Box 8

GEOLOGICAL RECONNAISSANCE
SOUTH CARIBOO
P.N. 123
1971
N.T.S. 92-P

Vancouver, B.C.
January 1972

S. Pilcher
W. Howell

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I. INTRODUCTION

The areas covered during the 1971 field season are indicated on the index map (Figure 1). Extensive reconnaissance was carried out in the central part of the Taseko Lake map sheet (A), and in the Young Lake, Bridge Lake, and Bonaparte Lake area (B). Limited reconnaissance was also done over a small area in the northwest part of the Nicola map sheet (C). Property examinations were made at Poison Mountain (D), Harper Creek (E), Granite Mountain (F), Canim Lake (G), Williams Lake (H), and Spout Lake (I). Nothing of any particular interest developed as a result of the above investigations.

A considerable amount of work was also done on the Murphy Lake property which was described in a separate 1970 report dated March 1971. The program at Murphy Lake included line cutting, EM-16 and magnetometer surveys, an I.P. survey, and diamond drilling. The details of this work will be included in a separate report.

A total of four men were employed on South Cariboo reconnaissance during the 1971 field season. One crew, consisting of the writer and Mr. M. McPhail, did the reconnaissance work on the Taseko Lake and Nicola map sheets and made the property examinations listed. The writer also supervised the diamond drilling at Murphy Lake during the latter part of the season. The second crew, which included Mr. W. Howell and Mr. W. Prescott, covered the Young Lake, Bridge Lake, and Bonaparte Lake area. Mr. Howell's report concerning this reconnaissance is included under Section II.

The magnetometer and EM-16 surveys at Murphy Lake were done by Mr. R. McGuire, who also managed the camp during the line cutting and geophysical work.

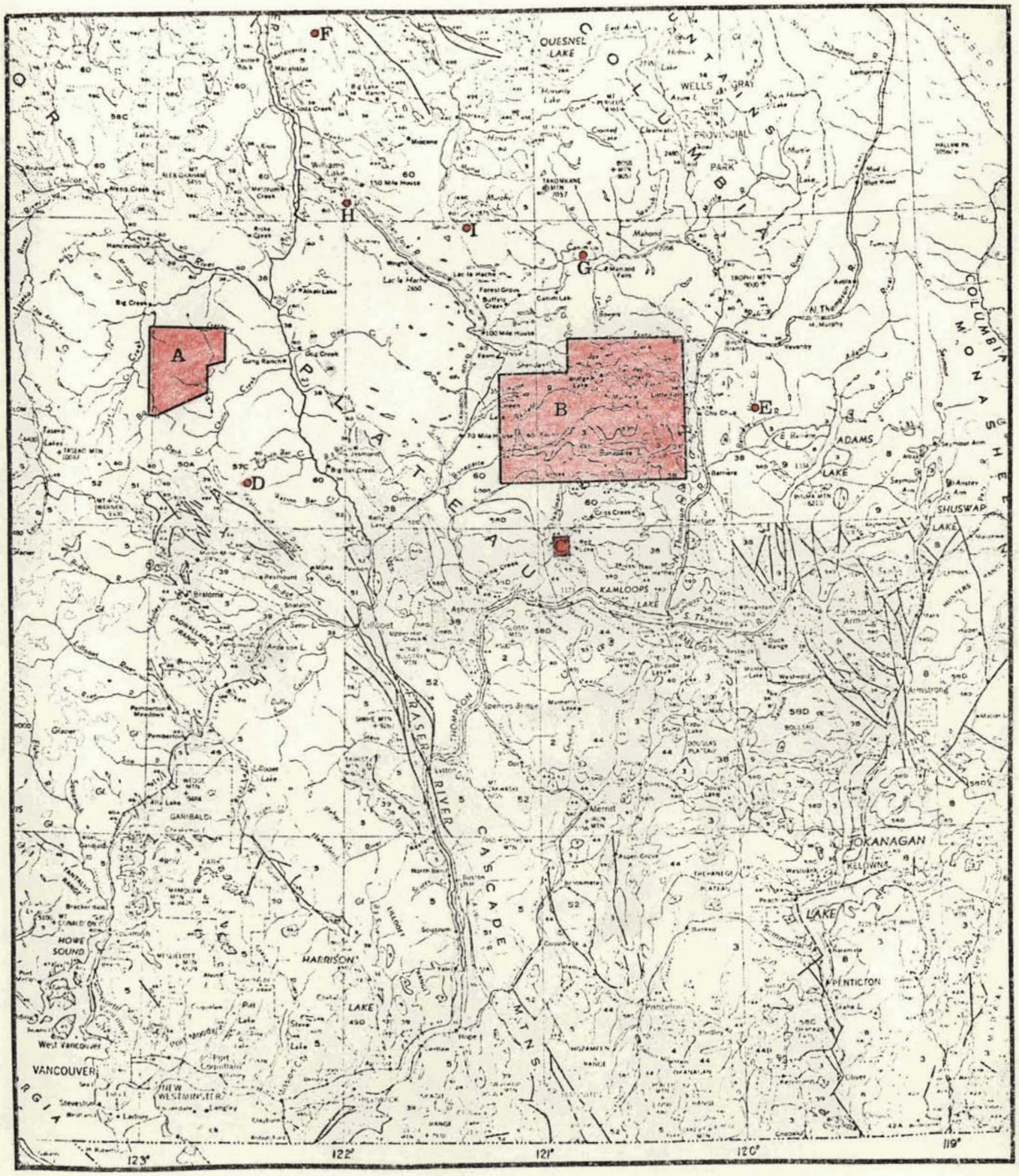

Figure 1. INDEX MAP

II. RECONNAISSANCE

Taseko Lake Map Sheet
(NTS 92-O-7/10, Area A - Index Map)

A. General Discussion

Mesozoic intrusives are favorable for porphyry copper mineralization throughout south-central B.C. and, because of our present ignorance concerning the controls for this type of mineralization, most exposure areas of these rocks are worthy of some reconnaissance work, even though known mineralization is rare.

A number of intrusives, dated as Mesozoic or earlier, are indicated on the four-mile geology map (29-1963) compiled by the G.S.C. Almost all of the known mineral showings are associated with those intrusives located in the vicinity of Taseko Lake in the southwest corner of the map sheet, and most of the exploration work to date has been centred in that area. Elsewhere within the map sheet, known mineralization is very sparse and the amount of exploration carried out in these areas is limited. The one property of some merit is Poison Mountain which is presently under option to Canadian Superior.

During the 1971 field season geological reconnaissance was carried out over a large intrusive mass which crops out in the centre of the Taseko Lake map sheet in the vicinity of Mons and Gaspard Creeks and Piltz Peak (Figure 1 and map 123-71-1). This intrusive will be referred to as the Gaspard Creek intrusive. Nothing of interest was found within the area of reconnaissance and no follow-up work is planned. Other intrusive areas on the Taseko Lake map sheet will be looked at in 1972.

Most accessible outcrop areas of the Gaspard Creek intrusive were examined and the accessible drainages were sampled.

The sediments were analysed for copper and molybdenum. The central part of the intrusive could not be reached via foot traverse; however, several streams draining that area were sampled.

In general, the intrusive consists of a peripheral zone of gneissic diorite which grades to more granitic textured quartz diorite and granodiorite towards the centre. More acidic rock was found only in one area in the vicinity of points M, N, and O (map 123-71-1) where a relatively fresh quartz monzonite is exposed along the creek. The quartz monzonite grades to a quartz feldspar porphyry over limited areas. Although this rock is very favourable-appearing, no sulfides of any type are present in the surface exposure, nor is there any geochemical indication of their presence elsewhere.

The only mineralization observed within the entire reconnaissance area occurs in the vicinity of point P. This ground is held by Royal Canadian Ventures who, in 1970, trenched for approximately 1000 feet along the west bank of the creek. This trenching has exposed several zones of intense shearing, up to 100 feet in width, which cut a fine-grained diorite (?). The shears trend approximately N70^{o}W and carry heavy limonite with minor malachite and chrysocolla and traces of pyrite and chalcopyrite. Near the shears the intrusive rock is heavily bleached and argillized and veined by gypsum. On the east bank several hundred feet of trenching have exposed similar material. The mineralization exposed is too narrow and weak to be of any interest, nor does there appear to be any potential for better material in the immediate surrounding area.

Seventy-seven stream sediment samples were collected during the reconnaissance of this area. Except for two samples, the values were extremely low, with copper varying from 9 to 32 ppm and molybdenum at 1 ppm.

The higher copper values, 170 and 66 ppm, were from samples

collected from the headwaters of a small creek located on the northeast part of the Gaspard Creek intrusive. These particular samples were taken from an area of low swampy ground with no outcrop. The creek here is little more than a narrow wash and the material collected consists mostly of organic-rich soil rather than sediment. For this reason these relatively high values are of no particular significance and no follow-up is planned.

B. Rock Description

At point A (map 123-71-1) the rock is a gneissic medium-grained diorite with mafics 50% replaced by chlorite. The feldspars are cloudy. This rock grades to a granitic-textured granodiorite at point B. This latter rock-type crops out along the ridge to the northeast of B.

A similar gneissic diorite crops out at C and along the ridge to the west of that point. This rock grades to a granitic-textured diorite over limited areas along this traverse. Towards the west end of the ridge some mylonitic zones occur which may contact features.

A granitic-textured rock which varies in composition from a quartz diorite to a granodiorite occurs along the ridge northwest from D. At E on the same traverse a small body of basic feldspar porphyry crops out.

At point F on the south side of Piltz Peak and at several other locations along that traverse, the rock is a somewhat sheared and gneissic granodiorite to quartz diorite. The mafics here are completely chloritized, whereas the feldspars are relatively fresh. To the east at G a contact is exposed between Triassic metasediments on the south and intrusive rock on the north. The Triassic rocks are fine-grained chlorite-sericite schists which are extensively veined by aplite and granite stringers, most of which parallel the schistosity. Also present are a few cross-cutting barren quartz veins. The intrusive north of G is a slightly

gneissic medium-grained granodiorite to quartz diorite which locally exhibits intense chloritization. This rock occurs along the ridge to the northwest of G and along the spur, west and south from H. Along the spur the intrusive is cut by scattered dikes of aplite and gray, feldspar porphyry.

East of Gaspard Lake the intrusive in the vicinity of point I is a diorite. The mafic minerals here are 50-100% chloritized and some are heavily stained by hematite. Epidote is present in minor to moderate amounts, occurring as veinlets and irregular clots. A few widely scattered veinlets of quartz and K-feldspar were also observed. On the same traverse, green, brown, and black porphyritic volcanic rocks crop out in the vicinity of J. A deeply-weathered and highly-fractured granodiorite (?) crops out at K. This exposure contains a few barren quartz veins.

The G.S.C. map indicates a small area of intrusive rock to the northeast of the main intrusive mass in the vicinity of point L. Outcrops here were found to consists mostly of relatively fresh andesite, though occasional sub-outcrops of diorite do occur, especially along the west-facing slope located about one mile southwest of L.

The only acidic rock noted within the entire area examined crops out nearly continuously for 7000 feet along the creek between points M and O. This rock is a relatively fresh medium-grained quartz monzonite. The intrusive grades to a well-developed quartz feldspar porphyry in the vicinity of N. Minor chlorite and sericite replace biotite, and the feldspars exhibit a slight argillization. Many of the outcrops are heavily stained with manganese oxides. Traces of limonite occur along a very tight set of fractures trending N15^{o}E and dipping 85^{o} northwest. The rock is barren of any sulfides in the area of exposure.

At P, near the Royal Canadian Ventures' showing, the peripheral rock is a strongly foliated, relatively fresh granodiorite. The more highly altered material in the immediate vicinity of the showing appears to be a fine-grained diorite.

Farther to the west, at point Q, a small outcrop of highly-altered granodiorite is exposed. Here the mafics are completely chloritized, the feldspars heavily kaolinized, whereas the biotite is relatively fresh. Trace amounts of sericite are also present. At point R on the same traverse a relatively fresh, medium-grained diorite to quartz diorite is exposed along the ridge top.

Bonaparte River Map Sheet
(NTS 92-P-1W, 2, 3E, 6E, 7, 8W, 9W, 10E, Area B - Index Map)

A. Summary

The Project area was the Young Lake-Bonaparte Lake-Bridge Lake area of the South Cariboo.

Upper Triassic Nicola volcanics and Upper Triassic to Lower Jurassic "granitic" intrusives were subjected to a regional reconnaissance of geological mapping, prospecting, and geochemical sampling by a two-man crew. Speculation is made on the presence of a northeast trend of copper mineralization, and a northwest trend to an area of variable intrusive types. Further work is recommended in the Rayfield River-Bonaparte River area, the area northeast of Lac des Roches, and the areas southeast and southwest of Bonaparte Lake.

B. General Discussion

(a) Purpose and Setting - The aim of this project was to mount a regional prospecting, geological mapping and geochemical survey across a portion of the South Central Cariboo Plateau (Map 123-71-2). Within this region, Upper Triassic to Mid-Jurassic intrusives are unconformably overlain by Tertiary volcanics (olivine basalt and related

sediments). The overlying volcanics are, for the most part but not exclusively, confined to the western portion of the map area. The intrusives were emplaced within Permian to Upper Triassic volcanics and sediments of the Cache Creek and Nicola groups (G.S.C. Map 3-1966). The Nicola rocks consist largely of metamorphosed argillites, greywackes, limestones, and andesites.

Within the map area, exploration was mostly confined to the intrusive and Nicola group rocks. No intrusive-Cache Creek group relationships were examined.

The Nicola group is for the most part, but not exclusively, found in the northeastern portion of the map area (Map 123-71-2).

(b) Access - Primary access to the map area is made via B.C. Highway 24, a good, all-weather gravel road which bisects the southern Cariboo district from east to west. Highway 24 joins the village of Little Fort on the Yellowhead Highway (B.C.5) with the communities of 70 Mile House and 100 Mile House on the Cariboo Highway (B.C. 97).

Forest access, logging and resort area roads provide the secondary access.

Travel on several of the larger lakes, through the use of a car-top boat with outboard motor, provided additional avenues of access.

Traverses were made by boat, four-wheel drive vehicle, and on foot. Traverse locations are plotted on Map 123-71-2.

Access to the region east of Bonaparte Lake was found to be difficult from the west and north. New logging roads from Highway 24 lead to the northern part of the Thuya batholith in the vicinity of Thuya Lakes. Access to the Thuya Lakes region can also be found from Highway 5, south of Little Fort.

Road access is available to the east end of Bonaparte Lake. It is reported that the road commences from Highway 5 approximately five miles north of Barriere.

Logging operations are currently taking place to the southeast of Bonaparte Lake and reasonably good access and road coverage of this area should be possible.

(c) Field Crew and Camp - The field crew consisted of a two-man party operating from a base camp consisting of small tent-trailer-camper. The combination of trailer-camper, four-wheel drive vehicle and boat gave the crew reasonably comfortable accommodations and provided optimum mobility and ease of handling. The outfit was admired by field crews of three separate exploration companies met during the summer.

(d) Rock Exposure - Outcrop was generally very scarce with large areas extensively covered by swampland or glacial drift. Locally, outcrop may be fairly abundant, particularly where a break in the topography occurs or on ridge crests and local heights of land.

