



Mineral Potential of the Northern Coast Belt, Khutze River Area, British Columbia (103H)

By R.H. Pinsent

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INTRODUCTION

This report discusses the geology and mineral potential of a segment of the Coast Mountains, east of Princess Royal Island (in NTS area 103H) termed the Khutze River area. The information presented is based on public domain reports and old staking records. In 1999, a regional stream sediment survey was conducted in the area by the Ministry of Energy and Mines. The results of the geochemical survey will be reported separately. The project was funded under the Provincial Government's Corporate Resource Inventory Initiative (CRII), as part of the Ministry's contribution to the Central Coast Land and Coastal Resource Management (CCLCRMP) planning process.

The area is approximately 150 kilometres south of the community of Terrace and includes the Khutze and the Aaltanhash river drainages (Figure 1). The terrain is varied and locally, exceedingly rugged. It includes mountain peaks, alpine glaciers, wooded slopes and flat bottomed valleys. Elevations range from sea level to 1500 metres. Although the coastal portion is readily accessible by boat or float plane, much of the area is accessible only by helicopter.

PREVIOUS WORK

Ministry records indicate that there was a considerable amount of exploration and mine development along the British Columbia coast in the late 1800s and early 1900s. This is best illustrated by the work carried out before the Second World War at the Surf Inlet and Pugsley mines (MINFILE 103H 027) located west of the Khutze River area, on Princess Royal Island. The combined operation is reported to have produced 918 128 tonnes of quartz vein material containing 12 095 368 grams of gold, 6 258 235 grams of silver and 2 834 461 kilograms of copper between 1902 and 1943.

The Khutze River area, on the east side of Graham Reach was mapped at 1:250 000-scale by the Geological Survey of Canada in the mid 1960s as part of its Coast Mountain Project (Roddick *et al.*, 1965; Roddick, 1970).

This was well after the main period of exploration on the coast, which was conducted without the benefit of good quality maps.

