GEOLOGICAL AND GEOCHEMICAL REPORT

on the

ROW PROPERTY

NELSON MINING DIVISION

NTS: 82 F/1W

49° 10'N

116° 28'W

Owner:

493744 Ontario Limited
2300 - 855 West Georgia Street
Vancouver, B.C.
V6C 3E8

February, 1993

Gordon J. Allen, P. Geo

SUMMARY

The Row property is located approximately 7 km north of Creston in southeast British Columbia. It is underlain by Proterozoic Middle Aldridge Formation turbidites and was staked in 1986 to assess its potential of hosting a Sullivan-type Sedex deposit.

Previous programs on the property by F.R. Edmunds (1986) and Esso Minerals Canada (1987) outlined a lead-zinc-in-soil anomaly on the steep western slope of the Arrow Creek valley, on the eastern part of the property. Edmunds (1986) found a marker horizon in this area which he felt was "Sundown Time", or approximately 960 to 1200m above the Sullivan horizon at the base of the Middle Aldridge Formation. Rock samples from this area were analyzed for lead, zinc and mercury and a factor analysis score calculated. A positive score indicates that sample sites are possibly peripheral to a hydrothermal vent or sedex deposit on that particular horizon. Two such positive scores were obtained from the soil anomaly area.

Between September 18 and October 7, 1992, Granges Inc. conducted a short program of geological mapping, lithogeochemical and soil sampling, and line cutting on the Row property.

The property is largely underlain by a north-northeast-trending fault-bounded block of north-striking gently westerly-dipping grey argillite to sandstone turbidite sequences. On the western part of the property rocks have been altered to a greenish-grey phyllite, presumably due to proximity to a major fault zone. No significant visible mineralization was observed.

Factor analysis of rock sample analyses data confirmed four positive scores in the vicinity of the Sundown marker.

Petrographic studies of one of these samples indicates that the rocks have undergone some sericitic alteration similar to alteration peripheral to the Sullivan deposit.

The conclusions are that a favourable horizon does occur on the Row property but that where it has been observed it is a long way from any significant deposit, if in fact one exists. The distance to such a deposit could easily be beyond the 2 km width of the claim block.

To better assess the property, and specifically the favourable horizon, a program of grid flagging, geological mapping and lithogeochemical sampling is proposed.

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1.0 INTRODUCTION

Fieldwork on the Row property was conducted between September 18 and October 7, 1992. A total of 27 mandays (includes 17 mandays line cutting) were spent on the property during this program.

1.1 Program Objectives

The main objectives of the program were to visit the property, assess its potential of hosting a Sullivan-type sedex deposit, and to determine if any further work was warranted. Until this program, the Row property had not been visited by any Granges Inc. personnel.

In addition to collection of data from this property, the program provided some opportunity to become familiar with the geology of the Sullivan sedex lead-zinc deposit and exploration techniques used in the search for similar deposits in this region.

1.2 Exploration Techniques used in the Search for Sullivan-Type Sedex Deposits

1.2.1 Sullivan-Aldridge Project

On September 24th and 25th Granges personnel were fortunate to be able to attend a field trip in the Sullivan deposit area hosted by the British Columbia Geological Survey and the Geological Survey of Canada (Turner <u>et al.</u>, 1992). The field trip was directed by several members of the Sullivan-Aldridge Project. Several conclusions relevant to the exploration for Sullivan-type deposits were presented during this field trip:

A - The Sullivan deposit is located at the intersection of two roughly orthogonal regional scale faults. Movement occurred along these faults in the Mesozoic Era, but they were probably reactivated deep seated Proterozoic structures.

B - The Sullivan deposit occurs within a 6 km long north-south (fault-parallel) alteration zone known as the Sullivan-North Star Corridor. Biotite and most feldspar have been largely altered to muscovite within this alteration zone. "Altered rocks in the Sullivan-North Star trend are distinguished from unaltered equivalents by the near absence of feldspars and the collective abundance of chlorite, epidote, garnet, tourmaline and sulphides" (Turner <u>et al.</u>, 1992).

C - Tourmaline altered rocks (black, cherty material) are clearly spatially related to the ore. Tourmalinized rocks also occur in apparently unmineralized rock within the Aldridge Formation. Tourmalinized rocks in mineralized zones can apparently be distinguished from those in unmineralized zones by the presence of abundant sulphides and pale pink manganese garnets (up to 2mm in diameter in the Sullivan-North Star Corridor).

D - Albite alteration of sedimentary rocks (pale cream coloured, hard) occurs peripheral to the Sullivan ore body. It is also relatively common in other, unmineralized parts of the Aldridge Formation and may be unrelated to ore-forming processes.

E - The Aldridge Formation is largely a monotonous sequence of quartzite and argillite turbidites deposited in a deep water basin. Fragmental rocks, including sedimentary breccias and conglomerates are common in the Sullivan area. It is postulated that these fragmental rocks formed during slumping associated with block faulting. Conglomerates are postulated to have formed virtually in situ as a result of the tumbling and winnowing or washing of fragments by upwelling hydrothermal solutions in fault zones.

1.2.2 Stratigraphic Marker Horizons

Cominco Ltd. personnel recognized that several unique, thinly laminated (black and light grey) horizons within the Middle Aldridge Formation were persistent and identifiable over large distances (up to 300 km). With the use of these marker horizons, stratigraphic positions within the monotonous and otherwise undifferentiatable sequence of sandstones, siltstones and argillites could be determined.

The technique requires the use of photocatalogues of the marker horizons. These catalogues are not widely accessible and identification of any potential markers at present requires a consultant (eg. Dave Piggen, Cranbrook; Art Hagen, Vernon).

It is not clear how these marker horizons formed. The grain size and modal composition are apparently the same in the light and dark bands. Colour is the only significant difference. The sequence of bands can be spread apart and 'inflated' by turbidite layers suggesting that they were not formed by ordinary sedimentary process.

It has been suggested that the dark-coloured bands simply have a higher graphite content, possibly derived from wide-spread planktonic blooms in a quiet basin.

1.2.3 Factor Analysis

Metal content in the stratigraphic horizon containing a sedimentary exhalative deposit is generally elevated above background for several kilometres away from the deposit. Dr. R.F. Edmunds, while working for Cominco Ltd., developed a technique using factor analysis of lead, zinc and mercury contents of sedimentary rocks (preferably argillaceous material) whereby a sample could be given a grade ranging from 'not likely' to 'probably' peripheral to an exhalative centre.

1.3 Work Completed on the Row Property in 1992

1.3.1 Geological Mapping

Given the limited nature of the program only a few areas were mapped in any detail. Mapping was focused along roads and in areas with anomalous soil geochemistry. Mapping covers approximately 125 hectares.

1.3.2 Rock Sampling

A total of 36 rocks samples were sent to Acme Analytical Laboratories Ltd. of Vancouver for 30-element ICP and Hg analyses. Results were subsequently sent to Dr. F.R. Edmunds in Vancouver for factor analysis.

Nine rocks were collected and sent to Dr. Craig Leitch for thin section description. Petrographic work was done in an attempt to identify any alteration (ie. muscovite, garnet, or tourmaline) which could be associated with a vent.

Two samples of gabbro were sent to X-Ray Assay Laboratories for major oxide and rare earth element analyses as part of an on-going study of the Moyie sills.

1.3.3 Soil Sampling

Eleven soil samples were collected from previously sampled sites to confirm anomalous metal content.

1.3.4 Line Cutting

A total of 7.01 km of line was cut in preparation for possible future mapping and geophysical surveys.

The new cut lines are roughly coincidental with previously flagged lines, but did not follow them exactly. A new slope-corrected baseline (20+00E; old 0+00E) was started at 119+00N (old 19+00N) and cut true north to 150+00N and south to 100+00N from that point, traversing the entire length of the claim block (Figures 6 and 7). The previous base line extended from 0+00N to 50+00N. Stations on the new grid were made distinct from the old grid to avoid possible confusion between the two data sets.

Cross line 119+00 was cut from the 20+00E baseline true east to Arrow Creek at 38+20 E. This line was not slope-corrected.

1.4 Location and Access

The Row property is located in southeast British Columbia, in the Nelson Mining District, approximately 7 km north of Creston (Figure 1).

It is accessed via highway 3A which heads north on the west side of Creston. Approximately 6 km north of Creston the Lakeview-Arrow Creek road heads east to the Big Bear Creek Forest Service road which leads north up onto the property. Numerous unmaintained logging roads provide reasonable access to the central part of the claim block.

1.5 Property Title

The Row property is owned by 493744 Ontario Limited, a wholly owned subsidiary of Granges Inc (Figure 2). The property consists of the following mineral claims:

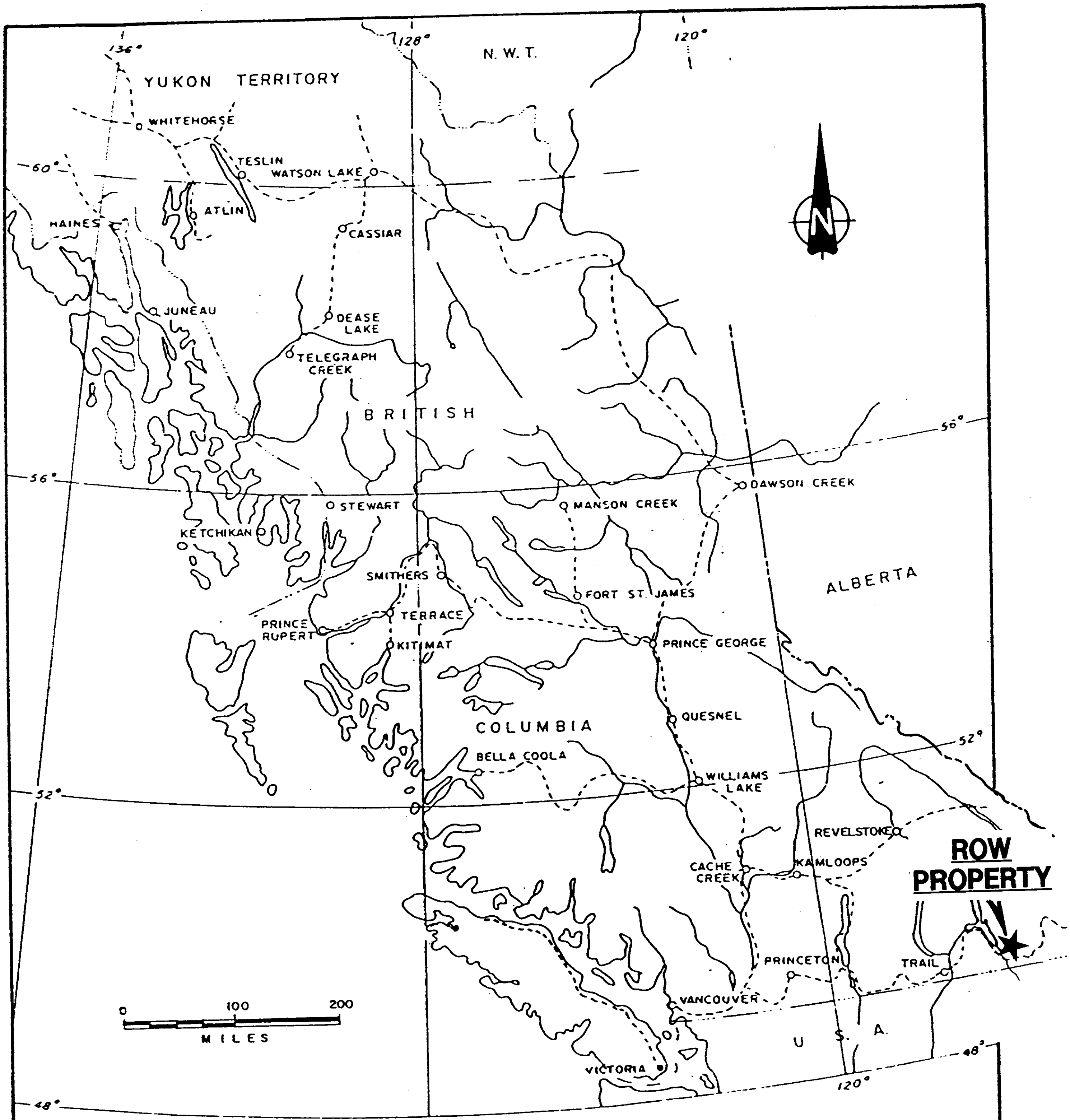
Tenure No.	Name	Claim Size (Units)	Expiry Date
233405	Row 1	20	April 18, 1994
233406	Row 2	20	April 18, 1994
233407	Row 3	10	April 18, 1994

Expiry dates shown above include extensions as a result of assessment work covered by this report.

1.6 Previous Work

The Row claims were staked in 1986 during a regional exploration program of the Aldridge Formation funded by Esso Minerals Canada and Chevron Canada Resources Limited, and conducted by F.R. Edmunds.

The property was staked to cover an anomaly identified on the west bank of Arrow Creek during a reconnaissance soil geochemistry survey. Geology of the property was poorly understood and no showings were known to exist. The property does, however, surround a group of Crown Grants covering the inactive Delaware Mine; a galena-bearing quartz vein explored by at least two adits.



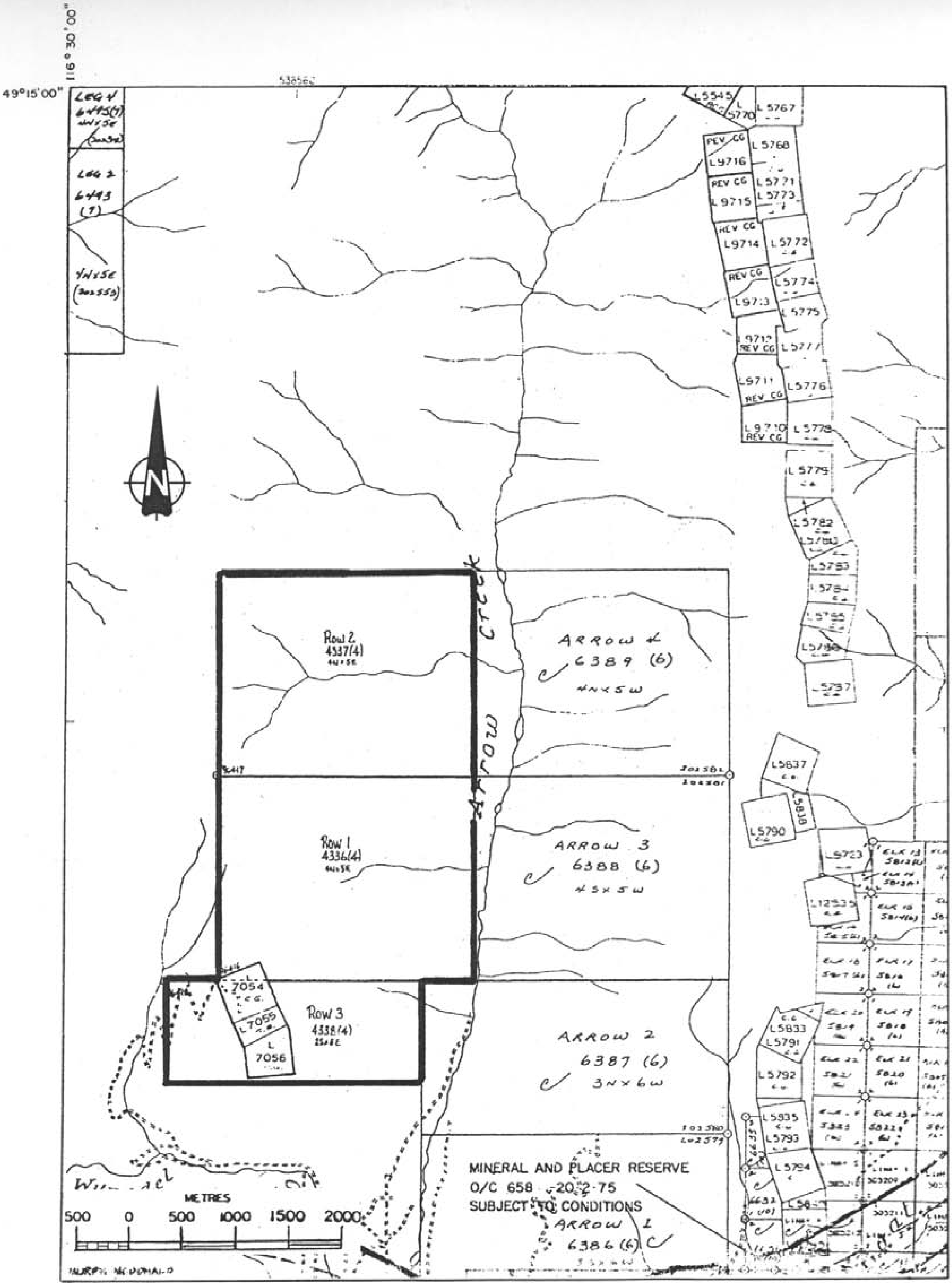
LOCATION MAP

ROW PROPERTY

GRANGES INC.

