

GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORTS

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GETTY COPPER CORP.

**A GEOPHYSICAL REPORT
ON INDUCED POLARIZATION AND
GROUND MAGNETIC SURVEYS ON
THE CINDER HILL PROPERTY NEAR LOGAN LAKE,
BRITISH COLUMBIA, KAMLOOPS MINING DIVISION**

NTS 92I

BY

LLOYD GEOPHYSICS INC.

Daniel A. Klit, B.Sc.

DECEMBER 1996

GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

24,691

PART 1 of 2



Lloyd Geophysics

TABLE OF CONTENTS

	Page
1.0 INTRODUCTION	1
2.0 INSTRUMENT SPECIFICATIONS	
2.1 Induced Polarization Survey Equipment	1
2.2 Ground Magnetometer Survey	2
3.0 SURVEY SPECIFICATIONS	
3.1 Induced Polarization Survey	2
3.2 Ground Magnetometer Survey	4
4.0 DATA PROCESSING	4
5.0 DATA PRESENTATION	4
6.0 DISCUSSION OF RESULTS	5
7.0 CONCLUSIONS AND RECOMMENDATIONS	7

1.0 INTRODUCTION

During the period of October 23 to September 18, 1996, Lloyd Geophysics Inc. carried out induced polarization (IP) and ground magnetic (Mag) surveys on the Getty North property near Logan Lake, British Columbia, for Getty Copper Corp.

The purpose of the surveys was to locate areas of sulphide mineralization with potential for hosting copper-gold-silver deposits which could be followed up by further exploration drilling.

2.0 INSTRUMENT SPECIFICATIONS

2.1 Induced Polarization Survey Equipment

The equipment used was a time domain measuring system consisting of a Wagner Leland/Onan motor generator set and a Mark II transmitter manufactured by Hunttec Limited, Toronto, Canada and a 6 channel IP-6 receiver manufactured by BRGM Instruments, Orleans, France. The Wagner Leland/Onan motor generator supplies in excess of 7.5 kilowatts of 3 phase power to the ground at 400 hertz via the Mark II transmitter.

The transmitter was operated with a cycle time of 8 seconds and the duty cycle ratio: [(time on)/(time + time off)] was 0.5. This means the cycling sequence of the transmitter was 2 seconds current "on" and 2 seconds current "off" with consecutive pulses reversed in polarity. The IP-6 receiver can read up to 6 dipoles simultaneously. It is microprocessor controlled, featuring automatic calibration, gain setting, SP cancellation and fault diagnosis. To accommodate a wide range of geological conditions, the delay time, the window widths and hence the total integration time is programmable via the keypad. Measurements are calculated automatically every 2 to 4 seconds from the averaged waveform which is accumulated in memory.

The window widths of the IP-6 receiver can be programmed arithmetically or logarithmically. For this particular survey the instrument was programmed arithmetically into 10 equal window widths or channels, Ch₀, Ch₁, Ch₂, Ch₃, Ch₄, Ch₅, Ch₆, Ch₇, Ch₈, Ch₉. These may be recorded individually and

summed up automatically to obtain the total chargeability. Similarly, the resistivity (ρ_a) in ohm-metres is also calculated automatically.

The instrument parameters chosen for this survey were as follows:

Cycle Time (T_c)	=8 seconds
Ratio $\frac{\text{(Time On)}}{\text{(Time Off)}}$	=1:1
Duty Cycle Ratio	
$\frac{\text{(Time On)}}{\text{(Time On) + (Time Off)}}$	=0.5
Delay Time (T_D)	=120 milliseconds
Window Width (t_p)	=90 milliseconds
Total Integration Time	=900 milliseconds

2.2 Ground Magnetometer Survey Equipment

The equipment used on this survey was the Omni Plus ground magnetometer and an Omni IV recording base station magnetometer both manufactured by EDA Instruments Inc., Toronto, Canada.

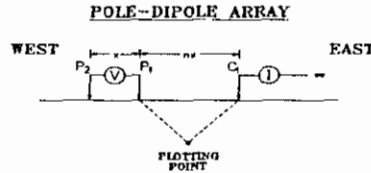
The system is completely software/microprocessor controlled. A portable proton precession magnetometer measures and stores in memory the total earth's magnetic field at the touch of a key. It also identifies and stores the location and time of each measurement and computes the statistical

error of the reading and stores the decay and strength of the signal being measured. Throughout the survey day a similar base station magnetometer measures and stores in memory the daily fluctuations of the earth's magnetic field. The use of two magnetometers eliminates the need for a network of base stations on the grid. At the end of each day, the field data is merged with the base station data in the field computer and automatic diurnal corrections are applied to correct the field data, resulting in a very accurate ($\pm 5\text{nT}$) measurement of the earth's total magnetic field.

3.0 SURVEY SPECIFICATIONS

3.1 Induced Polarization Survey Specifications

The configuration of the pole-dipole array used for the survey is shown below:



$$X=50 \text{ meters} \quad n=1,2,3,4 \text{ and } 5$$

The dipole length (x) is the distance between P_1 and P_2 and mainly determines the sensitivity of the array. The electrode separation (nx) is the distance between C_1 and P_1 and mainly determines the depth of penetration of the array.

The induced polarization survey was carried out with the current electrode, C_1 East of the potential measuring dipole P_1P_2 on lines 200 meters apart and measurements were taken for $x=50$ meters and $n=1, 2, 3, 4$ and 5 .

3.2 Ground Magnetometer Survey Specifications

The ground magnetic data was acquired at 12.5 metre station internals on lines spaced from 100 metres to 300 apart.

4.0 DATA PROCESSING

All the geophysical data collected was processed in the field using a 386 computer and a Fujitsu color printer. Using this system , IP pseudo-sections and magnetic profiles were generated and plotted at the end of each survey day.

In our office, using appropriate software, final data processing was completed and the field data was transferred to mylar or colour prints (not included in this report) using a Pentium desktop computer coupled to a Hewlett Packard Design Jet 650C colour plotter.

5.0 DATA PRESENTATION

The data obtained from the ground magnetic and induced polarization surveys is presented on 21 pseudo sections and 3 contour plan maps as outlined below:

Pseudo Sections (1:5000)

<u>Line No.</u>	<u>Dwg. No.</u>	<u>Line No.</u>	<u>Dwg. No.</u>
1900N	96392-01	4550N	96392-12
2150N	96392-02	4800N	96392-13
2400N	96392-03	5050N	96392-14
2650N	96392-04	5300N	96392-15
2900N	96392-05	5550N	96392-16

3100N	96392-06	5800N	96392-17
3300N	96392-07	6050N	96392-18
3550N	96392-08	6300N	96392-19
3800N	96392-09	6800N	96392-20
4050N	96392-10	7300N	96392-21
4300N	99392-11		

Contour Plan Maps (1:10000)

Total Field Magnetic Contours	96392-22
Chargeability 15 Point Triangular Filter	96392-23
Resistivity 15 Point Triangular Filter	96392-24

6.0 DISCUSSION OF RESULTS

It is important to keep in mind that an IP response depends on a number of factors. These factors are as follows:

- the volume content of sulphide minerals
- the number of pore paths that are blocked by sulphide grains
- the number of sulphide faces that are available for polarization
- the absolute size and shape of the sulphide grains and the relationship of their size and shape to the size and shape of the available pore paths
- the electrode array employed
- the width, depth, thickness and strike length of the mineralized body and its location relative to the array
- the resistivity contrast between the mineralized body and the unmineralized host rock

The sulphide content of the underlying rocks is one of the critical factors that we would like to

determine from field measurements. Experience has shown that this is both difficult and unreliable because of the large number of variables, described above, which contribute to an IP response. The problem is further complicated by the fact that rocks containing magnetite, graphite, clay minerals and variably altered rocks produce IP responses of varying amplitudes.

A detailed study has been made of the pseudo-sections which accompany this report. These pseudo-sections are not sections of the electrical properties of the sub-surface strata and cannot be treated as such when determining the depth, width, and thickness of a zone which produces an anomalous pattern. The anomalies are classified into four groups: definite, probable and possible anomalies and anomalies which have a much deeper source.

This classification is based partly on the relative amplitudes of the chargeability and to a lesser degree on the resistivity response. In addition the overall anomaly pattern and the degree to which this pattern may be correlated from line to line is of equal importance.

The IP survey detected two weak zones of increased chargeability. These two zones are shown on the chargeability contour map Dwg. No. 96392-93.

The **North Zone** is at best 1000m long and 400m wide. However the lines here are 500m apart. The zone is best developed between 3600W and 3800W on line 6800N, where it reaches maximum chargeability values of 8 or 9 milliseconds over a back ground of 4 or 5 milliseconds. The source of this anomaly does not persist at depth and is therefore believed to represent a small target at a fairly shallow depth.

The **South Zone** is about 1600m long and 400m wide. These dimensions are based on 100m dipoles. If the zone was surveyed with 25 or 50 m dipoles its indicated width would be expected to be much narrower. The zone is more interesting on lines 2400N, 2650N and 2900N where it appears to be wider than at either its north or south extremities. The maximum chargeability values never exceed more than about three times background and as such the zone is not expected to contain more than

a few percent sulphides by volume. The zone is more persistent at depth on lines 2400N and 2650N, and it is here that drill testing is warranted.

Both zones are underlain by fairly low resistivity values.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The IP survey described in this report delineated two weak chargeability zones which warrant limited drilling to test for the presence of sulphides with associated gold.

It is recommended that 5 diamond drill holes be completed as follows:

<u>Hole No</u>	<u>Line No</u>	<u>Location</u>	<u>Dip</u>	<u>Length(m)</u>
1	2650N	3500W	Vertical	150
2	2650N	3600W	Vertical	150
3	2650N	3400W	Vertical	150
4	6800N	3650W	Vertical	100
5	6800N	3750W	Vertical	100

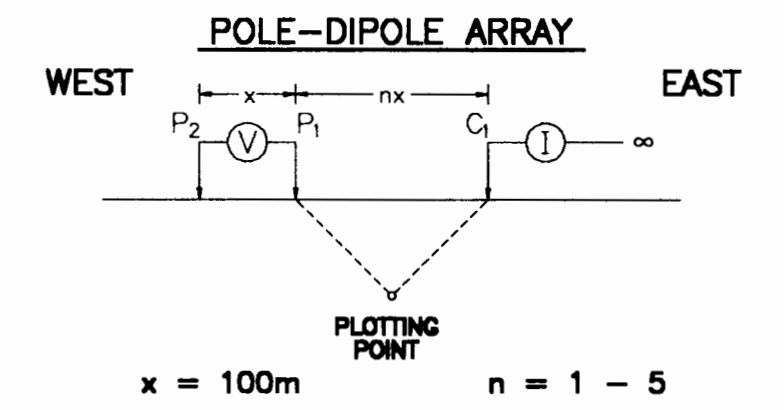
Respectfully submitted,
LLOYD GEOPHYSICS INC.



Daniel A. Klit, B.Sc.
Project Geophysicist

CINDER HILL
LOGAN LAKE, B.C.

LINE: 1900N



CURRENT ELECTRODE C1 EAST
OF POTENTIAL DIPOLE PP2

SURFACE PROJECTION
OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE
- AT DEPTH

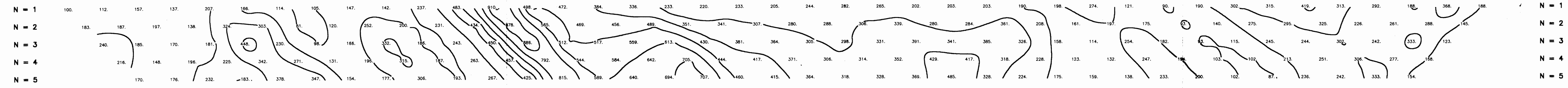
SCALE 1 : 5000

CONTOUR INTERVALS
APP.CHARGEABILITY : 0.5 (msec)
APP.RESISTIVITY : 100 (ohm-m)
DATE SURVEYED: SEPTEMBER 2, 1996
Tx: Huntac Mk2 Model 7500
Rx: EDA IP-6

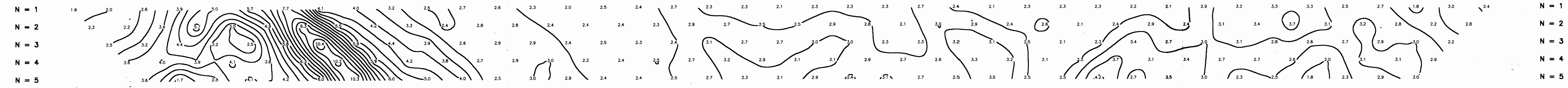
LLOYD GEOPHYSICS INC.

INDUCED POLARIZATION SURVEY
DRAWING NUMBER : 96392-01

RESISTIVITY (OHM-M)



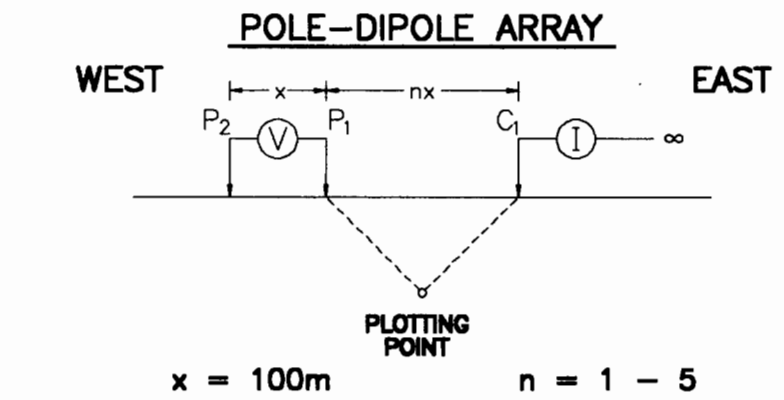
CHARGEABILITY (MSEC)



GETTY COPPER INC.

**CINDER HILL
LOGAN LAKE, B.C.**

LINE: 2150N



CURRENT ELECTRODE C₁ EAST OF POTENTIAL DIPOLE PP₂

SURFACE PROJECTION OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE
- AT DEPTH

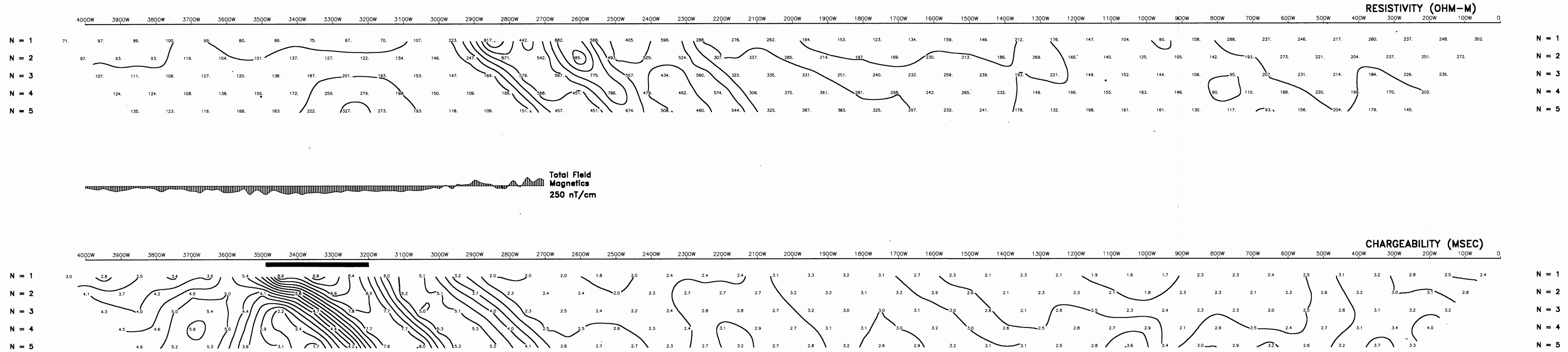
SCALE 1 : 5000

CONTOUR INTERVALS
APP.CHARGEABILITY : 0.5 (msec)
APP.RESISTIVITY : 100 (ohm-m)

DATE SURVEYED: AUGUST 31, 1998
Tx: Huntac Mk2 Model 7500
Rx: EDA IP-6



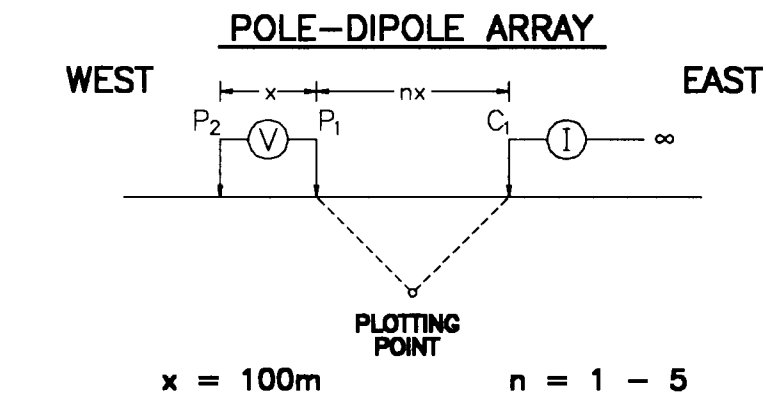
INDUCED POLARIZATION SURVEY
DRAWING NUMBER : 96392-02



GETTY COPPER INC.

CINDER HILL
LOGAN LAKE, B.C.

LINE: 2400N



CURRENT ELECTRODE C₁ EAST
OF POTENTIAL DIPOLE P₁P₂

SURFACE PROJECTION
OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE
- AT DEPTH

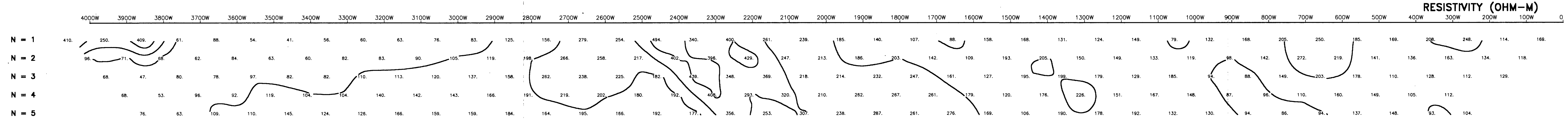
SCALE 1 : 5000

CONTOUR INTERVALS
APP.CHARGEABILITY : 0.5 (msec)
APP.RESISTIVITY : 100 (ohm-m)
DATE SURVEYED: AUGUST 30, 1996
Tx: Huntac Mk2 Model 7500
Rx: EDA IP-6

LLOYD GEOPHYSICS INC.

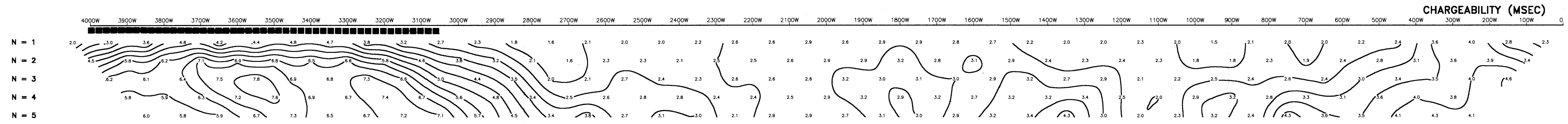
INDUCED POLARIZATION SURVEY
DRAWING NUMBER : 96392-03

RESISTIVITY (OHM-M)



Total Field
Magnetics
250 nT/cm

CHARGEABILITY (MSEC)

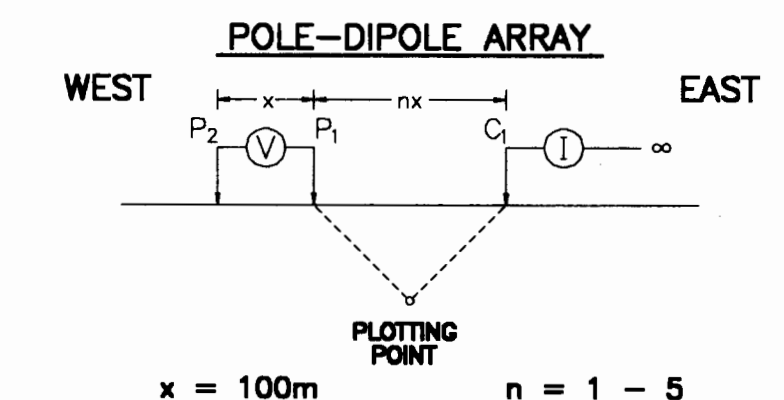


GETTY COPPER INC.

CINDER HILL

LOGAN LAKE, B.C.

LINE: 2650N



CURRENT ELECTRODE C_1 EAST
OF POTENTIAL DIPOLE PP_2

SURFACE PROJECTION
OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE
- AT DEPTH

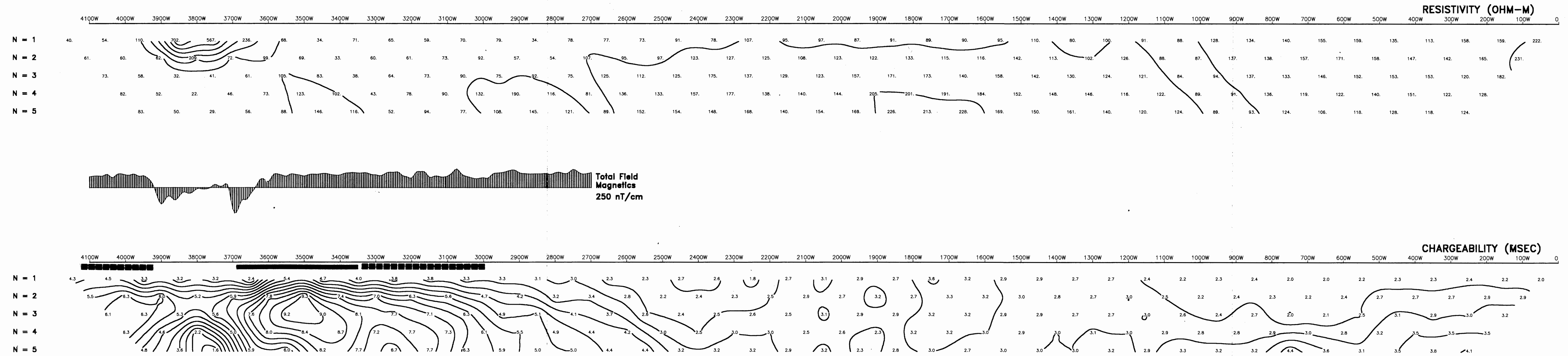
SCALE 1 : 5000

CONTOUR INTERVALS
APP. CHARGEABILITY : 0.5 (msec)
APP. RESISTIVITY : 100 (ohm-m)

DATE SURVEYED: AUGUST 25, 1986
Tx: Huntac Mk2 Model 7500
Rc: EDA IP-8



INDUCED POLARIZATION SURVEY
DRAWING NUMBER : 96392-04

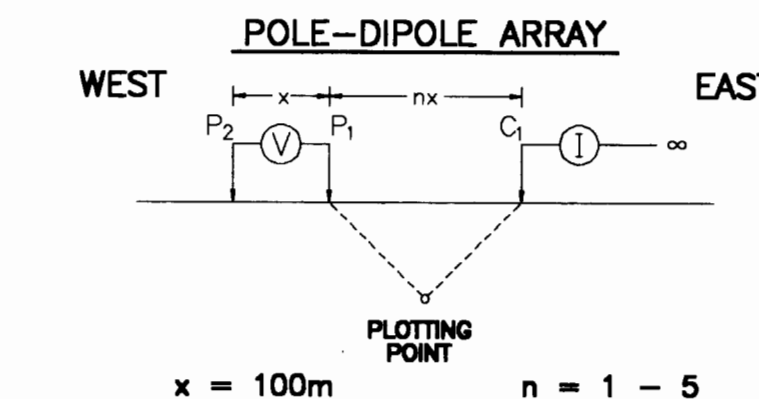


GETTY COPPER INC.

CINDER HILL

LOGAN LAKE, B.C.

LINE: 2900N



CURRENT ELECTRODE C₁ EAST OF POTENTIAL DIPOLE PP₂

SURFACE PROJECTION OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE
- AT DEPTH

SCALE 1 : 5000

CONTOUR INTERVALS
 APP.CHARGEABILITY : 0.5 (msec)
 APP.RESISTIVITY : 100 (ohm-m)

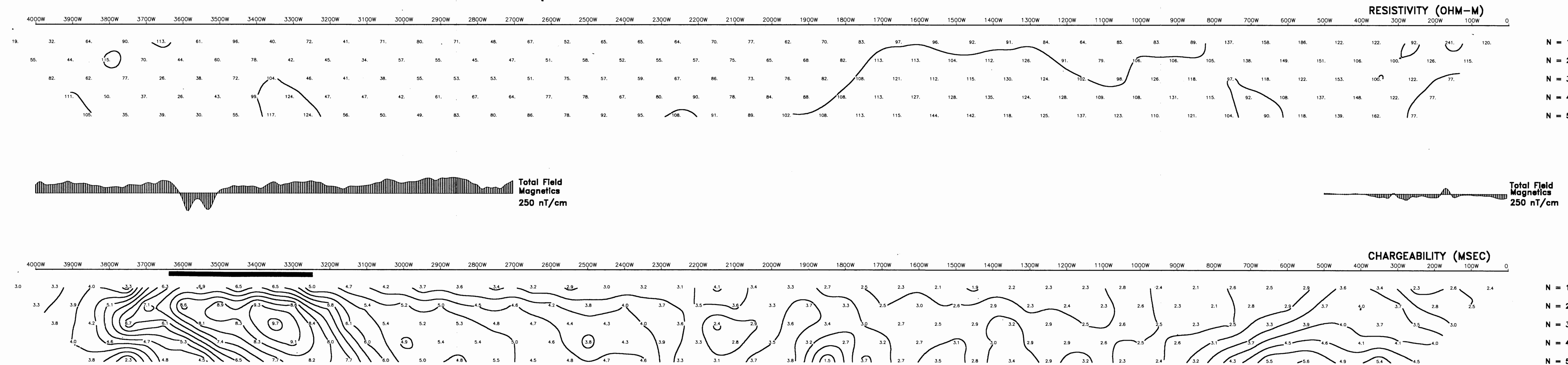
DATE SURVEYED: AUGUST 24, 1988
 Tx: Huntec Mk2 Model 7500
 Rx: EDA IP-8



LLOYD GEOPHYSICS INC.

INDUCED POLARIZATION SURVEY

DRAWING NUMBER : 96392-05

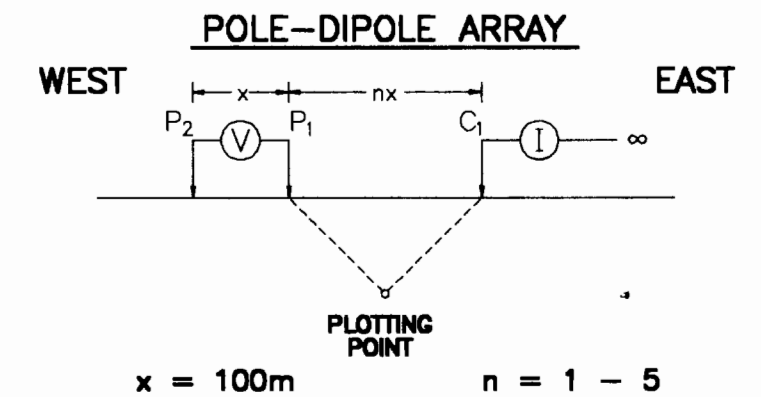


GETTY COPPER INC.

CINDER HILL

LOGAN LAKE, B.C.

LINE: 3100N



CURRENT ELECTRODE C₁ EAST OF POTENTIAL DIPOLE P₁P₂

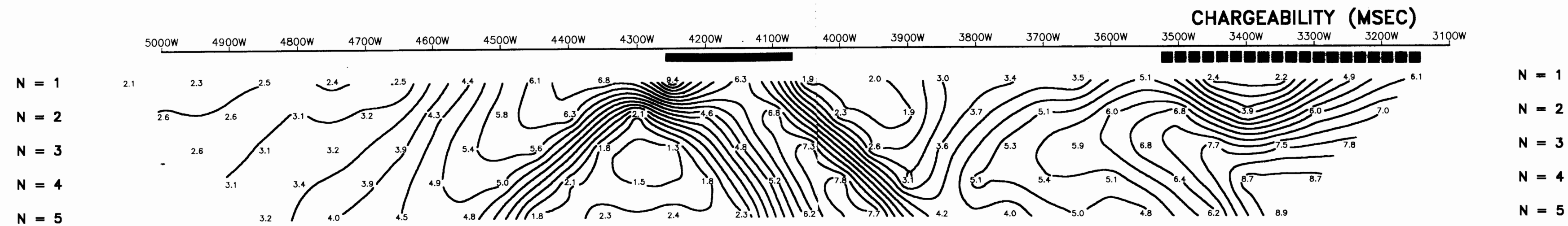
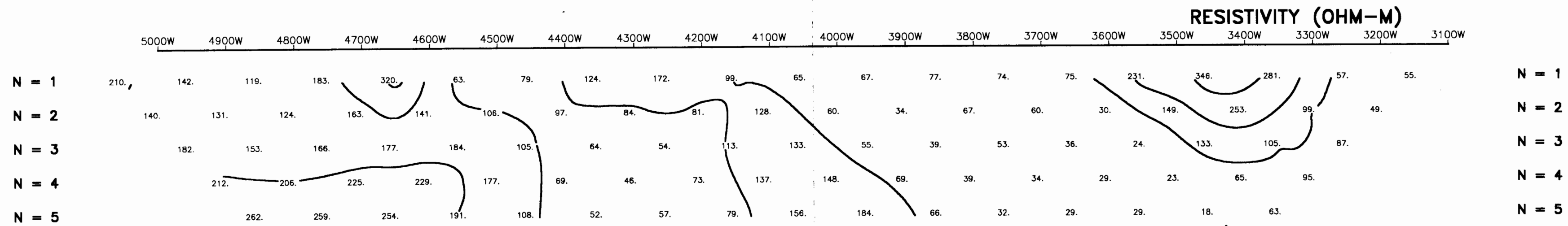
SURFACE PROJECTION OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE
- AT DEPTH

SCALE 1 : 5000

CONTOUR INTERVALS
 APP.CHARGEABILITY : 0.5 (msec)
 APP.RESISTIVITY : 100 (ohm-m)

DATE SURVEYED: SEPTEMBER 8, 1996
 Tx: Huntec Mk2 Model 7500
 Rx: EDA IP-6



LLOYD GEOPHYSICS INC.

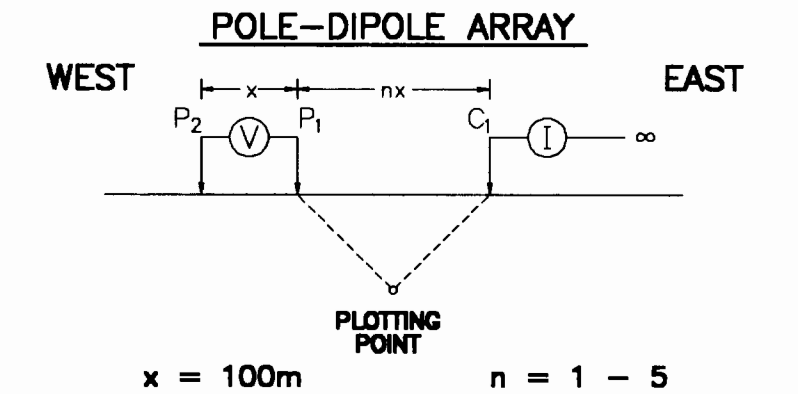
INDUCED POLARIZATION SURVEY

DRAWING NUMBER : 96392-06

GETTY COPPER INC.

**CINDER HILL
LOGAN LAKE, B.C.**

LINE: 3300N



CURRENT ELECTRODE C₁ EAST
OF POTENTIAL DIPOLE PP₂

SURFACE PROJECTION
OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE
- AT DEPTH

SCALE 1 : 5000

CONTOUR INTERVALS

APP.CHARGEABILITY : 0.5 (msec)

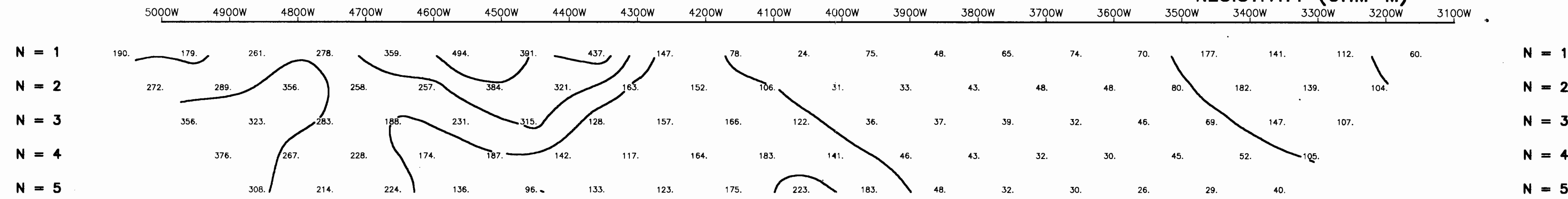
APP.RESISTIVITY : 100 (ohm-m)

DATE SURVEYED: SEPTEMBER 4, 1998

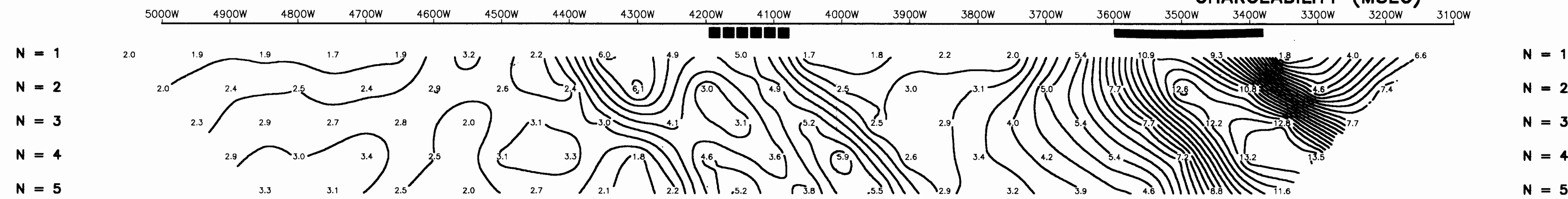
Tx: Huntec Mk2 Model 7500

Rx: EDA IP-6

RESISTIVITY (OHM-M)



CHARGEABILITY (MSEC)



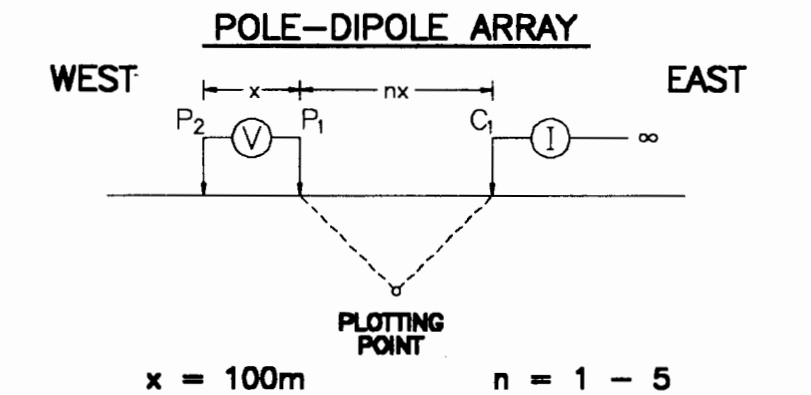
INDUCED POLARIZATION SURVEY

DRAWING NUMBER : 96392-07

GETTY COPPER INC.

