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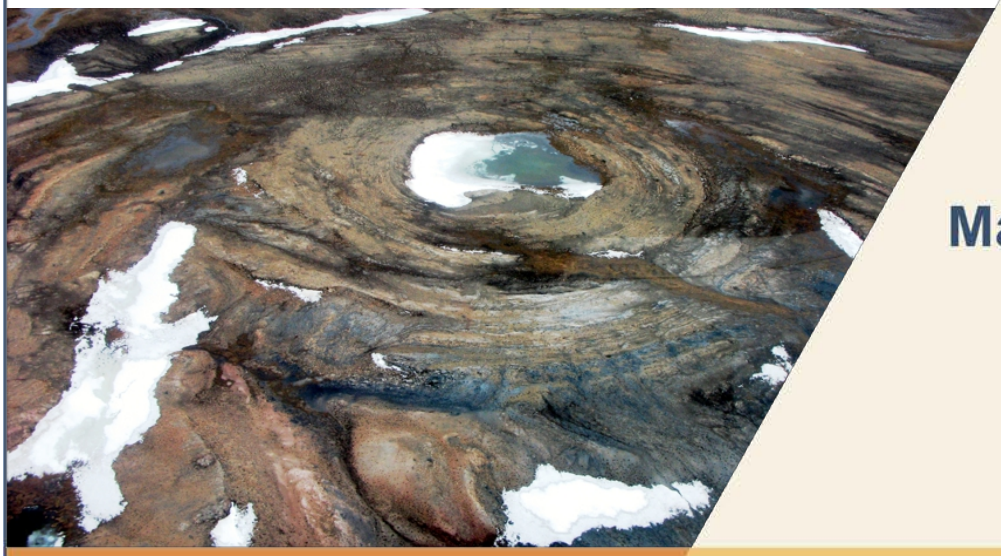
CANADIAN GEOSCIENCE MAP 177

GEOLOGY

QIKIGTALIK

Victoria Island, Northwest Territories



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Cover Illustration

Oblique aerial view of enigmatic knot-like structure, exposed near the eastern border of the map area. Field of view is approximately 500 m. Photograph by R.H. Rainbird. 2015-018

ABSTRACT

Bedrock geology of NTS 87-H/11 is heavily masked by Quaternary glacial till (~75% of map's area). It is underlain mainly by carbonate rocks and dark shales of the middle-upper Wynniatt Formation of the Shaler Supergroup, which is best-exposed in the southwest corner of the map area. Together with several thick (up to 50 m) diabase sills, these strata comprise the gently south-dipping northern limb of the Holman Island Syncline. The outcrop pattern of bedrock units on this map is strongly influenced by evenly spaced, ENE-striking normal faults that form horst and gräben, with variable along-strike separation and are thus akin to piano keys. Proterozoic rocks are unconformably overlain by Early Cambrian to Ordovician (?) strata of the recently defined, Quyuk, Uvayualuk and Mount Phayre formations, which are preserved in the gräben. Faults cut all of the bedrock units in the map area indicating that latest movement occurred in Ordovician or later times.

RÉSUMÉ

La géologie solide du feuillet SNRC 87-H/11 est largement cachée par des tills Quaternaires (~75% de la surface). La géologie est dominée par des calcaires et shales foncés de la formation de Wynniatt (moyen et supérieur) du Supergroupe Shaler, avec des filons-couches diabasiques atteignant 50 m d'épaisseur. Les meilleurs affleurements sont dans le secteur sud-ouest de la carte. Les strates pendent doucement vers le sud, constituant le flanc nord du synclinal de Holman Island. La distribution des unités est fortement influencée par une série de failles normales orientées ENE. Le déplacement des failles varie latéralement, formant une série de horst et gräben à jeu variable, comme les clefs d'un piano. Au cœur des gräben des strates d'âge Cambrien inférieur à Ordovicien sont préservées localement. Elles appartiennent aux Formations de Quyuk, Uvayualuk et Mount Phayre (nouvellement définies) qui reposent en discordance sur les roches Protérozoïques. Puisque les failles recoupent tous les unités, leur âge doit être plus jeune que l'Ordovicien.

