GEOPHYSICAL REPORT ON AN

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AIRBORNE MAGNETOMETER- VLF ELECTROMAGNETOMETER SURVEY RHYOLITE RESOURCES INC. INFERNO I to XII FIRE MOUNTAIN NEW WESTMINSTER M.D.,B.C. NTS92G/16W Lat.49<sup>0</sup>53'N, Long.122<sup>0</sup>24'W AUTHOR: Glen E. White P.Eng. DATE OF WORK: OCT. 1983 DATE OF REPORT: DEC. 1983

# GEOLOGICAL BRANCH ASSESSMENT REPORT

11,796

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#### INTRODUCTION

Rhyolite Resources Inc. commissioned Western Geophysical Aero Data Ltd. to undertake an airborne magnetometer- VLFelectromagnetometer survey of their Doctors Point gold property. This survey showed a direct correlation between areas of high magnetic values and the gold mineralization as indicated by diamond drilling. Thus this survey over Fire Mountain in late October 1983 was completed to examine the property for any interesting magnetic and VLF-electromagnetometer anomalies that would aid in the search for gold mineralization on the Fire Mountain project.

#### PROPERTY

The property consists of the INFERNO I to XII mineral claims comprising 240 units. The record numbers are as follows:

INFERNO I to X, 1663 to 1672 Dec.30,1982 INFERNO XI to XII, 1659 and 1660 Jan. 7, 1983 The claims are depicted on Figure 1.

#### LOCATION AND ACCESS

The Fire Mt. area is some 25 km northwest of Harrison Lake with Fire Lake on the south and Glacier Lake on the west. Lat. 49<sup>0</sup>53'N, Long. 122<sup>0</sup>24'W, NTS 92G/16W.

Access to Glacier Lake and Fire Lake is by gravel logging roads and by helicopter to the higher regions of Fire Mountain.

#### GENERAL GEOLOGY

The history, regional geology and local geology of the Fire Mountain area is described by J.Vincent P.Eng. as follows:

#### HISTORY

Prospecting and claim staking in 1897 -1898 was focused on gold-silver discoveries on Fire Mountain and the west side of Harrison Lake at the Providence about 15 miles northwest of Harrison Hotsprings. About 55 tons of unknown value was produced from the Fire Mountain prospect, and 350 tons with a value of \$34/ton in gold and silver was produced from the Providence showing. Further work was done on the Providence in 1929 by the Harrison Gold Mining and Development Co., but without success. During the period 1930 - 1934, further underground exploration work was carried out on the Fire Mountain occurrences.

In the early 1950's exploration interest through the area along the southwest side of Harrison Lake was sparked with the discovery of copper-zinc sulphides. In 1971, Cominco geologists recognized the geological setting as similar to the Kuroko-type and Noranda-type environment which has been exceptionally productive in Japan. Since then, exploration activity has continued in varying degrees, and the SENECA prospect, No. 13 on the map, has received considerable effort by Noranda, Cominco and Chevron. In 1972 and 1973, the B.C. Mines Branch completed a mapping project which contributed to the understanding of the geological setting.

At present, Curator Resources Ltd. of Calgary holds the prospect under option and during the 1983 season completed 8400 feet of drilling in 18 diamond drill holes. Eleven holes intersected the mineralized zone, and a release of information will be forthcoming. A search of the records shows a number of assessment reports filed on prospects which consist of varying amounts of base

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metal sulphides hosted by the Harrison Lake volcanics.

The present interest in the area has been generated by the discovery in 1981-82 of gold-silver mineralization approximately 3 miles northwest of the PROVIDENCE in the Doctor's Point area. Trenching and diamond drilling in 1982 and 1983 has defined a significant zone of goldbearing mineralization which occurs in the Fire Lake Group of rocks. The drilling program is continuing with very encouraging results, and an induced polarization survey was successful in delineating additional target areas.

