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<u>REPORT</u> on the

TRANSVAAL PROPERTY.

Highland Valley Area

for

ALWIN MINING CO. LTD.

Ьу

JOHN S. VINCENT, P. Eng. Consulting Geologist.

Vancouver, B. C.

December 20, 1971.

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<u>INTRODUCTION</u>

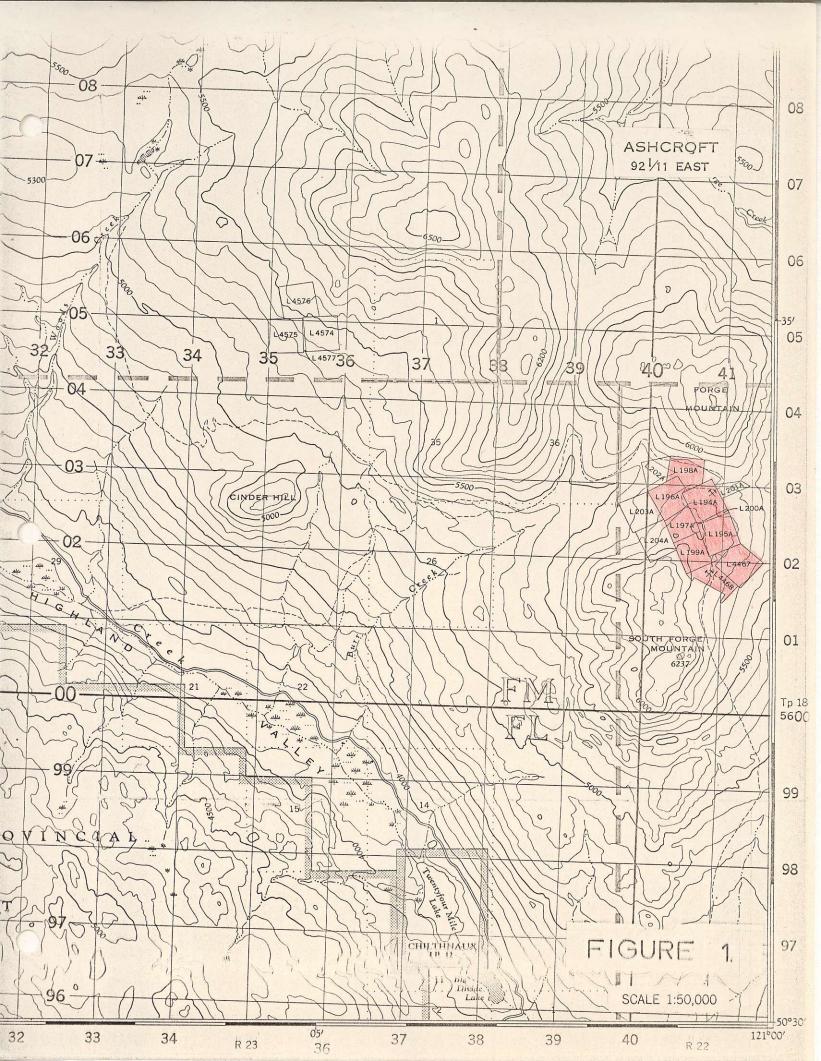
At the request of Mr. Harold Jacques, President of Alwin Mining Co. Ltd., and Mr. D. W. Pringle, P. Eng., the writer undertook a study of the Transvaal Property in the Highland Valley, An attempt to examine the property was made on October 26th, 1971, but 4 to 6 inches of fresh snow precluded seeing much.

The following report is based on a compilation and study of maps and reports prepared by previous workers, and discussions with local Geologists familiar with the area. Mr. Arpad Fustos provided much appreciated assistance in compiling data from the Minister of Mines reports, 1901 to the present.

The body of the report consists of a review of previous activity on the Transvael property and a discussion of the results and possible significance of the most recent work carried out. Sketch maps and reproductions are included for illustration.

