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The Granby Mining Company Limited

PHOENIX COPPER DIVISION

Grand Forks, B. C.

# 1968 EXPLORATION REPORT

# AND RECOMMENDATIONS FOR 1969

by

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Mine Geologist

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# Introduction

This report describes the major activities and projects undertaken by the Geology Department at the Phoenix mine in the period January 1st to November 30th, 1968. During this period the writer was assisted by the following men. Mr. T. B. Smart who was in charge of the percussion drilling in the Rawhide-Monarch area. His assistant was Mr. R. A. Hamaguchi. Mr. G. R. Percy who was in charge of geological mapping in the areas where geophysics was being carried out. His assistant Mr. C. W. Glanville. Mr. R. T. Forshaw who was in charge of the line cutting and magnetometer surveying. All the above people worked out of the mine geology office at Phoenix.

## DRILLING PROGRAMS IN THE PHOENIX MINE AREA

### A - The Rawhide-Monarch Test Drilling Project

This project was carried out over the area covering the old workings of the former Rawhide, Monarch, Goldrop, Curlew and Snowshoe Mines, and is referred to in this report as the Rawhide-Monarch or R-M Area.

In March of 1968 all the available records of previous work in the area were studied. This previous work falls into three periods.

The first period, 1895 to 1919, was the most active period. During it the orebodies were discovered, most of the ore grading above 1% copper was mined out by underground methods and approximately 200 vertical diamond drill holes were drilled from surface. The following records survive from this period:

(1) Generalized plans and sections of the underground workings.

(2) Plans showing the location of most of the old diamond drill holes. There are a few that conflict and are shown in different locations on different maps.

(3) Assays and footage of mineralized material intersected in the drill holes and a general outline of the ore inferred from the drilling.

(4) The 1911 G.S.C. Report by O.E. LeRoy, "Geology And Ore Deposits, Phoenix, B. C.", which describes the general geology of some of the underground workings as they were in 1910.

The second period, 1951 to 1955, was that in which the property was held by Attwood Copper Mines Limited. During this period most of the old workings were surveyed and geologically mapped and half a dozen surface diamond drill holes drilled. From this period we have the field notes, drill logs, and most

of the geological maps. The geological mapping was apparently done very rapidly and none of the maps are in finished form.

The third period, 1955 to the present, is that in which the property was acquired by The Granby Mining Company Limited and open pit mining of the old mines begun. During this period most of the underground workings were re-surveyed, many of the drifts were geologically mapped and several of the larger pillars were chip sampled. Above the old Snowshoe mine several short diamond drill holes were drilled which outlined a block of ore which was mined out by open pit methods from 1959 to 1962. An attempt was made to mine southward from the Snowshoe into the Rawhide mine area but was defeated by the high stripping ratio and the rough terrain. Following this, several attempts were made to assess the potential of the neighbouring old underground mining areas but results were inconclusive. Two lines of 100 foot airtrac drill holes were drilled but with disappointing results. The records from this period are virtually complete.

From a study of the old records outlined above it was seen, that in designing the drilling program, the following factors would have to be taken into account.

(1) That pillars should contain ore especially in areas where the ore was flat lying and the back needed maximum support.

(2) That in locations where the ore dipped or was faulted below the haulage level there would be ore left because it could not be loaded by gravity.

(3) That the areas fringing old stopes would probably contain ore grading up to 1% which was too low grade to mine before 1919. This was assuming that the stopes were bound by "assay walls" and not by geological contacts, that is, the ore mineralization

did not stop abruptly but decreased gradually.

(4) That there should be ore in several areas where old drill holes had intersected ore but where there was no record of it having been mined.

(5) That the object of the program was to develop an orebody suitable for open pit mining. Open pit mining requires that the mining be done from the top down. For this reason the drilling should start in the most elevated part of the area and work downward. If once an orebody could be developed on the relatively flat and accessible upper area, mining could begin and if there were any extensions to the ore they would be outlined by the production drilling.

Design of the drilling program was then begun, keeping the above factors in mind. A series of ten blocks or areas were picked out, which seemed to have the most potential. Also a series of plans of the whole area made at 50 foot intervals showing all the old stopes and drill holes. All the old ore intersections were recalculated on 25 foot intervals since this was considered the minimum bench height for efficient open pit mining. Proposed holes were laid out on a 50 foot square grid pattern, orientated to the mine survey grid system. It was planned to use a "Drillmaster", 6 inch percussion drill for the holes up to 150 feet in depth and a diamond drill for deeper holes.

The diamond drilling began on April 24th and was completed May 16th after drilling 4,707 feet. The drilling presented few problems. Drilling was rapid and core recovery good. All the core was logged and stored, and where mineralized, was split and assayed on five foot intervals.

The percussion drilling was begun in May and was completed in

September with 8,556 feet being drilled. The cuttings from this drilling were collected over ten foot intervals and one part was sent for assay, one part stored and one part washed, screened and bottled as a permanent record. The holes were logged from these cuttings and plotted on sections. While drilling was in progress the geologist in charge would periodically visit the drill with a bottle of water and a test tube and would wash small samples of the cuttings. From inspection of these he would decide when to stop the hole.

