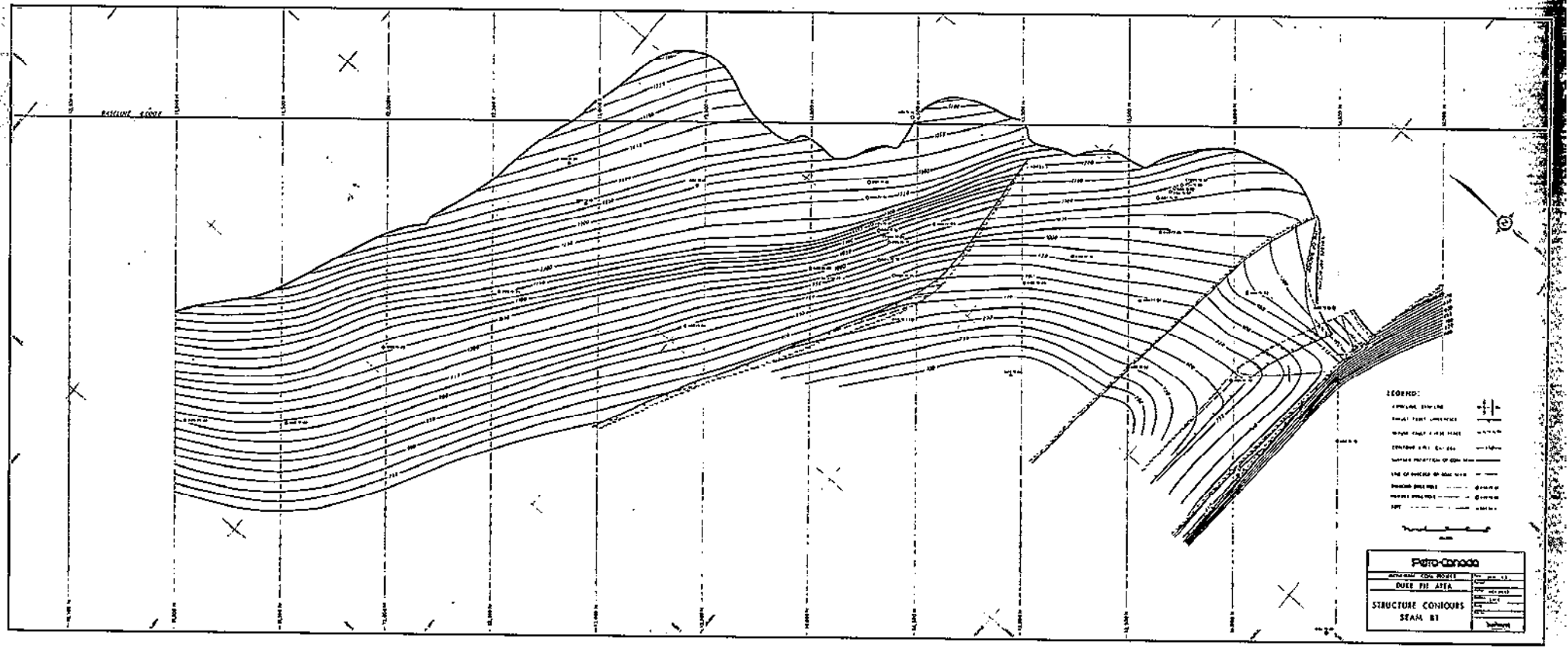
Petro-Canada
BANFF PIT AREA
STRUCTURE CONTOURS
SEAM B9


LEGEND
Petro-Canada
DUKE PIT AREA
STRUCTURE CONTOURS
SEAM 67


LEGEND:
Petro-Canada
GULF BH AREA
STRUCTURE CONTOURS
SEAM B3


Petro-Canada
BRENNAN COAL PROJECT
QUICK PIT AREA
STRUCTURE CONTOURS
SEAM B4


Petro-Canada
OLDS PIT AREA
STRUCTURE CONTOURS
SEAM 03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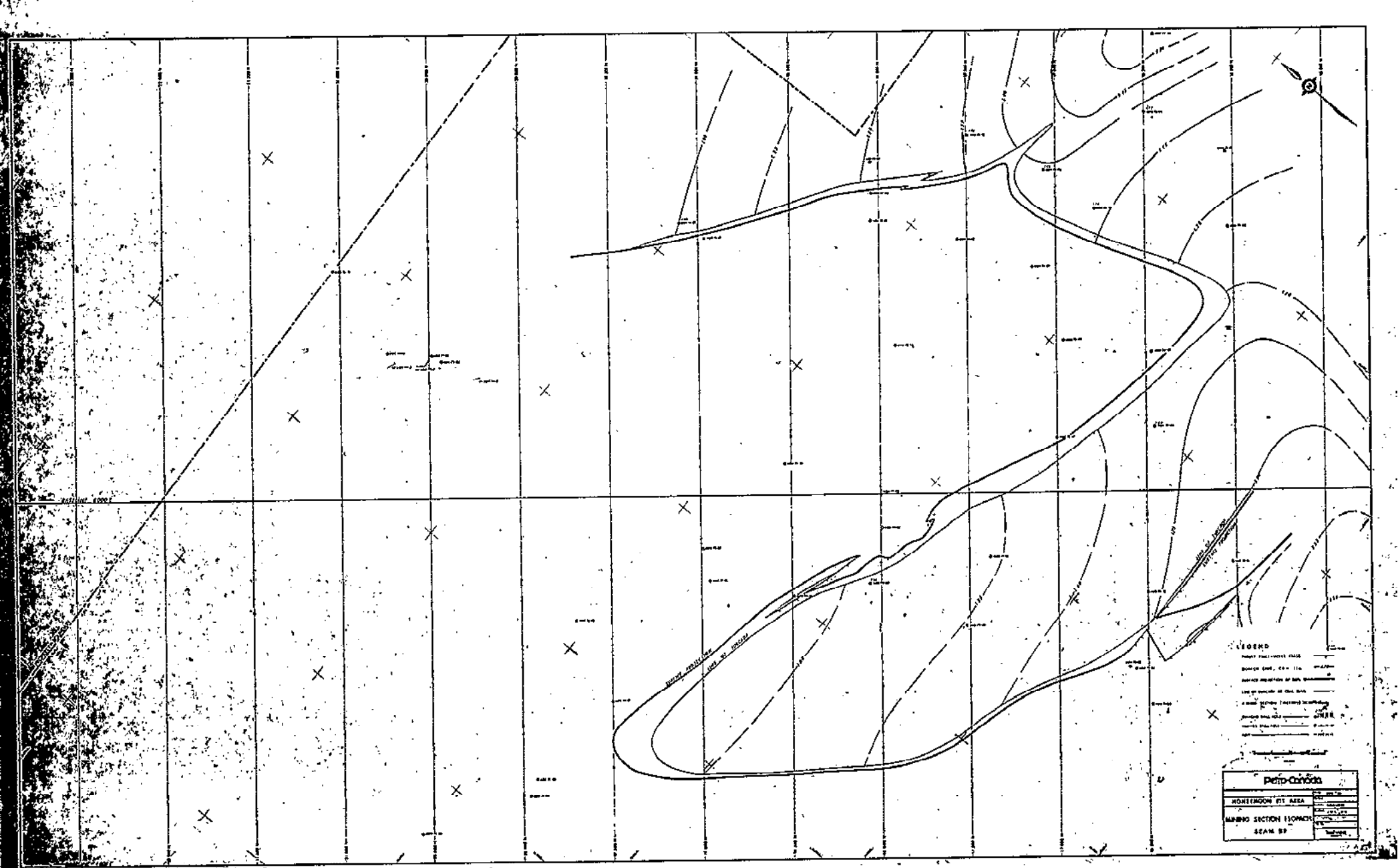
Petro-Canada
DUKE PIT AREA
STRUCTURE CONTOURS
SEAM B1

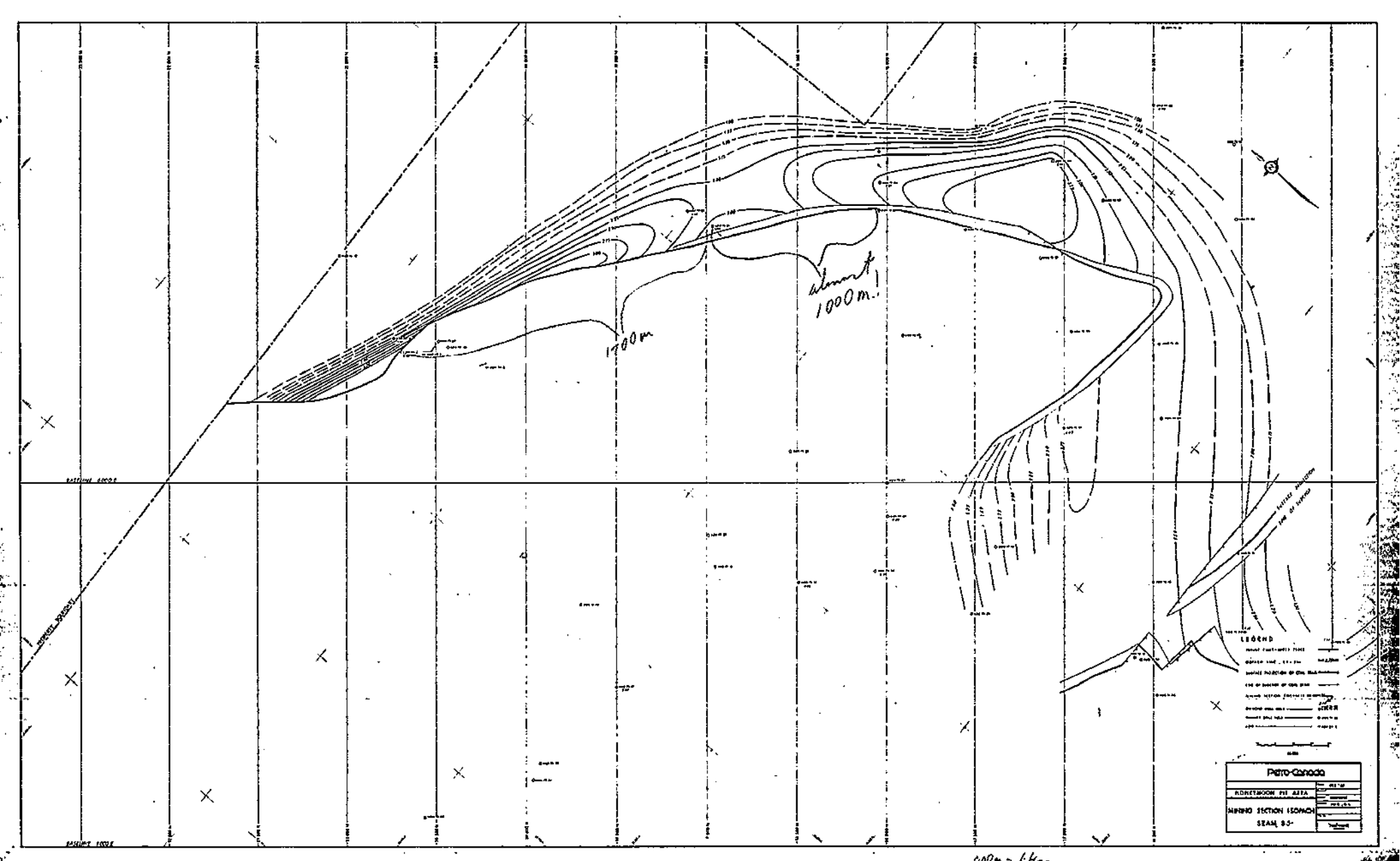

LEGEND
perp-canada
HONEYMOON EXT. AREA
MINING SECTION ESOPHUS
SCALE 50'

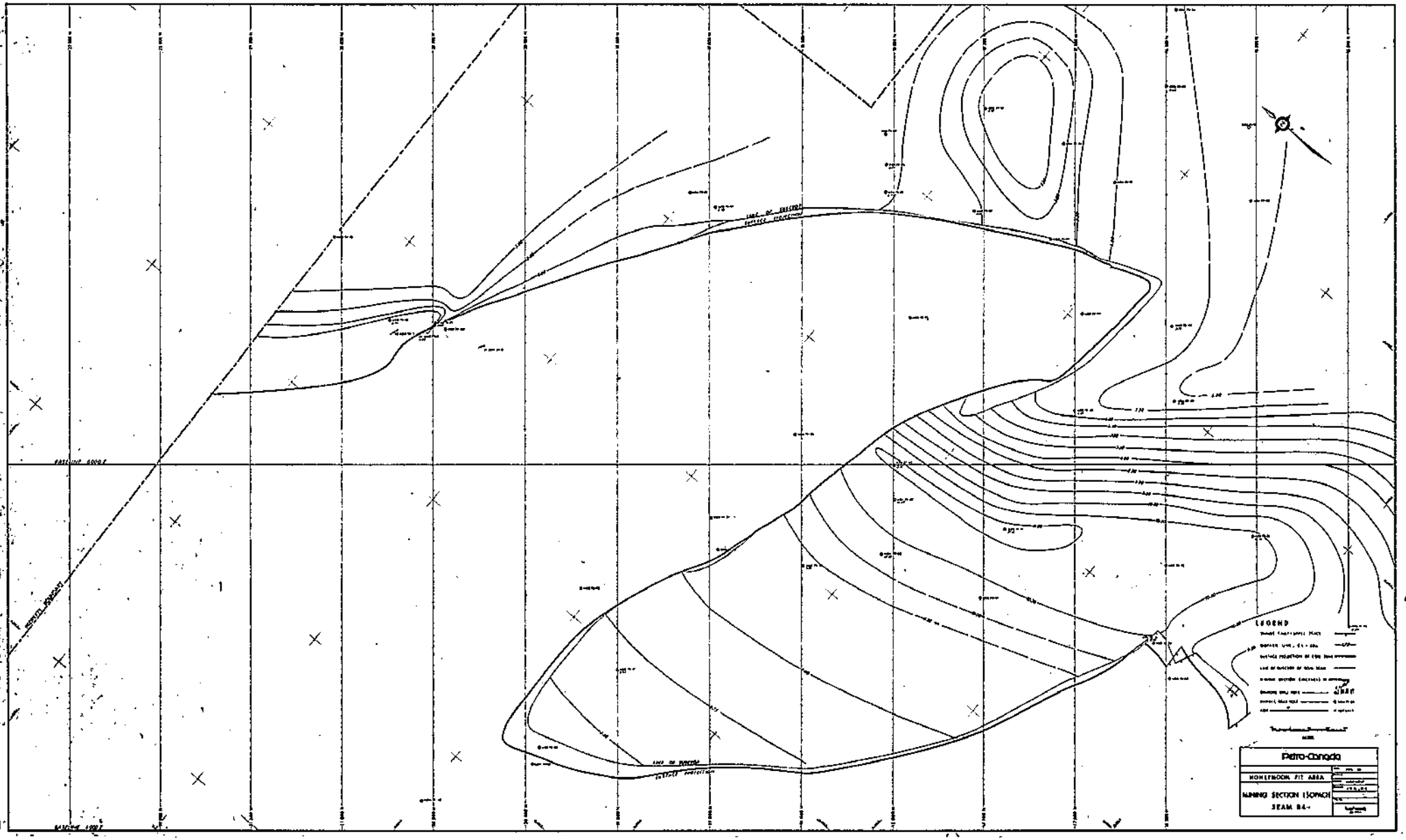
Petro-Canada

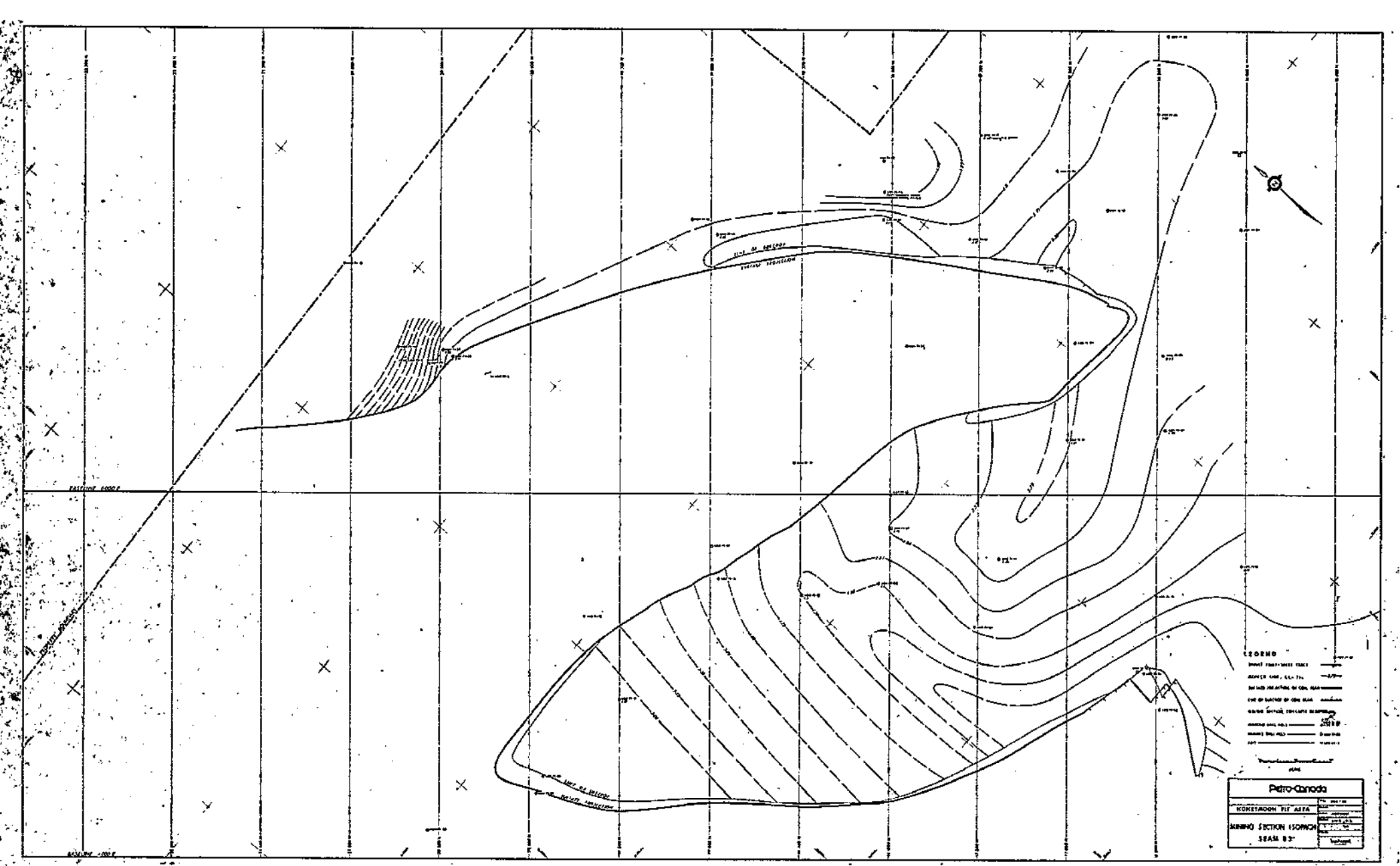
HONEYMOON PIT AREA

NUMBER SECTION ISOPACH

SEAM 88 F


almost 1000m.
1700m
LEGEND
Petro-Canada
ROBERTSON PIT AREA
MINING SECTION ISOMACH
SEAM 93-