(e) Brief Exploration History - The map area has been partially and incompletely covered by Falconbridge over several periods since 1965. Falconbridge, Kennco, Rio Tinto, Cominco and Amax, amongst others, have explored different aspects and parts of the Rayfield River Area. The most extensive of these programs appears to have been the Amax program over the copper showings in the Rayfield River canyon and adjacent ground, primarily to the west. This program was completed in 1970.

In the northeastern portion of the map area, Anaconda, Royal Canadian Ventures, and others have conducted programs over various parts of the Nicola rocks and some associated "granitic" intrusions. Royal Canadian Ventures were doing

an E.M.-16 survey in conjunction with a reported drilling program during 1971 on claims held approximately 1.5 miles northwest of Janice Lake.

Van-Gulf Explorations, Utah Construction & Mining Co., Bethlehem Copper Mines, and Western Geological Exploration Services were through the area briefly while doing broad regional scale programs. In addition to the above, a few apparently independent prospectors were active throughout the summer.

C. Rock Type Description and Distribution

(a) Rayfield River Intrusive - The predominant characteristic of the Rayfield intrusive is the lack of quartz. The major rock types are medium- to coarse-grained hornblende syenite and hornblende monzonite. Bornite, chalcopyrite, and chalcocite are observed in very tight fractures as well as in feldspathized fractures or stringers. Sulfides also occur as inclusions within mafic minerals or as massive "blebs" up to three-quarters of an inch across, the latter being in pegmatitic syenite rock.

Along the southern portion of the Rayfield intrusive and included here within the Rayfield suite of silica-deficient rocks is found a leucoblastic monzonite (T.S.71, Appendix 3).

The rock contains large whitish-pink, occasionally zoned, porphyroblasts of orthoclase in a fine-grained, brown biotite, hornblende, albite matrix. The rock may be a contact phase with the Young Lake type intrusive. The leucoblastic monzonite carries minor quantities of bornite and chalcopyrite commonly associated with mafic-rich clots of hornblende and biotite. A coarse-grained hornblende, orthoclase, pegmatitic syenite dike was found to intrude leucoblastic monzonite on the south side of the Bonaparte River, approximately 3000 feet northeast of

location B (Map 123-71-2). No copper minerals were observed in the syenite dike.

Massive outcrop of a similar syenite was observed on the west bank of the Rayfield River near its junction with the Bonaparte River. The outcrop is immediately upstream from the Highstead property, known locally as "Turkey Gulch."

The pegmatitic syenite is made up predominantly of very coarse-grained, grey, orthoclase with acicular crystals of hornblende. No sulfide minerals were observed in the outcrop.

(b) Young Lake Intrusive (Appendix 3; T.S. 34, T.S. 101) - The Young Lake Intrusive type is a quartz diorite to quartz monzonite. The quartz is commonly present as discreet "eyes" in unfoliated variants. This may result in an almost quartz porphyry appearance. In foliated varieties the quartz is elongated and less distinct. The Young Lake type intrusive extends, with little variation compositionally or texturally, to the Bonaparte Lake region.

Minor bornite and chalcopyrite were found in occasional, steeply-dipping, north to northwest-trending quartz, K-feldspar veins and stringers. The Young Lake intrusive appears to be the "Western Phase" mapped by Campbell and Tipper as unit 17 on G.S.C. Map 3-1966.

(c) West Bonaparte Intrusives - A variety of different intrusive rocks appear to be centralized around a zone trending northwesterly through the western Bonaparte Lake region. The zonal features and implication between these and other varieties of intrusives are discussed in a following section of this report.

i. A few outcrops of uniformly fine- to medium-grained biotite quartz monzonite are found on the southwest

side of Bonaparte Lake (T.S. 126, Appendix 3). The primary differences between this unit and the Young Lake type are textural with some compositional differences noted also. More quartz is present; however, the rock lacks the large quartz "eyes" and occasional orthoclase phenocrysts common to the Young Lake type. Orthoclase is slightly more abundant. Sericite and muscovite are more developed, but are not extensive. Very minor molybdenite was observed with this rock type.

ii. An occasional outcrop of a foliated hornblende diorite was also observed southwest of Bonaparte Lake. Minor pyrite was associated with this rock in the few instances where it was found. Contact relations were not exposed.

To the northeast of the Bonaparte River and south of Eagan Lake, the rock encountered was unique in its type and textural variation compared to the intrusives noted in the entire map area examined during 1971.

An extremely well-developed foliation is characteristic (in places it approaches an augen gneiss or mylonite). The rock varies from a hornblende diorite to fine-grained biotite gneiss containing approximately 50% mafics. In some places the rock may resemble a fine-grained biotite amphibolite and the mafic content may be as high as 70%. Where foliation is extremely well-developed the rock approaches a fine-grained augen gneiss. The foliated hornblende diorite commonly contains lenticular xenoliths of fine-grained biotite-rich gneiss. The foliation attitude is approximately 155^{o}/55NE. Xenoliths occasionally show a right-hand sense of shear.

Pyrite and pyrrhotite were found along occasional

fracture surfaces and as disseminations. Hornblende, altering to biotite and chlorite was commonly observed. Fractures are commonly coated with epidote.

iii. Also included with the "West Bonaparte Intrusive" is a very fine-grained dacite with occasional plagioclase phenocrysts measuring up to ¼ inch in length (T.S. 107, Appendix 3). Outcrop of this type was only found at location I.

Small vuggy cavities are present, these being sub-aligned and elongated. The vuggy texture is interpreted as having been "frozen" into a very high level intrusive. The topographic expression of the outcrop area suggests that this rock is part of a small plug. No sulfides of any kind were observed within this unit.

iv. Included also with the "West Bonaparte Intrusions" is a body of fine-grained, grey, porphyritic plagioclase, diorite found at location G. This rock again, largely because of its topographic expression, is considered to be a plug. This body is observed to be contacting a medium-grained hornblendite but the relationships are not apparent. Several dikes of this rock type were encountered in the west Bonaparte region. These are discussed further under the section on dikes and sills.

v. Limited outcrop of a medium-coarse grained aphitic hornblende monzonite was found adjacent to a large dike of grey plagioclase porphyry diorite at location G. Hornblende is present as sub-aphitic clots in an orthoclase and plagioclase matrix. The hornblende is nearly completely altered to chlorite and (?) epidote. Effervescence with HCl tends to localize around the hornblende indicating that calcite is also present;

however, it was not observed as a distinct mineral.

(d) Lac des Roches Type Intrusive (T.S. 228, Appendix 3) - This unit is probably the type mapped by Campbell and Tipper as their Eastern Phase intrusive, shown as unit 14 on G.S.C. Map 3-1966. It may be equivalent to the "Bradley Creek Intrusive" reported on by B. Calder (FNML) in "Geological Reconnaissance South Cariboo, P.N. 123, 1970" by S. H. Pilcher. The rock varies from a hornblende quartz diorite, to granodiorite, to quartz monzonite. The boundary relationships between this unit and the Young Lake unit are not distinct. Campbell and Tipper have placed the boundary between their eastern and western phases near the west end of Bonaparte Lake. This writer would place such a boundary somewhat arbitrarily around the southeastern edge of Bonaparte Lake, extending to the northwest and passing south of Machete Lake.

The Lac des Roches type is characteristically more mafic-rich than the Young Lake quartz diorite/monzonite type. Hornblende or biotite alteration to chlorite is a common feature. The rock often has a pale green cast to the feldspars due to micro-inclusions of epidote. Occasional pink feldspar grains can be seen and some K-feldspathization may be evident along occasional fractures. Similar distinct pink feldspar is lacking in the Young Lake type intrusion. A relatively rare and unusual feature, and one which may simply reflect a locally higher potassium content of the rocks, is the occurrence of black tourmaline and pink orthoclase pegmatitic float in the creek draining into the northeast side of Birch Lake. Small pegmatitic veins of similar material were found in outcrop of typical Lac des Roches Intrusives near the extreme southeastern end of Lac des Roches. No sulfides were observed with any of this pegmatite.

Unmapped exposure of the Lac des Roches type intrusive was found within the Nicola volcanic rocks in an area north of Janice Lake (Long Island Lake) and west of locations "S" and "R". The volcanic rocks here were subsequently found to contain minor chalcopyrite mineralization. The extent of the unmapped intrusive is expected to be considerably larger than the area observed. This expectation is based largely on air photo interpretation.

(e) Dikes and Sills

i. Occasional diabase dikes were observed throughout the area. These were not found to contain significant mineralization or have appreciable wall rock alteration associated with them. They are probably related to the Tertiary period of volcanism.

ii. A grey, porphyritic plagioclase, diorite occurs as a dike rock in a loosely defined northwesterly-trending pattern across the western end of Bonaparte Lake. The dikes commonly crop out on ridge crests and local topographic prominences. Dikes of this type are similar to the rock described for the grey, porphyritic plagioclase, diorite plug.

The groundmass of the dike rock consists primarily of fine-grained plagioclase and biotite. Relict (?) hornblende crystals are largely chloritized or altered to biotite.

Occasional pyrite is observed within the relict hornblende. The groundmass has occasionally undergone potassic alteration with the development of pink feldspar and a better development of small brown biotite flakes. This is accompanied by the disappearance of the relict hornblende. Very minor chalcopyrite and pyrite mineralization is also present in the altered groundmass.

iii. Aplite dikes, usually only up to a few inches in width, are present in the west Bonaparte Lake region, and occasionally in the Young Lake type intrusive and the Rayfield type intrusive. No sulfides were observed in these aplite dikes, except for one dike cutting the Rayfield type intrusive.

iv. A northwest-striking, moderately northeast-dipping dike, composed of chalky white porphyritic feldspars in a pale grey aphanitic groundmass occurs along the ridge crest at location "N". The groundmass contains relict grains of hornblende and biotite altered to chlorite, and minor amounts of magnetite. The feldspar was originally felt to be all plagioclase, based on crystal cross section, but later observation under increased magnification showed many of the feldspars to be orthoclase. The degree of alteration is also less than at first assumed. Many of the phenocrysts have a pink core but it is not certain that this represents compositional zoning. The rock is tentatively labelled a dacite. The possibility exists that this dike may be an alteration product of the grey, porphyritic plagioclase, diorite dikes mentioned previously. In the absence of any detailed chemical or petrographic analysis of the two units, any suggestion of a common genetic origin is purely speculative.

(f) Nicola Group - Campbell and Tipper have described the most common Nicola rocks as "...dull, greenish grey, aphanitic or very fine-grained 'greenstone.' Associated with them are dark grey to pale green laminated tuff, dark grey limestones and possibly some argillite. Near the Thuya-batholith, fine-to medium-grained dioritic rocks interspersed with greenstone, are relatively abundant.

"The greenstone is mainly aphanitic or very fine-grained, but small and rarely large pyroxene crystals can be identified in hand specimens...." Campbell and Tipper go on to point out that the greenstone is "dominantly, if not entirely, fine to moderately coarse volcanic clastics in which the matrix is indistinguishable in colour and composition from the fragments." While definitely clastic material was observed in the field by the writer, in the absence of thin-section evidence to the contrary, the clastic rocks were considered to be the exception rather than the rule.

Nicola "greenstone" was observed north and south of the Bonaparte River west of Young Lake. Greenstone also occurs within the mapped Nicola area northeast of Lac des Roches.

The rocks described as Nicola argillites in this report may be correlative with Campbell's and Tipper's "uniformly fine-grained fragmented rocks or tuff" which "vary in appearance from relatively massive dark rocks resembling argillite to medium grey and green finely-laminated varieties."

Extensive regions felt to be argillite were noted around Bridge Lake, north of Janice Lake, and in the vicinity of the old "Lakeview" sulfide deposits near Deer Lake (mineral reference location 16).

In the absence of petrographic analysis the possibility of some of these "argillites" representing Campbell's and Tipper's "tuffs" must be considered.

The only region where limestone of the Nicola group was observed to crop out was in the trenches and workings at the old "Lakeview" deposit near Deer Lake in the north-eastern portion of the map area.

An area of unmapped Nicola greenstone was located south of

the Bonaparte-Rayfield river confluence. This body has an observable contact with the Rayfield type intrusives to the north and is overlain by Tertiary basalts to the south. Minor chalcopyrite mineralization was observed in contact rocks and is discussed under "Mineral Occurrences" in this report.

The area mapped as Nicola rocks in the northeastern portion of the map area was found to consist of greenstones and argillaceous sediments varying from fine-grained pyroxene hornblende diorites to apparent andesites, and to a previously unmapped occurrence of intrusive monzonite, similar to the Lac des Roches type intrusive and tentatively classified here with that unit.

The region northeast of Lac des Roches to the Friendly Lakes area has come under considerable exploration pressure since 1965. Anaconda American Brass Company, amongst others, has completed sampling, trenching, geophysical, geological and drilling programs over portions of the area, especially in the vicinity of the three small syenite bodies shown on Map 3-1966 (two bodies are actually present).

Near one old drill site observed by the writer, chalcopyrite mineralization occurs along the contact between syenite and Nicola volcanic rocks. Visual estimates in selected 20 lbs boulders indicated that up to 10% of the rock may be chalcopyrite. Campbell and Tipper have reported that argillites and limestones, approximately two to three miles to the north of Janice Lake, have yielded Permian fossils. They speculate that minor argillites and possibly some limestones may be correlative with the Cache Creek group which is exposed in the southeast part of the map area and to the west just outside the map area.

Float found at the mouth of Creek 21 on the south side of Bonaparte Lake, ½ mile east of the district land boundary, has, in addition to the weathered fragments of the local intrusive rocks, flat pebbles suggestive of Nicola argillite. The presence of Nicola rocks in the area to the south is not indicated on Map 3-1966.

(g) Nicola Hybrid Diorite - A fine- to medium-grained hornblende diorite to hornblende gabbro rock was occasionally noted throughout the map area. Its occurrence appears to be related to the contacts of Nicola group rocks and the acidic intrusives. Contact relationships are noted in the Rayfield River-Bonapart River area and the Bridge Lake region. The diorite/gabbro occasionally carries disseminated pyrite, pyrrhotite and traces or minor amounts of chalcopyrite.

Campbell and Tipper report the occurrence of an augite diorite near Nicola-intrusive contacts and suggest that it may represent a hybrid phase belonging to either the intrusives or the Nicola group. The writer concurs with this hypothesis and would correlate the hornblende diorite/gabbro mentioned above with Campbell's and Tipper's augite diorite.

(h) Minor Hornblendite Intrusions - These were found on the northeast side and west end of Bridge Lake. In both cases the hornblendites appeared spatially related to hornblende gabbroic rock of "Nicola Hybrid" type. On the northeast side of Bridge Lake the hornblendite was cut by felsitic dikes, apparently related to nearby hornblende granodiorite or quartz monzonite of the Lac des Roches type of intrusive.

Widely scattered float of coarse-grained hornblendite was found in minor quantities throughout the project area.

(i) Syenite Plutons - Two small syenite bodies in the north-eastern portion of the map area have been described by A. Sutherland Brown in the 1968 B.C. Minister of Mines Annual Report as "foliated leucocratic pink syenite."

