GEOLOGICAL, GEOCHEMICAL AND GEOPHYSICAL REPORT

ON THE

LOGAN CLAIM GROUP

WATSON LAKE MINING DISTRICT
Little Moose River Area, Yukon Territory
N.T.S. 105-B/7, 8, 9
Latitude 60°30'N; Longitude 130°28'W

FOR

REGIONAL RESOURCES LTD.
720 - 800 W Pender Street
Vancouver, B.C. V6C 2V6

By
C. G. Verley, B.S., Geologist
SUPERVISED BY: Michael H. Sanguinetti, P.Eng.

CORDILLERAN ENGINEERING
1418 - 355 Burrard Street
Vancouver, B.C. V6C 2G8

JANUARY, 1980

CLAIMS: Logan Numbers 1-36 inclusive
LOCATION: 68 airmiles NW of Watson Lake, Y.T.
DATE: August 15 to October 25, 1979
This report has been examined by the Geological Evaluation Unit and is recom-
manded to the Commissioner to be considered as representation work in the amount of

$15,450.00

J. A. Morris
Resident Geologist or
Resident Mining Engineer

Considered as representation work under
Section 53 (4) Yukon Quartz Mining Act

W. N. Bayliss
Commissioner Mining Recorder

Commissioner of Yukon Territory
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FIGURE 2: Logan #1-6 claims, looking west.
The Logan group (36 claims) is located 109 kilometres (68 miles) northwest of Watson Lake, Y.T. in the Watson Lake Mining District (N.T.S. 105-B/7,8,9). The claims are situated at latitude 60°30'N and longitude 130°28'W and lie 39 kilometres (24 miles) north of the Alaska Highway. A new discovery, the Logan was found for Regional Resources Ltd. during the 1979 field season by Cordilleran Engineering.

Zn, Cu, Ag mineralization occurs in a vein system associated with a felsite dyke - both of which cut granodiorite. Chip samples across a five foot wide, steep southerly-dipping vein average: 5.29% Zn, 0.58% Cu, and 1.79 oz/ton Ag with trace Pb, Sn, WO3. Grab samples of typical mineralized vein float assay: 8.15% Zn, 0.29% Cu, 5.01 oz/ton Ag with selected samples running up to 35.88% Zn, 1.42% Cu and 16.35 oz/ton Ag. Samples of silicified and brecciated felsite assay up to 1.42% Sn (tin).
CLAIM MAP
LOGAN GROUP
WATSON LAKE MINING DISTRICT, YUKON TERRITORIAL N.T.S. 105B-7,8,9
SCALE: 1 inch = 1/2 mile
CONTOUR INTERVAL = 500 feet
FIGURE 3
The results of soil sampling indicate a zone with coincident anomalies in Cu, Pb, Zn, Ag, Sn extends for a length of 750 metres (2500 feet) and width of 150 metres (500 feet) on the property. Mineralization adequate to explain very high Pb (up to 9900 ppm) and Ag (up to 50 ppm) in soils has not been located at present.

The Logan group hosts vein-type Zn-Cu-Ag mineralization which may have potential to support a small tonnage high grade mining operation. Many geological similarities with greissen-type deposits exist. The property is also believed to have good potential for hosting significant Sn and Ag mineralization.
G E O L O G Y

(Plate 1)

The Logan property lies in the northern Cassiar Mountains in the Omineca crystalline belt. The claims are situated on the contact between highly deformed metasediments (Lower Cambrian and earlier (?)) and a magmatitic, Upper Cretaceous intrusive. A shattered, mineralized felsite dyke and mineralized quartz vein system are associated with pronounced northerly, northeasterly and easterly trending lineaments in the intrusive on the north side of the claims. Gossanous quartz veins in the metasediments are associated with areas of anomalous soil geochemistry (Cu, Pb, Zn, Ag, Sn) on the southwest part of the group.

The physiography of the property is characterized by rolling hills with elevations ranging from 4500' to 5100' ASL. A cover of pine, spruce and juniper prevails below 4700'. Soils are well developed over most of the property.
GEOLOGY (cont'd)

LITHOLOGIES

Preliminary mapping was restricted to the Logan 1-6 claims. Despite limited exposure (less than 1%) three lithologies were located, descriptions of these follow. Petrographic descriptions of specimens from each unit and mineralization have been prepared by Dr. J. Payne of Vancouver Petrographics.

CREATCEOUS

Unit K_{PG}: Pegmatitic Granodiorite

Much of the Logan group is underlain by a medium-grained biotite-muscovite granodiorite. Coarse pegmatitic lenses (15 cm to 60 cm in length), with graphic textures, are common throughout the intrusive. Large xenoliths of metasediments occur in this unit immediately north of the property. Local layering within K_{PG} may represent relict structures suggesting a migmatitic origin for this rock. Near quartz veins, plagioclase and biotite are intensely altered to sericite.

Unit K_{P}: Felsite

A northeasterly trending dyke of felsite approximately 12 metres (40 feet) wide is inferred to intrude granodiorite on the Logan 3, 5 claims. The felsite is an aphanitic, pale brown rock, which is commonly highly fractured and
veined with quartz. Sphalerite and arsenopyrite occur in veins and on fracture surfaces. In thin-section the rock consists of euhedral to subhedral plagioclase (7-10%) and mafic phenocrysts (biotite? 1-2%) in a groundmass of plagioclase (45-50%), quartz (20-25%), mafics (7-10%, biotite?). Phenocrysts and groundmass feldspars are intensely altered to sericite. In hand specimen rare, anhedral quartz phenocrysts (2-3 mm dia.) were noted. Float boulders of a silicified breccia containing angular fragments of felsite occur in a slight topographic depression approximately 75 metres north of the west end of the dyke. Minor sphalerite and galena are found in the breccia, cassiterite has tentatively been identified.