LEGEND
Petro-Canada
HOMEBROOK PIT AREA
MINING SECTION 1 (SOPACH)
SEAM B4-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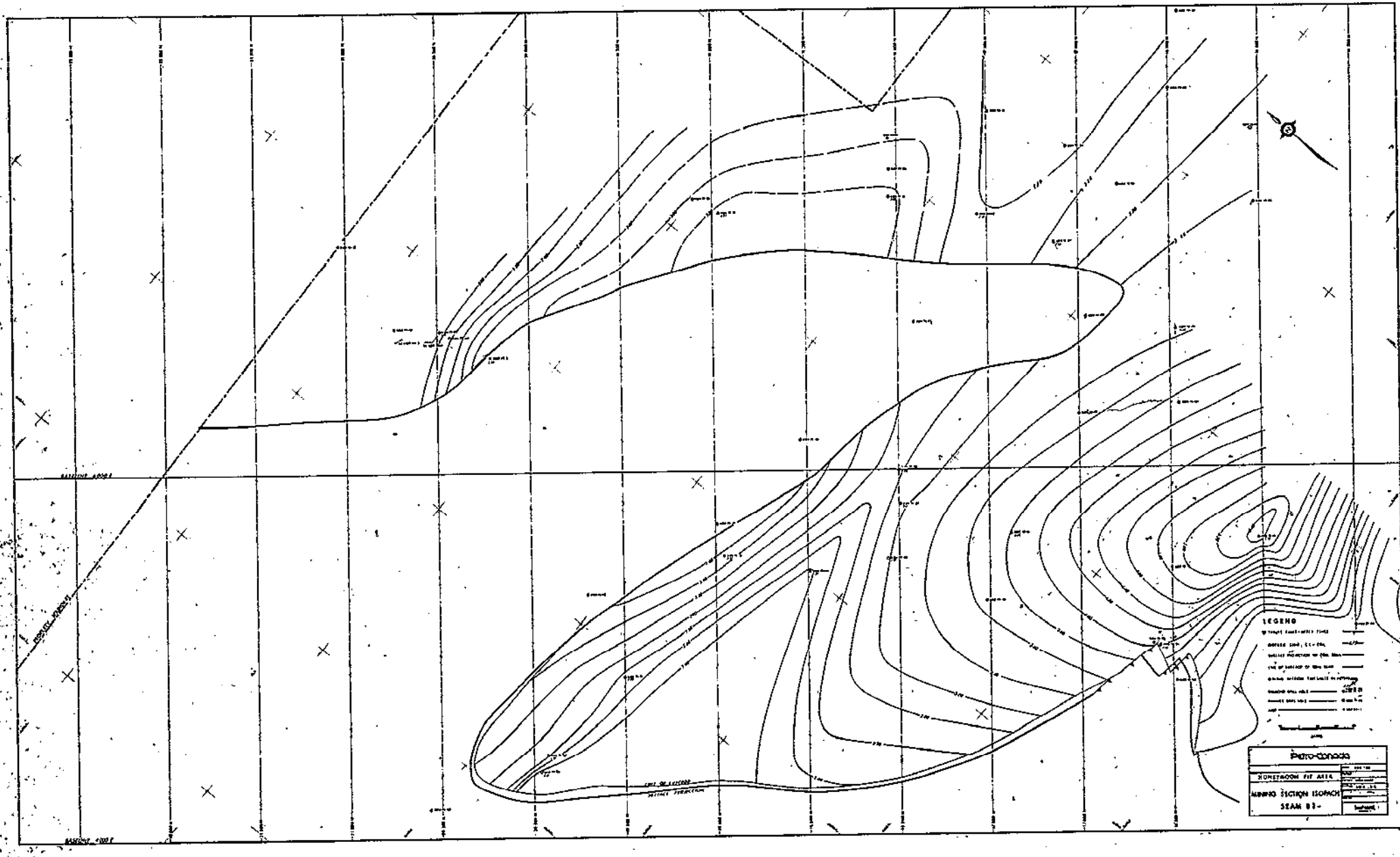
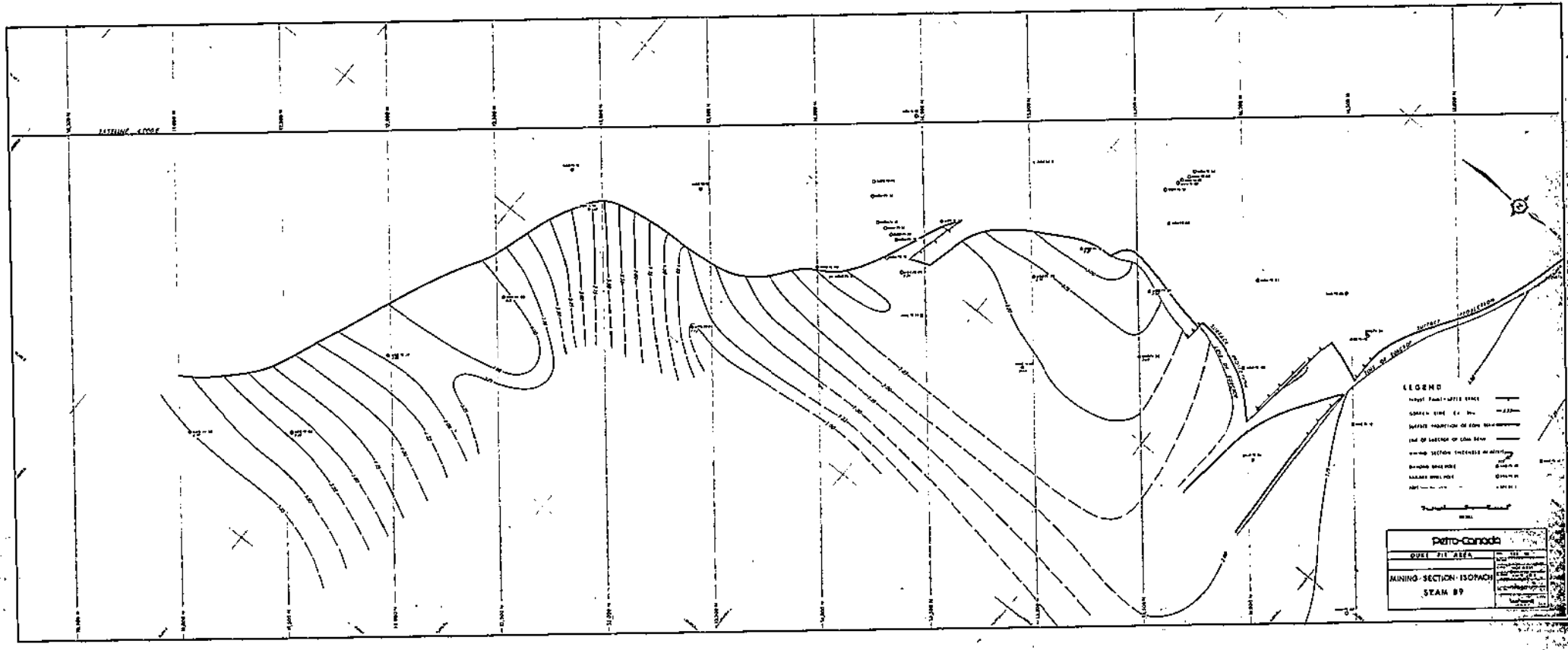
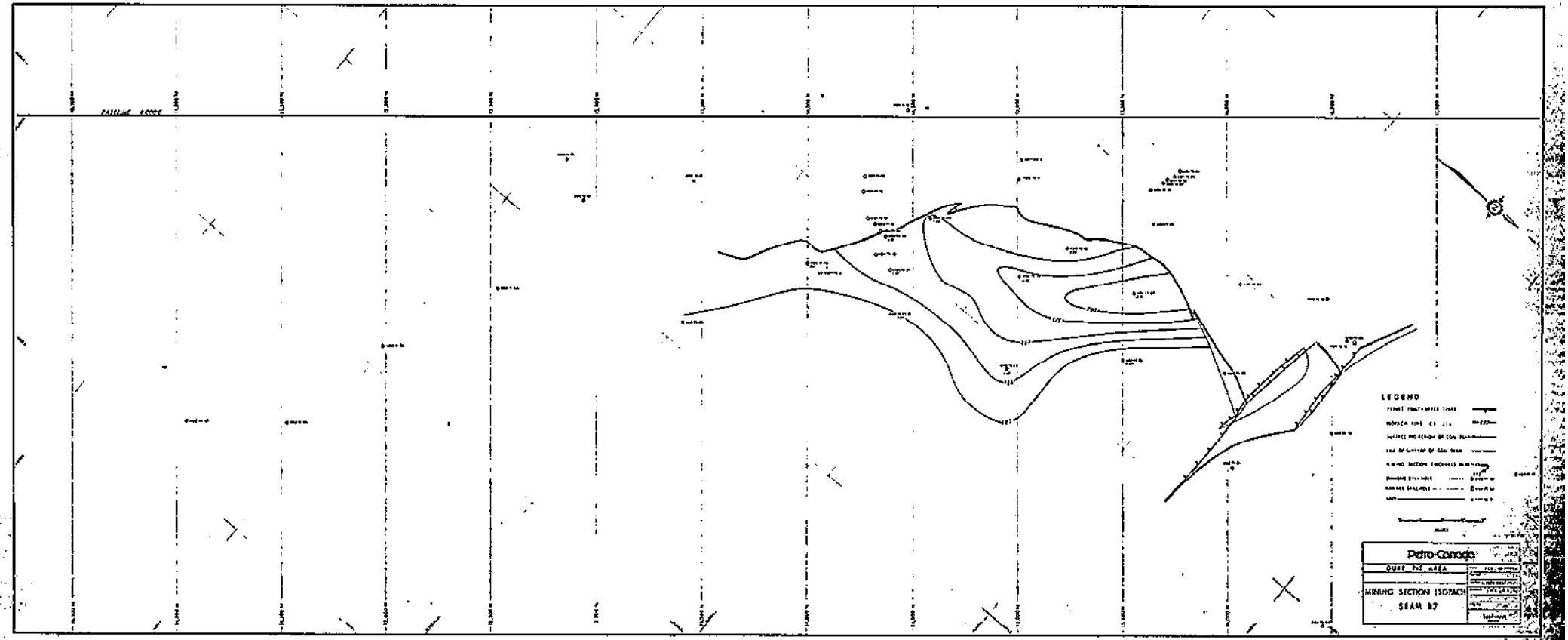
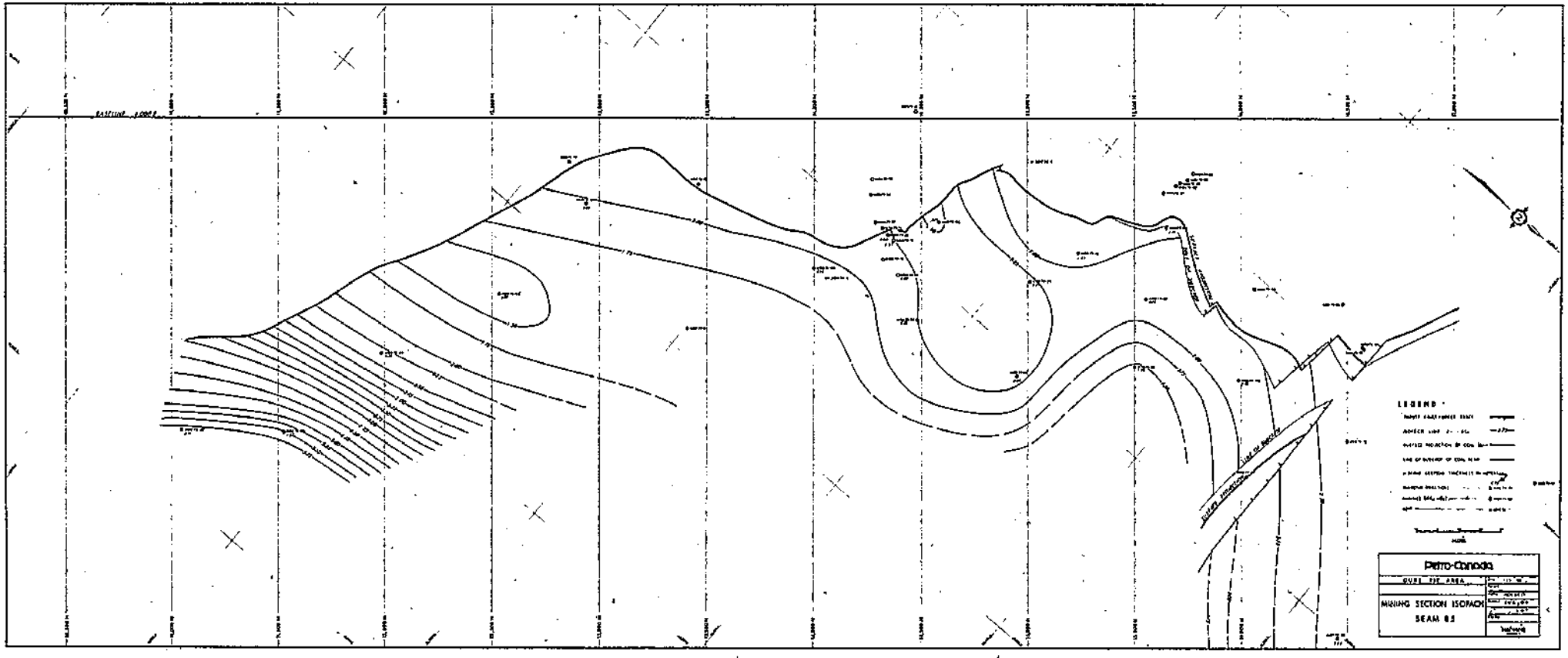
Petro-Canada
KOREAN PIT AREA
MINING SECTION ISOPACH
SEAM B3


LEGEND
Petro-Canada
HOMESTAKE PIT AREA
MINING SECTION ISOPACH
SEAM B1-


LEGEND
Petro-Canada
QUEST PIT AREA
MINING - SECTION - ISOPACH
SEAM 89


LEGEND
Petro-Canada
QUAD PIT AREA
MINING SECTION ISOPACH
SEAM B7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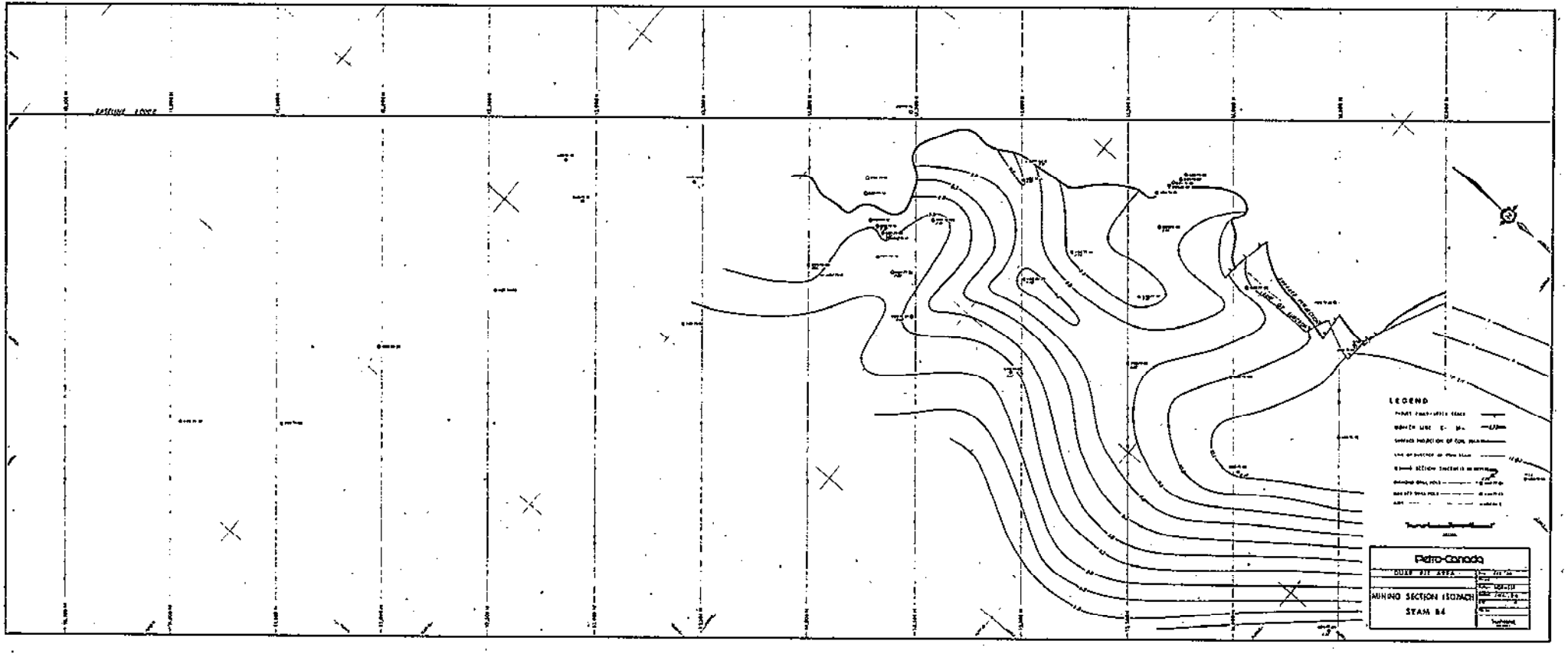
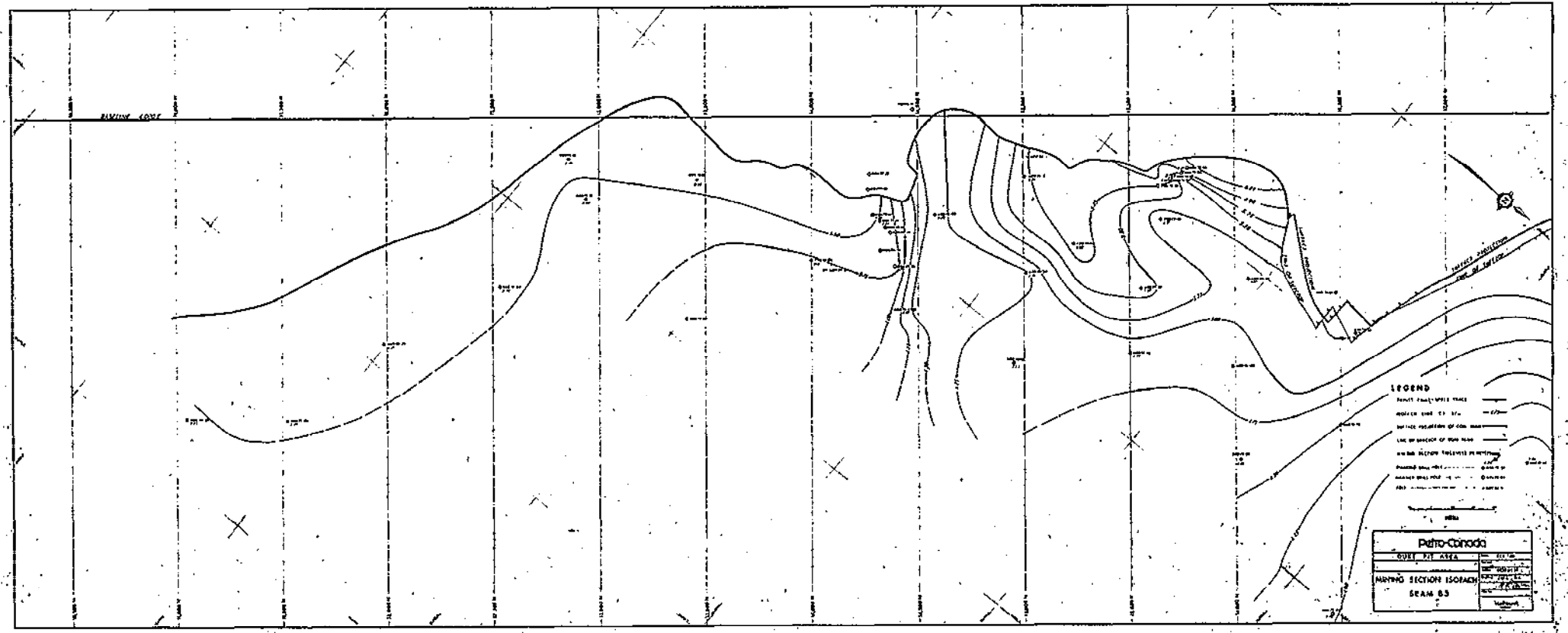
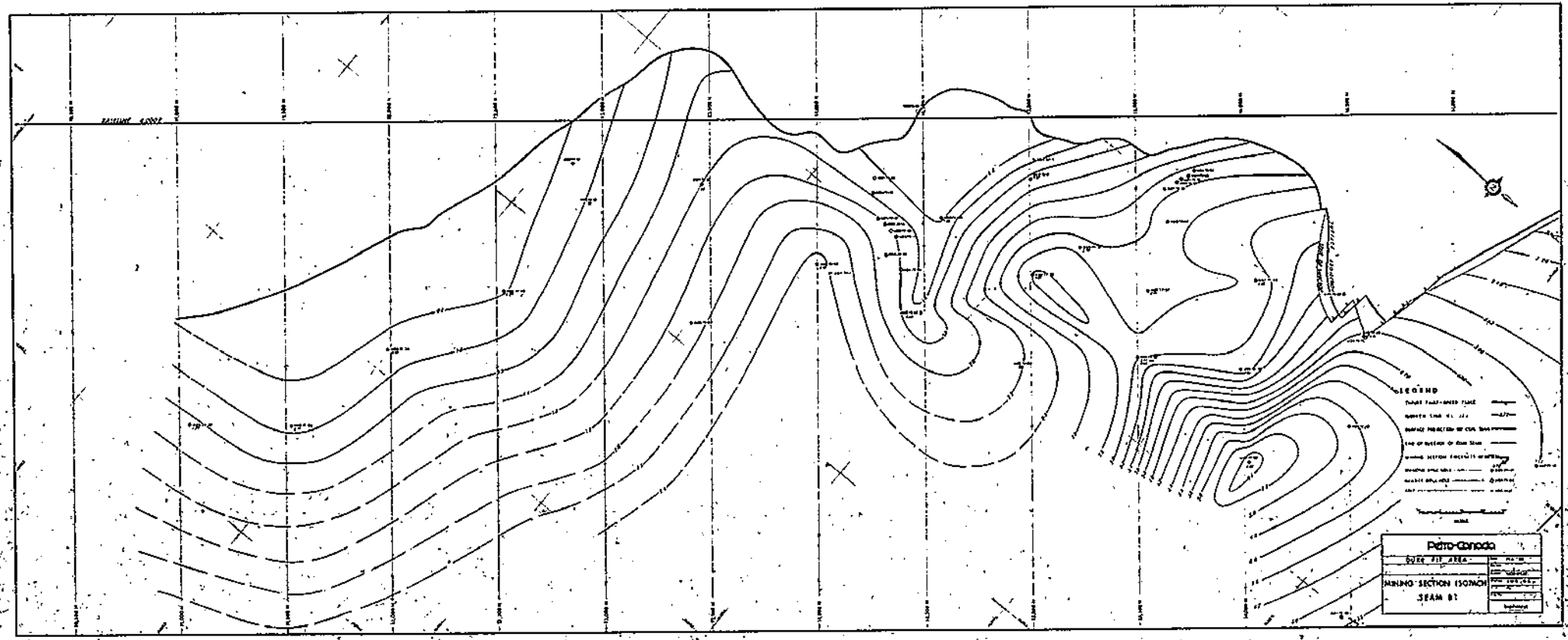
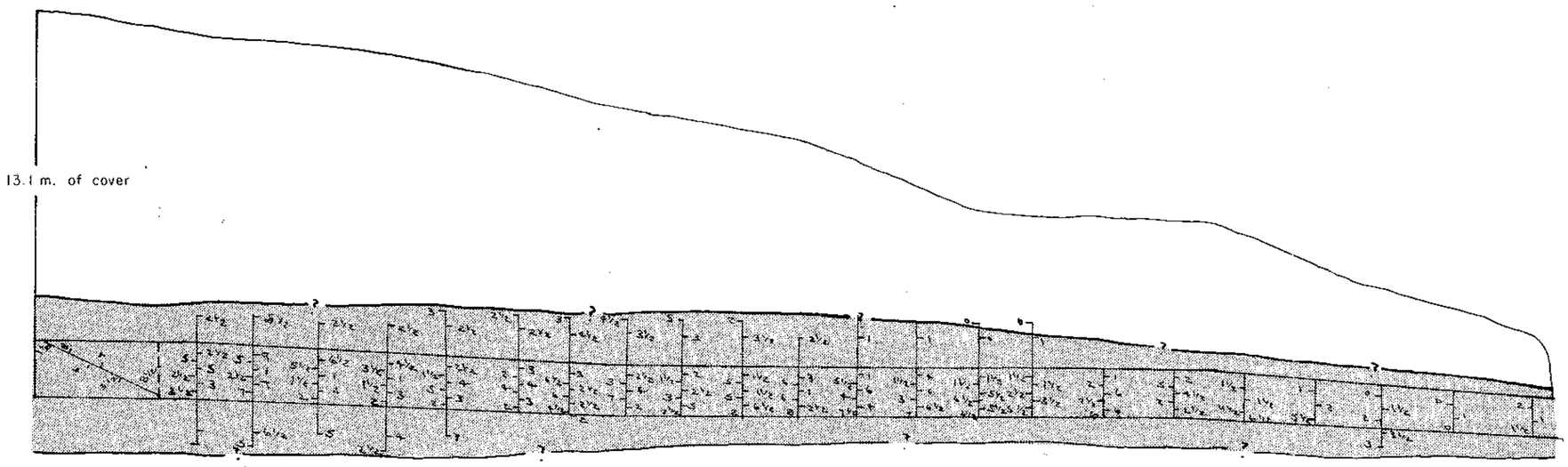
Petro-Canada
QUEST EXT. AREA
MINING SECTION ISOPACH
SEAM 85

