# REPORT ON A PRELIMINARY ASSESSMENT OF THE IOTA MINERAL TENURE, Squamish, British Columbia No. 408296

## Vancouver Mining Division

Latitude: 49° 46' 21.7" N,
Longitude: 123° 18' 33.1" W
477,736m E, 5,513,405 m N
(UTM, NAD 83, Zone 10)
NTS Map Sheet: 092G/14
TRIM Map Sheet: 092G074



prepared for

**Brenda Marie Brannstrom, Owner**
#204-130 East Queens Road,
North Vancouver, B.C.
V7N 1G6

by

**Brenda Marie Brannstrom B.Sc.**
**and**
**Paul Metcalfe Ph.D., P.Geo.**
Palatine Geological

**February 17th, 2006**

## SUMMARY

The IOTA claim is a single 20 unit legacy mineral tenure, located in the Squamish area of southwestern British Columbia, west of Brackendale across the Squamish River. The area is in the southern Tantalus Range, immediately north of Red Tusk Creek. Access to the claim is solely by helicopter; the Squamish Airport is the nearest base. The terrain is extremely rugged and elevations range from 2000 feet at the Squamish River to 6000 feet at the mountain tops. Topography is typically castellated and requires climbing ability for comprehensive access.

This area is in the Western Coast Belt of southwestern British Columbia, typified by late Mesozoic intrusive rocks of mainly intermediate to felsic composition. The property covers the southern end of a pendant of Cretaceous Gambier Group volcanic and sedimentary rocks called the Clowhom Pendant. The Gambier Group is prospective for volcanogenic massive sulphide type mineralization similar in style to that which hosted the past producing Cu-Zn-Au Britannia Mine. The area covered by the property has been the object of previous exploration, including diamond drilling.

In October 2005, the authors spent 8 man-days on the property to begin an assessment of the potential for base and precious metal mineralization. The purpose of the exploration was to locate the previous drill collars and to establish whether previous exploration models (i.e.: Kuroko-type volcanogenic massive sulphide) were appropriate for the property.

The drill collars were not located during the property visit. Samples taken from both float and outcrop include lithologies consistent with previous mapping and confirm the presence of brecciated, possibly autobrecciated, mineralized quartz-phyric rhyolite and a mineralized siliceous unit consistent with a siliceous exhalite deposit. Volcaniclastic textures diagnostic of hot emplacement were not observed. The observed stratigraphy is consistent with a subaqueous volcanic environment with associated hydrothermal mineralization similar to that at Britannia.

Detailed examination of the samples is recommended for follow-up. The drill core should be located (if possible) and sampled. Petrographic and whole-rock analysis of all samples is recommended in order to begin a programme of lithochemical mapping. Targets identified by the lithochemical methods will be refined by geophysical survey, then tested by drilling.

## TABLE OF CONTENTS


Summary ........ 1

List of figures ........ 3

List of tables ........ 3

Introduction ........ 4

Property location and description ........ 4

Location of property ........ 4

Property description and mineral tenure ........ 4

Physiography, climate, vegetation, access, local resources and infrastructure ........ 7

History ........ 8

Geological setting ........ 10

Regional geology ........ 10

Property geology ........ 12

Regional metallogeny and target deposit types ........ 15

2005 Exploration activities ........ 16

Geological fieldwork ........ 16

Interpretation and conclusions ........ 18

Recommendations ........ 18

2005 Statement of costs ........ 19

Acknowledgements ........ 20

References ........ 20

Appendix I: A note on coordinate systems ........ 21

Appendix II: Relevant B.C.G.S.B.Mineral Deposit Profile(s) ........ 22

Appendix III: hand specimen descriptions ........ 26

Appendix IV: Statements of qualifications ........ 31

## LIST OF FIGURES

Page

Figure 1. Property location map........................................................................................ 5

Figure 2. Topographic map of the IOTA property showing mineral occurrences........................ 6

Figure 3. Regional geological map (1:250,000) of Squamish area, showing property location.. 11

Figure 4. Legend for Figure 3. ......................................................................................... 12

Figure 5. Geological map of SW corner of IOTA (Chung 1988), showing sample locations..... 13

Figure 6. Legend for Figure 5. ......................................................................................... 14

## LIST OF TABLES

Page

Table 1. Mineral tenure of the IOTA property........................................................................ 7

Table 2. 2005 Statement of Costs ...................................................................................... 19

## INTRODUCTION

The purpose of this report is to describe the findings of fieldwork carried out for assessment purposes on the IOTA mineral tenure, located west of Squamish, to test whether the exploration model used by previous workers are valid.

This report is based on geological fieldwork carried out by the authors at the property. Field observations from this site visit are supplemented with data from previous visits, upon information made available by the client and upon geological information retrieved from published sources, including government. The previously existing geological information is correct and complete to the best of the authors' knowledge.

## PROPERTY LOCATION AND DESCRIPTION

### Location of property

The IOTA claim is situated in southwestern B.C., approximately 12 km west of the town of Squamish (Figure 1). The co-ordinates of the property's geographic centre are 477,736 m E, 5,513,405 m N (UTM NAD'83, Zone 10). Pursuant to the mineral tenure regulations in effect at the time, a differential Global Positioning System (GPS) survey was carried out on the Legal Corner Post at the time of staking and the position of the mineral tenure is accurately known.

Maps in this report are based either upon a Universal Transverse Mercator (UTM) projection using the 1983 North American (NAD83) datum. The property lies within Zone 10. The reader is referred to Appendix I for a detailed description of co-ordinate systems.

### Property description and mineral tenure

The IOTA claim (tenure no. 408296) is a legacy mineral tenure comprising 20 units (4N x 5E) (Figure 2), located on February 8$^{th}$, 2004. The claim partly covered the improperly located, co-existing mineral tenures Commonwealth 1-4 (nos. 406701-406704). Upon application and successful execution of a complaint under Section 40 of the Mineral Tenure Act of B.C., the Commonwealth tenures were cancelled.