(j) Tertiary Volcanic Rocks - The predominant variety of the Tertiary volcanic rocks within the map area is a dense, fresh-looking, often greenish black olivine basalt. The basalt may be vesicular or amygdaloidal.

The plateau south of Young Lake, towards Upper Loon Lake, was noted to be composed, at least in part, of porphyritic hornblende basalt. In the vicinity of Upper Loon Lake, within an area mapped as intrusive rocks on Map 3-1966, only volcanic rocks of suspected Tertiary age were found. This conclusion was based on the following:

> Outcrops of typical basalt are to the northwest and east of the lake, olivine basalt breccia is on the southwest end of the lake, fine-grained andesitic flow and breccia is found on the south side of the lake.
>
> The andesitic variants appear less fresh than the basalts, but less altered than the Nicola volcanic rocks. Brecciated portions have clasts of what appear to be intrusive rocks. If the breccias and related andesites are post-intrusion, they are certainly not correlative with the Nicola group. It would seem more probable that these rocks belong to the Eocene Skull Hill formation described by Campbell and Tipper and mapped by them approximately 4 miles to the southwest, near the head of Loon Lake.

D. Treatment of Geochemical Sampling Results

A total of two-hundred-twenty-nine samples were collected. Anomalous values and their significance are discussed under "Mineral Occurrences and Anomalous Geochemical Expressions" in a following section of this report.

Silt samples were collected from every drainage system crossed on traverse. In some cases soil samples were collected from gulleys having no permanent drainage but serving as preferred runways or seeps for periodic runoff. Clean, uncontaminated representative samples were taken wherever possible.

Runoff was excessive during the early part of the field season (late May to early July) and rapidly became non-existent, except in the largest of creeks and rivers, throughout the latter part of the summer. Autumn rains restored drainage to most of the streams during the last part of the field season. The effect on the sample values of this seasonal fluctuation is not known. The pH values for samples collected during the latter half of the field season were recorded with the use of pH paper sensitized in the range 4.0 to 8.0. Results taken indicated a consistent range from 5 to 6.

The distribution of samples with respect to rock type is as follows.

No. of Samples	Underlying Rock Type	Copper Range of Values (ppm)
21	Rayfield Type Intrusive	12 - 136
117	Young Lake & West Bon. Lk. Intrusives	8 - 90
23	Lac des Roches Type Intrusives	5 - 120
23	Nicola Group	13 - 320
26	Tertiary Volcanics	4 - 212
19	Unknown	4 - 90
229		4 - 320

Data were not considered sufficient to permit a valid comparison of sample populations from each rock type encountered.

The cumulative plot of geochemical data shown in Fig. 2 represents only values taken in areas underlain, or suspected of being underlain by intrusive rocks of the Young Lake type or the West Bonaparte Intrusions.

It would seem reasonable to expect the Nicola volcanics to have a much higher copper expression than the intrusives. For this reason, geochemical data from areas underlain by Nicola rocks were excluded from the compilation of Fig. 2. The population of samples taken from the Nicola group, the Lac des Roches type and the Rayfield type of intrusives were not considered large enough for treatment similar to that given for the Young Lake type of intrusive. The writer suspects that such a comparison would show the Lac des Roches intrusive to have generally higher copper values than the Young Lake intrusive type.

A limited number of samples were analysed for arsenic, in the hope that a local source of the chalcopyrite, arsenopyrite, pyrrhotite assemblage found in float near location "O" could be traced. The results were inconclusive.

E. Metallic Mineral Occurrences and Anomalous Geochemical Expressions

(a) Rayfield River Intrusive Type Rock

i. At the Amax property on the Rayfield River, northwest of Young Lake, the river appears to follow an offset structural lineament which cuts through the quartz-deficient rocks of the Rayfield intrusive type. Outcrop observed upstream and downstream from the offset was hornblende monzonite. The rocks cropping out in the canyon walls along the offset were extensively fractured and weathered. Along this section, malachite is fairly abundant in local shear zones and on fracture faces. Little primary sulfide was present, perhaps due to the extensive fracturing and deep weathering of the rock.

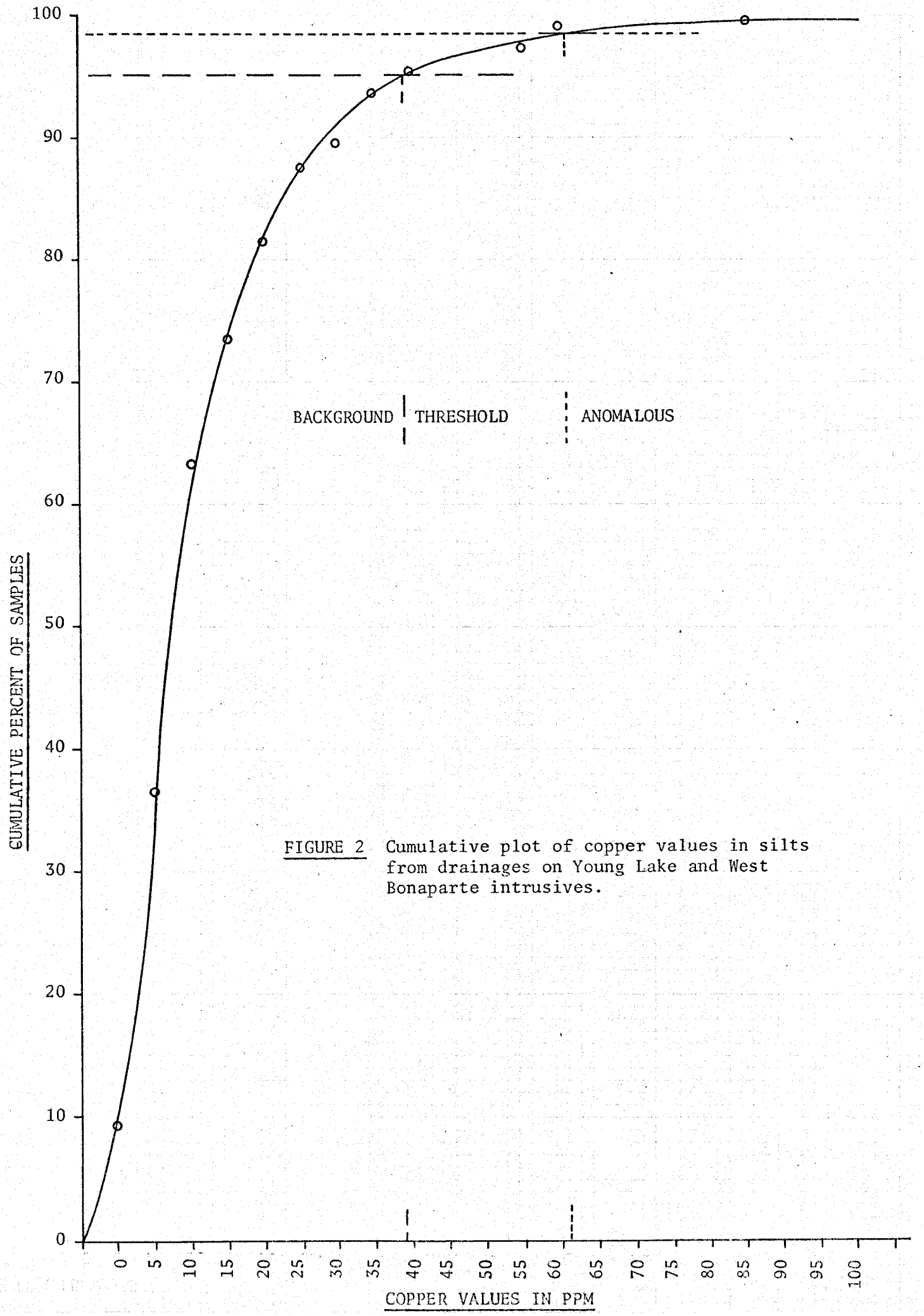

FIGURE 2 Cumulative plot of copper values in silts from drainages on Young Lake and West Bonaparte intrusives.

Because of the previous work done by Falconbridge and others, very little time was spent prospecting and sampling the showings along the Rayfield canyon.

ii. Bornite, chalcopyrite and minor chalcocite were observed on fractures cutting hornblende monzonite and aplite at location "T". Mineralization was not extensive. The fractures were widely spaced and irregular in their attitudes. Alteration, either in the host rock or along the fracture walls, was not very pervasive.

The alteration, where present, usually consisted of K-feldspathization of the fracture walls, usually no more than 1/16 to 1/8 inch on either side.

iii. Hornblende monzonite float, containing mineralized fracture fillings of grey orthoclase with disseminated bornite and chalcopyrite, was found in the southern Rayfield intrusive region on both sides of the Bonaparte River. An unidentified, fine-grained, dark brown, translucent, hard ($h > \sim 5.5$), sugary textured mineral is observed to commonly accompany the mineralized fractures. Mineralized float is fairly abundant in the large boulders of the Bonaparte River near the washed out bridge south of location "A". The maximum mineralized fracture density in float was approximately seven sub-parallel fractures per foot; however, this density was felt to be exceptional. The fractures vary from tight hairlines up to 1/8 inch wide. Mineralization covers up to approximately 5% of the surface area of any one fracture.

It is difficult to speculate on the significance of the mineralized boulders in the Bonaparte River south of location "A". The distribution of observed mineralized float throughout the Rayfield River area

is consistent with suspected and reported ice movements from the northwest and subsequent resorting and transportation by runoff along the Rayfield and Bonaparte rivers. River gravels along the Bonaparte and Rayfield rivers were not examined extensively or in any detail. The actual junction of the two rivers and compositional differences of float in each component were not examined.

iv. A hand sample, collected by prospector L. E. Timmins of G. V. Lloyd Explorations Ltd., and examined by the writer, consisted of pegmatitic grey orthoclase, and hornblende altered to biotite. This sample contained a single 3/4 inch bleb of massive bornite and chalcocite. It was reported to have come from a massive pegmatitic outcrop. Mr. Timmins did not reveal the location of the outcrop.

Similar syenite was observed by the writer near the mouth of the Rayfield River and south of the Bonaparte River, approximately 3000 feet northeast of location "B". However, there was less alteration of the hornblende and no sulfides were observed there.

v. Trace amounts of chalcopyrite and bornite were observed in leucoblastic monzonite (T.S.71, Appendix 3) found as outcrop south of the Bonaparte River, between locations "B" and "C". The leucoblastic monzonite is also found north of the Bonaparte River and adjacent to the Nicola rocks mapped in the vicinity of location "A". Where present, the chalcopyrite and bornite occur as small disseminations within mafic-rich clots. The mineralization is a very minor constituent but is widespread in its occurrence.

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(b) Young Lake Intrusive Type - The Young Lake Intrusive type is particularly barren of sulfide mineralization. A few minor occurrences are discussed below.

i. Minor amounts of bornite and chalcopyrite occur as isolated grains in occasional quartz and K-feldspar veins and stringers which vary from 1/16 inch to 24 inches in width. In these veins the quartz is predominant over the K-feldspar.

The location of these mineralized veins and stringers plots in a crude northeast-trending pattern extending from a point on the south shore of Young Lake at location U-1 northeasterly to location U-2. A minor amount of bornite and chalcopyrite was also noted in predominantly barren quartz vein float found south of the southeastern end of Young Lake. The specimen was presumably from cliffs which are present uphill from the specimen location.

ii. Only one other occurrence of sulfide mineralization was noted in the Young Lake type of intrusive. A very minor amount of pyrite was found in a hand specimen collected from outcrop alongside the road approximately one mile north of location J-2. The pyrite occurs in a small tight quartz stringer in a slightly fresher, finer-grained, and more monzonitic appearing variation of the intrusive.

(c) West Bonaparte Intrusions

i. Disseminated pyrite occurs at location "G" as a minor constituent in the medium- to coarse-grained ophitic hornblende monzonite, and in an adjacent, prominent, grey, porphyritic plagioclase, diorite dike. The presence of pyrite as a common but minor constituent in the grey porphyry diorite was noted throughout the West Bonaparte region where the rock type occurs.

ii. Pyrite and pyrrhotite are occasionally found along fractures and as disseminations in the mafic-rich foliated rocks around location "L", south of Eagan Lake. A single trace of chalcopyrite was also found in a small northeast-trending quartz vein cutting the foliated diorite in the vicinity of location "L".

iii. Very minor molybdenite was observed in the fine- to medium-grained biotite, quartz monzonite (T.S.126, Appendix 3) located at "M" on the south side of Bonaparte Lake. The minor molybdenite is localized on isolated tight quartz stringers.

iv. Float found at the southernmost part of traverse in creek 17, west of location "M", contained disseminated pyrite in the medium-grained, biotite, quartz monzonite. This creek had been sampled, without significant results, during the course of Falconbridge's 1966 exploration program in this region.

(d) Lac des Roches Intrusive Type

i. Within the Lac des Roches intrusive type, molybdenite and chalcopyrite were found near location "N", in a single occurrence as minor constituents on a K-feldspathized fracture. Epidote and hematite are locally more abundant, particularly along fractures. Location "N" is near Eugene Lake, south of Bridge Lake.

A single geochemical sample collected from a very minor seep draining the above mineralized location gave results of 97 ppm copper and 1 ppm molybdenum.

ii. A copper value of 118 ppm was found to occur in stream sediments collected at location "P" on the Little Fort road (Highway 24). A value of 96 ppm copper was obtained from sediments in a creek crossing Highway 24 approximately 3½ miles west of "P".

Both of the above two creeks collect drainage from a common source area underlain by Lac des Roches type intrusive rock. No confirmation of the sample values was made and no conclusive explanation for their values can be given.

The area drained by the two streams was partially held by Royal Canadian Ventures as the "E.C." claim group. The claims have now lapsed. Royal Canadian Ventures are reported to have completed a geochemical silt and soil sampling program in 1967, followed by an E.M. survey and detailed soil geochemical study in 1968 over part of the E.C. group. The precise locations and extent of the programs are not known.

(e) Nicola Group of Rocks

i. A geochemical value of 240 ppm copper was obtained from a silt sample collected at location "O" on the northeast side of Lac des Roches. Follow-up prospecting and sampling did not confirm the original high value, but gave results of 79 ppm copper. Prospecting revealed, in the drainage channel, a boulder which contained disseminated chalcopyrite, pyrrhotite and arsenopyrite, localized in a medium-grained gabbro and accompanied by weak skarn type alteration. Outcrop is scarce in the small drainage basin and the source of the float was not found.

Minor chalcopyrite and bornite were noted within a biotite-rich clot of mafic minerals within an interfingered felsite and andesite zone approximately 2000 feet north of the 240 ppm sample site. On the basis of the few outcrops which are present in the drainage basin, the drainage gully appears to be a northwest-trending fault with Nicola rocks to the southwest and intrusive rocks to the northeast.

Fault contact relationships are probably repeated to the northeast and also to the west along the Lake shore.

ii. Results from a silt sample collected at location "R" indicated values of 173 ppm copper and 1 ppm molybdenum. Confirmatory sampling upstream yielded results of 230 and 315 ppm copper with 2 and 3 ppm molybdenum respectively.

