TRACKING THE ESKAY RIFT THROUGH NORTHERN BRITISH COLUMBIA - GEOLOGY AND MINERAL OCCURRENCES OF THE UPPER ISKUT RIVER AREA

(TELEGRAPH CREEK NTS 104G/1, 2, 7, 8, 9, 10)

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INTRODUCTION

The Eskay Creek gold-silver mine, located in northwest British Columbia, is an unusually high-grade ore deposit. The mining industry continues to spend more than $2 million each year on exploration for similar deposits in the area. The geologic setting at the minesite is well studied, but large tracts in north-central British Columbia require more detailed surveys to determine if favourable sites exist for formation and preservation of additional deposits. The British Columbia Geological Survey and the Geological Survey of Canada have launched a two-year mapping program to delineate the critical ore horizon through the region north of the mine and to assess potential for additional Eskay Creek type deposits. This horizon lies within Lower to Middle Jurassic, arc-related, rift sequence rocks along the northwest perimeter of the Bowser Basin, a large (48,000 km^2), Middle to Upper Jurassic sedimentary basin (Figure 1).

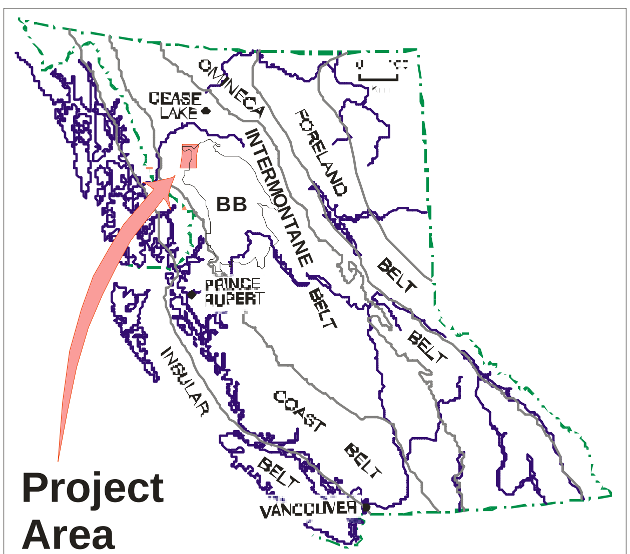

Figure 1. Project location map and Bowser Basin (BB). Modified from Logan (2000).

The two-year study will cover 6,250 km^2, extending 125 km north from the Eskay Creek mine to the Spectrum porphyry copper-gold deposit (Figure 2). The paved Stewart-Cassiar Highway (Highway 37) runs northward through the eastern part of the map area. In 2003, the first field season, an eight-person team mapped 70 km along the rift sequence between Kinaskan Lake and More Creek, west of the highway (Figure 2).

The project area straddles the eastern edge of the Coast Mountains and the broad valley of the upper Iskut River. This area lies within the Tahltan First Nation traditional area and they participated directly in this project. Topography varys from rounded glacial valleys along the upper Iskut River, to the extensive Spatsizi Plateau, to high serrated ridges and peaks that are being actively glaciated. Elevations range from 250 metres above sea level at the confluence of Iskut River and Forrest Kerr Creek, up to 2,662 metres at the summit of Hankin Peak in the west-central region of the field area. Mount Edziza can be seen rising to 2780 meters near the northern boundary of the study area. Vegetation comprises boreal spruce-pine-fir forest at low-elevation. Timberline is at 1400 metres elevation with subalpine fir and meadow areas above.

Regional-scale geology maps and reports for this area include: Operation Stikine (1957), Souther (1972), Read (1989), Evenchick (1991), Logan *et al.* (1990, 1992, 1993, 1997, 2000), Gunning (1996) and Ash *et al.* (1995, 1996, 1997a, 1997b) (Figure 2). Detailed geological maps are available in theses by Schmitt (1977) and Kaip (1997) and in many company assessment reports cited in ARIS and MINFILE. The most recent and most comprehensive study of the Eskay Creek orebodies is the Ph.D. thesis by Tina Roth (October, 2002) which offers an extensive bibliography of all previous reports on the deposit, including many progress reports and final reports that were part of the Iskut Metallogeny Project of the Mineral Deposits Research Unit at the University of British Columbia (Macdonald *et al.*, 1996).

Anderson (1993) interpreted the present study area as the northern extension of a large fault-bounded belt or rift. Sections of this area have been mapped at 1:50,000 scale

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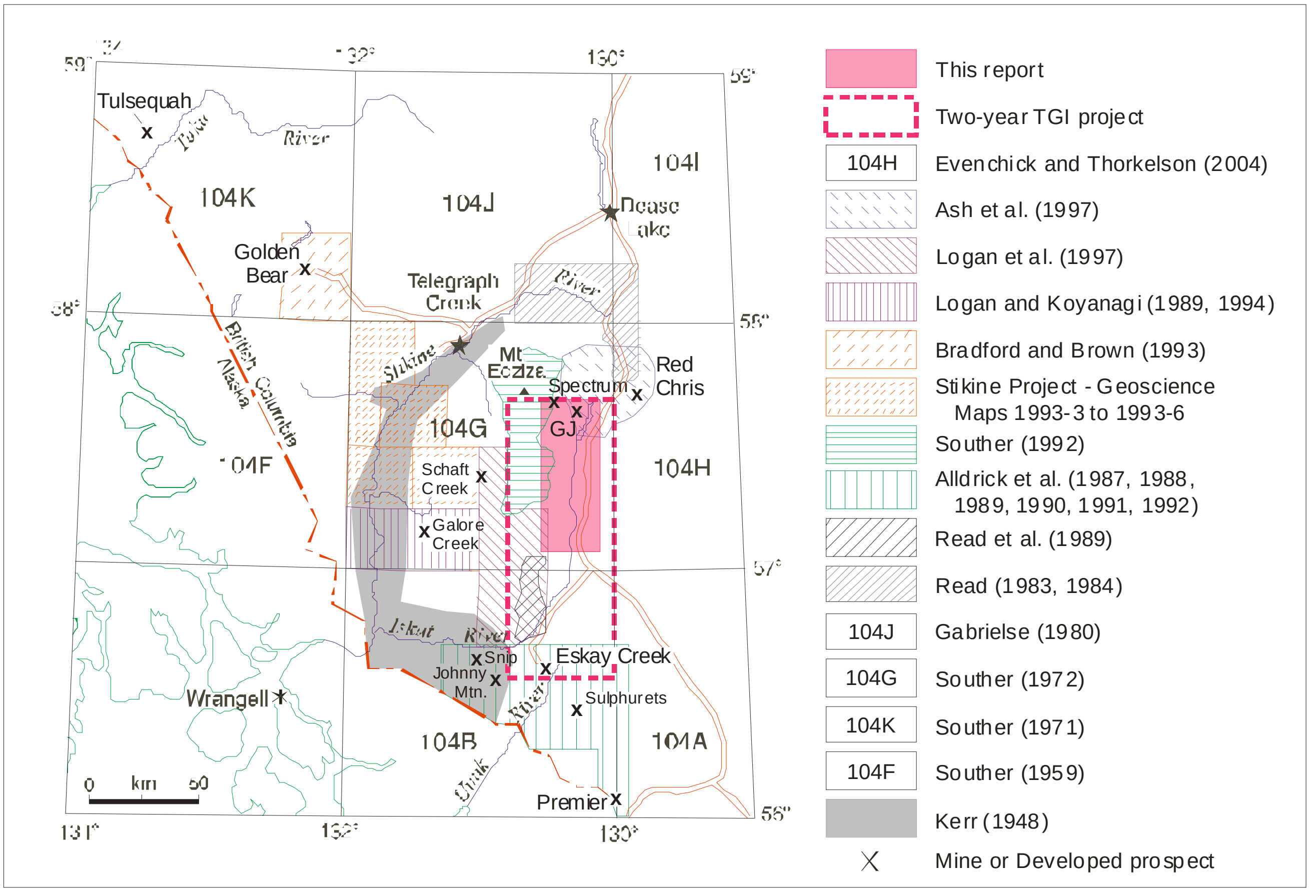

Figure 2. Previous geological mapping and current project outline. Modified from Logan (2000).

by Read (1991), Logan *et al*. (1990, 1992, 1993) and Ash *et al*. (1997b). The current project will complete 1:50,000-scale coverage between these earlier mapping projects, with more detailed mapping of the strata of the upper Hazelton Group, and detailed stratigraphic investigations within the Eskay Rift (e.g. Simpson and Nelson, 2004). The federal and provincial governments have jointly funded this study as part of the "Bowser Basin Energy and Mineral Resource Potential Targeted Geoscience Initiative".

REGIONAL GEOLOGIC SETTING

The project area lies on the western edge of the Intermontane tectonic belt, within Stikine terrane, and is bounded to the east by the Bowser sedimentary basin (Figure 1). It straddles the tectonic elements of the Bowser structural basin and the Stikine Arch to the northwest.

Souther (1972) and Logan *et al*. (2000) describe the geological history of the area as a series of five mid-Paleozoic to mid-Mesozoic volcanic arcs developed in sediment-poor and sediment-rich marine settings. Lulls in volcanism at the Triassic-Jurassic boundary and in the uppermost Lower Jurassic were marked by tectonic uplift, deformation and erosion, termed the Inklinian and Nassian orogenies, respectively (Souther, 1972).

Strata range in age from Devonian through to Holocene (Figure 3). The major stratigraphic components of the project area are the Stikine Assemblage, Stuhini Group, Hazelton Group, Bowser Lake Group and Mount Edziza Complex. The Stikine Assemblage was defined by a Geological Survey of Canada team (Operation Stikine, 1957) and has most recently been described by Logan *et al*. (2000). The Stikine Assemblage consists of Early Devonian to mid-Permian volcanic and sedimentary strata, which culminate in a thick carbonate succession. The Upper Triassic Stuhini Group is characterized by pyroxene porphyritic basalt flows and breccias with intercalated clastic sedimentary rocks and minor carbonate units. The Early to Middle Jurassic Hazelton Group is an island arc succession consisting of a lower package of intermediate volcanic rocks and derived clastic sedimentary units; a middle interval of thin, but widely distributed felsic volcanic rocks; and an upper unit of fine clastic sedimentary rocks with local bimodal volcanic rocks dominated by basalt. Carbonate units are rare or absent in Hazelton Group strata. The Middle to Late Jurassic Bowser Lake Group is a thick, clastic marine sedimentary succession. Miocene to Recent

