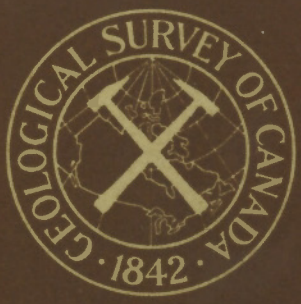

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AND TECHNICAL SURVEYS

PAPER 59-11

HORN RIVER MAP-AREA, NORTHWEST TERRITORIES

North Halves of
85 and 95 (parts of)

R. J. W. Douglas and A. W. Norris

Price, 50 cents

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Illustrations

HORN RIVER MAP-AREA, NORTHWEST TERRITORIES

INTRODUCTION

Horn River map-area lies within southwestern District of Mackenzie, Northwest Territories. It includes the eastern part of Map 95 NW and NE (Wrigley) and the western part of Map 85NW and NE (Rae), of the National Topographic Series. The map-area is bounded by latitudes 62°N and 64°N, and extends eastward from longitude 116°W to a diagonal line from the north arm of Great Slave Lake to Faber Lake passing through Maps 85J and 85N. Horn River map-area embraces part of the region investigated geologically in 1957 by Operation Mackenzie; it joins Great Slave and Trout River map-areas (Douglas, 1959)[1] to the south.

Officers of the Geological Survey on Operation Mackenzie were W. B. Brady, B. G. Craig, R. J. W. Douglas, P. Harker, D. J. McLaren, A. W. Norris, D. K. Norris, B. R. Pelletier, and D. F. Stott. They were assisted in the field by D. A. Andrews, F. J. A. Arthur, R. K. Broeder, K. P. R. Cole, W. N. Hamilton, I. M. Harris, R. N. McCowan, D. B. McKennitt, and J. B. Read. Crew for the helicopters, supplied by Associated Helicopters, Ltd., were N. R. Staniland, R. Huff, J. Brochu, and R. Barnes, and crew for the Beaver aircraft, supplied by Pacific Western Airlines Ltd., were W. McKinney and J. Furber. The boat and barge were operated by G. P. J. Turner and D. Turner. Other members of the party included W. T. Spratt, radio operator; E. Greyson and A. E. Martin, cooks; C. F. Parnall, labourer; and A. Konisenta, H. Martell, and M. McKay, canoemen. To all these men, the writers and other officers of the party extend their appreciation.

This map and report on the geology of Horn River map-area are based on observations on the Palaeozoic and Mesozoic strata by R. J. W. Douglas, D. J. McLaren, A. W. Norris, D. K. Norris, and B. R. Pelletier. Information on the adjacent Precambrian rocks is from published data by Kidd (1936), Lord (1942), McGlynn (1957), and a preliminary compilation map (1941). Ordovician fossils were dated by G. W. Sinclair of the Geological Survey.

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[1] Names and dates in parentheses refer to publications listed under References.

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PHYSICAL FEATURES

Horn River map-area is underlain by Precambrian rocks of the Canadian Shield and by Ordovician, Devonian and Cretaceous rocks of the Interior Plains. The bedrock, particularly of the plains, is overlain by a mantle of glacial deposits.

Along the border of the Palaeozoic strata the Precambrian rocks of the Canadian Shield are in general well exposed. They form low knobs and hills scoured by glacial action and surrounded or nearly surrounded by irregularly shaped lakes and small deposits of glacial material. Some of the lakes are linear or partly linear in outline and, together with some elements of the drainage, form linear trends.

Relief is low, about 100 to 200 feet, in much of the region underlain by the granitic rocks of map-unit A and the metamorphosed sedimentary and volcanic rocks of the Yellowknife group (1). It is greater in some parts, particularly in those underlain by the Yellowknife group. This extensive, minutely irregular surface may possibly be a peneplain. It dips southwestward beneath the waters of the north arm of Great Slave Lake where the shoreline is finely indented and the lake is dotted with numerous small islands, or beneath nearly flat-lying Palaeozoic strata where a few scattered knobs of Precambrian rocks protrude through thin veneers of the basal beds of map-units 5, 6 and 7, or beneath the glacial lacustrine deposits of map-unit 19 that obscure the contact between the Precambrian and the Palaeozoic.

Ranges of irregular hills, knobs and linear ridges rise as monadnocks above the peneplain surface. These hills are underlain mainly by rocks of the Snare group (2), porphyritic granite (3), and are associated with quartz veins and large stockworks of map-unit 4, (see Lord, 1942; Kidd, 1936). Relief is of the order of 400 to 500 feet, rarely more than 800 feet; the greatest heights are developed on the porphyritic granites. The quartz stockworks outcrop along linear ridges formed partly of map-unit A, apparently rendering these rocks more resistant to erosion. The stockworks are less prominent topographically where they cut rocks of the Snare group or the porphyritic granites. The trends are generally southwest, south, or southeast, corresponding to the trends of faults and lineaments in the older rocks. East of Lac la Martre many inliers or mendips of these more resistant rocks protrude through all of the Ordovician map-units, and in a single instance noted southwest of Rae, through map-unit 12 of the Devonian. Not all the mendips were examined in the field; accordingly, some are shown as map-unit A which includes undifferentiated Precambrian.

