4763

82E/6W 82E/6W 4763

GEOCHEMICAL AND GEOPHYSICAL REPORT

ON THE

Au - RAIN CLAIM GROUP

6 Miles Southeast of Okanagan Falls, B.C.

Lat. 49° 18'N., Long. 119° 26'W (82E/6)

By

R.S. Verzosa, P. Eng.

Teck Corporation Limited

On Behalf Of

K.G. Ewers, R.W. McLean, K.G. Thompson
(Owners)

Work Period: November 17-18, 1973

December 10, 1973 Vancouver, B.C.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

INTRODUCTION

General Statement

As a part of an agreement dated November, 1973, Teck Corporation Limited offered to make a geochemical orientation survey in the vicinity of a gold showing situated in a group of 8 claims owned by K.G. Ewers and Partners of Okanagan Falls, B.C. Further in the agreement Teck Corporation Limited offered to file the results of the survey to comply with one year's requirement for assessment work. The survey was done on November 17-18, 1973 during which time up to one foot of snow was present. As a routine procedure a magnetometer and VLF-EM orientation survey was incorporated into the program.

Location and Access

The Au-Rain group of claims is located 6-1/4 miles east-south-east of Okanagan Falls, B.C. (Figure 1). The showing is on a road cut on the east side of Fish Creek at an approximate elevation of 4600 feet. It is accessible by means of an all-weather logging road maintained by Northwood Pulp.

Property and Ownership

The property comprises a total of eight contiguous claims staked in June, 1973 by K.G. Ewers and his partners K.G. Thompson and R.W. McLean, all of Okanagan Falls, B.C.

GENERAL GEOLOGY

The only outcrops observed on the property were those at the showing along the access road and at a shallow trench downslope from the showing (Figure 3). On the basis of G.S.C. Map 15-1961 the property appears to straddle the contact between Tertiary sediments and Tertiary volcanics.

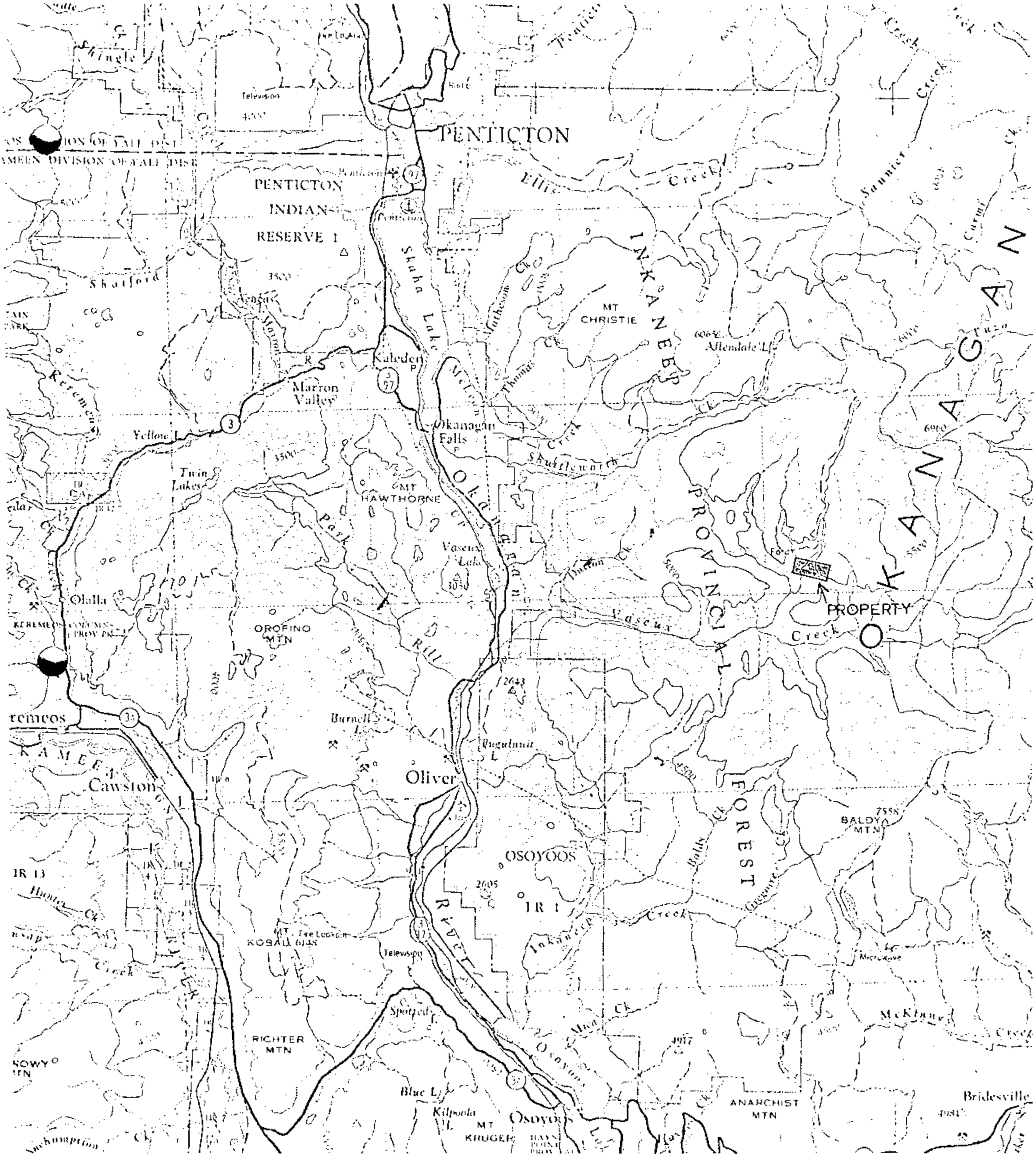


Figure 1. Location Map of AU-Rain group (82E)
Scale 1:250,000.