**CINDER HILL
LOGAN LAKE, B.C.**

LINE: 3550N



CURRENT ELECTRODE C₁ EAST OF POTENTIAL DIPOLE P₁P₂

SURFACE PROJECTION OF ANOMALOUS ZONES

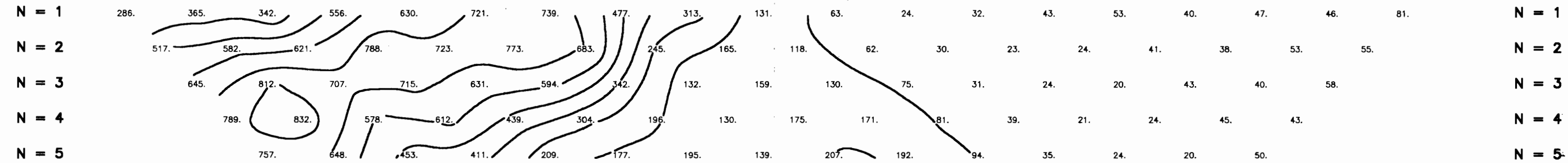
DEFINITE ■■■■■■
PROBABLE ■■■■■■
POSSIBLE ▨▨▨▨▨
AT DEPTH ●●●●●●

SCALE 1 : 5000

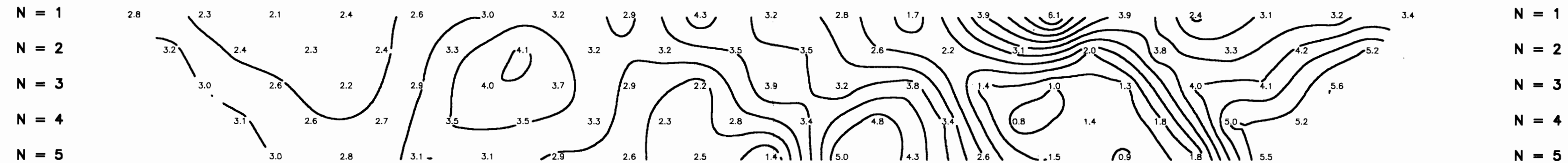
CONTOUR INTERVALS
APP.CHARGEABILITY : 0.5 (msec)
APP.RESISTIVITY : 100 (ohm-m)

DATE SURVEYED: SEPTEMBER 5, 1998
Tx: Hurtec Mk2 Model 7500
Rx: EDA IP-6

RESISTIVITY (OHM-M)



CHARGEABILITY (MSEC)



LLOYD GEOPHYSICS INC.

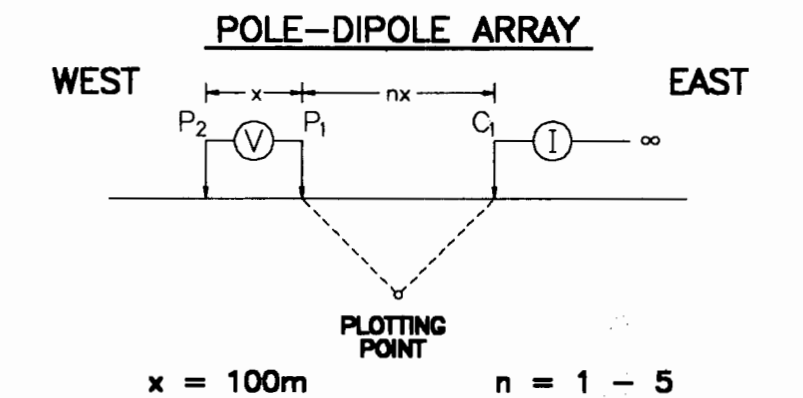
INDUCED POLARIZATION SURVEY

DRAWING NUMBER : 96392-08

GETTY COPPER INC.

**CINDER HILL
LOGAN LAKE, B.C.**

LINE: 3800N



CURRENT ELECTRODE C₁ EAST
OF POTENTIAL DIPOLE RP₂

SURFACE PROJECTION
OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE
- AT DEPTH

SCALE 1 : 5000

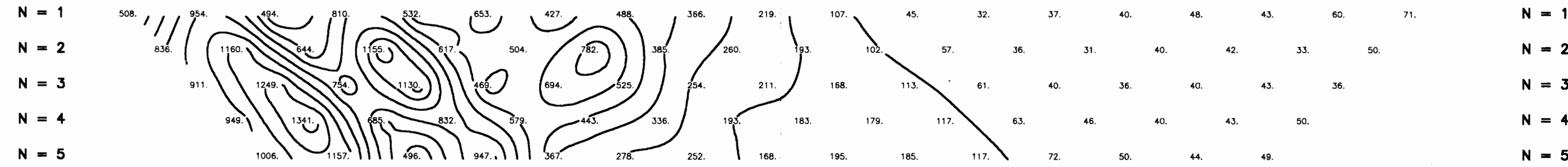
CONTOUR INTERVALS

APP.CHARGEABILITY : 0.5 (msec)
APP.RESISTIVITY : 100 (ohm-m)

DATE SURVEYED: SEPTEMBER 6, 1996
Tx: Huntac Mk2 Model 7500
Rx: EDA IP-6

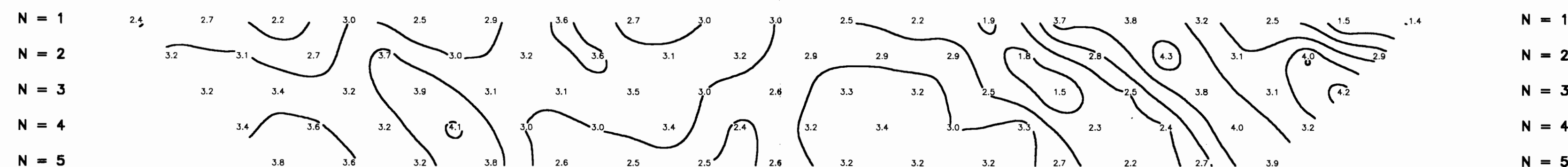
RESISTIVITY (OHM-M)

5000W 4900W 4800W 4700W 4600W 4500W 4400W 4300W 4200W 4100W 4000W 3900W 3800W 3700W 3600W 3500W 3400W 3300W 3200W



CHARGEABILITY (MSEC)

5000W 4900W 4800W 4700W 4600W 4500W 4400W 4300W 4200W 4100W 4000W 3900W 3800W 3700W 3600W 3500W 3400W 3300W 3200W



LLOYD GEOPHYSICS INC.

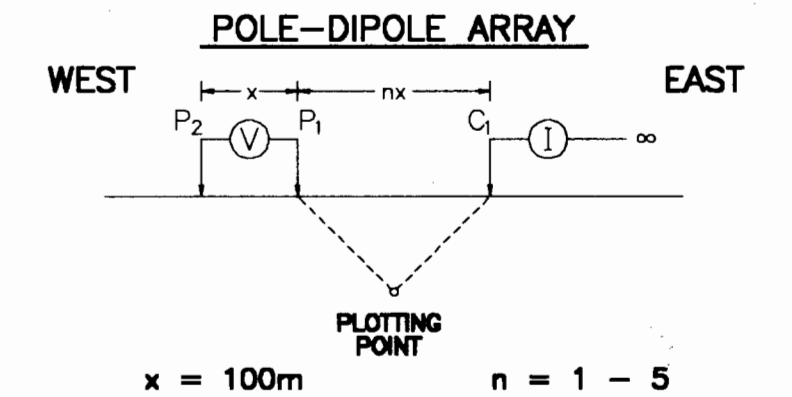
INDUCED POLARIZATION SURVEY
DRAWING NUMBER : 96392-09

GETTY COPPER INC.

CINDER HILL

LOGAN LAKE, B.C.

LINE: 4050N



CURRENT ELECTRODE C_1 EAST OF POTENTIAL DIPOLE P_1P_2

SURFACE PROJECTION OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE
- AT DEPTH

SCALE 1 : 5000

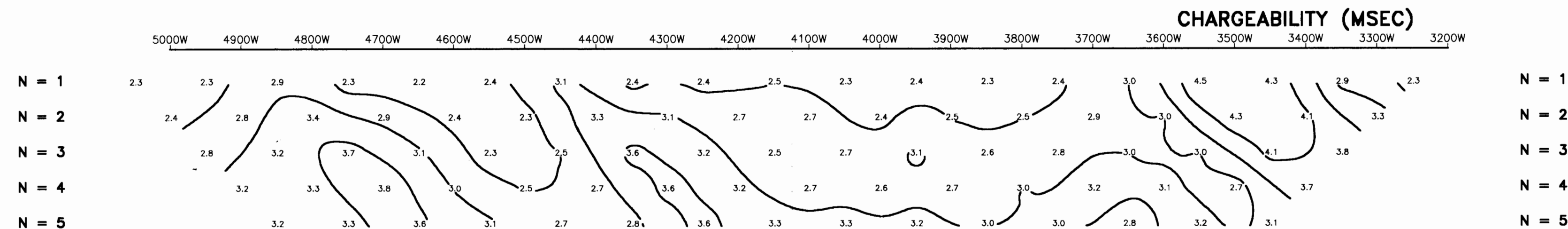
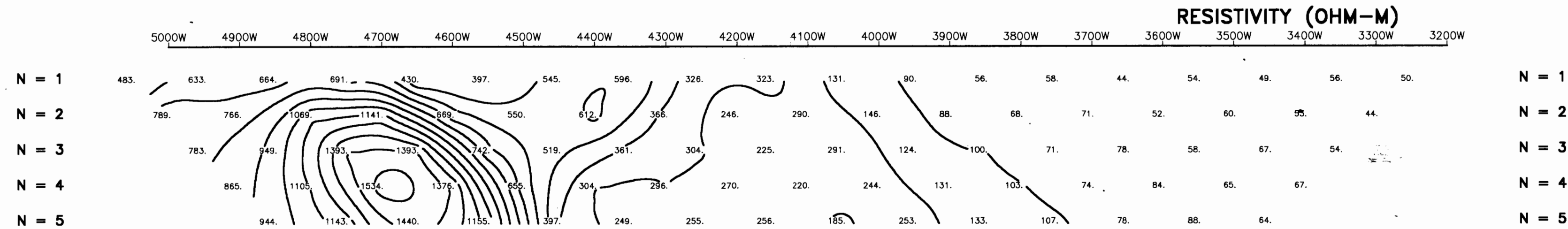
CONTOUR INTERVALS

APP.CHARGEABILITY : 0.5 (msec)
APP.RESISTIVITY : 100 (ohm-m)

DATE SURVEYED: SEPTEMBER 7, 1996

Tx: Hurtec Mk2 Model 7500

Rx: EDA IP-6



LLOYD GEOPHYSICS INC.

INDUCED POLARIZATION SURVEY

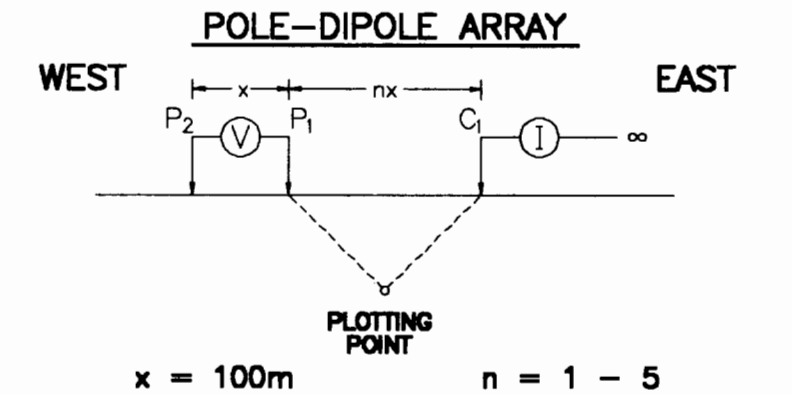
DRAWING NUMBER : 96392-10

GETTY COPPER INC.

CINDER HILL

LOGAN LAKE, B.C.

LINE: 4300N



CURRENT ELECTRODE C₁ EAST
OF POTENTIAL DIPOLE P₁P₂

SURFACE PROJECTION
OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE
- AT DEPTH

SCALE 1 : 5000

CONTOUR INTERVALS

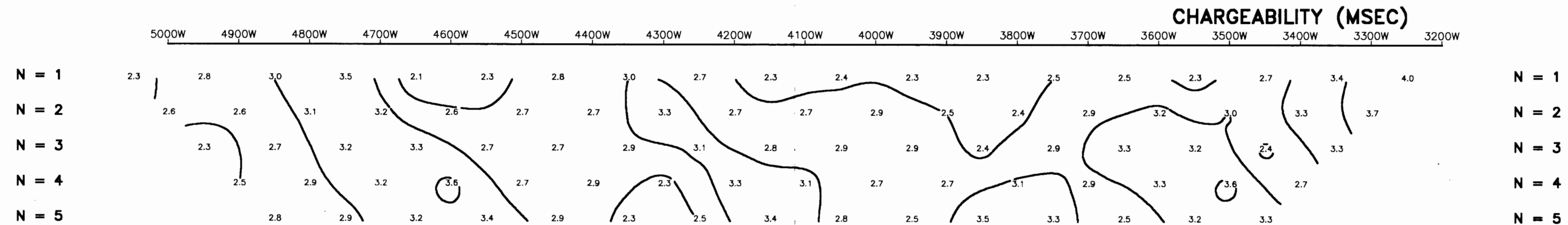
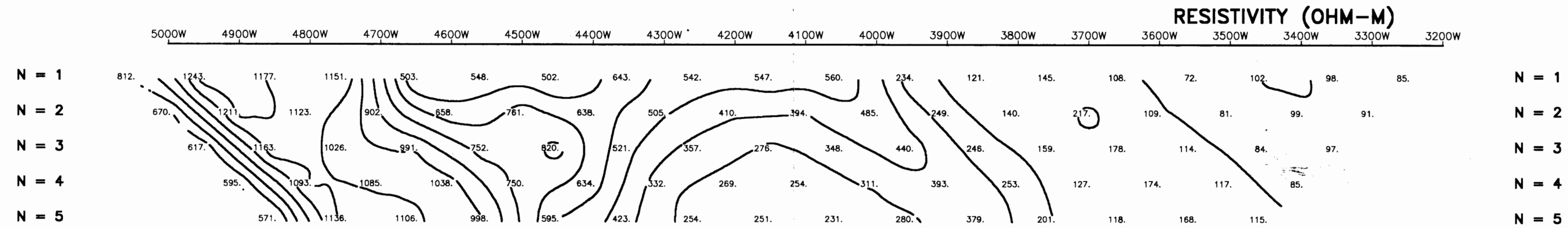
APP.CHARGEABILITY : 0.5 (msec)

APP.RESISTIVITY : 100 (ohm-m)

DATE SURVEYED: SEPTEMBER 7, 1998

Tx: Huntac Mk2 Model 7500

Rx: EDA IP-8



LLOYD GEOPHYSICS INC.

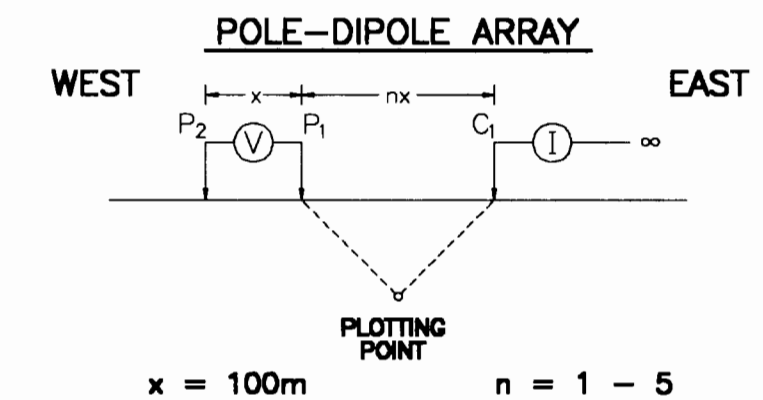
INDUCED POLARIZATION SURVEY

DRAWING NUMBER : 96392-11

GETTY COPPER INC.

**CINDER HILL
LOGAN LAKE, B.C.**

LINE: 4550N



CURRENT ELECTRODE C_1 EAST OF POTENTIAL DIPOLE PP_2

SURFACE PROJECTION OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE
- AT DEPTH

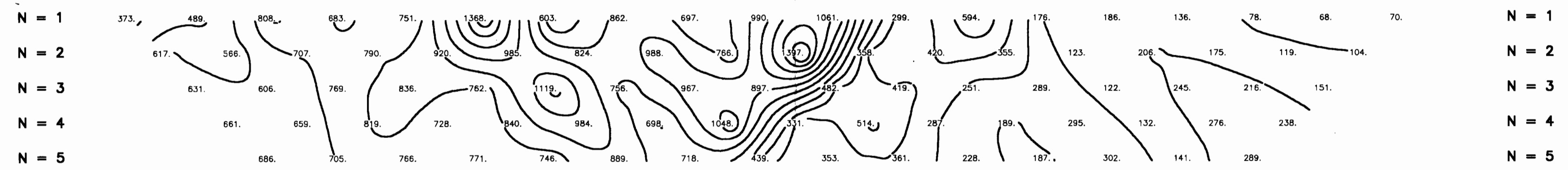
SCALE 1 : 5000

CONTOUR INTERVALS
APP.CHARGEABILITY : 0.5 (msec)
APP.RESISTIVITY : 100 (ohm-m)

DATE SURVEYED: SEPTEMBER 8, 1986
Tx: Huntac Mk2 Model 7500
Rx: EDA IP-8

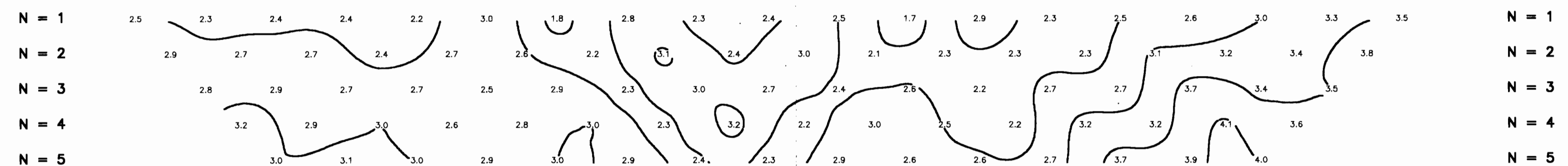
RESISTIVITY (OHM-M)

5000W 4900W 4800W 4700W 4600W 4500W 4400W 4300W 4200W 4100W 4000W 3900W 3800W 3700W 3600W 3500W 3400W 3300W 3200W



CHARGEABILITY (MSEC)

5000W 4900W 4800W 4700W 4600W 4500W 4400W 4300W 4200W 4100W 4000W 3900W 3800W 3700W 3600W 3500W 3400W 3300W 3200W



LLOYD GEOPHYSICS INC.

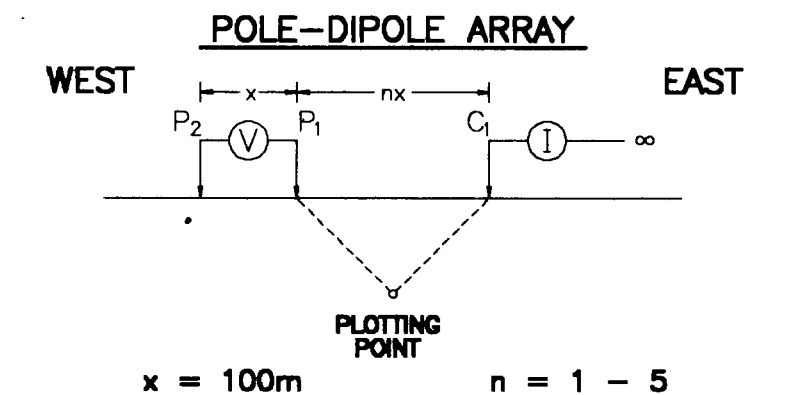
INDUCED POLARIZATION SURVEY
DRAWING NUMBER : 96392-12

GETTY COPPER INC.

CINDER HILL

LOGAN LAKE, B.C.

LINE: 4800N



CURRENT ELECTRODE C_1 EAST OF POTENTIAL DIPOLE P_1P_2

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

AT DEPTH

SCALE 1 : 5000

CONTOUR INTERVALS

APP.CHARGEABILITY : 0.5 (msec)

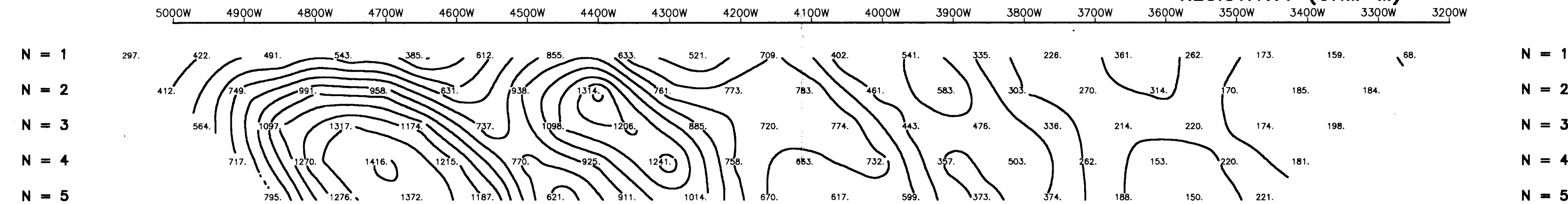
APP.RESISTIVITY : 100 (ohm-m)

DATE SURVEYED: SEPTEMBER 9, 1996

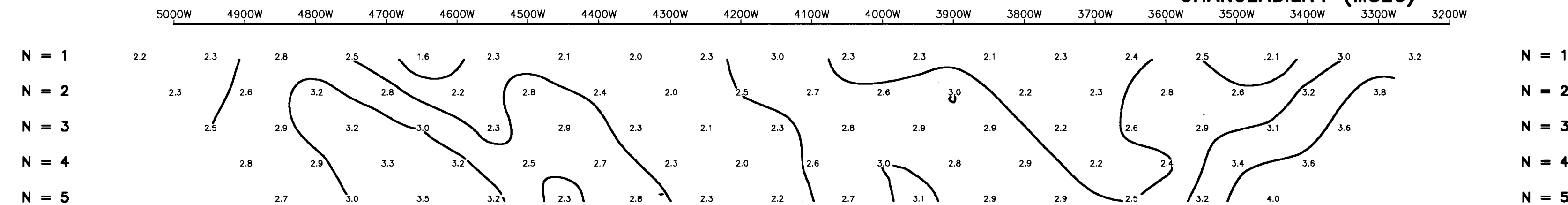
Tx: Huntac Mk2 Model 7500

Rx: EDA IP-6

RESISTIVITY (OHM-M)



CHARGEABILITY (MSEC)



LLOYD GEOPHYSICS INC.

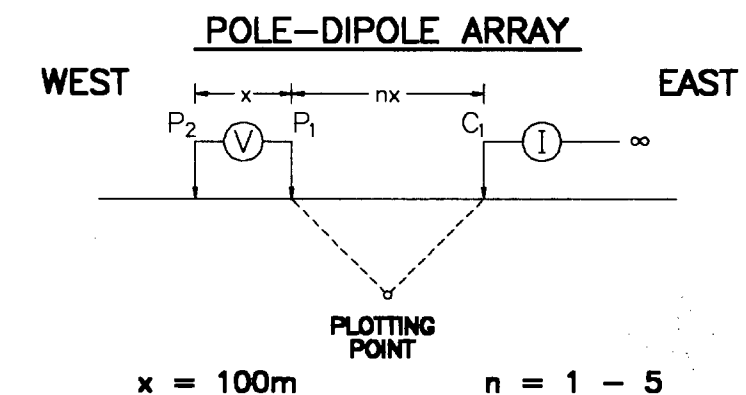
INDUCED POLARIZATION SURVEY

DRAWING NUMBER : 96392-13

GETTY COPPER INC.

CINDER HILL
LOGAN LAKE, B.C.

LINE: 5300N



CURRENT ELECTRODE C_1 EAST OF POTENTIAL DIPOLE PP_2

SURFACE PROJECTION OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE
- AT DEPTH

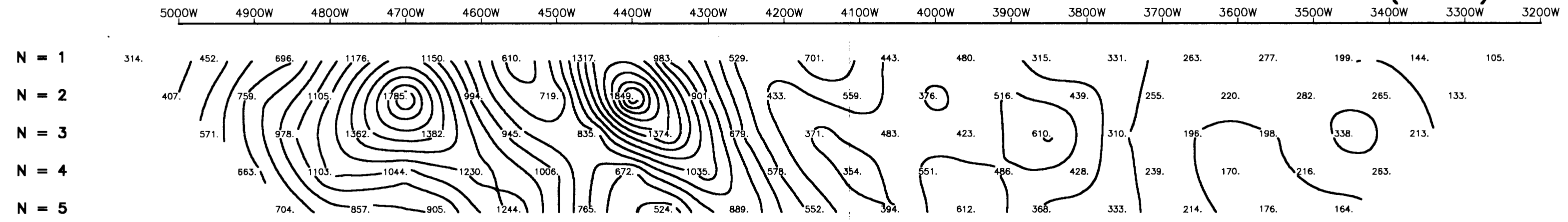
SCALE 1 : 5000

CONTOUR INTERVALS

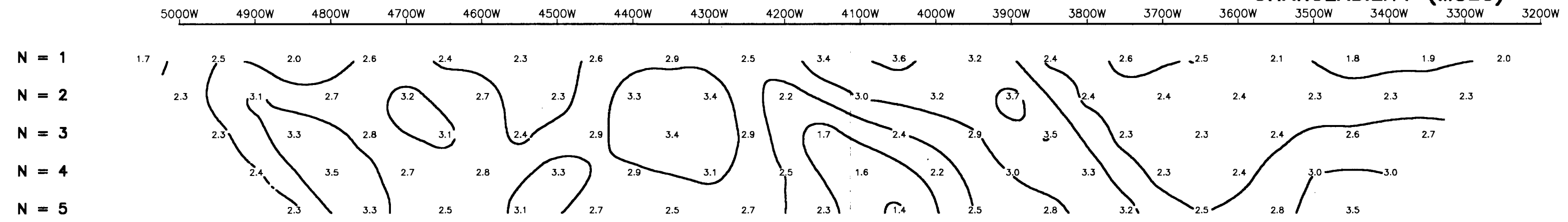
APP.CHARGEABILITY : 0.5 (msec)
APP.RESISTIVITY : 100 (ohm-m)

DATE SURVEYED: SEPTEMBER 10, 1986
Tx: Huntac Mk2 Model 7500
Rx: EDA IP-8

RESISTIVITY (OHM-M)



CHARGEABILITY (MSEC)



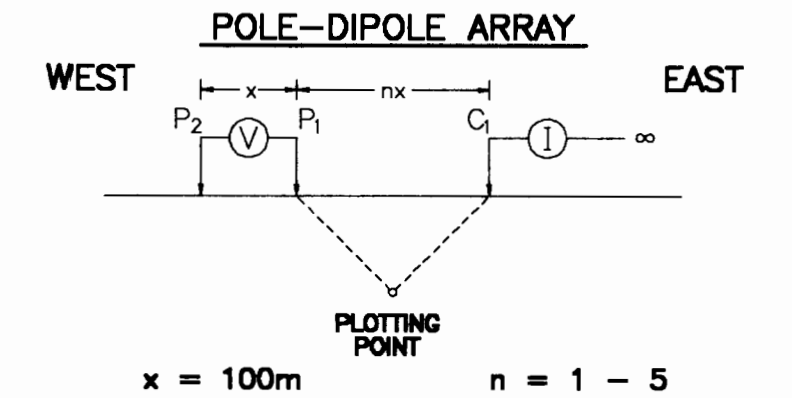
INDUCED POLARIZATION SURVEY

DRAWING NUMBER : 96392-15

GETTY COPPER INC.

CINDER HILL
LOGAN LAKE, B.C.

LINE: 5550N



CURRENT ELECTRODE C₁ EAST
OF POTENTIAL DIPOLE P₁P₂

SURFACE PROJECTION
OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

AT DEPTH

SCALE 1 : 5000

CONTOUR INTERVALS

APP.CHARGEABILITY : 0.5 (msec)

APP.RESISTIVITY : 100 (ohm-m)

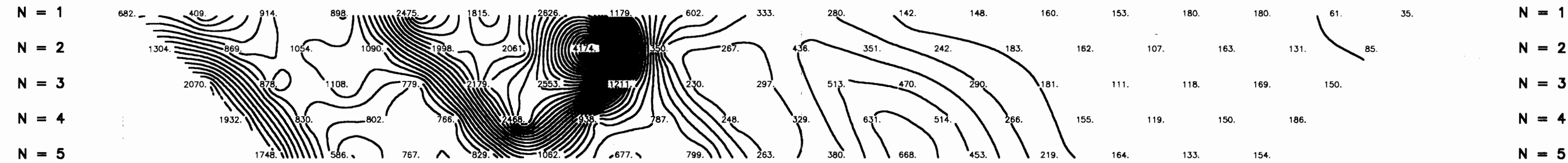
DATE SURVEYED: SEPTEMBER 10, 1998

Tx: Huntac Mk2 Model 7500

Rx: EDA IP-8

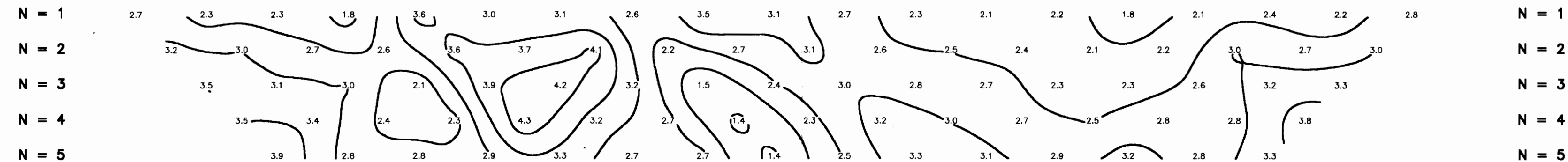
RESISTIVITY (OHM-M)

5000W 4900W 4800W 4700W 4600W 4500W 4400W 4300W 4200W 4100W 4000W 3900W 3800W 3700W 3600W 3500W 3400W 3300W 3200W



CHARGEABILITY (MSEC)

5000W 4900W 4800W 4700W 4600W 4500W 4400W 4300W 4200W 4100W 4000W 3900W 3800W 3700W 3600W 3500W 3400W 3300W 3200W



LLOYD GEOPHYSICS INC.

INDUCED POLARIZATION SURVEY

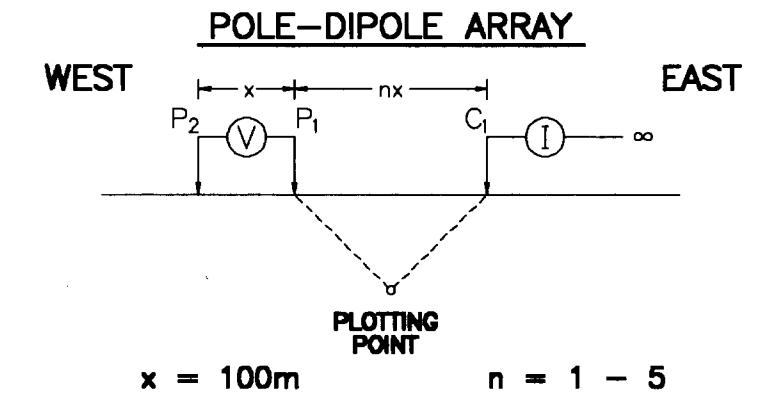
DRAWING NUMBER : 96392-16

GETTY COPPER INC.

CINDER HILL

LOGAN LAKE, B.C.

LINE: 5800N



CURRENT ELECTRODE C₁ EAST OF POTENTIAL DIPOLE PP₂

SURFACE PROJECTION OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE
- AT DEPTH

SCALE 1 : 5000

CONTOUR INTERVALS

APP.CHARGEABILITY : 0.5 (msec)

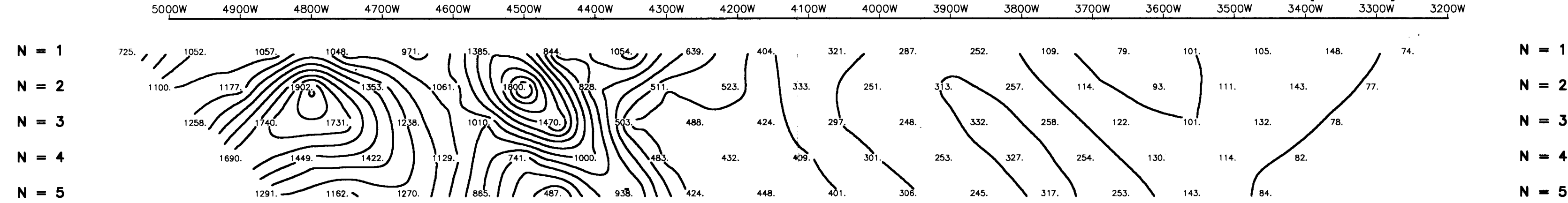
APP.RESISTIVITY : 100 (ohm-m)

DATE SURVEYED: SEPTEMBER 11, 1998

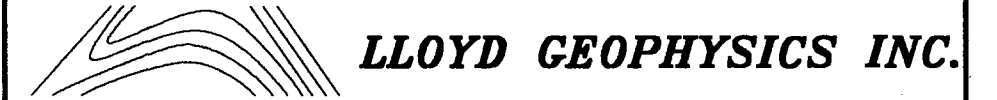
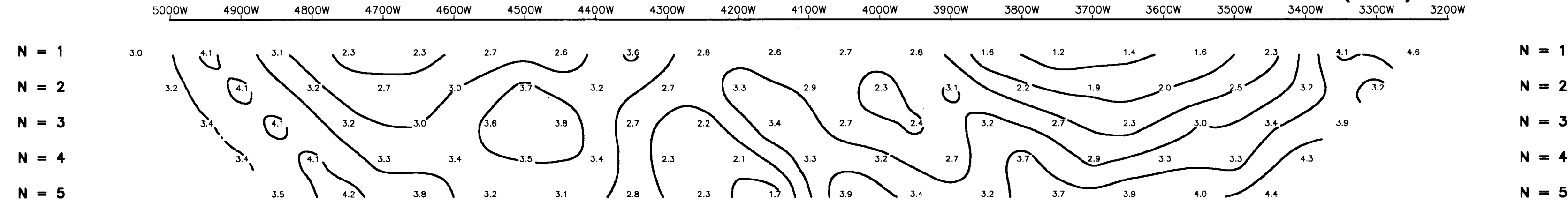
Tx: Huntec Mk2 Model 7500

Rx: EDA IP-8

RESISTIVITY (OHM-M)



CHARGEABILITY (MSEC)



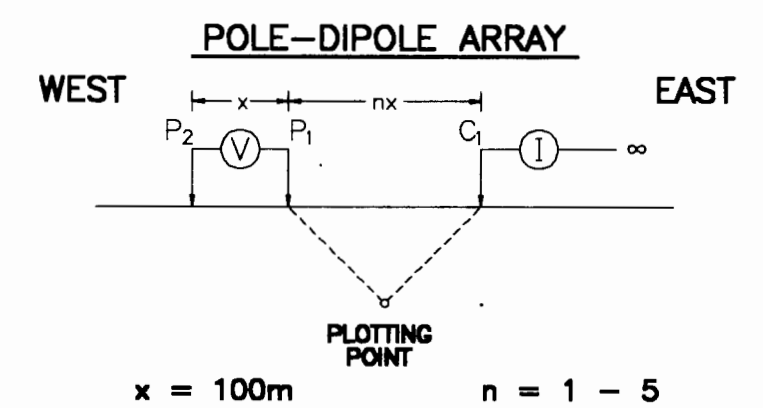
INDUCED POLARIZATION SURVEY

DRAWING NUMBER : 96392-17

GETTY COPPER INC.