The present topography of the Canadian Shield bordering the Interior Plains is thought to reflect to a large degree that developed on the Precambrian rocks prior to the deposition of Palaeozoic strata. The relatively soft Palaeozoic sandstones, shales, evaporates, limestones, and dolomites may reasonably be expected to have been eroded more readily than the underlying metamorphic and igneous rocks of the Precambrian. Furthermore, there appears to be little difference between mendips in the Palaeozoic and monadnocks on the Precambrian peneplain. However, the amount of modification of the Precambrian surface by glacial erosion is not known. As the monadnocks on the Precambrian peneplain were present as islands in the Palaeozoic seas, their distribution beneath the sedimentary cover may well have an important bearing on the distribution, structure, and oil and gas potentialities of the Palaeozoic rocks within the more westerly parts of the map-area.

The Interior Plains are largely forested; the topography is subdued and rolling, broken by a few low, sharp escarpments or rising gradually to low, tundra-covered plateaux of the Horn Plateau and Cartridge Mountain. The largest rivers, Horn and Willowlake, and their tributaries, drain most of the map-area. Respectively, they flow into Mackenzie River at Fort Providence and just south of Wrigley. A few small streams flow eastward to the north arm of Great Slave Lake and to Marian and Camsell Rivers on the Shield. Lakes are abundant, mainly rather large and smooth in outline but varying to narrow and linear or very irregular. The larger lakes such as la Martre are gouged out of the soft evaporites of map-unit 12, or, such as Faber Lake, are formed along the boundary with the Shield. Some are ephemeral and bordered by broad flats of light-coloured, gypsiferous mud. Their size, shape and abundance are governed by the nature of the bedrock and the erosional and depositional effects of glacial action. Outcrops are extremely rare in most of the plains area, being most abundant on the escarpments and stripped surfaces developed on the Ordovician rocks. Extrapolation of many of the map-units, particularly the Cretaceous and Devonian, is largely dependent on the present physical features of the topography which reflect in various degrees the physical nature of the underlying rock, the pre-Pleistocene topography, and the effects of these factors on glacial processes.

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TABLE OF FORMATIONS

Era	Period or Epoch	Group or Formation (map-unit)	Thickness (feet)	Lithology
Cenozoic	Pleistocene and Recent	(19)		Glacial lacustrine deposits
		Unconformity		
Mesozoic	Cretaceous	(18)		White to yellow, friable, concretionary sandstone; and black shale partings
		(17)	1,000 to 1,250	Grey, argillaceous limestone; banded, black, fissile, non-calcareous shale; and dark grey to black concretionary shale
		Unconformity		
PALAEOZOIC	Upper Devonian	Simpson shale (16)		Thinly bedded, greenish grey, calcareous shale; and pale olive-green mudstone
		Unconformity ?		
	Middle Devonian	(15)	40 exposed	Richly fossiliferous, coarse-grained, light to medium brown limestone; and fine-grained, pale brown, reefal limestone
		Unconformity ?		
		Horn River (14)	50 exposed	Dark grey, non-calcareous shale; and fossiliferous, medium grey limestone and nodular limestone

TABLE OF FORMATIONS (cont'd)

Era	Period or Epoch	Group or Formation (map-unit)	Thickness (feet)	Lithology
PALAEOZOIC (cont'd)	Middle Devonian (cont'd)	(13)	700 ? to 900 ?	Dark brown, fossiliferous limestone; bituminous limestone; nodular limestone and richly fossiliferous argillaceous limestone
		(12)	300 ? to 400 ?	Gypsum; limestone and dolomite, and limestone and dolomite breccia
	Unconformity			
	ORDOVICIAN OR OLDER	(11)		Red beds of shale, gypsum, anhydrite, salt, sandy dolomite, and sandstone. (Equivalent to map-units 5 and 6 and part of 10)
		(10)	0 ? to 580 ?	Thick-bedded to massive, medium brown dolomite containing some chert and silicified fossils
		(9)	300 to 400	Yellowish grey sandstone, red shale with salt-crystal mould, red sandy dolomite, and yellowish brown shaly, silty, and sandy dolomite

TABLE OF FORMATIONS (cont'd)

