

EXPLORATION OF GRAND MANAN ISLAND  
FOR  
KEEVIL MINING GROUP LIMITED .

1964

470333

T. O. H. Patrick

## ABSTRACT

Intensive exploration of the Triassic rocks of Grand Manan Island failed to discover a large, low grade, copper deposit. Copper occurs locally as minor mineral occurrences but observations and projections by previous workers indicating commercial ore were not verified.



COLUMNAR BASALT OVERLYING SHALE AND SANDSTONE  
WEST SHORE OF GRAND MANAN ISLAND, NEW BRUNSWICK

GRAND MANAN  
PROJECT  
1964  
REPORT ON THE EXPLORATION OF GRAND MANAN ISLAND  
FOR  
KEEVIL MINING GROUP LIMITED  
BY  
GEOPHYSICAL ENGINEERING & SURVEYS LIMITED

T. O. H. PATRICK

## CONTENTS

	<u>Page</u>
Introduction	1
General Geology	3
Economic Geology	5
Exploration Programme	7
Compilation and Photogeology	8
Reconnaissance	9
Geophysical Tests	10
Prospecting and Geochemical Sampling	10
Diamond Drilling	12
Sloop Cove Adit	13
Conclusions	15
Recommendations	15
References	

Page

## ILLUSTRATIONS

Frontispiece	Front Cover
Columnar Basalt overlying shale and sandstone West Shore of Grand Manan Island, New Brunswick	
Index map of Grand Manan Island	After Page 1
Figure I Aerial View of Cliffs West Shore of Grand Manan	After Page 4
Figure II Sea Cliffs near Sloop Cove Adit	After Page 9
Figure III Triassic Shale and Sandstone near Adit	After Page 10
Location Map West Central Area	After Page 11
Drill Hole Sections	After Page 12
Figure IV Portals of North and South Adits near Sloop Cove	After Page 13
Figure V Central Timbered Section North Adit	After Figure IV
Plan and Sections Sloop Cove Mine	After Page 14
Figure VI Multi-colored Lenticular Shale Beds North Wall of Adit	After Page 14
Figure VII Local Concentration of Malachite in Sandy Argillite North Wall of North Adit	After Figure VI
Surface Plan Diamond Drilling	In Pocket

## APPENDIX

Geochemical Exploration Surface Rock Samples Assay Data
Diamond Drill Logs Surveyed Elevations

# EXPLORATION OF GRAND MANAN ISLAND

BY

GEOPHYSICAL ENGINEERING AND SURVEYS LIMITED

1964

## INTRODUCTION

Grand Manan is the largest island of the Fundy group located on the north-west side of the Bay of Fundy off the coast of Maine and New Brunswick at the mouth of Passamaquoddy Bay. The Grand Manan group consists of Grand Manan Island proper, about 15 subsidiary islands and a number of small islets and rocks.

Although Grand Manan is part of New Brunswick its closest point on the mainland shore is West Quoddy Head on the coast of the State of Maine 6.8 miles away. The nearest Canadian point is the southerly tip of Campobello Island.

The main island of Grand Manan is a north-northeast trending prominent land mass which forms an abrupt scarp about 500 feet high on the west side and slopes gradually to low tidal flats on the east side. A number of small ponds and streams are found on the island with a few swampy areas. The main body of the island is timbered with commercial pulp cutting operations currently in progress. There are several villages connected by a network of good roads, with a total population of 3,000 approximately. The island is served by a regular ferry from Saint John and St. Andrews, New Brunswick. There is a small air port with air service available from Saint John when the weather permits.

Fishing is the main industry of the island although the area is popular as a quiet seaside resort. At present the pulp cutting operation employs a number of



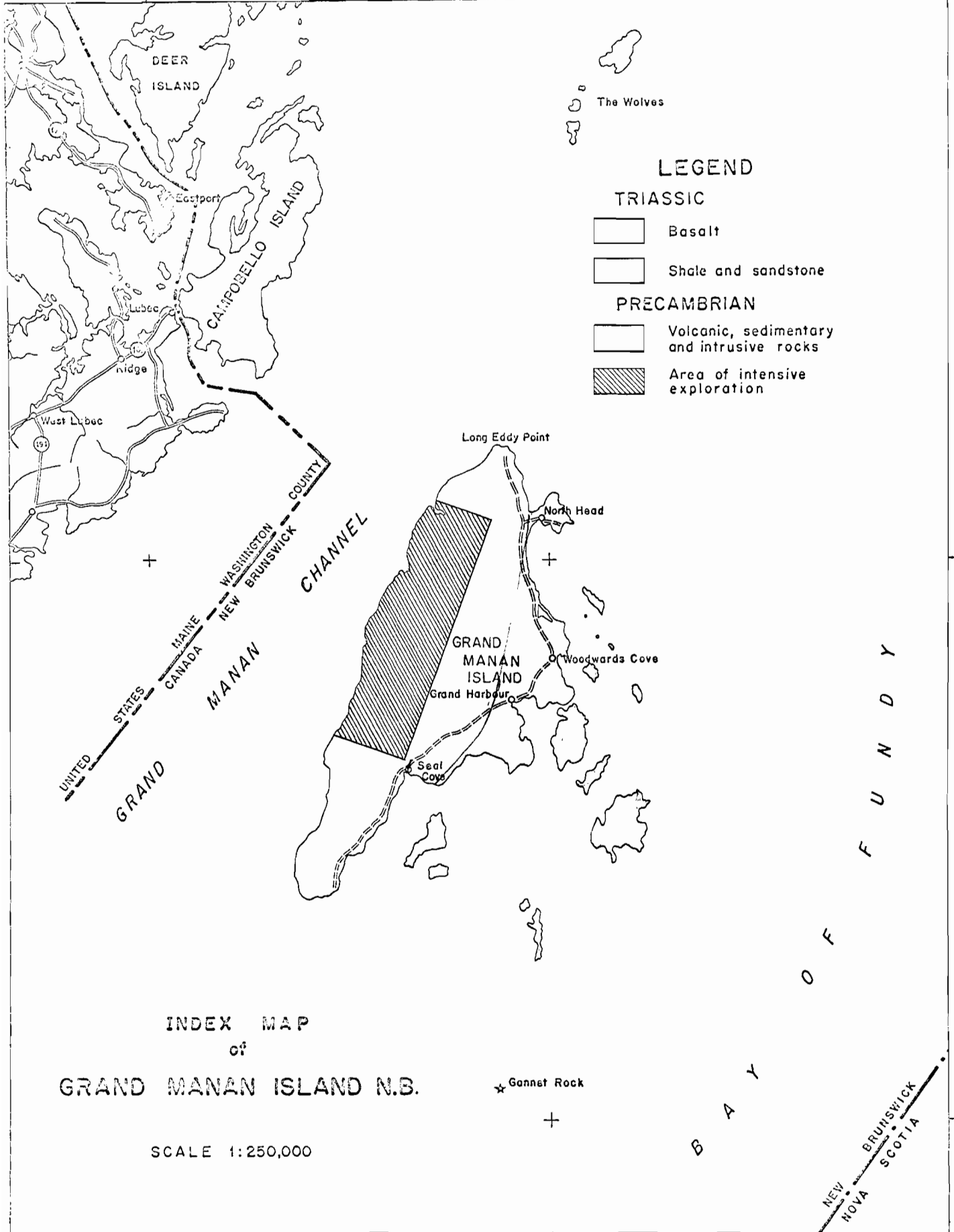
AERIAL VIEW OF CLIFFS  
WEST SHORE OF GRAND MANAN

FIGURE I

67°00'

66°45'

45°00'



### LEGEND

#### TRIASSIC

- Basalt
- Shale and sandstone

#### PRECAMBRIAN

- Volcanic, sedimentary and intrusive rocks
- Area of intensive exploration

### INDEX MAP

of

## GRAND MANAN ISLAND N.B.

SCALE 1:250,000

★ Gannet Rock

67°00'

66°45'

44°45'

NEW BRUNSWICK  
NOVA SCOTIA

B  
A  
Y  
O  
F  
G  
R  
A  
N  
D  
M  
A  
N  
I  
S  
L  
A  
N  
D

UNITED STATES  
CANADA  
MAINE  
NEW BRUNSWICK  
WASHINGTON COUNTY

GRAND

MANAN

CHANNEL

GRAND  
MANAN  
ISLAND

Grand Harbour

Seal Cove

Long Eddy Point

North Head

Woodwards Cove

+

+

+

people, although wood cutting has been discontinuous, a harvest being taken approximately every 20 to 25 years.

There is a history of small scale sporadic mineral exploration activity on the island, although there are few formal documents which record the early work. The rocks of the area have been known to contain copper mineralization for many years although no economic deposits have been discovered. The most important of the early prospecting activity was centred upon the old Sloop Cove adit. This adit was uncovered late in the summer exploration season and investigated in detail with disappointing results. No evidence of commercial production was found although legend has it that there were shipments of high grade ore from the "mine". There are no records available of this mining operation other than those reported by Prof. Chapman and brief mentions in the local journals of the latter part of the last century.

The 1964 exploration project was inspired by reports of extensive copper mineralization in the Triassic formations which underlie the western 2/3 of the island and reports of significant copper mineralization in a hole drilled in 1957 near the Sloop Cove adit. The mineral potential of the area was pointed out by Prof. Chapman of the University of Toronto, who visited the island on behalf of private mining interests in September, 1870 and published a paper on his findings in the Journal of the Philosophical Society. In 1963 Mr. E. K. Fockler reported on the geology and copper occurrences in a private report to H. F. Ditchburn & Associates.

The geology of Grand Manan was mapped by F. J. Alcock in 1946 for the Geological Survey of Canada and several research projects, notably by the University of New Brunswick, have been carried out on the island as it is an ideal location for summer field work and training student geologists.

The 1964 programme was limited almost exclusively to exploration for a large tonnage, low grade, copper deposit in the sedimentary rocks of Triassic age which underlie the Triassic basalt which forms western portion of the island.

Mr. Vernon Bagley of Seal Cove gave considerable assistance to field operations through his knowledge of the island. Andris Betmanis was a valuable field assistant. Sirdar Ingalls and Craig Bagley as well as the other Grand Manan men of the field crew worked commendably.

The writer benefited from geological discussions with Professors A. L. McAllister and G. E. Pajari of the University of New Brunswick, John Smith of the New Brunswick Department of Mines and E. K. Fockler consulting geologist.

Contract diamond drilling was by Boyles Bros. , Noranda, Quebec.

### General Geology

The surface geology is adequately illustrated by Geological Survey of Canada Map 965A published in 1948. The flat lying Triassic volcanic rocks are in contact with the older metamorphic series to the east along a major fault

structure indicated on the geological map. Rocks are well exposed on the islands and along the coast but with the exception of certain hill tops and fault scarp there are few inland outcrops other than those found along streams.

The Precambrian rocks east of the major north-northeast trending fault show low rank regional metamorphism chiefly due to dynamic changes resulting from intense and intricate folding with accompanying fault displacements.

Triassic volcanic rocks consisting of tholeiitic basalt vary in texture but are apparently compositionally uniform with minor variations due to differentiation. The main mass of the island consists of a single thick flow covering the westerly and southerly part of the island. To the north there seem to be a number of thinner successive flows marked by amygdaloidal flow top and bottom boundaries and other interflow structures. On the east shore of the southern part of the island there are a number of amygdaloidal and pseudo-pillowed features. Over the interior and the western part of the island the basalt is typically massive material with spectacular development of columnar jointing along the sea cliffs which form the western shore. Some amygdaloidal horizons were observed.

Underlying the basalt is a series of clastic sedimentary rocks ranging from coarse sandstone to shale and mudstone with intermittent gypsum bearing horizons and veins, beds, blebs and cavity fillings of acicular white selenite. The sedimentary rocks observed in outcrop consist of the top 30 to 40 feet of what is apparently a considerable thickness of Triassic sediments underlying



SEA CLIFFS NEAR SLOOP COVE ADIT

FIGURE II

the Bay of Fundy. The deepest drill hole gave a continuous section of some 380 feet of sediments which are mainly red sandstone with some greenish coloured members and red and green shale and mudstone near the top of the sequence. The upper most 20 feet of the sedimentary sequence is cupriferous and was the main object of the exploration program.

### Economic Geology

A number of mineral occurrences chiefly of copper, have been reported on Grand Manan island in the Precambrian rocks to the east. Chalcocite, native copper, barite, quartzite, etc. have been found in veins or isolated mineral occurrences. A brief reconnaissance of these deposits indicated that they were unlikely to have major economic significance and no further work was done on them.

The Triassic basalt contains calcite veins in which native copper has been found as well as chalcocite and chalcopyrite. In addition, the amygdaloidal horizons, notably at the northeast end of the island contain native copper and malachite as well as a variety of zeolite, chalcedony and other amygdule filling minerals. Crystalline quartz and amethyst occurs in veins in the basalt. Although copper mineralization was found in several other localities in the basalt, there appears to be no tendency for this mineralization to be concentrated in other than very minor structures and exploration for copper deposits in the basalt was discontinued after preliminary reconnaissance and prospecting failed to yield encouraging results. Veins of massive hematite and some magnetite

were also found in the basalt but with minor traces of copper mineralization with no commercial significance.

Along the west shore at the foot of the sea cliffs the basalt is underlain by fine grained sedimentary material which contains a light green chlorite like mineral, possibly greenalite, near the contact with the overlying basalts. This green colour, which resembles earthy malachite, attracted early workers to explore for copper. Geochemical analyses indicate poor correlation between the copper values which exist in the sediments and the green colour indicating that although a certain amount of malachite may be present, apparently there is insufficient to cause significant colour in the rocks except locally where a more intense green can be seen in patches and blebs superimposed upon the greenish chloritic mineral in the shale. In some cases, anomalous copper values were found in the grey and red coloured shales indicating that malachite was not the copper mineral. Close examination reveals sooty chalcocite to be present. Occasionally small grains of black looking chalcocite can be found surrounded by malachite stain in the sedimentary rocks. The Triassic sediments underlying the basalt are considered to have economic potential for a variety of geological reasons. These theoretical considerations are summarized as follows:

The Triassic rocks deposited in the Bay of Fundy result from erosion of the Paleozoic rocks of the northern Appalachian region. This indicates a potential for sedimentary base metal deposits in

these sedimentary rocks. The occurrence of copper on Grand Manan Island suggests that this might be a locus of such primary deposition. The basalt flows, which are themselves cupriferous and contain many occurrences of high-grade copper mineralization, may have contributed copper to the sediments through late stage hydrothermal activity which will have the effect of concentrating copper values in the sediments as well as adding to the copper content to produce possible commercial deposits. The observations of Prof. Chapman indicates that such secondary enrichment has indeed taken place and the reports of high grade mineralization from the Sloop Cove Mine are consistent with this observation. For these reasons the copper intersection reported from the drill hole of 1957, although not confirmed by adequate supporting documentation nevertheless indicated further potential in the Sloop Cove area.

