81-298-9350

# REPORT

On The

# "SUDS" GROUP OF CLAIMS

SITUATED AT

MENZIES BAY, VANCOUVER ISLAND

FOR

CAL-STAR RESOURCES LTD.

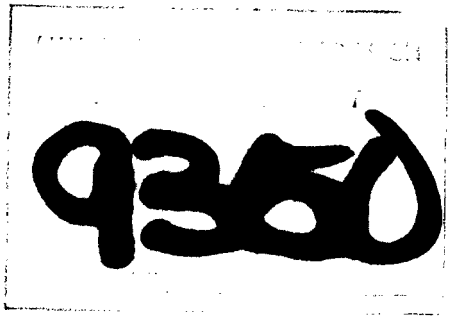
Nanaimo M.D.

50° 09 N 125° 26 W.

92K/3W

By: E. Cruz, Mining Engineer
D. Basco, Geologist

August 27, 1980



ASSESSMENT REPORTS

on the

SUDS GROUP OF CLAIMS

CONTENTS

E.D. CRUZ, P. ENG.
#790 - 885 DUNSMUIR ST.
VANCOUVER, B.C.
V6C 1N8

August 28, 1980

Cal-Star Resources Ltd.
#237 - Hotel Vancouver
Vancouver, B.C.
V6C 2W6

Summary of Expenditures

| | | |
|---|---|---|
| 1. | Geological, Geochemical and Vector Pulse Electromagnetic Survey | $ 13,904.58 |
| 2. | Induced Polarization | 6,500.00 |
| | Total | $ 20,404.58 |

Submitted by:

E.D. CRUZ, P. Eng.

E.D. CRUZ, P. ENG.
#790 - 885 DUNSMUIR ST.
VANCOUVER, B.C.
V6C 1N8

August 28, 1980

Cal-Star Resources Ltd.
#237 - Hotel Vancouver
Vancouver, B.C.
V6C 2W6

## Statement of Expenditures

Re: Geological, Geochemical and Vector Pulse EM of the "SUDS" Mineral Claim, Campbell River, B.C.

| | |
|---|---|
| Geological Mapping and Supervision<br>10 days @ 250.00/day | $ 2,500.00 |
| Geochemical Survey (includes Grid est.)<br>10 days @ 250.00/day | 2,500.00 |
| Transportation (Truck Rental, Gas, Mileage, Ferry) | 596.43 |
| Pulse Electromagnetic Survey | 3,000.00 |
| Food & Lodging<br>3 men @ 35.00/Man for 10 days | 1,050.00 |
| I. Sutherland's Services | 846.00 |
| Supplies | 150.00 |
| Soil and Rock Analyses | 798.15 |
| Report Preparation | 1,200.00 |
| Overhead - 10% | 1,264.00 |
| TOTAL | $13,904.58 |

Submitted by:

E.D. CRUZ, P. Eng.

## COST BREAKDOWN

| PERSONNEL | DATES | WAGES | TOTAL |
|---|---|---|---|
| Mark Gray | Dec. 6-12/80 | $145.00 | $1,015.00 |
| Brent Robertson | Dec. 6-12/80 | $135.00 | $ 945.00 |
| Joel Graham | Dec. 6-12/80 | $115.00 | $ 805.00 |
| Ovind Aaraskjold | Dec. 6-12/80 | $120.00 | $ 840.00 |

| | |
|---|---|
| Meals and Accomodations ..... | $ 980.00 |
| Instrument Lease ..... | $ 700.00 |
| Vehicle All Inclusive ..... | $ 455.00 |
| Interpretation Maps and Reports ..... | $ 760.00 |
| Total ..... | $6,500.00 |

# TABLE OF CONTENTS

(CONT'D) TABLE OF CONTENTS

## INTRODUCTION

The writers upon the request of Mr. Paul Shatzko of Cal-Star Resources Ltd of Vancouver, B.C. undertook pertinent work programme on the company's "SUDS" group of claims (12 units) in Vancouver Island, in order to assess the mineralization potential of the property. The work programme include geologic mapping, soil geochemistry, Pulse EM survey and sampling of the workings done on the mineral showings in the area covering the northern portion of the property where the host rocks are either exposed or are in close proximity to the surface.

## SUMMARY

The property is located at approx. Lat. 50° 09'N. and Long. 125° 25.6'W., Nanaimo Mining Division, Vancouver Island. It consists of a group of 12 units known collectively as "SUDS" claim owned by Paul Shatzko and recorded at the Nanaimo Gold Commissioner's Office. The claim is optioned by Cal-Star Resources Ltd of Vancouver, B.C.

The area is underlain by massive basalt flows with minor interbedded pillow lava belonging to Upper Karmutsen formation of early to Late Triassic age. Diabase dykes and sills intrude the lava in places.

Nine mineral showings have been mapped and sampled. The showings consist of individual outcrops, more or less mineralized with native copper, its sulphides and oxidation products, explored by earlier

open-cutting and trenching. With a few exceptions the showings are seen to occur in cluster within a prospective area of about 200,000 square meters situated in the north-central part of the property. The copper minerals are mainly confined within the matrix of the pillow lava found embedded as minor intercalated layers with the massive basalt at lower elevations. No mineralization has been observed in the massive basalt, nor ever reported by earlier investigators.

A significant geochemical anomaly was delineated in the general area where cluster of mineral showings occur. The limited pulse electromagnetic survey carried out in the area failed to detect any anomaly which relates to the presence of strata-bound type of blind massive sulphides. Induced polarization survey should then be considered for probing low grade copper mineralization and to further delineate subsurface extension of the mineral-bearing beds of pillow lava. In case a sizeable target is yielded, test drilling would then be recommended in subsequent work programming.

## LOCATION AND ACCESSIBILITY

The property is located at approx. Latitude 50° 09'N. and Longitude 125° 25.6'W., Nanaimo Mining Division, Vancouver Island. It is just 20 kilometers to the north of Campbell River.

Access to the property is by a dirt road from the paved Island

Highway which crosses it at the northeastern corner about 4 kilometers past Menzies Bay.

## CLAIMS

The property is made up of a group of 12 units known collectively as "SUDS" claim owned by Mr. Paul Shatzko and recorded at the Nanaimo Gold Commissioner's Office, Record No. 560 (3). This claim is optioned by Cal-Star Resources Ltd of Vancouver, B.C.

## PHYSIOGRAPHY

From an elevation of 500 feet in the northeast to a peak of 1,300 feet in the southwest, the relief rises steeply through a series of cliffs and benches. The terrane is quite difficult to traverse because of impassable bluffs, dense overgrowths, and numerous deadfalls of old trees.

Abundant timber is available and several small springs occur in the property and vicinity.

## HISTORY

The earliest report of staking in the Menzies Bay area was in 1899. In 1953, Indian Mines Ltd (1946) drilled 543 feet with negative results. In 1954 the Department of Mines prospected the area for native copper. The Ministry of Mines in 1959 reported that Argus Consolidated Mines Ltd has developed the property in 1955 shipping 5 tons of high grade copper ore to a

Tacoma smelter. In 1959 the Geojimal Mining Development Co. Ltd. of Vancouver drove a 40-foot adit following two narrow parallel stringers. A shipment of 18 tons of 24% copper was shipped out to Cowichan Copper Ltd and thence to Japan.

The Menzies Bay Mining Syndicate in 1962 acquired the property and conducted a limited E.M. survey through Hunting Survey Corp. Ltd, using a Ronka Mark 1V unit with 200-foot cable separation.

In 1969, Calmac Mines Ltd of Vancouver conducted a rock, soil and minor drilling programme. Results were of no consequence may be, so that the consultant recommended no further work.

In 1971, Four Seasons Manufacturing Co. of Vancouver, B.C. acquired the property and its 1973 assessment report indicated a 200-foot by 1,000-foot anomalous copper and lead values and confirmed by VLF-EM survey over the area. The consultant recommended further work, but the property was abandoned.

In March 1980, the property was acquired by the present owner and optioned to Cal-Star Resources Ltd.

## GEOLOGY

The area is underlain mainly by massive basalt flows with minor interbedded pillow lava belonging to Upper Karmutsen formation of early Late Triassic age. Low-grade metamorphism up to pumpellyite-prehnite facies had affected the basaltic lavas. A monoclinal dip of $8^{\circ}\pm$ to the southeast with minor block faulting characterize

the over-all structure of the formation. Diabase dykes and sills intrude the lava in places.

MINERALIZATION

Nine (9) mineral showings have been mapped and sampled. See Fig. 3, Figs. 6-9. Samples from CS-Showing No. 1 have all been assayed for copper, whereas those samples from all other showings were analyzed for copper in p.p.m. The showings have earlier been explored by open-cutting, trenching and shallow shaft sinking. They consist of individual outcrops unequally mineralized with copper, its sulphides and oxidation products. With a few exceptions, the showings are seen to occur in cluster within a prospective area of about 200,000 square meters on the north-central part of the property at between 700 and 900 feet of elevations. However, the 200 feet difference in elevation does not indicate the thickness of the mineralized zone, since the mineralization is confined within the matrix of pillow lava embedded as minor intercalated layers in the massive basalt. It is conceded that the copper minerals are syngenetic with the pillow lava beds modified somewhat by later remobilization. No mineralization was observed in the massive basalt, nor ever reported by earlier investigators. The barren basalt becomes thicker to the south and southwest where it attains heights of more than 1,300 feet.

The mineralization consists of native copper, bornite, chalcocite and minor chalcopyrite found mostly in the interstices or matrix

of tuff and other clastic sediments in the pillow lava. Malachite and azurite stainings are omnipresent. Some native copper occur with quartz in the amydales with chalcocite. Chalcocite and covellite are sometimes seen together in veinlets and fractures. Chalcopyrite and bornite are occassionally observed as sparse dissemination in the pillow lava.

The copper values in most of the showings are variable, spotty, and for the most parts just above background anomalous level. However, one showing, that of CS-Showing No. 1 (Fig. 6a) is the sole exception, because it carries higher copper values of up to 4.1% over sample widths of 30 centimeters. The diabasic sill found intruding the bedding plane between adjoining pillow lava beds could have remobilized the copper minerals in the matrix and redistribute themselves along sill's dual contacts in greater concentration. Dyke swarms possibility could then be an added object of interest to subsequent programming in the property.

SURVEY SPECIFICATIONS

(a) Survey Grid:

A westerly trending base line, about 1 kilometer long, was established from which cross lines running due south were laid out at 100 - meter intervals along which every 25 meters were marked as sites for soil sampling. A total of 254 soil samples were collected from the entire grid.

(b) Geochemistry:

Soil samples from the enriched B-horizon when present were obtained by mattock and placed in soil bags. Samples were delivered to Min-En Laboratories in North Vancouver where they were screened to minus 40 mesh, digested by nitric perchloric acid and analyzed for copper by atomic absorption.

(c) Discussion of Results:

A significant geochemical anomaly trending northwesterly and measuring about 380 meters long and 200 meters wide was delineated. See Fig. 4. The anomaly is still open beyond the northern boundary of the claims.

The significant geochemical anomaly bounded by the 200 p.p.m. contour show copper values of up to 2200 p.p.m. This anomaly in space coincides with the pillow lava beds that carry some copper values of consequence exposed or worked out by open cutting and trenching done earlier in the area.

## CONCLUSION AND RECOMMENDATIONS

Geological mapping, mineral showings investigation, and geochemical survey combined to disclose the occurrence of the mineral-bearing beds of pillow lava situated in the north-central portion of the property embedded in the barren massive lava flows as discrete intercalated layers at between 700 and 900 feet of elevation. As

a unit the barren massive lava flows thickens southward and southwestward attaining heights of more than 1,300 feet. Limited pulse electromagnetic survey carried out in the same area failed to detect any anomaly which relates to the presence of subsurface strata-bound type massive sulphide body. Induced polarization survey should therefore be considered to probe any possible occurrence of low grade copper mineralization, as well as, to further delineate the subsurface extension of the mineral-bearing pillow lava beds. If a sizeable target is yielded, test drilling may be recommended in subsequent work programme.

ESTIMATED COST OF PROGRAMME

Phase I:

| | | |
|---|---|---|
| 1. | Induced Polarization Survey, 8 days @ 800/day | $ 6,400.00 |
| 2. | Project Supervision | 2,000.00 |
| 3. | Transportation | 500.00 |
| 4. | Meals & Accomodations | 800.00 |
| 5. | Line Cutting, 5 days @ $200/day | 1,000.00 |
| 6. | Report & Interpretation | 2,000.00 |
| 7. | Contingencies - 15% | 1,905.00 |
| | | $14,605.00 |

Say $15,000.00

Phase II:

| | | |
|---|---|---|
| 1. | Diamond Drilling - 300 meters @ 100/m | $30,000.00 |
| 2. | Site Preparation | 1,500.00 |
| 3. | Mobilization & Demobilization | 2,000.00 |
| 4. | Project Supervision (includes project helper) | 5,000.00 |
| 5. | Assaying - 100 samples @ 9/sample | 900.00 |
| 6. | Transportation | 1,200.00 |
| 7. | Meals & Accomodations | 1,800.00 |
| 8. | Contingencies - 15% | 6,360.00 |
| | TOTAL | $48,760.00 |
| | Say $49,000.00 | |

Respectfully submitted,

E.D. Cruz, P. Eng.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
ERNESTO D. CRUZ

D.M. Basco, Geologist

REFERENCES

1. Report on the Geology of the Melan Claim Group, Menzies Bay, Vancouver Island, by A.M. de Quadros, May 13, 1976.

2. Report on the "SUDS" claim, Record No. 560 (3) 12 Units, Menzies Bay, Vancouver Island, for Cal-Star Resources Ltd. A.M. de Quadros, 1980.

3. Vancouver Island (Revised) Geol. Surv. Canada Open File Map 463. J.E. Muller, 1977.

STATEMENT OF QUALIFICATIONS

Name: BASCO, Daniel M.

Proffession: Geologist

Education: B. Sc. Geology, University of the Philippines, 1935

Took post-graduate courses in Economic Geology, University of the Philippines, 1936-1940.

Made studies and observations of basemetal mining and exploration projects in Japan, under the auspices of Mitsui Mining & Smelting Co., 1957.

Professional Associations: Registered Geologist, Philippines Board of Examiners.
Fellow, Geological Association of Canada
Member, Mineralogical Association of Canada

Philippines Experience: Eleven years teaching geology as Asst. Professor, University of the Philippines.
Four years as Government Geologist for Philippines Bureau of Mines.
Fifteen years diversified experience in the practice of geology having been connected as Field, Mining, Exploration, and Chief Geologist for different mining and exploration companies, such as Mitsui Mining & Smelting Co., Marsman & Co., Elizalde & Co., Island Oil & Industrial Corporation, and Marinduque Mining & Industrial Corporation.

Canadian Experience: Fifteen years geological experience as Mines, Exploration and Consulting Geologist at one time or another for Western Mines, Ltd., Kerr Addison Mines, Ltd., Condor Mines, Ltd., Columbia River Mines, Ltd., Mt. Sicker Mines Ltd., and Nordic Management & Development, Ltd., Exploram Minerals Ltd., Annie Lake Mines Ltd., etc.

Daniel M. Basco

# CERTIFICATE

I. Ernesto D. Cruz, DO HEREBY CERTIFY AS FOLLOWS:

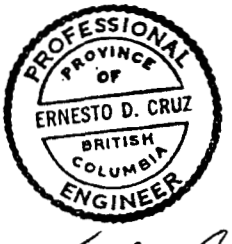
1. That I am a consulting mining engineer-geologist and reside at 7734 Garrett Drive, Delta, B.C.