PROPERTY, LOCATION and ACCESS

The Transvaal Property consists of 8 Crown Granted mineral claims in the Kamloops Mining Division, situated in the Highland Valley area approximately 4 miles north of the Bethlehem Mine. The claims lie in a saddle at an elevation of 6,000 feet, between Forge Mtn. and South



Forge Mtn. (Figure 1).

Title to the claims was investigated by the writer while in Kamloops.

| CLAIM NAME | LOT NO. | CROWN GRANTED | SIZE | INTEREST |
|----------------|---------|------------------|----------|----------|
| Transveal | L194A | August 15, 1936 | 52 Acres | 1 |
| Pretorie | L195A | 89 PV | 52 | 1 |
| Imperial | L196A | 88 99 | 46 | 1 |
| Chamberlain | L197A | 17 17 | 31 | 1 |
| Mafeking | L198A | 11 Fi | 39 | 1 |
| Ladysmith | L199A | 59 54 | 45 | 1 |
| Pratoria Fr. | L200A | May 22, 1913 | 3 | 2 |
| Glenora | L4467 | January 28, 1929 | 49.69 | 3 |
| Highland No. 2 | 4468 | January 28, 1929 | 32.89 | 3 |

<u>McNabb Fr.</u>; record number 40061; recorded December 11, 1962. Whole interest transferred to W. J. Hasking, August 25, 1964. Interest transferred to Taseko Mines Ltd., Whist, Wozniak, and Webber, Kamloops.

Interests:

 K. D. Houghton administering estate of J. Hasking and Jehn Jehnson Executor for estate of G. Novak for undivided one-half interest.
John Johnson Executor of estate of G. Novak, c/o Houghton and Gray.
John Johnson Executor of estate of James Novak, c/o K. Houghton, and Edith Houghton undivided one-half interest each.

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For the year 1970, reports were submitted in lieu of taxes on the Transveal, Pretoria, Imperial, and Ladysmith claims.

The property is accessible by car from a gravel-surfaced road which cuts off the Bethlehem road at the bend just below the mine. Two and a half miles along the South Seas road the Novak road cuts off to the left, and the Transvaal claims lie another 2 miles to the northwest.

HISTORY AND PREVIOUS WORK.

The Transvaal Property appears to be one of the earliest recorded claim groups in the Highland Valley area. The claims were staked in the late 1800's and the first Crown Grants recorded in 1906. Initial interest was generated by veins and pods of chalcopyrite mineralization in zones of sheared and altered granodiorite. The early 1900's witnessed considerable activity in open cutting, shaft sinking, and drifting, but the inaccessability and lack of a wagon road into the area precluded shipment of any ore. The 1902 Minister of Mines Report indicates that 700 to 800 tons of copper-gold ore was stockpiled and ready for shipment to a smelter.

In 1906 and 1907 Cominco optioned the property and commenced underground development. A two compartment shaft was sunk to a depth of 200 feet and levels established at 100 and 200 feet. On the 100 level, drifts were driven to the east and west distances of 180 feet

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and 160 feet respectively. A 40 foot cross cut was driven from the east drift. A 75 foot drift to the east is reported on the 200 level. In a brief report dated November 1917, and written by "B. Bash, M.E.", the underground workings are described, and it appears that Bash had access to the drifts. His description is quoted directly as follows:

"Imperial:- On the Imperial are a number of large outcrops with cuts and shallow shafts showing ore from four feet to twenty feet or more in about 100 feet weat from the end line between it and the Chamberlain. At the 100 feet level a drift has been run easterly about 180 feet, about 110 feet from the shaft in the above drift crosscut to the south about 56 feet long was run which cut an ore body 15 feet thick, of carbonate and sulphides of copper and also bleck iron which lay in altered and decomposed granite.

Ore was first encountered in the south drift above referred to about 15 feet from the main east drift.

