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CONSULTING GEOLOGIST . . . PROFESSIONAL ENGINEER
P.O. Box 566
WHITEHORSE, YUKON TERRITORY
"LAND OF THE MIDNIGHT SUN"

GEOLOGICAL AND GEOCHEMICAL REPORT

ON THE

CUB 2-16 (Y44539-Y44553) AND CUB 18-36 (Y44554-Y44572)

MINERAL CLAIMS

DAWSON RANGE AREA

YUKON TERRITORY

62°-40'N LATITUDE

138°-52'W LONGITUDE

N.T.S. DESIGNATION: 115-J-10

WHITEHORSE MINING DIVISION

BY

G.S. ZIMMER, GEOLOGIST

G.G. CARLSON, GEOLOGIST

OF

R.G. HILKER LIMITED

WHITEHORSE, YUKON TERRITORY

27 AUGUST 1970

UNDER THE SUPERVISION OF

R.G. HILKER, P.ENG.

This report has been examined by the Geological Evaluation Unit and is recommended to be [illegible] as assessment work.

28,683.37

J.R. Craig

[illegible] or
[illegible] Engineer

Considered [illegible] evaluation work under Section 86 of the Yukon Mining Act.

Commissioner of Yukon Territory

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* * * * * * * *

INTRODUCTION

A property examination on the CUB claim group was carried out by R.G. Hilker, P.Eng., on January 27th, 1970. Following the property examination, a geological-geochemical program over a linegrid was recommended. In accordance with the recommendations, 40.9 miles of linegrid were cut on the property by Eastern Associates Reg.'d between May 12th and June 5th, 1970. Plans were made to commence the geological-geochemical program and the camp was moved to the Casino airstrip from Whitehorse by Beaver, Cessna 206 and Cessna 172 aircraft on June 27th, 1970. From the Casino airstrip, the five-man camp was moved to the property by a Bell Jet Ranger helicopter.

As no accessible water was found by aerial reconnaissance over the claim group, the camp was located on a creek about one-half mile east of the CUB linegrid. Geological mapping and geochemical mapping commenced on June 28th. Twelve new CUB claims (CUB 37-48) were staked on July 1st to cover open ground between the CUB and CASH groups. Mapping and sampling were finished on July 5th. July 6th was spent bringing maps and report information up to date. The camp was pulled out on the morning of July 7th.

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LIST OF PERSONNEL

The following personnel of R.G. Hilker Limited were directly involved in the geological and geochemical program on the CUB claim group:

Name	Address	Position
R.G. Hilker, P.Eng.	Box 1566 Whitehorse, Y.T.	Geologist - supervision.
G.S. Zimmer	Box 1293 Whitehorse, Y.T.	Geologist - mapping and supervision.
G.G. Carlson	Box 548 Whitehorse, Y.T.	Geologist - mapping and supervision of geochemical program.
B. Slater	Box 1408 Whitehorse, Y.T.	Soil sampler.
N. Marty	Box 1922 Whitehorse, Y.T.	Soil sampler.
J. Greer	Box 422 Whitehorse, Y.T.	Soil sampler.
R. Voisine	Box 3245 Whitehorse, Y.T.	Linecutter.
P. Laramée	Box 3245 Whitehorse, Y.T.	Linecutter.

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FIELD METHODS

GEOLOGY

Mapping was carried out on a scale of 1" = 400' over the grid lines. As the CUB claims are located in an unglaciated portion of the Dawson Range, boulder fields may be considered residual and were mapped as outcrop. Total rock exposure, either as true outcrop or as residual boulder patches, is estimated less than one percent of the total area included in the claim group. Accordingly, individual boulders were mapped and included on the geology map denoted by an "X". The mapping of individual small boulders and gravels makes the conclusions drawn from such information relatively uncertain. The assumed geological contacts, as shown, should be considered accordingly.

In the process of mapping, all claim posts were tagged and located on the map. Claim posts of adjacent claim groups were also located when found.

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FIELD METHODS

GEOCHEMISTRY

The soil sampling program was carried out using three samplers. Samples were taken along the baseline and all crosslines at 100-foot intervals. Sample material was taken, wherever possible, from the upper sand or clay soil horizon, at least a few inches below the upper humus layer ("A" horizon) using a 2½-lb. grubhoe. The sample material was collected in a pre-numbered Kraft paper sample bag, while notes on location, soil color and type, slope and grade direction, vegetation and any other pertinent data, were taken at each station. The samples were strung on wire, with approximately 30 samples per string, and hung at camp for partial drying.

All creeks encountered were noted and the pH was tested using Fisher Scientific Company alkacid test ribbon, which ranges from pH 2 to pH 10. In addition, pH determinations were carried out at camp on sample material from each station on L60+00S, L84+00S, L108+00S, L132+00S and L160+00S using a LaMotte-Morgan Soil pH Testing Kit.

LOCATION AND ACCESS

The Dawson Range lies in the west central part of the Yukon, between latitudes 62° 00' and 62° 45' north and longitudes 137° 00' and 140° 00' west. The range trends approximately N 45° W, with a length of about 110 miles and a width of 20 miles. It is roughly parallel to the Yukon River, which lies to the north and east, and is cut off by the White River on the northwest, and by the Donject and Nisling Rivers on the southwest. Physiographically, it is bounded by the Klondike Plateau to the north and by the Lewes Plateau to the southwest.

The CUB claim group (CUB 2 to 16 inclusive and CUB 18 to 36 inclusive) is located at approximately 62°-40' north latitude and 138°-52' west longitude. The groups is just to the north of Dip Creek and to the west of Casino Creek, near their confluence. This is roughly six miles due south of the Casino Mine drill site. The claims are located within the Whitehorse Mining Division, on Claim Sheet 115-J-10, in the Dawson Range of the Yukon Territory.

The Casino Mines discovery has opened up access to the area to some extent. A winter road, leaving the Alaska Highway at Mile 1097, follows Dip Creek and then Casino Creek to the Casino drill site. Because of some areas of muskeg, this route is impassable after thaw. Best access to

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the area is by air. The Casino airstrip, 194 miles from Whitehorse, is in good condition and will accommodate fixed-wing aircraft as large as a DC-3. Here, Trans North Turbo Air is maintaining a helicopter base for access to outlying properties. Helicopter transportation may be taken directly from Whitehorse or Carmacks.

