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STRATIGRAPHIC NOTES FROM THE ISKUT-SULPHURETS PROJECT AREA (104B)

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KEYWORDS: Regional geology, stratigraphy, Stikine assemblage, Stuhini Group, Hazelton Group, Texas Creek intrusive suite.

INTRODUCTION

The Iskut-Sulphurets project (Figure 1-13-1) completed its final field season with an abbreviated program of fill-in mapping and examination of major mineral properties. This report emphasizes stratigraphic revisions based on the mapping and on new fossil identifications.

PREVIOUS AND CURRENT WORK

The list of published geological reports on the Iskut-Sulphurets gold camp continues to grow. The regional geologic framework has been presented by Anderson (1989), Anderson and Thorkelson (1990) and Anderson and Bevier (1990). The geology and mineralization of the Sulphurets, Unuk and Snippaker areas have been described in maps and reports by Alldrick and Britton (1988), Alldrick *et al.* (1989, 1990), Britton and Alldrick (1988), Britton *et al.* (1989, 1990b). Maps and reports of contiguous areas include Alldrick (1985, 1987), Read *et al.* (1989) and Logan *et al.* (1990a, b). There are detailed geologic maps of the Bronson Creek – Johnny Mountain area by Lefebure and Gunning (1989) and Fletcher and Hiebert (1990). Published mineral deposit descriptions include the E&L nickel prospect (Hancock, 1990), the Colagh prospect (MacLean, 1990), the recent discoveries at Eskay Creek (Britton *et al.*, 1990a), and skarns (Ray and Webster, 1991, this volume). New galena-lead isotope data from many deposits of this region are presented in Godwin *et al.* (1991, this volume).

In addition to these reports are rock and stream-sediment geochemical data (Lefebure and Gunning, 1988, 1989; National Geochemical Reconnaissance, 1988), MINFILE descriptions of 360 mineral occurrences, and more than 225 assessment reports now in the public domain.

The Geological Survey of Canada will continue regional mapping of the Iskut River sheet (104B) under the direction of R.G. Anderson. In July, 1990 the recently established Mineral Deposit Research Unit began studies of the major mineral deposits in the Iskut-Sulphurets camp, including Sulphurets, Kerr, Eskay Creek, Snip and Johnny Mountain.

Our 1990 field area extended from Mount Verrett in the northwest to McQuillan Ridge in the southeast, mainly between Snippaker and Harrymel creeks (Figure 1-13-2). This area had been only briefly reconnoitred in 1988 and 1989 and there remained the task of correlating our units with those of adjacent map areas (Read *et al.*, 1989; Logan *et al.*, 1990b).

STRATIGRAPHIC NOMENCLATURE

Stratigraphic nomenclature in this part of the Intermontane Belt is evolving (Figure 1-13-3). Anderson (1989) defined the regional stratigraphic framework in terms of four tectonostratigraphic assemblages:

- Paleozoic Stikine assemblage;
- Triassic to Jurassic volcanic-plutonic arc complexes;
- Middle and Upper Jurassic Bowser overlap assemblage; and,
- Tertiary Coast plutonic complex.

The Paleozoic Stikine assemblage comprises three separate lithologic sequences deposited, respectively, in the Early Devonian, Mississippian and Early Permian. Lithologies include coralline limestone, chert, mafic to felsic volcanic and volcaniclastic rocks, and derived sediments. Of the four tectonostratigraphic assemblages this is the least well known. None of its sequences has been named, nor have contact relationships between them been defined.

Triassic and Jurassic arc rocks are divided into two main groups: the Upper Triassic Stuhini (Takla) Group and the Lower (to Middle) Jurassic Hazelton Group. Read *et al.* (1989) identified Middle Triassic rocks that may represent a third, as yet unnamed group. Lower to Middle Jurassic rocks (basinal sediments and distal tuffs) mark the end of arc volcanism.

