4446

GEOPHYSICAL REPORT
ON AN
INDUCED POLARIZATION SURVEY
FOR
COMMAND RESOURCES LTD. (N.P.L.)

JAY GROUP OF 38 CLAIMS, 25 miles north of Princeton, B.C.

N.T.S. 92-H-15 Longitude 120° 35'W, Latitude 49° 47' N.

AUTHOR: D. R. Cochrane, P.Eng; Geophysicist
R. W. MacDermott, Dipl.T.

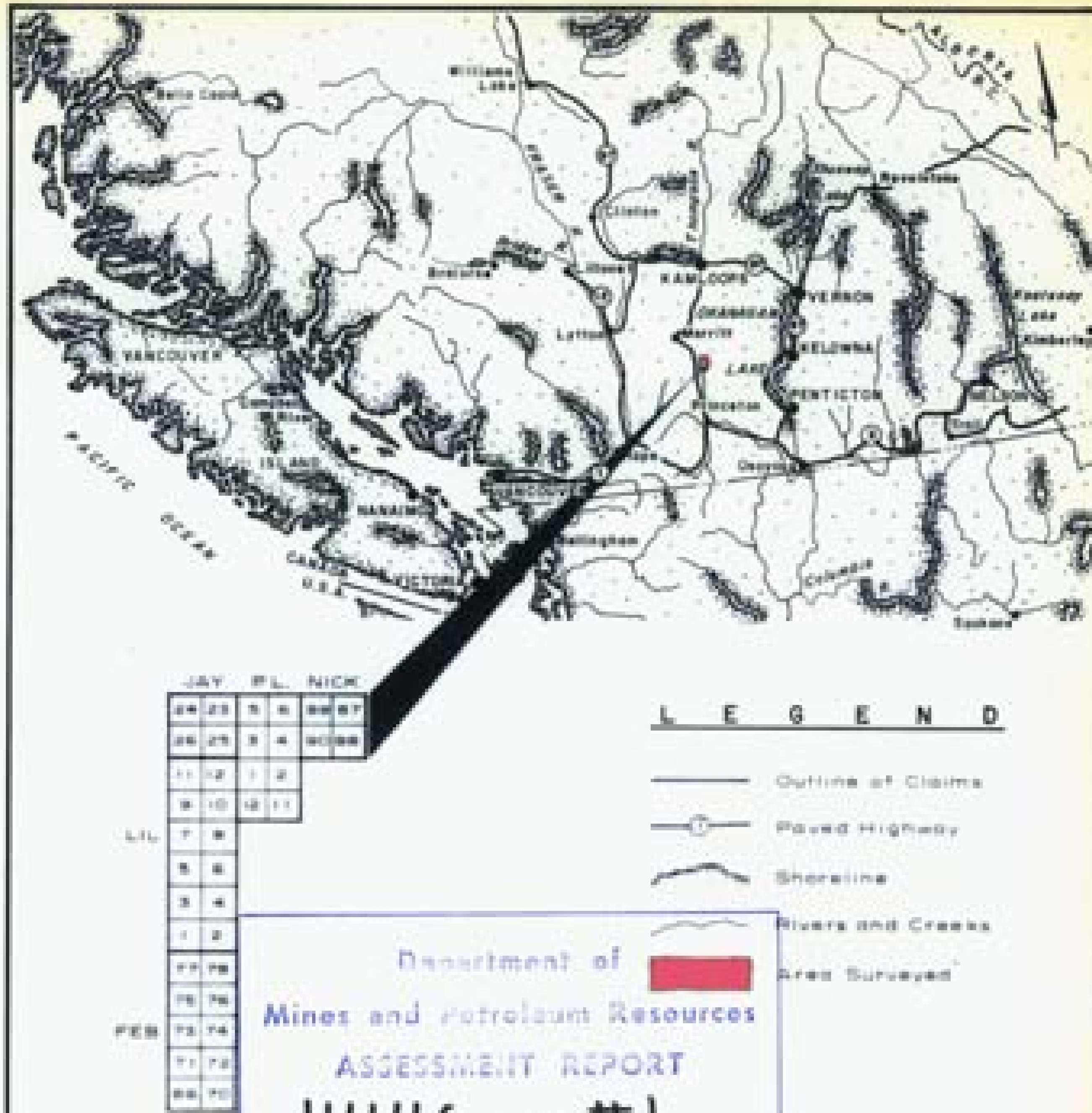
Lil, PL, Feb, Jay

DATE OF WORK: September 14 - 25, 1972

92H/15E