#### EXPLORATION PROGRAMME

The Keevil Mining Group undertook to explore the Grand Manan Island area under a concession type agreement between the New Brunswick government and H. F. Ditchburn & Associates. The agreement called for the expenditure of a minimum of \$50,000 during the year 1964. In part the exploration programme was limited by the requirements of this agreement. Since a decision had to be made for extensive further commitment by the end of 1964 in order to maintain the ground under concession it was decided to confine exploration attempts to a

search for large tonnage, low grade, type deposit which could be found and evaluated by broad scale exploration techniques. The exploration programme consisted of 6 phases as follows:

1. Compilation and photogeological study
2. Reconnaissance
3. Geophysical Testing
4. Prospecting and geochemical sampling
5. Diamond Drilling
6. Adit investigation.

The agreement was entered into at the end of 1963 and the office compilation and photogeological study proceeded intermittently during the first 3 months of 1964. A three day reconnaissance in the field was made in April 1964 before the snow had left the ground and regular field work culminating in the diamond drilling programme was carried out from May to October, 1964.

#### Compilation and Photogeology

A search was made for reference data on Grand Manan with very few concrete references being found. No specific details of the alleged mining operation at Sloop Cove could be found but a number of indirect sources gave credence to these reports. Aerial photographs at a scale of 1" = 1/4 mile were obtained and used as a basis for an uncontrolled mosaic as an exploration base map and for photogeological study as a mosaic laydown and as stereoscopic

pairs. From the study certain structures and surficial features were selected for investigation in the field as possible loci of mineralization and a general approach to the exploration programme was planned.

### Reconnaissance

A trip to the field in April with both detailed aerial reconnaissance by chartered air craft and ground reconnaissance with some preliminary checking of the geology caused some modifications in exploration plans.

Preliminary geochemical tests indicated a widespread occurrence of low concentrations of copper and indicated that more emphasis should be placed on a geochemical programme.

The terrain over the western portion of the island is quite level and easy of access and foot travel. The cliffs were found to be a formidable obstacle except in certain places where natural gullies made access to the seashore possible on foot. The strong Fundy tides and exposed nature most of the western coast of the island precluded the use of small boats for access. The Dark Harbour road gives direct vehicle transportation to sea level for the northern part of the island and a network of bush roads in use by the St. Regis Paper Company, plus older trails which were improved by hand labor made much of the southern part of the island accessible by tractor or four wheel drive vehicle.

Detailed aerial reconnaissance and hand held/photographs supplemented the aerial photographs and assisted in locating the area along the west shore in



TRIASSIC SHALE AND SANDSTONE NEAR ADIT

FIGURE III

which the sedimentary rocks underlying the basalt were exposed along the shore above the sea level.

### Geophysical Tests

Library research included a study of the airborne magnetometer survey carried out by the G. S. C. which indicated low magnetic relief over the islands. The existence of magnetite altered to hematite, in most cases in veins and fault zones, in the volcanic rocks suggested that these structures might be picked up on surface by detailed magnetometer profiles. These surveys failed to give sufficient magnetic contrast to be of any practical value in picking up the structures. A very detailed precisely controlled magnetic survey would be required to be of any geological value and this method was abandoned as being impractical as an exploration tool. A network of picket lines was laid out and cut over the area selected as the most probable locus of valuable information. Geophysical tests including reconnaissance, E. M., resistivity and induced polarization, were carried out. These tests were all negative and indicated that the electrical surveys were unlikely to be of value in locating drilling targets because of the blanketing effect of the basalt flows overlying the target horizon of sedimentary rocks. These tests were terminated and no further attempt at geophysical exploration was made.

### Prospecting and Geochemical Sampling

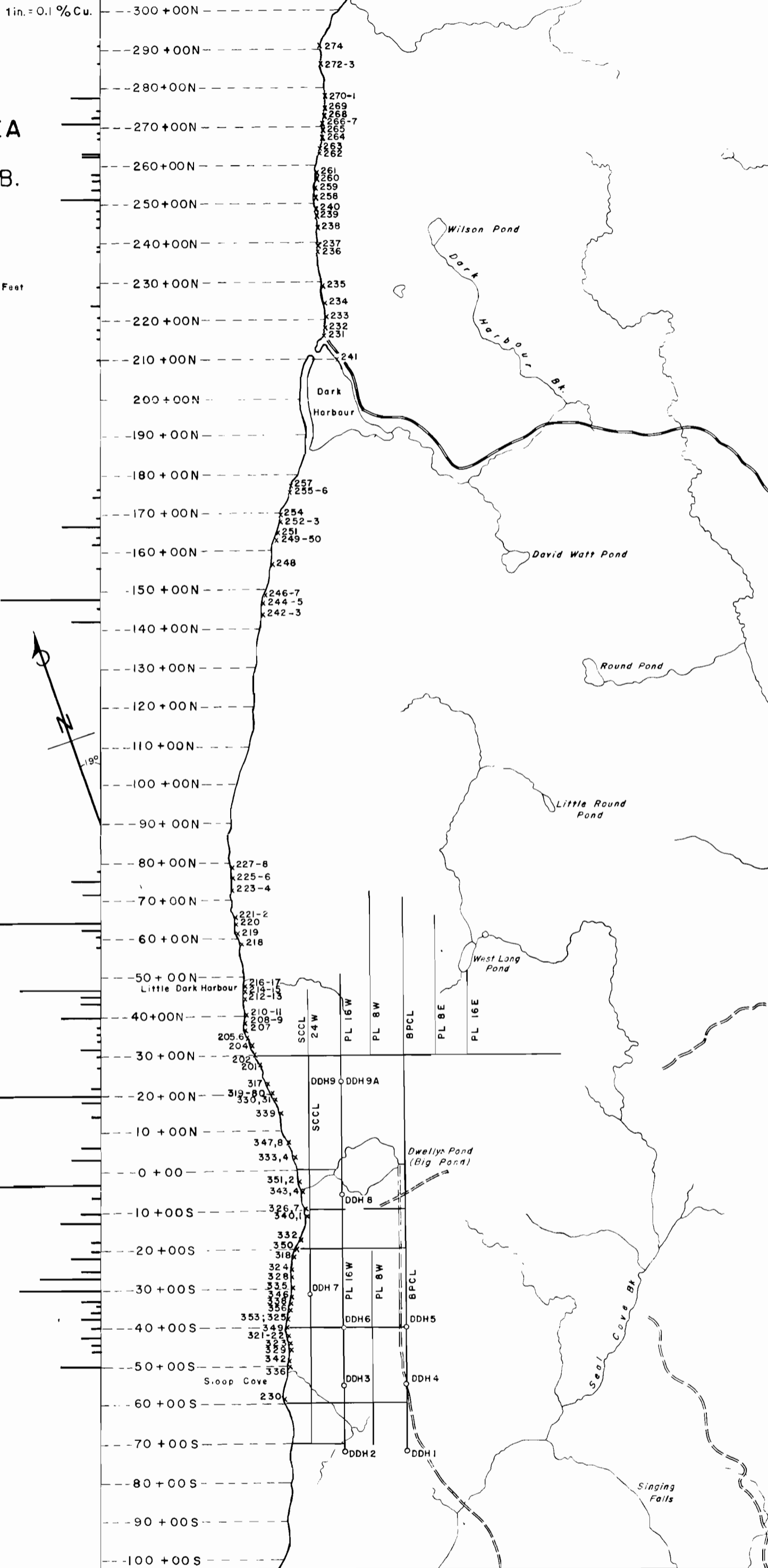
Since little value could be seen in duplicating the geological mapping of the government surveys, geological work was confined to detailed prospecting

in the form of examination and sampling of all known and reported mineral occurrences and a search for additional mineralization along the structures indicated by the photogeological study. No features of commercial significance could be located on the ground related to the photogeological structures and the program soon boiled down to a detailed study of the rock outcrops along the cliff faces particularly on the western shore of the island. A detailed search was made for fault structures, veins and wallrock alteration which might be caused by ore depositing solutions. Nothing of this kind was discovered and little correlation could be found along the shore on the projections of many of the linear photogeological features indicating that these are caused by minor joints and fractures rather than major faults. The structure of the area is apparently an easterly dipping monocline with very gentle basin and dome like features superimposed upon it. The basalt, shale contact varies in elevation from below sea level to a maximum of 60 feet above sea level along the northerly 2/3 of the west shore of Grand Manan Island. With the highest elevation of the contact being approximately 1/2 mile north of Dark Harbour Pond. There appears to be little displacement of this contact by faulting, however, the contact disappears at Sloop Cove where a fault transverse to shore is interpreted. Other undulations and displacements of the contact are chiefly due to shallow folds or primary depositional features rather than fault displacements.

A series of 10 pits and trenches were dug to further expose the sedimentary rocks and the contact zone in the vicinity of Sloop Cove. In most cases additional

LOCATION MAP  
**WEST CENTRAL AREA**  
 Grand Manan Island N.B.

SCALE: 1 in = 2640 Feet

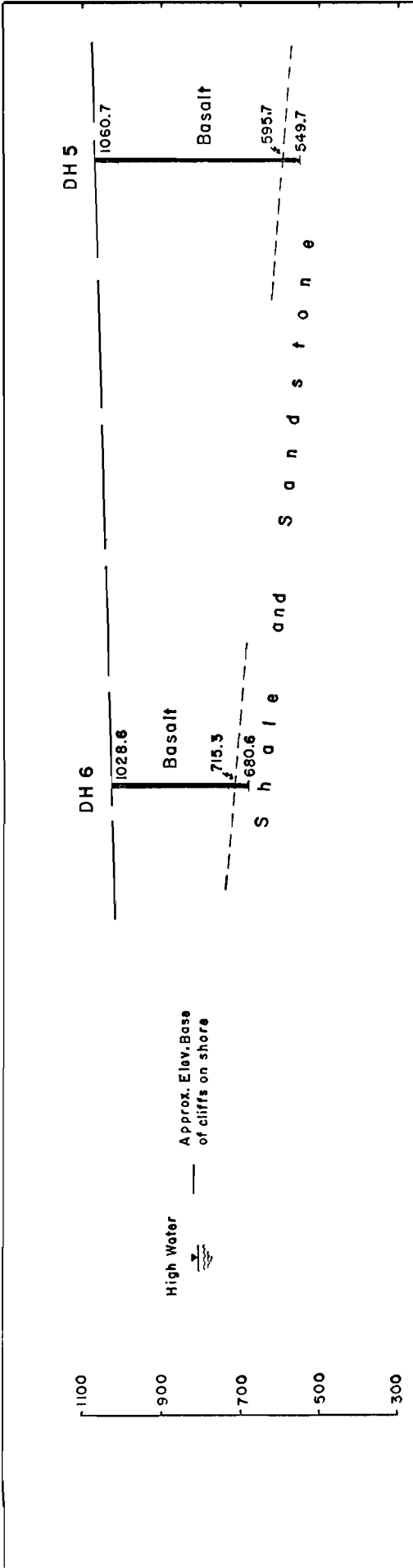


exposure of the sedimentary horizons was achieved by removal of beach material. A strong tide accompanying a severe storm in September caused most of these trenches to be filled with boulders and beach debris before the exploration program was completed, however, all the desired data was obtained from these trenches before they were destroyed by the storm.

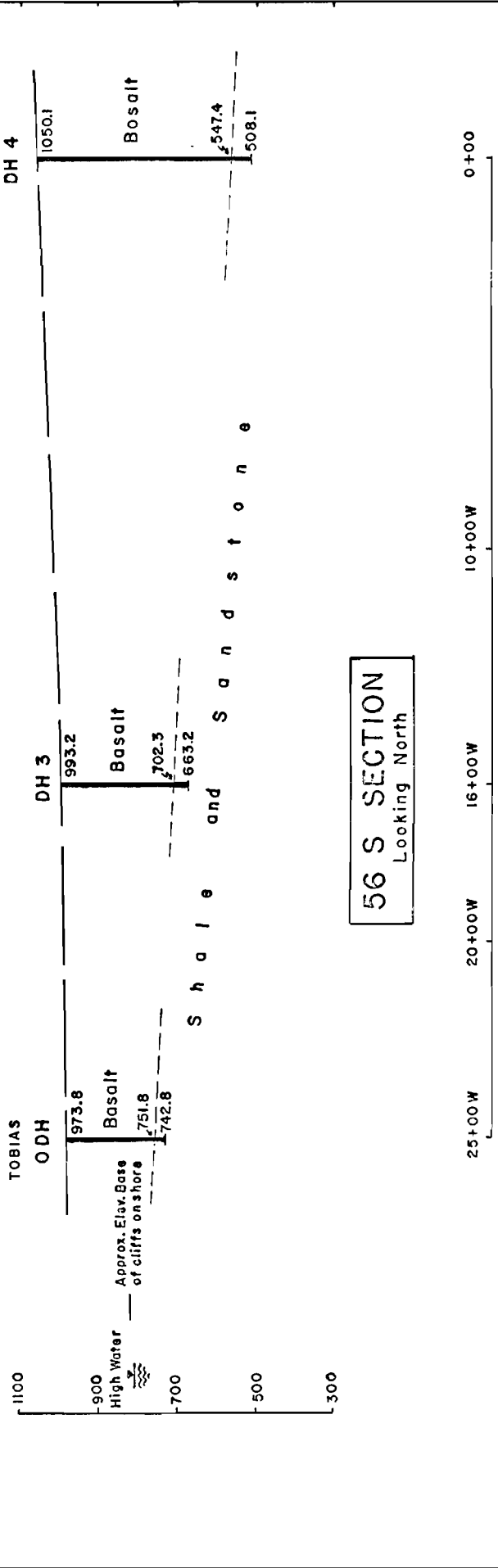
Reconnaissance work served to emphasize the value of the rock sampling program and this was carried out concurrently with the geophysical and prospecting work. A thorough sampling, at intervals from 50 to 200 feet, of representative material from each lithological unit exposed below the basalt contact was taken throughout the full length of exposure of sedimentary rock along the west shore of the island. The single occurrence of red sandstone and shale near the major fault on the easterly part of the island and a number of samples of basalt were also analyzed. This geochemical sampling program revealed certain anomalous areas of higher than average copper content and detailed prospecting and sampling was carried out in these areas.