Outcrop observed 1.5 miles to the northwest of "R" was intrusive of medium- to coarse-grained hornblende, biotite diorite similar to the Lac des Roches type of intrusive. Minor pyrite, and some slight malachite stain were observed in the diorite. Pyrite, pyrrhotite, and chalcopyrite in minor quantities were found in basic variations of the surrounding Nicola volcanic rocks.

iii. Chalcopyrite and pyrrhotite occur in a small outcrop of massive garnet skarn at location "Q". The geochemical expression in an adjacent stream silt sample was 55 ppm copper. This may have been affected by dilution or contamination from road bed gravels and sand. Outcrop of highly silicified argillites were found approximately 1 mile to the northwest of location "Q".

iv. Continuing to the northwest and on the south side of a major mapped fault, argillites were found to be variably silicified and became more calcareous to the northwest. At the western end of the traverse, fairly abundant, very-fine-grained sulfides occur in the argillites. These sulfides are most likely pyrite. A rock geochemical sample of these argillites gave results of 103 ppm copper.

v. Massive sulfides, mostly pyrrhotite with some chalcopyrite and reported auriferous arsenopyrite, at location "S" were examined by the writer. The massive sulfides were first located in 1930 by two local prospectors and almost immediately investigated by the Premier Gold Company. The sulfide bodies occur in limestone and are reported to be in contact with a "porphyritic intrusive"; the contact and the intrusive were not observed. More recently, fairly extensive trenching and some drilling have been done in the area by unknown persons or corporations.

vi. Massive magnetite and pyrite are exposed in trenches to the north of location "S". Some zoning of pyrrhotite, chalcopyrite, pyrite and magnetite may exist. The presence of such a zonation can be confirmed only by more detailed examination.

Anaconda has completed a variety of programs over a large block of claims covering portions of the region from location "Q" to the syenite bodies mapped approximately 10 miles to the northwest. Silt and soil sampling, hammer siesmic, I.P. and E.M. programs, trenching and drilling, in addition to geochemical mapping, were carried out by Anaconda between 1966 and 1969. The disposition of such programs is not certain.

vii. Unmapped Nicola rocks exist southwest of Young Lake. On the southern edge of the Rayfield River area, at locations K_1 and K_2, a gradational contact was sporadically observed over several hundred feet across an east-west striking contact. Skarn type mineralization of epidote and calcite was developed along shears and fractures in "Nicola hybrid diorite" type rock. The diorites appeared to grade into greenstones of altered Nicola volcanic rocks.

Occasional minor amounts of chalcopyrite were found to accompany the skarny shears. Fine-grained sulphides of (?) pyrite were observed in the greenstone.

The relatively high geochemical values in copper at locations "B" and "C" may be either the result of copper mineralization along the contact or simply of inherently higher copper values of the Nicola volcanics.

F. Speculations

(a) Northwest Zone of Intrusives - The intrusive rocks of the Young Lake type, extending to the east end of Bonaparte Lake, are remarkably similar within limits of normal textural variation. An exception is the area included between Hammer Lake and the west end of Bonaparte Lake, and extending somewhat arbitrarily in a northwesterly direction (Fig. 3). Within this zone a variety of intrusive rock types and features occur; these are listed below.

1. The grey porphyritic plagioclase dike system. Almost all outcrops reflect a northwest trend and are commonly dipping to the northeast.
2. The uniform, medium-grained biotite quartz monzonite.
3. The foliated, hornblende, biotite, diorite with the foliation trends to the northwest.
4. A host of felsitic and mafic dike variants with variable attitudes.
5. Peripheral quartz veining to the east.
6. The tentatively identified dacite plug.
7. Right-hand offset on northwest fractures.

   Right-hand sense of shear in xenoliths.

   Right-hand offset in west end of Bonaparte Lake, subtly reflected in other lake offsets.

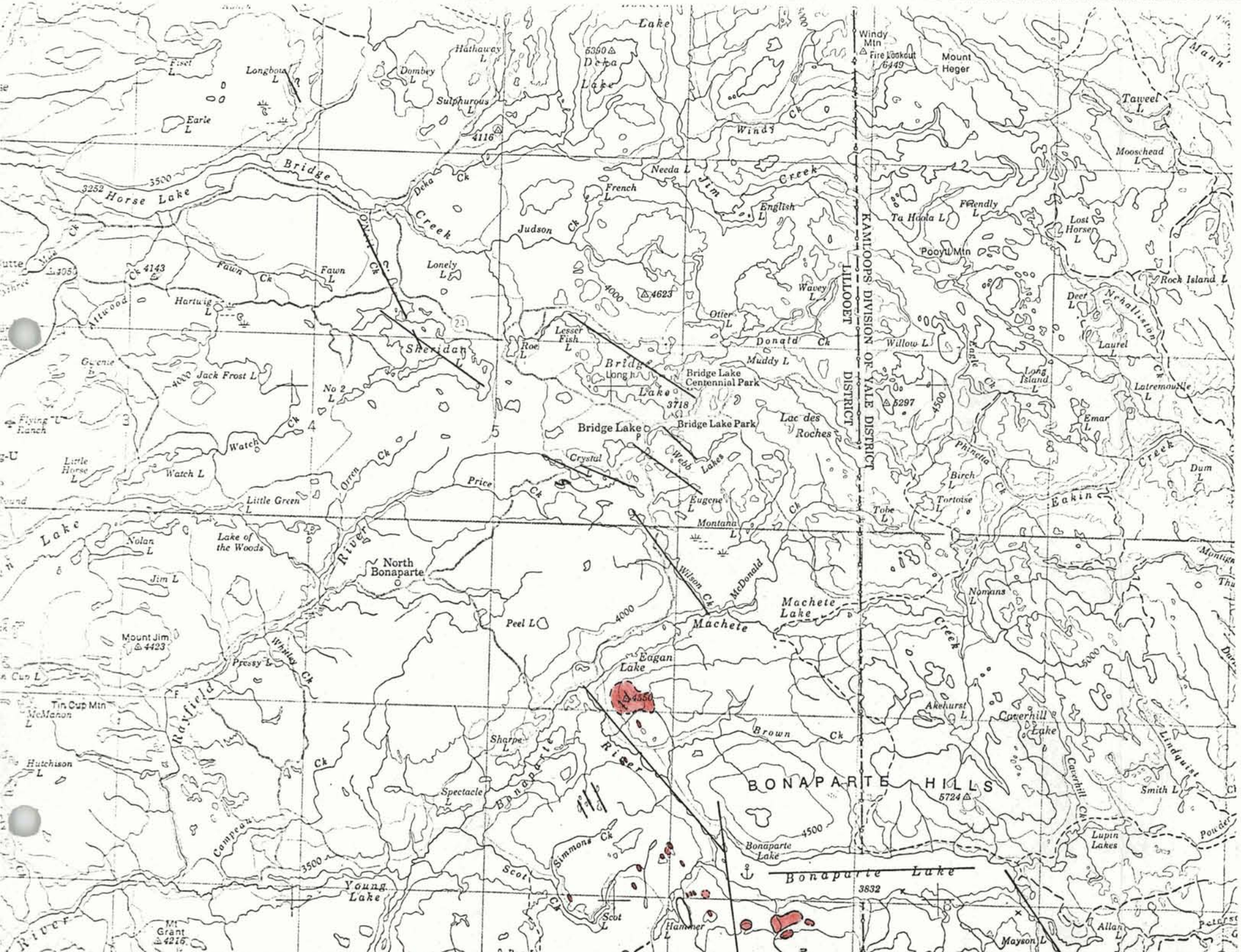


FIGURE 3 Postulated northwest-trending zone showing lineaments and distribution of "West Bonaparte Intrusive" types.

scale: 1/250,000

8. Minor pyrite and possibly molybdenite occurrences appear restricted to this northwest trend or to features related to it.

9. Previous geochemical data have shown significantly high copper values to occur in the southwest corner of sheet 92-P in the upper Rum Creek area. This anomaly lies on the southeast extension of the northwest-trending zone.

10. By extending the trend to the northwest, the alignment is found to pass through Falconbridge's Murphy Lake prospect (discussed in another report). Still further extension to the northwest puts the trend through the mineralized quartz monzonites at the Cariboo Bell property.

11. A subtle low trend can be followed on compilations of the aeromagnetic maps. The low trend is coincidental with the northwesterly extension of the zone to Cariboo Bell.

(b) Northeast Trend of Copper Mineralization - Another feature offered for speculative interest is a postulated northeasterly-trending zone which appears to correlate with the distribution of copper occurrences through the map area (Fig. 4). The trend coincides with some prominent topographic features, but is also reflected by some subtle and hidden features. On a very regional scale a recurrent lineament trending north-easterly from Bonaparte River to Taweel Lake is expressed or reflected by the following features:

1. The Loon Lake - upper Bonaparte River Valley.

2. The lower Bonaparte River Valley within Map Area 92-P.

3. The offset in the Rayfield River.

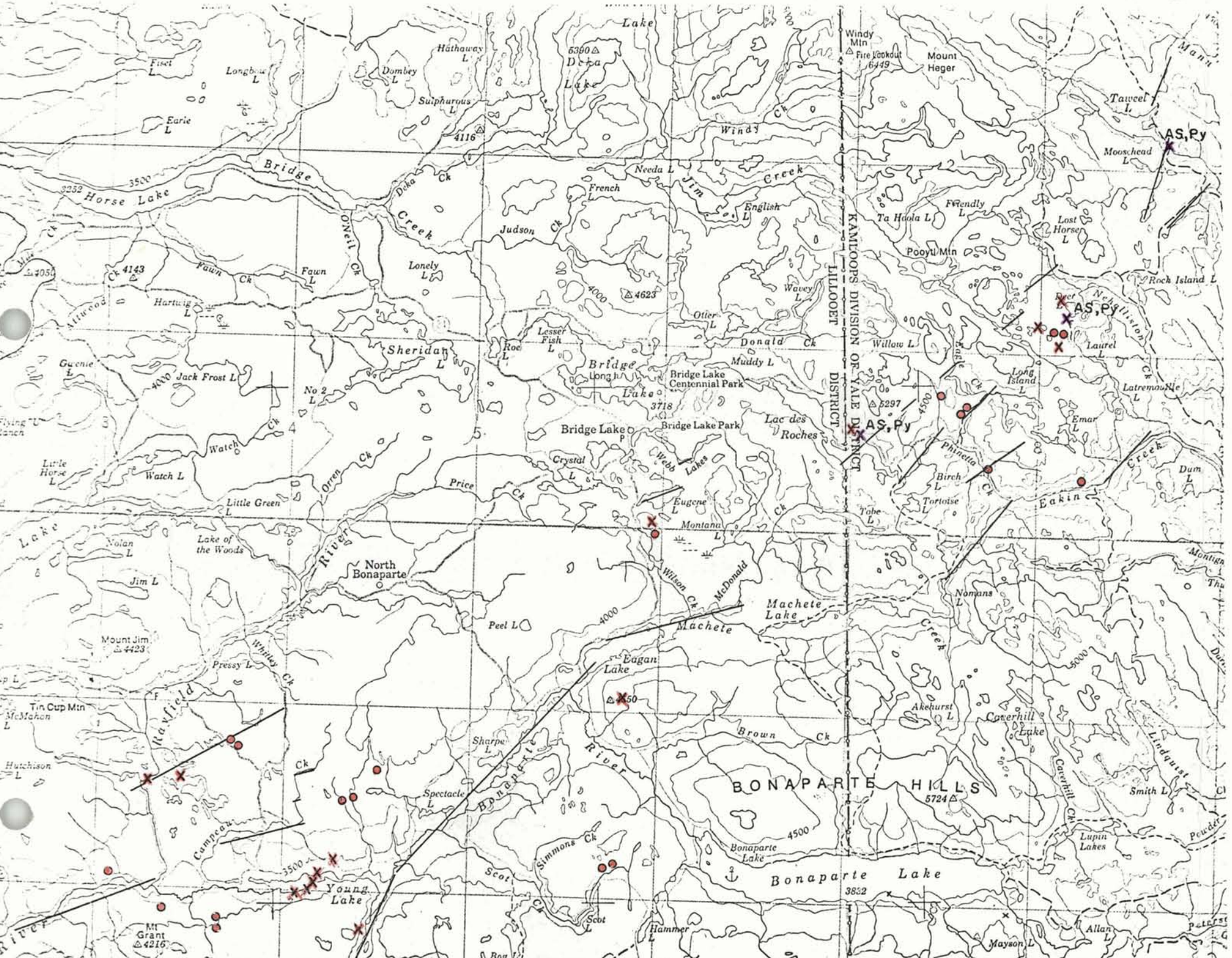


FIGURE 4 Postulated northeast-trending zone showing lineaments and distribution of copper and arsenic occurrences, and anomalous copper geochemical values.

- copper occurrence
- arsenic occurrence
- anomalous copper geochemical value

scale; 1/250,000

4. Green Lake - Watch Lake and Creek to Sheridan Lake lineament.

5. Upper Rayfield River and Pressy Lake lineament.

6. The offset in Lac des Roches, reflected by a similar offset in Eagle Creek and Eagle Lake.

7. Birch Lake - Phinetta Lake - Eagle Creek lineament.

Subtle expressions of the northeast trend are expressed by the following:

(1) Several minor topographic expressions from Lac des Roches to Taweel Lake.

(2) Geochemical anomalous values lie on the northeastern extension of the Rayfield river offset.

(3) The Rayfield River quartz-deficient and copper mineralized rocks lie astride northeast-trending elements.

(4) The known copper mineral occurrences on Young Lake plot in a northeast trend.

(5) Geochemical threshold values north of Young Lake plot on a northeastwards extension of the few known mineralized fracture locations.

(6) The only copper-molybdenum mineral occurrence observed in the Bridge Lake area lies within the postulated northeast zone.

(7) One of the few geochemical anomalies around Lac des Roches plots on the northeast zone at the offset in Lac des Roches. Chalcopyrite and arsenopyrite were observed at this locality.

(8) Royal Canadian Ventures is reported drilling a prospect approximately 1½ miles northeast of Janice Lake. This location lies astride the postulated zone.

(9) Massive sulfide deposits on the southwest end of Deer Lake (location "S"), reported as containing auriferous arsenopyrite, are on the trend.

(10) A reported deposit of galena and arsenopyrite occurs at the south end of Taweel Lake.

(11) The "Mo" Molybdenite prospect explored by Falconbridge near Taweel Lake lies close to the postulated trend.

(12) The unmapped intrusives and observed mineralization in the vicinity of location "R" appear to straddle the zone.

(13) It may be noted, that the recent discovery of a porphyry copper deposit at the old Maggie Mine by Bethlehem Copper Corporation is generally within the projected extension of the zone to the southwest, off the Bonaparte map sheet.

The subject of linear trends is commonly regarded with skepticism. Meaningful relations and directions are often difficult, if not impossible to determine with certainty. Any one of the points illustrated may not be suggestive of a trend. However, the writer feels that the apparent relationship of so many seemingly unrelated features to observed linear components may be more than purely coincidental. The apparent northwesterly trend in the localization of pyrite mineralization and a variety of intrusive types, and the apparent northeast trend of the copper mineralization, is felt to be of potential significance in the direction of future exploration activity within the Bonaparte Lake and adjacent map areas. Further work and detailed studies would be needed to ascertain the presence of the postulated zones conclusively.