Grab samples of this material assay 0.33 to 1.42% Sn and 4.85 to 16.35 oz/ton Ag. Two stages of quartz veining are evident in the breccia.

**Unit K_MV**: Main Vein

A slight topographic, linear depression up to 20 metres in width, easterly trending, occurs in the center of Logan 1-6. Sphalerite, arsenopyrite, chalcopyrite, pyrite-bearing quartz vein float lies in the depression. A large "poison-patch" of exotic or transported gossan containing fragments of vein material, granodiorite and felsite is situated south of the vein. Small patches of exotic gossan lie adjacent to the south side of the vein at several other localities. At approximately 250E, 50N (soil grid coordinates) a quartz vein system 1.5 metres (5 feet) wide, with steep southerly dip, is exposed. From this exposure and the vein float distribution it is inferred that a vein system, the
"Main Vein", underlies the depression. The exposed vein contains relatively massive sphalerite with chalcopyrite and siderite (?) in vuggy comb-textured quartz, arsenopyrite and lessor sphalerite disseminated in medium-to coarse-grained quartz. Chip samples taken across the vein average 5.29% Zn, 0.58% Cu, 0.02% Pb, 1.79 oz/ton Ag. A more detailed description of the vein and mineralization is given under "Mineralization". The width of the topographic depression (20 metres) relative to the vein width (1.5 metres) suggest either several parallel veins may occur in this zone or sericitization of \( K_{PG} \) is extensive on the vein hanging wall.
FIGURE 4: Trench exposing "Main Vein".
Easterly and northeasterly linear trends are the main structures on the Logan claims, with northerly and northwesterly trends less well developed. It is conceivable that these features developed through north-northeasterly compression, with the main vein and felsite being emplaced after relaxation of this stress.
MINERALIZATION

In place mineralization is exposed on the Logan group at the "Main Vein Showing". The outcrop is interpreted to be composed of a set of several parallel veins (Figure 5). The intensity of mineralization appears to increase from south to north across the system. South veins (5 to 10 cm wide) contain disseminated arsenopyrite with minor sphalerite in thin walls and coarse euhedral sphalerite and minor arsenopyrite in vugs between comb-textured quartz walls. A vein central to the system has walls that are impregnated with sphalerite (up to 15% ZnS) and arsenopyrite (approximately 3%). Textures in this vein suggest that the walls were shattered, then flooded with mineralizing solutions. On the north side a thick vein (30 cm) has a core of relatively massive sphalerite with chalcopyrite, pyrite and carbonate. Paragenesis of this vein is illustrated in Figure 6. The wall rock of the vein system is intensely sericitized pegmatitic granodiorite. The foot wall is mineralized with sheet-like series of quartz-sphalerite
FIGURE 5: SCHEMATIC CROSS-SECTION: MAIN VEIN

SOUTH
ALTERED $K_{PG}$
BARREN QUARTZ STRINGERS

1.5m

NORTH
ALTERED $K_{mg}$
QUARTZ-SPHALERITE VEINS IN $K_{pg}$

RELATIVELY MASSIVE SPHALERITE VEIN FILLING WITH CHALCOPYRITE, CARBONATE AND MINOR PYRITE.

VEIN WALL IMPREGNATED WITH SPHALERITE AND ARSENOPYRITE.

INDIVIDUAL VEIN CYCLE: DISSEMINATED ARSENOPYRITE AND MINOR SPHALERITE IN WALLS, COARSE EUHEDRAL SPHALERITE, MINOR ARSENOPYRITE IN VUGS BETWEEN COMB-TEXTURED QUARTZ WALLS.

FIGURE 6: VEIN PARAGENESIS

QUARTZ
ARSENOPYRITE
SPHALERITE
CHALCOPYRITE
PYRITE
CARBONATE

TIME $\rightarrow$
FIGURE 7: Chip sample sections, "Main Vein Showing".
### TABLE I

#### ASSAYS AND ANALYSES

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<tr>
<th>ASSAYS</th>
<th>% Cu</th>
<th>% Pb</th>
<th>% Zn</th>
<th>oz/T Ag</th>
<th>% WO3</th>
<th>% Sn</th>
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1 Weighted Average 0.64 0.02 7.67 1.75

2 Weighted Average 0.58 0.02 5.29 1.79

#### CHECK ASSAYS

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<tr>
<th>Cu</th>
<th>Pb</th>
<th>Zn</th>
<th>Ag</th>
<th>WO3</th>
<th>Sn</th>
<th>oz/T Ag</th>
<th>% Sn</th>
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<td>ppm</td>
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<td>ppm</td>
<td>ppm</td>
<td>ppm</td>
<td>ppm</td>
<td>ppm</td>
<td>ppm</td>
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<tr>
<td>VR-35</td>
<td>148</td>
<td>400</td>
<td>55</td>
<td>26</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
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<td>1600</td>
<td>1790</td>
<td>&gt;100</td>
<td>13</td>
<td>24</td>
<td>7.84</td>
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<td>VR-86</td>
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<td>3860</td>
<td>&gt;100</td>
<td>2</td>
<td>610</td>
<td>6.80</td>
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<td>VR-87</td>
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<td>153</td>
<td>340</td>
<td>18</td>
<td>2</td>
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<td>-</td>
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<td>66</td>
<td>2</td>
<td>&gt;10000</td>
<td>-</td>
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<td>VR-92</td>
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<td>3600</td>
<td>166</td>
<td>&gt;100</td>
<td>2</td>
<td>730</td>
<td>16.35</td>
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Nature of Sample | Width | Remarks
--- | --- | ---
Grab | - | Min'zd vein float
Continuous chip | 28 cm | "Main Vein"
Continuous chip | 64 cm | """"
Continuous chip | 76 cm | """"
Continuous chip | 33 cm | """"
Continuous chip | 33 cm | """"
Continuous chip | 38 cm | """"
Continuous chip | 38 cm | """"
Selected Grab | - | Min'zd vein float
Selected Grab | - | """"
Selected Grab | - | """"
Selected Grab | - | """"
Selected Grab | - | Silicified breccia float
Selected Grab | - | Silicified breccia float

Remarks:
- Mint'zd vein float
- "Main Vein"
- """"
- """"
- """"
- """"
- """"
- """"
- Silicified breccia float
- Silicified breccia float
MINERALIZATION (cont'd)

veins, the hanging wall is relatively barren. Fragments of wall rock occur, rarely, within the vein. Assays of chip samples taken across the vein system are listed in Table I and illustrated in Figure 7A.

