

## Section 5—Petrology

TR6-79-85

PETROLOGICAL NOTES ON THE BLUFF  
POINT AND TROWUTTA QUADRANGLES

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## ALTERED DOLERITE—61/82—NELSON RIVER

*Hand Specimen:* The rock is pale green in colour composed of crystals about 1 mm in size of a dark green ferromagnesian mineral, pale green plagioclase and black magnetite. The rock is well jointed and three distinct sets exist.

*Thin Section:* Few details can be seen in thin section as plagioclase with R I > Canada balsam is extensively saussuritized destroying all structure and the original ferromagnesian mineral is completely replaced by an aggregate of tremolite-actinolite, chlorite and epidote. Quartz veins occur throughout the section.

## GABBRO—61/83—BLACKWATER RIVULET

*Hand Specimen:* This rock when fresh is grey green in colour and composed of anhedral crystals up to 3.0 mm in length of grey saussuritized plagioclase, black ilmenite and dark green pyroxene showing alteration to chlorite. The rock weathers to a dark brown limonite crust.

*Thin Section:**Composition:*

Diallage	50%
Labradorite	20%
Chlorite	20%
Ilmenite	10%
Actinolite, Antigorite, Apatite, Zircon	tr.

*Grainsize:* variable between 3.0 mm and 0.2 mm, average 2.0 mm.

*Texture:* intergranular.

*Comments:* Anhedral diallage, showing pyroxene cleavage with an additional parting parallel to 100 and multiple twinning with 100 as twin plane, is extensively corroded by plagioclase and replaced either marginally or completely by chlorite with minor antigorite and actinolite. Plagioclase is almost completely saussuritized forming structureless white masses interstitial to diallage. The less altered crystals are labradorite showing normal zoning, albite twinning and combined Carlsbad and albite twinning. Chlorite, containing abundant pleochroic haloes around inclusions of zircon occurs as massive plates showing multiple twinning or as spherulitic aggregates, both varieties replacing the pyroxene either marginally or along cleavages. Closely associated with chlorite is acicular

actinolite, pleochroic from pale green to colourless, and minor antigorite usually as cores. Ilmenite, superficially altered to leucoxene, forms subhedral to euhedral crystals enclosed by diagenetic or chlorite indicating it was the first major mineral to crystallize. Apatite is the main accessory occurring as hexagonal acicular crystals which penetrate all other minerals.

#### **DOLOMITE BRECCIA—61/84—ARTHUR RIVER**

*Hand Specimen:* The unweathered rock, blue grey to dark grey in colour, is composed of angular to well rounded fragments, up to 2.0 cm in diameter, of brown, grey and black massive chert, black banded chert and pale grey dolomite set in a matrix of fine grained blue grey dolomite. The matrix, which shows faint bedding, forms more than 50% of the rock. The weathered surface, usually 1.0 cm thick and dark brown to orange in colour, is covered with nodules of chert and cavities formed by the weathering out of dolomite fragments, which gives the rock its characteristic honeycomb texture.

*Thin Section:* The breccia is composed of fragments in three distinct size groups: the largest, angular to subrounded chert ranging in size from 5.0 mm to 1.0 mm forms 30% of the rock; smaller fragments, 0.5 mm to 0.2 mm in diameter, (forming 20% of the rock) are rounded to subrounded dolomitic chert, chert and dolomite; the smallest fragments form the groundmass which shows faint bedding and consists of dolomite 0.01 mm in size. Graded bedding was not observed.

#### **BRECCIA—61/85—BLACKWATER RIVULET**

*Hand Specimen:* This rock represents the transitional type between dolomitic breccia and shale and is dark grey to black in colour with a resinous lustre. It is composed of angular chert fragments, less than 5.0 mm in size, set in a fine grained dolomitic groundmass.

*Thin Section:* Angular to subrounded chert fragments, varying in size from 5.0 mm to 0.1 mm and forming 10% of the rock are enclosed in a finely bedded matrix of dolomite and rock fragments, mainly quartz, 0.01 mm in grain size, which form the remaining 90% of the rock.

