013329

PRELIMINARY EVALUATION

H Y A N D S U N C L A I M G R O U P S

Watson Lake Mining District, Y.T.
N.T.S. 105-A-7 and 8
Lat. 60°20'N; Long. 128°05'W (HY) and 128°30'W (SUN)

BY

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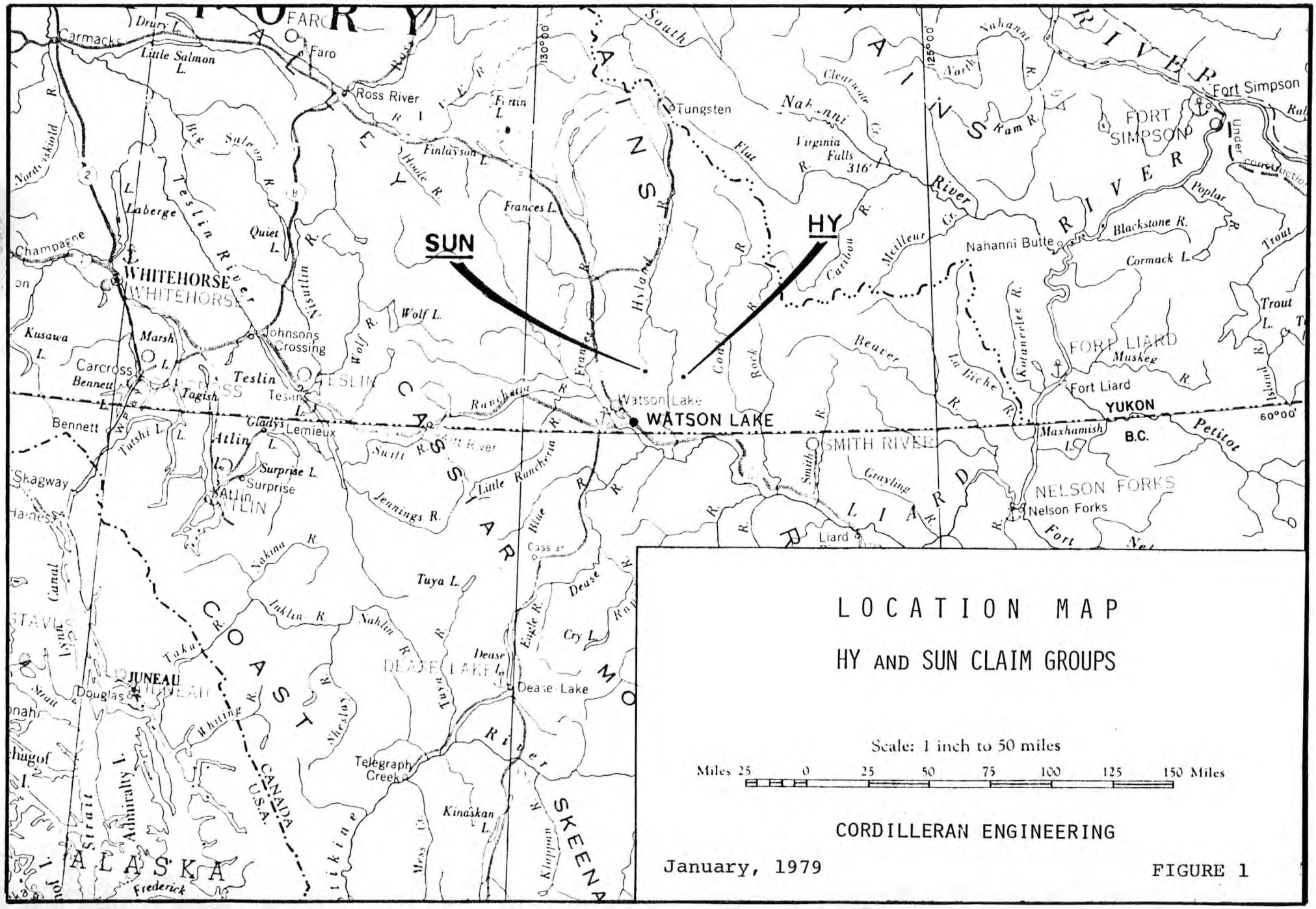

LOCATION MAP

HY AND SUN CLAIM GROUPS

Scale: 1 inch to 50 miles

Miles 25 0 25 50 75 100 125 150 Miles

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FIGURE 1

INTRODUCTION

The HY and SUN properties are new geochemical discoveries located in the Watson Lake Mining District, Y.T. In terms of regional Cu, Pb, Zn, Ag geochemistry anomalous samples from each group show exceptional relief above a very flat and low background.

The HY consists of 180 mineral claims, the SUN, 24 (Appendix "A"). The groups are situated between 20 and 30 miles north and northeast of Watson Lake at latitude 60°20'N and longitudes 128°05'W (HY) and 128°30'W (SUN). Both properties were acquired by Cordilleran Engineering for Render Resources Ltd. during the course of 1978 regional exploration.

The groups are underlain by Precambrian(?) sediments which are intruded, at the HY by granite porphyry

dykes and minor andesitic dykes; at the SUN by an altered granite porphyry stock. Geological Survey of Canada aeromagnetic maps indicate the HY is underlain by an isolated magnetic anomaly: a magnetic high, flanked by lows. Pronounced magnetic gradients occur on the SUN. Doming of the sediments and an apparent radial fracture pattern are developed about the center of the HY property.

Mineralization adequate to explain the geochemical anomalies has not been discovered on either claim group. Rock sampling indicates that the known lithologies have low backgrounds. Direct prospecting was hampered due to very limited outcrop exposure (less than 5 percent).

A model satisfactorily explaining the geochemistry is open to speculation. Four types of deposits are considered possible: massive sulphide (Cu, Pb, Zn, Ag), porphyry Mo (W, Sn), colloidal gold, or low-grade, large tonnage silver. Each of these could have geochemical expressions similar to those found on the HY and SUN and each could fall into the geological setting as presently envisaged.

REGIONAL HISTORY

Exploration has been undertaken in the vicinity of the HY and SUN since the 1890's when prospectors first noted mineralization at what is now the Quartz Lake property (10 miles north of HY). Extensive work has been conducted on the Quartz Lake property. A massive sulphide body of approximately 1.5 million tons grading 6% Pb, 9% Zn and 3.0 oz/ton Ag has been investigated by a joint venture of Asarco and Noranda (refer to Northern Cordillera Mineral Inventory: Occurrence 6, NTS 95 D/12). Regional work has been persued by various companies and individuals in the Precambrian and lower Paleozoic sediments. The most recent discovery (1967) being the MEL property in Cambro-Ordovician sediments, 20 miles east of the HY (refer to N.C.M.I. #5, NTS 95 D/6). This property is presently under option to Granby Mining Company Limited, who in 1977, entered into a joint venture agreement with St. Joseph Explorations Limited. St. Joe conducted

diamond drilling during the winter of 1978 an additional 15,000 feet is planned for the winter of 1979.

Due to the heavy vegetation, effective regional geochemical prospecting has been hampered and direct prospecting restricted to creeks and ridge tops. Persistent application of modern geochemical exploration techniques combined with thorough evaluation of anomalies led to the acquisition of the HY and SUN groups where traditional techniques and cursory geochemical sampling proved ineffective.

REGIONAL SETTING:

HY AND SUN PROPERTIES

GEOCHEMISTRY

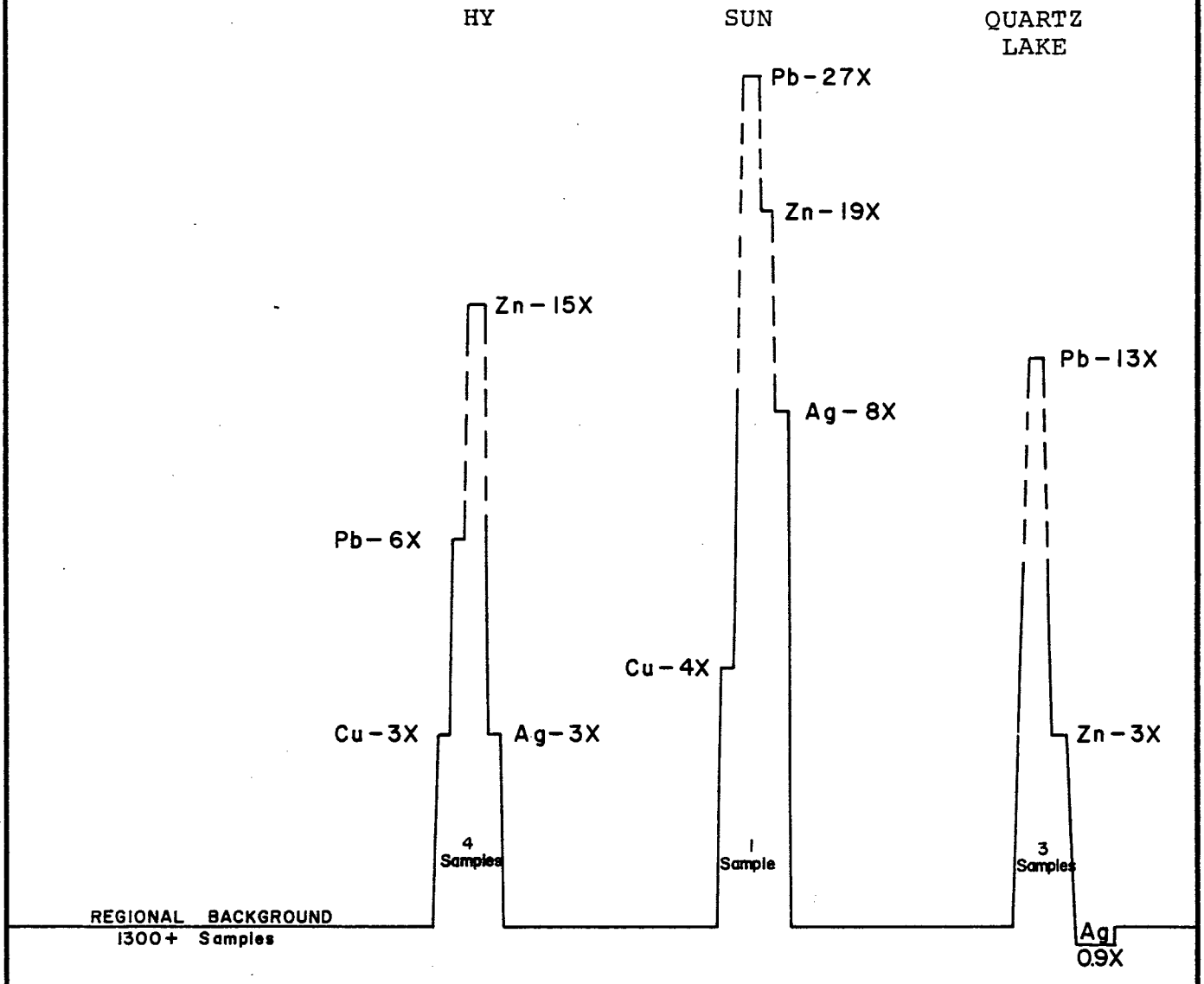
The HY and SUN claim groups cover Cu, Pb, Zn, Ag geochemical anomalies that were found during an intensive stream sediment sampling campaign encompassing approximately 1,100 square miles of the Watson Lake and Coal River map sheets (105 A, 95 D) Yukon Territory during the summer of 1978. Over 1300 stream sediment samples were collected in the course of this program. In Precambrian sediments, backgrounds (mean plus two standard deviations) are 40 ppm Cu, 26 ppm Pb, 205 ppm Zn and 0.8 ppm Ag. From this regional data the HY is marked by four very highly anomalous stream sediment samples (Cu: 61,74,102,112; Pb: 92,97,132,148; Zn 770,1940,2300,3100; Ag: 1.4,2.0,2.1,2.2 - in ppm), the

REGIONAL SETTING: HY AND SUN PROPERTIES
Geochemistry (cont'd)

SUN by one (Cu: 147, Pb: 700, Zn: 3850, Ag: 6.6 - in ppm). Both properties have outstanding geochemical expressions (Figure 2) not only in terms of regional background, but also relative to areas with known sulphide mineralization (i.e., Quartz Lake). Follow-up sampling of the anomalous drainages confirmed and produced higher values in Cu, Pb, Zn and Ag.

On both claim groups, rolling hills and elevations ranging from 2,800' to 4,650' (ASL) are dissected by rust-free creeks having moderate slopes and containing abundant float of the underlying lithologies. Drainages are commonly overgrown with willow and spruce. Hills are covered with relatively open pine stands on south and west facing slopes; dense balsam growth occurs on north and east facing slopes; buck-brush covers forest floors. Soil horizons are well developed over most of each property.

Reconnaissance on the HY and SUN properties consisted of follow-up stream sediment, limited water and heavy mineral concentrate, as well as soil sampling. The results of this work are summarized in Table 1: a discussion follows.



HY, SUN ANOMALIES AND QUARTZ LAKE PROPERTY VERSUS REGIONAL BACKGROUND FOR Cu, Pb, Zn, Ag

DISCOVERY SAMPLES on the HY and SUN show exceptional relief above a very flat regional background (values x background)

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FIGURE 2

TABLE 1 SUMMARY OF GEOCHEMISTRY

STREAM SEDIMENTS (ppm):

	REGIONAL	HY	SUN			QUARTZ LAKE		
						Down Stream From Mineralization		
	Background	Range	Anomalous	Anomalous Samples				
Mo	2	1-20	13+ (5 samples)	2	N.A.	N.A.	N.A.	N.A.	N.A.
Cu	46	25-311	61+ (40 samples)	147	274	217	N.A.	N.A.	N.A.
Pb	26	10-270	45+ (41 samples)	700	1480	1310	110	350	320
Zn	205	152-4200	336+ (52 samples)	3850	5120	4970	289	590	740
Ag	0.8	0.2-4.3	1.5+ (18 samples)	6.6	12.0	9.6	0.4	0.7	0.5
No.of samples	1300	57		3 from one drainage			3 from one drainage		

SOILS (ppm):

	HY		SUN	QUARTZ LAKE
	Background	Range	Range	Range
Mo	0-8	<1-30	16+ (9 samples)	1-4	N.A.
W	0-8	2-23	15+ (3 samples)	N.A.	N.A.
Sn	0-4	<1-34	11+ (8 samples)	N.A.	N.A.
Cu	0-58	1-167	95+ (5 samples)	4-86	6-30
Pb	0-82	7-710	147+ (5 samples)	7-154	4-26
Zn	0-374	51-1430	587+ (6 samples)	36-364	46-197
Ag	0-2.6	0.2-8.2	4.7+ (8 samples)	0.2-1.8	0.2-2.2
No.of samples		228		48	26

(Note: average pH, SUN and HY soils: 6.0)

HEAVY MINERAL CONCENTRATES:

	HY		SUN
	Range	Average	
W	3-45 ppm	17 ppm	6 ppm
Sn	21-120 ppm	49 ppm	7 ppm
Au	25-240 ppb	52 ppb	130 ppb
No.of samples	11		1

STREAM WATERS:

	HY	
	Range	Average
Mo	2-10 ppb	6 ppb
U	<0.05-2.5 ppb	0.5 ppb
pH	7.5 -8.1	7.7

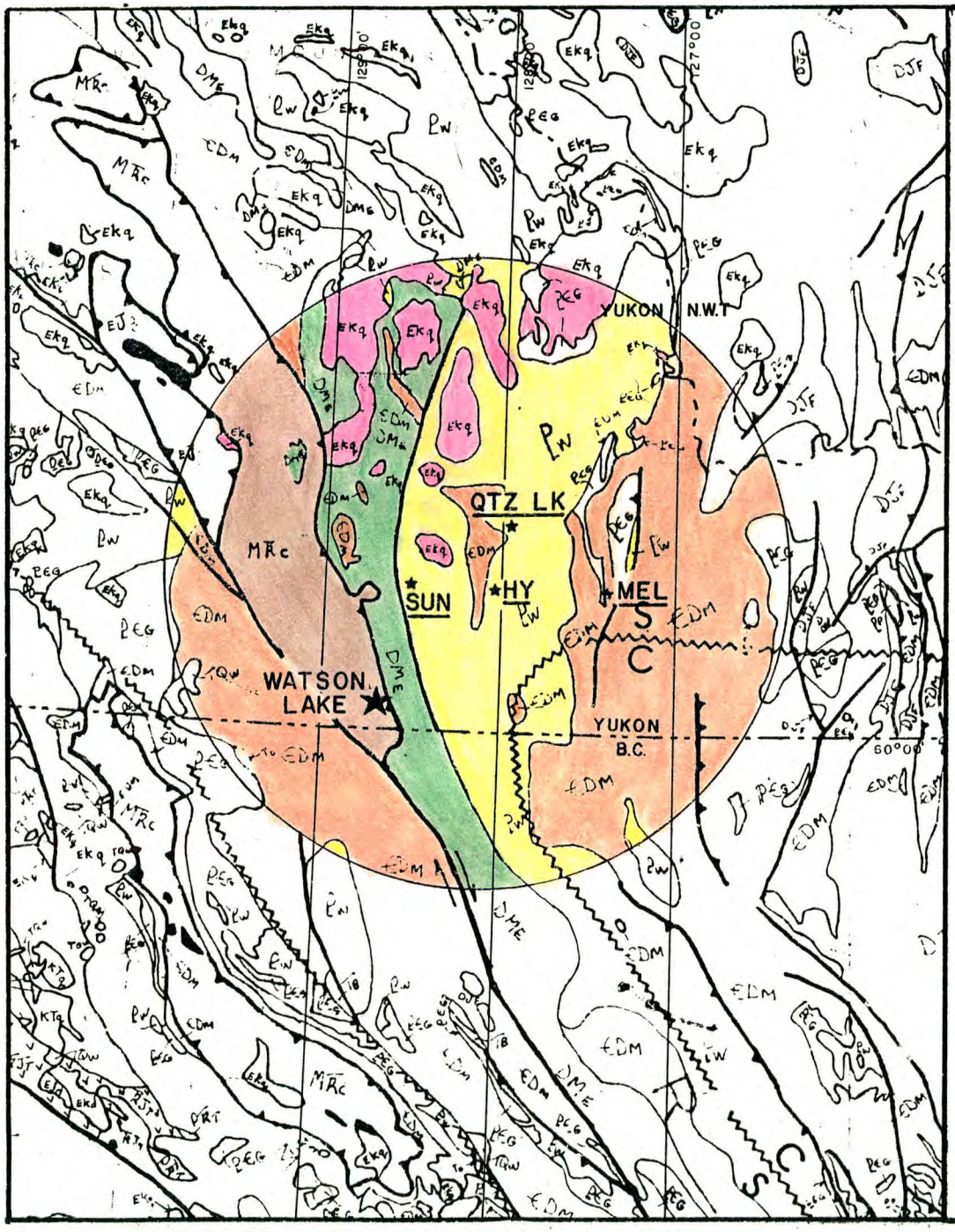
REGIONAL SETTING: HY AND SUN PROPERTIES
Geochemistry (cont'd)

Rock sampling results are appended. Analytical work was conducted by Bondar-Clegg and Company Ltd., North Vancouver, B.C.

