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PROTEROZOIC STRATIGRAPHY OF
NORTHEASTERN BRITISH COLUMBIA

(Report, 1 figure and 3 tables)

R. T. Bell



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NORTHEASTERN BRITISH COLUMBIA

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ABSTRACT

Proterozoic rocks of northeastern British Columbia are divisible into three successions. The lower and oldest, of probable Helikian age and consisting dominantly of quartzites and carbonate rocks, is at least 11,000 feet thick and is divided into the Chischa, Tetsa, George, Henry Creek, and Tuchodi Formations. The middle succession, also of probable Helikian age, consists of at least 8,000 feet of shaly flysch and is divided into the Aida and Gataga Formations. The uppermost succession of phyllites, slates, and greenstones is at least 5,000 feet thick and is probably of Hadrynian age but may be as young as Early Cambrian. The Gataga Formation and older units are cut by diabase dykes and underwent gentle deformation in the Late Proterozoic.

PROTEROZOIC STRATIGRAPHY OF NORTHEASTERN BRITISH COLUMBIA

INTRODUCTION

During the summers of 1963 to 1965 about 25,000 square miles of northeastern British Columbia adjacent to the District of Mackenzie and the Yukon Territory were mapped by the Geological Survey during Operation Liard, an aircraft-supported reconnaissance mapping program.

About 1,700 square miles of the area is underlain by strata of Proterozoic age. These strata lie within the Tuchodi Lakes (94K), Toad River (94N), and Ware (94F) map-sheets. This preliminary report presents some of the measured sections (Appendix) and defines seven rock-stratigraphic units. This report is based in part on a Ph.D. dissertation submitted to Princeton University (Bell, 1966).

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PREVIOUS WORK

The northern part of the eastern Cordillera and adjacent regions has been a site of vigorous exploration by petroleum companies for the past 15 years. They have concentrated on Phanerozoic strata and little of their work has been published and none has direct bearing on Precambrian stratigraphy.

Mining companies have investigated several copper prospects in Proterozoic strata near Racing and Toad Rivers. Brief descriptions of some of these locations have been published by the Government of the Province of British Columbia (1958, 1959, and 1965). Menzies (1951) described the geology and mineralogy of a prospect near Tetsa River.

Williams (1944) first recognized the Precambrian rocks along the newly opened Alaska Highway. Laudon and Chronic (1947, 1949) make brief mention of these rocks in reports on Palaeozoic rocks between Mile 381 and the Liard River bridge. Menzies (1951) briefly described the Precambrian strata at the mountain front in the Tetsa Valley. Vail (1957) made a reconnaissance study of the geology near the Racing River.

During the summers of 1960 and 1961, Taylor (1963) mapped the MacDonald Creek area. His report includes the first published systematic mapping of several distinct Precambrian units in northeastern British Columbia. The author was introduced to this study at that time.

Surveys bordering Operation Liard are: Halfway River area (Irish, 1963), Trutch area (Pelletier, and Stott, 1963), Kechika area (Gabrielse, 1962a), Rabbit River area (Gabrielse, 1962b) and Fort Liard and La Biche areas (Douglas and Norris, 1959). Precambrian strata are reported from the La Biche, Halfway River, Kechika, and Rabbit River areas.

STRATIGRAPHY

Rocks of Proterozoic age in the Tuchodi Lakes, Ware, and Toad River areas form an unmetamorphosed to very low grade metamorphosed, largely sedimentary sequence at least 24,000 feet thick.

Strata of probable Helikian¹ age are divisible into two successions: (1) a lower quartzite-carbonate succession, at least 11,000 feet thick, divided into the Chischa, Tetsa, George, Henry Creek, and Tuchodi Formations; and (2) an upper shaly flysch² succession, at least 8,000 feet in thickness, divided into the Aida and Gataga Formations (Table I). These strata are cut by diabase dykes.

Strata of probable Hadrynian¹ age comprise a succession of green and grey phyllites, slates, and greenstones, at least 5,000 feet in thickness. They are exposed in the western part of the Tuchodi Lakes area. These rocks may be as young as Early Cambrian (Table II).

HELIKIAN

Chischa Formation

The name Chischa Formation is proposed for the succession of interlayered, pastel-hued and grey aphanitic dolomites and quartzites that are exposed near the mountain front between Mount St. George and Chischa River (see Fig. 1 for geographic locations). The type section is designated on the south side of the Chischa Valley at the mountain front (Appendix, Section 2). The maximum exposed thickness is about 3,000 feet at the mountain front on Tetsa River. The formation is equivalent to map-unit 1 of the MacDonald Creek area (Taylor, 1963).

¹ For usage of the terms Helikian and Hadrynian see Stockwell, 1964.

² For usage of the term shaly flysch see Dzulynski, and Walton, 1965.

Table I. Table of Formations east of Gataga River.

Eon	Era	Period	Rock-unit	Lithology	Thickness (feet)
Phanerozoic	Palaeozoic	Early Silurian	Nonda Formation	Dark grey dolomite and limestone, and white quartzite.	
		angular unconformity			
		Early Ordovician	Kechika Group	Light grey limestone, argillaceous limestone, and black shale.	2, 000 to 5, 000 *
		angular unconformity			
		Early Cambrian	unnamed units	Conglomerates, red beds, limestone, dolomite and shale.	2, 000 to 6, 000 *
angular unconformity					
Proterozoic	Helikian	Helikian ?	Diabase intrusions	Diabase dykes	
			Gataga Formation	Slaty-cleaved, dark grey mudstone, siltstone, and minor sandstone.	4, 500 plus *
			Aida Formation	Slaty-cleaved, light to medium grey mudstone, siltstone; minor chamositic and carbonaceous mudstone, dolomite, and limestone.	3, 470 to 7, 100 *
			Tuchodi Formation	Quartzite, dolomite, and siltstone; minor red beds and shale.	5, 000 *
			Henry Creek Formation	Slaty-cleaved, dark grey calcareous mudstone, and siltstone; minor sandstone, and limestone.	700 * to 1, 550
			George Formation	Grey dolomitic limestone, limestone, and dolomite.	1, 170 to 1, 750
			Tetsa Formation	Dark grey and black mudstone, siltstone, and sandstone; minor quartzite.	1, 030 to 1, 060
		angular unconformity ?			
			Chischa Formation	Very light grey, brown, pink and green dolomite, and quartzite; minor siltstone.	3, 100 *

* approximate thickness

Table II. Table of Formations, Gataga River Region.

Eon	Era	Period	Rock-unit	Lithology	Thickness (feet)
Phanerozoic	Palaeozoic	Early and Middle Ordovician	Kechika Group	Light grey limestone and shale; black shales and siltstones.	3, 000 plus
		angular unconformity ?			
		Early Cambrian	Atan Group	Limestone, dolomite, shale, and sandstone.	2, 000 plus
Proterozoic	Hadrynian ?		Greenish grey phyllitic succession (unnamed)	Phyllites, and low-grade chlorite schists; minor sandstone, and greenstones.	5, 000 plus

Pale grey and pastel-hued aphanitic dolomites are the characteristic lithology. Quartzites are common in the lower part of Section 3 (maximum 30 per cent) and dominate in the upper 1,000 feet but dominate only in the upper 346 feet in the type section on the Chischa River. Stromatolites, desiccation breccias, molar-tooth structures, and ripple-marks are common in the lower carbonate rocks. The dolomites interlayered with the quartzites in the upper quartzitic member are thin bedded and commonly laminated. The Chischa Formation resembles parts of the Waterton and Altyn Formations of southwestern Alberta.

The Chischa Formation is the oldest exposed unit in the region surveyed during Operation Liard. The base of the formation is nowhere exposed. Its upper boundary is marked by an unconformity with gentle relief of as much as three feet. The upper quartzitic member, approximately 1,000 feet thick at Bathtub Creek¹ (Section I), and about 350 feet at the type section on Chischa River, suggests either removal of strata in a southwesterly direction, or rapid change in facies, with evidence in favour of the former interpretation. For example the base of the overlying Tetsa Formation locally contains coarse-grained sandstone with pebbles similar to the lithology of the Chischa Formation.

Tetsa Formation

The name Tetsa Formation is proposed for the succession of thin-bedded, dark grey to black siltstones forming a distinctive unit at the mountain front between Mount St. George and Chischa River and along Tetsa River west of the mountain front. There the formation is 1,058 feet thick. The

¹ The Canadian Permanent Committee on Geographic Names approved this name in 1966.

type section (Section 3) is chosen about one mile west of the largest lake in the Tetsa Valley, locally known as 'Tetsa Lake'. The Tetsa Formation is uniformly about 1,050 feet thick throughout the area. North of Mount Mary Henry at the mountain front, however, a major part of the Tetsa Formation has been removed prior to deposition of the Silurian Nonda Formation. The formation is equivalent to map-unit 2 and the lower part of map-unit 3 in the MacDonald Creek area (Taylor, 1963).

Thin-bedded, dark grey to black, siliceous, feldspathic micaceous, and carbonaceous mudstone, siltstone, and shale characterize the formation. Several very light grey quartzite units are present in the basal 200 feet at the type section and to the northeast of this section. Only the lowermost unit of quartzite persists to the southwest. Ripple-marks are common in the lower 200 feet. The formation becomes increasingly dolomitic toward the top. The uppermost 200 feet of the Tetsa contains soft-sediment deformational structures.

The Tetsa Formation everywhere overlies the Chischa Formation, and commonly is marked by a thick basal quartzite bed, but locally, e.g. on the Chischa River, by a thin, pebbly, coarse-grained sandstone.

The upper beds of the Tetsa Formation are increasingly dolomitic and grade upward into the George Formation. The top is defined as below the first occurrence of light orange-brown weathering, resistant, medium grey dolomites and dolomitic siltstones which have a bedding thickness in excess of 2 inches.

George Formation

The name George Formation is proposed for the succession of grey, dolomitic limestones outcropping near Mount St. George. This sequence of carbonate rocks is exposed near the mountain front between Mount St. George and an unnamed creek approximately 4 miles south of Chischa River and is 1,745 feet thick at the type section at Mount St. George (Section 4). The formation thins southwesterly to approximately 1,200 feet at the headwaters of Henry Creek (Section 5). All, or part of the formation has been removed by pre-Silurian erosion at the mountain front north of Henry Creek. The George Formation is equivalent to map-unit 4 and most of map-unit 3 in the MacDonald Creek area (Taylor, 1963).

The formation consists of medium- and thick-bedded light grey-brown weathering, very fine crystalline, grey limestones, dolomitic limestones, and argillaceous, silty limestones and dolomites. Stromatolitic beds, desiccation breccias, and parallel and irregularly laminated carbonate rocks with molar-tooth structures typify the formation. The lowermost 100 to 600 feet is dominantly argillaceous dolomite and dark-hued dolomitic siltstones weathering orange-brown. Thin units of slaty-cleaved, calcareous mudstones are a minor constituent. The lithology and sedimentary structures of the George Formation resemble those of the Siyeh Formation of northern Montana.

The lower beds of the George Formation are transitional with the Tetsa Formation. The upper 100 feet of the George Formation is increasingly argillaceous and grades upward into the Henry Creek Formation. The top is

defined as below the surface where the moderately resistant brown weathering, slaty-cleaved, dark to medium grey, calcareous mudstones, which are typical of the Henry Creek Formation, comprise more than 50 per cent of the lithology.

Henry Creek Formation

The name Henry Creek Formation is proposed for the succession of slaty-cleaved, moderately resistant, light brown-grey weathering mudstones exposed near the mountain front between MacDonald Creek and Tuchodi Lakes. Its maximum thickness, approximately 1,550 feet, is at the type section (Section 5) near the headwaters of Henry Creek. It thins to about 700 feet near Mount St. George. All, or part of the formation has been removed by erosion prior to deposition of Lower Cambrian and Lower Silurian beds on the eastern flank of the MacDonald Anticlinorium. The Henry Creek Formation is equivalent to map-unit 5 in MacDonald Creek area (Taylor, 1963).

The formation consists of slaty-cleaved, medium to dark grey, calcareous mudstones and siltstones. Thin units of very fine grained sandstones and carbonate rocks are common but comprise only a minor part of the formation. Most of the mudstones have parallel, or irregular laminations and some contain dispersed, tiny black shale chips, and more rarely, dispersed angular carbonate chips similar to fragments of the George Formation.

The mudstones grade upward into calcareous siltstones and fine-grained, quartzitic sandstones which are the dominant lithologies in the upper third of the formation.

The Henry Creek Formation overlies the George Formation; the lower contact is gradational through an interval of about 100 feet. The base of the Henry Creek Formation is defined as the surface where moderately resistant slaty-cleaved, dark grey calcareous mudstones typical of the Henry Creek Formation comprise more than 50 per cent of the lithology.

The lithology of the upper beds of the Henry Creek Formation is similar to beds contained within the overlying Tuchodi Formation. The upper contact is arbitrarily placed immediately below the first thickly bedded, very resistant, very light grey to white, medium-grained quartzite of the Tuchodi Formation. This contact appears to be conformable.

Lateral gradation in the lower beds of the Henry Creek Formation results in an inverse thickness relationship of the Henry Creek and George Formations.

Tuchodi Formation

The name Tuchodi Formation is proposed for the thick succession of feldspathic quartzites and argillaceous, silty, dolomites overlying the Henry Creek Formation. The type section (Section 6) and the supplementary reference section (Section 7) are respectively north and south of Tuchodi Lakes. The lower beds of the Tuchodi Formation are represented by map-unit 6 in the MacDonald Creek area (Taylor, 1963).

This formation is the most extensively exposed Proterozoic unit in the Tuchodi Lakes area and is about 5,000 feet thick. The Tuchodi Formation is exposed on Racing and Toad Rivers, and Churchill, Tentzi, Yedhe, and Yash Creeks, and near the mountain front between MacDonald Creek and Mount Sylvia in the Tuchodi Lakes area. These are inliers of the Tuchodi Formation northeast of Muncho Lake in the Toad River area, north of Wahthinli Mountain, and at the mountain front on Muskawa River in the Ware area. Near the mountain front the top of the Tuchodi Formation has been erosionally truncated, and is unconformably overlain successively from southwest to northeast by strata of Early Cambrian, Early Ordovician, and Early Silurian ages.

The Tuchodi Formation is typified by resistant, brown weathering, white to light grey and light brown feldspathic quartzites, dolomitic siltstones, and sandstones, and argillaceous, silty, light grey-brown, aphanitic dolomites. Varicoloured shales and sandstones constitute a significant minor lithologic element, particularly near the mountain front. Sandstones and siltstones are crossbedded and ripple-marked, and commonly are accompanied by mud-cracked layers. Minor stromatolitic units occur in the MacDonald Creek area. The Tuchodi Formation is similar to the Roosville Formation of northern Montana.

Three facies are distinguished on the basis of percentages of quartzite and dolomite. In upper Muskwa Valley the formation comprises 85 per cent quartzite and 9 per cent dolomite. Near MacDonald Creek and Tetsa River the formation comprises 35 per cent quartzite and 40 per cent dolomite. In the region between the Toad River Canyon and Mount Sylvia the Tuchodi Formation consists of about 65 per cent quartzite and 10 per cent dolomite. A fourth facies along the mountain front between Chischa and Muskwa Rivers is distinguished by interfingering red and varicoloured shale and dolomite with the typical quartzite and dolomite.

The base of the Tuchodi Formation is exposed only near the mountain front between Mount St. George and Tuchodi Lakes where it conformably overlies the Henry Creek Formation. South and west of Tuchodi Lakes, and near Churchill Creek and Yedhe Creek the Tuchodi Formation is conformably overlain by the Aida Formation. Elsewhere the top of the Tuchodi Formation has been erosionally truncated. In the region near Tuchodi Lakes it is possible to observe complete exposure of the Tuchodi Formation, which is about 5,000 feet thick, although the ruggedness of the terrain does not permit ready access to a complete section. Estimates of thickness beyond this region do not exceed 5,000 feet.

