GEOLOGY OF THE LAMPREY CREEK MAP SHEET (93L/3)

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KEYWORDS: Regional geology, Jurassic stratigraphy, Hazelton Group, Telkwa Formation, structure, Skeena Group, Mount Ney volcanics, Kasalka Group, Ootsa Lake Group, Thautil River sediments, Buck Creek volcanics, Bulkley intrusions, Topley intrusions.

INTRODUCTION

This report discusses the geology and mineral occurrences of the Lamprey Creek map area (93L/3). These observations are based on 1:50 000 mapping conducted as part of the Telkwa project (Figure 1-11-1) in 1990. The project area includes the Babine and Telkwa ranges; approximately six 1:50 000 scale-map sheets have now been completed.

REGIONAL GEOLOGIC SETTING

The project area is located within the Stikine Terrane, a collage of Jurassic, Cretaceous and Tertiary magmatic arcs and related successor basins (MacIntyre *et al.*, 1989). Mineral deposits are associated with Late Triassic to Early Jurassic , Middle to Late Cretaceous and Eocene granitic intrusions (Carter, 1981). The most economically important exploration targets are porphyry copper and molybdenum deposits and related mesothermal and epithermal precious metal veins. A few small massive sulphide occurrences have also been discovered.

TECTONIC HISTORY

The geologic history of the project area can be traced from Early to Middle Jurassic time when the area was part of the regionally extensive Hazelton calcalkaline island arc. From late Middle Jurassic to Early Cretaceous time thick deposits of molasse derived from an uplifted Skeena arch and Omineca crystalline belt were deposited in fault-controlled basins. A major plate collision in Middle Cretaceous time resulted in uplift of the Coast Range and extensive folding of rocks to the east. Debris was shed eastward across the area from the rising metamorphic-plutonic complex and this was followed by the growth of a north-trending Andean-type volcanic arc in Middle to Late Cretaceous time. A transtensional tectonic regime in Late Cretaceous to Early Tertiary time produced the basin-and-range geomorphology that controls the current pattern of the map area. The latest tectonic event appears to be northeast shearing and tilting of fault blocks to the southeast. This shearing has offset earlier northwest-trending grabens and horsts (MacIntyre *et al.*, 1989).

LITHOSTRATIGRAPHY OF THE STUDY AREA

The generalized geology of the Lamprey Creek area is shown in Figure 1-11-2. In this area Early Jurassic to Tertiary volcanic and sedimentary rocks are preserved in a series of north-trending grabens and horsts. The youngest rocks are Miocene and crop out as a northwest-trending ridge east of Nanika Mountain. Tertiary sediments are preserved within the north-trending Thautil River graben which follows the southern reaches of the Thautil River and continues south to the Morice River. Inliers of Eocene Ootsa Lake

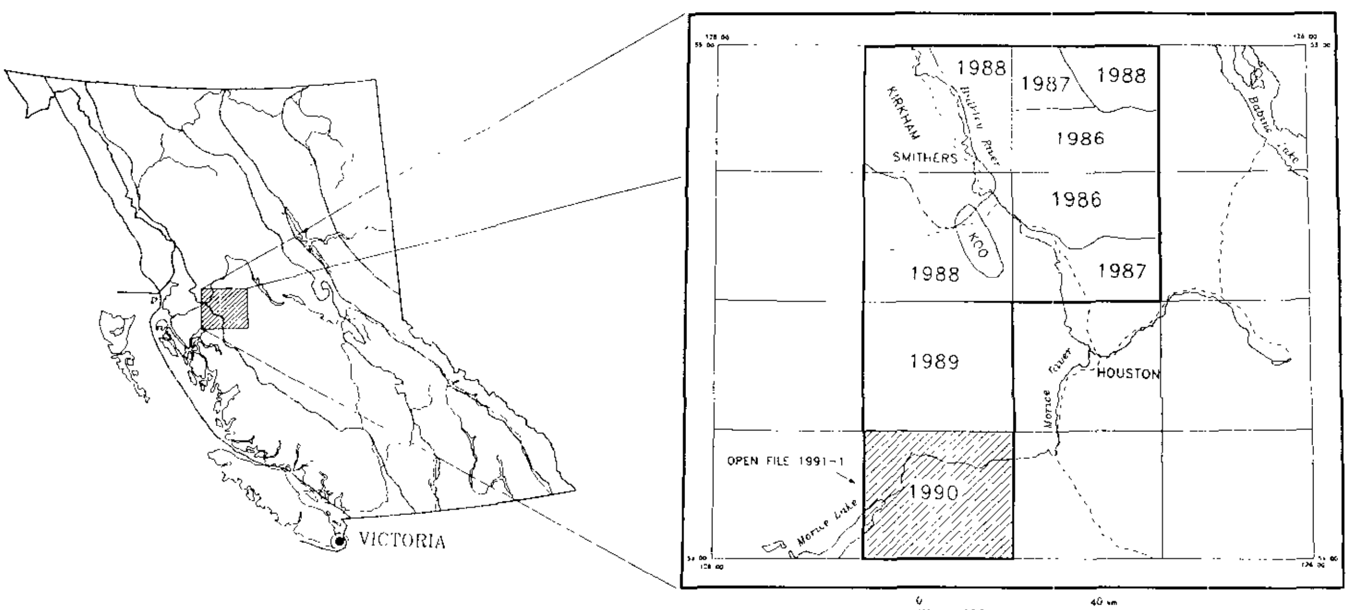

Figure 1-11-1. Location of the Lamprey Creek map sheet, (NTS 93L/3) relative to the area covered by the Babine and Telkwa projects to date.

