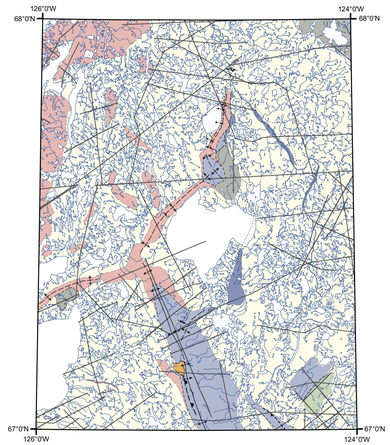

Figure 1. Lac Maunoir map area (NTS 96-N) showing seismic lines (grey lines) on record with the National Energy Board (NEB) that were used to augment the bedrock geology interpretation. Line names are provided in the digital data files.

Abstract

The Lac Maunoir map area (NTS 96-N) lies within the Colville Hills region of the Northwest Territories. Sparse bedrock exposures in the area include carbonate and siliciclastic strata ranging from Cambrian to Paleogene. These strata were deformed in the Cretaceous to Eocene by folding and contractional faulting associated with Cordilleran deformation. A pre-Cordilleran set of approximately north-trending extensional faults are preserved within subsurface Proterozoic and Cambrian strata, and were locally reactivated by Cordilleran deformation. A major unconformity between Devonian and Cretaceous strata is marked by tilted Paleozoic strata beneath the Cretaceous, and the absence of Devonian strata in the eastern part of the map area. Oil has been reported from petroleum exploration wells drilled into Mount Clark Formation (Cambrian) sandstone.

Résumé

La région cartographique de Lac Maunoir (SNRC 96-N) se situe dans la région des collines Colville des Territoires du Nord-Ouest. Dans la région, des affleurements clairsemés du socle rocheux renferment des strates carbonatées et des strates siliciclastiques rapportées à l'intervalle du Cambrien au Paléogène. Ces strates ont été déformées dans l'intervalle du Crétacé à l'Eocène par des plis et des failles de compression associés à la déformation cordillérienne. Des failles de distension de direction à peu près nord appartenant à un ensemble pré-cordillérien sont conservées en profondeur dans les strates du Protérozoïque et du Cambrien et ont été réactivées localement par la déformation cordillérienne. Une discordance majeure entre les strates du Dévonien et celles du Crétacé est révélée par l'inclinaison des strates du Paléozoïque sous celles du Crétacé ainsi que par l'absence de strates du Dévonien dans la partie est de la région cartographique. On a signalé la présence de pétrole dans des puits d'exploration pétrolière forés dans le grès de la Formation de Mount Clark (Cambrien).

National Topographic System reference and index to adjoining published Geological Survey of Canada maps

