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RECONNAISSANCE DEVONIAN STRATIGRAPHY  
OF NORTHERN YUKON TERRITORY AND  
NORTHWESTERN DISTRICT OF MACKENZIE

(Report, 17 plates and 9 figures)

A. W. Norris



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### ABSTRACT

This report is based on field work by the writer and other members of Operation Porcupine in 1962 covering an area north of latitude 65° and west of longitude 132°. Ten Devonian sections are presented in the Appendix.

Formation names used comprise the Michelle, Gossage, Prongs Creek, Cranswick, Ogilvie, Hume, Hare Indian, Canol, unnamed shale, and Imperial, of which the first five are new.

The Lower (?) to lower Middle Devonian Michelle Formation consists of limestone, dolomite, and shale developed in the Hart-Ogilvie Rivers area. The Gossage Formation applies to banded dolomites and limestones roughly coeval with the Bear Rock evaporites and breccia. The Prongs Creek Formation applies to shale, argillaceous limestone, and chert which are confined roughly to the Richardson Mountain uplift and range in age from Lower to Middle Devonian and possibly younger. The lower Middle Devonian Cranswick Formation consists of limestone and calcareous shale developed in the Snake River area. The Ogilvie Formation consists of resistant grey-weathering carbonates ranging in age from lower to upper Middle Devonian. The upper Middle Devonian Hume Formation does not occur west of Flyaway Creek. An unusually thick Hare Indian Shale occurs in the Snake River area. The lower Upper Devonian Canol Shale occurs mainly in the eastern sector of the area. The unnamed shale refers to an interval of poorly exposed shales ranging in age from Middle to Upper Devonian present mainly in the Ogilvie Mountains. The Upper Devonian Imperial Formation consists of clastic rocks in places about 6,000 feet thick.



# RECONNAISSANCE DEVONIAN STRATIGRAPHY OF NORTHERN YUKON TERRITORY AND NORTHWESTERN DISTRICT OF MACKENZIE

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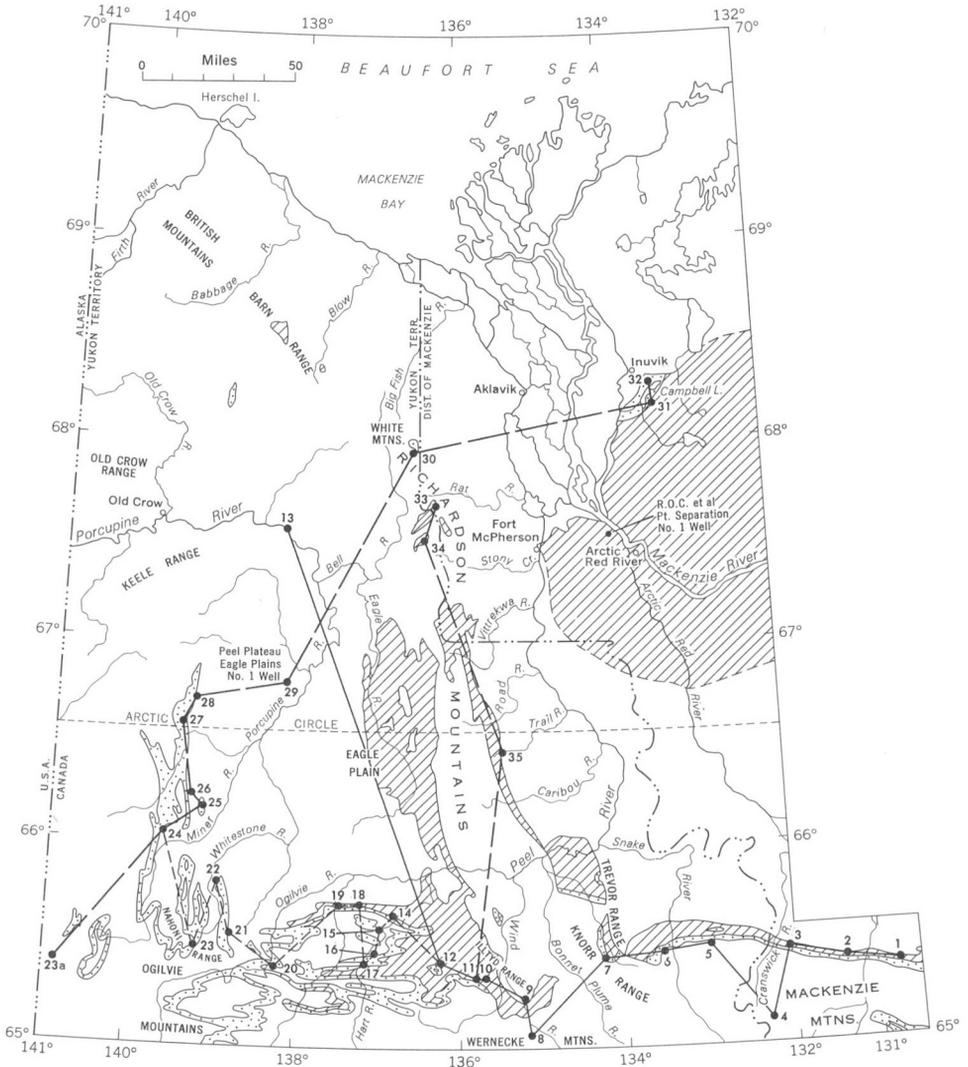
## INTRODUCTION

### LOCATION, PRESENT WORK, AND ACKNOWLEDGMENTS

The report area lies mainly between latitude 65°N and the Arctic Coast and between longitudes 132°W and 141°W (Yukon-Alaska boundary), embracing an area of about 80,000 square miles within the northern Yukon Territory and northwestern District of Mackenzie (see Fig. 1). Two sections a short distance east of the southeast corner of the above area are located immediately east (ca. 65°21.4'N, 130°46'W) and west (ca. 65°24'N, 131°21.5'W) of the Arctic Red River.

Most of this report is based on field work done by the writer during the summer of 1962 as a member of Operation Porcupine. The field operations, transportation, and other logistic problems of Operation Porcupine have been described in Caley *et al.* (1962, pp. 17-18), and by D.K. Norris (1963a, pp. 17-19; 1963b, pp. 45-50). The details of 22 stratigraphic sections have been published separately (Norris, 1967). In that paper it was stated that that report was supplementary to a fuller report to be published as a bulletin of the Geological Survey. However, to expedite the publication of the comprehensive report, it was decided to publish it in the Geological Survey's paper series and thus this report constitutes the detailed account of the stratigraphy, fossil lists, distribution, correlations, etc. of the various formations. Figures 3 to 6 inclusive of this report illustrate the locations of all sections studied, both those presented in the appendix of this report and those published in the Geological Survey Paper 66-39. All but two of the Devonian sections measured (sections 1 and 2, Fig. 3) are within the area mapped (see Geol. Surv. Can., Map 10-1963) in the district of Mackenzie and Yukon Territory north of latitude 65°N and west of longitude 132°W. Sections 1 and 2, immediately east and west of the Arctic Red River, were measured as far east as logistics would permit in an attempt to get as close a tie in as possible with the much better known Devonian sequence of the central Mackenzie River area. Preliminary stratigraphic results of Operation Porcupine, as part of a synthesis of the stratigraphy of a large part of northern Canada, were reported on by Douglas, *et al.* (1963a and b) at the Sixth World Petroleum Congress held in Frankfurt on Main, 19-26 June, 1963.

Ten Devonian sections are presented in the appendix of this report. Sections 8 and 30 were measured by B.S. Norford. Information obtained from scattered helicopter stops by D.K. Norris, R.A. Price, and G.C. Taylor are also incorporated in this report. In the field the writer was ably assisted by A.J. Jenik, D.L. Jordan, and D.A. McAuslan.



LEGEND



Upper Devonian



Lower and Middle Devonian

Line of section, Figure 3 . . . . .

Line of section, Figure 4 . . . . .

Line of section, Figure 5 . . . . .

Line of section, Figure 6 . . . . .

GSC

Figure 1. Index map of report area showing main belts of Devonian outcrops and location of sections

The fossils from the measured Devonian sections and grab samples from scattered localities collected on short helicopter stops have been given only preliminary examination in the laboratory. None of the corals or stromatoporoids have been sectioned and only very few of the shale samples collected for microfossils have as yet been investigated. Therefore, the conclusions presented are only tentative, until such time as the large fossil collections from the Devonian and underlying and overlying beds are more thoroughly studied and reported on.

E. J. Tassonyi kindly provided advance copies of columnar sections and notes on some of his formational units from his subsurface study of the Devonian of the central and lower Mackenzie River region. Helen R. Belyea and E. J. Tassonyi provided descriptive logs of some of the bore holes within the report area.

M. J. Copeland identified the ostracods of this report. M. R. House of Oxford University, England, provided a few tentative identifications of goniatites collected from the area, which he will more thoroughly study at a later date. D. C. McGregor is responsible for the identification of most of the plant remains and all of the spores. Two collections of plant remains from the Barn Mountains in the north were identified by W. A. Bell. D. J. McLaren identified the Middle and Upper Devonian rhynchonelloid brachiopods and some of the other Upper Devonian brachiopods. A. R. Ormiston identified and dated most of the trilobite faunas from the report area, and he intends to describe these faunas at a later date.

The writer is indebted to H. G. Bassett of Shell Oil Company of Canada, Limited (personal communication, 1963), for pointing out that the distinctive echinoderm ossicle with a double axial canal does not occur in the Hume Formation of the type area but in a pre-Hume position. Bassett also provided three measured sections for comparison located within the southeast sector of the report area, and he pointed out the lower Upper Devonian age of the Canol Formation based on microfossil evidence.

#### PREVIOUS GEOLOGICAL WORK

Camsell (1907, pp. 9-11) has summarized the earliest explorations in northern Yukon, which included Sir John Franklin, Bell, Isbister (1845, 1855), Count V. E. de Sainville, prospectors participating in the Klondike rush of 1898, and patrols made by the North-West Mounted Police. Sir John Franklin on returning from his second voyage to the Arctic 1822-1828 mistakenly ascended the stream, which he named Peel River. Mr. Bell of the Hudson's Bay Company in 1839 explored parts of Peel and Snake Rivers preparatory to establishing Fort McPherson at the head of the delta in 1840. Isbister (1845, 1855), also employed by the Hudson's Bay Company, during the winter of 1840-41 made a survey and sketch map of part of the Peel River

and Rat River. Count V.E. de Sainville made a survey and map of Peel River up to the mouth of Wind River and also ascended the Bonnet Plume River a short distance.

McConnell (1891) was the first geologist to report on the region covered by this report. During the summer of 1888 he traversed up the Peel River to Fort McPherson, and from there westward across the Richardson Mountains to Porcupine River, which he followed into Alaska. During the same summer William Ogilvie, a Dominion land surveyor, traversed up Tatonduk River and descended the upper Porcupine River to its junction with Bell River and up the latter river eastward across the Richardson Mountains to the Mackenzie River delta. His geologic notes of the Tatonduk and upper Porcupine Rivers were summarized by McConnell (1891, p. 138).

Charles Camsell (1906, 1907) in 1904 made a reconnaissance survey across the Ogilvie Mountains by way of Braine Pass and the Wind River and followed the Peel River down to the Mackenzie delta. Fossils collected in Braine Pass, south of the report area, were identified as Devonian by Mr. J. F. Whiteaves of the Geological Survey of Canada.

Brooks and Kindle (1908) in their study of the Yukon basin in 1906 from the International Boundary (141st Meridian) westward to the 152nd Meridian mapped several areas of Middle and Upper Devonian rocks along and near the river. In their review of previous work they pointed out (Brooks and Kindle, 1908, p. 259) that the Devonian fossils recorded by Meek (1867) as coming from the Porcupine River more probably came from the Mackenzie River basin.

Kindle (1908) during the summer of 1906 made a geological investigation of the rocks along the Porcupine River below the International Boundary for the United States Geological Survey. He (1908, pp. 327-329) mapped richly fossiliferous massive light grey to blue limestone weathering buff (325 feet thick) outcropping on both banks of the river, which he named the Salmontrout Limestone after a nearby stream. Brownish coloured shales several hundred feet thick overlie the limestone and although unfossiliferous were tentatively dated by Kindle as Upper Devonian in age. He (1908, p. 329) thought that the fossils in the Salmontrout Limestone represented a Middle Devonian age. The writer made an unsuccessful attempt in 1962 to reexamine the Devonian exposures in the vicinity of Salmon Trout River in Alaska a short distance west of the border.

Cairnes (1912, 1914a, 1914b, 1914c) of the Geological Survey of Canada accompanied International Boundary Survey parties in 1911 and 1912, working along the 141st Meridian between the Yukon and Porcupine Rivers. Maddren (1912) of the United States Geological Survey worked with Boundary Survey parties in 1911 and 1912 between the Porcupine River and the Arctic Coast. Devonian strata mapped by Cairnes (1914b) along the boundary comprised light to dark grey crystalline limestone (300 feet thick) in the north,

in part correlative with Kindle's (1908) Salmontrout Limestone of Alaska. From Harrington Creek (now named Hard Luck Creek) southward to Yukon River he mapped Devonian beds made up mainly of interbedded black, grey, and red shales and cherts (about 500 feet thick) overlying in the north light to dark grey crystalline limestone (100 feet thick). Kindle (in Kindle and Burling, 1914) identified the Devonian fossils collected by D.D. Cairnes from along the Yukon-Alaska boundary in 1911 and 1912 and by Burling in 1913. He reported a fauna similar to that present in the Salmontrout Limestone, and a "Portage fauna" from overlying shales. With the exception of the incomplete section measured by E. W. Bamber (1964, p. 18) in 1963 between Ettrain and Jungle Creeks, beds of Devonian age have not been reinvestigated by the Survey along the boundary.

Of special interest amongst Cairnes's collections is a fossil suggestive of Gruenewaldtia americana Stainbrook collected from immediately east of the Yukon-Alaska boundary (ca. 66°56'N, 140°58'W). This or a closely related form occurs in the lower Upper Devonian (late Frasnian) Mount Hawk Formation of the Alberta Rocky Mountains. This fossil was not found in any of the sections east of the Yukon-Alaska boundary measured by members of Operation Porcupine.

Mertie (1932) in 1930 mapped Devonian rocks immediately west of the Yukon-Alaska boundary at five main localities between the Yukon River (64°45'N) in the south and Ettrain Creek (ca. 65°25'N) in the north. The Devonian in this area is represented by three units; a lower fossiliferous limestone identified with the Salmontrout Limestone of lower Middle Devonian age; a middle unit of thin-bedded limestone, shale, and chert dated as Middle Devonian; and an upper unit of argillite, chert, and cherty grit dated as late Middle Devonian, but which may include some Upper Devonian.

Brosgé et al. (1962) between 1950 and 1960 have mapped a thin quartzitic chert-pebble conglomerate they named the Kekiktuk Conglomerate, which occurs beneath the Kyak(?) Shale and unconformably above the Neruokpuk Formation at many places in northeastern Brooks Range. Outcrops along and near the Yukon-Alaska boundary are present near Joe Creek (68°56'N) and to the south. On the basis of indeterminate plant fragments and stratigraphic position the conglomerate was dated by Brosgé et al. (1962, p. 2185) as Late(?) Devonian or Mississippian age.

Canol geologists including F. A. McKinnon, E. J. Foley, C. R. Stelck, and A. W. Nauss between 1942 and 1945 traversed parts of the Arctic Red, Peel, and lower Mackenzie Rivers within the present report area, the results of which were summarized by Hume and Link (1945) and by Hume (1954). Devonian strata outcrop along all of the above-mentioned streams.

Goodman (1951) in describing the tectonics of the east side of the Cordillera in western Canada described some of the structural features of the Mackenzie and Richardson Mountains within the report area.

Geologists of Peel Plateau Exploration Ltd., of which the writer was a member in 1953 and 1954, were the first to use helicopter support in investigating the geology of several large concessions in the northern Yukon all within the area bounded by latitudes  $65^{\circ}30'N$  to  $67^{\circ}00'N$  and longitudes  $129^{\circ}00'W$  to  $139^{\circ}00'W$ . Some of the geological results summarized by R.G. Perry (1954), who headed the operation, were included on the Geological Map of the Yukon Territory (Geol. Surv. Can., Map 1048A, 1957). Since the advent of the use of helicopters all of the present report area has been investigated by numerous oil company geologists in the search for oil and gas, but their results are largely unpublished.

Gabrielse (1957) in 1955 made geological observations while accompanying a Topographical Survey party of the Department of Mines and Technical Surveys engaged in mapping northernmost Yukon and adjacent Northwest Territories. His report described the area bounded approximately by latitudes  $67^{\circ}00'$  and  $68^{\circ}30'N$  and longitudes  $135^{\circ}00'$  and  $138^{\circ}00'W$ . He mapped clastic rocks of Upper Devonian age outcropping near the headwaters of Vittrekwa River and near the headwaters of Rat River along the eastern flank of the northern Richardson Mountains.

Martin (1959) has presented the most detailed account of the stratigraphy and tectonic history based on geological work done in 1955 and 1956 of an area bounded by latitude  $65^{\circ}00'N$  on the south, and the Arctic coast on the north, longitude  $125^{\circ}00'W$  on the east, and the Yukon-Alaska Boundary (longitude  $141^{\circ}00'W$ ) on the west.

Baadsgaard, Folinsbee, and Lipson (1961) have dated the biotite from a granite on Mount Fitton, northern Yukon Territory, as 353 million years using the potassium-argon method. They suggest granite emplacement and orogeny taking place during the Devonian. Potassium-argon age determinations by the Geological Survey of Canada (Wanless, *et al.*, 1965) on samples collected by G. C. Taylor of Operation Porcupine from the igneous plutons near Mount Sedgewick, Mount Fitton, and Old Crow Range yielded the following dates: 355, 370, and 265 million years respectively.

Green and Roddick (1962), on a helicopter-supported party known as Operation Ogilvie in 1958 and 1961, mapped three areas immediately south of the present report area. The three areas comprised Nash Creek (lat.  $64^{\circ}$  to  $65^{\circ}N$ , long.  $134^{\circ}$  to  $136^{\circ}W$ ), Larsen Creek (lat.  $64^{\circ}$  to  $65^{\circ}N$ , long.  $136^{\circ}$  to  $138^{\circ}W$ ), and Dawson (lat.  $64^{\circ}$  to  $65^{\circ}N$ , long.  $138^{\circ}$  to  $141^{\circ}W$ ). In the northern half of the most eastern map-area, Nash Creek, four map-units include Devonian rocks. Map-unit 10 (Nash Creek) consists of a banded unfossiliferous limestone and dolomite about 3,500 feet thick, which is possibly approximately equivalent to the Gossage Formation of the present area. Map-unit 11 (Nash Creek, Larsen Creek) consists of richly fossiliferous, dark grey, brown and black, massive to thin-bedded, buff-grey weathering limestone dated as lower Middle Devonian. Map-unit 12 (Nash Creek) consists of dark, platy limestones commonly argillaceous and locally siliceous, and interbedded

black chert. It is the facies equivalent of all or parts of map-units 10 and 11 and possibly of map-unit 8, and presumably ranges in age from Silurian(?) to Middle Devonian. Map-unit 12 appears to be equivalent to the Prongs Creek Formation in the present report area. Map-unit 13 (Nash Creek, Larsen Creek, Dawson) consists of recessive poorly exposed black shales, argillite, slate, platy limestone, chert, chert pebble conglomerate, and quartzite. It ranges in age from Middle Devonian to Carboniferous and outcrops in the northern third of all three map-areas.

McLaren (in Caley, *et al.*, 1962, pp. 76-77) in 1961 measured a Devonian section on Hart River and reported that some of the fossils collected from the lower part of the Devonian sequence are similar to forms present in the early Middle Devonian Blue Fiord Formation of southern Ellesmere Island.

Kindle and Bosworth (1921), Hume (1923, 1954), Hume and Link (1945), Laudon (1950), Hume (1954), Warren and Stelck (1950), Crickmay (1957), Bassett (1961), and many others have contributed to the study of the Devonian of the central and lower Mackenzie region east of the report area. Bassett's (1961) study is the most recent and comprehensive account, in which he has given a discussion of the confused nomenclature of the rocks and proposed certain changes in the terminology. The formational nomenclature used by Bassett (1961) comprised the following in ascending sequence: Bear Rock, Hume, Hare Indian, Kee Scarp, Canol, and Imperial Formations.

McLaren (1962, pp. 8-12) has discussed the Devonian stratigraphy and stratigraphic palaeontology of the central Mackenzie River region in a study of Middle and early Upper Devonian rhynchonelloid brachiopods from western Canada. On the basis of rhynchonelloids he has indicated long range correlations of some of the Devonian Formations of the Mackenzie region with other areas in western Canada.

Douglas and Norris (1963), in a preliminary report of Operation Mackenzie covering the Dahadinni and Wrigley map-areas bounded by latitudes 63° and 64°N and longitudes 122° and 126°W, have delineated sixteen Devonian rock units. There, the Middle Devonian succession comprising nine formations is about 10,000 feet thick, and the Upper Devonian comprising four formations is about 7,000 feet thick. The latter area is approximately 190 miles southeast of the report area.

Gabrielse (1964, pp. 16-17) and other members of Operation Nahanni made a geological reconnaissance survey in 1963 of the Logan and Mackenzie Mountains of Yukon Territory and the adjoining District of Mackenzie. This area is immediately east of the area covered by Green and Roddick (1962) and southeast of the report area, and will provide more detailed geological information of a hitherto little known region. Gabrielse reported Middle Devonian carbonates and Upper Devonian clastic deposits within the area.

Caldwell (1964) has reviewed in detail the history of nomenclature of the various Devonian formations in the lower Mackenzie River region and concluded that the following names were valid: Bear Rock (Hume and Link, 1945), Hume (Bassett, 1961), Hare Indian (Kindle and Bosworth, 1921, emended Bassett, 1961), Ramparts (Kindle and Bosworth, 1921), Canol (Bassett, 1961), or Fort Creek (Kindle and Bosworth, 1921), and Imperial (Hume and Link, 1945).

Tassonyi (unpub. report) formerly on the staff of the Geological Survey of Canada made a detailed study of the subsurface geology of the lower Mackenzie River and Anderson River area, District of Mackenzie. He proposed a new formational name, the Gossage Formation, for the rocks occupying the interval between the Ronning Formation and the Hume Formation west and outside the area of the evaporitic and brecciated facies of the Bear Rock Formation. He also informally referred to the basal bituminous shales of the Hare Indian Formation as the "Spore-bearing Member" because of its distinctive lithology and spore content. Both of these rock units extend westward into the present report area.

Norford (1964) of the Geological Survey of Canada has prepared a preliminary account of some twenty-three sections of Ordovician and Silurian rocks examined by members of Operation Porcupine in 1962. The relationship of the Ordovician and Silurian to the overlying Devonian rocks is shown in many of his sections.

L. H. Green of the Geological Survey of Canada in 1964 measured two sections containing Devonian strata near the headwaters of Royal Creek (64°48'N, 135°11'W and 64°46'N, 135°15'W) immediately south of the present area. The basal Devonian beds of the two sections contain a rich coral and brachiopod fauna overlapping the upper range of the graptolite Monograptus yukonensis Jackson and Lenz (1963) of Lower Devonian age. His sections are of considerable help in delineating the southward distribution of a Devonian dark shale, limestone, and chert facies with characteristic fossils named the Prongs Creek Formation in the report area to the north.

Meek (1867), Kindle (1916), Copeland (1962), Corgan (1963), Jackson and Lenz (1963), and House and Pedder (1963) have described, illustrated or listed Devonian invertebrate fossils from the report area. Many more workers including Meek (1867), Whiteaves (1891), Kindle (1916), Smith (1945), Warren (1944a and b), Warren and Stelck (1956, 1962), Crickmay (1960a), Galloway (1960), Lenz (1961), House (1962), McLaren (1962), McLaren, Norris, and McGregor (1962), Miedema (1962), Roed (1962), House and Pedder (1963), Sykes (1964), Pedder (1964), and Sartenaer (in press) have described or illustrated Devonian invertebrate fossils collected from the nearby central and lower Mackenzie basin.

Denison, et al. (1963) described Silurian fish remains, which he later (Denison, 1964) dated as Lower Devonian, from southeast of the report

area in southeastern Yukon. Denison (1964) described additional vertebrate material from a number of localities in the Yukon Territory and the Northwest Territories. From one locality on Snake River, presumably within the report area, several fish genera suggesting a Lower Devonian (Gedinnian) age were collected from beds 40 to 50 feet above limestone beds containing brachiopods and corals of probable Upper Silurian age (Denison, 1964, p. 451).

After this report had been submitted to the Geological Survey for publication, a paper by Churkin and Brabb (1965) was published covering a small area of east-central Alaska extending from the Alaska-Yukon boundary just south of latitude 65°N to the Nation River about 25 miles northwest. In this area they recognized a new formation named the McCann Hill Chert, which is 200 to 800 feet thick and disconformably overlies the Road River Formation. A lower member of this formation consists of limestone and shale and contains a varied fauna dated as early Middle Devonian (Eifelian). An upper member consists of chert and shale containing spores dated as Upper Devonian. The McCann Hill Chert is conformably overlain by a thick succession of interbedded greywacke, chert conglomerate, and silty shale of the Nation River Formation formerly thought to be of Pennsylvanian(?) age by Mertie (1930, 1932) and now dated by Churkin and Brabb (1965) as Upper Devonian in age on the basis of spores.



## STRATIGRAPHY

The Devonian System is moderately widespread and well exposed, especially within the southeast half of the area mapped (see Fig. 1; also Geol. Surv. Can., Map 10-1963). The Lower and Middle Devonian Series are represented by marine strata of both carbonate and shale facies that outcrop mainly in the folded belts of the Mackenzie and Ogilvie Mountains. Smaller scattered outcrop areas of Lower and Middle Devonian rocks are present also in the Keele Range, in the northern part of Porcupine Plain, and in the core of the Campbell Lake uplift on the east side of the Mackenzie delta. On the preliminary Geological Survey of Canada Map 10-1963 these rocks are included in map-units 6 and 7. In contrast, the Upper Devonian Series consists largely of recessive weathering clastic rocks that outcrop in the plateaus and lowland areas flanking the Mackenzie, Wernecke, Ogilvie, Richardson, and Barn Mountains. These rocks also underlie a large area on both sides of the Mackenzie River immediately south and east of the upper part of the delta. On the preliminary Geological Survey of Canada Map 10-1963 these rocks are indicated by map-unit 8.

The Devonian formational nomenclature and relationships of the rocks in the area studied are indicated in a general way by Figure 2. Four illustrations (Figs. 3-6) of columnar sections indicate the lithology and correlation of the rock units. Descriptions and fossil lists of 10 measured Devonian sections are included in the Appendix of this report.

With the exception of the Kee Scarp and the Bear Rock (restricted), all of the formations typically developed in the central Mackenzie River region to the east can be recognized in the report area. Besides these and because of facies changes four new distinctive rock units are developed in the present area and are named in this report.

In the south-central part of the area, occupying a north-northwest-trending belt coinciding very roughly with the Richardson Mountain uplift in the north, and underlying the Trevor, Knorr, and Iltyd Ranges in the south, the Devonian succession (see Fig. 3) consists in ascending sequence of the Prongs Creek, Canol, and Imperial Formations. The total thickness of the complete succession is probably close to 3,600 feet. The Prongs Creek is a new name applied to a sequence of dark shales, and dark thin-bedded argillaceous limestones and cherts of marine origin, that reaches a maximum thickness of about 2,700 feet in the Royal Creek area. The Canol Formation consists of black shale with clay ironstone nodules and is about 500 feet thick. The Imperial Formation in this area consists of shales, siltstones, sandstones, and cherty conglomerates about 1,550 feet thick in the Lake Creek area.

Eastward, in the Snake River area, the above succession is replaced by the following, in ascending sequence: the Gossage and Cranswick Formations, Prongs Creek tongue, Hare Indian and Canol Formations

(Pls. XIII and XIV), with a total thickness of about 3,260 feet. The Gossage is a new name introduced by Tassonyi (unpub. report) to apply to a dolomite and limestone sequence more or less coeval with the evaporites and brecciated carbonates of the Bear Rock Formation in the type area. The Cranswick Formation is a new name to apply to a sequence of dark limestones, argillaceous limestones, and calcareous shale overlying the Gossage Formation and underlying the Hare Indian Formation in the Snake River area. The Cranswick is older than the Hume Formation of the central Mackenzie River region. Only the two lower formations of this succession, the Gossage and Cranswick with a total thickness of 850 feet (section 6, Fig. 3; Pl. XIII) consist essentially of carbonate rocks, the remaining upper part consists mainly of shales. The thickest unit by far of this succession is the Hare Indian Formation (2,338 feet; section 6, Fig. 3; Pl. XIV), consisting essentially of greenish grey shales that weather yellowish brown.

In the southeast sector of the area mapped, near the headwaters of Cranswick River in the Mackenzie Mountains, most of the Devonian succession (see Fig. 3; Pl. II) consists of carbonate rocks. The sequence is about 2,600 feet thick and contains the following rock units in ascending sequence; the Gossage and Ogilvie Formations and the Hare Indian tongue. The Ogilvie Formation is a new name for resistant, grey weathering relatively pure carbonate rocks that vary considerably in thickness from place to place.

To the north and east, on Flyaway Creek and in the Arctic Red River area (Fig. 3, sections 1 to 3; Pls. VII, VIII and XII), much of the Devonian succession can be identified with the much better known formational units present in the central Mackenzie River region described by Bassett (1961) and others.

In the southwest sector of the report area, in the Hart-Ogilvie Rivers area of the Ogilvie Mountains, the Devonian succession (see Fig. 4) consists mainly of argillaceous carbonate and carbonate rocks with a thin shale unit at the top. The succession in ascending sequence consists of the Michelle and Ogilvie Formations (Pls. IV and XVI) and an unnamed shale unit. The Michelle Formation is a new name applied to a recessive sequence of dark argillaceous limestone and dolomite and some shale weathering orange-brown with a maximum thickness of 615 feet in the Blackstone River area. The maximum total thickness of the Devonian succession in this area occurs in the Nahoni Range (see section 21, Fig. 4), where it is about 3,600 feet. The maximum thickness of the carbonates (ca. 3,250 feet) comprising the Michelle and Ogilvie Formations occurs near Blackstone River (section 19, Fig. 4) along the northern flank of the Ogilvie Mountains.

In the western third of the report area, north of latitude 66°N, in the northwestern end of the Ogilvie Mountains (Pl. III), in the White Mountains (Pl. I) within the northern Richardson Mountains, and in the Campbell Lake uplift (Pl. XV) the Devonian succession in ascending sequence consists (see Fig. 5) of the Gossage and Ogilvie Formations, comprising carbonate rocks

TABLE OF FORMATIONS

Era	Period or Epoch	Formation or Member	Thickness (feet)	Lithology and Distribution
Palaeozoic	Upper Devonian	Imperial	ca. 6000+ max.	Argillaceous and silty quartzose sandstone, sandy and silty shale, some sandy and ferruginous mudstone, and scattered beds of chert pebble conglomerate and conglomeratic sandstone. Marine fossils in upper part of formation immediately east of Arctic Red River; plant fragments at scattered horizons of formation in remainder of area.
		Canol	0-470 925?	Black variably silty shales, commonly coated with bright yellow, orange and brown staining; some orange-weathering clay ironstone nodules; formation present in eastern part of report area.
	Middle Devonian and Younger	Unnamed shale	0-1660	Black non-calcareous shale in Blackstone-Hart Rivers area of northeastern Ogilvie Mountains; bluish grey weathering siliceous shale interbedded with minor black shale in Nahoni Range; brownish grey and reddish shales in Ogilvie Mountains near Yukon-Alaska boundary and in Ogilvie-Hart Rivers areas; silty and ferruginous shales and minor sandstones along northeastern flank of Ogilvie Mountains.
Middle Devonian		Hare Indian Formation and tongue	1950 max.	Dark greenish grey, calcareous shale weathering orange-brown, minor interbeds of mudstone of same colour, and

TABLE OF FORMATIONS (cont'd)

Era	Period or Epoch	Formation or Member	Thickness (feet)	Lithology and Distribution
Palaeozoic	Middle Devonian	Hare Indian Formation and tongue (cont'd)		black argillaceous limestone; present in Snake River area. A tongue of black, calcareous shale weathering orange-brown developed near headwaters of Cranswick River.
		Hume	757 max.	Dark, rubbly, thin- to thick-bedded, richly fossiliferous argillaceous limestones with shale partings; and a black non-calcareous shale 60 feet thick present in upper quarter of formation on Flyaway Creek.
		Ogilvie	285 - 2640	Brown and black, aphanitic to fine-grained, thin-bedded to massive, resistant, cliff-forming limestones, in part crinoidal, weathering light to medium grey; some beds moderately fossiliferous. Lower third to half of formation dolomitized in Hart and Blackstone Rivers areas, and lower half to two-thirds dolomitized along east flank of Nahoni Range.
		Cranswick	443	Medium brownish grey to black, aphanitic to fine-grained, thin-bedded to massive limestone in lower half; and black, fine-grained limestone and argillaceous limestone, interbedded with black calcareous shale in upper half of formation in type section immediately west of Snake River.

TABLE OF FORMATIONS (cont'd)

Era	Period or Epoch	Formation or Member	Thickness (feet)	Lithology and Distribution
Palaeozoic	Lower and Middle Devonian and Younger(?)	Prongs Creek	212 - 2464	A lower member of dark shale with thin beds of dark limestone; a middle member of dark grey, recessive shale, argillaceous and silty limestones, and dark chert; and an upper member of dark shales with thin interbeds of dark grey cherts; formation thickest and typically developed in Royal Creek area. Prongs Creek tongue consists of black carbonaceous shale with some slightly calcareous shale, present in Snake River area.
	Middle Devonian and Older	Gossage	352 - 2431	Moderately resistant, grey, black or brown, fine-grained to aphanitic, commonly pelletoid limestones, dolomitic limestones, or dolomites, weathering a banded grey, brown or orange; authigenic quartz needles present in some beds. Bright orange weathering dolomite at base of formation in sections near headwaters of Cranswick and Snake Rivers areas. Basal chert pebble conglomerate in matrix of red shale in Mount Burgess area.
		Michelle	184 - 614	Moderately recessive, black, silty and argillaceous limestones and dolomites weathering orange and brown; and dark variably carbonaceous, calcareous and silty shales; some beds richly fossiliferous. Formation extends from Hart River to Nahoni Range areas.

overlain in places by an unnamed shale unit of unknown age. The carbonate succession reaches a maximum thickness of about 3,200 feet in the White Mountains.

Flanking the Richardson Mountains the Devonian succession (see Fig. 6) in ascending sequence comprises the Prongs Creek and Imperial Formations. The Prongs Creek consists of dark shales and chert, about 870 feet thick on Trail River. The overlying Imperial Formation consists of shales, siltstones, mudstones, and sandstones. Maximum thickness of the Imperial Formation in this area is about 6,000 feet or more.

## DESCRIPTION OF FORMATIONS

### Michelle Formation

The name Michelle Formation is proposed for a basal Devonian recessive shale and argillaceous limestone and dolomite unit unconformably (?) overlying Silurian graptolitic shales of the Road River Formation (Pl. XVI) and sharply underlying Middle Devonian carbonates named the Ogilvie Formation (Pl. IV). The type section here selected is section 14 (Fig. 4 and Appendix) located immediately west of the Hart River in the northern flank of the Ogilvie Mountains. The formation is named after Michelle Creek, a tributary of the Hart River. On the preliminary Geological Survey of Canada Geology Map 10-1963 (Norris, D.K., et al., 1963) beds of the Michelle Formation were included in map-unit 6.

The areal extent of the Michelle Formation is within the northeastern part of the Ogilvie Mountains. Its southward extent is not known, but it has not been mapped south of latitude 65°N according to Maps 13-1962 and 14-1962 of Green and Roddick (1962).

The lithology of the Michelle Formation in most sections consists mainly of interbedded black, calcareous shales and richly fossiliferous black, fine-grained to aphanitic, argillaceous and silty limestones and dolomites weathering orange-brown. The upper part of the formation is predominantly brownish grey weathering dolomite and silty and argillaceous dolomite in section 17 immediately west of Hart River. The formation is generally recessive and poorly exposed compared to the carbonates of the Ogilvie Formation above, but more resistant than the underlying relatively soft shales of the Road River Formation.

The lower contact with the Road River Formation may be unconformable, and is selected at the first appearance of closely spaced interbeds of argillaceous limestone and dolomite. The upper contact with the more resistant, purer carbonates of the Ogilvie Formation is sharp and could represent a disconformity.

Table 1  
Michelle Formation Data

Section No.	Figure No.	Thickness (feet)	Locality and Comments
14	4	548.5	One mile west-northwest of Hart River. Type section.
15	4	ca. 460	West bank of Hart River.
16	4	380	One mile east of Hart River.
17	4	375.5	One mile east of Hart River.
18	4	381.9	Eight miles east of Blackstone River.
19	4	613.5	Immediately east of Blackstone River.
20	4	ca. 360	Ogilvie River.
21	4	184	Southeast flank of Nahoni Range.
23	4	279.1	Southern end of Nahoni Range.

Measured thicknesses of the Michelle Formation are shown in Table 1 and range from a minimum of 184 feet (section 21) on the southeast flank of Nahoni Range to a maximum of 614 feet (section 19) immediately west of Blackstone River.

#### Fossils and Age

Beds of the Michelle Formation contain a rich fauna at most localities visited. A composite list of most of the fossils collected is given below: Receptaculites sp., stromatoporoids, Amphipora sp., Alveolites sp., Coenites sp., Coenites cf. C. rectilineatus (Simpson), Favosites sp., large cup corals, bryozoa fragments, Nematopora sp., Ptiloporella? sp., Ptilopora sp., Chonetes cf. C. sp. L, Chonetes sp. L, Dalmanella? sp., Levenea? sp., Schuchertella? sp., Schuchertella sp., Schizophoria sp., Gypidula sp., very large Gypidula sp., Carinatina? sp., Atrypa sp., Atrypa cf. A. parva Hume, Spinatrypa sp., Emanuella sp., Warrenella? sp., Warrenella sp., Eospirifer? sp., Brevispirifer? sp., Plectospirifer? sp., rhynchonelloids, Styliolina sp., Tentaculites sp., Cypricardella? sp., Edmondia? sp., cf. Paracyclas sp., Ptychospirina? sp., Bactrites? sp., goniatite, Michelinoceras sp., Cornuproetus sp., ?Dechenellurus sp., Dechenellurus sp. B, Harpes cf. H. reticulatus Hawle and Corda, Leonaspis sp., Otarion sp. C, indet. proetid, Ozarkodina denckmanni Ziegler, circular echinoderm ossicles with single, double, and cross-like axial canals, and five-sided echinoderm ossicles with single axial canals.

This rich fauna is unfamiliar and has not yet been adequately studied. On the basis of stratigraphic position of the Michelle Formation between the base of the Ogilvie Formation (above) dated as upper lower Middle Devonian and the Silurian Road River Formation (below) containing monograptids, the Michelle probably ranges in age from early Middle to Lower Devonian. Corgan (1963) has listed and illustrated some of this fauna and dated it as Lower Devonian (Onesquethawan). Fossils from his locality A on the Blackstone River are almost certainly from the unit here described as the Michelle Formation. Oliver (1960) has shown on the basis of corals that the Onesquethawan Stage of Cooper et al. (1942) corresponds largely to the lower Middle and not the upper Lower Devonian. Ormiston (1967) is of the opinion that the trilobites figured by Corgan are almost certainly representative of the Onesquethawan and indicate an early Middle Devonian (Eifelian) age. McLaren (in Caley et al., 1962, pp. 76-77) dated this fauna as early Middle Devonian on the basis of similarity with certain forms particularly the rhynchonelloids, occurring in the Blue Fiord Formation of southern Ellesmere Island. It should be pointed out that the fossils showing closest similarity to the Blue Fiord forms are from roughly the upper half to upper two-thirds of the Michelle Formation. House (in House and Pedder, 1963, p. 508, Pl. 75, Figs. 1-3, 10, 11; text-fig. 3) has described a new goniatite species, Teicherticeras lenzi, collected from 296 feet below the base of the Ogilvie Formation on Ogilvie River, Yukon Territory, 65°23'N, 138°31'W. This location is between sections 20 and 21 and within the Michelle Formation of this report. House favoured an Emsian (upper Lower Devonian) rather than an Eifelian (lower Middle Devonian) age for the new goniatite species.

Trilobites are fairly numerous in the lower half to third of the Michelle Formation and these were examined and identified by A. R. Ormiston. Dechenellurus sp. B and Harpes cf. H. reticulatus are the more diagnostic forms and they indicate an Emsian age for the containing beds. Ormiston stated also that the associated conodont Ozarkodina denckmanni can be no younger than Emsian. He further stated that all of the above forms have been recorded from the Charley River Quadrangle of Alaska (USGS 6492-SD) where they have been firmly dated as Emsian on the basis of trilobites and conodonts.

#### Gossage Formation

Tassonyi (unpub. report) has restricted the name Bear Rock Formation to the sequence comprising a lower evaporitic member and an upper brecciated member, which occurs in a relatively small area of the east central Mackenzie region. He has introduced a new name, the Gossage Formation, after Gossage River, a tributary of Mackenzie River near the type well, for the sequence of limestones and dolomites overlying the Ronning Formation and underlying the Hume Formation, which rocks are presumably more or less coeval with the Bear Rock (restricted) beds. The type section of the Gossage Formation selected by Tassonyi is the Richfield Oil Corporation et al. Grandview Hills No. 1 well (67°13'40"N, 130°51'16"W) between 1,871

and 3,460 feet depths. In the subsurface throughout most of west-central Mackenzie region the Gossage Formation is composed essentially of three members, a lower thin limestone, a middle brown dolomite, and an upper pellet limestone.

Beds assigned to the Gossage Formation outcrop in the Canyon (sections 2, 3, 5, and 6) and Backbone (section 4) Ranges of the Mackenzie Mountains in the southeastern part of the map-area; in the northwestern part of the Ogilvie Mountains (sections 23a, 24, 25, 26, 27, and 28) in the southwestern part of the map-area; in the White Mountains (section 30) and in the Campbell Lake uplift (sections 31 and 32) in the northern and northeastern parts respectively of the map-area. On the preliminary Geological Survey of Canada Map 10 by Norris, D.K., et al. (1963) beds of the Gossage Formation have been included in map-unit 7.

In the subsurface the lower limestone member consists of very pale creamy brown or buff, aphanitic limestones, with thin interbeds of light green or bluish green waxy, non-calcareous shales, and minor beds of light or pale green, aphanitic, slightly argillaceous dolomite. In the type section this member is 170 feet thick and lies between 3,290 to 3,460 feet depths.

The middle brown dolomite member is generally buff or brown in colour, but with some lighter beds, occasionally fairly calcareous, and fine to very finely crystalline with some intercrystalline porosity. It contains rare subpelletoidal or oölitic structures. Green shale partings are rare. Authigenic quartz between  $\frac{1}{3}$  to 1 millimetre in diameter is developed at scattered horizons. The member is rather clean with a small amount of insoluble residue, which increases towards the west. In the type section this member is 670 feet thick between the 2,620- and 3,290-foot depths.

The upper pellet limestone member is variably argillaceous, buff or light brown, very fine grained or aphanitic, with abundant lime mud matrix. Pellets are up to 1.6 millimetres in diameter and commonly show that they are made up of coagulent lumps. Partings of bluish green, waxy, non-calcareous shale are common. In the type section this member is 749 feet thick between the 1,871- and 2,620-foot depths.

The lithology of the Gossage Formation in outcrops within the report area consists of evenly thin- to thick-bedded, light grey to black, fine-grained to aphanitic limestones, dolomitic limestones, and dolomites. The beds commonly weather a banded light to dark grey and are generally more resistant where they have not been altered to dolomite. An orange-brown weathering dolomite unit occurs at the base of the formation at some of the sections in the southeast. Some of the Gossage beds are argillaceous and silty, and minor chert is encountered towards the top of the formation in some of the eastern sections. A close examination reveals that many of the apparently aphanitic limestone beds are actually pelletoid in character.

The most atypical lithological development of the Gossage Formation occurs in the Mount Burgess area (section 24). There, the formation consists of a basal unit of chert pebble conglomerate in a matrix of reddish brown, silty shale; this unit is overlain by hematitic red, silty and sandy shale, and capped by recessive, thin-bedded, dark grey, fine-grained dolomite, weathering orange-brown.

The lower contact of the Bear Rock, according to Bassett (1961), is everywhere sharp in the central Mackenzie area and may represent a disconformity. In the Mackenzie Mountains (see sections 4 and 6, Fig. 3; Pls. II and XIII) in the southeastern corner of the map-area a regional unconformity, plainly evident on air photographs, separates the Gossage Formation from older strata. In the Mount Burgess area (section 24) conglomerate beds of the Gossage Formation disconformably overlie carbonate beds of Middle Ordovician age. Unfortunately the lower contact of the Gossage Formation is not exposed at any of the sections measured in the northern Ogilvie Mountains. In the White Mountains (section 30; see Fig. 5; Pl. I), the contact between the Gossage and underlying Middle or Upper Silurian carbonate beds (named the Vunta Formation by Norford, 1964) appears to be conformable.

The upper contact of the Gossage Formation in the southeastern part of the map-area (sections 2 and 3, Fig. 3) is with abundantly fossiliferous, dark, argillaceous limestones of the Hume Formation. West of Flyaway Creek the upper contact of the Gossage Formation is with purer carbonates named the Ogilvie Formation (see Figs. 2 and 3). The lower part of the Ogilvie Formation is older than the Hume Formation so that the upper boundary of the Gossage is diachronous, that is, younger in the east and older in the west and northwest.

The thickness of the Gossage Formation in the Mackenzie Mountains in the southeast corner of the map-area varies from greater than 725 feet (section 5, Fig. 3) to 407 feet (section 6, Fig. 3). To the north, out on the plains east of the Richardson Mountains, about 1,000 feet of the Gossage Strata were penetrated in the R. O. C. et al. Point Separation No. 1 well (67°34'06"N, 134°00'10"W). Still farther east at the type section in the R. O. C. et al. Grandview Hills No. 1 well (67°13'40"N, 130°51'16"W) the Gossage Formation is 1,589 feet thick. In the White Mountains (section 30, Fig. 5) the Gossage Formation appears to reach a maximum thickness of 2,431 feet. In the Mount Burgess area (section 24, Figs. 4 and 5) in the northern Ogilvie Mountains, where the Gossage Formation is lithologically atypical, it is only 352 feet thick.

### Fossils and Age

The age of the Gossage Formation near the type section on Mackenzie River is still in doubt for lack of diagnostic fossils. Bassett (1961), on the basis of a fauna found in the lower part of a very thick "Bear Rock Formation" on the upper Redstone River, dated the Bear Rock as Keyserian or

Table 2  
Gossage Formation Data

Section No.	Figure No.	Thickness (feet)	Locality and Comments
2	3	411.4 incomplete	Immediately west of Arctic Red River.
3	3	123 incomplete	Flyaway Creek.
4	3	536.9	Near headwaters of Cranswick River.
5	3	725 incomplete	Canyon Ranges of Mackenzie Mountains.
6	3	406.8	Immediately west of Snake River.
24	4 & 5	352.2	Mount Burgess.
23a	5	573 incomplete	Between Ettrain and Jungle Creeks near Yukon-Alaska boundary.
25	5	907 incomplete	North of Mount Dewdney.
26	5	747.5 incomplete	Ogilvie Mountains, 19 miles bearing 175T from Bear Cave Mountain.
27	5	779.8 incomplete	Ogilvie Mountains 7.2 miles bearing 338T from Bear Cave Mountain.
28	5	1,250.3 incomplete	Northern end of Ogilvie Mountains 6 miles west of Cody Creek.
29	5	2,032	Peel Plateau Eagle Plains Y. T. No. 1 well. 66°48'54"N, 138°08'30"W. Top - 4,770'; Bottom - 6,802'.
30	5	2,431	Fish Creek, White Mountains.
31	5	350.6 incomplete	East of south end of Campbell Lake.
32	5	697.3 incomplete	North side of Campbell Lake.

Helderbergian age. The Keyser fauna is frequently shifted back and forth between latest Upper Silurian or Lower Devonian. The barren Gossage and Bear Rock carbonates in the Norman Wells area are bounded above by a Schuchertella adoceta fauna occurring in the lower Hume that is dated by Bassett (1961) as lower Middle Devonian. Within the present area Gossage beds, with a few exceptions, are only sparsely fossiliferous. Coenites cf. C. rectilineatus (Simpson) has been collected from the Gossage Formation at some localities (sections 6 and 25), but has been noted also in the upper part of underlying beds, and in the Michelle Formation. The large smooth ostracod Moelleritia canadensis Copeland is relatively common at scattered horizons throughout roughly the upper third or so of the Gossage Formation at most sections measured in the northern Ogilvie Mountains. This form is taken to indicate a lower Middle Devonian (Eifelian) age (Copeland, 1961, pp. 1-8; Thorsteinsson and Tozer, 1962, p. 50). In Russia a papillated species of Moelleritia is a zone fossil indicating an upper Eifelian age (Domratshev and Tikhy, 1962). A fairly rich fauna occurs below Moelleritia-bearing beds in the lowest exposed unit of the Gossage Formation of section 25, but unfortunately the base of the formation is not exposed in the area. Fossils from 12 to 25 feet up (GSC loc. 53276) comprise: stromatoporoid, Alveolites sp., Favosites sp., cf. Hexagonaria sp., large rugose coral, Atrypa cf. A. sp. E, 'Camarotoechia' cf. 'C.' sp. C, Michelinoceras sp., and leperditiid-like ostracods in a different matrix. Both the Atrypa cf. A. sp. E and 'Camarotoechia' cf. 'C.' sp. C are fairly close to forms present in the Blue Fiord Formation of the Canadian Arctic Archipelago, which is dated by McLaren (1959) as lower Middle Devonian (Eifelian) in age.

Fish remains collected from beds here assigned to the Gossage Formation in the Snake River area (65°22'N, 133°30'W; near section 6) have been dated as Lower Devonian (Gedinnian) in age by Dr. D. L. Dineley of Ottawa University (personal communication, 1964). The fish remains occur in a buff-weathering unit 70 feet above the top of beds dated as Upper Silurian on the basis of Conchidium sp.

In the White Mountains where a complete and unusually thick section of the Gossage Formation is exposed (section 30) Atrypella and other fossils are present in roughly the lower 620 feet of the formation, and Moelleritia sp. and other fossils were collected from roughly the upper 250 feet of the formation. The formation overlies limestone beds (named the Vunta Formation by Norford, 1964) containing fossils dated as Middle and Upper Silurian in its upper part. The lower Atrypella-bearing beds of the Gossage Formation are dated as Upper Silurian and possibly earliest Lower Devonian (see Boucot, et al., 1964); the upper beds bearing Moelleritia are dated as early Middle Devonian. The intervening 1,440 feet of beds composed mainly of siliceous dolomites are apparently unfossiliferous.

In the Campbell Lake uplift, on the north side of the lake (section 32; Pl. XV) beds assigned to the Gossage Formation are of Silurian age as

suggested by silicified fossils including Atrypa cf. A. gabrielsi Norford and corals collected 54 feet from the top of the formation.

Lithologically the Gossage Formation most nearly resembles the Arnica Formation of the southern Mackenzie Mountains (see Douglas and Norris, D.K., 1961, 1963). Some of the features common to both are the fine textures of the rock, the conspicuous colour banding as seen from a distance, and the presence of scattered authigenic quartz needles.

### Prongs Creek Formation

The name Prongs Creek Formation is here proposed for the sequence of Devonian dark grey to black shales with thin interbeds of black argillaceous limestones, and black chert, which overlie graptolitic shales of the Road River Formation, and are overlain by dark grey silty shales of the Canol (?) and Imperial Formations. The type section selected is on Royal Creek (section 8; 65°02'-04'W, 135°08'-10'W), near the middle of its basin of deposition where the formation is thickest. The name is after Prongs Creek, a tributary of the Little Wind River.

The Prongs Creek Formation seems to be confined to a relatively narrow north-trending belt extending from the southern border of the report area northward to coincide roughly with part of the Richardson Mountains uplift. The formation appears to pinch-out north of latitude 67°34'N. The belt of distribution is widest in the south, where it extends from Trevor and Knorr Ranges in the east, to the northern end of the Wernecke Mountains in the west. Near the eastern margin of the Prongs Creek basin, as at section 6 near Snake River (see Fig. 3), the formation pinches out as a tongue between the Cranswick Formation (below) and the Hare Indian Formation (above). On the preliminary Geological Survey of Canada Map 10-1963 by Norris, D.K., et al. (1963) beds of the Prongs Creek Formation have been included in map-units 6 and 7. South of latitude 65°N this unit is presumably included in map-unit 13 of Green and Roddick (1962, Maps 13-1962 and 14-1962) where the belt swings abruptly westward.

A rough three-fold lithological division is apparent in the thicker sections of the Prongs Creek Formation. A lower division consists mainly of dark grey to black shales with widely spaced thin interbeds of limestones and argillaceous limestones, some of which show brecciation and graded bedding suggesting deposition by turbidity currents; a middle division consists of interbedded shale and limestone, in part argillaceous and slightly cherty; and an upper division consists of interbedded shale and black chert. In the condensed sequences in the north (see sections 13 and 35; Figs. 3 and 6) most of the formation is made up of interbedded black shale and chert. Where present as a tongue near Snake River (section 6) it consists of a black, soft, carbonaceous shale with some beds of slightly calcareous shale.

The lower contact of the formation in the southern part of the area is within shales and is for the present arbitrarily and tentatively drawn immediately above the highest occurrences of monograptids. A detailed study of the rich faunas from immediately above and below will no doubt provide a more accurate placement of this boundary at a later date. On Trail River (section 35; Pl. X), on the east flank of Richardson Mountains, the lower contact of the Prongs Creek with the Road River Formation is an erosional unconformity with a relief on top of the Road River of 2 to 3 feet. In the southern part of the area the upper contact is arbitrarily drawn at the disappearance of chert and change of colour of shales from dark grey or black, to brownish grey shales generally containing orange-brown weathering clay ironstone nodules of the Canol (?) or Imperial Formation. In the north on Porcupine River (section 13), an angular unconformity separates thinly bedded, black cherts of the Prongs Creek Formation from the overlying conglomeratic beds of Permo-Pennsylvanian age.