#### **BANDED GREYWACKE SILTSTONE—61/86—ARTHUR RIVER**

*Hand Specimen:* The rock is composed of irregular bands of alternating dark and light grey material, varying in thickness from 0.5 mm which show slight intraformational slumping and flow casts. Graded bedding was not seen. Limonite emphasizes the bedding planes, joints and fractures in the rock.

*Thin Section:* The dark bands are composed of angular to subrounded fragments, varying in size from 0.5 to 0.1 mm, of quartz, subordinate plagioclase and muscovite set in a matrix, 0.05 mm in grain size, of angular quartz, muscovite and clay minerals. This matrix has the same composition as the material that forms the thicker light bands. Magnetite, an accessory in both types of band, weathers to form limonite, which stains quartz veins and emphasizes bedding planes. Intraformational slumps and load casts about 1-2 mm in size are common and the finer bands are often broken by the movement of coarser material.

**INTRAFORMATIONAL BRECCIA—61/87—SADDLE CREEK**

*Hand Specimen and Thin Section:* This rock, which shows graded bedding, is composed of angular to subrounded black siltstone fragments, varying in size from 5 cm near the base to 0.5 mm at the top of the bed, set in a fine grained cream matrix. This matrix, similar in composition to the fine bands of specimen 61-86 contains angular to subrounded chert, quartz and quartzite fragments, 0.1 mm in size, in a fine grained (0.05 mm) aggregate of quartz, muscovite and clay.

**GREYWACKE—61/88—KEPPLE CREEK**

*Hand Specimen:* Alternating bands of blue-grey greywacke siltstone with small scale current bedding and massive green-grey greywacke, the lamellae varying in thickness from 5 cm to 15 cm. When weathered this rock is orange brown in colour.

*Thin Section:* The greywacke, which is faintly bedded, consists of angular to subrounded fragments, 0.1 mm in size, of quartz, dolomite, shale, chert, chlorite aggregates and plagioclase set in a matrix less than 0.01 mm in grainsize of quartz, dolomite and clay. The greywacke siltstone, while similar in composition, contains more dolomite, about 10%, and is composed of smaller fragments, 0.05 mm in size. The banding is due to lamellae of slightly different composition and grainsize. Magnetite is an accessory in both rock types.

**GREYWACKE—61/89—ARTHUR RIVER**

*Hand Specimen:* This rock, which is extensively limonite stained is similar to 61/88 but the banding, consisting of alternating black and grey material, is finer and more pronounced.

*Thin Section:* Angular to subrounded fragments of quartz, plagioclase, magnetite, minor quartzite and chert, 0.1 to 0.02mm in size, enclosed in a matrix of fine grained quartz, muscovite, clay, chlorite and an unidentified brown isotropic mineral (palagonite?) are the rock components. The black colour is due to concentration of magnetite in bands.

**THOLEIITIC BASALT—61/90—ARTHUR RIVER**

*Hand Specimen:* This specimen shows portion of the chilled surface, black in colour and composed of pyroxene and acicular plagioclase crystals enclosed in a dark glass, and the coarser interior, dark green in colour, composed of subhedral pyroxene, plagioclase and magnetite. The rare vughs are lined with quartz, calcite, zeolites and copper minerals, mainly azurite.

*Thin Section (coarser rock):*

*Composition:*

Labradorite	50%
Pigeonite	35%
Chlorite	10%
Magnetite	5%
Epidote, Antigorite, Quartz, K. feldspar	
intergrowths	tr.
No glass.	

*Grainsize:* Even, varying between 0.1 and 0.5 mm.

*Texture:* Intergranular to sub-ophitic.

*Comments:* Labradorite, in ragged laths showing albite and combined albite and Carlsbad twinning is superficially altered to clinozoisite and sericite and partially encloses subhedral pigeonite, zoned and lamellar twinned parallel to 100 with  $2v = 0 - 10^\circ$ . Although rimmed by chlorite, pigeonite shows no trace of alteration in contrast to enstatite, which is now completely pseudomorphed by a chlorite antigorite aggregate. Intersertal quartz K-feldspar intergrowths occur while magnetite forms large aggregates of octahedral crystals up to 1.0 mm in size.