GEOLOGY

(Figure 3)

The HY and SUN properties occur in a northerly trending belt of Precambrian(?) metasediments (Unit 1, G.S.C. map 19-1966) that has been thrust up against a folded and faulted belt of Paleozoic clastics and carbonates to the east (Coal River map-sheet, G.S.C. paper 68-38). Cambro-Ordovician (Road River Formation) black carbonaceous shales and argillaceous limestones occurs as a relatively thin veneer on top of the Precambrian and are restricted to a narrow belt along the Hyland River. The Precambrian sequence appears to be in fault contact with down-dropped Paleozoic sediments to the west and



LEGEND

- EKq — LATE CRETACEOUS and EARLY TERTIARY - Intrusives
- MTRc — MISSISSIPPIAN-TRIASSIC - Anvil Range Equivalents: sediments and volcanics
- DME — DEVONO-MISSISSIPPIAN - Earn Group Equivalents: sediments
- €DM — CAMBRIAN-MISSISSIPPIAN - Road River Equivalents: sediments
- Pw — PROTEROZOIC - Windermere Equivalents: sediments

Structure Symbols

- Thrust faults
- Dextral transcurrent faults (approximate, assumed)
- Fault with downthrown side indicated by solid circle
- Faults with sense of movement not indicated (approximate, assumed)
- Assemblage contact (approximate, unknown)
- Late Ordovician-Early Silurian Carbonate (C) - Shale (S) facies boundary
- Mesozoic assemblages with dominantly volcanic rocks

Adapted from G.S.C. O.F. 572

REGIONAL GEOLOGY

SCALE: 1 inch equals approximately 32 miles

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FIGURE 3

REGIONAL SETTING: HY AND SUN PROPERTIES
Geology (cont'd)

and is cut off by the Tintina fault to the south. Unit 1 consists of phyllites, phyllitic shales, quartzites and limestones that are tightly folded locally, but generally strike north-northwesterly. Granite porphyry dykes on the HY and a small granite porphyry stock on the SUN are not noted on G.S.C. maps. Ten miles north of the SUN a granitic pluton intrudes the Precambrian package and is part of a northerly trending belt of intrusives. Outcrop exposure on both groups is less than 5% being limited to stream gulches and ridges.

HY PROPERTY

GEOCHEMISTRY

STREAM SEDIMENTS (Plate 1)

Drainages on the HY produce values of up to 311 ppm Cu, 270 ppm Pb, 4200 ppm Zn, 4.3 ppm Ag and 20 ppm Mo in the -80 mesh fraction of stream sediments. Values generally increase up stream with highly anomalous values being confined to the headwaters of creeks draining the central and north part of the property, in areas underlain by chert and intruded by granite porphyry dykes. For comparative purposes orientation stream sediment samples from the Quartz Lake property are listed in Table 1. Lead values compare favourably with the HY results, however, Zn and Ag are considerably lower than values obtained on the HY. Samples from the Quartz Lake property were down stream (100 m and 500 m) from exposed massive sulphide mineralization. The drainage sampled is larger by a factor of ten than headwater drainages on the central HY and is gently sloping with rust coated boulders down stream from mineralization.

FIGURE 4: HY GROUP - looking east.

HY PROPERTY
Geochemistry - Stream Sediments (cont'd)

Heavy mineral concentrates (the panned -40 mesh fraction of five pound samples) are anomalous in gold at one location (240 ppb) and also in tin in three drainages (up to 120 ppm). Tungsten ranges up to 45 ppm in concentrates but is not strongly anomalous.

SOILS (Plate 2)

On the HY a thin A-horizon (3-5 cm) is commonly underlain by a layer of pale grey volcanic ash (2-3 cm). B-horizon is up to 30 cm thick grading down from a reddish-brown clayey soil with roots to a relatively root-free, pale greenish-yellow clayey soil with angular rock fragments. The C-horizon consists of sandy material with angular rock fragments. Soil sampling was conducted along claim lines at 400 foot spacings (120 metres). The upper B-horizon was sampled where possible. Soil profiles from four locations are summarized in Table 2. The profiles, taken after grid sampling, indicate that nearly all metal values increase with depth at these sites. This suggests a residual as opposed to a transported anomaly. From the results it is also concluded that careful, selective sampling of appropriate

HY PROPERTY
Geochemistry - Soils (cont'd)

soil horizons will yield higher values than those plotted on Plate 2 and may eliminate erratic patterns, defining anomalous areas more closely.

Statistical categories used in Plate 2 were calculated from probability graphs illustrated in Figures 5 and 6[1]. The near linear plots indicate an approximately normal distribution for the data. Separate statistical analyses to differentiate areas underlain by chert from those underlain by shale have not been undertaken.

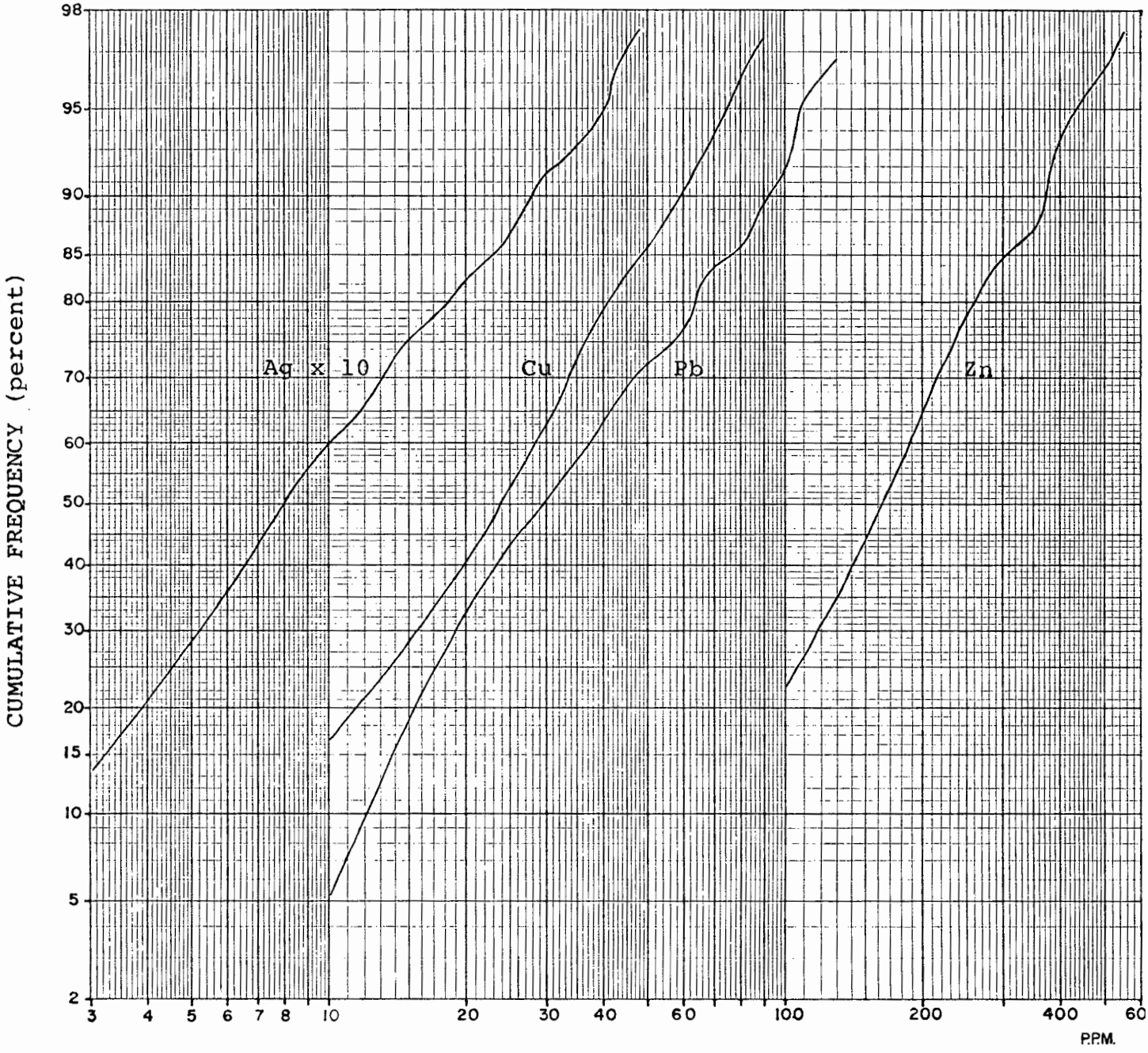
Anomalous values in soils on the HY correlate very strongly with an area that is underlain by chert and in which the majority of the exposed granite porphyry dykes lie. Samples from a section of line 30S were analysed for minor elements (As, Au, Ba, Be, F, Sb, Tl, V refer to Figures 7 and 8). A strong correlation exists between high values in these elements and Cu, Pb, Zn, Ag, Mo, W, Sn: areas underlain by chert are anomalous or have high values in the minor elements. Because only a small section of one line was analysed for minor elements the

---

[1] Mean (M) = Median = 50% cumulative frequency

Standard Deviation (SD) = $\frac{X_{84\%} - X_{16\%}}{2}$

Background:	up to M + 2SD
Above Background:	M + 2SD to M + 3SD
Possibly Anomalous:	M + 3SD to M + 4SD
Anomalous:	M + 4SD to M + 5SD
Strongly Anomalous:	>M + 5SD



CUMULATIVE FREQUENCY DISTRIBUTION

Cu, Pb, Zn, Ag IN SOILS - HY GROUP

	MEAN (ppm)	STANDARD DEVIATION (ppm)
Cu	24	17
Pb	30	26
Zn	164	105
Ag	0.8	0.9

Plotted on Probability Paper, 100% = 228 Samples

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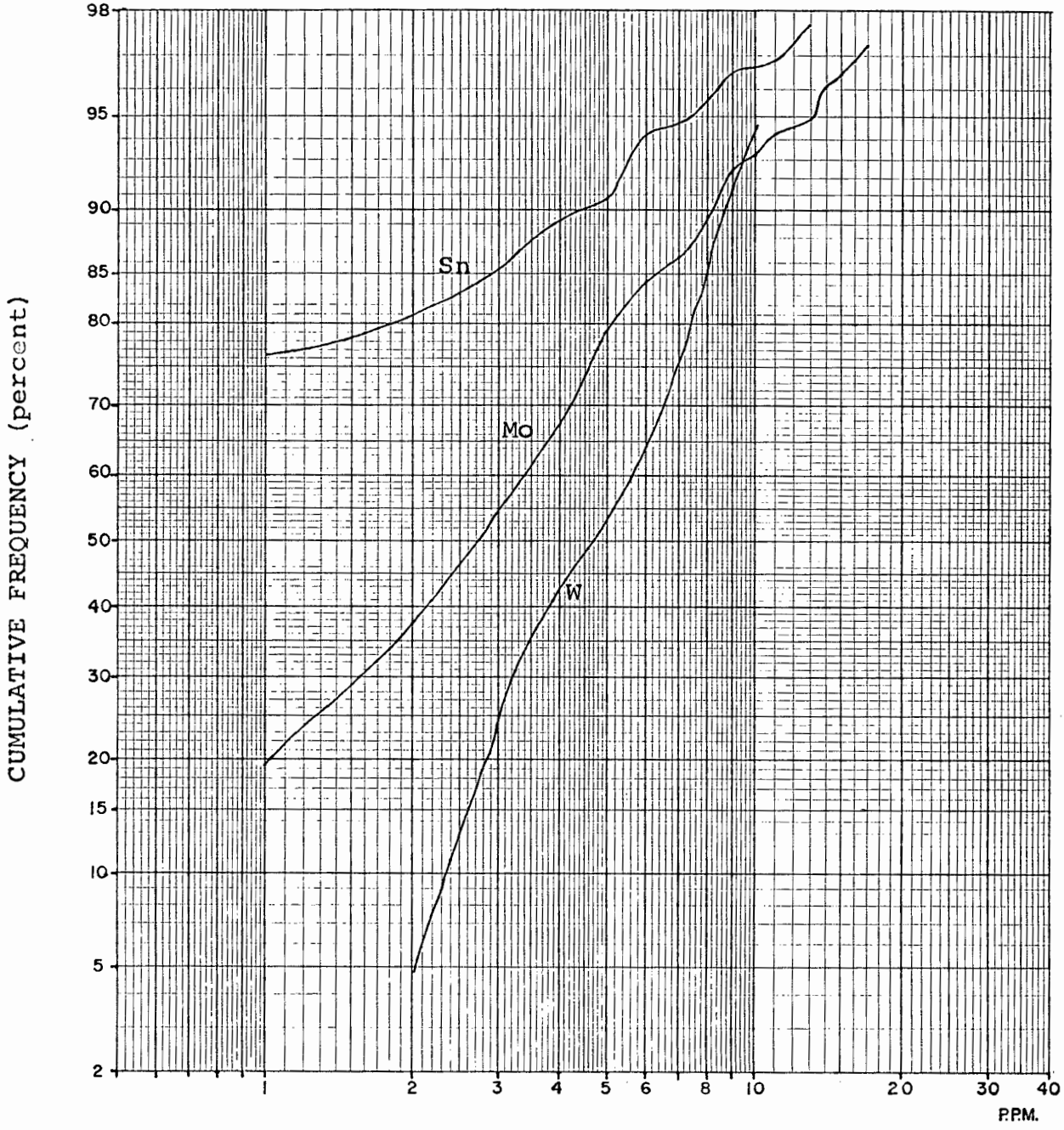
FIGURE 5



CUMULATIVE FREQUENCY DISTRIBUTION

Mo, W, Sn IN SOILS - HY GROUP

	MEAN (ppm)	STANDARD DEVIATION (ppm)
Mo	3	3
W	5	2
Sn	<1	2

Plotted on Probability Paper, 100% = 228 Samples

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FIGURE 6

TABLE 2

SOIL PROFILE RESULTS - HY PROPERTY

(in ppm)

Horizon	Depth (cm)	Mo	W	Sn	Cu	Pb	Zn	Ag	pH
Location: 400' N of 30S, 32W									
Upper B	15	10	3	5	47	116	233	3.5	6.2
Lower B	25	11	3	<1	49	90	273	3.6	6.6
C	35	16	5	14	124	380	368	3.2	6.5
100' N of 30S, 26W									
Upper B	15	6	4	5	27	110	277	2.3	5.4
Lower B	30	11	6	6	60	179	500	3.9	5.9
C	40	14	10	12	81	240	580	2.3	5.8
30S, 20W									
A	3	3	8	5	9	46	65	0.7	N.A.
Upper B	10	6	5	<1	25	75	355	2.0	N.A.
Lower B	20	10	10	2	53	192	490	1.3	N.A.
30S, 24W									
A	3	2	23	1	13	78	87	1.6	N.A.
Upper B	10	7	10	<1	52	190	376	3.8	N.A.
Lower B	20	11	10	6	82	340	520	3.0	N.A.

HY PROPERTY
Geochemistry - Soils (cont'd)

overall relationship of these elements to base metals and Ag, Mo, W, Sn is not known, i.e. a zoning pattern, if it exists,has not been observed in the small section sampled.

Twenty-six orientation soil samples were collected at 200 foot intervals along lines in an H-shaped grid covering 1,800' x 1,600' immediately east of the Quartz Lake massive sulphide showing (i.e. above the deposit). None of these soils are above the background levels of Cu, Pb, Zn, Ag for the HY property (refer to Table 1).

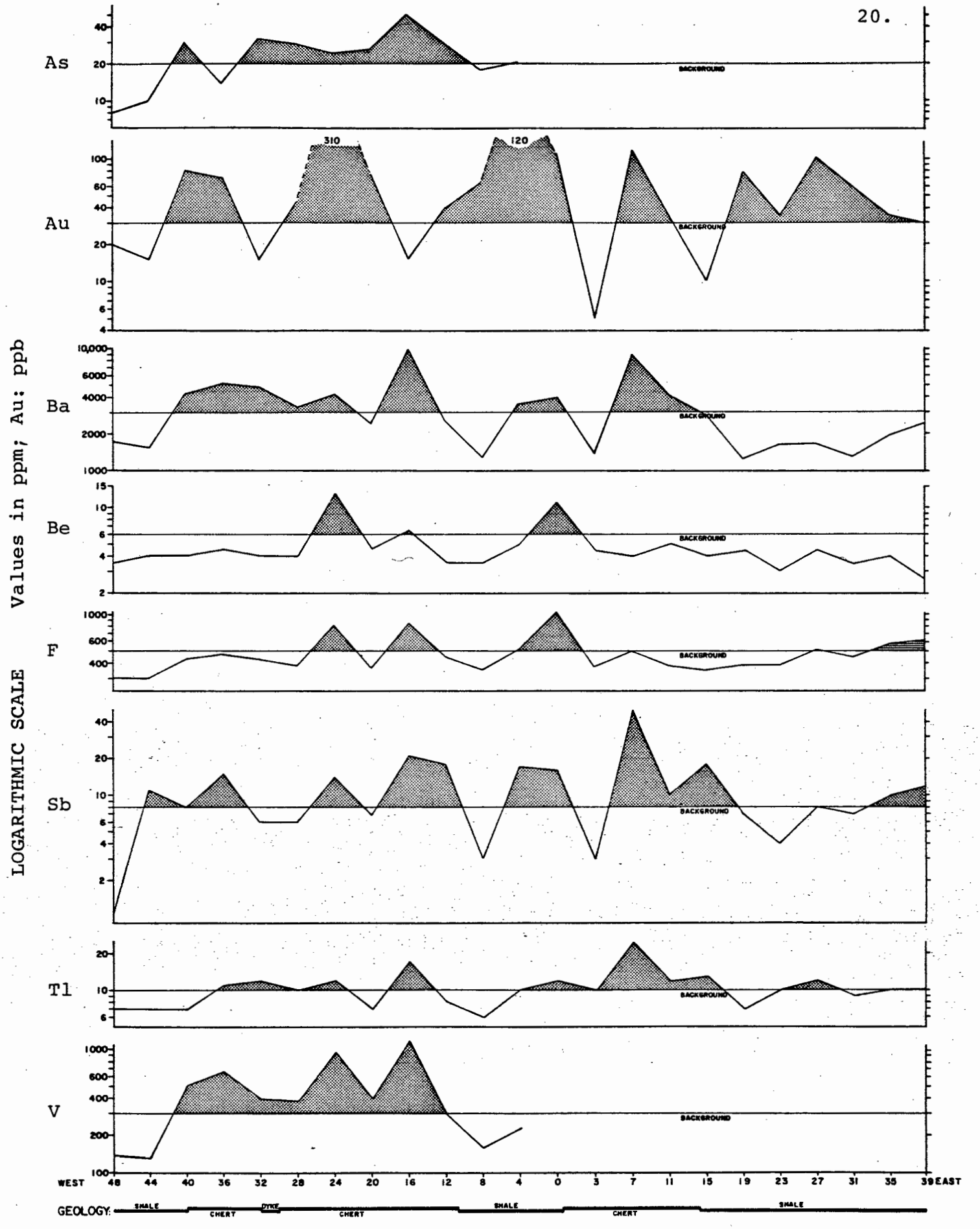
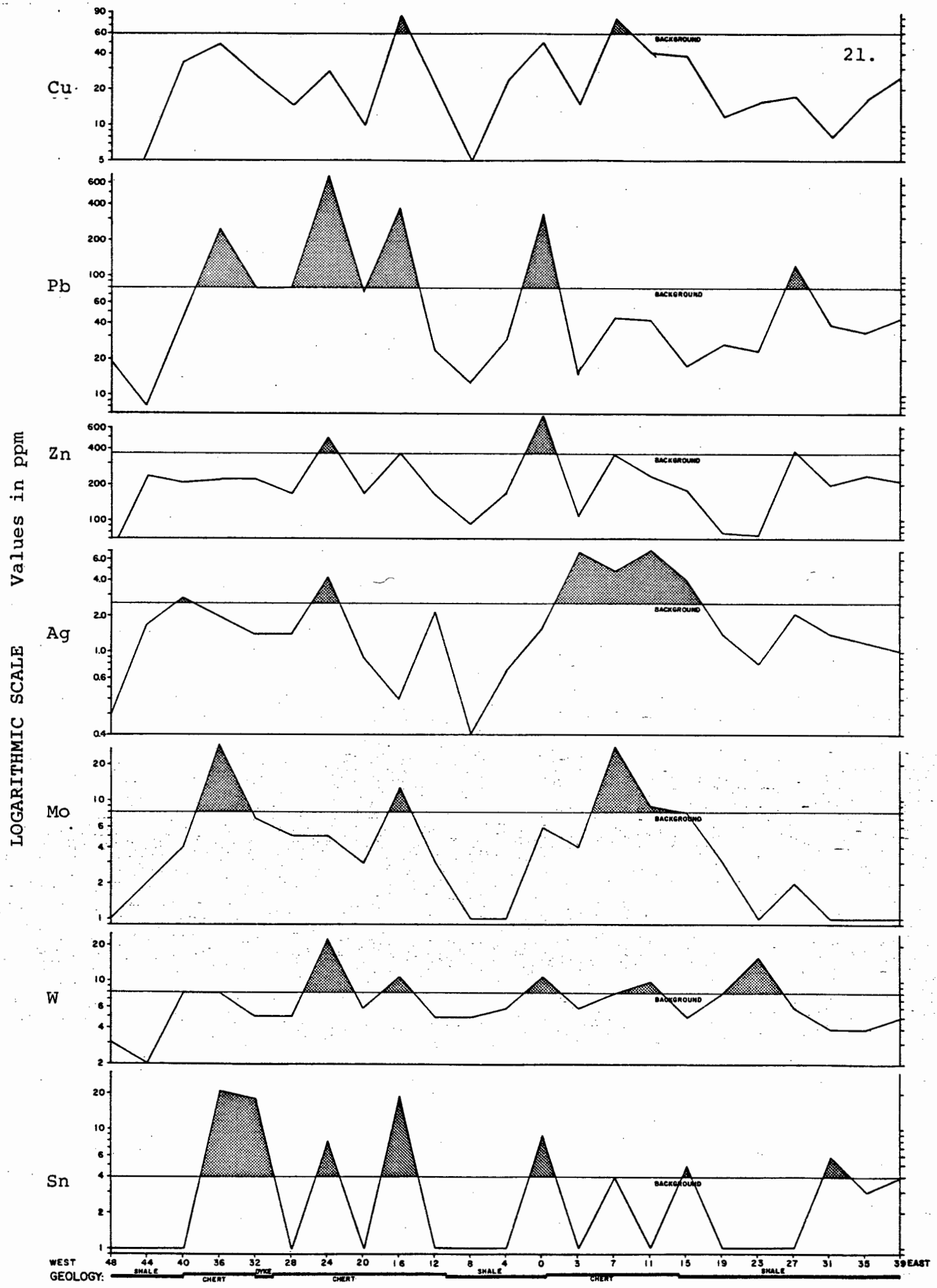