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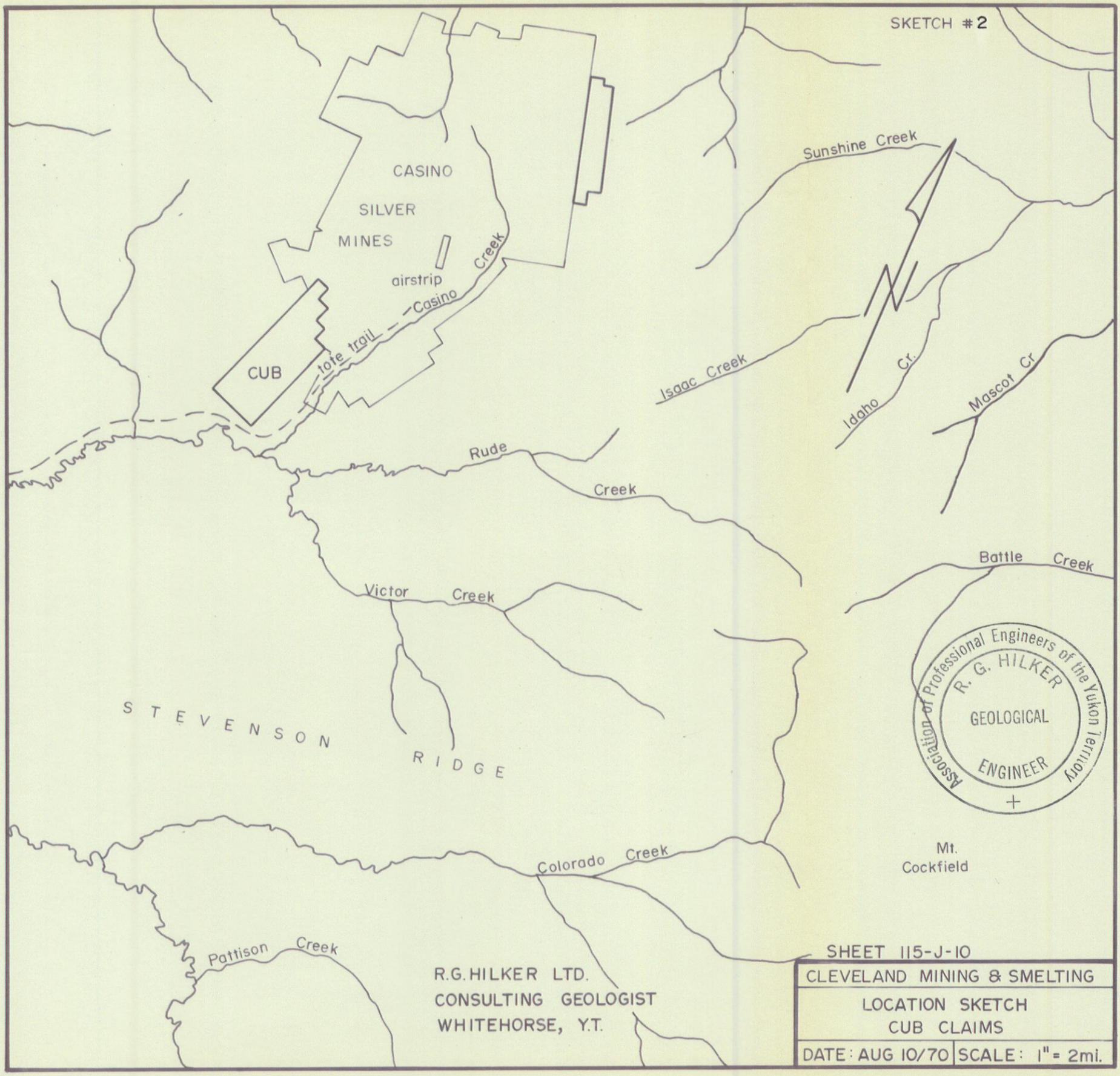
SKETCH #2
CASINO
SILVER
MINES
airstrip
Casino Creek
CUB
tote trail
Sunshine Creek
Isaac Creek
Idaho Cr.
Mascot Cr
Rude
Creek
Battle Creek
Victor Creek
STEVENSON RIDGE
Association of Professional Engineers of the Yukon Territory
R. G. HILKER
GEOLOGICAL
ENGINEER
Mt.
Cockfield
Colorado Creek
Pattison Creek
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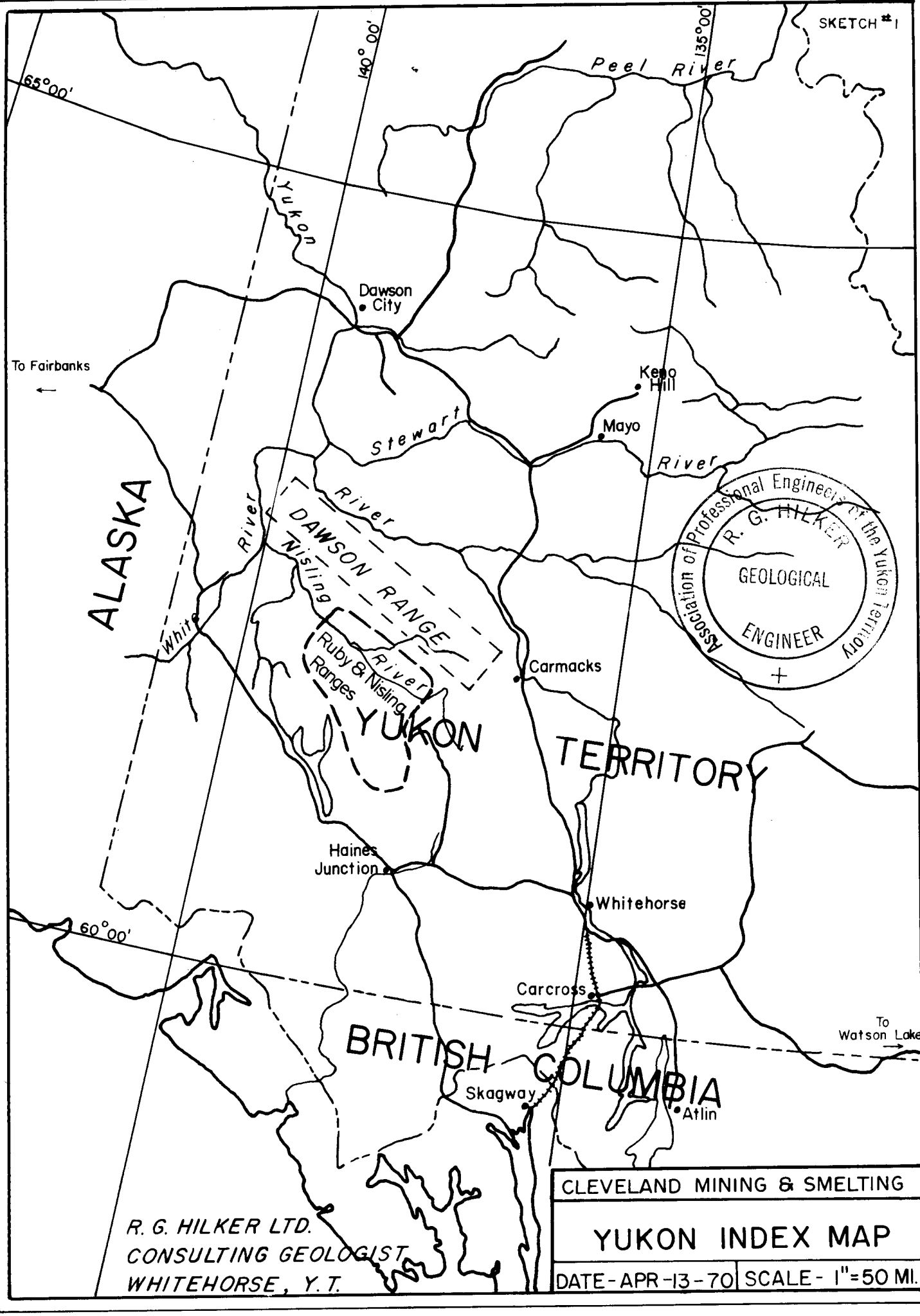
WHITEHORSE, Y.T.
SHEET 115-J-10
CLEVELAND MINING & SMELTING
LOCATION SKETCH
CUB CLAIMS
DATE: AUG 10/70
SCALE: 1" = 2mi.


SKETCH #1
65°00'
140°00'
135°00'
Peel River
Yukon
Dawson City
To Fairbanks
Keno Hill
Mayo
Stewart River
River
River
DAWSON RANGE
Nisling
White
ALASKA
Ruby & Nisling Ranges
River
YUKON TERRITORY
Carmacks
Haines Junction
Whitehorse
60°00'
Carcross
To Watson Lake
BRITISH COLUMBIA
Skagway
Atlin
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WHITEHORSE, Y.T.
CLEVELAND MINING & SMELTING
YUKON INDEX MAP
DATE - APR - 13 - 70
SCALE - 1" = 50 MI.

CLAIMS

The following information on the CUB claim group was obtained from the records in the Whitehorse Mining Recorder's Office on August 18th, 1970:

Claim	Grant Nos.	Anniversary Date	Recorded Owner
CUB 2-16	Y44539-Y44553	15 December 1970	Cleveland Mining & Smelting Co.Ltd.
CUB 18-36	Y44554-Y44572	15 December 1970	Cleveland Mining & Smelting Co.Ltd.
CUB 37-44	Y53533-Y53540	14 July 1970	S. Zimmer
CUB 45-48	Y53541-Y53544	14 July 1970	G. Carlson

The CUB 37-48 claims were staked on July 1st, 1970 and recorded on July 14th, 1970. The claims are to be transferred to Cleveland Mining & Smelting Co. Ltd.

