SUKUNKA COAL PROJECT
MIDDLE COALS AREA

VOLUME 1

GEOLOGICAL REPORT ON THE LOWER GETHING SEQUENCE IN THE VICINITY OF SKEETER CREEK

PREPARED FOR: COALITION MINING LIMITED
BY: CLIFFORD MCELROY & ASSOCIATES PTY. LIMITED

REPORT NO. : 1/4/23 JUNE, 1975

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PREFACE

This geological report on the Lower Gething sequence of rocks in the vicinity of Skeeter Creek on the Sukunka Coal Property, British Columbia, has been prepared for Coalition Mining Limited by Clifford McElroy & Associates Pty. Limited.

The report, in 4 volumes, contains the results of an exploration programme carried out between August and November, 1974 to assess both the general area around Skeeter Creek and a potential open pit area.

Volume 1 contains the text, with supporting tables and figures, summarized drill hole and quality data (Appendix A), measured trench sections (Appendix B), and geological cross sections. Geological, structure contour, isopach, and quality maps are included in Volume 2. The drill hole records are included as Appendix C in Volumes 3 and 4.

CLIFFORD McELROY & ASSOCIATES PTY. LIMITED

G.R. Wallis,
B.E., M.Aus.I.M.M.

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An evaluation of 23 rotary and 6 diamond drill holes completed on the north and south sides of Skeeter Creek during September and November, 1974, in conjunction with previously drilled holes, has confirmed the presence of three coal horizons in the Lower Gething sequence, and revealed the existence of a fourth coal unit deeper in the stratigraphic column.

Of these four coal horizons, the 'B' Seam contains economic tonnages in a potential open pit situation. Further, an average thickness of 10 feet of this seam of low ash coal occurs throughout the area drilled to the south of Skeeter Creek. 11.3 feet of newly identified 'D' Coaly Horizon has been intersected in only one drill hole, approximately 300 feet below the 'B' Seam, and hence remains to be proved further. The 'A' Coaly Horizon occurs in the centre of the property, south of the area reviewed, as a significant thickness of coal in only two drill holes, being represented elsewhere by carbonaceous mudstone. The 'C' Coaly Horizon is composed of carbonaceous mudstone and coal, and is not regarded as economic.

The economic potential of these coal horizons is currently limited to a structurally thickened occurrence of the 'B' Seam at one locality adjacent to Skeeter Creek, which has been investigated in detail. Of the indicated total of 2.05 million short tons of raw coal-in-place, excluding the contained rock, 1.4 million short tons have been delineated

at a stripping ratio of 7:1, though in three separate areas, at this locality. The seam thickness is 10 feet when undeformed, but ranges up to 30 feet when faulted, while an average thickness, corrected for dip, is of the order of 18 feet, excluding an average of 5 feet of rock.

Due to the tectonic action, contamination of the coal by sheared rock has occurred. The run-of-mine coal is predicted to average 30% ash, with an F.S.I. of less than 2. The clean coal is expected to contain 7.5% ash, 19.5% volatile matter, and to have an F.S.I. of 3 and calorific value of approximately 14,000 B.T.U./lb.

Elsewhere in the area reviewed, no economic tonnages have been located. However, the presence of the 'B' Seam, the 'D' Horizon, and possibly the 'A' Horizon, indicate that the probability exists of locating additional tonnages in structurally thickened occurrences. The structure to the north of Skeeter Creek is such as to place a low probability of success on this area; however, the region to the south, toward Chamberlain Creek, warrants exploration.

SECTION 3

INTRODUCTION

3.1 OBJECTIVES

In August, 1974, Coalition Mining Limited commenced a programme to assess the strip mine potential of the coal seams in the various geological sequences of the Sukunka Property, which is located 37 miles south of Chetwynd, B.C.

Previous field investigations, outlined in part in Section 3.2 below, have indicated that there existed seams which might be amenable to strip mining in:

(a) the Lower Gething sequence - "Middle Coals;"
(b) the Upper Gething sequence - Skeeter and Chamberlain Seams; and
(c) the Commotion Formation - Gates Member coals.

An evaluation of the Lower Gething "Middle Coals" at the northern end of the property was commenced in September, 1974. The results of more than 25 drill holes indicated that, while in excess of one million tons of coal could be inferred to exist, the quality and structural complexities were such as to warrant a re-direction of activities, at this time, toward the Upper Gething Skeeter and Chamberlain Seams. Consequently, field activities were concentrated on these seams in the Plate 1 Area of the property. Report 1/4/20, dated March 31, 1975 (Wallis, 1975a) documents the results of that programme.

Previous geological investigations relating to the "Middle Coals" were based on limited field data, and consequently were not able to provide a complete evaluation of the potential of the coal seams in the Lower Gething sequence, particularly in respect to structure.

In view of the paucity of data and the possible potential of the coal seams in the Lower Gething sequence, an exploration programme was commenced in September, 1974, with the following objectives:

(a) a detailed evaluation of the "Middle Coals" 'B' Seam at the rear of the plant site clearing;
(b) determining any extension of these reserves;
(c) delineating any potential reserves of the "Middle Coals" on the north side of Skeeter Creek;
(d) assessing the Upper Gething seams toward the northern boundary of the Sukunka Property.

3.2 PREVIOUS INVESTIGATIONS

Previous reports have defined the geology and economic potential of the property as a whole. Two principal reports which refer, are the results of the 1971 and 1972 exploration programmes, McElroy & Wallis (1972), and Bryan, McElroy & Wallis (1973), respectively. For ease of reference in this report the above two documents are referred to as the 1972 Report and the 1972 Supplement, respectively, when applicable data from these investigations have been integrated into this programme.

The 1972 Report and the report by Jordon & Wallis (1973) both concluded that ". . . there is insufficient data on which to draw any conclusions as to the economic potential . . ." of the "Middle Coals."

The quality of the coal, based on one drill intersection, D.D.H. M-1A, indicated that a washed product at 1.60 S.G. could have an ash range of 1.3% to 11.3%. The crucible swell number of the raw coal ranged from 0 to 4 with the ash content ranging between 1.4% and 70.5%. Recommendations

were made in the report by Jordan & Wallis (1973) for further evaluation such that a definitive statement could be made.

In July, 1974, a photogeologic study by Hulbert (1974) discussed a number of areas where open pit coal may exist.

Dyson (1974), after field examination in August, 1974, concluded that ". . . very limited potential for open pit coal exists . . . in the Middle Coals of the Lower Gething." He stated that "As much as 2,000,000 tons of coal could be present (beneath the conveyor decline), but the prospect is not rated highly." in comparison with other areas on the property. To the north of Skeeter Creek, Dyson indicated that ". . . Middle Coals may be present . . ." dependent on structure and stratigraphy.

The work by Hulbert and Dyson, above, was part of an overall programme proposed by Dr. C. B. Newmarch of Brascan Resources (Newmarch, 1974a), which also provided for detailed evaluation by field mapping and drilling of, inter alia, the Lower Gething sequence north and south of Skeeter Creek.

As a consequence of the foregoing work and reports, an exploration programme was recommended in detail by Wallis (1974) with the aim of satisfying the objectives set out in Section 3.1, above.

3.3 GEOLOGICAL PROGRAMME

The field programme was commenced with the spudding of diamond drill hole (D.D.H.) M-2 on September 20, 1974, and was completed with rotary drill hole (R.D.H.) '0' on December 13, 1974.

A base map, at a scale of 1 inch equals 400 feet, with contours at an interval of 50 feet, was used for the Geological Map, Map 1. This base map had been previously produced photogrammetrically from 1970 air photography at a scale of approximately 1 inch equals 2,000 feet. A base map at 1 inch equals 100 feet was photographically produced from the above map for detailed control in the region of the plant site.

All access roads and drill sites were constructed using a Terex bulldozer on lease to Sukunka Colliery. Where practicable, existing roads were used, for example the access road to an abandoned gas well on the north side of Skeeter Creek. The survey control point, Master 'A', is located at the site of this well, Triad-BP Sukunka b-10-A.

3.3.1 DRILLING PROGRAMME

The drilling programme may be regarded as being in two phases, the detailed phase relating to the plant site area, and the more wide-ranging prospecting phase, primarily to the north of Skeeter Creek. The drill hole positions are shown on the various maps accompanying this report, in particular, Map 3 which shows their positions determined by surveying.

Table 3.1 lists the drill hole numbers and their respective footages. A total of 6,310 feet of drilling was completed, of which 1,679 feet was diamond cored, and 4,631 feet by rotary drilling.

In order to provide stratigraphic control through the Lower Gething sequence, a control hole, D.D.H. M-2, was drilled to 923 feet, being collared approximately 450 feet stratigraphically below the Upper Gething Chamberlain Seam. The objective of this hole, to penetrate the Cadomin Formation underlying the Lower Gething sequence, was not fully realised. The results are discussed in Section 4, below. The hole was contracted to Canadian Longyear Ltd., using conventional wire-line diamond drilling.

That phase of the drilling programme related to the detailed evaluation of the 'B' Seam at the rear of the plant site clearing, used both diamond and rotary drilling. All holes were drilled by Sedco Drilling, using a Mayhew 1500 rotary drilling rig employing mud circulation. The diamond cored holes, D.D.H.'s M-3 to M-6, were drilled using a Christensen core barrel with plastic inner liner to provide accurate coal quality data and structural control.

The "prospecting" or scout-drilling phase used only rotary drilling, and comprised R.D.H.'s 'A' to 'E', and 'K' to 'O', totaling 1,967 feet. A 220 feet deep hole, sunk to provide an underground water supply for the camp, R.D.H. 'WW', provided additional stratigraphic control to the north of Skeeter Creek.

Comments on the relative merits of the various drilling techniques employed were included in Section 3.1.1 (i) of the Plate 1 Report (Wallis, 1975), and are relevant here. Reference should be made to that report for those comments.

TABLE 3.1

MIDDLE COALS DRILLING PROGRAMME

D.D.H.* No.	Total Depth (ft)
M-2/2A	923
M-3	131
M-4	103
M-5	161
M-6	361
Total	1,679

R.D.H.* No.	Total Depth (ft)
A	202
B	200
C	202
D	200
E	200
F	177
G	195
H	200
I	223
K	205

R.D.H.* No.	Total Depth (ft)
L	260
M	193
N	200
O	105
P	157
Q	204
R	203
S	200
T	271
U	210
V	160
W	244
WW**	220
R.D.H. Total	4,631
D.D.H. Total	1,679
Total footage	6,310

Drilled in 1973:

D.D.H. M-1/1A 304 ft.

* D.D.H. = Diamond Drill Hole
R.D.H. = Rotary Drill Hole

** WW = Water Well for camp.

See Appendix A-1 for Summarized Drill Hole Data, and Volumes 3 and 4 for individual drill hole records.

Drilling costs are similarly discussed in Section 3.1.1 (ii) of the above report. In summary, the rotary drilling footage cost approximate $11.00 per foot, while the use of a Christensen barrel increased the cost to $20 per foot.

The results of the drilling programme are summarised in Appendix A-1.

3.3.2 RADIATION LOGGING

All holes were radiation logged to obtain three logs:

(i) natural gamma radiation log;
(ii) neutron log; and
(iii) density log.

These logs were used primarily as a check against seam depths and thicknesses, and, in the non-cored holes, as a control for the description of the cuttings and stratigraphic correlation.

Water levels were also identified in those bore holes where free standing water was present.

The logging was contracted to Roke Oil Enterprises Ltd., Calgary.

3.3.3 ANALYTICAL PROGRAMME

The core samples, after visual logging, were split into a number of plies, or increments, on the basis of lithotype and/or thickness. A proximate analysis plus free swelling index (F.S.I.), calorific value (C.V.), and specific gravity (S.G.) on the raw coal were determined. Composites were

prepared from various groups of ply samples; on these, a head raw analysis, a wash at 1.30, 1.40, and 1.60, S.G.'s, and froth flotation tests were conducted. The washed products were analysed as for the raw coal plies.

Coal samples were collected at two feet to five feet increments from the rotary drill holes. Due to contamination by rock cuttings, as observed under the microscope, only five such sets of samples warranted analysis. The analytical procedure followed was essentially the same as for the core samples.

The prime purpose of washing the samples was to determine the specific gravity of the cleaned coal and to assess the coking potential of the coal.

The analytical data for each hole analysed is tabulated in Appendix A-3, and the complete analytical reports from the laboratory are included with the respective bore records in Appendices C-1 and C-2, Volume 3.

Ash values and F.S.I.'s are shown on each seam section for the analysed seams in the diamond drill holes and R.D.H.'s 'C', 'H', 'T', 'V' and 'W'.

All analytical work was carried out by the Coal Sciences and Minerals Testing Division of Birtley Engineering Ltd., Calgary.

3.3.4 GEOLOGICAL EVALUATION AND REPORT PREPARATION

Logging of the rotary drill hole cuttings and diamond core was carried out throughout the drilling phase of the programme. Description of the cuttings was by use of a binocular

microscope, using accepted descriptive procedures. All cuttings and drill core are stored at the site, as in previous programmes.

A preliminary evaluation was produced for a Coalition Mining Limited Board Meeting in November, 1974 (Newmarch, 1974b). For this evaluation the strategic drill holes were used to provide a preliminary evaluation of the structure, stratigraphy, and coal quality of the potential open pit area near the proposed plant site. In view of the shift in emphasis to the Plate 1 Area, referred to above, the final evaluation was deferred until April, 1975, after completion of the Plate 1 Report.

The geology of the area to the north and south of Skeeter Creek is shown on Map 1, and illustrated in the sub-surface by two geological Cross Sections, A-B-C and D-E, at a scale of 1 inch equals 400 feet.

The detail of the potential open pit area near the plant site is illustrated on seven cross sections at a scale of 1 inch equals 100 feet. Two Cross Sections, L+0 and L+500, are approximately longitudinal to the structural trend; the remaining five, designated by the prefix T plus a footage, are transverse to the structural trend. The identification of the transverse cross sections is based on the point of their intersection with the base line L+0, since they are not perpendicular to it.

The large-scale cross sections are integrated with the Structure Contour Map on the Roof of the 'B' Seam, Map 5, and Depth of Cover Isopach Map, Map 8.

Appendix C contains the drill hole data on which this evaluation is based. The Appendix is divided in three parts

containing the records for the diamond drill holes (C-1), rotary drill holes from which the seams have been analysed (C-2), and rotary drill holes where no analyses are available (C-3). Each drill hole record in Appendices C-1 and C-2 contains:

(i) summary data, location, etc.;
(ii) seam sections;
(iii) analytical data;
(iv) written description, if D.D.H., or strip log if R.D.H.;
(v) stratigraphic/lithologic graphic section combined with radiation log at a scale of 1" = 10'.

Appendix C-3 contains the rotary strip log showing the lithologic column, and the radiation log of each hole where no analysis of the seam is available. All pertinent details (location, etc.) are included on the rotary strip log.

The completion of the field programme and the report has been facilitiated by the very willing assistance and cooperation of many people. Thanks are due in particular to Dr. C. B. Newmarch of Brascan Resources Limited, who laid down the broad framework for the programme and provided constructive criticism and comment throughout the evaluation. The assistance of those staff of Brascan Resources Limited for the drafting, typing, and collation of the report is also gratefully acknowledged.

Mr. R. S. Vogan of Ross S. Vogan & Associates Ltd. assisted materially in the field and office during the field programme phase in setting up guidelines for the sampling and description of the rotary drill cuttings, logging of the cuttings, and participating in the synthesis of the data during the development of the structural concepts detailed in Section 4.3 below.

The willing assistance from the personnel of the Sukunka Colliery, made available by Mr. J. A. Burns, was also very much appreciated. In particular, Mr. R. E. Shields, who ably provided the field control of the drilling rig and support facilities, also logged the drill holes on the north side of Skeeter Creek, and produced the basic geological interpretation of that area.

Clifford McElroy & Associates Pty. Limited

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July 3, 1975

Dr. C. B. Newmarch,
Vice President, Exploration
Coalition Mining Limited
Suite 1200, Bow Valley Square 1
202 Sixth Avenue S. W.
C a l g a r y , Alberta
T 2 P - 2 R 9

Re: Report No. 1/4/23 - Geological Report on the Lower Gething Sequence in the Vicinity of Skeeter Creek

Dear Dr. Newmarch,

Herewith are copies of the above report, in four volumes, detailing the results of the exploration programme conducted between August and November, 1974.

Six copies of the report have been prepared for distribution as follows:

Coalition Mining Limited, Calgary	-	2 copies
Coalition Mining Limited, Vancouver	-	1 copy
Coalition Mining Limited, Sukunka	-	1 copy
Austen & Butta Ltd., Sydney	-	1 copy
Clifford McElroy & Associates, Sydney	-	1 copy

A set of mylars of the maps and cross sections have been produced for Austen & Butta Limited, as requested by them.

Thanking you for the opportunity to be of service to you in this regard,

Yours very truly,

G. R. Wallis

cc.: Dr. C.T. McElroy; Mr. R. Austen

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COALITION MINING LTD.

SUKUNKA COAL PROJECT

LOCALITY MAP
FIGURE 3.1

MAY 1975

SCALE 1" = 1000'

0 500 1000 2000 3000 FT.