LAYERED ROCKS

EOCENE TO OLIGOCENE

ENDAKO GROUP

EO_B	*Buck Creek volcanics: basalt flows (olivine-phyric), columnar-jointed, amygdaloidal basalt, breccia*

PALEOCENE TO EOCENE

PEs	*Thautil River sediments: heterolithic, poorly sorted conglomerate, sandstone, siltstone, minor coal, wood fragments; biotite phyric Ootsa Lake clasts*

OOTSA LAKE GROUP

EO	*rhyolite to dacite flows and tuffs, layered, light grey, pink to chalky white, typically biotite-phyric, flow banded; local basalt flows; felsic biotite bearing lapilli, crystal and lithic tuff; minor breccia*

UPPER CRETACEOUS

KASALKA GROUP

uKK	*hornblende-feldspar and hornblende-biotite-feldspar porphyry flows; lapilli and crystal tuff; lahar of andesitic composition*

LOWER CRETACEOUS (ALBIAN)

SKEENA GROUP

lKs	*sandstone, siltstone, shale, micaceous greywacke, coal bearing*
lKv	*Mount Ney volcanics: andesitic flows, grey, porphyritic, thin platy plagioclase, amygdaloidal*

LOWER JURASSIC (SINEMURIAN TO TOARCIAN)

HAZELTON GROUP

lJT	*Telkwa Formation: undivided andesite, dacite, rhyolite, basalt, flows and pyroclastics*
lJTd	*Shallow marine sedimentary unit: well-bedded limestone, calcareous sandstone, siltstone; interbedded with epiclastics and air-fall tuff; fossiliferous; may be early facies of Nilkitkwa Formation*
lJTc	*Siliceous pyroclastic facies: well-bedded quartz-feldspar-phyric ash flows, ignimbrite, breccia, siliceous air-fall tuff, red tuff, basalt, rhyolite flows.*
lJTb	*Basaltic flow facies: massive maroon to green augite-feldspar-phyric to aphyric basalt flows; minor maroon tuff between flows; flow-top breccia common; locally amygdaloidal*
lJTa	*Andesitic pyroclastic facies: andesitic air-fall tuff, breccia, feldspathic epiclastics, minor welded lapilli tuff*

INTRUSIVE ROCKS

EOCENE

Erh	*Rhyolite intrusions: biotite-phyric felsic intrusives*
En	*Nanika intrusions: porphyritic quartz monzonite, hornblende-quartz-biotite-feldspar porphyry*

LATE CRETACEOUS

Kg	*Bulkley intrusions: gr - undivided granitic intrusions; gd - granodiorite; dr - diorite; rh - rhyolite; fp - feldspar porphyry; hbqfp - hornblende-biotite-quartz-feldspar porphyry; qm - quartz monzonite*

