GEOLOGICAL SURVEY OF CANADA

DEPARTMENT OF ENERGY, MINES AND RESOURCES

PAPER 68-49

DESCRIPTIVE NOTES (WITH PARTICULAR REFERENCE TO THE LATE PROTEROZOIC DUBAWNT GROUP) TO ACCOMPANY A GEOLOGICAL MAP OF CENTRAL THELON PLAIN, DISTRICTS OF KEEWATIN AND MACKENZIE (65 M, N W½, 66 B, C, D, 75 P E½, 76 A E½)

(Report and P.S. Map 16-1968)

J. A. Donaldson

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Illustration

Map 16-1968 Geology of Central Thelon Plain . . . . . in pocket

Abstract

More than three-quarters of the area mapped is underlain by the Paleohelikian (Late Proterozoic) Dubawnt Group, an assemblage of unmetamorphosed sedimentary and volcanic rocks. Elsewhere granitoid rocks and minor amounts of greenstone, quartzite and schist, form the bedrock. The area is extensively drift-covered. No significant mineralization was noted in the area.

DESCRIPTIVE NOTES (WITH PARTICULAR REFERENCE TO THE LATE PROTEROZOIC DUBAWNT GROUP) TO ACCOMPANY A GEOLOGICAL MAP OF CENTRAL THELON PLAIN, DISTRICTS OF KEEWATIN AND MACKENZIE

Introduction

The map-area is in the central part of an area previously mapped geologically, on a scale of 8 miles to 1 inch, during two helicopter-supported reconnaissance operations (Wright, 1955, 1957). The accompanying map is based on a subsequent study of the Dubawnt Group, which underlies more than three-quarters of the present map-area. Some earlier interpretations have been revised or extended, and all outcrops examined are shown on the accompanying map. Areas of good exposure south of Aberdeen Lake, north of Beverly Lake, around Steel Lake, and along Thelon River were mapped on foot, whereas the rest of the area was mapped primarily by helicopter traverses designed to supplement the earlier reconnaissance mapping. The area may be reached by air from Yellowknife, Uranium City, or Churchill, all of which are about 450 miles from Beverly Lake. The nearest settlement is Baker Lake, 60 miles east of the eastern boundary of the map-area.

Except for small tributaries of the Back River in the northern part of the map-area, drainage converges on the Thelon River system, which drains eastward to Hudson Bay via Baker Lake. Local relief exceeds 200 feet in only a few places, and gently rolling topography characterizes much of the area. Drumlins and drumlinoid ridges are abundant. These and other Pleistocene features are illustrated and described, along with discussions of the glacial history, by Craig (1964). Eskers and outwash sand deposits are common, and some areas are characterized by active sand dunes. Many streams, particularly in the western part of the map-area, occupy canyons that were major Pleistocene spillways. Abandoned Pleistocene beaches flank many of the hills, and recent ice-pushed lake ramparts up to 20 feet high occur along the exposed shores of the larger lakes. Patterned ground is abundant, and ranges from sorted stone circles a few feet in diameter to large ice-wedge polygons in the sand plain north of Aberdeen Lake.

Muskox Pingo, the top of which is about 60 feet above the relatively flat plain north of Thelon River near Lookout Point, has been described by Craig (1959). Less prominent domical hills that occur mainly along the Thelon valley may be either pingos or palsas, and their locations are shown on the map.

General Geology

Granitoid rocks (1) form most of the basement to the Dubawnt Group. Massive, medium- to coarse-grained, leucocratic granitic rocks rich in potash feldspar

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predominate, but large areas of moderately- to well-foliated gneissic rocks are included in this map-unit. As far as is known, gneisses predominate in the western part of the area, where granitoid outcrops were examined only a short distance beyond the margin of the Dubawnt Group. Melanocratic greenstones (2), probably metamorphosed volcanic rocks, occur in a small area northwest of Dubawnt Lake. These fine- to medium-grained, greenish black rocks are slightly schistose, and weather light- to rusty brown.

Quartzite (3) occurs north and south of Beverly Lake, north of Dubawnt Lake, and in a window within the Thelon Formation (6) east of Eyeberry Lake. White, massive, extremely well-indurated orthoquartzites predominate, and bedding commonly is obscure. The least indurated quartzites are south of Beverly Lake, where interbeds of maroon siltstone and argillite clearly define bedding. Some of these rocks closely resemble sedimentary rocks of the Dubawnt Group, and differentiation in this region is based mainly on degree of deformation. Schist, slate, and phyllite (4) associated with quartzites northwest of Beverly Lake is shown separately. These sedimentary and metasedimentary rocks (3, 4) have been extensively deformed, and steep dips predominate.

The Dubawnt Group (5-8) is a flat-lying assemblage of unmetamorphosed sedimentary and volcanic rocks that lies unconformably on the igneous, metamorphic, and deformed sedimentary rocks described above (1-4). Stratigraphic nomenclature for the group is presented in another report (Donaldson, 1965). The Pitz Formation (5) comprises reddish brown, pink, and mauve volcanic rocks that are typically rich in feldspar phenocrysts up to 2 cm in diameter. Less common are smaller phenocrysts of quartz, pyroxene, or biotite. The groundmass is aphanitic or very fine grained and rarely exhibits flow structure. Because the basal contact that demonstrates the extrusive nature of this unit is exposed in only a few places, some intrusive equivalents may also be present.

