GEOLOGICAL BRANCH ASSESSMENT REPORT

14,485

REPORT ON GEOPHYSICAL GROUND SURVEYS
ON THE WATER 5,6,7,8 & 9 MINERAL CLAIMS
MAGNETIC AND ELECTROMAGNETIC PULSE SURVEYS

BY

HEIKKI LIMION

NOVEMBER 19, 1985

LAT. 51°388

LONG. 120°00'

37'

Location:

Kamloops Mining Division British Columbia NTS: 82 M 2W, 92P9E

Claims owned by:

Newmont Exploration of Canada Limited

Work done by:

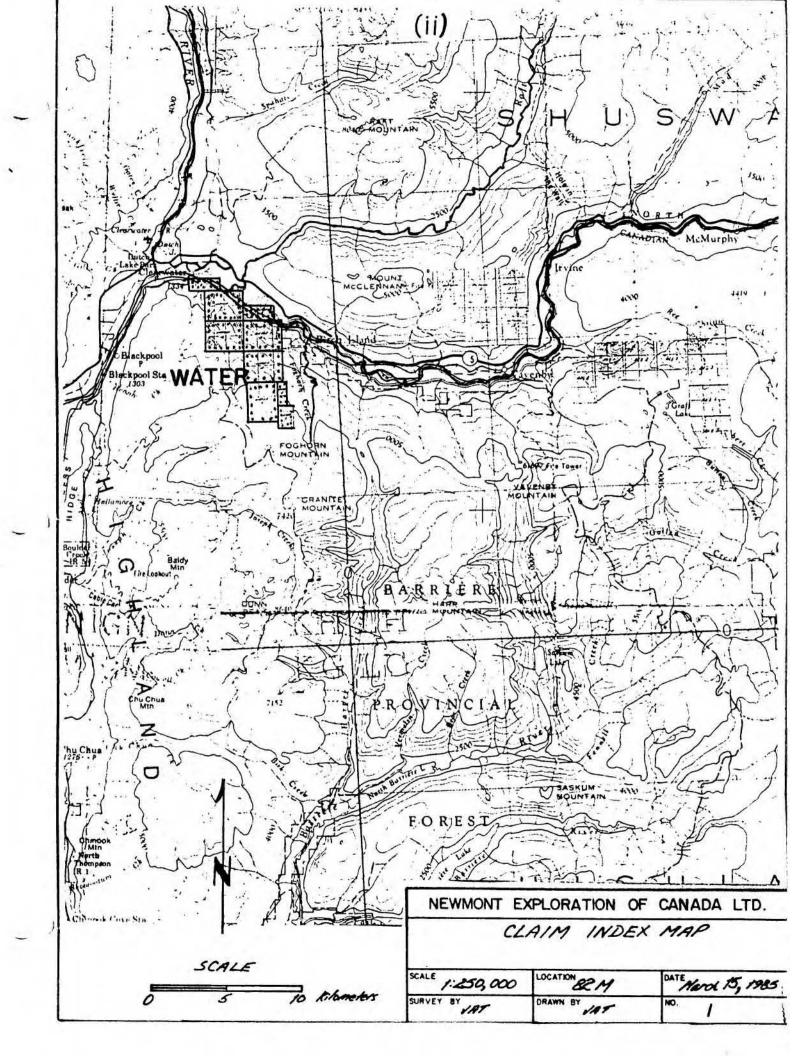
Newmont Exploration of Canada Limited

Work done between:

May 20 - August 13, 1985

Summary

A geophysical survey in the rocks of the Paleozoic Eagle Bay formation revealed magnetic trends and two electromagnetic pulse (EMP) conductors. The basalts, rhyolites, and exhalites show a magnetic strike of 340°. Two discrete conductors are defined. One has been investigated previously. The other is contained in a well defined magnetic unit, and is a conductive part of that unit.