**CINDER HILL
LOGAN LAKE, B.C.**

LINE: 6050N



CURRENT ELECTRODE C₁ EAST
OF POTENTIAL DIPOLE P₁P₂

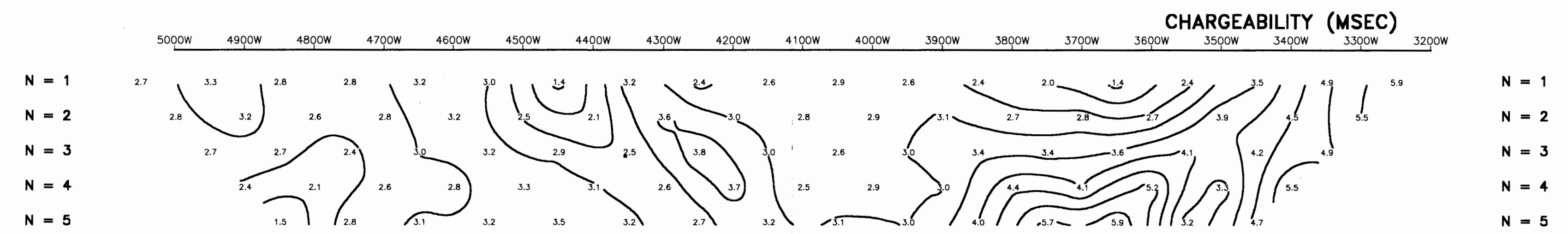
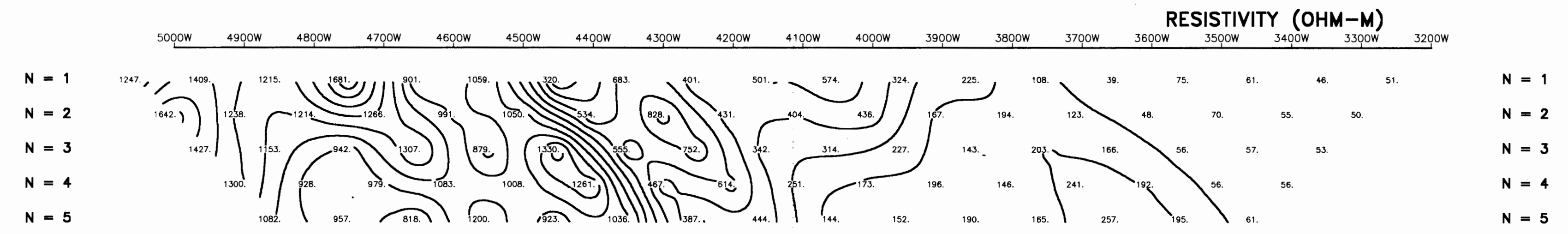
SURFACE PROJECTION
OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE
- AT DEPTH

SCALE 1 : 5000

CONTOUR INTERVALS
APP.CHARGEABILITY : 0.5 (msec)
APP.RESISTIVITY : 100 (ohm-m)

DATE SURVEYED: September 12, 1996
Tx: Huntac Mk2 Model 7500
Rx: EDA IP-8



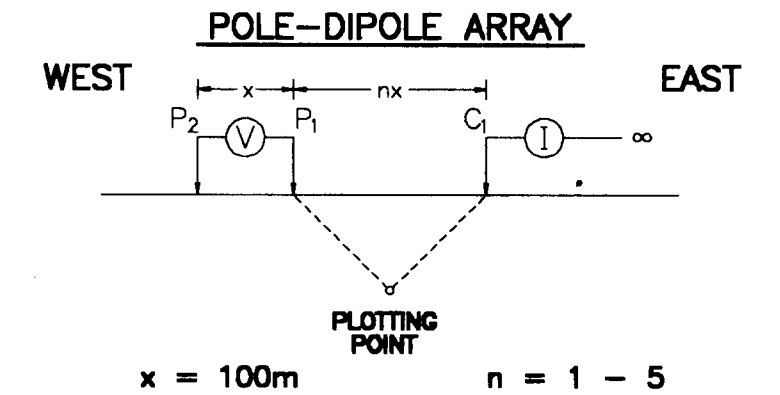
LLOYD GEOPHYSICS INC.
INDUCED POLARIZATION SURVEY
DRAWING NUMBER : 96392-18

GETTY COPPER INC.

CINDER HILL

LOGAN LAKE, B.C.

LINE: 6300N



CURRENT ELECTRODE C₁ EAST OF POTENTIAL DIPOLE PP₂

SURFACE PROJECTION OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE
- AT DEPTH

SCALE 1 : 5000

CONTOUR INTERVALS

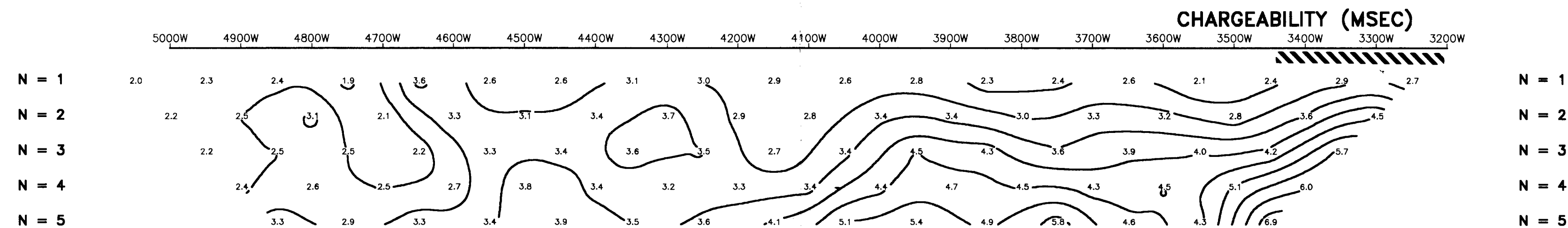
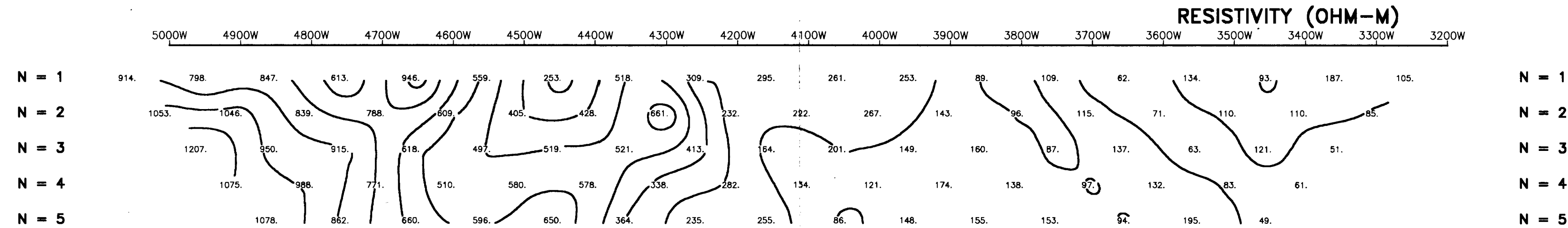
APP.CHARGEABILITY : 0.5 (msec)

APP.RESISTIVITY : 100 (ohm-m)

DATE SURVEYED: September 12, 1996

Tx: Hurtec Mk2 Model 7500

Rx: EDA IP-6



INDUCED POLARIZATION SURVEY

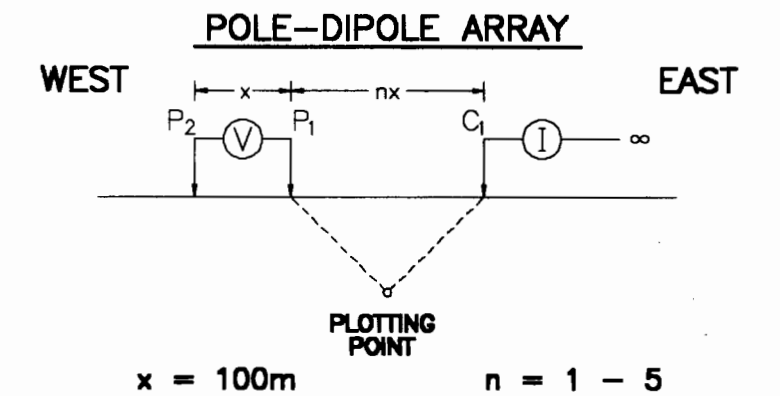
DRAWING NUMBER : 96392-19

GETTY COPPER INC.

CINDER HILL

LOGAN LAKE, B.C.

LINE: 6800N



CURRENT ELECTRODE C_1 EAST OF POTENTIAL DIPOLE PP_2

SURFACE PROJECTION OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE
- AT DEPTH

SCALE 1 : 5000

CONTOUR INTERVALS

APP.CHARGEABILITY : 0.5 (msec)

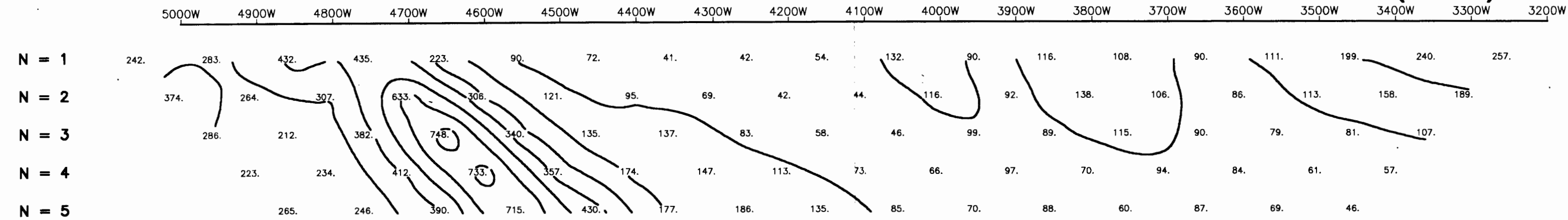
APP.RESISTIVITY : 100 (ohm-m)

DATE SURVEYED: SEPTEMBER 14, 1998

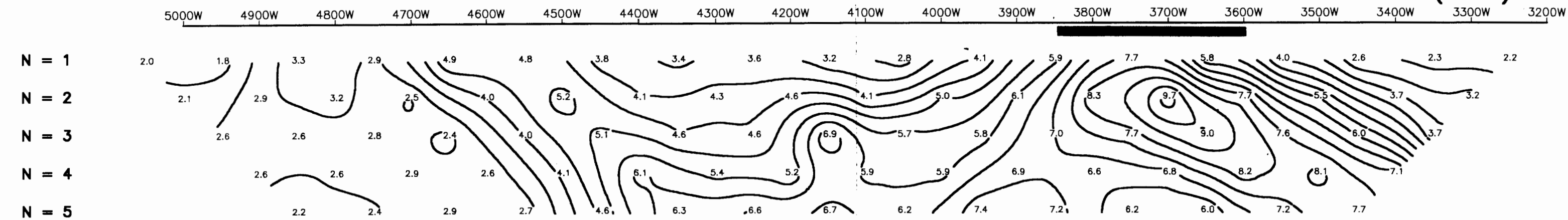
Tx: Huntec Mk2 Model 7500

Rx: EDA IP-8

RESISTIVITY (OHM-M)



CHARGEABILITY (MSEC)



LLOYD GEOPHYSICS INC.

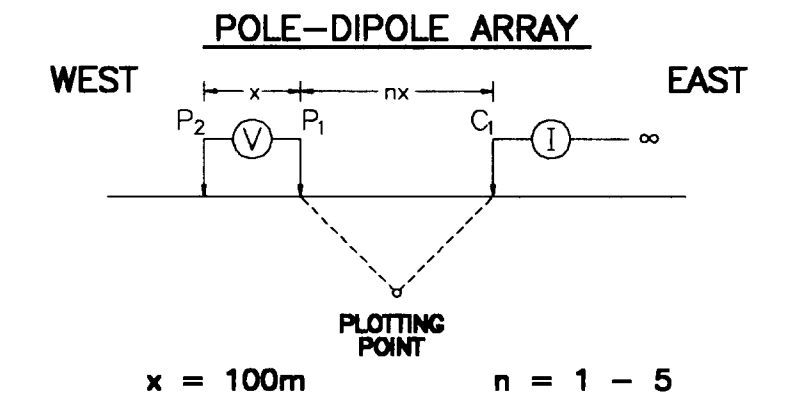
INDUCED POLARIZATION SURVEY

DRAWING NUMBER : 96392-20

GETTY COPPER INC.

CINDER HILL
LOGAN LAKE, B.C.

LINE: 7300N



CURRENT ELECTRODE C_1 EAST
OF POTENTIAL DIPOLE P_1P_2

SURFACE PROJECTION
OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE
- AT DEPTH

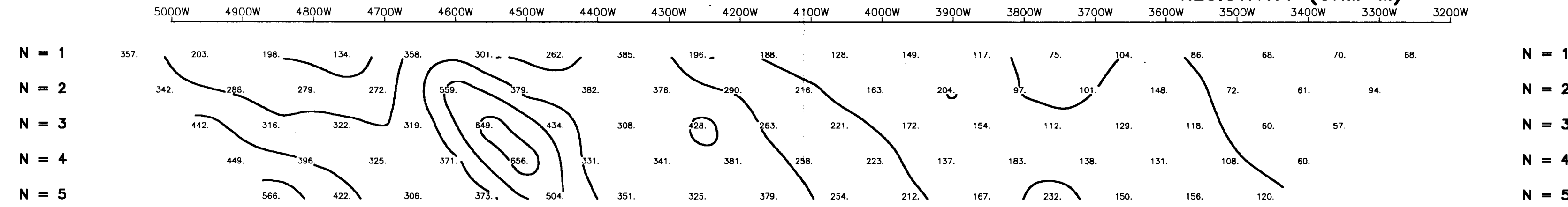
SCALE 1 : 5000

CONTOUR INTERVALS

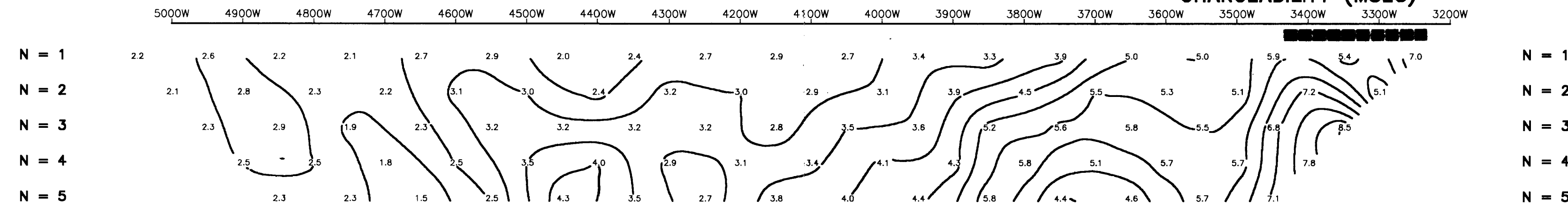
APP.CHARGEABILITY : 0.5 (msec)
APP.RESISTIVITY : 100 (ohm-m)

DATE SURVEYED: SEPTEMBER 18, 1996
Tx: Huntco Mik2 Model 7500
Rx: EDA IP-6

RESISTIVITY (OHM-M)



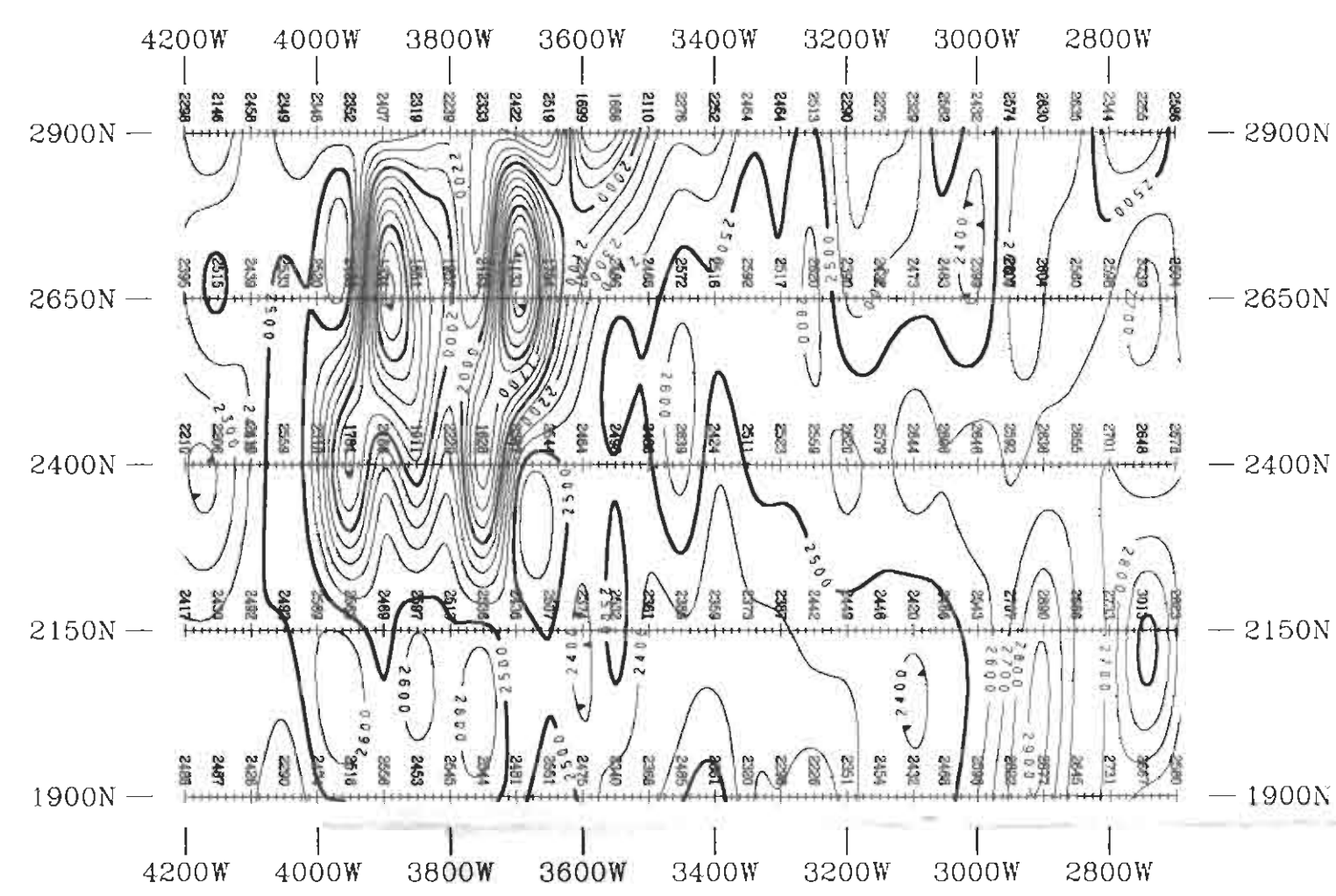
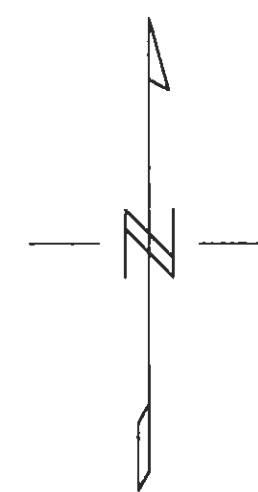
CHARGEABILITY (MSEC)



LLOYD GEOPHYSICS INC.

INDUCED POLARIZATION SURVEY

DRAWING NUMBER : 96392-21



LEGEND

CONTOUR INTERVALS	
	100 nT
	500 nT
	2500 nT

Station Separation: 12.5 metres

INSTRUMENT

EDA OMNI PLUS/ GEM GSM-19 MAGNETOMETER SYSTEM
GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

24,691

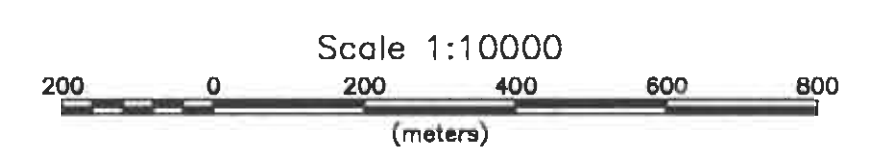
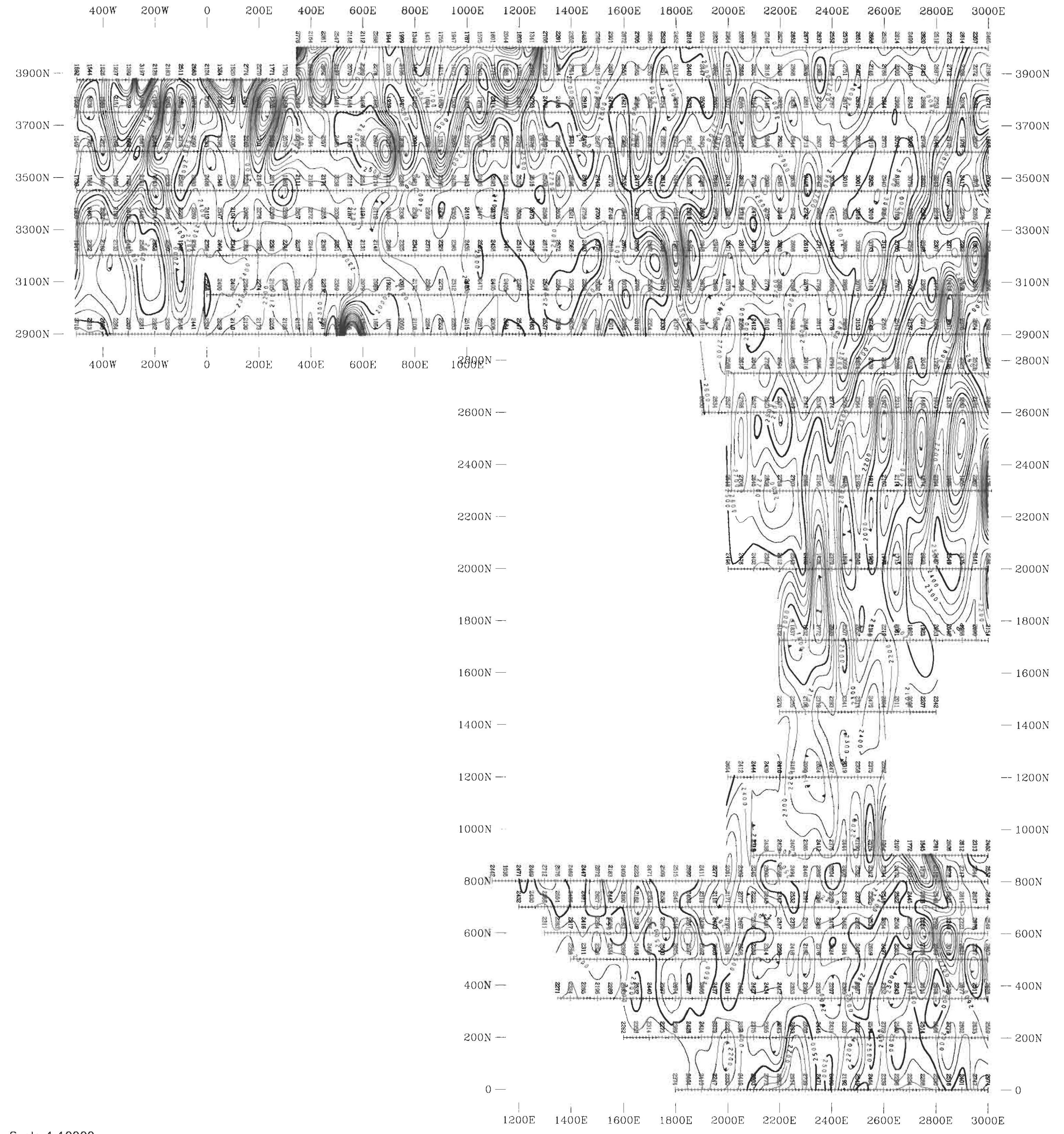
GETTY COPPER CORP.

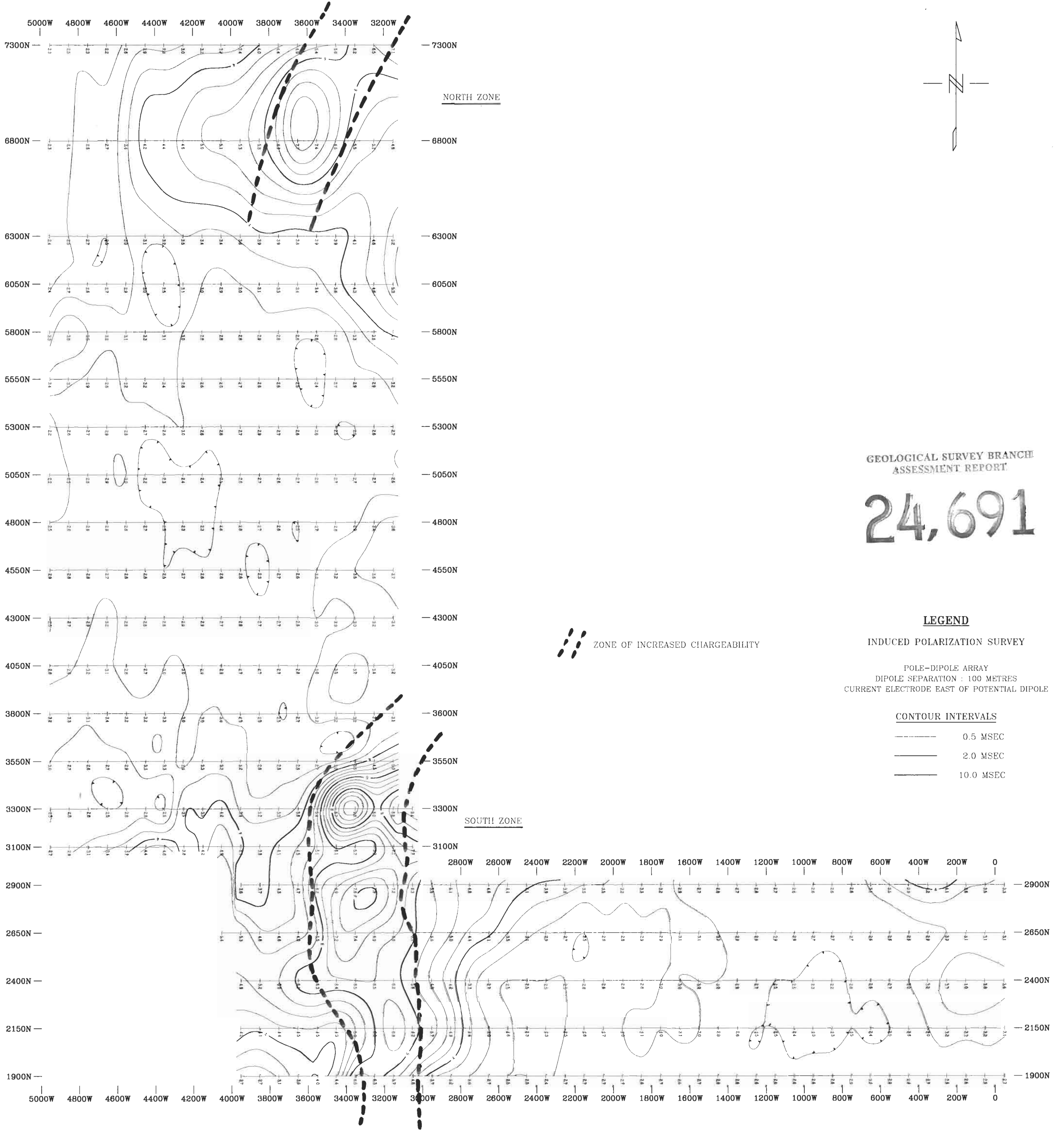
CINDER HILL
LOGAN LAKE, B.C.

TOTAL FIELD MAGNETICS

Scale 1:10000 Drawing No: 06392-22

LLOYD GEOPHYSICS INC.





GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

24,691

LEGEND

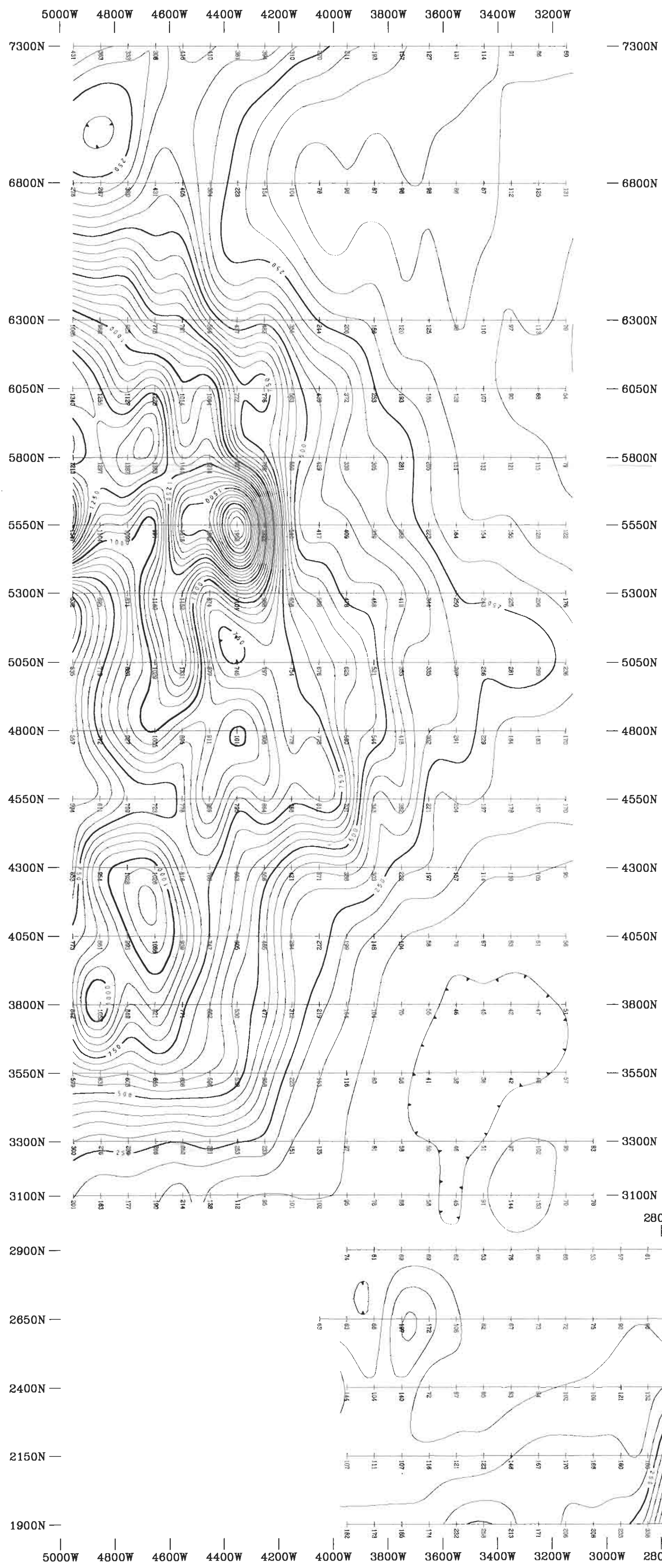
INDUCED POLARIZATION SURVEY
POLE-DIPOLE ARRAY
DIPOLE SEPARATION : 100 METRES
CURRENT ELECTRODE EAST OF POTENTIAL DIPOLE

CONTOUR INTERVALS

- 0.5 MSEC
- 2.0 MSEC
- 10.0 MSEC

Scale 1:10000
0 200 400 600
(metres)

GETTY COPPER CORP.
CINDER HILL
CHARGEABILITY
15 POINT TRIANGULAR FILTER
Scale 1:10000 Dwg. No.: 98392-23
LLOYD GEOPHYSICS INC.



GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

24,691

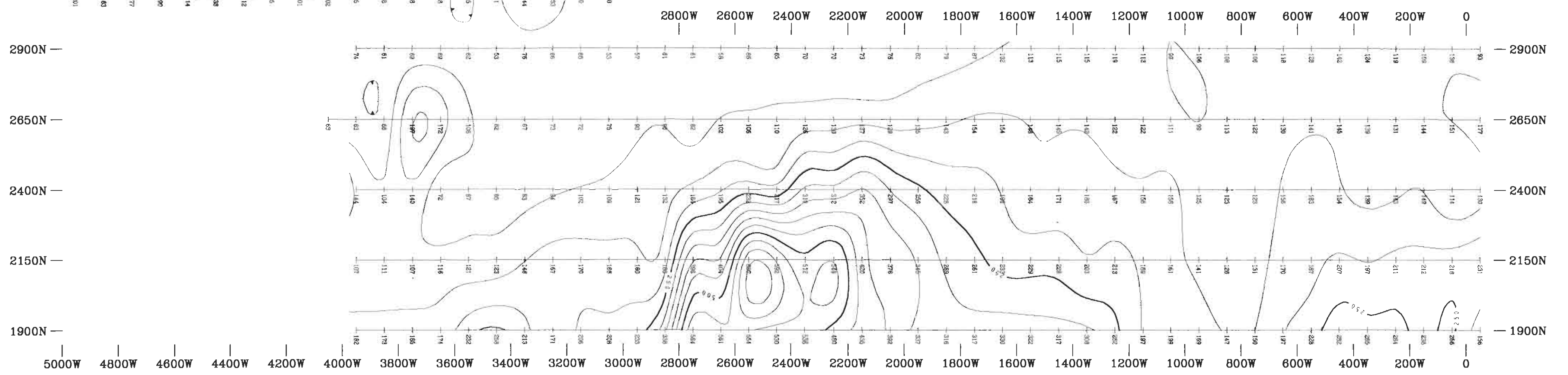
LEGEND

INDUCED POLARIZATION SURVEY

POLE-DIPOLE ARRAY
DIPOLE SEPARATION : 100 METRES
CURRENT ELECTRODE EAST OF POTENTIAL DIPOLE

CONTOUR INTERVALS

- 50 OHM-M
- 250 OHM-M
- 1000 OHM-M



Scale 1:10000
200 0 200 400 600
(metres)

GETTY COPPER CORP.

CINDER HILL

RESISTIVITY
15 POINT TRIANGULAR FILTER

Scale 1:10000 Dwg. No.: 96392-24

LLOYD GEOPHYSICS INC.