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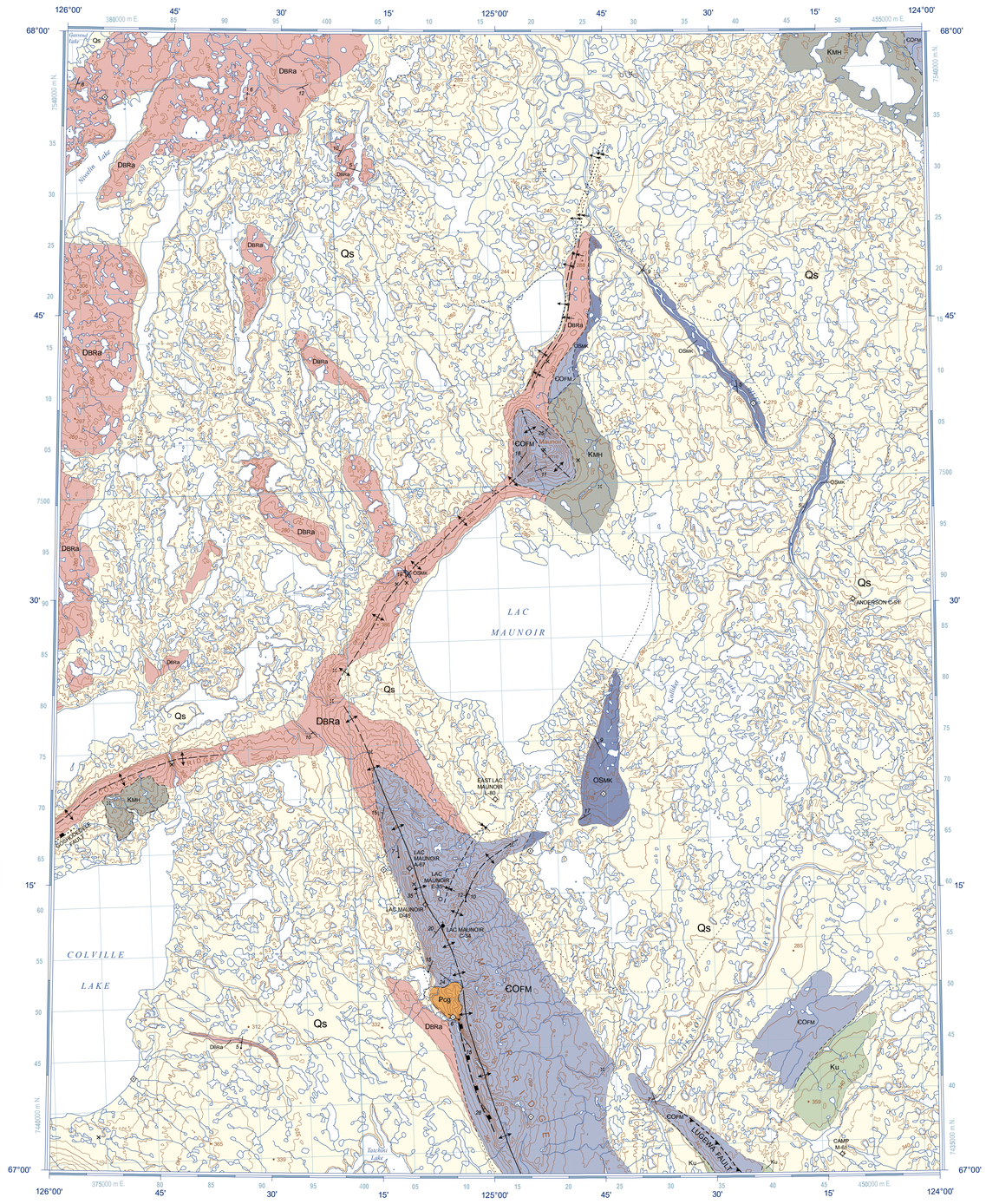
CANADIAN GEOSCIENCE MAP 311

BEDROCK GEOLOGY

LAC MAUNOIR

Northwest Territories

1:250 000



QUATERNARY

Qs — **Quaternary sediment:** sand, gravel, and mud: sediment includes sedimentary, igneous, and metamorphic material; sandy deposits typically brown to light orange or pale tan, some grey mud layers; unconsolidated.

PALEOGENE

Pcg — **Paleogene conglomerate:** conglomerate: polymict with clasts of chert, quartz arenite, and minor shale, hematitic cement, orange-brown- to rusty-weathering, granules to cobbles; and sandstone: quartzose, hematitic cement conglomeratic, dark red, dark-brown-weathering, very thick-bedded, crossbedded; likely equivalent to Summit Creek Formation of the Mackenzie Valley.

CRETACEOUS

Ku — **Cretaceous undivided:** shale and mudstone: locally sulphurous or gypsiferous, sideritic concretions common, dark grey to brownish grey; and sandstone: light grey, light-brown-weathering, laminated to thin-bedded; unit very poorly exposed; may include equivalents of Martin House, Arctic Red, and Slater River formations.

EARLY CRETACEOUS

KMH — **Martin House Formation:** sandstone: quartz arenite, patchy calcareous cement, locally oil-bearing, white to light grey or light brown on fresh and weathered surfaces but oil-bearing exposures have dark brown fresh surfaces, thin- to thick-bedded, crossbedded, friable, comminuted plant debris, rare interbeds of brown mudstone; overlain by shale or mudstone: sideritic concretions common, medium to dark grey, weathers grey or rusty-brown; shale may be equivalent to Arctic Red Formation.

DEVONIAN

DBra — **Bear Rock assemblage:** limestone and dolostone: variably petroliferous, locally evaporitic (gypsum and/or anhydrite), commonly brecciated with angular clasts ranging from granule- to boulder-sized, greyish-brown to grey, weathers light grey, thin- to thick-bedded but massive and rubbly where brecciated, features include microbial laminae, fenestrae, peloids, and vugs; includes strata equivalent to Delorme Group, Bear Rock Formation, Arnica Formation, and Landry Formation documented in adjacent map areas.

ORDOVICIAN TO SILURIAN

OSMK — **Mount Kindle Formation:** dolostone: dolowackestone to dolopackstone and dolofloatstone, siliceous and cherty, light to dark grey or brownish-grey fresh and weathered surfaces, locally colour-mottled, thin- to very thick-bedded, vuggy, recrystallized, bioturbated, and fossiliferous (mainly silicified corals, crinoids, orthocone cephalopods, and stromatoporoids); interbedded with dolomudstone: light grey or cream, laminated, unfossiliferous.

