

GEOLOGICAL
ASSESSMENT REPORT

'80-#510-#8284

ON

THE CLIFF CLAIMS 78 and 79FR

NANAIMO MINING DIVISION

BRITISH COLUMBIA

N. T. S. - 92 L 11 W

Latitude 50 38'

Longitude 127 28'

OWNER AND OPERATOR

John M. Mc Andrew, Prospector - Geologist
8961 Ursus Crescent, Surrey
British Columbia V3V 6L3
Phone: 591-6512

By

John M. Mc Andrew, P. Engr.

Field Examination Period:
November 12 - December 17, 1979

Submitted: SEPTEMBER 8, 1980

MINERAL RESOURCES BRANCH

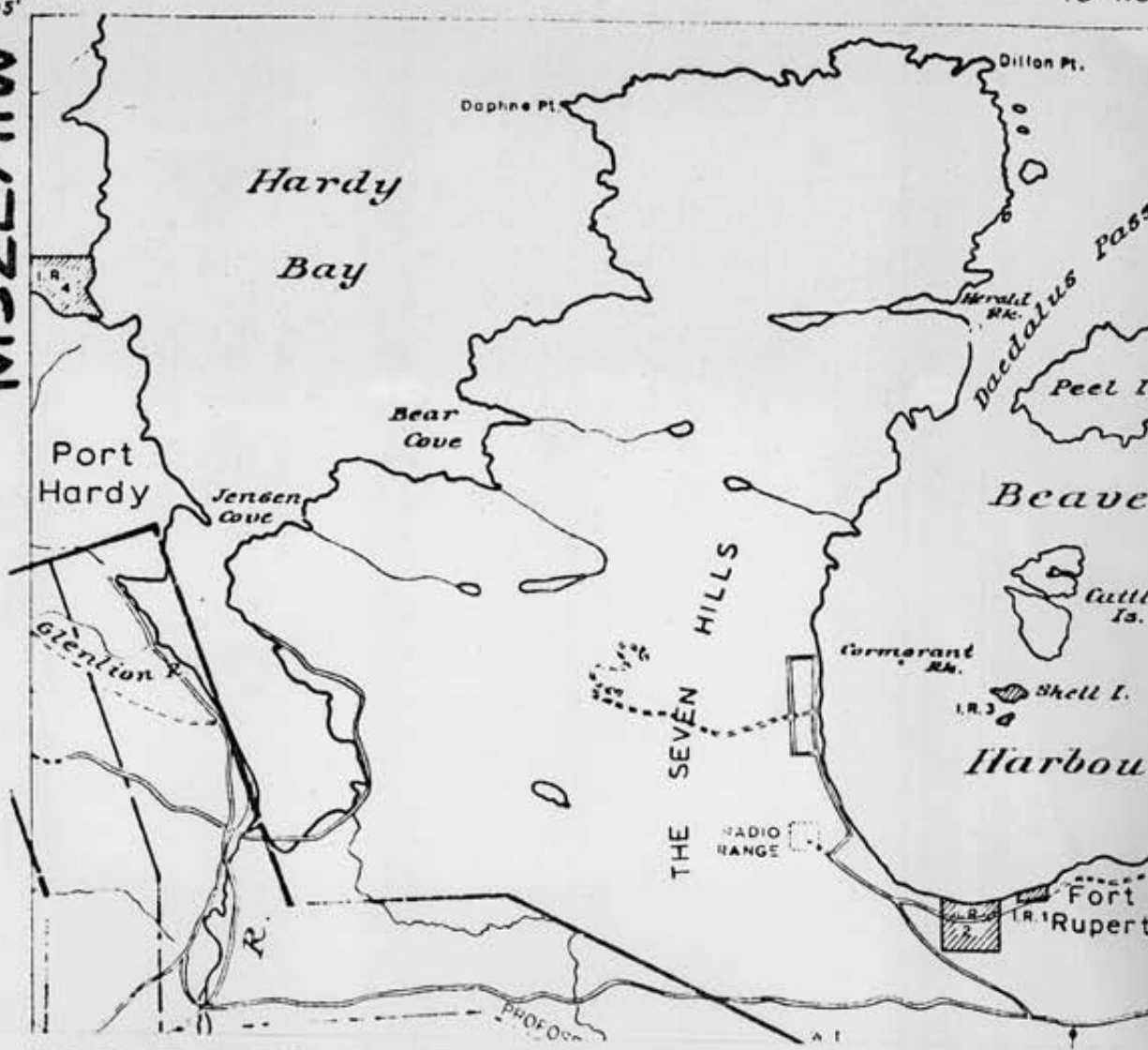
ASSESSMENT REPORT

8284

TABLE OF CONTENTS

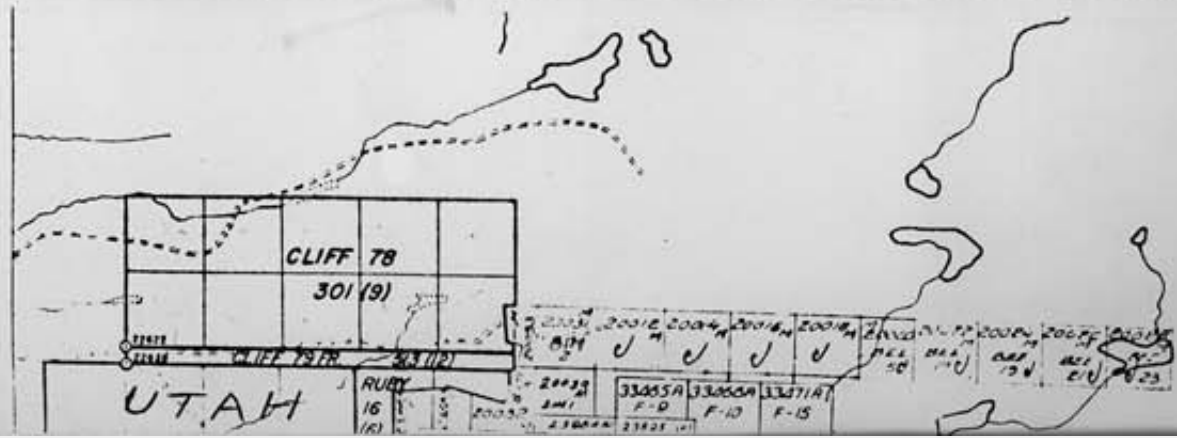
	Page No.
Location Map	
Introduction	1
Location and Access	1 - 2
Physiography	2 - 3
Topographic Map	2a
History	4 - 7
Claim Status	7 - 8
Details of the Survey	8 - 9
Geochemical and Magnetic Anomalies	9 - 10
Geology - General	11 - 15
Preliminary Geological Map by K. E. Northcote	11a
Detailed - Structure	15 - 16
- Alteration	16 - 17
- Mineralization	17 - 29
Vertical Sections Little Joe ie. Rainbow Showings	22a
Vertical Section Norm ie. South Showing	24a
Conclusions - Based on Geochemistry	29 - 30
Aeromagnetic Map	29a
Based on Magnetics	30 - 32
Based on Geology	32 - 34
Recommendations	34 - 38
Vertical Section Norm ie. Branch 7 Road Showing	37
Statement of Costs	39
Certification of John M. McAndrew	40
Assay Results	41 - 48
Map Little Joe ie. Rainbow Showings 1"-220'	49
Port Hardy Copper Mines Ltd. Drill Logs	50 - 59
In Back Pocket of Report:	
Map 1 - Preliminary Geological Map	Scale 1:2000
" 2 - Amended Geochemical Survey	Copper Scale 1:5000
" 3 - " " " "	Zinc " "
" 4 - " Magnetometer	" "

50°45' M92L/IIW



Location Map
of
CLIFF CLAIMS
Port Hardy, Vancouver Isl., B.C.
Scale 1:50,000 Sept. 1980

Miles 1 0 1 2 3 Miles
Metres 1000 0 1000 2000 3000 4000 Metres
Yards 1000 0 1000 2000 3000 4000 Verges



INTRODUCTION

During the period November 12 to December 17, 1979 John M. Mc Andrew, P. Engr., Prospector - Geologist of 8961 Ursus Crescent, Surrey, British Columbia conducted a program of geological mapping on his Cliff claims.

After researching all the available background data such as the B.C. Minister of Mines and Petroleum Resources Annual Reports, George Cross Newsletters, the Northern Miners, assessment reports on file at Victoria and the geological reference libraries of the Geological Survey of Canada and the Chamber of Mines in Vancouver I could obtain no detailed geological maps of the ground covered by the Cliff claims. The mining companies I contacted, who had done mapping in the area, would not let me examine their reports. Because of these negative aspects it was necessary to prepare my own detailed geological map, the subject of this report.

LOCATION AND ACCESS

The Cliff claims are 9.5 kilometers due south of Port Hardy, Vancouver Island, British Columbia in the Nanaimo Mining Division. Refer to the 1:100,000 insert Location Map on the 1:2,000 Preliminary Geological Map 1, which accompanies this report and shows the relationship of the Cliff claims to Port Hardy and Fort Rupert.

The claims are along the north boundary of Utah Mines Ltd. a major copper - molybdenum producer.

LOCATION AND ACCESS (Cont...)

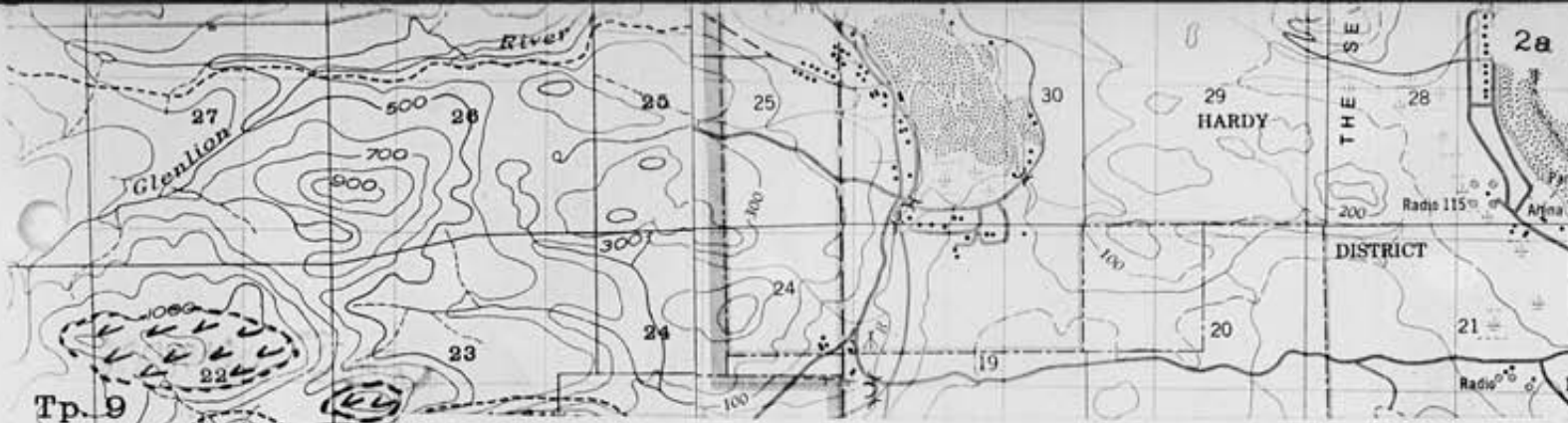
Driving from Surrey to the claims takes about 12 hours (480 miles) including the 2 hour ferry trip from Horseshoe Bay to Nanaimo. One travels on excellent paved roads to within 2 kilometers of the claims where gravel logging roads provide access to all parts of the claims using only 2 wheel drive vehicles. It is also possible to fly from Vancouver to Port Hardy and rent transportation there.

Rather than get involved in camp construction the author rented a housekeeping unit at the Pioneer Inn due south of Port Hardy and commuted 6 miles daily to the claims. Considering the short duration of the work, the inclement weather at that time of year and the fact that the author was working alone this seemed to be the most practical approach.

PHYSIOGRAPHY

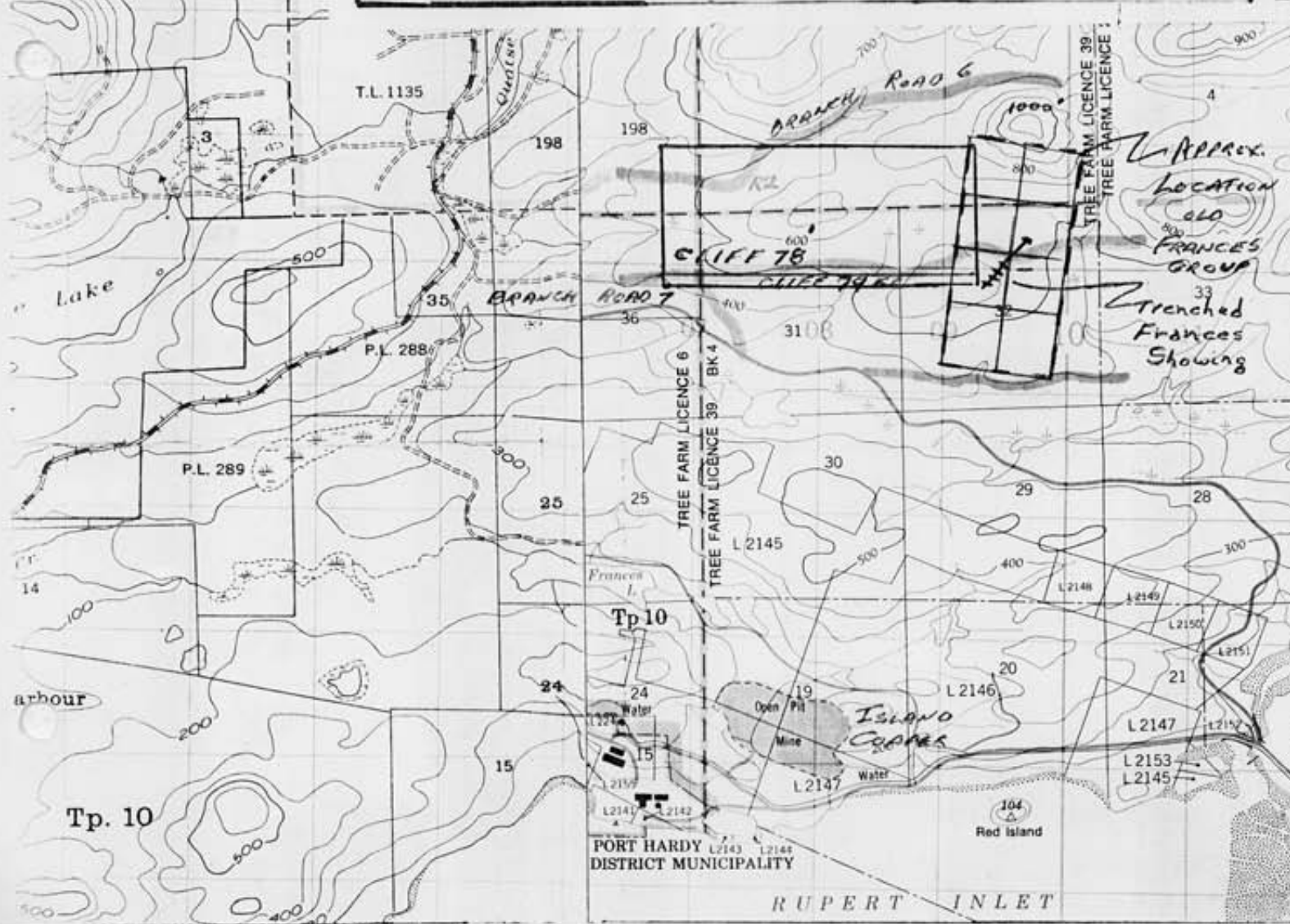
The claims lie at an elevation ranging from 122 m. (400') to 213 m. (700'). The mineral showings mapped to date occur along ridge tops or beside old logging roads.

