N.R.S. 92 I/11 50[°]32'N, 121[°]03'W

LITHOGEOCHEMICAL AND GEOLOGICAL REPORT ON THE DEN (3-7) CLAIM BLOCK, HIGHLAND VALLEY, BRITISH COLUMBIA

KAMLOOPS MINING DIVISION

GEOLOGICAL BRANCH ASSESSMENT PEPORT

SWE

Owner: Acheron Resources Ltd. Operator: Acheron Resources Ltd. by: Brian V. Hall, M.Sc., December 13, 1983

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1.0 INTRODUCTION

An exploration programme consisting of geological mapping and lithogeochemistry was conducted over the Den 3-7 claims. The purpose of this programme was to document the alteration and geochemical patterns of the intrusive rocks and relate them to the patterns anticipated for a buried porphyry copper deposit. A total of 135 representative rock samples were collected and anlyzed for Cu, Mo, Mn and F. In addition geological mapping of the rock types and wallrock alteration at a scale of 1: 5,000 accompanied the collection of the samples.

At present, the claims are owned and operated by Acheron Resources Ltd.

1.1 Location and Access

The Den 1-7 claims are situated on the southwest flank of South Forge Mountain of N.T.S. map sheet 92I/11 (50°32'N, 121°03'W). Ashcroft is approximately 35 km northwest of the property and Kamloops 50 km to the northeast. Producing mines in the area include Valley Copper (4.5 km to the south), Bethlehem Copper (4.5 km to the southeast), Lornex (6.0 km to the south) and Highmont (10.0 km to the south).

Access to the property is by paved highway from Ashcroft or Logan Lake to the Bethlehem Copper mine road, then by logging road to the centre of the property.

1.2 Exploration History

Exploration work on the property commenced in 1967 with the completion of a limited programme of geological mapping, soil geochemistry and geophysics by Adera Mining Ltd.



1.2 Exploration History (Continued)

In 1968 an I.P. survey was conducted by Huntec Ltd. over the southern portion of the property. This survey used a pole-dipole array and outlined four small chargeability highs.

Agilis Engineering on the behalf of Grandora Exploration Ltd. in 1972 conducted a programme of line cutting and geological mapping on the southern portion of the claim block.

In 1973, Acheron Mines Ltd. acquired the property through an option agreement. The next Spring (April, 1974) an exploration programme consisting of line cutting, geological mapping and a magnetometer survey was completed on the northern portion of the property. In addition, Atled Exploration Management conducted an I.P. survey over the entire property, plus nine percussion drill holes were drilled and soil samples were taken along the contact of the Kamloops Group volcanics. Details of this work are summarized by Holcapek (1974) and Petersen (1983).

1.3 Regional Geology

According to a regional compilation by McMillan (1978) the Den claim block is underlain by intrusive rocks of the Bethlehem phase of the Guichon Batholith and volcanic rocks of the Kamloops Group.

The Bethlehem phase, defined as granodioritic in composition normally contains 8% mafic minerals, and is characterized by several per cent coarse-grained poikilitic hornblende crystals (McMillan, 1976). This intrusive phase is separated from the central Bethsiada phase by a broad and somewhat arbitrary contact zone containing a middle member known as the Skeena variety. Surrounding the Bethlehem phase is the Highland Valley phase of which Guichon variety occurs in close proximity to the

1.3 Regional Geology (Continued)

claim block (McMillan, 1978). All the phases of the Guichon Batholith are considered to be Triassic in age and give a K/Ar date of 198 ± 8 Ma (Northcote, 1969).

Unconformably overlying the northern most portions of the claim block and Guichon Batholith are volcanic rocks of the Kamloops Group. Although age dates are not available for this unit, it is considered to be Eocene or younger in age.

Major structures for the Guichon Batholith area include the northerly striking Lornex and Guichon Creek Faults, plus a number of west to northwesterly striking faults (Barnes Creek, Highland Valley, and Skuhun Creek faults). The Lornex and Guichon Creek Faults have largely right lateral movement of inferred distances of 6 and 20 km respectively. For the west to northwesterly striking faults a combination of vertical and left lateral displacement is inferred. Data from the various Highland Valley ore deposits suggest that the tectonic fabric of the Batholith was established after the intrusion of the Bethsaida phase, but prior to the formation of the deposits (McMillan, 1976). Vertical movements on the faults occurred over a considerable time period, beginning in the Early to Middle Jurassic and remaining active until the Oligocene.