G. Recommendations

(a) Rayfield Area

i. The comprehensive exploration by Amax and others would seem to make further exploration of the Rayfield River prospect a dubious venture, to say the least.

With regard to the Owen and Allan group of claims held by G. V. Lloyd Explorations Ltd., mineralization observed in place, while of a "porphyry copper" nature, was not, in the writer's opinion, particularly well developed or extensive. Alteration of the rock was neither pervasive or extensive in the massive outcrop nor along fractures. Much of this region is drift-covered and was not examined in any great detail. No further reconnaissance exploration is recommended over either the Rayfield River canyon area or the area covered by the Owen and Allan claim groups.

ii. The contact between the Nicola volcanic rocks and the intrusives in the vicinity of location K_1 - K_2 and locations "C" and "D" should be examined in more detail, to determine whether the geochemical copper values are reflecting the higher copper values inherent to the Nicola volcanics or are the result of a copper mineralization.

iii. The copper values from locations "A" and "B" cannot be satisfactorily explained. Outcrop is very scarce around "A". Minor outcrop at "B" appears to represent a very small inlier of Nicola volcanic rock within leucoblastic monzonite. Further examination of the area around "A" and "B" should be undertaken in conjunction with the proposed examination of the contact area between K_1 and K_2.

iv. The region around the confluence of Fly Creek and the Bonaparte River (west of the Rayfield River) is of speculative interest to the writer. An aeromagnetic low region trends along the Fly Creek topographic linear. Should outcrop of any rock type other than the mapped Tertiary basalt (Map 3-1966) be present, it may most likely be found along the Bonaparte River where the deepest topographic disection of the plateau has taken place. The high copper value at location "A" is noted as being on a smaller, more subtle topographic linear feature paralleling Fly Creek and also having an aeromagnetic low expression. A brief exploratory examination would probably suffice to see the rock types, check the creek and river float, and determine the geochemical expression of Fly Creek. Access from the Hutchison Lake road is blocked by a private gate and a most unreasonable owner. Komori Sawmills are reported to be building a new access road during 1971 into the Fly Creek area. Alternative access can be found via the Westcoast Transmission Company's pipeline or from 70 Mile House.

(b) Young Lake Area

i. Higher than usual copper values for the Young Lake area were found to the north of Young Lake. These may be reflecting mineralization reported by Copper Soo Mining Corporation to occur approximately 2 miles north of the sample sites. This area, as shown on G.S.C. Map 3-1966, is extensively drift-covered; however, the writer feels it to be probably underlain by "granitic" rocks of the Young Lake type. Copper Soo reported "extremely low" copper values but did indicate a molybdenum assay of .074% MoS_2 over a drilled intersection of 52 feet.

A review of the Copper Soo exploration from old assessment records, with a view to technique and extent of exploration, may fill in some of the unknown area north of Young Lake, and shed more light on the significance of the threshold geochemical values found in that part of the map sheet.

ii. A large area shown on Map 3-1966 as overlain by Tertiary basalts lies between Young Lake, Scot Lake and upper Deadman Creek area. On the basis of air photo interpretation, aeromagnetic expression and the observed geomorphic expression of the basalts, Nicola rocks, and the intrusives throughout the map area, it is felt that intrusive rocks may exist within this region. Should this prove to be the case, the proximity to Nicola volcanic rocks and the copper location of the Vidette mine area may make further prospecting warranted.

At location J_1 and J_2, rocks similar to the "Nicola hybrid diorite" type were encountered, although no Nicola rocks were found. A local aeromagnetic high area is mapped just to the southwest of J_2; this may be related to the diorite outcrops.

The aeromagnetic expression over both the area north of Young Lake and the area between Young and Scot lakes would seem to indicate the presence of underlying intrusives. This area should be prospected with a view to determining the possible occurrence and extent of the suspected underlying intrusives as well as any mineralization which may be present.

The area south of Bonaparte Lake, and particularly the region covered by the postulated northwesterly-trending zone of intrusives, should receive a regional prospecting, mapping and geochemical survey similar to the 1971 South Cariboo program.

(c) Eakin Creek to Friendly Lakes Area

i. The reported occurrence of limestone three miles to the northwest of location "S", by Campbell and Tipper, opens the possibility of other massive sulfide replacement deposits similar to the old Lakeview occurrence at location "S". The presence of sulfide-bearing host rocks, favourable intrusive rock types, argillic limestones, and known massive sulfide deposits, all contribute to this possibility.

Within the same general area, more specifically the area upstream from location "R", the occurrence of high copper geochemical values and an increasing tendency in values of molybdenum; the presence of skarn type mineralization with chalcopyrite; the occurrence of previously unmapped intrusive rocks within favourable Nicola host rocks; and the observed occurrence of copper mineralization within the Nicola host rocks; make this region attractive as a future exploration target.

The presence of high copper geochemical values at location "P" and at a location 3.5 miles west of "P" should be investigated further.

The exploration pressure since 1965 exerted on the entire region from Eakin Creek north to the small syenite bodies, and encompassing the above-mentioned region, should be considered. Any further work contemplated in this region should definitely be preceded by a thorough search, study, and review of the available literature on the area (i.e., old assessment reports and maps, etc.).

Nicola Map Sheet
(NTS 92-I-15W, Area C - Index Map)

Some reconnaissance work was done in the vicinity of Criss Creek (Map 123-71-3), the main purpose being to examine and sample some altered zones noted previously and to look at a reported copper-molybdenum showing.

At points A-D the rock is a limestone member of the Nicola group, consisting of light grey, thinly-bedded, shaly limestone. Several altered zones occur within this area, some of which measure up to 400 feet across. The alteration is characterized by heavy limonite staining and impregnations accompanied by some brecciation and quartz veining. Minor hematite is also present. Samples were collected at the four locations indicated, and analysed for precious metals. Assays indicate only trace amounts of gold and silver present.

Points E-I represent sample locations in altered zones within volcanic members of the Nicola group. These zones are all relatively small and are characterized by bleaching and limonite straining. At G a small amount of cinnabar accompanies the alteration. Only trace amounts of gold and silver were detected in these samples.

The Vernon group of claims (J and K) include a copper-molybdenum showing associated with a small plug of granite porphyry.

On the hillside north of Criss Creek (J), trenching has exposed massive veins of milky quartz which cut Tertiary (?) sedimentary and volcanic rocks. The veins carry moderate amounts of pyrite and trace amounts of molybdenite. Tetrahedrite has also been reported but none was observed. Scattered quartz feldspar porphyry float is present in the trenched area, some of which contains intergrowths with the massive quartz.

Along the creek bottom (K) this porphyry crops out for a

distance of about 500 feet. Minor amounts of disseminated pyrite are contained in it, and at the west end of the exposure area minor amounts of malachite and azurite are present along the walls of a shallow adit. The adit has been driven near where the porphyry contacts a mariposite-bearing schist. To the east of the adit, three old diamond drill set-ups can be seen. These holes were probably drilled by Great Slave Exploration in 1966.

The showings exposed here contain only very weak copper and molybdenum mineralization of limited extent. Potential for better grade material is poor and the property is therefore of no further interest.

An area of previously unmapped intrusive rocks was observed at points L and M. At L the rock is a granodiorite with 10% fresh biotite. To the west, outcrops consist of a relatively fresh fine-grained quartz monzonite which contacts and veins a coarse-grained syenite at M, the western end of the intrusive exposure. Despite the interesting rock type occurring here, no indication of mineralization was found.

As a matter of interest some old mercury workings were examined in the vicinity of point N. The cinnabar here is associated with dolomite-ankerite veins cutting bleached Nicola volcanic rocks. The mineralization appears to have been very spotty and limited in extent.

III. PROPERTY EXAMINATIONS

Poison Mountain

One day was spent at Poison Mountain (location D on Index Map) in the company of Mr. Donald Hull of Homestake Mining Company. The property is presently under option to Canadian Superior who, at the time of the visit, were engaged in a percussion drilling program totalling about 5000-7000 feet.

The critical rocks are diorite porphyries (both biotite and hornblende) which intrude Cretaceous argillite, greywacke, and conglomerate. The earlier rock, biotite porphyry, crops out for about 3000 feet along Copper Creek and dikes of the same material occur to the north along Poison Mountain Creek. The hornblende porphyry intrudes the central part of the Copper Creek biotite porphyry as an elongate mass. It also occurs as a separate stock along Fenton Creek to the north.

Most of the mineralization appears to be confined to the southern margin of the Copper Creek biotite porphyry. The better grade material forms several narrow elongate zones which roughly parallel the contact. Another zone of mineralization occurs near the southern margin of the Fenton Creek hornblende porphyry in the vicinity of the biotite porphyry dikes.

In the mineralized zone chalcopyrite and minor bornite occur as narrow fracture fillings and as disseminated replacements of mafic minerals. Minor amounts of molybdenite form narrow fracture fillings. Pyrite and magnetite are also present, though most pyrite occurs as a rough halo in the surrounding sedimentary rocks.

Alteration of the biotite porphyry includes argillization of the feldspars and biotitization of hornblende and of primary biotite. Veinlets of gypsum occur throughout the area, though their relationship to mineralization is not known.

This property has been worked by several major companies and the main showings were drilled previous to 1962. Though no details of the present drilling results were discussed, it is the writer's opinion that very little if any ore grade material has been found in addition to that previously outlined.

Harper Creek

This property was visited at the request of Mr. Pat Russell who holds six claims covering a molybdenite showing located on the eastern slope of Harper Creek approximately five miles north of North Barrier Lake (location E).

Mineralization is confined to a sill-like zone of medium- to fine-grained quartz monzonite which crops out for approximately 3000 feet along a north-south strike and which has a probable thickness of up to 500 feet. The quartz monzonite is surrounded by a barren coarse-grained granodiorite.

Molybdenite occurs as coarse-grained rosettes which are true disseminations within the quartz monzonite and therefore represent late segregations of a primary constituent of the magma. Lesser amounts of molybdenite occur in quartz veins and in narrow fractures where it is accompanied by pyrite. Minor amounts of chalcopyrite and pyrrhotite are also present.

This property was first worked in 1957, at which time a limited program was sponsored by Quebec Metallurgical Industries Ltd. and directed by Mr. J. J. McDougall. Five short packsack holes were drilled and several rock cuts were blasted out and sampled. Assay results from the work are tabulated on page 41.

McDougall's map indicates that the best mineralization is confined to an east-west trending zone measuring approximately 100 x 300 feet with possible extensions along strike. Based on his work and observations, the known mineralization is too erratic and low in grade to be of further interest; however, he did recommend further prospecting in the surrounding area.

Assay Results - 1957

Hole No.	Assay
1	50' of 0.02% Mo
2	15' of 0.07% Mo
3	15' of 0.17% Mo
4	8' of 0.02% Mo
5	8' of 0.02% Mo
Chip Sample	
1	10' of 0.31% Mo
2	10' of 0.10% Mo

In 1964 Cominco drilled a 300-foot hole on a flat dip directly below the area of the main showing. The best assay results from this hole averaged 0.01% Mo.

Noranda, in 1965, did a limited soil geochemistry survey over the property. Their work indicates an extension of anomalous molybdenum values 3000 feet south of the main showing. This extension correlates with the known extent of the quartz monzonite.

In 1966 West Moly Mines drilled six holes on the claims. Of these, only three reached bedrock and these were all in the vicinity of the main showing. For a total of 2014 feet drilled, they report only 10 feet of 0.17% Mo and 100 feet of 0.04% Mo.

The writer concurs with McDougall's original conclusions and recommendations. Since most of the molybdenite is present as rather erratically distributed primary disseminations, there is little likelihood of any increased concentrations within this zone of quartz monzonite; however, this general area is a definite molybdenum province and as such it is good prospecting ground.

Troy Silver Properties

Three properties held jointly by Troy Silver Mines, Rokon Mines, and Tundra Holding Company were examined in the company of Mr. Ernest North, President of Troy Silver Mines. These are indicated on the index map as points F, G, and H.

A. Granite Mountain Property (location F)

This property, consisting of approximately 150 claims, adjoins that of Granite Mountain Mines on the northeast. No mineralization has as yet been found and the only things which might be considered favorable are its proximity to the Granite Mountain Mines' property, on which some copper mineralization has been found, and the presence of intrusive rock on at least part of the claim group. These intrusives are apparently part of the same series in which the copper occurs at the Gibralter Mine, located approximately nine miles to the southwest.

On the eastern part of the claims outcrop is very sparse. Wildcat trenching in this area has exposed bedrock in only one location. The rock there is a highly sheared and altered medium-grained quartz monzonite (?). Most of the rock exhibits a slight to moderate amount of argillic alteration. A few odd pieces are highly sericitized. No sulfides are present.

In the central and western parts of the property a considerable amount of outcrop is exposed. The rock here consists of a medium-grained diorite cut by occasional aplite stringers. The mafic minerals in the diorite are moderately altered to chlorite and sericite. No sulfides were observed.

Without some indication of the presence of sulfides, the favorable features of this property (location and rock types) are not (in the opinion of the writer) enough to justify an exploration program.

B. Canim Lake Property (location G)

This property, consisting of approximately 120 claims, lies on the north side of Canim Lake near a very small body of water known as Christmas Lake.

Induced polarization and magnetometer surveys have been run over an area measuring about 4000 x 4000 feet. A total of five holes have been diamond drilled, three on I.P. anomalies (34-36 millisecond) and two on magnetic anomalies. All holes cut both volcanic and intrusive rock.

The volcanic rocks vary from black basalt to green andesite. Some are altered and appear cherty and siliceous. They are mapped as members of the Nicola group of Triassic age. The intrusive is a fine-grained quartz-poor rock, either a syenite or a diorite in composition. Both hornblende and feldspar exhibit some lineation. All samples of intrusive examined are fresh. Some are very dark and difficult to distinguish from the volcanic material. A few lamprophyre dikes are present, both in surface outcrop and in drill core.

In the area of the grid and in the vicinity of the drill holes, a fair amount of outcrop is present, averaging about 20%. Approximately 18 trenches have been cut here with about one-third of these hitting bedrock. On the remainder of the property, except for rock bluffs overlooking Canim Lake, the amount of outcrop is considerably less.

The mineralization exposed consists mostly of pyrite and pyrrhotite. Some chalcopyrite is present, generally in only trace amounts, though some higher grade pieces have been found in the trenches or as float. These assayed up to 2% copper. The best section of core assayed 0.1% copper over 500 feet. The remainder of the core examined was barren or contained only pyrite and pyrrhotite.

In the volcanic rocks the sulfides occur as sparse coarse clots or as fracture fillings. In the intrusive they occur as

medium- to fine-grained disseminations and appear to be present in varying amounts throughout the entire intrusive. In some core samples of intrusive the sulfide content is as high as 10%. High sulfide content was not encountered in all holes drilled on I.P. anomalies. This lack of correlation may be due to incorrect interpretation of anomaly position.