The results of the drilling were disappointing. In many of the areas where the old plans indicated ore intersections but no mining, the holes broke into stopes. The two largest of these stopes were found on an old Attwood survey plan and the drilling program changed to accommodate them. Thus much hoped for ore was found to be nonexistent. It had also been hoped that the areas between stopes would contain low grade ore. This was found not to be the case. From the drilling and geological mapping done in the area it would appear that there are two types of rock that carry copper mineralization. One, a sheet of massive medium grained garnet skarn that is continuous over the whole area and two, intermittent lenses of banded silicified limestone below it. The garnet skarn rarely grades above 0.3% copper, the silicified limestone grades 1.5% to 5% copper and is practically all mined out. The diagram below will make this clearer.

Of the ten areas originally proposed, drilling was done only on the first four, and of the 15,000 feet of percussion drilling proposed only 8,000 feet were drilled. This was due to the poor results obtained, and geological conditions revealed during the program.

Of the four blocks tested only one appeared to have mining potential. This was the Monarch I block. A possible open pit was designed on the basis of the drilling, and ore and waste tonnages calculated. These figures are meant as a preliminary estimate only and could be subject to a good deal of error mainly because the calculation of the volume of ore is based on relatively few holes, and the ore is highly erratic.

Figure 3

MONARCH I BLOCK

PRELIMINARY ESTIMATE OF ORE POTENTIAL

| BENCH | ELEVATION | TONS ORE | TONS WASTE | TOTAL TONS | GRADE ORE | TONS X GRADE | WASTE/ORE |
|---|---|---|---|---|---|---|---|
| | 5025 | | | | | | |
| 29 | | - | 65,000 | 65,000 | - | - | - |
| | 5000 | | | | | | |
| 28 | | - | 103,675 | 103,675 | - | - | - |
| | 4975 | | | | | | |
| 27 | | - | 85,200 | 85,200 | - | - | - |
| | 4950 | | | | | | |
| 26 | | 21,521 | 61,126 | 82,647 | 1.00 | 21,521 | 2.8 |
| | 4925 | | | | | | |
| 25 | | 9,565 | 16,656 | 26,221 | 1.31 | 12,530 | 1.8 |
| | 4900 | | | | | | |
| | | 31,086 | 331,657 | 362,743 | | 34,051 | |

$$\text{GRADE} = \frac{34050}{31086} = 1.1\% \text{ Cu}$$

TOTAL ORE = 31,086 Tons

TOTAL WASTE = 331,657

$$\frac{\text{WASTE}}{\text{ORE}} = \frac{332}{31} = 10.7$$

TOTAL TONS = 362,743 Tons

B - The Idaho-Brooklyn Test Drilling Project

The Idaho and Brookly Mines were mined by underground methods prior to 1918. They form a continuous ore zone straddling the old Phoenix-Greenwood road in a north-south direction. In 1961 to 1963 a block of ore was mined in the Idaho by open pit methods. A large open stope plus the necessity of keeping the Greenwood road open prevented mining from continuing northward into the Brooklyn area. In 1966 the road was detoured to the north due to the construction of the Twin Creek tailings dam, and several test holes were drilled. Drilling was hindered by a perched water table in the overburden around the Greenwood road and results were unsatisfactory. In 1968 the Twin Creek tailings pond was rapidly rising and would soon cover the area. Therefore a final test drilling program was decided upon to make sure no ore would be left behind. The Idaho pit was pumped dry and the drilling begun. The drilling was still hindered by a small stream of water flowing into the area from the east. This stream was diverted by a pipeline and the drilling was then able to proceed normally.

The results of the drilling were not encouraging. Most of the values intersected were in the hanging wall and roof of several large open stopes. Before this material could be mined these stopes would have to be back-filled. Since the tonnage of ore involved was relatively small this was thought to be impractical. The drilling did help in the interpretation of the very complex geology of this area.

C - The Upper Ironsides Test Drilling Project

During the winter of 1967, an economic study of an isolated ore zone; shown on the old 1918 mine plans to lie south of the present Ironsides Pit between benches 11 and 21; was made by Walter Brown and Bob Jennings. In his report on this study, Walter Brown concluded that 387,000 tons of ore could be mined here and still make a small operating profit. 1966 costs plus 10%, and a price of 45¢ per pound for copper were used to make the calculations. Since the calculations were based on old sections and drill records which were not too reliable he proposed drilling three diamond drill holes from the pit to test the size and location of the zone. The three holes were drilled and intersected the zone as expected. The location, thickness and grade of the zone appeared to be similar to that shown on the old sections.

D - The Snowshoe Test Hole - GS-105

In 1964 Mr. George Addie proposed drilling a hole to the northeast of the Snowshoe Pit to cut a predicted under-thrust wedge of skarn below a major fault. A five hundred foot hole was drilled. Results were disappointing. No fault or skarn was intersected. The first 194 feet of the hole was in green andesite with numerous barren quartz veins and much pyrite, the remainder was in very strongly silicified conglomerate, similar, but not the same as sharpstone conglomerate. Occasional traces of chalcopyrite were noted near the end of the hole. This hole was a shot in the dark that missed and it was decided not to do more drilling in this area until the I.P. work was completed and analysed.