Table 3  
Prongs Creek Formation Data

Section No.	Figure No.	Thickness (feet)	Locality and Comments
6	3	386	Immediately west of Snake River. Present as a tongue.
7	3	1,951.9 incomplete	Knorr Range.
8	3	2,464 incomplete	Royal Creek. Type section.
10	3	1,212 incomplete	Lower Prongs Creek.
11	3 & 6	1,530.5	Upper Prongs Creek.
12	3 & 4	991	Anticline six miles west of Clear Creek.
13	3	212	Lower Porcupine River.
35	6	871.1	Trail River.

The thickest section of the Prongs Creek Formation (2,464 feet thick) was measured on Royal Creek (section 8) near the southern boundary of the report area. From there eastward it thins to 1,952 feet thick (section 7) in Knorr Range; westward it thins to 970 feet thick (section 12), near Clear Creek; and northward it thins to about 870 feet thick (section 35) on Trail River. Still farther north at section 13 on Porcupine River, the Prongs Creek is only 212 feet thick.

### Fossils and Age

Fossils are exceedingly numerous in beds of the lower half of the lower division of the Prongs Creek Formation on Prongs Creek (section 10) and include the following: Favosites sp., rugose coral fragments, Lingula sp., Cymostrophia sp., cf. Chonostrophia sp., Dalmanella? sp., Dicaloesia? sp., Schellwienella sp., pentamerid, Atrypa? sp. - finely costate, Atrypa sp., Atrypa cf. A. parva Hume, Carinatina sp., Spinatrypa sp., 'Camarotoechia' sp., 'Rhynchotrema' sp., leiorhynchid fragments, spiriferid impression, Delthyris? sp., Hysterolites sp., Meristella? sp., spirally coiled gastropod, Tentaculites sp., Michelinoceras sp., fenestellid bryozoa, pustulose trilobite fragments, and ostracods.

The above fossils are from between 95 and 246 feet above the highest occurrence of monograptids, and most of the forms are unfamiliar. The presence of Atrypa cf. A. parva Hume suggests a Silurian age, although the upper range of this species is not known. Until the complete fauna, including the underlying monograptids, are more thoroughly studied, the lower part of the Prongs Creek Formation is tentatively dated as Upper Silurian or Lower Devonian.

Recently Jackson and Lenz (1963, pp. 751-753) described Monograptus yukonensis from the uppermost part of the Road River Formation from several localities in the northern Yukon and suggested that it may be post-Ludlow in age. In the Royal Creek section the shales bearing M. yukonensis are interbedded with carbonates containing numerous brachiopods and corals. Johnson and Boucot (in Jackson and Lenz, 1963, p. 752) examined some of the brachiopods and concluded that they are post-Ludlow and probably early Gedinnian in age. More recently, Johnson and Boucot (personal communication, March 25, 1966), after further study of additional material collected by A. C. Lenz from the Royal Creek section, concluded that the Monograptus yukonensis zone in the Yukon Territory is probably Siegenian (mid Lower Devonian) in age.

The upper part of the lower division of the Prongs Creek Formation at the type section 8 (see Appendix) contains the following fossils: Lingula sp., Orbiculoidea sp., Warrenella sp. [= "Reticularia" ex. gp. "R." curvata (Schloth.) of the Blue Fiord Formation], Tentaculites sp., Michelinoceras sp. cf. Anetoceras sp. and other goniatites. The goniatite cf. Anetoceras sp.

from near the top of the lower division has been tentatively identified by M. R. House, who suggested a late Lower Devonian (Emsian) age for the containing beds.

The middle division contains: Coenites sp., rugose coral fragments, Gypidula sp. - very large form, Pholidostrophia? sp., Douvillina sp., Atrypa? sp., Spinatrypa sp., Emanuella sp., Warrenella sp., leiorhynchid n. genus (= "Eatonia medialis Vanuxem var." of Meyer, 1913, of Blue Fiord Formation), Plectospirifer sp., Palaeoneilo sp., Coleolus? sp., Bactrites sp., Agoniatites? sp., and echinoderm ossicles with single, double, and cross-like axial canals.

Warrenella sp. from both the lower and middle divisions, and the leiorhynchid from the middle division are very closely related to forms present in the Blue Fiord Formation of the Canadian Arctic Archipelago. The small echinoderm ossicles with double axial canals, and Plectospirifer sp. are common in the lower part of the Ogilvie Formation. On the basis of the above mentioned forms all of the middle division is tentatively dated as lower Middle Devonian (Eifelian) in age. The upper division of the Prongs Creek Formation contains considerable chert at the type section and elsewhere, and is generally barren of fossils except for an occasional Tentaculites sp. It may be upper Middle Devonian (Givetian) or younger in age.

Echinoderm ossicles with double and cross-like axial canals associated with corals and stromatoporoids in a thin limestone bed within the Prongs Creek Formation were collected 9 miles north of Trail River. On Trail River (section 35) the formation consists mainly of chert and shale and is barren of megafossils. The fossils collected north of Trail River indicate that at least part of the condensed sequence of the Prongs Creek Formation along the eastern flank of the Richardson Mountains is lower Middle Devonian in age and in part equivalent to the Cranswick Formation and lower part of the Ogilvie Formation. Some previous workers, including Jackson and Lenz (1962), have referred to this unit in this area as the Fort Creek Formation; others have referred to it as the Canol Formation.

The Prongs Creek tongue (see section 6, Fig. 3) in the Snake River area may be roughly equivalent to the dark bituminous shales at the base of the Hare Indian Formation of the central Mackenzie River region. According to Tassonyi (unpub. report) this basal member contains distinctive spores, which should make it relatively easy to test the validity of the suggested correlation when the shale samples from the Prongs Creek tongue are finally investigated for spores and other microfossils.

The middle division of the Prongs Creek Formation may correlate in part with the lower limestone and shale member of the McCann Hill Chert of Churkin and Brabb (1965) outcropping in east-central Alaska. The lower member of the McCann Hill Chert contains a varied fauna, which has been tentatively dated as late Lower Devonian (Emsian) or early Middle Devonian

(Eifelian) in age. The upper division of the Prongs Creek Formation is lithologically similar to the upper chert and shale member of the McCann Hill Chert, which Churkin and Brabb (1965) have dated as Upper Devonian on the basis of spores.

### Cranswick Formation

The name Cranswick Formation is proposed for a sequence of Middle Devonian limestones and minor shales that overlie dolomites of the Gossage Formation and underlie a tongue of dark carbonaceous shales of the Prongs Creek Formation. The type section is located at the Mackenzie Mountain front immediately west of Snake River (section 6, Fig. 3; Pls. XIII and XIV). The name is after Cranswick River, a tributary stream of the Arctic Red River. On the preliminary Geological Survey of Canada Map 10-1963 by Norris, D.K., et al. (1963) beds of the Cranswick Formation were included in map-unit 7.

The Cranswick Formation is developed in the southeast corner of the report area. Its distribution southward is not known.

The lithology of the Cranswick Formation consists of two distinct members; a lower member (208 feet thick) of medium brownish grey to black, aphanitic to fine-grained, thin-bedded to massive limestones; and an upper member (235 feet thick) of black, fine-grained limestone and argillaceous limestone, interbedded with black, calcareous shale.

At the type section the lower contact of the Cranswick Formation appears to be structurally conformable with the less resistant dolomites of the Gossage Formation. The upper contact is sharp with a tongue of black carbonaceous shale of the Prongs Creek Formation.

The thickness of the Cranswick Formation is 443 feet at section 6.

Fossils are only moderately abundant in the lower carbonate member of the Cranswick Formation and include stromatoporoids, cup corals, Alveolites sp., Coenites sp., Gypidula sp., Atrypa sp., Warrenella sp., ostracods, echinoderm ossicles with single, double and cross-like axial canals.

Fossils from the upper shale and limestone member of the Cranswick Formation comprise: inarticulate brachiopods, Lingula sp., Orbiculoidea? sp., Warrenella sp., brachiopod traces, Styliolina sp., Tentaculites sp., and echinoderm ossicles with double axial canals.

On the basis of stratigraphic position and the above fossils the Cranswick Formation is dated as lower Middle Devonian.

The presence of echinoderm ossicles with double axial canals in both members suggests that the Cranswick Formation correlates roughly with the lower part of the Ogilvie Formation and the middle part of the Prongs Creek Formation.

### Ogilvie Formation

The name Ogilvie Formation is here proposed for the Devonian carbonate succession overlying the Michelle and Gossage Formations and underlying the Hare Indian Formation and tongue, unnamed shales of Middle Devonian and younger (?) ages, and clastic rocks and carbonates of Carboniferous age. The type section selected is on the east flank of Mount Burgess and on the unnamed mountain immediately to the east (section 24). The name is after Ogilvie Mountains. On the preliminary Geological Survey of Canada Map 10-1963 by Norris, D.K., et al. (1963) beds of the Ogilvie Formation have been included in map-unit 7.

Within the report area the Ogilvie Formation is developed in the Backbone Ranges of the Mackenzie Mountains near the headwaters of Cranswick River, in the southern and eastern parts of the Ogilvie Mountains, and it appears also to underlie the southwestern part of the Porcupine Plateau and the southern part of the Eagle Plain. Its southern limit has not been delineated, but apparently it does not extend south of latitude 65°N, according to Green and Roddick, 1962; (see Map 13-1962).

The lithology of the Ogilvie Formation consists of medium brown to grey, fine-grained, thin-bedded to massive, resistant, cliff-forming limestone, generally weathering light to medium grey. Some beds are moderately argillaceous and scattered silt is also present. In the type section chert occurs at scattered intervals throughout the formation, but in the sections between the East Porcupine and Ogilvie Rivers, the chert is confined mainly to the upper part of the formation. In the Nahoni Range area, as in section 23 (Norris, 1967), approximately the lower two-thirds of the formation has been dolomitized. Scattered intervals of dolomite are also present in sections 16, 17, and 19 (Norris, 1967) in the area east of Blackstone River.

The lower contact of the Ogilvie Formation is sharp and is possibly disconformable with both the Michelle and Gossage Formations. The upper contact may be diachronous, as younger beds appear to be developed towards the northwest. In the northeastern ranges of the Ogilvie Mountains, roughly between the Hart and Blackstone Rivers, the upper contact with overlying strata was not seen. In this area the Ogilvie Formation is overlain by a recessive, mainly covered, interval of unnamed dark grey shales in places burnt to a pinkish red colour. The lower beds of this interval may be older than the Imperial Formation. Farther west in the Nahoni Range area between the Ogilvie and East Porcupine Rivers (sections 22 and 23; Norris, 1967) the Ogilvie Formation is overlain by an interval close to 1,000 feet thick of bluish

or silvery grey weathering shales, overlain by silty and cherty limestones containing a fauna dated as Mississippian (Chesterian) age by E. W. Bamber (personal communication). At the type section of the Ogilvie Formation on Mount Burgess (section 24), the formation is overlain by a very poorly exposed interval about 30 feet thick of dark grey shale weathering rusty red, in turn overlain by dark grey, medium- to thick-bedded limestones dated as Mississippian. In White Mountains (section 30; Pl. I) the Ogilvie Formation is unconformably overlain by carbonate rocks dated by C. A. Ross (personal communication to E. W. Bamber, 1966) as late Pennsylvanian (Missourian) or early Permian (Wolfcampian) in age.

Table 4  
Ogilvie Formation Data

Section No.	Figure No.	Thickness (feet)	Locality and Comments
4	3	1,822.2	Near headwaters of Cranswick River.
14	4	1,244.5	Northern Ogilvie Mountains one mile west-northwest of Hart River.
15	4	45 incomplete	West bank of Hart River.
16	4	615	Northern Ogilvie Mountains about one mile east of Hart River.
17	4	1,138	Northern Ogilvie Mountains about one mile east of Hart River.
18	4	2,305	Northern edge of Ogilvie Mountains about 8 miles east of Blackstone River.
19	4	2,638	Northern edge of Ogilvie Mountains immediately east of Blackstone River.
20	4	170 incomplete	Ogilvie River.
21	4	2,379.7	Southeast flank of Nahoni Range.

Table 4 (cont'd)

Section No.	Figure No.	Thickness (feet)	Locality and Comments
22	4	130 incomplete	Northeast flank of Nahoni Range.
23	4	2,393.1	Southern end of Nahoni Range.
23a	5	547	Between Ettrain and Jungle Creeks near Yukon-Alaska boundary.
24	4 & 5	2,190.1	Mount Burgess. Type section.
25	5	285	North of Mount Dewdney.
26	5	841.1	Ogilvie Mountains, 19 miles bearing 175 true from Bear Cave Mountain.
27	5	443.3	Ogilvie Mountains, 7.2 miles bearing 338 true from Bear Cave Mountain.
28	5	567.7	Northern end of Ogilvie Mountains, 6 miles west of Cody Creek.
29	5	1,194	Peel Plateau Eagle Plains Y. T. No. 1 well. 66°48'54"N, 138°08'30"W. Top - 3,586'; Bottom - 4,770'.
30	5	766	Fish Creek, White Mountains.
31	5	330 incomplete	East of south end of Campbell Lake.
32	5	287.9	North side of Campbell Lake.

The thickness of the Ogilvie Formation ranges from 615 feet thick (section 16; Norris, 1967) in the Hart River area, to 2,380 feet thick between the Ogilvie and East Porcupine Rivers (section 21; Norris, 1967). The thickness near Mount Burgess (type section 24) is 2,190 feet. An unusually thick section (2,638 feet) of the Ogilvie Formation was measured at the mountain front immediately east of Blackstone River (section 19, Fig. 4). This thickness measurement, however, may not be reliable as it was taken up to a presumed fault suggested by a repeat of fossils.

## Fossils and Age

Fossils from the lower part of the Ogilvie Formation from the zone of echinoderm ossicles with double axial canals, comprise the following: Receptaculites sp., stromatoporoids, Amphipora sp., cup coral fragments, Alveolites sp., Aulopora sp., Coenites sp., Coenites cf. C. rectilineatus (Simpson), Favosites sp., Hexagonaria sp., Phillipsastrea sp., Syringopora? sp., Trachypora sp., douvillinid?, Pholidostrophia? sp., Schizophoria? sp., Schizophoria sp., Schuchertella? sp., Schuchertella sp., stropheodontid, large Gypidula sp., Gypidula sp., Spinulicosta sp., Atrypa sp., Atrypa cf. A. arctica Warren, Atrypa cf. A. perfimbriata Crickmay, Spinatrypa? sp., Spinatrypa sp., Ambocoelia? sp., Warrenella sp., Cleiorthyris sp., Plectospirifer sp., Plectospirifer compactus (Meek), Cranaena sp., Loxonema sp., Orthonema? sp., Philoxene? sp., Actinopteria? sp., Conocardium sp., Grammatodon sp., Leptodesma? sp., Paracyclas sp., Styliolina sp., Tentaculites sp., Bactrites sp., ostracods, cf. Moelleritia sp., Dechenella (D.) sp., Dechenella (D.) sp. A, ?Odontocephalus sp., proetid tail with three border spines, Schizoproetoides richteri (Tolmachoff), echinoderm ossicles with single, double, cross-like, and five-star shaped axial canals.

The trilobites were identified by A.R. Ormiston, and of these, D. (D.) sp. A occurs in beds (section 24) immediately above strata containing echinoderm ossicles with double axial canals and indicates a probable Eifelian age. The remaining trilobites are within the zone of echinoderm ossicles with double axial canals, and of these, Schizoproetoides richteri from near the base of the Ogilvie Formation of section 23a (Norris, 1967) is known from well up in the Blue Fiord Formation of Ellesmere Island where it is dated by Ormiston as Eifelian. ?Odontocephalus sp. and Dechenella (D.) sp. occur between 152 and 162 feet above the base of the Ogilvie Formation of section 31 (Norris, 1967). Ormiston mentioned that true Odontocephalus is restricted to beds of Eifelian age.

Echinoderm ossicles with double axial canals were observed in scattered beds as high as 2,100 feet (see section 18) above the base of the Ogilvie Formation. At this particular section the formation is 2,305 feet thick. In a few sections the large smooth ostracod cf. Moelleritia sp. has been collected from the lower part of the Ogilvie Formation, especially in beds that have been altered to dolomite (see sections 21, 23, and 28; in Norris, 1967). Receptaculites sp. and Coenites cf. C. rectilineatus (Simpson) are holdovers from the older Michelle and Gossage Formations. They are exceedingly rare in the Ogilvie Formation and seem to be confined to beds very low in the formation.

Fossils of this lower zone of the Ogilvie Formation are pre-Hume in age and indicate a lower Middle Devonian (Eifelian) age. On the basis of the echinoderm ossicles with double axial canals the lower part of the Ogilvie Formation within the report area correlates roughly with the middle part of the Prongs Creek Formation, and with the Cranswick Formation. Outside of

the report area, on the basis of the distinctive echinoderm ossicles, the lower part of the Ogilvie Formation correlates roughly with the Manetoe Formation of the southern Mackenzie Mountains, and with the lower part of a carbonate sequence referred by G. C. Taylor to the Nahanni Formation that outcrops in the southwest part of Caribou Range (54°44.5'N, 126°32'W) in northeastern British Columbia.

Fossils from the upper part of the Ogilvie Formation (Stringocephalus zone) include the following: stromatoporoids, Amphipora sp., Alveolites sp., Coenites spp., Favosites sp., Phillipsastrea sp., Iteophyllum? sp., Syringopora? sp., Schuchertella? sp., costate pentamerid, Gipudula sp., Longispina sp., Carinatina? sp., Atrypa sp. - finely costate, Atrypa sp. - medium costate, Atrypa nasuta hearnei Norris, Spinatrypa sp., Lazutkinia sp., Emanuella sp., Warrenella sp., Stringocephalus sp., Stringocephalus obesus Grabau, Stringocephalus cf. S. obesus Grabau, Stringocephalus cf. S. sapiens Crickmay, Fenestrellina? sp., Paracyclas? sp., Halloceras logani (Meek), trilobite fragments, ostracods, and echinoderm ossicles with single axial canals.

The younger beds of the Ogilvie Formation appear to be developed only at some sections. The more diagnostic fossils of this upper zone of the Ogilvie Formation comprise the following: Atrypa nasuta hearnei Norris, Lazutkinia sp., Stringocephalus spp., and Halloceras logani (Meek). Atrypa nasuta hearnei Norris (in McLaren and Norris, 1964) occurs in the Horn Plateau Formation of Givetian age northwest of Great Slave Lake. Lazutkinia sp. is known from several places in western Canada associated with Stringocephalus sp. (see McLaren, Norris, and McGregor, 1962, Pl. X, Figs. 6-8). Halloceras logani (Meek) was originally collected from beds on Mackenzie River associated with Warrenella franklini (Meek), Hadorrhynchia sandersoni (Warren), and other fossils (Meek, 1867, p. 74). On Mount Burgess (section 24) species of Stringocephalus are present throughout the upper 1,020 feet of the Ogilvie Formation. From this section Warren and Stelck (1962, p. 281) have identified Geranocephalus n. sp. A from 1,000 feet down from the top; Stringocephalus sapiens Crickmay, 410 feet down; and G. inopinus Crickmay and S. obesus Grabau from 20 feet down from the top. The oldest form here, G. n. sp. A, is dated by Warren and Stelck as latest Eifelian or earliest Givetian. Therefore, at the type section and other localities where the Ogilvie is thickly developed, it probably spans much of the upper Eifelian and Givetian Stages of the Middle Devonian.

The upper part of the Ogilvie Formation correlates roughly with the Hare Indian and Ramparts Formations of the central Mackenzie region, and questionably with the upper part of the Prongs Creek Formation within the report area.

### Hume Formation

The name Hume Formation was proposed by Bassett (1961, p. 486) for the succession of fossiliferous Middle Devonian limestone and in places interbedded shale that overlies the Bear Rock Formation and underlies the Hare Indian Formation. The designated type section of the Hume Formation is at the front of the Mackenzie Mountains on the east branch of the Hume River at 65°20'30"N, 129°58'00"W, where it is 400 feet thick. The Hume Formation is equivalent to what was formerly called the "Lower Ramparts Limestone Member" by Hume and Link (1945, p. 19) on Mountain River. On preliminary Geological Survey of Canada Map 10-1963 (Norris, D.K., et al., 1963) beds of the Hume Formation were included in map-unit 7.

Crickmay (1960b, p. 877) in a footnote proposed a new formation, the Norman Wells, which is presumably equivalent to Bassett's (1961) Hume Formation, which it pre-dates, but it does not seem to have gained acceptance. At the present time no conclusions are drawn regarding the validity or desirability of using certain names over others. Bassett's terminology forms a convenient framework, which is adequately described and documented, and seems to have gained wide acceptance.

The Hume Formation is fairly widespread in the central Mackenzie region and can be traced from the type area into the southeastern part of the report area, where it is present along the Mackenzie Mountain front near Arctic Red River and on Flyaway Creek.

The lithology of the Hume Formation in the Arctic Red River area (sections 1 and 2; Pl. VIII) consists of richly fossiliferous, black, nodular, irregularly and evenly bedded limestones and argillaceous limestones weathering brown and grey, separated by dark shale laminae. On Flyaway Creek (section 3; Pl. VII) the formation consists of black, fine-grained, thick-bedded to thin rubbly bedded limestones weathering dark to light grey, some beds of which contain numerous corals; and a black, fissile, ferruginous non-calcareous shale 60 feet thick present in the upper quarter of the formation.

The lower contact of the Hume with the Bear Rock and Gossage Formations is sharp and probably disconformable at most localities. Within the report area the upper contact is highly variable, and may be an erosional surface at some places. At the Mackenzie Mountain front immediately east of Arctic Red River (section 1) the Hume Formation is overlain by a 1-foot argillaceous limestone coquina bed of Leiorhynchus castanea (Meek) of the Hare Indian Formation, in turn sharply and disconformably overlain by the Canol Formation. Immediately west of Arctic Red River (section 2; Pl. VIII) and on Flyaway Creek (section 3; Pl. VII) the coquina bed is missing and the Hume is sharply and disconformably overlain by the Canol Shale.

Table 5  
Hume Formation Data

Section No.	Figure No.	Thickness (feet)	Locality and Comments
1	3	35.6 incomplete	Immediately east of Arctic Red River.
2	3	398.1	Immediately west of Arctic Red River.
3	3	757	Flyaway Creek.

The thickness of the Hume Formation ranges from 400 feet, at its type locality, to 550 feet in the central Mackenzie region (Bassett, 1961, p. 488). In the area considered here, it ranges from 398 feet thick (section 2; Norris, 1967) at the Mackenzie Mountain front to 213 feet thick in the R. O. C. et al. Point Separation No. 1 well (67°34'06"N, 134°00'10"W).

#### Fossils and Age

Fossils are exceedingly numerous in some beds of the Hume Formation, particularly the argillaceous limestones. Fossils from the uppermost 35.6 feet of the formation immediately east of the Arctic Red River (section 1) comprise: Sphaerospongia sp., Alveolites sp., Coenites sp., Favosites sp., Phillipsastrea sp., Stringophyllum (Neospongophyllum)? sp., Spinulicosta sp., Carinatina sp., Atrypa arctica Warren, Spinatrypa sp., Warrenella sp., Bactrites sp., trilobite tail, ostracod, and echinoderm ossicles with single axial canals.

A composite list of all forms from the complete Hume Formation exposed immediately west of the Arctic Red River (section 2; Norris, 1967) comprises the following: Receptaculites sp., sponge spicules, Sphaerospongia sp., stromatoporoids, very large cup corals, Digonophyllum sp., Digonophyllum rectum (Meek), Aulopora sp., Alveolites sp., Favosites sp., Hexagonaria sp., Phillipsastrea sp., Syringopora sp., Stringophyllum (Neospongophyllum) sp., Utaratuia sp., douvillid, Schuchertella sp., productellid, Spinulicosta sp., Carinatina sp., Carinatina dysmorphostrota Crickmay, Atrypa sp., Atrypa arctica Warren, Atrypa perfimbriata Crickmay, Spinatrypa sp., Spinatrypa coriacea Crickmay, Emanuella sp., Emanuella meristoides (Meek), Warrenella sp., Plectospirifer sp., fenestellid bryozoa, planispiral gastropod, undet. gastropod, Philoxene? sp.,

large pelecypod, large cephalopod, Styliolina sp., Tentaculites sp., ostracod, Dechenella sp., Dechenella (Dechenella) sp., and echinoderm ossicles with single axial canals.

To the west on Flyaway Creek (section 3) the limestone beds of the Hume Formation become less argillaceous and conspicuously less fossiliferous, particularly in the number of brachiopods.

In the central Mackenzie region Bassett (1961, pp. 488-489) recognized two broad faunal associations in the Hume Formation characterized by Schuchertella nevadensis Merriam in the lower beds and Spinulicosta stainbrooki Crickmay in the upper beds. Both assemblages are associated with a large number of other organisms in part described by Crickmay (1960a), Lenz (1961), and others. In the report area it is only in the southeast corner of the area where the Hume beds are strongly argillaceous that brachiopods are moderately abundant. Elsewhere, as on Flyaway Creek (section 3), where the Hume beds are purer carbonates, the fauna is less abundant and consists mainly of corals and stromatoporoids.

Most workers including Bassett (1961, p. 489), Lenz (1961), and McLaren (1962, pp. 11-12) have tentatively dated the Hume Formation as lower Middle Devonian in age. Miedema (1962, p. 99) on the basis of a detailed study of some of the corals of the Hume Formation assigned an upper Middle Devonian age to the formation. McLaren (personal communication, 1964) on further study of some of the corals would now be inclined to agree with the latter dating. A recent discussion of the age of the Hume Formation, based on a study of Tetracorals, is given by Pedder (1964). He concluded that the age of the Hume Formation in most outcrop areas is early Givetian in the Belgian usage of the stage. The Hume Formation is older than beds containing Leiorhynchus castanea (Meek) dated as Givetian, and younger than beds containing echinoderm ossicles with double and cross-like axial canals dated as Eifelian in age by A. R. Ormiston on the basis of trilobites. In this report the Hume Formation and fauna is presumed to be in part of Eifelian age, and in part of Givetian age.

#### Hare Indian Formation

Bassett (1961) used the term Hare Indian Formation in the same manner as Kindle and Bosworth (1921, p. 45) to apply to the shales underlying the Kee Scarp Formation (then called Ramparts limestone) at the lower end of the Ramparts gorge on Mackenzie River. The base of the formation is not exposed at the type locality. All of the formation is exposed, however, at a number of localities, notably along the Mackenzie Mountain front, where it was described by Hume and Link (1945, p. 20) under the name "Middle Ramparts Shale Member" at Imperial anticline and Mountain River.

In the Snake River area (section 6; Pl. XIV) beds of the Hare Indian Formation overlie a tongue of dark carbonaceous shale of the Prongs Creek Formation and underlie dark shales of the Canol Formation. Near the headwaters of Cranswick River (section 4, Norris, 1967) the Hare Indian is present as a tongue overlying resistant carbonate beds of the Ogilvie Formation. Unfortunately the upper part of the section at this locality is faulted. Along the Mackenzie Mountain front immediately east of Arctic Red River (section 1) the Hare Indian Formation is represented by only 2 feet of beds overlying the Hume Formation. On Geological Survey of Canada preliminary Map 10-1963 (Norris, D.K., et al., 1963) beds of the Hare Indian Formation were included in map-unit 8.

The Hare Indian Formation in its typical development can be traced northwestwards in the subsurface from the central Mackenzie region into the report area east of the Richardson Mountains. In outcrops along the Mackenzie Mountain front it is last positively recognized immediately west of Snake River (section 6). Southward in the Mackenzie Mountains it appears to pinch out about latitude 65°N. It appears to be very thinly represented immediately east of Arctic Red River (section 1), and to be missing (due to erosion) immediately west of Arctic Red River (section 2; Pl. VIII).

The lithology of the Hare Indian Formation at the type locality consists of greenish grey, calcareous shale with scattered thin interbeds of argillaceous limestone. Commonly, the basal interval consists of dark grey, bituminous shales.

In the report area, the development of the Hare Indian Formation most similar to that of the type area was measured immediately west of Snake River (section 6; Fig. 3; Pl. XIV). There, the Hare Indian Formation consists of dark greenish grey, calcareous shales weathering orange-brown with three thin intervals of argillaceous limestone beds at the base, in the bottom third, and towards the top (1,532 feet thick); overlain by a resistant, cliff-forming argillaceous limestone unit (120 feet thick); capped by light yellowish brown weathering shale (ca. 300 feet thick). Where the Hare Indian Formation appears to pinch out as a tongue in the vicinity of the headwaters of Cranswick River (section 4; Pl. II), the beds consist of black calcareous shale weathering orange-brown.

The lower contact of the Hare Indian with the Hume Formation has already been described. The upper contact with the Canol Formation, where observed immediately east of the Arctic Red River (section 1; Pl. XII) and immediately west of Snake River (section 6), is exceedingly sharp and is probably disconformable. Evidence for a disconformity is suggested by the apparent absence of Hare Indian beds immediately west of Arctic Red River and probable absence of these beds also on Flyaway Creek.

Limestones named the Kee Scarp Formation by Bassett (1961) that overlie the Hare Indian Formation in the central Mackenzie region are not

developed at this stratigraphic interval in the report area. In the latter area it is the Canol Formation that immediately overlies either the Hare Indian Formation or in places the Hume and Ogilvie Formations (see Figs. 2 and 3).

Table 6  
Hare Indian Formation Data

Section No.	Figure No.	Thickness (feet)	Locality and Comments
1	3	2	Immediately east of Arctic Red River. Top of formation eroded.
4	3	257	Near headwaters of Cranswick River. Present as a tongue.
6	3	1,951.5	Immediately west of Snake River. Unusually thick development of formation.

The thickness of the Hare Indian Formation ranges from 500 to 600 feet in the type area of the central Mackenzie region, and appears to reach a maximum thickness of 1,952 feet immediately west of Snake River (section 6; Pl. XIV).

#### Fossils and Age

Bassett (1961, p. 491) has pointed out that the macrofauna of the Hare Indian Formation bears a strong resemblance to that of the uppermost Hume and lowermost Kee Scarp Formations, and where present it is characterized by: Emanuella meristoides (Meek) and vars., Warrenella kirki (Merriam), Leiorhynchus castanea (Meek), Schizophoria cf. S. allani Warren, Styliolina fissurella Hall, and Tentaculites sp.

Fossils from an exceedingly rich brachiopod coquina bed presumed to mark the base of the Hare Indian Formation in section 1 immediately east of Arctic Red River include the following: productellid - n. genus sp. L, Spinulicosta sp., Schizophoria cf. S. mcfarlanei (Meek), Atrypa cf. A. arctica Warren, and other species, Hadrorynchia sandersoni (Warren), Leiorhynchus awokanak McLaren, Leiorhynchus castanea (Meek), Emanuella meristoides (Meek), Warrenella kirki (Merriam), and cf. Straparolus sp.

Fossils from the Hare Indian Formation in the section immediately west of Snake River (section 6) include the following: cup corals, Alveolites

sp., Aulopora sp., Coenites sp., Favosites sp., Hexagonaria sp., Syringopora? sp., small punctate Lingula-like brachiopod, Lingula sp., Orbiculoidea sp., douvillinid, Douvillina? sp., stropheodontid, pentamerid?, Schizophoria sp., Chonetes sp., Pholidostrophia? sp., Devonoproductus? sp., Spinulicosta sp., Atrypa sp., Atrypa cf. A. arctica Warren, Atrypa cf. A. perfimbriata Crickmay, Spinatrypa sp., Spinatrypa andersonensis (Warren), Spinatrypa borealis (Warren), leiorhynchid, Leiorhynchus cf. L. manetoe McLaren, Leiorhynchus sp., Plectospirifer sp., Ambocoelia sp., Emanuella meristoides (Meek), Warrenella sp., Warrenella franklini (Meek), Warrenella cf. W. franklini (Meek), Warrenella kirki (Merriam), Nucleospira sp., undet. concentrically ornamented pelecypod, Eoschizodus? sp., Grammysoidea? sp., undet. planispiral gastropod, Cornellites? sp., Cyclonemina? sp., Philoxene sp., orthoconic cephalopod, cyrtocerid cephalopod fragments, Michelinoceras sp., Bactrites? sp., Styliolina sp., Tentaculites sp., Dechenella (D.) maclareni Ormiston, Dechenella (D.) aff. maclareni Ormiston, echinoderm ossicles with single axial canals, star-shaped echinoderm ossicles with single axial canals, star-shaped echinoderm ossicles with star-shaped axial canals, and large annulated echinoderm ossicles with single axial canals.

The inarticulate brachiopods, Styliolina sp., and Tentaculites sp. occur mainly in the shales; the remaining fossils occur largely in the argillaceous limestone beds.

The trilobites Dechenella (D.) maclareni and Dechenella (D.) aff. maclareni are present at scattered horizons in the upper half or so of the sequence referred to the Hare Indian Formation (see section 6 in Appendix) which A. R. Ormiston dates as lower Middle Devonian (Eifelian) in age. The brachiopod Nucleospira sp. occurs between 1592 and 1652 feet above the base of the formation in section 6. According to Hogg (1965), in the central Mackenzie area this form appears to be confined to the upper part of the Hume Formation. This suggests that only the upper 300 feet or so of this sequence is possibly in part equivalent to the Hare Indian Formation of the type area; the underlying 1,650 feet of beds are in part equivalent to and possibly in part older than the Hume Formation of the type area.

Many of the fossils of the Hare Indian Formation are known to be broadly contemporaneous with Stringocephalus elsewhere and are therefore dated as late Middle Devonian (Givetian) in age. Further evidence on the dating of the Hare Indian Formation near the type area is provided by goniatites from 20 feet above the base of the "Lower Fort Creek Shale" of the Bosworth Creek area, which are considered by House (1962, p. 255) to represent the Maenioceras terebratum Zone of late Middle Devonian (Givetian) age.

The Hare Indian Formation presumably correlates roughly with the upper parts of the Prongs Creek and Ogilvie Formations where the upper parts of these two formations are developed. Correlation with the upper part of the

Prongs Creek Formation is less certain because the latter is almost barren of macrofossils and is possibly younger in age.

#### Unnamed Shale Unit

The informally designated unnamed shale unit applies to a recessive interval comprising from place to place a variety of shales that overlie the Middle Devonian Ogilvie Formation and are overlain by relatively resistant clastic and carbonate rocks of late Mississippian age and other as yet undated beds. The unit is largely unknown because of its relative softness and paucity of well exposed sections. Physiographically the unit is generally marked by heavily vegetated valleys within which outcrops are generally small, discontinuous, and widely separated. Pinchouts or tongues of the Prongs Creek, Canol(?), Imperial, and Nation River Formations may be represented in it. On Geological Survey of Canada preliminary Map 10-1963 (Norris, D. K., et al., 1963) the unnamed shale unit has been included in map-unit 8 in the Hart-Blackstone Rivers area, and in map-unit 9 in the area to the west and north-west.

Scattered outcrops of the unit have been noted (see accompanying table) in the northern Ogilvie Mountains in the Hart-Blackstone Rivers area, along the eastern flank of the Nahoni Range, in the Ogilvie Mountains near the Yukon-Alaska boundary, and along the eastern flank of the northern Ogilvie Mountains. The unit is very thin or missing in the Mount Burgess area (section 24) and in the White Mountains area (section 30; Pl. I).

Between Blackstone and Hart Rivers (section 18) the unit appears to consist of black, fissile, non-calcareous shale. In the vicinity of and immediately east of Hart River parts of the unit are brick red or pink as seen from the air. In the Nahoni Range area (sections 21 and 22, Norris, 1967) the unit consists of black, hard, highly fissile, siliceous shale weathering bluish grey or silvery grey, interbedded with minor soft, black shale. In the Ogilvie Mountains between Ettrain and Jungle Creeks near the Yukon-Alaska boundary (section 23a, Norris, 1967) exposed beds consist of a medium brownish grey shale in part burnt to a brick red colour. Along the eastern flank of the northern Ogilvie Mountains (section 26) exposed parts of this unit consist of fairly hard, black, non-calcareous, in part silty and ferruginous shale, with minor interbeds of sandstone.

The lower contact of the unnamed shale unit is with resistant limestone beds of the Ogilvie Formation, the top of which varies in age from lower to upper Middle Devonian from place to place. The upper contact of the unnamed shale unit along the northern flank of the Ogilvie Mountains between Hart and Blackstone Rivers (section 18) is drawn at the base of hard beds consisting of silty shale, chert, and cherty limestone containing Orbiculoidea sp. and Leiorhynchus carboniferum Girty, of Nelson (1961), dated by E. W. Bamber as late Mississippian (Chesterian) in age. The upper contact of the

bluish grey or silvery grey weathering siliceous shales on the east flank of Nahoni Range (section 22; Norris, 1967) is with cherty carbonate beds, also of late Mississippian (Chesterian) age according to E. W. Bamber. The upper contact of the unnamed shale unit along the eastern flank of the northern Ogilvie Mountains (see section 26) is with unnamed resistant quartzose, ferruginous, cross-laminated sandstone weathering orange-brown and containing poorly preserved plant fragments, the age of which has not as yet been determined.

Table 7  
Unnamed Shale Unit Data

Section No.	Figure No.	Thickness (feet)	Locality and Comments
18	3	559	Northern edge of Ogilvie Mountains.
21	3	818.5 incomplete	Southeast flank of Nahoni Range.
22	3	1,057	Northeast flank of Nahoni Range.
23a	4	not measured	Between Ettrain and Jungle Creeks near Yukon-Alaska boundary.
26	4	1,657.4	Ogilvie Mountains, 19 miles bearing 175 true from Bear Cave Mountain.

Thickness of the unnamed shale unit at most places appears to vary roughly inversely as the thickness of the underlying Ogilvie Formation. Between the Hart and Blackstone Rivers (section 18) where the Ogilvie Formation is 2,305 feet thick the unnamed shale unit is only about 560 feet thick; and on the eastern flank of the Ogilvie Mountains (section 26) where the Ogilvie Formation is about 840 feet thick, the unnamed shale unit is close to 1,660 feet thick. Along the eastern flank of the Nahoni Range (sections 21 and 22; Norris, 1967) the unnamed shale unit is about 1,060 feet thick. At these latter two sections the inverse relationship may not apply because the thickness of the underlying Ogilvie Formation is 2,380 feet at section 21, and is probably the same order of thickness at section 22.

## Fossils and Age

Macrofossils appear to be relatively scarce in the unnamed shale unit and only one of the samples collected for microfossils by the writer and others of Operation Porcupine from this unit has as yet been reported on. House and Pedder (1963, pp. 501, 509-510) reported Agoniatites cf. A. fulguralis (Whidborne) collected from an unknown horizon within beds referred by them to the Fort Creek Formation outcropping on Ogilvie River (65°20'N, 138°44'W) and dated as Middle Devonian (Givetian) in age. This locality is close to sections 20, 21, and 23 (Norris, 1967). Plant stem impressions, still not reported on, were collected from talus 338-388 and 453-457 feet up from the base of the unit at section 26 on the eastern flank of the northern Ogilvie Mountains. Also from section 26, extremely corroded spores were identified by D. C. McGregor in a sample from 304-309 feet up comprising Hystricosporites sp. and Pilasporites plurigenus Balme and Hennelly. Hystricosporites is the more diagnostic form, but unfortunately ranges from Emsian to Famennian and occurs very rarely in the Carboniferous according to McGregor. From the above incomplete fossil evidence and stratigraphic position of the unnamed shale unit it appears to contain beds ranging in age from Middle to possibly Upper Devonian or even younger.

## Canol Formation

The term Canol Formation was proposed by Bassett (1961, p. 494) for the black shale unit that overlies the flanks of the Kee Scarp Formation, and the Hare Indian Formation where the Kee Scarp is missing. Previous workers, including Hume and Link (1945) and Warren and Stelck (1950), had referred to this unit as the "bituminous member of the Fort Creek formation". The type section of the Canol Formation designated by Bassett is on the north-west side of Powell Creek at the Mackenzie Mountain front (65°16'30"N, 128°46'30"W). On Geological Survey of Canada preliminary Map 10-1963 (Norris, D. K. et al., 1963) covering the report area, beds of the Canol Formation were included in map-unit 7.

Within the area mapped the Canol Formation seems to have been deposited throughout most of the area east of the Richardson Mountains as far south as the northern flanks of the Mackenzie Mountains. It is also possibly present within the northern flank of the Wernecke Mountains.

The lithology of the Canol Formation along the Mackenzie Mountain front between the Arctic Red and Snake Rivers (sections 1-3, and 6) consists of very dark grey to jet black, hard to soft non-calcareous shales and mudstones, commonly coated with a bright yellow, orange, and green patina, and rusty brown staining. Orange-brown weathering, clay ironstone nodules are present at scattered intervals as well as occasional sulphide nodules. In northern Wernecke Mountains the Canol beds are lighter grey in colour and

contain considerable siltstone. Still farther west, as in section 12 near the headwaters of Lake Creek (Norris, 1967), the beds become indistinguishable from the Imperial Formation.

As mentioned above, under description of the upper contact of the Hume Formation (sections 1 to 3, Fig. 3; Pls. VII and VIII), there is evidence to suggest a disconformity at the base of the Canol Formation at some places along the Mackenzie Mountain front. Stelck (Canol Report No. 18, p. 16; in Bassett, 1961) reported that the contact between the Canol and Kee Scarp Formation is exposed near the southeast end of Kee Scarp and there the contact was considered by Stelck to be disconformable. The upper contact with the Imperial Formation is fairly sharp and is marked by the influx of greenish grey siltstone and sandstone interbedded with shales of brownish grey colour.

Table 8  
Canol Formation Data

Section No.	Figure No.	Thickness (feet)	Locality and Comments
1	3	469.7	Immediately east of Arctic Red River.
2	3	ca. 50 incomplete	Immediately west of Arctic Red River.
3	3	361.9	Flyaway Creek.
6	3	ca. 100	Immediately west of Snake River.
11	3 & 6	501.5	Upper Prongs Creek. Questionable Canol beds.

The thickness of the Canol Formation in the lower Mackenzie River region, according to Tassonyi (unpub. report), thickens northward from about 78 feet thick in the R. O. C. et al. Grandview Hills No. 1 well (67°06.2'N, 130°52.5'W) to about 147 feet thick in the R. O. C. et al. Point Separation No. 1 well (67°34'06"N, 134°00'10"W). Along the Mackenzie Mountain front it ranges from about 470 feet thick at section 1, immediately east of Arctic Red River, to about 100 feet thick at section 6, immediately west of Snake River. In the northwestern end of the Wernecke Mountains (section 11) questionable Canol beds are about 500 feet thick.

The only macrofossils found in the Canol Formation were spathio-carids, shield-shaped organisms of arthropod or ammonoid affinities (see Copeland, 1960, pp. 7-9), at section 1 immediately east of the Arctic Red River. Unfortunately, these are non-diagnostic for dating purposes as they are known from both Middle and Upper Devonian black shales in western Canada. The Canol Formation contains a microfauna, some elements of which are present also in the Waterways Formation of northeastern Alberta and which are dated as lower Upper Devonian (Frasnian) in age according to H.G. Bassett (personal communication, 1964).

### Imperial Formation

The Imperial Formation was first defined by Hume and Link (1945, pp. 34-35), who designated a section described by Lawdon (1943, Canol Report No. 10) as the type section. This section is located on Imperial River at the front of the Mackenzie Mountains (65°07'N, 127°51'W). Bassett (1961) modified the definition of the Imperial Formation to include at the bottom a 361-foot sequence of grey shale, becoming silty towards the top, which is separated from the underlying Canol Shale by a sharp lithologic break, and which grades upwards into the overlying siltstones and shales of the Imperial Formation as defined by Hume and Link. This latter sequence, according to Bassett (1961), is well exposed on the northeast flank of the Imperial anticline on Imperial River. In the earlier literature this lower interval was generally referred to as "the upper non-bituminous shales of the Fort Creek Formation". As now defined by Bassett (1961) the name Imperial Formation applies to the sequence of Devonian clastic rocks and minor interbedded limestones that overlies the Canol Formation and is unconformably overlain throughout the central and northern Mackenzie River region by Cretaceous strata.

Clastic rocks of the Imperial Formation are widely distributed within the report area along the north flank of the Mackenzie Mountains, along the east and west flanks of the southern Richardson Mountains, along part of the north flank of Wernecke Mountains, and along part of the east flank of the Ogilvie Mountains. It outcrops also in a large area southeast of the Mackenzie River delta and Campbell Lake uplift. Small areas of scattered exposures of questionable Imperial beds are present also in the northern Richardson Mountains, and on the flanks and in the vicinity of the Barn Mountains. On Geological Survey of Canada preliminary Map 10-1963 (Norris, D.K., et al., 1963) beds of the Imperial Formation were included in map-unit 8.

The lithology of the Imperial Formation immediately east of the Arctic Red River (section 1; Pl. XII) and the nearest measured section to that of the type locality, consists of a lower unit (75 feet thick) of dark greenish grey, fine-grained, quartzose sandstone, overlain by about 560 feet of dark grey shales and mudstones weathering rusty brown; these in turn are overlain by: 218 feet of sandstones, silty sandstones, and siltstones; 170 feet of dark greenish grey recessive shale; about 412 feet of interbedded shales, silty

shales, and silty sandstones; and a capping of about 326 feet of resistant sandstones. Except for the uppermost beds most of the Imperial Formation is exposed at this section.

Clay ironstone nodules are generally present in the lower part of the Imperial Formation at most sections. Strong ferruginous staining is also commonly present in a shale unit immediately above beds containing clay ironstone nodules. Small flakes of sericite occur in most sections at scattered intervals. In most of the sections between the northern flank of the Wernecke Mountains and along the eastern flank of the Richardson Mountains scattered subrounded to rounded pebbles of black chert are present in some beds of sandstone within roughly the upper half to two-thirds of the formation. In places, as on Trail River (section 35), cherty conglomerate beds are present in the upper part of the Imperial Formation. Many sandstone beds are cross-laminated and show ripple-marks and flow cast structures. The latter structures along with graded bedding have been interpreted by Glennie (1963) to indicate deposition by turbidity currents. The variety of structures, along with the presence of scattered fragmentary plant fragments including spores, are more suggestive of a brackish or even continental environment of deposition for much of the Imperial Formation within the report area west of Arctic Red River.

The lower contact of the Imperial with the Canol Formation is sharp and easily determined throughout the eastern and southeastern parts of the area. To the west, near Clear Creek (see section 12; Norris, 1967), the Canol beds become indistinguishable lithologically from, and are arbitrarily included in the Imperial Formation. In this latter area the lower contact is with black siliceous shales and chert beds of the Prongs Creek Formation.

The upper contact of the Imperial Formation immediately east of the area mapped is, according to Bassett (1961), commonly marked by a basal Cretaceous sandstone or by a conglomerate. On Snake River just beyond the Mackenzie Mountain front the Imperial Formation is overlain by dark grey, silty shales containing pteridosperm plant remains first collected by the writer in 1954 and subsequently dated by geologists of the oil industry as Mississippian in age. Along the east flank of the northern Richardson Mountains (sections 33 and 34, Norris, 1967) a basal cherty conglomerate dated on spores by geologists of the oil industry as Permian, overlies the Imperial. In the north (sections 33 and 34; Pl. XI) a pronounced angular unconformity separates the top of the Imperial Formation from the overlying Permian beds. Similar conglomeratic beds developed in the area near the headwaters of Clear Creek (section 12, Norris, 1967) are taken to indicate the contact between the Imperial Formation and Mississippian or younger strata. On Peel River, on the west side of the Richardson Mountains, the upper beds of the Imperial Formation are sandstone, which are overlain by dark shales dated as Mississippian on the basis of goniatites found several hundred feet above the contact (E. W. Bamber, personal communication). Contact relations of the Imperial Formation along the western flank of the Richardson Mountains north of the Peel River were not investigated.

Table 9  
Imperial Formation Data

Section No.	Figure No.	Thickness (feet)	Locality and Comments
1	3	1,762.9 incomplete	Immediately east of Arctic Red River.
3	3	915.6 incomplete	Flyaway Creek.
6	3	ca. 50 incomplete	Immediately west of Snake River. Questionable Imperial beds.
11	3 & 6	3,726.2	Upper Prongs Creek. May include beds younger than Imperial Formation.
12	3 & 4	1,851	Anticline six miles west of Clear Creek.
33	6	3,200 incomplete	'Snafu' Mountain.
34	6	2,345 incomplete	Eight miles north of Rat River.
35	6	5,957.3 incomplete	Trail River.

The thickness of the Imperial Formation immediately southeast of the report area, near Arctic Red River (section 1), is 1,763 feet, but the uppermost beds are not exposed. To the west, in the Clear Creek anticline (section 12; Norris, 1967), the Imperial Formation is about 1,850 feet thick. The formation rapidly thickens northward to about 6,000 feet on Trail River (section 35) on the east flank of the Richardson Mountains, and about 4,400 feet of Imperial strata were penetrated in the R. O. C. et al Point Separation No. 1 well (67°34'06"N, 134°00'10"W), at the southern edge of the Mackenzie River delta.

## Fossils and Age

Marine macrofossils were collected from the Imperial Formation at one locality only (section 1), immediately east of the southeast corner of the map-area, where the upper 550 feet of the section consisting of sandstones and shales contains a rich brachiopod fauna. Fossils present include: Chonetes sp., Acanthatia sp., rhynchonelloid fragments, coarsely costate rhynchonelloid, Cyrtospirifer sp., Bellerophon sp., Leptodesma sp., pelecypod fragments, Bactrites sp., and echinoderm ossicles with single axial canals. The productelloid genus Acanthatia occurs in the Box Member of the Percha Formation of New Mexico, where it is dated as late Upper Devonian (Famennian) in age (Muir-Wood and Cooper, 1960, pp. 158-159, Pl. 38, Figs. 1-14). More recently this same genus has been collected by J. W. Kerr of the Geological Survey of Canada from beds similar in lithology to the Imperial Formation from the Arctic Archipelago (see Kerr et al., 1965). The associated rhynchonelloids may be identified with new genera from the southern part of the District of Mackenzie being studied by Paul Sartenaer and also dated as Upper Devonian (Famennian) in age (D. J. McLaren, personal communication). The remaining lower part of the section appears to be barren of macrofossils except for a few fossils collected loose, which were probably derived from above. Microfossils from this lower interval of section 1 comprising highly carbonized spores including Acanthotriletes uncatus Naumova and Retusotriletes greggsii McGregor from between 854 and 1,168 feet up in the formation are, according to D. C. McGregor, not too diagnostic and merely suggest a late Givetian (upper Middle Devonian) or Frasnian (lower Upper Devonian) age.

On Trail River (see Appendix, section 35) spores identified by D. C. McGregor in a sample from 210-258 feet above the base of the lower member of the Imperial Formation comprise ?Archaeoperisaccus sp., Retusotriletes greggsii McGregor, ?Hystricosporites sp. and Convolutispora sp., which he dates as of probable Frasnian (lower Upper Devonian) age. A sample containing spores from 402-409 feet up from the base is dated by McGregor as early or middle Frasnian (see Appendix). Spores including Lophozonotriletes cristifer (Luber) Kedo from near the top of the lower member of the Imperial are dated by McGregor as late Frasnian or more probably early Famennian. Spores from near the top of the upper member of the Imperial Formation in the same section include Hymenozonotriletes lepidophytus Kedo, which is, according to McGregor, a late Famennian index species in Russia. From the above evidence it appears that the lower member of the Imperial Formation on Trail River ranges in age from early Frasnian at the base to late Frasnian or more probably early Famennian at the top. The upper member appears to range in age from early to late Famennian.

Elsewhere within the report area fragmentary plant remains were the only macrofossils found in the formation. These are particularly prevalent in scattered beds in sections 33, 34, and 35, on the east flank of the Richardson Mountains.

## STRATIGRAPHIC PALAEOLOGY SUMMARY

### Silurian Faunas

Atrypella spp., with other fossils indicating an Upper Silurian age, and also earliest Lower Devonian according to Boucot, et al. (1964, text-fig. 3), occur in the lower 620 feet of the Gossage Formation in White Mountains (section 30) where an unusually thick sequence of the formation is developed. Atrypa cf. A. gabrielsi Norford associated with silicified corals indicating a Silurian age were collected 54 feet down from the top of beds assigned to the Gossage Formation on the north side of Campbell Lake (section 32). These beds containing Silurian fossils but otherwise lithologically indistinguishable from the Gossage Formation may on further study be excluded from the formation.

### Lower Devonian Faunas

Monograptus yukonensis Jackson and Lenz (1963, pp. 751-753) has been collected from the uppermost part of the Road River Formation from several localities in the northern Yukon, and it has been suggested that this species is possibly post-Ludlow in age. In the Royal Creek section shales bearing M. yukonensis are interbedded with carbonates containing numerous brachiopods and corals. Some of the brachiopods were examined by Johnson and Boucot (in Jackson and Lenz, 1963, p. 752), who concluded that they are post-Ludlow and probably early Gedinnian (early Lower Devonian) in age. More recently, Johnson and Boucot (personal communication, March 25, 1966) have tentatively dated the M. yukonensis zone as Siegenian (mid Lower Devonian) in age.

The goniatite Teicherticeras lenzi House described in House and Pedder (1963, p. 508, Pl. 75, Figs. 1-3, 10, 11, text-fig. 3) was collected from 296 feet down from the top of the Michelle Formation outcropping on Ogilvie River (65°23'N, 138°31'W). This location is between sections 20 and 21 of this report and the specimen is presumably from beds very low in the Michelle Formation. House favoured an Emsian (upper Lower Devonian) rather than an Eifelian (lower Middle Devonian) age for the new goniatite species.

Dechenellurus sp. B Zone - A rich fauna of corals, brachiopods, bryozoa, cricoconarids, ostracods, and trilobites, characterized by the trilobite Dechenellurus sp. B occurs in the lower third to half of the Michelle Formation at most sections examined. Except for the trilobites recently examined by A. R. Ormiston (May 10, 1966), this fauna has not been studied closely and is unfamiliar. Associated trilobites of this zone include Cornuproetus sp., Harpes cf. H. reticulatus, and others, and the ostracod Ozarkodina denckmanni. According to Ormiston, Dechenellurus sp. B has

been recorded from the Charley River Quadrangle of Alaska where it has been firmly dated as Emsian in age on the basis of associated trilobites and conodonts.

The goniatite cf. Anetoceras sp. from near the top of the richly fossiliferous lower third of the Prongs Creek Formation has been tentatively identified by M.R. House, who suggested a late Lower Devonian (Emsian) age for the containing beds.