Vegetation is typical temperate zone rain forest and once off the ridge tops and old logging roads the undergrowth of salal, highbush blueberry, blackberry and cranberry bushes is so thick that mapping becomes very tedious and at times hazardous. Commercial evergreens were logged off many years ago but local logging debris adds to the difficulty of traversing. This debris is piled so thickly in places that it was impossible to shovel through it to obtain soil samples. Some of the second growth conifers are large enough to be used for camp construction and mining timber. Portions of the logging roads are heavily overgrown by alder.



Topographic Map
 of
CLIFF CLAIM AREA
 Port Hardy, Vancouver Isl., B.C.
 Scale 1:50,000 Sept. 1980

1 Miles
 1000 500 0 1000 2000 3000 4000 Metres
 1000 500 0 1000 2000 3000 4000 Yards



PHYSIOGRAPHY (Cont...)

A major westerly flowing tributary of the Quatse River goes through the north section of the claims. This stream plus one in the center and another in the south of the claims along with numerous small ponds provide adequate water supplies for exploration.

Outcrop occurs mainly along ridges and in the vicinity of old logging roads. Dense undergrowth elsewhere on the claims greatly hinders geological mapping. Previous operators did extensive bulldozer stripping around many of the mineral showings unfortunately some of this was carelessly done and a good deal of possibly relevant geology is now covered by piles of loose.

Due to the lateness of the season the weather was usually wet and cool, rain showers were common in the afternoon and the bush rarely became completely dry. Towards the end of the examination there were several light snow falls which did not last. The motel owner said that in the past 10 years they had had permanent snow for Christmas twice. The Cliff area could probably be worked year around without difficulty. Winds up to 24 Km. (15 miles) per hour were not uncommon. Adequate heating and drying facilities would be essential in any bush camp on these claims.

Only a few Canada jays and squirrels were seen on the property. In the past numerous deer and the occasional black bear were observed but due to the many hunters in the area these have been wiped out or become more cautious. However because of the possibility of encountering bear the author never traverses this area without a gun.

HISTORY

Although there had probably been numerous regional geological studies by government and corporate geologists the first significant detailed examination in the immediate vicinity of the Cliff claims was by Cominco Ltd. in 1959 and has continued sporadically, with the ground open occasionally, by other operators until the summer of 1980 when Mitsubishi Metal Corporation examined the property.

The author researched all available literature, unfortunately the major corporations would not part with their data on detailed geological mapping or major drilling programs. There follows a list of the work done on the Cliff claims to date:

1959 - B.C. Minister of Mines Annual Report (p.132): Cominco Ltd. built 1,380' access road, excavated 13 cubic yards of rock, trenched 4,775 cubic yards on Frances Showing (Bim claims, now owned by Utah Mines Ltd.) due east of Cliff 78. They had a \$30,000 buy out option, which was cancelled. Any ore would have been trucked to their mill at Benson Lake, which was at that time operational. These showings, just beyond the east boundary of Cliff 78, are contact metasomatic.

1963 - B.C.M.M.A.R. (p.99): Port Hardy Copper Mines Ltd. (now defunct) stripped 10 acres, drilled 17 holes (3,000'), Big John Cottawick and Little Joe Nansen (dead) principals. Northern Miner July 4: Consultant Richard J. Rongey stated " Assays show values ranging to 9% copper, 10% zinc and 9.5 ozs of silver."

November 19: Report by A.W. Poole, P. Engr. for Port Hardy Copper Mines Ltd.

HISTORY (Cont...)

- 1964 - Examined by John M. Mc Andrew for Anaconda American Brass
 Lts. He suggested to Cottawick that they extend their
 exploration to south and open up T Showing (now known as
 Cranberry) which at the time was exposed along strike for
 120' and assayed 5% copper across 16', a high grade grab
 sample from this zone assayed 11% copper and 1 oz./ton
 gold (??) . He also recommended a re-examination by Anaconda
 after the T Showing was opened up but the property became
 involved in litigation and was never re-examined by Anaconda.
- 1968 - B.C.M.M.A.R. (p.90): joint participation Silver City
 Petroleum (defunct ?), Calgary 90% and Port Hardy Copper
 Mines 10% geological mapping, magnetometer and geochemical
 surveys (not filed), mention silver content of mineralization.
 N. Miner October 10: reported work planned by Silver City
 Petroleum.
 N. M. December 12: Goldfields Corporation, Denver, Colorado
 to drill 5,000', expenditures of \$260,000 planned to earn
 60% interest (Silver City Petroleum 35%, Port Hardy Copper
 Mines 5%).
 B.C.M.M.A.R. (p.85): Regional Geological Map of Coal Harbour
 - Port Hardy Area by Dr. K. E. Northcote.
- 1970 - B.C.M.M.A.R. (p.70): 60% Yellowknife Bear Mines Ltd., 1005,
 360 Bay St., Toronto and 40% Ram Petroleum (defunct ?) mapping
 at 1"-200', 10 diamond drill holes, total 5,728'. Filed
 Assessment Report 2381 " Magnetometer and Geochemical Surveys"
 at Victoria, excellent reference but mapping and drilling
 results not available.

HISTORY (Cont...)

- 1970 - B.C.M.M.A.R. (p.255): Preliminary Geological Map of Rupert Inlet - Cape Scott Area by Dr. K. E. Northcote.
N. Miner September 17: Reported drilling in progress but no results. Mentioned that the property had been optioned to Yellowknife Bear and Ram Petroleum by Barclay Resources (defunct ?).
- 1976-1977 - Canadian Mines Handbook (p.38): Barclay Resources Ltd.
" held copper-molybdenum prospect of 22 claims Port Hardy area, Vancouver Island; \$250,000 expended 1970-71 by 2 companies option dropped.
- 1976 - Staked by consulting geologist Ian Poyntz (formerly with Utah Mines Ltd.), Donian claim.
- 1978 - Cliff 78 staked and sampled by John M. Mc Andrew and son Cliff, copper assays 3.07-11.45%, silver 0.34-3.30 oz./ton, zinc 0.11-4.42%, gold .003-.015 oz./ton and cobalt .007-.021%.
- 1979 - Accompanied by wife Marie-Paule drilled and blasted trenches 5-7 in Rainbow Showing 4, filed assessment; geological mapping 1:1,000, staked Cliff 79FR, sampled, assay results copper 1.69-10.25%, silver Tr.-1.9 oz./ton, gold Tr.-0.09 oz./ton.
- 1980 - Field examination by geologist T. Nagamatsu of Mitsubishi Metal Corporation accompanied by geology professor from University of Kyoto, Japan.

HISTORY (Cont...)

An approximation of the expenditures on the Cliff 78 and Cliff 79 Fraction to date follows:

1963 - Port Hardy Copper Mines Ltd.	\$ 50,000
1964 - Anaconda American Brass Ltd.	2,000
1968 - Goldfields Corporation	100,000
1970-71 - Yellowknife Bear & Ram Petroleum	250,000
1978-79 - John M. Mc Andrew	<u>15,000</u>
	<u>\$417,000</u>

If the author had been able to study all the data resulting from these large expenditures it would have greatly facilitated assessing the economic potential of the Cliff claims. Although there have been many groups examine this ground and considerable expenditures the author is not particularly deterred from further evaluation. Large areas of geochemical and magnetic anomalies remain unmapped, the mineral showings observed to date are of excellent grade, the property is very accessible and the mineral controls have not been determined. If the author could have located any mill in British Columbia that would have accepted custom ore, shipments could have been made starting in 1979.

CLAIM STATUS

The Cliff 78 claim was staked August 24, 1978 and recorded September 21, 1978. It is presently in good standing till September 21, 1981. The assigned record number is 301.

The Cliff 79 Fractional claim was staked December 6, 1979 and recorded December 19, 1979 (No. 513). At present it is in good standing till December 19, 1980.

CLAIM STATUS (Cont...)

During the period November 12, 1979 to September 8, 1980 \$9,230.17 was spent on the Cliff 78 claim and \$1,313.73 on the Cliff 79 Fraction for a geological survey. \$5,000.00 of the \$9,230.17 spent on the Cliff 78 claim has been applied to the 10 units therein to put them in good standing for 3 additional years. \$500.00 of the \$1,313.73 spent on the Cliff 79 Fraction has been applied to put it in good standing for 4 years.

The field work for the survey was done by owner-operator John M. Mc Andrew, prospector-geologist, of 8961 Ursus Crescent, Surrey, British Columbia V3V 6L3 (phone 591-6512).

DETAILS OF THE SURVEY

All field mapping was done at a scale of 1 millimeter equals 1 meter or 1:1,000. For the convenience of this report the map was reduced to 1:2,000. Mapping was accomplished by Brunton and topolite traverses. Base stations, which should be useable for several years, were established to furnish control points. Because of the rate of decay in this area none of the control used by former operators could be located.

Typical specimens of all rock types and mineralization occurring on the Cliff claims were collected and will be retained for reference purposes and possible thin section examinations.

Specimens have been subjected to the following tests:

- 1) Free swinging hand magnet.
- 2) 5N hydrochloric acid.

DETAILS OF THE SURVEY (Cont...)

- 3) Examination under 10 and 20 power hand lens.
- 4) Observation under short (1,800-3,000 Angstrom Units) and long (3,000-4,000 Aus) wave ultraviolet light using a MSL-48 model lamp.

The leucocratic, acidic intrusive rocks were all stained using the hydrofluoric-sodium cobaltnitrite method to determine their percentage of orthoclase. The author prefers to classify intrusive rocks by the percentage of potassium feldspar they contain.

Approximately $\frac{1}{2}$ of the area covered by the claims was mapped.

GEOCHEMICAL AND MAGNETIC ANOMALIES

Although the author had visited the property in 1964 the exact location of the many mineral showings could not be recalled. Assessment Report 2381 filed at Victoria by Yellowknife Bear Mines Ltd. titled "Geochemical and Magnetometer Surveys" by consulting geologist L. C. Thelan, P. Engr. April 30, 1970 proved invaluable in relocating the mineral showings. It was discovered that the locations of their copper and zinc anomalies corresponded very well with zones of copper-silver-zinc mineralization. The magnetometer survey map was not as reliable as a search tool for the following reasons 1) Some of the mineralization contains little or no magnetite. 2) Certain volcanic rocks on the claims contain considerable magnetite and produce strong anomalies. Some geochemical anomalies are based on one station highs and may not be significant. Considering the many areas of thick logging debris makes one wonder how successful the samplers were in obtaining

GEOCHEMICAL AND MAGNETIC ANOMALIES (Cont...)

good representative soil samples.

Using Yellowknife Bear's geochemical and magnetometer results Geochemical Survey Copper Map 2, Geochemical Survey Zinc Map 3, Magnetometer Survey Map 4 have been recontoured at a scale of 1:5,000 so that they will more realistically reflect the trend of the geological formations and zones of mineralization. These maps accompany this report.

The numerous mineral showings mapped to date have been plotted on the geochemical and magnetometer maps to illustrate their relationship to the various anomalies. It is noteworthy that no single survey, be it geological, geochemical or magnetometer would have been successful in locating all the mineral showings.

These maps also indicate a large area of geochemical and magnetic anomalies in unmapped ground between the Cranberry B Showing and the West Showing. Significant anomalies occur in the west portion of the property, which are open to the west, where the geochemical and magnetometer surveys are incomplete. This will be a particularly difficult area to soil sample because of the thickness of rotting logging debris.

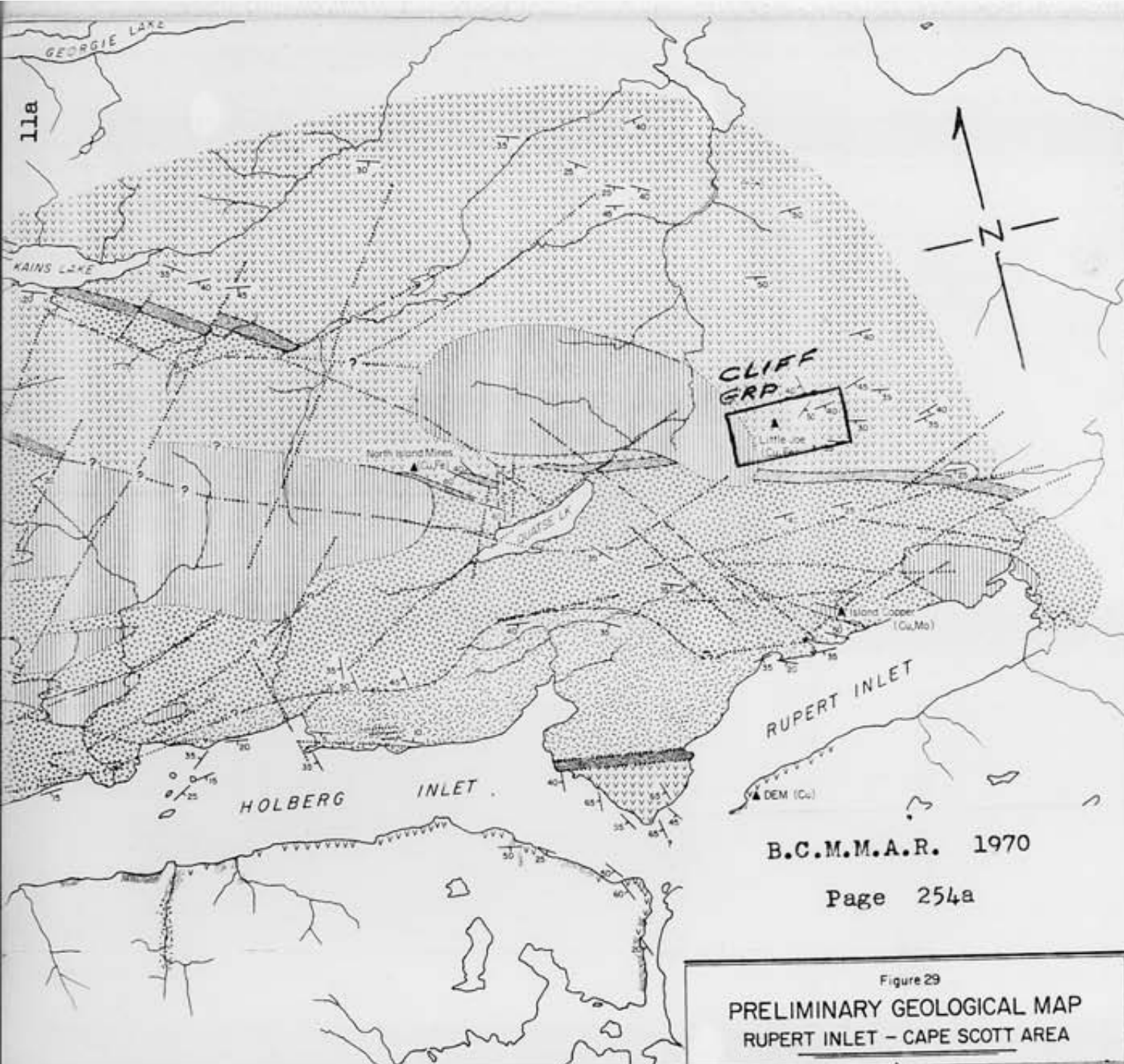
Yellowknife Bear's old and ammended geochemical and magnetometer maps will serve as very useful references for future geochemical, magnetometer and geological surveys. Because of the caliber of their work the author was disappointed that he could not obtain copies of their geological mapping and drilling results.

