COPPER FOX METALS INC.

SCHAFT CREEK PROJECT

ACCESS ROUTE
TERRAIN AND GEOHAZARDS MAPPING

PHASE 1 DRAFT REPORT

PROJECT NO: 0530-001
MARCH 19, 2008

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March 19, 2008

Project No. 0530-001

Shane Uren, M.A.Sc., R.P.Bio.
VP Environment & Permitting
Copper Fox Metals Inc.
Suite 404, 999 Canada Place
Vancouver, BC V6C 3E2

Dear Shane:

Re: Schaft Creek Access Route Terrain and Geohazards Mapping

Please find attached one copy of our above referenced final report dated March 19, 2008.

Should you have any questions or comments, please do not hesitate to contact us at your earliest convenience.

Yours sincerely,
BGC ENGINEERING INC.
per:

Kris Holm, M.Sc., P.Geo.
Project Manager

EXECUTIVE SUMMARY

The Schaft Creek copper-molybdenum deposit is located in the British Columbia Coast Mountains about 120 km northeast of Wrangell, Alaska, 60 km south of Telegraph Creek, BC, and about 160 km northwest of Stewart, BC (Figure 1). The access route and minesite areas are located within the Mess Creek Watershed, which drains an area of 2,306 km^2 and is a major tributary of the Stikine River. The minesite area and tailings options are located in upper Schaft and Hickman Creeks, tributaries to Mess Creek. Two access route options exist. The first option (referred to herein as the Mess Creek access route) extends north from More Creek along Upper Mess Creek, entering the minesite area and Schaft Creek drainage near Snipe Lake. A second option (Tahltan Highland route) traverses a high elevation plateau east of Mess Creek, and descends slopes on the east side of Mess Creek to intersect the Mess Creek access route at approximately km 25.5.

This report provides an overview assessment of surficial geology and geohazards for the Mess Creek Access route and for the part of the Tahltan Highland route descending into Mess Creek (Figure 1). A general overview of geohazards along the southernmost ~3 km of the Tahltan Highland route (ascent from More Creek) is also provided. This report forms part of a geohazards and terrain stability investigation that is a required component of the permitting process for the Schaft Creek Project, and provides information important for road and minesite development planning.

Upper Mess Creek follows a broad, U-shaped valley with elevations ranging from 720 – 1030 m along the valley bottom to 2300 m on adjacent ridgetops. Lower valley slopes are overlain by glacial till and colluvium, with sporadic bedrock outcrops in steeper areas and at channel crossings. Along the valley bottom, extensive sand and gravel fluvial deposits occur on a broad floodplain up to 1 km in width. Upper hillslopes are steep, gullied rockslopes partially overlain by thin rubble colluvium.

Geohazards with the potential to impact the Mess Creek access route include debris flows, debris floods, rockfall, snow avalanches, and flooding. Debris flow hazard was identified at 10 channel crossings, including 3 locations where the road crosses a major debris fan. Rockfall hazard exists where the road traverses below steep rockslopes; however, exposure to natural rockfall hazard is uncommon along the access route and of lower frequency than would likely occur on rock cuts. Snow avalanche hazard exists where the access road crosses avalanche paths below the treeline in the lower part of the runout zone; these occur within 23 terrain polygons intersecting the access route. Flood hazard exists at creek crossings and from km 31.7 to 32.9 where the access route crosses the Mess Creek floodplain.

The Tahltan Highland Route ascends steep terrain from More Creek onto a hummocky rock plateau in the vicinity of Arctic Lake (1475 m). Geohazards on the initial ascent from More Creek include snow avalanches and rockfall.

The Tahltan highland route descends slopes on the east side of Mess Creek to intersect the Mess Creek option at approximately km 25.5. The road alignment crosses hummocky, gullied bedrock partially overlain by colluvium in upper sections, and colluvium and till slopes at lower elevations. Slope gradients average 15° to 35°, up to ~45° in polygon 157 (terrain stability class V). Hazards include one debris flow gully (polygon 157) and several short (~200 m) slopes subject to snow avalanche hazard (Figure 3.2). The debris flow gully in polygon 157 is deeply incised and would require detailed assessment of rockslope stability for the design of bridge abutments.

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LIMITATIONS OF REPORT

BGC Engineering Inc. (BGC) prepared this report for the account of Copper Fox Metals Inc. The material in it reflects the judgment of BGC staff in light of the information available to BGC at the time of report preparation. Any use which a third party makes of this report, or any reliance on decisions to be based on it are the responsibility of such third parties. BGC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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This study is at an overview level only and should not be used for final design or construction. BGC will not assume any liability for damages that may occur as a consequence of using this report on a site-specific basis.

This report describes current conditions. Any future changes in the area (e.g., development, forest fires, logging, road building) may change geohazard levels and/or terrain characteristics within the study area. BGC will not assume any liability for damages that may occur as a consequence of such changes.

1.0 INTRODUCTION

1.1 Area Overview

The Schaft Creek copper-gold-molybdenum deposit is located in the British Columbia Coast Mountains about 120 km northeast of Wrangell, Alaska, 60 km south of Telegraph Creek, BC, and about 160 km northwest of Stewart, BC (Figure 1.1). The access route and minesite areas are located within the Mess Creek Watershed, which drains an area of 2,306 km^2 and is a major tributary of the Stikine River. The minesite area and tailings options are located in upper Schaft and Hickman Creeks, tributaries to Mess Creek. Two access route options exist. The first option (Mess Creek access route) extends north from More Creek along Upper Mess Creek, entering the minesite area and Schaft Creek drainage near Snipe Lake. A second option (Tahltan Highland route) traverses a high elevation plateau south of Mess Creek, and descends slopes on the east side of Mess Creek to intersect the first road option at km 25.5. A partially constructed access road parallel to More Creek extends to Highway 37 east of the Iskut River. The study area considered in this report includes the entire length of the Mess Creek access route, and the south and north ends of the Tahltan Highland where the alignment ascends and descends from the high plateau.

1.2 Terms of Reference

Copper Fox retained BGC Engineering Inc. (BGC) to prepare terrain and geohazard maps for the access route, with an initial office-based phase of work to be completed in early 2008, and a second phase commencing in Spring/Summer 2008 that will include fieldwork and a more detailed geohazard assessment. BGC's work was based on a work plan submitted to Copper Fox Metals Inc. (CF) titled "Terrain and Geohazards Mapping, Schaft Creek, BC" dated August 21, 2007.

1.3 Scope of Work

BGC understands that the following preliminary work was required within the study area shown in Figure 1, which encompasses slopes adjacent to the Mess Creek access route between More Creek and Snipe Lake:

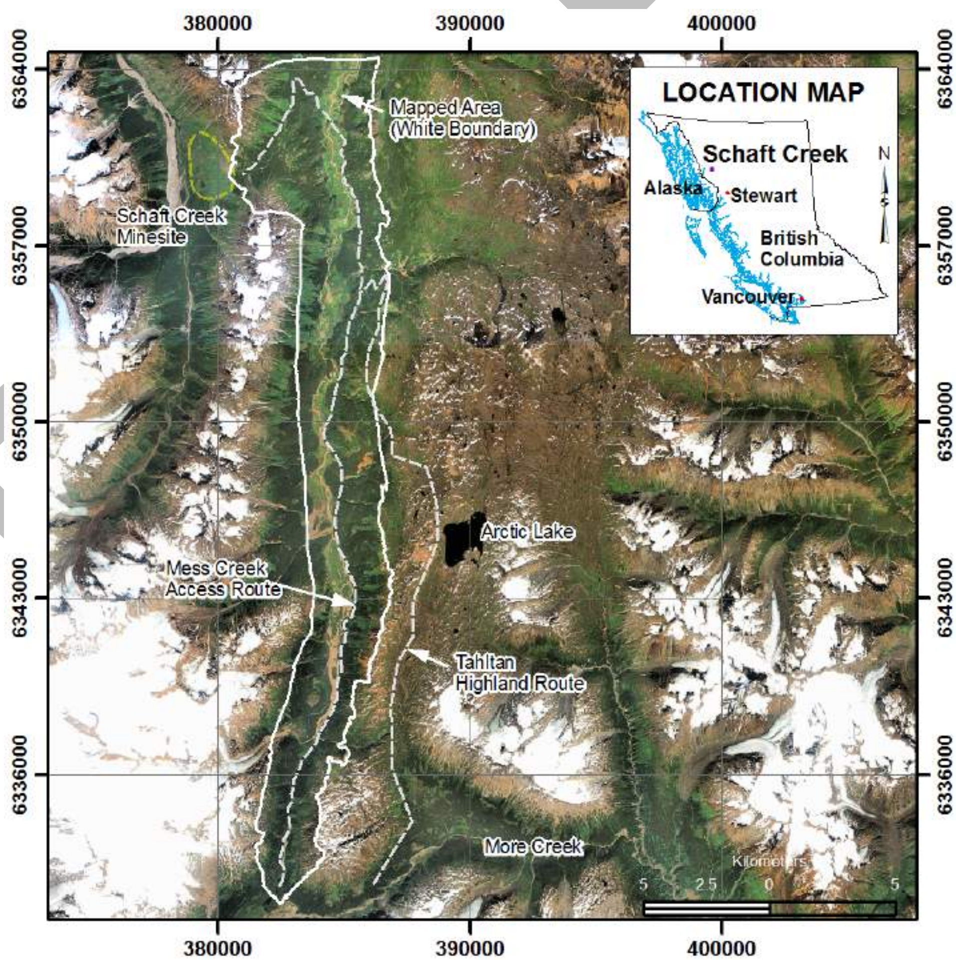
- Preparation of a terrain map showing surficial materials and geohazards, including the initation and runout zones of existing landslides, and zones subject to snow avalanche hazard; and an
- overview description of terrain and geohazards.