See MAP 1 for Geological Map

MAP 1 AREA
GEOLOGICAL MAP
1" = 400'

MIDDLE COALS
MAPS 6 - 9
1" = 200'

PLATE 1 AREA

GRID BASE LINES

TO CHETWYND

Sukunka Camp

Old Campsite

Skeeter Creek

Rim Fault

Chamberlain

Fault

gel

geu

mb

cos

cdl

nl

N

SECTION 4

GEOLOGY

4.1 INTRODUCTION AND GENERAL GEOLOGY

In that the geology of the Sukunka property has been previously dealt with in detail, reference should be made to the corresponding section of the 1972 Report for the considerable amount of data relevant to the stratigraphy and structure of the area as a whole. Consequently, only that part of the stratigraphic column relevant to this report will be discussed in any detail. The following summary of the stratigraphy will provide a useful background for the ensuing discussion.

The sequence of rocks of importance in this report is the Lower Gething sequence, which comprises approximately the lower 1,000 feet of the Gething Formation of Lower Cretaceous age. The sequence has been divided into ten individual rock units, including four coaly horizons.

Of the ten units, seven relate to the upper 500 feet of the sequence, which is more completely detailed than the basal three units.

Underlying the Lower Gething sequence is the Cadomin Formation which is dominantly a massive conglomerate and sandstone unit.

The Chamberlain Seam is the basal unit of the overlying Upper Gething sequence, which comprises the upper 150 feet to 290 feet of the Gething Formation. The marine mudstones of the Moosebar Formation overlie the Gething Formation.

The description of the Lower Gething units is based principally on drill hole data, since outcrop data is scant due to glacial debris, heavy tree-fall, and vegetal cover. Diamond drill holes S-2, S-4, S-7 and S-8, drilled by Brameda Resources Ltd. in 1969,

and C-35 and M-1A, drilled by Coalition Mining Limited in 1971 and 1973, respectively, were the principal holes to penetrate significant thicknesses of the Lower Gething strata prior to this study. These holes are the basis for the report by Jordan & Wallis (1973) on that sequence of rocks. Figure 5.1 shows the locations of these holes.

The rotary holes drilled during the 1974 programme, see Section 3.3.1, have further defined approximately the upper 450 feet of the Lower Gething strata, and D.D.H. M-2 has provided more data on the lower units of this sequence.

The quality of the samples collected during the drilling of Triad - B.P. well b-10-a, situated adjacent to the survey point, Master 'A', to the north of Skeeter Creek, is such as to preclude their usage for correlation pruposes in the interval of interest.

Correlation of the different units has been possible by use of those marker units present in the sequence. Cross Sections A-B-C and D-E illustrate the correlations established in an east-west direction.

4.2 STRATIGRAPHY OF THE SKEETER CREEK AREA

The area under discussion is covered by the Geological Map, Map 1. For completeness, a brief review of the Cadomin Formation is included, although no outcrop of this formation appears on the map, since conglomeratic units similar in character to the Cadomin Conglomerate are present in the basal section of the Lower Gething. The post-Lower Gething units are not treated in any detail since they have been fully discussed in previous reports.

The northern side of Skeeter Creek is essentially an extention of Plate 3, that is, below the Skeeter Fault. The 1972 Report details the structural entities of the property. To the west of the area, the basal units of the Lower Gething sequence have been thrust up over the upper units of the same sequence. East of the Skeeter Fault, the sequence becomes progressively younger, the Commotion Formation being the youngest unit to crop out; see Map 1.

The folding and faulting as shown on Section D-E is diagrammetric, since insufficient data is available to more fully define the configuration of the various units.

The lithologies comprising the dip slope to the north of the camp site area belong to the "sandstone-siltstone facies," Unit 3, below the potentially economic 'B' Seam; this sequence is described in Section 4.2.2 (iii), below. Correlation has been established between R.D.H.'s 'O', 'N', and 'WW'. The 'B' Seam was penetrated in the latter hole at 172 feet.

An undeformed 'B' Seam is inferred to occur approximately 290 feet below the surface at R.D.H. 'A'. A glauconitic horizon at 60 feet in R.D.H. 'B' is correlated with the same unit at 115 feet in R.D.H. 'A'. This unit also provides control for correlation with drill holes to the south across Skeeter Creek; R.D.H.

'K' at 115 feet; D.D.H. S-8 at 458 feet, and D.D.H. C-35 at 1180 feet.

At the permanent survey point, Master 'A', a highly folded sequence of Chamberlain Seam and related rock units crop out.

The identification of the Skeeter Seam in R.D.H. 'C' is not positive, due either to faulting or a possible facies change. This is the only hole in the northern area in which coal was intersected.

To the south of Skeeter Creek, and in the area of prime interest, sediments referrable to the middle and upper Lower Gething sequence occur. These are overlain by the Upper Gething sequence rocks, the region as a whole comprising Plates 2a and 2b. Section A-B-C illustrates the sub-surface geology of this area.

The rock units overlying the potentially economic 'B' Seam, Units 5 to 10, have been penetrated in numerous bore holes, and are clearly defined. Section 4.2.2 describes these units in detail; Section 5 outlines the economic potential of the coal seams.

4.2.1 CADOMIN FORMATION

The Cadomin Formation has been widely recognised throughout the Rocky Mountain Foothills, and has been described by Stott (1968; 1973) in detail. This formation, which underlies the Gething Formation, is typically a massive conglomerate containing well-rounded chert, quartz, and quartzite pebbles, cobbles, and boulders. From the Peace River region, where it consists of coarse-grained, conglomeratic sandstone, it grades northwards into a finer sandstone.

R. Verzosa of Teck Corporation Ltd. has recorded in excess of 300 feet of Cadomin Formation in Saddle Creek to the south of Bullmoose Mountain (Pers. Comm.).

The nearest section measured by Stott (1973), Section 70-4, on Bullmoose Mountain records 276 feet of Cadomin Formation

consisting of conglomerate and sandstone in beds up to 50 feet thick, though commonly of the order of 20 feet thick. To the south, in the vicinity of Wolverine Creek, Stott (1968) records 45 feet and 146 feet of Cadomin Formation in Sections 59-11 and 61-12A, respectively.

D.D.H. M-2 was drilled to provide stratigraphic control in the area, and to test the hitherto untested Lower Gething strata for additional coal seams. The target of this hole was selected as the Cadomin Formation in order to provide data on the thickness of a complete Gething Formation section at Sukunka. This hole was originally programmed for a total depth of 800 feet; however, it was drilled to 923 feet, without penetrating the Cadomin Formation. A 17 feet thick, pebbly sandstone unit, identifiable in the field as Unit 2 (see Figure 4.1), was penetrated at 889 feet, providing a guide to the thickness of the Lower Gething section. This unit is between 50 and 80 feet above the Cadomin Formation.

4.2.2 LOWER GETHING SEQUENCE

The top of the Lower Gething sequence of rocks is defined, informally, as the floor of the Chamberlain Seam. The base of the sequence is defined by the underlying conglomerates of the Cadomin Formation, though not at the same level at every locality due to lateral facies variations.

The thickness of the sequence, while not positively established, varies between 950 feet and 1,050 feet. D.D.H. M-2 has provided data on the lithologies and coaly members present in the lower 400 feet to 500 feet of Lower Gething strata, which is a monotonous sequence of interbedded sandstone and siltstone containing dark grey to carbonaceous mudstone and coaly beds. The lack of diagnostic features in this interval makes the identification of fault repetitions particularly difficult.

Stott (1973) has recognised 1,260 feet of Gething Formation in Section 70-4 on Bullmoose Mountain. From this, it is inferred

that approximately 1,000 feet of Lower Gething sequence rocks occur on the Sukunka property, confirming the interpretation in D.D.H. M-2.

The Lower Gething sequence has been divided into 10 individual rock units as shown in Figure 4.1 and described below in detail in ascending stratigraphic order. The upper 470 feet of strata, comprising units 4 to 10, are more completely defined than the underlying units, 1 to 3.

Table 4.1 shows the correlation between the 10 stratigraphic units and the symbols used on the Geological Map and Cross Sections. Figure 4.2 shows the drill holes from previous programmes which penetrated these rock units.

(i) Unit 1 - Fine-Grained Sandstone Facies

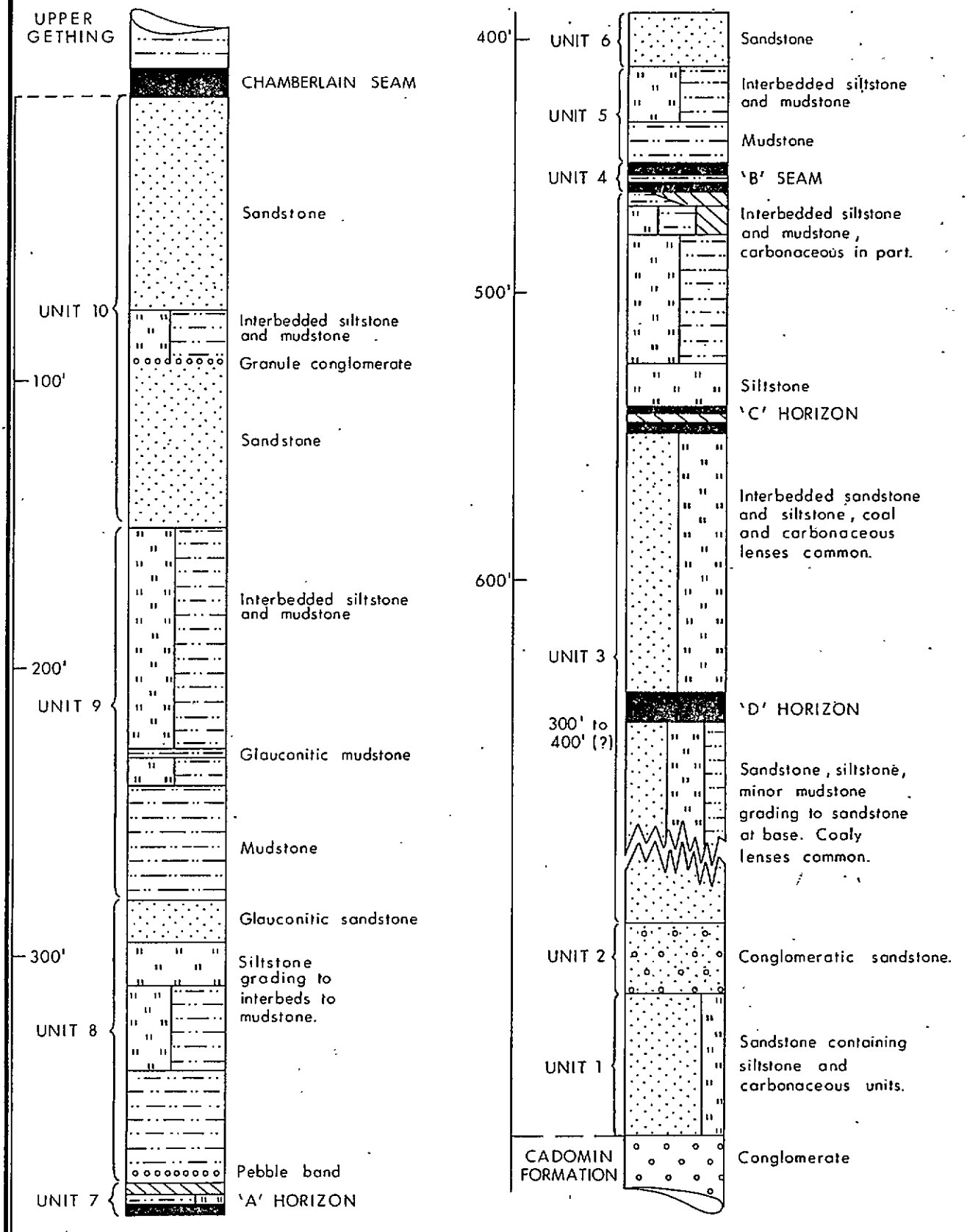
This unit has not been penetrated in any drill hole on the property to date, but is know from sections measured by Stott (1968 and 1970). It is principally a sandstone-siltstone sequence containing coaly and carbonaceous phases. Mudstone is also present in some sections.

Stott (op. cit.) records 83 feet to 90 feet in the vicinity of Wolverine Creek, and a similar thickness at Bullmoose Mountain.

(ii) Unit 2 - Conglomeratic Sandstone

This unit is composed of beds of conglomeratic sandstone and coarse to medium grained sandstone. The pebble size is commonly less than 2 inches, and averaging 0.75 inch. The sandstone matrix is medium to coarse grained and quartz-lithic in character. White chert, quartz, and mudstone constitute the pebble types.

Stott (1973) has termed this unit a "chert pebble conglomerate facies," and provides a fuller description in Bulletin 219. The unit is recognised in D.D.H. M-1 and in the field as a distinctive strongly outcropping series of beds. Thickness of the beds of



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CLIFFORD McELROY & ASSOCIATES PTY. LTD.
for
COALITION MINING LIMITED

COMPOSITE GRAPHIC SECTION
LOWER GETHING SEQUENCE

DRW BY G.R. WALLIS DATE: MAY 1975 SCALE: 1" = 50Ft.

FIGURE 4.1

TABLE 4.1

CORRELATION BETWEEN ROCK UNITS

AND MAP/SECTION SYMBOLS

UNIT	ROCK UNIT	MAP/SECTION SYMBOL
10	Sandstone Facies	Kgla
9	Interbedded Siltstone & Mudstone Facies	Kglb
8	Siltstone-mudstone Facies	Kglc
7	'A' Horizon	
6	Sandstone	Kgld
5	Interbedded Siltstone - Mudstone; Mudstone	Kgle
4	'B' Seam	
3	Sandstone-Siltstone Facies with Carbonaceous Phases	Kglf
2	Conglomeratic Sandstone	Kglg
1	Fine Grained Sandstone	Not Mapped

this unit ranges up to 50 feet, but is variable due to the nature of the lighology.

(iii) Unit 3 - Sandstone- Siltstone Facies with Carbonaceous Phases

This unit is ill-defined due to limited penetration by drilling and poor outcrop. Into the sequence have been placed all those sediments occurring between the 'B' Seam, Unit 4, and the preceding unit, Unit 2. It is anticipated that further subdivision will be possible with additional sub-surface data.

The sequence of rocks generally increases in grain size with depth. Siltstone and mudstone predominate in the upper 50 to 70 feet, grading to sandstone and siltstone throughout much of the underlying part of the unit, with sandstone occurring in the basal 20 to 40 feet. Carbonaceous lenses and coaly phases are common throughout the complete sequence.

Two Coaly Horizons, 'C' and 'D', occur approximately 70 feet and 180 feet respectively below the top of the unit. These are discussed further in Section 5, below. These horizons are referable to the "Lower Coals" of Jordan & Wallis (1973), though a re-definition is necessary at this time, with the additional data available. An exposed section of coal and carbonaceous material in the north bank of Skeeter Creek, measured in 1973, is included as, "Lower Coals" Section in Appendix B. No direct correlation of this section is possible with a definite part of Unit 3 at this time.

The sandstone in the basal part of the unit is fine to medium grained, with occassional coarse grained phases, light grey to mid-grey in colour, and commonly contains carbonaceous to dark grey mudstone laminae. The overlying sandstone units are similar in character though fine in grain size, grading into mid to dark grey coloured siltstone units. Slump structures, graded bedding, mud swirls, and penetration structures are common. Siltstone-mudstone interbeds, grading to laminite, are present in the upper

part of the unit, alternating with mudstone and siltstone beds.

Variations in the detailed stratigraphy 50 feet to 100 feet below the 'B' Seam (Unit 4) have been caused by a localisation of tectonism in the unit. A number of diagnostic features can be recognised from the radiation logs which have assisted correlation in the area of the potential open pit. Correlation with D.D.H. M-2, outside the open pit area, is not conclusive however. These relationships are illustrated on the Correlation Diagram, Drawing No. SKR 244, (Volume 2). The significance of tectonic action in relation to stratigraphic variations is discussed further in Section 4.3.3 (iii), below.

Faulting has been identified in D.D.H. M-2, but due to similarity of the strata, combined with a lack of diagnostic features, the positive identification of stratigraphic repetitions is not possible. As a consequence, the determination of the true thickness of this sequence is subject to further verification. Dependent on the vertical displacement of the Rim Fault in D.D.H. M-2, the thickness of Unit 3 varies between 300 feet and 400 feet.

(iv) Units 4 to 7 ("Middle Coals")

The lithologies included in these four units were, for the most part, originally referred to as the "Middle Coals" by Hughes (1969/70). The term was retained in the 1972 Report since it has been convenient to refer to that sequence of coal measures below the Chamberlain Seam by that name.

These units were further defined by Jordan and Wallis (1973), and the name has since been accepted in common usage. Thus it is retained in this report, though with further sub-surface exploration, it is suggested that a more correct terminology would be the "Lower Gething Coals." This would also provide for the inclusion of the hitherto unknown 'D' Coaly Horizon, and the 'C' Coaly Horizon, which are assigned to Unit 3 in this report.