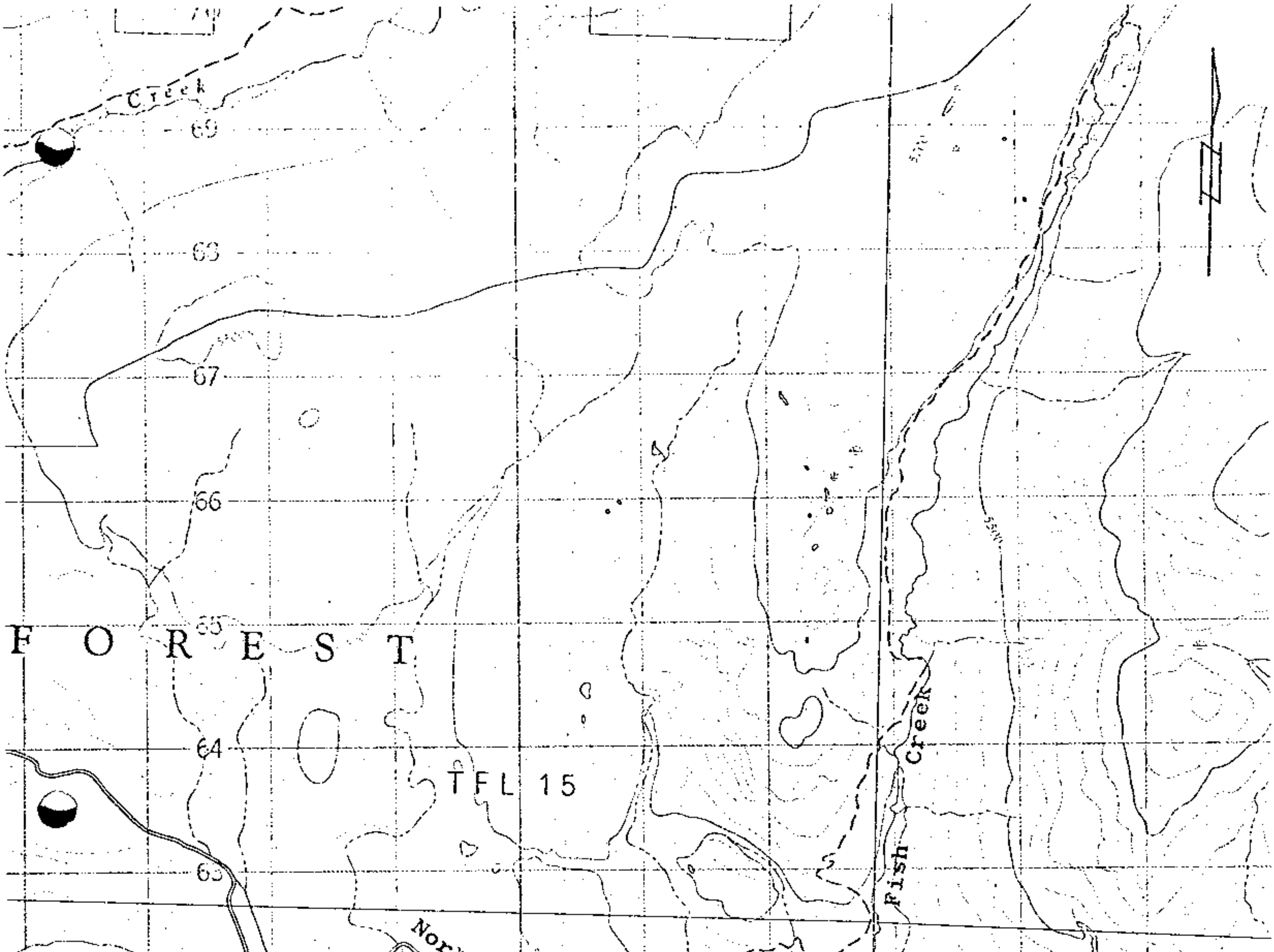
4763-M1

Department of

Mines and Petroleum Resources

ASSESSMENT REPORT

NO. 4763 MAP #1



Gigure 2. Claim Map of the AU-Rain group.(82 E/6)
Scale 1:50,000.

The showing is essentially in volcanics and appears in close proximity to the sedimentary-volcanics contact. It consists of a rusty, highly altered northeasterly trending sheared and fractured zone characterized by patches and bands of silicification and calcite veining. In places siliceous breccia of laharic texture is present. The only sulphide mineral observed was very fine pyrite rarely occurring in small patches. A nearby trench exposes a fresh dark coloured feldspar porphyry of andesitic composition.

GEOCHEMISTRY

Field Procedures

A grid with 200-foot spacings between lines and 50-foot spacings between sampling sites was established in the vicinity of the showing. A soil hand auger of one inch in diameter and 3 feet long was used to collect the samples. The "B" layer which was anywhere from 6 inches to 30 inches deep was sampled. The soil samples were packaged in 3-1/2" x 9-1/2" kraft paper envelopes and delivered unprocessed to Core Laboratories in Vancouver where they were air-dried, screened to minus 80 mesh and analysed for gold, silver and mercury using atomic absorption methods.

Discussion of Results

Figures 4, 5 and 6 are contoured plans of analysed values for gold, silver and mercury, respectively. From the contoured plans two features are readily apparent. Firstly, the degree of coincidence of higher values in gold with corresponding higher values in silver suggest a common mineral source for the two elements. Secondly, the higher values for gold and silver is displaced by a few tens of feet downslope with respect to the outcrop of known gold occurrence whereas, the higher values of mercury appear more coincident with the same outcrop.

