GEOLOGY AND MINERAL OCCURRENCES IN THE VICINITY OF TASEKO LAKES* (92O/3, 4, 5, 6)

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INTRODUCTION

Previous 1:50 000-scale mapping by the Geological Survey Branch in map sheets 92O/03 (Glover and Schiarizza, 1987) and 92O/04,05 (McLaren, 1986a) left a strip of unevaluated rocks centered on the Taseko Lakes – Lord River drainage system. During the 1988 field season approximately one month was spent in this area conducting geological mapping, lithogeochemical sampling and stream sediment sampling to complement the previous work. Figure 1-17-1 shows the location and geologic setting of the field area and areas of previous mapping.

Approximately 200 square kilometres were surveyed in this project. Stream sediment samples were collected from 39 locations to complement the geochemical surveys previously conducted west of Taseko Lakes (McLaren, 1986b, 1987b). Forty-one selected rock chip samples were collected from areas of mineralization or zones of alteration related to mineralizing processes. All of these data will be released as an Open File early in 1989.

REGIONAL GEOLOGY

The regional geology has previously been mapped by Tipper (1978) and the faunal stratigraphy discussed by Jeletzky and Tipper (1968). This work was refined by Glover and Schiarriza (1987), Glover *et al.* (1988) and McLaren (1986a, 1987a). The region is underlain by Middle Jurassic to Upper Cretaceous strata that accumulated within the Tyaughton trough. The coarse clastic sediments that dominate the axial regions of the trough interfinger with volcanic lithologies in the Taseko to Chilko lakes area. A number of significant northwest-trending faults, with both strike-slip and compressional movements, transect the region. Intrusive rocks of the Coast plutonic complex truncate the stratified rocks on the south and southwest.

Mineral occurrences are well documented throughout the region; primary exploration targets in the area have been precious metal vein deposits and porphyry copper-molybdenum deposits.

LOCAL GEOLOGY

Figure 1-17-2 outlines the general geology of the Taseko Lakes area. Work conducted in 1988 was concentrated in a zone varying from 5 to 10 kilometres wide surrounding Taseko Lakes. The figure incorporates previously published work of Glover and Schiarizza and of McLaren on the east and west respectively.

The area is underlain by Lower and Upper Cretaceous strata that have been intruded by a variety of stocks and dykes. Two large faults, the Tchaikazan and Chita Creek faults, cut across the area on a northwesterly trend. Lower Cretaceous strata south of the Tchaikazan fault comprise intimately interbedded volcanic, volcanic epiclastic and clastic sedimentary rocks. Rocks immediately north of this fault are Late Cretaceous in age. North of the Chita Creek fault, Lower Cretaceous strata comprise interbedded clastic sediments that are unconformably overlain by Upper Cretaceous volcanics and sediments. Only lithologies mapped during the 1988 fieldwork are described here; descriptions of other units shown on Figure 1-17-2 are provided by previous workers.

STRATIGRAPHY

UNIT LK_{tc}

Unit LK_{tc} comprises rocks that are correlative with late-Lower Cretaceous Taylor Creek Group lithologies. Two distinct Tyaughton trough depositional environments are represented. To the southwest interbedded volcanics and sediments (Unit LK_{tcv}) formed in a volcanic island arc environment on the southwest flank of the trough while to the northeast clastic sediments (Unit LK_{tcs}) are more typical of the axial regions of the trough.

Lower Cretaceous volcanics comprise intermediate to felsic pyroclastics and flows. Feldspar crystal and lapilli tuffs and lithic fragmental tuffs predominate and are well exposed on the ridge west of Lord River. These are dark green to pale grey, massive to well-layered units. Dacitic to rhyolitic horizons, often containing disseminated pyrite, are common. Thinly laminated black argillite, quartzose siltstone and sandstone are intimately interbedded with the tuffs and may also contain sufficient pyrite to produce local limonitic horizons. Quartz veins with drusy cavities and pyritic boxwork textures cut both the volcanics and sediments.