An overview description of geohazards is also provided for the southernmost 3 kilometres of the Tahltan Highland route, for the ascent to the high elevation plateau in the vicinity of Arctic Lake.

BGC further understands that this work will form Phase 1 of a geohazard assessment of the proposed access route, to be followed by a second phase of more detailed geohazard mapping and field assessments in 2008, including expansion of the study area to include the minesite. This report provides a description of work completed for Phase 1. The proposed scope of work for Phase 1 does **not** include:

- Site-specific assessments of geohazard frequency and magnitude
- Assessment of hydrologic (flood) hazards
- Mapping of individual snow avalanche paths
- Assessment of geohazards related to construction
- Assessment of geohazards related to seismic activity
- Recommendations for geohazard mitigation

Figure 1.1. Study Area (outlined in white)



1.4 Terrain Mapping Methods

Terrain mapping methods are based on the guidelines and standards set by the Resources Inventory Committee (1996) and the Mapping and Assessing Terrain Stability Guidebook (Ministry of Forests 1999). Terrain classification followed the provincial system (Howes and Kenk, 1997). Mapping symbols are defined on the terrain maps and in Appendix 1. A list of airphotos is provided in Appendix II.

Terrain mapping was done by Kris Holm, M.Sc., P.Geo. (KH) of BGC. Matthias Jakob, Ph.D., P.Geo. (MJ) reviewed the mapping. Work was based on airphoto interpretation with field checking anticipated during the second phase of this project in Summer 2008.

Symbols describing material types and drainage classes were added to all terrain polygons. Polygons intersected by the proposed road alignment were also assigned terrain stability classes. Atticus Spatial Information Management Ltd. (Atticus) transferred the polygon boundaries from the air photos to the digital trim base by mono-restitution methods.

1.5 Mapping Reliability

The accuracy of terrain mapping depends on numerous factors, such as the skill and experience of the mapper, the scale and quality of airphotos used, the type and density of vegetation, field access and length of time spent in the field, quality of base maps, and type and complexity of terrain and surficial materials. For this project, we consider the accuracy to be relatively high because the work was carried out by an experienced mapper (KH) under the review of an experienced geoscientist (MJ), and airphoto scale and quality is appropriate. Factors limiting the accuracy of mapping include dense forest cover in Mess Creek, and lack of field checking for this initial project phase (field checking to be conducted in project phase 2).

The minimum size of terrain polygons for 1:20,000 scale terrain mapping is about 2 ha. Thus local variations in terrain conditions over areas of 2-3 ha, or over distances of less than about 150 m, were not mapped. As a result, there may be considerable within-polygon variation in slope steepness, material characteristics and soil moisture. In addition, terrain stability ratings assigned to terrain polygons intersecting the proposed road alignment are representative of the entire polygon and may not reflect detailed site conditions on the alignment. This implies that detailed planning of construction will require further ground checking to identify sites that may be more sensitive to disturbance than the average conditions mapped for an individual polygon.

1.6 Drainage Interpretations

Drainage classes rate the potential for materials within a polygon to be saturated, and take into account both material permeability and the potential for water to drain into a polygon (Table 2.3). For example, a slope containing coarse, highly permeable material may be assigned an imperfect (i) drainage class if it was located in an area where abundant water drained into the polygon.

Table 1.1 - Example Materials and Locations for Each Drainage Class

Drainage Class	Description	Example materials and locations
Rapid (r)	Water is removed from the soil rapidly in relation to supply	Exposed rock
Well (w)	Water is removed from the soil readily but not rapidly	Thin colluvium, bedrock partially covered in colluvium, till, upper slopes
Moderate (m)	Water is removed from the soil somewhat slowly in relation to supply	Thicker colluvium, till, mid-lower slopes
Imperfect (i)	Water is removed from the soil sufficiently slowly in relation to supply to keep the soil wet for a significant part of the growing season	Lowermost slopes, gully bottoms, moist areas of floodplains
Poor (p), Very Poor (vp)	Water is removed so slowly in relation to supply that the soil remains wet for a comparatively large part of the time the soil is not frozen	Bogs in bedrock depressions, marshy or wet areas of floodplains.

1.7 Terrain Stability Interpretations

Terrain stability refers to mass movements such as debris avalanches, debris flows, and rock fall. Terrain stability ratings range from class **I** (stable) to class **V** (unstable), and indicate the likelihood of instability resulting from road construction (or clearcut logging in the case of forestry applications) (Table 1.2). Terrain stability ratings were assigned to polygons intersecting or adjacent to the proposed road alignment.

The general criteria for assigning terrain stability classes are shown in Table 1.3. These guidelines are based primarily on slope steepness, material type and texture, and geomorphological processes. In addition, ratings were adjusted based on site-specific factors such as slope morphology and soil drainage. For example, a slope morphology that includes irregular, near-surface bedrock would typically be rated as more stable than a similar slope with a smooth profile, because bedrock irregularities tend to hold surficial materials in place. Relatively poorly drained or wet slopes may be prone to slope failures through a reduction in shear strength due to high soil pore water pressure, and may be assigned a more conservative terrain stability rating.

Table 1.2. Terrain Stability Ratings for Road Construction

Terrain stability class	Interpretation
I	**No significant stability problems exist.**
II	**There is a very low likelihood of landslides following road construction. Minor slumping is expected along road cuts, especially for 1 or 2 years following construction.**
III	**There is a low likelihood of landslide initiation following road construction. Minor slumping is expected along road cuts, especially for 1 or 2 years following construction.**
IV	**Expected to contain areas with a moderate likelihood of landslide initiation following road construction.**
V	**Expected to contain areas with a high likelihood of landslide initiation following road construction.**

Table 1.3. Guidelines for Assigning Terrain Stability Classes

<table>
<tr><th rowspan="3">TERRAIN STABILITY CLASS</th><th colspan="6">SLOPE CLASS</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th colspan="2">4</th><th>5</th></tr>
<tr><th>0.5% (0-3°)</th><th>6-27% (3-15°)</th><th>28-49% (15-26°)</th><th>50-60% (26-30°)</th><th>61-70% (31-35°)</th><th>>70% (>35°)</th></tr>
<tr><td rowspan="2">I</td><td>Mv, Mb; F^Gp, F^Gu; Fp;; L^Gp, L^Gu; Rp, Ru</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>Rj, Ru</td><td></td><td></td><td></td><td></td></tr>
<tr><td>II</td><td></td><td>Mv, Mb; F^Gf, F^Gu, F^Gj; Ff, Fj; Cf; Dv; L^Gj, L^Gu</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="5">III</td><td></td><td colspan="2">Ruh, Rum, Rur with Mw, Cv, Ra</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>L^Ga</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td colspan="2">Mv, Mb; F^Gak, F^Ga; Cv, Cb</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td colspan="2">aCk;Rk</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">L^Ga</td><td></td><td></td></tr>
<tr><td rowspan="3">IV</td><td></td><td></td><td></td><td colspan="3">L^Gk, L^Gs</td></tr>
<tr><td></td><td></td><td></td><td colspan="3">Mb-V; Cb-V; (-V refers to dissected slopes)</td></tr>
<tr><td></td><td></td><td></td><td></td><td colspan="2">Mv, Mb; F^Gk, F^Gs; Cv; Cb, L^Gk, Uks, Us</td></tr>
<tr><td rowspan="2">V</td><td></td><td></td><td></td><td></td><td colspan="2">Mks-V; FGks-V; Cvb-V; L^Gks-V, L^Gs-V, Uks-V</td></tr>
<tr><td colspan="6">all materials and landforms that are unstable (i.e. include the initiation zone of mass movements: -F", -R"s, and/or –R"b*)</td></tr>
</table>

2.0 STUDY AREA DESCRIPTION

2.1 Bedrock Geology

The Schaft Creek copper-gold-molybdenum deposit and proposed access route are located in the northern part of the Intermontane Belt of the Canadian Cordillera, in Stikine assemblage rocks on the eastern boundary of the Coast Plutonic Complex (Logan et al. 1997, Giroux 2004). Much of Shaft Creek is located within Stuhini group volcanic and arc-derived sedimentary rocks. The porphyry mineral deposit is hosted in three main zones by hydrothermally altered volcaniclastic rocks, felsic porphyritic dykes, and breccias overlain by relatively unaltered andesitic volcanic rocks. Northeast of the proposed open pit footprint and Mt. LaCasse, limestone bedrock underlies terrain in the vicinity of Skeeter Lake.