#### Lower Middle Devonian (Eifelian) Faunas

Fossils from limestone beds of the Gossage Formation outcropping in the northwestern Ogilvie Mountains (section 25) comprise stromatoporoids, Alveolites sp., Favosites sp., cf. Hexagonaria sp., large rugose coral, Atrypa cf. A. sp. E, 'Camarotoechia' cf. 'C.' sp. C, and Michelinoceras sp. This fauna is probably from about the middle third or lower in the Gossage Formation, an interval that is generally dolomitized and organic remains obliterated or very poorly preserved. Both the Atrypa cf. A. sp. E and the 'Camarotoechia' cf. 'C.' sp. C are close to forms present in the Blue Fiord Formation of the Canadian Arctic Archipelago, which is dated by D. J. McLaren as lower Middle Devonian (Eifelian) in age.

Fossils from the upper half to two-thirds of the Michelle Formation include: Receptaculites sp., Coenites sp., rugose corals, a large Gypidula sp., Schizophoria sp., Atrypa sp., Spinatrypa sp., rhynchonelloids, trilobites, and others. McLaren (in Caley et al., 1962, pp. 76-77) dated this fauna as early Middle Devonian on the basis of similarity with some forms, particularly the rhynchonelloids, present in the Blue Fiord Formation of the Canadian Arctic Archipelago. Some of the trilobites of this fauna have been illustrated by Corgan (1963) and dated by him as Onesquethawan in age. Ormiston (in press) agreed that the forms were indeed representative of the Onesquethawan, and indicate an early Middle Devonian (Eifelian) age.

Moelleritia canadensis Zone - The large smooth leperditiid ostracods Moelleritia canadensis and M. c. insignis were named by Copeland (1962) from material collected from the northern Yukon and from Victoria Island, District of Franklin, and were dated as early Middle Devonian (Eifelian) in age (Copeland, 1962; Thorsteinsson and Tozer, 1962, p. 50). M. canadensis is fairly common at scattered horizons throughout the upper half or so of the thicker sequences of the Gossage Formation in the northern Ogilvie Mountains. In the Mount Burgess area, where the Gossage Formation is unusually thin and atypical in lithology, Moelleritia is found in the lower half of the formation. Other ostracods commonly associated with Moelleritia include 'Bythocypris' sp., Herrmannina sp., and Kloedenella sp. It appears that Moelleritia canadensis is facies controlled because it is found mainly in fine-grained to aphanitic dolomitic limestones and dolomites that are generally

otherwise barren of fossils. That it is a facies fossil is borne out by the fact that it is found also in the lower dolomitized parts of the younger Ogilvie Formation in several sections. Domratshev and Tikhy (1960) have indicated that a closely related ostracod, Moelleritia moelleri Schmidt, is a widespread zone fossil for the upper Eifelian (upper lower Middle Devonian) in Russia.

Zone of Echinoderm Ossicles with Double ('two-holes') and Cross-like ('four-holes') Axial Canals - Within the report area these distinctive echinoderm ossicles occur in the lower third to half of the Ogilvie Formation, in the middle third of the Prongs Creek Formation, and more or less throughout the relatively thin Cranswick Formation. They are rarely present also in the upper part of the Michelle Formation. In each of the above formations the 'two-holers' are associated with a large number of other organisms. Some of the associated fossils from the middle part of the Prongs Creek Formation include: Gypidula sp. - very large form, Pholidostrophia? sp., Atrypa? sp., Spinatrypa sp., Emanuella sp., Warrenella sp., leiorhynchid n. genus (= "Eatonia medialis Vanuxem var." of Meyer, 1913, of the Blue Fiord Formation), Plectospirifer sp., Bactrites sp., and Agoniatites sp. According to Bassett (personal communication, 1963) in the central Mackenzie region the echinoderm ossicles with double and cross-like canals occur in a pre-Hume position, that is, in the Bear Rock or equivalent beds. In the southern Mackenzie region the writer has collected echinoderm ossicles with double axial canals from the Manetoe Formation or equivalent beds outcropping in the Virginia Falls area, and in the first canyon of the Nahanni River. They have also been collected by G. C. Taylor in 1963 from the lower part of beds referred to the Nahanni Formation of northeastern British Columbia. These highly distinctive echinoderm ossicles appear to be an exceedingly useful zone fossil because of their small size, vast numbers, wide distribution, and tolerance of a great variety of argillaceous and carbonate facies. Wilson (1964) has recently presumably described them in more detail, but the writer has not seen his paper. On the basis of stratigraphic position and relationship to other faunas they are taken to indicate an upper lower Middle Devonian (Eifelian) age.

Dechenella (D.) maclareni Zone - In the report area (section 6) the trilobite Dechenella (D.) maclareni Ormiston and closely similar forms occur in beds well above the echinoderm ossicles with double axial canals and below or within beds possibly equivalent to the upper Hume Formation of the central Mackenzie region. This species occurs typically in the Blue Fiord Formation of Bathurst Island where it is dated as late Eifelian in age.

#### Upper Middle Devonian (Givetian) Faunas

Schuchertella nevadensis and Spinulicosta stainbrooki Zones - According to Bassett (1961, pp. 488-489) the Hume Formation of the central Mackenzie region contains two broad faunal associations characterized by

Schuchertella nevadensis Merriam in the lower beds, and Spinulicosta stainbrooki Crickmay in the upper beds. These faunas are older than Leiorhynchus castanea (Meek) dated as Givetian, and younger than the echi-  
noderm ossicles with double and cross-like axial canals presumed to be of late Eifelian age. The more typical, exceedingly rich Hume Formation fauna was found only in the Arctic Red River area immediately east of the southeast corner of the area mapped where the Hume beds consist of dark, argillaceous limestone and shale. The Hume fauna becomes less abundant and less typical westward because of a facies change to purer carbonate rocks and is last recognized on Flyaway Creek. The most conspicuous change is the disappearance of most of the brachiopods in the purer carbonates and the remaining fauna consists largely of corals. D. J. McLaren (personal communication), Miedema (1962), Pedder (1964), and others now favour an upper Middle Devonian (Givetian) rather than a lower Middle Devonian (Eifelian) age for the Hume faunas.

Leiorhynchus castanea Zone - Leiorhynchus castanea (Meek) generally occurs in the basal beds of the Hare Indian Formation of the central Mackenzie region (Bassett, 1961, Fig. 3), but as pointed out by McLaren (1962, pp. 10-11), at some localities, as at Carcajou Ridge, it may extend at least as high as about middle Kee Scarp. In the report area L. castanea and numerous associated fossils have been collected from only two localities, section 1 - immediately east of Arctic Red River, and section 6 - immediately west of Snake River. Some of the associated fossils include Hadrorhynchia sandersoni (Warren), Leiorhynchus awokanak McLaren, Emanuella meristoides (Meek), and Warrenella kirki (Merriam). Leiorhynchus castanea and associated fossils are known to be broadly contemporaneous with Stringocephalus elsewhere, particularly in the Great Slave Lake area (see Belyea and Norris, A. W., 1962; Norris, A. W., 1965), and therefore indicate a late Middle Devonian (Givetian) age.

An approximate tie-in of the shelly fauna of the Hare Indian Formation with the ammonoid zonal succession is provided by goniatites reported by House (1962, p. 255) from 20 feet above the base of the "Lower Fort Creek Shale" on Bosworth Creek. House considered the goniatites to represent the Maenioceras terebratum Zone of late Middle Devonian (Givetian) age.

Stringocephalus Zone - Stringocephalus sensu lato, the well known guide fossil for the Givetian, is now known from a fairly large number of localities and stratigraphic horizons of the central Mackenzie region (Kindle, 1921; Warren and Stelck, 1962); and also from several places in Alaska (Kirk, 1927; Kirk in Cooper et al., 1942). In the report area stringocephalids were collected from only one locality on Mount Burgess (section 24), where they range throughout the upper 1,020 feet of the Ogilvie Formation. From this locality Warren and Stelck have identified Geranocephalus n. sp. A from 1,000 feet down from the top, Stringocephalus sapiens Crickmay, 410 feet

down, G. inopinus Crickmay and S. obesus Crickmay from 20 feet down from the top. According to Warren and Stelck (1962, Fig. 4) the presence of G. n. sp. A suggests a correlation with the uppermost part of the Hume Formation dated as lowest Givetian, and the presence of S. obesus near the top of the Ogilvie suggests correlation with the Winnipegosis Formation of Manitoba, dated by them as early middle Givetian (loc. cit. Fig. 1).

Fossils found at other localities in the report area in the upper part of the Ogilvie Formation, which elsewhere are known to be closely or indirectly associated with stringocephalids, include Atrypa nasuta Norris, Hadorrhynchia sandersoni (Warren), Hypothyridina cameroni Warren, Lazutkinia sp., Warrenella franklini (Meek), and Halloceras logani (Meek). The younger beds of the Ogilvie Formation appear to be restricted to a few localities. With few exceptions stringocephalids are generally confined to relatively pure carbonate rocks of reef or near reef origin.

#### Upper Devonian Faunas

Spathiocarids - The black Canol Shale is practically barren of macrofossils except for sparse spathiocarids collected at only one locality (section 1) immediately east of the Arctic Red River. These are shield-shaped organisms of arthropod or ammonoid affinities (see Copeland, 1960, pp. 7-9), which are unfortunately non-diagnostic for dating purposes as they are known from both Middle and Upper Devonian black shales of Western Canada. On the basis of stratigraphic position between the Ramparts or Hare Indian Formation (below) and the Imperial Formation (above), and a microfauna in common with the Waterways Formation of northeastern Alberta (H.G. Bassett, personal communication, 1963), the Canol Formation is tentatively dated as early Upper Devonian (Frasnian) in age.

Acanthatia Zone - Acanthatia sp. associated with Cyrtospirifer sp. and rhynchonelloids, and other marine fossils occur more or less throughout the upper 550 feet of the Imperial Formation in section 1, immediately east of Arctic Red River. Both the productelloid genus Acanthatia and the rhynchonelloids indicate a late Upper Devonian (Famennian) age for the upper Imperial beds. The remaining lower part of section 1 appears to be barren of macrofossils but does contain spores. Elsewhere in the report area fragmentary plant remains were the only macrofossils found at scattered horizons in the Imperial Formation, and these as yet have not been identified or dated.

#### Microfloras

Spore assemblages identified by D. C. McGregor ranging in age from early Frasnian to early Famennian are present in the lower member of the Imperial Formation on Trail River. In the upper member of the Imperial Formation in the same section spore assemblages ranging in age from early to late Famennian are represented.

## DEVONIAN SEDIMENTATION

### INTRODUCTION

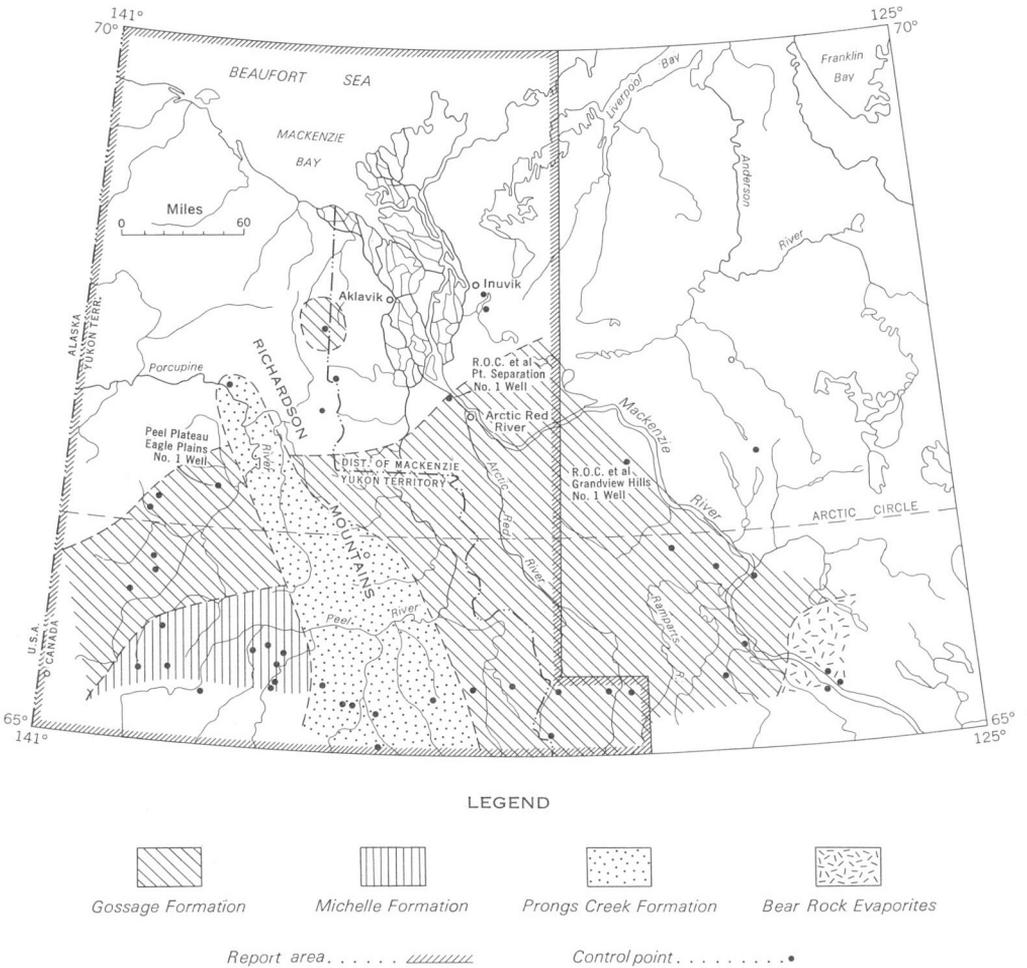
The tectonic framework of the report area has been dominated by the North American continental craton (Precambrian Shield), which extends as a shelf close to the Yukon-District of Mackenzie boundary. The craton is bounded on the northwest and north by the Franklinian geosyncline, and on the west by the Cordilleran geosyncline. The two geosynclines appear to merge with one another in the northern Yukon (Martin, 1959, 1961), but are separated in Alaska by the Yukon stable block, the median mass of interior Alaska (Jeletzky, 1961, Fig. 24).

Mildly deformed structural elements of the northern Yukon and adjacent District of Mackenzie comprise the Eagle and Old Crow Plains in the west, the Arctic Plateau in the north, and the Peel Plateau and Plain on the east. The more strongly folded and uplifted structural elements comprise the west-trending northern termination of the Mackenzie Mountains, Wernecke and southern Ogilvie Mountains in the south, and north-trending northern Ogilvie Mountains in the southwest. These structures involve rocks as young as Upper Cretaceous and are presumed to have been produced in the Laramide orogeny. The Keele and Old Crow Ranges trending northeast, British Mountains trending southeast, Barn Mountains of Arctic Plateau trending southeast, the Richardson Mountains trending south-southeast, and the Campbell uplift trending northeast involve Precambrian to Devonian rocks. These strata are overlain unconformably by Permo-Carboniferous or younger rocks and were deformed in the Palaeozoic Era, probably in the Variscan orogeny. Further deformation of strata as young as the Upper Cretaceous also is evident.

For more detailed discussions of the tectonic elements of the northern Yukon and adjacent areas the reader is referred to Dowling (1922), Goodman (1951), Martin (1959, 1961), Knipping (1960), Gabrielse and Wheeler (1961), Grye (1961), Jeletzky (1961), Thorsteinsson and Tozer (1961), Douglas, Norris, Thorsteinsson and Tozer (1963a and b), and Tozer and Thorsteinsson (1964).

### LOWER DEVONIAN TO EARLY MIDDLE DEVONIAN (see Fig. 7)

During the Lower Devonian dark Tentaculites-bearing shales and thinly interbedded limestones (Prongs Creek Formation) were deposited in a north-northwest trending trough coinciding roughly with the Richardson Mountains. Within the map-area the trough was widest in the south and extended from Trevor and Knorr Ranges in the east to immediately west of the Illyd Range in the west. The deepest part of the basin was presumably



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Figure 7. Extent of Lower and early Middle (early Eifelian) Devonian formations

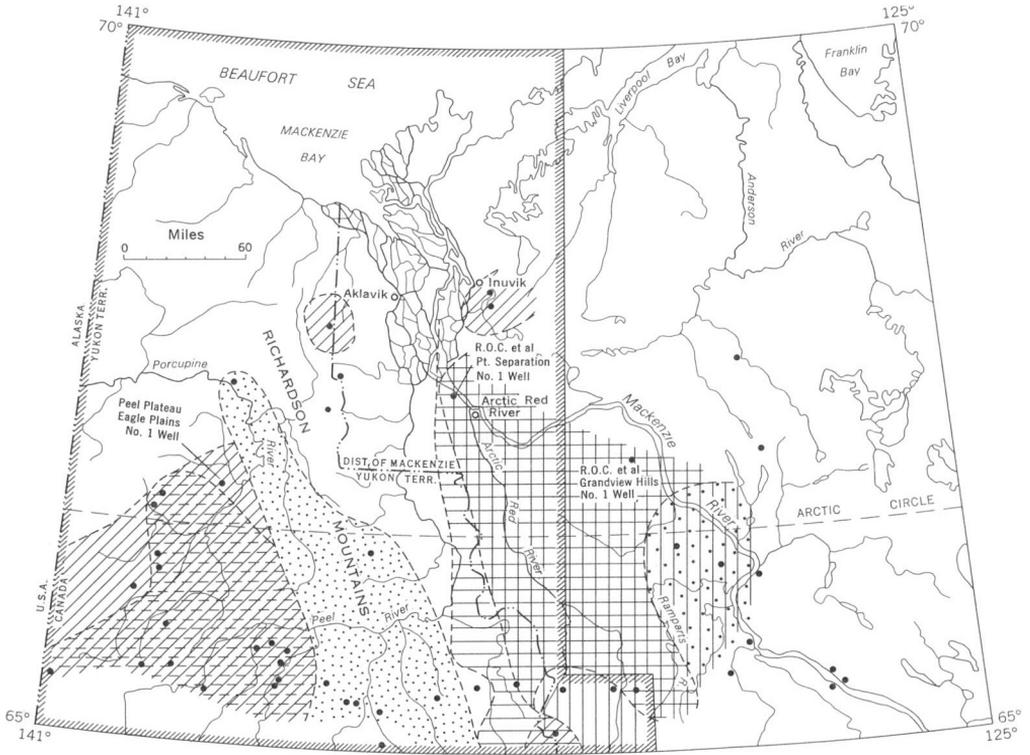
near Royal Creek. These rocks everywhere concordantly overlie graptolitic shales of the Road River Formation, but by Lower Devonian time the trough did not extend as far west as it did in the Upper Silurian (see Norford, 1964, Fig. 2). The southwest edge of the trough became shallower, and more carbonate than shale was deposited to form the Michelle Formation. Even more uplift is suggested along the north and east sides of the trough, where much of the Prongs Creek is missing in the north due to non-deposition or erosion, and on the east an erosional unconformity separates the Prongs Creek from the underlying Road River beds (Pl. X). The very thin sequence of Prongs Creek beds in the north presumably marks the beginning of uplift of the Dave Lord arch (see Martin, 1959, Fig. 12; Knipping, 1960, Fig. 6; and Jeletzky, 1961, Fig. 24). The Mount Fitton granitic pluton at the southeast end of Barn Mountains has been dated as 370 million years (Middle Devonian) by the Geological Survey of Canada (K-Ar No. 857) and its emplacement is possibly related to the Dave Lord uplift.

Throughout Lower Devonian time, outside of the trough and shallow trough areas indicated by the Prongs Creek and Michelle Formations respectively, very fine grained to aphanitic carbonate rocks (Gossage Formation) were laid down in a low energy shelf environment. Within the map-area this rock type was deposited in a wide area east of the Richardson Mountains, extending at least as far north as the Campbell Lake uplift (see sections 31 and 32; and Norris, Price, and Mountjoy, part of map-unit 7, Map 10-1963). It is represented also in the White Mountains at the north end of the Richardson Mountains. West of the Richardsons, Gossage-type rocks underlie the northern end of the Ogilvie Mountains and Eagle Plain. These areas coincide roughly with the areas of carbonate deposition in Upper Silurian time (see Norford, 1964, Fig. 2). East of the report area, in the central Mackenzie River region, Gossage-type rocks change to evaporites and solution brecciated carbonate rocks of the Bear Rock Formation. In the south, in the Snake River area, the lower part of the Gossage Formation is dated as early Lower Devonian on the basis of fish remains. To the north, in the Campbell Lake uplift (also part of the Aklavik Arch of Jeletzky, 1961, Fig. 24), the absence of Gossage rocks of Lower Devonian age suggests that uplift of this structure may have been initiated about this time. Throughout the southeastern and western areas of the report area, Gossage-type deposition continued until about mid-Eifelian time. From Flyaway Creek eastward to the central Mackenzie River region Gossage-type deposition apparently persisted longer, until the end of Eifelian time.

#### EARLY TO LATE MIDDLE DEVONIAN

(see Fig. 8)

Shallow water, bank-type, high-energy carbonate rocks, typified by the Ogilvie, Cranswick, and western part of the Hume Formations, were laid down during early to late Middle Devonian time at various localities within the report area. Thick limestone build-ups of the Ogilvie Formation outcrop



LEGEND



Report area . . . . . 

Control point . . . . . •

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Figure 8. Extent of early (late Eifelian) and late Middle (Givetian) Devonian formations

in the Ogilvie Mountains and probably underlie the southern parts of the Porcupine Plateau and Eagle Plain west of the Prongs Creek trough and south of Dave Lord arch. Ogilvie-type carbonate rocks outcrop also near the headwaters of Cranswick River in the Mackenzie Mountains on the southeast side of the Prongs Creek trough; and also in the Campbell Lake uplift, east of the north end of the Prongs Creek trough. There is a noticeable east to west change in the Hume Formation from dark impure bedded carbonates in the central Mackenzie region to relatively pure lighter coloured thick bedded carbonates in the Flyaway Creek area. The cleaner carbonates in the west suggest shallower water in that direction and a greater distance away from a provenance shedding fine clastic materials. Ogilvie carbonate build-ups apparently began about the same time (late Eifelian) throughout the map-area, as suggested by the presence of echinoderm ossicles with double and cross-like axial canals in the lower part of the formation. In contrast, the age of the upper beds of the Ogilvie Formation appears to vary considerably from place to place.

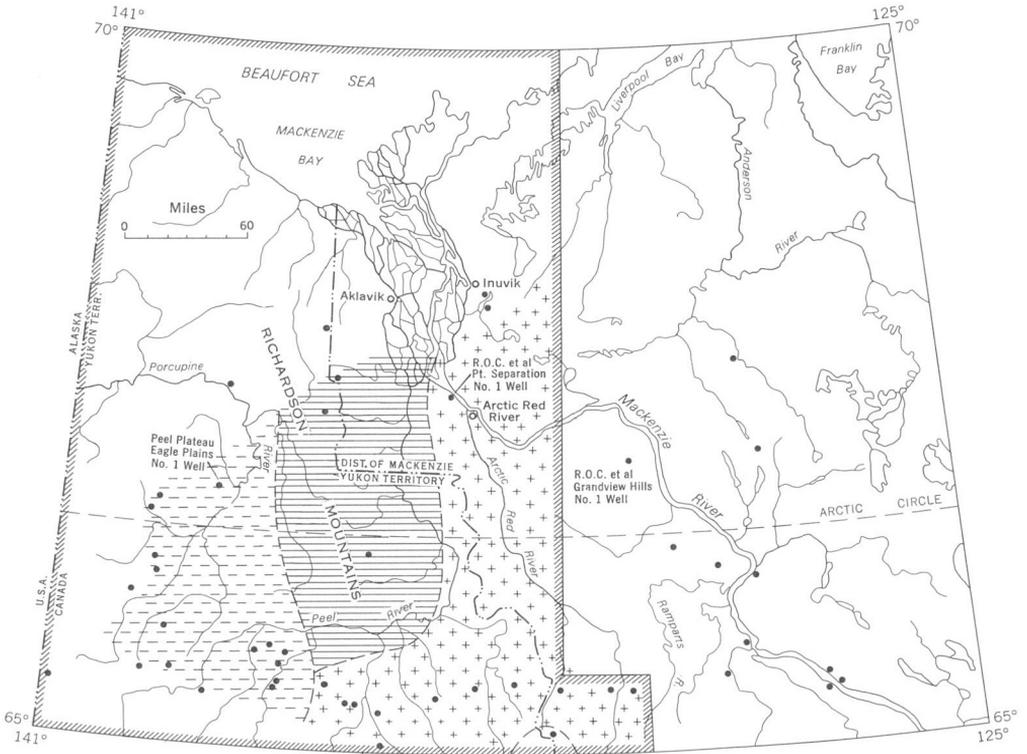
In late Middle Devonian (Givetian) time green calcareous shale with scattered interbeds of clastic limestone (Hare Indian Formation) were deposited throughout a large area north of the Mackenzie Mountains and east of the Richardson Mountains. Within the report area it is best represented in the Snake River area (section 6; Pl. XIV), and as a tongue at the headwaters of Cranswick River (section 4; Pl. II), and as an erosional remnant along the Mackenzie Mountain front near Arctic Red River (section 1). These beds were deposited more or less contemporaneously with the dark interbedded shales and chert of the upper part of the Prongs Creek Formation and the reef-like carbonates of the upper part of the Ogilvie Formation. The undated upper part of the Prongs Creek Formation, however, may be younger than the Hare Indian Formation.

A very poorly exposed dark non-calcareous shale (unnamed shale unit) ranging in age from late Middle to probable Upper Devonian occurs in the Ogilvie River-Hart River area and west of the Porcupine River of the Ogilvie Mountains. Another type of shale, highly siliceous and silvery grey weathering, and presumably roughly the same age as the aforementioned, occurs in the Nahoni Range area of the Ogilvie Mountains. Because of poor exposure the relationship of these two shales to one another and to the Prongs Creek, Canol, and Imperial Formations is unknown.

#### UPPER DEVONIAN

(see Fig. 9)

A black non-calcareous siliceous shale with clay ironstone nodules (Canol Formation) marks the base of Upper Devonian sediments throughout a large area north of the Mackenzie Mountains and east of Richardson Mountains. This unit can be traced from the central Mackenzie River region westward into the eastern part of the report area. This rock type suggests marked



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Figure 9. Extent of Upper Devonian formations

subsidence over this area accompanied by restricted sediment supply. Between the central Mackenzie River region westward to Flyaway Creek the dark shale of the Canol Formation overlies progressively older beds. The maximum hiatus indicated by the unconformity between the Canol and Hume Formations in the Flyaway Creek area suggests uplift for that area throughout much of Givetian time.

At the end of Canol time a sharply different type of sedimentary regime became established. Clastic sediments, which in time became sandstone, conglomeratic sandstone, siltstone, and shale (Imperial Formation) were deposited over large areas of the southeastern third of the report area. These beds are exposed on both the east and west flanks of the Richardson Mountains and in a relatively large area immediately south of the Mackenzie River delta (see Norris, Price, and Mountjoy, 1963, map-unit 8, and Douglas and MacLean, 1963). On the east side of the Richardson Mountains these beds attain a thickness of about 6,000 feet. Rare thin beds of clastic limestone with fragmentary corals and other invertebrate fossils have been seen in the Imperial Formation in the central Mackenzie River region, but these disappear westwards and do not extend into the report area. A rich marine invertebrate fauna occurs in the upper 500 feet or so of the Imperial Formation in the Arctic Red River area and this appears to be the western limit of this fauna. Throughout the report area primary features within the Imperial Formation such as ripple markings, sole structures and flutings, graded bedding, and fragmentary plant fragments and spores, point to shallow water deposition. Glennie (1963, p. 525) has referred to the Imperial Formation as "a thick sequence of turbidites". These rapidly deposited clastic sediments presumably flooded and filled the Prongs Creek trough, as well as spreading out over a wide area beyond the trough.

Tozer and Thorsteinsson (1964, Fig. 15) showed the distribution of analogous Devonian clastic formations in the Canadian Arctic Archipelago extending in a northeast-trending belt from northeast Banks Island to southwest Ellesmere Island. The Devonian Imperial Formation of the report area is probably related to this belt. Martin (1959, 1961) and Tozer and Thorsteinsson (1964) have postulated that the clastic sediments were derived from a northern provenance, the uplifted Franklinian geosyncline, which extended along the northern margin of North America. The Mount Sedgwick granitic pluton on the northeast side of the British Mountains is dated as 355 million years (K-Ar No. 858) by the Geological Survey of Canada and indicates that some orogenic activity did take place in the northern area during the Upper Devonian Epoch.

The upper contact of the Devonian succession shows considerable variation within the report area. Throughout a large part of the eastern and southeastern parts of the area the Upper Devonian Imperial Formation is unconformably overlain by clastic beds of Cretaceous age. Marked uplift on the northeast flank of the Richardson Mountains near Rat River (section 33; Pl. XI) and Stony Creek (section 34) is indicated by an angular unconformity

separating beds of the Imperial Formation of late Upper Devonian age from overlying clastic beds of Permian age. To the southwest in the Ogilvie River-Hart River area of the Ogilvie Mountains the Devonian unnamed shale unit is paraconformably overlain by clastic and cherty limestone beds of Upper Mississippian (Chesterian) age. To the north on lower Porcupine River (section 13) on the southern flank of the Dave Lord Arch, the Devonian is represented by a very thin Prongs Creek Formation separated by an angular unconformity from overlying beds of Pennsylvanian age. Farther west along the arch Knipping (1960, Fig. 2, locations G and H) mentioned two sections where the hiatus is probably less because the youngest beds below the unconformity are reported to be Middle Devonian limestones. Still farther west Knipping (1960, Fig. 2, location I) reported that Lower Mississippian fossils had been identified by Stelck from beds below the unconformity. In the north-central part of the area, in the White Mountains of the northern Richardson Mountains, the Middle Devonian Ogilvie Formation is paraconformably overlain by carbonate beds dated by C. A. Ross as late Pennsylvanian (Missourian) or early Permian (Wolfcampian) in age (personal communication to E. W. Bamber, 1966).

## ECONOMIC GEOLOGY

The preceding stratigraphic data has been assembled in an attempt to provide the facts that will enable petroleum geologists to form an opinion regarding petroleum possibilities of Devonian rocks of the area. The following remarks indicate other references where further information may be obtained, emphasize some relevant stratigraphic data, and point out specific occurrences of oil and gas within and near the report area. Campbell (1960) has pointed out many of the logistic problems encountered in drilling for oil and gas in the Eagle Plain of the northern Yukon. Douglas, et al. (1963a and b) have discussed the oil possibilities of the report area based on stratigraphic data provided by members of Operation Porcupine and other sources as part of their synthesis of the geology and petroleum potentialities of northern Canada. Norris, et al. (1963) have indicated the locations of five wells drilled in the area up to 1963 in the search for hydrocarbons. They reported that the Western Minerals Chance No. 1 well encountered a show of gas and oil in clastic rocks of Pennsylvanian (?) age in one of several major anticlinal structures in Eagle Plain.

The most promising areas for Devonian rocks as potential reservoirs appear to be in the Eagle Plain on the west side of the Richardson Mountains and in the Peel Plateau and Plain on the east side of the Richardson Mountains where the Devonian is covered by younger rocks.

Of the two main Devonian carbonate units, the Gossage Formation is considered less favourable as a reservoir rock because it is generally very fine grained to aphanitic with low porosity and permeability. In places, however, granular porosity has developed where the rock has been dolomitized. The Ogilvie Formation is considered to be the more favourable carbonate because it commonly contains thick units of porous, coarsely clastic limestone and is commonly involved in relatively thick reef-like build-ups especially in the area west of the Richardson Mountains. Analogous Devonian rocks have formed hydrocarbon reservoirs elsewhere in western and northern Canada. Presumably because of difficult logistics a large area within the Peel Plateau of the report area still has not been tested by drilling. Although the Kee Scarp (Ramparts) Formation, the reservoir rock at the Norman Wells oil field, appears to pinch-out within shales between the Mackenzie and Arctic Red Rivers, a local build-up of this unit in the subsurface of the Peel Plain should not be discounted as a good possibility.

A strong gas seep (see Pl. XVII) has been reported by Hensch (1961) in Swan Lake (67°8.8'N, 133°42'W), one of the Fishing Lakes, 21 miles south of Arctic Red River Settlement. The gas is escaping from clastic rocks of the Imperial Formation dated nearby by D. C. McGregor (December 30, 1964) as Upper Devonian in age on the basis of spores. The gas is derived presumably from the Imperial Formation, which is about 4,000 feet thick in this area, or from underlying older rocks. Another gas seep a short distance

east of the report area has been indicated by Douglas, et al. (1963a and b, Fig. 3). It is located in the Peel Plain about 90 miles east of the Arctic Red River and about 10 miles south of the Arctic Circle. The gas is escaping from clastic rocks of Lower Cretaceous age.

Scheelite occurs near the granitic intrusions at Mount Fitton, where it was emplaced in Middle Devonian time, and at Mount Sedgwick, where it was emplaced in Late Devonian time.

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APPENDIX

STRATIGRAPHIC SECTIONS

Nos. 1, 3, 6, 8, 14, 18, 24, 26, 30, and 35

(Fossil names preceded by an asterisk refer to forms set aside in index collection)

Section 1: IMMEDIATELY EAST OF ARCTIC RED RIVER (106G-1)

Section is located along and near a small tributary stream a short distance east of the Arctic Red River at approximately 65°21.4'N, 130°45'W. The Hume, Hare Indian, and Canol Formations outcrop along the stream whereas the Imperial Formation is fairly well exposed immediately north of the stream on the south face of an east-west trending cuesta-like ridge.

Section measured by A. W. Norris, assisted by A. J. Jenik, June 11-13, 1962.

UPPER DEVONIAN	
Imperial Formation	1762.9'; nearly complete
Canol Formation	469.7'
MIDDLE DEVONIAN	
Hare Indian Formation	2
Hume Formation	35.6'; incomplete

Unit	Description	Thickness (feet)	
		Unit	From base
UPPER DEVONIAN			
<u>Imperial Formation</u> (1762.9 feet; probably nearly complete)			
73	Sandstone, quartzose, fine flakes of sericite, medium greenish grey, faintly laminated, very fine grained, thin bedded, highly fissile, weathers medium brown.	2.5	1762.9
	Lithological specimen (GSC loc. 50182).		
	Station 72NB at top of unit 73 on highest part of ridge north of tributary stream. Bedding 110T/18N. A few feet of very poorly exposed beds are present some distance down the ridge to the north.		
72	Covered.	3	1760.4
71	Sandstone, quartzose, light greenish grey, very fine grained, irregularly very thin bedded, weathers pale orange.	10.8	1757.4

Unit	Description	Thickness (feet)	
		Unit	From base
70	Covered.	14	1746.6
69	Sandstone, quartzose, light greenish grey, irregularly thin bedded, resistant, weathers pale orange; unit forms a low rubbly scarp along southwest face of ridge.	23.5	1732.6
68	Covered.	1.8	1709.1
67	Sandstone, light green, very fine grained, irregularly thin bedded, weathers pale orange.	2	1707.3
66	Covered.	2	1705.3
65	Sandstone, quartzose, light green, very fine grained, irregularly thin bedded, weathers pale orange and medium brown.	8	1703.3
64	Covered; sandstone talus, recessive.	3	1695.3
63	Sandstone, quartzose, containing some flakes of sericite, very thin bedded, weathers pale orange-brown; very poorly exposed; <u>Cyrtospirifer</u> sp. impression collected in place (GSC loc. 50172).	3.5	1692.3
62	Sandstone, quartzose, light green, very fine grained, irregularly thin bedded; unit forms a small knoll on ridge.	5	1688.8
61	Covered by vegetation.	4.5	1683.8
60	Sandstone, strongly ferruginous, very fine grained, irregularly thin bedded, up to 3 inches thick, weathers light grey to pale orange-brown.  Bedding 125T/31NE.	9.4	1679.3
59	Covered by vegetation.	20	1669.9

Unit	Description	Thickness (feet)	
		Unit	From base
58	Sandstone, quartzose, very fine grained, granular, irregularly very thin bedded, weathers orange-brown; produces scarp along southwest face of ridge; unit contains rhynchonelloid fragments and <u>Cyrtospirifer</u> sp. (GSC loc. 50178).  Bedding 100T/10N.	25.5	1649.9
57	Sandstone, medium green, very fine grained, rubbly thin bedded, weathers medium orange; unit slightly recessive, in places standing out as a series of ribs along saddle.	13.8	1624.4
56	Covered by vegetation.	25.8	1610.6
55	Sandstone, pale greenish grey, very fine grained, irregular beds up to 3 inches thick, cliff-forming, weathers pale orange; poorly preserved <u>Cyrtospirifer</u> sp. from bed 11 feet down (GSC loc. 50186); a few worm castings noted also; impressions of <u>Cyrtospirifer</u> sp. collected loose 34 feet down (GSC loc. 50615).	48.5	1584.8
54	Covered; fragments of sandstone, recessive; gastropods, small pelecypods, echinoderm ossicles with single axial canals, and <u>Cyrtospirifer</u> sp. collected loose (GSC loc. 50488).	11.8	1536.3
53	Sandstone, slightly argillaceous at top; shale content increasing downwards, fine grained, pale brown and medium greenish grey, irregularly thin bedded up to 4 inches thick, weathers pale orange-brown; scarp-forming; casts of <u>Cyrtospirifer</u> sp. collected 4 feet down (GSC loc. 50175); <u>Cyrtospirifer</u> sp. collected loose 21 feet down (GSC loc. 50614); <u>Chonetes?</u> sp. and		

Unit	Description	Thickness (feet)	
		Unit	From base
	<u>Cyrtospirifer</u> sp. collected loose at base of unit (GSC loc. 50485).	32.4	1524.5
52	Covered; talus fragments of sandstone, strongly argillaceous; recessive.	7.4	1492.1
51	Sandstone, quartzose, very slightly argillaceous, dark greenish grey, unevenly bedded, cliff-forming, weathers dark brownish grey; <u>Chonetes</u> sp., and <u>Cyrtospirifer</u> sp. collected loose at base of unit (GSC loc. 50174).	10.3	1484.7
50	Covered; talus fragments of shale, sandy, sericitic, dark grey, in places burnt a hematitic red, weathers very dark grey; <u>Chonetes?</u> sp., and <u>Cyrtospirifer</u> sp. collected loose 12.5 feet down (GSC loc. 50173).	37.8	1474.4
49	Covered; talus of shale, silty, sericitic, dark greenish grey, as hard thin fragments, weathers dark greenish grey.	13.5	1436.6
48	Covered; talus fragments of shale, silty, sericitic, dark greenish grey, hard, platy, weathers dark greenish grey; associated with fragments of argillaceous sandstone; pelecypod fragment and <u>Cyrtospirifer</u> sp. collected loose 17.5 feet down (GSC loc. 50177); worm castings, <u>Leptodesma</u> sp., chonetid?, and <u>Cyrtospirifer</u> sp. in argillaceous sandstone fragments 47.5 feet down (GSC loc. 50171); <u>Leptodesma</u> sp., coarsely costate rhynchonelloid, and <u>Cyrtospirifer</u> sp. collected loose in hematitic red argillaceous sandstone fragments 47.5 feet down (GSC loc. 50489); coarsely costate rhynchonelloid and <u>Cyrtospirifer</u> sp. collected loose 54.5 feet down (GSC loc. 50185) in dark bluish grey sandy limestone weathering rusty brown.	94.2	1423.1

Unit	Description	Thickness (feet)	
		Unit	From base
47	Sandstone, strongly argillaceous, dark green, irregularly thin bedded, weathers dark green; worm castings in some beds.	8.4	1328.9
46	Sandstone, quartzose, medium green, crosslaminated on a small scale, weathers medium green; contains <u>Cyrtospirifer</u> sp. (GSC loc. 50484).	8	1320.5
45	Covered; fragments of shale, silty, sericitic, dark green, platy, recessive, weathers very dark grey; productid collected loose (GSC loc. 50487).	12.5	1312.5
44	Sandstone, slightly argillaceous, ferruginous, medium greenish grey, massive, cliff-forming, weathers bright rusty orange; contains numerous <u>Acanthatia</u> sp., <u>Cyrtospirifer</u> sp. and <u>Bactrites</u> sp. (GSC loc. 50176).	7	1300
43	Sandstone, argillaceous, medium green, very fine grained, thin bedded, weathers rusty brown; more recessive than unit above; numerous <u>Cyrtospirifer</u> sp., and <u>Bellerophon</u> sp. collected loose (GSC loc. 50189).	9	1293
42	Covered; talus fragments of shale, sandy and silty, dark greenish grey; <u>Acanthatia</u> sp., rhynchonelloid, and <u>Cyrtospirifer</u> sp. collected loose 24 feet down (GSC loc. 50180).	24	1284
41	Sandstone, dark greenish grey, fine grained, massive, even parting planes, cliff-forming.	6	1260
40	Covered; recessive; talus fragments of shale, dark greenish grey; and sandstone, thin bedded, weathers pale orange; contains <u>Cyrtospirifer</u> sp. (GSC loc. 50188).	12	1254

Unit	Description	Thickness (feet)	
		Unit	From base
39	Sandstone, variably argillaceous, fissile but massive, cliff-forming, weathers dark orange-brown; contains <u>Acanthatia</u> sp., <u>Cyrtospirifer</u> sp., and rhynchonelloid (GSC loc. 50187).  Well rounded silty sandstone pebbles noted loose at 7.5 feet down.  Station 74NB at base of unit 39. Bedding 104T/16N.	15.2	1242
38	Covered by vegetation.	59	1226.8
37	Covered; talus fragments of shale.  Shale for microfossils (GSC loc. 7307) from 15 feet down; contains very poorly preserved spores.  Shale for microfossils (GSC loc. 7308) from 40 feet down; contains very poorly preserved highly carbonized spores.	70	1167.8
36	Shale, non-calcareous, slightly sericitic, dark grey, very soft, weathers dark grey; with thin beds of sandstone, quartzose, ferruginous, medium green, weathers pale orange-brown; and shale, silty and sandy, dark grey.  Shale for microfossils (GSC loc. 7309); contains very poorly preserved highly carbonized spores.	38	1097.8
35	Shale, silty, fairly fissile, very dark grey with a slight greenish cast, harder than units above and below, weathers dark grey.	<u>c.</u> 35	1059.8
34	Shale, non-calcareous, dark greenish grey, soft, weathers same; unit contains a few scattered clay ironstone nodules.	<u>c.</u> 170	1024.8

Unit	Description	Thickness (feet) From base
	<p>Shale for microfossils (GSC loc. 7053) 24 feet down; spores identified by D. C. McGregor comprise:  <u>?Acanthotriletes uncatatus</u> Naumova  <u>Retusotriletes greggsii</u> McGregor                      Age: late Givetian or Frasnian</p>	
	<p>Shale for microfossils (Field No. 74NBe) from base of unit.</p>	
33	<p>Sandstone, quartzose, silty and argillaceous laminae, dark and light grey, unevenly very thin bedded, some beds ripple-marked, weathers dark grey; thin interbeds of shale, dark greenish grey; a rubbly weathering scarp-forming unit.</p>	<p>116 854.8</p>
	<p>Unit 33 is the top of a fairly thick sandstone member.</p>	
32	<p>Sandstone, strongly argillaceous and silty, fissile, dark green and where oxidized hematitic red; thin bedded, very small ripple marks; thin interbeds of shale, dark grey; unit weathers dark grey; slightly recessive.</p>	<p>26 738.8</p>
31	<p>Sandstone, quartzose, with an occasional widely spaced shale parting, medium green, very fine grained, massive, very hard, vertical scarp-former, weathers pale buff brown.</p>	<p>24 712.8</p>
	<p>Bedding 100T/10N.</p>	
30	<p>Sandstone, slightly argillaceous, fine grained, highly fissile, platy, faintly laminated, cliff-forming, weathers medium brown.</p>	<p>15 688.8</p>
29	<p>Sandstone, argillaceous, silty, sericite along parting planes, dark greenish grey, fissile, faintly colour laminated,</p>	

Unit	Description	Thickness (feet)	
		Unit	From base
	cliff-forming, weathers dark grey; slightly less resistant than two units above.	37	673.8
28	Shale and sandstone interbedded; very poorly exposed.	19	636.8
27	Sandstone, quartzose, ferruginous, medium orange, very fine grained, cliff-forming, resistant, weathers medium orange.	7	617.8
26	Shale, silty, dark grey, fissile, thinly interbedded with sandstone, cliff-forming, weathers pale orange; recessive.	6	610.8
25	Sandstone, argillaceous, dark reddish grey, evenly very thin bedded, fissile, weathers rusty brown.	11	604.8
24	Shale, silty, dark grey, recessive.	12	593.8
23	Shale, sandy, silty, dark grey, very hard, resistant, cliff-forming, weathers rusty orange.	10	581.8
22	Shale, silty, dark greenish grey, recessive, weathers dark grey.	8	571.8
21	Sandstone, dark grey, fine grained, thin bedded, weathers dark grey.	4	563.8
20	Shale, silty, very dark grey, fairly hard, with rare very thin beds of sandstone, silty, sericitic, one sandstone bed 2 feet thick 30 feet down, although hard this unit is recessive and poorly exposed.	58	559.8
	Coarsely costate rhynchonelloid collected loose at top of unit (GSC loc. 50181).		
	Coarsely costate rhynchonelloid collected loose 30 feet down (GSC loc. 50486).		

Unit	Description	Thickness (feet)	
		Unit	From base
19	Shale, silty, very dark grey, hard, breaks into irregular jagged fragments; with thin beds of sandstone, sericitic, medium greenish grey, fine grained, beds up to 6 inches thick, unit weathers rusty brown.	86	501.8
18	Mudstone, sandy, ferruginous, very dark grey, nodular and massive, resistant, weathers rusty brown; contains some highly oxidized marcasite nodules.	18.5	415.8
17	Shale, and mudstone, dark grey, massive, blocky habit, fairly hard, weathers dark grey.	12.5	397.3
16	Shale, in part silty, ferruginous, dark grey, beds up to 1/2 inch thick, weathers very dark grey and rusty brown; a few clay ironstone nodules present 20 feet down.	45	384.8
	Shale for microfossils (Field No. 74NBh).		
	Station 75NB at base of unit 16 at junction of two small streams.		
15	Shale, silty, dark grey, hard; with widely spaced thin beds of sandstone, argillaceous, sericitic; also an occasional mudstone nodule up to 1 1/2 inches thick; unit weathers dark grey, poorly exposed.	52	339.8
14	Mudstone, dark grey, blocky, resistant, weathers rusty brown; transitional contact with shale.	20	287.8
13	Shale, non-calcareous, variably silty, very dark grey, breaks into small irregular fragments, weathers very dark grey.	13	267.8

Unit	Description	Thickness (feet)	
		Unit	From base
12	Shale, very strongly silty, dark grey, vertical scarp-former, weathers rusty brown; with a few clay ironstone nodules weathering rusty brown.	8	254.8
11	Shale, moderately silty, dark grey, less resistant than unit above, weathers very dark grey and rusty brown.	23	246.8
10	Mudstone, silty, blocky, massive, highly resistant, weathers rusty brown.	8	223.8
9	Shale, dark grey; and sparse widely spaced sandstone beds up to 1.5 feet thick, dark greenish grey, fine grained, weathers rusty brown; also sporadic small clay ironstone nodules.	83	215.8
	<u>Acanthatia</u> sp., <u>Cyrtospirifer</u> sp., and coarsely costate rhynchonelloid (GSC loc. 50611) collected loose 50 feet down in silty sandstone fragments.		
8	Mudstone, blocky, massive, weathers rusty brown.	1.8	132.8
7	Shale, dark grey, soft, with sparse clay ironstone nodules	4	131
6	Mudstone, silty, resistant, weathers rusty brown.	6	127
5	Shale, silty, dark grey, fairly hard, weathers rusty brown; with sparse thin beds of sandstone.	6	121
4	Covered; fragments of shale, dark grey, with sparse thin beds of sandstone.	40	115
	Station 76NB at base of unit 4 on north side of creek.		

Unit	Description	Thickness (feet)	
		Unit	From base
3	Sandstone, quartzose, dark greenish grey, massive, resistant, vertical scarp-former, weathers medium buff brown.  Unit exposed at sharp bend of creek from water level up; inaccessible during periods of high water levels.	<u>c.</u> 30	75
2	Shale, medium grey weathering; inaccessible; not measured.	<u>c.</u> 10	45
1	Sandstone, weathering medium tan brown, rubbly blocky weathering appearance as seen from a distance in beds up to 4 feet thick; interbedded with dark grey weathering shale beds up to about 2 feet thick.  This is the lowest major sandy unit and presumably marks the base of the Imperial Formation. The shales below are very dark grey to black, which contrast strongly with the medium brownish buff weathering shales of the Imperial Formation.	<u>c.</u> 35	
<u>Canol Formation</u> (469.7 feet thick)			
37	Shale, black, soft, fissile, recessive, minor alum staining.  Shale for microfossils (Field No. 77NBk).  Station 78NB at top of unit 37 on east slope of creek gully.	<u>c.</u> 6	469.7
36	Shale, silty, black, very hard even thin beds up to 2 inches thick, vertical cliff-former, heavily coated with an orange-brown encrustation.	<u>c.</u> 35	463.7

Unit	Description	Thickness (feet)	
		Unit	From base
35	Shale, ferruginous, thin platy bedded, fissile, heavy coating of lemon yellow and bright orange alum, and rusty brown iron oxide staining.	21	428.7
34	Shale, strongly ferruginous, slightly silty, fissile, platy, weathers rusty brown.	7	407.7
33	Shale, silty, very hard, very even thin beds up to 2.5 inches thick, vertical cliff-former, weathers dark grey, and in places coated with lemon yellow and pale orange alum staining; an occasional sulphide nodule present.	39	400.7
32	Shale, black, recessive, a discontinuous layer of pale brown calcareous clay ironstone nodules 5 feet up; sharp upper contact.	6.5	361.7
31	Shale, slightly silty, black, hard, in beds up to 3 inches thick, weathers dark grey, in places coated a yellowish brown.	7	355.2
30	Shale, black, fissile, soft, recessive, poorly exposed.	22	348.2
29	Shale, slightly silty, in beds up to 3 inches thick, fairly hard, relatively resistant.	13	326.2
28	Shale, black, highly fissile, recessive.	3	313.2
27	Shale, silty, black, hard, blocky, beds; weathers dark grey.  Shale for microfossils (Field No. 77NBj).	5	310.2
26	Shale, slightly silty, black, fissile, poorly exposed; transitional upper contact.	21	305.2
25	Shale, non-calcareous, fissile, poorly exposed.	15	284.2

Unit	Description	Thickness (feet)	
		Unit	From base
24	Shale, silty, black, fissile, relatively resistant, yellow, orange and brown alum staining along fissility planes; spathiocarids collected loose at base of unit (GSC loc. 50491).	8	269.2
23	Shale, non-calcareous, black, fissile, recessive and poorly exposed; discontinuous layer of clay ironstone nodules 14 feet up.  Shale for microfossils (Field No. 77NBh).	29	261.2
22	Shale, black, soft, poorly exposed.	10	232.2
21	Shale, silty, non-calcareous, black, moderately resistant, weathers very dark grey.	11	222.2
20	Shale, non-calcareous, black, recessive, poorly exposed; sparse large clay ironstone nodules weathering pale orange.	10	211.2
19	Shale, silty, hard, in thin beds up to 3 inches thick, in places cliff-forming; spathiocarid-like impression collected loose (GSC loc. 50191).	<u>c.</u> 6	201.2
18	Shale, slightly silty, non-calcareous, black, fissile, recessive, poorly exposed; contains occasional large clay ironstone nodules weathering pale orange.	25	195.2
17	Shale, slightly silty, black, hard, platy, fissile, weathers black, not quite as resistant as unit below.	17	170.2
16	Shale, slightly silty, non-calcareous, black, hard, platy, highly fissile, closely jointed, more resistant than units above and below.	6	153.2

Unit	Description	Thickness (feet)	
		Unit	From base
15	Shale, black, highly fissile, relatively resistant, weathers jet black; sparse dark grey calcareous clay ironstone concretions, weathering pale orange.	26.5	147.2
14	Shale, black, fissile, recessive.	3.5	120.7
13	Mudstone, silty, black, blocky, irregular nodular beds, resistant, weathers black.	1.7	117.2
12	Shale, silty, ferruginous, more resistant than unit below, weathers rusty brown; with one thin mudstone bed, and a very thin bed of fibrous white calcite.	2.8	115.5
11	Shale, non-calcareous, black, fissile, soft, weathers dark grey, poorly exposed; considerable orange-weathering ochre, especially in upper two-thirds of unit.	52	112.7
10	Shale, non-calcareous, black, highly fissile, more resistant than units above and below.	2.2	60.7
9	Shale, highly ferruginous, black, very soft, mixed with considerable bright orange ochre.	14.4	58.5
8	Shale, highly ferruginous, black, fissile, fairly resistant, with thin siltstone beds.	2.8	44.1
7	Shale, black, very soft, highly fissile, recessive, alum stained a pale grey.	15	41.3
6	Shale; black, soft.  Shale for microfossils (Field No. 77NBd).	5	26.3
5	Shale, slightly silty, ferruginous, black, more resistant than unit below.	5.8	21.3
4	Two dark grey silty shale beds, separated by black, fissile shale.	1.2	15.5

Unit	Description	Thickness (feet)	
		Unit	From base
3	Shale, similar to unit 1.	5	14.3
2	Shale, silty, black, hard, fissile, weathering rusty brown.	0.7	9.3
1	Shale, very slightly calcareous, black, highly fissile, recessive.	8.6	

MIDDLE DEVONIAN

Hare Indian Formation  
(2 feet thick)

2	Limestone, slightly argillaceous, dark grey, even and irregular thin bedded, weathers pale brown and in places stained a rusty brown.	1	2
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Upper contact structurally conformable.