24691

PART 2 & 2

*Review of
Induced Polarization Survey
for
Getty Copper Corporation
by
Peter E. Walcott & Associates Limited*

H. Limion

April 2, 1996

24691
PART 2 of 2

Summary

An extensive IP survey carried out by Peter E. Walcott & Associates Limited in the summer of 1995 produced discrete chargeability anomalies and indicated zoning in ground resistivity. The chargeability anomalies have been graded and plotted on an accompanying map. They are most likely caused by metallic minerals such as pyrite, pyrrhotite, chalcopyrite, other sulphides and possibly graphite. Some anomalies are very definite, and should be easily found in diamond drill core. Other targets are weaker and may have more subtle causes.

Resistivity zoning could reflect bedrock geology and alteration. Pervasive silicification can increase apparent resistivity, while argillite alteration can decrease it. Resistivity is a measure of rock porosity in this environment.

IP Survey

The survey was carried out in the summer of 1995, and covered about 32 lines with approximately 120 km of survey. Data were collected with a pole-dipole array, an electrode spacing of 100 m, and separations of $n = 1$ to $n = 6$.

Data quality, judging by coherence of readings, looks good.

Registration

There was some question about registration of survey lines to topography. For this compilation, registration used by Walcott on the chargeability contour map has been adopted. IP anomalies were plotted relative to lines, as were resistivity zones. The relative position of lines and UTM co-ordinates needs to be confirmed.

IP Chargeability Anomalies

IP chargeability anomalies have been picked from the chargeability pseudo-section, supported by resistivity and metal factor data. An attempt has been made to present the surface trace of the anomaly in its most narrow aspect.

In general, anomalies are near surface, discrete and narrow. The most distinct anomalies are centred near 2000 E on line 3450 N. These are in a high resistivity area. There is another line of anomalies in a low resistivity area approximately 1500 m west of these. About 400 m east of the major anomalies, is a north-south zone of weaker chargeability. Other north-south sets of chargeability anomalies are found centred at 2200 E on line 500 N, at 2500 E on line 5100 N, and at 3500 E on line 5100 N.

The most definite chargeability trends are those centred at 2000 E on line 3450 N, at 500 E on line 3450 N and at 2200 E on line 500 N. The other individual and grouped targets are also of interest for exploration. Known geology and mineralization must be factored in assessing importance for drilling.

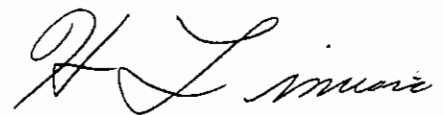
IP Resistivity Regions

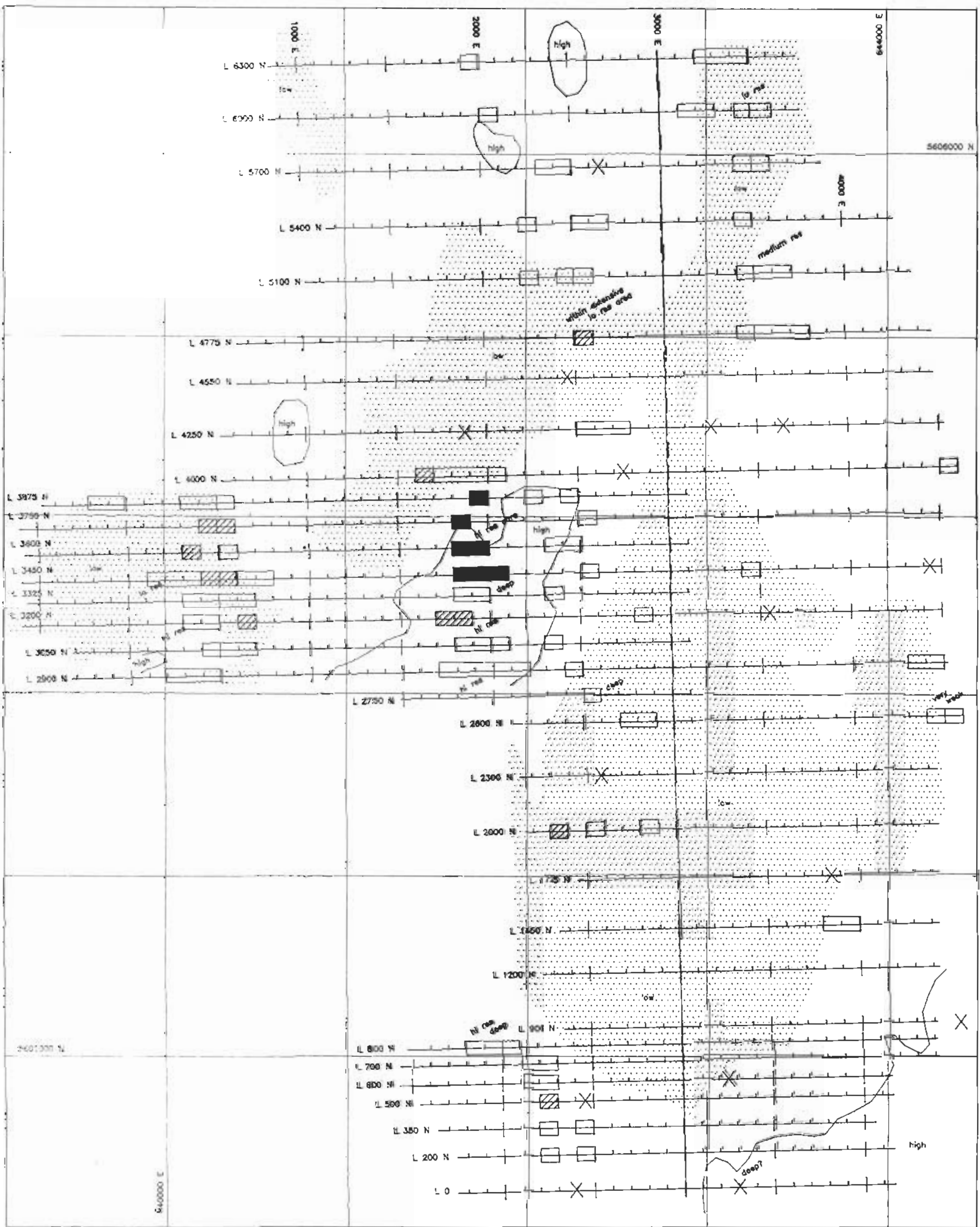
Filtered resistivity contours produced by Walcott have been abstracted in the compilation. The area can be divided into three resistivity regimes: high, medium and low. High and low areas are outlined.

It is recommended that these areas be examined for lithology and alteration. It is quite possible that a relationship can be established. Further interpretation could define the boundaries and help map possibly significant areas.






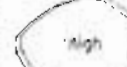
Final Interpretation

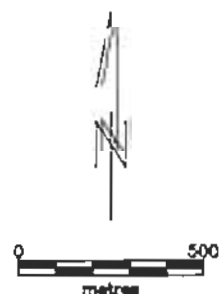
The boundaries of chargeability anomalies and regions of resistivity have been plotted. IP anomalies should be collected into zones of interest, based on geology, geochemistry and other work.





LEGEND

-  strong
 -  medium
 -  weak
 -  possible
 -  Position of IP Resistivity Regions
 -  high
- Interpreted position of IP Chargeability Anomaly



GETTY COPPER CORPORATION
HIGHLAND VALLEY PROJECT
IP Survey Compilation

Survey by Peter E. Walcott & Associates Limited
 Pole - Dipole Array
 a = 100 m, n = 1 to 6, Current to East
 SW British Columbia, NTS 92 11 10 & 11

Toronto April 1995

*Review of
Drilling over Previous Geophysics
IP and Magnetics in Target Areas
and an
Induced Polarization Survey
for
Getty Copper Corporation*

H. Limion

October 28, 1996

Summary

Drilling over an extensive IP survey produced some drill results that intersected sufficient sulphides and some that failed to intersect enough sulphides to explain chargeability anomalies. The most intense IP anomaly is easily explained at its core. On the flanks of the strong anomaly, and on weaker anomalies, drill results are not always definitive.

South of the Getty North deposit, IP anomalies are weaker but copper mineralization may be more encouraging than at the Getty North deposit. This area, the Getty West area and the Getty South area are worth re-examination.

A review of induced polarization anomalies and a recent magnetic survey allow for a better description of geophysical characteristics. The Getty North area appears to occur in a region of decreased magnetic susceptibility. The area south of Getty North appears to be in a magnetic high. The chargeability anomalies south of Getty North occur at the contact between high and low resistivity rocks, and are poorly defined. At Getty West, there appear to be two sets of concentric IP anomalies, about 300 - 400 m apart. The western one is in high resistivity rocks, the eastern one is in low resistivity rocks and may have increased magnetite content. At Getty South, the two parallel IP anomalies appear to occur in higher resistivity rocks. Magnetics shows a region of low magnetic field strength.

The Cinder Hill IP survey contains one trend of high chargeability anomalies in a conductive (Tertiary?) environment. There are several other IP anomalies that are probably caused by an increase in metallic mineral content. The trend of strongest IP may be coincident with a magnetic high, and is definitely flanked by a magnetic low to the west.

- 3 -

Drill results

Drilling in 1996 has shown some correlation between IP and metallic mineral content. Holes 96-16, 96-17 and 96-19 have intersected sufficient sulphides to explain the IP chargeability, with hole 96-17 showing 2-5 % sulphides over 132 m. Hole 96-18 does not indicate enough sulphides; possibly the hole has overshot a deep target. Holes 96-34 and 96-22 did not locate enough sulphides. Hole 96-24 shows a very small percentage of sulphides. Possibly the hole was too short to reach the target.

For the Getty North area, the IP anomaly appears to deepen south of line 3450 N. Any attempt to reach the target should be targetted at deeper than 150 metres.

South of Getty North

This area, sited near 2400 E / 2900 N has given some encouraging copper assays.

IP anomalies in this region are weak, indicating small (1% ?) sulphide content. The area is at the border of low/high resistivity, which will also complicate chargeability readings. The low resistivity side of the contact has higher magnetic field strengths, which can be traced from 2200 E / 2300 N to 2700 E / 3600 N.

Getty West

There is a good possibility that there are two parallel IP anomalies in this area, extending from 2900 N to 3450 N.

The western IP anomaly is resistive. It extends from 400 E / 2900 N to 600 E / 3450 N and may extend farther north. The eastern anomaly is relatively conductive and deep. It extends from 600 E / 2900 N to 900 E / 3450 N.

Both of these anomalies should be caused by higher than normal sulphide concentrations.

- 4 -

Getty South

The two sets of IP chargeability anomalies appear to occur in discrete, relatively resistive units. This should be manifested by changes in rock type or alteration. The anomalies extend at least 300 m from 200 N to 500 N, and probably even farther. The area of IP anomalies is in an area of relative magnetic low.

Cinder Hill IP Survey

This survey was carried out by Lloyd Geophysics in the late summer of 1996. Specification were as for the Getty survey, with a pole-dipole array, a spacing of 100 m, n = 1 to 6 and current electrodes to the east. Location of the grid relative to the original Getty grid was not definitely available, so results have been plotted on an idealized set of co-ordinates.

Resistivity results show regions of distinctive low resistivity, probably coincident with Tertiary cover. These have been marked on the accompanying map.

Chargeability anomalies are mostly in the low resistivity regions. Some of these anomalies are definite, especially the one extending from 3500 W / 1900 N to 3600 W / 4050 N. At the south end, the resistivity of the anomalous unit increases. It has possible magnetic high association, and is bounded to the west by a magnetic low.

IP anomalies on the interpretation map have been marked as to whether they are considered to be deep (>100 m) in origin and whether they occur in relatively higher or lower resistivity rocks.

- 5 -

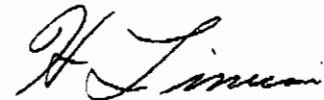
Conclusions and Recommendations

Drill results and core need to be reviewed for IP anomalies; that is, the percentage sulphides should be assessed to see if there is correlation between chargeability and mineralization.

In the area south of Getty North, IP anomalies are weak. Further work to integrate geology, mineralization and geophysics may be warranted in view of encouraging copper values.

At Getty West and Getty South, the IP anomalies appear to occur with definite strike. These areas will also require a further integration of geology, mineralization and geophysics.

The Cinder Hill IP survey has revealed IP chargeability anomalies ranked from definite to weak. These should be ranked on the basis of mineralization and geology.



**BOTTLE ROLL TESTING
OF SAMPLES FROM
THE GETTY NORTH DEPOSIT**

GETTY COPPER CORP.

JANUARY 1994

BEATTIE CONSULTING LTD.

VANCOUVER, B.C. CANADA

BEATTIE CONSULTING LTD.

2955 WEST 38th AVENUE
VANCOUVER, B.C.
V6N 2X2

TEL.(604) 263 0695
FAX.(604) 263 0695

January 26, 1994

Getty Copper Corp.
1000 Austin Ave.
Coquitlam, B.C. V3K 3P3
Canada

ATTENTION: Mr. J.B. Lepinski

Dear John,

Enclosed please find my report on the bottle roll testwork which was recently conducted by Process Research Associates Ltd. on the assay rejects from the 1993 drill program. As you will note in the report, the testwork was very encouraging in that it shows consistency in the metallurgical response of samples representing a cross section of the oxide zone in the Getty Deposit.

I look forward to participation in the further development of this project and would be pleased to discuss the results of the testwork once you have had an opportunity to review the report.

Yours truly,

BEATTIE CONSULTING LTD.



Dr. M.J.V. Beattie, P. Eng.

1.0 SUMMARY

Bottle roll leaching testwork has been conducted on a series of drill core rejects from the Getty North Copper deposit. The tests were conducted on composite samples from surface to a depth of 435 feet which had been crushed to nominally minus 3/4 inch although one sample was predominantly minus 6 mesh. The head grade of the composites varied from 0.28 to 1.32 % Cu. The test results demonstrated the following:

1. The copper extraction from the core samples achieved in a 6 day test varied from 67.5% to 92.0% except for one partially oxidized sample which achieved 43.5%. Comparing these results to those for a previous sample for which both bottle and column tests were conducted suggests that a heap leach extraction of 80% should be achievable for oxide ore from the various areas of the Getty North deposit which were tested. For material which is only partially oxidized, such as the deeper material from hole no. 2 (test L4), bacterial oxidation would be required to achieve this extraction.

The copper extraction obtained from different sections of the deposit is dependent only on the crush size of the rock and the degree of oxidation. For drill hole no. 1 for instance, the extraction in the six day tests was 67.5 to 71.9 % over the entire 435 feet represented by the composite samples.

2. The acid consumption in the bottle roll tests varied from 11.8 to 17.4 kg/tonne except for one sample which required 23.8 kg/tonne. Although limited data are available to correlate the bottle results to those to be achieved in heap leaching of material from this deposit, it appears that an acid consumption of 25 kg/tonne may be a reasonable expectation based on results to date. Optimization of operating procedures through further testing holds forth the possibility of achieving lower acid consumption.

2.0 INTRODUCTION

Preliminary metallurgical testwork on a bulk surface sample from the Getty Copper deposit was conducted by Bacon, Donaldson & Associates (BDA) in 1989. This testwork demonstrated by means of bottle roll and column testwork that the oxidized surface mineralization in this deposit is amenable to copper extraction by means of acidic heap leaching.

During 1993, a drill program was conducted by Getty Copper in order to confirm the presence of both oxide and sulphide copper mineralization and to provide samples for additional metallurgical testwork. The present report summarizes the results of bottle roll testwork conducted on crushed drill core from the 1993 program. All testwork was conducted by Process Research Associates Ltd. of Vancouver, in consultation with M. J. V. Beattie, P.Eng.

3.0 DISCUSSION

3.1 Sample description

A total of eight bottle roll tests were conducted by Process Research. The details of the individual assay rejects used to prepare the composites used for testing are included in Appendix A. The make-up of the composites is summarized in Table 3.1.

Table 3.1
Make-up of Composite Samples

TEST NO.	COMPOSITE	HOLE No.	FOOTAGE	
			From	To
L1	A	1993-1	94	235
L2	B	1993-1	235	335
L3	C	1993-1	335	435
L4	E	1993-2	100	210
L5	D	1993-2	40	100
L6	F	1993-3	30	60
L7	G	1993-5	29	129
L8	H	1993-5	129	219

The drill core had been crushed by Eco Tech Laboratories of Kamloops, B. C. All the samples had been crushed to at least minus 3/4 inch but showed considerable variation in their size distribution, being 77% to 87% passing 3/8 inch. Composite G, which was used for test L7,

had been inadvertently crushed to minus 6 mesh. The size distribution of each composite following the leaching is included with the test details in Appendix B.

3.2 Procedure

A standardized bottle roll procedure was used for all the tests. The test was initiated by combining 2 kilograms of the composite sample with an equivalent weight of solution containing 15 g/L H₂SO₄ in a large bottle. The bottle was placed on rollers and was periodically (once per hour) rotated to allow fresh solution to contact the rock. After set time intervals the sample was filtered and the pregnant leach solution was replaced with fresh acid solution. After 144 hours (6 days) of leaching, the solids were filtered, washed and analyzed for residual copper.

The pregnant solution from each leach cycle was analyzed for copper and residual free acid as well as pH, and solution potential.

3.3 Results

The detailed results for each test are included in Appendix B. The results are summarized in Table 3.2

Table 3.2
Results of bottle roll testwork

TEST NO.	COMP	% Oxdn.	Cu Extn. %	NET ACID kg/tonne	FEED Cu %	RESIDUE % -3/8"
L1	A	86.0	67.5	15.9	0.43	77.3
L2	B	89.3	71.9	23.8	0.28	87.0
L3	C	88.2	67.8	13.6	0.34	81.8
L4	E	64.5	43.5	17.4	0.31	83.4
L5	D	87.5	72.6	14.2	0.48	83.8
L6	F	96.2	85.4	14.2	1.32	86.4
L7	G	96.1	92.0	16.6	1.02	100
L8	H	89.8	78.4	11.8	0.59	86.2

The progression of copper leaching with time is summarized in Figures 3.1 and 3.2. The results for L1 through L3 are very similar, consistent with the similar copper content and degree of oxidation for these samples. Test L4 shows a slower extraction rate which can be explained by the fact that this composite is only 65% oxidized.

GETTY COPPER BOTTLE ROLL TESTS

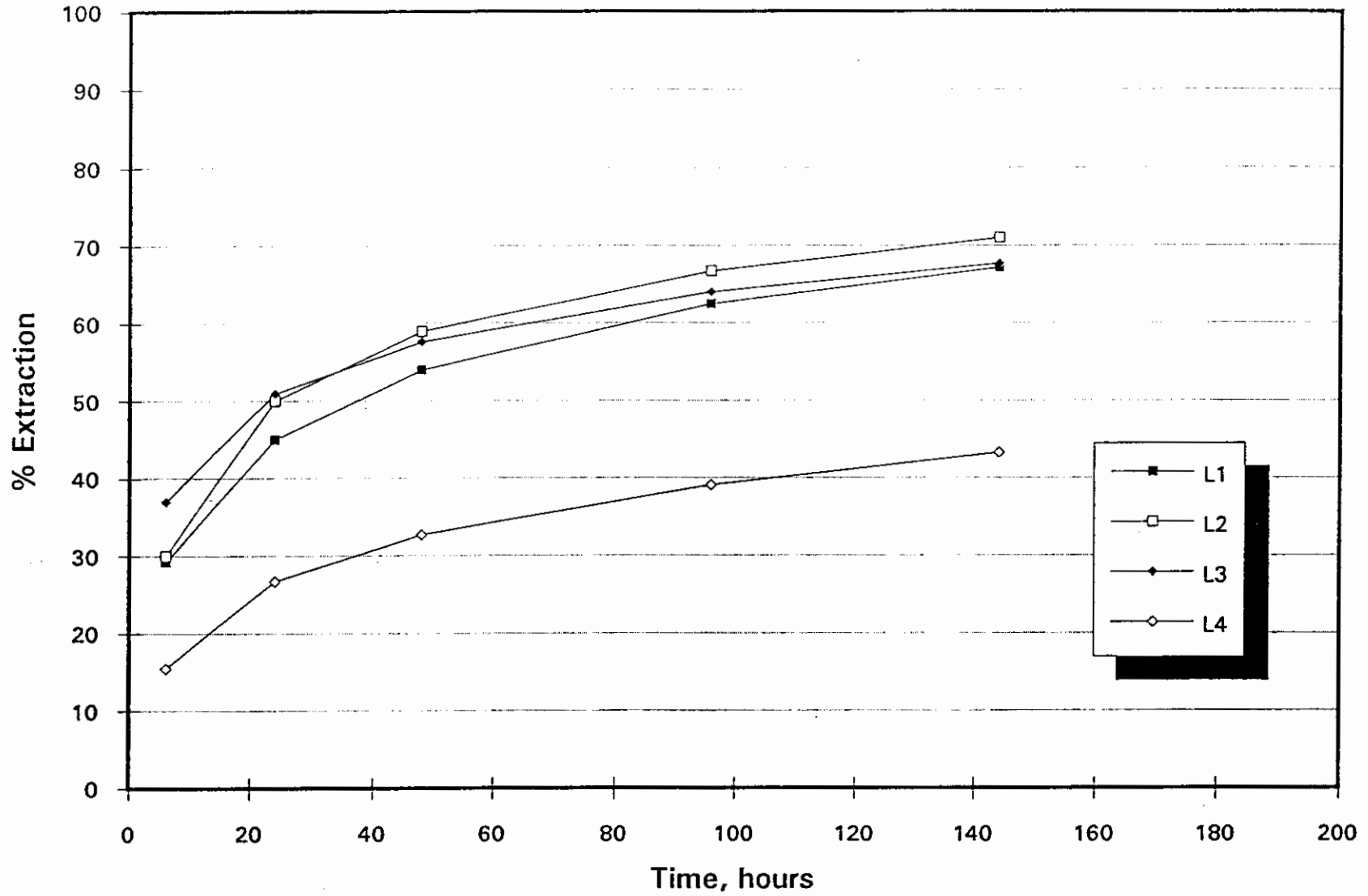


Figure 3.1

GETTY COPPER BOTTLE ROLL TESTS

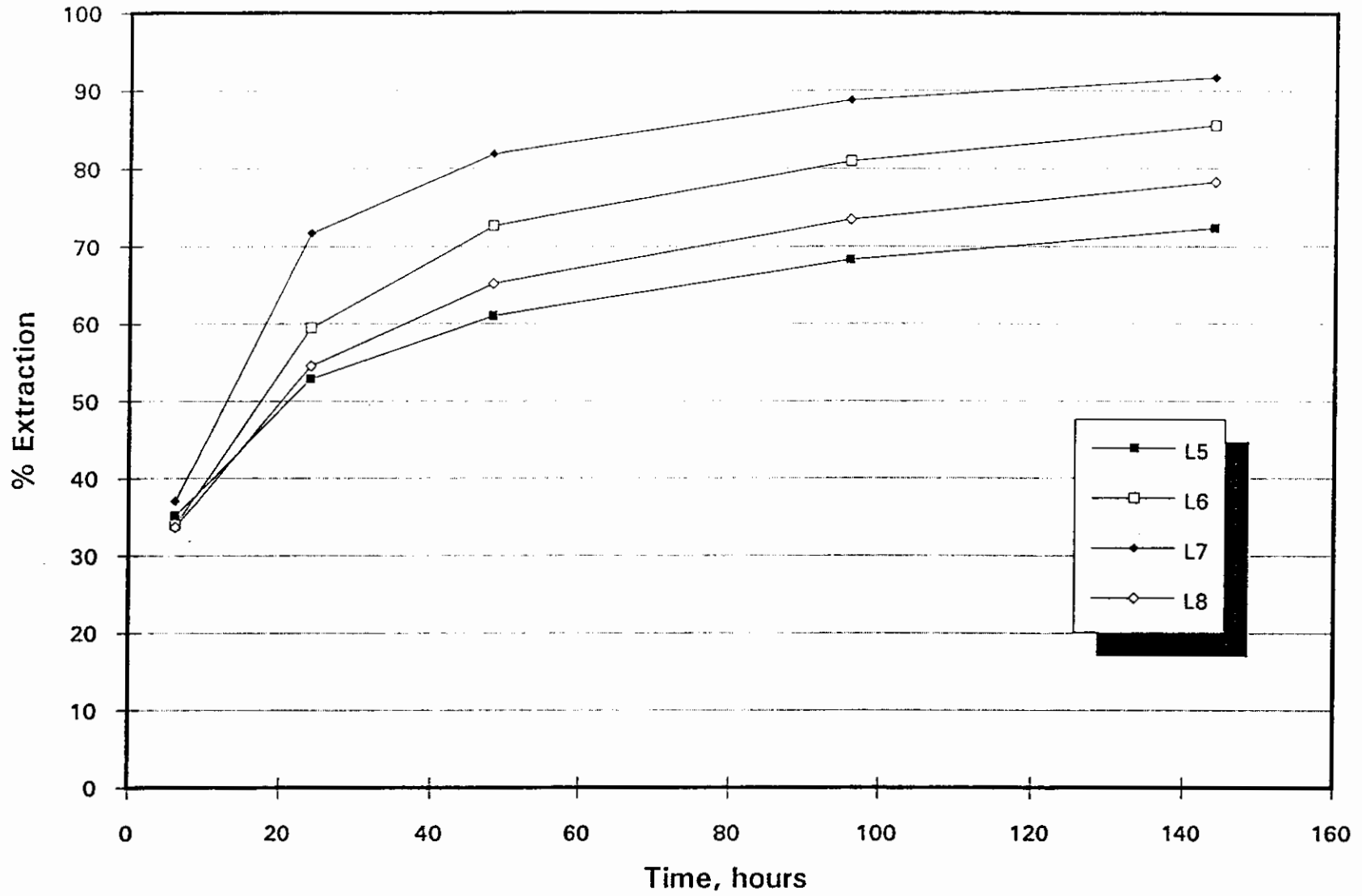


Figure 3.2

The results in Figure 3.2 are also consistent with the varying composition and size of the samples used for each test. L6 and L7 had the highest feed assays of 1.32 and 1.02 % Cu respectively and demonstrated the highest leach rates. Test L7 had a very fine size distribution compared to the other samples and consequently exhibited the highest leaching rate of all the tests and had a copper extraction of greater than 90% after 144 hours.

For the purpose of comparison, the bulk surface sample tested by BDA achieved copper extractions of 76 to 79% over a 120 hour (5 day) leach period with a feed assay of 1.80% copper which was essentially 100% in oxide form. Subsequent column testing of this material crushed to minus 3/4 inch resulted in a copper extraction of 80% after 66 days of leaching. The present drill core rejects have comparable bottle roll results to that of the bulk surface sample. The semi-log plots for the current testwork of copper extraction as a function of log-time included as figure 3 indicate that, with the exception of composite E, the samples should all achieve a copper extraction of at least 80% with extended leaching.

The acid consumption in the present tests ranged from 11.7 to 17.4 kg/tonne with the exception of test L2 (Composite B) which had an anomalously high consumption of 23.8 kg/tonne. Considering the longer duration of the present tests compared to the BDA tests the acid consumptions are comparable to the 9.7 to 12.5 kg/tonne experienced in the previous testwork. The subsequent column testwork on the surface composite conducted by BDA consumed 25.8 kg/tonne. It appears that similar consumptions can be anticipated for all the present samples except composite B which may show a higher consumption. It should be noted that the BDA column was preliminary in nature and that by optimizing the acid addition strategy and including solvent extraction in the test, the potential exists to decrease the acid requirement.

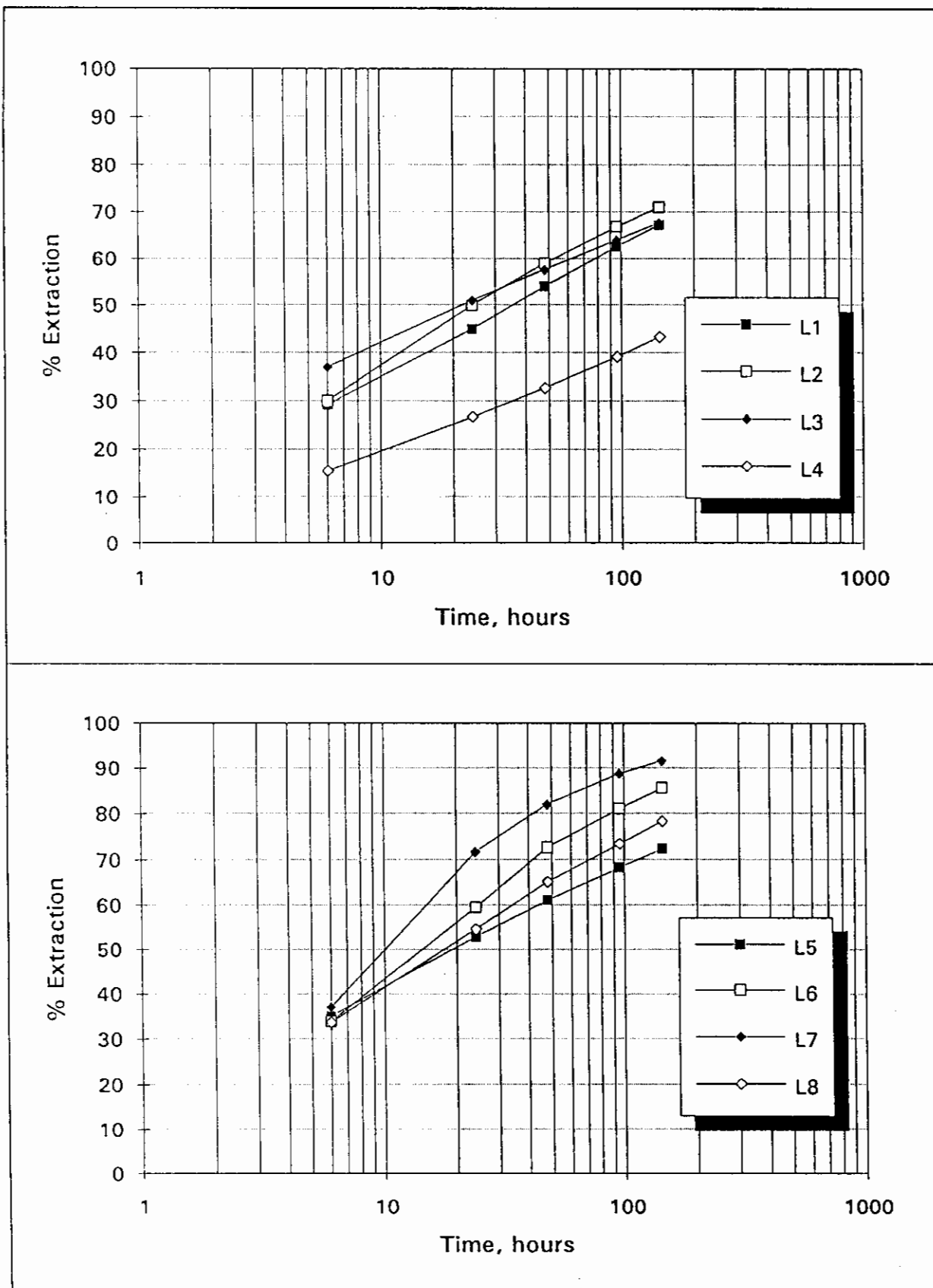


Figure 3.3

Appendix A
Sample details

COMPOSITE A

Sample	Weight, g
120001	2827.3
120002	3307.8
120003	3223.7
120004	2483.3
120005	3182.9
120006	3544.6
120007	2977.7
120008	2305.6
120009	2097.3
120010	2472.1
120011	2718.8
120012	2442.1
120013	2054.7
120014	2744.5

COMPOSITE D

Sample	Weight, g
122051	2748.5
122052	2921.4
122053	3217.2
122054	2674.0
122055	3340.5
122056	3100.4

COMPOSITE B

Sample	Weight, g
120015	2331.5
120016	2721.9
120017	2296.3
120018	2318.3
120019	1805.1
120020	2462.5
120021	2283.8
120022	2472.8
120023	2714.9
120024	2214.3

COMPOSITE E

Sample	Weight, g
122057	1515.6
	1223.0
122058	1248.3
	1485.0
122059	1282.7
	1507.3
122060	1459.6
	1919.6
122061	1446.6
	1273.7
122062	1562.8
	1520.9
122063	1247.0
	1584.5
122064	1643.5
	1307.9
122065	1461.0
	1807.8
122066	1522.9
	1463.6
122067	1531.1
	1676.5

COMPOSITE C

Sample	Weight, g
120025	2676.4
120026	3077.9
120027	2197.0
120028	2241.4
120029	3146.8
120030	3738.2
120031	3279.4
120032	3541.7
120033	2511.3
120034	3266.6

COMPOSITE F

Sample	Weight, g
122501	1534.5
	957.4
122502	1776.5
	1594.8
122503	1521.6
	1149.0

COMPOSITE G

Sample	Weight, g
122569	1055.8 746.9
122570	1556.5 1032.7
122571	1541.9 1133.2
122572	1333.5 1363.6
122573	1659.3 1505.5
122574	1912.7 1565.4
122575	1190.1 686.7
122576	1391.9 1452.7
122577	935.2 1021.0
122578	1265.5 1582.5

COMPOSITE H

Sample	Weight, g
122579	1130.6 835.1
122580	1623.8 1012.5
122581	1265.6 1402.4
122582	1399.5
122583	1617.1 1720.7
122584	1775.4 1350.2
122585	1525.4 1207.2
122586	1271.5 1151.2
122587	1310.1 2111.9

Appendix B
Testwork details

BOTTLE ROLL SULPHURIC ACID LEACHING OF GETTY OXIDE ORES

File No: 93 - 061

Date: 6-Dec-93

Test No: L1

Sample Description: Composite A

TEST CONDITIONS:

Solids: 2000 g
 H₂O: 2000 g
 % Solids: 50%
 Solution Strength: 15 g/l H₂SO₄
 Test Duration: 144 hours

TEST DESCRIPTION:

-solids and acid solution combined in large bottle
 -bottles placed on rollers
 -each day, acid solution decanted and replaced with fresh solution
 -decanted solution analyzed for Cu, free acid, and pH
 -test ended after 144 hours
 -solids washed and wash solutions analyzed
 -final solids assayed for TOTAL COPPER, OXIDE COPPER

TEST RESULTS:

Solution Analyses:

TIME hrs	PLS (ml)	COPPER		ORP mV	pH	H ₂ SO ₄	
		(g/l)	(g)			(g/l)	(g)
6	1857	1.26	2.34	465	1.36	8.78	16.30
24	1973	0.77	1.52	449	1.15	10.48	20.68
48	1971	0.41	0.81	445	1.16	11.94	23.53
96	1974	0.38	0.74	438	1.15	10.97	21.65
144	2008	0.21	0.43	437	1.48	11.79	23.67
wash	863	0.02	0.02				
TOTAL			5.86				105.84

Solids Analyses:

TIME	SAMPLE SIZE (g)	TOTAL COPPER		OXIDE COPPER		IRON	
		(%)	(g)	(%)	(g)	(%)	(g)
144	1859	0.152	2.83	0.086	1.60		0.00
TOTAL			2.83		1.60		0.00

CALCULATIONS:

TIME	COPPER EXTRACTION				ACID CONSUMPTION		NET Acid Kg/tonne
	INDV. %	CUM. %			INDV. kg/tonne	CUM. kg/tonne	
6	29.25%	29.25%			6.22	6.22	4.41
24	15.76%	45.00%			4.08	10.30	7.32
48	8.99%	54.00%			3.00	13.29	9.69
96	8.52%	62.52%			3.99	17.28	13.10
144	4.74%	67.25%			3.16	20.44	15.93
wash	0.22%	67.47%				20.44	15.93
TOTAL		67.47%				20.44	

