## 2 <br>  <br> 1

REPORT ON GEOLOGICAL AND GEOCHEMICAL WORK PERFORMED BY HIGHMONT MINING CORPORATION LTD. FROM JULY 1ST TO SEPTEMBER 30TH, 1970 ON THE PEN CLAIMS, LATITUDE $50^{\circ} 23^{\prime}$ NORTH, $120^{\circ} 57^{\prime}$ WEST, in the highland valley area, kamloops MINING DIVISION, BRITISH COLUMBIA.


BY
A.J. REED, PENG.

Dated: February 26th, 1971.

Department of
lilian. Fred

## Mines and Petroleum Resources

ASSESSMENT REPORT
No. $2 \% 1$
MAP

## TABLE OF CONTENTS

INTRODUCTION ..... Page 1
PHOTOGEOLOGICAL ANALYSIS ..... Page 3
GEOCHEMISTRY - SOIL SAMPLING Page 5
GEOLOGICAL MAPPING ..... Page 7
ECONOMIC MINE RALIZATION ..... Page 11
RECOMMENDATIONS FOR FURTHER WORK ..... Page 12
DECLARATION OF COSTS ..... Page 13
CERTIFICATE ..... Page 14
ILLUSTRATIONS (IN POCKET)
FIGURE \#1: PHOTOGEOLOGICAL ANALYSIS OF THE ROSCOE LAKEAREA. $1^{\prime \prime}=2000^{\prime}$
$V$ FIGURE \#2: DETAILED GEOLOGY. $1^{\prime \prime}=200^{\circ}$
3 FIGURE \#3: SOIL SAMPLE GEOCHEMISTRY. $1^{\prime \prime}=200^{\prime}$
4 FIGURE \# 4: HISTOGRAM OF SOIL SAMPLE COPPER ASSAYS.
5FIGURE \#5: HISTOGRAM OF SOIL SAMPLE MOLYBDENITE ASSAYS

REPORT ON GEOLOGICAL AND GEOCHEMICAL WORK PERFORMED BY HIGHMONT MINING CORPORATION LTD. FROM JULY 1ST TO SETPEMBER 30TH, 1970 ON THE PEN CLAIMS LATITUDE $50^{\circ} 23^{\prime}$ NORTH, $120^{\circ} 57^{\prime}$ WEST IN THE HIGHLAND VALLEY AREA, KAMLOOPS MINING DISTRICT, BRITISH COLUMBIA.

## INTRODUCTION

The PEN claims consist of 8 full-sized mining claims, numbered \#1 to \#8, and one fractional mining claim, numbered PEN \#1 FRACTION, located within the Kamloops Mining Division at the south end of Roscoe Lake, which is approximately 20 miles northnorthwest of Merritt.

The PEN claims are accessible by roads suitable for 4 -wheel drive vehicles from the Highmont property at Gnawed Mountain; from the Highland Valley road via Jericho, Billy Lake and Chataway Lake; and from Merritt via the Craigmont road.

The PEN claims comprise the ground that was originally staked as the "YUBET" claims on a discovery zone of spectacular bornite and chalcopyrite mineralization occurring within altered aplite. The YUBET claims were optioned by Stellako Mining Company Ltd. and Noranda Explorations who performed geophysical, geochemical and geological work, followed up by diamond-drilling and bulldozer trenching. W.M. Sharp, in a report dated December 1966, interpreted the results of this work as indicating an elliptical area on surface approximately 250 feet long and 57.5 feet wide, with a grade of $2.25 \%$ copper, diminishing very rapidly in grade and width between surface and depth of about 100 feet. The current Highmont program was designed to further investigate this "Discovery zone" and to seek other similar but unexposed zones on the property. The techniques employed were:
(1) Photogeological analysis
(2) Geochemical soil sampling
(3) Bulldozer trenching
(4) Geological mapping

A photogeological study of the ground covered by the PEN claims was made using a Dietzgen binocular stereoscope and air-photographs at a scale of approximately one inch to two thousand feet, flown by Lockwood Survey Corporation on 22nd August, 1969 at altitude of 17,000 feet above sea level, using a camera with focal length of six inches.

Figure (1) is a photogeological interpretation of the area around Roscoe Lake and shows three primary fractures: the Gnawed Mountain Break, the Lornex-Highmont Linear and the Roscoe Lake Linear, together with a series of secondary fractures generally striking northeasterly.