EARLY JURASSIC

eJt	*Topley intrusions: undivided granitic intrusions*

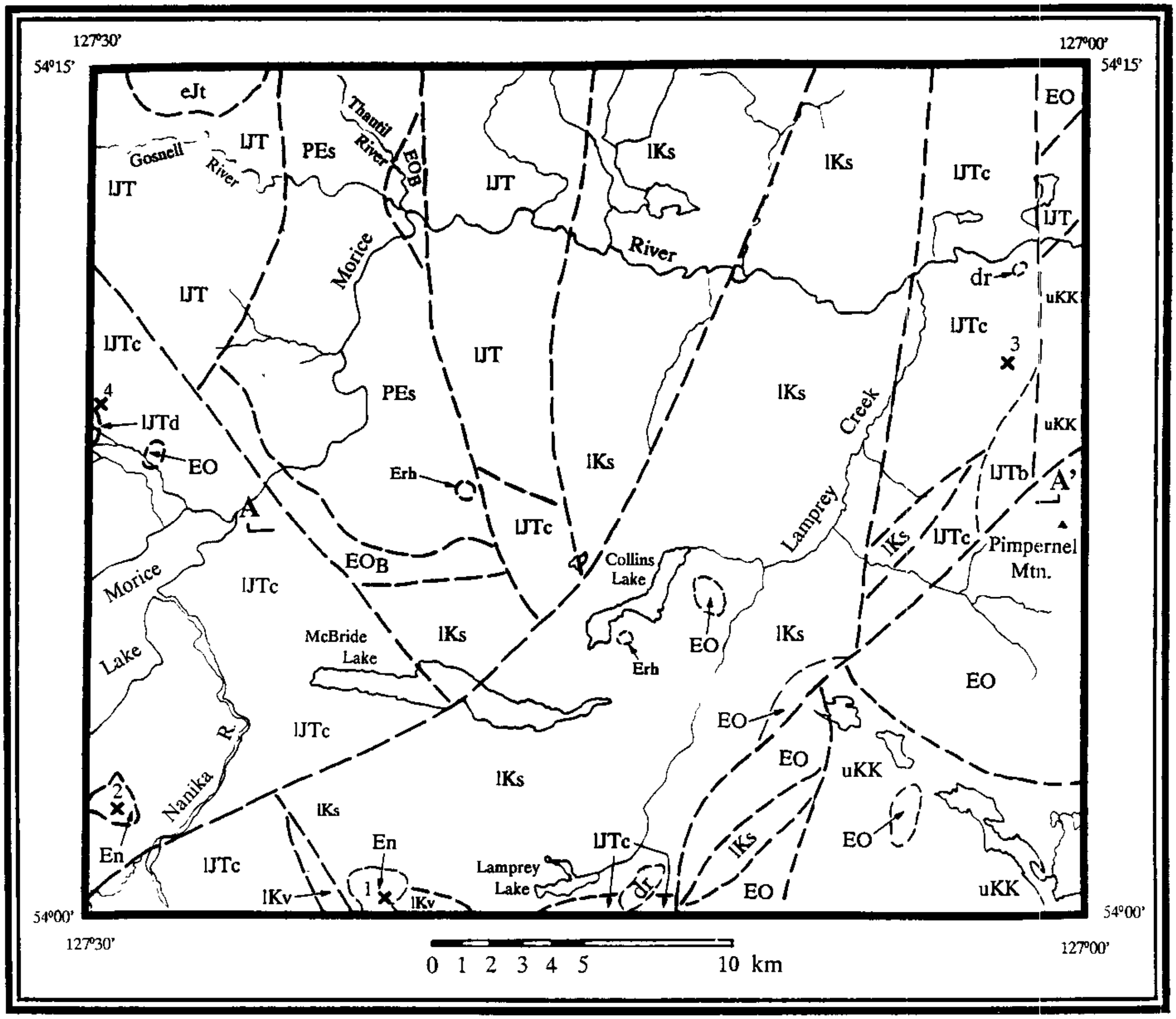

Figure 1-11-2. General geology of the Lamprey Creek area, (NTS 93L/3).

OCCURRENCE	NAME	MINFILE NO.
1	King	052
2	Lucky Ship	053
3	Hagas	221
4	Fire Lookout	309

volcanics occur in the southeast part of the map area where they overlie Upper Cretaceous Kasalka Group volcanic rocks. Similar relationships occur northeast of Morice Lake. Lower Cretaceous sediments are exposed in the Chisholm Lake area and extend to the area south of McBride Lake. Lower Jurassic volcanics crop out on the eastern border and southwest corner of the map area, and just east and south of Morice River. A generalized stratigraphic column is shown in Figure 1-11-3.

Hazelton Group

The Hazelton Group (Leach, 1910) is a calcalkaline island-arc assemblage that evolved in Early to Middle Jurassic time. Tipper and Richards (1976) divide the group into three major formations in the Smithers map area (93L). These are the Sinemurian to early Pliensbachian Telkwa Formation, the early Pliensbachian to middle Toarcian Nilkitkwa Formation and the middle Toarcian to early Callovian Smithers Formation. Only the Telkwa Formation is found in the Lamprey Creek map area.

TELKWA FORMATION

In the Telkwa Range north of the study area, a thick section of Early Jurassic volcanic rocks constitutes the type area for the Telkwa Formation of the Hazelton Group (Tipper and Richards, 1976; Desjardins *et al.*, 1990). Here the