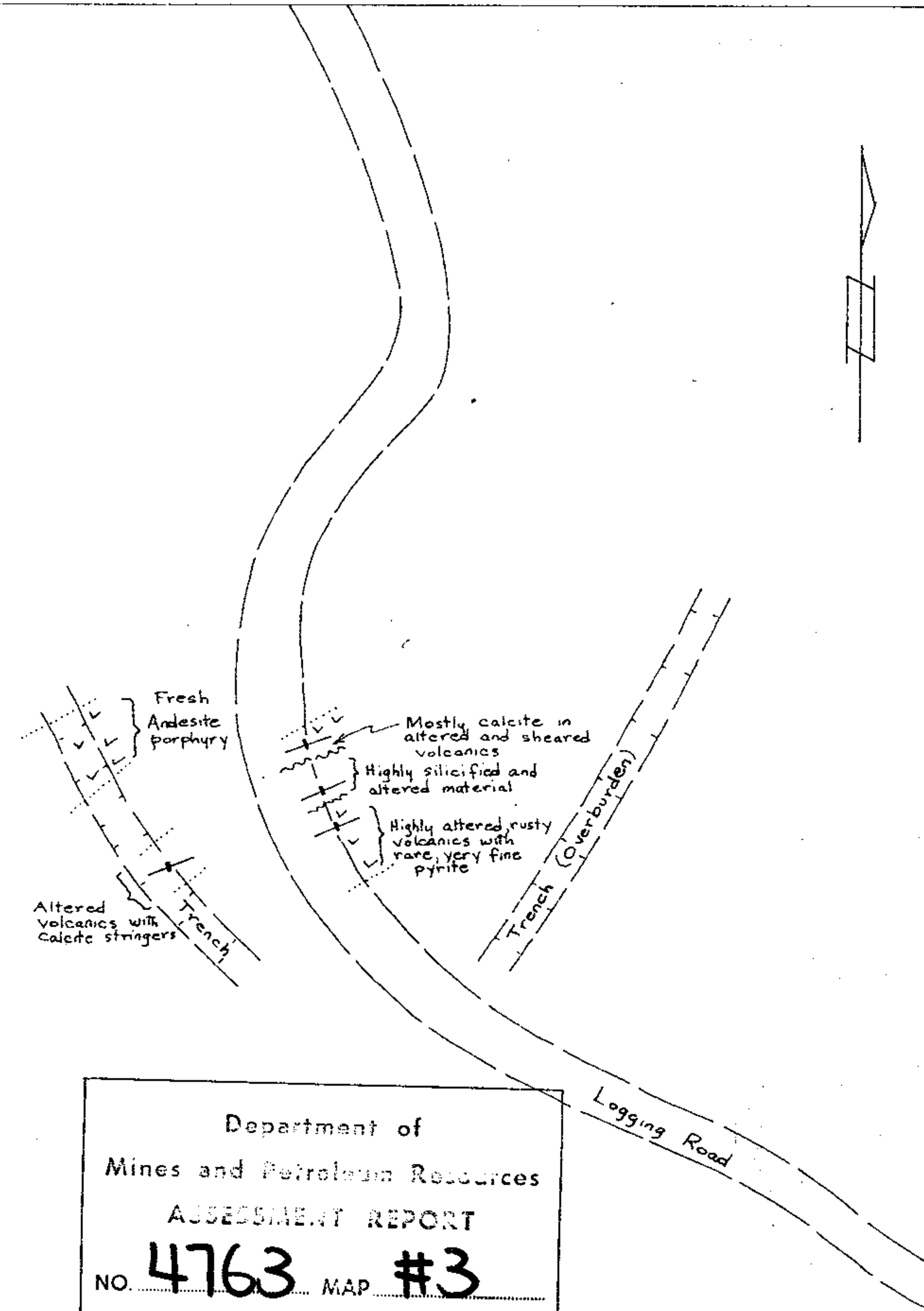


Figure 3. Geological sketch of showing of gold mineralization.
Scale 1" = 100'

GEOPHYSICS

A magnetometer and VLF-EM orientation survey was conducted to determine if there would be any response that may be related to the known mineralization. The survey was done in the same general vicinity where soil samples were taken.

Ground Magnetometer Survey

Procedure and Results

Magnetometer readings using a Scintrex MF-2 were taken at stations in an expanded grid incorporating the soil sampling grid (Figure 7). The results of this survey failed to show sufficient variation in the magnetic intensity of the immediate area with particular reference to the altered and mineralized zone nor of any related structural feature.

VLF-EM Survey

Procedure and Results

VLF readings using a Radem unit and using station NPG in Seattle, Washington were taken at the same grid as the magnetometer survey. Figure 8 shows profiles of tilt angle readings. The plotted figures are data derived by a method explained in Appendix I, to afford better interpretation. In general the VLF survey failed to detect any significant structure that could be related to the known mineralization.

R.S. Verzosa, P. Eng.,
December 10, 1973

PERSONNEL AND TIME DISTRIBUTION

R.S. Verzosa	- Geologist	1 Day
G. Lovang	- Prospector	2 Days
K.W. Davies	- Assistant	2 Days

Statement of Cost

R.S. Verzosa, supervision for 1 day	$100.00
G. Lovang, soil sampling and magnetometer surveys, 2 days @ $60/day	120.00
K.W. Davies, line cutting and VLF operator, 2 days @ $50/day	100.00
Truck Rental, 2 days @ $20/day	40.00
Board and Lodging, 5 man-days @ $20/man-day	100.00
Soil Analysis, 53 samples @ $5/sample (3 elements)	265.00
Drafting	50.00
Report Preparation	100.00
	$875.00

Declared before me at the City of Vancouver, in the Province of British Columbia, this 11th day of December, 1973, A.D.

R. S. Verzosa

R.S. Verzosa, P. Eng.,
December 10, 1973

Joan Paul Sub = mining Recorder

A Commissioner for taking Affidavits within British Columbia or
A Notary Public in and for the Province of British Columbia.

GEOPHYSICS / METHODS AND DATA

VLF-EM Data Processing

D. C. FRASER, Chief Geophysicist,
Geophysical Engineering and Surveys Limited,
(Keevil Mining Group Limited),
Toronto, Ontario

ABSTRACT

Geophysical Engineering and Surveys Limited of the Keevil Mining Group have routinely conducted ground surveys with VLF-EM receivers for the past two years. Both Crone's Radem and Ronka's EM16 have been used.

VLF-EM dip-angle data often yield complex patterns which require considerable study for a proper interpretation. A method was developed which allows field operators to transform the noncontourable dip angles into contourable data, producing conductor patterns which are immediately apparent to exploration personnel untrained in VLF-EM interpretation.

VLF-EM contoured data generally peak very close to the top of a conductor, thereby allowing drill holes to be spotted accurately. However, the data generally should not be used alone to select drill targets because structures may be sufficiently conductive to yield strong anomalies. Thus, magnetic and/or vertical-loop EM correlations may be considered as necessary criteria for drilling.

VLF-EM surveys can replace IP surveys in certain environments. For example, the Restigouche orebody in the Bathurst camp of New Brunswick yielded a VLF-EM anomaly as distinct as that obtained by IP, although the body did not respond to vertical- or horizontal-loop EM. However, the cupriferous breccia pipes of the Tribag mine near Batchawana, Ontario yield strong IP anomalies but not VLF-EM anomalies, illustrating that disseminated ore targets should be sought with IP rather than with VLF-EM.

INTRODUCTION

A METHOD HAS BEEN DESCRIBED (Fraser, 1969) which enables somewhat noisy, noncontourable dip-angle data to be transformed into less noisy, contourable data. This data processing is performed routinely by field personnel, and simply involves additions and subtractions.

Both magnetic and VLF-EM data can be collected by a single individual as part of a ground evaluation program. The VLF-EM method can provide contour maps which may be as useful to exploration geologists as magnetic maps. The key to the usefulness, however, lies in the data processing, because raw dip-angle data frequently are more confusing than elucidating. This point is illustrated in *Figure 1*, which presents dip-angle data from the Temagami mine in Ontario. Clearly, the complex pattern requires some thought for proper interpretation. Conversely, *Figure 2* provides a conductor pattern which is immediately apparent even to those untrained in VLF-EM interpretation. It is obtained from the data of *Figure 1*, using the method described in the Appendix. The contoured units are expressed in degrees. Only the positive quantities are contoured.