The Gnawed Mountain Break strikes eastsoutheasterly and may be traced for at least four miles along strike. At Gnawed Mountain itself, dykes of porphyritic granodiorite and tourmaline breccia (Minex Porphyry and Trojan Breccia respectively) have been intruded along the line of break. Important copper-molybdenum mineralization occurs on both flanks of the Gnawed Mountain Break on the Highmont property.

The Lornex-Highmont Linear strikes southsoutheasterly and can be traced at least 5 miles along strike. On the Highmont property, small lenses and pockets of copper-molybdenum mineralization are known close to this feature and with a sub-parallel orientation to it.

The Roscoe Lake Linear strikes N. $10^{\circ} \mathrm{E}$. along the east side of Roscoe Lake. South of Roscoe Lake, a dyke of pink aplite, which may be up to 500 feet wide, has been intruded along this feature. The "Discovery Zone" of the PEN claims occurs along the western side of the dyke. A series of
northeasterly striking linear features which may be traced across the area for distances of up to two miles appear to be secondary in importance to the three primary features already described. The dislocation of the drainage in the area immediately west of Roscoe Lake suggests that movement occurred along some of the northeasterly striking fractures with a horizontal component of right lateral displacement.

The "Discovery Zone" which has been known since 1965 on the PEN claims occurs along the Roscoe Lake Linear, where it is joined by two northeasterly striking and one northwesterly striking secondary fractures. The mineralization is considered to occur as a "plum" at the intersection of the various fractures. The search for further "plums" on the property should consider all of the similar fracture intersections. Several of these fracture intersections are shown on Figure (1) and the most interesting of these appear to be:-
(a) On the Roscoe Lake Linear at the south end of the Roscoe Lake
(b) On the eastern side of the property along an umamed linear which strikes northerly, sub-parallel to the Roscoe Lake Linear

If the geochemical survey shows anomalous values correlating with any of the various fracture intersections shown in Figure (1), then these should be the prime targets for the follow-up work.

## GEOCHEMISTRY - SOIL SAMPLING

Soil samples were collected at intervals of 100 feet along eastwest trending lines spaced 400 feet apart. In areas of especial interest, further samples were taken on a square grid spacing of 100 feet. Samples were taken from the upper part of the $B$ horizon by digging a hole approximately 9 inches deep with a mattock and collecting a sample from the bottom of the hole. The sample was placed into a special paper envelope supplied by Barringer Research Ltd. and dried by hanging the envelope on a wire in a heated room. After drying, the sample was shaken through an 80mesh nylon screen. The fine material passing through the screen was sealed in a paper envelope and sent to Seymour Labs. to be assayed for copper and molybdenite. The coarse fraction which did not pass the 80 -mesh screen was dis carded.

Seymour Labs. assayed the samples by hot acid digestion with determination of copper and molybdenite by atomic absorption methods.

Figure (3) shows the location, sample number, copper assay and molybdenite assay for each of the soil samples taken. Histograms were compiled showing frequency and grade of assay for both copper and molybdenite; these are reproduced as figures (4) and (5). Visual examination of the histograms indicated that, for copper, anything up to 175 or 200 ppm . could be considered as background, whereas for molybdenite background could be taken as all values up to 5 ppm .

The areas of anomalously high copper and molybdenite values in the soil correspond remarkably well with the intersections of air-photo linears shown on figure (1).

On the PEN \#2 and \#4 claims, the anomalous zones occur along the lineation which, it has been noted previously, might correspond with the Bethsaida/Skeena contact.

On the PEN \#1 and \#3 claims, anomalous values occur only in isolated samples and do not appear to hold much promise.

On the PEN \#5 and \#8 claims, anomalous zones occur along the Roscoe Lake Linear. On the PEN \#8 claim, the anomalies are associated with the known mineralization. The anomaly on the PEN \#5 claim, immediately south of Roscoe Lake, is in a very interesting position and should be explored further.

On the PEN \#7 claim, there is an interesting anomaly at the northern corner of the claim. This also corresponds with an intersection of air-photo linears.

The PEN \#6 claim has two anomalous areas but these appear less attractive than the anomalies associated with the north-trending linears.