G E O L O G Y

General - Dr. K. E. Northcote, formerly with the B.C. Department of Mines, and now with Bema Industries Ltd., 5780-203rd Street, Langley, British Columbia (phone 530-9731), has written two excellent reference reports titled " Geology of the Port Hardy-Coal Harbour Area " and " Rupert Inlet-Cape Scott Map-Area " which describe the regional geology on and around the Cliff group. These reports appear in the B.C. Minister of Mines Annual Reports for 1968 (pages 84-87) and 1970 (pages 254-258) respectively.

Northcote has mapped a eugeosynclinal belt of Upper Triassic to Lower Jurassic rocks of the Vancouver Group which includes the Karmutsen and Quatsino Formations and Bonanza Subgroup. He shows this series trending just north of west cut by intrusive stocks, ranging in age from middle to early Late Jurassic to early Tertiary and suggests they indicate a shallow underlying batholith. He depicts the Cliff claims as being underlain by the Karmutsen Formation, which contains limestone beds, and shows a large stock intruding this formation in the west portion of the property.

Detailed geological mapping on the Cliff group shows the main trend of the volcanics and sediments to be just north of east. It has been suggested that the limestone horizons that contain Rainbow Showings 1-4 and the Cranberry Showing are the same unit and are remnants of a large fold but there is little to support this contention. They may be the same unit which has been block faulted.



GEOLOGY BY K.E. NORTHCOTE



LEGEND

-  **INTRUSIVE ROCKS**
VARIED COMPOSITION FROM DIORITE TO GRANITE AND INCLUDES PORPHYRITIC PHASES
-  **LOWER CRETACEOUS SEDIMENTARY ROCKS**
CONGLOMERATE, SANDSTONE, SILTSTONE, SHALE, CARBONACEOUS HORIZONS.
-  **BONANZA SUBGROUP**
UPPER VOLCANIC UNIT, LARGELY PYROCLASTIC TUFF, LAPILLI TUFF AND TUFF BRECCIA OF ANDESITE AND BASALT COMPOSITION WITH SOME BASALT AND RHYODACITE FLOWS AT THE TOP OF THE UNIT
LOWER SEDIMENTARY UNIT; THIN BEDDED ARGILLACEOUS AND CARBONACEOUS LIMESTONE, CALCAREOUS SHALE AND SILTSTONE AND GREYWACKE
-  **QUATSINO FORMATION**
LIMESTONE, MEDIUM TO THICK BEDDED
-  **KARMUTSEN FORMATION**
BASALTIC AMYGDALOIDAL AND MASSIVE FLOWS, INTERBEDDED TUFF, SOME PILLOW BRECCIA AND POORLY DEVELOPED PILLOWS. THIN LIMESTONE BEDS NEAR TOP OF FORMATION.

SYMBOLS

- CONTACTS:
- KNOWN 
 - APPROXIMATE 
 - ASSUMED 
- LINEAMENTS FROM AIR PHOTOGRAPHS. SOME OF THESE ARE KNOWN TO REPRESENT FAULTS
- 
 - 
- BEDDING 
- MINERAL DEPOSITS 

B.C.M.M.A.R. 1970

Page 254a

Figure 29
PRELIMINARY GEOLOGICAL MAP
RUPERT INLET - CAPE SCOTT AREA

APRIL 15, 1971

GEOLOGY (Cont...)

General - Utah Mines Ltd. Lake, Ruby and Bim claims bound the Cliff group to the south and southeast. Their Island Copper Mine, which had estimated reserves of approximately 280 million tons of 0.522 percent copper and 0.028 percent molybdenum sulphide in 1968, is 4 Km (2.5 miles) due south of the main Cliff showings. The nearby concentrator is presently treating more than 30,000 tons of ore per day that averages 0.46 percent copper.

Specific Rock Types on the Cliff Claims - During the course of mapping specimens typical of the various rock types were collected to form a reference suite. If later investigations indicate some of these should be reclassified the geological map can be amended without difficulty. Yellowknife Bear had piled their diamond drill core due north of station C8 but vandals have made such a mess of this about all one can do with it now is study the various rock types cut in their drilling.

Sedimentary Rocks:

Limestone - The only sedimentary rock type mapped to date are medium grey beds of limestone, which occur near the top of the Upper Triassic Karmutsen Formation. These slightly argillaceous, very fine to medium grained, intervolcanic limestones are only tentatively included with the Karmutsen Formation and may actually be part of the Quatsino Formation. In some beds irregular siliceous nodules stand in relief on weathered surfaces. A few sinkholes have developed in the limestone.

GEOLOGY (Cont...)

Volcanic Rocks: All belong to the Karmutsen Formation and consist of flows, fragmental beds and poorly developed pillow lavas. These volcanic rocks are medium to dark green-grey, interbedded, massive to porphyritic and amygdaloidal flows. Tuff is interbedded with flows and some pillow breccia occurs. Refractive indices of fused beads of rock from the flows indicate a basaltic composition. Amygdules are filled by quartz, epidote, chlorite, and less commonly by calcite, pumpellyite, and zeolites.

Andesite - The main volcanic rock type on the Cliff claims is medium to dark green-grey, massive, locally amygdaloidal and weakly magnetic (weak pull on hand magnet) andesite. Although it may be basaltic in composition I have called it andesite, based on colour, and to differentiate it from the basalt on the property, a description of which follows.

Basalt - A black, aphanitic to very fine grained, strongly magnetic basalt occurs north of station C5 and outcrops intermittently to beyond station C1. Because of its high magnetic susceptibility magnetometer surveys over this rock type will result in significant anomalies. The author is not absolutely certain this unit is a basaltic flow and may in fact be a large hornblende-augite lamprophyre dyke which Northcote mentions in his reports. These can exceed 100 feet in thickness.

GEOLOGY (Cont...)

Tuff - A few outcrops of fine grained, competent, white to light tan tuff occur in the southwest portion of the Cliff 78 claim.

Metamorphic Rocks:

Marble - In the vicinity of intrusives the limestone is recrystallized to white to cream coloured, locally highly fractured, coarse-grained sugary-textured, impure marble which may lie within the limestone or at contacts with volcanic rocks. The large outcrop containing the South Showing is almost entirely marble.

Intrusive Rocks: Intrusive bodies ranging in size from narrow dykes to stocks one-half to several miles in longest dimension occur in the area and appear to be elongate in a northwesterly direction. They range in composition from diorite to quartz diorite, but the larger stocks are granodiorite to quartz monzonite in composition. These rocks range in age from middle to early Late Jurassic to early Tertiary. Mafic dykes, sills, and small stocks(?) of gabbroic to andesitic composition cut Karmutsen flows, Quatsino limestone, and Bonanza sedimentary and pyroclastic rocks. These intrusive rocks may represent Karmutsen, Bonanza, and later feeders. The basalt described under volcanic rocks may actually be a mafic dyke.

GEOLOGY (Cont...)

Quartz-diorite - Leucocratic, medium grained equigranular, weakly to moderately magnetic, resistant, generally fresh quartz-diorite has been mapped along the west ends of Branch Roads 6 and 7 and in the vicinity of Rainbow Showing 1. In the northeast section of the Cliff 78 claim a small exposure of K-spar flooded metadiorite containing quartz stringers intrudes porphyritic andesite.

Andesite Dykes - Light to dark green, aphanitic to fine grained, competent andesite dykes have been observed cutting the volcanics and limestone throughout the property. Because of their similarity to the andesite flows it is often difficult to differentiate them.

Detailed Geology of the Cliff Claims

Refer to accompanying Preliminary Geological Map 1 (in pocket) at a scale of 1:2,000.

Structure

The volcanics and limestone on the Cliff claims strike northeast and dip southeast. The average trend would be about N70 E dipping 35 SE in the area of the mineral showings.

Northcote in his reports mentions beds of limestone 25 to 50 feet thick within the Karmutsen Formation. Port Hardy Copper Mines Ltd. in their diamond drill holes L.J. 3 and 4 cut through a section of limestone 80 feet (25 meters) thick. Their drilling profile at a scale of 1" equals 50 feet is attached to this report. The author made a not too successful attempt to correlate his surface geology with their drilling results. Considering the type of mineralization they stepped out too far from the mineral

Detailed Geology (Cont...)

zones.

Mapping to date and Northcote's reports indicate a major northwesterly trending quartz-diorite stock occupying part of the west portion of the claims.

Andesite dykes strike just east or west of due north and dip vertically. A possible andesite sill, mineralized with disseminated chalcopyrite, occurs along the footwall of the South Showing. On the other hand this may be just an altered, very fine grained andesite flow.

Major northeasterly striking faults, which dip 40 to 70 degrees northwest, occur due east of the Rainbow Showing 3. They appear to be post-mineral and a product of block faulting. The profile of diamond drill holes L.J. 3 and 4 suggests a significant westerly dipping fault between these two holes. A fault may also go between holes L.J. 1 and 2, as indicated by the same profile, but it is possible that they actually cut an andesite intrusive in hole L.J. 2 rather than a flow and it would not be necessary to project a fault through here to make sense of the radical change in geology from hole L.J. 1 to 2.

Local minor faulting and intense fracturing are common on the Cliff property. One should proceed with caution since there are a few deep sinkholes in the limestone beds.

Alteration

The Karmutsen volcanic rocks commonly are altered to epidote, chlorite, sericite and calcite. Epidote characteristically stands in relief as nodules on weathered surfaces and occurs in veins with quartz and calcite.

Detailed Geology (Cont...)

Intrusive contacts or proximity to intrusives results in silicification or development of skarn consisting of epidote, yellow, brown and red garnet, amphiboles (tremolite, actinolite, hornblende), pyroxene, diopside, ilvaite, and hedenbergite within the Karmutsen volcanic and limestone.

Some of the drill core specimens contain a high percentage of pervasive epidotization.

Mineralization

The main deposits on the Cliff claims are contact metasomatic and occur in skarn at intrusive-limestone contacts and also within limestone and along limestone-volcanic contacts. Skarn in the limestone and along limestone-volcanic contacts is probably genetically related to intrusives.

Widespread disseminated bornite or chalcopyrite, or bornite and chalcopyrite occurs in the matrix and in amygdules of Karmutsen volcanic rocks. This type of mineralization is generally sparse but enrichments occur locally.

Contact metasomatism shows the effects of heat without appreciable accessions and manifests itself by endogene (internal) effects upon the margins of the intrusive body and exogene (external) effects on intruded rocks ie. contact-metamorphic aureole. Contact metasomatism connotes the intrusive relationship and a class of highly characteristic deposits recognized by their distinct assemblage of high temperature minerals. The typical skarn results from the alteration of carbonate rocks to complex silicate rocks at temperatures from 400-800 C; the recrystallization

Detailed Geology - Mineralization (Cont...)

and recombination of rock minerals in the alteration halo; and magma accessions (additions) ie. metals, silica, S, B, Cl, Fl, K, Mg and Na.

The general stages of formation of these deposits, which varies with different magmas, heat (recrystallization and recombination) - silicates - oxides (magnetite and hematite) - sulphides.

Characteristics of contact metasomatic deposits:

- a) Formed from gaseous emanations and in later stages by liquid emanations produced from silicic intrusive (high H₂O) into
2
basic rocks.
- b) Low H₂O content.
2
- c) Size dependent on shape of intrusive, shallow dip flank, irregular roofs (cupolas and roof pendants).
- d) Probably formed at depths of 5,000' plus.
- e) Little alteration of intrusive - epidote (absorption of CaO & CO₂).
2
- f) In limestone - garnet rock, silicates and ore: in sandstone - quartzite, sparse con.-meta. minerals, in shale and slate - hornfels and andalusite, sillimanite and staurolite; igneous rocks - do not contain con.-met. deposits. Rocks must be susceptible to con.-met. and those most favourable to formation of ore deposits are sediments, especially impure calcareous ones.
- g) ore deposits are likely to be larger up dip from intrusive.
- h) Scattered irregularly around contact, along faults extending outward from the contact (several thousand feet from contact).
- i) Generally irregular deposits.
- j) Crystals generally large and lack crystal outline.

Detailed Geology - Mineralization (Cont...)

K) Distinct assemblage of gangue minerals of high temperature formation - grossularite, andradite, garnet, hedenbergite, hastingsite, tremolite, actinolite, wollastonite, epidote, zoisite, vesuvianite, ilvaite, diopside, forsterite, anorthite, albite, fluorite, chlorite and micas, quartz and carbonates; silicates - tourmaline, axinite, scapolite, ludwigite, chondrodite and topaz; oxides - magnetite, ilmenite, hematite, corundum, spinel; native elements - graphite, gold and platinum (rare); sulphides - base metals; sulpho-arsenides, antimonides, tellurides (rare); scheelite and wolframite.

Two very distinct types of mineralization occur on the Cliff claims. For the convenience of this report I will refer to one as the brown "ore" and the other as the black "ore". The first is very friable and the latter tough and competent.

The gangue of the brown ore is almost entirely yellow garnet (derived from Latin granatus - grain like) or grossularite (derived from botanical name for gooseberry), $3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 3\text{SiO}_2$, hardness 6.5-7.5, specific gravity 3.53, Si 40%, Al 22.7%, lime 37.3%; amber, honey-yellow, wine yellow; isometric usually dodecahedrons or trapezohedrons. Grossularite fuses easily to light brown or black glass, after ignition it is soluble in HCl and yields gelatinous silica on evaporation, a characteristic of metamorphosed impure calcareous rocks. It is used as an abrasive.

Disseminated throughout the grossularite is abundant fine to coarse chalcopyrite. Weathered surfaces of the brown ore carry appreciable medium brown iron oxide (hence the

Detailed Geology - Mineralization (Cont...)

name), malachite and lesser amounts of azurite. The ore contains significant calcite but minor magnetite and only rarely produces strong magnetic anomalies. Four of the main showings on the Cliff property would probably not have been located using only a magnetometer survey.

The black ore is readily distinguished from the brown for the following reasons a) it is usually black in colour b) contains appreciable apatite, which is almost lacking in the brown ore c) is very rich in magnetite, large pods not uncommon d) competent and tough, would be harder to crush than brown e) gangue mainly metasilicates of Ca, Mg and Fe ie. black, dark brown and dark green pyroxenes, particularly black hedenbergite, and amphiboles - black hornblende, white tremolite and green actinolite f) often has banded appearance due to alternating layers of apatite, magnetite and chalcopyrite, the brown ore only occasionally displays banding. The main sulphide consists of fine to coarse disseminations and seams of chalcopyrite.

Forty pound bulk samples, of typical brown and black were assayed. The results are as follows:

	Cu %	Pb %	Zn %	Co %	Ag oz/ton	Au oz/ton
BRN ORE	3.070	.02	.11	.007	1.95	.003
BLK ORE	4.880	.10	4.42	.021	2.68	.004

All assay results are attached to the end of this report.

A semi quantitative spectrographic analysis was run on a composite sample of the brown and black ore bulk samples to insure that no important metal was being overlooked. This analysis is also attached to the back of this report and shows the brown

Detailed Geology - Mineralization (Cont...)

and black ore contains significant amounts of aluminum-1%, calcium-2%, copper-major%, iron-5%, lead-0.01%, magnesium-1%, manganese-0.1%, molybdenum-0.01%, potassium-2%, silicon-major%, silver-0.003%, sodium-0.5%, titanium-0.01%, vanadium-0.001% and zinc-0.1%. The sample was not checked for rhenium, which is an important byproduct at the nearby Island Copper Mine.