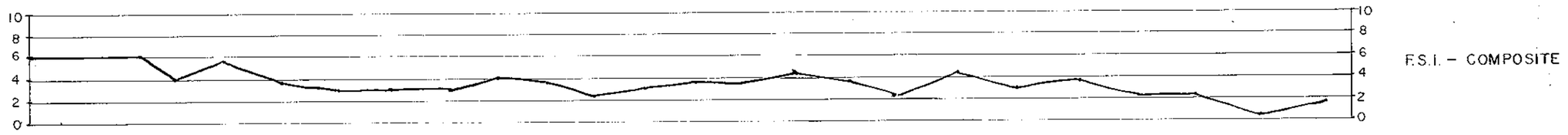

LEGEND
Petro-Canada
DUVER PIT AREA
MINING SECTION (SCHACH)
STAM 84

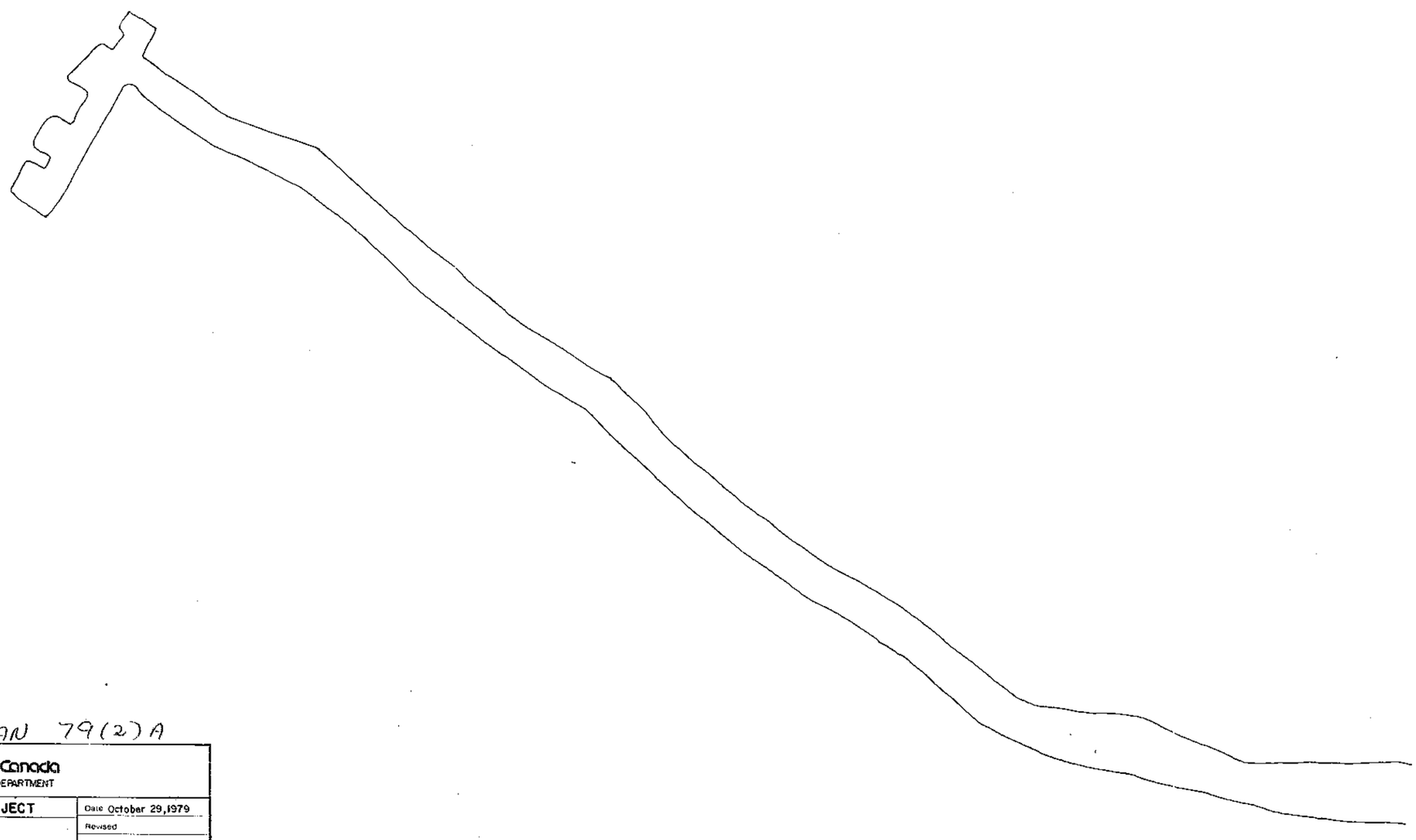

LEGEND
Petro-Canada
QUEST PIT AREA
MINING SECTION ISOPACH
SEAM B3


Petro-Canada
MINING SECTION ISOMAP
SEAM B1

VIEW NORTH





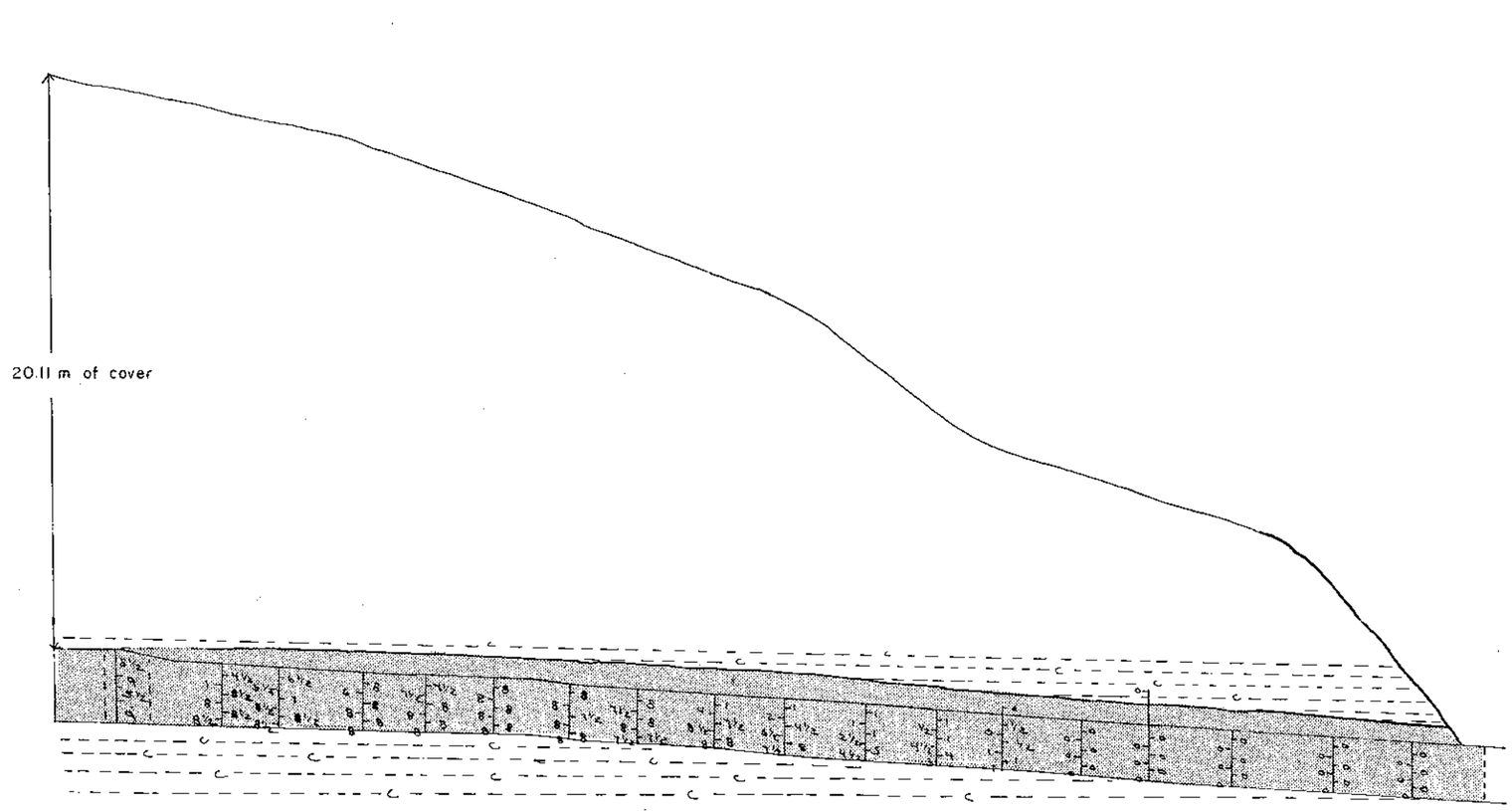


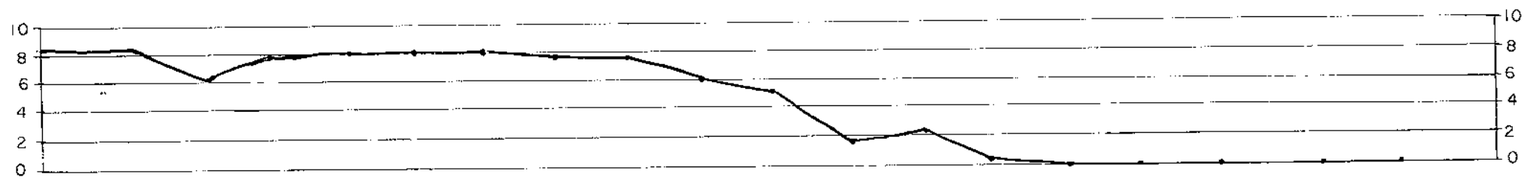
PR- MONKMAN 79(2)A

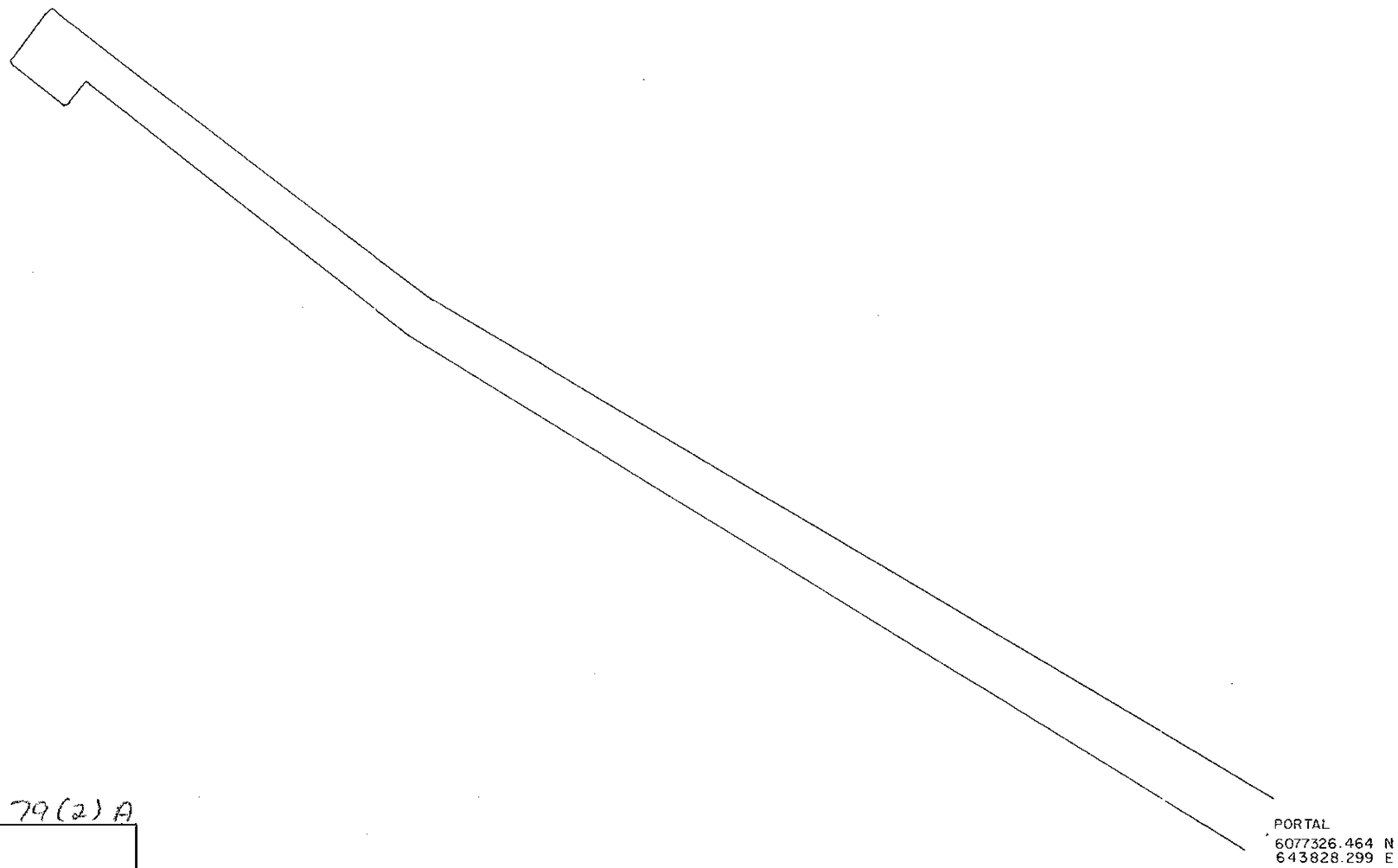
Petro-Canada MINING DEPARTMENT	
MONKMAN COAL PROJECT	Date October 29,1979
	Revised
	Author
ADIT 79-1, SEAM B4 CROSS SECTION AND PLAN	Drafted W. Nyysola
	Scale 1:200
	Surveyor S. Tupper
	FIGURE 8

545

VIEW NORTH-EAST





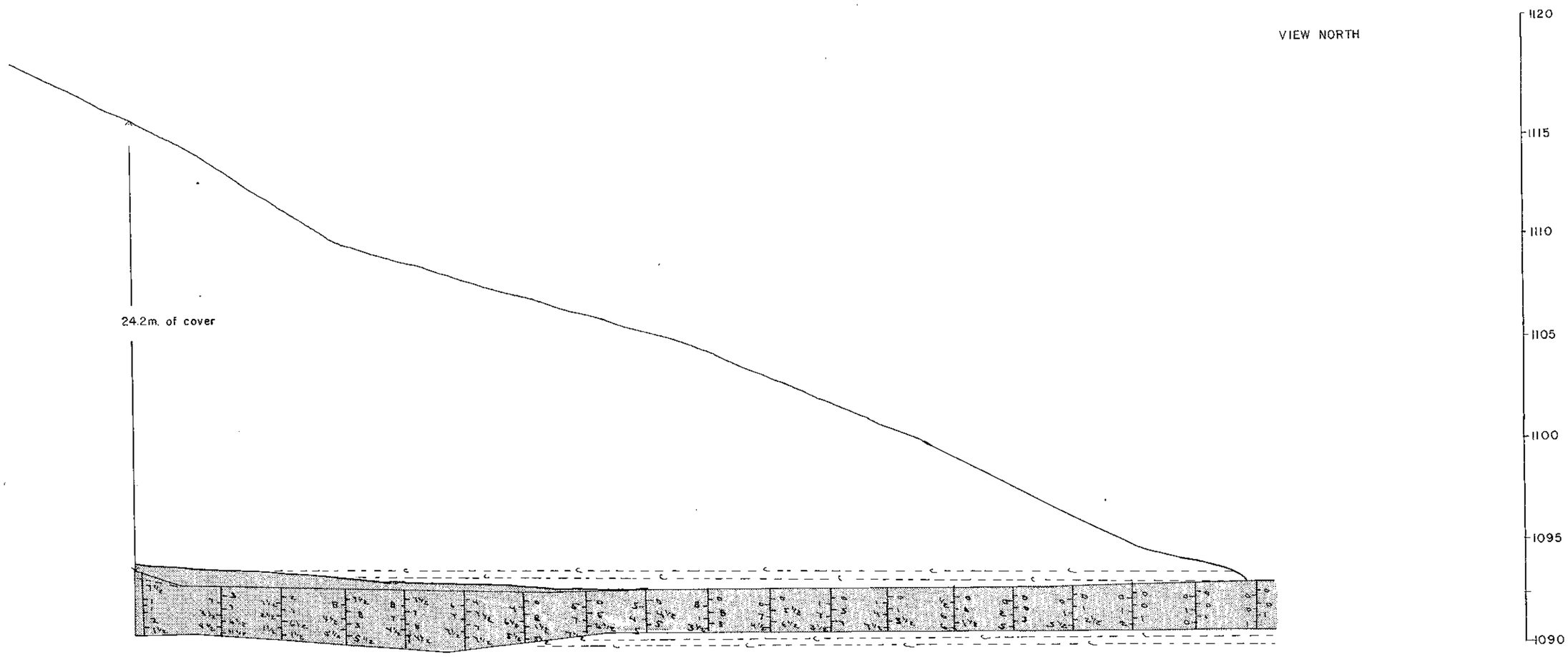


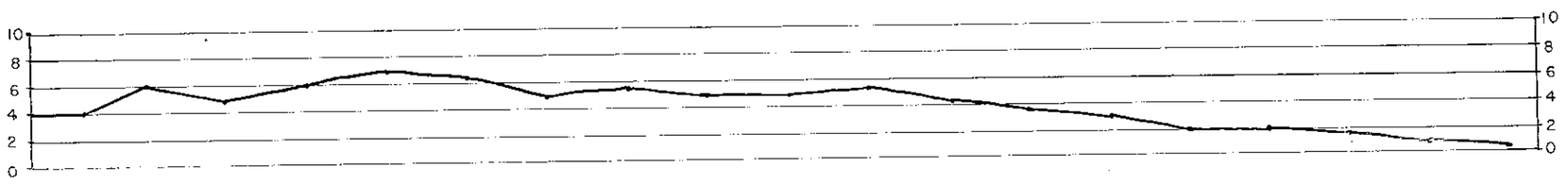
PR- MONKMAN 79(2) A

Petro-Canada MINING DEPARTMENT	
MONKMAN COAL PROJECT	Date October 29,1979
	Revised
	Author
ADIT 79-2, SEAM B1 CROSS SECTION AND PLAN	Drafted W. Nyysola
	Scale 1:200
	Surveyor B. Tupper
	FIGURE 9

