884030

93I5E 013

# HIGHMONT

by

T.G. Schroeter

Nov. 18/71 Vancouver, B.C.

AMOCO CANADA PETROLEUM COMPANY LTD.

**MINING DIVISION**

SUITE 2160 – 1055 WEST HASTINGS STREET, VANCOUVER 1, B.C. (604) 683-2591

# Report On Highmont Property
# Highland Valley, British Columbia

by

T.G. SCHROETER

Vancouver, B.C.
November 18, 1971

# TABLE OF CONTENTS

## SUMMARY AND CONCLUSIONS

The Highmont Mining Corp. Ltd. property in the Highland Valley is underlain chiefly by the Bethsaida phase (quartz monzonite) and the Bethsaida-Bethlehem Transitional phase (quartz diorite), the contact of which is most significant in localizing many ore deposits in the Highland Valley (e.g. Lornex and Valley Copper). A 400 foot composite east-west trending dyke extends across the property and may join with the Lornex deposit. The possibility exists that this dyke may have been a controlling factor in mineralization at both Lornex and Highmont.

Seven minerlized zones are recognised of which the Nos. 1, 2 and 5 zones are proven orebodies and the other zones are partly explored. The five other zones are larger and lower in grade and occur in quartz diorite, except for the No. 6 zone which ~~has~~ lies wholly within the Bethsaida quartz monzonite. The Nos. 1 and 2 zones have been fully explored, including geophysical and geochemical work, stripping, trenching, 133,000 ft. of drilling, including 4,000 feet of underground drilling and 4,000 feet of drifting and raising. Induced polarization surveys have delineated most of the orebodies. Geochemical work has likewise delineated anomalous areas which in general can be correlated with known mineralized zones. The South Zone (Nos. 3 and 4) is currently being explored with the hope of combining them into one large open pit mining operation.

Bulk sampling in the No. 1 zone has upgraded the copper content by 12% and, the molybdenite content by 15%. It is possible that this may be done for the South Zone.

Most of the detailed work on the Highmont property appears to have been done on the northern part of the property. The southwestern portion of the property is underlain by the contact between the Bethsaida phase and the Bethsaida-Bethlehem Transitional phase, which has been faulted and this represents a favourable exploration target. In this respect, it may be possible that the No. 5, 6, and 7 ore zones may be expanded.

## OWNERSHIP

At present, mineral rights on the Highmont property are owned by Highmont Mining Corp. Ltd. which has a 55% interest and Teck Corp. Ltd. which has a 45% interest. This agreement was made on October 1, 1969. The President of Highmont Mining is:-

R.W. Falkins,
Highmont Mining Corp. Ltd.,
7th Floor - 1177 West Hastings St.,
Vancouver 1, B.C.

or

P.O. Box 700,
Ashcroft, B.C.

## DESCRIPTION OF PROPERTY

As of October 1, 1971, Highmont owned and optioned a total of 289 claims in the Highland Valley. This total includes several claims optioned from other properties for the use of concentrator sites and waste disposal sites (e.g. adjoining Jericho, ~~and~~ Sheba, ~~and~~ Kennco, ~~exploration~~ and Gaza properties).

A total of $897,673.00 has been spent by Teck on exploration and development up to June 30, 1971. None of this is treated as Highmont costs until Teck elects to convert it to Highmont shares.

An estimated $66,000,000.00 will be required to place the Highmont property into production at a rate of 25,000 tons a day.

Teck owns 400,000 Highmont shares received for exploration and has the right to convert further exploration expenditures into Highmont shares at a price of $3.25 a share up to a maximum of 400,000 shares. It has the right to finance the Highmont property into production.

<u>Agreements</u>

(1) By June 24, 1970 agreement - Teck agreed to purchase an undivided 45% interest in Highmont Corp. properties for $2,500,000.00. Payment is secured by Teck, giving, on closing, an interest fee mortgage for $2,500,000.00 payable on or before December 31, 1974, or on the date that commercial production starts on a continuing basis for sale under a contract. If Teck has not completed its commitments by December 31, 1974, Teck will return the 45% interest to Highmont and will be released from liability under the mortgage.

