2700

REPORT ON
GEOLOGICAL AND GEOPHYSICAL SURVEYS OF THE

ZENITH MINING CORPORATION LTD. (N.P.L.)
and MOLLIE MAC MINES LIMITED (N.P.L.) PROPERTY

Highland Valley, B. C.
Kamloops Mining Division

Under Option to and Work Done by or on Behalf of
THE DOWA MINING CO. LTD.

by
W. Meyer, B. Sc.
and
A. I. Betmanis, BASc

Claims: Lorna Group, Mat Group, Pam Group and Jon Group

Location: 10 Miles east of Spences Bridge
Latitude 50° 25' N Longtitude 121° 08' W

Dates: July - November 12, 1970

November 12, 1970

Vancouver, B. C.

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INTRODUCTION

The following report is based on field work carried out by consultants to The Dowa Mining Co. Ltd. during the 1970 field season. The work was completed on a 112 claim group in the Pimainus Lake area of the Highland Valley owned by Zenith Mining Corporation Ltd. (N.P.L.) and Mollie Mac Limited (N.P.L.) and presently under option to Dowa.

The vendor company had previously cut a line grid which was used for control in the course of the present surveys. The initial part of the 1970 programme consisted of detailed geological mapping with emphasis on alteration and structures. The nomenclature used for describing the lithic units was that generally accepted locally and based on the nomenclature developed by Dr. Northcote of the B. C. Dept. of Mines.

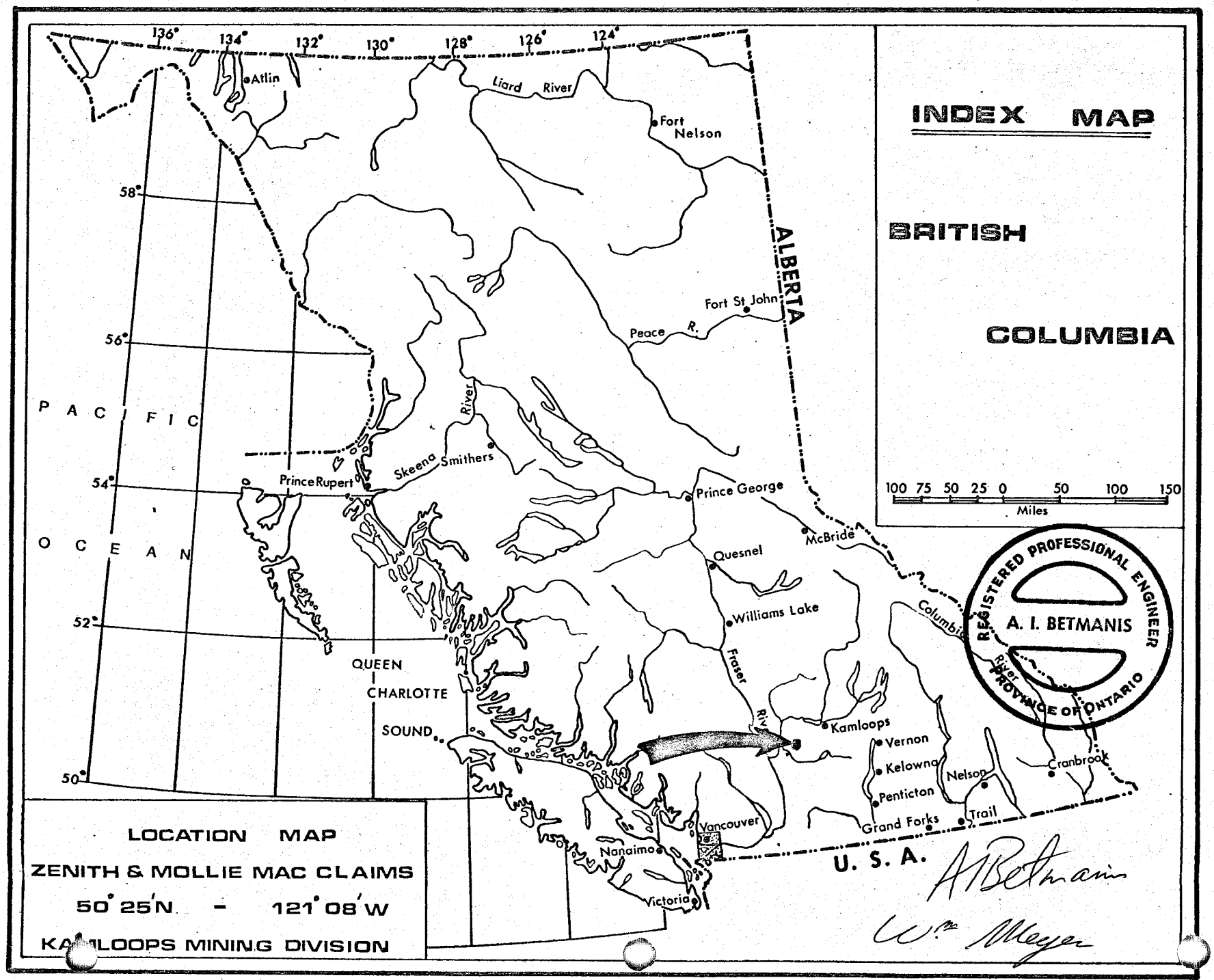
The second part of the programme consisted of an EM ("Radem"), magnetometer and hammer seismic survey. The object of the Radem was to pick-up possible conductors and structural features and the seismic to determine overburden depths, a factor that would later influence the type of physical work (ie. trenching or drilling).

The programme on behalf of The Dowa Mining Co. Ltd. was directed by W. R. Bergey of Geophysical Engineering & Surveys Ltd. and supervised by W. Meyer of Western Geological Services Ltd. Field mapping was carried out by G. D. Ulrich, geologist, and R. E. Reid, assistant, of Western Geological Services Ltd. and A. I. Betmanis, geologist, of Geophysical Engineering and Surveys Ltd. The geophysical surveys were supervised by A. I. Betmanis under the direction of W. R. Bergey.

LOCATION AND ACCESS

The Dowa Mining Co. Ltd. holds under option 112 contiguous mineral claims and fractions in the Highland Valley area of South Western British Columbia. The group covers an area of approximately 6 square miles, 2 miles west of Pimainus Lake in the Kamloops Mining Division centred around Lat 50° 25' N long 121° 08' W.

The claim area is accessable from Vancouver by major highways to Ashcroft and by good paved road to the Alwin "turn-off" on the Ashcroft-Highland Valley road. From the


INDEX MAP
BRITISH
COLUMBIA
136°
134°
132°
130°
128°
126°
124°
58°
56°
54°
52°
50°
Atlin
Liard River
Fort Nelson
ALBERTA
Fort St John
Peace R.
PACIFIC
OCEAN
Skeena River
Smithers
Prince Rupert
Prince George
McBride
Quesnel
Williams Lake
Columbia River
Fraser River
QUEEN CHARLOTTE SOUND
Kamloops
Vernon
Kelowna
Penticton
Nelson
Cranbrook
Grand Forks
Trail
Vancouver
Nanaimo
Victoria
U. S. A.
100 75 50 25 0 50 100 150
Miles
REGISTERED PROFESSIONAL ENGINEER
A. I. BETMANIS
PROVINCE OF ONTARIO
LOCATION MAP
ZENITH & MOLLIE MAC CLAIMS
50° 25'N - 121° 08'W
KAMLOOPS MINING DIVISION

"turn-off" the property is reached by 4 miles of good gravel road to the Alwin camp, and 7 miles of good 4-wheel drive road via Calling and Pimainus Lake.

CLAIMS

A complete list of the 112 claims and fractions on which work is being applied is tabulated in Appendix 1 attached to this report. The following is a summary of the groups.