Ten zones of mineralization have been located to date by detailed geological mapping. Six of these showings are economically significant, the four along Branch Road 7 have received inadequate stripping, trenching or drilling to classify. The Rainbow Showings 1-4 (called Little Joe by former operators) are spread out along a strike length of 500 meters (1,600') and across widths of up to 18 meters (59'). The Cranberry (formerly T Showing) A and B Showings have been exposed along strike for 100 meters (328') and across widths up to 5 meters (16'). These 6 showings strike northeasterly, dip on the average 35 degrees southeast and range in thickness from 4.5' to 9.8' (1.4-3.0 meters).

A description of each showing follows. Refer to Preliminary Geological Map 1 in the back pocket for further details on geology, trenching and assays.

Rainbow 1 - Trench 1 exposed high grade chalcopyrite mineralization

1 meter wide x 2 meters deep x 12 meters long. This zone, which lies within limestone, has a maximum width of 10 meters. A grab R1 of typical mineralization assayed 7.9% Cu, 3.10oz/ton Ag

Detailed Geology - Mineralization (Cont...)

and .014oz/ton gold. If this zone attains a depth of 10' it could contain 560 tons ($\frac{52 \text{sq.m.} \times 10.77 \times 10'}{10}$).

Rainbow 2 - Trench 2, 1m.d.x3-5m.w.x18m.l., contains mainly black ore and the bulk sample of same was collected here. Referring to A. W. Poole's profile through diamond drill holes L.J. 3 and 4 from his report for Port Hardy Copper Mines, which is attached to this report, it seems very likely that this zone continues down dip for at least 200' (61meters) if it is as persistent as the zone above and parallel to it. In that case, this zone, which exceeds 3 meters (9.8') in thickness could contain 12,858 tons ($\frac{65.6' \times 9.8' \times 200'}{10}$). The Rainbow 2 Showing occurs at a limestone-volcanic contact and is associated with intrusive andesite dykes. At surface the dip of the mineralization is not apparent. The road west and north of this showing is 3-6meters below the showing and would be an excellent location to start an open cut for testing purposes.

Rainbow 3 -Trench 3, 1-2m.d.x4.5-18m.w.x30m.l., contains mainly brown ore and the bulk sample of same was collected here. Grab sample R3, typical of the mineralization, assayed 4.350% Cu, 2.00oz/ton silver and .009oz/ton gold. Referring to Poole's profile again if this zone is the same one cut from 63-67.5' in hole L.J.1 it could contain 9,077 tons to a depth of 62meters (205'). One should be careful in making assumptions for this zone, Port Hardy Copper Mines stepped their drilling out too far for this

Detailed Geology - Mineralization (Cont...)

type of mineralization. The Rainbow 3 Showing may lie entirely within limestone or at a limestone-volcanic contact (the hanging wall was covered by loose from the trenching). It may also be faulted to the west, geology is badly obscured by loose in this area.

Rainbow 4 - This showing was trenched across its exposed width in three places - Trench 5, 1m.d.x1m.w.x4m.l., grab sample R4-300W assayed 5.750% Cu, 2.90oz/ton silver and .007oz/ton gold; Trench 6, 1m.d.x1m.w.x3m.l., grab sample R4-0W assayed 11.450% Cu, 3.30oz/ton silver and .015oz/ton gold, grab sample 3151 assayed 8.20% Cu, 1.5oz/ton silver and 0.01oz/ton gold; Trench 7, 1m.d.x1m.w.x3m.l., only sparsely mineralized. Only skarn is exposed in this area and the author had attempted to develop a decent open cut at Trench 5 to properly sample the mineralization and determine dip and contacts but the hand plugger and chisel bits (which stuck in fractures) were inadequate for the job. Because of the 3-5meter scarp at the footwall this would be an excellent place to open cut for testing purposes. The distance from Trench 5 to 6 is 50 meters (164') of mineralization at least 1.8 meters (6') thick. If this mineralization persists down dip for at least half its strike length (25 meters) there is a possible tonnage here of 8,069 tons ($\frac{164' \times 82' \times 6'}{10}$). For convenience of calculations I have used 10 cubic feet of ore per ton but because of its richness locally it might average out at less than this.

Detailed Geology - Mineralization (Cont...)

Cranberry A - This 2 meter (6.5') thick zone is exposed for 60 meters along a limestone-volcanic andesite contact that dips 30 degrees to the southeast. Trench 1, 2-3m.d.x8-15m.w.x20m.l., was dug in 1964 at the recommendation of the author who had collected a 4.9 meter (16') chip across the zone prior to trenching that assayed 5% Cu. If this mineralization persists down dip for 30 meters (98') or half its strike length there is a possible tonnage here of 12,485 tons (196'x98'x6.5'). Three samples were

10

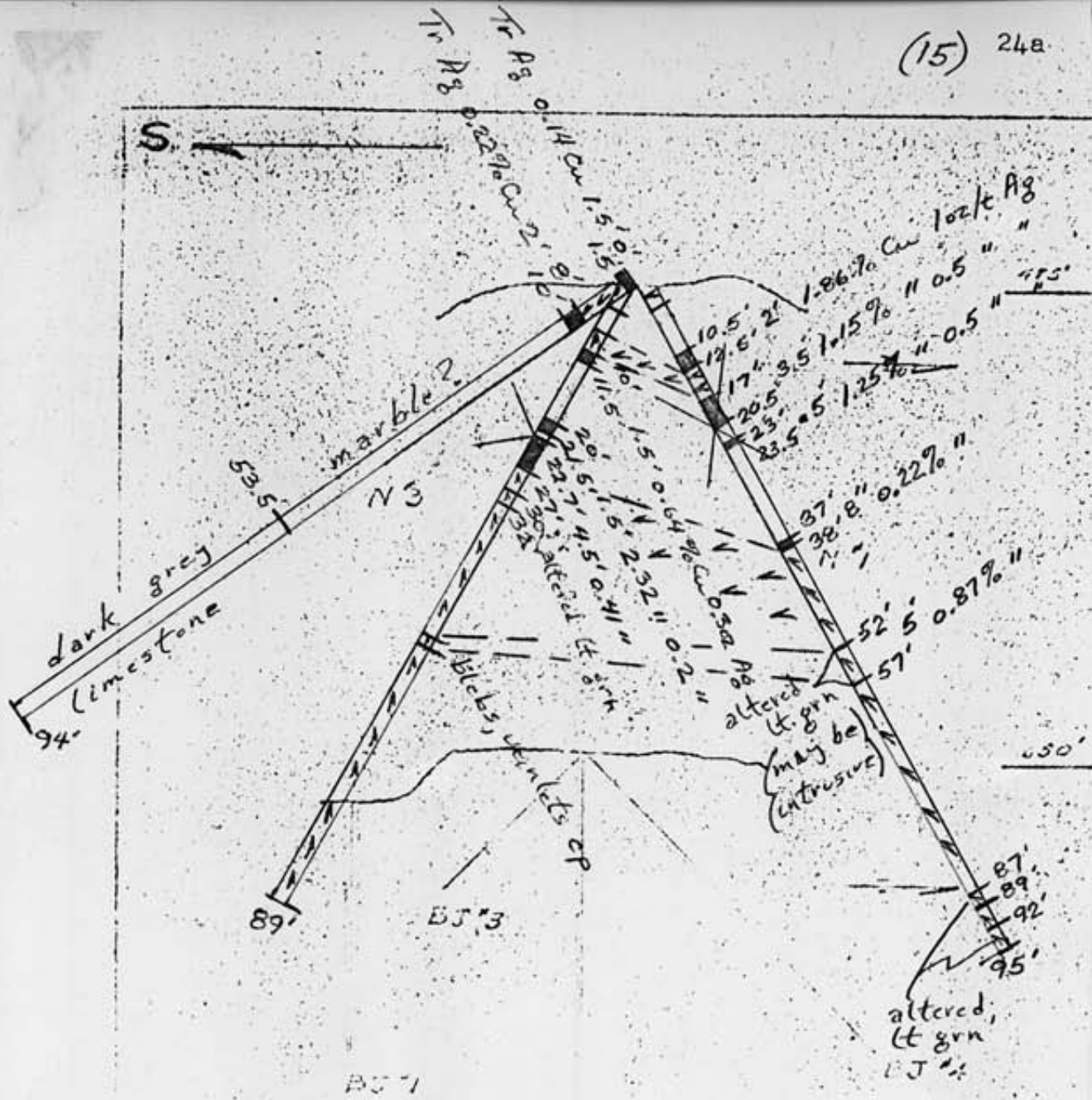
taken of this zone - grab Cranberry A assayed 3.180% Cu, .34oz/ton silver and .003oz/ton gold, grab sample 3150 assayed 10.25% Cu, Tr silver and Tr gold, and the aforementioned 4.9meter chip by the author.

Cranberry B - This 1.7 meter (5.5') thick zone is exposed for 27 meters (88.6') along a limestone-andesite contact that dips 35 degrees to the southeast. It appears to outcrop 70 meters (229.6') downslope. If this is so, there is a slab of mineralization containing 11,183 tons (88.6'x5.5'x229.6'). And the author was

10

very conservative in estimating the downward projection of the Cranberry A Showing. The Cranberry B Showing is in all likelihood a faulted portion of the Cranberry A Showing.

The following showings along Branch Road 7 are poorly exposed. Branch 7 Road Showing or the South Showing may correspond to Port Hardy Copper Mines Norm Showing. Their drilling profile of the Norm Showing, with mineralized intersections, is attached but without a location map I am uncertain if this drilling was done on the Branch 7 Road Showing or the South Showing. The profile



LEGEND

- Skarn
- Limestone
- Andesite

Vertical Section of
Norm (and Big John Showings)
 (McAndrew's) Scale - 1" = (50') 20'
 SOUTH SHOWING Nov. 12, 1963 AW Poole

Figure 3

Detailed Geology - Mineralization (Cont...)

does illustrate that they cut some significant values (copper to 2.32% and silver to 1oz/ton) in holes 1-3. The logs for Norm diamond drill holes 6 and 7 show significant intervals of copper mineralization but without their profile or location they are of little use.

East Showing - Is a very small exposure of skarn along an andesite contact due north of Branch Road 7. Grab sample 3320 assayed 1.69% Cu, 0.4oz/ton silver and 0.01oz/ton gold. This zone may be a continuation of the Branch 7 Road Showing 150 meters to the northwest. Additional trenching will be required to determine the trend and dimensions of this mineralization.

Branch 7 Road Showing - This skarn mineralization, greater than 5 meters wide, occurs along an andesite contact. Branch Road 7 obscures the true width and strike length. Grab sample 3319 from this zone assayed 8.45% Cu, 1.9oz/ton silver and 0.02oz/ton gold.

South Showing - The South Showing can be traced 35 meters along a limestone-andesite (?) contact, which strikes northwest and dips 30 degrees southwest. A trench, 1m.d.x2m.w.x3m.l., at the southeast limit of the exposure shows the mineralization consists of skarn rich in chalcopyrite and magnetite. The zone has a true thickness of 1 meter and the footwall is an aphanitic to very fine grained andesite, which is light green and carries appreciable disseminated chalcopyrite and may actually be an intrusive andesite sill. Two grab samples were taken, one rich in chalcopyrite and skarn assayed 4.25% Cu, 1.6oz/ton silver and 0.01oz/ton gold

Detailed Geology - Mineralization (Cont...)

(sample 3321) and the other sample 3322 rich in magnetite, chalcopyrite and skarn assayed 5.75% Cu, 0.2oz/ton silver and Tr gold. The limestone in the vicinity of the South Showing has nearly all been metamorphosed to marble. A vertical andesite dyke intrudes limestone and marble due west of the showing. It strikes northerly and has skarn rims, less than $\frac{1}{2}$ meter, thick, at the north limit of its exposure.

West Showing - Is a small, 1m.x3m., local zone of skarn within limestone. The unusual feature of this mineralization is its high pyrite content and the author thought it might contain significant gold. Grab sample 3318 assayed 6.7% Cu, 1.3oz/ton silver and 0.09oz/ton gold. The unique characteristic of the Cliff skarn deposits is their high silver content, elsewhere in British Columbia (exs. Texada Island, Hedley) the skarns usually carry significant gold values. A Vancouver geochemist remarked that if silver occurs in some of the showings on the property there was a good chance that elsewhere some mineralization might carry gold. Sample 3318 tends to support this contention and one should be on the lookout for zones rich in pyrite and/or arsenopyrite.

The author estimates there is more than 50,000 tons of ore in the Rainbow 1-4 and the Cranberry A and B Showings using depth projections of from 3 meters (10') to 70 meters (229.6'). Drilling information is inadequate to arrive at an average grade for this ore. Drill holes were too widely spaced.

Detailed Geology - Mineralization (Cont...)

Considering the numerous samples taken an initial mining product grading approximately 4% copper and 2oz/ton silver does not seem unrealistic. At \$1/lb copper and \$10/oz silver this would be \$100/ton ore.

To put the Cliff deposit in perspective a study was made of other deposits and mines in this general area, a few comments on each follows:

Copper Road (Bennet). Quadra Isl. - In 1963 had reserves of less than 230,000 tons grading 2.3% Cu and ½oz/ton silver, in shear zone. During 1966 processed 1,748 tons that yielded 118,427 lbs Cu.

Noble Claims. Quadra Isl. - Produced 248,848# Cu & 239ozs Au.

Santanna Group (D.C. Wing). Quadra Isl. - 4,000 tons of 2-4% Cu.

North Island Mines (Island Mines), Port Hardy - 4 miles due west of Cliff claims. In 1968 four areas of 1-6% Cu contained a total of approximately 10,000 tons across thicknesses up to 6.7', contact metasomatic.

H.P.H. Group (Pugh & Hepler), Nahwitti Lake - 14 miles northwest of Cliff claims, 1964 approximately 3,000 tons of massive Pb-Zn sulphides, some of which, assayed as high as 40oz/ton silver, within limestone. Examined by Giant Explorations Ltd. in 1965.

Nimpkish Copper (C. Millar), Nimpkish Lake - In 1970 planned to ship 4,000 tons of Cu & Cu-Zn higrade to Britannia Mines concentrator.

Nimpkish Iron, Nimpkish Lake - Produced 306,679 tons of iron ore with associated Cu and Zn, cont.-met. as was Nimpkish Copper.

Coast Copper (CM&S), Benson Lake - 20 miles southeast of Cliff claims. 1962-72 mined out 2.9million tons of Cu-Ag-Au ore, contact-

Detailed Geology - Mineralization (Cont...)

metasomatic. Except for the jaw crusher the Benson Lake concentrator was almost intact in 1979.

Yreka (Mitsubishi, Noranda), Yreka - 12 miles southwest of Cliff claims. Mined out 156,586 tons from 1965-67, which produced 19,665 tons of Cu concentrate or they were treating ore averaging about 4% Cu. This mine illustrates that the big corporations will work the small deposits if the demand is right. This was another contact metasomatic deposit.

Empire Development, Benson Lake - Produced 3 million tons of iron ore with associated Cu, con.-met.

Bob (R.A. McIver), Bonanza Lake - Reserves 15,000 tons of 4% Cu, 1970 M.B.H. Developments Ltd., Ex 4183 Station D., Vancouver mined 3,500 tons, con.-met.

Island Copper Mines (General Electric), Port Hardy - 2.5 miles due south of Cliff showings, 1968- 280 million tons of 0.522% Cu and 0.028% molybdenum sulphide, porphyry copper deposit. It is rumoured that Island Copper Mines has another major copper porphyry deposit 10 miles west of their present pit. In 1979 Island Copper's mill heads were averaging 0.46% Cu.