About 150 feet from the shaft in the same drift east a crosscut was run from about 70 feet north, which encountered a crushed zone. Apparently a mineralized section of country rock which carries a fair amount of copper in addition to the ore found just above referred to. Stringers from two to six inches thick, apparently, good grade of ore were frequently encountered between the shaft and the end of the main drift.

The east main drift was not advanced far enough to encounter the large ore deposits that are exposed on the surface east of the shaft.

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There is a trap-dyke in evidence on the surface east of the shaft. Its strike is almost north and south, and what effect this dyke may have in connection with the ore deposits is yet to be known. Taking it into consideration, the depression of the surface at this point gives the impression that the dyke may have caused some extensive faulting, the position of the dyke gives conclusive evidence that the east main drift on the 100-foot level is not in far enough to encounter any of the ore bodies east of the dyke, also those that are close to the dyke. One of these ore bodies is traced on the surface by open cuts for a distance of 1,500 feet.

The ore encountered in the south cross-cut has the appearance of not being in place. This cross-cut is not far enough to cut the vein exposed on the surface south of the shaft, which can be traced on the surface elong the strike close to 1,000 feet, and to encounter this vein it would be necessary to extend the cross-cut about 75-feet. A drift was also run 200 feet in a north-westerly direction on the 100-foot level. About 75 feet from the shaft a cross-cut was run 35 feet south. This cross-cut cut through some highly mineralized country rock; evidently this cross-cut was also started to intersect the vein that is exposed on the surface close to the wagon road south of the shaft, and if so, this cross-cut would have to be extended at least about 100 feet. As the course of the main drift is too much to the right from the mineral zone, when considering the unnecessary long distance in driving cross-cuts to encounter the veins south and west of the shaft. A short distance

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from the face of the main drift a seam about 8 inches thick of soft black and red gangue was cut, it contained some native copper. It assayed 70 per cent and \$20.00 in gold per ton.

About the same number of stringers were cut as in the east drift. Said stringers in both drifts ran in all directions, some of them with the drift.

In a westerly direction from the shaft is a large surface showing with some work done on it. The ore is a carbonate and silicate of copper and heavy black iron, and the formation at this place has changed to a pophyry. No efforts were made to develop this ore body on the 100 foot level.

All the work done on this level does not indicate that any great efforts were made to encounter any of the ore bodies that are in evidence on the surface. The formation on this level is badly fractured end decomposed. At the 200 foot level a cross-cut was run from the shaft 50 feet north and from it a drift was run about 75 feet westerly. The country rock in this drift close to the face is strongly mineralized with native copper and iron, it frequently being sufficiently heavy to hold pieces of broken rock together. And, according to the surface, this drift is driven under the present waste dump towards a depression or a gully, where there is no ore deposits in evidence on the surface of any great importance. My opinion is that the present course of this drift is more out of place then the one above it on the

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100 foot level, for the same reasons as already stated. It should run south westerly. A drift to the east was also run for about 125 feet from the shaft, in the face of this drift the formation has changed to a fine grain rock of granodiorite. And some of this rock is impregnated with copper sulphides and black iron. It was not assayed. In both said drifts on this level small stringers were encountered and apparently most all show a good grade of sulphide ore. The carbonate and silicates of copper are not in evidence on this level and the decomposed formation that is on the level above does not extend down to this level, the formation on this level is firm not broken or shattered, and well in place.