Aida Formation

The name Aida Formation is proposed for the thick succession of very light brown and light grey weathering, slaty-cleaved mudstones exposed on the flanks of Mount Aida (Section 8). A complete section of this unit was nowhere observed because of structural complexity. Supplementary reference Sections 7 and 9 near the type section are chosen to illustrate the lower and uppermost beds of the Aida Formation.

The formation is exposed in a belt from the confluence of Toad and West Toad Rivers to Muskwa River. A small, poorly exposed inlier, similar to basal beds of the Aida outcrops near Mile 472 of the Alaska Highway in the Toad River area. Near Mount Aida, the formation is about 3,400 feet thick; near Churchill Peak it is greater than 6,600 feet thick. In a large part of the Tuchodi Lakes area and in all of the Ware area, the Aida Formation has been erosionally truncated and unconformably overlain by strata of Early Cambrian age.

The Aida Formation is composed of calcareous and dolomitic, grey mudstones and siltstones, and lesser amounts of poorly sorted and graded, fine-grained sandstones. Soft-sediment deformational structures, thin, graded beds, and a few thickly bedded uniform or structureless, poorly sorted sandstone beds typify the formation. The uniform sandstone beds contain dispersed, tiny, dark shale chips, and some have in addition, deformed angular blocks of thin, graded beds, commonly as much as four feet in diameter.

A green chamositic mudstone member, about 185 feet thick, is succeeded by a black carbonaceous mudstone member, approximately 200 feet thick; these constitute a persistent marker unit. The base of the chamosite member is about 600 feet above the base of the Aida Formation.

Slaty-cleavage is commonly, but sporadically, developed in the lower 1,000 feet of the formation, and commonly well-developed in the remainder of the formation.

The basal contact relationship is commonly obscured by faulting, but where observed suggests conformity with the Tuchodi Formation. The basal beds of the Aida Formation can be contrasted sharply with the dominantly quartzitic beds of the upper part of the Tuchodi Formation. In the region of Tuchodi Lakes, the basal unit is dominantly calcareous mudstone and siltstone and has abundant limestone-chip conglomerates, with slaty cleavage restricted to the subsidiary mudstone units. North of Delano Creek and in the Ware area, the basal unit is largely dolomitic siltstones and mudstones in which the cleavage is pervasive.

The top of the Aida Formation is conformably below dark grey and black weathering, moderately recessive, non-calcareous slates of the Gataga Formation.

Gataga Formation

The name Gataga Formation is proposed for the succession of dark-coloured slates exposed at the headwaters of Gataga and Toad Rivers and at Churchill Peak. Lower beds of this formation are exposed about 10 miles west of Mount Aida. The Gataga Formation is approximately 4,500 feet thick at the type section (Section 10) near the headwaters of Gataga River. Exposures are restricted to the southwest region of the Tuchodi Lakes area.

The Gataga Formation consists of moderately recessive dark grey to dark olive-grey, slaty-cleaved, mudstones and siltstones, with very thin units of poorly sorted, graded, brown sandstones. The mudstones

commonly have parallel, or contorted laminations accompanied by flame structures. The sandstones are graded, poorly sorted, and bottom marked.

The Gataga Formation lies with apparent conformity on the Aida Formation. The Gataga Formation is much lower in carbonate content, has fewer sandy units, and has darker fresh, and weathered rock colours, than the underlying Aida Formation.

The top of the Gataga is everywhere unconformably overlain by strata of Early Cambrian age. The angularity of this unconformity is variable, but commonly is about 5 to 15 degrees. East of Mount Roosevelt, and the upper end of Tuchodi Lakes, the Gataga Formation has been removed by pre-Early Cambrian erosion.

PROTEROZOIC INTRUSIVE ROCKS

Diabase dykes intruding the Gataga and older formations appear to post-date gentle folding and tilting of these formations. The dykes are restricted to the Tuchodi Lakes and Toad River areas.

The dykes consist of 40 to 55 per cent augite, 30 to 40 per cent plagioclase (An_{55}), 4 to 8 per cent magnetite, and 2 to 4 per cent quartz and micropegmatite, with traces of pyrrhotite, pyrite, and sphene. The cores of the feldspars are commonly sericitized and saussuritized. An ubiquitous feature of the diabase is dispersed small clumps of chlorite and amphibole, presumably deuteric alteration products of pyroxene. The dykes are commonly sheared and heavily fractured, and the pyroxene and feldspar altered to sericite, epidote, amphibole, chlorite, and carbonate.

Most of the dykes are less than 20 feet wide, and exceed one mile in length. The tabular bodies vary from vertical to steeply westward dipping. Between Mount St. George and Mount Sylvia the dykes show a north-trending arcuate pattern convex to the east. Along the belt trending southeasterly from the confluence of Toad and West Toad Rivers the dykes strike uniformly north-northwest and commonly exceed 50 feet in thickness. In the remainder of the area underlain by the Gataga and older rocks, the dykes trend north-northwest, northeast, north-northeast, and rarely east.

The greenstones of the greenish grey phyllite succession described below and the diabase dykes may be coeval.

Pebbles of diabase and mineralized diabase were observed in the basal conglomerates of the Lower Cambrian succession at Muncho Lake, Mount Sylvia, Mount Aida, and at the headwaters of Gataga River (Section 10).

HADRYNIAN (?) OR EARLY CAMBRIAN (?)

Greenish Grey Phyllitic Succession

A succession of greenish grey, green and grey phyllites and slates is exposed in the valley of Gataga River of the Tuchodi Lakes area and continues into the Kechika area (Gabrielse, 1963a, most of map-unit 3) and into the Rabbit River area (Gabrielse, 1963b, most of map-unit 1). Phyllites

and low-grade schists and quartzites near Pesika River in the south-central part of Ware area are also assigned to this succession.

The succession consists of greenish grey-green, and grey chloritic phyllites and slates with minor maroon slates, sheared greenstone lenses and poorly sorted brown sandstone units. A lenticular body of coarse-grained and conglomeratic quartzite is exposed within the succession on the southwest side of Gataga River.

On the north side of Gataga Valley there are several 1- to 8-foot thick tabular bodies of sheared greenstone that are conformable with the bedding. These consist mostly of quartz and chlorite, and minor amounts of white mica, calcite, epidote, pyrite, and sphene. These are either sills or lava flows. No dykes were observed.

A member consisting of maroon and green phyllites, approximately 400 feet thick, outcrops on the north side of the Gataga Valley and in the Rabbit River and Kechika areas.

The phyllites are closely folded, and sheared, in addition to being very poorly exposed in the region surveyed during Operation Liard. A cautious estimate of thickness is in excess of 5,000 feet.

The eastern boundary of the greenish grey phyllitic succession is a thrust fault contact with lower Palaeozoic strata. The base of the succession was not seen in the region studied during Operation Liard. The top of the greenish grey phyllitic succession is conformable with Lower Cambrian limestones of the Atan Group.

The greenish grey phyllitic succession differs from the Aida-Gataga succession in several significant ways:

(i) The greenish grey phyllitic succession is dominated by chloritic phyllites, whereas the Aida-Gataga is dominated by slates in which chlorite is absent or uncommon.

(ii) The phyllite succession contains conformable greenstone bodies and lacks discordant diabasic intrusions. In contrast the Gataga and Aida Formations in their westernmost exposures (15 miles from the eastern exposures of the phyllites) are laced with many thick diabase intrusions.

(iii) The Aida and Gataga Formations were gently folded, and then intruded by diabase dykes prior to the deposition of Lower Cambrian strata (Bell, 1966). The phyllite succession grades upwards to strata of definite Early Cambrian age.

SEDIMENTOLOGY

Preliminary palaeocurrent investigations of the Proterozoic rocks of northeastern British Columbia (Bell, 1966) suggest that:

(a) between MacDonald Creek and Tuchodi Lakes palaeocurrent directions in the Chischa, Tetsa, George, and Tuchodi Formations are towards the southwest,

(b) palaeocurrent directions in the Tuchodi Formation outside of the region between MacDonald Creek and Tuchodi Lakes are complex and commonly show a bimodal distribution with a southwesterly component, and another component towards the north-northwest or rarely towards the south-southeast. More detailed inspection of the Tuchodi Formation is warranted, but the author suggests that the north-northwesterly trend may reflect long-shore drift,

(c) palaeocurrent directions in the Aida and Gataga Formations suggest transport towards the northwest,

(d) palaeocurrent directions in the greenish grey phyllite succession suggest transport towards the northwest.

Palaeocurrent directions of the Tuchodi and older formations are consistent with an hypothesis that these sediments were derived from the northeast and deposited on a shallow-water shelf environment upon the margin of the craton. The palaeocurrent directions of the Aida and Gataga Formations and the greenish grey phyllitic succession possibly represent transport along the axes of linear troughs, parallel with the margin of the craton. Composition of the sediments, sedimentary structures, and trends in thickness changes of these Proterozoic formations are in agreement with these conclusions (Bell, 1966).

CORRELATION AND AGE OF THE PROTEROZOIC ROCKS OF NORTHEASTERN BRITISH COLUMBIA

Menzies (1951) and Williams (1944) considered the Tuchodi and older rocks to be lithologically similar to Purcell rocks of southeastern British Columbia and southwestern Alberta, and suggested that they are probably of the same age.

Vail (1957) interpreted these rocks to be Windermere-type or Eocambrian in age (i. e. Hadrynian) partly because he believed that the Lower Cambrian overlies them disconformably. He recognized the angular unconformity in places but chose to disregard it in discussing the age of these rocks (Vail, 1957, p. 28). He may also have considered some of the Lower Cambrian conglomerates to be in the Proterozoic succession but did not make this clear (Vail, 1957, p. 34).

Williams (1944) apparently only saw rocks in the Proterozoic succession of northeastern British Columbia that are equivalent to the Tuchodi Formation and he compared these with the Purcell succession. The author agrees that rock types of the Tuchodi and older rock units resemble those of the Purcell 'Series'. In particular the Tuchodi is similar to the Roosville; the George is strikingly similar to Siyeh, and the Chischa is similar to the Waterton and Altyn Formations. The Tuchodi and older units also resemble some of the Precambrian rock units mapped in the Yukon (Gabrielse *et al.*, 1965).

In contrast, no previously described rock units in the eastern Cordillera closely resemble the Aida and Gataga Formations. The Aida and Gataga are unique in that they apparently represent deeper-water conditions closely following the shallow-water conditions of the Tuchodi and older rocks which may be correlative with Purcell rocks (Bell, 1966). The relationship

between the Aida and Tuchodi Formations is conformable suggesting that the Aida may be only slightly younger than the Tuchodi Formation.

The age of the crystalline basement rocks penetrated by drilling east of the Foothills is approximately 1,800 million years (Burwash et al., 1964).

Lowest Cambrian rocks, belonging to the Lower Ollenelus zone unconformably overlie the Gataga and older formations, and conformably overlie the greenish grey phyllitic succession.

The limits in absolute age, and the rock types of the Tuchodi and older formations are consistent with an interpretation that they are correlative with Purcell strata, and more broadly are of Helikian age. The Aida and Gataga Formations are unlike Purcell rocks, but they may be Helikian, rather than Hadrynian in age.

Similarities between the greenish grey phyllitic succession and Windermere-Miette strata of southeastern British Columbia and southwestern Alberta suggest that they may be correlative, and hence Hadrynian in age. The phyllitic succession may be related to the Wolverine, Inginka, and Misinchinka Complexes. It remains a possibility that part or all of the greenish grey phyllitic succession is Early Cambrian in age.

Successive events of folding, intrusion of diabase dykes, and repeated tilting followed the deposition of the Gataga Formation and preceded the deposition of the phyllitic succession (Bell, 1966). Pebbles of diabase are found in basal Cambrian strata. Samples of the dykes were collected by officers of the Geological Survey in 1964 and in 1966, but a radiometric age is not yet available. The age of the diabase may serve to establish closer limits to the age of these Proterozoic rocks.

At the mountain front near Tetsa River (e.g., see MacDonald Creek area, Taylor, 1963) about 4,000 feet of Proterozoic strata (mainly Chischa and Tetsa Formations) are exposed beneath the Silurian Nonda Formation. Successively younger Proterozoic beds are exposed beneath the Nonda Formation to the north and south of Tetsa River. The cumulative thickness of Proterozoic strata above the crystalline basement at Tuchodi Lakes exceeds 8,000 feet. This suggests that a considerable thickness of strata is present beneath the Foothills and western Plains in northeastern British Columbia. Heretofore most of the pre-Devonian unmetamorphosed strata penetrated by drilling beneath the Plains and Foothills of northeastern British Columbia have been interpreted as Middle Cambrian in age (van Hees, 1964). It is probable that some, if not most of these strata are in fact Proterozoic.

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A P P E N D I X

Stratigraphic Sections

APPENDIX

Stratigraphic Sections

The sections, described in the field, were amplified through later examination of hand specimens and thin sections. Measurements were made with a 5-foot staff and tape. Weathering character has been emphasized (i.e., colour, bedding, and weathering profile).

Most units labelled 'poorly exposed' are felsenmeer.

Limestones and dolomites were distinguished in the field by degree of effervescence in dilute hydrochloric acid. A number of mudstones and carbonate rock specimens were checked by X-ray analysis.

Some of the units in the measured sections were directly correlated by following these units out on foot or by helicopter.

The type sections have been augmented by choosing supplementary reference sections to illustrate features that differ significantly from features in the type section, or are poorly exposed in the type section.

Measured thicknesses of the various Proterozoic formations in each of the stratigraphic sections described in this appendix are summarized in Table III.

Terminology

Argillite-mudstone-shale: The reader is referred to the definitions of argillite (commonly used in description of Belt or Purcell rocks), mudstone and shale in the American Geological Institute 'Glossary of Geology and Related Sciences' (1960). The term mudstone does not carry the connotation of metamorphism that argillite does and consequently is preferred as a sedimentological term. The term shale is restricted to those mudstones with fissility.

Bed-bedding: Bedding is used here in the sense of the characteristic thickness of sedimentary units in the weathering profile. The thickness is controlled by parting separations and changes in composition.

Flysch: Flysch is used as a purely sedimentological term as by Dzulynski and Walton (1965).

Molar-tooth structure: Bauerman (1885, p. 26) was the first to use this name for the differentially weathered surface of parts of the Siyeh Formation which contained anastomosing systems of calcite veinlets.

Price (1961, p. 8) defined molar-tooth structure as: "typically comprises irregular laminae, veinlets, blebs, and anastomosing masses of medium grey to black, very fine crystalline limestone in a matrix of medium to black, very fine crystalline dolomitic limestone or dolomite. On the weathered surfaces the dolomitic parts of the rocks are yellowish or orange-brown and etched into relief, whereas the limestone is dark grey."

Quartzite: Quartzite is used as a sedimentological field term (American Geological Institute, 1960, p. 236). Thin section study of some of the quartzites in this report reveals that most 'quartzites' in the Proterozoic of north-eastern British Columbia are quartz arenites, subarkoses, and sublitharenites after McBride's (1963) classification.