[Note: Before the early 1980s Takla was the usual name for Triassic strata in the project area (Grove, 1986). Since then the term Stuhini has become more common. The Stuhini Group was first defined by Kerr in 1948; the Takla, by Armstrong in 1949. The groups comprise Upper Triassic strata that fringe the Bowser basin. As terrane concepts emerged and became entrenched in the literature, a new convention has developed. Stuhini is now the preferred term for Triassic strata west of the Cache Creek Terrane (*i.e.* in Stikinia). Takla is used for similar strata east of the Cache Creek Terrane (*i.e.* in Quesnellia). There is little difference in age, lithology, rock associations or chemistry between the two groups.]

The overlap assemblage of basinal marine and nonmarine sedimentary rocks is the Middle to Upper Jurassic Bowser Lake Group.

The Tertiary Coast plutonic complex is mostly granitic intrusive rocks but includes some (probably older) metamorphic rocks and tectonites that have been exhumed by rapid uplift and erosion.

Regional mapping has added refinements to this simple scheme. The Upper Triassic Stuhini Group has not yet been divided into formations but Anderson and Thorkelson

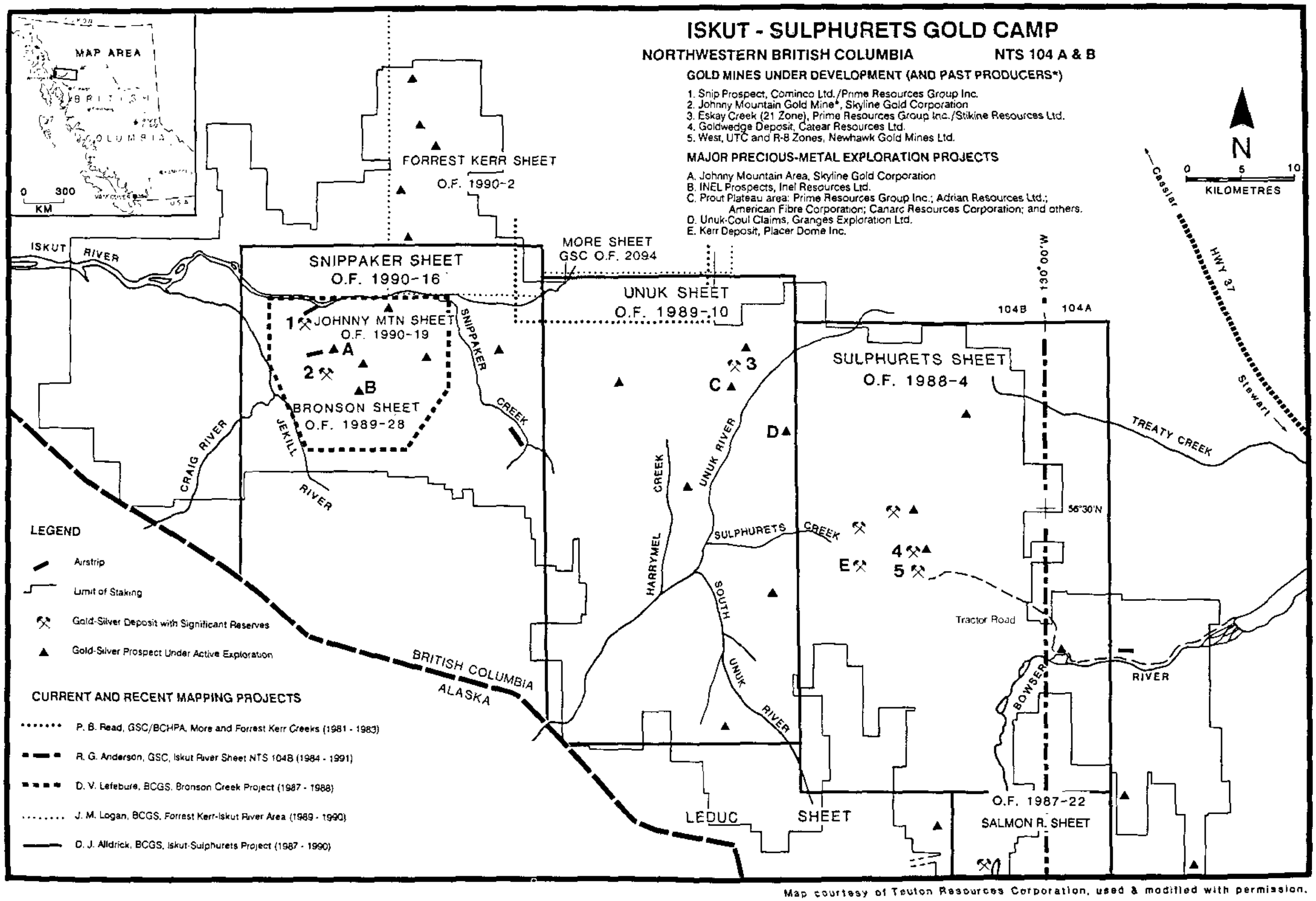

Figure 1-13-1. Iskut-Sulphurets gold camp: precious metal deposits and current mapping projects.