E - The Gilt Edge Project

The Gilt Edge zone lies half a mile north of the Ironsides pit. It has been prospected by several trenches and a small shaft. The main rock type is strongly hematized and chloritized sharpstone conglomerate, with sparsely scattered veinlets and blebs of chalcopyrite. In the north part of the area there are also outcrops of fine grained chloritized diorite containing fine disseminated pyrite, pyrrhotite and a small amount of chalcopyrite.

In 1966 three east-west I.P. lines were run over the area six hundred feet apart. The centre line, which ran directly over the shaft, showed a very slight rise in chargeability, the line to the south showed nothing and the line to the north, which ran off the Granby property onto the Monte Carlo claim owned by Georgia Leaseholds of Vancouver, showed a strong anomaly. In 1967 four percussion holes were drilled in the area and two of them intersected very low grade copper mineralization (see 1967 Exploration Report). In the early part of 1968 nine more holes were drilled with results as shown on figure 7. No further drilling was done because the steep topography and deep snow made servicing of the drill difficult and the drill was needed for mining in the pit.

F - A Review Of Diamond Drilling In the Mine Area

The diamond drilling was done under contract by Canadian Longyear Co. Ltd., using a sloop mounted, steel tower, wireline drill, drilling an AWL size hole. The drillers lived in a tent camp close to the drill site and worked three shifts per day. The water supply was maintained using a 500 gallon storage tank at the drill and two 500 gallon tanks mounted on a rented truck which filled up at the mine and hauled to the drill once or twice each shift. Water usage ranged from 1500 to 3000 gallons per shift and no attempt was made to conserve or reclaim water. Core recovery was excellent and the rate of drilling was practically triple that of the previous year. In a 32 day period which includes days off and other delays, 5860 feet were drilled, that is 183 feet per day. This was on 27 holes having an average depth of 220 feet. Most of the delays were due to the water truck breaking down or getting stuck. Core was put in boxes made in the mine carpentry shop and was transported from the drill by the geologist. The core was logged and mineralized sections split and sampled on five foot intervals. Shorter intervals were sampled when the hole intersected interesting looking quartz veins. The improvement in drilling performance compared to last year was due to four factors:

1. Good supervision.
2. A good supply of spare parts.
3. Having the drillers live in camp close to the job and way from town.
4. Using a water truck instead of depending for water on long pipe lines and pumps.

G - A Review of Percussion Drilling

The percussion drilling was done with an Ingersoll-Rand "Drillmaster", track mounted six inch, down the hole drill, that was formerly a production drill in the pit. It drilled at an average of 90 feet per eight hour shift which was lower than the mine production drilling rate of 150 feet per shift and was due to longer moves and set-up time plus deeper holes.

The tub type, cuttings collector, used previously in this type of drilling was found to overflow badly on 10 foot sample intervals and was discarded. Instead a four foot plywood sheet with a nine inch hole bored in it was used to collect suttings. At each ten foot interval, the sheet was cleaned off; and a segment of the cuttings run through a Jones riffle and bagged for assay. The drilling was done without the dust collector attached but with water injected into the airstream. This tended to mud in the bit if too much water was used, or, if too little was used; it created an unhealthy amount of dust. Toward the end of the period the dust collector was re-attached and the drilling was done dry. A screen analysis of six samples taken without the dust collector attached showed an increase in assay in the fine sizes as shown on figures 8 and 9. This raises the following questions:

1. As the rock is crushed by the drill bit, are the sulphide minerals reduced to fine sizes at a higher rate than the gangue minerals?
2. A certain proportion of the fine sizes crushed by the bit are subsequently blown into the air and do not get sampled. In these fine sizes that are lost, is there a concentration or a dilution of the sulphide minerals relative to the original rock?

Considering these questions, it would seem probable that since the sulphide minerals, being softer, and at least as brittle as the gangue minerals, would be reduced to fine sizes faster. These fine sizes would tend to be blown away as stated. This trend would be somewhat counteracted by the higher density of the sulphides but as the sizes become finer this would matter less and less. Therefore the following assumptions were made:

(1) Of the drill cuttings that are caught on the sample sheet for assay, the fine sizes assay higher because they contain more sulphides, and they contain more sulphides because the sulphides grind up faster, not because they have greater density.

(2) Part of the fine sizes blow away and are lost. That is, a portion of the cutting which is enriched in sulphides is not assayed.

(3) The finer the drill grinds the cuttings, the more the value of the cuttings sampled will be below that true assay value of the rock being drilled.