Granitic Coast intrusions occur to the northwest and south of the Schaft Creek deposit, including extensive exposures on the west side of Mess Creek and areas west of Schaft Creek. On the east side of Mess Creek in the vicinity of the access road, intrusives are also exposed within the monzonite Loon Lake Stock and in less extensive granitic Coast intrusion outcrops. Further north and south of the Loon Lake Stock, terrain is underlain by Devonian to Jurassic age, low grade (sub-greenschist) metamorphosed volcanic, volcanoclastic and sedimentary rock. Appendix III provides a list of bedrock types and faults that intersect the Schaft Creek access road, based on Logan et al. (1997).

Bedrock structure reflects complex, multiple phases and styles of deformation and faulting from Devonian to Late Tertiary time. The overall intensity of regional scale deformation increases northward, from weakly deformed bedrock in the Forrest Kerr area to more intensely deformed Devonian and Early Carboniferous rock in Mess Creek. Angular unconformities in the Mess creek area appear to reflect several phases of deformation, including an early contractional phase and two additional phases in Late Jurassic – Early Cretaceous and Late Cretaceous – Tertiary time that correspond with development of the Skeena Fold and Thrust Belt (Evenchick 1991). Both Mess creek and Schaft follow extensional fault zones comprised of several fault-bounded blocks (grabens). North-northeast trending listric normal faults associated with the graben structure form steep escarpments on the east side of Mess Creek.

2.2 Climate

Schaft Creek and the proposed access route are located in a transition zone between wetter conditions of the British Columbia coast and drier conditions in the interior. Most of the study area lies within the Northern Coastal Mountains hydrological zone (9A; Coulson and Obedkoff 1998), characterized at higher elevations by cold winters, short cool summers, and high annual precipitation. The major climatic processes during the fall and winter months include frontal cyclones arriving from the Pacific Ocean, resulting in precipitation as moist air masses are forced upwards over the Coast Mountains. Most precipitation from October through May falls as snow. A more detailed summary of climate at Schaft Creek is provided by Rescan (2006).

2.3 Topography, Glacial History, and Deposition of Surficial Materials

The portion of Mess Creek traversed by the access route follows a broad, U-shaped valley with elevations ranging from 720 –1030 m along the valley bottom to 2300 m on adjacent ridgetops. Lower valley slopes are overlain by glacial till and colluvium, with sporadic bedrock outcrops in steeper areas and at channel crossings. Along the valley bottom, extensive sand and gravel fluvial deposits occur on a broad floodplain up to 1 km in width. Upper hillslopes are steep, gullied rockslopes partially overlain by thin rubble colluvium. Surficial materials within terrain polygons intersecting the proposed access route are listed in Appendix V.

The Tahltan Highland Route ascends steep (approximately 20° – 40°) terrain north of More Creek (~1000 m elev.) onto a hummocky rock plateau east of the study area, in the vicinity of Arctic Lake (1475 m elev.). From there it descends moderately steep (average 15° to 35°) slopes on the east side of Mess Creek, intersecting the Mess Creek Access route at approximately km 25 (~775 m elev). The upper part of this road section crosses hummocky, gullied bedrock partially overlain by colluvium. Blankets of colluvium and till overlie slopes at lower elevations.

The topography within the study area reflects burial beneath the Cordilleran ice sheet during the Late Wisconsinan Fraser Glaciation (ca. 25-10 ka), followed by Holocene alpine glaciation and erosion due to fluvial and landslide processes. McCuaig (2002) notes two main phases of ice flow that are thought to have occurred during the Fraser Glaciation. In earlier to middle stages of glaciation, ice extent and thickness increased to form the continental scale, Cordilleran Ice Sheet, with south-westward flow towards the Pacific Ocean. During the later stages of glaciation, ice flow became confined to major valleys and fijords, and retreated primarily by frontal retreat and downwasting. The broad U-shape of Mess creek reflects preferential glacial scour of the weaker, fractured rocks along the Mess Creek fault zone.

During Holocene time, several episodes of glacial advance and retreat have occurred since about 7700 calendar years before present (cal-YBP), most recently during the "Little Ice Age" (LIA) from the 12th to 19th centuries (Ryder and Thomson 1986, Desloges and Ryder 1990, Luckman and Villalba 2001, Larocque and Smith 2003, Lewis and Smith 2004, Thompson et al. 2006, Koch 2006). In most areas, the largest Holocene glacial advance culminated in the early to mid 1800's. Since then, many glaciated areas have decreased by over 30% with over 200 m of associated loss in ice thickness in some basins (Bovis and Evans 1996, Ryder and Thompson 1986).

The valley bottom of Mess Creek has not been covered in ice since the Fraser Glaciation. However, several creeks on the west side of Mess Creek have increased sediment supply from areas subject to recent glacial retreat (e.g. polygons 269, 417, 429), and have glacially oversteepened slopes prone to rockfall or rock slides (e.g. polygon 434). In these locations, sediment from upper basins provides material subject to entrainment during debris flows, debris floods, or floods, and is a contributing factor for tributary fan development and channel aggradation in Mess Creek.

3.0 GEOHAZARDS

3.1 Mess Creek Access Route

Geohazards within terrain polygons intersecting the Mess Creek access route are listed in Appendix V, referenced to road kilometre. These include debris flows, debris floods, floods, rockfall, rock slides, and snow avalanches. The road alignment traverses 35 polygons rated terrain stability class IV; all contain till or colluvium with moderately steep (~30+) slopes. Eight polygons rated stability class V are intersected by the road alignment. In these cases, the stability rating refers to landslides initiating upslope of the road within the polygon; no cases were identified where the road alignment crosses existing terrain instabilities.

Debris flow hazard was identified at 10 channel crossings, including 3 locations where the road crosses a major fan (polygon nos. 246 at ~km 17), 618 at ~km 17.3, and 134 at ~km 26.1). Rockfall hazard exists where the road traverses below steep rockslopes (e.g. polygon 611); however, exposure to natural rockfall hazard is uncommon along the access route and of lower frequency than would likely occur on artificial rock cuts. One landslide interpreted as a rock slide was mapped at km 13.27, in terrain underlain by sandstone (Logan et al. 1997). The failure occurred within a ~100 m wide embayment above a ~80 m wide section of the proposed road. The embayment is poorly visible on the air photographs, and confirmation of this feature as a rock slide will require assessment in the field.

Snow avalanche hazard exists where the access road crosses avalanche vegetation scars below the treeline in the lower part of the runout zone. Flood hazard exists at creek crossings and from km 31.7 to 32.9 where the access route crosses Mess Creek floodplain.

The access road crosses several tributaries (e.g. polygons 134, 156, 246, 618) with upper channels underlain by highly fractured bedrock. Failures in upper portions of these channels have triggered debris flow activity and increased sediment supply, and have resulted in large fans at the confluence with Mess Creek. These channels are subject to the largest debris flows along the access route, particularly in the basin upstream of polygon no. 246, where slope sagging features (polygons 254, 256) exist above fractured volcaniclastic and granitic slopes undercut by gully erosion. More detailed field assessment of debris flow hazard and implications for bridge design and road alignment is warranted at these sites.

Extensive slope sagging[1] features were identified in polygons 491 and 501, about 700 m west (~100 m upslope) of road km 2.4. The upper part of the feature (1300 – 1500 m elevation) is underlain by quartz diorite, and the lower part (1200 – 1300 m elevation) by well foliated sericite schist (Logan et al. 1997). Slow, deep-seated sagging may be ongoing in

[1] slow, deep-seated, gravitational slope deformation

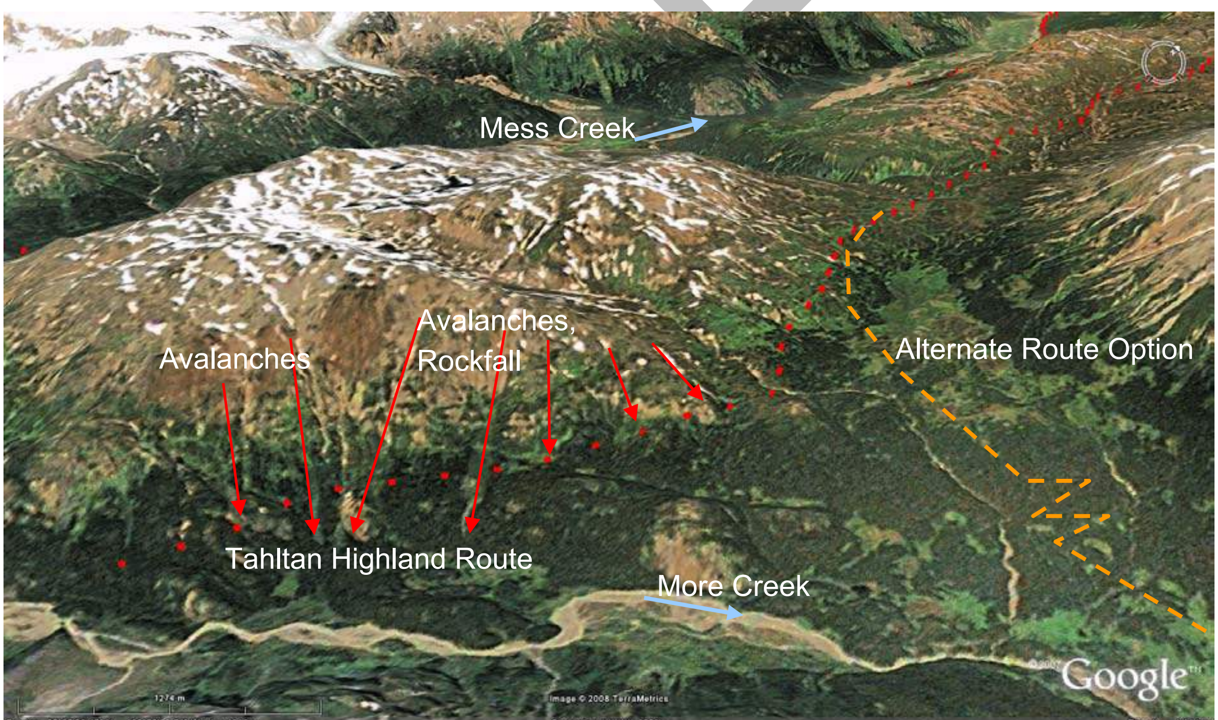
this area and is interpreted as possibly associated with gravitational loading and deformation of weaker underlying schist. However, rates of movement are unknown. Field surface investigation of this feature is recommended.