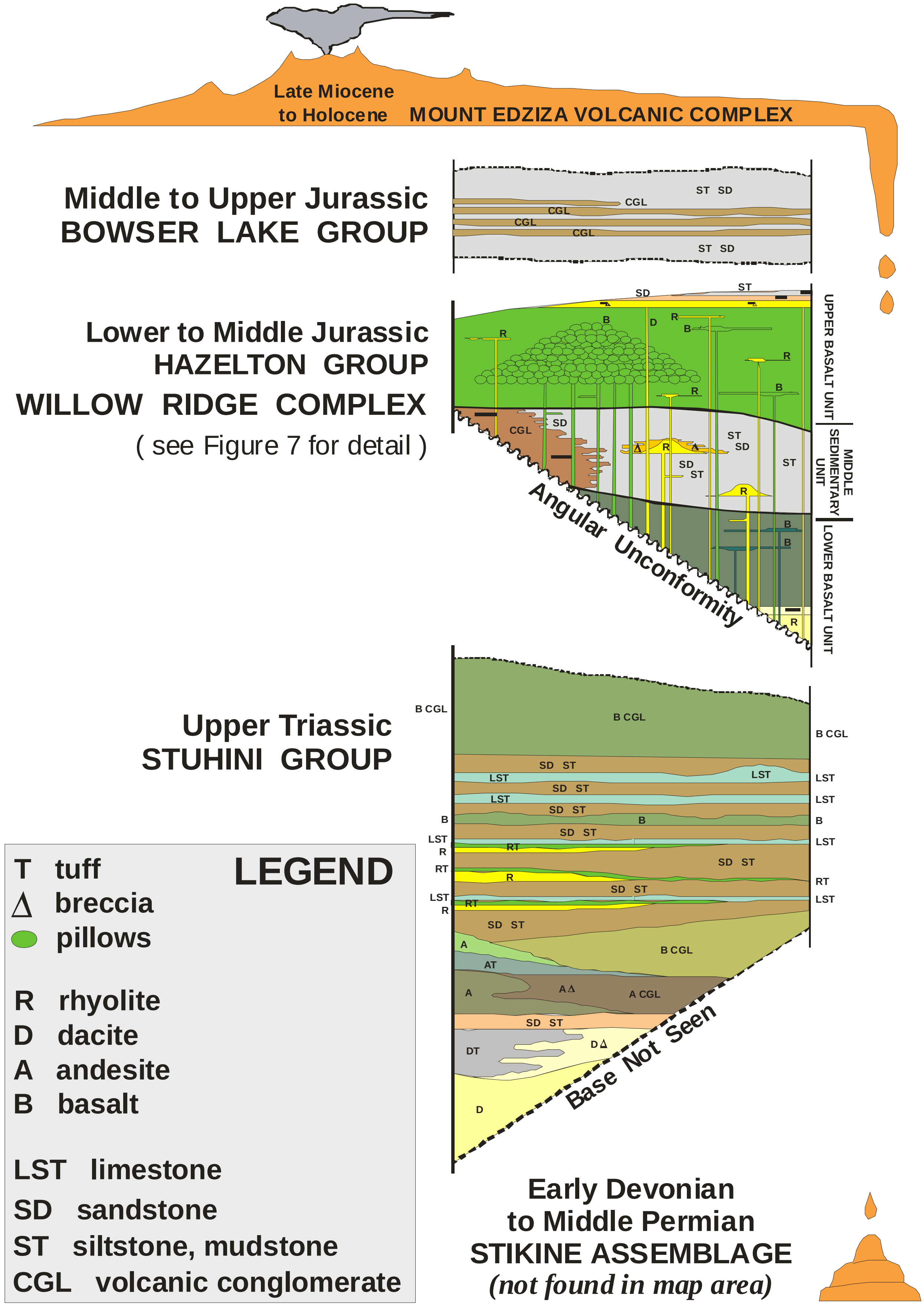

Figure 3. Schematic regional stratigraphy.

volcanic strata from the Mount Edziza Volcanic Complex blanket the northwest section of the project area.

Regional-scale unconformities within the study area include a Late Permian - Early Triassic disconformity, a Late Triassic - Early Jurassic angular unconformity and nonconformity, and an Early Jurassic angular unconformity.

Logan *et al*. (2000) describes five plutonic episodes in the area. The three youngest plutonic episodes have important mineral deposits associated with them.

To the south, mid-Cretaceous regional metamorphism reached a maximum grade of lower greenschist facies (Alldrick, 1993). In the current field area chlorite is rare to absent, thus the regional metamorphic grade is interpreted as sub-greenschist, probably mid-prehnite-pumpellyite facies (Figure 4).

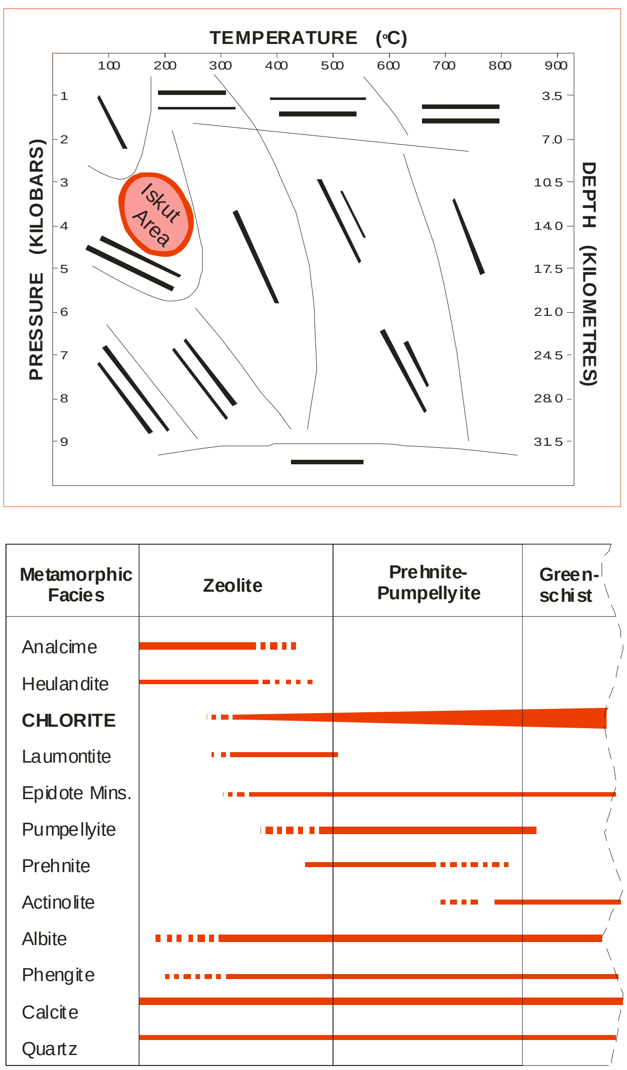

Figure 4. Regional metamorphic grade.

GEOLOGY OF THE MAP AREA

Mapping in the 2003 field season covered Upper Triassic to Middle Jurassic strata at the northern end of the two-year project area (Figure 2). Several topographic features in this year's map area have been informally named to simplify description of locations (Figure 5). Simplified geology of the 2003 map area is presented in Figure 6. Age control is provided by fossil collections from Souther (1972) and Evenchick *et al*. (2001), and by isotopic age dates tabulated in the new BCAge database (Breitsprecher and Mortensen, 2004).

STRATIFIED ROCKS

STIKINE ASSEMBLAGE (MIDDLE TO UPPER PALEOZOIC)

Carbonate-dominated Permian strata of the upper Stikine Assemblage have not been mapped in this year's survey.

STUHINI GROUP (UPPER TRIASSIC)

In the map area, the Stuhini Group consists of a lower volcanic package with lesser intercalated sedimentary rocks, overlain by a thick upper sedimentary package with lesser interlayered volcanic rocks. Locally, augite(-plagioclase)-phyric basaltic volcaniclastic rocks lie above the sedimentary succession. Upper Triassic strata extend uninterrupted from More Creek northward to the western cliffs of Table Mountain (Figure 6). On the upper plateau of Table Mountain, younger rocks of the Hazelton Group, herein defined as Willow Creek Complex, overlie the Stuhini Group. Stuhini Group strata also crop out 35 kilometres northeast of Table Mountain, on the ridgetops on either side of Kinaskan Lake (Ash *et al*., 1997b).

The base of the Stuhini Group and its contact with underlying Paleozoic units has not been observed in the map area. The top of the Stuhini group is an angular unconformity, overlain by Hazelton Group strata. Unconformable upper contacts were observed at three localities: east of Kinaskan Lake, at Table Mountain and near the Hank deposit (Figure 6). Total thickness of Stuhini Group strata cannot be determined due to this truncation, but minimum thickness is 3,000 metres.

The lower volcanic package of the Stuhini Group has been mapped in three locations and is also described at the Hank epithermal gold deposit (Kaip, 1997). These rocks, although lithologically similar to the lower Hazelton Group, are constrained as part of the Upper Triassic succession by fossils within the overlying sedimentary units. The stratigraphically lowest recognised lithology is dacitic volcanic rocks that display both proximal and intermediate facies relationships. The proximal facies is a thick (>100 metres) accumulation of

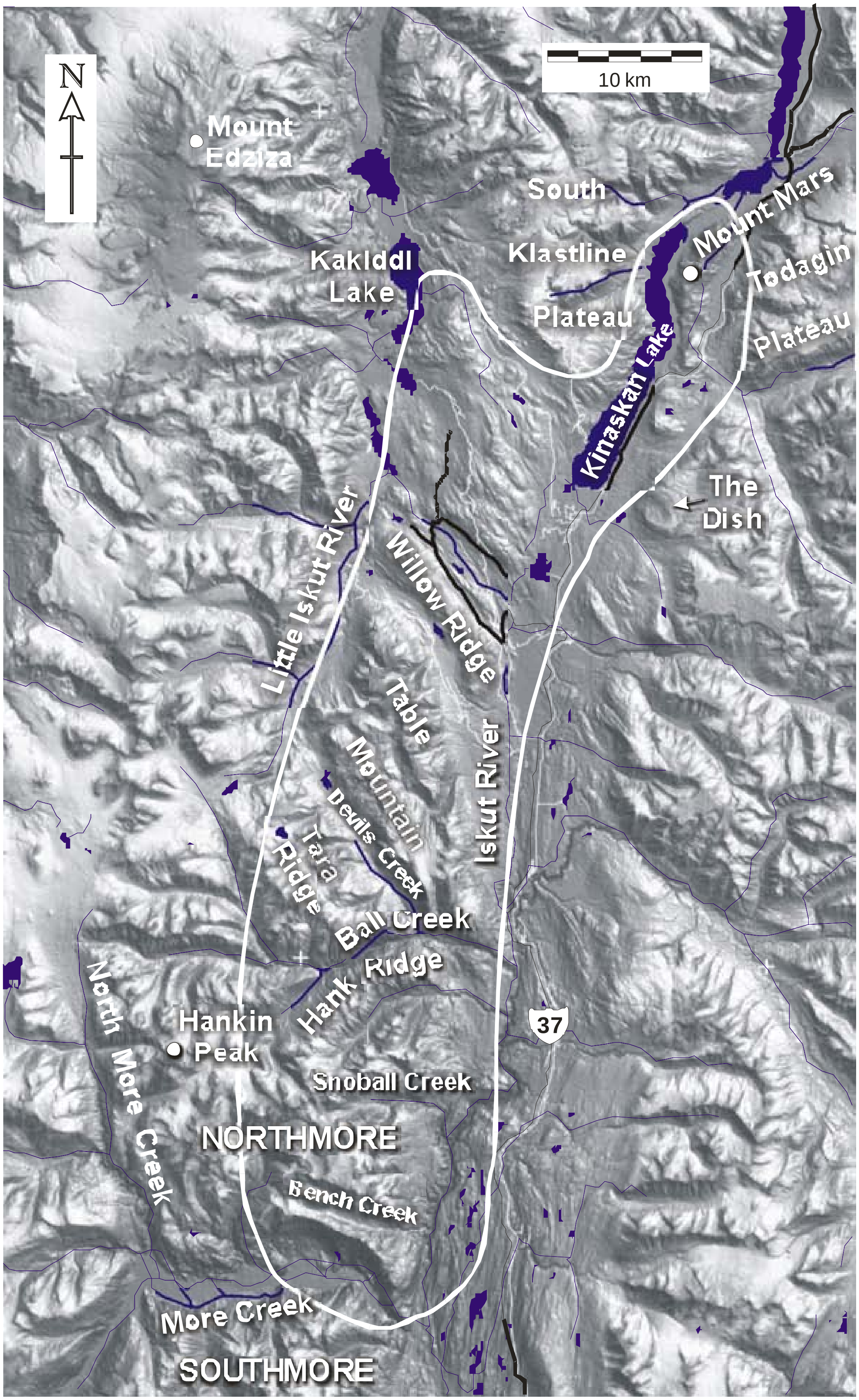

Figure 5. Shaded DEM map showing major topographic features.