For the porphyry copper deposits of the Highland Valley the most common hosts are the Skeena and Guichon intrusive varieties, followed by the Bethlehem and Bethsaida phases (Table 1). Individual deposits are localized by granitic dykes (Bethlehem), a major quartz-porphyry dyke (Lornex, Highmont) and stocks of quartz monzonite (JA). Structurally

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1.3 Regional Geology (Continued)

the Lornex Fault is considered to be controlling factor in the localization of the Lornex and Valley Copper deposits (Osatenko and Jones, 1976). Another feature considered to be important in the localization of some of the deposits are increases in the fracture density (Bethlehem, Valley Copper, Lornex and Highmont) (McMillan, 1976).

Metal zoning and wallrock alteration patterns are typical of most porphyry copper deposits with a central zone either barren or predominately bornite grading outward into a chalcopyrite zone and finally an outermost pyrite zone. The wallrock alteration patterns for the most part grade outward from a potassic core through zones dominated by sericite (phyllic zone) and clay minerals (argillic zone) to a peripheral zone containing epidote, chlorite and calcite (propylitic).

TABLE 1

SUMMARY OF HIGHLAND VALLEY DEPOSITS

DEPOSIT	TONNAGE	GRADE		HOST ROCK	WALLROCK ALTERATION *						
	million tons	<u>% Cu</u>	2 Mo		Quartz	Kspar	Biotite	Phy111c	Argillic	Propylitic	Tourmaline
Valley Copper	700	0.48		Bethsaida	S	M-S	-	S	S	w	3 - 3
Lornex	392	0.411	0.014	Skeena	M-S	vw	-	M-S	м	W	-
J.A.	260	0.43	0.017	Guichon Bethlehem	-	S	vw	w	W-M	м	-
Highmont	136	0.29	0.051	Skeena		-	vw	w	W-M	м	W
Bethlehem	55	0.47		Guichon Bethlehem	-	-	м	-	W-M	м	M
Ann Number One	48	0.27		Skeena							
Minex	36	0.2		Skeena							
Krain	15	0.5		Guichon		-	-	-	W-M	M	100
South Seas				Guichon							

* S strong; M moderate; W weak; VW very weak; - negligible

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Data from McMillan, 1976

2.0 PROPERTY GEOLOGY

2.1 Structure

The two main structural features of the Den claim block include;

- the unconformable relationship the Kamloops Group volcanics has to be the intrusives of the Guichon Batholith, and
- 2) the Lornex fault.

On the basis of the 1974 magnetometer survey it was postulated that the surface expression of the Lornex Fault coincided with a northerly trending magnetic low centered about L20N, 20W. This low in part coincided with the western contact of the Kamloops Group volcanics and an inferred fault situated at L88N, 20W (Holcapek, 1974).

Based upon the results of the rock geochemistry and this year's geological mapping it is suggested the Lornex Fault may be centered about L4N, 4W. Although the distinction between the Skeena variety (% SK) and Bethlehem Phase (% HG) is subtle the proposed contact between the two changes strike abruptly from the southeast to south in the vicinity of L22N, 4W. In addition, the degree of orthoclase veining and epidote alteration decreases significantly east of L45 to L20N, 4W (Fig. 2), and a zone of highly anomalous Cu values (Fig. 4) in part coincides with this inferred fault trace. One further point to be considered is the fault trace for the Lornex fault as proposed by McMillan (1978) best coincides with the location advocated by this report.

Another important structure in the vicinity of the Den claims is the Witches Brook fault. This structure appears to be a segment of the Highland Valley fault system and is situated immediately south of the claim block.

2.1 Structure (Continued)

Several small faults appear to be present on the property (Holcapek, 1974) and are largely manifested by pronounced linears. However, no displacements have been observed for these faults.

2.2 Lithology

As stated previously two main rock types occur on the property;

- 1) volcanics of the Kamloops Group, and
- 2) intrusive rocks of the Guichon Batholith.