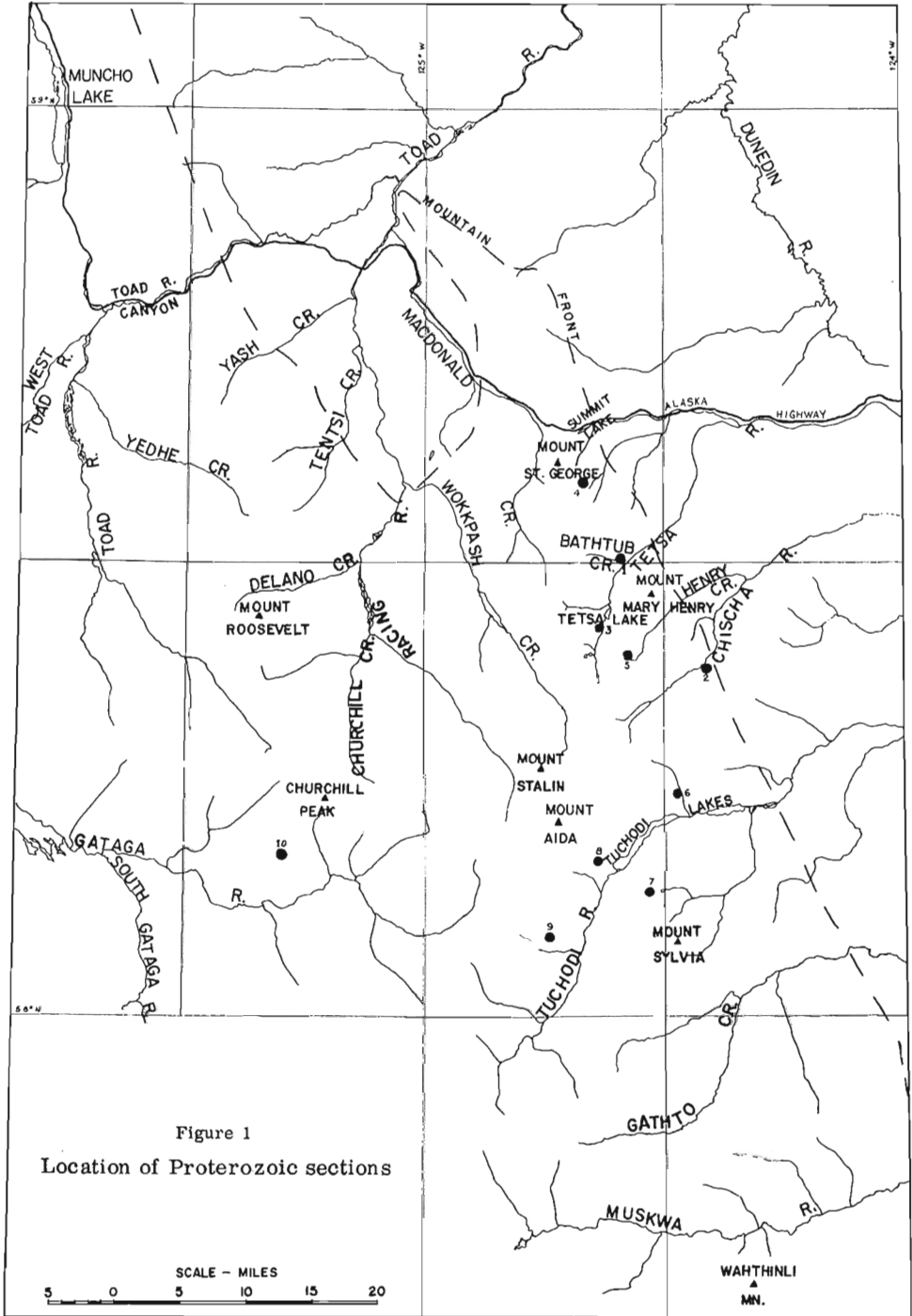
Resistant-recessive: The author recognized that the terms 'resistant' and 'recessive' are not objective terms. The terms very recessive, recessive, moderately recessive, moderately resistant, resistant, and very resistant can be used to indicate the weathering aspect of rocks having a progressively increasing property of withstanding the action of weathering processes. Resistant rocks have the general aspect in the weathering profile of a section as cliffs or ledges, whereas recessive rocks have the general aspect in the weathering profile of smooth or indented slopes. With very thick successions typified by these unmodified terms it may be advisable to modify these simple terms in order to describe smaller components of these successions. For example, the Tuchodi Formation as a whole is typified by resistant beds, however individual units show variation such that departures from the mean profile can be described as moderately resistant on one hand and very resistant on the other. In making a graphic profile of a particular section, use of unit differences between the successive resistance terms will result in an adequate representation of the weathering profile. These terms, therefore, have been used as a verbal aid to visualization of these sections.

Table III. Thicknesses of Proterozoic rock-units in measured sections.

Section	Chischa Formation	Tetsa Formation	George Formation	Henry Creek Formation	Tuchodi Formation	Aida Formation	Gataga Formation
1. Bathtub Creek	2,525a	1,031	1,158a				
2. Chischa River	648a	1,051	1,507	1,018	442b		
3. Tetsa River	1,207a	1,058	1,460	129a			
4. Mount St. George		163a	1,745	53a			
5. Henry Creek		151a	1,167	1,551	195a		
6. Tuchodi Lakes				263a	2,580a		
7. Tuchodi Lakes - Mount Sylvia					3,377a	1,214a	
8. Mount Aida						2,760b	
9. Upper Tuchodi River						1,365a	1,661b
10. Upper Gataga River						(6,606)	4,590b

a - incomplete unit.

b - incomplete unit, truncated by pre-Silurian periods of erosion.



MEASURED SECTIONS

Section 1: BATHTUB CREEK SECTION

(Field designation 64 BV-1)

The base of Section 1 is on Bathtub Creek about 1/8 mile upstream from Tetsa River. The section was measured along the creek bed to the base of a large waterfall, and thence up the east side of the creek valley to the top of the ridge, and then along the ridge crest to the first small saddle which is about 3 1/4 miles northwest of Tetsa River. The section ends within the upper third of the George Formation. This is a supplementary reference section for the Chischa Formation.

Base of section: 58°29'45"N, 124°34'15"W.

Top of section: 58°32'00"N, 124°38'20"W.

Unit	Lithology	Thickness (feet)	
		Unit	From Base
PROTEROZOIC			
<u>George Formation</u>			
47	Limestone and argillaceous dolomitic limestone, silty in part sandy, medium grey, minor dark grey, micritic to very fine-crystalline, in part medium-crystalline; beds 1 inch to 36 inches thick, averages around 4 to 12 inches, laminated, abundant molar-tooth structures, common stromatolites, common intraformational conglomerate, few silty beds with crosslamination, few pink and grey shaly partings; weathers light brown to light brown-grey, moderately resistant to resistant; contains minor siltstone, quartzite and mudstone beds.	1067	4714
46	Interbedded succession of: (a) dolomite, argillaceous, silty, in part siliceous, medium grey, micritic to very fine crystalline; beds 2 to 8 inches thick, laminated; weathers brown to orange, resistant; comprises 85 per cent and, (b) siltstone and mudstone, quartzitic, carbonaceous, shaly, slightly pyritic, black to dark grey, very fine grained to silt-size; beds 1/8 to 1 inch thick. Laminated; weathers dark brown, moderately recessive, in 1- to 3-foot units.	91	3647

Unit	Lithology	Unit	Thickness (feet) From Base
<u>Tetsa Formation</u>			
45	Interbedded succession of: (a) siltstone and mudstone, quartzitic, carbonaceous, shaly, slightly pyritic, in part dolomitic, black; beds 1/8 to 1 inch thick, laminated; weathers dark brown to black and rusty, moderately recessive to moderately resistant; comprises 55 per cent and, (b) dolomite, argillaceous, in part silty and sandy, dark grey to black, micritic to very fine crystalline; beds 1/4 to 1 inch thick, laminated; weathers light brown to orange, recessive to resistant, usually moderately recessive.	66	3556
44	Sandstone and mudstone, quartzitic, carbonaceous, black, in part dark grey, silt-sized to very fine grained; beds 1/8 to 1 inch thick usually less than 1/2 inch, rarely 1 1/2 inches, laminated in part ripple-marked, few slump structures, few sole marks; weathers dark brown to black, moderately recessive.	330	3490
43	Poorly exposed; siltstone and mudstone, quartzitic, carbonaceous, black; beds 1/4 to 1 inch thick, laminated, in part ripple-marked, weathers dark brown, moderately recessive.	57	3160
42	Siltstone, quartzitic, carbonaceous, medium grey to black, in part light grey; beds 1/4 to 1 inch thick, laminated, ripple-marked; weathers black to dark grey, resistant to moderately resistant; minor very fine grained sandstone.	215	3103
41	Quartzite, very light grey, very fine to medium grained; massive, in upper 15 feet beds get progressively thinner (to 2 inches) and darker grey, ripple-marked in upper 15 feet; weathers white to medium grey, very resistant.	78	2888
40	Covered interval; covered by talus of unit 41. Probably dark siltstones.	58	2810
39	Quartzite, white to very light grey, very fine to medium grained; massive; weathers white to medium grey, very resistant to resistant.	24	2752

Unit	Lithology	Unit	Thickness (feet) From Base
38	Covered interval; covered by talus of unit 39. Probably dark siltstones.	43	2728
37	Poorly exposed; quartzite, white to very light grey, very fine to medium grained; massive; weathers white to medium grey, very resistant to resistant.	55	2685
36B	Covered interval; covered by talus of units 37 and 39.	105	2630
Base of Tetsa Formation chosen here on comparison with nearby sections and interpolation of known contact from about 1/4 mile away.			
<u>Chischa Formation</u>			
(Quartzitic member)			
36A	Covered interval; covered by talus of units 37 and 39. See preceding comments.	120	2525
35	Quartzite and sandstone, dolomitic, white to light grey and light brown, very fine to fine grained; massive; weathers white to medium grey and light brown, very resistant.	50	2405
34	Poorly exposed; dolomite, silty, argillaceous, light grey to very light brownish grey, micritic to fine-crystalline; beds up to 3 inches thick, rarely 6 inches, laminated, in part crosslaminated; weathers brown, resistant.	40	2355
33	Covered interval.	123	2315
32	Poorly exposed; quartzite, in part dolomitic, white to light brown and medium grey, fine to medium grained; bedding 1 foot to massive, laminated to unlaminated; weathers light grey to light brown, resistant; minor silty dolomites.	72	2192
31	Quartzite, in part slightly dolomitic, white to very light brownish grey, fine to very fine grained; massive; weathers light grey, very resistant.	33	2120
30	Covered interval.	7	2087

Unit	Lithology	Unit	Thickness (feet) From Base
29B	Dolomite, silty to argillaceous, light to medium grey, micritic; beds 1 inch to 3 inches thick, laminated, in part mud-cracked, in part undulatory and irregularly laminated; weathers brown, resistant.	30	2080
29A	Quartzite, in part slightly dolomitic, very light grey to white, very fine grained to silt-sized; massive; weathers white to medium grey, very resistant.	89	2050
28	Dolomite, in part silty and argillaceous, medium grey, micritic to very fine crystalline; beds 1 inch to 30 inches thick, usually less than 12 inches, laminated, in part stromatolitic, few intraformational conglomerate lenses; weathers brown, resistant.	24	1961
27	Covered interval.	79	1937
26	Dolomite, in part silty and argillaceous, medium grey, micritic to very fine crystalline; beds 4 to 30 inches thick, usually 12 to 30 inches, in part laminated, in part stromatolitic, few intraformational conglomerate lenses; weathers brown, resistant.	64	1858
25	Poorly exposed; dolomite, in part silty and argillaceous, medium grey, micritic to very fine crystalline; beds 4 to 30 inches thick, laminated, in part stromatolitic, few intraformational conglomerate lenses; weathers brown, resistant.	84	1794
24	Quartzite, white, very fine grained to silt-sized; massive; weathers light grey, resistant.	28	1710
23	Covered interval.	11	1682
22	Dolomite, in part silty and argillaceous, medium grey, micritic to very fine crystalline; beds 4 to 30 inches thick, laminated, in part stromatolitic, few intraformational conglomerate lenses; weathers brown, resistant.	15	1671

Unit	Lithology	Thickness (feet)	
		Unit	From Base
21	Covered interval. Abundant white quartzite, frost-heaved blocks between 60 and 90 feet from base of unit 21.	180	1656
<u>Chischa Formation</u>			
(Dolomitic member)			
20	Poorly exposed; dolomite, silty to argillaceous, light to medium grey, very fine to fine crystalline; beds about 18 inches thick, laminated, in part crosslaminated, ripple-marked and stromatolitic; weathers brown to grey, moderately resistant to resistant.	74	1476
19	Covered interval.	26	1402
18	Dolomite, very light to medium grey, fine-crystalline to micritic; beds 18 inches thick, in part massive, poorly laminated, in part stromatolitic; weathers light brown to grey, resistant.	51	1376
17	Covered interval.	24	1325
16	Dolomite, in part argillaceous, light to medium grey, micritic to fine-crystalline; beds 18 inches thick, laminated, abundant silicified stromatolites in lower 8 feet; weathers light brown to grey, resistant.	12	1301
15	Covered interval.	74	1289
14	Dolomite, in part argillaceous, and silty, medium to light grey, micritic to fine-crystalline; beds 18 inches thick to massive, poorly laminated in basal 4 feet, well laminated above, in part stromatolitic; weathers medium grey to light brown, resistant.	59	1215
13	Poorly exposed; dolomite, silty to argillaceous, light grey, very fine crystalline; beds 2 to 3 inches thick in 9 to 40-inch units laminated, in part crosslaminated and stromatolitic, few intraformational conglomerate lenses; weathers light brown to very light grey, moderately resistant.	80	1156

Unit	Lithology	Thickness (feet)	
		Unit	From Base
12	Poorly exposed; dolomite, silty to argillaceous, in part sandy, light grey, very fine crystalline to micritic; beds 2 to 3 inches thick in 9 to 40-inch units, laminated, in part crosslaminated and stromatolites, very few intraformational dolomite-chip conglomerate lenses and quartzitic and dolomitic sandstone beds; weathers light brown, moderately recessive to resistant.	204	1076
11	Covered interval.	21	872
10	Dolomite, silty to argillaceous, in part sandy, light grey, very fine crystalline to micritic; beds 2 to 3 inches thick, laminated, silty lamellae, minor silty crosslaminations; weathers light brown, moderately resistant to resistant.	29	851
9	Covered interval.	19	822
8	Dolomite, silty, argillaceous, in part sandy, light grey to very light grey, micritic to very fine crystalline; beds 2 to 3 inches thick in 9 to 40-inch units, laminated, few stromatolite structures, few intraformational conglomerate, lenses, very few sandy beds; weathers light brown, moderately resistant to resistant.	101	803
7	Alternating succession of: (a) dolomite, silty, argillaceous, in part sandy, light to very light grey, micritic to very fine crystalline; beds 2 to 3 inches thick in 1 1/2- to 20-foot units, laminated, few stromatolite structures, few intraformational conglomerate lenses; weathers light brown, resistant and, (b) quartzite, in part slightly dolomitic, white to very light grey silt-sized to fine grained; beds 6 to 36 inches thick in 1 1/2 to 10-foot units in part laminated, in part ripple-marked; weathers light grey, slightly more resistant than dolomite units.	72	702
6	Dolomite, slightly argillaceous to silty, very light grey, very fine crystalline to micritic; beds 1 inch to 3 inches thick, laminated, few intraformational conglomerate lenses and stromatolite structures; weathers very light brown to very light grey, moderately resistant to resistant.	65	630

Unit	Lithology	Thickness (feet)	
		Unit	From Base
5	Poorly exposed; dolomite, argillaceous to silty, very light grey, very fine crystalline to micritic; beds 1 inch to 3 inches thick, laminated, few intraformational conglomerate lenses, few stromatolite structures; weathers very light brown to very light grey, moderately resistant to resistant.	53	565
4	Dolomite, slightly argillaceous to silty, very light grey, minor pink, very fine crystalline to micritic; beds 1 inch to 3 inches thick in 2- to 6-foot units, laminated, in part stromatolitic, few intraformational conglomerate lenses; weathers very light brown to very light grey, commonly has rusty cast, resistant.	163	512
3	Covered interval.	12	349
2	Dolomite, slightly argillaceous, in part silty, white, very light grey, pink, red, and green, very fine crystalline to micritic; beds 1 inch to 3 inches thick, rarely less than 1 inch, in 4-foot units, laminated, in part stromatolitic, very few intraformational conglomerate lenses, in part ripple-marked and cross-laminated; weathers very light brown to very light grey, resistant.	113	337
1	Dolomite, slightly argillaceous, in part silty, and sandy, very light grey to pink, minor red, pale green, and white, very fine crystalline to micritic; beds 2 to 6 feet thick, laminated, in part irregularly laminated, ripple-marked, crosslaminated and stromatolitic, few molar-tooth structures, few intraformational conglomerate lenses, very minor quartzite and quartzitic sandstone beds; weathers very light brown to very light grey, resistant.	224	224
Base of section.			