3.2 Tahltan Highland Route

3.2.1 South-most (More Creek) end of Tahltan Highland Route

Based on a review of approximately 1:60,000 scale airphotos (Appendix II), geohazards on the initial ascent north of More Creek include snow avalanches and rockfall (Figure 3.1). An approximate alignment option avoiding these geohazards is shown as an orange dashed line in Figure 3.1.

Figure 3.1. Ascent of Tahltan Highland Route from More Creek.



3.2.2 North-most (Mess Creek) end of Tahltan Highland Route

A Google Earth perspective of the Tahltan highland route descending northwest to Mess Creek is shown in Figure 3.2. This section was noted by Copper Fox as of concern from a terrain stability and geohazards perspective, and involves an approximately 600 m descent from the highland to Mess Creek. Through this section, the road alignment crosses primarily stability classes III and IV terrain, with slope gradients averaging 15° to 35°, and up to ~45° in polygon 157 (terrain stability class V). Hazards include one debris flow gully (polygon 157) and several short (~200 m) slopes subject to snow avalanche hazard (Figure 3.2). The debris flow gully in polygon 157 is deeply incised and would require detailed assessment of rockslope stability for the design of bridge abutments.

Figure 3.2. Descent of Tahltan High Route into Mess Creek.

4.0 RECOMMENDATIONS

This report provides an overview assessment of surficial geology and geohazards for the Mess Creek Access route, and the parts of the Tahltan Highland route descending into Mess Creek and ascending from More Creek. It comprises Phase 1 of a geohazards and terrain stability investigation program for Schaft Creek.

The following work is recommended for Phase 2 of BGC's geohazard assessment for the Schaft Creek project. A proposed work plan will be provided under separate cover.

Access Route:

- Field checking to verify terrain stability mapping conducted for Phase 1;
- addition of potential sediment delivery rating to polygons intersecting the proposed access road (rating of the potential for surface erosion to transport sediment to valley bottom streams);
- linear geohazard assessment of the proposed access road;
- terrain stability field assessment (TSFA)[1] including a geotechnical review of the design for road sections with cut and fill slopes ≥ 5 m high in soil[2];
- preparation of an Avalanche Atlas (CAA 2002);
- review of selected sections of the geometric design for the proposed access road;
- estimation of design flows at channel crossings;
- identification of geohazard mitigation options; and
- identification of road sections that will require more detailed investigations and/or supervision by a qualified registered professional during construction.

Minesite and Tailings:

- Expansion of the terrain stability and geohazard mapping study area to include the minesite;
- field assessment of glacier outburst flood hazard;
- provision of laser photocopies of terrain mapped airphotos to use as a basis for the surficial geological component of Terrestrial Ecosystem (TEM) mapping;
- field checking to verify terrain stability mapping and geohazards interpretations;
- preparation of an Avalanche Atlas (CAA 2002);
- overview description of landslide and snow avalanche geohazards with the potential to affect proposed facilities;
- identification of geohazard mitigation options; and
- identification of any requirements for landslide instrumentation.

[2] To be completed in close communication with McElhanney Consulting Services Ltd.

5.0 CLOSURE

We trust the information provided in this report meets your requirements. If you have any questions or comments, or if we can be of further assistance, please do not hesitate to contact the undersigned.

Yours sincerely,
BGC ENGINEERING INC.
per:

Kris Holm, M.Sc., P.Geo.
Project Geoscientist

Reviewed by:

Matthias Jakob, Ph.D., P.Geo.
Senior Geoscientist

6.0 REFERENCES

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APPENDIX I

Explanation of Terrain Mapping Symbols

(1a) POLYGON LABELS

	Detailed Terrain Stability Mapping	
Terrain Map	Polygon number	34
	Terrain symbol	dzsMb-V
	Soil drainage	m

(1b) TERRAIN SYMBOLS

Example:

aCk - Rb

- texture
- surficial materials
- surface expression
- geomorphological process subclass
- geomorphological process

Composite symbols: Up to three letters may be used to describe any characteristic. Processes follow the dash "-" symbol.

e.g.	Mv. Rk	indicates "Mv" and "Rk" are roughly equal in extent
	Mv/Rk	indicates "Mv" is more extensive than "Rk" (about 2/1 or 3/2)
	Mv//Rk	indicates "Mv" is more extensive than "Rk" (about 3/1 or 4/1)
	<u>/Mv</u> Rk	indicates "Rk" is partially buried by "Mv"

Stratigraphic Symbols: When one or more surficial materials overlie a different material or bedrock.

e.g. <u>Mv()Rr</u> means that "Mv" overlies "Rr"

(2) TEXTURE

Specific Clastic Terms

c	Clay	<2 μm
z	Silt	62.5 – 2 μm
s	Sand	2 mm – 62.5 μm
p	Pebbles	2 – 64 mm
k	Cobbles	64 – 256 mm
b	Boulders	>256 mm; predominantly boulders
a	Blocks	angular boulders; predominantly blocks

Common Clastic Terms

d	Mixed fragments	Round and angular particles of all sizes
x	Angular fragments	Mixture of rubble (r) blocks (a)
g	Gravel	Mixture of pebbles (p), cobbles (k), boulders (b), and up to 20% sand
r	Rubble	Angular particles 2 – 256 mm
m	Mud	Mixture of sand (s) and silt (z) and minor clay

(3) MATERIALS

C	Colluvium	Products of gravitational slope movements; materials derived from local bedrock and major deposits derived from drift; includes talus and landslide deposits.
D	Weathered Bedrock	Bedrock modified *in situ* by mechanical and chemical weathering.
E	Eolian sediments	Sand and silt transported and deposited by wind; includes loess.
F	Fluvial sediments	Sands and gravels transported and deposited by streams and rivers; floodplains, terraces and alluvial fans.
F^G	Glaciofluvial sediments	Sands and gravels transported and deposited by meltwater streams; includes kames, esters and outwash plains.
I	Ice	Permanent snow and ice; glaciers
L	Lacustrine sediments	Fine sand, silt and clay deposited in lakes and littoral.
L^G	Glaciolacustrine sediments	Fine sand, silt and clay deposited in ice-dammed lakes and littoral areas.
M	Till	Material deposited by glaciers without modification by flowing water. Typically consists of a mixture of pebbles, cobbles and boulders in a matrix of sand, silt and clay; diamicton. Includes up to 20% bedrock and/or colluvium.
O	Organic materials	Material resulting from the accumulation of decaying vegetative matter; includes peat and organic soils.
R	Bedrock	Outcrops, and bedrock within a few centimeters of the surface. Includes up to 20% colluvium.
U	Undifferentiated materials	Materials in such close proximity that they cannot be separated at the scale of the mapping. Two subtypes, U_1 and U_2, are identified and discussed in the text.

(4) SURFACE EXPRESSION

a	moderate slope(s)	predominantly planar slopes; 15-26° (28 – 49%)
b	Blanket	material >1-2 m thick with topography derived from underlying bedrock (which may not be mapped) or surficial material
c	Cone	a fan-shaped surface that is a sector of a cone; slopes 15° (27%) and steeper
d	Depression	enclosed depressions
f	Fan	a fan-shaped surface that is a sector of a cone; slopes 3-15° (5-27%)
h	Hummocky topography	steep-sided hillocks and hollows; many slopes 15° and steeper
j	Gentle slope(s)	predominantly planar slopes; 4-15° (6 – 27%)
k	moderately steep slope	predominantly planar slopes; 26-35° (50 – 70%)
m	Rolling topography	linear rises and depressions; <15° (27%)
p	Plain	0-3° (0-5%)
r	Ridged topography	linear rises and depressions with many slopes 15° and steeper
s	Steep slope(s)	slopes steeper than 35° (>70%)
t	Terraced	stepped topography and benchlands
u	Undulating topography	hillocks and hollows; slopes predominantly <15°
v	Veneer	material <1-2 m thick with topography derived from underlying bedrock (may not be mapped) or surficial materials; may include outcrops of underlying material.
w	Mantle	mantle of variable thickness

(5) GEOMORPHOLOGICAL PROCESSES

A	Avalanches	Slopes modified by frequent snow avalanches
F	Slow mass movement	Slope experiencing slow mass movement, such as sliding or slumping
F”	Initiation zone	Initiation zone of slow mass movement, such as sliding or slumping
R	Rapid mass movement	Slope or parts of slope affected by processes such as debris flows, debris slides and avalanches, and rockfall
R”	Rapid mass movement initiation zone	Slope or parts of slope affected by initiation of processes such as debris flows, debris slides and avalanches, and rockfall
S	Solifluction	Slope modified by slow downslope movement of seasonally unfrozen regolith.
U	Inundated	Areas submerged in standing water from a seasonally high watertable.
V	Gully erosion	slope affected by gully erosion.
Z	General periglacial processes	Solifluction, nivation and cryoturbation occurring together in a single terrain unit.