FIGURE 7: Minor element profiles: section of line 30S, HY GROUP.


LOGARITHMIC SCALE Values in ppm
Cu
Pb
Zn
Ag
Mo
W
Sn
BACKGROUND
WEST 48 44 40 36 32 28 24 20 16 12 8 4 0 3 7 11 15 19 23 27 31 35 39 EAST
GEOLOGY:
SHALE
CHERT
DYKE
CHERT
SHALE
CHERT
SHALE

HY PROPERTY (cont'd

GEOLOGY

Because of the limited rock exposures on the HY group only a vague picture of the stratigraphy and structure can be described. Weakly metamorphosed sediments are crudely domed, with cherts occuring central to the dome, i.e. at the base of the section. Phyllitic shales overlie the cherts. Granite porphyry dykes and minor andesitic dykes intrude the sediments. Poor exposure obscures trends in the dyke pattern but a northerly trend is inferred. Overburden is believed to be less than 3 metres (10 feet) in thickness in many ridge areas but thickens rapidly down slopes.

Thin-sections of intrusive rocks were analysed by Mr. Mark Bloom, an associate of Vancouver Petrographics Limited. A petrographic report is appended (Appendix "C").

HY PROPERTY
Geology (cont'd)

LITHOLOGIES

PRECAMBRIAN(?)

Chert (Pec)

Black, thin-bedded (2 to 40 mm) chert occurs at the base of the sedimentary package. Individual chert layers are separated by graphitic and argillaceous partings. At least 20 metres of this sequence is exposed, but the total thickness is not known. Locally, minor tight folds, and in some cases chevron folds, are found in this unit.

Phyllitic Shale (Pes)

Medium to dark grey, locally carbonaceous phyllitic shale overlies the chert in a sequence in excess of 200 metres in thickness. The shales are commonly thin-bedded and laminated. Quartzites, quartzose sandstones and fine-grained pebble conglomerates make up at least 10 percent of the shale sequence. Beds of the coarse clastics vary from seven to sixty centimeters in thickness. Sedimentary structures are rare within these rocks, but cross-bedding occurs in thin sand-bands in the shales. A sequence (approximately 15 metres thick) of thin-bedded, dark grey, finely crystalline limestone occurs in the shale-sandstone package adjacent to the northeast claim boundary. Immediately north of the claim group the sediments grade upwards into a section containing thin-bedded, pale green, tan and maroon shales with interbedded sandstones. East of the property there appears to be a coarsening of the sandstones and conglomerates.

TERTIARY(?)

Tourmaline-Bearing Porphyry Dykes (Ttbp)

Miarolitic and porphyritic micrographic granite with tourmaline-quartz aggregates occurs in the west central part of the property (refer to petrographic report, sample VR-5). Euhedral to subhedral quartz and feldspar phenocrysts occur in a white to pale-grey, fine-grained groundmass. Fine miarolitic cavities (up to 2 mm in diameter) and tourmaline-quartz clusters distinguish these from the other dykes. Contact relations between

HY PROPERTY
Geology - Lithologies (cont'd)

Ttbp and sediments have not been observed because of poor exposure, nor have cross-cutting relationships with other intrusives been seen. Width of these dykes is estimated to be 30 metres.

Quartz-Feldspar Porphyry Dykes (Tqfp)

These dykes (15 to 30 m in width) are pale cream coloured, fine-grained, porphyritic granites (samples 10, 15, VR-21, VR-27). Euhedral to subhedral phenocrysts of quartz and feldspar occur in fine-grained groundmass of quartz and K-feldspar with minor biotite. Alteration within the dykes is weak and at most could be considered incipient propylitization. Locally minor sericite, tourmaline and fluorite suggest a late stage, greissen-type alteration.

Several exposures reveal that Tqfp dykes are highly fractured. Quartz veining is not well developed within these bodies, but veining does appear to increase near the margins and in intensely shattered areas. One small outcrop of brecciated dyke material occurs at 500 feet north of 0N, 12W near the centre of the property. Angular fragments of quartz-feldspar porphyry occur in a vuggy, drusy quartz-feldspar matrix (sample VR-71).

Shales surrounding the dykes are altered to spotted hornfels (sample A). Cherts appear unaltered by dyke emplacement. Presumably because of the cherts' competence, quartz veins and quartz-matrix breccia veins are relatively common in this sequence, particularly around the dykes. Breccia veins (15 cm to 1 m wide) vary from vuggy with angular chert fragments cemented by drusy quartz (distal to dykes) to veins with corroded or ghost-like fragments and abundant gossanous material in a more dense quartz matrix (proximal to dykes). Fluorite occurs in breccia veins at one locality and in quartz vein float. The density of veins around the dykes is difficult to estimate because of poor exposure, but from rubble indications it is conceivable that stockworks are developed in some areas.

Andesite Dykes (Ta)

In two areas narrow (30 - 60 cm) dykes of porphyritic andesite occur beside granite porphyries. Cross-cutting relationships have not been observed; the andesites are assumed to be the younger intrusive phase. The dykes consist of coarse feldspar glomerocrysts set in a fine-grained, greenish-grey groundmass (sample 17).

HY PROPERTY
Geology (cont'd)

STRUCTURE

The metasediments on the HY group are crudely domed with the apex of this structure lying near the center of the property. Minor folds are found within the cherts. Immediately east and north of the property the metasediments are more tightly folded and phyllitic.

Northerly trending faults are inferred to exist on the east and west sides of the property from topographic evidence. These faults parallel and may be related to relatively old features such as the Hyland Valley lineament. Similarly, two northwesterly trending faults are inferred to cross the claim group. Creeks draining the central part of the property appear to have a radial fracture pattern (Figure 12, page 35; Figure 13, page 36).

MINERALIZATION

Galena, sphalerite, and tetrahedrite occur in quartz veins (up to 30 cm in width) at two localities. Chalcopyrite and galena occur on fracture surfaces in chert beside a quartz-feldspar porphyry dyke. This amount of mineralization does not explain the high geochemistry on the HY group nor does it give an indication of the type of sulphide deposit that may occur on this ground.

SUN PROPERTY

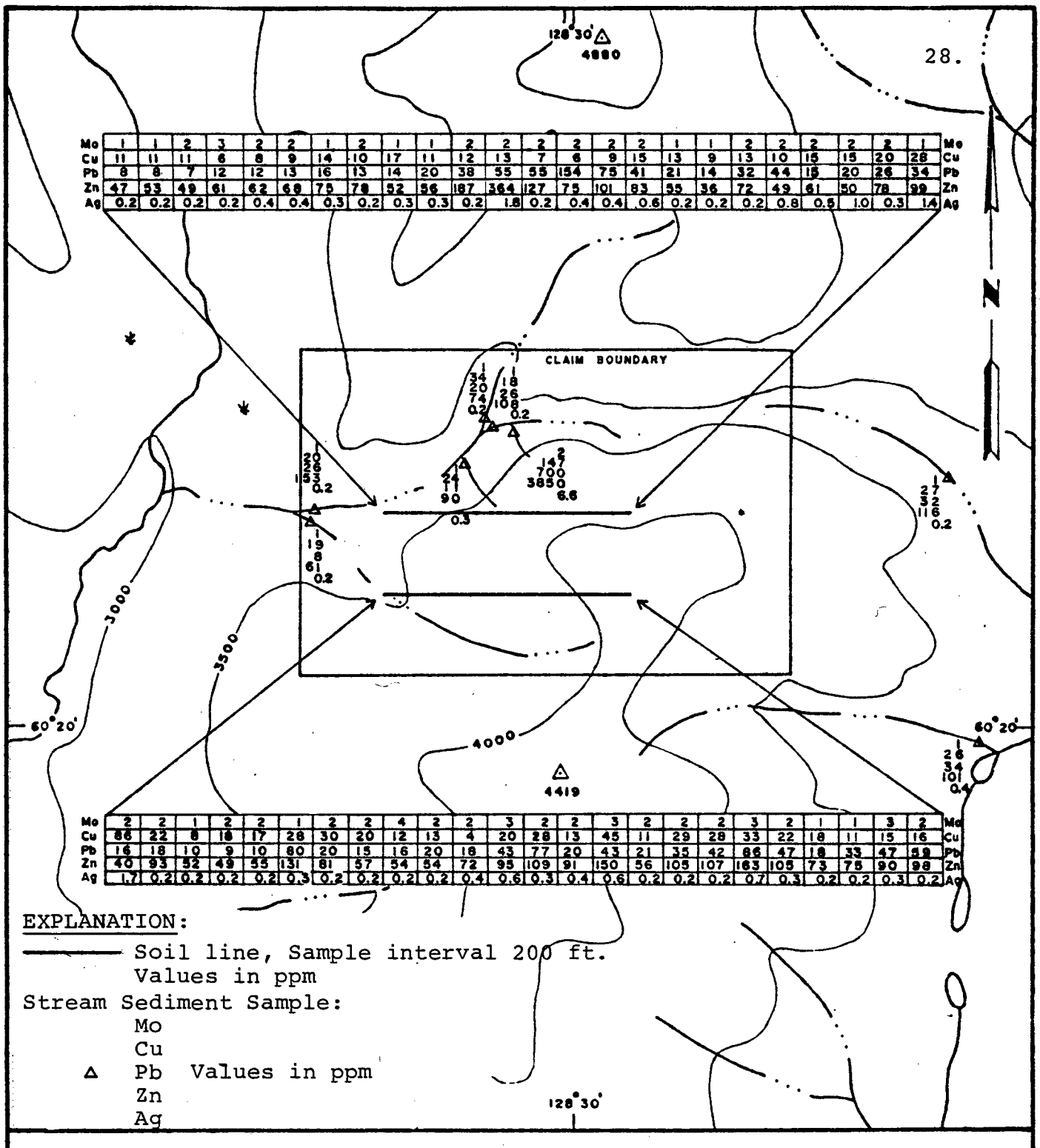
The SUN was staked, on the basis of one very highly anomalous stream sediment sample (Cu: 147 ppm, Pb: 700 ppm, Zn: 3850 ppm, Ag: 6.6 ppm) and the similar stratigraphic setting with the HY and Quartz Lake properties.

GEOCHEMISTRY

STREAM SEDIMENTS (Figure 10)

Follow-up sampling of the anomalous creek on the SUN confirmed initial results and yielded outstanding values up to 274 ppm Cu, 1480 ppm Pb, 5120 ppm Zn and 12 ppm Ag (1/3 oz/ton Ag). A heavy mineral concentrate from this creek is anomalous in gold (130 ppb). The anomalous creek is rust-free and appears to be spring fed, as it stops abruptly in

FIGURE 9: SUN GROUP - looking southeast.



Mo	1	1	2	3	2	2	1	2	1	1	2	2	2	2	2	2	1	1	2	2	2	2	2	1	Mo
Cu	11	11	11	6	8	9	14	10	17	11	12	13	7	6	9	15	13	9	13	10	15	15	20	28	Cu
Pb	8	8	7	12	12	13	16	13	14	20	38	55	55	154	75	41	21	14	32	44	15	20	26	34	Pb
Zn	47	53	49	61	62	69	75	78	52	56	187	364	127	75	101	83	55	36	72	49	61	50	78	99	Zn
Ag	0.2	0.2	0.2	0.2	0.4	0.4	0.3	0.2	0.3	0.3	0.2	1.8	0.2	0.4	0.4	0.6	0.2	0.2	0.2	0.8	0.5	1.0	0.3	1.4	Ag

Mo	2	2	1	2	2	1	2	2	4	2	2	3	2	2	3	2	2	2	3	2	1	1	3	2	Mo
Cu	86	22	8	18	17	28	30	20	12	13	4	20	28	13	45	11	29	28	33	22	18	11	15	16	Cu
Pb	16	18	10	9	10	80	20	15	16	20	18	43	77	20	43	21	35	42	86	47	18	33	47	58	Pb
Zn	40	93	52	49	55	131	81	57	54	54	72	95	109	91	150	56	105	107	163	105	73	75	90	98	Zn
Ag	1.7	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.4	0.6	0.3	0.4	0.6	0.2	0.2	0.2	0.7	0.3	0.2	0.2	0.3	0.2	Ag

EXPLANATION:

——— Soil line, Sample interval 200 ft.
Values in ppm

Stream Sediment Sample:

Mo
Cu
△ Pb Values in ppm
Zn
Ag

STREAM AND SOIL GEOCHEMISTRY

SUN GROUP

SCALE: 1 inch = 1/2 mile

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FIGURE 10

SUN GROUP
Geochemistry - Stream Sediments (cont'd)

the hillside without significantly diminished flow; the total length of this creek is approximately 200 metres.

SOILS (Figure 10)

Results from very limited soil sampling are inconclusive. It is important to note that many values in soils (Cu, Pb, Zn) on the SUN are higher than soil results taken directly above massive sulphide mineralization on the Quartz Lake orientation grid.

SUN GROUP (cont'd)

GEOLOGY

(Figure 11)

The SUN claim group occurs on the western edge of the Precambrian(?) sedimentary belt and lies 5 miles east of the Hyland Valley lineament, a major structural discontinuity. Minor gossanous quartz vein material is the only indication of mineralization that has been located on the SUN to date. Lack of outcrop severely limits any geological interpretations of this property.

LITHOLOGIES

PRECAMBRIAN(?)

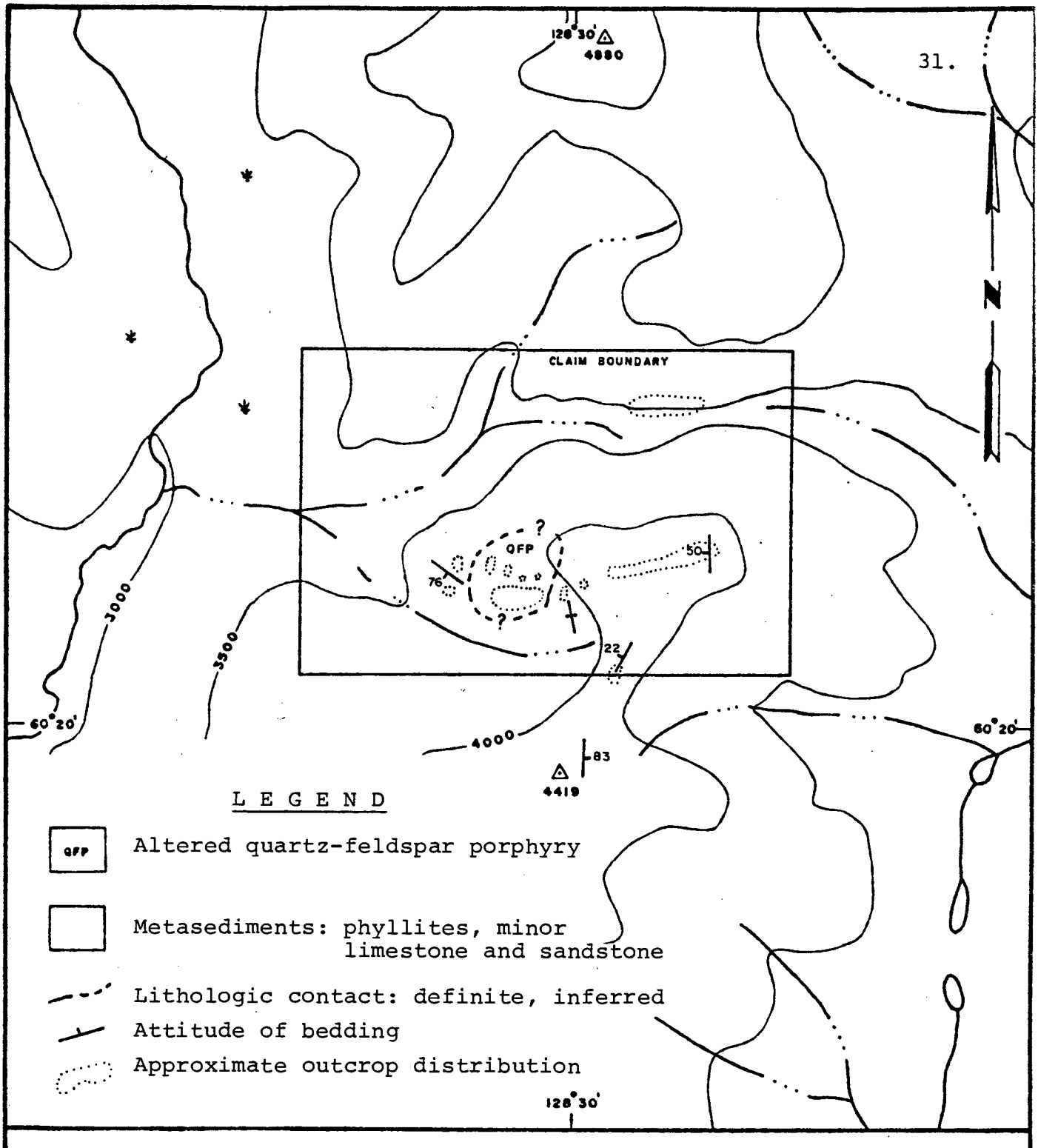
Metasediments

Metasediments on the SUN are similar to those on the HY, but the section appears to lack chert and significant sandstone or quartzites. The shales are more strongly metamorphosed than those on the HY, being well developed, medium to dark grey phyllites.