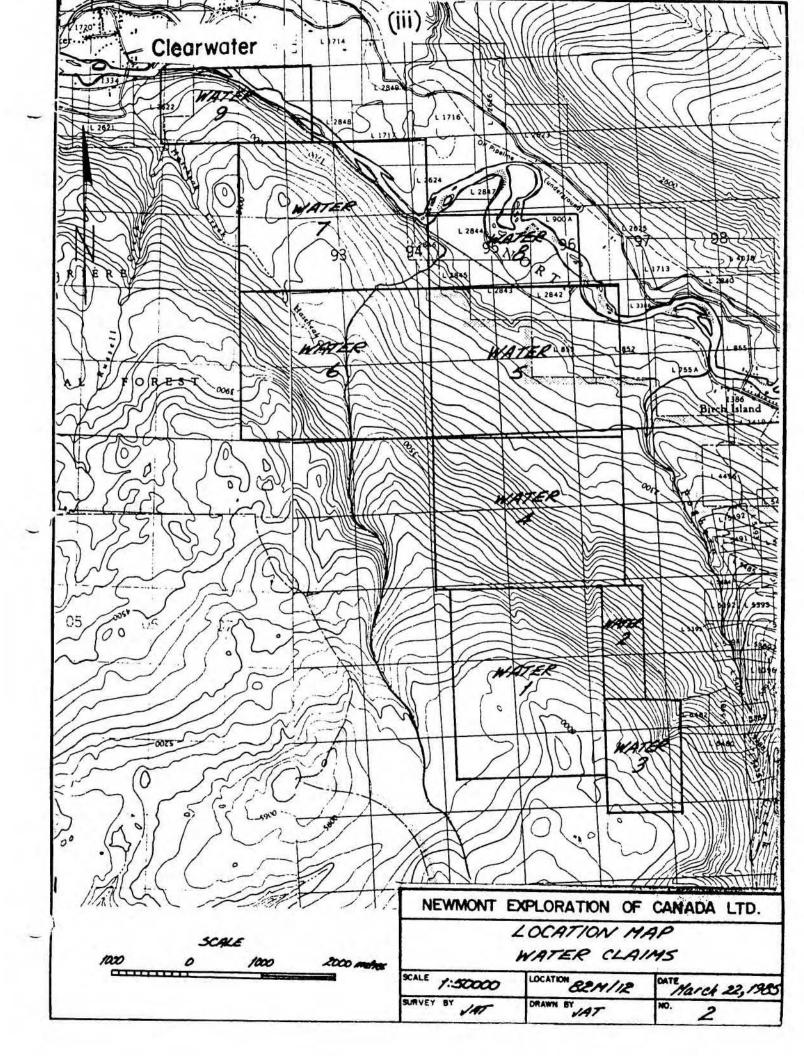


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EMP Profiles and Plans Loops 1,2,3 and 4 Under separate cover

Introduction

The WATER claims are south of Clearwater, B.C., in the Kamloops Mining Division. They lie along the western margin of the Omineca Crystalline Belt, and are mapped to be at the northwestern end of the Paleozoic Eagle Bay Formation.

The rocks are potential hosts for volcanic massive sulphides or exhalite hosted massive sulphides which may contain gold.

The geophysical survey was set up to help in mapping of the claims, and to look for conducting massive sulphide deposits. A grid was established over the claims. The lines have been read with a magnetometer. Four loops were set up and read with the Newmont EMP (Electromagnetic Pulse) system.

Location, Access, Topography - Figures 1 and 2

The claims start 1km SE of the town of Clearwater, on the south shore of the N. Thompson River. A road from Clearwater passes through the northern claims. The claims total 125 units in 9 modified grid claims, and they are recorded in the Kamloops Mining Division. The claims are 100% owned by Newmont Exploration of Canada Limited and are described as follows:

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CLAIM	UNITS	RECORD NO.	RECORD DATE
Water 1	20	5689	May 29, 1984
Water 2	3	5690	May 29, 1984
Water 3	6	5691	May 29, 1984
Water 4	20	5692	May 29, 1984
Water 5	20	5693	May 29, 1984
Water 6	20	5694	May 29, 1984
Water 7	20	5695	May 29, 1984
Water 8	8	5696	May 29, 1984
Water 9	8	5697	May 29, 1984

The northern part of the claim group was gridded for geophysics, for it is the more readily accessible.

