00 177

GEOLOGICAL REPORT OF THE 1982

WOLF MOUNTAIN EXPLORATION PROGRAMME

VOLUME I

Copy 1

Coal Licence Nos. 6083 - 6086
and 7470
Vancouver Island - Douglas District
N.T.S. Sheet 92F/1
Latitute 49° 07'N
Longitude 124° 02'W
Licences Held By: Netherland Pacific
Mining Co. Inc.
Operator: Wolf Mountain Coal
Partnership Ltd.
Consultant : JHP Coal-Ex Consulting Ltd.
Author: John H. Perry
Work Performed: June - November 1982
Date Submitted: July 15th, 1983

JHP COAL-EX CONSULTING LTD.
Suite 806
402 West Pender Street
Vancouver, B.C.
V6B 1T6

SUMMARY

The Wolf Mountain Coal Property consists of five coal licences which are held by Netherlands Pacific Mining Company Inc. These licences are located on Vancouver Island, British Columbia, within a few kilometres of the city of Nanaimo. The property comprises an area of 1,179 hectares and is located to cover strata which are known to be coal-bearing. Immediately to the east of the property are several small towns, as well as the Provincial Highway No. 1 and the Esquimalt-Nanaimo rail line. The principal industries in the region are forestry, forest products and tourism.

Exploration of the property during 1982 was conducted by Wolf Mountain Coal Partnership Ltd., a private group which has an agreement with Netherlands Pacific to earn a 50% interest in the property. Prior to 1982 it had been established that several coal seams were contained within the property. The purpose of the 1982 programme, therefore, was to establish the reserves and quality of the coal. The exploration undertaken consisted of geological mapping, rotary drilling, geophysical logging and coal quality analysis. A total of $114,304 was spent on exploration activities and a further $21,950 on environmental and engineering studies for a Stage I submission.

Six coal seams have been identified within the Extension-Protection Formation on the Wolf Mountain Coal Property. These seams range in thickness from a few tens of centimetres up to 2.76 metres. Only one seam is presently considered to be of economic interest. This seams ranges in true thickness from 0.84 to 2.76 metres and is correlated with the Wellington seam, the major coal seam of the region and one which has supported many old workings.

The coal seams are contained within an asymmetric syncline the axis of which plunges gently to the east. The structure noses sharply in the west where the plunge is approximately 20° to the southeast. A high-angle reverse fault occupies the fold axis over a large part of the reserve area. This fault is downthrown to the south and is hinged at its western extremity. The displacement associated with the fault increases to the east and reaches a maximum of approximately 20 metres on seam W.1. The southern limb of the syncline dips gently to the north (from 2° to 7°); the dip steepens to 20° in the nose of the fold. Dips on the north limb are between 20° to 26° to the south.

A total in situ resource of 3.16 million tonnes has been calculated for the property (from seam W.1). From this resource, 1.80 million tonnes of run-of-mine (R.O.M.) reserves have been calculated. A further 0.21 million tonnes of high ash coal will be produced from in-pit cleaning, due to the removal of at least one thin rock band and adjacent coal. This material may well be marketable to local cement plants. The drill hole spacing, which aproximates a 350 metre grid, and the regular nature of the coal seam stratigraphy over most of the property, allow the coal resources to be placed within the proven (or measured) category. Further tonnage could be obtained from seam W.4. However, the seam is less than one metre thick and economic extraction might be difficult.

Seam W.1 is a high quality thermal coal of high volatile bituminous B rank. On a dry basis, heating values of 12,368 to 13,148 BTU's/lb are obtained from samples of 15.23% and 10.53% ash, respectively. Moisture levels for run-of-mine coal have been arbitrarily set at 8%. On this basis, heating values range from 11,379 to 12,096 BTU's/lb at 14.01% and 9.69% ash, respectively. Fuel ratios are less than 1.40; the coal is also agglomerating with F.S.I. values of up to 4 1/2 for coal of 15% ash content. Sulphur content is consistently less than one percent and sodium content (as $\%Na_2O$ and water-soluble alkalies % in coal) is low. Other results of the ash analyses and ash fusibility tests are generally favourable. Size analysis indicates that even after crushing to 1/4" (6.3mm) x 0 very few fines are generated (8.6% for 0.15mm x 0). Petrographic analysis shows a vitrinite reflectance of 0.74%, high total reactives (79.2%) and low predicted combustibles in the fly-ash (3.4%). The material produced by in-pit cleaning is expected to contain approximately 40% ash and have a heating value of around 8,000 BTU's/lb.

TABLE OF CONTENTS

VOLUME I

TABLE OF CONTENTS (cont'd)

LIST OF TABLES

VOLUME I

LIST OF FIGURES

VOLUME I

LIST OF FIGURES (cont'd)

LIST OF APPENDICES

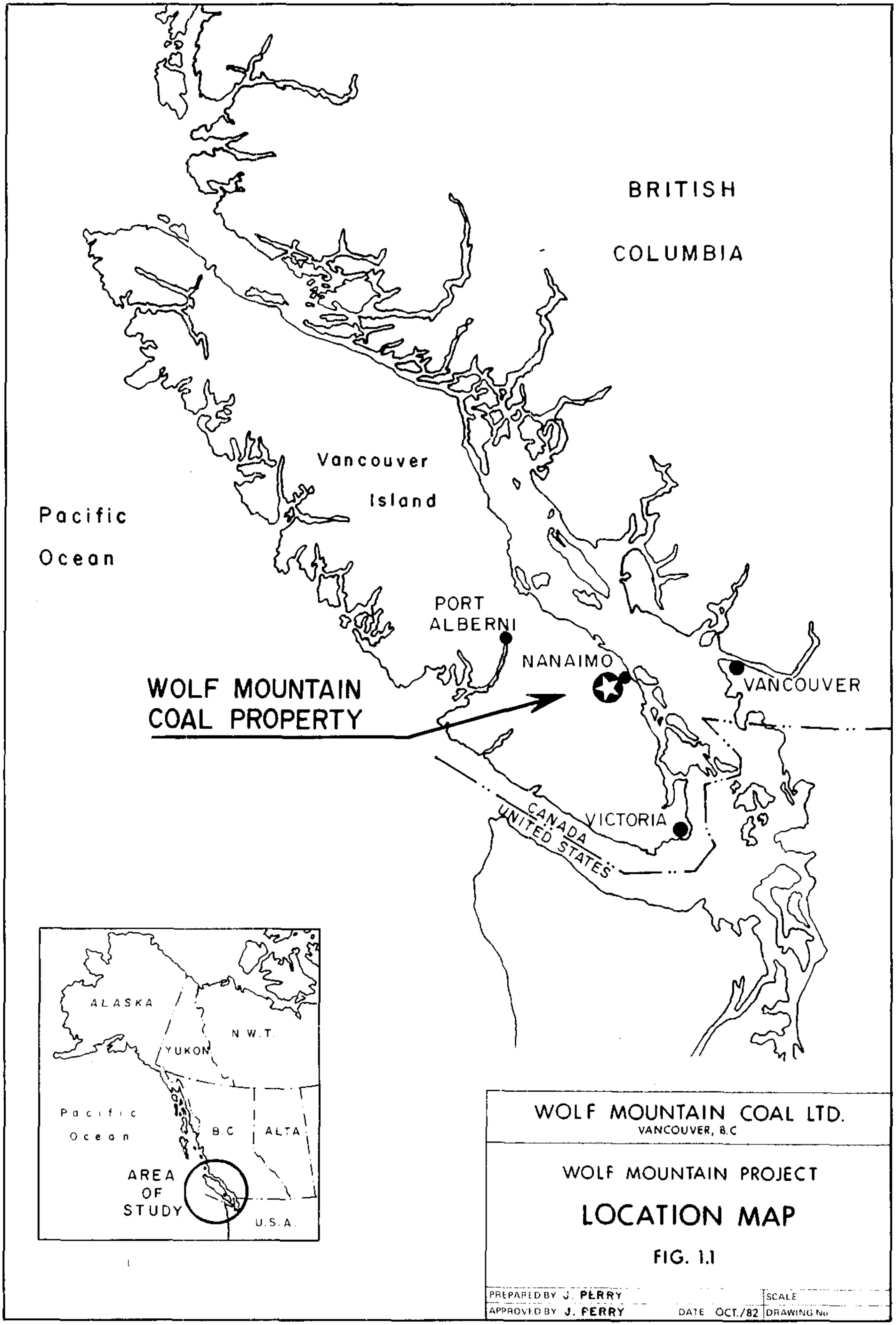
1.0 INTRODUCTION

This report presents the results of geological exploration carried out on the Wolf Mountain Coal Property during 1982. Most of the exploration was conducted during the summer although two holes were drilled during late-autumn. The data obtained from the summer's work was compiled into a report which formed part of a Stage I submission on the property (Perry, 1982). While that report forms the basis of this study it has been modified to include new and previously unsubmitted data.

Eastern central Vancouver Island is an area that has a long history of coal mining. Although no mines are presently in production, coal was mined in this region between 1852 and 1967. Recent increases in demand for thermal coal from Pacific Rim markets have caused a number of companies to take a second look at Vancouver Island coalfields. Areas that were previously mined or of low tonnage potential are being reconsidered, as well as previously untested areas.

The Wolf Mountain Coal Property is comprised of 1,179 hectares located along the eastern side of Vancouver Island in the immediate vicinity of Nanaimo, British Columbia (see Figures 1.1 and 1.2). The property was acquired by Netherlands Pacific Mining Company Inc. as part of a much larger block of coal licences in 1979. This block plus another which lay a few kilometers to the north were optioned to Gulf Canada Resources Inc. in January, 1981. Gulf subsequently named these coal licences the "Benson Coal Property". Reconnaissance exploration comprising regional-scale geological mapping and rotary drilling was undertaken by Gulf Canada later that spring. Only the Wolf Mountain area was identified as having any potential but, as the total estimated reserves were not of the magnitude required, Gulf withdrew their interest. The property returned to Netherlands Pacific who retained the coal licences around Wolf Mountain but allowed the rest to revert to the Crown.

Exploration of the property during 1982 has been conducted by Wolf Mountain Coal Partnership Ltd. This is a private group headed by Mr. Eric Roberts, P. Eng., which has recently entered into an agreement with Netherlands Pacific to acquire a 50% interest in the Wolf Mountain property. The focus of the exploration was to establish the reserves and quality of coal contained within the Wellington seam (seam W.1). Details of the geology, reserves and coal quality are presented in the following sections of the report.



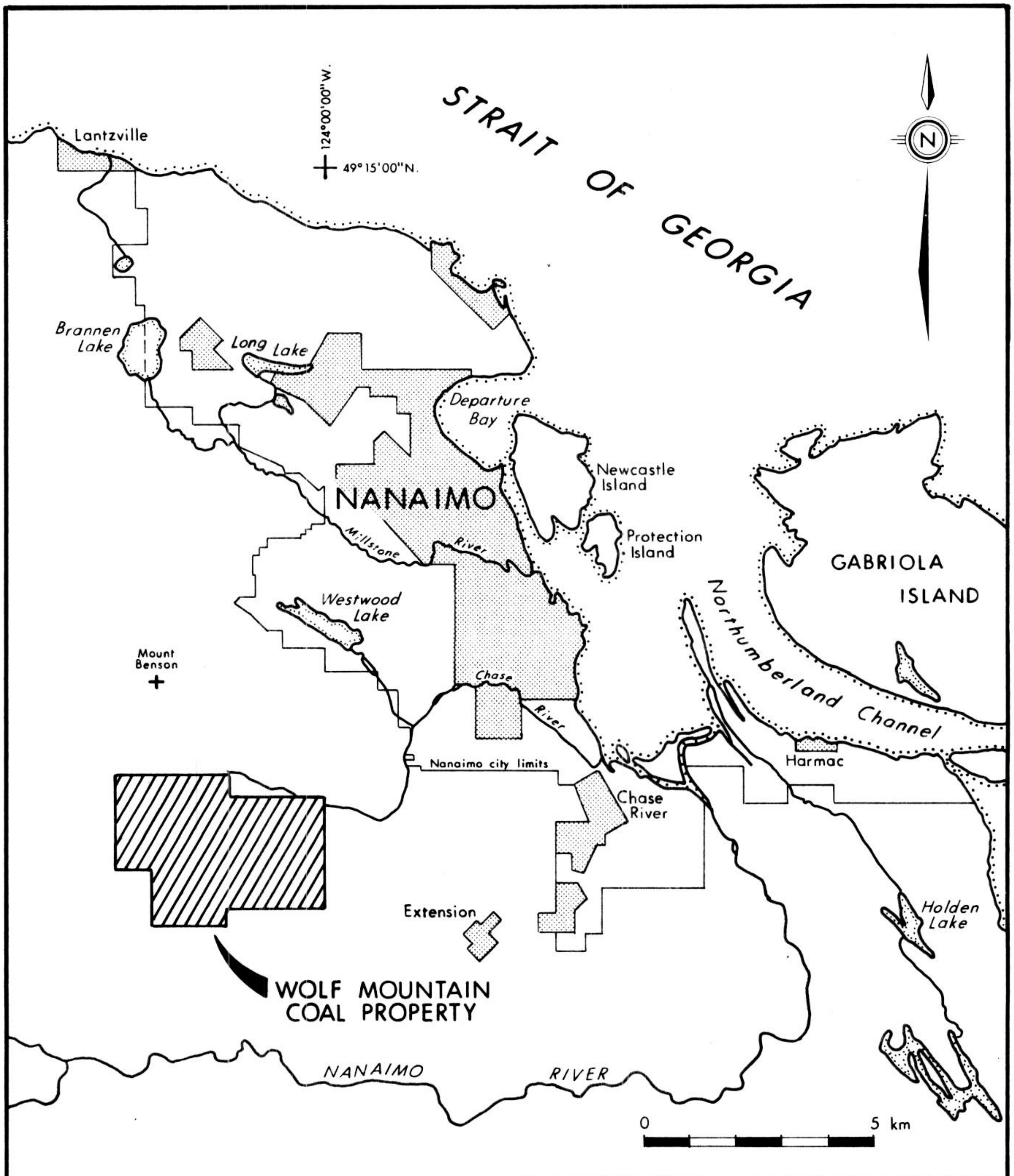
WOLF MOUNTAIN COAL LTD.
VANCOUVER, B.C

WOLF MOUNTAIN PROJECT

LOCATION MAP

FIG. 1.1

PREPARED BY J. PERRY
APPROVED BY J. PERRY DATE OCT./82
SCALE
DRAWING No



WOLF MOUNTAIN COAL LTD.	
WOLF MOUNTAIN PROJECT	
PROPERTY MAP	
FIG. 1.2	
M.D. NANAIMO	AUTHOR: J.H. Perry
N.T.S. 92F(SE) & 92G(SW)	DRAWN BY: P. Hall
SCALE: 1:125,000	DATE: April 1983
COAL-EX CONSULTING LTD.	DWG. No.

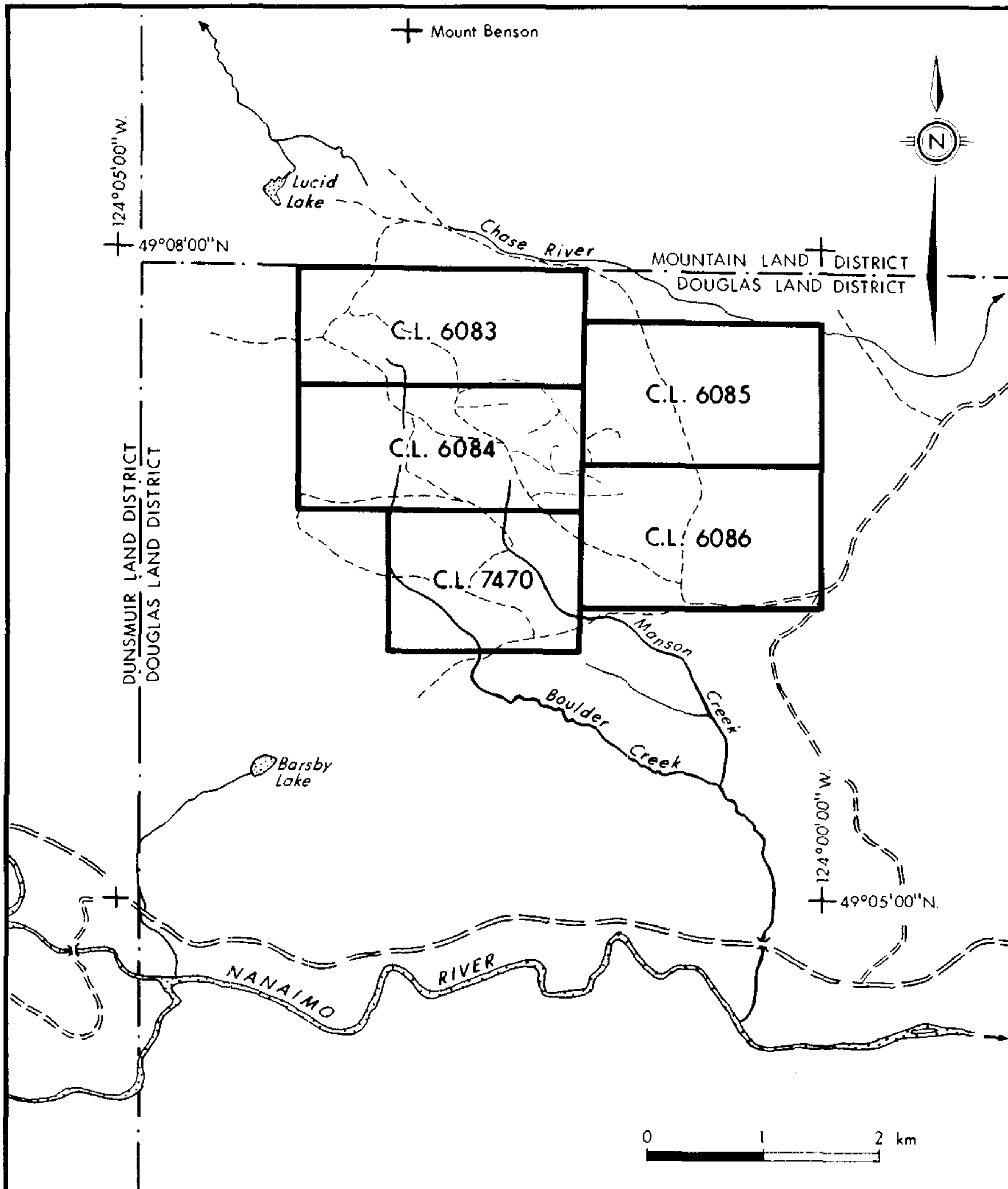
2.0 LOCATION, ACCESS AND PHYSIOGRAPHY

The Wolf Mountain Coal Property lies close to the city of Nanaimo (population 47,000) and occupies part of the eastern coastal plain of central Vancouver Island, British Columbia. The property is located within a region where coal mining was, for a long time, the primary industry. Although no mines are operational at the present time, coal was mined around Nanaimo between 1852 and 1953. Today, the major industries in the Nanaimo region are forestry-related industries and tourism.

The Wolf Mountain Coal Property is composed of five coal licences which are located along the western limits of the Nanaimo coalfield, approximately 10 kilometres southwest of Nanaimo (Figure 2.1). Access to the property is excellent; a major unpaved, all-weather forestry road extends from just south of the property to Nanaimo. Branching out from this road are a number of secondary logging roads and trails which cut through the property.

The Provincial Highway No. 1 and the Esquimalt-Nanaimo rail line are located a short distance to the east of the property. The highway and rail line provide a major transportation corridor to port facilities along the eastern coast of Vancouver Island.

Wolf Mountain is a steep-sided hill which forms the southeastern portion of a northwest trending ridge (Blackjack Ridge). Elevations range from approximately 400 to 740 metres above sea-level. The slopes are relatively regular except near the top where cliffs and benches predominate. The main drainages on Wolf Mountain are Boulder Creek (west slope), Manson Creek (south slope) and Chase River which trends along the northern edge of the property. Most of the property is covered by forest, generally second growth pine, fir and alder. Recent logging operations have been undertaken on the southern and upper, southeastern flanks and these areas will be slashed and cleared in the coming months.



From Coal Titles Reference Map C92F/1E

WOLF MOUNTAIN COAL LTD.

WOLF MOUNTAIN PROJECT

COAL LICENCE MAP

FIG. 2.1

M.D.	NANAIMO	AUTHOR:	J.H. Perry
N.T.S.	92F/1(E)	DRAWN BY:	P. Hall
SCALE:	1:50,000	DATE:	April 1983
COAL-EX CONSULTING LTD.		DWG. No.	

3.0 SUMMARY OF EXPLORATION WORK

3.1 Pre 1982 Exploration Work

The search for, and the mining of, coal in the Nanaimo area was quite extensive between 1852 and 1953. The Nanaimo coalfield quickly became established as a major producer of high quality steam coal in Western North America. By the time the industry closed down, a large portion of the coal seams had been mined.

The search for coal extended to Wolf Mountain where a number of prospect holes were dug (Buckman, 1947). These exploration efforts were directed at locating the Wellington seam which was mined in the Extension area to the east. However, these diggings, which are still visible today, only located thin and dirty seams. As a result no coal seams of economic importance were considered to be present on Wolf Mountain.

In 1981, Gulf Canada drilled a number of holes on and around Wolf Mountain as part of an exploration project over a much larger area. Only one hole (GBS-RDH-81-05) intersected any significant coal seams. This drill hole, located on the top of the mountain, established the presence of a thick seam below the lowest seam which had been excavated many years before. The exploration was of a reconnaissance nature and was pursued no further by Gulf.

3.2 The 1982 Exploration Programme

Exploration was carried out on the Wolf Mountain property between mid-July and mid-November of 1982. Most of the field work was completed by mid-August but two holes were drilled in mid-November to test geological interpretations based on data obtained in the summer.

The objective of the 1982 Exploration Programme was to delineate the coal reserves on Wolf Mountain and acquire data on the coal quality from drill core and rotary drill cuttings. To achieve these objectives, a programme of geological mapping, rotary drilling, down-hole geophysical logging, coal quality analysis and topographic mapping was undertaken.

A summary for each of the exploration activities is presented below.