FEBRUARY 1993

FIGURE: 1



GRANGES INC.

CLAIM MAP
ROW PROPERTY

FEBRUARY 1993

FIGURE: 2

In 1986 a flagged grid was established on the Row property, and 'B' horizon soil samples collected (100m x 50m sample spacing). This survey identified large coincident lead and zinc anomalies on the steep west side of the Arrow Creek valley.

A few lithogeochemical samples were taken and their analytical results subjected to factor analysis to provide an exhalative score. Two single sample positive responses were obtained from the western face of the Arrow Creek valley. Edmunds (1986) felt these responses could indicate that a Sullivan-type deposit occurs on the horizon from which the samples were taken, but either it is far away, or weak, thin and discontinuous.

In 1987 a short exploration program was conducted on the property by Esso Minerals Canada (MacLeod, 1988). A GENIE EM survey was conducted along lines 15+00N and 19+00N, between 6+75E and 14+75E to test the coincident Pb-Zn soil anomaly. Three anomalies were identified on line 19+00N which were thought to be possibly indicative of units with minor amounts of disseminated sulphides.

It was recommended at that time that no further work be conducted on the property.

1.7 Logistics

This year's program was conducted from a motel in Creston. Travel time to the property was approximately 30 minutes.

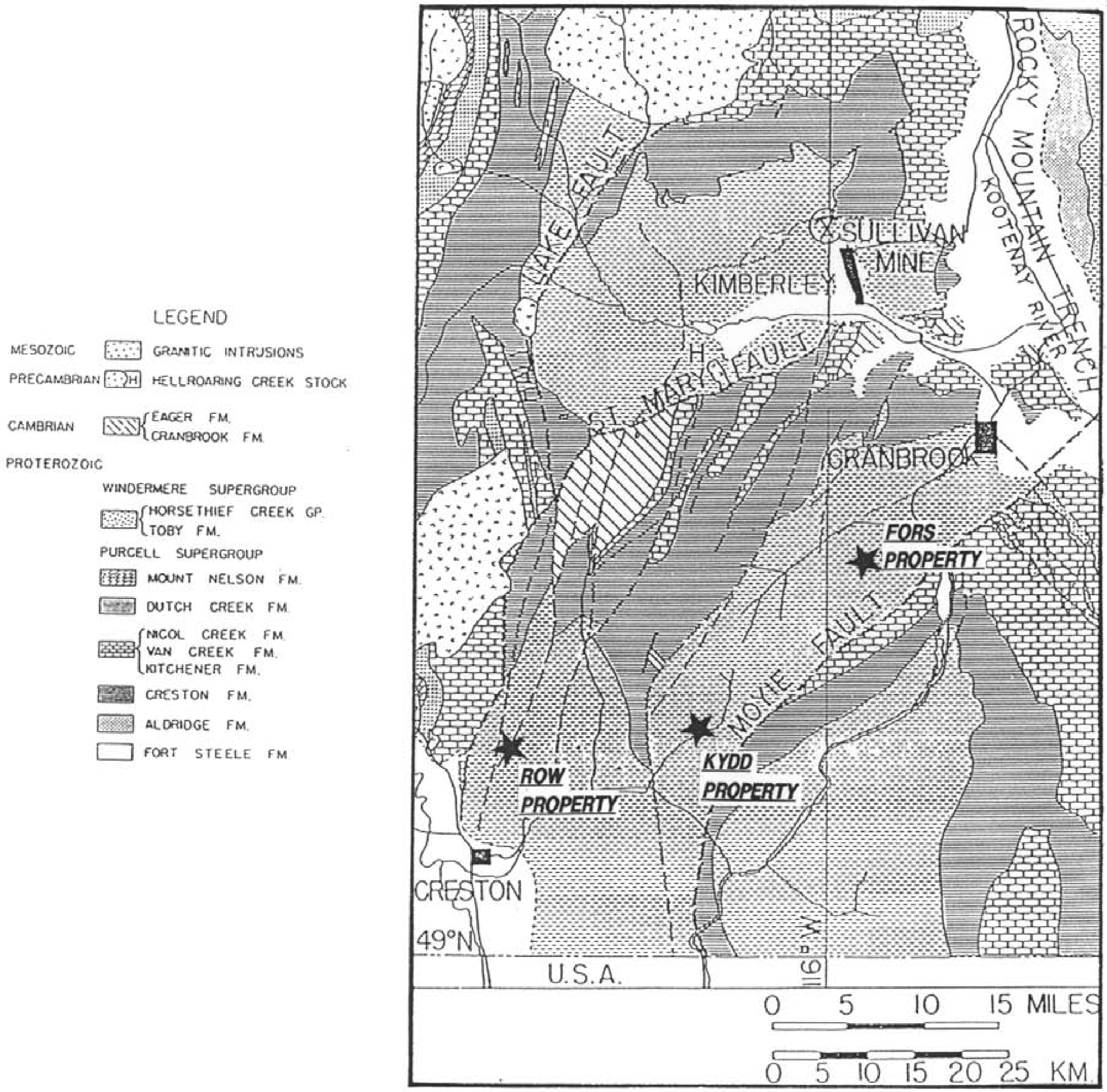
2.0 GEOLOGY

The following discussions of regional geology and economic setting are taken largely from a 1993 report on the Kydd property by R.D. Zawada (unpublished internal report for Granges Inc.)

2.1 Regional Geology

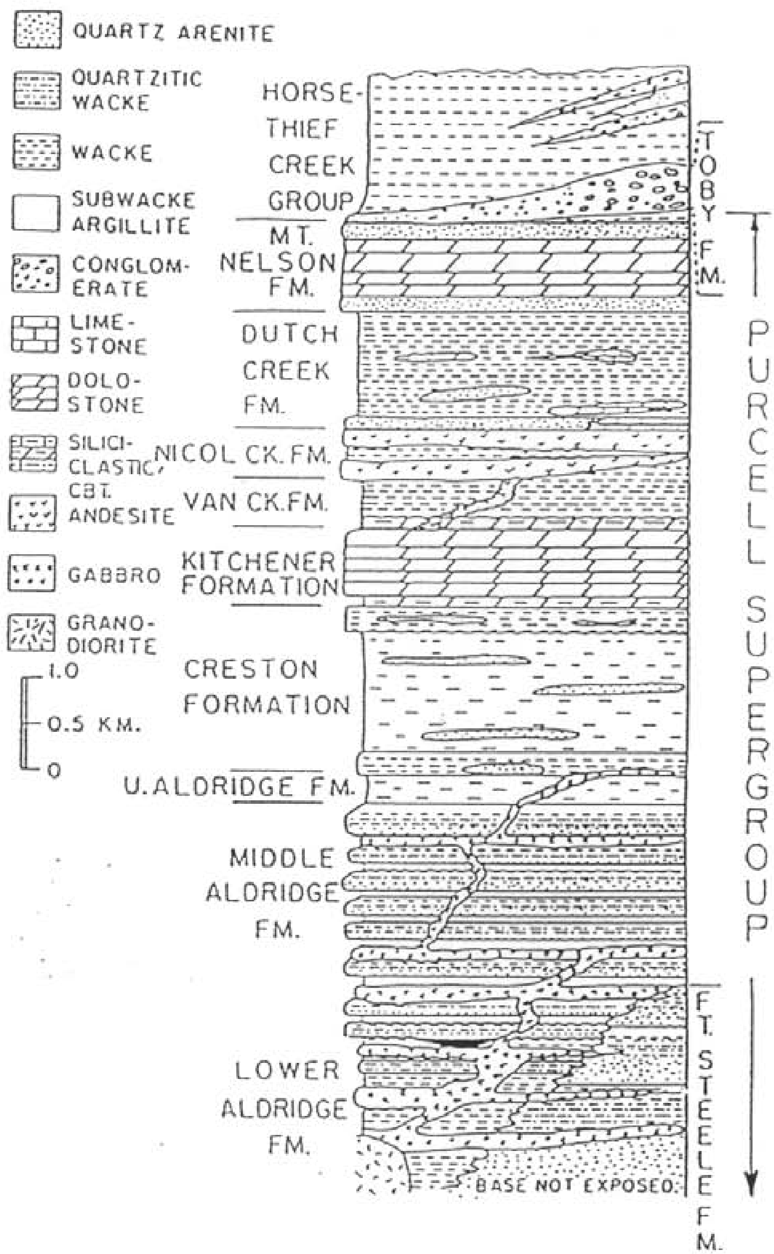
The Row property occurs on the western flank of the Purcell anticlinorium and is entirely underlain by rocks of the Belt-Purcell Supergroup (Hitzman, 1990). The middle Proterozoic (Helikian) Purcell Supergroup rocks are a thick sequence of predominantly sedimentary rock deposited in a large intercontinental flysch basin (Figures 3 and 4). The base of the sequence is not exposed but exceeds 10,000m in thickness in southeastern B.C. (Hamilton et al., 1983).

The basin falls within the Foreland Thrust and Fold Belt and is characterized by shallow, easterly-verging thrust faults and broad open folds. The Purcell anticlinorium was deformed



REGIONAL GEOLOGY MAP
KIMBERLEY AREA, B.C.

FIGURE: 3



PURCELL SUPERGROUP STRATIGRAPHIC COLUMN

(after Hamilton et al.,1983)

FIGURE: 4

and metamorphosed by the Kootenay orogeny. This allochthonous structure is believed to have been transported eastward by generally north-trending thrusts during the Laramide Orogeny of late Mesozoic to early Tertiary time (Turner et al., 1992).

The Row area is predominantly underlain by the Aldridge Formation, a greater than 4,000m succession of fine-grained siliciclastic rocks probably deposited by turbidity currents (Hamilton et al., 1983). Mineralogy is chiefly very fine-grained quartz, sericite and plagioclase. Biotite, muscovite, chlorite and garnet are also common; pyrrhotite is a typical accessory. Proterozoic gabbro intrusions termed Moyie sills intrude the Aldridge at all stratigraphic levels but are more common in the Lower Aldridge (McCartney, 1992).

Units are generally well bedded on a larger scale while being quite massive internally. Although the very fine-grained nature of the rock gives it a massive appearance in hand specimen, depositional features are common in some units. These features consistently show stratigraphic tops up. Strikes are generally north-south with shallow to moderate dips. Foliation is generally north to 010° with dips steeper than bedding. For a comprehensive review at the regional geology of the Purcell Supergroup the reader is directed to Hamilton et al., 1983.

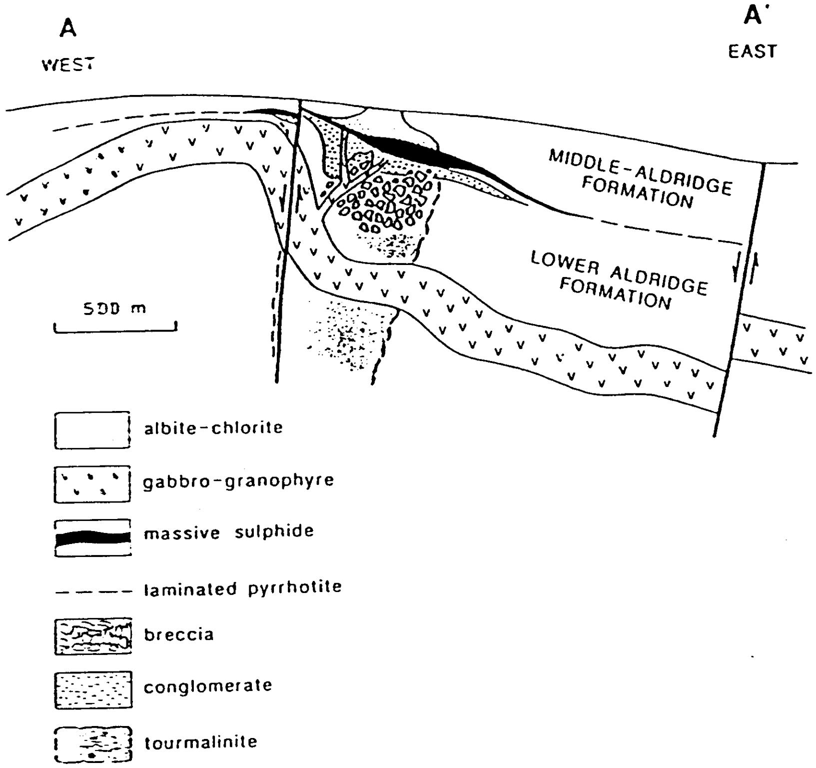
2.2 Economic Setting

2.2.1 Sullivan Mine

The Sullivan mine is located approximately 75 km northeast of the Row property (Figures 3 and 5). It is hosted in Aldridge Formation sedimentary rocks similar to those underlying the Row claims, and is one of the largest stratiform sediment hosted Pb-Zn-Ag sulphide deposits in the world. As of 1991 it has produced in excess of 134 million tons of ore averaging 6.5% Pb, 5.6% Zn and 67 g/T Ag (Hoy, 1993).

A simplified geological cross-section is shown in Figure 5. This figure and the following description of the mine are taken largely from Hamilton et al., 1983.

The Sullivan orebody occurs near the top of the Lower Aldridge Formation. It has the shape of an inverted saucer approximately 2,000m along its north-south axis and 1,600m along its east-west direction. In the west it has flat to gentle easterly dips, moderate easterly to northeasterly dips in the centre and gentle east to northeasterly dips in the east. Footwall rocks are intraformational conglomerates and massive wackes overlain by wackes and pyrrhotite laminated



Schematic east-west geological cross-section illustrating the relationship of the gabbro arch to the Sullivan orebody (modified from Hamilton, 1984).

GEOLOGICAL CROSS-SECTION
SULLIVAN MINE, KIMBERLEY, B.C.

subwackes. The upper part of the ore zone stratigraphy consists of several fining-upward sequences of quartzitic wacke and silty wacke.

Beneath the eastern part of the ore body are two gabbro sills separated by about 150m of quartz-feldspar biotite rock locally called granophyre, which in places has an igneous texture while elsewhere exhibits the texture of a highly altered sedimentary rock. The upper sill, 10 to 15m thick, is located about 500m below the orebody. The lower sill is approximately 50m thick.

In the west there is an abrupt change in the attitude of the gabbro-granophyre complex as it rises steeply to contact the footwall of the orebody near its western margin. To the west of this margin the gabbro-granophyre complex plunges downward again to resume a sill-like form at approximately its original stratigraphic position. The resulting configuration is a north-northwest trending arch.

Beneath and co-mingled with the ore body are fragmental rocks consisting of sedimentary breccia and conglomerate (Figure 5). These occur within a zone of muscovite, tourmaline, and garnet altered rocks.

The current most popular model for the genesis of the Sullivan ore body suggests that hydrothermal fluid flow, driven by some intrusion at depth, travelled along the gabbro sill margins and breached through the sedimentary rocks to the sea floor along a fault (Turner et al., 1992). Massive sulphides were either deposited on the sea floor or within the unconsolidated sea floor muds.

The fragmental rocks are thought to have been locally derived by brecciation along the fault and by winnowing and tumbling of fragments by upwelling fluids. Muscovite, tourmaline and garnet alteration occurs peripheral to the hydrothermal vent.

Two satellite deposits, the Stemwinder and the North Star, are located 2 km and 3.5 km respectively south of the Sullivan orebody.