The topography is mountainous, although grades in the gridded part do not exceed 45° . Elevations range from 427m to 1859 metres. The average slope on the gridded claims is approximately 17° , up from the river. The claims are wooded, with deadfall making passage difficult in spots.

Geology and Previous Work

The geology has been described in a report by Turner and Nebocat (1985). They note that 95% of the property is covered by overburden.

The property is partly underlain by the northern segment of the Paleozoic Eagle Bay formation. The rocks consist of a northwesterly striking, gently dipping sequence of basalt to rhyolite volcanic rocks, granitic intrusives, and metasediments. The Paleozoic Fennel Formation, which consists of tholeitic pillow basalts and chert, occurs in the western portion of the claim group.

The earliest exposed unit is a grey to black, graphitic, well bedded and foliated, phyllite and slate. It strikes about 045° and dips $20^{\circ}-29^{\circ}$ SE. In a few locations, it is interbedded with overlying felsic units.

The overlying felsic unit contains a silvery grey to white quartz eye sericite schist.

Within the felsic unit is a light coloured, well-foliated, pyritic, sericitic, silicified schist. It is believed to be an exhalite.

The felsic volcanics grade upward into a more intermediate volcanic or dacite. These are, in turn, overlain by a dark green, medium grained, porphyritic chlorite schist, which is probably a basalt or andesite.

Rocks of the Fennel formation are in thrust contact with those of the Eagle Bay formation. They consist of interbedded tholeitic basalts and cherts.

earliest recorded work completed in the covered by the WATER claims is described in the British Columbia Minister of Mines Annual Reports for the years 1913 to 1979. ground was originally staked as the SONJA claims, which are presently owned by R.J. Franks of Vavenby. The mineralization consists of galena and sphalerite in quartz veins. trenches, an adit, and several drill holes were completed on what is now known as the Julian claim. The deposit is described as the Sonja (Waterclear) mine in the Mineral Inventory as No.49. Franks optioned these claims plus additional claims to Craigmont Mines Limited in 1978 who carried out magnetic and VLF-EM surveys, a soil geochemical survey and drilled 5 diamond holes The results were disappointing and the option totalling 498m. was dropped. Cominco Limited optioned the property in 1979 and conducted geologic mapping and soil geochemical surveys mainly southwest of the area previously covered by Craigmont. No work after 1979 is recorded and claims were allowed to lapse in 1984. Mr Franks still holds four 2-post claims which covers the Waterclear adit area, i.e. Julian 1 & 2, Zen 6 & 7.

The WATER claims were staked in May 1984, and limited geological and geochemical surveys were completed in October of that year (Turner and Nebocat (1985)). The geophysical survey started in July of 1985.

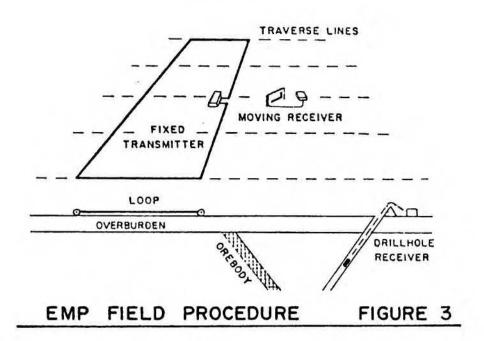
EMP Instrumentation - Figures 3 and 4

A cartoon (Figure 3) depicts the field layout.

