

GEOLOGICAL AND GEOCHEMICAL REPORT

FROM JULY 21st TO AUGUST 6th, 1968

ON

THE TK NOS. 1 - 88 CLAIMS

LIARD MINING DIVISION, BRITISH COLUMBIA

57° 00' N. - 127° 00' W - NE (NTS 94E)

HEADWATERS OF THE FROG RIVER

975-18

FOR

QUEBEC CARTIER MINING COMPANY

by

T. KALNINS, UNDER THE SUPERVISION OF
J.W. STOLLERY, P.ENG., GEOLOGICAL ENGINEER.

CORDILLERAN ENGINEERING LIMITED

400, 837 West Hastings Street
Vancouver 1, B.C.

October, 1968

1674

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INTRODUCTION

This report is based on geochemical and detailed geological investigation of the TK Nos. 1 - 88 claims, conducted between July 21 and August 6, 1968.

The above work is submitted to the British Columbia Department of Mines to fulfill assessment requirements for 18 of the above claims for one year: TK Nos. 37-40, 53-56, 69-74, 81-84; record numbers 28659-28662, 28675-28678, 28691-28696, and 28703-28706 respectively.

The TK Nos. 1 - 88 claims were staked in September, 1967, and recorded (Rec. Nos. 28623-28701) in Vancouver, October 13, 1967 by Cordilleran Engineering Limited.

The claims are located in the Toodoggone River area (NTS 94E), Liard Mining Division, B.C., $57^{\circ} 55' N$, $127^{\circ} 15' W$, on the west side of Frog River. Access is by float equipped fixed wing aircraft and/or helicopter 230 air miles north of Smithers, B.C. or by trail from Alaska Highway, McDame Post, Dease Lake, and Fort Ware.

There is no published geological map of the Toodoggone River area; published geological information closest to the property is the Kechika map 42-1962.

A total of 18 man-days were spent on the property to investigate copper and molybdenum occurrences. Topographic maps, altimeters, aerial photographs, and pace and compass traverses were used as working controls.

SUMMARY AND CONCLUSIONS

The TK Nos. 1 - 88 claims were recorded on October 13, 1967 by Cordilleran Engineering Limited. The claims were geologically examined and broadly geochemically surveyed during the 1968 working season from July 21 to August 6, 1968.

The geology consists of a metamorphic roof pendant of approximately Triassic age underlain by granitic intrusive of Cretaceous age.

Field evidence supports the following sequence of events:

- a - major batholithic intrusion and metamorphism of country rock.
- b - subsequent fracturing and intrusion of mineralized felsite, pegmatite and quartz dikes and veins.
- c - faulting and possibly additional mineralization over a wide area.

Molybdenum and copper mineralization occur independently. Molybdenite is found near the metamorphic-granite contact within the granite, the metamorphosed rock and in two fault zones in the northern part of the claims.

Most of the copper is found in the central part of

Summary and Conclusions (cont'd.)

the claims and is chiefly controlled by dikes and fractures. Bornite is the most abundant copper sulphide.

Economic considerations may be towards a high tonnage and lower than 0.5% grade copper deposit.

RECOMMENDATION

No additional work is recommended on the TK claims at this time.

GEOGRAPHY

The area forms part of the rugged Cassiar Mountain Ranges. Pine trees and brush vegetation extends to 5,000' elevation. Relief within the TK claims ranges from 4,500' to a summit of 7,905'. Rocks are exposed over approximately 35% of the area, but much of the outcrops are inaccessible cliff faces. On the claims and surrounding area there are active glaciers and rock glaciers partly filling recently eroded cirques which open to larger cirques covered by alpine meadows. Fast, clear mountain streams empty into the Frog River and subsequently into the Kechika, Liard and McKenzie Rivers and Arctic Ocean.

GEOCHEMISTRY

Analyses were done on stream sediment samples collected from the active channels. The finest sediment obtainable was collected, always trying to avoid organic material. The samples were placed in heavy paper sample bags which were then hung in a heated tent and dried. The dry samples were sieved to -80 mesh fraction.

Total heavy metals determinations were made in the field by scooping a constant volume of the -80 mesh fraction and leaching with cold, dilute ammonium citrate. The heavy metals removed were then determined by reaction with 0.001% W/V dithi-zone in benzene to form a coloured product.

Copper and molybdenum determinations were made in the laboratory of Bondar Clegg and Co. Ltd. of North Vancouver.