3.2.1. Geological Mapping

The geological mapping undertaken during 1982 was accomplished by one 2-man team. The mapping was concentrated in and around the coal bearing area although traverses extended throughout the property. As detailed topographic maps of the property were not available, the mapping was performed only on a regional scale. Data collection was carried out using aerial photographs in conjunction with enlargements of existing 1:50,000 government maps. The data was later transferred to the detailed (1:2,500) topographic maps when they became available. For the most part, the mapping was concentrated along the many logging roads and trails which cross the property and around the drill hole locations. Where bush traverses were undertaken, control of the traverse lines was achieved using chain and compass techniques, corrected for slope variation. Points such as creek and road intersections, existing drill holes and prominent topographic features were used as control points to locate the beginning and end of each traverse.

3.2.2. Rotary Drilling

Sixteen rotary drill holes were completed on the property for a total of 601.5 metres; 582.9 metres open-hole and 18.6 metres of core drilling. All drilling was carried out in the central, coal-bearing portion of the property. The holes were drilled on eleven sites; the majority of the holes were completed by open-hole drilling, however, four cored sections were taken across coal seams in three of the holes. The twinning of the "core" holes to existing "open" holes enabled precise core points to be established so that core could be obtained across the whole seam. An extra two holes were necessary on site WM-RDH-82-07 due to problems encountered in coring and poor coal-core recovery.

The open-hole drilling was performed by conventional air rotary techniques using a Schramm T-685 (850 c.f.m. at 350 psi) with an Ingersoll D.H.D. Hammer. Coring was undertaken by the same rig using a Christensen 3.05 metre (10 foot) split tube and both diamond and conventional bits. The rig was supported by a pipe truck with hiab crane, a 1500 gallon capacity water truck and a 3/4 ton 4x4 pickup truck.

All holes were cased to bedrock to ensure good hole conditions for drilling and geophysical logging. Drill cuttings and core were logged by a geologist. Cuttings were described only in terms of basic lithology while the core from coal seams, along with roof and floor lithologies, were logged in great detail with close reference to the detailed geophysical logs. Descriptions recorded lithological type, sedimentary structures, and structural features such as joints and faults. The descriptive core logs are presented in Appendices B.I and B.II.

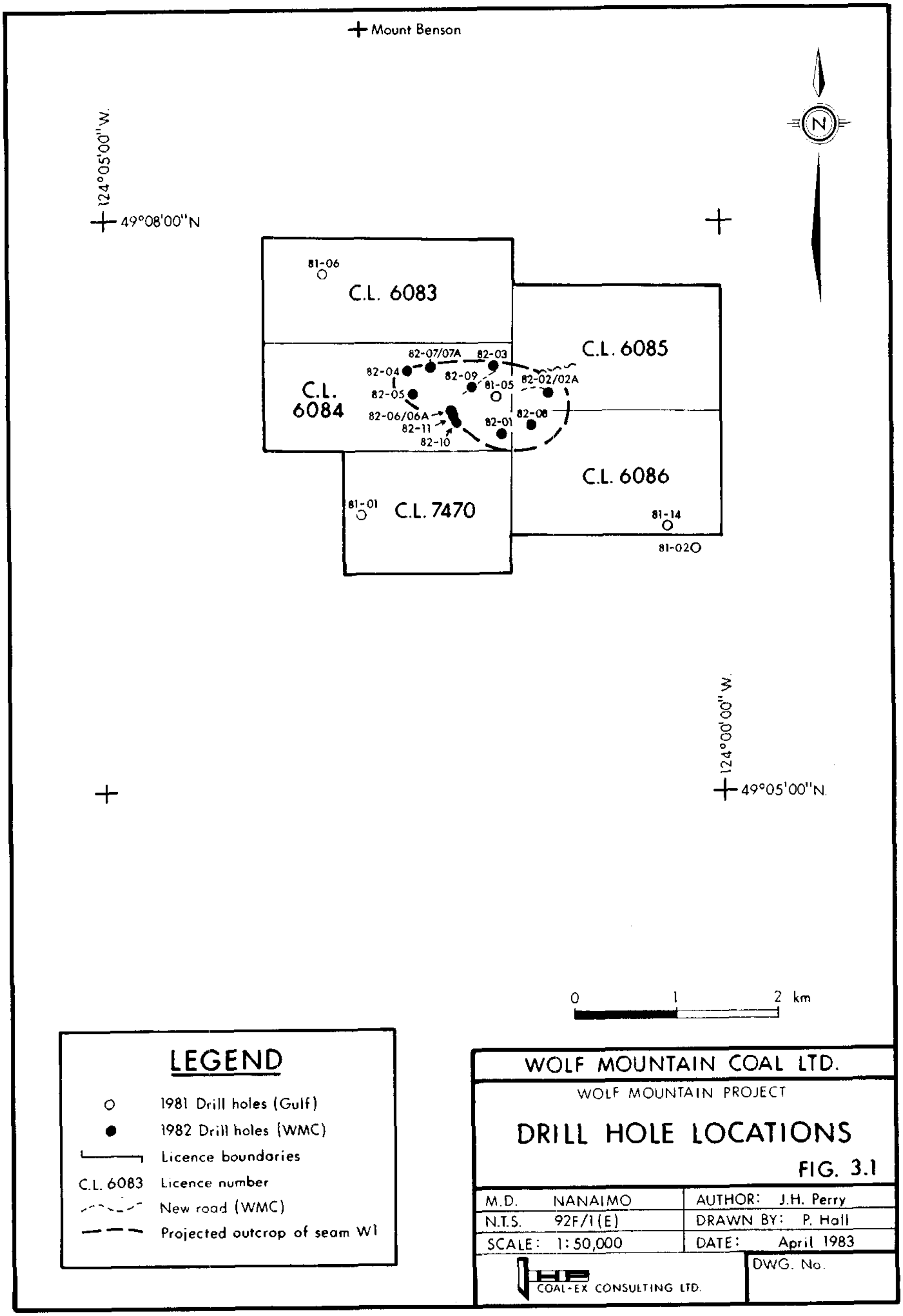
All drill holes except WM-RDH-82-07, 07A, 10, and 11 were cemented to surface using approved techniques. Holes 82-07 , 07A and 11 were left open for water quality studies and will be cemented later. Hole 82-10 was sited below the lowest seam and consequently did not intersect any coal.

The 1982 drill hole locations are shown on Figure 3.1 along with holes drilled in previous exploration programmes.

3.2.3. Geophysical Logging

A full suite of geophysical logs were obtained from drill holes WM-RDH-82-01 through to 82-09. This suite consisted of: gamma ray, neutron, sidewall-density, caliper, focussed resistivity and hole deviation. These logs were run at general scale of 1:100, supplemented by detailed (1:40) scale sidewall-density, gamma ray, focussed resistivity and caliper logs over coal-bearing intervals. All log information was stored in a digital form on cassette tapes.

As there was a delay of one week between finishing the open-hole drilling and starting the coring, the geophysical logging unit was released from the job. The "core" holes WM-RDH-82-02A, 06A, and 07A were drilled within a few metres of existing holes from which geophysical logs had been obtained. Consequently, these geophysical logs were used as if they had been obtained from the "core" holes themselves to assist in the description of core, determination of seam thickness and positioning of core loss.


Mount Benson
124°05'00"W.
49°08'00"N
124°00'00"W.
49°05'00"N.
N
C.L. 6083
C.L. 6084
C.L. 6085
C.L. 6086
C.L. 7470
81-06
81-05
81-01
81-14
81-02
82-01
82-02/02A
82-03
82-04
82-05
82-06/06A
82-07/07A
82-08
82-09
82-10
82-11
0
1
2 km
LEGEND
1981 Drill holes (Gulf)
1982 Drill holes (WMC)
Licence boundaries
C.L. 6083 Licence number
New road (WMC)
Projected outcrop of seam W1
WOLF MOUNTAIN COAL LTD.
WOLF MOUNTAIN PROJECT
DRILL HOLE LOCATIONS
FIG. 3.1
M.D. NANAIMO
N.T.S. 92F/1(E)
SCALE: 1:50,000
AUTHOR: J.H. Perry
DRAWN BY: P. Hall
DATE: April 1983
DWG. No.
COAL-EX CONSULTING LTD.

Holes WM-RDH-82-10 and 82-11 were drilled much later and, as they were intended only to confirm the position of the subcrop of the major coal seam, no geophysical logs were run.

The geophysical logs from holes drilled in the 1982 Wolf Mountain Exploration Programme, accompanied by the logs for GBS-RDH-81-05 (drilled in 1981), are presented in Appendix B.IV.

3.2.4. Coal Analysis

An extensive programme of analysis has been undertaken on the coal samples obtained from the 1982 drilling programme. Dependent upon the type of sample obtained, the testing followed one of two different procedures, (see Figure 6.1). Analysis of the individual core samples (or plys) was much the same as for the coal seam cuttings obtained from open-hole drilling, except that tests on the latter were performed on the float portion of a 1.60 specific gravity cut.

Analysis of the seam composites was performed on a raw basis only and the samples did not undergo any washability tests. Further, the selection of the composite samples was designed to correspond as closely as possible to the run-of-mine coal. The analyses of the composites are, therefore, considered to directly reflect the anticipated quality of the product coal. The composites for seam W.1 were later blended and divided into three portions; two were sent to potential customers and the third was retained for size analysis. Petrographic analysis was also undertaken on coal from this portion.

The results of all analyses are fully discussed in the "Coal Quality" section of this report and individual test results are presented in Appendices A.IV and A.V.

3.2.5. Surveying and Topographic Mapping

Survey control work was undertaken on the Wolf Mountain property from mid-August to late September. All of the 1982 drill holes were surveyed along with GBS-RDH-81-05, the only pre-1982 hole which lies within the coal reserve area. All traverse lines were closed and the drill holes and local survey control points were tied-in to existing Provincial Triangulation Stations (see Figure 3.2). Air photography of the property was carried out in late September. Targets which had been positioned prior to the photography were then surveyed and this information, along with that obtained earlier, was used as a base to generate a topographic map (see Figure 3.3). The topographic map produced is at a scale of 1:2,500 and at contour intervals of 2 metres and 5 metres above and below the 500 metre contour, respectively. This map covers an area of some 700 hectares which includes the coal reserve area and possible mine sites and access routes. Instruments used for the surveying included at Distomat Model DI 10 for measurements of angles and short distances and theodolites and a Geodimeter Model 76, for the measurements of angles and larger distances, respectively.

Co-ordinates and elevations for the drill holes and air photography control stations are given in Table 3.1 and all survey data is presented in Appendix B.III. All co-ordinates are polyconic.

TABLE 3.1

WOLF MOUNTAIN SURVEY CO-ORDINATES

DRILL HOLE	ELEVATION(m)	NORTHING	EASTING
GBS-RDH-81-05	669.51	13525.31652	70794.64407
WM-RDH-82-01	662.90	13165.73987	70837.83725
WM-RDH-82-02	643.37	13554.24666	71261.62811
WM-RDH-82-02A	643.21	13556.56162	71260.91171
WM-RDH-82-03	702.86	13795.47166	70769.64259
WM-RDH-82-04	707.69	13752.62812	69926.89448
WM-RDH-82-05	637.46	13523.55652	69989.30152
WM-RDH-82-06	635.90	13399.16493	70367.02033
WM-RDH-82-06A	635.52	13396.12052	70368.00520
WM-RDH-82-07	735.79	13843.85107	70191.29766
WM-RDH-82-07A	734.29	13832.27670	70184.73984
WM-RDH-82-07B	735.61	13842.76495	70190.39682
WM-RDH-82-07C	736.25	13844.91769	70192.76531
WM-RDH-82-08	663.24	13276.32475	71159.35511
WM-RDH-82-09	688.25	13652.05037	70579.73756
WM-RDH-82-10**	632.5	13341	70406
WM-RDH-82-11**	634.5	13374	70386

AIR PHOTOGRAPH CONTROL STATIONS

TARGET NO.	ELEVATION(m)	NORTHING	EASTING
1	459.61	12427.71743	69534.92065
2	415.52	12072.75614	70503.87350
3	580.04	12957.10793	70696.35063
4	362.35	12212.59137	71880.19531
5	448.74	13632.34864	71845.05757
6	508.55	14470.30011	71474.49711
7	669.87	14344.90660	70623.06508
8	702.38	14349.78107	69790.63300
9	628.64	13748.49784	69476.57170
10	599.65	13486.09468	69509.16628
11	562.84	13312.65928	69445.86224

** Not surveyed. Approximate elevations and co-ordinates only.

Note: All co-ordinates are polyconic.
Elevations are in metres.

3.2.6. Road Construction

Many forestry roads and trails cut across the Wolf Mountain property. The 1982 exploration programme was designed to take advantage of the existing access and most of the drill holes were positioned either on the trails or off to one side, on open ground. However, in order to achieve an adequate spacing of holes throughout the coal reserve area, several short trails had to be constructed (Figures 3.1 and 3.3). These trails were to provide access to sites 02, 07 and 09 and were approximately 350 metres, 50 metres and 250 metres in length, respectively.

The precise routes of these trails were discussed with representatives of the relevant government agencies and, in the case of site 02, MacMillan Bloedel. Access to sites 02 and 09 utilized old trails which were overgrown with second growth alder and pine while the route to site 07 was through small, well-spaced pine. As the trail to site 09 was through an area which had been "spaced" it was necessary to buck the fallen timber prior to any cat-work. The trail to site 02 was through a stand of alder so no pre-cutting was required. The trails were constructed with a minimum amount of surface disturbance and did not cross any drainages.

In addition to the above, on-going logging operations which were being conducted by MacMillan Bloedel generated further trails which were used to access sites 01 and 08.

3.2.7. Reclamation

No reclamation was undertaken during 1982. After completion of drilling, all holes were cemented to surface except for WM-RDH-82-07, 07A and 11 which were left open for water quality tests. Drill hole WM-RDH-82-10 was positioned below the lowest seam and so no coal was interesected. The casing was removed from drill holes WM-RDH-82-07B, and 82-10 but was left in all the others. After the cementing procedure was completed the casing was cut off just below ground level and the hole was covered with earth and rocks.

Reclamation of the drill sites and access trails will proceed during 1983.

3.2.8. Project Management and Primary Contractors

Geological services for programme organization, supervision of field operations, data reduction and report preparation were provided by JHP Coal-Ex Consulting Ltd., Vancouver, British Columbia. The programme was carried out under the direction of Mr. E. Roberts, the general partner of Wolf Mountain Coal Partnership Ltd., West Vancouver, British Columbia.

The primary contractors who performed work on the property are listed below:

1. Geology and Project Supervision
JHP Coal-Ex Consulting Ltd.
Vancouver, B.C.

2. Drilling
Ken's Drilling Ltd.
Brentwood Bay, B.C.

3. Geophysical Logging
   Century Geophysical Corp. of Canada
   Calgary, Alberta

4. Road Construction
   Fred Morris, Nanoose Bay, B.C.
   Veasey Banks, Nanaimo, B.C.

5. Truck Rental
   Cana Rentals
   Vancouver, B.C.

6. Surveying
   C.O. Smythies & Associates
   Nanaimo, B.C.

7. Topographic Map Preparation
   Aero Geometrics Ltd.
   New Westminster, B.C.

8. Coal Analysis
   General Testing Laboratories
   Vancouver, B.C.
   D.E. Pearson & Associates Ltd.
   Victoria, B.C.

9. Drafting
   P.S. Hall
   Vancouver, B.C.

Accomodation in Nanaimo was obtained at the Tally-Ho Town and Country and Inn.

3.2.9. Statement of Costs

Activity	Costs	Performed on Licence Nos.
Geology (covers programme prep., project supervision, geology, report prep. and includes costs for room and board, truck rental, travel, communications and miscellaneous carried expenses).	$35,245	6083-6086 and 7470
Drilling	38,478	6084, 6085, 6086
Geophysical Logging	10,551	6084, 6085, 6086
Road Construction	2,132	6084, 6085
Surveying & Topographic Mapping	14,272	6083-6086 and 7470
Coal Analysis	4,677	6084, 6085, 6086
Drafting	4,763	6083-686 and 7470
Stage 1 Preparation (includes engineering report and environmental consultants report).	17,763	6083-6086 and 7470
Miscellaneous Costs (includes management, legal and insurance).	8,373	6083-6086 and 7470
TOTAL	$136,254	

4.0 GEOLOGY

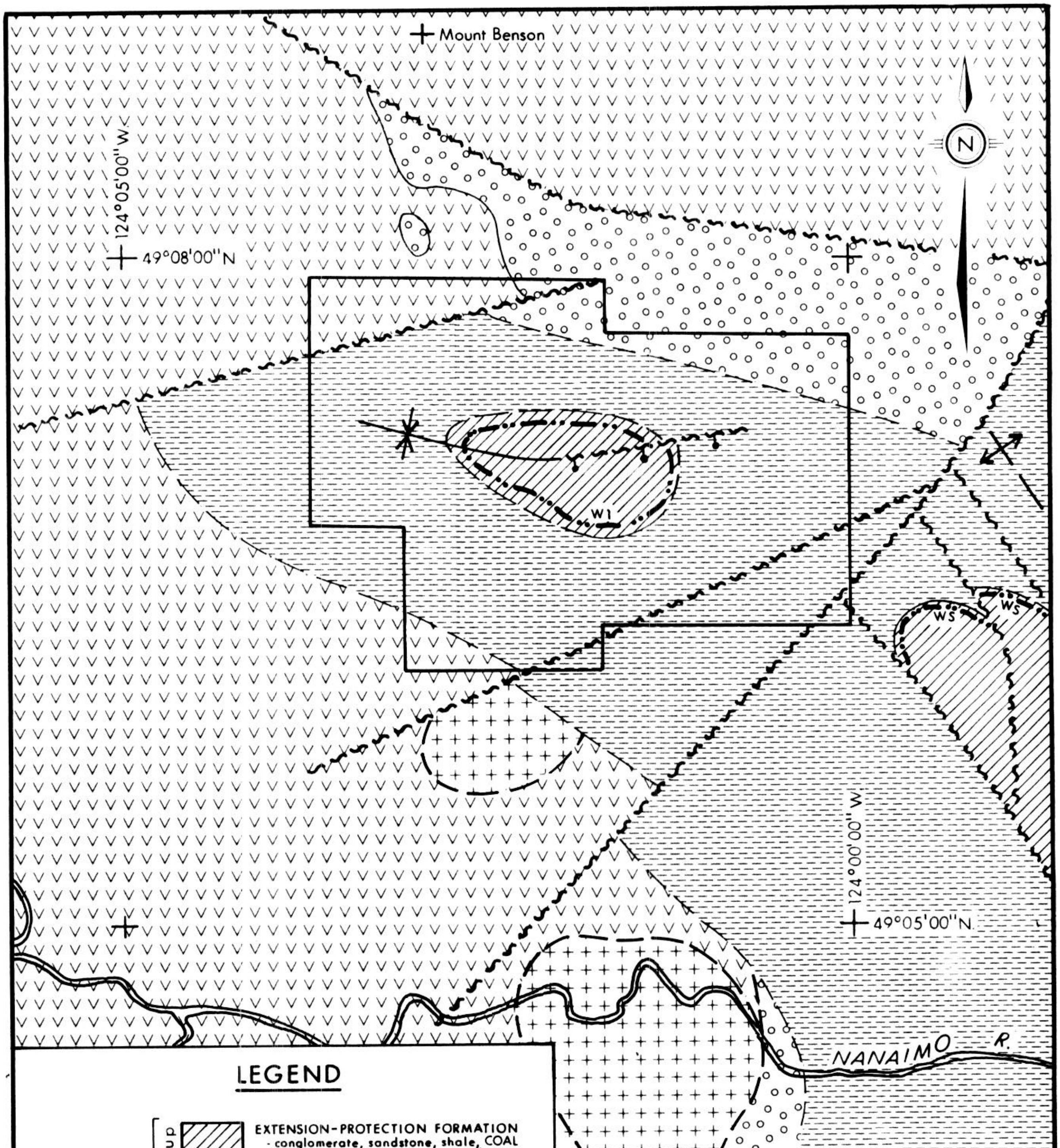
4.1 Stratigraphy

4.1.1. General Stratigraphy

The Wolf Mountain Coal Property is located to cover coal-bearing strata within the Extension-Protection Formation of the Upper Cretaceous Nanaimo Group. Strata of the Nanaimo Group unconformably overlie metasediments and igneous rocks of the Sicker and Vancouver Groups and Island Intrusions. The regional geology is outlined in Figure 4.1 while the distribution of the Nanaimo Group lithologies contained within the property is shown on the Geology Map and Structural Cross-Sections (Figures 4.2 and 4.3). Stratigraphic correlations of the rock units penetrated by the drill holes are presented in Figures 4.4 and 4.5.

Various formational names have been applied to the stratigraphy of the Upper Cretaceous strata of the eastern coastal plain of Vancouver Island. The first formational subdivisions and nomenclatures were established by Clapp (1912 a, b; 1917) while more recent revisions have been made by Muller and Jeletzky (1970) and Ward (1978). A comparison of the systems of nomenclature put forward by these authors is shown in Figure 4.6. As the formational subdivisions proposed by Ward (op.cit.) are not generally accepted for the Nanaimo area (J. Muller, pers. comm., 1983) the nomenclature used in this report is taken from Muller & Jeletzky (op.cit.).

The sediments that comprise the Nanaimo Group represent five sedimentary cycles. Four of the cycles are transgressive, each grading upwards from fluvial to deltaic and/or lagoonal, through nearshore to offshore marine. The fifth cycle is only deltaic.



LEGEND

UPPER CRETACEOUS — Nanaimo Group

- EXTENSION-PROTECTION FORMATION
  - conglomerate, sandstone, shale, COAL
  - W1 = seam W1 (Wolf Mountain)
  - WS = Wellington seam (Extension area)
- HASLAM FORMATION
  - shale, siltstone, sandstone
- COMOX FORMATION - BENSON MEMBER
  - conglomerate, greywacke

JURASSIC

- ISLAND INTRUSIONS
  - granodiorite, quartz diorite

TRIASSIC

- VANCOUVER GROUP
  - intermediate to basic volcanics

Contact — Fault — Anticline — Licence boundary — Syncline — Coal seam

WOLF MOUNTAIN COAL LTD.