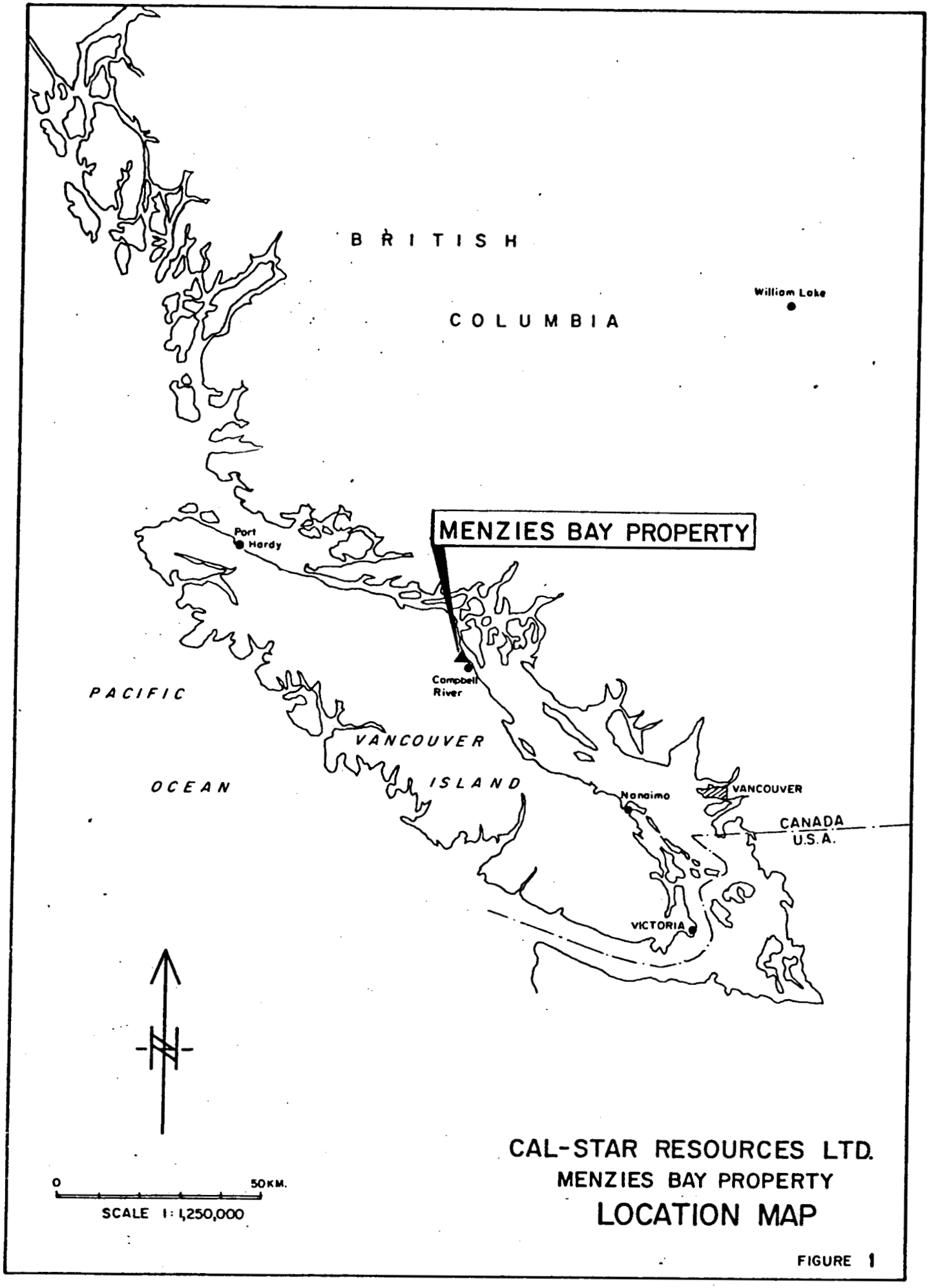
2. That I am a graduate mining engineer of Mapua Institute of Technology, Philippines (BSEM), Missouri School of Mines and University of Washington (MSEM).

3. That I have been engaged in mineral exploration for the past nineteen years (6 years in the Philippines, 13 years in North America).

4. That I am registered with the Association of Professional Engineers of British Columbia.

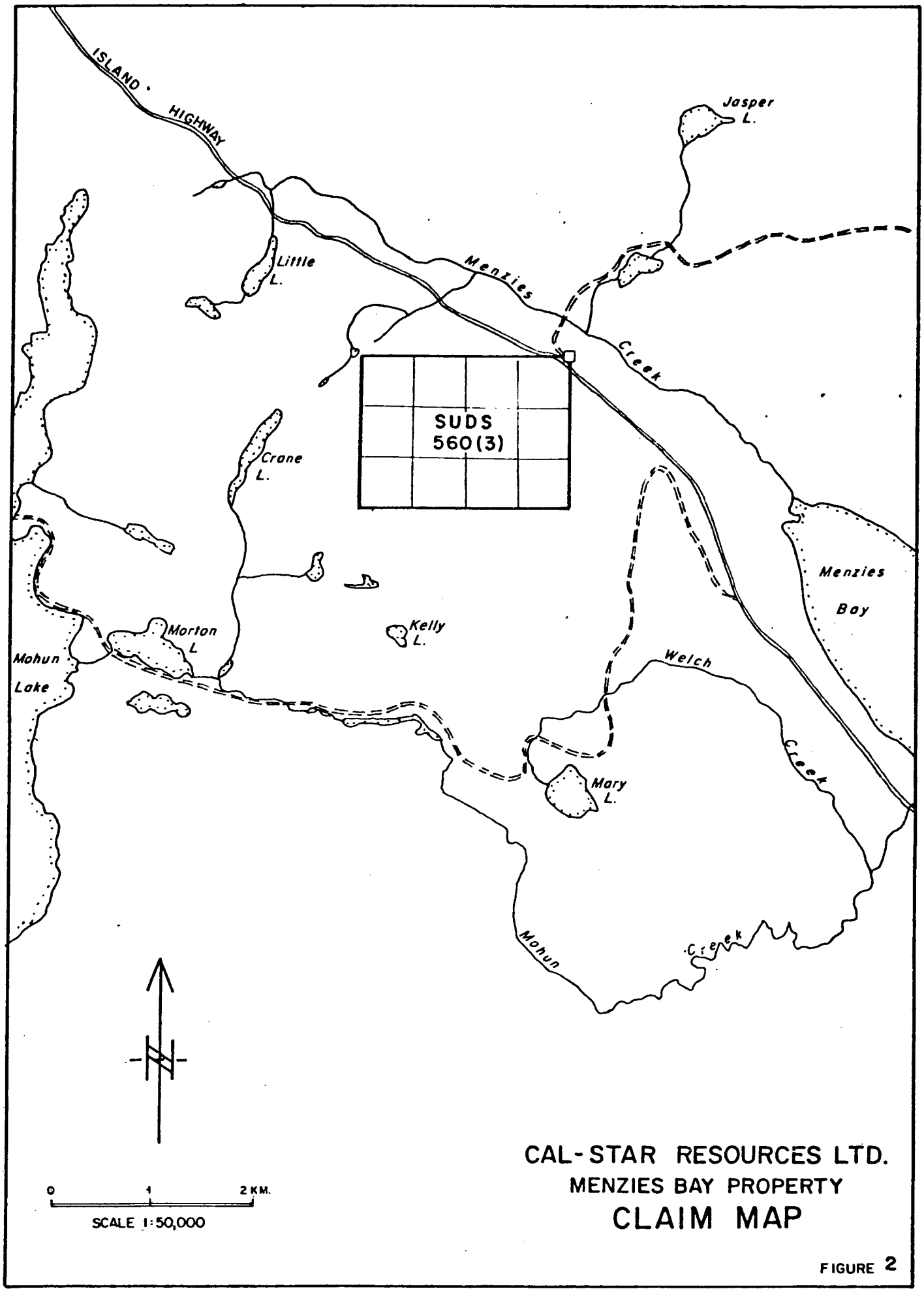
5. That I have no interest directly or indirectly in the "SUDS" Mineral Property or the securities of Cal-Star Resources Ltd.






CAL-STAR RESOURCES LTD.
MENZIES BAY PROPERTY
LOCATION MAP

FIGURE 1




CAL-STAR RESOURCES LTD.

MENZIES BAY PROPERTY

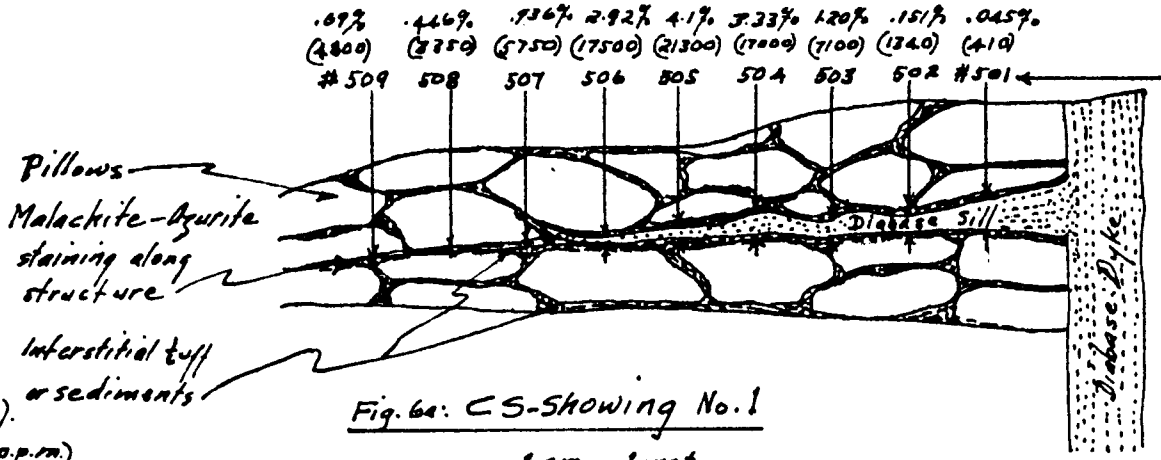
# CLAIM MAP

FIGURE 2

N

Note:

Flakes of native copper, chalcocite & covellite in cherty tuff bordering thin sill of diabase, and some mineralization along fissure beyond the sill. Average length of cut across structure is 30 cm.




Assay for Cu in per cent (%).
Geochem Analysis = (Cu: p.p.m.)

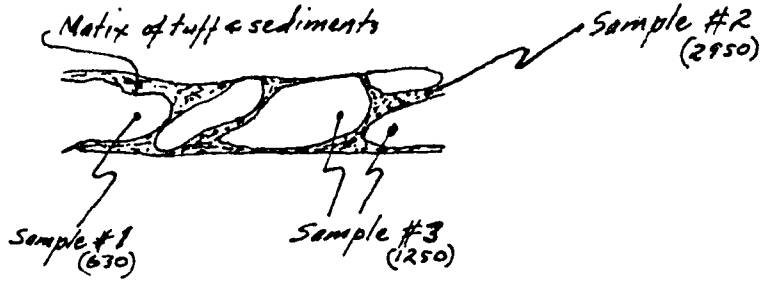
Fig. 6a: CS-Showing No. 1

1 cm. = 1 met.

Note:

In this showing, mineralization with native copper and malachite staining sparsely disseminated in interstial matrix, also rarely in pillow lava, mainly with quartz amygdales.

N




Geochem Analysis = (Cu: p.p.m)

Fig. 6b: CS Showing No. 2

1 cm. = 1 met.

Note:
Few small flakes of native copper in interstial matrix, also with quartz amygdales in pillow lava.

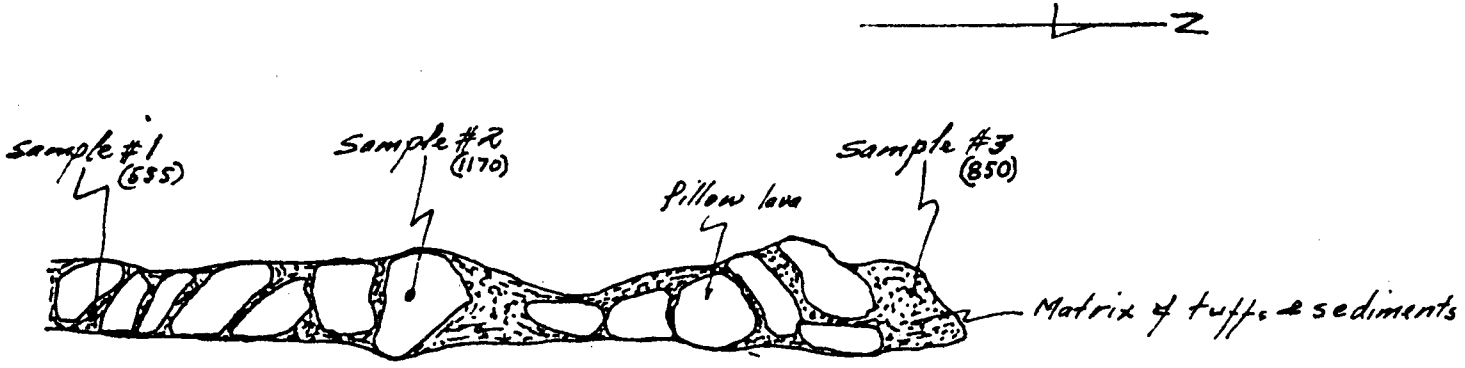
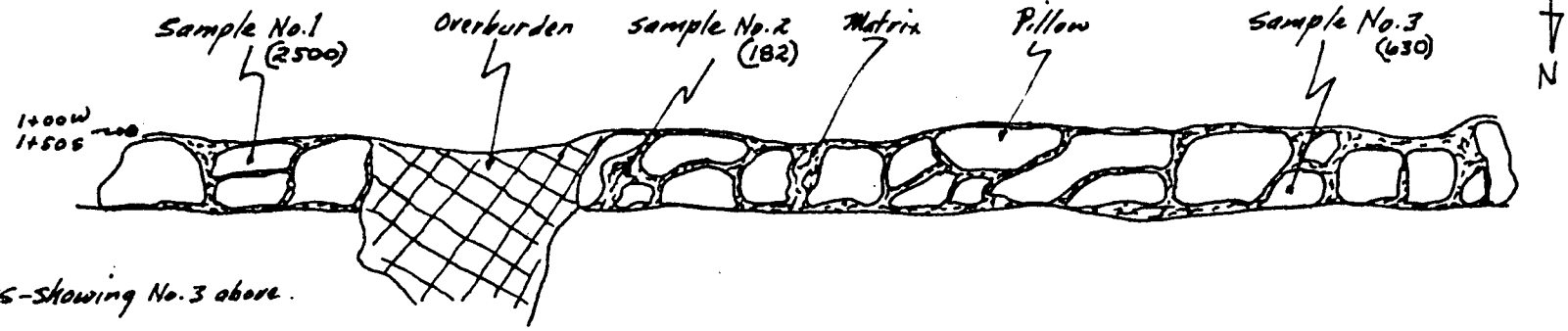



Fig. 7a: CS-Showing No. 3

Geochem Analysis = (Cu: p.p.m)

1 cm. = 1 met.




Note:
Same as that of CS-Showing No. 3 above.

Fig. 7b: CS-Showing No. 4

1 cm. = 1 met.

Note:

Rare native copper & malachite-azurite staining in pillow lava vertical fractures striking N 70° E.

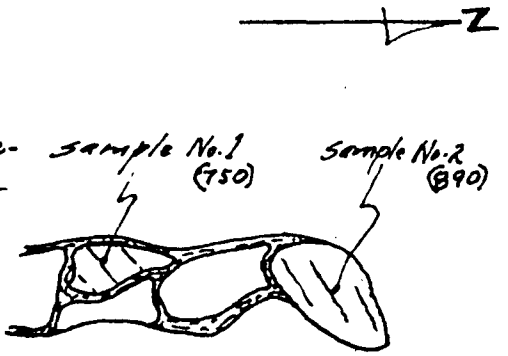



Fig. 8a: CS Showing No. 5

1 cm. = 1 met.