A regolith commonly is preserved beneath the base of the Thelon Formation (6), which lies directly on basement rock where the Pitz Formation (5) is absent because of erosion or nondeposition. This regolith, best developed where it caps granitic rocks, is rich in clay minerals and characteristically is hematite-stained. Conglomerate (6a), which commonly forms a basal unit of the Thelon Formation, is most abundant along the southeastern boundary of the formation, but it also occurs as channels and sheets at stratigraphically higher levels. Basal conglomerates contain cobbles and boulders derived predominantly from the Pitz Formation, but phenoclasts of quartzite and vein quartz are locally abundant, and commonly predominate in stratigraphically higher parts of the formation. Maximum size of the clasts generally decreases towards the northwest. Pebbly sandstone (6b) and sandstone (6c) typically are cream, greyish white, buff mauve, or pink. Variegated coloration is common, and Liesegang banding simulates bedding in some outcrops. Well-rounded, ellipsoidal to spherical pebbles of quartzite and vein quartz occur both along bedding surfaces and scattered throughout the sandstones. Areas differentiated as pebbly sandstone contain more than 10 per cent pebbles. More than 90 per cent of the sandstones are orthoquartzites with interstitial kaolin-group clays or siliceous cement. Lithic sandstone rich in volcanic detritus commonly occur in association with basal conglomerates. Grain size ranges from fine to very coarse, and induration from friable to extremely well indurated, but medium-grained, moderately-well indurated sandstone predominates. Trough-festoon crossbedding is characteristic, but tabular-planar crossbedding also occurs, particularly in the upper part of the formation. Ripple-marks are abundant, the frequency of symmetric ripple-marks slightly exceeding that of asymmetric varieties. Green, black, and maroon siltstones and mudstones are intercalated with sandstone beds in some outcrops, particularly near the top of the formation. Derived

intraformational conglomerates are commonly associated with the siltstones and mudstones, and many of the shaly layers are characterized by desiccation structures. Some outcrops near Lookout Point display regular and arcuate networks of sandstone ridges on bedding surfaces, and although an organic origin is appealing, these too probably formed by desiccation.

Massive, fine-grained, dull greenish to purplish brown basalt (7) outcrops southwest of Lookout Point. This unit overlies the Thelon Formation, but its relationship to the dolostone unit (8), with which it is locally in fault contact, is not known. One outcrop of flat-lying dolostone near the fault lies topographically above a nearby outcrop of basalt, suggesting the dolostone to be the younger of the two map-units. However, the basalt may have been extruded over an irregular surface (erosional unconformity), and thus may be the younger unit. Three small outcrops of similar basalt (7a) lie south of the main area, and appear to have filled valleys in dissected Thelon sandstone (6c), supporting the possibility of an erosional unconformity at the base of the basalt (7).

Dolostone and siliceous dolostone (8) underlie a large area south of Thelon River, and also form six smaller outcrop areas to the north and one to the south. Grey and buff coloration is characteristic, and siliceous interlayers accentuate bedding. Much of the dolostone is fine grained to aphanitic and thinly bedded, but clastic zones are abundant, and these in particular show crossbedding, ripple marks, and desiccation cracks. Stromatolites are abundant south of the Thelon River, and a few beds are oolitic. The stromatolites include both discrete and laterally linked varieties, with domical, undulatory, and bulbous types predominating.

Diabase dykes (9) belonging to the northwest-trending Mackenzie dyke swarm (Fahrig et al., 1965, p. 284) (6) cut the Thelon Formation and older rocks. They were not observed in contact with the basalt (7) or with the dolostone (8), and therefore their age relationships with these rocks was not established. The basalt may well be the extrusive equivalent of the diabase.

Ordovician limestone (10) outcrops along a shallow stream about 20 miles north of Aberdeen Lake. The limestone is grey, buff- to grey-weathering, finely crystalline, and fossiliferous. Abundant rubble defines the probable extent of this Paleozoic outlier. The strata are flat lying and bedding is undulatory to irregular. The basal contact is not exposed, but the unit lies in apparent conformity over the Thelon Formation (6).

Faults truncating the Dubawnt Group in the west probably are high-angle normal faults. Right-lateral offset is indicated for the northeast-trending fault that passes through the south side of Steel Lake. This fault, which is the eastern extension of the Macdonald Fault, shows only minor offset of the Thelon Formation, indicating much less post-Thelon movement in comparison with pre-Thelon movement as established in the Great Slave Lake district.

Economic Geology

Significant mineralization was not observed within the map-area. Sulphide minerals occur sporadically in the Pitz Formation, and those quartz veins in basement rocks (1-4) that were examined are barren. The Thelon Formation is similar to, and possibly correlative with, the Athabasca Formation, in which the discovery of uranium mineralization has recently led to extensive exploration. Limited ground checks with a scintillometer, however, showed only slight rises above background count in a few localities along the southeastern basal contact of the Thelon Formation.

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