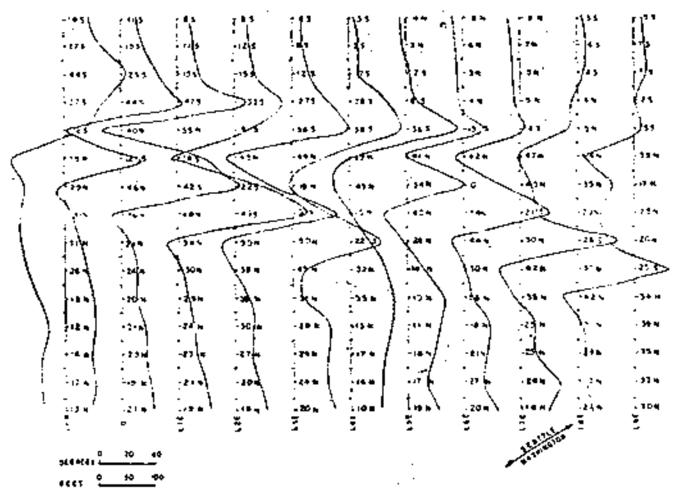


FIGURE 1 — Dip-angle VLF-EM data in the vicinity of the Temagami mine. The arrow defines the primary field direction from the transmitter at Seattle, Washington (after Fraser, 1969).

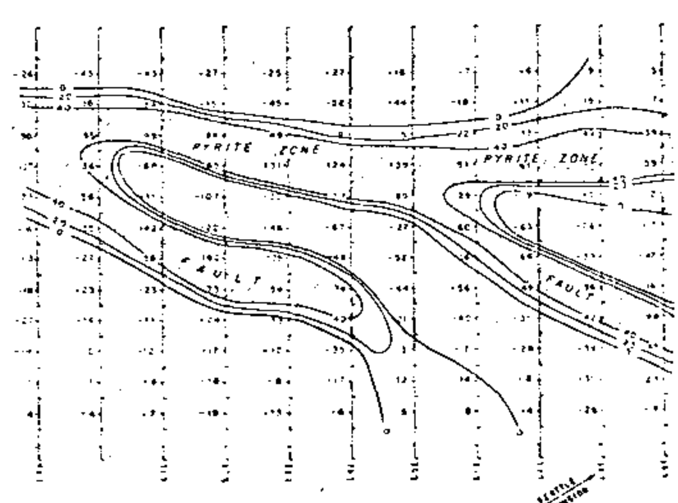


FIGURE 2 — Contoured VLF-EM data, in degrees, as calculated from the map of Figure 1 (after Fraser, 1969).

D. C. FRASER obtained a Bachelor's and a Master's degree in geology at the University of New Brunswick and, in 1966, a Ph.D. degree in geophysics at the University of California at Berkeley. He has performed research on induced polarization, resistivity, magnetics, gravity and electromagnetics, including the design of new interpretation methods employing, in part, digital filtering and correlation techniques. Recently, he has been involved to a considerable extent in mapping conductivity inhomogeneities, first with ground equipment as a thesis problem, and then with airborne equipment in collaboration with Barringer Research Limited.

Dr. Fraser has worked for several petroleum and mining companies and currently is chief geophysicist of Geophysical Engineering & Surveys Limited, a member of the Society of Exploration Geophysicists and of the CIM, and a past president of the Canadian Exploration Geophysical Society.

PAPER PRESENTED: at the 72nd Annual General Meeting of the CIM, Toronto, April, 1970.

KEYWORDS: Geophysical exploration, Data processing, Electromagnetic surveys, Dip angles, VLF-EM surveys, Filter theory, Contouring.

CIM TRANSACTIONS: Vol. LXXIV, pp. 11-13, 1971.

FIELD EXAMPLES

The following field examples were chosen to illustrate the three primary uses to which VLF-EM has been applied by Geophysical Engineering and Surveys Limited.

General Prospecting

General prospecting or ground evaluation provides the most common use for VLF-EM. Ground often is obtained which requires only a general approach to exploration, as when there is insufficient geological information regarding the specific target sought. In such cases, magnetic and VLF-EM surveys are routinely performed without the guidance of a geophysicist. VLF-EM conductors are tested by short traverses with vertical-loop EM. The anomaly patterns generally are sufficiently clear so that mapping, trenching, drilling or abandonment will be decided without consulting a geophysicist. Exceptions can occur when patterns become complex.

Figure 3 illustrates a survey in which two strong VLF-EM conductors were obtained. The southern anomaly has vertical-loop EM correlation and the northern one does not. The VLF-EM anomaly with vertical-loop correlation also coincides with a magnetic anomaly, and probably is due to magnetic sulphides. It will be drilled shortly. The other equally strong VLF-EM anomaly without vertical-loop correlation does not parallel the magnetic patterns, and probably is due to a fault.

In Place of IP

There are certain environments where VLF-EM can be used as an alternate to IP. These are the environments characterized by massive or heavily disseminated sulphides which occur within 300 feet of surface and yet do not respond to conventional EM. IP was considered to be the most suitable geophysical method for the detection of such bodies (Hallof, 1967). However, it is well worth testing VLF-EM in these environments because of the very substantial cost savings that result if the method is responsive. As an example, *Figure 4* illustrates a VLF-EM survey over the Restigouche orebody in the Bathurst area of New Brunswick. *Figure 5*, showing IP chargeability contours, allows a comparison to be made of the relative merits of IP and VLF-EM for this type of mineralization. The Restigouche body did not respond to vertical- or horizontal-loop EM because of the high sphalerite content of the massive sulphides.

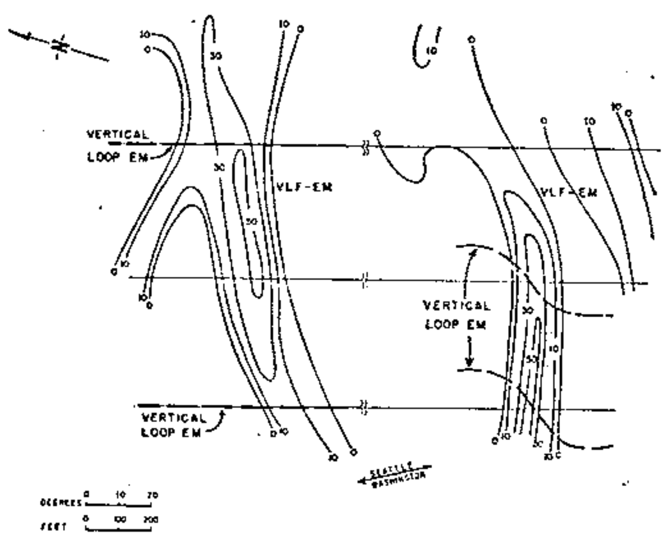


FIGURE 3 — Contoured VLF-EM in degrees and vertical-loop EM profiles (1,200 hz) from a property evaluation survey in the Uchi Lake area.