Geocham Analysis = (Cu: p.p.m)

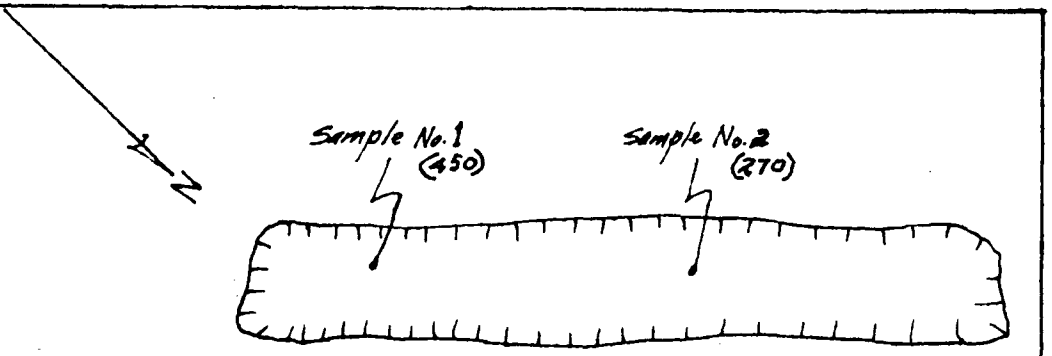
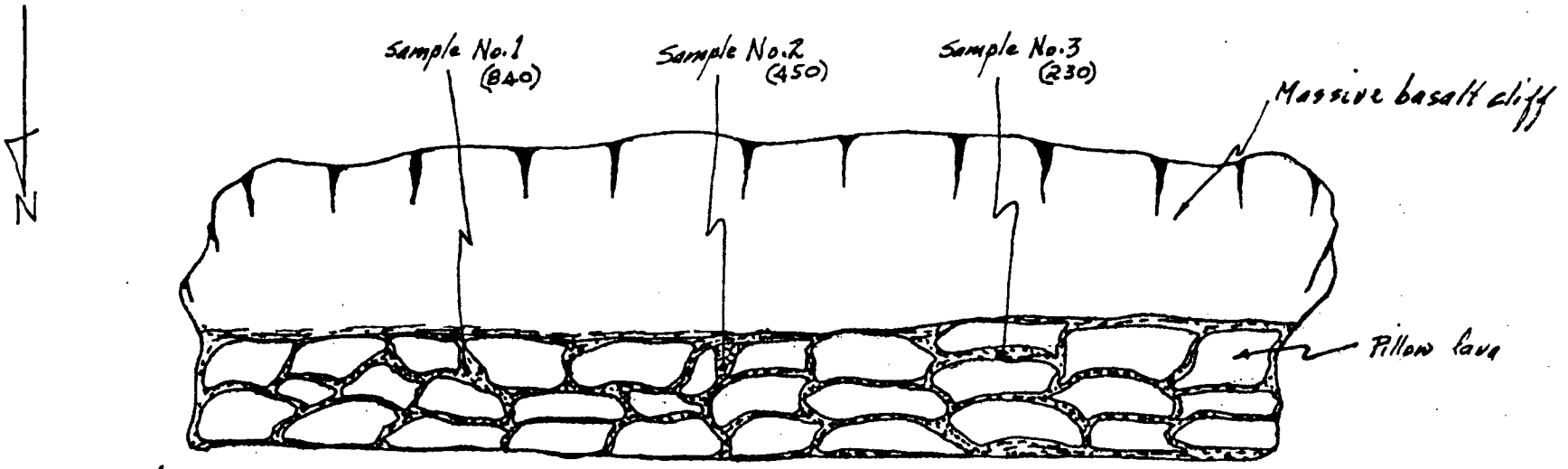



Fig. 8b: CS-Showing No. 6

1 cm. = 1 met.

Note:

Old Trench site in massive basalt.
No visible mineralization.




Note:

Rare native copper and chalcocite in interstitial matrix of tuff & other sediments in pillow lava.

Fig. 8c: CS Showing No. 7

1 cm. = 1 met.

Note:
Malachite – azurite staining, rare native copper copper & chalcocite along fractures.

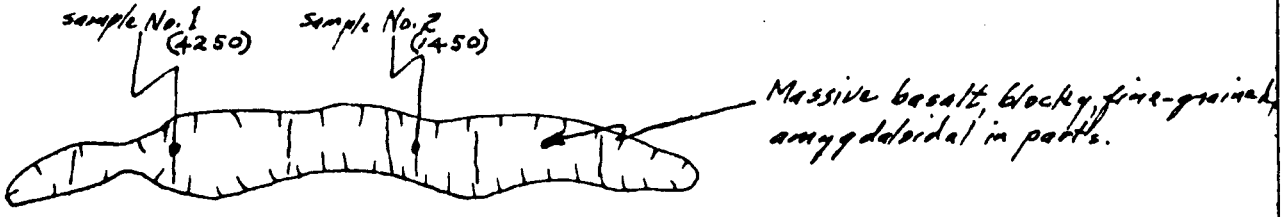



Fig. 9a: CS-Showing No.8

1 cm. = 1 met.

Geochem Analysis = (Cu: p.p.m)

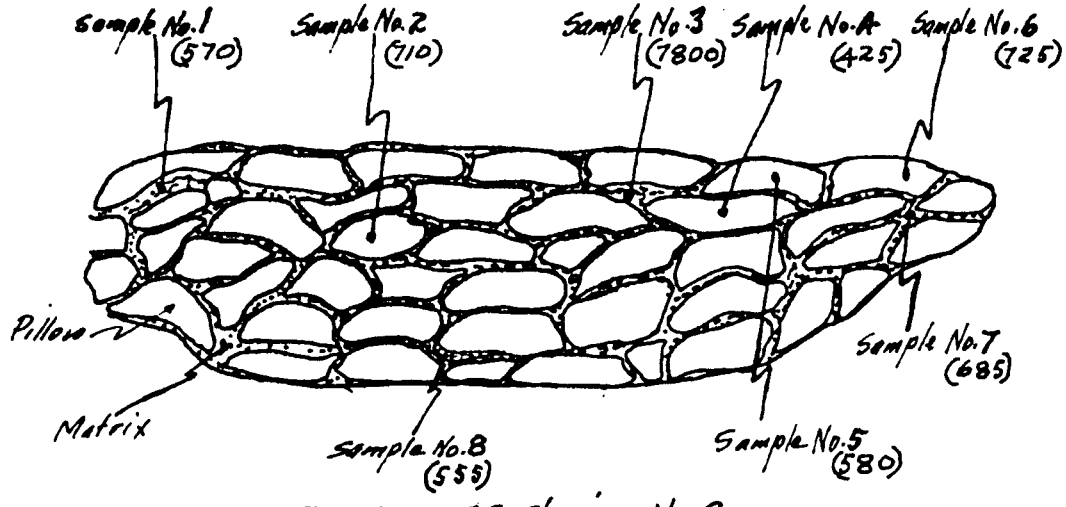



Fig. 9b: CS-Showing No.9

1 cm = 1 met.

'81- #298-#

# GEOPHYSICAL REPORT

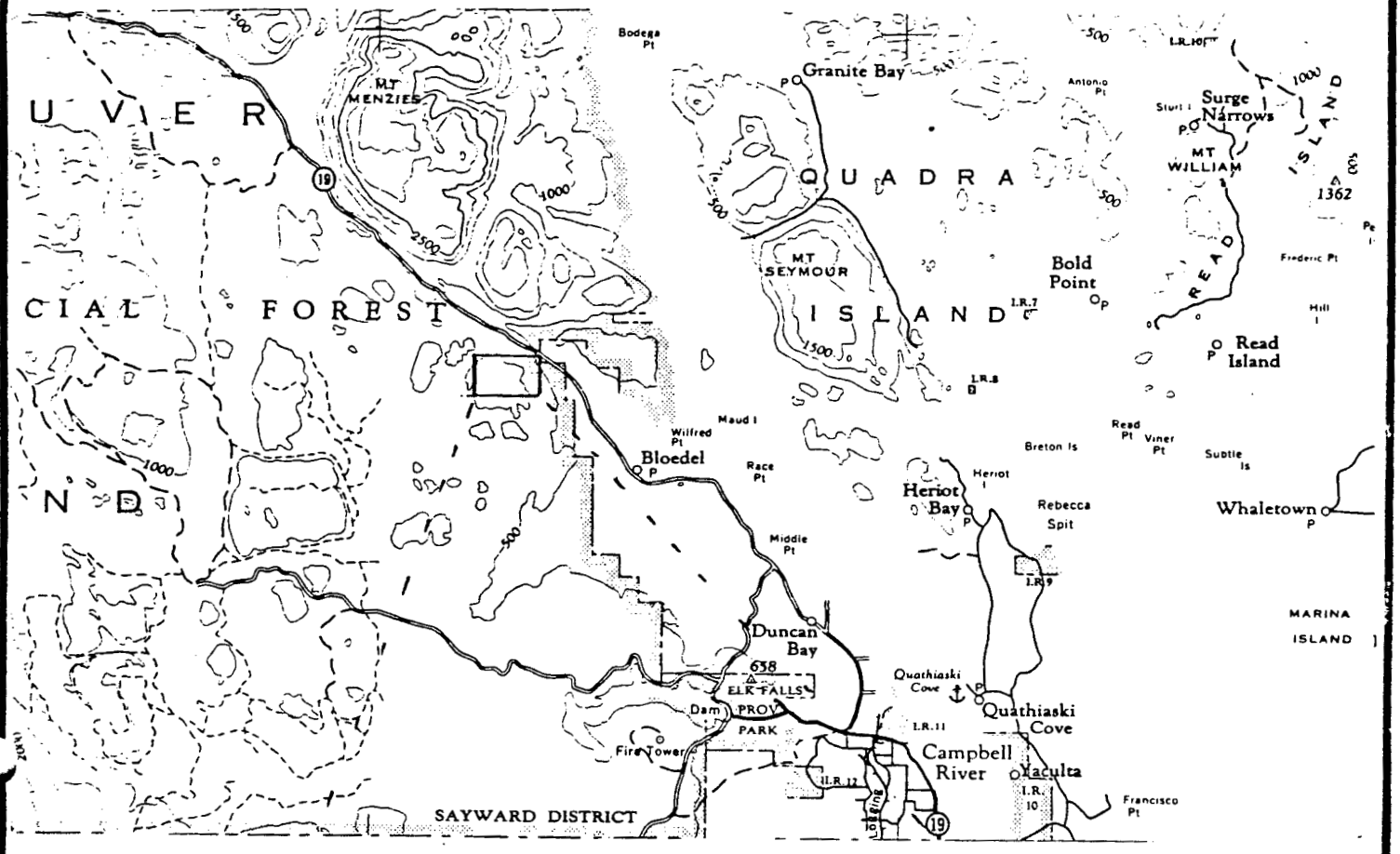
## CAL - STAR RESOURCES LTD.

Suds mineral claim, Nanaimo Mining Division,
B. C.
Lat. 50°09'N Long. 125°26'W N.T.S. 92 K/3W

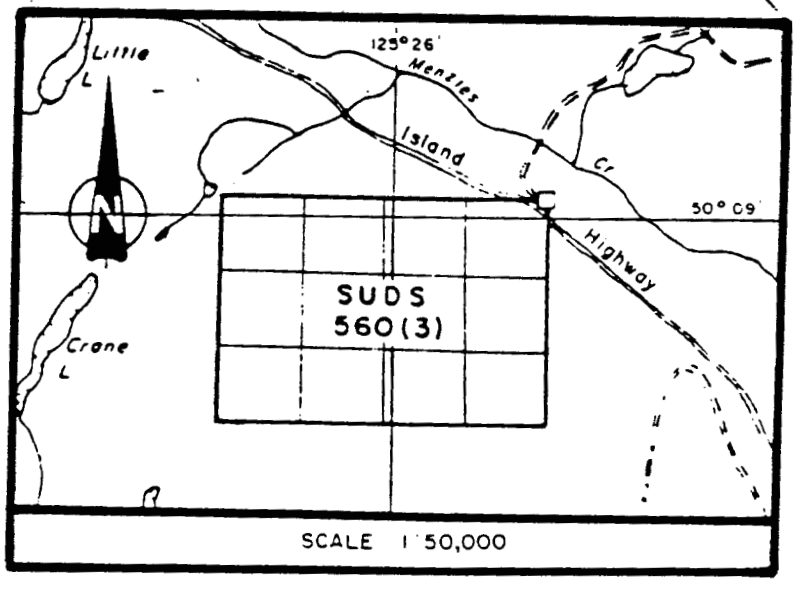
AUTHOR: Glen E. White, B.Sc., P. Eng.

DATE OF WORK: August 6 - 9, 1980

DATE OF REPORT: September 3, 1980




N.T.S. 92-K-3 W




# CAL-STAR RESOURCES LTD.
## LOCATION AND CLAIM MAP

Glen E. Wells
geological consulting
Ltd.

SCALE 1"=4 MILES

FIGURE 1

## INTRODUCTION

A limited amount of vector pulse electromagnetometer surveying was conducted over the Suds claim as directed by E. D. Cruz, P. Eng. The purpose of the test was to see if the sulphide mineralization reported to be associated with the lava flows occurs in sufficient quantities to yield an electromagnetic conductor. This test survey took place between August 6 - 9, 1980.

## DISCUSSION OF RESULTS

The vector pulse electromagnetometer system is described in the appendix of this report. Figure 2 gives an outline of the survey grid and the loop positions. Plates 1 - 8 illustrate the vertical and horizontal component data for channels 1, 2 and 3. The majority of the sections show a very steep half-space gradient proceeding away from the loop. This can be interpreted in two ways; first, that there is a major fault boundary to the south or second, that the volcanics overlay conductive sedimentary rocks. The only true conductor type response detected occurs on line 0 at 250S where there is a three channel crossover, Plate 6.

Thus, the VPEM survey did not locate any large massive sulphide conductors. However, the sulphide mineralization reported to be associated with the volcanic rocks may be of a more disseminated nature and respond to the induced polarization technique.

## CONCLUSIONS

The VPEM test located a small conductor response on line 0 at 250S which was not of sufficient magnitude to suggest a large massive sulphide target. It is therefore recommended that a limited amount of induced polarization surveying be undertaken to see if that method could assist in locating a large zone of poorly conducting sulphide mineralization.

Respectfully submitted,
GLEN E. WHITE GEOPHYSICAL
CONSULTING & SERVICES LTD.