In addition to the drill holes from the current programme which penetrated this sequence of rock units, part or all of the sequence was intersected by D.D.H.'s S-4, S-7, S-8, C-35, and M-1A, drilled in previous programmes. It was from these holes that the 'B' Seam was originally defined. See Figure 4.2.

Figure 4.1 shows the sequence to be composed of the 'A' Coaly Horizon (Unit 7) and the 'B' Seam (Unit 4), separated by three distinctive lithologies. The 'B' Seam is overlain by mudstone grading upwards into interbedded siltstone and mudstone (Unit 5), which in turn is overlain by fine to very fine grained argillaceous sandstone. Only Units 6 and 7 have been identified to the north of Skeeter Creek, due to the limited penetration of the strata. To the south these two units occur in the various drill holes, providing accurate control over the position and thickness of the 'B' Seam.

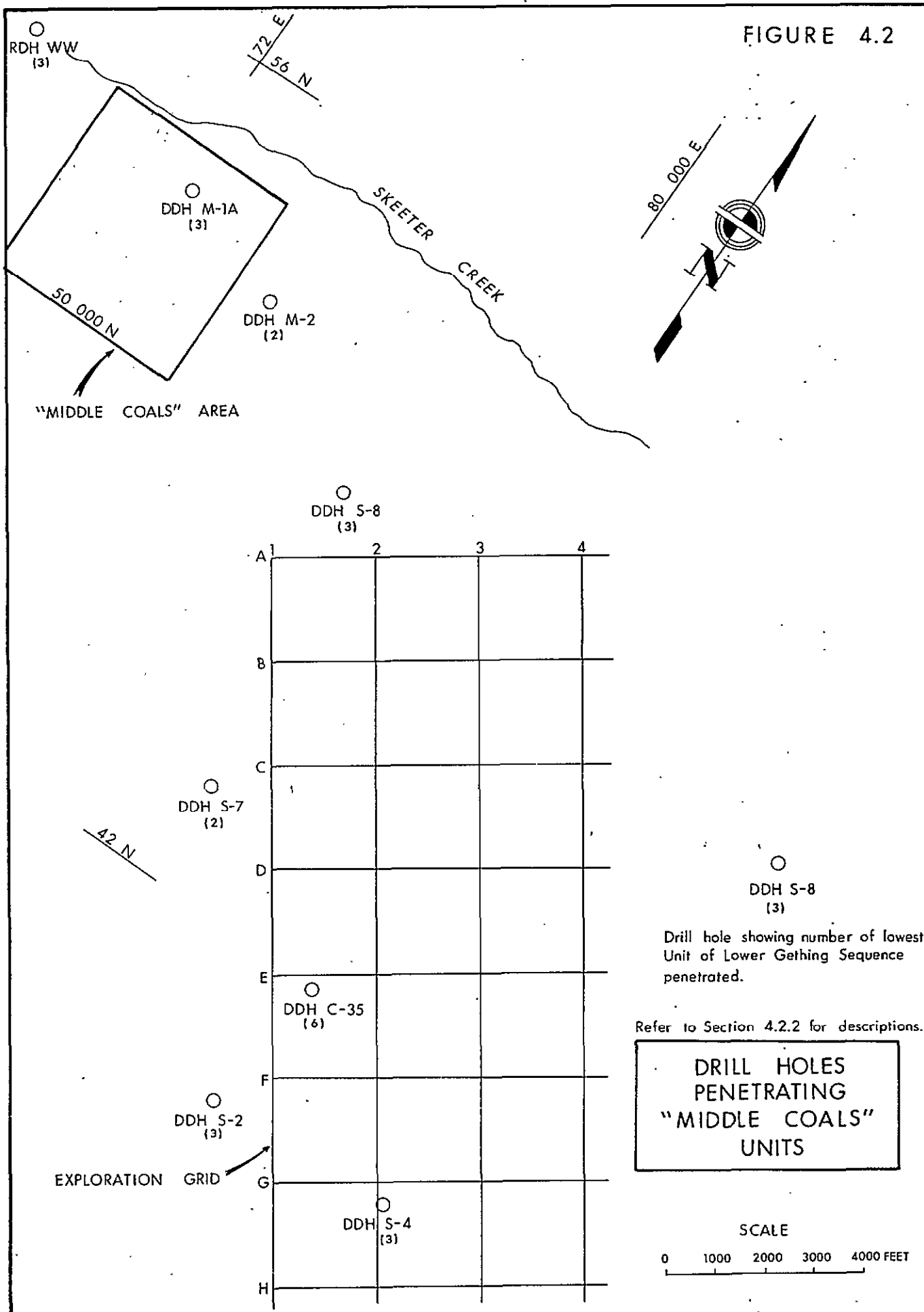
Unit 4, the 'B' Seam, is potentially economic, and while the 'A' Coaly Horizon is predominantly carbonaceous mudstone and coal, a number of drill holes record reasonable thicknesses of coal. Refer Section 5 for details of the economic potential of these units.

Unit 5 varies in thickness from 30 to 35 feet with the interbeds ranging in thickness from 18 to 20 feet. Unit 6 commonly is 20 feet thick, though a thickness of 32 feet is recorded in D.D.H. M-2.

(v) Unit 8 - Siltstone-Mudstone Facies

The top of the unit is defined as the top of a medium grained sandstone which is fine grained and glauconitic in the upper two feet. This unit grades downwards through siltstone to interbedded siltstone and mudstone to mudstone in the basal 35 to 60 feet. A pebble band at the base of the mudstone is common, but not always present.

FIGURE 4.2



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Both the pebble band and, more particularly, the glauconitic sandstone are distinctive markers in the Lower Gething sequence. They have been observed in the majority of the drill holes penetrating this part of the section.

The total thickness of the unit is reasonably constant, approximating 100 feet.

(vi) Unit 9 - Interbedded Siltstone and Mudstone Facies

Unit 9, overlying Unit 8, is composed predominantly of interbedded siltstone and mudstone, grading downwards into mid to dark grey mudstone in the basal 30 to 50 feet. Fifty feet above the base of the unit, and within the interbedded sequence, a glauconitic mudstone, one to two feet thick, commonly occurs.

Intersections in 5 diamond drill holes (S-2,S-4, S-8, S-48, and C-35) indicate that the thickness range of this unit is 120 to 140 feet and widely distributed.

(vii) Unit 10 - Sandstone Facies

The upper unit of the Lower Gething sequence, which forms the floor of the Chamberlain Seam, has been partially penetrated in the majority of the drill holes on the Sukunka Property. It is a sandstone sequence, massive and carbonaceous in the top 8 feet, becoming well bedded and flaggy in nature over the remainder of the interval. Approximately 20 feet of interbedded siltstone and mudstone, characterised by a thin basal granule conglomerate, occur near the centre of this unit. The maximum thickness of this unit is 150 feet.

4.2.3 POST LOWER GETHING SEDIMENTS

No detailed discussion of the Post Lower Gething sediments is included here since they have been described in considerable detail in both the 1972 Report and the 1972 Supplement.

Upper Gething sequence rocks crop out on the hills to the north of Skeeter Creek, and near Mine No. 1, above the potential open pit area. Section A-B-C and the Geological Map illustrate the conformable nature of the Upper Gething sequence above the potential open pit area.

At Master 'A, to the north of Skeeter Creek, the Chamberlain Seam and the floor of the seam, Unit 10 of the Lower Gething sequence, are intensely folded with associated minor faulting. These sediments have also been penetrated in R.D.H. 'C' and 'D'. To the north-east of this locality, mudstones of the Moosebar Formation crop out. Mapping by P. Dyson and photo-interpretation show that Commotion Formation sandstones and conglomerates overlie the Moosebar Formation.

4.3 STRUCTURAL GEOLOGY OF THE SKEETER CREEK AREA

4.3.1 INTRODUCTORY STATEMENT

As with previous sections of this report, reference should be made to the corresponding section of the 1972 Report for details of the structural geology of the area on a regional and property scale.

The following discussion of the structural geology is divided into two categories. Section 4.3.2 outlines the broad scale structure as it relates to the Skeeter Creek area.

Section 4.3.3 describes the structural geology of the potential open pit area immediately south-east of the preparation plant clearing; see Figure 3.1. This area, because of its potential economic importance, is treated in more detail than the regional scale structure.

Because of the complex structure in the latter area, and the data available, the results of the study are interpretive. Further infill development drilling is necessary before final open pit design can be undertaken; see Section 6 - Recommendations.

4.3.2 STRUCTURE OF SKEETER CREEK AREA

The Geological Map, Map 1, and Sections A-B-C and D-E, at a scale of 1 inch equals 400 feet, illustrate the structure north and south of Skeeter Creek. Map 1 shows the surface trace of the Skeeter and Rim Faults which were determined by converging the structure contours on the fault planes, projected from bore hole intersections to the east, with surface topographic contours.

In the absence of positive field evidence, the location of the Skeeter and Rim Faults as shown on Map 1 is considered to be inferred. A slight change in dip on either of the fault planes could alter the location of their surface traces significantly.

North of Skeeter Creek, the structure consists of a broad, north-westerly trending anticlinorium. The south-west limb dips between 20° and 40° west where older units have been thrust over younger beds of the Lower Gething sequence by the Skeeter Fault. The displacement of this fault in this area is in excess of 500 feet. The north-eastern limb dips to the east at between 5° and 15°, and is intersected by thrust faults with displacements of the order of 20 feet. Tight folding with associated faulting is in evidence at the survey point Master 'A' and small overthrust faults have been identified in R.D.H.'s 'C' and 'D'.

The Rim Fault to the south of Skeeter Creek, as shown on Section A-B-C, strikes north-westerly and dips west at between 10° and 12°. Although mapped as a single plane, in actuality, it occurs as a zone of deformation, the exact thickness and location of which has not been accurately defined in this study.

A series of "splinter" of "ski-jump" faults generated from the Rim Fault zone, have deformed the rock units in the immediate vicinity of the 'B' Seam with a consequent thickening of that seam. It is this structural thickening of the seam which makes it potentially attractive from an economic point of view.

A second major unnamed fault, shown on the eastern limit of Section A-B-C, has upthrust the lower units, Units 2 and 3, of the Lower Gething sequence over younger units, Units 5 and 6. This fault has a throw of approximately 300 feet and is thus a major structural feature in the area. It constitutes a western limit to the potential open pit area. While its relationship to the Rim Fault has not been defined, it is significant to record that it is of similar magnitude.

4.3.3 STRUCTURE OF POTENTIAL OPEN PIT AREA

(i) Introductory Statement

At the rear of the area previously cleared for the proposed preparation plant and on the south side of Skeeter Creek, an

area of potentially economic coal has been explored in detail (see Figure 3.1). The structure of this locality is discussed here, and the economic geology in Section 5.4.

A series of sections at a scale of 1 inch equals 100 feet are included to illustrate the structure in the subsurface. The location of the sections are shown on Maps 4 to 9. The data sources for the study are principally from drill hole records in Appendix C, supported by field mapping. The structural interpretation is based primarily on subsurface stratigraphic/lithologic correlations, since the majority of drill holes were drilled by rotary technique and few cores were taken.

(ii) Description of Structural Model

The following "model" describes the structure of the area where potential open pit coal occurs. Further infill development drilling is necessary to confirm this concept and to refine the interpretation in order to provide data for design purposes.

The model consists of a drag fold forming two west-dipping plates, separated by a west-dipping fault of relatively small throw. See Map 5, and Figure 4.3 Structure Contours on Roof of 'B' Seam.

The western plate is anticlinal in form, while the eastern one is synclinal. Sections T+515 and T+2250 illustrate these elements, while Section T+1190 shows a secondary fault dislocating the anticline. The fault is discontinuous to the south-east and is replaced by a large fold, as shown on Section T+2830.

The relationship of these various structural features to each other, and to the Rim Fault, are the prime elements requiring clarification.

(iii) Faulting

(a) Nature of Fault Zones:
The identification of faults or more correctly, fault zones, from rotary drill hole cuttings is based principally on the

repetition or thickening of stratigraphic units established in detailed log and sample correlations, and on the appearance of the cuttings (slickensided, calcite coated, etc.). In respect of the coal seams, an abnormal thickness of the seam is recognised as a positive indicator.

The thickness of the fault zones is variable. Thickening of the 'B' Seam, in particular, from a normal thickness of 10 to 12 feet, to greater than 30 feet, and of the underlying rock units suggests considerable bedding plane to sub-bedding plane movement or intense folding and crumpling of the sediments at the point of intersection of the rock unit and the fault plane. Confirmatory evidence is observed in Trench No. 1 (see Appendix B).

(b) Incidence and Effect of Faulting:

Reference to the various cross sections shows that much of the faulting has been localised in Units 4 and 3, the 'B' Seam and its immediate floor rocks, as evidenced by the extensive tectonically thickened seam intersections. Faulting above the seam is uncommon and, where present, is of small magnitude.

The locus for the faulting below the seam is in a carbonaceous mudstone unit interbedded with coaly phases. These lithologies are less competant and more susceptible to deformation. The extent of the faulting is illustrated on the cross sections by the deep blue colour of Unit 3, symbol Kglf.

Identification of the various lithologic variations below the seam is not positive due to limited hole depths, although tentative correlations have been established principally by the use of radiation log characteristics. The presence of fault action is indicated by the occurrence of rapid thickness changes, a sharp shift of the gamma-ray response to the right, slickensided surfaces and calcite fracturing. See correlation Diagram, Drawing No. SKR 244, (Volume 2).

(c) Configuration and Origin of Fault Zones:
The faults strike north-westerly, and dip to the south-west at angles between 30° and 45°, as shown on the various transverse cross sections.

Cross Section T+1190 illustrates the various forms of faulting which are present in the area under discussion. Two types are shown:

1. Sub-bedding to bedding plane faults, and
2. Steeper dipping, "splinter" or "ski-jump" faults.

The former cause more widespread thickening of part of the section, for example, the coal seam, with minimal vertical displacement, while the latter tend more to dislocate the stratigraphic sequence as a whole, by vertical displacement. The magnitude of this displacement in the case of the central fault is commonly less than 50 feet.

The presence of bedding plane faulting is indicated from the reasonably widespread occurrences of thickened seam intersections. Steeper faulting can and does cause the thickening but the incidence of such faults would be more common than is likely to occur if such faults were used to explain the number of thickened seams. Surface and subsurface data indicate the presence of one significant overthrust with smaller associated ones within the potentially economic area.

An alternative interpretation of the fault pattern might be an 80 to 100 feet disturbed zone below the mudstone roof of the 'B' Seam, Unit 5, representing a major zone of deformation. This is regarded as unlikely since such an occurrence has not been observed elsewhere on the property. The Rim Fault, a major entity in itself, is interpreted to be the source of the overthrust fault dissecting the area. Such an origin would not be contradictory to the generation of fault zones as it applies to the Rocky Mountains. See Irish (1968) for more detailed treatment of this concept.

(iv) Folding

The fold pattern is essentially a large drag fold, dislocated by a fault. The cross sections and the Structure Contour Map, Map 5 illustrate this feature; see also Figure 4.3. As a consequence of the faulting, two west dipping "plates" are formed, which in detail are anticlinal and synclinal in transverse cross-section. The longitudinal sections, L+0 and L+500, illustrate the "north-south" continuity of each plate.

The western limb of the anticline, which forms the upper or western plate dips at 30° to the south-east flattening to 15° west in the north-west. The eastern limb of the syncline, or the lower or eastern plate, dips at angles of between 30° and 45° to the west for most of the length.

To the south-east of the area, the structure is represented by an anticline and syncline not dislocated by faulting. This feature represents a region where the deformation was less intense, thus dislocation by overthrusting did not take place. The seam thicknesses in this area are considered essentially normal and unfaulted; refer to logs of R.D.H.'s 'R'and 'S'.

(v) Prediction of Similarly Deformed Areas

From a prospecting viewpoint, this study may have application to other areas on the property.

This subject has been discussed in relation to the Upper Gething sequence, Wallis (1975b) who, inter alia, concluded that:

> "5. In a general sense, it is not possible to predict with any significant degree of confidence if any particular fault/seam intersection has more potential than another. Rather, all must be regarded as having equal potential, all other factors being similar."

This conclusion will apply, in the general sense, to the Lower Gething sequence rock units.