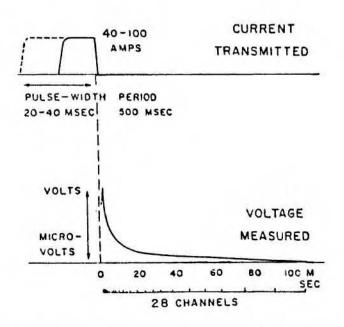
The transmitter loop is usually 400m x 800m, although its dimensions will vary depending on topography and target. It is thick, uninsulated aluminum wire. The transmitter is powered by a small generator. A typical transmitter current waveform is shown in Figure 4. Current shut-off takes place over a quarter sine wave shape in 0.3 to 0.4 msec., and a common period is 1/2 sec. The transmitter and receiver are synchronized by radio.

The ground survey receiving coil is air cored, measuring 4' x 3'. The drill hole coil is a narrow ferrite cored unit. The receiver itself will measure 28 samples of the decay curve over fifteen periods. Several replications are made. The channels measured will typically cover a range from 0.5 msec to 160 msec after turn-off. Data are recorded in internal solid state memory.

In the field, three modes of operation are in use. In the reconnaissance mode, vertical component readings over widely spaced grid points will give a general idea of back-ground and help to locate anomalies. Detailed surveys which record one vertical and two horizontal components map anomalous areas. Drill hole surveys measuring the along hole component are the third field method. On the WATER claims, the detailed mode is used.



NEWMONT TIME DOMAIN EMP SYSTEM



EMP MEASUREMENT PRINCIPLE FIGURE 4

i

The operator is critical to the success of field surveys. He monitors the magnetic field decay and decides whether data is acceptable. He will do the preliminary editing. He can observe the anomalous decay, and can monitor the migration of smoke rings (Nabighian (1979)).

Field data will consist of about 15,000 numbers daily. These numbers are recorded in instrument memory and are transcribed onto a computer tape in the evening. Editing of data is followed by the production of plots in the office, showing sectional profiles, contour maps, vector plans or profiles, decay plots, and combinations of the above.

Once the computer data has been viewed, it is possible to remove regional effects and to automatically fit rectangular or circular current distributions to explain field results.

Geophysical Coverage

Magnetic coverage was with the EDA OMNI IV total field recording magnetometer. There were 3770 field readings along the 47km of grid lines at 12-1/2m intervals. Data were corrected for diurnal variations, which were monitored by another EDA OMNI IV set up in the Clearwater Trailer Park. The data are plotted on the two Magnetic Contour Maps.

Four EMP loops were laid out, and the 47km of grid line are read at approximately 1000 sites. Three components of the decay of the induced magnetic field are measured. The locations of the four loops are on the Geophysical Interpretation maps. Data from the first 16 channels of the decay, contour plans of selected channels and components, and the shape of the decay curve for selected readings are plotted in Appendix I.

Results and Interpretation - Geophysical Interpretation Maps

Two discrete, conducting, anomalies are outlined on EMP Loops 1 and 3. The one on loop 1 may have been drilled. The anomaly on loop 3 is a weak conductor, and may be explained in part by outcrop in the creek bed.

The magnetic survey shows a general trend at approximately 340° . One feature - conceivably a cross-cutting magnetic dike - is at 007° . Both EMP anomalies are thought to be magnetic units, or to be spatially close to magnetically distinct units.

Loop 1 EMP - Figures 5 & 6

A background, or host, conductivity is apparent on data from loop O1. The effect is explained by Nabighian (1979), who pictures eddy currents in conductive ground as analogous to "smoke rings", travelling down from the loop with increasing radius. The secondary magnetic field from these induced currents is picked up in the receiver coil.

Superimposed on this background effect is a more local conductive effect, near the N edge of the loop. The apparent effect from this conductor is bounded to the east, west, and south. It is noted that the effect is located farther north with later time from current shut-off, indicating that the conductor does extend farther north than the edge of the loop. The resultant of the vector sum of all 3 components of the secondary field is contoured in Figure 5.

Assuming an exponential decay, we can give a time constant of 3.1 msec to the conductor at 100S/200W (Figure 6). This assigns a conductivity width of 1240 mhos to the best fitting conductor model.