C O N T E N T S

I L L U S T R A T I O N S



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JAY CLAIM GROUP

LOCATION AND CLAIMS MAP

SCALE: LOCATION MAP: 1" = 80 MILES APPROX. – CLAIMS MAP: 1" = [illegible] FEET APPROX.

EXPLORATION SURVEYS LTD

Fig. 1
File D.?

Anthony N. Schampler 1971

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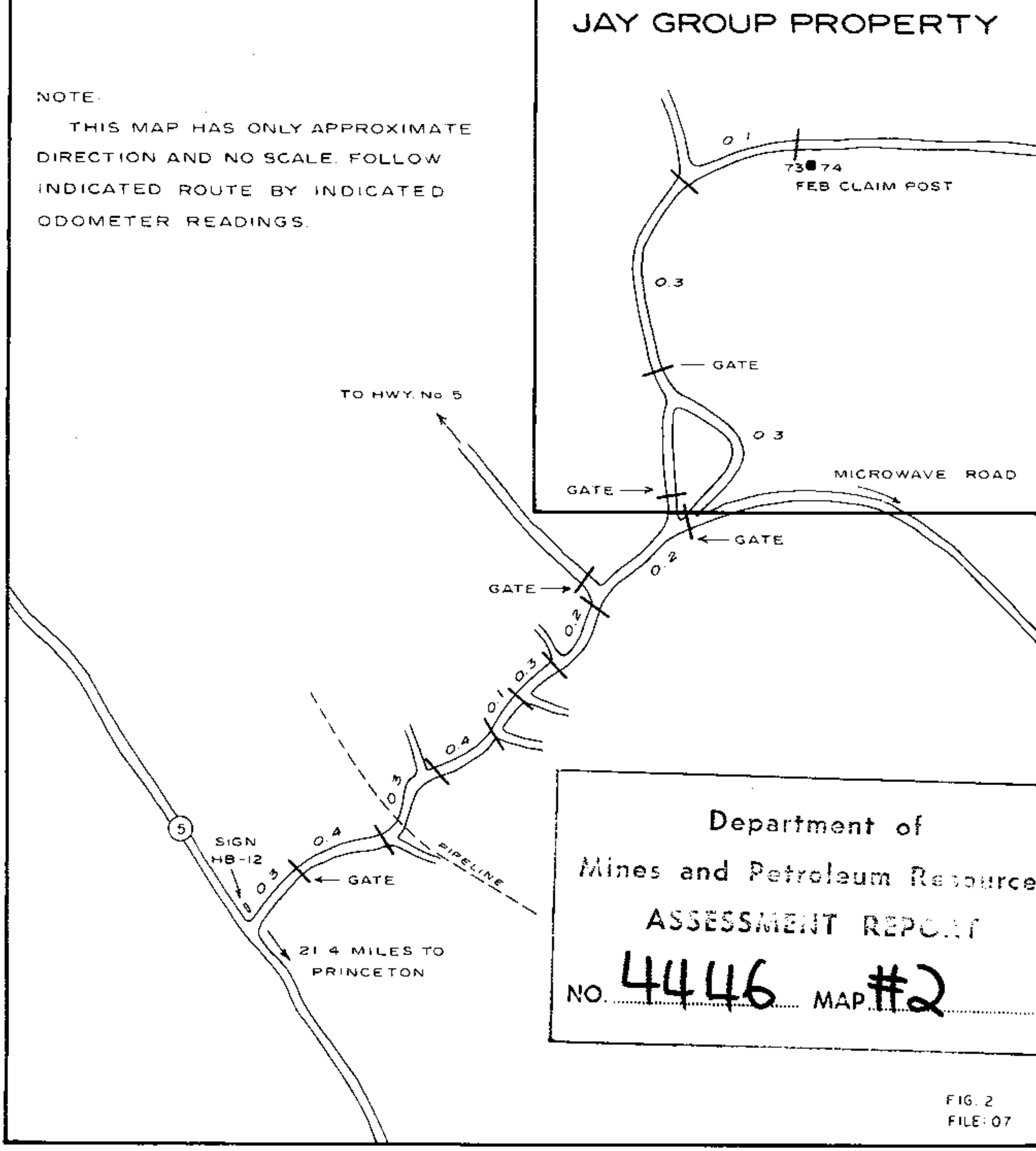
(N.P.L.)