TERTIARY(?)

Quartz-feldspar porphyry

What appears to be a small stock (exposed over approximately 2,500 sq. m) of quartz-feldspar porphyry intrudes the metasediments. Phenocrysts in the porphyry consist of



GEOLOGICAL PLAN

SUN GROUP

SCALE: 1 inch = 1/2 mile

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January, 1979

FIGURE 11

SUN PROPERTY
Geology - Lithologies (cont'd)

euhedral to subhedral smoky quartz (1-5 mm, 4%) and tabular feldspar (2-10 mm, 4%) in a pale greyish, fine-grained groundmass. Feldspar phenocrysts are intensely altered to clays and in most exposures clays are washed out of the rock leaving only the feldspar moulds. Pale purple fluorite occurs in the porphyry, but is not common. Intrusive breccia occurs on the southeast margin of the stock as a thin envelope varying from one metre to possibly 15 metres in width. The breccia consists of angular to rounded quartz-feldspar porphyry fragments (0.5 to 6 cm in diameter) and shreds of phyllite in quartz-feldspar porphyry matrix. Brecciation may have developed with pulsating intrusion of magma.

AEROMAGNETIC EXPRESSION

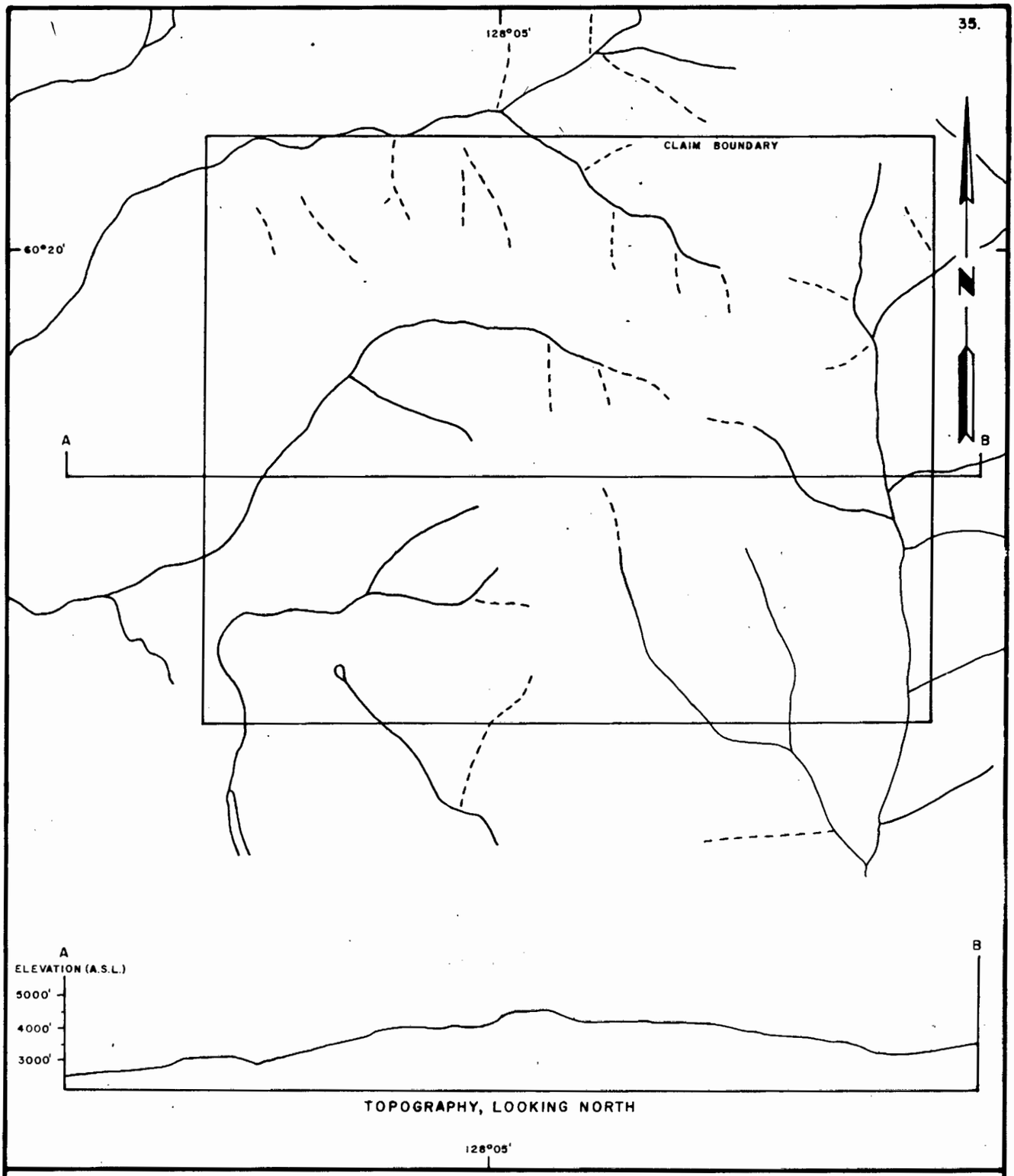
(Figures 14, 15)

Both the HY and SUN are associated with distinct aeromagnetic signatures.

On the HY two northwesterly trending ridges of high magnetism (59,040 and 59,020 gammas - uncorrected) form a pronounced high in the central part of the property. On the west side of the group an arcuate magnetic low (58,850 to 58,800 gammas) borders the high. Smaller magnetic lows occur on the northeast and southeast corners of the property giving the overall distribution of magnetic lows a crudely circular pattern about the area of high magnetic intensity. Structural control of the highs and lows is apparent from the coincidence of these features with topographic breaks.

On the Sun the quartz-feldspar porphyry stock

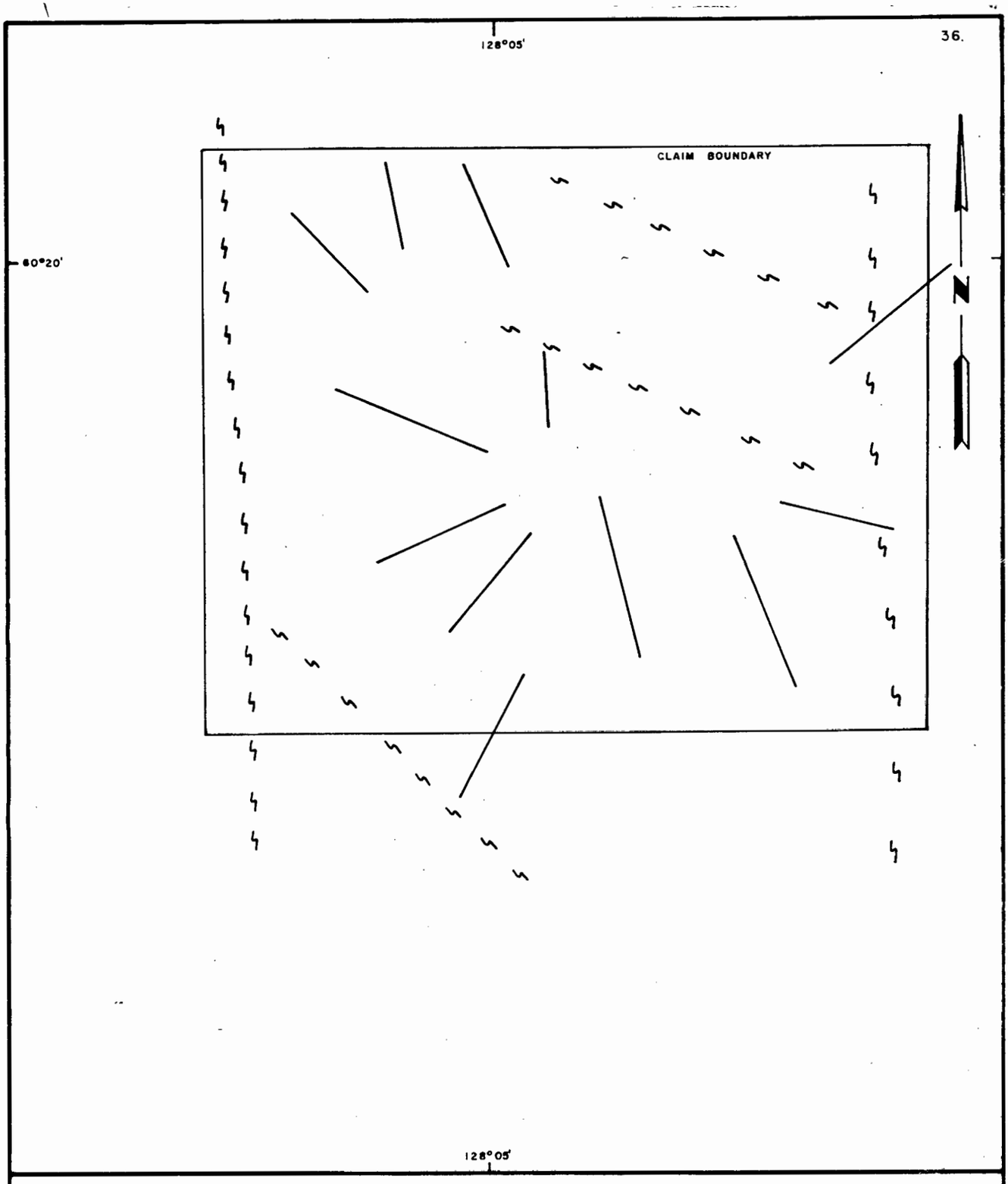
is situated on the flank of a local magnetic high (58,920 gammas) in an area of rapidly changing magnetic intensity (low: 58,400 gammas).



STREAM DRAINAGES – HY GROUP

SCALE 1:50,000

Adapted from Dept. of National Defence maps



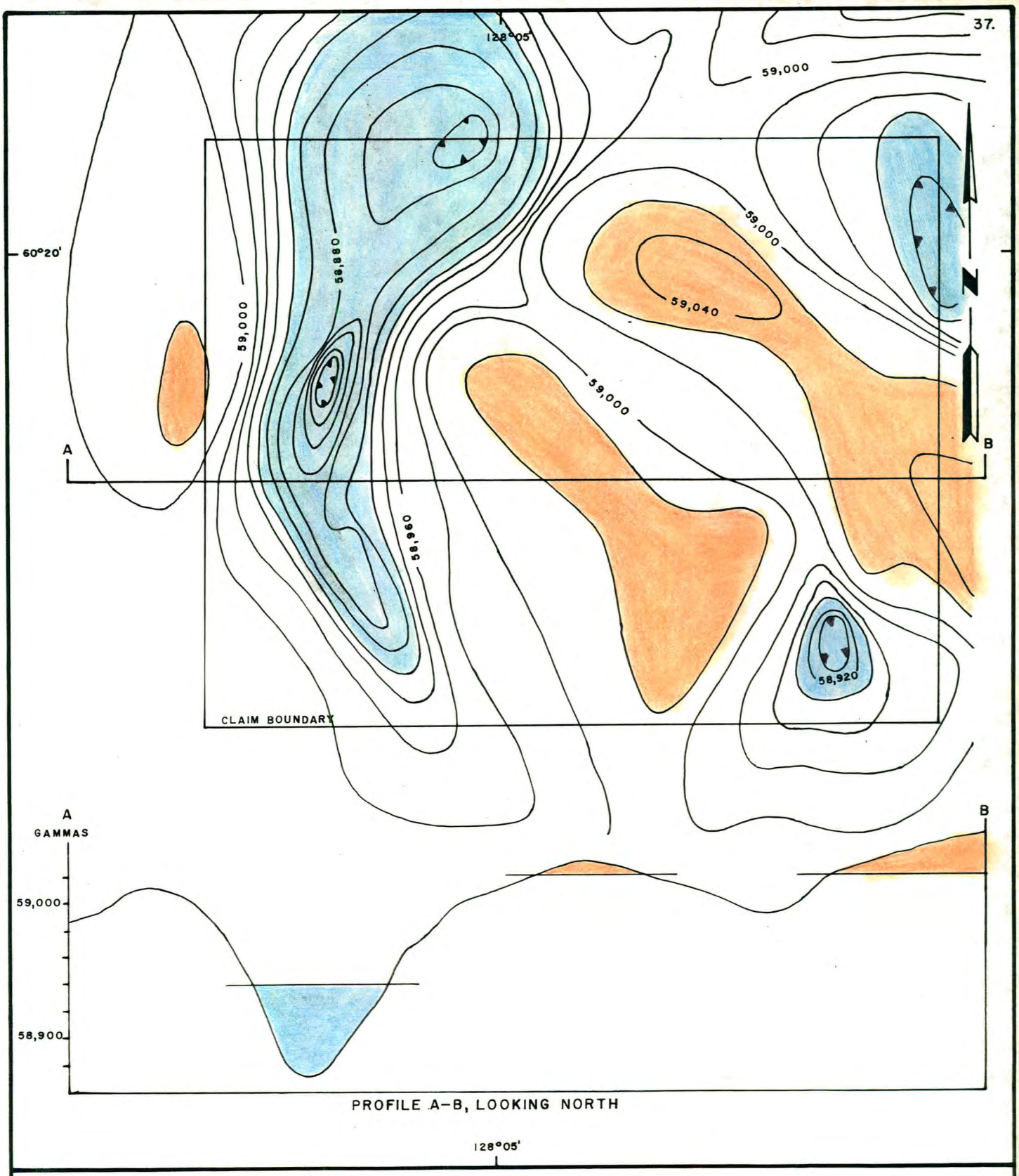
TOPOGRAPHIC LINEAMENTS – HY GROUP

SCALE 1:50,000

Inferred faults

Radial fractures

JANUARY, 1979 CORDILLERAN ENGINEERING FIGURE 13

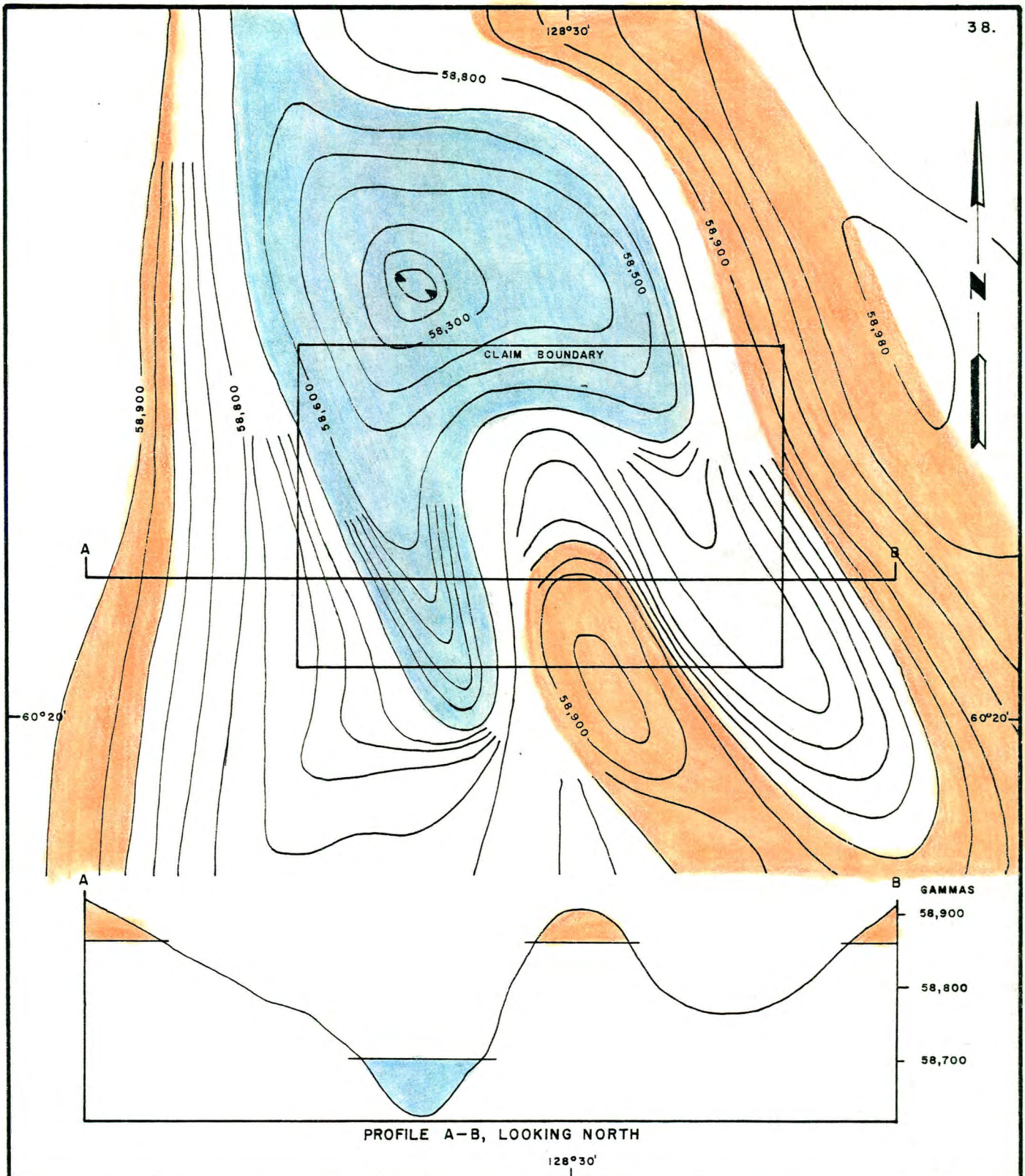


AEROMAGNETIC RESPONSE — HY GROUP

SCALE 1:50,000

Adapted from G.S.C. Aeromagnetic Series Map 1327G

Uncorrected for regional variation



AEROMAGNETIC RESPONSE – SUN GROUP

SCALE 1:50,000

Adapted from G.S.C. Aeromagnetic Series Maps 1326G & 1327G

Uncorrected for regional variation

EVALUATION

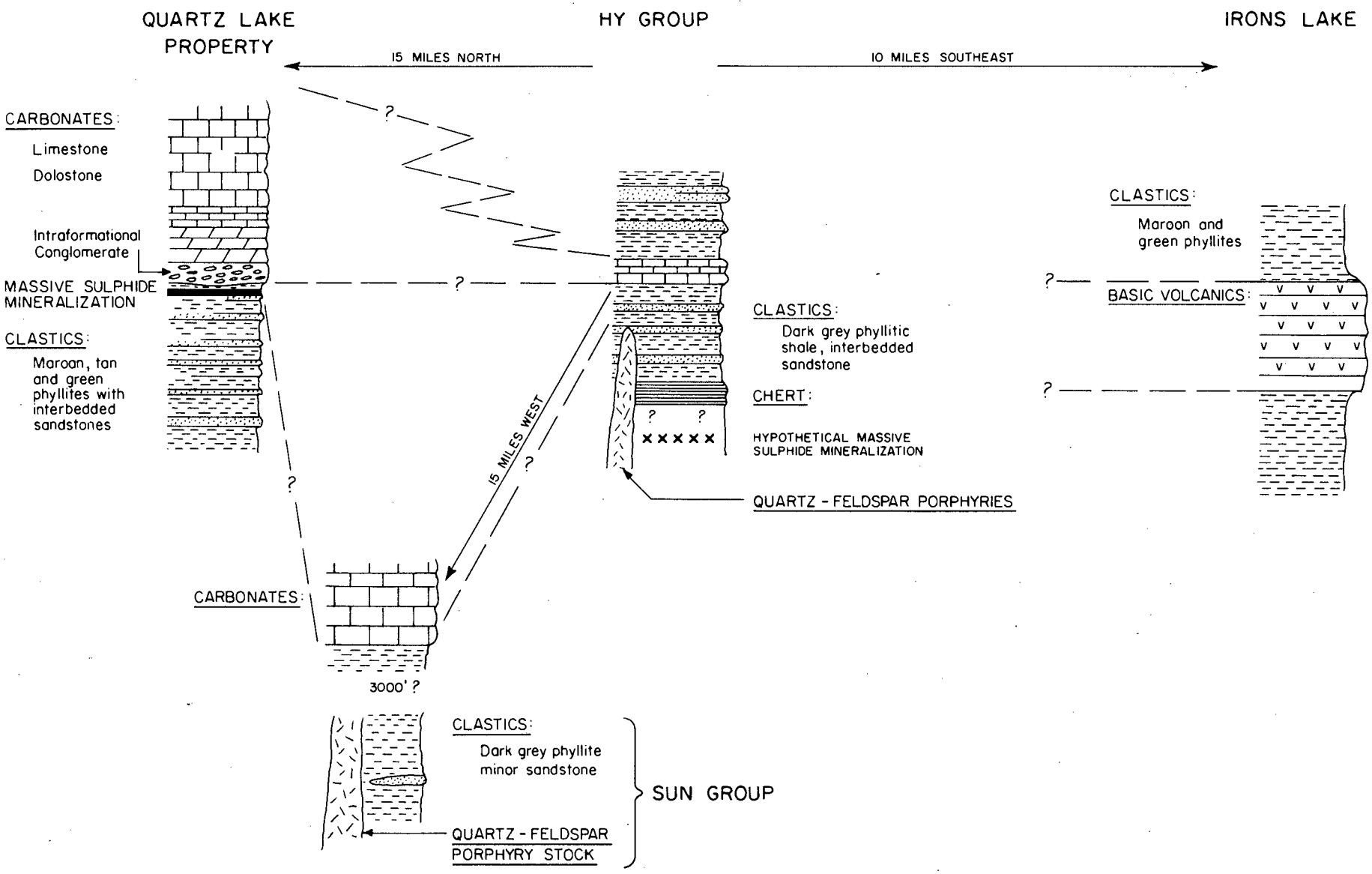
The HY and SUN groups protrude from a low, flat geochemical background as exceptionally strong stream sediment anomalies in Cu, Pb, Zn and Ag. This feature alone indicates that these anomalous areas may reflect sulphide concentrations (Barbier et al., 1978).