A "best" model to explain the conductor has been calculated for the 1.63 msec channel. It is plotted on the Geophysical Interpretation Map. The model used does take account of topography, so the depths for the anomaly are given as depth from surface.

Craigmont hole CW2, drilled N at -60° for 104m is thought to be located at 200S/175W. It has probably intersected the conductor. Look for an explanation 90m down the hole. If no satisfactory explanation exists, then the target could be drilled again.

The mag high on line 200S at 125W marks the surface trace of the conductor, in all likelihood.

On the north west corner of the loop, near 200S/600W, we find indications of a deeper conductor. If the area warrants more work, another EMP loop should be tried over that region.

Loop 2 - Figure 7

There are no anomalous areas detected on this loop. Figure 7 is a good example of the effects of background conductivity.

Loop 3 - Figures 8 & 9

At early time (less than 2.80 msec) a conductor is seen above the regional background (Figure 8). The decay from this conductor disappears in late time. The decay plot at 2400S/325W (Figure 9) gives a time constant of 0.35 msec., resulting in a conductivity width product of 117 mhos for the model conductor.

The best model conductor that explains the anomaly is plotted on the Geophysical Interpretation Map. Again, the depths shown are from the surface, since topog effects are compensated in calculating the best model.

The conductor that is plotted is considered a small and poor drill target. The horizon that contains the conductor may outcrop in the creek bed between 300W and 350W.

The surface trace of the conductor is probably marked by the magnetic feature that trends at approximately 340°. This is close to the interpreted strike (350.5°) for the conductor. It appears that the EMP survey has located a more strongly conducting part within a geologic unit.

Loop 4 - Figure 10

Loop 4 shows only background rock conductivity. Figure 10 is an example of results from that loop.

Magnetic Surveys - Magnetic Contour Maps N & S

The magnetic survey delineates trends at 340° . One passes through 350S/00, another through 1650S/00, another through 3350S/00, a fourth through 310OS/562W, and a fifth through 70OS/475W. A mag feature at 007° transects these others. It passes through 110OS/00.

Isolated magnetic features occur near the north end of the grid. The conductor from loop 1 is, in all probability, associated with the mag highs at 200S/125W and 00/200W. The magnetically active area W of 500W on lines 00,100S, and 200S reflects a change in magnetic mineral content, although the geologic reasons for that change are not known.

AREA

: CLEARWATER

PROJECT : WATER

OPERATOR

: GWB/DGL/PMD/HL

DATE

: JULY 1985 .

SURVEY TYPE : SURFACE EMP

EMP PLAN-VIEW PLOTS

TX LOOP NO. : 1

CHANNEL : 4.37 MS

COMPONENT : R (RESULTANT)