WOLF MOUNTAIN PROJECT

REGIONAL GEOLOGY

FIG. 4.1

M.D.	NANAIMO	GEOL. BY:	J.H. Perry
N.T.S.	92F/1(E)	DRAWN BY:	P. Hall
SCALE:	1:50,000	DATE:	April 1983

HB COAL-EX CONSULTING LTD.

DWG. No.

FORMATION NAMES: CLAPP (1914)	MULLER & JELETZKY (1970) and THIS STUDY	WARD (1978)	MAJOR COAL SEAMS
PROTECTION	EXTENSION-PROTECTION	PROTECTION	
NEWCASTLE		PENDER	DOUGLAS NEWCASTLE
CRANBERRY			
EXTENSION		EXTENSION	WELLINGTON
EAST WELLINGTON	(EAST WELLINGTON MEMBER)		(W-1)
HASLAM	HASLAM	HASLAM: (North) HASLAM CREEK MEMBER / (South) COWICHAN MEMBER	
COMOX	COMOX (BENSON MEMBER)	COMOX (BENSON MEMBER)	
BENSON			

FIGURE 4.6 - Upper Cretaceous Nanaimo Group Stratigraphic Nomenclature.

Each of the first four cycles is comprised of two formations: the first is a non-marine sandstone-conglomerate sequence which may contain lagoonal shale and coal; the second is an overlying, mainly marine, siltstone-shale sequence. Within the Nanaimo region only the lagoonal Extension-Protection Formation is coal-bearing. Of the Nanaimo Group, only sediments of the Comox, Haslam and Extension-Protection Formations are present within the Wolf Mountain Coal Property; these are discussed below. A general description of the stratigraphy of these formations is presented in Table 4.1.

TABLE 4.1

TABLE OF FORMATIONS -

LOWER PORTION OF THE UPPER CRETACEOUS

NANAIMO GROUP

Formation	Lithology	Regional Variation in Thickness (metres)
Extension-Protection	Sandstone, conglomerate shale, coal	0-580
Haslam	Shale, siltstone, fine-grained sandstone	0-305
Comox (Benson Member)	Sandstone, shale (conglomerate)	0-410

4.1.2. Nanaimo Group

4.1.2.1. Comox Formation

The Comox Formation forms the lower part of the first depositional cycle. Rocks of this formation are generally represented by the basal conglomerate of the Benson Member, a sequence of massive conglomerate of considerable lateral and vertical variation. Finer grained lithologies are present, but their thickness and extent are even more variable than that of the conglomerates. It is not known whether Comox Formation strata exist at depth throughout the property, but they are present in the southeast (as pebbly sandstones in drill holes GBS-RDH-81-02 and 81-14) and in the northeast (as outcroppings of the conglomeratic Benson Member). To the west, however, lithologies of the Haslam Formation directy overlie the basement volcanics. No significant coal seams have been found in the Comox Formation of the Nanaimo region (Perry, 1981).

4.1.2.2. Haslam Formation

The Haslam Formation represents the upper part of the first depositional cycle and is composed of a monotonous sequence of marine shales, siltstones, and fine-grained sandstones. The fine-grained lithologies of the upper portions of the Comox Formation are considered to be transitional with those of the overlying Haslam Formation. The Haslam shales are recessive and, hence, usually drift covered; exposures are largely confined to streams and occasional road-cuts. The shales and siltstones are commonly thin-bedded, dark grey to black when fresh, and often highly fossiliferous. They weather to a reddish-brown colour and appear in outcrop as oval, concentrically weathered masses, varying in size up to one metre in length. In drill hole GBS-RDH-81-05, the Haslam Formation is at least 260 metres thick.

4.1.2.3. Extension-Protection Formation

The Extension-Protection Formation conformably overlies the Haslam Formation and represents the lower part of the second depositional cycle. This formation contains the only coal seams of economic interest in the Nanaimo region. They are found in the lower half of the formation and were extensively mined between 1852 and 1953. The major seams are named Wellington, Newcastle and Douglas; most of the production came from the Wellington and Douglas seams.

The Extension-Protection Formation is a sequence of coarse clastic sediments composed mainly of interbedded conglomerates and sandstones with occasional horizons of shale and coal. The conglomerates are generally massive and clast size ranges from small pebble to cobble. The clasts vary from rounded to subrounded and are composed predominantly of cherts, although granitic and volcanic clasts are quite common. Sandstone interbeds are common; the sandstone is generally medium to coarse grained, yellow weathering but olive grey when fresh and consists of quartz, feldspar, volcanic and chert grains. At the base of the formation is a thick sandstone referred to as the East Wellington Member. This sandstone is approximately 40 metres thick and commonly forms the floor of the Wellington seam. On Wolf Mountain the thick conglomerate-sandstone horizons form cliffs and bluffs with shales and coal at their base. The prominent "benched" topography developed around the upper southern and eastern flanks of the mountain results from the recessive weathering of the coals and shales. Only the lowermost portions of the Extension-Protection Formation are represented on the property. Consequently, only the lowermost coal seams, (that is, the Wellington and associated minor seams), are present. A discussion of the coal seam stratigraphy is presented below.

4.1.3. Coal Seam Stratigraphy

A total of six coal seams have been identified on the Wolf Mountain Property (see Figure 4.5, drill hole GBS-RDH-81-05). However, because of thickness and quality considerations, only one of these is presently considered to be economically mineable. This seam is referred to as seam W.1 and is correlated with the Wellington seam. Throughout most of the reserve area seam W.1 is the lowermost coal seam within the Extension-Protection Formation. A thin coal seam (referred to as seam Wx) does, however, underlie seam W.1 in drill hole GBS-RDH-81-05. As seam Wx has not been intersected in any of the other drill holes, its development is obviously very limited. The main coal seams are numbered in ascending order, seam W.5 being the topmost coal seam. The areal extent of these coal seams diminishes rapidly from seam W.1 to seam W.5 due to the shape of the topography.

As a result of the drill programme it has been possible to establish positive correlation of the coal seams throughout the property. This correlation is readily apparent from the signatures each seam makes on the geophysical logs (see Figures 4.4 and 4.5). Some of the more pertinent characteristics of seam W.1 are summarized below and illustrated in Figure 4.7, the correlation chart for seam W.1.

Seam W.1 averages approximately 2.4 metres in true thickness and ranges between 0.84 metres and 2.76 metres. Throughout most of the property, however, the range in thickness is from 1.69 to 2.76 metres. Only hole WM-RDH-82-01 exhibits a seam thickness of less than 1.69 metres. Seam W.1 generally possesses good lateral and vertical continuity, except in the immediate vicinity of drill hole WM-RDH-82-01. Here the upper part of the seam is replaced by shale while shales and thin coal splits comprise the interseam strata between seams W.1 and W.2. The variation in the thickness of seam W.1 across the reserve area is illustrated by the Isopach Map (Figure 4.8). The pattern generated by the isopachs is quite simple. There is a small but steady decrease in the thickness of seam W.1 from north to south across the reserve area up to a line which would connect drill holes WM-RDH-82-05, GBS-RDH-81-05 and WM-RDH-82-08. South of this line there is a rapid but regular decrease in thickness towards drill hole WM-RDH-82-01.

As can be seen from Figure 4.7, several rock and/or poor coal bands are characteristically developed at specific horizons within seam W.1. One of these is located some 0.20 to 0.50 metres above the floor of the seam. Generally, this poor coal/rock band is 0.05 to 0.10 metres thick but in drill holes WM-RDH-82-03, 07 and 09 it ranges between 0.20 and 0.40 metres in thickness and is comprised mainly of carbonaceous mudstone. Two rock bands are present within the top half of the seam in drill holes WM-RDH-82-02, 03, 07, 08, and GBS-RDH-81-05. Again, these bands are between 0.10 to 0.15 metres in thickness. In the southwestern portions of the reserve area, however, only one band is present in the upper portions of the seam. This band reaches a thickness of approximately 0.35 metres in WM-RDH-82-09 but is approximately 0.10 metres thick in the rest of the drill holes. Other rock and poor coal bands may be present within seam W.1, but they are quite thin (0.01-0.03 metres) and mainly restricted to the upper half of the coal seam. The rock bands are comprised of highly carbonaceous, almost coaly, shales and mudstones and are difficult to distinguish in structurally deformed portions of the seam.

The floor of seam W.1 is usually a medium to coarse grained sandstone. In the core samples the sandstone is highly carbonaceous and even coaly at the contact with the seam. This sandstone, known as the East Wellington sandstone, is very thick and forms the floor in the old workings nearby.

Roof lithologies of seam W.1 range from carbonaceous claystone through interbedded shale and siltstone to medium grained silty sandstone. The shales are restricted to the south and eastern portions of the reserve area (WM-RDH-82-01, 02, and 08) while a predominantly sandstone roof is present in the north, central and western portions (WM-RDH-82-04, 06, 07, 09, and GBS-RDH-81-05). Shale and siltstone interbeds form the roof of seam W.1 in drill holes WM-RDH-82-03 and 05. The shale which forms the roof in WM-RDH-82-02A is quite competent, generally massive, with only a slight fissility and provides a sharp contact with the underlying coal. The sandstone roof exhibited in drill holes WM-RDH-82-06A and 07A is fine to medium grained, silty and interlayered with very thin coal bands and pods for the first 0.10 to 0.20 metres above the seam. Although no geotechnical work has been undertaken it is anticipated that roof conditions will be better in the areas where the roof is comprised of shale or siltstone and shale than where it is formed by sandstone. This observation is drawn from the fact that the thin coal bands and pods which are found within the sandstone provide planes of weakness within the immediate roof. These coal bands and pods were not present in the shale roof examined from hole WM-RDH-82-02A.

The outcrop trace of the Wellington seam as presented on the Geology Map (Figure 4.2) has been projected using drill hole and strike and dip data. The coal seam has not yet been located on the ground due, mainly, to the amount of talus and overburden in the areas of projected seam outcrop.

As the other coal seams are not, as yet, considered to possess any economic potential, they have not been studied in any detail. Seam W.3 is usually over two metres in thickness but is composed mainly of highly carbonaceous, coaly shale with only thin coal splits throughout. Although it is of a mineable thickness it could not provide an economical product for marketing (see Appendix A.III). Seam W.4 has been intersected only in drill hole GBS-RDH-81-05 where it is approximately 0.83 metres thick and appears to be free of rock bands. Although it is of very limited areal extent this seam might warrant further study if an economical extraction method could be devised.

These minor coal seams may also be correlated with seams described from other parts of the Nanaimo coalfield. Seam W.2 is believed to correlate with the Little Wellington seam, while seam W.3 probably correlates with a seam exposed at "Jack's Prospect" on the north bank of the Nanaimo River, south of Extension (see Dowling, 1915 b).

4.2 Structural Geology

The general geological structure of the region is illustrated in Figure 4.1 while the detailed structure of Wolf Mountain itself is presented in Figures 4.2, 4.3, and 4.9, the Geology Map. Structural Cross-Sections and Structure Contour Map (Seam W.1), respectively.

Analysis of the data indicates that the coal-bearing strata are contained within a faulted syncline. This syncline exhibits a gentle (2^{o}) plunge to the east over most of the reserve area but noses sharply in the west where it plunges at approximately 20^{o} to the southeast. The syncline is disrupted by a high-angle reverse fault contained within the hinge zone of the fold. This fault trends east-northeast across the central and eastern portions of the reserve area, is downthrown to the south and is hinged at its western extremity. The displacement associated with the fault increases to the east and on seam W.1 it reaches a maximum of approximately 20 metres. The displacement increases at higher stratigraphic levels.

The strike of the beds throughout most of the reserve area is to the east or southeast. On the north flank of the syncline the strata dip between 20^{o}-26^{o} to the south while the south flank dips gently to the north (from 2^{o} to 7^{o}). In the nose of the syncline the dips on the south flank steepen to approximately 20^{o}.

Geological mapping to date has largely been on a reconnaissance basis and, as a result, detailed analysis of the structural geology has been hampered by the lack of seam W.1 outcrop and reliable bedding measurements. The conglomerates and sandstones on Wolf Mountain show extensive cross-bedding and, as the shales and coals are recessive and covered with till, the dip and strike of true bedding is difficult to obtain. Consequently, the structure contours of seam W.1 (Figure 4.9) are based primarily on the drill hole data. The interpreted presence of a reverse fault is based on the development of the structure contours of seam W.1, particularly in the area between WM-RDH-82-09 and GBS-RDH-81-05. No mapping which could confirm this structure (in the area where the fault is projected to intersect the seam W.1 outcrop) has yet been carried out. Examination of air-photographs does not indicate any obvious displacement so further work will be necessary to properly define the nature of the transition from the south to north flank, where the fault is now proposed to exist.

Very little data is available on the small-scale structures which may affect seam W.1. Examination of core from WM-RDH-82-02A indicates that the amount of disturbance within, above and below seam W.1 is very slight in the eastern portions of the reserve area. Tectonic disturbance of the seam increases to the west in proximity to the nose of the syncline, as is indicated by intense shearing of the coal in hole WM-RDH-82-07A. Small scale roof structures which will be found in the underground operations of the proposed mine will be more prevalent in the western half than in the eastern half of the reserve area.

5.0 RESOURCES AND RESERVES

5.1 Summary of Resource and Reserve Evaluation

A calculation of the resources and reserves of seam W.1 has been made for the Wolf Mountain Coal Property. The classification of coal tonnage into "resource" and "reserve" is broadly analogous to the system proposed by the Federal Department of Energy, Mines and Resources (1979). The term "resource" is used here to denote the total tonnage of coal within the deposit which can be targeted for mining, (in this case for seam W.1 only). The term "reserve" is applied to that portion of the resource that can be recovered as run-of-mine coal using current technology. Other provisions such as profitability at current market prices have not been considered.

On the basis of the discussion above, a total resource base of 3.16 million tonnes for seam W.1 has been calculated for the property with a run-of-mine reserve of 1.80 million tonnes, (see Table 5.1 and Figures 5.1 to 5.4) A further 0.21 million tonnes of high-ash coal will be available from in-pit cleaning. This material may well be marketable to local cement plants.

The in-situ resources have been placed in the proven (or measured) category since the coal seams have been demonstrated to be very regular and, apart from in the vicinity of hole WM-RDH-82-01, thickness variations occur in a gradual manner. In addition, although the property has not been drilled on a grid pattern the drill hole spacing averages approximately 350 metres, with a range in spacing from 240 to 470 metres. The uncertainty with regard to the precise nature of the transition from south to north flank in the eastern part of the reserve area is not considered to detract significantly from the resource category.

TABLE 5.1

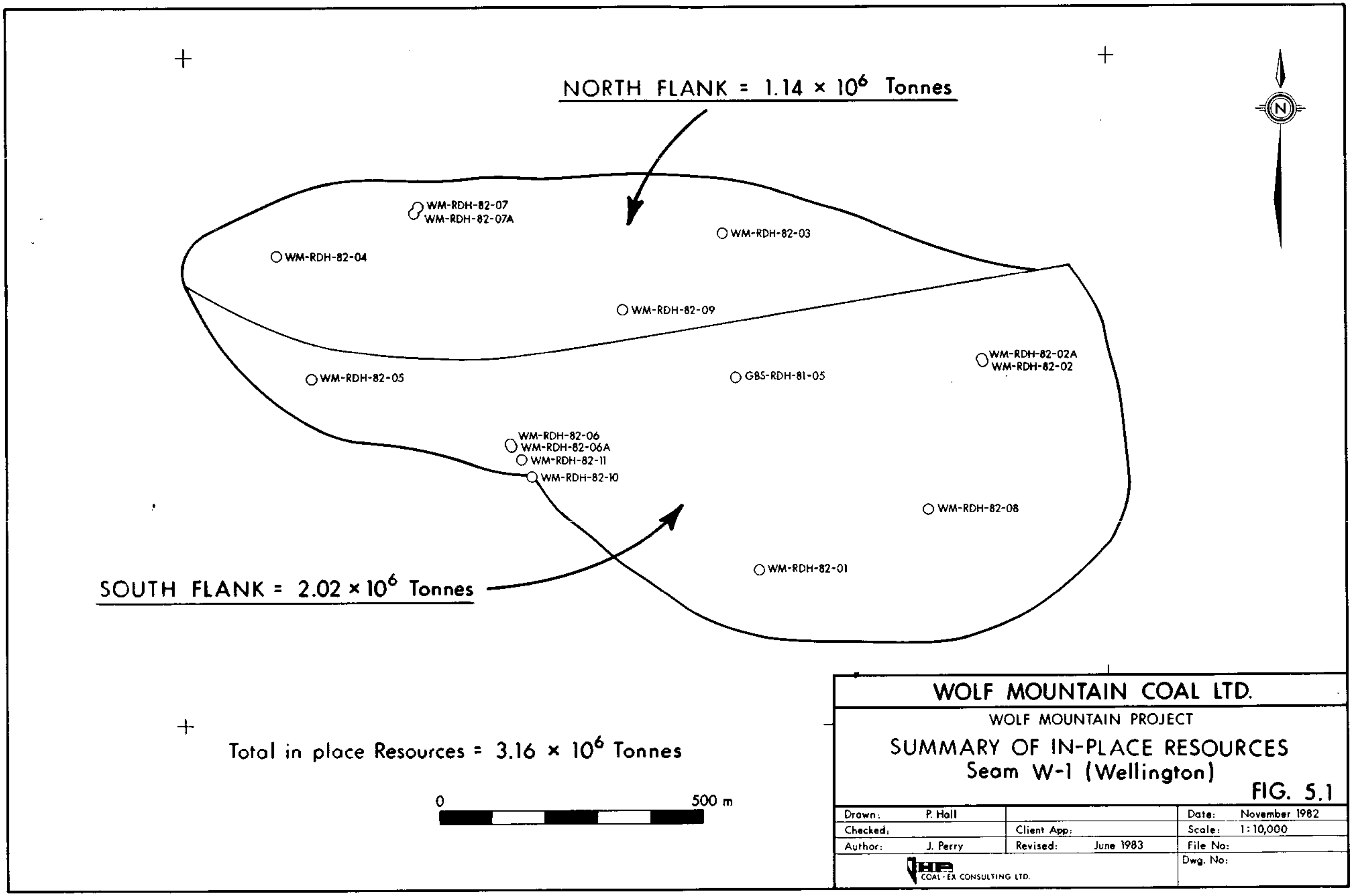
SUMMARY OF RESOURCES AND RESERVES

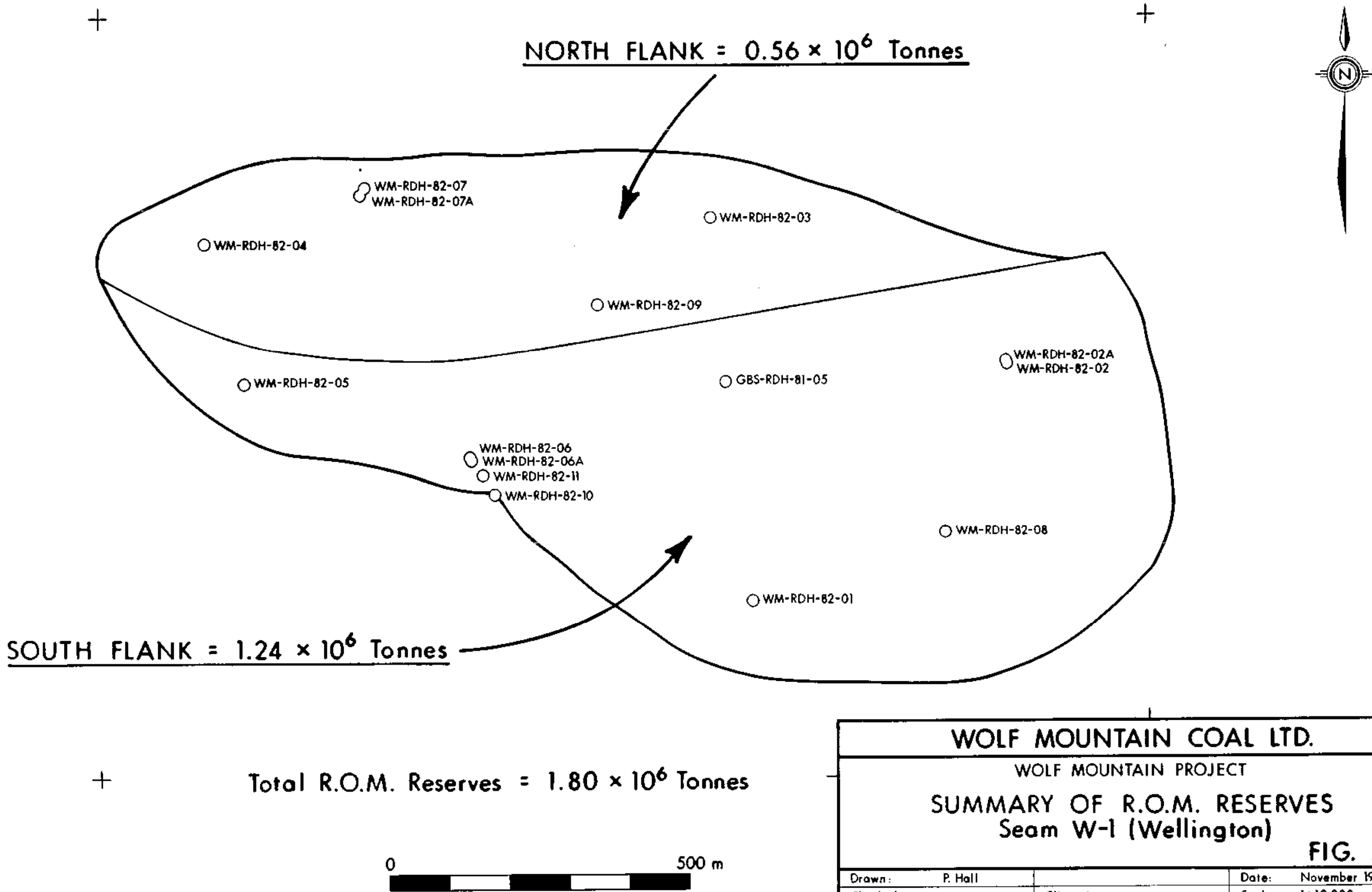
FOR SEAM W.1 - WOLF MOUNTAIN

RESERVE BLOCK		IN-PLACE RESOURCES x 10^6 TONNES	R.O.M. RESERVES x 10^6 TONNES
I	(A to C)	0.5047	0.2448
II	(A to D)	0.6371	0.3125
III	(A to D)	0.7423	0.4769
IV	(A to F)	0.9338	0.5610*
V	(A to B)	0.1131	0.0693
VI	(A to C)	0.1827	0.1106
VII	(A to B)	0.0477	0.0226
TOTAL		3.1614	1.7977 x 10^6 tonnes
North Flank		1.1418	0.5573 x 10^6 tonnes
South Flank		2.0196	1.2404 x 10^6 tonnes

Tonnage of High-ash "Cut" = 0.2090*x 10^6 tonnes

*Does not include IV.B


NORTH FLANK = 1.14 × 10⁶ Tonnes
SOUTH FLANK = 2.02 × 10⁶ Tonnes
Total in place Resources = 3.16 × 10⁶ Tonnes
WM-RDH-82-07
WM-RDH-82-07A
WM-RDH-82-03
WM-RDH-82-04
WM-RDH-82-09
WM-RDH-82-02A
WM-RDH-82-02
WM-RDH-82-05
GBS-RDH-81-05
WM-RDH-82-06
WM-RDH-82-06A
WM-RDH-82-11
WM-RDH-82-10
WM-RDH-82-08
WM-RDH-82-01
N
0
500 m
WOLF MOUNTAIN COAL LTD.
WOLF MOUNTAIN PROJECT
SUMMARY OF IN-PLACE RESOURCES
Seam W-1 (Wellington)
FIG. 5.1
Drawn: P. Hall
Checked:
Author: J. Perry
Client App:
Revised: June 1983
Date: November 1982
Scale: 1:10,000
File No:
Dwg. No:
COAL-EX CONSULTING LTD.