Section 2: CHISCHA RIVER SECTION

(Field designation 64 BV-46)

The section was measured on the southeast side of Chischa River about 7 1/2 miles upstream from the confluence of Chischa River and Henry Creek and was measured upsection, along the top of the talus-outcrop boundary northeastward toward the mountain front. Section 2 contains the type section for the Chischa Formation.

Base of section: 58°17'40"N, 124°25'00"W.

Top of section: 58°17'45"N, 124°22'30"W.

Unit	Lithology	Unit	Thickness (feet) From Base
LOWER CAMBRIAN (?)			
51	Conglomerate, in part grit and sandstone, with pebbles of quartzitic (well rounded, white, to light grey, fine-grained, size up to 8 inches) with matrix of quartzose sandstone (white to light grey, coarse to medium grained); bedding poor, lenticular; weathers resistant, light grey. Thickness not measured; Nonda Formation outcrops above this unit.		4652 (plus)
PROTEROZOIC			
<u>Tuchodi Formation</u>			
50	Poorly exposed, interbedded succession of: (a) quartzite, minor dolomitic, white to very light grey, pink, and light brown, very fine to medium grained; beds 1 foot to 9 feet thick, in part crossbedded and ripple-marked; weathers very light grey to light brown-grey, resistant and, (b) dolomite, argillaceous, shaly, silty and sandy, light grey, very fine-crystalline; beds generally thin, about 1/8 to 1 inch thick, few dolomitic siltstone interbeds, in 30- to 60-foot units; weathers very light brown to light brown, moderately resistant to recessive; upper 5 feet not exposed; from opposite side of valley angular unconformity observed at top of unit 50.	442	4652
<u>Henry Creek Formation</u>			
49	Covered interval, recessive.	57	4210

Unit	Lithology	Unit	Thickness (feet) From Base
48	Mudstone and siltstone, to very fine grained sandstone, quartzitic, slightly dolomitic, light grey to light green-grey, minor pink and pink-grey, beds 2 to 12 inches thick, lenticular, laminated and crosslaminated; weathers very light brown to light brown-grey, moderately resistant.	188	4153
47	Covered interval, recessive.	68	3965
46	Mudstone, slightly dolomitic, light grey to pink and medium red ('brick red'), minor green-grey; bedding poor, beds about 12 inches thick, in part laminated, slaty-cleaved; weathers light orange-brown to pink, recessive.	33	3896
45	Covered interval, recessive.	37	3863
44	Mudstone, slightly dolomitic to very dolomitic, medium to dark grey, in part light grey; bedding indistinct, beds about 1 foot to 2 feet thick, poorly laminated, few beds with tiny disperse black shale chips, slaty-cleaved; weathers medium grey, moderately recessive.	32	3826
43	Dolomite, dark grey, very fine crystalline; beds 8 inches thick, few molar-tooth structures, in part nodular; weathers light brown, moderately resistant.	4	3794
42	Mudstone, slightly dolomitic, medium to dark grey; bedding indistinct, beds about 1 foot to 2 feet thick, poorly laminated, few beds with tiny disperse dark shale chips, good slaty-cleavage; weathers medium grey, moderately recessive.	8	3790
41	Dolomite, slightly argillaceous, dark grey, very fine crystalline; beds 8 inches thick, minor molar-tooth structures, in part laminated and crosslaminated; weathers light brown, moderately resistant.	14	3782
40	Mudstone, slightly dolomitic, medium to dark grey; bedding indistinct, beds about 1 foot to 2 feet thick, poorly laminated, slaty-cleaved; weathers medium grey, moderately recessive.	13	3768

Unit	Lithology	Thickness (feet)	
		Unit	From Base
39	Dolomitic, slightly argillaceous, dark grey, very fine-crystalline; beds 8 inches thick, few molar-tooth structures; weathers light brown, moderately resistant.	2	3755
38	Mudstone, slightly dolomitic, medium to dark grey, in part light grey; bedding poor, beds about 1 foot to 2 feet thick, poorly laminated, few beds containing scattered tiny black shale chips, slaty-cleaved; weathers medium grey to medium brown-grey, moderately recessive.	212	3753
37	Dolomitic, slightly calcareous, medium grey, fine-crystalline; 3-foot bed; weathers light orange, moderately resistant.	3	3541
36	Mudstone, slightly calcareous to slightly dolomitic, medium grey; beds 1/4 to 1 inch thick, poorly laminated; weathers medium to light brown, moderately recessive.	12	3538
35	Interbedded succession of: (a) siltstone, dolomitic, quartzitic, light to very light grey; beds 2 to 8 inches thick, in part laminated; weathers brown, moderately recessive; constitutes about 60 per cent of unit 35 and, (b) dolomite, argillaceous, silty, very light pink to dark grey, very fine-crystalline; beds 1 inch to 10 inches thick; weathers brown, moderately recessive; constitutes about 35 per cent of unit 35 and, (c) mudstone, slightly calcareous to slightly dolomitic, medium brown-grey; beds 2 to 4 inches thick; weathers medium brown, recessive, constitutes about 5 per cent of unit 35.	97	3526
34	Covered interval, recessive.	41	3429
33	Interbedded succession of: (a) siltstone, argillaceous to shaly, slightly dolomitic to slightly calcareous, dark to medium grey; bedding indistinct, about 1 foot to 6 feet thick, irregularly laminated; weathers medium brown, recessive; constitutes about 45 per cent of unit 33 and, (b) mudstone, calcareous, medium to dark grey; beds 1 foot to 3 feet thick, irregular bedding surfaces,		

Unit	Lithology	Thickness (feet) From Base
	few thin nodular limestone beds; weathers light brown, moderately recessive; constitutes about 35 per cent of unit 33 and, (c) dolomite and limestone, light to medium grey, fine- to very fine-crystalline, in part coarse-crystalline; beds 1 foot to 2 feet thick, in part laminated, few intraformational conglomerate lenses, stromatolitic lenses, and molar-tooth structures; weathers light grey to light brown, moderately resistant; constitutes about 20 per cent of unit 33.	105 3388
32	Poorly exposed, interbedded succession of: (a) siltstone, dolomitic to calcareous, in part shaly, medium to dark grey; beds 6 to 10 inches thick, in 2- to 6-foot units, laminated, crosslaminated, not slaty-cleaved, few silty dolomite beds; weathers light grey-brown, moderately resistant and, (b) mudstone, shaly, in part silty, slightly dolomitic to slightly calcareous, dark to medium grey; beds 2 inches thick, in 2- to 24-inch units, irregularly laminated, slaty-cleaved; weathers medium to light brown, moderately recessive.	91 3283
<u>George Formation</u>		
31	Poorly exposed (frost heaved): dolomite, slightly argillaceous, in part silty and calcareous, light to medium grey, fine- to very fine-crystalline, in part coarse-crystalline (vuggy); beds 2 to 3 feet thick, laminated, crosslaminated, in part homogeneous, few stromatolite beds and intraformational conglomerate lenses, few molar-tooth structures; weathers light brown, moderately resistant.	79 3192
30	Dolomite, calcareous, slightly argillaceous, in part silty, light to medium grey, fine- to very fine-crystalline; beds 2 to 3 feet thick, laminated, crosslaminated, in part homogeneous, few stromatolite beds and intraformational conglomerate lenses, few molar-tooth structures, in part mud-cracked; weathers brown, resistant.	144 3113
29	Dolomite, slightly argillaceous, in part silty and calcareous, light to medium grey, in part brown mottled, fine- to very fine-crystalline,	

Unit	Lithology	Thickness (feet)	
		Unit	From Base
	in part coarse-crystalline (vuggy); beds 2 to 3 feet thick, laminated, crosslaminated, few stromatolite beds and intraformational conglomerate lenses, few molar-tooth structures, in part mud-cracked; weathers light brown, moderately resistant.	158	2969
28	Limestone, minor silty, light to medium grey, very fine-crystalline to micritic; beds 2 to 36 inches thick, in 5 to 10 foot units, abundant 2 to 12 inch lenses of intraformational conglomerate, laminated, in part crosslaminated and crossbedded, in part homogeneous, few stromatolite beds, very few mud-cracked and molar-tooth structures; weathers light grey, in part light brown-grey, resistant.	547	2811
27B	Dolomite, calcareous, slightly argillaceous, in part silty, medium to dark grey, very fine-crystalline to micritic; beds 2 to 60 inches thick, usually about 12 to 18 inches, laminated, molar-tooth structures; weathers light grey to light brown, resistant; minor dolomitic limestone.	72	2264
27A	Alternating succession of: (a) mudstone, slightly dolomitic, in part slightly silty and slightly sandy, dark to medium grey; beds 1/4 inch to 2 inches thick, in 2-to 6-foot units, laminated, contains minor tiny disperse black shale chips, in part homogeneous; weathers dark grey-brown, recessive to moderately recessive and, (b) dolomite, minor calcareous, slightly argillaceous, in part silty, medium to dark grey, very fine grained to micritic; beds 12 to 18 inches thick, in 8-to 15-foot units, laminated to homogeneous; weathers light orange-brown, resistant to moderately resistant.	43	2192
26	Dolomite, slightly calcareous, silty, and argillaceous, in part slightly sandy, medium grey, fine grained to micritic; beds 2 to 25 inches thick, usually 4 inches, in 1-to 3-foot units, laminated, crosslaminated (festoon to planar), in part homogeneous, molar-tooth structures common in upper 180 feet, few siltstone bands in lower 100 feet; weathers light brown to light brown-grey, moderately resistant; minor silty limestone.	381	2148

Unit	Lithology	Unit	Thickness (feet) From Base
25	Dolomite, slightly argillaceous, in part silty, medium to dark grey, very fine-crystalline to micritic; beds 1 inch to 4 inches thick, uniformly laminated, few argillaceous partings; weathers light brown, in part light grey, moderately resistant; minor dolomite, limestone.	69	1768

Unit	Lithology	Unit	Thickness (feet) From Base
	fine-crystalline; beds 2 to 12 inches thick, thickly laminated, abundant black shaly partings, contorted beds and load casts; weathers light brown, moderately recessive.	114	1339
19	Sandstone, quartzitic, argillaceous, medium grey to dark grey, very fine grained; beds 3 to 18 inches thick, laminated, few 1/4 to 4-inch black, silty, argillaceous beds, few contorted beds and load casts; weathers medium grey, moderately resistant.	32	1222
18	Mudstone, very light greenish grey; beds 1/4 to 1/2 inch thick; weathers very light green-grey, recessive.	11	1193
17	Alternating succession of: (a) mudstone, dolomitic, carbonaceous, medium grey to black; beds 1/2 inch to 4 inches thick, alternating laminated and unlaminated, in 2 to 10-foot units; weathers medium grey, moderately recessive and, (b) siltstone and sandstone, quartzitic, carbonaceous, non-dolomitic, black to medium grey, in part brown-grey, silt-sized to fine grained; beds 1/4 inch to 6 inches thick, abundant black shaly partings, abundant graded bedding, in part laminated, few sole markings; weathers black and dark brown, moderately recessive to moderately resistant.	50	1182
16	Mudstone, dolomitic, carbonaceous, medium grey to black; beds 1/2 inch to 4 inches thick, averages about 2 1/2 inches, alternating laminated and unlaminated, few black shaly partings; weathers medium grey, moderately recessive; minor argillaceous, black dolomite.	80	1122
15	Siltstone and sandstone, shaly, non-calcareous, in part dolomitic, medium grey to dark grey, silt-sized to very fine grained; beds 1/2 to 1 inch, laminated, abundant black shaly partings; weathers black, recessive.	28	1052
14	Siltstone, siliceous, slightly to moderately dolomitic, slightly carbonaceous, light grey to black; beds 1/2 inch to 3 inches thick, laminated, in part ripple-marked; weathers dark brown, moderately recessive.	69	1024

Unit	Lithology	Thickness (feet)	
		Unit	From Base
13	Siltstone and sandstone, shaly, non-calcareous, in part dolomitic, medium to dark grey, silt-sized to very fine grained; beds 1/2 to 1 inch thick, laminated, abundant black shaly partings; weathers dark grey to dark brown, recessive to moderately recessive.	67	955
12	Quartzite, very light grey to light grey, fine to very fine grained; massive, upper 2 feet thin bedded and darker grading into unit 13; weathers medium grey, very resistant.	22	888
11	Siltstone and sandstone, quartzitic, in part dolomitic, slightly carbonaceous, dark grey to black, silt-sized to very fine grained; beds 1/2 inch to 6 inches thick, averages 2 inches, in part laminated, few black shaly partings, minor 6 to 15-inch sandstone beds; weathers black and dark brown, minor light to very light brown, recessive to moderately recessive; minor mudstone.	108	866
10	Quartzite, very light grey to very light brown fine grained; massive; weathers light to medium grey, very resistant.	17	758
9	Quartzite, dark to medium grey, fine grained, beds 6 inches thick; weathers medium brown-grey; resistant.	3	741
8	Siltstone and sandstone, quartzitic carbonaceous, non-dolomitic, shaly, black to dark grey, silt-sized to very fine grained; beds 1/4 inch to 4 inches thick, averages 1/2 inch, in part laminated, abundant black shaly partings, few graded beds; weathers black and dark brown, moderately recessive.	9	738
7	Covered interval; recessive.	7	729
6	Quartzite, light grey to white, fine grained; massive; weathers light grey, very resistant.	43	722
5	Conglomerate with 10 to 40 per cent pebbles of siltstone, dolomite, sandstone, and shale (pebbles commonly light grey and white, few varicoloured, few dark grey; commonly sub-angular; few well-rounded; poorly sorted, size 1/4 inch to 10 inches, rarely 30 inches),		

Unit	Lithology	Thickness (feet) Unit From Base
	with about 60 to 90 per cent quartzitic matrix (quartzitic sand, slightly dolomitic, light grey, fine to coarse grained); massive, graded, mean pebble size decreases towards top, percentage of pebbles decreases towards top, channelled into unit 4; weathers medium grey to light grey-brown, resistant to very resistant.	21 679
4	Interbedded sequence of: (a) quartzitic, slightly dolomitic, light to medium grey, fine grained; beds 2 to 12 inches thick, laminated, few shaly partings, in part mud-cracked; weathers medium grey, resistant and, (b) sandstone, dolomitic, medium to light grey, medium grained; bedding indistinct and irregular about 6 to 10 inches, crossbedded; weathers light brown to medium grey, resistant and, (c) dolomite, light to very light grey, in part sandy, very fine-crystalline; beds 2 to 8 inches thick; weathers brown, resistant.	10 658
	Rests on erosional surface at top of Chischa Formation. Unit 5 channels into unit 4 and occasionally through unit 4 to lie on Unit 3.	
	<u>Chischa Formation</u> (Quartzitic member)	
3	Alternating succession of: (a) dolomite, slightly argillaceous, slightly silty, in part siliceous, pink and white, in part light grey, very fine crystalline to micritic; beds 1 foot to 4 feet thick with 1-to 3-inch silty and argillaceous beds, in part homogeneous, in part ripple-marked, in 2-to 25-foot units; weathers very light brown, resistant and, (b) quartzite, in part slightly dolomitic, pink to very light grey, fine grained to silt-sized; beds 1 foot to 4 feet thick, rarely ripple-marked, in 5-to 35-foot units; weathers light grey, resistant.	341 648
2	Quartzite, slightly dolomitic, very light pink, very fine grained to silt-sized; beds 1 foot to 2 feet thick; weathers light grey, moderately resistant.	5 307

Unit	Lithology	Thickness (feet)	
		Unit	From Base

Chischa Formation

(Dolomitic member)

1	Dolomite, slightly argillaceous, in part slightly silty, pink and white to very light grey, micritic; beds 1 foot to 3 1/2 feet thick, with 1- to 3-inch silty and argillaceous beds, in part uniform; weathers very light to medium brown-grey, resistant.	302	302
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Base of section.