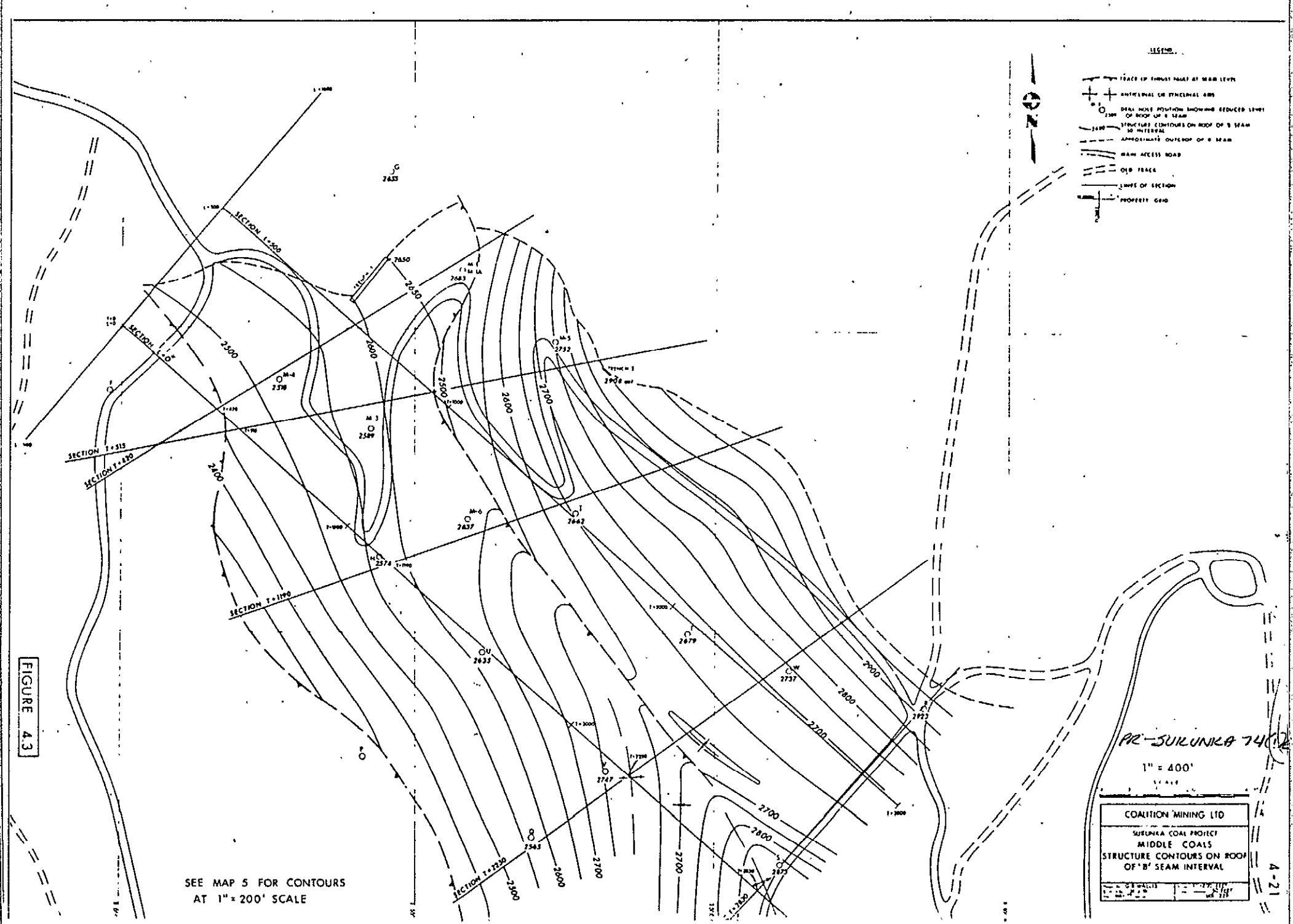

FIGURE 4.3

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For a structurally thickened seam with open-pit potential, three elements must be coincident at one point in space:

(a) a coal seam of significant thickness;
(b) a major fault system, or systems, intersecting the seam;
(c) topography conducive to low stripping ratios.

As to whether the particular structural configuration which exists in the potential open pit area, and described above, is unique or not (as raised by Dr. Newmarch), it is not possible to be definitive until the particular structural configuration is more completely defined. The close proximity of the two major faults, the eastern unnammed boundary fault and the Rim Fault, to each other may well be significant.

In other areas on the property where structurally thickened coal seams are known, the occurrence is normally on a more limited scale, being linear in extent and related to only one major fault, than the area described above. From this one may assume that the mechanism operating in relation to the "Middle Coals" area may have a "uniqueness" about it, though no other Lower Gething coals have been explored to date.

SECTION 5

ECONOMIC APPRAISAL

5.1 INTRODUCTION

This section provides an appraisal of the currently known potential of the Lower Gething sequence of rocks. Though the regional data is both scant and widespread within the property limits, some predictions are possible.

The results of the drilling programme in the vicinity of Skeeter Creek are discussed in Section 5.3; also included in this section are comments on the Upper Gething sequence of rocks, to the north of Skeeter Creek where a number of holes were drilled as part of the recent exploration programme.

Within the above region, one area, termed the "potential open pit area", has been explored in detail, allowing a provisional economic assessment to be made; section 5.4.7 summarises the assessment included in Section 5.4. Further, the quality data from this programme provides a guide to the likely quality of the main economic seam, the 'B' Seam, elsewhere on the property.

5.2 LOWER GETHING SEQUENCE COAL SEAMS

Four distinct coaly horizons have been identified in the Lower Gething sequence, in addition to the numerous carbonaceous phases which occur in the lower parts of the sequence. These are:

- 'A' Coaly Horizon
- 'B' Seam
- 'C' Coaly Horizon
- 'D' Coaly Horizon

The term "coaly horizon" is used herein in reference to an identifiable coal or carbonaceous member (a) for which the economic potential has not, as yet, been established or (b) is a distinct stratigraphic marker bed. The 'A' and 'D' Horizons may have economic potential dependent on lateral continuity. The 'C' Horizon is non-economic since it is essentially carbonaceous mudstone with occassional coal lenses thus placing it in category (b) above. The remaining member, the 'B' Seam is potentially economic, as detailed below. A description of the four coaly members follows.

5.2.1 'A' COALY HORIZON

The 'A' Horizon or Unit 7, overlies the strongly outcropping sandstone of Unit 6, see Figure 4.1, while a thin pebble band commonly overlies it, thus acting as a distinct marker for the identification of the unit.

This unit has been intersected in four drill holes from previous programmes, D.D.H.'s S-4, S-7, S-8 and C-35, (Table A-1.3) and eight drill holes from the 1974 programme, D.D.H.'s M-2/2A and M-5, R.D.H.'s 'I', 'L', 'R', 'S', 'T' and 'W'. Figure 5.1 shows that this unit can be recognised over a reasonably widespread area, though not always of economic thickness.

The following is reproduced from Jordan and Wallis (1973):

"In D.D.H. S-4, this seam is approximately 6 feet thick consisting of two major splits separated by 0.5 feet of mudstone. The lower split is approximately 1 foot thick and the original log suggests a high ash content. The upper split is approximately 4 feet thick and no indication of the nature of the seam can be gained since there is a large loss of core."

This seam is now interpreted as the 'B' Seam

"D.D.H. C-35 intersected 10 feet of coal containing stone bands at the 'A' coaly horizon level. D.D.H. S-7, further to the north, also intersected a coal seam at this point. The coal seam consists of two splits in the latter drill hole. The upper split was sampled and is in excess of eight feet in thickness. The lower split is over 4 feet thick but core loss allows only sketchy details of the seam characteristics to be gained.

"At the northern end of the property D.D.H. S-8 intersected coaly horizon 'A' and the drill site for D.D.H. M-1A was located on part of the same coaly horizon. The surface exposure at the drill site for D.D.H. M-1A showed a carbonaceous bed of claystone with some coaly bands having a thickness of approximately 3 feet. D.D.H. S-8 intersected one foot of coal at the same stratigraphic level; an estimated 10 feet of coal appears to have been present above the split but confirmatory data is absent."

The thickness of the 'A' Horizon in the holes which were drilled during 1974 varied between 1.00 foot and 7.0 feet.

R.D.H. 'T', which intersected 1.4 feet of coal in 7.2 feet of 'A' Horizon, was the only drill hole to record coal in the 1974 drilling programme. The remainder of the intersections were carbonaceous mudstone with occasional coaly phases.

One analysis of coal from D.D.H. S-7 is available which indicates that the raw coal contains 7.75% ash, 21.9% volatile matter, has an F.S.I. of 1½ and a calorific value of 14,521 B.T.U./lb.

5.2.2 'B' SEAM

The 'B' Seam, or Unit 4, is currently the only proven economic unit of the Lower Gething sediments. It was extensively drilled in detail at one locality during 1974; see Section 5.4, below for the results of that programme.

The seam underlies the mudstone of Unit 5 and is, in turn, underlain by dark grey to carbonaceous mudstone, which occasionally contains interbedded siltstone. The seam, which is composed of two coal splits separated by a mudstone band, varies in thickness from 8 feet to 12 feet in an undeformed sequence.

On a property scale, D.D.H.'s S-2, S-4, S-7 and S-8 have established intersections of this unit, in addition to a number of holes drilled during the 1974 exploration programme; see Appendix A-1, and Figure 5.1.

Nine feet of coal is recorded in three splits in 27 feet of intersection at 540 feet in D.D.H. S-2, and six feet of coal in 17 feet of intersection in D.D.H. S-4. In D.D.H. S-7 35 feet of coal in two beds, separated by three feet of mudstone, at 592 feet is recorded. These intersections are tectonically deformed. While the origin of the faulting is not identifiable, it is at least below the influence of the Chamberlain Fault.

D.D.H. S-8 intersected the 'B' Seam at 607 feet in a region of low tectonic disturbance at the northern end of the main grid area. Ten feet of coal are interpreted as being present though the drill hole record is somewhat unclear.

The only intersection of the 'B' Seam north of Skeeter Creek is in the water well, R.D.H. 'WW', at the camp site where 8 feet of seam containing 6.5 feet of coal is recorded at 171.5 feet. R.D.H. 'A' did not reach the 'B' Seam but, on the assumption that normal sequence exists at this locality, the seam would occur at 290 feet below the surface.

Analyses of the 'B' Seam from the various intersections shows the clean coal to be low in ash content, between 5.5% and 7.5%, though having a low free swelling index (1 to 4), making it a potential blending coal for coke manufacture.

5.2.3 'C' COALY HORIZON

The 'C' Horizon occurs approximately 70 feet below the 'B' Seam and is included in Unit 3, of the Lower Gething sequence. It has been intersected in a number of the drill holes completed in 1974, though positive identification is not always possible due to the presence of extensive faulting in this part of the sequence, as discussed in detail in Section 4.3.3 (iii).

S-7 intersected seven feet of coal at 667 feet which was regarded as the 'C' Horizon by Jordan and Wallis (1973). Faulting in this part of the sequence suggests that this may be a repetition of the 'B' Seam but no definitive statement can be made at this stage.

In the six drill holes in the potential open pit area which intersected the 'C' Horizon, the thickness varied between 2.6 feet and 7.7 feet. In all holes except D.D.H. M-2, this horizon is composed of carbonaceous mudstone and coaly phases. In D.D.H. M-2, 6.64 feet of coal occurs in 7.11 feet of section, though the identification is questionable, again due to faulting.

Because of the lack of economic coal thicknesses no analyses of this horizon have been carried out.

5.2.4 'D' COALY HORIZON

A hitherto unknown coal member on this property has been intersected in D.D.H. M-2 at 444 feet. The name 'C' Coaly Horizon is applied to this intersection of 11.34 feet, which contains 9.62 feet of coal.

The identification of this horizon as a new seam, which occurs approximately 180 feet below the top of Unit 3, is confirmed by reflectance measurements by Dr. P.A. Hacquebard of the Geological Survey of Canada (Pers. Comm.). Coal from this interval has a much higher reflectance than the overlying 'B' Seam, and further, fits Hacquebard's reflectance curves for the Rocky Mountain

Foothills. No other intersection of this unit is available for comparative purposes.

An analysis of three coal plies from this horizon gave the following results, indicating that the coal is a low volatile bituminous one based on rank classification.

TABLE 5.1

ANALYSIS OF 'D' HORIZON

(Air Dry Basis)

Ash %	3.6 - 8.5
V.M. %	15.1 - 15.9
F.C. %	74.9 - 78.9
S %	0.27 - 0.37
P %	0.02 - 0.23
F.S.I.	½
C.V. (B.T.U./lb)	13,690 - 14,025

Full analytical results are included with the drill hole record in Appendix C-1.

5.3 ECONOMIC POTENTIAL OF THE LOWER GETHING SEQUENCE

The following assessment, based on both the recent drilling and the available records of previously drilled holes, is provided in relation to the property as a whole. For conciseness, brief comments on the Upper Gething sequence north of Skeeter Creek are included in this section; refer Section 5.3.1 (ii).

A separate economic evaluation of the 'B' Seam in the "potential open pit area" is included as the following Section 5.4.

5.3.1 POTENTIAL NORTH OF SKEETER CREEK

(i) Lower Gething Sequence

In this area, the 'A' Horizon is not developed as an economic thickness of coal. In R.D.H. 'B', it is represented by two feet of carbonaceous mudstone at 160 feet. Data available to the south of Skeeter Creek indicates that this horizon is possibly only developed in the central part of the property (see Figure 5.1), and consequently it is unlikely that any economic coal can be expected to the north of Skeeter Creek.

An eight feet intersection of the 'B' Seam occurs between 171.5 feet and 179.5 feet in the camp water supply well, R.D.H. 'WW'; the rock band is 1.5 feet thick in this drill hole. This is the only coal intersection in the five drill holes which penetrated the Lower Gething sequence north of Skeeter Creek. The 'B' Seam is interpreted to occur at 290 feet and 240 feet below the surface in R.D.H. 'A' and 'B', respectively, assuming a normal unfaulted sequence is present. The seam may occur closer to the surface 800 to 1000 feet east of R.D.H. 'B' (Section D-E), or further to the north of the section line. A drill hole in this area would provide a guide to the seam thickness in the region.

The Geological Map and Section D-E show sediments lower in the sequence than the 'B' Seam forming a dip slope to the north of the camp. These sediments have been penetrated in R.D.H.'s 'N' and 'O'. The presence of the 'B' Seam in the water supply well further confirms the earlier predictions that it has been removed from this area by erosion. Remnants of coal may exist under the alluvial and colluvial material to the north of the camp, but the overburden to coal ratio possibly exceeds an economic figure.

The 'C' Horizon is not economic at any known occurrence throughout the property, as discussed in Section 5.2.3, above. A 3.5 feet interval in R.D.H. 'N' contains carbonaceous mudstone and coal at 105 feet below the surface.

Since the only intersection of the 'D' Horizon is south of Skeeter Creek no positive predictions are possible for this seam north of the creek. The stratigraphic succession indicates it could occur below the base of R.D.H. 'D'. Further definition of the stratigraphy and a drill hole in this area is necessary to confirm this prediction. However, due to the relatively steep dips of the structure at this locality, the overburden thickness would increase rapidly in a westward direction, thus limiting any extractable reserves which may be present.

The presence of pockets of structurally thickened coal upstream and above Skeeter Creek outside the area explored, cannot be discounted. Field traverses in this area record steep and variable dips with coaly members occurring; see "Lower Coals" Measured Section, Appendix B. Detailed mapping would be necessary to further extend the knowledge of this area, though it is anticipated that this part of the property may be considered "environmentally sensitive," since it is traversed by Skeeter Creek.

In summary, only the 'B' Seam and, if present, the 'D' Horizon are of possible "economic" thicknesses though no structurally thickened intersections have been located. Consequently, in the region recently explored, no real potential currently exists, however the structure and stratigraphy has been advanced to a stage where further exploration may produce some positive indications of economic coal occurrences.

Detailed structural mapping is necessary before further predictions can be justified. However, Upper Gething coals on the property as a whole, warrant prior evaluation, particularly in view of the relative quality of the respective coal seams.

(ii) Upper Gething Sequence

Three drill holes R.D.H.'s 'C', 'D' and 'E', north of Skeeter Creek penetrated this sequence of rocks. The coal which was intersected in R.D.H. 'C' is interpreted as being the Skeeter Seam, though structural complications exist which make the identification somewhat doubtful. An intensely folded and faulted sequence of Chamberlain Seam occurs at the survey point, Master 'A', which may hold some potential. This could be clarified with detailed mapping.

The proximity of the northern property boundary and the overlying Moosebar Formation sediments, coupled with steep topography, limits areas where potential Upper Gething coals can occur with favourable overburden ratios. Consequently, the data available in conjunction with geological mapping, indicates that little potential for open cut coal exists in this sequence of rocks to the north of Skeeter Creek.

5.3.2 POTENTIAL SOUTH OF SKEETER CREEK

The economic potential of the 'A Horizon immediately south of Skeeter Creek is negligible, however further to the south it cannot be discounted.

In the rotary drill holes completed in the 1974 programme the 'A' Horizon is represented up to 8 feet by carbonaceous mudstone containing coaly phases. R.D.H. 'T' intersected 1.4 feet of coal in 7.2 feet of section. In the drill holes completed in previous programmes two significant intersections were encountered; 7 feet in D.D.H. S-7 and 10 feet in D.D.H. C-35; see Table A-1.3. D.D.H.'s S-2, S-4 and S-8 did not reveal any significant coal at this level although the underlying 'B' Seam was penetrated; see Figure 5.1.