1	Limestone, black, aphanitic, irregular nodular bedded, resistant, weathers dark grey; contains an exceedingly rich brachiopod fauna including (GSC loc. 50200): productellid - n. genus, sp. L, <u>Spinulicosta</u> sp., <u>Schizophoria</u> cf. <u>S. mcfarlanei</u> (Meek), <u>Atrypa</u> cf. <u>A. arctica</u> Warren and other species, <u>Hadorrhynchia sandersoni</u> (Warren), <u>Leiorhynchus awokanak</u> (McLaren), <u>Leiorhynchus castanea</u> (Meek), <u>Emanuella meristoides</u> (Meek), <u>Warrenella kirki</u> (Merriam), and cf. <u>Straparolus</u> sp.	1	
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Hume Formation  
(35.6 feet; incomplete)

2	Limestone, black, aphanitic, irregular nodular bedded up to 6 inches thick, separated by black calcareous shale partings, resistant, cliff-forming,		
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Unit	Description	Thickness (feet) From base
	weathers black but coated with a medium brown wash from above, scattered fossils (GSC loc. 50490).	15.6      35.6
	<p>*<u>Sphaerospongia</u> sp., <u>Alveolites</u> sp., <u>Coenites</u> sp., <u>Favosites</u> sp., <u>Phillipsastrea</u> sp., <u>Stringophyllum</u> (<u>Neospongophyllum</u>) ? sp., *<u>Spinulicosta</u> sp., *<u>Carinatina</u> sp., <u>Atrypa arctica</u> Warren, *<u>Spinatrypa</u> sp., *<u>Warrenella</u> sp., <u>Bactrites</u> sp., trilobite tail, ostracod, echinoderm ossicles with single axial canals.</p> <p>Fossils mixed from unit 2 and from unit 1 above (GSC loc. 50199): <u>Favosites</u> sp., <u>Phillipsastrea</u> sp., *<u>Atrypa</u> cf. <u>A. asperanta</u> Crickmay, <u>Spinatrypa</u> sp., *<u>Leiorhynchus awokanak</u> McLaren, *<u>Leiorhynchus castanea</u> (Meek), *<u>Emanuella meristoides</u> (Meek) *<u>Spenotus</u> sp., <u>Tentaculites</u> sp., <u>Bactrites</u>? sp., echinoderm ossicles with single axial canals, and <u>Libumella</u> sp.</p> <p>Bedding 125T/15NE.</p>	
1	Covered down to creek level.	20
	Station 77NB at base of unit 1 on east side of creek at axis of a broad gentle anticlinal fold.	

Section 3: FLYAWAY CREEK (106F-6)

Section is exposed along Flyaway Creek near 65°27'N, 132°01'W, immediately north of the Mackenzie Mountain front. Part of the Gossage Formation is exposed in the south, overlain northward by the Hume, Canol, and Imperial Formations. A narrow moderately deep canyon has been formed where Flyaway Creek has eroded through resistant steeply north dipping limestone beds of the Hume Formation.

Section measured by A. W. Norris, assisted by A. J. Jenik, June 17-19, 1962.

UPPER DEVONIAN	
Imperial Formation	915.6'; incomplete
Canol Formation	361.9'
MIDDLE DEVONIAN	
Hume Formation	57.7'
MIDDLE DEVONIAN AND OLDER	
Gossage Formation	125'; incomplete

Unit	Description	Thickness (feet)	
		Unit	From base
UPPER DEVONIAN			
<u>Imperial Formation</u> (915.6 feet; incomplete)			
27	Shale, dark grey, soft, weathers dark grey, poorly exposed.	<u>c.</u> 100	915.6
26	Shale, silty, jet black, rust stained, relatively hard.	<u>c.</u> 50	815.6
25	Shale, relatively soft, weathers dark grey, poorly exposed.	<u>c.</u> 200	765.6
24	Shale, non-calcareous, black, rust stained, weathers dark grey.	<u>c.</u> 80	565.6
	Shale for microfossils (Field No. 90NBa).		

Units 24 to 27 are exposed along the west side of Flyaway Creek north of station

Unit	Description	Thickness (feet)	
		Unit	From base
	90NB. Thicknesses estimated by eye from station 90NB, which is located on the south side of a small tributary stream gully on the east bank of Flyaway Creek. Bedding at station 90NB is 090T/60N.		
23	Shale, non-calcareous, black, relatively hard, cliff-forming, weathers black.	11	485.6
22	Shale, variably silty, sericitic, ferruginous, dark grey, weathers dark grey; poorly exposed.	80	474.6
	Shale for microfossils from top of unit (GSC loc. 89NBa).		
	Station 89NB at base of unit 22. Bedding 130T/25NE.		
21	Shale and silty shale, thinly interbedded, very hard, blocky, vertical cliff-forming, weathers medium brownish grey; sharp lower contact.	c. 70	394.6
	Station 89NB at base of unit 21 at sharp bend in creek. Bedding 070T/30N.		
20	Sandstone, quartzose, very dark salt and pepper grey, very fine grained, irregularly thin bedded, weathers buff brown; flow cast structures and lenticular cross-laminated in some beds.	14	324.6
	Lithological specimen (GSC loc. 50609).		
	Bedding 110T/24N.		
19	Covered.	15	310.6
18	Shale, non-calcareous, ferruginous, black, hard, platy, in part rust stained.	30	295.6

Unit	Description	Thickness (feet)	
		Unit	From base
17	Shale, non-calcareous, in part silty, dark grey, with some clay ironstone nodules weathering buff brown, numerous marcasite nodules in one bed, unit weathers buff brown, also some yellow and green alum staining and in places heavily rust stained.  Bedding 105T/24N.	32.5	265.6
16	Siltstone, sandy, irregularly thin bedded, separated by very thin beds of dark grey silty, sericitic shale; poorly exposed.  Bedding 130T/30NE.	10	233.1
15	Covered.	8	223.1
14	Mudstone, with tiny flecks of sericite, dark grey, even beds up to 1 foot thick, unit stained rusty brown.	6	215.1
13	Shale, black, breaks into small irregular fragments, weathers dark grey.  Shale for microfossils (GSC loc. 50650).	6	209.1
12	Mudstone, silty and sandy, dark grey, interbedded with dark grey shale, resistant, rust stained.	6	203.1
11	Shale, dark grey, soft, with closely spaced thin interbeds of sandy siltstone up to 1.5 inches thick; recessive.	34.5	197.1
10	Mudstone, dark greenish grey; with thin beds of sandy siltstone, dark greenish grey, rust stained, up to 3 inches thick; and beds of dark grey shale up to 6 inches thick.	14	162.6

Unit	Description	Thickness (feet)	
		Unit	From base
9	Shale, dark grey, with widely spaced thin beds of siltstone up to 0.5 inch thick, rust stained.	21	148.6
	Shale for microfossils from top of unit (GSC loc. 50652).		
8	Shale, dark grey, weathers medium brownish grey; with thin interbeds of siltstone, sandy, greenish grey, beds up to 2 inches thick, stained a rusty brown; unit fairly resistant.	5	127.6
7	Shale, dark grey, with thin beds of sericitic mudstone and siltstone, recessive, poorly exposed.	21	122.6
6	Shale, dark grey; interbedded with mudstone, blocky, rust stained.	28	101.6
5	Siltstone, sandy, sericitic, very dark grey, massive, resistant, irregularly fractured, stained rusty brown.	7	73.6
	Macerated organic fragments collected loose (GSC loc. 50608).		
4	Shale, very dark grey, breaks into irregular fragments, rust stained.	1	66.6
	Shale for microfossils (GSC loc. 50648).		
3	Siltstone, mudstone, and shale interbedded; siltstone, ferruginous, sericitic, black, laminated, stained rusty brown; mudstone beds, sericitic, dark greenish grey; shale, black; both siltstone and mudstone beds in places oxidized a hematitic red; unit resistant.	27	65.6
	Bedding 105T/45N.		
2	Shale, silty, ferruginous, blocky, hard, in places recessive, iron stained.	2.6	38.6

Unit	Description	Thickness (feet)	
		Unit	From base
1	Siltstone, sandy and sericitic towards top, dark grey, irregular beds from 2 to 4 feet thick, weathering a brilliant orange; interbedded with shale, black, hard, platy, in beds up to 0.5 foot thick; unit resistant.	36	
	Base of the Imperial Formation.		
	<u>Canol Formation</u> (361.9 feet thick)		
36	Shale, black, platy, fairly hard, yellow, orange, and rusty stained, contains nodules of marcasite and clay ironstone.	11.2	361.9
35	Shale, mudstone, and clay ironstone interbedded; <u>Sigillaria</u> -like plant collected from clay ironstone bed (GSC loc. 50607).	2.7	350.7
34	Shale, black, hard, platy, fissile, iron stained; with a 6 inch dolomite bed, 4 feet up, dark grey, fine to coarse grained, weathering yellow.	7	348
33	Clay ironstone, slightly calcareous, with small nodules of marcasite, black, very hard, beds up to 3.5 feet thick, weathers brilliant orange; interbedded with shale, black, hard, platy, fissile.	12.1	341
32	Shale, ferruginous, jet black, hard, stained yellowish orange and brown.	11.8	328.9
31	Clay ironstone bed, slightly silty.	0.4	317.1
30	Shale, ferruginous, black, fissile, stained yellow, orange and brown.	11.2	316.7
	Shale for microfossils (GSC loc. 50651).		
29	Clay ironstone bed, black, weathers pale brownish grey.	0.6	305.5

Unit	Description	Thickness (feet)	
		Unit	From base
28	Shale, black, fissile, platy, slightly softer than units above and below; lenticular bed of clay ironstone at base; occasional layers of marcasite nodules.	12.8	304.9
27	Shale, ferruginous, black, hard, platy, highly fissile.	7	292.1
26	Clay ironstone bed, pinches and swells along strike, weathers medium grey.	1.7	285.1
25	Shale, same as unit 23.	5.5	283.4
24	Clay ironstone bed, black, weathers dark grey.	0.4	277.9
23	Shale, ferruginous, black, fissile, stained yellow, orange and brown.	11.5	277.5
22	Clay ironstone, non-calcareous, black, hard, pinches and swells along strike, weathers brownish grey.	1.5 max.	266
21	Shale, black, highly fissile, very soft, recessive; shale for microfossils (GSC loc. 50649).	0.9	264.5
20	Shale, ferruginous, black, platy, hard, stained yellow, orange and brown.	6.8	263.6
19	Mudstone, with marcasite nodules, black, hard but trench-forming.	0.5	256.8
18	Shale, ferruginous, black, hard, platy, fissile, strongly iron stained, also yellow and orange alum staining; resistant.	14.1	256.3
17	Mudstone, black, hard, weathers black.	0.7	242.2
16	Shale, non-calcareous, black, soft, recessive, trench-forming; shale for microfossils (GSC loc. 50647).	1.6	241.5

Unit	Description	Thickness (feet)	
		Unit	From base
15	Shale, non-calcareous, slightly siliceous in middle third of unit, black, very hard, platy, fissile, cliff-forming, coated with a brilliant yellow and orange stain.  Station 95NB at base of unit 15. Bedding 100T/50N.	38	239.9
14	Mudstone, black, even bed, resistant, heavily rust stained; pinches and swells along strike.	1.3	201.9
13	Shale, non-calcareous, black, hard, fissile, in beds up to 3 inches thick, weathers jet black, lightly coated with yellowish green staining; shale for microfossils (Field No. 86NBg).	29	200.6
12	Shale, non-calcareous, black, even beds up to 4 inches thick, fairly resistant, very heavily rust stained; discontinuous layer of rusty orange-weathering clay ironstone nodules at top of unit.	10	171.6
11	Shale, non-calcareous, black, highly fissile, moderately resistant, a very heavy yellowish green alum or sulphur coating; thinly interbedded with silty shale; lenticular layer up to 1/2 inch thick 16 feet up; shale for microfossils (Field No. 86NBf).	28.2	161.6
10	Mudstone, fairly hard, even bed, heavily rust stained.	1.7	133.4
9	Shale, non-calcareous, black, fairly hard, fissile, resistant, heavily coated with yellowish green alum staining.  Bedding 095T/45N.	26	131.7
8	Shale, black, soft, fissile.	9	105.7
7	Covered; a fault zone.	12	96.7

Unit	Description	Thickness (feet)	
		Unit	From base
6	Shale, black, soft, highly fissile, rust stained, contains small marcasite concretions (Field No. 86NB1); shale for microfossils (Field No. 86NBc).	6	84.7
5	Covered by black shale talus.	26	78.7
4	Shale, non-calcareous, black, soft, fissile, some rusty brown and yellow staining.	5.3	52.7
3	Shale, non-calcareous, black, fissile; capped by an even bed of mudstone about 0.5 foot thick.	11	47.4
2	Shale, non-calcareous, black, fissile, fairly hard, weathers black; shale for microfossils (Field No. 86NBd).  Bedding 095T/60N.	12.4	36.4
1	Shale, silty, black, hard, fissile, platy, rust stained, relatively resistant, weathers black; with occasional layers of siltstone.  Lower contact appears to be structurally conformable.	24	

MIDDLE DEVONIAN

Hume Formation  
(757.7 feet thick)

81	Limestone, black, and dark brownish grey, fine grained, nodular and evenly thin to thick bedded, weathers dark grey; fossiliferous: <u>Hexagonaria</u> sp., other colonial coral, and <u>Spinatrypa</u> sp. (GSC loc. 50470) collected 6 feet up; large cup corals, <u>Coenites</u> sp., and <u>Favosites</u> sp. collected from rubbly beds at top of unit (GSC loc. 50471).	c. 18	757.7
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Unit	Description	Thickness (feet)	
		Unit	From base
	Bedding 095T/65N.		
80	Limestone, nodular thin to medium bedded, separated by shale partings, weathers light to medium grey; inaccessible.	14	739.7
79	Limestone, nodular and irregularly medium bedded, weathers light grey; inaccessible.	11	725.7
78	Limestone, black, aphanitic, irregularly and evenly medium bedded, weathers light grey.	12	714.7
77	Limestone, very dark grey, fine grained, rubbly bedded, weathers medium grey.	7	702.7
76	Limestone, dark brownish grey, irregularly medium bedded, rubbly weathering, weathers medium grey; poorly preserved calcareous sponge spicules, <u>Coenites?</u> sp., and echinoderm ossicles with single axial canals from top of unit (GSC loc. 50469).	12	695.7
75	Limestone, black, aphanitic, medium to thick bedded, weathers light to medium grey; poorly exposed on east side of creek.	16.6	683.7
74	Limestone, slightly cherty, black, aphanitic, evenly thick bedded, highly fractured, weathers medium grey; chert tracery present.	8	667.1
73	Limestone, irregularly thin bedded, weathers medium grey; unit deep trench-forming.	1.8	659.1
72	Limestone, chert tracery present, medium brown, aphanitic, irregularly medium bedded, resistant, weathers light grey.	15	657.3
71	Covered.	1.5	642.3

Unit	Description	Thickness (feet)	
		Unit	From base
70	Limestone, black, aphanitic, evenly thick bedded, beds up to 1.5 feet thick, resistant, weathers light grey.  Station 86NB at base of unit 70 on the north side of a deep trench. Bedding 095T/90.	9	640.8
69	Limestone, rubbly thin bedded, weathers light grey; inaccessible.	12	631.8
68	Shale, non-calcareous, black, highly fissile, recessive, trench-forming, weathers black; thin rusty-weathering clay ironstone beds towards base.  Shale for microfossils (GSC loc. 50646) 9 feet up.	60	619.8
67	Limestone, evenly thin to medium bedded, weathers light grey; inaccessible.	10	559.8
66	Limestone, nodular and rubbly bedded, interbedded with black shale.	10	549.8
65	Limestone, fetid, black, fine grained, rubbly thin bedded, weathers dark grey; a few poorly preserved corals are present in upper beds (GSC loc. 50243).  Top of this unit is the south face of a deep trench easily visible on air photograph.	24.4	539.8
64	Limestone, black, rubbly thin bedded, trench-forming, weathers black.	8	515.4
63	Covered on east side of creek.	16.6	507.4
62	Limestone, slightly cherty, black, aphanitic, rubbly thin bedded, weathers medium grey.	4.7	490.8

Unit	Description	Thickness (feet)	
		Unit	From base
61	Limestone, black, fine grained, irregularly thin bedded, rubbly, recessive, weathers dark grey.	6.4	486.1
60	Limestone, black, aphanitic, rubbly thin bedded, recessive, capped by a bed 0.5 foot thick, weathers light grey.	6.2	479.7
59	Limestone, medium brown, aphanitic, evenly medium bedded, weathers light grey.	2	473.5
58	Limestone, black, rubbly, recessive, weathers dark grey.	6.5	471.5
57	Limestone, black, fine grained, irregularly very thin bedded, weathers dark grey.	8.7	465
56	Limestone, dark grey, fine grained, evenly medium bedded, resistant, weathers light grey.	2.5	456.3
55	Limestone, medium grey, fine grained, rubbly thin bedded, weathers dark grey; contains a few <u>Hexagonaria</u> sp. (GSC loc. 50242).	5.4	453.8
54	Limestone, dark grey, aphanitic, very evenly thick bedded, weathers light grey.  Bedding 090T/60N.	10.5	448.4
53	Limestone, fine grained, granular, rubbly thin bedded, recessive, weathers dark grey.	5	437.9
52	Limestone, black, aphanitic, massive, resistant, weathers dark grey; contains a few corals (GSC loc. 50468).	4	432.9
51	Limestone, argillaceous, black, rubbly thin bedded, recessive, weathers very dark grey.	4.5	428.9

Unit	Description	Thickness (feet)	
		Unit	From base
50	Limestone, fetid, black, thick bedded to massive, very resistant, weathers medium grey; transitional upper boundary; numerous large colonies of <u>Hexagonaria</u> sp. at base of unit (GSC loc. 50467).	4.4	424.4
49	Limestone, argillaceous, rubbly thin bedded, recessive, very poorly exposed.	4.6	420
48	Limestone, dark grey, very fine grained, massive but irregularly fractured, weathers light grey; contains a few coral fragments (GSC loc. 50241).	8	415.4
47	Limestone, slightly cherty, black, fine grained, irregularly thin to medium bedded, weathers medium grey; contains chert tracery.	10	407.4
46	Limestone, medium brown, aphanitic, evenly thick bedded, resistant, weathers light grey.	5.2	397.4
45	Limestone, dark grey, irregularly medium bedded, resistant, weathers medium grey.	5.8	392.2
44	Limestone, slightly argillaceous, dark grey, irregularly thin bedded, recessive, weathers dark grey; contains a few corals and an ostracod (GSC loc. 50240).	9	386.4
43	Limestone, dark brownish grey, aphanitic, irregularly thin bedded, resistant, weathers light grey.	12	377.4
42	Limestone, medium brownish grey, fine grained, granular, some beds aphanitic, irregularly thin bedded, fairly resistant, weathers light grey.	23	365.4
41	Limestone, stromatoporoidal, black, irregularly thin bedded, recessive.	3	342.4

Unit	Description	Thickness (feet)	
		Unit	From base
40	Limestone, black, fine grained, irregularly thick bedded, resistant, weathers black; contains a few scattered <u>Digonophyllum</u> sp., and colonial coral (GSC loc. 50238).  Bedding 095T/50N.	7	339.4
39	Limestone, argillaceous, black, recessive, weathers black.	2	332.4
38	Limestone, very dark grey, massive, 'rib-forming', weathers black, contains numerous stromatoporoids.	7	330.4
37	Limestone, slightly argillaceous, black, nodular and rubbly thin bedded, slightly recessive, contains numerous corals (GSC loc. 50466).	10.7	323.4
36	Limestone, dark grey, irregularly thick bed, highly resistant, weathers medium grey.	1.3	312.7
35	Limestone, argillaceous and silty, irregularly thin to medium bedded, weathers very dark grey to black, slightly recessive; contains stromatoporoids, <u>Digonophyllum</u> sp. and fragments of hyperstrophic gastropod (GSC loc. 50237).	16	311.4
34	Covered by gravel.	9	295.4
33	Limestone, strongly fetid, black, rubbly medium bedded, weathers very dark grey; contains stromatoporoids, and corals including <u>Favosites</u> sp., <u>Phillipsastrea</u> sp., and <u>Syringopora</u> sp. (GSC loc. 50234).	3.4	286.4
32	Limestone, silty and slightly argillaceous, thick bedded, resistant, scarp-forming, upper neck of chutes eroded in this unit;		

Unit	Description	Thickness (feet) From base
	fossiliferous: <u>Alveolites</u> sp., <u>Favosites</u> sp., <u>Hexagonaria?</u> sp., and planispiral gastropod (GSC loc. 50236).	8.5      283
	Bedding 090T/20N.	
31	Limestone, variably argillaceous and silty, black, fine grained, irregularly bedded up to 1.5 feet thick, separated by shale partings up to 3 inches thick, richly fossiliferous: stromatoporoids, <u>Digonophyllum?</u> sp., <u>Alveolites</u> sp., auloporid, <u>Favosites</u> sp., <u>Hexagonaria</u> sp., <u>Schizophoria</u> sp., <u>Spinatrypa</u> sp., * <u>Emanuella meristoides</u> (Meek), trilobite fragments, * <u>Dechenella</u> ( <u>D.</u> ) sp., and ostracod (GSC loc. 50235 & 50437).	11.5      274.5
	Station 85NB at base of unit 31. Bedding 080T/9N.	
30	Limestone, variably argillaceous, black, irregularly bedded between 1.5 to 2 feet thick, weathers black, moderately fossiliferous; <u>Favosites</u> sp., <u>Hexagonaria</u> sp., <u>Atrypa arctica</u> Warren, <u>Dechenella</u> sp.	13      263
	Station 94NB at base of unit 30 on west side of Flyaway Creek.	
29	Limestone, variably argillaceous and silty, irregularly medium bedded, weathers black, the more argillaceous and silty beds weather pale orange; fossiliferous; <u>Alveolites</u> sp., <u>Favosites</u> sp., <u>Hexagonaria</u> sp., and other colonial coral (GSC loc. 50603).	14      250
28	Limestone, black, fine grained, even and irregularly bedded up to 3 feet thick, thicker bedded towards top, unit coated with a pale orange-brown wash; contains	

Unit	Description	Thickness (feet)	
		Unit	From base
	scattered corals including <u>Coenites</u> sp., <u>Favosites</u> sp., and <u>Hexagonaria</u> sp. (GSC loc. 50604).	13	236
27	Covered; limestone talus, probably a fault zone; fossiliferous: cup coral, aulopodid, <u>Favosites</u> sp., <u>Hexagonaria</u> sp., and trilobite tail (GSC loc. 50602).	3	223
26	Limestone, black, thin bedded, nodular; interbedded with brown shale; limestone beds with macerated organic fragments including: fenestrate bryozoa, <u>Spinatrypa?</u> sp., <u>Tentaculites</u> sp., trilobite tail, and ostracods (GSC loc. 50605).	17	220
25	Limestone, with argillaceous lenses, irregularly nodular medium bedded, weathers bright orange-brown; contains ostracods (GSC loc. 50606).	12	203
24	Limestone, black, evenly and irregularly bedded up to 1-foot thick, separated by shale partings, weathers black and pale orange.	11	191
23	Covered by gravel.	12	180
22	Limestone, slightly argillaceous, black, hard, medium to thick bedded, coated with an orange-brown wash; fossils present but difficult to extract from matrix: stromatoporoids and <u>Favosites</u> sp. (GSC loc. 50610).	9	168
	Stations 92NB and 93NB at base of unit 22. Bedding 100T/68N.		
21	Limestone, dark grey, rubbly bedded, weathers orange-brown.	8	159
20	Covered; probably consists of black shale.	5	151

Unit	Description	Thickness (feet)	
		Unit	From base
19	Limestone, slightly argillaceous, black, very hard, evenly thin bedded and nodular, weathers dark grey and patches of orange-brown staining; contains a few fossils; * <u>Emanuella meristoides</u> (Meek) (GSC loc. 50601).	c. 4	146
18	Shale, black, with thin nodular beds of orange-brown weathering limestone.	c. 1.5	142
17	Limestone, argillaceous, thinly interbedded with black shale; an even thick bed of limestone in middle of unit.	c. 5	140.5
16	Shale, black, recessive.	c. 3	135.5
15	Limestone, black, rubbly thin bedded, weathers orange-brown.	c. 3	132.5
14	Limestone, black, evenly thick bedded, resistant, weathers orange-brown.	c. 6	129.5
13	Limestone, nodular, recessive, poorly exposed, weathers orange-brown; interbedded with black shale.	c. 20	123.5
12	Limestone, similar to unit 10.	c. 2	103.5
11	Shale, black, recessive.	c. 1.5	101.5
10	Limestone, black, massive, weathers orange-brown.	c. 16	100
9	Shale, black; with thin nodular limestone beds; recessive.	c. 8	84
8	Limestone, massive, weathers orange-brown; faulted.	c. 12	76
7	Mudstone, dark grey to black, weathers orange-brown.	c. 4	64
6	Similar to unit 4.	c. 12	60

Unit	Description	Thickness (feet)	
		Unit	From base
5	Limestone, argillaceous, evenly thick bedded, weathers orange-brown.	<u>c.</u> 10	48
4	Limestone, nodular thin bedded, inter-bedded with black shale.	<u>c.</u> 5	38
3	Limestone, rubbly thin bedded, and black shale.	<u>c.</u> 12	33
2	Limestone, even thick bed, weathers yellowish brown.	<u>c.</u> 3	21
	Unit 2 is repeated by faulting.		
1	Limestone, evenly thin bedded, weathers yellowish brown.	<u>c.</u> 18	

MIDDLE DEVONIAN AND OLDER

Gossage Formation  
(125 feet; incomplete)

8	Limestone, evenly thick bedded, weathers medium grey.	<u>c.</u> 12	125
7	Limestone, evenly thin bedded, weathers dark grey.	<u>c.</u> 8	113
6	Limestone, very thin bedded, weathers dark grey.	<u>c.</u> 8	105
5	Limestone, very evenly thin bedded, weathers medium to dark grey.	<u>c.</u> 7	97
4	Limestone, evenly thin to thick bedded; poorly exposed.	<u>c.</u> 10	90
3	Limestone, thin bedded to massive, weathers light grey.	<u>c.</u> 40	80
	Bedding 100T/25N.		
2	Covered by gravel.	<u>c.</u> 10	40

Unit	Description	Thickness (feet) From base
1	Limestone, evenly thick bedded, weathers medium to dark grey.	<u>c.</u> 30

Covered to south along creek.

Units 1 to 8 of the Gossage Formation and most of units 1 to 21 of the Hume Formation are exposed along the east bank of Flyaway Creek, but not on the west bank.

Section 6: IMMEDIATELY WEST OF SNAKE RIVER (106F-11)

Section was measured on the south and north sides of a tributary stream a short distance west of the Snake River just north of the Mackenzie Mountain front. The upper part of the Silurian, the Gossage, and part of the Cranswick Formations were measured on the east side of a narrow ridge immediately south of the tributary stream (65°26'N, 133°35'W). The remaining upper part of the section comprising part of the Cranswick, the Prongs Creek tongue, the Hare Indian, Canol, and lower part of the Imperial (?) Formations outcrop on the north side of the stream. Most of this part of the section was measured immediately north of the stream (65°27'-27.5'N, 133°34'-35'W). The uppermost part of the Hare Indian Formation was measured on a small mesa 2.4 miles north of the stream (65°29'N, 133°37.5'W); and the lower part of the Imperial (?) Formation was measured at top edge of a plateau to the west (65°27'N, 133°42'W).

Section measured by A. W. Norris, assisted by A. J. Jenik, June 25-29, 1962.

UPPER DEVONIAN

Imperial (?) Formation                    c. 50'; incomplete  
 Canol Formation                            c. 100'; not measured

MIDDLE DEVONIAN

Hare Indian Formation                    1951.5'  
 Prongs Creek tongue                      386'  
 Cranswick Formation                      442.7'

MIDDLE DEVONIAN AND OLDER

Gossage Formation                        406.8'  
 Regional unconformity

SILURIAN (?)                                44.2'; incomplete

Unit	Description	Thickness (feet)	
		Unit	From base

UPPER DEVONIAN

Imperial Formation  
 (c. 50 feet; incomplete)

1	Sandstone, quartzose, slightly cherty, dark grey, very fine grained, resistant, scarp-forming, weathers light orange-brown; unit caps plateau.	c. 50	c. 50
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Unit	Description	Thickness (feet)	
		Unit	From base
	Lithological specimen (GSC loc. 54527).		
	Station 127NB at top of unit.		
	<u>Canol Formation</u> (c. 100 feet thick)		
1	Shale, black, with orange weathering clay ironstone nodules; unit not measured but seen from helicopter.	c. 100	c. 100
	MIDDLE DEVONIAN		
	<u>Hare Indian Formation</u> (1951.5 feet thick)		
77	Shale, weathering pale brown; unit not measured but seen from helicopter.	c. 300	1951.5
76	Limestone, argillaceous, rubbly bedded; interbedded with shale, weathering pale brown; resistant but less so than unit below; limestone beds richly fossiliferous: cup coral, <u>Aulopora</u> sp., <u>Alveolites</u> sp., <u>Coenites</u> sp., <u>Syringopora?</u> sp., * <u>Schizophoria</u> sp., * <u>Atrypa</u> cf. <u>A. perfimbriata</u> Crickmay, * <u>Plectospirifer</u> sp., * <u>Cornellites?</u> sp., * <u>Cyclonemina?</u> sp., * <u>Philoxene</u> sp., <u>Tentaculites</u> sp., proetid hypostome ostracods, echinoderm ossicles with single axial canals, and 'star-shaped echinoderm ossicles' with small single axial canals (GSC loc. 54341).	c. 60	1651.5
	Station 128NB at top of unit 87.		
	Apparent dip 20 degrees /020T.		
75	Limestone, argillaceous, black, rubbly thin bedded, presumably separated by		

Unit	Description	Thickness (feet) From base
	shale partings; covered by a clay wash; poorly exposed; fossiliferous; cup corals, <u>Coenites</u> sp., <u>Favosites</u> sp., <u>Atrypa</u> cf. <u>A. arctica</u> Warren, * <u>Spinatrypa borealis</u> (Warren), cyrtocerid cephalopod fragment, and large annulated echinoderm ossicles with single axial canals (GSC loc. 54337).	c. 6 exposed 1591.5
	Station 126NB at top of unit 86 on top of cliff.	
74	Limestone, slightly argillaceous, black, aphanitic, irregularly bedded, up to 1.5 feet thick, weathers medium grey with patches of light orange; cup corals present in basal beds; vertical scarp-former; cup corals, <u>Coenites</u> sp., * <u>Spinulicosta</u> sp., * <u>douvillinid</u> , <u>Atrypa</u> cf. <u>A. perfimbriata</u> Crickmay, * <u>Spinatrypa borealis</u> (Warren), <u>Warrenella</u> sp., <u>Bactrites?</u> sp., and very large echinoderm ossicles with single axial canals (GSC loc. 54336).	10 1585.5
73	Limestone, very slightly argillaceous, black, fine grained, irregularly bedded, beds up to 10 inches thick, in places separated by shale partings, vertical scarp-forming, weathers light orange-brown; contains cup corals, * <u>Fenestrellina?</u> sp., * <u>Devonoproductus?</u> sp., * <u>Spinatrypa borealis</u> (Warren), * <u>leiorhynchid</u> , <u>Michelinoceras</u> sp., <u>Dechenella</u> sp., and echinoderm ossicles with single axial canals (GSC loc. 54335).	44 1575.5
	Bedding 180T/15W.	
72	Covered; interval presumably consists of shale; numerous fossils collected loose	

Unit	Description	Thickness (feet) From base
71	<p>derived from above: <u>Alveolites</u> sp., <u>Favosites</u> sp., <u>Hexagonaria</u> sp., pentamerid?, <u>Douvillina?</u> sp., <u>Schizophoria</u> sp., *<u>Atrypa</u> cf. <u>A. perfimbriata</u> Crickmay, <u>Spinatrypa</u> sp., *<u>Warrenella franklini</u> (Meek), <u>Grammysoidea?</u> sp., planispiral gastropod, orthoconic cephalopod, and echinoderm ossicles with single axial canals (GSC loc. 54334).</p> <p>Covered; interval presumably consists of shale similar to unit 70.</p> <p>Numerous fossils collected loose derived presumably from unit 75: sponge?, cup coral fragment, <u>Coenites</u> sp., fenestellid bryozoa, *<u>Spinulicosta</u> sp., *<u>Schizophoria</u> sp., *<u>Atrypa</u> cf. <u>A. perfimbriata</u> Crickmay, *<u>Spinatrypa</u> cf. <u>S. andersonensis</u> (Warren), <u>Spinatrypa</u> sp., *<u>Warrenella franklini</u> (Meek), concentrically ornamented pelecypod, <u>Tentaculites</u> sp., trilobite tail fragment, echinoderm ossicles with single axial canals, and *star-shaped echinoderm ossicles with star-shaped axial canals (GSC loc. 54333).</p> <p>Shale for microfossils from top of unit (Field No. 125NBt).</p>	<p>c. 25      1531.5</p> <p>90          1506.5</p>
70	<p>Shale, calcareous, dark greenish grey, soft, weathers yellowish brown; with widely spaced beds up to 1 foot thick of limestone, argillaceous, weathering pale orange; fossils collected loose: <u>Douvillina?</u> sp. - fragment, <u>Atrypa</u> sp., <u>Spinatrypa</u> cf. <u>S. andersonensis</u> (Warren), cf. <u>Emanuella meristoides</u> (Meek), *<u>Warrenella franklini</u> (Meek), *<u>Eoschizodus?</u> sp., <u>Dechenella</u> (D.) aff. <u>maclareni</u> Ormiston and</p>	

Unit	Description	Thickness (feet) From base
	echinoderm ossicles with single axial canals (GSC loc. 54997).	c. 15      1416.5
69	Limestone, argillaceous, dark grey, nodular, beds up 0.7 foot thick, thinly interbedded with shale, calcareous, dark greenish grey; unit weathers pale orange; limestone beds contain * <u>Warrenella kirki</u> (Merriam) and other macerated organic fragments (GSC loc. 54675).	4      1401.5
68	Shale, calcareous, dark greenish grey, with spherical limestone nodules, weathers bright medium orange; recessive.	10      1397.5
67	Limestone, strongly argillaceous, dark greenish grey, even beds up to 10 inches thick, interbedded with shale, calcareous, dark greenish grey, resistant, weathers bright orange; unit contains *small punctate <u>Lingula</u> -like brachiopod, concentrically ornamented pelecypod and trilobite fragments (GSC loc. 54674); <u>Michelinoceras</u> sp. collected loose (GSC loc. 54332).	5      1387.5
66	Shale, calcareous, dark greenish grey, relatively soft, with discontinuous layers of argillaceous limestone nodules, weathers bright medium orange.	19      1382.5
65	Mudstone, calcareous, dark greenish grey, blocky, fairly resistant, weathers medium orange-brown; fossils collected loose from base of unit: * <u>Warrenella</u> sp., and <u>Dechenella</u> (D.) <u>maclareni</u> Ormiston (GSC loc. 54673).	17      1363.5
64	Shale, calcareous, dark greenish grey, moderately fissile, recessive, weathers medium yellowish orange.	17      1346.5

Unit	Description	Thickness (feet)	
		Unit	From base
63	Mudstone, calcareous, dark grey, blocky, resistant, weathers bright pale orange; proetid tail fragment and orthoconic cephalopod collected from unit (GSC loc. 54331).	5	1329.5
62	Shale, calcareous, medium greenish grey, blocky, weathers light orange; brachiopod and plant fragments (GSC loc. 54329) from base of unit; <u>Warrenella cf. W. franklini</u> (Meek) (GSC loc. 54330) from 10 feet up; <u>Dechenella</u> sp. and cephalopod collected loose.	30	1324.5
61	Shale, calcareous, dark greenish grey, fissile, weathers light orange-brown; poorly exposed; transitional contacts.	45	1294.5
60	Shale, calcareous, dark greenish grey, blocky, soft but fairly resistant, weathers light orange-brown; shale for microfossils from base of unit (Field No. 125NBh); cup corals, * <u>Atrypa cf. A. perfimbriata</u> Crickmay, * <u>Hadorrhynchia sandersoni</u> (Warren), * <u>Warrenella kirki</u> (Merriam), and orthoconic cephalopod collected loose in limestone talus (GSC loc. 54327); cup coral, <u>Coenites</u> sp., <u>Tentaculites</u> sp., and <u>Dechenella (D.) aff. maclareni</u> Ormiston collected loose in shale talus (GSC loc. 54328).	71	1249.5
59	Shale, calcareous, dark greenish grey, soft, weathers light orange-brown; poorly exposed; <u>Atrypa cf. A. perfimbriata</u> Crickmay, <u>Spinatrypa</u> sp., <u>Warrenella franklini</u> (Meek), <u>Michelinoceras</u> sp., and echinoderm ossicles with single axial canals collected loose in limestone talus (GSC loc. 54326).	48	1178.5

Unit	Description	Thickness (feet)	
		Unit	From base
58	Shale, calcareous, dark greenish grey, fissile, soft; discontinuous exposure.  Fossils collected loose in limestone fragments slumped from above <u>Pholidostrophia?</u> sp., stropheodontid, and other brachiopod (GSC loc. 54325).  <u>Atrypa</u> cf. <u>A. perfimbriata</u> Crickmay, <u>Spinatrypa</u> sp., <u>Warrenella</u> sp., and <u>Dechenella</u> (D.) aff. <u>maclareni</u> Ormiston collected loose in black limestone fragments 15 to 34 feet up (GSC loc. 54324).  Shale for microfossils 34 feet up (Field No. 125NBf).	34	1130.5
57	Shale, calcareous, dark greenish grey, irregularly fissile, weathers orange-brown.	15	1096.5
56	Shale, strongly calcareous, dark greenish grey, blocky, 1 foot thick; overlain by fissile shale; weathers light orange-brown.	3	1081.5
55	Shale, strongly calcareous, dark greenish grey, fissile, very soft, weathers light orange-brown; poorly exposed; <u>Atrypa</u> cf. <u>A. perfimbriata</u> Crickmay, <u>Spinatrypa</u> sp., and echinoderm ossicles with single axial canals collected loose (GSC loc. 54323).  Station 125NB at base of unit 66.	55	1078.5
54	Shale, strongly calcareous, dark grey, fissile, resistant, weathers light tan brown.	c. 13	1023.5
53	Shale, calcareous, dark greenish grey, fissile, soft, weathers light tan brown; very poorly exposed.	11	1010.5

Unit	Description	Thickness (feet)	
		Unit	From base
52	Shale, strongly calcareous, medium greenish grey, highly fissile, soft, but scarp-forming in gully, weathers medium brown; shale for microfossils from 3 feet up (Field No. 124NBg).	8.5	999.5
51	Covered; talus fragments of shale, calcareous, dark greenish grey, soft, fissile, weathers light tan brown; cephalopod collected loose 21 feet up; echinoderm ossicles and cephalopod collected loose 40 feet up (GSC loc. 54321).	47	991
50	Shale, calcareous, slightly silty, blocky, fairly hard, medium grey, weathers light tan brown.	5	944
49	Covered; appears to be similar to unit 47.	9	939
48	Shale, calcareous, medium green, fissile, moderately resistant, weathers medium greenish grey.	1	930
47	Shale, dark greenish grey, fairly soft, evenly fissile, weathers light tan brown; very poorly exposed.	12	929
46	Shale, calcareous, very dark grey, irregularly fissile, upper 9 feet slightly less resistant than lower 16 feet, weathers light tan brown; shale for microfossils from top of unit (Field No. 124NBd).	25	917
45	Covered; presumably similar to unit 44.	15	892
44	Shale, strongly calcareous, dark greenish grey, fissile, moderately resistant, weathers light tan brown.	9	877
43	Shale, calcareous, very soft, fissile, recessive, very poorly exposed.	13	868

Unit	Description	Thickness (feet)	
		Unit	From base
42	Shale, calcareous, medium greenish grey, scarp-former, weathers light tan brown.	5	855
41	Shale, calcareous, dark grey, relatively soft, fissile, weathers light tan brown, poorly exposed.	9	850
	Shale for microfossils from base of unit (Field No. 124NBc).		
40	Shale, calcareous, dark grey, fairly hard, weathers light tan brown; a falls-former.	18	841
39	Shale, strongly calcareous; very dark grey, unctuous feel, recessive, weathers light tan brown; poorly exposed.	10	823
38	Shale, calcareous, fairly hard, beds up to 1.5 inches thick, very resistant, weathers light tan brown; a falls-former.	8	813
37	Shale, calcareous, some beds slightly silty, thin bedded, platy, recessive, weathers light tan brown; poorly exposed; <u>Tentaculites?</u> sp. collected loose at base of unit (GSC loc. 54320).	40	805
36	Shale, moderately calcareous, dark greenish grey, fairly fissile, beds up to 1/4 inch thick, weathers light tan brown; slightly less resistant than unit 35.	26	765
35	Shale, calcareous, black, beds up to 2 inches thick, hard, resistant, weathers light tan brown; a falls-former.	8	739
34	Shale, calcareous, dark greenish grey, fissile, more resistant than unit below; weathers light tan brown; shale for microfossils from top of unit (Field No. 124NBa).	48	731

Unit	Description	Thickness (feet)	
		Unit	From base
33	Shale, recessive; poorly exposed.  Station 124NB at base of unit.	27	683
32	Shale, calcareous, very dark grey, irregularly fissile, resistant, weathers light tan brown; a small falls-former.	9	656
31	Shale, moderately calcareous, dark grey, recessive, weathers dark grey and light tan brown; poorly exposed; shale for microfossils from top of unit (Field No. 123NBf).	20	647
30	Shale, calcareous, dark greenish grey, fairly soft but resistant weathering, weathers light tan brown; a falls-former; shale for microfossils 3 feet up (Field No. 123NBe).	60	627
29	Shale, recessive, poorly exposed.	7	567
28	Shale, calcareous, medium greenish grey, beds up to 1/2 inch thick, fairly hard, resistant, weathers light buff brown.	8	560
27	Shale, similar to unit 26 but slightly less resistant; markings suggestive of plant fragments collected 3 feet up.	20	552
26	Shale, calcareous, dark greenish grey, hard, fissile, platy, resistant, weathers pale brown.	7	532
25	Shale, calcareous, very dark greenish grey, unctuous feel, weathers light buff brown; shale for microfossils 2 feet from top (GSC loc. 54996).	7	525
24	Shale, calcareous, dark greenish grey, highly fissile, fairly resistant, coated with a pale greenish grey wash.	25	518

Unit	Description	Thickness (feet)	
		Unit	From base
23	Shale, calcareous, dark greenish grey, fissile, unctuous feel, less resistant than units above and below, weathers pale brownish grey; shale for microfossils from top of unit (GSC loc. 54319).  Station 123NB in main gully at base of unit 23. Bedding 090T/15N.	8	493
22	Shale, calcareous, dark greenish grey, unctuous feel, with thin, hard silty laminae spaced up to 6 inches apart; resistant, weathers light greenish grey; scarp-forming.  Station 122NB at base of unit 53 in subsidiary gully. Bedding 075T/10N.	39	485
21	Shale, strongly calcareous, dark greenish grey, fissile, weathers light orange-brown; recessive.	9	446
20	Covered; talus fragments of shale, strongly calcareous, medium green, fissile, weathers light tan brown; also some fragments of silty shale with worm burrowings; <u>Tentaculites?</u> sp. collected loose (GSC loc. 54322).	31	437
19	Shale, calcareous, dark greenish grey, unctuous feel, weathers medium grey, recessive.	23	406
18	Limestone, strongly argillaceous, dark greenish grey, fissile, hard, unctuous feel, weathers light orange-brown, resistant.	5	383
17	Shale, strongly calcareous, dark greenish grey, soft, weathers medium grey; poorly exposed.	14.5	378.0
16	Limestone, argillaceous, dark grey, hard, resistant, weathers light tan brown;		

Unit	Description	Thickness (feet)	
		Unit	From base
	contains <u>Orbiculoidea</u> sp., * <u>Chonetes</u> sp., <u>Ambocoelia</u> sp., <u>Tentaculites</u> sp., and <u>Eukloedenella?</u> sp. (GSC loc. 54519).	3	363.5
15	Shale, strongly calcareous, irregularly bedded, medium grey, weathers light grey; contains fossils near top; <u>Lingula</u> sp., <u>Orbiculoidea</u> sp., <u>Chonetes</u> sp., * <u>Ambocoelia</u> sp., <u>Styliolina</u> sp., * <u>Dechenella</u> (D.) cf. <u>maclareni</u> Ormiston, trilobite pygidium, and ostracods (GSC loc. 54524).	8	360.5
14	Limestone, strongly argillaceous, dark greenish grey, fissile, soft, weathers light greenish grey, resistant.	1.5	352.5
13	Shale, strongly calcareous, dark grey, thinly interbedded with softer fissile shale similar to unit 11; unit discontinuously exposed up small gully; a few thin nodular argillaceous limestone beds in upper 20 feet.	101	351
	Shale for microfossils 35 feet up (Field No. 120NBh).		
	* <u>Lingula</u> sp., * <u>Chonetes</u> sp., * <u>douvillinid</u> , * <u>Ambocoelia?</u> sp., <u>Styliolina</u> sp., ' <u>Primitia</u> ' sp., and echinoderm ossicles with single canals collected loose between 70 and 80 feet up (GSC loc. 54522).		
	<u>Lingula</u> sp., * <u>Chonetes</u> sp., <u>Ambocoelia?</u> sp., <u>Styliolina</u> sp., * <u>Dechenella</u> (D.) cf. <u>paragranulata</u> Ormiston, and <u>Kloedenella</u> sp. collected loose 97 feet up (GSC loc. 54523).		
12	Covered; talus fragments of shale, calcareous, similar to unit 13.	15	250

Unit	Description	Thickness (feet)	
		Unit	From base
	<u>Michelinoceras</u> sp. collected loose 10 feet up (GSC loc. 54421).		
11	Shale, strongly calcareous, medium greenish grey, unctuous feel, highly fissile, fairly soft, weathers light tan brown; contains poorly preserved <u>Styliolina</u> sp. and <u>Tentaculites</u> sp. (GSC loc. 54520).	26	235
10	Shale, strongly calcareous, medium greenish grey, laminated, in places nodular, but mainly highly fissile, unctuous feel, coated with a light tan brown weathering wash.	19	209
	Shale for microfossils from base of unit (GSC loc. 54519).		
9	Covered; talus appears to be similar to unit 8.	21	190
8	Shale, calcareous, medium grey, highly fissile, unctuous feel, weathers light tan brown; fairly well exposed up small gully.	37	169
	<u>Michelinoceras</u> sp. collected from base of unit (GSC loc. 54518).		
7	Covered.	9.5	132.0
6	Limestone, strongly argillaceous, black, blocky-weathering, coated with a light tan brown weathering wash; with widely separated thin beds of black, fissile, calcareous shale; poorly preserved <u>Warrenella?</u> sp. collected 35 feet up (GSC loc. 54517).	41	122.5
5	Covered; talus fragments of shale, calcareous, dark grey, unctuous feel, weathers light brownish grey;		

Unit	Description	Thickness (feet) From base
	<u>Styliolina</u> sp. collected loose 10 feet up (GSC loc 54515); * <u>Leiorhynchus</u> cf. <u>L. castanea</u> (Meek) collected loose in fragments of black limestone weathering light orange-brown (GSC loc. 54516).	40 81.5
	Station 120NB at base of unit 16 at top of falls. Bedding 110T/15N.	
4	Limestone, black, evenly interbedded with hard, black, calcareous shale; resistant, unit forms upper lip of falls.	c.9 41.5
3	Limestone, slightly argillaceous, black, massive, resistant, weathers light tan brown.	4 32.5
2	Shale, strongly calcareous, silty, hard, thin bedded up to 1/2 inch thick, weathers light tan brown; <u>Styliolina</u> sp. and <u>Tentaculites</u> sp. present in basal beds (GSC loc. 54513).	5.5 28.5
1	Limestone, black, irregularly thick bedded, weathers dark grey; a vertical scarp-former.	23
	<u>Prongs Creek tongue</u> (386 feet thick)	
11	Covered; talus of shale, black, carbonaceous, soft, recessive.	145 386
	<u>Atrypa perfimbriata</u> Crickmay, * <u>Warrenella kirki</u> (Merriam), <u>Styliolina</u> sp., and <u>Dechenella</u> sp. collected loose 25 feet up (GSC loc. 54511).	
	Poorly preserved <u>Styliolina</u> sp. and <u>Tentaculites</u> sp. collected loose 60 feet up; <u>Lingula</u> sp. collected loose 115 feet up (GSC loc. 54512).	