H - Costs And Rates Of Drilling Programs In the Mine Area

Diamond Drilling Costs

| Area | Footage | Footage Charge | Water Truck | Moves Over 200 Ft. | Other Charges |
|---|---|---|---|---|---|
| Rawhide-Monarch | 4,707 ft. | $29,412.50 | $549.90 | $496.89 | $1,618.40 |
| Upper Ironsides | 1,153 ft. | $ 7,206.75 | - | $106.48 | $ 110.50 |
| Snowshoe Hole GS-105 | 402 ft. | $ 2,351.70 | - | $341.55 | - |
| Totals: | 6,262 ft. | $38,970.95 | $549.90 | $944.92 | $1,728.90 |

Total Cost = $42,194.67 Cost Per Foot = $6.75

Percussion Drilling Costs

| Area | Footage | Operating Cost/ft. X Footage | D-8 Cat | Other Charges |
|---|---|---|---|---|
| Rawhide-Monarch | 8,556 ft. | 2.00 x 8556 = $17,112 | $440 | |
| Idaho-Brooklyn | 1,920 ft. | 2.00 x 1920 = $ 3,840 | $115 | Pumping Out Pit |
| | *approx 400 ft in mud | 2.00 x 400 = $ 800 | | estimated $250 |
| Glit Edge | 1,050 ft. | 2.00 x 1050 = $ 2,100 | | |
| Totals: | 11,526 ft. | $23,852 | $555 | $250 |

Total Cost = $24,657 Cost Per Foot = $2.14

*Note - Drilling in mud not included in footage total since holes lost.

## Diamond Drilling Rates

Drill #2

(Pit Drill)

| | | |
|---|---|---|
| Total hours - Drilling | 1151 hours equivalent to | 144 shifts |
| Total hours - Moving etc. | 859 hours equivalent to | 107 shifts |
| Total hours - Repairs | 4 hours equivalent to | 0.5 shifts |

Note: Upper Ironsides drilling not included

Feet per drilling crew shift (16 hrs) = $\frac{5109}{72}$ = 72 ft. (1967 = 26 ft.)

Feet per crew shift overall = $\frac{5109}{126}$ = 41 ft. (1967 = 17 ft.)

## Percussion Drilling Rates

Feet per scheduled shift = 90 ft.

Mechanical Availability = 89%

(Includes all minor delays and repairs, excludes major overhauls and servicing)

Calculated total drilling

shifts = $\frac{11526}{90}$ = 128 shifts

## TEST DRILLING OF INDUCED POLARIZATION ANOMALIES

Ever since 1965 an annual summer program of induced polarization surveys has been carried on, on various properties in the Boundary area. The anomalies located are subsequently drilled, usually as recommended by the geophysist in charge of the survey. The following table shows the results of these programs to date. Of fourteen anomalies tested by drilling ten appeared to be caused by pyrite and four were uncertain as to cause. None contained a significant amount of chalcopyrite but two contained traces.

### A - The Pac Group Drilling

In 1968 holes Pac #1, #2, #6, #7, #8, #9 and #10 were drilled on the east part of the Pac claim group to test several linear, north-south trending anomalies discovered in 1966. In 1966 it was thought that these anomalies represented mineralized belts of limestone lying beneath a thin, widespread, sheet of greywackes and greenstones. Drilling proved that this was not the case and that the anomalies are caused by pyritic zones in the greenstones. None of the holes intersected limestone except Pac #6 which encountered a queer type of hematized limestone breccia.

The last two holes drilled, Pac #11 and Pac #12, farther east and at the edge of the greenstone area (see map) encountered barren limestone and a wide section of pyritic diorite.

### B - The Lois Group Drilling

Further drilling was done on the Lois in 1968 on the anomalies located in 1966 and 1968. Four holes were drilled in addition to the two drilled in 1966. Strong pyrite mineralization was intersected in all of them and the geology was approximately as predicted by the surface mapping done in 1966 and

1968. Holes Lois #3, #4 and #5 intersected wide sections of pyrite diorite which contained very low values in copper up to 0.10%. Hole, Lois #6, intersected barren pyritic limestone.

C - A Review Of Drilling In the Anomaly Areas

The drilling in the anomaly areas was done under contract by Canadian Longyear Co. Ltd., using a conventional drill and tripod, and equipped with wireline to drill AWL size holes. A small cat was supplied to move the drill but all site preparation and road building had to be done by Granby. Surface streamlets or sloughs were used as a water supply and were adequate. The drilling was done on three shifts per day continuously, and core recovery was quite good. In a period of thirty three days 4,739 feet were drilled, the record being 228 feet in one shift. This averages 143 feet per day and includes a long move of 40 miles to the Lois claims near Midway B. C., and back. The drilling crew lived in the tent camp at Phoenix with the crew working in the Rawhide-Monarch area and commuted to the drill sites even while drilling at Midway.

D - Costs And Rates Of Drilling In Anomaly Areas

Costs

| Area | Footage | Footage Charges | Moving Charges | Other Charges |
|---|---|---|---|---|
| PAC | 3,016 | $17,643.60 | $3,276.08 | - |
| LOIS | 1,723 | $10,079.55 | $3,012.36 | $630.37 |
| Totals | 4,739 | $27,723.15 | $6,288.44 | $630.37 |

Total Cost = $34,641.96 Total Cost Per Foot = $7.32

## Drilling Rates

Drill #1 (Includes Upper Ironsides Pit Drilling)

(Anomaly Drill)

| | | | | |
|---|---|---|---|---|
| Total hours | - drilling | 1096 | equivalent to | 137 shifts |
| | - moving | 1253 | | 157 shifts |
| | - repairs | 26 | | 3 shifts |