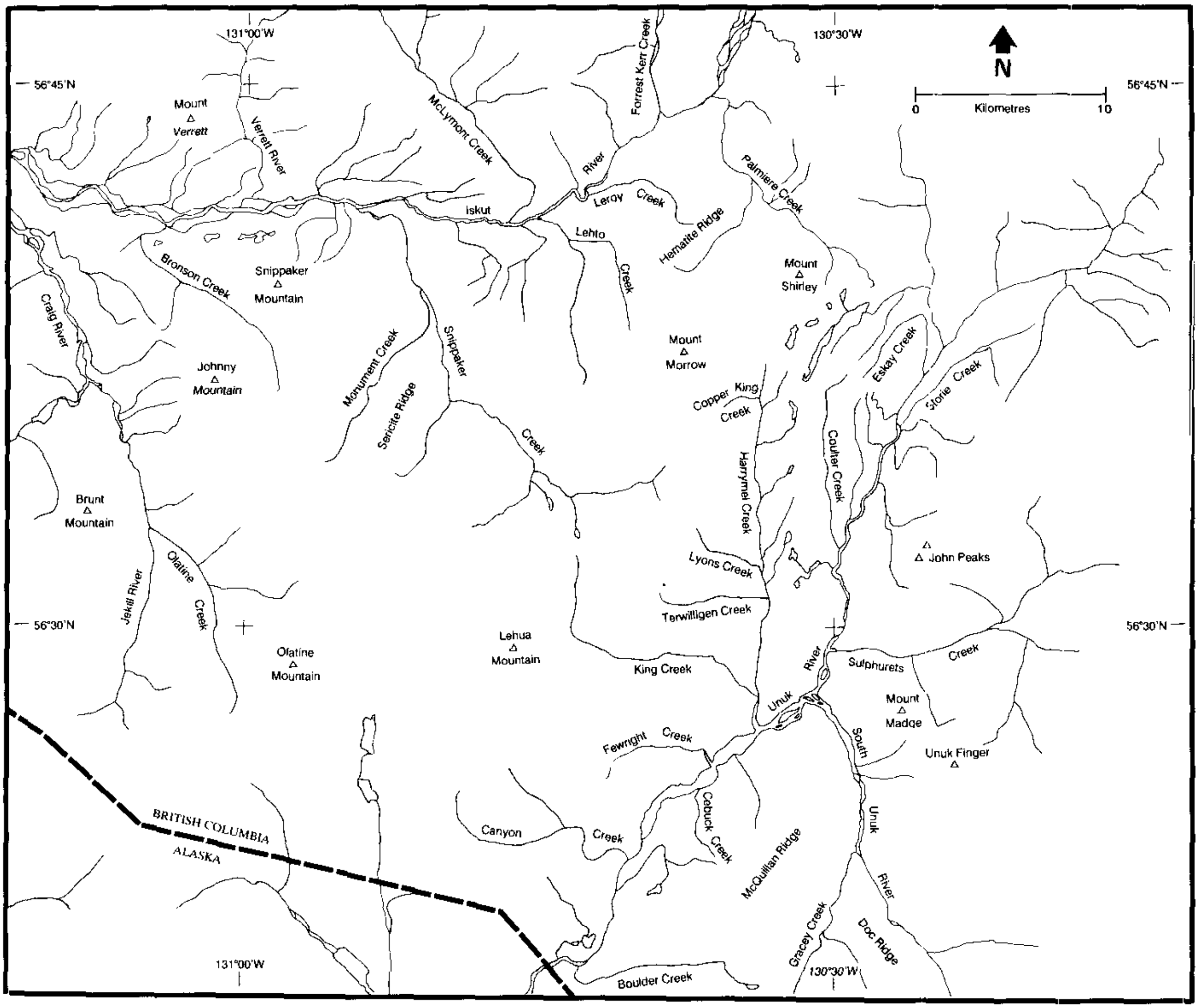

Figure 1-13-2. Location map for areas discussed in the text.

(1990) discuss this group in terms of unnamed eastern and western facies.

Only Jurassic strata (Hazelton and Bowser Lake groups) have been divided into named formations, most of which are not yet formally defined. The lowermost strata of the Hazelton Group are mainly volcanic or volcanogenic units. In order of decreasing age these have been divided into the Unuk River, Betty Creek and Mount Dilworth formations. Upper Lower Jurassic basinal sediments and distal tuffs (the Salmon River formation) follow the end of arc volcanism. Because rocks of the Salmon River formation are transitional between mostly volcanic Hazelton Group and the wholly sedimentary Bowser Lake Group they have been treated differently by different authors. Some consider them part of the Hazelton Group, others part of the Bowser Lake Group, still others part of the Spatsizi Group [defined by Thomson *et al.* (1986) in an area 160 kilometres to the northeast]. Because of lithological similarities and the difficulty of defining the upper boundary of the Salmon River formation it may be best to include it as a basal formation of the Bowser Lake Group. So far, the only basal formation of this group that has been recognized is the Ashman.

MOUNT VERRETT/HEMATITE RIDGE