Unit	Description	Thickness (feet)	
		Unit	From base
10	Shale, strongly calcareous, black, fissile.	1 exposed	241
9	Covered; fragments of shale, carbonaceous, black, very soft.  <u>Lingula</u> sp., <u>Styliolina</u> sp., and ostracods collected loose 32 feet up (GSC loc. 54514).	52	240
8	Limestone, argillaceous, thinly interbedded with black fissile shale; poorly exposed.	1	188
7	Shale, carbonaceous, black, very soft, poorly exposed.	20	187
6	Shale, calcareous, black, weathers dark grey.	1	167
5	Shale, carbonaceous, black, very soft, poorly exposed; shale for microfossils 15 feet up (Field No. 119NBe).	25	166
4	Shale, black, fissile, fairly hard; contains <u>Styliolina</u> sp. and <u>Tentaculites</u> sp. (GSC loc. 54510).	13	141
3	Shale, carbonaceous, black, soft; very poorly exposed; shale from top of unit for microfossils (Field No. 119NBc).	38	128
2	Shale, carbonaceous, slightly calcareous, black, fissile, weathers black; poorly exposed.  Shale for microfossils from top of unit (Field No. 119NBb).	15	90
1	Covered; talus fragments of shale, calcareous, black, fissile, weathering pale brown.  <u>Tentaculites</u> sp. collected loose 5 feet up (GSC loc. 54509).	75	

Unit	Description	Thickness (feet)	
		Unit	From base
<u>Cranswick Formation</u> (442.7 feet thick)			
35	Limestone, black, evenly thin bedded up to 8 inches thick; interbedded with shale, calcareous, black, hard, fissile.	3.4	442.7
	Station 119NB at top of unit 35. Bedding 085T/30N.		
34	Limestone, black, aphanitic, resistant, falls-forming, weathers black (wet); calcite filling joint fissures.	6	439.3
33	Shale, calcareous, black, fissile; with thin even beds of black limestone, becoming thicker bedded in upper 9 feet, unit fairly resistant.	19	433.3
32	Limestone, slightly argillaceous, black, evenly bedded up to 1.3 feet thick, resistant, falls-forming.	7	414.3
31	Shale, black, fissile, recessive.	4.5	407.3
30	Limestone, black, silty in upper 5.5 feet, thin bedded up to 6 inches thick but averaging 2 inches thick; contains sparse <u>Styliolina</u> sp. (GSC loc. 54995).	15.5	402.8
29	Limestone, black; thinly interbedded with shale, calcareous, black, fissile; recessive; poorly exposed.	24	387.3
28	Shale, calcareous, black, platy; interbedded with limestone, argillaceous, black, fissile; unit contains poorly preserved inarticulate brachiopods and <u>Tentaculites</u> sp. (GSC loc. 54508).	6.5	363.3
27	Limestone, black, even bed, weathers dark brownish grey.	3.2	356.8

Unit	Description	Thickness (feet)	
		Unit	From base
26	Shale, black, fissile; with thin beds of black argillaceous limestone.	9	353.6
25	Limestone, dark grey, fine grained, evenly and irregularly thin bedded, highly resistant, vertical scarp-forming, weathers yellowish orange; brachiopod traces from top 2 feet of unit (GSC loc. 54507).  Bedding 125T/20NE.	15	344.6
24	Shale, calcareous, black; thinly interbedded with limestone, argillaceous, black, fissile; some beds with <u>Tentaculites</u> sp. and echinoderm ossicles with double axial canals (GSC loc. 54506); unit recessive.	22.7	329.6
23	Shale, calcareous, black, in beds up to 1.5 feet thick; interbedded with limestone, black; in upper part of unit numerous fissures in limestone filled with coarse white and yellow calcite and some crystalline quartz; unit highly resistant, and falls-forming.  Bedding 105T/8N.	16.5	306.9
22	Limestone, black, beds up to 1.5 feet thick, evenly interbedded with shale, calcareous, black, fissile, hard, containing numerous <u>Styliolina</u> sp., <u>Tentaculites</u> sp. and inarticulate brachiopods (GSC loc. 54503) from near base of unit.  <u>Tentaculites</u> sp. and <u>Orbiculoidea</u> (?) sp. from near top of unit (GSC loc. 54504).	9.4	290.4
21	Limestone, black, even beds up to 1.5 feet thick, with numerous veins of		

Unit	Description	Thickness (feet)	
		Unit	From base
	coarse white calcite; separated by beds up to 0.5 foot thick of shale, calcareous, hard, containing numerous * <u>Lingula</u> sp., * <u>Warrenella</u> sp., and <u>Tentaculites</u> sp. (GSC loc. 54502); also some beds of black chert up to 2 1/2 inches thick.	6.6	281
20	Limestone, black, aphanitic, hard, evenly thick bedded, weathers dark grey; separated by black calcareous shale partings; unit contains poorly preserved brachiopods; <u>Warrenella</u> sp. collected loose (GSC loc. 54501).	5	274.4
19	Limestone, slightly argillaceous, black, aphanitic, evenly thick bedded, weathers dark grey; a few veins of white coarse calcite; unit contains <u>Tentaculites</u> sp. (GSC loc. 54500).	4.2	269.4
18	Limestone, black, fine grained, evenly bedded up to 1 foot thick; interbedded with shale, calcareous, weathers brownish grey; shale beds with numerous <u>Styliolina</u> sp. and <u>Tentaculites</u> sp. (GSC loc. 54599).  Bedding 155T/30NE.	7	265.2
17	Covered.	c. 50	258.2
	All of section above was measured on north side of tributary stream a short distance west of the Snake River. Section below was measured on the south side of tributary stream.		
16	Limestone, dark grey, fetid, irregularly and nodular thin bedded, beds up to 0.5 foot thick, resistant, weathers medium grey.	7 exposed	208.2

Unit	Description	Thickness (feet)	
		Unit	From base
	Station 114NB at top of unit 16 at top of plateau.		
15	Limestone, dark brownish grey, rubbly thin bedded, recessive, very poorly exposed.	5	201.2
14	Limestone, dark grey, fine grained, rubbly bedded, nodular, looks brecciated, weathers dark grey; exceedingly resistant and vertical scarp-forming; unit contains numerous <u>Atrypa</u> cf. <u>A. arctica</u> Warren and echinoderm ossicles with single axial canals (GSC loc. 54481).	20	196.2
13	Brecciated limestone, fragments of limestone, black, aphanitic, hard, weathers dark grey; in a matrix of limestone, medium brown, fine grained, unevenly bedded; <u>Atrypa</u> sp. collected loose (GSC loc. 54480).	1.2	176.2
12	Limestone, black, nodular, looks brecciated, highly resistant, weathers dark grey and black; unit contains lenses and nodules of black chert; also numerous veins of white coarse calcite; * <u>Warrenella</u> sp. collected 6 feet up (GSC loc. 54479).	22	175
11	Covered; talus fragments of limestone, black, aphanitic, weathers dark grey.	10	153
10	Limestone, crinoidal, dark grey, massive but in places rubbly weathering, weathers medium grey; contains *echinoderm ossicles with single and double axial canals (GSC loc. 54478).	11	143
9	Limestone, dark brown, very coarse grained, evenly medium bedded, weathers dark grey.	10	132

Unit	Description	Thickness (feet)	
		Unit	From base
8	Limestone, very dark grey, rubbly thin bedded, weathers medium grey.	7	122
7	Covered, recessive interval.	6	115
6	Limestone, very dark grey, fine grained, rubbly bedded, slightly recessive, weathers medium grey; transitional lower contact.	13	109
5	Limestone, almost black, fine grained, massive, vertical scarp-forming, weathers light grey; fossils moderately abundant; stromatoporoids, cup coral, <u>Gypidula</u> sp. and echinoderm ossicles with double and cross-like axial canals (GSC loc. 54477).	32	96
4	Limestone, medium brownish grey, fine grained, granular, irregularly medium bedded, weathers medium brownish grey; unit in places coated with a light grey staining; stromatoporoids and <u>Coenites</u> sp. in basal beds, large ostracods from top of unit (GSC loc. 54475); stromatoporoids, coral fragments, large ostracods, and echinoderm ossicles with single axial canals collected loose (GSC loc. 54476).	14	64
3	Limestone, dark brownish grey, aphanitic, evenly thick bedded to massive, weathers medium grey.	7	50
2	Covered; limestone fragments.  <u>Alveolites</u> sp., <u>Coenites</u> sp., and echinoderm ossicles with double and cross-like axial canals collected loose (GSC loc. 54474).	33	43
1	Limestone, dark brownish grey, aphanitic, thick bedded to massive, weathers dark grey; cup coral fragment, ostracod, and		

Unit	Description	Thickness (feet)	
		Unit	From base
	echinoderm ossicles with double and cross-like axial canals collected loose (GSC loc. 54473).	10	
	Station 113NB at base of unit 1.		
MIDDLE DEVONIAN AND OLDER			
<u>Gossage Formation</u> (406.8 feet thick)			
36	Covered.	34	406.8
35	Dolomite, fine grained, granular, vuggy; with considerable secondary quartz; <u>Coenites cf. C. rectilineatus</u> (Simpson) (GSC loc. 54472).	1	372.8
34	Covered; dolomite talus.	19	371.8
33	Limestone, black, fine grained, bed highly fractured, weathers dark grey.	1	352.8
32	Covered.	5	351.8
31	Dolomite, moderately calcareous, dark grey, irregular bed, small veins and irregular masses of white coarse calcite, weathers dark grey.	2	346.8
30	Covered; fragments of dolomite, medium grey, fine grained, granular, weathers medium grey; also fragments of pink coarsely crystalline calcite.	20	344.8
29	Covered; fragments of dolomite, dark grey, fine grained, weathers medium grey; also fragments of dolomite, light grey.	15	324.8

Unit	Description	Thickness (feet)	
		Unit	From base
28	Dolomite, strongly calcareous, dark grey, weathering medium grey; interbedded with dolomite, light brownish grey, fine grained, granular, weathers light grey.	30	309.8
27	Covered; talus fragments of dolomite, in part silty, dark grey, fine grained, weathers medium to dark grey; secondary quartz present in some fragments.	35	279.8
26	Covered; small fragments of dolomite, dark grey, fine grained, weathers medium grey.	34	244.8
25	Dolomite, dark grey, evenly bedded, between 0.5 and 1.3 feet thick, weathers dark grey, in places with an orange-brown coating.	6.7	210.8
24	Covered; fragments of dolomite, strongly calcareous, medium grey, fine grained, weathers medium grey; some layers contain thin layers of secondary quartz.	14	204.1
<u>Orange Weathering Dolomite Unit</u> (190.1 feet thick)			
23	Dolomite, calcareous, argillaceous in upper 3 feet, medium brownish grey; mainly evenly thick bedded, thinner bedded towards top, weathers pale orange; beds separated by medium greenish grey shale partings.  Bedding 150T/5SW.	18.2	190.1
22	Dolomite, medium brownish grey, aphanitic, evenly thick bedded, weathers pale orange.	5.8	171.9
21	Dolomite, medium brown, aphanitic, evenly thin bedded, weathers pale orange.	6.5	166.1

Unit	Description	Thickness (feet)	
		Unit	From base
20	Dolomite, light grey, very hard, unevenly thick bedded, separated by dark grey shale partings, weathers medium orange (GSC loc. 54471).	8	159.6
19	Covered.	11.5	151.6
18	Dolomite, very dark grey, fine grained, evenly thick bedded, weathers medium orange-brown.	5	140.1
17	Covered by vegetation.	3.5	135.1
16	Dolomite, dark brownish grey, aphanitic, massive, weathers medium orange-brown.	4	131.6
15	Covered by vegetation.	4	127.6
14	Dolomite, black, fine grained, even bed, weathers pale orange; frost heaved.	1.5	123.6
13	Covered by vegetation.	1.5	122.1
12	Dolomite, very dark grey, fine grained, even bed, resistant, weathers dark grey.  Bedding horizontal.	2.5	120.6
11	Dolomite, medium brown, aphanitic, highly brittle, shatters easily, recessive, weathers pale orange.	4	118.1
10	Large talus blocks of dolomite, dark grey; mixed with fragments of dolomite, weathering pale orange.	23	114.1
9	Covered; fragments of dolomite, slightly calcareous, medium brown, aphanitic, weathers pale orange; also fragments of dolomite, dark grey, fine grained, evenly thick bedded, weathers dark grey; some veins of coarse white calcite in the latter blocks.	23	91.1

Unit	Description	Thickness (feet)	
		Unit	From base
8	Covered; fragments of dolomite, light grey, very fine grained, weathers pale orange, some secondary quartz, also fragments of limestone, dark grey, aphanitic, weathers dark grey.	c. 25	68.1
7	Dolomite, slightly calcareous, dark brown, vaguely colour banded, aphanitic, even bed, weathers pale orange-brown.  Lithological specimen oriented (GSC loc. 54470).	1	43.1
6	Covered; fragments of dolomite, slightly calcareous, medium brown, aphanitic, weathers pale orange.	16	42.1
5	Covered; large blocks of dolomite, pale brown, aphanitic, weathers light grey; also fragments of dolomite, dark grey, fine grained, weathers medium grey.	11.5	26.1
4	Covered; fragments of dolomite, medium brownish grey, aphanitic, weathers light grey; also fragments of dolomite, argillaceous, dark grey, fine grained, weathers pale orange.	9.5	14.6
3	Dolomite, slightly argillaceous, pale grey, even bed, frost shattered, weathers pale buff brown.	1.2	5.1
2	Covered; large irregular fragments of dolomite, fine grained, light grey.	2.4	3.9
1	Dolomite, pale grey, fine grained, rubbly thin bedded, weathers light grey and pale brown.  A regional unconformity appears to be present at the base of this unit.	1.5	

Unit	Description	Thickness (feet)	
		Unit	From base
SILURIAN (?)			
(44.2 feet; incomplete)			
9	Covered; fragments of dolomite, fine grained, light grey.	6	44.2
8	Dolomite, light grey, fine grained, even bed, weathers light grey; frost heaved.	2	38.2
7	Covered; fragments of dolomite, light grey, fine grained, weathers light grey.	8	36.2
6	Limestone, medium grey, aphanitic, even thick bed, resistant, weathers light grey.	2.7	28.2
5	Covered; talus fragments of dolomite, light grey, fine grained, weathers light grey.	2	25.5
4	Limestone, dolomitic, light grey, aphanitic, evenly thin bedded, weathers light grey.	1	23.5
3	Covered.	5	22.5
2	Dolomite, slightly calcareous, slightly silty, light grey, evenly medium bedded, weathers light grey; some white calcite fissures parallel to bedding.	1.5	17.5
Lithological specimen (GSC loc. 54469).			
1	Covered; fragments of dolomite, very light creamy grey, fine grained, hard, weathers light grey.	16	
Station 112NB at base of unit 1.			

Section 8: ROYAL CREEK (106E-15)

Royal Creek cuts through the northwest flank of Royal Mountain and exposes an excellent section of recessive Silurian and Devonian rocks in its right bank at 65°02'-04'N, 135°08'-10'W. The base of the section is placed above a fault within an extensive outcrop of massive carbonates, the top is the highest bed exposed along a fault within an extensive outcrop of massive carbonates exposed along a stretch of bank where the creek flows almost parallel to the strike of the rocks. Dips are uniform, 30 to 50 degrees to the southwest. Measurement was by staff, with tape for covered intervals, in early June when snow was gone from the outcrops, but high water in the creek precluded access to some rocks. The section is unique in its good exposure of the recessive, cephalopod-rich shale, unit 1, 643 feet thick, at the base of the Devonian.

Section measured by B.S. Norford, assisted by U. Uptis, June 6-10, 1962.

Description of only the Devonian and immediately underlying beds is given here.

LOWER AND MIDDLE DEVONIAN	
Prongs Creek Formation	2464'; nearly complete
SILURIAN	
Road River Formation	952'
ORDOVICIAN AND/OR SILURIAN	1209'; incomplete

Unit	Description	Thickness (feet)	
		Unit	From base

LOWER AND MIDDLE DEVONIAN

Prongs Creek Formation  
(2,464 feet; nearly complete)

- 3 Shales, non-calcareous, grey-black and dark grey, weather dark grey, grey-black and metallic dark blue-grey, recessive, fissility medium to good; shales, cherty, dull grey-black, weather dull grey-black, metallic dark blue-grey, and rusty-brown, recessive, poorly fissile; cherts, impure, grey-black, weather dull

Unit	Description	Thickness (feet)	
		Unit	From base
	grey-black, bedding 1/2 inch to 6 inches. Unit more than 75 per cent covered; contact with unit 2 covered; barren of fossils.	916	2464
2	Shales, 60 to 70 per cent of unit, calcareous, dark grey, grey, and dark brownish grey, weather dark grey, brownish grey, and grey-black, recessive, fissile with limestone concretions. Limestones, 2 to 25 per cent of lower half of unit, 30 to 90 per cent of upper half, some siliceous, some slightly argillaceous, very finely crystalline, dark grey, grey, and dark bluish grey, weather grey, yellowish grey, light grey, and greyish orange, bedding 1 inch to 18 inches; some beds graded with conglomeratic basal layers of ill-sorted debris, preponderantly crinoidal, and rarely similar lenses within the beds; bases of such graded beds commonly irregular and undulatory with some contortion of subjacent shales and inclusion of discrete, nodular lenses of limestone within the shales; upper surfaces commonly abrupt, plane, with the uppermost layers of some beds finely laminated and rarely cross-laminated. Paper shales, 5 to 20 per cent of lower half of unit, grey-black, weather grey-black, very fissile. Cherts, 5 to 10 per cent of unit, impure, grey-black, weather grey-black, bedding 1/2 inch to 4 inches, and as layers within limestone beds. Limestone conglomerates and breccias, rare, ill-sorted pebbles and cobbles of limestones and bioclastic material in basal parts of beds, grade upwards into very finely crystalline limestones, bedding 1/4 foot to 3 feet; upper and lower surfaces		

Unit	Description	Thickness (feet) From base
	similar to those of limestones. Contact gradational with unit 1 below.	905 1548
	Fossils from 743 feet up (GSC loc. 53103):	
	<u>Tentaculites</u> sp. <u>Bactrites</u> ? sp. <u>Agoniatites</u> ? sp.	
	Fossils from 317-322 feet up (GSC loc. 53102):	
	echinoderm ossicles with double axial canals <u>Gypidula</u> sp. - very large form <u>Atrypa</u> sp. - very large form leiorhynchid n. genus (= " <u>Eatonia medialis</u> Vanuxem var." of Meyer, 1913) <u>Warrenella</u> sp.	
	Fossils from 237-240 feet up (GSC loc. 53101):	
	rugose coral fragment <u>Favosites</u> sp. echinoderm ossicles with single axial canals echinoderm ossicles with star-shaped axial canals echinoderm ossicles with double axial canals <u>Douvillina</u> ? sp. <u>Gypidula</u> sp. - large form <u>Spinatrypa</u> sp. <u>Emanuella</u> sp. <u>Warrenella</u> sp. leiorhynchid	
	Fossils from 222 feet up (GSC loc. 53100):	
	<u>Coenites</u> sp. echinoderm ossicles with single axial canals	

Unit	Description	Thickness (feet) From base
	echinoderm ossicles with cross-like axial canals	
	echinoderm ossicles with double axial canals	
	cf. <u>Palaeoneillo</u> sp.	
	<u>Michelinoceras</u> sp.	
	<u>Agoniatites</u> ? sp.	
	<u>Gypidula</u> sp.	
	<u>Pholidostrophia</u> ? sp.	
	<u>Douvillina</u> ? sp.	
	<u>Atrypa</u> ? sp.	
	<u>Spinatrypa</u> sp. - finely costate form	
	cf. <u>Ambocoelia</u> sp.	
	<u>Emanuella</u> ? sp.	
	<u>Warrenella</u> ? sp.	
	<u>Plectospirifer</u> sp.	
	Fossils from 139-145 feet up (GSC loc. 53099):	
	<u>Coleolus</u> ? sp.	
	<u>Bactrites</u> ? sp.	
	goniatite impression - very poorly preserved	
	Fossils from 120-125 feet up (GSC loc. 53098):	
	<u>Bactrites</u> ? sp.	
	<u>Agoniatites</u> ? sp.	
	Fossils from 52-62 feet up (GSC loc. 53097):	
	<u>Bactrites</u> sp.	
	goniatite impression	
	Fossils from 59 feet up (GSC loc. 53096):	
	<u>Michelinoceras</u> sp.	
	goniatite impression	
1	Shales, and paper shales, variably calcareous, grey-black, weather grey-black, dark grey and black,	

Unit	Description	Thickness (feet) From Unit base
	<p>commonly with an off-white mineral dusting, very recessive, fissility moderate to excellent, rarely very poor. Minor (1/2 to 5 per cent) argillaceous limestones, very finely crystalline, grey and dark grey, weather grey, dark grey, and yellowish grey, recessive, bedding 1/4 inch to 4 inches, some beds nodular and concretionary. Very rare siliceous limestones, very finely crystalline, dark grey, weather grey, as discrete beds, 8 to 24 inches, some laminated. Bioclastic limestone bed at 342-352 feet up, conglomeratic at base grading up into very finely crystalline limestone and obscurely into shale, rests on undisturbed shale. Impure chert beds at 238 feet up. Covered intervals at 540-550, 492-505, and 314-316. Contact with unit 4 below seemingly conformable.</p>	643
	<p>Fossils from 548-549 feet up (GSC loc. 53095):</p>	
	<p><u>Tentaculites</u> sp. <u>Michelinoceras</u>? sp. cf. <u>Anetoceras</u> sp. other goniatites</p>	
	<p>Fossils from 518-519 feet up (GSC loc. 53494):</p>	
	<p><u>Michelinoceras</u> sp.</p>	
	<p>Fossils from 321-327 feet up (GSC loc. 53093):</p>	
	<p><u>Tentaculites</u> sp. <u>Michelinoceras</u> sp. <u>Agoniatites</u>? spp. - fine and coarsely ornamented forms</p>	

Unit	Description	Thickness (feet)	
		Unit	From base
	Fossils from 241 feet up (GSC loc. 53092):		
	<u>Tentaculites</u> sp.		
	<u>Michelinoceras</u> sp.		
	<u>Orbiculoides</u> sp.		
	<u>Warrenella</u> sp. (= "Reticularia" ex. gp. "R." <u>curvata</u> (Schloth.)) present in the Blue Fiord Formation of Canadian Arctic Archipelago; micro-ornament is identical) trilobite fragment		
	Fossils from 166-171 feet up (GSC loc. 53091):		
	<u>Michelinoceras</u> sp.		
	Fossils from 130-150 feet up (GSC loc. 53090):		
	<u>Michelinoceras</u> sp.		
	Fossils from 0-25 feet up (GSC loc. 53089):		
	<u>Styliolina</u> sp.		
	<u>Lingula</u> sp.		
	<u>Michelinoceras</u> sp.		

SILURIAN

Road River Formation  
(952 feet thick)

4	Shales, calcareous, dark grey and grey-black, weather grey-black and dark grey, moderately to very fissile; with 2 to 10 per cent argillaceous limestone, very finely crystalline, grey and dark grey, weather grey and yellowish grey, bedding 1/2 inch to 2 inches; contact with underlying unit gradational.	95	952
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Unit	Description	Thickness (feet) From Unit base
	<u>Monograptus</u> sp., <u>Tentaculites?</u> sp., and inarticulate brachiopods seen. Fossils collected from 5-15 feet down in unit (GSC loc. 53088):  <u>Lingula</u> sp. <u>Orbiculoidea</u> sp.	

Section 14: NORTHERN OGILVIE MOUNTAINS ONE MILE WEST-NORTHWEST OF HART RIVER (116H-2)

Section is located in the northern Ogilvie Mountains 1 mile west-northwest of Hart River and was measured from 65°38'N, 136°45.6'W, northward across a 110T trending mountain ridge to 65°38.5'N, 136°45.2'W. The Silurian Road River Formation is poorly exposed along the lower part of the south slope of the ridge and is overlain up the slope by better exposure of the Devonian Michelle and Ogilvie Formations. Beds in the ridge strike 115T and dip 23 to 40 degrees north.

Section measured by A. W. Norris, assisted by A. J. Jenik, May 27-28, 1962.

MIDDLE DEVONIAN	
Ogilvie Formation	1244.5'
MIDDLE DEVONIAN AND OLDER	
Michelle Formation	548.5'
SILURIAN	
Road River Formation	748'; incomplete

Unit	Description	Thickness (feet)	
		Unit	From base
MIDDLE DEVONIAN			
	<u>Ogilvie Formation</u> (1244.5 feet thick)		
53	Limestone, crinoidal in lower part, dark grey, nodular thin bedded, beds up to 6 inches thick, weathers medium grey.	7	1244.5
	<u>Warrenella</u> sp. and echinoderm ossicles with single axial canals (GSC loc. 50562).		
	Station 32NB at top of unit 53 near bottom of north slope of mountain. Bedding 115T/40N. Soft beds, presumably shale, overlie unit 53 to the north, but there are no exposures in sight.		

Unit	Description	Thickness (feet)	
		Unit	From base
52	Limestone, pale brown, fine to medium grained, thick bedded, weathers light grey; sharp contact with unit above.	7	1237.5
51	Covered by talus.	12	1230.5
50	Limestone, dark brownish grey, fine grained, highly irregular bedding planes spaced 0.3 to 0.7 foot apart, highly resistant, weathers light grey.  Bedding 115T/40N.	24	1218.5
49	Covered by talus.  Numerous loose fossils at 69 feet up including stromatoporoids, <u>Alveolites</u> sp., <u>Favosites</u> sp., <u>Phillipsastrea</u> sp., and echinoderm ossicles with double axial canals (GSC loc. 50558).  Fossils collected loose between 70 and 108 feet up: cup coral and <u>Favosites</u> sp. (GSC loc. 50559).	108	1194.5
48	Limestone, pale brown, fine grained, thin bedded, weathers light grey.	8	1086.5
47	Limestone, pale brown, thin bedded, weathers light grey; poorly exposed.	16	1078.5
46	Limestone, light grey, fine grained, evenly thin bedded, weathers light grey; poorly exposed.  Lithological specimen (GSC loc. 50561).	38	1062.5
45	Covered by vegetation.	5	1024.5
44	Limestone, pale brown, aphanitic, thin bedded, up to 1.5 feet thick, weathers light grey; poorly preserved cup coral (?) (GSC loc. 50560).	19	1019.5

Unit	Description	Thickness (feet)	
		Unit	From base
43	Covered.	4	1000.5
42	Limestone, pale brown, fine grained, evenly thin bedded; interbedded with limestone, argillaceous, fissile, unit weathers light grey.	15	996.5
41	Limestone, pale brown, aphanitic, thin beds alternating with thicker beds, resistant, weathers light grey.	19	981.5
40	Limestone, pale brown, aphanitic, evenly thin bedded, recessive, weathers light grey; poorly exposed.	15	962.5
39	Limestone, pale brown, fine grained, evenly thick bedded, beds between 2 to 5 feet thick, weathers light grey.	30	947.5
	Station 31NB at top of unit 39 at peak of mountain ridge. Bedding 115T/35N.		
38	Covered by vegetation.	10	917.5
37	Limestone, pale brown and very light grey, aphanitic, evenly very thick bedded, beds between 4 to 6 feet thick, resistant, weathers light grey.	22.5	907.5
	Lithological specimen (GSC loc. 50322).		
36	Limestone, pale brown, aphanitic, massive, weathers light grey.	9	885
35	Limestone, pale brown, aphanitic, evenly thick bedded to massive, weathers light grey.	14	876
34	Covered.	11	862
33	Limestone, medium grey, fine grained, massive, weathers light grey; more resistant than unit below.	21.5	851

Unit	Description	Thickness (feet)	
		Unit	From base
32	Limestone, pale brown, aphanitic, thick bedded between 3 to 4 feet thick, recessive, weathers light grey; poorly exposed; a few scattered veins of white coarsely crystalline calcite.	31	829.5
31	Limestone, pale brown, aphanitic, hard, brittle, evenly very thick bedded to massive, weathers light grey.  Lithological specimen (GSC loc. 50329).	19	798.5
30	Limestone, with argillaceous limestone partings, pale brown, aphanitic, evenly thin bedded, recessive; weathers light grey.	9	779.5
29	Limestone, pale brown, aphanitic, evenly very thick bedded to massive, weathers light grey; silt filled worm burrows present about one-half way up.	10	770.5
28	Limestone, argillaceous towards top and bottom, pale brown, aphanitic, massive, weathers light grey.	11	760.5
27	Limestone, light grey, aphanitic, brittle, evenly thick bedded, weathers light grey.	22	749.5
26	Talus covered.	20	727.5
25	Limestone, pale brown, aphanitic, evenly thick bedded, weathers light grey; discontinuously exposed.	20	707.5
24	Covered.	12	687.5
23	Limestone, pale brown, aphanitic, evenly bedded between 2 to 4 feet thick.  Lithological specimen (GSC loc. 50319).	9	675.5
22	Covered.	20	666.5

Unit	Description	Thickness (feet)	
		Unit	From base
21	Limestone, pale brown, aphanitic, even bed, weathers light grey.	2	646.5
20	Covered.	8	644.5
19	Limestone, very light brownish grey, fine grained, evenly thick bedded, weathers light grey; poorly exposed.	10	636.5
18	Covered.	8	626.5
17	Limestone, pale brown, evenly medium to thick bedded, weathers light grey.	22	618.5
16	Covered.	5	596.5
15	Limestone, pale grey, fine grained, evenly thick bedded between 1 foot to 3 feet thick, weathers light grey; contains a few stromatoporoids? (GSC loc. 50328).  Lithological specimen (GSC loc. 50318).  Bedding 105T/35N.	10	591.5
14	Covered.	8	581.5
13	Limestone, medium brownish grey, aphanitic, evenly thick bedded between 2 and 4 feet thick, weathers light grey.  Lithological specimen from base of unit (GSC loc. 50317).  Bedding 080T/30N.	31.5	573.5
12	Limestone, medium brownish grey, aphanitic, massive, weathers light to medium grey.  Beds above unit 12 are considerably less resistant.	51	542

Unit	Description	Thickness (feet)	
		Unit	From base
11	Limestone, medium brown, aphanitic, massive, weathers light grey; in places unit is closely jointed.  <u>Atrypa</u> sp. from 60 feet up (GSC loc. 50326).  <u>Favosites</u> sp. collected loose 70 feet up (GSC loc. 50327).	104	491
10	Limestone, pale brown, aphanitic, very hard, massive, resistant, weathers light grey.  <u>Favosites</u> sp. collected loose at 54 feet up (GSC loc. 50325).	84	387
9	Limestone, pale brown, aphanitic, massive, weathers light grey.	36	303
8	Limestone, medium grey, aphanitic, massive, resistant, weathers light grey; contains cup corals (GSC loc. 50323).  Echinoderm ossicles with single, double, and cross-like axial canals collected loose (GSC loc. 50324).	42	267
7	Limestone, dark grey, fine grained, bedding planes from 1 foot to 3 feet apart, resistant but not as much so as unit 6, weathers light grey.	20	225
6	Limestone, medium brownish grey, massive, weathers light grey; numerous stromatoporoids at 57 feet up (GSC loc. 50322).	66	205
5	Limestone, medium grey, aphanitic, massive, with parting planes 2 to 6 feet apart, weathers light grey.	33	139

Unit	Description	Thickness (feet)	
		Unit	From base
4	Limestone, dark brownish grey, aphanitic, evenly thick bedded, parting planes 1.5 to 4 feet apart, weathers light grey; contains <u>Philoxene?</u> sp., and echinoderm ossicles with single and cross-like axial canals (GSC loc. 50320).  Bedding 085T/30N.	19	106
3	Limestone, crinoidal, black, aphanitic, massive, highly resistant, weathers light grey; in places covered with a light orange coating.  Ostracods and echinoderm ossicles (GSC loc. 50316).	25	87
2	Covered.	33	62
1	Limestone, argillaceous towards top, black, aphanitic, massive, highly resistant, weathers light grey.  Station 30NB at base of unit 1 at base of small cirque. Bedding 135T/40NE.	29	
MIDDLE DEVONIAN AND OLDER			
<u>Michelle Formation</u> (Type section; 548.5 feet thick)			
34	Limestone, slightly silty and argillaceous, dark grey to black, aphanitic, massive, weathers light grey and light orange; contains stromatoporoids, *rhynchonellid (GSC loc. 50397).  Gradational contact with unit above.  Station 29NB at top of unit 34 on the west side of a small cirque. Bedding 115T/23N.	12	548.5

Unit	Description	Thickness (feet)	
		Unit	From base
33	Covered.	10	536.5
32	Limestone, very dark grey, very fine grained, massive, resistant, weathers light orange-grey.  Echinoderm ossicles (GSC loc. 50408).	30	526.5
31	Covered; stromatoporoid collected loose 30 feet up (GSC loc. 50402).	41	496.5
30	Limestone, very dark grey, fine grained, massive, weathers light orange-grey; numerous loose stromatoporoids, and some coarsely costate <i>Atrypa</i> sp., presumably derived from this unit (GSC loc. 50409).  Algal structures, stromatoporoids, cup coral, and <i>Favosites</i> sp. collected loose and obviously derived from above (GSC loc. 50413).	8	455.5
29	Covered.	c. 42	447.5
28	Limestone, very dark grey to black, massive, weathers medium brownish grey; contains numerous silicified stromatoporoids and fragmentary <i>Coenites</i> sp. (GSC loc. 50404).	15	405.5
27	Limestone, almost black, fine grained, irregularly thick bedded, weathers dark grey; contains stromatoporoids, <i>Coenites</i> sp., and echinoderm ossicles with single axial canals (GSC loc. 50400).	2	390.5
26	Covered.	10.5	388.5
25	Limestone, silty and slightly argillaceous, jet black, fine grained, evenly very thick bedded, weathers medium brownish grey,		

Unit	Description	Thickness (feet)	
		Unit	From base
	and pale orange as seen from a distance; contains a few small stromatoporoids, <u>Favosites</u> sp. and echinoderm ossicles (GSC loc. 50398).	6	378
24	Covered.	24	372
23	Limestone, black, fine grained, evenly thick bedded, weathers dark grey.	2	348
22	Covered.	8	346
21	Limestone, black (wet), evenly thick bedded, weathers very dark grey; numerous large colonies of <u>Favosites</u> sp. (GSC loc. 50401).	16	338
20	Covered.	12	322
19	Limestone, argillaceous, black, even bed, resistant, weathers black.	3	310
18	Covered.	14	307
17	Limestone, silty and argillaceous, black, thick bedded, resistant, weathers dark grey; contains <u>Favosites</u> sp., *echinoderm ossicles with double, and cross-like axial canals (GSC loc. 50410).	5	293
16	Covered.	11	288
15	Limestone, silty, argillaceous, black, evenly thick bedded, fissile, weathers dark brownish grey; contains undetermined brachiopods, <u>Tentaculites</u> sp., and echinoderm ossicles with single axial canals (GSC loc. 50557).	18	277
14	Covered.	9	259
13	Limestone, argillaceous, silty, black, thick bedded in lower 24 feet, varying		

Unit	Description	Thickness (feet)	
		Unit	From base
	to thinner bedded in upper 6 feet; contains <u>Favosites</u> sp. (GSC loc. 50414).	30	250
12	Talus fragments of black argillaceous limestone.	12	220
11	Limestone, black, fine grained, massive, weathers light to medium grey.	6	208
10	Limestone, argillaceous, silty, black, thick bedded, fairly resistant, weathers dark grey; contains <u>Favosites</u> sp. and brachiopod traces (GSC loc. 50412).	14	202
9	Limestone, argillaceous, black, fissile, weathers dark grey.	26	188
8	Shale, calcareous, black, thin bedded, fissile, recessive, poorly exposed; * <u>Spinatrypa</u> sp., and * <u>Dechenellurus</u> sp. B present (GSC loc. 50405).  Stromatoporoids collected loose (GSC loc. 50407).	8	162
7	Limestone, black, aphanitic, evenly thick bedded, resistant, weathers dark grey.	6	154
6	Covered; fossils collected loose in this interval include: douvillinid?, ostracods, and echinoderm ossicles with single axial canals (GSC loc. 50411).	16	148
5	Limestone, slightly argillaceous, crinoidal, black, aphanitic, evenly thick bedded, resistant, weathers dark grey; sparse <u>Favosites</u> sp.	22	132
4	Talus covered interval; <u>Amphipora</u> sp., <u>Chonetes</u> cf. <u>C.</u> sp. L, douvillinid?, bryozoa fragments, ostracods, and		

Unit	Description	Thickness (feet)	
		Unit	From base
	echinoderm ossicles with single axial canals (GSC loc. 50399).	10	110
3	Limestone, slightly argillaceous, black, evenly thick bedded, beds between 3 and 4 feet thick, very resistant, weathers dark brownish grey.	24	100
2	Limestone, with argillaceous limestone partings, black, beds up to 2 feet thick, very resistant, weathers dark brownish grey; rhynchonelloid and trilobite fragments collected from lower 20 feet of unit (GSC loc. 50403); more fossils from upper 46 feet of unit include: <u>Chonetes</u> sp. L, <u>Warrenella</u> sp., <u>Michelinoceras</u> sp., cyrtconic cephalopod fragment, ostracods, and echinoderm ossicles with single axial canals (GSC loc. 50556); cup coral from top of unit (GSC loc. 50406).	66	76
1	Shale, strongly calcareous, black, platy, weathers medium brownish grey.	10	
	Station 10NB at base of unit 1 at base of outcrop on south slope of mountain.		

SILURIAN

Road River Formation  
(748 feet; incomplete)

9	Covered, talus fragments derived from above of limestone, argillaceous, black, disintegrate into small highly jagged fragments, weathers very dark grey to black.	106	748
	<u>Favosites</u> sp., <u>Chonetes</u> sp. L, <u>*Atrypa</u> sp., <u>*Warrenella</u> sp., <u>Styliolina</u> sp., <u>*Tentaculites</u> sp.,		

Unit	Description	Thickness (feet) From base
	<p>*<u>Leptagonia</u> sp., michelinoceroid, *<u>Dechenellurus</u> sp. B from lower part of interval (GSC loc. 50394).</p>	
	<p>Spiriferid? fragments collected loose from 54 feet up (GSC loc. 50389).</p>	
	<p>*<u>Orbiculoidea</u> sp., *<u>Chonetes</u> sp. L, *leiorhynchid, <u>Styliolina</u> sp., <u>Tentaculites</u> sp., <u>Leptodesma</u> sp., *<u>Lyriopecten</u> sp., *<u>Michelinoceras</u> sp., *<u>Dechenellurus</u> sp. B, trilobite head and tail fragments, and ostracods collected loose between 55 and 106 feet up (GSC loc. 50381).</p>	
8	<p>Covered; talus fragments of limestone, strongly argillaceous, black.</p>	200 642
	<p><u>Favosites</u> sp., dalmanellid, <u>Tentaculites</u> sp. collected loose 9 feet up (GSC loc. 50386).</p>	
	<p>Brachiopod fragments, bryozoa fragments, trilobite head fragments, and ostracods collected loose 36 feet up (GSC loc. 50396).</p>	
	<p><u>Coenites</u> cf. <u>C. rectilineatus</u> (Simpson) and <u>Atrypa</u> sp. collected loose 78 feet up (GSC loc. 50387).</p>	
	<p>*<u>Chonetes</u> sp. L, <u>Tentaculites</u> sp., and trilobite fragments collected loose 94 feet up (GSC loc. 50380).</p>	
7	<p>Covered; talus fragments of limestone, argillaceous, dark grey, small jagged fragments, weathers medium grey.</p>	35 442
	<p>Aulopodid, <u>Coenites</u> cf. <u>C. rectilineatus</u> (Simpson), <u>Favosites</u> sp., dalmanellid?,</p>	

Unit	Description	Thickness (feet)	
		Unit	From base
	and echinoderm ossicles with single axial canals collected loose between 30 and 35 feet up (GSC loc. 50382).		
	<u>Coenites</u> sp., <u>Favosites</u> sp., and <u>Trachypora</u> sp. collected loose (GSC loc. 50395).		
6	Covered; talus fragments of limestone, strongly argillaceous, black, small irregular jagged fragments, weathers dark grey.	90	407
	<u>Chonetes</u> sp. L collected loose in lower 48 feet (GSC loc. 50391).		
	<u>Coenites</u> cf. <u>C. rectilineatus</u> (Simpson), <u>Chonetes</u> sp. L, and echinoderm ossicles with single axial canals collected loose 78 feet up (GSC loc. 50390).		
5	Covered; talus fragments of limestone, very strongly argillaceous, black, thin bedded, fissile.	67	317
	<u>Chonetes</u> sp. L, <u>Tentaculites</u> sp., <u>Dechenellurus</u> sp. B sp., and echinoderm ossicles with a single axial canal collected loose 27 feet up (GSC loc. 50385).		
	* <u>Chonetes</u> sp. L, <u>Spinatrypa</u> sp., pelecypod, * <u>Tentaculites</u> sp., and <u>Dechenella</u> sp. collected loose 50 feet up (GSC loc. 50392).		
4	Covered; talus fragments of limestone, very strongly argillaceous, strongly fetid, black, disintegrates into small irregular fragments, weathers very dark grey to black.	57	250

Unit	Description	Thickness (feet)	From
		Unit	base
	<u>Coenites</u> sp., <u>Chonetes</u> sp., <u>Atrypa</u> sp., <u>Philoxene?</u> sp., <u>Tentaculites</u> sp., ostracods?, and echinoderm ossicles with single axial canals collected loose 41 feet up (GSC loc. 50383).		
3	Covered with vegetation.	48	193
2	Covered; talus fragments of limestone, very strongly argillaceous, presumably thin bedded, weathers very dark grey.	61	145
	Silicified <u>Alveolites</u> sp., <u>Coenites</u> sp., and <u>Coenites</u> cf. <u>C. rectlineatus</u> (Simpson) collected loose in lower part of interval; derived from Devonian beds above (GSC loc. 50379).		
	Stromatoporoid, <u>Coenites</u> sp., and echinoderm ossicles with single axial canals collected loose at 50 feet up (GSC loc. 54548).		
1	Covered; talus fragments of limestone, medium grey, aphanitic, thin to medium bedded, weathers light grey; numerous silicified stromatoporoids, <u>Alveolites</u> sp., <u>Aulopora</u> sp., and <u>Favosites</u> sp. (GSC loc. 50379).	84	
	Silicified stromatoporoids, <u>Alveolites</u> sp., and <u>Favosites</u> sp. collected loose 50 feet up (GSC loc. 50393).		
	Station 27NB at base of unit 1 about one-half way up south slope of mountain.		
	Bedding estimated on strata exposed to south 100T/32N.		

Section 18: NORTHERN EDGE OF OGILVIE MOUNTAINS ABOUT EIGHT MILES EAST OF BLACKSTONE RIVER (116H-8)

Section is located in the northern edge of the Ogilvie Mountains about 8 miles east of the Blackstone River. Section was measured from the crest of a mountain ridge at about 65°41'N, 137°10.2'W northward across a valley and another mountain ridge to a highland area along the mountain front at about 65°42'N, 137°11'W. In this area the beds strike east and dip steeply north so that the Ordovician and Silurian beds are exposed in the south and Devonian beds toward the north. Only the Devonian formations are described here.

Section measured by A. W. Norris, assisted by A. J. Jenik, May 23-26, 1962.

MISSISSIPPIAN (Chesterian)	30'; incomplete
MIDDLE AND UPPER DEVONIAN OR YOUNGER	
Unnamed Shale	559'
MIDDLE DEVONIAN	
Ogilvie Formation	2305'
MIDDLE DEVONIAN AND OLDER	
Michelle Formation	381.9'
SILURIAN	
Road River Formation	1213.3'
ORDOVICIAN	
Carbonates	2209.5'; incomplete

Unit	Description	Unit	Thickness (feet) From base
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MISSISSIPPIAN  
(Chesterian)  
(30 feet measured)

- 1 Shale, silty, black, hard, poorly exposed; with a few thin interbeds up to 1-foot thick of black chert; and an occasional loose fragment of limestone, cherty, dark grey, fine grained; a few fragmentary fossils collected loose include: \*Orbiculoidea sp., and \*Leiorhynchus

Unit	Description	Thickness (feet)	
		Unit	From base
	<u>carboniferum</u> Girty, of Nelson, 1961 (GSC loc. 50626).	<u>c.</u> 30	<u>c.</u> 30
	Unit poorly exposed in clearing on small knoll at station 26NB on north side of shallow valley at about 65°42'N, 137°11'W. Bedding 088T/78N.		
MIDDLE AND UPPER DEVONIAN OR YOUNGER			
<u>Unnamed Shale Unit</u> (559 feet thick)			
3	Covered interval across a shallow valley north of mountain front; interval presumably underlain by soft dark grey shale.	<u>c.</u> 520	559
2	Shale, black, fissile; fragments dug out of hillside by rodents.	<u>c.</u> 3	39
1	Covered; talus fan to bottom of slope	<u>c.</u> 36	
MIDDLE DEVONIAN			
<u>Ogilvie Formation</u> (2305 feet thick)			
123	Covered; blocks of limestone, medium brown, aphanitic, evenly thick bedded, weathers light grey.	<u>c.</u> 80	2305
122	Limestone, silty, black, evenly thick bedded, weathers pale orange-brown.	18	2225
121	Limestone, black, aphanitic, evenly thick bedded, weathers orange-brown to medium grey.	14	2207

Unit	Description	Thickness (feet)	
		Unit	From base
120	Limestone, very dark grey and medium brown, aphanitic, thick bedded to massive, weathers medium grey; contains fragments of a small brachiopod with a large beak (GSC loc. 50136).	10	2193
119	Limestone, dark brown, aphanitic, evenly very thick bedded, resistant, weathers medium grey.  Lithological specimen (GSC loc. 50424).	19	2183
118	Covered; talus fragments of limestone similar to unit above.	42	2164
117	Limestone, dark grey, aphanitic, evenly very thick bedded, weathers medium grey.	12	2122
116	Covered; talus fragments of limestone, dark grey, fine grained, evenly thick bedded, weathers light grey; one layer about 4 feet thick of limestone, medium brown, fine grained, even bed, weathers orange-brown; echinoderm ossicles with double axial canals (GSC loc. 50423).	41	2110
115	Covered; talus fragments of limestone, medium grey to brown, thick bedded, weathers light grey.	66	2069
114	Limestone, very dark grey, medium crystalline, massive, resistant, weathers dark grey.  Lithological specimen (GSC loc. 50134).  Station 25NB at top of unit 114. Bedding 070T/70N.	12	2003
113	Covered; talus fragments of limestone, dark brownish grey, evenly thick bedded, weathers very light grey.	8	1991

Unit	Description	Thickness (feet)	
		Unit	From base
112	Limestone, dark brownish grey, fine grained, massive, very resistant, weathers light grey, fairly numerous irregular fissures, some of which are filled with white calcite.	115	1983
111	Limestone, dark grey to black, thick bedded to massive, recessive, weathers light grey; poorly exposed.	22	1868
110	Covered.	24	1846
109	Limestone, medium grey, fine grained, massive, weathers medium grey; upper part poorly exposed.	25	1822
108	Limestone, dark grey, fine grained, massive, resistant, weathers light grey.	18	1797
107	Limestone, crinoidal, medium brown, medium grained, massive, exceedingly resistant, unit highly fractured and some fractures healed with white calcite, unit weathers medium grey; huge caverns present in places.	117	1779
	Echinoderm ossicles from top of unit (GSC loc. 50416). No other fossils seen.		
106	Covered.	8	1662
105	Limestone, dark grey, aphanitic, evenly very thick bedded, weathers medium grey.	3	1654
104	Covered; talus fragments of limestone, aphanitic, medium brown, thick bedded, weathers medium grey.	31	1650.8
	<u>Alveolites</u> sp. collected loose (GSC loc. 50417).		

Unit	Description	Thickness (feet)	
		Unit	From base
103	Limestone, very dark grey, fine grained, evenly thick bedded, weathers dark grey; unit discontinuously exposed.	9.5	1619.8
102	Limestone, very dark grey, evenly thick bedded, beds between 2 to 6 feet thick, weathers medium grey.  <u>Alveolites</u> sp. collected loose (GSC loc. 50418).	42	1610.3
101	Limestone, dark grey and medium brown, evenly very thick bedded, weathers medium grey; contains <u>Alveolites</u> sp. and <u>Coenites</u> sp. (GSC loc. 50415).	32	1568.3
100	Limestone, pale brown, aphanitic, thick bedded, weathers medium grey; discontinuous outcrop.	39	1536.3
99	Limestone, pale and medium brown, aphanitic, beds between 2 to 5 feet thick, weathers medium grey; discontinuously exposed.	21	1497.3
98	Limestone, pale brown, aphanitic, evenly very thick bedded, weathers light grey.  Bedding 080T/85N.	18	1476.3
97	Covered; talus fragments of limestone, medium brown, aphanitic, evenly thick bedded, weathers medium grey.	21	1458.3
96	Covered; unit on strike with this interval appears to consist of limestone, thick bedded, weathers medium grey.	30	1437.3
95	Limestone, dark grey, fine grained, massive, highly resistant, weathers medium grey; unit forms a nearly vertical wall.	12.5	1407.3

Unit	Description	Thickness (feet)	
		Unit	From base
94	Limestone, dark brown, fine grained, beds even and up to 3 feet thick, very resistant; vertical cliff-forming.  Bedding 077T/81S, overturned.	5.8	1394.8
93	Covered; fossils collected loose within interval include: cup coral fragments, <u>Coenites</u> sp., <u>Hexagonaria</u> sp., <u>Syringopora?</u> sp., and echinoderm ossicles with single axial canals (GSC loc. 50150).	14	1389
92	Limestone, dark brownish grey, aphanitic, massive even unit, strongly resistant, weathers medium grey; contains <u>Alveolites</u> sp. (GSC loc. 50420).  Bedding 075T/75S, overturned.	6	1375
91	Covered; coral fragments collected loose (GSC loc. 50419).	51	1369
90	Limestone, medium brown, aphanitic, massive, resistant, weathers medium grey; forms a nearly vertical wall.  Bedding 088T/85N.	9.3	1318
89	Covered, recessive interval.	15	1308.7
88	Limestone, medium brown, aphanitic, very hard, massive, highly resistant, weathers medium grey.	23.5	1293.7
87	Limestone, crinoidal, dark grey, evenly thin bedded, recessive; mainly inaccessible.  <u>Atrypa</u> sp. - finely costate, echinoderm ossicles with single and double? axial canals (GSC loc. 50135).	2	1270.2

Unit	Description	Thickness (feet)	
		Unit	From base
86	Limestone, medium grey, even bed, resistant.	2.5	1268.2
85	Limestone, evenly thin bedded, weathers medium grey.	1.5	1265.7
84	Limestone, medium brown, aphanitic, massive, resistant, weathers medium grey.	6	1264.2
83	Covered; recessive interval.	81	1258.2
82	Limestone, dark brownish grey, medium grained, bioclastic, friable, massive, resistant, weathers medium grey, contains numerous corals and stromatoporoids, but are difficult to extract from matrix.	108	1177.2
	Echinoderm ossicles with double and cross-like axial canals (GSC loc. 50422).		
	<u>Syringopora?</u> sp., echinoderm ossicles with double and cross-like axial canals from 56 feet up (GSC loc. 50421).		
	<u>Alveolites</u> sp. from 83 feet up (GSC loc. 50149).		
	Station 24NB at base of unit 82. Bedding 087T/82N.		
81	Covered; talus fragments of limestone, dark grey, fine grained, evenly medium bedded, recessive, weathers medium grey; numerous corals and stromatoporoids.	32	1069.2
	<u>Favosites</u> sp., <u>Hexagonaria</u> sp., and echinoderm ossicles with double axial canals (GSC loc. 50218).		

Unit	Description	Thickness (feet)	
		Unit	From base
	Station 17NB at top of unit 81 on north slope of mountain.		
80	Limestone, dark brownish grey, aphanitic and fine grained, granular, irregularly medium bedded, recessive, weathers medium grey.	3.5	1037.2
	Lithological specimen (GSC loc. 50221).		
79	Limestone, dark grey, aphanitic, massive, resistant, weathers light grey.	12.5	1033.7
78	Limestone, dark grey, aphanitic, even bed, recessive, weathers dark grey.	2.6	1021.2
77	Limestone, medium brown, aphanitic, beds 3 to 4 feet thick, weathers medium grey.	8.6	1018.6
76	Limestone, dark brownish grey, even bed, weathers medium grey, highly fractured.	1.5	1010
75	Limestone, medium brown, aphanitic, evenly bedded from 4 to 6 feet thick, weathers medium grey.	15	1008.5
74	Limestone, dark grey, aphanitic, evenly thick bedded, recessive, weathers medium grey.	9.8	993.5
73	Limestone, medium brown, fine grained, evenly thick bedded to massive, weathers medium grey.	14.5	983.7
72	Limestone, strongly fetid, dark brownish grey, weathers medium brownish grey.	12	969.2
71	Limestone, dark grey, fine grained, medium bedded, weathers medium grey.	5.5	957.2

Unit	Description	Thickness (feet)	
		Unit	From base
70	Limestone, medium brown, aphanitic, thick bedded, recessive, weathers medium grey.	9.2	951.7
69	Limestone, medium brown, fine grained, evenly thick bedded, weathers medium grey.	16	942.5
68	Limestone, medium brownish grey, thick bedded, weathers medium grey; contains <u>Alveolites?</u> sp., and echinoderm ossicles with single axial canals (GSC loc. 50220).	17.8	926.5
67	Limestone, black, fine grained, evenly thick bedded, weathers medium grey.	5	908.7
66	Limestone, medium brown, aphanitic, evenly thick bedded, variably resistant, weathers medium grey.	10.8	903.7
65	Limestone, almost black, evenly medium bedded, recessive, weathers medium grey.	32	892.9
64	Limestone, medium brown, aphanitic, massive, resistant, weathers medium grey.	4.7	860.9
63	Limestone, argillaceous, medium grey, fine grained, even bed, recessive, weathers medium grey.	3.3	856.2
62	Dolomite, slightly calcareous, pale brown, fine grained, evenly thin bedded, recessive, weathers pale orange-brown.	1.5	852.9
61	Limestone, dark grey to medium brown, aphanitic, evenly thick bedded, weathers light grey with patches of pale orange especially along bedding planes; contains a few <i>Phillipsastraea</i> sp. (GSC loc. 50217).	5	851.4

Unit	Description	Thickness (feet)	
		Unit	From base
	Lithological specimen (GSC loc. 50219).		
60	Covered; talus fragments of limestone, thin to medium bedded, weathers light grey.	c. 45	846.4
59	Limestone, medium brown, aphanitic, massive, weathers light grey; <u>Coenites</u> sp. and <u>Favosites</u> sp. from base of unit (GSC loc. 50216).	15.6	801.4
58	Limestone, irregularly thin to medium bedded, weathers medium grey.	8	785.8
57	Limestone, argillaceous, pale brown, aphanitic, irregularly thin bedded, weathers light grey; very poorly exposed.	4	777.8
56	Limestone, dark brown, aphanitic, massive, weathers light grey.	10	773.8
55	Covered; recessive interval.	4	763.8
54	Limestone, dark brown, aphanitic, evenly thick bedded, weathers light grey.	5	759.8
53	Limestone, dark brownish grey, aphanitic, even bed, irregularly fractured, weathers dark brown.	3	754.8
52	Limestone, dark brown, evenly thick bedded, weathers medium grey; dark grey argillaceous limestone layer 0.8 foot thick 3 feet from top.	7.1	751.8
51	Limestone, argillaceous, dark brown, aphanitic, even bed, irregularly fractured, weathers medium brown.	1.7	744.7
50	Limestone, pale brown, aphanitic, evenly thick bedded, weathers medium grey.	11.1	743

Unit	Description	Thickness (feet)	
		Unit	From base
49	Limestone, pale brown, aphanitic, massive, weathers light grey.	5.5	731.9
48	Covered.  Station 16NB at base of unit 48.	7.8	726.4
47	Limestone, brown, aphanitic, evenly thick bedded, up to 4 feet thick, resistant, weathers medium grey.  Bedding 080T/84N.	14	718.6
46	Limestone, medium grey, fine grained, massive, highly resistant, weathers medium grey.	9	704.6
45	Limestone, dark brownish grey, fine grained, evenly thick beds separated by irregularly thin beds of limestone, argillaceous, weathering brown; recessive.	19	695.6
44	Limestone, dark brownish grey, fine grained, thin to thick bedded and massive, weathers medium grey, resistant.	20	676.6
43	Covered.	11.5	656.6
42	Limestone, black, fine grained, irregularly thick bedded, argillaceous in bottom three feet, weathers medium grey; organic? remains collected loose (GSC loc. 50215).	8	645.1
41	Limestone, dark grey, evenly thick bedded to massive, weathers medium grey.	18	637.1
40	Limestone, argillaceous, pale brown, aphanitic, weathers light grey, recessive, poorly exposed.	2.7	619.1

Unit	Description	Thickness (feet)	
		Unit	From base
39	Limestone, black, fine grained, massive, weathers medium grey, highly resistant.	12.5	616.4
38	Covered; <u>Hexagonaria?</u> sp. collected loose (GSC loc. 50204).	16	603.9
37	Limestone, argillaceous, irregularly thin bedded, weathers medium grey, recessive.	3	587.9
36	Limestone, argillaceous, brown, recessive, weathers medium brown.	1	584.9
35	Limestone, black, fine grained, massive, highly resistant.	6	583.9
34	Covered; <u>Hexagonaria</u> sp. collected loose (GSC loc. 50214).	13	577.9
33	Limestone, evenly medium bedded, inaccessible.	18	564.9
32	Limestone, crinoidal, slightly fetid, dark grey, fine grained, massive, highly resistant; contains <u>Alveolites</u> sp. 18 feet up (GSC loc. 50213).	31	546.9
31	Limestone, medium brown, fine grained, massive, highly resistant, weathers a mottled light and medium grey.	15	515.9
30	Limestone, medium grey, medium grained, evenly thick bedded to massive, weathers medium grey.	30	500.9
29	Covered; limestone, dark grey, medium to thick bedded, separated by argillaceous partings; <u>Favosites</u> sp. collected loose (GSC loc. 50212).	54	470.9
28	Limestone, medium grey, medium and fine grained, evenly thick bedded to massive, weathers medium grey;		

Unit	Description	Thickness (feet)	
		Unit	From base
	<u>Coenites</u> sp., pentamerid fragments, and echinoderm ossicles with double axial canals collected loose (GSC loc. 50211).	36	416.9
27	Limestone, black, fine grained, irregularly bedded, weathers medium grey, recessive; contains crinoid ossicles with double and single canals.	5	380.9
26	Limestone, black, fine grained, irregularly medium bedded, highly and irregularly fractured, weathers a mottled medium and dark grey; contains <u>Receptaculites</u> sp., * <u>Chonetes</u> sp., and echinoderm ossicles with cross-like axial canals (GSC loc. 50210).	49	375.9
25	Limestone, black, fine grained, massive, resistant, weathers medium grey; unit cut by numerous veinlets of white calcite; crinoid ossicles and <u>Atrypa</u> sp. present.	36	326.9
24	Limestone, massive, weathers medium grey; inaccessible; <u>Favosites</u> sp., <u>Gypidula</u> sp., and * <u>Atrypa perfimbriata</u> Crickmay, <u>Bactrites?</u> sp., and echinoderm ossicles with single axial canals, collected loose 18 feet up.	c. 20	290.9
23	Limestone, black, fine grained, massive, irregularly fractured; weathers medium grey; contains <u>Favosites</u> sp. but these are difficult to extract from tough matrix (GSC loc. 50209).	8	270.9
22	Limestone, with argillaceous partings, dark grey, recessive, weathers medium grey.	2	262.9
21	Limestone, fetid, black, fine grained, irregular bed 0.5 to 1 foot thick, weathers medium grey.	1	260.9

Unit	Description	Thickness (feet)	
		Unit	From base
20	Covered by snow and ice, limestone, massive, weathers medium grey.	24	259.9
19	Limestone, black, fine grained, massive, weathers medium grey; contains *stropheodontid?, *Chonetes sp., <u>Atrypa?</u> sp., <u>Emanuella?</u> sp., <u>Dechenella?</u> sp., leperditiid ostracods, and large echinoderm ossicles with single axial canals (GSC loc. 50208).	6	235.9
18	Limestone, argillaceous, weathers a banded medium grey and light grey; inaccessible because of snow and ice on mountain.	12	229.9
17	Limestone, argillaceous, recessive, very poorly exposed.	<u>c.</u> 4	217.9
16	Limestone, almost black, massive, highly resistant, weathers medium grey; <u>Receptaculites</u> sp., <u>Orthonema?</u> sp., ostracods, and echinoderm ossicles with single axial canals collected from near base of unit (GSC loc. 50207).	18.5	213.9
15	Limestone, slightly argillaceous, very dark grey, rubbly bedded, weathers medium grey; <u>Favosites</u> sp., <u>Atrypa</u> cf. <u>A. perfimbriata</u> Crickmay, <u>Spinatrypa</u> sp., ostracod, and echinoderm ossicles with single axial canals present in basal beds (GSC loc. 50206).	4	195.4
14	Limestone, medium grey, recessive; inaccessible because of snow and ice.	8.5	191.4
13	Limestone, very dark grey, fine grained, massive, parting planes about 5 feet apart, weathers dark grey.	18	182.9

Unit	Description	Thickness (feet)	
		Unit	From base
12	Limestone, dark grey, fine grained, evenly thick bedded, highly resistant, weathers dark grey; * <u>Schizoproetus?</u> sp. collected loose (GSC loc. 50205).	30	164.9
11	Limestone, crinoidal, dark grey, fine grained, irregularly bedded, resistant.	11	134.9
10	Limestone, dark grey, fine grained, granular, thick bedded to massive; large echinoderm ossicles with single axial canals collected 10 feet up (GSC loc. 50224).	30	123.9
9	Limestone, argillaceous, thin bedded, recessive; mainly covered by snow and ice.	7	93.9
8	Limestone, some beds strongly fetid, dark grey, fine grained, massive, highly resistant, weathers medium to dark grey; contains douvillinid?, <u>Atrypa cf. A. perfimbriata</u> Crickmay, <u>Ambocoelia?</u> sp., ostracod, and echinoderm ossicles with double axial canals (GSC loc. 50232).	16.5	86.9
7	Limestone, black, fine grained, irregularly thin bedded, separated by argillaceous limestone partings; <u>Warrenella</u> sp. (GSC loc. 50204).	11	70.4
6	Limestone, dark grey, fine grained, granular, irregularly thin bedded, separated by argillaceous partings, unit weathers medium grey.	3	59.4
5	Limestone, argillaceous, crinoidal, recessive, weathers dark grey.	1.2	56.4
4	Limestone, pale brown, aphanitic, massive, highly resistant, weathers medium grey with patches of light orange; colonial corals from about middle of unit		

Unit	Description	Thickness (feet)	
		Unit	From base
	(GSC loc. 50233); <u>Atrypa</u> cf. <u>A. perfimbriata</u> Crickmay collected loose (GSC loc. 50303).	26	55.2
3	Limestone, black, fine grained, evenly thick bedded, weathers medium grey.	6.2	29.2
2	Limestone, black, fine grained, evenly thick bedded, beds between 2 and 4 feet thick, highly resistant, weathers medium grey; stromatoporoids, <u>Hexagonaria?</u> sp., and <u>Herrmannina?</u> sp. present, one bed 3 feet up contains numerous stromatoporoids (GSC loc. 50222); dalmanellid, <u>Schizophoria?</u> sp., <u>Atrypa</u> sp., and <u>Styliolina</u> sp. collected loose (GSC loc. 50202).	11	23
1	Limestone, black, fine grained, very thick fairly evenly bedded, resistant, but less so than unit above, weathers medium grey; poorly preserved stropheodontid, and echinoderm ossicles with single and double axial canals collected loose at base of unit (GSC loc. 50201).	12	

Station 15NB at base of unit.