GROUP	OWNERSHIP	MINING DIVISION	NO. OF CLAIMS
Lorna	Zenith	Kamloops	39
Mat	Zenith	Kamloops	26
Pam	Zenith	Kamloops	31
Jon	Mollie Mac	Kamloops	16
		TOTAL	112

GEOLOGY

General Statement

The claim area is completely underlain by rocks of the Guichon Batholith. The total area of the intrusive is approximately 400 square miles. The rocks were emplaced 198 ± 8 million years ago, their age being either Upper Triassic or Lower Jurassic (B. C. Department of Mines, Bulletin 56, 1969).

The batholith is a semi-concordant, composite pluton with several nearly concentric phases. The intrusion supposedly took place as a series of intrusions by a slowly crystallizing magma over a relatively short geological time. Roof stoping of overlying basic rocks by the outer phases is evident. The phases become more acidic towards the core. This effect is due to contamination of the outer phases and fractional crystallization, leaving a more siliceous melt after each intrusive pulse of crystals and magma.

LITHOLOGY

All of the main concentric phases of the Guichon Creek Batholith occur on the property. Two varieties of the "Witches Brook" phase, a quartz porphyry dyke and some later volcanic dykes have also been found. The units used on the map are described below.

1. "Hybrid" Phase

The "Hybrid" Phase forms the margin of the batholith. On the property it has been subdivided into two varieties.

(a) Variety A

Most of the "Hybrid" phase is composed of Variety A. This rock unit is highly variable and could be further subdivided with some difficulty. The writer sees no advantages in separating these areas. Variety A is a coarse to fine grained, strongly foliated hornblende-biotite quartz diorite with areas of diorite, amphibolite and granodiorite.

In general, the "Hybrid" phase contains 25% or more mafics. Hornblende: biotite is 2:1 in the south-east corner (south of 60N-BL1 and east of BL1). In all other locations the ratio averages approximately 1:1.3. Specimens rarely contain 5% orthoclase, usually have 12% or less fine grained interstitial quartz and greater than 5% magnetite. Plagioclase is in excess of 60%. Pyrite and chalcopyrite are sometimes found in the "Hybrid" as accessory minerals.

(b) Variety B

Variety B is composed of fine to medium grained diorite and amphibolite. Elongated bodies of it occur within Variety A. The elongation roughly parallels the foliation of the mafic's in the "Hybrid" phase. The writer believes these areas of diorite are actually elongated, partially assimilated and completely recrystallized inclusions of prebatholithic basic volcanics and sediments.

The mafic content in these rocks ranges from 30 to 60% or more. Magnetite content is approximately 5% in unaltered specimens. Hornblende: biotite, in general is 1.5:1. Quartz content is 3% or less. Feldspar makes up the remainder of the rock of which no more than 10% is potassium feldspar.

2. "Highland Valley" Phase

The "Highland Valley" phase occurs East of the "Hybrid" phase on the property. It is variable in width, being 7,000 feet wide at the north end of the property and approximately 200 feet wide where it swings to the West off the property. The "Highland Valley" phase is one of the major concentric phases, being closer to the core than the "Hybrid". The two varieties of the phase were identified.

(a) "Guichon" Variety

The "Hybrid" phase in the North grades into a large area of "Guichon" variety. To the South this variety appears to pinch out. The "Guichon" is, in general a medium grained, foliated, biotite-hornblende granodiorite with some large areas of quartz diorite. The more basic rocks occur near the "Hybrid" contact. The "Guichon" is distinguished from the "Hybrid" by being coarser grained, containing fewer mafics and more abundant interstitial quartz and orthoclase. The "Guichon" rarely shows contamination and is not as variable in composition as the "Hybrid" phase.

The "Guichon" variety contains 20 to 25% mafics. Hornblende: biotite is between 1:1 and 2:1. Magnetite is usually present up to about 7%. The mafics are ragged, medium grained and irregularly distributed throughout the rock. Closed interstitial medium-fine grained quartz makes up 10 or 12% of this variety; plagioclase about 50 to 60%. Orthoclase makes up 0 to 8% of the rock, and is interstitial to all other minerals.

(b) "Chataway" Variety

On the property the "Chataway" variety is a weakly foliated hornblende-biotite granodiorite-quartz diorite. It is coarser grained and contains fewer mafics than the "Guichon" variety. The "Chataway" commonly contains more orthoclase and coarser grained open interstitial quartz.

The "Chataway" variety contains 15 to 20% mafics; hornblende; biotite is 1:1 to 2:1. Magnetite makes up approximately 5% of the rock. The mafic texture is usually very distinct. Regularly distributed hornblende crystals are normally coarse grained, equidimensional, euhedral and markedly poitilitic. On the property the mafics are considerably sheared and do not always exhibit a distinctive texture. Quartz is medium-coarse grained interstitial material making up 15 to 20% of the rock. Potassium feldspar forms up to 10% of the "Chataway" variety and is interstitial. Euhedral to subhedral plagioclase makes up about 50 to 60% of the rock.

3. "Skeena" Phase

The "Skeena" phase occurs in contact with the "Highland Valley" phase and the "Bethsaida" phase on the property. It is a coarse-grained biotite-hornblende granodiorite. The mafics show no foliation although plagioclase has a preferred orientation parallel to the contacts.

The "Skeena" phase contains 10 - 15% mafics. Hornblende: biotite is about 1.5:1. Very large poitilitic hornblende crystals are common. Magnetite is present up to about 3%. Large crystals of mafics and clumps of crystals, as well as very fine grained mafics are irregularly distributed giving the rock a distinct fabric. The rock is granular with coarse-grained quartz making up 20% of the rock. The quartz, however, is interstitial. Potassium feldspar is irregularly distributed but is an average of about 8 to 10% of the rock. It is fine grained and interstitial to all other minerals. Plagioclase forms about 60% of the "Skeena" phase and is the earliest mineral being subhedral to euhedral.

4. "Witches Brook" Phase

Northcote (1969) describes a dyke phase ("Witches Brook") with three varieties which grade into each other. Some occurrences of dykes and small stocks which fit two of these varieties were found on the property in the "Guichon" phase.

(a) Variety B (Specimen 884U)

Variety B is light gray, slightly porphyritic with a medium grained, almost aphanitic groundmass. Quartz is interstitial, anhedral, wormy and almost rounded in some cases. It makes up about 10% or more of the rock. Orthoclase is interstitial and makes up about 5 to 10% of the rock. About 60% of the rock is plagioclase. It forms part of the fine to medium grained groundmass and some coarser grained, euhedral phenocrysts. The amount of mafics is low, being about 3 to 5%; they are fine grained and squarish.

(b) Variety C (8103U)

Variety C is pinkish gray and more definitely porphyritic than Variety B. It contains about 30% orthoclase and 20% quartz in a medium to fine grained aplitic groundmass. About 40% of the rock is plagioclase, most of which is medium grained euhedral to subhedral phenocrysts. Variety C is about 10% mafics. Most of the mafic is in phenocrysts as poikilitic hornblende and biotite. The remainder is fine grained interstitial mafic material. About 2 to 3% magnetite is associated with the mafics.

5. "Bethsaida" Phase

The "Bethsaida" phase forms the core of the batholith and is in contact with the "Skeena" phase on the property. This phase is very coarse-grained to medium coarse-grained biotite-granodiorite. It is in places porphyritic, especially near the contact with the "Skeena" phase.

Mafic minerals form about 5 to 12% of the "Bethsaida" phase with hornblende: biotite about 1:2; magnetite forms about 1 to 3% of the rock. Biotite is irregularly distributed forming very coarse books. Quartz makes up 20 to 30% of this phase. It is present as large, round anhedral eyes of clear quartz up to 0.5 inches across. Potassium feldspar makes up 8 to 20% of this phase and is fine grained interstitial material. Plagioclase is subhedral to anhedral, coarse grained; it makes up about 50% of the rock.

