

Note: Weighted legend blocks indicate map-units that appear on this map

- QUATERNARY**
- Q Glacial till, outwash, alluvium, etc.; mapped only where deposits are thick and continuous
 - Qm Thick morainal deposits forming prominent topography (Amundsen and Great Bear lobe moraines)
- TERTIARY and/or QUATERNARY**
- Tb BEAUFORT FORMATION (?): unconsolidated gravel and sand; quartzite, dolomite and black chert pebbles; wood fragments
- CRETACEOUS**
- UPPER CRETACEOUS**
- Kps "Fale shale zone": pale grey shale and mudstone; grey brown ferruginous shale; minor ironstone concretionary beds
 - Kbt "Bituminous zone": black bituminous shale; yellow jarosite; local earthy hematite; pale grey clay; local basal ironstone-pebble and shale-chip conglomerate
 - Ksh Undifferentiated shales, equivalent to the "Silty", "Bentonitic", and "Bituminous" zones
 - Kss Basal sandstone, white, very fine to coarse-grained, crossbedded, partly calcareous, commonly porous, locally oil-stained; equivalent to lower division of "Silty zone"
- LOWER CRETACEOUS**
- Kb "Bentonitic zone": black, soft, plastic shale; fossiliferous orange ironstone concretionary beds
 - Ks "Silty zone": upper division - argillaceous siltstone and mudstone; lower division - light grey friable sandstone and coal
- DEVONIAN**
- UPPER DEVONIAN**
- Di2 IMPERIAL FORMATION: shale, brown, greenish grey, generally fissile; subordinate sandstone, brown, impure, very fine grained; minor siltstone
 - Di1 Basal unit: shale, brown, fissile, with siltstone laminae and clay ironstone concretions
 - Di IMPERIAL FORMATION (Undivided)
- CANOL FORMATION**: shale, dark brown to black, mostly bituminous, partly fissile, partly siliceous and blocky
- MIDDLE AND (?) UPPER DEVONIAN**
- Drk RAMPARTS and KEE SCARP FORMATIONS (Undivided): limestone, generally well bedded and partly argillaceous below, massive above; commonly fossiliferous
- MIDDLE DEVONIAN**
- Dhi HARE INDIAN FORMATION: shale, black and highly fissile at base, green above; beds of siltstone and fossiliferous limestone locally developed
 - Dh HUME FORMATION: limestone, well bedded and rubbly, highly fossiliferous; shales in middle and lower parts
- MIDDLE AND (?) LOWER DEVONIAN**
- Db BEAR ROCK FORMATION: dolomite and limestone solution-breccia; bedded brown bituminous dolomite and dense limestone; gypsum
- ORDOVICIAN AND SILURIAN**
- UPPER ORDOVICIAN AND LOWER SILURIAN**
- RONNING GROUP**
- OsK MOUNT KINDLE FORMATION: dolomite, brownish grey to medium grey, fine crystalline; locally colour mottled; silicified fauna common
- LOWER AND (?) MIDDLE ORDOVICIAN**
- RONNING GROUP**
- Or2b Unit 2b: dolomite, pale yellow-brown to pale grey; mainly medium crystalline, abundant white and yellowish grey stromatolite and locally oolitic chert, abundant drusy quartz
 - Or2 Unit 2 (Undivided)
 - Or2a Unit 2a: dolomite, pale brownish grey, fine to coarse crystalline; interbedded with dolomite, greyish orange, very fine crystalline, partly laminated
 - Or1 Unit 1: dolomite and rare limestone; cyclic repetitions of dense, laminated beds, oolite beds, conglomerate beds, stromatolitic beds and thin dolomitic shale beds
- CAMBRIAN**
- Cs SALINE RIVER FORMATION: red and green shales, gypsum, halite, siltstone; dense flaggy dolomite with salt-crystal casts
 - Ccp MOUNT CAP FORMATION: green, grey, and minor red shales, glauconitic sandstone and siltstone; subordinate orange-weathering dolomite in some areas
 - Cck MOUNT CLARK FORMATION: sandstone, white, grey, locally red, quartzose, fine to very coarse-grained and conglomeratic, crossbedded, partly friable