In the northeastern corner of the area a few outcrops of chert-pebble conglomerate, sandstone, siltstone and minor interbedded tuff (Unit LK_{tcs}) were noted in creek valleys. The coarser sediments tend to be well bedded but poorly sorted. Although chert pebbles dominate, both sedimentary and volcanic lithic clasts are present. Interbedded tuffs are intermediate to felsic in composition and appear to increase in volume toward the northern boundary of the map area. These lithologies are identified as part of the Dash con-

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British Columbia Ministry of Energy, Mines and Petroleum Resources, Geological Fieldwork, 1988, Paper 1989-1.

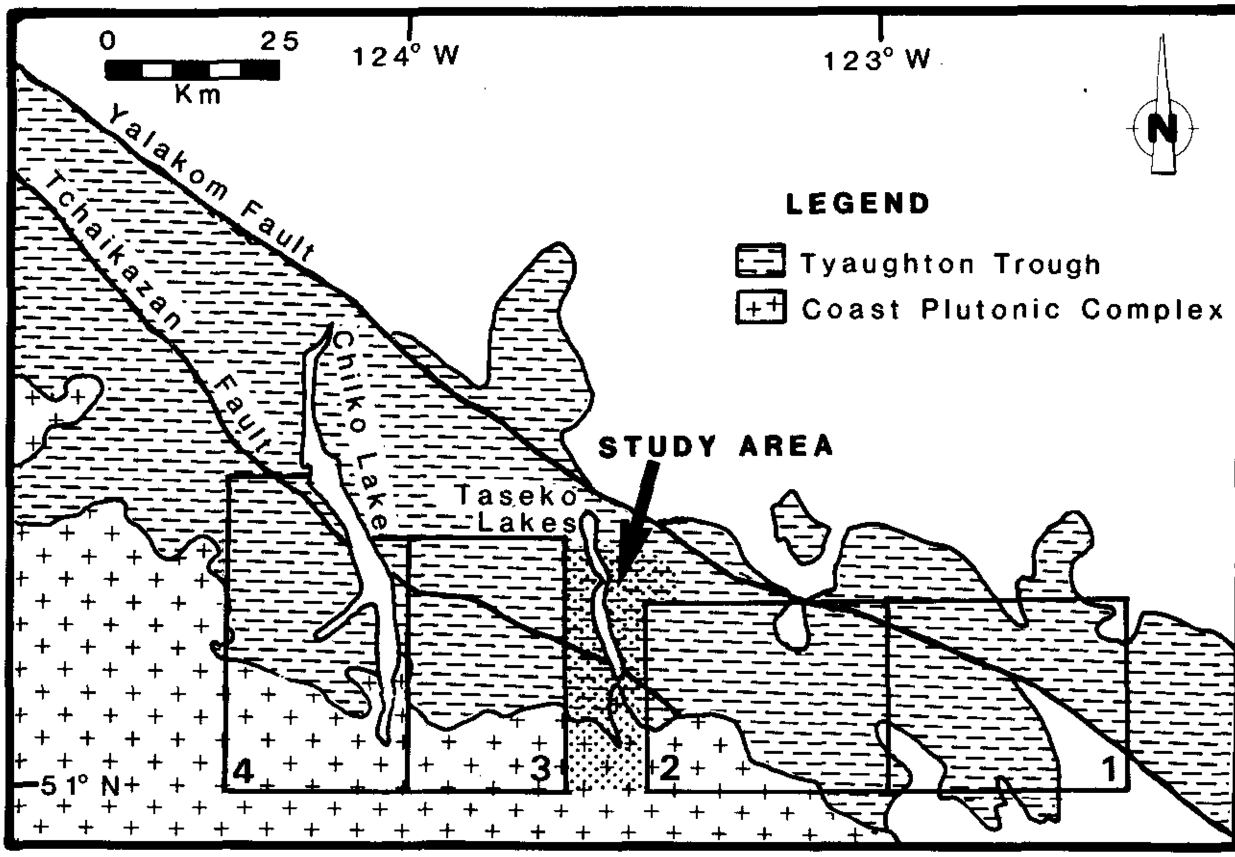

Figure 1-17-1: Location and geological setting of the Taseko Lakes area. Previous 1:50 000 mapping shown as: 1 – Glover *et al.* (1988), 2 – Glover and Schiarizza (1987), 3 – McLaren (1986), 4 – McLaren (1987).

glomerate (Schiarizza and Garver, personal communication, 1988) which is unconformably overlain by Upper Cretaceous rocks in this area (Glover *et al.*, 1988).

