# GEOPHYSICAL REPORT MAGNETOMETER AND VLF-EM SURVEY

on the

# E-D1 CLAIM

Kamloops, Mining Division

N.T.S. 82 M/5W

Prepared for:

# FORAN MINING CORPORATION

Survey by SJ GEOPHYSICS LTD.

Report And Plotting By S.J.V. CONSULTANTS LTD.

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#### INTRODUCTION

SJ Geophysics Ltd. conducted a program of induced polarization (IP), magnetic (mag) and vlf-electromagnetic (vlf-em) surveying on behalf of Foran Mining Corporation on the E-D1 Claim, in July, 1996. The claim is located approximately 80 kilometers north-northeast of Kamloops in the Kamloops mining division, B.C. (N.T.S. 82M/5W). Previous exploration on the property has identified two styles of mineralization: volcanogenic massive sulphides and polymetallic vein deposits.

The purpose of the survey was to test the IP technique across the Energite showing to the southeast of the claim and extend coverage across the Fennel/Eagle Bay thrust fault contact, along strike to the north-northwest. The magnetic and vlf-em surveys were intended to provide detailed fill-in lines across the previously surveyed grid.

The IP survey was conducted from July 10 - 16, 1996. The magnetic and vlf-em surveys were conducted on July 24, 1996. The surveys were terminated early by the field geophysicist for two reasons. First, and most importantly, the initial results showed the existing survey lines did not extend far enough to the south-west to cover the Fennel/Eagle Bay contact. Second, the poor condition of the survey grid slowed the progress of the survey to the point that surveying was not as cost-effective for the client as it should be and the inconsistent station spacing introduced unacceptable errors into the data.

# **SURVEY GRID**

The grid surveyed was never precisely identified but it is assumed to be the same grid on which the previous work was completed, in the southeast corner of E-D1 claim. One concern raised by the field crew was that there is no indication, on the maps provided, of the cliffs noted by this survey crew. The IP surveys were conducted across previously existing grids lines. The mag and vlf-em surveys were conducted across the southeast portion of the previous grid, along fill-in lines spaced at 100 metre intervals.

#### FIELD WORK AND INSTRUMENTATION

The IP crew, comprised of Rod Hill (geophysicist), Matt Kowalczyk (technician) and Matthew Davie are all employees of SJ Geophysics Ltd. Two local men were hired as field helpers during the course of the survey. The IP field crew and equipment were mobilised to the property on July 10 and demobilised on July 16, 1996. The field crew was under the direct supervision of Wayne Tyner, geologist for Foran Mining Corp.

The magnetometer and VLF-EM crew consisted of Matt Kowalczyk (technician), and Matthew Davie (technician). This crew mobilised to the property on July 21 and demobilised on July 25, 1996. During the first day, the field crew cut and flagged fill-in lines between the existing grid lines.

A Pole-Dipole I.P. survey, using 25m dipoles with N=1-6, was performed along 4 lines for a total of approximately 3.7 line kilometres. All lines were surveyed from east to west, with the current electrode placed consistently to the east of the potential array..

A Phoenix 3KW IPT-1 time domain transmitter with a cycle time of 2 second on and 2 second off and a Androtex TDR-6 time domain receiver were used throughout the survey. The receiver used the default settings of a 80 millisecond time delay after shutoff followed by 10 integration windows with widths of 80,80,80,80,160,160,160,320,320 and 320 millisecond each. Thus the chargeability was measured over each of the ten windows along the decay curve. The transmitter current was keyed into the Androtex receiver.

All the data was downloaded to a computer in the evening. The apparent resistivity was calculated for each station using the recorded transmitter current and the nominal dipole spacing (25 metres). Chargeability for time windows 3 and 6 and the calculated apparent resistivity were plotted each night as pseudosections on a colour dot matrix printer.

Magnetometer and vlf-em stations were occupied at 12.5 metre intervals along flagged lines that were 100 metres apart. Surveying was completed along detail lines in the

southern portion of the previous grid. A total of approximately 6.2 line km of both mag and vlf-em surveying was completed.

Magnetometer data was gathered using an EDA-OMNI IV proton precession magnetometer. Data was downloaded to a field computer each night for further processing. A tie-line looping survey technique was used, where diurnally corrected readings are determined for a series of survey line / tie line intersections. Diurnal variations for survey data are then calculated by interpolating between the shifts observed at the known points. Diurnal variations were on the order of +/- 50 nTs for the survey. Anomalous responses were on the order of 10 to 40 times higher than the diurnal variations.