The Kamloops group volcanics occur in the northern portion of the claim block with the exception of one small outlier situated in the vicinity of L4N, 14E. According to Holcapek (1974) this unit consists of an "interbedded sequence of buff rhyolites, andesitic tuffs with local agglomerates".

The intrusives have been subdivided into four rock types, three belonging to the Bethlehem Phase and one to the Skeena variety. For the most part the distinction between these rock types is subtle.

In general the rock types of the Bethlehem Phase are fine to mediumgrained, equigranular, holocrystalline and hypidiomorphic-granular. The quartz content is usually less than 15%, mafic content between 8 and 15 %, orthoclase content less than 15%, with the remainder plagioclase. Two members of this intrusive phase are characterized by conspicuous poikilitic phenocrysts of hornblende (1 - 3% of total rock). The main distinction between the R HG and R BG is one of biotite content, although the R BG is in some cases distinctly finer grained. For the R BG the hornblende: biotite ratio is roughly 1: 1, and for the R HG it is greater than 5: 1.

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2.2 Lithology (Continued)

The remaining rock type for the Bethlehem Phase is another hornblende granodiorite (% DG) which occurs as two small dykes located at L16N, OE and L12, IE. This rock type is similar in texture and composition to the hornblende granodiorite (% HG) with exception of the euhedral plagioclase phenocrysts (up to 1.0 cm long) which in part characterize this rock type.

Occupying the southwestern portion of the property are rocks of the Skeena Phase (% SK). With the exception of the Lornex fault the contact between the Skeena and Bethlehem phases is gradational and consequently somewhat arbitrary. For the purposes of mapping the Skeena Phase has been defined as containing greater than 15% quartz, although it also contains slightly more orthoclase (15 - 30%), and in most cases has a higher biotite : hornblende ratio. In addition it is slightly coarser grained. All these features represent an increased degree of magmatic differentiation proceeding westward into the core of the Guichon Batholith.

2.3 Alteration and Mineralization

For the most part the degree of wallrock alteration on the property is minimal and can be best described as weakly propylitic. In general the rocks have a relatively fresh appearance, which is especially evident in the plagioclase and biotite grains.

Hornblende is the most sensitive indicator of alteration, and is partially converted to chlorite over most of the property. Locally over small areas (L80N, 32W; L30N, 32W; BL 8N) the degree of this alteration form became slightly more intense, with up to 25% of a given hornblende grain pseudomorphed by a mixture of chlorite and magnetite.

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2.3 Alteration and Mineralization (Continued)

Epidote, another mineral characteristic of propylitic alteration occurs in local concentrations (L80N, 32W; L36N, 20W; and BL, 4N), which are spatially associated with the more intense zones of chloritic alteration. In outcrop it occurs mostly as disseminated grains (1 - 3%) or in small veinlets parallel to the main fractures.

Orthoclase, a mineral characteristic of the potassic zones of porphyry copper deposits occurs as veins or disseminated grains in a number of outcrops. For the most part it is most prevalent in the western portion of the property where the degree of magmatic differentiation is more advanced. As a result of this relationship magmatic processes appear to be the most likely cause for the formation of orthoclase, although anomalous Cu values and weak propylitic alteration occurs in close proximity to the orthoclase veining located at L4N, OE.

Mineralization was confined to two outcrops (154 and 156 located immediately southwest of the property) where minor amounts of malachite (<2%) and bornite (<0.5%) were observed along fractures. Both outcrops are considered to belong to the Skeena phase and contain a reasonably high orthoclase content (approximately 30%).

3.0 ROCK GEOCHEMISTRY

3.1 Method

A total of 135 rock samples were collected from the intrusive rock types over the southern portion of the property. (Figure 3). The sample density in general did not exceed one sample per hectare (10,000 m^2) and in most cases the samples were collected over an area of 100 m^2 using

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3.1 Method (Continued)

a geological hammer. Once the weathered surfaces were removed the samples ranged in weight from 1 - 3 kg. For shipping the samples were placed in heavy duty plastic bags and sent to Acme Analytical Laboratories Ltd. at 852 East Hastings Street, Vancouver. There, the samples were crushed to -150 mesh and analyzed for Cu, Mo, Mn and F.