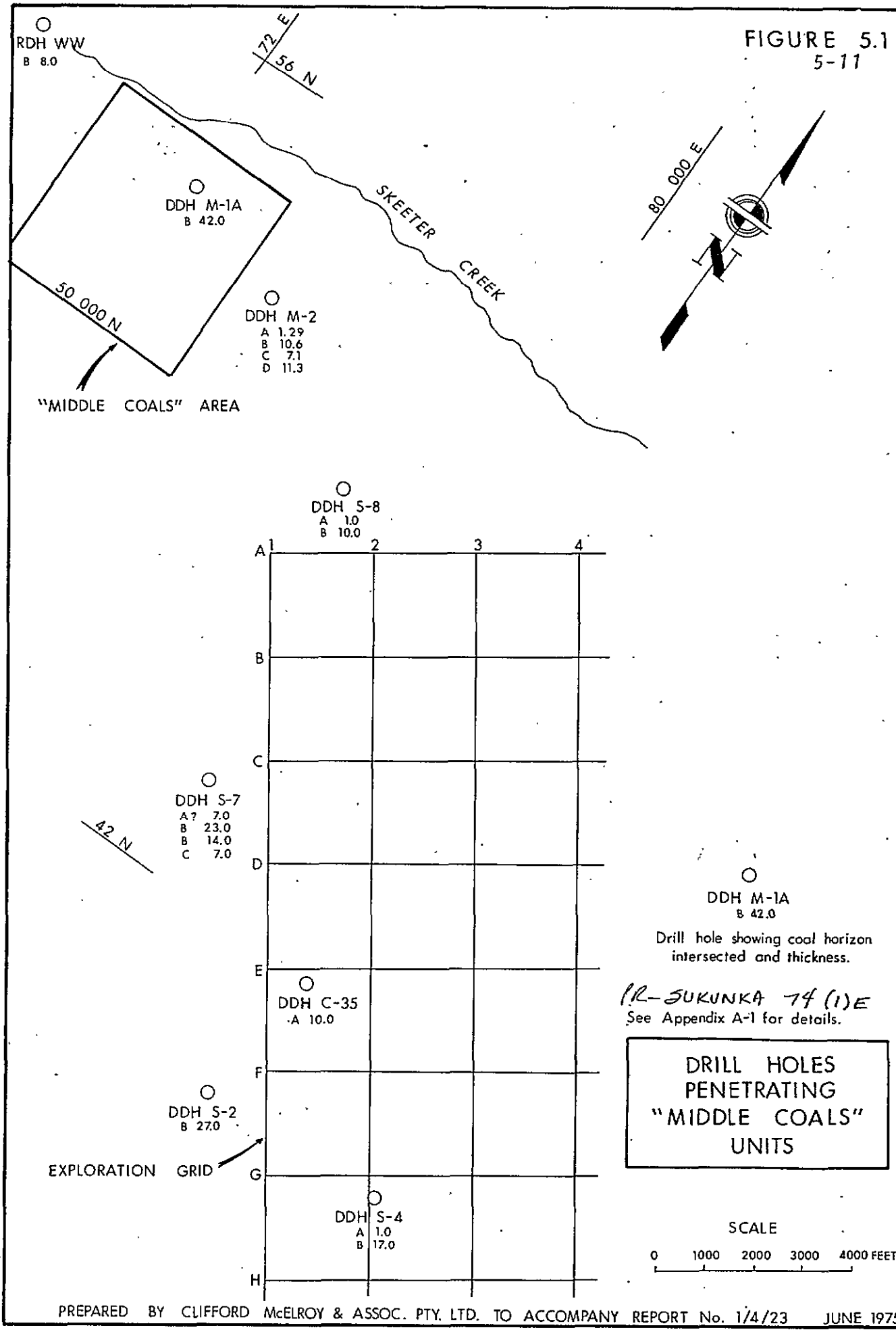
The distribution of significant coal thicknesses in the 'A' Horizon suggests that its development in a lateral sense is sporadic. The few intersections makes it impossible to comment meaningfully on its potential, but in the southern part of the property it warrants consideration. Immediately to the south of Skeeter Creek it is uneconomic.

Within the property, the 'B' Seam occurs along a strike length of approximately 6 miles, though no width, or east-west extent, can be defined. The seam has been intersected in R.D.H. 'WW', at the camp site, south to D.D.H. S-4; see Figure 5.1.

While the seam thickness variations have not been accurately defined, between 8 feet and 12 feet of total seam containing a rock band averaging 2 feet in thickness is inferred to be present throughout the area. Tectonically thickened occurrences of this seam occur, and the comments in Section 4.3.3 (v) apply. The "potential open pit area," to the rear of the plant site clearing, is one such area which has been explored in detail. An economic evaluation of this area is included as Section 5.4.

R.D.H.'s 'K', 'L' and 'M' were drilled to assess the extent of this 'B' Seam to the east of D.D.H. M-2; see the Geological Map and the Data Map, Map 2. R.D.H. 'L' did not penetrate the seam before reaching its programmed total depth. R.D.H.'s 'L' and 'M' intersected faulted intersections of the 'B' Seam 17.0

FIGURE 5.1
5-11



PREPARED BY CLIFFORD McELROY & ASSOC. PTY. LTD. TO ACCOMPANY REPORT No. 1/4/23 JUNE 1975

feet and 21.2 feet thick, respectively. The high overburden ratios and the outcrop position to the north, see Map 1, limit the occurrence of any significant reserves of coal in this area available for strip mining.

In the light of the current market requirements for coking coal, it is doubtful whether underground mining of this seam would be economic, given the marginal seam thickness, the coal quality and the increased depth of cover of approximately 450 feet greater than the Chamberlain Seam.

The 'C' Horizon throughout the drilled intersections is represented by carbonaceous mudstone containing coaly phases and partings. Consequently, no economic value can be placed on this unit.

The 'D' Horizon has been intersected in only one drill hole, D.D.H. M-2, between 444 feet and 455 feet. While it is of significant thickness and is of similar quality to the 'B' Seam, no potential can be inferred for this seam until further data becomes available. Since it is under very deep cover, the comments regarding the underground mining potential of the 'B' Seam also apply to this horizon.

5.4 ECONOMIC APPRAISAL OF POTENTIAL OPEN PIT AREA - 'B' SEAM

5.4.1 INTRODUCTION AND DESCRIPTION OF AREA

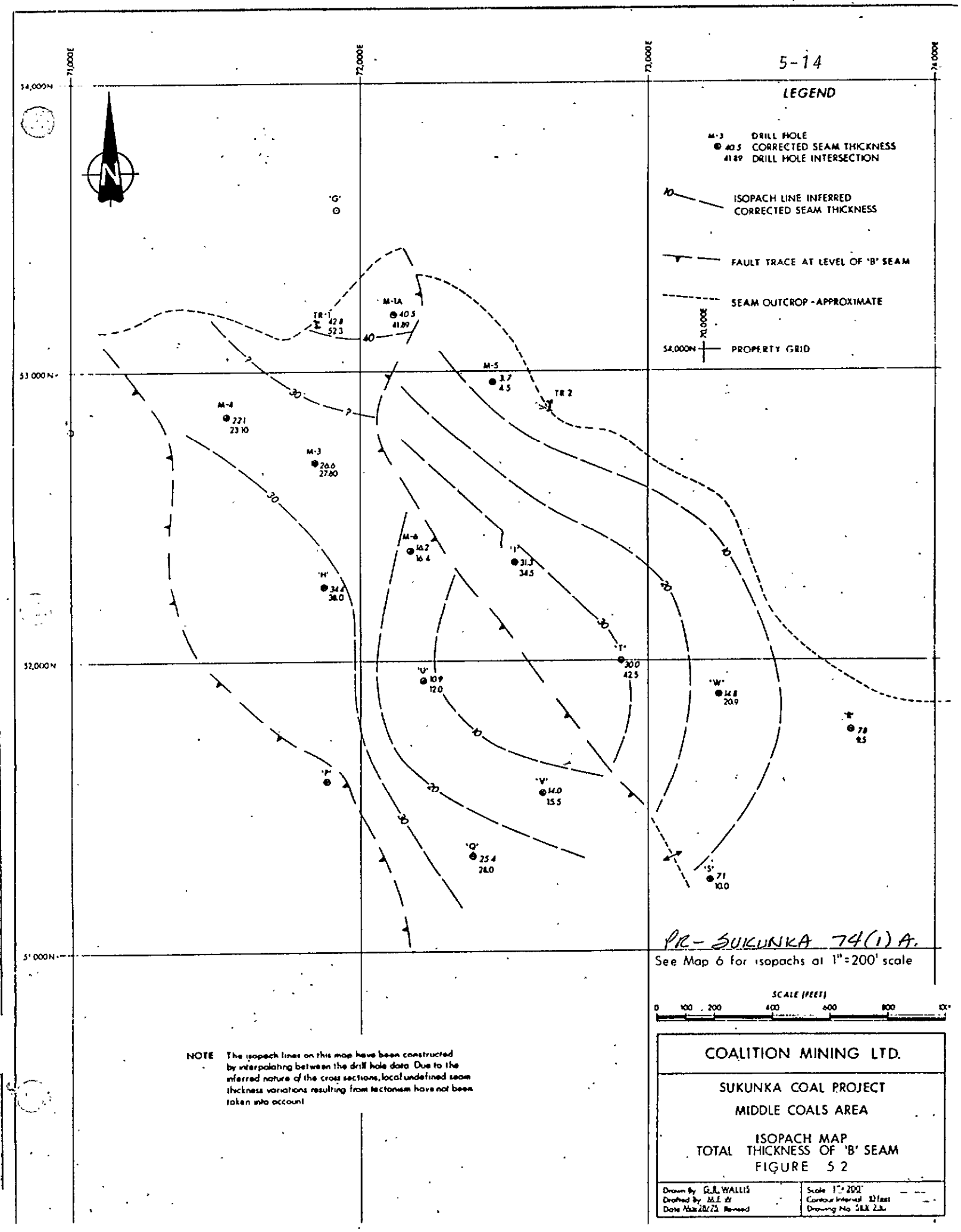
The focal point of the region investigated during the drilling programme carried out between September and November, 1974, is located approximately 1,000 feet to the south east of a clearing prepared for a previously proposed coal preparation plant, and south of Skeeter Creek (see Figure 3.1 - "Middle Coals Area"). During the clearing process in 1973, a thickened zone of the 'B' Seam was exposed at the lower end of a decline conveyor clearing. An adjacent drill hole, D.D.H. M-1A, which was drilled in the same year, intersected 42 feet of coal and rock bands of the same seam. As outlined in Section 3.1, a detailed drilling programme was initiated to assess this area from the viewpoint of an open pit mine. This section of the report details the results of that programme from an economic geology aspect. For convenience, a summary of this section is included as Section 5.4.7.

The relief of this area rises from the general level of the Sukunka Valley floor at 2450 feet to 3050 feet at the south eastern margin (see Map 4). The surface is a westerly dipping slope of relatively even gradient, with light to moderate tree cover throughout.

5.4.2 SEAM THICKNESS AND DISTRIBUTION

(i) Total Seam

The distribution and economic potential of the 'B' Seam on a property scale has been discussed in Sections 5.2.2 and 5.3. Within the detailed study area, the thickened 'B' Seam forms a roughly elongate body, bounded by the outcrop to the north and north east and by a major, unnamed fault to the south west (see Map 6 and Figure 5.2). A central fault separates the seam into two "plates", being the limbs of a drag fold, as shown on the



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See Map 6 for isopachs at 1"=200' scale

SCALE (FEET)

0 100 200 400 600 800 1000

NOTE The isopach lines on this map have been constructed by interpolating between the drill hole data. Due to the inferred nature of the cross sections, local undefined seam thickness variations resulting from tectonism have not been taken into account.

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MIDDLE COALS AREA

ISOPACH MAP
TOTAL THICKNESS OF 'B' SEAM
FIGURE 5 2

Drawn By G.R. WALLIS Drafted By M.E. W Date Mar 28/73 Revised	Scale 1" = 200' Contour Interval 10 feet Drawing No SUK 2.3-

detailed cross sections and discussed in Section 4.3.3.

An extension of the deformed seam may occur to the south east of the western plate since no "limiting" drill hole exists in this area. R.D.H.'s 'R' & 'S' effectively define the limit of the eastern plate in this direction.

The seam thicknesses are shown on Map 6, the Isopach Map of the 'B' Seam, also included as Figure 5.2. Note that the values contoured and quoted in the following description are the seam thicknesses corrected for dip, as measured from the cross sections.

Due to the pattern of faulting, it is not possible to define local variations of the seam thickness between the data points, consequently the isopachs have been constructed by interpolating between the drill hole values, with no subjective input. Thus, due to the conceptual nature of the structural model, an apparent discrepancy exists between the isopachs and the seam thickness as illustrated on the cross sections. The economic thickness of the seam at any one data point is dependent on the degree of faulting, which in turn influences the contamination of the coal with the adjacent rocks. While the roof can be accurately defined, the position of the "working floor" is not as clear cut. For example reference to the strip log of R.D.H. 'H' shows coal, in minor amounts occurring below the quoted depth of the seam floor of 97 feet in Table A-1.2. The floor of the seam has been determined on the basis of gamma-ray and density logs, visual logging of core or cuttings and analytical results where available.

A true, or undeformed thickness of the 'B' Seam varies between 8 feet and 12 feet, on a property scale, but in the vicinity of the potential open-pit area it approximates 10 feet. D.D.H. M-2A, to the east, records two splits of coal each 4.4 feet thick, separated by 1.7 feet of siltstone, totalling 10.62 feet. In R.D.H. 'S', a full seam thickness of 10.0 feet was intersected composed of

an upper split of coal 3.0 feet thick separated from a lower split 4.2 feet thick by 2.8 feet of silty mudstone.

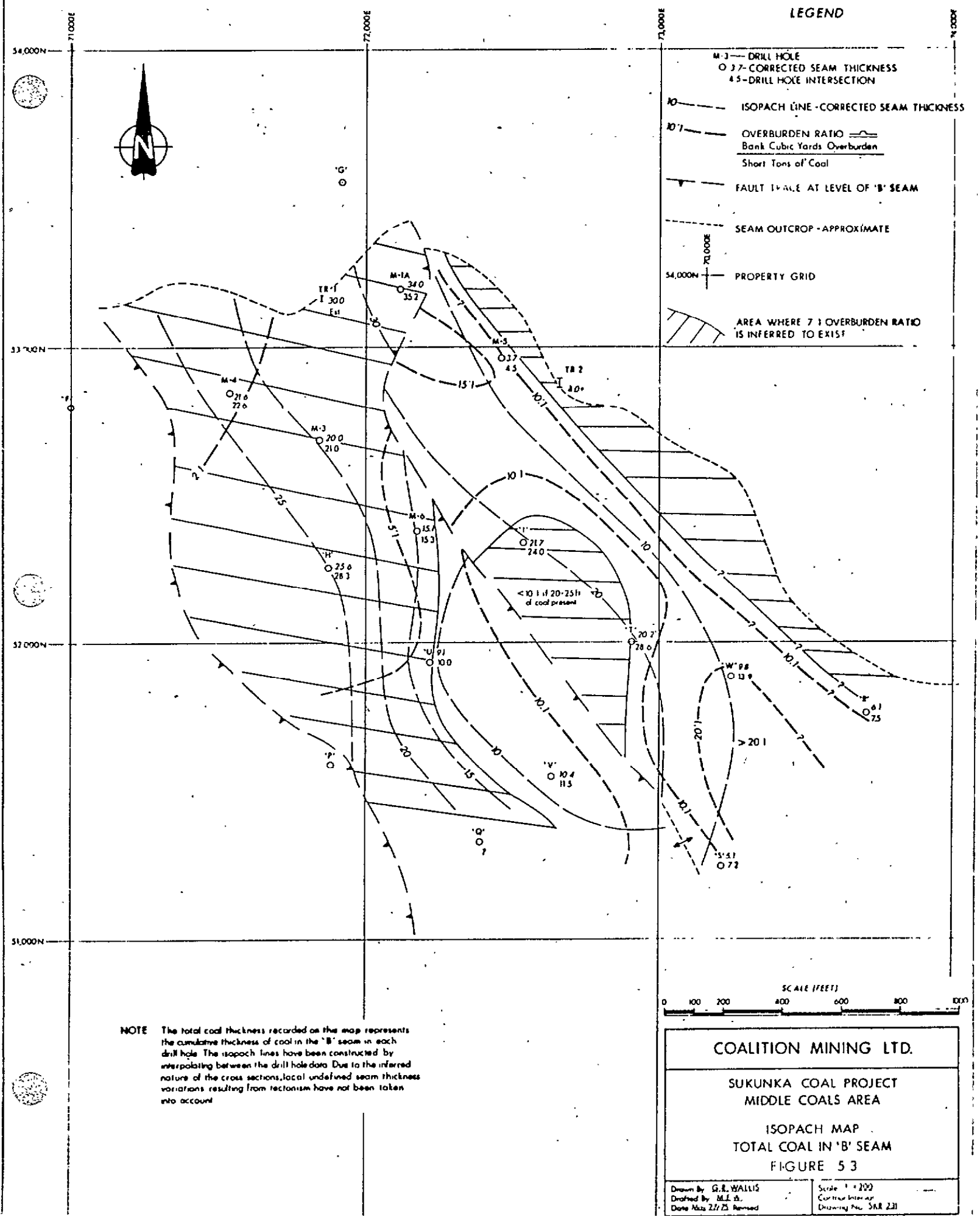
Where the seam has been tectonically thickened, it ranges up to in excess of 30 feet thick. The two plates or limbs of the drag fold thicken from 10 feet on the eastern side to 30 feet on the western side, as shown in Figure 5.2. D.D.H. M-1A and Trench No. 1 at the northern end of the area intersected 40 feet of sheared coal and rock.