Mass Movement SUB-Classes

-Fm	bedrock slump
-Fk	bedrock slope sagging and tension cracks
-Fc	soil creep
-Fu, -Ru	slump in surficial material
-R	rapid mass movement
-Rb	rock fall
-Rd	debris flow
-Rbd	rockfall on mid to upper slopes transforming to debris flows on mid to lower slopes
-Rr	rock avalanche
-Rs,	debris avalanche
$-Rd_2$	debris flood

(6) SOIL DRAINAGE CLASSES

r	Rapidly drained	water is removed from the soil rapidly in relation to supply
w	well-drained	water is removed from the soil readily but not rapidly
m	moderately well-drained	water is removed from the soil somewhat slowly in relation to supply
i	Imperfectly drained	water is removed from the soil sufficiently slowly in relation to supply to keep the soil wet for a significant part of the growing season
p	poorly drained	water is removed so slowly in relation to supply that the soil remains wet for a comparatively large part of the time the soil is not frozen
v	very poorly drained	water is removed from the soil so slowly that the water table remains at or on the surface for the greater part of the time the soil is not frozen

(8) BOUNDARY LINES AND FIELD CHECK SYMBOLS

Terrain Polygon Boundary Lines:

definite boundary	________________
indefinite, approximate or gradational boundary	– – – – – – – – – – – –
assumed or arbitrary boundary	....

Ground check site ⊙ 23

APPENDIX II

List of Airphotos

Mess Creek

Date Flown	Approx. Scale	Flightline Number	Photograph Number
Aug. 15, 2007	1:10,000	1	116-123
Aug. 15, 2007	1:10,000	2	124-138
Aug. 15, 2007	1:10,000	3	139-143
Aug. 15, 2007	1:10,000	4	144-160
Aug. 15, 2007	1:10,000	5	161-173
Aug. 15, 2007	1:10,000	6	174-180
Aug. 15, 2007	1:10,000	7	181-190
Aug. 15, 2007	1:10,000	8	191-204
Aug. 15, 2007	1:10,000	9	206-234
Aug. 15, 2007	1:10,000	10	243-265
Aug. 15, 2007	1:10,000	11	269-283
Aug. 15, 2007	1:10,000	12	286-296
Sept. 15, 2006	1:20,000	06-114 (Line 6)	39-43
Sept. 15, 2006	1:20,000	06-114 (Line 7)	59-64

More Creek & South End Tahltan Highland Route

1974	1:60,000	BC5612	11-14

APPENDIX III

Bedrock Geology Intersected by the Proposed Access Route

From (km)	To (km)	Geologic Feature[1]
0	4.67	ImDSqs
4.67	6.34	Qal
4.67	4.67	Fault: Unknown Type
6.34	7.57	ImDSqs
7.57	9.48	ImDSst
9.48	9.8	ImDSst
9.48	9.48	Fault
9.8	10.09	IJcg
9.8	9.8	Fault: Extension Fault
10.09	10.34	Qal
10.34	10.98	IJcg
10.98	11.65	Qal
11.55	11.55	Fault: Extension Fault
11.65	11.89	ImDSst
11.89	12.14	Qal
12	12	Fault: Extension Fault
12.14	12.4	IJcg
12.49	12.49	Fault: Extension Fault
12.4	13.82	Qal
13.59	13.59	Fault: Extension Fault
13.82	14.08	IJcg,Qal
14.08	14.35	LTmz,Qal
14.35	14.73	LTmz,Qal
14.73	15.8	LTmz
15.8	16.2	uTSs
16.2	16.56	uTmt
16.56	17.21	uTSs
17.03	17.03	Fault: Extension Fault
17.21	17.71	Qal
17.71	20.4	LTmz
20.4	21.23	Qal
21.23	25.79	LTpp
25.19	25.19	Fault: Extension Fault
25.79	26.24	LTpd
26.24	28.3	Qal
26.45	26.45	Fault: Extension Fault
28.3	31.67	uCSr
31.67	32.26	Qal
32.26	32.64	UCSmv
32.64	33.3	Qal
32.77	32.77	Fault: Extension Fault
32.64	33.3	Qal
33.3	33.72	uCSb?
33.72	33.93	IPSc
33.93	34.74	uCSb?
34.74	34.74	Fault: Extension Fault

From (km)	To (km)	Geologic Feature[1]
34.74	35.85	uCSc?,IPSc?
35.85	36.42	LTpp
36.42	36.42	Fault: Extension Fault
36.42	36.69	uTSvt
36.69	39.5	Qal

[1] Definitions for geologic feature symbols are provided in Appendix III. Geology is based on Geoscience Map 1997-3 (Logan et al. 1997).

APPENDIX IV

Geoscience Map 1997-3
Legend (Logan et al. 1997)

QUATERNARY

Qt — *Active hotspring, calcareous tufa deposits*

BIG RAVEN FORMATION

Qob — Nahta Cone: *Plagioclase-olivine phyric basalt, pyroclastic cone, tephra and lava flows*

Qal — *Unconsolidated glacial till and poorly sorted alluvium*

PLEISTOCENE

ARCTIC LAKE FORMATION

Qb — *Olivine-plagioclase-augite basalt, subaerial lava flows, pyroclastic breccia and lenses of alluvium*

TERTIARY- PLIOCENE

SPECTRUM FORMATION

Tsr — Exhile Hill Vent: *Leucocratic peralkaline rhyolite and dark grey trachyte flows and subvolcanic intrusions*

NIDO FORMATION (KOUNUGU MEMBER)

TNb — *Dark grey, aphyric and microporphyritic olivine basalt, subaerial flows, flow breccia and intercalated fluvial gravel*

UPPER CRETACEOUS TO PALEOCENE

SUSTUT GROUP

uKSs — *Chert-pebble conglomerate, quartzose sandstone, siltstone and carbonaceous shale, coaly layers and carbonaceous plant fragments*

MIDDLE TO UPPER JURASSIC

BOWSER LAKE GROUP

ASHMAN FORMATION

JBp — *Greywacke, planar-bedded shale and minor crossbedded sandstone, local chert-pebble conglomerate and granule conglomerate lenses*

LOWER TO MIDDLE JURASSIC

HAZELTON GROUP

JHu — *Undifferentiated volcanic and associated sedimentary rocks*

SALMON RIVER FORMATION

Jw — *Brecciated and fractured dark green and grey siliceous siltstone*

Jwcg — *Polylithic conglomerate containing sedimentary, intermediate and felsic volcanic and subvolcanic clasts*

mJHsl — *Dark grey to black, thin bedded carbonaceous siltstone and fine, rusty-brown bioclastic sandstone, minor intermediate to felsic crystal tuff*

mJHb — *Pillow basalt, breccia and tuff, interbedded white and grey, thin-laminated siliceous siltstone and tuff*

LOWER JURASSIC

UNUK RIVER - BETTY CREEK - MOUNT DILLWORTH FORMATIONS

lJHv — *Purple, maroon and green, plagioclase and augite phyric andesite, lapilli tuff, crystal tuff and pillowed lava flows*

lJHr — *Felsic welded-ash tuff, rhyolite lava and ashflow tuff*

lJHsn — *Tan-weathering sandstone, plagioclase crystal tuff, peperite flows, siltstone, carbonaceous plant fragments common*

lJHsl — *Black, graphitic siltstone, stratiform diagenetic pyrite to several percent*

lJcg — *Maroon-weathering, polylithic cobble to boulder conglomerate and coarse sandstone, well bedded, poorly-graded and quartz-rich, contains granitoid, volcanic and sedimentary clasts of Stikine assemblage and Stuhini Group strata*