6. Quartz Porphyry

One dyke of quartz porphyry occurs on the property in the "Hybrid" phase near the "Hybrid" - "Highland Valley" contact in the south. The rock is pink with an aphanitic groundmass. Quartz phenocrysts are anhedral to subhedral and form about 15 to 20% of the rock. The quartz is extremely coarse and resembles very much the quartz eyes in the "Bethsaida" phase.

7. Aplite and Pegmatite

Numerous occurrences of small dykes and odd shaped intrusions of aplitic and pegmatitic material occur in all the main concentric phases of the batholith. Texture and grain size vary greatly. Most bodies are very small and none are large enough to be shown on the map. Compositionally, there is little variation. Most of the dykes contain 40% or more potassium feldspar, 35% quartz, 20% plagioclase, 2% or less mafics and other accessories.

Some dykes contain porphyritic quartz in their cores and are fine to medium grained near the margins. The small dykes in the outer phases commonly have coarse pegmatitic cores of quartz and white or pink feldspar and are finer and aplitic near the contacts. Two occurrences of aplite dykes with pegmatitic borders were found on the property. Aplites and pegmatites tend to follow East - West fractures. A concentration of pegmatitic dykes occurs in the "Skeena" at the contact with the "Bethsaida."

8. Volcanic Dykes

Fine grained volcanic dykes cut the intrusive rocks on the property. These rocks are probably related to the volcanic activity associated with the Kamloops volcanics. The dykes are, in general, fine grained light to dark green andesite and dacite.

STRUCTURE

1. Contacts

Contacts between the different phases of the Guichon Creek batholith are complex and variable.

On the property, the "Bethsaida" - "Skeena" contact is well defined in a limited area. This contact is gradational on the property, probably over less than 300 feet. A gradational phase could be roughly mapped with more outcrop. Near the contact, the quartz eyes in the "Bethsaida" phase begin to look interstitial and gradually get smaller towards the "Skeena". Large poikilitic hornblendes gradually increase and large biotites decrease towards the "Skeena". Pegmatitic and aplitic bodies are common on East - West fractures in the "Skeena" at this contact.

The "Skeena" - "Chataway" contact is abrupt commonly with no chilled margin. In the North part of the property, this is a faulted contact.

The "Chataway" - "Guichon" and the "Guichon" - "Hybrid" contact are completely gradational. Poor outcrop in the areas of these contacts makes estimating the change in rock units difficult. Contacts are essentially arbitrary and depend on the definitions of the phases and varieties. The two varieties of the "Highland Valley" phase, by nature of their definition are never abruptly contacted. "Hybrid" in this area, especially in the North, appears to be essentially contaminated "Guichon" variety. These contacts are based on an extensive study of slabbed and stained specimens from the property as well as field relations.

2. Faults

Some major faults with sizeable offsets occur on the property. They are described below:

(a) A fault cutting lines 60N and 65N on the Zenith 1 grid has a strike of 60°. It appears to offset the "Chataway" phase 600 feet in a left handed sense. This fault was not observed on the ground although a structure was suspected in the field. A definite air photo linear was sighted and after transferring it to the map, supporting evidence of a fault was found. Jointing, outcrops patterns and topography support the idea of good sized fault through there. Some trace mineralization and strong epidotite alteration exists on fractures near the fault.

(b) Two intersecting faults are indicated on the map at 88N - 70E on the Zenith II grid. One is a faulted "Chataway" - "Skeena" contact which runs at 175°. This fault forms a well defined gulley. Jointing in the Skeena parallel to the gulley is intense on the cliff above the draw. The other fault there trending N85°E offsets the "Chataway" - "Skeena" contact by approximately 500 feet in a right handed sense. A gulley runs along here also.

(c) The trenches near 106N - 20W on the Zenith II grid have exposed a 30 foot shear. This is probably a major fault structure. A reliable attitude could not be measured but the fault appears to run at approximately 165°.

The shear zone contains mostly gouge with intense limonite and some late zeolite activity. This fault and the surrounding area contain no significant mineralization.

3. Joints

Well formed regional joints are common on the property. A stereonet of the poles to joints has not been plotted yet, but regional trends can be seen on the map. Two main joint directions exist: 000/90 to 010/90, and 090/90 to 110/90. These are not always vertical but are generally steeply dipping north or south. Joint density rarely exceeds 3 joints per foot. The best formed regional joints are in the vicinty of 106N - 20W on the Zenith II grid near the shear zone. Joints are at almost right angles to the shear being 090/85N with little variation. Density of joints there is up to 6 joints per foot.

The three faults described as running along gulleys and outcrop poor areas all have parallel joints in adjacent outcrops. These joints are not always obvious and are best formed near the faulted contact between the "Skeena" phase and the "Chataway" variety The fault crossing 60N and 65N on the Zenith I grid has conjugate joints at approximately 090/85N or 30° to the fault. These east - west fractures commonly contain aplite, pegmatite, epidote and some traces of copper mineralization in the general vicinity of this fault.

MINERALIZATION

No significant mineralization was found on the property. Most of the copper present is only in trace amounts along fractures as malachite, chalcopyrite or bornite on fractures.

Chalcopyrite and pyrite are present in places as accessory minerals in the rock. Copper mineralization is commonly associated with shears in epidote alteration on fractures.

ALTERATION

Hydrothermal alteration is widespread on the property. The alteration has variable intensity and commonly occurs in irregular patches.

Near 55N to 70N between 20E and 40E on the Zenith 1 grid, epidote alteration is common and generally controlled by east - west trending fractures.

Some heavy incipient sericitic alteration of the plagioclase in the Hybrid occurs in outcrops in the far Northwest and east of BL2 as shown on the map. Some of this alteration could be the cause of the I. P. anomalies reported.

In the corner near 104N - 40E on the Zenith 11 grid a zone of intense chlorite, epidote, potassium feldspar, some sericite and hematite was found. Some traces of mineralization were found in this area.

Alteration always accompanies mineralization although the alteration may not be widespread. Zones of alteration are good places to look for mineralization although these zones in the bedrock exposures are usually very poorly mineralized. Indirect exploration methods in some of these areas is warranted.

GEOPHYSICAL SURVEYS

MAGNETIC SURVEY

1. General

   The magnetic survey was carried out by a Geophysical Engineering and Surveys Ltd. field party consisting of K. Davies, R. Darlington and R. Watt, supervised by J. Ziegler. Instruments used were a Scintrex MF - 2 and a Jalander Model 505. A second MF - 2 was used as a base instrument. Measurements of variations in the magnetic field were taken at intervals of 100 feet along lines spaced at 500 feet in the southern section and 400 feet in the northern section.

The purpose of the magnetic survey was threefold:- definition of rock types, delineation of structures, and indication of zones of hydrothermal alteration.

The various phases of the Guichon batholith have varying amounts of magnetite and it was hoped to define the contacts between phases more closely by their magnetic property. Hydrothermal alteration tends to destroy magnetite. Hence the alteration accompanying ore deposition may be expressed as a magnetic low. Faulting and zones of brecciation may be expressed by lower magnetic values if accompanied by alteration, or may be indicated by their effect on the magnetic pattern.

2. Regional Pattern

The accompanying figure is an airborne magnetic survey along the western margin of the Guichon batholith including the Zenith and Mollie Mac properties. It represents aeromagnetic data collected at an average elevation of 1000 feet above the terrain by the Geological Survey of Canada.

In general, the oldest phase of the batholith contains the most magnetite and the amount decreases successively in the younger phases. Hence the magnetic intensity decreases from the outer margin of the batholith toward the center. This pattern is well demonstrated on the figure. The highest values (above 3000 gammas) are confined to the "Hybrid" phase and the lowest values occur over the Bethsaida phase.

A major disruption of the expected pattern occurs in the north-central portion of the properties. The values in this area are considerably lower than would be expected for the underlying phases of the intrusive.