The above examples show how common the contact metasomatic type of deposit is in this portion of Vancouver Island. Some of these have been mined successfully in the past. When Anaconda American Brass had their concentrator at Britannia Beach the custom shipper got a fair return for his ore. Present mill operators (Island Copper, Rupert Inlet; Western Mines, Buttle Lake and

Detailed Geology - Mineralization (Cont...)

Falconbridge, Tasu Sound), when contacted, were not interested in milling custom ore. One would need a very high grade of ore to make any money shipping directly to Asarco's smelter at Tacoma, Washington. I understand they no longer have barge unloading facilities. Northair's mill at Squamish lacks a copper circuit as does Cominco's at Trail.

CONCLUSIONSBased On Geochemistry

Yellowknife Bear's Assessment Report 2381 titled "Geochemical and Magnetometer Surveys " was an invaluable reference in the course of geological mapping and their maps and the author's ammended maps will continue to be of great use during future mapping. Although this is essentially a geological report, any data considered relevant for a proper evaluation of the claims has been incorporated. Unfortunately considerable past data could not be recovered.

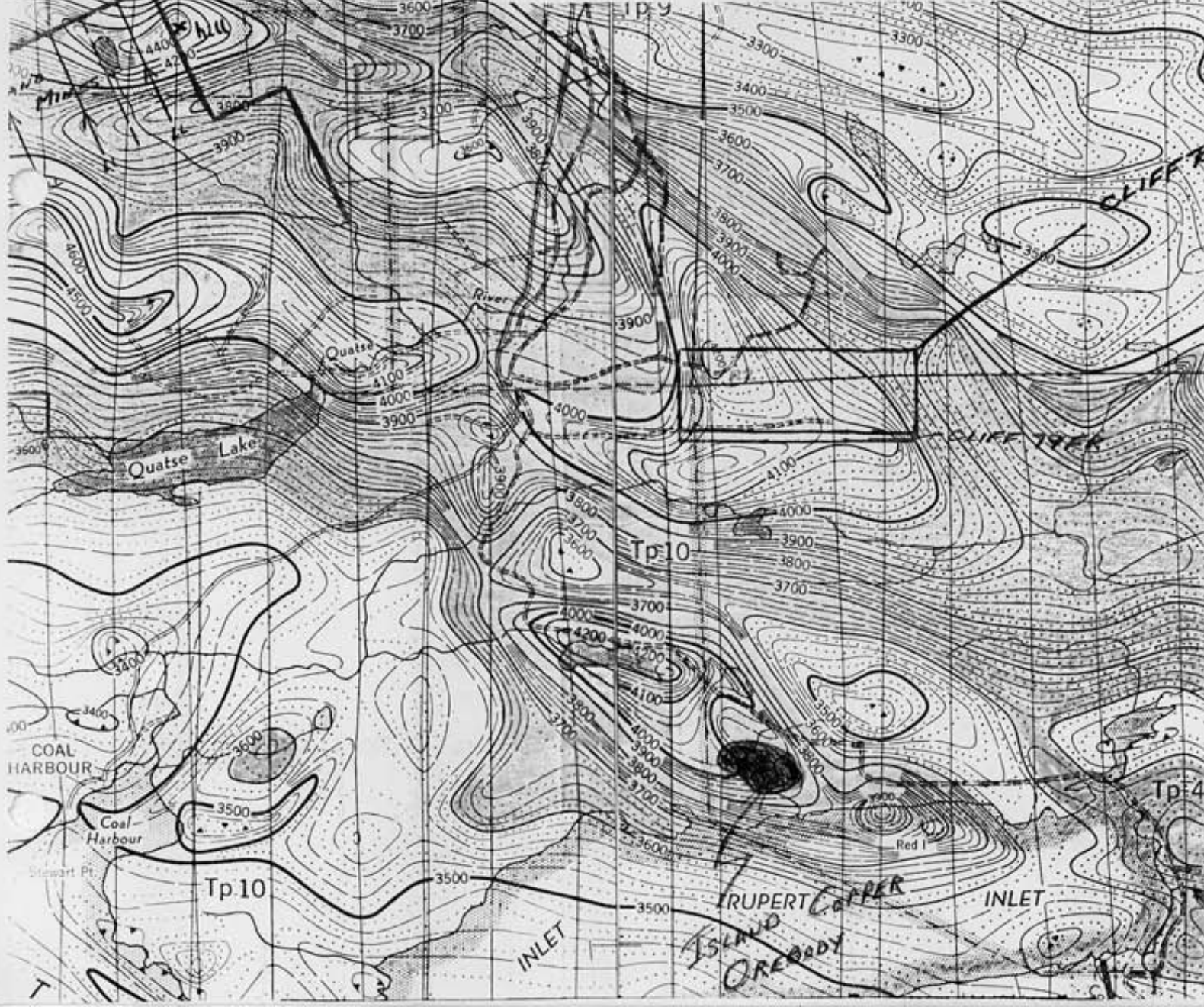
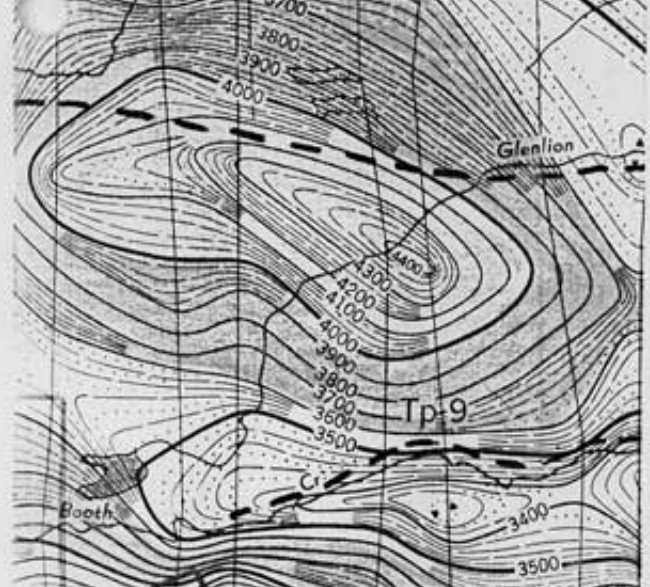
Geochemical Survey Copper Map 2 and Geochemical Survey Zinc Map 3, which accompany this report, show numerous significant anomalies in geologically unmapped portions of the claims, in particular:

- 1) Between the West Showing and the Cranberry B Showing.
- 2) West of Rainbow 1 and West Showings.
- 3) North of Cranberry A Showing.
- 4) North and east of East Showing.
- 5) South of the Rainbow 3 Showing.
- 6) West of the South Showing and south of Branch Road 7.



Aeromagnetic Map
of
CLIFF CLAIM AREA
Port Hardy, Vancouver Isl., B.C.
Scale 1:63,360 Survey 1962
Sept. 1980

Miles
1 1/2 0 1 2 3



Jenkinson RIVER 3500
3600
3700
3800
3900
4000
Glenlion
Tp-9
Booth
3400
3500
3600
3700

440
420
3800
3900
4000
4100
4200
4300
4400
4500
3600
Quatse Lake
3500
3600
3700
3800
3900
4000
4100
4200
4300
4400
4500
COAL HARBOUR
Coal Harbour
Stewart Pt
Tp-10
3500

Tp-9
3300
3400
3500
3600
3700
3800
3900
4000
4100
4200
4300
4400
4500
CLIFF RIVER
CLIFF TRAIL
Tp-10
3700
3800
3900
4000
4100
4200
4300
4400
4500
Red I
Tp-4
RUPERT COPPER INLET
ISLAND OREBODY

Conclusions - Based on Geochemistry (Cont...)

To date geochemistry has been very successful in locating zones of mineralization on the Cliff claims and the author is convinced that when the aforementioned anomalous areas are examined additional mineralization will be uncovered and tonnage possibilities markedly increased. There is every indication that another belt of mineralization, similar to that of the Rainbow 1-4 Showings, lies between the West and Cranberry B Showings.

Based On Magnetics

Yellowknife Bear's ammended Magnetometer Survey Map 4 also accompanies this report and shows numerous highly anomalous areas in unmapped portions of the claims. One cannot assume that all these anomalies indicate zones of mineralization since several of the rock types on the property, particularly the basalt and quartz-diorite, contain appreciable magnetite. Also some of the skarn mineralization has very little magnetite. Employing only a magnetometer survey the following showings would have been missed - Rainbow 2, Cranberry A and B, East and South.

The following anomalies will require future geological exploration to determine which are indicating mineralization:

- 1) Between West and Cranberry B Showings.
- 2) West and north of Rainbow 1 Showing.
- 3) South of Rainbow 4 Showing, one of these anomalies appears to be reflecting the downdip extension of this zone.

Conclusions - Based On Magnetics (Cont...)

- 4) Northeast of Cranberry A Showing, some of these anomalies are due to magnetic basalt.
- 5) East of East Showing.
- 6) East of Cranberry B Showing.
- 7) North of West Showing.

Naturally where geochemical and magnetic anomalies coincide there is a better chance of locating significant mineralization. The magnetic anomaly between the West and Cranberry B Showings because of its size (50meters x 480meters) and strength (3,500-5,150gammas) and the fact that it occurs in an area of numerous copper and zinc anomalies is of particular interest.

The 1 inch equals 1 mile aeromagnetic map of the Port Hardy-Rupert Inlet area surveyed by the Geological Survey of Canada, Department of Mines and Technical Surveys in 1962 is attached to this report. It consists of portions of the GSC Map 1734G-Quatsino and Map 1738G-Port McNeill. To obtain Total Field, add 53,071 gammas to the values shown. This map shows how the Cliff claims and the Island Copper orebody are related to aeromagnetic anomalies. The high (4,600gammas plus) due north of Quatse Lake probably indicates North Island Mines cont.-met. deposit. An anomaly that exceeds 4,200 gammas occurs immediately northwest of the Island Copper orebody. The showings of the Cliff claims lie within a large anomalous area which reaches a high of 4,200 gammas in the vicinity of the Rainbow 2 Showing.

Conclusions - Based On Magnetics (Cont...)

Insufficient geological mapping has been done in the area of the Cliff claims to determine exactly what is causing this large anomaly. Is it due to a concealed intrusive that is related to the mineralization? It does not coincide with the area of the magnetic quartz-diorite stock in the west portion of the property. Is it reflecting the mineralizing effects of this stock on the volcanics and sediments of the Cliff group? Future mapping and drilling may help to solve this problem.

Based On Geology

Ten (10) mineralized zones have been mapped on the Cliff claims to date. Six (6) of these consisting of the Rainbow 1-4 and Cranberry A and B Showings contain a possible tonnage in excess of 50,000 tons to down dip projections of from 3 to 70 meters. The drilling results available to the author are too limited and widely spaced to arrive at an overall grade for this tonnage but considering the many samples taken of typical mineralization from the various zones an initial mining product grading 4% copper and 2oz/ton silver seems realistic. Tonnage calculations were not projected along strike beyond the individual trenches so the above estimate is indeed very conservative. For example, if one assumes Rainbow 2 and 3 Showings are contiguous and part of the same zone, which they appear to be, the tonnage in this 150 meter interval to a depth of 61 meters would be approximately 69,000 tons (150x3.3'x 7'x200'). All showings have good road access.

10

The brown and black "ore" are quite distinct in appearance and could be selectively mined, considering the zinc and magnetite

Conclusions - Based On Geology (Cont...)

content of the black "ore", this might be desirable.

The West and Cranberry B Showings appear to occur at each end of a northeasterly trending belt of limestone and volcanics at least 800 meters (2,600') long. This belt is parallel to the one containing the Rainbow 1-4 Showings, which occur along a strike length of 500 meters (1,600'). The author is convinced that the lower belt will also contain significant mineral showings.

Mapping and drilling suggest that most of the deposits are tabular, dipping approximately 35 degrees southeasterly and 1.4-3 meters (4.5-9.8') thick, with the possible exception of the Rainbow 2 and 3 Showings, which are badly obscured by loose at the surface. These 2 showings may not conform to tabular shape. The Rainbow 2 Showing, considering the associated intrusive andesite dykes, may with drilling, prove to be an entirely different form of deposit. The Rainbow 3 Showing, because of its unusual width (up to 18 meters) at surface, suggests that these tabular deposits can thicken appreciably locally. One is left with the hope that on locating the proper geological environments on the Cliff claims skarn deposits of impressive dimensions will be discovered. There are some striking similarities between the Cliff deposits and the Craigmont orebodies (B.C.M.M.A.R. 1961 pages 31-37). They are all contact metasomatic and occur within Triassic rocks intruded by andesite, diorite and quartz-diorite. Craigmont's reserves in 1961 were 22,575,000 tons grading 2.08% copper and 19.6% iron.

Conclusions-- Based On Geology (Cont...)

Orebodies may be located by either extensive geosurveys, perseverance, or luck but it is usually a combination of all three of these. Approximately 18 outfits looked at the Craigmont property before 2 drillers, left to their own devices, drilled deeper than planned and hit the first orebody - net profits to date in excess of 50 million dollars. The Copper Island orebody was located with the eightieth hole.

Although approximately \$417,000 has been spent on the Cliff ground, the author views this as a plus feature. You have a large source of free data and work to base an evaluation on.

One can play number games with the total possible tonnage that might be developed within the Cliff claims but at this stage of knowledge that is all they would be. Suppose for example, that 1,000' of the 500 meter northern mineral belt persists down dip for 500' across a 5' thickness this would indicate 250,000 tons (1,000'x500'x5'). And suppose the south

10

belt contains an equal tonnage, that would boost the total possible tonnage to $\frac{1}{2}$ million.

If the author could have contacted someone, within a reasonable distance, willing to mill custom ore limited production could have commenced in 1979. Because of the topography there are several places ideal for open cuts (due west of Rainbow 2 and 4).

Recommendations

Findings to date on the Cliff claims are very encouraging

Recommendations (Cont...)

and further geosurveys and physical testing are now merited.

There follows a list of recommendations for such a program. One should never be dogmatic about recommendations and should newly acquired data warrant, the program can be modified.

1. Complete the detailed geological mapping, particularly in all geochemically and magnetically anomalous areas, at a scale of 1:1,000. It will be necessary to establish a grid system for control between the West and Cranberry B Showings. Great care should be taken in mapping faults and intrusives, ore controls will eventually have to be determined. In the past data, available to the author, little effort was made to differentiate between intrusive and flow andesite.

2. Complete the geochemical survey for copper and zinc in the west portion of the property, another grid system will be necessary. This will be a difficult area to soil sample due to the thickness of rotting logging debris. Do additional sampling in areas of 1 high anomalies.

3. Complete magnetometer survey in west portion of claims using geochem grid.

4. Contact outfit working ground due west of Cliff claims they might be willing to share some data.

5. Obtain recent air photo coverage of the claims ie. stereographic pairs. A topographic base will eventually be required for geological mapping, it may be feasible to prepare it from air photographs.

6. Investigate the feasibility of flying an EM survey

Recommendations (Cont...)

of the claims. Due to the dense undergrowth, in most parts of claims, any air survey that might be successful in locating new zones of mineralization should be considered.

7. Additional diamond drilling and trenching or stripping will be required to properly determine the grade and dimensions of the deposits, some of this could be done in conjunction with the aforementioned recommendations. Referring to Poole's profile of diamond drill holes L.J.1-4 page 22a it is obvious that they stepped their drilling out too far from the zones of surface mineralization to test this type of deposit particularly in view of the post mineral faulting noted in surface mapping and suggested by said profile. 20 to 30 meter step-outs should be planned for future drilling. Four (4) proposed holes have been plotted on Poole's profile.