Note: Talus obscures a 500-foot interval between the base of the measured section and the Chischa River. Beds, similar to those of unit 1, and containing stromatolites and intraformational conglomerate lenses, are sporadically exposed on the Chischa River below the measured section. These strata are probably equivalent to those obscured by the talus. Thus it is possible to observe approximately 1,150 feet of the Chischa Formation at this section.

Section 3: TETSA RIVER SECTION

(Field designation 65 BV-17)

The base of Section 3 lies about 1/3 mile upstream from the largest lake on Tetsa River. The section was measured, upsection, up the Tetsa River to the first tributary from the west, and thence up this tributary to the lip of a hanging valley. From the lip of the hanging valley the section was measured up the southeast-facing slope of the ridge north of the tributary to the top of the first small peak on this ridge. The section was terminated at the top of this peak. Beyond this peak lies a small saddle formed by incision into a north-trending fault zone. This section includes the type section of the Tetsa Formation.

Base of section: 58°26'15"N, 124°37'15"W.

Top of section: 58°26'30"N, 124°40'00"W.

Unit	Lithology	Thickness (feet)	
		Unit	From Base
PROTEROZOIC			
<u>Henry Creek Formation</u>			
19	Alternating succession of: (a) mudstone, in part silty, in part calcareous, medium to dark grey; beds 6 to 36 inches thick, increasing in thickness towards top, upper 40 feet of unit slaty-cleaved, poorly laminated, few beds with disperse tiny shale chips; weathers moderately recessive, light brown and, (b) limestone, argillaceous, silty, medium grey, micritic to very fine-crystalline; beds 1 inch to 36 inches thick, minor molar-tooth structure, laminated and irregularly laminated; weathers moderately resistant, and light grey-brown.	129	2854
<u>George Formation</u>			
18	Limestone, dolomitic limestone, and minor dolomite, in part argillaceous and silty, medium grey, in part dark grey, very fine-crystalline to micritic; beds 1 inch to 18 inches thick, average 4 to 12 inches, laminated, in part crosslaminated, few pink and grey shaly partings, abundant molar-tooth structures, common intraformational conglomerate lenses, scarce stromatolitic structures, few thin slaty-cleaved mudstone beds; weathers very light brown to light brown-grey, orangish cast near base, moderately resistant.	1460	2725

Unit	Lithology	Thickness (feet)	
		Unit	From Base
<u>Tetsa Formation</u>			
17	Alternating succession of: (a) dolomite, very silty to slightly silty, sandy, argillaceous, dark grey, micritic to very fine-crystalline; beds 1/4 inch to 2 inches thick, laminated, few shaly partings, in 2-to 10-foot units; weathers light orange, moderately recessive and, (b) siltstone and mudstone, quartzitic, argillaceous slightly pyritic, carbonaceous, black to dark grey; beds 1/8 to 1 inch thick in 2-to 10-foot units, laminated; weathers dark brown-grey to black, recessive.	79	1265
16A	Siltstone and mudstone, carbonaceous, quartzitic, in part slightly dolomitic and pyritic, black to dark grey; beds 1/8 to 1 inch thick, laminated; weathers dark brown-grey to orange, moderately recessive.	146	2186
16B	Siltstone and mudstone, carbonaceous, quartzitic, black; beds 1/8 to 1 inch thick, usually 1/8 inch, laminated, in part irregularly laminated; weathers black to dark brown, moderately recessive.	85	2040
16C	Siltstone and mudstone, carbonaceous, quartzitic, black; beds 1/8 to 1 inch thick, laminated, minor slump structures and contorted laminations; weathers black to dark brown, moderately recessive.	263	1955
16D	Siltstone, argillaceous, carbonaceous, quartzitic, slightly sandy, slightly dolomitic, black; beds 1/8 inch to 2 inches thick, laminated, commonly ripple-marked; weathers black to very dark brownish grey, recessive to moderately recessive.	252	1692
15	Quartzite, white to light grey, medium grey at top, fine to medium grained; beds 1 foot to 7 feet thick, usually 6 feet, crossbedded, in part laminated and irregularly laminated near base, few black shaly partings; weathers medium grey to light grey, very resistant, cliff former.	69	1440

Unit	Lithology	Unit	Thickness (feet) From Base
14	Dolomite, argillaceous, medium to dark grey, micritic; bedding obscure, irregularly laminated, minor dolomitic siltstone; weathers light brown, moderately recessive.	6	1371
13	Covered recessive.	13	1365
12	Siltstone and sandstone, quartzitic, carbonaceous, dark grey to black, silt-sized to very fine grained; beds 1/2 inch to 2 inches thick, laminated, alternating white and dark grey to black beds, in part ripple-marked; weathers dark brown, moderately recessive.	20	1352
11	Dolomite, argillaceous, silty, medium grey, micritic, beds 1/2 to 1 inch thick; weathers light brown, moderately recessive.	5	1332
10	Siltstone and sandstone, quartzitic, carbonaceous, dark grey to black, very fine grained; beds 1/2 inch to 2 inches thick, rarely up to 6 inches, laminated, few black shaly partings, in part ripple-marked; weathers dark brown, rusty brown, moderately recessive.	44	1327
9	Covered, recessive.	51	1283
8	Siltstone and sandstone, quartzitic, calcareous, slightly conglomeratic, dark grey to medium grey-brown, very fine grained; beds 1 inch thick, lower 2 inches contains abundant scattered argillaceous fragments up to 1/8 inch and mud chips and quartzite fragments (poorly rounded); weathers brown, moderately recessive.	25	1232

Chischa Formation

(Quartzitic member)

- 7 Interbedded succession of: (a) sandstone, quartzitic, in part slightly dolomitic, white to light grey, silt-sized to fine grained; beds 2 feet thick to massive, ripple-marked, in part laminated, crosslaminated, and irregularly laminated, common dark shaly partings, weathers light grey to brown, resistant to very resistant and, (b) dolomite and siltstone, siliceous, light grey; beds 1/2 inch to 3 inches

Unit	Lithology	Unit	Thickness (feet) From Base
	thick in 1-to 4-foot units, in part ripple-marked and laminated; weathers brown, moderately resistant to resistant.	160	1207
6	Covered by talus; on hillside to south equivalent strata are similar to unit 7.	210	1047
5	Sandstone, quartzitic, in part moderately dolomitic, very light to medium grey, silt-sized to fine grained; beds 1/2 inch to 4 inches thick, where dolomitic, 2-foot to massive in non-dolomitic quartzites, in part laminated, crosslaminated, and ripple-marked, common shale partings, in part irregularly laminated, contains few mud chips; weathers light grey to grey-brown, resistant.	68	837
4	Interbedded succession of: (a) dolomite, slightly argillaceous, in part silty, light grey, mottled, very fine- to fine-crystalline; beds 1 foot to 3 feet thick, in 5-to 30-foot units, irregularly bedded, in part irregularly laminated, few molar-tooth structures; weathers light orange-brown to light brown-grey, resistant and, (b) quartzite, in part very slightly dolomitic, light grey to white, silt-sized to fine grained; beds 1/2 foot to 4 feet thick, rarely 1/2 inch to 4 inches usually homogeneous, in part laminated and ripple-marked; weathers white to light brown-grey, resistant.	517	769
<u>Chischa Formation</u>			
(Dolomitic member)			
3	Dolomite, slightly argillaceous, in part sandy, light grey, mottled, micritic; beds 1 foot to 3 feet thick in 5-to 10-foot units, sandy beds, lenses of intraformational conglomerate, in part irregularly laminated, few molar-tooth structures; weathers light orange-brown to light brown, resistant.	70	252
2	Quartzite, in part dolomitic, light grey to very light grey, silt-sized to fine grained; beds 1/2 inch to 4 feet, usually homogeneous, in part laminated; weathers light grey-brown, resistant.	61	182

Unit	Lithology	Thickness (feet)	
		Unit	From Base
1	Dolomite, slightly argillaceous, in part silty, light grey to very light grey, pink, mottled, micritic; beds 1 foot to 3 feet, abundant molar-tooth structures, in part irregularly laminated, very few stromatolitic structures; weathers light orange-brown to light brown-grey, resistant.	121	121
	Base of section.		

Section 4: MOUNT ST. GEORGE SECTION

(Field designation 65 BV-23)

This section was measured upsection, starting about 1/2 mile upstream from a small lake northwest of the unnamed middle branch of the Tetsa River. The base of the section is about 5 1/2 miles south of Summit Lake townsite. The section was measured up a small tributary westerly to the lip of a moraine-filled cirque at the head of this tributary, and thence due north up the south-facing slope to the top of the small peak that lies 4 1/2 miles due south of the western end of Summit Lake. Section 4 includes the type section of the George Formation.

Base of section: 58°34'40"N, 124°35'15"W.

Top of section: 58°35'00"N, 124°35'45"W.

Unit	Lithology	Unit	Thickness (feet) From Base
PROTEROZOIC			
<u>Henry Creek Formation</u>			
28	Interbedded succession of: (a) mudstone, calcareous to dolomitic, medium to dark grey; beds 1 foot to 5 feet thick, irregularly laminated beds, few beds of calcareous nodules, few beds containing scattered tiny black mud chips, slaty-cleaved throughout; weathers medium brown to light grey-brown, moderately resistant to moderately recessive; constitutes 50 per cent of lithology in lower 30 feet and more than 70 per cent in upper part of unit 28 and, (b) limestone, argillaceous, dolomitic, silty, medium grey, micritic to very fine-crystalline; beds 1 foot to 3 feet thick, in part laminated and irregularly laminated, few molar-tooth structures, few intraformational conglomerate lenses, very few stromatolites; weathers light brown to light brown-grey; moderately resistant, to resistant; minor calcareous siltstone.	53	1961
<u>George Formation</u>			
(type section)			
27	Interbedded succession of: (a) limestone, argillaceous, dolomitic, silty, medium grey, micritic; beds 1 foot to 4 feet thick in part laminated and irregularly laminated, few		

Unit	Lithology	Thickness (feet)	
		Unit	From Base
	molar-tooth structures, stromatolitic structures, and intraformational conglomerate lenses; weathers light brown to light grey-brown, resistant to moderately resistant; constituted 80 per cent of the unit 27 and, (b) mudstone, calcareous to dolomitic medium to dark grey; beds 1 foot to 3 feet thick, irregularly laminated, slaty cleavage; weathers medium brown, moderately resistant.	75	1908
26	Limestone, in part dolomitic, argillaceous, and silty, medium grey, micritic; beds 1 foot to 4 feet thick, mud-cracked, in part laminated and irregularly laminated, abundant molar-tooth structures, few intraformational conglomerate lenses, and stromatolite lenses, few pink to grey shaly partings; weathers light grey to light brown-grey, resistant.	199	1833
25	Limestone, argillaceous, in part silty and sandy, medium grey, micritic to very fine-crystalline; bedding highly variable, 2 to 30 inches thick, laminated, irregularly laminated, and crosslaminated, abundant molar-tooth structures, very abundant stromatolitic structures (undulatory, hemispheric, digitate, compound lenses of hemispheric and digitate forms etc.), commonly mud-cracked, abundant intraformational conglomerate lenses, few pink to grey shaly partings and silty and sandy beds; weathers light to medium grey to light brown-grey, resistant.	412	1634
24	Limestone, argillaceous, in part silty, medium to light grey, micritic to fine-crystalline; beds 2 to 6 feet thick, laminated, irregularly laminated and cross-laminated, abundant molar-tooth structures, abundant stromatolitic structures (very large, mainly digitate and hemispheric), common intraformational conglomerate lenses, common pink shale partings, weathers medium to light grey-brown, resistant to moderately resistant.	159	1222
23	Limestone, slightly argillaceous, medium grey, micritic; beds 4 to 7 feet thick, laminated, abundant molar-tooth structures throughout (obscures internal structures); weathers light to medium brown-grey to very light brown, resistant.	66	1063

Unit	Lithology	Unit	Thickness (feet) From Base
22	Limestone, slightly argillaceous, medium to light grey, micritic to very fine-crystalline; beds 2 to 6 feet thick, laminated, irregularly laminated, abundant molar-tooth structures, common intraformational conglomerate lenses, common stromatolite structures (small in size in lower 160 feet, increasing in size to top of unit 22), few pink shaly partings, common calcarenite layers (commonly crosslaminated); weathers medium to light grey-brown, moderately resistant.	229	997
21	Alternating succession of: (a) limestone, slightly dolomitic, slight silty to very argillaceous, medium grey, micritic to fine-crystalline; beds 2 to 40 inches thick, usually 10 to 18 inches in 5- to 20-foot units; laminated, in part crosslaminations, common molar-tooth structures, few pink to black shale partings; weathers medium grey to light brown-grey, resistant to moderately recessive and, (b) mudstone and siltstone, slightly calcareous, siliceous, dark grey to black, in part medium pink-grey to pink; bedding poor, irregularly laminated, in 2- to 15-foot units, slaty-cleaved; weathers dark grey to buff, moderately resistant to moderately recessive; comprises 20 per cent of unit 21.	86	768
20	Siltstone, siliceous, shaly, slightly calcareous, dark grey to black; poorly laminated; weathers dark grey to very light brown and pink at top, moderately resistant, to recessive at top.	9	682
19	Limestone, slightly silty and argillaceous, medium grey, micritic to fine-crystalline; beds 2 to 40 inches thick, usually 10 to 18 inches, in 5-foot units, in part laminated and crosslaminated, common molar-tooth structures, one <i>Collenia</i> zone at 41 to 42 feet from base, rare pink shaly partings; weathers medium brown-grey, resistant.	64	673
18	Limestone, dolomitic, argillaceous, in part silty, medium grey, micritic to very fine crystalline; beds 2 to 8 inches thick in 1- to 4-foot units, laminated, abundant molar-tooth structures; weathers light orange-brown, moderately recessive.	7	609

Unit	Lithology	Thickness (feet)	
		Unit	From Base
17	Sandstone, quartzitic, calcareous, light grey, silt-sized to very fine grained; beds 2 to 4 inches thick, laminated, ripple-marked; weathers medium grey, moderately resistant.	5	602
16	Siltstone, calcareous to dolomitic, light to medium grey; beds 1 inch to 2 inches thick, averages 4 to 5 inches, few 2- to 6-inch beds of limestone with molar-tooth structures; weathers very light brown, moderately recessive.	17	597
15	Limestone, dolomitic, argillaceous, in part silty, medium grey, micritic to very fine-crystalline; beds 2 to 8 inches thick, laminated, common intraformational conglomerate lenses, abundant molar-tooth structures; weathers light brown-orange moderately resistant.	6	580
14	Siltstone, calcareous to dolomitic, light to medium grey; beds 1 inch to 20 inches thick, averages 4 to 5 inches, few 2- to 6-inch thick beds of limestone with molar-tooth structures; weathers medium grey-brown, moderately recessive.	26	574
13	Limestone, dolomitic, argillaceous, in part silty, medium grey, micritic to very fine-crystalline; beds 2 to 8 inches thick, in 3-foot units, laminated, abundant molar-tooth structures, few pink shaly partings; weathers light orange-brown, moderately resistant.	26	548
12	Siltstone, calcareous, light grey; beds 2 to 8 inches thick with 2- to 4-inch argillaceous limestone beds, laminated, crosslaminated; weathers medium grey-brown, moderately resistant.	4	522
11	Limestone, slightly dolomitic, argillaceous in part silty and sandy, medium grey, micritic; beds 6 to 18 inches thick, in part laminated and crosslaminated, abundant molar-tooth structures; weathers light brown, moderately resistant.	32	518

Unit	Lithology	Thickness (feet)	
		Unit	From Base
10	Siltstone, calcareous to dolomitic, light to medium grey; beds 2 to 8 inches thick alternating with 2- to 4-inch thick argillaceous limestone beds, laminated and cross-laminated; weathers medium grey-brown, moderately resistant.	12	486
9	Poorly exposed: limestone, slightly dolomitic, argillaceous, in part silty, medium grey, micritic; bedding poor, 6- to 18-inch thick beds, in part laminated and crosslaminated, very abundant molar-tooth structures; weathers light brown, resistant; tends to be more argillaceous towards top.	116	474
8	Siltstone, calcareous to dolomitic, quartzitic, light grey to very light grey; beds 1 inch to 8 inches thick, laminated, crosslaminated; weathers medium grey-brown, moderately recessive.	5	358
7	Poorly exposed: limestone, dolomitic, slightly argillaceous, slightly silty, medium grey, very fine-crystalline to micritic; beds 4 to 12 inches thick, laminated, in part crosslaminated, abundant molar-tooth structures; weathers very light brown, resistant; minor calcareous dolomite.	17	353
6	Limestone, slightly to moderately dolomitic, slightly silty, slightly argillaceous, in part sandy, light to medium grey, fine-crystalline to micritic; beds 1 inch to 4 inches thick, rarely 8 to 12 inches, alternating laminated and crosslaminated beds with homogeneous beds; weathers light brown to light grey, moderately resistant; above 56 feet from base of unit molar-tooth structures occur and are confined to clumps within non-crosslaminated beds.	96	336
5	Dolomite, argillaceous, silty, in part quartzitic, light to medium grey, very fine-crystalline; beds 2 to 4 inches thick, very rarely up to 40 inches, in part laminated and crosslaminated; weathers light orange to very light brown, moderately resistant; minor dolomitic siltstone beds, rare 2-inch thick quartzite beds.	77	240

Unit	Lithology	Thickness (feet)	
		Unit	From Base
<u>Tetsa Formation</u>			
4	Covered, recessive. On the hillside to south, this interval is exposed and resembles units (1) and (3) but contains more orange-weathering thin dolomitic beds.	145	163
3	Siltstone, dolomitic, black to dark grey; beds 1/2 inch to 4 inches thick, laminated; weathers black to orange-brown; recessive.	2	18
2	Covered, very recessive.	13	16
1	Siltstone, in part dolomitic, black to dark grey; beds 1/4 inch to 4 inches thick, laminated; weathers black to orange-brown, recessive.	3	3
Base of section.			