Taking into consideration the extensive minerelization of the country rock on this level, which is mostly due to chemical action or leaching, by descending water coming in contact with the ore deposits and percolating through and along the lines of least resistance and depositing their residue therein, wherever the conditions were most favourable. This is evidence that large ore bodies are in close proximity. The east drift should be continued for about 300 feet. This would bring it about 200 feet beyond the trap-dyke and into the Transvael claim, with this drift the different veins east of the shaft and dyke should be encountered, and this would also place this drift within a short distance of the section of the main Transvael vein, perheps not more than 300 feet. There should be no reason that under a good prectical management why those veins should not be encountered on

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the lower level. There are strong evidences that give good reason to believe that these large ore bodies are deep seated and that they will go down to a great depth. The 220 foot vertical shaft is of a two compartment, and was not sunk on ore but in country rock, as already pointed out, it is to one side of the mineral zone. In sinking some small veins were struck at intervals. About 140 feet down native copper was met about six feet thick, it appeared to be a mineralized section of country reck. Seven or eight feet of the bottom of the dump below the 200 foot level; the rock is strongly mineralized carrying native copper. Several cuts were made in large surface showings on the Imperial. Some of them being about 350 feet westerly from the shaft. All of them have more or lese good ore in sight."

Interesting mineralization is certainly described, and if it is as good as it sounds, it's hard to think someone has not attempted to check it out. It is possible that the workings have never been pumped out and examined since the 1916 activity reported by Bash. Assay results quoted from Bash's report are as follows:

"Assay of the Transvaal Group: Eight foot drift, from shaft, gold .04, silver trace, copper 1.89, face of the north cross-cut drift out of the main drift 100 foot level showing native copper, gold trace, silver trace, copper 2.5%. The south cross-cut in mineralized material, gold trace, silver trace, copper 1.67%.

Ore 15 feet wide in south cross-cut drift. Gold .07, silver

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trace, copper 4.8%. Ten feet of mineralized country rock carrying native copper from the west drift on the 200 foot level, gold trace, silver trace, copper 6.10%. Open cut 200 feet west from the main shaft, gold trace, silver trace, copper 5.48%. Selected sample of open cut 800 feet from the main shaft, gold trace, silver trace, copper 37.2%.

From stringer 180 feet tunnel Transvaal claim, gold .1, silver trece, copper 11.1%.

Open cut on Transvaal Claim: Gold trace, silver trace, copper .4% . Open cut on the Pretoria claim seven fest wide, gold .4, silver trace, copper .4%.

> Average of iron capping Transvaal claim copper 4.18%. Ladyamith claim everage of westerly cut copper 3.1%. Ladyamith claim average of capping of 4 foot ledge, copper 3%."

Although there are some pretty attractive grades and widths described, there is an interesting discrepancy between Bash and the 1907 Minister of Mines Reports

"The underground workings mentioned had been undertaken to prove this surface showing at a depth, and, judging from the character of the dump and the fact that no ore had been shipped, no ore-body of importance was encountered in the workings."

After Cominco dropped their option very little exploration work

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was carried out until Jackson Basin Mines optioned the property in 1955.

In the early days the Highland Group of claims was treated as a separate property, although in recent years, the Transvaal has included both the Highland and Transvaal Groups.

In the period 1907 to 1916 considerable aurface and underground work was carried out on several prominent mineralized "fissured zones". Three zones are described which strike in a northeasterly direction, dip to the southeast, and vary from several inches to 6 feet in width. A shaft was sunk to a depth of 65 feet with the intention to cross-cut the zones at depth, but it is not clear whether or not this was eccomplished. As in the case of the Transvaal claims immediately to the north, the writer has not yet obtained eny records or reports of work carried out in the interval 1917 to 1954.

With the kind co-operation of Dr. Mike Carr of Teck Corporation, and formerly of the B. C. Department of Mines, the writer was provided copies of geological and magnetometer maps made by Jackson Basin Mines in 1955, and a plan map of surface cuts and assays made by Consolidated Woodgreen Mines Ltd. in 1962. This information has been compiled and correlated with the results of Tascha Mines work, and is illustrated by Figure 3. As further information is recovered, it can be added to the compilation.