Era	Period or Epoch	Group or Formation (map-unit)	Thickness (feet)	Lithology
PALAEOZOIC (cont'd)	ORDOVICIAN OR OLDER (cont'd)	(8)	0 to 125 ±	Argillaceous and silty dolomite; oolitic limestone; basal sandy and conglomeratic dolomite, and sandstone over Precambrian knobs
		(7)	0 to 135 ±	Whitish yellow, medium-grained, non-calcareous sandstone; green shale, and gypsum
		(6)	100 to 225	Olive-green and dusky red shale; greenish grey, quartzose sandstone; and dark brownish grey, silty and sandy dolomite
		(5)	110 ±	White, friable, quartzose sandstone; and minor greenish grey siltstone and green shale
Unconformity				
PRECAMBRIAN	PROTEROZOIC	(4)		Milky white quartz
		(3)		Feldspar porphyry, feldspar quartz porphyry
		Snare (2)		Quartzite, conglomerate, slate, dolomite, andesite schist, gneiss, and andesite

TABLE OF FORMATIONS (cont'd)

Era	Period or Epoch	Group or Formation (map-unit)	Thickness (feet)	Lithology
PRECAMBRIAN (cont'd)	Unconformity			
	Archaean	Yellowknife (1)		Greywacke, slate, quartzite, schist, gneiss, and andesite
	Archaean and Proterozoic	(A)		Granite, granodiorite, and allied rocks. (Includes undifferentiated Precambrian)

DESCRIPTION OF FORMATIONS

PRECAMBRIAN (Map-units A, 1-4)

Precambrian rocks underlie the eastern part of the map-area. They have been mapped and described by Kidd (1936), Lord (1942) and McGlynn (1957). The reader is referred to these reports for more complete accounts.

Map-unit A comprises an assemblage of granites, granodiorite and allied rocks of Archaean and Proterozoic ages. They are intrusive into the Yellowknife and Snare groups and in part are known to be unconformably overlain by the Snare group. The map-unit also includes undifferentiated Precambrian inliers that were not examined in the field.

The oldest rocks present are sedimentary and volcanic rocks of the Yellowknife group (1). The group includes lower units of andesitic lavas with minor dacite, basalt, rhyolite and tuff, agglomerate and breccia, locally metamorphosed to amphibole and chlorite schist. These are overlain by greywacke, slate, arkose, quartzite, and phyllite, which grade laterally into knotted quartz-mica schists and gneisses. The Snare group (2) unconformably overlies the Yellowknife group and granitic intrusives into it. It comprises several formations which vary considerably in composition and degree of metamorphism. Where relatively unmetamorphosed it consists of shale, slate, argillite, greywacke, quartzite and dolomite with minor basic lavas and intrusives, but within that portion of its distribution included in the accompanying map the group consists of phyllite, quartzite, quartz-mica schist, knotted quartz-mica schist and gneisses.

Large and small stocks of feldspar porphyry and feldspar quartz porphyry (3) (massive but strongly jointed), are commonly a few square miles in extent and form prominent hills. They intrude the Snare and Yellowknife groups and rocks of map-unit A. Veins and stockworks of milky white quartz (4) cut rocks of map-unit 3, and they trend southwest, south and southeast, and are associated with faults of similar trend.