For the Cu, Mo and Mn analyses 0.5 g of sample was digested in 3 ml of dilute aqua regia over a boiling water bath for 1 hour. The solution is then diluted to 10 ml with de-ionized water and determined on a Varian Techtron Model 475 atomic absorption unit. The results were then compared to prepared standards.

For the F analyses, 0.25 g of sample was fused with 1.25 g of sodium hydroxide and leached with 10 ml of de-ionized water. The solution was then neutralized with sulphuric acid and buffered at a pH of 7.8 with sodium acetate. Finally the solution was diluted to 100 ml with de-ionized water and determined on a Orion Model 404 Ion Specific Electrode meter. The results were then compared to prepared standards.

For the determination of background and anomalous populations, a statistical approach was used. Frequency plots were constructed on log-probability paper for each element. By using this method statistically normal populations should plot as straight lines and points of inflection are generally considered to represent the boundaries between different populations.

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3.2 Results

Although the results of the rock geochemistry were somewhat confusing, the frequency plots for Cu, F and Mn (Appendix A) did indicate the presence of a number of distinct populations.

In the case of Cu, a number of highly anomalous samples (>140 ppm) occurred in a linear trending zone centred about L8N, OE (Figure 4). This zone is in part coincident with one of the more altered zones containing epidote and a moderate degree of chlorite alteration. In addition, a number of orthoclase veins were found in close proximity. Surrounding this was a rather diffuse zone containing above background values (>39 ppm). A second concentration of high values (>95 ppm) occurred in the northwestern portion of the property. This zone overlapped portions of the Skeena phase (\mathfrak{R} SK) and the biotite-hornblende granodiorite of the Bethlehem phase (\mathfrak{R} BG). In the two outcrops where malachite was observed (154 and 156), only one sample (154) contained appreciably high Cu (116 ppm).

With the exception of a number of one and two sample highs (Figure 6) containing values greater than 441 ppm, the Mn values can be separated into two populations (Appendix A). Each of these populations contains approximately 45% of the total sample population. Samples containing values greater than 295 ppm occur in two broad zones located in the central and northeastern portion of the property. The remainder of the property is occupied by samples containing less than 295 ppm.

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3.2 Results (Continued)

In general the points of inflection separating the different sample populations for F were not as distinct as the other elements. The exception being the population with the upper boundary at 220 ppm. Samples from this population were for the most part located in the southern portion of the property in the vicinity of L4S, 16W and L4S, 10E (Figure 5). Values greater than 410 ppm were for the most part concentrated in the northwestern portion of the property (L76N, 60W). Other than outlining what could be described as a south to north gradient of increasing F, the F geochemistry had little useful value in defining rock types or zones of possible hydrothermal alteration.

Mo, the final element to be considered served little use in defining zones of possible economic interest. With the exception of a few values, all the Mo values were at the detection limit (1.0 ppm) (Figure 7).

4.0 CONCLUSIONS AND RECOMMENDATIONS

The intrusive rocks underlying the claim block (Skeena variety and Bethlehem phase) are two of the most common host rocks for the porphyry copper deposits of the Highland Valley (Table 1). The surface trace of what has been interpreted to be the Lornex fault separates these two intrusive phases in the southern portion of the property. Over the remainder of the contact the boundary is more gradational and consequently not likely to be a fault.

Hydrothermal alteration was minimal over the property although local zones of propylitic alteration (epidote and chlorite) are present. Orthoclase veining occurs in a number of outcrops which are for the most part located in the western portion of the property. Magmatic differentiation appears to be a more logical reason for this relationship than hydrothermal alteration. One zone of orthoclase veining located in the vicinity of L4N, OE is associated with some anomalous Cu values and may be in part related to hydrothermal activity.

With the exception of Cu the rock geochemistry failed to indicate trends indicative of porphyry copper type mineralization. The Cu anomaly situated in the vicinity of L4N, OE was the most interesting area generated through the use of rock geochemistry.

Other than the work programme recommended by Petersen, 1983, the only additional work that would significantly add to our present knowledge of the property would be having the rock samples analyzed for Ca, K and Na. Numberous studies have shown that these elements are very sensitive indicators of porphyry copper mineralization (Olade and Fletcher, 1976; Osatenko and Fletcher, 1976).