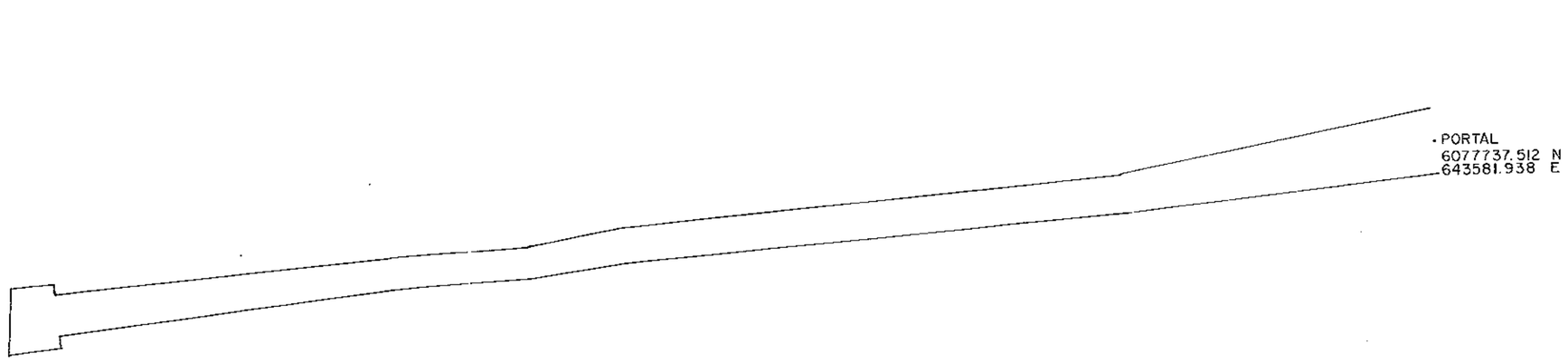
545

VIEW NORTH





F.S.I. — COMPOSITE

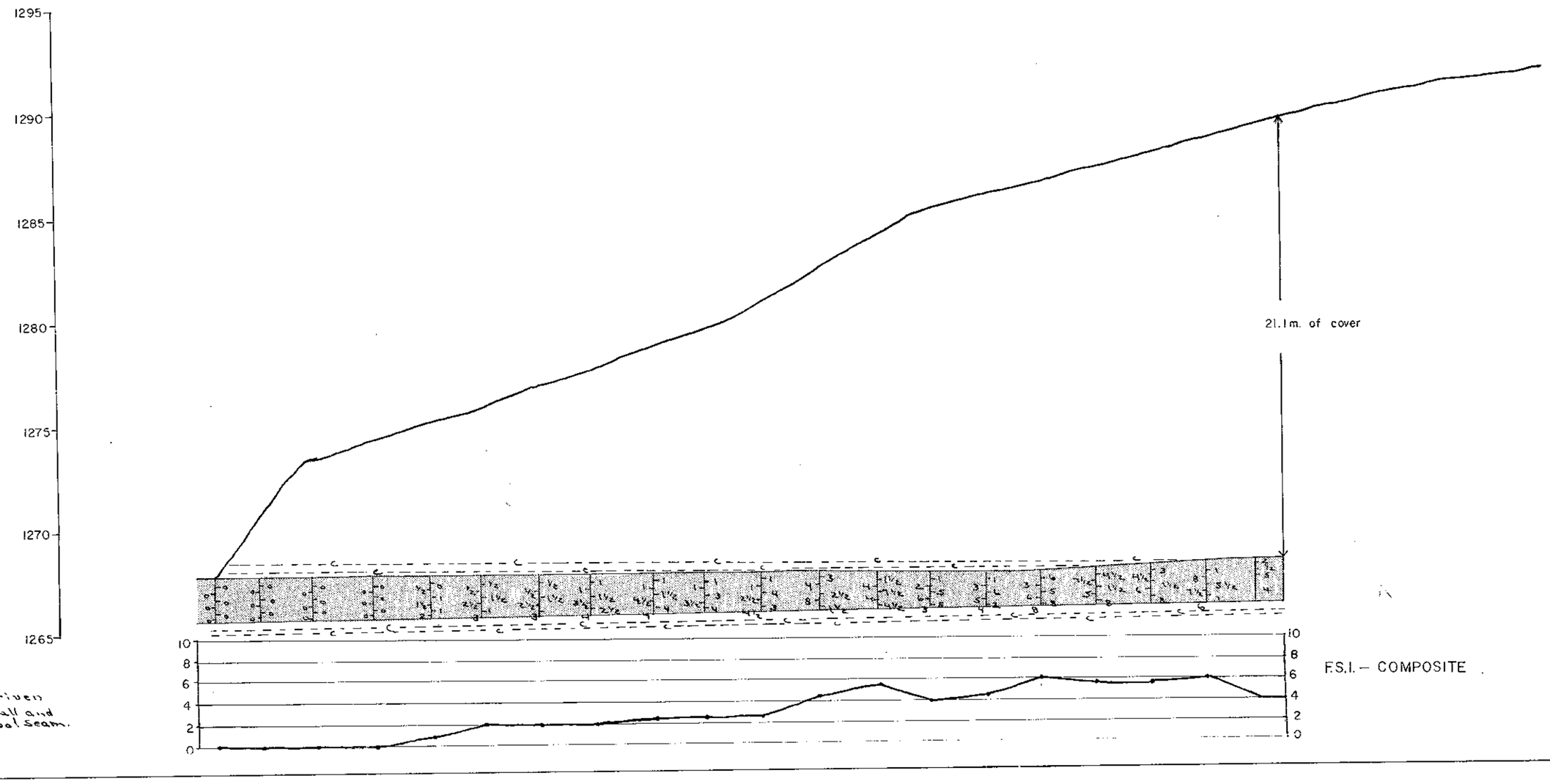


Pr-monkman 79(2)A

Petro-Canada MINING DEPARTMENT	
MONKMAN COAL PROJECT	Date October 29, 1979
	Revised
	Author
ADIT 79-3, SEAM B5 CROSS SECTION AND PLAN	Drafted W. Nyysola
	Scale 1:200
	Surveyor B. Tupper
	FIGURE 10

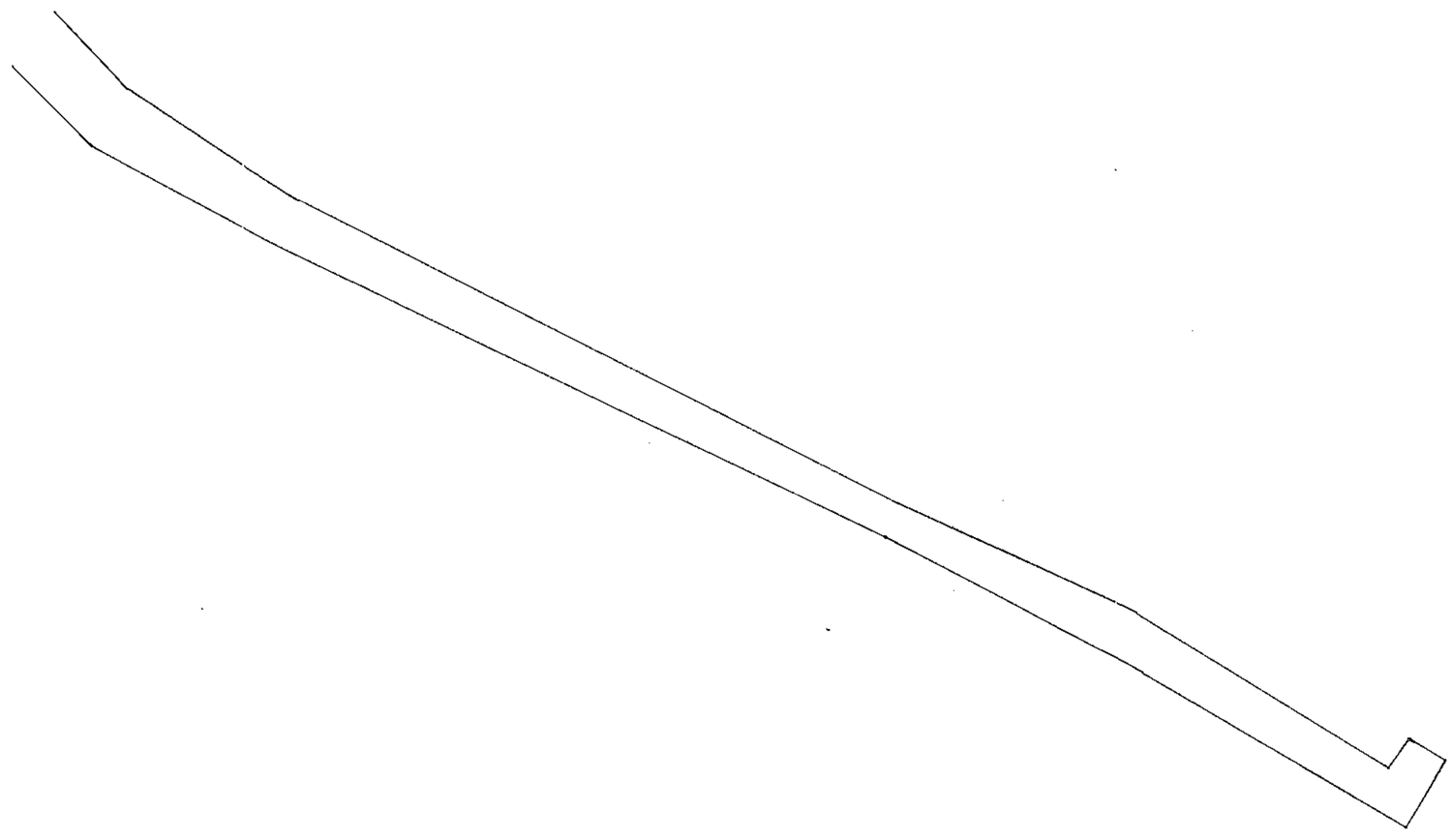
545

VIEW NORTH-WEST



This adit was driven along the Hangingwall and Foot Wall of the Coal seam.

79-4-C
6071349.159 N
646288.275 E



N

PR- MONKMAN 79(2)A

Petro-Canada MINING DEPARTMENT	
MONKMAN COAL PROJECT	Date October 29,1979
	Revised
	Author
ADIT 79-4, SEAM B9 CROSS SECTION AND PLAN	Drafted W. Nyysola
	Scale 1:200
	Surveyor B. Tupper
	FIGURE 11

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THE LEGEND BELOW APPLIES TO ALL OF THE FOLLOWING GEOLOGICAL SECTIONS

GEOLOGICAL LEGEND

LOWER CRETACEOUS

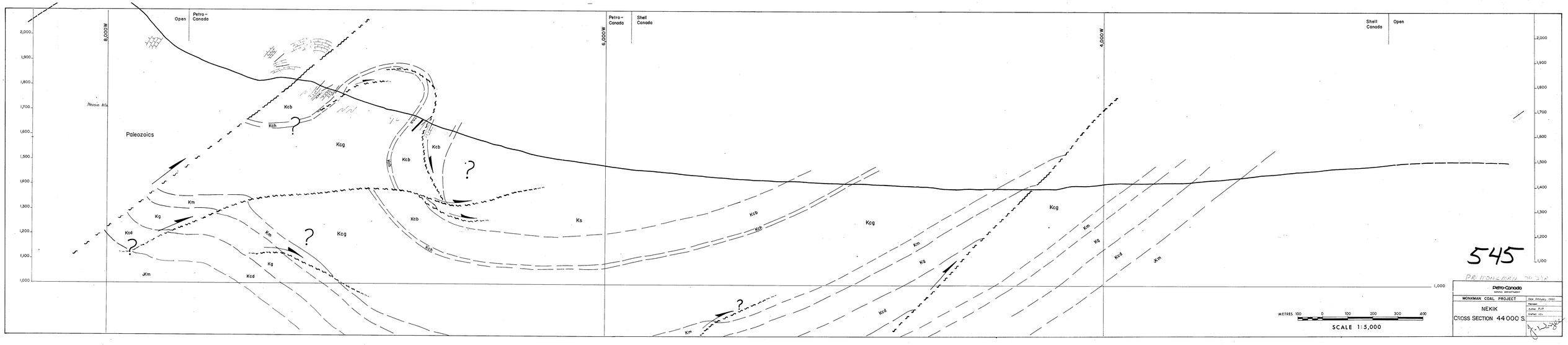
Ksh	SHAFTESBURY FORMATION	FORT ST. JOHN GROUP
Kcb	COMMOTION FORMATION (Boulder Creek Member)	
Kch	COMMOTION FORMATION (Hulcross Member)	
Kcg	COMMOTION FORMATION (Gates Member)	
Kmb	MOOSEBAR FORMATION	BULLHEAD GROUP
Kgt	GETHING FORMATION	
Kcd	CADOMIN FORMATION	

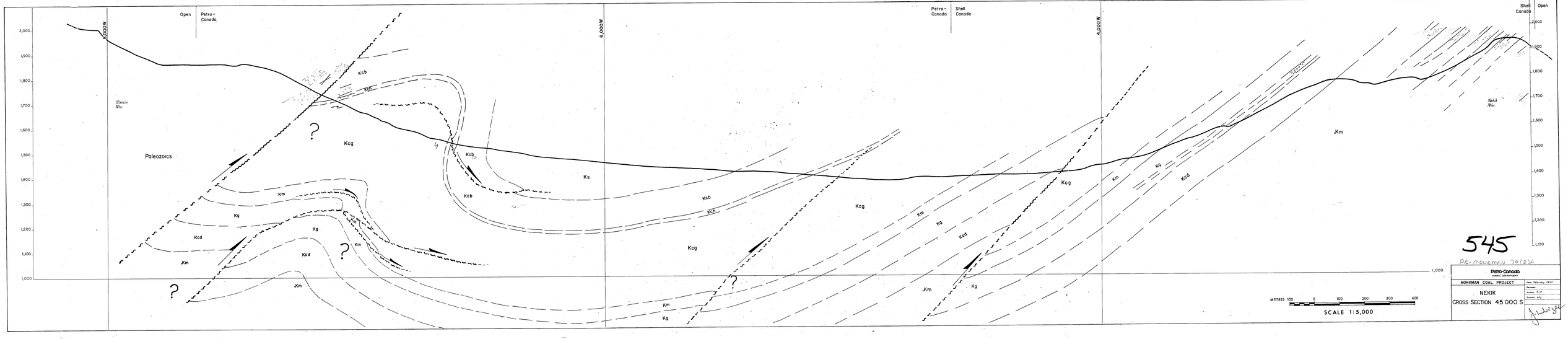
JURASSIC — CRETACEOUS

JKmi	MINNES GROUP

PALEOZOIC

P	DEVONIAN, MISSISSIPPIAN


Petro-Canada
Open
Petro-Canada
Shell Canada
Shell Canada
Open
8,000 W
6,000 W
4,000 W
2,000
1,900
1,800
1,700
1,600
1,500
1,400
1,300
1,200
1,100
1,000
Paleozoics
Kcb
Kch
Kcg
Km
Kg
Kcd
Jm
Ks
545
P.R. MONKMAN 74-32
Petro-Canada
MONKMAN COAL PROJECT
NEKIK
CROSS SECTION 44000 S.
Date February 1980
Drafted
METRES 100 0 100 200 300 400
SCALE 1:5,000



545

PR-MONKMAN 70(2)E

Petro-Canada
MINING DEPARTMENT

MONKMAN COAL PROJECT	Date February 1980
	Revised
NEKIK	Author PJP
CROSS SECTION 45 000 S	Drafted MTV

545

PR- MONKMAN 79(2)A

METRES 100 0 100 200 300 400

SCALE 1:5,000

Petro-Canada MINING DEPARTMENT	
MONKMAN COAL PROJECT	Date February 1980
NEKIK	Revised
CROSS SECTION 46 000 S.	Author PJP
	Drafted edy

545

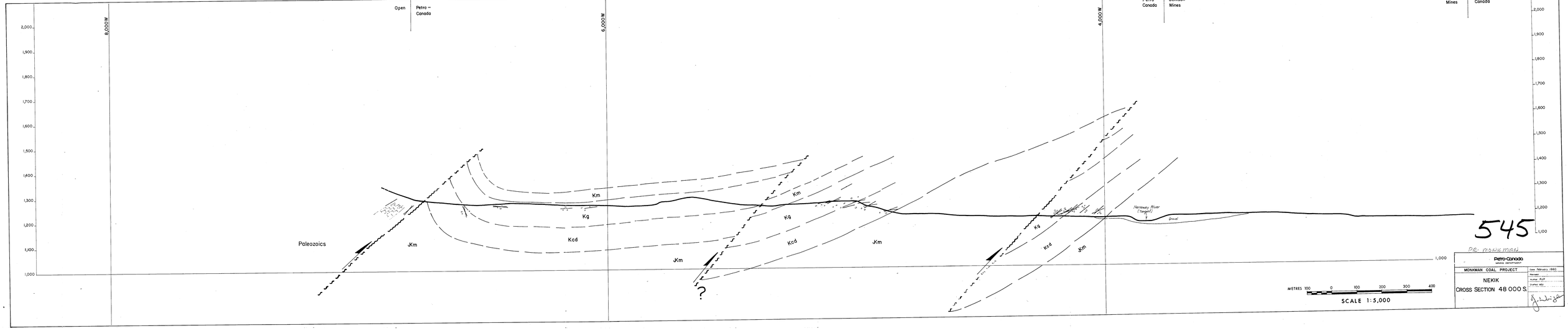
PK- MONKMAN 79(2) A

Petro-Canada
MINING DEPARTMENT

MONKMAN COAL PROJECT

NEKIK
CROSS SECTION 47 000 S.

Date February 1980
Revised
Author PJP
Drafted edy



545

RE: NEKIK MINE

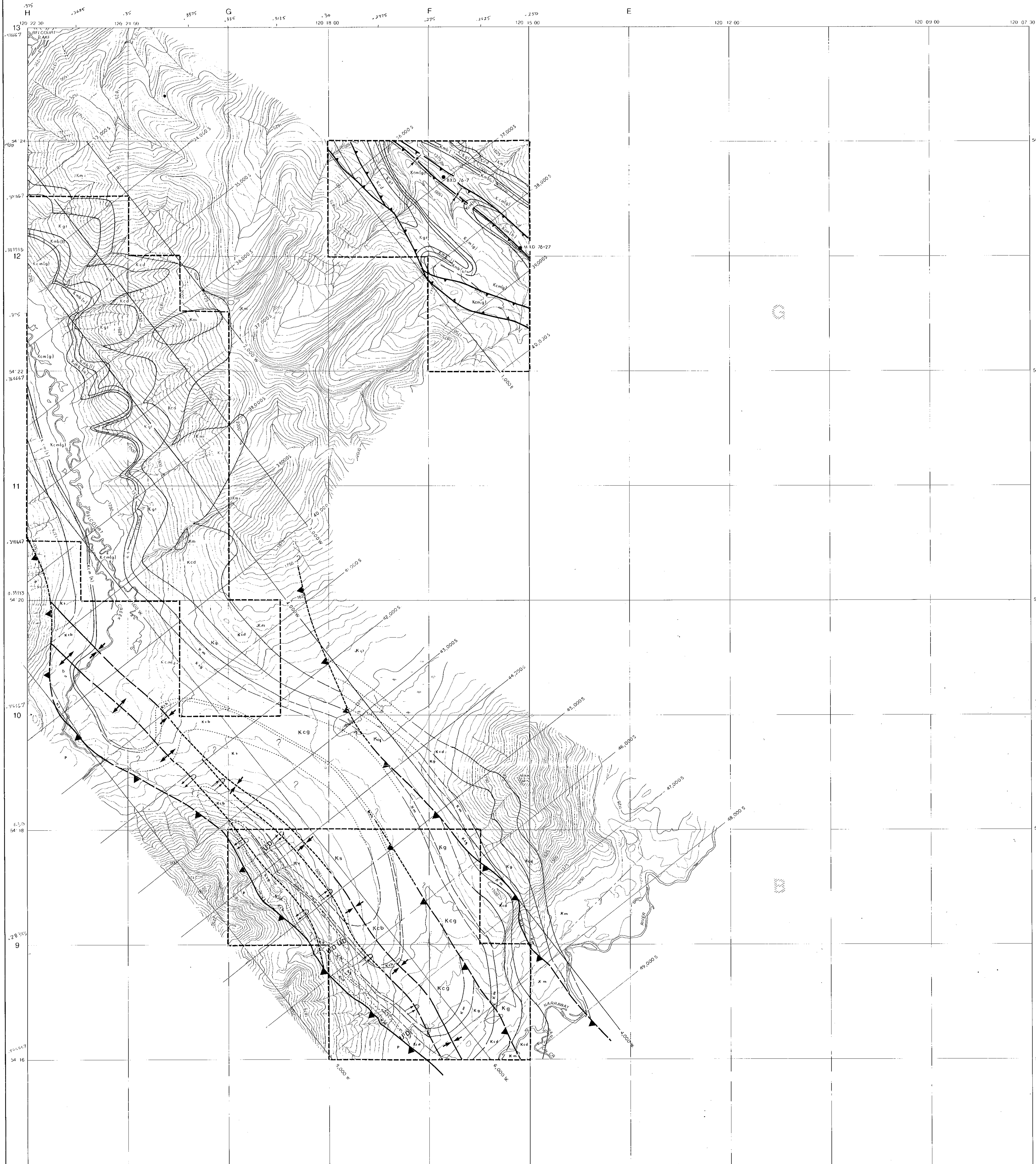
Petro-Canada
MINING DEPARTMENT

MONKMAN COAL PROJECT

Date February 1980
Revised
Author PJR
Drafted KEK

NEKIK

CROSS SECTION 48 000 S.