HEAD GRADE:

	TOTAL COPPER	OXIDE COPPER	IRON
ASSAY HEAD			
CALCULATED HEAD	0.43%	0.37%	

BOTTLE ROLL SULPHURIC ACID LEACHING OF GETTY OXIDE ORES

File No: 93 - 061

Date: Dec.6,1993

Test No: L2

Sample Description: Composite B

TEST CONDITIONS:

Solids: 2000 g
 H₂O: 2000 g
 % Solids: 50%
 Solution Strength: 15 g/l H₂SO₄
 Test Duration: 144 hours

TEST DESCRIPTION:

-solids and acid solution combined in large bottle
 -bottles placed on rollers
 -each day, acid solution decanted and replaced with fresh solution
 -decanted solution analyzed for Cu, free acid, and pH
 -test ended after 144 hours
 -solids washed and wash solutions analyzed
 -final solids assayed for TOTAL COPPER, OXIDE COPPER

TEST RESULTS:

Solution Analyses:

TIME hrs	PLS (ml)	COPPER		ORP mV	pH	H ₂ SO ₄	
		(g/l)	(g)			(g/l)	(g)
6	1906	0.82	1.56	452	1.47	4.89	9.32
24	1899	0.61	1.16	457	1.17	8.53	16.20
48	1921	0.31	0.59	450	1.11	11.17	21.46
96	1977	0.22	0.44	439	1.13	10.72	21.19
144	1983	0.12	0.25	434	1.42	11.79	23.38
wash	998	0.06	0.06				
TOTAL			4.06				91.55

Solids Analyses:

TIME	SAMPLE SIZE (g)	TOTAL COPPER		OXIDE COPPER		IRON	
		(%)	(g)	(%)	(g)	(%)	(g)
144	1845.1	0.086	1.59	0.046	0.85		0.00
TOTAL			1.59		0.85		0.00

CALCULATIONS:

TIME	COPPER EXTRACTION				ACID CONSUMPTION		NET Acid Kg/tonne
	INDV. %	CUM. %			INDV. kg/tonne	CUM. kg/tonne	
6	29.66%	29.66%			10.11	10.11	8.90
24	19.93%	49.59%			5.99	16.10	14.01
48	9.68%	59.26%			3.50	19.61	17.05
96	7.46%	66.73%			4.13	23.74	20.84
144	4.26%	70.98%			3.16	26.90	23.81
wash	0.92%	71.90%			0.00	26.90	23.76
TOTAL		71.90%				26.90	

HEAD GRADE:

	TOTAL COPPER	OXIDE COPPER	IRON
ASSAY HEAD			
CALCULATED HEAD	0.28%	0.25%	

BOTTLE ROLL SULPHURIC ACID LEACHING OF GETTY OXIDE ORES

File No: 93 - 061

Date: Dec. 6, 1993

Test No: L3

Sample Description: Composite C

TEST CONDITIONS:

Solids: 2000 g
 H₂O: 2000 g
 % Solids: 50%
 Solution Strength: 15 g/l H₂SO₄
 Test Duration: 144 hours

TEST DESCRIPTION:

-solids and acid solution combined in large bottle
 -bottles placed on rollers
 -each day, acid solution decanted and replaced with fresh solution
 -decanted solution analyzed for Cu, free acid, and pH
 -test ended after 144 hours
 -solids washed and wash solutions analyzed
 -final solids assayed for TOTAL COPPER, OXIDE COPPER

TEST RESULTS:

Solution Analyses:

TIME hrs	PLS (ml)	COPPER		ORP mV	pH	H ₂ SO ₄	
		(g/l)	(g)			(g/l)	(g)
6	1926	1.24	2.39	409	1.17	8.88	17.10
24	1929	0.53	1.02	431	1.16	11.60	22.38
48	1973	0.25	0.49	441	1.08	12.44	24.54
96	1983	0.22	0.44	443	1.11	11.89	23.58
144	1986	0.13	0.25	439	1.38	12.60	25.02
wash	1000	0.02	0.02				
TOTAL			4.60				112.62

Solids Analyses:

TIME	SAMPLE SIZE (g)	TOTAL COPPER		OXIDE COPPER		IRON	
		(%)	(g)	(%)	(g)	(%)	(g)
144	1880.1	0.116	2.18	0.074	1.39		0.00
TOTAL			2.18		1.39		0.00

CALCULATIONS:

TIME	COPPER EXTRACTION				ACID CONSUMPTION		NET Acid Kg/tonne
	INDV. %	CUM. %			INDV. kg/tonne	CUM. kg/tonne	
6	37.00%	37.00%			6.12	6.12	4.28
24	13.90%	50.90%			3.17	9.29	6.66
48	6.73%	57.63%			2.44	11.73	8.73
96	6.38%	64.02%			3.08	14.81	11.46
144	3.70%	67.71%			2.37	17.18	13.64
wash	0.14%	67.85%				17.18	13.64
TOTAL			67.85%			17.18	13.63

HEAD GRADE:

	TOTAL COPPER	OXIDE COPPER	IRON
ASSAY HEAD			
CALCULATED HEAD	0.34%	0.30%	

BOTTLE ROLL SULPHURIC ACID LEACHING OF GETTY OXIDE ORES

File No: 93 - 061

Date: Dec. 6, 1993

Test No: L4

Sample Description: Composite E

TEST CONDITIONS:

Solids: 2000 g
 H2O: 2000 g
 % Solids: 50%
 Solution Strength: 15 g/l H2SO4
 Test Duration: 144 hours

TEST DESCRIPTION:

-solids and acid solution combined in large bottle
 -bottles placed on rollers
 -each day, acid solution decanted and replaced with fresh solution
 -decanted solution analyzed for Cu, free acid, and pH
 -test ended after 144 hours
 -solids washed and wash solutions analyzed
 -final solids assayed for TOTAL COPPER, OXIDE COPPER

TEST RESULTS:

Solution Analyses:

TIME hrs	PLS (ml)	COPPER		ORP mV	pH	H2SO4	
		(g/l)	(g)			(g/l)	(g)
6	1885	0.47	0.89	416	1.16	7.94	14.97
24	1886	0.36	0.68	412	1.11	10.96	20.67
48	1923	0.22	0.42	417	1.07	12.25	23.56
96	1939	0.21	0.40	417	1.08	11.45	22.20
144	1953	0.14	0.27	416	1.35	12.05	23.53
wash	1235	0.02	0.02				
TOTAL			2.68				104.93

Solids Analyses:

TIME	SAMPLE SIZE (g)	TOTAL COPPER		OXIDE COPPER		IRON	
		(%)	(g)	(%)	(g)	(%)	(g)
144	1890.4	0.184	3.48	0.072	1.36		0.00
TOTAL			3.48		1.36		0.00

CALCULATIONS:

TIME	COPPER EXTRACTION				ACID CONSUMPTION		NET Acid Kg/tonne
	INDV. %	CUM. %			INDV. kg/tonne	CUM. kg/tonne	
6	15.47%	15.47%			7.06	7.06	6.38
24	10.81%	26.28%			3.63	10.69	9.49
48	6.38%	32.66%			2.52	13.21	11.68
96	6.49%	39.14%			3.44	16.66	14.81
144	4.18%	43.32%			2.84	19.50	17.45
wash	0.17%	43.49%				19.50	17.45
TOTAL		43.49%				19.50	

HEAD GRADE:

	TOTAL COPPER	OXIDE COPPER	IRON
ASSAY HEAD			
CALCULATED HEAD	0.31%	0.20%	

BOTTLE ROLL SULPHURIC ACID LEACHING OF GETTY OXIDE ORES

File No: 93 - 061

Date: Jan. 4, 1994

Test No: L5

Sample Description: Composite D

TEST CONDITIONS:

Solids: 2000 g
 H₂O: 2000 g
 % Solids: 50%
 Solution Strength: 15 g/l H₂SO₄
 Test Duration: 144 hours

TEST DESCRIPTION:

-solids and acid solution combined in large bottle
 -bottles placed on rollers
 -each day, acid solution decanted and replaced with fresh solution
 -decanted solution analyzed for Cu, free acid, and pH
 -test ended after 144 hours
 -solids washed and wash solutions analyzed
 -final solids assayed for TOTAL COPPER, OXIDE COPPER

TEST RESULTS:

Solution Analyses:

TIME hrs	PLS (ml)	COPPER		ORP mV	pH	H ₂ SO ₄	
		(g/l)	(g)			(g/l)	(g)
6	1885	1.70	3.20	459	1.34	7.17	13.52
24	1893	0.95	1.80	462	1.21	10.51	19.90
48	1895	0.44	0.83	461	1.58	12.15	23.02
96	1938	0.37	0.72	449	1.21	12.57	24.36
144	1906	0.21	0.40	449	1.06	12.09	23.04
wash	1786	0.02	0.03				
TOTAL			6.99				103.84

Solids Analyses:

TIME	SAMPLE SIZE (g)	TOTAL COPPER		OXIDE COPPER		IRON	
		(%)	(g)	(%)	(g)	(%)	(g)
144	1860	0.142	2.64	0.08	1.49		0.00
TOTAL			2.64		1.49		0.00

CALCULATIONS:

TIME	COPPER EXTRACTION				ACID CONSUMPTION		NET Acid Kg/tonne
	INDV. %	CUM. %			INDV. kg/tonne	CUM. kg/tonne	
6	35.19%	35.19%			7.83	7.83	5.36
24	17.73%	52.92%			4.04	11.87	8.01
48	8.16%	61.08%			2.61	14.48	9.98
96	7.24%	68.33%			2.28	16.76	11.70
144	4.09%	72.42%			2.83	19.59	14.23
wash	0.14%	72.57%				19.59	14.23
TOTAL						19.59	

HEAD GRADE:

	TOTAL COPPER	OXIDE COPPER	IRON
ASSAY HEAD			
CALCULATED HEAD	0.48%	0.42%	

BOTTLE ROLL SULPHURIC ACID LEACHING OF GETTY OXIDE ORES

File No: 93 - 061

Date: Jan. 4, 1994

Test No: L6

Sample Description: Composite F

TEST CONDITIONS:

Solids: 2000 g
 H₂O: 2000 g
 % Solids: 50%
 Solution Strength: 15 g/l H₂SO₄
 Test Duration: 144 hours

TEST DESCRIPTION:

-solids and acid solution combined in large bottle
 -bottles placed on rollers
 -each day, acid solution decanted and replaced with fresh solution
 -decanted solution analyzed for Cu, free acid, and pH
 -test ended after 144 hours
 -solids washed and wash solutions analyzed
 -final solids assayed for TOTAL COPPER, OXIDE COPPER

TEST RESULTS:

Solution Analyses:

TIME hrs	PLS (ml)	COPPER		ORP mV	pH	H ₂ SO ₄	
		(g/l)	(g)			(g/l)	(g)
6	1876	4.50	8.44	484	1.67	3.87	7.26
24	1935	3.62	7.00	493	1.37	6.61	12.79
48	1725	1.88	3.24	481	1.74	9.59	16.54
96	1805	1.36	2.45	478	1.23	9.80	17.69
144	1749	0.73	1.28	472	1.06	11.28	19.73
wash	1578	0.09	0.14				0.00
TOTAL			22.56				74.01

Solids Analyses:

TIME	SAMPLE SIZE (g)	TOTAL COPPER		OXIDE COPPER		IRON	
		(%)	(g)	(%)	(g)	(%)	(g)
144	1870	0.206	3.85	0.154	2.88		0.00
TOTAL			3.85		2.88		0.00

CALCULATIONS:

TIME	COPPER EXTRACTION				ACID CONSUMPTION		NET Acid Kg/tonne
	INDV. %	CUM. %			INDV. kg/tonne	CUM. kg/tonne	
6	34.03%	34.03%			11.13	11.13	4.62
24	25.49%	59.51%			7.70	18.83	6.91
48	13.17%	72.69%			5.14	23.97	9.55
96	8.34%	81.03%			4.46	28.42	12.11
144	4.56%	85.59%			3.21	31.64	14.34
wash	-0.17%	85.41%				31.64	14.34
TOTAL		85.41%				31.64	

HEAD GRADE:

	TOTAL COPPER	OXIDE COPPER	IRON
ASSAY HEAD			
CALCULATED HEAD	1.32%	1.27%	

BOTTLE ROLL SULPHURIC ACID LEACHING OF GETTY OXIDE ORES

File No: 93 - 061

Date:

Test No: L7

Jan. 4, 1994

Sample Description: Composite G

TEST CONDITIONS:

TEST DESCRIPTION:

Solids: 2000 g
 H₂O: 2000 g
 % Solids: 50%
 Solution Strength: 15 g/l H₂SO₄
 Test Duration: 144 hours

-solids and acid solution combined in large bottle
 -bottles placed on rollers
 -each day, acid solution decanted and replaced with fresh solution
 -decanted solution analyzed for Cu, free acid, and pH
 -test ended after 144 hours
 -solids washed and wash solutions analyzed
 -final solids assayed for TOTAL COPPER, OXIDE COPPER

TEST RESULTS:

Solution Analyses:

TIME hrs	PLS (ml)	COPPER		ORP mV	pH	H ₂ SO ₄	
		(g/l)	(g)			(g/l)	(g)
6	1855	3.80	7.05	446	1.50	3.08	5.71
24	1817	3.80	6.90	453	1.40	5.24	9.52
48	2020	1.42	2.87	473	1.52	10.25	20.71
96	2046	0.68	1.39	470	1.28	11.35	23.22
144	2034	0.29	0.59	472	1.06	12.34	25.10
wash	1400	0.04	0.06				0.00
TOTAL			18.86				84.26

Solids Analyses:

TIME	SAMPLE SIZE (g)	TOTAL COPPER		OXIDE COPPER		IRON	
		(%)	(g)	(%)	(g)	(%)	(g)
144	1852.3	0.088	1.63	0.042	0.78		0.00
TOTAL			1.63		0.78		0.00

CALCULATIONS:

TIME	COPPER EXTRACTION				ACID CONSUMPTION		NET Acid Kg/tonne
	INDV. %	CUM. %			INDV. kg/tonne	CUM. kg/tonne	
6	37.13%	37.13%			11.92	11.92	6.48
24	34.62%	71.75%			8.90	20.82	10.05
48	10.19%	81.94%			3.86	24.67	11.69
96	6.83%	88.77%			3.70	28.37	14.32
144	2.94%	91.71%			2.74	31.11	16.61
wash	0.34%	92.05%				31.11	16.61
TOTAL		92.05%				31.11	

HEAD GRADE:

	TOTAL COPPER	OXIDE COPPER	IRON
ASSAY HEAD			
CALCULATED HEAD	1.02%	0.98%	

BOTTLE ROLL SULPHURIC ACID LEACHING OF GETTY OXIDE ORES

File No: 93 - 061

Date: Jan. 4, 1994

Test No: L8

Sample Description: Composite H

TEST CONDITIONS:

Solids: 2000 g
 H₂O: 2000 g
 % Solids: 50%
 Solution Strength: 15 g/l H₂SO₄
 Test Duration: 144 hours

TEST DESCRIPTION:

-solids and acid solution combined in large bottle
 -bottles placed on rollers
 -each day, acid solution decanted and replaced with fresh solution
 -decanted solution analyzed for Cu, free acid, and pH
 -test ended after 144 hours
 -solids washed and wash solutions analyzed
 -final solids assayed for TOTAL COPPER, OXIDE COPPER

TEST RESULTS:

Solution Analyses:

TIME hrs	PLS (ml)	COPPER		ORP mV	pH	H ₂ SO ₄	
		(g/l)	(g)			(g/l)	(g)
6	1771	2.00	3.54	448	1.35	7.34	13.00
24	1791	1.47	2.63	449	1.29	9.77	17.50
48	1885	0.78	1.47	455	1.56	11.87	22.37
96	1698	0.59	1.00	448	1.33	11.93	20.26
144	1893	0.32	0.61	455	1.05	13.10	24.80
wash	1476	0.03	0.04				0.00
TOTAL		9.30					97.93

Solids Analyses:

TIME	SAMPLE SIZE (g)	TOTAL COPPER		OXIDE COPPER		IRON	
		(%)	(g)	(%)	(g)	(%)	(g)
144	1884	0.136	2.56	0.072	1.36		0.00
TOTAL			2.56		1.36		0.00

CALCULATIONS:

TIME	COPPER EXTRACTION				ACID CONSUMPTION		NET Acid Kg/tonne
	INDV. %	CUM. %			INDV. kg/tonne	CUM. kg/tonne	
6	33.71%	33.71%			7.66	7.66	4.93
24	20.91%	54.62%			4.35	12.01	7.25
48	10.62%	65.24%			2.58	14.60	8.70
96	8.26%	73.51%			2.89	17.49	10.82
144	4.80%	78.30%			1.44	18.92	11.78
wash	0.09%	78.39%				18.92	11.78
TOTAL		78.39%				18.92	

HEAD GRADE:

	TOTAL COPPER	OXIDE COPPER	IRON
ASSAY HEAD			
CALCULATED HEAD	0.59%	0.53%	

SIZE DISTRIBUTION

SAMPLE NO : 93-061 L1

Leach tails

Size Fraction (Tylor mesh)	Individual Percentage Retained	Cumulative Percentage Passing
1/2"	5.4	94.6
3/8"	17.3	77.3
6	55.6	21.6
10	7.7	13.9
20	5.6	8.3
35	2.6	5.7
48	1.0	4.7
Undersize	4.7	

SIZE DISTRIBUTION

SAMPLE NO : 93-061 L2

Leach tails

Size Fraction (Tylor mesh)	Individual Percentage Retained	Cumulative Percentage Passing
1/2"	1.2	98.8
3/8"	11.8	87.0
6	52.2	34.8
10	11.2	23.7
20	10.0	13.7
35	5.0	8.7
48	1.8	6.8
Undersize	6.8	

SIZE DISTRIBUTION

SAMPLE NO : 93-061 L3

Leach tails

Size Fraction (Tyler mesh)	Individual Percentage Retained	Cumulative Percentage Passing
1/2"	4.0	96.0
3/8"	14.2	81.8
6	51.6	30.2
10	10.7	19.5
20	8.8	10.6
35	3.8	6.8
48	1.4	5.5
Undersize	5.5	

SIZE DISTRIBUTION

SAMPLE NO : 93-061 L4

Leach tails

Size Fraction (Tylor mesh)	Individual Percentage Retained	Cumulative Percentage Passing
1/2"	1.0	99.0
3/8"	15.6	83.4
6	49.6	33.8
10	10.3	23.5
20	9.4	14.2
35	4.8	9.3
48	1.8	7.5
Undersize	7.5	

SIZE DISTRIBUTION

SAMPLE NO: 93-061 L5
Residue

Size Fraction (Tyler mesh)	Individual Percentage Retained	Cumulative Percentage Passing
1/2"	2.5	97.5
3/8"	13.6	83.8
6	52.8	31.1
10	11.9	19.1
20	6.6	12.5
35	4.2	8.3
48	1.6	6.7
Undersize	6.7	

SIZE DISTRIBUTION

SAMPLE NO: 93-061 L6

Residue

Size Fraction (Tyler mesh)	Individual Percentage Retained	Cumulative Percentage Passing
1/2"	1.9	98.1
3/8"	11.7	86.4
6	39.5	46.9
10	18.6	28.3
20	10.6	17.8
35	6.1	11.7
48	2.2	9.4
Undersize	9.4	

SIZE DISTRIBUTION

SAMPLE NO: 93-061 L7

Residue

Size Fraction (Tyler mesh)	Individual Percentage Retained	Cumulative Percentage Passing
10	40.4	59.6
20	30.1	29.4
35	10.5	18.9
48	3.8	15.1
60	1.7	13.4
100	3.9	9.5
Undersize	9.5	

SIZE DISTRIBUTION

**SAMPLE NO: 93-061 L8
Residue**

Size Fraction (Tyler mesh)	Individual Percentage Retained	Cumulative Percentage Passing
1/2"	2.5	97.5
3/8"	11.3	86.2
6	45.2	41.0
10	13.1	28.0
20	8.6	19.4
35	5.7	13.7
48	2.3	11.3
Undersize	11.3	

15/15

**FLOTATION TESTING OF
A SAMPLE FROM
THE GETTY NORTH DEPOSIT**

**GETTY COPPER CORP.
FEBRUARY 1994**

**BEATTIE CONSULTING LTD.
VANCOUVER, B.C. CANADA**

BEATTIE CONSULTING LTD.

2955 WEST 38th AVENUE
VANCOUVER, B.C.
V6N 2X2

TEL.(604) 263 0695
FAX.(604) 263 0695

February 10, 1994

Getty Copper Corp.
1000 Austin Ave.
Coquitlam, B.C. V3K 3P3

ATTENTION: Mr. J.B. Lepinski

Dear John,

Enclosed please find my report on the initial flotation test conducted on the drill core from the Getty North deposit. As you will note, the results obtained are excellent and further development work on the deposit should be undertaken.

Yours truly,
BEATTIE CONSULTING LTD



Dr. M.J.V. Beattie, P. Eng.

1.0 INTRODUCTION

A flotation test has been performed on a composite sample from the Getty North copper deposit in the Highland Valley region of B.C. The samples used to prepare the composite consisted of assay rejects from the 1993 drilling program and were selected to represent the unoxidized mineralization encountered in the lower portions of the drill holes. The objective of the test was to demonstrate that the sulphide mineralization responded well to flotation and at the same time to determine the deportment of the gold and silver in the sulphide zone.

The testwork was conducted by Process Research Associates Ltd of Vancouver under the direction of Dr. M.J.V. Beattie, P.Eng.

2.0 SUMMARY

The sulphide material encountered in drill hole no. 1993 - 2 from a depth of 410 to 500 feet responds very well to flotation, resulting in the production of a high grade copper concentrate.

The test achieved the following:

1. A cleaned concentrate containing 39.1% Cu at a copper recovery of 87.1%. Since the first cleaner concentrate contained 33.8% Cu at a copper recovery of 90.6%, with a closed circuit an overall copper recovery of 90% should be achievable.
2. The cleaned concentrate contained 1.92 g/t Au and 140 g/t Ag so that smelter credits will be obtained for both these metals. The recovery to the concentrate was 15% for the gold and 62.5% for the silver. The possibility of improving the gold and silver recovery should be investigated in future studies.

3.0 DISCUSSION

3.1 Sample description

The sample used for the testwork consisted of a composite sample prepared from crushed assay rejects of the 1993 drill program conducted by Getty Copper. The identification of the samples used for the composite is summarized in table 3.1. All the samples are from DDH 1993 - 2 between 410 and 500 feet in depth. The individual samples were combined, crushed to minus 6 mesh and blended prior to being split to provide individual samples for the testwork.

The calculated assay of the sample based on the results of the test is 0.41% Cu, 0.12 g/t Au and 2.03 g/t Ag.

Table 3.1
Make up of composite sample.

SAMPLE NO.	WEIGHT, grams
122087B	2051
122088A	1600
12088B	1377
122089A	1179
122089B	1175
122090A	1165
122090B	1188
122091A	1328
122091B	1156
122090A	867
122092B	948
122093A	976
122093B	1088
122094A	1102
122094B	1129
122095A	996
122095B	1132
122096A	1040

3.2 Results

The detailed test procedure and results are included as Appendix A. The test procedure consisted of grinding the sample to 70% passing 200 mesh followed by rougher and scavenger flotation under conditions which would result in the flotation of copper sulphide minerals as well as any molybdenite which was present. The present sample was found not to contain any molybdenite.

The rougher concentrate was cleaned twice in order to reject any liberated gangue minerals as well as any pyrite which was present. The copper was found to clean up very well with little loss during cleaning. This relationship is shown in figure 3.1 which shows copper recovery as a function of concentrate grade. The test produced a copper concentrate assaying 39.1% Cu at a recovery of 87.1%. This concentrate grade is considered to be very good as many copper producers only achieve concentrate grades of 28 to 30% Cu. It is expected that by recirculating the cleaner tailings and the scavenger concentrate the recovery will be increased. The scavenger concentrate was not cleaned in the present test. Future testwork should investigate whether this product should be included in the feed to the cleaners or recirculated to the head of the circuit.

The silver recovery to the rougher concentrate was 68.1% and to the cleaned concentrate was 62.5%. Therefore a significant proportion of the silver appears to be associated with the copper minerals while the gold is predominantly associated with the pyrite. As the development of the deposit proceeds, if sections having a higher gold content are encountered, alternatives for gold recovery should be considered. The content of both gold and silver in the concentrate is sufficiently high that smelter credits will be obtained.

Cu RECOVERY vs GRADE

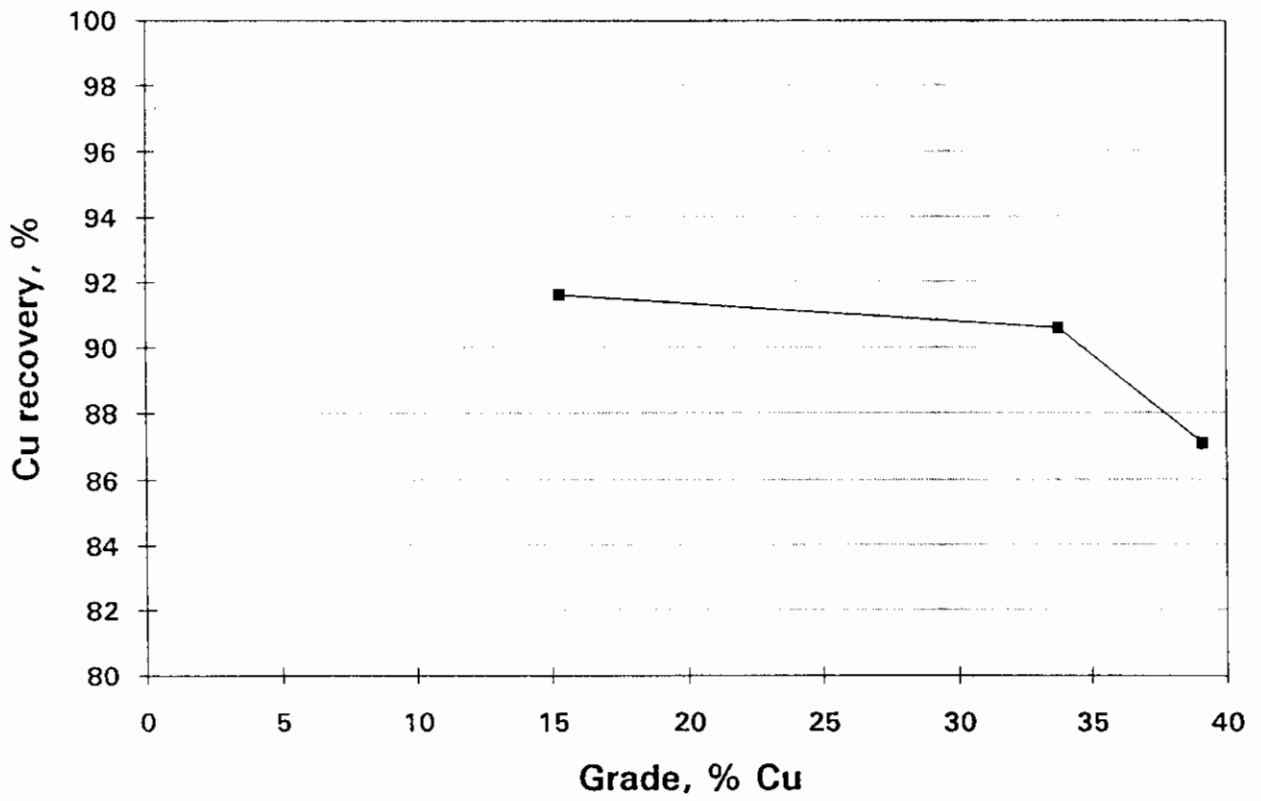


Figure 3.1

Appendix A
Test details

TESTWORK PROCEDURE

Test No: 93-066 F1

Date: 21-Dec-93

Purpose: Initial bench flotation scoping test

STAGE	TIME (Minutes)	ADDITIONS	
		g/tonne	REAGENT
Grind (2 kg)	19	200	Lime
Flotation		5	Sodium Isopropyl Xanthate
Rougher float	3	450	Lime pH = 8.5 to pH = 10.0
		27	DF 250
		4	Pine oil
Scavenger float	2	5	Sodium Isopropyl Xanthate
			Final pH = 9.6
Cleaner Flotation (Rougher conc.)			
1st Cleaner float	3	45	Lime pH = 9.1 to pH = 10.5
			Final pH = 10.3
2nd Cleaner float	3.5	360	Lime pH = 10.0 to pH = 11.4
			25
			Final pH = 11.3

MATERIAL BALANCE

Project no : 93-066

Date: December 21, 1993

Test no : F1

Sample description : Sulphide composite

Products	Weight		Assay				% Distribution			
	(g)	(%)	Au (g/t)	Ag (g/t)	Cu (%)	Mo (%)	Au	Ag	Cu	Mo
2nd Cleaner Conc	17.6	0.9	1.92	140.47	39.10	0.01	15.0	62.5	87.1	6.6
2nd Cleaner Tail	3.6	0.2	4.59	35.90	7.74	0.00	7.3	3.3	3.5	0.3
1st Cleaner Conc	21.2	1.1	2.37	122.71	33.77	0.01	22.3	65.7	90.6	7.0
1st Cleaner Tail	26.1	1.3	1.10	3.56	0.29	0.00	12.7	2.3	1.0	2.5
Rougher Conc	47.3	2.4	1.67	57.00	15.31	0.00	34.9	68.1	91.6	9.4
Scavenger Conc	24.6	1.3	0.75	4.39	0.65	0.00	8.2	2.7	2.0	2.3
Total Float Conc	71.9	3.7	1.36	38.99	10.29	0.00	43.2	70.8	93.6	11.8
Final Tail	1872.7	96.3	0.07	0.62	0.03	0.00	56.8	29.2	6.4	88.2
Calculated head	1944.6	100.0	0.12	2.03	0.41	0.00	100.0	100.0	100.0	100.0
Assay head					0.48					

SIZE DISTRIBUTION

SAMPLE NO : 93-066 F1
Head

Size Fraction (Tyler mesh)	Individual Percentage Retained	Cumulative Percentage Passing
65	0.1	99.9
100	0.4	99.5
150	8.3	91.2
200	20.7	70.5
270	17.2	53.3
325	7.5	45.8
400	4.0	41.9
Undersize	41.9	

BEATTIE CONSULTING LTD.2955 WEST 38th AVENUE
VANCOUVER, B.C.
V6N 2X2TEL. (604) 263 0695
FAX. (604) 263 0695**MEMO**

TO: Stephen Gower

CC: John Lepinski

FROM: Morris Beattie

DATE: October 30, 1996

RE: Getty Copper Sample Analysis Results

1. We have processed the two samples (16194 and 16195) which had been noted to contain abundant native copper. The procedure used at Eco Tech for these samples was to crush the entire sample to minus 6 mesh and then split out a sub-sample weighing several hundred grams. These sub-samples were then pulverized and the coarse (+100 mesh) copper was screened out. The oversize and undersize were assayed separately to establish the overall copper content.

For the present exercise, the balance of the crushed sample in each case was ground in a laboratory rod mill and was then concentrated by means of gravity concentration using a Knelson concentrator followed by hand panning of the Knelson concentrate. The final concentrate was screened at 65 mesh. The plus 65 mesh material was noted to consist solely of native copper up to 6 mm in length while the minus 65 mesh contained a mixture of native copper and sulphide. All the products except the plus 65 mesh gravity concentrate were analyzed for copper and gold. The plus 65 mesh material is being assayed for gold but due to its low weight is not expected to influence the overall results.

The results for the two samples are summarized in Table 1. The calculated metal contents for the two samples are as follows:

Sample 16194	Cu, % =	0.40
	Au, g/t =	0.04
Sample 16195	Cu, % =	0.38
	Au, g/t =	0.08

In each case, approximately 50% of the copper was recovered by gravity concentration and

Table 1**Sample 16194**

Product	Weight g	Assay		Distribution, %	
		Au, g/t	Cu, %	Au	Cu
+65 mesh pan conc	5.9		100		18.2
-65 mesh pan conc	15.7	4.1	57.8	18.2	28.2
Pan Tail	47.0	0.8	2.0	8.5	2.9
Knelson Conc.	68.5	1.4	23.2	27.8	49.3
Knelson Tails	8080.7	0.03	0.2	72.2	50.7
Calculated Head	8149.2	0.04	0.4		

Sample 16195

Product	Weight g	Assay		Distribution, %	
		Au, g/t	Cu, %	Au	Cu
+65 mesh pan conc	5.5		100		25.5
-65 mesh pan conc	10.6	0.9	51	1.9	25.2
Pan Tail	43.4	1.8	1.0	16.3	2.1
Knelson Conc.	59.4	1.5	19.0	18.2	52.9
Knelson Tails	5599.0	0.07	0.2	81.8	47.1
Calculated Head	5658.4	0.08	0.38		

this copper contained assayable concentrations of gold. The limit of detection by direct fire assaying of samples of this type is about 0.03 g/t Au so that the tailings for sample 16194 contain questionable gold values while sample 16195 has a real gold content of 0.07 g/t.

The calculated head assays for the two samples are comparable to the results reported by Eco Tech. Your log for these samples indicates that all the copper is in non sulphide form. This result is not possible since native copper is not soluble in dilute sulphuric acid such as is used in the non-sulphide copper determination. This native copper behaves as sulphide copper in the non-sulphide procedure and should have resulted in a significant difference between the total and non-sulphide figures. The difference between oxide, native copper bearing and sulphide ore types is important as it may influence the selection of processing procedures for the deposit.

2. Flotation tests have been conducted on five composites of drill core rejects. The composites used for this work are summarized in Table 2.

Table 2
Composites for flotation tests.

Comp. No.	Samples	Hole No.	Footage	
			From	To
1	15881 - 15889	6	112.8	114.3
2	15898 - 15905	6	138.3	150.3
3	15808 - 15812	5	208.6	216.1
4	16083 - 16085	7	184.9	186.4
5	16537 - 16551	11	172.6	195.1

A standardized test was used for each of the composites. The conditions for the overall deposit have not been optimized so that considerable variation in the flotation response of samples can be anticipated. The objective of the present tests was only to produce copper and pyrite concentrates to determine the gold content of these products and the overall sample in each case. The complete balance for each test is enclosed. The calculated head assays based on the tests are summarized in table 3.

Table 3
Calculated head assays for drill reject composites.

Comp. No.	Calculated Head Assay			
	Cu, %	MoS ₂ , %	Au, g/t	Ag, g/t
1	0.39	.007	0.04	0.5
2	0.40	.005	0.04	0.7
3	0.41	.018	0.03	0.4
4	0.46	.005	0.04	0.4
5	0.35	.005	0.04	0.5

The lower limit for gold detection by fire assay is about 0.03 g/t. Thus, the tailings assay in the attached detailed balance for each of the tests is just at the limit of being significant. For each test, the great majority of the gold is accounted for by the tailings and must be judged to be non-recoverable. The gold concentrations in the concentrates do not correlate with the copper content of this product but all the gold assays of these products appear to be below the level at which smelter payment would be realized. No upgrading of gold into the pyrite concentrate is observed for any of the samples.