### Diamond Drilling

A grid pattern of vertical diamond drill holes based on the results of the geochemical sampling and geometric exploration of the zone considered most favourable was carried out. Nine BX drill holes penetrated the basalt and intersected the upper portion of the Triassic sedimentary series. Sludge samples as well as split core were sent for analyses and the copper content is illustrated graphically in the drill hole cross sections. No commercial or near commercial



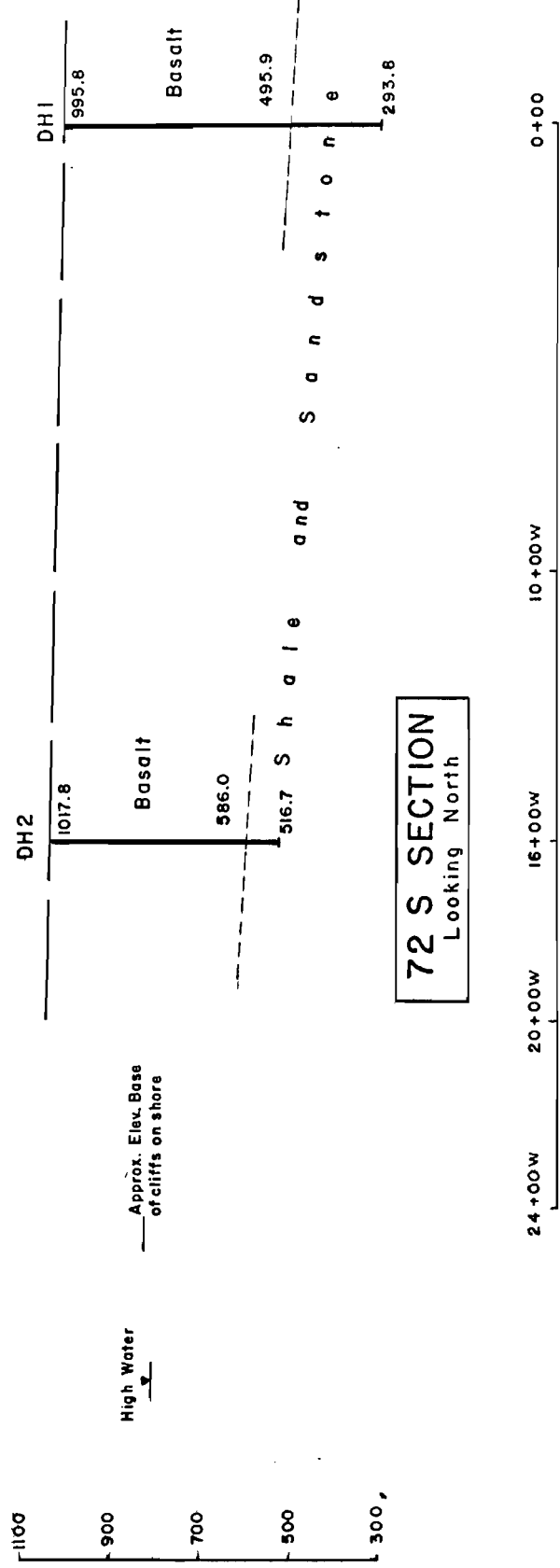
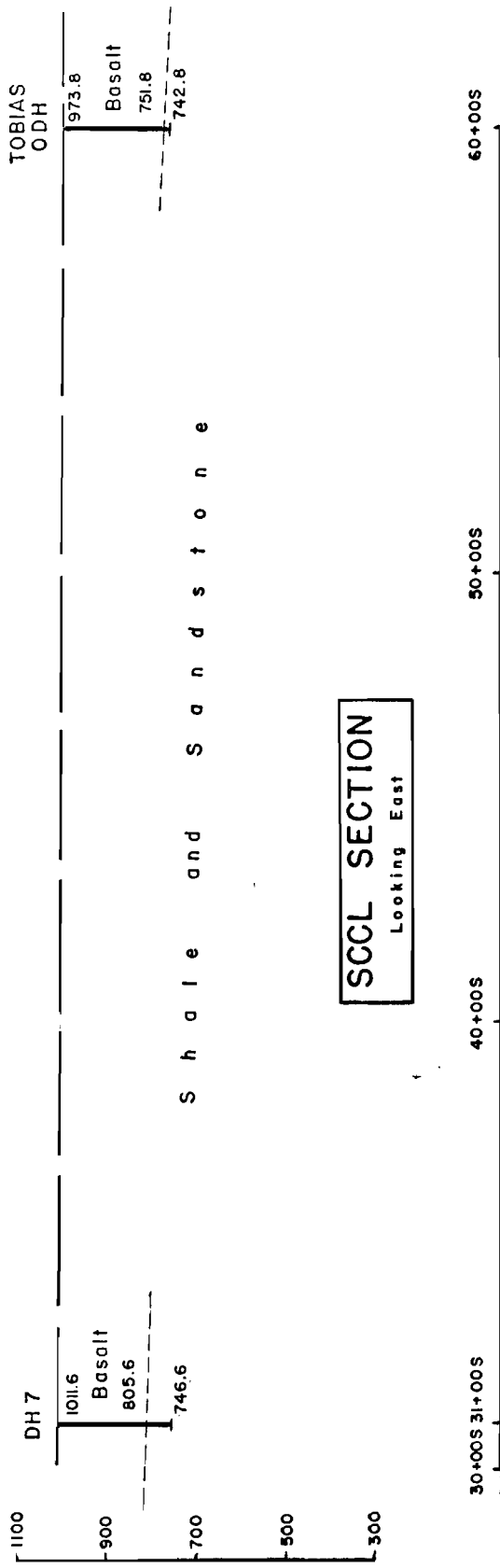
**40 S SECTION**  
Looking North



**56 S SECTION**  
Looking North

25+00W      20+00W      16+00W      10+00W      0+00

SCALE: 1 in. = 400 feet



SCALE: 1 in. = 400 feet

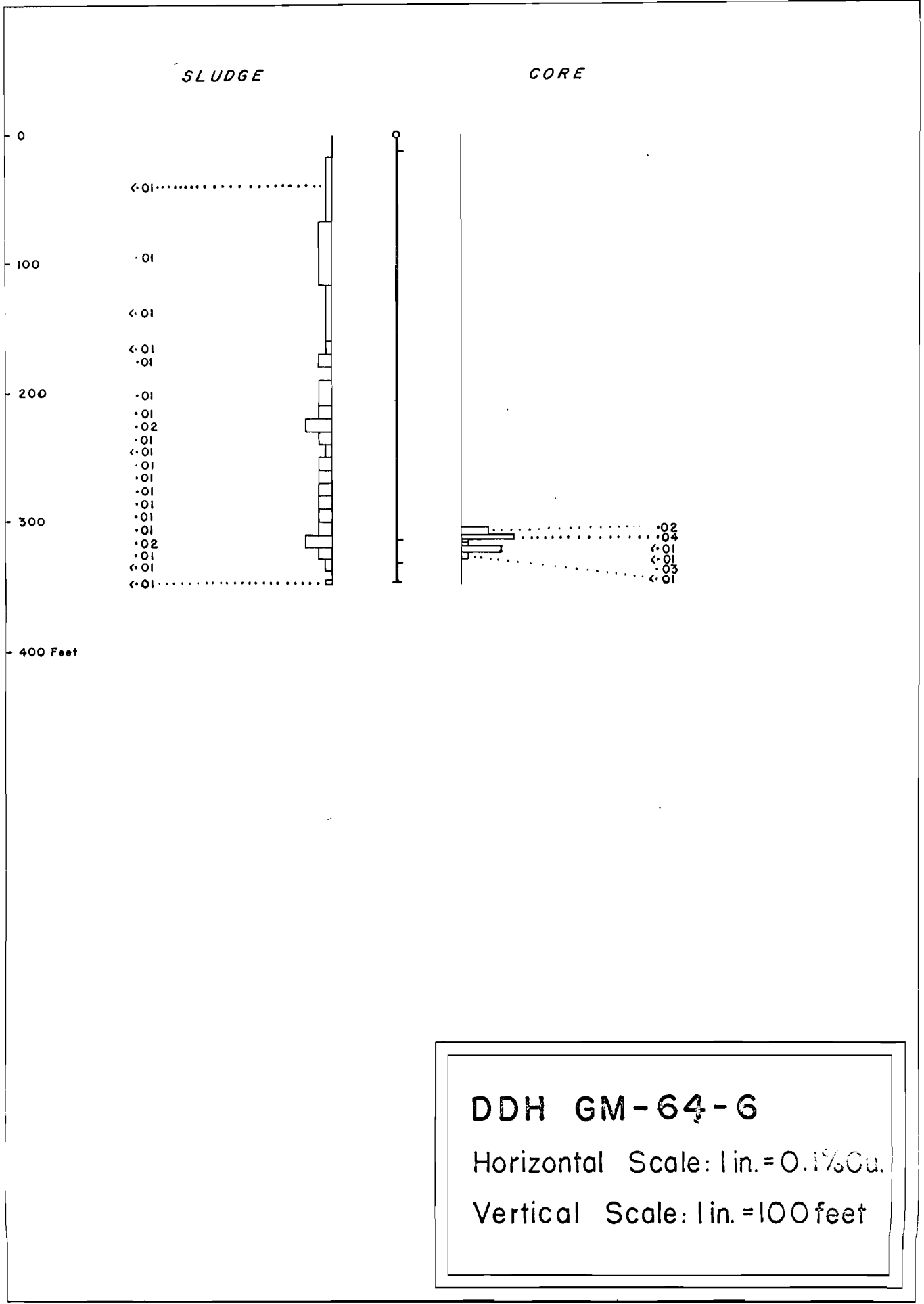












**DDH GM-64-6**  
 Horizontal Scale: 1 in. = 0.1% Cu.  
 Vertical Scale: 1 in. = 100 feet







copper values were intersected in the drilling program.

### Sloop Cove Adit

Mining operations, near Sloop Cove on the west shore of the island, are mentioned in Prof. Chapman's report and in local journals published at the end of the last century. No other documentation could be found but elderly residents of the island recall having seen the workings. The location of Sloop Cove is indicated on the surface plan south of the location indicated on Government maps. Mr. Vernon Bagley, a Game Warden with an intimate knowledge of the island, was able to guide us to the general vicinity of the mine workings but due to wave erosion and rock falls nothing remained visible. Continued searching revealed a piece of mine timber protruding from the rubble at the cliff base after a violent storm. This area was dug out and proved to be the south adit. After another storm the portal to the north adit, 45 ft. north of the south adit, was discovered and entrance was achieved by digging away rubble and fallen timber.

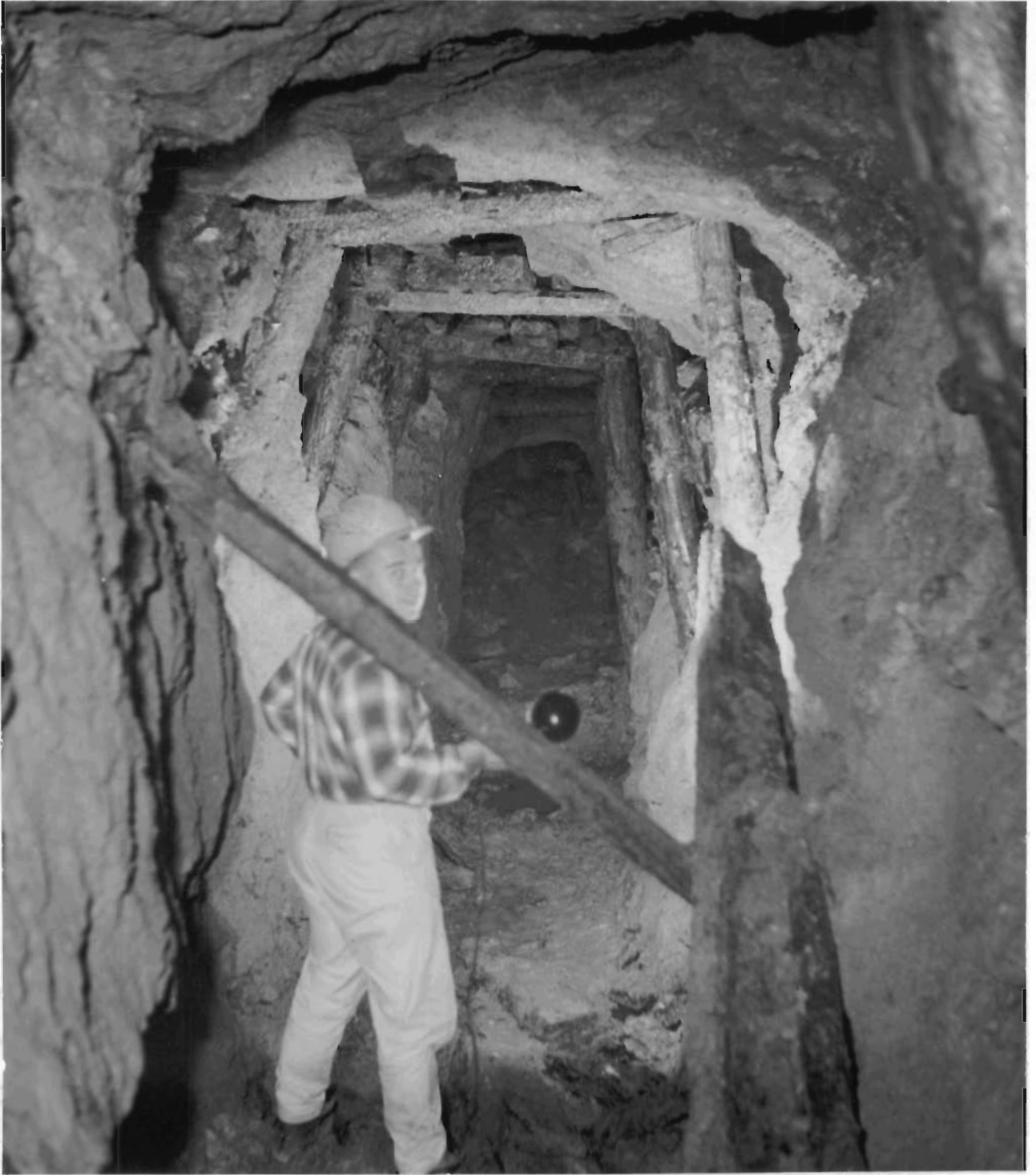
The mine was mapped and sampled in detail, but did not contain anything resembling commercial mineralization over the 230 ft. length which was accessible. No attempt was made to dewater and muck out the flooded east end of the island where the workings slope downward and are filled with broken rock. The adit is not believed to extend very far beyond this point, since the length exposed is nearly equal to the maximum indicated by all the old reports.

The adit entered the shale and shaley sandstone a few feet below the base of the basalt flow. The basalt contact was observed at high points in the back where



PORTALS OF NORTH ADIT (LEFT) AND SOUTH ADIT NEAR SLOOP COVE

FIGURE IV



CENTRAL TIMBERED SECTION NORTH ADIT

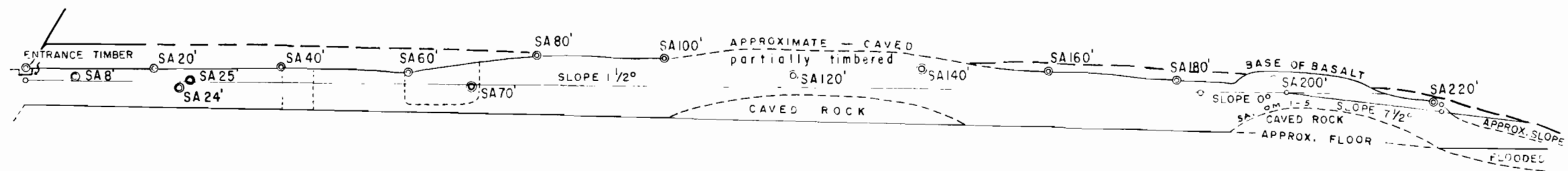
FIGURE V

the soft clay like sediments had fallen. The mining target appeared to be a horizon of fine grained sandy shale from two to four feet below the basalt contact.