DETAILED LOCATION MAP

NOTE:
THIS MAP HAS ONLY APPROXIMATE DIRECTION AND NO SCALE. FOLLOW INDICATED ROUTE BY INDICATED ODOMETER READINGS.



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4446 MAP #2

FIG. 2
FILE: 07

INTRODUCTION

During the period September 14, to September 25, 1972 inclusive, Tri-con Exploration Surveys Ltd., on behalf of Command Resources Ltd. (N.P.L.) conducted a program of induced polarization surveying on the Jay Group of 38 claims located some 25 miles north of Princeton, B. C. and some 2 miles east of Missezula Lake, Similkameen and Nicola Mining Divisions, Province of British Columbia.

The purpose of the induced polarization survey was to examine several geochemically anomalous areas by the induced polarization method to try and delineate any chargeable bodies which may possibly be caused by sulphide mineralization.

A crew of four men were employed in slashing out previously located grid lines and conducting the ensuing induced polarization program. Cochrane Consultants were employed to handle the technical aspects of the induced polarization survey and their report is appended.

LOCATION AND ACCESS

The Jay Group of 38 mineral claims, owned by Command Resources Ltd. (N.P.L.), is located some 25 miles north of Princeton, B. C. and some 2 miles east of Missezula Lake, latitude 49° 47' N, longitude 120° 35' W, N.T.S. 92H/15.

Access to the property is by four-wheel drive road off Highway #5 at a point some 21.4 miles north of Princeton, B. C. along Highway #5. See Detailed Location Map for exact route and location. Figure 2.

PROPERTY

The Jay Group of claims consist of some 38 full-sized, contiguous mineral claims situated in the Nicola and Similkameen Mining Divisions of British Columbia.

The mineral claims covered completely or partially by the induced polarization survey, which are illustrated in respect to the complete claim group in Figure 1, are listed as follows:

"LIL" claims 1 - 12 inclusive
"P.L." claims 1-2, 11-12 inclusive
"FEB" claims 73-78 inclusive

SURVEY SPECIFICATIONS

Survey Grid

The induced polarization survey was conducted on a previously established survey grid consisting of 12,800 feet of baseline directed in a north-south direction and 51,400 feet of well-cut and flagged survey lines turned off at right angles from the baseline at 800 foot intervals. Some 9.8 line miles of induced polarization surveying was conducted with an "a" spacing of 400 feet.

The Induced Polarization Survey

The induced polarization survey was conducted with a portable Hewitt - 100 pulse type I.P. unit deployed in the Wenner Array with an "a" spacing and traverse interval of 400 feet. From the measurements taken the chargeability in millivolts/volt and apparent resistivity in ohm-feet are calculated. The values calculated are then plotted at the center of the array for a given set of readings.

STATEMENT OF QUALIFICATIONS

I, R.W.MacDermott, of 12870 - 104 A Avenue, in the municipality of Surrey, Province of British Columbia, do hereby certify:

1. That I am a graduate of the British Columbia Institute of Technology, with a degree in Mining Technology.

2. That I have been employed in field exploration in British Columbia.

3. That I have been employed by Tri-con Exploration Surveys Ltd. for two seasons.

4. That I am presently employed by Tri-con Exploration Surveys Ltd. in the capacity of Field Supervisor.

Dated at Vancouver, British Columbia this _____ day of ________, 1972.

TRI-CON EXPLORATION SURVEYS LTD.

R.W.MacDermott
Dipl.Tech.