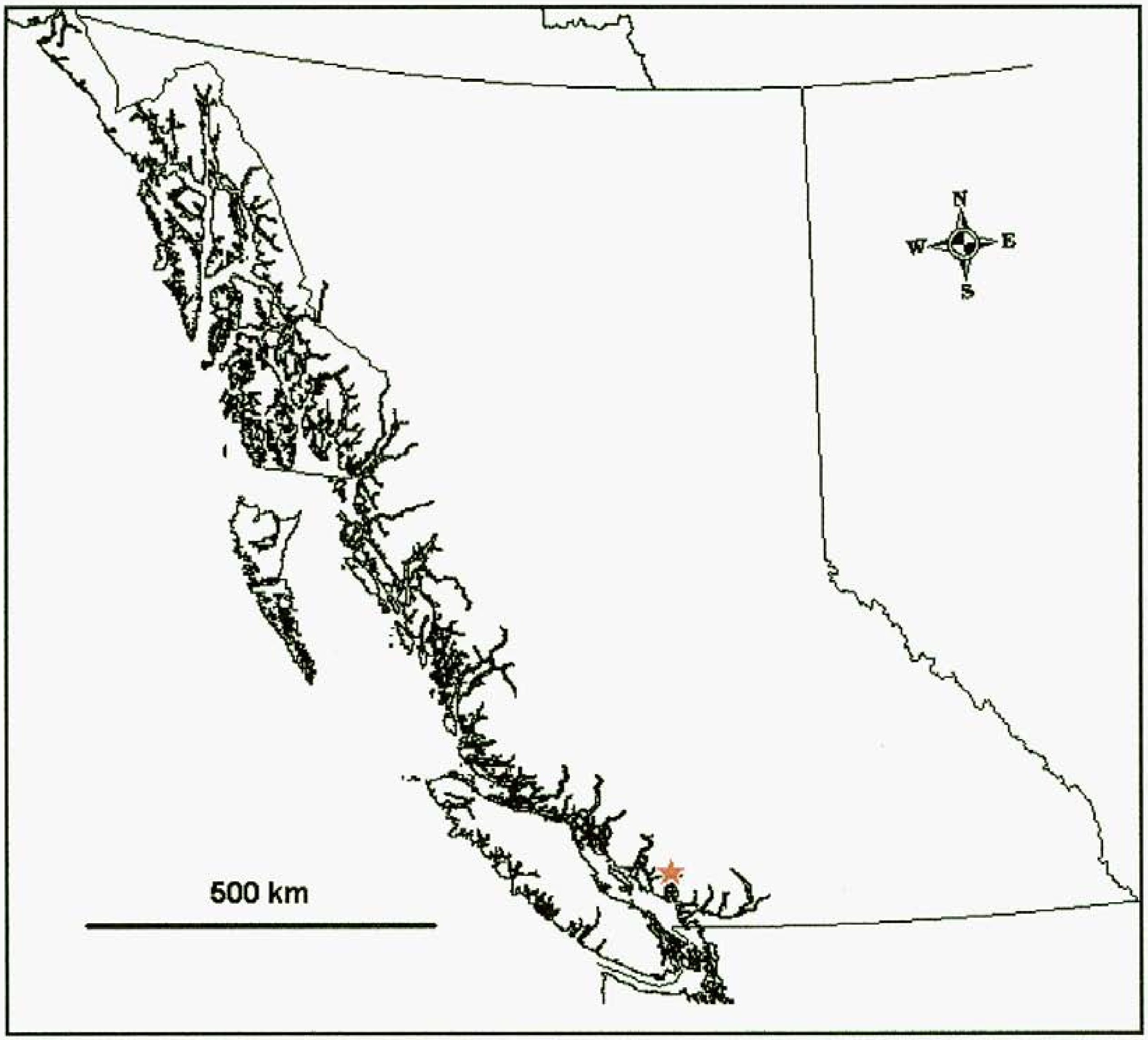


Figure 1. Property location map.

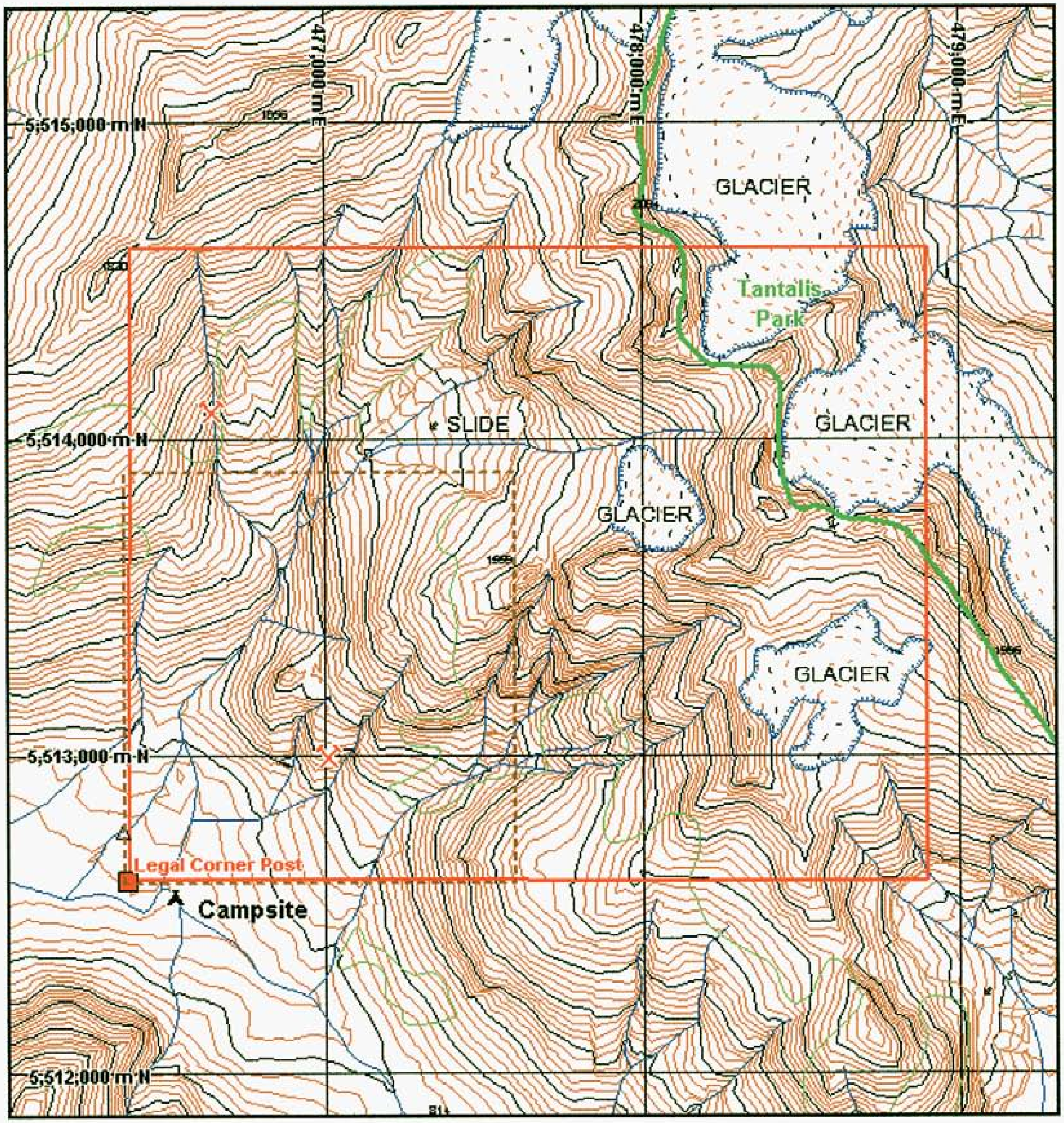


Figure 2. Topographic map of the IOTA property showing mineral occurrences.

Map scale approximately 1:20,000. Minor contour interval 20 m. Base is Terrain Resource Integrated Management (TRIM) sheet 092G074. UTM grid north is 359.76 true. 2005 magnetic declination used is 019.31. Dashed line is the approximate outline of Fig.5.

On February 8th, 2005 an application was made to challenge the IOTA under the same Section of the Act. In October 2005, the application was rejected. Free title in good standing was consequently established. The property details are summarised in Table 1:

Table 1. Mineral tenure of the IOTA property.

| TENURE NO. | NAME | OWNER (%) | EXPIRY DATE | STATUS | AREA (Ha) |
|---|---|---|---|---|---|
| 408296 | IOTA | Brenda Marie Brannstrom (100%) | January 9th, 2009 | Good | 500.00 |

The property is not, at the time of writing, encumbered by complaint, nor subject to any option or sale agreement.

## PHYSIOGRAPHY, CLIMATE, VEGETATION, ACCESS, LOCAL RESOURCES AND INFRASTRUCTURE

The property is located in the Tantalus Range, part of the Coast Ranges of southwestern British Columbia. Topography in the Tantalus Range is steep and rugged. Red Tusk Creek, which parallels the southern border of IOTA has an elevation of 720 metres above sea level (asl). By contrast, the peaks within the claim boundaries reach a maximum elevation of 2150 metres asl. Ridges are discontinuous and commonly knife-edged. Small icefields and permanent snow patches are common at high elevations. Slopes are typically steep and comprehensive coverage of the property requires climbing ability and helicopter support.

Vegetation in the valley bottom reflects the large amounts of annual precipitation: underbrush is thick with salmonberry; salal and devil's club populate the stream banks. Slopes are steep and are commonly covered with talus and blocky material; vegetation in these areas range from non-existent to thick bracken. Trees species are varied and include cedar, fir, spruce and hemlock. The stands can be very thick, but where mature, underbrush is greatly reduced. The tree line varies as a result of the extreme topography and the presence of glaciers, but is generally at 1600 m elevation.

Work on the property and surrounding areas is restricted to the late spring to early autumn (*i.e.*: April-May to late September). Depending upon the year, snow accumulation may begin in early October and the terrain presents extreme avalanche hazards until well into the spring. The snow, all bar the permanent fields, is usually gone by mid-May.

Access to the property can be attained only by helicopter and the nearest base is at the Squamish Airport, in the town of Brackendale. The old logging road which paralleled the Red Tusk Creek is now heavily overgrown and unusable; in previous years access to the Red Tusk valley from Clowhom Falls could be attained using this logging road.

## HISTORY

The area in which the IOTA tenure is situated has been the subject of intermittent mineral exploration at least since 1980. To the best of the authors' knowledge, James Laird was the first person to stake claims in the immediate area and has continued to be active in the area to the present day. The exploration summary below is excerpted from previous reports submitted for assessment work.