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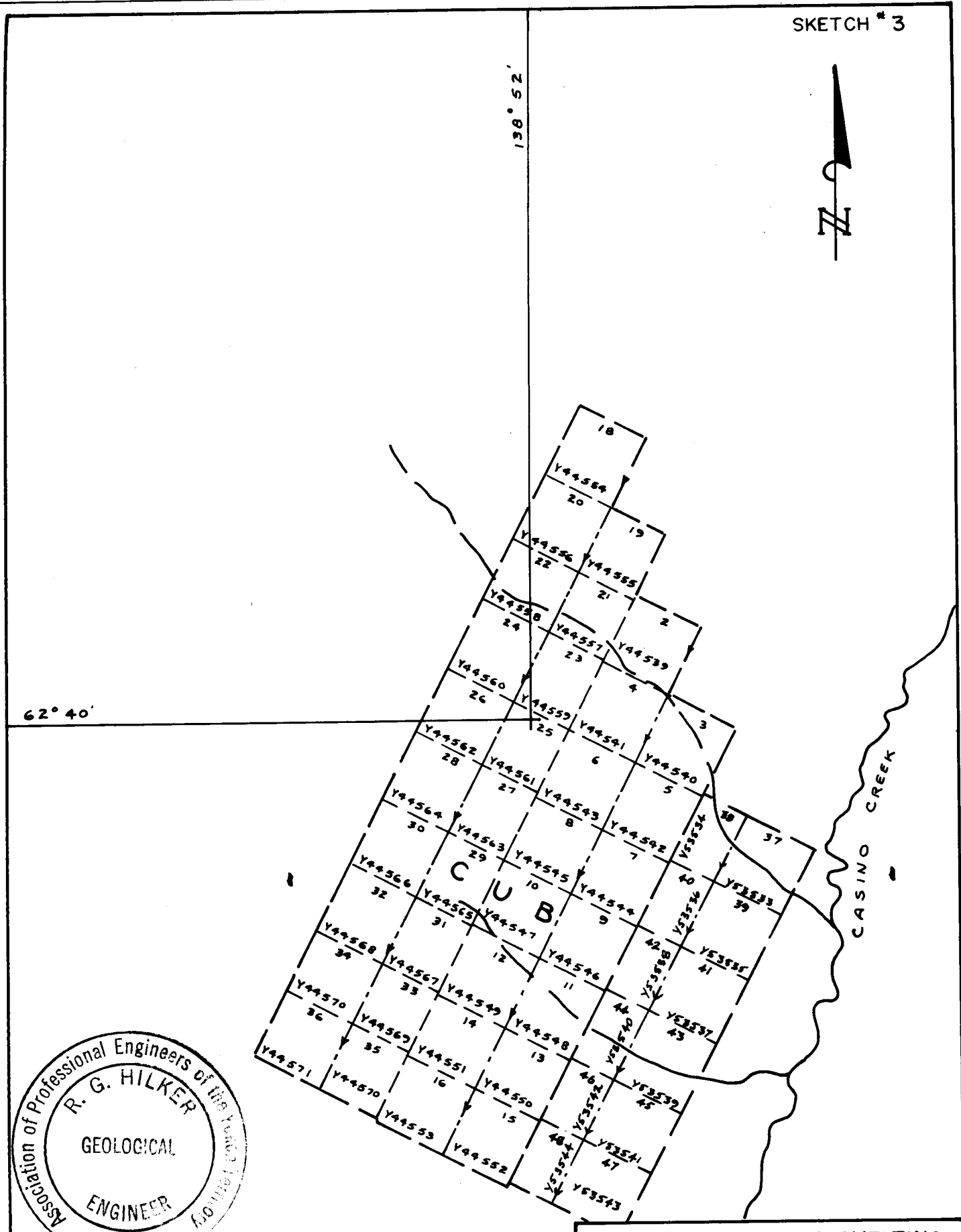
SKETCH # 3



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WHITEHORSE Y.T.

CLEVELAND MINING & SMELTING	
CLAIMS LOCATION PLAN CUB GROUP	
DATE - MAR - 31 - 70	SCALE - 1" = ½ MI.

GENERAL GEOLOGY

The Dawson Range occurs in the physiographic Yukon Plateau Province. It is a mountainous terrain, with peaks rising more than 2000 feet from the level of the plateau, and elevation within the range varying from 3000 feet to 6600 feet. Almost all of the area has been left completely untouched by recent glaciation. Thus, the outcrops, which predominate on the mountain tops and ridges, are quite irregular. They are very jointed, fractured and highly weathered due to frost heaving and wind erosion. Overburden may reach thicknesses greater than 50 feet in the lower areas, restricting outcrop occurrences to the steeper valley slopes.

The predominant rocks in the area consist of the Upper Cretaceous Coastal Intrusive granites which form a batholith intruding the Yukon Group of sediments, Precambrian in age. These are also in contact with the Jurassic Mount Nansen group of volcanics and sediments. The Tertiary Carmacks volcanics overlie all of the earlier rocks in some areas.

The following is a general summary of the granitic rock types which occur in the Coast Range intrusive:

1. Granite Porphyry - composed of 40% orthoclase felspar and 30% smoky quartz with biotite, augite and minor magnetite. Generally jointed and fractured and weathers a rusty brown color.

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2. Granodiorite Porphyry - composed of 50 to 60% orthoclase feldspar, 10 to 15% plagioclase feldspar, 15% clear quartz, augite, biotite and minor magnetite. Occurs in the Casino Creek area and is characterized by large phenocrysts.
3. Granodiorite - composed of 60% orthoclase feldspar and 20% plagioclase feldspar with augite and biotite. Fine to medium-grained texture.
4. Diorite - composed of plagioclase and orthoclase feldspar with approximately 30% augite and biotite.
5. Quartz Monzonite - composed of 50% plagioclase feldspar, 10 to 15% orthoclase feldspar, 15% clear quartz, augite and fine to coarse crystalline biotite.