VERT. UNITS : MICROVOLIS

HORZ. SCALE : 1 CM = 100 METERS

CONTOUR INTERVAL

50 MICROVOLTS

200N

ON

05ســـ

4005

6005

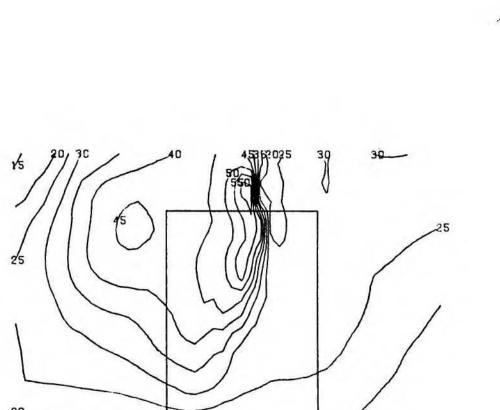
8005

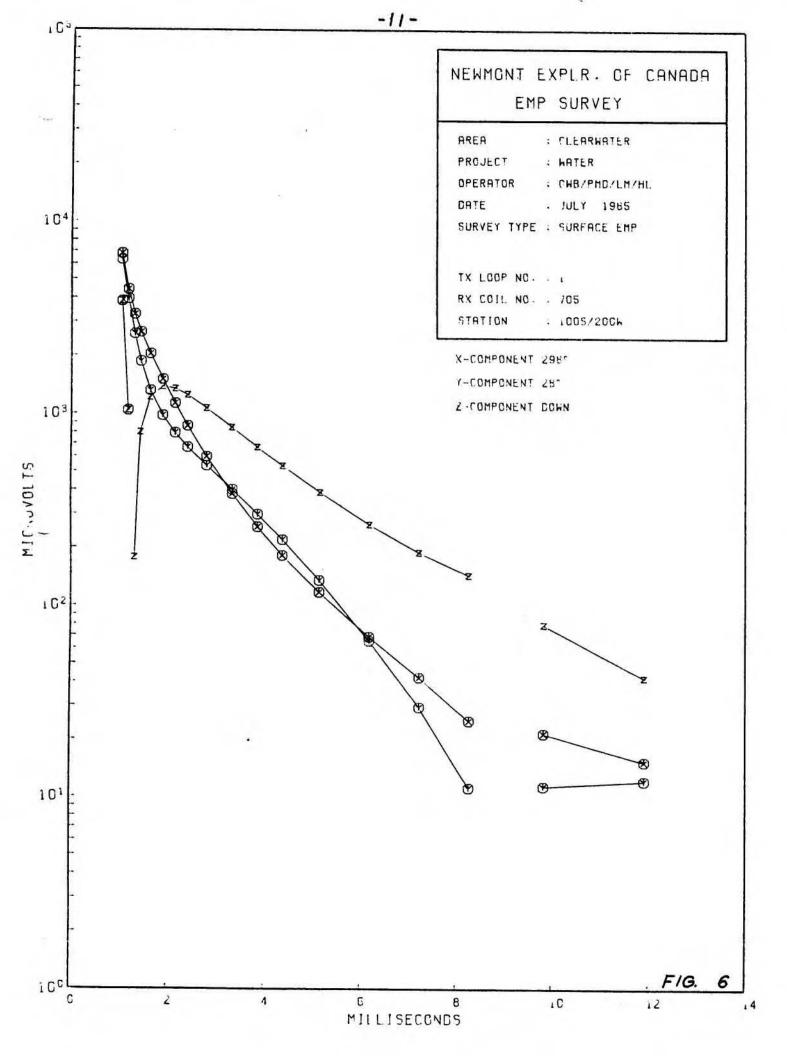
10005

12005

LOOP

FIG 5





AREA

: CLEARWATER

PROJECT

: WATER

CPERATOR

: PMD/LM

DATE

: JULY 1985

SURVEY TYPE : SURFACE EMP

EMP PLAN-VIEW PLOTS

TX LOOP NO. . 2

CHANNEL : 2.41 MS

COMPONENT : Z (VERT. DOWN) &

VERT. UNITS : MICROVOLTS

HORZ. SCALE : 1 CM = 100 METERS

CONTOUR INTERVAL

20 MICROVOLTS

1005

9005

-.005

13005

15005

17008

16 26 LOOP

19005

21005

FIG.

- AREA

: CLEARWATER

PROJECT

: WATER

OPERATOR

: PMD/LM

DATE

: JULY 1985

SURVEY TYPE : SURFACE EMP

EMP PLAN-VIEW PLOTS

TX LOOP NO. : 3

CHANNEL : 2.41 MS

COMPONENT : R (RESULTANT)