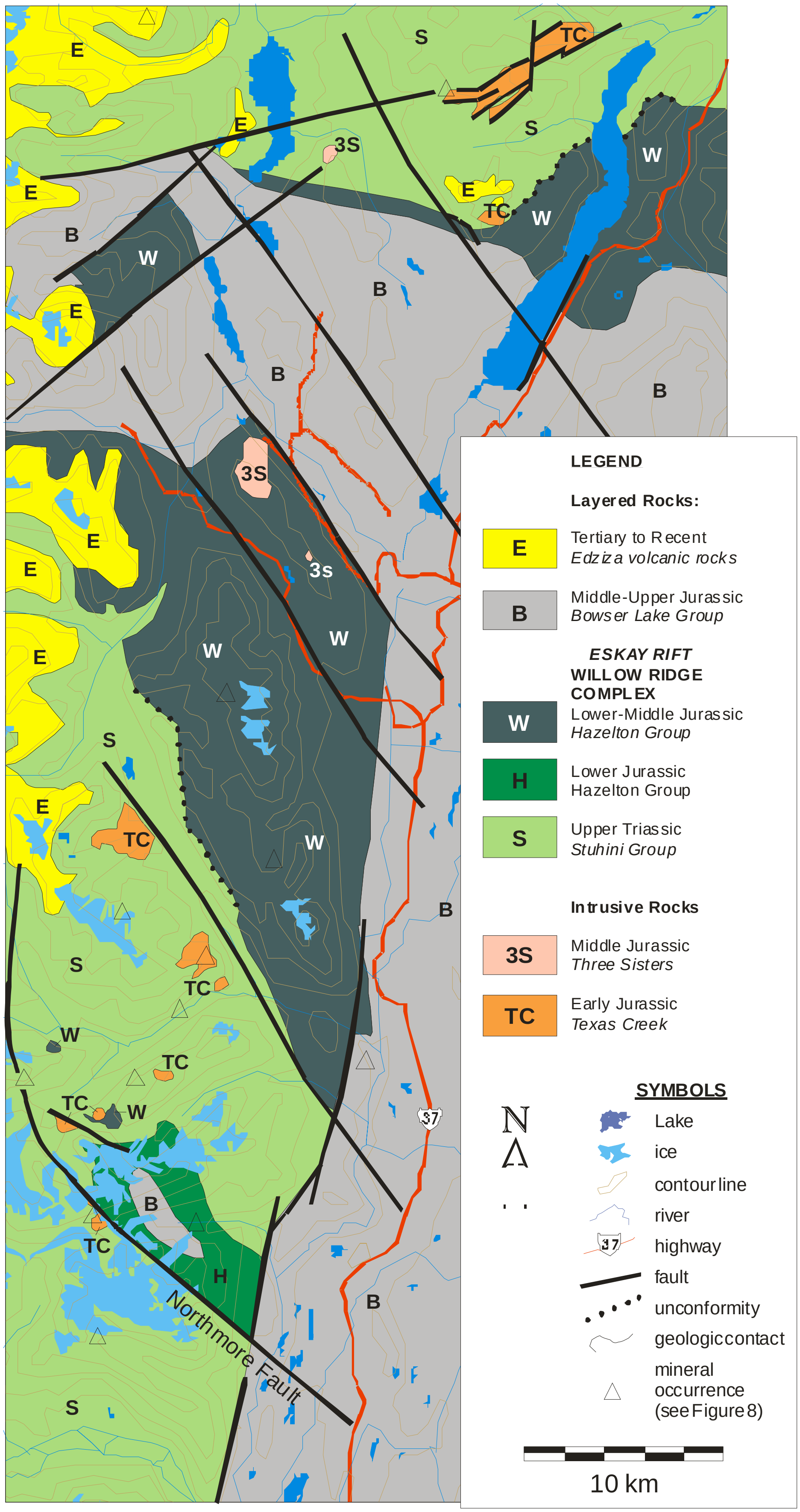

Figure 6. Simplified geology of the More Creek - Kinaskan Lake area (see Figure 8 for mineral occurrence names).

massive, fine-grained, light grey, aphanitic dacite overlain by a thick (150 metres) succession of light greenish grey, medium-bedded, rhythmically-bedded ash tuffs. Laterally equivalent units are preserved as coarse, massive dacite breccias and crudely bedded dacite conglomerates. Clasts are lapilli to cobble size and commonly display distinct flow banding. The dacitic units are overlain by 50 to 80 metres of fine to coarse volcanic sandstone, which is overlain in turn by an andesite sequence. The andesite sequence consists of several facies throughout the map area. Near Bench Creek in the south, the andesite sequence is a series of lava flows with varying porphyritic textures. Fine to medium grained plagioclase phenocrysts range in abundance from sparse to crowded. Minor units of tuff separate the massive andesite flows. The lateral facies equivalent to these proximal flows is a thick (>1,000 metres) succession of coarse plagioclase-phyric andesite fragmental rocks with rare sandstone interbeds. These andesitic fragmental facies are the host rock to both the Hank epithermal gold deposit and the Mary porphyry copper-molybdenum deposit. Andesitic rocks of the lower volcanic package are overlain by the upper sedimentary package of the Stuhini Group.

The upper sedimentary package consists of a fine to medium grained mixed clastic succession of siltstones, sandstones, rare pebble conglomerates and distinctive minor limestone and volcanic members. The sandstones and conglomerates are characterized by buff-orange weathering carbonate cement. Multiple horizons of massive light grey limestone and limestone conglomerates, basalt flows and breccias, and black to white rhyolite flows with associated bright apple green, massive to bedded rhyolite ash tuffs are preserved in most sections. Local thin flows of andesite and dacite have been noted, but are not evident in all areas mapped. This distinctive rock package is well exposed around the Bench and Rainbow prospects (Figures 6 and 8).

Carbonate-cemented clastic sedimentary rocks weather rapidly and generate a moderate to intense buff-orange weathered appearance to the slopes of cascading scree that can be confused with gossans from a distance. Basalt or basaltic andesite units are preserved as massive flows, which undulate in thickness along strike, and as substantial thicknesses (>200 metres) of coarse basalt volcaniclastics. These rocks are variably porphyritic with fine to coarse pyroxene phenocrysts. Minor lenses of poorly sorted, polymictic volcaniclastic layers and rare limestone layers are preserved within the thick accumulations of basaltic conglomerate.

Several thin rhyolite flows are preserved within the upper sedimentary package of the Stuhini Group. Rhyolite occurs as black, aphanitic to fine-grained, massive to flow-banded units with glassy lustre. Associated flow-banded black rhyolite dikes crosscut the underlying clastic sedimentary rocks and limestone beds. Black rhyolite flows are directly overlain by bright apple green fine-grained ash tuffs and faintly bedded tuffs. At the Rainbow prospect near the centre of Tara Ridge, rhyolite dikes have fine-grained yellow, orange and red mineral encrustations developed along hairline fractures. Analysis of these brightly coloured, vuggy dikes show elevated values of mercury, antimony and arsenic. The limestone units pinch and swell; local thick resistant limestone lenses form prominent cliffs and spires. An exceptional example is the "Easter Island Limestone", a limestone member that crops out as a series of adjacent resistant limestone pinnacles on the western slopes of Tara Ridge. Near the Bench prospect, a massive limestone unit is overlain by a conglomerate containing cobble to boulder size rounded limestone clasts in a dark brown sandy matrix.

The uppermost, clinopyroxene-bearing volcaniclastic unit occurs in two localities, at the eastern end of the ridge between More Creek and Bench Creek, and at the western edge of Tara Ridge. North of More Creek, coarse, poorly bedded augite(-plagioclase) volcanic breccia overlies a thin fossiliferous limestone to limy siltstone bed that contains corals, belemnites, ammonites and pelecypods. The volcanic breccia has incorporated limestone olistoliths, preserved as irregular bodies up to a kilometer long. On Tara Ridge, well-bedded clinopyroxene-phyric basalt conglomerate forms the top of the exposed Upper Triassic section.

The Stuhini Group in the map area is interpreted as a subaqueous accumulation of dacite, andesite and bimodal basalt-rhyolite volcanic rocks in a setting characterized by a progressively increasing accumulation of volcaniclastic sedimentary rocks with carbonate cement. The sedimentary succession is overlain by locally derived volcaniclastics from a second mafic volcanic pile. Interruptions in the deposition of clastic sedimentary units permitted the deposition and preservation of multiple carbonate units. Volcanic facies in the vicinity of the Bench prospect are proximal, facies preserved at the Hank deposit are intermediate, other locations have a mix of proximal and distal facies among the different units within the succession.

HAZELTON GROUP (LOWER TO MIDDLE JURASSIC)

The lower strata of the Hazelton Group have only been recognised in the northeast corner of the map area (Ash *et al*., 1997b). In addition to the units recognized as lower Hazelton Group (Ash *et al*., 1997b), we suggest that part of his unit lJme east of Kinaskan Lake also be included in the lower Hazelton Group. These rocks consist of polymictic, volcanic conglomerate, sandstone and grit. The conglomerate is dominated by plagioclase-phyric andesite clasts, but also includes sparse limestone fragments. The depositional relationship of this unit to the nearby-outcropping Upper Triassic volcanic strata is not known. These distinctive Lower Jurassic plagioclase-phyric, andesite- and dacite-dominated volcanic and sedimentary strata have not been identified in the south end of the project area, indicating that they were never deposited or have been eroded away.

Anderson and Thorkelson (1990) defined the uppermost division of the Hazelton Group as the "Eskay Creek Facies" of the Salmon River Formation. The MDRU Iskut Metallogeny Project (Macdonald *et al*, 1996) studied many features of this rock package in the Eskay Creek mine area. The key volcanic units of the Eskay Creek Facies are now recognized to extend even further to the north and south (Evenchick and McNicoll, 2002).

Willow Ridge Complex

Extensive exposures of bimodal volcanic rocks of the Eskay Creek Facies have been mapped in detail as part of this study. Based on this work and previous studies (Souther, 1972; Anderson, 1989, 1993; Anderson and Thorkelson, 1990; Evenchick, 1991), we define this sequence of bimodal volcanic rocks, and their related intrusive rocks and intercalated sedimentary rocks, as the Willow Ridge Complex (WRC). The type area for this distinctive bimodal volcanic assemblage is a long, low ridge of extensive outcrop west of the upper Iskut River between the Willow Creek Forest Access Road to the north and the old Telegraph trail to the south. The entire ridge is accessible on foot from the nearby forest service road. A second broad area of excellent exposure is Table Mountain, a high, flat-topped ridge immediately southwest of Willow Ridge.