- Rock outcrop..... x
- Rock outcrop visited by helicopter..... x
- Fossil locality..... ⊕
- Geological boundary (defined, approximate, assumed; includes contacts extended by air photo interpretation)..... - - - - -
- Limit of geological mapping..... +
- Bedding, tops known (horizontal, inclined)..... +
- Fault (inferred; solid circle on downthrown side)..... - - - - -
- Abandoned well..... - - - - -
- Stratigraphic section studied..... - - - - -

Stratigraphic Section Reference
W. S. MacKenzie..... MN-23

Geology by J. D. Aitken, M. E. Ayling, H. R. Balkwill, D. G. Cook, W. S. MacKenzie, C. J. Yorath, 1968

Compiled by D. G. Cook and J. D. Aitken, 1969

Abandoned Wells

- Glacier et al. Hare Indian No. 1..... 1
- Glacier et al. Ramparts No. 1..... 2
- Atlantic et al. Manitou Lake L-61..... 3
- Glacier et al. Loon River No. 1..... 4
- Atlantic SW. Airport Creek No. 1..... 5
- Atlantic N. Circle River No. 1..... 6
- Atlantic et al. Beavertail G-26..... 7

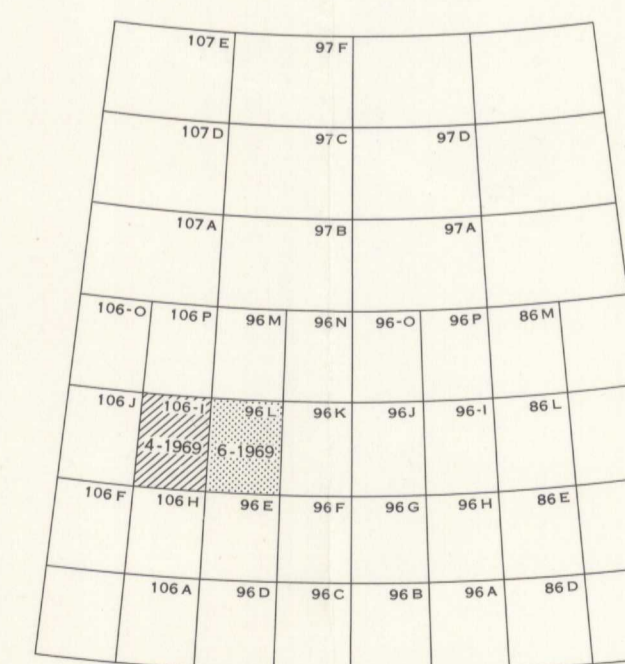
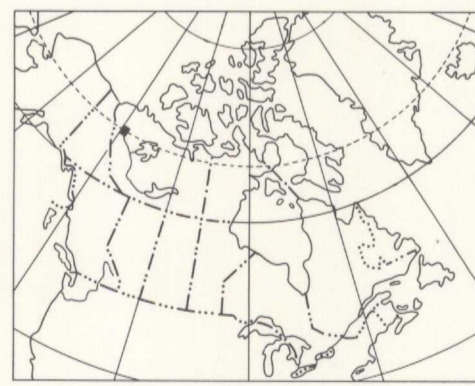
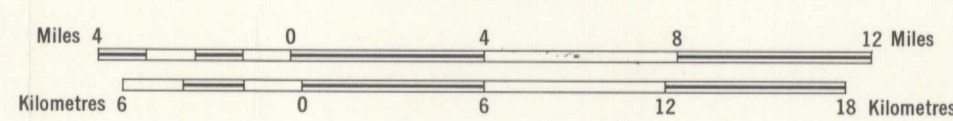
Geological cartography by the Institute of Sedimentary and Petroleum Geology, Geological Survey of Canada, 1969

Topographic base-map at the same scale published by the Surveys and Mapping Branch, 1959

Magnetic declination 1969 varies from 38° 03' easterly at centre of west edge to 38° 27' easterly at centre of east edge. Mean annual change: -6.4'



MAP 4-1969
GEOLOGY
FORT GOOD HOPE
DISTRICT OF MACKENZIE
Scale 1:250,000



National Topographical System designations indicate other quadrangles mapped geologically during Operation Norman

Geological mapping involving airborne, regional, geological reconnaissance, was carried out in 1968 as part of Operation Norman. That part of the map-area southwest of Mackenzie River lies in the Peel Plateau physiographic subdivision (Bostock, 1964), whereas the area east and north of the river is part of Anderson Plain (ibid.). In the northwest, the area bounded by Mackenzie River, Loon Lake, and Hare Lake forms the southern part of the Ramparts Plateau subdivision of Anderson Plain. Rock exposures are confined to river and lake valleys with the exception of scattered Cretaceous sandstone outcrops in the upland or interstream areas. Stratigraphic units are all recessive except the Ramparts/Kee Scarp unit, which is resistant cliff-forming limestone.