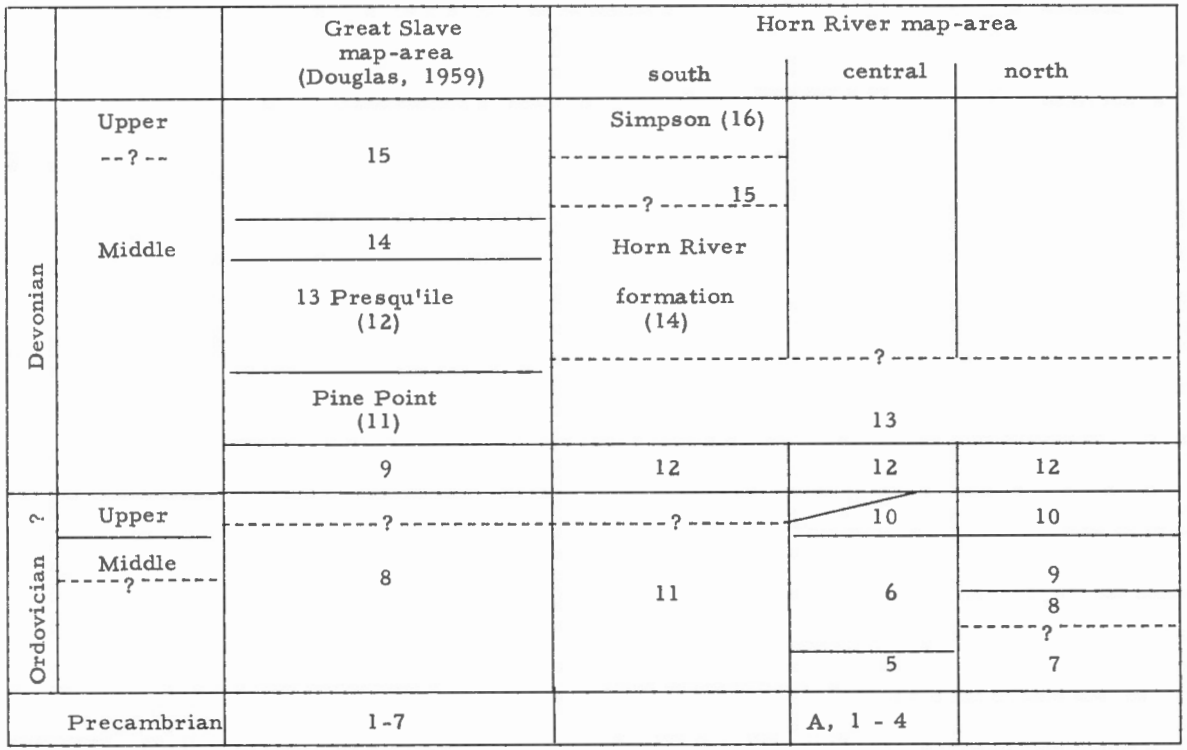

Figure 1. Correlation of Devonian and Ordovician map-units

PALAEOZOIC

Ordovician or Older

Map-unit 5

The basal Palaeozoic formation, map-unit 5, is a sandstone that presumably overlaps the Precambrian, although the contact was not observed. It is overlain in the southeastern part of the map-area by rocks of map-unit 6 (see Figure 1) where it outcrops at only a few places. Parts of this formation are exposed on the south side of Wrigley Point, discontinuously around Old Fort Island, on Louise Islands, and as frost-heaved blocks along the south shore of Shoti Lake.

Map-unit 5 consists mainly of thin- to thick-bedded, coarse- to medium-grained, varicoloured but mainly white, friable, quartzose sandstone; some thin beds of greenish grey siltstone; and occasional laminae and partings of green shale.

The lowest strata exposed on Old Fort Island are coarsely crossbedded. Overlying beds are irregularly thin- to medium-bedded. Iron-staining along laminae and bedding planes is common. Most of this sandstone is porous, loosely consolidated, and disintegrates on weathering to a white sand. Possibly the sand forming the beaches in the vicinity of Whitebeach Point was partly derived from this formation.

Map-unit 5 appears to be unfossiliferous. However, it is overlain by Middle Ordovician beds, and rests on the Precambrian. Hence, it is tentatively dated as Middle Ordovician or older. This formation is analogous to, but not necessarily the same age as the basal sandstone formation outcropping along the edge of the Precambrian Shield on Slave River south of Great Slave Lake (Norris, in press).

Map-unit 6

Fairly thick but incomplete sequences of map-unit 6 outcrop at numerous localities along the west shore of the north arm of Great Slave Lake between Redrock and Wrigley Points. A cleanly exposed section of this rock-unit outcrops along a 1.5-mile stretch of the river canyon immediately below La Martre Falls. Outside of these two main areas, outcrops of this unit are rare. On Old Fort Island the covered interval between the highest sandstone beds of map-unit 5 and the base of map-unit 10 is about 100 feet. This suggests a thickness of that order of magnitude for map-unit 6 in the south. The incomplete thickness of map-unit 6 (base not exposed) in

the La Martre Falls area is close to 125 feet, indicating a slight northward thickening between these two localities which are 75 miles apart.

In the southeastern part of the map-area, the exposed beds of map-unit 6 consist of soft, olive-green, rarely black, fissile, non-calcareous shale; some thin beds of friable, whitish grey, greenish grey, and in places white, quartzose sandstone; minor thin beds of sandy and silty, dark brownish grey dolomite; and some primary and secondary varicoloured gypsum in the lower part of some of the sections.

In the canyon of Rivière la Martre, map-unit 6 consists mainly of green and dusky red, fissile, soft, ferruginous shale, in places containing thin interbeds of fine-grained, ripple-marked, dolomitic sandstone; and a few harder fairly thick units of pale greenish grey and light grey, resistant, cliff-forming, sandy and silty dolomite.

The lower contact of map-unit 6 with sandstone of map-unit 5 is not exposed. The upper contact with the overlying resistant dolomite beds of map-unit 10 is sharp, and appears to be structurally conformable.

Fossils including graptolites, bryozoa, brachiopods, and trilobites, collected from the uppermost 25 to 30 feet of beds of map-unit 6 in the canyon of Rivière la Martre have been identified and tentatively dated by G. W. Sinclair as upper Middle Ordovician. On this basis all of map-unit 6 is provisionally dated as Middle Ordovician.

Map-unit 7

North of Rivière la Martre the poorly exposed interval between the base of the scarp-forming dolomites of map-unit 8 and the Precambrian is designated as map-unit 7. Rocks of map-unit 7 appear to occupy depressions on the Precambrian surface, as locally map-unit 8 lies in direct contact with topographically higher parts of the basement rocks.