Minor sulphide mineralization in quartz veins occurs on the HY and gossanous material associated with vein quartz is found on both properties. Because over 95 percent of each group is overburden covered, the occurrences found to date are not believed to satisfactorily explain the high geochemistry nor do they conclusively indicate the type of sulphide deposit which may occur. The vein mineralization can be interpreted either as leakage from an underlying sulphide body (i.e. remobilized) or as relatively low temperature, hypogene zoning around a sulphide body.

As a guide to evaluating the geochemistry and geology of the HY and SUN, four types of deposits are alternatively suggested as models having similar geochemical expressions to those observed on these properties. A brief discussion of features relevant to these models on the HY and SUN follows.

MASSIVE SULPHIDE (Cu, Pb, Zn, Ag) MODEL:

A known massive sulphide deposit occurs 10 miles north of the HY: the Quartz Lake deposit - a pyrite-rich, Ag, Pb, Zn massive sulphide - is situated in the upper section of iron-rich (oxidized) distal turbidites that are overlain by carbonates. On the HY, sedimentation, while in part turbiditic (shales and interbedded sandstones), appears to be in a quieter more euxinic environment (carbonaceous cherts) possibly lower in the section (Figure 16). Basic volcanics, in a stratigraphic section similar to that at the HY and Quartz Lake, occur 15 miles southeast of the HY at Irons Lake, substantiating the idea that the sedimentary environment is favourable for massive sulphide deposition. Chert which appears to be unique in the section, occuring only at the HY, may represent a (distal) facies of fumarolic exhalative activity, capping potential massive sulphide mineralization. Being a very competent rock under the metamorphic conditions to which the sequence on the HY has been subjected, chert is commonly well fractured. Silica and sulphides, possibly remobilized during metamorphism and with dyke emplacement, have been deposited in these fractures. The widespread nature of the soil anomalies over the chert could reflect leakage of sulphides from an underlaying massive sulphide body. The change in structural style to the east of the property suggests a hinge zone may be on the east side and may mark a transition from basin edge to deep basin facies. The SUN lies in similar rocks



TENTATIVE STRATIGRAPHIC CORRELATION

HY GROUP, SUN GROUP, IRONS LAKE AND QUARTZ LAKE PROPERTY

VERTICAL SCALE : 1 cm. = 200 m.

JANUARY, 1979

FIGURE 16

at a similar stratigraphic position to those at the HY and is a considerable distance below (300 m+) a thick accumulation of carbonates. Intrusives on both properties may have been emplaced along old feeder zones that once served as channel ways for massive sulphide mineralization.

The age of the section in which Quartz Lake, HY and SUN properties lie is in dispute. There is some thought that this sequence is Cambro-Ordovician which would put these properties at a similar time-stratigraphic level as the Cyprus-Anvil deposit. The location of the HY and SUN in the south Selwyn basin is a very favourable setting for massive sulphide deposits.

The geochemical response of the HY is very close to what one would expect for massive sulphide mineralization. The magnitude of Pb, Zn and Ag soil anomalies is similar to that found over the Lady Loretta massive sulphide deposit (R. Cox et al., 1977). Of particular interest is the high barium in soils, which may reflect bedded barite underlying the chert and associated with massive sulphide mineralization.

PORPHYRY Mo(W, Sn) MODEL

Evidence supporting the assertion that the HY and SUN have potential for hosting molybdenum mineralization with co- or by-product tungsten and tin is summarized below. A geological environment similar to that found at the Climax or Henderson deposit is envisaged.

1) Intrusive rocks: granite porphyries favourable for Mo (W, Sn) mineralization occur on each group. Eutectic textures within the intrusives are encouraging (Ganster, 1976).

2) Hydrothermal activity:

   i. Alteration: HY, greissen-type, typical of Mo (W, Sn) deposits and weak to moderate propylitic alteration. SUN, argillic alteration.

   ii. Veining, brecciation and possible silicification on the HY may mimic, on a small scale, large scale pervasive alteration and mineralization patterns associated with a buried intrusive.

3) Structure: a radial fracture pattern, doming of sediments and a dyke swarm occur on the HY, indicating forceful, localized intrusive activity. Major structural breaks occur in the vicinity of each property and possibly served as channelways for ascending intrusives.

4) Geochemistry:

   i. a base metal halo appears to be developed on the HY, indicating metals are associated with this intrusive center.

   ii. association of fluorite and high Mo, W, Sn with the intrusives on both groups.

5) Aeromagnetic expression: on the HY the aeromagnetic response is good evidence, although circumstantial, supporting the notion that a buried intrusive underlies this ground. The magnetic highs may be associated with areas of disseminated magnetite overlying or in the upper part of an intrusive. The lows possibly reflect an alteration halo around an intrusive.

Lack of mineralization indicating economic grades on either property is in part a function of the very limited bedrock exposures and may also reflect the high level of the porphyry systems exposed on each group.

COLLOIDAL GOLD MODEL:

Deposits containing very fine-grained disseminated gold are well documented in Nevada (Joralemon, P., 1978). These deposits, commonly called Colloidal Gold, have grades ranging between 0.05 and 0.10 oz/ton and contain reserves in the 100 million ton range. Arsenic, antimony, barite and fluorite are common in these deposits (Akright et al., 1969; Wells et al., 1969).

Heavy mineral concentrates from creeks draining the HY and SUN are relatively high in gold (HY: 240 ppb equivalent to $1.27/ton at $220/oz Au, soils up to 310 ppb equivalent to $1.64/ton). The values for As, Ba, F, Sb and W in soils on the HY are also relatively high compared to the expected averages for these rock types, suggesting the potential for this type of mineralization. The acid intrusives and quartz veining on both groups are favourable indicators for this type of deposit. Abundant cabronaceous material in the chert sequence on the HY may play an important role in forming concentrations of colloidal gold mineralization (Radtke et al., 1970.

LARGE-TONNAGE, LOW-GRADE SILVER MODEL:

These types of deposits, less well documented (Watson, 1977) than colloidal gold deposits, contain several 10's of millions of tons grading an average 3.0 oz/ton Ag and may have by-product Cu, Pb, Zn or Au. Arsenides and antimony-bearing minerals commonly contain the silver values. Barite and fluorite are frequent accessory minerals.

The very high silver in stream sediments in both the HY (4.3 ppm) and SUN (up to 12 ppm) and high values in the soils on the HY (up to 8.2 ppm equivalent to $0.88/ton at $4.50/oz Ag) suggests there is potential for locating this type of deposit on these

properties. The relatively high levels of As, Ba, F and Sb in soils adds weight to this idea. Acid intrusives are likely sources for mineralizing solutions on each property.

SUMMARY

LOCATION: Watson Lake Mining District, Y.T.

HY: 30 miles northeast of Watson Lake
at latitude 60°20'N, longitude 128°05'W

SUN: 20 miles north of Watson Lake
at latitude 60°20'N, longitude 128°30'W.

PREVIOUS WORK: None, both the HY and SUN are new discoveries.

GEOCHEMISTRY: (in ppm)

	Cu	Pb	Zn	Ag
Regional background, streams	40	26	205	0.8
HY: streams up to	311	260	4200	4.3
soils up to	167	790	1430	8.2
SUN: one stream up to	274	1480	5120	12.0
soils up to	86	154	364	1.8
Quartz Lake orientation:				
streams up to	N.A.	350	740	0.7
soils up to	30	26	197	2.2

On the HY, anomalous streams form a closed area of high geochemistry. Streams are anomalous in gold (up to 240 ppb) and relatively high in Mo, W, Sn. Soils are also relatively high in Mo, W and Sn.

On the SUN, the singularly anomalous creek is high in gold (130 ppb).

GEOLOGY:

HY: lithologies; Precambrian(?) phyllitic shales and cherts are intruded by Tertiary(?) granite porphyry dykes.

SUN: lithologies: Precambrian(?) phyllites are intruded by granite porphyry stock.

AEROMAGNETIC EXPRESSION:

Both properties have distinct aeromagnetic signatures.
The HY, a high flanked by lows.
The SUN, pronounced magnetic gradients.

EVALUATION:

Mineralization or indications of mineralization are insufficient to explain geochemical anomalies nor indicative of potential sulphide deposits speculated to occur on these properties. Mineralization can be interpreted either as epigenetic remobilizate from an underlying sulphide body or as a hypogene zoning system around a sulphide body. Possible models for mineralization are: Massive sulphide deposit (Cu, Pb, Zn, Ag); Porphyry Mo (W, Sn); Colloidal Au, Large-tonnage, low-grade Ag.

RECOMMENDATIONS

To further evaluate the HY and SUN properties a program for the 1979 field season is recommended as follows:

1. GRID PREPARATION

   Accurately cut and flag grids on each property.

2. GEOCHEMISTRY

   Detailed soil sampling of grid to determine metal (Cu, Pb, Zn, Ag, Au, Mo, W, Sn) distribution. Deep penetration of overburden will be required in some areas. Minor elements (As, B, Ba, F, Hg, S, Sb) should be considered in analytical work.

3. GEOPHYSICS

   Ground magnetometer survey to confirm aeromagnetic expressions. Induced polarization and electromagnetic surveys should be considered; graphitic material in the sediments may limit the utility of these techniques.

4. GEOLOGICAL MAPPING

1:5000 scale to accurately determine distribution, structure and alteration of lithologies.

Regional scale mapping (1:25,000) to the north and east of the HY as well as in the immediate vicinity of the SUN should be conducted in order to outline facies changes within the sedimentary package.

5. TRENCHING

In order to explain soil anomalies trenching to and of bedrock will be necessary.

Contingent upon the success of this work diamond drilling (1980 field season) would be required.

Respectfully submitted

CORDILLERAN ENGINEERING

Carl G. Verley

Carl G. Verley, B.Sc.
Geologist

CGV/z

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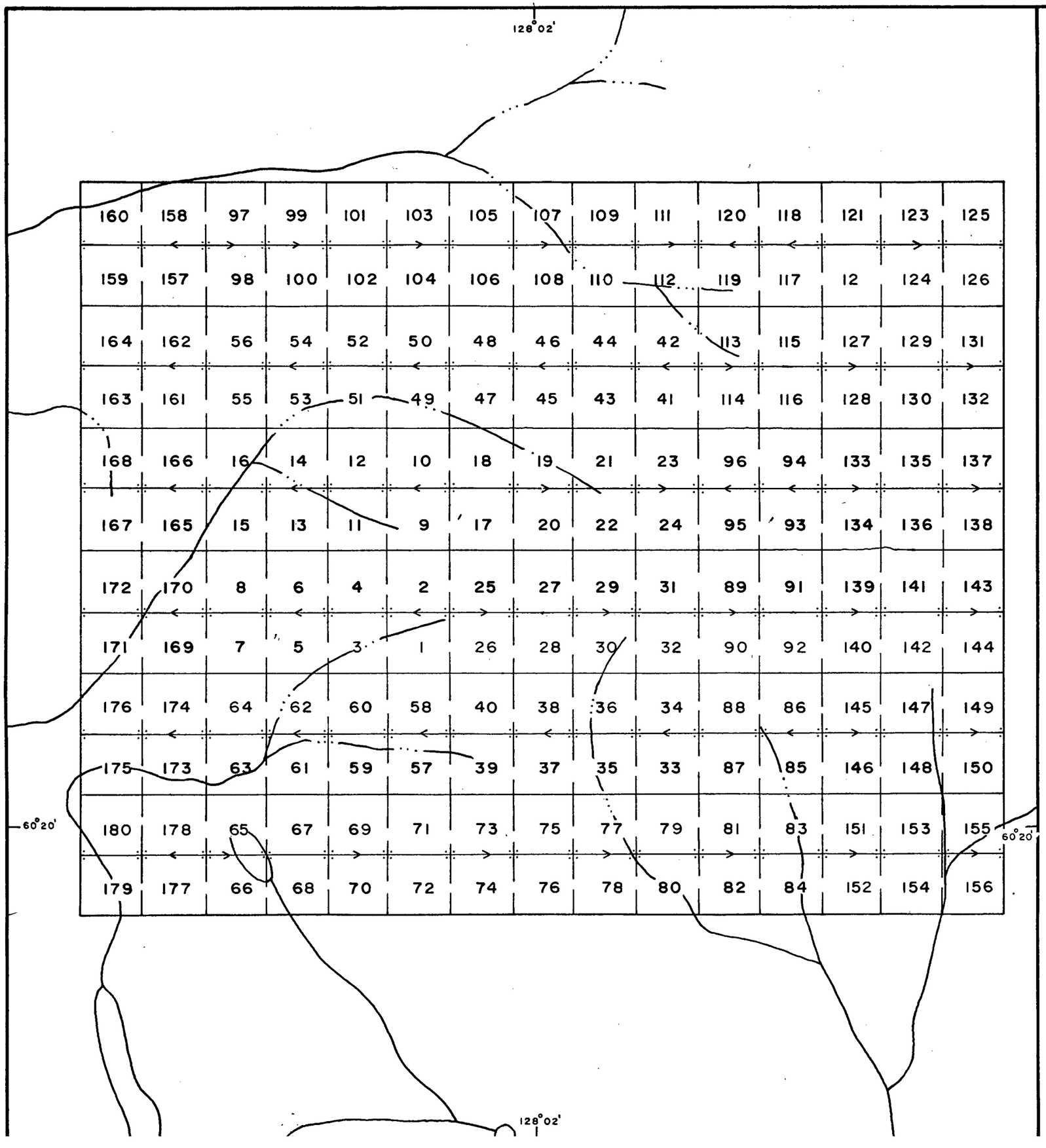
APPENDIX "A"

C L A I M M A P S

FIGURE 17: HY GROUP

FIGURE 18: SUN GROUP

APPENDIX "A"



	GRANT NO.	EXPIRY DATE
HY 1-120	YA34614-YA34733	Aug. 4, 1979
HY 121-180	YA34778-YA34837	Aug. 11, 1979

CLAIM MAP

HY GROUP

WATSON LAKE MINING DISTRICT, Y.T.