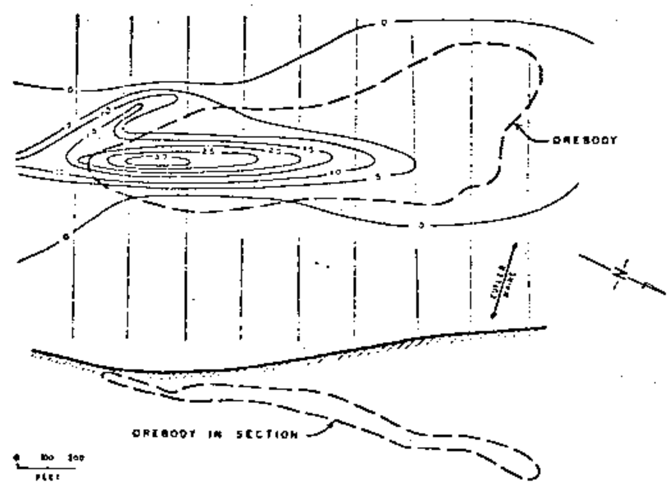


FIGURE 4 — Contoured VLF-EM in degrees from the Restigouche orebody, illustrating that the method is a viable alternate to IP in this environment (cf. Figure 5).

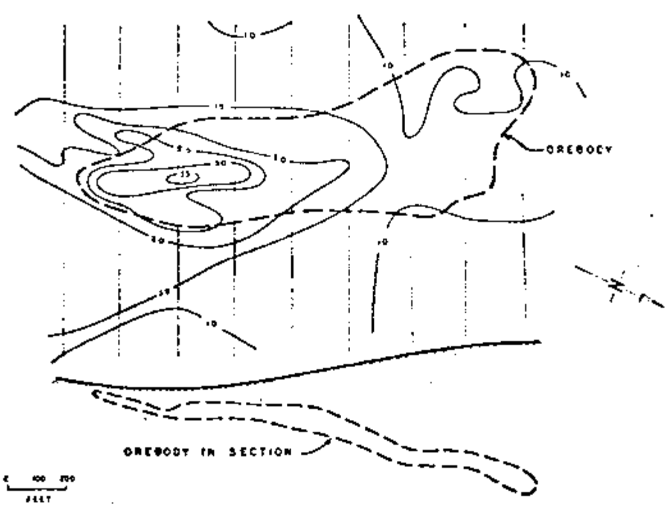


FIGURE 5 — Gradient-array IP chargeability in milliseconds over the Restigouche orebody, for comparison with the VLF-EM data of Figure 4.

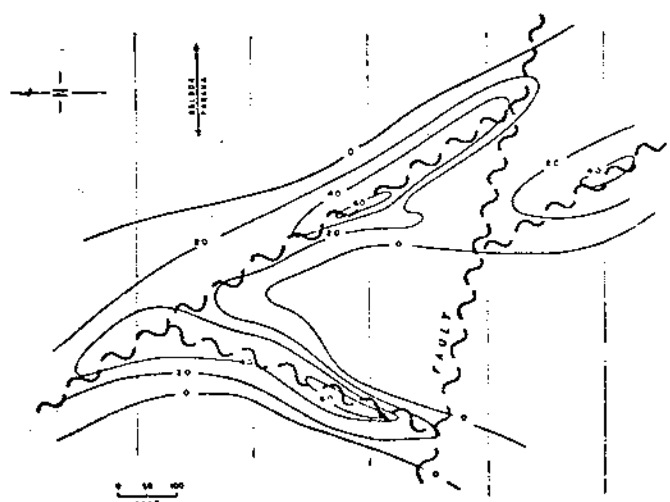


FIGURE 6 — Contoured VLF-EM in degrees from a fault-mapping survey in the Cobalt area.

Other environments described in Hallof (1967) would not be as amenable to the use of VLF-EM in place of IP. A truly disseminated copper deposit will not provide a VLF-EM anomaly but will yield a large IP effect, as was found to be the case for the breccia pipes of the Tribag mine near Batchawana, Ontario.

Structural Interpretation

Inasmuch as VLF-EM responds well to structures, the method has been applied to the mapping of faults. An example is shown in *Figure 6*, which depicts a portion of a survey in the Cobalt area of Ontario. The property was a silver prospect where the veins were postulated to be associated with faults. VLF-EM appeared to be the most reasonable geophysical method available to aid in tracing these faults. Considerable drilling has been done on this property, and the fault interpretation was verified.

Figure 2 illustrates that faults can be as conductive to VLF-EM as massive pyrite. In this Temagami example, the faults contain a brecciated matrix with some hematite cementing. They yield a strong IP anomaly, but are non-conductive to conventional EM.

DEPTH OF EXPLORATION

The relatively high transmitted frequency of approximately 20,000 hz severely limits the depth of exploration in areas of conductive overburden. As an example, penetration of the 100 to 200 feet of clay in the Timmins area often is not achieved.

In regions where the overburden has a less exceptional conductivity, such as the Bathurst area, depth of exploration generally is limited to about 300 feet. This depth was predicted from model curves in Fraser (1969), and appears to be true in practice, as over the Restigouche deposit (*Figure 4*).

CONCLUDING REMARKS

VLF-EM surveys are exceptionally easy to perform, but the dip-angle data may be exceedingly difficult to interpret correctly. This latter point has produced unfavourable comments regarding the utility of VLF-EM as a prospecting tool. The data-processing method used to transform somewhat noisy, noncontourable dip angles into less noisy, contourable data greatly increases the value of VLF-EM surveys.

The efficiency of data flow is significantly increased in the case of an active mining company performing such surveys in large quantities. This is because the contoured maps may be used directly by geologists in charge of their various projects, rather than requiring a geophysicist to study each dip-angle map.

Contoured VLF-EM maps form a useful complement to magnetic maps. The survey and data-processing cost is similar to that for a hand-held fluxgate magnetometer.

For general exploration in the Shield, VLF-EM conductors generally should be tested with vertical-loop EM to separate massive sulphides (and graphite) from conductive structures. As such structures can be mapped with VLF-EM, this provides another use for the method. Further, some massive and heavily disseminated sulphides, which do not respond to conventional EM, will yield VLF-EM anomalies as distinct as those obtained by IP. These three uses of VLF-EM, i.e., for general prospecting, mapping of structures and as a judicious alternate to IP, form our primary applications of VLF-EM to property evaluation.

APPENDIX

The Data-Processing Technique

THE DATA-PROCESSING TECHNIQUE is described in detail by Fraser (1969), where it is also discussed in terms of filter theory*. The method is very simple to apply, as is shown by the example of *Figure 7*. This figure illustrates that the contourable quantity is the sum of the values at two adjacent stations minus the sum at the next two adjacent stations. The above-referenced paper presents a tabulation method suited to the processing of this dip-angle data. The calculations are performed in the field by the instrument operators.