Loose fragments of sandstone of map-unit 7 were noted on the south shore of Tumi Lake and a few miles west of Mazenod Lake. On the south shore of Tumi Lake the sandstone shingle is light grey and fine-grained. It is estimated to be about 70 feet below the lowest exposed beds of map-unit 8 outcropping a short distance to the west. At the locality west of Mazenod Lake the loose blocks consist of whitish yellow, medium-grained, non-calcareous sandstone. Closely underlying map-unit 8 is green shale talus embedded in white gypsiferous mud.

The greatest observed difference in elevation between map-unit 8 and the Precambrian was about 135 feet and this is probably close to the maximum thickness of the unit.

Like map-unit 5, the age of map-unit 7 is assumed to be Ordovician or older.

Map-unit 8

Map-unit 8 is a relatively thin unit consisting mainly of dolomite. It overlies map-unit 7 and is overlain by shale, silty dolomite, siltstone, and minor sandstone of map-unit 9. Locally this unit directly overlies ridges and knobs of Precambrian rocks. Map-unit 8 is discontinuously exposed in a narrow belt near and more or less parallel to the western edge of the Precambrian Shield. This belt extends from about 5 miles north of la Martre Falls northward to the southwest edge of Faber Lake where it disappears beneath lake-level.

The dominant lithology of map-unit 8 is thinly bedded, fine- to medium-grained dolomite, weathering orange-brown and containing argillaceous, silty, and sandy laminae showing ripple-marks and cross-laminations. Medium-bedded, orange-brown-weathering, oolitic limestone was observed within the upper part of this map-unit at several places. The basal beds are strongly silty and sandy. Where map-unit 8 overlies ridges and knobs of Precambrian rocks, the basal beds commonly consist of a boulder-conglomerate of angular fragments of igneous rocks which grade upward into a conglomeratic sandy dolomite and light grey, slightly calcareous sandstone. A short distance away from the Precambrian ridges and knobs these beds grade laterally to dolomite.

Map-unit 8 is thickest in the north, being about 125 feet, southwest of Mazenod Lake. To the southeast it appears to 'pinch-out' within the lower part of map-unit 6 near Rivière la Martre.

Except for fucoidal markings, map-unit 8 appears to be unfossiliferous. Its age is assumed to be Middle Ordovician or older.

Map-unit 9

In the northern part of the map-area, beds lying between map-units 8 and 10 are referred to map-unit 9. This map-unit is the northward continuation and in part the stratigraphic equivalent of map-unit 6. Incomplete sequences outcrop at only three main localities north of Rivière la Martre.

In an escarpment 6 miles west of Hislop Lake a thin sequence within the lower part of map-unit 9 consists of thinly bedded, yellowish grey, very fine-grained sandstone. Higher beds in the same section consist of laminated, light grey and light greenish grey, fine-grained sandstone interbedded with pale red shale. Beds outcropping on the eastern edge of a small mesa 5 miles west of Mazenod Lake and presumed to be within the middle third of the map-unit consist of purplish red, fissile shale containing salt-crystal moulds, interbedded with pale pinkish red and pale red, sandy dolomite and dense dolomite. The most northerly outcrop of map-unit 9 within the map-area is exposed on the edge of a mesa 3 miles west of Faber Lake. Here some 80 feet or more of discontinuously exposed strata appear to be within the upper half of the map-unit. The sequence consists of irregularly thin-bedded, medium-grained, slightly shaly, silty, and sandy dolomite, weathering yellowish brown and in places containing fucoidal markings; also present are some thin interbeds of light grey, finely cross-laminated and ripple-marked shale and sandstone weathering a light greyish red.

Map-unit 9 is estimated to be about 300 to 400 feet thick.

The age of map-unit 9 is assumed to be Middle Ordovician on the basis of fossils found in the upper part of map-unit 6, its stratigraphic equivalent to the south.

Map-unit 10

Map-unit 10 is a thick-bedded to massive, scarp-forming dolomite, conformably overlying map-units 6 and 9. It is unconformably overlain by several rock types of probable Middle Devonian age assigned to map-unit 12. Map-unit 10 contains the youngest definitely dated Ordovician beds within the map-area.

Map-unit 10 appears as a lentil just south of Redrock Point but seems to merge and lose its identity southward within the upper part of map-unit 11. It gradually thickens and becomes more prominent, attaining a thickness of more than 100 feet in the area west of James Lake. North of La Martre Falls map-unit 10 thickens more abruptly to an estimated 320 to 580 feet, and underlies a belt of country between 16 to 24 miles wide. Because of the resistant nature of most of the rock, exposures are numerous, but there are no complete sections at any one place.