UNIT UK_{sq}

This unit is dominated by poorly sorted chert-pebble conglomerate that is interbedded with quartz-rich sandstones, argillites and minor volcanic flows. Pebble to cobble-sized clasts in the conglomerates are primarily chert or quartz, however up to 25 per cent may be volcanic or other sedimentary lithologies. Quartz-rich sandstone interbeds, often with sparsely distributed pebbles, are common. Crossbedding, scours and grading occur locally in the sandstones. Finer grained argillaceous sediments regularly contain woody fossil debris and leaf imprints. Sandstones often become brown weathering, calcareous and contain limy concretions. These rocks are well exposed on the shore of Lower Taseko Lake and on the ridges near the Chita porphyry copper-molybdenum occurrence. The sediments are locally hornfelsed adjacent to the Chita intrusive.

The contact with the overlying volcanics was observed in one location east of the Chita porphyry. It is conformable and displays a limited amount of erosional scouring by the volcanics. This unit is equivalent to the Upper Cretaceous Silverquick Formation (Schiarizza and Garver, personal communication, 1988) mapped in the Taseko River valley (Glover and Schiarizza, 1987) and is probably equivalent to the Upper Cretaceous sedimentary unit mapped west of Taseko Lakes (McLaren, 1986a).

UNIT UK_{pc}

Overlying the Upper Cretaceous clastic sediments is a thick succession of massive volcanic breccias, agglomerates and tuffs intercalated with minor basic flows. The pyroclastic rocks are generally poorly sorted and are comprised of hornblende-feldspar porphyry fragments set in a feldspar crystal to volcanic epiclastic matrix. Angular volcanic lithic fragments and rounded boulders range up to 2 metres in size. More recessive rocks have a distinct layering of finer grained tuffs; locally these are maroon and contain disseminated hematite. Hornblende-porphyritic flows are not extensive but locally form resistant ridges.

These volcanics are conformably overlain by a bedded unit of Upper Cretaceous andesitic lahars and epiclastic sediments outcropping on a ridge crest east of Upper Taseko Lake. This upper unit was not mapped in this project.

INTRUSIVE ROCKS

UNIT A — HORNBLENDE DIORITE

A small plug of hornblende diorite occurs on a steep ridge north of Taseko Mountain. Much of this intrusive is inaccessible, however it is significant as it is likely responsible for the numerous gossan zones and mineralization in the area. Limonitic talus of this material is medium grained and hornblende-phyric with moderate to strong epidote and chlorite alteration. The surrounding volcanics are fractured, extensively pyritized, and locally, strongly silicified.

UNIT B — COAST PLUTONIC COMPLEX

Granodiorite and quartz diorite of the Coast plutonic complex intrude Cretaceous sediments and volcanics across the southern margin of the map area. Biotite and hornblende, with variable chlorite and epidote alteration, are accessory minerals. The rocks are generally massive and often jointed. Foliations are developed locally in the Lord River valley where a faulted lobe of this unit extends well north of the general trend of the intrusive contact. Strong carbonate alteration was noted along one of the prominent faults in this area.

UNIT C — FELSITES

A number of white-weathering intrusive stocks were previously mapped west of Taseko Lakes (McLaren, 1986a; Tipper, 1978). These medium to fine-grained feldspar and biotite-feldspar porphyries often show argillic or carbonate alteration. One of these intrusions outcrops near the narrows between the Taseko Lakes and another on the ridge crest west of the south end of Upper Taseko Lake.

