BRITISH COLUMBIA

PROSPECTORS ASSISTANCE PROGRAM

MINISTRY OF ENERGY AND MINES

GEOLOGICAL SURVEY BRANCH

PROGRAM YEAR:	1994/95
REPORT #:	PAP 94-49
NAME:	DAVID JAVORSKY

1994 Prospectors Assistance Grant Ref. No. 94-95-P-148

Prospecting on the Troy and Grey Copper Mineral Claims and Adjoining Ground, along the extension of Big Missouri Ridge North of Stewart, British Columbia.

Summary: Gold and Silver mineralization is found with sulfides, in Quartz, in zones of intence alteration. These alteration Zones show up well to the Self Potential method of Geophysical Prospecting. The mineralized gold bearing veins on this Property Produced up to minus 90 milivolts Reading while background was a plus 5. This Prospecting Tool works well in this Survey Area.

Dave Javorsky
31 January 1995
P.O. Box 806
Stewart. B.C.
V0T-1W0.

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Contents of Prospecting Grant Report

BRITISH COLUMBIA
PROSPECTORS ASSISTANCE PROGRAM
PROSPECTING REPORT FORM (continued)

B. TECHNICAL REPORT

* One technical report to be completed for each project area
* Refer to Program Requirements/Regulations, section 15, 16 and 17
* If work was performed on claims a copy of the applicable assessment report may be submitted in lieu of the supporting data (see section 16) required with this TECHNICAL REPORT

Name Dave Javorsky Reference Number 94-95 P-148

LOCATION/COMMODITIES TROY - Big Missouri Ridge

Project Area (as listed in Part A.) 104 B - 1E Minfile No. if applicable ______

Location of Project Area NTS 104 B - 1E Lat 56° -15N Long 130° 04 W

Description of Location and Access North West end of Big Missouri Ridge before it goies Below the Samlom River Glacer. For Axess go North of Stewart B.C. on the Granduc Road.

Main Commodities Searched For Au Ag

Known Mineral Occurrences in Project Area Au Ag Cu Zn Pb.

WORK PERFORMED

1. Conventional Prospecting (area) 1) Troy Claim 2) Grey Copper Claim
2. Geological Mapping (hectares/scale) ______
3. Geochemical (type and no. of samples) ______ See Assessment
4. Geophysical (type and line km) Self Potential Survey. ≈ 5 KMS. Report
5. Physical Work (type and amount) on grey copper Trenching & Sampling
6. Drilling (no. holes, size, depth in m, total m) gas plugger and shovel (Grey Copper)
7. Other (specify) Using 2 ft Drill steel, 1½" in Diameter, 34 holes. 51 ft Drilled. ~~Cleared Avalanches of Road.~~

SIGNIFICANT RESULTS (if any)

Commodities Au & Ag, Cu Pb Zn Claim Name Troy

Location (show on map) Lat 56° 15' N Long 130° Elevation ?

Best assay/sample type A New showing found in area of Retreating ice Tetrahedrite 0.681 Au/Tn and 127.1 oz Ag/Tn

Description of mineralization, host rocks, anomalies Very Altered Tuffs of Big Missouri Ridge cooked up and flooded with silica.

Supporting data must be submitted with this TECHNICAL REPORT.

Note Report on Self Potential Survey.

1994 Prospecting Report On The TROY Mineral Claims, Tendure # 253479
Located on the East edge of the Salmon Glacier,
N.W. British Columbia, 104 B- 01 E.

During the 1994 field season a total of 27 days was spent prospecting on the Troy Mineral Claim. Axcess was vie road from Stewart, B.C. vie the Granduc Mine Road.

A Self Potential Survey was ran across the mineralized zone for assessment work. This Prospecting Report is in addition to the following Geophical S.P. Assessment Report.

One full day and part of various other days were spent clearing avalanche rocks off the road.

A new discovery of Tetradrite mineralization was found where Ice had recently retreated from the Troy claim. A sample of massive tetradrite assayed; 0.687 ounce per ton gold, 127.15 ounce per ton silver, 8.92% copper, and 33.2% zinc.

The Self Potential survey also showed a continuation of the main showing away from the trenches, across a fault, and out over the cliffs where a sample of black sulfides in quartz assayed 1.141 ounce per ton gold and 0.361 ounce per ton silver.

The Self Potential survey high-lighted the mineralized tuffs that had been altered and the high minus readings within these tuffs was prospected and sampled as part of this prospecting program.

The following photograph shows a faced off adit only a few feet deep. The showing consist of very altered tuffs with silica flooding and serricite alteration and a meter wide quartz vein, in the foot wall. The banded quartz vein carries a zone of disseminated black sulfides which carry gold and silver values in the ounces. The alteration zone is wedge shaped in the area of the old portal.(era 1935) The quartz vein continues across a fault, down the hill, into the cliffs and crosses the road above the orange paint marking. The vein reduces in width as it leaves the alteration zone. The black sulfides are located mainily in the wedge shaped alteration zone. Indicating that it probably was placed at the time of the alteration event. While the quartz vein continues along the fault, it is barren if there is no overprint zone of alteration.

Much of this ridge is rusty, most of the tuff shows signs of alteration. It appears that the intersection of low angle faults create a conductor for

hot mineralized solutions that also altered the rocks. Since heat cooks things above it, the footwall of the alteration zone is where the mineral carring solutions deposited the gold bearing quartz vein. Many of the faults running through the hanging wall of the altered tuff carry barren quartz with secondary pyrite.

ALTERATION

The Andesitic Volcanic Tuffs becone progressively more altered, more bleached towards the major foot wall mineral carring vein. The bleached tuffs are quite soft and react with diluted hydrocloric acid.(a prospecting tool picked up from Westmin's geologist Shawn Dykes.) There is probably quite a bit of carbonate in the alteration from the hot fluids that altered the rock. All of the iron has been driven out of the highest altered areas and flooded into the less altered tuffs forming secondary pyrite. This creates a rusty cap on the rock outcrop.

On the photograph of the troy workings a second alteration zone cones down the ridge and crosses the road at the bottom of the picture near the snow patch. Various assays from this rusty area have produced 0.1 ounce per ton gold assays. A very steep canon forms the contact just below the edge of the picture, between rusty tuffs and unaltered green andesites. Since the veins in the bluff dip towards the top of the picture(to the south). We are looking at the rusty hanging wall alteration and I havent yet found the main foot wall vein.

✓ New DISCOUVERY

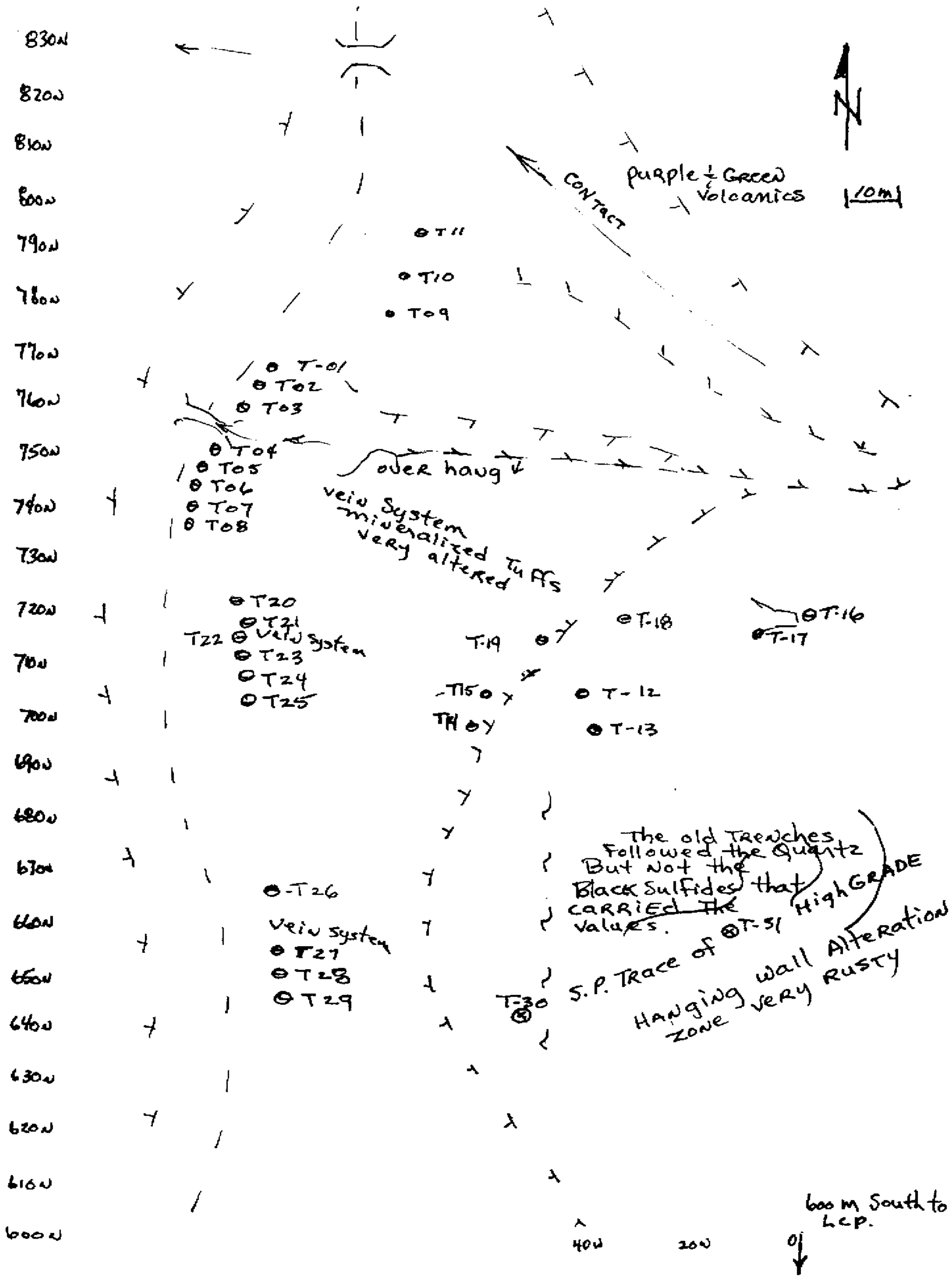
A quartz serricite, pyrite, alteration zone crosses a Quartz Calcite vein below the road in an area recently uncovered by the retreating ice. A Replacement zone of Tetradrite was formed probably due to reaction with the calcite. Highgrade assays of 0.6 ounce per ton Gold and 127 ounces per ton silver were obtained from this meter wide surface showing. How much tonnage this showing will produce is questionable. The presents of 8% copper supports the suggestion that gold in the Stewart Mining Camp is associated with the mineralizing event that brought in the copper mineralization. See: MEMPR Bulletin 85, (1993) Geology and Metallurgy of the Stewart Mining Camp, by Alldrick.

ROCK SAMPLES

Various rock samples were taken for analysis during the prospecting stage of this program. mostly to test various anomalities generated by the Self Potential survey. All of the samples showed pyrite mineralization, quartz and heavy alteration. The following Maps shows where these samples were taken from.

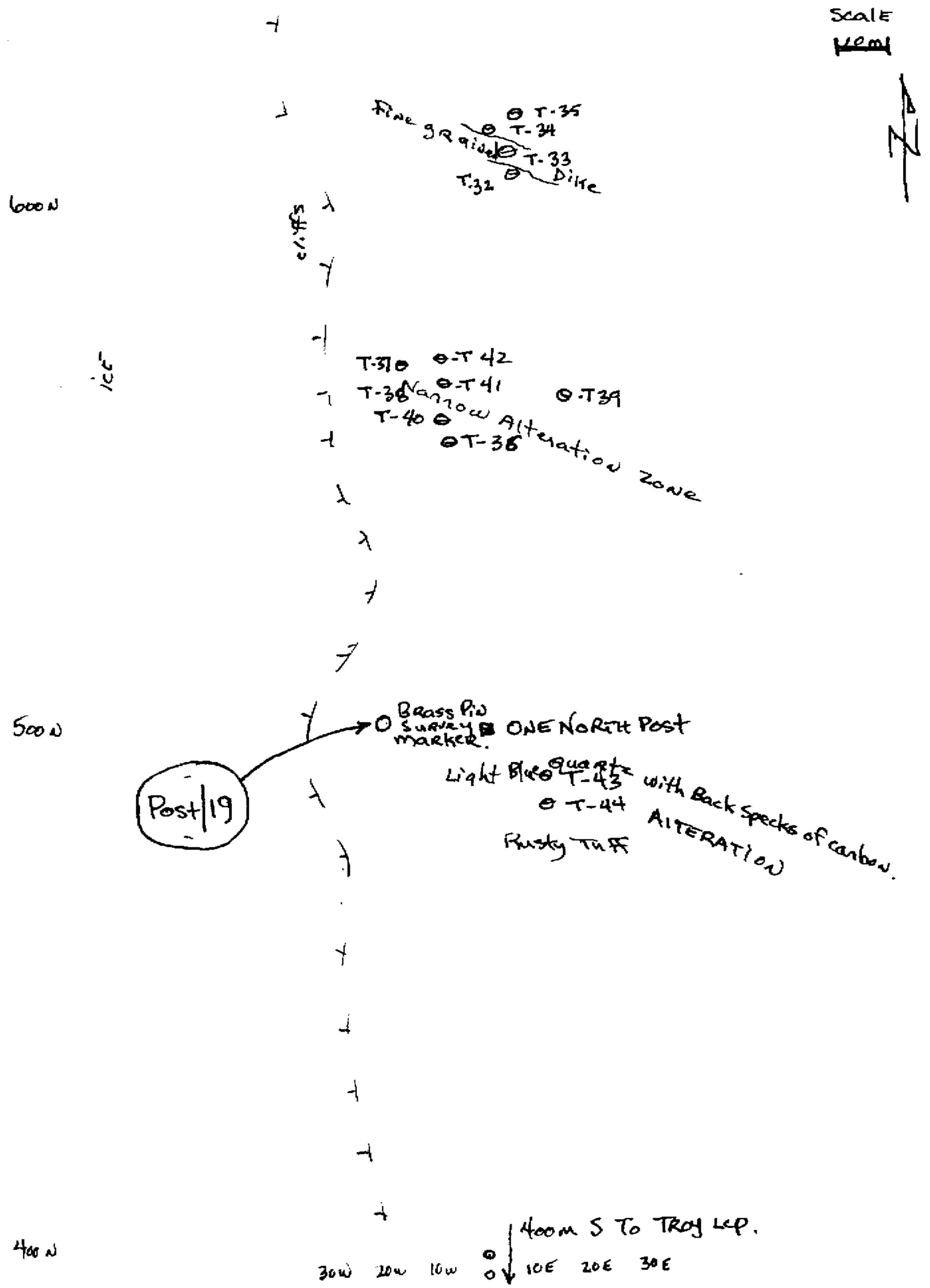
Troy Mineral Claim Rock Sample Location Map

NORTHERN SECTION



TRoy Mineral Claim

Rock Sample Location Map
SOUTHERN SECTION



quanta trace laboratories inc.
#401-3700 GILMORE WAY, BURNABY, B.C., CANADA, V5G 4M1 TEL:(604)438-5226

To: Mr.D.Javorsky
Box 806
Stewart,B.C.
VOT 1WO

File: 24148

Date: 15-Nov-94

Attention:

Project: Troy Property

CERTIFICATE OF ASSAY

	Sample Number	Gold PPM	Silver PPM			
1	T 01	0.02	3.9			
2	T 02	0.34	4.4			
3	T 03	0.42	11.0			
4	T 04	4.06	163.	MINOR Black sulfides in Quartz North vein		
5	T 05	0.39	10.1			
6	T 06	0.23	1.9			
7	T 07	0.04	1.8			
8	T 08	0.04	3.0			
9	T 09	0.02	0.4			
10	T 10	0.02	1.2			
11	T 11	0.01	0.2			
12	T 12	0.51	6.3			
13	T 13	0.23	9.2			
14	T 14	1.52	38.5			
15	T 15	0.13	3.0			
16	T 16	0.55	53.9			
17	T 17	0.06	4.6			
18	T 18	0.19	3.4			
19	T 19	0.81	61.4			
20	T 20	0.18	6.2			
21	T 21	5.70	42.4			
22	T 22	1.16	22.4			
23	T 23	6.92	105.			
24	T 24	0.52	15.1			
25	T 25	0.08	1.1			
26	T 26	6.35	145.	Possible extention of upper showing		
27	T 27	0.24	4.2			
28	T 28	0.87	5.3			
29	T 29	1.81	20.1			
30	T 30	37.1	11.7	Crossing fault Black Sulfides in Quartz		

Silver determined by AA.
Gold determined by FA/AA

Samples were Sulfide Rocks.

SKC.

provincial assayer

quanta trace laboratories inc.
#401-3700 GILMORE WAY, BURNABY, B.C., CANADA, V5G 4M1 TEL:(604)438-5226

To: Mr.D.Javorsky
Box 806
Stewart,B.C.
VOT 1WO

File: 24148-2

Date: 15-Nov-9

Attention:

Project: Troy Property

CERTIFICATE OF ASSAY

	Sample Number	Gold ppm	Silver ppm			
1	T 31	0.01	0.8			
2	T 32	0.02	0.9			
3	T 33	0.03	1.4			
4	T 34	0.02	0.4			
5	T 35	0.04	2.3			
6	T 36	0.04	0.3			
7	T 37	0.11	2.4			
8	T 38	0.02	5.4			
9	T 39	0.10	3.9			
10	T 40	0.02	2.1			
11	T 41	0.02	0.7			
12	T 42	0.02	0.9			
13	T 43	0.20	3.8			
14	T 44	0.17	3.5			
15						
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30						

Silver determined by AA.
Gold determined by FA/AA

Samples were Sulfide Rocks.

provincial assayer

MINFILE NO.: 104B 035
NATIONAL MINERAL INVENTORY NO.: 104B1 Ag10

NAME(S): TROY

STATUS: Showing
MINING DIVISION: Skeena
N.T.S.: 104B01E
LATITUDE: 56 10 52
LONGITUDE: 130 02 39
ELEVATION 1073 Metres
UTM ZONE: 9
UTM NORTHING: 6226520
UTM EASTING: 435190
COMMENTS: Location of several veins, southeast of Daisy Lake (south end of Summit Lake). See Shannon, 1925.

LOCATION ACCURACY: Within 500 M

COMMODITIES: Silver, Lead, Zinc, Copper, Gold, Tungsten
SIGNIFICANT MINERALS: Galena, Sphalerite, Tetrahedrite, Chalcopyrite, Freibergite, Argentite, Silver, Pyrargyrite, Scheelite
SIGNIFICANT MINERALS COMMENTS: Scheelite probably present as evidenced by assay.
ASSOCIATED MINERALS: Quartz, Pyrite
ALTERATION MINERALS: Silica
ALTERATION TYPE(S): Silicific'n, Pyrite
AGE OF MINERALIZATION: Unknown
DEPOSIT CHARACTER: Vein, Disseminated
DEPOSIT CLASS.: Hydrothermal, Epigenetic
DIMENSIONS: 1200 900 (METRES) STRIKE/DIP: 160 60E
COMMENTS: Area containing several quartz veins and alteration zones. Dip of veins varies from 45 to 80 degrees east. Veins average 10 metres in width over 700 metres length.

DOMINANT HOST ROCK: Sedimentary

GROUP: Hazelton
FORMATION: Salmon River
STRATIGRAPHIC AGE: Middle Jurassic

GROUP: Hazelton
FORMATION: Unuk River
STRATIGRAPHIC AGE: Lower Jurassic
ISOTOPIC AGE: 210+24-14 Ma
DATING METHOD: Uranium/Lead
MATERIAL DATED: Zircon
LITHOLOGY: Andesite
Argillite
Siltstone
Volcanic
Lamprophyre Dyke
Microdiorite
COMMENTS: Isotopic age reference: Brown, D.A., 1987.

TECTONIC BELT: Intermontane
TERRANE: Stikinia
PHYSIOGRAPHIC AREA: Boundary Ranges
METAMORPHIC TYPE: Regional
GRADE: Greenschist

RESERVES:

MINFILE NO.: 104B 035
CONTINUED...

EXPLORATION—
going electronic

Notice - Self Potential Works

SELF POTENTIAL REPORT
(SPONTANIOUS POLARIZATION OR NATURAL BATTERY EFFECT)
on the
TROY MINERAL CLAIM
Tendure Number 253479
Skeena Mining Division
Submitted For
1994 ASSESSMENT WORK

Located on the East edge of
the Salmon Glacier, NW, British Columbia

130° - 04' W.

56° - 15' N.

David Javorsky
P.O. Box 806
Stewart, B.C

TABLE OF CONTENTS

1994 ASSESSMENT WORK REPORT

SUMMARY

During the 1994 Field Season, the Self Potential Method of Geogyhsical Prospecting was used on the Troy Mineral Claim.

The mineral showings on the Troy Claim are fault controlled alteration zones that contain quartz, massive silica flooding, sericite alteration, massive pyrite and disiminated pyrite. In some locations, the alteration has changed the rock completely to a clay. Suggesting Epithermal type alteration.