UPPER TRIASSIC

STUHINI GROUP

u>S — *Undifferentiated volcanic and arc-derived sedimentary rocks*

NEWMONT LAKE GRABEN

u>Svr — *Felsic and intermediate lapilli and plagioclase crystal tuff and pink flow-layered rhyolite*

u>Svs — *Intermediate volcanic conglomerate, sandstone and minor thin bedded siliceous limestone lenses*

u>Sl — *Algal limestone, laminated, dark grey to black*

Maroon hornblende-plagioclase porphyritic andesite breccia flows

>Svat — *Maroon lapilli and plagioclase crystal tuff and epiclastic rocks*

MESS LAKE VOLCANIC FACIES

u>Spp — *Maroon and dark green pyroxene porphyritic, plagioclase porphyritic and aphyric-basalt flows and fragmental rocks*

u>Svt — *Massive to weakly stratified, grey and mauve lapilli and crystal tuff*

u>Svb — *Dark grey, massive plagioclase porphyritic basalt flows and coarse-bladed plagioclase and pyroxene porphyry dikes*

u>Smt — *Dun-weathering mafic olivine lapilli tuff, includes some serpentinized peridotite*

MORE CREEK SEDIMENTARY FACIES

u>Sv — *Medium bedded, pale green tuff and epiclastic rocks, orange-weathering augite phyric and aphyric basalt flows and sills*

u>Ss — *Thick bedded augite-bearing volcaniclastic sandstone, interbeds of sharpstone conglomerate*

u>Sc — *Limestone, grey to black, sparse crinoid fragments, minor argillaceous limestone and silty shale*

u>Ssn — *Khaki, well bedded feldspathic sandstone, limestone-bearing conglomerate and thin bedded siltstone*

u>Ssl — *Massive, thin laminated black and brown calcareous siltstone, interbedded with fine grained orange sandstone*

MIDDLE TRIASSIC

m>s — *Black, thin bedded carbonaceous and pyritic silty shale, grey sandstone and siliceous siltstone*

STIKINE ASSEMBLAGE

$Su — *Undifferentiated Paleozoic foliated volcanic and associated sedimentary rock*

LOWER PERMIAN

lPSc — *Medium bedded to massive fossiliferous carbonate; deformed, thin layered carbonate of probable Permian age (lPSdc)*

lPSdt — *Deformed, interlayered intermediate siliceous tuff and sedimentary rocks*

CARBONIFEROUS

CSst — *Grey to light green phyllitic siltstone, graphitic argillite, siliceous phyllite/tuff and thin lenses of dark brown limestone*

UPPER CARBONIFEROUS

uCSc — *Grey, thin bedded, fetid and dolomitic limestone, minor interbeds of maroon and green tuff and cherty siltstone*

uCSr — *Pink flow-layered and spherulitic rhyolite, sparsely feldspar porphyritic lava and quartz feldspar-phyric flow breccia*

uCSmv — *Maroon andesitic feldspar-phyric lapilli and crystal tuff, includes unwelded to weakly welded ash-flow tuff beds*

uCSb — *Massive amygdaloidal, aphyric to plagioclase and pyroxene-phyric basalt and breccia flows*

uCScg — *Thick bedded, maroon volcanic conglomerate, clasts are augite and plagioclase-phyric mafic and intermediate volcanic and subvolcanic rocks and limestone, poorly sorted with tuff interbeds*

uCSss — *Thin bedded, siltstone, poorly bedded tuff, tuffaceous wacke and sandstone, lesser chert*

MID CARBONIFEROUS (SERPUKHOVIAN - BASHKIRIAN)

mCSc — *Grey, medium bedded to massive bioclastic limestone, locally with buff, silty dolomitic layers*

UPPER DEVONIAN AND LOWER CARBONIFEROUS (MISSISSIPPIAN)

DMSs — *Undifferentiated foliated sedimentary rocks*

DMSv — *Undifferentiated basalt and andesite, hyaloclastite, pillowed and flow breccia rocks*

DMSvb — *Massive to weakly foliated, dark green amygdaloidal basalt and related*

TERTIARY AND OLDER DIKES

Aphyric andesite and basalt, (a); mafic plagioclase ± pyroxene porphyry, (pp); lamprophyre, (l); felsic, (f); porphyritic syenite, (sy); basalt, (b)

MIDDLE JURASSIC

THREE SISTERS PLUTONIC SUITE (179 - 176 Ma)

MJmz — Yehiniko Pluton: *Pink, medium to coarse-grained, equigranular hornblende-biotite monzonite to granite*

MJdi — *Dark green, medium-grained seriate-textured diorite, pyroxene gabbro*

EARLY JURASSIC AND YOUNGER

EJd — *Medium-grained equigranular augite-plagioclase diorite and gabbro*

EARLY JURASSIC

TEXAS CREEK PLUTONIC SUITE (195 - 189 Ma)

EJmz — *Equigranular, pink, medium grained monzonite, grading to syenite at base*

EJg — *Hornblende-biotite potassium feldspar megacrystic monzogranite and syenite*

LATE TRIASSIC TO EARLY JURASSIC

COPPER MOUNTAIN PLUTONIC SUITE (210 - 200 Ma)

L>s — *Grey and pink, hornblende biotite syenite, orthoclase porphyry with large zoned phenocrysts*

L>mz — Loon Lake Stock: *Salmon-orange, crowded plagioclase-pyroxene monzonite porphyry, trachytic and equigranular phases*
Newmont Lake plugs: *Fine-grained and potassium feldspar porphyritic monzonite, granodiorite*

MIDDLE TO LATE TRIASSIC

STIKINE PLUTONIC SUITE (228 - 221 Ma)

L>Hd — Hickman Pluton: *Medium to fine-grained, equigranular hornblende diorite, hornblende monzonite*

L>pd — *Medium-grained equigranular augite diorite and gabbro*

L>pp — *Pale green, stubby-plagioclase porphyritic hornblende-pyroxene diorite*

EARLY MISSISSIPPIAN

MORE CREEK PLUTONIC SUITE (~ 355 Ma)

EMg — *Equigranular to quartz-porphyritic biotite granite*

EMd — *Coarse to medium-grained, hornblende diorite, hornblende quartz monzonite*

LATE DEVONIAN

FORREST KERR PLUTONIC SUITE (~ 370 Ma)

LDg — *Medium to coarse-grained pink, biotite granite, monzonite and tonalite*

LDd — *Heterogeneous, medium-grained hornblende diorite, quartz diorite mainly equigranular, gneissic in places*

LDum — *Coarse-grained gabbro, hornblendite, clinopyroxenite*

DEVONIAN

EDd — *Foliated to equigranular, green pyroxene quartz diorite, locally chlorite schist*

AGE UNKNOWN

gd — *Pink, equigranular biotite granite, monzonite, monzodiorite*

gd — *Aphanitic altered, granitoid rocks west of Forrest Kerr Creek and small isolated granodiorite plugs*

SYMBOLS

Geological boundary (defined, approximate, assumed)
Unconformity (defined, assumed)
Bedding; tops unknown (inclined, vertical)
Bedding; tops observed (inclined, overturned)
Igneous flow layering (inclined, vertical)
Dominant foliation (inclined, vertical)
Foliation; generation indicated by number of ticks
Lineation; bedding-cleavage intersection, m=mineral, s=stretching, ss=slickensides
Crenulation lineation; ages indicated by number of ticks (plunge indicated)
Joint (inclined, vertical)
Dike (inclined, vertical)
Vein (inclined, vertical)
Axial trace of overturned antiform, synform (arrow indicates plunge)
Axial trace of upright antiform, synform (arrow indicates plunge)
Fold axis of minor fold (arrow indicates plunge) m, s and z asymmetry
Brittle fault zone (inclined, vertical)
Extension fault; downthrown side indicated (defined, approximate, assumed)
Contraction fault; teeth indicate upthrust side (defined, approximate, assumed)
Cross-section line
Limit of mapped area
Fossil locality (macrofossil, conodont, foraminifera, radiolarian)
Isotopic age locality (U/Pb, Ar/Ar, K/Ar, Rb/Sr)
MINFILE occurrence; developed prospect, prospect, showing, number
Surface work; adit, trench
Topographic contour (200 metre interval) — 1200
Cart track

Fossil Identifications:

Mike J. Orchard, E. Wayne Bamber, Tim E. Tozer and Terry P. Poulton of the Geological Survey of Canada; Bernard L. Mamet of the University of Montreal and Fabrice Cordey.

Age Determinations:

Uranium-lead geochronology by Bill C. McClelland at University of California, Santa Barbara; potassium-argon determinations by Joe Harakal at The University of British Columbia; argon-argon dating by Peter Reynolds at Dalhousie University.