(2) By August 31, 1970 agreement - Teck to supply a feasibility study by December 31, 1972.

(3) Teck has right of first refusal for further financing up to 20 years from August 31, 1970.

<u>Location</u>

The copper-~~moly~~ molybdenum deposits of Highmont Corp. Ltd. are located in the south part of the Highland Valley porphyry copper district in southern B.C., approximately 28 miles, ~~S.E.~~ southeast of Ashcroft and 25 miles north-west of Merritt (see Map 1) [redacted] [Lat. 50° 25.5' - 26.5' Long. 120° 59' - 121° 60']. The large low grade mineralized zones cluster together on the west slopes of Gnawed Mountain at surface elevations between 5,200 and 5,700 feet. The deposits lie 4 miles due south of the Bethlehem mine and/2 miles south-east of the Lornex mine.

<u>Access</u>

The Highmont property may be reached by a paved road from Ashcroft to a point at the south end of Quiltanton Lake where one then proceeds approximately 1½ miles on a dirt road to the turn off to both Lornex and Highmont properties. The road to Highmont departs the Lornex road approx. ¼ mile along. It is approximately 3 miles to the main ore zones from this latter turnoff. Alternatively, the Highmont property may be reached from the east by mainly dirt road from either Kamloops in the north or Merritt in the south.

A new townsite named Logan Lake is well under construction approximately 10 miles to the east of the Highmont property. The dirt road to the Highland Valley from the east is currently being widened and will soon be paved.

In the case of production, concentrates could be easily shipped ~~via~~ by truck to Vancouver via Ashcroft, similar to the existing procedure employed by Bethlehem Copper Corp. Ltd. A new road could be built connecting the Highmont property with the main road to Lornex or a separate road could be built directly to the main Highland Valley road. Water supply is good, especially with the presence of Gnawed Lake, and several small streams. Test drilling for an underground water stream for the concentrator has indicated that there is ample water supply from underground and thus would negate a pumping system from the Thompson River, a saving of $3.5 million.

Power facilities etc. in the Highland Valley are presently being expanded and should prove to be no problem.

In general, the presence of other large operating mines such as, Bethlehem and Lornex in the near vicinity will reduce considerably the logistics, ~~in many cases.~~

## HISTORY, EXPLORATION AND DEVELOPMENT TO DATE

The Highmont deposits were largely hidden by a thin mantle of glacial till. However, nearby higher ground exposes showings of copper and molybdenum sulphides. Some of these were apparently explored by prospectors in the 1930s. The Gnawed Mountain area was repeatedly investigated from 1957 onward, and prior to 1960, a few short holes were drilled in the Highmont zones. Torwest Resources (1962) Ltd. acquired the Highmont property in 1962 and conducted an I.P. survey and did diamond drilling that discovered a part of the No. 1 zone. The claims were formerly held by Ventures Ltd. and Minex Development Ltd.. The property was later optioned to a major Japanese mining company. In 1966, Highmont Mining Corp. was formed with Torwest as chief shareholder to continue the development. The No. 1 zone was outlined and the existence of the No. 2 and other zones was indicated as a result of a large amount of percussion drilling and some diamond drilling done on a grid pattern in 1966 and 1967. Nippon Mining Co. Ltd. provided financial support for this program which also led to bulk sampling in the No. 1 zone by means of an adit and raises. Results of the initial phase of underground exploration deterred Nippon from further participation. Following new financing, the sampling program in the No. 1 zone was satisfactorily completed and property exploration continued. In 1969 Teck Corp. Ltd. entered into a financial agreement to continue the exploration with the right to finance the property into production. By 1971, Teck and Highmont jointly have acquired or optioned 166 additional claims from Jericho Mines Ltd., Gaza Mines Ltd., Sheba Copper Mines Ltd. and Kennco Exploration (Western) Ltd. The original Highmont property consists of 44 claims. The claims are identified as AM, IDE, and PEN claims. During 1971 more claims have been optioned by Teck and Highmont from the above -mentioned companies for the purpose of erecting a concentrator and use as waste sites. These include 6 claims adjoining the west property optioned from Kennco in January 1971,the adjoining Jericho property plus 21 claims on Witches Brook fault - bought by cash in September 1971 and 7 full and 3 fractional claims from Sheba Copper Mines Ltd. in March 1971 to build a $100,000.00 concentrator on them. By October 1, 1970, the pilot plant test work had been completed and metallurgical work shows concentrate grades of 32% Cu and 54% Mo with end recoveries of 92% Cu and 83% Mo. During the earlier years, there is a good potential for up-grading the mill feed while stock-piling lower grade material.

