



PETROLEUM AND ITS PRODUCTS

CANADIAN GULF OIL COMPANY

P. O. BOX 130 • CALGARY, ALBERTA, CANADA



E. D. LOUGHNEY,
VICE PRESIDENT



Mr. C. K. LeCaplain,
Chief Land Division,
Department of Northern Affairs and National Resources,
Ottawa, Ontario.

March 27, 1956.

North Adrin. & Lanes St.
Ottawa, Ont.
APR 4 1956
File No. _____
Refer To _____

Dear Sir:

Canadian Gulf Oil Company conducted geological mapping and stratigraphic studies during the field season of 1955 in the areas including and contiguous to Peel Plateau in the Northwest Territories and south Porcupine Plain in the Yukon. Investigations were carried out under Exploratory License number 190. A summary of the work accomplished is given below in compliance with section 5 of the Provisions of the Territorial Oil and Gas Regulations.

The area of investigation is bounded by north Latitudes 65°00' and 67°00', and west Longitudes 129°00' and 139°00'.

The purpose of the study was to sample, measure, and describe as many sections as possible in an effort to solve the stratigraphy. One hundred thirty sections were examined which, when considered in aggregate, total a sum of approximately 109,000 linear feet. A map showing the location of all sections studied relative to the positions of Hestock's physiographic divisions is here attached (figure No. 1).

The geological party consisted of four geologists, five student assistants, one supply co-ordinator, two cooks, and two boatmen. Transportation in the field was supplied by a Bell helicopter, a deHaviland Beaver float-plane, and a river tug boat equipped with a 30 ton barge.

The field season commenced June 1st and terminated September 1st. No potentially useful waters, coal, gravel or sand deposits were encountered.

GEOLOGY

Strata ranging in age from Cambrian and/or older to possibly Tertiary are exposed at one place or another in the project area. Rarely is a System completely exposed in any one locality; this is especially true of the western half

of the area. The lithologic character and stratigraphic relations of each system is described below.

CAMBRIAN and/or OLDER

Little attention was given to Cambrian and/or older rocks in the area but they are known to outcrop only in Mackenzie and southern Richardson Mountains. About 15 miles into Mackenzie Mountains on Snake River a sequence of 500 feet of brick red shales and white gypsum is overlain by rocks of definite Silurian age. A few miles farther south the Silurian beds overlie a 3,000 foot unit of limestone breccia-like conglomerate. This conglomerate is believed to be extremely local in distribution.

On the east flank of Richardson Mountains on Vittrekwa River a 350 foot exposure of dolomite, chert, gypsum, and red cavernous limestone was sampled. These beds are overlain by black shales of Ordovician age. On the west flank of Richardson Mountains in vicinity of Round River 500 feet of dark grey argillaceous sandstone and sandy shale containing Cambrian sponge spicules are exposed.

On the basis of lithology the evaporite beds on Vittrekwa and Snake Rivers are believed to correlate with the Middle Cambrian Saline River formation of the Cap Mountain area northeast of Fort Wrigley (Hume, 1954). It is suggested that the clastics at Round River are also Middle Cambrian in age but their relation to the evaporite beds is unknown.

ORDOVICIAN AND SILURIAN

Rocks of Ordovician and Silurian age outcrop extensively on both east and west flanks of southern Richardson Mountains. They attain a thickness of at least 4,000 feet and consist mainly of dark shales and shaly dolomite with irregular bodies of chert. Graptolites of both Ordovician and Silurian ages were collected from these strata but no lithologic break separates the two systems. The unit thins rapidly northward but its behaviour is not well known to the south.

A short distance north of Ogilvie Mountain front on Blackstone and Hart Rivers, small exposures of Silurian and Ordovician strata were sampled. The rocks in this locality consist of clean fossiliferous limestones with irregular bodies of black chert. These beds also underlie Ogilvie and Keele Mountains. It is therefore apparent that a lateral facies change occurs from fine clastics in vicinity of Richardson Mountains to carbonates in vicinity of Ogilvie Mountains.