### ECONOMIC POTENTIAL

Mineral prospects which have been included in the Provincial Mineral Inventory are plotted on Figure 3 and illustrate that occurrences of interest have been prospected along the full length of the belt. At the south end, the SENECA property has received the most concentrated work and comprehensive studies have shown that massive sphalerite, pyrite, and chalcopyrite occur as discontinuous lenses within a thin horizon of rhyolitic lithic and lapilli tuff. In 1961, 287 tons were shipped to Britannia Beach, and the grade recovered averaged 0.06 ounces of gold per ton, 3.34 ounces of silver per ton, 1.24% copper and 7.08% zinc. Although subsequent exploration has not outlined an orebody to date, work continues in a promising and complex environment.

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A study of assessment files shows that a number of sulphide occurrences in similar stratigraphic settings have been prospected to varying degrees. Although an economic discovery has not been made, the geologic setting is most encouraging.

The present activity towards the north end of the belt has developed as a result of the gold discovery made on the property of Rhyolite Resources Inc. on the west side of Harrison Lake on Westwood Bay. Published information indicates that the precious metal values are hosted by a gently dipping altered and mineralized zone in the Fire Lake rocks which varies in thickness up to 10 metres. Trenches and road cuts expose the zone, and the 1982-83 drilling program and IP survey has established a trend and geological control.

Although continuing work will contribute to the understanding of the geological setting, there are strong indications that the association of volcanic stratigraphy represents an important discovery perhaps similar to those found in the Precambrian volcanic terrains of Ontario and Quebec. The Noranda-type setting has been established for the SENECA prospect to the south, and the overall package of volcanic and volcanoclastic rocks represented by the Harrison and Fire Lake sections deserve thoughtful evaluation and exploration in the light of recent conceptual work relative to gold deposits.

### GEOLOGY

## Regional

The west side of Harrison Lake is underlain by the Harrison Lake Formation and Fire Lake Group of rocks which consists predominantly of a volcanic and volcanoclastic stratigraphic sequence. The Fire Lake Group is exposed in the north half of the area while the Harrison Lake section occupies the southern portion. The most recent compilation (GSC Map 1386A) places the Harrison Lake Formation in the Middle Jurassic and the Fire Lake Group in the Lower Cretaceous. Midway up the lake, outliers or segments of the Broken Back Hill Formation and Bill Hook Creek Group occur on Long Island and the west side of the lake. The former lies stratigraphically above the Fire Lake Group, and the latter between the Harrison Lake and Fire Lake rocks. They appear to be predominantly sedimentary, but have a pyroclastic content. In GSC Memoir 335, Dr. J.A. Roddick regards these areas as comprising roof pendants of varying size within the intrusive Coast Range plutonic complex.

The Chehalis Pendant includes the extensive area of Harrison Lake Formation along the west side of the Lake. The characteristic rocks are described as a thick sequence of metamorphosed porphyritic andesite and dacite. Since this work was completed in 1955, logging and mining exploration activity has opened up the area with the result that the stratigraphy has taken on considerable economic significance. Base and precious metal mineralization has been discovered in association with particular structural and stratigraphic features which suggest a volcanogenic relationship.

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The Fire Lake Group also occupies a roof pendant. In the Fire Lake area, northwest of Harrison Lake, three stratigraphic units have been mapped (Memoir 335,P.42):

- An upper unit of clastic feldspathic greenstones, chlorite schist and minor conglomerate has a thickness of 7000 feet.
- A middle unit of dark slates, shales, argillite, and greywacke is approximately 6000 feet thick.
- A basal section consisting of granulites, andesite, conglomerate, limestones and quartzite is approximately 2000 feet thick.

From the description provided by Dr. Roddick, it is apparent that the stratigraphic section represents well mixed volcanic and sedimentary activity during this period of geologic time.

In the vicinity of Bremner Creek, the upper unit of the Fire Lake section is exposed on the northern limb of a westward plunging anticline which exposes the Harrison Lake rocks in the core. The Fire Lake rocks consist of volcanic breccias, volcano-clastics and interbedded flows of andesite and rhyolite.

Intrusive rocks in the area belong to the Coast Plutonic Complex which represents a variety of phases and compositions. Outcrops along the west side of Harrison Lake expose a medium grey hornblende granodiorite which is regarded a Middle Eocene in age.