BEATTIE CONSULTING LTD.

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TEL.(604) 263 0695
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MEMO

TO: John Lepinski
Stephen Gower

FROM: Morris Beattie

DATE: December 11, 1996

RE: Getty North Metallurgical Program

A. PROGRESS TO DATE**1. Oxide zone heap leaching testwork.**

Two column tests have been completed, one on a composite of assay rejects from Hole 1993-1 (Test 95-T1) and the other on a composite of rejects from holes 1993-2 through 5 (Test 95-T2/5). A report on the results of these tests will be forwarded as soon as all the analytical results are received. The samples from the 1993 program were not considered ideal due to their fine crush size but they were useful in establishing some of the heap leach parameters. Test T1 achieved a copper extraction of 71.2% over a period of 56 days with an acid consumption of 25.9 kg/t. Test T2/5 achieved a copper extraction of 79% over a period of 91 days with an acid consumption of 45.1 kg/t. The acid consumption in this test was much higher than anticipated, based on bottle roll tests on the same material. A more complete analysis of the acid consumption and alternatives for reducing the consumption will be included in the report on the column tests. The fine particle size of the material used for these tests has likely contributed to the high acid consumption. The results to date also suggest that a longer overall leach period using multiple lift leaching will be more appropriate for this material than the single lift, short leach cycle approach originally envisaged.

2. Low grade material characterization.

A composite sample was prepared of drill rejects from samples 16405 - 16425. These samples are from DDH-10 and generally contain less than 0.2% Cu as sulphide copper and were noted to contain pyrite. A portion of this composite was pulverized, acidified and inoculated with bacteria. The objective of this test was to demonstrate that bacteria would

become established on this material and would result in net acid production during the bacterial leaching. The results of this test are positive in that the bacteria became active about 10 days after they were added and over the next 20 days resulted in a net acid production of about 9 kg/t and acid production was continuing at this time. Considering that the pulverized material used for this test would result in increased acid consumption compared to crushed rock, this result is very encouraging for the operation of a low grade waste dump which will produce some copper and acid.

3. Oxide material characterization.

Following discussions with Ken Northcote, two samples from the oxide zone were characterized for copper mineralogy in order to assist the core logging activities. Previous characterization of samples from the 1993 drilling had indicated that the copper in that material was primarily in the form of malachite while the current material appeared to be chrysocolla. A sequential leach was done on the two samples. Both samples selected had visible non-sulphide copper concentrations with sample 16153 being predominantly green and 16155 being blue. The procedure used for the analysis consisted of a sequential leach which would dissolve carbonates, followed by chrysocolla, then simple sulphides (chalcocite, covellite) and finally complex sulphides (chalcopyrite). The results achieved are as follows:

Sample 16153 Total copper = 1.12 % Cu

Distribution:	Carbonates	16.6 %
	Chrysocolla	81.3 %
	Simple sulphides	2.1 %
	Complex sulphides	0.01 %

Sample 16155 Total copper = 1.41 % Cu

Distribution:	Carbonates	18.7 %
	Chrysocolla	79.5 %
	Simple sulphides	1.8 %
	Complex sulphides	0.02 %

4. Analysis of native copper rich samples.

Two samples (16194 and 16195) which had been noted to contain abundant native copper were analyzed. The procedure used at Eco Tech for these samples was to crush the entire sample to minus 6 mesh and then split out a sub-sample weighing several hundred grams. These sub-samples were then pulverized and the coarse (+100 mesh) copper was screened

out. The oversize and undersize were assayed separately to establish the overall copper content.

For the present exercise, the balance of the crushed sample in each case was ground in a laboratory rod mill and was then concentrated by means of gravity concentration using a Knelson concentrator followed by hand panning of the Knelson concentrate. The final concentrate was screened at 65 mesh. The plus 65 mesh material was noted to consist solely of native copper up to 6 mm in length while the minus 65 mesh contained a mixture of native copper and sulphide. All the products except the plus 65 mesh gravity concentrate were analyzed for copper and gold.

The results for the two samples are summarized in Table 1. The calculated metal contents for the two samples are as follows:

Sample 16194	Cu, % =	0.40
	Au, g/t =	0.04
Sample 16195	Cu, % =	0.38
	Au, g/t =	0.08

In each case, approximately 50% of the copper was recovered by gravity concentration and this copper contained assayable concentrations of gold. The limit of detection by direct fire assaying of samples of this type is about 0.03 g/t Au so that the tailings for sample 16194 contain questionable gold values while sample 16195 has a real gold content of 0.07 g/t.

The calculated head assays for the two samples are comparable to the results reported by Eco Tech. The high native copper content of these samples indicates that they should not be added to the heap leach inventory since the native copper would not be dissolved by dilute sulphuric acid solutions. This material should be considered to be concentrator feed. If sufficient reserves of material which is high in native copper exists, a gravity concentration circuit should be considered for the concentrator.

Table 1

Product	Weight (g)	Assay		Distribution, %	
		Au, g/t	Cu, %	Au	Cu
Sample 16194					
+65 mesh pan conc.	5.9		100		18.2
-65 mesh pan conc.	15.7	4.1	57.8	19.2	28.2
Pan tail	47.0	0.6	2.0	8.5	2.9
Knelson conc.	68.5	1.4	23.2	27.8	49.3
Knelson Tails	8080.7	0.03	0.2	72.2	50.7
Total sample	8149.2	0.04	0.4		
Sample 16195					
+65 mesh pan conc	5.5		100		25.5
-65 mesh pan conc.	10.6	0.9	51	1.9	25.2
Pan tail	43.4	1.8	1.0	16.3	2.1
Knelson conc.	59.4	1.5	19.0	18.2	52.9
Knelson tails	5599.0	0.07	0.2	81.8	47.1
Total sample	5658.4	0.08	0.38		

5. Evaluation of gold in sulphide samples.

Preliminary flotation tests have been conducted on five composites of drill core rejects. The objective of the present tests was only to produce copper and pyrite concentrates to determine the gold content of these products and the overall sample in each case. The composites used for this work are summarized in Table 2.

Table 2
Composites for flotation tests.

Comp. No.	Samples	Hole No.	Footage	
			From	To
1	15881 - 15889	6	112.8	114.3
2	15898 - 15905	6	138.3	150.3
3	15808 - 15812	5	208.6	216.1
4	16083 - 16085	7	184.9	186.4
5	16537 - 16551	11	172.6	195.1

A standardized test was used for each of the composites. The conditions for the overall deposit have not been optimized so that considerable variation in the flotation response of samples was anticipated. Although the results cannot be correlated with the grind used for the individual tests, the grinds were generally coarser than is believed to be desirable for this material. The rougher copper recoveries varied from 49% to 92% and the cleaned concentrate grades varied from 17.6% Cu to 30.8% Cu. The calculated head assays based on the tests are summarized in Table 3.

Table 3
Calculated head assays for drill reject composites.

Comp. No.	Calculated Head Assay			
	Cu, %	MoS ₂ , %	Au, g/t	Ag, g/t
1	0.39	.007	0.04	0.5
2	0.40	.005	0.04	0.7
3	0.41	.018	0.03	0.4
4	0.46	.005	0.04	0.4
5	0.35	.005	0.04	0.5

The lower limit for gold detection by fire assay is about 0.03 g/t. Thus, the tailings assay in the attached detailed balance for each of the tests is just at the limit of being significant. For each test, the great majority of the gold is accounted for by the tailings and must be judged to be non-recoverable. The gold concentrations in the concentrates do not correlate with the copper content of this product but all the gold assays of these products appear to be below the level at which smelter payment would be realized. No upgrading of gold into the pyrite concentrate is observed for any of the samples.

6. Gold in oxide samples.

The size fractions from the T1 column were assayed for gold to confirm the Eco Tech assays which indicated insignificant gold and silver content for the oxide zone samples. Each of the fractions was assayed to contain gold and silver at or below the normal detection limit, confirming the Eco Tech assays.

B. ONGOING METALLURGICAL PROGRAM

1. Oxide zone heap leaching.

A bulk sample consisting of 6 barrels of material taken from the outcrop of the oxide zone (Figures 1 and 2) has been shipped to the laboratory in Vancouver. The sample was taken with a backhoe and is believed to be a good sample of the outcrop material.

It is proposed that this sample be used for the next phase of development for the oxide zone. As the material has not been crushed, tests can be included to show the effect of crush size on copper extraction kinetics as well as on acid consumption. Overall, the following parameters have to be established through column testing:

- crush size
- acid addition to cure
- leach solution flowrate
- target PLS pH
- duration of each leach cycle
- effect of multiple lift leaching
- variability across the deposit

It is proposed that four column tests be initiated on the bulk sample, two at a minus 2 inch crush size and two at a minus 3/4 inch crush. The operating conditions for these columns will be based on information gained from columns 95T1 and 95T1/5. One test at each crush size will be ended when 70% extraction is achieved and the other will be allowed to continue until the maximum copper extraction is achieved. These tests will establish the desired crush size and will define the leach cycle duration. Following these tests, additional column tests will be conducted on the bulk sample at the selected crush size in order to optimize some of the other parameters. At present, it is proposed that a total of 9 column tests will be conducted for this stage. Two of these columns will be a full lift height, 18 to 20 feet and will be one foot diameter. Once an optimized leach procedure is selected, additional column tests will be conducted on selected samples of crushed drill core to establish variability across the deposit. Approximately 6 additional column tests will be required for this stage.

Results for this work will be reported as the various tests are completed.

2. Characterization of Hole 10 oxide material.

The upper section of Hole DDH 95-10 was through material identified as a "jarosite zone". Assays for this material indicated copper values in the range of 0.4 to 0.5% although half or less was indicated to be acid soluble. It is proposed to do a bottle roll test on a composite of the interval from 46.6 to 72.1 m using the crushed assay rejects. This test will establish, on a comparative basis, the copper extraction and acid consumption to be observed and will establish

15/SS

**COLUMN TESTING
OF GETTY NORTH
DRILL CORE COMPOSITES**

**GETTY COPPER CORP.
JANUARY 1996**

**BEATTIE CONSULTING LTD
VANCOUVER, B.C. CANADA**

BEATTIE CONSULTING LTD.

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TEL.(604) 263 0695
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January 31, 1996

Getty Copper Corp.
1000 Austin Avenue
Coquitlam, B.C. V3K 3P3

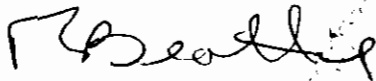
Attention: Mr. J.B. Lepinski

Dear John,

Enclosed please find the report on the column testwork conducted on rejects from the 1993 drill program on the Getty North deposit. The results of these tests will be of assistance in designing the operating parameters for additional column tests which are recommended for this project. Once you have reviewed the results I would be pleased to discuss any additional questions which you may have.

Yours sincerely,

BEATTIE CONSULTING LTD



Dr. M.J.V. Beattie, P.Eng.

Table of Contents

	Page
1.0 Summary	1
2.0 Introduction	2
3.0 Discussion	3
3.1 Sample description	3
3.2 Test procedures	4
3.3 Results	4
4.0 Recommendations	9
Appendix - Test Details	10

1.0 SUMMARY

Column tests have been conducted on samples of drill core reject from the 1993 drill program on the Getty North deposit. The tests demonstrate that in excess of 90% of the acid soluble copper can be extracted in under 100 days of leaching. The acid consumption in one test was as expected (approx. 25 kg/tonne) while in the other test it was much greater than expected (45 kg/t), based on the results of bottle roll tests on the same sample material. An analysis of the results from these tests suggests that the material may be more suited to a slower leach at lower acid concentration than used in the present tests. It should also be recognized that the assay rejects used for the testwork was crushed to a finer size than is normal commercial practice for oxide copper material. The presence of the fines may have resulted in the excessive acid consumption noted in Test T2/5.

Additional test work is recommended to establish the preferred operating conditions for the deposit and to establish variability in copper extraction rate and acid consumption across the deposit.

2.0 INTRODUCTION

The Getty North copper deposit in British Columbia contains an oxide copper zone overlying the primary sulphide deposit. A preliminary column test conducted by Bacon Donaldson and Associates in 1989 on a bulk surface sample indicated that copper could be leached from crushed material from the oxide zone, using a dilute sulphuric acid solution. The testwork indicated a copper extraction of 80% over a period 65 days with an acid consumption of 25.8 kg/tonne. The deposit therefore appeared to be attractive for exploitation by heap leaching followed by copper recovery using solvent extraction and electrowinning.

A series of bottle roll tests was conducted on drill core rejects by Process Research Associates of Vancouver under the direction of M.J.V. Beattie, P.Eng in 1994. The bottle roll tests indicated that for samples in which the copper occurred more than 85% in acid soluble form, heap leaching should result in high copper extraction. The acid consumption for the samples tested showed some variation but it was projected that the consumption in a heap leaching situation should be comparable to that demonstrated by the initial column test.

Composite samples were prepared by Process Research Associates from the same material as was used for the bottle roll tests. These composites were used for the column tests which are summarized in the present report.

3.0 DISCUSSION

3.1 Sample description

Two composites were prepared from the drill rejects of the 1993 drill program on Getty North. Composite 95-T1 included material from Hole 1993-1 from 94 to 435 feet. Composite 95-T2/5 included material from Hole 1993-2, 40 to 210 feet, Hole 1993-3, 30 to 60 feet and, Hole 1993-5, 129-219 feet. The assay of each composite by size fraction is summarized in Table 3.1. In each case the total and acid soluble copper is distributed fairly evenly through the fractions with some enrichment into the fines. The composites are generally quite fine, being minus 1/2 inch and containing a high proportion of minus 6 mesh material. While the fine particle size could be of benefit to the copper leaching rate, it could also result in increased acid consumption:

Table 3.1
Size assays of column feed samples.

FRACTION	Weight, %	ASSAY	
		Cu total, %	Cu Acid Sol., %
Comp. 95-T1			
+ 1/2 inch	2.6	0.31	0.24
- 1/2 + 3/8	17.6	0.32	0.25
- 3/8 + 1/4	34.1	0.35	0.27
- 1/4 + 6m	17.9	0.36	0.28
- 6m	27.8	0.54	0.43
Total		0.40	0.31
Comp. 95-T2/5			
+ 1/2 inch	2.8	0.44	0.36
- 1/2 + 3/8	18.6	0.47	0.36
- 3/8 + 1/4	34.4	0.46	0.36
- 1/4 + 6m	18.8	0.47	0.38
- 6m	25.4	0.67	0.54
Total		0.52	0.41

3.2 Test procedures

Both composites were tested without any additional size reduction. The screened fractions were recombined in the appropriate proportions and cure acid was added before the batches were placed in the test columns. A cure acid addition of 12 kg/t of 98% H_2SO_4 was made to test T1 and an addition of 15 kg/t was made to test T2/5. Sufficient water was added to increase the total moisture content of each sample to 4% and the sample was rolled back and forth on a plastic sheet to ensure distribution of the acid. The samples were then placed in the test columns and allowed to cure for 7 days before leaching was started. Each test was conducted in an 8 inch diameter by 10 feet tall column.

Leaching was started by pumping a 10 g/l H_2SO_4 solution onto the top of the charge at a target rate of 14 l/m²/hr. The PLS pH was monitored to ensure that a range of 2 to 2.2 was maintained. For each test, it was found that the pH increased rapidly in the first few days and the acid concentration in the feed solution was therefore increased. As the PLS pH subsequently dropped, the acid concentration of the feed was decreased.

The PLS was treated by solvent extraction using Acorga reagent before being recycled to the feed. Upon completion of the test the residue was dumped from the column and allowed to dry before being screened into the same series of size fractions as the feed for analysis.

3.3 Results

The detailed test results for both tests are appended to this report. The copper extraction as a function of time is summarized for both tests in Figure 3.1. Both tests demonstrate a high copper extraction rate which then slows significantly. Test T1 was ended when the copper extraction reached 71.8% at which time (56 days) the rate had become very slow. Test T2/5 was continued for 91 days and achieved an extraction of 78.9%. The leaching rate for this test had also become very slow by this time. The feed sample analysis indicated that the copper in composite T1 was 77.5% acid soluble while for composite T2/5 it was 78.8% acid soluble. In both tests a very high extraction (>90%) of the soluble copper was therefore achieved. It should be noted that the determination of the soluble copper content of a sample is only an approximate procedure and is very dependent on the exact conditions used. The soluble copper content of a sample can therefore only be used as a guide for determining the proportion of the total copper content which may be ultimately recoverable by heap leaching.

It is apparent in Figure 3.1 that the higher acid addition to the cure step in test T2/5 resulted in a higher copper extraction in the first day of leaching, compared to test T1. The rate in Test T2/5 dropped off in the subsequent days before sufficient acid was introduced to reduce the PLS pH to the desired level. The PLS pH as a function of leach time is summarized in Figure 3.2. For both tests, the pH was at high levels for the first 7 to 10 days before settling to levels near pH 2. The lower pH (ie higher acid concentration) for test T1 after the first 10 days did not have a beneficial

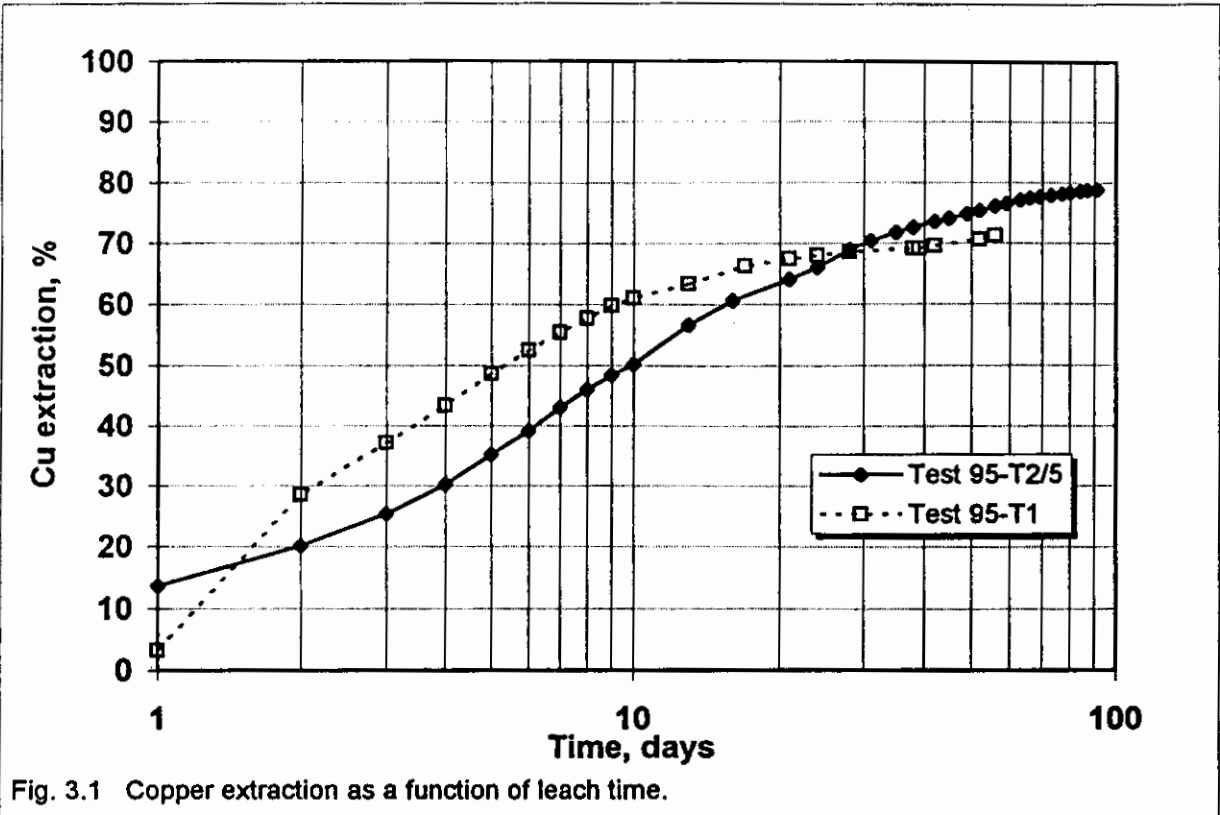


Fig. 3.1 Copper extraction as a function of leach time.

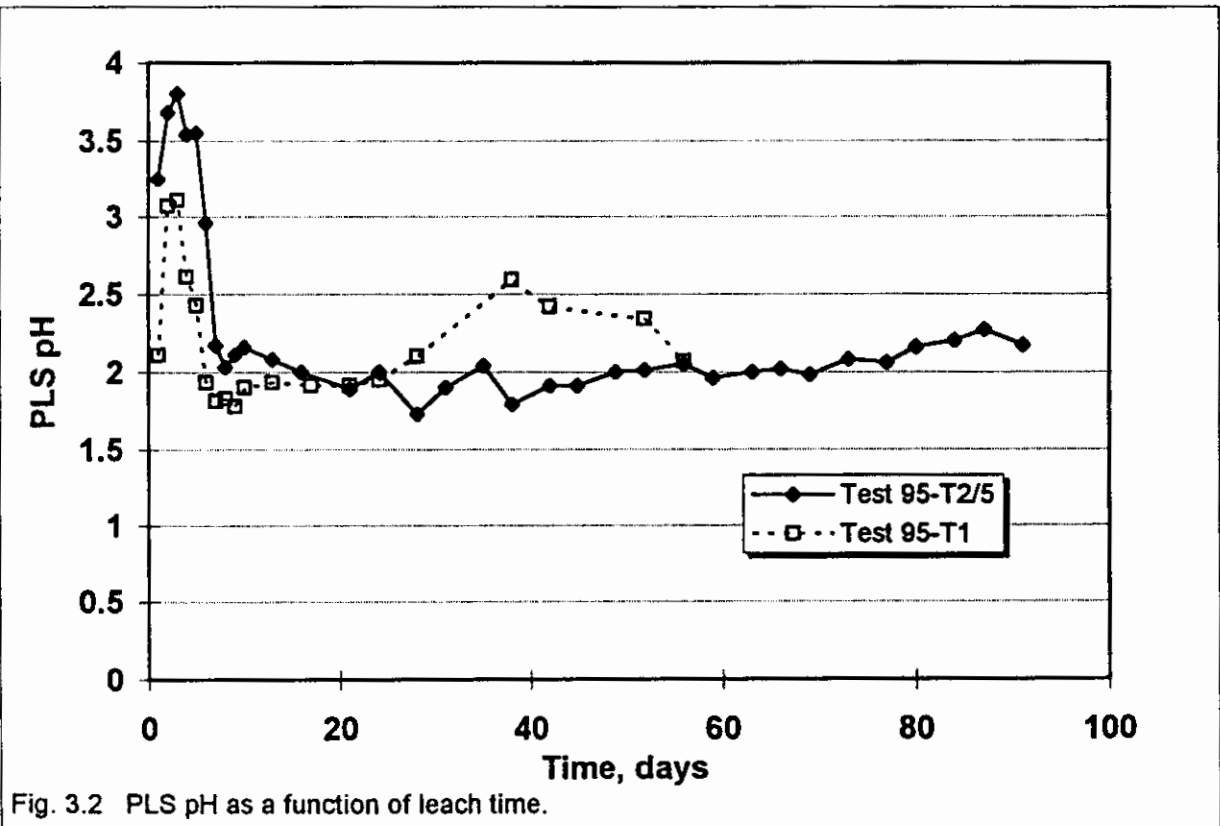


Fig. 3.2 PLS pH as a function of leach time.

effect on copper leaching as the leaching rate was dropping continuously during this period. Similarly, for test T2/5 the leaching rate dropped off over the period from 20 to 30 days, in spite of acidic conditions. It appears that once the exposed surface copper is leached, a slow diffusion of solutions into and out of the individual particles takes place and this process is not being assisted by increased acid concentration. It appears that following the first 10 to 20 days of intensive leaching, it may be beneficial to leach with low acid solutions for an extended period of time in order to achieve maximum ultimate extraction with minimal acid consumption. Considering the fact that the present column charges are at a finer crush size than would be expected for a commercial operation, the effect of particle size on copper extraction has to be evaluated. The complete analyses for the residue fractions from each of the columns are included with the detailed column results in the appendix. The recovery by size fraction is summarized in Table 3.2.

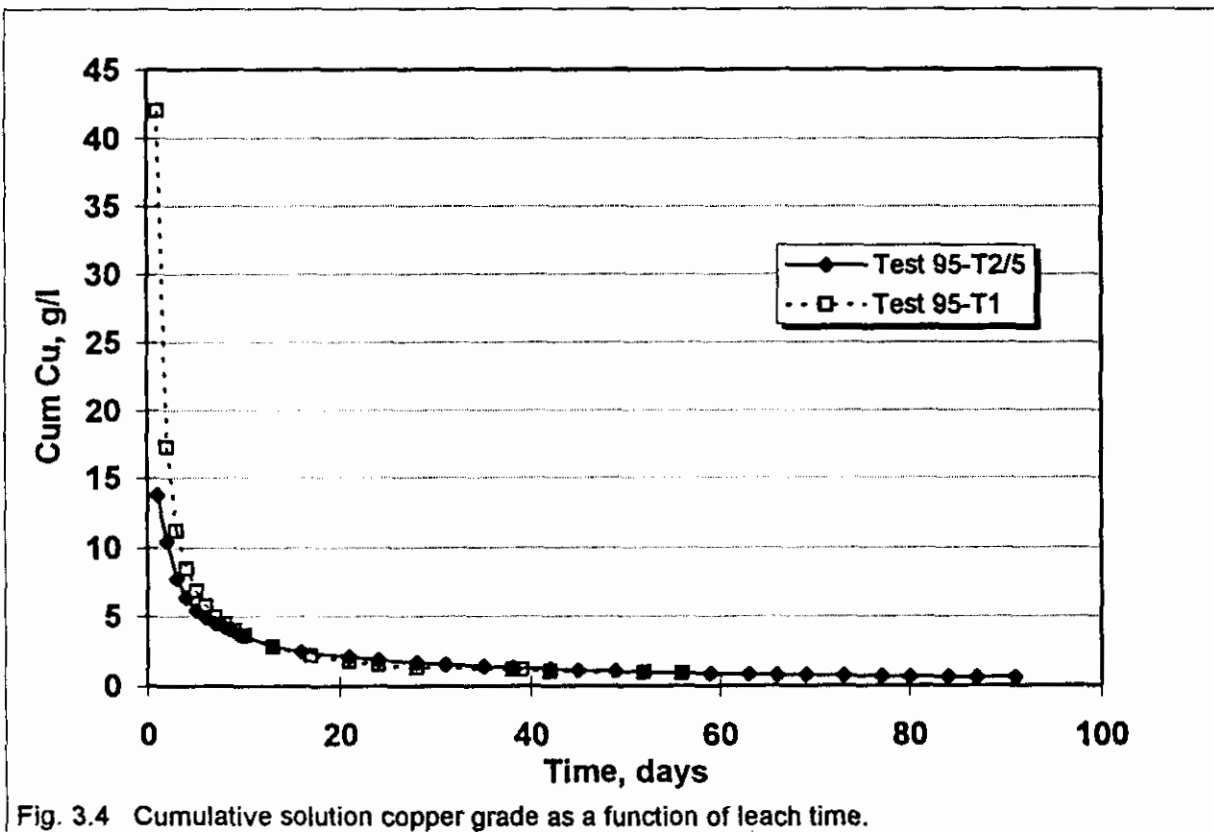
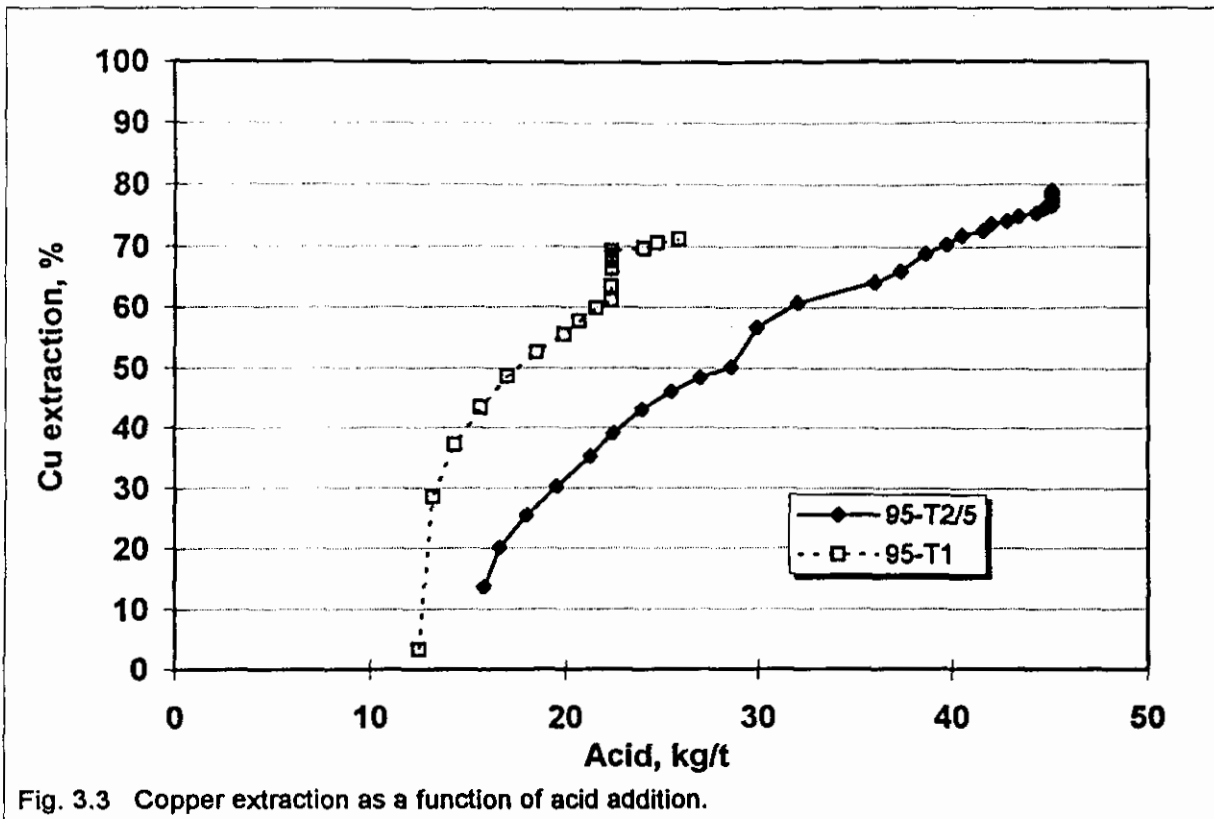
Table 3.2
Copper recovery by size fraction.

Fraction	Test T1		Test T2/5	
	Degradation index	% Recovery	Degradation index	% Recovery
+ 1/2 inch	0.1	48.4	0.39	56.8
- 1/2 + 3/8	0.05	53.1	0.28	63.8
- 3/8 + 1/4	0.05	62.9	0.15	71.7
- 1/4 + 6m	0.01	72.2	-0.01	74.5
- 6m	-0.1	81.5	-0.44	88.1

The degradation index in Table 3.2 is a fractional representation of changes in size distribution. A positive number indicates a loss of material from that size fraction while a negative number indicates that material was gained. It is apparent that little degradation occurred for sample T1 while there was some shifting of material from the coarse fractions to the fines for sample T2/5.

Both test residues show an increasing copper extraction from the coarse to the fine fractions with the extractions for test T2/5 being higher for each fraction, consistent with the overall results. The results suggest that as coarser crush sizes are tested, the leach time will have to be longer than in the present testwork.

The copper extraction as a function of the amount of acid added to each test is summarized in Figure 3.3. While the acid consumption for test T1 was in the expected range, the consumption for test T2/5 was far greater than expected, based on previous testwork including the bottle roll tests conducted on the same sample material as used for the column test. The ideal shape for the



curves in Figure 3.3 is a vertical line at the minimal possible acid addition. It appears that in test T2/5, the acid concentration in the feed was such that the gangue was being dissolved to a far greater degree than is desirable. The resulting PLS pH of 2 and less appears to be lower than is necessary for this material. Future tests should be conducted with a target pH of 2.2 to determine the effect on acid consumption as well as the leach rate. It should be recognized that as the leach time is extended, the cumulative average copper concentration in the PLS becomes lower, as shown in Figure 3.4, increasing the size of the SX plant. In order to overcome this increase in plant size, the solutions will have to be recirculated to achieve the desired copper concentration.

From the consideration of leach times and acid consumption, it appears that this material is a candidate for multiple lift leaching. The initial lift should be conducted until a copper extraction in the order of 70% is achieved and the next lift should then be placed on top. In this manner a long leach time is achieved with the latter stages of leaching being conducted at low acid concentration.

4.0 RECOMMENDATIONS

Additional column testwork should be undertaken to establish the preferred operating parameters for the Getty deposit. The tests should be designed to establish the following parameters:

- crush size
- acid addition to the cure
- leach solution flowrate
- effect of multiple lift leaching
- target PLS pH
- duration of each leach cycle

grade - % Cu

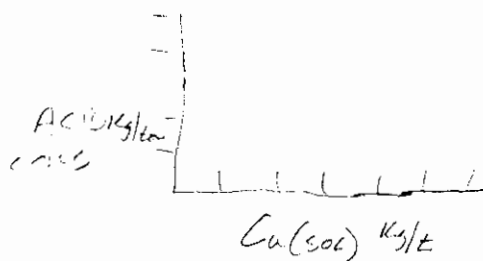
*calculated extraction efficiency @ various grades
→ cost/kg Sol
→ % Cu/kg Sol*

These tests can be conducted on a bulk sample which is presently available at Process Research Associates. In addition, once the basic parameters are established, column tests should be conducted on additional drill core samples to demonstrate variability across the deposit. The drill core to be used for this testwork may have to be obtained by twinning several drill holes unless the core can be crushed to a significantly coarser top size than is the current practice at the assay laboratory.