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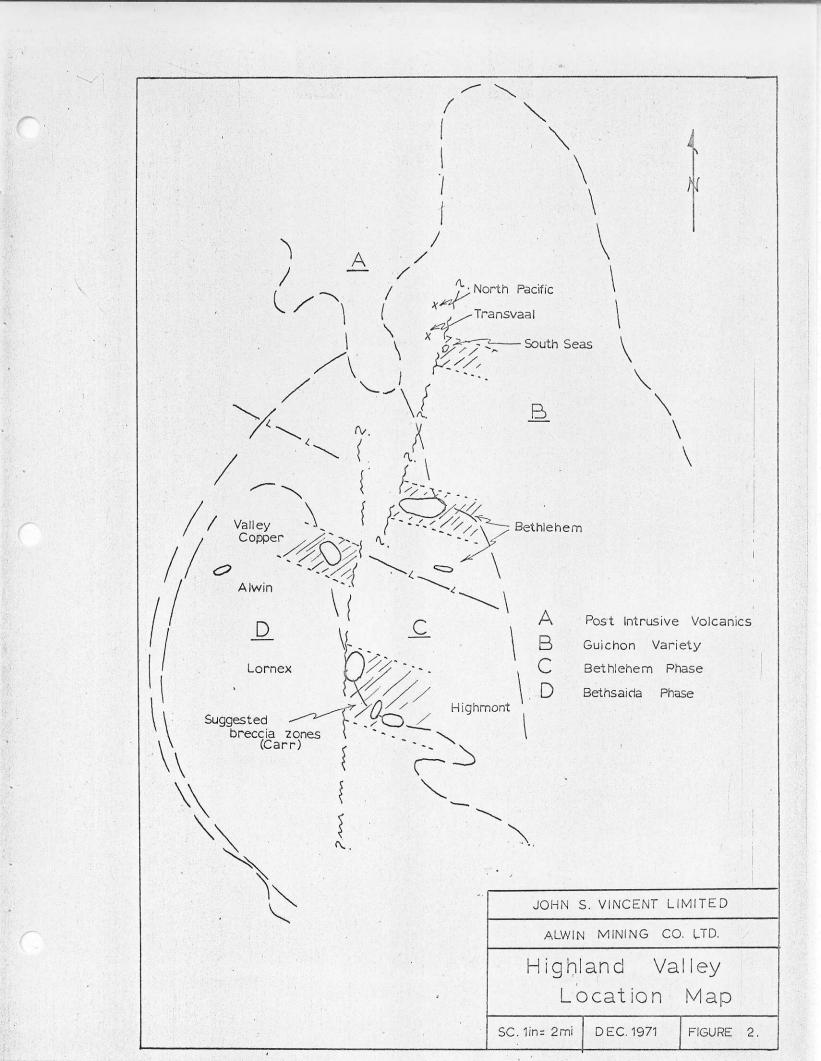
GEOLOGY

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REGIONAL:

The Transvaal Property is located towards the north end of the Guichon Batholith approximately 4 miles north of the Bethlehem Mine. The batholith is at least 25 miles long, up to 15 miles wide, and the long axis strikes at 345°. Dr. K. E. Northcote (1969) distinguishes no less than 13 phasee and varieties of intrusive rock in the batholith, the major phases of which exhibit a concentric pattern around a central core of Bethsaida quartz monzonite. The various phases are quite similar and distinction is based primarily on textural and mineralogical features rather than bulk compositional differences. Increasing differentiation may be reflected by a decrease in specific gravity from 2.80 to 2.64 from the outer hybrid zone to the Bethseida core. Geologic evidence suggests that age increases from the core outwards, but isotopic age determination show a remarkable concordance and indicate that there is no significant difference in the absolute ages of the intrusive phases. The results of 55 determinations shown an average age of 196 million years 1 8 M.Y. On the absolute scale, this would place the time of consolidation of the Guichon rocks in the Upper Triessic.

The batholith has been intruded into an up-faulted block (Carr) of Cache Creek and Nicola rocks, and is overlain by four later groups of volcanic rocks ranging in age from Middle Jurassic to Eccene.