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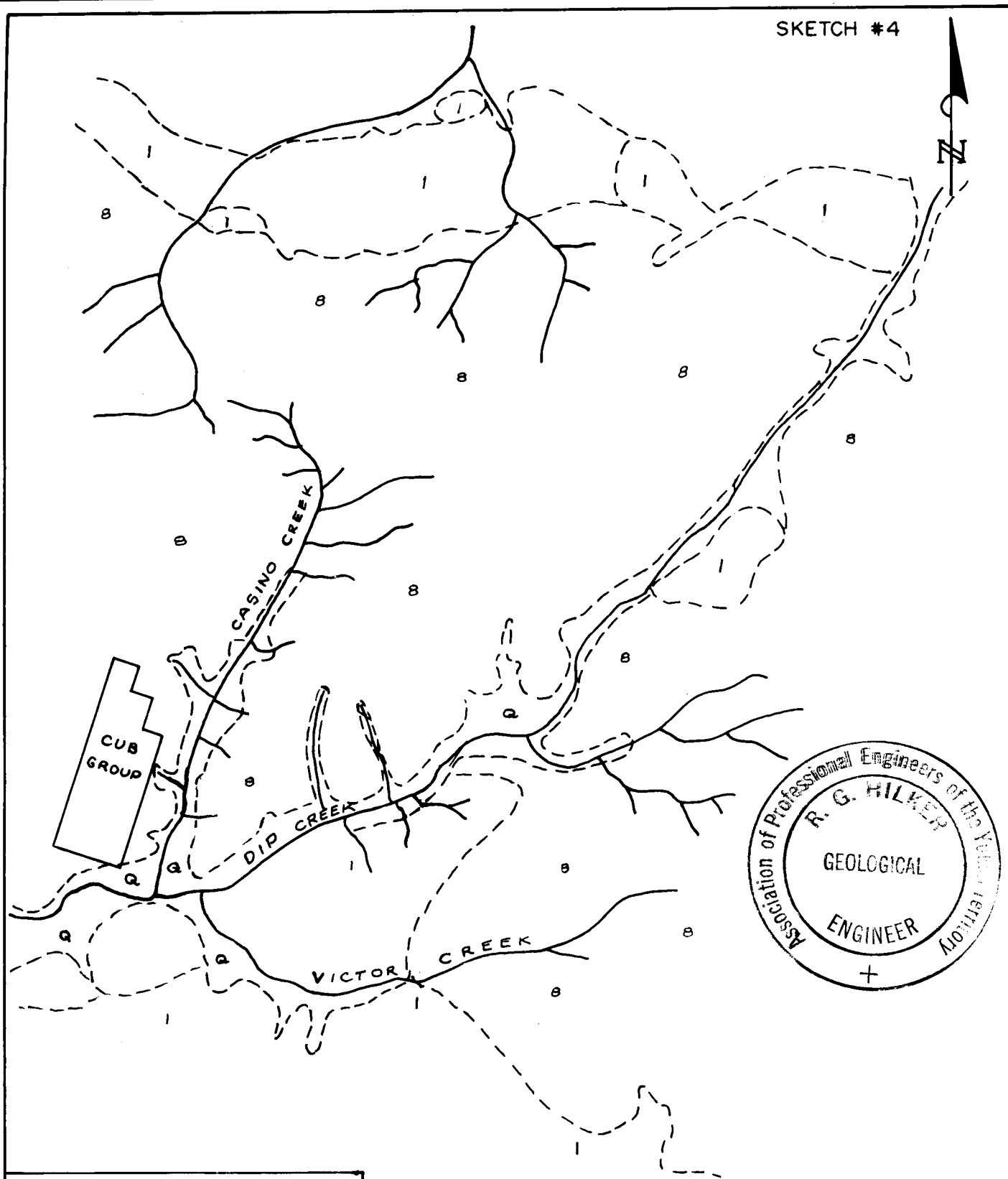

LEGEND

CENOZOIC

RECENT

Q ALLUVIUM

MESOZOIC

JURASSIC - UPPER CRETACEOUS

8 GRANITE (COASTAL INTRUSIVE)

TRIASSIC

2 GRANITE

PRECAMBRIAN

1 YUKON GROUP

AFTER CAIRNES

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CLEVELAND MINING & SMELTING

CUB GROUP
GENERAL GEOLOGY

DATE - MAR-31-70 | SCALE - 1" = 2 MI.

CLAIM GEOLOGY

The 34 claims comprising the CUB group are situated within the Dawson Range Batholith, consisting primarily of granitic intrusives. The CUB claims cover an area whose major rock-type is a hornblende granodiorite or hornblende-quartz diorite. The granodiorite contains minor small inclusions or roof pendants of the Palaeozoic-Precambrian Yukon Group and also contains small plugs or stocks of more acid intrusives. An area of gabbro was also noted, which is thought to be a segregation product from the same magma which produced the granodiorite rather than a secondary phase of igneous activity.

The granodiorite (Unit 2) on the claim group is readily recognized and is characterized by the presence of hornblende phenocrysts (average size: 1/8" x 3/8"). Megascopic examination in the field has given the following as an average composition:

20-25% hornblende (phenocrysts)
15-20% quartz
15-20% plagioclase
30-35% orthoclase
10% biotite

In several instances, a preferred orientation and sub-parallel alignment of the hornblende and biotite was observed, giving the intrusive a slightly gneissic texture. Some jointing was observed in the grancdiorite, but the outcrops were noted to be displaced slightly due to weathering and frost action and the general trend, if any, was not apparent.

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Gabbro (Unit 3) was observed in only one area of the grid. Megascopic examination in the field gave the following composition:

35-40% hornblende
30-40% plagioclase
20-30% orthoclase
-05% quartz

The gabbro is generally coarse-grained with only a very slight preferred orientation evident. The transition from the granodiorite to the gabbro appears to be gradual, hence the assumption that the gabbro is a segregation product rather than the emplacement of another igneous body.

The granite/rhyolite of Unit 4 may be considered in two ways. As no outcroppings of the rock types were found and only boulders mapped, the unit may be considered a plug or stock within the granodiorite, or the rock types may be the product of a swarm of acid dikes within the granodiorite. The hypothesis of a dike swarm is feasible as the granite/rhyolite is more resistant to weathering than the granodiorite which would decompose leaving the granite/rhyolite as larger fragments in the residual soil. Megascopic field examination has yielded the following composition for Unit 4:

20-40% quartz
5-15% plagioclase
50-60% orthoclase
to 5% mafic minerals

Texturally, the rock type varies between rhyolite and fine-grained granite.

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The "gossan" zone located in the vicinity of Line 60 South at 18 West is associated with and appears to be part of Unit 4. The gossan is a limonite-rich variety with occasional small zones of secondary carbonate (calcite) and manganese staining. No sulfides were observed in the field. Occasional fragments of the gossan were noted with prominent slickensides, indicating faulting in the area.

Evidence of a basalt porphyry was found on Line 60 South at 12 West. The discovery consisted only of a few fragments mixed with boulders and fragments of granodiorite. The rock type (Unit 5) has the appearance of amygdaloidal basalt, but closer examination reveals that the "amydgules" are plagioclase phenocrysts.

The Yukon Group (Unit 1), consisting of crystallized quartzite with minor phyllite, was noted in the vicinity of the western extremities of Lines 100 South and 104 South. The exposure showed considerable metamorphism to the extent that the original bedding planes were only occasionally visible.

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GEOCHEMICAL SURVEY

INTRODUCTION

The systematic sampling of soils and the subsequent analysis of these samples for trace amounts of copper and molybdenum has been successfully used throughout the Cordilleran region in the search for porphyry-type copper-molybdenum mineralization. This success has been extended to the Dawson Range, where several mineralized zones, including the Casino Silver Mines deposit, have been outlined by this technique.

For the successful application of a soil sampling survey, however, a careful study of all factors which might affect the geochemical characteristics of the soils, referred to here as the geochemical environment, must be undertaken. This environment is defined mainly by the characteristics of the soil. Basically, two distinctly different environments exist in the Dawson Range area, which are described below.

The "slope" environment exists mainly on slopes steeper than 5° and on the hill and ridge tops. The soil is residual or it has been transported a short distance down slope, and is composed mainly of weathered granite. A thin layer of humus and partially decomposed organic material may form the surface horizon. Vegetation may be completely lacking, but generally moss, grass and buckbrush are prominent, with minor spruce. Drainage in these areas is good, due to the slope and the general permeability of the soils.

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The "bench" environment, by far the most predominant in this area, occurs over most of the flat or gently sloping areas. Here a thick humus, almost muskeg layer, has developed over the underlying soils. Drainage is poor, and the ground is often frozen quite close to surface. Vegetation consists of thick moss and grass with buckbrush and minor spruce. The underlying soils consist of alternating clay-rich and sand-rich horizons, which are partly colluvial (transported by gravity) and partly alluvial (transported by water).

Soil sampling conditions in "slope" areas are generally very good, except on very steep slopes where talus may be abundant. The "bench" environment, however, presents sampling difficulties. The humus layer is often very thick and hard to penetrate, especially if it is frozen at depth. A meaningful sample from this area, though, must be completely humus-free. As a result, during the survey, several "No Sample" stations were encountered. Here, the ground in the vicinity of the station is either frozen or swampy, and a humus-free sample could not be obtained.

The soil samples are all taken from the upper "C" soil horizon, or the layer directly beneath the surface humus-rich "A" horizon. As the soils in this area have been transported only a short distance from the parent bedrock source, the samples collected are expected to reflect fairly accurately metal abundances in bedrock in the general vicinity.

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After collection, samples were wired in strings of 30 to 40 samples, partially dried, and then packed in burlap sacks for shipment to Whitehorse. At Whitehorse, the samples were crated and sent via C.P. Air freight to Chemex Labs in North Vancouver, where they were analyzed for copper and molybdenum.