Copper was determined directly by atomic absorption methods after leaching the sample with a mixture of 1.5 mls. concentrated nitric acid and 0.5 ml. concentrated hydrochloric acid in a hot water bath for 2.5 hours and adjusting the final volume to 10 mls.

Molybdenum was determined colourimetrically by stannous chloride - thiocyanate method using a pyrosulphate fusion. The molybdenum - thiocyanate complex was extracted into isopropyl ether.

Geochemistry (cont'd.)

A total of 33 stream sediment samples were collected on the TK property. Based on statistical analysis of regional survey the metal content of stream sediments in this area may be classified as follows:

THM	Cu.	Mo.	Interpretation
0 - 7 ppm	0 - 100 ppm	0 - 9 ppm	background
8 - 14 ppm	101 - 200 ppm	10 - 18 ppm	slightly positive
15 - 21 ppm	201 - 300 ppm	19 - 27 ppm	positive
22 ppm or greater	301 ppm or greater	28 ppm or greater	anomalous

All positive results of the stream sediment survey were traced to a source of respective molybdenum or copper mineralization described under economic geology.

GEOLOGY

The claims are situated in the Stikine Mountain Range and are underlain principally by a batholith of Cretaceous age varying in composition from granite to granodiorite. The intrusive is capped by a presumably older metamorphosed rock unit.

The metamorphic rocks, map unit 1, are composed of quartzite, chlorite, sericite and biotite schists. Inclination of the intrusive-metamorphic contact decreases from vertical in the west to 30° south in the eastern sector. Schistosity is parallel to the attitude of the contact. The rock contains disseminated pyrite and pyrrhotite which have weathered to produce an outstandingly rusty color.

Evidence suggests that older sedimentary rocks were intruded by the batholith, metamorphosed, and eroded leaving a remnant.

The granite-granodiorite, mapped as units 2a and 2b, are massive, light grey rocks. They are poorly fractured, blocky, and frequently show pegmatitic structure composed of feldspar, quartz (including amethyst), biotite and muscovite micas, and specs of magnetite.

The pegmatitic dikes and pockets in the coarse grained granite contain crystals up to 2" large. Fractures in the granite have been invaded by a finer grained rock of

Geology (cont'd.)

similar composition. These dikes range up to 2 feet wide. The wider dikes are marked by 1" - 2" wide cooled margins while the narrower dikes have no distinct margin but rather grade into the granite.

The rock shows at least three fracture systems.

strike	dip	spacing
120° (az)	65° NE	6" to 38"
200°	38° W	
55°	49° NW	

The granodiorite is coarse to fine grained frequently cut by medium grained lamprophyre dikes. Its structure is similar to that of the granite, but a definite relationship was not established. However, it appears to be a phase of the same intrusive mass.

ECONOMIC GEOLOGY

Molybdenum

Molybdenite was found near the metamorphic-granite contact in the northern part of the claim group; its mode of occurrence is: a) blebs and sheets parallel to planes of schistosity, b) as replacement of mafic minerals in granite; c) as blebs and scales in widely spaced fault zones.

The sericite schist contains the bulk of the molybdenite. Best showing (U) occurs on claim 81 over an area of 75 feet long and 2 to 30 feet wide. The best grade may run up to 1% MoS₂. The granite contains sparse molybdenite as blebs up to 1/4 inch in diameter.

Minor occurrences of molybdenite were traced to two fault zones, (S) and (T), traversing both the granite and the metamorphic rocks. On claims 81 and 84 molybdenite was found in scattered rich pockets throughout the fractured material. A portion of the fault on claim 84, shortly above the talus - cliff contact, exposed a rich section 12 feet high by few inches wide estimated to contain up to 2% molybdenite (MoS₂).

Copper

Bornite, chalcopyrite, chalcocite and copper carbonates occur independently of molybdenite. Bornite is the most widely distributed copper sulphide.

Economic Geology (cont'd.)Copper (cont'd.)

Modes of occurrence are:

- a) Disseminated in infrequent patches of a few square feet in the intrusive.
- b) As blebs in quartz veins and pegmatite and felsite dikes from a few inches to several feet in width.
- c) As narrow fracture fillings.
- d) Contact metamorphic.

The following is a description of mineralized areas (see Fig. No. 2).