The WRC is a thick package of basalt lava flows and feeder dikes, minor interlayered dacite and rhyolite lava flows, breccias, feeder dikes and lava domes, and intercalated volcaniclastic sedimentary rocks. A composite schematic section of this sequence is presented in Figure 7. Extensions of the WRC crop out further north

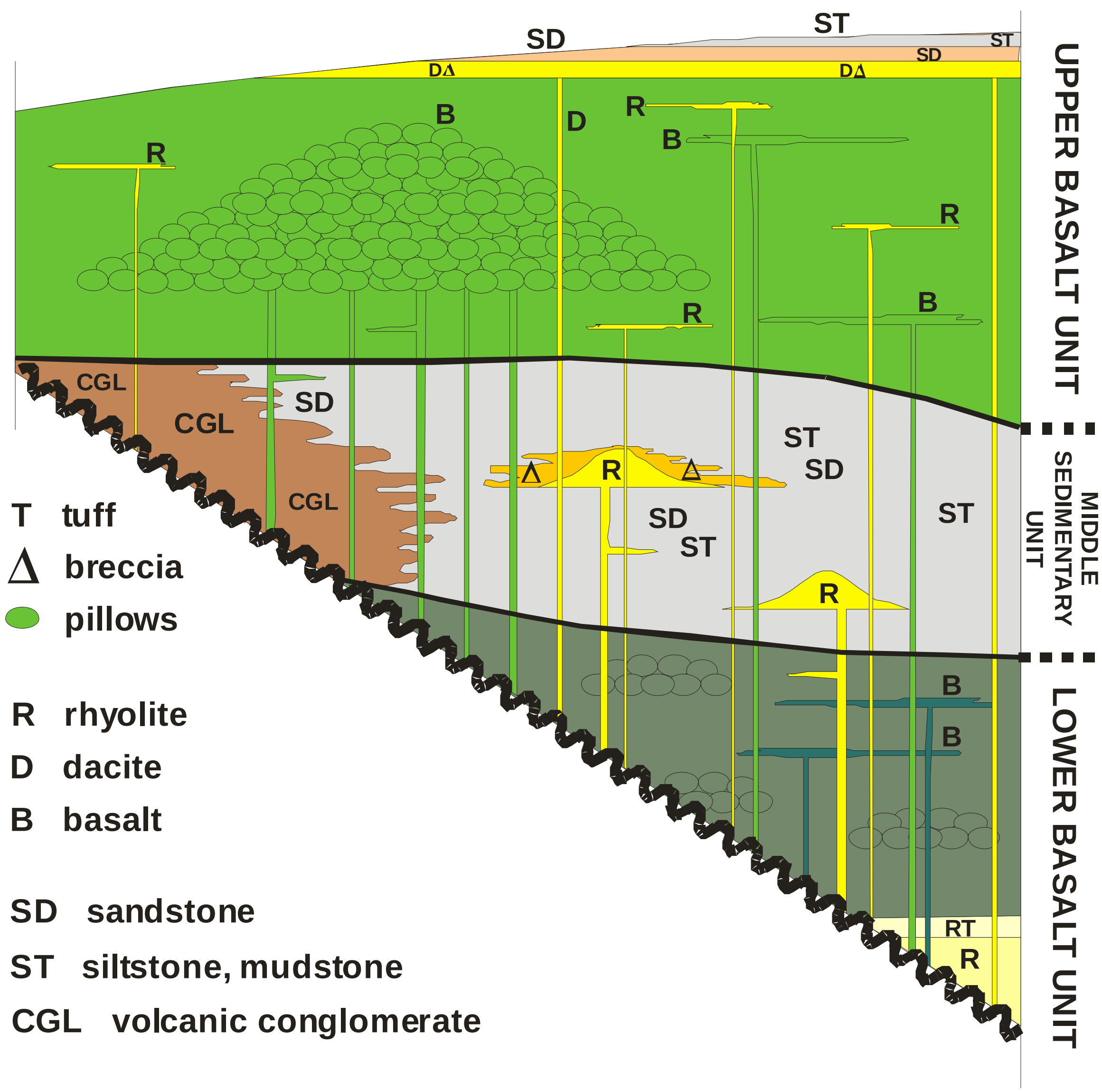

Figure 7. Schematic section of the Willow Ridge Complex, Upper Hazelton Group.

between Kakiddi Lake and Kinaskan Lake, and east and southeast of Kinaskan Lake (Figure 6). However, WRC rocks have not been recognised in mapping south of Ball Creek where distinctly different contemporaneous strata have been documented (see Snoball Creek descriptions below).

The complex is at least four kilometres thick on Table Mountain, where it consists of two distinct basalt units separated by a clastic sedimentary member. This thickness is the same order of magnitude as Pillow Basalt Ridge northwest of the Eskay Creek mine (2,000 metres, Read, 1989). On Table Mountain the base of the WRC is an angular unconformity above Upper Triassic volcaniclastic rocks; six kilometres to the northeast, the upper part of the WRC strata is eroded away.

The WRC succession exposed on Table Mountain and Willow Ridge consists of three units: a Lower Basalt Unit with intercalated rhyolite flows, sills and dikes; a Middle Sedimentary Unit with interlayered basalt and rhyolite flows, fissure dikes and several discrete felsic domes; and an Upper Basalt Unit with feeder dikes and rare intercalated sedimentary rocks and rhyolite, dacite and their feeder dikes (Figure 7; see also Simpson and Nelson, 2004). Along the western side of Table Mountain the base of the WRC lies along an angular unconformity where polymictic conglomerate, massive and pillow basalt, basalt hyaloclastite, and minor rhyolite flows and ash flow tuffs lap up against the underlying Upper Triassic andesitic volcaniclastics (Figure 7).

The lowermost section of the WRC on southwestern Table Mountain preserves thick (20-40m) altered and brecciated rhyolite and overlying ash tuffs at the base of the Lower Basalt Unit. The lower contact of these rhyolites and basalts is not exposed at this location, but is assumed to unconformably overlie Upper Triassic stratigraphy to the west. Basalts within the Lower Basalt Unit are dark green to olive green massive, pillowed or brecciated, with rare deposits of agglutinate spatter and brecciated scoria. The uppermost flows of the Lower Basalt Unit are pillow breccias and hydrothermal breccias with vugs and fractures containing agate and bladed calcite. Fine-grained volcaniclastic strata or local conglomerates of the Middle Sedimentary Unit conformably overlie the Lower Basalt Unit.

To the northwest, the Lower Basalt Unit wedges out along the unconformity and heterolithic, volcanic-dominated conglomerate with interlayered basalt hyaloclastite lies above the unconformity. The conglomerate forms an eastward-tapering lens in the centre of Table Mountain, interfingering with thin-bedded sandstones and mudstones to the east; all these lithologies form part of the Middle Sedimentary Unit. The heterolithic conglomerate incorporates clasts of the underlying Upper Triassic andesitic conglomerate lithologies near its base. Higher in the section, it contains clasts of rhyolite, basalt, mudstone, and pyritic rhyolite all derived from within the WRC. Belemnites, ammonites, pelecypods and fragments of petrified wood occur at numerous localities. Preliminary macrofossil identification from the conglomerate includes dicoelitid belemnites ranging from the Toarcian to Middle Bajocian (~184-170 Ma; J. Haggart pers. comm., 2004). Within the mudstones, aphanitic white rhyolite bodies form a northwest-trending line of lava domes and cryptodomes. These consist of massive to brecciated rhyolite, that in some cases grade outwards into carapaces of mixed rhyolite-sedimentary breccia. A few thin basalt hyaloclastite units occur within the sedimentary sequence. Interbedded spherulitic dacite and clastic sedimentary lenses indicate that the Middle Sedimentary Unit is undeformed and dips shallowly to the east.

On central Table Mountain, coarse clastic sedimentary rocks and multiple felsic eruptive centres characterize the Middle Sedimentary Member, and indicate a high-energy environment of deposition. At the northwestern and southeastern ends of Table Mountain, the Middle Sedimentary Member is preserved as a finer-grained sequence of sandstones, siltstones, mudstones and limestones and rare, thin interbedded volcanic units, suggesting a comparatively quiescent depositional environment. These latter areas of distal sediment accumulation and minor volcanism may be more favourable for the accumulation and preservation of exhalative sulphides, demonstrated by the Griz and Zinc Moss prospects described below.

The Upper Basalt Unit is extensively exposed on the eastern side of Table Mountain and on Willow Ridge. It is at least 2000 metres thick and consists of massive basalt flows, pillowed basalt flows, pillow and angular clast basalt breccia, and small bodies of rhyolite and dacite. Basalt dikes and sills are abundant; the prevalence of these intrusive equivalents within the upper basalt unit compared with their general absence in the underlying Middle Sedimentary Unit suggests that the upper basalt flows and breccias were sourced locally, and represent accumulation directly above a restricted feeder zone.

On Willow Ridge, the uppermost strata of the Upper Basalt Unit progress from massive basalt and basaltic hyaloclastite to a 100-metre-thick section of fragmental dacitic lithologies capped by thin-bedded pyritic siltstone and shale. The pyritic sedimentary unit may record the end of volcanism or it may represent a sedimentary interval within a thicker, unexposed volcanic section. The dacitic units consist of fine-grained ash tuff; fine lapilli tuff including two thin fragment-rich layers; a coarser dacite lapilli tuff with distinctive armoured clasts and columnar-jointed clasts; and a heterolithic fragmental unit with scattered pyritic clasts (interpreted as a subaqueous mass flow deposit).

The age of the WRC is constrained by previous fossil collections from the Middle Sedimentary Unit on Table Mountain. Souther (1972) reported on four ammonoid collections of Upper Toarcian (probable) and Middle Bajocian ages (GSC Nos. 37109, 85097, 85099, 85117). Evenchick *et al*. (2001) report one Middle Jurassic ammonite (GSC No. 177824) and one radiolarian collection of Bajocian or younger age (GSC No. 177823).

Lithologies and textures preserved throughout the Willow Ridge Complex indicate rapid accumulation of volcanic and sedimentary rocks in a deep-water marine setting. Feeder dikes to felsic lava flows trend northward. Feeder dikes to mafic lava flows trend eastward. Correlation with similar rock successions at the same stratigraphic position elsewhere in the region (Ash *et al*., 1997b, Logan *et al*, 2000; Roth, 2002) suggests that these rocks span the Toarcian-Aalenian boundary (Lower Jurassic - Middle Jurassic) and are age-equivalent to the host rocks of the Eskay Creek gold mine. WRC strata constrain the age of a large diorite intrusion that cuts the Upper Basalt Unit at the northwest end of Willow Ridge (Figure 6). First mapped by Souther (1972), this stock is interpreted as part of the Middle Jurassic Three Sisters Suite (179-176 Ma).

Sulphide mineralisation within the WRC is most typically pyritic sandstones, pyritic rhyolite flows and pyritic felsic clasts in pebble to cobble conglomerates. A significant mineralized horizon of pyritic black mudstones was identified at the Griz prospect on south-central Table Mountain by M. Stewart (see below).