The amount of iron sulfides occurring on this property is of some interest, especially when the possibility of a pyrite halo around better grade material is considered. Though an examination of the property and of the data revealed no evidence of such a zonation, the data are not complete enough to eliminate this possibility. Under less restricted budgetary conditions this property would be worth a serious consideration. An option could be arranged for a straight work commitment. The best approach would be a program consisting of a geochemical survey, and a resurvey of the I.P. data extending beyond the present grid area, followed by percussion drilling if warranted. Under the present economic conditions, however, such a consideration is out of the question.

C. Williams Lake Nickel (location H)

This property, consisting of 48 claims, is located just southwest of Williams Lake. Granby drilled three holes for a total of 1200 feet in 1956. These averaged about 0.25% nickel.

The property was examined by Kaiser Cement & Gypsum Corporation in 1969, and a Mr. E. B. Connors recommended that Kaiser option the property at that time. Mr. North's partners could not agree on the option terms and the agreement was never completed. All the claims are presently in Mr. North's name.

Dolmage and Campbell did a study of the property for Kaiser in 1969, and some of their findings are discussed below.

The area of interest lies at the southwest edge of Williams Lake and extends about two miles farther to the south.

The width is about one mile. At the south end of this zone is a body of serpentine which has been trenched occasionally for asbestos. At the north end the outcrops consist of a buff-weathering highly altered rock whose origin has not been determined. Between these two rock types is a zone described as a mafic breccia.

The serpentine body contains minor relict grains of pyroxene, talc, and 1-2% chormite plus magnetite. Some of the magnetite has a few minute grains of pentlandite and nickel-iron alloy associated with it. Some carbonate veining is present. Two chip samples covering zones up to 250 feet in length assayed 0.25 - 0.26% nickel.

The mafic breccia consists of coarse and scattered clino-pyroxene crystals in a matrix of limonite-stained ankerite, sericite, and finely-crushed quartz. No sulfides of any type have been found in this rock.

Most of the interest in this area lies just south of the lake where the so-called buff-weathering rock forms prominent limonite-stained bluffs. These bluffs are bright orange to red. They are fractured and vuggy and appear cherty and tuffaceous. Chalcedony, quartz, and calcite form stockworks and boxworks throughout most of the outcrops. In thin section the rock is seen to consist mostly of quartz, ankerite, calcite, and limonite.

In outcrop small amounts of a green mineral occur throughout this highly altered rock. Some is micaceous and resembles mariposite. Some is dull and earthy and resembles garnierite. None of this material has ever been positively identified.

The only sulfide seen to date in this rock is pyrite and it is only present in trace amounts. Five chip samples collected by Kaiser over zones of up to 500 feet in length assayed 0.18 - 0.23% nickel. One 500-foot chip sample collected by the writer assayed 0.18% nickel. The source of the nickel is not known.

Two possible origins have been suggested for this buff-weathering rock. It may represent an intensely altered serpentine.

This origin is suggested by the similarity in nickel content between this rock and the serpentine body to the south. In this case the nickel probably represents that previously held in the silicates and intergrown with the magnetite. The rock could also have been derived by alteration of cherty limestones and tuffs which are common in the Cache Creek group. The present mineral composition is more consistent with this origin. In this case the alteration and introduction of nickel might be related to the nearby ultrabasic.

In either case there is no evidence for the presence of nickel sulfides or nickel values, whatever their source, in quantities high enough to be of interest.

Spout Lake (location I)

This property, staked by Bethlehem Copper in 1971, covers a block of ground extending from the old Coranex property on the south, northwards to the south shore of Spout Lake. It includes the west side of the Takomkane Batholith, the Nicola volcanic rocks west of the intrusive, and the contact zone between the two.

The Coranex property contains weak copper mineralization along the contact zone. ASARCO drilled and trenched here in 1969. The immediate showing area was examined by a South Cariboo reconnaissance crew in 1970.

Bethlehem have discovered a very interesting copper showing located approximately 2½ miles north-northwest of the Coranex ground and lying one mile west of the intrusive contact, and just south of Spout Lake. The mineralization occurs within a small body of altered gabbro which forms a topographic and magnetic high. A few narrow dikes of quartz monzonite cut the gabbro.

The outcrop area, measuring approximately 1000 x 1000 feet has been sporadically trenched and pitted. No grid of any type is in evidence and it is probable that no geophysical or

geochemical work, or geological mapping has as yet been done.

Nearly every pit and trench within the area of outcrop contains chalcopyrite in varying amounts. The chalcopyrite occurs mostly as disseminated clots within the gabbro; however, a few veinlets and fracture fillings are also present. No continuity is apparent between sections of the better grade material. Trace amounts of disseminated chalcopyrite are present within the quartz monzonite dikes. The writer estimates a considerable tonnage of 0.15 - 0.2% copper averaged over the entire trenched area.

The gabbro is slightly to intensely altered; however, a correlation between alteration and mineralization is not apparent. Alteration consists of chlorite and epidote, accompanied in some areas by a diffuse pink feldspathization. Magnetite is also present, some as thin seams and some as massive clots. It often contains disseminations of chalcopyrite.

This property is one of the better ones in the area and definitely warrants detailed work and drilling.

IV. RECONNAISSANCE PROGRAM PLANNED FOR 1972

Geological Reconnaissance

As planned, reconnaissance work will be carried out on the same scale as in the previous two years using two 2-man crews.

Reconnaissance will be continued by one crew in the eastern and northern parts of the Taseko Lake sheet. Even though the work to date does not indicate much encouragement, there are several areas of Mesozoic intrusive rock, and the area definitely warrants at least one more season's work, especially since so little geology and exploration has been done here relative to most areas in south central British Columbia.

The second crew will spend approximately one month covering two small intrusives in the south part of Wells Gray Park and an area in the vicinity of Coquihalla Mountain northeast of Hope. Other areas to be covered by this crew will be decided upon during the winter.

Further testing of the Murphy Lake I.P. anomalies is covered by a separate Murphy Lake - P.N. 165 budget proposal.

Office Work

During the winter, work will be continued on the geologic folios. Those already completed will have to be revised and updated. If time permits, new ones will be started for those areas as yet not covered. The new folios will include the Kettle River, Pemberton, Hope, and Quesnel map sheets.

Supervision

S. Pilcher

1 assistant ??

Crews

2 (1 geol. graduate
(1 assistant undergraduate

Timing - Late May - September plus carryovers.

Equipment - 3 trucks, 3 trailers (as 1971).

APPENDIX 1

South Cariboo (P.N.123) Costs For 1971

Anticipated	$87,975	Direct
	17,595	Overhead (@ 20%)
	$105,570	Total
Actual	$118,641	Total
	14,756	Less drilling costs (Not originally budgeted for.)
	$103,885	Total

FALCONBRIDGE NICKEL MINES LIMITED

Project No. 123

SOUTH CARIBOO

EXPLORATION DEPARTMENT

EXPENDITURES - 1971

	JANUARY	FEBRUARY		MARCH		APRIL		MAY		JUNE	
	Month $	Month $	Year To Date $	Month $	Year To Date $	Month $	Year To Date $	Month $	Year To Date $	Month $	Year To Date $
General & Geology											
Salaries & Wages	2,181	2,573	4,754	2,689	7,443	2,254	9,697	6,111	15,808	4,726	20,534
Contract Payments	-	-	-	-	-	-	-	-	-	4,672	4,672
Field Expenses	-	21	21	928	949	23	972	399	1,371	95	1,466
Local Transportation	17	6	23	41	64	105	169	267	436	441	877
Travelling & Expenses	-	-	-	-	-	-	-	21	21	87	108
Assays	-	-	-	-	-	-	-	-	-	-	-
	2,198	2,600	4,798	3,658	8,456	2,382	10,838	6,798	17,636	10,021	27,657
Geophysics											
Salaries & Wages	-	-	-	-	-	-	-	-	-	862	862
Contract Payments	-	-	-	-	-	-	-	-	-	-	-
Field Expenses	-	-	-	-	-	-	-	-	-	-	-
Local Transportation	-	-	-	-	-	-	-	-	-	-	-
Travelling & Expenses	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	862	862
Geochemistry											
Salaries & Wages	-	-	-	-	-	-	-	-	-	865	865
Contract Payments	-	-	-	-	-	-	-	-	-	-	-
Field Expenses	-	-	-	-	-	-	-	-	-	-	-
Local Transportation	-	-	-	-	-	-	-	-	-	-	-
Travelling & Expenses	-	-	-	-	-	-	-	-	-	-	-
Analyses	90	30	120	-	120	-	120	-	120	140	260
	90	30	120	-	120	-	120	-	120	1,005	1,125

FALCONBRIDGE NICKEL MINES LIMITED

Project No. 123

EXPLORATION DEPARTMENT

SOUTH CARIBOO

EXPENDITURES - 1971

	JANUARY	FEBRUARY		MARCH		APRIL		MAY		JUNE	
	Month $	Month $	Year to Date $	Month $	Year to Date $	Month $	Year to Date $	Month $	Year to Date $	Month $	Year to Date $
Diamond Drilling											
Salaries & Wages	-	-	-	-	-	-	-	-	-	-	-
Contract Payments	-	-	-	-	-	-	-	-	-	-	-
Field Expenses	(78)	-	(78)	-	(78)	-	(78)	-	(78)	-	(78)
Local Transportation	-	-	-	-	-	-	-	-	-	-	-
Travelling & Expenses	-	-	-	-	-	-	-	-	-	-	-
Assays	-	-	-	-	-	-	-	-	-	-	-
	(78)	-	(78)	-	(78)	-	(78)	-	(78)	-	(78)
Camp Operation											
Salaries & Wages	-	-	-	-	-	-	-	-	-	750	750
Camp Supplies	21	-	21	-	21	-	21	339	360	931	1,291
Hotels & Meals	-	-	-	-	-	100	100	20	120	472	592
	21	-	21	-	21	100	121	359	480	2,153	2,633
Metallurgy & Mineralogy	-	-	-	-	-	-	-	-	-	-	-
Option Payments & Participation	-	-	-	-	-	-	-	-	-	-	-
Property Maintenance	-	-	-	-	-	-	-	-	-	-	-
Draughting	44	66	110	112	222	39	261	502	763	89	852
Exploration Overhead Expense	982	1,157	2,139	1,211	3,350	1,013	4,363	2,750	7,113	3,242	10,355
Other Expenses	-	-	-	-	-	-	-	-	-	-	-
	3,257	3,853	7,110	4,981	12,091	3,534	15,625	10,409	26,034	17,372	43,406

FALCONBRIDGE NICKEL MINES LIMITED

EXPLORATION DEPARTMENT

EXPENDITURES - 1971

Project No. 123

SOUTH CARIBOO

	JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
	Month $	Year To Date $	Month $	Year To Date $	Month $	Year To Date $	Month $	Year To Date $	Month $	Year To Date $	Month $	Year To Date $
General & Geology												
Salaries & Wages	6,400	26,934	5,164	32,098	5,706	37,804	4,322	42,126	3,533	45,659	(1,397)	44,262
Contract Payments	-	4,672	-	4,672	-	4,672	-	4,672	-	4,672	-	4,672
Field Expenses	11	1,477	129	1,606	20	1,626	61	1,687	49	1,736	(45)	1,691
Local Transportation	1,060	1,937	1,060	2,997	1,445	4,442	130	4,572	488	5,060	33	5,093
Travelling & Expenses	93	201	170	371	69	440	351	791	33	824	17	841
Assays	-	-	-	-	55	55	-	55	-	55	-	55
	7,564	35,221	6,523	41,744	7,295	49,039	4,864	53,903	4,103	58,006	(1,392)	56,614
Geophysics												
Salaries & Wages	872	1,734	4,649	6,383	(977)	5,406	111	5,517	-	5,517	(396)	5,121
Contract Payments	-	-	-	-	-	-	-	-	-	-	-	-
Field Expenses	15	15	12	27	115	142	64	206	141	347	-	347
Local Transportation	136	136	60	196	122	318	39	357	-	357	-	357
Travelling & Expenses	86	86	39	125	270	395	(62)	333	185	518	-	518
	1,109	1,971	4,760	6,731	(470)	6,261	152	6,413	326	6,739	(396)	6,343
Geochemistry												
Salaries & Wages	-	865	-	865	-	865	-	865	-	865	(77)	788
Contract Payments	-	-	-	-	-	-	-	-	-	-	-	-
Field Expenses	-	-	-	-	-	-	-	-	-	-	-	-
Local Transportation	-	-	-	-	-	-	-	-	-	-	-	-
Travelling & Expenses	-	-	-	-	-	-	-	-	-	-	-	-
Analyses	114	374	221	595	187	782	177	959	93	1,052	-	1,052
	114	1,239	221	1,460	187	1,647	177	1,824	93	1,917	(77)	1,840

FALCONBRIDGE NICKEL MINES LIMITED

EXPLORATION DEPARTMENT

EXPENDITURES - 1971

Project No. 123

SOUTH CARIBOO

	JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
	Month $	Year to Date $	Month $	Year to Date $	Month $	Year to Date $	Month $	Year to Date $	Month $	Year to Date $	Month $	Year to Date $
Diamond Drilling												
Salaries & Wages	-	-	-	-	-	-	-	-	-	-	-	-
Contract Payments	-	-	-	-	-	-	14,756	14,756	-	14,756	-	14,756
Field Expenses	-	(78)	-	(78)	105	27	120	147	-	147	14	161
Local Transportation	-	-	-	-	-	-	60	60	13	73	-	73
Travelling & Expenses	-	-	-	-	-	-	54	54	198	252	-	252
Assays	-	-	-	-	-	-	-	-	-	-	-	-
	-	(78)	-	(78)	105	27	14,990	15,017	211	15,228	14	15,242
Camp Operation												
Salaries & Wages	-	750	-	750	-	750	-	750	-	750	(67)	683
Camp Supplies	1,697	2,988	245	3,233	1,411	4,644	1,411	6,055	356	6,411	9	6,420
Hotels & Meals	906	1,498	536	2,034	567	2,601	237	2,838	-	2,838	44	2,882
	2,603	5,236	781	6,017	1,978	7,995	1,648	9,643	356	9,999	(14)	9,985
Metallurgy & Mineralogy	-	-	-	-	-	-	-	-	-	-	45	45
Option Payments & Participation	-	-	-	-	-	-	-	-	-	-	-	-
Property Maintenance	-	-	995	995	160	1,155	-	1,155	-	1,155	-	1,155
Draughting	6	858	30	888	91	979	26	1,005	145	1,150	-	1,150
Exploration Overhead Expense	3,272	13,627	3,246	16,873	2,819	19,692	1,995	21,687	1,589	23,276	2,991	26,267
Other Expenses	-	-	-	-	-	-						
	14,668	58,074	16,556	74,630	12,165	86,795	23,852	110,647	6,823	117,470	1,171	118,641

APPENDIX 2

Anticipated South Cariboo Reconnaissance Costs, 1972

EXPLORATION FORECAST

1972

Project Number 123

Project Name SOUTH CARIBOO

	$ Estimate	
Surveys		
Salaries	43,000	
Contract Payments	7,000	
Field Expenses	17,000	
Transportation	4,000	
Sub-Total		71,000
Diamond Drilling		
Salaries		
Contract Payments	4,500	
Field Expenses		
Transportation	2,500	
Sub-Total		7,000
Option Payments & Participations		
Assay & Mill Tests		2,000
Regional Office Expenses (80,000 X 20.2)		16,160
Total for Project		$96,160

1972 FORECAST OF EXPENDITURES

SOUTH CARIBOO - P.N. 123

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Salaries													
Sen. Geol. - Supervision	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	20,400
Assistant Geologist	200	200		200	1,400	2,400	2,400	2,400	800	1,600	1,800		13,400
Samplers and Prospectors					600	1,500	2,000	2,000	500			500	7,100
Surveyor - draughtsman	200	100		200	200	400	400	400	200				2,100
I.P. Survey					1,000	3,000			3,000				7,000
Diamond Drilling (P.S. test)							2,000	2,500					4,500
Transportation													
Vehicles	100	100	100	200	300	1,000	1,000	1,000	1,000	1,000	500	200	6,500
Field Expenses													
Camp Operation					1,000	1,000	2,000	2,000	1,000				7,000
Hotels and Meals					400	400	1,400	1,400	400				4,000
Analyses													
Geochem.					300	300	300	300	300				1,500
Assays					100	100	100	100	100				500
	2,200	2,100	1,800	2,300	7,000	11,800	13,300	13,800	9,000	4,300	4,000	2,400	74,000
Contingencies					1,000	1,000	1,000	1,000	1,000	500	500		6,000
Total	2,200	2,100	1,800	2,300	8,000	12,800	14,300	14,800	10,000	4,800	4,500	2,400	$80,000

APPENDIX 3

Description of Thin Sections

TS 34

TS 53

TS 71

TS 101

TS 107

TS 126

TS 228

HAND SPECIMEN 34 (YOUNG LAKE)

HAND SPECIMEN - A medium-grained "sugary" textured quartz porphyry with a slight greenish yellow speckled appearance, no sulfides observed.