APPENDIX I

GEOPHYSICAL SURVEY

NOTES on the

GEOPHYSICAL INDUCED POLARIZATION SURVEY

of portions of the JAY Group

Princeton Area

Nicola and Similkameen Mining Divisions

British Columbia

on behalf of

COMMAND RESOURCES LTD.

By:

D. R. Cochrane, P.Eng.,
October 2, 1972,
Delta, B.C.

TABLE OF CONTENTS

PREAMBLE:

During the last two weeks of September, 1972, induced polarization equipment, and an operator of Cochrane Consultants Ltd., and a field crew employed by Tri-Con Exploration Ltd. completed an induced polarization survey on the Jay Claims on behalf of Command Resources Ltd.

This report describes the field and data processing procedures and discusses the results obtained.

GENERAL CONSIDERATIONS OF THE PULSE TYPE INDUCED POLARIZATION METHOD:

Two varieties of induced polarization surveys are in common use today in mineral exploration. The first is the time domain or pulse type method in which a steady direct current is impressed on the ground for a few seconds and then abruptly terminated. A fraction of a second after cessation of current impulse, the decay voltage, (caused by sub-surface capacitive-like storage) is measured. The second method is the variable (dual) frequency technique or frequency domain. In this variety, the percentage difference between the impedance (a.c. resistance) offered at two separate frequencies, is measured.

The Hewitt (HEW 100) I.P. Unit is a time domain unit and the exact method of measurement is outlined in the field procedure section.

The reader is referred to Wait, J.R. (1966), for a thorough treatment of frequency domain, and Seigel, H.O. (1966) and/or Brant (1966), for a discussion of time domain.

I.P. effect occurs when a current is passed through a volume of rock containing electronic conductors. Geophysical electronic conductors, or "metallic minerals" include most sulphides, (pyrite, chalcopyrite, bornite, molybdenite) certain oxides, clays graphite and certain micas. Apart from the sulphides, minerals with highly unsatisfied basal lattice surfaces act as leaky condensers and give rise to I.P. effects. All common rocks are responsive to some degree, and this response is designated background. It is often equivalent to one volume percent of scattered pyrite, and probably due to unsatisfied charges at lattice imperfections, mineral and rock boundaries, fractures, and so on. Background in various parts of B.C. with the HEW-100 I.P. unit is as follows:

Area	Lithology	Background (m.s.)
Highland Valley	Guichon Batholith	2.5 to 4.0
Ashnola, Southern B.C.	Unaltered rhyolite porphyry	7.0
Aspen Grove	Nicola Sediments	4.0 to 7.5
Princeton	Princeton Sediments	Approx. 17.0
Cassiar area	Lower Paleozoic sediments	1.5 to 5.0

Factors other than the amount of metallic conductors which affect I.P. response are grain size, conductivity of mineral, porosity, tortuosity (pore geometry), type of gangue minerals, composition and amount of pore fluid, degree of alteration, and mode of mineralization (disseminated, lode, vein type, etc.).

Rogers, (1966), has pointed out that the resistivity of rock is only slightly influenced by changes in the sulphide content at low levels. Much of the change is due to other effects such as moisture content, fracturing, pore space, ground water, extent, degree and type of alteration, type of sulphides and mode of sulphide distribution, etc. However, alteration in combination with increased sulphide content, not uncommonly affects the resistivity significantly. Unfortunately, there are many additional causes for resistivity variation and rarely can sulphides be recognized or predicted from resistivity data alone.

Background d.c. apparent resistivity in various parts of B.C. with the HEW-100 I.P. unit follows:

Area	Lithology	Background (ohm-feet)
Highland Valley	Guichon Batholith	1600
Ashnola, Southern B.C.	Rhyolite porphyry	3300
Aspen Grove	Nicola Volcanics	1000
Princeton	Princeton sediments	500
Cassiar	Lower Paleozoic sediments	1000 - 2000

Self potential results are also recorded with the HEW-100 and is measured prior to current impression. The SP is often a useful geophysical tool and SP response occurs when metallic lustered sulphide minerals are situated in a suitable geological-hydrological environment. Currents are created when sulphides oxidize and a natural or spontaneous "battery effect" occurs. Often the self potential effect over sulphide bodies is negative and in the order of a few hundred millivolts.