On the east part of Peel Plateau near and at Mackenzie Mountain front, three localities of exposed Silurian rocks were studied. They are included in the previously defined Ronning group (Link, cited by Hume 1954). The Ronning group is uniformly about 2,000 feet thick as far west as Bonnet Plume Basin and is composed of grey thick bedded cherty dolomite containing chertified fossils. Little is known of its relation with the underlying beds, but disconformably overlying the group in the area lying east of Arctic Red River is the Silurian or Devonian Bear Rock formation (Hume 1954). The typical brecciated dolomite and gypsiferous lithologies of the unfossiliferous Bear Rock formation are not represented on Arctic Red River.

or westward although their time correlatives may be present. Further detail is required to establish the presence or absence of Bear Rock equivalents from Arctic Red River westward.

DEVONIAN

As indicated above, the Bear Rock formation could be Devonian in age but for the sake of convenience it was treated with Silurian strata.

Middle Devonian

Rocks of definite Middle Devonian age were observed in 16 localities along the northern fronts of Mackenzie and Ogilvie Mountains and in isolated outcrops in the vicinity of Dave Lord Ridge.

In the Mackenzie Mountains the Middle Devonian has been previously studied and named the Ramparts formation (Hume 1954). The Ramparts formation is divided threefold, namely, the lower limestone member, the middle shale member, and the upper limestone member. These three members are recognized throughout that part of Mackenzie Mountains which is adjacent to Peel Plateau. All three members, in general, exhibit little lithologic change and are fossiliferous. The Ramparts, as a unit, thickens from about 2,000 feet in the east to 3,000 feet in the west toward Bonnet Plume Basin.

West of Bonnet Plume Basin along Ogilvie Mountains Middle Devonian strata are about 3,000 feet thick. They consist of a lower argillaceous fossiliferous limestone member and a thicker upper dolomitic limestone member. Although these beds are equivalent, generally, to the Ramparts formation, an exact correlation has not yet been attempted.

Some of the lower beds of a thick Upper Devonian sequence of sandy shale and argillaceous sandstone exposed on both east and west flanks of the southern Richardson Mountains may be Middle Devonian in age. The lack of fossils, however, prohibits a definite age assignment.

Middle Devonian strata within the limits of the project area are everywhere overlain by Upper Devonian clastics except for the portion of Porcupine Plateau lying east of Keele Range where Cretaceous rocks are believed to overlie them. Underlying Middle Devonian strata in the eastern part of the area is the Bear Rock formation or its equivalents. In the western part of the area Middle Devonian strata are underlain by a thick sequence of Ordovician and Silurian sediments.

Upper Devonian

Strata of Upper Devonian age were measured in 46 localities throughout the whole of the project area. The sediments are entirely clastic in character. In general it can be stated that a definite lithofacies pattern in Upper Devonian rocks exists; fine clastics and calcareous material predominate in the eastern area around Mountain River and coarse clastics mixed with some fine predominate in the northwest at both Vittrekwa River and Dave Lord Ridge.

At Mountain River the Upper Devonian is divided into the Fort Creek and Imperial formations. The Fort Creek formation unconformably overlies Middle Devonian limestones and consists of black platy shales with irregularly distributed argillaceous limestone beds. The thickness ranges vastly from 1,600 to 1,800 feet in the Norman Wells area to about 500 feet on Snake River. North and west of Snake River the Fort Creek is difficult to recognize.

The Imperial formation conformably overlies the Fort Creek shales in the Mountain River area and is about 1,500 feet thick. It is composed of grey and greenish siltstone, sandstone, and shale. The thickness of Snake River is about 3,000 feet. North of Snake River the Fort Creek and Imperial formations are not recognized as discrete formations but exist as one lithologic unit with basically the same composition as the Imperial formation.