Section 5:

HENRY CREEK SECTION

(Field designation 64 BV-4)

Section 5 was measured at the head of Henry Creek, on the north side of the valley, measuring upsection to the north, from the last exposure of the Tetsa Formation in the creek to the top of the eastern peak of an unnamed mountain. Section 5 includes the type section of the Henry Creek Formation.

Base of section: 58°22'40"N, 124°33'30"W.

Top of section: 58°23'20"N, 124°33'30"W.

Unit	Lithology	Unit	Thickness (feet) From Base
PROTEROZOIC			
<u>Tuchodi Formation</u>			
55	Dolomite, silty and sandy, medium grey, very fine-crystalline, sandy (quartz) fraction is coarse; beds 1/4 to 1 inch thick, laminated, ripple-marked, few intraformational conglomerate lenses; weathers light brown-orange, recessive.	40	3064
54	Poorly exposed (frost heaved): (a) sandstone, quartzitic, feldspathic, in part dolomitic, very light grey to white, fine to medium grained; massive, crossbedded, ripple-marked; weathers light brown to white and light grey, resistant to very resistant and, (b) dolomite, sandy, silty and argillaceous, dark grey, fine-crystalline; beds 2 to 20 inches thick, in part laminated and cross-laminated; weathers brown, moderately recessive. Base marked by thick quartzite bed.	155	3024
<u>Henry Creek Formation</u>			
(type section)			
53B	Covered interval, recessive.	55	2869
53A	Poorly exposed: (a) siltstone and mudstone, slightly dolomitic, in part slightly calcareous, medium to dark grey; beds 2 to 8 inches thick, laminated, few shale partings; weathers light brown, moderately recessive		

Unit	Lithology	Thickness (feet)	
		Unit	From Base
	and, (b) dolomite, quartzitic, medium grey to light grey; bedding obscure, crossbedded, channelled; weathers brown, moderately resistant.	80	2814
52	Limestone and dolomite, argillaceous, medium to dark grey, very fine-crystalline; beds 2 to 30 inches thick, laminated, mud-cracked, few intraformational conglomerate lenses, few shaly partings; weathers light brown, moderately resistant.	60	2734
51	Poorly exposed; siltstone and mudstone, slightly dolomitic, in part slightly calcareous, medium to dark grey; beds 2 to 8 inches thick, rarely 12 inches, laminated, few shaly partings; weathers light brown, moderately recessive.	125	2674
50	Covered interval, recessive.	30	2549
49	Siltstone, dolomitic, medium grey; bedding obscure, laminated, few 6- to 18-inch thick beds of fine-grained sandstone; weathers brown, moderately resistant.	50	2519
48	Siltstone, dolomitic, dark grey; beds 4 to 30 inches thick, average 4 to 6 inches, with 1- to 2-inch calcareous dolomite beds; weathers light brown, moderately resistant.	50	2469
47	(a) Siltstone and sandstone, slightly dolomitic, feldspathic, argillaceous, dark grey to black, silt-sized to very fine-grained; bedding obscure, laminated, in part irregularly laminated, few beds with disperse tiny black shale chips, slaty-cleaved; weathers dark grey, moderately recessive; with minor beds of: (b) sandstone, dolomitic, siliceous, light to medium grey, very fine grained; beds 6 to 18 inches thick, laminated; weathers light brown, moderately resistant.	70	2419
46	Siltstone and sandstone, slightly dolomitic, feldspathic, shaly, dark grey to black, silt-sized to very fine grained; beds 12 to 20 inches thick, laminated, in part irregularly		

Unit	Lithology	Unit	Thickness (feet) From Base
	laminated, few beds with disperse tiny black shale chips, slaty-cleaved; weathers dark grey to medium brown, moderately recessive.	280	2349
45	Limestone, dolomitic, in part silty and argillaceous, medium to dark grey, very fine-crystalline; beds 4 to 16 inches thick, in part laminated and irregularly laminated, few contorted beds; weathers medium brown-grey, moderately resistant to moderately recessive.	13	2069
44	Siltstone, shaly, minor dolomitic, in part calcareous, dark grey; beds 12 to 20 inches thick, laminated, in part irregularly laminated, minor beds with disperse tiny black shale chips, slaty-cleaved; weathers medium brown-grey to light brown, moderately recessive; contains minor 1- to 4-inch thick nodular limestone beds.	315	2056
43	Poorly exposed; mudstone, dolomitic to slightly calcareous, silty, in part sandy, medium to dark grey; beds 1/2 inch thick in 8- to 12-inch units, few thin beds of nodular limestone, few beds containing disperse tiny black shale chips, slaty-cleaved; weathers light brown to grey-brown, recessive.	115	1741
42	Covered interval, recessive.	40	1626
41	Limestone, argillaceous, medium grey, very fine-crystalline; bedding obscure, graded (from intraformational conglomerates, fine argillaceous limestone); weathers medium grey to light brown-grey, moderately recessive to recessive.	14	1586
40	Covered interval, recessive.	39	1572
39	Mudstone, dolomitic to slightly calcareous, in part silty and sandy, medium to dark grey; bedding in 8- to 12-inch units, abundant beds containing disperse tiny dark shale chips, in part laminated, few nodular limestone beds, slaty-cleaved; weathers light grey-brown, recessive.	215	1533

Unit	Lithology	Thickness (feet)	
		Unit	From Base
<u>George Formation</u>			
38	Limestone, argillaceous to very argillaceous, dolomitic, in part silty, medium to dark grey, very fine-crystalline; beds 2 to 12 inches thick, laminated, in part cross-laminated, few intraformational conglomeratic lenses; weathers light grey to light brown, resistant to moderately resistant. Transitional with units 39 and 37.	95	1318
37	Limestone, silty, in part dolomitic and argillaceous, dark grey, minor medium grey, fine- to very fine-crystalline; beds 1 foot to 2 feet thick, rarely 4 to 5 feet, commonly graded, laminated, few grey to pink shaly partings, few 2- to 6-inch thick lenses of intraformational conglomerate, few molar-tooth structures, in part mud-cracked and crosslaminated, few stromatolitic beds; weathers light grey, resistant to very resistant.	355	1223
36	Limestone, dolomitic and argillaceous, in part silty, medium grey to medium blue-grey, fine grained to micritic; beds 2 to 8 feet thick, in part laminated, irregularly laminated, and crosslaminated, few lenses of intraformational conglomerate, common graded beds, common molar-tooth structure, in part mud-cracked; weathers light to medium grey, resistant to very resistant.	220	868
35	Limestone, dolomitic, in part argillaceous, medium to dark grey, very fine-crystalline; beds 1/2 inch to 6 inches thick, in part laminated, few intraformational conglomerate lenses; weathers light grey-brown, moderately recessive to recessive.	25	648
34	Dolomite, in part calcareous and argillaceous, medium to dark grey, very fine-crystalline; beds 1 inch to 6 inches thick, in part laminated; weathers light brown to light grey-brown, moderately resistant.	42	623
33	Alternating succession of: (a) mudstone, dolomitic, siliceous, medium to dark grey; beds 8 to 24 inches thick, in part irregularly laminated, poorly slaty-cleaved; weathers		

Unit	Lithology	Unit	Thickness (feet) From Base
	brown, moderately resistant and, (b) siltstone, in part dolomitic, and siliceous, dark grey to black; beds 18 to 24 inches thick, in part laminated and irregularly laminated, few beds containing dispersed tiny dark shale chips, graded, slaty-cleaved; weathers dark grey, with brown cast, recessive.	45	581
32	Mudstone, dolomitic, siliceous, medium to dark grey; beds 8 to 24 inches thick, in part laminated, poorly slaty-cleaved; weathers brown, moderately resistant.	8	536
31	Siltstone, in part dolomitic, and siliceous, dark grey to black; beds 12 inches thick, in part laminated, poorly graded, few beds containing dispersed tiny dark shale chips, slaty-cleaved; weathers dark grey-brown, recessive.	12	528
30	Mudstone, dolomitic, siliceous, medium to dark grey; beds 8 to 24 inches thick, in part laminated, poorly slaty-cleaved; weathers brown, moderately resistant.	8.5	516
29	Siltstone, shaly, in part dolomitic and siliceous, dark grey to black; beds 12 inches thick to massive, in part laminated, and irregularly laminated, poorly graded, few beds containing dispersed tiny dark shale chips, slaty-cleaved; weathers dark grey, in part light brown, recessive.	13	507.5
28	Poorly exposed; mudstone, dolomitic, siliceous, medium to dark grey; beds 8 to 24 inches thick, in part poorly laminated, poorly slaty-cleaved; weathers brown, moderately recessive.	13	494.5
27	Dolomite, calcareous, silty, medium grey, very fine-crystalline; beds 2 to 4 feet thick, in part laminated, irregularly laminated, and crosslaminated, in part mud-cracked, few intraformational conglomerate lenses, few molar-tooth structures; weathers light grey-brown, resistant; minor dolomitic, argillaceous limestone.	21	481.5
26	Poorly exposed; dolomite, calcareous, silty, argillaceous, medium grey, very fine-crystalline; beds 2 to 4 inches thick, in part laminated and crosslaminated, in part mud-cracked, few intraformational conglomerate lenses, few molar-tooth structures; weathers light grey-brown, moderately recessive; minor dolomitic limestone.	27	460.5

Unit	Lithology	Thickness (feet)	
		Unit	From Base
25	Dolomite, calcareous, silty, argillaceous, medium grey, micritic; beds 2 to 4 feet thick, in part laminated, irregularly laminated, and crosslaminated, in part mud-cracked, few intraformational conglomerate lenses, few molar-tooth structures; weathers light grey-brown, moderately resistant; minor argillaceous, dolomitic limestone.	43	433.5
24	Poorly exposed; limestone and dolomite, argillaceous, medium grey, micritic; beds 2 to 4 feet thick, contorted bedding, laminated, in part irregularly laminated and crosslaminated, in part mud-cracked, few intraformational conglomerate lenses, stromatolitic beds, and molar-tooth structures; weathers light grey to light grey-brown, moderately resistant.	10	387.5
23	Limestone and dolomite, in part argillaceous, medium grey, very fine-crystalline to micritic; beds 2 to 4 feet thick, contorted bedding, laminated, in part irregularly laminated and crosslaminated, few intraformational conglomerate lenses, stromatolitic beds, and molar-tooth structures; weathers light grey to light grey-brown, resistant.	8	380.5
22	Dolomite, silty, medium to light grey, very fine-crystalline; beds 2 to 8 inches thick, laminated, in part crosslaminated; weathers light brown, moderately resistant.	2.5	372.5
21	Limestone and dolomite, in part argillaceous, medium grey; very fine-crystalline to micritic; beds 2 to 4 feet thick, laminated, few intraformational conglomerate lenses, stromatolitic beds, and molar-tooth structures; weathers light grey to light grey-brown, resistant.	25	370
20	Dolomite, silty, medium grey, micritic; beds 1 inch to 2 inches thick in 12-inch units, laminated and crosslaminated, few limestone beds; weathers light brown, moderately recessive.	14	345
19	Mudstone, dolomitic, siliceous, medium to dark grey; beds 2 to 3 feet thick; weathers medium brown, moderately resistant.	5	331

Unit	Lithology	Thickness (feet)	
		Unit	From Base
18	Dolomite, silty, medium to light grey, very fine-crystalline; beds 2 to 8 inches thick, laminated, in part crosslaminated, few intraformational conglomerate lenses; weathers light brown, moderately resistant.	9	326
17	Mudstone, dolomitic to very dolomitic, siliceous, medium to dark grey; beds 2 to 3 feet thick; weathers medium brown, moderately resistant.	15	317
16	Mudstone, dolomitic to very dolomitic, medium to dark grey, beds 2 to 24 inches thick, in part laminated and crosslaminated; weathers light to medium brown, moderately resistant.	15.5	302
15	Covered interval, recessive.	62	286.5
14	Siltstone, dolomitic, quartzitic, dark grey to black; beds 1 inch to 4 inches thick, laminated, in part crosslaminated; weathers brown, moderately resistant.	3	224.5
13	Covered interval, recessive.	2	221.5
12	Siltstone, dolomitic, quartzitic, dark grey to black; beds 1 inch to 2 1/2 inches thick, laminated, minor crosslaminated; weathers brown, moderately resistant.	8	219.5
11	Covered interval, recessive.	12	211.5
10	Alternating succession of: (a) dolomite, very silty and argillaceous, dark grey to black, very fine-crystalline; beds 2 to 15 inches thick, in 1- to 4-foot units, minor indistinct laminations; weathers light brown, moderately resistant and, (b) siltstone, dolomitic, quartzitic, dark grey to black; beds 1 inch to 4 inches thick in 1- to 4-foot units, laminated, in part crosslaminated; weathers medium brown, moderately resistant.	29	199.5
9	Dolomite, silty, argillaceous, siliceous, dark grey to black, micritic; beds 2 to 15 inches thick, in part indistinct laminations; weathers light brown, moderately resistant.	4	170.5

Unit	Lithology	Thickness (feet)	
		Unit	From Base
8	Siltstone, dolomitic, quartzitic, dark grey to black; beds 1 inch to 4 inches thick, laminated, in part crosslaminated; weathers brown, moderately resistant.	3.5	166.5
7	Mudstone, siliceous, black; beds 1/4 to 1 inch thick, laminated; weathers black, recessive.	0.5	163
6	Dolomite, silty, siliceous, dark grey to black; beds 1 inch to 4 inches thick, laminated, in part crosslaminated; weathers brown, moderately resistant.	4	162.5
5	Mudstone, siliceous, black to dark grey; beds 1/2 to 1 inch thick, laminated; weathers black, rusty, recessive.	2.5	158.5
4	Siltstone, dolomitic, quartzitic; dark grey to black; beds 1 inch to 4 inches thick, in part laminated and crosslaminated; weathers brown, moderately resistant; minor silty dolomite.	5	156
<u>Tetsa Formation</u>			
3	Covered interval, very recessive.	111	151
2	Poorly exposed; siltstone, shaly, quartzitic, black; beds 1/4 to 1 inch thick, laminated, weathers black to dark brown (rusty), very recessive.	5	40
1	Siltstone, shaly, quartzitic, black to dark grey; beds 1/4 to 1 inch thick, in part laminated and ripple-marked; weathers dark brown (rusty) to black, recessive.	35	35
Base of section.			