Hazelton Group Strata near Kinaskan Lake

Strata of the upper Hazelton Group have been reconnaissance mapped along both sides of central Kinaskan Lake in the northern part of the map area, in order to integrate mapping by Ash *et al*. (1997b) with the present project. These strata rest unconformably above maroon clinopyroxene-phyric, monolithologic volcanic breccia assigned to the Upper Triassic Stuhini Group by Ash *et al*. (1997b), and above unit lJme (described previously). Near the lake, the unconformity surface strikes northeast and dips moderately southeastwards (Figure 6). Overlying layered units, including rhyolite flows, rhyolite breccia and aphyric andesite hyaloclastite, parallel the surface of the unconformity. On the ridge on the east side of the lake, these units are subsequently overlain by an eastward-thickening (to 500-1000 m) sequence of interbedded, bimodal andesite-rhyolite volcanic rocks, volcaniclastic rocks and polymictic conglomerates, in which bedding attitudes flatten up-section. Lithologies include andesite lava flows with variable grey to green to maroon colouring, and related pillow breccias. The uppermost unit in this ridge is a distinctive shallowly dipping, multicoloured clast-rich pebble conglomerate that onlaps both the mixed sequence and locally, the unconformity surface itself. This conglomerate is polymictic, containing a mixture of bright turquoise to apple green clasts of rhyolite (similar to rhyolites flows, breccias and dikes preserved in bimodal sequences around Kinaskan Lake), aphyric basalt and andesite, and, within a few metres of the unconformity, clasts of the underlying maroon clinopyroxene-phyric volcanic rocks. This unit also contains fossil fragments of belemnites and pelecypod shells. A U-Pb analysis of rhyolite from the bimodal sequence overlying the unconformity at Kinaskan Lake yields a 183 Ma age (Toarcian; see Ash *et al*., 1997b), contemporaneous with the lower units of the Willow Ridge Complex and probably representing related strata.

Basal Conglomerate on the Hank Property

At the Hank property, Lower Jurassic or younger sedimentary units unconformably overlie Upper Triassic volcanic rocks of the Stuhini Group. These sedimentary units are characterized by a coarsening-up sequence of siltstone through sandstone to cobble conglomerate. The dominant lithologies are interbedded siltstone, sandstone and pebbly sandstone. Pebbly sandstone is composed of subrounded lithic grains, and subrounded to well-rounded equant pebbles. Overlying cobble conglomerates display volcanic clasts with minor chert and mudstone clasts and syenite clasts similar to the felsic intrusions cutting the underlying stratigraphy. These carbonate-cemented sedimentary rocks are poorly consolidated and friable. Sedimentary structures are dominated by crude cross-bedding with shallow but variable orientations. This unit appears to fill topographic lows on underlying Upper Triassic stratigraphy. The lowermost lithology is siliceous siltstone and mudstone containing well-preserved carbonaceous leaf fossils including conifer and long bladed leaf varieties. This package is unaltered by, and may onlap onto, the eroded cap of the 184 Ma Hank porphyry dated by Kaip (1997). This sedimentary unit is correlated with Jurassic sandstones mapped six kilometres to the northwest by Logan *et al*. (1997) and with the basal conglomerates mapped above unconformities on the west side of Table Mountain and east of Kinaskan Lake.

Upper Hazelton Group strata at Snoball Creek

A section of fine-grained clastic sedimentary strata occupies the core of a tight, northwest-trending syncline exposed on three ridges between Ball Creek and More Creek. Strata consist of grey to black siltstone to mudstone, fine sandstone, limy siltstone, and sedimentary breccia with angular black mudstone intraclasts. In general this unit weathers recessively, with resistant ribs corresponding to the sandstone beds. In places thick, lumpy beds represent the sedimentary breccias and possibly olistostromes. The sedimentary strata overlie a thick section of volcaniclastic strata on a sharp but apparently conformable contact. Near the contact, bedding is parallel in both units. West of the fine-grained clastics, the volcaniclastic section forms a tight anticline. On the western limb of this fold, the uppermost volcanic unit is a thick maroon andesite flow and flow breccia that is not repeated in the fold limb below the clastic section to the east. It may have been removed by erosion prior to deposition of the overlying sedimentary strata.

This volcaniclastic sequence is dominated by resistant, ribby-outcropping, well-bedded, coarse volcanic debris flows. Most beds are monolithologic. In polymictic beds, clasts are andesite, dacite and basalt(?). Many fragments are plagioclase-phyric. Colors vary from green to dark maroon. Coarse units are interbedded with finer grained equivalents - volcanic sandstone, siltstone and tuff. A turbidite origin for the sequence is suggested by the coarse and fine sediment interbedding, by sedimentary textures such as graded bedding, load casts and flame structures, and by synsedimentary deformation features. Tabular rhyolite bodies form part of the uppermost 100 metres of section, immediately below the base of the overlying clastic sequence. Rhyolites are creamy white to grey to bright turquoise green, commonly pyritic, and show a textural variation from massive to flow-banded to brecciated to peperitic (angular to irregular, green rhyolite fragments with black mudstone infillings) to tuffaceous.

The age of the fine-grained clastic sequence is constrained by two macrofossil collections of ammonites that give Pliensbachian ages (Souther, 1972; GSC Nos. 32773 and 32802). However, two radiolarian collections of Bajocian or younger age have been obtained from the same sedimentary units (Evenchick et al., 2001; GSC Nos. 177838 and 177840). These ages would imply, respectively, correlation with the lower and upper Hazelton Group. The age of the underlying volcanic and volcaniclastic section is unknown and it is included here within the Stuhini Group (Figure 6). A sample of rhyolite within the volcaniclastic strata has been submitted for U-Pb age determination.

BOWSER LAKE GROUP

Strata of the Middle to Upper Jurassic Bowser Lake Group overlap the older volcanic sequences along the eastern part of the study area and have been most recently mapped by Evenchick (1991) and Ricketts and Evenchick (1991). To the east, stratigraphy and nomenclature for the Bowser Lake Group in the Spatsizi River mapsheet (NTS 104H) have been wholly revised and updated (Evenchick and Thorkelson, 2004).

Regionally, the basal contact of the Bowser Lake Group grades upward from the upper sedimentary strata of the Salmon River Formation (Spatsizi Formation) of the underlying Hazelton Group. The Middle Jurassic boundary between these similar sedimentary packages roughly coincides with the Bajocian-Bathonian transition at 166 Ma.

Anderson (1993) describes the lowest units within the Bowser Lake Group as thin to thick-bedded, fine to coarse-grained siliciclastic rocks including turbiditic shale, siltstone, greywacke, fine to medium grained sandstone and rare conglomerate. Anderson cautions that these units are indistinguishable in the field from similar lithologies at the top of the underlying Salmon River Formation of the Hazelton Group.

Evenchick (1991), mapping in the current study area, correlated black siltstone, fine grained sandstone and minor to large proportions of chert pebble conglomerate with the Ashman Formation of the Bowser Lake Group. Evenchick and Thorkelson (2004) note that the Hazelton Group - Bowser Lake Group contact is gradational, however, they place the boundary where thin, white-weathering tuffaceous laminae, typical of the upper Spatsizi Formation (Salmon River Formation), are no longer present in black siltstones.

Bowser Lake Group strata are well exposed along and around the road network of the Willow Creek Forest Access Road and along a low ridge which trends northward between Willow Ridge and Kakiddi Lake. Strata are notably flat lying to shallowly southeast dipping over much of this area, suggesting that the sedimentary cover over underlying volcanic strata of the Hazelton Group is relatively thin. Chert pebble conglomerate is the most resistant lithology and consequently the most prominent rock unit; black mudstone and well-sorted sandstone are less extensively exposed. Pebble conglomerate cropping out along the Willow Creek road displays distinctive multicolored pebbles including red jasper, green rhyolite or chert, pyritic volcanic rock, and black and white chert.

MOUNT EDZIZA VOLCANIC COMPLEX

The Late Cenozoic Mount Edziza Volcanic Complex blankets 1000 km^2, including part of the northwest corner of the map area. The complex is comprehensively described and illustrated in Geological Survey of Canada Memoir 420 (Souther, 1992). Volcanic rocks range in age from 7.5 Ma to 2,000 B.P. The complex comprises alkaline basalt and hawaiite with lesser intermediate and felsic volcanic flows, and it records five major cycles of magmatic activity.

INTRUSIVE ROCKS

COPPER MOUNTAIN PLUTONIC SUITE

A small pyroxenite plug first mapped by Souther (1972) crops out in central Northmore Ridge, south of the Hank prospect and near the head of Snoball Creek. Cut by a minor fault, this stock intrudes Upper Triassic sedimentary strata. It is correlated here with the similar small ultramafic stocks of the Late Triassic to Early Jurassic Copper Mountain Suite (Logan *et al*. 2000).

TEXAS CREEK PLUTONIC SUITE

A variety of fine to medium grained, commonly porphyritic, leucocratic intrusive rocks found in the map area are correlated with the Early Jurassic Texas Creek Suite (Logan *et al*. 2000). The intrusions appear as simple stocks or as clusters of anastomosing dikes. A string of small plugs and dikes are distributed along the trend of the Hank, ME and Mary mineral prospects. Intrusions of this suite are important regional loci for porphyry copper-gold, transitional gold and epithermal gold-silver deposits. In the study area, they are associated with the Hank epithermal gold, and the ME, Mary, Spectrum, GJ, Groat and Red Chris porphyry copper-gold prospects.

THREE SISTERS PLUTONIC SUITE

Fine to medium grained equigranular diorite stocks and a small medium grained gabbro plug cut Lower to Middle Jurassic strata of the Willow Creek Complex in the northern map area. These plutons are assigned to the Middle Jurassic (179-176 Ma) Three Sisters Suite defined by Anderson (1983).

HYDER PLUTONIC SUITE

The Eocene Hyder Suite forms the eastern margin of the Coast Crystalline Belt to the west of the study area. This continental-scale magmatic event is recorded within the map area by a series of north-trending, fine-grained to aphanitic rhyolite dikes first identified by Souther (1972). These intrusions are likely feeders to overlying felsic flows that have been subsequently eroded.

STRUCTURE

The dominant northwest structural grain through the central and southern map area is due to a set of northwest-trending faults that divide the region into a series of elongate, fault-parallel blocks of intact stratigraphy. Differential uplift between blocks, followed by erosion down to the common elevation of the Spatsizi Plateau, results in adjacent blocks displaying different stratigraphic levels in the regional stratigraphy (Figure 6). Minor warps and gentle folds mapped within the Upper Triassic stratigraphy are also developed along northwest-trending fold axes, suggesting minor buckling accompanying the faulting and differential uplift of blocks of intact strata.

The Northmore Fault (Figure 6) is a map-scale feature with significant sinistral offset. This fault is the locus for a string of small plutons and appears to be syn-intrusive. Strata near the fault are also more intensely folded than equivalent strata elsewhere in the region.

Anderson (1993) first described the north-trending, fault-bounded belt that hosts the "Eskay facies" strata of the Salmon River Formation. Smaller-scale, north-trending growth faults were intersected in drillholes testing Eskay facies strata near the mine workings; these faults may be important fluid pathways responsible for localizing mineralisation (Anderson, 1993).

In the present project, two lines of evidence for the northerly orientation of the Eskay Rift are the north-trending unconformity exposed along the western cliffs of Table Mountain and prominent north- to northwest-trending rhyolite and dacite feeder dikes and strings of felsic domes exposed in the central and northern areas of Table Mountain (Figure 6; see also Simpson and Nelson, 2004, Figure 2). The rhyolite dike and dome relationships are similar to those described for the Eskay Creek mine area (Bartsch, 1993).