An independent feasibility study was carried out between 1969 - 1970 by Chapman, Wood and Griswold Ltd. (consulting mining engineers & geologists) and WrightEngineers Ltd. (plant design engineers).

As of May, 1970, geophysical (including over 20 miles of I.P. surveys) and geochemical work, stripping, trenching (over 2,000 feet), over 76,000 ft. of surface diamond drilling, 65,000 ft. of percussion drilling, 4,000 ft. underground diamond drilling and 4,000 ft. of drifting and raising had been completed.

The Nos. 1 and No. 2 zones have been fully explored by a total of 133,000 ft. of drilling.

Next in importance to the East and West zones (No. 1 and No. 2 zones) is the South zone, (3,200 ft. long x 900 ft. wide) about 800 ft. south of the east pit and 200 ft. south of the west pit. As of September, 1971, only 11 holes had been drilled on the South zone, the deepest to 600 feet.

In September 1971, H.A. Simons (International) Ltd. was engaged for a detailed design on engineering and contour mapping of the area around the plant, pits and tailings pond sites and drilling to ensure no potentially economic mineralization was covered. Also during September 1971, diamond drilling on the adjoining Jericho property (70% Teck-Highmont - 30% Jericho) along Witches Creek was carried out.

The current program is the clearing and layout of sites for permanent camp, the processing plant and related buildings, the tailings pond and some excavation work, all in preparation for the start of the big construction program in April of 1972. The program will include further percussion drilling in the tailings pond area to ensure no potential mineralization will be covered and completion of testing for the underground water stream for the concentrator.

Stripping of only about 12 ft. of overburden will be required in preparing the east and west pits for open pit mining operations.

The west pit (2,200 ft. long x 2,000 ft. wide) will be mined to a depth of 620 ft. The east pit (4,000 ft. long x 2,000 ft. wide), 500 ft., to the east will be mined to a depth of 810 ft. The mill site is located approximately 2,000 ft. due north of the east pit and the tailings pond about 2 miles east of the east pit.

REGIONAL GEOLOGY

The Highland Valley district lies near the centre of the Lower Jurassic ( ~ 200 my). Guichon Creek Batholith. The batholith is a semi-concordant domal body having an axis 40 miles long, which is directly slightly west of north and has a width of 16 miles. It intrudes sedimentary and volcanic strata of the Permian Cache Creek group and Upper Triassic Nicola Group and is uncomformably overlain by sedimentary and volcanic strata ranging from Middle Jurassic to Middle Tertiary. The major phases of the batholith are concentrically disposed, with older quartz diorites occurring toward the margin, a younger quartz diorite as an intermediate ring, and a still younger granodiorite forming an elongate central core that is aligned along the axis from the Highland Valley southward for a distance of about 12 miles (see Fig. 1). From this core a 400 foot wide dyke of granodiorite projects eastward across the Highmont property to Gnawed Mountain. Contacts may be sharp locally but are generally gradational.

The phases of the batholith are separable on the basis of compositional and textural character. From oldest to youngest they are:

(1) Hybrid phase-highly variable to uniform in composition as a result of contamination by adjoining country rock.

(2) Highland Valley phase
   (a) Guichon granodiorite
   (b) Chataway "
   - characterized by 12 - 15% mafics.

(3) Bethlehem phase - granodiorite ~ 8% mafics.

(4) Bethsaida phase - quartz monzonite ~ 6% or less mafics.