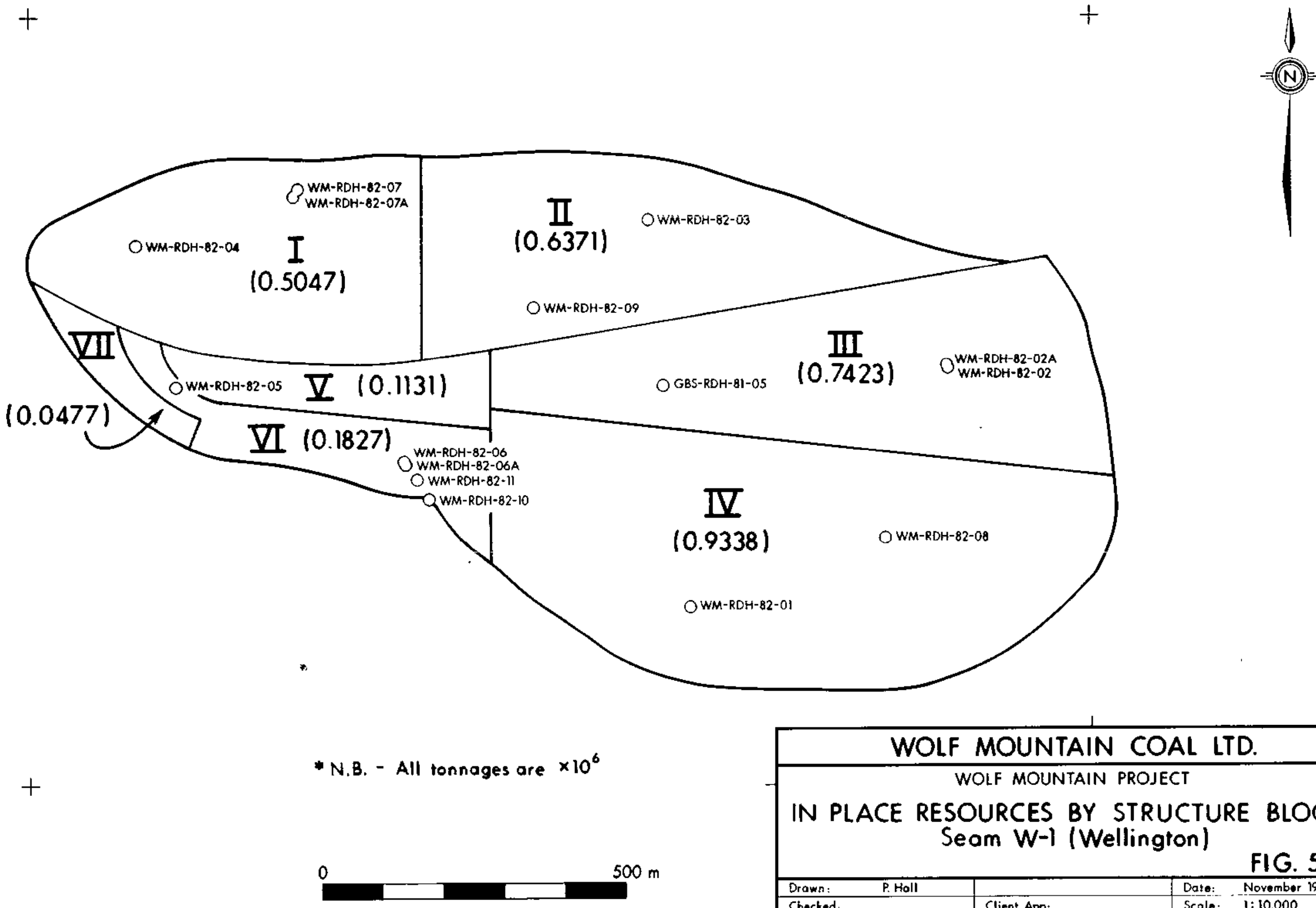
WOLF MOUNTAIN COAL LTD.

WOLF MOUNTAIN PROJECT

SUMMARY OF R.O.M. RESERVES
Seam W-1 (Wellington)

FIG. 5.2

Drawn: P. Hall		Date: November 1982	
Checked:	Client App:	Scale: 1:10,000	
Author: J. Perry	Revised: June 1983	File No:	
COAL-EX CONSULTING LTD.		Dwg. No:	



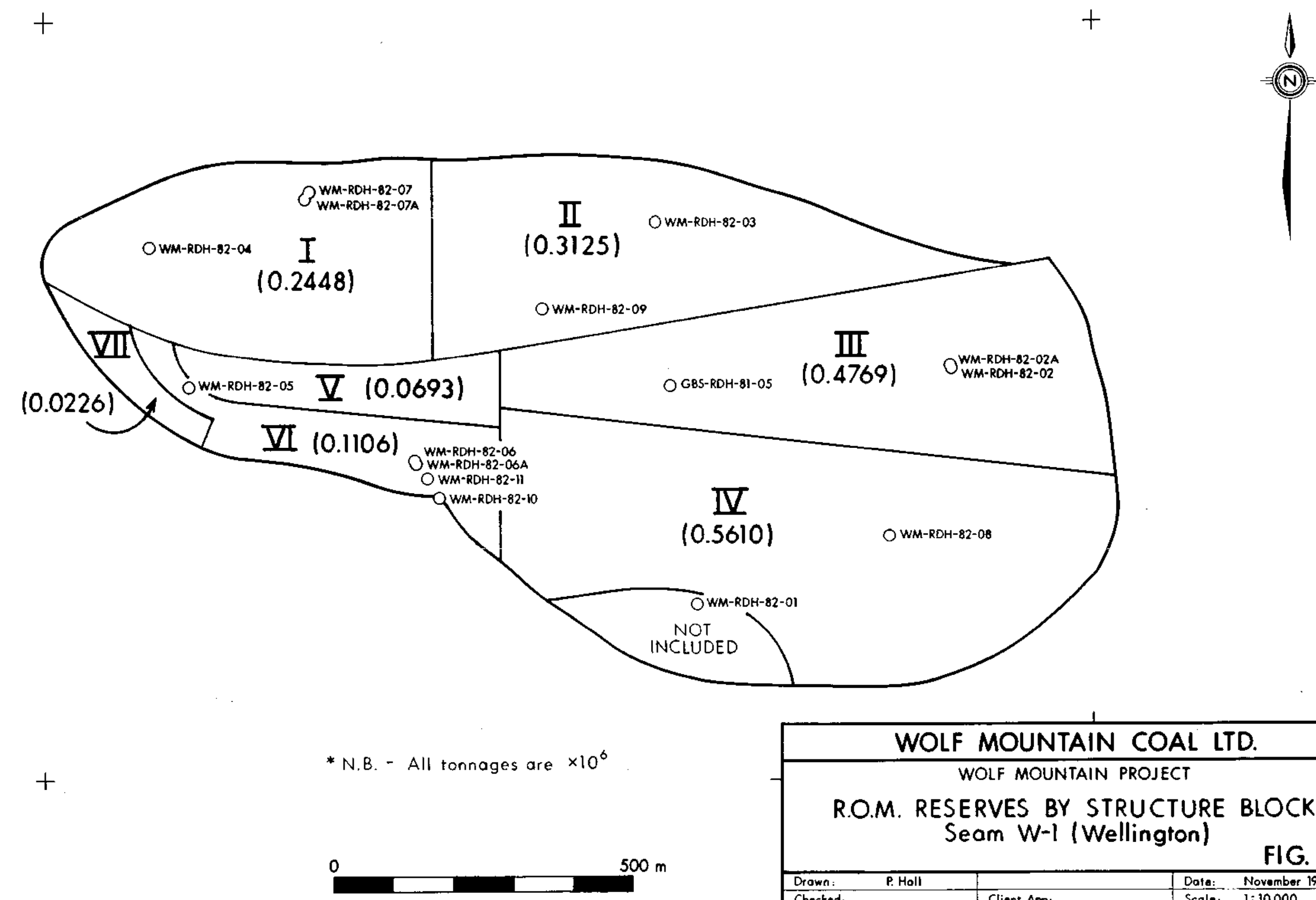
WOLF MOUNTAIN COAL LTD.

WOLF MOUNTAIN PROJECT

IN PLACE RESOURCES BY STRUCTURE BLOCK
Seam W-1 (Wellington)

FIG. 5.3

Drawn: P. Hall		Date: November 1982	
Checked:	Client App:	Scale: 1:10,000	
Author: J. Perry	Revised: June 1983	File No:	
COAL-EX CONSULTING LTD.		Dwg. No:	



WOLF MOUNTAIN COAL LTD.

WOLF MOUNTAIN PROJECT

R.O.M. RESERVES BY STRUCTURE BLOCK
Seam W-1 (Wellington)

FIG. 5.4

Drawn: P. Hall		Date: November 1982	
Checked:	Client App:	Scale: 1:10,000	
Author: J. Perry	Revised: June 1983	File No:	
COAL-EX CONSULTING LTD.		Dwg. No:	

5.2 Method of Resource and Reserve Calculations

5.2.1. Total In-Place Coal Resources

The in-situ resource calculations for the Wolf Mountain property were calculated by the planimeter method. The area was divided into blocks based on the structure contours of seam W.1. (see Figure 5.5). These blocks were further subdivided according to the seam thickness as defined by the isopach map. Each sub- block was planimetered and the resulting area was corrected for the effects of dip. The corrected area was then multiplied by the seam thickness, specific gravity (for the total seam) and geological factor to give the in-situ coal tonnage. The geological factor (92.5%) was applied for uncertainity with respect to the precise outcrop and subcrop patterns of the coal seam. The resulting tonnages correspond to the total in-situ seam W.1 resource, for each sub-block. The detailed calculation of the seam W.1 resource is presented in Appendix A.II.

5.2.2. Run-of-Mine (R.O.M.) Reserves

For the purpose of this calculation, any area where the seam was less than one metre thick was not included (eg. sub-block IV.B). A seam thickness of one metre is considered to be a minimum practical limit to underground mining in western Canada at this time.

Present plans for the mining of seam W.1 call for the removal of at least one rock band from the coal seam as a method of producing a higher quality product. Mr. Eric Roberts has suggested that these rock bands will be removed in total or in part by a single 0.20 metre cut using a conventional miner. In most cases coal adjacent to the rock band will also be removed as in most instances the rock bands are less than 0.20 metres in thickness.

The detailed calculation of the R.O.M. reserves is presented in Appendix A.II and summarized in Table 5.1. For this calculation the seam thickness was reduced by 0.20 metres, a revised specific gravity (determined from the composites) was used and mining factors of 55% (for strata dipping at 20^0 or greater) and 70% (dips of less than 20^o) were applied. The mining factors were suggested by Mr. E. Roberts and reflect the amount of coal which can be recovered by the mining process. The resulting tonnages are the run-of-mine reserves. No adjustment has been made for the effects of any out-of-seam dilution which may be derived from the roof or floor.

The amount of high-ash coal derived from the 0.20 metre "cut" has been calculated to be 0.21 million tonnes (Appendix A.II). It is quite possible that a market can be found for this material and its potential quality is outlined in Section 6.0 below.

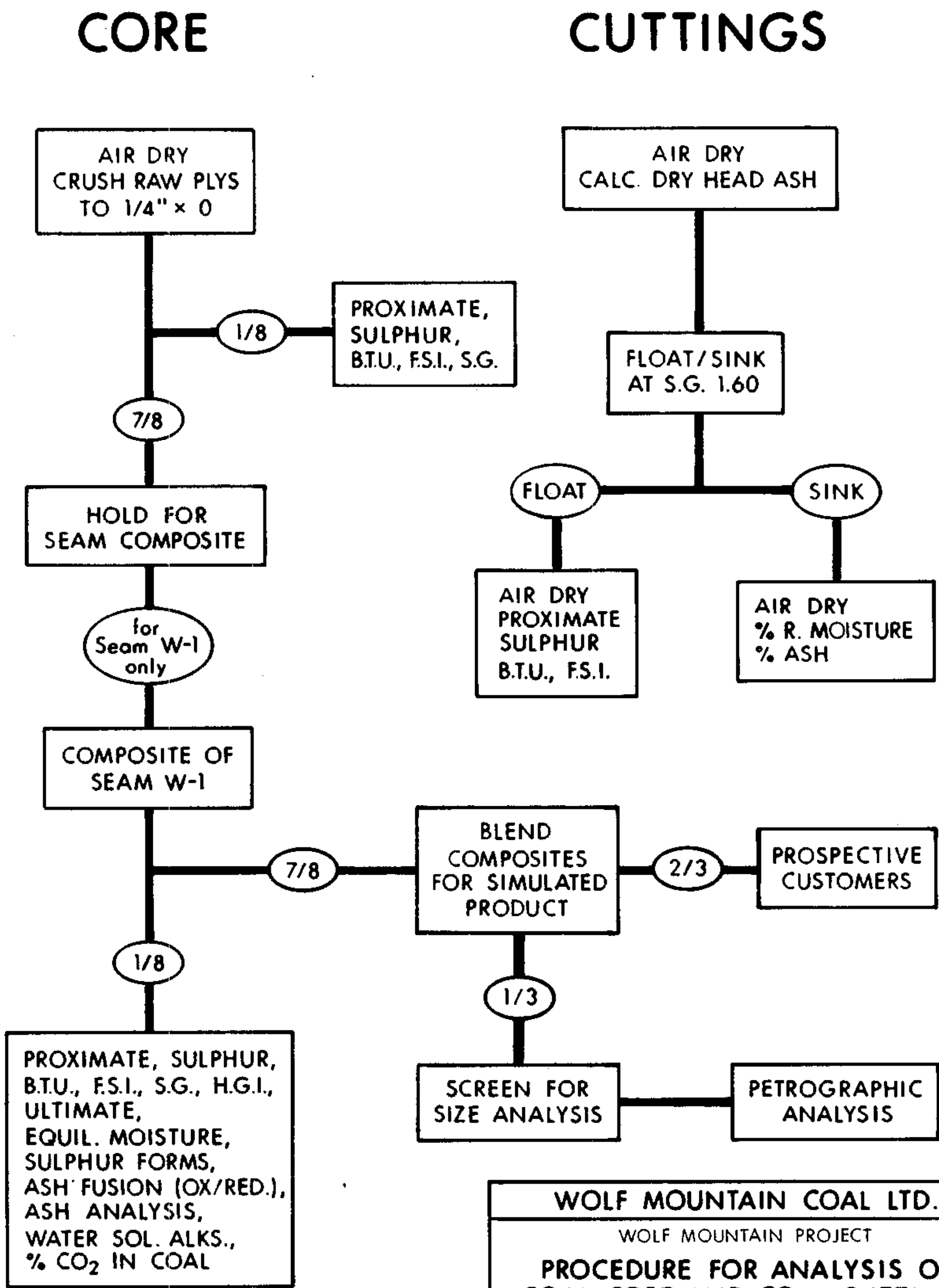
The coal reserves of Wolf Mountain could be increased if an economical method can be found to exploit the thin (less than one metre thick) seams. In sub-block IV.B, 42,600 tonnes of coal resource are present in seam W.1. In addition, it is estimated that up to 175,000 tonnes of coal resource is contained within seam W.4. This tonnage should be viewed with some caution, however, as seam W.4 has only been intersected by drill hole GBS-RDH-81-05 (where it is 0.83 metres thick).

6.0 COAL QUALITY

Data on the quality of coal from the Wolf Mountain property has come mainly from three drill cores of seam W.1 and one core of seam W.3. This data has been supplemented by analyses of cuttings from seams W.1 and W.3 obtained from open hole drilling. As the coal resources and reserves have been based soley on seam W.1 the discussion of coal quality presented below is restricted to this seam also. The summary data for seam W.1 core analyses are presented in Tables 6.1 to 6.4 and the detailed analytical data for both core and cuttings form Appendix A.IV. Analytical data from the Wellington seam in other parts of the Nanaimo coalfield are also included in Appendix A.IV for comparison purposes. Petrographic analysis of the coal was undertaken by D.E. Pearson & Associates Ltd. The results are summarized in Table 6.5 and the full report is presented in Appendix A.V.

The results confirm seam W.1 to be a high quality thermal coal of high volatile bituminous B rank. The coal is also agglomerating with free swelling indicies (F.S.I.'s) of 3 to 4 1/2, for samples between 7% and 14% ash content.

The most reliable information regarding the quality of seam W.1 has been obtained from the core samples. Each seam was divided into several samples (plys) which were then subjected to basic analytical tests. These plys were then combined into a single composite for each seam intersection and analysed in more detail. The procedure employed for the analysis of coal seam core and cuttings is outlined in Figure 6.1. The composite sample is meant to represent the equivalent seam section on which the R.O.M. reserves have been based. Consequently, not all of the ply samples have been included in the composites (see the Seam Profiles, Appendix A.III). Ply 10450 has not been included the composite for hole WM-RDH-82-02A, ply 10442 has been excluded from drill hole WM-RDH-82-06A, and ply 10544 excluded from hole WM-RDH-82-07A. Also the amount of ply 10547 which



WOLF MOUNTAIN COAL LTD.

WOLF MOUNTAIN PROJECT

PROCEDURE FOR ANALYSIS OF COAL CORE AND COAL CUTTINGS

FIG. 6.1

CHECKED:	AUTHOR: J.H. Perry
CLIENT APP:	DRAWN BY: P. Hall
REVISED:	DATE: May 1983
COAL-EX CONSULTING LTD.	DWG. No.

was added to the composite of seam W.1 in hole WM-RDH-82-07A was reduced by 60% (to conform to the removal of a 0.20 metre cut). The analytical results presented herein have not been adjusted for any coal lost in the removal of a 0.20 metre cut; neither have they been adjusted for core loss or the effects of out-of-seam dilution during mining.

As can be seen from Table 6.1, seam W.1 composites exhibit quite consistent results. On an air-dried basis, moisture contents are just above 2%, ash values are between 10.3% and 14.9%, and the calorific values are greater than 12,000 BTU's/lb. (6,670 Kcal/kg).

Sulphur values for drill holes WM-RDH-82-02A and 82-07A are below 0.5% while hole WM-RDH-82-06A shows a sulphur content of 0.96%. This latter value is considered to be high and is due, in part, to the loss of relatively low-sulphur coal from the lower part of the seam (see Appendix A.III) which would have reduced the overall sulphur content. Sulphur values obtained from seam W.1 cuttings throughout the area range between 0.34% and 0.83%; hole WM-RDH-82-06 shows a value of 0.73%. Analysis of the sulphur forms indicates that the sulphur occurs principally in an organic form (Table 6.1).

The heating value of coal from seam W.1 is consistently high. From the composite samples, calorific values determined on an air dried basis range from 12,090 BTU's/lb (at 2.25% moisture and 14.89% ash) to 12,884 BTU's/lb (at 2.01% moisture and 10.32% ash). On a dry basis the range is between 12,368 to 13,148 BTU's/lb at ash contents of 15.23% and 10.53%, respectively. A plot of dry BTU's/lb vs. % Dry Ash is presented in Figure 6.2. The regression line established by this plot indicates that coal from seam W.1 has a dry, ash-free heating value of 14,756 BTU's/lb (8,201 Kcal/kg).

TABLE 6.1

SUMMARY OF ANALYSES OF COMPOSITES (a.d.b.)