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## Local

The south slope of Fire Mountain exposes the section of mixed volcanic and sedimentary as previously described, and a section along the logging road on the north side of Fire Creek shows the stratigraphy to strike at 300° and dip 30° northeasterly. This trend is accentuated in the geologic 'grain' of the air photo across the southern side of the mountain.

Regional faulting and shearing through the valleys of Fire Creek and the Lillooet River and on southerly down the Harrison Lake valley, has left Fire Mountain as a wedge-block. Hydrothermal activity along this system is evidenced in the alteration and mineralization being explored on the Rhyolite Resources property, and in the intensely altered gossan zone in the canyon of Fire Creek. Thus, it is apparent that the timing of ground preparation and hydrothermal activity was conducive to the concentration of precious metal mineralization.

The recent airborne magnetic and VLF survey described by Mr. G.E.White, P.Eng., has delineated an interesting area of 'magnetic highs' at the top of Fire Mountain, and within a broader zone of stronger response trending southeasterly from the peak. This direction is generally concordant with the geologic 'grain' as described. The outcropping rock at the peak has not been examined, but the ragged weathering characteristics suggest an intrusive core or spine to the mountain complex. The zones of high magnetic intensity correlate with this possible core.

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The Crown Granted mineral claims located on the south and western slopes of the mountain date to the turn of the century. Free gold in association with pyrite and chalcopyrite was discovered in 1897 in quartz veins. The country rock is described as a, "fine grained to porphyritic greenstone -----, intensely sheared in places, forming belts of schists." The largest vein discussed was traced for 1000 feet along a strike of N25<sup>O</sup>W. A 4 foot width is reported. The MONEY SPINNER was the most active of 5 prospects, and several hundred feet of drifting and raising is reported. In the early 1900's a small mill was built, and the 1930 Minister's report suggests that, "possibly 50 tons had been milled altogether."

The other 4 properties; the Barkoola, Blue Lead, King 1 and Richfield, were worked within the same time frame as the Money Spinner. Quartz vein systems within the schist zones were explored, but grades were not sufficiently encouraging.

Grade information reported in 1934 by the Minister includes values which range from trace to 0.16 ounces of gold per ton. Samples were shipped across vein widths averaging 3-5 feet.

Although values are low and erratic, the system of quartz veins is auriferous, and a thorough evaluation and exploration program is warranted.

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# LEGEND

### EOCENE

20	Granodiorite
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Quartz Diorite

LOWER CRETACEOUS

16

19

FIRE LAKE GROUP: Pyroclastics, greenstones, slate, greywocke, conglomerate, limestone.

15

9

8

BROKEN BACK HILL: Pyroclastics, greywacke

### MIDDLE JURASSIC

BILLHOOK CREEK FORMATION: Tuff, sandstone

MYSTERIOUS CREEK FORMATION: Pelite

7

6

ECHO ISLAND: Argillite, tuff

HARRISON LAKE: Flows, volcanoclastics, pyroclastics

### TRIASSIC ( ond older )

1

HOZAMEEN GROUP: Volcanics, sediments

# SYMBOLS

- --- Geological Contacts, approximate
- ⊗13 Mineral Prospect; MI number
- X Recorded Pyritization

> 50° Bedding Attitude







### AIRBORNE VLF-ELECTROMAGNETIC AND MAGNETIC SURVEY

This survey system simultaneously monitors and records the output signal from a proton precession magnetometer and two VLF-EM receivers installed in a bird designed to be towed 100 feet below a helicopter. A gimbal and shock mounted TV camera, fixed to the helicopter skid, provides input signal to a video cassette recorder allowing for accurate flight path recovery by correlation between the flight path cassette and air photographs of the survey area. A KING KRA-10A radar altimeter allows the pilot to continually monitor and control terrain clearance along any flight path.