With a Wenner electrode configuration, the self potential and first derivative of the self potential are valuable information if the transit interval is equal to, or is one-half the "a" spacing distance.

FIELD PROCEDURE:

A standard Wenner Array with an "a" spacing of 400 feet was used for the I.P. survey of the Jay Claims. For this array, the distance between pots and electrodes is equal, as illustrated below:

E_1 --- "a" --- P_1 --- "a" --- P_2 --- "a" --- E_2

transit direction →

The front positions are positive and rear positions negative. At the first of each day the instrument moves to a station and the stake men and front pot man moved to the appropriate positions on the line. A small hole is dug beneath the humus and cleared of rocks in order to seat the pots (positions P_1 and P_2). In dry soil, a small amount of salt water is added to improve electrical contact.

The stakemen (positions E_1 and E_2) clear a strip of ground (roughly 1 foot square) of moss, leaves and rocks, spread aluminum foil over the cleared part and buried the foil. Salt water is poured into the foil to assure good ground contact. If contact is still subnormal, two or more stakes are set out some 6 feet to either side of the foil.

Communication with the instrument operator was facilitated by small transceivers and when all positions were reported "ready", the instrument operator commenced measurement. Firstly, the self potential of the ground between front (P_1) and rear (P_2) pots was balanced and recorded in millivolts (front pot was always defined as positive pole and data was corrected when plotted to account for changes in transit direction). A 4 second current pulse was then initiated during which the transmitter current and impressed EMF between the pots was noted. On cessation of the current pulse, an integrated value of the residual decay voltage is automatically registered on the receiver galvanometer. This value was recorded along with position of instrument, RC filter, integration function, output voltage of the transmitter, notes on terrain, steadiness of SP, and the "sharpness" of the I.P. The I.P. was normalized and the procedure repeated several times. Often an 8 second current pulse was used and various combinations of filters and integration times to assist in interpretation of results.

The order was then given to move on 400 feet to the next station.

DATA REDUCTION AND PRESENTATION:

The raw I.P. data, recorded on standard note forms, was normalized in the field by Mr. W. Chase (by slide rule) and checked in the office by the author. The chargeability is defined by the relationship--

$$\text{chargeability (in milliseconds)} = 100 \times \frac{\text{IP (decay voltage)}}{\text{dV (m.v.)}}$$

and resistivity by the relationship--

$$\text{apparent resistivity (ohm-feet)} = 2\pi\text{"a"} \times \frac{dV}{I}$$

where IP	=	the integrated decay voltage
dV	=	impressed EMF between receiving pots
a	=	"a" spacing (300 feet in this instance)
I	=	electrode current

These normalized variables were plotted, contoured, and accompany this report in plan form at a scale of 1 inch: 400 feet. The arithmetic mean, standard deviation and coefficient of correlation of the geophysical data were computed by the author using a Diehl electronic calculator. Frequency histograms were prepared and accompany this report.

DISCUSSION OF RESULTS:

1. Self Potential Results

Self potential values, in millivolts were recorded prior to the "current on" period and were read between two receiving electrodes spaced 400 feet apart. These results are presented in the accompanying Self Potential Gradient plan, and values are "sign" corrected for a standard arbitrary direction. (i.e. front receiving pot electrically positive and always "east" of rear receiving pot). Each line is independent of adjacent lines and thus the values are free floating.

Gradient SP results ranged from a low of -36 to a high of +52 millivolts (m.v.) per 400 feet. Normally individual values in excess of fifty millivolts are considered strongly anomalous. If the sum of two consecutive values is greater than 50 millivolts the area is considered slightly to moderately anomalous.

Only two such anomalies exist within the survey area; (a) a strongly anomalous zone centered at 8 + 00 east on line 16 + 00 north; and (b) a slightly to moderately anomalous change near 8 + 00 east on line 64 + 00 north. The causes of these isolated anomalous changes is not known, nor do they appear to persist to adjacent lines. The SP anomaly at (a) however is located on the flank of a slightly high chargeability zone, and at the north end of an apparent resistivity high. The latter features suggests a change in rock type occurs in this area.