The lithology of map-unit 10 consists of thick-bedded to massive, highly resistant, scarp-forming, fine-grained, granular, in places minutely vuggy, medium brown dolomite, commonly weathering a pale orange or orange-brown. Purplish red mottling is

particularly prevalent in the southern part of the map-area, becoming less conspicuous north of La Martre Falls area. Light-grey-weathering chert in the form of delicate tracery and small nodules is present in some beds. Most of the fossils present are silicified. The basal part of this unit forms the protective capping of the most prominent scarp in the area. The scarp can be traced from just south of Redrock Point to west of Faber Lake at lat. 64°N.

The lower contact of map-unit 10 with map-units 6 and 9 is sharp and appears to be structurally conformable. The upper contact with overlying map-unit 12 is less distinct, and appears to be unconformable.

Fossils have been collected at numerous scattered localities from various horizons throughout map-unit 10. The fossils appear to be most abundant within the lower half of the formation south of Rivière la Martre, and within the lower and upper beds of the formation in the area to the north. Most of the fossils from south of Faber Lake have been examined by G. W. Sinclair and tentatively dated as of Richmond (Upper Ordovician) age. Fossils from the upper part of the formation from localities in the vicinity of Rivière Grandin have as yet received only superficial examination, but are also provisionally considered to be of Ordovician age.

Map-unit 11

In the southeastern part of the map-area, map-units 6 and 10 appear inseparable, and are, accordingly, included in map-unit 11. (See Figure 1). Beds exposed in the vicinity of Foam Point consist of thinly interbedded, orange-brown and red, sandy dolomite. The lower part of the map-unit is covered by Great Slave Lake. Map-unit 11 is considered to be equivalent to map-unit 8 of the Great Slave Lake map-area (Douglas, 1959).

In the Imperial Windy Point No. 1 well this unit is 705 feet thick and lies between depths of 1,045 to 1,750 feet. It consists of red shale, gypsum, anhydrite, and salt, and red and brownish red sandstone at the base.

The age of the strata assigned to map-unit 11 is presumed to range from Upper ? to Middle Ordovician or older.

Middle Devonian

Map-unit 12

Map-unit 12 contains an heterogeneous assemblage of beds comprising some limestone, dolomite, minor limestone and dolomite breccia and a considerable thickness of gypsum. It unconformably overlies map-unit 10 of Upper Ordovician age, and is probably conformably overlain by map-unit 13 containing fossils of undoubted Middle Devonian age.

The main lithology of map-unit 12 consists of white, grey, and brown gypsum. Red-weathering gypsum is present in the basal part of the map-unit in the southern part of the map-area. Within the map-unit there are a number of relatively thin carbonate units that change facies rapidly. One of these carbonate sequences outcrops west of Redrock Point where about 34 feet are exposed. The section consists of irregularly thin- to medium-bedded, laminated, pale to medium brownish grey, fissile limestone; dark grey and brown argillaceous and gypsiferous shale; thinly bedded, pale brown, gypsiferous limestone; laminated pale and dark grey, irregularly thick-bedded, in part vuggy and brecciated limestone; and thin interbeds of white gypsum. Parts of this hard unit are recognized northwards to about lat. 62°50'N.

In the area west of Pte. du Lac the lower half of map-unit 12 appears to consist largely of gypsum, and within the upper half, 48 feet of limestone breccia are present. The angular fragments are up to 2.5 feet in diameter, and consist of dark brown, aphanitic to fine-grained, medium-grey-weathering limestone, in places containing traces of poorly preserved stromatoporoids, corals, and a few brachiopods. As the breccia is immediately underlain by 15 feet of evaporites it is probable that the breccia is of solution and collapse origin.

In the area between Chedabucto and Marian Lakes, thin exposed sequences of limestone and limestone breccia are present at and very near the base. The fragments of this basal breccia are up to 6 inches in diameter, and consist of light to dark grey, fine-grained, light-grey-weathering limestone, in a vaguely bedded matrix of finer material of the same lithology. At most other places the basal beds of map-unit 12 consist of evaporites.

A section 14 feet thick comprising light olive-grey, massive, in part brecciated, argillaceous dolomite and olive-grey, argillaceous limestone, overlain by dolomite breccia, is exposed on Big Island in Lac la Martre. Younger beds consisting of evaporites outcrop at the south end and along the west shore of Lac la Martre. Beach talus along the west shore of the lake indicate that evaporites are overlain by medium brown, fine-grained, granular limestone.

The age of the rocks comprising map-unit 12 is dated tentatively as Middle Devonian on the basis of poorly preserved fossils collected from limestone beds near the base and middle of the formation. This map-unit is more or less on strike with beds to the south dated as Upper Silurian by Hume (1921, 1926) and Cameron (1922). No evidence was found to substantiate this dating, either in the area immediately southwest of Gypsum Point, or in the area to the north, covered by this report.

Map-unit 13

Very little of map-unit 13 is exposed, but it appears to be the approximate stratigraphic equivalent of some of the beds included in the Pine Point formation in Great Slave map-area (Douglas, 1959).