The felsite dyke is intensely shattered and altered. Veinlets and fractures within this unit are commonly mineralized with spaherlite and rarely arsenopyrite. Float of brecciated and silicified felsite located 75 metres (250 feet) north of the western most exposure of the dyke shows evidence of at least two stages of quartz veining. The only galena found on the property to date (and in minor amounts, 1.3%) occurs in silicified breccia. Two grab samples of breccia assayed 0.33% and 1.42% Sn. The tin bearing mineral is presumed to be cassiterite.

Mineralized quartz vein float is common in some topographic depressions and abundant around and south of the Main Vein. Locations of selected grab samples of this mineralization are plotted in Plate I, assay values are reported in Table I. The distribution of vein float suggests that there are numerous veins in this area of the property or alternately several large veins or vein systems similar to the "Main Vein". Limited exposure has prevented determination of whether a stock-
MINERALIZATION (cont'd)

Stockwork development is consistent with features such as the intense hydrothermal alteration, brecciation and intrusive activity observed on the property. These features and tin values in breccia indicate that potential exists for locating greissen-type Sn mineralization with associated Ag on the Logan group.
Soil sampling on the Logan property consisted of grid sampling over 17.5 kilometres of line (360 samples) on Logan 1-6 and reconnaissance sampling on Logan 31-34 claims (150 samples). Frequency distributions of data for the detailed sampling are found in figures 8 to 12. Statistical categories, estimated from histograms are listed below (in ppm).

**TABLE II**

**STATISTICAL CATEGORIES: SOIL ANALYSES - LOGAN 1-6**

<table>
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<tr>
<th>Element</th>
<th>Background</th>
<th>Possibly Anomalous</th>
<th>Anomalous</th>
<th>Maximum Value</th>
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<tr>
<td>Cu</td>
<td>0 - 40</td>
<td>41 - 109</td>
<td>110+</td>
<td>1140</td>
</tr>
<tr>
<td>Pb</td>
<td>0 - 60</td>
<td>61 - 124</td>
<td>125+</td>
<td>9900</td>
</tr>
<tr>
<td>Zn</td>
<td>0 - 400</td>
<td>401 - 849</td>
<td>850+</td>
<td>&gt;20000</td>
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<tr>
<td>Ag</td>
<td>0 - 1.5</td>
<td>1.6 - 3.5</td>
<td>3.5+</td>
<td>50</td>
</tr>
<tr>
<td>Sn</td>
<td>0 - 60</td>
<td>61 - 99</td>
<td>100+</td>
<td>635</td>
</tr>
</tbody>
</table>

Contours of anomalous levels in each element are plotted on transparencies (Figures 13 and 14) at the same scale as Plate I.
SOIL SAMPLE FREQUENCY DISTRIBUTION

COPPER (P.P.M.)
360 SAMPLES

LOGAN PROPERTY (N.T.S. 105B-8,9)
WATSON LAKE MINING DISTRICT, YUKON TERRITORY

FIGURE 8
SOIL SAMPLE FREQUENCY DISTRIBUTION

LEAD (P.P.M.)
360 SAMPLES

LOGAN PROPERTY (N.T.S. 105B-8,9)
WATSON LAKE MINING DISTRICT, YUKON TERRITORY

FIGURE 9
SOIL SAMPLE FREQUENCY DISTRIBUTION

ZINC (P.P.M.)
360 SAMPLES

LOGAN PROPERTY (N.T.S. 105B-8,9)
WATSON LAKE MINING DISTRICT, YUKON TERRITORY

FIGURE 10
SOIL SAMPLE FREQUENCY DISTRIBUTION

SILVER (P.P.M.)
360 SAMPLES

LOGAN PROPERTY (N.T.S. 105B-8,9)
WATSON LAKE MINING DISTRICT, YUKON TERRITORY

FIGURE II
SOIL SAMPLE FREQUENCY DISTRIBUTION

TIN (P.P.M.)
360 SAMPLES

LOGAN PROPERTY (N.T.S. 105B-8,9)
WATSON LAKE MINING DISTRICT, YUKON TERRITORY

FIGURE 12
FIGURE 13: SOIL GEOCHEMISTRY, Pb, Ag, Sn ANOMALOUS ZONES. LOGAN 1-6 CLAIMS
FIGURE 14: SOIL GEOCHEMISTRY, Pb, Cu, Zn ANOMALOUS ZONES. LOGAN 1-6 CLAIMS
Results of the sampling on Logan 1-6 indicate anomalous trends in Cu, Pb, Zn, Ag, Sn are coincident with major structures, the main vein system and felsite. The most highly anomalous area is situated around the inferred intersection of the Main Vein and felsite and between the felsite and silicified breccia. It is important to note that the exposure of the Main Vein that was sampled lies in an area that is not considered anomalous. This may be a result of soil sample spacing or it could imply that the anomalous areas are underlain by better grade mineralization than that found in the vein exposed.

Reconnaissance sampling on Logan 31-34 indicates an anomalous area at the northwest end of the grid, with high values (in ppm) of Pb: 98, Cu: 102, Zn: 860, Ag: 3.2, Sn: 240. Prospecting suggests that the area is underlain by metasediments which are intruded by pegmatitic dykes and cut by quartz veins (4 to 60 cm wide).