The Upper Devonian increases in thickness to 10,000 feet or more at Vittrekwa River and north where sandy shales at the base are overlain by thick sandstones and conglomerates containing Upper Devonian plants.

West of Richardson Mountains in vicinity of Upper Peel River and north of Round River, Upper Devonian sediments are about 5,000 feet thick but east of Rock River they are more than 10,000 feet thick. On the west side of Eagle Plain near East Porcupine River they are only 1,500 feet thick and a short distance north on Porcupine Plateau opposite Keele Mountains they are apparently absent. Still farther north on Dave Lord Ridge about 3,000 feet of conglomerates and sandstones are poorly exposed.

Around the rim of Eagle Plain the Upper Devonian follows much the same pattern as on Peel Plateau. Fine clastics in the south with one exception, notably, a 2,000 foot unit of sandstones and conglomerates on Hart River, grade laterally into predominantly coarse clastics in the north.

East of Richardson Mountains Upper Devonian rocks are unconformably overlain by Cretaceous strata. West of Richardson Mountains, however, these beds are, where observed, overlain by Carboniferous strata.

CARBONIFEROUS

Carboniferous rocks are known to be present only in that portion of the project area lying west of Richardson Mountains. These strata reach an estimated maximum thickness of 5,000 feet and were examined in part at 13 different localities on or near the rim of Eagle Plain. They are thickest in the vicinity of Peel River from whence they seem to thin in all directions.

The succession consists basically of carbonates comprising several zones of coarse fragmental crinoidal limestone, grey normal marine limestone, and some silty or sandy argillaceous limestone. Conglomeratic zones were observed in one or two places. Fossils are present throughout. The sequence rests conformably, where observed, on Upper Devonian strata and is unconformably overlain by Cretaceous clastics.

Only a cursory examination of the fossils has, as yet, been made but it is almost certain that rocks of both Mississippian and Pennsylvanian ages are present. It is probable that Permian sediments are also present.

CRETACEOUS

Strata of Cretaceous age have been studied along most of the main streams. They consist entirely of clastics, vary greatly in thickness, and rest disconformably on older beds.

The fourfold division of Cretaceous strata in Mackenzie Basin is not readily applicable in the area of study. On Arctic Red River and east, the lower part of about 3,000 feet of Cretaceous beds consists predominantly of dark silty sandy shale with clay ironstone nodules. The upper part is composed mainly of argillaceous cross-bedded sandstone containing rare fossils and a few interbeds of shale.

Westward toward Richardson Mountains on Vittrekwa River a 200 foot exposure of conglomerate marks the base of a 1,000 foot section of Cretaceous composed largely of sandy shale. This conglomerate represents a major unconformity where Cretaceous strata rest on Upper Devonian clastics.

West of Richardson Mountains Cretaceous beds attain an estimated maximum thickness of 8,000 feet. They were studied only in part owing to limited exposure. The lower portion of these strata consists mainly of dark shales and is overlain by a thick series of interbedded sandstones and shales.

Fossils are not abundant in the Cretaceous strata of the project area. Meagre data suggests, however, that most if not all of these rocks are of Lower Cretaceous age. No sign of either Triassic or Jurassic sediments has so far been detected.

TERTIARY

Tertiary sediments have been reported in Bonnet Plume Basin (Stelck, cited by Hume, 1954). They are recorded as being present northwest of the project area in Old Crow Plain (McConnell 1990). Although Tertiary sediments were not studied during the field season of 1955, they are known to be absent from Peel Plateau proper. They may, however, be present on Eagle Plain.

REFERENCES

Hume, G.S.: The Lower Mackenzie River Area, N.W.T. and Yukon; Geol. Surv. Canada, Memoir 273, 1954

McConnell, R.G.: Report on an Exploration in the Yukon and Mackenzie Basin, N.W.T., Geol. Surv. Canada, Ann. Report 1898-99, Vol. IV, pt. D (1990).

Very truly yours,

CANADIAN GULF OIL COMPANY,

John Henry
John Henry
Vice President