Continuous measurements of the earth's total magnetic field intensity and of the total horizontal VLF-EM field strength of two transmission frequencies are stored in three independent modes: an analogue strip chart recorder, digital magnetic tapes and a digital video recovery system. A threepen analogue power recorder provides direct, unfiltered recordings of the three geophysical instrument output signals. A Hewlett-Packard 9875 tape drive system digitally records all information as it is processed through an onboard micro-computer. The magnetic and electromagnetic data is also processed through the onboard micro-computer, incorporating an analogue to digital converter and a character generator, then superimposed along with the date, real time and terrain clearance upon the actual flight path video recording to allow exact correlation between geophysical data and ground location. The input signals are averaged and updated on the video display every second. Correlation between the strip chart, digital tape and the video flight path recovery tape is controlled via fiducial marks common to all systems. Line identification, flight direction and pertinent survey information are recorded on the audio track of the video recording tape.

### DATA PROCESSING

Field data is digitally recorded on magnetic cassettes in a format compatible with the Hewlett-Packard 9845 computer. The flight path locations are digitized, thus the information can be processed as either time series or space point data.

Total field intensity magnetic information is routinely edited for noise spikes and corrected for any diurnal variations recorded on a base magnetometer located in the survey area.

Total field intensity VLF-EM signals are sensitive to topographic changes and receiver oscillation. Oscillation effects can be removed by filters tuned to the dominant period. Long period terrain effects can be removed by subtracting a polynomial fitted base level from the data. The degree of the polynomial can be selected to best represent terrain variations observed in the survey area.

Short period terrain effects often have similar response parameters to target conductive features. An interpretational technique often useful in distinguishing between terrain anomalies and conductor anomalies is to observe the difference between the responses from two transmitter stations. Terrain variations normally affect both data sets to a similar degree and are much reduced on a difference plot. The amplitude of the response due to a conductive body is dependent upon the relationship between the conductors' strike and direction to the transmitter station. In most instances the anomalous responses will vary between frequencies and therefore remain evident on the difference plot.

#### DISCUSSION OF RESULTS

The airborne survey covered some 360 line kilometres. The magnetic intensity data is shown on Figure 2. The survey map covers an area of some 9 km x 9 km and is dominated by a strong magnetic ridge which trends northwest across the survey.area. It rises some 2000 gammas above background and terminates abruptly some 1.5 km northwest of Fire Mountain. Research into the geology of the Fire Mt. area by J. Vincent did not indicate the presence of any intrusive rocks, however, the elongate shape of the magnetic body would suggest an intrusive which has invaded an area of structural weakness. The strong magnetic values and steep magnetic gradients in area of interest I suggest the close proximity to the surface of intrusive rocks or a possible volcanic vent.

The crown grant claims cluster along the western flank of this anomaly. The gold on the claims is associated with quartz and sulphide mineralization including chalcopyrite, sphalerite and arsenopyrite. Personal communication with J. Stewart of Rhyolite Resources Inc. confirms the presence of the sulphide mineralization which he reports contain consistant low grade gold values. The magnetic data would suggest the presence of pyrrhotite and/or magnetite.

Ten areas of interest are blocked out on the map; they cover small irregular magnetic high anomalies. A possible interpretation is that if the large magnetic anomaly reflects an underlaying intrusion these small anomalies may possibly be due to auriferous high susceptibility minerals following zones of structural weakness. It is interesting to note that the southern crown grants on Fire Mt. cluster close to area C and that Kidd Creek Mines located the Lilabet 1 mineral claim based on gold in stream sediments which

obviously are derived from the magnetic anomaly in area D. Thus the magnetic anomalies A to J are of exploration merit.

The VLF-electromagnetometer survey detected a series of long conductor trends which follow the strike of the geology and lie along the western flank of the large magnetic high. These are partially obscured by terrain variation responses from the VLF-EM system but show good line to line correlation. These conductors may possibly be due to an argillaceous graphite horizon, massive sulphide mineralization or possibly as major structure since they align with the major structure in Fire Creek to the southeast and a steep canyoned creek to the northwest. The most interesting VLF-EM anomaly has been designated area J, here it follows a magnetic finger protruding from the large magnetic ridge.