Geophysical tests on one line across the vein, felsite and breccia were conducted by Pheonix Geophysics Limited. The results of this work indicate definite induced polarization anomalies are associated with the region underlain by the Main Vein and felsite. A "probable" anomaly extends from the
felsite to the silicified breccia. Magnetometer and electromagnetic results are inconclusive.
EVALUATION

The nature of the Main Vein Showing, associated float distribution and geochemical expression suggests that there may be sufficient mineralization associated with this structure to support a small tonnage, high grade mining operation. Geochemical response suggests higher grade Pb, Ag sections of the vein may occur along strike from the area of exposed mineralization.

A pronounced lineament pattern, possibly acting as a channeling or focusing mechanism for hydrothermal solutions and intrusive activity, as well as multiple hydrothermal events, alteration, veining, brecciation and tin mineralization are strong evidence favouring the possibility that Sn-Ag greissen zones may occur at relatively shallow depths.
RECOMMENDATIONS

For the 1980 field season a three-stage exploration program is recommended for the Logan claim group:

PHASE I

1) Grid Preparation
Accurately cut and flag grid: 10 kilometres.

2) Geochemistry
Detailed soil sampling of grid to determine metal (Cu, Pb, Zn, Ag, Sn) distribution: 1200 samples.

3) Geophysics
Geophysical survey of grid using induced polarization, MaxMin electromagnetic and magnetometer methods.

4) Geological Mapping
1:5000 scale mapping, conducted concurrent to soil sampling.

PHASE II

Diamond drilling, 2000 ft (600 m), is recommended to test existing geochemical anomalies and the Main Vein.
RECOMMENDATIONS (cont'd)

PHASE III

Contingent upon the success of Phases 1 and 2, 2000 feet of further diamond drilling is recommended.
## Estimated Cost of Recommended Exploration Program

### LOGAN #1-36 Claim Group

#### Phase I

**Program:**
- Grid preparation
- Soil geochemistry
- Geophysical survey
- Geological mapping

**Time Period:** One month

**Personnel:**
- Geologist
- Two linecutters
- Two samplers/geophysical assistants
- Two geophysicists
- Cook

**Costs:**

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<td>Fixed-wing aircraft support (1000 mi x $2.50/mi)</td>
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<td>Camp supplies, food</td>
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<td>Camp equipment and rentals</td>
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<td>Assays and analyses</td>
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<td>Geochemical survey (1200 samples, Cu, Pb, Zn, Ag, Sn)</td>
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<td>Geophysical surveys: mobilization</td>
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<tr>
<td>Induced polarization survey (10 km x $385/km)</td>
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<td>Magnetometer (10 km x $90/km)</td>
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<tr>
<td>Linecutting (10 km x $300/km)</td>
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<tr>
<td>Miscellaneous expense</td>
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**Total Phase I** $85,000
TOTAL PHASE I forward ........... $85,000

PHASE II
A diamond drilling program of 2000 feet (600 metres) is recommended to test the best geochemical anomalies and known mineralization.

ESTIMATED COST OF PHASE II ........ 100,000

ESTIMATED COST OF RECOMMENDED 1980 EXPLORATION PROGRAM
PHASES I and II ............ $185,000

PHASE III
Contingent upon the success of Phases I and II, a further 2000 feet (600 metres) of BQLW diamond drilling is recommended at an estimated cost of $100,000

Respectfully submitted

C. G. Verley, B.Sc., Geologist

SUPERVISED BY: M. H. Sanguinetti, P.Eng.

Vancouver, B.C.
ADDENDUM

GEOCHEMISTRY

Soil samples were taken at 50 metre intervals along grid lines. Each sample site was flagged and labelled. Samples were collected from the "B" horizon which was fairly well developed over most of the property. The sample depth, soil type, colour, drained and slope were recorded for each site. Samples were placed in numbered kraft enveloped, dried and sieved (to -80 mesh) at base camp then delivered to Bondar-Clegg and Company Ltd's North Vancouver laboratory. There a fraction of each samples was digested by perchloric and nitric acids for Cu, Pb, Zn, and Ag analysis by the atomic absorption method. Tin determinations were made by the X-ray diffraction method.

SUMMARY AND CONCLUSIONS

In excess of $21,000.00 has been expended to conduct preliminary geological, geophysical and geochemical
investigations on the Logan #1-36 claim block, Watson Lake Mining District, Y.T.

Zn, Cu, Ag mineralization occurs in a vein system associated with a felsite dyke - both of which cut granodiorite. Chip samples across a five foot wide, steep southerly-dipping vein average: 5.29% Zn, 0.58% Cu and 1.79 oz/ton Ag with trace Pb, Sn and WO3. Grab samples of typical mineralized vein float assay: 8.15% Zn, 0.29% Cu, 5.01 oz/ton Ag with selected samples running up to 35.88% Zn, 1.42% Cu and 16.35 oz/ton Ag. Samples of silicified and brecciated felsite assay up to 1.42% Sn.

Soil sampling on the Logan property consisted of grid sampling over 17.5 kilometres of line (360 samples) on Logan #1-6 and reconnaissance sampling on Logan 31-34 claims (150 samples). All samples were collected at 50 metre intervals and analyzed for Cu, Pb, Zn, Ag and Sn. Results of the sampling indicate anomalous values in soils are related to mineralized structures. Geophysical tests were conducted on one line on the Logan 1-6. Results of this work indicate definite induced polarization anomalies are associated with the region underlain by the Main Vein and felsite. Electromagnetic and magnetic methods gave inconclusive results.
The Logan group hosts vein-type Zn-Cu-Ag mineralization which may have potential to support a small tonnage high grade mining operation. Many geological similarities with greissen-type deposits exist. The property is also believed to have good potential for hosting significant Sn and Ag mineralization.
APPENDIX "A"

CERTIFICATES
I, Carl G. Verley of Vancouver, British Columbia hereby certify that:

1. I am a geologist residing at 301 - 1867 West 3rd Avenue, Vancouver, B.C. and employed by Cordilleran Engineering of 1418-355 Burrard Street, Vancouver, B.C., V6C 2G8.