CAMBRIAN TO ORDOVICIAN

COFM — **Franklin Mountain Formation:** dolostone: dolomudstone to dolograinstone, cherty in upper part, grey, cream, or light brown, weathers white to light grey, yellowish-grey, or orange-brown, very thin- to thick-bedded, typically recrystallized, locally vuggy, stromatolitic, bioturbated, oolitic, or intraclast-bearing; minor shale: greenish-grey or red, fissile, and laminated; shale found in basal part of unit; resistant.

Geological contact
- Defined
- Approximate
- Inferred
- Concealed

Drift contact
- Approximate
- Inferred
- Concealed

Thrust fault, symbol on hanging-wall side
- Inferred

Reverse fault, symbol on hanging-wall side
- Approximate
- Concealed

Anticline, upright
- Defined
- Approximate

Syncline, upright
- Inferred
- Concealed

Monocline, anticlinal bend, shorter arrow on steeper limb
- Approximate
- Concealed

Monocline, synclinal bend, shorter arrow on steeper limb
- Approximate
- Concealed

- Visited locality (bedrock or surficial), no measurements
- Locality observed remotely from aircraft

Bedding strike and dip, inclined, upright
- Younging direction known
- No evidence for younging direction or younging evidence unknown
- No evidence for younging direction or younging evidence unknown, estimated measurement

- Fossil locality

Petroleum wells
- LAC MAUNOIR C-34 — Oil, suspended
- CAMP M-61 — Dry and abandoned
- LAC MAUNOIR E-35 — Unknown status

Descriptive Notes

Initial bedrock mapping and stratigraphic studies by the Geological Survey of Canada in the Lac Maunoir map area (NTS 96-N) were conducted in 1968 as part of Operation Norman. This operation led to the release of a report and preliminary map of the area (Aitken and Cook, 1970; Cook and Aitken, 1971). Observations from the 1968 field activities have been incorporated into this compilation along with observations collected in 2015 as part of the Geo-mapping for Energy and Minerals (GEM) Program. Petroleum exploration wells and reflection-seismic data drilled or collected since 1970 have also helped constrain the map interpretation and geological relationships in the subsurface (Fig. 1, 2). Despite significant areas of unconsolidated Quaternary sediment cover, the bedrock units have been interpreted beneath that cover in an attempt to create a seamless bedrock interpretation.

Starting with the oldest bedrock units, changes to the stratigraphic map units from Aitken and Cook (1970) include the subdivision of the obsolete Ronning Group into the Franklin Mountain and Mount Kindle formations (Norford and Macqueen, 1975), separated by an unconformity spanning the Middle Ordovician. Erosion on the sub-Devonian unconformity has removed the Mount Kindle Formation along Maunoir Ridge ('Maunoir Arch' of Fig. 2). Morrow (1991) documents the lateral relationship between Devonian bedded carbonates of the Arnica and Landry formations and brecciated carbonate of the Bear Rock Formation. Limited outcrop exposure combined with irregular brecciation of this interval encouraged the adoption of 'Bear Rock assemblage' in this area to encompass lithologies found in each of these units as well as postulated occurrences of Delorme Group strata (Gouwy et al., 2017). Although common to the south in the Lac des Bois map area (NTS 96-K; Fallas, 2018), karst features within carbonate strata of the above mentioned units are not noticeable at surface.

Low-angle tilting and erosion of the Paleozoic units are evident beneath the sub-Cretaceous unconformity, with Mount Kindle and Bear Rock formations missing beneath the Cretaceous on the east flank of Maunoir Dome and east of Maunoir Ridge ('Maunoir Arch' in Fig. 2). Limited exposure of the Cretaceous units makes it difficult to map formation boundaries; however, some sandstone strata are assigned to Martin House Formation with some confidence (equivalent to Langton Bay Formation of the Anderson Plain; Dixon, 1999). An isolated outcrop of iron-stained conglomerate on the west flank of Maunoir Ridge has been dated as Paleogene (see accompanying digital data for more details). Areas shown as Quaternary sediment on the map include substantial areas of unconsolidated glacial (e.g. hummocky terrain, eskers) and fluvial deposits left behind by the Laurentide ice sheet (Hughes, 1987), but rare bedrock exposures may be present.