The basal beds form a prominent escarpment consisting of very irregularly medium-bedded fossiliferous limestone that weathers light grey. Bituminous limestone beds occur towards the top of the succession and are exposed in some sections. Fossils are locally abundant. Younger beds outcrop in a sink-hole. They consist of thick-bedded, medium to dark brown, fine- to medium-grained, fetid limestone, in places with some argillaceous partings; overlain by medium brown, hard, fine-grained, nodular limestone, and medium brown, crypto-grained, irregularly bedded limestone and nodular limestone.

On Clive River about 15 feet of olive-grey, aphanitic to fine-grained, rubbly bedded, in part richly fossiliferous argillaceous limestone are exposed.

Map-unit 13 is dated as Middle Devonian on the basis of fossils collected from the lower third and near the top of the formation. Throughout this relatively thick part of the stratigraphic succession there appears to be little or no faunal differentiation.

Horn River Formation (Map-unit 14)

Shales named the Horn River shale by Whittaker (1922, pp. 51-52) outcrop discontinuously along the banks of Horn River. The shale is dark grey, mainly non-calcareous, soft, fissile, rubbly bedded, and weathers into small irregular flakes, and is everywhere well jointed. Orange and rusty brown iron-staining and sulphurous encrustations are common in some outcrops. Some 35 feet of composite section is estimated to be present in the outcrop area; the lower contact is not exposed. Similar beds are believed to underlie a large area east of the Horn River outcrop area suggesting

a much greater overall thickness for this unit. This latter area is one of low relief and is marked by numerous closely spaced lakes. The Horn River shale is sharply overlain by limestone referred to the Pine Point limestone by Whittaker (1922, pp. 51-52). No megafossils have been collected from the shales except for fragmentary organisms suggestive of Styliolina sp., reported by Whittaker (1922, p. 52). The age of the shale is undoubtedly Middle Devonian because it is underlain and overlain by fossiliferous Middle Devonian strata.

A thin sequence of limestone referred to the Pine Point limestone by Whittaker (1922, pp. 51-52) and herein included with the Horn River formation outcrops on Horn River 15.5 miles northwest of Fawn Lake. It consists of irregularly medium- to thick-bedded, medium grey limestone and nodular limestone, weathering light grey. About 15 feet of this unit outcrops as broken ledges along the top of the river bank. It overlies the Horn River shale and the contact is very clearly defined.

Fossils are abundant in some beds and indicate a Middle Devonian age.

Map-unit 15

The youngest Middle Devonian strata observed in the map-area outcrop discontinuously as erosional stacks and pillars within, but mainly around the periphery of a remarkably circular hill. The hill is about 1/4 mile in diameter, and is situated about 2.5 miles west of the west side of Fawn Lake, and near the southeast flank of Horn Plateau. Limestone strata around the periphery of the hill dip outward suggesting a reef or domed structure. An incomplete section of about 40 feet of beds was measured along the northern edge and near the centre of the hill. The base of these exposures is roughly 50 to 100 feet higher in elevation than the top of the limestones exposed on Horn River some 16 miles to the northwest. The lowest exposed strata (about 20 feet discontinuously exposed) consist of massive, very coarse-grained, light and medium brown, richly fossiliferous limestone of bioclastic origin. The clastic fragments are loosely cemented and the unit weathers into thin irregular layers from an inch to 3 inches thick. The numerous fossils from this lower unit consist mainly of brachiopod species, a few corals, and crinoid remains. These beds grade upward into more resistant, massive, pale brown, fine-grained limestone, presumably of reefal origin, of which about 20 feet is exposed. This unit contains a less prolific fauna consisting mainly of corals and some brachiopods.

Map-unit 15 is tentatively dated as late Middle Devonian. It contains an unique fauna distinct from anything seen to date (June, 1959) from Devonian beds in the Mackenzie basin. Its age is

later than the fauna from the Pine Point-Presqu'ile succession, and older than the basal Waterways fauna of northeastern Alberta.

Upper Devonian

Simpson Formation (Map-unit 16)

The Simpson formation outcrops along Willowlake River near the west border of the map-area. It consists of greenish grey, thinly bedded, calcareous shale weathering dark yellowish orange, contorted through slumping; and massive mudstone, non-calcareous, pale olive-green, friable and stained brownish grey.

MESOZOIC

Cretaceous

(Map-units 17 and 18)

Cretaceous shales underlie Horn Plateau and are assumed to underlie much of the northwestern part of the area above 1,000 feet in elevation.