H
G
F
E
120 22 30
120 21 00
120 18 00
120 15 00
120 12 00
120 09 00
120 07 30
54 24
54 22
54 20
54 18
54 16
54 15
13
12
11
10
9
BELCOURT LAKE
BELCOURT CREEK
NARRAWAY
RIVER
BXD 76-7
MXD 76-27
JKmi
Kgt
Kcd
Kmb(l)
Kmb(u)
Kcm(g)
Kcm(h)
Kcm(b)
Km
Ks
Kcb
Kcg
Kch
Kg
P
33,000 S
34,000 S
35,000 S
36,000 S
37,000 S
38,000 S
39,000 S
40,000 S
41,000 S
42,000 S
43,000 S
44,000 S
45,000 S
46,000 S
47,000 S
48,000 S
49,000 S
1,000 E
2,000 W
3,000 W
4,000 W
6,000 W
9,000 W

TOPOGRAPHIC LEGEND

MAIN ACCESS ROAD — DRY WEATHER
EXPLORATION ROAD
EXPLORATION TRAIL
AIR STRIP
SEISMIC LINE, CUT LINE
POWER TRANSMISSION LINE
RIVER
STREAM
LAKE
SWAMP
CONTOURS (1625, 1500)
DEPRESSION CONTOUR

GEOLOGICAL LEGEND

LOWER CRETACEOUS

Ksh	SHAFTESBURY FORMATION	
Kcb	COMMOTION FORMATION (Boulder Creek Member)	FORT ST. JOHN GROUP
Kch	COMMOTION FORMATION (Hulcross Member)	
Kcg	COMMOTION FORMATION (Gates Member)	
Kmb	MOOSEBAR FORMATION	
Kgt	GETHING FORMATION	BULLHEAD GROUP
Kcd	CADOMIN FORMATION	

JURASSIC — CRETACEOUS

JKmi	MINNES GROUP

PALEOZOIC

P	DEVONIAN, MISSISSIPPIAN

SYMBOLS

GEOLOGICAL CONTACT
DIP AND STRIKE: REGULAR
VERTICAL
HORIZONTAL
OVERTURNED
THRUST: FLAGS SHOW DIP DIRECTION
NORMAL FAULT
ANTICLINE, SYNCLINE
DRILL HOLE COLLAR
TRENCH
ADIT

KEY MAP

SURVEY NOTE

Control Survey was carried out for Photogrammetric Mapping to cover MONKMAN COAL PROJECT COAL LEASES. Mapping outside of the Coal Leases was taken from existing N.T.S. maps, and 25 metre contour intervals were interpolated.

CONTOUR INTERVAL 25 m

R.M.HARDY & ASSOCIATES LTD.
1978

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PR MONKMAN 79(3)A

Petro-Canada
MINING DEPARTMENT

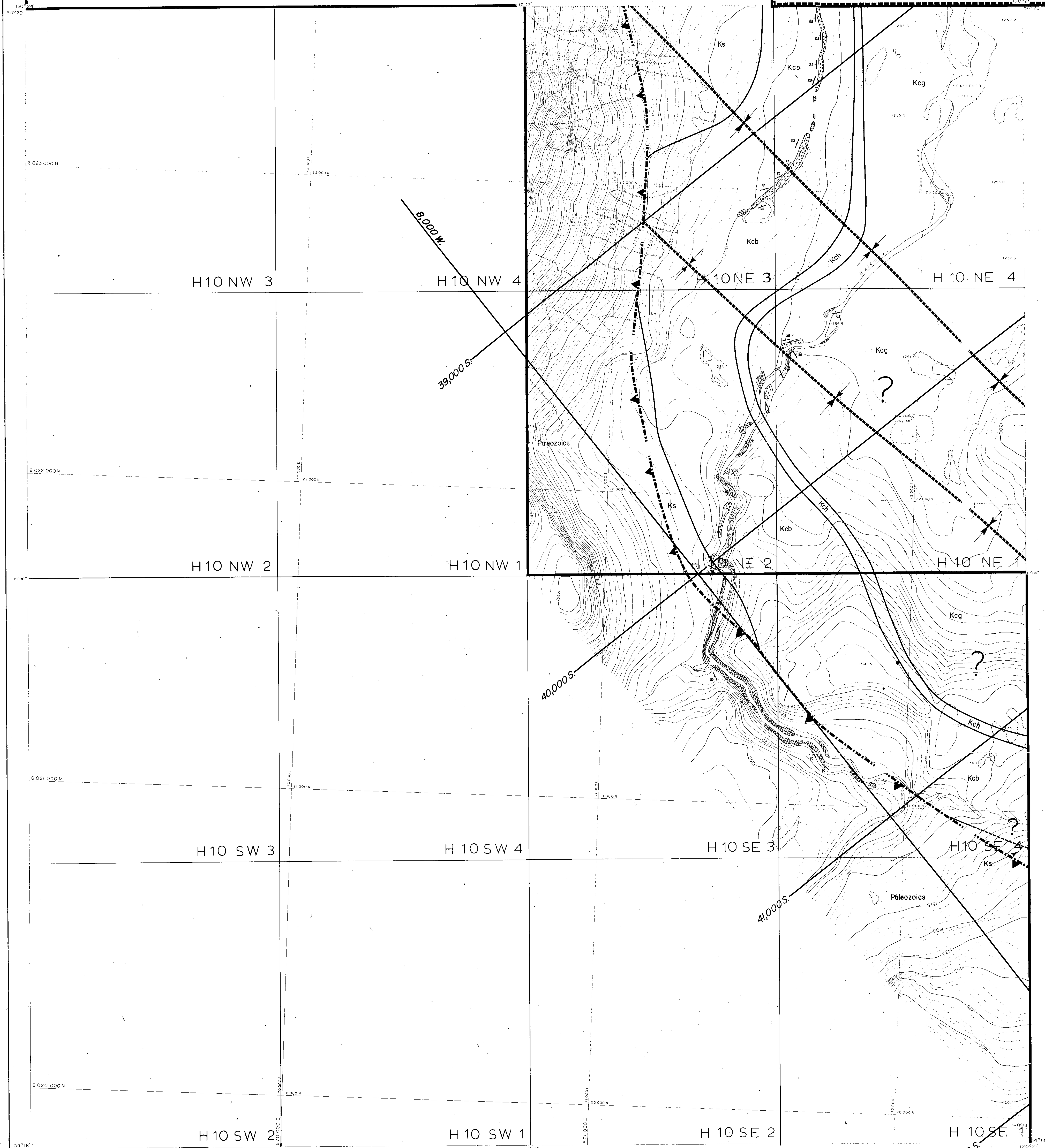
MONKMAN COAL PROJECT

GEOLOGICAL MAP

SECUS SAXON EXTENSION AND NEKIK BLOCKS

Date	MAR. '79
Revised	P.J.P. Feb. 1980.
Author	G.J., A.B.
Drafted	J.W.K.
Scale	1 : 25,000

5 of 5


120°24'
54°20'
22'30"
120°21'
54°20'
6 023 000 N
70 000 E
23 000 N
71 000 E
72 000 E
6 022 000 N
22 000 N
6 021 000 N
21 000 N
6 020 000 N
20 000 N
670 000 E
671 000 E
19'00"
54°18'
120°24'
54°18'
120°21'
8,000 W.
39,000 S.
40,000 S.
41,000 S.
42,000 S.
H10 NW 3
H10 NW 4
H10 NE 3
H 10 NE 4
H10 NW 2
H10 NW 1
H 10 NE 2
H 10 NE 1
H10 SW 3
H 10 SW 4
H 10 SE 3
H10 SE 4
H10 SW 2
H 10 SW 1
H 10 SE 2
H 10 SE 1
Ks
Kcb
Kcg
Kch
Paleozoics
SCATTERED TREES
Belcourt Creek
?
1625
1600
1575
1550
1525
1500
1475
1450
1425
1400
1375
1350
1325
1300
1275
1252.2
1253.3
1255
1255.5
1255.8
1257.5
1264.8
1261.0
1285.5
V799
1262.48
IP
1360.5
1352.3
1349.0
1450
1525
1550

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 1372.1
Spot elevation	1247.9
Iron Pin	◇ IP

.ONTOUR 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.

GEOLOGICAL LEGEND

LOWER CRETACEOUS

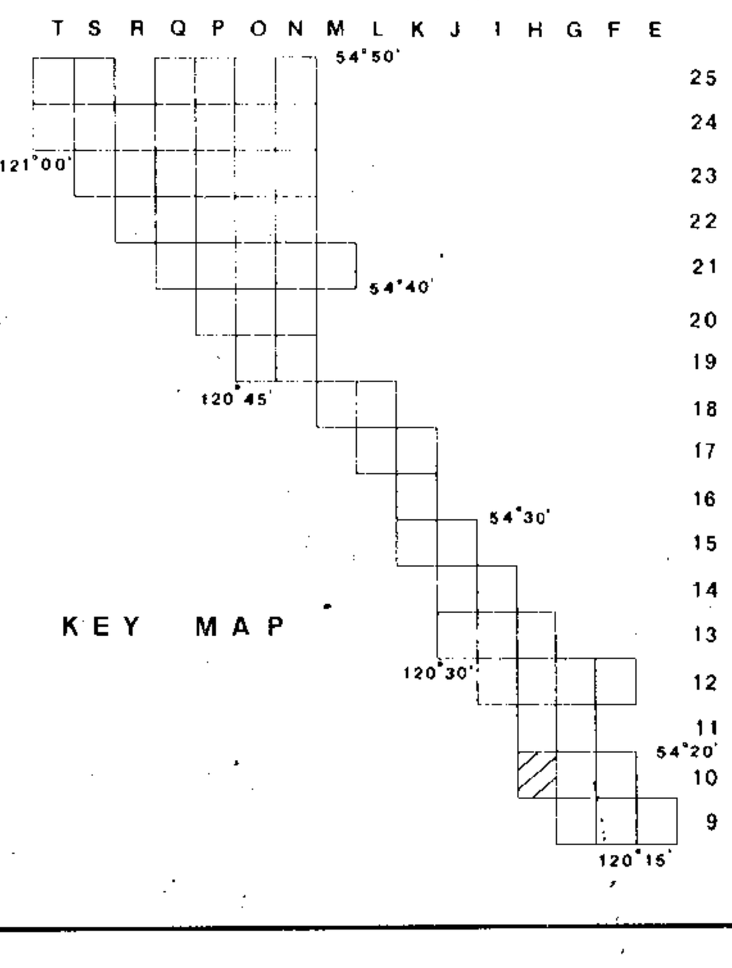
Symbol	Formation	Group
Ksh	SHAFTESBURY FORMATION	
Kcb	COMMOTION FORMATION (Boulder Creek Member)	FORT ST. JOHN GROUP
Kch	COMMOTION FORMATION (Hulcross Member)	
Kcg	COMMOTION FORMATION (Gates Member)	
Kmb	MOOSEBAR FORMATION	
Kgt	GETHING FORMATION	BULLHEAD GROUP
Kcd	CADOMIN FORMATION	

JURASSIC — CRETACEOUS

Symbol	Group
JKmi	MINNES GROUP

PALEOZOIC

Symbol	Period
P	DEVONIAN, MISSISSIPPIAN



KEY MAP

LEGEND
SHELL CANADA BOUNDARY
PACIFIC PETROLEUMS BOUNDARY

545

Petro·Canada
MINING DEPARTMENT

MONKMAN COAL PROJECT	Date FEB. 1980.
	Revised
NEKIK DIP SLOPE GEOLOGICAL MAP	Author P.J.P.
	Drafted edy
	Scale 1:5,000
	H 10

R.M. HARDY & ASSOCIATES LTD.

G 10 NW 3 | G 10 NW 4 | G 10 NE 3 | G 10 NE 4

G 10 NW 2 | G 10 NW 1 | G 10 NE 2 | G 10 NE 1

G 10 SW 3 | G 10 SW 4 | G 10 SE 3 | G 10 SE 4

G 10 SW 2 | G 10 SW 1 | G 10 SE 2 | G 10 SE 1

40,000 S.

41,000 S.

42,000 S.

43,000 S.

44,000 S.

4,000 W.

8,000 W.

MND-78-26 (chained)

Km

Kg

Kcd

Kcg

Kcb

Kch

Ks

Paleozoics

?

LEGEND

Improved road
Secondary road
Track or trail
Cut line
Tree area
River
Stream
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., Manee Hawk, Manea, Kinused. 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.

GEOLOGICAL LEGEND

LOWER CRETACEOUS

- Ksh — SHAFTESBURY FORMATION
- Kcb — COMMOTION FORMATION (Boulder Creek Member)
- Kch — COMMOTION FORMATION (Hulcross Member)
- Kcg — COMMOTION FORMATION (Gates Member)

FORT ST. JOHN GROUP

- Kmb — MOOSEBAR FORMATION
- Kgt — GETHING FORMATION
- Kcd — CADOMIN FORMATION

BULLHEAD GROUP

JURASSIC — CRETACEOUS

- JKmi — MINNES GROUP

PALEOZOIC

- P — DEVONIAN, MISSISSIPPIAN

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'

LEGEND

SHELL CANADA BOUNDARY
PACIFIC PETROLEUMS BOUNDARY

545

PR-MONKMAN 39(2)A

Petro-Canada
MINING DEPARTMENT

MONKMAN COAL PROJECT

NEKIK DIP SLOPE GEOLOGICAL MAP

Date FEB. 1980.
Revised
Author P.J.P.
Drafted edy
Scale 1:5,000
G 10

R.M. HARDY & ASSOCIATES LTD.

E 9 NW 3 | E 9 NW 4 | E 9 NE 3 | E 9 NE 4

E 9 NW 2 | E 9 NW 1 | E 9 NE 2 | E 9 NE 1

E 9 SW 3 | E 9 SW 4 | E 9 SE 3 | E 9 SE 4

E 9 SW 2 | E 9 SW 1 | E 9 SE 2 | E 9 SE 1

47,000 S.

48,000 S.

49,000 S.

4,000 W.

120°12'
54°18'
54°16'
120°15'

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, Mancia, 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.

GEOLOGICAL LEGEND

LOWER CRETACEOUS

- Ksh — SHAFTESBURY FORMATION
- Kcb — COMMOTION FORMATION (Boulder Creek Member) — FORT ST. JOHN GROUP
- Kch — COMMOTION FORMATION (Hutcross Member) — FORT ST. JOHN GROUP
- Kcg — COMMOTION FORMATION (Gates Member) — FORT ST. JOHN GROUP
- Kmb — MOOSEBAR FORMATION — BULLHEAD GROUP
- Kgt — GETHING FORMATION — BULLHEAD GROUP
- Kcd — CADOMIN FORMATION — BULLHEAD GROUP

JURASSIC — CRETACEOUS

- JKmi — MINNES GROUP

PALEOZOIC

- P — DEVONIAN, MISSISSIPPIAN

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'

LEGEND

- SHELL CANADA BOUNDARY
- PACIFIC PETROLEUMS BOUNDARY

545

PE-MONKMAN 7912A

Petro-Canada
MINING DEPARTMENT

MONKMAN COAL PROJECT

NEKIK DIP SLOPE GEOLOGICAL MAP

Date FEB. 1980.
Revised
Author P.J.P.
Drafted sdy
Scale 1:5,000

E 9

H.M. HARVEY & ASSOCIATES LTD.

NEKIK DIP SLOPE GEOLOGICAL MAP

Petro-Canada MINING DEPARTMENT

MONKMAN COAL PROJECT

545

PR-MONKMAN 79(2)A

Date	FEB. 1980.
Revised	
Author	P.J.P.
Drafted	edy
Scale	1:5,000

R.M. HARDY & ASSOCIATES LTD.

45,000S. 46,000S. 47,000S. 48,000S. 4,000W. 8,000W.

F9 NW3 F9 NW4 F9 NE3 F9 NE4
F9 NW2 F9 NW1 F9 NE2 F9 NE
F9 SW3 F9 SW4 F9 SE3 F9 SE4
F9 SW2 F9 SW1 F9 SE2 F9 SE1

Ks Kcb Kch Kcg Km Kg Kcd JKm Paleozoics

U D

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-372
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., Morrow Hawk, Marcot, 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.

GEOLOGICAL LEGEND

LOWER CRETACEOUS

- Ksh — SHAFTESBURY FORMATION
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- Kch — COMMOTION FORMATION (Hulcross Member) — FORT ST. JOHN GROUP
- Kcg — COMMOTION FORMATION (Gates Member) — FORT ST. JOHN GROUP
- Kmb — MOOSEBAR FORMATION — BULLHEAD GROUP
- Kgt — GETHING FORMATION — BULLHEAD GROUP
- Kcd — CADOMIN FORMATION — BULLHEAD GROUP

JURASSIC — CRETACEOUS

- JKmi — MINNES GROUP

PALEOZOIC

- P — DEVONIAN, MISSISSIPPIAN

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'

LEGEND

SHELL CANADA BOUNDARY
PACIFIC PETROLEUMS BOUNDARY

F 10 NW 3 | F 10 NW 4 | F 10 NE 3 | F 10 NE 4

F 10 NW 2 | F 10 NW 1 | F 10 NE 2 | F 10 NE 1

F 10 SW 3 | F 10 SW 4 | F 10 SE 3 | F 10 SE 4

F 10 SW 2 | F 10 SW 1 | F 10 SE 2 | F 10 SE 1

120°18' 54°20' 120°15' 54°20' 54°18' 120°18' 120°15' 54°18'

16 30

19'00

42,000 S.

43,000 S.

44,000 S.

45,000 S.

46,000 S.

4,000 W.

6 023 000 N 23 000 N 76 000 E 77 000 E 78 000 E

6 022 000 N 22 000 N

6 021 000 N 21 000 N

HV 817 1364 13

1P

NEKIK (HUB) 2021 21

Km Kcd Kg Kcg Kcb Kch Ks JKm

1525 1500 1475 1450 1425 1400 1375 1350 1325 1300 1275 1250 1225 1200 1175 1150 1125 1100 1075 1050 1025 1000 975 950 925 900 875 850 825 800 775 750 725 700 675 650 625 600 575 550 525 500 475 450 425 400 375 350 325 300 275 250 225 200 175 150 125 100 75 50 25

LEGEND

Improved road
Secondary road
Track or trail
Cut line
Tree area
River
Steam
Intermittent stream
Swamp
Contours 300
Horizontal control △ 390
Vertical control ○ V 1372 1
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.

GEOLOGICAL LEGEND

LOWER CRETACEOUS

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- Kcg — COMMOTION FORMATION (Gates Member) — FORT ST. JOHN GROUP
- Kmb — MOOSEBAR FORMATION — BULLHEAD GROUP
- Kgt — GETHING FORMATION — BULLHEAD GROUP
- Kcd — CADOMIN FORMATION — BULLHEAD GROUP

JURASSIC — CRETACEOUS

- JKmi — MINNES GROUP

PALEOZOIC

- P — DEVONIAN, MISSISSIPPIAN

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' 54°18'

121°00' 120°45' 120°30' 120°15'

KEY MAP

LEGEND

SHELL CANADA BOUNDARY

PACIFIC PETROLEUMS BOUNDARY

545

PR-MONKMAN 79(2)A

Petro-Canada
MINING DEPARTMENT

MONKMAN COAL PROJECT	Date FEB. 1980
	Revised
NEKIK DIP SLOPE GEOLOGICAL MAP	Author P.J.P.
	Drafted edy
	Scale 1:5,000
	F 10.

R M HARDY & ASSOCIATES LTD.

G 9 NW 3 | G 9 NW 4 | G 9 NE 3 | G 9 NE 4

G 9 NW 2 | G 9 NW 1 | G 9 NE 2 | G 9 NE 1

G 9 SW 3 | G 9 SW 4 | G 9 SE 3 | G 9 SE 4

G 9 SW 2 | G 9 SW 1 | G 9 SE 2 | G 9 SE 1

43,000 S.

44,000 S.

45,000 S.

46,000 S.

47,000 S.

8,000 W.

120°18'

54°16'

Paleozoics

Kcb

Kch

Kcg

Ks

Kcd

Km

Kg

U

D

?

LEGEND

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

ONTOUR 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 O. 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 Gauntlette E, Gauntlette S.W., Maimie, Hawk, Marcia, Kinusco. 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 in both ends of each course simultaneously.