A period of extensive dyke emplacement followed the intrusion of the Bethlehem phase and a lesser period followed the Bethsaida phase.

The Highland Valley porphyry copper deposits are all near the northern part of the core of the batholith. They adjoin either the Guichon-Bethlehem or Bethlehem-Bethsaida contacts. The Highmont property lies within the Bethsaida-Bethlehem contact area (see Fig. 2).

Five major ore bodies are located within the area of the Highland Valley (see Fig. 1). They include:

| Capital Cost Est.($million) | | Est. Production (tons/day) | Grade | Reserves |
|---|---|---|---|---|
| ? | Bethlehem | 16,000 | 0.51% Cu | 49,000,000 |
| 27 | Lake Zone | 11,000 | 0.48% Cu | 190,000,000 |
| ? | J_-A Zone | 11,000 | 0.45% Cu | 150,000,000 |
| 138 | Lornex | 38,000 | 0.427% Cu<br>0.014% $MoS_2$ | 293,000,000 |
| 150 | Valley Copper | 40,000 | 0.5% Cu | 870,000,000 |
| 66 | Highmont | 25,000 | 0.285% Cu<br>0.051% $MoS_2$ | 150,000,000 |
| 3.4 | Alvin | 500 | 2.51% Cu | 1,000,000 |

Recognition of fault and joint features is hampered by the presence of deep glacial overburden. Many of the copper occurrences in the batholith are associated with faults. The more prominent faults associated with sulphide mineralization trend N-S and NW-SE.

## GEOLOGY OF PROPERTY

The mineral claims of the Highmont property are located on the west slopes of Gnawed Mountain in the Highland Valley.

The Highmont property is underlain chiefly by the Bethlehem quartz diorite (also termed Bethsaida-Bethlehem transitional contact phase by W.J. MacMillan, B.C. Dept. Mines, 1971). The extreme western part of the property is occupied by the Bethsaida quartz monzonite representing the central core of the batholith. The contact dips east at 65 degrees and has been found to be commonly faulted in drill holes. A composite dyke 400 feet wide extends east-southeastward for nearly 2 miles from this contact to the summit of Gnawed Mountain and is a principal geological feature of the property, The dyke is emplaced in strongly fractured quartz diorite. It comprises porphyritic Bethsaida quartz monzonite and later intrusions of quartz porphyry and breccia. The porphyritic granodiorite is considerably finer grained than its counterpart in the central care to the west and shows little decrease in grain size at its contacts with the quartz diorite. Quartz porphyry bodies, which are best exposed on the higher ground east of the property, possess irregular shapes and local offshoots that extend as dykes into the nearby quartz diorite. Some of these dykes possess aphanitic chilled margins. The quartz prophyry has quartz phenocrysts embedded in an aplitic groundmass. The very fine groundmass apparently indicates a sudden crystallization due to widespread and sudden loss of volatiles. This inferred explosive escape of volatiles from the prophyry is believed to have caused the formation of adjacent bodies of breccia, which consists of abundant angular fragments of the local rocks, including aphanitic quartz porphyry, that are embedded in a clastic matrix largely representing porphyry.

Some fragments contain barren quartz veins, thus indicating that fracturing and alteration of the host rocks, was initiated before brecciation and suggesting that the breccia bodies occupy parts of early fracture zones. The only breccia body recognized on the Highmont property is in the south part of the No. 1 zone.

The Highmont ore zones lie beneath overburden which averages 12 feet thick, over the Nos. 1 and 2 zones and is mainly glacial till. The direction of ice movement during deposition of the till was from the N.W. Oxidation of the ore is very limited and has penetrated downward only near faults.

Four types of veins or fracture-fillings are commonly recognized within the orebodies:

Type (1) - Veins contain essentially quartz chalcopyrite and bornite in addition to scattered flaky molybdenite, and they range in width generally between 1/16 inch and 1 inch. In these veins quartz has a vuggy texture; chalcopyrite and bornite occupy the central part of the vein; and a 1 to 2 inch wide envelope of altered wallrock is characterized by relatively coarse (1 mm) flakes of white sericite and commonly by tourmaline clusters. Abundant K-feldspar near the veins causes a pink-coloured envelope.

