GEOPHYSICAL REPORT

on the

Toe Group of Claims
Centered 2 miles West of Paradise Lake
and
2 miles Northeast of The Wart Mountain
Nicola M.D.
British Columbia
N.T.S. 92H/16 W

Latitude 120° 20' West: Longitude 49° 55' North

Owned by

CONSOLIDATED SKEENA MINES LTD.

Work done between July 9 and July 7, 1968.

By

D.R. Cochrane, P.Eng.

Vancouver, B. C.

July 15, 1968.
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INTRODUCTION

Between June 9 and July 7, 1968 a Geo-X Surveys field crew completed just over 12 line miles of coincident induced polarization, resistivity and self potential surveys on the Toe Group of mineral claims owned by Consolidated Skeena Mines Ltd.

This report describes the instrumentation - field procedures and discusses the results of the surveys.

LOCATION AND ACCESS

The Toe Group is centered 2 miles west of Paradise Lake and 2 miles northeast of The Wart Mountain, Nicola - Merritt area. Normal access is by truck proceeding northeast from Merritt, B.C. on Highway No. 5 for approximately 14 miles to Quilchena; thence south on the Paradise gravel road to the property.

CLAIMS AND OWNERSHIP

The Toe Group, Toe #1 to 81 inclusive, and Toe #1 to 5 Fractions form a contiguous block of mineral claims and are owned by Consolidated Skeena Mines Ltd. (N.P.L.), 1st Floor - 1033 West Pender Street, Vancouver, B.C. The claims, situated in the Nicola M.D. have the following record numbers:
CONSOLIDATED SKEENA MINES LTD.
BOOT LAKE, NICOLA M.D. B.C.

GENERAL LOCATION MAP

GEO-X SURVEYS LTD.

DRAWN DEY CKD JOB
APPR'D DATES FIG. 1
Claims
Toe #1 to 23, incl.
Toe #24 to 37, incl.
Toe #38 to 49, incl.
Toe #50 to 59, incl.
Toe #60 to 65, incl.
Toe #66 to 81, incl.
Toe #1 Fract., Toe #2 Fract.
Toe #3 Fract.
Toe #4 Fract., Toe #5 Fract.

Record Number
32702 to 32724, incl.
35336 to 35349, incl.
35550 to 35561, incl.
35378 to 35387, incl.
35464 to 35469, incl.
35874 to 35889, incl.
35362 and 35363
35470
35890 and 35891

GEOMORPHOLOGY

The Toe Group lies within the Thompson Plateau subdivision of the Interior Plateau physiographic province of British Columbia. It is characterized by gently rolling uplands of relatively low relief. Prominences of more resistant rock rise to elevations of just over 5,500 feet above sea level in the general area - e.g. The Wart, Culmination Point. The plateau represents a late Tertiary erosion surface dissected by rivers and streams.

Much of the area in and around the Toe Group is underlain by Upper Triassic Nicola Group intermediate volcanic rocks, intruded by Jurassic - Cretaceous Coast Acidic Intrusions. To the east, this bedrock complex is overlain by relatively flatlying Miocene (?) sediments.

A thick mantle of glacial drift covers the majority of bedrock near the Toe Group. The specific area is characterized
by numerous pot hole lakes, eskers, moraines and sand-gravel drift that may have been caused by interlobate Pleistocene ice deposition.

The writer received the impression that there is considerable bedrock palaeotopographic relief, and considerable variation in the thickness of glacial drift.

GROUND CONTROL

A base line, running approximately $70^\circ$ (true azimuth) was chained, flagged and numbered through the center of the claim group, and is coincident with the Toe 24 - 25 to Toe 32 - 33 claim location line. Cross lines were constructed at right angles, and at 7+50 foot intervals along the base line these lines were flagged, chained and stations numbered to approximately 20+00 North and to a maximum of 50+00 South. The induced polarization survey was completed within the above described ground control grid.

INDUCED POLARIZATION FIELD PROCEDURE

A Hewitt Enterprises pulse type induced polarization unit (HEW100) was used exclusively on the project. Instrument specifications are described in Appendix IV.

The standard Wenner electrode arrangement was employed with an "a" spacing (one third the distance between the current electrodes) of 200 feet. The field procedure is described over page.
Prior to voltage application, the self potential is observed and recorded (between the two pots, 200 feet apart).