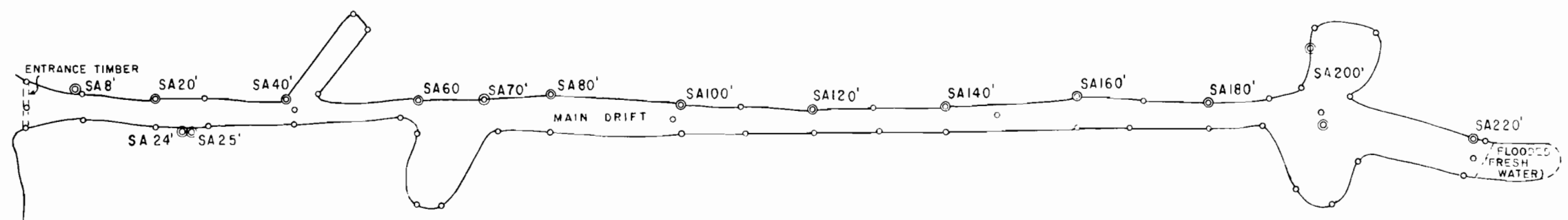
Systematic sampling indicated a low average copper content for even the richest sedimentary horizon 2 ft. below the base of the basalt. Copper does occur mainly as malachite in small blebs patches and seams along this horizon. The richest grab sample from the biggest malachite occurrence contained over 10% copper, but no consistent volume of this material exists.



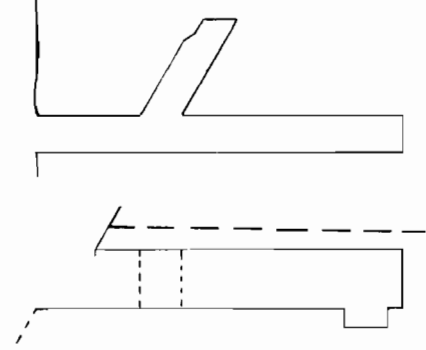
SECTION LOOKING NORTH  
NORTH ADIT



PLAN OF NORTH AND SOUTH ADITS



SECTION LOOKING NORTH  
SOUTH ADIT



LEGEND

- Survey Points
- ⊙ Sample Locations (Plan)
- Line of sight with Brunton

NOTE: Plan by plane table  
 † Section by Brunton compass  
 and vertical measurements

SAMPLE	TYPE	% CU.
SA 8'	Grab	4.50
SA 20'	Channel 6.0'	.02
SA 24'	Chip	3.32
SA 25'	Channel 2.0'	Trace
SA 40'	Chip (2)	.16
SA 60'	Chip (2)	.06
SA 70'	Grab	10.65
SA 80'	Channel 7.5'	.19
SA 100'	Channel 9.0'	.83
SA 120'	Channel 7.6'	.01
SA 140'	Channel 8.3'	.2
SA 160'	Channel 7.0'	.2
	Channel 6.0'	.01
SA 180'	Channel 6.5'	1.05
SA 200'	Grab (5)	.01
	Channel 1.0'	.09
SA 220'	Channel 5.2	.01

PLAN AND SECTIONS  
 SLOOP COVE MINE  
 GRAND MANAN ISLAND, NEW BRUNSWICK

SCALE: 1 inch = 20 Feet

## SLOOP COVE MINE

## ASSAY DATA

Sample Area	Number	Description	% Copper
SA - 8'	OM 31	Grab - 4-5' above floor grey shale, rust and malachite stain	4.50
SA - 20'	OM 7	Channel - 0'-2' above floor, grey sandstone	.01
	OM 8	Channel - 2'-4' above floor, grey sandy shale	.03
	OM 9	Channel - 4'-6' above floor, grey shale, earthy	.01
SA - 24'	OM 32	Chip - 4' above floor, rusty shale with malachite	3.32
SA - 25'	OM 33	Channel - 2'-4' above floor, across mineralized bed	Trace
SA - 40'	OM 29	Chip - representative of adit wall	.19
	OM 30	Chip - representative of adit wall	.13
SA - 60'	OM 27	Chip - representative of adit wall	.02
	OM 28	Chip - representative of adit wall	.09
SA - 70'	OM 34	Grab - 4' above floor, strong malachite	10.65
SA - 80'	OM 23	Channel - 0-3' above floor, grey shaly sandstone	.3
	OM 24	Channel -3'-5.2' above floor, grey argillite	.2
	OM 26	Channel -5.2'-7.5' above floor, greenish shale	.02
SA - 100	OM 21	Channel - 0'-5' above floor, grey shaly sandstone	.3
	OM 22	Channel - 5'-9' above floor, grey shaly sandstone	1.42
SA - 120	OM 19	Channel - 0'-5' above floor, greenish shaly sandstone	.02
	OM 20	Channel - 5' - 7.6' above floor, greenish soft shale	.01

Sample Area	Number	Description	% Copper
SA - 140	OM 17	Channel-0' - 5.3' above floor, grey shaly sandstone	.3
	OM 18	Channel - 5.3' - 8.3' above floor, greenish shale	.01
SA - 160	OM 15	Channel - 0'-3' above floor, grey shaly sandstone	.1
	OM 16	Channel - 3'-6' above floor, greenish argillite	.3
	OM 25	Channel - 1' - 7' above floor	< .01
SA - 180'	OM 12	Channel - 0'-2' above floor, grey shaly sandstone	2.28
	OM 13	Channel - 2'-4' above floor, grey argillite	.87
	OM 14	Channel - 4'-6.5' above floor, grey argillite	.2
SA - 200	OM 1	Grab - broken rock, greenish shale	< .01
	OM 2	Grab - broken rock, greenish shale	< .01
	OM 3	Grab - broken rock, grey sandstone	.01
	OM 4	Grab - broken rock, grey shaly sandstone	.02
	OM 5	Grab - broken rock, grey shaly sandstone	.02
	OM 6	Channel, 1'-2' below back, green clay	.09
SA - 220	OM 10	Channel -0'-0.9' below back, green clay	< .01
	OM 11	Channel -0.9'-5.2' below back, grey shale	.01

AVERAGE OF CHANNEL SAMPLES 0.29% Cu . over 66.1 feet.



MULTICOLOURED LENTICULAR SHALE BEDS NORTH WALL OF ADIT

FIGURE VI



LOCAL CONCENTRATION OF MALACHITE IN SANDY ARGILLITE  
NORTH WALL OF NORTH ADIT  
FIGURE VII

## CONCLUSIONS

1. Copper mineralization is widespread throughout the Triassic volcanic and sedimentary rocks of Grand Manan Island. None of the observed mineralization is economic.
2. The green coloured sedimentary rocks underlying the basalt flow owe their colour to an iron bearing chlorite or clay material rather than malachite.
3. Reports and rumours of extensive high-grade copper mineralization in the Sloop Cove adit were not confirmed by this programme. The sea cliffs are under constant and extensive erosion and it is possible that the section reported by Prof. Chapman has been eroded away and no longer exists.
4. Local concentrations of copper mineralization may indicate that commercial size deposits do exist but exploration for such deposits are prohibitively expensive due to the cover of thick basaltic material overlying the sedimentary rocks.
5. A commitment of \$100,000 to maintain the mineral rights on Grand Manan Island for another year is not justified by the results of this exploration programme.

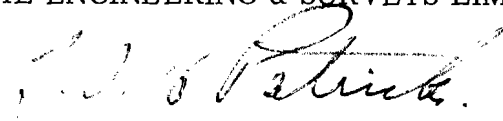
## RECOMMENDATIONS

1. The Grand Manan Project should be abandoned as an exploration venture.
2. Data obtained should be turned over to the University of New Brunswick and the New Brunswick Government to assist future workers who may devise techniques and methods for economically exploring the potential horizon beneath the basalt at some time in the future.

3. Suggested research which might eventually lead to a commercial discovery should include a detailed sedimentation study which might reveal stream channels or drainage patterns which could be the locus of local concentrations of copper minerals.
4. Discussions should be entered into to explore the possibility of reviving the project should new knowledge become available or new techniques be devised which could provide targets within the 50 sq. miles underlain by Triassic copper bearing strata.
5. Detailed seismic surveys might reveal structures at the base of the basalt formation which would be potential ore zones.

Respectfully submitted,

GEOPHYSICAL ENGINEERING & SURVEYS LIMITED



T. O. H. Patrick  
Vice President

Toronto, Ontario  
May, 1966

## REFERENCES

1. Alcock, F. J.
  - 1948 - Geological Survey of Canada Map 965A  
1" = 1 mile, Grand Manan, New Brunswick.
  - 1949 - Geological Survey of Canada Map 910A  
1" = 12 miles, Geological Map of the Maritime  
Provinces.
2. Bailey, L. W.
  - 1898 - The Mineral Resources of the Province  
of New Brunswick, Geological Survey of Canada  
Annual Report, Vol. 10, 1897, pages 19-20.
3. Betmanis, A. E.
  - 1965 - Differentiation in the Basalt Flow of  
Grand Manan Island, New Brunswick,  
Unpublished Bachelor's Thesis, University  
of Toronto.
4. Canada Dept. of Mines &  
Technical Surveys
  - 1953 - Topographic Maps, Grand Manan, New  
Brunswick and Campobello, New Brunswick,  
Sheets 21-B-10 and 21-B-15, Scale: 1:50,000.
  - 1960 - Geophysics Papers 765 and 773 Campo-  
bello and Grand Manan, New Brunswick,  
Sheets 21-B-10 and 21-B-15, Scale: 1:63,360.
5. Chapman, Prof. J.
  - 1870 - Report on the Copper Deposit of  
Grand Manan, private report.
6. Crinine, Paul D.
  - 1950 - Petrology, Stratigraphy and Origin of  
the Triassic Sedimentary Rocks of Connecticut  
Bulletin No. 73, State Geological and Natural  
History Survey, Hartford, Connecticut.
7. Fockler, E. K.
  - 1963 - Geology and Occurrences of Copper on  
the Island of Grand Manan. Private report.
8. Marsh, O. C.
  - 1863 - Catalogue of Mineral Localities in New  
Brunswick, Nova Scotia and Newfoundland,  
American Journal of Science, Second Series,  
Vol. 35.

9. New Brunswick Department of  
Lands & Mines - Grand Manan, Map No. 167  
Scale 1:31,680.
10. Sebina, Anne P. - 1964 - Rocks and Minerals for the Collector,  
Bay of Fundy Area, Geological Survey of  
Canada, Paper 64-10, Pages 10-11.

A P P E N D I X

GRAND MANAN

GEOCHEMICAL EXPLORATION

SURFACE ROCK SAMPLES

SEMI - QUANTITATIVE ASSAY DATA

Q = QUANTITATIVE

< = LESS THAN

Sample No.	Copper % Q	Location	Description
201	.006	27 + 50 N	Hard pink shale, green stain. About 5' from top of bed. - Character sample
202	.004	30 + 00 N	Hard pink shale. About 5' from top of bed - Character sample
203	.044		Soft green clay, brown stain. Top of soft clayey bed. - Character sample
204	.019	32 + 00 N	Hard pink shale. About 6' from top of bed - Character sample
205	.005	34 + 00 N	Hard pink shale. About 8 - 10' from top of bed - Character sample
206	.005	34 + 00 N	Soft green clay, pink and brown stain. Top of clayey bed - Character sample
207	.002	36 + 00 N	Hard grey - pink shale. About 12' from top of bed - Character sample
208	.004	38 + 00 N	Hard grey pink shale. About 6' from top of bed - Character sample
209	.006	38 + 00 N	Soft green clay, pink and brown stain. - Character sample
210	.005	40 + 00 N	Hard pink shale. About 10' from top of bed. - Character sample
211	.043	40 + 00 N	Soft green clay, brown stain - Character sample
212	.013	44 + 00 N	Hard dark grey shale, pink stain. About 3' from top of bed. - Character sample
213	.020	44 + 00 N	Soft green clay, brown stain. Top of clayey bed. - Character sample

Sample No.	Copper % Q	Location	Description
214	.005	46 + 00 N	Medium - hard light pinkish shale. About 3 - 4' from top of sediments. Character sample.
215	.021	46 + 00 N	Soft grey-green clay, some pink-brown stains - Character sample.
216	.005	47 + 00 N	Hard dark grey shale. About 2 - 3' from top of bed. Character sample.
217	.085	47 + 00 N	Soft green clay, brown stain. Character sample.
218	.004	58 + 00 N	Medium hard grey shale. Character sample.
219	.009	61 + 00 N	Soft green-grey clay. Character sample.
220	.026	63 + 50 N	Soft green-grey clay; top of clayey bed. Character sample.
221	.007	65 + 00 N	Hard grey shale, brown stain. Character sample.
222	.109	65 + 00 N	Soft grey clay, green stain. Character sample.
223	.007	72 + 50 N	Hard dark grey shale. About 1' from top of bed. Character sample.
224	.025	72 + 50 N	Soft green sandy clay. Character sample.
225	.003	75 + 50 N	Hard beige shale, pink stain. About 3 - 4' from top of bed. Character sample.
226	.030	75 + 50 N	Medium-soft green sandy clay, pink stain. Character sample.
227	.009	78 + 00 N	Hard dark grey shale. About 1' from top of bed. Character sample.
228	.005	78 + 00 N	Medium-soft grey-green sandy clay, pink stain. About 1' or less thick. Overlying basalts with thin horizontal veins. Character sample

Sample No.	Copper % Q	Location	Description
229	.001	Quarry by highway and road to Miller's Pond	Crumbly brick-red sandy shale. Character sample.
230	.001	58 + 50 S	Hard dark grey shale, green and pink stain. Character sample.
231	.002	216 + 00 N	Hard dark pink shale. Character sample.
232	.004	218 + 00 N	Hard dark grey shale. Character sample.
233	.002	221 + 00 N	Hard mottled dark grey shale. Character sample.
234	.011	224 + 50 N	Hard grey-pink shale. Character sample.
235	.003	229 + 00 N	Hard pink shale. Character sample.
236	.001	238 + 00 N	Hard dark pink shale. Character sample.
237	.003	239 + 75 N	Hard dark pink shale. Character sample.
238	.003	244 + 50 N	Hard dark pink shale. Character sample.
239	.001	247 + 00 N	Hard dark pink shale. Character sample.
240	.001	249 + 00 N	Hard dark pink shale. Character sample.
241	.004	N side of Dark Harbour	Coarse grained red sandstone. Compact massive. Character sample.
242	.003	143 + 00 N	Hard dark grey shale. About 2' from top of bed. Character sample.
243	.030	143 + 00 N	Soft grey-green clay. Character sample.
244	.005	146 + 00 N	Hard pink shale. 3' from top of bed. Character sample.

Sample No.	Copper % Q	Location	Description
245	.006	146 + 00 N	Soft pink-green clay. Top of bed. Character Sample
246	.003	148 + 00 N	Hard grey shale, pink stain. About 5' from top of bed. Character sample.
247	.106	148 + 00 N	Soft green clay - Character sample.
248	.004	156 + 00 N	Hard mottled massive grey shale. Character Sample.
249	.004	162 + 00 N	Hard grey massive shale, pink and green stain. Character sample.
250	.013	162 + 00 N	Soft green clay. Top of bed. Character sample.
251	.009	164 + 00 N	Hard dark grey shale, pink stain. Character sample.
252	.021	167 + 00 N	Hard mottled grey shale. Character sample.
253	.041	167 + 00 N	Soft grey-green clay. Top of bed. Character sample.
254	.007	169 + 50 N	Hard mottled grey shale. Character sample.
255	<.001	175 + 00 N	Hard mottled grey-pink shale. Character sample
256	.013	175 + 00 N	Soft green clay . Top of bed. Character sample.
257	.002	177 + 00 N	Hard mottled grey-pink shale. Character sample
353	.018 Cu .08 Mn	38 + 00 S approx.	Hard black massive rock. Special sample assayed for Cu and Mn.