(ii) Total Coal in 'B' Seam

The thickness of coal in the thickened intersection and the physical constitution is dependent on the degree of deformation. In the various seam sections, the coal and rock varies from an intimate mixture of sheared coal and rock to discrete bands of coal and rock. The seam sections for the drill holes in Appendices C-1 and C-2, Volume 3, where the ash content is plotted against the sampled intersection, illustrate these variations. The mining implications of this are discussed in Section 5.4.6. Map 7 and Figure 5.3 is the Isopach Map of the Total Coal in the 'B' Seam. A comparison of this map with Map 6 shows that an average of approximately 5 feet of rock is present throughout the area under review. In general, a maximum of 20 feet of coal is present to the east of the dividing fault, and a maximum of 25 feet to the west.

5.4.3. DEPTH OF COVER - OVERBURDEN RATIOS

Map 8 illustrates the depth of cover which exists over the 'B' Seam on both sides of the central fault. In the eastern plate the overburden increases from the outcrop to 350 feet in the south east, while over the majority of the area it is less than 200 feet. The whole of the drilled area of the western plate is under less than 175 feet of overburden.



NOTE The total coal thickness recorded on the map represents the cumulative thickness of coal in the 'B' seam in each drill hole. The isopach lines have been constructed by interpolating between the drill hole data. Due to the inferred nature of the cross sections, local undefined seam thickness variations resulting from tectonism have not been taken into account.

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SUKUNKA COAL PROJECT
MIDDLE COALS AREA

ISOPACH MAP
TOTAL COAL IN 'B' SEAM
FIGURE 5.3

Drawn By G.R. WALLIS
Drafted By M.L.W.
Date Nov. 27/75 Revised

Scale 1" = 200'
Contour Interval
Drawing No. SKR 2.31

Overburden ratios have been calculated on the basis of the isopachs on Maps 7 and 8, and are shown on Map 7. The overburden ratio used, which is approximate due to the inferred nature of the isopachs, is bank cubic yards to short tons of coal in place.

Map 7 also illustrates the areas where less than a 7:1 ratio exists, this ratio being regarded as an economic mining limit, for the purpose of this study; in excess of half the area is at less than a 7:1 ratio. The consequence of such a ratio, however, renders a significant area of the eastern plate uneconomic. Further evaluation may upgrade this area. For example, no data exists in the 10:1 to 15:1 ratio area between D.D.H.'s M-1A, M-5, M-6 and R.D.H. 'I'.

5.4.4 COAL RESERVES

The reserves of coal in the potential open pit area have been calculated for various overburden ratios using the isopachs of the total coal in the 'B' Seam, Map 7. The reserve figures in Table 5.2 and shown on Figure 5.4, refer to the total coal in the seam excluding the rock.

Three figures are quoted for the various areas:

(a) Raw coal in-place;

(b) Raw coal recoverable allowing for 10% loss during mining; and

(c) Clean coal at a recovery of 90%.

The recoverable raw coal reserve figures, (b) above, are quoted to provide a guide should consideration be given to blending the run-of-mine coal with Skeeter or Chamberlain Seam coal, prior to cleaning.

If the coal is cleaned separately, a yield of 90% should be achievable since the tonnages calculated do not include the rock which will be mined with the coal. A comparative calculation assuming an average of 5 feet of rock in the seam, 10% loss during

TABLE 5.2

RESERVE CATEGORIES - 'B' SEAM

POTENTIAL OPEN CUT AREA

OVERBURDEN RATIO	LOCATION (1)	AV. SEAM THICKNESS (feet)	AREA (sq. yards)	RESERVES - ,000 SHORT TONS		
				RAW COAL IN PLACE (2)	RAW COAL RECOVERABLE (3)	CLEAN COAL (4)
7:1	West	20	155,000	1,157.0	1,041.3	937.2
	East	20	24,600	183.7	165.3	148.8
	East	20	30,800	57.5	51.8	46.6
Sub Totals			210.400	1,398.2	1,258.4	1,132.6
7:1 10:1	A	10	41,600	155.0	139.5	125.6
7:1 10:1	C	15	15,500	86.8	78.1	70.3
10:1 20:1	B	5 - 15	80,000	335.0	301.5	271.4
15:1	D	20	5,700	42.6	38.3	34.5
20:1	E	7	12,500	32.7	29.4	26.5
Sub Totals			155,300	652.1	586.8	528.3
T O T A L S			365,700	2,050.3	1,845.2	1,660.9

NOTES: 1) Location: Western or Eastern limb of fold; see Figure 5.4 for areas A to F.
2) Raw coal excluding rock.
3) Raw recoverable coal, allowing for 10% mining loss.
4) Clean coal at 90% recovery.

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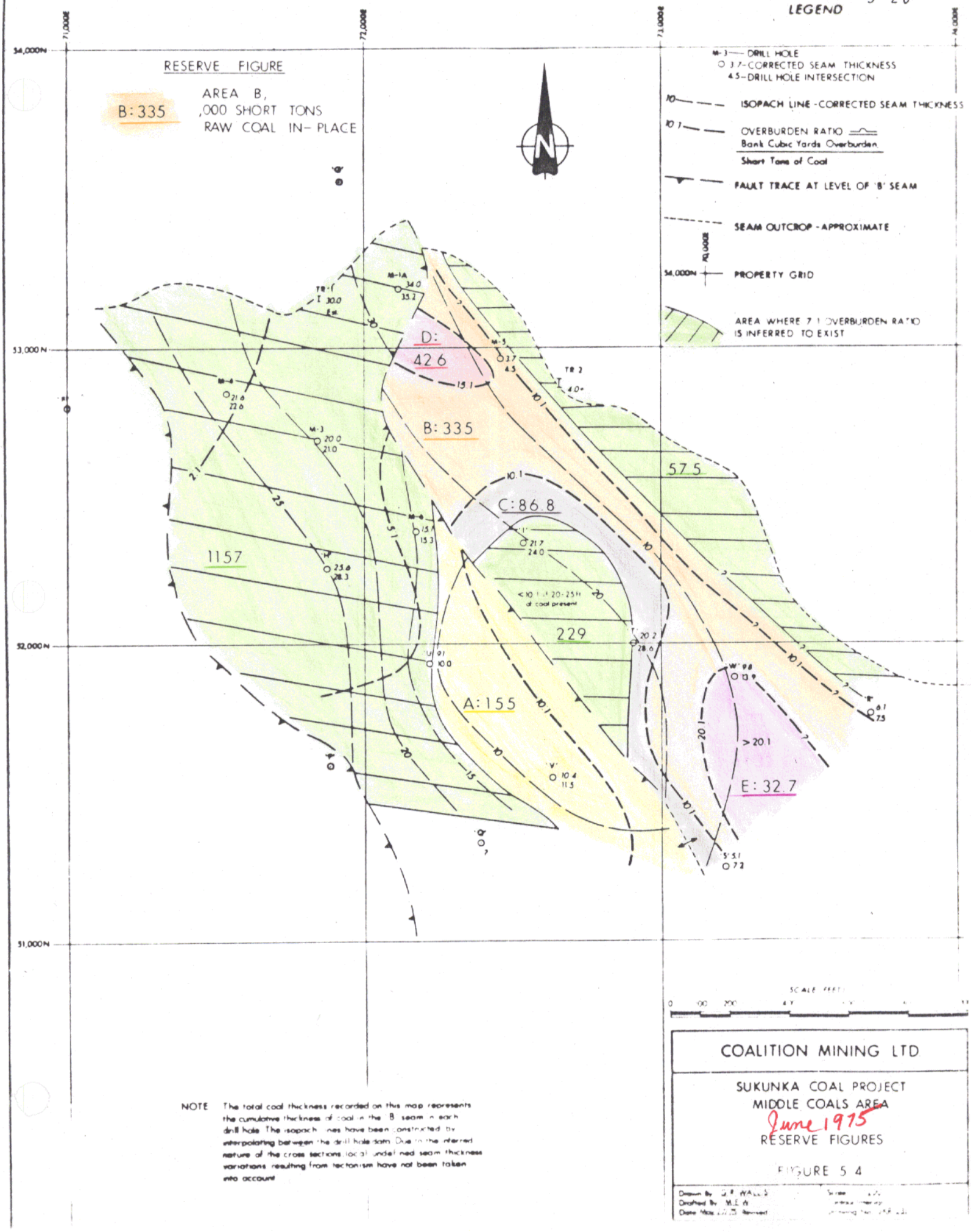

NOTE The total coal thickness recorded on this map represents the cumulative thickness of coal in the 'B' seam in each drill hole. The isopach lines have been constructed by interpolating between the drill hole data. Due to the inferred nature of the cross sections local undetected seam thickness variations resulting from tectonism have not been taken into account.

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MIDDLE COALS AREA
June 1975
RESERVE FIGURES

FIGURE 5.4

Drawn By J.P. WALLS
Drafted By M.E.H.
Date Mar. 27/75 Revised

mining and 60% recovery on cleaning a 35% ash coal, produces similar figures to those quoted in Table 5.2 for the clean coal tonnage, (c) above.

A total of 2.05 million short tons of coal in-place exist within the defined area, however, only 1.4 million short tons of coal in-place are mineable at an overburden ratio of less than 7:1. Of this figure 1.26 million short tons should be available as a raw coal product though with an ash content of approximately 30%.

Clarification of the structural complexities within the area may release some of the high overburden ratio coal for extraction. A further factor requiring more evaluation is that of the cleaning characteristics of the coal which could affect the reserve figures in either a positive or negative sense.

5.4.5 COAL QUALITY

Analyses of the raw coal and resultant washed products from the diamond drill holes and R.D.H.'s 'C', 'H', 'T', 'V' and 'W' were carried out to determine the quality of the 'B' Seam. The complete results are included with the respective drill hole records in Volume 3. Appendix A-3 summarizes the analyses of the raw coal and the 1.60 S.G. washed products for both the individual sampled increments and composites of each intersection, the averages of which are included herein as Table 5.3 . Map 9 and Figure 5.5, herein, provides a visual display of the quality of the raw coal and the resultant washed products.

(i) Raw Coal Quality

The quality of the clean coal in an undeformed 'B' Seam is low in ash but has minimal coking properties. The ash content of the raw coal, exlcuding rock bands, in D.D.H. M-2A, for example, ranges between 5.5% and 7.5%; 19% volatile matter and a free swelling index of 2½ to 3 applies to this sample.

TABLE A-3.1

AVERAGE VALUES OF ANALYTICAL DATA - 'B' SEAM

(Air Dried Basis)

	Average	Range	No. of Values
Raw Coal			
Ash %	33.9	2.7 - 84.5	56
V.M. %	16.8	6.6 - 21.2	68
S%	0.41	0.15 - 1.38	45
F.S.I.	3.5	½ - 8	46
C.V. (BTU/lb).	12,013	3,760 - 19,960	60

As with the seam thickness, the degree of deformation influence the quality of the raw or as mined coal, by virtue of the amount of contaminating rock. The analytical results of the sampled increments indicate that a variation from 2.7% to 84.5% ash can occur in a deformed 'B' Seam, while the average is 33.9%. It is noteworthy that within this range, 50% of the analysed samples have an ash content of between 5% and 20%.

TABLE 5.3

AVERAGE VALUES OF ANALYTICAL DATA - 'B' SEAM

(Air Dried Basis)

	Average	Range	No. of Values
Raw Coal			
Ash %	33.9	2.7 - 84.5	56
V.M. %	16.8	6.6 - 21.2	68
S %	0.41	0.15 - 1.38	45
F.S.I.	3.5	½ - 8	46
C.V. (BTU/lb)	12,013	3,760 - 19,960	60

The ash content and F.S.I. of the full 'coal plus rock' intersections have been calculated for the analysed seams, using the analytical data and assumed values for non-analysed plies in Table A-3.1, Appendix A. On the basis of these figures listed in Table 5.4, it is predicted that the ash content of the run-of-mine coal can range between 13.3% and 51.4% and average 26%.

With regard to the ash, volatile matter, sulphur, F.S.I. and calorific value of the various sampled increments of raw coal in each drilled intersection, Table 5.3 lists the averages of these factors.

The sulphur content of the coal is predicted to be normally less than 0.50%. While the maximum sulphur content shown in Table 5.3 is 1.38%, 80% of the analyses are less than 0.50%, and of three values exceeding 0.75%, two report from the top split of D.D.H. M-2A.

TABLE 5.4

CALCULATED ASH % AND F.S.I.

OF RUN-OF-MINE COAL

Drill Hole	Interval (ft)	Thickn (ft)	Raw Coal (A-D B) Ash %	F.S.I.
M-1	60.05 - 66.42) 68.30 - 101.92)	39.99	13.3	1½
M-2	166.21 - 176.83	10.62	31.9	2
M-3	73.20 - 93.00	19.80	24.5	1½
	73.20 - 102.80	29.60	26.6	2
M-4	43.50 - 67.70	24.20	15.8	-
	43.50 - 81.52	38.02	31.9	-
M-6	93.00 - 109.40	16.40	14.4	4
'H'	57.00 - 98.00	41.00	21.2	3½
'T'	177.00 - 222.00	45.00	27.9	1½
'V'	55.00 - 65.00	10.00	28.8	1
'W'	200.40 - 221.30	20.90	51.4	1
Averages			26.1	2

5.4.6 Mineability

The following comments are included for completeness, though additional detailed exploration is required before open pit design can commence. For example, detailed infill drilling in the vicinity of the isolated block of coal, around R.D.H.'s 'I' and 'T', which is surrounded by high overburden ratio areas, may extend the limits of the blocks, thus changing the economics of extracting this coal.

(i) Selective Mining

Due to the deformation which the coal and contained rock band have sustained, selective mining of the coal and rock is not regarded as practicable. A typical thickened intersection of coal and rock is exposed in Trench No. 1 where faulting has increased the thickness to approximately 40 feet. See Appendix B for section description.

Where undeformed, the top split, the intermediate rock band and the lower split would lend themselves to selective mining. While it is not known how extensive the occurrence of the undeformed seam is in the potential open pit, the limits of the pit area may be the only localities where such a condition occurs.

(ii) Overburden Rock Types

The majority of the overburden rock types are siltstones and mudstones, commonly interbedded. It is probable that these rock types will require minimal blasting due to their bedded character. A 20 feet bed of sandstone, Unit 6, occurs above the 'B' Seam, which will require heavier charges than the remainder of the overburden. Forming the roof of the seam is a mudstone, 30 to 35 feet thick which possibly can be mined by ripping and loading only.

Descriptions of the rock types are included in Section 4.2.2, above.

(iii) Mining Floor

The definition of the working floor of the seam, discussed in Section 5.4.2 (i) above, is governed by the degree of contamination of the coal by the underlying carbonaceous mudstone. During mining, detailed drilling will be necessary to provide a limit of extraction in terms of quality of the run-of-mine coal. This limit is anticipated to be considerably variable.

5.4.7. SUMMARY OF ECONOMIC APPRAISAL

The following is a summary of the economic factors relating to the 'B' Seam in the potential open pit area, near Skeeter Creek.

(i) The seam which averages 10 feet thick when undeformed by tectonic action, has been structurally thickened to in excess of 30 feet. The average thickness over the western half of the area is 18 feet and 12 feet over the eastern half.

(ii) The configuration of the area conforms to a faulted, west dipping drag fold, bounded on the west by a major fault, and on the east by the outcrop.

(iii) The overburden ranges up to 350 feet thick in the south, while much of the area is under approximately 175 feet of cover. More than half the area is at an overburden to coal ratio of less than 7:1 (bank cubic yards to short tons of coal in-place), though in 3 separate areas.

(iv) On the assumption that an overburden ratio of 7:1 is an economic mining limit, 1.4 million short tons of coal in-place, excluding rock, exist within this area. Additional reserves of 0.65 million short tons of coal in-place exist at ratios up to 20:1, which may become available in part after the completion of detailed infill drilling which is required to further clarify the structure.

(v) The coal in the 'B' Seam is a low volatile bituminous coal.

(vi) When free of rock bands, it has an average analysis of less than 7.5% ash, 19.5% volatile matter and a fixed carbon content of 73%, by difference.

(vii) The F.S.I. of the clean coal in the seam as a whole is predicted to be 3.

(viii) The calorific value of the clean coal is in excess of 14,000 B.T.U./lb.

(ix) The run-of-mine coal from a future open pit in the area reviewed is predicted to average 30%, though ranging from 20% upwards, with an F.S.I. of less than 2.

(x) It is predicted to be an easily cleaned coal as a wide specific gravity difference exists between the coal (S.G. 1.35) and the contaminating rock. Refer to Map 9 and Figure 5.5.

(ix) The coal will require blending, either in the raw or cleaned state, with a coal having better coking properties to make it economic in the current market situation.

SECTION.6

RECOMMENDATIONS FOR FURTHER EVALUATION

6.1 POTENTIAL OPEN PIT AREA

The structural model of the potential open pit area, as described in Section 4.3.3(ii), requires further evaluation:

a) to verify the concept; and
b) to provide further definition of the seam thickness and quality variations.