Proterozoic deformation of sedimentary strata in this map area is documented from reflection-seismic data (Cook and MacLean, 2004). No dominant structural trend is interpreted from the Proterozoic contractional features. Subsequent to Proterozoic deformation, extensional faults developed in the Cambrian (MacLean, 2011) with a dominant north to northeast trend. During Cordilleran deformation in Cretaceous to Eocene time, the pre-existing structures in the subsurface influenced the location and trend of Cordilleran structures, in some cases through reactivation of older structures. Reactivated structures typically have steeper dips on the fault plane cutting into Proterozoic strata and are therefore shown as reverse faults rather than thrust faults. In contrast, thrust faults show evidence of detachment in evaporite of the Cambrian Saline River Formation on reflection-seismic data.

Petroleum exploration wells in the Lac Maunoir area have targeted Cambrian sandstone of the Mount Clark Formation (Dixon and Stasiuk, 1998). An oil showing has been reported from the Lac Maunoir C-34 well. In agreement with the statement in Cook and Aitken (1971), 2015 field activities did not observe the presence of any metallic minerals of economic significance in the map area. Deposits of sand and gravel within the Quaternary unit (Smith and Lesk-Winfield, 2010) may be useful for infrastructure development, but more detailed study of the surficial materials found in this area is required to identify suitable deposits.

Acknowledgments

This work was carried out on lands within the Sahtu Settlement Area as identified in the Sahtu Dene and Métis Comprehensive Land Claim Agreement. The author gratefully acknowledges the gracious welcome and logistical support of the Behdzi Ahda First Nation (Colville Lake, Northwest Territories). Helicopter and fixed-wing transportation was provided by local service providers based in Norman Wells. Additional field assistance was cheerfully provided by B. Manuel, and the geology team was kept safe by the wildlife monitoring of F.J. Barnaby and C. Oudzi. C. Yakeleya reliably ensured that logistics were co-ordinated. The author also thanks L.D. Currie and L.S. Lane for critical reviews of the map.

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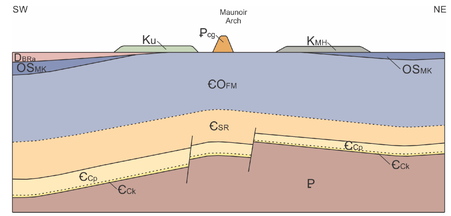

Figure 2. Schematic stratigraphic relationship diagram for the Lac Maunoir map area (NTS 96-N). Subsurface relationships are based on public-domain reflection-seismic data and petroleum exploration wells.

Recommended citation
Fallas, K.M., 2018. Bedrock geology, Lac Maunoir, Northwest Territories; Geological Survey of Canada, Canadian Geoscience Map 311, scale 1:250 000. https://doi.org/10.4095/306205

CANADIAN GEOSCIENCE MAP 311

Celebrating 175 yrs

Geological Survey of Canada
Canadian Geoscience Maps

Canada

Author: K.M. Fallas

Geological compilation by K.M. Fallas, 2015–2016

Geology conforms to Bedrock Data Model v. 4.0

Geological field observations by K.M. Fallas, R.B. MacNaughton, and M.J. Sommers, 2015; D.G. Cook and M. Ayling, 1968

Stratigraphic sections measured by E.C. Turner (Laurentian University), 2015; R.W. Macqueen, 1968

Reflection-seismic data interpreted by B.C. MacLean and K.M. Fallas, 2015. Petroleum exploration well-picks selected by J. Dixon, 2016

BEDROCK GEOLOGY
LAC MAUNOIR
Northwest Territories
1:250 000

5 0 5 10 15 20 km

Geomatics by K.M. Fallas and D.A. Lemay

Cartography by D.A. Lemay

Initiative of the Geological Survey of Canada, conducted under the auspices of the Mackenzie Project as part of Natural Resources Canada's Geo-mapping for Energy and Minerals (GEM) program

Logistical support provided by the Polar Continental Shelf Program as part of its mandate to promote scientific research in the Canadian North. PCSP 05415

Map projection Universal Transverse Mercator, zone 10. North American Datum 1983

Base map at the scale of 1:250 000 from Natural Resources Canada, with modifications.
Elevations in metres above mean sea level

Mean magnetic declination 2018, 21°11'E, decreasing 32.5' annually. Readings vary from 21°25'E in the NW corner to 20°54'E in the SE corner of the map.

This map is not to be used for navigational purposes.

Title photograph: View of Paleogene conglomerate outcrop on west flank of Maunoir Ridge in the Colville Hills, Northwest Territories. Photograph by K.M. Fallas. 2017-044

The Geological Survey of Canada welcomes corrections or additional information from users.

Data may include additional observations not portrayed on this map. See map info document accompanying the downloaded data for more information about this publication.

This publication is available for free download through GEOSCAN (http://geoscan.nrcan.gc.ca/).

CANADIAN GEOSCIENCE MAP 311
BEDROCK GEOLOGY
LAC MAUNOIR
Northwest Territories