2. I am a graduate of the University of British Columbia, B.Sc., in 1974, and have practiced my profession since that time.

3. I am an engineering pupil with the Association of Professional Engineers of the Province of British Columbia.

4. I am the author of this report which is based on work conducted on the Logan #1-36 mineral claims during the period August 15 to October 25, 1979. This work included geological mapping and geochemical sampling, geophysics undertaken on behalf of the Logan Joint Venture.

CORDILLERAN ENGINEERING

Carl G. Verley, B.Sc.,
Geologist

January, 1980
Vancouver, B.C.
SUPERVISOR'S CERTIFICATE

I, Michael H. Sanguinetti of Vancouver, British Columbia hereby certify that:

1. I am a geologist residing at 2208 West 35 Avenue, and employed by Cordilleran Engineering of 1418-355 Burrard Street, Vancouver, B.C., V6C 2G8.

2. I am a graduate of the University of British Columbia, B.Sc., in 1965, and have practiced my profession since that time.

3. I am a member of the Association of Professional Engineers of the Province of British Columbia.

4. I supervised the writing of this report which is based on the results of a field program conducted by Cordilleran Engineering during the period August 15 to October 25, 1979.

5. Field work was done under the supervision of Mr. J. W. Stollery, P.Eng.

Michael H. Sanguinetti, B.Sc., P.Eng.
Geologist

January, 1980
Vancouver, B.C.
APPENDIX "B"

ASSAY CERTIFICATES
BONDAR-CLEGG & COMPANY LTD.

CERTIFICATE OF ASSAY

I hereby certify that the following are the results of assays made by us upon the herein described pulp samples.

<table>
<thead>
<tr>
<th>MARKED</th>
<th>GOLD</th>
<th>SILVER</th>
</tr>
</thead>
<tbody>
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<td>92</td>
<td>16.35</td>
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NOTE:
Rejects retained three weeks
Pulps retained three months
unless otherwise arranged.

Registered Assay Office Province of British Columbia
I hereby certify that the following are the results of assays made by us upon the herein described pulp samples.

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NOTE:
Rejects retained three weeks
Pulps retained three months unless otherwise arranged.
I hereby certify that the following are the results of assays made by us upon the herein described samples.

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<th>MARKED</th>
<th>GOLD</th>
<th>SILVER</th>
<th>Cu</th>
<th>Pb</th>
<th>Zn</th>
<th>WO₃</th>
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<td>Ounces per Ton</td>
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</table>

NOTE:
Rejects retained three weeks
Pulps retained three months
unless otherwise arranged.

cc: Mr. E. Balon

Registered Assayer, Province of British Columbia
I hereby certify that the following are the results of assays made by us upon the herein described ore samples.

<table>
<thead>
<tr>
<th>MARKED</th>
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<th>Cu</th>
<th>Zn</th>
<th>WO₃</th>
<th>Sn</th>
<th>Pb</th>
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<tbody>
<tr>
<td></td>
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<td>Ounces per Ton</td>
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<td>0.04</td>
</tr>
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</table>

cc Mr. E. Balon

NOTE:
Rejets retained three weeks
Pulps retained three months
unless otherwise arranged.
APPENDIX "C"

GEOPHYSICAL REPORT
PHOENIX GEOPHYSICS LIMITED

REPORT ON THE
GEOPHYSICAL ORIENTATION PROGRAM
AND
LOGAN, EAGLE AND WOLF CLAIM GROUPS
WATSON LAKE MINING DISTRICT
YUKON TERRITORY
FOR
CORDILLERAN ENGINEERING LIMITED

1. INTRODUCTION

A geophysical orientation survey has been carried out on three properties for Cordilleran Engineering Limited. The test surveys consisting of magnetometer, electromagnetic, induced polarization and resistivity surveys were conducted on the Logan, Eagle and Wolf Claim Groups. The properties are located 100km west-northwest of Watson Lake in the Yukon Territory.

The object of the survey was to investigate the geophysical response of mineral discoveries on the three claim groups. The tests were limited in nature, with just one line being surveyed on each claim group.
The surveys were carried out under the supervision of Crew Leader John Marsh. His certificate of qualification is appended to this report.

A McPhar M-700 Fluxgate Magnetometer with a sensitivity of 20 gammas per scale division was used for the magnetic survey. The electromagnetic survey was carried out with a McPhar VHEM dual frequency 600 and 2400 Hz unit operating in the vertical mode. A Phoenix IPT-1, IPV-1 frequency domain IP system was used for the induced polarization and resistivity survey operating at 0.3 and 5.0 Hz.

Field work was carried out during October, 1979.

2. DESCRIPTION OF PROPERTIES

The orientation survey took place on three properties described as follows:

- WOLF Claims 1-52 inclusive, NTS 105-B - 10,
  Longitude 130° 02', Latitude 60° 30'
- EAGLE Claims 1-8 inclusive, NTS 105-B - 8,
  Longitude 130° 26', Latitude 60° 26'
- LOGAN Claims - 106 inclusive, NTS 105-B - 8 + 9,
  Longitude 130° 28', Latitude 60° 30'.

3. PRESENTATION OF RESULTS

The results of the geophysical surveys are shown on the following data plots. The induced polarization and resistivity results are plotted in the manner described in the notes preceding this report. The electromagnetic and magnetometer results have been profiled.