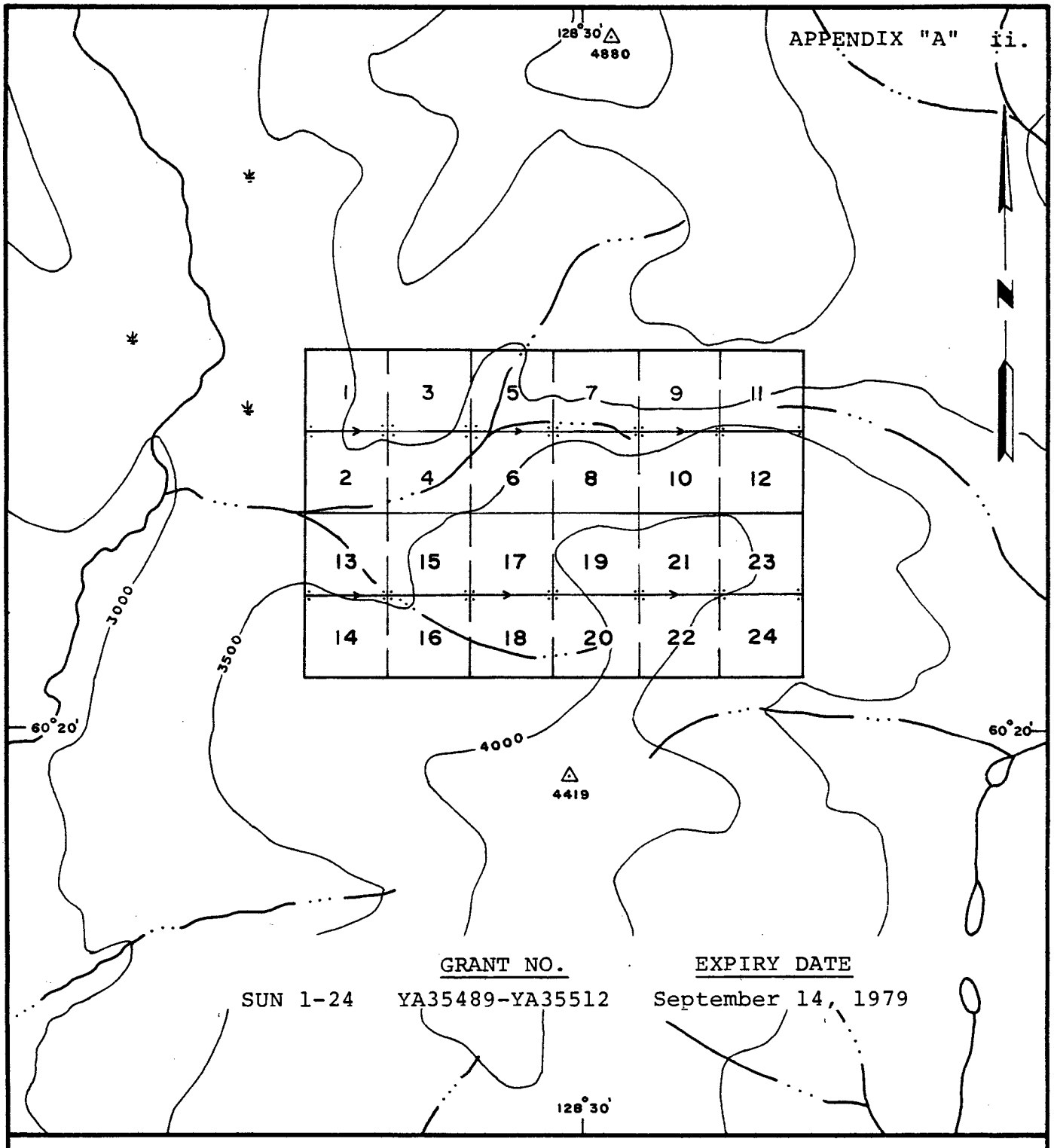
N.T.S. 105-A-7 & 8

SCALE: 1 inch = 1/2 mile

CORDILLERAN ENGINEERING

January, 1979

FIGURE 17



CLAIM MAP

SUN GROUP

WATSON LAKE MINING DISTRICT, YUKON TERRITORY
N.T.S. 105-A-7 & 8

SCALE: 1 inch = 1/2 mile

CONTOUR INTERVAL = 500 feet

CORDILLERAN ENGINEERING

January, 1979

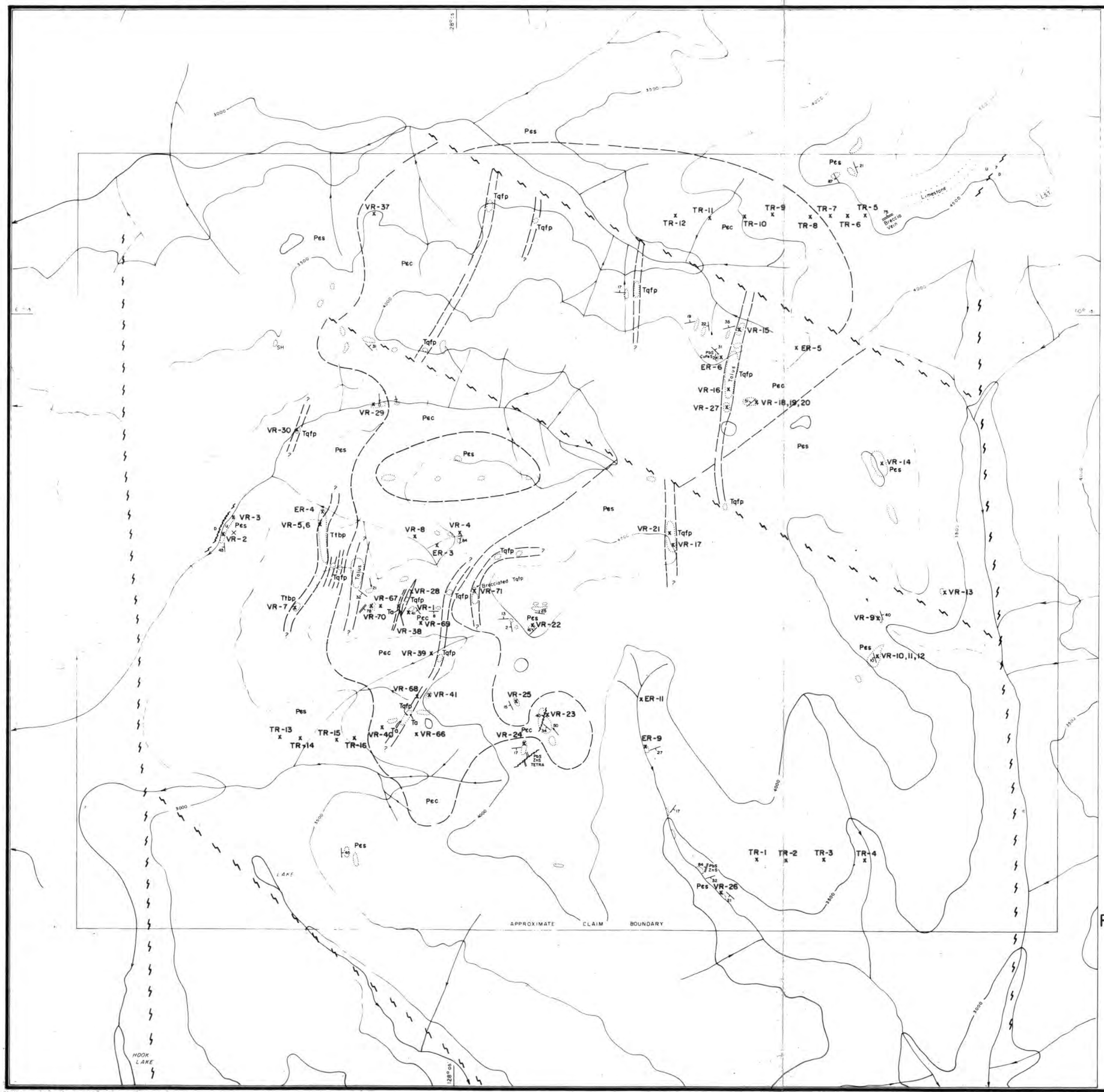
FIGURE 18

APPENDIX "B"

ROCK CHIP GEOCHEMISTRY

FIGURE 19: Rock-Chip Sample Location Map
HY Claim Group

TABLE 3: Rock Chip Geochemistry
HY and SUN Groups



LEGEND

TERTIARY (?)

To — ANDESITE DYKES

GREENISH-GREY, FINE-GRAINED ANDESITE WITH COARSE GLOMEROCRYSTS OF PLAGIOCLASE. DYKES ARE 30–60 cm WIDE AND OCCUR IN CONTACT WITH QUARTZ-FELDSPAR PORPHYRIES. CROSS-CUTTING RELATIONSHIPS HAVE NOT BEEN OBSERVED

Tqfp — QUARTZ - FELDSPAR PORPHYRY DYKES

PALE CREAM COLOURED, FINE-GRAINED PORPHYRITIC GRANITE EUHEDRAL TO SUBHEDRAL PHENOCRYSTS OF QUARTZ, K-FELDSPAR AND PLAGIOCLASE OCCUR IN A FINE-GRAINED GROUNDMASS OF INTERLOCKING QUARTZ AND K-FELDSPAR. THESE DYKES ARE IN THE ORDER OF 15 TO 30 METRES WIDE. ALTERATION CONSISTS OF AN INCIPIENT OR WEAK PROPYLLITIC ASSEMBLAGE. SOME OF THE DYKES ARE HIGHLY SHATTERED. QUARTZ VEINING AND QUARTZ BRECCIA VEINS ARE FOUND IN THE METASEDIMENTS SURROUNDING THE DYKES. QUARTZ VEINS WITHIN DYKES APPEAR RESTRICTED TO THE MARGINS

Ttbp — TOURMALINE - BEARING PORPHYRY DYKES

WHITE TO PALE GREY, FINE GRAINED, MIAROLITIC AND PORPHYRITIC MICROGRAPHIC GRANITE. CORRODED QUARTZ, K-FELDSPAR AND PLAGIOCLASE PHENOCRYSTS OCCUR IN A GROUNDMASS OF THE SAME AGGREGATES (UP TO 1 cm ø) OF QUARTZ AND TOURMALINE OCCUR THROUGHOUT THIS ROCK. TOURMALINE AND SERICITE SUGGESTS INCIPIENT TO WEAK GREISSEN - TYPE ALTERATION.

PRECAMBRIAN (?)

Pes — PHYLLITIC SHALE

THIN - BEDDED, DARK GREY TO BLACK, LOCALLY CARBONACEOUS PHYLLITIC SHALE, QUARTZITES, SANDSTONES, AND PEBBLE CONGLOMERATES COMPRISE APPROXIMATELY 10 PERCENT OF THIS PACKAGE. CONTAINS MINOR LIMESTONE

Pec — CHERT

THIN - BEDDED, BLACK CHERT. INDIVIDUAL CHERT LAYERS ARE SEPERATED BY CARBONACEOUS AND ARGILLACEOUS PARTINGS.

- OUTCROP
- INFERRED LITHOLOGIC CONTACT
- STRIKE AND DIP OF BEDDING
- QUARTZ VEIN ATTITUDE
- VEIN OR FRACTURE MINERALIZATION — PbS GALENA, ZnS SPHALERITE, CuFeS2 CHALCOPYRITE, TETRA TETRAHEDRITE
- TREND AND PLUNGE OF MINOR FOLDS
- FAULT : DEFINITE
- INFERRED FAULTS

x ER-6 ROCK CHIP SAMPLE SITE

NOTE:

TOPOGRAPHY ADAPTED FROM DEPARTMENT OF NATIONAL DEFENCE 1:50,000 MAPS FOR 105-A-8.

CONTOUR INTERVAL : 500 FEET

MAGNETIC DECLINATION 31° EAST

RENDER RESOURCES LTD.

HY CLAIM GROUP

ROCK - CHIP SAMPLE LOCATION MAP

WATSON LAKE MINING DISTRICT, YUKON TERRITORY

WATSON LAKE MAP AREA (105A/8)

SCALE

500 0 500 1000 1500 2000 2500 3000 FEET

100 0 500 1000 METRES

BY

CORDILLERAN ENGINEERING

1418 - 355 BURRARD STREET

VANCOUVER, B.C. V6C 2G8

JANUARY, 1979

FIGURE 19

TABLE 3

ROCK CHIP GEOCHEMISTRY

HY GROUP

Sample	Cu	Pb	Zn	Ag	Mo	W	Sn	Remarks
ER-3		8	1470	0.3				Pes
ER-4					1	10	8	Ttbp
ER-5	198	84	101	1.1				Pes
ER-6	120	28	64	1.4				Pes (float)
ER-9	39	35	470	0.9				Pes
ER-11	15	27	28	0.2				Pes
TR-1	53	11	127	0.2				Pes (float)
TR-2	61	16	16	0.2				Pes (float)
TR-3	10	7	10	0.2				Pes (float)
TR-4	36	16	56	0.2				Pes (float)
TR-5	36	14	52	0.2				Pes (float)
TR-6	24	26	159	0.2				Pes (float)
TR-7	27	12	85	0.2				Pes (float)
TR-8	25	57	42	0.2				Pes
TR-9	26	13	129	0.2				Pes (float)
TR-10	58	25	91	0.6				Pes (float)
TR-11	20	9	105	0.5				Pes (float)
TR-12	82	90	233	0.2				Pes (float)
TR-13	23	17	54	0.4				Pes (float)
TR-14	13	17	113	0.2				Pes (float)
TR-15	25	16	53	0.2				Pes (float)
TR-16	13	46	39	0.2				Pes (float)
VR-1	89	19	201	2.0				Pes
VR-2	41	17	240	0.2				Pes
VR-3	61	20	630	0.2				Pes
VR-4	53	16	212	0.4				Pes
VR-5	5				2	3	14	Ttbp
VR-6	5				6	4	9	Ttbp
VR-7	15				1	4	10	Ttbp
VR-8	17				2	3	5	Tqfp (float)
VR-9	46	36	61	0.3				Pes
VR-10	32	35	49	0.2				Pes
VR-11	19	12	78	0.2				Pes
VR-12	342	350	550	0.2				Gossanous qtz vein
VR-13	40	40	35	0.3				Pes
VR-14	40	26	110	0.2				Pes
VR-15	7				1	4	14	Tqfp
VR-16	14				3	4	9	Tqfp
VR-17	20	26	33	0.3				Pes (float)

TABLE 3 - ROCK CHIP GEOCHEMISTRY (cont'd)

HY Group (cont'd)

Sample	Cu	Pb	Zn	Ag	Mo	W	Sn	Remarks
VR-18	17	17	9	1.0				Pes
VR-19	26	8	22	0.7				Pes
VR-20	39	21	110	0.2				Pes
VR-21	12				1	3	14	Tqfp
VR-22	54	11	114	0.2				Pes
VR-23	34	820	257	0.2				Pes
VR-24	103	12	2610	0.3				Pes
VR-25	111	11	80	0.9				Pes
VR-26	40	8	97	0.3				Pes
VR-27	17	300	313	1.0	2	10	37	Tqfp (talus)
VR-28	41				2	15	4	Tqfp
VR-29	78	12	640	0.4				Pes
VR-30	7				2	2	21	Tqfp
VR-37					<1	5	15	Tqfp
VR-38					<1	6	10	Tqfp
VR-39	31	470	150	1.2	2	75	80	Breccia vein
VR-40	341	1300	206	1.4	15	3	35	Breccia vein
VR-41	830	6900	228	40.0	270	5	16	Breccia vein with CaF_2
VR-66	32	66	67	0.5	12	2	6	Breccia vein
VR-67	17	840	500	0.4	95	5	<1	Breccia vein
VR-68	21	38	41	0.4	4	15	6	Tqfp
VR-69	22	22	118	0.2	5	2	<1	Pes
VR-70	26	740	115	0.3	20	40	4	Breccia vein
VR-71	14	122	202	0.4	21	2	<1	Tqfp-hydrothermal breccia

SUN GROUP

VR-72	38	38	31	0.3	7			Gossanous qtz vein
VR-73					6	15	2	Altered qtz-feldspar porphyry
VR-74					7	3	28	Intrusion breccia
VR-75					3	6	25	Intrusion breccia
VR-76					2	16	80	Hematitic, brecciated phyllite
VR-77					2	15	22	Quartz-feldspar porphyr

APPENDIX "C"

P E T R O G R A P H I C R E P O R T

By

Mark S. Bloom

Vancouver Petrographics Ltd.

APPENDIX "C"

Vancouver Petrographics Ltd.

JAMES VINNELL, Manager
JOHN G. PAYNE, Ph. D. Geologist

P.O. BOX 39
8887 NASH STREET
FORT LANGLEY, B.C.
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PHONE (604) 533-1155

Mr. Carl Verley, Geologist
Cordilleran Engineering
Marine Building
355 Burrard Street
Vancouver, B.C.

Dear Mr. Verley:

Enclosed are eight petrographic descriptions for rock samples of the Render project. The following classifications are suggested:

A	spotted hornfels, formerly a mudstone
B	hornfels, formerly a siltstone or mudstone
10	granite porphyry
15	granite porphyry
17	pyroxene-biotite andesite
VR-5	micrographic potash granite
VR-21	micrographic potash granite
VR-27	graphic potash granite

The thin sections, prepared reject slices, and remnant rock samples follow under separate cover. Please direct any enquiries regarding these descriptions to Mark Bloom c/o Vancouver Petrographics.

The alteration assemblages and textures in the metasediments A and B suggest infiltration by hydrothermal fluids. Sericite, clinozoisite, and carbonate are typical of the wallrock alteration and imply an alteration style similar to propylitic assemblages in porphyry-type environments. These minerals are present along the paths of least resistance to the penetrating fluids, but are only weak to moderate in intensity, suggesting low volumes of fluid. The vein assemblage in A suggests remobilization and introduction of components at temperatures higher than the general wallrock alteration and perhaps related to magmatic processes.

The texture and mineralogy of the dyke rocks are similar to those associated with stockwork molybdenum deposits. Particularly interesting are the graphic textures of VR-5, -21, and -27 which have been shown to be related in time and space to molybdenite mineralization (Ganster, 1976). The hydrothermal alteration is of incipient/weak to moderate intensity. The sericite is often associated with clinozoisite; the assemblage and intensity are not typical within economic deposits, but suggest a mineralization potential deeper within the system. The VR series of samples show evidence of greissen-type alterationin the presence of tourmaline. Alteration of this type is nearly always spacially associated with economic molybdenum mineralization and further suggests potential in this system, particularly if quartz-fluorite veining is also present.

Thank you for using our services.

Very truly yours,

Mark S. Bloom

Sample Number: A

Mineralogy (%):

vein filling (±10% of total)	
K-feldspar	72
scapolite	8
clinozoisite	12
plagioclase	2
chlorite	6
sediment/meta sediment	84
sericite	2
clinozoisite	4

Texture: Exceedingly fine-grained non-foliated original fabric, possibly a mudstone or siltstone. No textural evidence remains of original bedding surfaces. The original rock has been recrystallized to a mosaic of equidimensional, unoriented grains, and the texture is generally hornfelsic (granoblastic). The constituents of this fabric are generally too fine-grained for identification; however, quartz and randomly-oriented shreds of sericite are visible, and the presence of clays and feldspars is suggested. Wisps of light gray-coloured material transverse the prepared slice in a subparallel fashion (possibly defining former bedding surfaces). Darker gray-coloured spots, slightly elongated in the direction of these wisps, pepper the fabric. These spots consist of granular aggregates of clinozoisite in thin section. The rock might now be classified as a spotted hornfels. Cutting the rock are irregular veins which are in subparallel arrangement with the proposed bedding surfaces and are filled with various combinations of the phases listed above. Many of these minerals are crowded with minute fluid inclusions, strongly implying a hydrothermal original for the veins. The mineral descriptions which follow correspond to these vein minerals.

K-feldspar: The most predominant vein constituent, it occurs in subhedral to anhedral aggregates. It is generally not perthitic, although some larger grains show minor perthitic texture. A combination of adularia and orthoclase is suggested. A profusion of solid and fluid inclusions give the appearance of alteration clouding; however, the K-feldspar is quite fresh.

Plagioclase: Subhedral laths of plagioclase are scattered throughout the veins. They are generally somewhat larger than the K-feldspar and give the impression of having formed earlier. Faint albite and carlsbad twinning is visible in the plagioclase; however, it was not possible to estimate the plagioclase composition.

Scapolite: Idioblastic grains of scapolite are scattered throughout the veins. There is no tendency to occur either as selvedges along the vein walls, or along the center lines. In some instances, the scapolite appears to have grown into open spaces. Very fine compositional zoning is present in the scapolite, as evidenced by the extinction behaviour.

Clinozoisite: Characterized by higher relief, absence of pleochroism, and distinctive anomalous interference colours. Occurs as single idioblastic grains and aggregates of columnar laths. Possibly

one of the earlier minerals to form in the veins, as evidenced by a strong association with the vein walls. Clinozoisite is a constituent in most if not all of the veins, whereas scapolite appears restricted to the veins of larger aperture.

Chlorite: Faintly pleochroic green chlorite is a late mineral to form in the veins, possibly as alteration of the original constituents. It is often present along the center lines of the veins, or it may occur in random patches anywhere within the veins. In some instances it may be a late interstitial filling.

Sample Number: B

Mineralogy (%):		
	quartzo-feldspathic meta sediment	70
	quartz (alteration)	1
	sericite (muscovite)	10
	carbonate	15
	epidote	4

Texture: Very fine-grained, foliated (bedded?). Approximately three-fourths of the thin section consists of the original sediment (meta sediment?). The primary constituents appear to be quartz and clays; the fine-grained nature of the rock, however, prevents examination and identification of the individual grains and textures. The original constituents are aligned in a parallel fashion and folded into crenulations which are easily observed in hand specimen. These crenulations may either be original irregularities in bedding, or compaction due to metamorphic processes. The absence of uniquely metamorphic minerals and textures suggests the former interpretation. Quartz is the single most abundant mineral in the rock. It is elongated parallel to the foliation and shows evidence of at least partial recrystallization (i.e., absence of individual grains with sedimentary textures). Undulatory extinction has developed. Other minerals could not be identified, but it is suggested that clays and feldspar may also be present. The rock mineralogy coincides with siltstone, although the quartz recrystallization suggests very low grade metamorphism. For reasons discussed below, the coarser-grained minerals present are presumed related to the dyke emplacement.