In 1981 Laird located the Silver Tusk and Silver Tusk I claims, after prospecting in the Silver Tusk Creek and Red Tusk Creek valleys. This activity was made possible by the construction of a logging road which opened up the Red Tusk Valley in the late 1970s (Laird, 1982). The claims were subsequently extended and optioned to Newmont Exploration of Canada (Newmont). Over the course of the next few years, Newmont operated the claims and carried out prospecting, sampling, geological mapping, geochemical analysis, petrography and diamond drilling. During the tenure of Newmont's option, zones of anomalous base and precious metal mineral mineralization were identified. These were named the Mavis, North, South and Main zones. Anomalous concentrations of Cu, Pb, Zn, Ag and Au mineralization were correlated with outcrop and float of Gambier Group pendant rocks; significance was placed upon a rhyolitic-dacitic horizon which appeared to host the highest concentrations and be traceable along a distance of approximately 2000 m (Delane, 1983). In 1985, Newmont completed twelve diamond drill holes, a total of 647 m of core, with the North and South zones as their target. The target horizon was an altered volcanic assemblage of rhyolitic composition. Drill holes in the

North Zone intersected large slide blocks which, prior to drilling, had been thought to be bedrock; in the South Zone, drilling indicated that mineralization grades increased with depth and to the north. However, results were discouraging inasmuch as the core assays returned significantly less base and precious metal concentrations than those obtained during previous years' surface sampling (Boyle, 1986). Additional exploration of the South Zone and pendant rocks in the eastern portion of the claim block was recommended, however no further exploration by Newmont on the Red Tusk property is reported.

In 1988, Mr. Laird optioned the remaining claims (Silver Tusk, Paydirt, Mavis and Golden Chance) to Schellex Gold Corp. Schellex commissioned a two stage field exploration program consisting of prospecting, trenching and sampling. As a result of their investigations, two new zones, the North Zone Extension and the Cirque Zone were identified and the property was extended. Trenching on the Cirque Zone produced base and precious metal concentrations as high as 1.47% Cu, 1.74% Pb, 7.63% Zn, 2.25 oz/ton Ag and 0.012 oz/ton Au. Higher values were obtained from float whose source was inferred to be from higher elevations in the zone (Chung, 1988). Although further investigation of the South, Cirque and North Extension Zones were recommended, Schellex did not return to the area. The claims were forfeited by the spring of 1995.

A small, six unit claim, Red Tusk 1, was staked in 1995 on behalf of the Phoenix Syndicate. The claim covered most of the previous zones of mineralization, including the North, North Extension, Main and South zones. Discovery Consultants conducted a very limited rock and heavy mineral sampling program that same year over portions of the property. The claim was dropped in 2001 and no further work was reported in the Red Tusk area until 2004.

In 2003 the Gambier Syndicate staked more than 400 tenures in the Red Tusk area and to the north. The most southerly portion of the northwest-trending claim block covered the previously identified zones of mineralization. The property was optioned to Red Tusk Resources Inc., a private corporation and a work program composed of limited mapping, rock and silt sediment sampling was conducted. In the Red Tusk area itself, exploration focused primarily on sampling gossans located at higher elevations and was cursory in nature. Grab samples were taken from the Cirque Zone and assays returned maximum concentrations of 1.92% Cu, 0.25% Pb, 2.42% Zn, 59.2ppm Ag and 980ppb Au (Raven, 2004). 15 soil samples were taken in the North

Extension Zone and in areas east and topographically lower to the Cirque Zone; these yielded no significantly anomalous results. In 2004, the four claims covering the mineralized zones were cancelled by the Gold Commissioner.

## GEOLOGICAL SETTING

### Regional geology

The property lies in the Western Coast Belt of southwestern British Columbia, a geological region underlain predominantly by felsic to intermediate intrusions of Late Jurassic to mid-Cretaceous age (Figure 3). In the immediate area of the property there are two major intrusions, a more westerly granodiorite with a mid-to late Cretaceous age and a more easterly quartz diorite with a late Jurassic age. These ages have been constrained, albeit sparsely by isotopic analyses using various methods, by several workers. At or near the northwesterly trending contact between the two main intrusions is a more mafic phase, possibly a border phase, comprising diorite and gabbro and poorly constrained in age.

The intrusions throughout the Coast Belt contain pendants and screens of supracrustal rock of various ages. In the immediate area of the property these are exclusively of the Lower Cretaceous Gambier Group, an assemblage of marine sedimentary and volcanic rocks which compose an important metallogenic province within the Coast Belt (see below). The Gambier Group assemblage which underlies much of the IOTA tenure lies at the south end of the Clowhom Pendant, a pendant or screen of Gambier Group rocks that extends for over 30 km to the north and west.

Major faults mapped in the area generally have a northwesterly strike. Local and more minor faults are more complex and some may represent palaeofaults in the ancient Gambier volcanic terrain. A detailed description of the structural complexity is beyond the scope of this report. The part of the Clowhom Pendant covered by the property appears to be structurally coherent, albeit with the abrupt lateral facies changes characteristic of volcanic terrains.

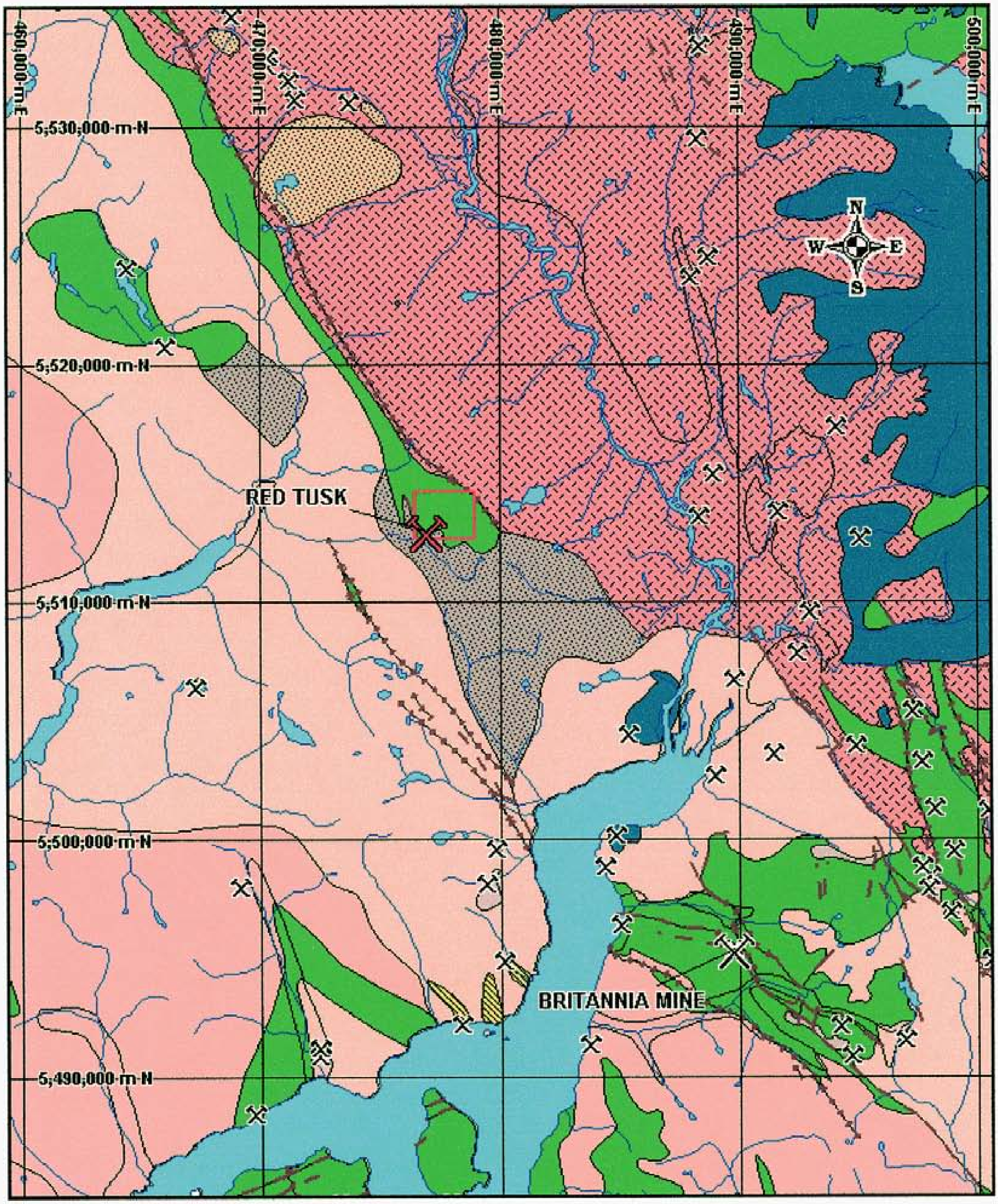


Figure 3. Regional geological map (1:250,000) of Squamish area, showing property location.