On Willow Ridge, southwest of Kinaskan Lake, the edge of the Eskay Rift is not exposed, but the western edge of the Eskay Rift is well-exposed on the southern Klastline Plateau, on the west side of Kinaskan Lake, as a prominent northeast-trending rhyolite dike (unit lJFve of Ash *et al*., 1997b). The western edge of the Eskay Rift crops out again on the slopes of Mount Mars on the east side of Kinaskan Lake as a distinct erosional unconformity (described above). South of the project area, similar abrupt increases in the thickness of bimodal volcanic strata correlated with the Willow Ridge Complex are evident in two east-west transects: from the toe of Bruce Glacier to the Eskay Creek minesite; and south of Sulphurets Creek from the HSOV prospect to Mount Madge.

MINERAL DEPOSITS

Northwestern BC hosts a variety of mineral deposit types characteristic of magmatic arc environments ,including calc-alkaline porphyry copper-gold deposits (Figure 1 in Schroeter and Pardy, 2004); Eskay Creek-type subaqueous hotspring deposits (Massey, 1999a); Kuroko-type VMS deposits (Massey, 1999b); and low-sulphidation epithermal deposits (Figure 1 in Schroeter and Pardy, 2004). Near the current study area, intrusive-related Cu-Ni deposits (Lefebure and Fournier, 2000) and Besshi-type VMS deposits (Massey, 1999b) are hosted in rock units that may also be present within the map area. Sedimentary strata of the Bowser Lake Group host coal deposits and have elevated concentrations of molybdenum and nickel (Alldrick *et al*., this volume). Recent study of the Bowser Lake Group has shown potential for the generation and accumulation of petroleum (Evenchick *et al*., 2002).

Figure 8 shows the distribution of mineral deposits and prospects in the study area. These occurrences are concentrated in the volcanic strata that pre-date deposition of the Bowser Lake Group. This distribution is reflected in metal concentrations detected in the Regional Geochemical Surveys (see Figures 5 and 7 in Lett and Jackaman, this volume). This metals-rich region lies west of Highway 37 and corresponds to the eastern edge of the Coast Mountains. Bowser Lake Group sedimentary strata, with its coal, petroleum and sediment-hosted metal potential, generally lies east of Highway 37.

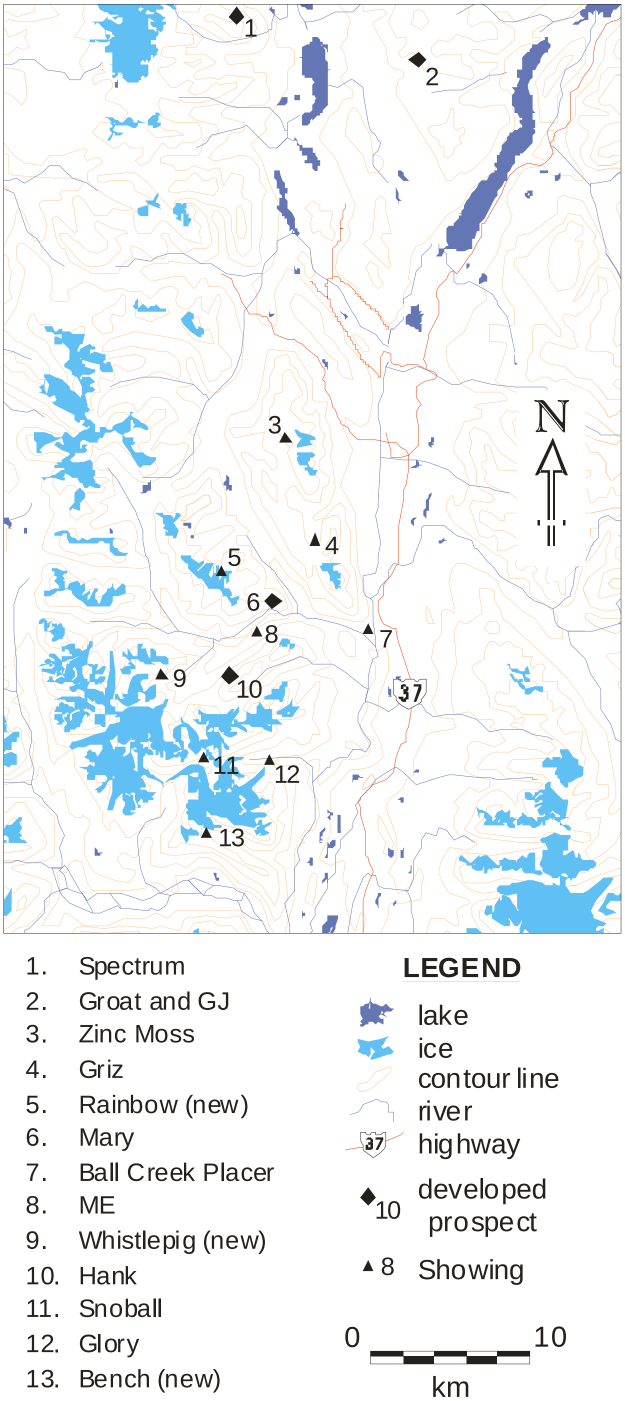

Figure 8. Mineral deposits and prospects in map area.

Intrusion-related deposit types in or near the study area include porphyry copper-gold deposits, which are particularly common in this region (Schroeter and Pardy, 2004); intrusion-related low-sulphidation epithermal deposits; and magmatic copper-nickel deposits. Volcanic-hosted deposits include some of the Eskay Creek deposits and some low-sulphidation epithermal veins (Massey, 1999a). Stratiform or stratabound deposit types include sediment-hosted molybdenum and nickel, Besshi-type sediment-hosted massive sulphide deposits, as well as volcanic-hosted VMS deposits (Massey, 1999b). Limestone units are favourable host rocks for gold-rich skarn deposits (e.g. McLymont Creek).

During the 2003 mapping program, three new mineral showings were located by government geologists on the Targeted Geoscience Inititative project. As these crews focus on mapping, not prospecting, this is a surprisingly high number of new mineral occurrences. It reflects both the high mineral potential of the region and the limited exploration work to date. More exploration work is justified in this area based on these discoveries and the presence of the "Eskay Facies" strata.

GRIZ

(UTM 09/0417580E/6354153N)

Thin-bedded black mudstones of the Middle Sedimentary Unit of the Lower to Middle Jurassic Willow Ridge Complex host thin laminae (2-8 mm) of fine-grained, pale pyrite (Figure 9). The Griz prospect is exposed where a creek cuts down through siltstone and pyritic mudstone beds (Figure 10), which conformably overlie pillow basalt and basalt breccia hosting disseminated sulphides. This recessive-weathering, poorly exposed horizon lies along strike with several gossanous exposures that extend one kilometre due south of the mudstone exposure. Gossanous units are reworked volcanic breccias, and include basalt clasts cut by pyrite veins. The prospect was explored in 1990 and 1991 by Noranda Inc. (Campbell *et al.*, 1990). Of six samples collected in 2003 along these exposures, a sample of the laminated sulphide and mudstone unit in the creekbed (Figure 9) at the north end returned the highest assay values: 0.6 ppb Au, 765 ppb Ag, 56 ppm Cu, 23 ppm Pb, 794 ppm Zn, 31 ppm As, 348 ppb Hg, 9 ppm Sb.

ZINC MOSS

(UTM 09/0415282E/6361706N)

At this location, pyritic clastic sedimentary beds in the Middle Sedimentary Unit of the Lower to Middle Jurassic Willow Ridge Complex are interbedded with thin flows of pyritic massive basalt. The basalt and adjacent sandstones, siltstones, grits, granule conglomerates and rare pebble conglomerate and limestone at the Zinc Moss prospect are strongly pyritic and well exposed over an extensive area of outcrop near the head of Compass Creek on northern Table Mountain. The prospect was explored in 1990 and 1991 by Noranda Inc. (Campbell *et al.*, 1990). Pyrite occurs as disseminations in the sedimentary rocks and as fine-grained seams and irregular pods and zones of fine-grained pyrite replacement within the basalt flows. From four samples collected for assay, the best results were obtained from a sample of pyritic pebble conglomerate: 13 ppm Cu, 11 ppm Pb, 120 ppm Zn, 1 ppb Au, 126 ppb Ag, 50 ppm As, 6 ppm Sb, 262 ppb Hg.

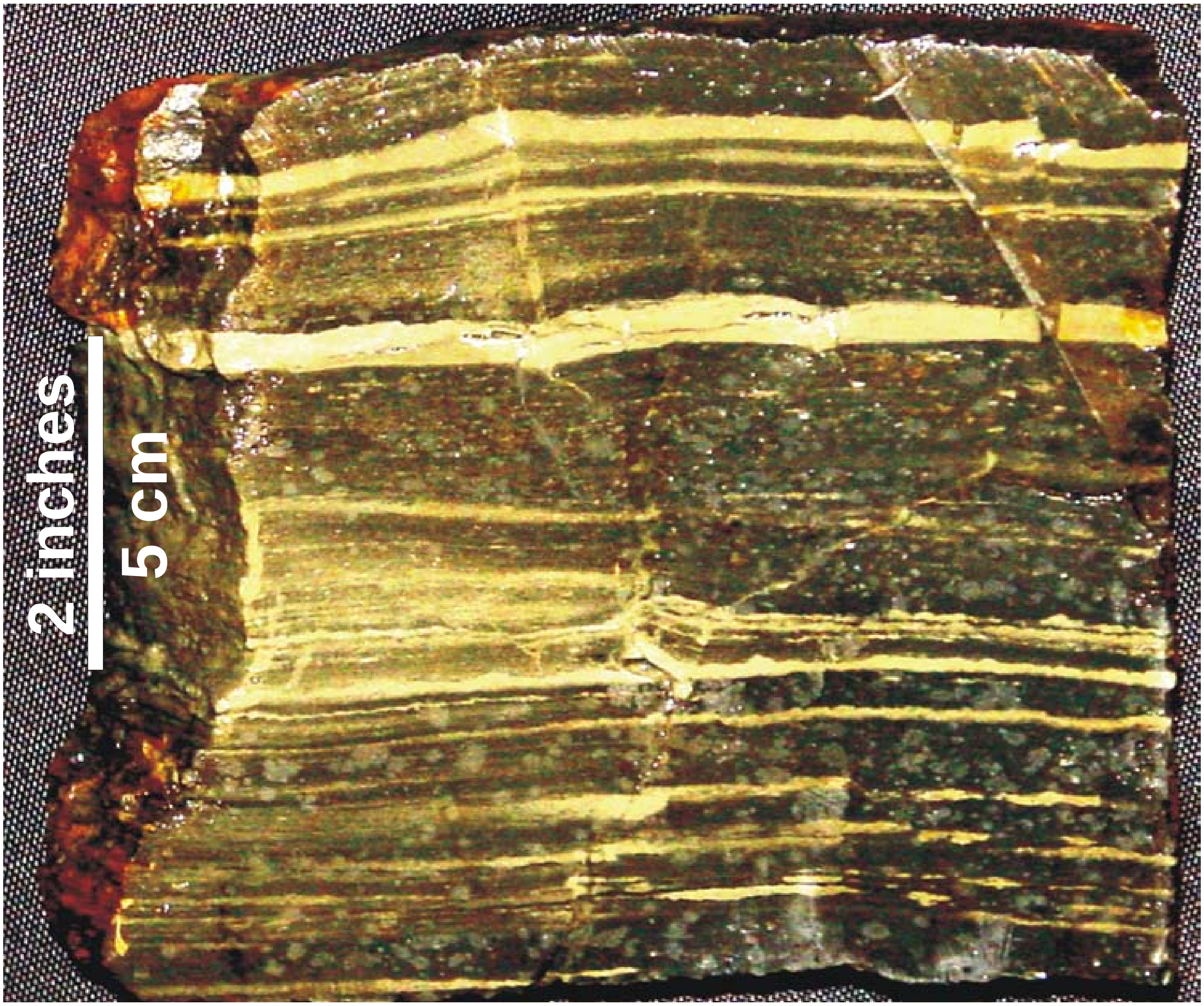

Figure 9. Sample of laminated pyrite and mudstone, Griz prospect.