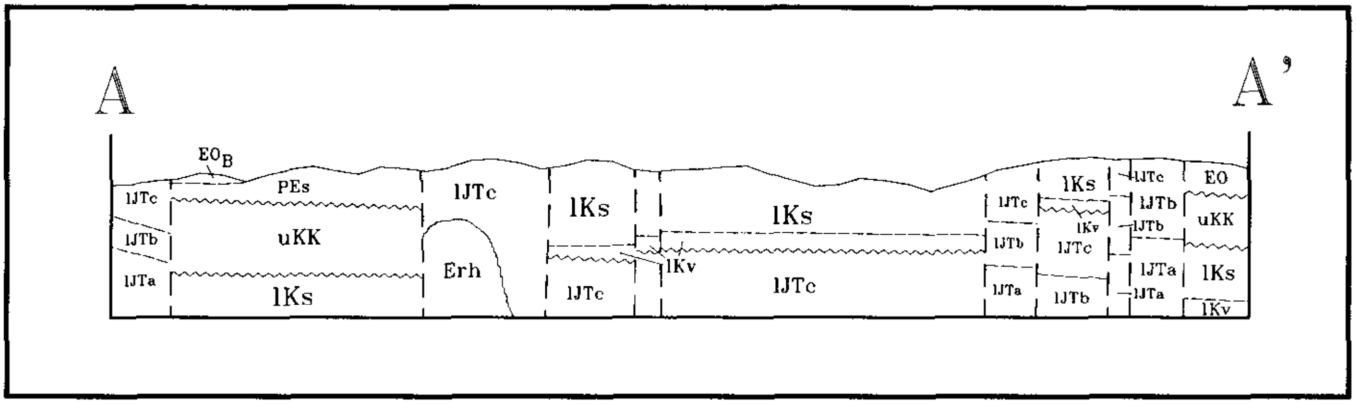

Figure 1-11-3. Cross-section showing typical structural style of the map area. *See* Figure 1-11-2 for location of section.

formation is predominantly subaerial and is mainly Sinemurian or older.

Mapping in the Telkwa range (Desjardins *et al.*, 1990) suggests the Telkwa Formation (lJT) is divisible into five major lithostratigraphic units, each representing distinct cycles of arc volcanism. These units are characterized by their predominant lithologies although internal facies variations are common. In ascending stratigraphic order they are: an andesitic pyroclastic unit comprised of thick-bedded, massive, maroon andesitic lapilli, crystal and ash tuffs with minor interbeds of siliceous, banded ash flows and grey, welded lapilli tuffs; a flow unit which is predominantly massive, cliff-forming, augite-feldspar-phyric to aphyric, dark green to maroon basalt; a siliceous pyroclastic unit that is well bedded and includes felsic epiclastics, welded lapilli tuffs, flow-banded ash flows, feldspathic breccias, pebble conglomerates, lahars, sandstones, air-fall lapilli and crystal-lithic tuffs; a marine sedimentary unit characterized by well-bedded, near-shore, fossiliferous limy sandstone, siltstone, conglomerate, grey bioclastic and massive limestone; and a recessive unit of well-bedded maroon to red crystal, lapilli and ash tuff and associated epiclastics with lesser flows of amygdaloidal augite-feldspar-phyric basalt. A similar stratigraphic sequence underlies the Middle Jurassic Smithers and Ashman formations on Ashman Ridge, 85 kilometres northwest of the map area. Only the siliceous pyroclastic (lJTc) and marine sedimentary (lJTd) units are recognized in the study area; other units of the Telkwa Formation are missing or not exposed.

Siliceous Pyroclastic Unit (lJTc)

Well-bedded lapilli tuffs, with lesser breccias and flows occur throughout the map area. This unit is typically well bedded and consists of a mixture of maroon and green lapilli tuffs, grey welded crystal and lapilli tuffs, minor feldspar-phyric flows, and minor green and maroon feldspathic volcanic-clast breccias. The siliceous pyroclastic unit is widespread within the Lamprey Creek map area but its thickness is unknown. Tuff breccias consisting mainly of angular felsic, minor irregular-shaped feldspar-phyric andesite and basalt clasts crop out north of McBride Lake. White-weathering, fine-grained angular rhyolite clasts up to 30 centimetres long, occur locally. Heterolithic lapilli tuffs with mainly felsic, minor maroon or green basalt and flow-banded clasts are also exposed. Minor augite-feldspar-phyric basalt flows occur here as well. Maroon lapilli tuffs with quartz crystal fragments are exposed just northwest of Tableland Mountain.

Marine Sedimentary Unit (lJTd)

Marine sedimentary strata with graded bedding and ripple marks are exposed near the top of Nanika Mountain, on the western margin of the map area. These rocks stratigraphically overlie and are in part interfingered with well-bedded siliceous pyroclastic rocks.

These sedimentary rocks are probably equivalent to the Sinemurian marine sedimentary unit (lJTd) recognized in the Telkwa Mountains north of the map area (Desjardins *et al.*, 1990).

Age of the Telkwa Formation

The Telkwa Formation is Sinemurian or older based on sporadic fossil fauna within the stratigraphic succession (Tipper and Richards, 1976). In the map area, which covers part of the Skeena arch, the granitic Topley intrusions cut the Telkwa Formation. These intrusions give K-Ar ages between 195 and 205 Ma (Carter, 1981). This is further evidence that the formation is predominantly Sinemurian or older. Fossils collected from the marine sedimentary unit (lJTd) in the Thautil River map area are early Sinemurian to early Pliensbachian in age (Desjardins *et al.*, 1990). No fossils were found in the study area, however.

Mount Ney Volcanics

In the Tahtsa Lake area amygdaloidal basalts conformably underlie Early Cretaceous marine turbidites of the Skeena Group (MacIntyre, 1985). These volcanics are well exposed on the east flank of Mount Ney and the name Mount Ney volcanics has been proposed. Rocks correlative with this unit were mapped by Diakow and Drobe (1989) in the northern half of the Newcombe Lake map area where they crop out on the north flank of Tableland Mountain. Here the characteristic lithology is an augite-feldspar-phyric basalt. This rock is dark green in colour and contains 10 to 15 per cent feldspar laths between 1 to 3 millimetres long.