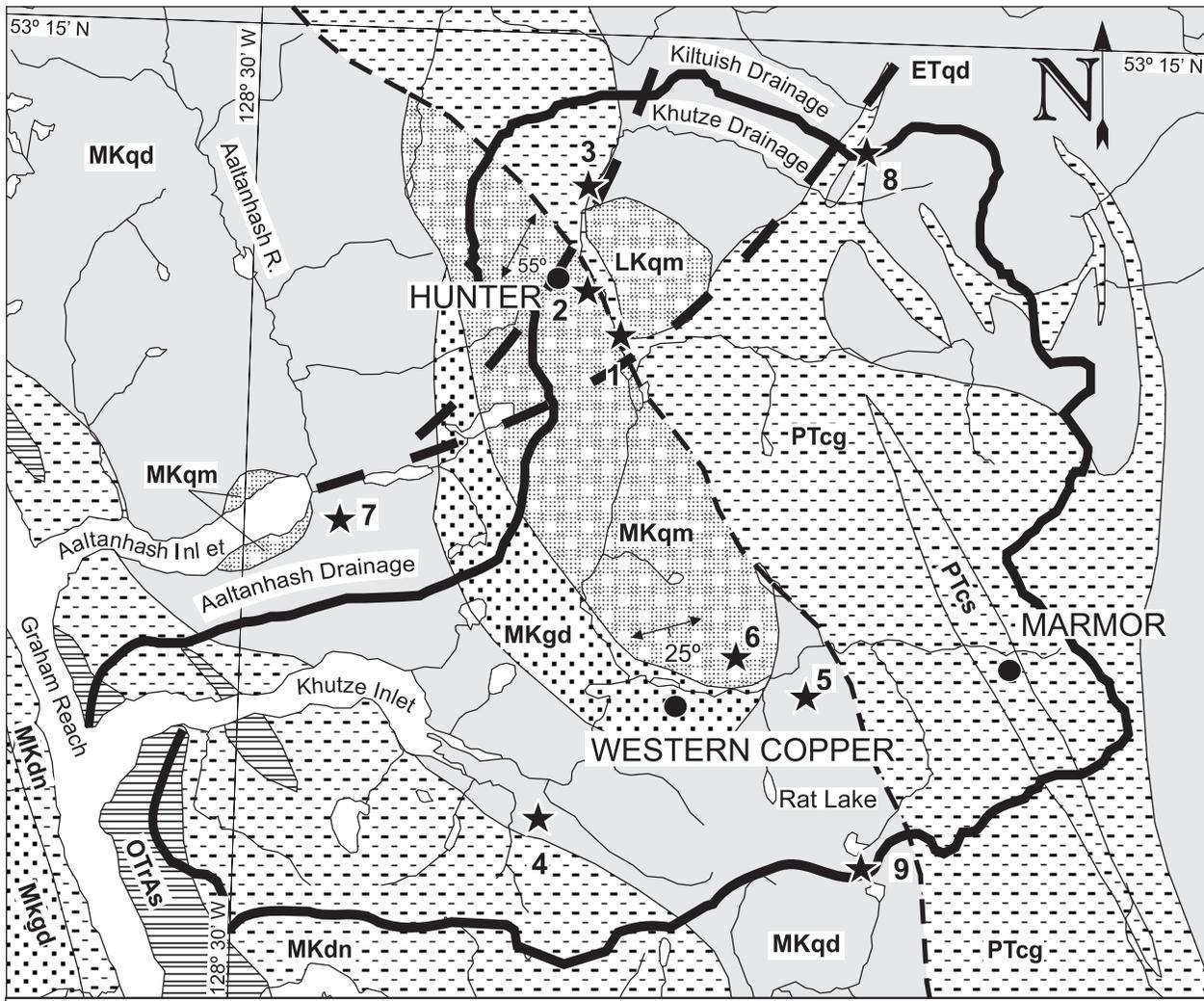
GEOLOGY

The simplified geological map of the Khutze River area shown in Figure 1 is based on government mapping as shown on The MapPlace website (Bellefontaine and Alldrick, 1994). The area is underlain by plutonic rocks and by pendants of deformed and metamorphosed volcanic and sedimentary rocks. Although it has not been mapped in detail, the geology appears to be fairly typical of the core region of the Coast Mountains.

The stratabound rocks occur in two northwesterly-trending belts. One belt comprises a minor amount of thinly laminated micaceous quartzite, crystalline limestone, skarn, and greenstone and schist of possible Paleozoic age (OTrAs). The greenstone and schist is intimately associated with a gneissic and dioritic migmatite complex (MKdn) near the mouth of Khutze Inlet. The other belt is a broad zone of "granitoid gneiss" that includes gneissic quartz diorite, rusty fine-grained gneiss and schist. It is well exposed in the mountains at the head of the Khutze River (PTcg). Some of the more schistose components of the "granitoid gneiss" are clearly sedimentary as they include a recognizable band of thick-bedded recrystallized limestone (PTcs).

The plutonic rocks include the migmatite unit (MKdn) found in the complex referred to above and also broad, northwesterly trending zones of hornblende biotite-rich quartz diorite (MKqd and ETqd), biotite hornblende-rich granodiorite (MKgd) and both biotite quartz rich and leucoquartz monzonite (MKqm, LKqm). Although many of the plutonic rock ages are uncertain, contact relationships suggest the early formation of a central belt of quartz diorite followed by later intrusion of granodiorite and a still later intrusion of quartz monzonite. Most of the plutonic rocks to the southwest of the granitoid gneiss unit are reported to be Middle Cretaceous in age. Those to the northeast may be Tertiary (Roddick, 1970).