Muscovite: Shreds of muscovite (sericite) are aligned in a subparallel fashion following the foliation. Individual grains are disseminated throughout the fabric, but the muscovite is generally concentrated in aggregates along the foliation. These aggregates follow the crenulations; however, the individual flakes are not bent at the crests of the crenulations, suggesting crystallization after formation of these structures. This implies fluid flow along planes of weakness defined by the foliation.

Carbonate: Turbid mosaics of carbonate are also visible arranged parallel to the foliation/crenulations. It is exceedingly fine-grained, such that individual grain are rarely visible. The carbonate occurs randomly throughout the fabric, but is most concentrated in the same areas as the muscovite. No true replacement textures, however, were visible.

Quartz: Anhedral interstitial grains of quartz are intimately associated with the sericite. This variety of quartz is clearly the product of introduced fluids and is not an original constituent of the rock. The quartz has developed weak indulatory extinction.

Epidote: Individual xenoblastic grains and granular aggregates of green pleochroic epidote are associated with the zones of quartz-sericite and are rarely found isolated in the original fabric. The outlines of the epidote grains are quite irregular; there is no suggestion

epidote replaces sericite. An association with quartz appears more ubiquitous than with sericite.

Sample Number: 10

Mineralogy (%):

quartz phenocrysts	7
K-feldspar phenocrysts	5
plagioclase phenocrysts	3
groundmass	80
biotite	3
chlorite	2
opaques	tr
zircon, sphere	tr

Texture: Euhedral to subhedral phenocrysts of quartz (1-5mm), K-feldspar (1-10mm), plagioclase (1-4mm) and biotite (1mm or less) set in a fine-grained groundmass of anhedral interlocking quartz and K-feldspar with disseminated subhedral biotite. The overall fabric is porphyritic, hypidiomorphic-granular with an allotriomorphic-granular groundmass. K-feldspar phenocrysts have a skeletal structure in hand specimen.

Quartz phenocrysts: Original bipyramidal and hexagonal prism outlines are still visible in some phenocrysts, but most are rounded and embayed, indicating resorbtion. Kelyphitic rims are not present. Undulatory extinction has not developed. A few phenocrysts appear to have developed a weak irregular cleavage and have anomalous biaxiod negative interference figures. The complete absence of alteration in these grains is not typical of the feldspar, it is suggested that these grains are quartz which have developed anomalous optical properties in response to strain.

K-feldspar phenocrysts: The skeletal structure visible in hand specimen is manifest in thin section as irregular areas within the phenocrysts devoid of feldspar or alteration products. The general weak alteration does not support the hypothesis that these areas were formerly filled with alteration products. No satisfactory explanation other than plucking during sample preparation is apparent from this examination. The K-feldspar phenocrysts are individual euhedral grains, without evidence of twinning. Most are optically continuous and show little if any perthitic texture. One glomeroporphyritic aggregate is intergrown with optically continuous quartz grains which resembles graphic intergrowth.

Plagioclase phenocrysts: Euhedral to subhedral in outline and often in glomeroporphyritic aggregates with the K-feldspar, which generally is larger. The plagioclase shows a variety of twin forms, including carlsbad, albite, combined carlsbad-albite, and pericline. The average phenocryst composition is andesine (An_{32}), determined by the Michel-Levy technique. Biotite is occassionally poikiolitically enclosed.

Biotite: Two textural variations are present as in VR21. The earlier form is as euhedral phenocrysts much smaller than the quartzo-feldspathic phenocrysts. This biotite is frequently associated with granular opaques but is otherwise unaltered. Fine-grained irregular shreds of biotite, the second form, is disseminated throughout the groundmass and occasionally occurs in aggregates which replace the original biotite phenocryst or

are associated with feldspars. The second variety of biotite is in part chloritized.

Groundmass: Exceedingly fine-grained and consisting of an anhedral interlocking mosaic of K-feldspar quartz and biotite. No plagioclase is visible in the groundmass. The K-feldspar is microperthitic, but no granophyric intergrowth with quartz is visible.

Alteration: Plagioclase phenocrysts are the most intensely altered phase. They are moderately clouded by clays and incipiently dusted with shreds of sericite. No clinozoisite or carbonate is visible. K-feldspar phenocrysts are incipiently altered to clays and stand out as relatively unaltered against the groundmass K-feldspar, which is weakly altered to clay. Biotite is weakly to strongly chloritized, without any apparent pattern. The alteration style is generally weak and may be the combined effects of deuteric and supergene processes.

Rock type: The texture indicates rapid cooling, more so than the other samples in this suite. The absence of glass precludes a volcanic affiliation, suggesting shallow emplacement. The rock is mineralogically a porphyritic granite.

Sample Number: 15

Mineralogy (%):

quartz phenocrysts	3
K-feldspar phenocrysts	4
plagioclase phenocrysts	5
clay	tr -1
chlorite	tr -1
clinozoisite	tr -1
sphene	tr
carbonate	tr -1
apatite	tr
groundmass	86

Texture: Medium-grained, porphyritic, hypidiomorphic-granular; subequal proportions of euhedral to subhedral quartz (1-4mm), K-feldspar (1-3mm), and plagioclase (2-5mm) phenocrysts in an allotriomorphic-granular quartzo-feldspathic groundmass consisting primarily of quartz and K-feldspar.

Quartz phenocrysts: Original outlines were variations of bipyramidal and hexagonal prisms. The phenocryst margins are embayed and somehwat rounded, in part resorbed by the groundmass. As in VR21 and VR5, kelyphitic rims of perthitic and in part granophyric K-feldspar surround the phenocrysts. The rims are generally 1mm or less in width. Some phenocrysts poikiolitically enclose grains of K-feldspar. Undulatory extinction is not present in the quartz phenocrysts. Fluid inclusions vary in size and density. Most phenocrysts contain low to moderate densities of small inclusions; some have numerous healed fractures lined with large two-phase inclusions. Daughter minerals were rarily visible.

K-feldspar phenocrysts: Equant grains randomly scattered throughout groundmass. Little twinning is visible; when present, it is according to the carlsbad law. Quadrille structure is not present. The Phenocrysts are perthitic in small irregular patches. Most are enclosed in thin radial aggregate (kelyphitic rim) of groundmass K-feldspar.

Plagioclase phenocrysts: Glomeroporphyritic aggregates of euhedral to subhedral laths. All are extremely turbid, but internal textures remain visible. Twinning is generally according to the carlsbad or albite laws, with occasional combined carlsbad-albite twinning. The average plagioclase composition, determined by the Michel-Levy technique, is andesine (An_{44}). The phenocryst margins are only slightly irregular, and are not significantly surrounded by reaction rims.

Groundmass: Consists predominantly of an interlocking mosaic of quartz and K-feldspar. The K-feldspar occurs as anhedral, radial aggregates of perthitic material. Quartz in generally interstitial. Granophyric/graphic textures are not significant, although occurring locally. Plagioclase was not observed in the groundmass.

Alteration: Plagioclase is the most intensely altered phase, being extremely clouded by clays. Minute shreds of sericite are generally present but not in significant quantities. The plagioclase is also altered to granular aggregates of clinozoisite with interstitial carbonate. K-feldspar phenocrysts are less clouded by clay alteration, and appear less affected than the groundmass. The clinozoisite-carbonate assemblage is also associated with K-feldspar. Granular masses of chlorite, clinozoisite, carbonate, and sphene are disseminated throughout the groundmass; they may replace formed ferromagnesian minerals. The overall alteration appears to be a combination of supergene (clay) and hypogene (clinozoisite) processes.

Rock type: The combined porphyritic texture and allotriomorphic groundmass is characteristic of high level, rapidly-cooled intrusives (dykes). The overall composition is consistent with granite porphyry.

Sample Number: 17

Mineralogy (%):

plagioclase phenocrysts	12
plagioclase (groundmass)	30
biotite	4
chlorite	43
opaques	8
clinozoisite	2
epidote	1

Texture: Medium to coarse-grained, porphyritic, hypidiomorphic-granular. Glomeroporphyritic plagioclase phenocrysts, euhedral in outline and up to 8mm in length, set in a groundmass of euhedral to subhedral plagioclase laths up to several mm in length with interstitial chlorite, biotite, clinozoisite, epidote, and opaques.

Plagioclase phenocrysts: Elongate laths with an aspect ratio often greater than 5:1. The ends of the laths may be slightly irregular and/or ragged, but the general outlines are sharp and well-defined. Various twin laws are represented in the phenocrysts, but albite, carlsbad. and combined carlsbad-albite are most frequent with minor pericline twinning. A few cross-sections are visible which show evidence of normal and oscillatory zoning. The average phenocryst composition is labradorite (An_{52}), determined by the Michel-Levy technique. Phenocrysts are intensely shattered internally with incipient clay alteration along the fractures. Some phenocrysts poikiolitically enclose chloritic material similar to the groundmass.

Groundmass plagioclase: Similar in most respects to the phenocrysts. Glomeroporphyritic texture is not evident, and the laths truncate one another in various random orientations. Twinning is somewhat less complex, with predominant albite forms. The average groundmass plagioclase composition, determined by the Michel-Levy technique, is more sodic than the phenocrysts at An_{44} (calcic andesine). Like the phenocrysts, the groundmass plagioclase is moderately to intensely fractured.

Chlorite: Irregular mosaics of chlorite occupy intersticies among the plagioclase laths. No relic material to indicate the original composition remains. Considering the overall mafic composition reflected in the plagioclase, pyroxene is suggested as a possibility. Granular epidote (weakly pleochroic green) and radial aggregates of clinozoisite laths are frequently associated with the chlorite and are more or less randomly scattered throughout.

Biotite: Reddish pleochroic biotite is scattered throughout the interstitial chlorite. The biotite is euhedral to subhedral in outline and less than 1mm in diameter. It is in part replaced by the chlorite, but generally is only incipiently affected by the chloritization. This biotite may be a late magmatic hydration of the ferromagnesian minerals.

Opaques: Granular iron oxides are scattered throughout the groundmass. The opaques are considered to be an original magmatic constituent.

Alteration: Incipient clay alteration along fractures in the plagioclase. Chlorite penetrates the plagioclase along the fractures with larger apertures. Pervasive chloritization of groundmass ferromagnesian minerals is the most predominant alteration, and is presumed to be of deuteric origin. There is no evidence for substantial hydrothermal alteration.

Rock type: Based upon mineralogy, this rock may be classified as a pyroxene - biotite andesite (dependent somewhat on the original composition of the chloritic material). The texture is typical of andesitic dykes, but is too fine-grained to be classified as diorite and contains no glass typical of volcanic affiliations.

Sample Number: VR5

Mineralogy (%):

quartz phenocrysts	5
plagioclase	4
K-feldspar phenocrysts	2
sericite	tr
tourmaline	18
chlorite	tr -1
clinozoisite	tr -1
zircon	tr
groundmass	69

Texture: Medium-grained, porphyritic, hypidiomorphic-granular, phenocrysts of quartz (1-4mm), plagioclase (2-3mm), and K-feldspar (3-6mm) set in a largely allotriomorphic-granular groundmass consisting of quartz, K-feldspar, and plagioclase. Idioblastic aggregates of quartz-tourmaline are visible as dark-coloured spots in hand specimen.

Quartz phenocrysts: Formerly bipyramidal to hexagonal prisms, now irregular in outline and strongly embayed owing to resorbtion by the groundmass. The phenocrysts are often surrounded by intense zones of granophyric intergrowth, but not by rims of K-feldspar as in VR-21. Undulatory extinction has not developed. Fluid inclusions are numerous; they have variable liquid vapour ratios which suggests boiling of the associated fluids. Many contain one or more daughter minerals (Halite, sylvite?).

Plagioclase phenocrysts: Relatively rare, and subhedral in outline. An arbitrary distinction of 2mm is suggested as the dividing line between groundmass and phenocryst plagioclase, as the two differ only in grain size and not in texture. Carlsbad twinning and less frequent albite twinning are visible. The average plagioclase composition, determined by the Michel-Levy technique, is oligoclase (An_{28}). The plagioclase is partially resorbed into the groundmass, and generally shows some degree of myrmekitic texture.

K-feldspar phenocrysts: Subhedral in outline and strongly resorbed. The phenocrysts are generally surrounded by zones of intense graphic intergrowth which penetrate the original margins. It is perthitic in irregular patches, but does not show quadrille structure. Most phenocrysts are single grains, with some showing carlsbad twinning.

Tourmaline: Large radial sprays of green to blue pleochroic tourmaline with interstitial quartz is concentrated in dark-coloured "eyes" which on cursory examination might appear to be xenoliths. The tourmaline-quartz aggregates pervasively replace the original fabric and are not inclusions of preexisting rock. The quartz in these aggregates is crowded with large fluid inclusions, many of which contain one or more daughter minerals, suggesting highly saline solutions associated with the tourmalinization.

Clinozoisite: Radial aggregates of elongated prisms showing the typical anomalous first order interference colours. The clinozoisite is scattered throughout the section, and locally

concentrated along fractures. In some instances it has grown at the expense of feldspar and quartz, but in others it is clearly the product of hydrothermal(?) solutions introduced into the rock.

Groundmass: Largely an interlocking mosaic of plagioclase, K-feldspar, and quartz. The plagioclase is subhedral in outline, whereas K-feldspar and quartz are anhedral. The K-feldspar is strongly granophyric, although some does not show the intergrowth texture. Quartz is both associated with these intergrowths, and in anhedral interstitial grains.

Alteration: Feldspars, both plagioclase and K-feldspar, are weakly to moderately clouded by clay alteration. The plagioclase is generally slightly more altered than K-feldspar, but not significantly so. Shreds of sericite are associated with the feldspars in varying intensities. Generally, only a few sericite flakes are visible, constituting incipient sericitization but locally the sericite concentration may be considered weak to moderate in intensity. Late interstitial muscovite is present in trace amounts, occurring interstitially among quartz and K-feldspar and growing at the expense of these phases; the muscovite is suggested to be a late magmatic to deuteric product rather than of hydrothermal origin. Green, weakly pleochroic chlorite is randomly scattered throughout the groundmass, and presumably replaces late biotite such as that observed in VR21. Minute inclusions of zircon with pleochroic halves are still visible in the chlorite masses. Clinozoisite is often associated with the chlorite, and also occurs independently. Clinozoisite is not considered a magmatic constituent, and attests to some degree of hydrothermal alteration. The quartz-tourmaline aggregates are clearly of deuteric or perhaps greissen-type alteration. The overall alteration suggests late magmatic transitional into hydrothermal origin associated with saline solutions, and should be considered as a potential mineralizing source.

Rock type: Micrographic potash granite is suggested by the mineralogy and texture. The texture is atypical of volcanic rocks, and implies shallow emplacement consistent with the field identification as a dyke of grantic composition.

Sample Number: VR21

Mineralogy (%):

quartz phenocrysts	4
plagioclase phenocrysts	2
K-feldspar phenocrysts	2
biotite	3
opaques	tr
apatite	tr
zircon	tr
groundmass	89

Texture: Medium-grained, porphyritic, hypidiomorphic-granular. Euhedral phenocrysts of quartz (1-4mm), plagioclase (1-2mm), K-feldspar (2-6mm) and biotite (less than 1mm) set in a holocrystalline, allotriomorphic-granular groundmass.

Quartz phenocrysts: Bipyramidal to hexagonal prisms, often glomeroporphyritic in texture. The phenocryst margins are sharp and rarely embayed, showing little evidence for resorbtion. The margins are frequently surrounded by radial aggregates of micrographic K-feldspar-quartz intergrowths. Undulatory extinction has not developed. Fluid inclusions are neither as large nor as frequent as in VR27. The inclusions are generally two-phase, with relatively few having daughter minerals.

Plagioclase phenocrysts: Originally euhedral in outline, the plagioclase phenocrysts generally have somewhat ragged margins and are frequently enclosed in micrographic K-feldspar-quartz as with the quartz phenocrysts. The texture indicates partial resorbtion by the groundmass. Carlsbad, albite, and combined carlsbad-albite twinning is visible. The average plagioclase composition is oligoclase (An_{27}) with a few as sodic an An_{30}, determined by the Michel-Levy technique. The twin lamellae are rarely deformed.

K-feldspar phenocrysts: Euhedral to subhedral in outline, generally showing moderate to strong resorbtion by the groundmass. Granophyric intergrowths often extend into the phenocrysts. The K-feldspar is perthitic in varying degrees from minor flame-like patches to blocky, twinned patches. Single grains and carlsbad twins of two individuals are both common; pericline twinning (quadrille structure) is not visible.

Biotite: Occurs in two textural variations, suggesting two generations of growth. The first is as euhedral laths which are presumably primary magmatic constituents. These are often replaced by a second generation of biotite which consists of much smaller, irregular shreds. The minute biotite shreds are also disseminated throughout the groundmass, where they are distinctly interstitial. The second generation biotite resembles secondary biotite in porphyry-type environments. Inclusions of apatite and zircon (without significant pleochroic halves) as well as granular opaques are associated with the biotite laths.

Groundmass: The most predominant constituent of the section is a quartzo-feldspathic groundmass which is primarily K-feldspar. The K-feldspar occurs in an anhedral interlocking mosaic with subordinate interstitial quartz. The K-feldspar shows strong

micrographic intergrowths which are not as prominant as in VR27, partially due to the finer grain size. Plagioclase is not visible in the groundmass.

Alteration: Weak clouding of both feldspar by clays, with plagioclase generally more strongly affected than K-feldspar. K-feldspar is sparsely dusted with sericite. Fine-grained biotite may be deuteric or early hydrothermal in origin. Greissen-type alteration as in VR5 and VR27 is not visible.

Rock type: Micrographic potash granite; the allotriomorphic-granular groundmass texture indicates a rapid quench consistent with interpretation as a dyke rock and does not support volcanic affiliation.

Sample Number: VR27

Mineralogy (%):

quartz phenocrysts	4
quartz (groundmass)	32
K-feldspar	47
plagioclase	12
tourmaline	1
muscovite	1
clay	3
opaque	tr
biotite	tr

Texture: Porphyritic, hypidiomorphic-granular, medium-grained. Euhedral to subhedral phenocrysts of K-feldspar to 4mm in length and quartz from 1 to 2mm in diameter set in a groundmass consisting of an interlocking mosaic of quartz, K-feldspar, and plagioclase.

Quartz phenocrysts: Bipyramidal to hexagonal prisms typical of high-level pluton environments. Some phenocrysts are partially resorbed by the groundmass, whereas others have sharp regular outlines, suggesting local equilibrium effects. Undulatory extinction has not developed in the phenocrysts. Healed fractures are lined by minute fluid inclusions. The inclusions are generally two-phase with a large vapour bubble, and some contain cubic daughter minerals (halite?). It is suggested that intrusion of this rock was associated with relatively saline fluids.

K-feldspar phenocrysts: Slightly irregular in outline, owing to partial resorption by the groundmass. Often intergrown with quartz along the margins. Most frequently the phenocrysts are carlsbad twins consisting of two individuals. Perthitic texture and quadrille structure are not visible. The K-feldspar phenocrysts are commonly glomeroporphyritic, associated with quartz and occasionally biotite.

Biotite: Sparsely scattered throughout the section. The biotite is in random orientations and is considered to be an original magmatic constituent. Little if any original biotite remains; the laths are pervasively replaced by chlorite with associated opaques and minor carbonate.