UNIT D — PLAGIOCLASE HORNBLENDE PORPHYRY

North of Chita Creek an elongate body of feldspar porphyry, extending over 5 kilometres in length and up to 1.3 kilometres in width, intrudes the clastic sediments of Unit UK_{sq}. The intrusive is characterized by coarse euhedral plagioclase phenocrysts that are often zoned and range up to 2 centimetres in size. Smaller hornblende phenocrysts are common and euhedral biotite or quartz crystals may be present locally. The grey to green matrix is a medium to fine-grained composite of feldspar, quartz and mafic minerals. This intrusive varies from relatively fresh through a general argillic alteration to pervasive and intense carbonate and argillic alteration. The highly altered zones include narrow sections of multiple veining and variable silicification. This intense alteration extends into the surrounding sediments, particularly at the southern end of the porphyry where it forms prominent red cliffs. The main porphyry stock has a very irregular shape and a number of small satellite bodies crop out peripheral to it, particularly to the east and southeast. A large sill of this unit caps a low ridge of Unit LK_{tcs} in the northeastern corner of the map area. Other isolated feldspar porphyry outcrops between here and the main body are also suspected to be remnants of a sill.

A few isolated outcrops of intrusive hornblende porphyry were noted peripheral to the main feldspar porphyry body. They lack the distinctive large plagioclase phenocrysts and have a finer grained equigranular matrix.

UNIT E — BEECE CREEK PLUTON

The Beece Creek pluton in the northeastern corner of the map area comprises a fine to medium-grained quartz monzonite to granodiorite. Epidote is a common accessory mineral and weak chlorite and sericite alteration are present. The surrounding volcanics and sediments are strongly hornfelsed.

DYKES

Numerous quartz-eye felsite dykes cut virtually all rock types in the Taseko Mountain to Chita porphyry area. These distinctive rocks form white to buff-weathering outcrops that produce flaggy talus. Contorted flow laminae are common. Larger, more massive bodies of this rock occur adjacent to Unit D. Elsewhere narrow diabase and lamprophyre dykes are present.

STRUCTURE

The structure of the area is dominated by the northwest-trending Tchaikazan and Chita Creek faults. There are numerous subsidiary splays and other subparallel structures. Northeasterly trending faults with apparently little displacement are relatively young structures. No significant folding was seen in the area mapped.

The Tchaikazan fault has previously been traced westwards through the Chilko Lake area (McLaren, 1986a, 1987a) and beyond to the Tatlayoko Lake area where more than 30 kilometres of dextral transcurrent movement has been suggested (Tipper, 1969). Considerable compressional movement is evident on a parallel structure between Taseko and Chilko lakes. Near Taseko Lakes the fault is poorly exposed as it follows topographic depressions, however in the Taseko River valley to the east, prominent orange-weathering alteration zones highlight the trend of the fault. Here a broad zone of pervasive carbonate alteration with localized zones of brecciation and moderate to intense silicification is remarkably similar to alteration in this fault zone along the west shore of Chilko Lake. Geochemical anomalies in the Taseko valley are also similar to those determined to the west. No sense of movement can be confidently assigned to the fault in the study area.

The location of the Tchaikazan fault to the southeast is somewhat problematical due to sparse outcrop and alteration along the contact of the Coast plutonic complex. Carbonate alteration zones trending south of Taseko River across Amazon Creek suggest the fault extension is truncated by the Coast intrusives. The altered volcanic rocks south of the fault are attributed to Unit LK_{tcv} since the Tchaikazan fault separates Lower and Upper Cretaceous lithologies west of Taseko Lakes. Felsic volcanic rocks west of Amazon Creek support this hypothesis as they are known to occur commonly in unit LK_{tcv} but not in unit UK_{pc}. Movements on the Tchaikazan fault in this area are then constrained to older than Middle to Late Cretaceous by biotite potassium-argon radiometric dates (84.7 to 86.7 ± 2.5 million years) obtained from granodiorite near Granite Creek (McMillan, 1976).

The Chita Creek fault also follows topographic lows and does not outcrop in the map area. Mapping to the east has indicated both vertical and transcurrent movements on this fault (Glover *et al.*, 1988). An extension of the fault has been mapped well to the west of Taseko Lakes, cutting Upper Cretaceous rocks.