- (L) Sparse chalcopyrite and bornite mineralization found in a 4-inch wide vertical quartz vein.
- (J) Bornite and malachite in a quartz vein varying from 1 to 8 feet in width. The vein spreads into a horsetail and pinches out ^{7.62m} 25 feet above the talus. A picked sample assayed 10.81% Cu, 0.01% Mo.
- (K) Trace of chalcopyrite in fractures.
- (A) Below ore grade chalcopyrite and bornite are continuously disseminated along bedding planes in the metamorphic rock within a few feet of the intrusive.

Economic Geology (cont'd.)Copper (cont'd.)

(A) to (B) Chalcopyrite and bornite disseminated in fine grained diorite dikes up to 4 ft. wide. The grade is well below 1% Cu. and decreases in the direction of (B) The outcrops above the talus are unstable and inaccessible but the talus contains approximately 10% dike material.

(C) and (D) Bornite and chalcopyrite disseminated in the granite, pegmatite and felsite dikes, and narrow fractures. The felsite dikes contain the more consistent mineralization; a selected sample assayed 0.80% Cu.

List of dikes:

Texture	Strike	Dip	Thickness
White aphanitic	110°	85° SW	2"
Pegmatite	180°	45° E	30"
White aphanitic	140°	70° NE	8"
" "	90°	45° S	3"
" "	50°	47° SE	12"

(E), (F), (G), (I), (H) are extensions of (C) and (D) but copper sulphide mineralization decreases to negligible amounts.

Economic Geology (cont'd.)Copper (cont'd.)

- (M) Malachite stains associated with a narrow quartz vein; no mineralization was found in the host rock.
- (N) A large quartz vein mineralized with trace amounts of malachite.
- (O) Trace of chalcopyrite in narrow quartz filled fissures penetrating granodiorite. This showing could not be traced because of a vertical cliff, but the talus contained only minor amounts of copper sulphides.
- (P) and (Q) Sparse malachite stains found in narrow quartz veins.
- (R) Sparse malachite present in fractured granodiorite.

Respectfully submitted,

CORDILLERAN ENGINEERING LIMITED,



T. Kalnins,

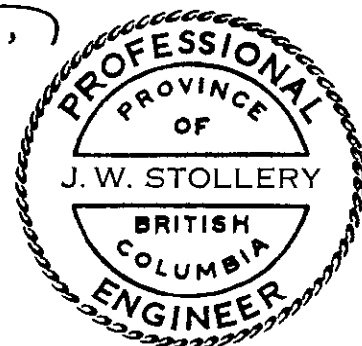
Under the supervision of



J.W. Stollery, P.Eng.,
Geological Engineer

Vancouver, B.C.

October, 1968.



STATEMENT OF EXPENDITURES

Date	Personnel	Rate of Pay (\$/mo.)	Cost per day based on 22 w.days/mo	Living Expenses
July 21	W. Ash F. Hastings F. Pelletier R. Ritchie	650 450 550 450	29.50 20.50 25.00 20.50	18 man- days @ \$18 per day.
July 22	"	"	"	
July 23	"	"	"	
July 24	F. Pelletier R. Ritchie	550 450	25.00 20.50	
July 27	J.W.Stollery W. Ash	- 650	100.00 29.50	
August 6	T. Kalnins W. Ash	750 650	34.00 29.50	

SUB TOTAL:

525

324 \$849

BELL 47G3B-1 HELICOPTER SUPPORT COSTS

Average cost per hour (including fuel) \$ 160/hr.

Distance from camp to TK claim group (return) 20 min./2 passengers
(Three return trips when two 2-man crews are transported.)

<u>Date</u>	<u>Personnel</u>	<u>Helicopter Time (hrs.)</u>		<u>Cost</u>
		<u>Total</u>	<u>On Property.</u>	
July 21	W. Ash F. Hastings F. Pelletier R. Ritchie	2:45	1:45	280
July 22	W. Ash F. Hastings F. Pelletier R. Ritchie	2:10	1:10	190
July 23	W. Ash F. Hastings F. Pelletier R. Ritchie	2:05	1:05	175
July 24	F. Pelletier R. Ritchie	1:20	1:00	160
July 27	J.W. Stollery W. Ash	0:40	0:20	53
August 6	T. Kalnins W. Ash	0:50	0:30	80

SUB TOTAL COST: \$938

Geochemical analysis 66

Total Expenditures: . \$ 1853

Note: Apply \$1800 to cover assessment requirements on 18 claims for 1 year.