PROXIMATE ANALYSIS

HOLE No.	COMP. No.	R.M. %	ASH %	V.M. %	F.C. %	C.V. BTU/lb	F.S.I.
82-02A	WDC-2	2.25	14.89	36.93	45.93	12090	4
82-06A	WDC-1	2.01	10.32	39.09	48.58	12884	4
82-07A	WDC-3	2.00	14.71	37.95	45.34	12175	3

ULTIMATE ANALYSIS

		%C	%H	%N	%S	%O
82-02A	WDC-2	71.71	5.57	1.33	0.42	6.08
82-06A	WDC-1	72.89	5.24	1.39	0.96	9.20
82-07A	WDC-3	68.74	5.16	1.29	0.46	9.64

		SPECIFIC GRAVITY	H.G.I.	EQUIL. MOISURE	SULPHUR FORMS Pyritic	Sulphate	Organic
82-02A	WDC-2	1.36	54	10.9	0.05	0.00	0.37
82-06A	WDC-1	1.32	53	11.2	0.26	0.00	0.70
82-07A	WDC-3	1.35	85	16.2	0.08	0.00	0.38

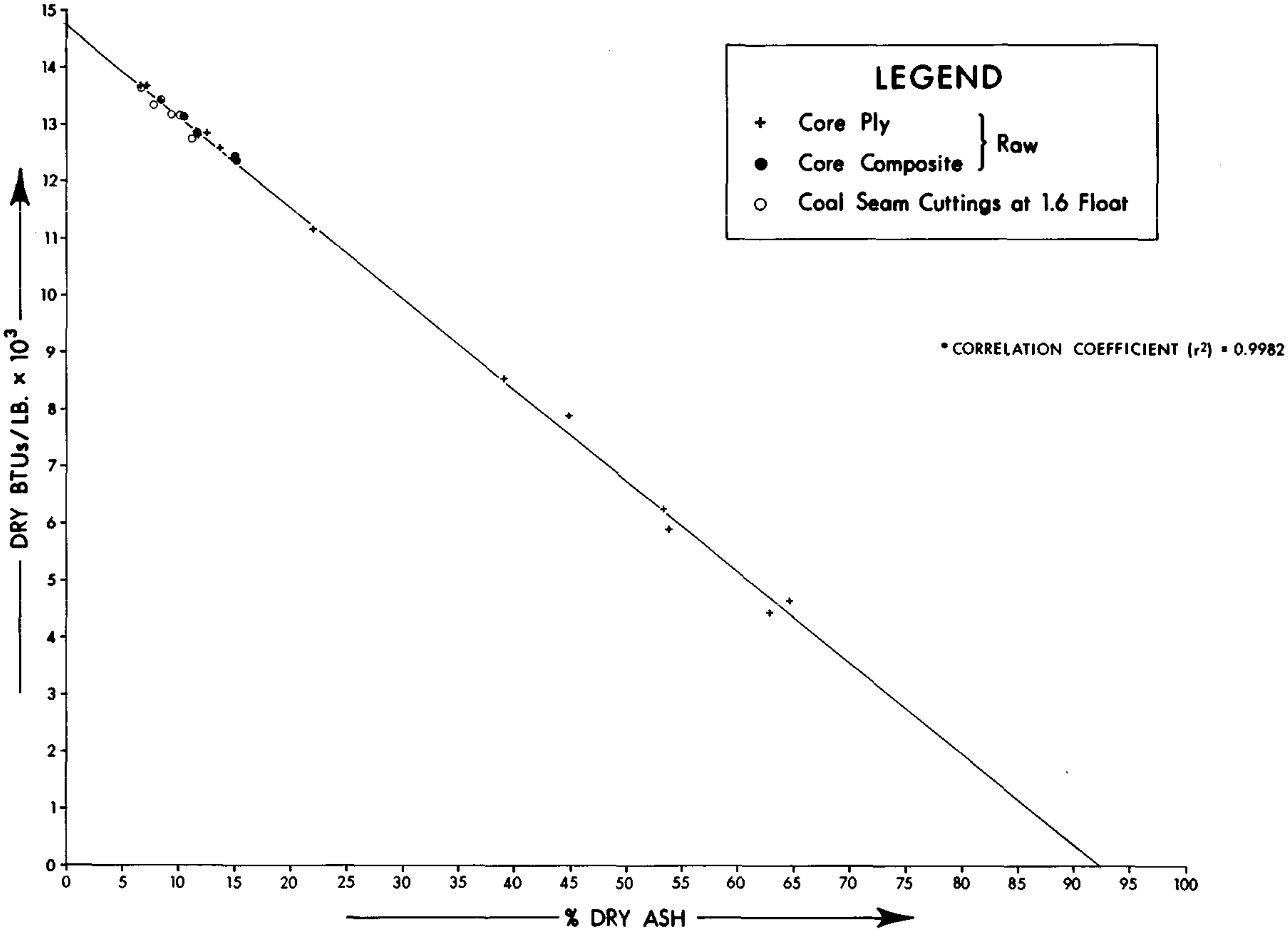


FIGURE 6.2. PLOT OF DRY BTUs/LB. VS. % DRY ASH BY WEIGHT.

Petrographic analysis indicates quite conclusively that the coal is of the high volatile bituminous B rank (see below). However, application of the Parr Formula to the analyses, for rank determination by the A.S.T.M. method, suggests that the coal should be of the high volatile bituminous C rank. This difference is caused by the difficulty in assessing the actual bed moisture for the in-situ coal. The A.S.T.M. method requires the use of the laboratory determined equilibrium moisture content and equates this with the bed moisture content of the seam. As the equilibrium moisture values obtained for seam W.1 give a coal rank lower than is indicated by petrographic analysis, it must be assumed that the actual bed moisture is less than that determined in the laboratory. A moisture content of 8% has, therefore, arbitrarily been assigned to the "product" coal. Table 6.2 presents the adjusted proximate and sulphur analyses and BTU determinations, based on an 8% moisture content.

TABLE 6.2

PROXIMATE, SULPHUR AND BTU VALUES FOR THE COMPOSITE SAMPLES, ADJUSTED TO A MOISTURE CONTENT OF 8%

DRILL HOLE	%M	%ASH	%V.M.	%F.C.	%S	BTU/lb
82-02A	8	14.01	34.76	43.23	0.40	11,379
82-06A	8	9.69	36.71	45.60	0.90	12,096
82-07A	8	13.81	35.63	42.56	0.43	11,430

The use of 8% as the moisture content is consistent with the coal having a rank of high volatile bituminous B using the A.S.T.M. method.

Fuel Ratios vary between 1.19 and 1.24 for the composites and between 1.30 and 1.39 for the "cuttings" samples.

The Hardgrove Grindability Index for seam W.1 is anticipated to be in the mid-50 range over most of the area. In places where the coal seam has undergone intense shearing however, such as around WM-RDH-82-07A (H.G.I.= 85), higher values can be expected.

The chemical analyses of the coal ash are summarized in Table 6.3 together with the corresponding ash indicies and ratios. The results of ash fusion determinations and tests for % CO_2 in coal and %water-soluble alkalies in coal are also presented. No detailed discussion of these results is included here. The results from the three samples are, however, broadly consistent although some of the values for hole WM-RDH-82-06A deviate somewhat from those of the other two. Sodium contents and % water-soluble alkalies (in coal) are low, with correspondingly low values for the slagging and fouling indicies. Fairly high values are present for CaO (17.59% to 25.60%) and so the coal was analyzed for CO_2 content. Values of 2.11% to 2.14% were found for the CO_2 percentage in the coal. This is of the necessary order to bring the mathematical totals of the ash analyses closer to 100%. Initial deformation of the ash occurs (in a reducing atmosphere) at 1205°C for WM-RDH-82-06A but at substantially higher temperatures (between 1270°C and 1302°C) for WM-RDH-82-02A and 07A.

After the testing of each composite was completed the remaining material from all three composites was blended together to form one sample. The blending was not performed on a proportional basis, all coal that remained from each composite was used. This sample was subsequently split into three portions; two were sent to local coal users for testing while the other was retained by Wolf Mountain Coal Ltd. for size analysis. The results are presented in Table 6.4.

Table 6.4

Size Analysis

Size Fraction	Weight %	Cummulative Weight %
Oversize +6.3mm	1.0	1.0
6.3mm x 1.0mm	64.7	65.7
1.0mm x 0.5mm	13.3	79.0
0.5mm x 0.15mm	12.4	91.4
0.15mm x 0	8.6	100.0

As can be seen, even after crushing to 1/4" (6.3mm) x 0, seventy-nine percent of the coal is larger than 0.5mm. Only 8.6% of the coal is less than 0.15mm in size.

A grab sample taken from one of the combined composite samples was sent to D.E. Pearson & Associates Ltd. for petrographic analysis. Their full report is presented in Appendix A.V. while the results are summarized in Table 6.5.

The coal from seam W.1 is shown to be of the high volatile bituminous B rank and possesses a vitrinite reflectance of 0.74%. The total amount of reactives is 79.2% which "....correlates with good ignition and flame stability, and combustion efficiency," (Pearson's report p.3). The predicted combustibles in the fly-ash are low, at 3.4%, and are not expected to significantly affect the electrical resistivity or efficiency of existing electrostatic precipitators.

The material produced by the removal of a 0.20 metre cut is calculated to possess a specific gravity of 1.626. Based on this value, the coal-rock mixture would contain approximately 40% ash and have a heating value of around 8,000 BTU's/lb.

The analytical results from the rotary cuttings are generally consistent with those of the core. The analyses were performed on the float portion of a 1.6 specific gravity cut to minimize the effects of roof and floor rock contamination. The results provide a good guide to the quality of the coal seam across the property.

The quality of seams W.3 and W.4 have not been evaluated for the purposes of this report. Examination of the core and test results does indicate, however, that seam W.3 is high in ash and mainly composed of highly carbonaceous, coaly shale (see Appendicies A.III and A.IV).

7.0 REFERENCES

Buckham, A.F.
1947: Preliminary Map, Nanaimo Coalfield, British Columbia; Geological Survey of Canada, Paper 47-22.

Canada Department of Energy, Mines and Resources.
1979: Coal Resources and Reserves of Canada, Report 79-9.

Clapp, C.H.
1912a: Geology of Nanaimo Sseet, Nanaimo Coal Field, Vancouver Island, British Columbia; Geological Survey of Canada, Summary Report 1911, pp. 91-105.

1912b: Note on the geology of the Comox and Suquash Coal Fields; Geological Survey of Canada, Summary Report 1911, pp. 105-107.

1914: Geology of the Nanaimo Map-Area; Geological Survey of Canada, Mem. 51.

1917: Sooke and Duncan Map-Areas, Vancouver Island; Geological Survey of Canada, Mem. 96.

Curcio, M.P.
1979: Preliminary Report of Nanaimo Coal Basin; for Netherlands Pacific Mining Company Inc., Unpublished.

Dowling, D.B.
1915a: Coal Fields and Coal Resources of Canada; Geological Survey of Canada, Mem. 59.

1915b: Coal Fields of British Columbia; Geological Survey of Canada, Mem. 69.

Muller, J.E. and Jeletzky, J.A.
1970: Geology of the Upper Cretaceous Nanaimo Group, Vancouver Island and Gulf Islands, British Columbia; Geological Survey of Canada, Paper 69-25.

Muller, J.E. and Atchison, M.E.
1971: Geology, History and Potential of Vancouver Island Coal Deposits; Geological Survey of Canada, Paper 70-53.

Perry, J.H.
1981: Benson Coal Property, Geological Report; for Gulf Canada Resources Inc., Unpublished.

Perry, J.H.
1982: Wolf Mountain Coal Property, Geological Report; for Netherlands Pacific Mining Co. Inc., Unpublished.

Perry, J.H.
1982: Geological Data Summary of the Wolf Mountain Coal Property; for Wolf Mountain Coal Ltd., (to accompany Stage I submission), Unpublished.

Ward, P.D.
1978: Revisions to the stratigraphy and biochronology of the Upper Cretaceous Nanaimo Group, British Columbia and Washington State; Canadian Journal of Eath Science, 15 pp. 405-423.

APPENDIX A.I

STATEMENT OF QUALIFICATION

STATEMENT OF QUALIFICATION

I, J.H. Perry, do hereby certify:

1. That I am a consulting geologist with a business office at #806, 402 West Pender Street, Vancouver, British Columbia, V6B 1T6, and am President of JHP COAL-EX CONSULTING LTD.

2. That I hold a BSc(Hons) degree in Geology from Exeter University (1972) and that I undertook post-graduate study at the University of Calgary (1972-1976).

3. That I am a Registered Professional Geologist in the Association of Professional Engineers, Geologists and Geophysicists of the Province of Alberta.

4. That I am a Member of the Canadian Institute of Mining and Metallurgy, an Associate Fellow of the Geological Association of Canada and a Fellow of the Geological Society (London).

5. That I have practiced my profession as a geologist for the past seven years.

PROFESSIONAL GEOLOGIST JOHN H. PERRY ALBERTA

J.H. PERRY, P. GEOL.

APPENDIX A.II

RESOURCE AND RESERVE CALCULATIONS

DETAILED CALCULATION FOR IN-PLACE RESOURCES

SEAM W.1- WOLF MOUNTAIN

BLOCK		PLAN AREA (m^2)	ASSIGNED DIP°	CORRECTED AREA (m^2)	ASSIGNED TRUE THICK(m)	VOLUME (m^3)	ASSIGNED S.G.	GEOLOGICAL FACTOR	IN-PLACE TONNES x 10^6
I	A	30,360	25.3	33,580	1.73	58,093	1.39	0.925	0.0747
	B	35,040	25.3	38,757	2.00	77,514	1.39	0.925	0.0997
	C	97,600	25.3	107,953	2.38	256,928	1.39	0.925	0.3303
II	A	58,080	22.3	62,776	2.48	155,684	1.39	0.925	0.2002
	B	48,880	22.3	52,832	2.28	120,457	1.39	0.925	0.1549
	C	70,320	22.3	76,005	2.50	190,013	1.39	0.925	0.2443
	D	10,240	22.3	11,068	2.65	29,330	1.39	0.925	0.0377
III	A	18,520	4.0	18,565	2.22	41,214	1.37	0.925	0.0522
	B	36,760	4.0	36,848	2.50	92,120	1.37	0.925	0.1167
	C	49,640	4.0	49,759	2.65	131,861	1.37	0.925	0.1671
	D	115,880	4.0	116,159	2.76	320,599	1.37	0.925	0.4063
IV	A	92,840	7.0	93,542	1.66	155,280	1.37	0.925	0.1968
	B	39,760	7.0	40,060	0.84	33,650	1.37	0.925	0.0426
	C	46,520	7.0	46,872	1.43	67,027	1.37	0.925	0.0849
	D	74,800	7.0	75,365	2.20	165,803	1.37	0.925	0.2101
	E	30,800	7.0	31,113	2.65	82,449	1.37	0.925	0.1045
	F	83,680	7.0	84,312	2.76	232,701	1.37	0.925	0.2949
V	A	15,280	4.0	15,317	2.10	32,166	1.36	0.925	0.0405
	B	28,800	4.0	28,869	2.00	57,738	1.36	0.925	0.0726
VI	A	7,280	15.0	7,537	2.01	15,149	1.36	0.925	0.0191
	B	44,400	15.0	45,967	1.90	87,337	1.36	0.925	0.1099
	C	25,160	15.0	26,048	1.64	42,719	1.36	0.925	0.0537
VII	A	9,640	20.0	10,259	1.73	17,748	1.36	0.925	0.0223
	B	9,880	20.0	10,514	1.92	20,187	1.36	0.925	0.0254
TOTALS		1,080,240 m^2		1,120,077m^2		2,483,767m^3			3.1614 x10^6tonnes

North Flank =1.1418 x10^6tonnes

South Flank =2.0196 x10^6tonnes

Weighted Average Seam Thickness = 2.22 metres
Weighted Average Specific Gravity = 1.376

DETAILED CALCULATION FOR RUN-OF-MINE (R.O.M.) RESERVES

SEAM W.1 - WOLF MOUNTAIN

BLOCK		CORRECTED AREA (m^2)	TRUE THICKNESS MINUS A 0.20m "CUT" (m)	VOLUME (m^3)	REVISED S.G.	GEOLOGICAL FACTOR	MINING FACTOR	R.O.M. RESERVES $x\ 10^6$
I	A	33,580	1.53	51,377	1.35	0.925	0.55	0.0353
	B	38,757	1.80	69,763	1.35	0.925	0.55	0.0479
	C	107,953	2.18	235,338	1.35	0.925	0.55	0.1616
II	A	62,776	2.28	143,129	1.35	0.925	0.55	0.0983
	B	52,832	2.08	109,891	1.35	0.925	0.55	0.0755
	C	76,005	2.30	174,812	1.35	0.925	0.55	0.1201
	D	11,068	2.45	27,117	1.35	0.925	0.55	0.0186
III	A	18,565	2.02	37,501	1.36	0.925	0.70	0.0330
	B	36,848	2.30	84,750	1.36	0.925	0.70	0.0746
	C	49,759	2.45	121,910	1.36	0.925	0.70	0.1074
	D	116,159	2.56	297,367	1.36	0.925	0.70	0.2619
IV	A	93,542	1.46	136,571	1.36	0.925	0.70	0.1203
	B	----Not included. Seam less than 1.0 m thick -------						
	C	46,872	1.23	57,653	1.36	0.925	0.70	0.0508
	D	75,365	2.00	150,730	1.36	0.925	0.70	0.1327
	E	31,113	2.45	76,227	1.36	0.925	0.70	0.0671
	F	84,312	2.56	215,839	1.36	0.925	0.70	0.1901
V	A	15,317	1.90	29,102	1.32	0.925	0.70	0.0249
	B	28,869	1.80	51,964	1.32	0.925	0.70	0.0444
VI	A	7,537	1.81	13,642	1.32	0.925	0.70	0.0117
	B	45,967	1.70	78,144	1.32	0.925	0.70	0.0668
	C	26,048	1.44	37,509	1.32	0.925	0.70	0.0321
VII	A	10,259	1.53	15,696	1.32	0.925	0.55	0.0105
	B	10,514	1.72	18,048	1.32	0.925	0.55	0.0121
TOTALS		1,080,017 m^2		2,234,080m^3				1.7977 x 10^6 tonnes
						North Flank =		0.5573 x 10^6 tonnes
						South Flank =		1.2404 x 10^6 tones

Weighted Average Specific Gravity = 1.352
Weighted Average Mining Factor = 64.34%

CALCULATION OF TONNAGE OF HIGH-ASH COAL

PRODUCED AS THE RESULT OF A 0.20 METRE "CUT"

Tonnes Produced = [(In-Place Resources*) - (In-Place Resources* [minus a 0.20 cut])]

x Weighted Average Mining Factor

= (3.1188 - 2.7939) x 0.6434

= (0.3249) x 0.6434

= $\underline{0.2090 \times 10^6 \text{tonnes}}$

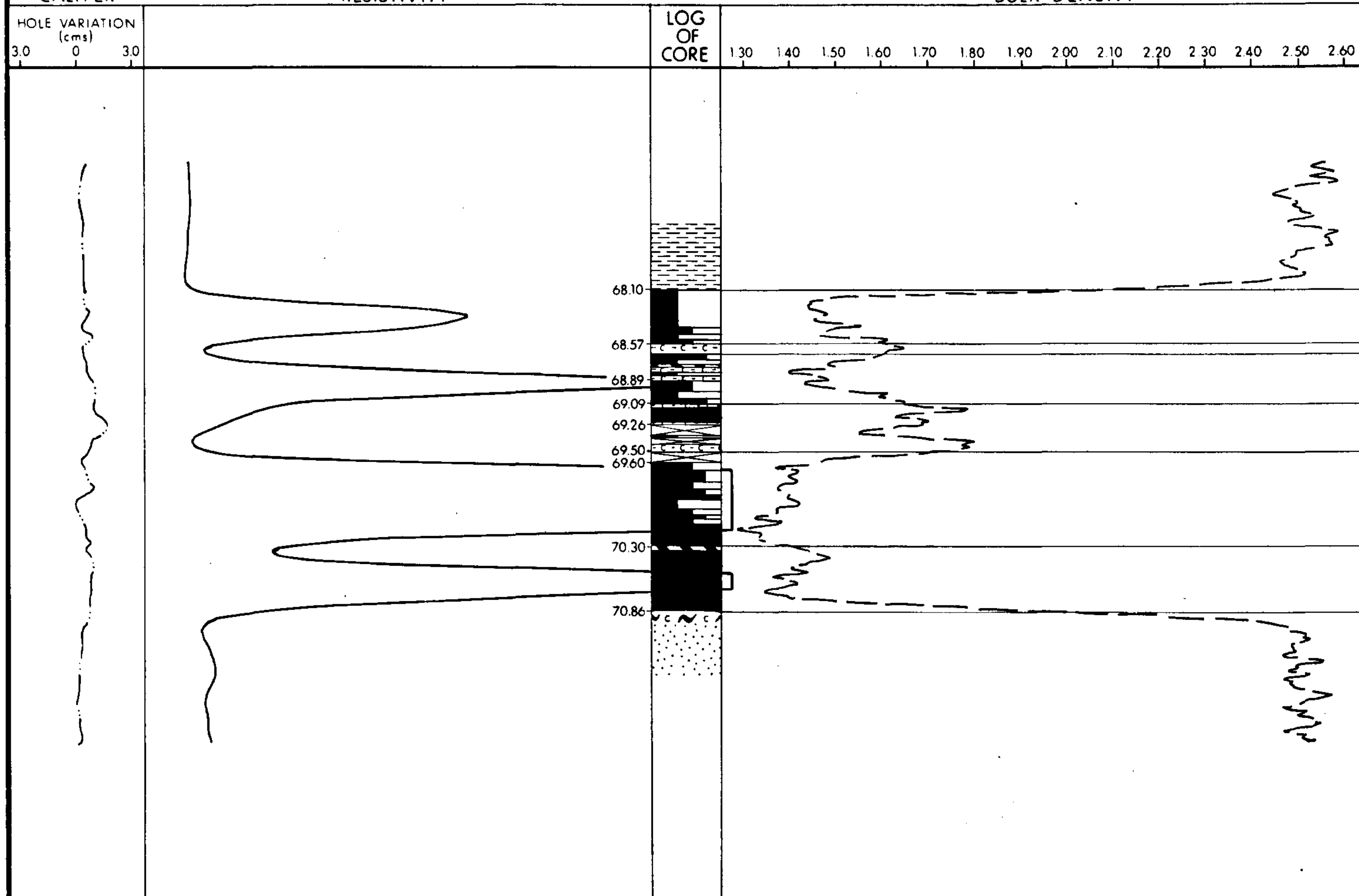
Weighted Average Specific Gravity = 1.626

*Note: the tonnages of Block IV.B have been removed from the calculation.

APPENDIX A.III

SEAM PROFILES

GEOPHYSICAL LOGS



R%	INT. METRES	SAMPLE No.	CMP.
100	0.47	10449	
100	0.09	10450	
100	0.43	10540	
63.4	0.41	10541	
87.5	0.80	10542	
100	0.56	10543	
91.9%		WDC-2	

ANALYTICAL DATA (A.D.B.)