The author has prepared a profile of Port Hardy Copper's diamond drill hole N7, which was a poor test of the dimensions of the Branch 7 Road Showing, since they drilled down the dip of the mineralization. It does show they cut some significant copper mineralization, and is attached.

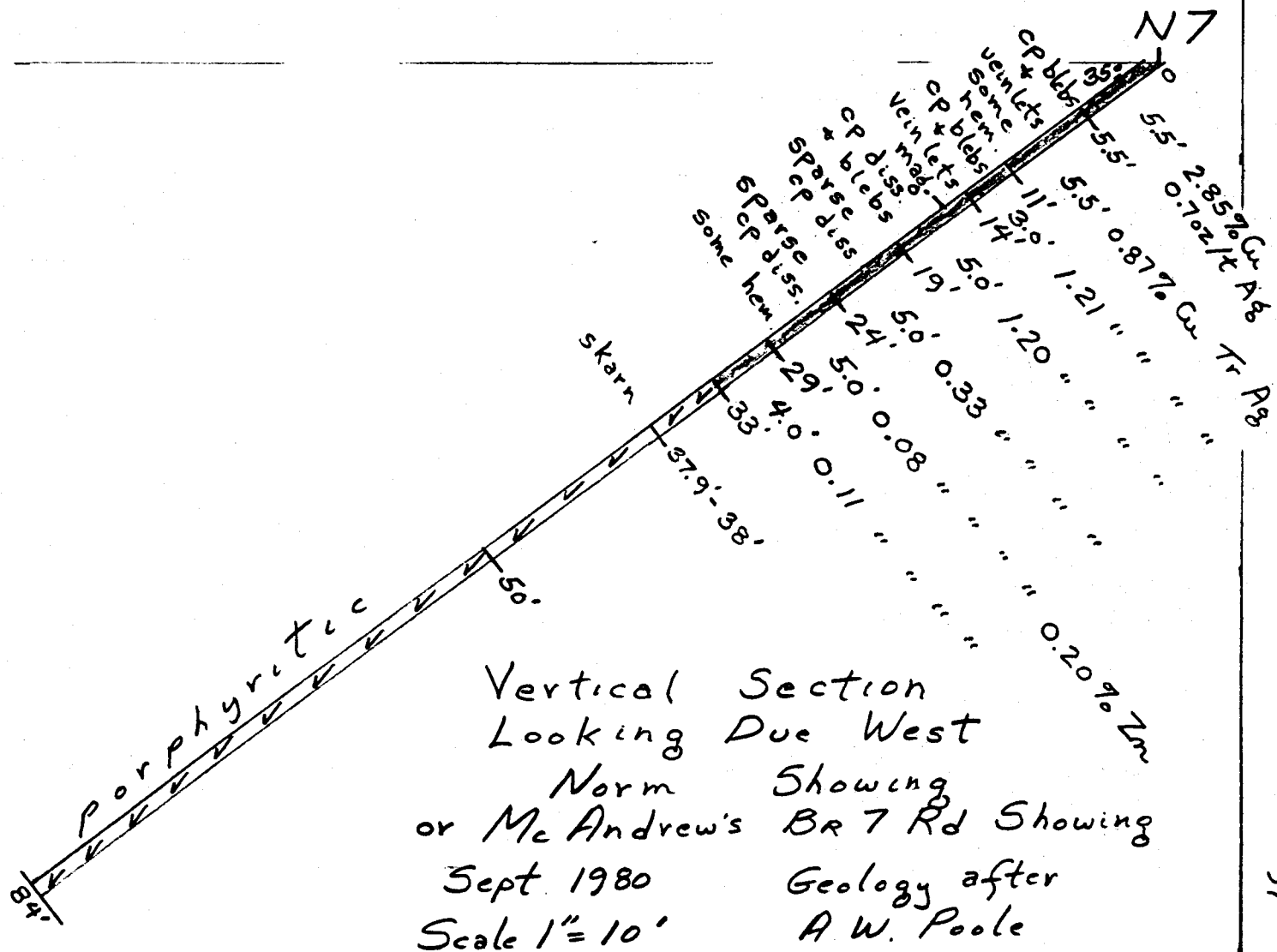
All the drill logs of holes drilled by Port Hardy Copper on the Cliff claims, that the author was able to obtain, are attached to this report for future reference. Drill hole N6, a test of the South Showing, did not merit a profile.

If the limestone and andesite horizons northwest of the West Showing are the same as those containing the Cranberry Showings

South

LEGEND

-  Skarn
-  Limestone
-  Andesite

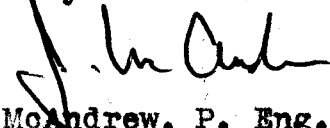


Recommendations (Cont...)

the large swamp in this area may conceal a mineralized limestone-andesite contact. A hole drilled northwesterly will probably be necessary to test this possibility.

8. Get some milling tests run on the brown and black "ore". Bulk samples for testing purposes can be easily obtained from open cuts in the various showings.

Submitted by



John M. McAndrew, P. Eng.

Prospector - Geologist

8961 Ursus Crescent
Surrey, B. C.

September 8, 1980

STATEMENT OF COSTS

CANADA
Province of British Columbia

IN the MATTER of

TO WIT: Geological report on behalf of
John M. McAndrew, Prospector-
Geologist

I John M. McAndrew of 8961 Ursus Crescent of Surrey in the Province of British Columbia Do Solemnly Declare that a geological survey was conducted on the Cliff 78 claim, consisting of 10 units, and the Cliff 79 Fraction in the Nanaimo M.D. located 9.5 kilometers south of Port Hardy, B.C. during the period November 12 to December 17, 1979 and a report describing this survey was prepared during the period August 18 to September 8, 1980. The following expenses were incurred:

1. Maps, drafting supplies, stationery	\$ 99.46
2. Field equipment	22.89
3. Room and board - 1 man 34 days (5/34 of this amount to Cliff 79 Fraction-\$120.55)	819.75
4. Transportation, ferries \$48, vehicle \$103.80	151.80
5. Wages - John M. McAndrew, Professional Engineer, November 12-23, 1979 - 12 days mapping on Cliff 78 claim	2,100.00
November 26-30, " - 5 days mapping on Cliff 78 claim	875.00
December 1-5 & 11-17, 1979 - 12 days mapping on Cliff 78 claim	2,100.00
December 6-10, 1979 - 5 days mapping on Cliff 79 Fr.	875.00
August 18 - September 8, 1980 - 20 days report preparation (apply 1/11 of this amount to Cliff 79 Fr - Daily rate \$175/day. \$318.18)	3,500.00
	<u>\$ 10,543.90</u>

AND I make this solemn Declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath, and by virtue of the Canada Evidence Act.

Declared before me

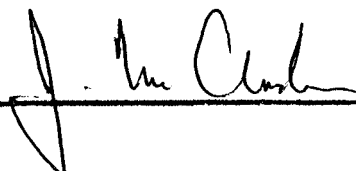
at

in the Province of

this

day of

A.D. 19



CERTIFICATION of JOHN M. McANDREW

8961 Ursus Crescent, Surrey, B. C. V3V 6L3 Phone 591-6512

1. Registered as a Professional Engineer by the Association of Professional Engineers of British Columbia, Canada.
2. B. Sc. in Geology from the University of Alberta, Edmonton, Alberta; post graduate courses in surveying, McGill University, Montreal, Quebec.
3. Prior to consulting the author spent seventeen years in exploration, property evaluation, mine geology and production with the following companies:

Anaconda American Brass Limited - Copper, Molybdenum, Tungsten.

Silver Titan Mines - Silver, Lead, Zinc.

Columbia Iron Mining Co. - Coal.

Newmont Exploration Ltd. - Nickel, Copper.

Iron Ore Company of Canada Ltd. - Direct Shipping Iron Ore.

N. W. Byrne Company - Gold.

Quebec Cartier Mining Co. Ltd. - Concentrating Iron Ore.

Eldorado Mining and Refining Co. - Uranium.

International Nickel Co. - Nickel, Copper.

Addendum:

1979 Risby Tungsten Mines Ltd. - Tungsten.

Dated this 8 day of SEPT. . 1980, in VANCOUVER, B. C.


JOHN M. McANDREW, P. Eng.

Prospector - Geologist



can test

45

To:

1650 DUVER, B.C. V5L 1L6 • TELEPHONE 254-7278

Min En Laboratories Ltd. *SEMI QUANTITATIVE SPECTROGRAPHIC*

Telex 04-54210

ANALYSIS CERTIFICATE

705 West 15th Street,

File No. 9076 C

North Vancouver, B. C.

Date Feb. 9, 1979.

*COMPOSITE SAMPLE OF
BROWN & BLACK ORES CUFF CLAIMS*We hereby Certify that the following are the results of semi analysis made on Ore samples submitted.

		1	2	3	Sample Identification
Aluminum	Al	1.			Sample 1: 100
Antimony	Sb	ND			Sample 2:
Arsenic	As	ND			Sample 3:
Barium	Ba	ND			Sample 4:
Beryllium	Be	ND			Sample 5:
Bismuth	Bi	ND			
Boron	B	TRACE			
Cadmium	Cd	ND			
Calcium	Ca	2.			
Chromium	Cr	ND			
Cobalt	Co	ND			
Copper	Cu	MAJOR			
Gallium	Ga	ND			
Gold	Au	TRACE			
Iron	Fe	5.			
Lead	Pb	0.01			
Magnesium	Mg	1.			
Manganese	Mn	0.1			
Molybdenum	Mo	0.01			
Niobium	Nb	ND			
Nickel	Ni	ND			
Potassium	K	2.			
Silicon	Si	MAJOR			
Silver	Ag	0.003			
Sodium	Na	0.5			
Strontium	Sr	ND			
Tantalum	Ta	ND			
Thorium	Th	ND			
Tin	Sn	ND			
Titanium	Ti	0.01			
Tungsten	W	ND			
Uranium	U	ND			
Vanadium	V	0.001			
Zinc	Zn	0.1			

Percentages of the various elements expressed in these analyses may be considered accurate to within plus or minus 35 to 50% of the amount present.

Semi-quantitative spectrographic analytical results for gold and silver are normally not of a sufficient degree of precision to enable calculation of the true value of ores. Therefore, should exact values be required, it is recommended that these elements be assayed by the conventional Fire Assay Method. Quantitative and Fire Assays may be carried out on the retained pulp samples.

Silicon, aluminum, magnesium, calcium and iron are normal components of complex silicates.

MATRIX -- Major constituent
 MAJOR -- Above normal spectrographic range
 TRACE -- Detected but minor amounts
 N.D. -- Not detected
 * -- Suggest assay (above 0.3%)

All results expressed as **Percent**

Note: Pulps retained one week.

ALL REPORTS ARE THE CONFIDENTIAL PROPERTY OF CLIENTS. PUBLICATION OF STATEMENTS, CONCLUSION OR EXTRACTS FROM OR REGARDING OUR REPORTS IS NOT PERMITTED WITHOUT OUR WRITTEN APPROVAL. ANY LIABILITY ATTACHED THERETO IS LIMITED TO THE FEE CHARGED.

CAN TEST LTD.

C. F. Burgess

Spectroscopist

PREMIUM - NOT R U W!



DEPARTMENT OF MINES AND PETROLEUM RESOURCES
VICTORIA

SAMPLE RECEIVED FROM..... JOHN McANDREW

ADDRESS..... 8961 Ursus Crescent, Surrey, B. C. V3V 6L3

LABORATORY No.	SUBMITTER'S MARK	LABORATORY REPORT
3318	6901 A WEST SHOWING	<p>Spectrographic Analysis: Copper; 0.4% Zinc; 0.03% Lead; 0.15% Arsenic and 0.08% Cobalt were found. The other base metals found, and their percentages, were those occurring normally in rocks.</p> <p>Gold - 0.09 oz. per ton Silver - 1.3 oz. per ton Copper - 6.7%</p>
3319	6902 A BRANCH 7 ROAD	<p>Spectrographic Analysis: Copper; 0.03% Lead and 0.01% Zinc were found. The other base metals found, and their percentages, were those occurring normally in rocks.</p> <p>Gold - 0.02 oz. per ton Silver - 1.9 oz. per ton Copper - 8.45%</p>
3320	6903 A EAST SHOWING	<p>Spectrographic Analysis: Copper; 0.015% Cobalt and 0.01% Molybdenum were found. The other base metals found, and their percentages, were those occurring normally in rocks.</p> <p>Gold - 0.01 oz. per ton Silver - 0.4 oz. per ton Copper - 1.69%</p>

THIS DOCUMENT, OR ANY PART THEREOF, MAY NOT BE REPRODUCED
FOR PROMOTIONAL OR ADVERTISING PURPOSES.

DATE..... February 18, 1980

W. M. G. Jones
CHIEF ANALYST AND AS



DEPARTMENT OF MINES AND PETROLEUM RESOURCES
VICTORIA

SAMPLE RECEIVED FROM..... JOHN McANDREW Page 2

ADDRESS..... 8961 Ursus Crescent, Surrey, B.C.

LABORATORY No.	SUBMITTER'S MARK	LABORATORY REPORT
3321	6904 A SOUTH SHOWING SKARN	<p>Spectrographic Analysis: Copper was found. The other base metals found, and their percentages, were those occurring normally in rocks.</p> <p>Gold - 0.01 oz. per ton Silver - 1.6 oz. per ton Copper - 4.25%</p>
3322	6905 A SOUTH SHOWING MAGNETITE	<p>Spectrographic Analysis: Copper and 0.025% Cobalt were found. The other base metals found, and their percentages, were those occurring normally in rocks.</p> <p>Gold - Trace Silver - 0.2 oz. per ton Copper - 5.75%</p>

THIS DOCUMENT, OR ANY PART THEREOF, MAY NOT BE REPRODUCED FOR PROMOTIONAL OR ADVERTISING PURPOSES.