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<th>Line</th>
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<th>Geophysical Method</th>
<th>Dwg. No</th>
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<td>50S</td>
<td>Wolf Claims</td>
<td>IP - 100 m Dipoles</td>
<td>IP 5178-1</td>
</tr>
<tr>
<td>50S</td>
<td>Wolf Claims</td>
<td>EM &amp; Magnetic</td>
<td>G 5178-2</td>
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<tr>
<td>0+00</td>
<td>Eagle Claims</td>
<td>IP - 100 m Dipoles</td>
<td>IP 5178-3</td>
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</tbody>
</table>
Also enclosed with this report is Dwg. I.P.P. 1047-1,-2,-3, plan maps of the Wolf, Eagle & Logan Grids. The definite, probable and possible Induced Polarization and EM anomalies are indicated by symbols, in the manner shown on the legend, on these plan maps as well as on the data plots.

Since the Induced Polarization measurement is essentially an averaging process, as are all potential methods, it is frequently difficult to exactly pinpoint the source of an anomaly. Certainly, no anomaly can be located with more accuracy than the electrode interval length; i.e. when using 100 m electrode intervals the position of a narrow sulphide body can only be determined to lie between two stations 100 m apart. In order to definitely locate, and fully evaluate, a narrow, shallow source it is necessary to use shorter electrode intervals. In order to locate sources at some depth, larger electrode intervals must be used, with a corresponding increase in the uncertainties of location. Therefore, while the centre of the indicated anomaly probably corresponds fairly well with source, the length of the indicated anomaly along the line should not be taken to represent the exact edges of the anomalous material.

The Grid information shown on Dwg. I.P.P. 1047-1,-2,-3 has been taken from maps made available by the staff of Cordilleran Engineering Ltd.

4. DISCUSSION OF RESULTS

(a) Wolf Claims

Stratiform massive sulfide mineralization occurs in a northeasterly
trending outcrop of lower Cambrian, or earlier, metamorphic rocks. The showing is located about 50 meters northeast of station 0400, Line 50S. The country rock consists of rusty weathering metapelites and metagrits.

The mineralization consists of Lamellae of galena, sphalerite and minor chalcopyrite and pyrite alternating between thin layers of greenish quartz-muscovite schist, dark grey siliceous schist and pale feldspar bands. The showing, exposed over 3 meters, contains three 0.6 meter bands of mineralization separated by quartz rich beds.

A bed of massive granular pyrite in a sericite muscovite schist is poorly exposed in a small outcrop located 25 meters east of the above showing.

The induced polarization and resistivity survey did not locate an anomaly adjacent to these mineral occurrences. The resistivities were moderately high and the IP effects were background levels.

A well defined moderate magnitude IP anomaly indicating some distance to the source occurs between 4000W and 2000W and may extend to 1000W. The distance to the source, either beneath or adjacent to the line is estimated at 25 - 30 meters. The correlating resistivity low appears deeper than the frequency effect anomaly and suggests disseminated material surrounding a more conductive core.

A second lower magnitude IP anomaly was located between 1000E and 4000E. The frequency effect anomaly is shallow relative to the 100 meter dipoles while the accompanying resistivity low indicates some distance to the source. This again is suggestive of disseminated material over a more conductive core.

Very weak IP effects were recorded between 6000E and 7000E in a moderate magnitude resistivity environment.
The electromagnetic (EM) survey did not locate any well defined strong conductors. A weak anomaly at 2+75W correlates with the deep IP anomaly.

The magnetometer survey shows an unusually flat response over the entire line. There is an indication of two distinct magnetic plateaus with a 600 gamma level west of 2+50E and 550 gammas to the east. There is no correlating magnetic high with either the IP or EM anomalies.

(b) Eagle Claims

The Eagle Claim area is underlain by a biotite-muscovite-quartz schist (metagrit), metaquartzite, and crystalline limestone. This sequence has been folded into a northeasterly trending synform.

Mineralized float containing Cu, Pb, Zn, and Ag was discovered beside a gossan on the Little Moose River, (0+00, Base Line). The gossan consists of a highly fractured quartz-sericite schist, probably the equivalent of the metagrit. Sphalerite and pyrite occur on fracture surfaces. The crystalline limestone should provide a marker horizon underlying the gossan.

A northeasterly trending geochemical anomaly conforms roughly with the synforms.

The IP survey outlined a weak but well defined anomaly centred at 0+50W and extending from 1+00E to 2+00W. Less anomalous material probably extends both east and west to 2+00E and 4+00W respectively. The frequency effects are moderately anomalous and the associated resistivities are moderately high. This suggests that metallic minerals are disseminated within a resistive medium. In this context, sphalerite is non-conductive and could form part of the ground mass. The anomalous pattern suggests an easterly dip.
PHOENIX GEOPHYSICS LIMITED
Theoretical Induced Polarization and Resistivity Studies
Scale Model Cases

\[ (\rho/2\pi) = 50 \]
\[ (M_f) = 12,500 \]

\[ (P/2\pi) = 50 \quad (P/2\pi) = 2.0 \]
\[ (M_f) = 0 \quad (M_f) = 12,500 \]

\[ (f_e) = 25\% \]

CASE III-05-PH-50-\( \theta \)30°

FIGURE #1
Weak IP effects centred at 7+00E are associated with moderate magnitude resistivities.

No strong, well defined EM anomalies were located on this line with the possible exception of the conductor at 9+00E. The anomaly is positioned east of the resistivity survey coverage, but probably occurs within a high resistivity environment.

(c) Logan Claims

The Logan Claims are underlain by a migmatitic, pegmatitic quartz monzonite. A northeast trending felsite dyke dipping to the southeast intrudes the quartz monzonite. The felsite is fractured, locally contains sphalerite in fractures and is cut by sphalerite-arsenopyrite-bearing quartz veins.