North and south of the Iskut River, extending from the southern flank of Mount Verrett to Snippaker, Lehto and Leroy creeks, are thick, monotonous sequences of massive andesitic tuffs and flows, locally with clasts and lenses of limestone, and interbeds of siltstone and wacke. Correct stratigraphic assignment of these rocks remains an unresolved problem, it creates the most noticable difference between various geological maps published to date.

Based on lithostratigraphic correlations the rocks have been variously assigned to Jurassic Hazelton Group (Grove, 1986; Alldrick *et al.*, 1989), Triassic Stuhini Group (Lefebure and Gunning, 1989; Alldrick *et al.*, 1990) and Paleozoic Stikine assemblage (Read *et al.*, 1989; Logan *et al.*, 1990b). As stratigraphic correlations have been

PERIOD	FORMATION	GROUP
MIDDLE JURASSIC	ASHMAN	BOWSER LAKE
190 Ma		
LOWER JURASSIC	SALMON RIVER	HAZELTON
	MOUNT DILWORTH	
	BETTY CREEK	
	UNUK RIVER	
210 Ma		
UPPER TRIASSIC		STUHINI
230 Ma		
MIDDLE TRIASSIC		
245 Ma		
PERMIAN		STIKINE ASSEMBLAGE
285 Ma		
320 Ma		
MISSISSIPPIAN		
360 Ma		
DEVONIAN		

Figure 1-13-3. Simplified table of formations for the Iskut-Sulphurets project area.

developed north of the Iskut and extended south (*e.g.* by P.B. Read, J.M. Logan and others) the tendency has been to place them in the Paleozoic. Based on correlations developed to the south and extended north they can be fitted without difficulty into Mesozoic sequences. If nothing else, these rocks serve as an object lesson in the limitations of lithostratigraphic correlation. To date the limestones have proven to be barren of conodonts and carry only rare, nondiagnostic crinoid fragments.