Internal structural features are characterized by faults, shears, breccia and shatter zones; dikes and dike swarms may define another type of structure. The Bethsaida quartz monzonite is bisected by the Lornex Fault, a northerly-trending break which defines a well developed and common direction for linear structure. Northeasterlystriking lineaments do not appear to be well developed, but the northwesterly direction is somewhat stronger and more important economically. Recent work by Carr suggests that major breccia zones which include the Lornex-Highmont, Velley Copper, Bethlehem, and South Seas ore zones may lie within important northwesterly-trending structures which have been cut and displaced by northerly-trending faults.

Breccia and shatter zones are extremely important structurally and economically, and three main types are distinguished by Northcote (1969); fault breccia, intrusion breccia, and pipe breccia. The important sulphide occurrences are associated with fault breccias which form complicated branching and braided structures of sheared, slickensided, eltered rock end gouge ranging from a few feet to hundreds of feet in width. On the Bethlehem property the faulting and shearing strikes within 20° of north and dips steeply to the east or west. Similar faults occur to the north on the Trojan and Krain, and to the south on the Skeene, all within a 6 mile radius of the Bethlehem Mine.

The study and interpretation of topographic linears becomes an interesting and important aspect of structural analysis in the Highland

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Valley, end as a result of a statistical compilation, Northcote distinguishes a strong set in a direction ranging N 20° W to N 40° W, and a second prominent set at N 10° E. Glaciation has accentuated structural features, particularly where the two directions are parallel. Drainage has further developed these linears with the result that faults and shear zones in the northwesterly direction are more readily identified. By the same reasoning, economically important faults and shears transverse to this direction may be "filled in" and not clearly developed. Topographically, they may be much more subtle.

It seems apparent that copper mineralization in the Batholith is localized in the plumbing systems created by faults, shears, and their associated breccia zones. Northerly and northwesterly trending structures have proven to be very important to date, and points of intersection of fault zones make particuarly attractive loci for the development of breccias. The distribution of mineralization within the batholith is related to structure, and it seems that any of the major rock units may contain copper showings. It seems reasonable to conclude that the mineralization is related to the overall magneatic process essociated with the batholith, and it is difficult to prove a genetic relationship to any rock unit.

LOCAL:

The Transvaal Property is underlain by rocks of the Guichon

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variety of the batholith, and is adjacent to the Krain, or North Pacific Property, on the north, and the South Seas and Trojan Properties to the east and south. Fault zones and related breccias are described on these adjacent claim groups, and it seems apparent that a strong northerly-trending fault cuts through the area, possibly, as illustrated in Figure 2. Carr (1971) suggests that a prominent northwesterly-trending breccia zone may be indicated on the South Seas-Trojan side of the fault (Figure 2), and if these concepts have any degree of merit, it then seems reasonable to investigate the other side for the northwest segment.

The North Pacific, and north end of the Transvaal claims are partially underlain by volcanic rocks post-batholithic in age, and exploration is underway at present on the North Pacific to ebtain information beneath the cover. The Glossy Property, 9 miles to the northwest, received considerable attention in the early days, and it is of interest in this discussion because it is underlain by a deeply oxidized zone only recently exposed by removal of the volcanic cap. In the case of North Pacific, if a mineralized zone is located below the basalt a similar oxidized zone may bo present. Although the Glossy is a considerable distance away, structural attitudes coincide, and it is tempting to speculate on the ground in between and under the volcanics to the northwest of the Transvaal. It is interesting to note that in Northcote's compilation of linear features the north end of the bathelith is relatively blank.

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The Guichon variety of the batholith belongs to the Highland Valley phase, and is principally found in the northern part of the intrusive. It is mainly granodiorite in composition, and is generally richer in mafic minerals than the other varieties. It is light grey, occasionally mottled pink, and evenly flecked by black to dark green mafic minerals.