PROXIMATE ANALYSIS

M%	A%	VM%	FC%	S%	BTU/lb.	S.G.
2.29	12.38	38.79	46.54	0.59	12556	1.31
3.13	51.72	-	-	0.20	6077	1.76
2.36	21.53	35.53	40.58	0.48	10912	1.40
2.82	38.02	28.40	30.76	0.27	8289	1.55
2.11	8.25	39.20	50.44	0.41	13129	1.29
2.11	7.04	40.14	50.71	0.47	13404	1.28

ANALYSIS OF COMPOSITE

M%	A%	VM%	FC%	S%	BTU/lb.	S.G.
2.25	14.89	36.93	45.93	0.42	12090	1.36

177 (i) (M1)

LEGEND

CALIPER
RESISTIVITY
BULK DENSITY
RECOVERY - R%
COMPOSITE - CMP
AIR DRIED BASIS - A.D.B

BRIGHT COAL
BRIGHT BANDED COAL
DULL & BRIGHT COAL
DULL BANDED COAL
DULL COAL
BONEY/STONEY COAL
SHEARED COAL
COAL & BANDS
CARBONACEOUS SHALE/MUDSTONE
SHALE/MUDSTONE
SANDSTONE
SILTSTONE
COAL LENSES
CORE LOSS

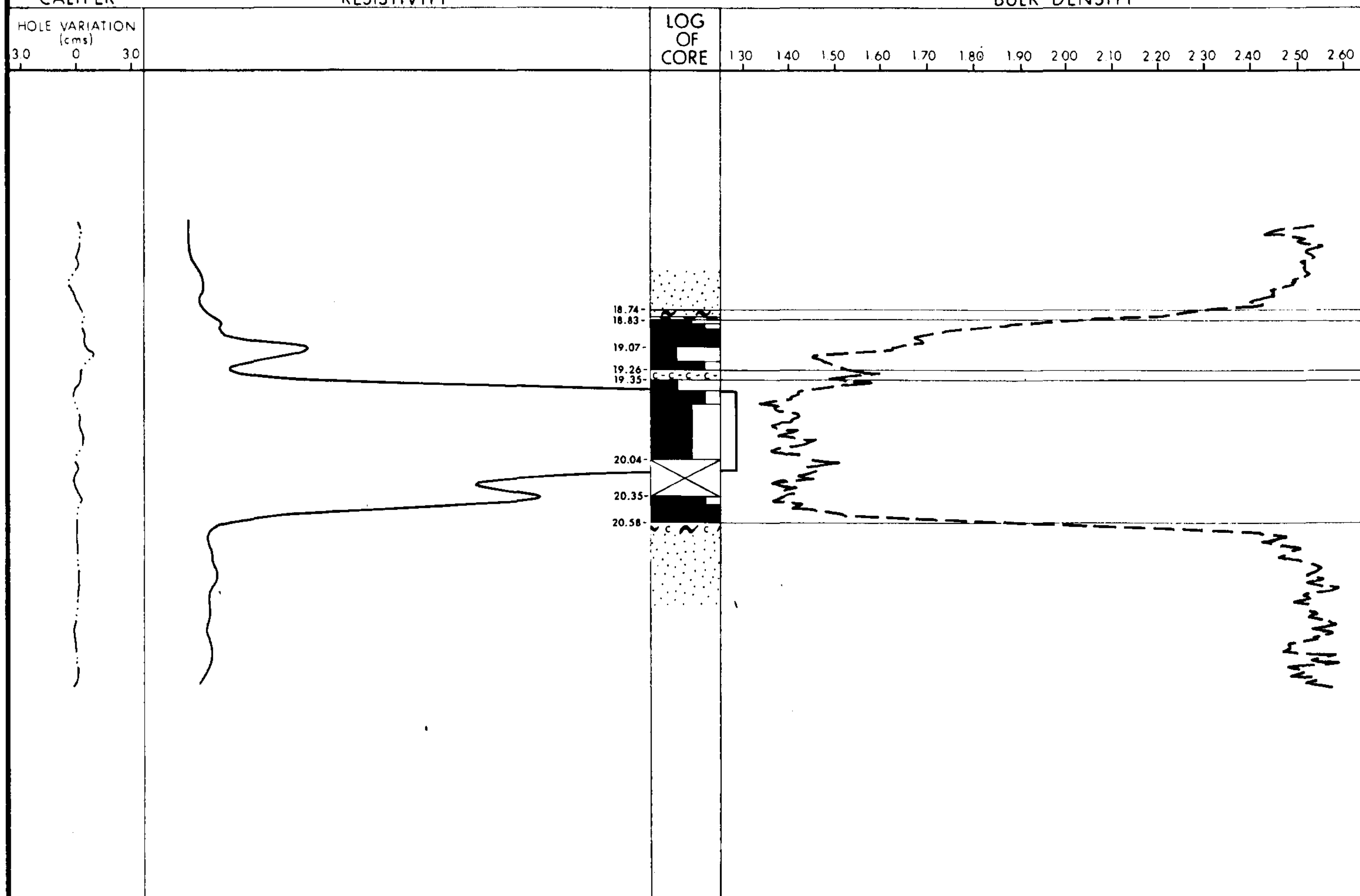
WOLF MOUNTAIN COAL LTD.

WOLF MOUNTAIN PROJECT

SEAM PROFILE
DRILL HOLE WM-RDH-82-02A
SEAM W.1 (Wellington)

Drawn: P.S.H.		Date: October 1982
Checked:	Client App.	Scale: 1:40
Author: J. Perry	Revised	File No:
COAL-EX CONSULTING LTD.	Dwg. No.	

GEOPHYSICAL LOGS



R%	INT. METRES	SAMPLE No.	CMP.
100	0.09	10444	
100	0.43	10441	↕
100	0.09	10442	
74.8	1.23	10443	↕
83.2%		WDC-1	

ANALYTICAL DATA (A.D.B.)

PROXIMATE ANALYSIS

M%	A%	VM%	FC%	S%	BTU/lb.	S.G.
1.10	63.92	-	-	-	4600	2.03
1.98	13.36	38.30	46.36	1.38	12341	1.34
2.82	61.09	-	-	2.11	4320	1.89
2.11	11.48	38.33	48.08	0.89	12556	1.31

ANALYSIS OF COMPOSITE

M%	A%	VM%	FC%	S%	BTU/lb.	S.G.
2.01	10.32	39.09	48.58	0.96	12884	1.32

177 (1) (MZ)

LEGEND

CALIPER —.—.—
RESISTIVITY ———
BULK DENSITY — — —
RECOVERY - R%
COMPOSITE - CMP
AIR DRIED BASIS - A.D.B.

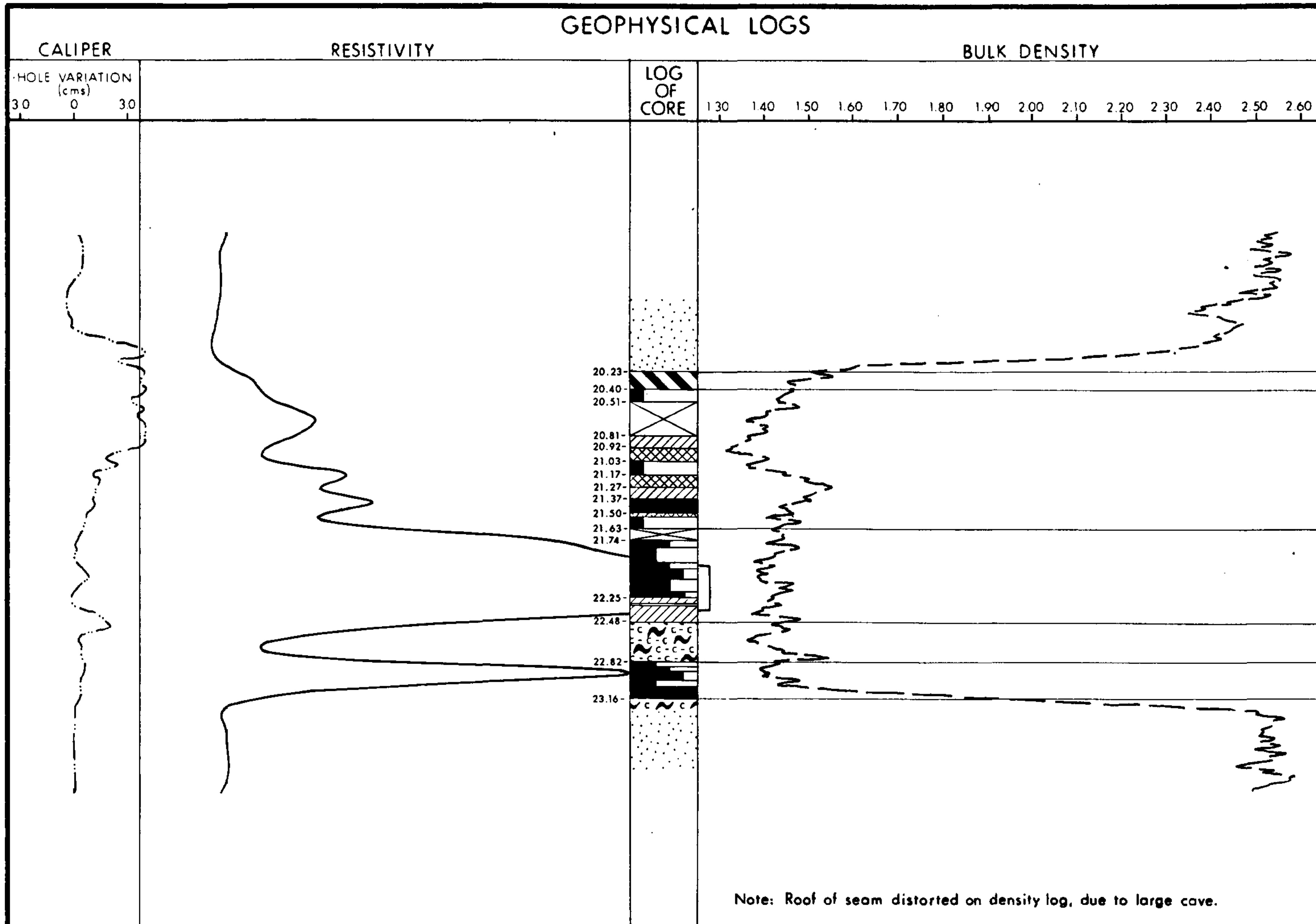
BRIGHT COAL
BRIGHT BANDED COAL
DULL & BRIGHT COAL
DULL BANDED COAL
DULL COAL
BONEY/STONEY COAL
SHEARED COAL
COAL & BANDS
CARBONACEOUS SHALE/MUDSTONE
SHALE/MUDSTONE
SANDSTONE
SILTSTONE
COAL LENSES
CORE LOSS

WOLF MOUNTAIN COAL LTD.

WOLF MOUNTAIN PROJECT

SEAM PROFILE
DRILL HOLE WM-RDH-82-06A
SEAM W.1 (Wellington)

Drawn P.S.H		Date	October 1982
Checked	Client App.	Scale	1:40
Author J. Perry	Revised	File No	
	Dwg No		



Note: Roof of seam distorted on density log, due to large cave.

R%	INT. METRES	SAMPLE No.	CMP.							
				PROXIMATE ANALYSIS						
				M%	A%	VM%	FC%	S%	BTU/lb.	S.G.
100	0.17	10544		1.69	44.09	-	-	-	7763	1.68
75.6	1.23	10545	↑	2.03	14.54	38.04	45.39	0.64	12165	1.34
87.1	0.85	10546	│	1.94	6.48	41.88	49.70	0.44	13428	1.29
100	0.34	10547*	│	2.54	52.36	24.52	20.58	0.26	5746	1.79
100	0.34	10548	↓	1.95	11.45	38.29	48.31	0.46	12640	1.30
				ANALYSIS OF COMPOSITE						
				M%	A%	VM%	FC%	S%	BTU/lb.	S.G.
		WDC-3*		2.00	14.71	37.95	45.34	0.46	12175	1.35

(*) Only 40% of ply No. 10547 was added to the composite. (See Text Sect. 6.0)

LEGEND

- CALIPER
- RESISTIVITY
- BULK DENSITY
- RECOVERY - R%
- COMPOSITE - CMP
- AIR DRIED BASIS - A.D.B.

- BRIGHT COAL
- BRIGHT BANDED COAL
- DULL & BRIGHT COAL
- DULL BANDED COAL
- DULL COAL
- BONEY/STONEY COAL
- SHEARED COAL
- COAL & BANDS
- CARBONACEOUS SHALE/MUDSTONE
- SHALE/MUDSTONE
- SANDSTONE
- SILTSTONE
- COAL LENSES
- CORE LOSS

WOLF MOUNTAIN COAL LTD.

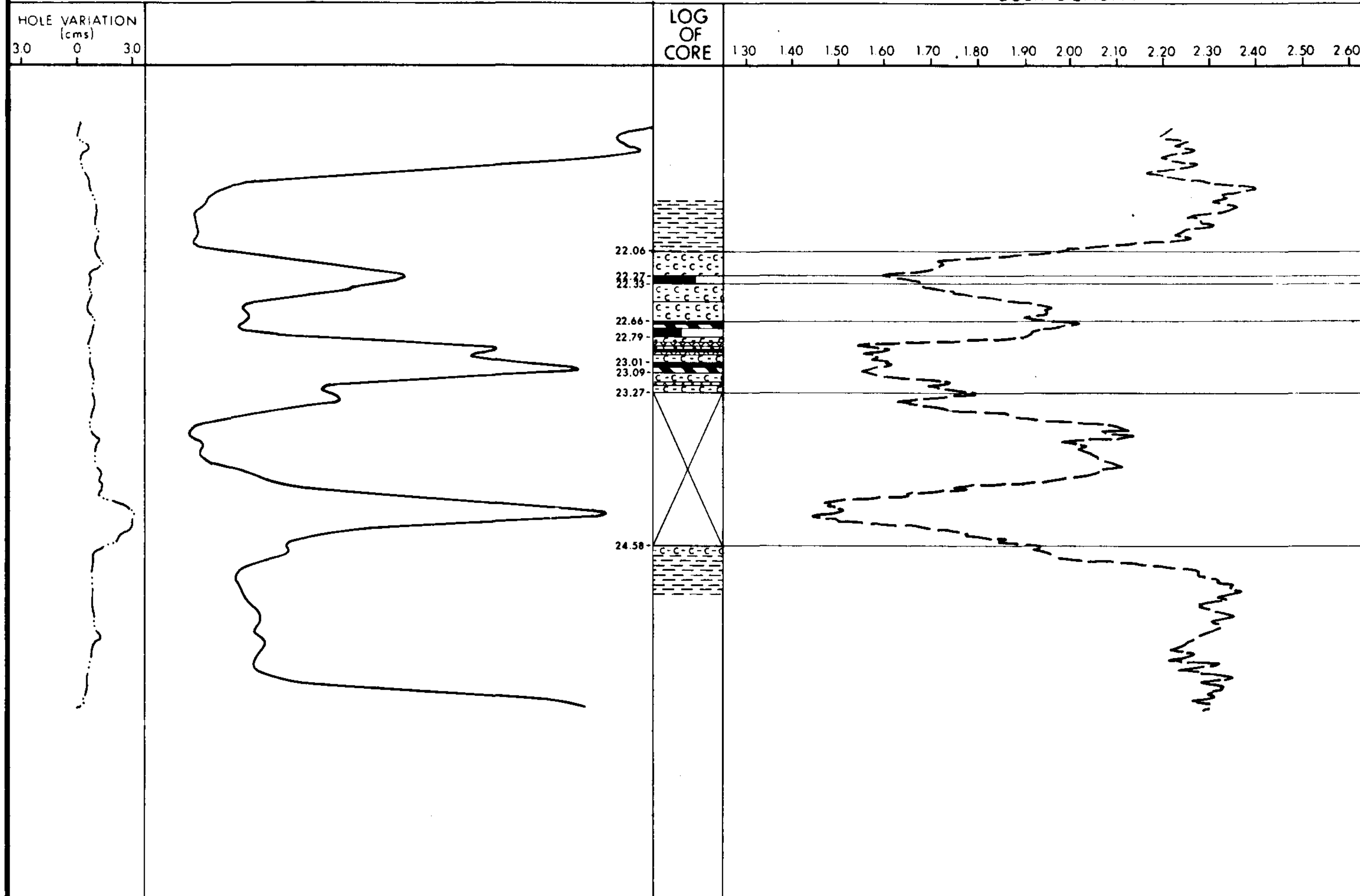
WOLF MOUNTAIN PROJECT

SEAM PROFILE
DRILL HOLE WM-RDH-82-07A
SEAM W.1 (Wellington)

Drawn: P.S.H.		Date: October 1982
Checked:	Client App.:	Scale: 1:40
Author: J. Perry	Revised:	File No:
	Dwg. No.	

177(1) M3

GEOPHYSICAL LOGS



INT. R%	INT. METRES	SAMPLE No.	SAMPLE CMP.
100	0.21	10445	↕
100	0.06	10446	↕
100	0.33	10447	↕
100	0.61	10448	↕
0	1.31	-	-
		10445 to 10448	

ANALYTICAL DATA (A.D.B.)

PROXIMATE ANALYSIS

Sample No.	M%	A%	VM%	FC%	S%	BTU/lb.	S.G.
10445	2.55	61.70	19.98	15.77	0.31	4495	1.87
10446	1.65	33.61	31.09	33.65	0.48	9358	1.47
10447	2.55	68.69	17.12	11.64	0.17	3192	2.00
10448	2.83	44.62	26.16	26.39	0.37	7366	1.63

ANALYSIS OF COMPOSITE*

Sample No.	M%	A%	VM%	FC%	S%	BTU/lb.	S.G.
10445 to 10448	2.64	54.75	22.43	20.18	0.30	5630	1.78

(* Calculated)

LEGEND

CALIPER — ·· — ·· —
RESISTIVITY ————
BULK DENSITY — — — —
RECOVERY - R%
COMPOSITE - CMP
AIR DRIED BASIS - A.D.B.

- BRIGHT COAL
- BRIGHT BANDED COAL
- DULL & BRIGHT COAL
- DULL BANDED COAL
- DULL COAL
- BONEY / STONEY COAL
- SHEARED COAL
- COAL & BANDS
- CARBONACEOUS SHALE/MUDSTONE
- SHALE/MUDSTONE
- SANDSTONE
- SILTSTONE
- CORE LOSS

WOLF MOUNTAIN COAL LTD.		
WOLF MOUNTAIN PROJECT		
SEAM PROFILE DRILL HOLE WM-RDH-82-02A SEAM W-3		
Drawn: P.S.H.		Date: October 1982
Checked:	Client App.	Scale: 1:40
Author: J. Perry	Revised:	File No:
	Dwg. No.	

APPENDIX A.IV

COAL QUALITY ANALYSES

General Testing Laboratories
A Division of SGS Supervision Services Inc.
1001 East Pender Street,
Vancouver, B.C. Canada V6A 1W2
Telephone: (604) 254-1647 Telex: 04-507514 Cable: Supervise

SGS

TO: WOLF MOUNTAIN COAL CO.
Mr. Eric Roberts
5240 Gulf Place
West Vancouver, B.C.
V7W 2V9

CERTIFICATE OF ANALYSIS

No. C	DATE:
FILE: 8209-0768 C	Sept. 20, 1982

WOLF MOUNTAIN - 82-02-SEAM W1

RAW COAL - Proximate analysis
Calorific value, Sulfur
Specific gravity

TAG NO	BASIS	R.M. %	ASH %	V.M. %	F.C. %	C.V. BTU/LB	SULFUR %	S.G. G/CM3
10449	AIR DRY	2.29	12.38	38.79	46.54	12556	0.59	1.31
	DRY	-	12.67	39.70	47.63	12850	0.61	
10450	AIR DRY	3.13	51.72	0.00	0.00	6077	0.20	1.76
	DRY	-	53.39	0.00	0.00	6273	0.21	
10540	AIR DRY	2.36	21.53	35.53	40.58	10912	0.48	1.40
	DRY	-	22.05	36.39	41.56	11176	0.50	
10541	AIR DRY	2.82	38.02	28.40	30.76	8289	0.27	1.55
	DRY	-	39.12	29.22	31.66	8530	0.28	
10542	AIR DRY	2.11	8.25	39.20	50.44	13129	0.41	1.29
	DRY	-	8.43	40.04	51.53	13412	0.42	
10543	AIR DRY	2.11	7.04	40.14	50.71	13404	0.47	1.28
	DRY	-	7.19	41.01	51.80	13693	0.48	

10449 Free Swelling Index 3-1/2
10540 Free Swelling Index 2
10542 Free Swelling Index 4-1/2
10543 Free Swelling Index 4

L. Lakosil
L. Lakosil - Chief Coal Chemist.
SIGNATURE AND TITLE

General Testing Laboratories
A Division of SGS Supervision Services Inc.
1001 East Pender Street,
Vancouver, B.C. Canada V6A 1W2
Telephone: (604) 254-1647 Telex: 04-507514 Cable: Supervise

SGS

TO:
WOLF MOUNTAIN COAL CO.,
Mr. Eric Roberts
5240 Gulf Place,
West Vancouver, B.C.

CERTIFICATE OF ANALYSIS

No. A	DATE:
FILE: 8209-0768C	Sept. 20, 1982

WOLF MOUNTAIN - 82-05-SEAM W1

RAW COAL - Proximate analysis
Calorific value, Sulfur
Specific gravity

TAG NO	BASIS	R.M. %	ASH %	V.M. %	F.C. %	C.V. BTU/LB	SULFUR %	S.G. G/CM3
10441	AIR DRY	1.98	13.36	38.30	46.36	12341	1.38	1.34
	DRY	-	13.63	39.07	47.30	12590	1.41	
10442	AIR DRY	2.82	61.09	0.00	0.00	4320	2.11	1.89
	DRY	-	62.86	0.00	0.00	4446	2.17	
10443	AIR DRY	2.11	11.48	38.33	48.08	12556	0.89	1.31
	DRY	-	11.73	39.16	49.11	12826	0.91	
10444	AIR DRY	1.10	63.92	0.00	0.00	4600	0.00	2.03
	DRY	-	64.63	0.00	0.00	4651	0.00	

10441 Free Swelling Index 4-1/2

10443 Free Swelling Index 4-1/2

L. Lakosil

L. Lakosil - Chief Coal Chemist

SIGNATURE AND TITLE

General Testing Laboratories
A Division of SGS Supervision Services Inc.