ABOUT THE MAP

General Information

Authors: R.H. Rainbird, J.H. Bédard, K. Dewing, and T. Hadlari

Geology by R.H. Rainbird and J.H. Bédard, 2010, 2011

Geomatics by É. Girard

Cartography by N. Côté

Initiative of the Geological Survey of Canada, conducted under the auspices of the Victoria Island PGE/Base Metals project, as part of Natural Resources Canada's Geo-mapping for Energy and Minerals (GEM) program.

Map projection Universal Transverse Mercator, zone 11.
North American Datum 1983

Base map at the scale of 1:50 000 from Natural Resources Canada, with modifications.
Elevations in metres above mean sea level

Shaded relief image derived from the digital elevation model supplied by GeoBase.
Illumination: azimuth 225º, altitude 45º, vertical factor 1x

Proximity to the North Magnetic Pole causes the magnetic compass to be erratic in this area.Magnetic declination 2015, 17º54'E, decreasing 45' annually.

This map is not to be used for navigational purposes.

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

Data may include additional observations not portrayed on this map.
See documentation accompanying the data.

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Preliminary publications in this series have not been scientifically edited.

Map Viewing Files

The published map is distributed as a Portable Document File (PDF), and may contain a subset of the overall geological data for legibility reasons at the publication scale.

ABOUT THE GEOLOGY

Descriptive Notes

The map area (NTS 87-H/11) lies within the Minto Inlier, a ~300 km long by 100–150 m wide belt of gently folded sedimentary and igneous rocks of early Neoproterozoic (late Tonian-early Cryogenian) age. The Neoproterozoic sedimentary strata belong to the Shaler Supergroup, an approximately 4 km thick succession of shallow marine carbonate rocks and evaporite rocks with interbedded terrigenous rocks that were mainly deposited in a shallow intracontinental epeiric sea, referred to as the Amundsen Basin (Rainbird et al., 1994; Rainbird et al., 1996a; Thorsteinsson and Tozer, 1962; Young, 1981). The basin is considered to have formed within the supercontinent Rodinia and exposures of similar rocks, in what are now the Mackenzie Mountains of the northern Cordillera, suggest that it extended for more than 1000 km to the southwest (Long et al., 2008; Rainbird et al., 1996a). Basal strata of the Shaler Supergroup (Rae Group) are exposed only at the northeastern end of Minto Inlier, near Hadley Bay, where they unconformably overlie Paleoproterozoic sedimentary rocks, which, in turn, unconformably overlie Archean granitic rocks (Campbell, 1981; Rainbird et al., 1994). Shaler Supergroup strata are were injected by tholeiitic basaltic sills and dykes of the ca. 720–723 Ma Franklin large igneous province (Heaman et al., 1992; Macdonald et al, 2010). The sills are of variable thickness up to 100m, but most are 20–60 m thick. In many cases, individual sills extend for 20 km or more along-strike with little significant change in thickness. Sills constitute anywhere from 10 to 50 per cent of the stratigraphic section. Sills of similar type and age also occur in the Coppermine Homocline, Brock Inlier and Duke of York Inlier to the south (Rainbird et al., 1996b; Shellnutt et al., 2004) and coeval, geochemically similar intrusions and volcanic rocks associated with the Franklin event extend from Greenland to the western Yukon (Denyszyn et al., 2009; Heaman et al., 1992; Macdonald et al., 2010). The Shaler Supergroup in Minto Inlier is capped by a succession of flood basalt flows and interflow sedimentary rocks (Natkusiak Fm), more than 1 km thick, which are the extrusive equivalent of the sills (Baragar, 1976; Jefferson et al., 1985). Rare north-northwest-striking dykes are interpreted to have intruded along syn-magmatic normal faults, to feed sills and possibly the flood basalts (Bédard et al., 2012). Three magma populations are identified in the lavas, which have correlatives in the different sill subtypes. The

oldest sills and corresponding basal lavas are enriched in incompatible trace elements and may have olivine-enriched bases. Younger diabasic sills correspond to the major sheet-flow units of the lava succession. The irregular edge of Minto Inlier is defined by an erosional unconformity that separates the Neoproterozoic rocks from Lower Cambrian sandstone and siltstone that passes upward into a thick succession of mainly dolomitic carbonate rocks, ranging in age from Cambrian to Devonian (Thorsteinsson and Tozer, 1962; Dewing et al., 2015). Structurally, the Minto Inlier is composed of the open, NE-trending Holman Island syncline and a smaller Walker Bay anticline to the northwest. Beds typically dip no more than 10° and there is generally no penetrative cleavage or other apparent outcrop-scale fabric. The origin of the folding is unknown but it occurred after deposition of the early Neoproterozoic rocks and before uplift, erosion and deposition of overlying Lower Cambrian siliclastic rocks, which are not folded. All rocks are dissected by east-northeast to east-striking faults that form a horst and graben system with up to 200 of metres of stratigraphic separation on individual faults. The zone of faulting is about 100 km wide and stretches from the head of Minto Inlet in the west to Wynniatt Bay in the east and is spectacularly imaged as prominent lineaments on recently published aeromagnetic maps (e.g. Kiss and Oneschuk, 2010).