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carbonaceous plant fragments common

lJHsl — Black, graphitic siltstone, stratiform diagenetic pyrite to several percent

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UPPER TRIASSIC

STUHINI GROUP

u>S — Undifferentiated volcanic and arc-derived sedimentary rocks

NEWMONT LAKE GRABEN

u>Svr — Felsic and intermediate lapilli and plagioclase crystal tuff and pink flow-layered rhyolite

u>Svs — Intermediate volcanic conglomerate, sandstone and minor thin bedded siliceous limestone lenses

u>Sl — Algal limestone, laminated, dark grey to black

u>Sva — Maroon hornblende-plagioclase porphyritic andesite breccia flows

u>Svat — Maroon lapilli and plagioclase crystal tuff and epiclastic rocks

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u>Spp — Maroon and dark green pyroxene porphyritic, plagioclase porphyritic and aphyric-basalt flows and fragmental rocks

u>Svt — Massive to weakly stratified, grey and mauve lapilli and crystal tuff

u>Bvb — Dark grey, massive plagioclase porphyritic basalt flows and coarse-bladed plagioclase and pyroxene porphyry dikes

u>Smt — Dun-weathering mafic olivine lapilli tuff, includes some serpentinized peridotite

MORE CREEK SEDIMENTARY FACIES

u>Sv — Medium bedded, pale green tuff and epiclastic rocks, orange-weathering augite phyric and aphyric basalt flows and sills

u>Ss — Thick bedded augite-bearing volcaniclastic sandstone, interbeds of sharpstone conglomerate

u>Sc — Limestone, grey to black, sparse crinoid fragments, minor argillaceous limestone and silty shale

u>San — Khaki, well bedded feldspathic sandstone, limestone-bearing conglomerate and thin bedded siltstone

u>Ssl — Massive, thin laminated black and brown calcareous siltstone, interbedded with fine grained orange sandstone

MIDDLE TRIASSIC

m>s — Black, thin bedded carbonaceous and pyritic silty shale, grey sandstone and siliceous siltstone

STIKINE ASSEMBLAGE

$Su — Undifferentiated Paleozoic foliated volcanic and associated sedimentary rock

LOWER PERMIAN

lPSc — Medium bedded to massive fossiliferous carbonate; deformed, thin layered carbonate of probable Permian age (lPSdc)

lPSdt — Deformed, interlayered intermediate siliceous tuff and sedimentary rocks

CARBONIFEROUS

CSst — Grey to light green phyllitic siltstone, graphitic argillite, siliceous phyllite/tuff and thin lenses of dark brown limestone

UPPER CARBONIFEROUS

uCSc — Grey, thin bedded, fetid and dolomitic limestone, minor interbeds of maroon and green tuff and cherty siltstone

uCSr — Pink flow-layered and spherulitic rhyolite, sparsely feldspar porphyritic lava and quartz feldspar-phyric flow breccia

uCSaw — Maroon andesitic feldspar-phyric lapilli and crystal tuff, includes unwelded to weakly welded ash-flow tuff beds

uCSb — Massive amygdaloidal, aphyric to plagioclase and pyroxene-phyric basalt and breccia flows

uCScg — Thick bedded, maroon volcanic conglomerate, clasts are augite and plagioclase-phyric mafic and intermediate volcanic and subvolcanic rocks and limestone, poorly sorted with tuff interbeds

uCSss — Thin bedded, siltstone, poorly bedded tuff, tuffaceous wacke and sandstone, lesser chert

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mCSc — Grey, medium bedded to massive bioclastic limestone, locally with buff, silty dolomitic layers

UPPER DEVONIAN AND LOWER CARBONIFEROUS (MISSISSIPPIAN)

DMSs — Undifferentiated foliated sedimentary rocks

DMSv — Undifferentiated basalt and andesite, hyaloclastite, pillowed and flow breccia rocks

DMSvb — Massive to weakly foliated, dark green amygdaloidal basalt and related hyaloclastite, pillowed flows (p) and scoriaceous tephra

DMSvr — Pale pink, quartz-eye rhyolite and aphyric to weakly porphyritic rhyodacite flows and flow breccias, includes orange-weathering, pyritic plagioclase porphyritic subvolcanic bodies

DMSiv — Pale grey and green, intermediate to felsic, fine tuff, aphyric-dacite flows and volcaniclastic rocks

DMSvt — Pale to dark green, well bedded siliceous dust and ash tuff, scoriaceous mafic tuff and minor pyritic felsic welded tuff

LOWER AND MIDDLE DEVONIAN

lmDSiv — Green and grey intermediate to felsic plagioclase crystal tuff, breccia and flow rocks

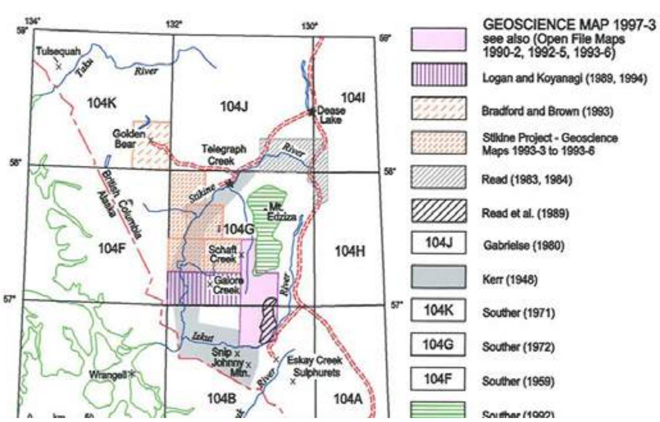
lmDSc — Deformed grey and buff thin layered to massive coralline marble and limestone

lmDSs — Pale green and grey thin bedded siltstone, sandstone and cherty tuff

lmDSst — Bright green chlorite and red-purple schistose tuff and minor basalt flows, interbedded dust tuff and thin layered recrystallized limestone

lmDSqs — White and pale green quartz sericite schist, well foliated and tightly crenulated

lmDSgs — Graphitic schist, black siliceous phyllite and chert



EDd — Foliated to equigranular, green pyroxene quartz diorite, locally chlorite schist

AGE UNKNOWN

qd — Pink, equigranular biotite granite, monzonite, monzodiorite

gd — Aphanitic altered, granitoid rocks west of Forrest Kerr Creek and small isolated granodiorite plugs

SYMBOLS

Geological boundary (defined, approximate, assumed)
Unconformity (defined, assumed)
Bedding; tops unknown (inclined, vertical)
Bedding; tops observed (inclined, overturned)
Igneous flow layering (inclined, vertical)
Dominant foliation (inclined, vertical)
Foliation; generation indicated by number of ticks
Lineation; bedding-cleavage intersection, m=mineral, s=stretching, ss=slickensides
Crenulation lineation; ages indicated by number of ticks (plunge indicated)
Joint (inclined, vertical)
Dike (inclined, vertical)
Vein (inclined, vertical)
Axial trace of overturned antiform, synform (arrow indicates plunge)
Axial trace of upright antiform, synform (arrow indicates plunge)
Fold axis of minor fold (arrow indicates plunge) m, s and z asymmetry
Brittle fault zone (inclined, vertical)
Extension fault; downthrown side indicated (defined, approximate, assumed)
Contraction fault; teeth indicate upthrust side (defined, approximate, assumed)
Cross-section line
Limit of mapped area
Fossil locality (macrofossil, conodont, foraminifera, radiolarian)
Isotopic age locality (U/Pb, Ar/Ar, K/Ar, Rb/Sr)
MINFILE occurrence; developed prospect, prospect, showing, number — 10403
Surface work; adit, trench
Topographic contour (200 metre interval) — 1200
Cart track

Fossil Identifications:

Mike J. Orchard, E. Wayne Bamber, Tim E. Tozer and Terry P. Poulton of the Geological Survey of Canada; Bernard L. Mamet of the University of Montreal and Fabrice Cordey.

Age Determinations:

Uranium-lead geochronology by Bill C. McClelland at University of California, Santa Barbara; potassium-argon determinations by Joe Harakal at The University of British Columbia; argon-argon dating by Peter Reynolds at Dalhousie University.

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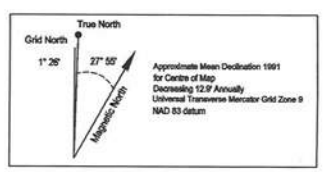

Copies of this map may be obtained from Crown Publications Inc., Victoria, B.C.
This map can be viewed over the internet through the website:
http://www.em.gov.bc.ca/mining/geolsurv/bedrock/mapsonline/

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APPENDIX V

Surficial Geology and Geohazards For Terrain Polygons Intersecting Access Route Option 1.

Table IV.1 summarizes surficial geology and geohazards mapped for terrain polygons intersecting Access Route Option 1. Terrain data is representative of average conditions mapped for an entire terrain polygon and thus is not necessarily site-specific to the access route alignment. Within-polygon variations in surficial geology or geohazards are not described in the table.

Table IV.1. Surficial Geology and Geohazards, Schaft Creek Access Route Option 1.