In more detail, the elements requiring attention are:

1) The exact location of the outcrop;
2) The location and trend to the south of the boundary fault situated west of R.D.H.'s 'H' and 'Q', and east of R.D.H. 'P';
3) The intensity, and the influence on the seam thickness, of the small fault east of R.D.H. 'Q';
4) The extent of the thickened coal, if present, to the south of R.D.H.'s 'Q' and 'S';
5) The exact location of the central dividing fault between D.D.H. M-6 and R.D.H. 'I', and between R.D.H.'s 'V' and 'W'. For example, no interesection of the fault exists on Sections T+575 or T+2250;
6) The seam thickness variations between drill holes; this is directly related to the structural configuration of the area under review;
7) Although the seam quality variations are reasonably well quantified, further evaluation is recommended by both core drilling and, most importantly, bulk sampling.

   a) to provide more accurate definition of these variations; and

b) to assess the cleaning characteristics of the seam.

The latter is necessary to determine its compatibility with the Chamberlain and Skeeter Seams.

While a detailed programme is not outlined here, the following techniques are recommended for consideration:

(i) Diamond drilling, to provide structural and quality control. To reduce moving and site preparation costs, a number of angled holes should be drilled from one drill site. Further, to provide structural control, the strata well below the coal seam should be intersected in strategically placed drill holes, commensurate with costs.

(ii) Rotary drilling may be applicable to provide verification of predictions based on a refined "model", as elucidated from the diamond drilling, (i), above.

(iii) Trenching around the outcrop, to accurately define its position. Dependent on the overburden and the presence of a thickened seam section, bulk sampling may be practicable by this method.

(iv) Detailed geological and structural mapping at a scale of 10 feet or 20 feet to an inch, will materially assist in the structural interpretation.

6.2 AREA IN VICINITY OF SKEETER CREEK

The recently completed programme to the north and south of Skeeter Creek has provided data across the structural trend, which has allowed a provisional assessment of the potential of these areas to be made; see Section 5.3 and Map 1. No further work is warranted in these two areas, with the following exceptions:

(1) Detailed mapping to assess the extension of Upper Gething sequence coal seams in the north-eastern corner of the map area. Structural complexities, increased depth of cover, and the property boundary location, are regarded as limiting factors, however.

(2) To the north of R.D.H.'s 'A' and 'B', mapping is warranted to determine the stratigraphy and structure in relation to near-surface 'B' Seam coal.

(3) Upstream of the Sukunka Camp and to the north of Skeeter Creek, mapping will elucidate further the structure, but the potential is rated as low.

(4) Geological mapping is recommended to the south, and outside the map area, of the "Middle Coals" region shown on Map 1, that is, toward Chamberlain Creek. The occurrence of structurally thickened 'B' Seam or 'D' Horizon, due to the presence of the Chamberlain Fault, is regarded as probable.

Attention is drawn to the fact that the quality of the Lower Gething coal seams is not equal to that of the Chamberlain and Skeeter Seams, since they will require both cleaning and/or blending to produce a saleable product. As a consequence, they are assigned a lower potential than the, as yet, unexplored Upper Gething coal seams elsewhere on the property.

Recommendations relating to the Upper Gething coal seams are included in Section 6.2 of Report 1/4/20, Wallis (1975a).

SECTION 7

CONCLUSIONS

During the latter months of 1974, a drilling and mapping programme was carried out in two phases to assess the economic potential of the Lower Gething sequence coal seams - also termed the "Middle Coals" - in the vicinity of Skeeter Creek at the northern end of the Sukunka Property.

A scout drilling programme, consisting of 10 rotary drill holes totalling 1,967 feet, provided data on the sequence both to the north and south of Skeeter Creek. Four diamond drill holes, totalling 756 feet, and 12 rotary drill holes, totalling 4,631 feet, were completed within a "potential open pit area" of which an economic geological assessment has been made. D.D.H. M-2, 923 feet deep, was drilled to provide stratigraphic control and to test the basal Lower Gething for additional coal seams.

The knowledge of the Lower Gething sequence has been extended as a result of the drilling programme, enabling the stratigraphy to be divided into 10 individual rock units. The upper 450 feet, comprising Units 4 to 10 shown in Figure 4.1, is more completely defined due to a greater number of intersections of this part of the sequence. Units 1 to 3 comprise the lower 550 feet of the stratigraphic column.

Structurally, the area consists of a north-south trending anticlinorium intersected by the Rim and Skeeter Faults. Splinter faults generated from the Rim Fault zone, with associated bedding to sub-bedding plane faults, are interpreted as being responsible for a thickened zone of coal

located to the south of Skeeter Creek.

Four coal horizons, 'A' to 'D', are identifiable within the Lower Gething sequence, of which the hitherto unknown 'D' Coaly Horizon is the oldest. In the only intersection of this unit in D.D.H. M-2, 9.6 feet of coal occur in 11.3 feet of section. The potential of this horizon requires further definition. The 'C' Coaly Horizon consists of carbonaceous mudstone and coal, and is regarded as uneconomic, while the 'B' Seam, approximately 70 feet higher in the sequence, is economic, having been tectonically thickened at one locality, and further, occurs as an average 10-foot seam in all drill holes which have penetrated this part of the sequence throughout the property. The upper, 'A' Coaly Horizon occurs in significant thicknesses in only two drill holes in the central part of the property, south of the area recently explored. It is regarded as having a low potential, however, due to a lack of lateral development.

Analyses of the 'A', 'B', and 'D' Horizons indicate that the ash content of the raw coal varies between 3.5% and 8%, the sulphur content is less than 0.50%, and the calorific value approximates 14,000 B.T.U./lb. The volatile matter is variable, depending on depth of burial, from 22% in the 'A' Coaly Horizon to 15% in the lower, 'D' Coaly Horizon. Due to a consistently low free swelling index of between 1 and 4 in both the raw and clean coal, these "seams" must be regarded as blending coals if metallurgical coal products are under consideration.

The economic potential of these horizons on a property basis is regarded as low within the area explored, due to their being under a greater depth of cover and of a lower quality than the Chamberlain and Skeeter Seams, an increased structural complexity of the sequence, and their minimal seam

thicknesses. The location of tectonically thickened seams with low overburden ratios offers the greatest potential for the seams in this rock sequence. To date, only one of these occurrences has been located, but additional exploration is warranted in currently unexplored areas. Recommendations for further evaluation are included in Section 6.

Within the "potential open pit area", tectonically thickened 'B' Seam occurs in economic tonnages of blending quality coal suitable for use in coke manufacture. The structural model proposed for the area consists of a drag fold dislocated by a west-dipping fault, effectively forming two "plates", from a mining viewpoint. Bedding plane to sub-bedding plane faulting is interpreted as being the prime cause of the thickening of the coal seam.

The thickness of the 'B' Seam when undeformed averages 10 feet, but may be in excess of 30 feet when deformed. The corrected average thickness of the coal in the seam over the western half of the potential open pit is 18 feet, and 12 feet over the eastern half; both these figures exclude an average of 5 feet of sheared rock contained in the seam. While overburden thickness reaches a maximum of 350 feet in the south, more than 50% of the area is at less than a 7:1 overburden ratio, on the basis of bank cubic yards to short tons of coal-in-place. Within three separate areas of 7:1 overburden ratio, 1.4 million short tons of coal-in-place exist, while an additional 0.65 million short tons of coal-in-place are available at ratios of up to 20:1.

Due to the tectonic action, contamination of the coal by sheared rock has occurred. The run-of-mine coal is predicted to average 30% ash, with an F.S.I. of less than 2. The clean coal is expected to contain 7.5% ash, 19.5% volatile matter, have an F.S.I. of 3, and a calorific value in excess of approximately 14,000 B.T.U./lb.

An exploration cost of $0.12 per short ton of coal-in-place was incurred for the 1.4 million short tons of 7:1 ratio coal in the Lower Gething sequence, based on the on-site expenditure. It is estimated that a similar expenditure would be necessary to upgrade the 'potential open pit area' to the stage where detailed mine design can commence. The above figure may be compared with an exploration cost of $0.26/short ton of Chamberlain and Skeeter Seams proven in Plate 1.

SECTION 8

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APPENDIX A

ECONOMIC DATA

APPENDIX A-1

SUMMARIZED DRILL HOLE DATA

Notes To Accompany Tables A-1.1 and A-1.2

1) *Reduced Level above Standard Datum.*

2) *Seam Names:*

Sk	=	*Skeeter Seam, Upper Gething*
Ch	=	*Chamberlain Seam, Upper Gething*
'A'	=	*'A' Horizon, Lower Gething*
'B'	=	*'B' Seam, Lower Gething*
'C'	=	*'C' Horizon, Lower Gething*

3) *Coal intersections include minor rock bands less than 0.40 feet, except where noted in the Remarks column.*

4) *Due to absence of bedding dips, the thicknesses reported are uncorrected for dip.*

5) *The "Total Seam Thickness" is the thickness of the seam, either normal or deformed by faulting, including all rock bands, uncorrected for dip.*

6) *'A' Horizon equivalent, where coal is absent, is included for completeness of stratigraphic data.*

TABLE A-1.1

SUMMARIZED DIAMOND DRILL HOLE DATA

(Including Coal Intersections)

No.	Date Completed	Total Depth (feet)	Collar R.L.(1) (feet)	Seam (2)	R.L. Seam Floor (feet)	Coal Intersections (feet) (3)	Thick-ness (ft)(4)	Total Coal in Seam (4)	Total Seam Thick-ness (ft)(5)	Remarks
M-1A	June 30,'73	304	2743	'B'	2641	60.05 - 101.92	41.87	35.19	41.87	
M-2/ M-2A	Sept.26,'74	923	3332	'A'	3233	97.39 - 98.68	1.29	-	1.29	Carbonaceous
				'B'	3155	166.21 - 170.69	4.48			
						172.42 - 176.83	4.41	8.64	10.62	
				'B'	3136	191.28 - 195.28	4.0	4.0	4.0	Repetition
				'C'	3035	289.25 - 296.36	7.11	6.64	7.11	Identification(?)
				?	2993	333.75 - 338.98	5.23	3.9	5.23	Not identified
				'D'	2876	444.29 - 455.63	11.34	9.62	11.34	
M-3	Oct.27,'74	131	2662	'B'	2550	73.20 - 83.41	10.21			
						86.66 - 88.00	1.34			
						89.55 - 93.00	3.45			
						93.65 - 97.86	4.06			
						98.66 - 101.00	2.34	20.98	27.80	Lower split con-
						101.00 - 111.90	10.90	26.78	38.70	tains 5.80' coal.
M-4	Oct.27,'74	103	2561	'B'	2479	43.50 - 66.60	23.10			Basal ply contains
						66.60 - 81.52	14.92	29.96	38.02	7.35' coal.
M-5	Oct.31,'74	161	2861	'A'	2826	34.20 - 35.20	1.00	1.00	1.00	Coal & carb. mudstone
				'B'	2747	109.50 - 114.00	4.50	4.50	4.50	Faulted out

TABLE A-1.1

SUMMARIZED DIAMOND DRILL HOLE DATA

(Including Coal Intersections)

No.	Date Completed	Total Depth (feet)	Collar R.L.(1) (feet)	Seam (2)	R.L. Seam Floor (feet)	Coal Intersections (feet) (3)	Thickness (ft)(4)	Total Coal in Seam (4)	Total Seam Thickness (ft)(5)	Remarks
M-6	Nov.22,'74	361	2730	'B'	2621	93.00 - 109.40	16.40	15.28	16.40	Total seam: 26.90'; lower split contains 3.24' coal.
						109.40 - 119.90	10.50	3.24	10.50	
				'B'	2599	126.95 - 131.50	4.55	3.45	4.55	Coal & carb. mudstone interbedded.
				'C'	2469	257.00 - 261.00	4.00	4.00	4.00	Contains carb. mudstone.

TABLE A-1.2

SUMMARIZED ROTARY DRILL HOLE DATA

(Including Coal Intersections)

RDH No.	Date Completed	Total Depth (feet)	Collar R.L.(1) (feet)	Seam (2)	R.L. Seam Floor (feet)	Coal Intersections (feet) (3)	Thickness (ft)(4)	Total Coal in Seam (4)	Total Seam Thickness (ft)(5)	Remarks
'A'	Oct.17,'74	202	2956	No	coal	intersections				
'B'	Oct.16,'74	200	3261	No	coal	intersections				
'C'	Oct.11,'74	202	3893	Sk	3789.5	95.5 - 103.5	8.0	8.0	8.0	See analytical data and seam section.
				Sk ?	3726.0	160.5 - 167.0	6.5	6.5	6.5	
					3786.8	186.0 - 196.2	10.2	8.0	10.2	Includes 2.2' stone band in centre of seam.
'D'	Oct.15,'74	200	3897	No	coal	intersection				
'E'	Oct.12,'74	200	3946	No	coal	intersections				
'F'	Oct. 7,'74	177	2505	No	coal	intersections				
'G'	Oct. 8,'74	195	2636	'C'	2476.2	157.2 - 159.8	2.6	2.6	2.6	
'H'	Oct. 5,'74	200	2633	'B'	2536	59.0 - 70.1	11.1			Faulted intersection (See anal. details & seam sections)
						71.8 - 74.0	2.2			
						75.0 - 78.0	3.0			
						82.0 - 90.0	8.0			
						93.0 - 97.0	4.0	28.3	38.0	
I	Oct. 4,'74	223	2814	'A' (6)	2721.0	86.0 - 93.0	7.0	nil	7.0	Carbonaceous mudstone.
				'B'	2627.5	152.0 - 154.3	2.3			Faulted intersection.
						155.5 - 160.2	4.7			
						162.0 - 167.0	5.0			
						168.5 - 175.5	7.0			
						181.5 - 186.5	5.0	24.0	34.5	

TABLE A-1.2 (Continued)

RDH No.	Date Completed	Total Depth (feet)	Collar R.L.(1) (feet)	Seam (2)	R.L. Seam Floor feet)	Coal Intersections (feet) (3)	Thick-ness (ft)(4)	Total Coal in Seam (4)	Total Seam Thick-ness (ft)(5)	Remarks
K	Sept.29,'74	205	3431	No	coal	intersections				
L	Oct. 1,'74	260	3436	'B'	3224.0	195.0 - 201.0	6.0			Minor rock bands
						206.0 - 212.0	6.0	12.0	17.0	between 195 & 201 ft.
M	Oct. 3,'74	193	3495	'B'	3364.0	109.8 - 115.0	5.2			Lower section faulted.
						122.0 - 131.0	9.0	14.2	21.2	
N	Oct. 9,'74	200	2542	'C'	2435	103.5 - 107.0	3.5			
O	Dec.13,'74	105	2960	No	coal	intersection				
P	Nov.24,'74	157	2591	No	coal	intersection				
Q	Nov.24,'74	204	2697	'C'	2658.0	33.0 - 39.0	6.0	4.7	6.0	Incl. 1.3' of stone,
				'B'	2537	142.0 - 160.0	28.0	?	28.0	coaly. Faulted seam, mostly mudstone and stone, coaly.
R	Oct.23,'74	203	3022	'A' (6)	2995.5	18.5 - 26.5	8.0	nil	8.0	Mostly carbonaceous mudstone.
				'B'	2913.5	99.0 - 102.5	3.5			
						104.5 - 108.5	4.0	7.5	9.5	
S	Oct.24,'74	200	2950	'A' (6)	2942.0	4.0 - 8.0	4.0	nil	4.0	Seam roof missing
				'B'	2863.0	77.0 - 80.0	3.0			
						82.8 - 87.0	4.2	7.2	10.0	

TABLE A-1.2 (Continued)

RDH No.	Date Completed	Total Depth (feet)	Collar R.L.(1) (feet)	Seam (2)	R.L. Seam Floor feet)	Coal Intersections (feet) (3)	Thickness (ft)(4)	Total Coal in Seam (4)	Total Seam Thickness (ft)(5)	Remarks
T	Nov. 1,'74	271	2856	'A' (6)	2741.0	107.8 - 115.0	7.2	1.4	7.2	
				'B'	2635.5	178.0 - 182.5	4.5			Faulted seam
						185.7 - 187.0	1.3			11.8 ft coal between
						188.5 - 195.0	6.5			196.0-213.0, remainder
						196.0 - 213.0	17.0			stone, coaly.
						216.0 - 220.5	4.5	28.6	42.5	(See anal. details & seam sections)
				'B'	2613.0	238.3 - 243.0	4.7	4.7	4.7	Repeated 'B' seam.
U	Nov. 2,'74	210	2700	'B'	2622.0	66.0 - 71.0	5.0			
						73.0 - 78.0	5.0	10.0	12.0	
				'C'	2501.8	190.5 - 198.2	7.7	6.2	7.7	Contains stone, coaly band.
V	Nov. 4,'74	160	2800	'B'	2731.0	53.5 - 56.0	2.5			
						57.4 - 60.7	3.3			0.7 ft coal between
						61.8 - 62.5	0.7			61.8 and 62.5 ft.
						64.0 - 69.0	5.0	11.5	15.5	
W	Nov. 6,'74	244	2937	'A' (6)	2801.0	130.5 - 136.0	5.5	-	5.5	Carbonaceous mudstone.
				'B'	2715.6	200.5 - 205.0	4.5			Faulted seam.
						208.0 - 212.5	4.5			See seam sections and
						215.0 - 217.0	2.0			analytical data.
						218.5 - 221.4	2.9	13.9	20.9	
WW	Nov.28,'74	220	2435	'B'	2255.5	171.5 - 175.0	3.5			
						176.5 - 179.5	3.0	6.5	8.0	