The analytical procedure at Chemex Labs consists of drying and sieving the samples, saving the -80 mesh fraction. One gram of this fraction is digested using perchlorate and is then dissolved in hot aqua regia. This solution is evaporated to dryness overnight. The residual is dissolved in hydrochloric acid and this solution is brought to volume for final analysis. The solution is run for copper and then molybdenum (using the Loring method) on a Techtron AA-5 Digital atomic absorption unit. Results were returned to Whitehorse by First Class Mail.

Certificates of Analysis, for all soil samples tested, from Chemex Labs Limited in North Vancouver, are on file in the office of R.G. Hilker Limited, #8 Northern Metalic Bldg., Whitehorse, Y.T.

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TOPOGRAPHY, VEGETATION AND SOILS

The crosslines of the grid are roughly paralleled by three major ridges and two valleys containing small creeks which flow into Casino Creek to the east. Smaller ridges parallel the major features.

Soils and vegetation may be roughly linked to the topography. Since the area has not been glaciated, the soils are more or less residual. The only exceptions here are on the lower slopes, where creep and solifluction have transported soils down slope, and in the valleys, where minor sandy alluvial deposits occur.

The ridge tops, south slopes and upper north slopes are generally quite similar. These areas fall under the "slope" environment classification. Vegetation consists of stunted spruce, poplars, birch, low-growing willows and buckbrush. The ground is thinly covered with low-growing shrubs and minor areas of moss with some grassy patches. Soils are characterized by a generally thin humus layer followed by sand and often abundant small angular boulders of resistant bedrock material. Clay is also evident and may form a substantial layer between the humus and sand layers. This soil profile is more fully described under "Test Pits".

The valley floors, upland depressions and lower north-facing slopes, classified as "bench" environment, consist of muskeg to sub-muskeg areas. Vegetation is limited to

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very stunted spruce on the borders, low-growing willows and alders, buckbrush, and generally thick grass and moss. The ground is usually water-saturated. Upper soils are mainly humus with intermixed clay at depth and frequent thin layers of probably alluvial sand. In some areas, especially on the lower slopes, clay-rich residual sands may be reached at 12 to 18-inch depth. On north-facing slopes, particularly where moss is very thick, frozen soil is encountered at a depth of approximately one foot. This may indicate permafrost below. The sample material collected from these areas is of relatively poor quality, with a high clay and humus content.

The soil pH survey indicated that the soils in this area are slightly acidic and show very little variation. Samples with pH less than 5 are not abundant and appear in areas where sampling conditions are poor and humus comprises some of the sample material.

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TEST PITS

Test Pit #1 (Sketch No. 5) was dug adjacent to camp near the base of a south-facing hillside. The soil here is obviously residual, with little evidence of solifluction or soil creep. The soil profile, when compared with pH, Cu and Mo values, shows very little information. High Cu and low Mo should correspond with a higher pH, but as the pH values are not extreme, this correlation is not evident. Low pH and high Cu are caused by the humus and organic-rich surface "A" horizon. Below this, one slightly clay-rich horizon gives low Cu and a trace of Mo. Otherwise there is a very gradual increase of metal concentration with depth, a phenomenon typical of residual soils.

Test Pit #2 (Sketch No. 6) located on the grid at 73+50S; 8+20E, shows a much more interesting profile. Due to mud flows, the residual soil in this area has been covered with alternating clay-rich and sand-rich layers. The residual soil below this has even maintained some of its original granitic texture, and crystals of biotite, feldspar and quartz are very evident. Generally, both pH and the Cu concentration increase with depth, while the Mo concentration is very low and irregular. The two recorded Mo values are associated with horizons of slightly lower pH and, as in Test Pit #1, with clay-rich soils. The Cu concentrations do not appear to vary appreciably with

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pH, but are higher in the clay-rich horizons and lower in the well-drained sand and gravel-rich horizons. Zones of oxidation, indicated by a reddish soil color, do not have a consistent effect on Cu P.P.M.

It is evident from this study that the best sampling medium would be the residual soil, below any clay or sand horizons, where trace Cu concentrations are relatively high and do not vary greatly with depth. However, this is impossible due to the great depth at which this soil lies in most areas. The alternative chosen for this survey was a relatively shallow sample, in the upper "C" horizon. This sample, brown to yellow-brown in color and consisting of equal parts sand and clay, with minor gravel, was taken wherever possible. The test pit values, assuming they are representative of background, indicate that copper concentrations from 10 to 30 parts per million and non-detectable molybdenum concentrations will be typical of most of the samples.

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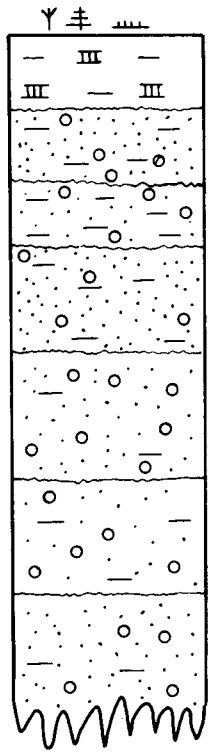
CUB TEST PIT 1

location - campsite

Sample number	Color	Sample Depth (inches)
C-1	br.bl.	2
C-2	br.y	6
C-3	br.	9
C-4	br.	13
C-5	br.r.y.	20
C-6	br.r.	26
C-7	br.	32