Hard evidence for a Paleozoic age for some of these rocks comes from three Early Permian fossils found by Read *et al.* (1989) 5 kilometres south of the confluence of Forrest Kerr Creek and Iskut River, on the northeast end of "Hematite Ridge" (Unit "Ptf" of Read *et al.*, 1989). Previously they were mapped as Lower Jurassic Hazelton Group (Unit "3a" of Alldrick *et al.*, 1989). Hematite Ridge was re-examined this year and found to be very complexly faulted. The fossil-bearing strata occur both structurally above and below a volcanic conglomerate unit assigned to the Stuhini Group (Unit "Trs" of Read *et al.*, 1989). The fossil locations were resampled for conodonts and it is hoped these samples will help resolve the apparent discrepencies.

Read *et al.* (1989) also assigned andesitic volcanics to the Paleozoic on the basis of greater structural deformation, such as zones of foliation or widespread phyllite, that appear to be lacking in younger sequences. On these grounds rocks near Lehto Creek were assigned to the Upper Permian. Phyllonitic to mylonitic zones are fairly common along the major faults and splays off them. Given the abundance of faults in the area, rock fabric is at best an equivocal criterion for dating the rocks.

Lithostratigraphic association can also provide some help in assigning a relative age.

A body of coarsely recrystallized limestone, 200 metres thick, on the east side of Mount Verrett, may correlate with a Permian limestone marker (Kerr, 1948) that occurs near the top of the Paleozoic succession. If so the Mount Verrett limestone may mark the Permo-Triassic boundary at Verrett Creek. The unit strikes northerly and dips moderately to steeply to the west. Beneath it are mixed sediments and andesitic tuffs of probable Early Permian age, above it similar lithologies of probable Triassic age. The principal difference between andesites above the limestone and those below it is that the former have more prominent feldspar phenocrysts (A. Travis, personal communication, 1990). Minor limestone lenses also seem less abundant above the marker.

Farther east, near Snippaker and Lehto creeks, andesitic rocks locally have pyroxene phenocrysts and are generally unfoliated, except near faults or shears. In some exposures they appear to be immediately overlain by dated Lower Jurassic strata. For these reasons they are more likely part of the Stuhini Group than the Paleozoic Stikine assemblage.

SERICITE RIDGE

The tentative identification of *Weyla* (H.W. Tipper, personal communication, 1990) suggests an Early Jurassic age for a sequence of wackes and siltstones that crop out near the northern end of Sericite Ridge. These sediments can be assigned to the Hazelton Group. Structurally beneath them are thin pyroxene-porphyritic andesitic tuffs that, on the basis of phenocryst association, may be part of the Late Triassic Stuhini Group.

Monument Creek valley, especially its lower slopes along Monument and Pyramid glaciers, is underlain by quartz-poor monzonitic to dioritic intrusive rocks, locally with coarse potassium feldspar phenocrysts. These resemble an Early Jurassic (189 to 195 Ma) suite of plutons that includes the Texas Creek, Mitchell Glacier and McLymont Creek plutons (Anderson and Bevier, 1990) and may include the Lehto pluton (Britton *et al.*, 1989). Important base and precious metal deposits are spatially associated with these intrusives and a genetic link seems probable. The extensive gossans found on Sericite Ridge, Pyramid Hill and Khyber Pass (and perhaps the Inel property) are developed in volcanic and sedimentary rocks that form a roof over relatively fresh monzodiorite stocks and are probably caused by these intrusions. The Lehto pluton has also generated several small skarns (Ray and Webster, 1991, this volume).

NICKEL MOUNTAIN

Black, thinly bedded siltstone and shale cap the western slopes of Nickel Mountain in upper Snippaker Creek. Fossils collected in 1989 include an ammonoid of late Early Jurassic age (probably middle Toarcian; H.W. Tipper, personal communication, 1990). These sediments have been intruded by small olivine and pyroxene-bearing gabbro plugs that host the E&L nickel-copper deposit (Hancock, 1990). Fossil data thus confirm a post-Early Jurassic age of intrusion and sulphide mineralization. These gabbroic plugs are the youngest mafic plutons in the map area (apart from basaltic dikes related to Pleistocene and Recent volcanism: Stasiuk and Russell, 1990). Well dated Middle Jurassic plutons are not common in the Iskut area (Anderson and Bevier, 1990). Magmatism of that age (175-180 Ma) may have a mainly volcanic expression in the pillow lavas of the Eskay Creek facies of the Salmon River formation, of Anderson and Thorkelson (1990).