#### BASALT—61/91—BLACKWATER RIVULET

*Hand Specimen:* Plagioclase phenocrysts and chlorite pseudomorphs up to 1 cm in size occur in a dark green groundmass which contains small aligned plagioclase laths. Asbestos forms small veins 1 cm wide and accessory minerals are hematite and epidote. The rock weathers readily, first to a pale green grey layer, then to an orange limonite crust.

##### *Thin Section:*

##### *Composition:*

Plagioclase (Labradorite) .....	45%
Pyroxene (Augite) .....	30%
Chlorite .....	15%
Magnetite .....	10%

*Grainsize:* Groundmass 0.1 mm, phenocrysts up to 4.0 mm.

*Texture:* Porphyritic—groundmass shows flow structure.

*Comments:* The phenocrysts, of subhedral to anhedral saussuritized plagioclase and chloritized pyroxene (augite?) are set in a groundmass of intergranular anhedral pyroxene and chlorite, subhedral magnetite and plagioclase, the latter showing parallel alignment. Plagioclase phenocrysts, labradorite in composition are slightly zoned, show combined albite and Carlsbad twinning and contain orientated inclusions of a ferromagnesian mineral, now pseudomorphed by chlorite and calcite aggregates.

In the groundmass, symmetrical extinction angles of the albite twinning of plagioclase indicate labradorite composition, but the pyroxene, possibly augite, is difficult to identify due to the small size.

#### LITHIC TUFF—61/92—UNNAMED CREEK WEST OF HELICOPTER CAMP TWO

*Hand Specimen:* Fragments, outlined with limonite, of banded grey chert, up to 5 cm in size, basalt, tachylite and rarely dolomite, 5 mm in size, occur in a dark grey glassy matrix, containing pyrite, pyroxene and feldspar crystals. The rock weathers readily to an orange brown crust.

*Thin Section:* The fragments, angular and varying in size from 1.0 to 6.0 mm, of tholeiitic basalt, dolerite and tachylite, the latter containing feldspar microlites, are set in a matrix of subhedral to euhedral pigeonite, magnetite, plagioclase, pyrite, and basalt fragments, 0.1 mm in size, embedded in devitrified glass. Lineation in the matrix components, emphasized by limonite staining, appears to be due to compression of the groundmass between the larger fragments. No sedimentary rock fragments occur in the slide.

**BANDED CHERT—61/125—BLACKWATER RIVULET**

*Hand Specimen:* This chert, black in colour is well bedded and crossed by quartz veins. Pyrite is plentiful, occurring concentrated along bedding planes and scattered throughout the rock. When weathered the rock is pale grey in colour with limonite concentrations along the bedding and joint planes.

*Thin Section:* The banding is due to alternating layers of finely laminated light to dark brown chalcedony and clear chalcedony and quartz fragments.

The laminated chalcedony bands contain numerous clear chalcedony spherulites, some with cores of fine grained quartz, which show the typical black cross, usually off centred under crossed nicols. These bands are folded, contorted and slumped and in many regular folds spherulites are ellipsoidal on the limbs while in irregular folding, egg, comma and rarely cone shaped spherulites are formed. The clear bands, which were once continuous, have been dislocated and rotated and now composed of irregular fragments up to 15 mm long and 0.2-0.5 mm wide of banded quartz, showing variation in colour and crystal size and fine grained quartz containing crescent shaped areas of chalcedony, set in the distorted banded brown chalcedony.

In other sections the banding is completely destroyed, the fragments occur as irregular patches in contorted laminated chalcedony.

Pyrite forms euhedral crystals 0.5 mm in size and numerous fine grained quartz veins cross each section.

**CHERT—61/126—ARTHUR RIVER**

*Hand Specimen:* This specimen, cellular in structure, is composed of rounded fragments cemented by quartz and numerous quartz lined cavities.

*Thin Section:* The rounded fragments are oolites, varying in diameter from 0.3 to 0.1 mm and replaced by chalcedony, which show radial and concentric structure, sometimes in the one oolite. The matrix is massive quartz 0.05 mm in size and acicular quartz crystals rim cavities and oolite margins.