Geological boundaries from British Columbia Geological Survey Branch (1999).

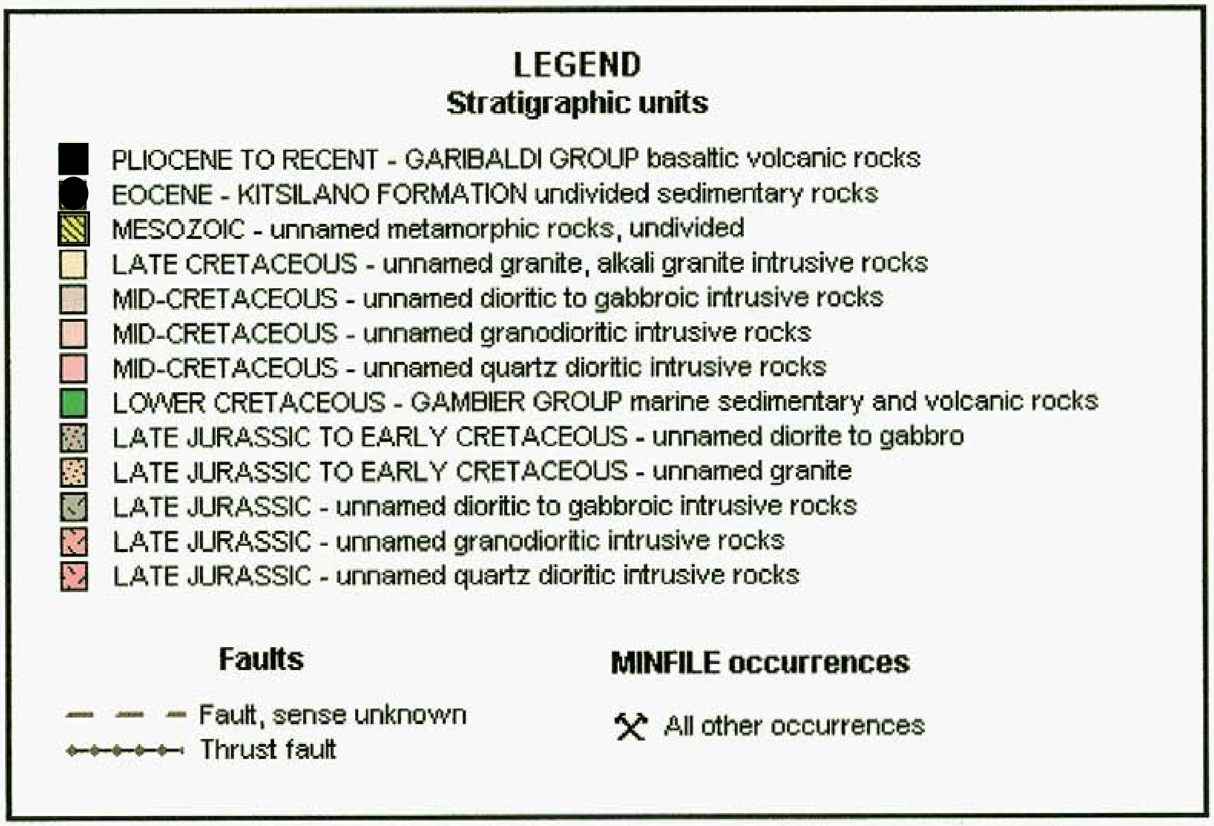


Figure 4. Legend for Figure 3.

**Property geology**

The brevity of the 2005 fieldwork at the property precluded detailed geological mapping. A geological map of the southwestern corner of the property, after Chung (1988), is shown in Figure 5. The area is underlain predominantly by volcanic and sedimentary rocks of the Gambier Group. A dioritic intrusion of inferred Late Mesozoic age is in a steeply inclined contact at the western edge of the Clowhom pendant. Chung (1988) notes that this contact is at least in part intrusive in nature, although it may be structural at the property's southwest corner. The geometry of the contact suggests that it is steeply inclined to the west.

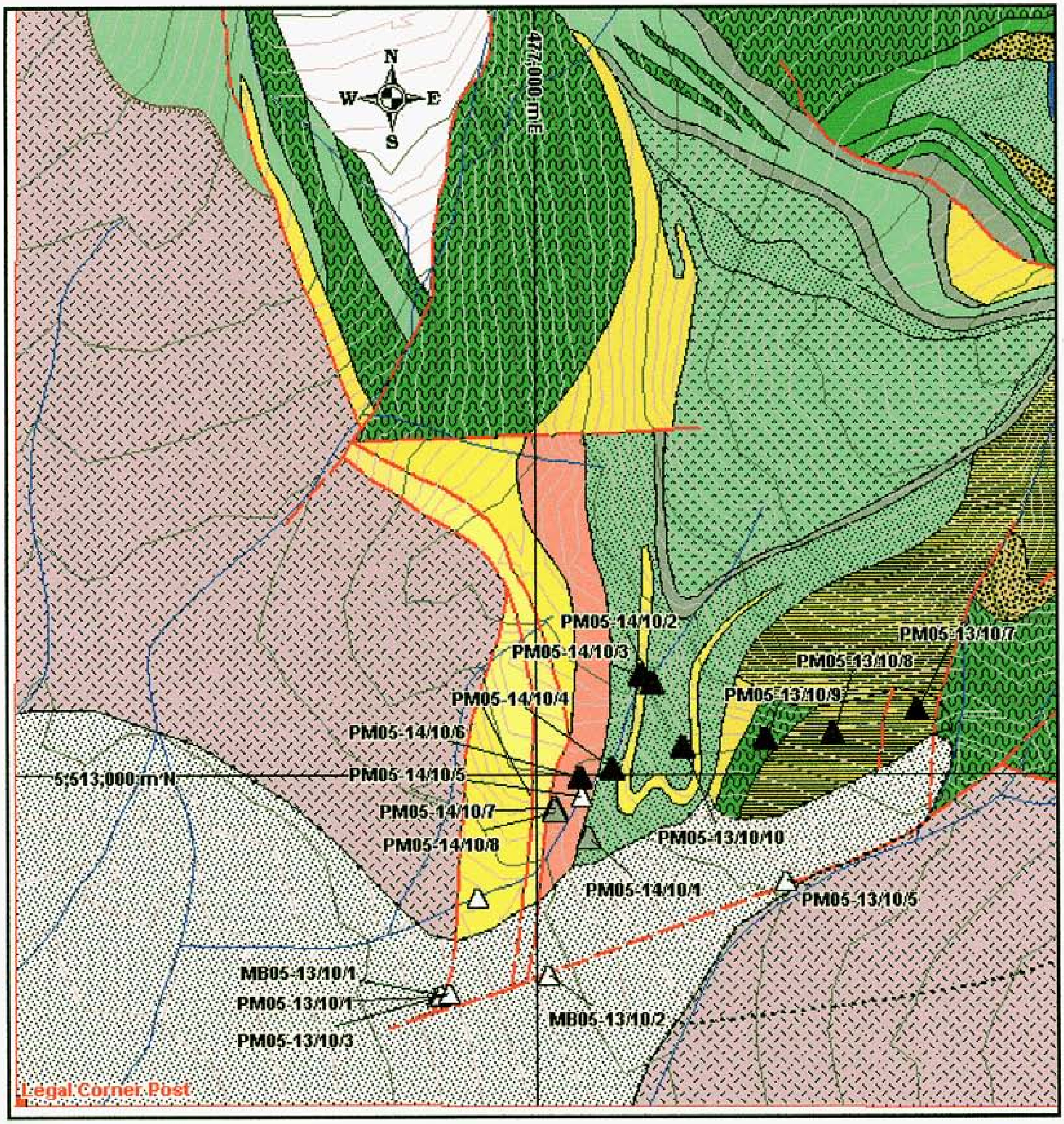


Figure 5. Geological map of SW corner of IOTA (Chung 1988), showing sample locations.