1001 East Pender Street,
Vancouver, B.C. Canada V6A 1W2
Telephone: (604) 254-1647 Telex: 04-507514 Cable: Supervise

SGS

TO: WOLF MOUNTAIN COAL CO.
Mr Eric Roberts
5240 Gulf Place
West Vancouver, B.C.
V7W 2V9

CERTIFICATE OF ANALYSIS

NO. D	DATE:
FILE: 8209-0768C	Sept. 20, 1982

WOLF MOUNTAIN - 82-07-SEAM W1

RAW COAL - Proximate analysis
Calorific value, Sulfur
Specific gravity

TAG NO	BASIS	R.M. %	ASH %	V.M. %	F.C. %	C.V. BTU/LB	SULFUR %	S.G. G/CM3
10544	AIR DRY	1.63	44.03	0.00	0.00	7763	0.00	1.68
	DRY	-	44.84	0.00	0.00	7896	0.00	
10545	AIR DRY	2.03	14.54	38.04	45.39	12165	0.64	1.34
	DRY	-	14.84	38.83	46.33	12417	0.65	
10546	AIR DRY	1.94	6.48	41.88	49.70	13428	0.44	1.29
	DRY	-	6.61	42.71	50.68	13693	0.45	
10547	AIR DRY	2.54	52.36	24.52	20.58	5746	0.26	1.79
	DRY	-	53.72	25.16	21.12	5895	0.27	
10548	AIR DRY	1.95	11.45	38.29	48.31	12640	0.46	1.30
	DRY	-	11.68	39.05	49.27	12891	0.47	

10545 Free Swelling Index 3-1/2
10546 Free Swelling Index 3-1/2
10547 Free Swelling Index 1
10548 Free Swelling Index 3-1/2

L. Lakosil - Chief Coal Chemist.
SIGNATURE AND TITLE

WOLF MOUNTAIN - 8206-8202-8207

RAW COMPOSITES - Proximate analysis
FSI, Calorific value, Sulfur
Specific gravity, Grindability

COMP. NO	BASIS	R.M. %	ASH %	V.M. %	F.C. %	FSI	C.V. CAL/G	SULFUR %	S.G. G/CM3	HGI
WDC-1	AIR DRY	2.01	10.32	39.09	48.58	4.0	12884	0.96	1.32	53
	DRY	-	10.53	39.90	49.57	-	13148	0.98	-	-
WDC-2	AIR DRY	2.25	14.89	36.93	45.93	4.0	12090	0.42	1.36	54
	DRY	-	15.23	37.78	46.99	-	12368	0.43	-	-
WDC-3	AIR DRY	2.00	14.71	37.95	45.34	3.0	12175	0.46	1.35	85
	DRY	-	15.01	38.73	46.26	-	12424	0.47	-	-

WDC-1 = WM-RDH-82-06A

WDC-2 = WM-RDH-82-02A

WDC-3 = WM-RDH-82-07A

General Testing Laboratories
A Division of SGS Supervision Services Inc.

SGS

1001 East Pender Street,
Vancouver, B.C. Canada V6A 1W2
Telephone: (604) 254-1647 Telex: 04-507514 Cable: Supervise

TO:
WOLF MOUNTAIN COAL CO.
Mr. Eric Roberts,
5240 Gulf Place
West Vancouver, B.C.

CERTIFICATE OF ANALYSIS

No.	DATE:
FILE: 8210-0152 C	Oct. 26, 1982

WE HAVE ANALYZED the herein described composites (RAW COAL) and report as follows:

FORMS OF SULPHUR	TOTAL SULPHUR %	PYRITIC SULPHUR %	SULPHATE SULPHER %	ORGANIC SULPHUR %
Sample WDC - 1				
AIR DRY	0.96	0.26	0.00	0.70
DRY	0.98	0.26	0.00	0.72
Sample WDC - 2				
AIR DRY	0.42	0.05	0.00	0.37
DRY	0.43	0.05	0.00	0.38
Sample WDC - 3				
AIR DRY	0.46	0.08	0.00	0.38
DRY	0.47	0.08	0.00	0.39

EQUILIBRIUM MOISTURE

WDC - 1 .... 11.2%

WDC - 2 .... 10.9%

WDC - 3 .... 16.2%

WDC-1 = WM-RDH-82-06A

WDC-2 = WM-RDH-82-02A

WDC-3 = WM-RDH-82-07A

LL:at

L. Lakosil - Chief Coal Chemist.

SIGNATURE AND TITLE

WOLF MOUNTAIN - 8210-0152-C

RAW COAL - Ash analysis

COMP. NO	SIO2 %	AL2O3 %	TIO2 %	FE2O3 %	CAO %	MGO %	NA2O %	K2O %	P2O5 %	SO3 %
WDC-1	32.77	14.63	0.60	5.66	25.60	3.95	0.35	0.55	0.50	6.47
WDC-2	43.96	19.47	0.80	3.78	17.59	3.24	0.52	1.01	0.63	3.34
WDC-3	40.71	22.21	0.84	2.92	18.59	2.83	0.48	1.07	0.16	3.02

RAW COAL - Slagging & Fouling indices

COMP. NO	SLAGGING	FOULING
WDC-1	0.74	0.26
WDC-2	0.17	0.21
WDC-3	0.19	0.19

WDC-1 = WM-RDH-82-06A

WDC-2 = WM-RDH-82-02A

WDC-3 = WM-RDH-82-07A

GENERAL TESTING LABORATORIES

A Division of SGS SUPERVISION SERVICES INC.

L. Lakosil

per: L. Lakosil - Chief Coal Chemist

General Testing Laboratories
A Division of SGS Supervision Services Inc.

1001 East Pender Street,
Vancouver, B.C. Canada V6A 1W2
Telephone: (604) 254-1647 Telex: 04-507514 Cable: Supervise

TO:
WOLF MOUNTAIN COAL CO.
Mr. Eric Roberts,
5240 Gulf Place,
West Vancouver B.C. Canada
V7W 2V9

CERTIFICATE OF ANALYSIS

No.	DATE:
FILE: 8211-1552C	Nov. 16, 1982

We have performed additional testing on your RAW COAL COMPOSITES per Mr. Perry's instructions and report as follows:

COMPOSITE NO;	CO_2 % in Coal	H_2O Soluble Na + K % in Coal
WDC - 1	2.14	0.06
WDC - 2	2.11	0.16
WDC - 3	2.12	0.17

Cc : Mr. Perry, P. Geol.
Coal-Ex Consulting
#312 - 525 Seymour Street,
Vancouver, B.C.
V6B 3H7

WDC-1 = WM-RDH-82-06A
WDC-2 = WM-RDH-82-02A
WDC-3 = WM-RDH-82-07A

LL:at

L. Lakosil

L. Lakosil, Chief Coal Chemist.

SIGNATURE AND TITLE

WOLF MOUNTAIN - 8207-8202-8206

RAW COAL - Fusibility of coal ash

COMP. NO.	ATMOSPHERE	ASH FUSION TEMPERATURE DEG.C			
		INITIAL DEFORMATION	SOFTENING	HEMISPHERICAL	FLUID
WDC 1	REDUCING	1205	1225	1233	1246
	OXIDIZING	1224	1230	1236	1247
WDC 2	REDUCING	1270	1297	1308	1351
	OXIDIZING	1290	1302	1323	1364
WDC 3	REDUCING	1302	1317	1345	1408
	OXIDIZING	1317	1348	1372	1420

WDC-1 = WM-RDH-82-06A

WDC-2 = WM-RDH-82-02A

WDC-3 = WM-RDH-82-07A

WOLF MOUNTAIN - 8207-8202-8206

RAW COAL - Fusibility of coal ash

		ASH FUSION TEMPERATURE DEG.F			
COMP. NO.	ATMOSPHERE	INITIAL DEFORMATION	SOFTENING	HEMISPHERICAL	FLUID
WDC 1	REDUCING	2201	2238	2252	2275
	OXIDIZING	2236	2247	2257	2278
WDC 2	REDUCING	2318	2367	2388	2465
	OXIDIZING	2354	2377	2415	2488
WDC 3	REDUCING	2376	2404	2454	2568
	OXIDIZING	2404	2460	2502	2589

WDC-1 = WM-RDH-82-06A

WDC-2 = WM-RDH-82-02A

WDC-3 = WM-RDH-82-07A

General Testing Laboratories
A Division of SGS Supervision Services Inc.
1001 East Pender Street,
Vancouver, B.C. Canada V6A 1W2
Telephone: (604) 254-1647 Telex: 04-507514 Cable: Supervise

SGS

TO:
WOLF MOUNTAIN COAL LTD.,
5240 Gulf Place
West Vancouver, B.C. Canada
V7W 2V9

CERTIFICATE OF ANALYSIS

No.	DATE:
FILE: 8302-1653 C	Feb. 17, 1983

Attention; Mr. Eric Roberts

WE HAVE ANALYZED the herein described sample submitted by you and report as follows:

DESCRIPTION: A submitted sample - marked:

WOLF MOUNTAIN CLEAN COAL
SEAM W.1 - combined composites

SCREEN TEST (according to your instructions)

Oversize + 6.3 mm	1.0%
6.3 mm x 1.0 mm	64.7%
1 mm x 0.5 mm	13.3%
0.5 mm x 0.15	12.4%
0.15 x 0	8.6%

L. Lakosil

LL:at

L. Lakosil - Chief Coal Chemist.

SIGNATURE AND TITLE

General Testing Laboratories
A Division of SGS Supervision Services Inc.
1001 East Pender Street,
Vancouver, B.C. Canada V6A 1W2
Telephone: (604) 254-1647 Telex: 04-507514 Cable: Supervise

SGS

TO:
WOLF MOUNTAIN COAL CO.
Mr. Eric Roberts
5240 Gulf Place
West Vancouver, B.C.

CERTIFICATE OF ANALYSIS

No. B
FILE: 8209-0768C
DATE: Sept. 20, 1982

WOLF MOUNTAIN - 82-02-SEAM W3

RAW COAL - Proximate analysis
Calorific value, Sulfur
Specific gravity

TAG NO	BASIS	R.M. %	ASH %	V.M. %	F.C. %	C.V. BTU/LB	SULFUR %	S.G. G/CM3
10445	AIR DRY	2.55	61.70	19.98	15.77	4495	0.31	1.87
	DRY	-	63.32	20.50	16.18	4612	0.32	
10446	AIR DRY	1.65	33.61	31.09	33.65	9358	0.48	1.47
	DRY	-	34.17	31.62	34.21	9515	0.49	
10447	AIR DRY	2.55	68.69	17.12	11.64	3192	0.17	2.00
	DRY	-	70.49	17.56	11.95	3275	0.18	
10448	AIR DRY	2.83	44.62	26.16	26.39	7366	0.37	1.63
	DRY	-	45.92	26.93	27.15	7580	0.38	

L. Lakosil

L. Lakosil - Chief Coal Chemist.

SIGNATURE AND TITLE

PROXIMATE ANALYSES OF THE WELLINGTON SEAM

EXTENSION AREA*

	Location	M. %	Vols.%	Fixed Carbon %	Ash %	S %	Calorific Value BTU/1b
1.	Harewood Mine	1.58	33.84	52.17	11.85	0.56	12 238
2.	Extension Collieries	1.44	31.40	46.18	20.65	0.33	11 401
3.	Extension Collieries	1.52	35.27	57.04	5.85	0.32	13 416
4.	Extension Collieries	1.24	36.49	53.72	8.20	0.35	13 261
5.	Extension Collieries	1.28	35.26	55.83	7.30	0.33	13 199

* Taken from Clapp (1914)

WELLINGTON SEAM - ANALYSES*

Location	Proximate Analyses Moist.	Vol.	F.C.	Ash	Ultimate Analyses C	H	N	O	S	Calorific Value Dry Coal BTU/lb	Calories Calculated from Ultimate Analysis	Fuel Ratio
A	1.1	39.3	49.2	10.0	72.1	4.7	1.2	11.6	0.4	13 160	6 980	1.25
B	1.16	40.47	50.04	7.80	75.53	5.13	1.19	9.82	0.53	--	7 450	1.23
C	1.65	43.25	45.52	9.24	72.80	5.17	0.88	10.67	1.24	--	7 230	1.05

A = Regular sample of commercial coal 1½" screen and picking belt.
Extension Mine, Wellington Collieries Co. (recalculated to an air dry basis)

B = "Run of Mine"
Nos. 1, 2, and 3 Extension Mines, Canadian Collieries Co.

C = "Run of Mine"
East Wellington, No. 1 Mine, Vancouver - Nanaimo Coal Mining Co.

* Taken from Clapp (1914)

177

WOLF MOUNTAIN COAL LTD.

WOLF MOUNTAIN PROJECT

SURVEY CONTROL POINTS FOR DRILL HOLE LOCATIONS AND TOPOGRAPHIC MAPPING

FIG. 3.2 PART 1 of 2

Author: C.O. Smythies & Associates		Date: November 1982
Checked:	Client App:	Scale: 1: 2,500
Revised:		File No:
COAL-EX CONSULTING LTD.		Dwg. No:


PROJECT : AERO
SHEET : 9999-1
SCALE 1:2500
GRID 1:250 IN X
GRID 1:250 IN Y
MODELS: 102
O VERTICAL CONTROL POINT (DRILL HOLE)
△ HORIZONTAL CONTROL POINT
& VERTICAL
+ TRAVERSE STATION
124°02'35"
49°07'25"
49°06'25"
13250 N
13000 N
12750 N
12500 N
12250 N
12000 N
69750 E

0177(1)
M06a


124°01'
49°07'25"
12750 N
12500 N
12250 N
124°01'
49°06'25"
0
100
200
300 m
N
177 M6
P/C
WOLF MOUNTAIN COAL LTD.
WOLF MOUNTAIN PROJECT
SURVEY CONTROL POINTS FOR DRILL HOLE LOCATIONS AND TOPOGRAPHIC MAPPING
FIG. 3.2 PART 2 of 2
Author: C.O. Smythies & Associates
Date: November 1982
Checked:
Client App:
Scale: 1: 2,500
Revised:
File No:
Dwg. No:
COAL-EX CONSULTING LTD.
0177(1)

HORIZONTAL & VERTICAL CONTROL POINT
DRILL HOLE
PHOTO CENTRE
ROAD
INDEFINITE ROAD
TREE LINE

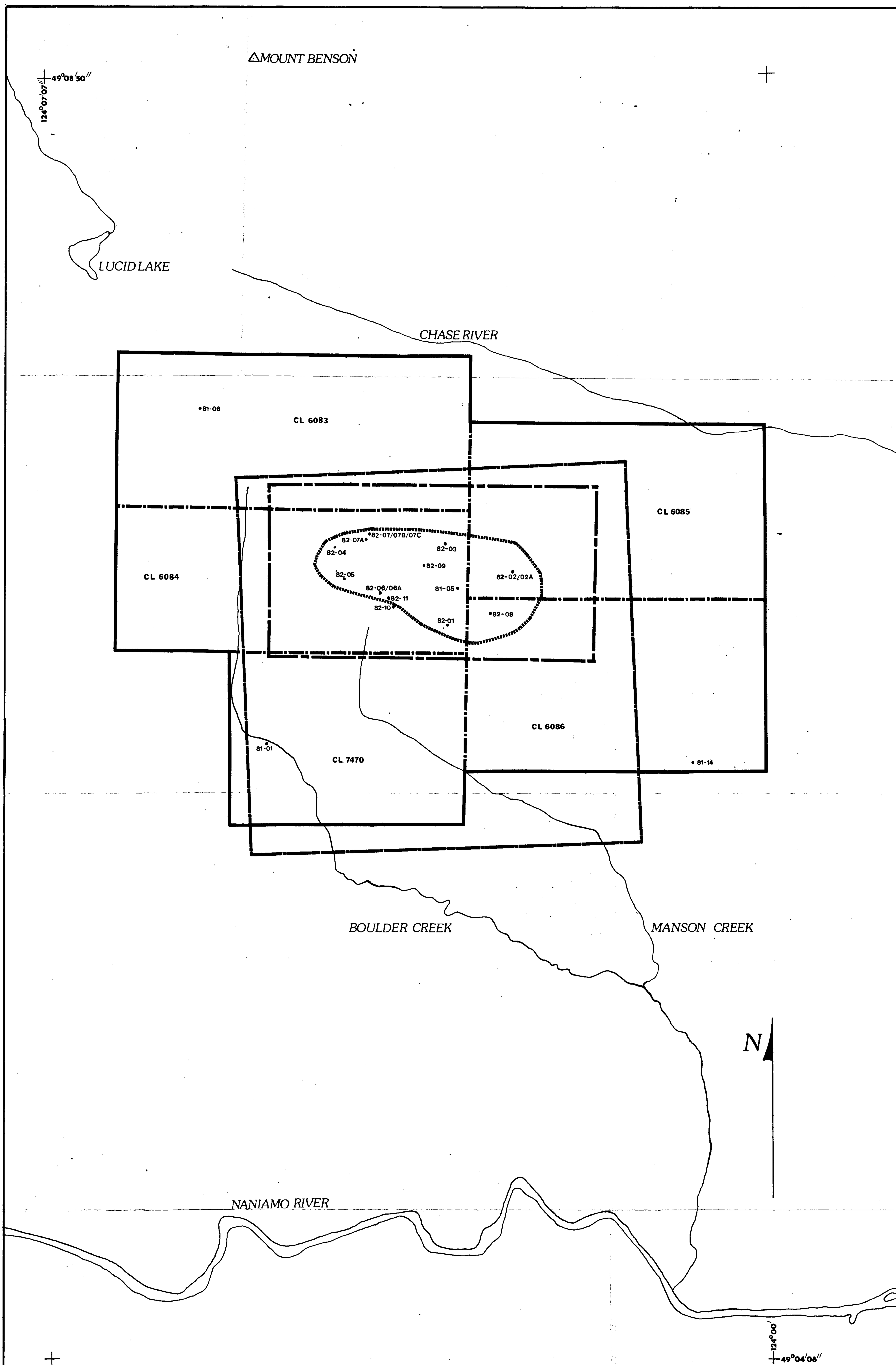
SCALE: 1:2500
CONTOUR INTERVAL: 2 METERS ABOVE 550
5 METERS BELOW 550

DATE OF PHOTOGRAPHY:
SEPTEMBER 29, 1982

PREPARED BY:
AERO GEOMETRICS LTD.

177(1)
M07a


70500E
71000E
71500E
72000E
49°06'25"
124°01'
0 100 200 300 m
SCALE: 1:2500
CONTOUR INTERVAL: 2 METERS ABOVE 550
5 METERS BELOW 550
DATE OF PHOTOGRAPHY:
SEPTEMBER 29, 1982
PREPARED BY:
AERO GEOMETRICS LTD.
WOLF MOUNTAIN COAL LTD.
WOLF MOUNTAIN PROJECT
TOPOGRAPHIC MAP
WOLF MOUNTAIN
FIG. 3.3
Prep. by: AERO GEOMETRICS LTD.
Photography: 29 September 1982
Contours: 5 m < 550 m > 2 m
Checked:
Client App:
Revised:
Date: November 1982
Scale: 1:2,500
File No:
Dwg. No:
COAL-EX CONSULTING LTD.