Type(2) - Veins contain quartz and chalcopyrite in places with pyrite and minor molybdenite, and they range in width to 4 inches. The quartz is massive and it may enclose tourmaline; chalcopyrite is not restricted to the centre of the vein; and sericite is not conspicuous in the wallrock.

Type (3) - Veins are later than Type (1) veins and they contain quartz, molybdenite and clay minerals in widths up to 3 feet. The quartz is greyish, brecciated and seamed by molybdenite and chalky white clay minerals. These veins commonly occur in altered wallrock that is intensely argillic.

Type (4) - Veins are barren and apparently later than the mineralized veins. They consist of greyish-white quartz with a fine grained sugary texture.

Calcite, siderite, epidote, zeolites (including prehnite) and gypsum also occupy veins and fractures. Fracturing appears to have controlled wall-rock alteration which is locally intense. Several alteration types are recognized which ~~inclosed~~ include those mentioned above in discussion of veins as well as pervasive development of chlorite and green sericite.

Four distinct attitudes of fractures have been mapped on the 5,400 level in the No. 1 zone. They are in order of decreasing importance:

| | | |
|---|---|---|
| $F_1$ | strike 140° - 150°; | Dip 80° NE |
| $F_2$ | strike 040° - 050°; | Dip 45° NW |
| $f_1$ | strike 075°; | Dip, vertical |
| $f_2$ | strike 095°; | Dip, vertical |

The fractures tend to be concentrated in swarms of parallel fractures. Each swarm extends parallel to the fracture direction and its width is as much as 200 feet. Swarms of mineralized $F_1$ and $F_2$ fractures coincide underground with higher grade mineralization.

Shear zones and faults are numerous and partly have similar directions as the veins and fracture swarms. Movement is post-mineral but actual displacements are unknown. Two northeasterly faults which apparently form the eastern limit of ore in the Nos. 1 and 2 zones, respectively, seem to involve no major displacement (see Fig. 2).

MINERALIZATION

Copper-molybdenum mineralization occurs in all rock types on the Highmont property, i.e. porphyritic Bethsaida quartz monzonite, quartz porphyry, quartz diorite, and breccia. Seven mineralized zones are recognized of which the Nos. 1, 2 and 5 zones are proven orebodies and the other zones are partly explored. The two south-westernmost zones (Nos. 5 and 7) are small deposits occupying shear zones parallel to and on either side of the Bethsaida-Bethlehem contact. The five other zones are larger and lower in grade and occur in quartz diorite except for the No. 6 zone which ~~has~~ wholly within the Bethsaida quartz monzonite. The mineralized zones occupy the best mineralized parts of a more or less continuous fracture zone that is more than a mile long and is roughly bisected by the dyke. This fracture zone probably continues N.W. along the granodiorite contact to the vicinity of the Lornex Mine.

The principal economic minerals are chalcopyrite, bornite and molybdenite which occur predominantly in veins and fractures, but are also disseminated in significant amounts in the adjacent altered rock. The Cu sulphides in the Nos. 1 & 2 zones show a distinct mineral zoning that is roughly parallel to the dyke, with bornite accompanying chalcopyrite approximately in equal amounts to distances of about 700 feet and 1,200 feet northward from the dyke in the Nos. 1 and 2 zones respectively, then a zone of chalcopyrite with minor pyrite and rarely bornite, followed at the northern limits of ore by a decrease in the amount of pyrite which may locally amount to 1% of the rock (see Figs. 8 and 9). A similar zoning south of the dyke has not yet been substantiated. No systematic pattern of molybdenite distribution is detected. The only other metallic mineral introduced in appreciable amounts is specular hematite. It is widely distributed but has not been studied in relation to zoning.

The occurrence of metallic minerals in veins or fracture-fillings has been discussed earlier.

In the Nos. 3 and 4 zones, mineralization probably is controlled by fractures possessing a southerly dip (see Figs. 8 & 9).