Section 6: TUCHODI LAKES SECTION

(Field designation 64 BV-42)

The base of this section is 3 1/2 miles upstream from Tuchodi Lakes on an unnamed creek flowing from a northerly direction into a short section of Tuchodi River between upper and lower Tuchodi Lakes. The section was measured due west up the flank of an unnamed mountain. Section 5 includes the type section for the Tuchodi Formation. The top of the section is inaccessible, therefore Section 7 is presented as a supplementary reference section for the top of the Tuchodi Formation.

Base of section: 58°15'30"N, 124°28'00"W.

Top of section: 58°16'00"N, 124°32'00"W.

Unit	Lithology	Thickness (feet)	
		Unit	From Base
PROTEROZOIC			
<u>Tuchodi Formation</u>			
(type section)			
10	Quartzite, feldspathic, varicoloured, mainly light grey, very light brown, white and pink, fine to medium grained; beds 1/2 foot to 5 feet thick, ripple-marked, crossbedded, rarely mud-cracked, few dark grey to green shaly partings; weathers medium grey to white, very resistant.	725	3843
Note: The base of this unit is equivalent to the top of unit 13 of Section 7.			
9	Interbedded sequence of: (a) siltstone and sandstone, quartzitic, feldspathic, dolomitic, light grey to very light brown and white, silt-sized to fine-grained; beds 2 to 18 inches thick, unlaminated, in part crossbedded; weathers medium to light brown, moderately resistant; constitutes about 50 per cent of unit and, (b) quartzite, feldspathic, in part slightly dolomitic, very light brown to light grey and white, fine to medium grained; beds 2 to 16 inches thick, in part laminated and cross-bedded; weathers medium grey, resistant; constitutes about 30 per cent of unit and, (c) dolomite, silty and argillaceous, medium grey, fine-crystalline; beds 2 to 4 inches thick, with silty irregular partings; weathers brown, moderately resistant; constitutes about 20 per cent of unit.	469	3118

Unit	Lithology	Thickness (feet)	
		Unit	From Base
8	Very poorly exposed (frost-heaved, and talus covered): (a) dolomite, argillaceous to silty, very light grey to light brown-grey, fine- to very fine-crystalline; beds 2 to 20 inches thick, laminated; weathers light brown, moderately recessive and, (b) sandstone and siltstone, quartzitic, feldspathic, moderately to very slightly dolomitic, very light grey to dark grey, silt-sized to medium-grained; beds 1/2 inch to 12 inches thick, laminated, few shaly partings; weathers medium brown to dark grey, moderately recessive.	253	2649
7	Poorly exposed: sandstone, quartzitic, feldspathic, slightly to moderately dolomitic, very light grey to very light brown, fine to very fine grained; beds 4 to 7 feet thick, crossbedded, laminated, few shaly partings; weathers light grey, resistant.	137	2396
6	Interbedded sequence of: (a) siltstone and sandstone, quartzitic, feldspathic, in part dolomitic, light to medium grey and light brown-grey, fine grained to silt-sized; beds 1 1/2 to 18 inches thick, usually in 4- to 50-foot units, crossbedded, few dark grey shaly partings, in part laminated, in part ripple-marked; weathers medium brown to light grey-brown, moderately recessive to moderately resistant and, (b) quartzite, feldspathic, in part dolomitic, light grey to very light brown, in part white, fine grained; beds 1 1/2 to 8 feet thick, usually 2 to 4 feet thick in 10- to 100-foot units, lenticular, crossbedded, commonly ripple-marked, in part mud-cracked, weathers light grey, very resistant to resistant and, (c) minor dolomite, silty to argillaceous, medium grey, fine-crystalline; beds 1/2 inch thick in 5-foot units with lithology (a), laminated; weathers light brown, moderately recessive.	1663	2259
Note: sandstones contain a few silicified, and dolomitic oolite fragments.			
5	Covered interval, moderately recessive, with occasional quartzite bed exposed.	105	596

Unit	Lithology	Thickness (feet)	
		Unit	From Base
4	Poorly exposed, interbedded succession of: (a) quartzite, slightly dolomitic and feldspathic, light to medium grey, fine to medium grained; beds 4 to 6 feet thick, in part laminated; weathers medium brown-grey to medium grey, moderately resistant and, (b) dolomite, argillaceous, light to medium grey, very fine-crystalline; beds 12 to 18 inches thick; weathers brown, moderately resistant.	120	491
3	Interbedded succession of: (a) dolomite, sandy, argillaceous, light to medium grey, very fine-crystalline; beds 1/4 to 1/2 inch thick with dark grey shale partings, in 2- to 2 1/2-foot units; weathers brown, recessive and, (b) quartzite, slightly dolomitic, light to medium grey, fine to medium grained; beds 1 foot to 6 feet thick, usually about 3 feet, in part laminated; weathers medium brown-grey to medium grey, moderately resistant to very resistant and, (c) dolomite, argillaceous, light to medium grey, very fine-crystalline; beds 12 to 18 inches thick; weathers dark brown, moderately resistant.	35	371
2	Quartzite, slightly dolomitic, feldspathic, white to medium grey and very light brown, fine to medium grained; beds 4 to 15 feet thick, mainly 9 to 15 feet; weathers medium grey, resistant.	73	336

Henry Creek Formation

(upper clastic, transitional part)

1	Siltstone and sandstone, shaly, quartzitic, feldspathic, in part slightly siliceous, light grey to medium blue-grey, silt-sized to fine grained; beds about 7 inches thick, rarely 48 inches, few shaly partings and 1/2-inch beds, in part laminated and irregularly laminated; weathers dark grey to medium brown, moderately resistant.	263	263
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Note: (a) becomes more sandy towards top, (b) bedding becomes thicker towards top and (c) more pronounced siltstone, sandstone alternating beds towards top of unit 1.

Base of section.

Section 7: TUCHODI LAKES-MOUNT SYLVIA SECTION

(Field designation 64 BV-44)

The top of Section 7 is 3 miles from the western end of the upper Tuchodi Lake on an azimuth of 130°. The section was measured eastwards from the cirque at the top of the section, and down-section toward two tiny unnamed lakes. The upper part of the section was measured along the north side of the cirque to the west end of the first lake, and thence along the south side of the valley above the talus slope. Because the lower part of the section was measured early in 1965, snow conditions dictated using the south side of the valley. Snow also covered parts of the section, particularly unit 13. Section 7 includes beds of the Tuchodi Formation and beds in the lower part of the Aida Formation and is a supplementary reference section for these formations.

Base of section: 124°29'00"W, 58°08'30"N.

Top of section: 124°32'30"W, 58°07'45"N.

Unit	Lithology	Thickness (feet)	
		Unit	From Base
PROTEROZOIC			
<u>Aida Formation</u>			
1B	Alternating succession of: (a) siltstone to mudstone, slightly to moderately dolomitic, light to medium grey; beds about 6 to 24 inches thick in 1- to 8-foot units, in part laminated; weathers light to medium brown, moderately recessive and, (b) limestone, slightly argillaceous, light to dark grey, very fine-crystalline; beds 1/2 inch to 1 1/2 inches thick, with argillaceous partings, minor dolomite beds; weathers light grey to buff, moderately recessive; in 2- to 6-foot units.	73	4591
Note: poorly developed slaty cleavage in unit 1B.			
1A	Limestone, in part argillaceous and dolomitic, light to dark grey, fine-crystalline; beds 1 inch to 8 inches thick, with argillaceous partings, laminated, crosslaminated (festoon type), sole marked, few intraformational conglomerate lenses; weathers very light grey-brown to medium grey, moderately resistant.	229	4518
Note: lower 35 feet becomes more dolomitic and grades to unit 2.			

Unit	Lithology	Unit	Thickness (feet) From Base
2	Poorly exposed (frost heaved): dolomite, argillaceous, medium grey, very fine-crystalline; beds 1 inch to 3 inches thick; weathers very light brown, moderately recessive.	7	4289
<u>Aida Formation</u> (Carbonaceous member)			
3B	Shale, siliceous, non-calcareous, carbonaceous, in part silty, in part pyritic, black to very dark grey; bedding fissile to very thin, laminated; weathers black to dark brown (rusty), very recessive to moderately recessive.	132	4282
Note: has sharp contact with unit 2, gradational to unit 3A. Recessive at top with increasing resistance to base.			
<u>Aida Formation</u> (Chamositic member)			
3A	Mudstone, chamositic, siliceous, slightly to moderately calcareous, medium green-grey to light green; thinly bedded, few thin dark green beds; weathers light green-grey to very light brown, moderately recessive.	185	4150
Note: sharp contact with unit 4.			
<u>Aida Formation</u> (Lowest member)			
4	Interbedded succession of: (a) mudstone, slightly to very calcareous, chamositic, siliceous, in part sandy, light green-grey; laminated, in 2- to 4-inch thick beds; weathers olive-grey, moderately recessive and, (b) limestone, slightly argillaceous, light to medium grey, very fine-crystalline to micritic; beds 2 to 4 inches thick, lenticular, laminated, crosslaminated, few thin intraformational conglomerate lenses; weathers light grey, moderately resistant.	6	3965
Note: Gradational with unit 5.			

Unit	Lithology	Unit	Thickness (feet) From Base
5	Interbedded succession of: (a) limestone, in part slightly argillaceous, medium grey, very fine-crystalline to micritic; beds 2 to 4 inches thick, commonly in 18-inch thick units, lenticular, laminated, crosslaminated, in part intraformational conglomerate; weathers light to medium grey, moderately resistant and, (b) dolomite, calcareous, argillaceous to very argillaceous, in part silty, medium grey, fine-crystalline; beds 2 to 4 inches thick, laminated, in part cross-laminated; weathers brown, moderately resistant.	41	3959
6	Interbedded succession of: (a) limestone, minor argillaceous, medium to dark grey, very fine- to fine-crystalline; beds 12 to 24 inches thick, in part laminated, few intraformational conglomerate lenses; weathers medium grey, resistant; comprises about 25 per cent of the unit and, (b) mudstone, dolomitic to slightly calcareous, in part silty, medium to dark grey; bedding obscure (in part due to penetrative slaty-cleavage), in 1- to 4-foot units, irregularly laminated; weathers light brown-grey, moderately resistant; comprises about 60 per cent of unit and, (c) dolomite, silty, slightly calcareous, slightly argillaceous, medium grey, very fine-crystalline; beds 2 to 12 inches thick in 1- to 2-foot units, in part unlaminated, in part nodular (nodules of medium grey limestone); weathers light to medium brown, resistant; comprises about 15 per cent of the unit.	146	3918
7	Interbedded succession of: (a) limestone, silty, argillaceous, medium grey, very fine-crystalline; beds 1 inch to 30 inches thick (usually about 20 to 24 inches), laminated, few beds with disperse tiny argillaceous limestone-chips; weathers light brown-grey to medium grey, resistant and, (b) mudstone and siltstone, very calcareous, medium grey; bedding poor, in 2- to 5-foot units, in part laminated, nodular, and graded, few unlaminated units with disperse tiny dark mud-chips; weathers medium to light brown with grey mottle, resistant and, (c) conglomerate, intraformational, framework of		

Unit	Lithology	Thickness (feet) From Base
	chips and poorly rounded pebbles of laminated, medium grey limestone, size range 1/2 inch to 6 inches with maximum thickness rarely exceeding 1/2 inch; matrix of limestone, silty, argillaceous, medium grey, very fine calcarenite; beds 4 to 6 inches thick, rarely 18 inches, lenticular; weathers light brown-grey to medium grey, resistant; comprises approximately 15 per cent of the lower half of this unit, but slightly less in upper half.	395 3772
	Note: good repetitive development (from bottom to top) of lithology (a) to (b) and repeat, or (a) to (c) to (b) and repeat.	
	<u>Tuchodi Formation</u>	
8	Covered interval, recessive.	6 3377
9	Interbedded succession of: (a) quartzite, feldspathic, white to grey, minor dark grey to black, medium to fine grained, and silt-sized; beds 6 to 12 inches thick, laminated crosslaminated, in part crossbedded, ripple-marked, and mud-cracked, abundant black phyllitic shaly partings; weathers white to medium grey, resistant; comprises approximately 50 per cent of unit 9 and, (b) sandstone, quartzitic, feldspathic, dolomitic, light to medium grey, fine grained to silt-sized; beds 4 to 12 inches thick, rarely less than 4 inches, sporadically laminated, ripple-marked, commonly mud-cracked, few shaly partings; weathers brown, moderately resistant; comprises approximately 35 per cent of unit 9 and, (c) dolomite, argillaceous, light to medium grey, very fine-crystalline; beds 2 to 12 inches thick, with grey argillaceous partings, ripple-marked, mud-cracked; weathers brown, moderately resistant; comprises 10 per cent of unit 9 and, (d) shale, micaceous, black; bedding fissile, in 1/2- to 12-inch units, weathers black, recessive.	804 3371
	Note: (i) Generally each lithology with the exception of (d) occurs in units of 1 1/2 to 6 feet thick.	

Unit	Lithology	Thickness (feet)	
		Unit	From Base
	(ii) unit 9 weathers light to medium brown, with dark grey and light brown bands; semi-resistant.		
	(iii) probably the covered interval (unit 8) is of lithology (d).		
10	Quartzite, white to light grey, fine grained to silt-sized; beds 6 to 12 inches thick, laminated, abundant green, dark grey and black shaly partings, ripple-marked, few 2- to 3-foot thick lenticular beds of white quartzite; weathers medium to dark grey, resistant; gradational to units 9 and 11.	124	2567
11	Quartzite, feldspathic, white to light grey, medium to fine grained; beds 2 to 6 feet thick, average 2 1/2 feet, crossbedded, in part ripple-marked; weathers medium grey, very resistant.	330	2443
12	Quartzite, feldspathic, white, light pink to red, in part green, very fine to medium grained; beds 1 inch to 2 inches thick, crossbedded, ripple-marked, few dark grey to black shale chips in some beds, few shaly partings; weathers dark grey to pink-grey, resistant to very resistant.	454	2113
13	Covered by large blocky talus and snow. Exposure on the valley sides is identical with unit 14. The base of this unit coincides with the base of unit 10 in Section 6.	420	1659
14	Quartzite, feldspathic, very slightly dolomitic, white to light grey-brown, in part light green and light pink, very fine to medium grained; beds 2 to 24 inches thick, commonly lenticular, laminated, ripple-marked, mud-cracked, crossbedded, few shaly partings; weathers light brown to dark grey, very resistant to resistant (alternating in 15- to 20-foot thick units).	430	1239
15	Shale and siltstone, black to grey; bedding thin, with 2- to 4-inch thick beds of white quartzitic siltstone, laminated; weathers dark brown to black, moderately recessive.	38	809

		Thickness (feet)	
Unit	Lithology	Unit	Base
16	Quartzite, feldspathic, white to light brown, very fine-grained; beds 2 to 8 inches thick; weathers light brown, resistant.	12	771
17	Shale and siltstone, black to grey, and white; bedding thin, with 2- to 4-inch thick beds of white siltstone and lenticular siltstone beds, black shaly partings, laminated; weathers dark brown to black, moderately recessive.	21	759
Note: unit 16 is channelled into unit 17.			
18	Quartzite, feldspathic, white, medium to fine grained; massive; weathers light grey, very resistant.	23	738
Note: this unit pinches out about a hundred yards to the east.			
19	Shale and siltstone, black to grey; beds 2 to 12 inches thick, with 2-inch beds of white and grey siltstone, black shaly partings, laminated; weathers dark brown to black, moderately recessive.	14	715
Note: unit 18 is channelled into unit 19.			
20	Quartzite, feldspathic, white to light grey, fine grained; beds 4 to 24 inches thick, thickest beds to base of this unit; weathers light grey, resistant.	31	701
21	Quartzite, feldspathic, white to dark grey, fine grained; beds 1/2 inch to 5 inches thick; weathers light grey to dark grey; resistant to very resistant.	160	670
22	Shale and siltstone, black and grey, minor white; beds 2 to 12 inches thick, with 2-inch beds of white and grey siltstone, laminated, with lenticular siltstone beds, black shaly partings; weathers dark brown, moderately recessive.	6	510
23	Covered, recessive.	94	504
24	Interbedded succession of: (a) quartzite, feldspathic, white to light grey, very fine grained to medium grained; beds 6 to 36		

Unit	Lithology	Thickness (feet)	
		Unit	From Base
	inches thick, usually about 24 inches, laminated, crossbedded, minor ripple-marked; weathers medium brown, resistant and, (b) sandstone, dolomitic, feldspathic, slightly argillaceous, light grey to light brown-grey, very fine to medium grained; beds 1/4- to 1-inch thick, in 3- to 5-foot units, irregularly laminated; weathers brown, moderately resistant to resistant.	75	410
25	Poorly exposed, interbedded succession of: (a) quartzite, feldspathic, white to light grey, very fine to medium grained; beds 6 to 36 inches thick, usually 24 inches, laminated, crossbedded, in part ripple-marked; weathers medium brown, resistant to moderately resistant and, (b) sandstone, dolomitic, feldspathic, slightly argillaceous, light grey to light brown-grey, silt-sized to medium grained; beds 1/4 to 1 inch thick, in 3- to 5-foot units, irregularly laminated, mud-cracked; weathers brown, moderately resistant.	120	335
26	Siltstone and sandstone, in part dolomitic feldspathic, light brown, white to medium grey, and very minor pink, silt-sized to fine grained; beds 1/2 inch to 12 inches thick, usually about 1/2 inch, very commonly ripple-marked, commonly mud-cracked, laminated, in part crosslaminated, minor grey shaly partings; weathers medium brown to dark brown and light brown, resistant to moderately resistant; with minor quartzite and argillaceous dolomite.	215	215
	Base of section.		