2.2.2 Other Deposits and Prospects

Numerous other past-producing mines or advanced exploration plays are located in the Sullivan Camp. All of the following are found within the Aldridge Formation and can be divided into two categories based on styles of mineralization: stratiform or vein type deposits.

The Vulcan property and the Kootenay King Mine are examples of stratiform type Pb-Zn mineralization. While the Vulcan

Property consists of low grade-sub-economic Pb-Zn-Ag mineralization the Kootenay King Mine contains the only high-grade stratiform mineralization within the Aldridge Formation outside of the Sullivan area. This deposit has produced 22,000 tons of 14% combined Pb-Zn.

Other deposits in the area such as the St. Eugene Mine, the Vine Property, the Estella Mine, the Star properties and the Delaware Mine are classified as vein type deposits. The Star Property is located approximately 23 km northeast of the Row Property. It is believed to represent a small argillite sub-basin within the lower to middle part of the middle Aldridge Formation. It consists of low-grade Pb-Zn sulphides within a vein stockwork and possibly limited stratiform mineralization in a weakly tourmalinitized host.

The Fors property is located approximately 50 km east-northeast of the Row property, 15 km southwest of Cranbrook (Figure 3). Recent drilling on the property indicates that a single vent system may have deposited base metals at three horizons within 450m of stratigraphy, one of which is at the top of the Lower Aldridge Formation or 'Sullivan time'. A 3m thick massive sulphide horizon graded 7.25% zinc, 6.47% lead and 1.95 oz/t silver (George Cross News Letter Ltd., No. 240, 1992)

The Fors vent is associated with muscovite altered, tourmalinitized, garnetiferous fragmental rocks similar to the host of the Sullivan ore body.

2.3 Property Geology

2.3.1 Structure and Stratigraphy

The Row property appears to be mostly underlain by a north-northeast-trending fault-bounded block between Arrow and Big Bear Creeks (Figure 6). This block where mapped consists of a generally gently west-dipping (average 12/30 NW) turbidite sequence dominated by fine-grained sandstone with lesser amounts of siltstone and argillaceous sediment. A moderate west-dipping foliation (average 177/50 SW) has been developed in all rock types.

Bedding and foliation attitudes appear to be relatively consistent across the property except in the vicinity of the Big Bear Creek fault where an apparently fault-parallel fold has distorted both.

In the 1986 program Edmunds identified the Sundown marker horizon, apparently near the top of the cliff on the east side of the property. The Sundown marker is thought to be

960m - 1200m above the Sullivan horizon, in the Middle Aldridge Formation. Unless there has been significant movement along the 'Big Bear Creek fault' the entire Row property is underlain by rocks of the Middle Aldridge Formation, well above the Sullivan horizon.

2.3.2 Lithology

On the east part of the property bedrock exposure is good along the steep west bank of Arrow Creek, in the vicinity of the coincident lead-zinc soil anomaly. Lithologies range from sandstone to argillite in typical interbedded turbidite sequences.

The sandstone in this area is generally medium grey fine-grained thinly laminated to massive quartzite with 5% biotite. The argillite is generally dark blue-grey, phyllitic, and contains a silty component. Biotite is more abundant in the argillite than in the sandstone. Lithologies grade from argillite to sandstone through a range of grain sizes.

On the west part of the property, within approximately 1 km of the fault along Big Bear Creek, the rocks are greenish-grey phyllites. In some areas they have undergone strong carbonate alteration. These rocks may be altered equivalents of the argillite and sandstone members observed to the east.

Sedimentary rocks described above have been intruded by a few narrow gabbro sills or dykes. Compared to other parts of the Aldridge Formation, gabbro is not abundant on the property. Gabbro adjacent the Big Bear Creek fault is sheared and foliated along with the host sedimentary rock.

2.3.3 Mineralization

Sheared, altered sedimentary rocks adjacent to the Big Bear Creek fault contain sporadic zones with up to 8% fine-grained disseminated pyrite. Samples of this material contained no significant amounts of base or precious metals.

No sulphide mineralization was noted in the east part of the property in the vicinity of the coincident Pb-Zn soil anomaly.

The most significant mineralization in the area known to date is the galena-bearing quartz vein at the Delaware mine. This vein appears to have an attitude of approximately 157/72 SW.

3.0 ROCK GEOCHEMISTRY AND FACTOR ANALYSIS

Thirty-six rock samples were collected and sent for 30 element ICP and mercury (flameless AA) analyses. Results are plotted in Figure 7.

Sample 24713 from the Delaware mine dump contained 33,877 ppm lead, 215.2 ppm silver, 1,745 ppm mercury, and only 5 ppm zinc.

A few samples, both of argillite and quartz siltstone, in the east part of the grid area in the vicinity of the Pb-Zn soil anomaly, contained a few hundred ppm lead but low levels of zinc. These rocks may be the source of the lead-in-soil anomaly, but the zinc-in-soil anomaly is still unexplained.

Lithogeochemical analyses were forwarded to F.R. Edmunds for factor score calculation (Appendix V). Only four samples had a positive score, (shown with stars in Figure 7) indicating that the horizons from which the samples came are possibly affected by a sedex halo. These samples are clustered within 200m of each other and cover approximately 140m of stratigraphy.

On the negative side, however, is the fact that at each sample site only one of a pair of samples had positive factor scores. Also, a series of samples approximately 200m to the north came from the same stratigraphy and no positive scores were obtained.

4.0 WHOLE ROCK GEOCHEMISTRY (MOYIE SILL DATA BASE)

The relationship between the formation of the Sullivan deposit and the emplacement of the Moyie gabbro sills is unclear. In an attempt to see if there is anything geochemically distinct about the gabbro adjacent to the Sullivan deposit a regional sampling program of the Moyie sills has been initiated.

Only two samples of gabbro were collected from the Row property during this program. They were sent to X-Ray Assay Laboratories for major oxide and rare-earth element analyses (using pressed pellet technique). These analyses have been added to the Moyie sill data base and no significant interpretation can be made at this time.

5.0 PETROGRAPHIC STUDIES

Nine rocks were sent to Dr. Craig Leitch for thin section descriptions. The purpose of this study was to identify any alteration (specifically the development of muscovite, garnet, and/or tourmaline) which could be associated with a hydrothermal vent. The petrographic report is included as Appendix II. Samples with significant alteration are discussed below.

Sample 24798 was collected from the Pb-Zn-in-soil anomaly area on the east side of the grid. It is a fine-grained siltite with 45% muscovite, no fresh feldspar preserved, and has possibly been sericitically altered. This sample also had a positive factor score.

Samples 24832 and 24835 were collected from the vicinity of an isolated lead-in-soil anomaly near the baseline at 135+00N (old 35+00N). Both are sand to silt-sized wackes which display strong albite-muscovite-chlorite alteration, and have abundant quartz-chlorite-pyrite(?) veinlets with muscovite selvages.

6.0 SOIL GEOCHEMISTRY

Eleven soil samples were collected along the old cross line 19+00N between 3+50E and 4+50E, and 9+00E and 12+50E at 50m intervals. Samples were taken to confirm anomalies defined in the 1986 survey.

The following table compares lead and zinc values between surveys.

Soil Samples along 19+00N

Station	1986 Pb (ppm)	1992 Pb (ppm)	1986 Zn (ppm)	1992 Zn (ppm)
3+50E	139	137	103	125
4+00E	49	20	165	123
4+50E	18	18	113	133
9+00E	85	15	208	129
9+50E	36	23	138	174
10+00E	58	37	112	106
10+50E	121	88	244	285
11+00E	86	70	164	146
11+50E	149	165	260	284
12+00E	153	148	207	243
12+50E	124	80	205	189

Resampling has confirmed the existence of low level lead and zinc anomalies in this area.

7.0 DISCUSSION AND CONCLUSIONS

The cluster of positive factor scores within a coincident lead and zinc-in-soil anomaly (approximately 118+00N, 30+00E) make this an interesting area. In addition, petrographic analyses of samples from this area suggest that the rocks have undergone sericitic alteration. All features, however, are weak and nothing significant could be seen in outcrop. A GENIE EM survey conducted across this area in 1987 identified three weak anomalies. MacLeod (1987) attributed the anomalies to minor amounts of disseminated sulphides, but it is possible that they simply outlined the argillite members in a predominantly sandstone sequence.

The weak lead-in-soil anomaly near the base line at 135+00N (old 33+00-35+00N) has no coincident zinc anomaly. It was previously thought that perhaps this anomaly outlined the continuation of the lead-rich, zinc-deficient Delaware vein. Unless there has been some major offset, however, the Delaware vein strikes well to the southwest of this anomalous zone. Similar veining may occur in the area as evidenced by signs of strong hydrothermal alteration observed in thin sections of samples 24832 and 24835.

Mapping on the property is far from adequate. Edmunds mentions in his 1986 report (page 36) that during staking of the Row claims "Aldridge fragmental and a unit of shales exhibiting the characteristics of weathering iron sulphides (a friable yellow rind) were encountered. These units lie at Sundown time." The anomalous horizon described in the first part of this section is probably also near what Edmunds calls Sundown time.

It is clear, therefore, that the property has some potential to host a sedex deposit, but also that further exploration expenditures would be in the high risk category.

More mapping and lithogeochemical sampling are required to confirm the continuity of the anomalous horizon, and also to find the fragmental and sulphidic argillite noted by Edmunds.

MacLeod (1987) estimated that to drill-test the anomalous horizon from the west side of the property would require a 1200m hole. A quick plot of the topography and bedding orientation confirms his estimate.

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9.0 STATEMENT OF EXPENDITURES

Geological Survey	$4,289.10
Line Cutting (Calder Explorations)	3,675.00
Analyses (Acme Analytical Laboratories Ltd.) (X-Ray Assay Laboratories)	807.00
Petrographic Work (Dr. C. Leitch)	630.00
Drafting, Report writing	2,727.00
Management Fee	1,212.81
Total	$13,340.91

10.0 STATEMENT OF QUALIFICATIONS

I, Gordon J. Allen, do hereby certify;

1) I am a graduate in geology of the University of British Columbia (B.Sc. 1975)

2) I have practised as a geologist in mineral exploration for seventeen years.

3) I am a member in good standing of the Association of Professional Engineers and Geoscientists of British Columbia.

4) Opinions, conclusions and recommendations contained herein are based on fieldwork and research performed by or overseen by me between September 15, 1992 and February 5, 1993.

5) I own no direct, indirect, or contingent interests in the subject property, or shares or securities of Granges Inc.

Vancouver, B.C.

February 5, 1993

Gordon J. Allen

GORDON J. ALLEN, P. GEO.

APPENDIX I

ROCK SAMPLE DESCRIPTIONS

Row PROJECT (139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24687	G.A.	BIG BEAR CR. ROAD, ROW 3 CLAIM	OCT. 2/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ______)

OCCURRENCE SIZE:

ROCK NAME: LIMONITIC PHYLLITE

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

Greenish-grey phyllite largely altered to iron carbonate and weathered to a soft red-brown limonite. 10% fine-grained silica flooding. 5% goethite after pyrite cubes.

This rock is probably part of the alteration zone around the Big Bear fault.

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu		Other		
Geochemical								
Assay								

Row PROJECT (139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.: 24688	TRAVERSE NO. AND/OR COLLECTOR: G.A.	LOCATION: Big Bear Cr. Road, Row 3	DATE COLLECTED: Oct. 2/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ______)

OCCURRENCE SIZE:

ROCK NAME: Quartzose Siltstone

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

Mottled dark to light greenish-grey sericitic chloritic fine-grained sheared quartz-rich siltstone with 5-10% limonitic specks and masses, probably after iron carbonate alteration. 5-8% pyrite in cubes to 1 mm, altered to goethite.

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu		Other		
Geochemical								
Assay								

Row PROJECT (139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24689	G.A.	BIG BEAR CREEK ROAD, ROW 3 CLAIM	OCT. 2/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ______)

OCCURRENCE SIZE:

ROCK NAME: PHYLLITIC SILTSTONE ? LIMONITE

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)
Intensely weathered sheared phyllite ? The rock is now mostly an orange-brown (Fox) limonite, but was probably an iron carbonate altered phyllitic siltstone.

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu	Other			
Geochemical								
Assay								

WR

ROW PROJECT (139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.: 24690	TRAVERSE NO. AND/OR COLLECTOR: G.A.	LOCATION: BIG BEAR CREEK ROAD, ABOVE BIG BEAR CR, ROW 3 CL.	DATE COLLECTED: OCT. 2/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ______)

OCCURRENCE SIZE:

ROCK NAME: PHYLLITIC GABBRO

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

Dark green fine-grained moderately magnetic chloritic gabbro. Probably phyllitic gabbro with amphibole altered to chlorite.

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu		Other		
Geochemical								
Assay								

ICP, TS

Row PROJECT (139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24691	G.A.		

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ______)

OCCURRENCE SIZE:

ROCK NAME: QUARTZ SERICITE CHLORITE SCHIST

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

Medium greenish-grey fine-grained relatively massive rock composed of quartz (~20%, ≤ 1mm) in a groundmass of sericite ± chlorite. 5-8% fine-grained crystalline pyrite. Sample from footwall of shallow shear. Pyrite above and below shear.

Protolith possibly a tuff ? or intrusion ?

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu	Other			
Geochemical								
Assay								

Row PROJECT (139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.: 24692	TRAVERSE NO. AND/OR COLLECTOR: G.A.	LOCATION: 19+00 N, 9+72 E; Row 1 Claim	DATE COLLECTED: Oct. 3/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ____
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ____)

OCCURRENCE SIZE:

ROCK NAME: PHYLLITIC ARGILLITE TO SILTSTONE

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)
Dark grey to medium grey phyllitic argillite to siltstone with an earthy hematitic stain on bedding surface. Thinly laminated.

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu	Other			
Geochemical								
Assay								

Row PROJECT (139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION: 19+00N, 1000E	DATE COLLECTED:
24693	G.A.	Row 1	Oct. 3/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ____
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ____)

OCCURRENCE SIZE:

ROCK NAME: QUARTZITE

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

Grey fine-grained thinly laminated to massive quartzite with 5% biotite. Quartzite interbedded with minor argillaceous beds to 10 cm (not sampled).

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu		Other		
Geochemical								
Assay								

Row PROJECT (139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.: 24694	TRAVERSE NO. AND/OR COLLECTOR: G.A.	LOCATION: 19+00N, 10+80E ROW 1 CLAIM	DATE COLLECTED: OCT. 3/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ______)

OCCURRENCE SIZE:

ROCK NAME: PHYLLITIC ARGILLITE

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)
Dark blue-grey fine-grained phyllitic argillite.

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu			Other	
Geochemical								
Assay								

ROW PROJECT (139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24695	G.A.	19+00N, 11+47 E ROW 1 CLAIM	OCT. 3/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ______)

OCCURRENCE SIZE:

ROCK NAME: ARGILLITE

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

Medium to dark blue-grey, phyllitic argillite with 5% <1cm lighter grey beds.

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu		Other		
Geochemical								
Assay								

Row PROJECT (139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION: 19+00N, 11+50E ;	DATE COLLECTED:
24696	G-A.	Row 1 Claim	Oct. 3/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ______)

OCCURRENCE SIZE:

ROCK NAME: ARGILLITE

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

Medium to dark blue-grey thinly laminated argillite with a silty component.

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu	Other			
Geochemical								
Assay								

Row PROJECT (139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION: 19+05N, 12+05E	DATE COLLECTED:
24697	G.A.	ROW 1 CLAIM	OCT. 3/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ______)

OCCURRENCE SIZE:

ROCK NAME: QUARTZITE

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

Medium grey massive fine-grained sericitic quartzite. 20% interbedded argillite (not sampled).

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu		Other		
Geochemical								
Assay								

ROW PROJECT (139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24698	G.A.	19+00N, 12+50E ROW 1 CLAIM	OCT. 3 '92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ______)

OCCURRENCE SIZE:

ROCK NAME: QUARTZITE

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

Medium grey fine-grained to medium-grained quartzite with a sericitic groundmass and 5% biotite overall. Quartzite in this area occurs in beds to 1 m, interbedded with 30% argillite (not sampled).

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu	Other			
Geochemical								
Assay								

Row PROJECT (139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24699	G.-A.	19+00N, 12+50E ROW 1 CLAIM	Oct. 3/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ______)

OCCURRENCE SIZE:

ROCK NAME: PHYLLITIC ARGILLITE

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

Medium grey fissile fine-grained phyllitic argillite in a 1m bed. Argillite makes up roughly 20% of sequence.