> Respectfully submitted, Brain V Hell Brian V. Hall, M.Sc.

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REFERENCES

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- McMillan, W.J., 1976, Geology and Genesis of the Highland Valley Ore Deposits and the Guichon Creek Batholith. Porphyry Deposits of the Canadian Cordillera, Canadian Institute of Mining and Metallurgy, Special Volume 15, pp. 85 - 104.
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APPENDIX A

CUMULATIVE FREQUENCY PLOTS

FOR THE LITHOGEOCHEMISTRY VALUES

1

GRF G-23 PROBABILITY SPECIFY TRACING OR DRAWING PAPER GRAPHIC CONTROLS CANADA LTD.



GRF G-23 PROBABILITY SPECIFY TRACING OR DRAWING PAPER GRAPHIC CONTROLS CANADA LTD.



frequency %



22



46 8080

KAE PROBABILITY X 3 LOG CYCLES

APPENDIX B

COST STATEMENT

Wages	
D.B. Petersen - 4 days at \$230/day	\$ 920.00
October 13, 14, 17, 27, 1983.	
Project preparation (3 days) and supervision (1 day).	
B.V. Hall - 12 days at \$250/day	3,000.00
October 19 - 30, 1983	
Field work (7 days) and report preparation (5 days).	
T. Hayes - 7 days at \$70/day	490.00
October 19 - 26, 1983	
Field assistant.	
Accommodation	
Sands Motel, Ashcroft, B.C., 1 week at \$110/wk	110.00
October 20 - 27, 1983	
B.V. Hall, T. Hayes	
Food	4
B.V. Hall - October 20 - 27, 1983	280,71
Field Costs	
Chain saw rental, telephone calls, supplies	244.39
Truck Rental	527.97
Gas	188.34

1

Geochemical Analyses

135 samples at \$9.55/sample \$ 1,289.25

(Cu, F, Mn, Mo)

Typing and Drafting

	882.89
TOTAL	\$ 7,933.55

Brin Y Hall

APPENDIX C

STATEMENT OF QUALIFICATIONS

I, Brian V. Hall, of Vancouver, British Columbia do hereby certify that:

- I am a geologist presently residing at #115 1999 Nelson Street, Vancouver, B.C. V6G 1N4.
- I am a graduate in geology of the University of British Columbia (B.Sc. 1975) and University of Waterloo (M.Sc. 1978).
- 3. I have practised my profession for twelve field seasons.
- I am presently a Fellow of the Geological Association of Canada.
- 5. I have no beneficial interest in the property discussed in this report, nor do I expect to receive any in the future.

Brin VHall

Brian V. Hall, M.Sc. December 13, 1983 DOMINION OF CANADA:

PROVINCE OF BRITISH COLUMBIA.

To WIT:

In the Matter of the geological and litho geochemical surveys conducted on the DEN 3, 4, 5, 6 and 7 Claims, Kamloops Mining Division

I, Brian Verner Hall

of Agilis Engineering Ltd., 1010 - 409 Granville Street, Vancouver, B.C. V6C 1W9 in the Province of British Columbia, do solemnly declare that the following personnel were employed and costs incurred in conducting the surveys:-

Personne1

Disomhurgomente

B.V. Hall - Geologist	12 days	at	\$250/day	\$3,000.00	
D.B. Petersen - "	4 days	at	\$230/day	920.00	e)
T. Hayes - Helper	7 days	at	\$70/day	490.00	

\$ 4,410.00

Disember sementes			-14
Accommodation	\$	110.00	
Meals '		280.71	
Supplies and Rentals		244.39	
Truck Rental		527.97	
Gasoline	* 1	188.34	
Geochemical Analyses		1,289.25	
Typing and Drafting	at is	882.89	

3,523.55

TOTAL $\frac{\$.7,933.55}{1.5}$ And I make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath and by virtue of the "Canada Evidence Act."

Declared before me at the City

of Vancouver

Province of British Columbia, this 2/

day of Dece

Brin VHall

A Commissioner for taking Affidavits for Bringh Columbia or

, A.D.

in the





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