Sample No.	Copper %	Location	Description
258	.04	252 + 00 N	Hard dark pink shale, small vesicles - Character sample.
259	.01	254 + 00 N	Hard dark pink shale, small vesicles, brown stain. About 15' from top of bed. Character sample.
260	.01	256 + 50 N	Hard dark pink shale, small lighter patches - Character sample.
261	.01	258 + 00 N	Hard dark pink shale, a little brown green stain. Character sample.
262	.02	263 + 00 N	Hard dark pink shale. Character sample.
263	.02	264 + 50 N	Medium-hard dark pink shale, small vesicles in alignment filled with light powder. Character sample.
264	nil	267 + 00 N	Dark pink shale, slightly vuggy, a little brown-green stain. Character sample.
265	nil	269 + 00 N	Hard dark pink shale, 1 cm. vesicles, brown stain. Character sample.
266	.02	271 + 00 N	Hard grey massive shale, brown to pink stain, tiny vesicles, shows sheared surfaces of soft black mineral - chlorite ? Character sample.
267	.04	271 + 00 N	Soft green clay. Total thickness approx. 4". Character sample.
268	.01	273 + 00 N	Massive hard mottled grey shale, slightly pinkish. Character sample.
269	nil	275 + 50 N	Hard dark grey to pink streaked shale, vesicular pink stain. Character sample.

Sample No.	Copper %	Location	Sample Length	Description
270	.01	278 + 50 N		Hard mottled massive grey shale. Character sample.
271	.03	278 + 50 N		Soft crumbly light green-yellow sandy clay. Character sample
272	nil	286 + 50 N		Hard dark pink shale, small vugs, brown-green stain. Character sample.
273	nil	286 + 50 N		Soft crumbly green-pink sandy clay. Character sample.
274	nil	291 + 00 N		Hard dark pink sandy shale, faintly banded, vuggy, brown stain. Character sample.
*				
276	Trace Au	North Head		Quartz veins, near Ferry Wha.
277	< .01	Trench no. 1 (from bedrock surface)		Greenish grey massive argillaceous sandstone. Loosened and disturbed by rock slide. Elevation unknown.
278	.01	Trench no. 2; top of sediments -0.5' (from bedrock surface)	0.2'	Soft pale grey and green tuffaceous clay, mixed with fine basalt fragments.
279	.01	Trench no. 2; 0.5' - 1.0' (from bedrock surface)	0.5'	Thin bedded greenish grey mottled shaly sediments.
280	< .01	Trench no. 2; 1.0' - 1.6'	0.6'	Thin bedded greenish grey shaly sediments.
281	.01	Trench no. 2; 1.6' - 3.0'	1.4'	Massive grey with some green argillaceous sandstone.

\* No. 275 not done.

Sample No.	Copper %	Location	Sample Length	Description
282	.01	Trench no. 3, Top of sediments - 0.5' (from bedrock surface)	0.5'	Soft pale grey tuffaceous clay
283	.05	Trench no. 3, 0.5' - 1.0' (from bedrock surface)	0.5'	Mottled green and grey shaly thin bedded sediments earthy.
284	.01	Trench no. 3, 1.0' - 1.6' (from bedrock surface)	0.6'	Earthy grey thin bedded shaly sediments
285	.08	Trench no. 3, 1.6' - 2.8' (from bedrock surface)	1.2'	Massive grey with some green argillaceous sandstone
286	.1	Trench no. 3, 2.8' - 3.2' (from bedrock surface)	0.4'	Earthy thin bedded grey and light green shaly sediments
287	.05	Trench no. 3, 3.2' - 4.0' (from bedrock surface)	0.8'	Massive grey with some green argillaceous sandstone
288	< .01	Trench no. 4, Top of sediments - 0.8' (from bedrock surface)	0.8'	Pale greenish grey soft tuffaceous clay. Mixed with small basalt fragments.
289	< .01	Trench no. 4, 0.8' - 1.2' (from bedrock surface)	0.4'	Earthy thin bedded grey and green shaly sediments
290	< .01	Trench no. 4, 1.2' - 2.2' (from bedrock surface)	1.0'	Massive greenish grey shaly sediments
291	.05	Trench no. 4, 2.2' - 3.5' (from bedrock surface)	1.3'	Massive mottled green and grey argillaceous sandstone.
292	< .01	Trench no. 4, 3.5' - 3.7' (from bedrock surface)	0.2'	Thin bedded mottled grey and green shaly sandstone

Sample No.	Copper %	Location	Sample Length	Description
293	< .01	Trench no. 5, Top of Sediments (from bedrock surface)	1.8'	Massive greenish grey argillaceous sandstone, fractured probably by slide
294	.01	Trench no. 6, Top of sediments - 0.9' (from bedrock surface)	0.9'	Soft grey tuffaceous clay; mixed with few fine basalt fragments
295	.05	Trench no. 6, 0.9' - 2.3' (from bedrock surface)	1.4'	Earthy thin bedded fairly soft mottled grey green shaly sediments
296	.05	Trench no. 6, 2.3' - 2.8' (from bedrock surface)	0.5'	Thin bedded mottled grey green shaly sandstone
297	< .01	Trench no. 6, 2.8' - 5.5' (from bedrock surface)	2.7'	Massive grey with some green argillaceous sandstone
298	< .01	Trench no. 6, 5.5' - 7.8' (from bedrock surface)	2.3'	Massive grey with some green argillaceous sandstone
299	.02	Trench no. 7, Top of sediments - 0.9' (from bedrock surface)	0.9'	Soft grey tuffaceous clay
300	.02	Trench no. 7, 0.9' - 1.9' (from bedrock surface)	1.0'	Earthy mottled grey and green argillaceous sediments
301	.01	Trench no. 7, 1.9' - 4.8' (from bedrock surface)	2.9'	Massive grey and green mottled argillaceous sediments
302	.05	Trench no. 7, 4.8' - 6.6' (from bedrock surface)	2.2'	Massive grey and green argillaceous sandstone

Sample No.	Copper %	Location	Sample Length	Description
303	.05	Trench no. 7, 6.6' - 8.0' (from bedrock surface)	1.4'	Fairly soft massive mottled grey and green argillaceous sandstone
304	.02	Trench no. 7, 8.0' - 10.2' (from bedrock surface)	2.2'	Massive mottled grey and green pink argillaceous sandstone
305	.02	Trench no. 8, top of sediments - 0.6' (from bedrock surface)	0.6'	Soft pale greenish grey with some brown tuffaceous clay
306	.01	Trench no. 8, 0.6' - 1.7' (from bedrock surface)	1.1'	Thin bedded mottled grey green argillaceous sediments
307	< .01	Trench no. 8, 1.7' - 3.9' (from bedrock surface)	2.2'	Massive slightly mottled grey and green argillaceous sediments
308	.03	Trench no. 8, 3.9' - 4.2' (from bedrock surface)	0.3'	Very thin bedded grey and green with some black (chalcocite?) shaly sediments
309	.01	Trench no. 8, 4.2' - 6.4' (from bedrock surface)	2.2'	Massive grey with some green argillaceous sandstone
310	< .01	Trench no. 8, 6.4' - 7.5' (from bedrock surface)	1.1'	Dark purplish grey with some green argillaceous sandstone Bottom third of bed massive.
311	.01	Trench no. 8, 7.5' - 9.5' (from bedrock surface)	2.0'	Massive grey argillaceous sandstone.
312	.01	Trench no. 8, 9.5' - 11.6' (from bedrock surface)	2.1'	Massive grey to pink argillaceous sandstone.
313	.02	Trench no. 9, Top of sediments - 0.9' (from bedrock surface)	0.9'	Soft grey tuffaceous clay

Sample No.	Copper %	Location	Sample Length	Description
314	.05	Trench no. 9, 0.9' - 3.1' (from bedrock surface)	2.2'	Fairly massive mottled grey argillaceous sediments. Grey green, reddish black in lower half foot.
315	.01	Trench no. 9, 3.1' - 3.7' (from bedrock surface)	0.6'	Massive light green grey slightly earthy argillaceous sediments.
316	.05	Trench no. 9, 3.7' - 4.0' (from bedrock surface)	0.3'	Soft earthy very thin bedded green shaly sediments
317	< .01	Trench no. 9, 4.0' - 6.2' (from bedrock surface)	2.2'	Massive grey argillaceous sediments.
318	< .01	Trench no. 9, 6.2' - 7.1' (from bedrock surface)	0.9'	Thin bedded grey with some green shaly sediments.
319	< .01	Trench no. 9, 7.1' - 9.1' (from bedrock surface)	2.0'	Massive hard grey argillaceous sandstone. Few very thin horizontal calcite veins.
320	.01	Trench no. 9, 9.1' - 10.0' (from bedrock surface)	0.9'	Massive grey with some green argillaceous sandstone
321	.02	Trench no. 9, 10.0' - 11.5' (from bedrock surface)	1.5'	Massive pinkish grey argillaceous sandstone.
322	< .01	Trench no. 9, 11.5' - 12.7' (from bedrock surface)	1.2'	Massive pink argillaceous sandstone mottled with some light green.
323	.02	Trench no. 10, Top of sediments - 1.2' (from bedrock surface)	1.2'	Soft pale grey tuffaceous clay
324	< .01	Trench no. 10, 1.2' - 2.8' (from bedrock surface)	1.6'	Thin bedded mottled greenish grey argillaceous sediments

Sample No.	Copper %	Location	Sample Length	Description
325	.01	Trench no. 10, 2.8' - 4.0' (from bedrock surface)	1.2'	Thin bedded greenish grey earthy argillaceous sediments. Very thin bedded earthy green bed in centre, 0.2' thick.
326	.01	Trench no. 10, 4.0' - 5.7'	1.7'	Massive grey with some green argillaceous sandstone
327	.01	Trench no. 10, 5.7' - 6.4' (from bedrock surface)	0.7'	Thin bedded dark pinkish grey argillaceous sandstone.
328	.01	Trench no. 10, 6.4' - 8.5' (from bedrock surface)	2.1'	Massive pink argillaceous sandstone
329	.01	Trench no. 10, 8.5' - 10.8' (from bedrock surface)	2.3'	Fairly massive pinkish grey argillaceous sandstone
330	.01	Trench no. 10, 10.8' - 15.6' (from bedrock surface)	4.8'	Massive pink argillaceous sandstone
313 R	.05	100 yds. south of Little Dark Harbour		Soft greenish clay at top of sedimentary series.
314 R	.07	As above		Shale below greenish clay.
315 R	.21	40 + 00S		Green shale 2' below volcanic contact.
316 R	.02	40 + 00S		Dark sooty basalt near base of flow.

Sample No.	Copper % Q	Location	Description
317 (31)	.01	22 + 00 N	Dark grey-brown thin bedded (?) shale from close to top of bed. Sheared appearance. Character sample.
318 (8)	.03	22 + 00 S (approx)	Massive shale. Some malachite stains. Approximately centre of bed. Character sample.
319 (30)	.18	20 + 00 N	Light green on wet weathered surface, thin bedded, about 2' from top of bed. Sample by groundwater seepage. Character sample.
320 (30A)	.11	20 + 00 N	Soft unconsolidated light grey upper clayey bed. Character sample.
321 (16)	.01	42 + 50S	Dark green massive shale close to top of bed. Character sample.
322 (16A)	.02	42 + 50 S	Compact top clayey bed just above shale. Light grey. Character sample.
323 (17)	.01	44 + 00 S	Massive, fairly hard shale from near centre of bed (Thickness about 15 - 20') Character sample
324 (9)	.02	25 + 00 S (approx.)	Sample from between massive and thinly bedded shale at approx. centre of bed. Some malachite stains. Character sample.
325 (14)	.02	38 + 00 S	Massive shale close to top of bed. Sample from dark and light green band about 2" - 3" thick. Character sample.
326 (23)	.01	10 + 00 S	Greenish grey shale with good light green mineralization - malachite (?). About 6" from top of bed. Character sample.
327 (23A)	.02	10 + 00 S	Grey upper clayey bed with greenish streaks. Character sample.

## SURVEYED ELEVATIONS

Permanent Turning Points  
(1-3" inch peeled and pointed saplings  
generally one foot high)

Diamond Drill Holes  
(top of casings)

<u>P. T. P.</u>	<u>Elevation</u>	<u>D. D. H.</u>	<u>Elevation</u>
1	1,000.0 (datum)	1	995.8
2	1,038.6	2	1,017.9
3	993.7	3	994.7
4	992.4	4	1,050.1
5	991.0	5	1,060.7
6	1,018.3	6	1,027.4
7	1,052.2	7	1,011.6
8	996.7	8	1,078.0
9	1,067.2	9	1,096.9
10*	1,085.7	9A	1,098.7
11	1,082.6	ODH	973.8
12	1,080.7		
13	1,085.9		
14	977.6		
DH8 (old)	1,084.3		
10S.	969.9		
20S.	973.6		
B.M. at 55+36 N. on B. P. C. L.	1,138.62		

Sample No.	Copper % Q	Location	Description
328 (10)	.06	27 + 00 S (approx.)	Massive shale near bottom of bed. Dark green on moist fresh surface, some small vugs, very dark, small stringers. Character sample.
329 (18)	.01	46 + 00 S	Massive shale from bottom half of bed. Character sample.
330 (29)	.02	18 + 00 N	Light grey, massive shale. (location by narrow, dry, ravine about 2 1/2 feet from top of bed). Character sample.
331 (29A)	.01	18 + 00 N	Soft unconsolidated light grey upper clayey bed. (sample location by dry, narrow ravine). Character sample.
332 (21)	.01	17 + 50 S	Dark green-grey shale about 2' from top of bed. Character sample.
333 (26)	.01	3 + 00 N	Light grey shale with yellowish green (malachite ?) streaks. About 4' from top of bed. Character sample.
334 (26A)	.03	3 + 00 N	Light grey upper clayey bed. Thin bed of brown clay included. Character sample.
335 (11)	.08	30 + 00 S (approx.)	Thin bedded shale near top of bed. Dark green on fresh surface. Character sample.
336 (20)	.04	50 + 00 S (approx.)	Massive shale from top half of bed. Character sample.
337 (20A)	.03	50 + 00 S	Top clayey bed. Below fragmental basalts with yellow green (malachite ?) stained matrix. Character sample.
338 (12)	< .005	34 + 00 S (approx.)	Massive shale. Malachite stains. Character sample.
339 (28)	.01	14 + 50 N	Massive shale. Light yellowish green on dry weathered surface. About 2 - 3' from top of bed. Character sample.