Feet per drilling crew shift (16 hrs) = $\frac{5892}{68}$ = 87 (1967 = 26)

Feet per crew shift overall = $\frac{5892}{149}$ = 40 (1967 = 14)

Figure 10

INDUCED POLARIZATION RESULTS TO DATE IN THE PHOENIX AREA

| Area & Year Anomaly Located | Size of Anomaly | Subsequent Drill Holes And Footage | Drilling Results | Remarks |
|---|---|---|---|---|
| MOE-1965 & 1966 | 3500' x 500' | MOE 3 503 ft. | Not much visible sulphides | |
| | | MOE 4 302 ft. | Scattered Pyrite & Pyrrhotite | There does not seem to be enought sulphides to explain the anomaly |
| | | MOE 5 152 ft. | Scattered Pyrite | |
| | | MOE 7 393 ft. | Traces Cpy. | |
| | | MOE 8 302 ft. | Abundant very fine pyrite | |
| | 2000' x 500' | MOE 6 388 ft. | Short sections with fine pyrite | As above |
| B.C. MINE-1966 | 800' x 800' | B.C. 3 665 ft. | 0.83% Py/15' 1.40% Py/15'<br>1.87% Py/15' 3.9 % Py/25' | |
| | | T.H. 1 | Trace | |
| | | T.H. 2 | Not drilled - too wet | Anomaly caused by pyrite |
| | | T.H. 3 | 0.17% Cu/10' .10% Cu/10' | |
| | | T.H. 4 | Trace | |
| | | T.H. 5 | Trace | |
| | 200' x 600' | B.C. 4 459 ft. | Shorts sections well pyritized | |
| | | B.C. 5 388 Ft. | " | Anomaly caused by pyrite |
| | | B.C. 6 401 ft. | " | |
| GILT EDGE 1966 | 500' x 2000' | G.E.-1 620 ft. | 1.65% Py/600' | |
| | | T.C.-1 226 ft. | Scattered pyrite | Anomaly caused by pyrite |
| | | T.C.-3 390 ft. | Scattered pyrite | |

| Area & Year Anomaly Located | Size of Anomaly | Subsequent Drill Holes And Footage | Drilling Results | Remarks |
|---|---|---|---|---|
| TWIN CREEK 1966 | 300' x 800' | T.C.-2 409 ft. | Talc. Pyrite? | |
| | | T.C.-4 314 ft. | 1.54% Py/30', 1.54% PY/60' | Anomaly caused by pyrite |
| LOIS | 1600' x 2400' | LOIS 1 401 ft. | Much black pyritic limestone | |
| | | LOIS 2 601 ft. | " | Anomaly caused by pyrite |
| | | LOIS 3 501 ft. | 0.88% Py/100',2.79% Py/60' | |
| | | LOIS 6 456 ft. | Much black pyritic limestone | |
| WEST PAC | 400' x 3500' | W.P. 1 536 ft. | 2.58% Py/170' | Anomaly caused by pyrite |
| | | W.P. 2 300 ft. | Visible Pyrite Scarce | |
| | 800' x 2000' | W.P. 3 169 ft. | Short pyritized sections | |
| | | W.P. 4 302 ft. | 4.95% Py/20'1.72% Py/20' | Anomaly caused by pyrite |
| | | W.P. 5 409 ft. | 2.70% Py/50' | |
| PAC 1966 (Drilled 1968) | 200' x 1200' | PAC 1 362 ft. | 3.2% Py/60' | Anomaly caused by pyrite |
| | | PAC 2 202 ft. | Pyrite Scarce | |
| | | PAC 6 268 ft. | Scattered pyrite | |
| | 400' x 1600' | PAC 7 308 ft. | Epidotized Very litte pyrite | Missed target? |
| | | PAC 8 210 ft. | " | |
| | 400' x 1200' | PAC 9 498 ft. | Very little pyrite | Missed target? |
| | | PAC 10 418 ft. | " , some graphite | |
| | 1000' x 200' | PAC 11 482 ft. | 2.54% Py/70' | Anomaly caused by pyrite |
| | | PAC 12 268 ft. | 2.17% Py/125' | |

## GEOPHYSICAL PROGRAMS

### A - GRID LINE LAYOUT AND LINE CUTTING

In 1968 five line grids were laid out and surveyed totalling 31.4 line miles. The grids were all located to cover the projected extensions of anomalies found in previous I.P. surveys into unsurveyed areas. They were designated LG-1, LG-2, LG-3, LG-4, and LG-5. On LG-1 the line spacing was 200 feet, on all the others 400 feet. On LG-1 the base lines and cross-lines were surveyed with a transit and tied into the mine survey system. On the other grids the surveying was done with a tripod mounted Brunton compass, and they were tied in to each other and to previous line grids. The lines were chained using an Abney hand level and a 300 foot fibreglass chain. The line cutting was done by Mr. J. Forshaw of Greenwood on a cost plus 20% contract. At the start of the program, due to the inexperience of the cutters, several lines went astray and had to be re-cut. There was no charge for this. Mr. R. Forshaw was in charge of chaining the lines.