GEOLOGICAL LEGEND

LOWER CRETACEOUS

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- Kch — COMMOTION FORMATION (Hulcross Member) — FORT ST. JOHN GROUP
- Kcg — COMMOTION FORMATION (Gates Member) — FORT ST. JOHN GROUP
- Kmb — MOOSEBAR FORMATION — BULLHEAD GROUP
- Kgt — GETHING FORMATION — BULLHEAD GROUP
- Kcd — CADOMIN FORMATION — BULLHEAD GROUP

JURASSIC — CRETACEOUS

- JKmi — MINNES GROUP

PALEOZOIC

- P — DEVONIAN, MISSISSIPPIAN

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'

LEGEND

SHELL CANADA BOUNDARY

PACIFIC PETROLEUMS BOUNDARY

545

PR- MONKMAN 79(2)A

Petro-Canada
MINING DEPARTMENT

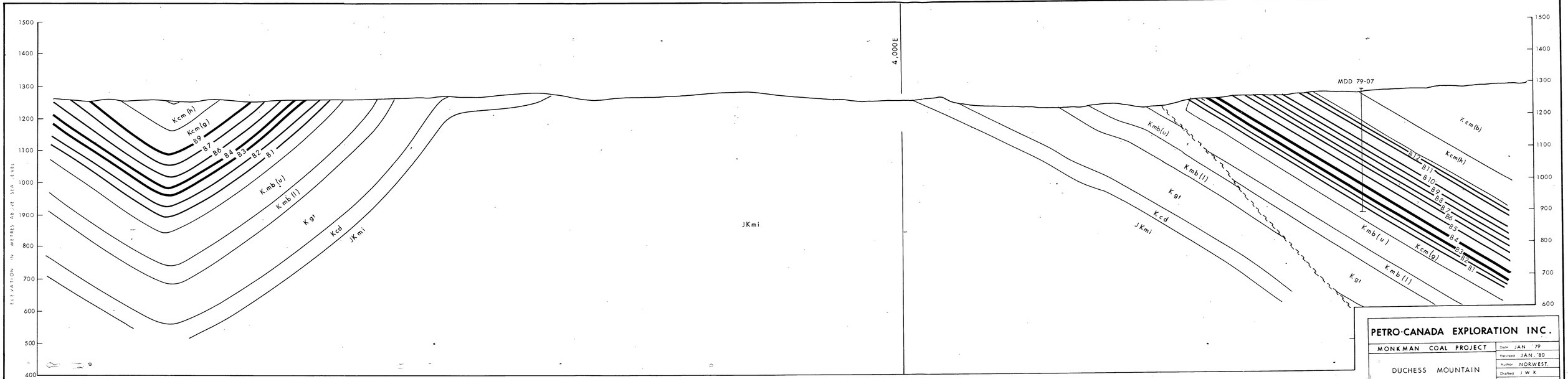
MONKMAN COAL PROJECT

NEKIK DIP SLOPE GEOLOGICAL MAP

Date FEB. 1980
Revised
Author P.J.P.
Drafted edy
Scale 1:5,000

G 9

H.M. HARDY & ASSOCIATES LTD.



PETRO-CANADA EXPLORATION INC.

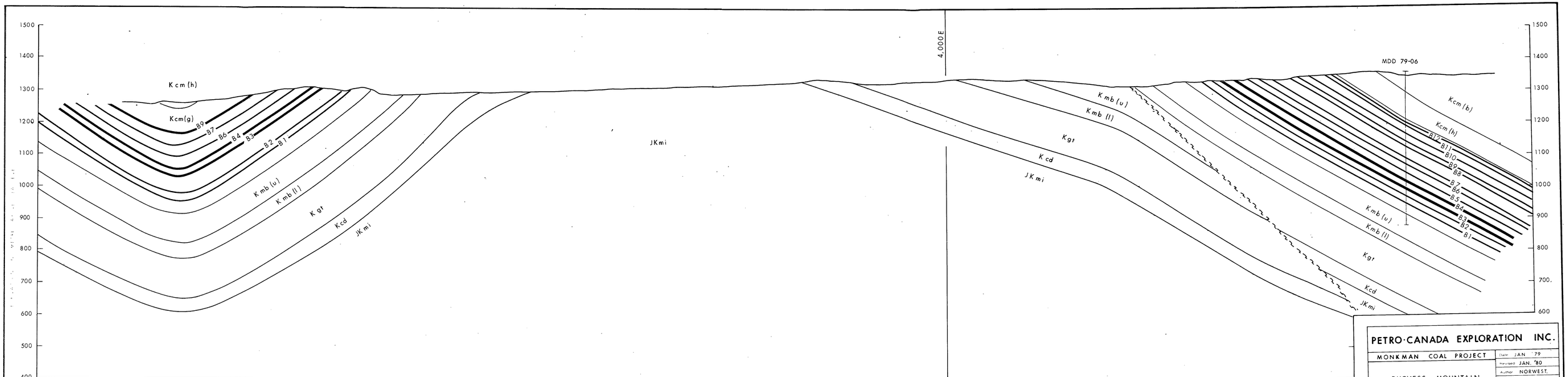
MONKMAN COAL PROJECT

DUCHESS MOUNTAIN

CROSS SECTION 11,000N

Date	JAN. '79
Revised	JAN. '80
Author	NORWEST
Drafted	J W K
Scale	1:5,000

NorWest



PETRO·CANADA EXPLORATION INC.

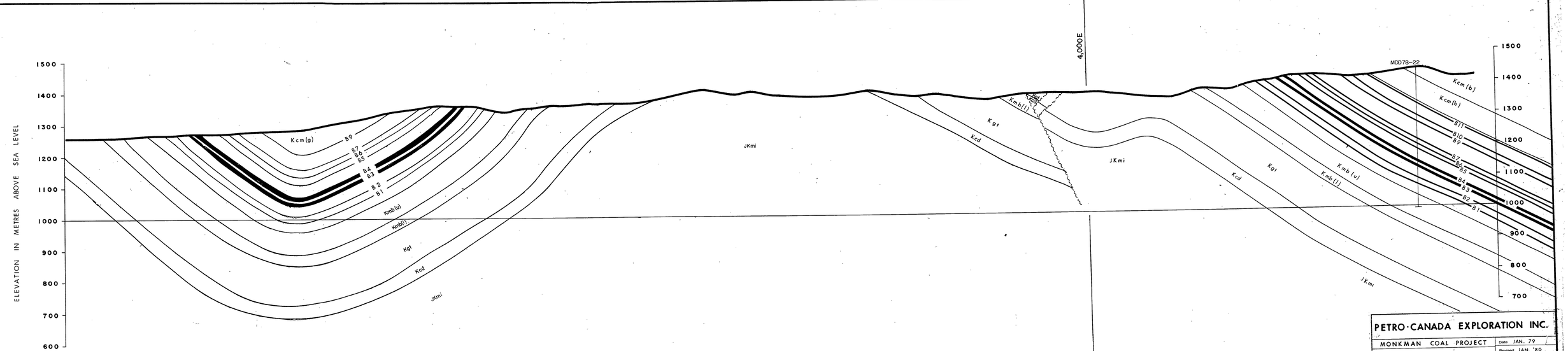
MONKMAN COAL PROJECT

DUCHESS MOUNTAIN

CROSS SECTION 11,500N.

Date	JAN. '79
Revised	JAN. '80
Author	NORWEST.
Drafted	J.W.K.
Scale	1:5,000

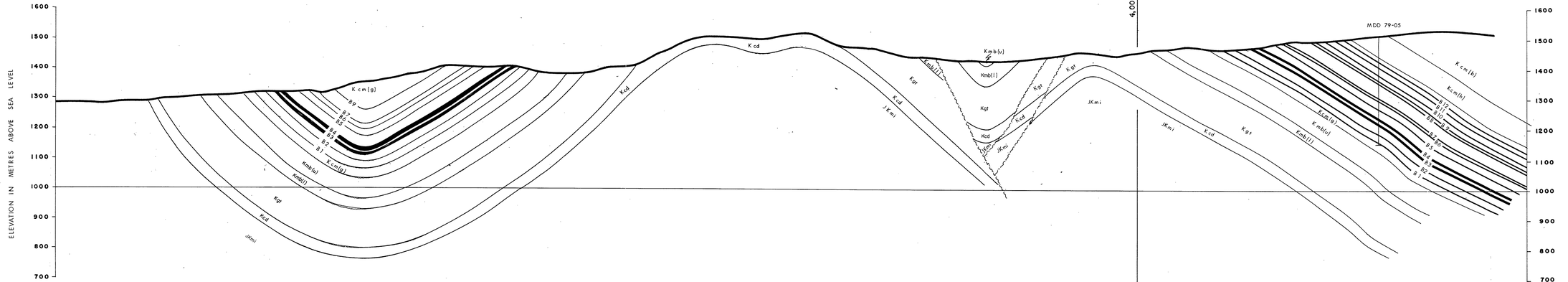
Norwest



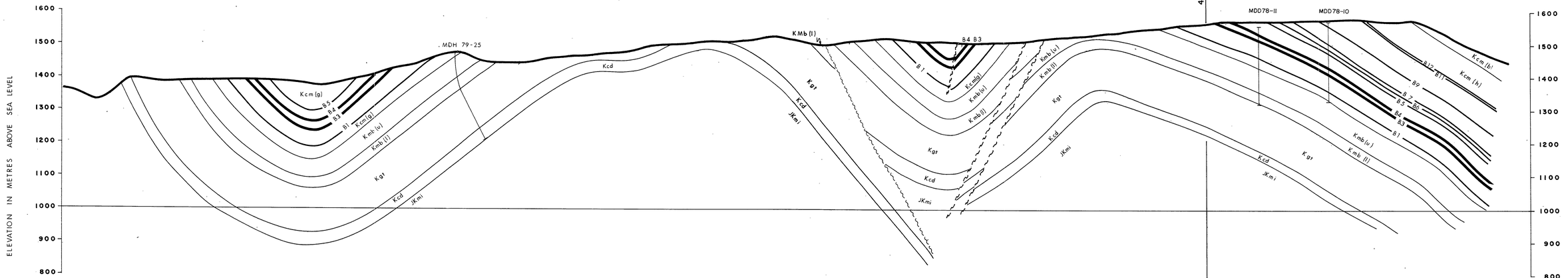
PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT	Date JAN. 79
	Revised JAN. '80
DUKE MOUNTAIN	Author NORWEST
CROSS SECTION 12,000N.	Drafted J.W.K.
	Scale 1:5000

NORWEST

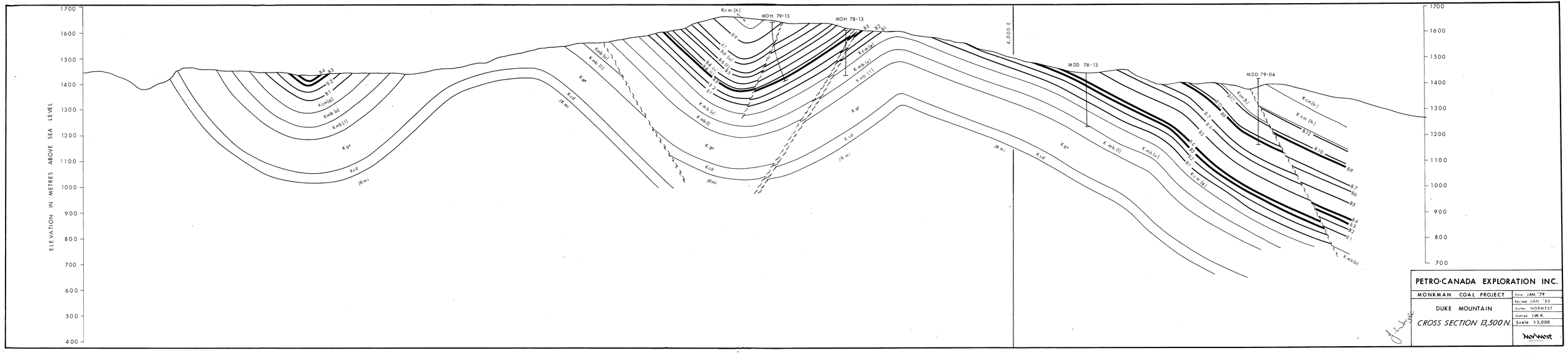


PETRO-CANADA EXPLORATION INC.	
MONKMAN COAL PROJECT	Date JAN. '79
	Revised JAN. '80
DUKE MOUNTAIN	Author NORWEST.
	Drafted J.W.K.
CROSS SECTION 12,500N.	Scale 1:5000
	NORWEST



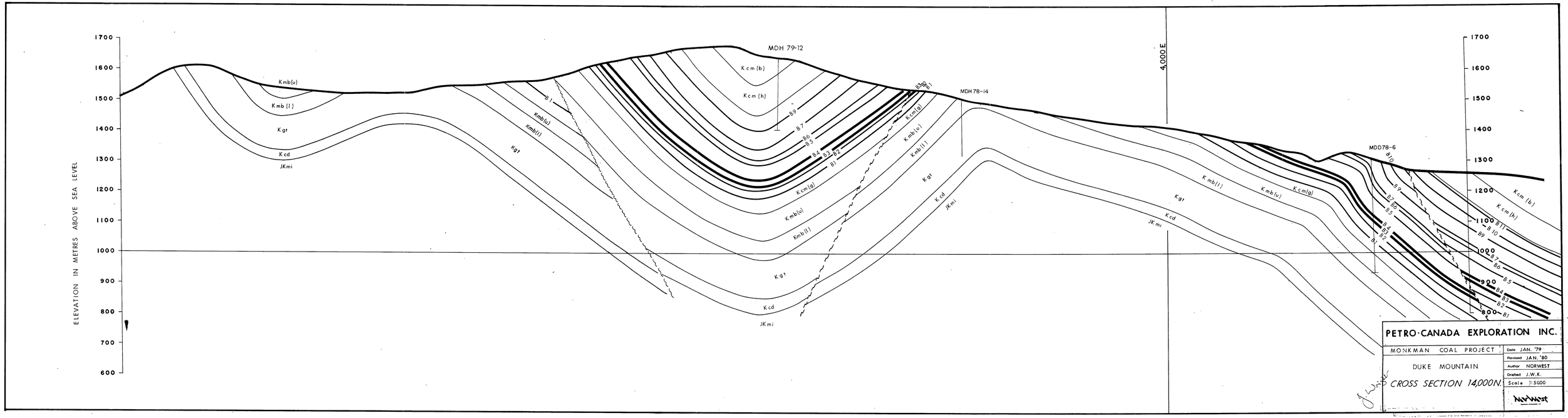
PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT	Date JAN. '79
	Revised JAN. '80
DUKE MOUNTAIN	Author W.P.
	Drafted J.W.K.
CROSS SECTION 13,000N	Scale 1:5000
	Norwest



PETRO-CANADA EXPLORATION INC.

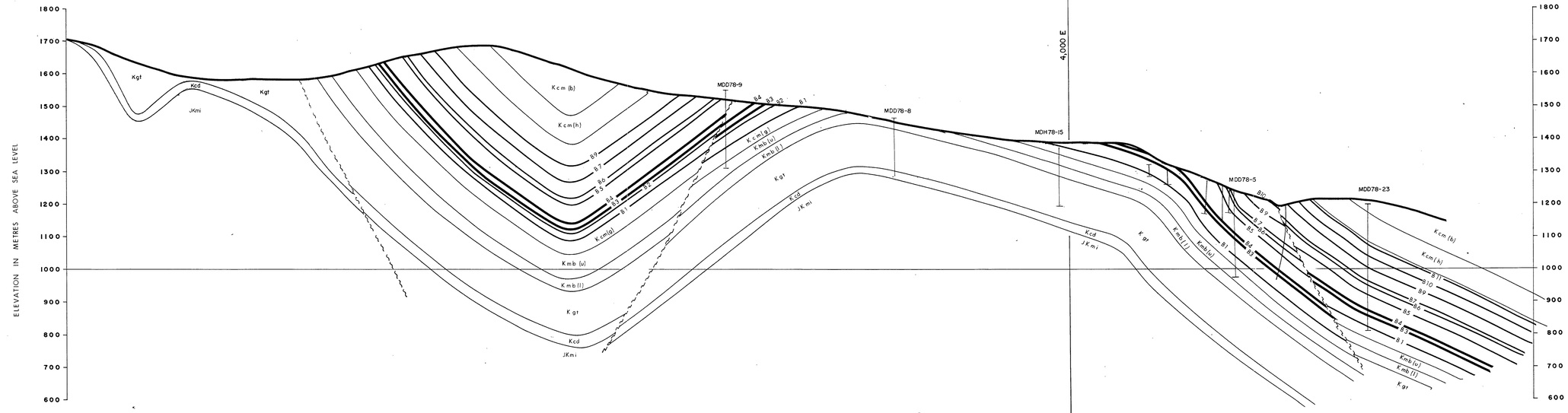
MONKMAN COAL PROJECT	Date JAN. '79
	Revised JAN. '80
DUKE MOUNTAIN	Author NORWEST
	Drafted J.W.K.
CROSS SECTION 13,500 N.	Scale 1:5,000
	Norwest



PETRO-CANADA EXPLORATION INC.

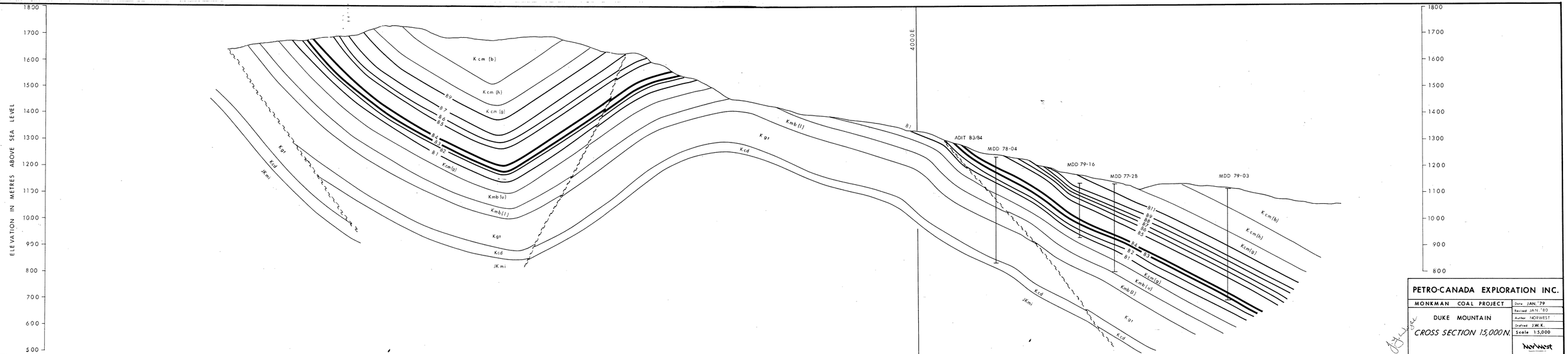
MONKMAN COAL PROJECT	Date JAN. '79
	Revised JAN. '80
DUKE MOUNTAIN	Author NORWEST
	Drafted J.W.K.
CROSS SECTION 14,000N.	Scale 1:5000

NORWEST



PETRO-CANADA EXPLORATION INC.