Glen E. White, B.Sc., P. Eng.
Consulting Geophysicist

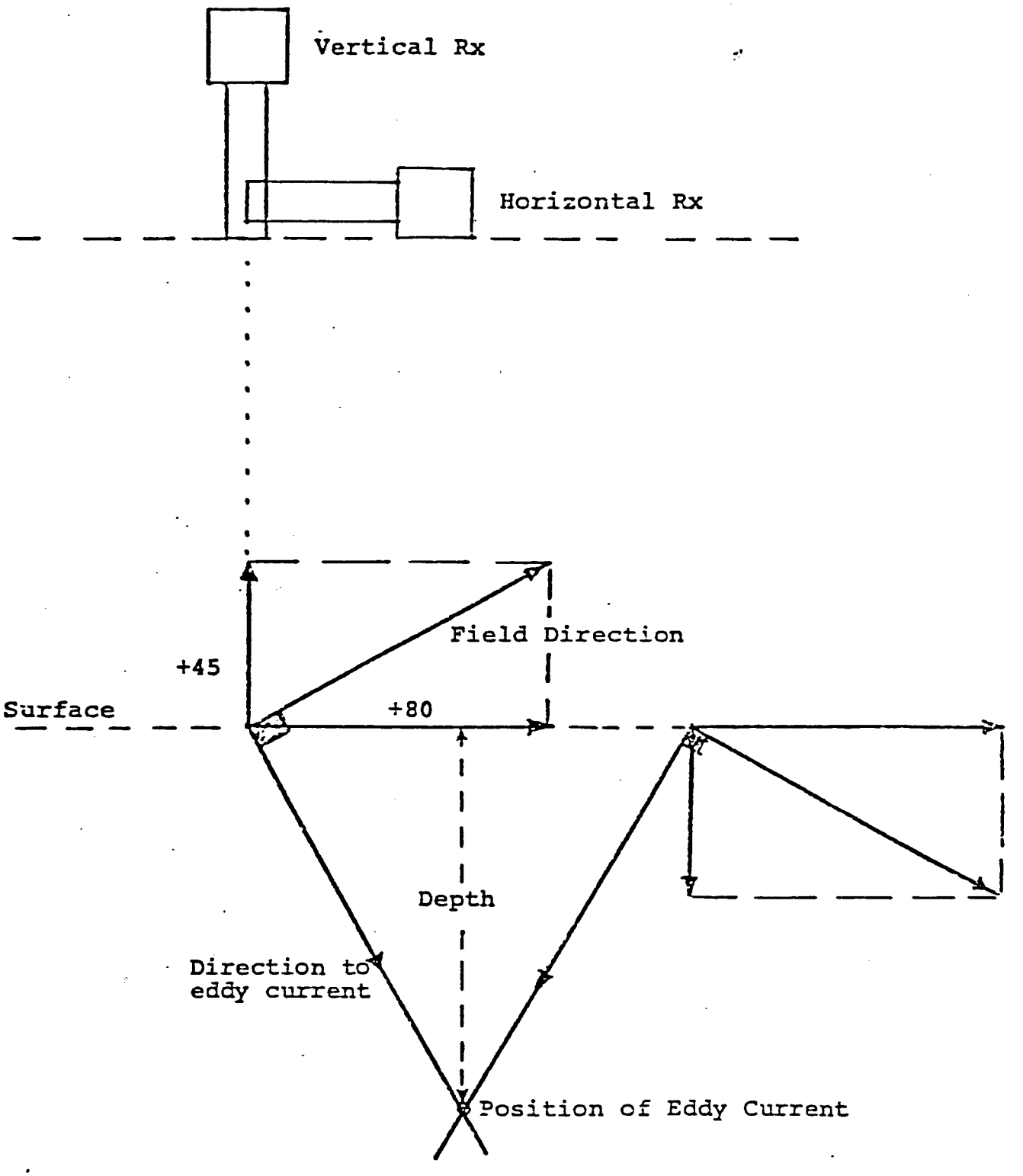
## VECTOR PULSE ELECTROMAGNETOMETER SURVEY

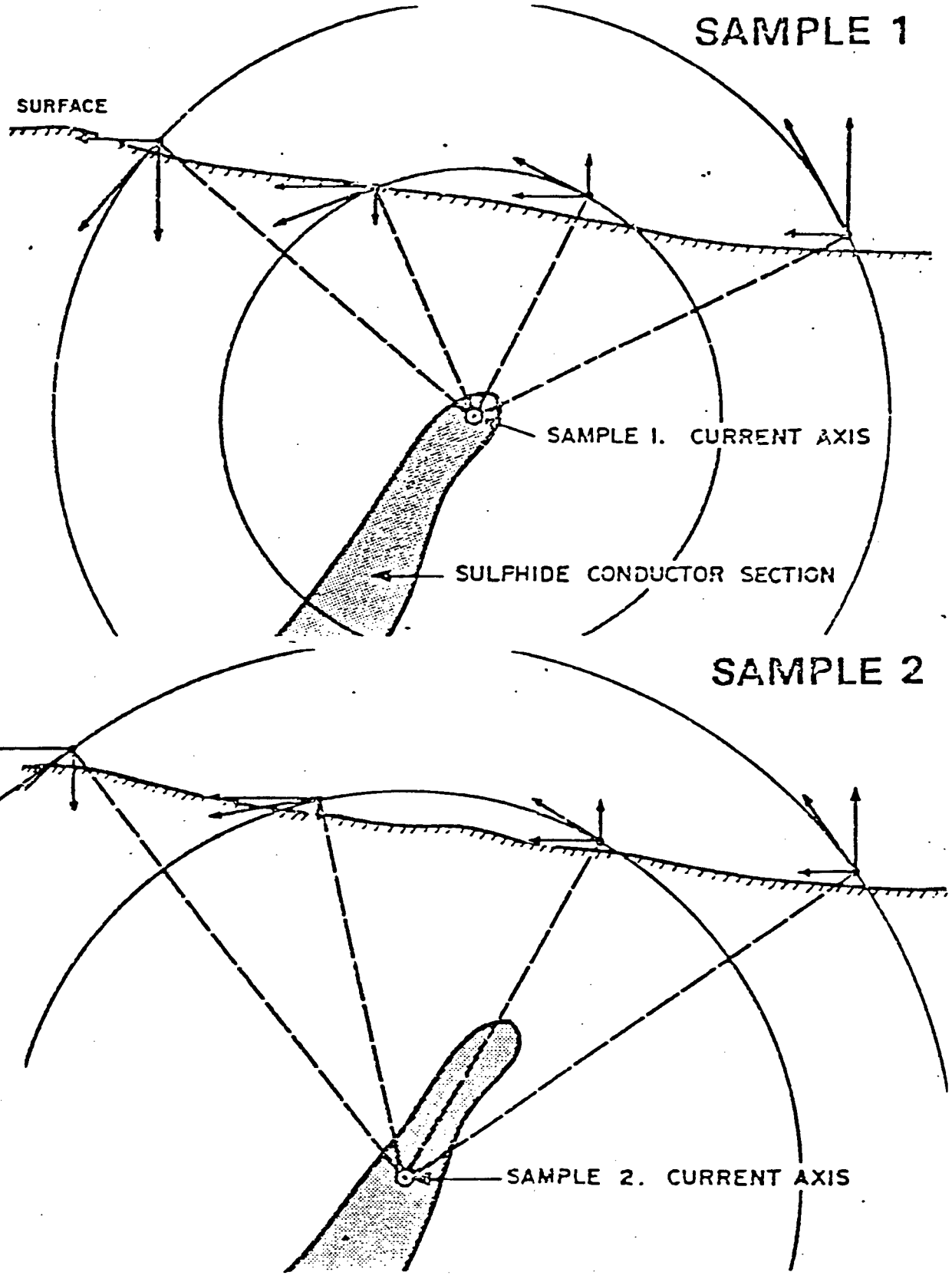
The pulse electromagnetometer system is a time domain E.M. system which can be used in the borehole mode, standard horizontal loop mode or deep penetrating vector mode.

The primary field for the horizontal loop survey is obtained from a transmit loop 9 meters in diameter laid out horizontally on the ground and energized by a pulse of 20 amps at 24 volts with an on-off time of 10.8 ms. The receiver coil is generally spaced 25 - 100 m from the transmitter loop. Both are moved simultaneously from station to station. The secondary field signal from the reciever coil is sampled and averaged for 11 seconds and then stored for readout. Eight samples of the secondary field are obtained with increasing window widths during the primary field off time. Time synchronization is by radio link or cable.

The eight channels of secondary field information are equivalent to a wide spectrum of frequencies from approximately 2KH$_z$ to 16H$_z$ which allows for determination of overburden effects and penetration of conductive overburden. Since the time derivative of the secondary field is measured directly during the primary field off time, the pulse method is relatively free of geometrical restrictions, such as topography interference and coil alignment.

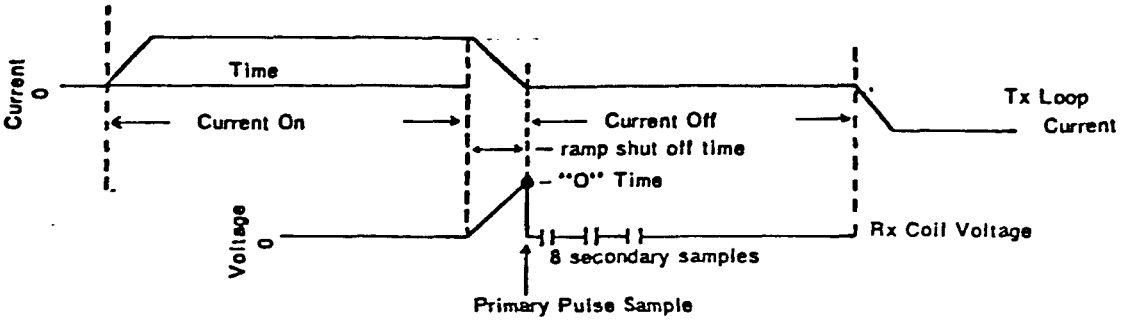
The primary field for the vector EM technique is obtained from a LSL (Large Scale Loop) of 150 m (492 ft.) per side which is energized with a current of 25 amps at 24 volts. A resultant vector can be obtained by vector addition of the horizontal and vertical components of the secondary field. A right angle to this resultant points to the eddy current position. See Appendix for diagrams. Additionally, detailed conductor information can be obtained from the analysis of the individual component information.


Vertical Rx
Horizontal Rx
Field Direction
+45
Surface
+80
Depth
Direction to
eddy current
Position of Eddy Current




**Location of the Current Path in the Conductor**

## PEM SPECIFICATIONS




Current Off time: 9.4 ms
Current on time: 10.8 ms
Current shut off (ramp) time: 1.4 ms
Sample times (zero to centre of sample): .15ms, .45ms, .85ms, 1.45ms, 2.45ms, 3.75ms, 5.85ms, 8.85ms.

Sample width: 100 μs
Zero time set at drop off point of primary pulse

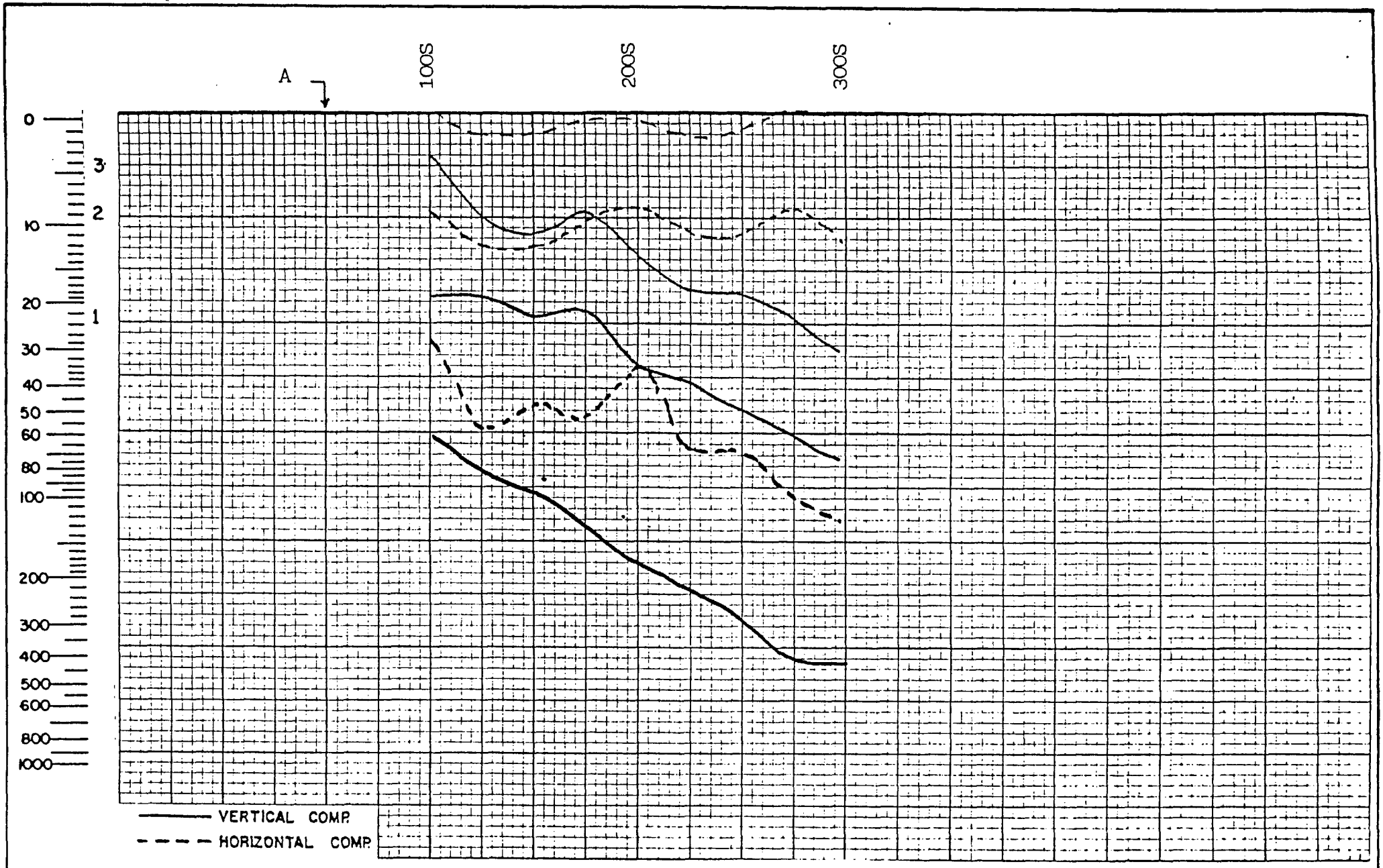
TRANSMITTER — Transmitter power and loop size may be increased to obtain increased penetration. Weight, portability and power capabilities of the control instrument are the limiting factors. The standard transmitter is designed to be carried by two men.

| | |
|---|---|
| Loop diameter | — minimum 4 meters (13 feet) |
| Loop current | — 15 to 20 amps |
| Loop applied voltage | — 24 volts |
| Loop output | — minimum 4500 amps x meter $^2$ |
| Loop weight | — 11.8 kilos (26 lb) |
| Control unit weight | — 10 kilos (22 lb) |
| Control unit dimensions | — 20.5cm x 25.5cm x 36.5cm (8" x 10" x 14.5") |
| Battery supply weight | — 18.1 kilos (40 lb) |
| Battery supply | — 2 of 12 volt, 14 to 20 ampere hour |

Timing control by radio synchronization

RECEIVER

- Receive coil dimensions: 55cm x 15cm (22" x 6")
- Receive coil weight: 4.5 kilos (10 lb)
- Preamplifier in coil
- Preamplifier batteries: 2 of 9 volt
- Receive coil tripod mounted
- Receiver measuring instrument dimensions: 28cm x 18cm x 21.5cm (11" x 7" x 9")
- Receiver measuring instrument weight: 6.3 kilos (14 lb)
- Timing control by radio synchronization
- Primary sample width: 100 μs
- Primary sample can be swept through primary pulse by means of a time calibrated pot
- Zero time set at primary pulse drop-off
- Secondary samples (eight of them) width: 100 μs
- Secondary samples time (zero to middle of sample): (1) .15ms (2) .45ms (3) .85ms (4) 1.45ms (5) 2.45ms (6) 3.75ms (7) 5.85ms (8) 8.85ms
- Automatic sampling for 5 seconds then all samples automatically stored
- Sample read out by means of meter
- Continuous sampling possible by switching function switch to "Continuous"
- Noise can be monitored by switching function switch to "Noise"
- Battery supply: 24 volt rechargeable, 2 of 12 volt Gel GC 12-15

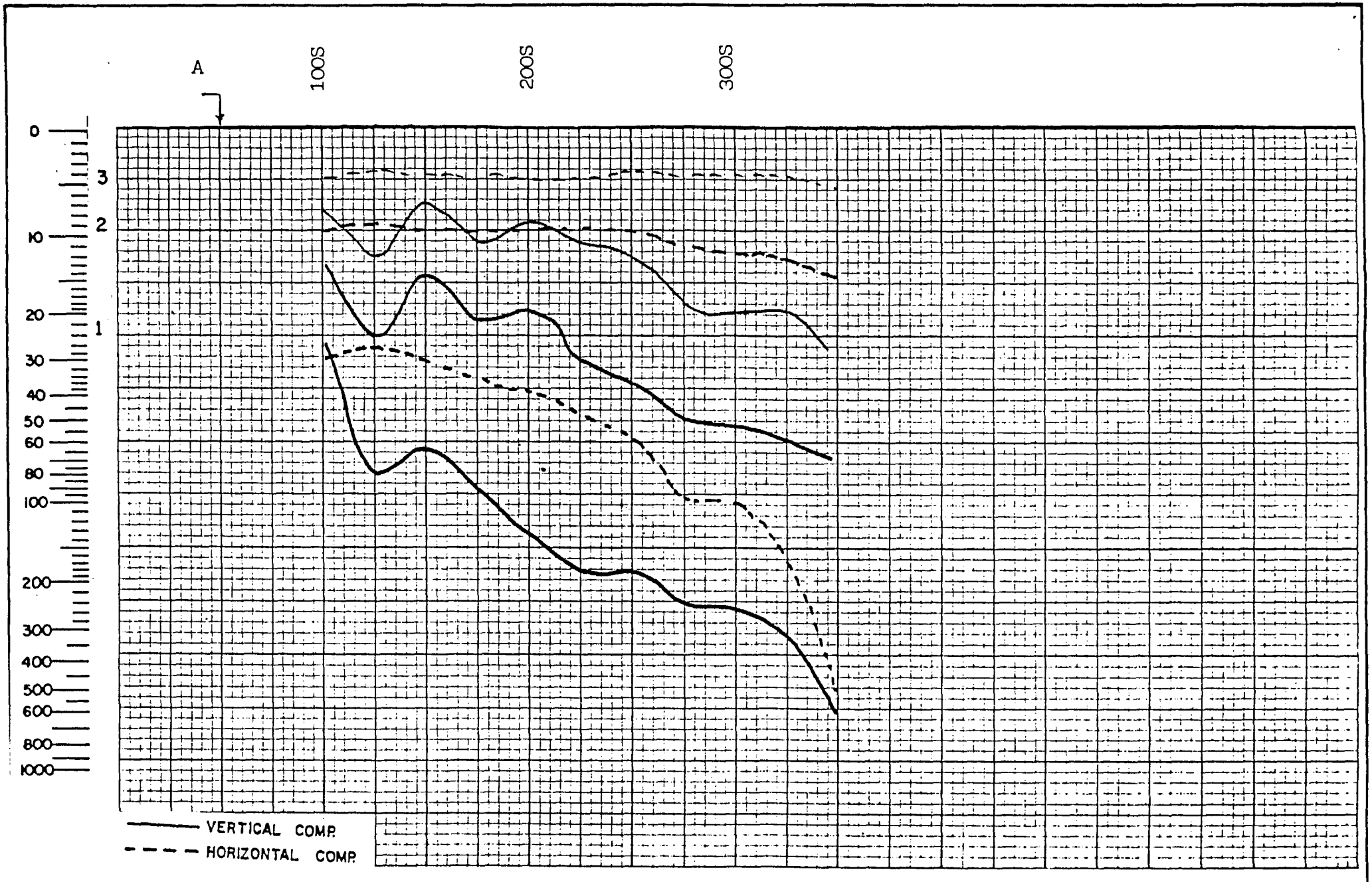



CAL STAR RESOURCES LTD.