Compare Pb-Zn values between quartzite and argillite. Soil anomaly may be related to argillite.

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu		Other		
Geochemical	___	___	___	___	___	___	___	___
Assay	___	___	___	___	___	___	___	___

ICP

Row PROJECT (139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24713	G-A.	DELAWARE MINE DUMP	SEPT. 19/92

MATERIAL SAMPLED:
ROCK - OUTCROP [ ] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [✓]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ______)

OCCURRENCE SIZE:

ROCK NAME: QUARTZ VEIN

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

White vuggy quartz vein material with up to 30% galena in masses to 1 cm.

Possibly this sample will be sent for Pb isotope dating.

DESCRIPTION BY: G-A.

ANALYSES:	Au	Ag	As	Cu		Other		
Geochemical								
Assay								

24794 - T.S., ICP
24795 - ICP

Row PROJECT (139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.: 24794 24795	TRAVERSE NO. AND/OR COLLECTOR: G.A.	LOCATION: 255 m ~~WEST~~ EAST OF TIGHT SWITCHBACK, ~17N ROW 1 CLAIM	DATE COLLECTED: SEPT 28/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ______)

OCCURRENCE SIZE:

ROCK NAME: QUARTZ SILTSTONE, PHYLLITE

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)
Thinly interbedded (<1mm - 10mm bands) light grey to dark grey quartz-rich phyllitic siltstone

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu		Other		
Geochemical								
Assay								

24796 – TS, ICP
24797 – ICP

Row PROJECT (139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24796 24797	G.A.	~17 N, ~350m EAST of TIGHT SWITCHBACK	SEPT. 28/92

MATERIAL SAMPLED:
ROCK – OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ____
– FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ____)

OCCURRENCE SIZE:

ROCK NAME: PHYLLITIC ARGILLITE

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

Medium grey phyllitic argillite with minor light grey quartz-rich beds to 1 cm.

Above material interbedded with fine-grained quartzite in beds to 2 m (not sampled).

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu	Other			
Geochemical								
Assay								

24798 – ICP
24799 – ICP, T.S.

Row PROJECT (139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.: 24798 24799	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION: 416 m ~~WEST~~ EAST OF TIGHT SWITCHBACK, ~17N. ROW 1 CLAIM	DATE COLLECTED: SEPT. 28/92

MATERIAL SAMPLED:
ROCK – OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
– FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ______)

OCCURRENCE SIZE:

ROCK NAME: PHYLLITIC ARGILLITE

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

Beds of quartzite up to 5m thick interbedded with argillaceous intervals to 30 cm. Argillaceous material sampled.

Bedding 173/42 SW

Foliation 173/64 SW

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu	Other			
Geochemical								
Assay								

TS., ICP

ROW PROJECT (139): ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24800	G.A.	NORTH SIDE OF LOGGING SLASH EAST OF DELAWARE MINE	SEPT. 19/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ________
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ________)

OCCURRENCE SIZE:

ROCK NAME: PHYLLITE

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

Greenish-grey f-g phyllite/schist. Foliated 000/32 W.

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu	Other			
Geochemical								
Assay								

24812 - ICP, TS
24813 - ICP

ROW PROJECT (139) : ROCK SAMPLE DESCRIPTION

* NO SLOPE CORRECTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24812 24813	G.A.	504m+ WEST OF TIGHT SWITCHBACK, ~18+00N, 1050E; ROW/ CLAIM	SEPT. 28

~20m E of OLD SAMPLES 1919, 1920

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ______)

OCCURRENCE SIZE:

ROCK NAME: PHYLLITIC ARGILLITE / ARGILLACEOUS SILTSTONE

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

24812 - Phyllitic grey argillite.

Foliation: 169/50 SW

24813 - Argillaceous siltstone.

DESCRIPTION BY: G.A.

ANALYSES:	Au	Ag	As	Cu		Other		
Geochemical								
Assay								

Row PROJECT (#139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24838	R. ZAWADA	Row Claims Soil Grid Co-ord. 1590N/750E	Oct. 3/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [ ] CHIP [✓] CHANNEL [ ] (SAMPLE WIDTH 5cm)

OCCURRENCE SIZE:

ROCK NAME: Argillaceous Siltstone.

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

dark grey in color, very fine grained with a strong foliation and a weak phyllitic lustre.

DESCRIPTION BY: [signature]

ANALYSES:	Au	Ag	As	Cu	Other			
Geochemical								
Assay								

Row PROJECT (#139): ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24839	R. ZAWADA	Row Claims Soil Grid location 1600N/765E	Oct. 3/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [ ] CHIP [✓] CHANNEL [ ] (SAMPLE WIDTH ______)

OCCURRENCE SIZE:

ROCK NAME: Argillite

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

A dark grey to black strongly foliated phyllitic rock with mm scale lenses of limonite elongated parallel to foliation.

DESCRIPTION BY: [signature]

ANALYSES:	Au	Ag	As	Cu	Other			
Geochemical								
Assay								

Raw PROJECT (#139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24840	R. ZAWADA	Raw Claims Soil Grid location 1600 N/ 830E	Oct. 3/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [ ] CHIP [✓] CHANNEL [ ] (SAMPLE WIDTH 15cm)

OCCURRENCE SIZE:

ROCK NAME: Argillite.

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

a dark grey to black silty argillite. Strongly foliated and weakly phyllitic. 2-3% "vugs" that are sometimes filled with limonite (?)

DESCRIPTION BY: [signature]

ANALYSES:	Au	Ag	As	Cu		Other		
Geochemical								
Assay								

Row PROJECT (#139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24841	P. ZAWADA	Row Claims Soil Grid Co-ord. 16N/900E	Oct 3/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ____
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [ ] CHIP [✓] CHANNEL [ ] (SAMPLE WIDTH ____)

OCCURRENCE SIZE:

ROCK NAME: Argillite.

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

a black strongly foliated, weakly phyllitic Rock

DESCRIPTION BY:

ANALYSES:	Au	Ag	As	Cu	Other			
Geochemical								
Assay								

Row PROJECT (#139): ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24842	R. ZAWADA	Row Claims Soil Grid Co-ord. 16N/903E 4120	Oct. 3/92

MATERIAL SAMPLED:
ROCK – OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
– FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [ ] CHIP [✓] CHANNEL [ ] (SAMPLE WIDTH 10 cm)

OCCURRENCE SIZE:

ROCK NAME: Argillite.

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)
dark grey → black, strongly foliated & weakly phyllitic.

DESCRIPTION BY:

ANALYSES:	Au	Ag	As	Cu	Other			
Geochemical								
Assay								

Row PROJECT (#139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24843	R. ZAWADA	Row Claims Soil Grid Co-ord. 15N/9E	Oct. 3rd/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ____
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [✓] CHIP [ ] CHANNEL [ ] (SAMPLE WIDTH ____)

OCCURRENCE SIZE:

ROCK NAME: Gabbro

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)
fine grained, massive with equal amounts of hornblende + fsp.

DESCRIPTION BY:

ANALYSES:	Au	Ag	As	Cu		Other		
Geochemical								
Assay								

Row PROJECT (#139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24844	R. ZAWADA	Row Claims Soil Geochem. 15N/875E	Oct. 3/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [ ] CHIP [✓] CHANNEL [ ] (SAMPLE WIDTH ______)

OCCURRENCE SIZE:

ROCK NAME: Argillite.

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

a black, weakly foliated, fissile, weakly phyllitic rock.

DESCRIPTION BY: [signature]

ANALYSES:	Au	Ag	As	Cu	Other			
Geochemical								
Assay								

Row PROJECT (#139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24845	R. ZAWADA.	Row Claims. Soil Grid Co-ord's 14N/920E (?) 3945	Oct. 3/92

MATERIAL SAMPLED:
ROCK – OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
– FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [ ] CHIP [✓] CHANNEL [ ] (SAMPLE WIDTH 10cm)

OCCURRENCE SIZE:

ROCK NAME: Argillite.

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

a black strongly foliated rock. Very fissile with a week phyllitic lustre.

DESCRIPTION BY:

ANALYSES:	Au	Ag	As	Cu	Other			
Geochemical								
Assay								

Row PROJECT (#139) : ROCK SAMPLE DESCRIPTION

SAMPLE NO.:	TRAVERSE NO. AND/OR COLLECTOR:	LOCATION:	DATE COLLECTED:
24846	R. ZAWADA	Row Claims Soil Grid location 14N/975E (?) 3840	Oct. 3/92

MATERIAL SAMPLED:
ROCK - OUTCROP [✓] SILT [ ] SOIL [ ] OTHER ______
- FLOAT [ ]

ROCK SAMPLE TYPE:
GRAB [ ] CHIP [✓] CHANNEL [ ] (SAMPLE WIDTH 10cm)

OCCURRENCE SIZE:

ROCK NAME: Argillite.

SAMPLE DESCRIPTION: (If Rock, Include Colour, Texture, Rock Forming Minerals, Mineralization, and Etc.)

a strongly foliated black rock with a weak phyllitic lustre.

DESCRIPTION BY:

ANALYSES:	Au	Ag	As	Cu	Other			
Geochemical								
Assay								

APPENDIX II

PETROGRAPHIC REPORTS

PETROGRAPHIC REPORT ON 9 THIN SECTIONS FROM THE ROW PROPERTY, B.C. (PROJECT NO. 139)

Report for: Gordon Allen
Granges Inc.
2300-885 West Georgia St.
Vancouver, B.C.
V6T 2Z4.

Nov. 14, 1992

Invoice attached

Samples submitted: 24691, 24794, 24796, 24798; 24800, 24812, 24832, 24835, 24836.

SUMMARY:

The rocks in this suite may be divided into two groups: Aldridge sediments (24794, 96, 98, 24812-24836) and Moyie sills (24691 and 24800).

Sediments include (1) finely laminated quartz-sericite (muscovite) ± chlorite, biotite siltite with abundant ?carbonaceous matter giving a dark colour (24794, 96, 98) although 798 is marked by a distinctive greenish mica that may be phengitic (Fe-rich) and
(2) fine-medium sand-sized wackes composed of quartz, plagioclase, muscovite, chlorite and rare biotite (24812, 832, 835, 836). In 24812, a fine "sand dyke" richer in quartz appears to cut fine silt-sized sediments richer in muscovite and chlorite.

Moyie sills include intensely quartz-chlorite-muscovite-rutile (± rare pyrite) altered examples that are fine-grained compared to normal sills and may be partly contaminated in 24800 by sediments, probably from a contact.

Alteration in this suite is strongest in the pale green, veined samples 24832 and 24835; it is weak in 24836, and it is not certain that the ?phengitic mica in 24798 is due to alteration. Alteration is mainly to muscovite and chlorite along the envelopes of thin quartz-albite-chlorite-?pyrite veins; it is not certain whether the plagioclase in these rocks is secondary or not, although it appears optically to be albitic. The alteration in the sills or sill margins (24691, 24800) is intense but may be related to the sill margin and emplacement rather than to sulfide-related hydrothermal activity. The abundance of quartz in the altered sills and absence of albite is unusual. Note that the altered sills are distinguished by abundant fine buff-coloured TiO_2 relics (mainly ?rutile).

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24691: INTENSELY QUARTZ-CHLORITE-ALBITE±MUSCOVITE ALTERED FINE-MEDIUM GABBRO (?MOYIE SILL) WITH MINOR PYRITE

Medium-grained, grey-green, moderately altered mafic intrusive (Moyie sill) characterized by an abundance of white-buff TiO_2 relics and ragged green mafic relics. The outside of the sample is significantly weathered to a brown rind. The rock is slightly magnetic although the only sulfide visible appears to be pyrite; there is no reaction to cold dilute HCl. Modal mineralogy in thin section is:

Chlorite	45%
Quartz (largely secondary?)	35%
?Feldspar (albitic)	10%
Semi-opaque (rutile, leucoxene)	5%
Muscovite	3%
Opaque (pyrite?)	2%
Limonite	<1%
Apatite	tr
Allanite	tr

This rock consists of coarse sub- to anhedral quartz crystals and TiO_2 relics in a matrix of chlorite and minor muscovite.

Quartz forms crystals up to 2 mm in diameter displaying signs of strain (strong undulose extinction, minor sutured grain boundaries). Most grains show evidence of recrystallization and overgrowth at their margins (inclusions of chlorite, sericite, feldspar). Much of the quartz is probably secondary, after former feldspar. Occasional euhedral prisms of apatite up to 0.2 mm long are present in some quartz grains; rarely, larger grains occur in chlorite masses.

Feldspar is minor in this rock, and this is unusual for the Moyie sills. It can only be recognized by slightly lower relief against the quartz. It forms finely granulated anhedral crystals about 30-40 μm in diameter, generally separated from each other by films of chlorite or sericite. No twinning is evident but the relief suggests albite-oligoclase compositions.

Chlorite forms subhedral wavy, bent flakes up to about 0.2 mm diameter. Weakly anomalous (green) birefringence and distinct green colour, but lack of pleochroism and length-fast character, suggest an intermediate composition at a Fe:Fe+Mg ratio about 0.4-0.5. Minute subhedral grains of allanite to 20 μm diameter occur in the chlorite, marked by darker radioactive haloes.

Muscovite forms subhedral flakes up to 0.3 mm diameter interleaved with the chlorite along certain layers. Minor limonite is found staining both chlorite and muscovite in places. Patches of very fine-grained (5-20 μm, but aggregating to 0.1 mm long) semi-opaque material are probably rutile and leucoxene, after former Ti minerals such as ilmenite or sphene that were up to 1.5 mm long and which have been destroyed by the significant alteration in this specimen. Scattered subhedral opaque grains are mainly pyrite, oxidized at rims to limonite.

<u>24794: FINELY LAMINATED, QUARTZ-SERICITE ± CHLORITE, BIOTITE SILTITE WITH ABUNDANT CARBON AND RARE (?DETRITAL) TOURMALINE</u>

Finely laminated, dark grey sediment with 1 mm light layers alternating with 2-3 mm dark layers, rather like a marker horizon. Foliation weak, cuts layering at low angle. Non-magnetic, no reaction to cold dilute HCl. Mineralogy in thin section is approximately (difficult to determine due to fine grain size):

Sericite (muscovite)	45%
Quartz (partly secondary)	35%
Opaque (?carbonaceous matter, ?sulfide)	10%
Biotite	5%
Chlorite	5%
Tourmaline	<1%
Zircon	tr

Muscovite is found mainly as fine felted masses of subhedral flakes of about 20-30 μm but also forms rare euhedral flakes up to 0.1 mm diameter; this is typical of Aldridge sediments. Biotite forms scattered clusters of subhedral dark brown flakes up to 0.1 mm diameter. Chlorite is found as fine anhedral to subhedral flakes generally less than 25 μm in diameter, so intimately mixed with muscovite that it is difficult to estimate its abundance. Chlorite is pale green, with weak green anomalous birefringence and length-slow character indicating Fe:Fe+Mg ratios about 0.5 to 0.55.

Quartz forms rounded to anhedral grains about 25-50 μm in diameter that are probably mostly detrital in origin, as well as coarser grains up to 0.1 mm diameter in lenses that look to be metamorphic "sweats". The latter cross bedding at a low angle and contain many fine muscovite inclusions; many of them have been severely plucked during section preparation.

Opaques include abundant very fine (sub-micron to a few microns) grains in wispy lenses or laminae that may be carbonaceous material, as well as scattered crystals up to 0.1 mm diameter that may be sulfide or Fe oxides.

Tourmaline forms scattered subhedral crystals to 125 μm long with green to brown pleochrosim indicating relatively Fe-rich (schorl) compositions. Rare zircon crystals are euhedral and up to 50 μm long.

Although there is no feldspar evident and biotite abundance is low, this fine quartz-sericite ± chlorite-biotite siltite does not appear to be a highly altered rock nor to be proximal to a mineralized system. It is possible that it comes from a marker unit or equivalent, as indicated by the abundance of carbon.