Normally a voltage of 250, 500, or 1000 volts is impressed between the front and back aluminum electrodes which are spaced 600 feet apart. During the four second voltage application, the $dV$ (impressed EMF in millivolts) and the $I$ (current in milliamperes) is read and recorded. 0.3 seconds after the cessation of pulse, the residual voltage is integrated for 0.8 seconds, during which time the IP decay (in millivolts) is recorded. From these data, the self potential, apparent resistivity, and normalized induced polarization may be calculated, as described in Appendix V (Sample Calculations).

A number of pulses and subsequent readings were recorded at each station on standard field note forms. The results were compared and at least two complete sets of readings had to agree within 10% before the crew moved to the next set-up. The transit (station) interval was 200 feet along all cross lines, except in anomalous areas where 100 foot stations were established.

The field results were calculated, compared, and the most frequent and probable values at each station were tabulated, plotted and contoured.

Due to the varying thickness of overburden, several areas (especially the north ends of lines) necessitated double integration to obtain satisfactory I.P. During tandem integration
the signal is integrated for .8 or 1.6 seconds in one direction and for the same length of time in the opposite direction and then compared. Double or tandem integration allows the operator to measure the residual decay voltage, even though the balance point voltage may have shifted.

**DISCUSSION OF RESULTS**

A discussion of the resistivity, self potential and induced polarization results follows:

(a) Resistivity

A total of 330 apparent resistivity values are plotted and contoured in Figure 5. The arithmetic mean of the total is 3,069 ohm feet. The minimum value was 586 ohm feet and the maximum value 8,800 ohm feet. A frequency Histogram is presented as Figure 3. Distribution is trimodal and positively skewed. For descriptive purposes the apparent resistivities can be grouped into three families, defined as follows:

<table>
<thead>
<tr>
<th>Family</th>
<th>Range (in ohm feet)</th>
<th>Mode (in ohm feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0 to 5000</td>
<td>2001 to 2500</td>
</tr>
<tr>
<td>B</td>
<td>5001 to 7000</td>
<td>5001 to 5500</td>
</tr>
<tr>
<td>C</td>
<td>7001 to 9000</td>
<td>8001 to 8500</td>
</tr>
</tbody>
</table>

The apparent volume resistivity families separate the area surveyed into three classes of rocks: Family A representing rock types of good to moderate conductivity;
family B representing rocks of moderate to poor conductivity; and family C representing rocks of very poor conductivity.

The final apparent resistivity values are plotted, contoured and presented in the Map Pocket on Figure 5. General resistivity trends are east-west with a well developed intersecting north-south trend apparent along line 30+00 East. The majority of family B and C apparent resistivities lie in the southwest corner of the grid. Smaller patches of these high resistivities fall near 45+00 East and 12+00 South on line 45+00 East.

Low resistivity values less than 1000 ohm feet (high conductivity areas) are classed as anomalous. The most widespread resistivity low, designated resistivity Anomaly #1, is situated at the north end of lines 15+00 and 22+50 East. The lowest apparent resistivity value recorded (586 ohm feet) is situated immediately south of the main body of resistivity Anomaly #1.

Resistivity Anomaly #2 is centered on line 0+00 at 4+00 North. Two values recorded in this area were 945 and 860 ohm feet, and recheck values of 655 and 950 ohm feet were recorded later. Depth probing in this area revealed that the apparent resistivity values decrease at depth (rocks become more conductive).

Resistivity Anomaly #3 is centered at 30+00 north on line 8+00 west. Two consecutive values obtained were 860 and 867 ohm feet.
Six additional one reading low resistivity values were encountered, and are situated as follows:

<table>
<thead>
<tr>
<th>Value (ohm feet)</th>
<th>Line</th>
<th>Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>910</td>
<td>8+00W</td>
<td>15+00N</td>
</tr>
<tr>
<td>961</td>
<td>15+00E</td>
<td>13+00N</td>
</tr>
<tr>
<td>586</td>
<td>15+00E</td>
<td>10+00N</td>
</tr>
<tr>
<td>838</td>
<td>60+00E</td>
<td>1+00N</td>
</tr>
<tr>
<td>966</td>
<td>60+00E</td>
<td>9+00S</td>
</tr>
<tr>
<td>878</td>
<td>60+00E</td>
<td>43+00S</td>
</tr>
</tbody>
</table>

(b) Self Potential Results

The self potential results (in millivolts) are plotted, contoured and presented in Figure 6 (Map Pocket).

These values are relative, and represent the difference in potential (either positive or negative) between two stations 200 feet apart. Readings are plotted midway between the two stations.