2. Apparent Resistivity Results

D.C. Apparent resistivity results are presented in contoured plan in an accompanying figure. Response ranged from a low of 423 ohm-feet to a high of 1598 ohm feet. The arithmetic mean is 909 ohm-feet and the standard deviation is 267 ohm-feet.

A frequency histogram of the apparent resistivity values was prepared, and the distribution is multimodal and positively skewed. The primary mode (most frequent class of calues) occurs in the 1000 to 1100 ohm-feet range and encompasses 18 percent of the total number of readings. A secondary mode occurs in the 800 to 900 ohm-foot range. Based on the statistical information, there is a suggestion of two families of values, representing two subsurface resistivity conditions. The boundary between the two families is close to the 1000 ohm-foot level. Resistivity response below this boundary may be due to more fractured and/or altered rock; response above this level may be due to more competent and/or unaltered bedrock.

The isoresistivity trends are predominantly north trending and presumably reflect the dominant lithologic or structural "grain" of the subsurface.

Several disruptions occur in the survey data, the most notable along a line designated A-A'. Several resistivity features are terminated along this boundary and it is possible that this feature is a fault zone.

3. Chargeability

The apparent chargeability results accompany this report in a contoured plan. Plotted values are in milliseconds, or millivolt seconds per volt.

Chargeability response ranged from a high of 13.3 m.s. to a low of 3.3 m.s. The arithmetic mean is 7.8 and standard deviation is 1.9 milliseconds. The frequency histogram of the chargeability results shows the primary mode lies in the 8 to 9 millisecond class. Just over 50 percent of the chargeability values lie in the 6 to 9 millisecond range.

Several negative I.P. responses were recorded and these fell entirely in the north sector of the property, often when traversing gullies and cliffs in this area. Mr. J. Bertin (Some Aspects of Induced Polarization-Time Domain; in Geophysical Prospecting Volume 16, 1968), describes in detail negative I.P. response, and concludes that the effect is often due to a near surface polarizing/conducting layer such as clay, which causes a skin effect and reverses currents in the vicinity of the receiving electrodes. The amplitude of the negative values are not included in the chargeability plan, and have been replaced by the symbol N.R.

Based on the chargeability statistics the following categories of values has been arranged.

Range (m.s.)	Class
0 to (but not including) 8	background
8 to " " " 12	slightly anomalous
12 and over	moderately anomalous

The peak chargeability value, and the only reading in excess of 12 milliseconds, occurs at the east end of line 48N. This moderately anomalous value is enclosed in a slightly anomalous response zone which extends southerly for almost one mile and is in excess of 1,000 feet wide. This area is by far the best defined, but other (smaller) areas of slightly anomalous response exist within the area surveyed (see apparent chargeability plan).

CORRELATION:

A coefficient of correlation on paired apparent resistivity and apparent chargeability values was calculated on results from the survey area. The correlation coefficient tests the "similarity" of the two data sets and ranges in value from plus one (a perfect correlation) through zero (no correlation) to negative one (perfect inverse correlation, i.e. if one variable increases in amplitude the second variable decreases). The calculated coefficient is -0.218 which means there is a very slight tendency for low apparent resistivity values to correlate with high chargeability values. The incidence of this occurring however, is very low.

As previously mentioned the best SP gradient anomaly lies on the flank of a resistivity high. It is possible that this resistivity change is due to a change in rock types.

CONCLUSIONS:

The weak to moderately high chargeability zones should be investigated if encouraging geological or geochemical features occur in these areas.

Respectfully submitted,

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D. R. COCHRANE

D. R. Cochrane, P.Eng.,
October 2, 1972,
Delta, B.C.

APPENDIX I

Certificates

NAME: COCHRANE, Donald Robert
EDUCATION: B.A.Sc. - U. of T., M.Sc. (Eng.) - Queen's
PROFESSIONAL ASSOCIATIONS: Professional Engineer of B.C., Ontario, and Saskatchewan. Member of C.I.M.M., G.A.C., M.A.C., - Geological Engineer
EXPERIENCE: Engaged in the profession since 1963 while employed with Noranda Exploration Co. Ltd., Quebec Cartier Mines Ltd. and Meridian Exploration Syndicate.