The bedrock geology of NTS 87-H/11 is largely masked by thick blanket of Quaternary glacial till and till veneer, which occupies about 75 percent of the map's area (Hodgson, 2012). The bedrock geology that is exposed comprises stratigraphic units from the Minto Inlet and Wynniatt formations of the Shaler Supergroup (Rainbird et al., 1994) and Cambrian to Early Devonian sedimentary strata of the Arctic Platform (Dewing at al. 2015). Rocks of the Shaler Supergroup are mainly exposed in the southern half of the map sheet. The Minto Inlet Formation crops out weakly in one small area near the western border of the map and where it comprises laminated white gypsum with interbedded grey-green calcisiltite and gypsiferous siltstone. Strata of the conformably overlying lower carbonate member of the Wynniatt Formation are interpreted from satellite imagery (SPOT4) to occur a few kilometres to the south. The stromatolitic carbonate and upper carbonate members of the Wynniatt Formation (see legend for details) are relatively well exposed in a band that runs from the southwest corner of the map area northeastward to the middle of the eastern edge of the map area. These units are repeated southward across several, up-stepping, normal faults (see below). One of the fault panels preserves the generally recessive black shale member of the Wynniatt Formation (W2). In the vicinity of UTM574191E, 7935359N, W2 is cut by at least two, northwest-trending alteration zones, characterized by Fe-oxide alteration and strong silicification of the host rocks causing them to crop out as resistant ridges. The ridges are parallel to two nearby Franklin dykes, suggesting that the alteration is related to their intrusion. The easternmost of the two dykes cuts, or is part of, a broader, irregular intrusion that feeds upward into two, thick diabase sills. The sills are of the type 2 (diabasic) as described in the legend.

Together with diabase sills, the Neoproterozoic strata comprise the gently southeast-dipping northern limb of the Holman Island Syncline. Similar to NTS 87-H/12 (Rainbird et al. 2014), the outcrop pattern of bedrock units on NTS 87-H/11 is strongly influenced by evenly spaced, horst and gräben, with variable along-strike separation and are thus akin to piano keys. Proterozoic strata are uncornformably overlain by Lower Cambrian to Ordovician (?) strata of the recently named, Quyuk, Uvayualuk, and Mount Phayre formations (Dewing et al., 2015), which are preserved in the gräben. The unconformity marks the northern margin of the Minto Inlier. The best exposures of the

Paleozoic units are in the northeast corner of the map area; all of the main units can be seen north and south of a short normal fault located near UTM, 604724E, 7956075N. The earliest fault movement preceded deposition of Cambrian strata and occurred at the same time as folding of the Shaler Supergroup, but reactivation during Cambrian time is suggested by thickness variations between adjacent fault panels. The sub-Cambrian unconformity and Cambrian-Ordovician strata are offset across several NE-striking faults indicating significant post-Ordovician (?), probably normal, fault activity. An unexplained, knot-like, circular-feature of 300 m diameter (outlined) occurs in otherwise sub-horizontal homoclinal strata of the upper carbonate member of the Wynniatt Formation, near the eastern edge of the map sheet (UTM, 604444E, 7947034N).

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Coordinate System

Projection: Universal Transverse Mercator
Units: metres
Zone: 11
Horizontal Datum: NAD83
Vertical Datum: mean sea level

Bounding Coordinates

Western longitude: 115°00’00”W
Eastern longitude: 114°00’00”W
Northern latitude: 71°45’00”N
Southern latitude: 71°30’00”N

Data Model Information

This Canadian Geoscience Map does not conform to either the Bedrock or Surficial Mapping Geodatabase Data Models. The author may have included a complete description of the feature classes and attributes in the Data\Data Model Info folder.

LICENCE AGREEMENT

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