500W

Glen E. White geophysical consulting services ltd.

Plate 1

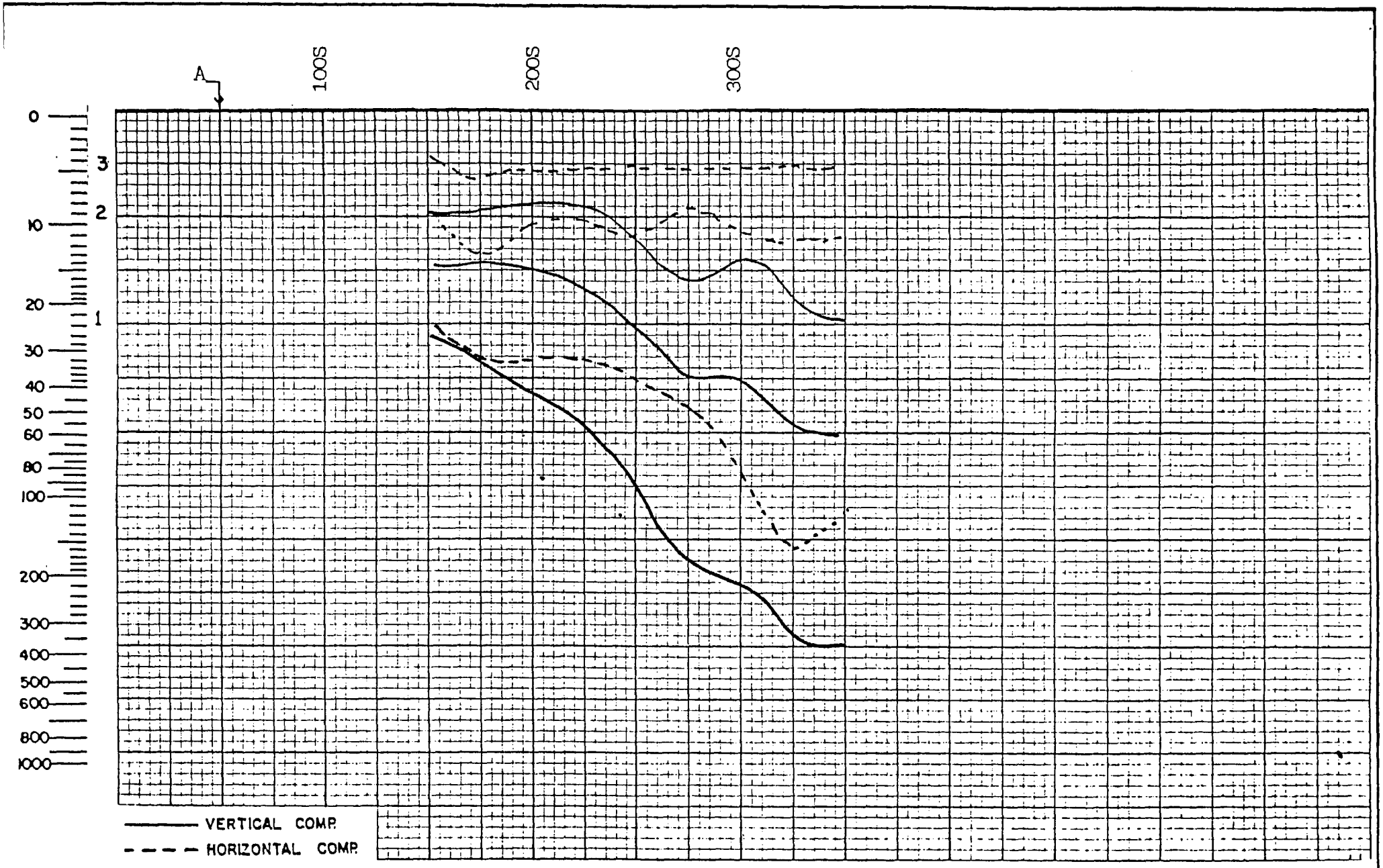



CAL STAR RESOURCES LTD

400W

Glen E. White
geophysical consulting
services ltd.

Plate 2

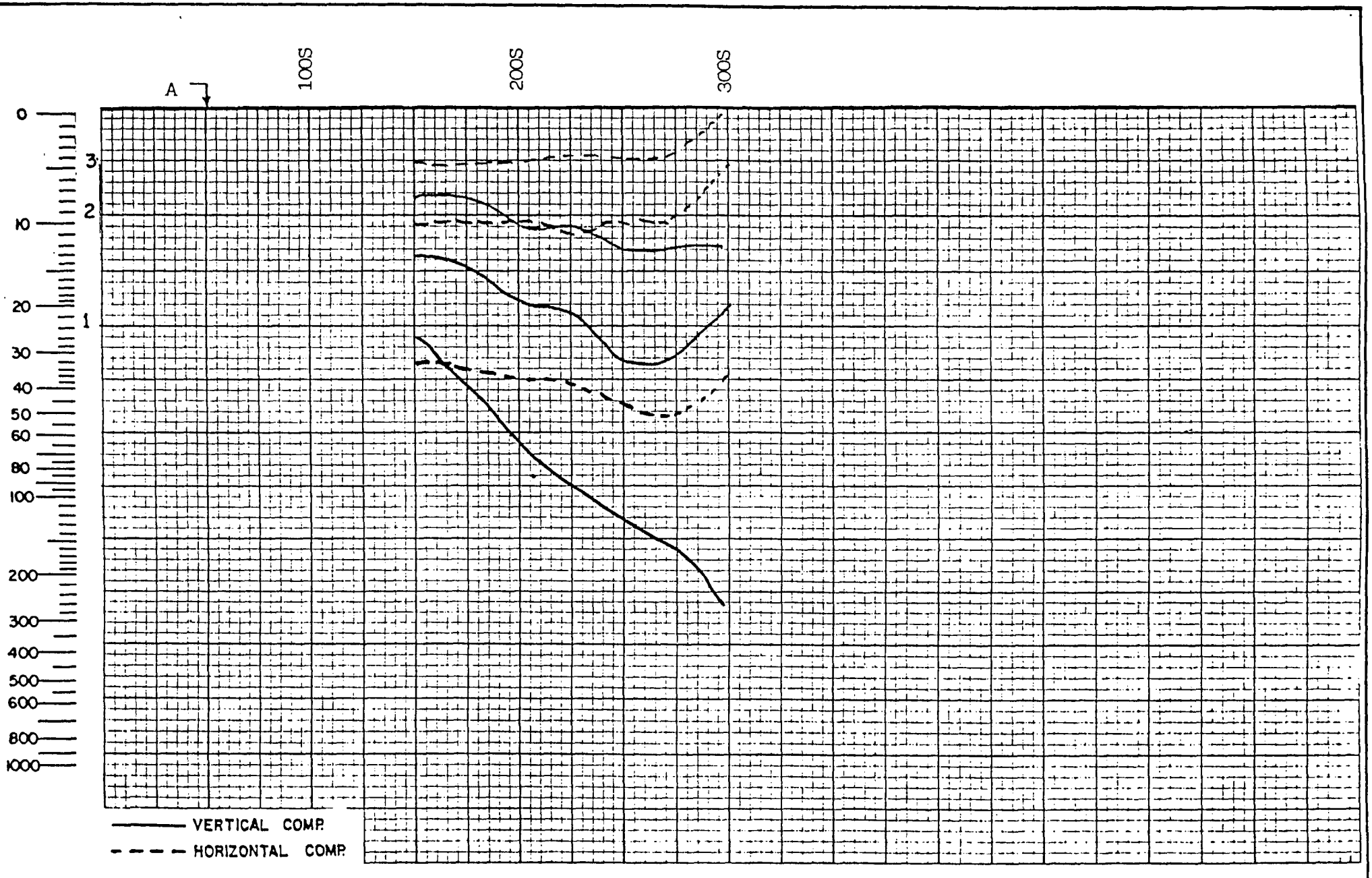



CAL STAR RESOURCES LTD

300W

Glen E. White
geophysical consulting
services ltd.

Plate 3

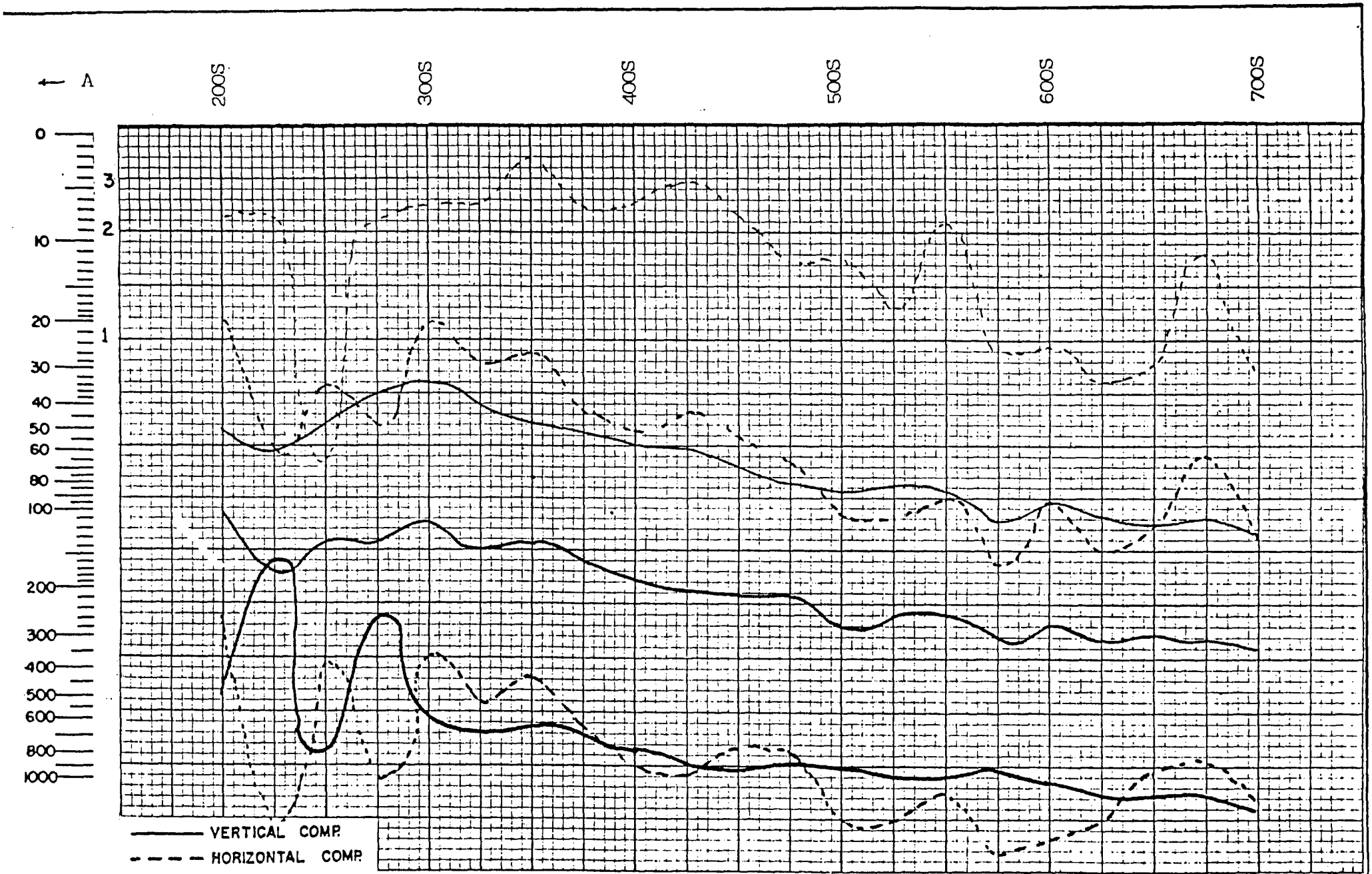



CAL STAR RESOURCES LTD

200W

Glen E. White
geophysical consulting services ltd.

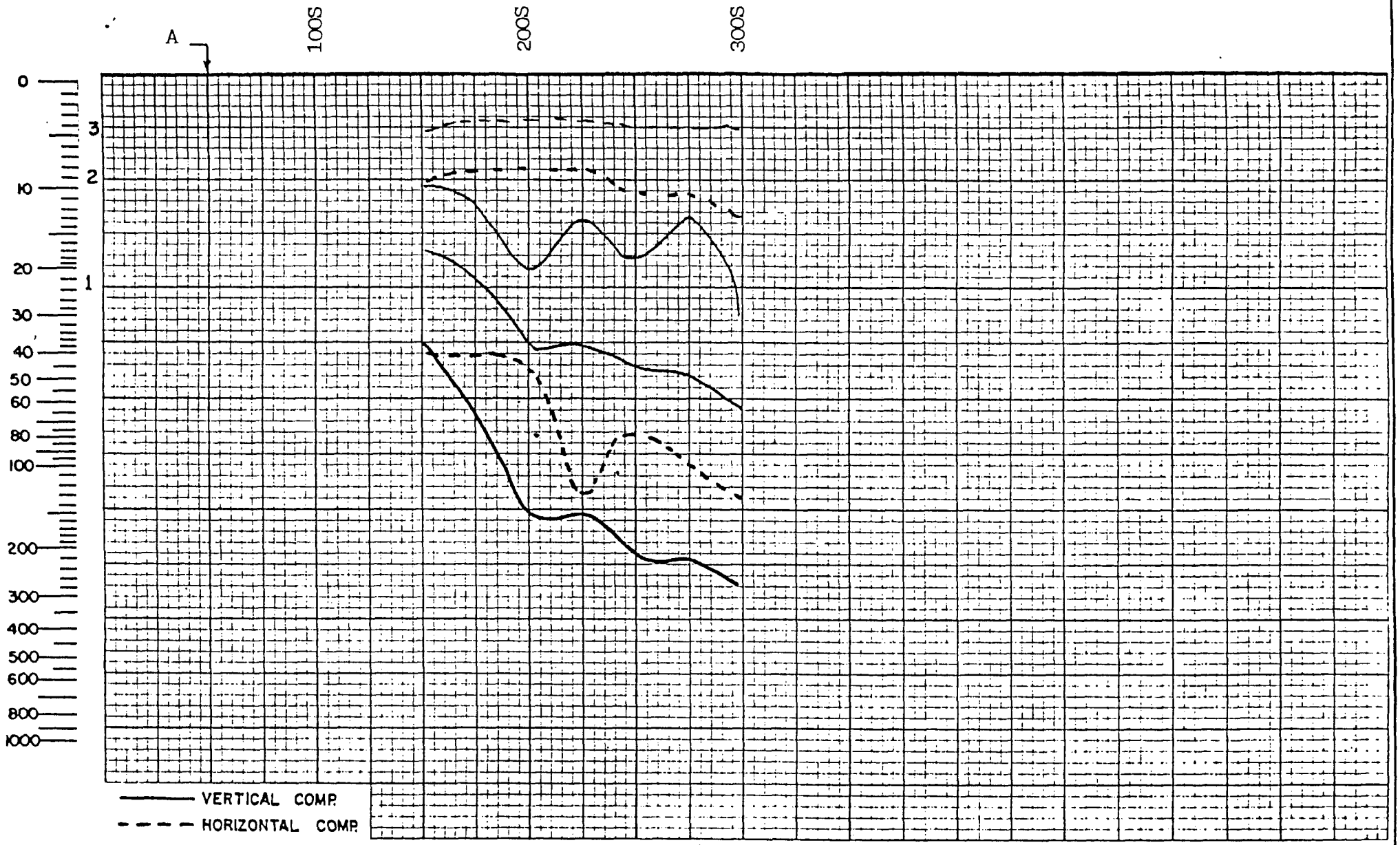
Plate 4




CAL STAR RESOURCES LTD

Glen E. White
geophysical consultants Ltd.