Several first derivative (rapid rate change) anomalies were encountered, one of the largest between 25+00 and 27+00 North on line 22+50 east. Similar self potential rate change anomalies are plotted in conjunction with generalized I.P. and resistivity data in Figure 8.

(c) Induced Polarization Results

Normalized I.P. data are presented in contoured plan in Figure 7 (Map pocket). A frequency Histogram of values is shown in Figure 4.

The arithmetic mean of the normalized I.P. results is 10.1, (which may be considered background) and values
range from 0.0 to 40.0 millivolt seconds per volt (milliseconds). The frequency distribution of I.P. values is multimodal, with modes at 6.1 to 8.0; 14.1 to 16.0; 18.1 to 20.0; and 28.1 to 30.0. The standard deviation (root mean square of the deviations from the arithmetic mean) is 6.4. Thus, values above 16.5 milliseconds are considered possibly to probably anomalous. The contoured I.P. data features strong east-west lineation, with only minor cross trends situated along line 8+00 West and the north half of line 60+00 East. Above background I.P. response is somewhat sporatic, however, the wide cross line separation must be considered. The overall pattern is a birds eye effect, often quite typical response within intermediate volcanic bedrock areas. A total of seven areas of above background I.P. response have been numbered and priority rated. Several others are unnamed. The priority rating of I.P. anomalies depends on S.P., resistivity and observed frequency effect in addition to normalized I.P. response.

The area designated I.P. Anomaly 1 (A) is situated around 6+00 North on line 0+00. Anomaly 1 exhibits a coincident resistivity low (Resistivity Anomaly #2) and was the only area in which a perceptible frequency effect was observed (the latter often indicative of sulphides). Depth probing in the area revealed the I.P. response
increased with depth (maximum of 21.0 m/s at 100 feet, to 24.3 at 200 feet). I.P. Anomaly 1 (B) exhibits many of the characteristics of 1 (A), however distinct frequency effect was not observed.

I.P. Anomaly 2 is centered immediately south of the base line between lines 37+50 and 45+00 East. Although the resistivity is moderately high, the maximum I.P. response (40.0 m/s) was the highest obtained on the property.

I.P. Anomaly 3, centered near the south end of line 7+50 East contains three I.P. values above 20 milliseconds. The shape of this I.P. high is similar to the shape of a relative resistivity low. The highest I.P. value in Anomaly 3 (30.0 m/s) is coincident with the lowest resistivity value in the general area (1571 ohm feet). A self potential anomaly is situated immediately north. I.P. Anomaly #4 is centered near 35+00 South on line 60+00 East. The coincident resistivity is moderately low and a self potential low flanks the I.P. high to the south.

I.P. Anomaly #5 is situated north of the base line on lines 37+50 East and 45+00 East. Maximum I.P. response (26.5 m/s) corresponds with minimum resistivity, (1616 ohm feet).

I.P. Anomaly #6 is roughly 1000 feet north of #4 and contains three I.P. values of 20 milliseconds or
higher, is just south of a self potential low and has coincident apparent resistivity less than 2000 ohm feet.

I.P. Anomaly #7 is located at the extreme south end of line 15+00 East. Four consecutive I.P. values are above 16.4 milliseconds; however, the apparent resistivity and self potential response is normal.

Several other areas of above 16.4 milliseconds were discovered and are outlined in Figure 7.
SUMMARY AND CONCLUSIONS

Between June 9 and July 7, 1968 a Geo-X Surveys Ltd. field crew completed over 12 line miles of coincident induced polarization, resistivity and self potential surveys on the Toe Group of claims, Nicola Mining Division. The 81 claims and 5 fractions forming a contiguous block are owned by Consolidated Skeena Mines Ltd.

The claim group is apparently underlain predominantly by Nicola Group intermediate volcanics, with sections of what appears to be fairly thick glacial till (characterized by pot hole lakes, eskers, and sand-gravel moraines).

The survey was completed on a grid whose base line runs 70° (true azimuth) with cross lines at right angle to the base line spaced 7±50 feet apart.

A Hewitt Time Domain Pulse Type I.P. unit was utilized throughout the survey, with a Wenner electrode array. The "a" spacing was fixed at 200 feet, and the transit interval 200 or 100 feet.

Normally single pulse integration (0.8 seconds) was sufficient to obtain a series of satisfactory I.P. values; however, in certain areas of the Toe Group, double integration (at 1.6 seconds) was necessary due to field conditions. These areas were rechecked early in July.