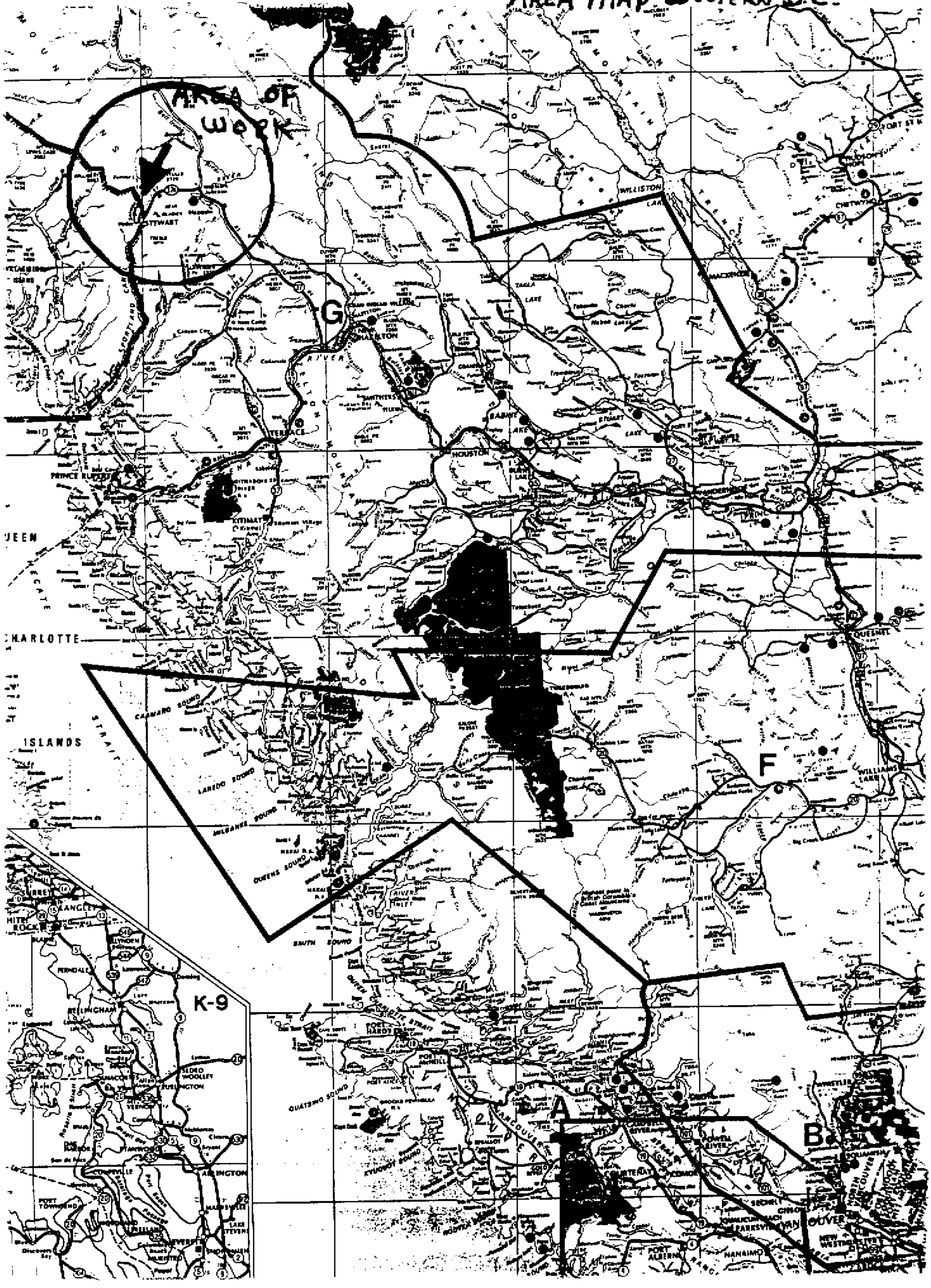
In the Lila showing, a band of black sulfides within a meter wide quartz zone carry gold and silver values. The Fault Controlled Quartz zone shows up well to the Self Potential Method of Prospecting. This Zone is reduced by pinching as it is offset by a latteral fault to the west and is open to the east where it passes off the claim.

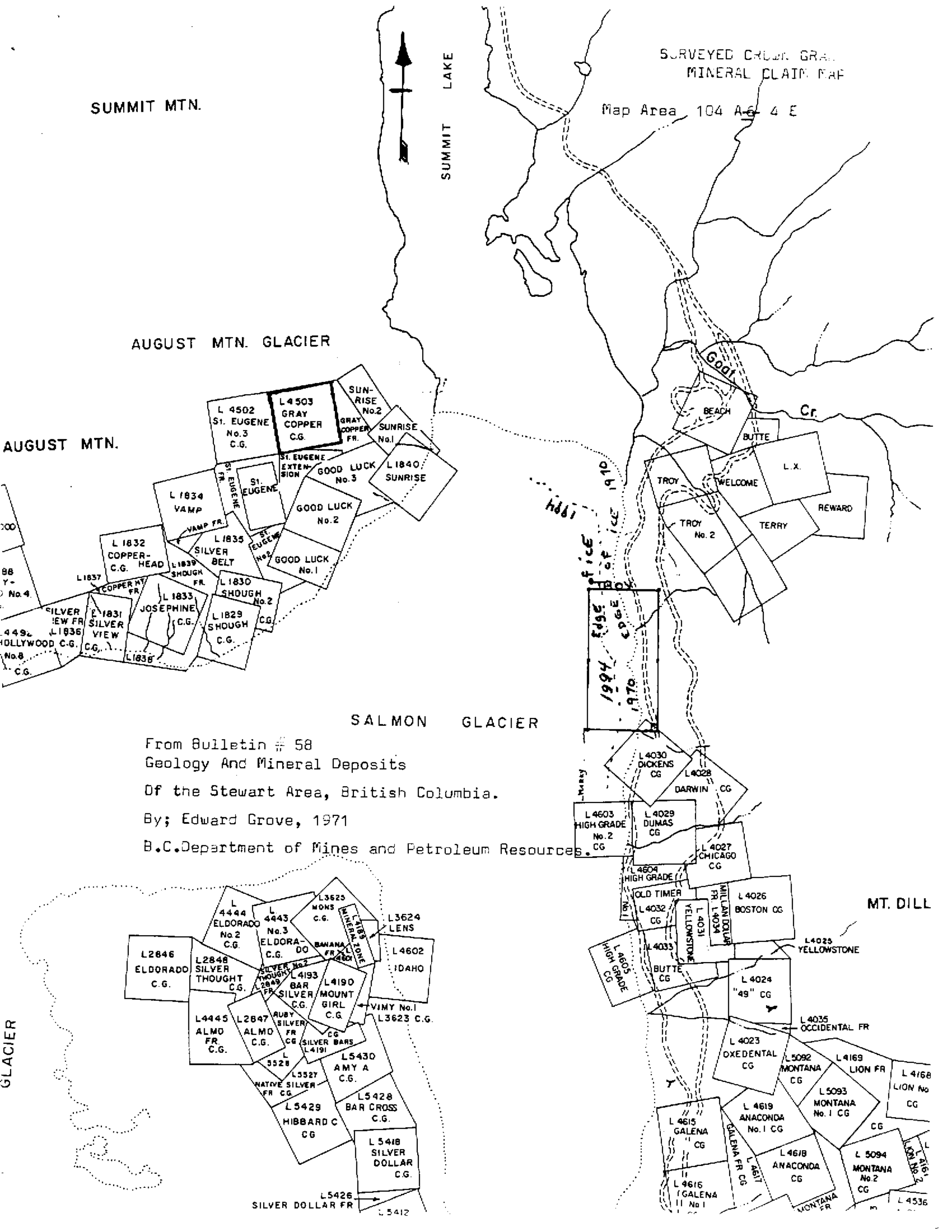
Grafitic inclusion in the fault zones also show up to S.P. producing a high positive reading.

Where fault zones carrying alteration were traced into unaltered greenstone carrying banded quartz carbonate veins, the veins were deformed and the carbonate veins were mineralized with galena, sphalerite and tetrahedrite.

Lack of soil cover hindered the S.P. survey, however reading are meaningful when taken from rocks and tallus. S.P. works well on Big Missouri type acid generating sulfide deposits.

AREA MAP Western B.C.





From Bulletin # 58
Geology And Mineral Deposits
Of the Stewart Area, British Columbia.
By; Edward Grove, 1971
B.C.Department of Mines and Petroleum Resources.

HISTORY

Big Missouri Ridge lies in the eight (8) miles between the Premier Mine and the Salmon Glacier. Much of this ridge is made up of volcanic tuffs of the Mt. Dilsworth formation. Within these tuffs lay mineralized sections that are locally known as Big Missouri Massive Sulfide Zones. At least sixteen (16) of these mineralized zones, lining up with a NNW strike, are found between the Premier Mine and the Salmon Glacier.

Three (3) of the Big Missouri Mineralized Zones - The Dago Hill Zone, The S-2 Zone, and the Province Zone have recently been mined by Westmin Resources. And, Tenajon Resources Corp. has recently shipped ore from their Silver Bute deposit.

Between 1938 and 1942 the Buena Vista Mining Co. produced 850,000 tons of ore producing 58,384 ounces of gold and 52,677 ounces of silver from the Big Missouri Group of claims.

Exploration has taken place along Big Missouri Ridge for over 85 years. The massive outcrops of rusty volcanics lying between ice, greenstone and granite dikes naturally catch the prospector's eye. The reverted Crown Grant Claim, Dickens, L-4030, which lies immediately to the south of the Troy Claim, was located September 26, 1909. At that time part of the Dickens Claim was covered by ice. Since 1937 the glacier has receded approximately 100 meters in elevation.

The Troy Claim was staked by D. Johnson in December 1989, and obtained by this author in September 1991. This Troy Claim covers the Big Missouri type massive sulfide zone named Lila by: Tournigan Mines, also called Lila and mapped as one of the sixteen (16) Big Missouri type zones by Old Western Mines and referred to as Troy #6, in the 1937 Premier Mines report by Mr. Jim Mitchell. Bulletin 85 Geology and Metallogeny of Stewart Mining Camp by D. Alldrick, 1993, called it the "Lila Occurrence Number 24."

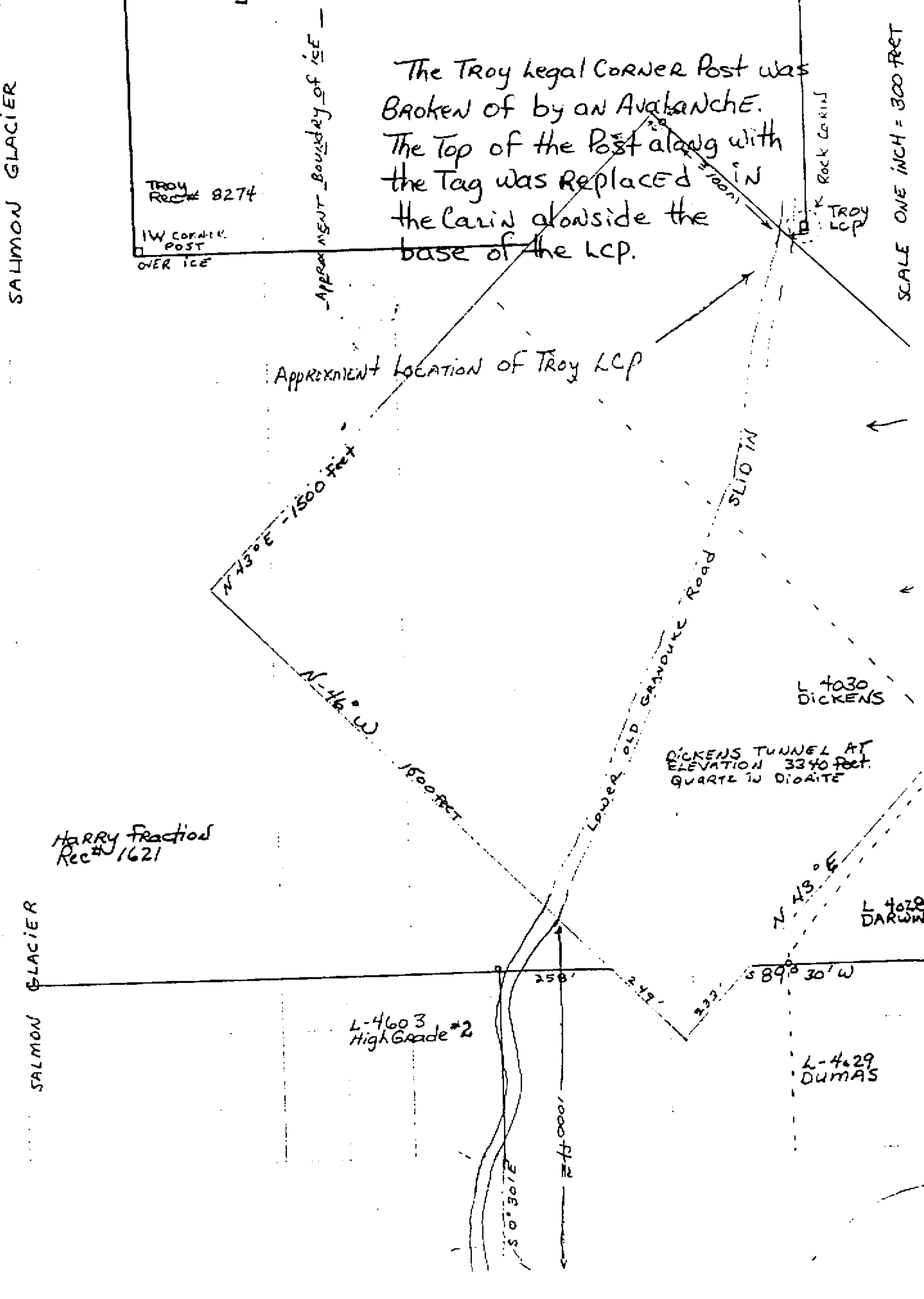
ACCESS

Access to the Troy Claim is via the Granduc Mine Road to Mineral Gulch then across Troy Flats to the old Lower Road. The drive from Stewart takes forty minutes to an hour. The snow has usually melted off the road by July 1st and is accessible through September. Vehicle access at other times requires the ploughing of a considerable amount of snow. This year's avalanches blocked the road for half of the summer season.

L.C.P. Covered by Avalanche

A Rock Avalanche came down upon the Troy Legal Corner Post breaking it off from where it had been placed in a carin of stone. A three foot section of the 4 X 4 post carrying the claim tag was found. Rocks were removed from the carin and the broken off top was replaced in the carin along side its broken off base.

Troy LCP Location Map



Geology Map from Bulletin 58

Geology and Mineral Deposits of Stewart Area

SEDIMENTARY AND VOLCANIC ROCKS

CENOZOIC

PLEISTOCENE AND RECENT

- Unconsolidated deposits: River flood plain; estuarine deposits; river channel and stream-cut terraces; alluvial fans, deltas and beaches; outwash, glacial lake sediments

MESOZOIC

MIDDLE TO UPPER JURASSIC

Bowser assemblage

- B1 — Siltstones, greywacke, argillite, minor chert pebble conglomerate, minor limestone (including equivalent phyllites)
- B2 — Lithic wacke, feldspathic wacke, siltstone, pebble conglomerate (including equivalent phyllites)
- Rhyolite, Rhyolite breccia
- Green, red, and buff volcanic sandstone, conglomerate, minor breccia
- Red and black volcanic sandstones, conglomerates minor breccia
- Red, green, and black volcanic breccia (with purple phases)

LOWER TO MIDDLE JURASSIC

Hazelton assemblage

- H1 — Red and green volcanic conglomerates and sandstones, crystal and lithic tuffs
- H2 — Green massive volcanic conglomerates, sandstones, minor breccia with minor intercalated siltstones
- H3 — Red and purple massive volcanic conglomerate, breccia, and sandstone with minor intercalated siltstones
- H4 — Green volcanic breccia, with sandstone and conglomerate

PLUTONIC ROCKS

Coast Crystalline Belt

CENOZOIC

TERTIARY

- Bitter Creek quartz monzonite, granodiorite
- gcd — Glacier Creek augite diorite (and equivalent)
- sld — Summit Lake diorite
- bgd — Boundary granodiorite
- hqm — Hyder quartz monzonite (and equivalent)

MESOZOIC

MIDDLE JURASSIC ?

- tcg — Texas Creek granodiorite (and equivalent)
- H — Hornblende is the predominant mafic mineral
- B — Biotite is the predominant mafic mineral
- Inclusions of country rocks
- h — Metasomatic hornblende
- po — Porphyry phase

METAMORPHIC ROCKS

JURASSIC-CRETACEOUS ?

Hazelton equivalents

- M1 — Green cataclasites, mylonites, schists
- M2 — Black (bl), purple (pu), red (r), and green (gn), mylonite (predominant colour)
- M3 — Buff and green schists (including phyllonite)

ALTERATION

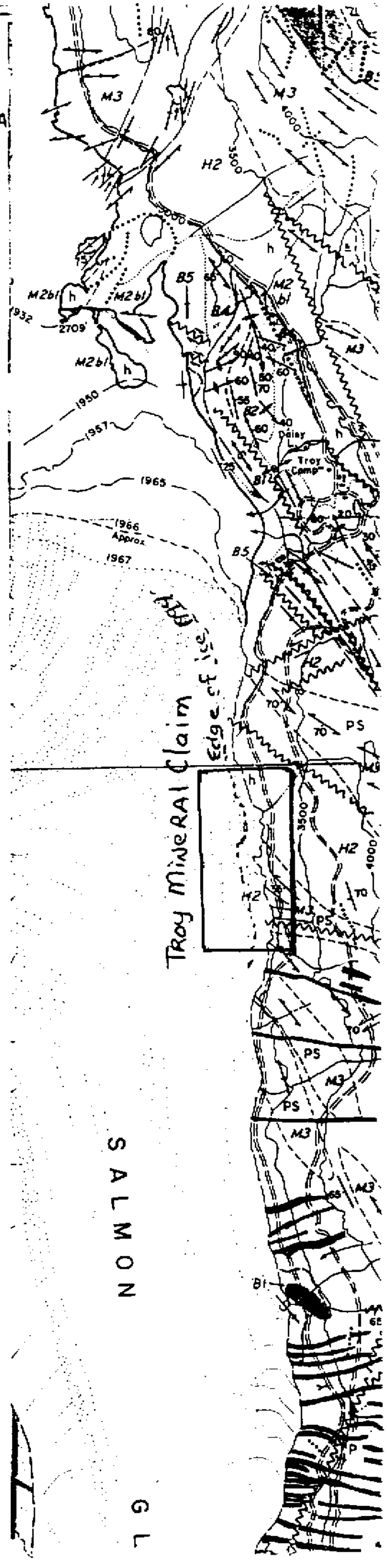
- P — Pyritization
- S — Silicification
- K — Feldspathization
- h — Metasomatic hornblende prominent

DYKE ROCKS

CENOZOIC

TERTIARY

- Hornblende diorite, quartz diorite (lamprophyre everywhere)
- Diorite, hornblende diorite (mainly Bear Pass area)
- Quartz monzonite, granodiorite and quartz diorite commonly porphyritic (belt of dykes) (mainly Portland Canal dyke swarm)
- Granodiorite porphyry (in Premier area) (includes Premier dyke swarm)



SELF POTENTIAL SURVEY

The Self Potential method of Geophysical Survey depends on detecting and mapping, at the surface, those weak electrical currents, which are spontaneously generated by electrochemical reaction taking place within bodies of electrically conductive sulfides.

This method of prospecting was pattened in France by C. Schlumberger and introduced to Canada, under license, in 1921 by Sherwin F. Kelly. Self Potential became well known in 1924 as a result of its success at Noranda's Horn Mine in Rouyn, Quebec. Kelly did many geophysical surveys in the Highland Valley of British Columbia and retired in Merritt, B.C. Sherwin Kelly passed away in the spring of 1994, at Merritt, he was 100 years old.

The equipment used on this survey consist of IP type ceramic pots filled with saturated copper sulfate solution, a roll of wire, a wire reel that has a brush on it to allow for continuous reading and a voltmeter for measuring D.C. milivolts. The voltmeter must have a very high imput impedance, luckily most of all the current digital read out voltmeters have a high impedance. The meter used on this survey was a MICRONTA Auto Range Digital Multimeter # 22-166, that automatically allows for reversing the D.C. polarity and measures D.C. to 0.1 millivolt. This digital read-out-meter has a "greater than" ten million OWM impedance. Works well.

SURVEY SAFE GUARDS

Each time the trailing pot (Negative pot) was moved, it was checked to see how good a contact it had with the ground by reversing the wire hook up to the meter. If there was any more than 25 millivolts difference, the pot was readjusted to get a better negative contact with the ground. Also cross lines (E-W) were run to check the long lines (N-S). If errors were found, (and there were some) the line was rerun till it checked. Further, the pots were checked each day to see if they were full of copper sulfate solution and to see if any cracks had developed in the ceramic pots. Further, the batteries in the meter were measured at the start of each day. And the wire and the reel were visually checked each day for damage and measured for electrical continuity.

As a check, 2 lines were run across the main Lila showing, one with the positive pot leading and the other with the negative pot leading. As would be expected, the positive pot leading method worked best and was used on the rest of the survey.

Problems: There was very little soil on the claims. Thus the readings were taken from solid Rock and Talus. With no soil to hold the electrochemical solution the halos were greatly reduced in dimension. However, when testing on bare rock, you could see the decomposing sulfides that were producing the acid battery effect reaction.

Also the meter readings will change with the elevation difference between the Leading-Positive pot and the Tailing-Stationary-Negative pot, this elevation difference must be taken into account.

Main problem encountered was the terrain. The Troy Claim covers a steep hillside from which the Salmon Glacier has recently retreated. Across the Lila showing the average slope to the ice below is minus 40°.

RESULTS

The Self Potential Method does work on Big Missouri Massive sulfide deposits.

The decomposing massive sulfide produces a negative voltage, as opposited to the positive voltage created by the adjoining unaltered rock.

A sharp high positive peak within the zone of negative voltage appears to be produced by grafite from the fault zone which hosted the mineralizing solutions. Thus, the fault zone can be followed.

The known zone of hightest gold-silver mineralization produced the highest negative value.

The alteration has probably been caused by hot solutions passing through the faults. The andesitic volcanic rocks become progressively more altered and more bleached towards each fault filled vein. The S.P. values become more negative with the amount of alteration. And the pyrite flooding becomes greater with the amount of alteration.

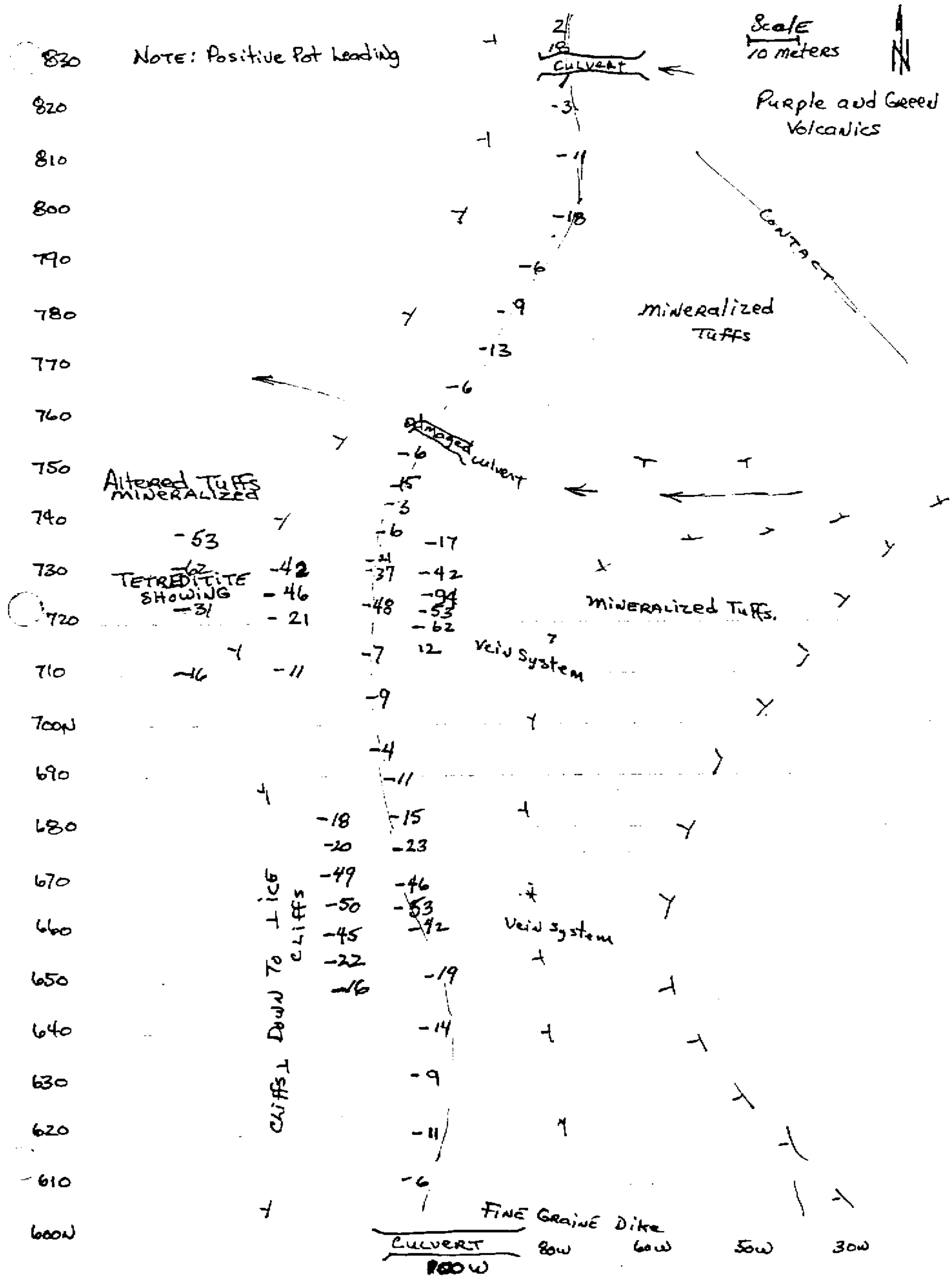
The pyrite mineralization, silica flooding and alteration appear to cross both andesitic greenstone and Tuffs.

Where quartz-carbonate veins in the greenstone are crossed and deformed by these fault controlled quartz-sericite-pyrite zones, the quartz carbonate veins are mineralized with tetrahedrite, galena and sphalerite.

TROY MINERAL CLAIMS

SELF POTENTIAL SURVEY

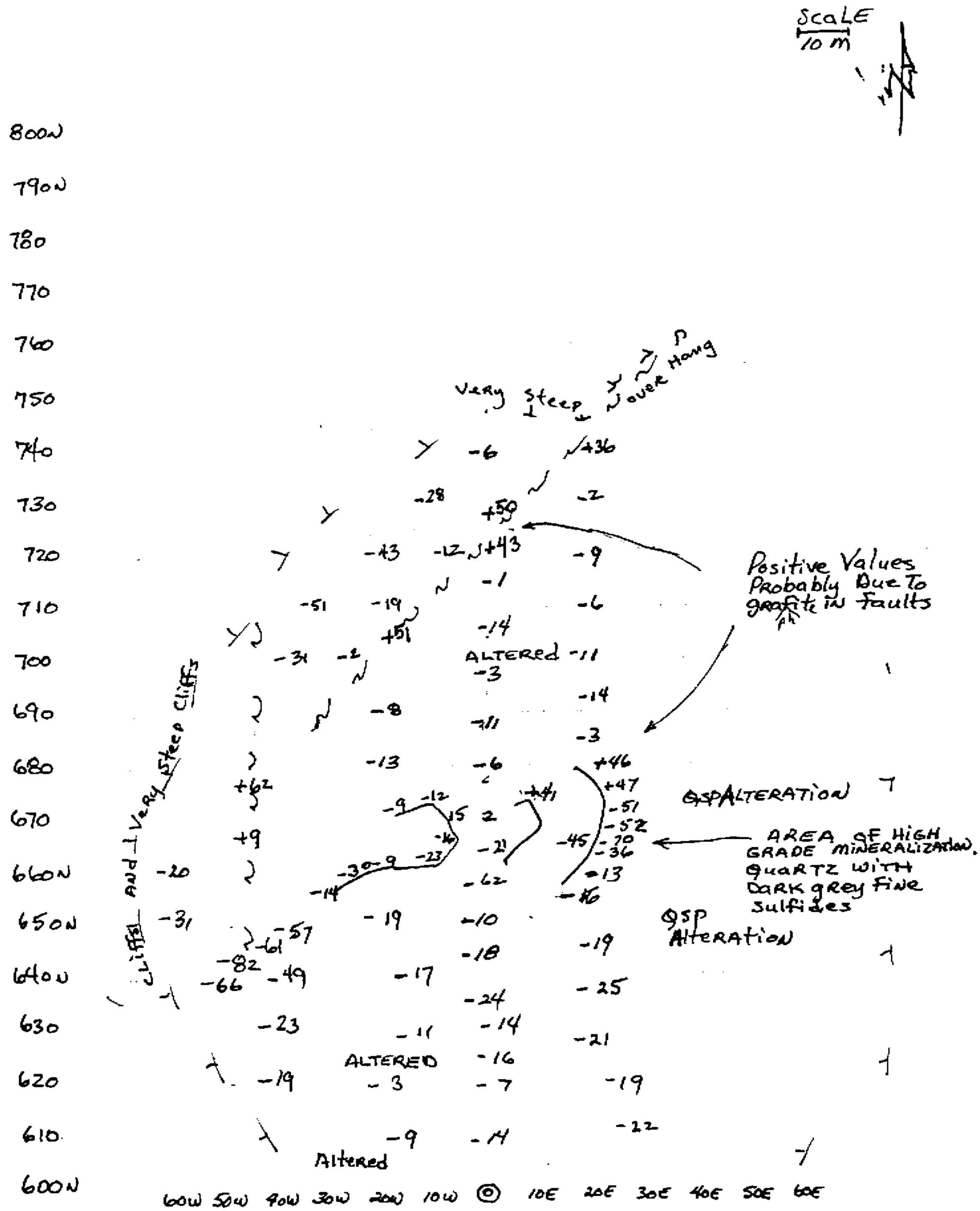
600 to 830N , 100 W



TROY MINERAL CLAIMS

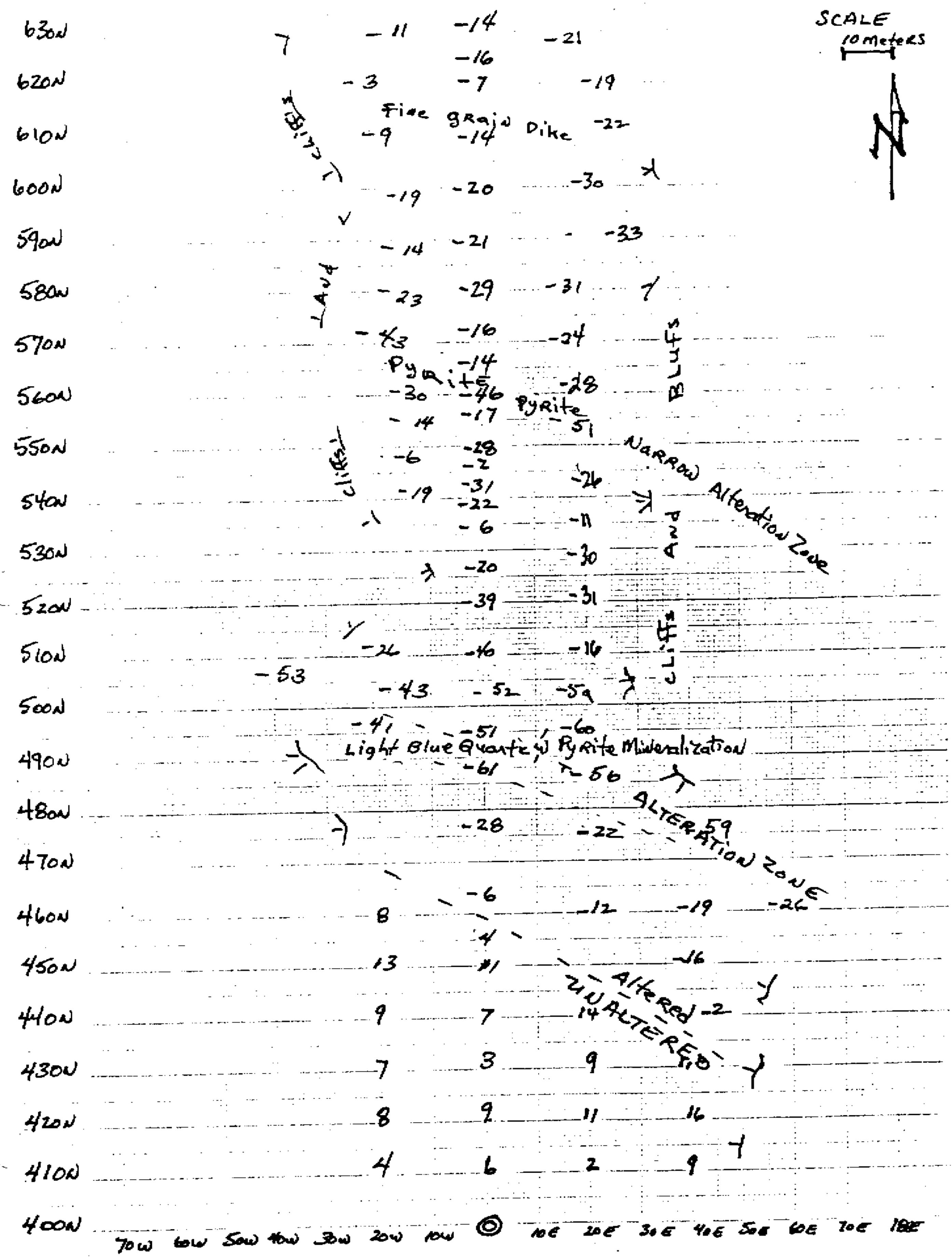
SELF POTENTIAL SURVEY
600m to 750N, 0W

Portal Area Troy Showing



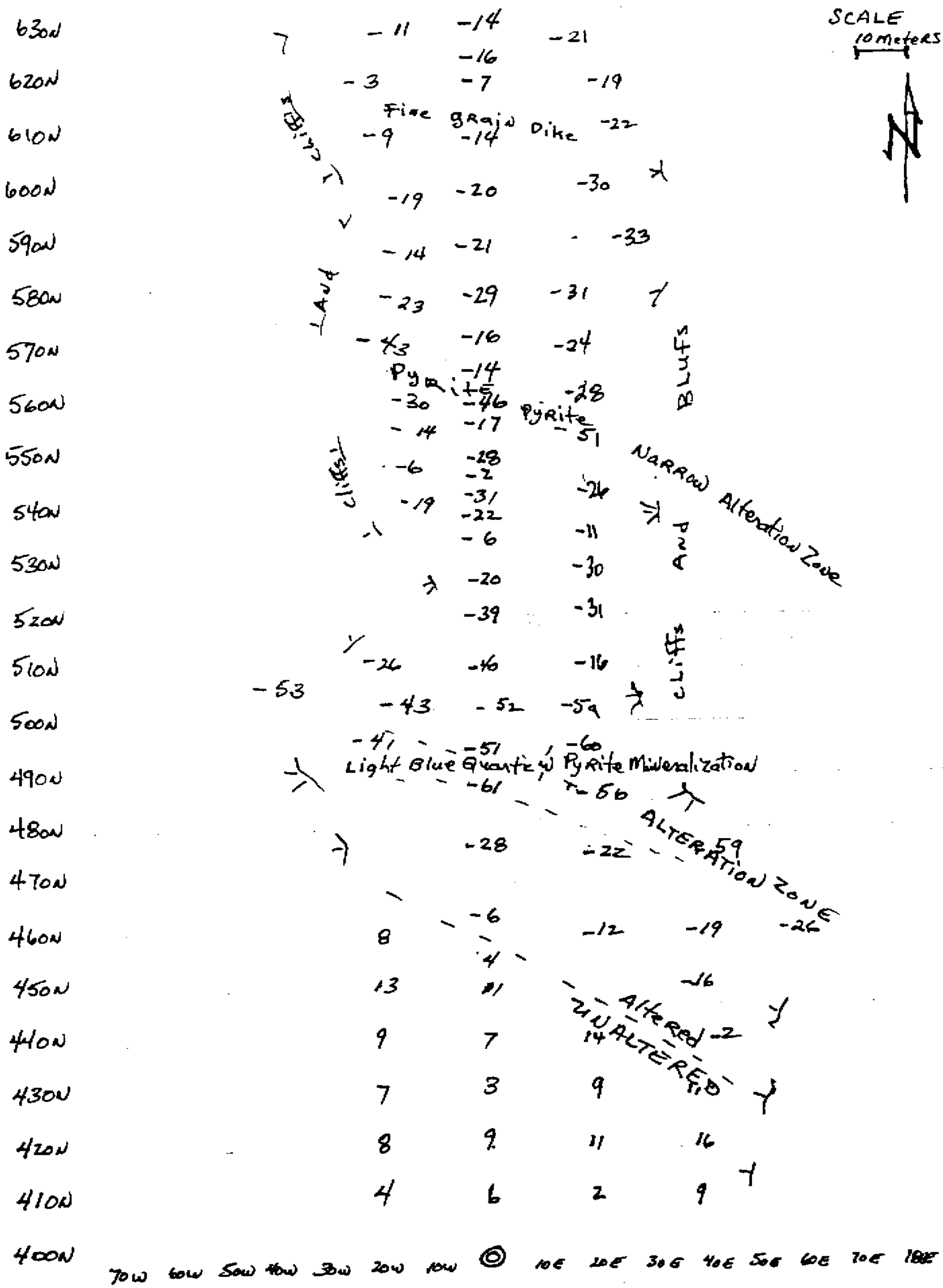
TROY MINERAL CLAIM

SELF POTENTIAL SURVEY
400 to 640N., 0W



TROY MINERAL CLAIM

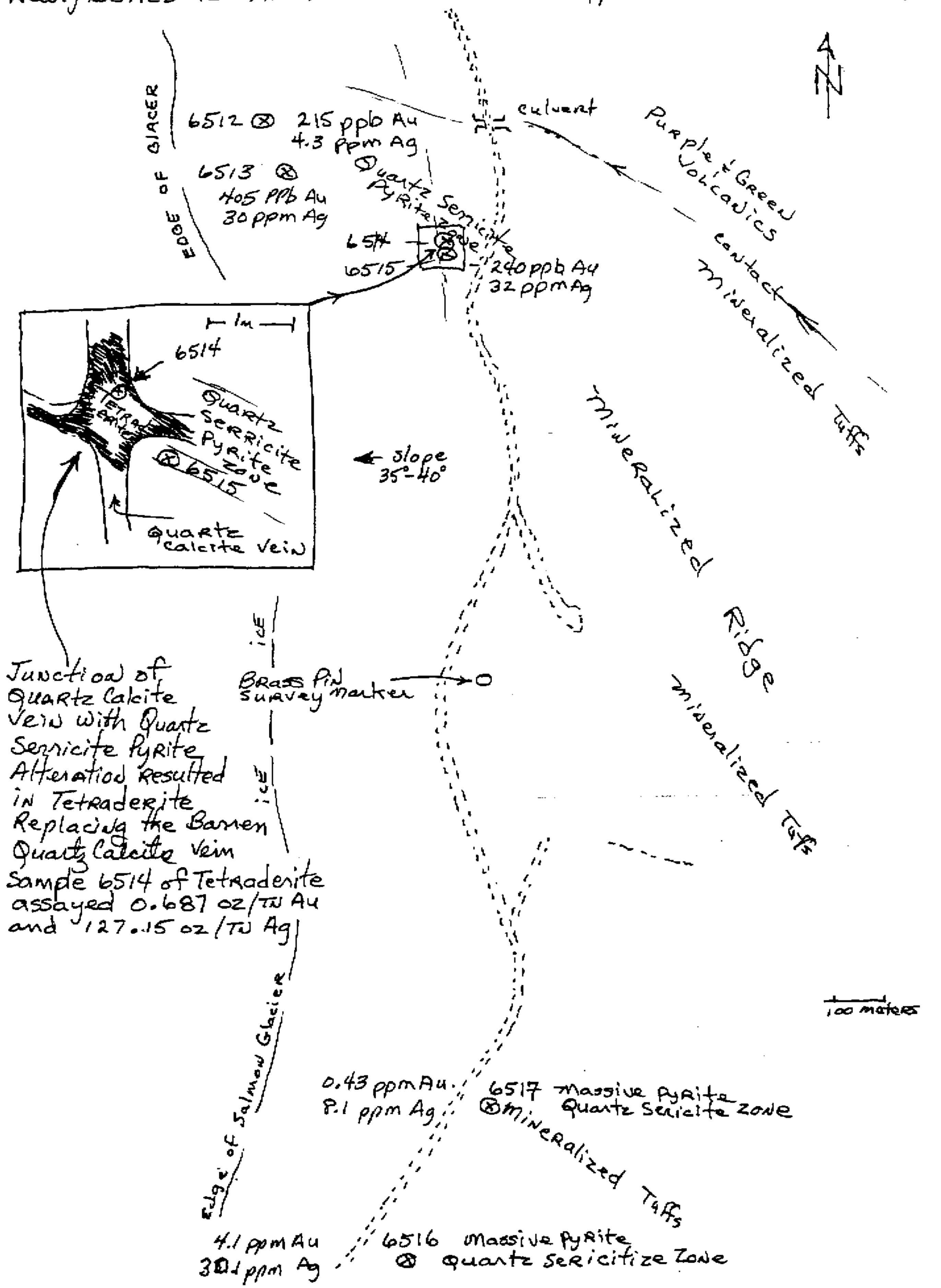
SELF POTENTIAL SURVEY
400 to 640N., 0W



Troy Mineral Claim — Rock Sample Location Map

Newly Located Tetraderite Showing

Check Appendix C for Rock Discription



STATEMENT OF QUALIFICATIONS

I, David Javorsky, state as follows:

That I am graduate of the ADVANCES PROSPECTING SCHOOL sponsored by the B.C. Ministry of Education and the Ministry of Energy, Mines and Petroleium Resources.

That I have completed the Petrology and Alteration for Prospectors course presented by the British Columbia Prospectors Training Program, Geological Survey Branch.

That I have spent over 25 years working in the mining, prospecting and mineral exploration industry.

That I have been instructed in the use of the Self Potential Method by Sherwin Kelly, who introduced the Self Potential Method to Canada in 1924 and recently passed away at Merritt, B.C.

That I have performed Self Potential Survey under the guidance of George McDonald, who was a licensed agent to do Self Potential surveys (at Cowichan Copper Mines) by Sherwin F. Kelly, President of Geophysical Exploration Limited of Toronto, Ontario.

That I have taken instruction in the Self Potential Method by the Geophysical instructures at the B.C. Ministry of Mines, Advanced Prospecting School.

That I was directly involved with doing the work presented in the forgoing 1994 Assessment Work Report.

That my mailing address is: P.O. Box 806, Stewart, B.C. VOT 1WO where I reside on Glacier road.

David Javorsky
David Javorsky
November, 1994

APPENDIX

APPENDIX B

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Appendix A

ASSAYING
GEOCHEMISTRY
ANALYTICAL CHEMISTRY
ENVIRONMENTAL TESTING

Eco-Tech LABORATORIES LTD.
10041 E. Trans Canada Hwy., R.R. #2, Kamloops, B.C. V2C 2J3 Phone (604) 573-5700
Fax (604) 573-4557

CERTIFICATE OF ANALYSIS ETS3133

DAVID JAVORSKY
P.O. BOX 806
STEWART, B.C.
V0T-1W0

10-Nov-94

11 ROCK samples received October 24, 1994
Project No.- Troy - Greg Copper

Sample Number	ET #.	Tag #	Au (ppb)	Ag (ppm)
6512	1	6512	215	4.3
6513	2	6513	405	>30
6514 -	3	6514	>1000	>30
6515	4	6515	240	>30
6516	5	6516	>1000	30.0
6517 -	6	6517	>1000	8.1
6518	7	6518	205	10.6
6519	8	6519	80	9.7
6520 -	9	6520	<5	0.7
6521	10	6521	10	1.0
6522	11	6522	>1000	9.9

QC DATA
Repeat:

	1	6512	320	4.2

ECO-TECH LABORATORIES LTD.
Frank J. Pezzotti, A.Sc.T.
B.C. Certified Assayer

XLS/StewMisc

Eco-Tech LABORATORIES LTD.

ASSAYING
GEOCHEMISTRY
ANALYTICAL CHEMISTRY
ENVIRONMENTAL TESTING

10041 E. Trans Canada Hwy., R.R. #2, Kamloops, B.C. V2C 2J3 Phone (604) 573-5700
Fax (604) 573-4557

CERTIFICATE OF ASSAY ETS3133

DAVID JAVORSKY
P.O. BOX 806
STEWART, B.C.
V0T-1W0

10-Nov-94

11 ROCK samples received October 24, 1994
Project No.- Troy - Greg Copper

ET #.	Tag #	Au (g/t)	Au (oz/t)	Ag (g/t)	Ag (oz/t)	Cu %	Zn %
2	6513			30.3	0.88		
3	6514	23.56	0.687	4360.0	127.15	8.92	33.20
4	6515			32.6	0.95		
5	6516	4.10	0.120				
6	6517	0.43	0.013				
11	6518	1.05	0.031				

ECO-TECH LABORATORIES LTD.
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B.C. Certified Assayer

XLS/StewMisc

4-Nov-94

ECO-TECH LABORATORIES LTD.
10041 East Trans Canada Highway
KAMLOOPS, B.C.
V2C 2J3

Phone: 604-573-5700
Fax : 604-573-4557

DAVID JAVORSKY ETS 3133
P.O. BOX 806
STEWART, B.C.
V0T 1W0

11 ROCK samples received October 24, 1994
Project No: Troy - Grey Copper

Values in ppm unless otherwise reported

silver aluminium arsenic copper iron manganese phosphorus lead antimony tin zinc

Et #.	Tag #	Ag	Al %	As	Ba	Bi	Ca %	Cd	Co	Cr	Cu	Fe %	La	Mg %	Mn	Mo	Na %	Ni	P	Pb	Sb	Sn	Sr	Ti%	U	V	W	Y	Zn
3	6514	>30	0.03	1255	20	<5	0.42	<1	40	44	>10000	4.87	<10	0.07	333	<1	<.01	12	530	1866	63	<20	45	<.01	<10	4	10	<1	>10000

QC DATA:

Repeat:																													
3	6514	>30	0.03	1240	15	<5	0.43	<1	40	42	>10000	4.87	<10	0.07	335	<1	<.01	13	510	1770	56	<20	47	<.01	<10	4	10	<1	>10000
Standard:		1.2	1.85	80	165	<5	1.78	2	21	66	90	4.25	<10	0.94	694	<1	0.02	28	690	24	5	<20	63	0.12	<10	81	<10	4	82

XLS/StewartMisc
df/6446

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Frank J. Pezzotti, A.Sc.T.
B.C. Certified Assayer

NAME(S) TROY
DAISY

N.T.S. 104B01E

MI 104B 035

LAT 5611.6
LONG 13003.4
ELEVATION 933
MINING DIVISION SKEE
LOCATION ACCURACY 5

UTMZ 300
UTMN VN6227500
UTME VN0434500
MINERAL STATUS
DEPOSIT TYPE
MINDEPID 08422

COMMODITIES PRESENT AG
PB
ZN
CU
AU

MINERALS PRESENT SPLR
GLEN
CLCP
THOR

CAPSULE GEOLOGICAL COMMENT FORMATION CONSISTS OF HAZELTON VOLCANICS OVERLAIN BY HAZELTON ARGILLITES. TWO TYPES MINERALIZATION: 1. IRREGULAR NARROW LENTICULAR NW STRIKING QUARTZ VEINS LESS THAN 1 M WIDE CUTTING ARGILLITE CONTAIN SPHALERITE, GALENA AND MINOR CHALCOPYRITE AND TETRAHEDRITE; 2. ERRATIC SILICIFIED, PYRITIZED REPLACEMENT ZONES IN VOLCANICS ADJACENT TO A BAND OF ANDESITIC PORPHYRY 120 M WIDE CONTAIN ERRATIC, SPARSE PYRITE WITH GALENA AND SPHALERITE.

NATIONAL MINERAL INVENTORY NO.104P1 AG10

PUBLISHED PRODUCTION DATA

YEAR	TONNES MINED	TONNES MILLED	GOLD (G)	SILVER (G)	COPPER (KG)	LEAD (KG)	ZINC (KG)	MOLY (KG)	OTHER
1978	0	0	370	5,038	0	420	641	0	0
1979	0	0	505	16,588	0	870	1,004	0	0
TOTALS=	0	0	875	21,626	0	1,290	1,645	0	
IMPERIAL	0	0	26	695	0	2,843	3,626	0	

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3 1936-B25
4 BCDM BULL 58-168
5 GSC MEM 175-169
6 GSC SUM RPT 1931A-20
7 GSC MAP 307A, 315A
8 EMR MRB CORPFILE (NORTHLAND MINING CO.LTD., SALMON RIVER HIGH GRADES00
9 CO.LTD.)

APPENDIX C

ROCK DESCRIPTION

6512 Troy Quartz Sericite Pyrite Zone. Below Road 181 Meters West of Plugged, Slide Filled Culvert. A Volcanic Rock completely altered and flooded with silica. Disiminated pyrite - Sample taken across Zone of Major Quartz. 215 ppb. Au, 4.3 ppm. Ag.

6513 Troy, 52 meters south of sample 6512. In the middle of the zone of Troy Ridge Mineralization. Grey mineralized (with Pyrite) Quartz. 405 ppb. Au, 30 ppm. Ag.

6514 Troy, West of Road 57 meters down cliff. Quartz vein banding in volcanios. These Quartz veins run for a long ways. Where they cross the Troy Ridge mineralization they fold perpendicular and show grey copper mineralization. Tetraderite 50%. Black Streak. Some Spallerite 10%, Galena, Quartz, Iron Carbonate Rust, minor Mallacite copper oxide stain. Minor Boronite stain. 23.56 ppm. Au. or 0.687,Oz/Tn Au. and 4360 ppm. Ag. or 127.15 Oz/Tn Ag.

6515 Troy, West of Road 55 meters down cliff towards glacier 2 meters from Sample 6514. Typical Troy Ridge Mineralization. Quartz Sericitize Pyrite zone. Sample is mainly massive pyrite. 240 ppb. Au, 32.6 ppm. Ag. or 0.95 Oz/Tn. Ag.

6516 Troy, 700 meters south of zero picket in cliffs above Road Ridge Mineralization Quartz Sericitize Pyrite Zone. Sample is mainly massive pyrite and in a Quartz Matrix. Sample Labled Grey Copper 6516. 4.10 ppm. Au. or 0.120 Oz/Tn. Au., 30 ppm. Ag.

6517 Troy, 275 meters south of zero picket where Troy Ridge Mineralization Zone drops down cliff to Road. Sample is Quartz vein with very massive Pyrite. Sample labled Grey Copper 6517. 0.43 ppm. Au., 8.1 ppm. Ag.

6518 Grey Copper - From Road at Bend in Salmon River below Cascade Creek. Below gravel quarry. A Contact Zone granite and Volcanic Breccia Pyrite and Perrilite. 205 ppb. Au., 10.6 ppm. Ag.

6519 Grey Copper selected out from sample 6518 pieces Pyrrhotite for sure and Pyrite Semi massive. The Volcanic Breccia is pale lavender to pale green. This granite contact can be traced for quite a ways. The area under the gravel quarry has a Mag high and if these samples carry should be staked. 80 ppb. Au., 9.7 ppm. Ag.

6520 Grey Copper. Same Zone as 6518-6519 above only this is 3 to 6 inches of Quartz with Brecciated inclusions of broken wall rock. Some of the Matrix of Greenstone has minor mineralization. The Brecciated claps are again pale in color and appear to be an altered greenstone or Rhyolite. Less than 5 ppb. Au., 0.7 ppm. Ag.

6521 Troy, 227 m. north of Road culvert. Light Blue Volcanics. Very silicious, Rhyolite? Heavy disiminated pyrite plus pyrite bands. 10 ppb. Au., 1 ppm Ag.

6522 Troy, 199 m. north of Road culvert. Quartz zone with heavy veining of pyrite. Next to a rusty tuff appears to be in a minor alteration zone. 1.05 ppm. Au., 9.9 ppm. Ag.

Appendix D

Ontario Geological Survey
Miscellaneous Paper 99

A Guide to Prospecting by the Self-Potential Method

by
S.V. Burr

1982

Ontario

Ministry of
Natural
Resources

CONTENTS

TABLES

FIGURES

A Guide to Prospecting by the Self-Potential Method

by
S.V. Burr[1]

INTRODUCTION

The author has used the self-potential or spontaneous polarization (SP) prospecting method extensively for 35 years in surveying mining claims, and considers it the best of the electrical geophysical methods.

Recently, interest in the method has revived, probably due to renewed gold exploration. Most gold deposits are not good conductors, but do contain some sulphides which can be detected by the SP method.

The few available textbooks which mention the SP method are brief in their descriptions of field prospecting methods, and some prospectors, who have tried the method with insufficient understanding of the technique, have become discouraged and added to the misconceptions about it. Good practical descriptions of the SP method are contained in "Prospecting in Canada" by Lang (1970) and in "Mining Geophysics, Second Edition" by Parasnis (1975).

This guide incorporates and updates information from a previous paper by the author (Burr 1960) and is intended to instruct the layperson in the routine prospecting use of the method and to encourage more geophysical research of the SP phenomenon. Much of the material presented is unavailable elsewhere and was derived by experience through field applications.

IMPORTANT FACTS

Although the author has endeavoured to dispell some misconceptions, and to add some new facts on the SP method in the body of this guide, some isolated facts could be emphasized at the beginning:

1) Hydro and telephone lines, which plague some of the other electrical methods, do not affect SP

2) Iron formation, which acts as a "good conductor" with some of the other electrical methods, does not affect SP unless sulphides or graphite are associated with it. One major iron formation at the Sherman Iron Mine, Temagami, Ontario, contains graphite. The SP method begins to detect this anomaly at least two miles away. On the basis of one long north-south traverse conducted by the author, a peak of 4000 mv (4 volts) was obtained over or near this iron formation.

3) Buried or grounded metal objects can produce spurious SP "spot anomalies". A buried long metal pipe can produce a linear and sometimes genuine-looking (pseudo)anomaly. Graphite cathodes are used beside gas pipe lines to prevent corrosion and can produce an abnormally high negative SP anomaly. Similarly, it can be demonstrated that an axe, pick or knife driven into the ground beside the forward pot (an SP ground electrode) produces a high negative reading in the instrument.

4) Several years ago in Northern Quebec, the author discovered a graphite SP anomaly of 1 volt at a pot separation of 300 feet. An unsuccessful experiment was conducted to try and achieve a 6 volt potential and power a radio. An additional pot merely cut the potential to .05 volts. Apparently the current strength or "ground amperage" in a near-surface self-potential electrical field is not proportional to the number of pots used.

5) Natural SP anomalies of a few hundred to over a thousand millivolts, and of negative sign by convention, are caused by the iron sulphides pyrite and pyrrhotite, the copper sulphide chalcopyrite, and the native element graphite. Graphite gives the strongest SP reaction, followed by pyrrhotite, pyrite, and chalcopyrite. Strong negative anomalies have also been reported over chalcocite, covellite and anthracite (Sato and Mooney 1960). Because of the many other factors influencing the strength of an SP response, it is not possible to predict which type of sulphide is responsible for the anomaly. A magnetometer or dip needle survey may help to determine whether the magnetic

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iron sulphide pyrrhotite is present or not.

6) Magnetic storms, dealt with in the "Instructions" section of this guide, are a natural phenomenon which can be detected by the SP instrument. It has been suggested that approaching earthquakes, or an atomic explosion anywhere in the world could be detected by a monitoring SP instrument. In California, the method is used to locate water leaks in pipelines; in Australia, to detect salt springs; and it can also be used in geothermal exploration and in structural studies. Other applications are also possible but await further research of the SP method.

7) Manganese oxides (psilomelane and pyrolusite wads) have been observed to give positive SP anomalies. In Jamaica, the author detected high grade manganese "veins" or "dykes" which gave strong positive anomalies. The sedimentary Sibley Formation in the District of Thunder Bay, Ontario contains a manganese oxide unit which produces alternating high positive and high negative readings which the author interprets as a possible indication of the presence of graphite.

8) Finally, the peak of an SP anomaly is detected with the measuring pot positioned directly above the source. This is in contrast to other electrical methods which can be responsive to the dip of the anomalous source, and through misinterpretation have led to some drill holes that have overshot, or have been spotted too far from or too near the target.

BRIEF HISTORY

The SP method is the earliest electrical geophysical method to be discovered or invented. It was first applied in England by Robert Fox (1830) who conducted SP research around the tin mines of Cornwall, and later by Carl Barus (1882) who applied the method at the Comestock Lode in Nevada. The first sulphide orebody discovered by an electrical method was detected by SP at Nautenen, Lapland, Sweden in 1907 (Lundberg 1948).

BRIEF THEORY

Most explanations of the SP phenomenon propose that a "wet" sulphide (or graphite) body develops negative and positive electrical potentials at its top and bottom, resulting in a both metallically and electrolytically mediated "flow" of electrochemically generated current around and through the body as shown in Figure 1.

It is possible that sulphide and graphite bodies in contact with ground water electrolytes induce a "spontaneous" DC flow of current, but local ground currents are not solely related to potential differences arising from spontaneous polarization of a conducting body. The author considers that the natural telluric fields and currents encircling the earth provide a natural applied electrical

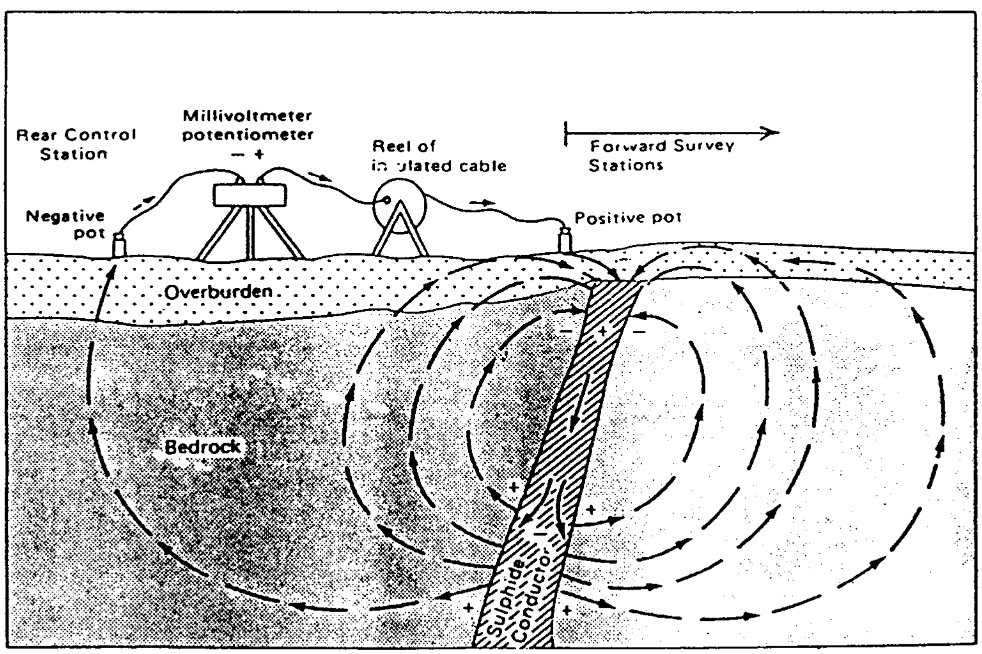

Figure 1—Schematic representation of spontaneously generated electric current flow near a sulphide body, showing current paths through the ground and the SP apparatus (after Lang 1970)

field which—close to an electrolyte-bathed SP body—can give rise to a "conductive" spontaneous polarization effect which distorts the local primary geosymmetry of natural electrical fields near the earth's surface.

For example, if these ground currents are flowing through an electrically isotropic and homogeneous rock type, they are like the parallel, equispaced strings of a harp, and a uniform potential difference field is developed (see A in Figure 2). If they are passing through different rock types with different conductivities, some of the nearby "harp strings" will converge slightly to take advantage of a better conducting rock unit, resulting in a "resistivity" map which differentiates between different conductivities of the rock types (see B in Figure 2). If the currents come upon sulphides or graphite they will be drawn towards such bodies in an attempt to flow through them, resulting in a high potential or anomaly (see C in Figure 2). Finally, in a strong magnetic storm, the harp strings will quiver as if they were being stroked (see D in Figure 2). The effect of a magnetic storm will be discussed at greater length in the "Instructions" section.

COMPARISON OF ELECTRICAL GEOPHYSICAL METHODS

Although the SP method was extensively and routinely used during the 1930's and 40's by many well-known professional geophysicists, currently, it is generally misunderstood or overlooked as a useful and economical geophysical prospecting method.

The first orebody found in Canada by electrical methods was surveyed by Hans Lundberg (1928) at the Buchan's Mine in Newfoundland, where conductive ore was detected using the SP method. At least one orebody was found in the Noranda area and Lundberg (1948, p.179) reports: "...a lead-zinc-copper orebody was found in the Eastern Townships of Quebec. This survey was carried out by A.R. Clark and H.G. Honeyman, and the results were well confirmed by subsequent drilling." He also states: "The outlining of the Flin Flon orebody in Manitoba is perhaps the best known example of his [Sherwin Kelly's] surveys."

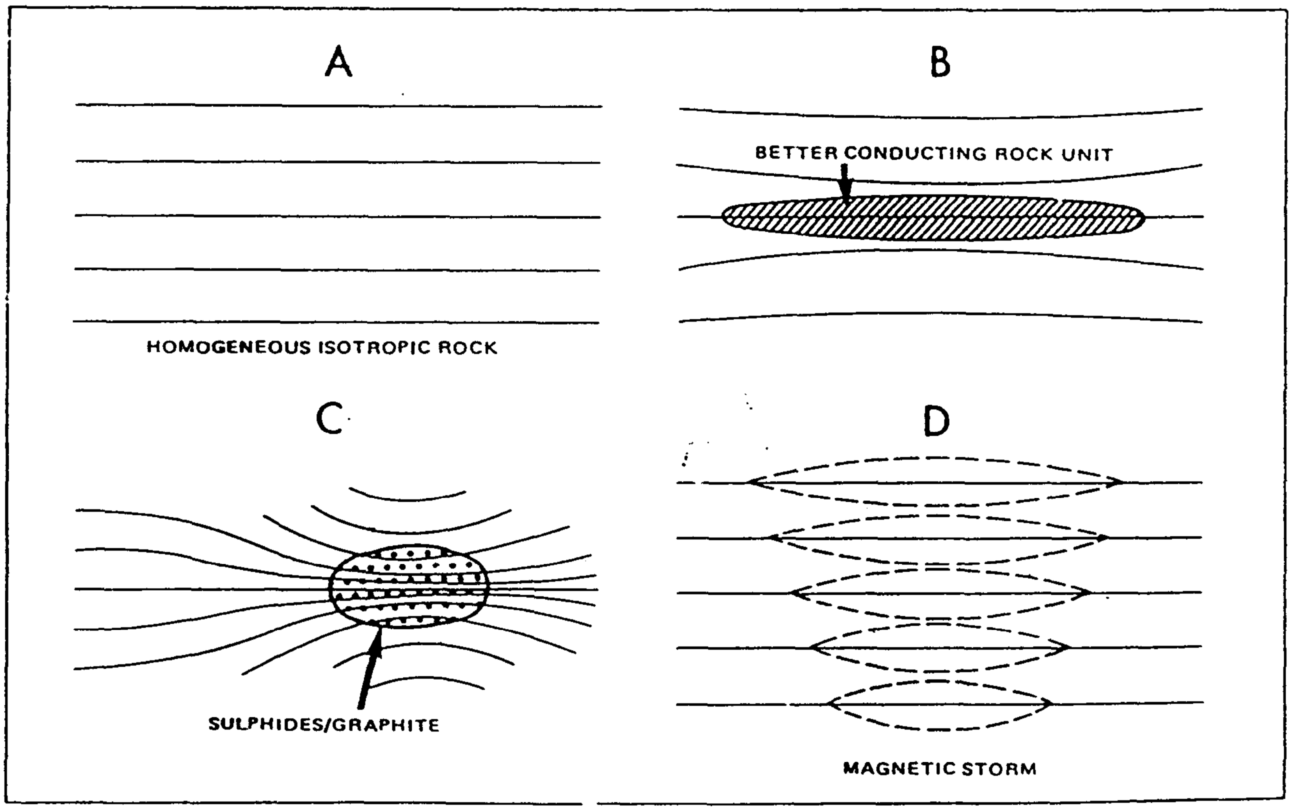

Figure 2—Schematic representation of various naturally occurring configurations of electrical equipotential fields.

The author was involved in early field surveying experiments with the resistivity method, using formulae developed by Dr. Arthur Brant, University of Toronto. This method requires the "pushing" of alternating current into the ground and can provide an excellent interpretive model of the geological stratigraphy and structure. Resistivity surveying can also detect conducting anomalies which may correlate with buried sulphides or graphite. However, the method was found to be cumbersome and slow, and soon gave way to the faster, more portable, but less informative electromagnetic (EM) methods. More recently the induced polarization (IP) method has been developed and applied. It also "pushes" current [as DC pulses which naturally decay] into the ground but is much more cumbersome than the resistivity method, and much more expensive than most of the EM methods. It is considered to be a composite of the resistivity and SP methods and is capable of detecting low resistivity "good" conductors and disseminated sulphides (including oxidized orebodies).

Unfortunately, the interpretation procedure is complicated and the method will equally well detect iron oxides and other semimetallic uneconomic minerals. A drawback with the resistivity, EM and IP methods is that they measure secondary electrical fields which are sometimes difficult to interpret. They also respond to unmineralized wet shears, faults, and fissure zones. Perhaps the most common cause of "false" anomalies with these methods is the variable depth of overburden over the rock surface. If there is a subsurface valley buried by overburden, all the above methods will yield a "psuedoanomaly" similar to an anomaly observable over a massive sulphide zone.

Alternatively, the SP method does not determine secondary fields, so survey results are much easier to interpret. It does not respond to subsurface valleys, wet clay, shears, or faults; and, in the author's experience, the SP method does not provide results which could lead to a false anomaly. In over 500 SP anomalies which were stripped or drilled, the author always found the source of the SP anomaly to be sulphides and/or graphite in the underlying rock.

The SP method responds to good conducting sulphides (both oxidized and unoxidized bodies), graphite, and nonconducting (disseminated) sulphides if these sulphides are oxidizing. The author has encountered only two cases where disseminated sulphides were not detected by the SP method. In one case, an exposure of disseminated pyrite showed no oxidation "rust" (gossan) whatsoever; in another, sulphides of a pyrite-chalcopyrite-bearing copper orebody were also fresh, and the pH of the ground water was found to be 10.0, too basic to oxidize the pyrite. According to Lundberg (1948, p.179): "The self-potential method must be used with some caution....and many orebodies may not cause any anomalies at all, owing to certain ground-water or overburden conditions." The proportion of nonoxidizing, nonconducting sulphide bodies is unknown, but the author expects that the number in Canada is probably very small. It is this small percentage of nonconducting sulphide bodies which prevents one from saying the SP is a "Yes" or "No" method in geophysical prospecting for sulphide ores. It is a Yes or No method for the detection of good conductors only, but not necessarily for disseminated sulphides.

Another feature of the SP method is its ability to differentiate between anomalies caused by sulphides and anomalies caused by graphite. Sulphides produce a range of up to 350 millivolts between the most positive and most negative SP readings, graphite has a higher range. The SP method also has the ability to "smell" an anomaly some distance away and can smell graphite at a greater distance than sulphides.

One of the popular misconceptions about the SP method is that it is limited to shallow depths as its detecting ability is dependent on the presence of oxidizing sulphides which usually occur close to surface of the earth. Lundberg (1948, p.179) states: "The self-potential method is based on the fact that slowly proceeding weathering in the upper portion of a sulphide body is accompanied by electrical potential differences between the surficial oxidiation zone and the deeper nonoxidized portions of the orebody". Lang (1970, p.162) contends this idea by noting that graphite is not oxidizing. The author has located disseminated sulphides under 25 m of sand (including a quicksand layer), and a weak conductor under 36 m of overburden. Lang (1970, p.162) also states: "...reactions at the surface may become too weak to interpret when the overburden is more than about 300 feet [91 m] thick." The author has located "heavy" sulphides capped by 7.6 m of barren rock, with no apparent indications of oxidation.

Another misconception is that one can derive a formula to determine the percentage of sulphides in an SP anomaly based on the strength of the readings. Lang (1970, p.162) states: "The strength of the potential generated depends largely on the concentration of sulphides." One cannot, however, determine any variations in the strength of anomalies as dependent on the concentration of sulphides. For example, the strongest SP value along the strike of an anomaly does not occur where the sulphides are most highly concentrated, but where the source of the anomaly is closest to surface. With a little practice, one can determine whether the source of the anomaly is close enough to the surface to be exposed by stripping. Details are given in the section "Mineral Prospecting with the SP Method".

Although the author has stated that the SP method does not give false anomalies, certain operator errors can produce them. To help operators avoid such errors is one of the objectives of this guide.

LIMITATIONS OF THE SELF-POTENTIAL METHOD

As no one geophysical method is all-embracing, the following limitations of the SP method should be borne in mind when planning surveys:

1) The SP method cannot be used over water. How

ever, Lang (1970, p.162) states: "Where sulphide deposits lie beneath lake waters, the method is not usually applicable *except over the ice in the winter*". Further research is needed to refine this technique.

2) Winter surveys are now possible through snow cover using high impedance voltmeters, but dampness can short-circuit the instrument, extreme cold can weaken the batteries, and ice can encrust the pots and prevent ground contact. Preventive measures include addition of glycerine to the pots, and carefully planned quick checks over target areas, to maximize surveying before prolonged frigid temperatures can affect the equipment.

3) An SP anomaly does not indicate whether conducting sulphides are disseminated or massive. Accordingly, the anomaly could be tested by another electrical method such as VLF (very low frequency) to determine whether it is a good conductor. At the same time, the anomaly could be checked with a magnetometer to determine whether the magnetic iron sulphide pyrrhotite is present.

4) As mentioned in the section "Important Facts", the SP method responds to pyrrhotite, pyrite, and chalcopyrite. It does not respond to zinc, lead, gold, or silver minerals. However, some iron or copper sulphides are generally present with these other metals and, if oxidizing, will result in an SP anomaly.

5) In the case of a strong and obvious graphite SP anomaly, the method cannot indicate the presence or absence of associated sulphides. Presently, only one instrument, the RONKA EM-15, can resolve associated sulphides, but only if the anomalous source is shallow, and if any associated sulphides are good conductors. For reasons not fully understood, this instrument only responds to good conducting sulphides, but not to graphite.

SELF-POTENTIAL EQUIPMENT

A millivoltmeter-potentiometer is used to take SP readings by a needle and scale, digital readout, or an adjustable dial which brings a needle or audio signal to a null position. The operator will likely make fewer mistakes in recording with a digital readout. Readings should be double-checked for precision, particularly at established control stations.

A basic requirement is a reel of wire. In most cases, more than 600 m of wire is desirable. Another useful and timesaving item in conjunction with the use of a long wire is a pair of walkie-talkies. Lastly, the most important items are the porous pots. If these do not function properly, the survey becomes a wasted endeavour. Occasionally the millivoltmeter may get wet and short-circuited. This condition is easy to detect if not to rectify. Also, the wire may develop a bare spot which may make contact with the wet ground and give a sudden strong negative reading. This is also easily identified, though of infrequent occurrence. In some circumstances, an unmonitored pot may change its potential along a survey line and produce false anomalous readings. The pots are crucial to the successful operation of the SP equipment, and accordingly, will be discussed first in the "Instructions" section.

INSTRUCTIONS

(1) Operation of SP Equipment

The Pots

The two pots are generally made of porcelain ceramic in hollow cylindrical forms with porous bottoms. From the caps, copper electrodes are suspended down into the pots. A saturated copper sulphate solution is used as the medium to connect the porous pot contact with the ground, which establishes a mediated electrical contact with the copper electrodes suspended in solution. If two bare metal electrodes made contact with the ground, there would be an instantaneous surge in polarization between them which would then drop quickly to zero. With the copper sulphate solution as the mediator of the ground contact, no net polarization effect involving a discharge of current takes place and the relative potential difference between two survey stations can be measured with considerable accuracy.

Occasionally, the two pots will have, or may develop an inherent potential difference between them. If this is only a few millivolts, no harm is done in running survey lines with the reel and not correcting the individual readings. An error of a few millivolts will not result in false or obscured anomalies. However, a high pot potential difference can be very critical in some situations as discussed below.

The reason for an original pot difference is probably due to slight variations in construction making one pot more porous than the other, and thereby, of a slightly different conductive response. This is usually a fixed and unchanging condition which does not hamper the SP survey. However, a sudden change in pot difference may be caused by a crack, by contact of the porous part of the pot with metal or sulphides, by the drying out of one pot, or by the solution in one or both pots becoming undersaturated in copper sulphate. The pot difference should be checked often; for example, at the start of the day, at noon, at the end of the day, and at each control station and tie-in point.

The filling of the pots must be carried out with care, the level of the solution checked often, and additional crystals or powder added frequently as required. Without ample copper sulphate solids in contact with the solution, a rise in temperature of one or both pots may result in undersaturation. This is because of the increased solubility of copper sulphate at higher temperatures. To make the saturated copper sulphate solution, it is advisable to heat the water as the crystals are being added, until the solution is hot and solid crystals are still present. A pyrex bowl is recommended, as the solution is corrosive, and a wooden spoon or stick is useful for stirring.

Jellying the Pots

If the pots are to be used for a week or more, it is timesaving to make a jelly of the solution. Only enough jellied solution to fill the two pots is required. The operation is similar to making any jelly, except it is advisable to add two or three times as much gelatin to the water to make a good set. The hot water plus gelatin solution should be well stirred as the copper sulphate crystals are added. After the solution has cooled, a few crystals should be added to each pot. The jelly solution can then be poured into the pots, capped, and allowed to set. One set of jellied pots should last an entire prospecting season of 3 or 4 months.

However, the pots should always be stored under moist conditions away from excessive heat to prevent evaporation and danger of drying out.

Pot Difference

Once the pots have been filled and allowed to cool it is possible to determine by a simple procedure whether there is any inherent pot difference:

(1) The pots are placed on or in the ground, close together, with one pot connected to wire running from the positive ("far") connection of the millivoltmeter, and the other pot connected by wire to the negative ("near") connection. A first reading is taken.

(2) The pots are now reversed leaving the same wires attached to the positive and negative connections of the millivoltmeter, and a second reading is taken.

(3) The formula for calculating the pot difference is: (1st Reading + 2nd Reading)/2.

For example, if the *1st Reading* is -8 millivolts and the *2nd Reading* is + 10 millivolts, the pot difference is ((-8) + (+10))/2 = +1 mv. These relatively high readings indicate that the potential difference between the ground and each pot is 9 millivolts, suggesting that the pot difference was measured in an anomalous area. However, as long as the correct procedure is followed, the true pot difference is obtainable anywhere. Once the magnitude of the pot difference is established, the positive and negative pots should not be interchanged during the course of SP survey readings. An alligator clamp on the "forward" positive pot is ample identification, and is useful for engaging and disengaging the end of the wire. The pot difference should be regularly monitored and carefully measured at each control station and tie-in point.

The Millivoltmeter-Potentiometer

Most voltmeters are accompanied by full operating instructions which describe how to read the instrument. It is important to emphasize that by convention the *forward* advancing pot should be linked to the positive or *far* instrument connection and the stationary or *rear* control station pot should linked to the negative *near* connection (Figure 1). With the positive pot moving "ahead", anomalies are negative after the traditional Carl Barus method which is the currently accepted convention. If the negative pot is inadvertently sent ahead, strong positive readings would be anomalous.

The Reel of Wire

Wire used in SP prospecting should be strong, thin, light, flexible, and well-insulated with a smooth surface. Depending on the roughness of the terrain, thickness of underbush, and straightness of the traverse line, a 0.8 km length of wire can be pulled off a reel to its end. Wire should be attached to the forward pot by a clove hitch knot, with a bared end connected to the copper electrode which protrudes above the pot cap. The connection should be made with a short piece of insulated wire securely attached at one end to the pot electrode, and to an alligator clamp at the other end in order to make contact with the reel wire. With this arrangement, an SP surveyor can pull the wire and the forward pot with one hand without danger of disengagement of the pot connection.

Theoretically, the potential difference due to the SP effect could be measured with the two pots several kilometers apart. Although impracticable, a longer wire is preferable as more readings can be taken with the millivoltmeter and rear pot set up at a single control station, and fewer control stations are needed as discussed below.

A reel with only 244 m (800 ft) of wire should not be spliced onto an extra length of wire. Regardless of how well the wire is spliced and insulated, it will come apart or become entangled under most field conditions. The time gained from avoiding such survey delays will more than compensate for the cost of an appropriate length (e.g. 610 m (2000 ft.) of wire.

The positive wire from the millivoltmeter should have an alligator clamp to attach to the reel wire, as it is generally necessary to disengage the clamp before the reel unwinds.

The Walkie-Talkies

Although the two SP operators can shout for a few hundred meters and then send messages by tugs on the taut wire, a faster and more reliable survey can result from use of walkie-talkies for voice communication. The forward operator can describe the topography (e.g. swamps, creeks, up-hill, down-hill, etc.) to the note-taker operating the millivoltmeter, and can notify when the forward pot is in ground contact and ready for a reading. Often, the reel will stop, the instrument operator will attach the millivoltmeter at the rear control station wire, and then the reel will suddenly move forward, resulting in possible damage. The instrument operator can also inform the forward operator of the trend of the readings, and, if "smelling" an anomaly, to cut down the readings from, for example, 20 m intervals to 10 m or less for a preliminary detailed survey of the anomaly.

The walkie-talkies should not be so powerful as to interfere with nearby citizens bands.

(2) Conducting an SP Survey

After the pots have been prepared and the initial pot difference measured, they may be combined with the millivoltmeter, the reel of wire, the walkie-talkies, and weatherproof note-taking materials in preparation for an SP survey along a predetermined line grid. The starting procedure will depend on the size of the grid and the length of wire on the reel. For example, the grid shown in Figure 3 is oriented with a base line (BL) parallel to the structure or strike of rock units and cross lines at right angles.

With 610 m (2000 ft) of wire a survey moving from east to west could effectively cover the area as follows: (1) The first control station is established on the base line at cross line 4W. This station is given a *tentative value* of 0 mv. (2) The pot difference is recorded, and (3) SP survey measurements are recorded along with pot locations and other notes, north and south on lines 0, 4W and 8W, as well as readings along the base line between line 0 and line 8W. Readings should never be taken at forward pot spacing intervals of over 15 m (50 ft), except possibly along the base line. In exploration for narrow vein deposits, the intervals should be shortened to define the peak. Bends in the wire of 90 degrees or even 360-degree loops do not affect the readings.

After line 8W has been traversed, readings are taken along the base line to line 16W where a careful measurement is taken and added to the inverse of the pot difference. Next, the second control station at BL,16W is established. If the tentative value of the second control station is +5 mv, then all readings taken from the second control station set-up—along lines 12W, 16W, 20W, and

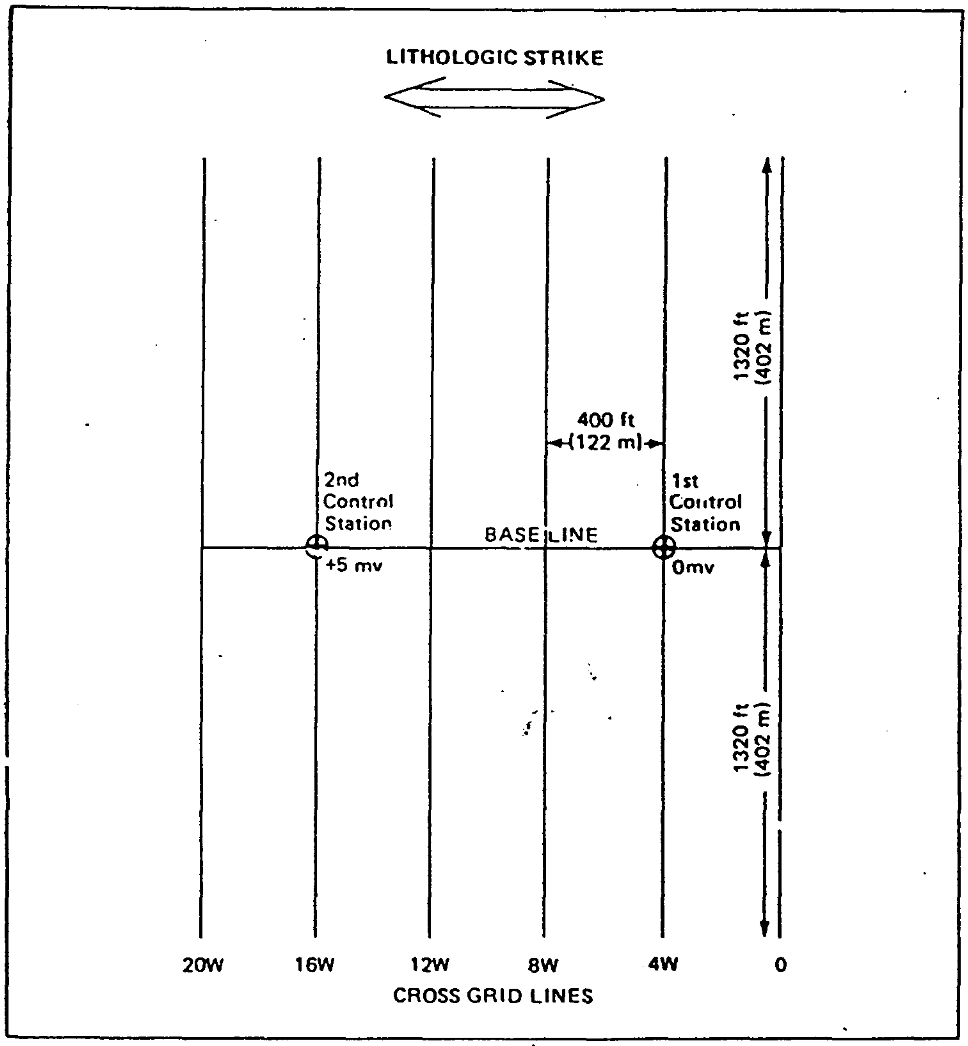

Figure 3—An example of logistical details for an SP survey conducted with 610 m (2000 ft) of wire (see also Table 1).

the rest of the base line—are relative to a value of +5 mv. For example, a reading of -25 mv gives a tentative value for that point, or survey station, of -20 mv. All readings or final adjusted values may be plotted on suitably scaled maps beside the appropriate survey stations.

With only 244 m (800 ft) of wire, an SP survey conducted over the same grid would require more set-ups, or control stations (Figure 4). In such a situation the first control station is set up at 7+00N on line 0 (tentative value 0 mv), and readings taken north, and south to the base line. Along the base line the pot positions should be carefully marked for tie-in with other control stations south of the base line. After the northern part of line 0 has been run, a reading is taken at 4W,7+00N and the inverse of pot difference is added. After this, the rear operator traverses over to 4W,7+00N where a second control station is established. The rest of the northern part of line 4W, including the base line, is surveyed and the procedure is repeated across the northern section of the grid to control station 20W, 7+00N. Next the pots, millivoltmeter, and reel of wire are moved to 20W,7+00S. The southern section of line 20W is traversed, tieing-in at the base line station. Assuming the value at BL,20W had been given as -23 mv from the control station at line 20W,7 + 00N; then, if the reading (including pot difference) from the new control station at 20W,7+00S is +10 mv, it follows that the new control station is 10 mv more negative than the base line at line 20W— thus -33 mv. The survey is continued eastward in the same fashion as the north section. It is unlikely that the rest of the base line tie-ins will check as the potential will have changed somewhat because of moisture and temperature variations. Any discrepancies should not produce or hide anomalies. Nevertheless, it is obvious from the above examples that a longer wire provides better control of background SP variations over a larger area (2 control stations versus 12 control stations and 6 tie-ins), and allows a faster and more efficient survey to be run.

When following the normal procedure of placing the pots on or in the ground, it is possible to obtain variations of up to 110 mv due to the varying acidity and bioelectric activity of soils. Wet swamps tend to give positive SP values, and dry hills negative ones. In areas where there is a more uniform type of soil cover, the background range is

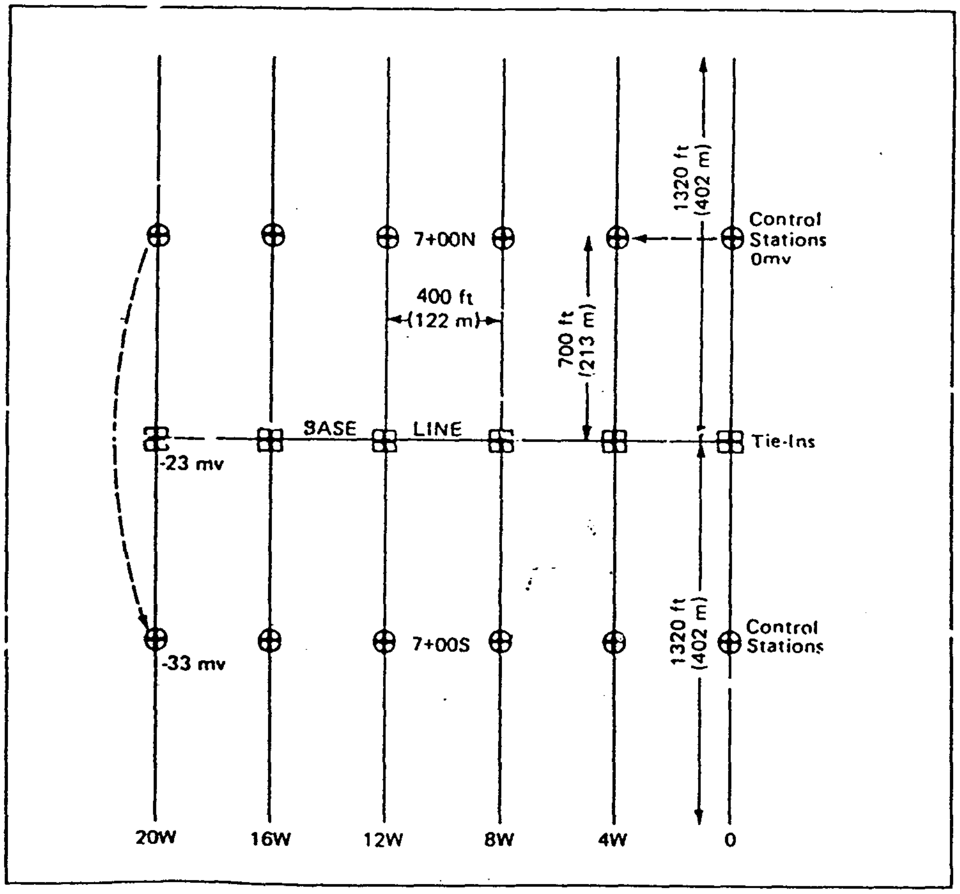

Figure 4—An example of logistical details for an SP survey conducted with 244 m (800 ft) of wire.

much less. As an extreme example of this, a detailed traverse across a 244 m (800 ft) wide tailings pond may give a range in readings from +1 to -1 mv, probably due to the uniform acidity of the tailings. The author observed similar small variations in the residual soils of Jamaica. Lang (1970, p.162) states: "Pronounced slopes...-sometimes introduce a topographic effect..." Fortunately, in Canada this potential variation of the background agrees with the topography, and, in nonanomalous areas of swamps and hills, the SP contours correlate to topographic features. This is one reason why the topography at each station should be noted. Another important reason is shown in Figure 5.

Figure 5 represents hypothetical SP values along one line. In example **A** SP measurements occur on a "flat" map showing no topography, such that the weak negatives opposite the **?** would normally be ignored. Example **B** shows a small rise which would explain the negative readings in terms of normal background topographic variation. However, if there is a swamp, as in example **C**, these weak negatives would definitely be anomalous.

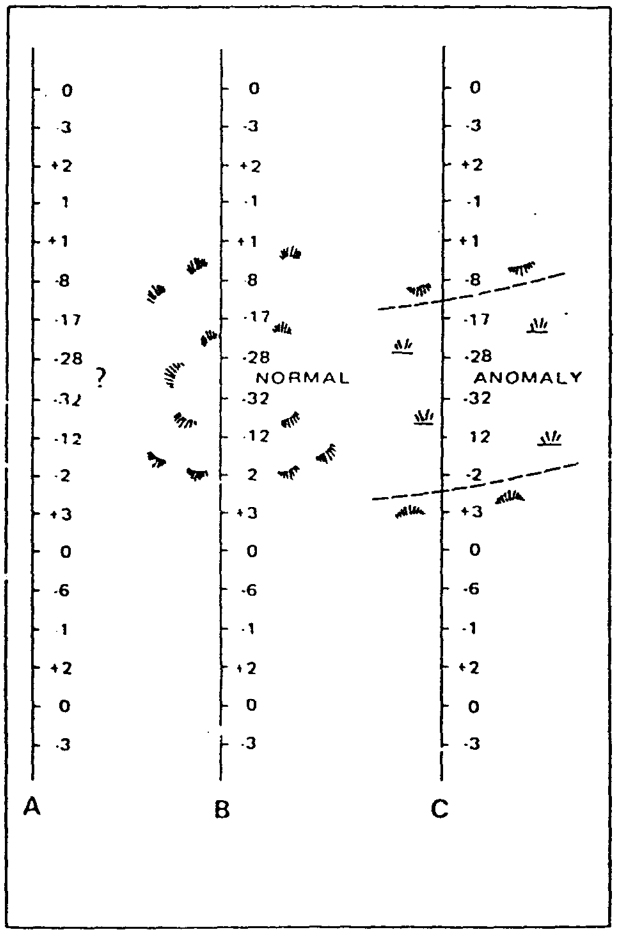

Figure 5—Theoretical SP readings showing the effects of topography.

Under favourable conditions an SP survey such as that depicted by Figure 3 could cover the area with a few hundred readings in one or two days, traversing approximately 4 km of grid. If an SP survey detects strong anomalous negatives and has also covered a few swampy areas, it is likely that the greatest positive and negative values of the survey have been encountered. As an example, SP survey notes might read as shown in Table 1.

If the range of values is of the order of 250-300 mv, or more, about one third of that range is probably background variation due to the varying acidity of the soils. In this case, if the most positive tentative value is near +100 mv, or near +10 mv, it should be given an adjusted value of +50 mv and the other tentative values adjusted accordingly. For example, if the most positive tentative value is +75 mv, it is adjusted to +50 mv, and it follows that a *normalizer* of -25 mv must be added to all the tentative values, as in Table 1, to yield the *final adjusted value*.

If the most positive tentative value is between +40 and +60 mv, no adjustment is necessary. In most cases the most positive value is over a swamp or low wet ground.

In some localized anomalous areas the range from most positive to most negative readings may be 150 mv, or less, and is probably due to a more uniform soil cover. In such a case, the most positive tentative value should be adjusted to about +25 mv. In most circumstances, one does not know at the time when the first control station is set-up, what anomalous conditions will occur. On more than one occasion, the author has unknowingly set-up a first control station over an anomaly and all the subsequent readings were positive to high positive.

The purpose of the adjustment is to attain a final balanced background range about the zero value, such that the anomalous signals are more readily recognized and interpreted. The background is the range of electrical self-potential which is due mostly to variations in topography or soil pH. For example, a final adjusted value of -50 mv on top of a hill would not necessarily be anomalous. A value of -70 mv, or more negative, would be. In the second case above, with a background range of 50 mv or less, an adjusted value of -25 mv on top of a hill would not necessarily be anomalous. A value of -40 mv would be. It should be stressed that over a swamp, as illustrated above, an anomaly due to buried sulphides might be much less negative, or in some cases, a low positive. SP anomalies under swamps and deep overburden are much weaker than on hills and shallow overburden. Thus, topographic information is needed in this type of electrical survey. Below, in the section on "Alternative Field Methods", a simple technique which minimizes the topographic effect is discussed.

Magnetic Storms

Solar flares produce geomagnetic disturbances which are related to the phenomenon of the aurora borealis and can cause magnetic storms of several days duration.

TABLE 1	AN EXAMPLE OF SP SURVEY NOTES FOR A SURVEY CONDUCTED WITH A REEL OF WIRE 610 METERS (2000 ft.) LONG ON A 400 ft. – SPACED GRID (see Figure 3).				
Control Station	Survey Station	Reading	Tentative Value	+(-25) = (Normalizer)	Final Adjusted Value
			(Millivolts)		
BL, 4W	–	–	0		-25
	BL,3W	+3	+3		-22
	BL,2W	-8	-8		-33
	BL,1W	-12	-12		-37
	BL,O	-7	-7		-32
	O+5ON	-2	-2		-27
	:				
	etc.		(a "quiet" area)		
	:				
	BL,16W	+5	+5		-20
BL,16W	–	–	+5		-20
	BL,15W	-25	-20		-45
	:				
	etc.		(probably anomalous)		
	:				
	BL,12W	-70	-65		-90
	O+50N	-44	-39		-64

The intensity and effects of magnetic storms in northern areas are enhanced near strongly magnetic iron formation. During a magnetic storm, SP readings fluctuate in an unpredictable and random fashion similar to fluctuations observable on a magnetometer under the same conditions. Generally, the magnetic storm has no effect on the SP readings until the two pots are more than about 100 metres apart; and increased pot separations increase the violence of the fluctuations. Magnetic storms may start suddenly and last only a few minutes, or they may last a few days. Except for short traverses, an SP survey with a reel of wire is not possible under storm conditions. Below, an alternative field method will be discussed which can avoid the effects of a magnetic storm.

(3) Alternative Field Methods

Topographic Problems

Although the influence of topography on SP readings may be interpreted and anomalies recognized, the problems can be confusing to the inexperienced operator. For several years, the author has used a technique which effectively inhibits the topographic effect and gives better ground contacts, even on rubble and bare outcrops

First, two porous canvas sample bags are filled with material which will stay wet for several hours, such as black muck, loam, or sawdust. Second, a pot is inserted in each sample bag and tied on. Both pots are then in contact with a medium of constant pH, and the influence of varying acidity is strongly attenuated. As a result, readings become more uniform, the background displays a narrower range, anomalies in swamps are better defined, and anomalies on hills are less negative and less exaggerated. A final adjusted value of +10 mv for the most positive value is adequate, and a -25 mv value may be anomalous.

Magnetic Storm Problems

A magnetic storm can hamper or preclude an SP survey conducted with a reel of wire. However, by moving both pots at a constant separation along a survey line, it is possible to overcome the effects of a magnetic storm. Only on rare occasions such as in northern latitudes near strongly magnetic iron formation, could there be any fluctuation with a pot separation of about 15 metres (50 ft) or so.

There are two alternative methods by which two operators can move aong a survey line without the reel, but linked together by about 20 m of wire, to allow for 15 metre-spaced (50 ft) readings in rugged topography. Both methods are much faster than a survey conducted with a reel since it is not necessary to walk back along a line and reel the wire in. From the base line the operators can survey along the longest lines, traverse across along a tie-line or through the bush to an adjoining line, and survey along it back to the base line, and over to the starting station to tie in—similar to magnetic surveying methods.

One method requires that the rear negative pot be moved up to the same ground contact location on which the forward positive pot was positioned. Under field survey conditions this method is impracticable due to the difficulty of placing the rear pot on the exact ground contact position of the forward pot, such that every station becomes an uncontrolled "control station".

A preferable alternative for SP surveying during magnetic storms is the "leapfrog method" shown in Figure 6.

This method solves the problem of uncontrolled control stations, but adds to the arithmetic computations of the operator taking notes since each station has to be evaluated before the next station is "read". Both of the methods involve adding the inverse pot difference to each reading.

For example, the leapfrog pattern can be started from an established control station on the base line with an assigned tentative value of 0 mv. An example of typical survey notes is shown in Table 2.

The control station, with a tentative value of 0 mv, reads the positive pot at 0+50N. The reading is +5 mv; thus, with a pot difference (P.D.) of -1 mv, the corrected reading is +6 mv and the tentative value is 0+6 = +6 mv. Next, the negative pot is moved to 1+00N and reads station 0+50N. The corrected reading is -9 mv. Thus, 0+50N is 9 mv more negative than 1+00N; or 1+00N is 9 mv more positive than 0+50N. Thus 1+00N has a transposed reading of +9 mv (see Table 2), and the tentative value at 1+00N is (+6) + (+9) = +15 mv. The positive pot is then moved from 0+50N to 1+50N. Station 1+50N has a tentative value of +31 mv. The negative pot is then moved to 2+00N and reads 1+50N. If the corrected reading is +36 mv, then the transposed reading of -36 mv means that 2+00N is 36 mv more negative than 1+50N and thus has a tentative value of -5 mv.

To ensure that results are meaningful, it is important to keep a careful record of each reading and calculation for later rechecking. On returning to the base line, the readings should be tied-in to the control station from which the traverse started. An exact tie-in or equivalence of starting and finishing readings at the control station is unlikely, but depending on the number of stations read, one can treat the tie-in error as one would treat corrections for magnetic diurnal variation during a magnetic survey. For example if the tie-in reading is +50 mv after 50 readings, then working backwards one would distribute the discrepancy by adding -50 to the last reading, -49 to the second last, and so on. However, if the change in readings at the control station is several hundred milli-

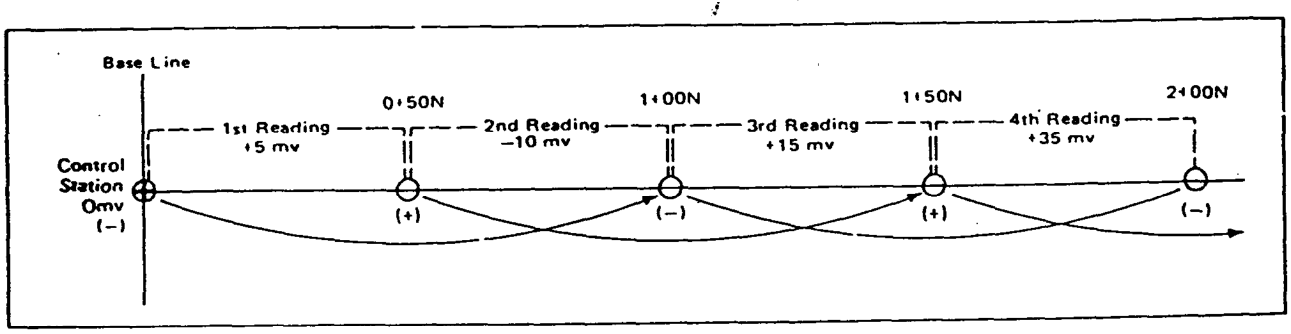

Figure 6—An example of the "leapfrog" method of SP surveying with a fixed length of wire (see also Table 2).

TABLE 2 | AN EXAMPLE OF SP SURVEY NOTES FOR A SURVEY CONDUCTED USING THE "LEAPFROG" METHOD WITH A FIXED LENGTH OF WIRE (see Figure 6).

Control Station	Survey Station	Pot	Reading plus inverse Pot Difference P.D. = (−1)	Transposed Reading at Negative Pot	Tentative Value	Final Adjusted Value
				(Millivolts)		
BL,O	0+00	(-)	–	–	0	....
	0+50N	(+)	+5+(+1)=+6	+(+6)	+6	....
	1+00N	(-)	-10+(+1)=-9	-(-9)	+15	....
	1+50N	(+)	+15+(+1)=+16	+(+16)	+31	....
	2+00N	(-)	+35+(+1)=+36	-(+36)	-5	....

volts it is necessary to recheck calculations or resurvey the lines.

Although faster, this alternative method is somewhat complicated, requires careful arithmetic, and usually involves an adjustment to bring the relative values into reasonable perspective for interpretation. Despite savings in time, it is not recommended unless one is obliged to use it due to magnetic storms or a shortage of wire.

(4) Notes on the Interpretation of SP Survey Results

The results of an SP survey can be effectively represented and interpreted by using maps on which the final adjusted values are shown along with SP line profiles, or more preferably, SP contours of appropriate intervals. If a good background range is established, most anomalies are well delineated as more negative areas.

Anomalies of -450 mv, or more negative, are due to graphite, but anomalies of -350 to -400 mv can occur in a variety of lithologic or mineralized conditions. Generally, detailed follow-up readings along the strike of the anomaly can resolve some of the possibilites.

Another situation sometimes encountered during an SP survey is a line of values which are more negative than the values along the adjacent lines on each side. This means that the anomalous SP contours run along the line at right angles to the base line and also to the regional strike. This condition may either be due to a loss of control, or the presence of a crosscutting conducting body which may contain sulphides. Loss of control may be due to a sudden change in pot difference, an erroneous reading (value) of the control station, or location of the control station over an anomaly. Similar to magnetic surveys, SP surveys are better controlled from nonanomalous control stations. If control stations are to be set up on the base line, it is preferable to first survey the base line, back and forth if necessary, to establish reliable values. Then, if some parts of the base line are anomalous, these should be avoided as control stations if possible. Since slight variations in moisture or temperature can change the electrical potential of any station, it is likely that in an anomalous area the change will be greater. To determine the cause of an anomalous line of values, the readings along it should be repeated. Repeated surveys of SP anomalies due to buried conductors are generally replicative; although, they may change in strength due mainly to variations in the level of the water table. A low water table produces stronger negatives than a high water table.

If duplicate readings should substantiate that an anomaly follows along a survey line, some follow-up cross traverses perpendicular to the line may be required in order to detail the anomaly as depicted in Figure 7.

In some cases the line profiles or contours of SP values may be used to approximately indicate the direction of dip of a conducting body (see Figure 8). This is particularly so in level areas of no topographical effect or when using the canvas sample-bag method (see "Alternative Field Methods").

(5) Mineral Prospecting with the SP Method

The main procedures of the SP method are described under the heading "Conducting an SP Survey". SP prospecting may be conducted with a reel of wire; or, at a constant pot separation, depending on which is more

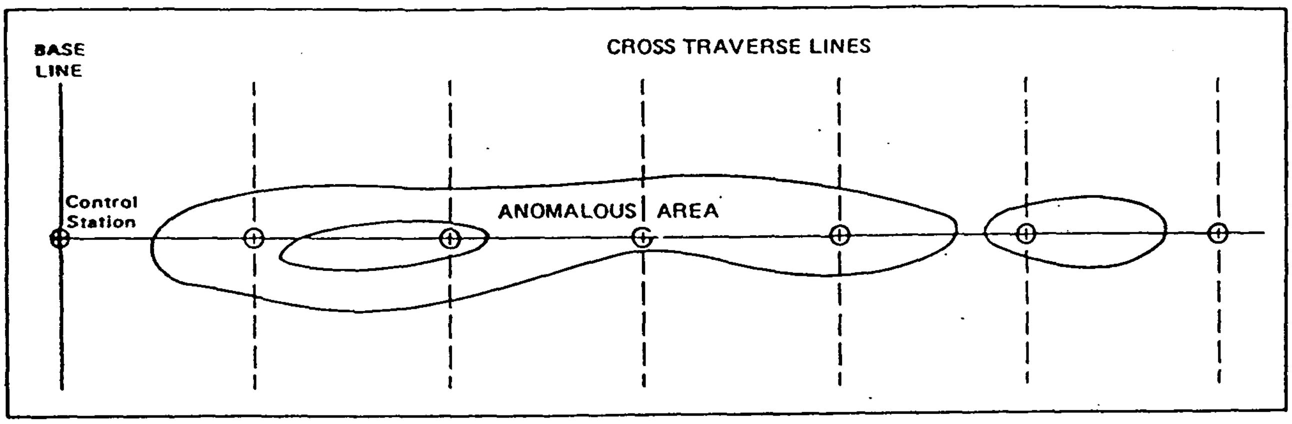

Figure 7—An example of an SP anomaly (arbitrary contour values) detailed by cross traverse lines.

convenient. Normally, it is not necessary to cut picketed grid lines for prospecting, as pace-and-compass traverses provide sufficient control over location of anomalies.

When an anomaly has been detected it should be "peaked up". This means that the forward pot is moved back along the survey line until the highest reading on that traverse line is accurately located. This may require moving the pot only a few centimetres along the line. Next, the rear pot and millivoltmeter are moved up close to the anomaly, preferably at or near a surveyed station so that the new control station can be tied-in to the rest of the survey values. As an example, the peak on the survey line in Figure 9 is -225 mv; since somewhere along strike the peak could rise to a "graphite" level, it is necessary to maintain some control over the relative magnitude of SP values. Assuming the new control station is found to be valued at -125 mv, it is possible to do a further check perpendicular to the traverse line to establish the location of the anomaly peak more accurately. If there is higher ground to the right and lower ground to the left, it is preferable to test the higher ground first by a detailed parallel traverse line some 5 to 10 m from the original survey line, as shown in Figure 9.

If a second peak of -285 mv is located to the right, this means that the best direction was chosen, and another detailed traverse line should be surveyed farther to the right. The third peak may be only -105 mv. Thus the strongest vaule is near -285 mv. Next, it is possible to pinpoint the SP target by "potting" along strike until the maxi-

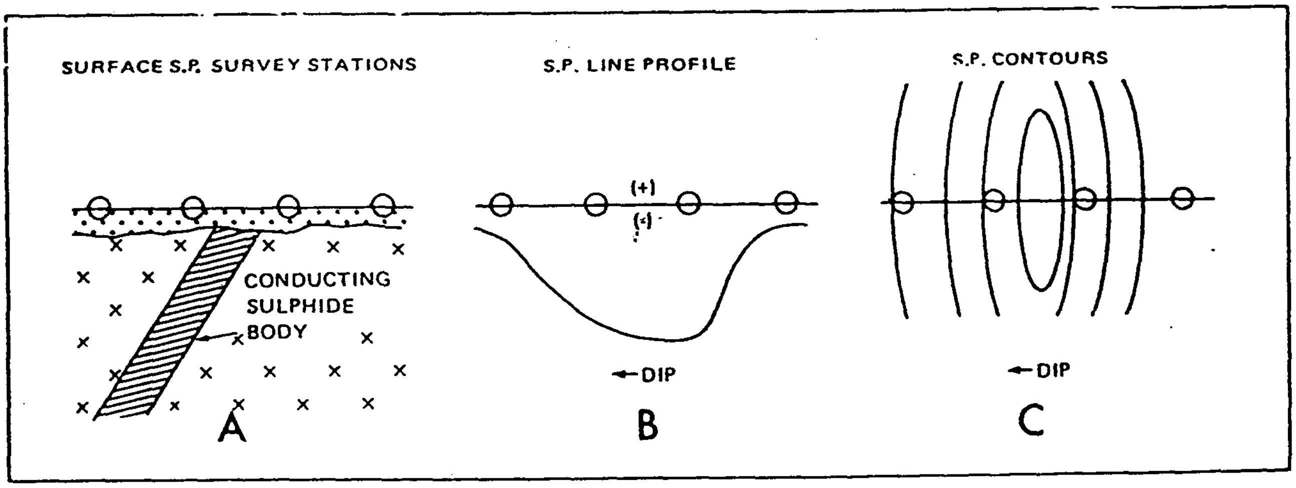

Figure 8—An example of dip determination using SP data.
(A)—cross-section of a dipping sulphide body.
(B)—line profile of SP readings over (A) showing smooth gentle slope on the down-dip side and steep abrupt slope on the up-dip side.
(C)—contours of SP readings over (A) showing wider spacing interval down-dip and a closer interval up-dip.

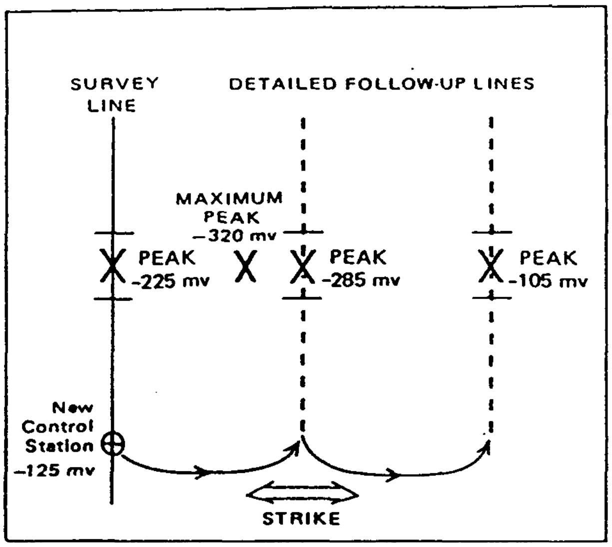

Figure 9—An example of detailed follow-up surveying used to locate a maximum SP peak.

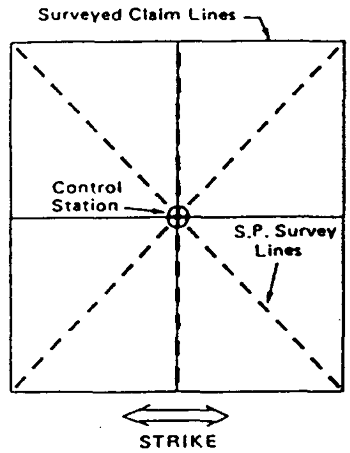

Figure 10—The "spiderweb" method of SP surveying.

mum peak is located, probably between the original traverse line and the -285 mv value for the above example. Assuming the highest peak value is -320 mv, this is where the source of the anomaly is closest to surface. To evaluate whether the anomaly can be exposed by stripping, it is necessary to "pot" around the highest peak by taking a dozen or so readings over an area of about 30x30 cm^2 (1 ft^2).

If the readings around the peak vary by only 1 to 5 mv within the square area, then the source of the anomaly is probably below the water table and inaccessible by ordinary overburden stripping. If the readings vary by 5 to 15 mv or more, the anomaly is above the water table and probably may be exposed by stripping off the overburden with a shovel and pick. If the peak area varies by 25 to 50 mv or more, the source of the anomaly is probably graphite which may, or may not, be above the water table.

An alternative to the grid prospecting method for surveying well-staked contiguous claims is the "spiderweb" technique illustrated in Figure 10.

Four claims can be covered from a single control station. This method is recommended for base metal prospecting in areas where only large sulphide bodies are of interest. It is not recommended for gold prospecting.

CONCLUSIONS

Lang (1970, p.162) states. "Of all the geophysical methods applicable to the search for sulphides, the spontaneous polarization technique provides the quickest field procedure and also furnishes highly definite information as to the occurrence or absence of sulphide mineralization...With the exception of graphite there are but few insignificant factors to lead the geophysicist astray when interpreting the spontaneous polarization results."

Nevertheless, because varying concentrations of iron sulphide are common near the surface of the earth's crust, and are readily detected by the SP method, there may be a considerable number of SP anomalies which are due to uneconomic mineralization. Thus SP should be combined with other prospecting methods when the nature of mineralization is in doubt. Also, laboratory and field research into several important aspects of the SP method are lacking. For example, the feasibility and effectiveness of SP surveys over ice are not well established. Other areas of possible investigation include the effects of magnetic storms, the extra intensity of these storms near major iron formations, the effect of hydrothermal alteration on SP anomalies, improvement of the canvas sample-bag technique (see "Alternative Field Methods") to eliminate potentials due to varying soil acidity, derivation and refinement of topographic correction techniques, and use of the SP method to monitor earthquakes or atomic explosions.

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BRITISH COLUMBIA
PROSPECTORS ASSISTANCE PROGRAM
PROSPECTING REPORT FORM (continued)

B. TECHNICAL REPORT

* One technical report to be completed for each project area
* Refer to Program Requirements/Regulations, section 15, 16 and 17
* If work was performed on claims a copy of the applicable assessment report may be submitted in lieu of the supporting data (see section 16) required with this TECHNICAL REPORT

Name JAVORSKY, David Reference Number 94-95 P-148

LOCATION/COMMODITIES

Project Area (as listed in Part A.) Grey Copper Minfile No. if applicable ____

Location of Project Area NTS 104 B 1E Lat 56° 15 N Long 130°-04 W

Description of Location and Access Helicopter from Stewart BC. Across salmon Glacer or else walk down side of glacer from Scottie Gold Mine ≈ 10 KMS.

Main Commodities Searched For Au. Ag

Known Mineral Occurrences in Project Area ? Old trenches on zone of pyrite - Silica flooded - Altered - Mineralized zone.

WORK PERFORMED

1. Conventional Prospecting (area) Yes. Pounding Rocks.
2. Geological Mapping (hectares/scale) ____
3. Geochemical (type and no. of samples) ____
4. Geophysical (type and line km) ____
5. Physical Work (type and amount) cleaning out old Trenches Small Blast
6. Drilling (no. holes, size, depth in m, total m) to deepen trench to Fresh Rock - this area is very altered.
7. Other (specify) 51 Feet drilled with cobra using 8" steel 34 holes.

SIGNIFICANT RESULTS (if any)

Commodities Au Claim Name Grey Copper -

Location (show on map) Lat ____ Long ____ Elevation ____

Best assay/sample type ____

Description of mineralization, host rocks, anomalies This Quartz Sericite Pyrite alteration zone is a continuation of Big Missouri Ridge onto the West side of the Salmon Glacier. The host Rock is andesite however the mineralization appears to have came later and

Supporting data must be submitted with this TECHNICAL REPORT. Replaced it. The ice has receeded quite a bit along North wall of Glacier.

1994 PROSPECTING REPORT ON THE GREY COPPER MINERAL CLAIM

Tendure # 300897, Salmon Glacier 104 B- 01 E

Two people went to the Grey Copper mineral claim, and camped on the claim for five days. A mineralized alteration zone was found in the walls of the receeded glacial canyon. Quartz veins with Tetraderite and galena were located from float off the claim to the west. Quartz veins in a rusty zone in an alteration enevelope on the Grey Copper claim were trenched and sampled. Old workings were origionally worked off the top of the glacier. The glacier now has receeded quite a bit and much of the old workings are on steep walls and are difficult of axcess.

The mineralized area is coveredwwith rust and makes finding a precious metal zone difficult. The fact that the float carried gold while samples in place did not, only means that rocks move down hill and I have to climb up further to find out where they came from. On the adjoining claim quartz calcite veins carry values in galena and sphalerite. Signs of previous workings on the Grey Copper claims indicate that where-ever mineralization of value, was found, it was completely cleaned out by surface blasting and shipped. The old trenches were cleaned out and a total of 14 meters by 0.5m x 0.5m was drilled, blasted, and sampled. The results were dissipointing for the amount of work performed.

There is a chanch that Mt. August is a old volcano and mineral producer similar to Mt. Dilworth. Large rusty gossans like those on Big Missouri Ridge are appearing on Mt.August to the west off this claim.

The following two photographs show the hump to the left (south) of Mt. August Glacier where the Grey Copper claim is located.

On the East side of the Grey Copper claim part of the Portland Cannal Dike Swarm cross the claim in a north-south direction. Trench GCT2 explores a rusty contact zone with the dike. Trench GCT4 crosses a silicious-serricite-pyrite zone in a altered volcanic, however no vein was found. The vein in trench GCT1 was found, however it assayed poorly and no black sulfides were seen. Trench GCT3 was along strike of a narrow quartz vein showing minor blebs of sphalerite, not economic.

am989

Summit Glacier; beyond Salmon Glacier; northwest of Stewart B.C.

Photo
: Dolcie Johnson - Hyder - Alaska - 99923

Aug 84

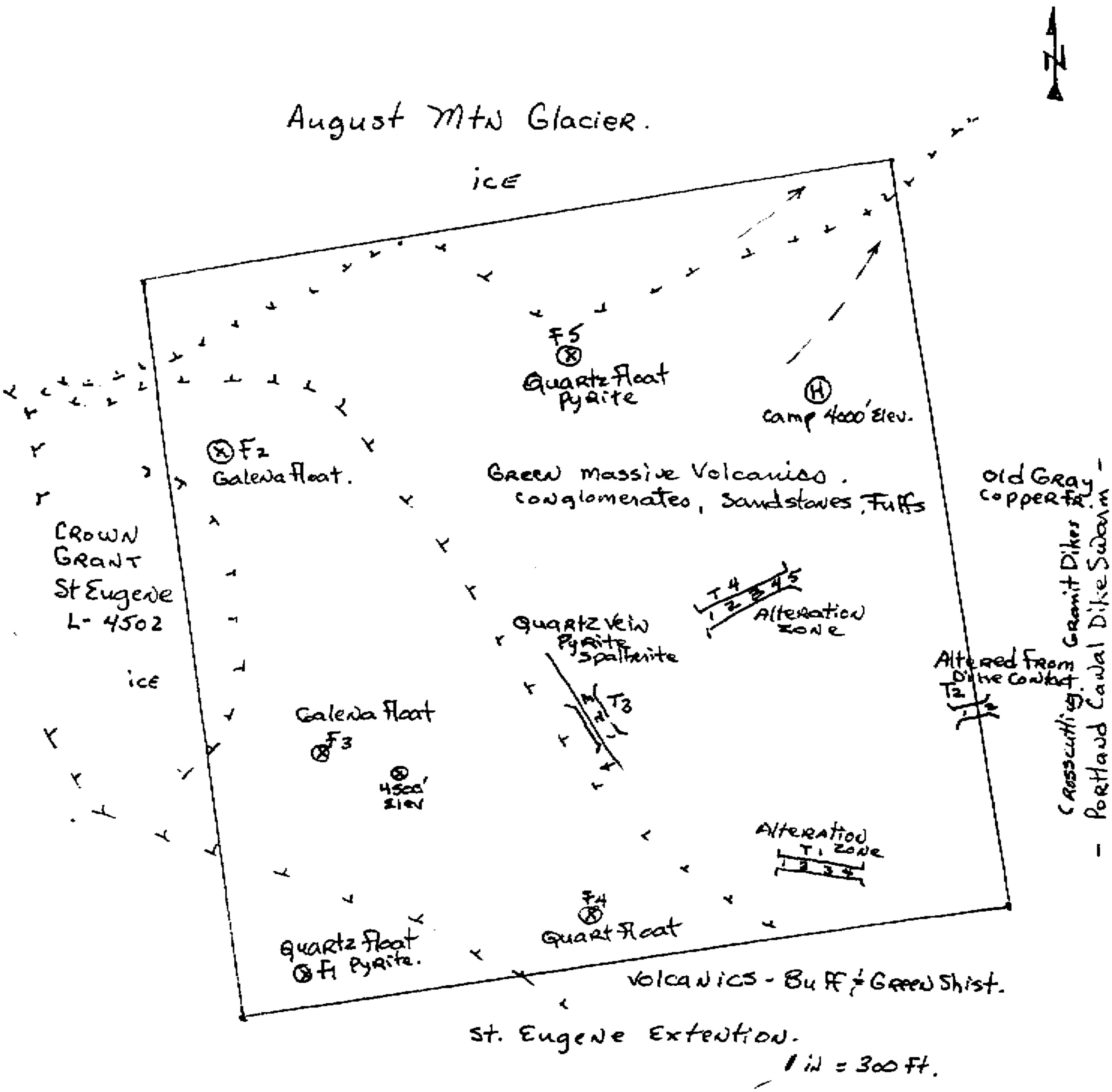
Summit Glacier & dry Tide Lake after the ice Dam broke. "beyond Salmon Glacier".

...s Photo

...: Pollie Johnson - Hyder - Alaska - 99923

Grey Copper Mineral Claim
104 B-1E

1994 Sample Location Map.



quanta trace laboratories inc.
#401-3700 GILMORE WAY, BURNABY, B.C., CANADA, V5G 4M1 TEL:(604)438-5226

To: Mr.D.Javorsky
Box 806
Stewart,B.C.
V0T 1W0

File: 24148-3

Date: 15-Nov-94

Attention:

Project: Grey Copper Property

CERTIFICATE OF ASSAY

	Sample Number	Gold ppm	Silver ppm			
1	GCTRENCH 101	0.04	3.8			
2	102	0.03	2.6			
3	103	0.08	3.2			
4	104	0.10	3.8			
5	201	0.12	2.3			
6	GCTRENCH 202	0.03	5.4			
7	301	0.02	10.1			
8	302	0.03	1.3			
9	303	0.02	0.9			
10	401	0.02	0.4			
11	GCTRENCH 402	0.04	2.3			
12	403	0.15	3.3			
13	404	0.09	3.3			
14	405	0.11	3.9			
15	GCFLOAT 01	0.42	6.1			
16	GCFFloat 02	11.0	158.	galena, sphalerite, Cu?		
17	03	20.9	414.	galena, sphalerite, Cu?		
18	04	0.11	4.1			
19	05	0.05	1.3			
20	06	0.06	3.1			
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

Silver determined by AA.
Gold determined by FA/AA

Samples were Sulfide Rocks.

[signature]
provincial assayer

BRITISH COLUMBIA
PROSPECTORS ASSISTANCE PROGRAM
PROSPECTING REPORT FORM (continued)

B. TECHNICAL REPORT

- One technical report to be completed for each project area
- Refer to Program Requirements/Regulations, section 15, 16 and 17
- If work was performed on claims a copy of the applicable assessment report may be submitted in lieu of the supporting data (see section 16) required with this TECHNICAL REPORT

Name Jabresky David Reference Number 94-95 P-148

LOCATION/COMMODITIES

Project Area (as listed in Part A.) Anaconda Harvy Fr. Minfile No. if applicable

Location of Project Area NTS 104 B-1E Lat 56° 15N Long 130° 04W

Description of Location and Access Big Missouri Ridge the Anaconda is a Crown Grants on Mt Dilworth what was looked at the Harvy Fr. was adjoining troy group also on Big Missouri Ridge next to Salmon Glacer & Access is by vehical along granduc Road

Main Commodities Searched For Au Ag

Known Mineral Occurrences in Project Area Both of these areas are covered by Iron Rust alteration. Au Ag, Pb Zn,

WORK PERFORMED

1. Conventional Prospecting (area) Yes Rock Pounding
2. Geological Mapping (hectares/scale)
3. Geochemical (type and no. of samples)
4. Geophysical (type and line km)
5. Physical Work (type and amount)
6. Drilling (no. holes, size, depth in m, total m)
7. Other (specify) The Anaconda claims were staked.

SIGNIFICANT RESULTS (if any)

Commodities Au Ag ? (Pb Zn ?) Claim Name Anaconda. Harvy Fr.

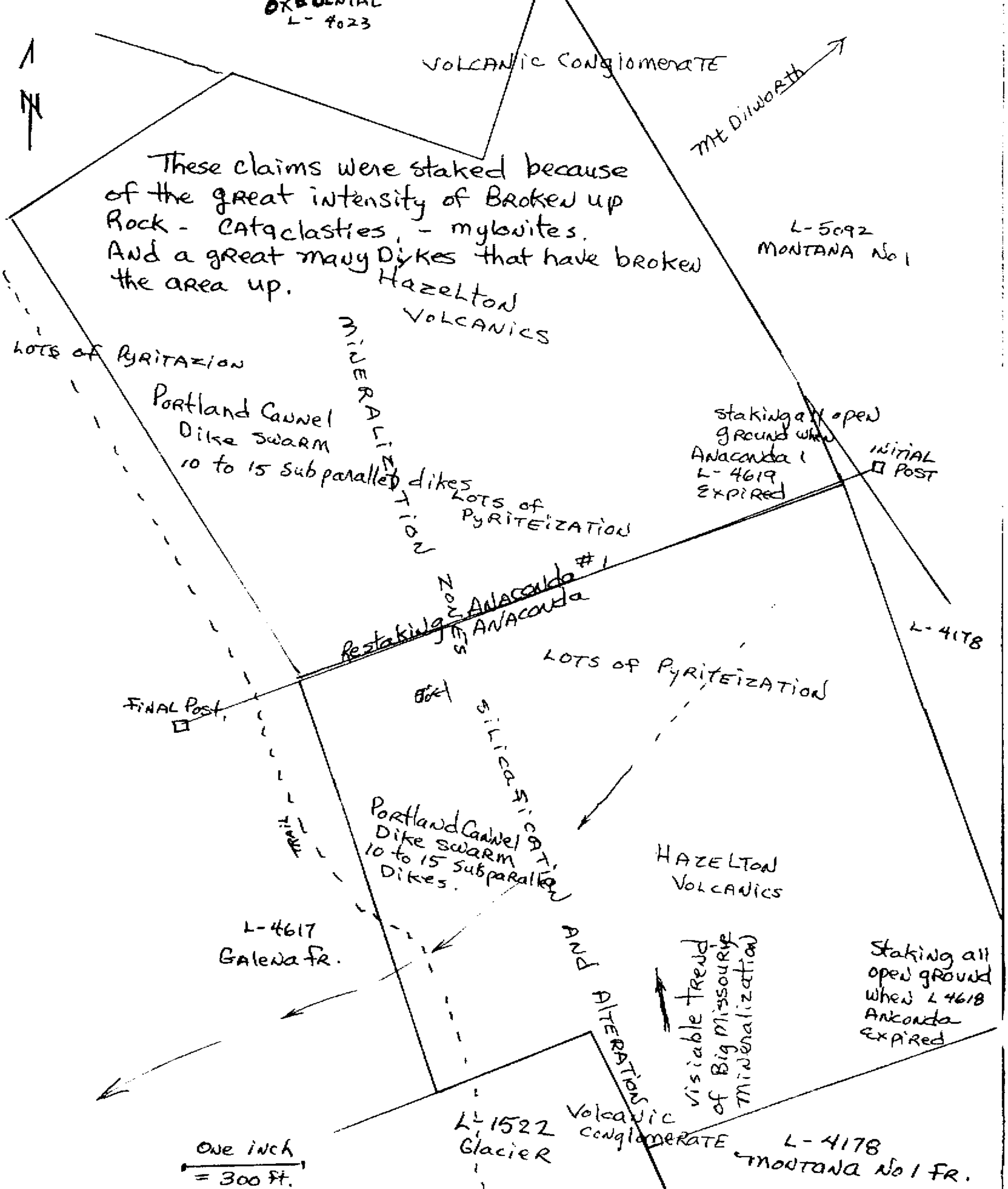
Location (show on map) Lat Big Missouri Long Ridge Elevation

Best assay/sample type Nothing Significant. Yet.

Description of mineralization, host rocks, anomalies altered Tuff. intense fractioning on anaconda, Because of the extent of Broken up Rock pyritation, and the Portland Carnel Dyke swarm, the anaconda claims were staked.

Supporting data must be submitted with this TECHNICAL REPORT.

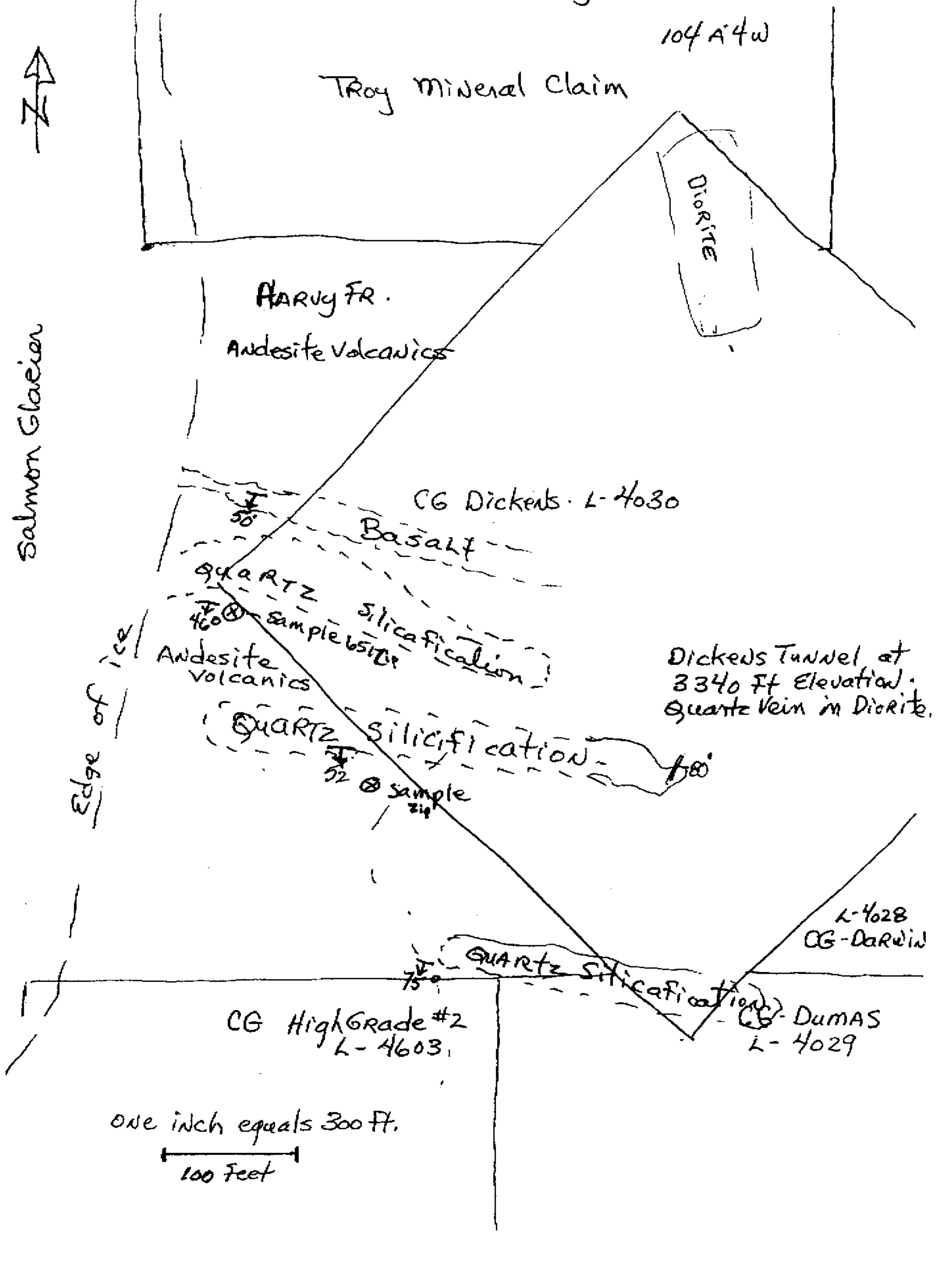
ANACONDA PROJECT
NEW STAKING

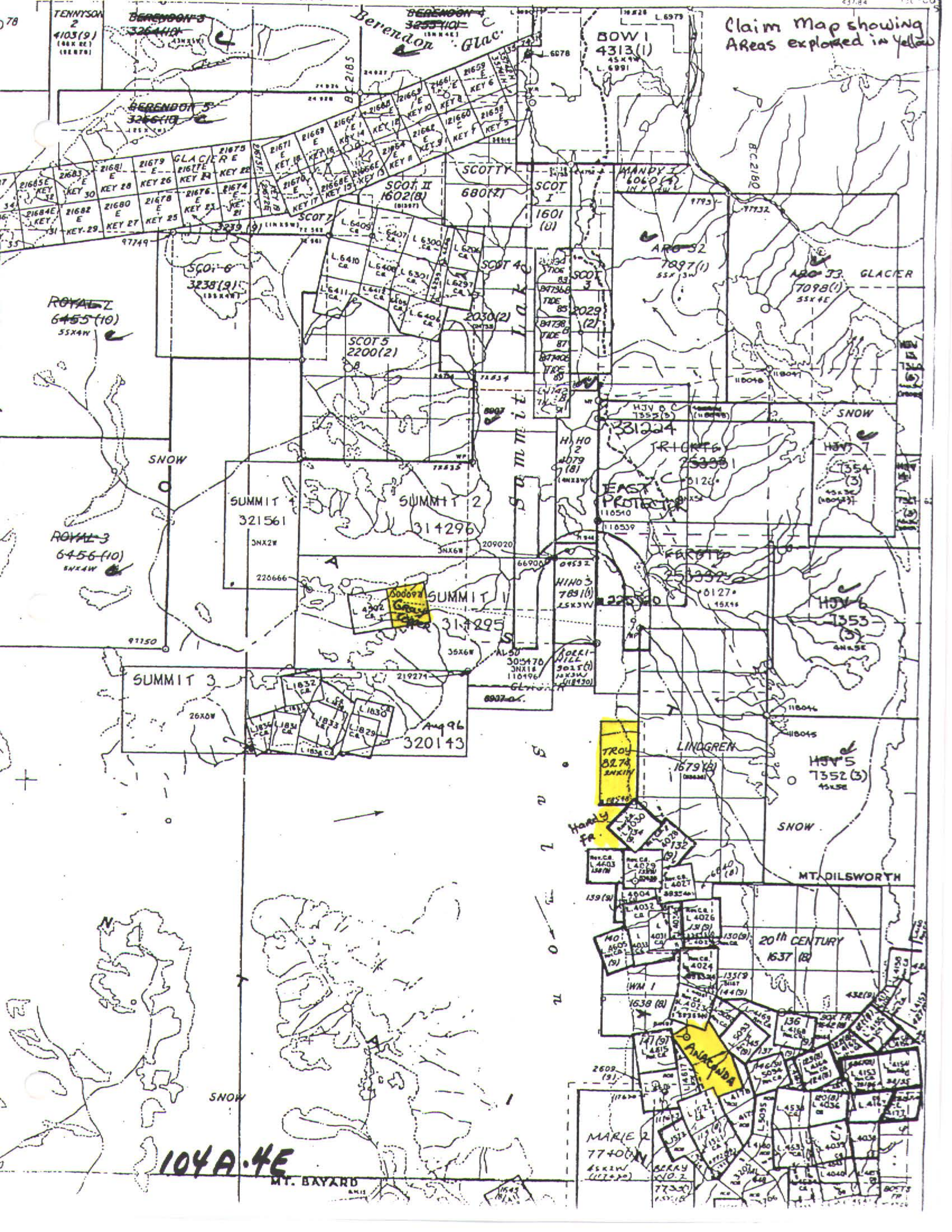


Taken From Old Crawn Grant Survey map.

Location of Harvy FR
Big Missouri Ridge

Troy Mineral Claim
Prospecting Open Ground South of the Troy Mineral Claim.





Claim Map showing Areas explored in Yellow
BOW 1 4313(1)
BERENDON 3 3264(10)
BERENDON 4 3255(10)
BERENDON 5 3266(10)
Berendon Glac.
TENNYSON 2 4103(9)
GLACIER E
SCOT II 1602(8)
SCOTTY 680(7)
SCOT I 1601(U)
MANDY I 6060(4)
ARO 32 7097(1)
ARO 33 7098(1)
GLACIER
SCOT 6 3238(9)
ROYAL 2 6455(10)
SCOT 4 2030(2)
SCOT 3 2029(2)
SCOT 5 2200(2)
SCOT 7 3239(9)
HJV 8 7355(3)
331224
HJV 7 7354(3)
SNOW
SUMMIT 4 321561
SUMMIT 2 314296
HIHO 2 4079(8)
EAST PROTECTOR
ROYAL 3 6456(10)
SUMMIT 1 314295
HIHO 3 7891(1)
HJV 6 7353(3)
Summit Lake
SUMMIT 3
Aug 96 320143
TROY 8274
LINDGREN 1679(8)
HJV 5 7352(3)
Hardy Fr.
MT. DILSWORTH
20th CENTURY 1637(8)
WM 1 1638(8)
ANACONDA
MARIE 2 7740(1)
BERRY No. 2
104A·4E
MT. BAYARD

CIM Operating Techniques

Stop screening — start digging!

Although mineralization found on the Silidor outcrop contained only 2% to 3% sulphides, the Beep Mat could detect it.

Description of the Instrument

The Beep Mat was created to detect conductive or magnetic outcrops or boulders hidden under up to five feet of overburden. This electromagnetic survey instrument consists of a unicoil inserted in a polyethylene shell and a separate readout module. A microprocessor analyzes and signals underlying conductors by an alarm and a digital display. Its limited depth of penetration is actually an advantage as it allows one to select the shallowest spots to dig, identify and sample hidden underlying conductors.

The 1990 model is 3 to 10 times more productive than previous models, thanks in part to its active electronic shield (patent pending) which increased markedly its penetration.

Efficiency of Sulphide Detectors

In this period of recession and budget restrictions, it is more important than ever to optimize the efficiency of your exploration program. The Beep Mat may be your ally! In 1990, even with six corporate customers, there were often less than 10 Beep Mats in use on any one day. Yet, these few instruments allowed to localize, then dig or blast out, assay or examine over a thousand conductive sites! Each of these sites was underlain by a sulphide or graphitic bedrock conductor or boulder. In some areas, barren sulphides were the rule, in others, ore grade showings were uncovered.

From the size of the crews using Beep Mats, it is estimated that during the 1990 season, the cost of examining a conductive site averaged $500, including assays. Of this amount, the expenditure for the Beep Mat was less then $50. And yet, in 1990, Beep Mat allowed users to examine as many conductive sites (occurrences) as all the wildcat drill holes and trenches of all other exploration methods either in Ontario or Quebec, while spending only 2% to 3% of the budget of their competitors.

Even if a drill hole may discover ore under a barren surface sulphide conductor, the odds of discovering a mine are much better if one begins by drilling those conductors which are also ore-bearing on the surface. In Canada, there are millions of surface conductors that can be inexpensively sampled with a Beep Mat. Hundreds and even thousands of these probably occur and could be sampled and assayed with a modest budget.

Examples of the 1990 Field Season

In northern Ontario, two crews working for Granges Inc. used three Beep Mats to locate anomalous sites identified by an airborne EM survey. These anomalies had been detailed by MaxMin on cut lines and their axes were traced out with the Beep Mat. Gaining experience with the instrument in this "gridded" area, surveying was extended along strike where claim lines were used as control and additional airborne EM anomalies were located, blasted and sampled. Considerable cost and time were saved and confidence

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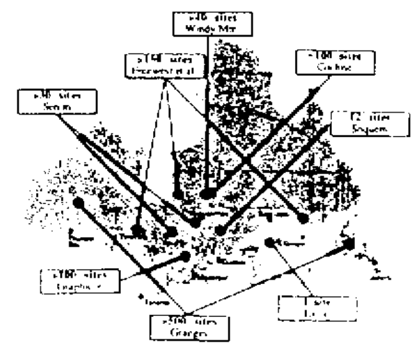
STOP SCREENING - START DIGGING!

1990 BEEP MAT SAMPLING



Successes of sulfide detectors herald the dawn of a new era in Canadian exploration

In 1975, Edwin Gaucher, Eng., Ph.D., published in the CIM Bulletin an article entitled Stop Screening - Start Drilling. Sixteen years later, as consultant and geophysical contractor, the author proposes an even more effective approach to exploration. As approximately a third of Canada is covered by shallow till (zero to 1,5 meters) overlying unaltered bedrock, a sulfide detector, such as the Beep Mat, allows to sample by digging tens and even hundreds of sulfide occurrences for the cost of a single drill hole. The purpose of the game is to find mines, not to screen anomalies, and the cheapest ones to find are near the surface. The Beep Mat is a return to traditional prospecting values which discovered most Canadian mining camps.

Getting information on the Beep Mat

If you need information or help with your Beep Mat surveys, contact GEOSIG INC., (418) 877-4249/659-3513, a service group headed by the author, or the following contractors who have successfully run Beep Mat surveys: Bedrock Consulting Inc., G.L. Geoservice Inc., Natives Exploration Services, Nord-Fort Enr., Norwin Geological Ltd. and W.E. Holmstead & Ass. Inc.

We hope to meet all interested parties before or at the Prospectors and Developers convention in Toronto, where we will have an exhibit in the Territories Room, booh 98. For all firm orders for Beep Mats (rental or purchase) received before March 30th, we will absorb the GST and any applicable provincial tax. Some detailed maps of case histories are available on request.

GDD Instrumentation GDD Inc.
3700, boul. de la Chaudière
Sainte-Foy (Québec) G1X 4B7
Tel: (418) 877-4249
Fax: (418) 877-4054

Circle No. 14 on Reply Card

in the method was increased as a result of the large number of samples collected per airborne anomaly.

For Cochise, in central Quebec, a crew of 14 geoscientists and helpers from Norwin Geological had to evaluate, in a one-month period, 59 airborne EM anomalies within a 935 km² property which had previously been covered by a 7600 line-km helicopter EM survey. Approximately 45 EM anomalies were evaluated using three VLF, eight Beep Mats, geological mapping, prospecting, trenching and sampling using shovels and dynamite. The Beep Mats contributed by identifying over 100 conductive sulphide occurrences mostly hidden by overburden in the vicinity of all the anomalies evaluated. In addition to checking the 45 EM airborne anomalies, the helicopter-supported crew from Norwin managed to prospect the extension of the favourable horizon previously drilled out by Windy Mountain with Beep Mats. Thus, a spectacular high-grade copper showing not detected by the airborne survey was discovered.

The six other Beep Mat users of last summer verbally reported that many conductive sites were discovered with several mineralized showings and favourable geological horizons such as exhalites. In two specific instances, the Beep Mat contributed to localize the bedrock source of two previously defined copper-rich float trains, one already drill-tested.

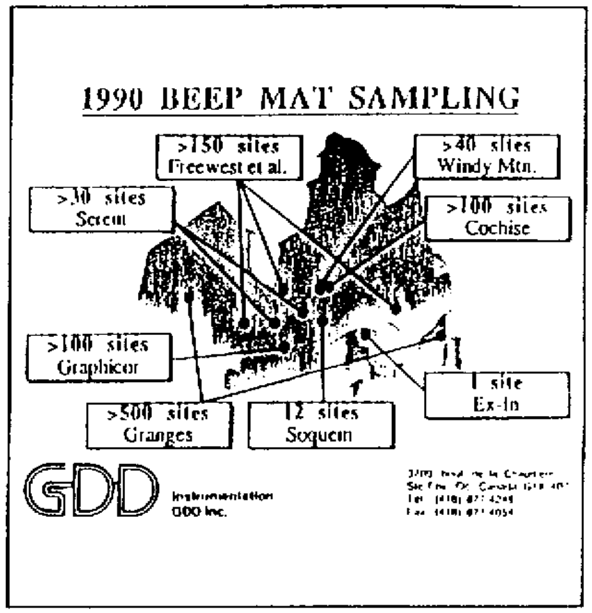
Applications of the Beep Mat

Within 1.5 m from the surface, the instrument can easily detect most sub-surface massive sulphides and base metal graphite occurrences, either in bedrock or as floats. In can also help prospect for gold! It has detected shallow but hidden quartz veins containing minor sulphide veinlets, some of which did not even react to I.P. surveys, e.g. Beep Mat tests signaled conductors over the sub-outcrops of the Sillidor and New Pascalis mines. Samples of sulphide-rich veinlets from Doyon and Belmoral mines also reacted. Over porphyric-copper type mineralization, Beep Mats often detect sulphide veinlets.

Action Plan

Most companies have properties on which past surveys have indicated numerous geophysical and other geoscientific anomalies. Beep Mats can be especially effective if present anomaly compilations are combined with maps showing depth of overburden. It is possible to outline areas of shallow overburden and of till particularly favourable for Beep Mat prospecting by satellite imagery, aerial photography and topographic maps. In many mining areas, the Quebec Forestry Department has already published overburden depth maps.

STOP SCREENING START DIGGING



"Successes of sulphide detectors herald the dawn of a new era in Canadian Exploration"

The BEEP MAT was created to efficiently and inexpensively detect conductive outcrops, magnetic outcrops or boulders hidden under, up to, five feet of overburden. This electromagnetic survey instrument consists of a unicoil inserted in a polyethylene shell and a separate readout module. A micro processor analyses and signals underlying conductors by an alarm and a digital display. Its limited depth of penetration is actually an advantage as it allows one to identify the shallowest spots to dig, identify, and sample hidden underlying conductors.

From the size of crews using BEEP MATS it is estimated that during the 1990 season, the cost of examining a conductive site averaged $500.00 including assays. Of this amount, the expenditure for the BEEP MAT was less than $50.00. In 1990 BEEP MAT allowed users to examine as many conductive occurrences as all the wildcat drill holes and trenches of all other exploration methods in Ontario or Quebec while spending only 2% to 3% of the budget spent by competitors.

The new model used during 1990 was 3 to 10 times more productive than previous ones, partially because of its active electronic shield, which markedly increased penetration. The 1991 model will integrate even further improvements.

If you need information about or help with your BEEP MAT surveys contact GEOSIG INC (418) 877-4249/659-3513; or the following contractors who have successfully run BEEP MAT surveys: Bedrock Consulting Inc.; G.L. Geoservice Inc; Natives Exploration Services; Nord-Fort Enr; Norwin Geological Ltd; and W. E. Holmstead & Associates Inc.

INSTRUMENTATION GDD Inc.

NATIVE EXPLORATION SERVICE

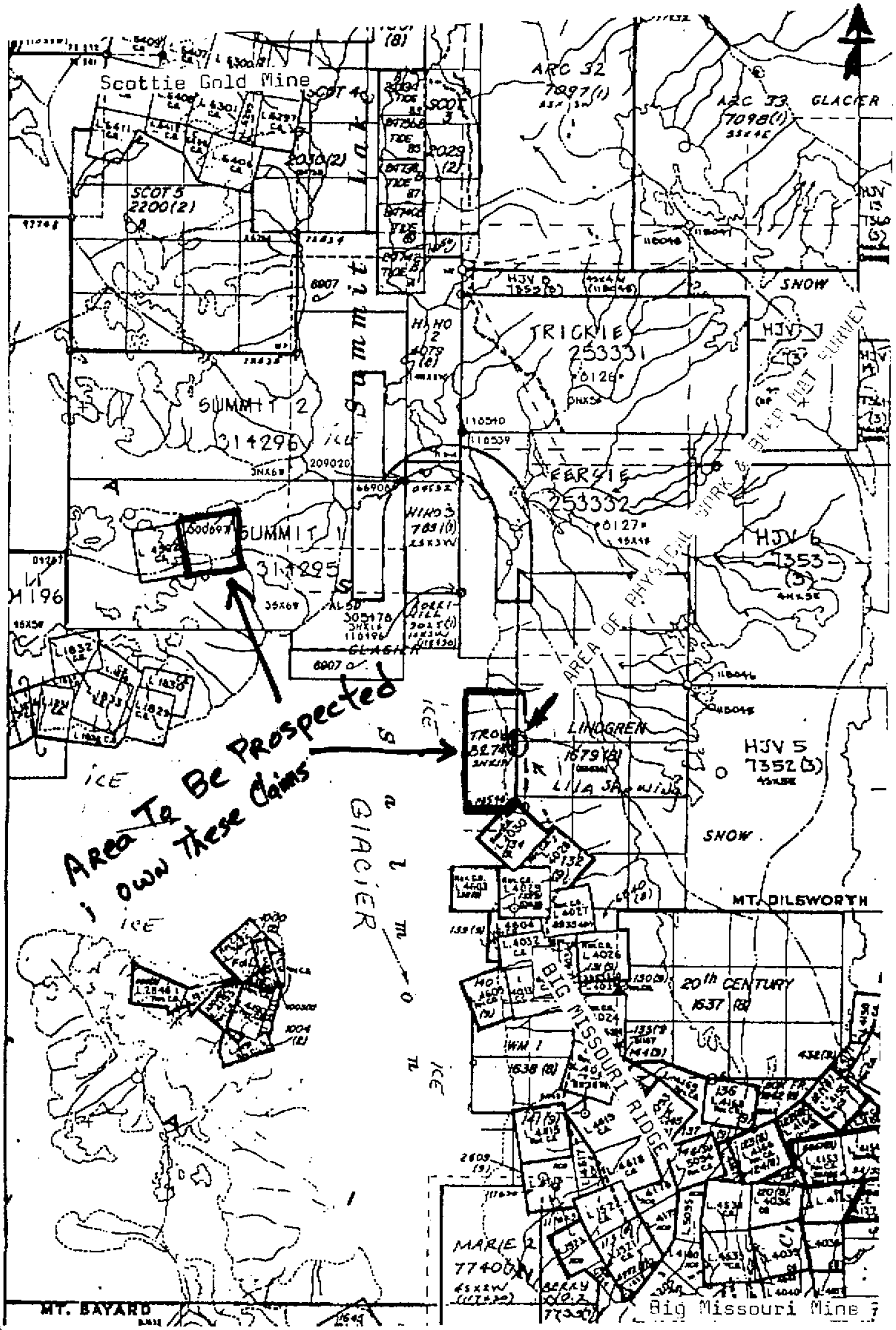
GEOSIG Inc.

3700 boul. de la Chaudiere, Ste-Foy, Quebec G1X 4B7

Tel.: (418) 877-4249 – Fax: (418) 877-4054

MAP - A

MINERAL CLAIM LOCATION MAP M - 104 B/ 1 E



MAP - A

MINERAL CLAIM LOCATION MAP   M - 104 B/ 1 E

104 B · 1E