**CHERT—61/127—QUARRY WEST OF ROGER RIVER MILL**

*Hand Specimen:* Small translucent milky quartz fragments and vughs lined with quartz crystals, set in an opaque siliceous matrix, are the characteristic features of this rock.

*Thin Section:* Fragments, 0.1 to 0.2 mm in size, of small anhedral quartz aggregates and a few rare anhedral crystals of dolomite, the boundaries outlined with pyrite cubes, are set in a matrix of mosaic quartz, 0.05 mm or smaller in grain size. The vughs, formed by the solution of dolomite crystals, are lined with acicular quartz crystals.

**DOLOMITE—61/128—ARTHUR RIVER**

*Hand Specimen:* This rock, pale grey in colour, is composed of small glistening crystals of dolomite. When weathered, a pale yellow limonite deposit occurs on the exposed surface and in joint planes.

*Thin Section:* Anhedra dolomite, in crystals 0.2 mm in size, crossed by limonite stained stylolites is the only constituent.

#### **DOLOMITE—61/129—KEPPLE CREEK**

*Hand Specimen:* This rock consists mainly of fine grained grey dolomite, intersected by numerous veins of white dolomite with no apparent orientation and seams of graphite outlining stylolites. A thin white crust coated with limonite forms on the weathered surface.

*Thin Section:* Anhedra dolomite crystals, 0.01 mm in size, intersected by veins of coarser anhedra dolomite, 0.2 mm in size, and stylolites, outlined with impure graphite form 90% of the rock. The graphite was probably formed from the organic remains of the reef building animals. Accessories are angular quartz fragments and euhedral pyrite crystals, 0.01 mm in size.

#### **QUARTZITE—61/130—SALMON RIVER MILL**

*Hand Specimen:* This rock, white to pale grey in colour, is well bedded and composed of alternating bands of coarse and fine quartz fragments in a siliceous cement. On weathered surface these fragments are easily seen.

*Thin Section:* Alternating bands of well sorted subrounded quartz, minor quartz siltstone and chloritic siltstone grains, 0.5 mm in diameter and subangular quartz, 0.1 mm in size, also well sorted, are cemented by quartz, which has recrystallized forming overgrowths in optical continuity with the larger grains. All quartz fragments show mosaic or undulose extinction, and the boundary between lamellae is sharp.

#### **BANDED ARGILLITE—61/131—ARTHUR RIVER**

*Hand Specimen:* The rock is composed of alternating bands less than 0.2 mm thick of pale grey and green grey material. Brown limonite patches surround weathered pyrite cubes and quartz veins.

*Thin Section:* Pebbles of limonite stained siltstone, 1 mm in diameter, scattered throughout a mosaic of muscovite flakes 0.01 mm in length, quartz fragments 0.005 mm in diameter and clay minerals, together with skeletal pyrite crystals and quartz veins are the rock components. Banding is not apparent in thin section.

#### **BANDED SILTSTONE—61/132—FRANKLAND RIVER**

*Hand Specimen and Thin Section:* This rock is similar in composition and appearance to 61-133 but shows more extensive chlorite development, with parallel alignment of many crystals. The finer bands contain rounded siltstone pellets, surrounded by thick chlorite rims.

#### **LAMINATED SILTSTONE—61/133—FRANKLAND RIVER**

*Hand Specimen:* Dark green chloritic siltstone 2-4 mm thick alternates with pale green siltstone, up to 1.5 cm thick, containing green chlorite clusters, 1 mm in diameter. Both are intersected by limonite stained quartz veins and a slaty cleavage is developed parallel to the bedding. The weathered rock is orange red to brown in colour with the chlorite rich bands weathering more extensively than the chlorite poor siltstone.

*Thin Section:* The finer bands containing quartz fragments and muscovite flakes, 0.05 mm in size, show extensive development of chlorite, which in some bands is the dominant mineral. The thicker bands composed of quartz fragments, muscovite flakes and clay about 0.01 mm in size, contain occasional chlorite clusters 0.5 mm in diameter. Pyrite is a common accessory in both bands but many crystals are replaced by quartz-limonite aggregates. Quartz veins, 0.1 mm thick, occur parallel to and crossing the bedding.