Because of the wide spacing of the lines (one-half mile) and the height of the aircraft the magnetic pattern is highly generalized. A ground magnetic survey was necessary to give the amount of detail required for the purposes of the exploration program.

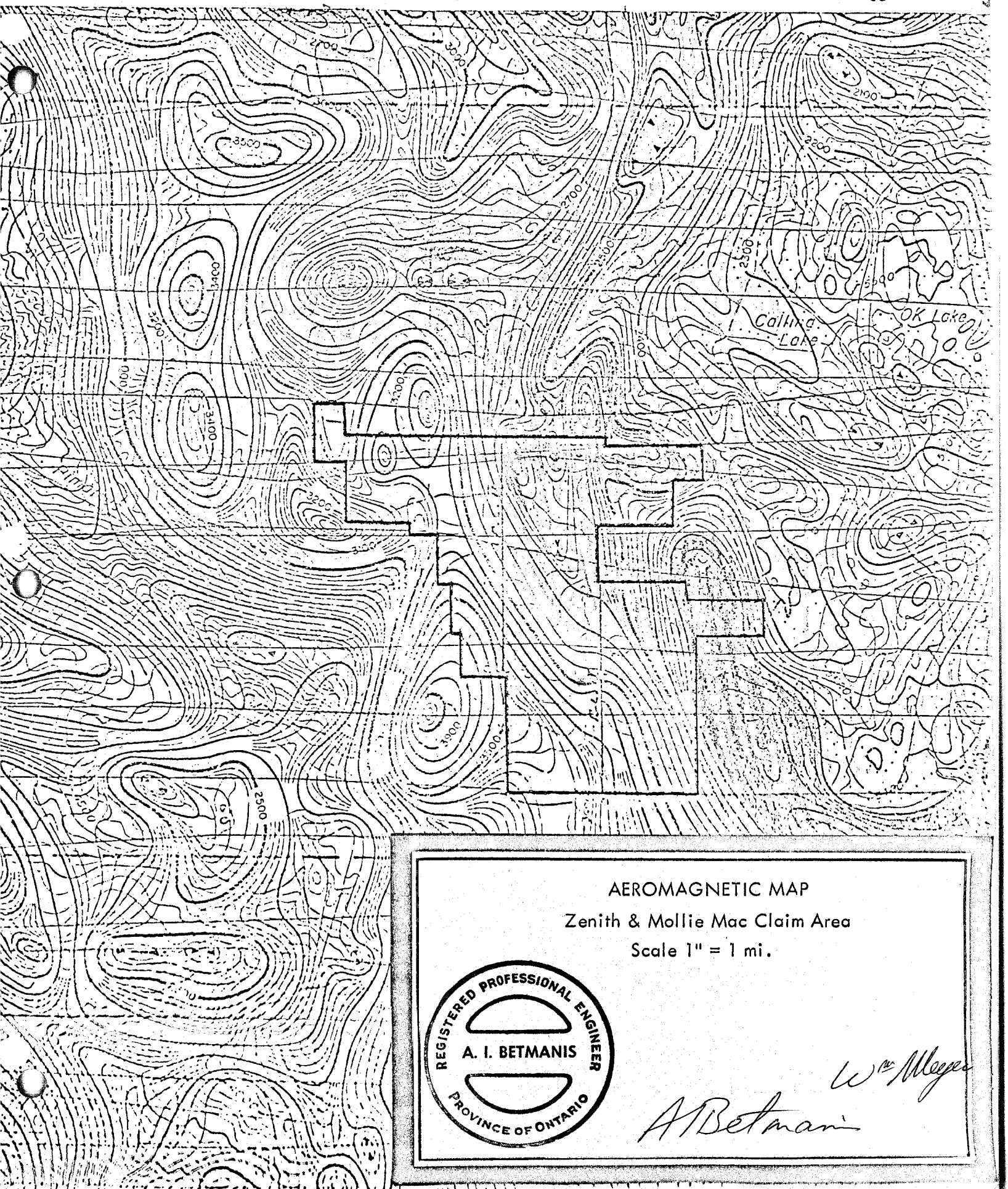
3. Detailed Survey

The ground magnetic survey is characterized by an extremely complex pattern. In general, the trend is parallel to the contacts of the intrusive phases but there are frequent interuptions as well as wide variations within the same rock type.

Ashcroft R24

10'

R23 05'



AEROMAGNETIC MAP

Zenith & Mollie Mac Claim Area

Scale 1" = 1 mi.

REGISTERED PROFESSIONAL ENGINEER
A. I. BETMANIS
PROVINCE OF ONTARIO

Wm Meyer

A Betmanis

The highest magnetic intensities occur within the area underlain by "Hybrid" phase in the southern portion of the properties. To the north the values greatly diminish over this phase.

The younger phases of the batholith cannot be separated by the magnetic data. The lowest values occur over the Guichon variety of the Highland Valley phase in the northern portion of the map area. This variety normally is characterized in this portion of the property and the broad magnetic low can be attributed reasonably to this cause.

A number of other magnetic lows occur within the survey area which may reflect zones of alteration. In two cases sufficient corroborative evidence is provided by other surveys to warrant drilling.

ELECTROMAGNETIC SURVEY

1. The "Radem" unit, manufactured by Crone Geophysics, utilizes very low frequency (12 - 24 kilocycle) radio waves broadcast by the U. S. Navy. In this instance the station at Seattle, Washington, was employed, with a frequency of 18.6 kilocycles. This frequency is very much higher than the normal frequency range employed in electromagnetic prospecting. As a result, the effect of relatively poor conductors such as water - filled shears and deep swamps may be comparable to that over more conductive sulphide zones. Since the signal derives from an essentially infinite source, faults of great horizontal and vertical extent give a particularly strong anomalous response.

   The very low sulphide content of typical Highland Valley porphyry copper deposits provides a poor target for Radem. However, the method can be effective in locating faults and shears which may provide the structural control for the disseminated deposits. The Radem method also can be used in the detection of higher grade copper mineralization related to shears. The effectiveness of the method in both of these cases has been demonstrated on the Highmont property.

   The data are recorded as inclinations of the electromagnetic field. A conductor is indicated by a "crossover" in the angle of inclination. This can be observed in profile form; however, presentation of the data is awkward when only profiles are

plotted. A filter operator was designed by Dr. D. C. Fraser, Chief Geophysicist of Geophysical Engineering and Surveys Ltd., to phase shift the dipangle data by 90 degrees. Crossovers are transformed into peaks to yield contourable quantities. Only the filtered data are shown on the accompanying map. Negative values are not meaningful and have not been plotted.

2. Discussion of the Results

A number of conductive zones suggestive of faults or shears were indicated by the Radem survey. With one exception all of the faults determined by the geological mapping gave electromagnetic response and it was possible in most cases to extend the faults beyond the limits shown on the geological map. The exception was the regional east-west fault in the vicinity of Lines 56N and 60N; the direction of the fault precluded detection using the Seattle station.

In several instances the Radem trends were coincident with other favourable factors (geochemical, I.P. magnetic lows, favourable geology) and these provide targets for additional work.

SEISMIC SURVEY

Shallow refraction seismic testing was undertaken using a Portable Facsimile Seismograph, Model FS-3, manufactured by Huntec Ltd. Energy was transmitted to the ground by means of a sledge hammer striking a heavy steel plate. The work consisted of 60 stations along 10 traverse lines, mainly within the area of anomalous I. P. response in the northern portion of the property.

In the refraction method of seismic prospecting the quantity observed is the time between the initiation of the seismic wave (by the hammer blow) and the first arrival of the wave at a geophone which is placed at a measured distance from the hammer station. By observing first arrival times for a variety of stations along a line, a time versus distance curve can be constructed. The time distance relationships can be analysed in terms of the variation with distance of minimum time paths. From these variations deductions can be made of the nature and depth of the elastic discontinuities required to account for the observed time-distance curves. Finally, the elastic discontinuities may be interpreted in terms of the nature, depth and attitude of geologic units below the surface. It is fundamental to the method that accurate data on the nature of the underlying material can be obtained only if the discontinuities are such that a lower velocity layer always overlies a higher velocity material.