## Percussion and Rotary Drilling

In 1966 and 1967 percussion drilling preceded diamond drilling and effectively located most of the Highmont deposits. Altogether, more than 60,000 feet of wet percussion drilling was done in 2¼ inch diameter holes that were drilled vertically to a depth of 250 feet on 200-foot centres along east-west lines spaced 200 feet apart at the No. 1 zone and 400 feet apart at the Nos. 2, 3 & 4 zones. Rotary drilling was xxx tried in 1966 and was discontinued, after three holes were drilled, being found too slow and expensive.

## Diamond Drilling

More than 130,000 feet of diamond drilling using BQ wireline equipment with conventional water circulation and sludge collection was done on the property between 1966 and 1970. Core recovery averaged about 85%. Drilling in 1968 tested the Nos. 1 and 2 zones to a vertical depth of 500 feet. Later drilling revealed that mineralization persists to depths of at least 1,300 feet.

In a hole put down to test for a water stream on Highmont's Jericho property about 3 miles east of Bethlehem's new J-A zone in the same major east-west fault, copper-molybdenum mineralization was encountered. The hole hit bedrock at 400 ft. The hole is to be drilled to 1,000 feet. Three other holes also drilled to test for water will be deepened.

<u>Geochemical Surveys</u>

Soil samples were collected at the base of the "B" horizon at an average depth of about 10 inches. The samples were analyzed for total copper, cold-extractable copper, and molybdenum. In addition, 20 vertical profiles were sampled in trenches and test pits.

Generalized contours of total copper and molybdenum are shown on Figures 5 and 6. The most notable feature is the abrupt increase in metal content near the northern or northwestern edges of the main ore zones. Background values in the northern portion of the property are less than 100 p.p.m. copper and less than 2 p.p.m. molybdenum. The orebodies are reflected by values of 250 p.p.m. copper and 8 p.p.m. molybdenum. The geochemical pattern in the southern and western portions of the property is complex, apparently the result of glacial dispersion as well as of rather widespread copper molybdenum mineralization. The strongest values for both copper and molybdenum occur over a broad area on the slope of Gnawed Mountain along the glacial trend southeast of the main ore zones. The drilling results in the area suggest that this is mainly a transported metal anomaly, augmented by local sub-economic mineralization.

The total copper, cold extractable copper ratios and the results of the profile sampling indicate that mechanical movement due to glaciation was of much greater importance than saline dispersion even in the immediate vicinity of the ore zones. However, saline dispersion is important locally and provides a clue to the source of the anomalous metal values.

## Geophysical Surveys

### Induced Polarization

Several I.P. surveys have been carried out over portions of the property. These included both time-domain and frequency-domain methods. The generalized results of the most complete survey (McPhar frequency domain) are shown in Figure 7. Comparable results were obtained by the other surveys.

By the end of 1969, 20 miles of I.P. survey had been carried out. The I.P. method gave very weak but significant response over the known ore zones. The main deposits are reflected by frequency effects in the range of 1.0 to 2.5 percent. The anomalous response extends some distance north of the ore zones, reflecting a partial pyritic halo.

## Resistivity

The resistivity data which were obtained in the I.P. survey do not reflect the known economic mineralization.

## V.L.F. Electromagnetic

Electro magnetic surveys utilizing the V.L.F. transmitter near Seattle were of limited use in outlining faults. The higher-grade No. 5 ore zone showed moderate V.L.F. - EM response. The results are not diagnostic and the main usefulness of the method was in providing information on trend and continuity.

Magnetic

Airborne and ground magnetic surveys have been carried out. Both techniques indicate that the magnetic property of the ore zones is indistinquishable from that of the adjacent rock. There was apparently no significant destruction or introduction of magnetite during alteration or metallization. A fairly strong magnetic gradient along the south side of the main ore zones reflects the greater magnetite content of the Bethlehem phase rocks north of the dyke (Figs. 8 and 9). A magnetic property difference between the Bethlehem and Bethsaida phases is indicated by a lower magnetic intensity over the rocks of the Bethsaida phase.