Chlorite-altered augite crystals are 3 millimetres long and comprise 2 per cent of the rock. The rock is amygdaloidal and slightly magnetic.

Skeena Group

The Skeena Group (Leach, 1910) comprises interbedded marine and nonmarine sedimentary strata of an Early Cretaceous successor basin. West of Telkwa these rocks unconformably overlie the Telkwa Formation and contain important coal seams (Koo, 1984). The coal seams occur in upward-fining fluvial clastic sequences of conglomerate, sandstone, siltstone and mudstone.

Strata of the Skeena Group crop out in the middle of the map area from north of Chisholm Lake to south of McBride Lake. Here lithologies include massive sandstone, conglomerate, minor mudstone and siltstone. The predominant lithology is a fine-grained, equigranular, massive, blocky weathering sandstone. It is micaceous, commonly has concretions ranging from 4 to 30 centimetres in diameter, and weathers reddish brown. Crossbedding and wisps of organic matter occur locally, particularly north of McBride Lake. Elsewhere in the region, this unit contains Albian macrofossils, although fossils were not found in the study area.

Probable Early Cretaceous conglomerates crop out in a west-flowing tributary of Lamprey Creek approximately 3 kilometres north of Pimpernel Creek. The clasts in the pebble conglomerate are mainly feldspar-phyric andesite and siltstone averaging 8 centimetres across. The rock is clast-supported with a sandy matrix. Medium-grained, green micaceous sandstone crops out in the central area. This rock, which has a exfoliation weathering style, also contains concretions 4 to 30 centimetres in diameter. Minor mudstone, siltstone, and well-jointed micaceous sandstone with organic wisps paralleling bedding are exposed in the same area.

Upper Cretaceous Kasalka Group

The Kasalka Group is an informal name proposed by MacIntyre (1976) for an Upper Cretaceous volcanic succession that unconformably overlies the Skeena Group in the Tahtsa Lake area. The succession varies from early silicic to late mafic eruptive rocks that collectively represent a cauldron-forming eruptive cycle. Rocks lithologically similar to the Kasalka Group occur in the Tagetochlain Lake area of the Newcombe Lake map sheet where a comagmatic intrusion has been dated at 85 Ma (Diakow and Drobe, 1989). These same volcanics extend northward into the southeast corner of the Lamprey Creek map area. There are also small inliers north of McBride Lake and on Nanika Mountain.

The main Kasalka Group lithologies in the map area are porphyritic andesite, lapilli tuff, breccia, and crystal tuff. In

Plate 1-11-1. View looking east near Tagetochlain Lake. The white-weathering unit is bedded rhyolite flows of the Ootsa Lake Group.

the Tagetochlain Lake area, the flows are hornblende-biotite-feldspar-porphyritic andesites containing 15 to 40 per cent feldspar phenocrysts (4 to 15 millimetres) and 5 per cent hornblende plus or minus biotite phenocrysts (1 to 2 millimetres). Quartz-biotite-feldspar-phyric andesite flows, maroon crystal-lapilli tuffs containing irregular shaped angular volcanic clasts and feldspar crystal fragments, and tuff breccias with irregular shaped volcanic clasts are also present.

Ootsa Lake Group

The Ootsa Lake Group (Duffell, 1959) is a succession of continental calcalkaline volcanic rocks and less abundant sedimentary rocks. Recent mapping has recognized six lithologic divisions in the Whitesail Lake area. The volcanic members are differentiated andesites, dacites and rhyolites. The dacites and rhyolites are sporadic, extrusive flow and flow-breccia dome complexes while the andesite flows and tuffs are more extensive. Several dates determined in the Whitesail Lake area constrain the timing of volcanic eruptions. The Ootsa Lake volcanics erupted 50 million years ago for a period of 1 million years (Diakow and Mihalynuk, 1987). The volcanic succession is capped by a polymitic conglomerate similar to the one that crops out in the Thautil River graben on the Lamprey Creek map sheet.

Small inliers of predominantly flat-lying rhyolitic flows crop out in the Lamprey Creek area (Plate 1-11-1). These rocks are correlated with the Eocene Ootsa Lake Group based on lithology. Biotite-phyric rhyolite, biotite-feldspar-quartz-phyric dacite, feldspar-hornblende-phyric rhyolite, flow-banded rhyolite, rhyolitic tuff and dacitic tuff are exposed in the southeast corner of the map area. Purple welded rhyolite with biotite phenocrysts crops out just north of Tagetochlain Lake. Feldspar-phyric andesite with variable biotite phenocrysts occurs locally. This rock usually has a fine foliated texture. Feldspar-quartz-phyric dacite with minor biotite phenocrysts is common just south of Pimpernel Mountain.