DATE..... February 18, 1980

W. M. Johnson

CHIEF ANALYST AND



DEPARTMENT OF MINES AND PETROLEUM RESOURCES
VICTORIA

SAMPLE RECEIVED FROM..... JOHN McANDREW

ADDRESS..... 8961 Ursus Crescent, Surrey, B. C. V3V 6L3

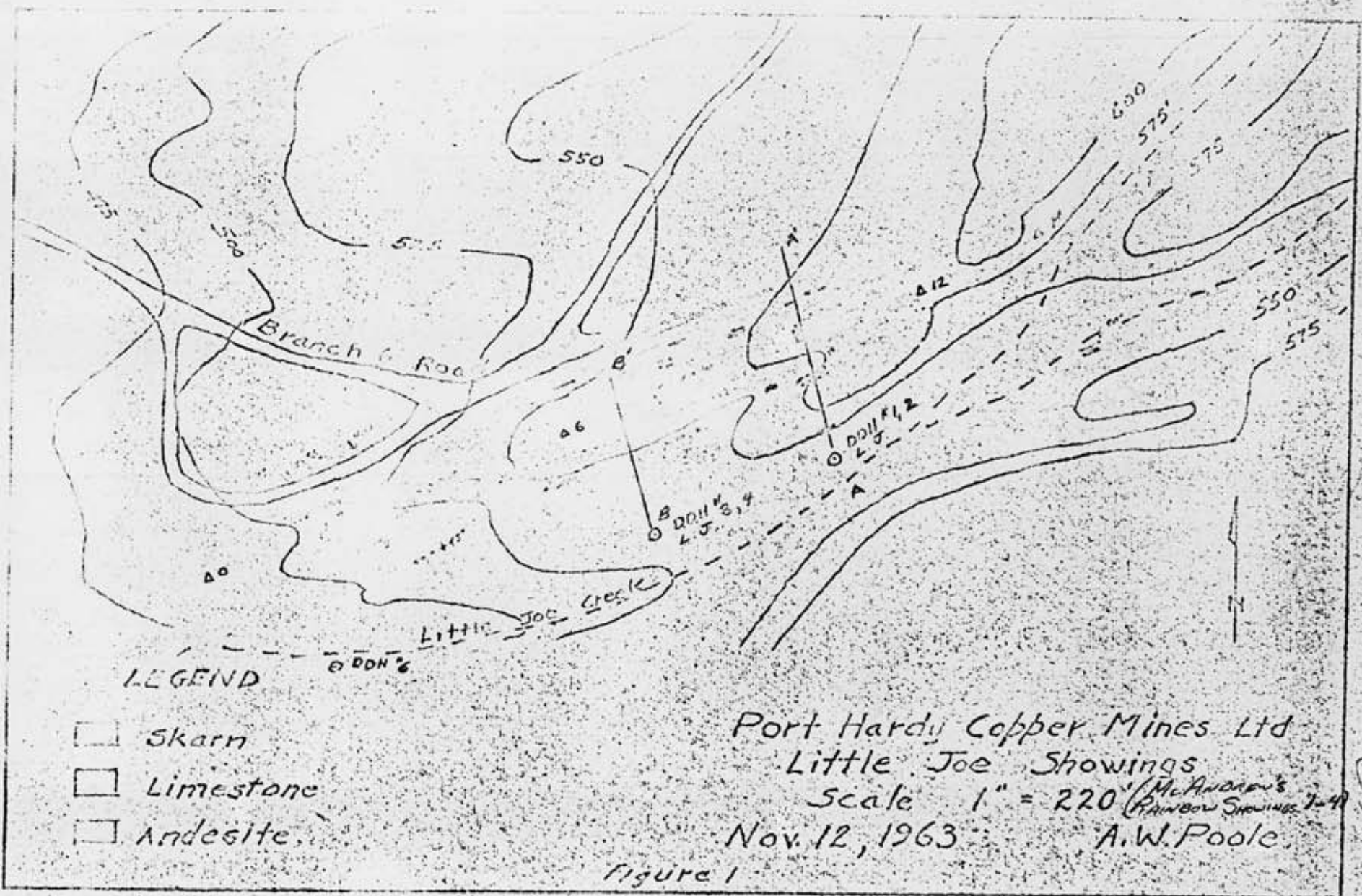
LABORATORY No.	SUBMITTER'S MARK	LABORATORY REPORT
3150	CRANBERRY TRENCH #1	<p>Spectrochemical Analysis: Copper; 0.02% Cobalt and 0.03% Zinc were found. The other base metals found, and their percentages, were those occurring normally in rocks.</p> <p>Gold - Trace Silver - Trace Copper - 10.25%</p>
3151	RAINBOW 4 TRENCH #6	<p>Spectrochemical Analysis: Copper; 0.02% Cobalt and 0.06% Zinc were found. The other base metals found, and their percentages, were those occurring normally in rocks.</p> <p>Gold - 0.01 oz. per ton Silver - 1.5 oz. per ton Copper - 8.20%</p>

THIS DOCUMENT, OR ANY PART THEREOF, MAY NOT BE REPRODUCED
FOR PROMOTIONAL OR ADVERTISING PURPOSES.

DATE..... October 10, 1979.....

William Johnson

CHIEF ANALYST AND ASSAYER



DIAMOND DRILL - HOLE LOG

PORT HARDY COPPER MINES LTD.

HOLE NO. L.J. #1 Little Joe
 LENGTH 165'
 Bearing As 345°
 Dip -45°

Page 1 of 2

Depth Core, Formation

	EX	
0 - 6		Overburden - no core.
6 - 42		Andesite - light to dark grey-porphyrific minute calcite seams, epidote inclusions. 17' to 22' - limestone pieces intermixed with and. 22' to 42' pyrite crystals sparsely disseminated throughout. Occasional bleb of chalcopyrite.
42 - 53		Limestone - grey to dark grey, contact gradational within inches.
53 - 58		Skarn - gradational change from limestone, garnet, epidote, some calcite seams,
58 - 63		Skarn-garnet, 59.4' to 61.5' blebs and veinlets chalcopyrite. Increase of amphibole at 61.5'.
63 - 65		Skarn-amphibole-garnet pyroxene, alternate veinlets, considerable chalcopyrite in blebs and veinlets, magnetite.
65 - 67		Skarn-amphibole, occasional crystal of chalcopyrite and sphalerite. Sphalerite at 66.5'. Contact -60° to core axis.
67 - 70		Limestone - dark grey, bottom contact 45°

CORE SAMPLES

<u>Core</u>	<u>Assay</u>			<u>Length</u>	<u>No.</u>
<u>Cu</u>	<u>Au</u>	<u>Ag</u>	<u>Zn</u>		
<u>%</u>	<u>oz/ton</u>	<u>oz/ton</u>	<u>%</u>		

0.04	Tr.	Tr.	Tr.	5.0'	110
0.15			Tr.	5.0'	S-1
2.23			0.47	4.5'	S-2

70 - 72	Skarn - fibrous amphibole, some pyroxene inclusions, sphalerite, rare chalcopyrite blebs.				
72 - 77	Skarn-amphibole grading to garnet to pyroxene. 74' to 75' strongly magnetic slightly magnetic to 77', 73' to garnet - pyroxene bands 1/8" inch wide. Occasional sphalerite.	Tr.	0.56 Tr.	4.5' 3.0'	
77 - 82	Skarn-pyroxene grading into mixed pyroxene-garnet skarn. Magnetite from 77' to 80'.	Tr.	Tr.	5.5'	
82 - 97	Andesite-grey green to dark green, occasional speck chalcopyrite, epidote inclusions.				
97 - 101	Skarn - garnet, occasional bleb chalcopyrite. " calcite stringer at 98'				
101- 104	Skarn - pyroxene, garnet andesite mixture. Some chalcopyrite, pyrite hematite.		0.04	Tr.	Tr. 3.75'
104- 116.5	Andesite-grey green to dark green, many small calcite stringers, some hematite. Amygdaloidal 108' to 112'		0.04 0.01	Tr.	0.10 3.0'
116.5-123	Skarn - garnet. No apparent mineralization		0.05		
123 -145	Andesite - dark greenish grey, some hematite on fractures. Limey throughout. Mud at 139'. Considerable disseminated pyrite from 147' to 149'.			Tr.	5.5'
165'	End of hole.				

Note: Sample no. designated with prefix S were sampled prior to the logging of core and assay results were obtained from Port Hardy Copper Mines Ltd.

DIAMOND DRILL - HOLE LOG

PORT HARDY COPPER MINES LTD.

Page 1 of 1.

HOLE NO. L.J. #2 Little Joe
Length 112'
Dip 90°

CORE SAMPLES

Depth Core Formation
BX

0 - 20		Overburden - no core.	
20- 80		Andesite - greenish grey, porphyritic some minute calcite stringers, chips from 50' to 53'. Core becomes darker in color towards 80'.	None taken
80- 95		Andesite - dark grey, few calcite stringers, at 85'.	
95- 112		Andesite - greenish grey.	
112		End of hole.	

DIAMOND DRILL - HOLE LOG

PORT HARDY COPPER MINES LTD.

HOLE NO. L.J. #3 Little Joe
 Length 149'
 Bearing Az 345°
 Dip -39°

Page 1 of 1.

Depth	Core	Formation	CORE SAMPLES				Length	No.
			Core Cu %	Au Oz/ton	Assay Ag Oz/ton	Zn %		
0 - 12	BX	Overburden - no core						
12 - 28		Andesite- dark grey - porphyritic from 12' to 13' and 18' to 28'/some pyrite crystals from 18' to 19'						
28 - 41.5		Limestone- dark grey						
41.5-46		Skarn - high percentage of epidote from 42' to 46'. Sparse sulphide crystals	0.04	Tr.	Tr.	0.05	4.5'	113
46 - 47		Skarn - garnet 9"	0.03	Tr.	Tr.	0.10	0.8'	112
47 - 53.5		Limestone - dark grey						
53.5-58		Skarn - 1/2" band garnet followed by epidote. Few bands garnet, some amphibole from 57.5' to 58'						
58'-110.7		Limestone - dark grey, broken chips and mud at 64' - 83.5'						
110.7-115		Skarn - garnet to garnet pyroxene - pyroxene from 113' to 115'. Chalcocopyrite in veinlets and blebs throughout, high percentage of epidote from 114' to 115'	0.43	Tr.	Tr.	0.25	4.3'	114
115 - 149		Andesite-dark greenish grey-altered zone from 115' to 117'- limey to 122'. Epidote inclusions quite prominent in places. Occasional cluster of chalcocopyrite crystals, bleb at 145'. Color becomes almost black for last feet of core. Chips from 148' to 149'						
149		End of hole						

DIAMOND DRILL- HOLE LOG

PORT HARDY COPPER MINES LTD.

page 1 of 1.

HOLE NO. L.J.#4 Little Joe
 Length 132'
 Dip 90°

Depth	Core	Formation	CORE SAMPLES				Length No.
			Core Cu %	Au oz/ton	Assay Ag oz/ton	Zn %	
	BX						
0 - 13		Overburden - no core					
13 - 20.5		Limestone -silicified from 13' to 13.5', dark grey, crystalline, some pyrite crystals at lower contact					
20.5-22		Andesite-greenish grey, contact at 70° to axis. Epidote at contact					
22 -23		Skarn - 6" high percentage epidote than 6" dark grey andesite. Both contacts 70° to axis of core					
23 -25.5		Skarn-epidote to 23.5', change to garnet with pyroxene inclusions. Blebs and veinlets of chalcopyrite magnetite, last 6"	0.04	Tr.	Tr.	Tr.	2.5' 115
25.5-30.5		Limestone - dark grey, crystalline, some calcite veinlets at 30' to 30.5'					
30.5-34.5		Altered zone-high percentage of epidote, pyroxene inclusions, some blebs of sulphide at 34'	0.04	Tr.	Tr.	Tr.	4.0' 116
34.5-102		Limestone - dark grey to black, lower contact at 45° to core.					
102-110		Skarn - garnet with epidote, no apparent mineralization	0.04	Tr.	Tr.	0.15	4' 117
110-132		Andesite - dark greenish grey	0.04	Tr.	Tr.	0.20	4' 118
132		End of hole					

DIAMOND DRILL - HOLE LOG

PORT HARDY COPPER MINES LTD.

Page 1 of 1.

HOLE NO. N#1 Norm
 Length 95'
 Bearing Az 350°
 Dip -60°

Depth	Core	Formation	CORE SAMPLES				Length	No.
			Core		Assay			
			Cu	Au	Ag	Zn		
			%	oz/ton	oz/ton	%		
	BX							
0 - 4		Andesite-chips and pieces						
4 - 10.5		Limestone-light grey to almost white						
10.5-12.5		Skarn-garnet, blebs and veinlets of chalcopryrite, bornite bleb at 10.5'. No mineral last 6"	1.86	0.04	1.0		2.0	S-8
12.5 - 17		Andesite-grey green, limey						
17 - 20.5		Skarn - garnet with some pyroxene inclusions, some blebs and veinlets of chalcopryrite, some hematite, lower contact at 35° to core.	1.15		0.5	0.05	3.5	S-9
20.5-23		Limestone dark grey						
23 - 23.5		Skarn - garnet, blebs and veinlets of chalcopryrite	1.25	0.02	0.5	0.05	0.5'	119
23.5 - 37		Limestone - dark grey						
37 - 38		Skarn - 8", garnet, veinlet of chalcopryrite at contact with limestone; no further apparent mineralization.	0.22				3.0	S-10
38 - 57		Andesite - altered, soft, light green, minute calcite stringers, occasional epidote. Section 52' to 57 contains sparse chalcopryrite as blebs and veinlets.	0.87				5.0	S-11
57 -87		Andesite - hard, dark grey						
87 - 89		Andesite - altered, light green						
89 - 92		Andesite - dark grey, broken pieces						
92 - 95		Andesite - altered, light green-minute calcite stringers.						
		And of hole						

DIAMOND DRILL - HOLE LOG

PORT HARDY COPPER MINES LTD.

Page 1 of 1.

HOLE NO. N#2 Norm
 Length 89'
 Bearing Az 176°
 Dip 61°

Depth Core Formation
 BX

CORE SAMPLES

<u>Core</u>	<u>Assay</u>			<u>Length</u>	<u>No.</u>
<u>Cu</u>	<u>Au</u>	<u>Ag</u>	<u>Zn</u>		
<u>%</u>	<u>oz/ton</u>	<u>oz/ton</u>	<u>%</u>		

0 - 4		Overburden						
4 - 7		Limestone- light grey, crystalline						
7 - 10		Andesite - light green, limey						
10 - 11.5		Skarn- garnet, pyroxene inclusions, some hematite, chalcopyrite blebs and veinlets from 10.3' to 10.5'	0.64	0.01	0.3	0.10	1.5'	120
11.5-20		Limestone- light grey						
20 - 21.5		Skarn-garnet, few pyroxene inclusions, well mineralized with blebs and veinlets chalcopyrite	2.32	0.01	0.2	0.05	1.5'	121
21.5-22.7		Limestone-dark grey, contact with skarn 50° to axis of core						
22.7-27		Skarn- garnet, blebs and veinlets of chalcopyrite, become very sparse towards 27'	0.41			0.05	4.5'	S-12
27 - 89		Andesite - dark grey, porphyritic, altered to light green from 30 to 32', then greenish grey from 32' to 50'- Water loss at 40.5'. Occasional bleb and veinlets of chalcopyrite from 51' to 52.5'						
89		End of hole						

DIAMOND DRILL - HOLE LOG

PORT HARDY COPPER MINES LTD.

HOLE NO. N#3 Norm
Length 94'
Bearing Az 180°
Dip -36°

Page 1 of 1.

<u>Depth</u>	<u>Core</u>	<u>Formation</u>	<u>CORE SAMPLES</u>				<u>Length</u>	<u>No.</u>
			<u>Core</u>	<u>Assay</u>				
			<u>Cu</u>	<u>Au</u>	<u>Ag</u>	<u>Zn</u>		
			<u>%</u>	<u>oz/ton</u>	<u>oz/ton</u>	<u>%</u>		
	BX							
0 - 1.5'		Skarn - garnet, occasional chalcopyrite crystal, hematite stain	0.14	Tr.	Tr.	Tr.	1.5'	122
1.5- 8		Andesite - light greenish grey, pieces & chips						
8 - 10		Skarn - (highly altered limestone) some hematite, and disseminated pyrite, chalcopyrite	0.22	Tr.	Tr.	0.10	2.0'	123
10 - 94		Limestone - light grey, crystalline, Change to dark grey at 53.5'						
94		End of hole						

DIAMOND DRILL - HOLE LOG

PORT HARDY COPPER MINES LTD

HOLE NO. N#6 Norm
Length 21.5'
Bearing Az 148°
Dip -35°

Page 1 of 1.

Depth core Formation

EX

0 - 2.3 Skarn - garnet, altered, some chalcopyrite
in blebs and veinlets, bleb of bornite.
2.3- 4.5 Skarn - altered, mineralization as above.
4.5-21-5 Andesite-grey, green, pieces and chips
to 11'. Porphyritic epidote inclusion from
18' to 21.5'
21.5 End of hole

CORE SAMPLES

Core		Assay		Length	No.
Cu	Au	Ag	Zn		
%	oz/ton	oz/ton	%		

1.62	0.02	1.0	0.10	2.3'	124
2.19	0.02	0.9	0.10	2.2'	125

DIAMOND DRILL - HOLE LOG

PORT HARDY COPPER MINES LTD.