### B - INDUCED POLARIZATION SURVEYS

Induced polarization surveys were done on the grids by Huntec Ltd. of Vancouver on contract. Two helpers were supplied by J. Forshaw of Greenwood for Granby and one helper was supplied directly by Granby (Clarke Glanville). Strong anomalies were located on all the grids with some very high ones on LG-1. Extensions were added to LG-1 on the south and on the east to follow these anomalies to the property boundary. No problems were encountered except on LG-1, where due to the high chargeability of the ground, power requirements reduced the range of the transmitter.

On LG-1 the line cutting was extended west of the Snowshoe Pit road as far as the power line, to assist in laying out holes in the Rawhide-Monarch area. The I.P. survey did not go west of the road south of line 48672N. (Please refer to map in pocket).

C - GEOLOGICAL SURVEYS

Geological mapping was done on the line grids by Mr. G. R. Percy assisted by Mr. C. Glanville. Using the cut lines and enlarged airphotos for control, the outcrops were sketched and described and a suite of typical rock specimens collected. On LG-2 the mapping was extended beyond the property boundary to include the Lancashire Lass claim and the skarn zone which occurs on it.

D- MAGNETOMETER SURVEY

A magnetometer survey was run over the line grids by Mr. R. Forshaw and Mr. C. Glanville using a Sharpe MF-1 magnetometer. The "West Pac" grid, surveyed by I.P. in 1967, was also covered. In areas where the bush was not too thick (LG-2, LG-5 and West Pact) readings were taken on a squaee 100 foot grid. In the bushy areas, they were taken every 100 feet along the lines.

The magnetometer survey reflected very few of the mapped geological contacts. Trouble was experienced again with short circuits in the instrument and battery case.

E - COSTS AND RATES

1. Lines Cut

| | | | |
|---|---|---|---|
| Base Line | 12,400 | = | 2.4 miles |
| Cross Line | 146,200 feet + 5% for slope = 153,500 | = | 29.0 miles |
| | Total | = | 31.4 miles |
| | Total I.P. Survey Lines | = | 24.3 miles |

2. I.P. Survey

| | |
|---|---|
| Preliminary survey | 21.87 line miles |
| Detail survey | 6.25 line miles |
| Total | 28.12 line miles |

1. Line Cutting Cost---------- Total $4,300.96 or $137 per line mile
   Total cost on I.P. Grids = $3,330
2. Surveying & Chaining Cost (estimated) Total $600 or $20 per line mile
3. I.P. Survey Cost ------ Total $12,300 or $563 per line mile

4. Geological Survey Cost -----Total $3,450 or $119 per line mile

5. Magnetometer Survey Cost (estimate 50 miles) $600 or at $12 per line mile

Total cost $21,250
Cost on I.P. Grids = $19,680 or $880 per line mile

1. Line Cutting Rate 1760 feet or 0.36 line miles per crew day
or 880 feet or 0.18 line miles per man shift

2. I.P. Survey Rate .91 suvey miles per crew day; 0.71 line miles per crew day

3. Geological Survey Rate 0.48 line miles per crew day

4. Magnetometer survey rate (estimated) 2 line miles per crew day
Including office work

5. Chaining Rate (estimated) 2 line miles per crew day
Including office work

## PROSPECT EXAMINATIONS AND CLAIM STAKING

### A - THE STAKING OF THE AMP AND WET GROUPS

This is covered in a preceeding report presented in October 1968.

### B - EXAMINATION OF THE SANDY CLAIM GROUP

The Sandy group consists of four claims located one mile east of July creek, one mile north of the U.S.A. border and three miles west of Grand Forks. They are owned by Mr. Peter Koochin of Grand Forks. The showings consist of two quartz veins cutting granodirorite. One vein strikes 330° and dips 40° east. The second vein strikes 045° and dips 30° S.E. Both veins are white quartz with scattered blebs of chalcopyrite, scheelite and galena. Both veins have been trenched and two short (20 to 30 feet) shafts sunk down dip, one on each of the veins. The veins have an average width of about 6 inches. Samples taken assayed as follows.

| Sample Description | Tag | Au | Ag | Cu |
|---|---|---|---|---|
| Vein I - Chip sample along vein exposure | 16829 E | .620 | 2.00 | - |
| II - Chip sample from a pocket of pyrite | 16830 E | TR | 0.12 | 0.20 |
| Vein II - Grab sample from vein | 16831 E | 0.320 | 0.50 | - |
| II - Sample of kaolinized wall rock | 16832 E | 0.020 | 0.16 | - |

No action was taken on this showing. It is probably part of the vein structure on which the Yankee Bay Mine is located. This mine lies about one mile northeast of the Sandy claims.

## PART V MISCELLANEOUS PROJECTS

### A - GEOLOGICAL MAPPING IN RAWHIDE-MONARCH AREA

Most of the Rawhide-Monarch area was re-mapped by Mr. T. B. Smart. An attempt was made to correlate the geology of the drill holes with the surface geology. Previous mapping done in the area was checked. This resulted in several previously unsuspected skarn areas being located. Cut lines every 200 feet were used as control for the mapping. This map will be completed by the end of the year.