On the Zenith property the seismic work was utilized only to obtain depths of overburden, mainly within the area of the strong I. P. anomaly. The main purpose of this information was to determine whether the anomaly could be tested by trenching. Additionally the information is of value in determining the usefulness of the geochemical data.

The refraction results indicated that the velocity in the overlying material (glacial till) ranged from 2000 to 5000 feet per second. Velocity in bedrock was in the range of 8000 to 15000 feet per second. A thin, very low-velocity layer, presumably soil and organic matter, overlies the till.

The quality of the data was affected by wet and soft surface materials and by undulations in the bedrock surface. The former condition attenuates the seismic waves rapidly and gives rise to poor quality records. Sharp irregularities in the bedrock topography can affect the accuracy of the depth calculations. However, it is believed that the calculated depths are within the accuracy required for the purposes intended.

The results of the seismic refraction work confirmed that the overburden is too thick over much of the anomaly area for practical use of a bulldozer for stripping. West of the baseline the bedrock is indicated to be relatively shallow. However, the lack of a consistent geochemical anomaly in this area of thin cover tends to downgrade the potential. East of the baseline the glacial till is indicated to be sufficiently thick over much of the I. P. anomaly area to effectively prevent the migration of copper ions to surface. Hence the absense of a broad geochemical anomaly does not necessarily preclude the possibility of a copper orebody within the anomaly area.

CONCLUSIONS

Although no significant copper mineralization was noted in the geological mapping, a number of exploration targets have been outlined on the basis of the combined surveys. The favourable indications are:

1) anomalous I. P. results;
2) area of hydrothermal alteration;
3) magnetic low;
4) conductor indicated by Radem;
5) anomalous geochemical values;
6) regional structure.

Further physical work in the form of percussion drilling will be necessary to evaluate these areas.

Respectfully submitted,

Wm Meyer

W. Meyer

A Betmanis

A. I. Betmanis

REGISTERED PROFESSIONAL ENGINEER
A. I. BETMANIS
PROVINCE OF ONTARIO

Appendix I

CLAIMS

Claim	Record Number	Expiry Date	Title
LORNA GROUPING			
Lorna 1 - 15	52588 - 602	November 15, 1970	Zenith
Lorna 18, 20, 22, 24	52605, 07, 09, 11	November 15, 1971	Zenith
Lorna 26, 28, 30, 31	52613, 15, 17, 18	November 15, 1971	Zenith
Zen 1 - 6	53559 - 564	February 9, 1973	Zenith
Lorna Fr. 1 - 3	65643 - 645	August 15, 1972	Zenith
Lorna Fr. 4	65646	August 15, 1972	Zenith
Lorna Fr. 5, 6,	65647 - 48	August 15, 1972	Zenith
Lorna Fr. 7, 8,	65649 - 50	August 15, 1973	Zenith
Mac 4	65651	August 15, 1972	Zenith
Mac 5	65652	August 15, 1971	Zenith
MAT GROUP			
Mat 1 - 20	52833 - 852	November 29, 1971	Zenith
Lorna 19, 21, 23, 25	52606, 08, 10, 12	November 15, 1971	Zenith
Lorna 27, 29	52614, 16	November 15, 1971	Zenith
PAM GROUP			
Mars 1 - 3	54394 - 396	March 22, 1973	Zenith
Mars 4 - 12	54397 - 405	March 22, 1974	Zenith
Mars 13 - 19	54406 - 412	March 22, 1973	Zenith
Pam 1, 3, 5, 7, 9, 11	52938, 40, 42, 44, 46, 48	December 9, 1973	Zenith
Pam 13, 15, 17	52950, 52, 54	December 9, 1972	Zenith
Pamm	66403	October 10, 1975	Zenith
Pam Fr. #1	66404	October 10, 1974	Zenith
Mars Fr. #1	66673	October 20, 1974	Zenith

CLAIMS continued

Claim	Record Number	Expiry Date	Title
JON GROUP			
Brennan 1 - 4	74119 - 74122	November 6, 1973	Mollie Mac
Jon Fr. 1	74421	November 12, 1973	Mollie Mac
Jon Fr. 2	74422	November 12, 1973	Mollie Mac
Jonn 1	81570	July 11, 1973	Mollie Mac
Jonn 2	85171	July 11, 1973	Mollie Mac
Jonn 3	81572	July 11, 1973	Mollie Mac
Jonn 4 Fr.	81573	July 11, 1973	Mollie Mac
Jonn 5 Fr.	83348	August 29, 1973	Mollie Mac
Ban 1 - 3	74423 - 25	November 12, 1973	Mollie Mac
Jon 1 - 2	74419 - 20	November 12, 1973	Mollie Mac

Appendix II

CERTIFICATE

I, Andris Betmanis, do hereby certify that:

1. I am a geologist with residence at Suite 512, 1550 Duchess Avenue, West Vancouver, B. C.

2. I am a graduate of the University of Toronto, (BASc - 1965, Applied Geology)

3. I am a Professional Engineer registered in the Province of Ontario.

4. From graduation to the present I have been employed as a geologist with Geophysical Engineering and Surveys Limited.

5. Between July and November 1970 I supervised the geological and geophysical work on the property on behalf of Geophysical Engineering and Surveys Ltd.

A Betmanis

Andris Betmanis

REGISTERED PROFESSIONAL ENGINEER
A. I. BETMANIS
PROVINCE OF ONTARIO

CERTIFICATE

I, William Meyer, do hereby certify that:

1. I am a geologist with residence at 555 Cochrane Avenue, Coquitlam, B. C.

2. I am a graduate of the University of British Columbia (B. Sc., Physics & Geology, 1962)

3. Since Graduation, I have been employed as a geologist with Phelps Dodge Corporation of Canada (4 years), Gibraltar Mines Ltd. (1½ years), Associated Geological Services (½ year) and Western Geological Services Ltd. (from April 1968 to the present.)

4. During the period July - November 1970 I supervised the geological mapping of the claims covered by this report.

Wm Meyer

William Meyer

November 12, 1970

Appendix III

PERSONNEL & DATES

Name and Address	Position	Employed From - To	Days
W. R. Bergey 700 - 1177 W. Hastings St.	Geologist	July 15 - Nov. 5/70	4
W. Meyer 1015 - 470 Granville St.	Geologist	July 15 - Nov. 12/70	5
A. I. Betmanis 141½ Riverside Dr. N.Van	Geologist	July 22 - Nov. 12/70	39
G. D. Ulrich 1015 - 470 Granville St.	Geologist	July 22 - Sept. 21/70	33
R. E. Reid 1015 - 470 Granville St.	Geological Assistant	July 18 - Sept. 4/70	31
J. Ziegler 141½ Riverside Dr. N.Van	Geophysical Instrument Operator	Sept. 9 - Nov. 5/70	38
K. Davies 141½ Riverside Dr.	Assistant	Sept. 9 - Oct. 15/70	35
R. Darlington 141½ Riverside Dr.	Assistant	Sept. 9 - Oct. 15/70	35
R. Watt 141½ Riverside Dr.	Assistant	Aug. 29 - Oct. 15/70	47
R. Barnes 141½ Riverside Dr.	Seismic Operator	Aug. 29 - Sept. 8/70	10
D. la Prairie 141½ Riverside Dr.	Assistant	Aug. 29 - Sept. 5/70	7
			284

Appendix IV

COST OF SURVEY

ITEM	AMOUNT
Professional Services	
Geophysical Engineering & Surveys Ltd. & Western Geological Services Ltd.	$ 9,395.74
Technical Services	
Field Labour, Instrument Operators & Assistants	6,803.80
Related Costs	
Field supplies + expenses	1,256.13
Accommodation + meals	953.55
Transportation (truck + car rental)	1,308.60
Drafting Services	862.00
	$ 20,579.82

The above costs are property related costs only and do not include preliminary compilation of previous data, administration costs, transportation to and from Vancouver and other costs not normally appliable for assessment credits.