SCALE : 1:7,500

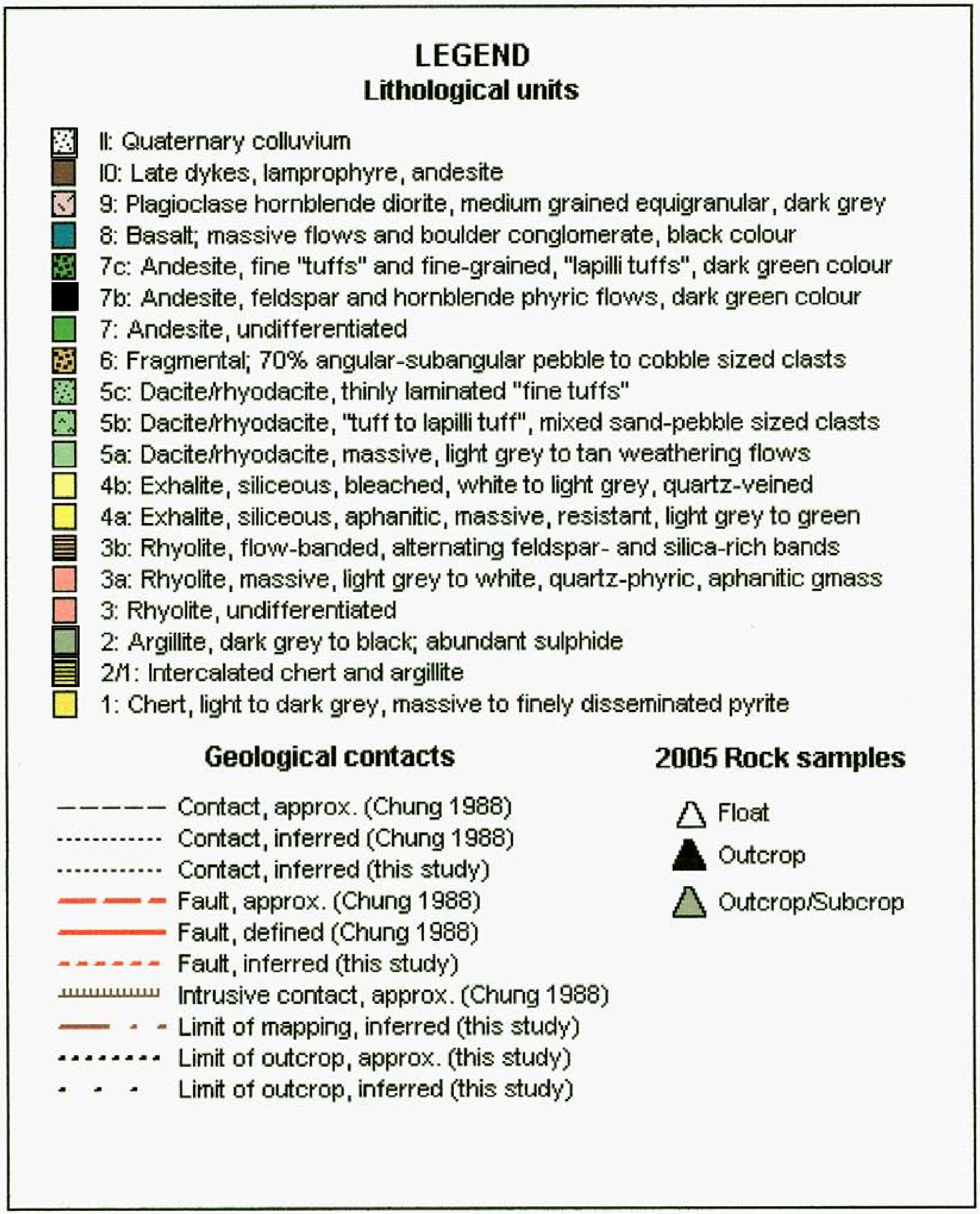


Figure 6. Legend for Figure 5.

Most of the area of the property is underlain by groups assigned to the Gambier Group by previous workers. Extensive mapping, using climbers, established that the stratigraphy has the complexity characteristic of a volcanic terrain. The principal components are:

1. Siltstone and argillite with characteristics suggesting subaqueous deposition;
2. Chert;
3. Coherent (*i.e.*: lava flows or intrusions) volcanic rocks; of compositions ranging from basaltic to rhyolitic;
4. Fragmental equivalents of the coherent volcanic rocks, dominantly those of intermediate to felsic composition and:
5. Chemical sedimentary rocks identified as the products of volcanogenic exhalatives, siliceous in nature and hosting copper-lead-zinc mineralization with significant gold values.

It is noted here that the fine grain size of many chemical sedimentary rocks, particularly those of siliceous composition, precludes accurate field determination of genesis; it is quite possible for chert to form in relatively cool water. It is further noted that, to the best of the authors' knowledge, no petrographic work has been carried out on this assemblage.

The units as mapped show considerable lateral variation. However, the assemblage may be subdivided crudely into a basal andesite/basalt with chert beds, overlain by intercalated chert and argillite and grading up into coherent and fragmental volcanic rocks of dacitic composition. A pervasively altered and mineralized rhyolite unit, associated with mineralized siliceous exhalite overlies the dacite in the area of the South Zone and hosts the mineral occurrence there.

## REGIONAL METALLOGENY AND TARGET DEPOSIT TYPES

The Squamish area has a long history of mining, centred around the Britannia Mine (MINFILE 092GNW003), which operated from 1905 to 1977, producing approximately 47.8 million tonnes of ore grading 1.1 per cent copper, 0.65 per cent zinc, 6.8 grams per tonne silver and 0.6 grams per tonne gold (MINFILE capsule report). The Britannia deposit has been identified as a Kuroko/Noranda-type volcanogenic massive sulphide deposit (Mineral deposit profile G06; Höy, 1995).

MINFILE occurrences in the Squamish area which have been classified as to type are sharply divided in provenance. The area around Squamish itself, underlain by the quartz diorite, is dominantly an area of industrial mineral prospects. Areas underlain by Gambier Group rocks host occurrences assigned as Kuroko/Noranda-type volcanogenic massive sulphide types or polymetallic vein types. Several porphyry-style prospects and polymetallic vein type occurrences are hosted by the mid- to late Cretaceous granodiorite. It should be noted here that the stockwork keel to a volcanogenic massive sulphide deposit possesses many features of the polymetallic base and precious metal vein type described by Lefebure and Church (1996). A similar observation might be made of the stockwork mineralization in a porphyry deposit.

The most prospective exploration model for the area covered by the IOTA mineral tenure is, without doubt, that of the Kuroko/Noranda-type volcanogenic massive sulphide deposit typical of Britannia. Fieldwork was directed to testing the hypothesis that the mineralization on the property might be of this deposit type.

## 2005 EXPLORATION ACTIVITIES

### Geological fieldwork

Eight man-days were spent on the property, two of these in mobilization/demobilization. A further two man-days were lost to a severe autumn storm. The remaining time was spent at the South Zone, examining the stratigraphy. The purpose of the examination was to locate the old drill collars, to confirm the presence of subaqueous volcanic rocks and to collect samples for preliminary petrographic and lithochemical study.

The diamond drill collars were not located. Subsequent enquiry revealed that the rig employed had been very small, with a minimal footprint (Chung, pers. comm. to P. Metcalfe, December 2005). The intervening 20 years will have obscured the drill sites quite effectively. Further information will be necessary in order to ensure the success of a second search.

Two traverses across the strike of the volcanic stratigraphy confirmed the results of previous work. A sequence of argillites with intercalated siliceous chemical sedimentary rock (identified as chert in Chung 1988) is overlain by intermediate and rhyolitic fragmental and coherent volcanic or volcanogenic rock in the vicinity of the South Zone mineralization. However, the "chert" itself is fractured and veined in at least one location visited (PM05-13/10/8 in Appendix III), with abundant development of chlorite and associated pyrite and sphalerite. The chlorite and sulphide mineralization is not inconsistent with a stockwork or stringer system at the base of a volcanogenic massive sulphide system. The chemical sediments previously identified as chert might therefore have formed from exhalative fluids also.