#### CONCLUSION AND RECOMMENDATIONS

The Lillooet River, Fire Creek and Harrison Lake are associated with a major regional fault system and hot spring activity. Airborne magnetometer surveying has outlined a direct association with high susceptibility minerals, pyrite, arsenopyrite and gold mineralization at Doctors Point on Harrison Lake and in Fire Creek. It would appear that late intrusions have invaded this major zone of structural weakness and given rise to a significant amount of epigentic mineralization. The airborne survey has delineated a major lenticular magnetic anomaly on the INFERNO claims of Rhyolite Resources Inc. This magnetic anomaly appears to be controlling the gold mineralization of Fire Mountain. The head of this anomaly shows steep magnetic gradients and would suggest

good chemical activity. It is recommended that this anomaly be examined for massive sulphide mineralization as well as precious metals. Each of the anomaly areas should be covered with a mini grid, geologically mapped, soil sampled along with ground magnetometer and VLF-electromagnetometer surveys. A second stage would be to conduct large loop vector pulse electromagnetometer surveying on a reconnaissance basis over Fire Mountain to search for a major massive sulphide deposit and to conduct multipole high resolution induced polarization surveying to search for less conductive auriferous sulphide mineralization on the smaller grids.

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Respectfully submitted,

Glen E. White P.Eng., Consulting Geophysicist

#### STATEMENT OF QUALIFICATIONS

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

PROFESSION: Geophysicist

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

PROFESSIONAL ASSOCIATIONS:

Registered Professional Engineer, Province of British Columbia.

Associate member of Society of Exploration Geophysicists.

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

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

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

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

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

Two years Chief Geophysicist Tri-Con Exploration Surveys Ltd.

Eleven years Consulting Geophysicist.

Active experience in all Geologic provinces of Canada.

# INSTRUMENT SPECIFICATIONS

# BARRINGER AIRBORNE MAGNETOMETER

MODEL:	Nimbin M-123				
TYPE:	Proton Precession				
RANGE:	20,000 to 100,000 gammas				
ACCURACY :	+ 1 gamma at 24 V d.c.				
SENSITIVITY:	1 gamma throughout range				
CYCLE RATES:					
Continuous	0.6, 0.8, 1.2 and 1.9 seconds				
Automatic	2 seconds to 99 minutes in 1 second steps				
Manual	Pushbutton single cycling at 1.9 seconds				
External	Actuated by a 2.5 to 12 volt pulse longer than 1 millisecond.				
OUTPUTS :					
Analogue	0 to 99 gammas or 0 to 990 gammas - automatic stepping				
Visual	5 digit numeric display directly in gammas				
EXTERNAL OUTPUTS:					
Analogue	2 channels, 0 to 99 gammas or 0 to 990 gammas at 1 m.a. or 1 volt full scale deflection.				
Digital	BCD 1, 2, 4, 8 code, TTL compatible.				
SIZE:	Instrument set in console 30 cm X 10 cm X 25 cm				
WEIGHT:	3.5 Kg				
POWER REQUIREMENTS:	12 to 30 volts dc, 60 to 200 milliamps maximum.				
DETECTOR:	Noise cancelling torroidal coil installed				

#### INSTRUMENT SPECIFICATIONS

#### SABRE AIRBORNE VLF SYSTEM

Source of Primary Field:VLF radio stations in the frequency range of 14KHz to 30 KHz.

Type of Measurement: -Horizontal field strength Number of Channels: -Two; Seattle, Washington at 24.8 KH<sub>z</sub> -Cutler, Maine at 17.8 KH<sub>z</sub> Type of Sensor: -Two ferrite antennae arrays, one for each channel, mounted in magnetometer bird. Output: -0 - 100 mV displayed on two analogue meters ( one for each channel)

-recorder output posts mounted on rear of instrument panel

-Eight alkaline 'AA' cells in main instrument case (life 100 hours)

-Two 9- volt alkaline transistor batteries in bird (life 309 hours)

-Dimensions -30 cm x 10 cm x 25 cm

Instrument Console:

Power Supply:

-Weight - 3.5 Kg.