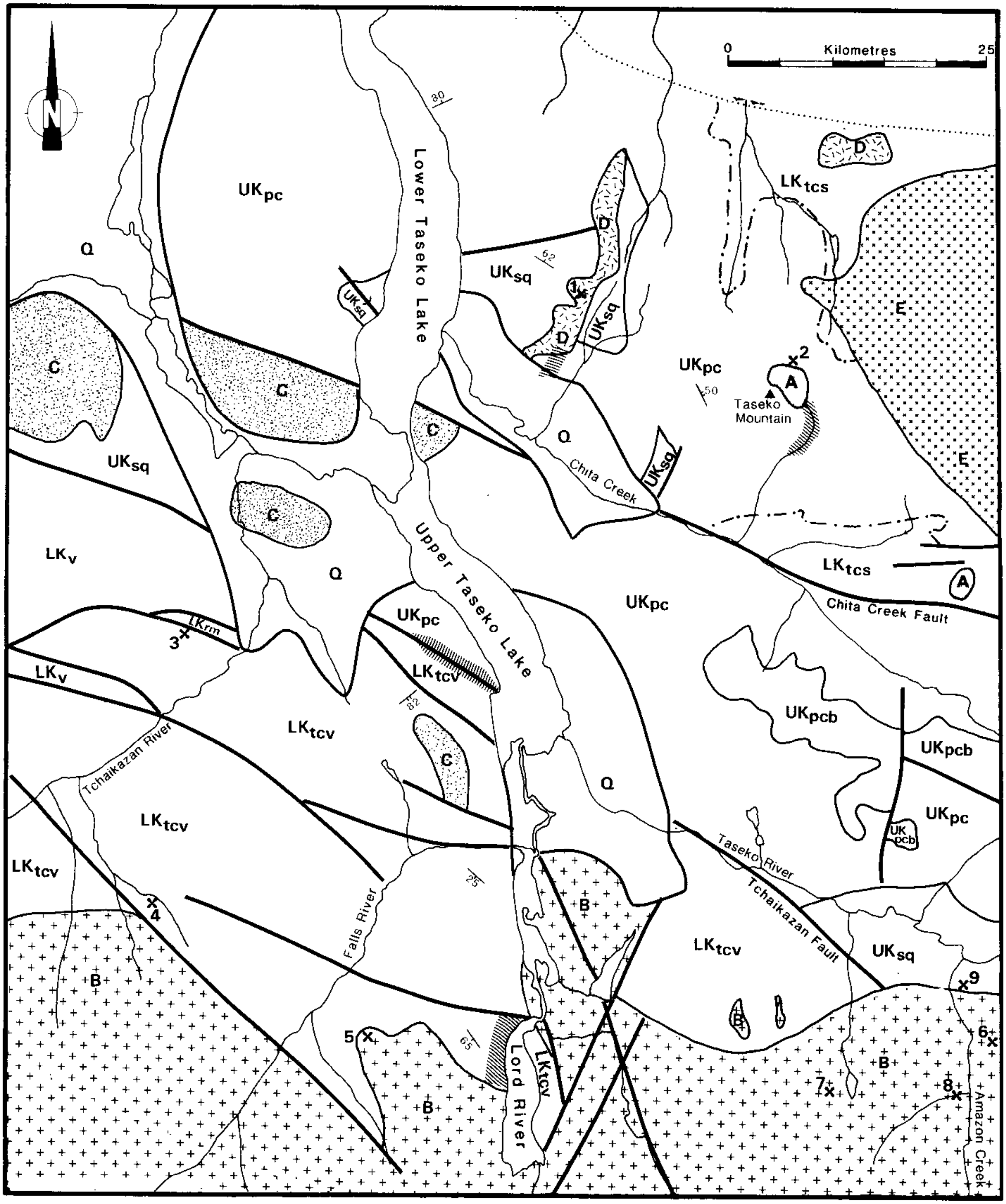

Figure 1-17-2: Geology and mineral occurrences of the Taseko Lakes area.

LEGEND FOR FIGURE 1-17-2

STRATIFIED ROCKS

Quaternary

Q Alluvium, till

Upper Cretaceous

UK_{pbc} Powell Creek Formation: bedded laharic andesitic breccia and epiclastic sediments.