The only modification possible to the mapping described by Chung (*ibid.*) is to take account of the fragmental and possibly epiclastic nature of the dacite unit, exemplified by PM05-13/10/10. In addition, it is possible that areas identified as flow-banded rhyolite are of the rock type exemplified by PM05-14/10/1 (Appendix III). Although banded, this rock type contains nothing identifiable as a phenocryst and may, in fact be a recrystallized or altered, extremely fine grained siliceous sedimentary rock. Lithologies upsection from this are explicitly quartz-phyric rhyolite and samples taken from local float exhibit mineralized, jigsaw fit, homolithic breccia textures, possibly derived from autobrecciation of feldspar-phyric dacite.

**Petrological sampling**

A total of seventeen samples were taken, to confirm field identification and to form the basis of a petrological suite of specimens for lithochemical analysis. Programmes similar to that proposed herein have proved useful in locating economic mineralization in similar volcanogenic massive sulphide palaeoenvironments.

At the time of writing, the samples have been slabbed and selected samples polished. Brief hand specimen descriptions are presented in Appendix III. Thin sections or polished thin sections were prepared for fifteen of these samples, based upon examination of the hand specimens and polished slabs. Detailed petrographic descriptions are pending.

## INTERPRETATION AND CONCLUSIONS

The observations made by the authors in the area of the South Zone are consistent with previous interpretations of the area. Mineralization is hosted by a sequence of volcanic and related clastic and chemical sedimentary rocks. The fragmental, volcaniclastic rocks lack any textures diagnostic of hot emplacement, consistent with a subaqueous or submarine volcanic environment. The abundance of siliceous chemical sedimentary rocks hosting sulphide mineralization is consistent with a hydrothermal system associated with the intermediate to siliceous volcanic rocks. Based upon these observations, the IOTA mineral tenure, despite its lack of development as a prospect, is certainly prospective for a deposit or deposits of the type encountered at the Britannia Mine.

## RECOMMENDATIONS

The following are recommended:

1. Detailed petrographic work on the existing samples from 2005 fieldwork
2. Whole-rock lithochemical analysis using a total fusion method and comprehensive multi-element analysis using inductively coupled plasma spectrometry.
3. Location of the drill core from the 1985 diamond drill programme and sampling of the drill core; the samples would undergo the same petrographic and lithochemical work as the 2005 samples.
4. Renewed efforts to locate previous drill collars.
5. Extension of the surface sampling along strike to the North Zone stratigraphy, with similar analytical work carried out on these samples also.
6. Contingent upon results from the petrological and lithochemical studies, a ground geophysical survey comprising magnetic and electrical components. A test gravimetric survey should also be carried out, to establish whether the severe terrain precludes use of gravity as an exploration tool.

## 2005 STATEMENT OF COSTS

Table 2. 2005 Statement of Costs

| DESCRIPTION | QUANTITY | RATE | COST |
|---|---|---|---|
| **Labour** | | | |
| Sr. Geologist | 4.0 | $600.00 per diem | $2,400.00 |
| Jr. Geologist | 4.0 | $350.00 per diem | $1,400.00 |
| **Transportation** | | | |
| Omega Aviation Bell 206B helicopter charter | 1.1 | $1,190.00 per hour | $1,309.00 |
| **Expenses** | | | |
| Food and Accommodation | 8.0 | $50.00 per man-day | $400.00 |
| Supplies, incl. equip. rental | | | $487.74 |
| Topographic maps, incl. TRIM digital data | | | $236.75 |
| **Report** | 2.0 | $600.00 per diem | $1,200.00 |
| | 1.0 | $350.00 per diem | $350.00 |
| TOTAL | | | $7,783.49 |

## ACKNOWLEDGEMENTS

The authors wish to thank Paul Chung of the Coast Mountain Group for his time and recollections of the Red Tusk area. Thanks are also due to Red Tusk Resources for making available a copy of their unpublished report (Raven 2004) on their Clowhom Pendant property.

## REFERENCES

Boyle, H.C., 1986. Diamond Drilling Program on the Red Tusk Claim Group. B.C. Geological Branch Assessment Report Number 14,478.

Chung, P.L., 1988. Geochemical and Geological on the Red Tusk Property. B.C. Geological Branch Assessment Report Number 18,615.

Delane, G.D., 1983. Geological and Geochemical Report on the red Tusk Claim Group. B.C. Geological Branch Assessment Report Number 11,180.

Delane, G.D., 1984. A Technical Report on the red Tusk Claim Group in the Vancouver Mining Division, British Columbia. B.C. Geological Branch Assessment Report Number 12,660.

Gilmour, W.R., 1996. Assessment Report on a Heavy Mineral Stream Sediment and rock Sampling Program on the Red tusk Property Red Tusk 1 Mineral Claim, Squamish Area, Vancouver Mining Division, B.C. B.C. Geological Branch Assessment Report 24,421.

Höy, T. (1995): Noranda/Kuroko Massive Sulphide Cu-Pb-Zn; *in* Selected British Columbia Mineral Deposit Profiles, Volume 1, D.V. Lefebure and G.E. Ray, Editors, British Columbia Ministry of Energy, Mines and Petroleum Resources, pages 53-54.

Laird, J.W., 1982. Prospecting Report on the Silver Tusk Claims. B.C. Geological Branch Assessment Report Number 10,279.

Lefebure, D.V. and Church, B.N. (1996): Polymetallic Veins Ag-Pb-Zn□Au; in Selected British Columbia Mineral Deposit Profiles, Volume 2, D.V. Lefebure and T. Höy, Editors, British Columbia Ministry of Energy, Mines and Petroleum Resources, pages 67-70.

Raven, W., 2004. Geological & Geochemical Report on the Red Tusk Project for Red Tusk Resources Inc. Red Tusk Resources Internal Report.

## APPENDIX I: A NOTE ON COORDINATE SYSTEMS

### (After Harrop, unpubl. 2004)

Grids are the co-ordinate systems used to identify field locations uniquely in notes and on maps. These are systems of easting and northing values or **co-ordinates**, which are displacements of distance or angle measured from defined zero-lines or **origins**. The geographic co-ordinate system is the best-known of these systems, where meridians (north-south lines of longitude) and parallels (east-west lines of latitude) are measured in degrees, from the Greenwich zero meridian and from the equator, respectively. For a unique combination of values (e.g. 49°N, 123°W, there is a corresponding, unique location on the Earth's surface.

As noted above, the geographic system uses angles to measure location and is therefore not based upon a rectangular grid. Moreover, this system is a direct representation of the Earth's curved surface and translates poorly onto a flat sheet of paper, making it difficult to use in many applications unless a **projection** is carried out.

A **projection** is a mathematical method for converting the curved surface of the earth to a flat surface, tangential to the earth's surface at a particular point. An **ellipsoid** is a model for the shape of the earth's globe used in the projection calculation. A **datum** identifies the location(s) where the ellipsoid is fixed to specific geographic locations and from which the resulting grid is measured or surveyed. This grid is therefore rectangular or **Cartesian** and can be represented by a distance X (easting) and a distance Y (northing) from an origin point; elevations are measured as distance above (or below) the geoid's surface.

National and regional grid systems and their associated maps that are based on the earth's shape require all three components in their definition: a projection, an ellipsoid and a datum. All three should be specified, or co-ordinates given in a report or map will be ambiguous. Frequently a particular datum implies the use of a specific ellipsoid, which is therefore not necessarily mentioned.

Maps of small areas that do not need to account for the curvature of the earth or irregularities in its shape are based on simple, non-earth co-ordinate systems. These are usually called local grids and are commonly used for geological data collection. A local grid may be oriented arbitrarily and the conversion from local grid co-ordinates to a national or regional grid is simply treated as a shift and rotate operation.

## APPENDIX II: RELEVANT B.C.G.S.B.MINERAL DEPOSIT PROFILE(S)

# NORANDA/KUROKO MASSIVE SULPHIDE Cu-Pb-Zn G06

by Trygve Höy[1]

## *IDENTIFICATION*

SYNONYM: Polymetallic volcanogenic massive sulphide.