VERT. UNITS : MICROVOLTS

HORZ. SCALE : 1 CM = 100 METERS

CONTOUR INTERVAL

50 MICROVOLTS

16005

18005

22005

24005

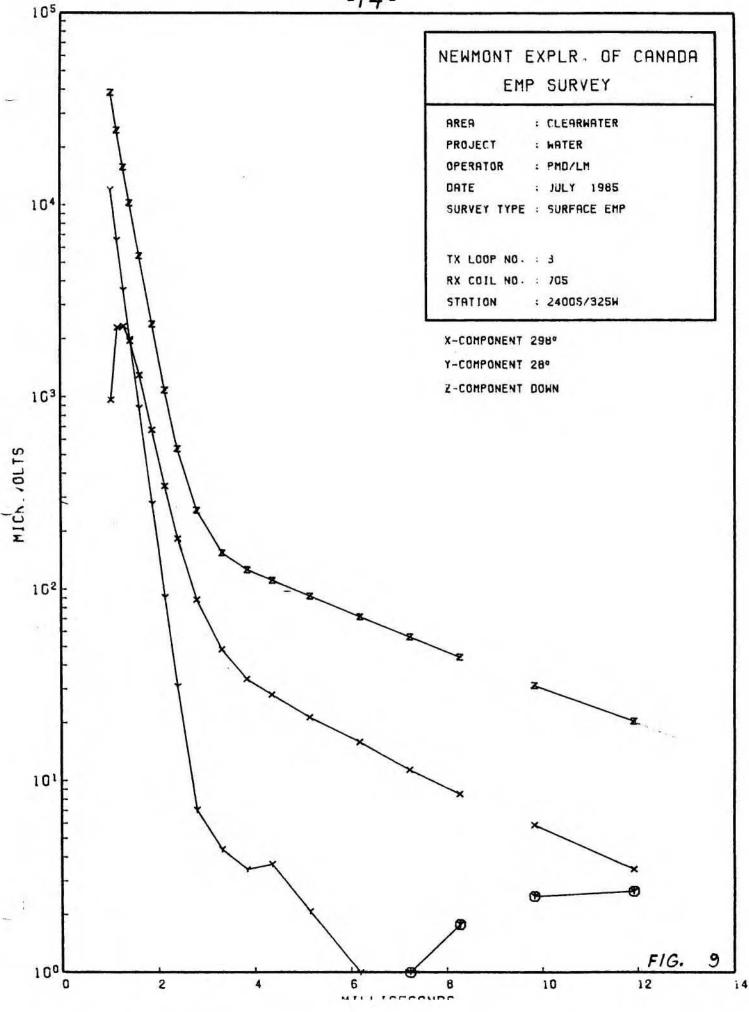
26005

28005

30005

FIG





- AREA

: CLEARWATER

PROJECT

: WATER

OPERATOR

: PMD/LM

DATE

: AUGUST 1985

SURVEY TYPE : SURFACE EMP

EMP PLAN-VIEW PLOTS

TX LOOP NO. : 4

CHANNEL : 4.37 MS

COMPONENT : Z (VERT. DOWN)

VERT. UNITS : MICROVOLTS

HORZ. SCALE : 1 CM = 100 METERS

CONTOUR INTERVAL

20 MICROVOLTS

27005

2900S

105

33005

3500S

3700S

39005

41005

2 LOOP

975W

FIG.

Conclusions and Recommendations

The magnetic survey shows a general geologic trend at approximately 340°. This trend is transected by a dike. Near the north end of the grid area, the magnetic signature changes, and a geologic understanding for that change will be sought.

Two EMP conductors are found. One, from loop 1, has probably been drilled. The actual location of the drill hole is still not certain, so some doubt remains as to whether the conductor has been found. Efforts to pin point the exact drill hole site would be worth while. A second EMP conductor, from loop 3, is part of a longer, magnetically distinct unit. Because of its small size, it remains as a lower priority drill target. Northwest of loop 1, indications of conductive material should be followed by further surveys, if interest in the area continues.

MI

References

- Nabighian, M. N., 1979: Quasi-static transient response of a conducting half-space-an approximate representation. Geophysics, vol.44, no.10, pp 1700-1705.
- Turner, J.A., and Nebocat, J., 1985: Geological and Geochemical Report on the Water 1-9 Claims. Newmont Exploration of Canada Limited, Vancouver, British Columbia.