0 500 1000M

FIGURES REFERRED TOO ARE CONTAINED IN THE GEOLOGICAL REPORT OF THE 1982 WOLF MOUNTAIN EXPLORATION PROGRAMME

LEGEND

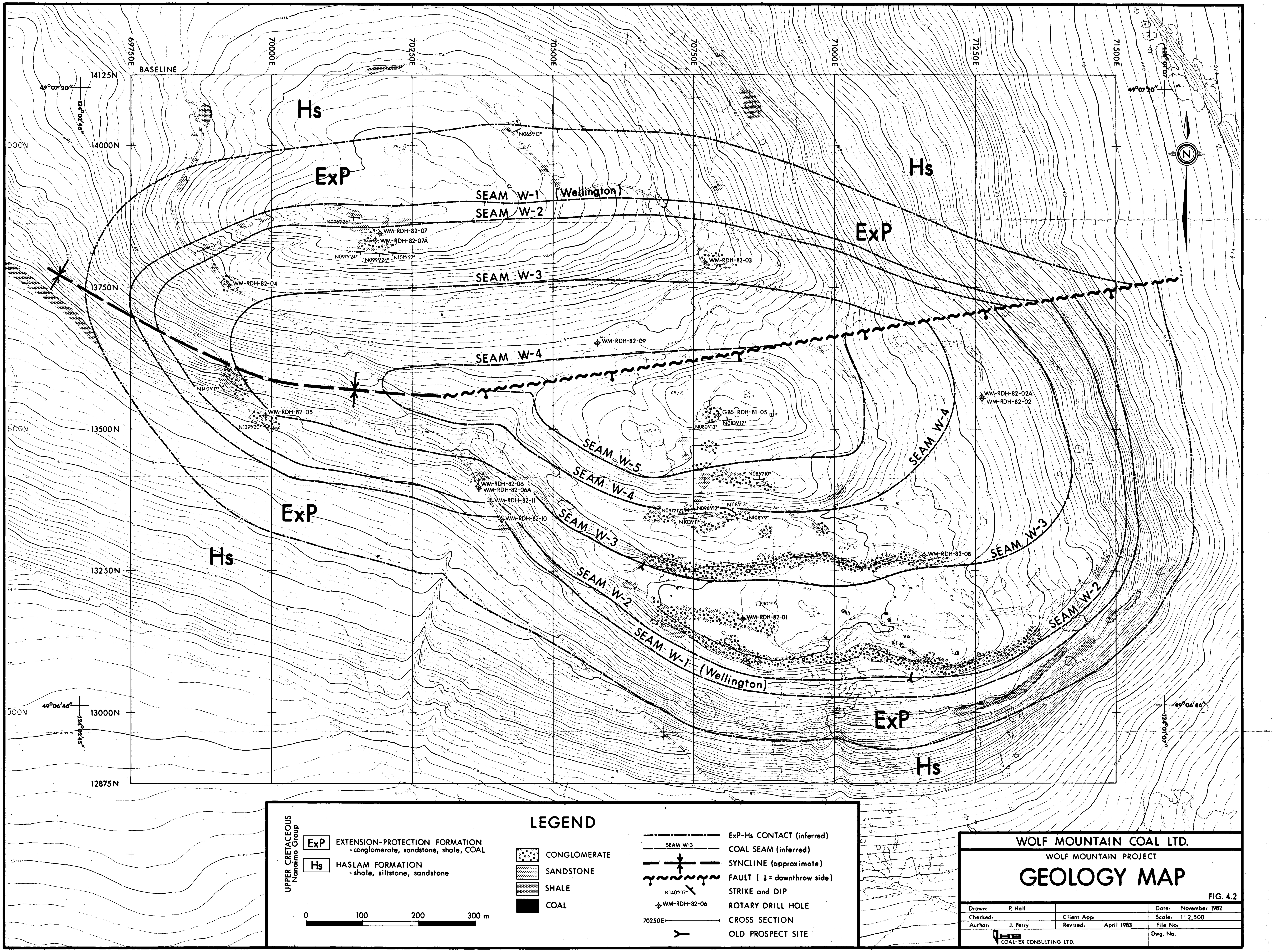
- PROPERTY BOUNDARY
- LICENCE BOUNDARY
- BOUNDARY OF FIGURES 3.2 & 3.3*
- BOUNDARY OF FIGURES 4.2,4.8,4.9 & 5.5*
- DRILL LOCATIONS
- WELLINGTON SEAM

WOLF MOUNTAIN COAL

WOLF MOUNTAIN PROJECT
WORK AREA LOCATION MAP - FIG 1

DRAWN BY : S. ROBERTS
AUTHOR : J. PERRY
DATE : MAY 1984
SCALE 1:12 500

177
M8



BASELINE
69750E
70000E
70250E
70500E
70750E
71000E
71250E
71500E
14125N
14000N
13750N
13500N
13250N
13000N
12875N
49°07'20"
124°02'45"
49°06'46"
124°07'07"
Hs
ExP
SEAM W-1 (Wellington)
SEAM W-2
SEAM W-3
SEAM W-4
SEAM W-5
WM-RDH-82-07
WM-RDH-82-07A
WM-RDH-82-03
WM-RDH-82-04
WM-RDH-82-09
WM-RDH-82-05
GBS-RDH-81-05
WM-RDH-82-02A
WM-RDH-82-02
WM-RDH-82-06
WM-RDH-82-06A
WM-RDH-82-11
WM-RDH-82-10
WM-RDH-82-08
WM-RDH-82-01
N065°/13°
N096°/26°
N091°/24°
N099°/24°
N101°/22°
N140°/17°
N139°/20°
N083°/17°
N080°/13°
N085°/10°
N091°/12°
N096°/12°
N118°/13°
N103°/11°
N108°/9°
LEGEND
UPPER CRETACEOUS Nanaimo Group
ExP EXTENSION-PROTECTION FORMATION -conglomerate, sandstone, shale, COAL
Hs HASLAM FORMATION -shale, siltstone, sandstone
CONGLOMERATE
SANDSTONE
SHALE
COAL
0 100 200 300 m
ExP-Hs CONTACT (inferred)
SEAM W-3 COAL SEAM (inferred)
SYNCLINE (approximate)
FAULT (↓ = downthrow side)
N140°/17° STRIKE and DIP
WM-RDH-82-06 ROTARY DRILL HOLE
70250E CROSS SECTION
OLD PROSPECT SITE
WOLF MOUNTAIN COAL LTD.
WOLF MOUNTAIN PROJECT
GEOLOGY MAP
FIG. 4.2
Drawn: P. Hall
Checked:
Client App:
Author: J. Perry
Revised: April 1983
Date: November 1982
Scale: 1:2,500
File No:
Dwg. No:
COAL-EX CONSULTING LTD.

177 (M9)


NORTH FLANK
WM-RDH-82-04
Apparent thickness = 1.92 m
True thickness = 1.73 m
WM-RDH-82-07/07A
Apparent thickness = 2.76 m
True thickness = 2.51 m
WM-RDH-82-09
Apparent thickness = 2.50 m
True thickness = 2.28 m
WM-RDH-82-03
Apparent thickness = 2.55 m
True thickness = 2.39 m
DATUM
SOUTH FLANK (West 1/2)
WM-RDH-82-05
Apparent thickness = 2.22 m
True thickness = 2.12 m
WM-RDH-82-06/06A
Apparent thickness = 1.75 m
True thickness = 1.69 m
WM-RDH-82-01
Apparent thickness = 0.85 m
True thickness = 0.84 m
SOUTH FLANK (East 1/2)
GBS-RDH-81-05
Apparent thickness = 2.63 m
True thickness = 2.62 m
WM-RDH-82-08
Apparent thickness = 2.71 m
True thickness = 2.69 m
WM-RDH-82-02/02A
Apparent thickness = 2.76 m
True thickness = 2.76 m
NOTES
Coal seam trace from Detailed Density Log
Coal seam trace from Detailed Focussed Resistivity Log
Coal seam intersections reflect apparent thickness.
NORTH FLANK LOCATION KEY
WM-RDH 82-04
WM-RDH 82-07
WM-RDH 82-09
WM-RDH 82-03
SEAM W-1
0
500 m
SOUTH FLANK (West 1/2)
WM-RDH 82-05
WM-RDH 82-06
WM-RDH 82-01
SOUTH FLANK (East 1/2)
GBS-RDH 81-05
WM-RDH 82-02
WM-RDH 82-08
177
LEGEND
BRIGHT COAL
BRIGHT BANDED COAL
DULL & BRIGHT COAL
DULL BANDED COAL
DULL COAL
BONEY/STONEY COAL
SHEARED COAL
COAL & BANDS
CARBONACEOUS SHALE/MUDSTONE
SHALE/MUDSTONE
SANDSTONE
SILTSTONE
COAL LENSES
CORE LOSS
177
W- Wolf Mountain 82(2)A *(i) M10
WOLF MOUNTAIN COAL LTD.
WOLF MOUNTAIN PROJECT
SEAM CORRELATION CHART
SEAM W-1 (Wellington)
FIG. 4.7
Drawn: P. Hall
Checked:
Author: J. Perry
Client App:
Revised:
Date: December 1982
Scale: 1:40
File No:
Dwg. No:
COAL-EX CONSULTING LTD.


UPPER CRETACEOUS (NANAIMO GROUP)
EXTENSION-PROTECTION FORMATION
KEY MAP
WM-82-05
WM-82-06
GBS-81-05
WM-82-02
WM-82-08
WM-82-01
0
500 m
GBS-81-05
SEAM W-5
SEAM W-5
SEAM W-4
SEAM W-4
WM-82-02
WM-82-08
SEAM W-3
WM-82-05
WM-82-01
W-3
SEAM W-3
WM-82-06
SEAM W-2
W-2
SEAM W-2
SEAM W-1
(Wellington)
DATUM LINE
W-1
SEAM W-1
DATUM LINE
(Wellington)
SEAM Wx
GAM.
CAL.
DEN.
T.D. = 45.72 m
T.D. = 27.43 m
T.D. = 60.96 m
T.D. = 411.5 m
T.D. = 65.53 m
T.D. = 77.72 m
177
M11
NOTE: No horizontal scale.
LEGEND
"70-" = Drill hole depth in metres
GAM. = Natural gamma log
CAL. = Caliper log
DEN. = Density log
WOLF MOUNTAIN COAL LTD.
WOLF MOUNTAIN PROJECT
DRILL HOLE CORRELATION CHART
SOUTH FLANK
FIG. #4.4
Drawn: P. Hall
Checked:
Author: J. Perry
Client App:
Revised:
Date: October 1982
Scale: 1:200 (vertical)
File No:
Dwg. No:
COAL-EX CONSULTING LTD.

177 (MR) - Wolf Mountain 83(2)A *(1)

NOTE: No horizontal scale.

LEGEND

"70-" = Drill hole depth in metres
GAM = Natural gamma log
CAL. = Caliper log
DEN. = Density log

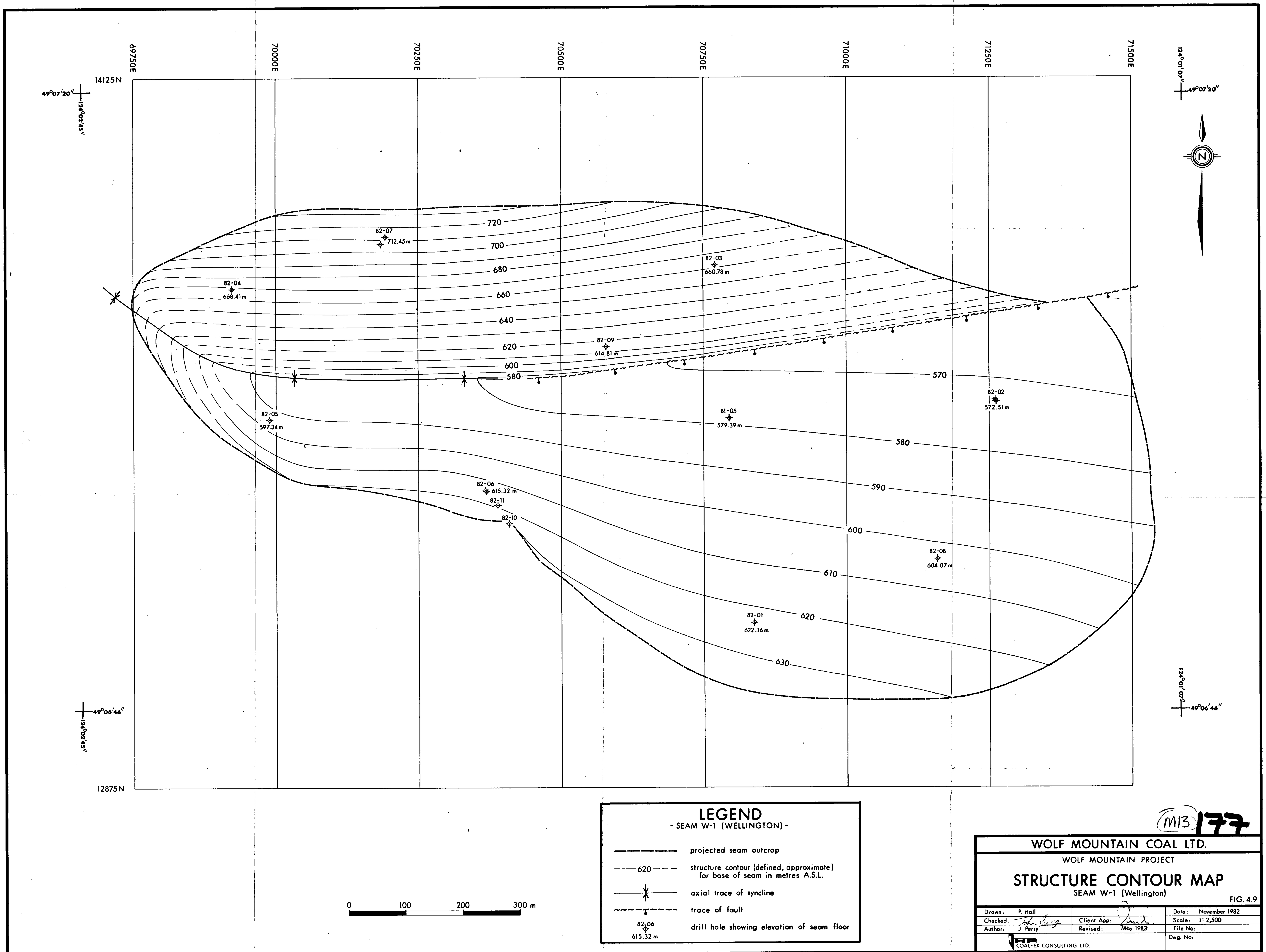
WOLF MOUNTAIN COAL LTD.

WOLF MOUNTAIN PROJECT

DRILL HOLE CORRELATION CHART
NORTH FLANK

FIG. #4 ~~3~~ 4

Drawn: P. Hall		Date: October 1982
Checked: [signature]	Client App: [signature]	Scale: 1: 200 (vertical)
Author: J. Perry	Revised:	File No:
COAL-EX CONSULTING LTD.		Dwg. No:



(M13) 177

WOLF MOUNTAIN COAL LTD.

WOLF MOUNTAIN PROJECT

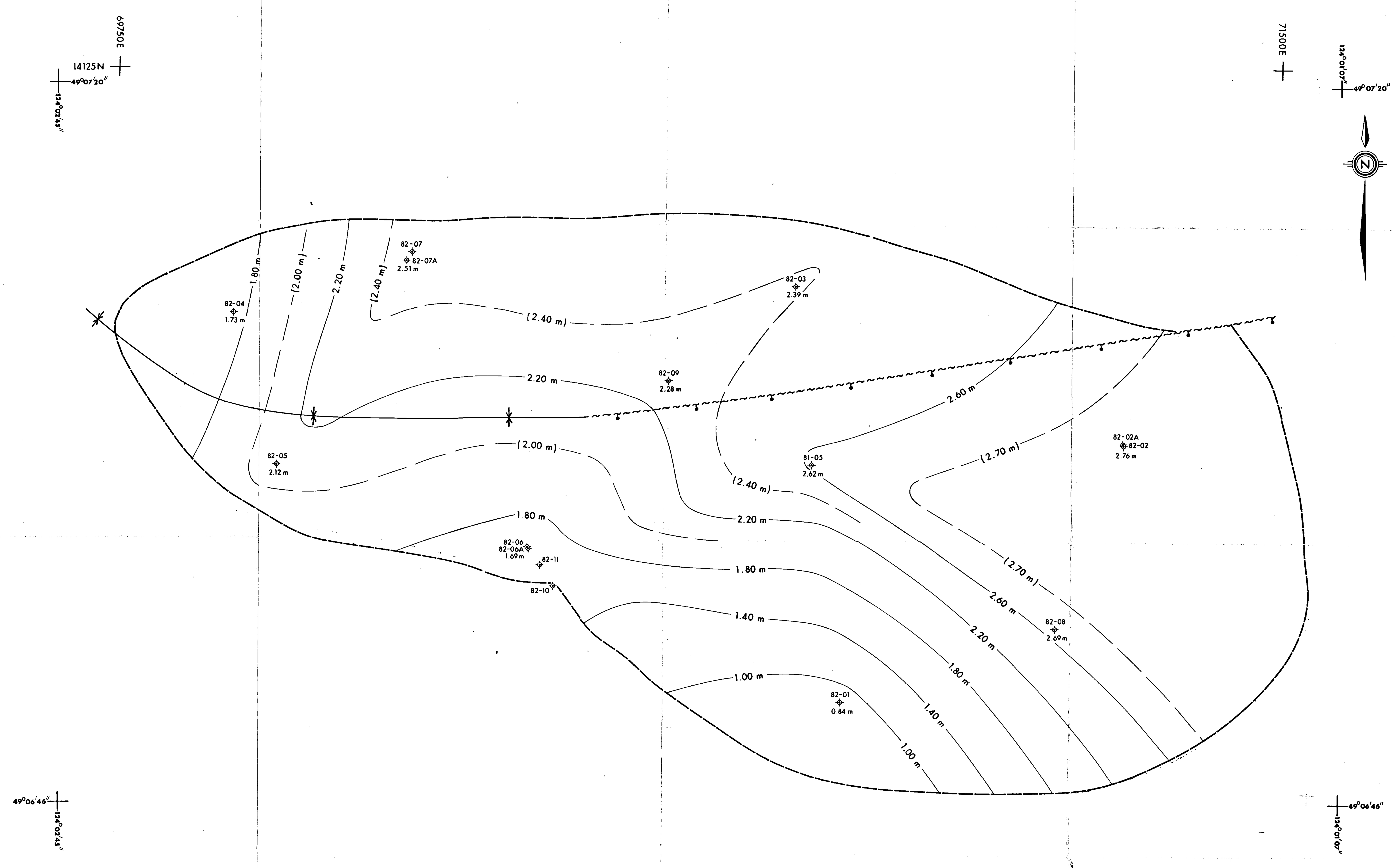
STRUCTURE CONTOUR MAP

SEAM W-1 (Wellington)

FIG. 4.9

Drawn: P. Hall		Date: November 1982	
Checked:	Client App:	Scale: 1: 2,500	
Author: J. Perry	Revised: May 1983	File No:	
		Dwg. No:	

COAL-EX CONSULTING LTD.



0 100 200 300 m

LEGEND
- SEAM W-1 (WELLINGTON) -

——— ———	projected seam outcrop
— 2.20 m —	seam thickness (true thickness)
——✕——	axial trace of syncline (through seam floor)
~~T~~~	trace of fault (through seam floor)
82-06 ⊕ 1.69 m	drill hole showing true thickness of intersected seam

(M14) 177

WOLF MOUNTAIN COAL LTD.

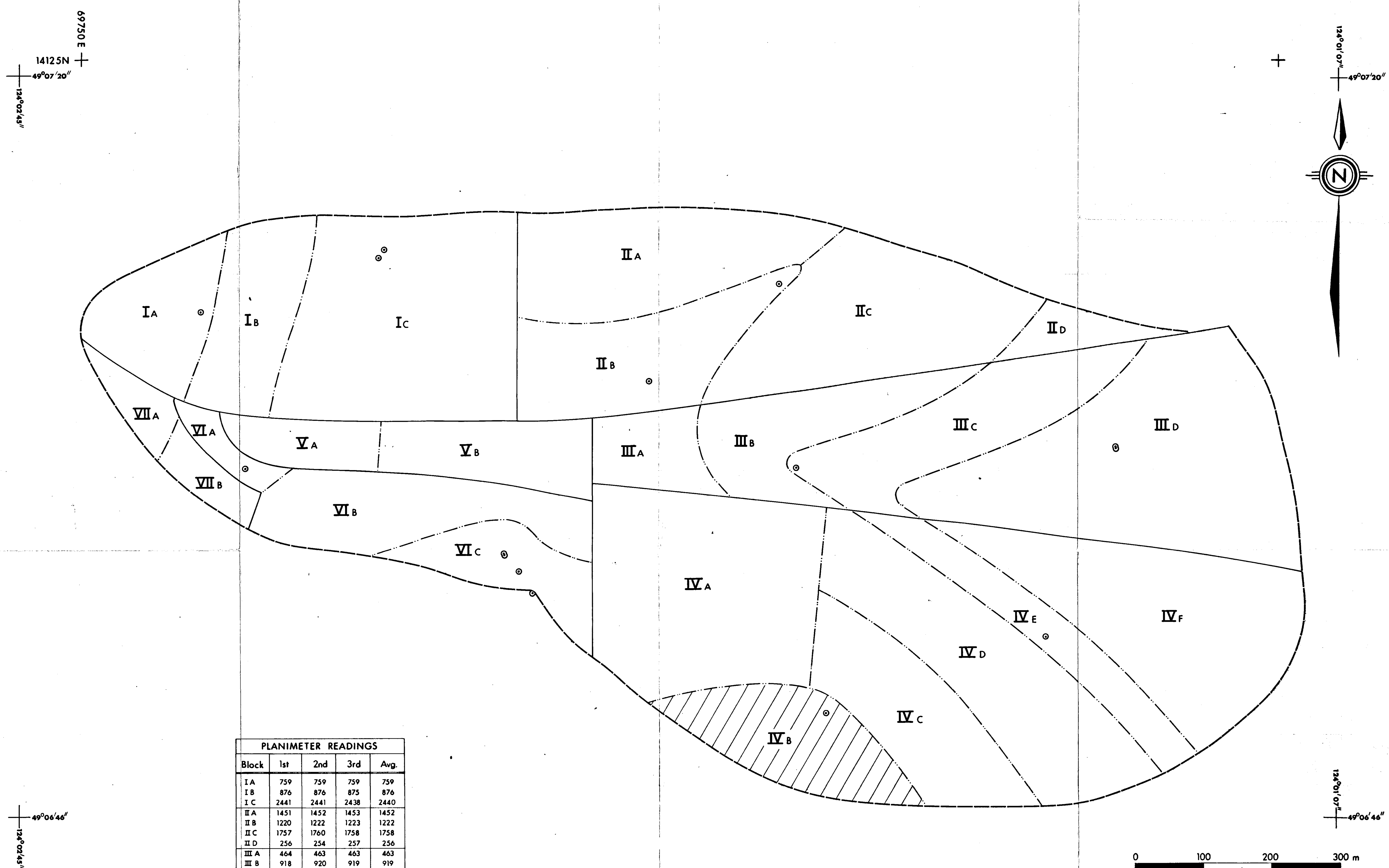
WOLF MOUNTAIN PROJECT

ISOPACH MAP
SEAM W-1 (Wellington)

FIG. 4.8

Drawn: P. Hall		Date: November 1982	
Checked: [signature]	Client App: [signature]	Scale: 1:2,500	
Author: J. Perry	Revised: May 1983	File No.	
		Dwg. No:	

CHP COAL-EX CONSULTING LTD.



PLANIMETER READINGS				
Block	1st	2nd	3rd	Avg.
I A	759	759	759	759
I B	876	876	875	876
I C	2441	2441	2438	2440
II A	1451	1452	1453	1452
II B	1220	1222	1223	1222
II C	1757	1760	1758	1758
II D	256	254	257	256
III A	464	463	463	463
III B	918	920	919	919
III C	1242	1238	1243	1241
III D	2895	2900	2897	2897
IV A	2321	2320	2323	2321
IV B	993	994	995	994
IV C	1164	1161	1163	1163
IV D	1870	1871	1869	1870
IV E	769	772	774	772
IV F	2092	2093	2092	2092
V A	384	382	380	382
V B	719	720	720	720
VI A	182	181	183	182
VI B	1110	1111	1109	1110
VI C	630	627	629	629
VII A	241	240	241	241
VII B	245	247	248	247

LEGEND

IV C	RESOURCE/RESERVE BLOCK
IV	STRUCTURE BLOCK
C	ISOPACH SUB-BLOCK
———	BOUNDARY OF STRUCTURE BLOCK
—·—·—	BOUNDARY OF ISOPACH SUB-BLOCK
— — —	SEAM W-1 OUTCROP
⊙	DRILL HOLES

M15 177

WOLF MOUNTAIN COAL LTD.

WOLF MOUNTAIN PROJECT

STRUCTURE BLOCKS AND ISOPACH SUB-BLOCKS USED FOR RESOURCE/RESERVE CALCULATIONS

FIG. 5.5

Drawn: P. Hall		Date: July 1983
Checked:	Client App:	Scale: 1: 2,500
Author: J. Perry	Revised:	File No:
COAL-EX CONSULTING LTD.		Dwg. No: