LOG NO: 0219	RD.
ACTION:	
FILE NO:	

GEOLOGICAL, GEOCHEMICAL, and GEOPHYSICAL REPORT

FILMED

on the

MARBLE 1-5 CLAIM GROUP

Vancouver Mining Division
NTS: 92J/3

Longitude: 123 05.5′ Latitude: 50 00.5′

By

Jim Cuttle, B.Sc , F.G.A.C
#103 1612 St. Georges Ave,
North Vancouver,B.C.
V7L 3J7

TABLE OF CONTENTS

	page
SUMMARY	iii
INTRODUCTION	1.
LOCATION, ACCESS, and GEOGRAPHY	1.
PROPERTY STATUS	1.
AREA HISTORY, REGIONAL GEOLOGY, and MINERALIZATION	2.
PROPERTY GEOLOGY, and ECONOMIC INTEREST	6.
PROPERTY SURVEYS and DISCUSSIONS	8.
Prospecting	8.
Rock Geochemistry	8.
VLF-EM-16 Survey	9.
Resistivity Survey	10.
CONCLUSIONS	10.
REFERENCES	11.

APPENDICIES

Appendix A	Cost Breakdown of Fieldwork
Appendix B	Rock Sample Locations
Appendix C	Rock Geochemical Results
Appendix D	VLF-EM-16 Field Data
Appendix E	Resistivity Field Data
Appendix F	Resistivity Interpretation Data
Appendix G	Statement of Qualifications

LIST of FIGURES

		after page
Figure 1	General B.C. Location Map	1.
Figure 2	Claim Location Map (1:100,000)	1.
Figure 3	Detail Claim Map (1:50,000)	1.
Figure 4	General Geology (1:20,000)	6.

LIST of MAPS

Figure 5	Rock Geochemistry with grid VLF (Seattle) (Au, Ag,)	8.
Figure 6	Grid VLF-EM-16 Survey (Cutler)	9.
Figure 7	Grid Resistivity Survey	9.
Figure 8	Property Compilation	9.

The Marble 1-5 claims, located in the Vancouver Mining Division, includes 44 adjoining units staked and recorded in April, 1987. The property itself is 115 kilometers north of Vancouver via highway #99 and consists of numerous secondary roads throughout its boundaries.

The claims are part of the Coast Plutonic Complex and are underlain by a package of Lower Cretaceous volcanic and volcanoclastic roof pendant rock. Surrounding the volcanics are a series of Cretaceous and Tertiary diorite and quartz diorite intrusives. Age dating has suggested similarities in time to that of the Britannia roof pendant.

Two mining camps are located in the area, all within the volcanic pendant rock. The Northair Mine, approximately 13 kilometers to the north of the Marble claims, was an important gold silver producer between 1976 to 1982. After mine shutdown indicated reserves are presently at 65121 tons (Mines Handbook, 1986-1987) grading 0.265 oz/ton Au, 0.78 oz/ton Ag, and approximately 2% combined lead zinc. The Brandywine camp, located 8 kilometers to the north northwest of the property, has several massive sulphide and gold quartz vein prospects. Values in grab and chip samples have been found up to 0.4 oz/ton Au, 2.0 oz/ton Ag over widths of 2 feet. Numerous other zones have been isolated with similar values.

The 1987 program on the Marble claims included prospecting, rock sampling, VLF, and resistivity surveys. The work isolated three prominent areas. Two main converging northerly trending shear zones traced over 800 meters (2625 ft), returned values up to 0.878 oz/ton Au, 2.51 oz/ton Ag and 1.46 oz/ton Au, 1.4 oz/ton Ag, located in silicified intrusive and quartz veins respectively. East west quartz vein tension gashes very probably related to the main shears, returned values of 2.42 oz/ton Au, 3.21 oz/ton Ag. A third area located approximately 700 meters (2300 ft) to the east of the northerly shear returned grab samples and chip samples of 1.41 oz/ton Au, 3.58 oz/ton Ag and 0.10 oz/ton Au, 0.12 oz/ton Ag over 1.0 meter respectively. These zones had previously never been discovered in recorded literature.

The subject property confines approximately 3.5 kilometers of the main shear zone and it is strongly believed this shear has excellent potential for remobilized precious metal vein type mineralization.

INTRODUCTION

The Marble 1 - 5 claim groups consist of 44 units, and are owned by J. Cuttle of #103-1612 St. George's Ave. N. Vancouver, B.C. V7L3J7.

Exporation was carried out during selected times in March, April and August of 1987, and included property prospecting, rock sampling, VLF-EM-16, and resistivity. A total of 85 rock samples were analyzed for Au, Ag, (Pb,Zn,Cu) and approximately 3.5 kilometers of VLF and 3.0 kilometers of resistivity were preformed over prospective areas.

The work and results described within this report are intended to fulfill assessment requirements for the Marble 1 - 5 claims groups.

LOCATION, ACCESS, and GEOGRAPHY

The Marble claims, found in the Vancouver Mining Division on map sheet number 92J/3, are 115 kilometers north of Vancouver and approximately 13 kilometers southwest of Whistler. The property bounds the eastern edge of Daisy lake.

A major logging road running through the center of the claim group is accessible by the main Vancouver/Pemberton highway # 99 just north of Callaghan Creek. New and old logging operations throughout the property have left a network of smaller roads driveable with the use of both two wheel and four wheel drive trucks. The main logging road is presently being kept open year round due to active forestry work on and around the property.

The area commonly receives 250 cms (100 inches) of annual precipitation of which 40% is snow. From field work experience depth of snow varies greatly with elevation, although the property itself lies between 500m - 1000m (1640 -3280 ft), it can conceiveably be worked from April to December. The area is presently 40% logged and is characterized by rugged northerly trending cliffs and steep depressions offering roughly 20% rock exposure.

PROPERTY STATUS

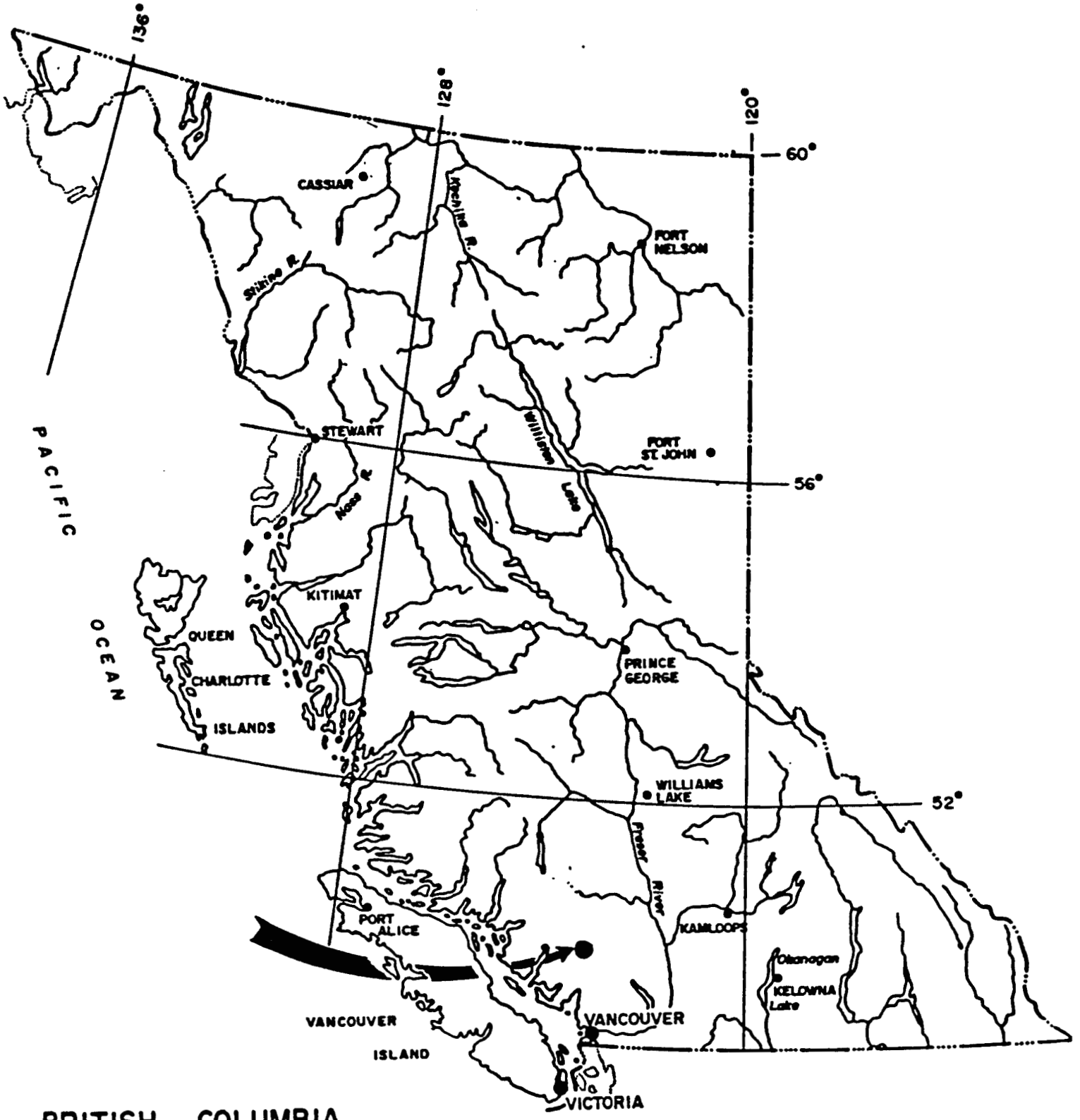
The claims include five different groups (Marble 1-5), totalling 44 units in all, located in the Vancouver Mining Division. The eastern and southern boundaries of the claim are bounded by Garibaldi Park, while the western edge runs along Daisy Lake. The group is overlapped by the Helpful claim to the north.

ARIS SUMMARY SHEET

District Geologist, Victoria — Off Confidential: 89.02.12

ASSESSMENT REPORT 17079 — MINING DIVISION: Vancouver

PROPERTY: Marble
LOCATION: LAT 50 01 04 LONG 123 06 06
UTM 10 5540393 492716
NTS 092J03E
CLAIM(S): Marble 1
OPERATOR(S): Cuttle, J.F.
AUTHOR(S): Cuttle, J.F.
REPORT YEAR: 1988, 62 Pages
COMMODITIES
SEARCHED FOR: Gold,Silver,Copper,Lead,Zinc
GEOLOGICAL
SUMMARY: The claims are underlain by a north-northwesterly trending sheared contact between Lower Cretaceous Gambier Group(?) volcanics and Cretaceous and Tertiary Coast Plutonic Complex quartz diorite. Overlying an area of the claim are Garibaldi Formation basalt flows. The sheared contact is highly altered and contains mineralized concordant and discordant quartz veins.
WORK
DONE: Geophysical,Geochemical
EMGR 3.5 km;VLF
REST 3.0 km
ROCK 85 sample(s) ;AU,AG,PB,ZN,CU

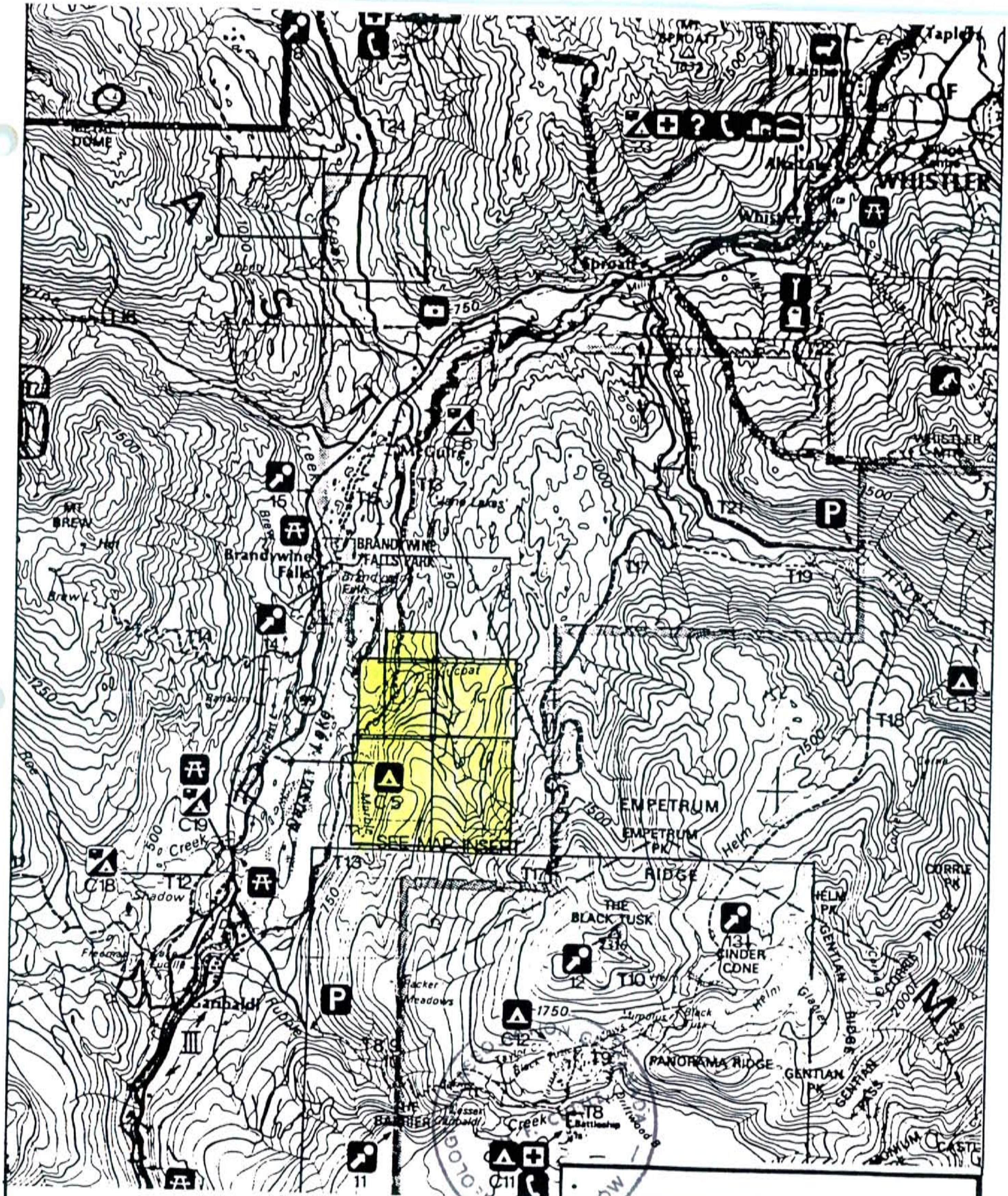


BRITISH COLUMBIA

Scale 1 : 7,500,000 approx.

General Location Map

	By: J. CUTTLE	Figure: 1
	Drawn:	
	Date: October 1987	



Scale

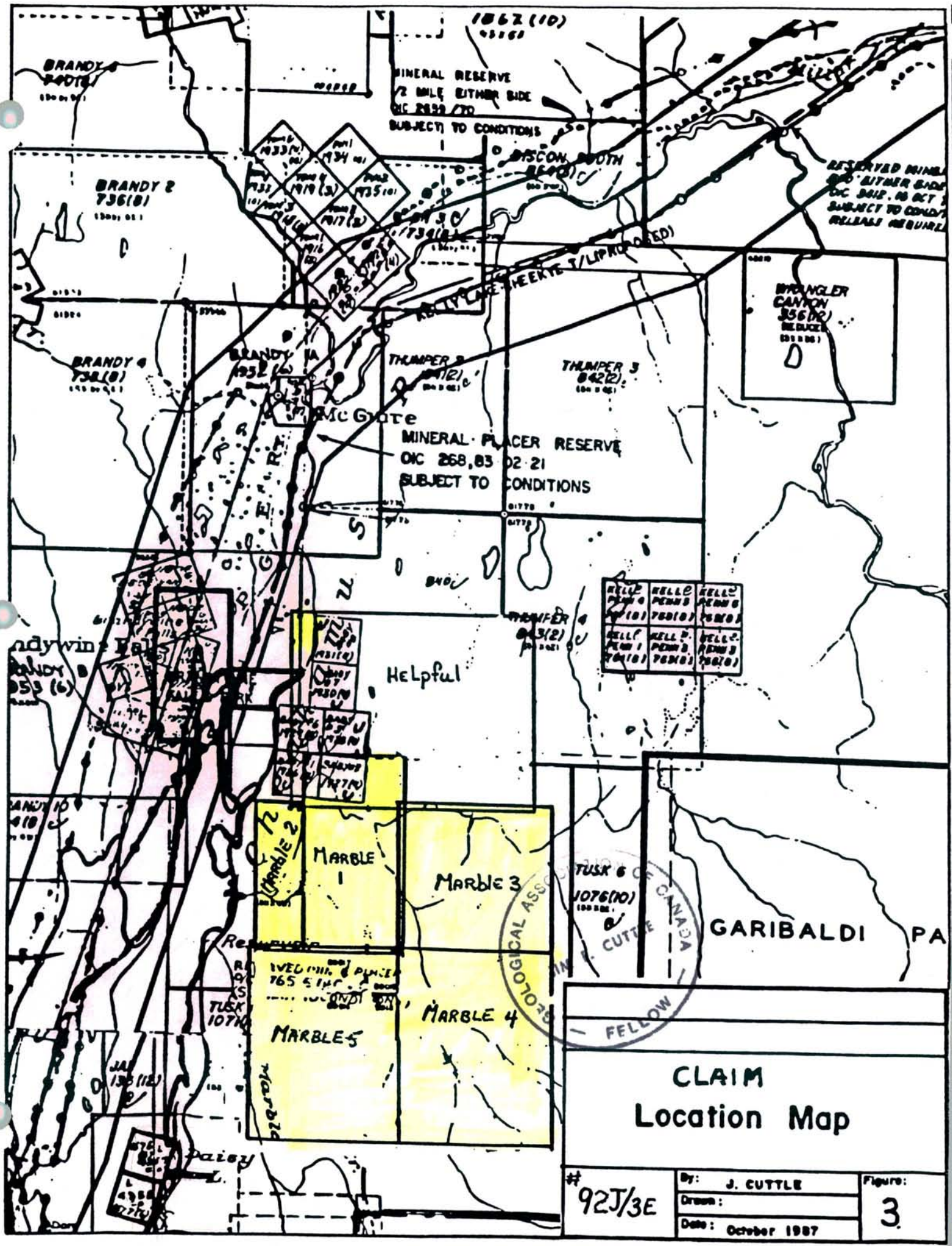
0 1 2 3 4 5

1:100,000

CLAIM

Location Map

By:	J. CUTTLE
Drawn:	
Date:	October 1987
Figure:	2.


MINERAL RESERVE
SUBJECT TO CONDITIONS
BRANDY 2
BRANDY 4
McGuire
MINERAL PLACER RESERVE
SUBJECT TO CONDITIONS
THUMPER 3
Helpful
MARBLE 1
MARBLE 3
MARBLE 4
MARBLE 5
GARIBALDI
CLAIM
Location Map
#92J/3E
By: J. CUTTLE
Drawn:
Date: October 1987
Figure: 3

Claim	Record #	# of units	Recording date
Marble 1	2085	8 (4s x 2e)	March 11,1987
Marble 2	2086	3 (3s x 1w)	March 11,1987
Marble 3	2111	9 (3n x 3e)	April 14,1987
Marble 4	2112	12(4s x 3e)	April 14,1987
Marble 5	2113	12(4s x 3w)	April 14,1987

The claims were staked and are presently owned by J. Cuttle. The claims have all been grouped and with the submission of the 1987 field work will be in good standing until their anniversary dates in 1989.

AREA HISTORY REGIONAL GEOLOGY and MINERALIZATION

The earliest recorded work in the area dates back to 1917 when prospectors first located veins with precious and base metal values in the Brandywine Creek area. Various mineral groups such as the AMADRA, BRANDYWINE, BLUEJACK, ASTRA, and FITZSIMMONS were staked along with numerous other small groups. Sporadic interest continued through the years in areas such as these and others such as the east side of Daisy Lake (VENETIAN, NANI, DAISY) and in the vicinity of Highway #99 in the Alta Lake area. In 1969, a Vancouver dentist prospecting along Callaghan Creek isolated mineralized float in conjunction with anomalous stream sediment samples. Lead-zinc-copper mineralization was later isolated in outcrop during the 1970 summer and later trenching exposed what is known today as the Manifold Zone. Two other zones (Discovery and Warman) were also found, and the three combined gave birth to the Northair Mine.

Regionally the area is underlain by volcanic and sedimentary rocks of the Callaghan Creek roof pendant. This pendant forms one of the many volcano/sedimentary roof pendants found within the Coastal Plutonic Complex of British Columbia and correlates similarily to the age and formation of the Gambier Group Britannia Mine roof pendant. Associations of the Callaghan Creek roof pendant to the Cheakamus and Fire Lake Groups have also been suggested but confirmation is still in doubt. A K/Ar date of 127±4 Ma on hornblende on a possible zone within the Callaghan Creek pendant suggests a lower Cretaceous age for the volcanics (Miller,1978). Surrounding the pendant rocks is the Coast Plutonic Complex of Cretaceous and early Tertiary diorite, quartz diorite, and quartz monzonite. Overlying these units are local Pleistocene mafic and felsic volcanic flows of the Garibaldi Group. Regionally the Callaghan Creek pendant rocks can best be described by Miller (1978) in increasing order of age as follows:

GARIBALDI GROUP

Olivine basalt occurs as a sequence of flows which are medium mauve-brown amygdaloidal, porphyritic, and exhibit a well developed columnar jointing.
Equigranular rhyodacite is a pale pink to tan, fine grained to aphanitic, and equigranular. This rock unit occurs in elongate north south pods, as dykes and, locally as blankets capping feeder dykes.
Porphyritic rhyodacite is a pale pink to tan colour with phenocrysts of (in decreasing order of abundance) quartz, plagioclase, sanidine, and biotite. These phenocrysts constitute about 50 % of the rock. This rock unit is similar in occurrence to equigranular rhyodacite mentioned above.
Epiclastic breccia has a dark grey to black, aphanitic matrix which averages 40% and supports fragments of quartz diorite (60%) and basalt (40%). The fragments are angular to subangular and generally spherical in shape.

COAST PLUTONIC COMPLEX

Quartz diorite is fine to medium grained and pale to medium greygreen with a typical granitic texture. Quartz constitutes about 16 % of the rock.
Hornblende diorite is generally medium grained and medium grey-green with a granitic texture. Hornblende composes approximately 20% of the rock.
Granodiorite is medium grained with anhedral patches of salmon pink perthite interrupting the monotony of an otherwise pale grey-green rock. The rock has a granitic texture with potassium feldspar comprising approximately one-fifth of the rock.

GAMBIER GROUP EQUIVALENT(?)

Andesitic agglomerate has a fine grained, dark grey-green tuffaceous matrix, averaging 40 volume percent. Fragments are porphyritic andesite (70%), equigranular andesite (22%), porphyritic dacite (5%), sandstone (2%), and equigranular dacite (1%). Fragments are rounded to subangular, ovoid, and up to 70 cms in diameter.
Epiclastic volcanic breccia has a fine-grained black matrix, comprising an average of 15% of the rock unit. Porphyritic andesite (38%), andesitic crystal tuff (32%), equigranular andesite (20%), equigranular dacite (8%), siliceous (1%), and glass (1%) are the remaining fragments. Fragments are angular to subangular, elongate; they have an average diameter of 3 cms but range up to 30 cms.
Arkosic wacke and minor amounts of interbedded mudstone are pale to medium grey and brown and coarse to fine grained. Poorly developed crossbedding and graded bedding indicate stratagraphic tops are to the east.

Andesitic crystal tuff has an aphanitic, dark grey matrix surrounding broken clasts of subhedral zoned plagioclase. These clasts comprise an average of 25% of the rock but may vary from 20 to 40 percent over a distance of 8 cms. Clasts of plagioclase average 0.8 mm in length.

Matrix supported dacitic agglomerate is a massive, epiclastic rock consisting of 50% medium grey-green matrix and 50% medium to light grey-green, dacitic to rhyodacitic fragments. The fragments are subangular, elongate, and up to 30cms in length. Cross bedding and graded bedding observed in the basal section of this unit indicate that stratigraphic tops are to the east.

Siliceous siltstone is very fine grained and dark grey. It occurs as pods within the matrix supported dacitic agglomerate, sandstones, and siltstones.

Tuffaceous sandstones and siltstones contain interbedded, very fine grained dark grey siltstones, pale brown arkosic wackes, and minor amounts of very fine grained rhyolite tuffs. Wackes comprise 70% of the unit; siltstones make up 25%.

Andesitic crystal tuff is a dark grey fine grained rock containing abundant subhedral, zoned plagioclase clasts and less abundant subhedral hornblende clasts. The clasts average 1 cm in length and generally comprise approximately 20% of the rock. Small hornblendite dykes crosscut southern exposures of andesitic crystal tuff and are assumed to represent a feeder zone. Hornblende within the dykes has a K/Ar model age of 127±4 Ma.

Andesitic agglomerate is a massive, epiclastic rock containing 30% dark grey-green matrix; the remainder is composed of dark grey-green, porphyritic fragments and slightly less abundant medium grey-green, dacitic fragments. The fragments are well rounded to subangular, are commonly ovoid in shape, and are up to 1 meter in diameter.

Greenstone is dark grey-green, fine grained, well sheared, and primarily andesitic in composition.

Marble occurs as several moderately sheared pods that are interbedded with greenstone and chert layers, varying from 1mm to 1 meter in thickness.

The volcanic rocks have been metamorphosed to greenschist facies, characterized by the occurrence of actinolite, epidote, zoisite, chlorite, biotite, and albite. North northwesterly trending schistosity is commonly subparalell to bedding in the volcanic rocks with near vertical dips. Miller (1978) has indicated with the use of sedimentary structures that units young to the east. Unit contacts, noteably the pendant contacts are generally sharp and are commonly associated with narrow shear zones subparalell to foliation.

Important to note regionally is all orebodies presently known in the area are restricted to particular units within the volcanics rocks, which inturn offers excellent advantages for mineral exploration. The following are descriptions of known occurrences:

The Brandywine Camp (Silver Tunnel, Millsite, Tedi-Pit, Zone 4)

Located 8 kilometers northwest along strike of the Marble claims, these old showings have extensive history for volcanogenic massive sulphide (Pb,Zn,Cu) and high grade gold silver base metal quartz veins. Presently Silver Tusk Mines of Vancouver own 100% interest in the properties. These ore bodies are confined to lense like satellite pendants of the main Callaghan roof pendant. They include greenstone, andesitic volcanics, marbles, and intrusive hornblende diorite. These rock units are considered the oldest within the volcanic package.

The Silver Tunnel(Blue Jack) occurs as sulphide minerals in veinlets crosscutting the host greenstone. Ore also occurs as massive sulphide formed parallel to foliation (Miller,1978). Previous recorded values from field work are as follows:

open cut 1	0.24 oz/ton Au ,	1.8 oz/ton Ag
open cut 2	0.20 oz/ton Au ,	2.4 oz/ton Ag
open cut 3	0.36 oz/ton Au ,	2.6 oz/ton Ag, 2.5%Pb

The Millsite showing is essentially a base metal (Pb,Zn,Cu) occurrence located within greenstone with associated nearby hornblende diorite. Small veinlets and stringers of sphalerite, galena, and chalcopyrite are commonly found within the greenstone.

The Tedi-Pit (Cambria and Astra)has four distinguishable rock units. The mineralized greenstone unit consists of both disseminated and massive sulphide zones of galena, sphalerite, pyrite, and chalcopyrite. Meta dacite, hornblende diorite, and rhyodacite dykes are also closely associated with the ore. Small amounts of mineralized (Pb,Zn,Cu) fault breccia have been isolated in the Tedi-Pit but remain limited in strike length.

Width	Au oz/ton	Ag oz/ton	Pb	Zn
15 ft chip	0.4	2.0	2.6%	4.0%
75 ft chip	tr.	1.5	1.4%	4.0%

(after Marton,1978)

Other chip samples from underground workings have yielded similar values as above.

The Zone 4 showing is very possibly a replacement base metal occurrence (Zn,Pb,Cu) located within a pod of marble surrounded by massive greenstone. Limited work has been done on this showing.

The Northair Camp (Warman, Discovery, Manifold)

Located 13 kilometers north of the Marble claims, the Northair mine first began producing ore in 1976 at a rate of 300 tpd. Reserves as of May,1977, were estimated at 330,637 tons (Ditson) averaging 0.4 oz/ton Au, 4.6 oz/ton Ag, 2.7% Pb, and 4.0 % Zn. After mine closure in 1982 reserves are presently 65121 tons averaging 0.265 oz/ton Au, 0.78 oz/ton Ag, and 2% combined Pb,Zn (Gardner,1986).

The ore body is confined to the upper units of the Callaghan Creek roof pendant. It strikes south southeasterly and is confined to quartz and quartz carbonate veins within andesitic agglomerate and volcanic breccia. It has been suggested these deposits formed originally as distal volcanogenic ore bodies and were later partially remobilized into crosscutting vein structures. High level hydrothermal (?) precious metal mineralization may have accompanied the remobilization during Tertiary times.

Drill indicated grades from 1976 (after Ditson) are as follows

	Cu	Pb	Zn	Au oz/ton	Ag oz/ton
Discovery Zone	0.55%	5.4%	6.5%	0.10	1.18
Warman Zone	0.24%	1.4%	2.4%	0.68	0.85
Manifold Zone	0.07%	0.3%	0.5%	0.28	14.48

Daisy Lake (Venetian,Nani,Daisy)

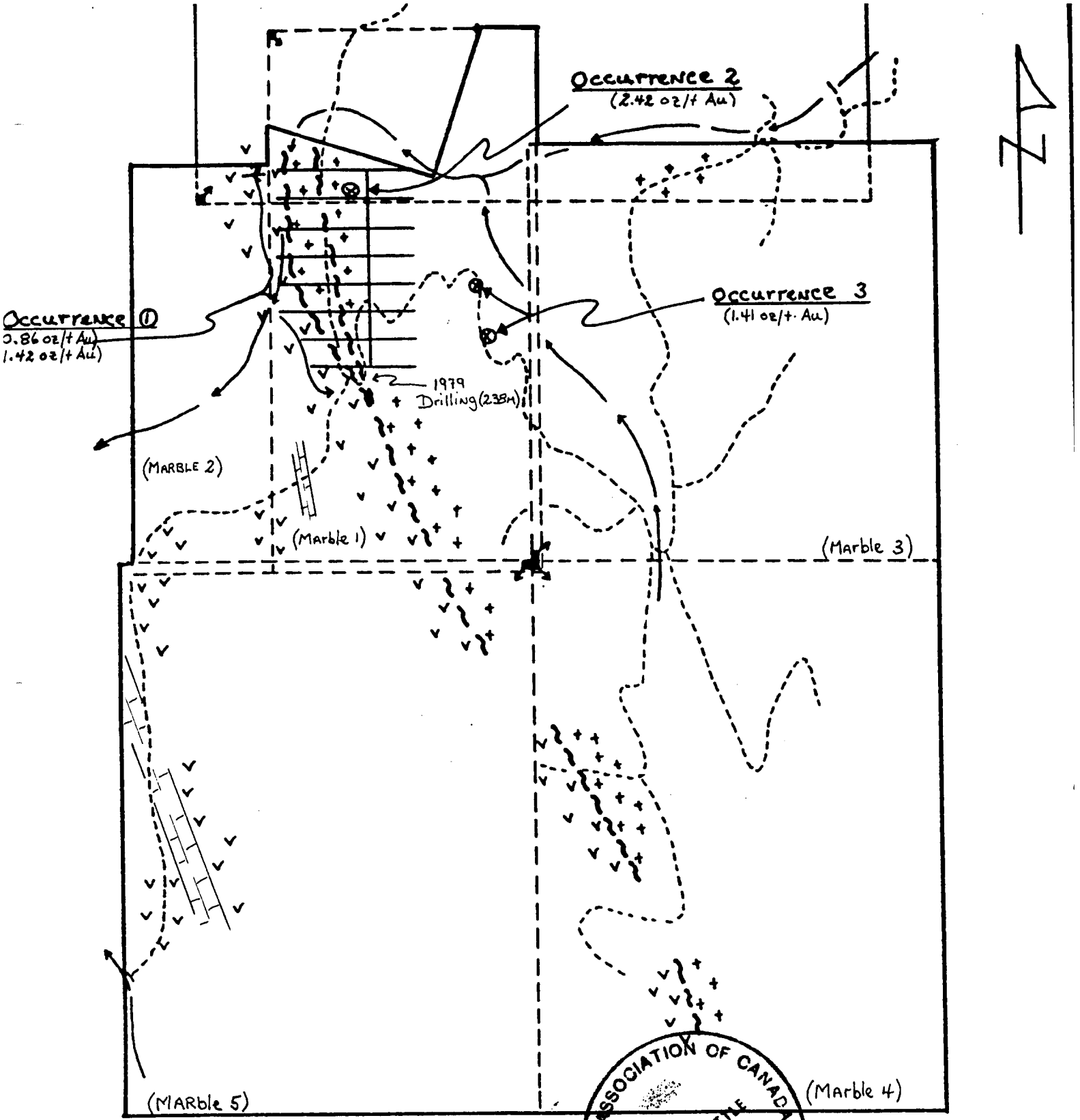
These old showings and adits are located approximately 800 meters southwest of the southwest corner of the Marble #5 claim. Work dates back to 1917 and very possibly earlier. The adits are covered by two crown grants with lot numbers #4357 and # 4358. Property descriptions are best described by Camsell (1917) as follows:

> "Several mineral locations have been made on the east side of Daisy Lake, but the only important deposits seem to be on the Venetian group which is 750 ft above the lake. Sandstone, slate, and some limestone north 30 degrees west and dipping at high angles, are traversed by a quartz vein striking north 75 degrees west and dipping southward 20 to 35 degrees. The vein is very irregular in size and pinches and swells from a few inches up to 15 feet. The ore minerals are mainly pyrite and chalcopyrite which occur more abundantly near the walls and along fractures in the quartz. The ore contains gold, silver, and copper and about fifteen tons of it have been picked and sacked for shipment. The owners estimate this will average about $80 per ton in these metals. The vein is developed by an incline from the outcrop, 72 feet in length, and a crosscut tunnel 158 ft long which cuts the vein at a vertical depth of 40 feet below the outcrop."

PROPERTY GEOLOGY and ECONOMIC INTEREST

The claims were staked with the idea of covering a northerly trending sheared contact between Coast Plutonic quartz diorite and Gambier Group (?) mafic and intermediate volcanics. The contact is presently known to stretch 3.5 kilometers within the claims boundaries and it is this contact and neighbouring zones that have been found anomalous in gold and silver.

To the east of the sheared contact is a routine series of medium grained light grey-green quartz diorite with minor amounts of diorite and granodiorite. This unit presently covers



GEOLOGICAL ASSOCIATION OF CANADA
J. CUTTLE
FELLOW

General GEOLOGY Map

	By: J. CUTTLE	Figure: 4.
	Drawn:	
	Date: October 1987	

approximately half of the claim group (Marble 1,3,4) and is (7 exposed primarily in the north east sections of the claim. Schistosity trends between 155 degrees to 175 degrees and dips are steep to the east. Degree of schistosity becomes pronounced closer to the large sheared contact with the volcanics. Minor creamy aphanetec felsite dykes up to 3 meters wide following schistosity are found locally throughout the intrusive.

To the west of the sheared contact is a series of Gambier Group (?) bimodal volcanic and volcanoclastic rocks. Sequences of massive dark green mafic volcanic flows, with associated pods of marble up to 100 meters wide were isolated in road cuts on the Marble 1 and 5 claim. Intermediate volcanic tuffs (lapilli to agglomerate) with alternating thin felsic volcanic horizons have also been seen, generally overlying the main massive mafic volcanic units. Siltstone, cherts and tuffaceous horizons have been located on the Marble 2 claim although it is not sure where these rocks are located with respect to the remainder of the package.

The main sheared contact is made up of two southerly converging shears, one of which seperates the volcanics and intrusive and the second that parallels the first although found primary in the quartz diorite. Where the zones converge the shear has been visibly estimated at 60 meters wide. The two individual shears to the north are partically exposed and average from 10 - 15 meters in width. The shears are commonly associated with pinkish red carbonate weathering, chloritization, sericitization and silicification. Paralleling these sheared zones of weakness are small feeder dykes of young Pleistocene basalt related to the Garibaidi Group. These units pinch and swell along strike and average from 0.5 meters to 5 meters in width.

Three individual types of precious metal mineralization have been isolated on the property. Besides the fact of 238 meters of drilling in 1979, located to the south along the sheared contact, these showings are considered new. No visible fieldwork was seen nor was there any obtainable pubic data on the occurrences themselves. The main shear or converging parallel shears have been grid isolated from the northern boundary of the Marble 1 claim down to the south 800 meters (2500ft). These northerly trending zones range up to 15 meters on width and show a high degree of chlorite - sericite - silica + sulphide (py,cp) alteration. The westerly most shear is recognized as the contact shear between westerly mafic volcanic and easterly quartz diorite. The mineralized zone of interest is found in a creek bed primarily within the hanging wall quartz diorite. Values in a 15 cm chip along the creek band haved returned 0.878 oz/t Au,and 2.51 oz/t Ag. The sample was highly silicified, rusty,altered quartz diorite with 3% disseminated pyrite. A paralleling shear to the east of the creek on L-0+00, has similar mineralogy, although cross cutting vuggy micro quartz veins returned values up to 1.46 oz/t Au, and 1.4 oz/t Ag. The hanging wall of this zone is made up of long paralleling quartz veins up to 2 meters wide.

A series of paralleling east west "tension-gashes" (occurrence 2) returned values up to 2.42 oz/t Au and 3.21 oz/t Ag. These

are rusty quartz veins, possible related to the main shears that are found to pinch and swell from 15 cm to 2 meters. Dips are highly varible from 20 degrees to 70 degrees to the north. Mineralogy includes, pyrite, pyrrhotite, and chalcopyrite.

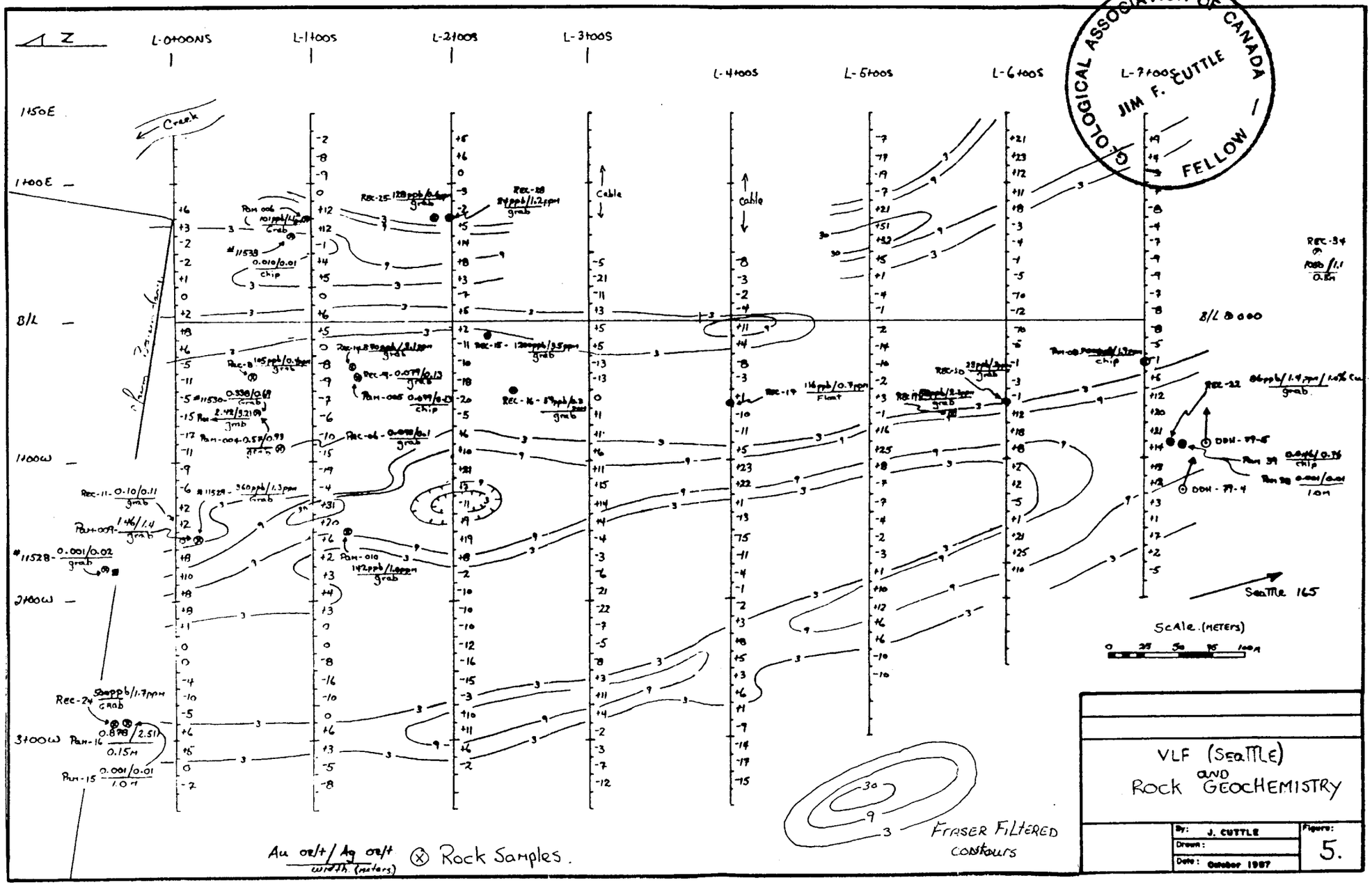
Along a newly exposed road outcrop in the eastern section of the Marble #1 claim is a northerly trending sugary quartz vein (occurrence #3). Value of 0.10 oz/t Au over 1.0 meter and grabs of 1.41 oz/t Au, 3.58 oz/t Ag have been obtained in sugary quartz veins with 10 per cent fine disseminated pyrite.

PROPERTY SURVEYS and DISCUSSION

Field work was limited to four basic types of exploration. Prospecting was needed first, to isolate perspective areas and secondly, to get a better understanding of the property geology. This method prompted various rock samples to be taked throughout the property. Positive results from rock geochemistry initiated a flagged and hip chain grid to be set up. The grid isolated the two main converging shears and the possible related " tensions-gashes". Approximately 3.5 kilometers of flagged profiles were run, along with 700 meters of baseline, from the northern boundary of the Marble 1 claim trending due south. All profiles were seperated by 100 meters with a flagged station separation of 25 meters. Both VLF-EM-16 and VLF-EM-16R (resistivity) further helped isolate the main shears where overburden proved to be a hinderence.

Prospecting: The prime concern during the field program was to prospect throughly the complete extent of the sheared contact of the pendant rock and intrusive suite. Any exposure of this zone should be examined for sulphide enrichment with crosscutting and paralleling quartz veins. It is believed that not only this zone but several possible paralleling zones, particularily in the quartz diorite, may exhibit mineralized precious metal quartz veins (occurrence #3). Assessment work including several unexplained I.P. anomalies are located in the northern part of the Marble #4 claim. These anomalies are coincident with Cu, Mo, Ag soil geochemistry. No analysis for Au was previously made.

Rock Geochemistry: Of the three zones isolated through prospecting occurrence #1 has the best potential for continued mineralized strike length. The two paralleling shears isolated with VLF returned selected values as follows:



Occurrence #1

(East shear)	Au	Ag	Location	Type
Rec 11	3500 ppb	3.7 ppm	L-0+15s,1+55w	grab sample
Pam 009	1.46 oz/t	1.40 oz/t	L-0+15s,1+55w	selected chip
Pam 19	0.027 oz/t	0.03 oz/t	L-1+50s,1+55w	0.6m chip
(West shear)				
Rec 24	500 ppb	1.7ppm	L-0+60n,3+00w	grab sample
Pam 16	0.878 oz/t	2.51 oz/t	L-0+60n,3+00w	.15m chip
(Main south shear)				
Pam 008	700ppb	1.9ppm	L-7+00s,0+25w	selected chip
Pam 39	0.046 oz/t	0.76 oz/t	L-7+25s,0+85w	grab
Rec 22	1.0% Cu		L-7+25s,0+85w	0.4m chip
Rec 34	1050ppb	1.1ppm	L-8+00s,1+00e	0.5m chip

Occurrence #2 located on the Marble 2 claims, and possibly formed as east west tension gashes related to the main shear, returned selected values as follows:

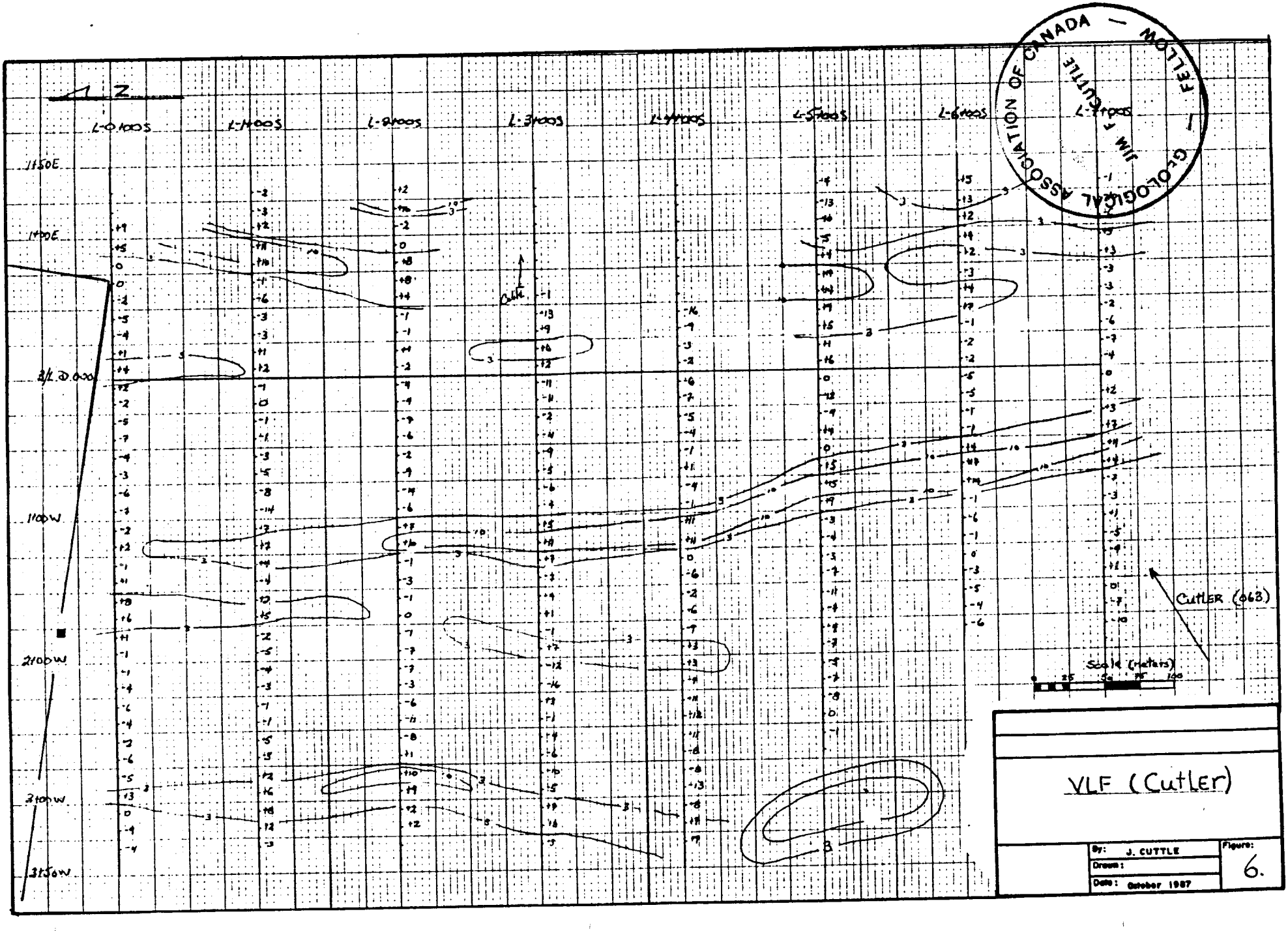
	Au	Ag	Location	Type
Rec 06	2550ppb	3.4ppm	L-0+75s,0+85w	grab sample
Rec 12	2.42 oz/t	3.21 oz/t	L-0+55s,0+65w	selected chip
#11530	0.338 oz/t	0.69 oz/t	L-0+55s,0+65w	selected chip
Pam 004	0.54 oz/t	0.93 oz/t	L-0+55s,0+65w	selected chip
Rec 09	2700ppb	4.6ppm	L-1+30s,0+40w	grab
Pam 005	0.052 oz/t	4.7ppm	L-1+30s,0+40w	grab
Rec 15	1200ppb	3.5ppm	L-2+25s,0+10w	grab

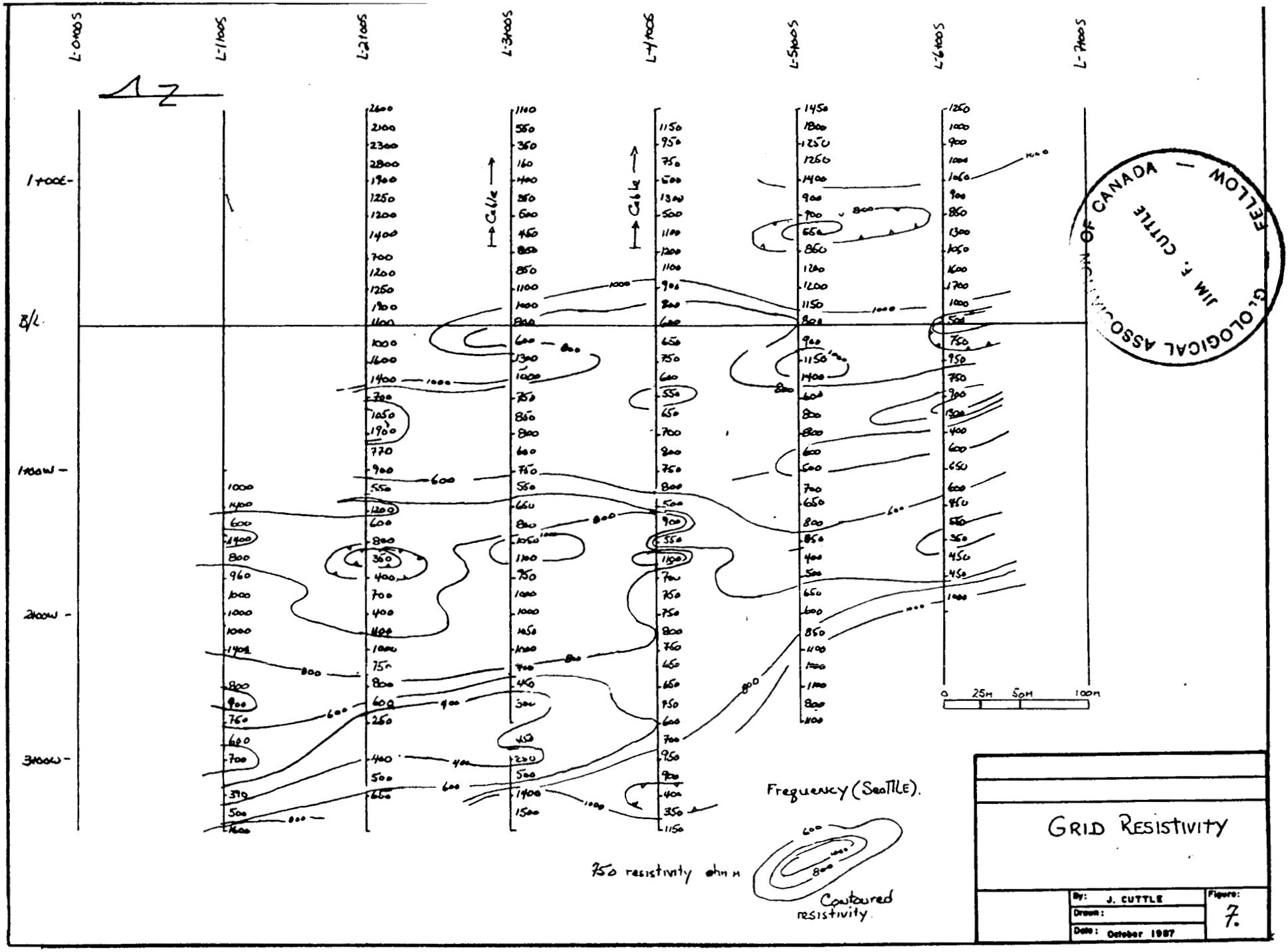
Occurrence #3 is again quartz vein related, although trending in a northerly direction.

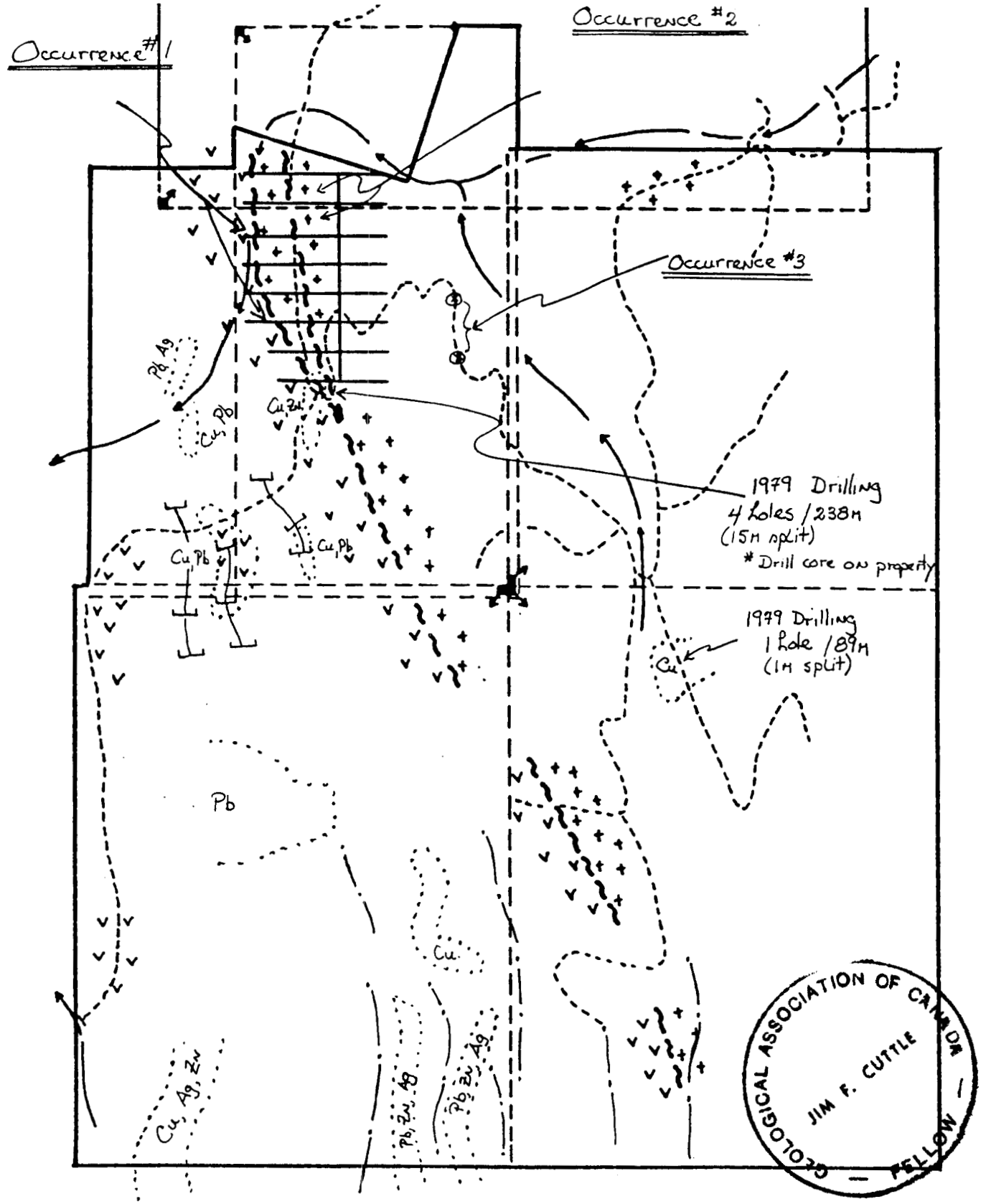
	Au	Ag	Location	Type
#30248	1075ppb	5.0ppm	upper road	grab sample
Pam 001	0.05 oz/t	0.2 oz/t	upper road	grab sample
Pam 003	1.41 oz/t	3.58 oz/t	upper road(n)	grab sample
Pam 32	0.10 oz/t	0.12 oz/t	upper road(s)	1.0m chip

Various other samples have been taken throughout the property and can be referred to in the appendix as to their location.

VLF-EM-16: 3.5 line kilometers of VLF data are plotted on figures 5, 6. All readings were taken at 12.5 meter station intervals, involving two frequencies (Seattle, Cutler). Data was later fraser filtered to better isolate true conductive horizons. Two main conductive horizons were isolated that coincided with the main north, south trending shear zones. A third conductor to the east paralleling these zones has yet to be explained. These zones were all picked up by both frequencies, although Seattle is possibly the best frequency to use for these shears. The east/west trending "tension gashes"


Z
L-0+00S
L-1+00S
L-2+00S
L-3+00S
L-4+00S
L-5+00S
L-6+00S
L-7+00S
1150E
1100E
2+00.000
1100W
2100W
3100W
3150W
Cutt
Cutler (68)
Scale (metres)
0
25
50
75
100
GEOLOGICAL ASSOCIATION OF CANADA — FELLOW — JIM CUTTLE
VLF (Cutler)
By: J. CUTTLE
Drawn:
Date: October 1987
Figure:
6.


L-0+00S
L-1+00S
L-2+00S
L-3+00S
L-4+00S
L-5+00S
L-6+00S
L-7+00S
1+00E
B/L
1+00W
2+00W
3+00W
Cable
Cable
0 25M 50M 100M
Frequency (Seattle).
750 resistivity ohm m
Contoured resistivity.
GEOLOGICAL ASSOCIATION OF CANADA — FELLOW
JIM F. CUTTLE
GRID RESISTIVITY
By: J. CUTTLE
Drawn:
Date: October 1987
Figure: 7.



Previous Assessment work

Cu — untested geochem

I - Pulse EM conductor

\- VLF

Approximate Fault / Pendant contact.

Volcanics

Quartz Diorite

0 500m 1000m

Scale.

General Compilation Map

	By: J. CUTTLE	Figure: 8.
	Drawn:	
	Date: October 1987	

were not isolated by the Cutler frequence, due possibly to (10 their non-conductive nature.

Resistivity: The resistivity survey , run in conjunction with the EM-16 survey isolated both resistivity highs and lows. At present the highs can not reasonably be explained although the resistivity lows coincided with the two shear zones and represent sericite alteration or possible sulphide enrichment. The data is highly interpretative and may have been influenced by varying degrees of cultural effects (probe contacts, signal strength, overburden).

CONCLUSION

With the isolation of 800 meters of conductive shear zones that are known to contain up to 1.46 oz/t gold, 1.40 oz/t silver and its possible related "tension gashes" with values of 2.42 oz/t gold, 3.21 oz/t silver, the potential for economic ore bearing horizons remains extremely high. The claims currently cover approximately 3.5 kilometers of this known shear and detailed field investigation remains a priority for both precious metal and base metal mineralization.

Bacon, W.R. (1975) Lode Gold Deposits in Western Canada. Paper presented at C.I.M annual western meeting, Edmonton, Alberta. p 103 - 104

Barr, D.A. (1979) Gold in the Canadian Cordillera. C.I.M Bulletin, March 1980. p 53 - 54

Camsell, C. (1917) "Venetian", G.S.C Summary Report 1, 1917 , p 21b

Dickson, M.P., and Mcleod, D.A. (1975) Northair Mines: Grassroots to Senior Financing, Cdn Min Jour, April, p 79 - 82

Ditson, G.M. (1978) Metallogeny of the Vancouver - Hope Areas. Unpublished M.Sc Thesis, 1978. University of Southern California.

Fraser, D.C. (1966) Contouring of VLF-EM Data. Geophysics, 34 p 958 - 967

Gardner, C.D. ed. (1986) Canadian Mines Handbook, 1986 - 1987 pp 496.

Geonics Ltd., (1970) Operating Manual for EM-16 VLF Electromagnetic unit, Toronto, Ontario.

Geonics Ltd., (1972) Operating Manual for EM-16R. Direct reading ground resistivity meter. Toronto,Ont.

Hjelt, S.E., Kaikkonen, P., Pietila, R. (1985) On the Interpretation of VLF Resistivity Measurements. Geoexploration, 23, p 171 - 181.

Marton, A.S. (1978) Bedrock Geology of thr Tedi-Pit Lead Zinc Copper Silver Showing. Unpublished B.Sc. Thesis, 1978. University of British Columbia. pp 59

McCall, K.M. (1987) Geology of the Britannia Ridge, East Section, Southwest B.C. Unpublished M.Sc. Thesis, 1987. University of British Columbia.

Miller, J.H.L and Sinclair, A.J. (1978) Geology of Part of the Callaghan Creek Roof Pendant, B.C. Ministry of Energy, Mines, and Pet. Resources. Geological Fieldwork, 1978, Paper 1979-1, p 124-131.

Miller, J.H.L and Sinclair, A.J. (1979) Geology of an Area including Northair Mines Ltd., Callaghan Creek Property; B.C. Ministry of Energy, Mines, and Pet. Resources. Geological Fieldwork, 1979.

Phillips, W.J., Richards, W.E. (1975) A Study of the (12
Effectiveness of the VLF Method for the Location
of Narrow Mineralized Fault Zones.
Geoexploration,13; p 215-226.

Roddick, J.A. and Woodsworth, G.J. (1975): Coast Mountain
Project. Pemberton (92J) Map-Area, B.C., G.S.C
Paper 75-1 Pt.A, p 37-40.

Woodsworth, G.J. (1977) Geology, Pemberton (92J) Map Area, G.S.C.
O.F. # 482.

_____ B.C. Ministry of Mines Annual Report. "Venetian",
1916,p372; 1974,p198; 1976,E121.

_____ B.C. Ministry of Mines Annual Report. "Northair",
1973, p245-248; 1974, p200-202.

_____ B.C. Minister of Mines; Assessment Report #6114,
#7793.

APPENDIX A

STATEMENT OF EXPENSES

Marble 1-5 claim group (44 units)

Personnel:	J.Cuttle,B.Sc, Geologist. 12 days(200/day) (Mar,12,14,15)(Apr,11,12,15-18) (Aug,12,15,16)	$2400.00
	N.Reeves, helper 4 days (125/day) (Apr,15-18)	$ 500.00
	G.Crowe, M.Sc, Geologist. 1 day (250/day) (Mar,14)	$ 250.00
Food and Accomodation:	8 mandays at 50/day (Apr,15-18)	$ 400.00
VLF Rental	4 days at 35/day (Apr,15-18)	$ 140.00
EM-16 Resistivity Rental:	4 days at 30/day (Apr,15-18)	$ 120.00
Rock Saw Cuts:	6 rocks at 25/rock (quartz vein and shear zone)	$ 150.00

Rock Geochem:

Rec 01-034 (27 rocks)	336.30	
#30246-30248 (3 rocks)	35.25	
#11528-11534 (7 rocks)	106.50	
Pam 001-010 (10 rocks)	160.00	
Pam 011-048 (38 rocks)	646.00	
	1284.05	$1284.05

Field Supplies:	(flagging,maps,sample bags,thread)	$ 100.00
Transportation:	(20% of $5344.05)	$1068.81
Report Writing:	7 days (writing and drafting)	$1400.00
	typing and zerox	$ 300.00
Total		$8112.86

GEOLOGICAL ASSOCIATION OF CANADA
JIM F. CUTTLE
FELLOW

APPENDIX B

ROCK SAMPLE LOCATIONS

REC 02	south of claim post 3S,0E 245m Marble#1
Rec 03	--------"---------
Rec 04	--------"---------
Rec 06	L-0+75s,0+85w
Rec 07	L-5+00s,0+75w
Rec 08	L-0+75s,1+00w
Rec 09	L-1+30s,0+40w
Rec 11	L-0+15s,1+55w
Rec 12	L-0+55s,0+65w
Rec 14	L-1+30s,0+35w
Rec 15	L-2+25s,0+10w
Rec 16	L-2+25s,0+40w
Rec 17	L-4+00s,0+55w
Rec 19	L-5+00s,0+75w
Rec 20	------"------
Rec 22	L-7+25s,0+85w
Rec 23	------"------
Rec 24	L-0+60n,3+00w
Rec 25	L-1+95s,0+75e
Rec 26	L-5+00s,0+75w
Rec 28	L-2+02s,0+75e
Rec 29	L-0+40n,3+00w
Rec 30	L-0+10s,3+00w
Rec 31	L-2+90s,2+75w
Rec 32	L-3+00s,2+80w
Rec 33	L-8+50s,1+00e
Rec 34	------"------
30246	L-0+55s,0+40w
30247	L-1+00s,0+75w
30248	upper road exposure
11528	L-1+00n,1+75w
11529	L-0+25s,1+50w
11530	L-0+55s,0+65w
11531	L-0+50s,0+40w
11532	L-0+50s,0+25w
11533	L-0+85s,0+65e
11534	L-6+85s,0+80w
Pam 01	occurrence 3
Pam 02	Marble 3 north
Pam 03	occurrence 3
Pam 04	L-0+55s,0+65w
Pam 05	L-1+30s,0+40w
Pam 06	L-1+00s,0+75e
Pam 07	L-1+95s,0+75e
Pam 08	L-7+00s,0+25w
Pam 09	L-0+15s,1+55w
Pam 10	L-1+25s,1+50w
Pam 16	L-0+60s,3+00w
Pam 19	L-1+50s,1+55w
Pam 28	L-0+15s,1+55w
Pam 29	-----"-------
Pam 30	-----"-------
Pam 31	-----"-------
Pam 32	occurrence 3
Pam 33	-----"-------
Pam 34	-----"-------
Pam 35	-----"-------
Pam 36	-----"-------
Pam 39	L-7+25s,0+85w
Pam 40	L-7+10s,0+85w
Pam 41	-----"-------
Pam 42	-----"-------
Pam 43	-----"-------
Pam 44	-----"-------
Pam 45	L-6+20s,0+80w
Pam 46	-----"-------
Pam 47	-----"-------
Pam 48	-----"-------

APPENDIX C

COMPANY: JIM CUTTLE — MIN-EN LABS ICP REPORT — (ACT:GE027) PAGE 1 OF 1

PROJECT NO: — 705 WEST 15TH ST., NORTH VANCOUVER, B.C. V7M 1T2 — FILE NO: 7-197

ATTENTION: JIM CUTTLE — (604)980-5814 OR (604)988-4524 — * TYPE ROCK GEOCHEM * — DATE:MARCH 10, 1987

(VALUES IN PPM)	AG	AS	CU	PB	SB	ZN	AU-PPB
REC-02	1.1	4	30	19	1	102	2
REC-03	.9	30	44	13	2	27	6
REC-04	.3	1	19	8	1	17	1
REC-06	3.4	1	7	3	2	12	2550
REC-07	3.4	10	434	7	3	10	42

MIN-EN LABORATORIES LTD.

Specialists in Mineral Environments

705 West 15th Street North Vancouver, B.C. Canada V7M 1T2

PHONE:(604)980-5814 OR (604)988-4524 TELEX:VIA USA 7601067 UC

Certificate of GEOCHEM

Company:J.CUTTLE
Project:
Attention:J.CUTTLE

File:7-211
Date:MARCH 13/87
Type:ROCK GEOCHEM

We hereby certify the following results for samples submitted.

Sample Number	AG PPM	AU-FIRE PPB
REC-08	0.4	105
REC-09	4.6	2700

Certified by

MIN-EN LABORATORIES LTD.

MIN-EN LABORATORIES LTD.

Specialists in Mineral Environments

705 West 15th Street North Vancouver, B.C. Canada V7M 1T2

PHONE:(604)980-5814 OR (604)988-4524 TELEX:VIA USA 7601067 UC

Certificate of GEOCHEM

Company:JIM CUTTLE
Project:MARBLE
Attention:J.CUTTLE

File:7-224
Date:MARCH 17/87
Type:ROCK GEOCHEM

We hereby certify the following results for samples submitted.

Sample Number	CU PPM	AG PPM	AU-FIRE PPB	AU G/TONNE	AU OZ/TON
REC-11		3.7	3500		
REC-12		110.0	50000	83.0	2.42
REC-14		3.1	370		
REC-15		3.5	1200		
REC-16		0.3	59		
REC-17		0.7	116		
REC-19	890	2.3	58		
REC-20		0.2	23		
REC-22	10400	1.4	86		
REC-23		0.5	15		

Certified by _____

MIN-EN LABORATORIES LTD.

236
182
056

Specialists in Mineral Environments
705 West 15th Street North Vancouver, B.C. Canada V7M 1T2

PHONE:(604)980-5814 OR (604)988-4524 TELEX:VIA USA 7601067 UC

Certificate of GEOCHEM

Company:JIM CUTTLE
Project:MARBLE
Attention:J.CUTTLE

File:7-295
Date:APRIL 14/87
Type:ROCK GEOCHEM

We hereby certify the following results for samples submitted.

Sample Number	AG PPM	AU-FIRE PPB
REC-24	1.7	500
REC-25	0.6	128
REC-26	0.3	39
REC-28	1.2	24

Certified by

MIN-EN LABORATORIES LTD.

MIN-EN LABORATORIES LTD.

Specialists in Mineral Environments

705 West 15th Street North Vancouver, B.C. Canada V7M 1T2

PHONE:(604)980-5814 OR (604)988-4524 TELEX:VIA USA 7601067 UC

Certificate of Geochem

Company:JIM CUTTLE
Project:MARBLE
Attention:J.CUTTLE

File:7-1094/P1
Date:AUGUST 20/87
Type:ROCK GEOCHEM

We hereby certify the following results for samples submitted.

Sample Number	AG PPM	AU-FIRE PPB
REC-29	3.4	21
REC-30	1.1	4
REC-31	1.7	6
REC-32	0.9	18
REC-33	1.3	9
REC-34	1.1	1050

Certified by _____

MIN-EN LABORATORIES LTD.

MIN-EN LABORATORIES LTD.

Specialists in Mineral Environments

705 West 15th Street North Vancouver, B.C. Canada V7M 1T2

:(604)980-5814 OR (604)988-4524 TELEX:VIA USA 7601067 UC

Certificate of Assay

ompany:CYPRUS MINERALS
roject:
ttention:J.CUTTLE/A.JACKSON

File:7-432/P1
Date:MAY 21/87
Type:ROCK ASSAY

e hereby certify the following results for samples submitted.

Sample Number	AG G/TONNE	AG OZ/TON	AU G/TONNE	AU OZ/TON
1528	0.2	0.01	0.02	0.001
1530	23.6	0.69	11.58	0.338
1531	0.2	0.01	0.06	0.002
1533	0.1	0.01	0.35	0.010

Certified by

MIN-EN LABORATORIES LTD.

MIN-EN LABORATORIES LTD.

Specialists in Mineral Environments

705 West 15th Street North Vancouver, B.C. Canada V7M 1T2

E:(604)980-5814 OR (604)988-4524 TELEX:VIA USA 7601067 UC

Certificate of GEOCHEM

Company:CYPRUS MINERALS
Project:
Attention:J.CUTTLE/A.JACKSON

File:7-432/P2
Date:MAY 21/87
Type:ROCK GEOCHEM

We hereby certify the following results for samples submitted.

Sample Number	CU PPM	PB PPM	ZN PPM	AG PPM	AU-FIRE PPB
11528	102	103	600	L-1700W / 1+50S	
11529				1.3	360 ~L-0100E / 1+50S
11532				0.2	69 ~0+50S 0+85S
11534				0.6	13 0+85S 2+80S

Certified by _____

MIN-EN LABORATORIES LTD.

MIN-EN LABORATORIES LTD.

Specialists in Mineral Environments

705 West 15th Street North Vancouver, B.C. Canada V7M 1T2

PHONE:(604)980-5814 OR (604)988-4524 TELEX:VIA USA 7601067 UC

Certificate of GEOCHEM

Company:NICK CARTER
Project:
Attention:NICK CARTER

File:7-422/P1
Date:MAY 15/87
Type:ROCK GEOCHEM

We hereby certify the following results for samples submitted.

Sample Number	AG PPM	AU-FIRE PPB
0246	2.1	470 ← L-0+50S /0+40S
0247	0.5	61 ← L-1+00S OFFE
0248	5.0	1075 ← Road % 3 & V

Certified by Eric Arsenault

MIN-EN LABORATORIES LTD.

COMPANY: ST.JOE CANADA — MIN-EN LABS ICP REPORT — (ACT:GE027) PAGE 3 OF 3

PROJECT NO: — 705 WEST 15TH ST., NORTH VANCOUVER, B.C. V7M 1T2 — FILE NO: 7-514

ATTENTION: A.H.VOGT — (604)980-5814 OR (604)988-4524 — * TYPE ROCK GEOCHEM * — DATE:JUNE 4, 1987

(VALUES IN PPM)	U	V	ZN	AU-PPB	FA	Ag g/T	Au oz/t	Ag oz/t
PAM 001	1	4.6	8	1200	1.67	76	0.035 (.05)	0.2
PAM 002	1	44.3	33	18				
PAM 003	3	2.8	7	26000	48.4	122.9g	0.96 (1.41)	3.58
PAM 004	1	6.8	10	11000	18.5	32.1g	0.32	0.73
PAM 005	3	2.5	8	1800	2.7	4.7g	0.052	
PAM 006	2	2.3	12	101				
PAM 007	2	1.8	10	22				
PAM 008	1	4.9	14	700			0.02	
PAM 009	1	9.7	41	35000	50.0	47.9	1.02	
PAM 010	2	2.5	277	142				

MIN-EN LABS ICP REPORT
705 WEST 15TH ST., NORTH VANCOUVER, B.C. V7M 1T2
(604)980-5814 OR (604)988-4524

* TYPE ROCK GEOCHEM * DATE:JUNE 4, 1987

(VALUES IN PPM)	K	LI	MG	MN	MO	NA	NI	P	PB	SB	SR	TH
PAM 001	430	1	430	7	708	30	1	10	19	9	8	1
PAM 002	1050	8	8090	212	5	560	1	640	11	1	21	1
PAM 003	550	1	260	15	71	30	1	50	6	5	5	1
PAM 004	490	1	330	25	8	180	4	190	9	7	8	1
PAM 005	100	1	290	32	1	40	1	60	20	4	3	1
PAM 006	220	1	820	119	1	60	1	50	11	2	3	1
PAM 007	130	1	360	84	1	20	1	20	5	2	2	1
PAM 008	650	1	290	59	715	180	1	230	11	4	7	1
PAM 009	1410	2	390	129	32	140	1	480	33	13	20	2
PAM 010	520	1	200	39	45	80	1	110	377	1	4	1

COMPANY: ST.JOE CANADA
PROJECT NO:
ATTENTION: A.H.VOGT

MIN-EN LABS ICP REPORT
705 WEST 15TH ST., NORTH VANCOUVER, B.C. V7M 1T2
(604)980-5814 OR (604)988-4524

FILE NO: 7-514
* TYPE ROCK GEOCHEM *
DATE:JUNE 4, 1987

(VALUES IN PPM)	AG	AL	AS	B	BA	BE	BI	CA	CD	CO	CU	FE
PAM 001	7.6	1210	10	6	36	1.2	6	590	1.4	4	92	35870
PAM 002	.9	13110	4	8	56	.7	2	1190	2.0	2	10	48020
PAM 003	122.5	1360	9	1	26	.6	1	210	.1	1	9	14900
PAM 004	32.1	1550	9	1	45	1.1	5	90	1.6	5	50	29250
PAM 005	4.7	660	13	1	13	.1	1	80	2.1	1	93	11590
PAM 006	1.1	1540	8	1	16	.3	1	720	.5	1	8	7170
PAM 007	.6	810	9	1	8	.1	2	370	1.4	1	160	4970
PAM 008	1.9	2440	17	3	53	.7	1	310	1.0	2	7	16010
PAM 009	47.4	6340	19	3	71	2.3	25	140	4.5	6	24	50220
PAM 010	1.0	1770	9	1	16	.1	2	330	16.9	1	87	6070

4.7

LABORATORIES LTD.
s in Mineral Environments
treet North Vancouver, B.C. Canada V7M 1T2

'604)980-5814 OR (604 TELEX:VIA USA 7601067 UC

ficate of ASSAY

ompany:ST. JOE
roject:
ttention:D. KEN

File:7-577/P1
Date:JUNE 16/87
Type:ROCK ASSAY

e hereby certi ng results for samples submitted.

ample umber	AG OZ/TON	AU G/TONNE	AU OZ/TON	
AM 11	0.01	.01	0.001	
AM 12	0.01	.01	0.001	
AM 13	0.01	.04	0.001	
AM 14	0.01	.01	0.001	
AM 15	0.01	.03	0.001	1m chip (lower fault contact)
AM 16	2.51	30.10	0.878	15cm chip (lower fault contact).
AM 17	0.01	.10	0.003	
AM 18	0.01	.03	0.001	
AM 19	0.03	.92	0.027	
AM 20	0.01	.02	0.001	
21	0.01	.01	0.001	
22	0.01	.02	0.001	
AM 23	0.01	.01	0.001	
AM 24	0.01	.01	0.001	
AM 25	0.01	.01	0.001	
AM 26	0.01	.02	0.001	Shear zone (road) North
AM 27	0.01	.04	0.001	
AM 28	0.06	.80	0.023	
AM 29	0.01	.40	0.012	
AM 30	0.05	.63	0.018	
AM 31	0.07	1.13	0.033	
AM 32	0.12	3.42	0.100	Road zone upper.
AM 33	0.04	.01	0.001	
AM 34	0.03	.38	0.011	
AM 35	0.01	.54	0.016	
AM 36	0.01	.38	0.011	
AM 37	0.01	.24	0.007	down from road zone
AM 38	0.01	.01	0.001	Drill zone
AM 39*	0.76	1.58	0.046	Drill zone (?)
AM 40	0.01	.02	0.001	

Certified by [signature]

BIN-EN LABORATORIES LTD.

MIN-EN LABORATORIES LTD.
Specialists in Mineral Environments
705 West 15th Street North Vancouver, B.C. Canada V7M 1T2

(604)980-5814 OR (604)980-4524 TELEX:VIA USA 7601067 UC

Certificate of ASSAY

ompany:ST. JOE CANADA
oject:
ttention:D. KENNEDY

File:7-577/P2
Date:JUNE 16/87
Type:ROCK ASSAY

hereby certify the following results for samples submitted.

ample umber	AG G/TONNE	AG OZ/TON	AU G/TONNE	AU OZ/TON
M 41	0.2	0.01	.01	0.001
M 42	0.2	0.01	.01	0.001
M 43	0.1	0.01	.02	0.001
M 44	0.5	0.01	.01	0.001
M 45	0.3	0.01	.01	0.001
M 46	0.2	0.01	.01	0.001
M 47	0.2	0.01	.01	0.001
M 48	0.1	0.01	.01	0.001

Certified by

Min-En Laboratories Ltd.

APPENDIX D

VLF-EM-16 Field Data (%Dip/Quadrature)

(Dip % is North,West +, South,East -)

L-0+00NS	Seattle (24.8KHZ) Dip %/Quadrature	Cutler (24.0Khz) Dip %/Quadrature
3+50W	-6/+18	+5/+12
	-9/+14	+4/+10
3+25W	-11/+12	+6/+8
	-11/+10	-1/+6
3+00W	-9/+6	+2/+6
	-6/+6	+3/+2
2+75W	-8/+2	+1/0
	-12/-1	-1/+1
2+50W	-12/0	-1/0
	-12/-1	-2/-2
2+25W	-12/3	-4/-2
	-12/-4	-5/0
2+00W	-11/-4	-5/-5
	-5/0	-6/-2
1+75W	-6/-3	-5/-5
	-2/-1	-5/0
1+50W	+1/-1	0/+1
	-1/-1	-2/+4
1+25W	0/0	-2/+2
	+2/+2	-1/-2
1+00W	-1/+1	-1/-2
	-3/0	-4/-2
0+75W	-5/-2	-5/-4
	-12/-4	-6/-7
0+50W	-17/-4	-6/-4
	-17/-4	-9/-2
0+25W	-17/-7	-10/-6
	-22/-6	-10/-2
B/L	-23/-6	-11/-5
	-21/-5	-9/-2
0+25E	-18/-4	-8/-2
	-18/-3	-10/-6
0+50E	-19/-4	-11/-3
	-17/+1	-12/-5
0+75E	-19/+1	-11/-4
	-19/0	-12/-6
1+00E	-19/+2	-11/-4
	-16/+4	-7/-3
1+25E	-16/+3	-7/0
River		

L-1+00S	Seattle (24.8KHZ) Dip %/Quadrature	Cutler (24.0Khz) Dip %/Quadrature
3+50W	-2/+19	-6/+10
	-2/+18	-4/+10
3+25W	-5/+16	-7/+8
	-6/+8	-6/+2
3+00W	-9/+6	-3/+2
	-7/+5	-2/+3
2+75W	-5/+2	-1/0
	-5/+2	-2/-1
2+50W	-7/-3	-4/+3
	-13/-4	-4/-6
2+25W	-15/-3	-3/-1
	-13/-7	-6/+3
2+00W	-15/-6	-5/-6
	-13/-6	-8/-5
1+75W	-12/-6	-8/-4
	-12/-5	-7/+1
1+50W	-11/-8	-4/+1
	-11/-5	-9/+2
1+25W	-6/-1	-6/+4
	+4/+1	-3/-8
1+00W	0/-1	-5/-1
	-6/-2	-11/-3
0+75W	-9/-4	-11/-3
	-12/-6	-13/-7
0+50W	-13/-5	-14/-10
	-14/-8	-13/-3
0+25W	-18/-8	-15/-2
	-20/-8	-13/-5
B/L	-20/-8	-15/-4
	-18/-7	-14/-5
0+25E	-17/-3	-12/-2
	-15/-3	-16/-4
0+50E	-20/-3	-13/-2
	-17/-1	-18/-2
0+75E	-22/-2	-17/0
	-14/-1	-15/+1
1+00E	-13/+4	-10/0
	-11/+4	-11/-6
1+25E	-16/+4	-12/-2
	-17/+2	-12/+1
1+50E	-18/+2	-13/+1
	-17/+1	-13/-5

L-2+00S	Seattle (24.8Khz) Dip% / Quad	Cutler (24.0Khz) Dip% / Quad
3+50W		
	-6/+14	-6/+6
3+25W	-11/+13	-6/+5
	-10/+9	-4/+4
3+00W	-9/+8	-6/+4
	-6/+8	-2/+5
2+75W	-2/+4	+1/+2
	-3/+1	+1/+4
2+50W	-8/-2	-1/0
	-12/-5	-5/-4
2+25W	-15/-7	-6/+1
	-17/-8	-6/0
2+00W	-20/-9	-8/0
	-22/-9	-11/-4
1+75W	-24/-12	-10/-2
	-20/-10	-10/-2
1+50W	-18/-6	-11/-6
	-7/+2	-10/-2
1+25W	-22/-10	-14/-5
	-13/-5	-8/0
1+00W	-9/-4	-6/0
	-6/-2	-9/+1
0+75W	-6/-4	-12/-3
	-3/-5	-17/-4
0+50W	-14/-7	-13/-4
	-15/-9	-18/-8
0+25W	-20/-8	-18/-2
	-19/-5	-20/-6
B/L	-17/-4	-20/-3
	-20/-6	-22/-4
0+25E	-21/-6	-20/+1
	-23/-6	-21/0
0+50E	-21/-8	-22/-2
	-15/+1	-20/-2
0+75E	-15/-2	-19/+3
	-16/-2	-15/-2
1+00E	-16/-2	-16/+1
	-18/-2	-18/-1
1+25E	-14/+2	-11/+3
	-14/0	-11/+3
1+50E	-13/+4	-14/+1

L-3+00S	Seattle (24.8Khz) Dip% / Quad	Cutler (24.0Khz) Dip% / Quad
3+50W	-3/+14	-2/+8
	-8/+11	-5/+6
3+25W	-10/+10	-7/+16
	-13/+6	-3/+3
3+00W	-12/+4	-1/+4
	-14/+2	-2/+6
2+75W	-13/0	-7/+1
	-9/0	-6/-2
2+50W	-7/-1	-9/-2
	-12/-2	-8/-2
2+25W	-12/-3	-8/-4
	-12/-2	-6/+6
2+00W	-19/-6	-16/+2
	-27/-7	-10/-7
1+75W	-25/-8	-15/-4
	-27/-11	-12/-5
1+50W	-28/-12	-12/+2
	-28/-14	-19/-3
1+25W	-23/-6	-12/-3
	-19/-6	-12/-2
1+00W	-17/-4	-8/0
	-14/-4	-11/-5
0+75W	-16/-5	-13/-4
	-14/-9	-12/-3
0+50W	-15/-5	-17/-1
	-14/-4	-17/-2
0+25W	-15/-9	-14/+2
	-22/-8	-20/-1
B/L	-20/-1	-24/-4
	-19/-8	-23/-3
0+25E	-18/-6	-19/-2
	-18/-8	-22/-1
0+50E	-31/-11	-29/-2
	-26/-5	-26/-5
0+75E	-28/-3	-26/-2
	-32/-3	-31/0
1+00E	Cable effect to 1+50E	

L-4+00S	Seattle (24.8) Dip% / Quad	Cutler (24.0) Dip% / Quad
3+50W	-6/+11	0/+5
	-9/+12	-1/+3
3+25W	-12/+11	+2/+2
	-18/+6	+6/+2
3+00W	-20/+1	+2/+2
	-24/-2	-2/-2
2+75W	-23/-2	-3/-2
	-20/-2	-5/-4
2+50W	-21/-5	-8/-3
	-19/-5	-11/-2
2+25W	-17/-1	-14/-4
	-15/0	-16/-1
2+00W	-18/0	-16/0
	-16/-2	-11/+2
1+75W	-18/-5	-18/0
	-20/-5	-18/-2
1+50W	-25/-10	-17/-7
	-28/-10	-21/-7
1+25W	-30/-11	-20/-4
	-22/-8	-18/0
1+00W	-14/-2	-12/-4
	-15/-4	-15/-2
0+75W	-19/-7	-16/-3
	-21/-8	-15/-3
0+50W	-20/-7	-15/-4
	-19/-6	-17/0
0+25W	-25/-8	-17/-6
	-22/-7	-20/-2
B/L	-18/-2	-21/-4
	-18/-7	-22/+2
0+25E	-26/-9	-21/-11
	-22/-6	-25/0
0+50E	-25/-6	-27/+1
	-31/-9	-32/-14
0+75E	Cable interference to 1+50E	

L-5+00S	Seattle (24.8Khz) Dip% / Quad	Cutler (24.0Khz) Dip% /Quad
2+75W	-23/-2	-4/-7
	-26/-2	-7/-5
2+50W	-30/-2	-7/0
	-29/-3	-5/-1
2+25W	-27/-2	-9/-2
	-26/-2	-11/-10
2+00W	-22/+1	-10/-1
	-19/0	-15/-4
1+75W	-19/0	-13/-2
	-21/-2	-16/-5
1+50W	-20/-6	-19/-1
	-22/-5	-21/-4
1+25W	-23/-8	-21/-10
	-26/-10	-22/-3
1+00W	-26/-10	-24/-4
	-15/-5	-22/-1
0+75W	-12/-2	-15/+1
	-13/-4	-16/+1
0+50W	-15/-4	-16/+2
	-17/-6	-15/+3
0+25W	-20/-8	-13/+1
	-22/-8	-22/-3
B/L	-22/-8	-18/0
	-22/-8	-17/-2
0+25E	-23/-8	-17/0
	-25/-8	-17/0
0+50E	-19/-5	-12/-3
	-14/-2	-13/0
0+75E	+2/+4	-2/+8
	+6/+5	-6/+1
1+00E	+3/+4	-5/-2
	-2/-1	-8/-2
1+25E	-8/-5	-13/-5
	-8/-4	-13/-3
1+50E	-9/-5	-12/-1

L-6+00S	Seattle (24.8Khz) Dip% / Quad	Cutler (24.0Khz) Dip% / Quad
2+00W	-37/-5	-17/-5
	-37/-6	-21/-9
1+75W	-35/-4	-22/-6
	-29/-1	-22/-8
1+50W	-20/+2	-25/+1
	-23/-2	-24/0
1+25W	-25/-3	-26/-1
	-23/-5	-23/0
1+00W	-23/-7	-28/-2
	-22/-7	-27/+1
0+75W	-16/-6	-25/-6
	-12/-4	-16/0
0+50W	-14/-7	-19/-2
	-15/-6	-18/-8
0+25W	-14/-6	-18/-2
	-16/-7	-20/-3
B/L	-18/-8	-21/-2
	-22/-8	-22/-2
0+25E	-24/-9	-21/-7
	-26/-10	-24/-3
0+50E	-25/-10	-20/-4
	-26/-10	-18/-1
0+75E	-29/-11	-22/-10
	-25/-10	-19/-8
1+00E	-22/-6	-19/-5
	-21/-8	-18/-5
1+25E	-14/-4	-18/-5
	-6/0	-16/-2
1+50E	-8/+4	-15/-2

L-7+00S	Seattle	Cutler
2+00W	-37/+2	-19/-7
	-33/+1	-19/-6
1+75W	-39/-1	-25/-2
	-36/-1	-25/-2
1+50W	-34/-1	-24/-10
	-34/-1	-24/-6
1+25W	-35/-4	-24/-2
	-30/-3	-28/-6
1+00W	-27/-5	-25/-13
	-25/-6	-26/-4
0+75W	-18/-8	-30/-2
	-13/-5	-28/-5
0+50W	-10/-6	-24/-1
	-9/-7	-23/-3
0+25W	-9/-7	-22/-5
	-11/-9	-22/-5
B/L	-12/-8	-21/-4
	-16/-10	-23/-2
0+25E	-15/-10	-24/-9
	-20/-10	-27/-7
0+50E	-20/-10	-26/-9
	-24/-10	-27/-8
0+75E	-23/-11	-29/-11
	-25/-13	-27/-14
1+00E	-27/-13	-26/-7
	-28/-13	-27/-12
1+25E	-27/-11	-32/-11
	-24/-10	-31/-11
1+50E	-22/-9	-29/-8

APPENDIX E

Resistivity Survey

Resistivity (VLF-EM-16R). Resistivity(ohm meters)/Phase Angle

L1+00S					
3+50W	1600/45		800/42	1+25W	1400/47
	500	2+25W	1400/39		1000/44
3+25W	390/45		1000/42		
	River	2+00W	1000/42		
3+00W	700/41		1000/40		
	600/44	1+75W	900/41		
2+75W	750/53		800/41		
	900/49	1+50W	1400/36		
2+50W	800/52		600/45		
1-2+00S					
3+25W	650/48		400/47	1+00W	900/36
	500/45	2+00W	400/47		770/35
3+00W	400/40		700/44	0+75W	1900/45
	river	1+75W	400/48		1050/45
2+75W	250/43		350/44	0+50W	700/45
	600/45	1+50W	800/44		1400/47
2+50W	800/44		600/36	0+25W	1600/49
	950/43	1+25W	1200/39		1000/45
2+25W	1000/43		550/40	B/L	1100/45
	1900/49	1+25E	2300/36		
0+25E	1250/48		2100/40		
	1200/45	1+50E	2600/43		
0+50E	700/40				
	1400/42				
0+75	1200/42				
	1250/44				
1+00E	1900/44				
	2800/38				

L-3+00S (cable interference from 1+00E - 1+50E)

3+50W			700/45	1+25W	650/37
	1500/43	2+25W	1000/47		550/43
3+25W	1400/41		1050/45	1+00W	750/44
	500/45	2+00W	1000/44		600/40
3+00W	250/45		1000/45	0+75W	800/48
	450/41	1+75W	950/46		850/47
2+75W	river		1100/50	0+50W	750/39
	300/41	1+50W	1050/47		1000/44
2+50W	450/45		800/42	0+25W	1300/44

	600/45	1+00E	400/43
B/L	800/41		160/62
	1000/45	1+25E	350/61
0+25E	1100/42		550/55
	850/45	1+50E	1100/43
0+50E	850/45		
	450/41		
0+75E	500/40		
	350/41		

L-4+00S (cable interference 0+50E - 1+00E)

3+50W	1150/42		650/42	1+25W	500/45		
	350/46	2+25W	750/44		800/36		
3+25W	400/48		800/46	1+00w	750/40		
	900/41	2+00W	750/45		800/47		
3+00W	950/44		750/44	0+75W	700/50		
	700/48	1+75W	700/44		650/53		
2+75W	600/44		1100/52	0+50W	550/48		
	750/44	1+50W	550/53		600/43		
2+50W	650/45		900/49	0+25W	750/72		
	650/36	1+00E	500/34				
B/L	600/34		750/36				
	800/42	1+25E	950/38				
0+25E	900/40		1150/41				
	1100/38	1+50E					
0+50E	1200/39						
	1100/40						
0+75E	500/40						
	1300/24						

L-5+00S

2+75W	1100/56		400/40	0+50W	600/46		550/30
	800/53	1+50W	550/44		1400/47	0+75E	900/32
2+50W	1100/49		800/42	0+25W	1150/45		900/34
	1000/50	1+25W	650/44		900/50	1+00E	1400/37
2+25W	1100/41		700/45	B/L	800/45		1250/42
	850/40	1+00W	500/43		1140/45	1+25E	1250/41
2+00W	600/39		600/36	0+25E	1200/45		1800/42
	650/40	0+75W	800/44		1200/39	1+50E	1450/47
1+75W	500/45		800/45	0+50E	850/38		

L6+00S

2+00W			600/40	0+25E	1700/45		1000/40
	1000/46	0+75W	400/37		1600/45	1+50E	1250/41
1+75W	450/40		1300/42	0+50E	1050/47		
	450/37	0+50W	900/44		1300/41		
1+50W	350/37		250/43	0+75E	850/43		
	550/39	0+25W	950/49		900/42		
1+25W	450/38		750/52	1+00E	1050/36		
	650/38	B/L	500/46		1000/35		
1+00W	650/41		1000/48	1+25E	900/38		

APPENDIX F

EM16R SPECIFICATIONS

MEASURED QUANTITY	•Apparent Resistivity of the ground in ohm-meters •Phase angle between E_x and H_y in degrees
RESISTIVITY RANGES	• 10 - 300 ohm-meters • 100 - 3000 ohm-meters •1000 - 30000 ohm-meters
PHASE RANGE	0-90 degrees
RESOLUTION	•Resistivity: ± 2% full scale •Phase : ± 0.5°
OUTPUT	Null by audio tone. Resistivity and phase angle read from graduated dials.
OPERATING FREQUENCY	15-25 kHz VLF Radio Band. Station selection by means of rotary switch.
INTERPROBE SPACING	10 meters
PROBE INPUT IMPEDANCE	100 MΩ in parallel with 0.5 picofarads
DIMENSIONS	19 x 11.5 x 10 cm. (attached to side of EM16)
WEIGHT	1.5 kg (including probes and cable)

FIELD PROCEDURE

1. Mounting of The EM16R Console To The EM16 Unit

Align the EM16R console, in respect to the EM16 cover, so that the station selector on the console is close to the EM16R output receptacle on the EM16 control plate. See photograph on facing page.

To mount the console on the EM16 use 4 stud fasteners.

To connect the EM16 console with the EM16 electrically, plug the EM16R console output plug in the corresponding receptacle on the EM16 control panel.

2. Orientation

The instrument measures resistivity along a line in the same direction as the station. After a VLF transmitting station has been selected EM16 is used to determine the direction to the transmitter.

The MODE selector switch is thrown to EM16, and the QUADRATURE/RESISTIVITY dial is turned to zero. With the two receiver coils in the handle of the EM16 in a horizontal plane, with the EM16R unit underneath, turn the whole instrument in a horizontal plane until the station signal goes to null. At this time the long axis of the EM16 handle (signal coil) is pointing towards the station, and the short axis (reference coil) is maximum coupled to the magnetic field. Switch mode to EM16R.

The EM16 QUADRATURE Knob zero line is used as a cursor for the EM16R RESISTIVITY Index ring, and the EM16R RESISTIVITY Index ring zero line is the cursor for the EM16R QUADRATURE Knob.

All EM16 calibrations are in black, all EM16R calibrations are in red.

3. Taking a Reading

To take a reading, orient the unit so that the shorter handle arm is at the right angle to the direction of the station and in the horizontal plane, as described in 2.

For convenience and stability the instrument can be laid on the ground during the reading, with the EM16R console beneath. Connect the probes to the EM16R console receptacle through the 10 meters long probe cable.

Ensure that the station selector switch on the EM16 and EM16R are both turned to the desired station frequency.

Push the probes into the ground 10 metres apart in the direction of the station, that is to say aligned with the long axis of the handle. The cable end with a red marker sleeve goes to the probe nearest the top of the EM16 instrument case, the unmarked cable goes to the probe off in the direction of the EM16 coil handle. Set the resistivity multiplier switch to x1000 position, rotate the EM16R RESISTIVITY CONTROL (same knob as for QUADRATURE when using EM16) for minimum sound intensity in the speaker.

Turn the phase control knob on the EM16R console to further minimize the sound.

Resistivity is read from the position of the red zero line on the quadrature dial against the red numerals on the index ring. Multiply by 1000 in this case to obtain actual resistivity in ohm meters.

If the number on the resistivity index ring is 3 or less, use a lower resistivity multiplier scale and re-do the nulling procedure.

The x10 resistivity multiplier scale should be used in the case of a resistivity reading of 300 ohm meters or less.

Record the phase angle by which the measured electrical field component leads the reference magnetic field component. This is 45^{o} for homogeneous conditions, as when the depth of the layer being measured is more than one or two skin depths. When a lower layer more resistive is present the phase angle will generally decrease, and increases when a more conductive layer is present.

Res = < 45
Cond > 45

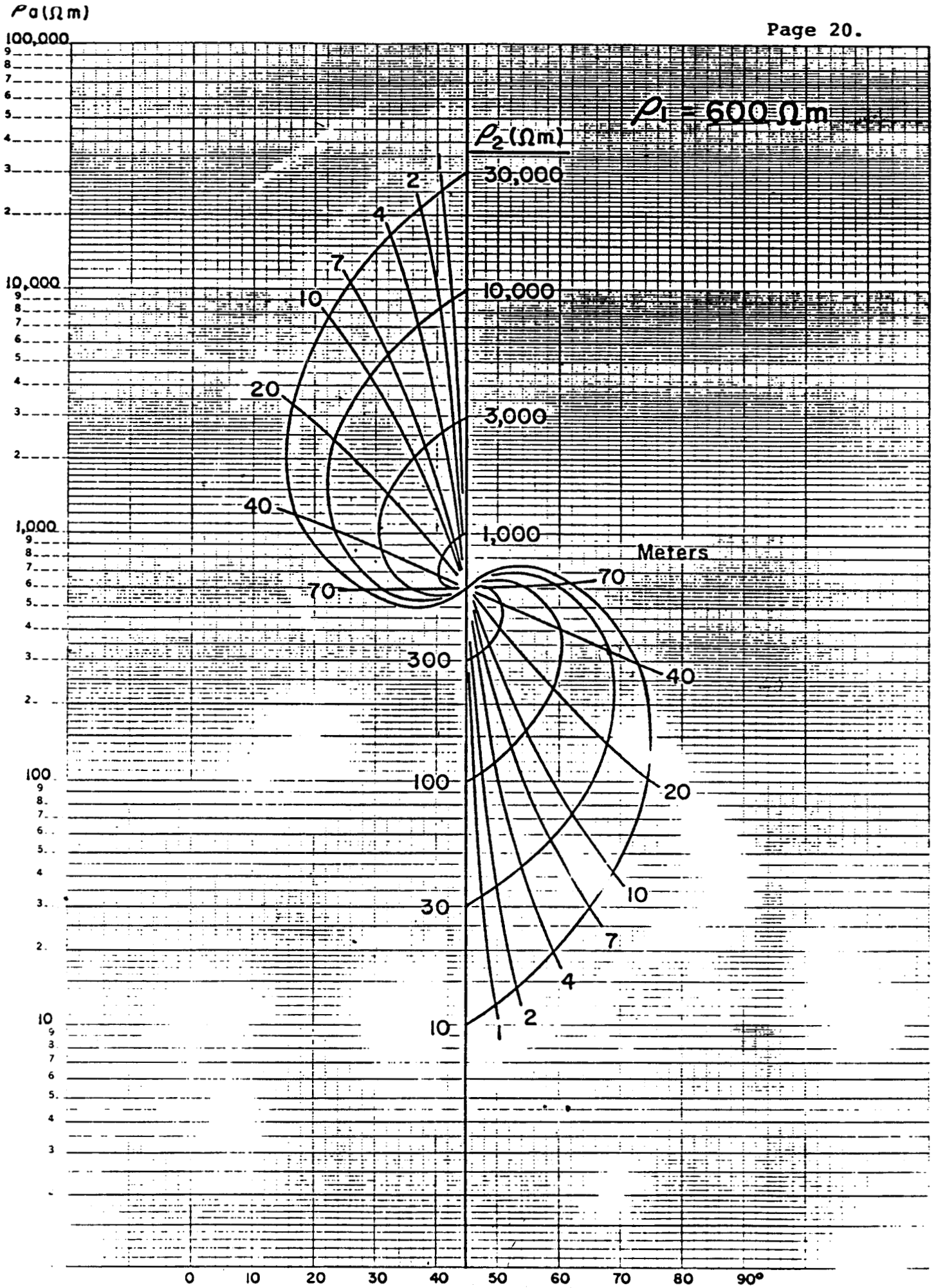

ρa(Ωm)
100,000
10,000
1,000
100
10
ρ1 = 600 Ωm
ρ2(Ωm)
30,000
10,000
3,000
1,000
300
100
30
10
1
2
4
7
10
20
40
70
Meters
0
10
20
30
40
50
60
70
80
90°
46 6210
KEUFFEL & ESSER CO. MADE IN U.S.A.
SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS

Fig.

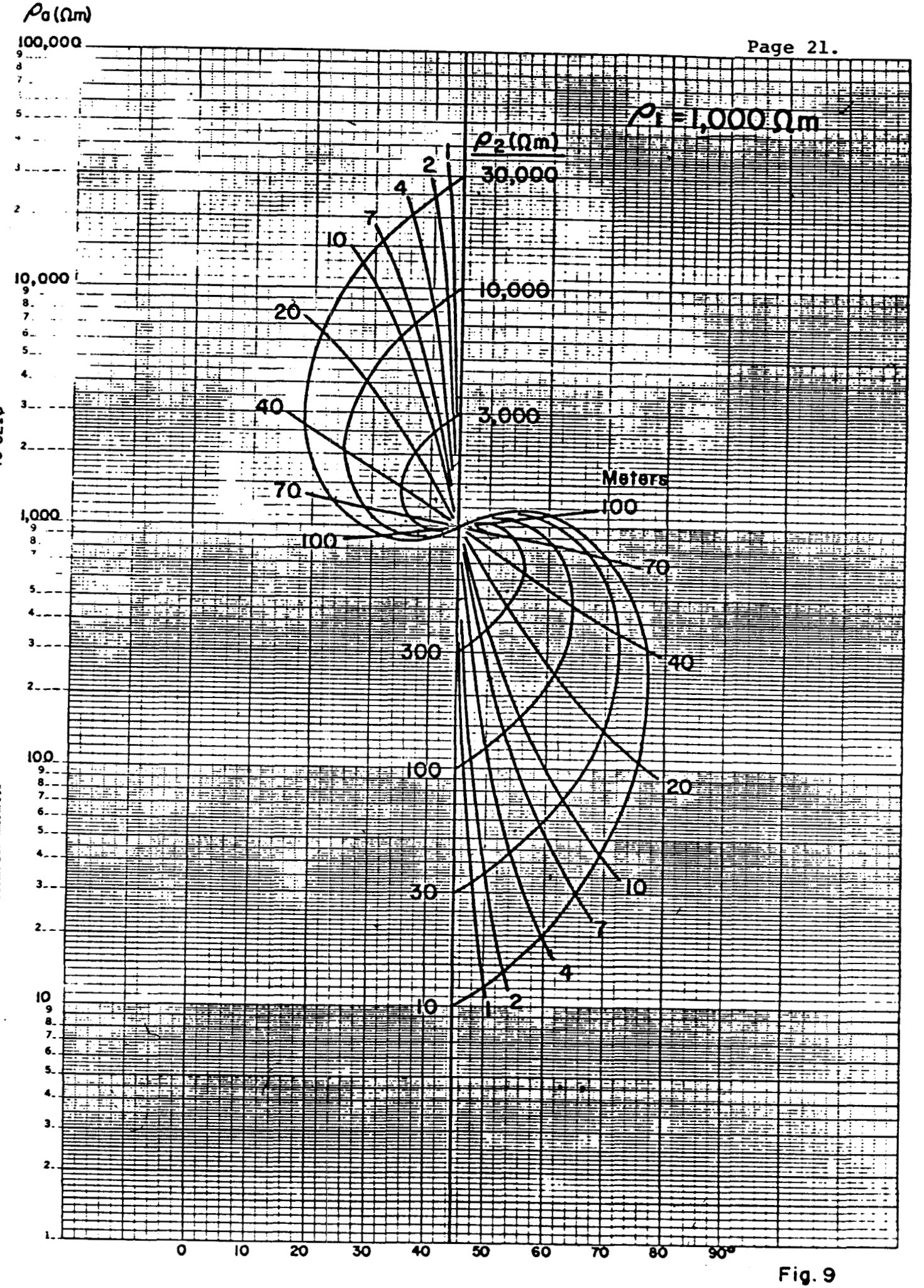
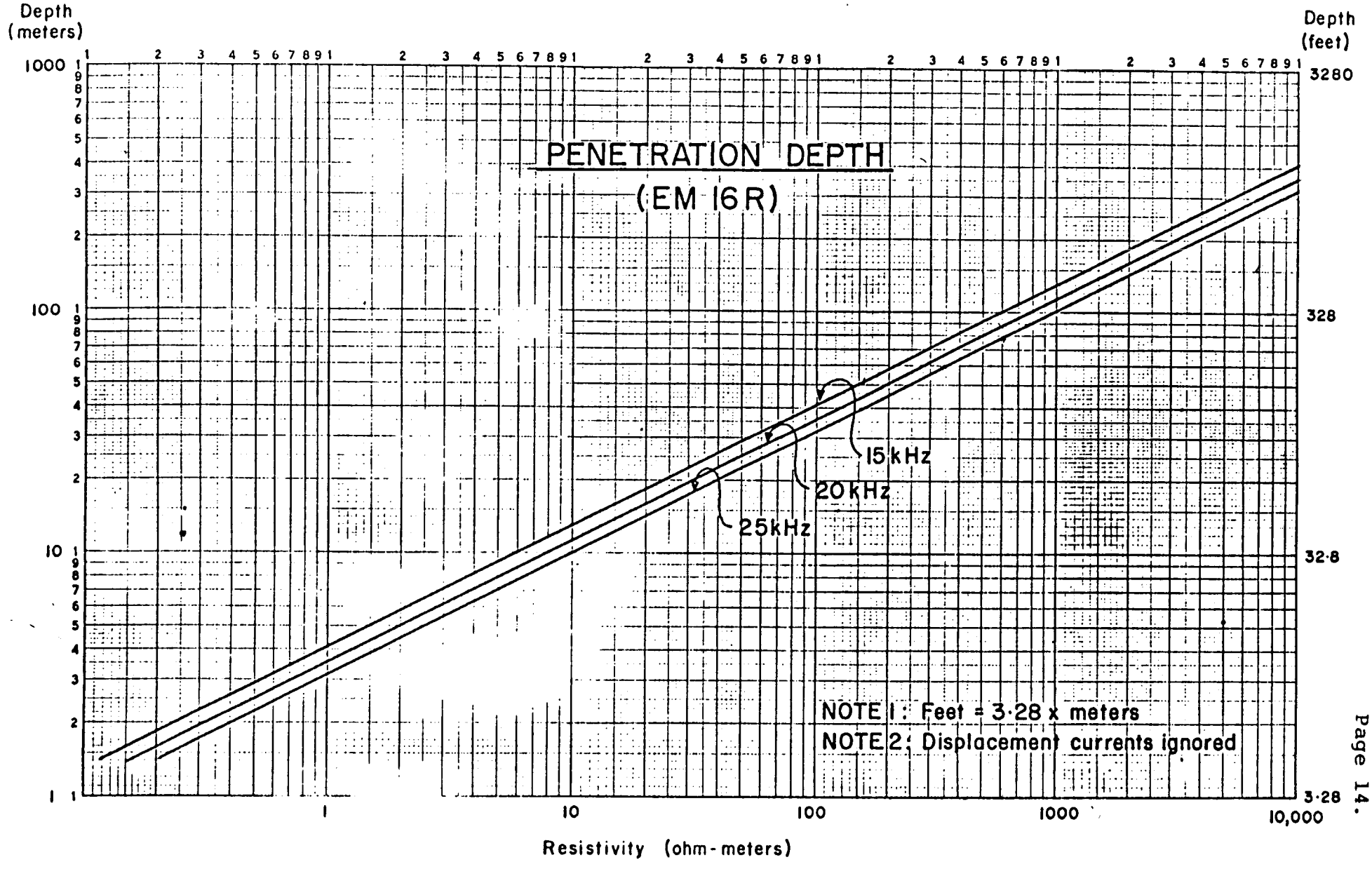

ρa (Ωm)
100,000
10,000
1,000
100
10
ρ1 = 1,000 Ωm
ρ2 (Ωm)
30,000
10,000
3,000
1
2
4
7
10
20
40
70
100
300
Meters
0
10
20
30
40
50
60
70
80
90°
46 6210
K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

Fig. 9



APPENDIX G

STATEMENT OF QUALIFICATIONS

I, JIM F. CUTTLE, of the Municipality of North Vancouver, in the Province of British Columbia, certify as follows regarding the report on the Marble 1-5 mineral claims:

That I am a geologist having practiced my profession in Canada and Norway for the past 7 years.

That I am a graduate of the University of New Brunswick with a B.Sc. in Geology.

That I am presently working as a private consultant.

That I am a Fellow of the Geological Association of Canada.

That I am presently residing at #103-1612 St. Georges Ave., North Vancouver, British Columbia.

Signed: _____
Jim F. Cuttle B.Sc.

December 10, 1987

GEOLOGICAL ASSOCIATION OF CANADA
JIM F. CUTTLE
FELLOW