LEGEND

Vegetation

- deciduous trees
- conifers
- grass

Soil Composition

- clay
- sand
- gravel
- humus

Soil Color

- br. brown
- bl. black
- r. red
- y. yellow

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CLEVELAND MINING & SMELTING

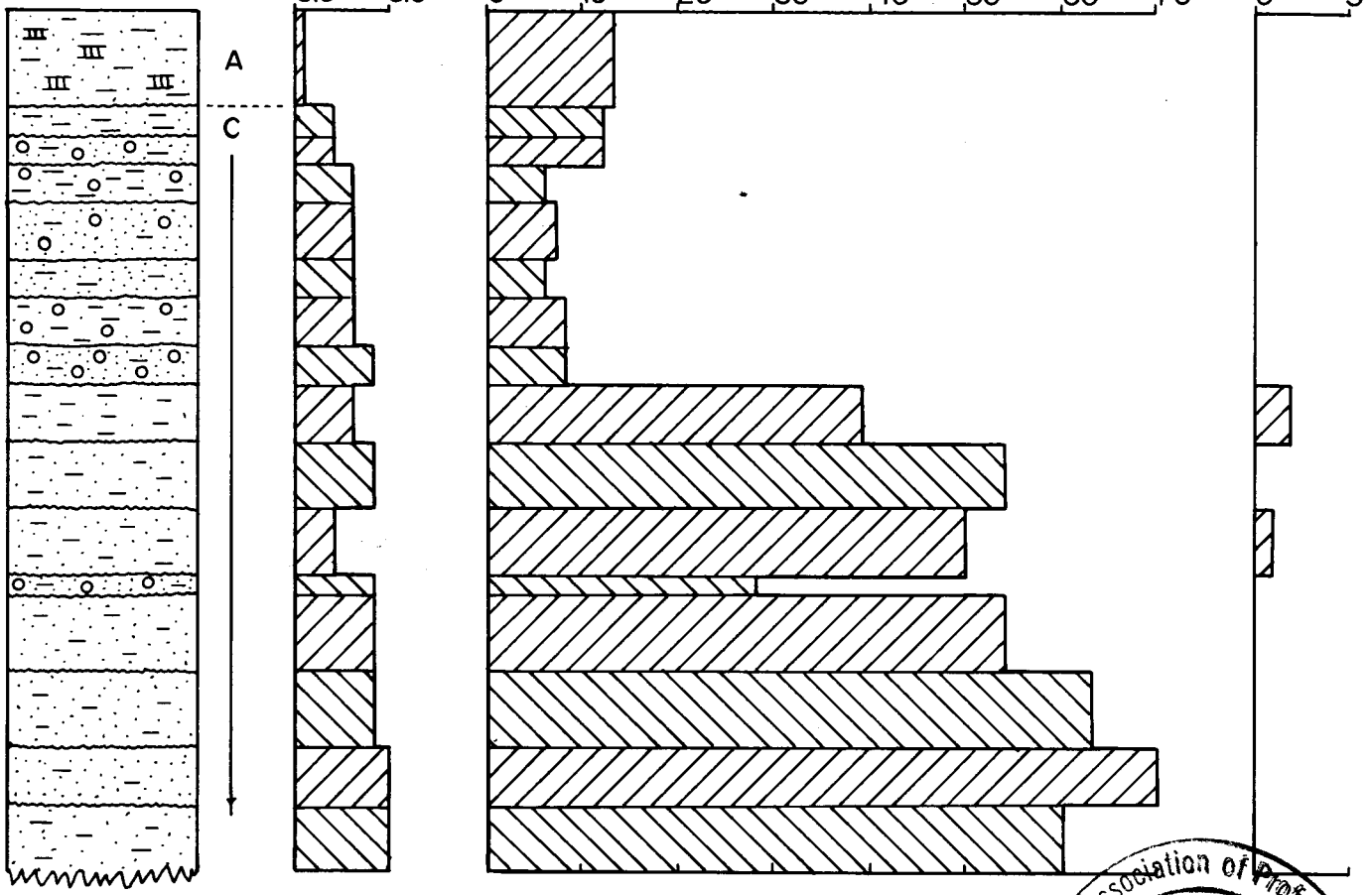
CUB TEST PIT #1

DATE: AUG. 24/70 | SCALE: AS SHOWN

SKETCH # 5

CUB TEST PIT 2

location - 8+20E; 73+50S



LEGEND

Vegetation

- deciduous trees
- coniferous trees
- grass

Soil Composition

- clay
- sand
- gravel
- humus

Soil Color

- br. brown
- bl. black
- gr. grey
- r. red
- y. yellow

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WHITEHORSE, Y.T.

CLEVELAND MINING & SMELTING

CUB TEST PIT # 2

DATE: AUG. 24/70

SCALE AS SHOWN

Association of Professional Engineers of the Yukon Territory
R. G. HILKER
GEOLOGICAL ENGINEER

SKETCH # 6

INTERPRETATION

As indicated by the test pit surveys, most of the soils analyzed contain less than 30 P.P.M. copper and less than 2 P.P.M. molybdenum. Although there are several scattered and minor exceptions to this, there is only one larger continuous zone of anomalous metal values on the grid. This anomaly is centred on the baseline at 112+00S. Both copper and molybdenum values are high in this region. The copper values have been contoured on the accompanying Geochemical Survey Map. The anomaly appears to be a downslope reflection of a bedrock source of copper and molybdenum ions, as the higher values are more abundant in areas of concentrated run-off and the anomaly is pinched off in ridge areas.

The nature of this anomaly, with only moderately high trace metal concentrations and relatively limited extent, makes it a low grade target. Several possible causes for this anomaly are suggested by the geology.

Firstly, it is quite evident that the source of the metal ions is the bedrock within the claim group in this general area, and probably only a short distance upslope from the major centres of the anomaly. As this is near the top of a major ridge in the area, and glaciation does not appear to have affected the area in any way, metal contamination in the soils of this area appears very unlikely.

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The nature of the source of the metal ions in an anomaly of this nature becomes a perplexing problem. Structural activity has been observed in outcrop, and faulting may have been followed by minor copper and molybdenum mineralization. All four rock types occur in this area, and excessive trace amounts of copper and molybdenum localized in any of these could conceivably cause an anomaly such as this. Pendants of Yukon Group sediments within the large intrusive are particularly susceptible to this type of mineralization, perhaps as a minor skarn zone.

In order to more fully evaluate this anomaly, a detailed survey is necessary over the area. This would involve more closely-spaced sample stations and deeper sample holes. Sampling at a consistent depth of approximately three feet, in mainly unaltered true residual soils, using a hand auger, should provide more accurate information on not only the size but also the intensity of any mineralized zone present in the area.

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CONCLUSIONS

The CUB claim group is situated over a small portion of the Dawson Range Batholith, which consists of a hornblende granodiorite or quartz diorite in the vicinity of the claim group. The major intrusive contains small inclusions or roof pendants of metamorphosed Yukon Group sediments. Local areas of gabbro were noted and are thought to be segregation products of the original intrusive body. Areas of rhyolite and fine-grained granite were observed as residual material and the areas or zones may either represent a plug or a concentration of small dikes. A small zone of basalt porphyry was located, which may either represent a small area of the Carmacks Volcanics or a basic dike. One area of limonite staining, loosely termed a gossan, was observed and mapped, but no sulfides were visible in the field and the "gossan" was not anomalous in the geochemical analysis. Alteration, other than normal surface weathering, was not conspicuous in the claims area.

Soil sampling has indicated a low-order anomaly centered on the baseline on Line 112+00S. The zone appears to trend almost east-west for approximately 3000 feet. Contoured values range from 20 to a maximum of 82 P.P.M. copper. Molybdenum values are uniformly zero except in the vicinity of the area of the copper anomaly, where values to 12 P.P.M. may be obtained. The cause of the anomalous values is unknown. The values might possibly reflect a zone of mineralized shears, a small intrusive

.../23

body, or a weakly mineralized portion of the granodiorite. Further work will be required before any positive statements may be made as to the significance of the anomalous values.

.../24

RECOMMENDATIONS

Additional soil sampling on a detailed grid, followed by an induced polarization survey if warranted, is recommended to evaluate the anomalous area outlined by the present sampling. Intermediate grid lines should be cut between the existing lines starting at 78+00S and continuing to 134+00S and the lines should be sampled on 100-foot intervals using an auger to sample material well into the "C" horizon. The existing lines from 76+00S to 136+00S should be re-sampled with the auger to give continuity to the survey. All samples should be analyzed for copper, molybdenum and lead. If results from the soil sampling warrant, an induced polarization survey, employing both 100 and 400-foot electrode intervals, is recommended. With careful planning and scheduling, costs may be kept to a minimum by utilizing aircraft in both directions (pulling one crew out on the same day a second crew is sent in).

The following is an estimate covering a two-stage project of soil sampling followed by geophysics, if warranted, on the CUB claim g[illegible]

Linecutting (16 li[illegible]les @ $85.00)		$ 1,360.00
Geochemical Survey [illegible] sampling with auger):		
Re-sample 17 lin[illegible] @ $100	$1,700.00	
Sample 16 linemil[illegible] $100	1,600.00	
Analysis (1,716 sa[illegible] for copper, moly, lead @ $1.[illegible])	2,830.00	
Sample shipping	100.00...	6,230.00
Camp Equipment Rental		600.00

.../25

Radio Rental	$ 150.00
Transportation	2,500.00
Camp Supplies (food, etc.)	600.00
Report Preparation	1,000.00
TOTAL	$12,440.00

Induced Polarization Survey (if warranted):

Induced Polarization Survey (17 linemiles @ $350.00)	$5,950.00
Transportation	500.00
Camp Supplies	500.00
Report	500.00
TOTAL	$7,450.00

Total Program - Geochemistry and Geophysics $19,890.00

SUMMARY OF EXPENDITURES

The following costs were incurred during the evaluation program carried out on the CUB claim group between May 12th, 1970 and August 27th, 1970 (invoices are included in Appendix of this report):-

Transportation:		
Fixed-wing aircraft	$1,983.05	
Helicopter	539.89	
Truck	105.00	$ 2,627.94
Camp Rental		600.00
Radio Rental		250.00
Camp Supplies (food & misc.)		654.60
Professional Fees (expediting, misc. drafting, geological consulting, etc.)		1,264.17
Miscellaneous (telephone, etc.)		12.00
Geochemical Survey:		
Soil Sampling (40.9 linemiles) ...	$3,500.00	
Geochemical Analysis	2,587.20	
Sample Shipping Charges	85.96	6,173.16
Geological Mapping		2,400.00

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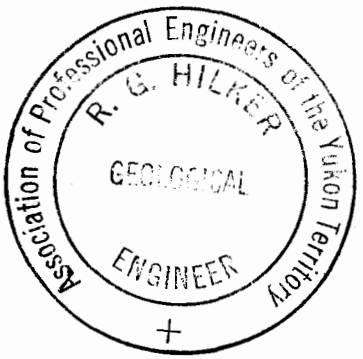
Linecutting (40.9 linemiles @ $85)		$ 3,476.50
Report Preparation:		
Drafting	$225.00	
Typing, map printing, etc.	200.00	
Report writing	800.00	1,225.00
TOTAL EXPENDITURES claimed for assessment purposes:		$18,683.37

CERTIFICATION OF EXPENDITURES

I, ROBERT G. HILKER, P.Eng., do hereby certify that the statement of costs incurred during the geological-geochemical evaluation of the CUB claim group as stated above is a true statement to the best of my knowledge.