Appendix V

AFFIDAVIT re: COST OF SURVEY

I, William Meyer, B. Sc. of 555 Cochrane Avenue in the Municipality of Coquitlam in the Province of British Columbia, DO SOLEMNLY DECLARE that the geological and geophysical surveys of 112 located mineral claims and fractional mineral claims owned by Zenith Mining Corporation Ltd. (N.P.L.) and Mollie Mac Mines Limited (N.P.L.) of Vancouver, B. C. and under option to The Dowa Mining Co. Ltd., were conducted during the field season of 1970, are described by this report and the field data was obtained at a total property-related cost of at least $20,579.82.

AND I make this solemn declaration conscientiously beleiving 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, in the Province of British Columbia, this 20 day of November, A. D. 1970.

Wm. Meyer

Joan Turner
Sub-mining Recorder

NORTHLODE EXPLORATIONS LTD.

BELCARRA EXPLORATIONS LTD.

VALLEY COPPER MINES LTD.

PAMM | PAM 17 | PAMM FR. | PAM 15 | PAM 13 | PAM 11 | PAM 9 | PAM 7 | PAM 5 | PAM 3 | PAM 1

MARS 19 | MARS 17 | MARS 15 | MARS 13 | MARS 11 | MARS 9 | MARS 7 | MARS 5 | MARS 3 | MARS 1

MARS 18 | MARS 16 | MARS 14 | MARS 12 | MARS 10 | MARS 8 | MARS 6 | MARS 4 | MARS 2

MARS FR. 1

Pam Group

JON FR 2 | BRENNAN 3 | BRENNON 4 | BRENNAN 1 | JON 1 | BRENNAN 2 | JON 2 | JON FR 1

JONN 2 | JONN FR. 4 | JONN 1 | JONN 3

Jon Group

MOLLIE MAC MINES LIMITED

JONN FR 5

VALLEY COPPER MINES LTD

MAT 19 | MAT 20 | MAT 17 | MAT 18 | MAT 15 | MAT 16 | MAT 13 | MAT 14 | MAT 11 | MAT 12 | MAT 9 | MAT 10 | MAT 7 | MAT 8 | MAT 5 | MAT 6 | MAT 3 | MAT 4 | MAT 1 | MAT 2

Mat Group

staked

staked

BAN 3 | BAN 2 | BAN 1

LORNA 31 | LORNA 30 | LORNA FR. 3 | LORNA 28 | LORNA 29 | LORNA 26 | LORNA 27 | LORNA 24 | LORNA 25 | LORNA 22 | LORNA 23 | LORNA 20 | LORNA 21 | LORNA 18 | LORNA 19

LORNA FR. 4

MAC 4 | MAC 5

ZEN 6 | ZEN 5 | ZEN 4 | ZEN 3 | ZEN 2 | ZEN 1

LORNA FR. 2 | LORNA 6 | LORNA 4 | LORNA FR. 1 | LORNA 2 | LORNA 1

Lorna Group

LORNA 7 | LORNA 5 | LORNA 3

LORNA FR. 8 | LORNA 8 | LORNA 9

LORNA FR. 5 | LORNA FR. 7 | LORNA 10 | LORNA 11

FR. 5 | LORNA 12 | LORNA 13

LORNA FR. 6 | LORNA 14 | LORNA 15

HIGHLAND CHIEFTAIN MINES LTD.

T C EXPLORATIONS LTD.

Calling Lake

Pimainus Lake

Pimainus Lake

REGISTERED PROFESSIONAL ENGINEER
A. I. BETMANIS
PROVINCE OF ONTARIO

2700 M3

TO ACCOMPANY "REPORT ON GEOLOGICAL AND GEOPHYSICAL SURVEYS OF THE ZENITH MINING CORP. LTD. (N.P.L.) & MOLLIE MAC MINES LTD. (N.P.L.) PROPERTY" DATED: NOV 12, 1970 HIGHLAND VALLEY B.C. KAMLOOPS MINING DIVISION
BY W. Meyer B.Sc. & A.I. Betmanis P.Eng.

Fig 2.

A Betmanis W. Meyer

ZENITH MINING CORPORATION LTD. (N.P.L.)

Mineral Claim Map

PIMAINUS LAKE – HIGHLAND VALLEY, BC.

SCALE : 1" = 1000'

1000 500 0 1000 2000 3000

SCALE IN FEET

DRAWN BY: L.M. | CHECKED BY: M.P.S. | DECEMBER, 1969

LEGEND

POST BATHOLITHIC ROCKS (CRETACEOUS)

10 VOLCANIC DYKES

GUICHON BATHOLITH (JURASSIC)

9 QUARTZ PORPHYRY

8 BETHSAIDA PHASE

WITCHES BROOK PHASE

7 VARIETY B

6 VARIETY C

5 SKEENA PHASE

HIGHLAND VALLEY PHASE

4 CHATAWAY VARIETY

3 GUICHON VARIETY

HYBRID PHASE

2 VARIETY A

1 VARIETY B

ALTERATION

arg.	ARGILLIC
cal.	CALCITE
chl.	CHLORITE
clay	CLAY
ep.	EPIDOTE
hem	HEMATITE
k-s.	K-SPAR (SECONDARY)
lim.	LIMONITE
pyr.	PYRITE
ser.	SERICITE
sil.	SILICIFICATION
tr.	TRACE

SYMBOLS

- OBSERVED CONTACT
- IMPLIED CONTACT
- INFERRED CONTACT
- VERTICAL JOINT
- JOINT SHOWING DIP
- VERTICAL SHEAR
- SHEAR SHOWING DIP
- FAULT SHOWING DIP
- POSSIBLE FAULT
- REGIONAL FAULT
- FOLIATIONS
- TRENCH
- ROAD
- CAT LINE
- CUT LINE
- OUTCROP
- SWAMP
- qtz. QUARTZ VEINS
- ap. APLITE
- peg. PEGMATITE
- SMALL DYKE SHOWING ATTITUDE
- Cu. COPPER MINERALIZATION
- w. fract. WELL FRACTURED
- P.H. PERCUSSION DRILL HOLE

REGISTERED PROFESSIONAL ENGINEER A. I. BETMANIS PROVINCE OF ONTARIO

2700 M4 2700 #4

TO ACCOMPANY "REPORT ON GEOLOGICAL AND GEOPHYSICAL SURVEYS OF THE ZENITH MINING CORP. LTD. (N.P.L.) & MOLLIE MAC MINES LTD. (N.P.L.) PROPERTY" DATED: NOV. 12, 1970 HIGHLAND VALLEY B.C. KAMLOOPS MINING DIVISION BY W. Meyer B.Sc. & A.I. Betmanis P.Eng.

W. Meyer A.I. Betmanis

FIG. 3A

GEOPHYSICAL ENGINEERING & SURVEYS LTD.

GEOLOGY

ZENITH MINING CORPORATION LTD.