#### Instrument Specifications

#### FLIGHT PATH RECOVERY SYSTEM

i) T.V. Camera:

Model: RCA TC2055 Vidicon Power Supply: 12 volt de Lens: variable, selected on basis of expected terrain clearance Mounting: Gimbal and shock mounted to housing - housing bolted to helicopter skid

ii) Video Recorder:

Model: Sony SLO - 340 Power Supply: 12 volt dc / 120 volt AC (60 H\_)

Tape: Betamex ½" video cassette - optional length Dimensions: 30 cm x 13 cm x 35 cm Weight: 8.8 Kg Audio Input: Microphone in - 60 db low impedance microphone Video Input: 1.0 volt P-P, 75 Ω unbalanced, sync negative from camera

iii) Altimeter:

Hodel: Bonzer M: 10 Radar Altimeter Power Supply: 12 - 25 volts dc Output: 0 - 25 volt ( 1 volt / 1000 feet ) dc signal split to microprocessor and analogue meter Hounting: fixed to T.V. camera housing, attached to helicopter skid

Instrument Specifications

#### DATA RECORDING SYSTEM

i) Chart Recorder

Type: Esterline Angus Miniservo III Bench AC Ammeter -Voltmeter Power Recorder

Model: MS 413 B

Specification: S-22719, 3-pen servo recorder

Amplifiers: Three independent isolated DC amplifiers ( 1 per channel) providing range of acceptable input signals

Chart: 10 cm calibrated width 2-fold chart

Chart Drive: Multispeed stepper motor chart drive, Type D850, with speeds of 2, 5, 10, 15, 30 and 60 cm/hr. and cm/min.

Controls: Separate front mounted slide switches for power onoff, chart drive on-off, chart speed cm/hr - cm/min. Six position chart speed selector. Individual front zero controls for each channel.

Power Requirements: 115/230 volts AC at 50/60  $\rm H_{Z}$  ( Approximately 30 VA)

Writing System: Disposable fibre tipped ink cartridge (variable colors)

Dimensions: 38.6 cm x 16.5 cm x 43.2 cm Weight: 9.3 Kg.

#### ii) Digital Video Recording System

Type: L.H. Microcontrols Ltd. Microprocessor Control Data Acquisition System Hodel: DADG - 68 Power Requirements: 10 - 14 volts dc, Maximum 2 amps Input Signal: 3, 0 - 100 mvolt d c signals 1. 0 - 25 volt d c signal Microprocessor: Motorola MC-6800 CRT Controller: Motorola MC-6845 Character Generator: Notorola MCM-6670 Analogue/Digital Convertor: Intersil 7109 Multiplexer: Intersil IH 6208 Digital Clock: National MI 5318 chip 9 volt internal rechargeable nickle-cadhium battery Fiducial Generator: internally variable time set controls relay contact and audio output Dimensions: 30 cm x 30 cm x 13 cm Weight: 3 Kg

#### DATA RECORDING SYSTEM (CON'T)

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iii) Digital Magnetic Tape

Type: Hewlett Packard cartridge tape unit Model: 9875A Power Requirements: 24 volt d.c. Data Format: HP's Standard Interchange Format (SIF) Tape Cartridge: HP 98200A 225K byte cartridge compatible with HP Series 9800 desktop computers. Tape Drive: Dual tape drives providing up to 8 hours continual recording time. Controller: Internal micro-computer provides 23 built in commands.

: External computer generated commands.

# COST BREAKDOWN

DATE	PERSONNEL	PRODUCTION	RATE	CHARGEAB	
Oct.11-27	E.T.Pezzot M.McDermott	Pre-survey Preparation	500	8	\$4,000.00
Oct. 28, 1983	E.T.Pezzot M.McDermott	Field Survey	550	1	550.00
Nov.18-Dec.1	J. Behenna	Flight Path Recovery	225	10	2,250.00
Dec.5-Dec.13	E.T.Pezzot	Computer	275	7	1,925.00
k.	Analysis Processing		Sub	Sub-Total \$8	
Helicopter & F	uel				2,900.00
Vehicle					160.00
Meals & Accomm	odations				28.00
Equipment Leas	le			775.00	
Materials & su	pplies			220.00	
Air Photos		32.00			
Photographic E	Cnlargement, F	Reproduction			1,150.00
Drafting, Repr		1,200.00			
Computer Proce	ssing & Plott			4,950.00	
Interpretation	& Reports				4,600.00
Miscellaneous					260.00
			То	tal	\$25,000.00