Flow-banded feldspar-phyric rhyolite, biotite-phyric rhyolite and rhyolite tuffs crop out in the area near the head of Pimpernel Creek. The rhyolite has less than 1 per cent feldspar phenocrysts that are aligned parallel to the flow direction. This rock locally contains minor quartz crystals. Rhyolite flows may also contain up to 2 per cent biotite phenocrysts. Locally the flows are columnar jointed and bedded. The rhyolite tuff has 30 to 40 per cent subangular fragments ranging from 1 to 4 millimetres in length.

A dull greyish white dacitic tuff, with minor aligned hornblende crystal fragments, is exposed in the Tagetochlain Lake area. Dull grey to chalky white, well-banded feldspar-hornblende-phyric rhyolite crops out near Lamprey Lake.

Tuffs with felsic clasts and biotite crystal fragments are exposed east of Lamprey Creek and are also mapped as part of the Ootsa Lake Group. These rocks are locally strongly fractured and brecciated with minor jasper occurring between clasts. Biotite-feldspar-porphyritic andesite with chalcedonic veins and veinlets crops out north of McBride Lake.

Paleocene to Eocene Thautil River Sediments

Interbedded pebble conglomerate, sandstone and siltstone, with minor coal seams, crop out in the northwest quadrant of the map area, within the Thautil River graben. These rocks are correlated with the Paleocene to Eocene Thautil River sediments described in a previous report (Desjardins *et al.*, 1990). Exposures include a clast-supported heterolithic pebble conglomerate north of McBride Lake. Here clasts are feldspar-phyric andesite, amygdaloidal andesite, biotite-hornblende-feldspar-phyric andesite, maroon and red volcanics, and sandstone. Clasts range from 2 to 20 centimetres across, averaging 6 centimetres; the matrix is green sandstone. Semiconsolidated, clast-supported, heterolithic conglomerates with a fine to medium-grained, dirty sandstone to mudstone matrix crop out west of Morice River. Clasts are well rounded, range from 2 to 20 centimetres across and make up 60 to 75 per cent of the rock. Lithologies include trachyte with feldspar laths 2 to 6 millimetres long; biotite-phyric felsic intrusive; diorite; quartz-feldspar crystal tuff and green medium-grained sandstone. Well-bedded fine-grained black to dark green shale underlies the conglomerate. Bedding is laminar and defined by wispy partings. Wood fragments occur locally.

Lithologies similar to the Thautil River sediments also crop out in Gosnell River. Here beds of bright green to turquoise, medium-grained sandstone and medium-grained well-fractured siltstone, 30 to 50 centimetres thick, contain wood fragments, particularly near the top of the unit. Sandstone is interbedded with siltstone and laminar-bedded mudstone. The sandstone and siltstone beds are 50 centimetres thick. This unit is overlain by a thick bed of pebble conglomerate. The conglomerate contains lapilli tuff, augite porphyry, basalt, maroon tuff and sandstone clasts. A layer of coal 25 centimetres thick overlies an organic-rich mudstone.

Conglomerates in the Thautil River area contain 40 to 50 per cent clasts of mafic, biotite or hornblende-feldspar-phyric flows, ranging from 1 to 3 centimetres in diameter; feldspar-phyric, very magnetic basalt clasts, 2 to 8 centimetres in length; 10 to 15 per cent micaceous sandstone; and 2 to 5 per cent wood fragments. There are minor clasts of chlorite and calcite-filled amygdaloidal basalt. The matrix is coarse grained, grey, green and white. Locally 1 to 2-metre beds of medium to coarse-grained arkosic sandstone are interbedded in the conglomerate. The sandstone is mottled olive-green to white on fresh surfaces. Interbedded conglomerate, sandstone, siltstone, and very thin coal partings contain abundant wood fragments.

Some of the clasts in Thautil River conglomerates are tentatively recognized as specific older lithologies. Micaceous sandstone clasts are most likely from the Skeena Group; feldspar-phyric andesite clasts are probably from the Upper Cretaceous Kasalka Group.

Buck Creek Volcanics

Inliers of fine-grained dark green to black basalt crop out east of Nanika Mountain and in the Thautil River graben.

Fine-grained, black olivine-phyric basalt exposed on a ridge just east of Nanika Mountain, contains less than 1 per cent olivine crystals ranging from 2 to 3 millimetres in diameter. The rock is locally magnetic, columnar jointed and has less than 1 per cent feldspar crystals ranging from 3 to 4 millimetres long. Calcite veining occurs locally. Fine-grained, dark green basalt also occurs in the Morice River area. Locally it is amygdaloidal with contorted quartz veining and flow breccias. Amygdules are chlorite filled. Fine-grained, massive pyroxene-hornblende-phyric basalt crops out in the centre of the map area. Subhedral pyroxene and hornblende make up 3 to 4 per cent of the rock. Quartz crystals, 2 to 3 millimetres in diameter, comprise less than 1 per cent of the rock. Foliation with variable orientation and calcite-filled amygdules are present locally.