A quartz-siderite vein containing sphalerite, chalcopyrite, pyrite and arsenopyrite, strikes east-west and apparently dips steeply south. Line 3+00E crosses the vein at about 15 meters north, and the felsite dyke at 100 meters north. The quartz monzonite is intensely sericitized adjacent to the vein and felsite dyke.

Line 3E was surveyed with IP using 100 meter electrode intervals. An anomalous section was subsequently detailed with shorter 50 meter intervals.

The 100 meter data discovered a weak well defined IP anomaly that straddles the mineralized vein and terminates near the felsite dyke. Assuming a simple source, the anomalous pattern suggests a body dipping steeply north, with a depth to the source of 30 - 50 meters (Fig. #1). Since this interpretation does not agree with field observation which indicate a steep south dip, the source may be complex involving more than one mineralized body.
The 50 meter detail examines the shallow part of the section and does not penetrate sufficiently deep to investigate the deeper source. It does indicate weak shallow anomalies probably with two separate sources.

The EM survey did not locate a significant anomaly. The several weak responses may be due to orientation errors or conductive overburden.

Similar to the other grids, the magnetic response was relatively flat across grid Line 3+00E with a total relief of about 125 gammas. The base level averages about 430 gammas north of 0+50S and 525 gammas to the south. This could indicate a geological formation change.

5. CONCLUSIONS AND RECOMMENDATIONS

The geophysical test surveys on the three grids for Cordilleran Engineering Limited, were planned in an attempt to gather some information concerning the geophysical response to be expected from the mineralization that had been located as a result of geochemical sampling and geological mapping. The field work was extremely rushed due to the weather conditions, and only a limited time could be spent at each property.

One line was surveyed in each area. The magnetic and electromagnetic results from the three areas do not show any anomalous response that correlates with the known mineralization. This indicates that pyrrhotite and magnetite are not present, and the conducting sulphide minerals are not present in sufficient concentration and volume to produce an electromagnetic conductor. Even the bedded, massive granular pyrite band on the Wolf Prospect did not produce an EM anomaly.

The sulphide material itself is not a good conductor. The resistivity values for the band samples shown in Table I does not show high conductivity. The lowest resistivity sample is the massive pyrite from the Wolf Prospect.
<table>
<thead>
<tr>
<th>Sample and Description</th>
<th>Resistivity Ohm ft.</th>
<th>F.E.Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOGAN #2 - Vein material - contains sphalerite, arsenopyrite and trace of chalcopyrite.</td>
<td>133K</td>
<td>16</td>
</tr>
<tr>
<td>LOGAN #4 - Altered felsite</td>
<td>212K</td>
<td>8</td>
</tr>
<tr>
<td>LOGAN #5 - Unaltered wall rock</td>
<td>15K</td>
<td>3</td>
</tr>
<tr>
<td>LOGAN ASSAY # 13544 - Altered and mineralized wall rock</td>
<td>124K</td>
<td>11</td>
</tr>
<tr>
<td>WOLF # 37 - Massive pyrite and sericite</td>
<td>62</td>
<td>20</td>
</tr>
<tr>
<td>WOLF ASSAY # 2205 - Showing material</td>
<td>181K</td>
<td>13</td>
</tr>
</tbody>
</table>

TABLE I
There are significant frequency effect values measured from all of the rock samples from the showings that contained sulphide mineralization. If appreciable volumes of this material are present, and if the parameters of the survey are properly chosen, mineralization of this type could be located, and traced, using the induced polarization method.

The field measurements at the three prospects were made using a 100 meter electrode interval. This was chosen to give as much coverage as possible in the limited time available for field work. Weak, shallow anomalies were measured at the Eagle Prospect and the Logan Prospect. There was no IP anomaly measured at the showing on the Wolf Prospect; however, a fairly definite anomaly was measured, at depth to the west.

The absence of a measured IP anomaly over the showing at the Wolf Prospect may not be significant, since the 100 meter electrode interval is appreciably greater than the possible width of the source. As outlined in the Appendix to this report, it is possible that only very weak, or no, apparent IP effects will be measured if the electrode interval used is appreciably greater than the width of the source. For the same reasons of scale, the weak, shallow effects measured at the Eagle Prospect and the Logan Prospect can not be fully evaluated with the current data.

Since the magnetic method and the electromagnetic method did not indicate the presence of the mineralization at the three properties, the induced polarization and resistivity technique should be used in further exploration. At the Eagle Prospect and the Logan Prospect, measurements with shorter electrode intervals should be made, to determine the interval that results in the most definite anomaly. A grid should then be surveyed to cover the entire area of interest to be certain that all zones of metallic mineralization have been located.
At the Wolf Prospect, measurements with very short electrode intervals should be made to determine the IP effects to be expected from the mineralization in the showing and the pyrite band. A grid can then be surveyed to trace the extent of the zones.

When the detailed IP data is available, a program of short drill holes can be planned to determine the possible economic importance of the mineralization.

PHOENIX GEOPHYSICS LIMITED

Paul A. Cartwright, Geophysicist

Dated: January 9, 1980
ASSESSMENT DETAILS

PROPERTY: Wolf, Logan, Eagle Claims
SPONSOR: Cordilleran Engineering Ltd.
LOCATION: Watson Lake Area
TYPE OF SURVEY: Induced Polarization, Resistivity, Electromagnetic Magnetometer
OPERATING MAN DAYS: 10.0
EQUIVALENT 8 HR. MAN DAYS: 15.0
CONSULTING MAN DAYS: 2.0
DRAFTING MAN DAYS: 9.0
TOTAL MAN DAYS: 26.0
KM. OF LINE SURVEYED: 10.8
DATE STARTED: October 12, 1979
DATE FINISHED: October 24, 1979

CONSULTANTS:
Paul A. Cartwright, 45 La Rose Avenue, Apt. 1204, Weston, Ontario.