24796: FINELY LAMINATED QUARTZ-SERICITE ± CHLORITE, BIOTITE, K-FELDSPAR SILTITE WITH SIGNIFICANT ?CARBON, RARE TOURMALINE

Dark grey, finely laminated sediment similar to the dark layers in 24794. Rusty oxidation near the surface of the sample. Mineralogy in thin section is approximately as follows:

Quartz (detrital?)	40%
Sericite (muscovite)	35%
Chlorite	10%
Biotite	5%
Opaque (?carbonaceous matter, sulfide)	5%
K-feldspar (?microcline)	3%
Limonite	1%
Tourmaline (schorlitic)	1%

Quartz grains are sub- to anhedral and range up to 50 μm in diameter, set in a "hash" of finer grains plus micas. Coarser grains are found scattered throughout the rock as opposed to the concentrations in lenses found in 24794.

Sericite (muscovite) forms fine flakes up to 0.1 mm in diameter oriented parallel to a weak foliation that is itself parallel to bedding rather than oblique as in 24794. Muscovite is mixed with chlorite in places, so it is hard to estimate their relative concentrations. Chlorite is as described in 24794; biotite is also similar in size, form, colour and distribution to that described in 24794.

Rarely, a few grains of feldspar are evident by their twinning ("grid" indicating microcline); they are anhedral, up to 0.1 mm in diameter, and appear to be detrital or at least non-hydrothermal. A few voids where plucking has been severe during section preparation have euhedral outlines suggestive of former ?feldspar crystals or aggregates up to 0.4 mm across; they are similar in outline to K-feldspar thought to be after ?garnet in some samples from the KYDD property (see report by Leitch dated Oct 12, 1992).

Opaques consist of extremely fine grains that may be carbonaceous matter, as in 24794, concentrated in wispy lenses or laminae, and scattered euhedral tabular crystals to 0.1 mm long that may be Fe-Ti oxides such as ilmenite or sulfides. Limonite is found as discrete patches that may have replaced either oxides or sulfides.

Tourmaline crystals are scattered in certain layers as euhedral crystals up to 100 μm long with green-brown pleochroism indicating moderate Fe (schorl) content. They are not likely to be hydrothermal; they may be detrital.

In many ways this rock is similar to 24794 (mineralogy, abundance of ?carbonaceous matter) but it is if anything less altered (feldspar present, less sericite) and shows less effect of strain. It may also be from a "marker" type horizon; it does not appear to be indicating proximity to a mineralized system.

24798: ?PHENGITIC SERICITE-RICH FINE SILTITE WITH MINOR CHLORITE, MAGNETITE AND TOURMALINE

Hand specimen is a very fine-grained, dark grey to black, sediment similar to 24796 except for a ?lens or layer of coarser-grained material with abundant vugs or voids. Non-magnetic, no reaction to cold dilute HCl. Modal mineralogy in thin section is:

Sericite (?phengitic muscovite)	45%
Quartz (largely detrital)	40%
Chlorite (?)	10%
Opaque (?Fe-Ti oxides)	3%
Tourmaline	1%
Biotite	1%
Limonite	<1%

The mica making up the bulk of this slide forms eu- to subhedral flakes up to 0.05 mm diameter that are strongly oriented parallel to layering, defining a foliation. The colour is pale but distinctly green, suggesting an Fe-bearing muscovite or phengite; note that bright green Fe-rich micas are found in the ore horizon at the edge of the Sullivan deposit. In places some flakes which are large enough (75 μm) to not be stacked on top of each other can be seen to have green colour and low (anomalous green) birefringence, suggesting some ?length-slow ferroan chlorite may be admixed with the mica. Biotite occurs as rare deep brown subhedral flakes up to 0.05 mm diameter.

Quartz is less abundant than mica in this sample, forming elongated anhedral grains rarely over 50 μm in diameter that are mainly oriented parallel to the foliation, implying strong flattening. The lenses of slightly coarser quartz contain most of the biotite in this rock, as well as common voids that may have contained ?carbonate that has been completely weathered out.

Opaques are generally euhedral crystals about 50-75 μm across scattered evenly through the rock. Limonite occurs as rare patches to 0.05 mm across that are of uncertain derivation. Tourmaline crystals are euhedral, generally show deep brown pleochroism suggestive of moderate Fe contents (Fe:Fe+ Mg about 0.5), and are up to 70 μm long. They appear to be concentrated in certain 1 mm layers, implying that they are detrital in origin.

It is possible that this muscovite-rich fine sediment (siltite) represents sericitic alteration. There is no feldspar preserved, and muscovite is more than usually abundant.

24836: INTERLAYERED SAND-SILT-FINE SILT SIZED QUARTZ-?PLAGIOCLASE WACKE WITH WEAK MUSCOVITE-CHLORITE ALTERATION

No hand specimen, but the thin section clearly shows that this is an interlayered sand-silt-fine silt sized sequence, with fractures oblique to the layering offsetting and partially dismembering the layers Limonite is present along these fractures and other larger fracture systems crossing the rock. Modal mineralogy in thin section is approximately:

Quartz (detrital)	40%
Muscovite (?partly hydrothermal)	35%
Chlorite	15%
Feldspar (?albitic plagioclase)	7%
Opaque (rutile, limonite)	3%
Tourmaline (schorl)	<1%
Biotite	<1%
Zircon	tr

The coarsest-grained portions consist of coarse detrital quartz grains up to 0.5 mm long set in a matrix of fine subhedral intermixed muscovite/chlorite. There are scatteed large euhedral flakes of muscovite to 0.3 mm diameter, plagioclase to 0.15 mm, common euhedral prisms of brown schorlitic tourmaline to 200 μm, rare deep brown biotite flakes to 0.15 mm diameter, and small zircon crystals to 50 μm long. In the finer-grained layers, there is a steady increase in the proportions of muscovite/chlorite compared to quartz as grain size decreases.

Quartz grains look detrital, are slightly strained and show minor overgrowths at their margins. Feldspar is not common in this rock, and is difficult to recognize, but a few subhedral crystals show albite twinning with extinction angles Y^010 up to 13 °, suggesting either oligoclase-andesine or albite; relief is difficult to estimate, but may be below that of quartz, suggesting albitic compositions. The feldspar is found both in veins/fractures and in the rock, so it is difficult to be sure if it is secondary.

Increased concentrations of muscovite along certain fractures suggests some muscovite may be secondary (although in this rock it could also be reconcentrated during shearing). Chlorite forms subhedral flakes up to 0.1 m diameter with distinct green pleochroism, length-slow and anomalous blue birefringent character indicating a moderately Fe-rich composition (Fe:Fe+Mg about 0.55-0.6?).

Opaques scattered throughout appear to be mostly clusters of minute ?rutile crystals, indicating possible hydrothermal alteration. Most limonite found along the fractures appears to be transported rather than clearly after sulfides. Some quartz veins can be seen in thin section to be folded, indicating they are early (pre-dynamic metamorphism) although extensions of these veins cross-cut the layering along what appear to be syn-deformational shears, indicating reactivation. Note that although probably detrital, tourmaline is more abundant than is usual.

In summary, I have the impression that this rock displays moderate muscovite-chlorite alteration, but I am not sure that the plagioclase is secondary albite. Veining and sulfide appear to be weaker than in 24832 and 24835.

APPENDIX III

WHOLE ROCK DATA

XRAL

X-RAY ASSAY LABORATORIES
A DIVISION OF SGS SUPERVISION SERVICES INC.
1885 LESLIE STREET • DON MILLS, ONTARIO M3B 3J4 • CANADA
TEL: (416)445-5755 TELEX: 06-986947 FAX: (416)445-4152

CERTIFICATE OF ANALYSIS

REPORT 21060

TO: GRANGES INC.
ATTN: BRUCE DOWNING
2300 - 885 W. GEORGIA STREET
VANCOUVER, BRITISH COLUMBIA
V6C 3E8

CUSTOMER No. 1984

DATE SUBMITTED
23-Oct-92

REF. FILE 13605-I5

Total Pages 5

2 ROCKS Proj. ROW (139)

	METHOD	DETECTION LIMIT
AU PPB	NA	2.
NA PPM	NA	50.
WRMAJ %	WR	.01
CA %	NA	.2
SC PPM	NA	.01
CR PPM	NA	.5
FE %	NA	.005
CO PPM	NA	.5
NI PPM	NA	50.
ZN PPM	NA	20.
AS PPM	NA	1.
SE PPM	NA	1.
BR PPM	NA	.5
RB PPM	XRF	2.
RB PPM	NA	10.
SR PPM	XRF	2.
SR PPM	NA	100.
Y PPM	XRF	2.
ZR PPM	XRF	3.
NB PPM	XRF	2.

	METHOD	DETECTION LIMIT
MO PPM	NA	2.
AG PPM	NA	2.
SB PPM	NA	.1
CS PPM	NA	.5
BA PPM	NA	50.
LA PPM	NA	.1
CE PPM	NA	1.
ND PPM	NA	3.
SM PPM	NA	.01
EU PPM	NA	.05
TB PPM	NA	.1
YB PPM	NA	.05
LU PPM	NA	.01
HF PPM	NA	.2
TA PPM	NA	.5
W PPM	NA	1.
IR PPB	NA	5.
TH PPM	NA	.2
U PPM	NA	.1

DATE 13-NOV-92

CERTIFIED BY ....
Jean H.L. Opdebeeck, General Manager

XRAL

NOTE: As per our list of upper limits in our current schedule of services, some of the results are outside the applicable analytical range. Please contact us should you require assays.

X-RAY ASSAY LABORATORIES 1885 Leslie Street Don Mills Ontario M3B 3J4 (416)445-5755 Fax (416)445-4152 Tlx 06-986947

SAMPLE	AU PPB	NA PPM	CA %	SC PPM	CR PPM	FE %	CO PPM	NI PPM	ZN PPM	AS PPM
24690	<2	33000	4.1	38.9	120.	10.0	50.0	90	130	3
24843	<2	15000	5.4	42.9	140.	11.4	58.0	100	180	4

SAMPLE	SE PPM	BR PPM	RB PPM	RB PPM	SR PPM	SR PPM	Y PPM	ZR PPM	NB PPM	MO PPM
24690	<1	3.7	14	20	210	<100	19	160	14	<2
24843	<1	4.3	54	70	163	<100	29	180	20	<2

SAMPLE	AG PPM	SB PPM	CS PPM	BA PPM	LA PPM	CE PPM	ND PPM	SM PPM	EU PPM
24690	<2	6.8	2.6	130	15.0	36	22	5.38	2.09
24843	<2	4.1	2.5	330	18.3	42	25	6.14	2.06

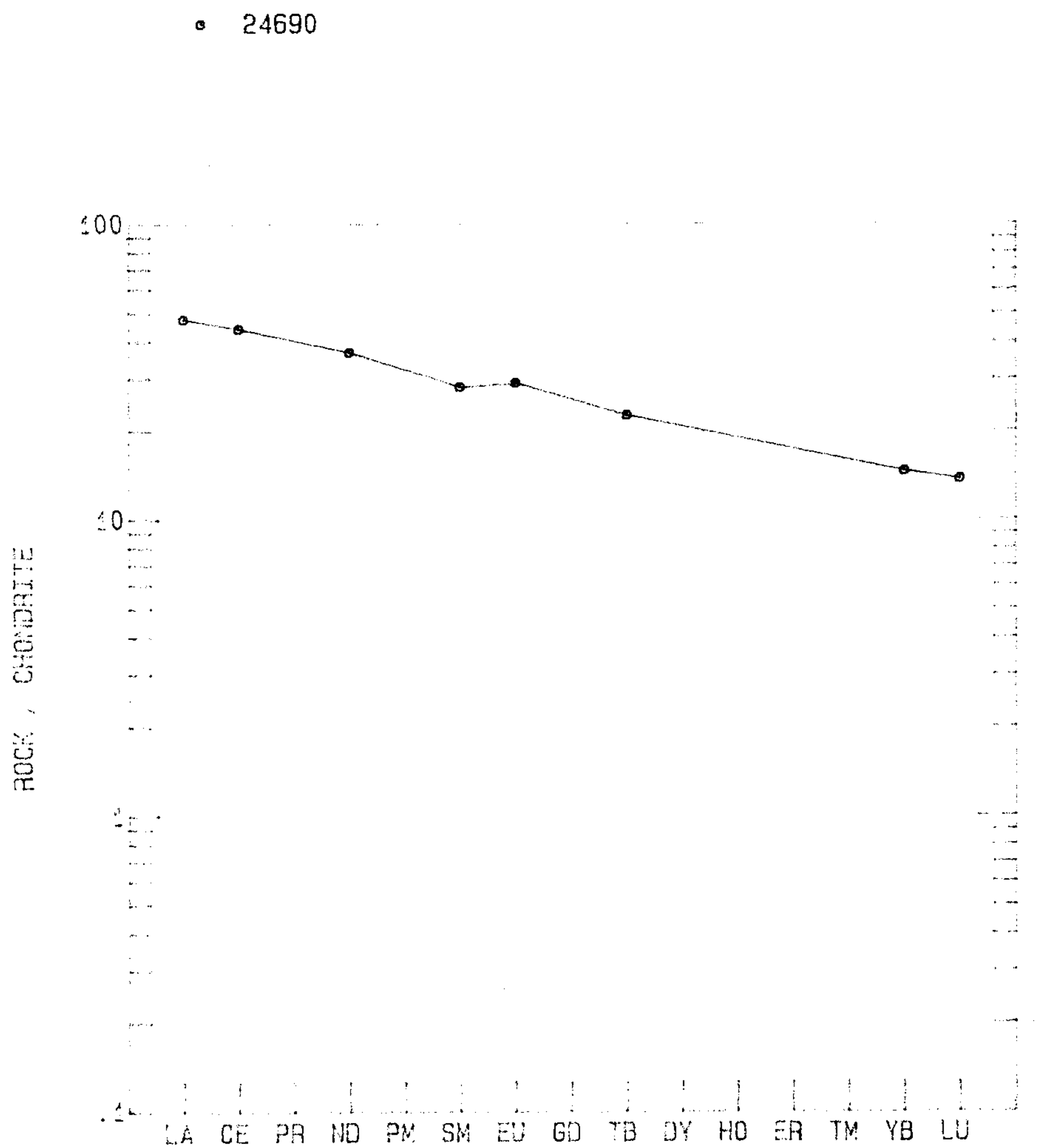
SAMPLE	TB PPM	YB PPM	LU PPM	HF PPM	TA PPM	W PPM	IR PPB	TH PPM	U PPM
24690	1.1	3.03	.44	4.6	.8	<2	<5	1.8	.7
24843	1.1	3.44	.50	5.7	1.6	<2	<5	2.3	1.1

SAMPLE \ %	SIO2	AL2O3	CAO	MGO	NA2O	K2O	FE2O3	MNO	TIO2	P2O5	CR2O3	LOI	SUM
24690	49.4	12.7	6.07	5.90	4.28	.23	14.5	.22	2.52	.24	<.01	2.30	98.4
24843	48.5	12.0	6.94	5.16	1.85	1.52	16.4	.24	2.87	.28	<.01	2.75	98.5

XRF W.R.A. SUMS INCLUDE ALL ELEMENTS DETERMINED. FOR SUMMATION, ELEMENTS ARE CALCULATED AS OXIDES

X-RAY ASSAY LABORATORIES 03-DEC-92
RARE EARTH CHONDRITE PLOTS

GRANGES INC.
(REF# 13605)