UK_{pc} Powell Creek Formation: andesitic breccia, lapilli tuff, crystal tuff and ash tuff; minor andesitic to basaltic flows.

UK_{sq} Silverquick Formation: pebble to cobble polymict conglomerates, sandstones and argillite; minor andesitic flows.

Lower Cretaceous

LK_{tcv} Taylor Creek Group: rhyolitic to basaltic tuffs and flows; black argillite, siltstone, sandstone.

LK_{tcs} Taylor Creek Group: argillite, siltstone, sandstone; minor tuffs.

LK_{rm} Relay Mountain Group: black argillite, siltstone, sandstone, minor andesitic tuffs and flows.

LK_{v} Purple andesitic pyroclastics and breccias, minor flows.

Intrusive Rocks

A Hornblende diorite

B Coast plutonic complex: granodiorite, quartz diorite

C Felsites: feldspar and biotite-feldspar porphyry

D Plagioclase hornblende porphyry

E Beece Creek pluton: quartz monzonite to granodiorite

× Mineral occurrences.

Areas of anomalous stream sediment geochemistry.

Name	MINFILE Number	Type	Commodities
1. Chita Mountain	092O 049	Porphyry	Co, Mo
2. Taseko Mountain	—	Vein	Au, As, Cu, Zn
3. Charlie	092O 043	Vein	Au, Ag
4. Twin Creek	—	Vein	As
5. Pellaire	092O 045	Vein	Au, Ag
6. Mohawk	092O 001	Porphyry	Cu, Mo, Au, Ag
7. Spokane	092O 004	Porphyry	Cu, Ag, Au
8. Rowbottom	092O 025	Porphyry	Cu, Mo
9. Empress	092O 033	Porphyry	Cu, Au

GEOCHEMISTRY

Approximately 25 stream sediment samples were collected from the current map area in the course of Regional Geochemical Survey 3-1979. Analyses of these samples show a sporadic distribution of elevated levels of copper, molybdenum, arsenic and mercury. The 39 sites sampled in 1988 served to confirm the geochemical patterns determined in the regional geochemical survey and highlighted some further anomalies. These data, to be released as an Open File map at 1:50 000 scale, are summarized in the following paragraphs. The small data population precludes any meaningful calculation of anomalous thresholds; anomalous values have been estimated based on levels determined from previous stream sediment surveys in the Taseko – Chilko Lakes area (McLaren, 1986b, 1987b). Areas of anomalous stream sediment results are indicated on Figure 1-17-2.

Samples collected from streams draining Unit UK_{pc} returned uniformly low values, except from areas of known mineral occurrences. Unit LK_{tcv} however, produced several anomalous levels of copper and zinc, and scattered samples with elevated levels of molybdenum, lead and arsenic. Most of these anomalies occur in the limonitic felsic volcanic and sedimentary sequence west of Lord River.

Streams draining the Chita porphyry copper-molybdenum occurrence carry sediments anomalous in copper and zinc and with elevated nickel, cobalt, manganese, lead and gold values. A single sample anomalous in arsenic, copper and zinc was obtained from a creek east of Taseko Mountain draining a limonite-stained diorite intrusive. Arsenic anomalies were detected in streams draining the Tchaikazan fault zone on the west side of Upper Taseko Lake, confirming data determined in the regional geochemical survey.

MINERAL OCCURRENCES

Known mineral occurrences in the region are primarily precious metal vein deposits (epithermal or mesothermal) and porphyry copper-molybdenum (± gold) deposits (Figure 1-17-2). The only deposit with recorded production in the vicinity, the Taylor-Windfall occurrence (MINFILE 092O 028) 10 kilometres east of the study area in the Taseko River valley, appears to have developed in a setting transitional between a porphyry and epithermal environment. A number of mineral showings south of Taseko River near the contact of the Coast plutonic complex have also been explored for both porphyry copper-molybdenum and precious metal mineralization. The Fish Lake porphyry copper-gold occurrence (MINFILE 092O 041, 042) lies 15 kilometres north of the map area.