The geological mapping carried out by Jackson Basin distinguished granite and altered granite, and the outline of the latter division is sketched on the compilation map, Figure 3. Porphyry dikes are mapped, but their significance is not clear at present.

The more recent examination and report prepared by H. D. Forman, P. Eng. for Taseko Mines Ltd. describes chalcopyrite mineralization localized in breccia zones and fracture systems. Around the Imperial Shaft a northerly-trending set of fractures is favoured, while to the south in the area of the Highland shaft, a north and northeasterly set are nicely mineralized. Vein widths of several inches to several feet are reported in the underground workings, and chalcopyrite and chalcocite constitute the main metallics. Forman describes 4 bulldozer trenches he examined in which he found well fractured and brecciated rock with verying amounts of chalcopyrite. Malachite staining is quite prominent, and hematite and tourmaline are common associates. Forman does not report any assay results.

The plan map prepared by Consolidated Woodgreen Mines Ltd. shows

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the surface cuts available in 1962, and indicates the details of their sampling efforts. An interesting fracture zone on the Glenora claims trends northeasterly from the Highland Shaft and has an indicated strike length of at least 1,100 feet. The various trenches are spread across a 350 foot width, and a 150 foot adit has been driven on one of the more strongly mineralized shears. Grab samples range from 0.7% to 2. % copper.

Several hundred feet of adit were driven on a well mineralized zone on the Transvaal Claim 900 feet east of the Imperial Shaft. Several zones are apparent which strike northerly and crosscuts were driven in an attempt to intersect them. A major fault is noted striking north and dipping 65° east. Grab samples range from 7 to 10% copper. Several trenches between the adit and the shaft expose zones which vary in strike from east to northwesterly. Dimensions are not apparent, and grab samples range from 2% to 5% copper.

This map locates 8 bore holes spotted in various locations, likely to evaluated projected extensions of zones exposed in trenching. The writer has not examined any drill logs, but it does not eppear that results were encouraging.

While Taseko Mines Ltd. had the property in 1968 an induced polarization survey was carried out by Geo-X Surveys Ltd. over the Transvaal, Imperial, and Mafeking claims. A Hewitt Enterprises pulse type battery powered unit was used with the standard Wenner electrode erray. An "a" spacing of 300 feet was used with a transit interval of

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200 feet along picket lines spaced at 200 foot intervals. With this technique the induced polarization, resistivity, and self potential effects are measured.

The general results of this survey are plotted on the compilation map, Figure 3, and the features of interest are itemized as follows:

- 1. A broad resistivity low, or trough, strikes northerly across the surveyed claims.
- 2. Several I.P. anomalies are outlined and were subsequently eveluated by diamond drilling.
- 3. Geo-X Personnel's interpretation suggests northerly and easterly trending fault zones.

Taseko drilled 6 bore holes to test the I.P. anomalies, and numbers 1, 2, 3, 5, and 6 are located very approximately on Figure 3. Forman logged the holes and generally reported insufficient mineralization to account for the anomalies. No grades are available, but the "best mineralization yet" is reported in BH 3 by the Imperial Shaft, and in an area where the I. P. response was only weakly anomalous. In general, alteration, brecciation, and crushed zones are reported.

Jackson Basin Mines carried out a magnetometer survey over the northern portion of the property which includes the area covered by Geo-X. There is no indication of the instrumentation or sensitivity, or of how the survey results were processed. A feature of interest is the broad mag. "low" which generally coincides with the resistivity low. The mag anomaly culminates in the -2000 gamma low shown on Figure 3.

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CONCLUSIONS

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In spite of the length of time the Transvaal Property has been held and worked on, the writer has no evidence to indicate that the ground has been effectively explored by modern techniques and current thinking. Unless evidence is turned up to the contrary, it must be concluded that an attractive geologic potential still exists and remains to be evaluated. It appears that work to date has been directed towards finding a massive, or high grade, ore body, and little work has heen oriented towards a porphyry-type target. Future exploration planning must consider both possibilities.