The rock units display a broad northwesterly trend and the western contact of the "granitoid gneiss" unit appears to be defined by a major northwesterly-trending fault (Figure 1). North to northeasterly trending faults have not been mapped in the area; however, lineaments



LEGEND

	OTrAs	Greenstone and Schist		Mineral Occurrence
	MKdn/PTcg -/PTcs	Diorite Migmatite and Granitoid Gneiss		Lapsed Tenures
	MKqm /LKqm	Quartz Monzonite		Faults and Postulated Faults
	MKgd	Granodiorite		Quartz Veins
	MKqd /ETqd	Quartz Diorite		Drainage Boundary



Geology after Roddick (1970) and The MapPlace Website

Figure 1. Generalized geology of the Khutze River area showing the location of mineral occurrences and lapsed tenure sites.

and contact relations suggest that there may be several within the map area.

MINERALIZATION

There are three occurrences in the Khutze River drainage listed in the Ministry's MINFILE database (Figure 1). Two are metallic mineral occurrences (Western Copper, 103H 033 and Hunter, 103H 034), and one is a limestone deposit (Marmor, 103H 063). Figure 1 also shows nine "areas of past exploration interest". These are sites that are known to have been staked at some point over the past seventy years but are now lapsed and are no longer located on tenure maps. In most instances, there is insufficient information available on the site to warrant its inclusion as an occurrence in the Ministry's MINFILE database.

The present report is primarily concerned with the two metallic prospects, both of which show enrichment in copper, gold and silver.

Hunter (MINFILE 103H 034)

The Hunter gold deposit (latitude 53° 11' 39" N, longitude 128° 23' 06" W) is on the north fork of the Khutze River approximately 22 kilometres from tidewater, at the head of Khutze Inlet, 150 kilometres from Terrace. The deposit is covered by crown granted mineral claims located in the early 1900s.

The Hunter deposit consists of shear-hosted quartz veins which were located in 1927 and prospected and trenched in the late 1920s and early 1930s. The first underground development took place in 1940. The then owners drove a decline for 47 metres into the River vein and drifted along it for a further 57 metres. The following year, they drove an adit for 144 metres on the "Main" vein. The old workings were rehabilitated and the veins were sampled in 1980. Arnhem Resources Inc. further explored the property in 1983. The company mapped the area, resampled the veins and conducted geochemical surveys (Scott, 1984a). It continued the program the following year, diamond drilling seven holes for an aggregate depth of 737 metres (Scott, 1984b).

The Hunter property straddles the north fork of the Khutze River in the floor of a deep, northerly to northwesterly trending, "U"-shaped valley formed along the trace of a section of the possible fault on the southwestern side of the granitoid gneiss (PTcg) unit. The property straddles a contact between quartz monzonite (MKqm) and "granitoid gneiss" (PTcg) (Figure 1).

The geology is described by Mandy (1932) and by Scott (1984a,b). The principal feature is a north to northwesterly trending pendant (or tectonic sliver) of biotite gneiss that underlies the floor of the valley. The biotite gneiss pendant appears to be largely metavolcanic in origin, although it is highly deformed and displays a pronounced north to northwesterly trending foliation. The pendant hasn't been fully delineated, but it is about 700 metres wide. It is bounded by granitic gneiss and is cut by

a variety of plutonic rocks, including foliated quartz diorite and quartz monzonite, and non-foliated aplite and pegmatite.

The mineralized quartz veins are markedly discordant to the foliation in the pendant and the foliated plutonic rock. The veins display north to northeasterly strikes and steep to moderate easterly dips. For example, the "Main" vein is reported to have a strike of between 20 and 35 degrees and a dip of 55 to 70 degrees to the southeast. The cluster of veins, as a whole, also displays a pronounced northeasterly trend. It has been traced intermittently for a distance of approximately 1.5 kilometres from the "Main" zone, which cuts granite gneiss on the west side of the Khutze River, to the River zone which cuts biotite gneiss on the east side. Several veins are, at least in part, located in or along narrow pegmatitic dikes (Scott, 1984a,b).