## GEOLOGICAL MAPPING

The geology of the Highland Valley has been described by K.E. Northcote in Bulletin 56 of the British Columbia Department of Mines and Petroleum Resources. North cote divided the essentially granodioritic a Guichon Creek Batholith into 6 phases and number of sub-phases or varieties. The youngest phase is called the Bethsaida and this occupies the central part of the outcrop of the Guichon Creek Batholith. The PEN claims lie close to the edge of the outcrop of the Bethsaida phase and probably include part of the slightly older Bethsaida or Skeena phase.

Figure (2) is the geological map produced during the current work programme. The whole of the PEN claims are mantled by glacial till varying in thickness from 2 feet to more than 15 feet. In general, the glacial deposits are thinnest on the westem side of the property and become thicker towards the east. The only natural bedrock exposures occur on the PEN \#7 and \#8 claims and on the PEN \#l Fraction. All other bedrock exposures on the property have been made by trenching with a bulldozer either during the current programme of work or in previous years.

Bethlehem or Skeena Phase.
Rocks of the Skeena or Bethlehem phase of the Guichon Creek Batholith are not exposed anywhere on the PEN claims but probably occupy the eastern half of the PEN \#2 claim. A short distance northeast of the PEN \#2 claim at 48 E . on line 32 N. , there is an exposure of Skeena in a rock bluff overlooking a small glacial overflow channel. The Skeena is a light grey, coarsegrained quartz-diorite characterised by the presence of two generations of hornblende (large poikilitic tabular crystals up to 1 inch or more in diameter
and small ${ }^{a}$ cicular prisms usually less than $1 / 2$ inch in length) and a tendency for quartz to show an interstitial relationship with the other minerals. The contact between the Skeena and Bethsaida phases is thought to coincide with LINEAR "A" on Figure 1.

## Bethsaida Phase

Rocks of the Bethsaida phase of the Guichon Creek Batholith are exposed on PEN \#1, \#3, \#5, \#7, \#8 claims and PEN \#l Fraction.

On the PEN \#1 claim, Bethsaida is exposed in the trench at 26E on the line 29 N . The overburden is 11 feet thick at the point. The rock is pale cream or pinkish cream in colour with hypidiomérphic inequigranular texture. Subhedral cream coloured plagioclase crystals generally $1 / 4$ inch in length constitute approximately $50 \%$ of the volume. Quartz occurs as stubby subhedral crystals up to $1 / 4$ inch diameter, making up about $20 \%$ of the volume. Pink orthoclase occurs in somewhat diffuse blobs, apparently interstitial to quartz and plagioclase, forming approximately $10 \%$ of the volume. There are a few sparsely scattered grains of chalcopyrite at this exposure.

On the PEN \#3 claim, Bethsaida is exposed in a trench at 19 E . on line 29 N . The rock is very similar to that of the PEN \#l claim with a slightly greenish tinge due to an increasing degree of sericite alteration of the plagioclase. There is no visible mineralization at this exposure.

On the PEN \#5 claim, Bethsaida exposed in a trench at $3 \mathrm{~W} ., 15 \mathrm{~N}$. The overburden is 12 feet deep at this point. The rock is coarse-grained with a slightly pinkish colour and shows traces of malachite on some fractures.

On the PEN \#7 claim, Bethsaida is exposed in 5 natural outcrops and 2 trenches. The rock is generally fresh, showing pink and white feldspar in the western part of the claim. On the eastern side of the claim, there is an aplite sil1, 18 inches thick, dipping northeastwards at $35^{\circ}$.

On the PEN \#8 claim, the Bethsaida shows moderate to intense sericite alteration and also a tendency for an aplitic matrix to be present enclosing the coarse phenocrysts of quartz, feldspar and biotite which are characteristic of the Bethsaida.

On the PEN \#1 Fraction, there is a natural exposure of fresh Bethsaida with unusually well developed phenocrysts of plagioclase.

## Aplite

Aplite is exposed on the $\operatorname{PEN~\# 7~and~\# 8~claims~on~numerous~trenches.~}$ The aplite has the form of a dyke trending $N .10^{\circ} \mathrm{E}$. which is exposed for a distance of 1400 feet along strike. The dyke appears to bifurcate or branch at its southern end and has width of at least 500 feet. The aplite is pink in colour with typically aplitic texture. Many of the joints show well developed dendritic coating or "fern" of pyrolusite.