Sample No.	Copper % Q	Location	Description
340 (22)	.04	12 + 00 S	Dark green-grey shale, massive, good malachite mineralization. About 1' below top of bed. Character sample.
341 (22A)	.01	12 + 00 S	Unconsolidated, wet upper clayey bed. Grey with light green streaks. Character sample.
342 (19)	<.005	48 + 50 S	Massive shale from approx. centre of bed. Character sample.
343 (24)	.01	6.+ 00 S	Dark grey shale with green streaks on fresh moist surface. From about 6' from top of bed. Character sample.
344 (24A)	.01	6 + 00 S	Light grey wet unconsolidated upper clayey bed. Character sample.
345 (5 or 6)	.02	32 + 50 S (approx.) on W coast by old mine adit	Massive shale from approx. centre of bed. Some malachite stains. About 6' in from face. Character sample.
346 (13)	.01	35 + 75 S	Massive shale, dark green, near top of bed. Character sample.
347 (27)	.02	7 + 00 N	Massive very light greenish grey shale. About 5' from top of bed. Character sample.
348 (27A)	.01	7 + 00 N	Light grey unconsolidated upper clayey bed. Character sample.
349 (15)	.01	40 + 00 S	Massive light and dark green shale. Probably from near top of bed. Character sample.
350 (7)	.01	20 + 00 S (approx.)	Fairly massive shale. Character sample.

---

Sample No.	Copper % Q	Location	Description
351 (25)	.02	3 + 00 S	Light green-grey shale, thinner bedded. About 5' from top of bed. Character sample.
352 (25A)	.29	3 + 00 S	Top clayey bed. Interbedded grey and brownish green, mostly grey.

---

DIAMOND DRILL LOGS

COMPANY KEEVIL MINING GROUPPROPERTY GRAND MANAN

Township \_\_\_\_\_

Claim No. \_\_\_\_\_

SHEET No. 1 of 3Reference Big Pond Control LineHOLE No. KMG-64-1Started 8 July, 1964Location See Drawing No. 2829Bearing VerticalFinished 17 July, 19640+00 @ 72 + 00S.Dip: -90° @ Collar; -90° @Depth 702.3'Elevation 995.8

FROM	TO	DESCRIPTION	CORE SAMPLES				ASSAYS		
			NO	FROM	TO	WIDTH	% CU		
0	- 6.0	Casing, overburden	C1-20A	305.0-310.0	5.0	.01			
			-21A	310.0-315.0	5.0	.01			
6.0	-495.7	Basalt, Massive, medium grained, fresh looking, brownish weathering near surface, mottled texture, pyroxene in clusters, larger grains than feldspar. Feldspar has "schiller" lustre.	C1-22	315.0-320.0	5.0	.01			
			-23	320.0-325.0	5.0	.01			
			-24	325.0-330.0	5.0	.02			
			-25	330.0-335.0	5.0	.01			
		Minor slips, fractures and brecciated zones with talc, chlorite and calcite veinlets.							
		@ 209 - minor fleck of native copper in chlorite.	C1-26	450.0-455.0	5.0	.01			
		Most slips and joints parallel to core axis.	-27	455.0-460.0	5.0	.02			
		From 460 - becoming fine grained	-28	460.0-465.0	5.0	.01			
			-29	465.0-470.0	5.0	.01			
495.7-512.1		Clay, shale and argillite - fine grained plastic, grey-green material near contact gradually becoming coarse grained.	-30	470.0-475.0	5.0	.02			
			-31	475.0-480.0	5.0	.05			
			-32	480.0-485.0	5.0	.01			
512.1 - 521.1		Argillaceous sandstone, mottled texture, transition from grey, green to redish brown colour.	-33	485.0-490.0	5.0	.01			
			C1- 1	490.0-492.2	2.2	.3			
			- 2	492.2-494.2	2.0	.01			
			- 3	494.2-496.8	2.7	.01			
521.1-702.3		Sandstone, increasing red colour with depth. Grey beds irregularly scattered through section.	- 4	496.8-499.2	2.4	.03			
			- 5	499.2-501.7	2.5	.02			
			- 6	501.7-504.2	2.5	.2			
		After 550 frequent thin beds and veinlets of gypsum especially after 600 feet.	- 7	504.2-506.7	2.5	.02			
			- 8	506.7-508.2	1.5	.01			
			- 9	508.2-509.6	1.4	.01			
			-10	509.6-511.7	2.1	<.01			

Drilled by Boyles Bros.Core Size BXLogged by T. O. H. Patrick  
Andris Betmanis



COMPANY \_\_\_\_\_

PROPERTY \_\_\_\_\_

Township \_\_\_\_\_

Claim No. \_\_\_\_\_

SHEET No. 2 of 3 \_\_\_\_\_

Reference \_\_\_\_\_

HOLE No. KMG-64-1 \_\_\_\_\_

Started \_\_\_\_\_

Location \_\_\_\_\_

Bearing \_\_\_\_\_

Finished \_\_\_\_\_

Dip: \_\_\_\_\_ @ Collar; \_\_\_\_\_ @ \_\_\_\_\_

Depth \_\_\_\_\_

Elevation \_\_\_\_\_

FROM	TO	DESCRIPTION	CORE SAMPLES				ASSAYS		
			NO	FROM	TO	WIDTH	% CU		
		END OF HOLE	-11	511.7-514.3		2.6	.01		
			-12	514.3-516.9		2.6	.01		
			-13	516.9-518.8		1.9	.01		
			-14	518.8-521.7		2.8	.01		
			C1 -15	521.7-523.7		2.0	.01		
			-16	523.7-526.5		2.8	.01		
			-17	526.5-529.5		3.0	.03		
			-18	529.5-532.5		3.0	< .01		
			-19	532.5-534.8		2.3	< .01		
			-20	534.8-537.4		2.6	< .01		
			-21	537.4-540.0		2.6	< .01		
			SLUDGE						
			S1 -10	201.6-205.5		3.9	.01		
			-11	205.5-210.0		4.5	.01		
			-12	210.0-220.0		10.0	.01		
			-13	220.0-229.0		9.0	< .01		
			SS - 1	229.0-237.5		8.5	.01		
			SS - 5	237.5-247.5		10.0	.01		
			SS - 3	247.5-260.0		12.5	.01		
			S1 -17	260.0-266.0		6.0	.02		
			-18	266.0-276.0		10.0	.03		
			-19	276.0-285.5		9.5	.02		
			-20	285.5-295.5		10.0	.02		
			-21	295.5-305.0		9.5	.03		

Drilled by \_\_\_\_\_

Core Size \_\_\_\_\_

Logged by \_\_\_\_\_

COMPANY KEEVIL MINING GROUPPROPERTY GRAND MANAN

Township \_\_\_\_\_

Claim No. \_\_\_\_\_

SHEET No. 1 of 3  
 Started 18 JULY 1964  
 Finished 30 JULY 1964  
 Depth 501'

Reference B.P.C.L.  
 Location 16 + 00 W. 72 + 00S.  
 Elevation 1017.8'

HOLE No. KMG-64-2  
 Bearing VERTICAL  
 Dip: -90° @ Collar; -90° @ 200'  
-90° @ 400', -89 1/2° @ 500'

FROM	TO	DESCRIPTION	CORE		SAMPLES			ASSAYS			
			NO		FROM	TO	WIDTH	% CU			
0	13.0	Casing, overburden	C2 -18		370.0	- 375.0	5.0	.02			
			-19		375.0	- 380.0	5.0	.02			
13.0	- 431.8	Basalt, massive, medium grained	-20		380.0	- 385.0	5.0	.02			
		mottled texture, grey - brown colour.	-21		385.0	- 390.0	5.0	.02			
		13-50 concave bit, sludge only	-22		390.0	- 395.0	5.0	.02			
		50-54 core, medium grained, minor slips	-23		395.0	- 400.0	5.0	.1			
		54-100 concave bit	-24		400.0	- 405.0	5.0	.02			
		100-105 core, quartz, veinlets, minor slips	-25		405.0	- 410.0	5.0	.1			
		105-150 concave bit	C2 - 1		410.0	- 413.0	3.0	lost			
		150-155 core, medium grained	- 2		413.0	- 414.5	1.5	.08			
		155-200 concave bit	- 3		414.5	- 417.3	2.8	.05			
		200-205 core, coarse, mafic grains	- 4		417.3	- 420.4	3.1	.08			
		205-275 concave bit	- 5		420.4	- 424.0	3.6	.05			
		275- onward, continuous core.	- 6		424.0	- 427.1	3.1	.05			
		275 -277 - brecciated zone, rusty weathering	- 7		427.1	- 430.0	2.9	.1			
		277-310 abundant veins of chlorite	- 8		430.0	- 431.8	1.8	.1	)	Contact Zone	
		silica and carbonate, some hematite	- 9		431.8	- 433.9	2.1	.2	)		
		343-359 amygdaloidal zone	-10		433.9	- 435.0	1.1	.05			
		@ 359 brecciated zone, possible fault	-11		435.0	- 436.9	1.9	.01			
		@ 413 - fault breccia zone, chlorite	-12		436.9	- 439.2	2.3	.01			
		and hematite stained silica and	-13		439.2	- 440.9	1.7	.02			
		calcite.	-14		440.9	- 442.8	2.9	< .01			
		413 - 431.8 - becoming finer grained,	-15		442.8	- 445.6	2.8	.01			
		scattered mafic phenocrysts.	-16		445.6	- 448	2.4	< .01			
		Fine grained, dark colour at contact	C2 -17		448.0	- 451.2	3.2	< .01			

Drilled by BOYLES BROS.Core Size BX

ANDRIS BETMANIS  
 Logged by T. O. H. PATRICK

COMPANY \_\_\_\_\_

PROPERTY \_\_\_\_\_

Township \_\_\_\_\_

Claim No. \_\_\_\_\_

SHEET No. 2 of 3 \_\_\_\_\_

Reference \_\_\_\_\_

HOLE No. KMG-64-2 \_\_\_\_\_

Started \_\_\_\_\_

Location \_\_\_\_\_

Bearing \_\_\_\_\_

Finished \_\_\_\_\_

Dip: \_\_\_\_\_ @ Collar; \_\_\_\_\_ @ \_\_\_\_\_

Depth \_\_\_\_\_

Elevation \_\_\_\_\_

FROM	TO	DESCRIPTION	SAMPLES			ASSAYS							
			NO	FROM	TO	WIDTH							
431.8	450.6	Clay, shale and argillite, light grey and greenish colour, very soft, gradational increase in hardness and particle size to fine, argillaceous sandstone. Minor pink coloured beds with pock-marked and mottled texture.											
450.6	501.1	Sandstone, minor argillaceous horizons	S2 - 16	18.0	30.0	12.0	.01						
			S2 - 17	30.0	150.0	120.0	.01						
		@ 463 - beginning of predominantly red sandstone.	S2 - 1	175.0	200.0	25.0	<.01						
			- 2	200.0	225.0	25.0	.01						
		@ 470 - fault zone, drill lost return water.	- 3	225.0	250.0	25.0	.01						
			S2 - 4	250.0	275.0	25.0	.02						
		@ 501.1 - End of Hole	S2 - 5	299.0	302.0	3.0	.02						
			- 6	302.0	312.0	10.0	.02						
			- 7	312.0	323.0	11.0	.02						
			- 8	323.0	333.0	10.0	.02						
			S2 - 9	333.0	343.0	10.0	.03						
			S2 -24	343.0	355.0	12.0	.03						
			S2 -10	355.0	363.0	8.0	.03						
			-11	363.0	373.0	10.0	.03						
			-12	373.0	383.0	10.0	.03						
			-13	383.0	392.5	9.5	.02						
			-14	392.5	400.0	7.5	.05						
			S2 -15	400.0	409.0	9.0	.08						

Drilled by \_\_\_\_\_

Core Size \_\_\_\_\_

Logged by \_\_\_\_\_



COMPANY KEEVIL MINING GROUPPROPERTY GRAND MANAN

Township \_\_\_\_\_

Claim No. \_\_\_\_\_

SHEET No. 1 of 2Reference B.P.C.L.HOLE No. KMG-64-3Started 31 July 1964Location 16+00 W. 56+00SBearing VERTICALFinished 7 August 1964Dip: -90° @ Collar; -90° @ 160'Depth 330'Elevation 993.2-90° @ 330'

FROM	TO	DESCRIPTION	CORE				ASSAYS		
			NO	FROM	TO	WIDTH	% CU		
0	-13.0	Casing - overburden to 11.0	C3-18	225.0-230.0	5.0	<.01			
			-19	230.0-235.0	5.0	.01			
13.0	-290.9	Basalt, amygdaloidal near surface weathered and fractured more than holes 1 & 2	-20	235.0-240.0	5.0	.01			
		194-203 - brecciated zone	-21	240.0-245.0	5.0	<.01			
			-22	245.0-250.0	5.0	<.01			
		207-219 - Minor quartz and carbonate veinlets	-23	250.0-255.0	5.0	.01			
			C3-24	255.0-260.0	5.0	.01			
		@ 240 - Scattered amygdules	C3- 1	280.0-283.5	3.5	.01			
			2	283.5-285.5	2.0	.01			
		260 - 290.9 - amygdules scarce, gradational decrease in grain size and darkening of colour to sooty black at contact.	3	285.5-287.0	1.5	.01			
			4	287.0-289.5	2.5	.02			
			5	289.5-291.0	1.5	.02			
			6	291.0-292.5	1.4	<.01			
			7	292.5-294.6	2.1	<.01			
290.9-330		Clay, argillite and fine grained sandstone, brick red colour throughout, softer than sedimentary section in holes 1 and 2.	8	294.6-297.2	2.6	<.01			
		Gradual increase in particle size and hardness. Some horizons have green alternation spots and patches.	9	297.2-299.2	2.0	<.01			
			10	299.2-302.2	3.0	<.01			
			11	302.2-305.4	3.2	<.01			
			12	305.4-307.9	2.5	<.01			
			13	307.9-311.7	3.8	<.01			
			14	311.7-314.2	2.5	<.01			
			15	314.2-316.6	2.4	<.01			
		@ 330 END OF HOLE	16	316.6-319.0	2.4	<.01			
			C3-17	319.0-321.0	2.0	<.01			

ANDRIS BETMANIS

Drilled by BOYLES BROS.Core Size BXLogged by T. O. H. PATRICK

COMPANY \_\_\_\_\_

PROPERTY \_\_\_\_\_

Township \_\_\_\_\_

Claim No. \_\_\_\_\_

SHEET No. 2 of 2

Reference \_\_\_\_\_

HOLE No. KMG-64-3

Started \_\_\_\_\_

Location \_\_\_\_\_

Bearing \_\_\_\_\_

Finished \_\_\_\_\_

Dip: \_\_\_\_\_ @ Collar; \_\_\_\_\_ @ \_\_\_\_\_

Depth \_\_\_\_\_

Elevation \_\_\_\_\_

FROM	TO	DESCRIPTION	SLUDGE SAMPLES				ASSAYS		
			NO	FROM	TO	WIDTH	% CU		
			S3 - 1	11.0	36.0	25.0	.01		
			- 2	36.0	61.0	25.0	.02		
			- 3	61.0	87.0	26.0	.02		
			- 4	87.0	112.0	25.0	.01		
			- 5	112.0	137.0	25.0	.01		
			- 6	137.0	162.0	25.0	.02		
			- 7	162.0	175.0	13.0	.02		
			- 8	175.0	185.0	10.0	.01		
			- 9	185.0	195.0	10.0	.01		
			-10	195.0	205.0	10.0	.01		
			-11	205.0	215.0	10.0	.01		
			-12	215.0	227.0	12.0	.02		
			-13	227.0	236.8	9.8	.03		
			-14	236.8	248.0	11.2	.03		
			-15	248.0	260.0	12.0	.01		
			-16	260.0	27.0	10.0	.01		
			-17	270.0	278.8	8.8	.01		
			-18	278.8	287.0	8.2	.01		
			-19	287.0	297.0	10.0	.02		
			-20	297.0	307.0	10.0	.03		
			-21	307.0	317.0	10.0	.02		
			-22	317.0	330.0	13.0	.01		

ANDRIS BETMANIS

Drilled by BOYLES BROS.