The Hunter veins pinch and swell along strike, but rarely attain widths in excess of 0.25 metre. Some of the veins display minor amounts of wall-rock alteration. Adjacent host rocks are bleached and enriched in pyrite, chlorite, sericite, carbonate and clay. The veins are composed of milky-white, massive quartz, a variable amount of pyrite and lesser amounts of chalcopyrite. The gold content of the veins appears to increase with an increase in the pyrite content. The higher values, in the order of several tens of grams per tonne gold, are most commonly found in sections of vein that contain semi-massive to massive sulphides. These appear to be best developed near flexures in the vein system (Scott, 1984a,b). Mandy (1932) indicates that gold to silver ratios increase with an increase in elevation. The River vein has a ratio of approximately 1:0.5. The "Main" vein, higher up the valley wall, has a ratio of approximately 1:1.5. A three-tonne sample, collected from an open cut on the River vein in 1933, yielded 933 grams of gold, 373 grams of silver and 40 kilograms of copper.

In 1984, Arnhem Resources Inc. established a resource of 94 338 tonnes grading 12 grams per tonne gold, at a mine width diluted to 1.2 metres (MINFILE).

Western Copper (MINFILE 103H 033)

The Western Copper gold deposit (latitude 53° 05' 49" N, longitude 128° 20' 06" W) crops out on a precipitous mountain side on the east fork of the Khutze River, approximately eight kilometres from the head of Khutze Inlet and 160 kilometres south of Terrace. It is covered by a cluster of Crown Granted and reverted Crown Granted mineral claims.

The property was located in 1908 and saw considerable development over the next few years and again in the mid-1920s. The work included construction of a narrow-gauge railway from the head of the inlet to the property, construction of camps connected by tramways and ladder-assisted trails at three elevations. Also included was the driving of approximately 370 metres of drifts and crosscuts and 245 metres of shafts and raises. This early work was followed by more limited development in the

early 1930s (Mandy, 1932). After a prolonged break, Noranda Exploration Company Limited examined the property and carried out a stream sediment survey in the area in 1987 (Maxwell, 1987).

The Western Copper deposit is a vein occurrence in a biotite, hornblende granodiorite intrusion (MKgd) that is cut by aplite and pegmatitic dikes. The principal vein occupies a joint in a shear zone that strikes 070 degrees and dips at 20 to 30 degrees to the south, into the north-facing wall of the Khutze River canyon. The vein has been traced for approximately 1200 metres along strike. It pinches and swells, and locally attains a maximum width of approximately 2.0 metres. The wall-rocks locally exhibit minor amounts of quartz and sericite alteration (Mandy, 1932).

The vein is described as being “of pegmatitic affinity” (Mandy, 1932). It contains quartz, feldspar and variable amount of sulphides. Discrete zones of massive sulphides, predominantly pyrite and chalcopyrite with lesser chalcocite and covellite, grade outward into zones of increasingly more sparsely disseminated mineralization. These zones are separated by sections of quartz vein that contain intermittent narrow streaks of high-grade mineralization. Although these streaks produce values of many tens of grams of gold and silver per tonne and several percent copper, they are commonly only a few centimetres in width. According to Mandy, the mineralization may be zoned. Streaks of sulphide found at the west end of the vein contain more chalcopyrite than those at the east end. The latter are more pyritic but are equally enriched in gold and silver. The richest lens, so far identified, has a strike length of 10 metres and a width of approximately 1.5 metres. Its down dip extent has yet to be determined (Mandy, 1932).

According to MINFILE, a small, 215 - tonne bulk sample, collected in 1928 and 1929, yielded 5319 grams of gold, 45 193 grams of silver and 30 812 kilograms of copper.

Lapsed Tenures

In addition to the MINFILE occurrences, Figure 1 shows the location of nine lapsed claim groups. Three were staked by C.W. and J.M. Meldrum between 1931 and 1940, while Meldrum and Associates were working on the Hunter property. They include two (1, 2) that follow the trace of the main northwesterly trending structure to the southeast of the Hunter prospect and one (3) that straddles a possible north-northeasterly trending fault contact a short distance to the northeast of the deposit (Figure 1).