Due to a shortage of EDA vlf-em units, the vlf-em data was gathered using a Geonics EM-16. Transmitter station NLK, Seattle @ 24.8 kHz was monitored and dip angle and quadrature measurements recorded. Topographic slopes, both along the survey line and in the direction of the vlf-em reading, were also recorded at each station.

Final data plotting and compilation was performed by S.J.V. Consultants Ltd. in Vancouver using Geopak RTI-CAD and a 36 inch Ink Jet Colour Plotter.

# **DATA PRESENTATION**

The magnetic and vlf-em and data are presented in stacked profile format. Additionally, the magnetic data is presented in plan false colour format. The I.P. data are presented on 4 pseudosections. A compilation map displays the geophysical trends discussed in this report.

Table 1 DATA PRESENTATION

Plate G1A	TOTAL FIELD MAGNETIC INTENSITY STACKED PROFILE MAP	In Pocket
Plate G1B	TOTAL FIELD MAGNETIC INTENSITY FALSE COLOUR CONTOUR MAP	In Pocket

Plate G2A	VLF-EM SEATTLE (NLK) DIP ANGLE AND QUADRATURE PROFILES (%)	In Pocket
Plate G2B	VLF-EM SEATTLE (NLK) DIP ANGLE AND QUADRATURE PROFILES (%) TOPOGRAPHIC SLOPES (%)	In Pocket
Plate G3A	GEOPHYSICAL COMPILATION MAP	In Pocket
Line 100N Line 1000N Line 1600N	INDUCED POLARIZATION SURVEY PSEUDOSECTIONS	Appendix-2
Line 2200N		

#### **DISCUSSION OF RESULTS**

The field geophysicist reported that the grid was in terrible condition with irregularly spaced stations, regions of uncut brush and dramatic fluctuations in line direction. Poorly flagged regions made it very difficult to follow the line and to obtain any accurate data. He also stated that the compilation maps that were compiled by INCO when they were considering an option on the property show inconsistencies between the grid location, the forestry service road, and the position of the geology.

IP surveys were conducted across 4 widely spaced lines to map areas of interest. The mag and vlf-em surveys detailed the southeast corner of the grid, providing fill in lines at 100 metre separations.

The surveys were terminated after gathering some 3.7 line kilometres of IP and 6.2 line kilometres of mag and vlf-em data. The primary reason was that the initial survey results indicated that the grid needs to be extended to the southwest to cover one of the primary exploration targets, the Fennel/Eagle Bay thrust fault contact. Additionally, the poor condition of the grid slowed the progress of the survey to the point that surveying was no longer cost-effective for the client and the inconsistent station spacing introduced unacceptable errors into the data.

#### VIf-em

The Annapolis vlf-em station was unavailable for use at the time of the survey and Seattle was used as a default. It is preferable that the direction towards the transmitter station be 90° with respect to the survey lines however, in this instance we have a very poor coupling angle of ~36°. When this restriction is coupled with the grid problems described above, the interpretability of the data becomes highly questionable.

A proper vlf-em interpretation requires detailed topographic information. None was available therefore slope measurements were taken at each station in two directions: along the survey line (nominally 50°) and along the reading direction (~ 104°). The portion of the grid surveyed included impassable cliffs and the surrounding terrain is steep. Plate G2b overlays the recorded slopes with the vlf-em profiles.

Seven anomalies are flagged which exhibit a dip angle response indicative of a conductive sheet-like body. They have been flagged on the Plates G-2B and G-3A. Of these, four correlate with extreme slopes and are attributed to topography. Due to the survey grid condition, the remaining conductive responses are considered unreliable. The flagged anomalous trends all strike, as expected, towards Seattle. This direction opposes NW trends reported in results of airborne em and previous ground vlf-em / mag. (Carter pp 17 - 18).

HLEM genie survey reports 4 conductors in the general area however none were covered by this vlf-em survey.

#### Magnetometer

The magnetic data is presented in stacked profile and false colour contour formats. Anomalous responses are on the order of several hundred to thousand nanoteslas, while diurnal variations were on the order of tens of nanoteslas. Diurnal corrections have not been applied to this data.

Several single line, high amplitude anomalies are noted. Those occurring at the east ends of lines 8N to 10N are attributed to the severe topography in the area. One weak trend is observed, striking roughly north-west from 7N/200W to 12N/150W. This response generally follows the dominant strike noted in the previous magnetic data. Offsets along this trend are possibly due to grid labelling errors. The bulk of the responses

however are seen on one or two lines only. Additional surveying, once the survey grid has been repaired, will be required before interpreting these responses.