HIGHLAND VALLEY, BRITISH COLUMBIA

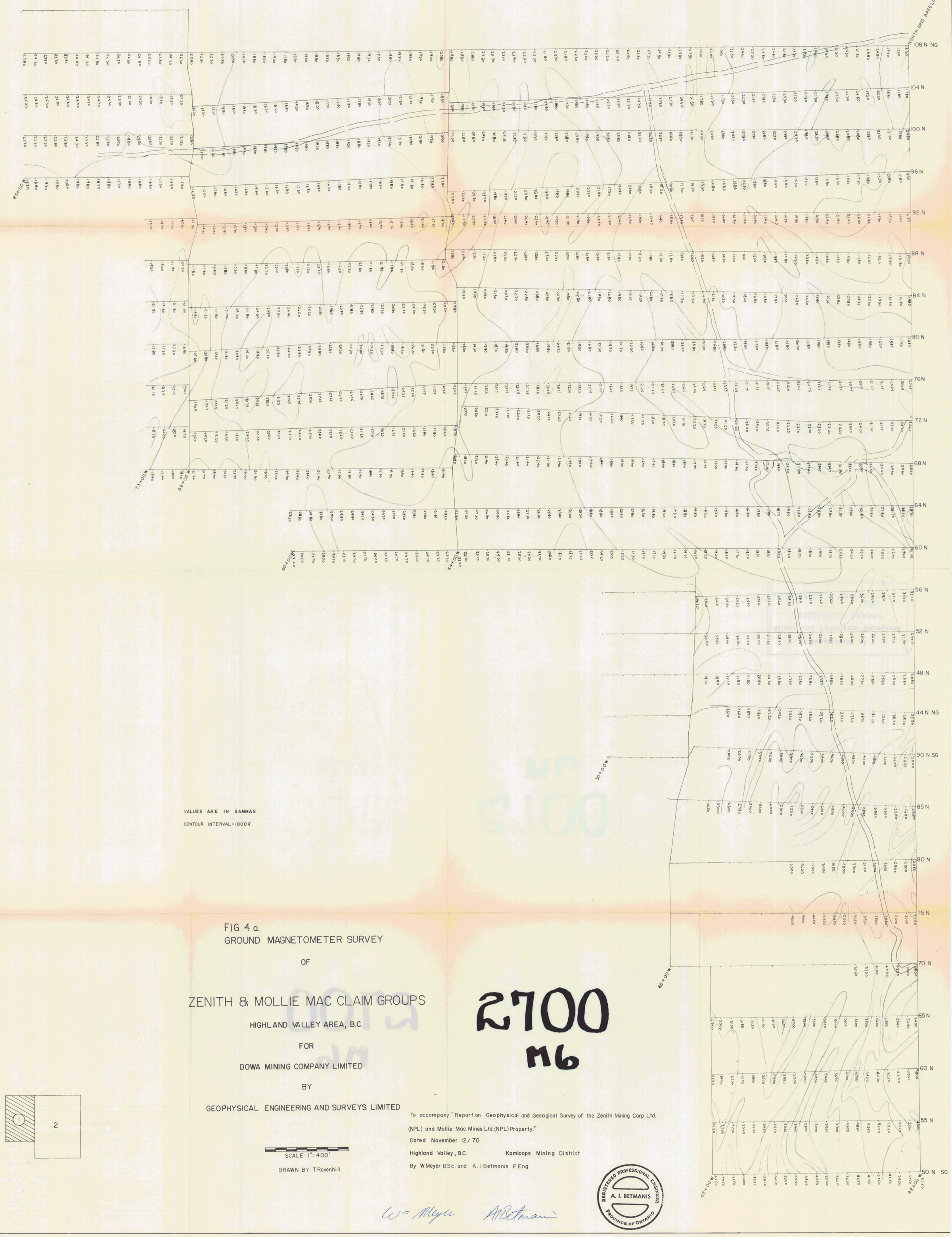
SCALE: 1" = 400'

400 0 400 800

2700 #4

W. G. S. NOVEMBER, 1970

SHEET 1 of 2



VALUES ARE IN GAMMAS

CONTOUR INTERVAL = 1000 ɣ

FIG 4 a.
GROUND MAGNETOMETER SURVEY

OF

ZENITH & MOLLIE MAC CLAIM GROUPS

HIGHLAND VALLEY AREA, B.C.

FOR

DOWA MINING COMPANY LIMITED

BY

GEOPHYSICAL ENGINEERING AND SURVEYS LIMITED

SCALE : 1" = 400'

DRAWN BY T. Ravenhill

2700
M6

To accompany "Report on Geophysical and Geological Survey of the Zenith Mining Corp. Ltd. (NPL) and Mollie Mac Mines Ltd. (NPL) Property."

Dated November 12 / 70

Highland Valley, B.C. Kamloops Mining District

By W. Meyer B.Sc. and A. I. Betmanis P. Eng.

Wm Meyer A I Betmanis

REGISTERED PROFESSIONAL ENGINEER
A. I. BETMANIS
PROVINCE OF ONTARIO

VALUES ARE IN GAMMAS

CONTOUR INTERVAL = 1000γ

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W. Meyer A.I. Betmanis

REGISTERED PROFESSIONAL ENGINEER — A. I. BETMANIS — PROVINCE OF ONTARIO

FIG 4b.

GROUND MAGNETOMETER SURVEY

OF

ZENITH & MOLLIE MAC CLAIM GROUP

HIGHLAND VALLEY AREA, B.C.

FOR

DOWA MINING COMPANY LIMITED

BY

GEOPHYSICAL ENGINEERING AND SURVEYS LIMITED

SCALE 1"=400'

DRAWN BY T.Ravenhill

2700 #7

L 108 N
L 104 N
L 100 N
L 96 N
L 92 N
L 88 N
L 84 N
L 80 N
L 76 N
L 72 N
L 68 N
L 64N
L 60 N
L 56 N
L 52 N
L 48 N
L 44 N
L 40 N
L 35 N
L 30 N
L 25 N
L 20 N
L 15 N
L 10N
L 5N
L 0+00

L90N
L85N
L80N
L75N
L70N
L65N
L60N
L55N
L50N
L45N
L40N
L35N
L30N
L25N
L20N
L15N
L10N
L5N
L0+00

108N 36E
96N 13E
88N 0+00
80N 5E
80N 10E
80N 15E
80N 48E
70N 4+50W
60N 11E
60N 19E
60N 34E
55N 4E
50N 30W

BL 1
40 E

LAKE

APPROX. CLAIM BOUNDARY

LEGEND

POST BATHOLITHIC ROCKS (CRETACEOUS)

10 VOLCANIC DYKES

GUICHON BATHOLITH. (JURASSIC)

9 QUARTZ PORPHYRY

8 BETHSAIDA PHASE

WITCHES BROOK PHASE

7 VARIETY B

6 VARIETY C

5 SKEENA PHASE

HIGHLAND VALLEY PHASE

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HYBRID PHASE

2 VARIETY A

1 VARIETY B

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- CUT LINE
- OUTCROP
- SWAMP
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- peg. PEGMATITE
- SMALL DYKE SHOWING ATTITUDE
- Cu. COPPER MINERALIZATION
- w. fract. WELL FRACTURED
- P.H. PERCUSSION DRILL HOLE
- CLAIM POST
- PROPOSED PERCUSSION HOLES

2700 #5

REGISTERED PROFESSIONAL ENGINEER
A. I. BETMANIS
PROVINCE OF ONTARIO

TO ACCOMPANY "REPORT ON GEOLOGICAL AND GEOPHYSICAL SURVEYS OF THE ZENITH MINING CORP. LTD. (N.P.L.) & MOLLIE MAC MINES LTD. (N.P.L.) PROPERTY" DATED: NOV. 12, 1970 HIGHLAND VALLEY B.C. KAMLOOPS MINING DIVISION BY W. Meyer B.Sc. & A.I. Betmanis P. Eng.

W. Meyer A.I. Betmanis

FIG. 3B

GEOPHYSICAL ENGINEERING & SURVEYS LTD.

GEOLOGY

ZENITH MINING CORPORATION LTD.

HIGHLAND VALLEY, BRITISH COLUMBIA

SCALE: 1" = 400'

400 0 400 800

W. G. S. NOVEMBER, 1970

2700 M5

2700 #5

SHEET 2 of 2

NORTH GRID 108 N

104N

100 N

96N

92N

88N

84N

80N

76N

72N

68N

64N

60N

56N

52N

48N

NORTH GRID 44N

SOUTH GRID 90N

85 N

80 N

75 N

70N

65N

60 N

55N

SOUTH GRID 50N

FILTERED VALUE (90° PHASE SHIFT) OF DIP ANGLE DATA - ONLY POSITIVE VALUES ARE SHOWN.