Plate 6

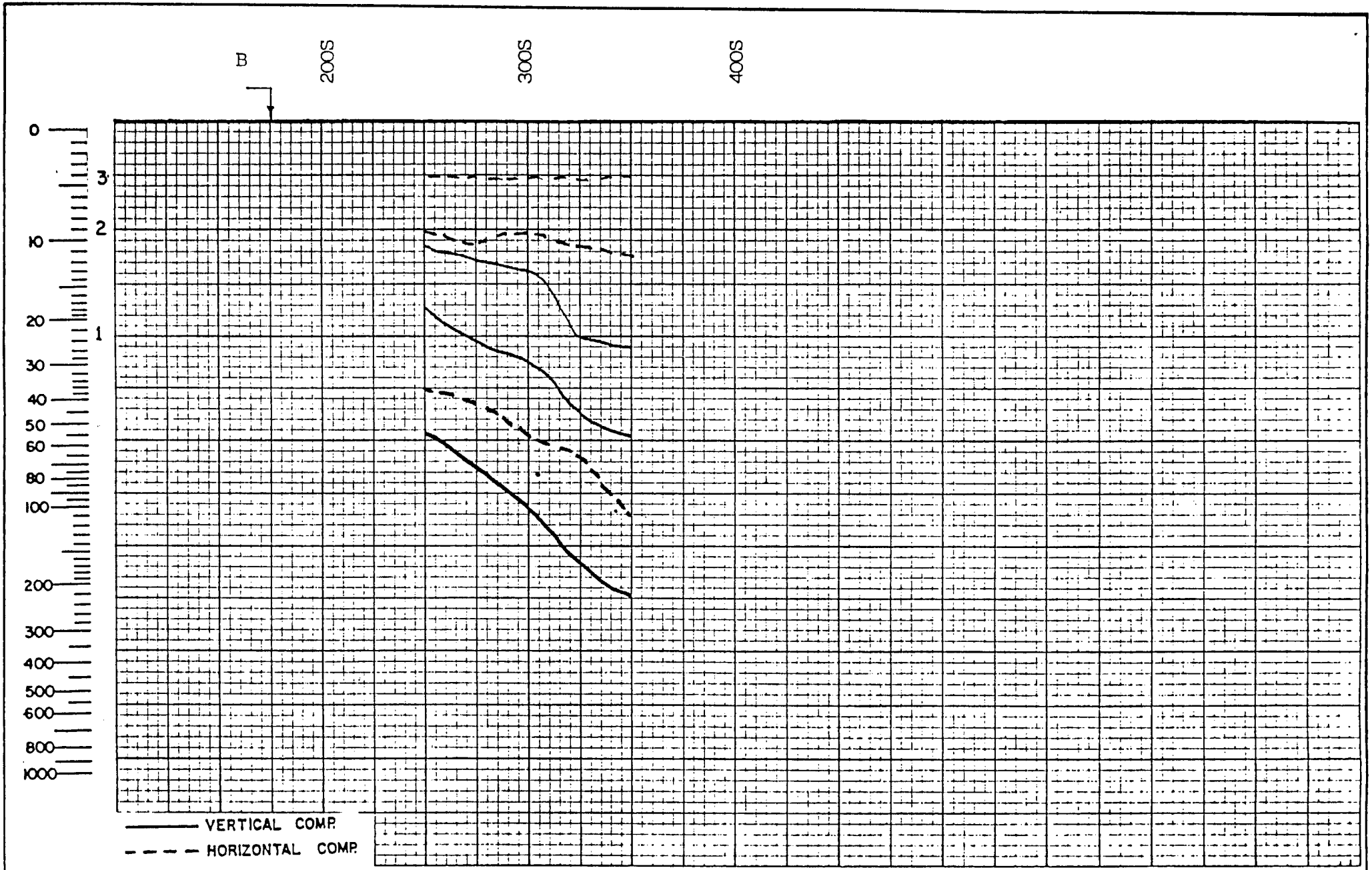



CAL STAR RESOURCES LTD

100W

Glen E. Wa... geophysical con... services ltd.

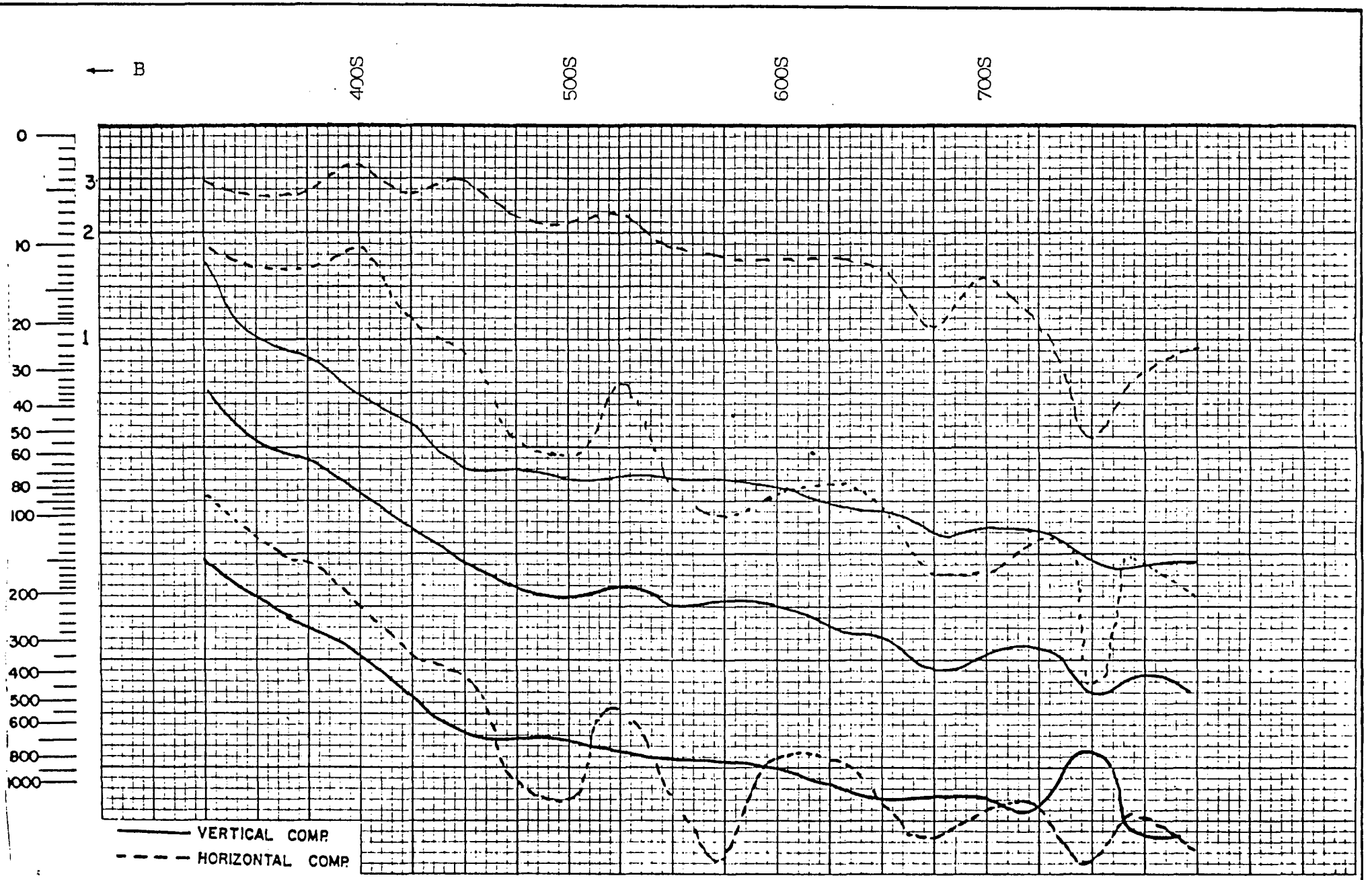
Plate 5




CAL STAR RESOURCES LTD

100E

Plate 7




CAL STAR RESOURCES LTD

200

Glen E.W. geophysical engineering services ltd.

9330

125° 26'

5+00W 4+00W 3+00W 2+00W 1+00W 0+00 1+00E 2+00E 3+00E 4+00E 5+30E

LOOP A

LOOP B

SUDS CLAIM L.C.P.

Island Highway

50° 09'

50° 09'

Pond

BLUFF

Also 0+00 ; 2+75S — 3+50S

3+50S

5+50S

CLAIM LINE

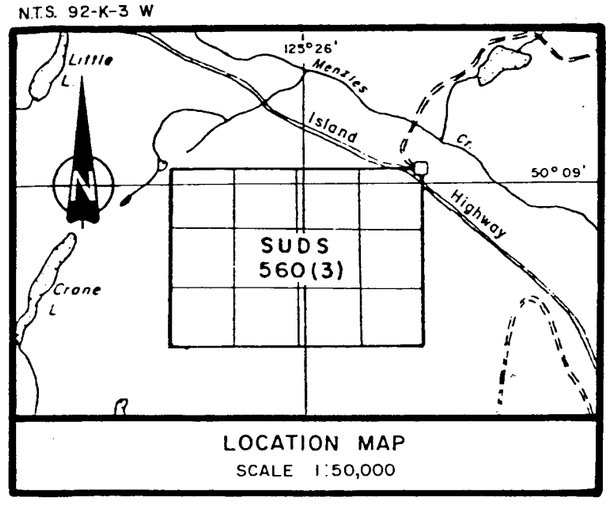
# SUDS CLAIM

LEGEND:

- GRID STATION
- WEAK CONDUCTOR
- POSSIBLE FAULT
- VPEM LOOP LOCATION

INSTRUMENT : CRONE PULSE E.M.

N.T.S. 92-K-3 W




LOCATION MAP
SCALE 1:50,000

100 0 100 200 300
SCALE IN METRES

CAL-STAR RESOURCES LTD.

SUDS CLAIM

NANAIMO MINING DIVISION, B.C.

VECTOR PULSE
ELECTROMAGNETOMETER SURVEY

*Glen E. White geophysical consulting & services ltd.*

| | |
|---|---|
| INTERPRETED BY: | G.E.W. |
| DRAWN BY: | F.W.F. |
| CHECKED BY: | |
| DATE: | AUGUST 20, 1980 |
| FIG No.: | 2 |

To Accompany Geophysical Report on
SUDS CLAIM
Date: _____
By GLEN E. WHITE-B.Sc. _____ GEOPYHSICIST

'81- #298- #

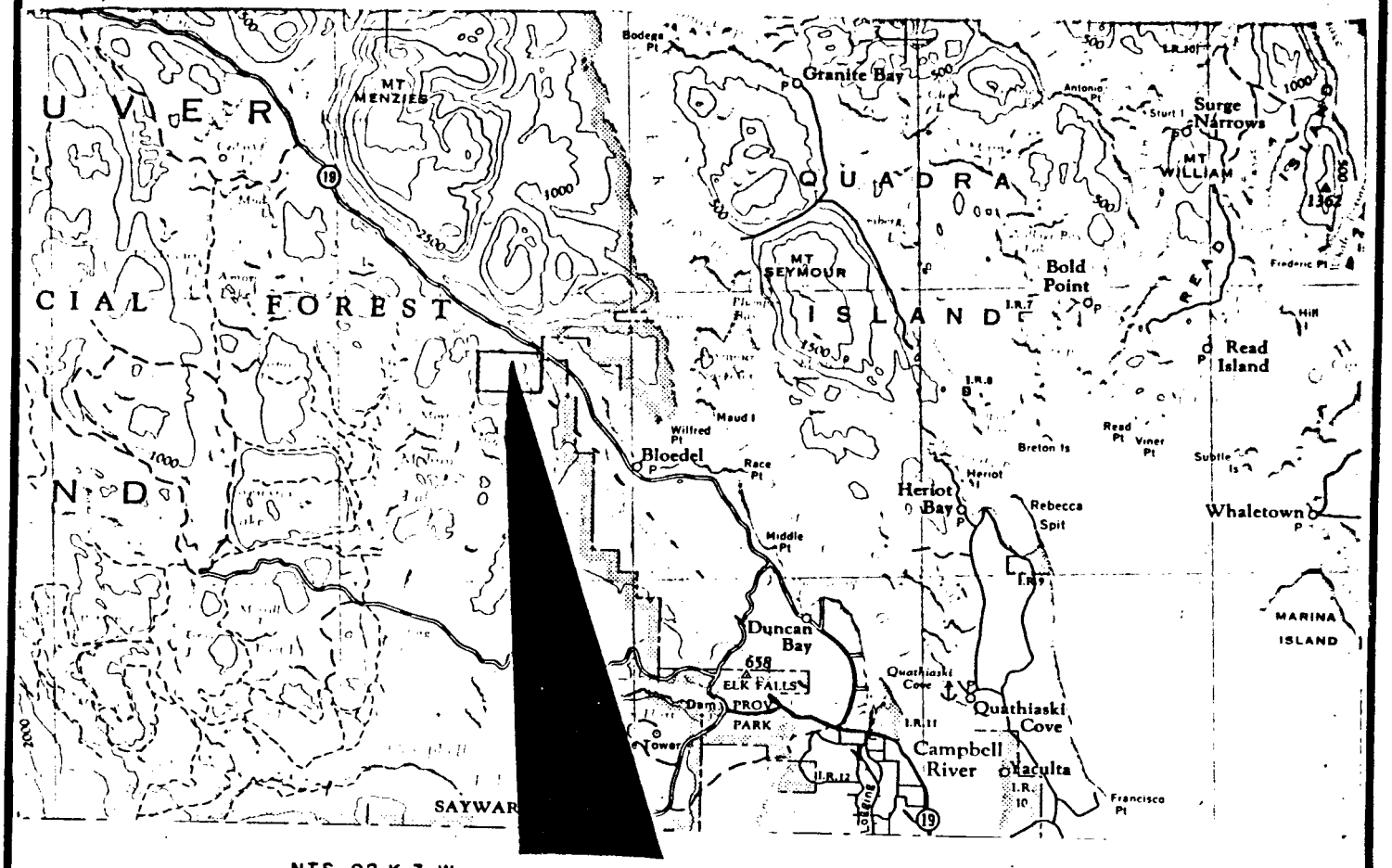
# CAL - STAR RESOURCES LIMITED
# GEOPHYSICAL REPORT
# on an
# Induced Polarization Survey

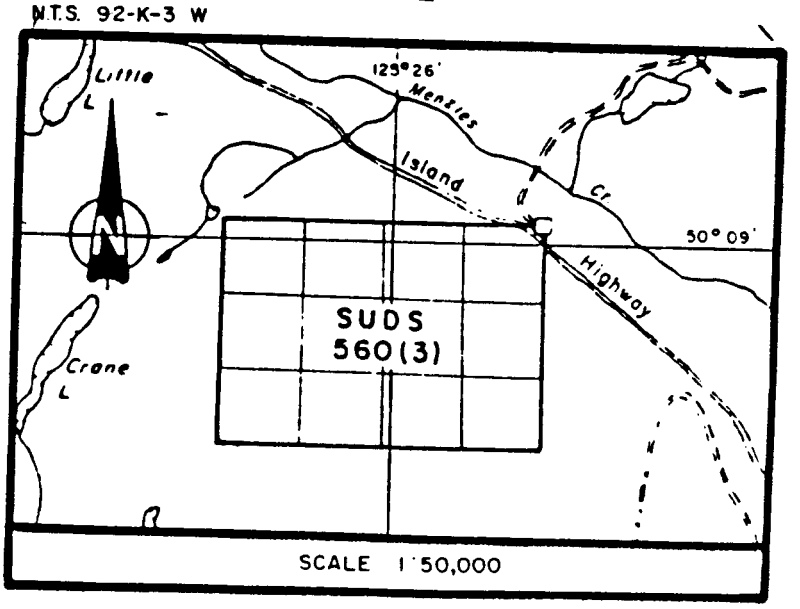
Suds Mineral Claim, Nanaimo Mining Division, B.C.
Latitude 50°09'N, Longitude 125°26'W NTS 92 K/3W

Authors: E. Trent Pezzot, B.Sc.
Glen E. White, B.Sc., P.Eng.

Date of Work: Dec. 06, 1980 - Dec. 12, 1980

Date of Report: Jan. 14, 1981




# CAL-STAR RESOURCES LTD.
## LOCATION AND CLAIM MAP

Glen E White
geological consulting
services ltd.