Bedding 075T/71N.

#### MIDDLE DEVONIAN AND OLDER

##### Michelle Formation (381.9 feet thick)

- 40 Limestone, pale brown, very fine grained, evenly thick bedded, beds between 2 and 3 feet thick, highly resistant, weathers medium grey; douvillinid, ostracod, echinoderm ossicles with single, and

Unit	Description	Thickness (feet)	
		Unit	From base
	double? axial canals collected loose (GSC loc. 50151).	18	381.9
39	Limestone, some beds slightly argillaceous, black, fine grained, evenly thick bedded, weathers medium grey; <u>Atrypa perfimbriata</u> Crickmay collected loose (GSC loc. 50146); small <u>Favosites</u> sp. from 4 feet up (Field No. 14NBt).	16	363.9
38	Limestone, pale brown, aphanitic, recessive, weathers light grey; unit poorly exposed; one bed near top contains poorly preserved <u>Amphipora</u> sp.	11.3	347.9
	Costate pentamerid?, concentrically ornamented productid fragment, <u>Michelinoceras?</u> sp., <u>Dechenella</u> sp., echinoderm ossicles with single, double, and cross-like axial canals collected loose (GSC loc. 50145).		
37	Limestone, pale brown, aphanitic, massive, strongly resistant, weathers medium grey; <u>Coenites?</u> <u>rectilineatus</u> (Simpson) collected loose (GSC loc. 50157).	12	336.6
36	Limestone, pale brown, aphanitic, evenly thick bedded, alternating with limestone, black, aphanitic, colonial corals present 11 feet up (GSC loc. 50133).	19.3	324.6
35	Limestone, medium brownish grey, aphanitic, massive, weathers light brownish grey; <u>Spinatrypa</u> sp. collected loose (GSC loc. 50152).	2.7	305.3
34	Covered; stromatoporoid and indeterminate ostracods collected loose at about 36 feet up (GSC loc. 50163).	100	302.6

Unit	Description	Thickness (feet)	
		Unit	From base
33	Limestone, silty, pale brown, fine grained, massive, weathers medium grey; contains <u>Amphipora</u> sp., and small gastropods.	11	192.6
32	Covered.	10.5	181.6
31	Limestone, pale brown, aphanitic, massive, weathers medium grey; cf. <u>Coenites rectilineatus</u> (Simpson) present 2 feet up (GSC loc. 50138).	6.2	171.1
30	Mainly covered; one bed of limestone showing, pale brown, fine grained, evenly thick bedded.	5	164.9
29	Limestone, pale brown, fine grained, massive, weathers medium grey; contains numerous small <u>Coenites</u> sp. (GSC loc. 50160).	3.2	159.9
28	Covered.	9	156.7
27	Limestone, pale brown, aphanitic, massive, resistant, weathers medium grey; contains <u>Coenites</u> sp., and small concentrically ornamented pelecypod (GSC loc. 50131).  Bedding 080T/83N.	2	147.7
26	Dolomite, light brown, very fine grained, even bed, weathers pale brown; stromatoporoid and <u>Coenites</u> sp. collected loose (GSC loc. 50155).	2	145.7
25	Covered.	4	143.7
24	Limestone, black, fine grained, massive, weathers dark grey; a bed 4 inches thick of limestone, light brown, aphanitic, 1 foot from base; poorly preserved structures suggestive of <u>Amphipora</u> sp. (GSC loc. 50130).	3	139.7

Unit	Description	Thickness (feet)	
		Unit	From base
23	Covered.	6	136.7
22	Limestone, medium brownish grey, fine grained, hard, massive, weathers medium grey; contains organic? fragments (GSC loc. 50147).	7.5	130.7
21	Limestone, dark brownish grey, aphanitic, massive, resistant, weathers a mottled light and medium grey; contains nodules of light grey weathering silty limestone.	9	123.2
20	Limestone, light brownish grey, evenly medium bedded, recessive, weathers medium grey.	3	114.2
19	Covered; fragments of limestone, argillaceous, weathers pale brown.  <u>Favosites?</u> sp. collected loose (GSC loc. 50129).	12	111.2
18	Limestone, dark brownish grey, massive, weathers dark grey; unit contains a few algal structures.  Small rhynchonelloid fragments and ostracod traces collected loose (GSC loc. 50138).	5.2	99.2
17	Limestone, light grey, fine grained, evenly thick bedded, recessive towards top.  <u>Sphenotus?</u> sp., ostracod, echinoderm ossicles with single, and double? axial canals collected loose towards top (GSC loc. 50162).	3	94
16	Limestone, light grey, fine grained, granular, medium bedded, faintly colour laminated, weathers light and medium grey.	3.4	91

Unit	Description	Thickness (feet)	
		Unit	From base
15	Limestone, black, fine grained, irregular bed, weathers a mottled light and dark grey; contains numerous stromatoporoids including <u>Amphipora</u> sp., <u>Atrypa</u> sp. collected loose from this interval (GSC loc. 50154).	2.2	87.6
14	Covered; talus fragments of limestone, argillaceous, weathers pale brown.	4.5	85.4
13	Limestone, black, fine grained, massive, even, weathers medium grey.	8	80.9
12	Limestone, laminated pale brown and light grey, aphanitic, recessive, weathers same.  Lithological specimen (GSC loc. 50132).	0.7	72.9
11	Limestone, very pale brown, very fine grained, massive, highly resistant, weathers light to medium grey.	4	72.2
10	Limestone, strongly argillaceous, recessive, weathers pale orange.	0.5	68.2
9	Covered.	12	67.7
8	Limestone, black to very dark grey, fine grained, evenly thick bedded, resistant, weathers medium brownish grey.  Lithological specimen (GSC loc. 50144).	1.5	55.7
7	Covered.	8.5	54.2
6	Limestone, pale brownish grey, fine grained, evenly thick bedded, weathers light grey.  Lithological specimen (GSC loc. 50139).	6	45.7
5	Covered; <u>Favosites</u> sp. collected loose (GSC loc. 50141).	16.8	39.7

Unit	Description	Thickness (feet)	
		Unit	From base
4	Limestone, slightly fetid, almost black, fine grained, granular, hard, resistant, weathers light brownish grey.  Lithological specimen (GSC loc. 50148).	2.6	22.9
3	Covered.	14.5	20.3
2	Limestone, black, fine grained, even bed, weathers light grey; contains small stromatoporoids.	3	5.8
1	Limestone, light brownish grey, fine grained, even bed, weathers light grey; contains vague traces of <u>Amphipora?</u> sp. (GSC loc. 50137).  Station 14NB at base of unit 1.  Bedding 075T/74N.	2.8	

#### SILURIAN

##### Road River Formation (1213.3 feet thick)

15	Covered.	296	1213.3
14	Covered; talus fragments of limestone, dark grey, fine grained, presumably thin to medium bedded, weathers light grey; mixed with fragments of limestone, argillaceous, weathers pale orange.	95	917.3
13	Covered; at 130 feet up talus fragments of limestone, light grey, fine grained, weathers very light grey; mixed with fragments of limestone, argillaceous, weathers light orange and light grey, and contains irregular masses of white coarsely crystalline calcite.	241	822.3

Unit	Description	Thickness (feet)	
		Unit	From base
12	Covered; at 9 feet up talus fragments of limestone breccia, weathers light grey, in part replaced by white coarsely crystalline calcite.	43	581.3
11	Covered; talus fragments of limestone, black, fine grained, presumably medium bedded, weathers medium brownish grey.	14	538.3
10	Covered.	110	524.3
9	Limestone, black, aphanitic, even bed, resistant, weathers medium grey.	1.3	414.3
8	Covered.	1	413
7	Limestone, black, aphanitic, even bed, weathers medium grey.	0.8	412
	Small <u>Favosites</u> sp. collected loose (GSC loc. 50156).		
6	Limestone, moderately argillaceous, black, thinly bedded, recessive, weathers dark grey, very poorly exposed.	13	411.2
	Stropheodontid (GSC loc. 50159).		
	Bedding 079T/22N.		
5	Limestone, black, fine grained, even thick bedded, weathers medium grey; contains coarsely costate brachiopod and cf. <u>Paracyclas</u> sp. (GSC loc. 50140 & 50142).	1.7	398.2
4	Limestone, black, fine grained, thin bedded, recessive, weathers dark grey; stropheodontids, <u>Atrypa</u> sp. and concentrically ornamented pelecypod collected loose (GSC loc. 50158).	1.3	396.5

Unit	Description	Thickness (feet)	
		Unit	From base
3	Limestone, black, fine grained, even bed, resistant, weathers dark grey.  Lithological specimen (GSC loc. 50143).	1.2	395.2
2	Covered; at 95 feet talus fragments of limestone, black, fine grained, presumably thin bedded, weathers dark grey; also fragments of limestone, partly dolomitic, fine grained, granular, in part vuggy, weathers very light grey.  Inarticulate brachiopods collected loose from 22 feet up (GSC loc. 50153).  Crinoid ossicles with double canals and cross-like canals collected loose 57 feet up (GSC loc. 50161).  Station 13NB at base of unit 2 on north side of creek at base of mountain slope.	99	394
1	Covered by trees in valley south of creek.	295	

ORDOVICIAN

Recessive Cherty Limestone Unit  
(2209.5 feet; incomplete)

60	Covered; talus blocks of limestone, with considerable chert, dark grey, fine grained, probably thick bedded to massive, weathers medium grey; numerous silicified fossils consisting of <u>Favosites</u> sp., <u>Streptelasma</u> sp., and others (GSC loc. 50554).  Station 23NB at top of unit 60 near bottom of talus fan and beginning of trees.	136	2209.5
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Unit	Description	Thickness (feet)	
		Unit	From base
59	Covered.	18	2073.5
58	Limestone, with nodules and lenses of light grey chert, dark grey, massive, weathers medium grey; contains large <u>Favosites</u> sp. which could not be extracted from tough matrix.	18	2055.5

Section 24: MOUNT BURGESS (116J-5)

Section extends from the bottom of a valley at approximately 66°03'N, 139°35.2'W on the east side of an unnamed mountain immediately east of Mount Burgess westward to the peak of Mount Burgess at approximately 66°03'N, 139°37'W. In this area the dip is westward so that the lowest beds are exposed in the east. The lower part of the succession consists predominantly of dolomite of Middle Ordovician and older? ages and is exposed on the east flank of the unnamed mountain. Older beds of the Neruokpuk Formation outcrop a short distance down the valley to the south. The upper part of the succession consists predominantly of carbonates of Lower and Middle Devonian ages that underlie Mount Burgess and cap the mountain to the east. The Devonian is overlain by shales and carbonates of Mississippian age, which outcrop in the valley immediately west of Mount Burgess. Only the Devonian part of the succession is described here.

Section measured by A. W. Norris, assisted by D. L. Jordan, August 14-19, 1962.

MIDDLE DEVONIAN	
Ogilvie Formation	2190.1'
MIDDLE DEVONIAN AND OLDER	
Gossage Formation	352.2'
MIDDLE ORDOVICIAN AND OLDER?	3563.9'

Unit	Description	Thickness (feet)	
		Unit	From base
MIDDLE DEVONIAN			
	<u>Ogilvie Formation</u> (2190.1 feet thick)		
	Recessive Medium to Thin Bedded, Light Grey Weathering Limestone Unit.		
174	Limestone, argillaceous, medium brown, fine grained, rubbly thin bedded, weathers very light grey; contains fairly numerous <u>Coenites</u> sp. (GSC loc. 54950) from 10 feet up.	11	2190.1

Unit	Description	Thickness (feet) From base
	Unit 208 caps the dip slope of Mount Burgess. Station 316NB on peak of ridge of Mount Burgess (66°03'N, 139°37'W). Bedding 103T/12N.	
	Near the bottom of the valley immediately west of Mount Burgess, unit 174 of the Ogilvie Formation is overlain by shale and limestone of Mississippian age.	
173	Limestone, black, fine grained, irregularly thin bedded, from 3 to 5 inches thick, weathers light grey; <u>Amphipora</u> sp. abundant more or less throughout.	2 2179.1
172	Limestone, dark grey, aphanitic, massive, scarp-forming, weathers light grey; <u>Stringocephalus obesus</u> Grabau numerous in top 4 feet; <u>Amphipora</u> sp. present throughout unit (GSC loc. 54250).	10 2177.1
171	Limestone, slightly argillaceous, black, aphanitic, evenly medium bedded, weathers pale orange-brown; contains some <u>Amphipora</u> sp., and very poorly preserved brachiopods.	6 2167.1
170	Limestone, dark grey, fine grained, rubbly thin bedded, weathers light grey.	6 2161.1
169	Limestone, dark grey, aphanitic, irregularly medium to thick bedded, weathers light grey.	10.5 2155.1
	This unit caps part of ridge along top of Mount Burgess.	
168	Limestone, dark grey, aphanitic, even bed, hard, resistant, weathers light grey.	3 2144.6
167	Limestone, argillaceous, black, fine grained, rubbly to even thin bedded, recessive, weathers light grey; some beds contain <u>Amphipora</u> sp.	5.3 2141.6

Unit	Description	Thickness (feet)	
		Unit	From base
166	Limestone, dark brownish grey, fine grained, evenly thick bedded, fairly resistant, weathers light grey; stromatoporoid collected loose 3 feet up (GSC loc. 54949).	7.3	2136.3
165	Limestone, dark grey, fine grained, massive, resistant, weathers light grey; <u>Coenites</u> sp. exceedingly numerous; sample (GSC loc. 54948) from 4 feet up.	4.2	2129
164	Limestone, argillaceous, rubbly thin bedded, recessive, weathers medium grey.	1.5	2124.8
163	Limestone, dark grey, aphanitic, evenly and irregularly, thin to medium bedded, weathers light grey; poorly exposed.	23.5	2123.3
162	Limestone, dark grey, fine grained, irregularly medium bedded; some beds with very numerous <u>Coenites</u> sp.; poorly preserved <u>Stringocephalus</u> sp. in upper bed, sample (GSC loc. 54947) from 9 feet up; fossils slightly silicified, chert present as fine tracery.	10.4	2099.8
161	Limestone, dark grey, fine grained, even bed, resistant, weathers light grey.	1.8	2089.4
160	Covered; large blocks of limestone, thick bedded, weathers light grey.	10.3	2087.6
159	Limestone, dark grey, fine grained, thick bedded to massive, fairly resistant, weathers light grey.	7.5	2077.3
	<u>Coenites</u> sp. and <u>Stringocephalus</u> sp. (GSC loc. 54946) collected loose 1 foot up.		

Unit	Description	Thickness (feet)	
		Unit	From base
158	Limestone, dark brown, aphanitic, rubbly thin to medium bedded, scarp-forming, weathers light grey; some beds contain numerous <u>Coenites</u> sp.	9.5	2069.8
157	Limestone, dark grey, irregularly thin to medium bedded, weathers light grey; fairly resistant but poorly exposed; some beds with fine chert tracery; <u>Coenites</u> sp. (GSC loc. 54945) exceedingly numerous in bed 6 feet up.	22.8	2060.3
156	Limestone, argillaceous, dark grey, rubbly thin bedded, recessive, weathers light grey; numerous <u>Coenites</u> sp. in some beds; <u>Stringocephalus</u> sp. (GSC loc. 54944) collected loose 19 feet up.	23.8	2037.5
155	Limestone, dark brown, aphanitic, irregularly medium bedded, resistant, weathers light grey; numerous <u>Coenites</u> sp. in top 2 feet of unit.	5.5	2013.7
154	Covered; blocks of limestone, weathers light grey; contains numerous <u>Coenites</u> sp.	29	2008.2
153	Limestone, medium brown, aphanitic, irregularly thin bedded, contains lensing beds and nodules of black chert; moderately recessive.	5	1979.2
152	Limestone, medium brown, fine grained, nodular and irregularly thin to medium bedded, weathers light grey; moderately recessive, transitional upper contact.	9.2	1974.2
151	Covered.	5	1965
150	Limestone, medium brown, fine grained, irregularly medium bedded, fairly resistant, weathers light grey.	6	1960

Unit	Description	Thickness (feet)	
		Unit	From base
149	Limestone, argillaceous, dark brown, rubbly thin bedded; contains numerous <u>Coenites</u> sp. and spherically shaped stromatoporoids, sample (GSC loc. 54943) from basal 8 feet.	11	1954
148	Limestone, medium brown, aphanitic, thin to medium bedded, weathers light grey.	10	1943
147	Limestone, medium brown, aphanitic, evenly thick bedded to massive, resistant, weathers light grey.	6	1933
146	Limestone, dark brownish grey, aphanitic, thick bedded, weathers light grey; fairly resistant; numerous <u>Amphipora</u> sp. in upper 4 feet.	8.5	1927
145	Limestone, dark grey, aphanitic, evenly thick bedded, with thin interbeds of rubbly argillaceous limestone, weathers light grey; <u>Amphipora</u> sp. exceedingly numerous in some beds; <u>Stringocephalus</u> sp. numerous and associated with <u>Amphipora</u> sp. in a bed 2 feet thick 16 feet up (GSC loc. 54942).	26	1818.5
144	Limestone, medium brown, fine grained, evenly medium bedded, weathers light grey; numerous <u>Amphipora</u> sp. and <u>Stringocephalus</u> sp. in top bed.	4.8	1892.5
143	Limestone, argillaceous, dark grey, rubbly thin bedded, weathers medium grey; recessive; poorly exposed; some beds contain numerous <u>Amphipora</u> sp.	26	1887.7
142	Limestone, dark grey, evenly and irregularly thin to medium bedded, weathers light grey; recessive and unevenly exposed; some beds contain		

Unit	Description	Thickness (feet)	
		Unit	From base
	numerous <u>Coenites</u> sp. and some <u>Stringocephalus</u> cf. <u>S. obesus</u> Grabau (GSC loc. 54941).	16	1861.7
141	Limestone, argillaceous, dark grey, rubbly thin bedded, weathers light grey; recessive; contains <u>Coenites</u> sp., <u>Dendrostella?</u> sp., and <u>Stringocephalus</u> cf. <u>S. obesus</u> Grabau (GSC loc. 54940).	14.3	1845.7
	<u>Ramparts-Forming Limestone Unit</u>		
140	Limestone, medium brown, aphanitic, evenly thick bedded to massive, weathers light grey; some beds contain numerous <u>Coenites</u> sp.	27	1831.4
	A profusion of <u>Coenites</u> sp. and <u>Stringocephalus</u> cf. <u>S. obesus</u> Grabau (GSC loc. 54939) present in loose blocks at top of unit.		
139	Limestone, dark brown, fine grained, medium bedded, weathers light grey; numerous <u>Coenites</u> sp. and macerated fragments of <u>Stringocephalus</u> sp.	9	1804.4
138	Limestone, dark brown, aphanitic, rubbly thin bedded, weathers medium to dark brown, recessive; contains fairly numerous stromatoporoids, including <u>Coenites</u> sp., and numerous macerated <u>Stringocephalus</u> sp. in some beds (GSC loc. 54938).	5	1795.4
137	Limestone, dark brown, fine grained to aphanitic, massive, and in places rubbly bedded, weathers dark grey; layers of numerous <u>Coenites</u> sp. scattered throughout.	28.5	1790.4

Unit	Description	Thickness (feet)	
		Unit	From base
136	Limestone, argillaceous, medium brown, fine grained, rubbly thin bedded, weathers medium grey; some beds contain numerous matted <u>Coenites</u> sp.; pelecypod collected loose 6.5 feet up (GSC loc. 54937).	6.5	1761.9
135	Limestone, dark brown, fine grained, weathers light grey; unit made up largely of colonies of <u>Coenites</u> sp.	9	1755.4
134	Limestone, dark brown, fine grained, evenly thick bedded to massive, weathers light grey; stromatoporoids abundant, and <u>Coenites</u> sp.	22.3	1746.4
133	Limestone, with argillaceous partings, dark brown, aphanitic, nodular very thin bedded, weathers medium grey; recessive; some beds contain numerous <u>Coenites</u> sp. (GSC loc. 54936).	2	1724.1
132	Limestone, dark brown, fine grained, massive, weathers very light grey; scarp-forming.	15.8	1722.1
131	Limestone, silty and argillaceous, black and dark brown, aphanitic, rubbly thin bedded, weathers very dark grey; recessive; contains a few <u>Coenites</u> sp.	7.3	1706.3
130	Limestone, dark brown, massive, resistant, scarp-forming, weathers light grey; <u>Coenites</u> sp. exceedingly abundant throughout; sample (GSC loc. 54935) from 4 feet up.	12.5	1699
129	Limestone, dark grey, fine grained, massive, scarp-forming, weathers light grey; <u>Stringocephalus</u> sp. present in talus.	17	1686.5
128	Limestone, dark brown, aphanitic, very evenly thin to medium bedded, weathers		

Unit	Description	Thickness (feet) From base
	light grey; slightly recessive; <u>Stringocephalus</u> sp. collected loose (GSC loc. 54934).	5.3 1669.5
127	Limestone, light grey, fine grained, massive, weathers light grey, contains numerous stromatoporoids, <u>Coenites</u> sp.; <u>Stringocephalus</u> sp. collected loose 2 feet up (GSC loc. 54933).	4.2 1664.2
126	Limestone, dark brownish grey, aphanitic, evenly very thick bedded to massive, weathers light grey; interbeds of rubbly limestone with numerous <u>Coenites</u> sp.	29.4 1660
125	Limestone, dark grey, rubbly thin bedded, between 1 to 5 inches thick, slightly recessive, weathers medium to dark grey; <u>Coenites</u> sp. abundant throughout ' <u>Bythocypris</u> ' sp. sparse (GSC loc. 54932).	7.9 1630.6
124	Limestone, dark grey, fine grained, massive, weathers light grey; vertical cliff-forming.	14.3 1622.7
123	Limestone, dark brownish grey, aphanitic, massive, weathers light grey; vertical cliff-forming except upper 1.2 feet, which is irregularly thin bedded and slightly recessive in places.	16.7 1608.4
122	Limestone, medium brown, aphanitic, irregularly bedded between 0.7 to 1.3 feet thick, weathers light grey; spherical stromatoporoid and <u>Coenites</u> sp. collected between 11 and 12 feet up (GSC loc. 54931); stromatoporoids numerous throughout.	16.5 1591.7
121	Covered; <u>Alveolites</u> sp. and <u>Coenites</u> sp. collected loose (GSC loc. 54930).	3.2 1575.2

Unit	Description	Thickness (feet)	
		Unit	From base
120	Limestone, dark brownish grey, massive, vertical cliff-forming, weathers light grey; contains an occasional small stromatoporoid; sample (GSC loc. 54929) from 2 feet up.	11.5	1572
119	Limestone, dark grey, fine grained, rubbly thin bedded, weathers light grey; recessive.	2.1	1560.5
118	Limestone, very dark grey, aphanitic, evenly thick bedded, between 2 to 4 feet thick, weathers light grey.	10.5	1558.4
117	Limestone, medium brown to dark grey, fine grained, massive, vertical cliff-forming, weathers light grey; stromatoporoid, <u>Iteophyllum?</u> sp. collected 5 feet up (GSC loc. 54928).	13	1547.9
116	Limestone, light brown, fine grained, massive, vertical cliff-forming, weathers light grey.	13.8	1534.9
115	Limestone, medium brown, fine grained, massive, weathers light grey; parting planes about 6 feet apart.	12.3	1521.1
114	Limestone, dark brown, aphanitic, some of the beds made up largely of <u>Coenites</u> sp., weathers medium grey and very light pinkish grey; relatively recessive.	6.7	1508.8
113	Limestone, dark grey, fine grained, massive, resistant, weathers light grey; contains stromatoporoids and <u>Coenites</u> sp.	6	1502.1
112	Limestone, dark grey to black, fine grained, thick bedded, weathers dark grey.  <u>Stromatoporoids</u> , <u>Coenites</u> sp., and <u>Stringocephalus</u> sp. (GSC loc. 54927) collected loose 10 feet up.	49	1496.1

Unit	Description	Thickness (feet)	
		Unit	From base
	Station 315NB at top of unit 112 about three-quarters up the east side of Mount Burgess. Bedding 119T/36N.		
111	Limestone, medium brown, fine grained, evenly thick bedded to massive, resistant, scarp-forming, weathers light grey; numerous <u>Coenites</u> sp. in talus.	15.8	1447.1
110	Limestone, dark brown, aphanitic, evenly thick bedded to massive, cliff-forming, weathers light grey; a few <u>Coenites</u> sp. noted in places; and <u>Stringocephalus</u> sp. fragments noted loose.	25	1431.3
109	Limestone, dark brownish grey, aphanitic, massive, vertical cliff-forming, weathers light grey; stromatoporoid collected 4 feet up (GSC loc. 54254); stromatoporoid and <u>Stringocephalus</u> sp. collected loose 5.3 feet up (GSC loc. 54255).	12.3	1406.3
108	Limestone, dark grey, aphanitic, massive, upper 3 feet evenly thick bedded, vertical cliff-forming, weathers light grey.	10.3	1394
107	Limestone, pale to medium brown, fine grained, massive, vertical cliff-forming, weathers light grey.	9	1383.7
106	Limestone, pale brown, fine grained, massive, cliff-forming, weathers light grey; stromatoporoids, <u>Coenites</u> sp. and <u>Stringocephalus</u> sp. from 19 feet up (GSC loc. 54926).	28.5	1374.7
105	Limestone, medium brown, fine grained, granular, thin bedded, slightly recessive, weathers light grey; <u>Emanuella</u> sp. from 3 feet up, and a colonial coral from 12 feet up (GSC loc. 54253).	12.8	1346.2

Unit	Description	Thickness (feet)	
		Unit	From base
104	Limestone, medium brown, aphanitic, massive, vertical cliff-forming, weathers light grey; sparsely fossiliferous; well preserved stromatoporoids and <u>Coenites</u> sp. present 19 feet up but these could not be extracted from tough matrix.	23.5	1333.4
103	Limestone, cherty, fine grained to aphanitic, massive, light grey chert as irregular beds between 1/2 to 3 inches thick, spaced about 1 foot apart, and weathering pale orange-brown; <u>Archimedes?</u> sp. collected loose (GSC loc. 54242) at 7 feet up.	19	1309.9
102	Limestone, black, aphanitic, massive, vertical scarp-forming, weathers light grey; <u>Coenites</u> sp. abundant at some horizons.  Digitate stromatoporoid, <u>Coenites</u> sp. from 7 feet up, and * <u>Stringocephalus</u> sp. collected loose 7 and 15 feet up (GSC loc. 54924); <u>Coenites?</u> sp., colonial coral fragments, and <u>Stringocephalus</u> sp. collected loose 61 feet up (GSC loc. 54925).	61	1290.9
101	Limestone, medium brown, aphanitic, massive, very few parting planes, vertical cliff-forming, weathers light grey; contains fairly numerous stromatoporoids and corals; stromatoporoids, <u>Favosites</u> sp., and brachiopods collected from 9 feet up (GSC loc. 54923).	24.5	1229.9
100	Limestone, very dark grey, massive, but in places rubbly weathering, weathers light grey; stromatoporoids and corals fairly numerous; stromatoporoids, <u>Favosites</u> sp. collected 5 and 25 feet up (GSC loc. 54922).	27	1205.4

Unit	Description	Thickness (feet)	
		Unit	From base
99	Limestone, dark grey, fine grained to aphanitic, massive, scarp-forming, weathers light grey; unit richly fossiliferous; stromatoporoids, corals, and <u>Stringocephalus</u> cf. <u>S. sapiens</u> Crickmay from 6 feet up (GSC loc. 54251).	21	1178.4
98	Limestone, dark grey, fine grained, rubbly thin to medium bedded, weathers medium brownish grey; unit richly fossiliferous: <u>Alveolites</u> sp., <u>Favosites</u> sp., other colonial corals, and echinoderm ossicles with single axial canals collected 5 feet up (GSC loc. 54919); <u>Favosites</u> sp., <u>Hexagonaria</u> sp., <u>Syringopora</u> sp., and other colonial corals from 13 feet up (GSC loc. 54920); stromatoporoids, <u>Alveolites</u> sp., <u>Coenites</u> sp., colonial coral, and <u>Stringocephalus</u> sp. from 25 feet up (GSC loc. 54921).	24.5	1157.4
97	Limestone, dark brown, aphanitic, massive, pinnacle-forming, weathers light and medium grey; closely and irregularly jointed; unit richly fossiliferous: <u>Coenites</u> sp., <u>Favosites</u> sp. and echinoderm ossicles with single axial canals collected loose 6 feet up (GSC loc. 54917); <u>Coenites</u> sp., <u>Favosites</u> sp., coral fragments, gastropod fragments, echinoderm ossicles with single and double axial canals collected loose 13 feet up (GSC loc. 54270); <u>Favosites</u> sp., <u>Stringophyllum?</u> sp., <u>Syringopora?</u> sp., and * <u>Schuchertella</u> sp. collected loose 17 feet up (GSC loc. 54918).	17.4	1132.9
96	Limestone, dark brown, aphanitic, thick bedded to massive, weathers light grey, relatively recessive.	10.3	1115.5

Unit	Description	Thickness (feet)	
		Unit	From base
95	Limestone, medium brown, aphanitic, massive, highly fractured, cavernous, weathers light grey and medium brownish grey; <u>Alveolites</u> sp., <u>Coenites</u> sp. and <u>Favosites</u> sp. from 14.4 feet up (GSC loc. 54914); stromatoporoids, <u>Coenites</u> sp., and <u>Favosites</u> sp. collected loose 30 feet up (GSC loc. 54915); <u>Favosites</u> sp. and <u>Utaratuia</u> sp. from 38 feet up (GSC loc. 54916).	38.2	1105.2
	Station 314NB at top of unit 95 about two-thirds distance up east flank of Mount Burgess.		
94	Limestone, dark brownish grey, fine grained, rubbly thin to medium bedded, weathers light grey; colonial corals in basal 2 feet.	11.6	1067
	Lithological specimen from 5 feet up (GSC loc. 54913); aulopodid? and other coral fragments collected loose (GSC loc. 54269).		
93	Limestone, slightly crinoidal, black to dark brown, fine grained to aphanitic, massive, cliff-forming, weathers medium brownish grey; lower 3 feet slightly less resistant than beds above and below; <u>Coenites</u> sp. and <u>Favosites</u> sp. collected loose (GSC loc. 54268).	15.5	1055.4
92	Limestone, pale brownish grey, fine grained, massive, weathers light grey; unit very resistant; transitional upper contact.	9.8	1039.9
91	Limestone, dark grey, fine grained, rubbly thick bedded, weathers medium grey, fairly resistant; contains small stromatoporoids (GSC loc. 54267).	7.8	1030.1

Unit	Description	Thickness (feet)	
		Unit	From base
	Station 313NB at top of unit 125 and base of an escarpment on east flank of Mount Burgess.		
90	Limestone, dark grey, fine grained, massive, highly resistant, weathers medium grey; contains vague traces of organic remains; stromatoporoids, <u>Coenites</u> sp., and other colonial coral collected loose (GSC loc. 54912).	3	1022.3
89	Limestone, slightly silty and argillaceous, light brownish grey, fine grained; contains a rich coral fauna; <u>Coenites</u> sp. exceedingly numerous in lower 2 feet, also <u>Alveolites</u> sp., <u>Favosites</u> sp., <u>Hexagonaria</u> sp., and <u>Phillipsastrea</u> sp. scattered throughout (GSC loc. 54911).	7.5	1019.3
88	Covered; talus fragments, medium grey to medium brown, rubbly thin bedded, weathers medium grey; <u>Coenites</u> sp. and <u>Syringopora?</u> sp. collected loose 5 and 13 feet up, and <u>Favosites</u> sp. collected loose 13 feet up (GSC loc. 54266).	16.5	1011.8
87	Limestone, dark brown, very fine grained, massive, very resistant, weathers very light grey.	3	995.3
86	Covered; talus fragments of limestone, medium grey, fine grained, rubbly thin bedded, weathers medium grey; stromatoporoids and <u>Favosites</u> sp. collected loose in this interval (GSC loc. 54910).	49	992.3
85	Limestone, medium brown, aphanitic, massive, rubbly weathering, resistant, weathers light grey.	2.8	943.3
84	Covered; stromatoporoids and <u>Favosites</u> sp. numerous in talus (GSC loc. 54909).	19.7	940.5

Unit	Description	Thickness (feet)	
		Unit	From base
83	Limestone, cherty, dark grey, fine grained, even bed, weathers very light grey; contains pale brown weathering jagged nodules of chert.	1	920.8
82	Covered; <u>Favosites</u> sp., <u>Hexagonaria</u> sp., and <u>Syringopora</u> ? sp. collected loose (GSC loc. 54908).	2	919.8
81	Limestone, medium brown, fine grained, massive, rubbly weathering, weathers very light grey; contains a few poorly preserved stromatoporoids and <u>Coenites</u> sp. (GSC loc. 54907).	4.3	917.8
80	Covered; <u>Favosites</u> sp. and <u>Syringopora</u> ? sp., and trilobite tail fragments collected loose (GSC loc. 54906).	18.4	913.5
79	Limestone, dark brownish grey, fine grained, massive, weathers very light grey; with irregular nodules of pale brown weathering chert; very poorly preserved silicified stromatoporoids and corals.	3	895.1
78	Covered; talus fragments of limestone, dark grey, fine grained, presumably rubbly thin bedded, weathers medium grey; numerous corals including <u>Alveolites</u> sp., <u>Favosites</u> sp. and others (GSC loc. 54905).	42.5	892.1
77	Limestone, slightly argillaceous, dark grey, fine grained, massive, weathers light grey; poorly exposed; <u>Alveolites</u> sp., <u>Favosites</u> spp., and <u>Hexagonaria</u> sp. collected loose (GSC loc. 54904).	13.7	849.6
76	Limestone, dark brownish grey, fine grained, massive, very resistant, highly fractured, weathers light grey; <u>Alveolites</u> sp. and other fossils collected		

Unit	Description	Thickness (feet)	
		Unit	From base
	loose at base of unit (GSC loc. 54264); stromatoporoids, <u>Alveolites</u> sp., <u>Coenites</u> sp., and <u>Favosites</u> sp. collected loose 12 feet up (GSC loc. 54265).	24.1	835.9
	Station 313NB at base of unit 76 located towards the bottom of the east flank of Mount Burgess. Bedding 047T/2N.		
	Station 311NB on 'saddle' in valley separating Mount Burgess on the west and unnamed mountain to east.		
	Stromatoporoid and <u>Stringocephalus</u> sp. collected loose (GSC loc. 54903); horizon is close to unit 75.		
75	Limestone, medium brown, aphanitic, massive, very resistant, cliff-forming, weathers light grey.	23.5	811.8
	Station 310NB at top of unit 75 towards bottom of the west slope of mountain immediately east of Mount Burgess.		
74	Limestone, medium brown, aphanitic, massive, cliff-forming, weathers light grey.	21	788.3
73	Limestone, dark grey, fine grained, massive, weathers light grey.	3.5	767.3
72	Limestone, dark brownish grey, aphanitic, massive, rubbly weathering, moderately resistant, weathers light grey.	9.1	763.8
71	Covered; recessive, saddle-forming.	10	754.7
70	Limestone, black, fine grained, rubbly bedded, fairly resistant, weathers medium brown.	3	744.7

Unit	Description	Thickness (feet)	
		Unit	From base
69	Limestone, medium grey, very evenly medium bedded, weathers very light grey; not as resistant as unit 102.	15	741.7
68	Limestone, medium brown, fine grained, granular, thick bedded to massive, very resistant, weathers light grey.	32.5	726.7
67	Limestone, medium brownish grey, fine grained, rubbly thin to thick bedded, weathers very light grey; dark grey chert nodules present throughout but most abundant towards base of unit.	7	694.2
66	Limestone, medium brownish grey, fine grained, irregularly thick bedded, rubbly weathering, weathers light brownish grey; dark grey chert nodules numerous in upper 6 feet.	22	687.2
65	Limestone, cherty, medium grey, fine grained, massive, cliff-forming, resistant, weathers whitish grey; contains numerous silicified stromatoporoids, <u>Alveolites</u> sp., <u>Coenites</u> sp. and other corals in lower 6 feet (GSC loc. 54263).	29	665.2
64	Covered; talus fragments of limestone, cherty, medium grey, fine grained, weathers light grey; contains silicified stromatoporoid and coral remains.	15	636.2
63	Limestone, with argillaceous limestone partings, black, aphanitic, rubbly thin bedded, weathers pale brownish grey, poorly exposed.	3.5	621.2
62	Covered; talus fragments of limestone, cherty, dark brownish grey, presumably rubbly thin bedded, weathers dark brownish grey; numerous black chert nodules and silicified stromatoporoids, aulopoid,		

Unit	Description	Thickness (feet)	
		Unit	From base
	<u>Coenites</u> spp., and cup coral, sample (GSC loc. 54902) from 6 feet up.	7	617.7
61	Limestone, medium grey, fine grained, evenly medium bedded, resistant, cliff-forming, weathers whitish grey; black chert nodules and very poorly preserved stromatoporoid and coral remains.	3.1	610.7
60	Covered; talus blocks and smaller fragments of limestone, medium brown, fine grained, granular, porous, rubbly thin bedded, weathers very light grey; contains considerable light to dark grey chert in form of nodules; very poorly preserved silicified stromatoporoid and coral remains.	15	607.6
59	Limestone, medium brownish grey, fine grained, granular, massive, weathers whitish grey.	4.5	592.6
58	Covered; talus fragments of limestone, dark grey, fine grained, thin bedded, weathers dark grey; stromatoporoid, <u>Thamnopora</u> sp. and cup corals collected loose 2 feet up (GSC loc. 54901).	10	588.1
57	Limestone, dark brownish grey, aphanitic, evenly thick bedded, weathers very light whitish grey; contains very numerous silicified digitate stromatoporoids and <u>Coenites</u> sp. (GSC loc. 54262).	5	578.1
56	Covered.	3.4	573.1
55	Limestone, dark grey, fine grained, evenly medium bedded, weathers whitish grey; abundant silicified stromatoporoids, <u>Coenites</u> sp. and cup corals present more or less throughout.	5.3	569.7

Unit	Description	Thickness (feet)	
		Unit	From base
54	Covered; cherty limestone fragments with silicified stromatoporoids and other organisms (GSC loc. 54261).	15	564.4
53	Limestone, black, fine grained, irregularly medium bedded, weathers medium brownish grey; discontinuously exposed; top bed with numerous <u>Coenites</u> sp. (GSC loc. 54271).	9.7	549.4
52	Limestone, dark grey, fine grained, irregularly medium bedded, weathers very light grey.	6.8	539.7
51	Limestone, dark grey, fine grained, evenly medium bedded, resistant, weathers very light grey.	4.8	532.9
50	Covered.	2.6	528.1
49	Limestone, dark grey, fine grained, lower 5 feet rubbly thin bedded, upper 3 feet rubbly medium bedded, weathers medium to dark grey.	8	525.5
48	Limestone, light brown, fine grained, granular, evenly thick bedded, resistant, weathers light grey; stromatoporoids abundant in lower 2 feet and upper 1/2 foot of unit (GSC loc. 54260).	4.8	517.5
47	Covered.	4.2	512.7
46	Limestone, medium grey, fine grained, very evenly thick bedded, resistant, especially upper part, weathers very light grey; numerous small veins of white calcite.	5	508.5
45	Limestone, dark brownish grey, aphanitic, massive, weathers light grey; contains a few poorly preserved silicified <u>Amphipora</u> sp.	4	503.5

Unit	Description	Thickness (feet)	
		Unit	From base
44	Covered; talus fragments of limestone, dark grey, fine grained, rubbly thin bedded, weathers dark grey, unit recessive; silicified but poorly preserved <u>Coenites</u> sp. collected loose 6 feet up (GSC loc. 54259).	8	499.5
43	Limestone, dark grey, fine grained, rubbly medium to thick bedded, resistant, weathers light grey; stromatoporoids and <u>Coenites</u> sp. present in basal bed (GSC loc. 54258).	14	491.5
42	Limestone, medium brownish grey, fine grained, thin to medium bedded, weathers light grey; recessive.	7	477.5
41	Limestone, black and dark grey, fine grained, thin bedded, recessive, weathers medium grey; small pale brown nodules of chert weathering light grey.	3.5	470.5
40	Limestone, black, aphanitic, evenly thick bedded, weathers medium brownish grey; numerous silicified <u>Aulopora</u> sp., <u>Coenites</u> sp., <u>Favosites</u> sp., cup coral, stropheodontid?, gastropod, echinoderm ossicles with single, and double axial canals (GSC loc. 54257).	2.8	467
39	Limestone, silty, dark grey, irregularly thin bedded to massive in upper part, weathers medium grey changing to lighter grey towards top; fossiliferous: *douvillinid, * <u>Spinulicosta</u> sp., <u>Schuchertella?</u> sp., * <u>Spinatrypa</u> sp., <u>Ambocoelia</u> sp., <u>Cranaena?</u> sp., pelecypod, and * <u>Dechenella</u> (D.) sp. A (GSC loc. 54900).	7	464.2
38	Limestone, dark grey, rubbly thin bedded, beds between 3 to 8 inches		

Unit	Description	Thickness (feet)	
		Unit	From base
	thick, very hard, resistant, weathers medium brownish grey; some orange-weathering ochre present.	13	457.2
37	Limestone, medium grey, fine grained, massive, resistant, weathers light grey; contains very poorly preserved <u>Coenites</u> sp. (GSC loc. 54256).	6.5	444.2
36	Limestone, silty, limonitic, medium crystalline, very hard, weathers medium orange-brown; <u>Spinatrypa</u> sp., trilobite fragments, and echinoderm ossicles with single axial canals, collected 6 feet up (GSC loc. 54899); * <u>Schuchertella</u> sp., productellid, * <u>Emanuella</u> sp., * <u>Cranaena</u> sp., * <u>Conocardium</u> sp., * <u>Tentaculites</u> sp., <u>Dechenella</u> (D.) sp. A, ' <u>Primitia</u> ' sp., and echinoderm ossicles with single axial canals, from 13 feet up (GSC loc. 54285).	13	437.7
	Station 309NB at top of unit 36 on peak of ridge of unnamed mountain immediately east of Mount Burgess.		
35	Limestone, dark grey, fine to medium crystalline, irregularly thin bedded, weathers dark brownish grey; recessive, trench-forming.	6	424.7
34	Limestone, crinoidal, dark grey, aphanitic, massive, cliff-forming, weathers light grey; echinoderm ossicles with double axial canals from base of unit (GSC loc. 54283); <u>Coenites</u> sp. and * <u>Dechenella</u> sp. indet. collected loose 32.5 feet up (GSC loc. 54284).	41.5	418.7
33	Limestone, dark brownish grey, fine grained, massive, cliff-forming, weathers light brownish grey;		

Unit	Description	Thickness (feet)	
		Unit	From base
	pelecypods collected loose 29 feet up; <u>Coenites</u> sp., <u>Emanuella?</u> sp., and <u>Paracyclas?</u> sp. collected loose 33 feet up (GSC loc. 54282).	46	377.2
32	Limestone, dark grey, fine grained, massive, cliff-forming, weathers light and medium grey; unit strongly fractured.	12	331.2
31	Limestone, light and medium grey, fine grained, massive, irregularly fractured, cliff-forming, weathers light grey.	29	319.2
30	Limestone, crinoidal, strongly fetid, medium brown, fine grained, nodular bedded and massive, very resistant, scarp-forming, weathers very light grey; contains digitate stromatoporoids, <u>Coenites</u> sp., <u>Synaptophyllum?</u> sp., and echinoderm ossicles with single axial canals, from 19 feet up (GSC loc. 54281).	23	290.2
29	Limestone, colour laminated medium and dark grey, evenly thin bedded, averaging 0.5 foot thick, recessive, weathers medium and dark grey; an occasional thin nodular layer of pale brown chert in lower 3 feet; unit poorly exposed.	7.4	267.2
28	Limestone, dark to medium brown, aphanitic, massive, resistant, weathers very light grey.	9	259.8
27	Limestone, slightly silty and argillaceous, dark brown, fine grained, granular, medium bedded between 1-2 feet thick, weathers medium brownish grey; slightly recessive; stromatoporoids? from 20 feet up (GSC loc. 54280).	44.5	250.8

Unit	Description	Thickness (feet)	
		Unit	From base
26	Limestone, dark grey, aphanitic, thick bedded, irregular parting planes, resistant, scarp-forming, weathers medium brownish grey.	9	206.3
25	Limestone, dark grey, fine grained, massive, resistant, scarp-forming, weathers light grey; <u>Favosites</u> sp. from 6 feet up (GSC loc. 54898); stromatoporoids collected loose 32 feet up (GSC loc. 54279).	48	197.3
24	Covered; auloporids and <u>Favosites</u> sp. collected loose from near top of interval (GSC loc. 54897).	6	149.3
23	Limestone, dark grey, aphanitic, rubbly thin bedded to massive, weathers light grey.	23	143.3
22	Limestone, dark grey, aphanitic, irregularly medium bedded, weathers medium grey; ostracods from 1.5 feet up (GSC loc. 54277); <u>Alveolites</u> sp., <u>Favosites</u> sp., and echinoderm ossicles with double axial canals from 5 feet up (GSC loc. 54278).	7.4	120.3
21	Covered.	3.3	112.9
20	Limestone, medium grey, irregular bed, weathers very light grey; considerable secondary white coarsely crystalline calcite.	1.5	109.6
19	Covered.	3.9	108.1
18	Limestone, crinoidal, dark grey, thick bedded to massive, resistant, weathers light grey, becoming darker grey in upper 4 feet; some secondary coarsely crystalline white calcite in upper 4 feet;		

Unit	Description	Thickness (feet)	
		Unit	From base
	unit contains tiny echinoderm ossicles with single, and double axial canals (GSC loc. 54276).	10.5	104.2
17	Limestone, slightly silty, dark brownish grey, rubbly thin bedded, recessive, weathers medium brownish grey.	2.8	93.7
16	Limestone, medium grey, aphanitic, massive, resistant, weathers very light grey; small stromatoporoid from 3 feet up (GSC loc. 308NBd).	6.7	90.9
15	Limestone, medium grey, fine grained; interbedded with darker grey, rubbly, argillaceous limestone.	7.5	84.2
14	Limestone, dark brown, aphanitic, evenly thin to medium bedded, weathers very light grey.	12	76.7
13	Covered by vegetation and talus.	2.7	64.7
12	Limestone, aphanitic, dark brown, evenly thick bedded, weathers very light grey; indeterminate ostracods from top of unit (GSC loc. 54275).	6.5	62
11	Covered by vegetation and talus.	5.6	55.5
10	Limestone, dark grey, aphanitic, evenly medium bedded, weathers medium grey; poorly preserved <u>Favosites</u> sp. seen loose.	5.5	49.9
9	Covered.	3.5	44.4
8	Limestone, slightly argillaceous, black, aphanitic, even bed, weathers dark grey.	4	40.9
7	Limestone, black, aphanitic, evenly bedded to massive, weathers very light grey.	6	36.9

Unit	Description	Thickness (feet)	
		Unit	From base
6	Limestone, strongly silty and argillaceous, some beds ferruginous, black, aphanitic, evenly thin bedded, weathers very dark brownish grey; poorly exposed; indeterminate Bythociprid ostracods from 2.5 feet up (GSC loc. 54274).	3.5	30.9
5	Covered; small ostracods collected loose, obviously derived from unit immediately above (GSC loc. 54273).	3.5	27.4
4	Limestone, black, aphanitic, evenly thick bedded, between 0.8 to 3 feet thick, weathers very light grey.	5.3	23.9
3	Limestone, with argillaceous limestone partings, black, aphanitic, evenly medium bedded, beds up to 2 feet thick, weathers medium orange-brown.	4.5	18.6
2	Covered.	2.9	14.1
1	Limestone, silty and argillaceous, very dark grey to black, aphanitic, evenly bedded up to 1.5 feet thick, weathers medium orange-brown; discontinuously exposed; oriented lithological specimen from top of unit (GSC loc. 54272).	11.2	

Station 308NB at base of unit 1 near the top of east flank of unnamed mountain immediately east of Mount Burgess. Bedding 026T/22NW.

MIDDLE DEVONIAN AND OLDER

Gossage Formation  
(352.2 feet thick)

34	Covered; talus fragments similar to unit 33.	30	352.2
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Unit	Description	Unit	Thickness (feet) From base
	Station 307NB at top of unit 34 about 0.2 mile south of station 308NB.		
33	Dolomite, medium grey, fine grained, evenly thin to medium bedded, weathers light orange; very poorly exposed.	3	322.2
32	Covered.	8.5	319.2
31	Dolomite, strongly calcareous, towards base, diminishing upwards, black, aphanitic, evenly thin to medium bedded, weathers orange-brown; very poorly exposed.	9.4	310.7
30	Covered.	4.7	301.3
29	Dolomite, dark grey, fine grained, even bed, weathers medium orange-brown.	2	296.6
28	Covered.	29	294.6
27	Dolomite, dark grey, fine grained, evenly thin to medium bedded, weathers pale orange-brown; poorly exposed.	3.8	265.6
26	Covered.	3.8	261.8
25	Dolomite, slightly argillaceous, dark grey, fine grained, evenly medium bedded, weathers orange-brown; thin, fissile interbeds of argillaceous dolomite of same colour in basal foot.	3.2	258
24	Covered by vegetation.	11.5	254.8
23	Dolomite, slightly argillaceous, medium grey, fine grained, weathers pale orange-brown.	3	243.3
	Bedding 180T/23W.		
22	Covered; a few fragments of purplish grey shale noted in interval.	11	240.3

Unit	Description	Thickness (feet)	
		Unit	From base
21	Limestone, dolomitic, dark grey, aphanitic, evenly thick bedded, weathers medium orange-brown.	9.5	229.3
20	Covered.	5	219.8
19	Dolomite, black, aphanitic, even bed, resistant, weathers medium orange-brown.	2.3	214.8
18	Covered; fragments of dolomite.	21	212.5
	<u>Schizophoria</u> sp. and echinoderm ossicles with single axial canals, in dark brown limestone fragment derived from above (GSC loc. 54896).		
17	Dolomite, colour banded light brown and dark grey, fine grained, medium bedded, weathers medium brownish grey; poorly exposed; <u>Moelleritia</u> sp. collected loose (GSC loc. 54895).	6	191.5
16	Covered.	6.5	185.5
15	Dolomite, slightly argillaceous, light to medium grey, thin to medium bedded, weathers medium brownish grey; strongly fractured.	18	179
14	Dolomite, argillaceous, silty, dark grey, irregularly very thin bedded, weathers medium orange-brown; <u>Herrmannina</u> ? sp., ' <u>Bythocypris</u> ' sp., and <u>Kloedanella</u> ? sp. present in these beds (GSC loc. 54894).	4.3	161
13	Dolomite, argillaceous, black, aphanitic, evenly thick bedded, weathers medium orange-brown; beds separated by nodular argillaceous dolomite layers up to 2 inches thick; <u>Moelleritia</u> sp. from top of unit (GSC loc. 54893).	8	156.7

Unit	Description	Thickness (feet)	
		Unit	From base
12	Covered.	8.4	148.7
11	Dolomite, dark grey, fine grained, even bed, weathers medium orange-brown.	2.4	140.3
10	Covered.	11	137.9
9	Limestone, argillaceous, dark grey, fine grained, evenly thick bedded, weathers dark orange-brown.	9.3	126.9
8	Covered; <u>Moelleritia?</u> sp. collected loose (GSC loc. 54892).	55	117.6
7	Shale, calcareous, silty and sandy, hematite red, beds up to about 2 feet thick; interbedded with sandstone, calcareous, argillaceous, medium reddish brown, beds up to 1.5 feet thick; unit weathers medium yellowish brown; trilobite fragments from 5 feet up (GSC loc. 54891); <u>Styliolina?</u> sp., <u>Moelleritia</u> sp., and other ostracods from 6 to 17 feet up (GSC loc. 54286).	17	62.6
6	Covered; talus fragments of shale, silty and sandy, hematite red; trilobite fragments collected loose (GSC loc. 54890).	12.5	45.6
5	Conglomerate, pebbles of brown, black, and dark grey chert up to 1/2 inch in diameter; matrix of silty and sandy shale; unit weathers dark reddish brown; resistant.	2	33.1
4	Shale, red; thinly interbedded with conglomerate; recessive; poorly exposed.	4.8	31.1
3	Conglomerate, sharply angular to moderately rounded pebbles of dark grey to black and some red chert in a matrix of fine grained,		

Unit	Description	Thickness (feet)	
		Unit	From base
	greenish grey calcareous shale, silty, massive, very hard, resistant, weathers reddish brown.	5.3	26.3
	Lithological specimen, oriented (GSC loc. 54287). Bedding 005T/39W.		
2	Conglomerate with matrix of shale, silty, reddish brown, irregular beds up to 1/3 inch thick containing rounded pebbles of reddish brown and black chert; unit pinches and swells along strike; also within the shale are fine blebs of olive-green shale and rounded floating grains of quartz and chert.	2.5	21
	Lithological specimen (GSC loc. 54889).		
1	Covered; reddish brown weathering soil with small rounded pebbles of vari-coloured chert and large blocks of chert pebble conglomerate.	18.5	
	MIDDLE ORDOVICIAN AND OLDER? (3563.9 feet; incomplete)		
59	Limestone, slightly dolomitic, very pale brown, thick bedded to massive, present as large frost-heaved blocks.	5	3563.9
58	Limestone, pale brown, aphanitic, evenly thin bedded, beds average 8 inches thick, weathers light grey; contains irregular nodules of light brown to black chert; poorly preserved brachiopods from 2 feet up (GSC loc. 54888).	12.5	3558.9
	Station 306NB at base of unit 58. Bedding 155T/27SW.		