Bulk Sampling and Òre Reserve Calculation

Bulk sampling was confined to the No. 1 zone and was done by means of a 5 x 7 foot adit drift which was collared at 5,400 feet elevation and driven southward in the zone to obtain maximum backs of 250 feet. Drifting and cross-cutting totalled 2,860 feet; raising totalled nearly 1,000 feet and included three vertical and four inclined raises.

Rounds we mucked, stored, crushed and sampled individually. The crushing and sampling plant could handle 200 tons per day and it included a jam crusher and a set of rolls which reduced the muck to minus 3/4 inch. This product was conveyed to the top of a tower where a Denver Cutter-type sampler took a 1/120th portion as sample, and the remainder dropped into a bin for removal to field storage for future reference. The 400 lb. sample was reduced by gyratory crusher to a 5-mesh product which was cut by a Vezin sampler in the ratio 20:1. The larger portion (380 lbs) was boxed and made available for metallurgical bench-testing. The 20 lb. sample was split four ways by a Jones riffle, one portion being retained at the property and the other three being sent for assay.

Assaying was checked constantly by using one principal assay laboratory and submitting pulp rejects to independent assayers.

Totals of 1,144 feet of drifting and cross-cutting and 979 feet of raising coincide with diamond drill holes. Sampling data from these sections were used to establish the following correlations between bulk sample assays and diamond drill core assays:

% Cu in bulk sample = % Cu in diamond drill core x 1.12

% $MoS_2$ in bulk sample = % $MoS_2$ in diamond drill core x 1.15

These correlations indicate increases of 12% in Cu content and 15% in $MoS_2$ content of bulk samples relative to recovered diamond drill core. The lower assays from diamond drill core were due to below average recoveries in core of material of above-average grade. Altered and sheared ground gives the worst recovery and is commonly well mineralized, especially in regard to molybdenite as illustrated by the following underground channel samples which were taken across three typical shear zones:

| | Channel(1) | | Channel (2) | | Channel (3) | |
|---|---|---|---|---|---|---|
| | % Cu | % $MoS_2$ | % Cu | % $MoS_2$ | % Cu | % $MoS_2$ |
| Hanging Wall | 0.31 | 0.010 | 0.18 | 0.012 | 2.64 | 0.016 |
| Shear Zone | 0.43 | 0.353 | 0.56 | 0.300 | 0.11 | 0.112 |
| Footwall | 0.94 | 0.060 | 0.20 | 0.052 | 0.21 | 0.052 |

Graphical comparisons of core recovery and assays with bulk sample assays (Figs. 10 & 11) demonstrate the reduced recovery in core obtained from higher grade material and they illustrate the validity of using the above-mentioned correlations in calculation of ore reserves at Highmont.

Sludge assays from diamond drill holes were generally higher than assays of the corresponding core. Difficulty was experienced in obtaining uniform sludge recovery and consequently sludge assays were not employed for calculating ore reserves. Percussion hole assays were likewise not employed because they appeared too high in comparison with other available sample data. However, the relationship between core recovery, core assays and sludge assays werexxxi studied and found to be similar for both the Nos. 1 and 2 zones, thus further confirming the validity of the correlations used in calculating ore reserves.

## Ore Reserves and Planned Mining Operation

Completed feasibility studies indicate that the Highmont No. 1 and 2 zones can support a xaxa viable mining and milling operation at 25,000 tons per day.

The Nos. 1 and 2 zones will be mined as two separate pits. The East Pit (No. 1 zone) will be 870 feet deep yielding 123.5 million tons of ore at an average grade of 0.287% Cu and 0.042% $MoS_2$, with an indicated waste to ore ratio of 1.03 : 1. The West Pit (No. 2 zone) will be 610 feet deep yielding 26.5 million tons of ore grading 0.273% Cu and ).093% $MoS_2$ with an indicated waste to ore ratio of 1.79 : 1.

In the initial years of mining, 50,650,000 tons of ore, grading 0.331% Cu and 0.060% $MoS_2$, combining for 0.463% copper equivalent, will be available with a waste to ore ratio 1.1 : 1 (copper equivalent = Cu, plus $MoS_2$ x 2.2).