(S) (W) CONDUCTOR INDICATED BY VLF-EM SURVEY ((S)= STRONG, (W)= WEAK)

SEATTLE TRANSMITTER (18.6 KILOCYLES) WAS USED THROUGHOUT.

INSTUMENT - CRONE "RADEM"

1 2

FIG 5a.
RADEM SURVEY
OF

ZENITH AND MOLLIE MAC CLAIM GROUPS

HIGHLAND VALLEY AREA, B.C.

FOR

DOWA MINING COMPANY LIMITED

BY

GEOPHYSICAL ENGINEERING AND SURVEYS LIMITED

SCALE: 1"= 400'
DRAWN BY T. RAVENHILL

To accompany "Report on Geophysical and Geological Survey of the Zenith Mining Corp. Ltd. (NPL) and Mollie Mac Mines Ltd (NPL) Property."

Dated November 12/70

Highland Valley, B.C. Kamloops Mining District

By W. Meyer B.Sc. and Al. Betmanis P. Eng.

Wm Meyer Al Betmanis

REGISTERED PROFESSIONAL ENGINEER
A. I. BETMANIS
PROVINCE OF ONTARIO

108 NORTH GRID

104N

100N

96N

92N

88N

84N

80N

76N

72N

68N

64N

60N

56N

52N

48N

44N NORTH GRID

90N SOUTH GRID

85N

80N

75N

70N

65N

60N

55N

50N

45N

40N

35N

30N

25N

20N

15N

10N

5N

00 SOUTH GRID

N

FILTERED VALUE (90° PHASE SHIFT) OF DIP ANGLE DATA - ONLY POSITIVE VALUES ARE SHOWN

(S) (W) CONDUCTOR INDICATED BY VLF-EM SURVEY ((S)=STRONG,(W)=WEAK)

SEATTLE TRANSMITTER (18.6 KILOCYCLES) WAS USED THROUGHOUT

INSTRUMENT - CRONE "RADEM"

FIG 5b.

RADEM SURVEY

OF

ZENITH AND MOLLIE MAC CLAIM GROUPS

HIGHLAND VALLEY AREA, B.C.

FOR

DOWA MINING COMPANY LIMITED

BY

GEOPHYSICAL ENGINEERING AND SURVEYS LIMITED

SCALE: 1"=400'
DRAWN BY T.RAVENHILL

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By W. Meyer B.Sc. and A.I. Betmanis P.Eng.

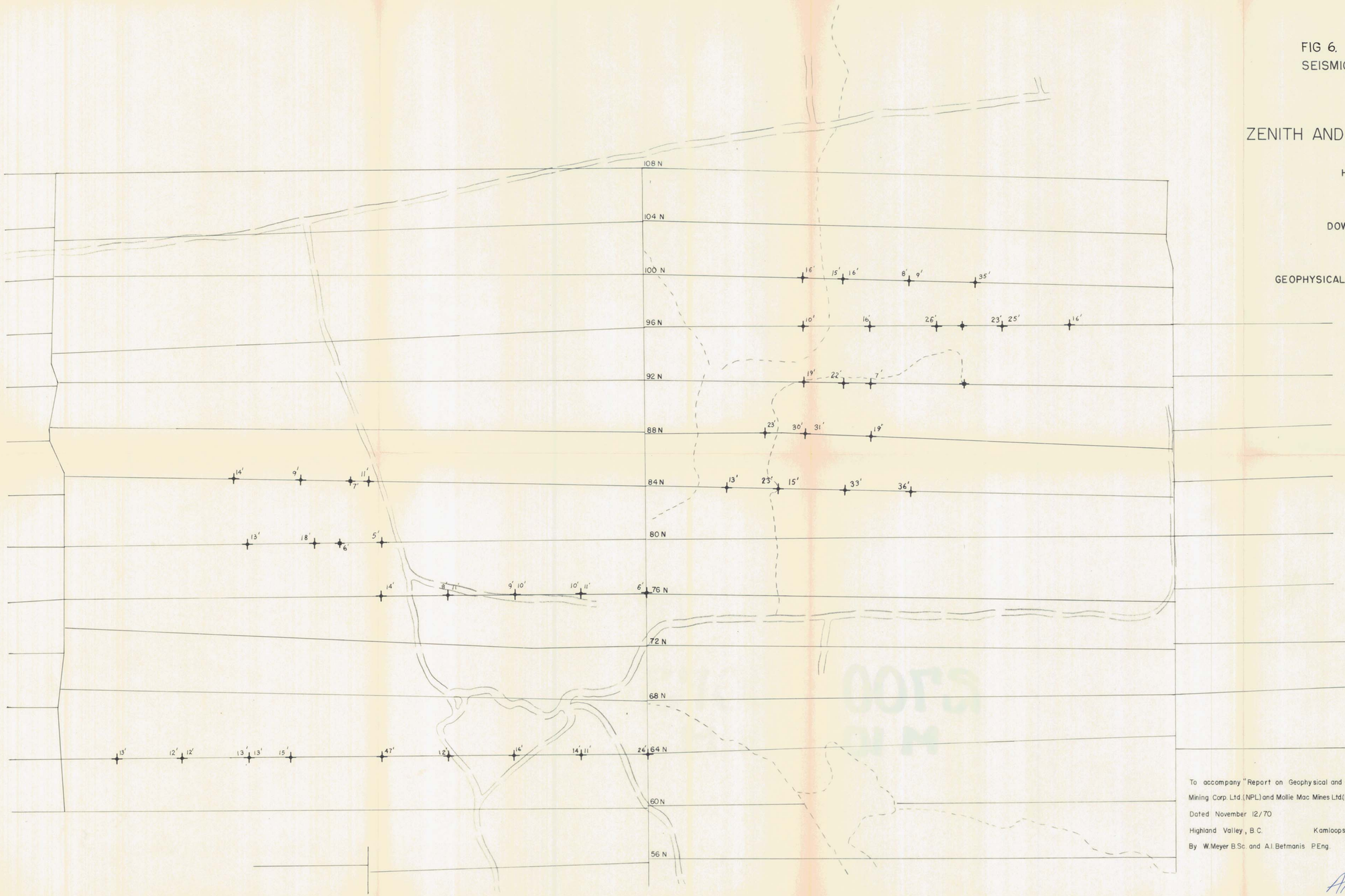
REGISTERED PROFESSIONAL ENGINEER A. I. BETMANIS PROVINCE OF ONTARIO

W. Meyer A.I. Betmanis

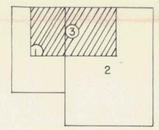
FIG 6.
SEISMIC DEPTH DETERMINATIONS
OF

ZENITH AND MOLLIE MAC CLAIM GROUPS

HIGHLAND VALLEY AREA, B.C.
FOR
DOWA MINING COMPANY LIMITED
BY
GEOPHYSICAL ENGINEERING AND SURVEY LIMITED



SCALE: 1"=400'
DRAWN BY: T. RAVENHILL



+ SEISMIC REFRACTION STATIONS SHOWING INDICATED DEPTH TO BEDROCK
+ DEPTH OF BEDROCK REPORTED FROM DRILLING

To accompany "Report on Geophysical and Geological Survey of the Zenith Mining Corp. Ltd. (NPL) and Mollie Mac Mines Ltd. (NPL) Property."
Dated November 12/70
Highland Valley, B.C. Kamloops Mining District
By W. Meyer B.Sc. and A.I. Betmanis P.Eng.

A.I. Betmanis
Wm Meyer

REGISTERED PROFESSIONAL ENGINEER
A. I. BETMANIS
PROVINCE OF ONTARIO