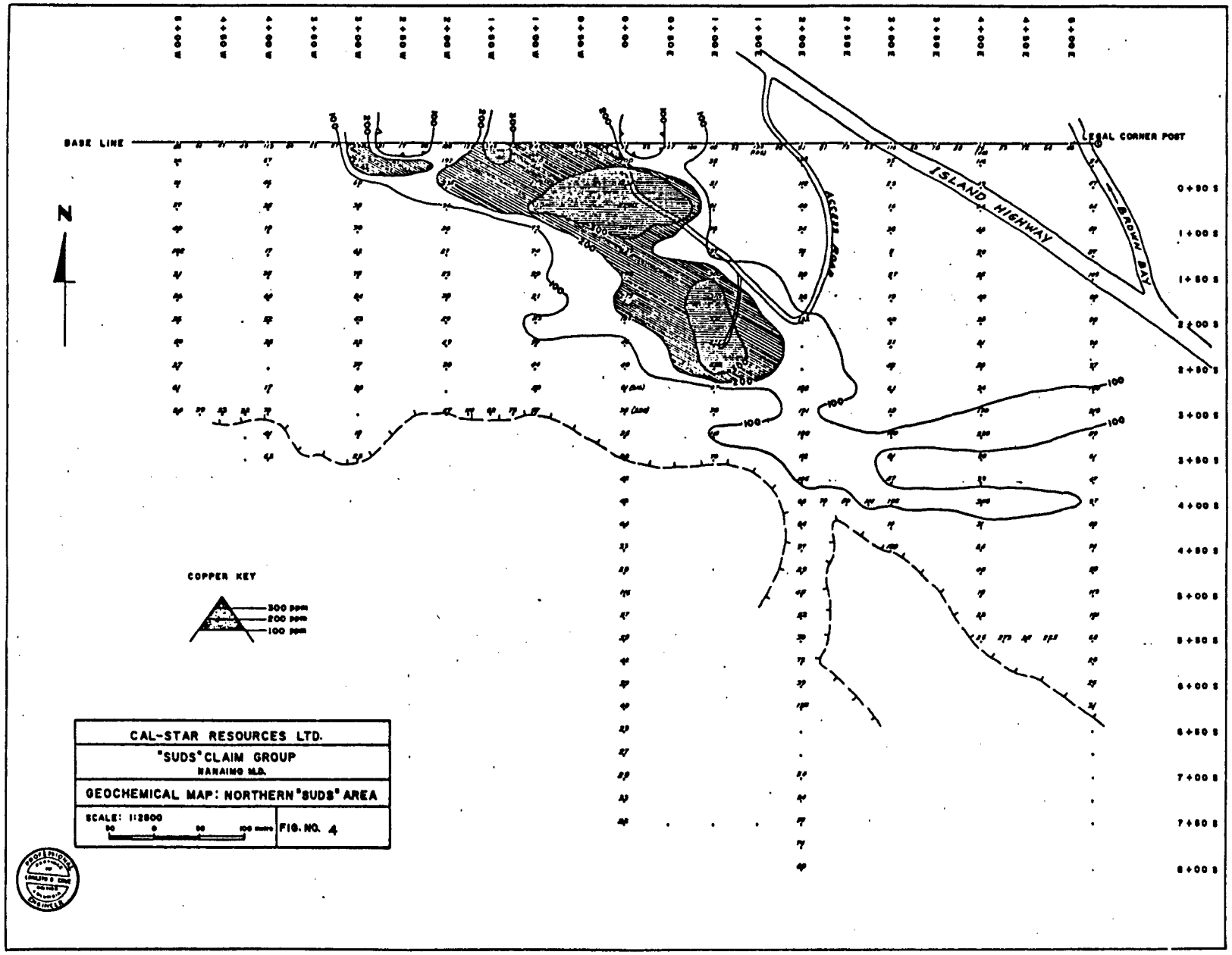
SCALE 1"=4 MILES

FIGURE 1

# C O N T E N T S



## Illustrations




Glen & Wells
geophysical consulting
services ltd.

Plate 1

## INTRODUCTION

Glen E. White Geophysical Consulting and Services Limited conducted a small induced polarization test survey over the Suds claim on behalf of CAL-STAR RESOURCES LIMITED between December 06, 1980 and December 12, 1980. The purpose of the survey was to locate any large zones of poorly conducting sulphide mineralization in the area of a large copper soil geochemistry anomaly.

## PROPERTY

The Suds mineral claim (Record Number 560 (3) ) comprises 12 contiguous units as illustrated on figure 1.

## LOCATION AND ACCESS

The claim area is located at latitude 50°09'N and longitude 125°26'W in the Nanaimo Mining Division of B.C. Island highway #19 intersects the north-east corner of the claim block approximately 19 km north-west of Campbell River (see figure 1). An unimproved road provides access from this point on to the north-east unit of the claim.

## PREVIOUS WORK

Two previous surveys are known to have been conducted over the area of interest. Initially a soil geochemistry survey located a copper anomaly in the north-east corner of the claim area as shown on Plate 1.

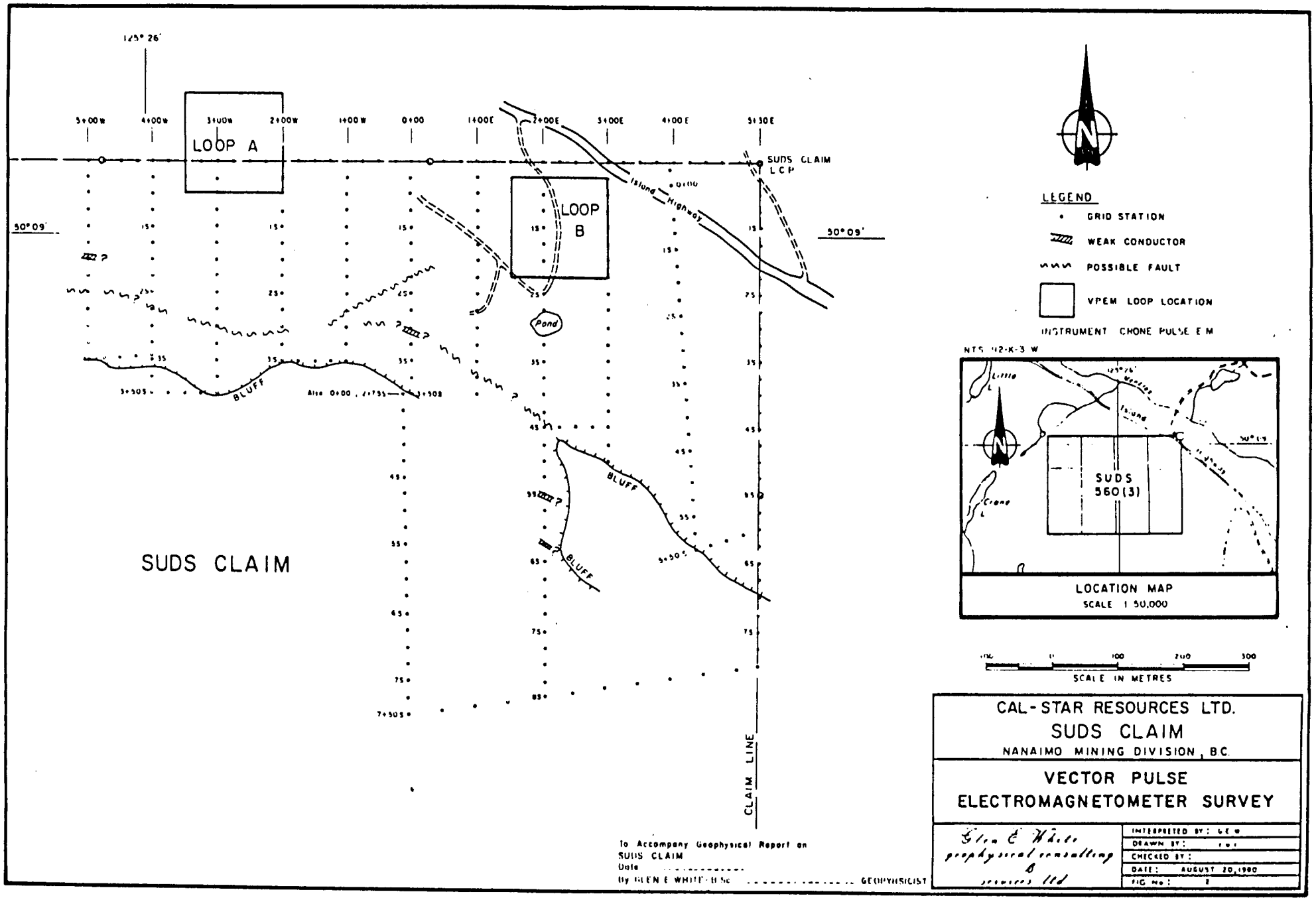
A test pulse electromagnetometer survey was conducted over this anomaly and reported on by Glen E. White Geophysical Consulting and Services Limited on August 20, 1980 (Plate 2). This survey failed to locate any conductive responses of sufficient magnitude to suggest a massive sulphide target. An induced polarization test survey was recommended at this time with the intent of locating a large zone of poorly conducting sulphide mineralization.

## LOCAL GEOLOGY

The area is underlain mainly by massive basalt flows with minor interbedded pillow lava belonging to the upper Karmutson formation of early late Triassic age. Low grade metamorphism up to the pumpellyite - prehnite facies has affected the basalt lavas. A monoclinal dip of $\pm$ 8 degrees to the south-east with minor block faulting characterized the overall structure of the formation. Diabase dykes and sills intrude the lava in places.

## INDUCED POLARIZATION

The equipment used on this survey was the Huntec pulse-type unit and Mark III receiver. Power was obtained from a Briggs and Stratton motor coupled to a 2.5 KW 400 cycle, three phase generator, providing a maximum of 2.5 KW D.C. to the ground. The cycling rate is 1.5 seconds "current on" and 0.5 seconds "current off", the pulse reversing continuously in polarity. Power was transmitted to the




Glen E White
geophysical consulting
services ltd.

Plate 2

ground through two potential electrodes, $P_1$ and $P_2$. Which were deployed in the three electrode array with an "a" spacing of 50m and a separation of n=1. In addition 3 lines were surveyed with n=2, 3 and 4.

The data recorded in the field consists of careful measurements of the current (I) in amperes flowing through electrodes $C_1$ and $C_2$, the primary voltage ($V_p$) appearing between electrodes $P_1$ and $P_2$ during the "current on" part of the cycle, and the secondary voltage ($V_s$) appearing between electrodes $P_1$ and $P_2$ during the "current off" part of the cycle. A cycle time of 4 seconds was used with a duty ratio of 2.2:1, Tp 20ms and Td 60ms.

The apparent chargeability (M') in milliseconds, is calculated by $T_p\ (M_1 + 2M_2 + 4M_3 + 8M_4) = M'$, where $T_p$ is the basic integrating time in tenths of seconds. $M_1$, $M_2$, $M_3$ and $M_4$ are the chargeability effects at various times on the voltage decay curve following switch off of the transmitter, measured as a percentage of the primary voltage, $V_p$ recorded during the "current on" time. By the use of these factors, one can gain an estimate of the decay curve in terms of chargeability for the given time $T_p$. This gives a quantitative value to the data measured.

The apparent resistivity, in ohm-meters is proportional to the ratio of the primary voltage to the measured current, the proportionality factor depending on the geometry of the electrode array used. The chargeability and resistivity values obtained are called

"apparent" as they are values which that portion of the earth sampled by the array would have if it were homogeneous. As the earth sample is usually inhomogeneous, the calculated apparent chargeability and apparent resistivity are functions of the actual chargeabilities and resistivities of the rocks sampled and of the geometry of the rocks.

## DISCUSSION OF RESULTS

An area of high copper soil geochemistry values was examined by an induced polarization survey in order to test for disseminated sulphides. Eleven lines (5+00W through 5+00E) were surveyed at 50 meter station intervals with n=1 and a=50 meters. The data gathered is presented as apparent resistivity and chargeability plan maps as figures 2 and 3. In addition, lines 5+00W, 3+00W and 0+00 were surveyed with n values of 2, 3 and 4. Apparent resistivity and chargeability profiles of these lines are presented as figures 4, 5 and 6.

The induced polarization survey delineated a north-west, south-east trending chargeability and resistivity lineament along strike from the cliff to the south-east and coincident with a pulse electromagnetometer defined fault and the main copper geochemistry anomaly. To the north-west, along strike from this lineament an isolated chargeability high is noted and considered open to the north and west. The lineament separates two zones with different background chargeabilities (3ms and 8ms). The higher

8ms background values likely reflect 1% - 3% by volume disseminated sulphides in the volcanics up slope, to the southwest of the copper geochemistry anomaly. The chargeability values increase slightly to the south indicating either an increase in the thickness of the disseminated sulphide bearing volcanic unit or an increased amount of sulphides in the area. A 10.1% chargeability value noted on line 0+00 at station 2+25S is coincident with the strongest pulse electromagnetometer conductive response observed and occurs approximately 50 meters south-west of the soil geochemistry anomaly.

Two closed chargeability highs are located on line 1+00W at stations 0+25N (2ms above background) and 0+75S (1ms above background) coincident with the north-west, south-east lineament and the copper geochemistry anomaly. A 3ms above background chargeability high observed on line 5+00E is open to the east and correlates with a narrow and weak copper geochemistry trend. Highway 19 and high voltage power lines in the vicinity make this anomaly less reliable than those observed to the west.

The induced polarization survey detected a second lineament, trending east-west near the northern boundary of the claim block and separating the north-west, south-east lineament from the isolated chargeability high observed on line 5+00W, station 1+25N. The results from the test pulse electromagnetometer survey conducted in August, 1980 exhibited a steep half-space gradient in this area. This was inter-

pretted as the response from either a major fault or conductive sedimentary rocks underlying the volcanics. The expanding array induced polarization survey in the area does not exhibit any significant decrease of apparent resistivity between 0 and 100 meters depth; henceforth supports the former interpretation. This expanding array survey detected an apparent resistivity low on line 5+00W at station 1+50S at an approximate depth of 100 meters. Weak chargeability highs for n values of 1, 2 and 3 and a weak pulse electromagnetometer conductive response were also observed at this same location.

## SUMMARY AND RECOMMENDATIONS

In December, 1980 a limited amount of induced polarization surveying was conducted on the Suds claim to test for the presence of disseminated sulphides in the area of a copper soil geochemistry anomaly. The survey supports the previous interpretation of a northwest - southeast trending fault, coincident with the geochemical trend, and infers the presence of a second fault along the northern claim boundary. Background chargeabilities to the south and west of these faults are approximately 5ms greater than those observed elsewhere on the grid and appear to be increasing to the south. The chargeability values observed in this area could result from finely disseminated sulphides (1-3% by volume) in the volcanics.

Small but closed chargeability highs are observed along the main copper geochemical trend on line 1+00W

at stations 0+25N (2ms above background) and 0+75S (1ms above background). Along strike to the north-west on line 5+00W at station 1+25N a 6ms chargeability high possibly represents a continuation of the copper anomaly in this direction. A 3ms chargeability increase is observed on line 5+00E from 1+75S to 2+75S. Both this feature and the associated weak and narrow copper trend are considered open to the east.

Two areas exhibit strong correlation between induced polarization and pulse electromagnetometer defined anomalies and should be examined by diamond drilling. Geological structure and terrain conditions considered, diamond drill sites should be set up to interest the geophysical targets on line 0+00, 50-60 meters beneath station 2+50S and on line 5+00W, 80 meters beneath station 1+50S. Continued geochemical and geophysical surveying should be undertaken to determine the extent of the anomalous trends presently considered open to the east and north-west.

Respectfully submitted,

E. Trent Pezzot, B.Sc.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA GLEN E. WHITE

Glen E. White, B.Sc., P.Eng.

# INSTRUMENT SPECIFICATIONS

## INDUCED POLARIZATION SYSTEM

A. Instruments

(a) Type - pulse

(b) Make - Huntec

(c) Serial No. - transmitter #107 - receiver #3016

B. Specifications

(a) Size and Power - 2.5 KW

(b) Sensitivity - 300 x 10.5 volts

(c) Power Sources - 2.5 KW 400 cycle - three-phase generator

(d) Power - 8 H.P. Briggs and Stratton @ 3000 R.P.M.

(e) Timing - electronic, remote and direct.