Section 26: OGILVIE MOUNTAINS, 19 MILES BEARING 175T FROM  
BEAR CAVE MOUNTAIN (116J-10)

Section on the northeast flank of Ogilvie Mountains was measured from the axis of a broad gentle anticline in an unnamed creek at about 66°12.7'N, 139°18'W southeastward across a mountain to about 66°12.5'N, 139°17'W where the upper part of the Gossage Formation and all of the Ogilvie Formation are exposed. Dark shales questionably assigned to the Imperial Formation outcrop along the south bank of the unnamed stream between 0.4 to 0.6 mile eastward beyond the mountain front near 66°14'N, 139°15'W. Still higher resistant sandstone beds, also questionably assigned to the Imperial Formation, outcrop along a low ridge about 2 miles beyond the mountain front about 66°15.3'N, 139°12.5'W.

Section measured by A. W. Norris, assisted by D. L. Jordan, August 11-13, 1962.

UPPER DEVONIAN OR YOUNGER	
Unnamed Sandstone	125.7'; incomplete
MIDDLE DEVONIAN AND YOUNGER	
Unnamed Shale	1657.4
MIDDLE DEVONIAN	
Ogilvie Formation	841.1
Upper Member	205.7'
Lower Member	635.4'
MIDDLE DEVONIAN AND OLDER	
Gossage Formation	747.5'; incomplete

Unit	Description	Thickness (feet)	
		Unit	From base
UPPER DEVONIAN OR YOUNGER			
	<u>Unnamed Sandstone</u> (125.7 feet; incomplete)		
7	Sandstone, quartzose, ferruginous, non-calcareous, medium brown, irregularly medium to thick bedded, weathers bright rusty orange.	27	125.7
	Straight cephalopod (GSC loc. 54291) from 2 feet up.		

Unit	Description	Thickness (feet)	
		Unit	From base
	Plant stem fragments (GSC loc. 54879) from 10 feet up.		
	Worm? tube markings in loose blocks (GSC loc. 54880) at top of unit 31, which caps an escarpment.		
6	Sandstone, argillaceous, dark grey, nodular bedded, interbedded with sandy shale, weathers rusty brown; a transitional unit, harder than unit below.	4.5	98.7
5	Shale, silty and sandy, dark grey, irregularly fissile, recessive, weathers medium orange-brown.  Bedding 360T/15E.	5	94.2
4	Siltstone, argillaceous and sandy, ferruginous, dark grey, irregularly bedded, blocky, fairly resistant, weathers rusty orange.	6.6	89.2
3	Covered by talus; noted worm burrowings in large loose block of sandstone 15 feet up.	35	82.6
2	Covered by vegetation.	25	47.6
1	Covered; large frost-heaved blocks of sandstone, quartzose, slightly ferruginous, pale brownish grey, very fine grained, weathers rusty brown; some sandstone blocks cross-laminated.	22.6	
	Poorly preserved plant stem fragments (GSC loc. 54291) collected loose at base of unit.		
	Station 301NB at base of unit 25 at stream level on the east side of creek opposite the south end of cliff-like escarpment at approximately 66°15.3'N, 139°12.5'W.		

Unit	Description	Thickness (feet)	
		Unit	From base
MIDDLE AND UPPER DEVONIAN OR YOUNGER			
Unnamed Shale (1657.4 feet thick)			
24	Covered interval.	c. 1200	1657.4
23	Shale, non-calcareous, soft, with hard, silty, ferruginous shale layers up to 0.3 foot thick; upper part of unit is fairly soft.	4	457.4
	Shale for microfossils (Field No. 299NBa) from top 1 foot.		
	Station 300NB at top of unit 23 on east bank of stream 0.62 mile beyond the mountain front.		
	Plant stem impression (GSC loc. 54878) collected loose 30 feet downstream from end of outcrop.		
22	Shale, non-calcareous, carbonaceous, black, highly fissile, coated with a medium brown wash from above; exposed at top of bank.	2	453.4
	Shale for microfossils (Field No. 298NBa).		
	Station 299NB at base of unit 22 on east bank of stream 0.6 mile beyond the mountain front.		
	Bedding 000T/10E.		
21	Shale, silty, non-calcareous, black, irregularly fissile, orange and yellow stained; harder than unit 20.	9.8	451.4

Unit	Description	Thickness (feet)	
		Unit	From base
20	Shale, non-calcareous, black, fissile, fairly soft, weathers dark grey, slightly rust stained, slumped in most places.	11	441.6
19	Shale, silty, black, hard, platy, beds up to 1/2 inch thick, fairly resistant, in part coated with yellow and orange staining.	5	430.6
	Station 298NB at base of unit 18 on the east bank of stream 0.58 mile beyond the mountain front. Bedding 150T/57NE.		
18	Shale, non-calcareous, black, highly fissile, fairly soft, weathers black, slightly rust stained; contains a few scattered clay ironstone nodules; shale for microfossils from top of unit (Field No. 297NBd).	5.3	425.6
17	Covered.	20	420.3
16	Shale, non-calcareous, black, fissile, fairly soft, weathers black; much softer than unit 14.	12	400.3
	Shale for microfossils (Field No. 297NBc) from 1 foot up.		
15	Covered; plant stem (GSC loc. 54877) impressions collected loose; and black, hard, fissile shale for microfossils.	50	388.3
14	Shale, silty, ferruginous, non-calcareous, hard, platy, rust stained; soft carbonaceous shale layer up to 0.4 foot thick that pinches and swells along strike 7.5 feet up.	26	338.3
	Shale for microfossils 7.5 feet up (Field No. 297NBa).		

Unit	Description	Thickness (feet)	
		Unit	From base
	Station 297NB at base of unit 13 on east bank of creek where there is a sharp change of dip of strata; station 0.53 mile beyond the mountain front. Bedding 172T/70E.		
13	Shale, silty, non-calcareous, black, hard, fissile, evenly jointed, joint faces stained a medium orange-brown.	3.5	312.3
12	Shale, slightly silty, non-calcareous, highly fissile, softer than unit below, weathers medium rusty brown.	4.8	308.8
	Shale for microfossils (GSC loc. 7318); contains highly corroded spores identified by D. C. McGregor: <u>Hystricosporites</u> sp., and <u>Pilasporites plurigenus</u> Balme and Hennelly, <u>Hystricosporites</u> ranges from Emsian to Famennian and occurs rarely in the Lower Carboniferous.		
	Station 296NB at base of unit 12 on the east bank of stream 0.48 mile beyond the mountain front. Bedding 045T/15SE.		
11	Shale, silty, non-calcareous, black, evenly and highly jointed, joint faces stained a rusty brown.	4.3	304
	Shale for microfossils (Field No. 295NBc).		
10	Shale, silty and sandy, non-calcareous, beds up to 1/4 inch thick, highly fissile, stained orange and rusty brown.	4	299.7
	Lithological specimen (GSC loc. 54668).		
9	Covered.	4.4	295.7
8	Shale, silty, non-calcareous, black, fairly hard, rust stained; alternating		

Unit	Description	Thickness (feet)	
		Unit	From base
	with less silty beds; beds of both rock types average 0.6 foot thick.	5.3	291.3
7	Shale, non-calcareous, black, highly fissile, joint faces coated with rusty brown staining.	3.6	286
6	Sandstone, black, fine grained, hard, even bed, rusty orange-brown stained.	0.3	282.4
5	Shale, non-calcareous, black, fissile, softer than unit 3, rust stained, also some orange staining.	3.4	282.1
	Shale for microfossils (Field No. 295NBb).		
4	Shale, silty, non-calcareous, black, hard, highly fissile, resistant, coated with a rusty brown stain.	1.2	278.7
3	Shale, non-calcareous, black, highly fissile, softer than unit below.	4.5	277.5
	Shale for microfossils (Field No. 295NBa).		
2	Shale, black, hard, fissile, resistant, closely and evenly jointed, joint faces rust stained.	3	273
	Station 295NB at base of unit 1 on east bank of stream at upstream end of discontinuous shale exposure 0.38 mile beyond the mountain front. Bedding 146T/15NE.		
1	Covered.	<u>c.</u> 270	

Unit	Description	Thickness (feet)	From base
MIDDLE DEVONIAN			
<u>Ogilvie Formation</u>			
Upper Member			
(205.7 feet thick)			
26	Limestone, light brown, fine grained, massive in lower part grading up into rubbly beds in upper 2 feet, weathers light grey; stromatoporoid collected 6 feet up (GSC loc. 54875); this unit caps the formation.	7	205.7
Station 289NB at top of unit 26 on the east flank of the Ogilvie Mountains at approximately 66°12.5'N, 139°17'W.			
25	Limestone, pale brown, fine grained, rubbly thin bedded, recessive, weathers light grey.	5.3	198.7
24	Limestone, medium brown, very fine grained, even hard bed, resistant, weathers light grey.	1.8	193.4
23	Limestone, fine grained, medium brown, rubbly thin bedded, recessive, weathers light grey; very poorly exposed.	12.3	191.6
22	Limestone, medium brown, fine grained, granular, evenly medium bedded, beds average 1 foot thick, resistant, weathers light grey.	9	179.3
21	Limestone, dark grey, rubbly thin bedded, beds separated by argillaceous limestone partings, weathers medium brown; contains cup corals (GSC loc. 54874).	3	170.3
20	Limestone, pale brown, fine grained, massive, resistant, weathers light grey; <u>Alveolites</u> sp. present (GSC loc. 54873).	4.8	167.3

Unit	Description	Thickness (feet)	
		Unit	From base
19	Covered by talus; <u>Coenites</u> sp. and <u>Spinatrypa</u> sp. collected loose (GSC loc. 54872).	16.5	162.5
18	Limestone, dark grey, rubbly medium bedded, weathers light grey; poorly exposed; contains numerous <u>Coenites</u> sp., <u>Favosites</u> sp., <u>Gypidula</u> sp., costate pentamerid, * <u>Carinatina?</u> sp., and <u>Spinatrypa</u> sp. (GSC loc. 54871).	6.3	146
17	Covered; <u>Alveolites</u> sp., <u>Coenites</u> sp., costate pentamerid, <u>Carinatina?</u> sp. and <u>Spinatrypa</u> sp. (GSC loc. 54870) collected loose.	9.5	139.7
16	Limestone, dark grey, irregularly medium bedded, resistant, weathers medium grey.	3	130.2
15	Limestone, dark grey, fine grained, irregularly medium bedded, separated by argillaceous limestone partings, weathers dark grey; poorly exposed; stromatoporoids and <u>Coenites</u> sp. from base of unit; and <u>Alveolites</u> sp. from 9.7 feet up (GSC loc. 54869).	19.5	127.2
14	Limestone, dark grey, rubbly medium bedded, highly resistant, cliff-forming, weathers light grey.	11	107.7
13	Limestone, medium brown, fine grained, irregularly medium bedded, weathers medium grey; poorly exposed; contains numerous cup corals, <u>Alveolites</u> sp., <u>Favosites</u> sp., <u>Phillipsastrea</u> sp., <u>Paracyclas?</u> sp., and *? <u>Halloceras logani</u> (Meek) (GSC loc. 54868).	9	96.7
12	Covered by talus; <u>Alveolites</u> sp. and pentamerid fragments collected loose (GSC loc. 54867).	7.5	87.7

Unit	Description	Thickness (feet)	
		Unit	From base
11	Limestone, very dark grey, fine grained, irregularly medium bedded, resistant, weathers light brownish grey.	5.3	80.2
10	Limestone, argillaceous, rubbly and nodular thin bedded, weathers pale brown; only upper 1 foot well exposed; contains numerous corals especially <u>Alveolites</u> sp., and echinoderm? ossicles (GSC loc. 54866).	11.5	74.9
9	Limestone, dark brown, fine grained, irregularly medium bedded, weathers light grey.	2	63.4
8	Covered by talus; numerous stromatoporoids, <u>Alveolites</u> sp., <u>Coenites</u> sp., <u>Favosites</u> sp., and <u>Phillipsastrea</u> sp. collected loose (GSC loc. 54865).	3.3	61.4
7	Limestone, pale brown, aphanitic, massive, vertical cliff-forming, weathers light grey.	13	58.1
6	Covered by vegetation.	3.4	45.1
5	Limestone, dark brown, fine grained, irregularly medium bedded, weathers light grey, only upper 3 feet well exposed; <u>Alveolites</u> sp. (GSC loc. 54864) from 7 feet up.	7	41.7
4	Limestone, argillaceous, light grey, rubbly thin bedded, weathers light grey; <u>Schuchertella?</u> sp., <u>Atrypa</u> sp., * <u>Emanuella</u> sp., ostracod?, and echinoderm ossicles with single axial canals (GSC loc. 54863) from 7.5 feet up.	12.5	34.7
	<u>Atrypa?</u> sp. collected loose 7.5 feet up (GSC loc. 54862).		

Unit	Description	Thickness (feet)	
		Unit	From base
3	Limestone, dark brownish grey, aphanitic, massive, upper 2 feet rubbly bedded, weathers light grey; poorly preserved pentamerid (GSC loc. 54861) collected loose 5 feet up.	13.5	22.2
2	Limestone, dark brown, fine grained, thin bedded between 3 and 9 inches thick, recessive, weathers light grey.	4.5	8.7
1	Covered by vegetation and talus; lithology similar to unit 2.  Station 288NB at base of unit 1 on north side of gully on east flank of mountain. Bedding 030T/28SE.	4.2	
Lower Member (635.4 feet thick)			
49	Limestone, dark brown, aphanitic, massive, very resistant, cliff-forming, weathers light grey.  Station 287NB at top of unit 49 on south side of gully on east flank of mountain. Bedding 010T/22E.	10	635.4
48	Limestone, dark brown, aphanitic, rubbly thin bedded, recessive, weathers pale orange-brown; contains tiny brachiopods? (GSC loc. 54860).	1.8	625.4
47	Limestone, dark grey, fine grained, massive, cliff-forming, weathers light grey.	2.3	623.6
46	Limestone, black, fine grained, nodular thin bedded, separated by argillaceous limestone partings, weathers pale brown; transitional upper contact;		

Unit	Description	Thickness (feet)	
		Unit	From base
	contains a few small stromatoporoids, <u>Favosites</u> sp., and undetermined small pelecypod (GSC loc. 54859).	6.4	621.3
45	Limestone, dark grey, aphanitic, very evenly thin to medium bedded, weathers light grey.	4.1	614.9
44	Limestone, crinoidal, dark grey, rubbly very thin bedded, weathers light grey; contains <u>Dechenella?</u> sp., and small echinoderm ossicles with single axial canals; sample from 4 feet up (GSC loc. 54858).	12.7	610.8
43	Limestone, dark brown, aphanitic, even bed, weathers light grey.	1.5	598.1
42	Covered by vegetation.	3.4	596.6
41	Limestone, medium brown, aphanitic, evenly and irregularly bedded, between 0.3 and 0.8 foot thick, weathers very light grey.	5.7	593.2
40	Covered.	4.5	587.5
39	Limestone, dark brown, aphanitic, irregularly bedded between 0.5 and 0.8 foot thick, weathers light grey.  Bedding 190T/24E.	7.4	583
38	Covered.	23.5	575.6
37	Limestone, slightly argillaceous, crinoidal, dark grey, fine grained, rubbly thin bedded, recessive, weathers light grey; this unit caps the mountain at this locality.	<u>c.</u> 15	552.1
	Station 286NB at top of unit 37 at peak of north-trending mountain ridge.		

Unit	Description	Thickness (feet)	
		Unit	From base
36	Limestone, argillaceous, crinoidal, dark brownish grey, medium grained, medium bedded, weathers dark grey; transitional upper contact.	13	537.1
35	Limestone, dark brown, aphanitic, massive, jointed on a large scale, cliff-forming, weathers light grey; transitional upper contact.	23.5	524.1
34	Limestone, crinoidal in part, dark brown, fine to coarse grained, in part bioclastic, rubbly thick bedded to massive, weathers light grey.	49	500.6
33	Limestone, crinoidal, medium grained, evenly very thick bedded, highly resistant, weathers light grey.	21.5	451.6
32	Limestone, medium brown, aphanitic, evenly and irregularly medium bedded, weathers light grey.	11.5	430.1
31	Limestone, medium brown, aphanitic, massive, weathers light grey; contains large irregular masses of coarsely crystalline calcite.	5	418.6
30	Limestone, medium brown, fine grained, irregularly very thick bedded, weathers light grey.	9.3	413.6
29	Limestone, medium brown, aphanitic, massive, very resistant, cliff-forming, weathers light grey.	17	404.3
28	Limestone, dark brown, fine grained, rubbly very thin bedded, beds 2 to 3 inches thick, recessive, weathers medium brownish grey; transitional upper contact.	3	387.3

Unit	Description	Thickness (feet)	
		Unit	From base
27	Limestone, dark grey, crystalline, evenly thick bedded, recessive, weathers light grey; stromatoporoids (GSC loc. 54857) collected loose from 5 feet up.	23.5	384.3
26	Limestone, medium brown, aphanitic, massive, with lenses of limestone, slightly fetid, crinoidal, medium grained, medium brown; unit resistant, cliff-forming, weathers light grey.	30.9	360.8
25	Covered.	1.4	329.9
24	Limestone, crinoidal, dark brown, medium grained, irregularly medium bedded, recessive, weathers light grey; poorly exposed; cup coral, <u>Coenites</u> sp., <u>Phillipsastrea</u> sp., echinoderm ossicles with double, and cross-like axial canals collected loose from 11 feet up (GSC loc. 54854); digitate stromatoporoid and <u>Coenites</u> sp. from 21.4 feet up (GSC loc. 54855); digitate stromatoporoid <u>Coenites</u> sp. collected loose 21.4 feet up (GSC loc. 54858).	21.4	328.5
23	Limestone, crinoidal, slightly fetid, medium brown, fine to medium grained, massive, cliff-forming; <u>Alveolites</u> sp., <u>Phillipsastrea</u> sp., echinoderm ossicles with double and cross-like axial canals from 1 foot up (GSC loc. 54853).	20	307.1
22	Limestone, medium brown, fine grained, irregularly bedded, slightly recessive, weathers light grey; transitional upper contact.	5	287.1
21	Limestone, crinoidal, dark brown, fine to medium grained, rubbly and nodular bedded to massive, weathers light grey; stromatoporoid, <u>Alveolites</u> sp., and		

Unit	Description	Thickness (feet)	
		Unit	From base
	echinoderm ossicles with double axial canals from 4 feet up (GSC loc. 54850); large pentamerid from 5 feet up (GSC loc. 54851); stromatoporoid collected loose at 6 feet up (GSC loc. 54852).	12.5	282.1
20	Limestone, crinoidal, slightly argillaceous, slightly fetid, dark brown, fine to medium grained, massive, in places rubbly weathering and recessive, weathers light grey; contains <u>Favosites</u> sp., large pentamerid, and echinoderm ossicles with double axial canals, from 9 feet up (GSC loc. 54849).	18	269.6
19	Limestone, crinoidal, dark brown, fine grained, massive, very resistant, weathers light grey; <u>Favosites</u> sp., *echinoderm ossicles with double and cross-like axial canals from 8 feet up (GSC loc. 54847); <u>Alveolites</u> sp., and echinoderm ossicles with double axial canals from 9.4 feet up (GSC loc. 54848).	9.4	251.6
18	Limestone, crinoidal, dark brownish grey, massive, very resistant, weathers light grey; arbitrary upper cut-off.	10.1	242.2
17	Limestone, slightly argillaceous, dark grey, aphanitic, massive, slightly recessive, weathers medium grey; *cf. <u>Paracyclas</u> sp. collected loose 0.7 foot up (GSC loc. 54526).	8	232.1
16	Limestone, crinoidal, dark brownish grey, massive, scarp-forming, weathers light grey.	16.9	224.1
15	Covered by vegetation.	4	207.2
14	Limestone, very dark grey, fine grained, massive, very resistant, weathers light		

Unit	Description	Thickness (feet)	
		Unit	From base
	grey; 'ghosts' of brachiopods noted 6 feet up; cup coral, <u>Favosites</u> sp. and numerous echinoderm ossicles with double axial canals present 25 feet up (GSC loc. 54846); large replacement mass of coarsely crystalline calcite at 25 feet up.	53.5	203.2
	Bedding 119T/18S.		
13	Limestone, dark brownish grey, aphanitic, massive, hoodoo-forming, weathers light grey; a small * <u>Emanuella</u> sp. and sparse echinoderm ossicles with double axial canals from 16 feet up (GSC loc. 54843); * <u>Chonetes</u> sp., * <u>Emanuella</u> sp., echinoderm ossicles with single, double, and five-star-shaped axial canals from 28 feet up (GSC loc. 54844); cf. <u>Paracyclas</u> sp. collected loose (GSC loc. 54845).	32	149.7
12	Limestone, dark brownish grey, aphanitic, massive, cliff-forming, weathers light grey, thin crinoidal limestone lenses with echinoderm ossicles with *double, *cross-like, and star-shaped axial canals (GSC loc. 54842) from 2 feet up.	13.3	117.7
11	Limestone, very dark grey, almost black, rubbly thin bedded, recessive, weathers dark grey.	5	104.4
10	Limestone, dark grey, aphanitic, massive, cliff-forming, weathers light grey; contains very large masses of white coarsely crystalline calcite.	11	99.4
	Station 285NB at base of unit 10 on the northwest slope of mountain ridge. Bedding 182T/6E.		
9	Covered.	6	88.4

Unit	Description	Thickness (feet)	
		Unit	From base
8	Limestone, very dark grey, aphanitic, massive, and scarp-forming, weathers light to medium grey.	27	82.4
7	Covered by vegetation.	9	55.4
6	Limestone, dark brownish grey, aphanitic, massive, highly fractured, recessive, weathers light grey and light pinkish grey.  Bedding 165T/21E.	6	46.4
5	Limestone, very dark grey, aphanitic, massive, weathers light grey; tiny echinoderm ossicles with single and double axial canals and algal structures from 7 feet up (GSC loc. 54840); echinoderm ossicles with double axial canals from 22.9 feet up (GSC loc. 54841).	22.9	40.4
4	Covered by vegetation.	9.1	17.5
3	Limestone, medium brownish grey, fine grained, granular, highly fractured, weathers light grey; discontinuously and poorly exposed.	3.8	8.4
2	Covered by vegetation.	1.9	4.6
1	Limestone, very dark grey, fine grained, massive, resistant, weathers light grey; <u>Douvillina?</u> sp., and echinoderm ossicles with single axial canals collected loose at base of unit (GSC loc. 54839).	2.7	
	Station 284NB at base of unit 1 about one-half way up northwest flank of mountain ridge. Bedding 172T/18E.		

Unit	Description	Thickness (feet)	
		Unit	From base
MIDDLE DEVONIAN AND OLDER			
<u>Gossage Formation</u> (747.5 feet; incomplete)			
54	Limestone, dolomitic, pale brown, fine grained, granular, irregularly and evenly thick bedded, weathers pale orange-brown; scattered large masses of white coarsely crystalline calcite.  Bedding 048T/9SE.	37.1	747.5
53	Dolomite, medium brown, fine grained, granular, massive, variably resistant, weathers light grey with pale orange mottling.	3	710.4
52	Limestone, dolomitic, very dark grey, fine grained, granular, thick bedded, strongly and irregularly fractured, weathers pale orange-brown.	5	706.4
51	Limestone, dark grey and dark brown, evenly bedded, beds up to 2.5 feet thick, weathers medium brownish grey.	16.3	701.4
50	Limestone, dolomitic, fine grained, granular, lower part evenly medium bedded, upper part irregularly thin bedded, weathers medium brownish grey.	23	685.1
49	Covered by talus.	9.2	662.1
48	Dolomite, fetid, medium brown, medium grained, porous, evenly medium bedded, weathers light brownish grey; discontinuously exposed.	12.8	652.9
47	Dolomite, laminated medium to very dark grey, almost black, thin bedded, recessive, weathers light grey.	5.1	640.1

Unit	Description	Thickness (feet)	
		Unit	From base
46	Dolomite, medium brown, medium grained, granular, beds between 0.8 foot and 1.2 feet thick, weathers light brownish grey; some beds colour laminated light and medium grey.	13.8	635
45	Dolomite, slightly calcareous, colour laminated light to dark brown, medium grained, granular, evenly thick bedded, resistant, weathers medium to dark grey, in places stained a pale orange.	25.2	621.2
44	Dolomite, medium brown, medium grained, granular, evenly medium bedded, slightly recessive, weathers medium brownish grey; small amount of red mineral coating one bed; lithological specimen (GSC loc. 54838).	3.9	596
43	Dolomite, variably calcareous, fine grained, granular, slightly porous, lower four feet massive, upper two feet evenly bedded and vuggy weathering; lithological specimen from top of unit (GSC loc. 54837).	6	592.1
42	Covered by talus.	2.4	586.1
41	Dolomite, dark grey, fine grained, granular, evenly medium to thick bedded, resistant, weathers light to medium grey; some joint faces coated a rusty orange-red.	13.4	583.7
40	Covered by talus.	2.7	570.3
39	Dolomite, very fine grained, granular, hard, massive, even hard bed, weathers medium brownish grey.	1.8	567.6
38	Covered by talus.	3.5	565.8

Unit	Description	Thickness (feet)	
		Unit	From base
37	Dolomite, fetid, medium grained, granular and crystalline, porous, very irregularly medium bedded, fairly resistant, weathers mottled light grey and pale orange.	2.5	562.3
36	Limestone, brown, aphanitic, highly fractured, coated with a rusty orange stain; only upper 1 foot well exposed.	2.1	559.8
35	Dolomite, silty laminae, colour laminated, medium brown to dark grey, evenly medium bedded, highly fissile, weathers a laminated light to dark grey.  Bedding 016T/12E.	6	557.7
34	Covered by talus.	5	551.7
33	Limestone, light to medium brown, aphanitic, even bed, resistant, weathers medium brownish grey; quartz geode noted loose at top of unit.	2.9	546.7
32	Dolomite, slightly calcareous, silty laminae, medium to dark grey, weathers medium brownish grey; even upper contact.	3.8	543.8
31	Covered by soil and vegetation.	4	540
30	Dolomite, with silty laminae, moderately calcareous, medium brown, fine grained, evenly thick bedded, weathers medium grey.	6.8	536
29	Covered by talus and vegetation.	19.7	529.2
28	Dolomite, slightly calcareous, medium brown, fine grained, granular, even bed, resistant, weathers medium grey; irregular veins filled with dolomite along the edges and calcite towards the middle.	3.3	509.5

Unit	Description	Thickness (feet)	
		Unit	From base
27	Covered by talus.	6	506.2
26	Dolomite, with fine silty laminae, fine grained, granular, relict pelletoid structure, colour laminated, evenly thick bedded, resistant, weathers medium orange-brown; oriented lithological specimen from top of unit (GSC loc. 54836).	3.9	500.2
25	Covered by vegetation.	4.6	496.3
24	Limestone, dark brown, aphanitic, evenly thick bedded, resistant; weathers medium grey.  Bedding 020T/15E.	4	491.7
23	Covered.	2.5	487.7
22	Dolomite, light brown, fine grained, granular, even bed, weathers medium orange-brown; with irregular veinlets of white dolomite.	2	485.2
21	Covered.	4.3	483.2
20	Limestone, medium brown, aphanitic, evenly thin to thick bedded, some of the thicker beds separated by very thin rubbly recessive limestone beds, weathers medium grey; unit highly resistant and scarp-forming; parts of the upper beds altered to a fine grained, granular, porous dolomite; 'ghosts' of brachiopods present 16.5 feet up.	18.5	478.9
19	Covered.	1.5	460.4
18	Dolomite, medium grained, granular, even bed, weathers medium grey.	2.2	458.9
17	Covered.	1	456.7

Unit	Description	Thickness (feet)	
		Unit	From base
16	Dolomite, slightly calcareous, medium grained, granular, pelletoid, porous, evenly thin bedded, weathers medium grey; in places unit contains considerable medium orange weathering ochre; <u>Moelleritia canadensis</u> Copeland present (GSC loc. 54835).	1.4	455.7
15	Limestone, slightly silty, dark brown, aphanitic, pelletoid, evenly thick bedded, resistant, weathers medium grey; <u>Moelleritia</u> sp. from 4 feet up (GSC loc. 54834).	6.1	454.3
14	Covered from stream level up to base of outcrop.  Station 283NB at base of unit 14 on south side of stream.	17.2	448.2
13	Covered by stream gravel.	97.2	431
12	Limestone, medium brown, aphanitic, evenly medium bedded, washed a light grey; beds exposed in middle of stream channel.	2	333.8
11	Covered interval across a braided stream channel.	10	331.8
10	Limestone, medium brown, aphanitic, pelletoid, fairly evenly medium bedded, resistant, weathers medium grey where not washed by stream, light grey where so washed.  Lithological specimen from top of unit (GSC loc. 54833). Bedding 195T/21E.	18	321.8
9	Limestone, medium brown, aphanitic, beds between 1 foot and 1.5 feet thick, weathers light grey; large masses of white coarsely crystalline calcite		

Unit	Description	Thickness (feet)	
		Unit	From base
	about 2 feet by 10 feet in areal extent; unit discontinuously exposed along bank of creek.	42.3	303.8
	Bedding 167T/31E.		
8	Limestone, dark brown, aphanitic, evenly bedded between 0.3 foot to 1.2 feet thick, weathers medium to dark brownish grey; contains numerous stringers of white calcite; exposed as a series of rib-like beds along north bank of stream.	30.8	261.5
	<u>Moelleritia?</u> sp. from 9.8 feet up (GSC loc. 54832).		
7	Limestone, aphanitic, pelletoid, evenly medium to thick bedded, resistant, scarp-forming, weathers medium brownish grey; eastward along strike these beds have been altered to a medium grained, granular dolomite, highly fractured and jointed, and contain large irregular masses of white coarsely crystalline calcite so that from a distance unit appears brecciated.	24.5	230.7
	Limestone specimen (GSC loc. 54830).		
	Dolomite specimen (GSC loc. 54831).		
	Station 281NB at base of unit 7 on south bank of stream 1.6 miles upstream from mountain front.		
6	Limestone, slightly silty, medium brown, fine grained, pelletoid, evenly medium to thick bedded, resistant, weathers medium brown, in places coated with a medium orange stain; ostracod fragments present 3 feet up (GSC loc. 54829);		

Unit	Description	Thickness (feet)	
		Unit	From base
	lower 15 feet well exposed; upper beds discontinuously exposed.	39.4	206.2
	Station 280NB at base of unit 6 on south side of stream 1.7 miles upstream from the mountain front.		
5	Covered.	150	166.8
4	Dolomite, medium brown, medium grained, granular, porous, massive, resistant, weathers pale orange-brown.	2.8	16.8
3	Dolomite, argillaceous, mottled medium brown and pale orange, medium grained, rubbly thin bedded, slightly recessive, weathers pale orange.	3.5	14
2	Dolomite, mottled pale brown and pale orange, fine to medium grained, granular, thick bedded to massive, fairly resistant, weathers light grey and in places with pale orange mottling.	7	10.5
	Lithological specimen (GSC loc. 54828).		
	Station 279NB at base of unit 2 on south side of stream about 1.8 miles upstream from the mountain front. Bedding 184T/27E.		
1	Dolomite, argillaceous, pale brownish grey, massive, strongly fractured, weathers pale orange-brown; irregular veinlets filled with white opaque dolomite along walls and milky white translucent calcite away from walls of veinlets; stromatoporoid collected loose (GSC loc. 54827).	3.5	exposed
	Station 278NB at base of exposure at axis of a broad gentle anticline on south side of creek 1.85 miles upstream from the mountain front at approximately 66°12.7'N, 139°18'W.		

Section 30: FISH CREEK, WHITE MOUNTAINS (116P-7)

Light grey weathering Palaeozoic carbonates form a faulted dome at the headwaters of Fish Creek. The lower part of the section is best exposed in the canyon of an east-flowing major tributary creek (67°56'N, 136°33'-40'W), and the Devonian and Permian-Pennsylvanian rocks outcrop along a steep, west-flowing minor creek (67°45'N, 136°31'-33'W) that enters Fish Creek a mile above the major creek. Faults are common and render uncertain the true thicknesses of the units in the lower part of the section. The base of the section is the lowest bed exposed in the central part of the dome and may be within the Cambrian or the Ordovician, but, off to the north of the main dome, fault slices show Cambrian(?) sandstones, mudstones, and dolomites that are thought to underlie the carbonate sequence. The top of the section is a stripped bedding-plane surface at the top of cliffs of Permian-Pennsylvanian limestone. Measurement was by staff.

Section measured by B.S. Norford, assisted by N.L. Ball, July 18-20, 1962.

PERMIAN-PENNSYLVANIAN	
Carbonates	352'
Disconformity	
MIDDLE DEVONIAN	
Ogilvie Formation	766'
MIDDLE DEVONIAN AND OLDER	
Gossage Formation	2431'
MIDDLE SILURIAN	
Carbonates	633'
PRE-ORDOVICIAN, ORDOVICIAN, AND SILURIAN	
Carbonates	4810'

Unit	Description	Thickness (feet)	
		Unit	From base

PERMIAN-PENNSYLVANIAN  
(352 feet)

- |   |  |
|---|--|
| 1 | Limestone, mostly siliceous, very finely to coarsely crystalline, grey, weather yellowish orange, yellowish grey, and dark yellowish orange, recessive, bedding 1/4 foot to 3 feet; with irregular siliceous partings in the basal beds; |
|---|--|

Unit	Description	Thickness (feet) From Unit base
	with rare chert nodules in the upper beds; with 5 per cent thin limy shale interbeds in the upper beds, dark brown, weather dark brown, very poorly fissile. Covered intervals at 17-52, and 5-12 feet up; fault at 76 feet up; brachiopods and large solitary corals 117-131 and 114-124 feet up.	82
	Contact between units 1 (above) and 4 (below) is marked by a disconformity with abrupt lithologic change and an erosion surface cut 2 inches deep. Scattered quartz sand grains are present in the basal bed of unit 1.	
MIDDLE DEVONIAN		
<u>Ogilvie Formation</u> (766 feet thick)		
4	Limestones, aphanitic, dark grey, grey, and grey-black, weather light grey and grey, resistant, bedding 1 foot to massive; with uncommon grey-black weathering chert nodules and laminae and local irregular silicification laminae.	96                      766
	Fossils from top of unit (Field No. 51NEfF): stromatoporoids and corals including <u>Cystiphylloides</u> ( <u>Cystiplasma?</u> ) sp. and <u>Favosites</u> sp. (Field No. 51NEjF).	
	Fossils from 8 feet up (GSC loc. 53218); undet. brachiopod?.	
3	Limestones, aphanitic to very finely crystalline, some pelletoid, dark grey, weather grey, light grey, with buff stains, bedding 1/4 foot to 3 feet; with 30 per cent calcareous dolomites at 49 feet up, very finely crystalline, light grey, weathers	

Unit	Description	Thickness (feet)	
		Unit	From base
	<p>yellowish orange; with 10 per cent calcareous shales at 351-353 feet, dark grey, poorly fissile; covered intervals at 341-344, 193-196, and 53-61 feet, erosion surface 2 inches deep at 86 feet up.</p> <p>(GSC loc. 53217) shale for microfossils from 351-353 feet up.</p> <p>Stromatoporoids and corals from 276-277 feet up (Field No. 51NE cF).</p>	418	670
2	<p>Limestones, very finely crystalline and aphanitic, some beds pelletoid, others with significant amounts of bioclastic debris, dark grey and grey, weather light grey and grey, resistant, bedding mostly massive; recessive breaks at 54 and 110-121 feet up.</p> <p>Fossils from 167-169 feet up (GSC loc. 53215): <u>Alveolites</u> sp., <u>Favosites</u> sp., <u>Atrypa</u> cf. <u>A. perfimbriata</u> Crickmay, echinoderm ossicles with single, double, and cross-like axial canals.</p> <p>Fossils from 94-144 feet up (GSC loc. 53214): <u>Favosites</u> sp., cf. <u>Hexagonaria</u> sp., fragments of a large pentamerid, echinoderm ossicles with single, and double axial canals.</p> <p>Fossils from 64-68 feet up (GSC loc. 53213): <u>Favosites</u> sp.</p>	196	252
1	<p>Limestones, very finely crystalline to aphanitic, dark grey, weather grey and light grey, resistant but less so than unit 2, bedding 1 foot to massive; covered interval at 37-39 feet up.</p>	56	

Unit	Description	Thickness (feet) From base
	Fossils from 15-20 feet up (GSC loc. 53212): <u>digitate stromatoporoid</u> , and <u>Coenites</u> sp.	
MIDDLE DEVONIAN AND OLDER		
<u>Gossage Formation</u> (2431 feet thick)		
4	Limestones, mostly somewhat siliceous, some dolomitic, very finely crystalline to finely crystalline, grey and dark grey, weather grey, light grey, bluish grey, yellowish grey, with buff stains, bedding 1 foot to 8 feet; with rare chert nodules at 140 feet up, weather dark brown; siliceous calcareous dolomites, amount to about 35 per cent of rock, very finely crystalline, grey, and dark grey, weather grey, light grey, and yellowish grey, with buff stains, bedding 1/2 foot to 5 feet; with very rare dolomite-breccia beds; unit is more recessive in its lower part that contains more dolomites; covered intervals at 546-553, 467-469, 363-365, 321-325, 309-313, 296-299, 193-195. Large ostracods in thin bedded limestones at 370-401 feet up; corals and brachiopods above. Gradational contact with unit 3.	625                      2431
	Fossils from 484-485 feet up (GSC loc. 53211): <u>Alveolites?</u> sp., <u>Coenites</u> sp., undet. colonial coral, cf. <u>Ambocoelia</u> sp., and very small poorly preserved brachiopods.	
	Fossils from 371 feet up (GSC loc. 53210): <u>Moelleritia?</u> sp.	
3	Siliceous dolomites, finely crystalline to aphanitic, rare beds probably pelletoid, grey, dark grey, brownish grey, and	

Unit	Description	Thickness (feet) From base
	<p>light grey, weather grey, yellowish grey, pale yellowish orange, dark grey, greyish orange, with buff stains, bedding 1/4 foot to 4 feet, good; with minor limestones in the lowest 200 feet, very finely crystalline to aphanitic, dark grey and brownish grey weather grey, bedding 1/4 foot to 2 feet; with dolomite breccia at 1157 feet; covered intervals at 902-911, 770-807, 733-839, 667-671, 627-647, 617-625, 597-604, 313-352, 271-282, 100-200; shallow erosion surfaces at 825 and 659 feet; faults at 1022 and 902 feet; barren except for fossil debris near base of unit; contact gradational with unit 2.</p>	<p>1187 1806</p>
2	<p>Limestones, rarely bioclastic or biostromal, finely crystalline to aphanitic, dark grey, grey, and dark bluish grey, weather grey with buff stains, recessive, bedding 1 inch to 24 inches, fairly good; with 10 to 30 per cent interbeds of siliceous limestone, very finely crystalline, grey, olive-grey, yellowish grey, weather grey, grey-yellow, light orange-brown, with buff stains, bedding 3 to 18 inches; with rare, very siliceous dolomites, aphanitic to very finely crystalline, light grey, weather light greyish orange, and yellowish orange, bedding 3 to 24 inches, with rare chert nodules, weather grey-black; covered intervals at 501-510, 415-434, 210-247, 199-205, 173-182, 150-154, 112-114, 91-94, 24-44; fault at 305 feet.</p>	<p>545 619</p>
	<p>Fossils from 534 feet up (GSC loc. 53209): <u>Atrypella</u> cf. <u>A. scheii</u> (Holtedahl).</p>	
	<p>Fossils from 518 feet up (GSC loc. 53208): colonial coral.</p>	

Unit	Description	Thickness (feet) From base
	Fossils from 513 feet up (GSC loc. 53207): cf. <u>Harpidium</u> sp. <u>Atrypella</u> cf. <u>A. phoca</u> (Salter).	
	Fossils from 476 feet up (GSC loc. 53206): echinoderm ossicles with single axial canals, and indeterminate organic remains.	
	Fossils from 335 feet up (GSC loc. 53205): stromatoporoid, <u>Favosites</u> sp., and cf. <u>Atrypella</u> sp.	
	Fossils from 325 feet up (GSC loc. 53204): digitate stromatoporoid.	
	Fossils from 263-266 feet up (GSC loc. 53203): stromatoporoid, cf. <u>Coenites</u> sp. - same form as in GSC loc. 53202, cf. <u>Coenites rectilineatus</u> (Simpson), cup coral, and stropheodontid? fragment.	
	Fossils from 144 feet up (GSC loc. 53202): stromatoporoid, and cf. <u>Coenites</u> sp.	
	Fossils from 71 feet up (GSC loc. 53201): cf. <u>Atrypella</u> sp.	
	Fossils from 0-5 feet up (GSC loc. 53200): undetermined colonial coral, and brachiopod fragment.	
1	Covered interval; base of Gossage Formation tentatively picked at base of this interval.	74

MIDDLE SILURIAN  
(633 feet thick)

- 8 Limestones, very finely crystalline to finely crystalline, with rare aphanitic pelletoid limestones, grey and dark

Unit	Description	Thickness (feet) From base
	grey, weather light grey, grey, with buff stains, moderately resistant, bedding 1 foot to 8 feet, commonly weathering platy or rubbly; with nodular limestone conglomerate beds at 195-198, 122-130, 103-106 feet up; covered intervals at 77-89, 60-72, and 45-52 feet up; corals, brachiopods and ostracods (GSC locs. 53199 189-191 feet up, 53198 183-191 feet up, 53193 10-18 feet up, 53194 0-18 feet up); lower contact gradational with unit 7.	228

Section 35: TRAIL RIVER, EAST FLANK OF RICHARDSON MOUNTAINS  
(106L-5)

Section was measured along Trail River from a point (66°24.5'N, 135°31'W) just within the east flank of the Richardson Mountains to a point about five miles (air distance) beyond and northeast of the front (66°27.5'N, 135°22'W). Only the Devonian formations are presented here.

Section measured by A. W. Norris, assisted by A. J. Jenik; July 1-6, 1962.

UPPER DEVONIAN	
Imperial Formation	5957.3'; incomplete
Upper Member	1161.3'; incomplete
Lower Member	4796'
MIDDLE DEVONIAN	
Prongs Creek Formation	871.1'
Unconformity	
SILURIAN	
Road River Formation	874.8'
Fault contact	
ORDOVICIAN or SILURIAN	159'; incomplete

Unit	Description	Unit	Thickness (feet) From base
UPPER DEVONIAN			
Imperial Formation (5957.3 feet; incomplete)			
Upper Member (1161.3 feet; incomplete)			
25	Shale, dark brownish grey, with thin scattered beds of rusty brown weathering sandstone.	c. 14	1161.3
24	Sandstone, evenly medium to thick bedded, weathers rusty orange.	c. 5	1147.3
23	Sandstone, evenly thin bedded, weathers rusty orange.	c. 5	1142.3

Unit	Description	Thickness (feet)	
		Unit	From base
22	Shale, dark grey, with widely spaced thin beds of orange weathering sandstone.  Beds highly contorted and upper part faulted.  All of the above units are exposed at station 160NB on the north bank of a small tributary of the Trail River 0.2 mile north of the river and 5.2 miles northeast of the mountain front. Thicknesses estimated.	c. 60	1137.3
21	Shale, dark grey, fissile, soft, weathers medium grey; with thin beds of sandstone, dark bluish grey, fine grained, weathers bright rusty orange.  Shale for microfossils from the west bank and mouth of the above mentioned creek where the upper part of unit is well exposed (GSC loc. 7048); spores identified by D. C. McGregor comprise: <u>Archaeozonotriletes cancellothyris</u> (Waltz) Kedo <u>A. malevkensis</u> Naumova <u>?A. gloriosus</u> Naumova <u>Hymenozonotriletes lepidophytus</u> Kedo <u>H. spinulosus</u> Naumova <u>Hystricosporites</u> sp. <u>Lophozonotriletes cristifer</u> (Luber) Kedo <u>L. curvatus</u> Naumova cf. <u>Retusotriletes greggsii</u> McGregor Age: late Famennian  Bedding 175/68E.	22	1077.3
20	Sandstone, some beds argillaceous and nodular, salt and pepper grey, cross-laminated, in beds up to 1 foot thick, weathers bright orange; interbedded with dark grey shale up to 3 feet thick.	210	1055.3

Unit	Description	Thickness (feet)	
		Unit	From base
	Only lower 50 feet of this unit is accessible along north bank of Trail River.		
	Tree stem tissue in argillaceous nodular sandstone; also carbonized woody tissue collected from sandstone at base of unit (GSC loc. 54367).		
	Plant stem impression from 23 feet up (GSC loc. 54368).		
19	Covered; presumably interval consists of shale similar to unit 18.	32	845.3
18	Shale, black, fissile, weathers dark grey, with occasional layers up to 1 inch thick of clay ironstone nodules weathering rusty brown.	12	813.3
	Shale for microfossils (Field No. 159NBd). Bedding 205/65E.		
17	Covered.	134	801.3
16	Sandstone, granule grain size, very hard even beds up to 1 foot thick, weathers orange; interbedded with shale, non-calcareous, dark greenish grey, poorly exposed.	10.5	667.3
15	Conglomeratic sandstone, silty and argillaceous in upper 3 feet, dark greenish grey, weathers orange; thickly interbedded with shale; sandstone beds contain numerous macerated plant fragments in upper 3 feet (GSC loc. 54366).	20	656.8
14	Shale, dark grey, weathers medium brownish grey; with thin beds of sandstone, bluish grey, fine grained; and one layer of clay ironstone nodules.	9	636.8

Unit	Description	Thickness (feet)	
		Unit	From base
13	Conglomeratic sandstone; interbedded with dark grey shale; sandstone beds up to 4 feet thick, shale beds up to 3 feet thick.  Sample of conglomeratic sandstone from top of unit (GSC loc. 54365).	20	627.8
12	Sandstone, conglomeratic, pebbles up to 1/8 inch, medium greenish grey, massive, weathers bright orange.	16	607.8
11	Shale, dark grey, recessive, poorly exposed.	4.8	591.8
10	Sandstone, conglomeratic, medium grey, coarse grained, pebbles up to granule size, very hard beds up to 4 feet thick, weathers orange; separated by thin beds of dark grey shale up to 6 inches thick.	10	587
9	Conglomerate, pebble sizes up to 1/4 inch, crossbedded, weathers orange.	4	577
8	Sandstone, conglomeratic, fine to coarse grained matrix, basal 4 feet thin bedded and recessive; beds above evenly thick bedded to massive; in upper 14 feet dark grey shale interbeds up to 2 feet thick.  Shale for microfossils (GSC loc. 7049); spores identified by D. C. McGregor comprise: <u>Ancyrospora</u> sp. <u>Calamospora atava</u> (Naumova) McGregor ? <u>Cymbosporites cyathus</u> Allen <u>Grandispora</u> sp. <u>Hystricosporites</u> (2 species) <u>Lophozonotriletes cristifer</u> (Luber) Kedo ? <u>L. excisus</u> Naumova <u>Verrucosisporites</u> sp. Age: probably Famennian	34	573

Unit	Description	Thickness (feet)	
		Unit	From base
7	Sandstone, salt and pepper greenish grey, fine to coarse grained, medium bedded to massive, coated with a conspicuous orange stain; thin interbeds of conglomerate.	48	539
	Station 159NB at base of unit 7 on north bank of Trail River 5 miles northeast of mountain front.		
	Bedding 195T/60E.		
6	Shale, dark grey weathering, poorly exposed, with some thin beds of orange weathering sandstone.	c. 400	491
	Upper 200 feet of unit is mainly covered.		
	Shale for microfossils from top of unit 6 (Field No. 159NBa).		
5	Shale, dark grey; with thin closely spaced beds of orange weathering sandstone.	10	91
4	Sandstone, argillaceous, silty, sericite along foliate planes, dark grey, highly fissile, recessive, weathers rusty brown.	0.5	81
3	Sandstone, conglomeratic, matrix medium to coarse grained, medium greenish grey, evenly bedded up to 3 feet thick, weathers medium greenish grey and stained a bright orange; interbedded with conglomerate beds up to about 1 foot thick, containing pebbles of white quartz, black chert, and white feldspar, pebbles angular to partly rounded up to about 1/4 inch in diameter; unit highly resistant; in upper 2 feet also pebbles of Imperial sandstone.	46.5	80.5
	Specimen of conglomerate (GSC loc. 54361).		

Unit	Description	Thickness (feet)	
		Unit	From base
	Pebbles of Imperial sandstone (GSC loc. 54362).		
	Oriented specimen of sandstone 3.5 feet from top of unit (GSC loc. 54363).		
	Sandstone specimen 3 feet from top of unit (GSC loc. 54364).		
	Bedding 175T/90 at east end of outcrop.		
2	Sandstone, in part argillaceous, salt and pepper grey, fine grained, thin bedded, up to 3 inches thick, recessive, weathers rusty orange; poorly exposed.	4	34
1	Sandstone, medium to dark grey, medium to coarse grained, evenly thin to medium bedded, weathers light orange-brown; separated by thin beds of sandstone, argillaceous and ferruginous, weathers rusty brown; and thin beds of shale.	30	
	Granule sandstone from base of unit (GSC loc. 54360).		
	Lower Member (4796 feet thick)		
163	Shale, non-calcareous, ferruginous, dark grey, fairly soft, weathers dark grey.	30	4796
	Shale for microfossils (GSC loc. 7317); spores identified by D. C. McGregor comprise:		
	? <u>Archaeozonotriletes famenensis</u> Naumova		
	<u>Cymbosporites cyathus</u> Allen		
	? <u>Lophotriletes salebrosus</u> Naumova		
	<u>Lophozonotriletes cristifer</u> (Luber) Kedo		
	? <u>L. curvatus</u> Naumova		

Unit	Description	Thickness (feet)	
		Unit	From base
<u>Retusotriletes</u> sp.			
Age: probably early Famennian			
Station 158NB at top of unit 163 on north bank of Trail River 4.83 miles north-east of mountain front.			
162	Shale, weathers medium brownish grey, with thin beds of sandstone up to 1.5 feet thick weathering rusty brown.	c. 30 exposed	4766
161	Sandstone, evenly very thick bedded, up to 4.5 feet thick, resistant, weathers medium brown and orange.	30	4736
Station 157NB at base of unit 161 on the south side of Trail River 4.8 miles northeast of mountain front. Bedding estimated 165T/45E.			
160	Covered.	c. 254	4706
159	Shale, similar to unit 157.	140	4452
158	Sandstone, evenly thick bedded, highly resistant, weathers bright orange.	30	4312
157	Shale, black, weathers rusty brown.	120	4282
156	Sandstone, evenly thick bedded, weathers rusty brown; with thin interbeds of dark brownish grey weathering shale; unit very resistant; eastern or upper part of unit drag folded.	80	4162
155	Sandstone, medium bedded, weathers rusty brown, interbedded with shale, weathering brownish grey.	40	4082
154	Shale, weathers medium brownish grey; with thin to medium bedded sandstone in bottom and upper quarters of unit.	50	4042

Unit	Description	Thickness (feet)	
		Unit	From base
	Drag-folded and possibly faulted towards bottom (west side) of unit.		
153	Shale, weathers medium orange, recessive, poorly exposed.	30	3992
152	Shale, medium brownish grey; capped by an even bed of sandstone 10 inches thick weathering orange.	18	3962
151	Sandstone, evenly thin bedded, weathers orange-brown; interbedded with medium brown weathering shale.	20	3944
150	Covered.	40	3924
149	Sandstone, strongly ferruginous, salt and pepper greenish grey, fine grained, evenly thin to medium bedded, weathers bright orange; interbedded with shale, weathers bright orange; interbedded with shale, weathers medium brownish grey.	12	3884
	Oriented specimen of sandstone from near top of unit (GSC loc. 54359). Bedding 160T/68E.		
148	Shale, weathers medium brownish grey; very poorly exposed.	40	3872
	Shale for microfossils from top of unit (Field No. 156NBa).		
147	Sandstone, rubbly bedded up to 8 inches thick, weathers pale orange; interbedded with buff-brown weathering shale.	10	3832
146	Shale, weathers light tan brown; poorly exposed; faulted lower contact.	<u>c.</u> 50	3822

Unit	Description	Thickness (feet)	
		Unit	From base
	Units 146 to 159 are exposed along the north bank of Trail River at station 156NB between 4.55 and 4.69 miles northeast of mountain front.		
145	Sandstone, evenly thin bedded, weathers pale orange; interbedded with black and dark grey shale.	72	3772
144	Shale, black, recessive; with very thin argillaceous sandstone beds in lower quarter of unit.	14	3700
143	Sandstone, evenly bedded, average 9 inches thick towards the base and average about 1 inch thick towards top; beds separated by dark shale partings.	12	3686
142	Shale, black, with very thin beds of orange weathering sandstone; recessive.	12	3674
141	Sandstone, evenly bedded, varying between 15 inches at base and 1/2 inch thick towards top; separated by black shale partings.	38	3662
140	Shale, black; with widely spaced beds of sandstone up to 1 inch thick, weathering pale orange.	12	3624
139	Sandstone, evenly thin bedded up to 6 inches thick; separated by black shale partings and beds up to 4 inches thick.  Beds drag-folded.	22	3612
138	Shale, black; with moderately spaced very thin beds of argillaceous sandstone up to 1/4 inch thick; beds severely drag-folded.	4	3590
137	Shale, dark grey to black; with closely spaced beds of sandstone up to 4 inches		

Unit	Description	Thickness (feet)	
		Unit	From base
	thick, weathering pale orange and rusty brown; unit fairly resistant.	26	3586
136	Shale, black, with even thin beds of rusty brown-weathering sandstone; more shaly towards top.	26	3560
135	Shale, black, with very thin beds of rusty brown-weathering sandstone up to 1 inch thick; unit severely drag-folded.	3	3534
134	Shale, dark to medium grey; with thin beds up to 4 inches thick of sandstone, weathers rusty brown; fairly resistant.	30	3531
133	Shale, dark grey; with thin beds of sandstone, argillaceous, weathers pale orange; unit drag-folded and may be faulted.	54	3501
132	Sandstone and shale, thinly interbedded; severely drag-folded.	36	3447
131	Sandstone, evenly bedded up to 10 inches thick, weathers orange-brown; separated by dark grey shale partings.	7	3411
130	Sandstone, with argillaceous sandstone partings, dark grey, recessive.	5	3404
129	Sandstone, evenly thick bedded, weathers brownish grey.	10	3399
128	Shale, dark grey, recessive.	3	3389
127	Sandstone, medium to thick bedded, separated by thin beds of shale, weathers orange-brown; unit drag-folded in upper part.	12	3386
126	Sandstone, evenly thin bedded, separated by thin beds of dark grey and black shale; slightly recessive.	18	3374

Unit	Description	Thickness (feet)	
		Unit	From base
125	Sandstone, quartzose, silty, argillaceous, sericitic, greenish grey, fine grained, mainly massive, weathers rusty brown.	6	3356
124	Shale, dark grey, recessive, poorly exposed.	3	3350
123	Sandstone, quartzose, silty, sericitic, medium green, lenticular cross-laminated, weathers light greenish grey; in places coated with an orange staining; contains macerated carbonaceous plant fragments (GSC loc. 54358).	15	3347
122	Shale, dark grey; with thin beds up to 4 inches thick of brownish grey and orange-weathering sandstone.	12	3332
121	Sandstone, with dark grey argillaceous sandstone partings, medium to thick bedded, up to 1.5 feet thick, weathers rusty brown; oriented lithological specimen (GSC loc. 54357).	30	3320
Units 121 to 145 exposed at station 155NB along the south bank of the Trail River 4.5 miles northeast of mountain front.			
120	Shale, dark grey, soft, fissile, with widely spaced thin beds of siltstone weathering orange, and irregular layers and nodules of clay ironstone; also thin beds of argillaceous and silty sandstone, which become more numerous and closely spaced in upper third of unit.	c. 1166	3290
Shale for microfossils from base of unit (GSC loc. 7315); sample contains very poorly preserved spores.			