VARY

ACID CONSUMPTION (Kg/tonne Soln) cont'd

Cu(SOL) Kg/tonne Soln



APPENDIX
Test Details

COPPER COLUMN LEACH TESTWORK DATA
GETTY COPPER PROJECT

Page: 1

Project #: 95-057
Column #: 95-T1
Column Size: 8 inch x 10 feet
Ore Sample: Composite 95-T1

Sample Weight: 140 kg
Copper Grade: 0.40 %
Charge Height: 2.85 m
Bulk S.G.: 1.51 tonne/m3
Curing: 7 days

Agglomeration Acid Concentration: 1675 g 98% H2SO4/L
Agglomeration Acid Consumption: 12 kg/tonne
Sample Moisture: 4 % by weight
Initial H2SO4 Solution Concentration: 10.0 g/L

Date	Time on	Time off	Days	FEED SOLUTION					LEACHATE					RAFFINATE				Cu Extr. %	H2SO4 Add'n kg/t				
				s.g.	pH	Free H ⁺ g/L	H2SO4 g	Flow mL/min	s.g.	Vol. L	pH	ORP mV*	Cu g/L	Fe g/L	s.g.	Vol. L	pH			Cu g/L	Fe g/L	Free H2SO4 g/L	
1995																							
Jul-18	8:45			1.002	1.12	9.78																	
Jul-19		8:45	1				70	4.93	1.200	0.43	2.11	337	42.00	6.43								3.3	12.5
Jul-20	8:31			1.002	1.08	10.00																	
Jul-20		8:30	2				100	6.99	1.061	8.74	3.07	336	16.00	1.59								28.5	13.2
Jul-21	8:31			1.007	0.83	16.02																	
Jul-21		8:30	3				154	6.91	1.024	9.17	3.11	332	5.20	0.73								37.1	14.3
Jul-22	9:05			1.006	0.88	15.06																	
Jul-22		8:00	4				179	7.49	1.018	10.11	2.61	332	3.40	0.76								43.3	15.6
Jul-23	8:30			1.009	0.79	17.85																	
Jul-23		9:00	5				200	7.48	1.018	10.84	2.43	399	2.70	0.64								48.6	17.0
Jul-24	9:03			1.009	0.79	17.85																	
Jul-24		9:25	6				208	7.84	1.018	11.25	1.93	397	1.90	1.05								52.5	18.5
Jul-25	9:30			1.009	0.79	17.85																	
Jul-25		8:10	7				198	8.02	1.017	10.93	1.81	388	1.49	1.17								55.4	19.9
Jul-26	10:30			1.004	1.07	10.21																	
Jul-26		9:20	8				111	7.84	1.019	10.25	1.83	382	1.27	1.36								57.7	20.7
Jul-27	9:20			1.004	1.18	10.11																	
Jul-27		9:00	9				115	7.97	1.024	10.77	1.78	383	1.03	1.80								59.8	21.6
Jul-28	9:00			1.004	1.18	10.10																	
Jul-28		9:00	10				112	7.67	1.024	10.93	1.90	388	0.84	1.66	1.021	10.91	1.14	0.131				61.1	22.4
Jul-31	9:05			1.010	1.00	10.40																	
Jul-31		10:00	13				0	7.88	1.014	33.97	1.93	395	0.46	0.94	1.022	33.29	1.23	0.088				63.4	22.4
Aug-04	10:00			1.024	1.47	9.10																	
Aug-04		9:15	17				0	7.57	1.025	42.22	1.91	396	0.43	1.95	1.021	42.17	1.65	0.050				66.3	22.4
Aug-04	10:45			1.021	1.65	5.92																	
Aug-08	9:00			1.021	1.65	5.92																	
Aug-08		9:00	21				0	7.81	1.021	44.07	1.92	383	0.15	1.52	1.022	43.88	1.42	0.001				67.5	22.4
Aug-11	10:30			1.022	1.74	4.98																	
Aug-11		10:30	24				0	7.77	1.02	33.24	1.95	380	0.09	1.50	1.022	33.14	1.91	0.001				68.0	22.4
Aug-15	11:30			1.022	1.86	4.55																	
Aug-15		9:30	28				0	7.83	1.022	43.28	2.10	376	0.07	1.49	1.022	42.92	2.00	0.001				68.5	22.4

* vs Ag/AgCl reference

MATERIAL BALANCE

Project no : 95-057

Date : July 20, 1995

Test no : T1

Sample description : Column head

Products	Weight		Assay			%Distribution		
	(kg)	(%)	Cu(T) (%)	Cu(ox) (%)	Cu(S#) (%)	Cu(T)	Cu(ox)	Cu(S#)
+ 1/2 inch	5.5	2.6	0.31	0.24	0.07	2.0	2.0	2.1
-1/2 + 3/8 inch	36.8	17.6	0.32	0.25	0.07	14.2	14.1	14.3
-3/8 + 1/4 inch	71.1	34.1	0.35	0.27	0.08	30.0	29.5	31.6
-1/4 inch + 6 mesh	37.3	17.9	0.36	0.28	0.08	16.2	16.0	16.6
-6 mesh	57.9	27.8	0.54	0.43	0.11	37.7	38.3	35.4
Calculated head	208.5	100.0	0.40	0.31	0.09	100.0	100.0	100.0
Assay head								

MATERIAL BALANCE

Project no : 95-057

Date : 4-Oct-95

Test no : T1

Sample description : Column residue

Products	Weight		Assay		%Distribution	
	(kg)	(%)	Cu (%)	Fe (%)	Cu	Fe
+1/2"	3.3	2.4	0.16	1.92	3.3	4.4
-1/2"+3/8"	23.0	16.7	0.15	1.84	20.9	29.8
-3/8"+1/4"	45.2	32.7	0.13	1.84	35.5	58.5
-1/4"+6 mesh	24.4	17.7	0.10	1.68	14.4	2.8
-6 mesh	42.3	30.6	0.10	1.52	26.0	4.5
Calculated head	138.2	100.0	0.12	1.03	100.0	100.0
Assay head						

COPPER COLUMN LEACH TESTWORK DATA

GETTY COPPER PROJECT

Page: 1

Project #: 95-057
 Column #: 95-T2/5
 Column Size: 8 inch x 10 feet
 Ore Sample: Composite 95-T2/5

Sample Weight: 136 kg
 Copper Grade: 0.54 %
 Charge Height: 3.15 m
 Bulk S.G.: 1.33 tonne/m³
 Curing: 7 days

Agglomeration Acid Concentration: 98 %H₂SO₄
 Agglomeration Acid Consumption: 15 kg/tonne
 Sample Moisture: 4 % by weight
 Initial H₂SO₄ Solution Concentration: 10.0 g/L

Date	Time on	Time off	Days	FEED SOLUTION					LEACHATE					RAFFINATE					Cu Extr. %	H ₂ SO ₄ Add'n kg/t					
				s.g.	pH	Free H ⁺ g/L	H ₂ SO ₄ g	Flow mL/min	s.g.	Vol. L	pH	ORP mV*	Cu g/L	Fe g/L	s.g.	Vol. L	pH	Cu g/L			Fe g/L	Free H ₂ SO ₄ g/L			
1995																									
Aug-16	9:35			1.004	1.26	10.1																			
Aug-16		16:05	0				111	5.95	1.057	7.13	3.25	351	13.80	0.83									13.4	15.8	
Aug-17	8:15			1.004	1.26	10.1																			
Aug-18		8:20	2				107	7.27	1.028	6.73	3.68	327	6.90	0.38									19.7	16.6	
	8:30			1.006	0.77	18.2																			
Aug-19		8:25	3				187	7.09	1.015	9.85	3.8	321	3.90	0.21									24.9	18.0	
	8:35			1.010	0.77	18.2																			
Aug-20		8:10	4				204	7.75	1.015	10.42	3.54	334	3.30	0.25									29.5	19.5	
	8:10			1.010	0.77	18.2																			
Aug-21		9:40	5				247	8.71	1.015	12.55	3.55	333	2.90	0.33									34.5	21.3	
	9:40			1.010	0.88	20.0																			
Aug-22		8:40	6				163	7.89	1.014	10.71	2.96	365	2.60	0.43									38.3	22.5	
	8:54			1.009	0.88	20.0																			
Aug-23		9:00	7				213	7.94	1.016	11.20	2.17	400	2.50	0.76									42.1	24.1	
	9:05			1.006	0.88	15.0																			
Aug-24		8:20	8				198	7.69	1.018	10.38	2.03	409	2.10	1.08									45.0	25.5	
	8:25			1.004	1.26	10.1																			
Aug-25		8:10	9				200	7.64	1.016	10.52	2.11	409	1.65	0.92									47.4	27.0	
	8:10			1.004	1.26	10.5																			
Aug-26		10:00	10				223	7.83	1.009	11.12	2.16	407	1.15	0.66									49.1	28.6	
	10:30			1.018	0.97	14.5																			
Aug-29		8:30	13				175	7.64	1.015	42.76	2.08	410	1.10	1.01	1.013	42.67	1.63	0.007		4.6		55.5	29.9		
	9:00			1.015	1.10	10.6																			
Sep-01		10:30	16				282	7.83	1.019	33.83	2.00	399	0.87	1.33	1.010	34.03	1.80	0.006		5.4		59.5	32.0		
	11:00			1.020	1.29	9.6																			
Sep-05		8:33	21				170	7.81	1.022	43.19	1.89	426	0.56	1.41	1.020	43.10	1.65	0.002		4.7		62.7	33.2		
	11:43			1.027	1.38	16.0																			
Sep-08		11:22	24				557	7.48	1.030	31.07	2.00	385	0.46	1.68	1.026	33.14	1.89	0.003		4.7		64.7	37.3		
	12:03			1.026	1.28	11.3																			
Sep-12		14:18	28				176	7.55	1.032	43.25	1.73	380	0.48	2.21	1.030	42.92	1.91	0.004		7.0		67.5	38.6		

* vs Ag/AgCl reference

COPPER COLUMN LEACH TESTWORK DATA

GETTY COPPER PROJECT

Page: 2

Project #: 95-057
 Column #: 95-T2/5
 Column Size: 8 inch x 10 feet
 Ore Sample: Composite 95-T2/5

Sample Weight: 136 kg
 Copper Grade: 0.54 %
 Charge Height: 3.15 m
 Bulk S.G.: 1.33 tonne/m³
 Curing: 7 days

Agglomeration Acid Concentration: 98 %H₂SO₄
 Agglomeration Acid Consumption: 15 kg/tonne
 Sample Moisture: 4 % by weight
 Initial H₂SO₄ Solution Concentration: 10.0 g/L

Date 1995	Time on	Time off	Days	FEED SOLUTION				LEACHATE					RAFFINATE				Free H ₂ SO ₄ g/L	Cu Extr. %	H ₂ SO ₄ Add'n kg/t		
				s.g.	pH	Free H ⁺ g/L	H ₂ SO ₄ g	Flow mL/min	s.g.	Vol. L	pH	ORP mV*	Cu g/L	Fe g/L	s.g.	Vol. L				pH	Cu g/L
Sep-15	15:35	12:20	31	1.033	1.27	10.1	141	7.75	1.032	31.16	1.90	406	0.35	2.43	1.032	30.96	1.92	0.003	6.6	68.9	39.7
Sep-19	12:20	11:08	35	1.033	1.70	10.4	108	7.44	1.036	40.38	2.04	396	0.25	2.68	1.063	39.41	2.21	0.002	6.5	70.3	40.5
Sep-22	11:10	8:31	38	1.036	1.92	9.5	153	7.30	1.037	29.39	1.79	395	0.21	2.67	1.038	29.34	1.72	0.002	8.1	71.1	41.6
Sep-26	9:31	9:12	42	1.039	1.45	10.4	60	7.30	1.040	40.27	1.91	392	0.18	2.86	1.040	40.14	1.87	0.001	7.6	72.0	42.0
Sep-29	11:32	8:31	45	1.037	1.48	9.9	105	8.35	1.041	33.84	1.91	395	0.12	2.48	1.042	33.66	1.84	0.002	7.8	72.6	42.8
Oct-03	9:28	8:36	49	1.041	1.35	10.0	79	7.36	1.040	40.87	2.00	391	0.13	2.70	1.040	40.79	1.80	0.002	7.2	73.3	43.4
Oct-06	9:58	8:41	52	1.043	1.33	10.3	124	7.85	1.043	32.97	2.01	391	0.11	3.17	1.043	32.85	1.88	0.001	8.5	73.8	44.3
Oct-10	9:50	15:03	56	1.044	1.28	10.4	54	7.46	1.044	44.85	2.05	386	0.12	3.07	1.044	44.25	2.02	0.001	8.8	74.5	44.7
Oct-13	17:09	9:51	59	1.045	1.65	10.4	59	7.37	1.045	28.94	1.96	397	0.11	3.26	1.045	28.34	1.86	0.001	8.8	74.9	45.1
Oct-17	10:41	10:50	63	1.046	1.84	9.5	0	7.65	1.046	43.65	2.00	392	0.09	3.30	1.046	43.41	1.84	0.001	8.0	75.4	45.1
Oct-20	12:44	14:05	66	1.046	1.84	8.0	0	7.92	1.047	34.08	2.02	387	0.07	3.30	1.046	33.87	1.90	0.001	8.1	75.8	45.1
Oct-23	15:28	10:05	69	1.044	1.92	8.2	0	7.38	1.044	29.36	1.98	385	0.06	3.20	1.045	29.03	1.84	0.001	8.3	76.0	45.1
Oct-27	10:50	10:13	73	1.046	1.84	7.9	0	7.88	1.045	44.56	2.08	381	0.05	3.20	1.045	44.29	2.03	0.0004	8.2	76.3	45.1
Oct-31	11:15	11:36	77	1.046	2.03	8.7	0	7.70	1.045	43.85	2.06	371	0.04	3.60	1.045	43.70	2.02	0.0004	8.0	76.5	45.1
Nov-03	13:15	11:00	80	1.045	2.06	8.0	0	7.56	1.046	31.98	2.16	377	0.04	3.10	1.046	31.84	2.02	0.0004	8.2	76.7	45.1

* vs Ag/AgCl reference

COPPER COLUMN LEACH TESTWORK DATA

GETTY COPPER PROJECT

Project #: 95-057
 Column #: 95-T2/5
 Column Size: 8 inch x 10 feet
 Ore Sample: Composite 95-T2/5

Sample Weight: 136 kg
 Copper Grade: 0.55 %
 Charge Height: 3.15 m
 Bulk S.G.: 1.33 tonne/m3
 Curing: 7 days

Agglomeration Acid Concentration: 98 % H2SO4
 Agglomeration Acid Consumption: 15 kg/tonne
 Sample Moisture: 4 % by weight
 Initial H2SO4 Solution Concentration: 10.0 g/L

Fig

Date	Time on	Time off	Days	FEED SOLUTION				LEACHATE					RAFFINATE				Free H2SO4 g/L	Cu Extr. %	H2SO4 Add'n kg/t				
				s.g.	pH	Free H ⁺ g/L	H2SO4 g	Flow mL/min	s.g.	Vol. L	pH	ORP mV*	Cu g/L	Fe g/L	s.g.	Vol. L				pH	Cu g/L	Fe g/L	
1995				1.046	2.08																		
Nov-07	12:17					8.1	0	7.31	1.045	41.08	2.20	380	0.360	3.10	1.046	40.81	2.15	0.0004		8.1	78.7	45.1	
	13:05	11:47	84	1.045	2.74																		
Nov-10		9:50	87			8.5	0	7.49	1.045	29.69	2.27	396	0.031	3.60	1.045	29.64	2.17	0.0003		8.5	78.8	45.1	
	11:13			1.046	2.17																		
Nov-14		8:15	91			7.9	0	6.45	1.046	35.42	2.17	380	0.028	3.20	1.046	35.53	2.20	0.0003		7.9	78.9	45.1	
								Final pregnant	1.047	22.16	2.30	375	0.034	2.97							79.1	45.1	
								Wash solution	1.023	15.99	2.43		0.038								79.1	45.1	

Cu in final residue = 0.12 %
 Total Cu in final residue = 153.50 grams

 Total Cu extracted = 583.45 grams
 Total Cu in head sample = 736.95 grams

otal Cu extraction = 79.17 %

Calculated head = 0.54 %

* vs Ag/AgCl reference

MATERIAL BALANCE

Project no : 95-057

Date : 7-Dec-95

Test no : T2/5

Sample description : Column residue

Products	Weight		Assay			%Distribution		
	(kg)	(%)	Cu(T) (%)	Cu(ox) (%)	Fe(T)	Cu(T)	Cu(ox)	Fe(T)
+1/2"	2.4	1.7	0.19	0.10	2.03	2.9	5.5	4.3
-1/2"+3/8"	18.2	13.4	0.17	0.08	1.88	19.7	35.9	30.9
-3/8"+1/4"	39.7	29.2	0.13	0.06	1.80	33.8	54.1	64.5
-1/4"+6 mesh	25.6	18.9	0.12	0.04	1.64	18.9	3.1	0.2
-6 mesh	49.9	36.7	0.08	0.02	1.48	24.7	1.5	0.1
Calculated head	135.8	100.0	0.12	0.03	0.82	100.0	100.0	100.0
Assay head								

**COLUMN TESTING
OF BULK SAMPLE FROM
GETTY NORTH DEPOSIT**

GETTY COPPER CORPORATION

SEPTEMBER 1996

**BEATTIE CONSULTING LTD
VANCOUVER, B.C.**

TABLE OF CONTENTS

	<u>Page</u>
1.0 SUMMARY	1
2.0 INTRODUCTION	1
3.0 DISCUSSION	2
3.1 Sample Description	2
3.2 Procedures	4
3.3 Results	4
4.0 RECOMMENDATIONS	10

Appendix A Details of Process Research Associates Testwork

1.0 SUMMARY

Two column tests have been conducted on a bulk sample taken from an outcrop on the Getty North copper deposit. The tests were conducted at different crush sizes to demonstrate the sensitivity of the material to crush size. The operating parameters for the columns were based on assumed conditions for a commercial heap leach operation on the deposit.

The Getty North material has been demonstrated to be sensitive to crush size and a minus 3/4 inch crush size is indicated. At a 2 inch crush size it appeared that excessive leach times would be required and the ultimate extraction could be limited. At a minus 3/4 inch crush size, the test column achieved a copper extraction of 82.4% over a period of 120 days, which is assumed to represent three lifts of operation. The net acid consumption after accounting for acid remaining in the circuit at the end of the test was 17.4 kg/tonne.

Since the basic operating parameters have been established, additional samples representing different areas of the deposit should be tested to establish the range of metallurgical performance to be encountered with respect to copper extraction and acid consumption. Such additional samples should include material having a range of soluble to total copper ratios to establish the effect of this variation on copper extraction. Consideration should also be given to conducting a two lift test using the remaining bulk sample to demonstrate that leaching and acid consumption in the multiple lift scenario are as predicted from the present testwork.

2.0 INTRODUCTION

Previous metallurgical testwork consisting of both bottle roll tests and column tests on samples from the Getty North deposit demonstrated that the acid soluble copper in the deposit is amenable to extraction by heap leaching. These tests had been preliminary in nature and had not established the necessary parameters for a commercial heap leach operation.

A bulk sample was taken from the outcrop on the deposit in the fall of 1995 for the purpose of conducting additional metallurgical testwork. The sample was tested at the laboratories of Process Research Associates of Vancouver according to operating parameters established by M.J.V. Beattie, P.Eng. While the principal purpose of the tests was to establish the required crush size for the material, the tests also were designed to operate according to conditions which were projected as being realistic for a full scale operation. These conditions are discussed in the report.

3.0 DISCUSSION

3.1 Sample Description

The sample used for the testwork consisted of a bulk sample taken by means of a backhoe from the north end of the outcrop area on Getty North by hole DDH95-3 under the supervision of S.C. Gower, P. Geo. The sample material was taken to a depth of 2 meters and consisted of fragments up to 50 cm in diameter which were placed in 6 plastic barrels for shipment to Vancouver.

The entire sample was emptied at Process Research and although it had much coarse material, it was found to contain some very moist fine material as well. The sample was therefore allowed to air dry until it could be screened at 2 inches. All pieces larger than 2 inches in diameter were broken by means of a sledge hammer until they would pass the screen. The entire minus 2 inch sample was then cone and quartered to provide four sample portions. One portion was tested at the minus 2 inch size while a second portion was screened at 3/4 inch and the oversize material was crushed until it all passed the screen.

The total sample in each case was screened into a series of size fractions and each fraction was assayed for total and acid soluble copper. The analyses of the two samples are summarized in Tables 3.1 and 3.2. In each case there is a significant increase in copper content from the coarse to the fine fractions. This concentration of copper into the fines is consistent with the nature of the copper mineralization which has been noted to be concentrated along fractures in the rock and which is also very friable. A portion of the overall sample was analyzed to contain 26.5% of the copper as carbonates and 64.9% as chrysocolla. For the minus 2 inch sample, although there is an enrichment of copper into the fines, the coarse size distribution of the material results in most of the copper being contained in the coarsest size fractions, i.e. 66% of the copper is in the plus 1/2 inch material. For the minus 3/4 inch sample the values are more evenly distributed and only 32.2% of the copper is in the plus 1/2 inch material.

Table 3.1
Assay by Size Fractions for Minus 2 inch Sample.

Fraction	Weight %	Assay, %		Distribution, %	
		Cu total	Cu soluble	Cu total	Cu soluble
+ 1 inch	43.0	1.22	1.12	42.5	42.3
- 1 + 3/4	14.3	0.96	0.88	11.1	11.1
- 3/4 + 1/2	16.8	0.92	0.84	12.5	12.4
- 1/2 + 3/8	7.6	1.04	0.96	6.4	6.4
- 3/8 + 1/4	6.5	1.24	1.14	6.5	6.5
- 1/4 + 6m	4.1	1.62	1.54	5.3	5.5
- 6m	7.8	2.46	2.30	15.6	15.8
Total		1.23	1.14		

Table 3.2
Assay by Size Fraction for Minus 3/4 inch Sample

Fraction	Weight %	Assay, %		Distribution, %	
		Cu total	Cu soluble	Cu total	Cu soluble
+ 1/2 inch	43.5	0.88	0.81	32.2	31.9
- 1/2 + 3/8	18.4	0.98	0.89	15.2	14.9
- 3/8 + 1/4	13.3	1.12	1.04	12.5	12.5
- 1/4 + 6m	9.5	1.40	1.32	11.2	11.4
- 6m	15.3	2.26	2.12	29.0	29.3
Total		1.19	1.10		

3.2 Procedures

For each sample, the size fractions were recombined in the appropriate proportions to provide a series of batches for introduction into the test column. The cure acid was added as 93% acid which was sprinkled over the sample prior to sufficient water being added to bring the total moisture content to 4% by weight. The material was then mixed to distribute the acid throughout the sample and each batch was dumped into the column. The samples were allowed to cure for 7 days before the leaching solution was added.

The timing of the test was started when the leach solution was first pumped onto the column at a rate of 12 l/m²/hr. For each test the initial acid concentration in the feed was 12 gpl H₂SO₄. Fresh feed solution was added to the column for approximately the first week. At the end of this period, the PLS solution was treated by means of solvent extraction to produce a raffinate for recycle to the column. Since the solutions from the first few days were very high in acid, these solutions were blended so that the acid concentration in the feed never exceeded 12 gpl. The solvent extraction was done with a 20% solution of Acorga M5460 in kerosene. For each test, the PLS pH stabilized very quickly and further acid additions were not required to maintain the target feed acid concentration which was reduced from 12 to 10 gpl once the PLS pH was stable.

Upon completion of each test, the contents of the column were dumped out and allowed to dry before being screened into the same series of size fractions as the feed for analysis.

3.3 Results

The detailed balances for both tests are appended to this report. The copper extraction as a function of time for both columns is summarized in Figures 3.1 and 3.2. In Figure 3.1 it can be seen that both columns achieved a rapid initial copper extraction which then became progressively slower with time. The extraction for test CB1, at a minus 2 inch crush size, decreased more quickly than for test CB2 at the finer crush size, as would be expected. It also appeared from the shape of the curve for test CB1 that this test would have difficulty achieving 80% copper extraction without exceedingly long leach times. The test was therefore ended after 60 days while test CB2, using the minus 3/4 inch crush was continued for the full 120 day period. It was concluded at this point that a crush size of minus 3/4 inch was appropriate for this material.

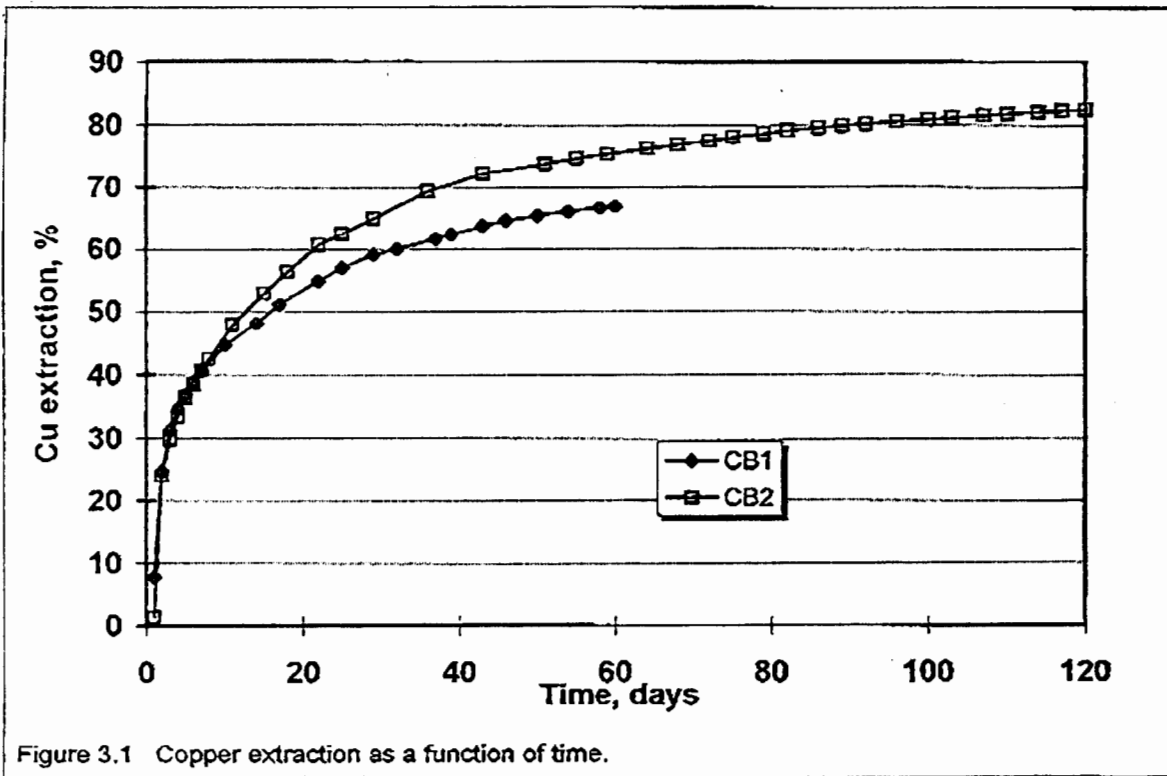


Figure 3.1 Copper extraction as a function of time.

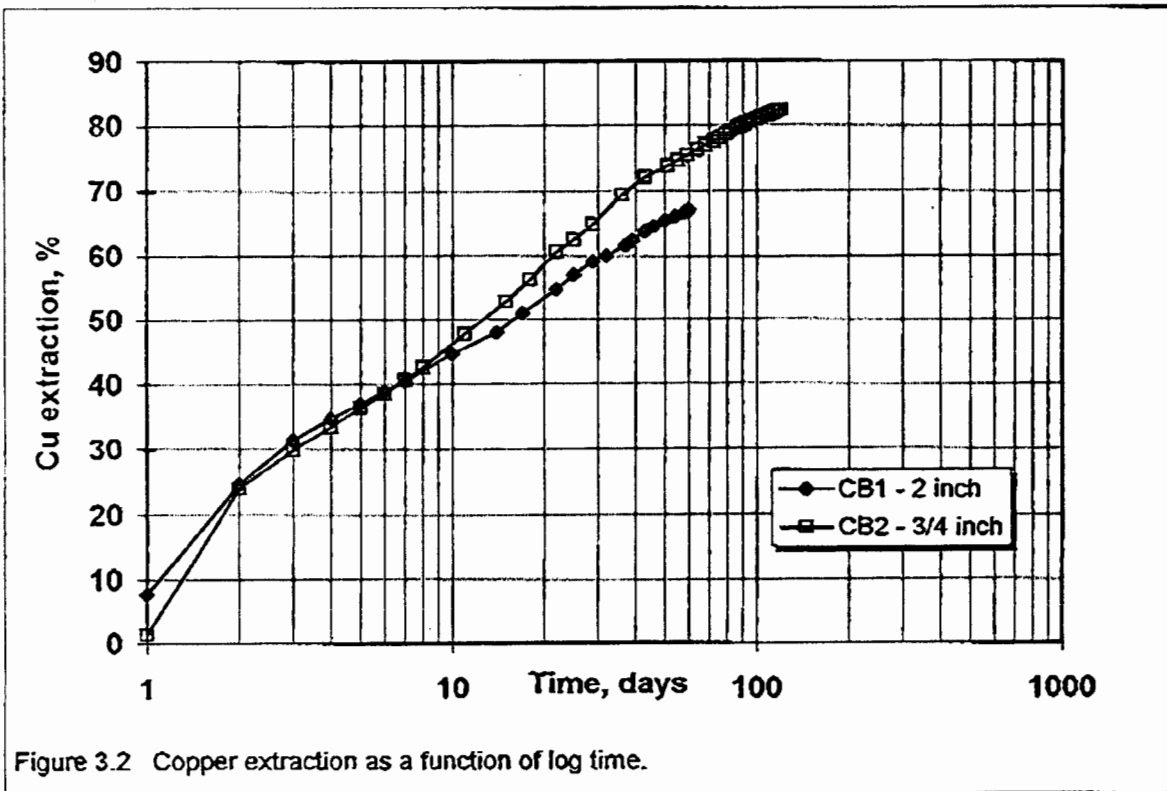


Figure 3.2 Copper extraction as a function of log time.

The procedure for the columns was based on information gained from previous column tests and assumptions made for a full scale operation. It was assumed that the average feed grade would be 0.57% Cu of which 80% was acid soluble and that the material would be leached in 6 meter lifts. Using a single lift leach time of 40 days with a solution addition rate of 12 l/m²/hr and assuming that 70% copper extraction was achieved over 40 days would result in an average PLS grade of 1 gpl Cu. Additional extraction would be achieved during the subsequent two lifts to bring the extraction to the level indicated by the testwork. In the case of test CB2 a copper extraction of 82.4%, based on the total copper content, was achieved over the 120 day leach period. Assuming that 92% of the copper was in acid soluble form, 90% of the acid soluble copper was leached over the 120 day period.

Both tests were given an acid cure addition of 15 kg/tonne and leaching was started with a 12 gpl H₂SO₄. For each test there was an excursion to increased PLS pH which then quickly stabilized to a value near pH 2 as shown in Figure 3.3. It was found that once the PLS pH stabilized, further acid additions were not required and in the case of CB2, a PLS acid concentration of 9 to 10 gpl was maintained. The acid consumption shown in the test spreadsheets in Appendix A are in fact the acid inventory rather than consumption since various raffinate solutions were not returned to the circuit once the PLS pH was determined to be stable. Figures 3.4 and 3.5 show the copper extraction as a function of actual acid consumption as well as the acid inventory. The drop in the acid consumption at the maximum copper extraction in each case represents the acid present in the final PLS. The final net acid consumption for CB1 was 11.3 kg/tonne and for CB2 was 17.4 kg/tonne. At the 3/4 inch crush size, the cure acid addition of 15 kg/tonne appears to be appropriate in order to minimize excessive breakthrough PLS pH.

The recovery by size was determined for each of the two columns and the results are summarized in Figures 3.6 and 3.7. In each case there is a strong dependence of recovery on average particle size in the range of about 1/2 inch. The higher recovery for CB2 compared to CB1 at each size is consistent with the longer leach time for CB2. The greatest increase in recovery for CB2 however results from the fact that it had a much finer overall average particle size. The size distributions for the feed and residues from the two tests included in Appendix A. indicate some decrepitation for the coarsest size fraction in test CB1 but very little decrepitation in test CB2.

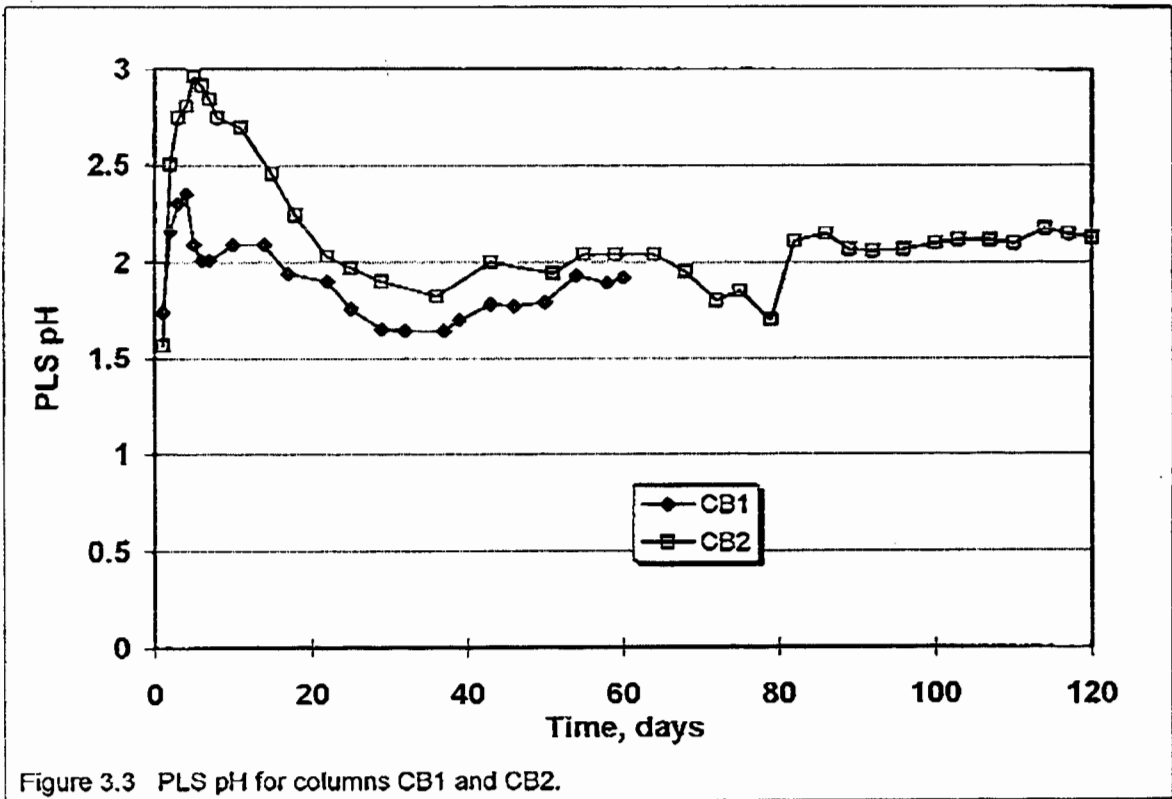


Figure 3.3 PLS pH for columns CB1 and CB2.