A total of seven I.P. and three resistivity anomalies are discussed. The most interesting, geophysically, is I.P.
Anomaly #1 and coincident resistivity Anomaly #2. A depth probe in this area revealed increasing normalized I.P. and decreasing resistivity with depth.

Investigation of the causes of the seven I.P. anomalies is recommended.

Respectfully submitted,

D.R. Cochrane, P.Eng.,
Vancouver, B.C.

July 18, 1968.
APPENDIX I

PERSONNEL

Name: COCHRANE, Donald Robert

Education: B.Sc. - University of Toronto
M.Sc.(Eng.) - Queen's University

Professional Associations: Professional Engineer of British Columbia,
Ontario and Saskatchewan.

Jr. member of C.I.M.M., member of G.A.C.,
M.A.C. Geological Engineer.

Experience: Engaged in the profession since 1962 while
employed with Noranda Exploration Co. Ltd.,
Quebec Cartier Mines Ltd., Meridian Explora-
tion Syndicate.

Presently employed as Engineer with Geo-X
Surveys Ltd.

Experience in West Indies, Latin America,
South America, United States and Canada.
APPENDIX I

PERSONNEL

Name: LEE, Wilfred Kwong

Education: B.Sc.(Eng.) - Queen's University
M.Sc.(Geol.) - University of Washington, Seattle.

Professional Associations: Professional Engineer of British Columbia and Ontario.
Member of G.S.A. Geological Engineer.

Experience: Engaged in the profession since 1962 while employed with Earl-Jack Exploration Syndicate, PreCambrian Mining Services Ltd., Inland Copper Ltd., Westland Mines Ltd.
Presently employed as Engineer with Geo-X Surveys Ltd.
Experience in Mexico, United States and Canada.
APPENDIX V

SAMPLE CALCULATIONS:

On standard field note forms, the following is recorded:

1. Property, date, operator, job number, page number, "a" spacing, transit interval and remarks;

2. The line (X) and station (Y);

3. R.C. (resistor-capacitor switch);

4. S.P. (self potential reading) either + or -

5. I (ma) - current in milliamps

6. dV (mv) - the impressed emf in millivolts;

7. IP (mv) - the induced potential decay voltage in millivolts

From the above field data (a) the apparent resistivity, and (b) the normalized IP is calculated as follows:

(a) Apparent Resistivity:

\[ p = \frac{2 \pi \times "a" \times dV(mv)}{I \text{ (ma)}} \]

From field data, line 0, station 10+00W:

\[ 2 \pi \times "a" \text{ where } "a" = 200' = 1257 \]
\[ dV(mv) = 209 \]
\[ I \text{ (ma)} = 50 \]
\[ p = \frac{1257 \times 209}{50} = 5250 \text{ ohm-feet} \]

(b) Normalized IP:

\[ \text{Normalized IP} = \frac{IP \text{ (mv) } \times 100}{dV} \]
Sample Calculations - cont

(b) Normalized IP:

from field data, line 0, station 10+00W

\[
\begin{align*}
\text{IP (mv)} &= 54 \\
\text{dV (mv)} &= 209
\end{align*}
\]

\[
\text{Normalized IP} = \frac{54 \times 100}{209} = 25.8 \text{ millivolts} \quad \text{milliseconds}
\]

or
APPENDIX IV

GENERAL SPECIFICATIONS OF THE HEMITT PULSE TYPE INDUCED POLARIZATION UNIT

Transmitter Unit

Current pulse period (D.C. Pulse Manual initiated timer) 1 - 10 seconds

Current measuring ranges
0 - 500
0 - 1000 Milliamperes
0 - 5000

Internal voltage converter
27 volt D.C. 350 watt
Output with belt pack batteries
250
500 volts D.C.
1000 Nominal

500 watts using 27 volt aircraft batteries.

Transmitter can switch up to 3 amps at 1000 volts from generator or battery supply with resistive load. The switching is done internally in the transmitter unit. Remote control output can switch up to 10 kilowatts of power by using a separate control unit. A remote control cord is supplied with auxiliary equipment.