NAME: CHASE, William
AGE: 21
EDUCATION: Grade 12 Diploma
EXPERIENCE: Employed since September, 1970 and engaged in EM and IP surveying. Previous experience at the Anvil Mine, Y.T. Summer, 1970

NAME: ROSSIER, Jean-Claude
Age: 27
EDUCATION: Secondary and Vocational School - Architectural Drafting Courses
EXPERIENCE: Since 1965 - General Drafting
Geophysical Drafting - Seigel Associates - 1969-1972
Employed with Cochrane Consultants since April, 1972

APPENDIX II

Survey Details

PROPERTY: JAY GROUP MINING DIVISION: NICOLA & SIMILKAMEEN

SPONSOR: COMMAND RESOURCES LTD.

LOCATION: 22 airmiles north-northeast of Princeton, B.C.

SURVEY: Hewitt 100 Pulse Type I.P.

SURVEY MAN DAYS: 4 x 10½ = 42 days
(September 15 - September 25(½)

STANDBY-MOBILIZATION MAN DAYS: 4 x 1½ = 6 days
(September 14 & September 25)

DATA PROCESSING, REPORT PREPARATION:
B. Chase - 1 day
J.C. Rossier - ½ day
D. R. Cochrane - 1 day

DRAFTING MAN DAYS: Preliminary - J.C. Rossier - 1 day
Final - Tri-con - 9 days

NO. ALONG LINE READINGS: 95

FIELD CREW:

B. Chase (Cochrane Consultants)
Rick MacDermott (Tri-Con Ex)
Jeff Randall (" ")
Rick Bauman (" ")

D. R. Cochrane, P.Eng.,
Cochrane Consultants Ltd.

12+00 W
8+00 W
4+00 W
0+00 BASELINE
4+00 E
8+00 E
12+00 E
16+00 E
20+00 E
24+00 E
28+00 E
32+00 E
120+00 N.
112+00 N.
104+00 N.
96+00 N.
88+00 N.
80+00 N.
72+00 N.
64+00 N.
56+00 N.
48+00 N.
40+00 N.
32+00 N.
24+00 N.
16+00 N.
8+00 N.
0+00
8+00 S.
To Merritt
To Power-Line Road
To Highway No. 5
49° 47'
120° 35'
LEGEND
OUTCROP
CLIFF
SWAMP
LAKE OR POND
CLAIM POST
I.P. STATION
POWER LINE (INACTIVE)
ROAD
4 x 4 ROAD
INDICATES DIRECTION OF TRAVERSE
CREEK OR RIVER
STRONGLY ANOMALOUS
WEAK TO MODERATELY ANOMALOUS
NOTE: Signs changed east constant. Results are in millivolts.
M-3
4446
Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4446 MAP #3
N.T.S. 82 E/2
LOCATION MAP
SCALE: 1" = 39 MILES APPROX.
SCALE
FEET 400 0 400 800 FEET
1" = 400'
COMMAND RESOURCES LTD. (N.P.L.)
JAY GROUP OF 38 CLAIMS
SIMILKAMEEN AND NICOLA MINING DIVISIONS OF BRITISH COLUMBIA, CANADA
GEOPHYSICAL MAP
INDUCED POLARIZATION
GRADIENT SELF POTENTIAL
EXPLORATION SURVEYS LTD.
INTERPRETED BY:
DRAFTED BY:
CHECKED BY:
FIG. 3
DATE: OCTOBER, 1972
REVISED
PROJECT No. 7213
FILE No. 07
NOTE: To accompany Geophysical Report, Dated on Jay Group Claims Similkameen and Nicola Mining Divisions, British Columbia, Canada.
By: D. R. COCHRANE, P. Eng. , Geophysicist.