XRAL

X-RAY ASSAY LABORATORIES 03-DEC-92 GRANGES INC. (REF# 13605) CHONDRITE NORMALIZED VALUES

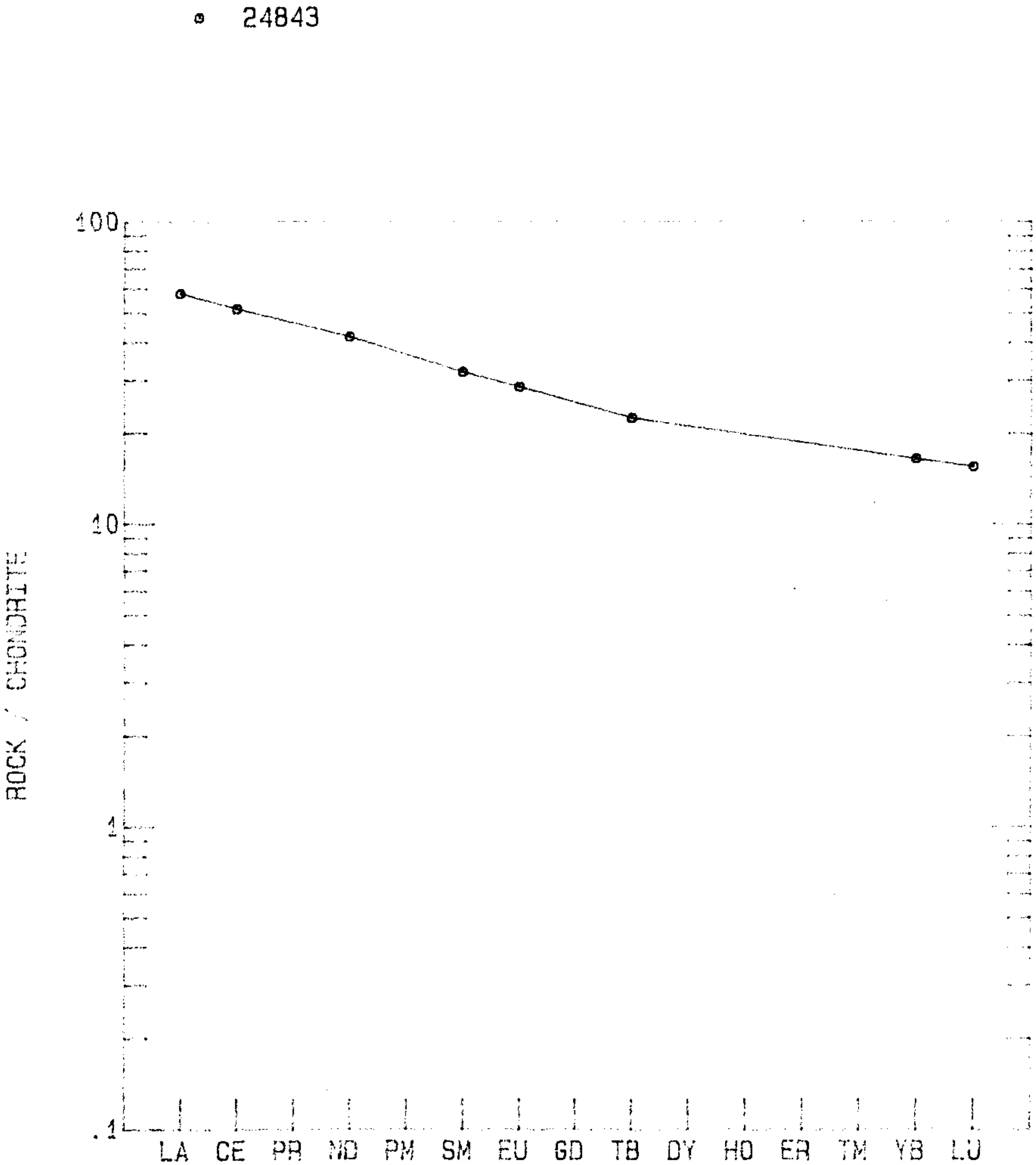
LE	LA	CE	PR	ND	SM	EU	GD	TB	DY	HO	ER	TM	YB	LU
24843	58.1	51.7	.0	41.9	32.0	28.5	.0	22.4	.0	.0	.0	.0	16.5	15.5

CHONDRITE RARE EARTH ELEMENT FACTORS USED TO NORMALIZE THE SAMPLE DATA :

LA .3150	CE .8130	PR .1000	ND .5970	SM .1920	EU .0722	GD .2590
TB .0490	DY .3250	HO .0720	ER .2130	TM .0320	YB .2090	LU .0323

X-RAY ASSAY LABORATORIES 03-DEC-92
RARE EARTH CHONDRITE PLOTS

GRANGES INC.
(REF# 13605)



X-RAY ASSAY LABORATORIES 03-DEC-92 GRANGES INC. (REF# 13605) CHONDRITE NORMALIZED VALUES

LE	LA	CE	PR	ND	SM	EU	GD	TB	DY	HO	ER	TM	[illegible]	LU
24690	47.6	44.3	.0	35.9	28.0	28.9	.0	22.4	.0	.0	.0	.0	14.5	13.6

CHONDRITE RARE EARTH ELEMENT FACTORS USED TO NORMALIZE THE SAMPLE DATA :

LA .3150	CE .8130	PR .1000	ND .5970	SM .1920	EU .0722	GD .2590
TB .0490	DY .3250	HO .0720	ER .2130	TM .0320	YB .2090	LU .0323

APPENDIX IV

CERTIFICATES OF ANALYSIS

ROW (139)

1992 SAMPLE CHECKLIST

Shipment	Date Out	Sample Numbers	Rock	Soil	Silt	Pan	Heav	WR	TS	PTS	Hg	Lab	Report No.	Date
ROW 92-1	Oct. 4	24687-24689	3									Acme	92-3494	Oct. 14
		24691-24699	9									Acme		
		24794-24799	6									Acme		
		24713	1									Acme		
		24800	1									Acme		
		24812, 24813	2									Acme		
		24832-24842	11									Acme		
		24844-24846	3									Acme		
		19N; 350E-450E		3								Acme		
		19N; 900E-1250E		8								Acme		
ROW 92-2	Oct. 6	24690, 24843						2				Xral	21060 File 13605-I5	Nov. 13
ROW 92-3	Oct. 6	24691							1			C. L.		Nov. 14
		24794, 24796, 24798							3					
		24800, 24812, 24832							3					
		24835, 24836							2					
TOTALS			36	11	0	0	0	2	9	0	0			

ACME ANALYTICAL LABORATORIES LTD. 852 E. HASTINGS ST. VANCOUVER B.C. V6A 1R6 PHONE(604)253-3158 FAX(604)253-1716

GEOCHEMICAL ANALYSIS CERTIFICATE

Granges Inc. PROJECT ROW 92-1 File # 92-3494 Page 1

2300 - 885 W. Georgia St., Vancouver BC V6C 3E8 Submitted by: GORDON ALLEN

SAMPLE#	Mo ppm	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Ni ppm	Co ppm	Mn ppm	Fe %	As ppm	U ppm	Au ppm	Th ppm	Sr ppm	Cd ppm	Sb ppm	Bi ppm	V ppm	Ca %	P %	La ppm	Cr ppm	Mg %	Ba ppm	Ti %	B ppm	Al %	Na %	K %	W ppm	Au* ppb	Hg ppb
24687-X	1	15	7	38	.3	11	13	1567	4.38	9	5	ND	6	10	.2	2	2	24	.21	.077	19	6	.29	24	.01	3	.56	.14	.06	2	3	10
24688-X	1	20	7	21	.2	14	14	305	2.01	6	5	ND	11	3	.2	3	2	3	.03	.010	23	7	.20	45	.01	2	.52	.04	.21	1	4	10
24689-X	1	53	3	131	.1	84	61	1632	10.52	7	5	ND	1	7	.2	2	2	112	.07	.033	5	22	.73	22	.01	2	1.49	.11	.10	2	3	30
24691-X	1	20	11	118	.1	6	15	286	8.37	29	5	ND	2	6	.2	2	2	12	.20	.104	6	2	5.33	5	.01	2	4.78	.01	.01	1	3	15
24692-X	8	37	147	29	.4	5	1	116	2.83	2	5	ND	13	23	.2	3	2	7	.02	.030	28	11	.32	105	.04	3	.95	.03	.45	1	3	10
24693-X	1	6	12	23	.1	9	4	318	1.19	4	5	ND	14	25	.2	2	2	7	.32	.013	20	11	.14	77	.07	2	.45	.04	.33	1	2	10
24694-X	1	8	6	34	.3	4	3	187	1.73	2	6	ND	18	8	.2	3	2	6	.04	.020	29	8	.53	81	.01	2	1.12	.02	.36	1	1	10
24695-X	1	44	63	38	.1	14	8	362	3.04	2	5	ND	10	20	.2	2	2	4	.05	.036	20	7	.26	64	.02	4	.72	.03	.30	1	1	10
24696-X	1	52	128	29	.7	25	11	481	2.71	2	5	ND	11	33	.2	4	2	5	.50	.025	13	6	.26	74	.02	3	.58	.03	.33	1	2	10
24697-X	1	29	21	55	.3	14	6	266	2.09	8	5	ND	12	8	.2	4	3	4	.05	.016	28	9	.26	85	.01	3	.74	.04	.28	1	2	10
24698-X	2	12	23	50	.1	14	4	475	1.87	5	5	ND	7	12	.2	2	2	6	.35	.023	17	9	.29	48	.05	3	.69	.04	.32	1	1	5
24699-X	1	29	12	108	.1	25	8	626	3.74	2	5	ND	24	28	.2	2	2	8	.25	.095	65	11	.39	137	.01	4	1.42	.02	.58	1	1	10
24713-X	6	26	33877	5	215.2	15	1	70	.54	7	5	ND	1	13	24.2	259	24	1	.01	.005	3	16	.07	9	.01	3	.11	.02	.02	1	24	1745
24794-X	1	37	406	38	.6	7	2	159	2.57	2	5	ND	11	23	.2	3	2	8	.06	.047	25	9	.31	85	.03	3	.82	.03	.39	1	5	5
24795-X	1	7	279	53	.6	13	4	205	1.13	10	5	ND	17	6	.2	2	5	2	.04	.016	33	4	.18	64	.01	2	.59	.02	.29	1	7	5
24796-X	1	40	617	37	.9	7	3	103	2.38	2	5	ND	17	19	.2	4	2	5	.04	.041	33	9	.21	106	.01	3	.82	.02	.37	1	5	10
24797-X	1	25	26	74	.3	13	4	205	3.16	18	5	ND	23	16	.2	5	2	9	.05	.032	42	13	.46	107	.01	3	1.50	.02	.52	1	4	15
24798-X	17	42	309	41	.9	7	2	165	3.06	2	5	ND	16	20	.2	2	6	8	.08	.048	29	9	.37	126	.03	2	1.17	.03	.52	1	6	15
24799-X	1	22	41	82	.2	25	6	197	3.16	10	5	ND	19	20	.2	4	2	9	.14	.042	34	14	.51	129	.04	3	1.44	.02	.55	1	3	10
24800-X	1	4	10	77	.1	13	6	279	3.56	2	5	ND	9	3	.2	2	3	19	.14	.051	26	11	7.49	11	.01	3	4.84	.01	.07	3	5	10
24812-X	1	17	28	77	.1	20	6	306	3.54	17	5	ND	19	12	.2	2	2	8	.08	.033	38	14	.66	108	.01	3	1.61	.02	.34	1	4	5
24813-X	1	30	68	122	.2	39	12	993	3.48	20	5	ND	15	18	.2	3	5	8	.18	.063	35	12	.53	120	.01	3	1.52	.03	.41	1	4	10
24832-X	1	10	13	41	.1	18	12	362	2.83	4	5	ND	10	2	.2	3	2	8	.01	.013	27	12	1.09	25	.01	2	1.58	.05	.12	2	4	5
24833-X	1	8	57	22	.4	9	2	157	.99	3	5	ND	2	4	.2	3	2	2	.05	.019	6	7	.23	10	.01	2	.29	.02	.06	1	2	5
24834-X	3	6	169	34	.6	10	1	225	.63	3	5	ND	1	2	.2	2	2	1	.01	.008	9	10	.02	11	.01	2	.13	.01	.06	1	2	10
24835-X	1	6	10	31	.1	14	7	144	1.70	5	5	ND	10	2	.2	2	2	4	.03	.018	36	8	.49	44	.01	2	.88	.04	.21	1	4	5
24836-X	1	30	10	56	.2	9	3	177	3.85	6	5	ND	19	14	.2	2	2	7	.14	.079	40	11	.50	67	.01	2	1.37	.02	.37	1	4	10
24837-X	1	10	23	40	.2	12	5	229	1.43	8	5	ND	12	7	.2	5	2	3	.01	.017	42	7	.03	56	.01	2	.47	.03	.28	1	4	10
RE 24833-X	2	4	54	21	.3	9	1	133	.82	3	5	ND	1	4	.2	2	2	2	.05	.018	6	7	.21	10	.01	2	.28	.02	.07	1	4	10
24838-X	1	12	35	40	.1	8	2	149	2.22	4	5	ND	10	19	.2	2	2	6	.06	.037	29	9	.39	124	.03	2	.96	.03	.38	1	4	10
24839-X	1	28	7	60	.1	7	3	227	4.60	21	5	ND	21	14	.2	2	2	8	.04	.046	56	13	.43	96	.02	2	1.37	.02	.40	1	4	5
24840-X	2	37	563	23	.1	5	1	46	1.68	2	5	ND	10	19	.3	2	2	3	.04	.034	26	6	.09	64	.01	2	.50	.03	.36	1	2	10
24841-X	1	9	14	67	.1	21	6	194	2.94	21	5	ND	21	12	.2	3	2	8	.09	.038	44	12	.46	102	.03	2	1.42	.02	.56	1	2	5
24842-X	2	121	188	62	.1	15	6	148	3.71	2	5	ND	13	27	.3	2	2	6	.11	.043	32	11	.29	79	.03	4	1.18	.04	.53	1	3	10
24844-X	1	21	18	56	.1	20	8	177	2.34	23	5	ND	22	21	.2	2	2	7	.22	.035	46	11	.37	95	.03	3	1.26	.02	.68	1	2	5
24845-X	1	30	13	86	.1	29	10	244	3.42	27	5	ND	17	15	.2	2	3	9	.10	.034	34	13	.54	100	.04	2	1.55	.02	.56	1	3	5
24846-X	1	8	8	61	.1	20	8	158	2.97	15	5	ND	16	12	.2	2	2	7	.10	.039	47	12	.45	84	.02	2	1.33	.03	.41	1	3	10
STANDARD C/AU-R	18	64	38	134	7.4	75	31	1072	3.96	42	17	7	40	52	19.2	15	20	58	.50	.088	41	62	.94	184	.09	34	1.88	.08	.16	11	520	1600

ICP - .500 GRAM SAMPLE IS DIGESTED WITH 3ML 3-1-2 HCL-HNO3-H2O AT 95 DEG. C FOR ONE HOUR AND IS DILUTED TO 10 ML WITH WATER.
THIS LEACH IS PARTIAL FOR MN FE SR CA P LA CR MG BA TI B W AND LIMITED FOR NA K AND AL. AU DETECTION LIMIT BY ICP IS 3 PPM.
ASSAY RECOMMENDED FOR ROCK AND CORE SAMPLES IF CU PB ZN AS > 1%, AG > 30 PPM & AU > 1000 PPB
- SAMPLE TYPE: P1 ROCK P2 SOIL AU* ANALYSIS BY ACID LEACH/AA FROM 10 GM SAMPLE. HG ANALYSIS BY FLAMELESS AA.
Samples beginning 'RE' are duplicate samples.