Canada

Province of British Columbia

To Wit:

In the Matter of

the statement of expenditures for work performed on the TK Mineral Claims in the Liard Mining Division

I, TALIS KALNINS

, of 400, 837 West Hastings Street,

City of Vancouver

in the Province of British Columbia.

Do Solemnly Declare that

1. The geological and geochemical investigation of the TK Mineral Claims was carried out under my supervision.
2. The Statement of Expenditures set out in Appendix "B" of my "Geological and Geochemical Report, from July 21st to August 6th, 1968, on the TK Nos. 1 - 88 claims", truly represents the amounts expended on the said claims.

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

Declared before me

at the City of Vancouver

in the Province of British Columbia.

this 24th day of

October A.D. 19 68

J. T. Lee

Talis Kalnins

CONTRACTORS AND PERSONNEL

Cordilleran Engineering Limited 400 - 837 W. Hastings Street, Vancouver 1, B.C.	Geological Consultants
J.W. Stollery, P.Eng.	Geological Engineer
T. Kalnins, B.Sc.	Geologist
W. Ash	Assistant Geologist
F. Pelletier	Assistant Geologist
R. Ritchie	Assistant
F. Hastings	Assistant
L. Tanguay	Cook
Leo Lannon Helicopters Ltd. Vancouver, B.C.	Air support on location
P. Bronson	Pilot
R. Zimmerman	Mechanic
Omineca Air Service Ltd., Smithers, B.C.	Fixed Wing air support
Bondar-Clegg and Co. Ltd., Vancouver, B.C.	Geochemists

WRITER'S QUALIFICATIONS

I, T. Kalnins, of Vancouver, B.C.,
hereby certify that:

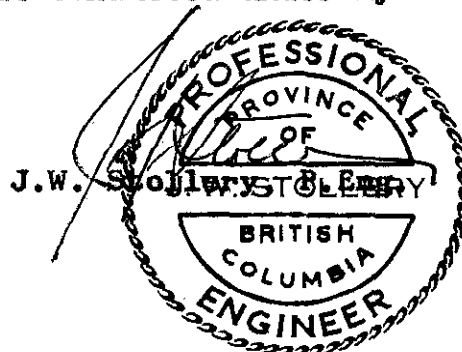
1. I am a geologist residing at 2736 West 3rd Ave.,
Vancouver 8, B.C., with an office at 814, 837
West Hastings Street, Vancouver 1, B.C.
2. I am a graduate of the University of British
Columbia (Bachelor of Science, 1964).
3. I am the author of this report.



T. Kalnins.

I, JOHN W. STOLLERY, of VANCOUVER,
B.C. certify that the above report and the work
upon which it is based was conducted under my
supervision.

J.W. Stollery



1270

WEST FORK

TL 13-14
31099-31100 H

Frog 1-8
(34171-8K)

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36

OPAL 1-20
30752-71 H

EARL 1-8
31883-90 M

NOTE
EARL 1-8 &
NN 1-26
STARTED
SAME DAY

NN 1-26
32018-43 M

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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TK 1-36
28623-58 N
TK 37-40 (28659-62 N)
TK 41-52
28663-74 N C
TK 53-56
(28675-78 N)
TK 57-63
28679-90 N C
TK 69-74 (28691-96 N). TK 75-80 (28697-28702 C)
TK 81-84 (28703-06 N)
TK 85-88
28707-10 N C