THIN SECTION - TS 34

Mode	-	Quartz	15%
		Plagioclase	50%
		Orthoclase	25%
		Chlorite	2%
		Epidote	2%
		Pyroxenes	< 1%
		Accessory minerals	< 1%

Name - Quartz Monzonite

Texture and Description: The rock is medium-to coarse-grained hypidiomorphic granular. Quartz is largely interstitial with "replacement" boundaries in contact with feldspar grains. Plagioclase usually appears as discreet subhedral grains. Grain boundaries are often "corroded" by quartz and orthoclase.

Small euhedral plagioclase crystals are commonly observed as included grains within orthoclase crystals. The plagioclase commonly have albitized cores. Orthoclase occurs as a large anhedral interstitial mineral, often showing slight sericitic alteration of the cores. Orthoclase occurs with quartz, as discreet grains, and micrographic intergrowths with quartz. Chlorite is an alteration product largely from biotite. Epidote occurs as discreet granules within small clots of chlorite, orthopyroxene, and small flecks of biotite. Epidote also occurs as part of the typically "dirty" granular cores of feldspars having undergone some degree of albitization. Very small amounts of relict pyroxene exist with chlorite and minor biotite in small localized clots. Both clino- and ortho-pyroxenes are evident.

Accessory minerals include sphene, zircon, and opaques (? magnetite), of which sphene is the most common. Sphene occurs predominantly with or within the relict biotites as does

the zircon. Sphene can occur as a free mineral within the feldspars or as a discreet component of the yellow-green clots of chlorite and epidote mentioned previously.

Altered cores of the feldspars are most commonly albitized, followed by sericitization in order of degree. Biotite is almost exclusively altered to chlorite, as is relict pyroxene and hornblende, which may also be altered to biotite.

Origins: A resurgence of passive magmatic activity in the late stages of cooling or reheating of the cooled magma with possible introduction of a fluid phase to account for the corroded crystal contacts, the replacement of minerals, the eutectic exsolution textures, and possibly the development of biotite and epidote from original pyroxenes and hornblende, is felt to be a plausible explanation of the mineralogy and textures observed.

HAND SPECIMEN 53 (WEST BONAPARTE)

HAND SPECIMEN - A medium-fine-grained, white-grey speckled intrusive rock on a cut surface under 20x. Approximately ¼-inch areas of epidote, chlorite, and sericite are separated by intergrowths of quartz and orthoclase. Quartz also appears on the broken surface as discreet small clots or eyes, the largest of which is ¼" in length. Sericite is developed on crystal boundaries and within orthoclase-rich areas. In the hand specimen, on a moistened cut or fresh break, the orthoclase-quartz areas have the slight suggestion of a pale green hue.

THIN SECTION - TS 53

Mode	-	Quartz	25%
		Orthoclase	35%
		Plagioclase	17%
		Epidote	8%
		Sericite/Muscovite	10%
		Chlorite	5%
		Apatite	minor
Name	-	Quartz Monzonite	

Texture and Description: Plagioclase appears as corroded subhedral crystals. Corrosion of plagioclase is commonly by a eutectic intergrowth of quartz and orthoclase. Graphic or very coarse myrmekitic intergrowths are common. Orthoclase is found as large anhedral crystalline clots or interstitial masses as well as an intergrowth mineral. Epidote is commonly found as radiating crystalline masses and as clots within subhedral orthoclase and relict plagioclase crystals. Epidote is seen also as inclusions in chlorite. Chlorite is found as distinct flakes (probably after biotite) with epidote and sericite.

Fine-grained sericite with epidote is also found somewhat concentrated in relict plagioclase crystals. Radiating masses of either large sericite or fine-grained muscovite can also be found associated with epidote. These masses may be original muscovite, but complete alteration from biotite through chlorite may be the more correct interpretation. Chloritic remnants still remain in the "muscovite". Apatite is observed as a very minor accessory mineral. Very minor, very fine-grained opaques were observed associated with epidote; these are felt likely to be magnetite. A plagioclase determination of An_{10} - Ab_{90}, based on extinction angles in a section oriented $\perp a$, was derived from the thin section.

Origins: The degree of alteration, type of alteration, and the mineralogy and textures observed may be the result of a resurgence of magmatic activity or the introduction of a fluid phase late in the history of the cooling magma.

HAND SPECIMEN 71 (RAYFIELD RIVER - BONAPARTE RIVER)

HAND SPECIMEN - The rock contains large (3/4-inch) whitish pink, occasionally zoned, porphyroblasts of orthoclase in a fine-grained, brown biotite, hornblende albite orthoclase matrix. Biotite cleavage is often sub-aligned. Clots of mafic mineral occasionally carry disseminated chalcopyrite and bornite; magnetite is also present.

THIN SECTION - TS 71

Mode	-	Biotite	10%
		Pyroxene (augite)	15%
		Orthoclase	53%
		Plagioclase	15%
		Opaques	5%
		Quartz	2%
		Apatite	acc.
Name	-	Monzonite	

Texture and Description: The rock is almost completely composed of anhedral crystalline masses of small grains of orthoclase and plagioclase with the mafics spread throughout the section. (The scale of the slide does not permit viewing the gross texture of the rock in this section.)

Plagioclase crystals seem to "grade" into perthite and orthoclase. Biotite is present in poikilitic grains with pyroxene and magnetite. Biotite grains are occasionally fractured and bent. Very faint rims of quartz can be found on some of the grains of orthoclase and plagioclase. The quartz may exhibit a slight intergrowth texture with the orthoclase. Augite appears as broken granular fragments commonly within poikilitic biotite grains.

The biotite may be an alteration product of the pyroxene. Small included grains of apatite are found in the pyroxene and the biotite.

Origin: The fragmental nature of many crystals, the bent and broken biotites, the annealed appearance of many grain relationships, the indistinct crystalline borders of the large "porphyroblasts"

observed in the hand specimen and the poikilitic appearance of some of the biotite, lead to the conclusion that this rock is the product of an original intrusive altered and remade by some tectonic intrusive or cataclysmic event. The writer's biases, and the location of this type of rock on the southern periphery of the Rayfield Intrusive, leads to the proposition that the leucoblastic monzonite is a contact phase with the Young Lake Intrusive type.

HAND SPECIMEN 101 (BONAPARTE LAKE)

HAND SPECIMEN - Pale pinkish-yellow intrusive, with large (¼-inch) quartz and poikilitic orthoclase crystals in a fine- to medium-grained groundmass of euhedral plagioclase. Plagioclase is common as inclusions in the orthoclase. Mafics are largely biotite, partially altered to chlorite. Magnetite is present as discreet grains and disseminations with the mafics.

THIN SECTION - TS 101

Mode	-	Quartz	20%
		Orthoclase	30%
		Plagioclase	45%
		Chlorite	3%
		Biotite	2%
		Epidote	1%
		Sphene	acc., <1%
		Orthopyroxene & Hornblende	acc., <1%
		Magnetite	acc., <1%
Name	-	Quartz Monzonite	

Texture and Description: Quartz is found as large anhedral crystaline masses, as is the orthoclase. Sphene is found as an accessory inclusion in the orthoclase. Plagioclase is generally observed as smaller euhedral crystals, often within larger orthoclase grains. Polysynthetic twinning is often developed on a very fine scale.

Chlorite and epidote both appear as alteration products associated with biotite. Sphene appears as small euhedral

grains included in biotite and orthoclase. Minor, accessory amounts of ortho-pyroxene and hornblende are largely altered to chlorite and epidote. Where observed, the pyroxene and hornblende were small crystal fragments. Compositional determination of plagioclase with a crystal oriented ⊥ "a" gave $An_{13}Ab_{87}$. A determination by the "carlsbad albite method" yielded $An_{10}Ab_{90}$.

Origin: A very fluid magma is suspected, allowing late-stage growth of the poikilitic orthoclase and allowing the "replacement" rims on the plagioclase. A resurgence of magmatism may account for the textures and also allow for the presence of pyroxene and hornblende in what is imagined as a "wet" or fluid magma. The hornblende and pyroxene would then be fragments of an earlier "dryer" magma. The rock may represent a degree of hybridization between the Young Lake type and the Lac des Roches type, although this is purely conjecture.

HAND SPECIMEN 107 (BONAPARTE LAKE)

HAND SPECIMEN - Buff weathering, pale grey color, euhedral orthoclase crystals up to ¼-inch long in a very-fine-grained groundmass. Small, drusy, sub-aligned cavities contain terminated crystals of quartz and often a dark prismatic pyroxene tentatively identified as augite. No sulfides noted, but minor magnetite is present.

THIN SECTION - TS 107

Mode	-	Orthoclase	30%
		Augite	15%
		Quartz	2%
		Plagioclase	50%
		Cavities	3%
		Accessory Hematite, Limonite	<1%
Name	-	Dacite	

Texture and Description: Slightly foliated diktytaxitic or weakly miarolitic. Orthoclase is present as phenocrysts up to ¼-inch in length. Augite is in euhedral to subhedral grains and as small intergranular blebs forming cores of weakly-developed aphitic clots of tiny felted feldspars. The groundmass is of very-fine-grained "felted" feldspar. The tiny feldspars are almost exclusively plagioclase and exhibit a sub-aligned orientation. Minor quartz occurs as interstitial grains and in cavities observed in the hand specimen.

The cavities are lined with augite, quartz, and orthoclase. Interstitial grains of hematite and limonite are also present.

Origin: The rock is felt to be of either very high level plutonic or extrusive origin. The drusy cavities are not of a vesicular nature and have well terminated crystals protruding into them. The favored explanation of this is the high level plutonic origin. The observed weak foliation is not incompatible with this theory. The data are insufficient to be conclusive.

HAND SPECIMEN 126 (WEST BONAPARTE)

HAND SPECIMEN - A medium-grained, cream-colored intrusive rock. Biotite is often in euhedral books and may be slightly chloritized. Orthoclase appears to have undergone slight argillic alteration. The zonal nature of orthoclase can be seen under 10x magnification. A small clot of MoS_2 is found on one face.

THIN SECTION - TS 126

Mode	-	Quartz	18%
		Plagioclase	35%
		Orthoclase	22%
		Biotite	15%
		Chlorite	5%
		Sphene	2%
		Epidote	1%
		acc. Orthopyroxene)	2%
		acc. Hornblende)	
		acc. Apatite)	
		acc. Magnetite)	
Name	-	Biotite, Quartz Monzonite	

Texture and Description: Subhedral to euhedral zoned plagioclase with sericitized and saussuritized cores are present. The rock often shows an interstitial eutectic mixture of quartz and orthoclase. Rims of plagioclase gave a composition of Ab_{90} An_{10}. Core compositions were not obtainable by simple methods. Micro perthite is fairly abundant and commonly exhibits micrographic intergrowths of quartz and orthoclase on crystal boundaries. Well-developed biotite is evident throughout the slide, often as euhedral crystals. Biotite is altered to chlorite and can be found with small amounts of sphene and minor amounts of orthopyroxene, epidote and magnetite.

Epidote is commonly observed with chlorite and as "dirty" cores in the plagioclase. Magnetite appears associated with the biotite and chlorite. Apatite is a minor mineral, found as accessory in the feldspars.

Origins: The presence of minor amounts of pyroxene and hornblende is suggestive of early-formed minerals not completely made over to other mafics such as biotite. The presence of the pyroxenes in a rock which, from the quartz orthoclase interstitial eutectic textures, might be interpreted as a "wet" or very fluid intrusion seems to be anomalous. However, if the intrusion was a relatively quick event, contaminant materials may not have had time to be fully assimilated. If the intrusive is a very local rock type (this has not been fully established but is suspected), it is possible that it is a derivation from a more pyroxene- and hornblende-rich parent, and the eutectic condition is simply an event passed through in the cooling process.

Further studies and more detailed examination of the intrusive would be a necessary prelude to any further speculation.

HAND SPECIMEN 228 (BRIDGE LAKE)

HAND SPECIMEN - Medium-grained quartz, feldspar, hornblende, biotite intrusive rock. Feldspars have a pale greenish or pink coloration. Weathered surface often has a pinkish hue.

Name Quartz Monzonite

THIN SECTION - TS 228

Mode -	Quartz	15%
	Plagioclase	48%
	Orthoclase	20%
	Chlorite	15%
	Accessory Sphene, Magnetite	2%

Name - Granodiorite

Texture and Description: Quartz is present as primary granular anhedral masses and as intergrowths with orthoclase. It is commonly concentrated along other crystal boundaries and as an interstitial mineral.

Plagioclase appears as relict euhedral crystals. Almost all have a rim of unaltered orthoclase or orthoclase/quartz intergrowths. Albite twinning is evident in the cores and is also observed in the smaller euhedral included grains within orthoclase.

A compositional determination of An_{53} was derived by the carlsbad albite method on a relatively unaltered crystal.