Figure 10. Outcrop exposure of Griz prospect.

WHISTLEPIG (new prospect)

(UTM 09/0406808E/6342298N)

A fault zone cutting Upper Triassic siltstones host mineralization exposed along a southwestern tributary of Ball Creek, two kilometres west of the Hank deposit. Siliceous siltstones are grey to white, massive and weakly colour-banded. The Whistlepig mineralization occurs as semi-massive sulphides in fault-hosted, quartz-calcite veins. The fault is part of a regionally extensive zone of faults called the Northmore fault zone, which ranges up to 100 metres wide. This shear zone is a steeply inclined, sinistral, transverse fault, easily traced for up to several kilometers by fractures and gossanous weathering of disseminated sulphides found throughout the fault system. The veins were sampled in two locations, the best assay yielded 732 ppb Au, 2867 ppb Ag, 1001 ppm Cu, 11 ppm Pb, 24 ppm Zn, 2 ppm As, 32 ppb Hg, 1 ppm Sb.

BENCH (new prospect)

(UTM 09/0409490E/6330105N)

A band of massive to semi-massive, fine-grained, bright pyrite crops out at the base of a high cliff of black rhyolite near the head of Bench Creek. The upper part of the cliff is massive to faintly banded, black to charcoal rhyolite. Throughout the lower five metres along the base of the cliff, the rhyolite is transected by many fine hairline cracks filled with pyrite. Along most of the length of the cliff, a talus pile of coarse blocks and boulders is piled up against the basal rhyolite layer with the pyritic fractures. At one location near the upstream end of the cliff, the top of the talus pile is lower and exposes two feet of massive, fine-grained granular pyrite and semi-massive granular pyrite disseminated in white, fine-grained quartz. The significance of this small showing is its stratabound character and the high probability that this mineralisation extends laterally under the blocky talus cover.

RAINBOW (new prospect)

(UTM 09/0409426E/6349633N)

Several black, flow-banded rhyolite flows and dikes are exposed within a one-kilometre radius of the Rainbow prospect. At this location the outcropping rhyolite dike has abundant encrustations of very fine-grained, bright yellow and orange minerals developed along many hairline fractures within the dike. The country rock is massive light grey Upper Triassic limestone, but other rhyolite exposures nearby lie within limy sandstones, grits and pebble conglomerates. The best assay from this dike rock is 70 ppm Cu, 114 ppm Pb, 283 ppm Zn, 76 ppb Au, 5325 ppb Ag, 688 ppm As, 24 ppm Sb, 418 ppb Hg. These results are significant because of the elevated gold, silver, mercury, arsenic and antimony values, and the several nearby isolated outcrops and semi-continuous exposures of dikes and flows of black rhyolite with glassy lustre.

Spectrum-Red Dog (104G 036) is a porphyry copper-gold deposit with reserves of 504,800 tonnes grading 9.6 grams per tonne Au. Moderate copper grades are patchy and highest grades are obtained in areas of chalcopyrite-magnetite mineralisation in skarn. Adjacent to Spectrum, the **Hawk** (104G 005) gold-silver prospect is a series of sulphide-rich, quartz-calcite veins cutting across Upper Triassic sedimentary and volcanic rocks around the perimeter of diorite and granodiorite intrusions. These two prospects resemble other porphyry copper-gold systems in the region which feature peripheral high grade precious metal mineralisation (e.g. Red Bluff/Snip/Johnny Mountain; Kerr/Sulphurets; Snowdrift/Tanzilla)

The **GJ** (104G 034) deposit is an Upper Triassic copper-gold porphyry system hosted by the Groat granodiorite stock (205.1 +/- 0.8 Ma;) and it's Upper Triassic sedimentary country rocks. The stock is contemporaneous with the stock hosting the Red-Chris porphyry Cu-Au deposit (203.8 +/- 1.3 Ma; Friedman and Ash, 1997) 25 km to the east.

The **Mary** (104G 018) occurrence is a porphyry copper-gold-silver-molybdenum prospect hosted in coarse mafic volcaniclastic rocks cut by several large parallel to anastomosing monzonite dikes and plugs (Panteleyev, 1975). The deposit has been interpreted as an Upper Triassic porphyry system developed in coeval Upper Norian volcanic, volcaniclastic and sedimentary strata, based on a 218 +/- 24 Ma sericite K-Ar date, but it is interpreted here as an Early Jurassic stock, contemporaneous with similar intrusions on the Hank property to the southwest.

The **ME** (104G 042) showing is a series of large gossans cropping out on the south side of Ball Creek, between the Mary and Hank deposits. Copper-molybdenum mineralisation occurs as disseminations in silicified alteration zones, in quartz veins, and with galena and sphalerite in carbonate veins.

The confluence of Ball Creek and Devil's Creek was the site of the **Ball Creek** (104G 072) placer gold operation between 1936 and 1940.

The Hank (104G 107) deposit is interpreted as a bulk-tonnage, low-grade epithermal system. The deposit occurs where stratabound alteration 'blankets' extend out from Early Jurassic granodiorite stocks into permeable Upper Triassic andesitic volcaniclastic country rock. A drill-indicated geological resource of 507,500 tonnes grading 3.43 gm/tonne gold has been established in three zones on the property (Kaip, 1997). The geometry of the planar stratabound alteration envelopes surrounding the central Early Jurassic stock resembles the geometry of the Tanzilla (104I 022) gold prospect 135 kilometres to the northeast.

The **Snoball** (104G 143) property is located where Upper Triassic Stuhini Group siltstones and andesites are intruded by a diorite stock. Gold-silver mineralisation occurs as sulphide disseminations and pods within silicified hornfels or as quartz-sulphide veins cutting unaltered siltstones. Vein sulphides are arsenopyrite, pyrite, sphalerite and galena.

The **Glory** prospect was discovered in 1990 by Keewatin Engineering Inc. (Bobyn, 1991) on the south side on Snoball Creek. Massive pyrite veins and lenses up to 1.0 m wide and 60 m long are developed along intrusive contacts where fine clastic sedimentary rocks are cut by felsic dikes and sills. Mineralisation is concordant with bedding, and the felsic intrusive rocks also contain thin lenses (10 cm by 30 cm) of massive pyrite. An assay of the massive pyrite returned 2,000 ppb Ag, 1 ppb Au, 8 ppm Cu, 13 ppm Pb, 28 ppm Zn, 60 ppm As, 1 ppm Sb, 1670 ppb Hg.

METALLOGENY

In the map area and in the surrounding region, Upper Triassic mineralisation includes large porphyry copper-gold systems (GJ, Galore Creek), Besshi-type VMS deposits (Rock and Roll), Kuroko-type VMS prospects (Bench) and vuggy rhyolite dikes and flows with elevated Au, Ag, Hg, Sb, As (Rainbow). Lower Jurassic mineralisation that predates the erosional interval marked by Nassian uplift is represented by large porphyry copper-molybdenum systems (Mary, Red-Chris), stratabound bulk-tonnage epithermal mineralisation (Hank), and precious metal rich skarn deposits (McLymont). Lower to Middle Jurassic mineralisation that post-dates the Nassian uplift includes the Griz prospect and many areas of pyritic felsic volcanic units and derived volcaniclastic sedimentary rocks (e.g. Figure 4 in Simpson and Nelson, 2004), plus the Eskay Creek gold mine and numerous nearby prospects (Lulu, 22 Zone, HSOV).

EXPLORATION POTENTIAL

In this region, where mineral deposit types are characteristic of their host strata, deposit-specific exploration programs can target particular stratigraphic intervals. Due to the highly dissected terrain, geochemical stream sediment sampling has proven to be a particularly successful and cost-effective tool for assessing the potential of larger areas (Lett and Jackaman, this volume), and should be equally powerful as a second phase follow-up technique. Discovery of a number of small prospects during this season's regional mapping program indicate that the potential of this area has not yet been thoroughly assessed.

The Middle Sedimentary Unit of the Willow Creek Complex and the many minor sedimentary members within the Lower and Upper Basalt Units of the Willow Creek Complex are all favourable sites for the deposition and preservation of exhalative sulphides and should be selectively prospected. Areas of quiescent, distal sedimentation will be more conducive to the accumulation and preservation of exhalative sulphides (e.g. Griz and Zinc Moss prospects).

DISCUSSION AND CONCLUSIONS

This project has provided important new detailed geological surveys of the northern Eskay Rift rocks within the Telegraph Creek map area. Tracts of "Eskay equivalent" strata crop out on Table Mountain, Willow Ridge and on ridges east and west of Kinaskan Lake. These exposures are defined here as the Willow Ridge Complex, a thick accumulation of basalt and lesser rhyolite, accompanied by fine to coarse-grained clastic sedimentary strata. Throughout the map area, WRC strata lie unconformably above Upper Triassic Stuhini Group volcanic rocks. The Kinaskan Lake bimodal sequence may in part unconformably overlie Lower Jurassic strata as well. Sub-Middle Jurassic unconformities also occur on the Hank property, where a petrified-log-bearing conglomerate overlies both Stuhini Group rocks and a 184-Ma pluton; six kilometres to the northwest of the Hank deposit, Logan *et al*. (1997) mapped gently dipping plant-bearing Lower Jurassic sandstones above Upper Triassic strata.

It is important to establish the exact age of these mapped unconformities since Souther (1972) recognised two separate unconformities within Early Jurassic time, the Inklinian uplift at the Triassic-Jurassic boundary, and the late Early Jurassic Nassian uplift. For unconformities mapped in this year's study area, evidence so far favors a correlation with the late Early Jurassic Nassian uplift. Near Kinaskan Lake, the overlying unit is, in part, of Toarcian age (183 Ma). Toarcian-Bajocian fossils occur in conglomerate near the unconformity at the base of the Willow Ridge Complex on Table Mountain. On the Hank property, the youngest underlying unit is a 184 Ma pluton. However, more radiometric and fossil data from both underlying and overlying units is required to verify this hypothesis. It is possible that both Triassic-Jurassic and late Early Jurassic unconformities exist in the area.

The Table Mountain and Kinaskan Lake unconformities show significant similarities and differences. Both are overlain by polymictic conglomerates that are similar in clast and fossil contents, which attest to coarse, proximal sedimentation unusual elsewhere in the sequences. Both dip moderately to steeply towards the overlying successions: east in the case of the Table Mountain unconformity, and south to southeast east of Kinaskan Lake. The Table Mountain unconformity is interpreted as a fossil rift margin (Simpson and Nelson, 2004). On the east side of Kinaskan Lake, based on basinward dips and the upward shallowing of unit dips above the unconformity, a similar rift-margin origin can be proposed. West of Kinaskan Lake, a prominent rhyolite sill intrudes the same unconformity (Ash *et al*., 1997b). The principal difference between the two localities is their strike: at Table Mountain, the western edge of the WRC strikes north, whereas near Kinaskan Lake the edge of the WRC strikes northeast. This could be due to later folding, alternatively the initial faults bounding the rift may shift from northerly trends near Table Mountain to northeasterly near Kinaskan Lake.