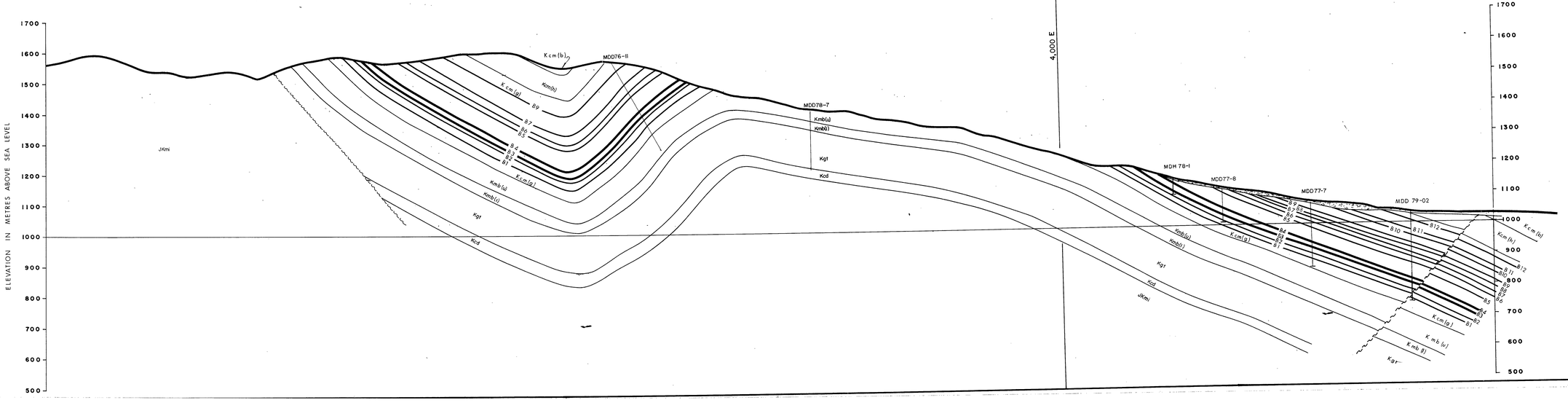
MONKMAN COAL PROJECT	Date JAN. '79
	Revised JAN. '80
DUKE MOUNTAIN	Author NORWEST
	Drafted J.W.K.
CROSS SECTION 14,500N.	Scale 1:5000
	NORWEST



PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT	Date JAN. '79
	Revised JAN. '80
DUKE MOUNTAIN	Author NORWEST
	Drafted J.W.K.
CROSS SECTION 15,000N.	Scale 1:5,000

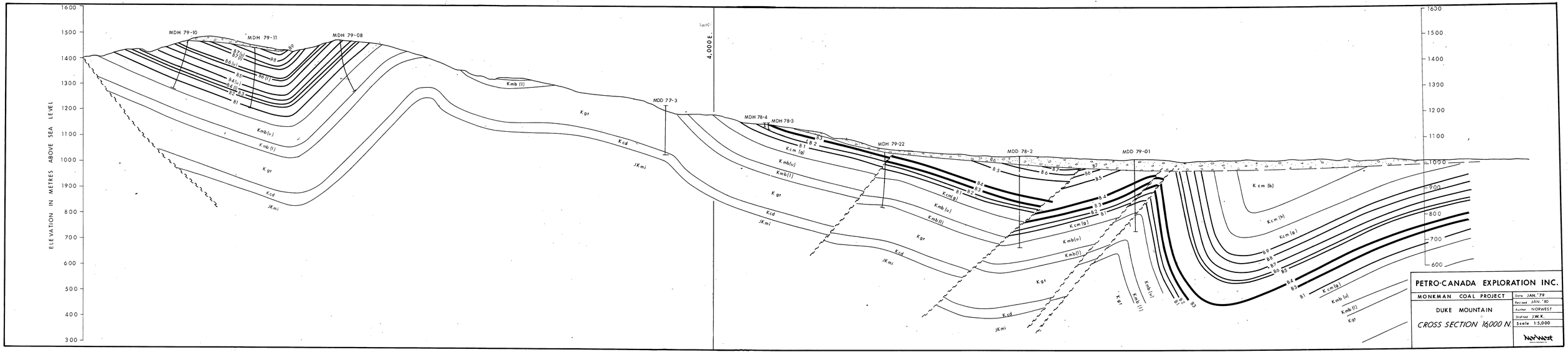
NORWEST



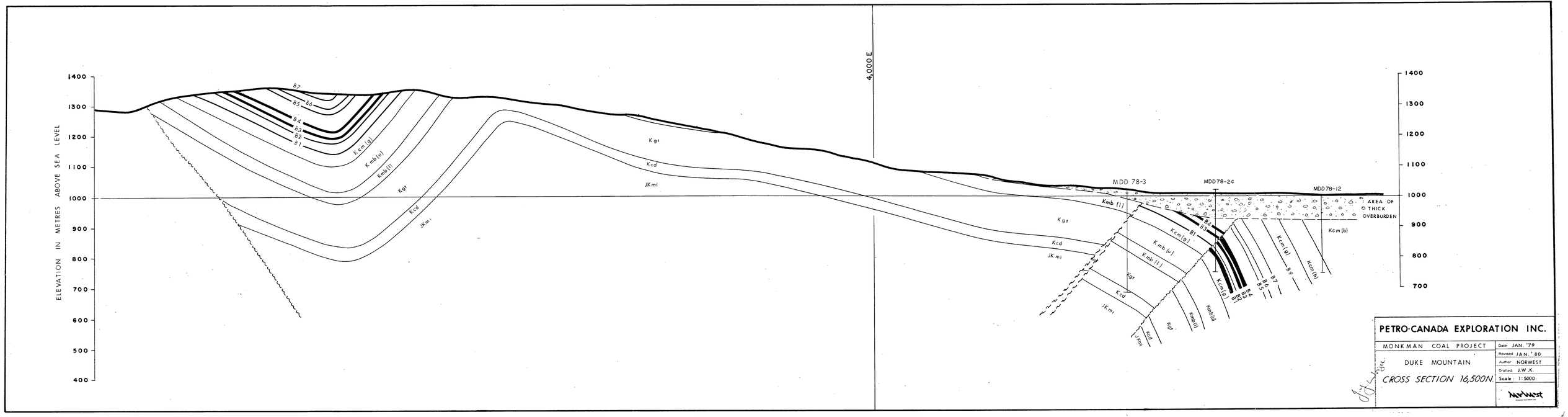
PETRO-CANADA EXPLORATION INC.

MONKMAN COAL PROJECT	Date JAN. '79
	Revised JAN. '80
DUKE MOUNTAIN	Author NORWEST
CROSS SECTION 15,500N.	Drafted J.W.K.
	Scale 1:5000

NORWEST



PETRO-CANADA EXPLORATION INC.	
MONKMAN COAL PROJECT	Date JAN.'79
	Revised JAN. '80
DUKE MOUNTAIN	Author NORWEST
	Drafted J.W.K.
CROSS SECTION 16000 N.	Scale 1:5,000
	NORWEST



PETRO-CANADA EXPLORATION INC.

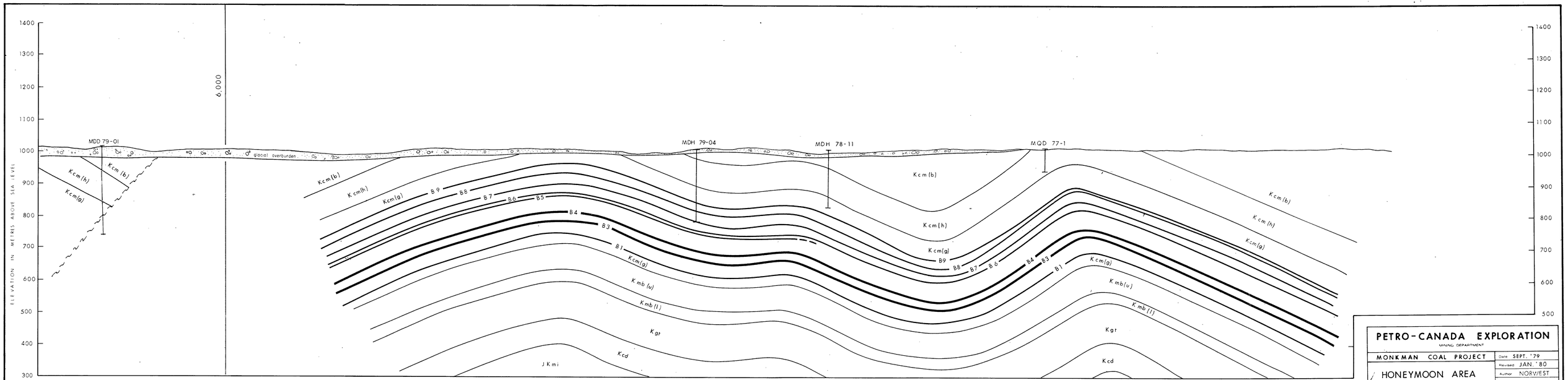
MONKMAN COAL PROJECT

DUKE MOUNTAIN

CROSS SECTION 16,500N.

Date	JAN. '79
Revised	JAN. '80
Author	NORWEST
Drafted	J.W.K.
Scale	1:5000

NORWEST



PETRO-CANADA EXPLORATION
MINING DEPARTMENT

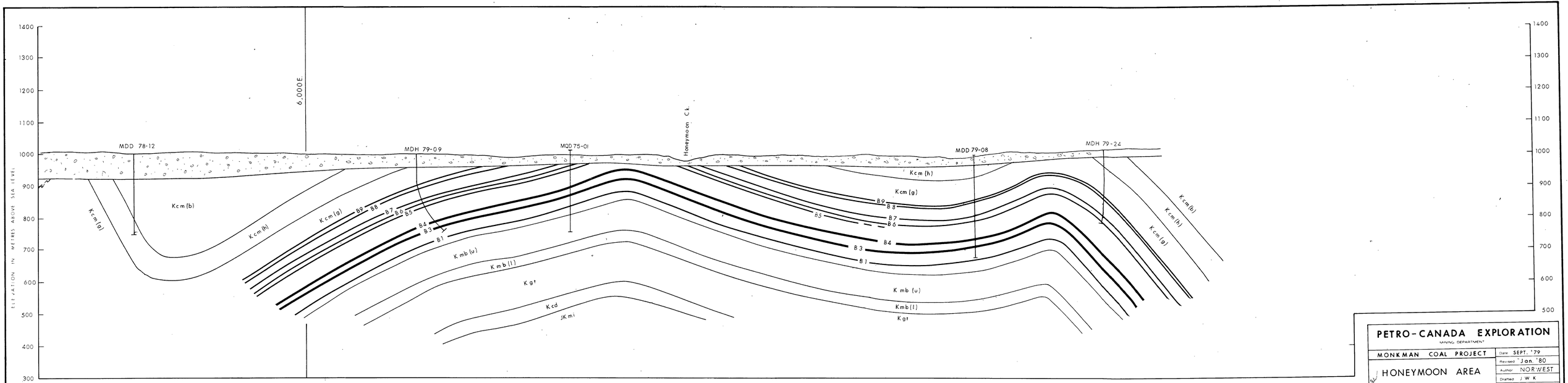
MONKMAN COAL PROJECT

HONEYMOON AREA

CROSS SECTION 16,000N.

Date SEPT. '79
Revised JAN. '80
Author NORWEST
Drafted J W K
Scale 1:5,000

NorWest

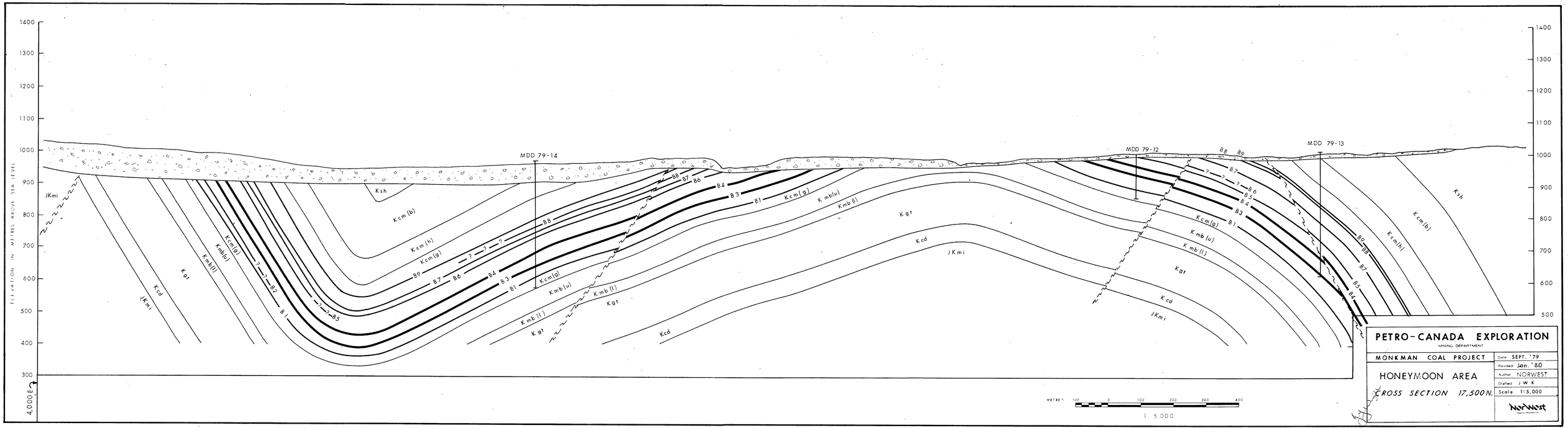


PETRO-CANADA EXPLORATION
MINING DEPARTMENT

MONKMAN COAL PROJECT	Date SEPT. '79
	Revised Jan. '80
HONEYMOON AREA	Author NOR'WEST
	Drafted J.W.K
CROSS SECTION 16,500N.	Scale 1:5,000

NorWest

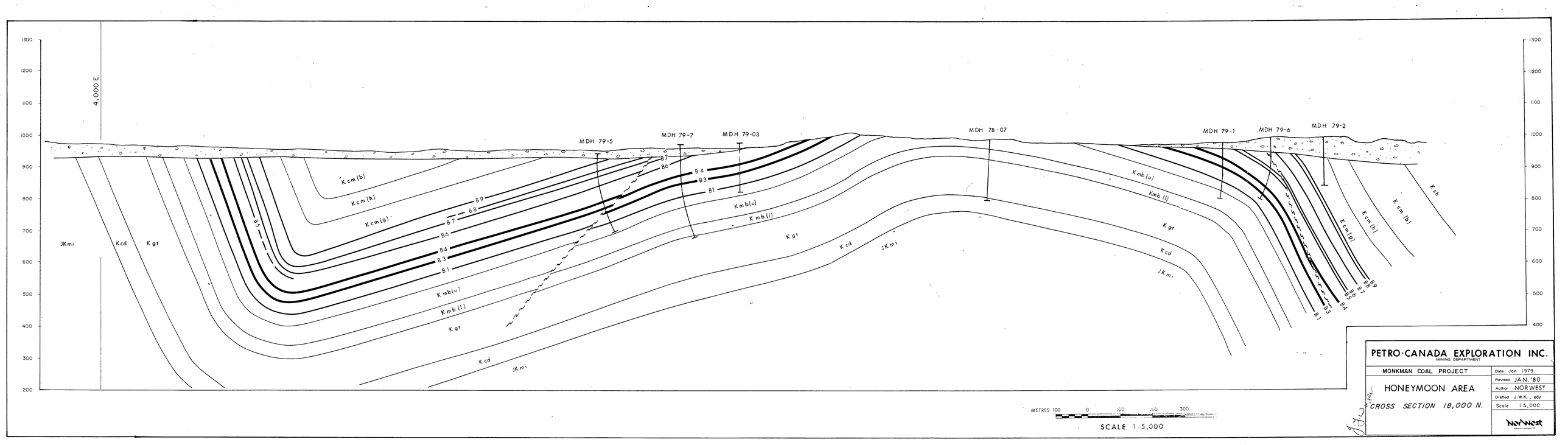
ELEVATION IN METRES ABOVE SEA LEVEL
1400
1300
1200
1100
1000
900
800
700
600
500
400
4,000 E
B1
K cm (g)
Kmb(u)
Kmb(l)
Kgt
Kcd
JKmi
AREA OF THICK OVERBURDEN
Ksh
Kcm (b)
Kcm (h)
B9
B8
B7
B6
B5
B4
B3
MDD 78-1
MDH 78-08
MDH 78-9
MDH 78-10
MDH 78-6
PETRO-CANADA EXPLORATION
MINING DEPARTMENT
MONKMAN COAL PROJECT
HONEYMOON AREA
CROSS SECTION 17,000N.
Date JAN. '79
Revised JAN. '80
Author NORWEST
Drafted J.W.K.
Scale 1:5,000
NorWest



PETRO-CANADA EXPLORATION
MINING DEPARTMENT

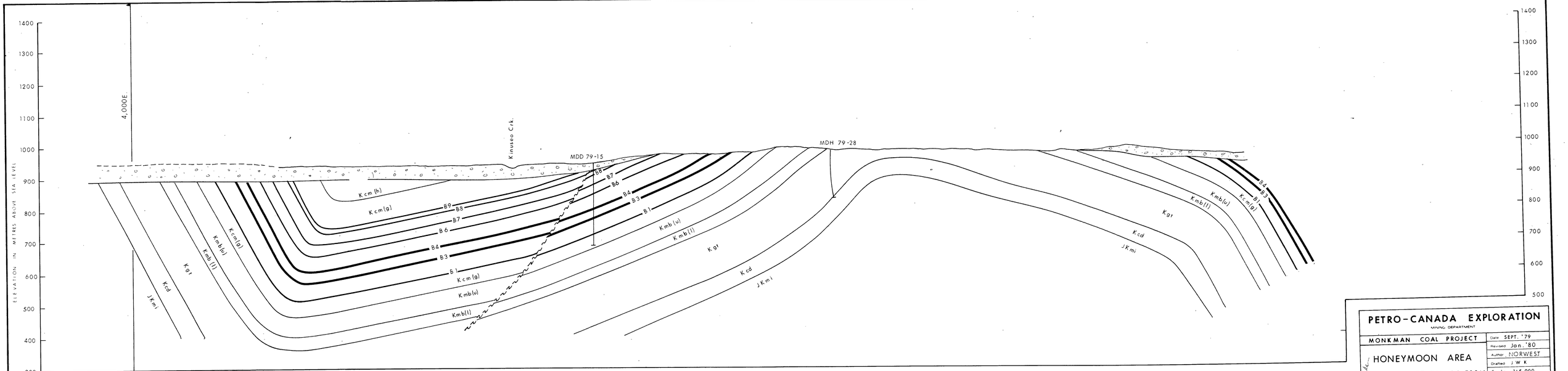
MONKMAN COAL PROJECT	Date SEPT. '79
	Revised Jan. '80
HONEYMOON AREA	Author NORWEST
CROSS SECTION 17,500N.	Drafted J.W.K.
	Scale 1:5,000

NorWest



PETRO-CANADA EXPLORATION INC.
MINING DEPARTMENT

MONKMAN COAL PROJECT	Date Jan 1979
	Revised JAN. '80
HONEYMOON AREA	Author NORWEST
	Drafted J.W.K., edy
CROSS SECTION 18,000 N.	Scale 1:5,000
	NorWest

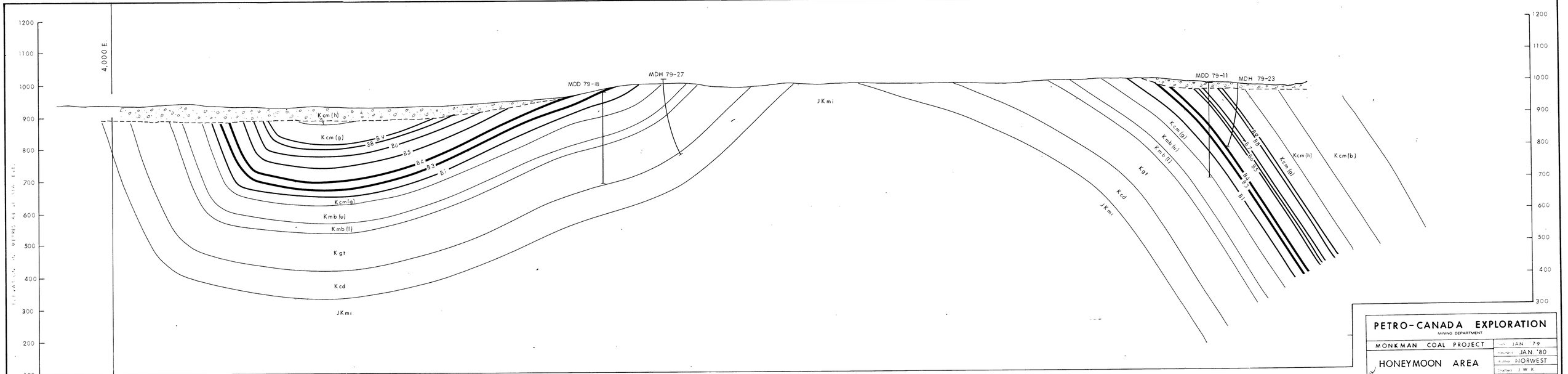


PETRO-CANADA EXPLORATION

MINING DEPARTMENT

MONKMAN COAL PROJECT	Date SEPT. '79
	Revised Jan. '80
HONEYMOON AREA	Author NORWEST
CROSS SECTION 18,500N.	Drafted J W K
	Scale 1:5,000

NorWest



PETRO-CANADA EXPLORATION
MINING DEPARTMENT

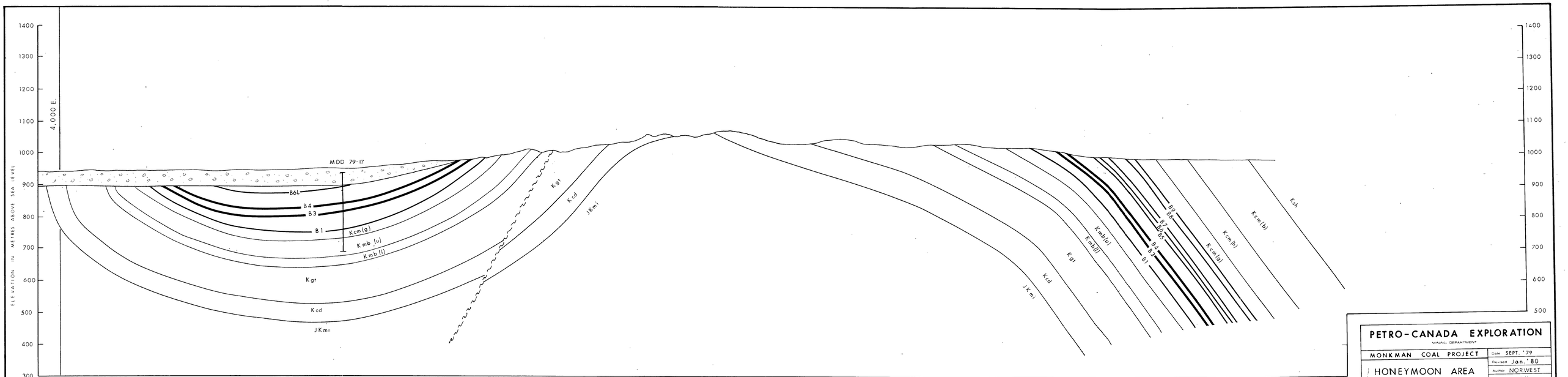
MONKMAN COAL PROJECT

HONEYMOON AREA

CROSS SECTION 19,000N.