R. G. Hilker

Robert G. Hilker, P.Eng.
Whitehorse, Yukon Territory
August 27th, 1970



CERTIFICATION

I, ROBERT G. HILKER of #6 Chalet Crescent, Hillcrest, in the City of Whitehorse, in the Yukon Territory, DO HEREBY CERTIFY:

1. THAT I am a Consulting Geologist, with an office located at #8 Northern Metalic Building and postal address P.O. Box 566, in the City of Whitehorse, in the Yukon Territory.

2. THAT I am a graduate of the Michigan Technological University located in Houghton, Michigan, U.S.A., where I obtained a Bachelor of Science degree in Geological Engineering (Exploration Option) in 1962.

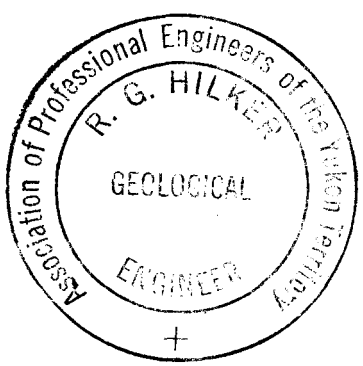
3. THAT I am a registered member in good standing of The Association of Professional Engineers of the Yukon Territory.

4. THAT I have practised my profession as an engineer and geologist for the past eight years.

5. THAT I have personally supervised the geological-geochemical evaluation conducted by G.S. Zimmer and G.G. Carlson, geologists, on the CUB 2-16 and CUB 18-36 claim group in the Whitehorse Mining Division of the Yukon Territory, from June 28th to July 6th, 1970.

6. THAT neither I nor G.S. Zimmer and G.G. Carlson have any direct or indirect interests in any of the mineral claims, or in any of the securities held by Cleveland Mining & Smelting Co. Ltd. (N.P.L.), nor do we expect to receive any.

DATED this 27th day of August, A.D. 1970.



R. G. Hilker

R.G. Hilker, P.Eng.

APPENDIX

EASTERN ASSOCIATES REG.'D.
BOX 3245
WHITEHORSE, Y.T.

Re: Cleveland Mining & Smelting Co. Ltd. (Cub Claim Group)

In Account With: R.G. Hilker Ltd.
P.O. Box 566
Whitehorse, Yukon

Linecutting - 40.90 miles, @ $85.00 per mile	$ 3,476.50
Rec'd on account	2,000.00
Balance Due	$ 1,476.50

25+00W TIE LINE

20+00W TIE LINE

15+00W TIE LINE

10+00W BASE LINE

BASE LINE

BASE LINE BEARING 44°00'

15+00E TIE LINE

20+00E TIE LINE

35+00E TIE LINE

40+00E TIE LINE

CREEK

CUB 1 Y44539

CUB 2 Y44539

CUB 3 Y44540

CUB 4 Y44541

CUB 5 Y44542

CUB 6 Y44543

CUB 7 Y44544

CUB 8 Y44545

CUB 9 Y44546

CUB 10 Y44547

CUB 11 Y44548

CUB 12 Y44549

CUB 13 Y44550

CUB 14 Y44551

CUB 15 Y44552

CUB 16 Y44553

CUB 18 Y44554

CUB 19 Y44555

CUB 20 Y44556

CUB 21 Y44557

CUB 22 Y44558

CUB 23 Y44559

CUB 24 Y44560

CUB 25 Y44561

CUB 26 Y44562

CUB 27 Y44563

CUB 28 Y44564

CUB 29 Y44565

CUB 30 Y44566

CUB 31 Y44567

CUB 32 Y44568

CUB 33 Y44569

CUB 34 Y44570

CUB 35 Y44571

CUB 36 Y44572

CASH 13 Y44138

CASH 14 Y44139

POST #1 ML 1 & 28

POST #1 TD 55

POST #1 TD 53

POST #1 BARB 23-24
POST #2 BARB 21-22

POST #2 BARB 19-20

POST #2 BARB 17-18
POST #1 BARB 19-20

POST #2 BARB 7-8

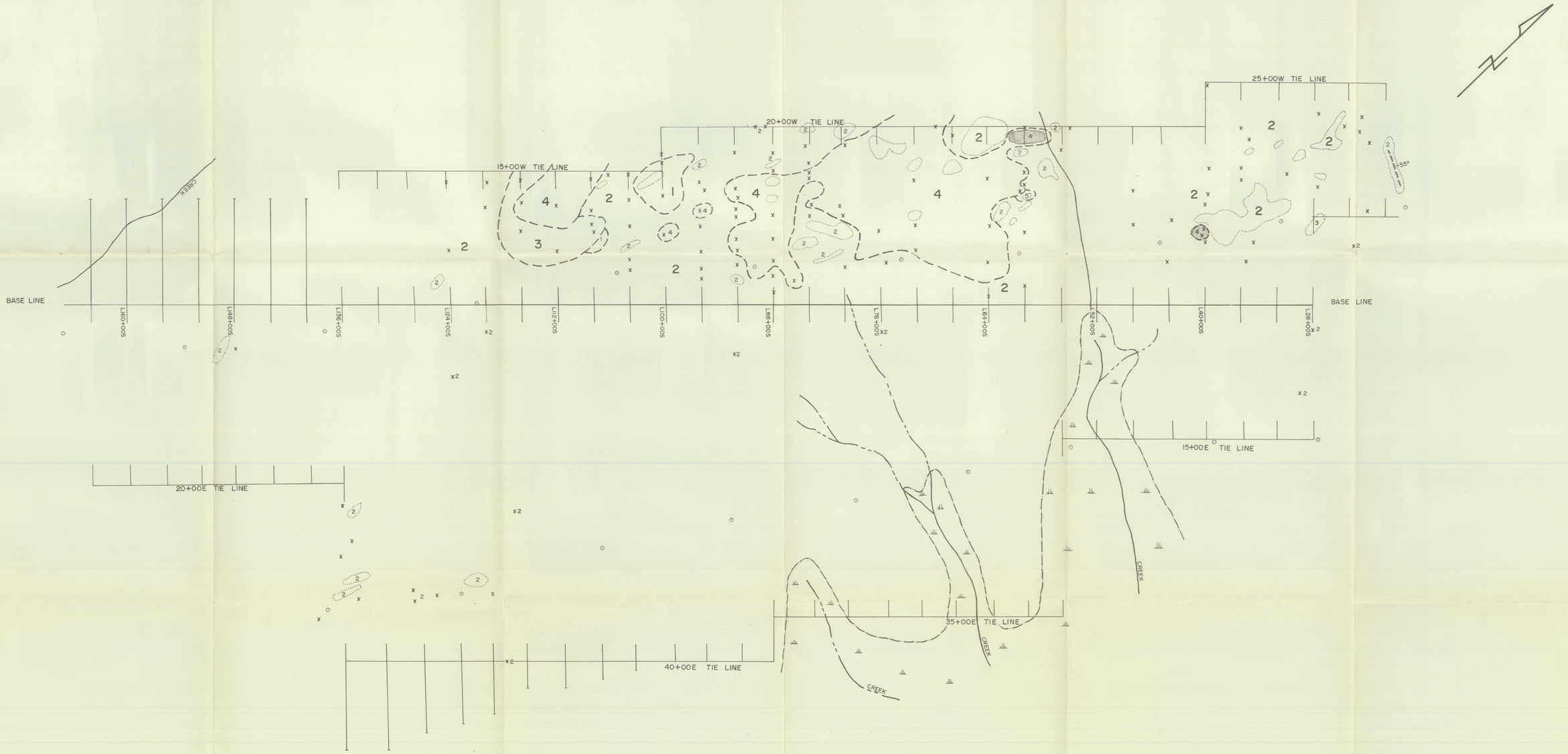
HELICOPTER LANDING AREA

CAMPSITE

R.G. HILKER LTD.
CONSULTING GEOLOGIST
WHITEHORSE, Y.T.