H. LIMION

STATEMENT OF QUALIFICATIONS

I, Heikki Limion, received my B.A.Sc degree in Engineering Science (Geophysics Option) from the University of Toronto in 1965.

I spent two summers in geophysical field work; one with Hudson's Bay Oil and Gas, and one with INCo exploration.

In 1965-66 I worked for one year with Hudson's Bay Oil and Gas as a Junior Geophysicist in seismic field work.

From 1967-1976 I worked with INCo Exploration, on ground and airborne geophysical surveys. I was in charge of airborne geophysical operations for four years, and worked on research and development of airborne geophysical systems. I conducted ground geophysical surveys in Canada, U.S.A., and Brazil.

In 1977 and 1978 I was the head of the geophysics section in the Kenya Department of Mines and Geology. During this time, I was under contract to CIDA (the Canadian International Development Agency).

Since the beginning of 1979, I have held the position of Chief Geophysicist of Newmont Exploration of Canada Limited.

I am a member of the Society of Exploration Geophysicists, the Association of Professional Engineers of Ontario, the Prospectors and Developers Association, and the Canadian Exploration Geophysical Society.

2/2

STATEMENT OF COSTS

A. PERSONNEL 1985

Project Geologists

May 20-28 J. Turner (Linecutting)
 May 30, 31
 June 1-4

15 days @ \$128.13

\$1,921.95

May 20-28 J. Nebocat (Linecutting)
 May 30, 31
 June 1-4

15 days @ \$129.17

\$1,937.55

Geophysicists

July 11, 15
 H. Limion
 July 16-19
 Oct 30, 31
 Nov 15, 18-19

11 days @ \$201.25

\$2,213.75

2. July 15 D. Leask July 16-30 Aug 5-13

25 days @ \$115.00

\$2,875.00

3. July 18-20 G. Boyd

3 days @ \$201.25

\$ 603.75

Field Assistants

1. May 20-28 I. Casidy (Linecutting)
May 30, 31
June 1-5

16 days @ \$101.00

\$1,616.00

May 20-28 G. Roste (Linecutting)
 May 30, 31
 June 1-6, 12

18 days @ \$82.50

\$1,485.00

3.	May 20-28 H. Klatt (Linecutting)		
٠.	June 1-4, 9		
	16 days @ \$80.00	\$1,280.00	
4.	July 16-19 P. Dunn July 21, 31 Aug 1-13		
	28 days @ \$84.75	\$2,373.00	
5.	July 19-31 L. Marchak Aug 1-13		
	26 days @ \$87.50	\$2,275.00	
6.	May 22-28 K. McNeil (linecutting) May 30-31 June 1, 2, 5		
	12 days @ \$100.00	\$1,200.00	\$19,781.00
В.	FOOD AND ACCOMMODATION inc. Hydro, pro	pane	
1.	Trailer Rental 47 days @ \$13.41	\$ 630.27	
2.	Cook 130.5 hrs @ 12.50/hr	\$1,631.25	
3.	Food 180 man-days @ \$16.25	\$2,925.00	\$ 5,186.52
c.	TRANSPORTATION		
1.	4 x 4 suburban 47 days @ \$65.00	\$3,055.00	
2.	Travel Expense	\$2,100.00	\$ 5,155.00
D.	CONTRACT		
1.	Linecutting 11.7 km @ \$283.59 or May 23 - May 30		
	14 man-days @ \$237.00		\$ 3,318.00

E.	INSTRUMENT RENTAL	July 15 - Augus	t 13	
1.	Magnetometer 13 day			
2.	Pulse EM 30 day	s @ \$333.00	\$9,990.00	\$11,277.00
F.	SUPPLIES			
1.	Flagging, freight,	etc.		\$ 1,000.00
G.	REPORT PREPARATION			
1.	Typing, drafting, e	tc.		\$ 2,500.00
				\$48,217.52
The	cost of this work is	s apportioned as	follows:	
WAT	ER 1-6, 8 Water A			\$15,381.39
WAT	ER 7, 9 Water B			\$32,836.13