TABLE A-2

MIDDLE COALS EVALUATION

LIST OF SAMPLE NUMBERS RELATING TO DRILL HOLES

Sample No. (SKR)	Bore No.	Seam*	Interval (feet)
422	D.D.H. M-2	'D'	444.29 - 446.74
423			446.74 - 450.05
424			450.05 - 453.30
425			453.30 - 455.63
426	D.D.H. M-2	'B'	165.68 - 166.77
427			166.77 - 166.82
428			166.82 - 169.63
	(See also 436)		
429	D.D.H. M-2A	'B'	166.21 - 167.19
430			167.19 - 167.24
431			167.24 - 170.15
432			170.15 - 170.25
433			170.25 - 170.69
434			170.69 - 173.84
435			173.84 - 176.83
436	D.D.H. M-2	'B'	169.63 - 169.75
437	D.D.H. M-2	'B'	191.28 - 195.28
438			192.72 - 192.78
439	R.D.H. "H"	'B'	63 - 68
440			68 - 73
441			73 - 78
442			78 - 83
443			83 - 88
444			88 - 93
445			93 - 98
446			57 - 63

TABLE A-2

Sample No. (SKR)	Bore No.	Seam	Interval (feet)
447	D.D.H. M-3	'B'	73.20 - 74.25
448			74.25 - 77.10
449			77.10 - 78.25
450			78.25 - 78.45
451			78.45 - 81.00
452			81.00 - 83.24
453			83.24 - 86.56
454			89.56 - 93.00
455			93.00 - 93.65
456			93.65 - 94.70
457			94.70 - 95.55
458			95.55 - 96.10
459			96.10 - 96.25
460			96.25 - 97.86
461			97.86 - 98.66
462			98.66 - 101.00
463			101.00 - 101.60
464			101.60 - 102.80
465	R.D.H. "T"	'B'	177 - 182
466			182 - 187
467			187 - 192
468			192 - 197
469			197 - 202
470			202 - 207
471			207 - 212
472			212 - 217
473			217 - 222
474	R.D.H. "W"	'B'	201 - 203
475			208 - 211
476			211 - 216
477			216 - 221
478	R.D.H. "V"	'B'	55 - 60
479			60 - 65

TABLE A-2

Sample No. (SKR)	Bore No.	Seam	Interval (feet)
480	D.D.H. M-4	'B'	54.00 - 57.58
481			57.58 - 57.68
482			57.68 - 60.21
483			60.21 - 60.60
484			60.60 - 63.35
485			63.35 - 66.60
486			66.60 - 67.70
487			68.80 - 72.15
488			72.15 - 73.73
489			73.73 - 75.13
490			75.13 - 75.48
491			75.48 - 76.70
492			76.70 - 77.60
493			77.60 - 78.45
494			78.45 - 78.73
495			78.73 - 79.81
496			79.81 - 80.57
497			80.57 - 81.52
498	D.D.H. M-6	'B'	93.00 - 95.90
499			95.90 - 100.30
500			100.30 - 100.47
501			100.47 - 101.42
502			101.42 - 103.17
503			103.17 - 104.02
504			104.02 - 106.47
505			107.67 - 107.77
506			107.77 - 109.40
515	R.D.H. C	Sk	98 - 103
516			103 - 104
517	R.D.H. C	Sk(?)	162 - 167

*) 'A' : 'A' Horizon - Lower Gething

'B' : 'B' Seam - Lower Gething

Sk : Skeeter Seam - Upper Gething

NOTES TO ACCOMPANY TABLE A-1.3

1. See Notes to Accompany Tables A-1.1 and A-1.2 for heading notes.

2. See Figure 5.1 for locations of drill holes.

3. For log and graphic section of holes see 1972 Report:

   (a) Vol. 8 for D.D.H. C-35,

   (b) Vol. 11 for D.D.H.'s S-4, S-7 and S-8.

4. Stratigraphic logs only for S- prefix holes, depths approximate; no written log for D.D.H. S-2.

TABLE A-1.3

SUMMARISED DIAMOND DRILL HOLE DATA

FROM PREVIOUS PROGRAMMES

DDH No.	Date Completed	Total Depth (feet)	Collar R.L. (1) (feet)	Seam (2)	R.L. Seam Floor (feet)	Coal Intersections (feet) (3)	Thick-ness (ft) (4)	Total Coal In Seam (4)	Total Seam Thick-ness (ft) (5)	Remarks
S-2	Nov.26/69	1063	3498.7	'B'	2932	540 - 567	27.0	9.0	27.0	Coal in 3 splits
S-4	Dec.1/69	545	3592.2	'A'	3190	401 - 402	1.0	1.0	1.0	
				'B'	3070	505 - 508	3.0			
						519 - 522	3.0	6.0	17.0	(?) Faulted
S-7	Dec.10/69	836	3644.8	'A' (?)	3086	552 - 559	7.0	7.0	7.0	Includes Carb. mudstone
				'B'	3015	607 - 630	23.0	23.0	23.0	
				'B'	2964	667 - 681	14.0	14.0	14.0	Seam repetition by faulting
				'C'	2882	756 - 757	1.0	1.0		
						759 - 763	4.0	4.0	7.0	
S-8	Dec.19/69	872	3908.3	'A'	3355	552 - 553	1.0	1.0	1.0	
				'B'	3291	607 - 617	10.0	10.0	10.0	
C-35	Oct.28/71	958	4565.3	'A'	3205	1350 - 1360	10.0		10.0	Coal contains rock bands

(See accompanying notes)

APPENDIX A-2

SAMPLE NUMBERS USED

APPENDIX A-3

SUMMARIZED QUALITY DATA

NOTES TO ACCOMPANY TABLE A-3.1

a - *Assumed value based on lithology or coal type.*

b - *Bore numbers:* *D.D.H.* - *prefixed by M-*
R.D.H. - *alphabetical*

c - *Calculated value from individual analyses, by use of weighted averages.*

d - *D.D.H. M-1A: The total coal intersection is divided into 26 individual plies and analysed individually; values tabulated are calculated by compositing on weighted average basis for raw coal, and by arithmetic average for washed product at 1.60 S.G., except for C.V. which is product at 1.40 S.G.*

e - *D.D.H. M-2A: Samples SKR 430, 432 excluded from composite analysis of top split due to insufficient sample after raw coal analysis.*

f - *1.60 S.G. Washed Product analysis on +100 mesh fraction.*

g - *The composites do not represent full seam or intersection since non-sampled intervals are not included. These composites represent only designated sampled intervals.*

COALITION COAL

Sample: SKR 441

November 13, 1974

LAB NO. 1333

FROTH FLOTATION ANALYSIS - 28 M

Product	Wt %	Ash %	Cum Wt %	Cum Ash %	F.S.I.
Stage I	41.9	8.0	41.9	8.0	5 1/2
Stage II	9.2	11.5	51.1	8.6	4
Tails	48.9	20.7	100.0	14.5	1 1/2

F.F. Parameters

Reagent Dosage	-	0.24 lbs/Ton Kerosene:MIBC (4:1)
Pulp Density	-	10 %
Stage I	-	First Minute froth
Stage II	-	Second Minute froth
Conditioning Time	-	1 minute

8-"H"

TABLE A-3.1

SUMMARY OF ANALYTICAL DATA - 'B' SEAM

(See Notes To Accompany Table)

BORE No. b	SAMPLE No. (SKR)	ANAL. NESS PLY	THICK- (feet) CUM.	RAW COAL ANALYSIS. A-D BASIS S.G.	Ash %	V.M. %	S %	FSI	C.V. Btu/lb
M-3	447	1.05	1.05	1.23	2.7	18.4	0.29	1½	15,170
	448	2.85	3.90	1.31	2.9	18.3	0.42	1½	15,130
	449	1.15	5.05	1.36	7.2	17.4	0.33	1½	14,440
	450	0.20	5.25	1.82	50.5	-	-	1	-
	451	2.55	7.80	1.33	4.4	18.3	0.28	1½	14,900
	452	2.41	10.21	1.37	11.6	19.0	0.26	7	13,730
	453	3.15	13.36	1.95	60.6	-	-	½	-
	-	2.99	16.35	1.51 a	35.0a	Not	Analysed		
	454	3.45	19.80	1.45	18.9	20.2	0.19	5½	12,490
	455	0.65	20.45	1.47	16.8	-	-	1	-
	456	1.05	21.50	1.31	3.2	20.2	0.15	7	15,080
	457	0.85	22.35	1.31	2.8	19.0	0.20	1½	15,150
	458	0.55	22.90	1.36	7.3	20.5	0.26	8	14,410
	459	0.15	23.05	2.30	78.6	-	-	½	-
	460	1.61	24.66	1.47	25.9	18.2	0.18	8	11,320
	461	0.80	25.46	2.10	74.6	-	-	½	-
	462	2.34	27.80	1.44	18.3	17.6	0.26	2½	12,690
	463	0.60	28.40	2.40	84.5	-	-	½	-
	464	1.20	29.60	1.83	55.9	11.7	0.12	-	6,310
	447-452	10.21		1.34	6.6	18.0	0.33	1½	14,550
	454-464	13.25		1.51	27.8	18.0	0.31	3½	11,020
	447-452, 454-464	23.46			18.3c				

TABLE A-3.1

SUMMARY OF ANALYTICAL DATA - 'B' SEAM

(See Notes To Accompany Table)

BORE No. b	SAMPLE No. (SKR)	ANAL. NESS PLY	THICK- (feet) CUM.	RAW COAL ANALYSIS. A-D BASIS S.G.	Ash %	V.M. %	S %	FSI	C.V. Btu/lb
M-4	-	10.75	10.75	1.32 a	6.0a	Not	Analysed		
	480	3.33	14.08	1.31	4.8	19.3	0.26	3½	14,820
	481	0.10	14.18	1.45	14.0	19.9	0.29	2½	13,230
	482	2.53	16.71	1.64	42.6	15.7	0.24	7	8,550
	483	0.39	17.10	2.15	75.0	7.5	0.22	N/A	-
	484	2.75	19.85	1.32	5.7	19.4	0.29	2½	14,680
	485	3.25	23.10	1.34	9.7	21.2	0.24	7½	14,020
	486	1.10	24.20	1.91	57.6	13.1	0.35	1	5,950
	-	1.10	25.30	1.90 a	60.0a	Not	Analysed		
	487	3.35	28.65	2.41	79.5	16.9	0.19	N/A	-
	488	1.58	30.23	1.88	62.2	-	-	1	-
	489	1.40	31.63	2.01	65.0	10.5	0.29	1	4,710
	490	0.35	31.98	2.49	80.0	16.9	0.14	N/A	-
	491	0.77	32.75	1.64	41.9	14.8	0.40	4½	8,810
	492	1.35	34.10	2.17	76.1	7.9	0.27	½	-
	493	0.85	34.95	1.55	32.2	16.2	0.55	4	10,220
	494	0.28	35.23	2.07	70.6	8.7	0.28	1	3,760
	495	1.08	36.31	1.62	37.6	15.2	0.47	5	9,275
	496	0.76	37.07	2.33	82.7	6.6	0.22	N/A	-
	497	0.95	38.02	1.35	10.5	20.7	0.75	8	13,930
	480-486, 487-497		26.17	1.63	38.9	16.0	0.33	2½	9,330

TABLE A-3.1

SUMMARY OF ANALYTICAL DATA - 'B' SEAM

(See Notes To Accompany Table)

BORE No. b	SAMPLE No. (SKR)	ANAL. NESS PLY	THICK- (feet) CUM.	RAW COAL ANALYSIS. A-D BASIS S.G.	Ash %	V.M. %	S %	FSI	C.V. Btu/lb
M-6	498	2.90	2.90	1.32	5.1	17.9	1.19	1½	14,790
	499	4.40	7.30	1.30	5.6	20.1	0.67	4½	14,690
	500	0.17	7.47	2.33	83.4	12.0	0.32	-	-
	501	0.95	8.42	1.32	8.7	22.3	0.44	9	14,250
	502	1.75	10.17	1.55	36.5	16.2	0.42	6½	9,760
	503	0.85	11.02	1.79	53.8	11.2	0.53	1	6,940
	504	2.45	13.47	1.31	3.7	19.5	0.54	3½	15,010
	-	1.20	14.67	1.34a	6.5a	Not	Analy	sed	
	505	0.10	14.77	1.85	58.1	12.0	0.29	½	6,270
	506	1.63	16.40	1.34	6.8	20.7	0.59	5	14,500
g	498-506		15.20		20.3	18.44 c		3	
'H'	446	6.0	6.0	1.63	38.8	15.5	0.33	-	8,995
	439	5.0	11.0	1.35	12.7	18.1	0.32	1½	13,245
	440	5.0	16.0	1.44	23.8	18.3	0.46	1½	11,435
	441	5.0	21.0	1.34	10.8	21.1	0.46	3½	13,500
	442	5.0	26.0	1.45	24.8	19.0	0.34	6½	11,255
	443	5.0	31.0	1.32	8.6	19.8	0.36	2½	13,860
	444	5.0	36.0	1.37	15.3	20.1	0.48	7	12,790
	445	5.0	41.0	1.49	29.6	18.6	0.43	6	10,500
	439-446 c		41.0		21.2	18.7		3½	

TABLE A-3.1

SUMMARY OF ANALYTICAL DATA - 'B' SEAM

(See Notes To Accompany Table)

				RAW COAL ANALYSIS. A-D BASIS					1.60 SG WASHED PRODUCT, A-D BASIS f
BORE No. b	SAMPLE No. (SKR)	ANAL. NESS PLY	THICK- (feet) CUM.	S.G.	Ash %	V.M. %	S %	FSI	C.V. Btu/lb
'T'	465	5.0	5.0	1.42	16.6	18.1	0.35	1½	12,870
	466	5.0	10.0	1.66	42.3	14.4	0.21	1	8,600
	467	5.0	15.0	1.63	40.2	14.4	0.19	1	8,950
	468	5.0	20.0	1.42	16.2	18.7	0.28	4½	12,910
	469	5.0	25.0	1.53	33.2	17.2	0.31	1½	10,100
	470	5.0	30.0	1.44	19.5	17.6	0.46	1	12,395
	471	5.0	35.0	1.37	12.3	19.8	0.28	2	13,600
	472	5.0	40.0	1.40	14.6	18.7	0.33	2	13,200
	473	5.0	45.0	1.61	14.7	15.4	0.21	1	13,195
	465-473		45.0	1.53	27.9	16.6	0.40	1½	10,990
'V'	478	5.0	5.0	1.64	39.5	14.8	0.24	1	9,050
	479	5.0	10.0	1.41	16.2	19.0	0.35	1½	12,930
	478-479		10.0	1.50	28.8	17.0	0.49	1	10,910
'W'	474	2.0	2.0	1.38	14.7	17.6	0.57	1½	13,195
	-	5.0	7.0	2.50	80.0a	N o t	A n	a l y	s e d
	475	3.0	10.0	1.55	29.6	16.4	0.46	1	10,710
	476	5.0	15.0	1.81	55.0	12.6	0.18	1	6,460
	477	5.3	20.3	1.84	34.0	15.9	0.24	1	9,990
	474-477		15.3	1.54	33.6	18.7	0.53	1	10,080

TABLE A-3.2

ANALYSES FROM 1969-70 FIELD PROGRAMME

MIDDLE COALS

Reproduced From:
Brameda Resources Ltd., April, 1971 -
Summary Report, Sukunka Coal Project, Peace River District, British Columbia, by W.R. Bergey, L. Bilheimer, J.C. Mitchell, and L.S. Trenholme.

SUHUNKA COAL TESTING

MIDDLE COALS

	HOLE NO.	FROM	TO	WIDTH FT.	REC. FT.	WEIGHT %	FLOAT SINK	A.D.M.	ASH %	V.M. %	FIXED CARBON	B.T.U. AIR DRY	S %	F.S.I.
1)	S-2	547.0	552.0	5.0				0.45	24.75	19.13	55.67	11,377	0.38	1.5
2)	S-7	526.0	534.0	8.0				0.50	7.75	21.90	69.85	14,521	0.46	1.5
3)	S-8	606.5	612.5	6.0				0.75	7.30	20.00	-	14,421	0.74	3.0
3)	S-8	612.5	617.5	5.0				0.80	7.75	19.70	-	14,721	0.30	2.0
4)	S-8	799.0	803.0	4.0				0.77	18.50	17.58	-	12,800	0.45	1.5
						AVERAGE		0.65	31.21	19.66	66.48	13,568	0.46	1.9

Seam Names

1) 'B' Seam
2) 'A' Horizon
3) 'B' Seam
4) 'D' Horizon

(Interpretation by G.R. Wallis, May, 1975)