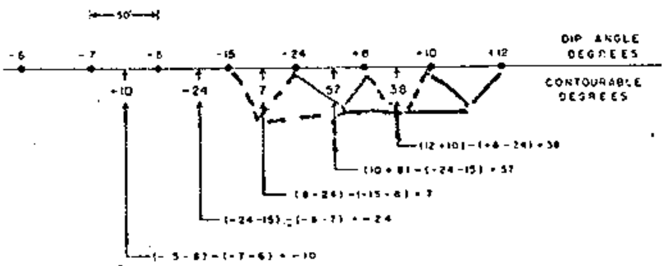


FIGURE 7 — Example of the data processing calculations, illustrating that the contoured quantities are obtained simply from additions and subtractions performed on the dip angles.

A 50-foot station interval is recommended to avoid the problem of near-surface conductors appearing as deeper conductors, as could occur if the station spacing was larger. In actual practice, data are collected at 100-foot intervals, with 50-foot readings being taken where anomalies occur. Later, 50-foot artificial data are interpolated in non-anomalous areas prior to performing the calculations. This procedure avoids some confusion in the contour patterns which would result from near-surface 'geological noise'.

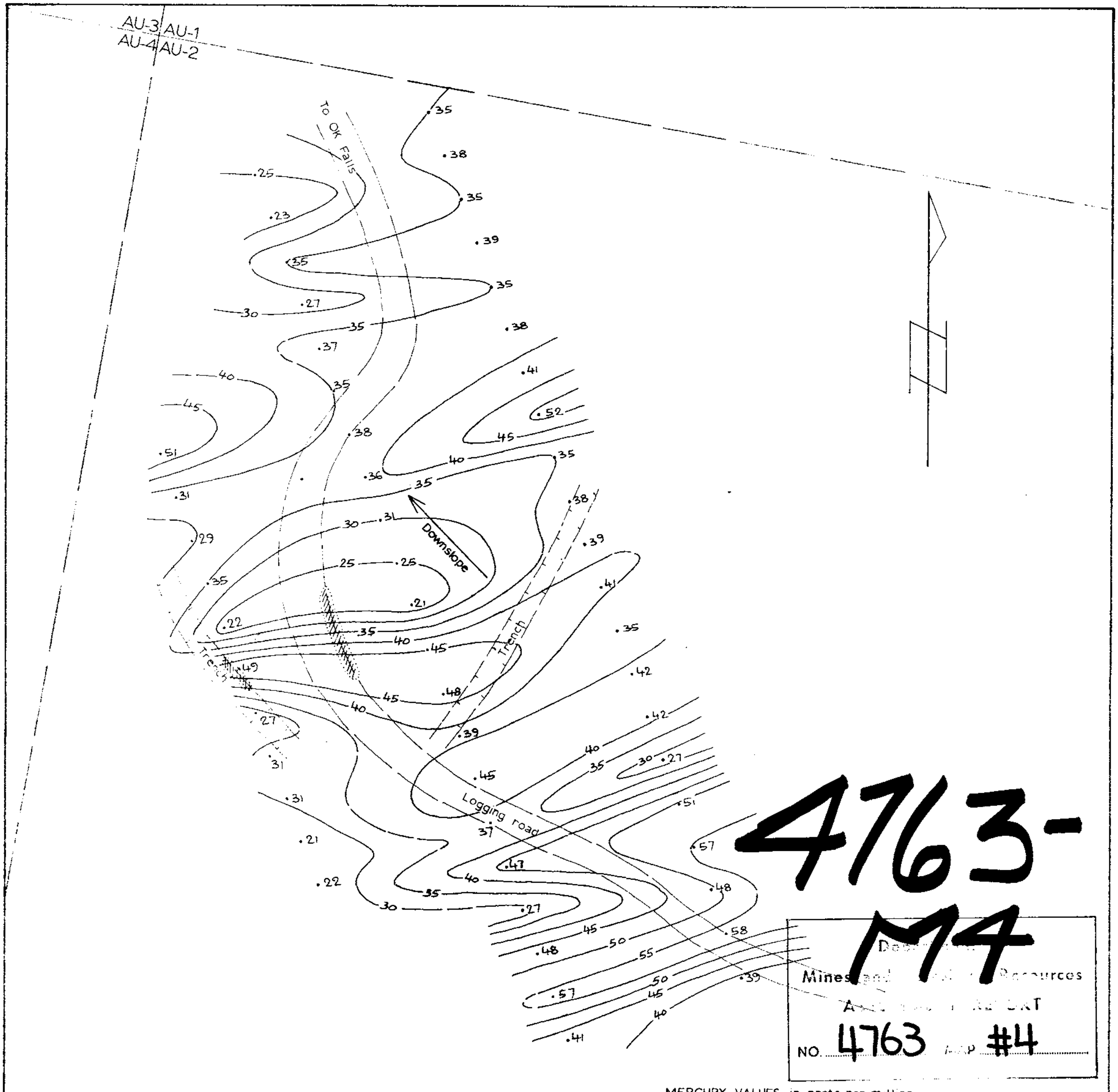
Normally, only the positive values are contoured, because the negative quantities generally represent anomaly flanks. Consequently, the inclusion of negative contours would serve only to confuse the conductor patterns. However, if a backward crossover was produced by a geological source, an erroneous interpretation of the contour map and the dip-angle profiles would result. To date, such a crossover has not been recognized on the predominantly in-phase dip-angle data.

REFERENCES

Fraser, D. C., (1969), Contouring of VLF-EM Data; *Geophysics*, Vol. 34, pp. 958-967.

Hallof, P. G., (1967), The Use of Induced Polarization Measurements to Locate Massive Sulphide Mineralization in Environments in which EM Methods Fail; paper presented at Canadian Centennial Conference on Mining and Groundwater Geophysics, Niagara, Ontario.

*The technique is analogous to passing the dip-angle data through a bandpass filter which (1) completely removes DC bias and greatly attenuates long wave lengths, (2) completely removes Nyquist frequency noise, (3) phase-shifts all frequencies by 90 degrees and (4) has the bandpass centered at a wave length of five times the station spacing.



MERCURY VALUES in parts per million

Outcrop

To accompany geochemical and geophysical report by R. S. Verzosa, P. Eng., on the AU-Rain group, Fish Creek, Osoyoos M.D., dated December 10, 1973.