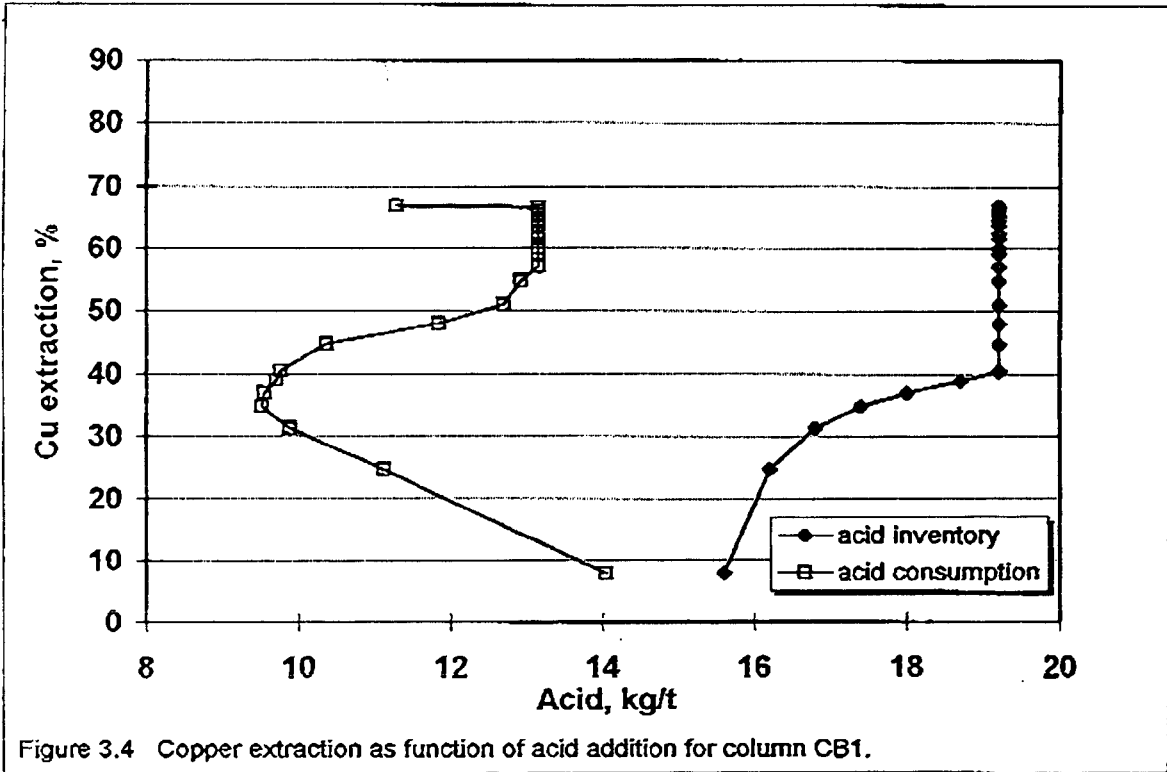


Figure 3.4 Copper extraction as function of acid addition for column CB1.

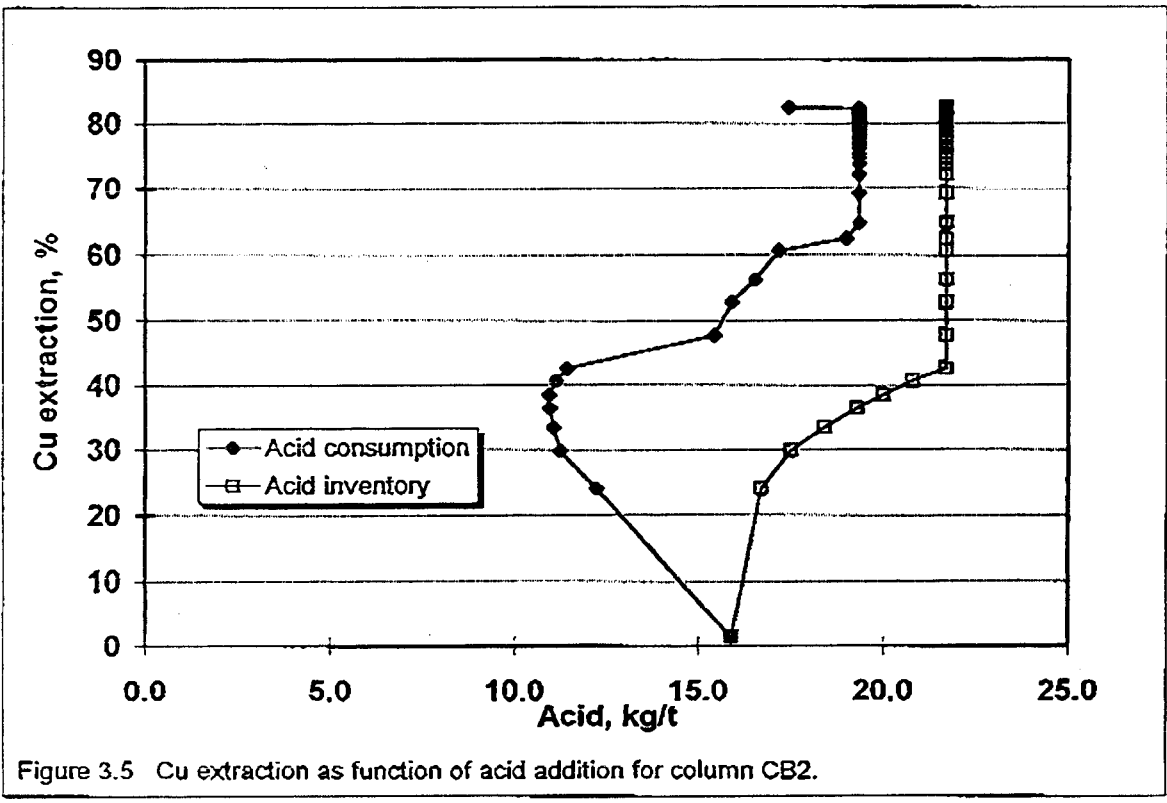


Figure 3.5 Cu extraction as function of acid addition for column CB2.

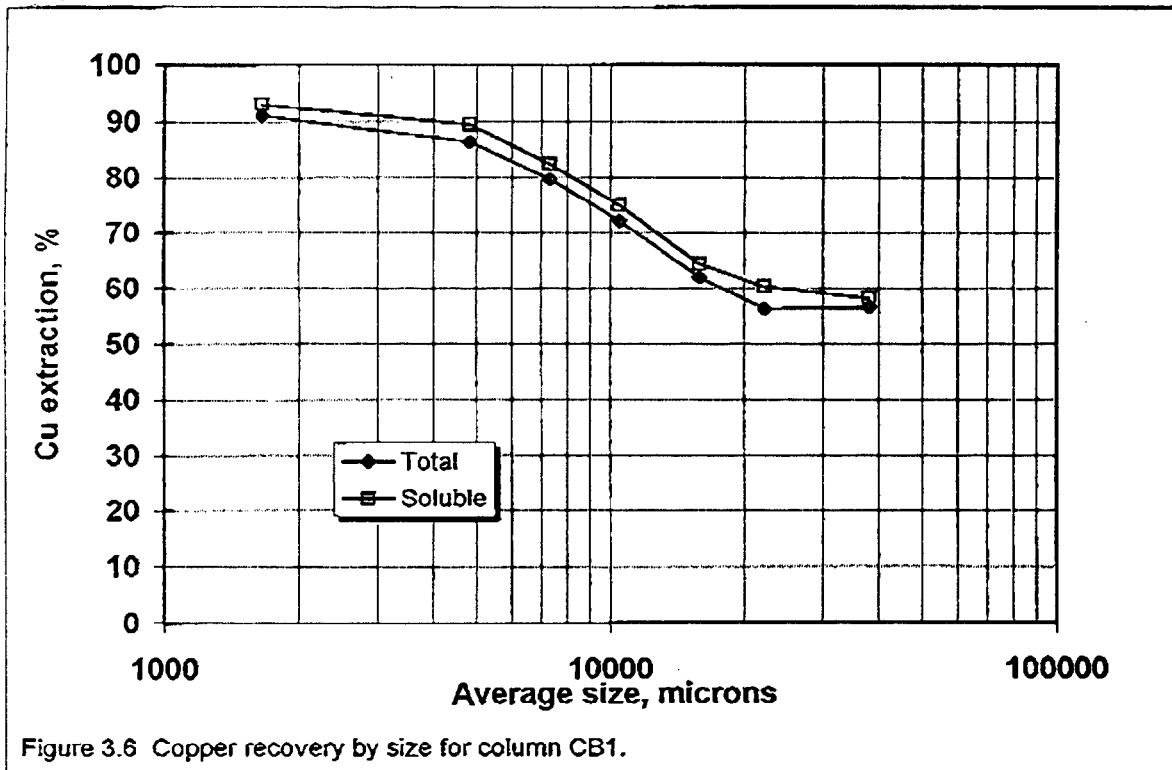


Figure 3.6 Copper recovery by size for column CB1.

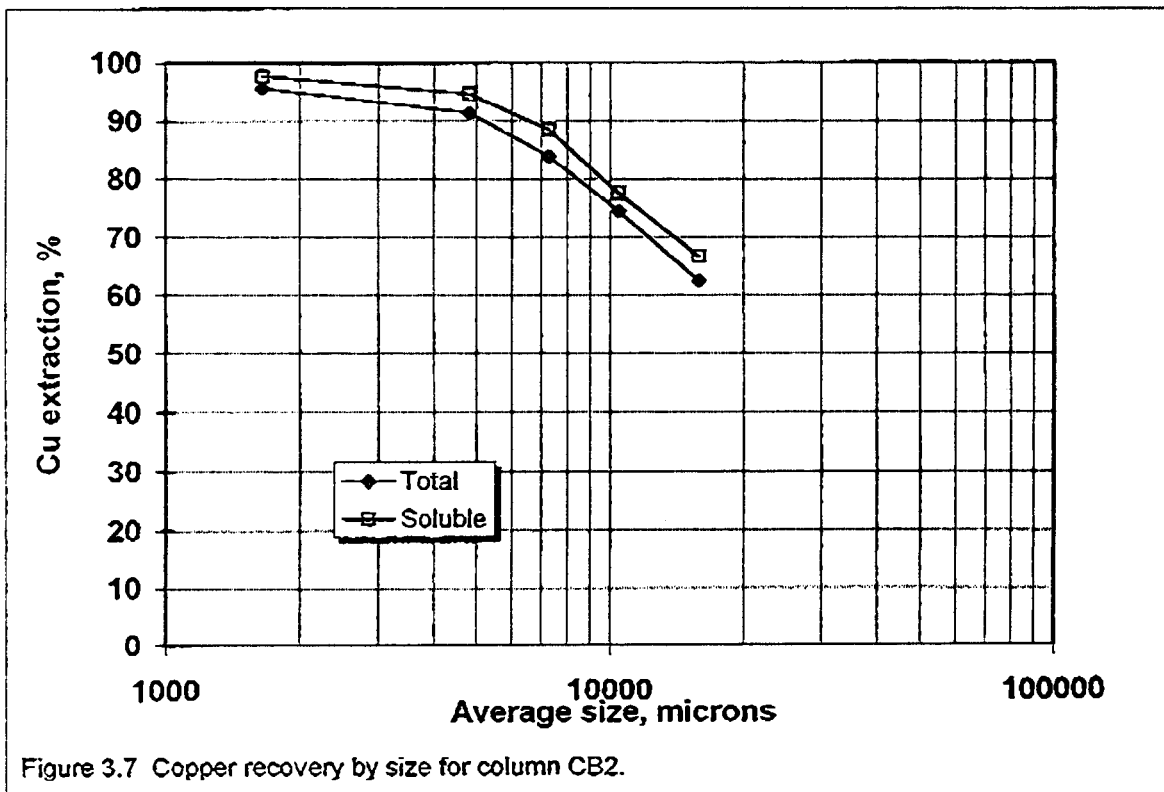


Figure 3.7 Copper recovery by size for column CB2.

4.0 RECOMMENDATIONS

The following additional testwork is recommended in order to establish the data required for the completion of a feasibility study for a heap leaching operation for this project.

1. Column tests using the parameters established by the present testwork on samples from different areas within the deposit. The samples selected for this work should represent a range of copper contents and a range of acid soluble to total copper ratios as well as different horizons within the deposit. The material to be mined during the initial two years of mine operation should be well represented.
2. A two lift column test using the remaining bulk sample to confirm that copper extraction and acid consumption experienced from the first lift during leaching of the overlying lift is as predicted from the present testwork.
3. To date, testwork has not been conducted on material which is below the cut off grade for heap leaching but which has a copper content which may be suitable for a ROM leach. Such ROM leach testwork should be undertaken.

Appendix A

Details of Process Research Associates Testwork

COPPER COLUMN LEACH TESTWORK DATA

GETTY COPPER PROJECT

Project #: 95-057
 Column #: CB1
 Column Size: 10 inch x 10 feet
 Initial Charge Height: 3.75 m
 Final Charge Height: 3.75 m
 Bulk S.G.: 1.45 tonne/m³

Ore Sample: Bulk sample
 Sample Weight: 276 kg
 Cu(T) Grade: 1.16 %
 Cu(sol) Grade: 1.14 %

Agglomeration Acid Concentration: 93 % H₂SO₄/L
 Agglomeration Acid Consumption: 15 kg/tonne
 Initial H₂SO₄ Solution Concentration: 11.7 g/L
 Total H₂O added to cure: 2167 mL
 Initial Sample Moisture: 4.1 % by weight
 Final residue Moisture: 3.4 % by weight
 Curing: 7 days

Breakthrough pH: 0.71
 Breakthrough + 4hrs pH: 1.40

Page: 1 of 2

Date	Time on	Time off	Days	FEED SOLUTION				LEACHATE						RAFFINATE				Cu Extr. %	H ₂ SO ₄ Add'n kg/t		
				Free H ₂ SO ₄ g/L	pH	H ₂ SO ₄ g	Flow mL/min	s.g.	Vol. L	pH	ORP mV*	Cu g/L	Fe g/L	Free H ₂ SO ₄ g/L	s.g.	Vol. L	pH			Cu g/L	Free H ₂ SO ₄ g/L
1996																					
Apr-01	8:32				0.97																
Apr-02		9:00	1			167	9.64	1.273	5.03	1.74	438	50.00	16.00	35.3	1.202	4.41	0.66	4.800	97.5	7.8	15.6
Apr-03		8:52	2		0.97	163	9.85	1.162	14.20	2.16	433	38.00	7.20	19.9	1.117	14.33	0.65	7.480	87.9	24.7	16.2
Apr-04		8:55			0.97	172	9.86	1.063	13.92	2.30	434	15.20	2.40	8.70	1.05	14.03	0.81	1.720	36.2	31.3	16.8
Apr-05		9:26	3		0.97	162	9.71	1.031	13.49	2.35	445	8.20	0.81	6.0	1.024	13.29	0.96	0.620	20.0	34.7	17.4
Apr-06		9:00	4		0.97	162	9.85	1.022	13.21	2.09	440	5.20	0.64	4.8	1.016	12.91	1.21	0.165	12.2	36.9	18.0
Apr-07		8:13	5		0.97	180	9.84	1.019	14.92	2.01	445	4.30	0.81	4.5	1.011	14.53	1.06	0.099	10.4	38.9	18.7
Apr-08		10:00	6		0.97	152	9.41	1.017	12.49	2.01	410	4.10	0.62	3.6	1.011	12.46	1.15	0.066	9.8	40.5	19.2
Apr-11		8:42	7		1.12																
Apr-11		8:18	10		11.8	0	9.59	1.019	39.43	2.09	424	3.60	0.72	4.2	1.016	39.37	1.21	1.70	9.7	44.7	19.2
Apr-15		9:08			1.10																
Apr-15		8:36	14		12.3	0	9.54	1.023	53.20	2.09	443	2.80	0.99	4.9	1.020	53.25	1.23	0.033	9.6	48.0	19.2
Apr-18		8:54			1.10																
Apr-18		10:42	17		12.8	0	9.50	1.024	41.88	1.94	442	2.50	1.39	7.2	1.021	41.62	1.29	0.370	11.3	51.0	19.2
Apr-23		10:52			1.21																
Apr-23		8:29	22		12.2	0	9.63	1.028	65.55	1.90	455	2.00	1.59	6.3	1.026	65.28	1.32	0.032	11.2	54.8	19.2
Apr-26		8:55			1.23																
Apr-26		8:44	25		10.9	0	10.33	1.031	43.15	1.76	454	1.70	1.95	7.2	1.029	42.67	1.34	0.020	10.2	57.0	19.2
Apr-30		8:46			1.32																
Apr-30		8:10	29		10.2	0	9.80	1.030	53.46	1.65	452	1.33	2.12	7.9	1.029	53.44	1.28	0.032	10.3	59.1	19.2
May-03		9:33			1.32																
May-03		9:00	32		11.2	0	9.70	1.033	37.75	1.64	431	1.03	2.02	8.5	1.032	37.59	1.36	0.019	11.0	60.0	19.2
May-08		9:00			1.38																
May-08		8:00	37		12.0	0	9.50	1.034	63.55	1.64	431	0.83	2.22	8.0	1.033	62.73	1.33	0.013	11.8	61.6	19.2
May-10		10:10			1.33																
May-10		8:10	39		10.9	0	9.08	1.036	28.06	1.70	426	0.79	2.54	8.6	1.036	25.77	1.44	0.011	11.7	62.3	19.2
May-14		8:10			1.38																
May-14		16:15	43		11.3	0	9.38	1.037	57.69	1.78	423	0.81	2.40	8.3	1.036	57.32	1.47	0.010	10.6	63.7	19.2
May-17		16:15			1.43																
May-17		11:21	46		10.5	0	10.91	1.038	41.71	1.77	419	0.83	2.15	7.3	1.038	41.35	1.46	0.013	10.4	64.5	19.2
May-17		11:21			1.46																

* vs Ag/AgCl reference

MATERIAL BALANCE

Project no : 95-057 **Date :** 22-Mar-96
Test no : CB1
Sample description : Column feed

Products	Weight		Assay			%Distribution		
	(kg)	(%)	Cu _i (%)	Cu _{ox} (%)	Cu _{sul} (%)	Cu _i	Cu _{ox}	Cu _{sul}
+1 onch	169	43.0	1.22	1.12	0.10	42.5	42.3	44.7
-1 inch+3/4 inch	53	14.3	0.96	0.88	0.08	11.1	11.1	11.9
-3/4 inch+1/2 inch	62	16.8	0.92	0.84	0.08	12.5	12.4	13.9
-1/2 inch+3/8 inch	28	7.6	1.04	0.96	0.08	6.4	6.4	6.3
-3/8 inch+1/4 inch	24	6.5	1.24	1.14	0.10	6.5	6.5	6.7
-1/4 inch+6 mesh	15	4.1	1.62	1.54	0.08	5.3	5.5	3.4
-6 mesh	29	7.8	2.46	2.30	0.16	15.6	15.8	13.0
Calculated head	370.0	100.0	1.23	1.14	0.10	100.0	100.0	100.0

MATERIAL BALANCE

Project no : 95-057 **Date :** 19-Jun-96
Test no : CB1
Sample description : Column residue

Products	Weight		Assay			%Distribution		
	(kg)	(%)	Cu _t (%)	Cu _{ox} (%)	Cu _{sul}	Cu _t	Cu _{ox}	Cu _{sul}
+1 onch	85.8	30.9	0.53	0.47	0.06	42.7	44.3	34.1
-1 inch+3/4 inch	48.8	17.6	0.42	0.35	0.06	19.0	18.9	19.4
-3/4 inch+1/2 inch	53.7	19.4	0.35	0.30	0.05	17.7	18.0	16.0
-1/2 inch+3/8 inch	25.8	9.3	0.29	0.24	0.05	7.1	6.8	8.3
-3/8 inch+1/4 inch	19.5	7.0	0.25	0.20	0.05	4.5	4.3	5.8
-1/4 inch+6 mesh	13.1	4.7	0.22	0.16	0.05	2.6	2.4	4.2
-6 mesh	30.8	11.1	0.22	0.16	0.06	6.3	5.3	12.2
Calculated head	277.5	100.0	0.38	0.33	0.06	100.0	100.0	100.0

00011100 00:00 FROM:UBELY COPPER CORP
 10:00:04 001 2014
 PAGE 10/25

Column Test CB1 Analysis by Size Fraction

Fraction Inches	Feed			Residue			Decrep. Index	Extraction, %	
	Weight %	Cu, total %	Cu, sol. %	Weight %	Cu, total %	Cu, sol. %		Total	Soluble
- 2 + 1	43	1.22	1.12	30.9	0.53	0.47	-28.1	56.6	58.0
- 1 + 3/4	14.3	0.98	0.88	17.6	0.42	0.35	23.1	56.3	60.2
- 3/4 + 1/2	16.8	0.92	0.84	19.4	0.35	0.3	15.5	62.0	64.3
- 1/2 + 3/8	7.6	1.04	0.96	9.3	0.29	0.24	22.4	72.1	75.0
- 3/8 + 1/4	6.5	1.24	1.14	7	0.25	0.2	7.7	79.8	82.5
- 1/4 + 6m	4.1	1.62	1.54	4.7	0.22	0.16	14.6	86.4	89.6
- 6m	7.8	2.46	2.3	11.1	0.22	0.16	42.3	91.1	93.0
Total		1.23	1.14		0.38	0.33			

COPPER COLUMN LEACH TESTWORK DATA

GETTY COPPER PROJECT

Project #: 95-057
 Column #: CB2
 Column Size: 8 inch x 10 feet
 Initial Charge Height: 2.86 m
 Final Charge Height: 2.76 m
 Bulk S.G.: 1.54 tonne/m³

Ore Sample: Bulk sample
 Sample Weight: 143 kg
 Cu(T) Grade: 1.24 %
 Cu(sol) Grade: 1.10 %

Breakthrough pH: 1.58
 Breakthrough + 4hrs pH: 2.12

Agglomeration Acid Concentration: 93 % H₂SO₄/L
 Agglomeration Acid Consumption: 15 kg/tonne
 Initial H₂SO₄ Solution Concentration: 11.7 g/L
 Total H₂O added to cure: 424 mL
 Initial Sample Moisture: 4.0 % by weight
 Final residue Moisture: 5.7 % by weight
 Curing: 7 days

Date	Time on	Time off	Days	FEED SOLUTION				LEACHATE						RAFFINATE							
				Free H ₂ SO ₄ g/L	pH	H ₂ SO ₄ g	Flow mL/min	s.g.	Vol. L	pH	ORP mV*	Cu g/L	Fe g/L	Free H ₂ SO ₄ g/L	s.g.	Vol. L	pH	Cu g/L	Free H ₂ SO ₄ g/L	Cu Extr. %	H ₂ SO ₄ Add'n kg/t
1996																					
Apr-22	8:12			11.8	1.02																
Apr-23		10:05	1			131	7.10	1.375	0.65	1.58	481	39.00	30.90	42.4						1.4	15.9
Apr-24	10:06			11.8	1.02																
Apr-24		8:11	2			109	6.97	1.178	10.27	2.50	438	39.00	9.74	18.8	1.117	10.39	0.64	10.6	61.5	24.0	16.7
Apr-26	8:13			11.8	1.02																
Apr-26		8:15	3			118	6.89	1.042	9.89	2.74	420	10.30	1.19	4.7	1.04	9.95	1.03	1.93	25.8	29.8	17.5
Apr-26	8:15			11.8	1.02																
Apr-26		9:44	4			128	6.95	1.025	10.54	2.80	422	6.10	0.44	4.1	1.017	10.43	1.15	0.330	15.0	33.4	18.4
Apr-27	9:44			11.8	1.02																
Apr-27		13:30	5			134	6.80	1.019	11.09	2.98	400	4.80	0.52	4.0	1.013	10.88	1.10	0.172	13.1	36.4	19.3
Apr-28	13:30			11.8	1.02																
Apr-28		10:40	6			102	6.80	1.015	8.47	2.91	423	4.30	0.35	4.7	1.012	8.20	1.05	0.134	12.5	38.5	20.0
Apr-29	10:40			11.8	1.02																
Apr-29		10:57	7			116	6.75	1.016	9.74	2.84	439	3.90	0.37	3.2	1.011	9.30	1.10	0.065	9.6	40.6	20.8
Apr-30	11:10			11.8	1.08																
Apr-30		10:58	8			123	7.32	1.016	9.05	2.74	444	3.70	0.44	3.2	1.010	8.91	1.12	0.056	9.6	42.5	21.7
May-03	11:45			11.8	1.10																
May-03		10:21	11			0	7.09	1.020	28.13	2.89	422	3.50	0.70	4.5	1.018	27.67	1.22	0.120	10.1	47.8	21.7
May-07	10:23			11.2	1.12																
May-07		8:20	15			0	6.91	1.022	36.61	2.45	419	2.70	0.05	4.9	1.020	26.79	1.32	0.049	9.5	52.8	21.7
May-10	8:22			11.2	1.25																
May-10		8:25	18			0	6.64	1.025	28.40	2.24	422	2.40	1.18	5.4	1.023	27.75	1.41	0.024	10.2	58.3	21.7
May-14	8:25			10.4	1.27																
May-14		15:10	22			0	6.93	1.028	42.72	2.03	421	2.20	1.42	6.6	1.027	42.26	1.43	0.018	9.1	60.6	21.7
May-17	15:10			11.8	1.23																
May-17		10:41	25			0	6.01	1.034	25.53	1.97	421	2.00	1.72	7.3	1.030	25.43	1.47	0.037	10.4	62.4	21.7
May-21	10:50			10.5	1.26																
May-21		15:07	29			0	6.88	1.031	40.95	1.90	427	1.58	1.97	7.5	1.028	40.38	1.46	0.019	10.8	64.8	21.7
May-28	15:07			11.0	1.35																
May-28		15:15	36			0	7.19	1.033	69.22	1.82	454	1.17	2.21	7.3	1.029	68.84	1.49	0.009	8.4	69.3	21.7
Jun-03	16:30			9.2	1.49																
Jun-03		12:30	43			0	7.00	1.032	66.28	2.00	500	0.76	2.19	7.7	1.031	65.99	1.80	0.005	8.8	72.1	21.7
Jun-11	14:20			8.8	1.80																
Jun-11		8:30	51			0	5.91	1.037	60.68	1.94	528	0.47	2.26	8.0	1.033	59.75	1.60	0.004	9.4	73.7	21.7
Jun-15	10:00			9.4	1.80																
Jun-15		14:00	55			0	6.91	1.034	41.97	2.04	553	0.39	2.60	8.5	1.033	39.40	1.77	0.003	9.9	74.6	21.7
Jun-15	14:55			9.8	1.79																

* vs Ag/AgCl reference

COPPER COLUMN LEACH TESTWORK DATA

GETTY COPPER PROJECT

Project #: 95-057
 Column #: CB2
 Column Size: 8 inch x 10 feet
 Initial Charge Height: 2.86 m
 Final Charge Height: 2.76 m
 Bulk S.G.: 1.54 tonne/m³

Ore Sample: Bulk sample
 Sample Weight: 143 kg
 Cu(T) Grade: 1.24 %
 Cu(sol) Grade: 1.10 %

Breakthrough pH: 1.56
 Breakthrough + 4hrs pH: 2.12

Agglomeration Acid Concentration: 93 % H₂SO₄/L
 Agglomeration Acid Consumption: 15 kg/tonne
 Initial H₂SO₄ Solution Concentration: 11.7 g/L
 Total H₂O added to cure: 424 mL
 Initial Sample Moisture: 4.0 % by weight
 Final residue Moisture: 5.7 % by weight
 Curing: 7 days

Date	Time on	Time off	Days	FEED SOLUTION				LEACHATE						RAFFINATE							
				Free H ₂ SO ₄ g/L	pH	H ₂ SO ₄ g	Flow mL/min	s.g.	Vol. L	pH	ORP mV*	Cu g/L	Fe g/L	Free H ₂ SO ₄ g/L	s.g.	Vol. L	pH	Cu g/L	Free H ₂ SO ₄ g/L	Cu Extr. %	H ₂ SO ₄ Add'n kg/t
1998 Jun-19	8:25	59				0	7.27	1.038	36.61	2.04	531	0.35	1.83	8.1	1.038	36.49	1.80	0.003	9.2	75.3	21.7
	8:27			9.3	1.78																
Jun-24	8:16	64				0	6.58	1.038	44.89	2.04	551	0.34	1.78	8.3	1.039	44.27	1.81	0.001	9.9	76.2	21.7
	8:16			9.8	1.76																
Jun-28	17:20	68				0	7.01	1.042	41.76	1.95	574	0.32	2.05	8.9	1.04	41.66	1.73	0.003	10.1	76.9	21.7
	19:53			10.0	1.74																
Jul-02	8:20	72				0	7.03	1.043	33.47	1.80	660	0.32	1.95	9.0	1.040	33.06	1.60	0.002	10.3	77.5	21.7
	8:20			10.6	1.61																
Jul-05	8:27	75				0	7.19	1.043	29.34	1.85	556	0.28	2.15	10.5	1.043	28.96	1.67	0.002	9.2	78.0	21.7
	8:27			10.5	1.67																
Jul-09	13:10	79				0	7.04	1.046	39.11	1.70	555	0.28	1.73	9.5	1.045	38.47	1.55	0.002	10.4	78.6	21.7
	13:10			10.5	1.55																
Jul-12	16:10	82				0	7.00	1.048	28.12	2.11	552	0.28	1.69	9.8	1.046	28.68	1.82	0.002	10.9	79.1	21.7
	16:13			11.1	1.80																
Jul-16	14:45	86				0	6.04	1.052	31.36	2.15	533	0.30	2.00	12.2	1.050	30.94	1.85	0.002	12.9	79.6	21.7
	14:45			12.4	1.88																
Jul-19	16:00	89				0	7.16	1.054	28.85	2.07	541	0.19	2.10	11.0	1.053	28.48	1.80	0.002	11.6	79.9	21.7
	16:02			11.9	1.83																
Jul-22	16:25	92				0	6.82	1.054	26.26	2.08	540	0.19	1.88	11.3	1.054	27.71	1.76	0.002	13.1	80.2	21.7
	16:25			9.0	1.83																
Jul-26	15:05	96				0	6.35	1.038	33.13	2.07	548	0.20	1.31	9.5	1.040	32.50	1.78	0.003	10.9	80.8	21.7
	15:05			10.8	1.82																
Jul-30	15:30	100				0	6.06	1.043	26.46	2.10	557	0.20	1.39	10.8	1.044	26.24	1.87	0.002	10.8	80.9	21.7
	15:30			11.0	1.85																
Aug-02	16:02	103				0	7.56	1.050	29.63	2.12	558	0.17	1.39	10.9	1.049	29.35	1.87	0.001	11.4	81.2	21.7
	16:02			9.4	2.00																
Aug-06	15:05	107				0	7.17	1.041	38.04	2.12	561	0.12	1.11	9.5	1.041	37.85	1.93	0.001	10.0	81.5	21.7
	15:05			8.4	1.94																
Aug-09	13:25	110				0	6.70	1.040	25.00	2.10	569	0.15	1.03	9.4	1.042	24.77	1.87	0.003	10.4	81.7	21.7
	13:25			9.2	1.96																
Aug-13	14:00	114				0	7.26	1.041	37.96	2.18	545	0.16	1.15	9.7	1.040	37.61	1.90	0.001	11.0	82.0	21.7
	14:00			10.0	1.93																
Aug-16	15:00	117				0	6.83	1.041	27.47	2.15	530	0.12	0.81	9.3	1.040	27.42	1.84	0.002	11.0	82.2	21.7
	15:00			10.6	1.89																
Aug-19	8:40	120				0	6.90	1.045	26.92	2.13	533	0.12	0.83							82.4	21.7

* vs Ag/AgCl reference

DOCUMENT NO. 95-057 FROM LIBRARY COPY NO. 1014
 AUGUST 2014
 PAGE 21/25

COPPER COLUMN LEACH TESTWORK DATA

GETTY COPPER PROJECT

Project #: 95-057
 Column #: CB2
 Column Size: 8 inch x 10 feet
 Initial Charge Height: 2.86 m
 Final Charge Height: 2.78 m
 Bulk S.G.: 1.54 tonne/m³

Ore Sample: Bulk sample
 Sample Weight: 143 kg
 Cu(T) Grade: 1.24 %
 Cu(sol) Grade: 1.10 %
 Breakthrough pH: 1.56
 Breakthrough + 4hrs pH: 2.12

Agglomeration Acid Concentration: 93 % H₂SO₄/L
 Agglomeration Acid Consumption: 15 kg/tonne
 Initial H₂SO₄ Solution Concentration: 11.7 g/L
 Total H₂O added to cure: 424 mL
 Initial Sample Moisture: 4.0 % by weight
 Final residue Moisture: 5.7 % by weight
 Curing: 7 days

Date	Time on	Time off	Days	FEED SOLUTION				LEACHATE						RAFFINATE			Cu Exlr. %	H2SO4 Add'n kg/t			
				Free H2SO4 g/L	pH	H2SO4 g	Flow mL/min	s.g.	Vol. L	pH	ORP mV ^a	Cu g/L	Fe g/L	Free H2SO4 g/L	s.g.	Vol. L			pH	Cu g/L	Free H2SO4 g/L
1996																					
								<p style="text-align: center;"> Wtgh Cu(T) Cu(ox) Cu(S=) Fe (g) (%) (%) (%) (%) Residue 141.6 0.23 0.18 0.05 2.3 </p> <p style="text-align: center;"> Cu (g) %dist'n Solution 1447 81.6 Residue 328 18.4 Total Cu 1772 100.0 </p> <p style="text-align: center;"> Calculated head 1.24 % Measured head 1.19 % </p>													

^a vs Ag/AgCl reference

Page: 3 of 3

MATERIAL BALANCE

Project no : 95-057 **Date :** 22-Mar-96
Test no : CB2
Sample description : Column feed

Products	Weight		Assay			%Distribution		
	(kg)	(%)	Cu(T) (%)	Cu(ox) (%)	Cu(sul) (%)	Cu(T)	Cu(ox)	Cu(sul)
+1/2"	151	43.5	0.88	0.81	0.07	32.2	31.9	35.2
-1/2"+3/8"	64	18.4	0.98	0.89	0.09	15.2	14.9	19.2
-3/8"+1/4"	46	13.3	1.12	1.04	0.08	12.5	12.5	12.2
-1/4"+6 mesh	33	9.5	1.40	1.32	0.08	11.2	11.4	8.8
-6 mesh	53	15.3	2.26	2.12	0.14	29.0	29.3	24.7
Calculated head	347.0	100.0	1.19	1.10	0.09	100.0	100.0	100.0
Assay head								

MATERIAL BALANCE

Project no : 95-057 **Date :** 27-Aug-96
Test no : CB2
Sample description : Column residue

Products	Weight		Assay			%Distribution		
	(kg)	(%)	Cu(T) (%)	Cu(ox) (%)	Fe (%)	Cu(T)	Cu(ox)	Fe
+1/2"	58.3	41.2	0.33	0.27	2.45	57.9	62.2	44.1
-1/2"+3/8"	26.0	18.4	0.25	0.20	2.33	19.7	20.5	18.7
-3/8"+1/4"	19.1	13.6	0.18	0.12	2.18	10.2	9.1	12.9
-1/4"+6 mesh	13.3	9.4	0.12	0.07	2.14	4.8	3.7	8.8
-6 mesh	24.9	17.6	0.10	0.05	2.02	7.5	4.5	15.5
Calculated head	141.6	100.0	0.23	0.18	2.29	100.0	100.0	100.0
Assay head								

DEC-11-96 09:18 FROM:UNCLY CUPPER CORP
 10:00 001 4014
 PAGE 24/25

Column Test CB2 Analysis by Size Fraction

Fraction Inches	Feed			Residue			Decrep. Index	Extraction, %	
	Weight %	Cu, total %	Cu, sol. %	Weight %	Cu, total %	Cu, sol. %		Total	Soluble
- 2 + 1									
- 1 + 3/4									
- 3/4 + 1/2	43.5	0.88	0.81	41.2	0.33	0.27	-5.3	62.5	66.7
- 1/2 + 3/8	18.4	0.98	0.89	18.4	0.25	0.2	0.0	74.5	77.5
- 3/8 + 1/4	13.3	1.12	1.04	13.5	0.18	0.12	1.5	83.9	88.6
- 1/4 + 6m	9.5	1.4	1.32	9.4	0.12	0.07	-1.1	91.4	94.7
- 6m	15.3	2.26	2.12	17.6	0.1	0.05	15.0	95.6	97.6
Total		1.19	1.1		0.23	0.18			