From (Km)	To (Km)	Polygon Number	Terrain Symbol	Material Description	Drainage Class	Geohazards	Stability Class
0.00	0.02	573	Mw	Till	m		II
0.02	0.30	562	Cv.Mv	Colluvium and Till	w		III
0.30	0.35	553	Op	Organic	vp		I
0.35	0.44	554	Mw	Till	m		II
0.44	0.49	553	Op	Organic	vp		I
0.49	0.70	555	Mb	Till	i		III
0.70	0.84	551	Mw	Till	m		II
0.84	0.92	550	Cv//Rks	Rock and Colluvium	w		IV
0.92	1.94	514	Mb.Cb	Colluvium and Till	m		III
1.94	2.28	498	Cf-Rd	Colluvium	i	Rd	II
2.28	2.96	489	Cv//Rs-R"bA	Rock and Colluvium	w	R"bA	V
2.96	3.26	488	Cv//Rks	Rock and Colluvium	w		IV
3.26	3.99	471	Cv/Rs-R"b	Rock and Colluvium	w	R"b	V
3.99	4.02	443	Fp	Fluvial	i		II
4.02	4.12	475	Cv/Mv/Rks	Colluvium and Till and Rock	m-w		IV
4.12	4.19	478	Mv	Till	m		II
4.19	4.23	477	Cv.Rs-V	Rock and Colluvium	m		IV
4.23	4.44	475	Cv/Mv/Rks	Colluvium and Till and Rock	m-w		IV
4.44	4.52	476	Cvb/Rs-V	Rock and Colluvium	m		IV
4.52	5.04	475	Cv/Mv/Rks	Colluvium and Till and Rock	m-w		IV
5.04	5.64	449	Cv	Colluvium	m-w		IV
5.64	5.68	445	Cvb//Rs-R"bA	Rock and Colluvium	w-r	R"bA	V
5.68	6.03	448	Cvb	Colluvium	m		III

From (Km)	To (Km)	Polygon Number	Terrain Symbol	Material Description	Drainage Class	Geohazards	Stability Class
6.03	6.10	445	Cvb//Rs-R"bA	Rock and Colluvium	w-r	R"bA	V
6.10	6.31	444	Cv	Colluvium	w		IV
6.31	6.37	389	Ff-Rd2	Fluvial	i	Rd2	II
6.37	6.39	453	Cc//Rs	Rock and Colluvium	w-r		IV
6.39	7.19	396	Cvb//Rk	Rock and Colluvium	w		IV
7.19	7.59	395	Cvb/Rs	Rock and Colluvium	w		IV
7.59	7.62	397	Cvb-VA	Colluvium	i	A	IV
7.62	7.65	398	Cv	Colluvium	w		IV
7.65	7.74	394	Cvb//Rs-VA	Rock and Colluvium	m	A	IV
7.74	8.12	391	Cv//Mv	Colluvium and Till	m		IV
8.12	8.20	386	Cvb//Rs-AV	Rock and Colluvium	w	A	IV
8.20	8.44	380	Cv/Rs	Rock and Colluvium			IV
8.44	9.09	379	Cvb.Mvb	Colluvium and Till	m		III
9.09	9.13	377	Cvb-ARd	Colluvium	m	RdA	IV
9.13	9.20	376	Mvb	Till	m		III
9.20	9.25	375	Cvb//Rs-A	Rock and Colluvium	w	A	III
9.25	9.82	366	Mvb/Cvb	Colluvium and Till	m		III
9.82	10.45	660	Cv	Colluvium	w		IV
10.45	10.67	363	Cv/Rk-A	Colluvium	m	A	III
10.67	10.87	362	Cv/Mv	Colluvium and Till	m		III
10.87	10.99	347	/Cvb()Mb-A	Colluvium and Till	m	A	II
10.99	11.49	346	Mw	Till	m		II
11.49	11.84	345	Cv-A	Colluvium	i	A	III
11.84	11.91	343	Cvb-RdAV	Colluvium	m	RdA	II
11.91	12.01	330	Cvb-A	Colluvium	m	A	III
12.01	13.25	323	Mb-A	Colluvium and Till	m	A	III

From (Km)	To (Km)	Polygon Number	Terrain Symbol	Material Description	Drainage Class	Geohazards	Stability Class
13.25	13.28	326	Cv/Rs-R"rA	Rock and Colluvium	m	R"rA	V
13.28	13.42	198	FAp-U	Fluvial	m-vp		II
13.42	14.26	606	Cv/Mv	Rock and Colluvium	w		III
14.26	14.81	299	Mv.Cv	Colluvium and Till	m		III
14.81	14.90	282	/Mw()Rh	Rock and Till	m		II
14.90	15.16	299	Mv.Cv	Colluvium and Till	m		III
15.16	15.29	282	/Mw()Rh	Rock and Till	m		II
15.29	15.42	299	Mv.Cv	Colluvium and Till	m		III
15.42	15.45	282	/Mw()Rh	Rock and Till	m		II
15.45	15.47	299	Mv.Cv	Colluvium and Till	m		III
15.47	15.52	272	Mv/Cv-V	Colluvium and Till	i		IV
15.52	16.55	271	Cv/Mv	Colluvium and Till	m		III
16.55	17.60	246	Cf-Rd	Colluvium	i	Rd	II
17.60	18.40	248	Cv.Mvb	Colluvium and Till	m		III
18.40	18.49	249	Mw	Till	m		II
18.49	18.63	248	Cv.Mvb	Colluvium and Till	m		III
18.63	18.80	247	Cv/Rs	Rock and Colluvium	w		IV
18.80	19.60	610	Mv	Till	m		II
19.60	19.63	198	FAp-U	Fluvial	m-vp		II
19.63	20.09	612	Cv.Mvb	Colluvium and Till	m		IV
20.09	20.19	611	Cf-ARb	Colluvium	i	RbA	III
20.19	20.66	616	Mvb	Till	m		III
20.66	21.28	618	Cf-Rd	Colluvium	i	Rd	II
21.28	21.34	210	Cb	Colluvium	m		II
21.34	21.64	204	Cv	Colluvium	w		IV
21.64	21.75	203	Mb	Till	m		II
21.75	21.99	202	Cb-RbA	Colluvium	i	RbA	II

From (Km)	To (Km)	Polygon Number	Terrain Symbol	Material Description	Drainage Class	Geohazards	Stability Class
21.99	22.14	201	Rs.Cv-R"bA	Rock and Colluvium	r	R"bA	V
22.14	22.29	200	Cb-RbA	Colluvium	i	RbA	III
22.29	22.56	199	Cb.Mb	Colluvium and Till	m		II
22.56	22.94	176	Cv//Rs-R"bA	Rock and Colluvium	w	R"bA	V
22.94	23.32	621	Mw	Till	m		III
23.32	23.51	171	Op.Mb	Organic and Till	p		I
23.51	23.92	170	Mb	Till	i		II
23.92	24.08	173	Mvb	Till	m		III
24.08	24.48	150	Mb	Colluvium	m		II
24.48	24.53	156	Cb-Rd	Colluvium	i	Rd	II
24.53	25.10	147	Mw	Till	m		II
25.10	25.26	146	Cv.Mv/Rh	Colluvium and Till and Rock	w		III
25.26	25.34	147	Mw	Till	m		II
25.34	25.49	146	Cv.Mv/Rh	Colluvium and Till and Rock	w		III
25.49	26.09	147	Mw	Till	m		II
26.09	26.70	134	Ff-Rd2	Fluvial	i	Rd2	II
26.70	27.70	124	Fp	Fluvial	i		I
27.70	28.40	110	Mb	Till	m		II
28.40	29.10	103	Mvb	Till	m		III
29.10	29.17	102	Cv	Colluvium	w		IV
29.17	29.27	101	Rh/Cv	Rock and Colluvium	r		IV
29.27	29.65	99	Mb/Cv	Colluvium and Till	m		III
29.65	30.12	95	Cv	Colluvium	w		III
30.12	30.24	94	Rs-R"b	Rock		R"b	V
30.24	30.29	86	Rh/Cv	Rock and Colluvium	w		II
30.29	30.68	85	Mw	Till	m		II
30.68	30.70	80	Cv-A	Colluvium	w	A	IV
30.70	30.88	83	Mvb	Till	m		III
30.88	30.94	79	Cv.Mv	Colluvium and Till	w		III

From (Km)	To (Km)	Polygon Number	Terrain Symbol	Material Description	Drainage Class	Geohazards	Stability Class
30.94	30.97	83	Mvb	Till	m		III
30.97	31.03	82	Cv/Rk	Rock and Colluvium	w		IV
31.03	31.38	79	Cv.Mv	Colluvium and Till	w		III
31.38	31.49	78	Cv	Colluvium	w		IV
31.49	31.61	79	Cv.Mv	Colluvium and Till	w		III
31.61	31.66	78	Cv	Colluvium	w		IV
31.66	31.68	79	Cv.Mv	Colluvium and Till	w		III
31.68	32.90	198	FAp-U	Fluvial	m-vp	U	II
32.90	33.38	590	Ff-Rd	Fluvial	i	Rd	II
33.38	33.49	47	Cv	Colluvium	w		IV
33.49	33.69	48	Cv.Rs	Rock and Colluvium	r		IV
33.69	34.06	47	Cv	Colluvium	w		IV
34.06	34.26	10	Mvb	Till	m		II
34.26	34.37	36	Mw	Till	m-i		III
34.37	34.60	43	Mv	Till	w		III
34.60	35.05	36	Mw	Till	m-i		III
35.05	36.20	9	Mv/Cv()Rh	Colluvium and Till	w		III
36.20	36.85	5	Rs/Cv-RbdVA	Rock and Colluvium	w	R"bdA	IV
36.85	37.11	15	Mb	Till	m		III
37.11	37.29	5	Rs/Cv-RbdVA	Rock and Colluvium	w	R"bdA	IV
37.29	38.84	15	Mb	Till	m		III
38.84	39.25	14	Mw()Rv	Rock and Till	m		II
39.25	39.31	13	Mw/Ov	Till	p		I
39.31	39.52	14	Mw()Rv	Rock and Till	m		II

DRAWINGS