The northeast quarter of NTS 104B (National Geochemical Reconnaissance, 1988) is an area mostly underlain by Toarcian and younger siltstones and shales of the Salmon River formation and Bowser Lake Group. Regional stream-sediment samples collected in this area have consistently higher nickel values than the rest of the sheet. The source of the nickel is not known but could be nickeliferous plugs intruded into this stratigraphic level.

WEST OF HARRYMEL CREEK

Immediately west of Harrymel Creek, from the outflow of Copper King Glacier south to Fewright Creek, is a thick sequence of mainly fine-grained siliciclastic sedimentary rocks locally with thin to thick limestones and minor dacitic and andesitic tuffs. Both Late Triassic and Early Jurassic fossils have been reported from this sequence.

Smith and Carter (1990) reported Early Jurassic (upper Pliensbachian, Kunae zone) fauna from a sequence of black siltstones and shales overlying a rusty buff limestone-mudstone unit, 180 metres thick, that in turn overlies red and green mottled polymictic conglomerate. Along strike to the north, a Late Triassic (probably Carnian) fauna was documented in 1961 (E.T. Tozer in Grove, 1986). To the south, in tan-weathering fine-grained wackes and coarse polymictic conglomerate (with pyroxene porphyry and rare limestone clasts) another probable Triassic fauna was found this year (H.W. Tipper, personal communication, 1990). Higher in the section the sediments give way to unfossiliferous dacitic pyroclastic rocks, including airfall tuffs.

The importance of these fossil discoveries is that they demonstrate a conformable, possibly even gradational transition between the Stuhini and Hazelton groups. East of the Unuk River, between Storie and Treaty creeks, a similar contact relationship has also been described (Britton *et al.*, 1989; Anderson and Thorkelson, 1990). More commonly this contact is a marked unconformity (Anderson, 1989).

McQUILLAN RIDGE

On ridges south of the confluence of Unuk and South Unuk rivers (McQuillan and Doc) a thick sequence of andesitic tuffs, tuffaceous siltstones and limestone lenses were included as part of the Hazelton Group (Unuk River formation; Alldrick *et al.*, 1989). Dating of crosscutting dioritic stocks indicates that they are all at least Late Triassic or older (about 221 and 226 Ma; Anderson and Bevier, 1990). In keeping with the current convention of including

Plate 1-13-1. Coarse hornblende-phyric andesite tuff of the Stuhini Group, near Cebuck Creek on McQuillan Ridge. X-ray diffractometer analysis indicates the phenocrysts are ferroan magnesio-hornblende.

Upper Triassic rocks in the Stuhini Group and Lower Jurassic rocks in the Hazelton Group, all these rocks should be assigned to the Stuhini Group.

Dips of strata on McQuillan Ridge appear to define a broad syncline with a northerly trending axis. From oldest to youngest the lithologic sequence is: metasiltstone and fine-grained meta-andesite tuff; foliated to gneissic andesite with minor siltstone; foliated to layered andesitic ash and lapilli tuff intercalated with siltstone and thin limestone lenses up to 10 metres thick; overlain by andesitic to dacitic ash and lapilli tuff, commonly with hornblende and pyroxene phenocrysts. Hornblende phenocrysts increase in abundance up-section and are locally very coarse (Plate 1-13-1).

Metamorphic fabrics increase down-section and have been attributed to thermal effects of the Coast plutonic complex which occupies the southern end of McQuillan Ridge, or to numerous faults. There appears to be a marked change in deformational intensity between the hornblende-pyroxene-phyric pyroclastics above and mixed andesite-siltstone-limestone sequence below. In view of the observation of widespread phyllite in Permian and older rocks (Read *et al.*, 1989) the possibility remains that these rocks are part of the Paleozoic Stikine assemblage.

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