The Buck Creek flows are distinguished from the Lower Jurassic and the Upper Cretaceous volcanic rocks by their very fine grained texture, black to dark green colour, local columnar jointing and the presence of olivine phenocrysts.

INTRUSIVE ROCKS

Quartz monzonite (qm), granodiorite (gd), diorite (dr), granite (gr), feldspar porphyry (fp), hornblende-quartz-biotite-feldspar porphyry (hqbfp), and rhyolite (rh) intrusions are recognized within the Lamprey Creek map area. Few radiometric dates are available, but most intrusions are believed to be part of the Late Cretaceous Bulkley plutonic suite or Eocene Nanika plutonic suite (Carter, 1981).

A medium to coarse-grained equigranular granodiorite, which has a mafic phase, underlies the northwest corner of the map area. It is an extension of an intrusion mapped in the Holland Lakes area of the Thautil River map sheet (Desjardins *et al.*, 1990). The intrusion is locally weakly foliated and epidotized. Country rocks are hornfelsed.

A medium to coarse-grained green diorite with creamy white feldspar, characterized by partially chloritized hornblende and biotite, occurs in the northeast corner of the map area.

Medium-grained, green diorite or gabbro crops out near Lamprey Lake. Locally, this intrusion is fine to medium-grained with a green, white and pink mottled texture. Rocks near the contact have been hornfelsed.

A multiphase intrusion is exposed in the Lucky Ship area just east of Morice Lake. This intrusive complex includes a plug of mainly quartz feldspar porphyry and also a light grey porphyry containing feldspar, quartz and biotite phenocrysts in an aphanitic groundmass. These phases do not necessarily represent separate intrusions and age relationships are not known (Sutherland Brown, 1966).

A biotite plagioclase porphyry is exposed on Tableland Mountain. Plagioclase phenocrysts average 7 millimetres in length and make up 25 per cent of the rock; biotite averages 5 millimetres in diameter and comprises 10 per cent of the rock. Minor hornblende laths and quartz crystals occur locally. A K-Ar date on biotite yielded an age of 47.4±1.6 Ma (C.I. Godwin, unpublished data).

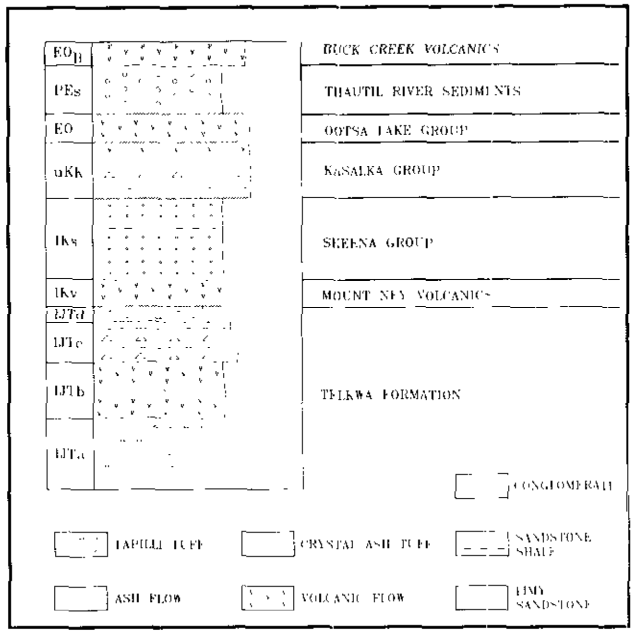

Figure 1-11-4. Generalized stratigraphic column for the map area. *See* legend, Figure 1-11-2 for explanation of symbols.

STRUCTURAL STYLE

The structural style of the Lamprey Creek map area is similar to that of the Telkwa Range (MacIntyre *et al.*, 1989). Extensive block faulting in Tertiary time produced a typical basin-and-range geomorphology (Figure 1-11-4). Brittle deformation and vertical tectonics has produced uplifted mountain blocks and broad, linear valleys. Although rarely exposed, bounding faults are probably normal and high angle; they typically follow the break in slope between valley floor and hillside. The regular, orthogonal pattern of block faults suggests an extensional regime resulting from domal uplift. Significant displacement is implied by juxtapositioning of Jurassic and Tertiary rocks. Uplifted areas are commonly cored by Upper Cretaceous to Paleocene plutons that intrude Lower Jurassic volcanics, whereas adjacent depressions are generally underlain by stratified, undeformed Cretaceous and Eocene rocks. Block faulting may have begun as early as the Jurassic and continued through to the Oligocene. Miocene plateau basalts are not disrupted by faulting.

MINERAL DEPOSITS

Mineral deposits in the Smithers area may be divided into four categories: (1) mesothermal and epithermal gold and silver-bearing quartz veins; (2) copper-silver veins and pods in mafic volcanic rocks; (3) copper-zinc-silver massive sulphide deposits associated with bimodal submarine volcanic rocks; and (4) porphyry copper-molybdenum deposits associated with monzonite to granodiorite intrusions (MacIntyre *et al.*, 1987).