COMMODITIES (*BYPRODUCTS*): Cu, Pb, Zn, Ag, Au (*Cd, S, Se, Sn, barite, gypsum*).

EXAMPLES (British Columbia - *Canada/International*): Homestake (082M025), Lara (092B001), Lynx (092B129), Myra (092F072), Price (092F073), H-W (092F330), Ecstall (103h011), Tulsequah Chief (104K011), Big Bull (104K008), Kutcho Creek (104J060), Britannia (092G003); *Kidd Creek (Ontario, Canada), Buchans (Newfoundland, Canada), Bathurst-Newcastle district (New Brunswick, Canada), Horne-Quemont (Québec, Canada), Kuroko district (Japan), Mount Lyell (Australia), Rio Tinto (Spain), Shasta King (California, USA), Lockwood (Washington, USA).*

## *GEOLOGICAL CHARACTERISTICS*

CAPSULE DESCRIPTION: One or more lenses of massive pyrite, sphalerite, galena and chalcopyrite commonly within felsic volcanic rocks in a calcalkaline bimodal arc succession. The lenses may be zoned, with a Cu-rich base and a Pb-Zn-rich top; low-grade stockwork zones commonly underlie lenses and barite or chert layers may overlie them.

TECTONIC SETTING: Island arc; typically in a local extensional setting or rift environment within, or perhaps behind, an oceanic or continental margin arc.

DEPOSITIONAL ENVIRONMENT / GEOLOGICAL SETTING: Marine volcanism; commonly during a period of more felsic volcanism in an andesite (or basalt) dominated succession; locally associated with fine-grained marine sediments; also associated with faults or prominent fractures.

AGE OF MINERALIZATION: Any age. In British Columbia typically Devonian; less commonly Permian-Mississippian, Late Triassic, Early (and Middle) Jurassic, and Cretaceous.

HOST/ASSOCIATED ROCK TYPES: Submarine volcanic arc rocks: rhyolite, dacite associated with andesite or basalt; less commonly, in mafic alkaline arc successions; associated epiclastic deposits and minor shale or sandstone; commonly in close proximity to felsic intrusive rocks. Ore horizon grades laterally and vertically into thin chert or sediment layers called informally “exhalites”.

DEPOSIT FORM: Concordant massive to banded sulphide lens which is typically metres to tens of metres thick and tens to hundreds of metres in horizontal dimension; sometimes there is a peripheral apron of "clastic" massive sulphides; underlying crosscutting “stringer” zone of intense alteration and stockwork veining.

TEXTURE/STRUCTURE: Massive to well layered sulphides, typically zoned vertically and laterally; sulphides with a quartz, chert or barite gangue (more common near top of deposit); disseminated, stockwork and vein sulphides (footwall).

Höy, T. (1995): Noranda/Kuroko Massive Sulphide Cu-Pb-Zn; *in* Selected British Columbia Mineral Deposit Profiles, Volume 1, D.V. Lefebure and G.E. Ray, Editors, *British Columbia Ministry of Energy, Mines and Petroleum Resources*, pages 53-54.

[1] British Columbia Geological Survey, Victoria, B.C., Canada

# NORANDA/KUROKO MASSIVE SULPHIDE Cu-Pb-Zn G06

ORE MINERALOGY (Principal and *subordinate*): Upper massive zone: pyrite, sphalerite, galena, chalcopyrite, *pyrrhotite, tetrahedrite-tennantite, bornite, arsenopyrite*. Lower massive zone: pyrite, chalcopyrite, *sphalerite, pyrrhotite, magnetite*.

GANGUE MINERALOGY: Barite, chert, *gypsum, anhydrite and carbonate* near top of lens, carbonate quartz, chlorite and sericite near the base.

ALTERATION MINERALOGY: Footwall alteration pipes are commonly zoned from the core with quartz, sericite or chlorite to an outer zone of clay minerals, albite and carbonate (siderite or ankerite).

ORE CONTROLS: More felsic component of mafic to intermediate volcanic arc succession; near centre of felsic volcanism (marked by coarse pyroclastic breccias or felsic dome); extensional faults.

ASSOCIATED DEPOSIT TYPES: Stockwork Cu deposits; vein Cu, Pb, Zn, Ag, Au.

## *EXPLORATION GUIDES*

GEOCHEMICAL SIGNATURE: Zn, Hg and Mg halos, K addition and Na and Ca depletion of footwall rocks; closer proximity to deposit - Cu, Ag, As, Pb; within deposit - Cu, Zn, Pb, Ba, As, Ag, Au, Se, Sn, Bi, As.

GEOPHYSICAL SIGNATURE: Sulphide lenses usually show either an electromagnetic or induced polarization signature depending on the style of mineralization and presence of conductive sulphides. In recent years borehole electromagnetic methods have proven successful.

OTHER EXPLORATION GUIDES: Explosive felsic volcanics, volcanic centres, extensional faults, exhalite (chert) horizons, pyritic horizons.

## *ECONOMIC FACTORS*

GRADE AND TONNAGE: Average deposit size is 1.5 Mt containing 1.3% Cu, 1.9 % Pb, 2.0 % Zn, 0.16 g/t Au and 13 g/T Ag (Cox and Singer, 1986). British Columbia deposits range from less than 1 to 2 Mt to more than 10 Mt. The largest are the H-W (10.1 Mt with 2.0 % Cu, 3.5 % Zn, 0.3 % Pb, 30.4 g/t Ag and 2.1 g/t Au) and Kutcho (combined tonnage of 17 Mt, 1.6 % Cu, 2.3 % Zn, 0.06 % Pb, 29 g/t Ag and 0.3 g/t Au).

IMPORTANCE: Noranda/Kuroko massive sulphide deposits are major producers of Cu, Zn, Ag, Au and Pb in Canada. Their high grade and commonly high precious metal content continue to make them attractive exploration targets.

## *REFERENCES*


Cox, D.P. and Singer, D.A., Editors (1986): Mineral Deposit Models; *U.S. Geological Survey*, Bulletin 1693, 379 pages.

Höy, T. (1991): Volcanogenic Massive Sulphide Deposits in British Columbia: *in* Ore Deposits, Tectonics and Metallogeny in the Canadian Cordillera, W.J. McMillan, Coordinator, *British Columbia Ministry of Energy, Mines and Petroleum Resources*, Paper 1991-4, pages 89-123.

Franklin, J.M., Lydon, J.W. and Sangster, D.M. (1981): Volcanic-associated Massive Sulphide Deposits; *Economic Geology*, 75th Anniversary Volume, pages 485-627.

Hutchinson, R.W. (1980): Massive Base Metal Sulphide Deposits as Guides to Tectonic Evolution; *in* The Continental Crust and its Mineral Deposits, D.W. Strangway, Editor, *Geological Association of Canada*, Special Paper 20, pages 659-684.

# NORANDA/KUROKO MASSIVE SULPHIDE Cu-Pb-Zn G06

Lydon, J.W. (1984): Volcanogenic Massive Sulphide Deposits, Part 1: A Descriptive Model, *Geoscience Canada,* Volume 11, No. 4, pages 195-202.

Ohmoto, H. and Skinner, B.J., Editors (1983): The Kuroko and Related Volcanogenic Massive Sulfide Deposits; *Economic Geology*, Monograph 5, 604 pages.

Scott, S.D. (1985): Seafloor Polymetallic Sulfide Deposits: Modern and Ancient; *Marine Geology*, Volume 5, pages 191-212.

Sangster, D.F. (1972): Precambrian Volcanogenic Massive Sulphide Deposits in Canada: a Review; *Geological Survey of Canada*; Paper 72-22, 44 pages.

DRAFT #: 1 February 5, 1995

## APPENDIX III: HAND SPECIMEN DESCRIPTIONS

**MB05-13/10/1**

Float

Jigsaw fit homolithic breccia with hydrothermal cement. Clasts are of the lithology seen in PM05-13/10/3 i.e.: 15% subhedral - euhedral feldspar and traces of anhedral, subrounded quartz in an aphanitic pale greenish grey groundmass with trace Fe-Ti oxide. Trace pyrite. The breccia matrix is dominantly chlorite with traces of very fine grained disseminated pyrite.