Core Size BX

Logged by T. O. H. PATRICK

COMPANY KEEVIL MINING GROUPPROPERTY GRAND MANAN

Township \_\_\_\_\_

Claim No. \_\_\_\_\_

SHEET No. 1 of 3  
Started 8 August 1964  
Finished 15 August 1964  
Depth 542'Reference B.P.C.L.  
Location 0 + 00 W. 56 + 00 S.  
Elevation 1050.1HOLE No. KMG-64-4  
Bearing VERTICAL  
Dip: -90° @ 360', -90° @ 540'  
-89° @ 180'

FROM	TO	DESCRIPTION	CORE		SAMPLES			ASSAYS			
			NO		FROM	TO	WIDTH	% CU			
0	- 11.0	Casing, overburden	C4 - 1		275.0-282.5		7.5	.01			
			2		282.5-296.2		13.7	.01			
11.0	- 502.7	Basalt, medium to fine grained, massive, brownish grey colour.	3		296.2-309.0		12.8	.02			
		- Minor quartz veinlets @ 151, 233, 282,	4		309.0-312.8		3.8	.01			
		309, 329, 336, 365, 430, 448, 457 and	5		312.8-319.5		6.7	.02			
		470.	6		319.5-324.4		4.9	.02			
		- Slip or joint @ 349, 397, 430 and 440.	7		324.4-329.5		5.1	.02			
		470-490 - gradation to finer grain size	8		329.5-334.4		4.9	.02			
		490-502 - broken core, finer grained	9		334.4-339.2		4.8	.02			
		and darker colour. Very few	10		339.2-345.0		5.8	.02			
		amygdules near contact.	11		345.0-350.0		5.0	.02			
			12		350.0-355.0		5.0	.02			
			C4 - 13		355.0-360.0		5.0	.02			
502.7	- 542.0	- Argillite and fine grained sandstone, about 2" of plastic clay at contact, apparently good core recovery.	C4 - 18		495.0-503.0		8.0	.02			
		Rapid transition from grey and	19		503.0-505.0		2.0	.02			
		greenish argillaceous beds to pink	20		505.0-507.0		2.0	.02			
		and reddish sandy beds.	21		507.0-509.0		2.0	.02			
			22		509.0-511.0		2.0	.02			
		@ 511 - gypsum veinlet parallel to core.	23		511.0-512.5		1.5	.02			
		@ 517 - Drill lost return water.	24		512.5 - 514.0		1.5	.04			
		@ 542 - End of Hole	25		514.0 - 517.6		3.6	.02			
			26		517.6 - 520.7		3.1	.02			
			27		520.7 - 524.2		3.5	.02			
			28		524.2 - 527.7		3.5	.02			

Drilled by BOYLES BROS.Core Size BXLogged by ANDRIS BETMANIS

T. O. H. PATRICK

COMPANY \_\_\_\_\_

PROPERTY \_\_\_\_\_

Township \_\_\_\_\_

Claim No. \_\_\_\_\_

SHEET No. 2 of 3

Reference \_\_\_\_\_

HOLE No. KMG-64-4

Started \_\_\_\_\_

Location \_\_\_\_\_

Bearing \_\_\_\_\_

Finished \_\_\_\_\_

Dip: \_\_\_\_\_ @ Collar; \_\_\_\_\_ @ \_\_\_\_\_

Depth \_\_\_\_\_

Elevation \_\_\_\_\_

FROM	TO	DESCRIPTION	CORE SAMPLES			ASSAYS			
			NO	FROM	TO	WIDTH	% CU		
			29	527.7	531.1	3.4	.02		
			30	531.1	534.0	2.9	.02		
			31	534.0	538.2	4.2	.02		
			C4 - 32	538.2	542.0	3.8	.02		
				SLUDGE					
			S4 - 1	11.0	36.0	25.0	.01		
			2	36.0	90.0	54.0	.01		
			3	90.0	125.0	35.0	< .01		
			4	125.0	150.0	25.0	< .01		
			5	150.0	175.0	25.0	< .01		
			6	175.0	200.0	25.0	< .01		
			7	200.0	225.0	25.0	< .01		
			8	225.0	250.0	25.0	.01		
			9	250.0	275.0	25.0	.02		
			10	275.0	300.0	25.0	.02		
			11	300.0	310.0	10.0	.03		
			12	310.0	320.0	10.0	.01		
			13	320.0	330.0	10.0	.01		
			14	330.0	340.0	10.0	.02		
			15	340.0	350.0	10.0	.02		
			16	350.0	360.0	10.0	.01		
			17	360.0	370.0	10.0	.01		
			18	370.0	380.0	10.0	.01		
			19	380.0	390.0	10.0	.01		
			20	390.0	400.0	10.0	.01		
			21	400.0	410.0	10.0	.01		

Drilled by \_\_\_\_\_

Core Size \_\_\_\_\_

Logged by \_\_\_\_\_



COMPANY KEEVIL MINING GROUP

PROPERTY GRAND MANAN

Township \_\_\_\_\_

Claim No. \_\_\_\_\_

SHEET No. 1 of 2  
 Started 16 August 1964  
 Finished 21 August 1964  
 Depth 511

Reference B.P.C.L.  
 Location 0 + 00 W 40 + 00 S  
 Elevation 1060.7

HOLE No. KMG-64-5  
 Bearing VERTICAL  
 Dip: -90° @ Collar; -89 1/2° @ 170'  
-89° @ 340'; -90° @ 500'

FROM	TO	DESCRIPTION	CORE		SAMPLES			ASSAYS				
			NO		FROM	TO	WIDTH	% CU				
0 - 12.0		Casing, overburden	C5 - 1		450.0 - 453.0		3.0		.02			
			2		453.0 - 456.0		3.0		.02			
12.0 - 465.0		Basalt, medium grained, to 390	3		456.0 - 459.0		3.0		.02			
			4		459.0 - 462.0		3.0		.02			
		390 - 440 - fine to medium grained	5		462.0 - 463.5		1.5		.06			
			6		463.5 - 464.8		1.3		.09			
		440 - 465 - gradation to fine grained	7		464.8 - 468.0		3.2		.01			
			8		468.0 - 471.0		3.0		.13			
465.0-473.5		Clay, shale and argillite, poor core	9		471.0 - 473.2		2.2		.19			
			10		473.2 - 476.0		2.8		< .01			
		recovery at contact zone. Grey	11		476.0 - 479.0		3.0		< .01			
			12		479.0 - 482.0		3.0		< .01			
		and greenish with irregular pink	13		482.0 - 485.5		3.5		< .01			
			14		485.5 - 489.0		3.5		< .01			
		zones and mottled texture.	15		489.0 - 493.0		4.0		< .01			
		Partial loss of drill water	16		493.0 - 497.0		4.0		< .01			
473.5-500.0		Argillaceous sandstone, grey to pink.	17		497.0 - 501.0		4.0		< .01			
			18		501.0 - 506.0		5.0		< .01			
500.0 - 511.0		Sandstone - red, mottled texture.	C5 - 19		506.0 - 511.0		5.0		< .01			
		Poor water return by end of hole.										
		END OF HOLE										
					SLUDGE							
			S5 - 1		12.0 - 37.0		25.0		.2			
			2		37.0 - 62.0		25.0		.01			
			3		62.0 - 87.0		25.0		.01			
			4		87.0 - 112.0		25.0		.01			
			5		112.0 - 137.0		25.0		.01			

Drilled by BOYLES BROS.

Core Size BX

Logged by T. O. H. PATRICK

ANDRIS BETMANIS

COMPANY \_\_\_\_\_

PROPERTY \_\_\_\_\_

Township \_\_\_\_\_

Claim No. \_\_\_\_\_

SHEET No. 2 of 2

Reference \_\_\_\_\_

HOLE No. KMG-64-5

Started \_\_\_\_\_

Location \_\_\_\_\_

Bearing \_\_\_\_\_

Finished \_\_\_\_\_

Elevation \_\_\_\_\_

Dip: \_\_\_\_\_ @ Collar; \_\_\_\_\_ @ \_\_\_\_\_

Depth \_\_\_\_\_

FROM	TO	DESCRIPTION	SLUDGE SAMPLES			ASSAYS			
			NO	FROM	TO	WIDTH	% CU		
			S5 - 6	137.0	162.0	25.0	.01		
			7	162.0	187.0	25.0	.01		
			8	187.0	212.0	25.0	.01		
			9	212.0	237.0	25.0	.01		
			10	237.0	262.0	25.0	.01		
			11	262.0	277.0	15.0	.01		
			12	277.0	287.0	10.0	.01		
			13	287.0	297.0	10.0	.01		
			14	297.0	307.0	10.0	< .01		
			15	307.0	317.0	10.0	< .01		
			16	317.0	327.0	10.0	< .01		
			17	327.0	337.0	10.0	< .01		
			18	337.0	347.0	10.0	.01		
			19	347.0	357.0	10.0	.01		
			20	357.0	367.0	10.0	.01		
			21	367.0	377.0	10.0	.01		
			22	377.0	387.0	10.0	.01		
			23	387.0	397.0	10.0	.02		
			24	397.0	407.0	10.0	.02		
			25	407.0	417.0	10.0	.01		
			26	417.0	427.0	10.0	.02		
			27	427.0	437.0	10.0	.01		
			28	437.0	447.0	10.0	.02		
			29	447.0	457.0	10.0	.02		
			30	457.0	467.0	10.0	.02		
			31	467.0	481.0	14.0	.02		
			32	481.0	491.0	10.0	.02		
			33	491.0	501.0	10.0	.02		

Drilled by \_\_\_\_\_

Core Size \_\_\_\_\_

Logged by \_\_\_\_\_





COMPANY KEEVIL MINING GROUPPROPERTY GRAND MANAN

Township \_\_\_\_\_

Claim No. \_\_\_\_\_

SHEET No. 1 of 2Reference B.P.C.L.HOLE No. KMG-64-7Started 28 August 1964Location On Sloop Cove Control LineBearing VerticalFinished 5 Sept. 196424 + 00W 31 + 00 SDip: -90° @ Collar; \_\_\_\_\_ @ \_\_\_\_\_Depth 265'Elevation 1011.6

FROM	TO	DESCRIPTION	CORE SAMPLES				ASSAYS		
			NO	FROM	TO	WIDTH	% CU		
0	- 12.0	Casing - overburden. Bedrock @ 8.0	C7 - 1	197.0 - 202.0		5.0	.02		
			2	202.0 - 206.7		4.7	.01		
12.0	- 206.7	Basalt, - medium grained, grey-brown. minor slips, joints and veinlets	3	206.7 - 209.7		3.0	.01		
		195 - 203 - fine grained, pyroxene phenocryst	4	209.7 - 213.0		3.3	.01		
		203.0 - brecciated zone, minor fault!	5	213.0 - 218.0		5.0	.04		
		@ 206 - weathered contact zone	6	218.0 - 223.0		5.0	.01		
206.7	- 213.0	Clay, shale and argillite - very soft, more weathering at contact zone than in other holes, poor core recovery	C7 - 7	223.0 - 228.0		5.0	.01		
		mottled colour and texture. Mainly greenish grey colour.		SLUDGE					
			S7 - 1	8.0 - 25.0		17.0	.01		
			2	25.0 - 50.0		25.0	.01		
			3	50.0 - 75.0		25.0	.01		
213.0	- 235.0	Argillite and sandstone - gradual increase in grain size, vugs and veinlets of calcite and gypsum.	4	75.0 - 100.0		25.0	.01		
			5	100.0 - 125.0		25.0	.01		
			6	125.0 - 150.0		25.0	.01		
			7	150.0 - 160.0		10.0	.01		
235.0	- 265.0	Sandstone - Red, fine grained, mottled and pitted.	8	160.0 - 170.0		10.0	.01		
			9	170.0 - 180.0		10.0	.01		
			10	180.0 - 190.0		10.0	.01		
			11	190.0 - 200.0		10.0	.01		
		END OF HOLE	12	200.0 - 210.0		10.0	.02		
			13	210.0 - 220.0		10.0	.02		
			14	220.0 - 230.0		10.0	.02		
			15	230.0 - 240.0		10.0	.02		
			16	240.0 - 250.0		10.0	.02		
			17	250.0 - 260.0		10.0	.02		

Drilled by BOYLES BROS.Core Size BXANDRIS BETMANIS  
Logged by T. O. H. PATRICK



COMPANY KEEVIL MINING GROUPPROPERTY GRAND MANAN

Township \_\_\_\_\_

Claim No. \_\_\_\_\_

SHEET No. 1 of 2  
Started 7 Sept. 1964  
Finished 19 Sept. 1964  
Depth 665'Reference B.P.C.L.  
Location 16 + 00 W. 8 + 00 S.  
Elevation 1078.0 (Approx.)HOLE No. KMG-64-8  
Bearing VERTICAL  
Dip: -90° @ Collar; \_\_\_\_\_ @ \_\_\_\_\_

FROM	TO	DESCRIPTION	CORE				ASSAYS		
			NO	FROM	TO	WIDTH	% CU		
0 - 4.0		Casing, overburden	C8 - 9	274.0-277.0		3.0	Trace		
			10	277.0-280.0		3.0	.12		
4.0 - 283.6		BASALT, Medium grained, massive, greyish, greenish brown in colour, from 260 - gradual decrease in grain size, gradual development of porphyritic texture, pyroxene phenocrysts, dark colour and weathered at contact zone.	11	280.0-283.6		3.6	.06		
			12	283.6-286.4		2.8	Trace		
			13	286.4-289.2		2.8	.09		
		@ 230 feet - fault zone - drill lost return water	C8 -14	289.2-292.2		3.0	.17		
			C8 - 1	292.2-297.0		4.8	.02		
			2	297.0-302.0		5.0	.01		
			3	302.0-307.0		5.0	.01		
			4	307.0-312.0		5.0	.01		
			5	312.0-317.0		5.0	.01		
			6	317.0-321.8		4.8	.01		
283.6-312.5		Clay, shale, argillite and minor argillaceous sandstone -grey-green soft plastic clay at contact gradually hardening to shale and grading into mottled argillite and sharp stone conglomerate - greenish shale fragments in pink shale matrix.	7	321.8-326.5		4.7	.01		
		Minor gypsum, etc.	C8 - 8	326.5-331.3		4.8	.01		
				SLUDGE					
			S8 - 1	4.0- 25.0		21.0	.03		
			2	25.0- 50.0		25.0	.01		
			3	50.0- 75.0		25.0	.01		
312.5-665.0		Sandstone - fine grained, pink with greenish and purple coloured zones, mottled and pitted, minor shale and gypsum horizons	4	75.0-100.0		25.0	.01		
		426-665 - Brick red, mainly sandstone, minor shaly, gypsum and gritty horizons, abundant gypsum veinlets, green alteration	5	100.0-125.0		25.0	.01		
			6	125.0-150.0		25.0	.01		
			7	150.0-175.0		25.0	.01		
			8	175.0-200.0		25.0	.01		
			9	200.0-220.0		20.0	.01		