Unit	Description	Thickness (feet)	
		Unit	From base
	Station 153NB at base of unit 120 at fault contact, on north side of Trail River and on the west side of a large cirque-like exposure 4.3 miles northeast of mountain front.		
119	Sandstone, argillaceous, silty, dark green, thin bedded up to 4 inches thick, weathers rusty orange; with thin interbeds of shale, dark grey to black; resistant, scarp-forming.	c. 100	2124
	Station 152NB at base of unit 119 on north side of river at top of a steep cliff 4.2 miles northeast of mountain front.		
118	Sandstone, argillaceous, thin to medium bedded, up to 1.2 feet thick, weathers medium orange; with thin interbeds of shale up to 0.5 foot thick, dark grey to black.	75	2024
	Bedding 200T/40E.		
117	Shale, dark grey to black, with widely spaced even beds of sandstone up to 7 inches thick, weathering medium orange.	25	1949
116	Sandstone, evenly bedded up to 7 inches thick, weathers medium orange-brown; thinly interbedded with dark grey shale up to 4 inches thick.	12	1924
115	Shale, dark grey; with thin closely spaced beds of argillaceous and silty sandstone; recessive, weathers dark grey.	6	1912
114	Sandstone, argillaceous and silty, even beds up to 2 feet thick, weathers orange-brown; interbeds of dark grey shale up to 0.5 foot thick; unit resistant.	14	1906

Unit	Description	Thickness (feet)	
		Unit	From base
113	Shale, silty, dark grey and black, recessive.	5	1892
112	Sandstone, even beds up to 0.5 foot thick, weathers pale orange; interbedded with shale, dark grey to black, weathers dark grey.	15	1887
111	Sandstone, evenly bedded up to 2.5 feet thick; thin interbeds of dark grey shale.  A fault (165T/60W) cuts through units 111 and 112.	18	1872
110	Sandstone, silty and argillaceous, weathering orange-brown; thinly interbedded with dark grey shale; unit resistant, vertical scarp-forming.  Station 151NB at base of unit 110 on south side of river at sharp bend 4.1 miles northeast of mountain front.	35	1854
109	Covered.	<u>c.</u> 20	1819
108	Sandstone, silty and argillaceous, sericitic, dark greenish grey, fine grained, beds up to 4 feet thick; separated by thin beds of dark grey to black shale.  Sandstone specimen from top of unit (GSC loc. 54356). Station 150NB at base of unit 108 on north bank of river 4 miles northeast of mountain front. Bedding 180T/15E.	20	1799
107	Shale, dark grey; thinly interbedded with pale orange-weathering siltstone.	12	1779

Unit	Description	Thickness (feet)	
		Unit	From base
106	Siltstone, sandy, beds from 0.5 foot to 3 feet thick, weathers pale orange-brown; interbedded with dark grey to black shale beds up to 0.5 foot thick; resistant.	14	1767
105	Siltstone, argillaceous, beds pinch and swell along strike, up to 3 feet thick, weather pale orange-brown, separated by very thin beds of dark grey shale; resistant.	15	1753
104	Shale, very dark grey to black; with very thin beds of rusty brown-weathering siltstone; recessive.	18	1738
	Station 149NB at base of unit 104 on south bank of Trail River 3.8 miles northeast of mountain front.		
103	Sandstone, argillaceous, silty, sericitic, dark greenish grey, very fine grained, in beds up to 1.5 feet thick, weathers pale orange-brown; beds separated by shale, dark grey, soft, fissile, beds 2 to 3 inches thick; unit very resistant, vertical scarp-forming.	36	1720
	Bedding 050T/8SE.		
102	Shale, non-calcareous, dark grey, soft, fissile; with widely spaced thin beds of sandstone, argillaceous and silty, dark greenish grey, fine grained, weathers light rusty brown.	47	1684
	Shale for microfossils 37 feet up (Field No. 148NBb).		
101	Sandstone, argillaceous, silty, sericitic, dark greenish grey, irregularly laminated, beds up to 1.5 feet thick, weathers light greenish grey; thinly interbedded with dark grey shale; resistant.	4	1637

Unit	Description	Thickness (feet)	
		Unit	From base
100	Shale, dark grey, soft, fissile; with widely spaced thin beds of sandstone, argillaceous and silty, fine grained, beds up to 6 inches thick; unit poorly exposed, recessive.	14	1633
99	Sandstone, dark greenish grey, very fine grained, cross-laminated, beds up to 8 inches thick; with interbeds of shale, dark grey; resistant.	10	1619
98	Shale, clay-like (wet), dark greenish brown, soft, fissile, weathers dark grey.	2	1609
97	Sandstone, variably silty and argillaceous, dark greenish grey, beds up to 1.2 feet thick; separated by very thin beds up to 1 inch thick of shale, non-calcareous, dark grey, soft, unit weathers a light yellowish green.	26	1607
	Macerated plant fragments collected loose (GSC loc. 54355).		
	Station 148NB at fault within unit 97 on north bank of Trail River 3.82 miles northeast of the mountain front.		
96	Shale, dark grey, soft, highly fissile, weathers dark brownish grey; recessive.	3.5	1581
95	Sandstone, silty, and some beds argillaceous, dark greenish grey, thick bedded to massive, cross-laminated, weathers medium green, resistant.	3.5	1577.5
94	Shale, dark greenish grey, soft, fissile, weathers medium grey, recessive.	4	1574

Unit	Description	Thickness (feet)	
		Unit	From base
	Shale for microfossils (Field No. 147NBb).		
93	Shale, dark grey, soft, fissile, breaks into small fragments, beds up to 6 inches thick; with thin beds of siltstone, dark greenish grey, beds 1 to 4 inches thick, weathers dark rusty brown; poorly exposed.	8	1570
92	Siltstone, sericitic, dark greenish grey, irregularly laminated, beds up to 7 inches thick; interbedded with shale, dark grey, fissile, both weathering rusty brown.	14	1562
	Bedding 180T/10E.		
91	Shale, ferruginous, dark grey, weathers dark grey and rusty brown; poorly exposed.	<u>c.</u> 20	1548
	Shale for microfossils from top of unit (Field No. 147NBa).		
90	Shale, very dark grey; with widely spaced thin beds of siltstone, sandy, sericitic, dark greenish grey, fissile.	<u>c.</u> 20	1528
89	Sandstone, sericitic, medium greenish grey, fine grained, medium bedded, cross-laminated, weathers medium greenish grey; interbedded with shale, black, fissile; resistant; poorly preserved woody tissue present in some sandstone beds (GSC loc. 54354).	7.2	1508
88	Shale, dark grey to black, soft, beds up to 4 inches thick; evenly interbedded with siltstone, sandy, beds up to 2 inches thick.	3	1500.8

Unit	Description	Thickness (feet)	
		Unit	From base
87	Sandstone, and shale interbedded; sandstone is quartzose, silty, sericitic, medium green, fine grained, cross-bedded, beds up to 0.8 foot thick, weathers light greenish grey; shale is dark grey, soft, fissile, in beds up to 0.5 foot thick, unit resistant.	6	1897.8
86	Shale, non-calcareous, dark grey to black, weathers rusty brown; with thin interbeds of siltstone, sericitic, dark greenish grey, weathers rusty brown; recessive.	5.8	1891.8
	Station 147NB at base of unit 86 on the north bank of Trail River 3.7 miles northeast of the mountain front.		
85	Siltstone, sandy, dark greenish grey, cross-laminated, and with flow-cast structures, beds between 6 to 8 inches thick, weathers rusty brown; with thin interbeds of shale, dark grey, soft, beds between 2 to 3 inches thick; resistant, vertical cliff-forming.	31	1486
	Bedding 175T/10E at top of unit.		
84	Shale, dark grey, fissile, weathers dark brownish grey; with thin beds of sandstone, sericitic, weathers dark grey.	15	1455
83	Sandstone, argillaceous, silty, sericitic, dark greenish grey, weathers medium greenish grey.	1	1440
	Flow-cast structures collected loose (GSC loc. 54352).		
82	Shale, non-calcareous, dark greenish grey, soft, weathers dark brownish grey.	8.5	1439

Unit	Description	Thickness (feet)	
		Unit	From base
	Shale for microfossils from top of unit (Field No. 146NBd).		
81	Sandstone, silty, sericitic, dark greenish grey, lenticular cross-laminated, beds up to 8 inches thick; interbedded with shale, dark grey, soft; unit resistant.	3.2	1430.5
80	Shale, non-calcareous, dark greenish grey, very soft, weathers dark rusty brown; recessive.	7	1427.3
	Plant stem collected loose (Field No. 146NBc).		
79	Shale, sericitic, dark greenish grey, beds up to 1 foot thick, weathers dark brownish grey; interbedded with sandstone, silty and argillaceous, dark greenish grey, beds up to 1 foot thick; unit resistant.	6	1420.3
	Woody plant tissue collected loose (GSC loc. 54353).		
78	Shale, dark greenish grey; interbedded with mudstone, ferruginous, nodular, weathers rusty brown.	8	1414.3
77	Sandstone, similar to unit 40.	1.2	1406.3
76	Shale, ferruginous, dark grey, recessive, weathers brownish grey.	1.5	1405.1
75	Sandstone, quartzose, dark greenish grey, very fine grained, resistant, weathers rusty brown.	1.2	1403.6
	Lithological specimen (GSC loc. 54351).		
74	Shale, dark grey, soft; with thin beds of sandstone, quartzose, medium greenish		

Unit	Description	Thickness (feet)	
		Unit	From base
	grey, fine grained, beds up to 4 inches thick, cross-laminated, weathers rusty brown.	12.5	1402.4
73	Shale, ferruginous, dark brownish grey, very soft, weathers brownish grey.	5.5	1389.9
72	Sandstone, silty, sericitic, very fine grained, thin bedded, cross-laminated, coated with a whitish grey patina; contains a 6-inch bed of dark grey shale.	2.3	1384.4
71	Shale, strongly silty, sericitic, dark grey, fissile, irregular beds up to 1 foot thick, cross-laminated, weathers dark grey; with thin interbeds of shale, ferruginous, dark grey, weathers medium brownish grey; in places unit coated with a whitish patina; unit resistant.	7.5	1382.1

Shale for microfossils 3 feet up (GSC loc. 7050); spores identified by D. C. McGregor comprise:

Archaeoperisaccus ?verrucosus  
Pashkevich  
cf. Chelinospora concinna Allen  
cf. Convolutispora dispiralis Allen  
Convolutispora (2 species)  
cf. Dictyotriletes trivialis Kedo  
Grandispora sp.  
Lophozonotriletes curvatus Naumova  
Retusotriletes greggsii McGregor  
Verrucosisporites sp.

Age: early or middle Frasnian

Station 146NB at base of unit 71 on north bank of Trail River 3.5 miles northeast of the mountain front.

Unit	Description	Thickness (feet)	
		Unit	From base
70	Shale, dark grey, soft, recessive, weathers dark brownish grey; poorly exposed.	12	1374.6
69	Covered by vegetation.  Station 145NB at top of unit 69 on south side of river 3.4 miles northeast of the mountain front.	38	1362.6
68	Shale, dark greenish grey, relatively soft, weathers dark brownish grey; thin interbeds of sandy siltstone, weathering orange-brown.	25	1324.6
67	Siltstone, sandy, sericitic, slightly ocherous, very dark grey, cross-laminated, weathers dark rusty brown.	2	1299.6
66	Shale, non-calcareous, dark grey to black, soft, recessive, poorly exposed.  Shale for microfossils from top of unit 66 (Field No. 143NBe).	10	1297.6
65	Siltstone, sandy, dark grey to black, beds up to 2 feet thick, lenticular cross-laminated, weathers medium brownish grey; separated by thin beds of shale, dark grey to black, beds up to 3 inches thick, unit fairly resistant.	10	1287.6
64	Shale, non-calcareous, dark grey, recessive, weathers dark brownish grey, poorly exposed.	7	1277.6
63	Siltstone, sandy, sericitic, dark greenish grey, beds up to 6 inches thick, lenticular cross-laminated; with thin beds of shale, dark grey, fissile, beds up to 2 inches thick; unit resistant.	5	1270.6

Unit	Description	Thickness (feet)	
		Unit	From base
62	Shale, dark grey, fissile, recessive.	2.5	1265.6
61	Siltstone, sandy, beds up to 4 inches thick, weathers yellowish brown; separated by shale partings.	3	1263.1
60	Shale, dark grey, fissile, recessive; poorly exposed.	6	1260.1
59	Shale, variably ferruginous, dark grey to black, hackly fracturing; with occasional thin beds of sandy siltstone, weathering orange-brown; recessive.	13	1254.1
58	Siltstone, sandy, dark brownish grey, bed pinches and swells along strike, weathers pale yellowish brown; resistant.	0.5	1241.1
57	Shale, ferruginous, dark greenish grey to black, nodular towards top, weathers rusty brown.	4	1240.6
56	Siltstone, sandy, dark greenish grey, lenticular cross-laminated, weathers pale orange; interbedded with shale, ferruginous, dark grey, beds up to 2 feet thick, weathers brownish grey and rusty brown.	17	1236.6
55	Mudstone, nodular, weathers rusty brown.	2	1219.6
54	Shale, dark greenish grey, with an occasional nodular mudstone layer; poorly exposed.	12	1217.6
53	Siltstone, sandy, in part argillaceous, very dark grey, massive, lenticular cross-laminated; weathers light greenish grey.	5	1205.6
	Bedding 170T/35E.		

Unit	Description	Thickness (feet)	
		Unit	From base
52	Shale, clay-like, dark grey, soft, fissile; with thin even beds of siltstone, dark greenish grey, weathering pale orange.  Shale for microfossils (Field No. 143NBd).	4	1200.6
51	Siltstone, sandy, dark greenish grey, weathers rusty brown; with thin interbeds of shale, dark grey, fissile.	4	1196.6
50	Covered.	46.5	1192.6
49	Shale, non-calcareous, dark grey, soft, beds up to 1 foot thick, weathers dark grey; interbedded with mudstone, highly ferruginous, dark grey, nodular, nodules between 2 to 3 inches thick, weathers rusty brown; also thin even beds of siltstone, sandy, up to 2 inches thick, weathers rusty brown.  Bedding 020T/40E.	8	1146.1
48	Sandstone, argillaceous, sericitic, very fine grained, dark greenish grey, hard, weathers very light brownish grey; lithological specimen (GSC loc. 54350).	0.6	1138.1
47	Mudstone, highly ferruginous, sericitic, with thin layers of coaly material, weathers rusty brown; thin interbeds of shale, dark grey; coal for spores (Field No. 143NBc).	4.5	1137.5
46	Sandstone, sericitic, dark greenish grey, oscillation ripple-marks, resistant, weathers rusty brown.	1	1133
45	Shale, non-calcareous, dark greenish grey, soft, weathers pale orange-brown; with widely spaced beds of siltstone and fine grained sandstone,		

Unit	Description	Thickness (feet)	
		Unit	From base
	sericitic, dark greenish grey, beds up to 8 inches thick, weathers pale orange; unit poorly exposed.	22	1132
	Shale for microfossils from base of unit (GSC loc. 7315); poorly preserved spores.		
	The top of unit 44 at station 139NB (1.3 miles east of the mountain front) ties in only approximately with the base of unit 45 at station 143NB. The latter station is located on the north bank of Trail River 3.3 miles northeast of the mountain front.		
44	Shale, ferruginous, dark grey, hackly fracturing; with fairly widely spaced thin beds of siltstone, sericitic, dark greenish grey; unit poorly exposed.	33	1110
43	Shale, ferruginous, dark grey, hackly fracturing and in part nodular; with widely spaced beds of siltstone, weathers rusty brown; poorly exposed; shale for microfossils from top of unit (Field No. 139NBe).	59	1077
42	Siltstone and silty mudstone, sericitic, dark greenish grey, beds up to 8 inches thick, weathers orange-brown; interbedded with shale, dark grey; unit relatively resistant.	2	1018
41	Shale, non-calcareous, ferruginous, recessive.	4	1016
40	Shale, non-calcareous, dark grey; with widely spaced siltstone beds in middle third of unit.	27	1012
39	Shale, non-calcareous, strongly ferruginous, hackly fracturing and nodular, beds up to 4 feet thick,		

Unit	Description	Thickness (feet)	
		Unit	From base
	weathers rusty brown, especially along bedding planes; interbedded with siltstone, sericitic, very dark grey, beds between 2 to 8 inches thick, lenticular cross-laminated, weathers rusty brown.	45.5	985
	Siltstone specimen showing flow casting (GSC loc. 54525).		
38	Shale, ferruginous, dark grey, weathers medium rusty brown; with widely spaced siltstone beds up to 6 inches thick, some of which show cone-in-cone structures; shale for microfossils from top of unit (Field No. 139NBd).	30	939.5
37	Shale, ferruginous, dark grey, hackly fracturing, with four thin beds of siltstone, sericitic, dark grey, beds up to 7 inches thick, weather orange-brown.	6	909.5
36	Shale, ferruginous, very dark grey; with thin beds of siltstone, weathering rusty orange; unit recessive.	6.7	903.5
35	Shale, dark grey, beds up to 7 inches thick; interbedded with siltstone, beds up to 6 inches thick.	1.8	896.8
34	Shale, non-calcareous, ferruginous, dark grey; contains thin beds of mudstone, and clay ironstone nodules.	9.5	895
33	Siltstone, similar to unit 31.	1	885.5
32	Shale, non-calcareous, ferruginous, dark grey, nodular, weathers pale brown.	5	884.5
31	Siltstone, sericitic, dark grey, weathers orange-brown.	1	879.5

Unit	Description	Thickness (feet)	
		Unit	From base
30	Shale, ferruginous, dark grey, hackly fracturing, weathers rusty brown; with beds of silty mudstone, weathering orange-brown, some beds with flow-cast markings.	16	878.5
	Shale for microfossils from top of unit (GSC loc. 7312); spores identified by D. C. McGregor comprise: <u>Convolutispora</u> (2 species) ? <u>Geminospora</u> sp. ? <u>Lycospora magnifica</u> McGregor <u>Retusotriletes greggsii</u> McGregor Age: Frasnian		
29	Shale, ferruginous, non-calcareous, beds up to 4 feet thick; interbedded with siltstone, sericitic, dark greenish grey, beds up to 2.5 feet thick, cross-laminated, weathers bright orange; also an occasional clay ironstone nodule.	39	862.5
28	Shale, highly ferruginous, dark grey, weathers rusty brown; contains an occasional layer of clay ironstone nodules.	19	823.5
	Bedding 060T/10S.		
27	Shale, highly ferruginous, dark grey, hackly fracturing; with beds of mudstone, silty, sericitic, beds up to 6 inches thick, weathers conspicuous orange-brown.	6	804.5
26	Shale, non-calcareous, ferruginous, dark grey; contains occasional layers of small clay ironstone nodules.	13	798.5
	Shale for microfossils from top of unit (Field No. 139NBb).		

Unit	Description	Thickness (feet)	
		Unit	From base
25	Siltstone, slightly calcareous, sericitic, black, cross-laminated, weathers rusty orange-brown.	0.5	785.5
24	Shale, ferruginous, dark grey, breaks into irregular fragments, fairly soft, weathers medium brownish grey.  Shale for microfossils from base of unit (GSC loc. 7311); contains a few poorly preserved spores including <u>Convolutispora</u> sp.	24	785
23	Covered; talus fragments of shale, non-calcareous, highly ferruginous, dark grey, weathers rusty brown; contains occasional layers and nodules of clay ironstone weathering rusty brown.  Station 139NB at base of unit 23 at base of a fairly high steep cut-bank on south side of Trail River about 1.3 miles east of the Richardson Mountain front.	20	761
22	Covered interval across to south side of river.	<u>c.</u> 10	741
21	Shale, rusty brown, weathers medium brownish grey.  Station 138NB at top of unit 21 at east end of low outcrop on north bank of Trail River about 1.2 miles east of the Richardson Mountain front.	<u>c.</u> 10	731
20	Shale, dark grey, weathers medium brownish grey; with four thin beds of mudstone, weathering light tan brown.	21	721
19	Shale, dark grey, weathers medium brownish grey.	7	700

Unit	Description	Thickness (feet)	
		Unit	From base
18	Shale, dark grey, weathers light tan brown and rusty brown; with three light tan brown, even, mudstone beds between 0.6 to 1.5 feet thick.	12	693
17	Shale, dark grey, weathers light tan brown and dark rusty brown.	50	681
16	Shale, very dark grey, weathers pale brownish grey and reddish brown; capped by a clay ironstone bed weathering pale orange.	12	631
15	Shale, dark grey, weathers medium reddish brown.	55	619
14	Shale and interbedded mudstone, dark grey, weathers reddish brown.	25	564
13	Mudstone similar to unit 11.	2.5	539
12	Shale, dark grey, breaks into irregular fragments, weathers rusty brown; with thin beds up to 2 inches thick of clay ironstone.	35	536.5
11	Mudstone, massive, weathers light tan brown.	3	501.5
10	Shale, weathers medium brownish grey; poorly exposed.	<u>c.</u> 30	498.5
	Station 137NB at base of unit 10 at west end of outcrop on north bank of Trail River 0.9 mile east of the Richardson Mountain front.		
9	Shale, non-calcareous, dark grey, soft, breaks into irregular fragments, weathers rusty brown; contains nodules and thin beds up to 1.5 inches thick of clay ironstone.	<u>c.</u> 40	468.5
	Bedding 180T/25E.		

Unit	Description	Thickness (feet)	
		Unit	From base
	Station 136NB at base of unit 9 at north-east end of island in Trail River 0.86 mile east of the Richardson Mountain front.		
8	Covered interval between stations 135NB and 136NB.	<u>c.</u> 20	428.5
7	Shale, dark grey, relatively soft, breaks into small irregular fragments, weathers rusty brown.	6	408.5
	Shale for microfossils from top of unit (GSC loc. 7052); faulted upper contact. Spores identified by D. C. McGregor comprise: <u>Archaeoperisaccus</u> ? <u>timanicus</u> Pashkevich <u>Convolutispora</u> sp. ?Geminospora sp. ?Hystricosporites <u>porcatus</u> (Winslow) Allen Age: early to middle Frasnian		
	Station 135NB at top of unit 7 on south-east side of island in Trail River 0.78 mile east of Richardson Mountain front. Bedding 175T/35E.		
6	Shale, non-calcareous, dark grey, fairly resistant, weathers rusty brown; with clay ironstone nodules and thin beds spaced 1.5 to 2 feet apart up to 1 inch thick weathering rusty brown.	81	402.5
	Shale for microfossils from base of unit (Field No. 134NBc).		
5	Mainly covered; poor exposure of shale, dark grey, soft, recessive, breaks into small fragments, weathers rusty brown.	<u>c.</u> 18	321.5

Unit	Description	Thickness (feet)	
		Unit	From base
4	Shale, non-calcareous, dark grey, fairly resistant, weathers rusty brown; with a few nodules and very thin beds of clay ironstone nodules, some of which are septarianized.	17	303.5
3	Shale, calcareous, silty, fairly hard, weathers dark rusty brown; with an occasional bed of clay ironstone, weathering pale orange.	28.5	286.5
2	Shale, non-calcareous, dark grey, very soft, breaks into small irregular fragments, with clay ironstone nodules.	48	258
	Shale for microfossils from near base of unit; spores identified by D. C. McGregor comprise: <u>?Archaeoperisaccus</u> sp. <u>Retusotriletes greggsii</u> McGregor <u>?Hystricosporites</u> sp. <u>Convolutispora</u> sp. Age: probably Frasnian		
	Carbonized woody tissue collected in clay ironstone nodule (GSC loc. 54349).		
1	Covered; interval presumably consists of soft shale similar to unit 2.	c. 210	

MIDDLE DEVONIAN

Prongs Creek Formation  
(871.1 feet thick)

34	Shale, non-calcareous, black, platy, highly fissile, relatively recessive, yellowish green patina.	4	871.1
	Goniatite? impression from base of unit (GSC loc. 54348). Bedding 185T/35E.		

Unit	Description	Thickness (feet)	
		Unit	From base
	Station 134NB at top of unit 34 on south-east side and about 0.2 mile from west end of island in Trail River, about 0.6 mile east of the Richardson Mountain front.		
33	Shale, cherty, black, evenly thin bedded, up to 4 inches thick, interbedded with considerably softer fissile shale; beds with a yellowish green and orange coating.	67	867.1
32	Shale, black, hard, beds up to 3 inches thick; interbedded with soft, fissile shale beds up to 1 inch thick, beds coated with a yellowish green staining; arbitrary cut-off.	19.3	800.1
31	Shale, siliceous, black, evenly thin bedded, interbedded with shale, black, fissile, platy; both stained yellowish green; marcasite nodule with impression suggestive of a goniatite (Field No. 133NBe).	10.5	780.8
30	Chert, black, evenly thin bedded, up to 4 inches thick; separated by partings of black fissile shale and very thin beds of black siliceous shale. Blotchy staining of rusty orange, reddish orange, and yellowish orange.	53	770.3
29	Shale, non-calcareous, black, fissile, relatively soft.	1.5	717.3
	Shale for microfossils (Field No. 133NBd).		
28	Chert, black, evenly very thin bedded; with black shale partings; yellowish orange staining.	8.5	715.8
27	Chert, black, evenly thin bedded, up to 4 inches thick; interbedded with shale,		

Unit	Description	Thickness (feet)	
		Unit	From base
	non-calcareous, fissile, platy, beds between 1 to 3 inches thick; very strong yellowish orange staining; arbitrary cut-off.	32	707.3
26	Shale, siliceous, black, evenly thin bedded up to 3 inches thick; interbedded with softer black, fissile, platy shale; transitional contacts; beds gently drag-folded.	25	675.3
25	Shale, black, platy, hard, weathers black and coated with patchy yellowish green staining.	15	650.3
24	Shale, highly siliceous, black, evenly bedded up to 7 inches thick; interbedded with softer, more fissile, platy shale.	14	635.3
23	Covered.	4	621.3
22	Shale, siliceous, black, evenly bedded up to 6 inches thick; interbedded with black fissile shale, up to 6 inches thick; strong yellow and orange coating.	52	617.3
21	Shale, non-calcareous, black, platy, fissile, recessive, poorly exposed.	16	565.3
	Shale for microfossils from base of unit (Field No. 133NBc).		
20	Covered.	26	549.3
19	Shale, siliceous, black, very evenly thin bedded, interbedded with shale, highly fissile, platy, hard; both coated with a bright orange stain.	36	523.3
18	Covered.	36	487.3
17	Shale, siliceous, black, hard, very evenly thin bedded, thick orange-brown patina coating.	35	451.3

Unit	Description	Thickness (feet)	
		Unit	From base
	Oriented specimen from base of unit (GSC loc. 54555). Bedding 182T/55E.		
16	Shale, non-calcareous, siliceous, black, hard, evenly very thin bedded, averaging 1.5 inches thick, minor orange staining.  Beds slightly drag-folded.	65	416.3
15	Covered.	4.5	351.3
14	Chert, black, evenly thin bedded, up to 3 inches thick, yellowish orange staining.	52	346.8
13	Shale, siliceous, black, hard, evenly bedded up to 2 feet thick; with some even thin beds of black chert.	37	294.8
12	Shale, siliceous, non-calcareous, black, beds up to 4 inches thick, with very thin interbeds of black, fissile shale.  Top of unit faulted, displacement small.	63	257.8
11	Shale, siliceous, hard, black, beds up to 2 inches thick; interbedded with shale, black, fissile; yellow and orange staining.  Faulted upper contact dipping steeply east; displacement unknown but probably only a few feet.	18	194.8
10	Shale, black, hard, fissile, beds up to 4 inches thick, more resistant than unit below.	26	176.8
9	Shale, siliceous, black, very hard, very evenly and highly fissile, beds up to 3 inches thick, covered by a thick coating of yellow, yellowish green, and orange patina.	18	150.8
8	Covered.	23	132.8

Unit	Description	Thickness (feet)	
		Unit	From base
7	Shale and mudstone, non-calcareous, black, lower half irregularly bedded, upper half evenly bedded, platy and fissile.  Shale for microfossils taken 6 feet from top (Field No. 133NBa).	17.5	109.8
6	Shale, siliceous, black, hard, even beds up to 6 inches thick, separated by black, soft, carbonaceous shale partings; strong yellow and green coating.  Lithological specimen oriented (GSC loc. 54347).  Bedding 175T/56E.	36	92.3
5	Shale, non-calcareous, black, hard, fissile, beds up to 4 inches thick; unit capped by bed of siliceous shale 1.2 feet thick weathering rusty brown; unit covered with yellowish green coating.  Minor drag-folds and faults in upper third of unit.	20.5	56.3
4	Shale, non-calcareous, black, fissile, recessive.	5	35.8
3	Shale, probably siliceous, non-calcareous, black, hard, fissile, strong coating of yellow, orange, and orange-brown patina.	11	30.8
2	Shale, non-calcareous, black, slightly recessive, weathers black, yellowish green coating.	1.8	19.8
1	Shale, siliceous, non-calcareous, black, hard, beds up to 4 inches thick, coated with a yellowish green stain.	18	

Unit	Description	Thickness (feet)	
		Unit	From base
	Station 133NB at base of unit 1 very near southwest tip of island in Trail River about 0.45 mile east of Richardson Mountain front.		
SILURIAN			
<u>Road River Formation</u> (874.8 feet thick)			
54	Shale, black, soft, fissile; with occasional widely spaced thin beds of black, slightly argillaceous and silty limestone beds up to 1 foot thick; unit recessive, weathers very light brownish grey.	c. 340	874.8
	Shale for microfossils 48 feet up (Field No. 132NBf).		
	Shale for microfossils from top of unit (Field No. 132NBg).		
	Erosional relief of between 2 and 3 feet at top of unit suggesting unconformable contact with overlying Prongs Creek Formation.		
53	Limestone, slightly argillaceous, black, aphanitic, but highly fissile, weathers pale brown.	10	534.8
	Unit 53 is faulted and displacement is about 50 feet.		
	Station 132NBb on south side of Trail River on fault trace 0.35 mile east of Richardson Mountain front.		
52	Shale, black, fissile, soft, recessive, weathers black; with a limestone bed pinching and swelling along strike between 0.5 to 1 foot thick, two-thirds up in unit.	6	524.8

Unit	Description	Thickness (feet)	
		Unit	From base
51	Limestone, black, aphanitic, beds up to 2 feet; interbedded with shale, non-calcareous, black, fissile.	13	518.8
50	Shale, in part ocherous, black, fissile, soft, weathers black.	4	505.8
49	Limestone, black, fine grained, evenly bedded up to 1.4 feet thick, weathers pale brown; interbedded with black, soft, fissile shale, beds up to 0.5 foot thick.	12	501.8
48	Shale, non-calcareous, black, fissile; with an occasional bed up to 4 inches thick of limestone, black, fine-grained.	5	489.8
47	Shale, non-calcareous, black, fissile, weathers black; contains monograptids (GSC loc. 54346).	5.8	484.8



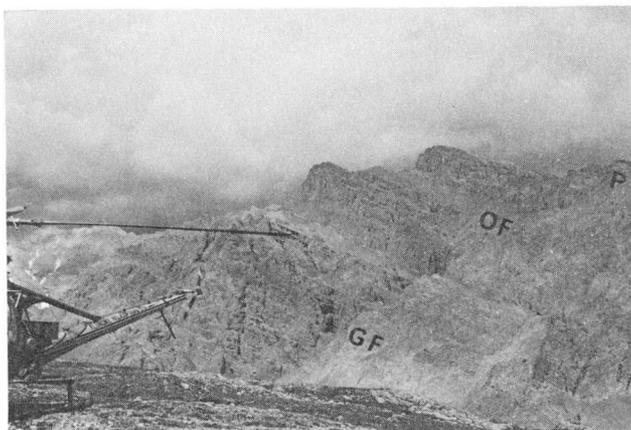


Plate I. Bedded carbonates of Gossage Formation (GF), overlain by limestones of the Ogilvie Formation (OF), unconformably overlain by carbonate beds of late Pennsylvanian (Missourian) or early Permian (Wolfcampian) age (P), on east flank of White Mountains ( $67^{\circ}57'N$ ,  $136^{\circ}32'W$ ) near section 30, northern Richardson Mountains. (GSC 117386)

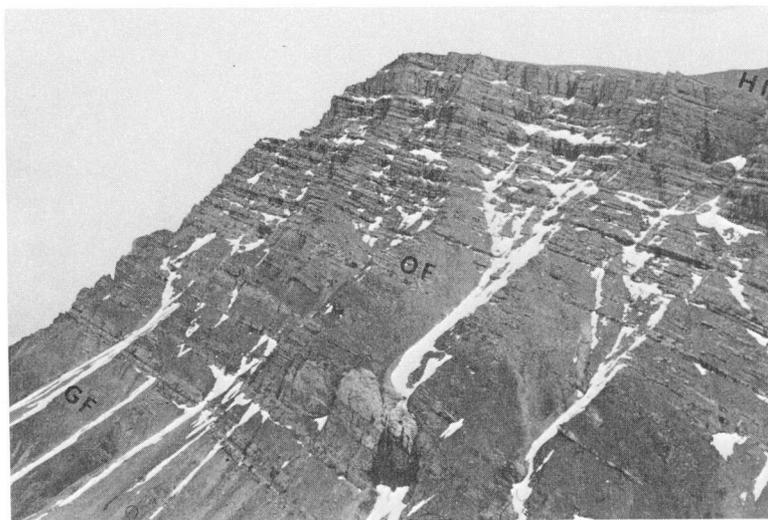


Plate II. Dolomites of the Gossage Formation (GF), overlain by limestones of the Ogilvie Formation (OF), overlain by a tongue of calcareous shale of the Hare Indian Formation (HI). View eastwards at section 4 (ca.  $65^{\circ}07.4'N$ ,  $132^{\circ}17'W$ ) near the headwaters of Cranswick River, in the Mackenzie Mountains. (A.W.N. 8-3-62)

Plate III. Castellated weathering massive limestone beds of the Ogilvie Formation capping mountain, underlain by darker rubbly weathering beds of dolomite and limestone of the Gossage Formation. View northwest at section 28 (ca.  $66^{\circ}42.9'N$ ,  $139^{\circ}15'W$ ) in the northern Ogilvie Mountains. (A.W.N. 11-6-62)

Plate IV. Graptolitic shale of Road River Formation (RF) present along the lower third of the slope, overlain by the Michelle Formation (MF), overlain by massive castellated weathering beds of the Ogilvie Formation (OF) capping the mountain. View west northwest of section 14 (ca.  $65^{\circ}38.2'N$ ,  $136^{\circ}45.4'W$ ), in the southern Ogilvie Mountains. (A.W.N. 2-6-62)

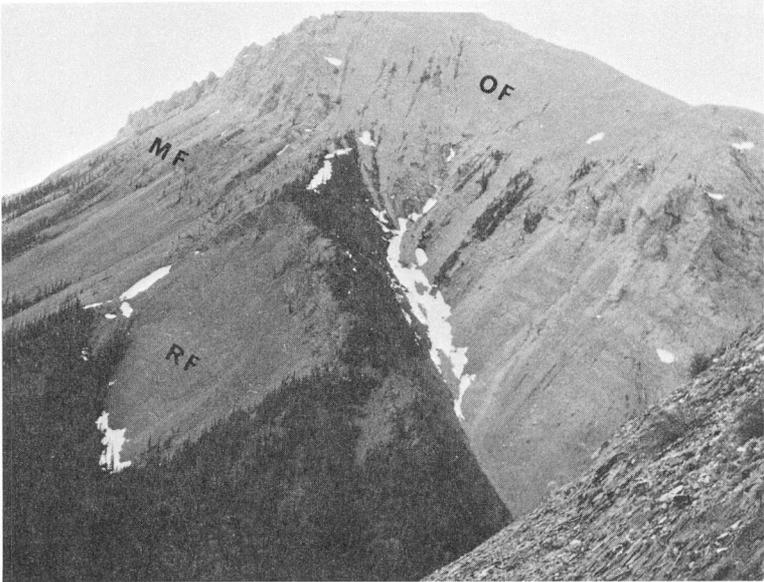




Plate V. Roughly the middle third of the Prongs Creek Formation exposed along the right bank of Royal Creek; part of section 8 measured at  $65^{\circ}02'-04''N$ ,  $135^{\circ}08'-10''W$ . (GSC 133793)

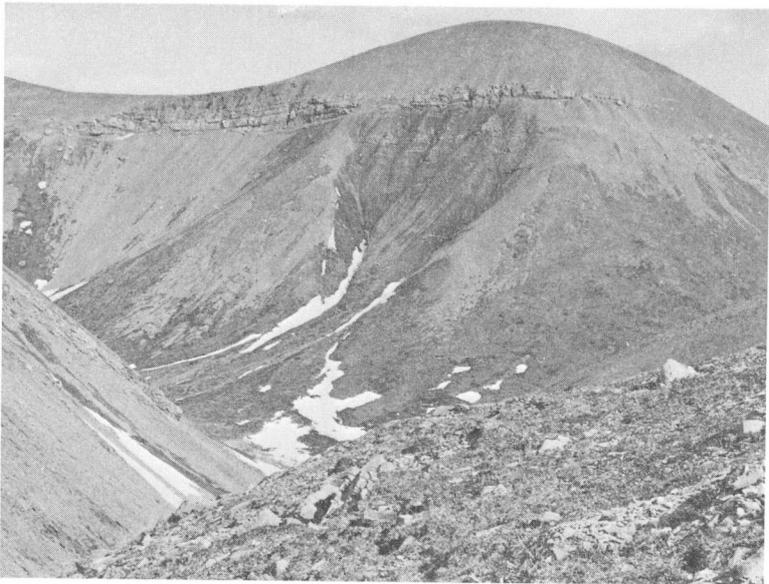


Plate VI. Prongs Creek Formation exposed on south-facing hill, underlain in creek valley by graptolitic shale of Road River Formation, section 7 (ca.  $65^{\circ}23''N$ ,  $134^{\circ}11''W$ ) in Knorr Range. (GSC 112934-I)

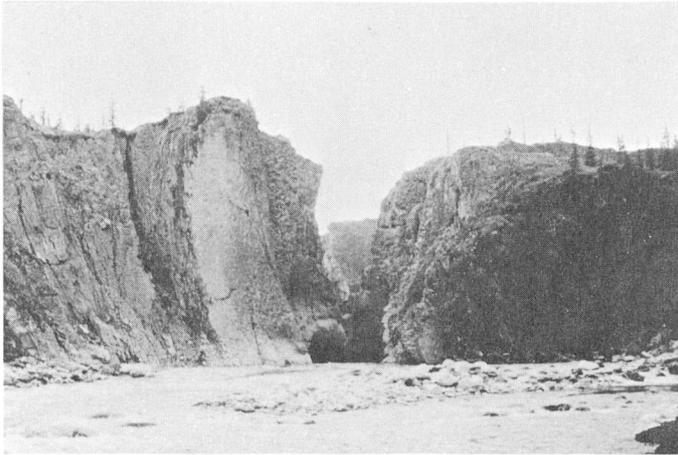


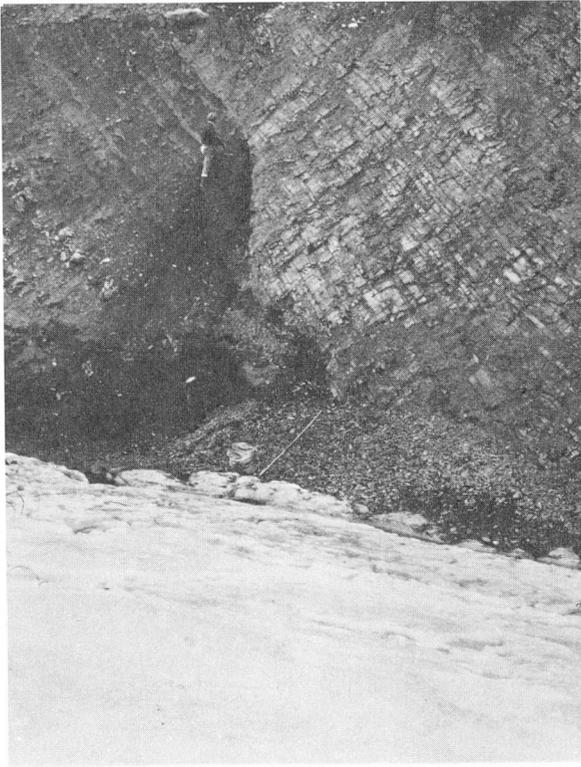
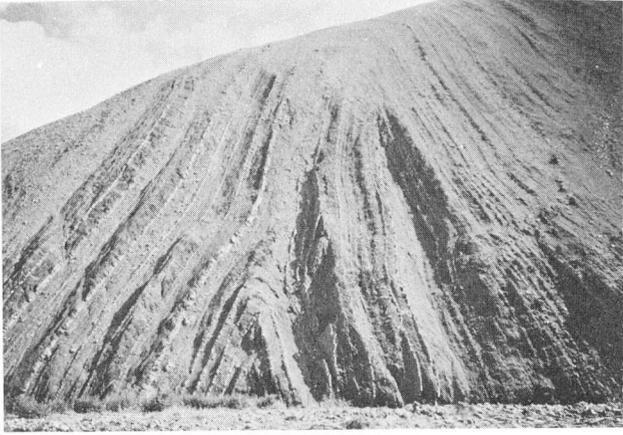
Plate VII. Very steeply dipping resistant thick beds of Hume Formation, overlain by recessive black shale beds of Canol Formation. Section 3 (ca.  $65^{\circ}27'N$ ,  $132^{\circ}01'W$ ) on Flyaway Creek immediately north of Mackenzie Mountain front. (GSC 112934-H)



Plate VIII. Resistant thinly bedded Hume Formation unconformably overlain by black shale beds of Canol Formation. Section 2 (ca.  $65^{\circ}23'N$ ,  $131^{\circ}20'W$ ) on tributary stream immediately west of Arctic Red River. (A.W.N. 4-8-62)

Plate IX. Chevron folded beds of sandstone, siltstone, and shale of Upper Devonian Imperial Formation outcropping near Sheep Creek (ca. 67°40'N, 136°15'W), northern Richardson Mountains. (GSC 117380)

Plate X. Dark graptolitic shale beds of Road River Formation separated by an erosional unconformity from overlying chert and shale beds of Prongs Creek Formation. Section 35 (ca. 66°27'N, 135°26'W) on Trail River on east flank of Richardson Mountains.  
(A.W.N. 7-7-62)



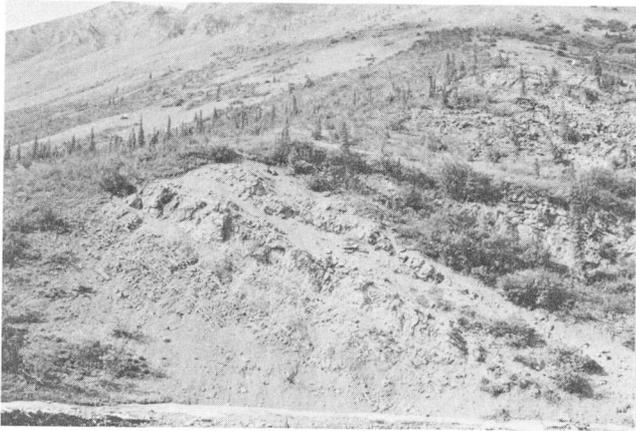


Plate XI. Angular unconformity between beds of sandstone, siltstone and shale of Upper Devonian Imperial Formation and overlying sandstone beds of Permian age; Sheep Creek ( $67^{\circ}41'N$ ,  $136^{\circ}15'W$ ), near section 33, northern Richardson Mountains. (GSC 117384)

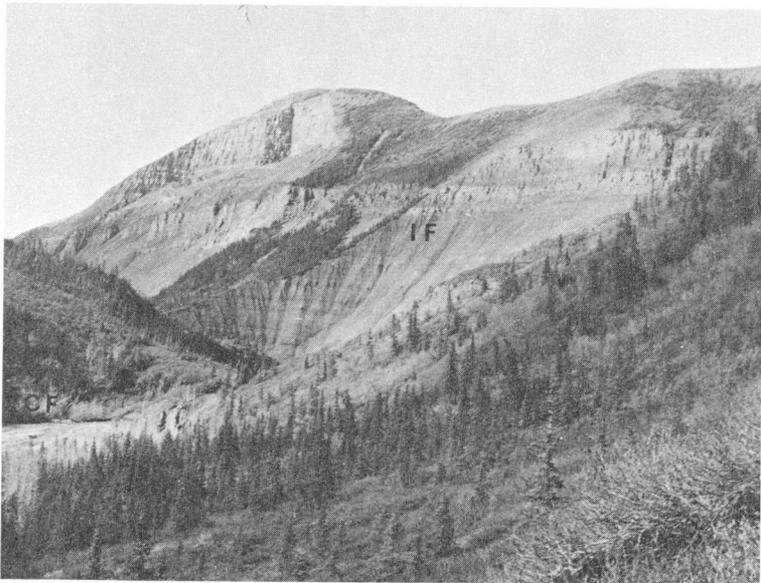


Plate XII. Imperial Formation (IF) exposed on south-facing hill underlain by beds of Canol Formation (CF) exposed at creek level in left foreground; section 1, 12 miles east of Arctic Red River at approximately  $65^{\circ}25'N$ ,  $130^{\circ}45'W$ . (A.W.N. 4-1-62)



Plate XIII. View southwards of cliff-forming limestone of the lower part of the Cranswick Formation capping mountain, underlain by poorly exposed dolomite beds of the Gossage Formation. Section 6 (ca.  $65^{\circ}26'N$ ,  $133^{\circ}35'W$ ), immediately west of Snake River just north of Mackenzie Mountain front. (A.W.N. 7-4-62)

Plate XIV. View northeastwards showing part of the Cranswick Formation along and just above creek gully, overlain by a tongue of dark bituminous shale of the Prongs Creek Formation, overlain by a thick succession of calcareous shale and limestone of the Hare Indian Formation. Section 6 ( $65^{\circ}27' - 27.5'N$ ,  $133^{\circ}34' - 35'W$ ) immediately west of Snake River, just north of Mackenzie Mountain front. (A.W.N. 7-5-62)

Plate XV. Typical upland terrain in Campbell Lake area. Dolomite beds containing Silurian fossils of Gossage Formation in foreground, overlain by limestone beds containing early Middle Devonian fossils of the Ogilvie Formation capping the low hills in the middle distance. Section 32 (ca.  $68^{\circ}16'N$ ,  $133^{\circ}23'W$ ), on the north side of Campbell Lake. (A.W.N. 8-7-62)

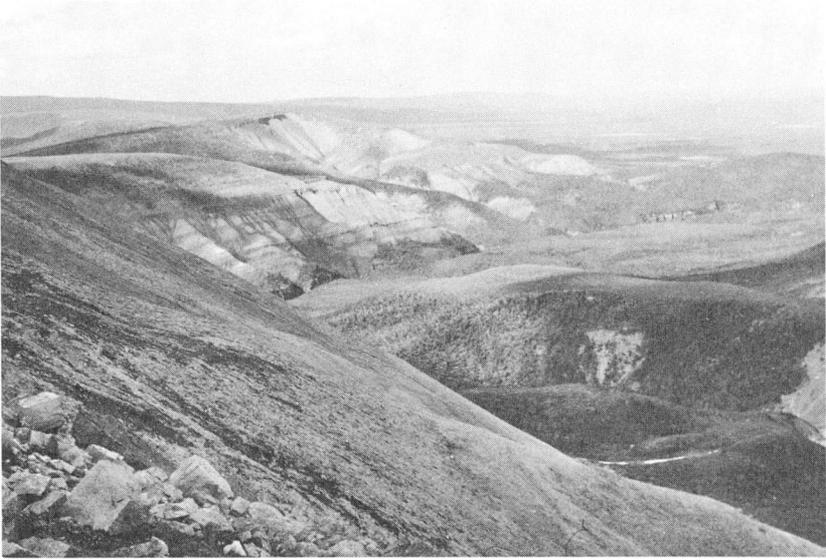




Plate XVI. A close-up view of the upper part of the graptolitic shale of the Road River Formation and the lower part of the interbedded argillaceous limestone, limestone and shale of the Michelle Formation. Section 16 (ca.  $65^{\circ}27.5'N$ ,  $137^{\circ}02'W$ ), about one mile east of Hart River, in Ogilvie Mountains. (A.W.N. 2-7-62)

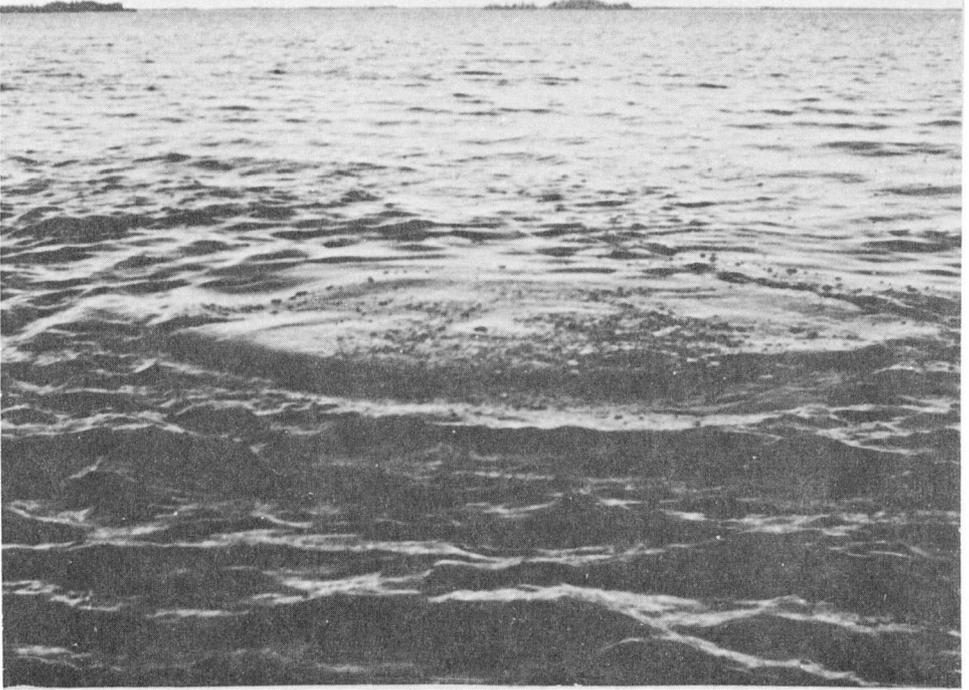


Plate XVII. View southwards of a strong gas seep in Swan Lake ( $67^{\circ}08.8'N$ ,  $133^{\circ}42'W$ ), one of the Fishing Lakes 21 miles south of Arctic Red River Settlement, in an area underlain by the Upper Devonian Imperial Formation. According to the local Indians this spot in the lake remains free of ice during the winter months. (W.E.S. Henoch, 1 August, 1960)