Groundmass: Subhedral laths of plagioclase, subhedral to anhedral K-feldspar, and anhedral interstitial quartz in an interlocking mosaic. The plagioclase shows carlsbad, albite, and combined carlsbad-albite twinning. The average plagioclase composition, determined by the Michel-Levy technique, is oligoclase (An_{28}). The twin lamellae are frequently bent, attesting to minor plastic deformation prior to complete solidification and possibly caused by compaction from the adjacent quartzo-feldspathic grains. K-feldspar is intimately intergrown with quartz; the most predominant feature of the fabric is the ubiquitous granophyric texture. Groundmass K-feldspar is rarely present without moderate to intense granophyric intergrowth, implying that the parent melt was near eutectic composition. Quartz fills intersticies among the groundmass feldspars. In many instances

it is clearly later than the K-feldspar, and is not graphically intergrown.

Alteration: Feldspar, both K-feldspar and plagioclase, are quite turbid and clouded by clay alteration. Flakes of sericite associated with feldspar are rare. Laths of sericite in random orientations, however, are common interstitial to the quartzo -feldspathic mosaic. The sericite appears to have been introduced contemporaneously with the anhedral quartz, with which it is often intimately intergrown. Dash green to blue pleochroic tourmaline is present in radial sprays from less than 1 to 3mm in diameter. The tourmaline grows at the expense of feldspar. Clay alteration in the section is presumably the consequence of supergene (weathering) conditions, whereas the sericite and tourmaline are late magmatic transitional to hydrothermal in origin, and may be a weak form of greissenization.

Rock type: The mineralogy and texture are consistent with graphic potash granite. The medium-grained, hypidiomorphic-granular groundmass texture is typical of high-level plutons environments (or dyke rocks); the absence of glass does not support a volcanic interpretation.

Sample Number: C

Mineralogy(%):		
	quartzo-feldspathic groundmass	30
	leucocratic igneous fragments	50
	clinozoisite	20
	sericite	tr
	chlorite	tr
	opaques	tr

Rock type: igneous breccia (intrusive ?)

Texture: fragmental

Fragments: Approximately one half of the section and three-fourths of the prepared slice consists of angular fragments of very fine grained, porphyritic, leucocratic igneous rock. The texture and mineralogy of the fragments are nearly identical to sample 15 (quartz-feldspar granite porphyry) previously described for the Render project. The major distinction is the increased content of clinozoisite in this rock. It occurs in the immediate vicinity of plagioclase phenocrysts (composition An_{32} - andesine). Since clinozoisite also occurs in sample 15, it is feasible that it existed in the original rock prior to fragmentation. The high content of clinozoisite in the matrix, however, suggests that it is in part related to hydrothermal activity concomitant with brecciation. Low-grade (sericite-clay-carbonate) hydrothermal alteration in not as pronounced in these fragments as in sample 15. The size of the fragments is quite variable even in thin section.

Groundmass: The matrix binding the granite porphyry fragments consists in large part of an interlocking mosaic of anhedral quartz grains. The average diameter of the grains does not exceed 1 mm. Mixed with the quartz is anhedral K-feldspar. An accurate estimate of the K-feldspar content is difficult in thin section owing to the grain size; however, an estimate of 20% of the groundmass is suggested from examination of the prepared slice. Scattered throughout the fine-grained quartz, and particularly near the fragment-groundmass interfaces, are euhedral bipyrimidal prisms, elongate laths, and hexagonal sections of quartz. This mixed texture suggests that the matrix is related to strong hydrothermal activity, and may actually be open-space filling of quartz associated with late-magmatic early-hydrothermal eminations. Cavities in the groundmass lined with free-standing euhedral quartz crystals suggests a very high level of emplacement.

Clinozoisite: Iron-free epidote is an important constituent of the groundmass. It occurs in granular aggregates of euhedral grains up to 1 mm in length, and as elongated crystals and columnar aggregates up to 6 mm in length. Clinozoisite is most frequently a hydrothermal alteration product of feldspars; however, relic feldspars are not present in significant amounts near the clinozoisite. Aggregates of sericite, chlorite, and opaques are often enclosed within the aggregates of clinozoisite laths. The morphology of these groups of sericite strongly resemble large (3 to 4 mm) books of biotite. Two

interpretations of this association and texture are possible. (1) The aggregates may be former books of hydrothermal biotite introduced with the quartz and subsequently altered by later influx of hydrothermal solutions. (2) The biotite (?) may be igneous in origin, and the strong association with clinozoisite may imply that these areas represent former fragments of igneous rock now pervasively-altered. If so, there is no gradation between pervasive and incipient alteration. The former hypothesis is preferred due to the low biotite content of the intact fragments (as well as the other igneous rocks examined) and the absence of textural evidence for pervasively altered fragments adjacent to incipient alteration.

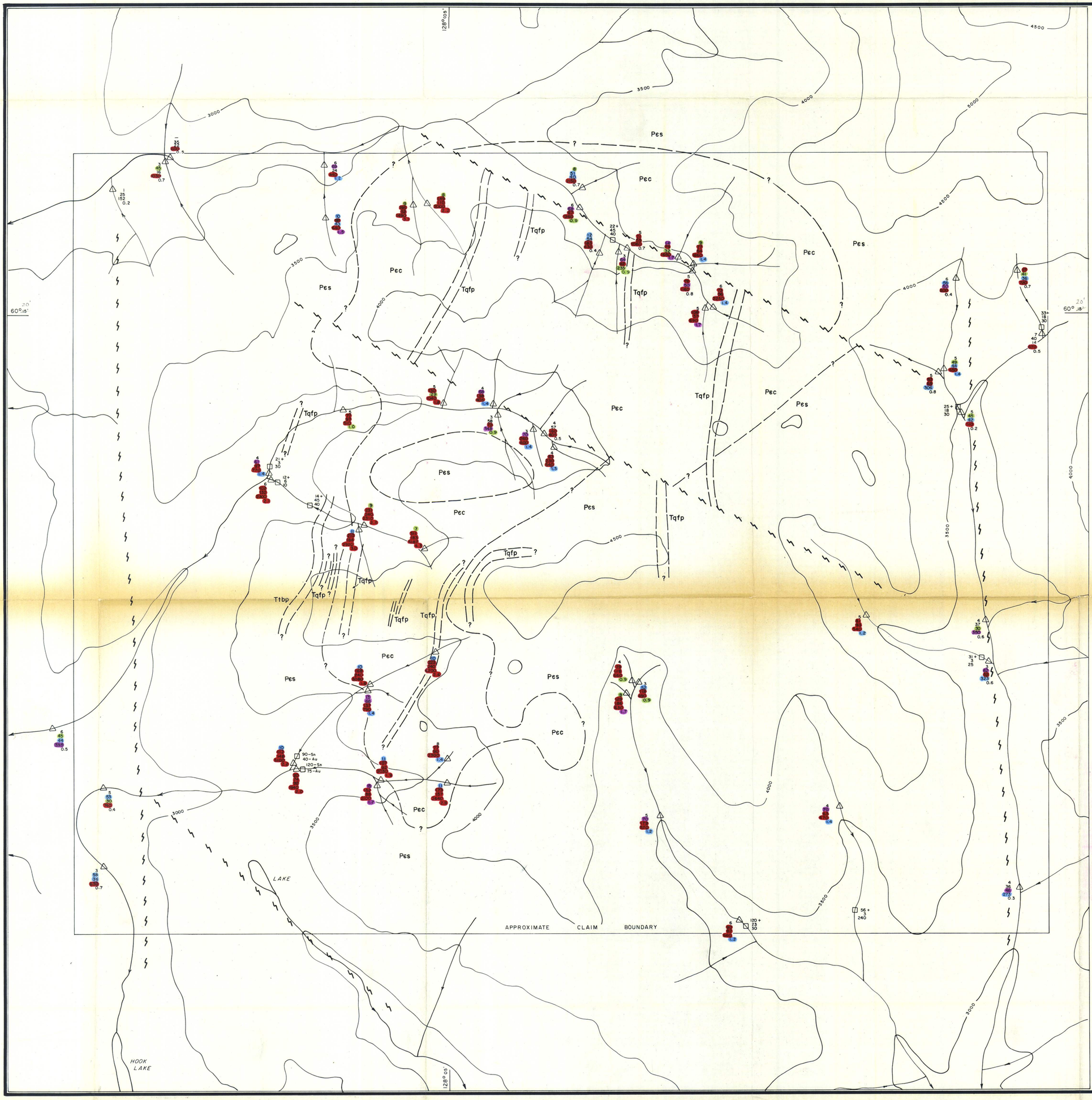
APPENDIX "D"

P L A T E S

PLATE 1: Stream Sediment Geochemistry, HY Property

PLATE 2: Soil Geochmeistry, HY Property

PLATE 3: Geology, HY Property



EXPLANATION

SAMPLE SITE

STREAM SEDIMENT

△ Mo, Cu, Pb, Zn, Ag — Values in ppm

HEAVY MINERAL CONCENTRATE

□ Sn, W, Au — Values in ppm, Au in ppb

\+ Denotes Analysis Determined From Small Sample.

	BACKGROUND	ABOVE BACKGROUND	POSSIBLY ANOMALOUS	ANOMALOUS	STRONGLY ANOMALOUS
MOLYBDENUM *	○ 0–6	7–9	10–12	13–15	16+
COPPER *	0–40	41–50	51–60	61–70	71+
LEAD	0–26	27–35	36–44	45–50	51+
ZINC	0–205	206–270	271–335	336–400	401+
SILVER	0–0.8	0.9–1.1	1.2–1.4	1.5–1.7	1.8+

* ESTIMATED STATISTICAL VALUES FOR Mo, Cu.

NOTE: REFER TO PLATE 3 FOR GEOLOGY LEGEND.
TOPOGRAPHY ADAPTED FROM DEPARTMENT OF NATIONAL DEFENCE 1:50,000 MAPS FOR 105-A-8.
CONTOUR INTERVAL : 500 FEET.
MAGNETIC DECLINATION : 31° EAST.

inches 0 1 2 / 0 1 2 3 4 5 centimetres

YUKON GEOLOGICAL SURVEY

This reference scale bar has been added to the original image. It will change if the image is resized as the image, therefore it can be used as a reference for the original size.

RENDER RESOURCES LTD.

HY CLAIM GROUP
STREAM SEDIMENT GEOCHEMISTRY

WATSON LAKE MINING DISTRICT, YUKON TERRITORY

WATSON LAKE MAP AREA (105A/8)

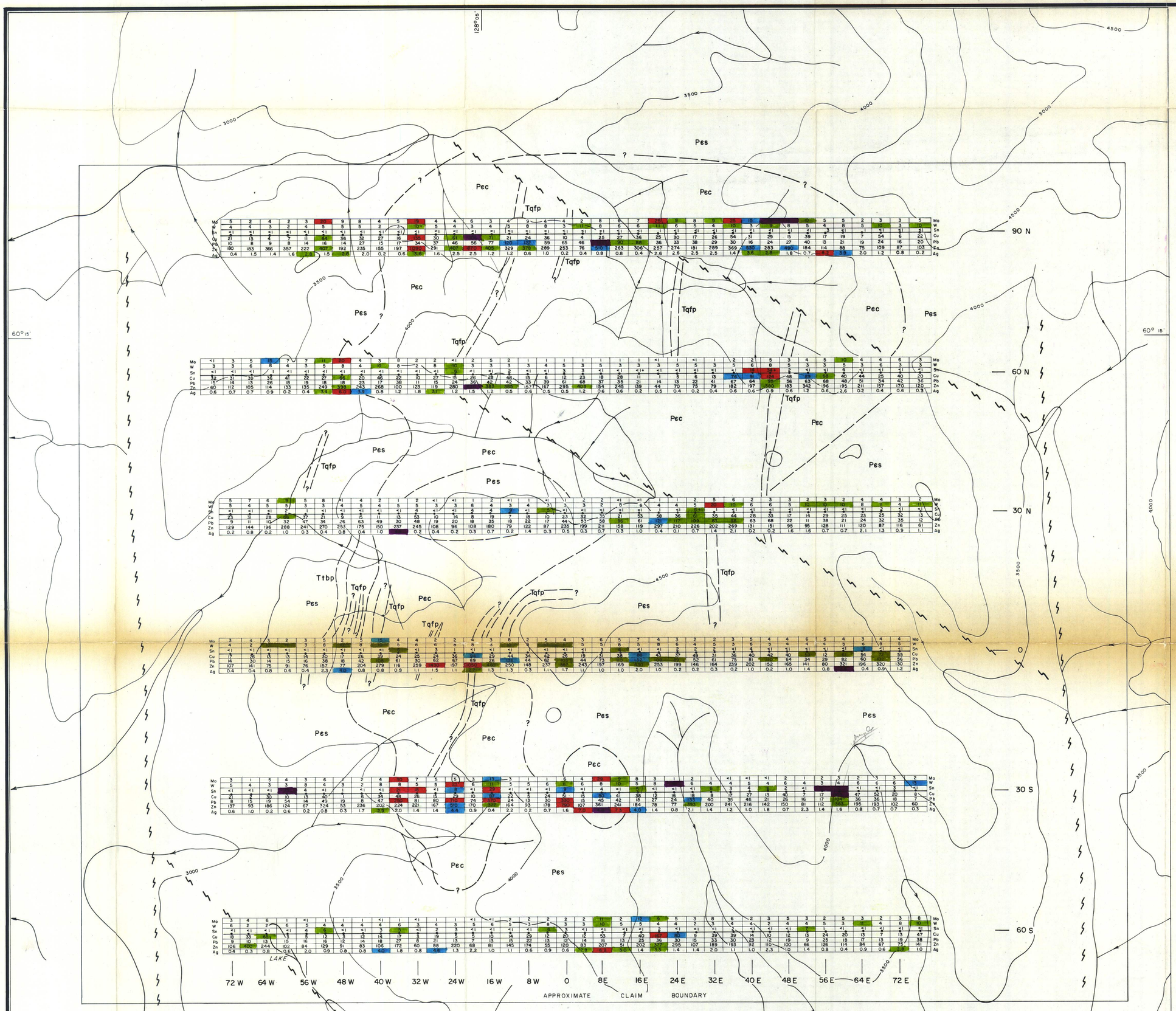
SCALE
500 0 500 1000 1500 2000 2500 3000 FEET
100 0 500 1000 METRES

BY

CORDILLERAN ENGINEERING
1418 – 355 BURRARD STREET
VANCOUVER, B.C. V6C 2G8

JANUARY, 1979

PLATE 1



EXPLANATION

Soil Sample Site

5	Mo
23	W
5+	Sn
29	Cu
76	Pb
510	Zn
4.4	Ag

Values in ppm

\+ Denotes Analysis Determined From Small Sample

Sample Interval : 120 meters (400 feet)

Lines : 923 meters (3000 feet) Apart

	BACKGROUND	ABOVE BACKGROUND	POSSIBLY ANOMALOUS	ANOMALOUS	STRONGLY ANOMALOUS
MOLYBDENUM	0 – 8	9 – 11	12 – 15	16 – 18	19 +
TUNGSTEN	0 – 8	9 – 11	12 – 14	15 – 17	18 +
TIN	0 – 4	5 – 7	8 – 10	11 – 13	14 +
COPPER	0 – 58	59 – 76	77 – 94	95 – 112	113 +
LEAD	0 – 82	83 – 119	120 – 146	147 – 173	174 +
ZINC	0 – 374	375 – 480	481 – 586	587 – 692	693 +
SILVER	0 – 2.6	2.7 – 3.6	3.7 – 4.6	4.7 – 5.6	5.7 +

NOTE: REFER TO PLATE 3 FOR GEOLOGY LEGEND.

TOPOGRAPHY ADAPTED FROM DEPARTMENT OF NATIONAL DEFENCE 1:50,000 MAPS FOR 105-A-8.

CONTOUR INTERVAL : 500 FEET.

MAGNETIC DECLINATION : 31° EAST.

inches 0 1 2

0 1 2 3 4 5 centimetres

This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.

YUKON GEOLOGICAL SURVEY

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HY CLAIM GROUP

SOIL GEOCHEMISTRY

WATSON LAKE MINING DISTRICT, YUKON TERRITORY

WATSON LAKE MAP AREA (105A/8)

SCALE

500 0 500 1000 1500 2000 2500 3000 FEET

100 0 500 1000 METRES

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PLATE 2

LEGEND

TERTIARY (?)

Ta — ANDESITE DYKES

GREENISH-GREY, FINE-GRAINED ANDESITE WITH COARSE GLOMEROCRYSTS OF PLAGIOCLASE. DYKES ARE 30–60 cm WIDE AND OCCUR IN CONTACT WITH QUARTZ-FELDSPAR PORPHYRIES. CROSS-CUTTING RELATIONSHIPS HAVE NOT BEEN OBSERVED.

Tqfp — QUARTZ-FELDSPAR PORPHYRY DYKES

PALE CREAM COLOURED, FINE-GRAINED PORPHYRITIC GRANITE. EUHEDRAL TO SUBHEDRAL PHENOCRYSTS OF QUARTZ, K-FELDSPAR AND PLAGIOCLASE OCCUR IN A FINE-GRAINED GROUNDMASS OF INTERLOCKING QUARTZ AND K-FELDSPAR. THESE DYKES ARE IN THE ORDER OF 15 TO 30 METRES WIDE. ALTERATION CONSISTS OF AN INCIPIENT OR WEAK PROPYLLITIC ASSEMBLAGE. SOME OF THE DYKES ARE HIGHLY SHATTERED. QUARTZ VEINING AND QUARTZ BRECCIA VEINS ARE FOUND IN THE METASEDIMENTS SURROUNDING THE DYKES. QUARTZ VEINS WITHIN DYKES APPEAR RESTRICTED TO THE MARGINS.

Ttbp — TOURMALINE-BEARING PORPHYRY DYKES

WHITE TO PALE GREY, FINE GRAINED, MIAROLITIC AND PORPHYRITIC MICROGRAPHIC GRANITE. CORRODED QUARTZ, K-FELDSPAR AND PLAGIOCLASE PHENOCRYSTS OCCUR IN A GROUNDMASS OF THE SAME. AGGREGATES (UP TO 1 cm ⌀) OF QUARTZ AND TOURMALINE OCCUR THROUGHOUT THIS ROCK. TOURMALINE AND SERICITE SUGGESTS INCIPIENT TO WEAK GREISSEN-TYPE ALTERATION.

PRECAMBRIAN (?)

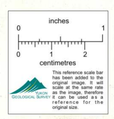
Pes — PHYLLITIC SHALE

THIN-BEDDED, DARK GREY TO BLACK, LOCALLY CARBONACEOUS, PHYLLITIC SHALE. QUARTZITES, SANDSTONES, AND PEBBLE CONGLOMERATES COMPRISE APPROXIMATELY 10 PERCENT OF THIS PACKAGE. CONTAINS MINOR LIMESTONE.

Pec — CHERT

THIN-BEDDED, BLACK CHERT. INDIVIDUAL CHERT LAYERS ARE SEPERATED BY CARBONACEOUS AND ARGILLACEOUS PARTINGS.

- OUTCROP
- INFERRED LITHOLOGIC CONTACT
- STRIKE AND DIP OF BEDDING
- QUARTZ VEIN ATTITUDE
- VEIN OR FRACTURE MINERALIZATION: PbS GALENA; ZnS SPHALERITE; $CuFeS_2$ CHALCOPYRITE; TETRA TETRAHEDRITE
- TREND AND PLUNGE OF MINOR FOLDS
- FAULT: DEFINITE
- INFERRED FAULTS



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CONTOUR INTERVAL: 500 FEET.

MAGNETIC DECLINATION: 31° EAST.

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GEOLOGY

WATSON LAKE MINING DISTRICT, YUKON TERRITORY

WATSON LAKE MAP AREA (105A/8)

SCALE

500 0 500 1000 1500 2000 2500 3000 FEET

100 0 500 1000 METRES

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JANUARY, 1979

PLATE 3