During the first five years of operation the cut-off grade will be 0.25% copper equivalent and material grading between 0.20% and 0.25% copper equivalent will be stockpiled.

Pilot scale metallurgical tests made on 400 tons of mined material indicated that over 90% of the copper and over 80% of the molybdenite will be recovered. The copper concentrate will grade at least 30% copper and 2 oz/ton silver. The molybdenite concentrate will grade about 54% molybdenum sulphide and approximately 0.017% rhenium.

Recent drilling has indicated the possibility that Nos. 3 and 4 zones south of the dyke will support a single open pit 3,000 feet long and at least 500 feet deep. The deepest hole so far drilled (mid-September, 1971) is at 600 feet. Assays from this hole ran better than 0.4% copper.

## EXPLORATION POTENTIAL

The southwestern portion of the Highmont property possesses the greatest exploration potential. This area encompasses the contact between the Bethsaida and Bethlehem phases - one which is considered as a favourable 'host' for localizing ore deposits in the Highland Valley (e.g. Lornex Valley Copper). The presence of a major northerly-trending fault at or near this contact and its intersection with a northeasterly-trending fault also enhance this area as being worthy of more detailed exploration.

The area to the north of the dyke has apparently been extensively studied and would not be a further target for exploration, at least, on the Highmont property. However, the area to the north owned by Sheba Copper Mines Ltd. may warrant a close check especially with the recent discovery of Bethlehem Copper's new J-A zone, just north of Witches Brook (see Fig. ?). The Sheba ground, however, is apparently covered by extensive, deep overburden which would hamper exploration.

The east-west composite dyke appears to be a controlling factor for mineralization especially on the Highmont property and possibly even for the Lornex deposit. Most of the ore zones are situated close to this dyke and mineralization even occurs within the dyke in the No. 1 zone. This composite dyke is post-Bethlehem and it is possible that mineralizing fluids accompanied its intrusion. These mineralizing fluids may have migrated through fractured and altered rock as a consequence of the dyke's intrusion. Zones of shearing and faulting would be particularly favourable for localizing mineralizing fluids. The distance of transport of these fluids away from the dyke would depend on several parameters. In general it appears that on the Highmont property, transport has not been too far. If this hypothesis that ore bodies are likely to be associated with the dyke, two areas in particular may be good exploration targets. One is at the west end of the dyke at the Bethsaida-Bethsaida-Bethlehem Transitional contact and the other would be the east end which would be off the Highmont property and would be on property owned by Minex Development Ltd. and Trojan Consolidated Mines. I.P. surveys at hand do not extend to either of these limits. The limited amount of geochemistry in these areas is interesting but would require further follow-up.

In considering the southwestern portion as a favourable area, it may be possible that the Nos. 5, 6 and 7 ore zones may be expanded so that they may become a viable open pit mining project. I.P. surveys on the property have proven to be very useful and would probably be the best tool to investigating the southwestern portion also. Geochemistry has already shown it is an interesting area. Drilling would then follow and Highmont is fortunate in that the depth of overburden is very small compared to other areas in the Highland Valley.

T. G. Schroeter

T. G. Schroeter

Vancouver, B.C.
November 18, 1971

Attachments:



(4) Canadian Mines Handbooks, 1969 - 1971 incl., Northern Miner Press Ltd., Toronto 247, Ontario.

SELECTED REFERENCES

(1) Northcote K.E., 1969, Geology and Geochronology of the Guichon Creek Batholith. B.C. Dept. of Mines, Bull. 56.

(2) Bergey, W.R., Carr, J.M. and Reed, A.J. 1971. The Highmont Copper-Molybdenum Deposits, Highland Valley, British Columbia. Paper to be presented at C.I.M. Annual General Meeting at Quebec City, April 25-28, 1971, 12 p.p. + figures.

(3) Brown Sutherland, A, and Ney, C.S., 1972. Preprint of Guide to Excursion A & C 09 British Columbia - Copper and Molybdenum Deposits of the Western Cordillera. Int. Geol. Congr. XXIV Sess. Montreal 1972 - Amoco copy.