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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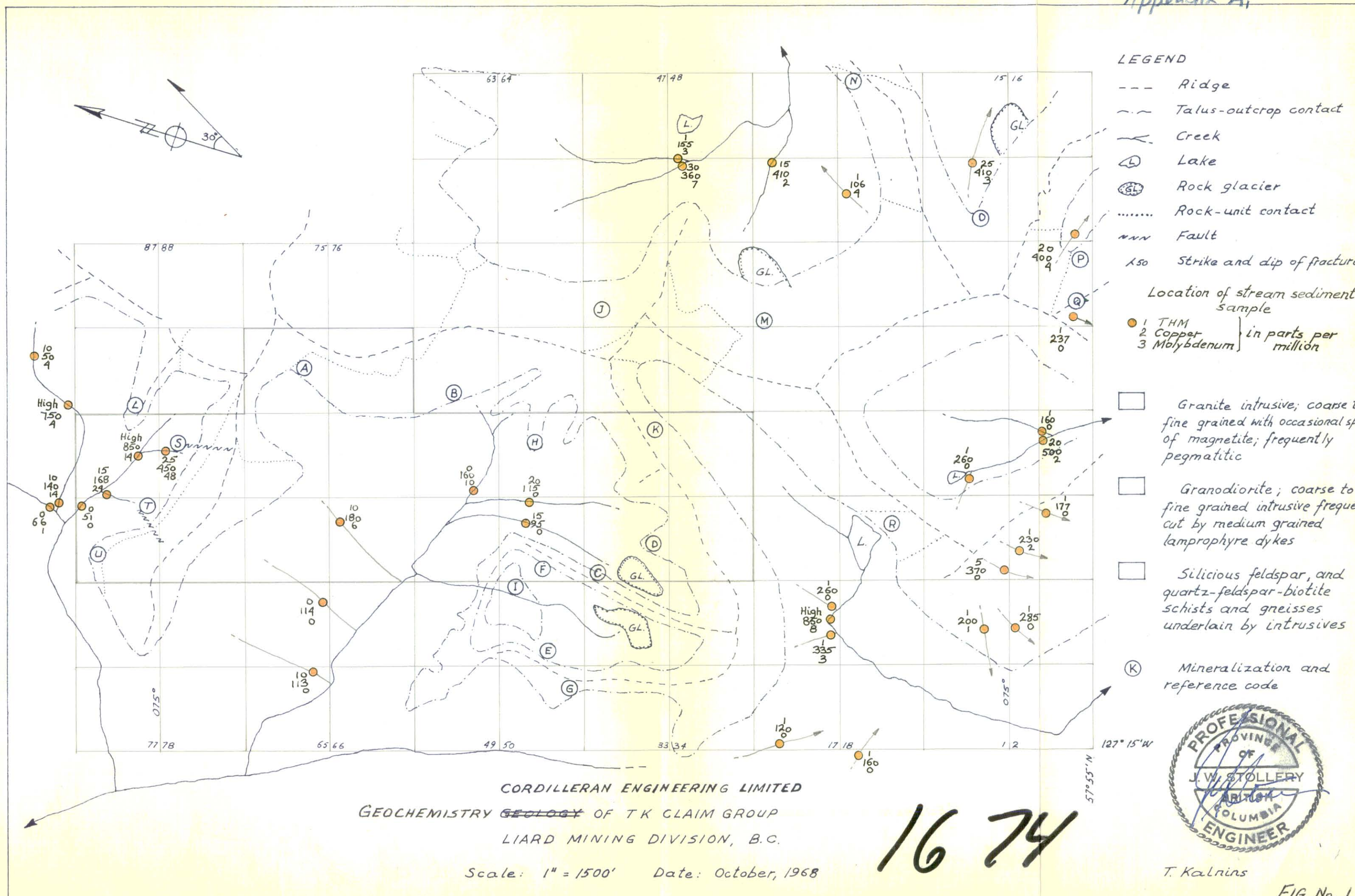
(NW 4, 6, 8, 10,
12, 14)

WEST 1-14
30561-74 H



ALF
2954

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- LEGEND**
- Ridge
 - - - Talus-outcrop contact
 - ~ ~ ~ Creek
 - L Lake
 - GL Rock glacier
 - Rock-unit contact
 - Fault
 - 150 Strike and dip of fractures
- Location of stream sediment sample
- 1 THM
 - 2 Copper
 - 3 Molybdenum
- in parts per million

- Granite intrusive; coarse to fine grained with occasional specs of magnetite; frequently pegmatitic
- Granodiorite; coarse to fine grained intrusive frequently cut by medium grained lamprophyre dykes
- Silicious feldspar, and quartz-feldspar-biotite schists and greisses underlain by intrusives
- (K) Mineralization and reference code