Nomenclature applied to Devonian strata is that of Bassett (1961), with the exception of the name Ramparts Formation which is used in its original sense as suggested by Caldwell (1964).

The oldest rocks exposed are assigned to the Hume Formation (Dh), which conformably overlies the Hume Formation. The exposed Hume consists of brown, dense, thin- and medium-bedded, very fossiliferous limestone that is characteristically rubbly in outcrop. In the subsurface the formation is about 350 feet thick. The Hare Indian Formation (Dhi), which conformably overlies the Hume Formation, is recessive and outcrops only in creek beds and on the banks of Mackenzie River, especially at The Ramparts southwest of Fort Good Hope and in the east bank northwest of Tieda River. The formation in part underlies, and in part is a lateral facies of, the Ramparts Formation so that variations in thickness and lithology are pronounced. A basal member consisting of dark brown, fissile, bituminous shale, is not exposed within the map-area but outcrops near Lac à Jacques a few miles to the east. The upper part of the formation consists of greenish grey, grey, and pale brown shales, with amounts of calcareous siltstone in thin beds and, locally, beds of fossiliferous limestone. The Hare Indian, about 200 feet thick in the Atlantic et al. Beavertail G-26 well west of Hare Lake, thickens westward and is about 700 feet thick in the Atlantic Southwest Airport Creek No. 1 well northwest of the Ramparts. The faunas of the Hare Indian Formation are Middle Devonian (Givérian).

Stratigraphic problems concerning the Kee Scarp and Ramparts Formations, which may or may not constitute a single lithogenetic unit, are not yet resolved. In any event, their separation in the course of reconnaissance mapping is not practical and they have been mapped as an undivided unit (Drk). The lower, "Ramparts" part is characterized by mainly medium-bedded, brown, partly argillaceous limestones characterized by, and largely consisting of, transported fragments of branching tabulate corals. This unit passes by facies change into the Hare Indian Formation along the Mackenzie River downstream from Fort Good Hope. The upper, "Kee Scarp" part is thick-bedded and massive, and consists of pale brown limestone commonly containing large globular stromatopora. The Ramparts/Kee Scarp, undivided, is a relatively local development within the Devonian succession (Bassett, 1961), and is markedly lenticular. It is absent from most of the eastern part of the map-area, owing to non-deposition or to pre-Cretaceous erosion. From a thickness of 400 feet in the Atlantic et al., Beavertail G-26 well west of Hare Lake, the Ramparts/Kee Scarp thins westward to zero southwest of Payne Creek near the western boundary of the map-area, a distance of about 36 miles. The type Ramparts Formation is Middle Devonian (Givérian) at its type section at The Ramparts. The age of the Kee Scarp Formation is in dispute (see Caldwell, 1964, p. 618); it is either Middle or Late Devonian.

The Canol Formation (De) unconformably overlies either Ramparts/Kee Scarp or Hare Indian Formations in this map-area. An unconformity is indicated by local channelling of the underlying Hare Indian northwest of the map-area, and by truncation of the underlying formations westward. About 40 miles west of the map-area, for example, the Canol Formation directly overlies the Hume Formation in the Atlantic et al., Ontario H-34 well. The Canol is composed of dark grey to black bituminous shales with some silty beds, clay-ironstone concretions, and pyritic nodules. Exposures are commonly coated with yellow bloom, but are locally oxidized and red. It is generally a poorly exposed, recessive unit. In rare, good exposures, closely spaced joints result in characteristic blocky fracture and vertical cliff faces. No complete sections of the Canol occur in this map-area, but the unit is consistently about 100 feet thick in wells. In the northwestern corner of the map-area where the Canol is rarely exposed, the top of the formation has been picked at the top of a prominent topographic bench; the resultant thickness is comparable to that in the subsurface. The Canol Formation is overlain at some localities by the Imperial Formation, and elsewhere, by the basal Cretaceous sandstone. The Canol is missing from the eastern part of the map-area mainly owing to pre-Cretaceous erosion. The Canol Formation is Late Devonian (Frasnian).