TECK CORPORATION LIMITED

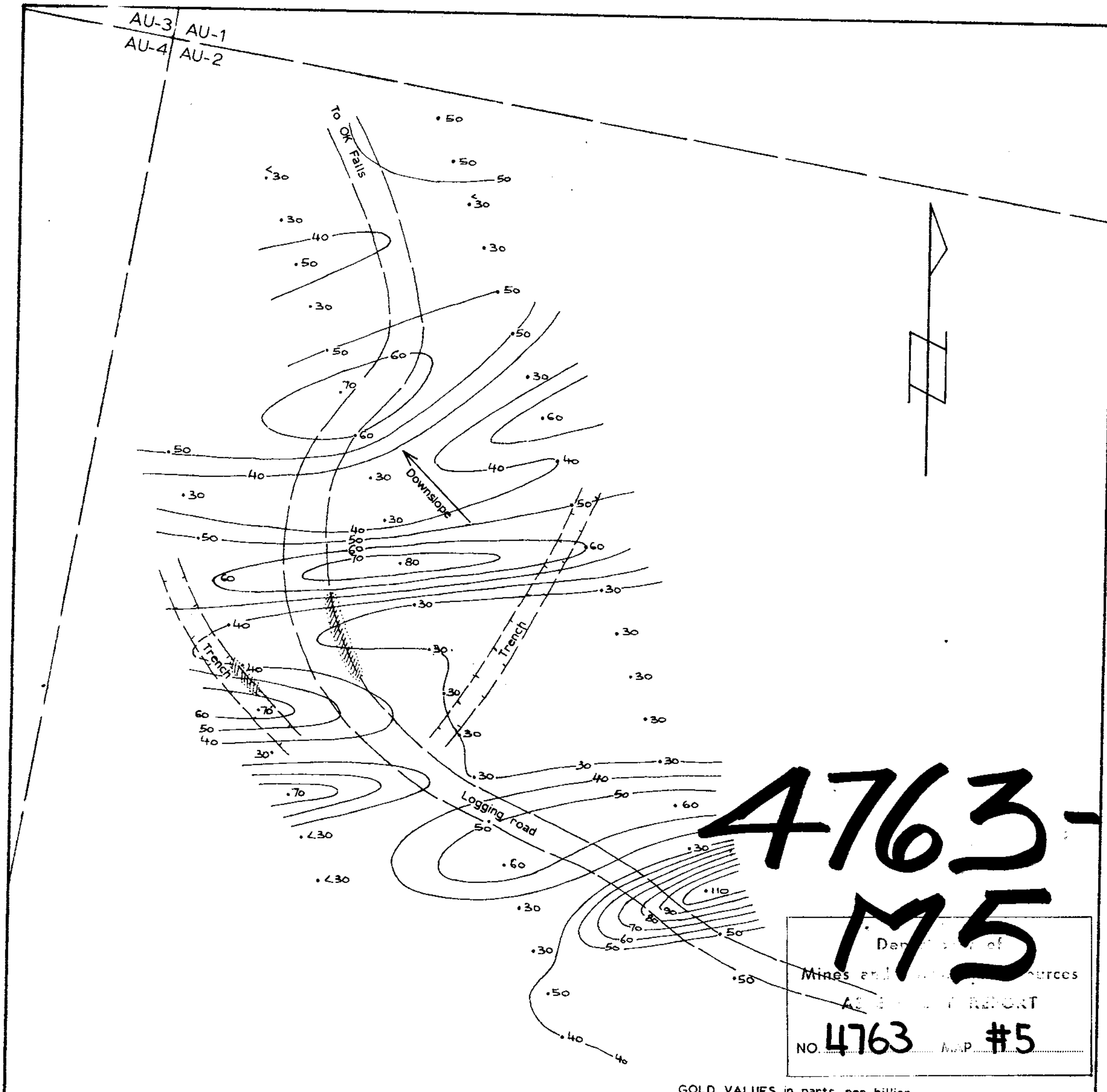
GEOCHEMICAL SURVEY OF SHOWING AND VICINITY AU-RAIN CLAIMS

FIGURE 6

OKANAGAN FALLS, B.C.

SCALE 1"=100'

RSV 1973



GOLD VALUES in parts per billion

Outcrop

To accompany geochemical and geophysical report by R. S. Verzosa, P. Eng., on the AU-Rain group, Fish Creek, Osoyoos M.D., dated December 10, 1973