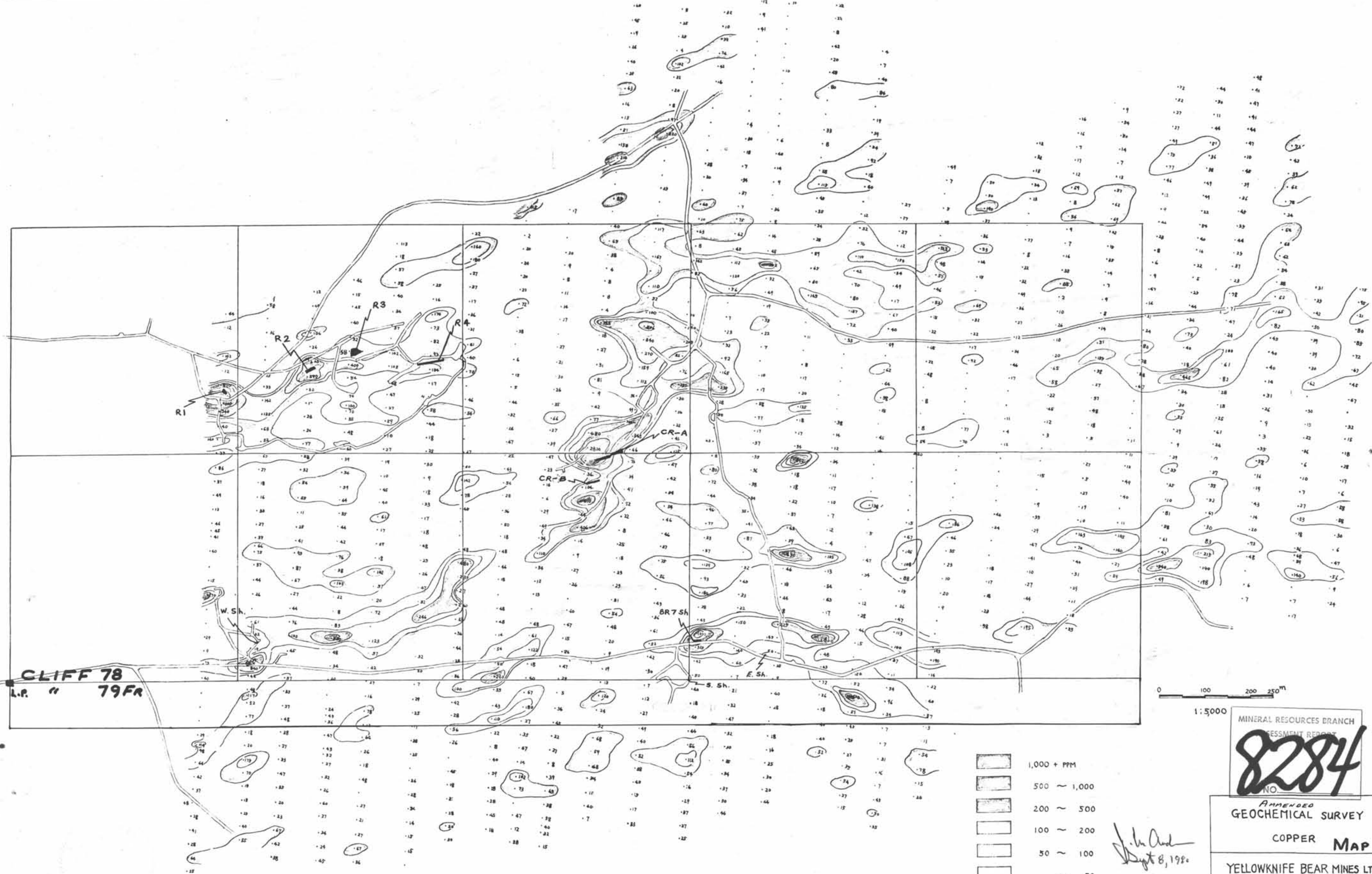
HOLE NO. N#7 Norm
 Length 84'
 Bearing Ag 180°
 Dip -35°

Page 1 of 1.

Depth Core Formation

CORE SAMPLES




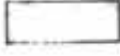
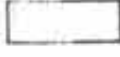

<u>Depth</u>	<u>Core</u>	<u>Formation</u>	<u>Assay</u>				<u>Length</u>	<u>No.</u>
			<u>Cu</u>	<u>Au</u>	<u>Ag</u>	<u>Zn</u>		
			<u>%</u>	<u>oz/ton</u>	<u>%</u>	<u>%</u>		
0 - 5.5		Skarn - altered, chalcOPYrite in blebs and veinlets	2.85	0.01	0.7	Tr.	5.5'	126
5.5 - 11.		Skarn - garnet, chalcOPYrite in blebs and veinlets, some hematite	0.87	Tr.	Tr.	Tr.	5.5'	127
11 - 14		Skarn - garnet, chalcOPYrite in blebs and veinlets	1.21	Tr.	Tr.	Tr.	3.0'	128
14 - 19		Skarn - garnet, well mineralized from 14' to 15.5' with chalcOPYrite, magnetite at 15.5'. ChalcOPYrite in blebs and disseminated from 15.5' to 19' - Pyroxene inclusions.	1.20	0.01	Tr.	Tr.	5.0'	129
19 - 24		Skarn - garnet, some pyroxene inclusions. ChalcOPYrite sparsely disseminated	0.33	Tr.	Tr.	Tr.	5.0'	130
24 - 29		Skarn - garnet with pyroxene inclusions. ChalcOPYrite very sparsely disseminated, some hematite	0.08	Tr.	Tr.	0.20	5.0'	131
29 - 33		Skarn - garnet, some pyroxene inclusions. ChalcOPYrite sparsely disseminated throughout some hematite	0.11	Tr.	Tr.	Tr.	4.0'	132
33 - 84		Andesite-dark grey green-some minute calcite stringers. Small bleb of garnet skarn at 37.9' to 38.0' Porphyritic from 50' to 84'						
84		End of hole						



CLIFF 78
L.R. " 79FR



1:5000

-  1,000 + PPM
-  500 ~ 1,000
-  200 ~ 500
-  100 ~ 200
-  50 ~ 100
-  ~ 50

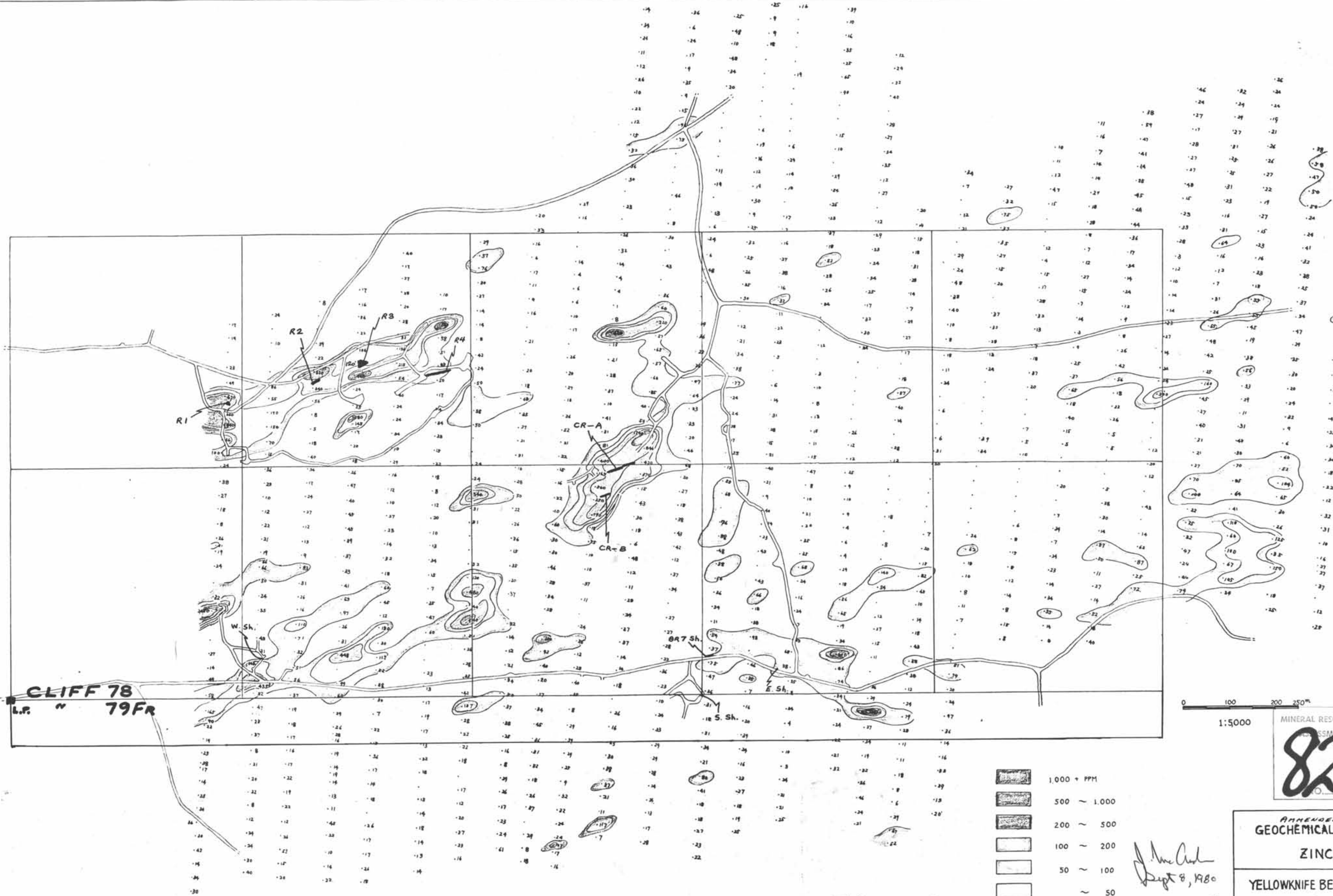
MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
8284
NO.

AMENDED
GEOCHEMICAL SURVEY
COPPER **MAP 2**







John M. M. Anderson
Sept 8, 1980
DATED SEPT 8, 1980

To ACCOMPANY GEOLOGICAL ASSESSMENT REPORT BY JOHN M. M. ANDERSON, P. ENG.

YELLOWKNIFE BEAR MINES LTD.
PORT HARDY OPTION
1970 ASSESSMENT REPORT 2381



CLIFF 78
L.R. " 79FR

-  1,000 + PPM
-  500 ~ 1,000
-  200 ~ 500
-  100 ~ 200
-  50 ~ 100
-  ~ 50

0 100 200 250m
1:5000 MINERAL RESOURCES BRANCH

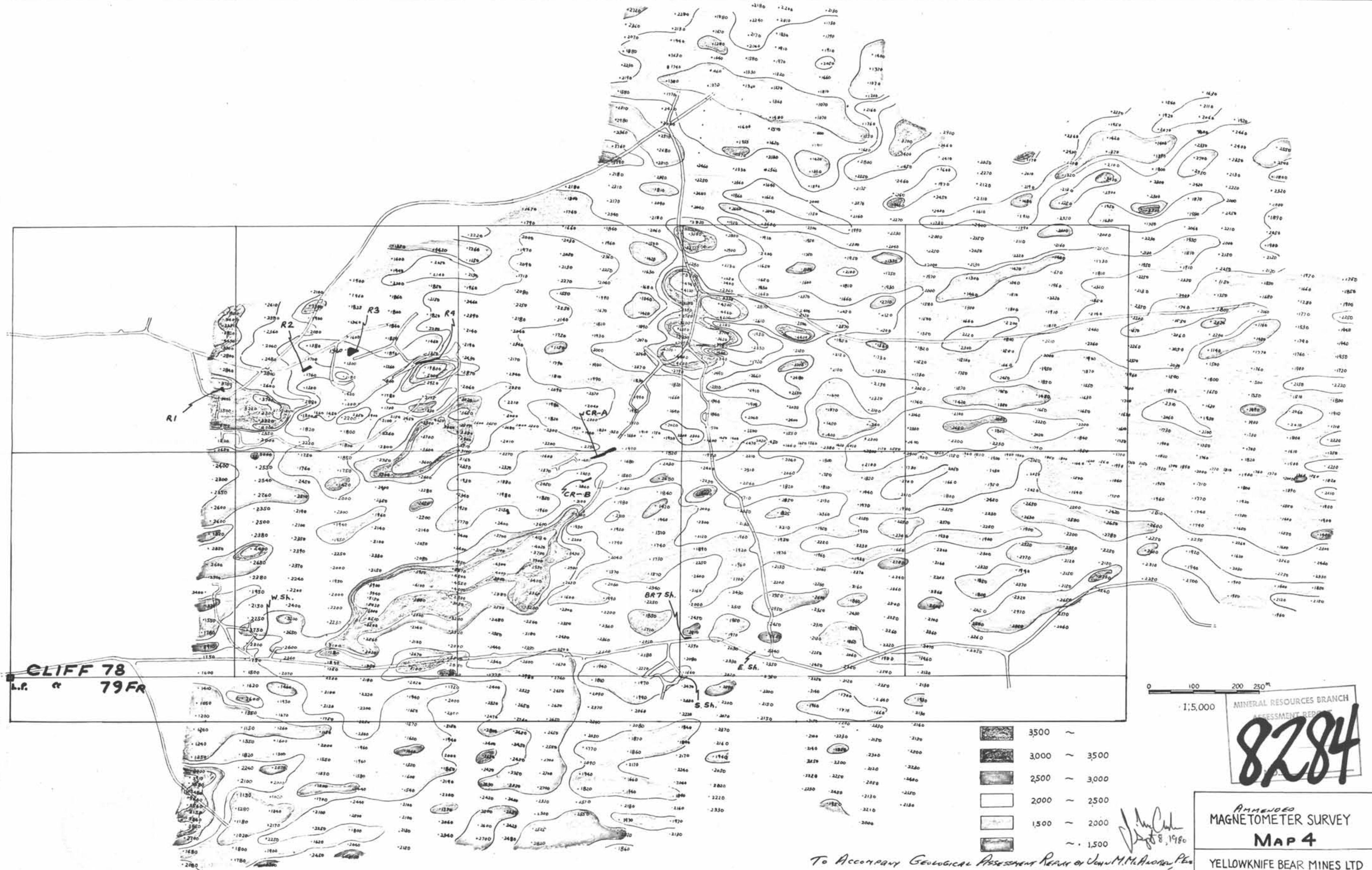
8284

AMENDED
GEOCHEMICAL SURVEY
ZINC MAP 3

YELLOWKNIFE BEAR MINES LTD.
PORT HARDY OPTION
1970 ASSESSMENT REPORT 2381

J. MacArthur
Sept 8, 1980
To Accompany Geological Assessment Report by John M. McArthur, P. Eng.
DATED September 8, 1980

TRUE
N



CLIFF 78
L.P. 79FR

- 3500 ~
- 3000 ~ 3500
- 2500 ~ 3000
- 2000 ~ 2500
- 1500 ~ 2000
- ~ 1500

0 100 200 250m
1:5,000

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
8284

AMENDED
MAGNETOMETER SURVEY
MAP 4
YELLOWKNIFE BEAR MINES LTD
PORT HARDY OPTION
1970 ASSESSMENT REPORT 2381

To Accompany Geological Assessment Report of J. M. C. M. A. R. P. Co.
DATED SEPTEMBER 8, 1980

J. M. C.
8/8/80