FIELD TECHNICIANS:
J. Marsh, 310 - 885 Dunsmuir Street, Vancouver, B.C.
D. Ouellette, 502 Taschereau Est., Rouyn, Quebec.

DRAUGHTSMEN:
R.J. Pryde, R.R.#1, Sharon, Ontario.
P.J. Anderson, 40 Landfair Crescent, Scarborough, Ontario.

PHOENIX GEOPHYSICS LIMITED

Dated: January 9, 1980
STATEMENT OF COST

Cordilleran Engineering Ltd. - Geophysical Surveys
Watson Lake Area of the Yukon Territory

CREW: J. Marsh - D. Ouellette

PERIOD: October 12 - 24, 1979

5 Operating days @ $560.00/day $2,800.00
1 Organization ) 2 days @ $210.00/day 420.00
1 Bad Weather ) 2 days
Mobilization 1,650.00

EXPENSES

Meals & Accommodation $ 70.00
Supplies 4.90
Telephone 46.41

121.31
+ 10% 12.13

133.44

$5,003.44

PHOENIX GEOPHYSICS LIMITED

Dated: January 9, 1980

Paul A. Cartwright, B.Sc.
CERTIFICATE

I, Paul A. Cartwright, of the City of Toronto, Province of Ontario, do hereby certify that:

1. I am a geophysicist residing at 45 La Rose Avenue, Weston, Ontario.

2. I am a graduate of the University of British Columbia, B.C. with a B.Sc. Degree.

3. I am a member of the Society of Exploration Geophysicists.

4. I have been practising my profession about 9 years.

5. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly, in the property or securities of Cordilleran Engineering Limited or any affiliate.

6. The statements made in this report are based on a study of published geological literature and unpublished private reports.

7. Permission is granted to use in whole or in part for assessment and qualification requirements but not for advertising purposes.

Dated at Toronto
This 9th day of January, 1980

Paul A. Cartwright, B.Sc.
CERTIFICATE

I, JOHN MARSH, of the Municipality of North York, Ontario, DO HEREBY CERTIFY THAT:

1. I am a geophysical crew leader residing at 200 Yorkland Blvd., Willowdale, Ontario.

2. I am a graduate of the City of Norwich Technical College, U.K., ordinary National Certificate (Electrical Engineering)

3. I worked with McPhar Geophysics Company from 1968 to 1975 as a geophysical crew leader.

4. I am presently employed as a geophysical crew leader by Phoenix Geophysics Ltd. of 310 - 885 Dunsmuir Street, Vancouver, B.C.

Dated at Vancouver, B.C.

This 29th Day of July, 1977

John Marsh
APPENDIX "D"

STATUTORY DECLARATION
In the matter of a geological geochemical and geophysical report on behalf of the Logan Joint Venture.

I, Michael H. Sanguinetti, agent for Cordilleran Engineering of 1418-355 Burrard St., Vancouver, B.C. V6C 2G8 do solemnly declare, that geological mapping, geochemical sampling, and geophysical surveys were conducted on the Logan #1-36 (inclusive) mineral claims, Watson Lake Mining District, Y.T., during the period August 15 to October 25, 1979. Expenditures for this work include:

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries, Management Fees, Consulting, and Petrographic Services</td>
<td>$6,176.88</td>
</tr>
<tr>
<td>Helicopter and fuel</td>
<td>$7,176.50</td>
</tr>
<tr>
<td>Assays and analysis</td>
<td>$5,082.40</td>
</tr>
<tr>
<td>Geophysical Survey</td>
<td>$1,650.79</td>
</tr>
<tr>
<td>Fixed Wing</td>
<td>$424.00</td>
</tr>
<tr>
<td>Accommodation, Food, Telephone, freight, supplies</td>
<td>$428.00</td>
</tr>
<tr>
<td>Drafting, printing</td>
<td>$432.81</td>
</tr>
<tr>
<td><strong>TOTAL</strong> $21,371.38</td>
<td></td>
</tr>
</tbody>
</table>

And I make this solemn declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath and by virtue of the Canada Evidence Act.

Declared before me at **Vancouver**

in the Prov. of B.C. this

11th day of February 1980

A notary Public in and for the Yukon Territory, B.C.
APPENDIX "E"

PERSONNEL
PERSONNEL

Mr. C. G. Verley, B.Sc.  
1418-355 Burrard St.  
Vancouver, B.C.  
Geologist

Mr. E. A. Balon  
1418-355 Burrard St.  
Vancouver, B.C.  
Prospector

Mr. J. W. Stollery, B.Sc., P.Eng.  
1418 - 355 Burrard Street  
Vancouver, B.C.  
Geological Engineer

Mr. M. H. Sanguinetti, B.Sc., P.Eng.  
1418-355 Burrard Street  
Vancouver, B.C.  
Geologist

Mr. H. E. Ewen  
1418-355 Burrard Street  
Vancouver, B.C.  
Field Assistant

Mr. T. Turner  
1418-355 Burrard Street  
Vancouver, B.C.  
Field Assistant

Mr. G. Didier  
1418-355 Burrard Street  
Vancouver, B.C.  
Field Assistant

Mr. B. Goodacre  
1418-355 Burrard St.  
Vancouver, B.C.  
Field Assistant
EXPLANATION:

SILVER CONTENT OF SOILS:

-オークワース: 0-1.5
- パスカル・アノーニマス: 1.5-3.5
- アノーニマス: 3.5+

VALUES AT 0.37 ppm LIMIT.
CONTAINERS ENCLOSING ANOMALOUS VALUES.

NOTE: ALL POINTS DATA 100% EVIDENT.

LOCAL TOWN VENTURE
SILVER GEOCHEMISTRY
LOCAL #1-6 CLAIMS
UNITED STATES PATENT OFFICE, USG S-4540
MINING LAND POLICY HANDBOOK.

SCALE:

PROFESSIONAL
ENGINEER