The western margin of the dyke is exposed in the trenches and shows intense sericite alteration of the aplite close to the edge. The actual contact is gradational with a sequence of rock types ranging from fresh aplite throgi of intensely-altered aplite, followed by a contact zone consisting of Beth-saida-type quartz and feldspar phenocrysts in an aplitic matrix, which is followed in turn by a zone of sericite-altered Bethsaida fading into fresh Bethsaida away from the aplite dyke. Two small pockets of spectacular
quartz-bornite-chalcopyrite mineralization have been found within the intensely-altered aplite close to the western margin of the dyke.

The eastern margin of the dyke is not exposed and is believed to lie underneath the long swamp area which extends southwards from Roscoe Lake. There seems to be no obvious reason why the eastern margin of the dyke should not be mineralized in the same fashion as the western margin and this is an exciting possibility that is completely unexplored to date.

Two pockets of bornite-chalcopyrite mineralization occur on the PEN \#8 claim within the intensely-altered marginal zone of the aplite dyke. The northernmost pocket occupies an area of about 13,500 square feet on surface but is very rapidly reduced in size below ground level. Estimated reserves in this pocket are 33,750 tons at $2.25 \%$ copper. The southernmost pocket is roughly oblong in shape with a surface area of about 4,800 square feet. Reserves in this pocket are estimated at 12,000 tons at $1 \%$ copper.

There are three structural features present on the PEN claims where small pockets of $2 \%-3 \%$ copper mineralization could occur. These structures should be tested with saturation programe of either percussion drill holes or small diameter diamond drill holes as follows:

1. The western margin of the aplite dyke between the Discovery showing and the south end of Roscoe Lake should be tested with 9 holes, to be drilled eastwards at $-45^{\circ}$ to a depth of 300 feet and spaced out at intervals of 200 feet along the strike of the dyke.
2. The eastern margin of the aplite dyke should be tested by 9 holes drilled at $-45^{\circ}$ to a depth of 300 feet beneath the slough on the PEN \#5, 6 and \#8 claims.
3. The air-photo linear with associated soil anomalies on the PEN \#2 claim should be tested by 7 holes drilled westward at $-45^{\circ}$ to a depth of 300 feet.

WAGES \& SALARIES

| A.J. REED | CHIEF GEOLOGIST $\$ 1200.00$ per month |  |
| :---: | :---: | :---: |
|  | July, August, September - 10\% of time | \$ 360.00 |
|  | February 1971-50\% of time | \$ 600.00 |
| BERT TAYLOR | GEOLOGIST July, August, September $-100 \%$ of time | \$3300.00 |
| FRANK MANTLE | ENGINEERING ASSISTANT $\$ 525.00$ per month July, August $-100 \%$ of time | \$1050.00 |
| BRUCE FALKINS | ENGINEERING ASSISTANT $\$ 525.00$ per month July - 100\% of time | \$ 525.00 |
| CRICHTON CLARKE | ENGINEERING ASSISTANT August - $100 \%$ of time | \$ 525.00 |
| BRT AN McClay | $\begin{aligned} & \text { CAT OPERATOR } \\ & \text { July } 20 \text { th }- \text { Aug. } 7 \text { th }-126 \text { hours } 3.77 \text { per } \mathrm{hr} \text {. } \end{aligned}$ | \$ 475.00 |
|  | TOTAL WAGES: | \$6835.00 |

## DIRECT COSTS

1. FREE BOARD \& LODGING TO SALARIED STAFF:

| BERT TAYLOR |  | days |  | \$8.60 |  | day |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| FRANK MANTLE | 43 | " | " | " | " | " |
| BRUCE FALKINS | 22 | " | " | " | " | " |
| CRICHTON CLARKE | 21 | " | " | " | " | " |

TOTAL $\quad 150$ days at $\$ 8.60$ per day $=\quad \$ 1290.00$
2. RENTAL OF D8 BULLDOZER FROM TYMAC CONSTRUCTION LTD. July 20th - Aug. 7th, $1970-69$ hours at $\$ 26.50$ per hour (invoice attached)
\$1828.50
3. RENTAL OF CHEV. $4 \times 4$ TRUCK FROM SYD SMITH U-DRIVE

2 weeks and 5 days (invoice attached)
\$ 388.80
4. PURCHASE OF SOIL SAMPLE BAGS \& NYLON SCREEN FROM BARRINGER RESEARCH (see invoice attached)
\$ 31.00
5. ASSAY OF SOIL SAMPLES BY SEYMOUR LABORATORY LTD. (see attached invoice) $\$ 821.86$
6. USE OF HIGHMONT $4 \times 4$ TRUCK, 6 weeks at $\$ 78.00$ per week $\$ 468.00$

## CERTIFICATE

I, Alan James Reed of Ashcroft, British Columbia do hereby certify that:
I am a geologist employed by Highmont Mining Corporation Ltd. of 700 - 1177 West Hastings Street, Vancouver 1, B.C.