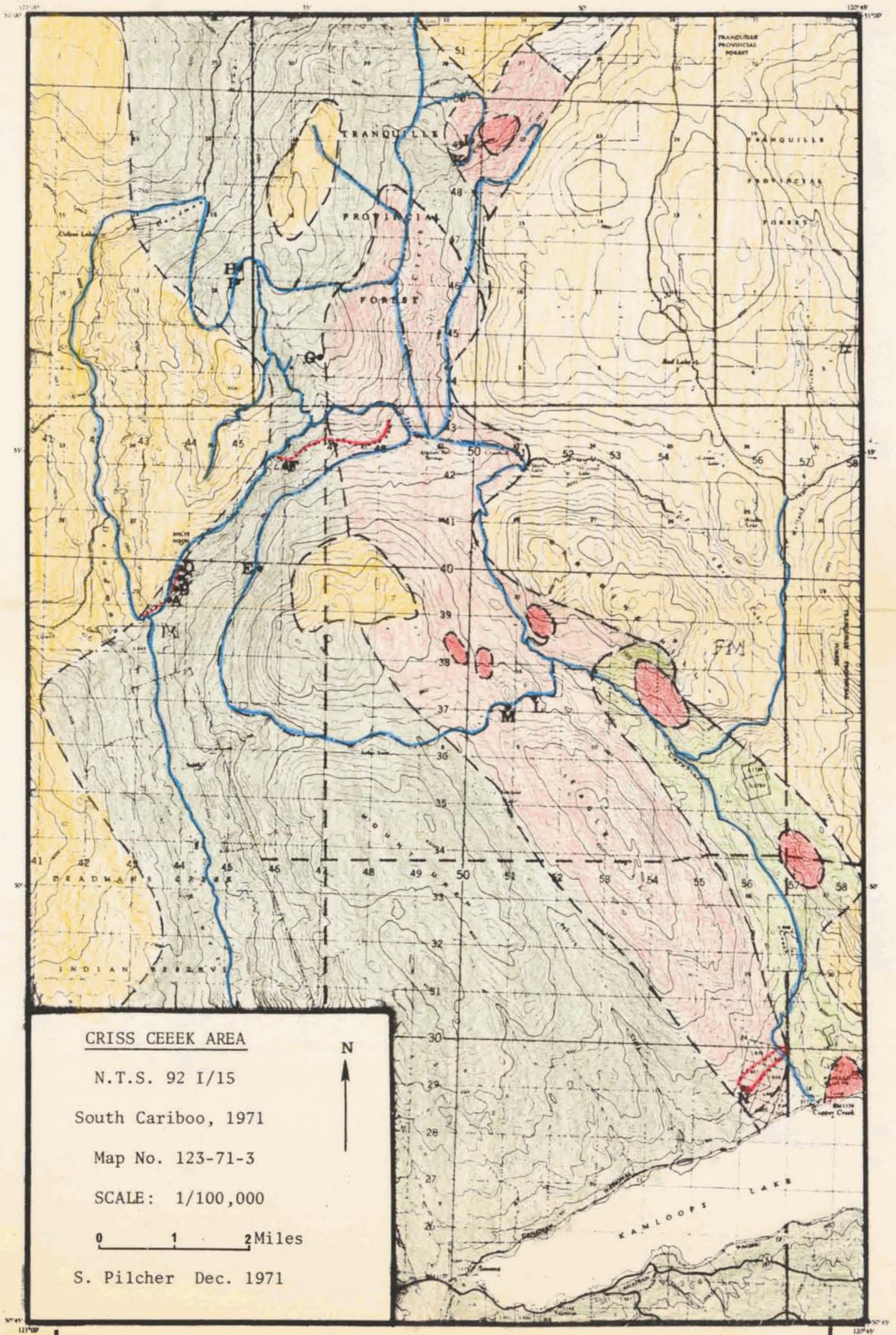
Most plagioclase has undergone saussuritization and has sericitized slightly.

Chlorite is present as an alteration product from hornblende and biotite. Pseudomorphs after each are apparent.

Occasional large anhedral crystalline masses of orthoclase, with inclusions of smaller euhedral crystals of plagioclase, are found. Orthoclase also occurs as tiny stringers cutting through the rock. Orthoclase is most apparent on the borders of the relict plagioclase crystals, where it may occur with quartz as myrmekitic intergrowths or as a discreet orthoclase rim.

Sphene and magnetite are observed as accessory minerals. Their affinity with the chlorite may be indicative of a secondary origin.

Origin: The rock has an intrusive origin, the history of which is not clear. The rimmed and altered plagioclase is perhaps due to a late-stage resurgence of magmatic activity or reheating of the intrusive. Alternatively, the rims may represent a period of eutectic crystallization during the cooling of the magma.



CRISS CEEEK AREA

N.T.S. 92 I/15

South Cariboo, 1971

Map No. 123-71-3

SCALE: 1/100,000

0 1 2 Miles

S. Pilcher Dec. 1971

N

LEGEND

(Geology from G.S.C. Map 886A)

Mesozoic or Cenozoic — Cenozoic

MIOCENE OR EARLIER

KAMLOOPS GROUP-Rhyolite, andesite, and basalt; associated tuffs, breccias, and agglomerates.

CRETACEOUS OR TERTIARY

COPPER CREEK INTRUSIVES-granite, granodiorite, and granite porphyry.

Andesite, basalt; picrite, agglomerate, breccia, tuff; minor sandstone and conglomerate.

Conglomerate, sandstone, and shale.

Mesozoic — Cenozoic

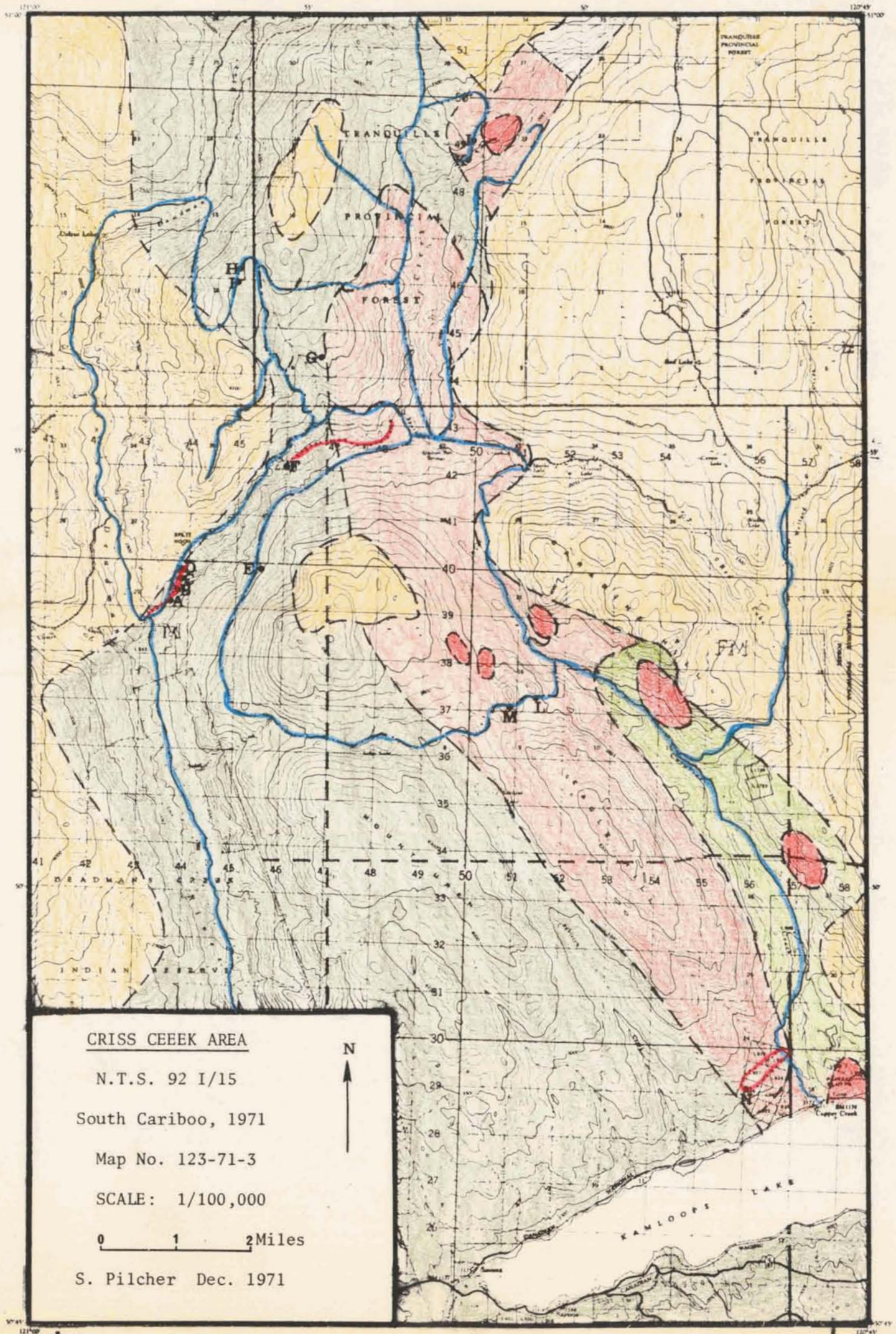
UPPER TRIASSIC

Greenstone; andesite, basalt; agglomerate, breccia, tuff; minor argillite, limestone, and conglomerate.

•A Traverse Point

Truck Traverse

Foot Traverse



LEGEND
(Geology from G.S.C. Map 886A)

Mesozoic or Cenozoic — Cenozoic

MIOCENE OR EARLIER

KAMLOOPS GROUP-Rhyolite, andesite, and basalt; associated tuffs, breccias, and agglomerates.

CRETACEOUS OR TERTIARY

COPPER CREEK INTRUSIVES-granite, granodiorite, and granite porphyry.

Andesite, basalt; picrite, agglomerate, breccia, tuff; minor sandstone and conglomerate.

Conglomerate, sandstone, and shale.

Mesozoic — Cenozoic

UPPER TRIASSIC

Greenstone; andesite, basalt; agglomerate, breccia, tuff; minor argillite, limestone, and conglomerate.

Mesozoic

•A Traverse Point

Truck Traverse

Foot Traverse

GASPARD CREEK AREA

N.T.S. 92 O/7, 10

South Cariboo, 1971

Map No. 123-71-1

SCALE: 1/100,000

0 1 2 miles

S.Pilcher - December 1971

N

LEGEND

(Geology From G.S.C. Map 29-1963)

Cenozoic

UPPER MIOCENE AND(?) YOUNGER

Olivine basalt, andesite, and related tuffs and breccias.

PRE-MIOCENE

Gray, reddish brown, greenish gray, and mauve andesite, dacite, and basalt;minor rhyolite.

Mesozoic

MIDDLE AND(?) UPPER JURASSIC

TAYLOR GROUP-Buff to green graywacke, light gray shale, pebble and massive boulder conglomerate.

Pink biotite granite, quartz monzonite, and monzonite.

Gneissic granodiorite, diorite, and quartz diorite.

MIDDLE OR UPPER TRIASSIC

Limestone, basalt, and related tuffs and breccias; argillite, graywacke, and conglomerate.

cu•mo Geochemical Sample

•A Traverse Point

Truck Traverse

Foot Traverse

MAP REF. NO.: 123-71-2
N.T.S.: 92 P

LEGEND

ROCK UNITS - Falconbridge 1971 Mapping

Basalts: Olivine and hornblende varieties.

Rayfield River Intrusive type: Quartz deficient. Made up, in part, of hornblende monzonite, pegmatitic hornblende syenite, leucoblastic monzonite.

Young Lake Intrusive type: Abundant quartz. Hornblende, biotite, quartz diorite. Mafic mineral content may vary from 3% - 15%. This unit is probably equivalent to Unit 17 mapped by Campbell and Tipper and shown on G.S.C. Map 3-1966.

West Bonaparte Intrusive types: A variety of textures and compositions include: (a) miarolitic, porphyritic plagioclase dacite; (b) medium-grained biotite, quartz monzonite; (c) porphyritic plagioclase diorite; (d) medium-coarse-grained ophitic hornblende monzonite; (e) fine-grained sericite, quartz monzonite; (f) foliated hornblende biotite quartz diorite; (g) hornblendite; sub units may occur as minor dikes, sills or plugs.

Lac des Roches Intrusive type: Granodiorite, quartz monzonite, minor monzonite. Mafic minerals comprise 15% to 35% of rock. Hornblende and biotite commonly altered to chlorite. Very fine-grained epidote in altered plagioclase commonly gives the rock a pale green colouration. Pink orthoclase is more common than in Unit 3.

Syenite: Foliated leucocratic rock, rich in pink orthoclase.

Nicola Group: (a) Volcanics of intermediate composition variably altered to greenstones. (b) Argillites - limey to silicic variations, minor breccia of argillite clasts in basaltic andesite matrix. (c) Grey limestone.

Nicola Hybrid Diorite: A fine- to medium-grained hornblende diorite. Hornblende may be variably altered to biotite and chlorite.

LEGEND

Rock Units - G.S.C. Map 3-1966

Cenozoic

TERTIARY

MIOCENE AND/OR PLIOCENE
Plateau lava; olivine basalt, andesite, ash and breccia beds, basaltic arenite; minor necks and plugs.

EOCENE
SKULL HILL FORMATION - dacite, trachyte, basalt, andesite, rhyolite, related breccias.

CRETACEOUS
Aplite and leuco-quartz monzonite.

Mesozoic

MIDDLE JURASSIC
Biotite granite, quartz diorite, hornblende granodiorite.

LOWER JURASSIC
Andesitic arenite, siltstone, grit and breccia, local granite bearing conglomerate, minor argillite and flows.

UPPER TRIASSIC OR LOWER JURASSIC
Hornblende-biotite quartz diorite and granodiorite, minor hornblende diorite, monzonite, gabbro, hornblendite.

Fine- to medium-grained, pink to brown and grey syenite and monzonite.

Medium-grained, creamy-buff, locally coarsely porphyritic syenite and monzonite.

UPPER TRIASSIC
NICOLA GROUP
Augite andesite flows and breccia, tuff, argillite, greywacke, limestone.

Paleozoic

LOWER PENNSYLVANIAN TO LOWER PERMIAN
CACHE CREEK GROUP (In Part)
Volcanic arenite, greenstone, argillite, phyllite, minor quartz-mica schist, limestone, basalt and andesite flows, amphibolite and conglomerate.

Map Symbols - Falconbridge 1971 Mapping

- Geological Contact
- Fault
- CU, MO, AS 78-1-30 — Geochemical Silt Sample
- A — Reference Point, 1971 Report
- Truck Traverse
- Foot Traverse
- Boat Traverse - Shoreline Traverses on the following lakes:
  1. Upper Loon Lake
  2. Bonaparte Lake
  3. Young Lake
  4. Bridge Lake
  5. Lac des Roches
- Zb — Mineral Reference Locations on File
- DTS-71 — Thin-Section Location and Number Referred to in Report
- 18252 / 38 — Air Photo Center (Federal)

0 1 2 3 4 MILES

SCALE: 1 INCH TO 1.5 MILES APPROX.
1:100 000

FALCONBRIDGE NICKEL MINES LIMITED	
PROPERTY: *SOUTH CARIBOO RECONNAISSANCE*	
LOCATION: *BONAPARTE RIVER MAP SHEET 92P-1W, 2, 3E, 6E, 7, 8W, 9W, 10W*	
TYPE OF MAP: *GEOLOGICAL RECONNAISSANCE*	
WORKING PLACE:	
BASED ON: *G.S.C. Map 3-1966 (in part) 1971 Field work (in part) W. Howell, W. Prescott*	
DATE OF WORK: *1971*	MAP REF. NO.: *123-71-2* — FIG. NO.:
DRAWN BY: *W. Howell*	
DATE: *December 1971*	N.T.S. NO.: *92 P*