DATE RECEIVED: OCT 5 1992 **DATE REPORT MAILED:** Oct 14/92 **SIGNED BY** C. Leong ..D.TOYE, C.LEONG, J.WANG; CERTIFIED B.C. ASSAYERS

SAMPLE#	Mo ppm	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Ni ppm	Co ppm	Mn ppm	Fe %	As ppm	U ppm	Au ppm	Th ppm	Sr ppm	Cd ppm	Sb ppm	Bi ppm	V ppm	Ca %	P %	La ppm	Cr ppm	Mg %	Ba ppm	Ti %	B ppm	Al %	Na %	K %	W ppm	Au* ppb	Hg ppb
19+00N 3+50E	1	94	127	125	.7	66	23	2896	4.82	9	5	ND	5	40	.7	2	2	65	.40	.067	34	24	1.39	128	.03	4	3.71	.02	.20	1	1	50
19+00N 4+00E	1	18	20	123	.8	24	9	863	2.23	2	10	ND	6	8	.2	2	5	30	.06	.104	10	10	.33	133	.09	2	3.07	.02	.09	1	1	60
19+00N 4+50E	1	14	18	133	.4	26	8	1057	2.07	3	12	ND	5	8	.3	2	2	31	.06	.061	10	11	.36	159	.09	2	2.94	.02	.08	1	2	35
19+00N 9+00E	1	12	15	129	.4	33	7	639	1.74	3	9	ND	5	26	.3	2	3	21	.18	.117	9	10	.21	208	.13	4	3.00	.03	.10	1	2	30
RE 19+00N 11+00E	1	34	71	156	.1	37	18	742	2.85	13	5	ND	10	27	.2	2	2	24	.18	.047	24	14	.38	179	.08	3	2.54	.01	.15	1	1	25
19+00N 9+50E	1	12	23	174	.4	34	9	1029	1.89	8	5	ND	5	25	.4	3	2	22	.18	.065	13	11	.25	251	.09	3	2.04	.02	.13	1	1	20
19+00N 10+00E	1	20	37	106	.3	26	12	1088	2.24	7	5	ND	7	23	.2	2	2	23	.16	.046	18	12	.32	169	.08	3	1.88	.01	.16	1	1	30
19+00N 10+50E	1	27	88	285	.3	34	23	3801	3.27	16	5	ND	6	46	2.2	2	2	25	.26	.176	25	16	.45	533	.10	5	2.67	.02	.24	1	1	40
19+00N 11+00E	1	32	70	146	.2	35	17	693	2.70	14	5	ND	11	26	.4	2	2	24	.17	.043	23	13	.36	169	.08	3	2.38	.02	.16	1	1	25
19+00N 11+50E	1	53	165	284	.5	72	42	2380	3.84	54	5	ND	4	56	.9	2	2	20	.43	.073	18	10	.26	166	.06	4	2.25	.02	.14	1	3	45
19+00N 12+00E	1	59	148	243	.8	65	41	3648	4.31	40	5	ND	7	62	1.1	5	3	25	.43	.094	28	15	.34	228	.07	5	2.69	.02	.19	1	4	50
19+00N 12+50E	1	36	80	189	.4	40	27	3676	3.21	23	5	ND	4	45	.8	2	2	27	.40	.076	22	13	.33	268	.08	4	2.38	.02	.18	1	3	50
STANDARD C/AU-S	20	61	42	139	7.3	77	32	1097	3.96	38	18	7	41	53	17.5	15	21	62	.50	.090	39	60	.92	184	.09	36	1.88	.08	.16	11	50	1500

Sample type: SOIL. Samples beginning 'RE' are duplicate samples.

APPENDIX V

FACTOR ANALYSIS

Gord. Allen
Ross Zawada.

Edmunds & Associates

CONSULTING GEOLOGISTS
6840 Hycroft Road, West Vancouver, B.C. V7W 2K8 Canada (604) 921-8616

10 November, 1992

Mr Gordon J. Allen,
Granges Inc.,
23rd Floor, 885 West Georgia Street,
Vancouver, B.C. V6C 3E8

Dear Gordon,

Enclosed are the results of scoring the sample sets from your Kydd and Row properties. I have added them to the disk as well, also enclosed.

I hope everythingis clear: if not, please call.

Regards,

F.R. Edmunds

EXPLANATION of the ACCOMPANYING TABLES

Summary: the Factor Score Estimate classifies samples in terms of the Sullivan trace element halo. Those marked with an asterisk are possible members of a Sillivan-type halo.

Previous work on SEDEX deposits shows them to be surrounded by a trace element halo extending radially several kilometres in the plane of the bedding. The elements comprising the halo, and their respective weightings have been sought by subjecting large sets of rock samples from the vicinity of SEDEX deposits to the statistical technique known as Factor Analysis in R-Mode.

R-Mode Factor Analysis is described by J.C. Davies ('Statistics and Data Analysis in Geology', 2nd. ed., John Wiley & Sons, Inc., New York, NY, 1986, 646p.). Given, say, 20 or 30 variables, R-Mode identifies groups that vary together throughout the samples. It is often justifiable to interpret such blocks of common variation as independent responses to different geologic processes.

Each group of variables is a FACTOR, and it consists of a set of coefficients recording the strength of the relationship between each variable and the conceptual geologic process. One attempts to interpret the Factor by considering the variables of which it consists.

One may score each sample in terms of any desired Factor to yield a Factor Score. As a further application, one may derive a Score for ANY sample, such as an exploration sample, and judge the extent to which it displays the effects of the interpreted geologic process. This requires, however, that the sample to be tested be analysed for all the oxides and trace elements employed in the original research - at a significant cost. One can produce a Factor Score Estimate that correlates very strongly with the full Factor Score much more cheaply from just those variables with significant weightings in the relevant Factor.

For SEDEX deposits, the identification of the process responsible for mineralization is fairly easy: it consists of those elements that are also concentrated in the ore deposit, and the highest Scores cluster around the deposit in the form of a halo. In the Aldridge and Prichard Formations, host to the Sullivan deposit, previous work has shown that Pb, Zn and Hg alone yield a sufficient Factor Score Estimate of the process interpreted as responsible for mineralization.

Factor Score Estimates are standardized to a mean of zero and a standard deviation of 1, and they have an approximately normal distribution in most cases: so most lie between plus and minus 3. The Sullivan-Aldridge test-bed study led to the conclusion that Factor Score Estimates above zero in exploration sampling can be considered as POSSIBLE members of a Sullivan-sized halo, while values above +0.5 indicate PROBABLE membership.

The Factor Score Estimate used here provides a valid rating to the extent that the tested samples are similar and are treated in a similar manner to those upon which the original Factor Analysis was performed. Principally, they should be shales of the Aldridge or Prichard Formations. A comparison of summary statistics with those from some previous regional surveys shows the type of variation encountered from place to place. Anomalous responses have been removed - so "background" values are being compared.

	Mean			Standard Deviation			
	Pb ppm	Zn ppm	Hg ppb	Pb ppm	Zn ppm	Hg ppb	N
Survey A	10.66	55.86	5.74	20.46	27.25	4.12	1785
Survey B	11.42	67.22	5.06	31.61	26.66	0.92	1796
Survey C	16.83	48.92	43.32	20.65	40.72	16.62	1826
Row 92	70.00	54.58	9.19	127.70	28.53	4.85	31
Kydd 92	18.10	53.26	7.01	19.36	28.85	3.53	83
Row+Kydd	32.21	53.62	7.60	71.69	28.64	4.03	114

The Hg difference in Survey C is a difference in laboratories. The small sample size in the Kydd and Row data may partly explain differences from the previous, larger surveys. Nevertheless, the Row Pb appears unusually high.

In the accompanying tables, the Factor Score Estimates are listed after the sample ID. Those above 0.0 are marked by a single asterisk; those above +0.5 are indicated with a double asterisk. The Pb, Zn and Hg values come next, and then the transformed values employed in the scoring. The raw data are transformed in an attempt to satisfy some of the assumptions of the statistical procedure. For Pb and Hg, the transform is log10, for Zn it is log100.

Spurious positive responses are produced in most surveys. In attempting to distinguish between a spurious response and a member of a genuine halo the following principles are helpful:-

1. It is generally impossible to reproduce a spurious response by check sampling within a metre or two of the original.

2. In the field, genuine responses cluster along a horizon in the form of a bedded geologic feature. This tendency may be more significant in identifying a response than the mere strength of the values.

3. The most satisfactory lithochemical response is one that coincides with one obtained by some other means - such as geophysics, or a good geologic model.

In the accompanying tables, most of the responses come from what appear (from the Sample ID) to be soil or silt samples - for which I have no absolute rating criterion. If they are rock samples, both Kydd and Row grids contain moderate, yet significant lithochemical anomalies in terms of the Sullivan halo.

If these samples are excepted, Kydd 92-1 contains 3 possible target samples and Row 92-1 contains 4. In the Row file, dependence on high Pb values in Samples 24796-X, 24798-X and 24842-X may cause one to suspect minor vein mineralization of the Delaware type. Otherwise, all 7 responses are of the tenor one might expect within the Sullivan halo 5km or more from the deposit. In a smaller deposit, of course, they would be closer to the source of mineralization.

In spite of this somewhat disheartening assessment, I think the Kydd results are worth following up if they come from east of the Spyder Fault - and especially if 2 or more represent the same stratigraphic package. They could be the first clue to mineralization in that region. I would recommend a small program of close-spaced sampling to try to establish an anomalous horizon.

FRE
09.11.92

PROJECT ROW 92-1: File 92-3494

	Sample ID	Factor Score Estimate	Pb ppm	Zn ppm	Hg ppb	Transformed Pb	Transformed Zn	Transformed Hg
122	24687-X	-0.860	7	38	10	0.8451	0.1986	1.0000
123	24688-X	-1.109	7	21	10	0.8451	0.1213	1.0000
124	24689-X	-0.306	3	131	30	0.4771	0.3258	1.4771
125	24691-X	-0.258	11	118	15	1.0414	0.3164	1.1761
126	24692-X	-0.294	147	29	10	2.1673	0.1651	1.0000
127	24693-X	-0.949	12	23	10	1.0792	0.1341	1.0000
128	24694-X	-0.938	6	34	10	0.7782	0.1851	1.0000
129	24695-X	-0.374	63	38	10	1.7993	0.1986	1.0000
130	24696-X	-0.325	128	29	10	2.1072	0.1651	1.0000
131	24697-X	-0.482	21	55	10	1.3222	0.2406	1.0000
132	24698-X	-0.704	23	50	5	1.3617	0.2302	0.6990
133	24699-X	-0.388	12	108	10	1.0792	0.3082	1.0000
134	24794-X	-0.171	406	38	5	2.6085	0.1986	0.6990
135	24795-X	-0.131	279	53	5	2.4456	0.2366	0.6990
136	24796-X	0.121*	617	37	10	2.7903	0.1954	1.0000
137	24797-X	-0.212	26	74	15	1.4150	0.2717	1.1761
138	24798-X	0.130*	309	41	15	2.4900	0.2076	1.1761
139	24799-X	-0.200	41	82	10	1.6128	0.2819	1.0000
140	24800-X	-0.533	10	77	10	1.0000	0.2757	1.0000
141	24812-X	-0.514	28	77	5	1.4472	0.2757	0.6990
142	24813-X	0.032*	68	122	10	1.8325	0.3194	1.0000
143	24832-X	-0.904	13	41	5	1.1139	0.2076	0.6990
144	24833-X	-0.833	57	22	5	1.7559	0.1279	0.6990
145	RE 24833-X	-0.657	54	21	10	1.7324	0.1213	1.0000
146	24834-X	-0.199	169	34	10	2.2279	0.1851	1.0000
147	24835-X	-1.071	10	31	5	1.0000	0.1736	0.6990
148	24836-X	-0.640	10	56	10	1.0000	0.2426	1.0000
149	24837-X	-0.577	23	40	10	1.3617	0.2047	1.0000
150	24838-X	-0.484	35	40	10	1.5441	0.2047	1.0000
151	24839-X	-0.904	7	60	5	0.8451	0.2500	0.6990
152	24840-X	-0.097	563	23	10	2.7505	0.1341	1.0000
153	24841-X	-0.713	14	67	5	1.1461	0.2615	0.6990
154	24842-X	0.045*	188	62	10	2.2742	0.2534	1.0000
155	24844-X	-0.719	18	56	5	1.2553	0.2426	0.6990
156	24845-X	-0.649	13	86	5	1.1139	0.2866	0.6990
157	24846-X	-0.660	8	61	10	0.9031	0.2517	1.0000
158	19+00N 3+50E	0.664**	127	125	50	2.1038	0.3216	1.6990
159	19+00N 4+00E	0.305*	20	123	60	1.3010	0.3201	1.7782
160	19+00N 4+50E	0.141*	18	133	35	1.2553	0.3271	1.5441
161	19+00N 9+00E	0.046*	15	129	30	1.1761	0.3244	1.4771
162	19+00N 9+50E	0.101*	23	174	20	1.3617	0.3504	1.3010
163	19+00N 10+00E	0.188*	37	106	30	1.5682	0.3065	1.4771
164	19+00N 10+50E	0.736**	88	285	40	1.9445	0.3900	1.6021
165	19+00N 11+00E	0.367*	70	146	25	1.8451	0.3353	1.3979
166	19+00N 11+50E	0.910**	165	284	45	2.2175	0.3898	1.6532
167	19+00N 12+00E	0.878**	148	243	50	2.1703	0.3776	1.6990
168	19+00N 12+50E	0.676**	80	189	50	1.9031	0.3573	1.6990
169	RE 19+0N 11+00E	0.388*	71	156	25	1.8513	0.3411	1.3979

24800: QUARTZ-CHLORITE-MUSCOVITE-RUTILE ALTERED ?FINE SEDIMENT-CONTAMINATED MARGIN OF MOYIE SILL

Fine-grained, even-textured igneous rock with only rare dark relict mafic phenocrysts and abundant buff-beige TiO2 relics in a strongly altered matrix; probably an altered fine Moyie sill margin. Not magnetic, no reaction to cold dilute HCl. Modal mineralogy in thin section is:

Chlorite	45%
Quartz (?largely secondary)	40%
Sericite (muscovite)	10%
Semi-opaque (rutile, leucoxene)	5%
Apatite	<1%
Epidote	<1%

Chlorite forms fairly fine (up to 0.1 mm diameter) subhedral flakes in aggregates up to 2 mm across. One such aggregate has distinctly euhedral rectangular outlines, and is composed of about 60% chlorite, 20% quartz, 10% muscovite and 10% fine opaques; this may have been an amphibole phenocryst. The chlorite is length-fast, with pale green colour but no pleochroism and non-anomalous birefringence; it probably is magnesian, with an Fe:Fe+Mg ratio less than 0.4.

Quartz grains are ragged, anhedral, and up to 0.5 mm in diameter. They are mostly strained (undulose extinction, sutured grain boundaries) and look recrystallized and secondary.

Muscovite is intimately mixed with the chlorite in most areas, although subordinate in abundance. It forms fine euhedral flakes to 0.1 mm diameter.

Grains of semi-opaque up to 0.1 mm across are composed of minute subhedral crystals of ?rutile, ± minor leucoxene and ?sphene; they are likely rleicts of alteration of former ilmenite or magnetite-ilmenite. Rare euhedral crystals of epidote are found associated with the TiO2 relics. In places there are slim needles of prismatic apatite up to 0.1 mm long in the quartz (this is not characteristic of Aldridge sediments).

This is similar to 24691 but finer-grained and less obviously an igneous rock; the quartz is present as smaller, ragged grains that almost look detrital, and there is no feldspar. However, the abundance of TiO2 relics and the occasional dark green ?altered mafic sites, plus absence of tourmaline that characterizes the Aldridge sediments suggest that it is in fact a Moyie sill, possibly very close to the margin where it may have incorporated a little sediment.

24812: QUARTZ-MUSCOVITE-CHLORITE±PLAGIOCLASE FINE "SAND DYKE" CUTTING FINE MUSCOVITE-QUARTZ-CHLORITE SILTITE

Alternating dark, fine-grained and lighter, coarser-grained sediment that appears to have been sheared, making the contact between the two layers highly irregular. Thus foliation appears to be oblique to bedding. Non-magnetic; crossed by limonitic fractures. Modal mineralogy is about:

Fine-grained portion		Coarse-grained portion	
Muscovite	65%	Muscovite	35%
Quartz	25%	Quartz	30%
Chlorite	10%	Chlorite	20%
Opaque, carbon?	5%	Plagioclase	10%
Tourmaline	<1%	Opaque, limonite	5%
		Tourmaline	<1%

In thin section, however, a simple sedimentary origin for the two rock types is difficult to support. Instead, it appears as if layering in the dark, fine-grained rock is cut abruptly by the coarser rock, and thin veinlets of the coarser rock cut the finer, suggesting a "sand dyke" type of scenario. Mineralogy is similar in the two although the finer portion is considerably richer in sericite (msucovite) and appears to lack feldspar.

The finer portion consists mainly of fine, subhedral muscovite flakes to about 25 µm diameter, intimately mixed in certain 0.1-0.2 mm layers with similar sized chlorite so that it is difficult to estimate their abundances, and with lesser quartz and minor opaques. Rare brown tourmaline forms euhedral prisms up to 50 µm long with random orientation. The chlorite is probably the same as large flakes found in coarser lenses of quartz and opaques: an Fe-rich length-slow variety with strong yellow to green pleochroism and anomalous blue birefringence. There may be very minor amounts of carbon as extremely fine (1 µm) grains in the more chloritic 0.1 mm laminae; most opaques form eu- to subhedral crystals of 50-75 µm diameter whose shapes are suggestive of Fe-Ti oxides such as ilmenite.