I am a Professional Engineer registered in the Province of British Columbia and the Province of Ontario.

I am a graduate of the University of Leeds, with a B. Sc. (Hons.1963) in Geology.

I have practised my profession since 1963 while employed by the Geological Survey of Jamaica, Siscoe Metals of Ontario Ltd. and Highmont Mining Corp. Ltd.

This report deals with work performed on the PEN claims under my supervision during the months of July, August and September 1970.

Dated: February 26, 1971


Ashcroft, B.C.
Alan J. Reed, P. Eng.


Vancouver 1, B.C.
August 19 th , 1970
In Account With:
Highmont Mining Corp. Ltd. 702 - 850 West Hastings Street vancouver 1, B.C.

Re :
Rental of D8 Cat


Less: Advances paid on account.
July $8 / 70 \quad \$ 1,500.00$

July 24/70 - 2,500.00 4,000.00
$\$ 2,784.00$
Less: Purchases by Highmont for Tymac.
Finning Tractor \& Equip.Ltd.
\#65657,66447,67091,67196, 67612.
135.04

Imperial Oil Limited.
\#151590,151640,151692, 151725,151912,151996.

WRGQ MODDORETON
oud in cgens WTGWMGMT MNNTMC

| TRES O. $\quad$. |  |
| :---: | :---: |
|  | Tt |
| תrachem - Dem | $18$ |
| AProven - Mrome | $H=1 / u$ |



304 CARLINGVIEW DRIVE REXDALE, ONTARIO, CANADA PHONE: 416.677 .2491 CABLE: BARESEARCH


AUTHORITY: B. Taylor

то:
Geochendcal Supplies

1,000 fieid envelones
2,400 lab envelopes
25.00
6.00

## SEYMOUR LABORATORVTD.

147. RIVERSIDE DRIVE,

6 NORTH VANCOUVER, B.C
invoice/fle No. 2053/1125

TELEPHONE 929-2228

```
            "TECK CORPN. & IT'S ACWNT
            HIURSORT MINING " CORPN. LTD.*
            720-850 WEST HASTINGS ST.,
            VAMCOUVER 1, R.C.
            ATIEN: MR. R.W. FALKINS
```

                                    date: july 28, 1970
    |  | CEO - CHEM TESTING | AMOUNT |
| :---: | :---: | :---: |
| 243 | IETERMINATIONS FOR COPPER AT \$1.00 EACH | \$243.00 |
| 243 | ITEMERMI ATIONS FOR MOLYBDENUM AT \$ 0.45 EACH | 109.35 |
| 243 | SAMPLE PREPARATIONS FOR SOIL AT \$.20 EACH | 48.60 |
|  | LESS 15\% | $\begin{array}{r} 400.95 \\ 60.14 \end{array}$ |
|  | TOPAL <br> (IN TRIPLICATE ) | \$340.81 |

भ7 RIVERSIDE DRIVE.

PLEASE PAY FROM THIS INVOICE Direct to 401-1111 West Hastings Street, Vancouver I, B.C. Monthly statements will not be issued except where necessary to confirm balance. TERMS NET 15th of Month Following.

* TGCR CORN \& IT ${ }^{2}$ S AGENY
- HIGHMONT MNDEG " CORPN. LTD. g 720-350 thest Restirags St。
- Vancouter l, B. C.
- Letn: Mr. K. Kaklkins

AMOUNT
55.00
28.25
17.09 140.25

LRSS $25 \%$
7024
( IN TRIPLICATE)

## SEYMOUR LABORATOI LTD.

147 RIVERSIDE DRIVE,
INYOICE/FILE No. 2069 / 1122
NORTH VANCOUVER, B.C.
TELEPHONE 929-2228
PLEASE PAY FROM THIS INVOICE
Vancouver 1, B. C.

Attn: Mr. R. W. Fakins