DATE	JAN. 79
REVISED	JAN. '80
DRAWN	NORWEST
CHECKED	J.W.K.
Scale	1:5,000

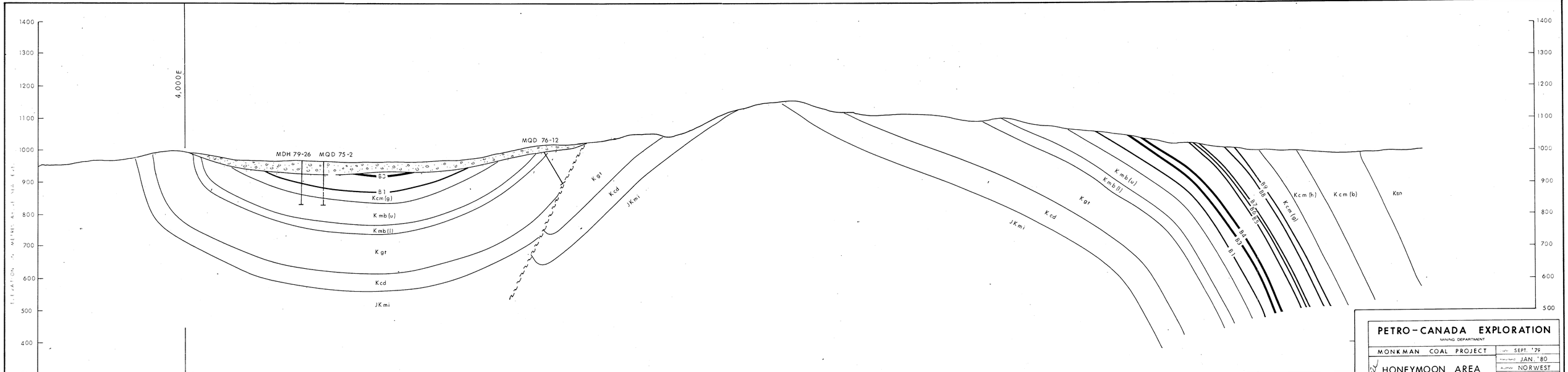
NorWest



PETRO-CANADA EXPLORATION
MINING DEPARTMENT

MONKMAN COAL PROJECT	Date SEPT. '79
	Revised Jan. '80
HONEYMOON AREA	Author NORWEST
	Drafted W. K.
CROSS SECTION 19,500 N.	Scale 1:5,000

NorWest



PETRO-CANADA EXPLORATION
MINING DEPARTMENT

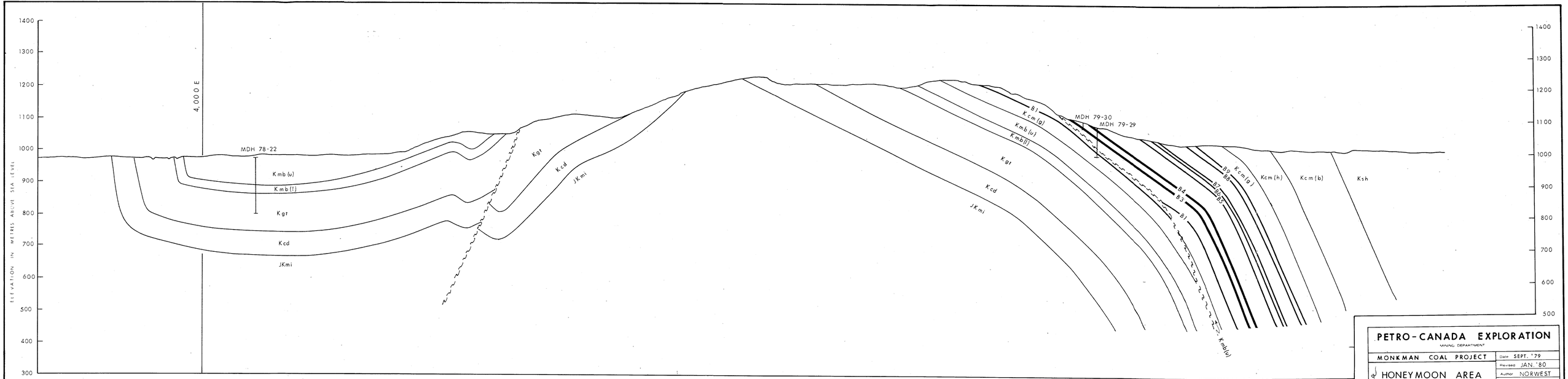
MONKMAN COAL PROJECT

HONEYMOON AREA

CROSS SECTION 20,000N.

Date	SEPT. '79
Revised	JAN. '80
Author	NORWEST
Drafted	J.W.K.
Scale	1:5,000

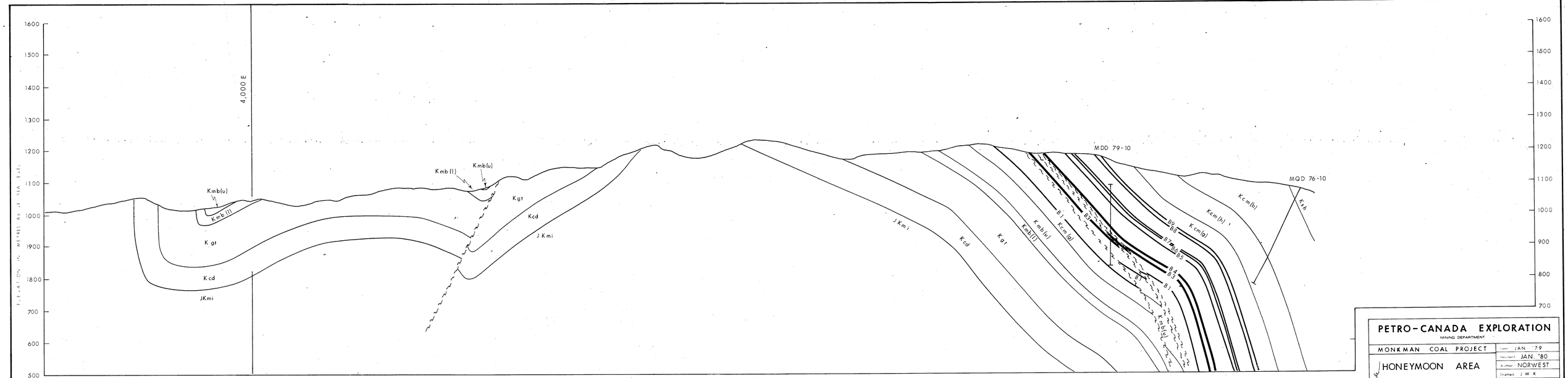
NORWEST



PETRO-CANADA EXPLORATION
MINING DEPARTMENT

MONKMAN COAL PROJECT	Date SEPT. '79
	Revised JAN. '80
HONEYMOON AREA	Author NORWEST
CROSS SECTION 20,500N	Drafted J.W.K.
	Scale 1:5,000

NorWest



PETRO-CANADA EXPLORATION

MINING DEPARTMENT

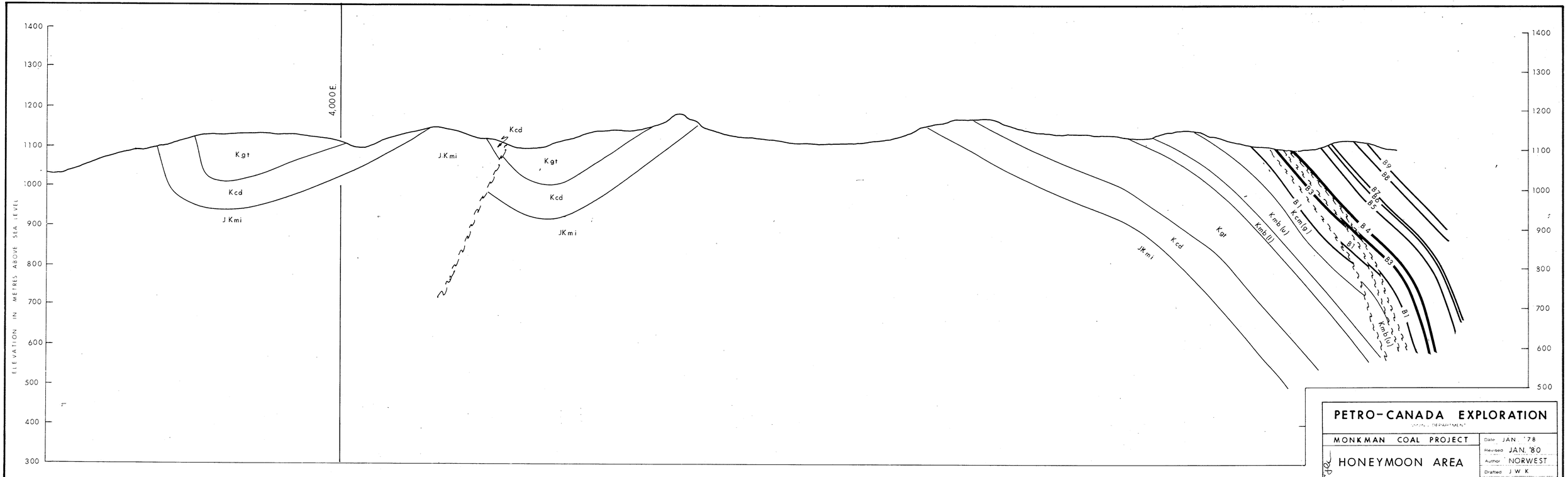
MONKMAN COAL PROJECT

HONEYMOON AREA

CROSS SECTION 21,000N.

Date	JAN. '79
Revised	JAN. '80
Author	NORWEST
Drafted	J W K
Scale	1:5,000

NORWEST



PETRO-CANADA EXPLORATION

EXPLORATION DEPARTMENT

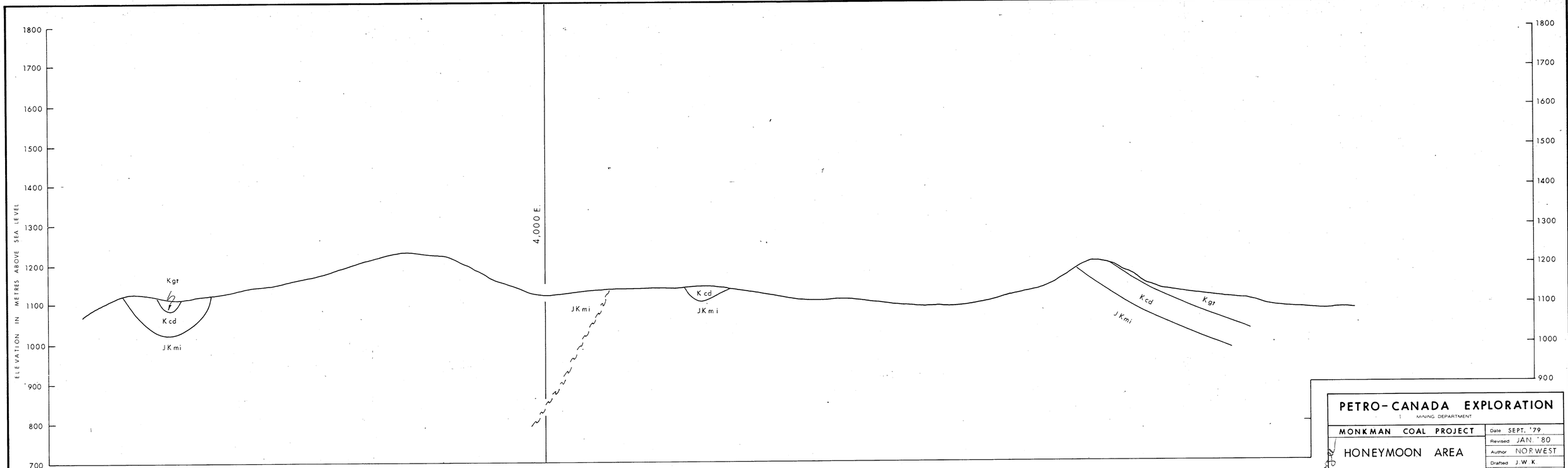
MONKMAN COAL PROJECT

HONEYMOON AREA

CROSS SECTION 21,500N.

Date JAN. '78
Revised JAN. '80
Author NORWEST
Drafted J W K
Scale 1:5000

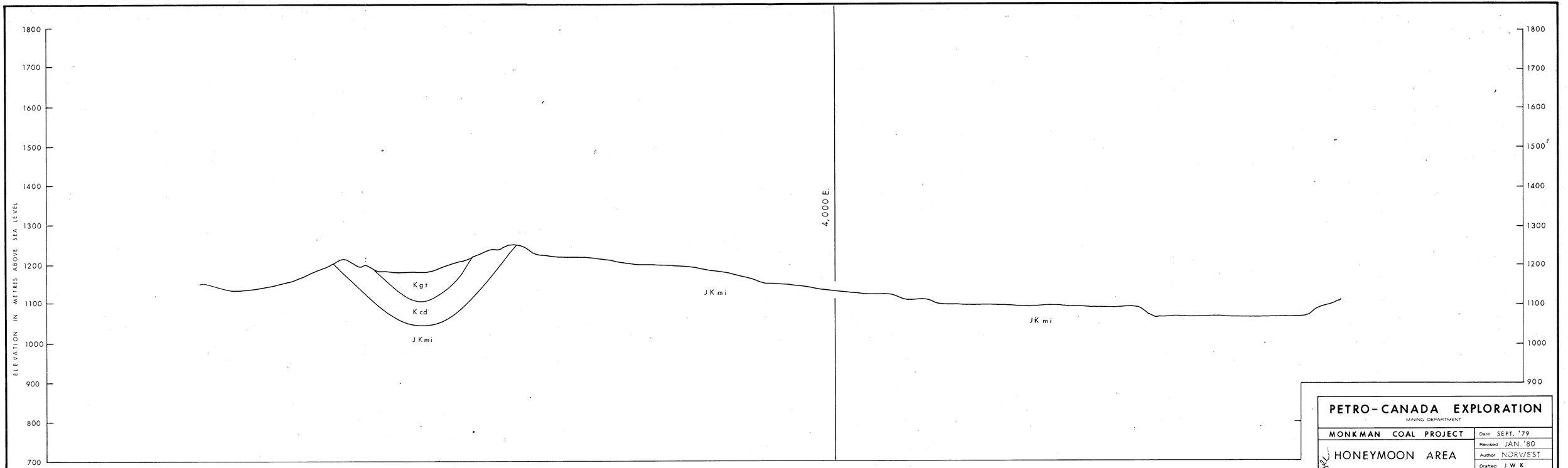
NorWest



PETRO-CANADA EXPLORATION

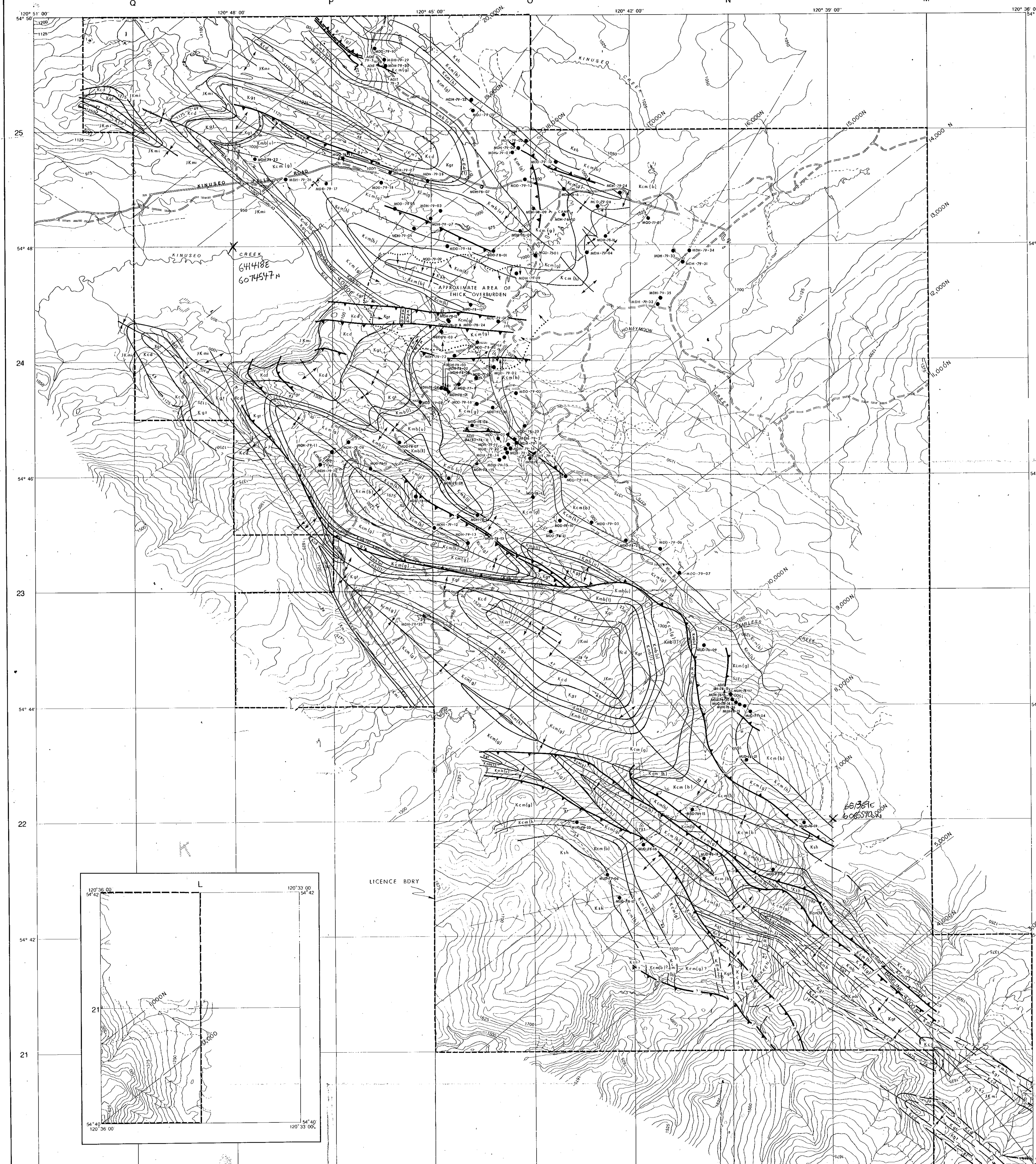
MINING DEPARTMENT

MONKMAN COAL PROJECT	Date SEPT. '79
	Revised JAN. '80
HONEYMOON AREA	Author NOR WEST
	Drafted J.W.K.
CROSS SECTION 22,000N.	Scale 1:5,000
	NorWest



PETRO-CANADA EXPLORATION
MINING DEPARTMENT

MONKMAN COAL PROJECT	Date SEPT. '79
	Revised JAN. '80
HONEYMOON AREA	Author NORWEST
	Drafted J.W.K.
CROSS SECTION 22,500N.	Scale 1:5,000
	NorWest



Q
P
O
N
M
120° 51' 00"
120° 48' 00"
120° 45' 00"
120° 42' 00"
120° 39' 00"
120° 36' 00"
54° 50'
54° 48'
54° 46'
54° 44'
54° 42'
54° 40'
25
24
23
22
21
KINUSEO FALLS ROAD
KINUSEO CREEK
HONEYMOON CREEK
FEARLESS CREEK
DOKKEN CREEK
APPROXIMATE AREA OF THICK OVERBURDEN
BASELINE 4,000E
LICENCE BDRY
641418E
6074547N
651369E
6065590N
L
120°36 00
120°33 00
54°42
54°40

TOPOGRAPHIC LEGEND

- MAIN ACCESS ROAD — DRY WEATHER
- EXPLORATION ROAD
- EXPLORATION TRAIL
- AIR STRIP
- SEISMIC LINE, CUT LINE
- POWER TRANSMISSION LINE
- RIVER
- STREAM
- LAKE
- SWAMP
- CONTOURS
- DEPRESSION CONTOUR

GEOLOGICAL LEGEND

LOWER CRETACEOUS

Ksh	SHAFTESBURY FORMATION	FORT ST. JOHN GROUP
Kcm(b)	COMMOTION FORMATION (Boulder Creek Member)	
Kcm(h)	COMMOTION FORMATION (Hulcross Member)	
Kcm(g)	COMMOTION FORMATION (Gates Member)	
Kmb	MOOSEBAR FORMATION	BULLHEAD GROUP
Kgt	GETHING FORMATION	
Kcd	CADOMIN FORMATION	

JURASSIC — CRETACEOUS

JKmi	MINNES GROUP

PALEOZOIC

P	DEVONIAN, MISSISSIPPIAN

SYMBOLS

- GEOLOGICAL CONTACT
- DIP AND STRIKE: REGULAR
- VERTICAL
- HORIZONTAL
- OVERTURNED
- THRUST: FLAGS SHOW DIP DIRECTION
- NORMAL FAULT
- ANTICLINE, SYNCLINE
- DRILL HOLE COLLAR
- TRENCH
- ADIT

KEY MAP

SURVEY NOTE

Control Survey was carried out for Photogrammetric Mapping to cover MONKMAN COAL PROJECT COAL LEASES. Mapping outside of the Coal Leases was taken from existing N.T.S. maps, and 25 metre contour intervals were interpolated.

CONTOUR INTERVAL 25m

R.M.HARDY & ASSOCIATES LTD.

1978

BASE REVISED MARCH 1979

545

PR - Monkman 79 (2) A

Petro·Canada

MONKMAN COAL PROJECT

DUKE MOUNTAIN BLOCK GEOLOGY

Date	MAR. '79
Revised	FEB. '80
Author	W.P., W.N., F.D.
Drafted	J.W.K.
Scale	1 : 25,000