(f) Readings - (i) ampls (ii) volts primary and secondary

(g) Calculate (i) Resistivity - ohm-meters (ohm-feet)

(ii) Chargeability - milliseconds

C. Survey Procedures

(a) Method - power supplied to mobile probe along TW 18 stranded wire from stationary set-up

(b) Configuration - Pole-dipole (three electrode array) Plot point midway between $C_1$ and $P_1$

D. Presentation

Contour Maps (i) Chargeability - milliseconds

(ii) Resistivity - ohm-meters (ohm-feet)

## COST BREAKDOWN

| PERSONNEL | DATES | WAGES | TOTAL |
|---|---|---|---|
| Mark Gray | Dec. 6-12/80 | $145.00 | $1,015.00 |
| Brent Robertson | Dec. 6-12/80 | $135.00 | $ 945.00 |
| Joel Graham | Dec. 6-12/80 | $115.00 | $ 805.00 |
| Ovind Aaraskjold | Dec. 6-12/80 | $120.00 | $ 840.00 |

| | |
|---|---|
| Meals and Accomodations ..... | $ 980.00 |
| Instrument Lease ..... | $ 700.00 |
| Vehicle All Inclusive ..... | $ 455.00 |
| Interpretation Maps and Reports ..... | $ 760.00 |
| Total ..... | $6,500.00 |

## STATEMENT OF QUALIFICATIONS

NAME: PEZZOT, E. Trent

PROFESSION: Geophysicist - Geologist

EDUCATION: University of Brisish Columbia - B.Sc. - Honors Geophysics and Geology

PROFESSIONAL ASSOCIATIONS: Society of Exploration Geophysicists

EXPERIENCE: Three years undergraduate work in geology - Geological Survey of Canada, consultants.

Three years Petroleum Geophysicist, Senior Grade, Amoco Canada Petroleum Co. Ltd.

Two years consulting geophysicist, Consulting geologist - B.C., Alberta, Saskatchewan, N.W.T., Yukon, western U.S.A.

Two years geophysicist with Glen E. White Geophysical Consulting & Services Ltd.

## STATEMENT OF QUALIFICATIONS

NAME: WHITE, Glen E., P. Eng.

PROFESSION: Geophysicist

EDUCATION: B.Sc. Geophysics - Geology
University of British Columbia

PROFESSIONAL ASSOCIATIONS: Registered Professional Engineer, Province of British Columbia

Associate member of Society of Exploration Geophysicists.

Past President of B. C. Society of Mining Geophysicists.

EXPERIENCE: Pre-Graduate experience in Geology - Geochemistry - Geophysics with Anaconda American Brass.

Two years Mining Geophysicist with Sulmac Exploration Ltd. and Airborne Geophysics with Spartan Air Services Ltd.

One year Mining Geophysicist and Technical Sales Manager in the Pacific north-west for W. P. McGill and Associates.

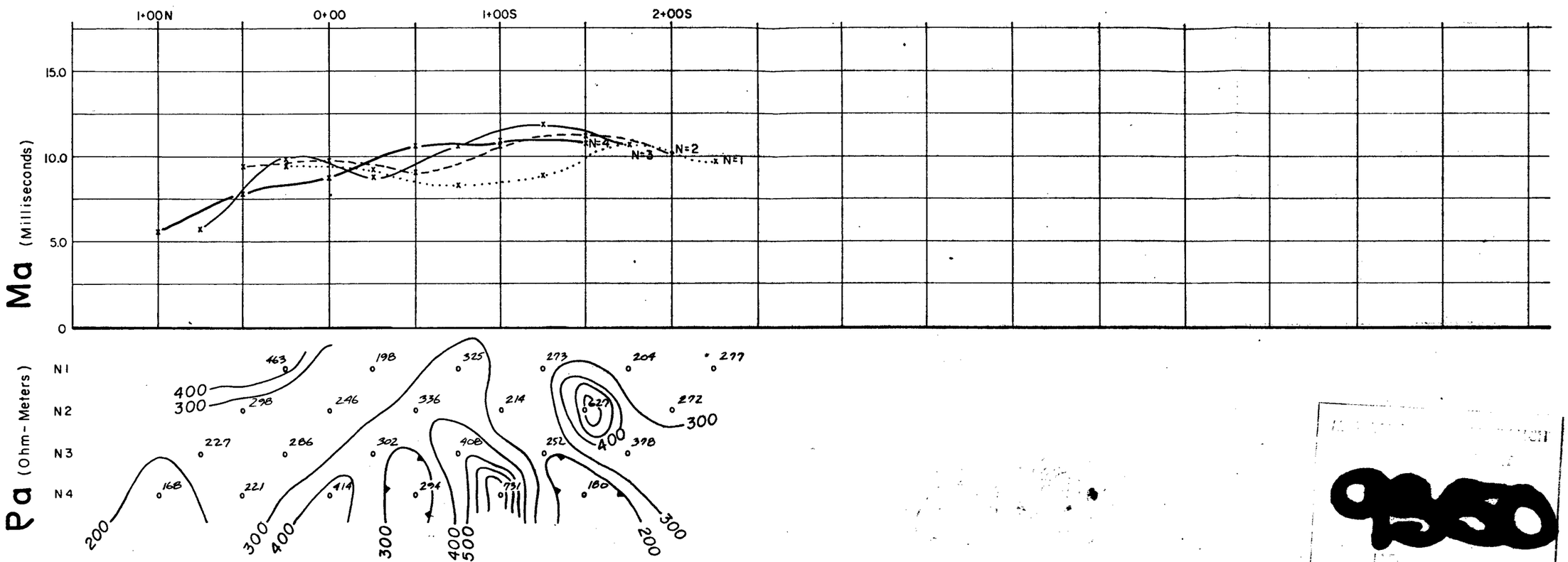
Two years Mining Geophysicist and supervisor Airborne and Ground Geophysical Divisions with Geo-X Surveys Ltd.

Two years Chief Geophysicist Tri-Con Exploration Surveys Ltd.

Ten years Consulting Geophysicist.

Active experience in all Geologic provinces of Canada.

# LINE 5+00 W






50m 25m 0 50m 100m 150m

1 : 2500

INSTRUMENT HUNTEC 2.5 KW TIME DOMAIN
(a = 50m)

C2 ← I — V
C1 Pole — P2 Dipole — P1

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA GLEN E. WHITE

To Accompany Geophysical Report on "SUDS" Claim

Date JAN. 1980

By GLEN E. WHITE B.Sc. GEOPHYSICIST

Glen E. White geophysical consulting services ltd.

**CALSTAR RESOURCES LTD.**

**"SUDS" CLAIM GROUP**

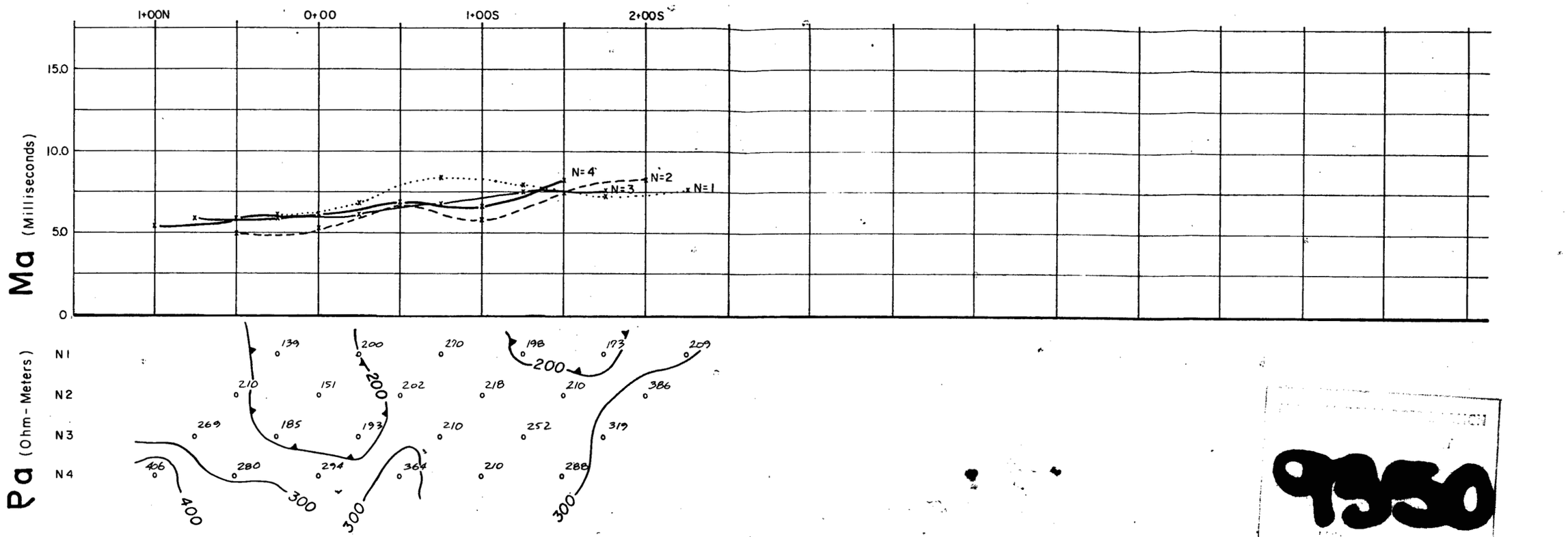
NANAIMO MINING DIVISION — BRITISH COLUMBIA

## INDUCED POLARIZATION SURVEY

Glen E. White geophysical consulting services ltd.

| | |
|---|---|
| INTERPRETED BY | E.T.P. |
| DRAWN BY | N.P. |
| CHECKED BY | G.E.W. |
| DATE | JAN./80 |
| FIGURE NO. | 4 |

# LINE 3+00 W




9950

50m 25m 0 50m 100m 150m

1 : 2500

INSTRUMENT HUNTEC 2.5 KW TIME DOMAIN

(a = 50m)

C2 ← I — V

C1 P2 P1

Pole Dipole

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA GLEN E. WHITE

To Accompany Geophysical Report on

Date JAN. 1980

By GLEN E. WHITE, B.Sc. GEOPHYSICIST

Glen E. White geophysical consulting & services Ltd.

# CALSTAR RESOURCES LTD.

"SUDS" CLAIM GROUP

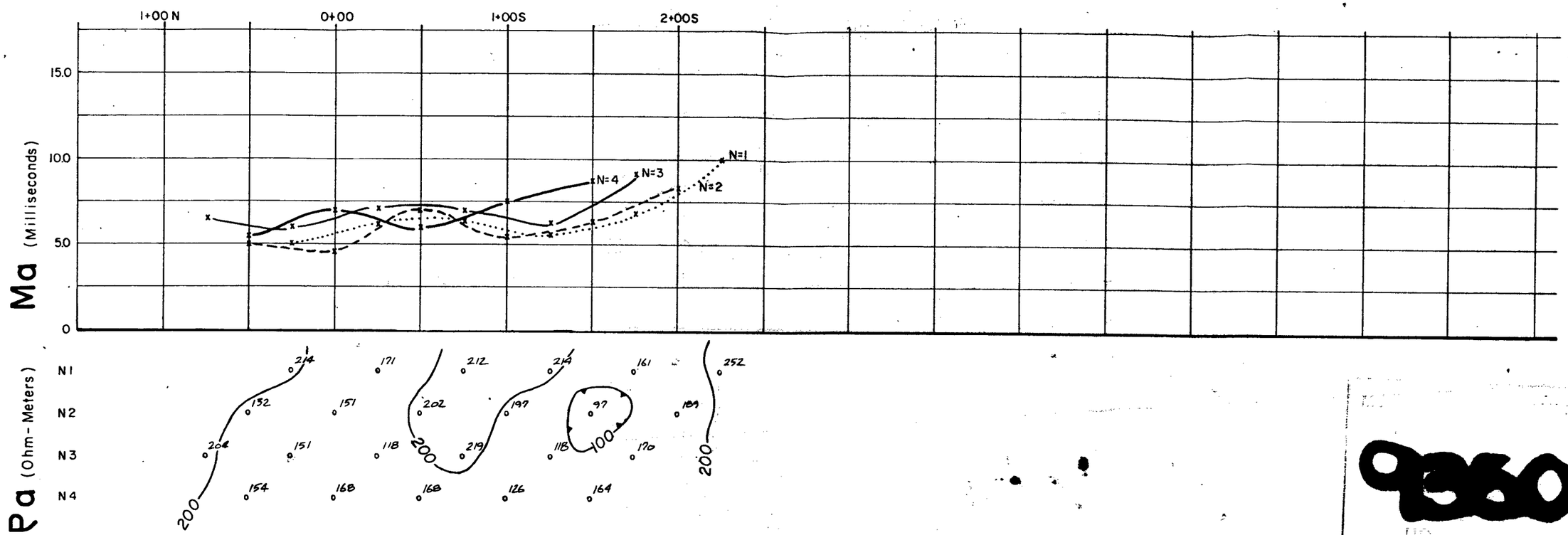
NANAIMO MINING DIVISION — BRITISH COLUMBIA

## INDUCED POLARIZATION SURVEY

Glen E. White geophysical consulting & services Ltd.

| | |
|---|---|
| INTERPRETED BY | E.T.P. |
| DRAWN BY | N.P. |
| CHECKED BY | G.E.W. |
| DATE | JAN./80 |
| FIGURE NO. | 5 |

# LINE 0+00

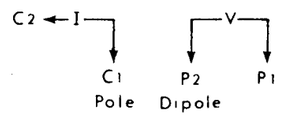





50m 25m 0 50m 100m 150m

1 : 2500

INSTRUMENT HUNTEC 2.5 KW TIME DOMAIN
(a = 50m)





To Accompany Geophysical Report on

Date Jan 1980

By GLEN F. WHITE, B.Sc. GEOPHYSICIST

Glen F. White geophysical consulting services ltd.

**CALSTAR RESOURCES LTD.**

"SUDS" CLAIM GROUP

NANAIMO MINING DIVISION — BRITISH COLUMBIA

## INDUCED POLARIZATION SURVEY

Glen F. White geophysical consulting services ltd.

| | |
|---|---|
| INTERPRETED BY | E.T.P. |
| DRAWN BY | N.P. |
| CHECKED BY | G.E.W. |
| DATE | JAN./80 |
| FIGURE NO. | 6 |

BASE LINE

5+00 W 4+50 W 4+00 W 3+50 W 3+00 W 2+50 W 2+00 W 1+50 W 1+00 W 0+50 W 0+00 0+50 E 1+00 E 1+50 E 2+00 E 2+50 E 3+00 E 3+50 E 4+00 E 4+50 E 5+00 E

900' 800' 700' 600' 500' 400'

LEGAL CORNER POST

0+50 S 1+00 S 1+50 S 2+00 S 2+50 S 3+00 S 3+50 S 4+00 S 4+50 S 5+00 S 5+50 S 6+00 S 6+50 S 7+00 S 7+50 S 8+00 S

N

CS-Showing No.1
CS-Showing No.2
CS-Showing No.3
CS-Showing No.4
CS-Showing No.5
CS-Showing No.6
CS-Showing No.7
CS-Showing No.8
CS-Showing No.9

Massive
Pillow
Amygdaloidal
Pillow breccia
Pond

ACCESS ROAD
ISLAND HIGHWAY
BROWN BAY

LEGEND:

- OUTCROPS OF BASALTIC LAVAS, BOUNDED BY ESCARPMENTS
- CLIFFS OR STEEP SLOPES
- OPEN-CUT OR TRENCHES IN SHOWINGS, NUMBERED
- DUMPS OF OLD WORKINGS
- HIGHWAY & DIRT ROAD
- CONTOUR LINE WITH ELEVATION IN FEET
- GRID INTERSECTIONS FOR GEOCHEM SOIL SAMPLING

9350

CAL-STAR RESOURCES LTD.

"SUDS" CLAIM GROUP
NANAIMO M.D.

GEOLOGIC MAP: NORTHERN "SUDS" AREA

TO ACCOMPANY REPORT OF:
E. D. CRUZ, P. ENG.
D. M. BASCO, GEOLOGIST

SCALE 1:2500
50 0 50 100 metre

FIG. NO. 3

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA ERNESTO D. CRUZ

5+00 W | 4+50 W | 4+00 W | 3+50 W | 3+00 W | 2+50 W | 2+00 W | 1+50 W | 1+00 W | 0+50 W | 0+00 | 0+50 E | 1+00 E | 1+50 E | 2+00 E | 2+50 E | 3+00 E | 3+50 E | 4+00 E | 4+50 E | 5+00 E

BASE LINE

LEGAL CORNER POST

ISLAND HIGHWAY

ACCESS ROAD

BROWN BAY

N

0+50 S
1+00 S
1+50 S
2+00 S
2+50 S
3+00 S
3+50 S
4+00 S
4+50 S
5+00 S
5+50 S
6+00 S
6+50 S
7+00 S
7+50 S
8+00 S

COPPER KEY

300 ppm
200 ppm
100 ppm

| CAL-STAR RESOURCES LTD. | |
|---|---|
| "SUDS" CLAIM GROUP<br>NANAIMO M.D. | |
| GEOCHEMICAL MAP: NORTHERN "SUDS" AREA | |
| SCALE: 1:2500<br>50 0 50 100 metre | FIG. NO. 4 |

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
ERNESTO D. CRUZ

9350
NO.