The mineral prospects in the Lamprey Creek map area are essentially confined to Types 2 and 4. The two styles of mineralization may be spatially and genetically related.

Type 2 showings in the Smithers area are preferentially associated with the upper facies of the Telkwa Formation and the overlying Nilkitkwa Formation. In the Lamprey Creek map area showings are generally small and isolated. This results from the sparse outcrop and the scarcity of exposed upper Telkwa facies or Nilkitkwa Formation. Porphyry deposits are confined to intrusions of Late Cretaceous and Early Tertiary age and adjacent hornfelsed country rocks.

King (MINFILE 93L 052)

A plagioclase biotite porphyry intrudes and has hornfelsed sediments of the Skeena Group. Disseminated and fracture-filling molybdenite, chalcopyrite and pyrite (as pyritohedrons) are hosted by the pervasively silicified porphyry. A narrow shear zone trending northwest and dipping moderately to the northeast carries little mineralization. A breccia zone is reported to host arsenopyrite, pyrite and pyrrhotite (Helgesen, 1969).

Lucky Ship (MINFILE 93L 053)

The Lucky Ship prospect is located on a ridge between Morice Lake and the mouth of the Nanika River. It has been described by Sutherland Brown (1966) and Carter (1981).

The Lucky Ship stock cuts and has hornfelsed lapilli tuffs of the siliceous pyroclastic facies (lJTc) of the Telkwa Formation. The stock, like most other Nanika intrusions, is a multiphase body and has two porphyry and two breccia phases. Most of the plug is a white aphanitic rock with sparse quartz and feldspar phenocrysts. The other porphyry is unaltered, light grey and has abundant feldspar, quartz and biotite phenocrysts. One breccia is comprised largely of fragments of the first porphyry, with some exotic fragments. The other breccia is homogeneous and composed of variably sized fragments of the first porphyry. The four phases do not necessarily represent unique intrusions or episodes and age relationships are uncertain (Sutherland Brown, 1966). Molybdenite mineralization is associated with the initial phase, but appears to have been overprinted by a later, unmineralized rhyolite porphyry phase. Sulphides are concentrated in an annular zone of intense silicification and quartz veining around the later stage quartz monzonite porphyry plug.

The prospect is marked by an extensive gossanous zone resulting from the oxidation of pyrite and chalcopyrite. Sulphides comprise 2 to 10 per cent of some samples, but appear to be preferentially concentrated in the more intermediate phases of the rhyolite breccia. This zone has undergone phyllic and minor propylitic alteration and silicification.

Mafic phases occur as dikes and have also been subjected to intense silicification. The dikes follow the dominant northeasterly structural trend. Sulphide mineralization, associated with the mafic phases occurs in a stockwork of quartz veins which cut earlier, unmineralized quartz veins.

A K-Ar whole-rock date on a biotite hornfels sample from the Lucky Ship deposit yielded an age of 49.9 ± 2.3 Ma (Carter, 1981). This date corresponds well with whole-rock ages obtained from other Nanika intrusions in the Smithers area and the age of the Lucky Ship intrusion may be inferred from this. The age of mineralization is believed to be contemporaneous or slightly younger than the age of intrusion.

Hagas (MINFILE 93L 221)

Quartz stringers and fractures within propylitically and argillically altered maroon tuffs of the siliceous pyroclastic facies (lJTc) contain chalcopyrite, sphalerite and minor native copper. These shear zones trend east and dip steeply to the south. Malachite staining is associated with a silicified and propylitically altered gabbroic body. Follow-up trenching exposed an extensive gossanous zone, but little sulphide mineralization.

Fire Lookout (MINFILE 93L 309)

Malachite staining, discovered during the 1990 field season, is extensive in a small gossanous zone and appears to follow bedding in the siliceous pyroclastic facies of the Telkwa Formation (lJTc). Bedding in the maroon lapilli tuffs strikes easterly and dips moderately to the south. A prominent east-trending, north-dipping joint set may have acted as the conduit for mineralizing fluids. Augite-bearing basalt is also present and has been extensively altered to carbonate. No significant veining was noted.

SUMMARY

Conclusions based on this field season's work are:

- North-trending horst-and-graben structures, such as the Thautil River graben, characterize the study area.
- Clasts of Skeena Group and Kasalka Group in the Thautil River conglomerate suggest these sediments are Tertiary in age.
- Ootsa Lake Group volcanics are present and overlie the Kasalka Group.
- The siliceous pyroclastic unit (lJTc) of the Telkwa Formation is more felsic in the Lamprey Creek area than it is to the north.
- Kasalka Group volcanics mapped by Diakow and Drobe (1989) in the northeast corner of the Newcombe Lake map area extend northward into the Lamprey Creek area. This unit has been informally named the Pimpernel Mountain volcanics.

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