**MB05-13/10/2**

Float

Fine-grained clastic rock without phenocrysts or crystals. May be volcanogenic; tuffaceous wacke.

**PM05-13/10/1**

Float

Same lithology as MB05-13/10/1. However, the feldspar phenocrysts are partially replaced by skeletal crystals of pyrite.

**PM05-13/10/3**

Float

Flow-banded (?)dacite; apparently competent, with no quartz phenocrysts. Some jigsaw fracturing and minor rotation of clasts. Clast lithology is coherent: 15% anhedral to subhedral feldspar phenocrysts, 1-3 mm, in flow-banded aphanitic pale greenish-grey groundmass. 1-2% euhedral pyrite as discrete grains, oxidized.

**PM05-13/10/5**

Float

Polymictic breccia with subangular clasts, mainly fine grained silica, either chert or silica-replaced protolith. Breccia is chaotic and might be either sedimentary on hydrothermal. Roughly 40-50 % of matrix (clast supported) is rock flour pervasively replaced by clay and silica. Roughly 10% whole rock is fine-grained, weathered pyrite in irregular subnetwork textured aggregates around clasts intergrown with fine-grained silica.

Best interpretation is a mineralized breccia, possibly gravel CG.

**PM05-13/10/7**

Outcrop

Very fine grained siliceous lithic siltstone, dark brownish grey in colour.

**PM05-13/10/8**

Outcrop

Aphanitic, beige in colour, white where altered peripheral to breccia cement. The rock is a jigsaw fit breccia, around a central fracture. Clast protolith unknown, aphanitic, beige in colour, contains concentric orbicular features which may be oxidation-related. Bleaching/silica flooding adjacent to fracture. Breccia matrix comprises chlorite and quartz +/- carbonate; sphalerite and (?) pyrite, very fine grained.

**PM05-13/10/9**

Outcrop

Monomictic gravel conglomerate, with massive clasts of roughly the same composition as 13/10/10; no quartz grains visible: rock composition appears intermediate and volcanogenic / volcaniclastic. Secondary biotite or chlorite, very fine grained, replaces or is metamorphic product of matrix. Clasts subangular, chaotic; no order visible in outcrop or hand specimen.

**PM05-13/10/10**

Outcrop

Anhedral to subhedral crystals, possibly phenocrysts in a dark grey green groundmass or matrix. The rock appears on close viewing to have a grit-gravel CG fragmental texture with subangular clasts and may be a volcaniclastic derived from an intermediate volcanic rock.

**PM05-14/10/1**

Outcrop

Banded on a scale of cm to 3 mm. The matrix, recrystallized, is quartzofeldspathic, very fine grained and siliceous. Banding is defined in part by Fe-Ti oxide with (?) no noticeable magnetism. Rare quartz (?) may be relic feldspar. Impossible to tell if this is indeed flow-banded. rhyolite or banded siliceous exhalite.

Fractures cutting banding are loci for bleaching in walls and introduction of epidote along the fracture. A fine-grained band 0.5 cm at one end of the slab may be a chert lamina.

**PM05-14/10/2**

Outcrop

Medium to dark grey foliated rock with a crenulation cleavage. May have been a feldspathic wacke, now recrystallized, or a feldspathic-lithic grit (if present grain size approximates primary). No explicit crystals, phenocrysts, or clasts.

**PM05-14/10/3**

Outcrop

Rusty brown weathering pale grey on fresh surfaces. Subangular to subrounded (?) chaotic clasts matrix-supported in recrystallized saccharoidal quartzofeldspathic matrix. Penetrative fabric obscures clasts which can only be seen by differential reflectance off polished surface. Pervasive silica alteration obscuring clast textures. A few are elongated and may be fiamme. Others, rounded, are distinguished only by presence of 10-15% subhedra and anhedra of pyrite, 1 mm. Volcaniclastic tuffaceous or epiclastic gravel to pebble conglomerate with mineralized rhyolitic clasts.

**PM05-14/10/4**

Outcrop

Extremely siliceous medium rock with a quartzofeldspathic groundmass or matrix. Crystals extremely hard to see. Banding defined by layers with as much as 10% (generally 5) very fine grained pyrite in irregular aggregates remobilized into tiny fractures at 60 degrees with banding. No other sulphides visible. TS might help.

**PM05-14/10/5**

Proximal float off cliff

Very fine-grained to aphanitic. The rock is essentially pure silica with late fracturing healed by quartz, very fine grained with pyrite as discrete corroded subhedra, 1-2 mm (2% WR) and 2% each of sphalerite and galena, also with quartz, as 1-2 mm anhedra. Interpreted as brecciated mineralized chert or siliceous exhalite.

**PM05-14/10/6**

Outcrop

Penetratively sheared volcaniclastic rock, probably epiclastic gravel conglomerate; buff-grey in colour, rusty weathering. Traces of pyrite as fine-grained clasts of massive pyrite 2-3 mm in size. The shearing looks tectonic (but may be autochthonous *i.e.*: flow banding- unlikely if it's a volcaniclastic).

**PM05-14/10/7**

Outcrop/subcrop

Crackle fractured (jigsaw fit) pinkish cream rock, rusty weathering. Coherent volcanic rock with quartz and feldspar phenocrysts, the rock is a flow laminated rhyolite with 5-10 % anhedral rounded quartz in an aphanitic matrix. Feldspar phenocrysts are rare, absent or obliterated by alteration. As much as 5% fine-grained sulphide in penetrative and non-penetrative fractures, dominantly pyrite with traces of (?)chalcopyrite. Very promising.

**PM05-14/10/8**

Outcrop/subcrop

Weakly mineralized feldspar-phyric rhyolite, coherent, with 5-10 % subhedral feldspar and trace quartz in an aphanitic pale greenish grey groundmass. 5-10% disseminated pyrite as discrete 1mm grains. Trace visible quartz phenocrysts rounded, anhedral.

## APPENDIX IV: STATEMENTS OF QUALIFICATIONS

I, Brenda Marie Brannstrom, of 204-130 East Queen's Road, North Vancouver, B.C. do hereby state that:

1. I graduated from Simon Fraser University in 2000, with an honours B.Sc. degree in Earth Sciences;
2. I am a practising geologist and have been since 1998;
3. I participated in the aforementioned field examination of the Iota claim from October 10th to 14th, 2005;
4. I hold a valid Free Miner's Certificate, number 144480 in the Province of British Columbia;
5. I am the recorded owner of the Iota mineral claim.

Signed on February 17$^{th}$, 2006

"B.M. Brannstrom"

______________________

Brenda Marie Brannstrom B.Sc.(Hon.)

Palatine Geological

I, Paul Metcalfe, do hereby state:

That I am a resident of British Columbia, with a business address of 204-130 East Queens Road, North Vancouver, British Columbia V7N 1G6.

That I am a member, in good standing, of the Association of Professional Engineers and Geoscientists of the Province of British Columbia;

That I am a graduate of the University of Durham (B.Sc. Hon., 1977);

That I am a graduate of the University of Manitoba (M.Sc. 1981);

That I am a graduate of the University of Alberta (Ph.D. 1987);

That my experience since graduation from Durham has been entirely within the western cordillera of North, Central and South America and has given me considerable knowledge of Cordilleran geology, in volcanology, in geological and geochemical exploration techniques and in the planning, execution and evaluation of exploration diamond drilling programs;

That I was employed as a postdoctoral research fellow by the Mineral Deposits Research Unit at the University of British Columbia and at the Geological Survey of Canada;

That I hold a valid Free Miner's Certificate, number 118248, in the Province of British Columbia;

That I participated in the field examination of the IOTA tenure from October 10th to 14th, 2005;

That the program described in this report was carried by myself by geologist Marie Brannstrom and that the costs of the program are accurately stated.

That the geological work was performed exclusively by myself and by geologist Marie Brannstrom, B.Sc., in whose work I have complete confidence.

That I am in an informal business partnership with Marie Brannstrom and therefore have an interest in the IOTA property.

Signed on the 17th day of February, 2005.

P Metcalfe

PROFESSIONAL
PROVINCE OF
P. METCALFE
BRITISH COLUMBIA
SCIENTIST

Paul Metcalfe, B.Sc. (Hon. *Dunelm.*) M.Sc. PhD. P.Geo.