Although there is no record of work conducted on the Western Copper deposit in the 1960s, staking records indicate that Mr. C. W. Hunt staked claims to the west (4) and east (5) of the main block of Western Copper crown grants in 1968. At the time, the south side of the Khutze River was covered by claims for over ten kilometres, from south of the head of Khutze Inlet in the west to well beyond Rat Lake in the east. At the same time, Mr. Hunt

staked another block (6) on the mountain across the east fork of the Khutze River from Western Copper (Figure 1).

In 1928, Mr. E. C. Brooke staked three units (7) immediately to the southeast of the head of Aaltanhash Inlet. The tenures indicate no apparent relation to known mineralization, however they display an easterly to northeasterly trend and they appear to be approximately on strike with the Hunter vein system. They are also close to a small plug of probably post-tectonic, leucocratic monzonite or granite (Figure 1).

An eighth group (8) was staked by United Pacific Gold Limited in 1988. It covers the ridge that separates the headwaters of the north fork of the Khutze River from the headwaters of the Kiltuish drainage. The tenures cover a postulated faulted contact between “granitoid gneiss” and quartz diorite. The location and size of the tenure group suggests staking in response to anomalous results in a stream geochemical survey.

The ninth lapsed tenure (9) was also staked by J. M. Meldrum in 1931. It straddles the height of land between two small lakes on the southern boundary of the Khutze drainage.

STREAM GEOCHEMISTRY

In July, 1999, the Geological Survey Branch conducted a stream sediment and water sampling survey in the Khutze River area. It sampled 111 sites over an area of approximately 800 square kilometres including the Khutze and adjacent Aaltanhash River drainages. The program is described by Jackaman *et al.* (1999), this volume.

SUMMARY AND CONCLUSION

The Hunter and Western Copper deposits are post-tectonic, shear-hosted vein deposits that formed in approximately northeasterly trending fractures that are markedly discordant to the regional trend of the plutonic and metamorphic rocks in the area. They are both associated with aplitic and pegmatitic dikes and both contain copper, gold and silver. In each case, the wall-rocks exhibit minor amounts of propylitic alteration. The deposit style and composition is consistent with intrusion-related vein-type mineralization.

Although major northeasterly trending faults have not yet been mapped in the Khutze River area, topographic and geological relations suggest that there may be a significant, post-orogenic, north-northeasterly to northeasterly trending fault and fracture system crossing the drainage. This may have influenced the location of mineralized veins, such as those found at the Hunter and Western Copper occurrences (Figure 1). The fault and fracture directions are found in the regional drainage pattern and in the contact relations displayed between the granitoid gneiss unit and the adjacent quartz diorite and quartz monzonite plutons. Figure 1 illustrates two postulated faults that may have influenced the distribution of rock

types and mineralization in the Khutze and Aaltanhash River drainages.

Although the aplitic and pegmatitic dikes found at the two showings have yet to be age-dated, they are described as being undeformed. They are postulated to be relatively young, possibly reflecting intrusion of felsic rocks within broad north-northeasterly to northeasterly trending zones of weakness underlying the drainage. The small leucocratic quartz monzonite pluton that straddles Aaltanhash Inlet may be a late-stage, high-level intrusion emplaced along similar, easterly to northeasterly trending structures.

There is no way of knowing why the lapsed claim groups in the area were staked, but it is interesting to note that several fall on, or are close to, postulated structures (Figure 1). This may reflect a prospector interest in similar style mineralization.

The style and composition of the mineralization at the Hunter and Western Copper occurrences suggest that they are probably related to high-level, Tertiary intrusions. If they are, the geology of the Khutze River area would appear to indicate considerable potential for additional quartz vein-hosted gold deposits and possibly also for porphyry copper-style deposits.

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