TECK CORPORATION LIMITED

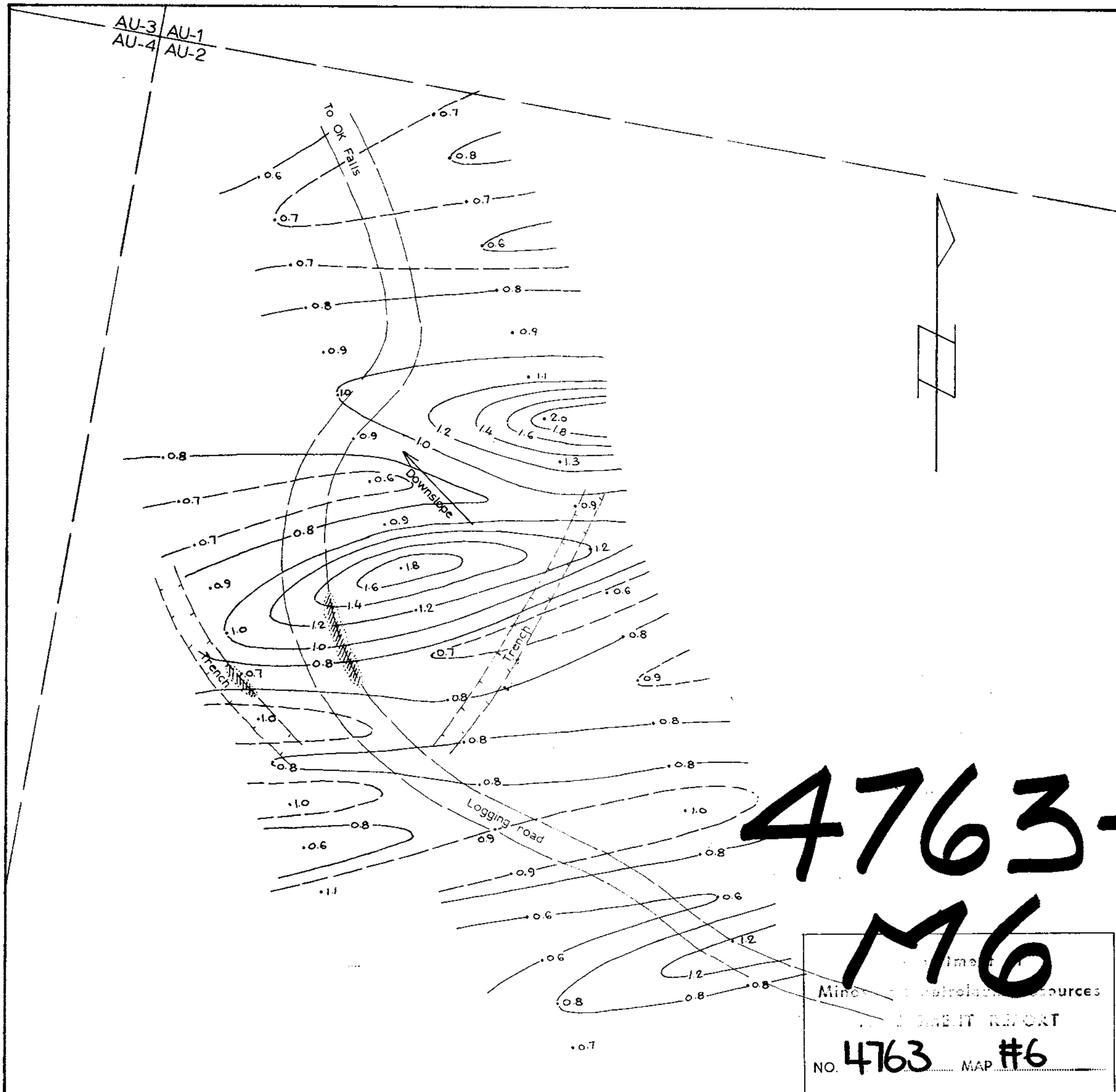
GEOCHEMICAL SURVEY OF SHOWING AND VICINITY AU-RAIN CLAIMS

FIGURE 4

OKANAGAN FALLS, B.C.

SCALE 1"=100'

RSV 1973



SILVER VALUES in parts per million

Outcrop

To accompany geochemical and geophysical report by R. S. Verzosa, P. Eng., on the Au-Rain group, Fish Creek, Osoyoos M.D., dated December 10, 1973.

TECK CORPORATION LIMITED

GEOCHEMICAL SURVEY OF SHOWING AND VICINITY AU-RAIN CLAIMS

FIGURE 5 OKANAGAN FALLS, B.C.

SCALE 1"=100' RSV 1973

4763-M7

Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4763 MAP #7

Values in gammas x 100
Contour Interval - 100 gammas

TECK CORPORATION LIMITED

GROUND MAGNETOMETER SURVEY
OF
SHOWING AND VICINITY
AU-RAIN CLAIMS

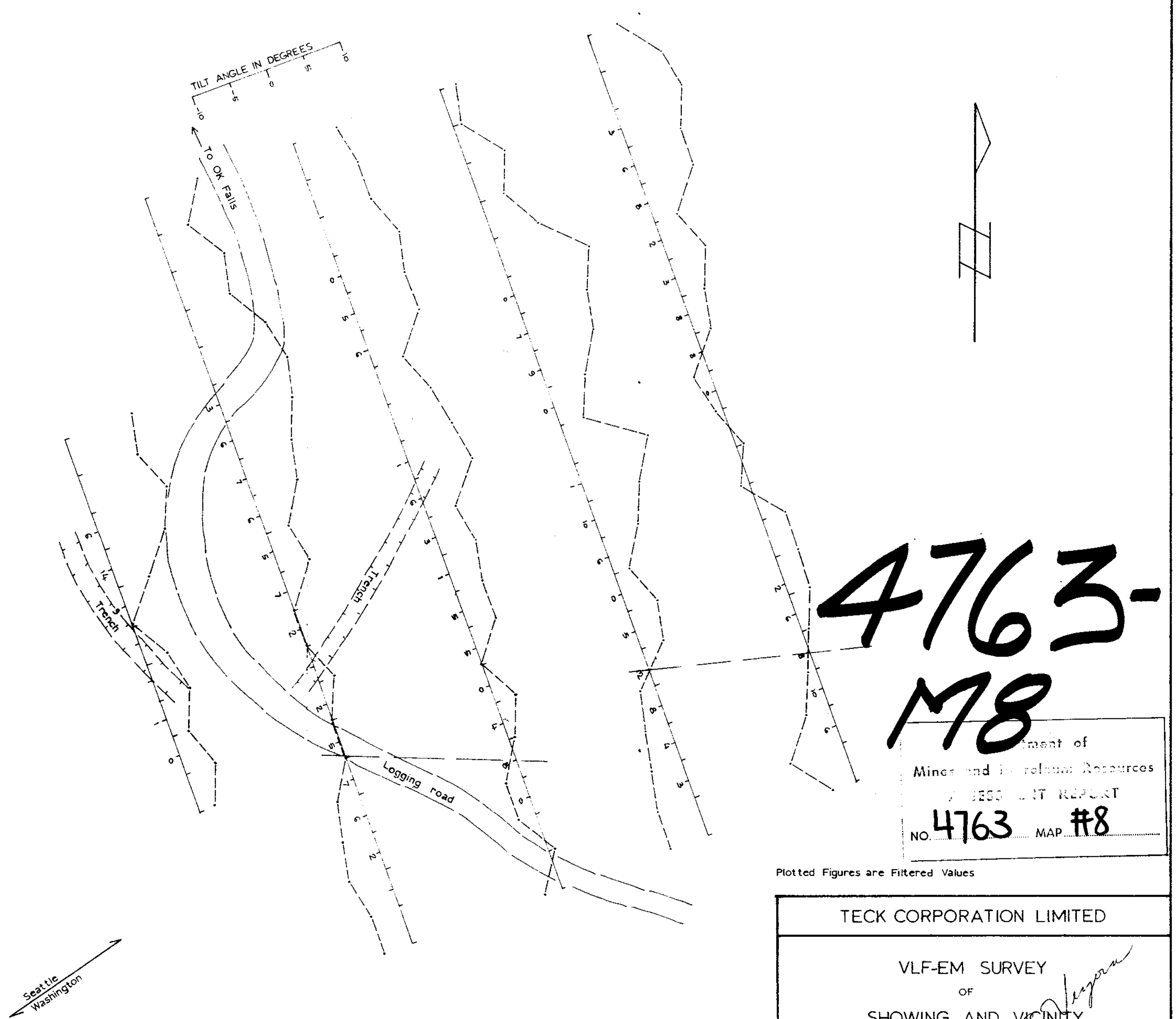
OKANAGAN FALLS, B.C.

FIGURE 7

SCALE 1" = 100'

RSV 1973

To accompany geochemical and geophysical report by R. S. Verzosa, P. Eng., on the AU-Rain group Fish Creek, Osoyoos M.D., dated December 10, 1973



TECK CORPORATION LIMITED

VLF-EM SURVEY
OF
SHOWING AND VICINITY
AU-RAIN CLAIMS

FIG. 8

OKANAGAN FALLS, B.C.

SCALE 1" = 100"   RSV 1973

To accompany geochemical and geophysical report by R. S. Verzosa, P. Eng., on the AU-Rain group Fish Creek, Osoyoos M.D., dated December 10, 1973.