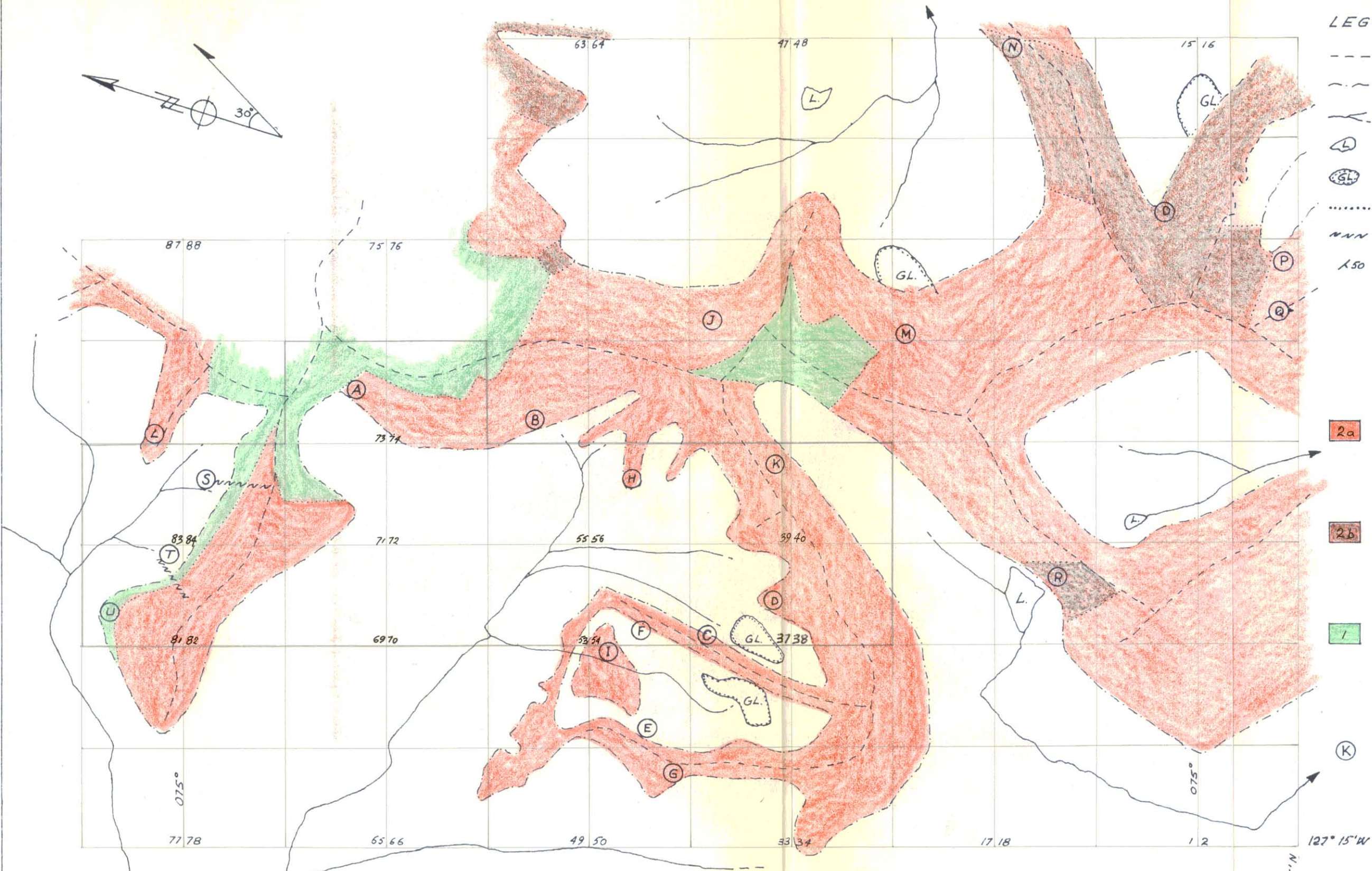
CORDILLERAN ENGINEERING LIMITED
 GEOCHEMISTRY ~~GEOLOGY~~ OF TK CLAIM GROUP
 LIARD MINING DIVISION, B.C.

Scale: 1" = 1500' Date: October, 1968

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T. Kalrins



- LEGEND**
- Ridge
 - - - Talus-outcrop contact
 - ~~~ Creek
 - L Lake
 - GL Rock glacier
 - Rock-unit contact
 - Fault
 - 150 Strike and dip of fractures

2a Granite intrusive; coarse to fine grained with occasional specs of magnetite; frequently pegmatitic

2b Granodiorite; coarse to fine grained intrusive frequently cut by medium grained lamprophyre dykes

1 Silicious feldspar, and quartz-feldspar-biotite schists and gneisses underlain by intrusives

(K) Mineralization and reference code



CORDILLERAN ENGINEERING LIMITED
 GEOLOGY OF TK CLAIM GROUP
 LIARD MINING DIVISION, B.C.

Scale: 1" = 1500' Date: October, 1968

1674

T. Kalnins