There are two significant mineral occurrences within the mapped area, the Chita porphyry (MINFILE 092O 049) and the Taseko Mountain gold-bearing sulphide veins. Minor mineralization hosted in favourable geologic environments is present in two other areas.

The Chita (Banner) porphyry copper-molybdenum occurrence has been explored intermittently since the early 1960s. A prominent red mound overlooking the Chita Creek valley comprises intense carbonate and argillic alteration with disseminated pyrrhotite and pyrite in Units A and UK_{sq}. These rocks are extensively fractured and cut by quartz veins that carry minor chalcopyrite, molybdenite and pyrite. Localized breccia zones and intensely silicified zones host the best chalcopyrite and molybdenite mineralization. The largest breccia zone, approximately 40 metres long and with an undetermined width, is composed of angular fragments of hornfelsed sediments and volcanics in a siliceous matrix; quartz veins cut both the matrix and fragments. Sulphide minerals occur interstitial to the fragments as streaks and large clots, along fracture planes, and within the quartz veins. Local intensely silicified zones in the feldspar porphyry also contain copper and molybdenum mineralization.

A previous soil geochemical survey over this property (Assessment Report 8893) confirmed a large copper and molybdenum anomaly adjacent to the main mineralized zone, but also indicated anomalous levels of copper, molybdenum, arsenic and gold over a broad area downslope to the west. Rock-chip sampling in this project was concentrated in this peripheral veined and carbonate-altered zone.

Disseminated and stockwork sulphide mineralization occurs on a very steep ridge northeast of Taseko Mountain. This mineralization, originally discovered through follow-up of stream sediment geochemical anomalies, was briefly explored in 1982 and yielded highly anomalous values in gold, silver, copper, zinc and arsenic in rock and soil samples (Assessment Report 10674). A diorite stock intruding volcanic rocks of Unit UK_{pc} has produced extensive limonitic hornfels zones, however the area of greatest interest is relatively inacessible due to the steep terrain. Intermittent limonitic alteration is visible for over 1 kilometre of cliff exposure. Intensely silicified boulders in the moraines immediately below the north side of this ridge contain sulphide veins up to 5 centimetres wide carrying arsenopyrite, sphalerite, chalcopyrite and pyrite. Analyses of 35 rock samples, from both outcrop and moraines, have been previously reported from this property. Gold and silver values range from below the detection limit to 7.3 grams per tonne and 58.0 grams per tonne respectively; copper and zinc analyses include results in excess of 1 per cent.

The Tchaikazan fault zone contains anomalous levels of mercury, arsenic and gold in rock and stream sediment samples from the Taseko River valley and west of Taseko Lake. The structural setting, associated limonitic alteration zones, and proximity to an intrusive heat source combine to provide a highly favourable environment for epithermal precious metal mineralization.

Anomalous stream sediment geochemistry derived from the sequence of gossanous felsic volcanics and sediments west of Lord River presents another zone of relatively unexplored potential. This zone lies 3 kilometres east of the Pellaire gold occurrence (MINFILE 092O 045) where gold-bearing quartz veins cut a lobe of granodiorite intruding the volcanic-sediment sequence. Pyritic quartz veins were noted cutting the rocks west of Lord River.

SUMMARY

This project has provided stratigraphic continuity of Lower to Upper Cretaceous lithologies across the Taseko Lakes area and has complemented the stream sediment geochemical and lithogeochemical database previously acquired for map sheets 92O/4 and 92O/5. Metallogenic environments characteristic of other parts of the Tyaughton trough are present in the study area.

Exploration completed to date on the Taseko Mountain gold-bearing sulphide veins has been limited by the steep terrain, however the extent of the limonitic zones and the high levels of precious metals indicated in the talus samples indicate a more thorough evaluation is warranted. The potential for epithermal vein mineralization in the altered segments of the Tchaikazan fault zone also has not been fully evaluated.

Porphyry copper-molybdenum mineralization at the Chita occurrence is not sufficiently extensive, as outlined by previous exploration, to suggest a large deposit is present. However the sizeable alteration zone peripheral to the intrusive has a moderate potential for precious metal mineral occurrences.

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