Section 8:

MOUNT AIDA SECTION

(Field designation 64 BV -47)

The base of Section 8 is at an elevation of 6,900 feet on the southeastern ridge of Mount Aida, about 2 1/3 miles (at an azimuth of 315°) from the west end of upper Tuchodi Lake. The section was measured along the ridge crest, upsection towards the base of steep cliffs of lower Palaeozoic rocks capping Mount Aida. This is the type section for the Aida Formation. The lower part of the Aida Formation (Member A) is inaccessible and the upper part has been removed by Precambrian erosion and unconformably overlain by Lower Cambrian strata. Supplementary reference Sections 7 and 9 are presented to rectify this situation.

Base of section: 58°11'30"N, 124°38'15"W.

Top of section: 58°11'30"N, 124°39'45"W.

Unit	Lithology	Unit	Thickness (feet) From Base
LOWER CAMBRIAN			
13	Interbedded sequence of: (a) sandstone to siltstone, dolomitic, quartzitic, light grey, medium grained to silt-sized; beds 1/2 inch to 24 inches thick; weathers light grey-brown, resistant and, (b) dolomite, in part sandy, medium to light grey, fine-crystalline; beds 12 to 36 inches thick, in part laminated; weathers light brown, resistant.	—	2764 (plus)
	Contains abundant worm trails and burrows.		
12	Conglomerate, with quartzite pebbles (1/4 inch to 12 inches in diameter, averaging 3 to 4 inches, well-rounded, white to light grey, poorly sorted), with matrix of quartzose sand, light grey to white, slightly dolomitic, poorly sorted; single bed which averages 4 feet, but varies from 0 to 12 feet over 100 feet laterally and channels into unit 11; weathers very light brown-grey, moderately resistant; in part coarse sandstone.	4	2764
	Angular unconformity of about 20° at base of unit 12.		
PROTEROZOIC			
<u>Aida Formation</u>			
11	Siltstone and mudstone, very slightly dolomitic, very light brown-white to light pink; beds 1/2 to 1 inch thick, laminated; weathers		

Unit	Lithology	Thickness (feet)	
		Unit	From Base
	very light grey, recessive. Appears to be deeply leached; not slaty-cleaved. See Section 9.	3	2760
10	Covered interval, recessive. On cliffs to the north, unit 10 is identical to unit 9, but the upper half is not slaty-cleaved.	46	2667
9	Siltstone and mudstone, slightly dolomitic, medium to dark grey; bedding obscure (because of well-developed slaty cleavage); laminated, and thinly bedded, contorted laminations; weathers light brown, moderately recessive; contains a few resistant beds of more dolomitic mudstone, up to 2 feet thick. Base of unit 9 is identical on base of unit 17 of Section 9.	990	2621
8	Mudstone, silty, siliceous, dark grey to black; bedding fissile to thin, laminated, slaty-cleaved; weathers dark grey, to dark brown-grey, moderately recessive.	86	1631
7	Siltstone, slightly calcareous, in part shaly, dark grey; beds 1/2 inch thick in 3- to 4-foot units, laminated, few thin calcareous and dolomitic beds; weathers medium grey-brown, moderately resistant.	35	1545
6	Alternating succession of: (a) siltstone, slightly calcareous, in part shaly, dark grey; beds 1/2 inch thick in 4- to 5-foot thick units, laminated; weathers medium grey-brown, moderately recessive and, (b) limestone and calcareous dolomite, slightly argillaceous, in part silty, medium to dark grey, very fine-crystalline; beds 2 to 3 inches thick in 4- to 5-foot thick units, in part laminated and crosslaminated, few lenses of intraformational conglomerate, medium grey, moderately recessive.	60	1510
5B	Poorly exposed; siltstone and mudstone, in part very slightly dolomitic, dark to medium grey; bedding obscure (because of cleavage), laminated, in part crosslaminated and irregularly laminated, contains few 1- to 14-inch thick beds of argillaceous dolomite and limestone; weathers medium brown to light grey-brown, recessive; gradational to unit 5A.	345	1450

Unit	Lithology	Thickness (feet)	
		Unit	From Base
5A	Alternating succession of: (a) mudstone, dolomitic, light grey; beds 12 to 18 inches thick, laminated, well-cleaved; weathers light grey, moderately recessive and, (b) shale, silty, dark to medium grey; beds 1/4 to 1/2 inch thick in 2- to 6-foot thick units, laminated, contains few dolomite and dolomitic limestone beds up to 2 inches thick; weathers light to medium grey, recessive.	195	1105
4	Interbedded succession of: (a) mudstone and siltstone, dolomitic, light grey; beds 12 to 36 inches thick, with 1/4- to 3/4-inch thick laminations, slaty-cleaved; weathers light grey-brown, recessive; constitutes about 70 per cent of unit and, (b) dolomite, calcareous, light to medium grey, very fine-crystalline; beds 2 to 6 inches thick, laminated, cross-laminated; weathers light brown to light grey, moderately recessive; constitutes about 30 per cent of unit.	234	910
3	Limestone, in part silty and argillaceous, light to medium grey, very fine-crystalline; beds 1/2 inch to 3 inches thick, with 1/4- to 1/2-inch thick silty and argillaceous beds, laminated, in part crosslaminated (often festoon), few intraformational conglomerate lenses; weathers light grey to very light brown, moderately resistant; minor mudstone and dolomite limestone; above 255 feet from base, limestone becomes increasingly more dolomitic.	282	676
2	Dolomite, silty, argillaceous, slightly pyritic; dark grey, beds 8 inches thick, few limestone beds in lower half, laminated; weathers medium grey-brown, moderately recessive.	65	394
<u>Aida Formation</u>			
(Carbonaceous member)			
1B	Poorly exposed; mudstone, siliceous, carbonaceous, silty, black to very dark grey; laminated, thin bedded; weathers black, recessive.	144	329

Unit	Lithology	Thickness (feet)	
		Unit	From Base

Aida Formation

(Chamositic member)

- 1A Poorly exposed; mudstone, chamositic, siliceous, slightly calcareous, green to green-grey; bedding poor, some laminated, minor crosslaminated, minor unlaminated; weathers green-grey, recessive; transitional with 1B.

185

185

Base of measured section .

Lowest member of Aida Formation, is exposed below this but is largely inaccessible. For this member see Section 7.

Section 9: UPPER TUCHODI RIVER SECTION

(Field designation 64 BV-43)

The top of Section 9 is on the crest of a ridge west of Tuchodi Lakes, about 7 miles upstream from the upper Tuchodi Lake, and approximately 4 miles from the river at an azimuth of 290°. The section was measured downward along the ridge at an azimuth of 110°. This is the supplementary reference section for the uppermost member of the Aida Formation.

Base of section: 58°04'45"N, 124°42'45"W.

Top of section: 58°05'30"N, 124°46'30"W.

Unit	Lithology	Thickness (feet)	
		Unit	From Base
LOWER CAMBRIAN			
1 to 11	Conglomerates, quartzites, siltstones, shales and mudstones, varicoloured; bedding thin to massive, abundant worm-burrows and trails; weathers medium grey, black, red and brown.	—	3026 (plus)
PROTEROZOIC			
<u>Gataga Formation</u>			
(lower 1,661 feet)			
12	Covered interval, recessive. Red shale in talus.	60	3026
13	Poorly exposed (felsenmeer): mudstone, silty, medium to dark red and medium red-grey; bedding fissile to 1/4 inch thick; weathers medium red, crumbly to platy, recessive; not slaty-cleaved in upper 30 feet, lower part has poorly developed slaty-cleavage.	92	2966
14	Poorly exposed: mudstone and siltstone, medium to light olive-grey; bedding poor, alternating 6-inch units of mudstone with 1- to 1 1/2-inch thick beds of laminated siltstone, slaty-cleaved; weathers light green-grey, recessive.	56	2874
15	Poorly exposed: mudstone, in part silty, medium to dark grey; bedding poor, few 1/8-inch thick shale beds, with 3- to 4-inch thick		

Unit	Lithology	Unit	Thickness (feet) From Base
	siltstone beds every 3 to 6 feet, slaty-cleaved; weathers dark grey to brown-grey, recessive.	418	2818
16	(a) Mudstone, in part silty, medium to dark grey; bedding poor, usually in 3- to 6-foot thick units, few 1/8-inch thick black shale bands, poorly slaty-cleaved; weathers medium to dark grey and medium olive-grey, moderately recessive to recessive; with beds every 3 to 6 feet of; (b) siltstone, slightly to moderately dolomitic, in part sandy, light grey to light green- and brown-grey, minor dark grey; beds 1 inch to 8 inches thick, usually 3 to 4 inches, commonly un laminated, in part laminated with convolute laminations; weathers light grey to medium brown, moderately recessive.	1035	2400
<u>Aida Formation</u>			
(uppermost member)			
17	Mudstone, siltstone and shale, slightly calcareous to moderately calcareous, in part slightly dolomitic, medium blue-grey to grey; bedding poor, in 1- to 4-foot thick units (averages 2 feet) with 1/4 to 1 inch dark grey and laminated beds, with few homogeneous, sandy, and very dolomitic to calcareous beds, good slaty-cleavage; weathers very light to light brown-grey, moderately recessive; gradational over top 20 feet with unit 16, and over basal 20 feet with unit 18.	1250	1365
18	Siltstone and mudstone, siliceous, non-calcareous, non-dolomitic, medium to dark grey and dark green-grey; bedding poor, 2-foot thick units with 1/4- to 1-inch thick laminated beds, minor un laminated, few dolomite beds in basal 10 feet, poorly developed slaty cleavage; weathers medium to dark grey, moderately recessive to moderately resistant; top of the unit is correlative with the top of unit 8 of Section 8.	115	115
Base of section.			

		Thickness (feet)	
Unit	Lithology	Unit	From Base

Note: at base of unit 18 the lithology grades back to lithology of unit 17; here it is cut by a diabase dyke along which there is extensive shearing.

Section 10: UPPER GATAGA RIVER SECTION

(Field designation 65 BV-73)

Section 10 is located near a small tributary from the north about 21 miles up the Gataga River from its confluence with the South Gataga River. The section was measured down section along the north side of the valley towards a small saddle where it was terminated at the top of the Aida Formation (see location below). The section includes the type section for the Gataga Formation.

Base of section: 58°10'45"N, 125°17'15"W.

Top of section: 58°10'45"N, 125°19'15"W.

Unit	Lithology	Unit	Thickness (feet) From Base
LOWER CAMBRIAN			
1	Limestone and dolomitic limestone, light to medium grey, fine-crystalline to micritic; bedding massive, laminated to uniform, intraformational breccia, minor oolitic beds; weathers light to very light grey, very resistant, massive cliff former. Thick carbonate rock-units (more than 1,000 feet thick) overlie this unit.	—	4705 (plus)
2	Limestone, dolomitic, in part argillaceous, light to medium grey, micritic to very fine-crystalline; beds 6 to 12 inches thick, laminated with undulatory lamination (suggestive of algal mats), argillaceous beds; weathers light grey, resistant.	12	4705
3	Mudstone, pebbly (open framework with rounded pebbles and cobbles, 1/8 inch to 48 inches in diameter, mainly limestone, quartzite, dark grey shale and very minor diabase, poorly sorted), dark brown-grey to black; bedding massive; slaty-cleaved; weathers dark brown to black, recessive.	47	4693
4	Limestone, dolomitic, in part argillaceous, light to medium grey, micritic to very fine-crystalline; beds 2 to 8 inches thick, laminated argillaceous beds; weathers light grey, resistant.	19	4646
5	Mudstone, pebbly (open framework with rounded pebbles, cobbles, and boulders, 1/8 inch to 48 inches in diameter, mainly limestone,		

Unit	Lithology	Thickness (feet) From Base
	quartzite, dark grey shale, and diabase, poorly sorted), dark brown-grey; bedding massive, slaty-cleaved; weathers light to medium brown, recessive; unit 5 is not cut by the diabase dykes which cut unit 6; angularity of unconformity beneath unit 5, obscure at the section, but on cliffs north of the section is about 15 degrees.	37 4627
PROTEROZOIC <u>Gataga Formation</u> (type section)		
6	Slate, siltstone, mudstone, and minor sandstone (lithic and quartzitic), non-calcareous, very dark grey to dark grey and dark brown-grey, in part light brown; bedding poorly defined, 2 inches thick to massive, with parallel, wavy, lenticular, and contorted laminations, flame-structures, deformed bedding, piled and load casted ripples, in part crosslaminated (festoon), few sole markings; weathers dark grey to dark grey-brown, moderately resistant to moderately recessive.	4590 4590
Notes: (a) Cut by numerous tabular diabase dykes which dip vertically to steeply to the west, some dykes anastomose upwards. Cumulative thickness of dykes may account for as much as 15 per cent of the thickness of the formation. (b) Thickness measured by Jacob's staff for upper 290 feet, remainder to base measured by compass, tape and pacing. (The latter checked by direct measurement on air photographs and on topographic map.) Probable error in thickness measurement 10 per cent. (c) Abundant mineralization surrounding dykes in middle of formation, namely chalcopyrite, pyrite and secondary malachite and azurite. Minor asbestos-like fillings in some fractures.		

Unit	Lithology	Thickness (feet)	
		Unit	From Base

(d) Contact metamorphic effects usually do not extend more than 10 feet from dyke borders; the first foot to 3 feet nearest the dyke border is not slaty-cleaved.

(e) Minor crenulation near dyke borders; slippage indeterminate but probably inconsequential.

Base of section.

Underlain by 6606 feet of the Aida Formation, consisting of the upper part of the formation to the base of the chamositic member. The most notable aspect of the Aida above the carbonaceous member is the presence of thick (as much as 14 feet) poorly sorted very fine-grained sandstone and siltstone units containing chips and fragments of the characteristic (thinly bedded) lithology, and with fragments up to 2 feet thick and 4 feet long. The larger fragments are commonly contorted.

The characteristic sedimentological features of Gataga and Aida Formations are readily observed on the polished walls of the cirques in this region; such features are commonly obscured in the more typical exposures of these formations to the east of the Gataga region because of the weathering of the slaty-cleaved units and the development of felsenmeer.