The Imperial Formation (Di), composed of brown and greenish brown, fissile shales, with subordinate impure, brown, fine-grained sandstone and siltstone beds appears to overlie the Canol Formation conformably. The Imperial is 850 feet thick 20 miles west of the map-area in the Atlantic Ontario K-1 well, and thins progressively to 280 feet at the Atlantic N. Circle No. 1 well, 12 miles inside the west boundary of the map-area, and to zero east of the Mackenzie River. Outcrops of the formation were observed at only one locality, in a creek valley about 16 miles northwest of Fort Good Hope. A substantial area in the northwest corner of the map-area is shown as being underlain by the Imperial Formation on the basis of topographic expression, exposures to the north of the map-area, and subsurface thicknesses. The Imperial Formation is of Late Devonian age (Frasnian and Famennian).

Basal Cretaceous sandstone (Ksa) lies with profound regional unconformity on all other formations exposed in the map-area. Furthermore, twenty-five miles to the east of the map-area, it lies on the Devonian Bear Rock Formation, and 85 miles to the east on the Ordovician-Silurian Ronning Group. In the vicinity of Hare Lake, there is evidence for at least 100 feet of relief on the sub-Cretaceous unconformity. Cretaceous sandstone beds overlie Hare Indian strata east of the lake, and consequently occupy the same stratigraphic position as Ramparts/Kee Scarp limestone west of the lake. This implies that a mesa, supported by the resistant Ramparts/Kee Scarp limestone existed during the Cretaceous. A similar relationship occurs a few miles east of the southern part of the map-area near Lac à Jacques (Aitken & Cook, in press). Local relief on the unconformity can be seen about ten and one-half miles northwest of Fort Good Hope in the west bank of Mackenzie River. A channel cut through the Ramparts/Kee Scarp is filled with Cretaceous sandstone and conglomerate which lie on Hare Indian shales.

The basal Cretaceous sandstone is quartzose and white, with local dark oil-staining. Grain size varies from very fine to very coarse, adjacent laminae commonly being of very different grain size. Layers of quartz and chert pebbles occur locally. Calcitic cement is widespread, and locally causes "laetre-mottling". Where not calcareous, the sandstone is friable and porous; many exposures consist of unconsolidated white sand. Crossbedding is ubiquitous. The basal sandstone is about 100 feet thick. It is probably correlative and continuous with the lower, sandstone and coal division of the "Silty Zone" (late Early Cretaceous) of the Anderson River region (Yorath et al., 1969).

Undifferentiated Cretaceous shales that overlie the basal sandstone, are exposed only in a few outcrops near the mouth of Ramparts River. These are dark grey to black, blocky, plastic, slightly silty shales with abundant flat, disc-shaped, rusty ironstone concretions. This unit may be equivalent to the upper "Silty Zone" and/or the "Bentonitic Zone" (late Early Cretaceous) of the Anderson River region (Yorath et al., 1969).

Rocks in the map-area are moderately deformed. A regional homocline, dipping southwestward at 20 to 30 feet per mile, is formed by Devonian formations which have been tilted and truncated by erosion in pre-Cretaceous time. Cretaceous strata, that overlap the Devonian sequence, also dip to the southwest at 10 to 15 feet per mile.

The entire area was covered by Laurentian ice during the last glaciation.

REFERENCES

- Aitken, James D., and Cook, Donald G. (in press): Lac Belot, District of Mackenzie; Geol. Surv. Can., Map 6-1969.
- Bassett, H. G. 1961: Devonian stratigraphy, central Mackenzie River region, Northwest Territories, Canada; in Raasch, G. O., Ed., Geology of the Arctic, Proc. First Int. Symposium on Arctic Geol., vol. 1, Univ. Toronto Press, pp. 481-499.
- Bostock, H. S. 1964: A provisional physiographic map of Canada; Geol. Surv. Can., Paper 64-35, 24 pp.
- Caldwell, W. G. E. 1964: The nomenclature of the Devonian formations in the lower Mackenzie River valley; Bull. Can. Petrol. Geol., vol. 12, pp. 611-622.
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MAP 4-1969
FORT GOOD HOPE
DISTRICT OF MACKENZIE

N.W.T. FORT GOOD HOPE
1:250,000
Prelim. Series Map 4-1969