#### **Induced Polarization**

IP surveying was run across portions of grid lines 1000N, 1600N and 2200N, which were previously surveyed with vlf-em, mag, HLEM and geochemical sampling techniques. HLEM anomalies #1 and #2, which have been interpreted as steeply east-dipping, thin, sheet-like bodies, cross the western ends of these lines. HLEM #3, a poor to moderate conductivity anomaly possibly due to overburden or a fault/lithologic contact, is tested on lines 1600N and 2200N. Several north-westerly trending vlf-em conductors and strong magnetic trends are also present.

A fourth line, 100N was established off the pre-existing grid in an area to test the IP response across the Energite showing and the thrust fault contact separating the Fennel Formation in the west from the Eagle Bay Assemblage to the east. According to Wayne Tyner, the geologist for Foran Mining Corporation, the western edge of the Eagle Bay Assemblage is a primary area of interest.

#### **Line 1000N**

This line extends from 1125W to 0E, crossing two vlf-em conductors and areas of Pb, Zn and Ag geochemical anomalies. The east end of the line terminates against a cliff.

Very low resistivity zone mapped west of station 900W coincides with anomalous Pb, Ag and Zn geochem samples. It is associated with a strong chargeability high. HLEM conductor #2 is mapped across centre of the chargeability high. It has been interpreted as a steeply east dipping, thin sheet like body. The chargeability response supports interpretation of a sulphide lens as a possible source..

A well developed pantleg anomaly, indicative of a near vertical dipping plate is centred across 462.5W. A weak resistivity high correlation is observed. The anomaly is coincident with a north-westerly trending vlf-em anomaly.

A scattering of chargeability highs are observed from 300W to 0W. The zone includes a vlf-em response near 225W with flanking Ag geochem values and a well

developed resistivity low east of 125W. No particular pattern is noted. It's possible that the anomalies are due to topography. Survey notes indicates they crossed a saddle near station 100W and extreme dips to the east.

#### **Line 1600N**

This line was surveyed from 1100W to 25W. It crosses HLEM conductors 2 & 3, 6 vlf-em conductors and two zones of anomalous Ag geochem.

Strong resistivity and chargeability lows mapped across the west end of the line coincide with HLEM #2. The pseudo-sections suggests the eastern contact of the source is near 900W, which is coincident with an area of magnetic highs. Lower chargeabilities than seen on the other lines downgrades this portion of the HLEM #1 & #2 trend.

A broad area of higher chargeability values extending from 750W to 300W is evident into the later chargeability windows. The response is roughly coincident with an area of relatively uniform 100-200 ohm-m apparent resistivity zone. It is centred about two converging vlf-em conductors which enclose an Au geochem anomaly. Slightly higher chargeability values are observed on the eastern flank, in the vicinity of HLEM conductor #3. The relatively high chargeability and low resistivity measurements could be indicating large sulphide concentrations. The vlf-em and HLEM trends may be reflecting controlling structures or contacts.

The eastern end of the line contains a small, isolated chargeability high and resistivity low under a shallow cover of overburden. It appears that the anomaly is only partially defined and that survey coverage needs to be extended to the east. The anomaly is coincident with two converging vlf-em conductors and an enclosed Ag geochem anomaly.

#### **Line 2200N**

HLEM #1 and #2 are poorly defined on line 2200N, although they are present on both adjacent lines. The IP and resistivity responses across the projections of HLEM #1 and #2 are only partially defined but appear to be similar to those seen across line 1000N. The eastern edge of the high conductivity lenses are indicated near station 725W. A high chargeability halo extends eastward to about 575E, where it coincides with an Au geochemical anomaly.

A strong localised resistivity and chargeability anomaly is mapped at station 250W. This response is atypical and considered to be noise.

HLEM conductor #3 and an Au geochemical anomaly are mapped across the eastern portion of the line. The apparent layering of chargeability and resistivity measurements in the pseudo-section profiles is indicative of a thickening overburden response.

#### Line 100N

This test line was installed by the survey crew in the area south of the E-D1 claim. The line direction parallels the survey grid lines and the 100N designation roughly describes is northerly position with respect to the previous survey grid. The line extends for some 700 metres, from 775E to 1450E. The main Energite adits are located near station 1000E and the eastern end of the line starts at the Birk Creek Logging Road.