### B - GEOLOGICAL INTERPRETATION OF SECTIONS IN THE RAWHIDE-MONARCH AREA

The 1" = 100 scale sections covering the Rawhide Monarch Area were re-drafted and some extra sections made in addition. A revised interpretation of the geology was put on them using the new drill hole and surface mapping information available. This work was done by Mr. T. B. Smart during November.

### C - LOCATION OF SOUTHEAST PROPERTY BOUNDARY

While mapping the south extension of L.G.-1 it was noted that cut lines made by Sabina Mines Ltd., for I.P. survey, lay as much as 1000 feet inside the Granby property boundary. Also posts of the Mack claim group, staked by Sabina in 1967, lay within the property boundary in the same area. After a week of search, the posts proving Granby's prior claim to the ground were located. Since several of the posts were rotten it was decided to tie them in by chain and transit to the mine survey system, andaalso tie in any old crown grant post in the area. This was done with the help of the engineering department.

### D - IRONSIDES PIT MAPPING

During September, all the unmapped faces available in the Ironsides Pit were mapped in the customary manner and plotted on a 1" = 100' scale map.

This will be added to periodically, as new faces appear, and when weather conditions permit.

# SUMMARY

| | 1968 ACTUAL | | January 1968 FORECAST | | March 1968 REVISION | | June 30, 1968. REVISION | |
|---|---|---|---|---|---|---|---|---|
| | Amount | Cost | Amount | Cost | Amount | Cost | Amount | Cost |
| **DIAMOND DRILLING** | | | | | | | | |
| UPPER IRONSIDES | 1,153 | 7,420 | not forecast | | 1,100 | 8,520 | | 8,300 |
| SNOWSHOE GS-105 | 402 | 2,690 | not forecast | | - | not forecast | | not forecast |
| RAWHIDE-MONARCH | 4,707 | 32,080 | 4,100 | 28,630 | 4,825 | 37,390 | | 34,700 |
| I.P. ANOMALIES | 4,739 | 34,640 | 3,725 | 22,090 | 3,725 | 28,870 | | 38,000 |
| TOTALS: | | 76,830 | | 50,720 | | 74,780 | | 81,000 |
| **PERCUSSION DRILLING** | | | | | | | | |
| RAWHIDE-MONARCH | 8,556 | 17,550 | 15,000 | 8,100 | 15,000 | 19,310 | 15,000 | 34,500 |
| GILT EDGE | 1,050 | 2,000 | 1,300 | 1,950 | 1,050 | 2,000 | 1,050 | 2,000 |
| BROOKLYN IDAHO | 1,920 | 4,760 | - | not forecast | - | not forecast | - | not forecast |
| TOTALS: | | 24,310 | | 10,050 | | 21,310 | | 36,500 |
| **GEOPHYSICAL SURVEYS** | | | | | | | | |
| I.P. SURVEY | 24.3 mi. | 12,300 | 22.3 mi. | 11,800 | 22.3 mi. | 11,800 | | 14,600 |
| GEOLOGY SURVEY | 29 mi. | see below | 25.0 mi. | | 25.0 mi. | | | |
| MAG. SURVEY | 50 mi. | see below | 25.0 mi. | | 25.0 mi. | | | |
| TOTALS: | | 12,300 | | 11,800 | | 11,800 | | 14,600 |
| **PERSONNEL** | | | | | | | | |
| J. PAXTON | 12 mon. | | 12 mon. | | 12 mon. | | 12 mon. | |
| T.B. SMART | 8 mon. | | 4 mon. | | 4 mon. | | 6 mon. | |
| G.R. PERCEY | 3 mon. | | 4 mon. | | 4 mon. | | 4 mon. | |
| R.T. FORSHAW | 6 mon. | | 4 mon. | | 4 mon. | | 6 mon. | |
| R. HAMAGUCHI | 4 mon. | | 4 mon. | | 4 mon. | | 4 mon. | |
| CLARK GLANVILLE | 3 mon. | | 4 mon. | | 4 mon. | | 4 mon. | |
| TOTALS: | | 25,000 | | 27,000 | | 23,288 | | 23,200 |
| GRAND TOTAL: | | 138,440 | | 99,570 | | 131,118 | | 155,300 |

## RECOMMENDATIONS

A - DIAMOND DRILLING (This is an estimate made prior to receiving Huntec's recommendations)

On the 1968 I.P. Anomalies

| | |
|---|---|
| LG-1 Area, 4 major anomalies | 3,500 feet required |
| LG-2 Area, 1 major anomaly | 1,500 feet required |
| LG-3 Area, 5 major anomalies | 1,000 feet required |
| LG-4 Area, 1 major anomaly | 1,000 feet required |
| LG-5 Area, 1 major anomaly | 500 feet required |
| Total: | 7,500 feet |

Additional testing of the 1966 Pac Anomalies after further I.P. work

| | | |
|---|---|---|
| A-1 Area, | estimate | 600 feet |
| A-2 Area, | estimate | 600 feet |
| C-1 Area, | estimate | 1,000 feet |
| D-1 Area, | estimate | 1,000 feet |
| Total: | | 3,200 feet |

Testing of the deep skarn zone indicated by percussion drilling in the Goldrop area. Estimate approximately 1000 feet.