Receiver Unit

Self Potential Range
0 - 1000 millivolts
1 millivolt resolution

Impressed EMF ranges
0 - 30
0 - 100 millivolts
0 - 300
0 - 1000

Input terminals with three combinations
F1 - F2
F1 - F0
F2 - F0

Induced Polarization ranges
0 - 30
0 - 60 millivolt
0 - 90 seconds

Integration time periods
0.8 seconds
1.6 seconds
<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tandem Integration time periods</td>
<td>1.6 seconds 3.2 seconds</td>
</tr>
<tr>
<td>Input Filtering</td>
<td>3 ranges plus 4 integration combinations</td>
</tr>
<tr>
<td>Delay time from cessation of current pulse</td>
<td>.3 seconds</td>
</tr>
<tr>
<td>(Combined Photo Electric Coupled Receiver and Transmitter)</td>
<td></td>
</tr>
<tr>
<td>Operation Temperature</td>
<td>-25°F to 120°F</td>
</tr>
</tbody>
</table>

**POWER SUPPLY**

**Receiver Unit**
- 4 Eveready E136 Mercury Batteries
- 2 Eveready E134 Mercury Batteries
- 2 Eveready E401 Mercury Batteries

**Transmitter Unit**
- Sealed Rechargeable 3 amp. hr. cell pack capable of driving the converter at 350 watts for a minimum of one day's operation before recharge.

Manufactured by Hewitt Enterprises, Box 978A, Sandy, Utah 84070
Phone: 801 571-0157
APPENDIX I

PERSONNEL

NAME: MARK, David


B. Sc. with Geophysics Major - University of British Columbia - 1968.


1966 - Magnetometer Operator and Assistant Prospector during four summer months for Mastodon Highland Bell Mines Ltd.

1967 - Party Chief during four months of summer work for Anaconda Co. (Canada) Ltd. doing soil sampling, prospecting, claim staking and geological mapping.
APPENDIX I

PERSONNEL

Name: WILSON, Norman George Robert

Education: Junior Matriculation equiv., Grade 13 Math.
2nd Year National Electrical Engineering

Experience: 12 years Royal Air Force - Radar Fitter.
6 months British Government Communications - Radio Technician.

Presently employed by Geo-X Surveys Ltd. since October 22, 1967 doing Induced Polarization, Electromagnetic and Magnetometer Surveys under Professional supervision.
**APPENDIX II**

**Personnel and Dates Worked**

The following Geo-X Surveys Ltd. personnel were employed on the Toe Group survey on the dates set out below.

<table>
<thead>
<tr>
<th>Name</th>
<th>Occupation</th>
<th>Dates Worked</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.R. Cochrane</td>
<td>P.Eng. Supervision (Field)</td>
<td>June 9 and 10/68</td>
</tr>
<tr>
<td></td>
<td>&quot; &quot; &quot; Report preparation</td>
<td>July 5 to 7, incl.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>June 18, July 16, 17, and 18/68.</td>
</tr>
<tr>
<td>N. Wilson</td>
<td>Instrument Operator, Party Chief</td>
<td>June 9 to 15/68</td>
</tr>
<tr>
<td>D. Mark</td>
<td>Geophysicist, Field Helper</td>
<td>July 5 to 7/68</td>
</tr>
<tr>
<td></td>
<td>Data Processing</td>
<td></td>
</tr>
<tr>
<td>M. Shue</td>
<td>Field Helper</td>
<td>July 5 to 7, incl.</td>
</tr>
<tr>
<td>D. Yip</td>
<td>Draughtsman</td>
<td>June - 23 hrs.</td>
</tr>
</tbody>
</table>
APPENDIX III

Cost Breakdown

As per Contract between Geo-X Surveys Ltd., 627 Hornby Street, Vancouver 1, B.C., and Consolidated Skeena Mines Ltd., 1st Floor, 1033 West Pender Street, Vancouver, B.C., and dated June 5, 1968 for Toe Group claims.

12.00 Line Miles I.P. Survey @ $345.00/line mile $4,140.00
0.27 Line Miles I.P. Survey @ $325.00/line mile $ 87.75

Total: 12.27 Line Miles $4,227.75

S.L. Sandner, President.
GEO-X SURVEYS LTD.
CONSOLIDATED SKEENA MINES LTD.
BOOT LAKE, NICOLA M.D., B.C.

TOE GROUP
NORMALIZED PULSE I.P.

NOTE 1
NOTE 2
SEE FIG 8 - GENERAL INTERPRETATION

TO ACCOMPANY THE GEOPHYSICAL SURVEY ON THE TOE GROUP OCHT BY CONSOLIDATED SKEENA MINES LTD.
SITUATED IN THE NICOLA M.D. USEA ROOF LAKE
BY P.E. COCHRANE, PINS. MACKAY, B.C.
DATED JULY 1, 1946.

Geo-X SURVEYS Ltd.