SUMMARY

Mapping has refined the stratigraphic and structural picture of the More Creek - Kinaskan Lake area. Important contributions include the recognition of the near absence of strata representing the lower Hazelton Group, and recognition of regional-scale unconformities that form irregular boundaries between major stratigraphic packages.

The Eskay Rift and "Eskay Facies" extend north to Kinaskan Lake. The newly defined Willow Ridge Complex comprises bimodal volcanic lithologies and related sedimentary strata correlative with strata that host the Eskay Creek orebodies to the south. The margin and base of the Willow Creek Complex is a readily recognised angular unconformity that sharply delineates these strata most favourable for the formation and preservation of similar deposits.

Previously documented mineral occurrences in the area are sparse; however, this must in part reflect limited exploration coverage as three new showings were found during this season's mapping program.

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REFERENCES

Alldrick, D.J. (1993): Geology and metallogeny of the Stewart Mining Camp, northwestern British Columbia; British Columbia Ministry of Energy and Mines, Bulletin 85, 105p

Alldrick, D.J., Jackaman, W. and Lett, R.E.W. (2004): Compilation and Analysis of Regional Geochemical Surveys around the Bowser Basin; British Columbia Ministry of Energy and Mines, Geological Fieldwork 2003, Paper 2004-1

Alldrick, D.J., Stewart, M.L., Nelson, J.L. and Simpson, K.A. (2004): Geology of the More Creek - Kinaskan Lake area, northwestern British Columbia; British Columbia Ministry of Energy and Mines, Open File Map 2004-2, Scale 1:50 000

Anderson, R.G. (1983): The geology of the Hotailuh Batholith and surrounding volcanic and sedimentary rocks, North-central British Columbia; Carleton University, Ph.D. thesis

Anderson, R.G. (1989): A stratigraphic, plutonic and structural framework for the Iskut Map area, northwestern British Columbia: Current Research, Part E, Geological Survey of Canada, Paper 89-1 E, p.145-154

Anderson, R.G. (1993): A Mesozoic stratigraphic and plutonic framework for northwestern Stikinia, northwestern British Columbia, Canada; in Dunne, G., and McDougall, K., editors, Mesozoic Paleogeography of the western United States-II, Pacific Section SEPM, vol. 71, p.477-494

Anderson, R.G. and Thorkelson, D.J. (1990): Mesozoic stratigraphy and setting for some mineral deposits in Iskut River map area, Northwestern British Columbia, in Current Research, Part E, Geological Survey of Canada, Paper 90-1 E, p.131-139

Ash, C.H., Fraser, T.M., Branchflower, J.D. and Thurston, B.Q. (1995): Tatogga Lake Project, Northwestern British Columbia (104H/11, 12); in Geological Fieldwork 1994, Grant, B. and Newell, J.M., Editors, British Columbia Ministry of Energy, Mines and Petroleum Resources. Paper 1995-1, p.343-358

Ash, C.H., Stinson, P.K. and Macdonald, R.W.J. (1996); Geology of the Todagin Plateau and Kinaskan Lake Area (104H/12, 104G/9); in Geological Fieldwork 1995, Grant, B. and Newell, J.M., Editors, British Columbia Ministry of Energy, Mines and Petroleum Resources, Paper 1996-1, p.155-174

Ash, C.H., Macdonald, R.W.J. and Friedman, P.M. (1997a); Stratigraphy of the Tatogga Lake Area, Northwestern British Columbia (104G/9,16); in Geological Fieldwork 1996, Lefebure, D.V., McMillan, W.J. and McArthur, J.G., Editors, British Columbia Ministry of Employment and Investment, Paper 1997-1, p.283-297

Ash, C.H., Macdonald, R.W.J., Stinson, P.K., Fraser, T.M., Read, P.R., Pustka, J.F., Nelson, K.J., Ardan, K.M., Friedman, R.M. and Lefebure, D.V. (1997b): Geology and Mineral Occurrences of the Tatogga Lake Area, Northwestern British Columbia (104G/9E&16SE, 104H/12NW&13SW); British Columbia Ministry of Energy and Mines. Open File Map 1997-3, scale 1:50 000

Bartsch, R.D. (1993): A rhyolite flow dome in the upper Hazelton Group, Eskay Creek area; Geological Fieldwork 1992, British Columbia Ministry of Energy, Mines and Petroleum Resources, Geological Fieldwork 1992, Paper 1993-1, p.331-334

Bobyn, M.G. (1991): Summary report on geological mapping, prospecting, and geochemistry of the Cal 1-4 Claim Group; British Columbia Ministry of Energy and Mines, Assessment Report 20,998, 10p

Breitsprecher, K. and Mortensen, J.K. (2004): BCAge 2004 - a database of isotopic age determinations for rock units in British Columbia; British Columbia Ministry of Energy and Mines, Geological Survey, Open File 2004-3

Campbell, T., Savell, M. and Wong, T. (1990): Geological geochemical and geophysical report on the Ball Creek property; British Columbia Minstry of Energy and Mines, Assessment Report 20,617, 15p

Evenchick, C.A. (1991): Jurassic stratigraphy of east Telegraph Creek and west Spatsizi map areas, British Columbia; in Current Research, Part A, Geological Survey of Canada, Paper 91-1A, p.155-162

Evenchick, C.A., Poulton, T.P., Tipper, H.W. and Braidek, I. (2001): Fossils and facies of the northern two-thirds of the Bowser Basin, British Columbia; Geological Survey of Canada, Open File Report 3956, 103p

Evenchick, C.A., Hayes, M.C., Buddell, K.A. and Osadetz, K.G. (2002): Vitrinite and bitumen reflectance data and preliminary organic maturity model for the northern two thirds of the Bowser and Sustut basins, north-central British Columbia; Geological Survey of Canada, Open File Map 4343, scale 1:250,000

Evenchick, C.A. and McNicoll, V.J. (2002): Stratigraphy, structure, and geochronology pf the Anyox Pendant, Northwest British Columbia, and implications for mineral exploration; Canadian Journal of Earth Sciences, 39: p.1313-1332

Evenchick, C.A. and Thorkelson, D.J. (in press): Geology of the Spatsizi River map area, North-central British Columbia; Geological Survey of Canada, Bulletin 577

Friedman, R.M. and Ash, C.A. (1997): U-Pb age of intrusions related to Porphyry Cu-Au mineralisation in the Tatogga Lake area; British Columbia Ministry of Employment and Investment, Geological Fieldwork 1996, Paper 1997-1, p.291-297

Gunning, M.H. (1996): Definition and interpretation of Paleozoic volcanic domains, Northwestern Stikinia, Iskut River area, British Columbia; University of Western Ontario, Ph.D. thesis, 388p

Kaip, A.W. (1997): Geology, alteration and mineralization on the Hank property, Northwestern British Columbia: a near-surface, low-sulfidation epithermal system; University of British Columbia, M.Sc. Thesis, 198p

Lefebure, D.V. and Fournier, M.A. (2000): Platinum group element mineral occurrences in British Columbia; British Columbia Ministry of Energy and Mines, Geofile Map 2000-2, scale 1:2,000,000

Lett, R. and Jackaman, W. (2004): New exploration opportunities in the B.C. regional geochemical survey database; British Columbia Ministry of Energy and Mines, Geological Fieldwork 2003, Paper 2004-1

Logan. J.M., Koyanagi, V.M. and Drobe, J.R (1990): Geology and Mineral Occurrences of the Forrest Kerr – Iskut River Area (104B/15); British Columbia Ministry of Energy Mines and Petroleum Resources, Open File Map 1990-2, scale 1:50,000

Logan. J.M., Drobe, J.R. and Elsby, D.C. (1992): Geology, Geochemistry and Mineral Occurrences of the More Creek Area, Northwestern British Columbia (104G/2): British Columbia Ministry of Energy, Mines and Petroleum Resources, Open File 1992-5

Logan, J.M. and Drobe, J.R. (1993): Geology of the Mess Lake Area, Northwestern British Columbia (104G/7W); British Columbia Ministry of Energy, Mines and Petroleum Resources, Open File 1993-6

Logan, J.M., Drobe, J.R., Koyanagi, V.M. and Elsby, D.C. (1997): Geology of the Forest Kerr - Mess Creek Area, Northwestern British Columbia (104B/10,15 & 104G/2 & 7W), British Columbia Ministry of Employment and Investment, Geoscience Map 1997-3, scale 1:100 000

Logan, J.M., Drobe, J.R. and McClelland, W.C. (2000): Geology of the Forest Kerr - Mess Creek Area, Northwestern British Columbia (104B/10,15 & 104G/2 & 7W); British Columbia Ministry of Energy and Mines, Bulletin 104, 164p

MacDonald, J.A., Lewis, P.D., Thompson, J.F.H., Nadaraju, G., Bartsch, R.D., Bridge, D.J., Rhys, D.A., Roth, T., Kaip, A., Godwin, C.I. and Sinclair, A.J. (1996): Metallogeny of an early to middle Jurassic Arc, Iskut River area, Northwestern British Columbia; Economic Geology, 91:6, p.1098-1114

Massey, N.W.D. (1999a): Potential for subaqueous hot-spring (Eskay Creek) deposits in British Columbia; British Columbia Ministry of Energy and Mines, Open File Map 1999-14, scale 1:2,000,000

Massey, N.W.D. (1999b): Volcanogenic massive sulphide deposits in British Columbia; British Columbia Ministry of Energy and Mines, Open File Map 1999-2, scale 1:2,000,000

Operation Stikine (1957): Stikine River area, British Columbia (104A, B, G, H, I, J). Map 9-1957

Panteleyev, A. (1975): Mary; in Geology in British Columbia, British Columbia Ministry of Mines and Petroleum Resources, p.G81-G85

Read, P.B., Brown, R.L., Psutka, J.F., Moore, J.M., Journeay, M., Lane, L.S. and Orchard, M.J. (1989): Geology, More and Forest Kerr Creeks (parts of 104B/10,15,16 & 104G/1, 2), Northwestern British Columbia; Geological Survey of Canada, Open File 2094

Ricketts, B.D. and Evenchick, C.A. (1991): Analysis of the middle to upper Jurassic Bowser Basin, Northern British Columbia; in Current Research, Part A, Geological Survey of Canada, Paper 91-1A, p.65-73

Roth, T. (2002): Physical and chemical constraints on mineralization in the Eskay Creek deposit, northwestern British Columbia: evidence from petrography, mineral chemistry, and sulfur isotopes; University of British Columbia, Ph.D. Thesis, 401p

Schmitt, H.R. (1977): Triassic - Jurassic granodiorite monzodiorite pluton southeast of Telegraph Creek, B.C. University of British Columbia, B.Sc. thesis, 79p

Schroeter, T.G. and Pardy, J.W. (2004): Lode gold production and resources in British Columbia; British Columbia Ministry of Energy and Mines, Open File 2004-1

Simpson, K.A. and Nelson, J.L. (2004): Preliminary interpretations of mid-Jurassic volcanic and sedimentary facies in the East Telegraph Creek map area; Geological Survey of Canada, Current Research 2004-A1, 8p

Souther, J.G., 1972: Telegraph Creek map-area, British Columbia; Geological Survey of Canada, Paper 71-44