Drilled by BOYLES BROS.Core Size BXLogged by T. O. H. PATRICK

COMPANY \_\_\_\_\_

PROPERTY \_\_\_\_\_

Township \_\_\_\_\_

Claim No. \_\_\_\_\_

SHEET No. 2 of 2 \_\_\_\_\_

Reference \_\_\_\_\_

HOLE No. KMG-64-8 \_\_\_\_\_

Started \_\_\_\_\_

Location \_\_\_\_\_

Bearing \_\_\_\_\_

Finished \_\_\_\_\_

Dip: \_\_\_\_\_ @ Collar; \_\_\_\_\_ @ \_\_\_\_\_

Depth \_\_\_\_\_

Elevation \_\_\_\_\_

FROM	TO	DESCRIPTION	SAMPLES			% CU	ASSAYS	
			NO	FROM	TO		WIDTH	
				SLUDGE				
		patches and zones.	10	220.0-230.0		10.0	< .01	
		@ 547.0 - 6" gypsum vein	11	230.0-240.0		10.0	< .01	
		@638.5 - 1" green alteration spot with	12	240.0-250.0		10.0	< .01	
		1/4" dark green centre.	13	250.0-260.0		10.0	.01	
		@649 - 2" bed of green sandstone	S8- 14	260.0-270.0		10.0	.03	
		@ 665' END OF HOLE	S8- 15	270.0-280.0		10.0	.05	
			16	280.0-290.0		10.0	.03	
			17	290.0-300.0		10.0	.03	
			18	300.0-310.0		10.0	.01	
			19	310.0-320.0		10.0	< .01	
			20	320.0-330.0		10.0	< .01	
			21	330.0-340.0		10.0	.01	
			S8- 22	340.0-350.0		10.0	.01	

Drilled by BOYLES BROS. \_\_\_\_\_

Core Size BX \_\_\_\_\_

Logged by T. O. H. PATRICK \_\_\_\_\_



COMPANY KEEVIL MINING GROUPPROPERTY GRAND MANAN

Township \_\_\_\_\_

Claim No. \_\_\_\_\_

SHEET No. 1 of 2  
 Started 1 October 1964  
 Finished 8 October 1964  
 Depth 437'

Reference B. P. C. L.  
 Location 15 + 56 W. 24 + 00 N.  
 Elevation 1098.7

HOLE No. KMG-64-9A  
 Bearing VERTICAL  
 Dip: -90° @ Collar; \_\_\_\_\_ @ \_\_\_\_\_

FROM	TO	DESCRIPTION	CORE			ASSAYS			
			NO	FROM	TO	WIDTH	% CU		
0	18.0	Casing, overburden, bedrock @ 10.0	C9A-1	324.5	328.0	3.5	< .01		
			2	328.0	330.0	2.0	.02		
18.0	328.0	Basalt, concave bit to 64.0 sludge recovery only.	3	330.0	334.6	4.6	.01		
		from 64.0 - massive, medium grained	4	334.6	339.4	4.8	< .01		
		scattered minor joints and parallel to core axis.	5	339.4	344.3	4.9	< .01		
			6	344.3	349.8	5.5	< .01		
		@ 215 - Strong slip with serpentine veinlet parallel to core axis.	C9A-7	349.8	354.8	5.0	< .01		
		From 250.0 - Gradual decrease in grain size, greenish grey colour.		SLUDGE					
		@ 291 - first appearance of amygdules	S9A-1	10.0	25.0	15.0	.01		
		basalt becomes fine grained very dark green at contact.	2	25.0	50.0	25.0	< .01		
			3	50.0	75.0	25.0	< .01		
			4	75.0	100.0	25.0	.01		
			5	100.0	125.0	25.0	.01		
			6	125.0	150.0	25.0	.01		
328.0	334.0	Clay, shale and argillite, very soft at contact, pink and/or green colour, grading from green to pink. Horizons, containing red shale fragments - edgewise conglomerate	7	150.0	160.0	10.0	.01		
			8	160.0	170.0	10.0	.01		
			9	170.0	180.0	10.0	.01		
			10	180.0	190.0	10.0	.01		
			11	190.0	200.0	10.0	.02		
334	437	Sandstone - argillaceous and pink to 345, green, pink & purple colours grade to predominantly red with depth. Some porous zones with open vugs and pits.	12	200.0	210.0	10.0	.02		
		368 - 370 ° Porous, mottled green horizon	13	210.0	220.0	10.0	.01		
		418 - 437 - abundant thin beds and veinlets of gypsum.	14	220.0	230.0	10.0	.01		
			15	230.0	240.0	10.0	.02		
			16	240.0	250.0	10.0	.01		
			17	250.0	260.0	10.0	.02		
			18	260.0	270.0	10.0	< .01		
			19	270.0	280.0	10.0	< .01		
			20	280.0	290.0	10.0	< .01		

Drilled by BOYLES BROS.Core Size BXLogged by T. O. H. PATRICK



COMPANY KEEVIL MINING GROUP

PROPERTY GRAND MANAN

Township \_\_\_\_\_

Claim No. TOBIAS PROPERTY

SHEET No. 1 of 1  
 Started \_\_\_\_\_  
 Finished \_\_\_\_\_  
 Depth 231'

Ref: G. E. & S. L.  
 Reference B.P.C.L. Dwg. No. 2829  
 Location 24 + 95 W. 55 + 95 S. Approx.  
 Elevation 973.8

HOLE No. TOBIAS #1 (ODH)  
 Bearing VERTICAL  
 Dip: -90° @ Collar; \_\_\_\_\_ @ \_\_\_\_\_

FROM	TO	DESCRIPTION	SAMPLES				ASSAYS						
			NO	FROM	TO	WIDTH							
0 - 12.0		No core											
12.0 - 222		Basalt - grey black to green black, medium grained, generally massive, some jointing parallel to core axis. 35.0 - 38.0 - Lost core 45.0 - 60.0 - Poor recovery 65.0 - 70.0 - Lost core 157.0 - 160.0 - Lost core											
222 - 225		Ground core - soft, friable and green - (basalt tuff contact).											
225 - 227.6		Tuff - grey green, fine grained, some malachite stain, poor recovery.											
227.6 - 231.0		Sandstone - red, fine grained											
		Submitted for assay 222.0 - 227.6 227.6 - 235.0											
		Copper assay reported by Mr. Tobias											
		222.0 - 232.5 - 10.5' 1.65% CU.											

Data supplied by Sterling P. Tobias

Drilled by \_\_\_\_\_

Core Size \_\_\_\_\_

Logged by \_\_\_\_\_

# DRILL HOLE SECTIONS

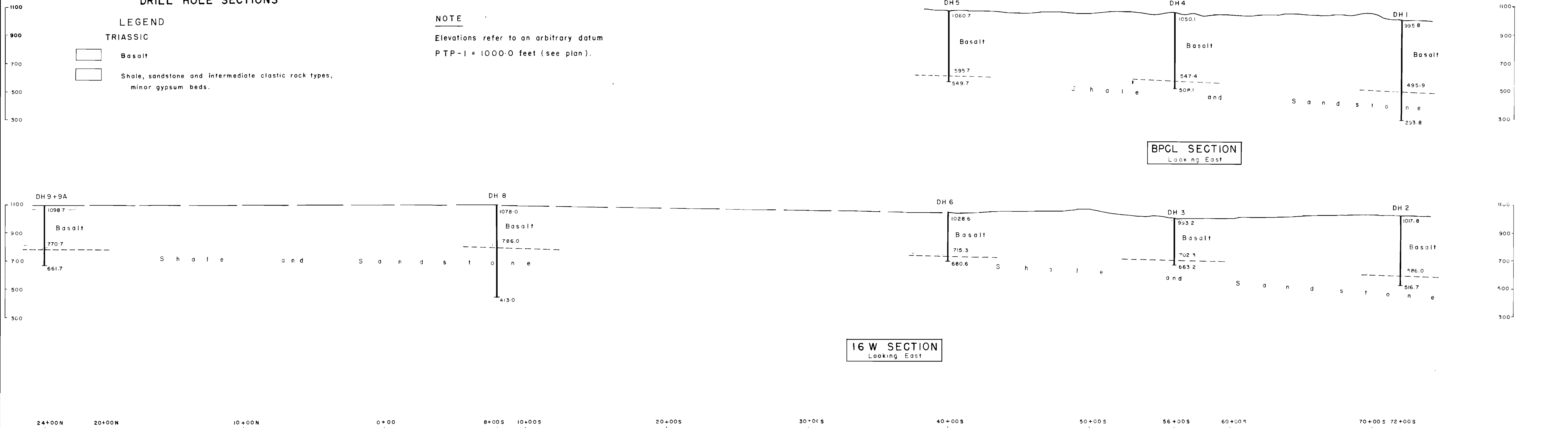
## LEGEND

### TRIASSIC

- Basalt
- Shale, sandstone and intermediate clastic rock types, minor gypsum beds.

## NOTE

Elevations refer to an arbitrary datum  
PTP-1 = 1000.0 feet (see plan).



## 16 W SECTION

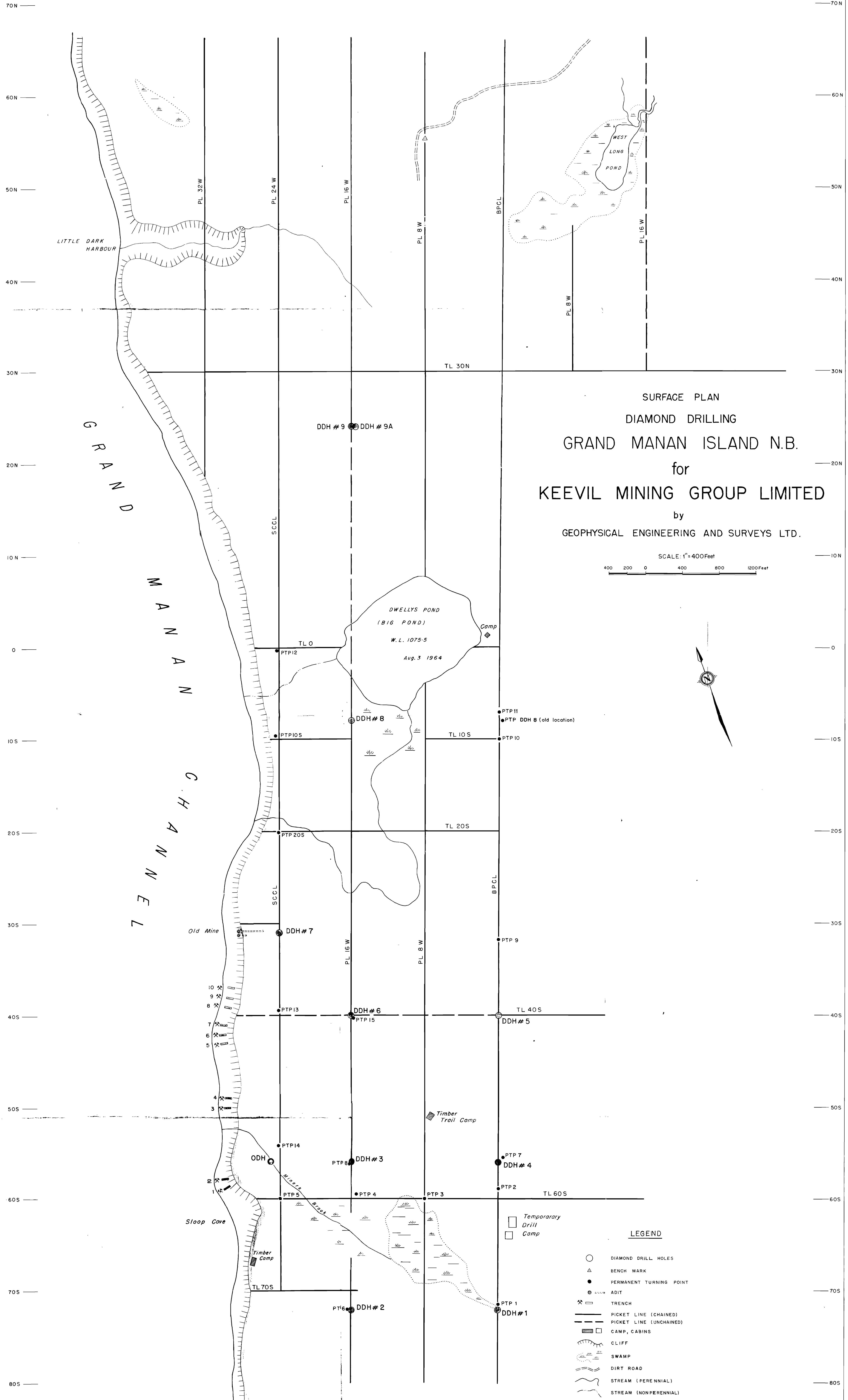
Looking East

## BPCL SECTION

Looking East

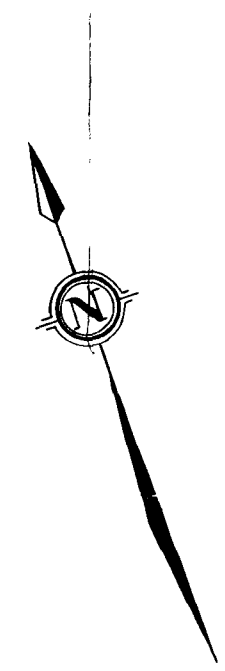
SCALE: 1 in. = 400 feet

50W 40W 30W 20W 10W 0 10E 20E 30E



SURFACE PLAN  
 DIAMOND DRILLING  
 GRAND MANAN ISLAND N.B.  
 for  
 KEEVIL MINING GROUP LIMITED  
 by  
 GEOPHYSICAL ENGINEERING AND SURVEYS LTD.

SCALE: 1"=400Feet  
 400 200 0 400 800 1200Feet



- LEGEND**
- DIAMOND DRILL HOLES
  - △ BENCH MARK
  - PERMANENT TURNING POINT
  - ○ ○ ○ ○ ADIT
  - ⊗ TRENCH
  - PICKET LINE (CHAINED)
  - - - PICKET LINE (UNCHAINED)
  - CAMP, CABINS
  - ▒ CLIFF
  - ~ SWAMP
  - DIRT ROAD
  - ~ STREAM (PERENNIAL)
  - ~ STREAM (NONPERENNIAL)

470333