Association of Professional Engineers of the Yukon
R. G. HILKER
GEOLOGICAL
ENGINEER

CLEVELAND MINING & SMELTING CO. LTD. (N.P.L.)
LINECUTTING GRID SHOWING CUB CLAIMS
SHEET 115-J-10
DATE: JUNE 9, 1970 | SCALE: 1" = 400'



GEOLOGICAL LEGEND

- 5 Basalt porphyry
- 4 Granite, rhyolite
- 3 Gabbro
- 2 Hornblende granodiorite, quartz diorite
- 1 Yukon Group: quartzite, schist, phyllite

- fault
- outcrop
- individual boulders
- geological contact (assumed)
- claim post
- swamp, muskeg
- gossan

Association of Professional Engineers of the Yukon Territory
R. G. HILKER
GEOLOGICAL ENGINEER

R.G. HILKER LTD.
CONSULTING GEOLOGIST
WHITEHORSE, Y.T.

SHEET 115-J-10

CLEVELAND MINING & SMELTING CO. LTD. (N.P.L.)

GEOLOGY - CUB CLAIMS

DATE: JULY 21, 1970 | SCALE: 1" = 400'

BASE LINE

BEARING 44°00'

L16+00S L15+00S L14+00S L13+00S L12+00S L11+00S L10+00S L9+00S L8+00S L7+00S L6+00S L5+00S L4+00S L3+00S L2+00S L1+00S

15+00W TIE LINE

20+00W TIE LINE

25+00W TIE LINE

10+00W BASE LINE

20+00E TIE LINE

15+00E TIE LINE

40+00E TIE LINE

35+00E TIE LINE

NOTE: Copper values are shown to the left, and moly to the right as in 34/3. Along the baseline copper values are to the west and moly to the east. All values are in parts per million.

Association of Professional Engineers of the Yukon Territory
R. G. HILKER
GEOLOGICAL ENGINEER

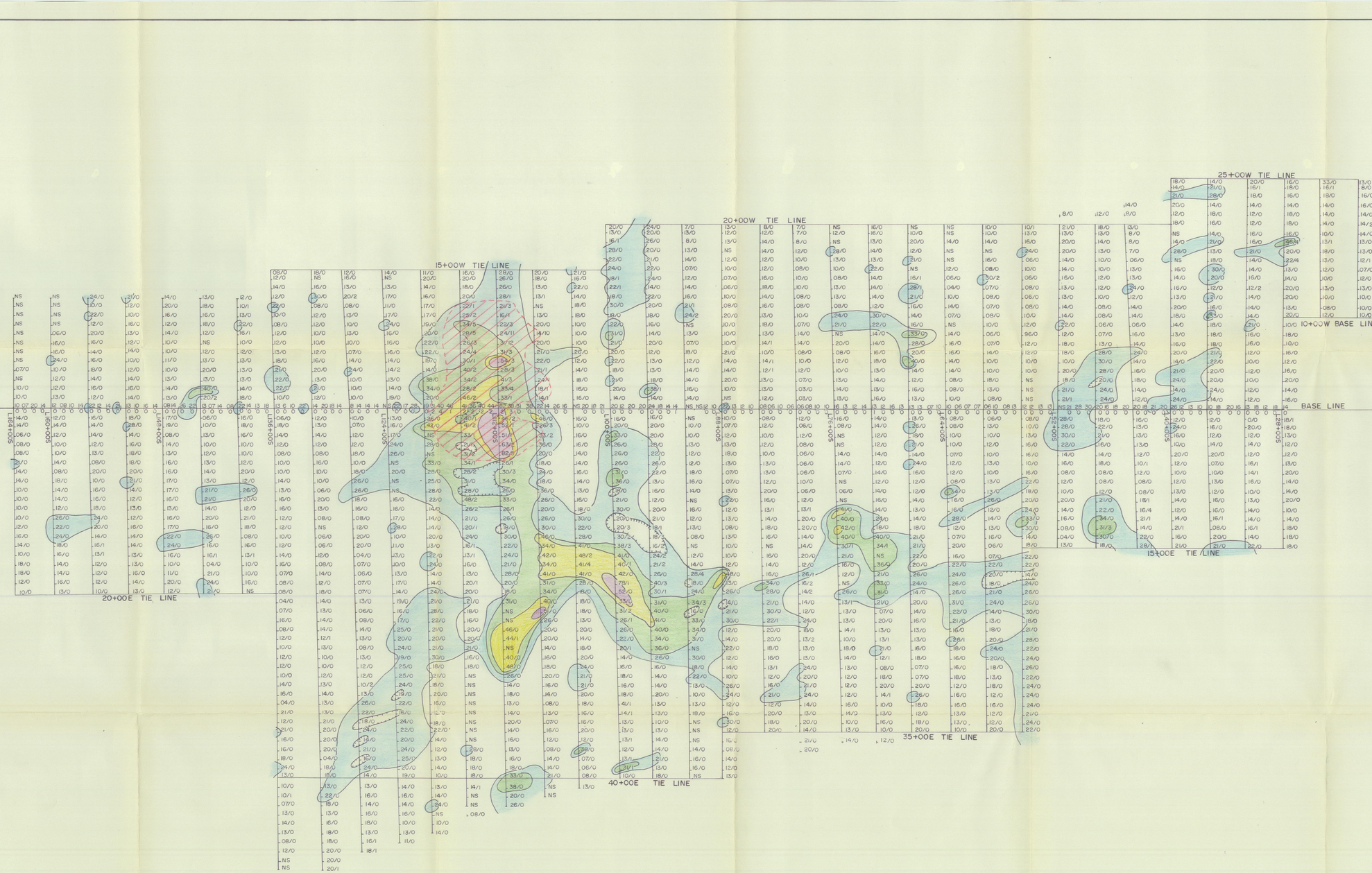
R.G. HILKER LTD.
CONSULTING GEOLOGIST
WHITEHORSE, Y.T.

CLEVELAND MINING & SMELTING CO. LTD. (NPL)

GEOCHEMICAL SURVEY - COPPER/MOLY
CUB CLAIMS
SHEET 115-J-10

DATE: JULY 21, 1970

SCALE: 1" = 400'



NOTE: Copper values are shown to the left, and moly to the right as in 34/3. Along the baseline copper values are to the west and moly to the east. All values are in parts per million.

NOTE: Copper values in excess of 21 p.p.m. are contoured in intervals of 10 p.p.m.

Association of Professional Engineers of the Yukon Territory
R. G. HILKER
GEOLOGICAL
ENGINEER

R.G. HILKER LTD.
CONSULTING GEOLOGIST
WHITEHORSE, Y.T.

CLEVELAND MINING & SMELTING CO. LTD. (NPL)

GEOCHEMICAL SURVEY - COPPER/MOLY
CUB CLAIMS
SHEET 115-J-10

DATE: JULY 21, 1970
SCALE: 1" = 400'