The effectiveness of the I. P. survey is questionable, and the sketchy drill results do not provide conclusive evidence one way or another. The coincident mag and resistivity lows correlate well with possible structure, and this data should be regarded as useful.

The geological mapping carried out by Jackson Basin outlined an area of "altered granite", as shown in Figure 3, which includes the major mineralized zones around the Imperial Shaft and Transvaal adit. However, no particular I. P. response was recorded over this area where surveyed.

It is apparent that the most concentrated effort has been directed towards the north half of the property, and very little has been done on the central and southern portions. Interesting structure, elteration, and associated mineralization has been exposed in bulldozer trenches, and further evaluation is required. Forman mentions that Rio Tinto located an electromagnetic anomaly in 1960 towards the southeest corner of the Glenora claim.

As further inquiries are made, and more information compiled, a more detailed picture will develop. However, it is reasonable to conclude that the potential exists for the discovery of economic mineralization, and an efficient and effective exploration program is justified.

RECOMMENDATIONS

The following exploration program is recommended to evaluate the Transvaal Property.

- Expand the Geo-X picket line grid system to cover all the claims. Lines spaced at 400 foot intervals along the base line will be adequate.
- 2. Carry out an induced polarization survey using a motor generator unit and a 200 foot electrode spacing. This electrode spread is suitable for both types of target under consideration. Depth penetration should be in the order of 250 feet.
- Carry out a detailed magnetometer survey utilizing optimum sensitivity.
- 4. Carry out detailed geological mapping and sampling.

COST ESTIMATE

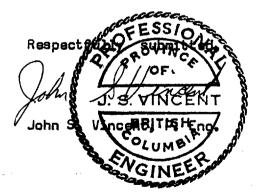
The following cost estimate is based on contracting the line

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cutting and induced polarization survey, and combining the magnetometer survey with the geological mapping. One month is allowed for the mag and geological work. Time might be used to advantage to carry out the line cutting and geophysical work during the winter or early spring.

1. Line cutting:

| | 6 line miles @ \$100 (all inclusive) | \$ 600.00 |
|----|--|-----------|
| 2. | Induced Polarization: | |
| | 8 miles @ \$550 (all inclusive)(quote from McPhar) | 4,400.00 |
| 3. | Magnetometer and Geological Work: | |
| | Geologist and Assistant for 1 month | 2,300.00 |
| 4. | Supervision and Evaluation (estimate) | 1,500.00 |
| 5. | Travel and Accommodation (estimate) | 1,600.00 |
| 6. | Contingencies @ 10% | 1,000.00 |
| 7. | Overhead and Administration @ 10% | 1,100.00 |



J.S. Vincent, M.Sc., F.G.A.C., P.Eng. Consulting: Geologist

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CERTIFICATE

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December 20, 1971.

I, JOHN S. VINCENT, with business and residential addresses in Vancouver, British Columbia, do hereby certify that:

- 1. I am a Consulting Mining Geologist.
- 2. I am a graduate of Queen's University, 8. Sc., 1959, Geological Sciences, and of McGill University, M. Sc., 1962, Economic Geology.
- I am a Fellow of the Geological Association of Canada, and a member of the Association of Professional Engineers in the Province of British Columbia.
- 4. From 1962 until 1969, I was engaged as a mine exploration geologist with the International Nickel Company of Canada Ltd., in Thompson, Manitoba, and since 1969 I have been practicing as a Consulting Mining and Exploration Geologist.
- 5. The information on which this report is based was obtained from the files of Alwin Mining Co. Ltd., and from extensive literature research from all available sources.
- 6. I have not received, nor do I expect to receive any interest, directly or indirectly, in the properties or securities of Alwin Mining Co. Ltd., or any associated company.

Respectfully submitted,

Ince

John S. Vincent, P. Eng.