The geological contact is clearly delineated by a strong resistivity contrast about station 975E which divides 2000 ohm-metre rocks in the west from < 20 ohm-metre rocks in the east. The Fennel Formation rocks to the west are associated with low chargeabilities.

The lead, silver and zinc mineralization at the Energite showing is located within very low resistivity host rocks and it is unlikely that a significant low resistivity anomaly will be generated by any massive sulphide deposit in this environment. However, a very weak pant-leg shaped chargeability anomaly is noted in the early time channels, in the vicinity of the Energite showing. It is unclear at this time whether this response can be directly attributed to the mineralization. Much stronger chargeabilities are mapped east of station 1150E.

The pseudo-section pattern east of station 1150E is repeated on the western ends of the grid lines surveyed. This infers that HLEM conductors #1 and #2 are located approximately 100-150 metres east of the Fennel Formation / Eagle Bay Assemblage contact. It is likely that the two features are structurally related.

## **SUMMARY AND CONCLUSIONS**

In July, 1996, S.J. Geophysics conducted a program of IP, magnetometer and vlf-electromagnetometer surveys across the E-D1 claim on behalf of Foran Mining Corporation. The surveys were terminated early because 1) preliminary results suggested the grid should be extended to the southwest to cover one of the primary exploration targets, and 2) the poor condition of the grid resulted in unacceptable survey production and unreliable data quality.

The IP test along Line 100N shows that, in this area, the Fennel Formation can be readily distinguished from the Eagle Bay Assemblage on the basis of a significantly higher resistivity. A comparison of these results and those across the other lines indicate the survey lines stop some 100 - 150 metres east of this contact. A weak pantleg chargeability anomaly is noted in the vicinity of the Energite showing however it is unclear at this point whether this is part of the contact (thrust fault) response or directly related to the known mineralization. Extension of the grid lines to the southwest and continuation of the IP survey should provide an accurate map of the contact.

High chargeability responses noted in the vicinity of HLEM conductors 1 and 2 are considered to be encouraging signs of sulphide mineralization. These conductors are located in the Eagle Bay Assemblage, some 100 metres east of the contact with the Fennel formation.

Several other areas of high chargeability are observed across the surveyed lines. Some are roughly coincident with anomalous geochemical results, however the poor condition of the survey grid makes any interpretation inconclusive at this time.

# RECOMMENDATIONS

Any continuation of the geophysical surveying should be preceded by a reconstruction of the survey grid. It is recommended that all grid lines be re-cut and re-flagged at 25 metre station increments, using a tight chain. The lines should be extended to the south-west to cover the Fennel/Eagle Bay contact. This will be require the lines be extended past the western edge of the E-D1 claim however, according to Wayne Tyner, the claims in this area are now in the possession of Foran Mining Corp.

Continuation of the IP survey is recommended, subject to the grid extension and reconstruction mentioned above.

Any additional vlf-em surveying should use the Cutler, Maine (NAA 24.0 kHz) transmitter.

The IP lines tested support the sulphide lense interpretation of the HLEM #2 & #1 anomalies. It would be preferable to complete the IP surveying prior to testing these targets however, based on the available data, these targets warrant drilling. It is recommended that the first holes be spotted on the basis of the HLEM genie survey to intersect the interpreted conductive lenses. Additional holes should be positioned to extend coverage out from these conductors, across the anomalous chargeability highs.

Respectfully submitted per S.J.V. Consultants Ltd.

E. Trent Per Geophysicist

# **REFERENCES**

 GEOLOGICAL REPORT ON THE E-D1 PROPERTY for FORAN MINING CORPORATION by N.C. CARTER, PH.D P.ENG, April 18, 1995

### APPENDIX 1

#### STATEMENT OF QUALIFICATIONS

I, E. Trent Pezzot, of the city of Surrey, Province of British Columbia, hereby certify:

- I graduated from the University of British Columbia in 1974 with a B.Sc. degree in the combined Honours Geology and Geophysics program.
  - I have practised my profession continuously from that date.
- I am a registered member of the Association of Professional Engineers and Geoscientists of British Columbia.
- I have no interest in Foran Mining Corporation or any of their subsidiaries or related companies, nor do I expect to receive any.

October 24, 1996

E. Trent Pezzot, P.Geo.

# **APPENDIX 2**

# INDUCED POLARIZATION PSEUDO-SECTIONS