If the above drilling is done arrangements should be made for a water truck and pump to be in service or at least on call during the drilling period. Also, an addition to the core shack will have to be built to store the additional core.

B - PERCUSSION DRILLING

Some of the diamond drilling listed above is shallow enough to be done by a percussion drill, especially in the LG-1 area. This would depend on the drill, cat and fuel truck being available and is suggested as a cheaper alternative.

C - GEOLOGICAL MAPPING

It is recommended that the surface and pit mapping done in the Rawhide-Monarch and Ironsides Areas, be extended from Marshall Lake to

Hartford Junction, that is, the area covered by the 1967 aerial photo survey, for the following reasons.

a. It is highly possible that the mineralization at Phoenix is controlled by deep seated fault zones which are marked by strong pyrite mineralization. If these could be traced away from the mine they would be a guide for future prospecting.

b. To fill in the detailed geology around the known copper showings near Marshall Lake, on the Gilt Edge Area, and near Hartford Junction.

c. As more I.P. anomalies are being located each year, and as more drilling is being done, it is important to know the detailed stratigraphy of the area particularly with regard to volcanic flows which may mask skarn zones.

D - MAGNETOMETER SURVEYS

Most of the major copper deposits in the area, Ironsides, Rawhide, Monarch, Motherlode, Oro Denora, Emma etc., are closely associated with narrow bands or sheets of massive magnetite either at the base, or along one side of the orebody. These magnetite bands are easily detectable with a ground magnetometer but they do not show up on the aerial survey done by Granby over the area in 1967. This is probably due to the low rate of response of the magnetometer relative to the flying speed. It is suggested that the right type of magnetometer survey would locate these magnetite bands and perhaps could distinguish between them and serpentine intrusives or magnetic volcanic flows.

It is recommended that as well as running surveys over I.P. grids as has been done in the past, that a program of test surveys over the Ironsides and Rawhide areas be undertaken with both vertical component, and total field instruments to see if the magnetite zones in these areas give a unique type of anomaly that could be recognized in other areas and would form a valuable prospecting tool.

E - INDUCED POLARIZATION SURVEYS

In the 1968 Pac drilling holes #7, #8, #9 and #10 were drilled to test anomalies located in 1966. They intersected very little sulphide mineralization, but encountered strong epidote mineralization which is typical in the area close to sulphide zones. Therefore it is recommended that this anomaly area be re-surveyed in detail to try and determine why the holes did not intersect the cause of the anomaly.

F - PROPERTIES

It is recommended that an effort be made this winter to option or lease the Monte Carlo crown grant claim L976 for the following reasons:

(a) Drilling has proved the existence of extensive low grade copper mineralization in the Gilt Edge area to the south of this claim.

(b) I.P. Surveys have shown strong anomalies on the south and east boundaries of the claim from which it can be inferred that there is an anomaly reaching from the Gilt Edge drilling area northeast across the Monte Carlo and onto LG-3 area.

(c) Work on the ski tow to the east of the Monte Carlo has uncovered traces of chalcopyrite mineralization.

G - WINTER PROJECTS

It is recommended that all geological data from the mining area to put on a series of 1" = 100' plans at hundred foot intervals of elevation. This should give an undistorted, over-all picture of the main skarn zone and its relationship to the orebodies.

It is further recommended that all the geological data from the Ironsides Pit mapping be added to the revised ore plans made this year by the engineers and used by them for ore calculations.

## H - SUMMARY OF RECOMMENDATIONS AND ESTIMATED COST

| | | |
|---|---|---|
| 1. | Diamond Drilling | |
| | 11,700 feet at $750 per foot | $87,750.00 |
| | Allowance for extra drilling | 10,000.00 |
| 2. | Geological Mapping | |
| | Detailed mapping of approximately four square miles | 12,000.00 |
| 3. | Magnetometer Surveys | 4,000.00 |
| 4. | Induced Polarization Surveys | |
| | Re-survey on Pac area - 3 line miles<br>Surveys on other areas -10 line miles<br>13 line miles at cost of $500 per line mile, line cutting included | 6,500.00 |
| 5. | Option on the Monte Carlo Claim | 5,000.00 |
| 6. | Winter Projects | 5,000.00 |
| 7. | Allowance for Extra Projects & Personnel Costs | 10,000.00 |
| 8. | Vehicle Rentals | |
| | Jeep for five months | 1,000.00 |
| | Water truck for two months | 2,000.00 |
| | | $143,250.00 |

Personnel will consist of the following groups:

a. Geologist, surveyor and rodman to do detailed geological mapping.
b. Geologist, assistant geologist to do core logging, drill supervision, grid layout and line geology.
c. Geophysist to do magnetometer surveys.

Capital Costs Will Consist Of:

| | | |
|---|---|---|
| 9. | Addition to Core Shack | 2,000.00 |
| 10. | Purchase of a water truck if one cannot be rented (Additional to rental cost shown in 8 above) | 8,000.00 |
| | | $ 10,000.00 |
| | TOTAL: | $153,250.00 |

JP:lc

James Paxton, Geologist