The coarser portion consists of anhedral detrital quartz, rare subhedral plagioclase and scattered euhedral muscovite flakes up to 0.1 mm long, all with random orientation, in a matrix of fine sericite (muscovite) similar to the fine-grained portion of the rock. Coarse flakes of Fe-rich chlorite and opaques up to 0.1 mm diameter are scattered through this portion of the rock. Although twinning is seen in some feldspar grains, they are too small and do not touch quartz to determine their composition; extinction angles of 13 degrees could be An_{30} (oligoclase-andesine) or An_7 (albite). Large euhedral deep brown (intermediate schorl-dravite) tourmaline crystals up to 200 µm long are probably detrital.

Although relatively rich in muscovite, the presence of fresh feldspar in this rock suggests it is not significantly hydrothermally altered, but merely an unusual sedimentary feature. Breccias at Sullivan are however related to such dewatering features. Opaques do not appear to be sulfides.

<u>24832: MEDIUM SAND-SIZED QUARTZ-PLAGIOCLASE WACKE CUT BY QUARTZ VEINS WITH ALBITE-CHLORITE-MUSCOVITE ENVELOPES</u>

Pale green, altered sand-sized wacke cut by numerous thin bed-parallel and bed-perpendicular quartz ± albite-chlorite veinlets, and many rusty fractures. A slightly darker green 7 mm envelope to one vein is unfortunately not cut in the section. Modal mineralogy is approximately:

Quartz (detrital and secondary, veins)	60%
Feldspar (?mainly albitic plagioclase)	15%
Muscovite	15%
Chlorite	5%
Opaque (rutile, limonite)	5%
Zircon	tr

This is a relatively coarse (0.1-0.2 mm) sandstone composed mainly of detrital quartz and plagioclase feldspar, with interstitial muscovite. Quartz forms anhedral grains that look mainly detrital but the margins are commonly slightly overgrown by ?secondary silica. Quartz in the 1-2 mm thick veins forms irregular, anhedral composite grains up to 0.8 mm diameter that are highly granulated. There appears to be a modest increase in the amount of muscovite, and a more obvious increase in chlorite, in the quartz vein envelopes; this would account for the slightly darker envelope seen to the major vein in hand specimen.

It is not clear whether all the plagioclase is albite and if it is all secondary; there could be both primary oligoclase and replacement albite. Measured extinction angles on one 0.2 mm anehdral grain of Y^010=17°, and relief less than quartz, suggest An_0. In hand specimen, white crystals in the quartz veins are probably albite, suggesting a link to hydrothermal activity, but this is not clear in thin section where the pattern of albite distribution in the wallrocks is not obvious.

Muscovite and intimately intergrown chlorite form sub- to euhedral flakes up to 0.15 mm diameter, making it difficult to estimate their relative abundances. Near veins the chlorite is better crystalline, showing Fe-rich characteristics length slow, anomalous blue birefringence).

Opaques consist mainly of small bunches of minute (5-15 µm) crystals of ?rutile scattered through the rock, as well as abundant transported limonite forming stains in muscovite and quartz near fractures. If there ever was sulfide along these fractures, it is not obvious. Rare zircon crystals are euhedral and up to 40 µm long.

The overall appearance and mineralogy of this rock suggest it is strongly altered to albite-muscovite-chlorite-rutile; rare limonite grains in the quartz vein in hand specimen suggests there may have been some (pyritic) sulfides. This sample could well be proximal (?above) a hydrothermal system, and as such is worthy of follow-up.

<u>24835: FINE SAND-SIZED QUARTZ-PLAGIOCLASE-MUSCOVITE-CHLORITE ±BIOTITE WACKE CUT BY QUARTZ-MUSCOVITE-CHLORITE-PYRITE VEINS</u>

Grey-green, fine sand-sized wacke cut by thin limonite-quartz rich fractures/veinlets and containing scattered coarse limonite pseudomorphs that appear to be after pyrite, although the rock is strongly magnetic. In thin section, the mineralogy is roughly as follows:

Quartz (detrital; minor secondary)	60%
Plagioclase (?albitic)	15%
Muscovite	15%
Chlorite	10%
Opaque (limonite)	3%
Biotite	2%
Tourmaline (schorl)	tr
Zircon	tr

The framework of this rock consists of anhedral 0.1-0.2 mm quartz, probably largely detrital, with minor thin overgrowths at the rims. Feldspar grains interstitial to this framework are also anhedral, and up to 0.15 mm in diameter. Twinning with extinction angles of up to 13 ° (Y^010) and relief lower than quartz suggests it is mainly albite similar to that in 24832. As in that sample its form and distibution are not obviously secondary (not found along veins or fractures); however, the presence in veined rocks with associated chlorite and muscovite that may be secondary suggests the ?albitic plagioclase may also be secondary.

Micas interstitial to the quartz and feldspars consist of common muscovite and less abundant but intimately intermixed chlorite and rare, mainly bleached (muscovitized) biotite. Both muscovite and biotite form large flakes up to 0.3 mm diameter; muscovite also is found as finer matted flakes of 50 μm size mixed with similar sized chlorite. Chlorite is best developed in "clots" of quartz-chlorite-opaque (cubic ?pyrite pseudomorphs) that are up to 2 mm across. Here the chlorite forms subhedral crystals up to 0.2 mm diameter that are length-slow, with brilliant yellow to deep green pleochroism and purple anomalous birefringence indicating an Fe-rich composition.

Veins are up to 0.25 mm thick and consist of the same minerals as seen in the "clots": quartz, chlorite and opaques that may include both magnetite (?) and pyrite (?) or limonite after pyrite. Some of the veins/fractures have distinct selvages or envelopes of muscovite, proving that at least some of the muscovite is hydrothermal in origin. Rare euhedral zircon crystals up to 60 μm long are scattered through the rock, and there are a few euhedral crystals of very dark blue-green (Fe-rich schorl) tourmalinite up to 100 μm long, probably detrital.

In summary, this appears to be an altered rock similar to 24832 (albite-muscovite-chlorite-pyrite-?magnetite). The extent of the alteration is difficult to judge since the same minerals are also stable in unaltered sediments and metamorphic rocks, but the association with veins suggests proximity to hydrothermal alteration.

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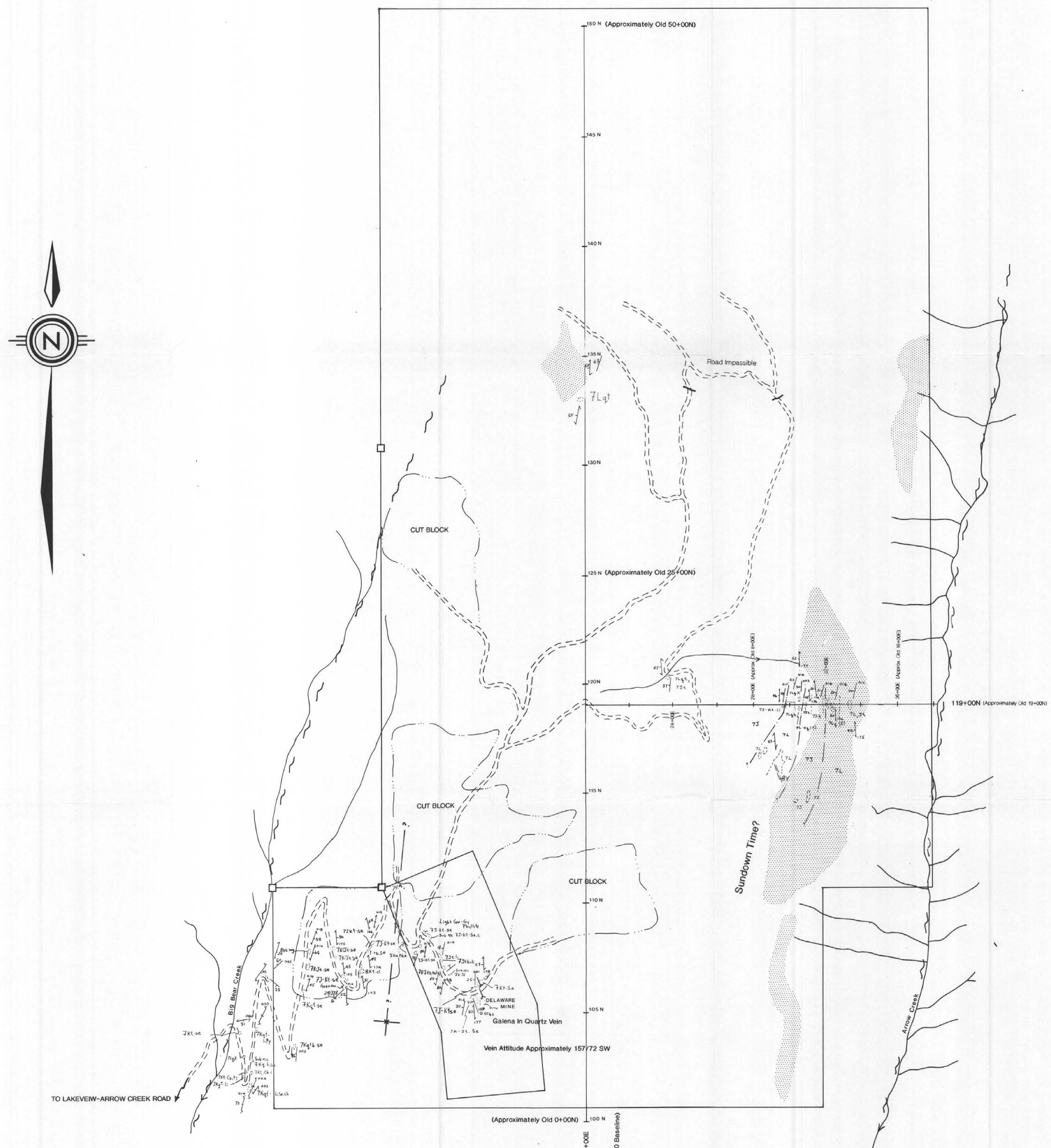

>80ppm Pb in soils

LEGEND

LITHOLOGY LEGEND

1 MAFIC VOLCANIC
2 INTERMEDIATE VOLCANIC
3 UNDIFFERENTIATED FELSIC VOLCANIC
4 DACITE
5 RHYOLITE
6 LIMESTONE
7 CLASTIC SEDIMENT
8 MAFIC INTRUSION
9 INTERMEDIATE INTRUSION
10 FELSIC INTRUSION

ROCK UNIT LETTER QUALIFIERS

The first letter indicates the type of rock; if omitted a dash should be inserted before additional letters are used.

A FINE-GRAINED TUFF (<0.5mm)
B MEDIUM-GRAINED TUFF (0.5mm-2mm)
C COARSE-GRAINED TUFF (>2-6.4mm)
D LAPILLI TUFF (>6.4mm-6.4cm)
E TUFF BRECCIA (>6.4 cm; matrix supported)
F VOLCANIC BRECCIA (>6.4cm; clast supported)
G FLOW
H FLOW BRECCIA
J ARGILLITE
K SILTSTONE
L SANDSTONE / WACKE
M CONGLOMERATE
N CHERT (CHERTY)
O DEBRIS FLOW
R DOLOMITIC (ANKERITIC) CARB.
T TUFFACEOUS SED.
W APHANITIC
X FINE-GRAINED
Y MEDIUM-GRAINED
Z COARSE-GRAINED

The second and third letters are optional and further define the rock.

a amygdaloidal
b bedded
c calcareous
d spherulitic
e fossiliferous
f flow banded
g graphitic
h hematitic
i hornfels
j argillaceous
k chloritic
l leucocratic
m magnetite-bearing (magnetic,no pyrrhotite)
n massive
o welded tuff
p pillowed
q quartz
r sheared
s siliceous/cherty
t phyllitic
u fragment
v quartz phyric
w feldspar phyric
x quartz-feldspar phyric
y mafic phyric
z mafic-feldspar phyric

Additional Qualifiers:

r	-	As a prefix to the basic rock type indicates rubble or abundant float giving an indication of underlying geology.
( )	-	A letter in parentheses indicates that this particular characteristic is poorly defined, vague, or a minor constituent.
.	-	A period within the code separates the basic lithology from additional information such as fragment type, mineralization, or alteration.
bx	-	Breccia. Separated from the main rock description by a period.
cr	-	Crenulated foliation or bedding.
/	-	A slash within the code between two rock types indicates uncertainty.
,	-	A comma within the code between two rock types indicates that both are present.
-	-	A dash within the code between two lithologies indicates a rock type gradational or intermediate between the two.

MINERALS

Au NATIVE GOLD
Ag NATIVE SILVER
az AZURITE
bo BORNITE
cp CHALCOPYRITE
el ELECTRUM
ep EPIDOTE
gl GALENA
go GOETHITE
hg CINABAR
hm HEMATITE
li LIMONITE
mg MAGNETITE
mc MALACHITE
mn MANGANESE STAIN
mo MOLYBDENITE
py PYRITE
po PYRRHOTITE
qz QUARTZ
sb STIBNITE
sl SPHALERITE
th TETRAHEDRITE

ALTERATION

Cl CHLORITE
Cb CARBONATE (ANKERITIC)
Se SERICITE
Si SILICA
Ka KAOLINITE
Kf K-FELDSPAR

Alteration Intensity:
0-Trace
1-Weak
2-Moderate
3-Strong

SYMBOLS

BEDDING:
TOPS UNKNOWN
TOPS UP
OVERTURNED
HORIZONTAL
FLOW BANDING, OR PLANE OF FLATTENING
FOLIATION, CLEAVAGE
FOLIATION PARALLEL TO BEDDING
LINEATION (PLUNGE, TREND):
F - fold axis
P - pencil lineation
M - mineral lineation
S - slickenside
JOINT
FAULT, SHEAR
THRUST FAULT
VEIN
Qv QUARTZ VEIN
Cv CARBONATE VEIN
QCv QUARTZ-CARBONATE VEIN
Hv CHLORITE VEIN
Pv PYRITE VEIN
GEOLOGICAL CONTACT; DEFINED, INTERPRETED
UNCONFORMABLE CONTACT ('U's on upper unit)
FOLD AXES:
ANTIFORM (WITH PLUNGE DIRECTION)
SYNFORM (WITH PLUNGE DIRECTION)
ZONE OF TIGHT FOLDING (WITH PLUNGE)
GLACIAL STRIATION
LINEAR TOPOGRAPHIC FEATURE
LIMIT OF SURFICIAL FEATURE
RIDGE
VALLEY
CLIFF
MORAINE
NARROW DYKE OR BED
OUTCROP
OUTCROP SEEN BUT NOT VISITED
OV OVERBURDEN
FOSSIL LOCALITY
AIRPHOTO TARGET
HELIPAD (GOOD)
HELIPAD (POOR)
FIELD NOTE LOCATION
ROCK SAMPLE LOCATIONS:
HAND SPECIMEN
HAND SPECIMEN - THIN SECTION
For Analyses:
BEDROCK (Grab unless noted; C - Chip, H - Channel)
BEDROCK - WHOLE ROCK, THIN SECTION
FLOAT
STREAM SEDIMENT
SOIL

GEOLOGICAL BRANCH
ASSESSMENT REPORT

22,847

0m 100m 500m 1000m

FIGURE 6

DRAWN BY: R. ZAWADA, G. ALLEN	GRANGES INC. VANCOUVER, B.C.	GEOLOGY	SCALE: 1:10,000
DATE: SEP., OCT. 1992		ROW PROPERTY	PROJECT No.: 139
		NELSON MINING DIVISION, B.C.	N.T.S. No.: 82 F/1

GEOLOGICAL BRANCH
ASSESSMENT REPORT

22,847

FIGURE 7

DRAWN BY: R. ZAWADA, G. ALLEN	GRANGES INC. VANCOUVER, B.C.	SAMPLE LOCATION PLAN	SCALE: 1:10,000
DATE: SEP., OCT. 1992		ROW PROPERTY NELSON MINING DIVISION, B.C.	PROJECT No.: 139
			N.T.S. No.: 82 F/1