COMMAND RESOURCES LTD. (N.P.L.)
JAY GROUP OF 38 CLAIMS
SIMILKAMEEN AND NICOLA MINING DIVISIONS OF BRITISH COLUMBIA, CANADA
GEOPHYSICAL MAP
INDUCED POLARIZATION
APPARENT RESISTIVITY CONTOUR PLAN
M-4 4446
LEGEND
OUTCROP
CLIFF
SWAMP
LAKE OR POND
CLAIM POST
I. P. STATION
POWER LINE (INACTIVE)
ROAD
4 x 4 ROAD
INDICATES DIRECTION OF TRAVERSE
CREEK OR RIVER
RESISTIVITY
RELATIVE FREQUENCY HISTOGRAM
Standard deviation about the mean 270 ohm f.
Arithmetic mean 910 ohm f.
RELATIVE FREQUENCY
OHM - FEET
200 Ohm feet contour interval
APPARENT RESISTIVITY CONTOUR PLAN
- Values in ohm-feet
- Scale: 1" = 400'
Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4446 MAP #4
N.T.S. 82 E/2
LOCATION MAP
SCALE: 1" = 39 MILES APPROX
SCALE 1" = 400'
To Merritt
To Highway No.5
To Power - Line Road
49° 47'
120° 35'
0+00 BASELINE
NOTE: To accompany Geophysical Report, Dated on Jay Group Claims Similkameen and Nicola Mining Divisions, British Columbia, Canada
By: D. R. COCHRANE, P. Eng , Geophysicist.
EXPLORATION SURVEYS LTD.
INTERPRETED BY
DRAFTED BY
CHECKED BY
FIG. 4
DATE: OCTOBER, 1972
REVISED:
PROJECT No. 7215
FILE No. 67


12+00 W
8+00 W
4+00 W
0+00 BASELINE
4+00 E
8+00 E
12+00 E
16+00 E
20+00 E
24+00 E
28+00 E
32+00 E
To Merritt
120+00 N
112+00 N
104+00 N
96+00 N
88+00 N
80+00 N
72+00 N
64+00 N
56+00 N
48+00 N
40+00 N
32+00 N
24+00 N
16+00 N
8+00 N
0+00
8+00 S
49° 47'
To Power-Line Road
To Highway No 5
LEGEND
OUTCROP
CLIFF
SWAMP
LAKE OR POND
CLAIM POST
I P STATION
POWER LINE (INACTIVE)
ROAD
4 x 4 ROAD
INDICATES DIRECTION OF TRAVERSE
CREEK OR RIVER
N.R. NEGATIVE CHARGEABILITY RESPONSE
CHARGEABILITY RELATIVE FREQUENCY HISTOGRAM
arithmetic mean 7.84 m.sec.
Standard deviation about the mean 1.94 m.sec.
RELATIVE FREQUENCY
MILLISECONDS
WENNER FIELD ARRAY
a = 400'
MILLISECONDS
NOTE: HEWITT 100 PULSE TYPE I.P. VALUES IN MILLISECONDS
Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4446 MAP #5
N.T.S. 82 E/2
COMMAND RESOURCES LTD. (N.P.L.)
KELOWNA
PENTICTON
VERNON
Osoyoos
Greenwood
Grand Forks
TRAIL
CANADA
USA
B.C.
WASHINGTON
PROV PARK
LOCATION MAP
SCALE 1" = 39 MILES APPROX
SCALE
FEET 400 0 400 800 FEET
1" = 400'
4446
M-5
NOTE To accompany Geophysical Report, Dated on Jay Group Claims Similkameen and Nicola Mining Divisions, British Columbia, Canada
By D R COCHRANE, P Eng , Geophysicist
COMMAND RESOURCES LTD. (N.P.L.)
JAY GROUP OF 38 CLAIMS
SIMILKAMEEN AND NICOLA MINING DIVISIONS OF BRITISH COLUMBIA, CANADA
GEOPHYSICAL MAP
INDUCED POLARIZATION
APPARENT CHARGEABILITY PLAN
Tri-Con EXPLORATION SURVEYS LTD.
INTERPRETED BY
DRAFTED BY
CHECKED BY
FIG 5
DATE OCTOBER, 1972
REVISED
PROJECT No 7213
FILE No: D7