Outcropping on Willowlake River at about 1,300 feet elevation are banded, fissile, black, non-calcareous, pyritic shale with yellowish orange to greyish yellow streaks, and abundant selenite crystals and rosettes. Ten inches of thin-bedded, argillaceous, pyritic, grey limestone lie at the base. Dark grey to black concretionary shales weathering to soft clay outcrop at 1,500 to 1,600 feet elevation on the east side of Horn Plateau and are thought to overlie the exposures on Willowlake River. Shales exposed on Ebbutt Hills (Williams, 1922) are tentatively included in this map-unit. All these shales are included in map-unit 17 which is equivalent to map-unit 23 of the area to the south (Douglas, 1959) and are probably equivalent to the upper shales (map-unit 16) of the Fort St. John group in the Fort Liard map-area (Douglas and Norris, 1959).

Assuming the beds to be flat, the thickness of map-unit 17 is estimated at between 1,000 to 1,250 feet.

The western part of Horn Plateau is shown underlain by map-unit 18. This is an assumed extension of outcrops of sandstone in Trout River map-area (Douglas, 1959) inadvertently omitted from that map. The outcrop occurs at about 2,000 feet elevation, but as a thick mantle of glacial drift caps Horn Plateau it is thought that the sandstone underlies only a small part of the plateau that rises

above 2,000 feet elevation. Whittaker (1923) describes the sandstone as rather coarse, white to rusty yellow, friable, in beds 6 to 10 inches thick, with partings of soft black shale and large concretions. He termed it the Rabbitskin sandstone and it is possibly equivalent (Stott, in press) to the Upper Cretaceous Fort Nelson formation of the Fort Liard map-area (Douglas and Norris, 1959).

STRUCTURAL AND ECONOMIC GEOLOGY

Palaeozoic rocks of Horn River map-area form a gently-southwest-dipping homocline. The amount of the dip cannot be readily estimated as no wells have been drilled within the map-area, nor are the stratigraphic thicknesses and positions of contacts of the various map-units known with sufficient accuracy. In Great Slave map-area (Douglas, 1959), regional dips to the southwest of 18 and 26 feet per mile for the base of the Pine Point formation and top of map-unit 8 (map-units 13 and 11 respectively of this report) were estimated from the Northwest Territories Windy Point No. 1 well, and probably apply only to the southeastern part of Horn River map-area. Cretaceous strata are assumed to be very nearly flat.

The structure of the Precambrian basement rocks is reflected only indirectly in the structure of the overlying sedimentary strata. Lineaments may be observed on stripped surfaces of the rocks of map-unit 10, some of which form the strike continuations of faults and quartz stockworks in the Precambrian. These lineaments appear to be zones of abundant fractures, but with little or no displacement. Contact with the Precambrian was observed only for map-unit 8. At several localities in the vicinity of faults and quartz stockworks between Sheldon Lake and Rivière la Martre, and southwest of Mazenod Lake, the contact is unfaulted (see also Lord, 1942; McGlynn, 1957).

The Ordovician formations exhibit some facies changes and a general convergence to the southeast from Faber Lake to the vicinity of Fort Rae. This convergence is due in part to bevelling of map-unit 10 by pre-Devonian erosion and to a general convergence and possibly also southeast overlap of the beds older than map-unit 10. The Ordovician section is probably thinnest at Rae Point and Old Fort Island where less than 200 feet of beds are present, in contrast with an estimated total section of more than 1,000 feet near the northern border. Southeast of Wrigley Point, Great Slave Lake obscures most of the Ordovician rocks. However, some 705 feet are present in Northwest Territories Windy Point No. 1 well in Great Slave map-area (Douglas, 1959) to the south. These data suggest the presence on the Precambrian surface of an arch, herein named the Fort Rae arch, whose summit appears to lie between Marian Lake and Wrigley Point. The trend is probably to the southwest to join with the high in the basement rocks in the vicinity of Mills Lake and Rabbit Lake in Trout River map-area to the south (Douglas, 1959).

Several formations may contain potential reservoir rocks. The sandstones of map-units 5 and 7 are probably erratic in thickness and distribution, occupying depressions in the Precambrian surface. The dolomites of map-units 8 and 10 are mainly dense to finely porous but may be considerably fractured particularly where differentially compacted in the vicinity of basement highs. These

highs may also be expected to produce reversals and changes of the regional southwest dip. The effect of highs of the Precambrian surface on the Devonian formations is not known, as the latter outcrop so sparingly. Little data are available on the nature of Devonian rocks within the map-areas; their oil and gas potentialities need to be assessed from consideration of data from adjoining map-areas. Rocks of map-unit 15 are reefy and porous and, although shown on the map as restricted in extent, the three dimensional form is not known.

The gypsum of map-unit 12 outcrops at several localities, some close to the road from Fort Providence to Yellowknife. Abundant salt casts attest to the presence of salt within map-units 6 and 9.

Mineralization of the Precambrian rocks of the Shield included in the map-area has been discussed by McGlynn (1957), Lord (1942), and Kidd (1936). Economic aspects of inliers of the Precambrian rocks within the Palaeozoic strata are probably comparable.