Natural Resources Canada / Ressources naturelles Canada

HIGHBANK LAKE AREA “RING OF FIRE” REGION, ONTARIO SOUTHERN SHEET

Ontario Geological Survey
MAP P.3806

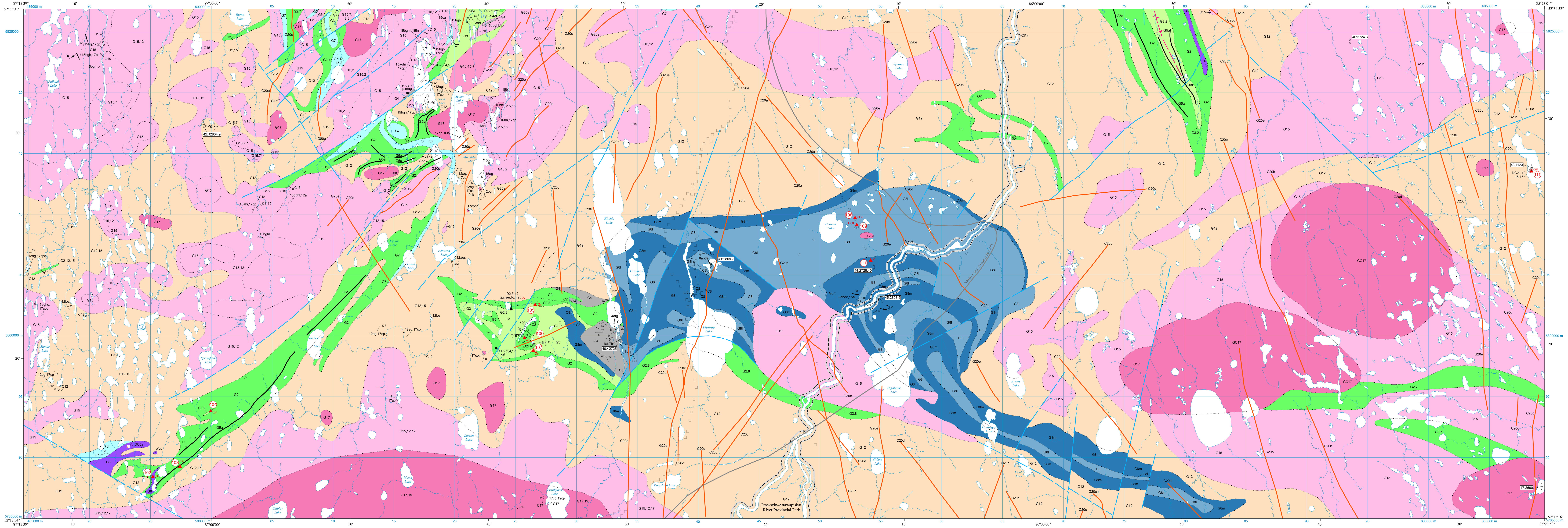
Geological Survey of Canada
OPEN FILE 8202

PRECAMBRIAN GEOLOGY

Scale 1:100 000

1000 m 0 1 2 km

NTS References: 43 C/4, 5, 6, 11, 12; 43 D/1, 2, 3, 6, 7, 8, 9, 10, 11



Marginal Notes

GEOPHYSICAL IMAGERY

Remnant magnetic intensity images (OGS, in press), at a scale of 1:200 000, are displayed in the surround of the map. Interpretation of the geology displayed on the map is largely based on this data, other airborne magnetic survey data (e.g., derivatives of the remnant magnetic field) and gravity gradiometer data (OGS–GSC 2011). Some contacts are interpreted from raster geophysical data present in the assessment files and from proprietary company data.

Note that many of the geological contacts displayed on the map are based on projected drilling intersections, but their interpreted extensions are mainly inferred from geophysical data.

Faults displayed on the map are mostly aeromagnetic discontinuities that are interpreted to represent offsets of geological units by faulting. The faults interpreted from the geophysical data may or may not be supported by geological observations.

GEOLOGY

Compiled outcrop locations should be verified and used with caution as the data are mainly compiled from older geological maps and locations could not be verified in many instances.

Where mineral abbreviations are shown on the map face, they represent noteworthy metamorphic and/or alteration minerals, and do not represent an exhaustive list of mineral species at each station. The presence of these minerals is shown in order to highlight occurrences of mineralization and/or unique mineralogy.

CENOZOIC

Apart from the limited number of outcrop exposures that are shown on the geological map, all Precambrian rocks in the area are overlain by non-indurated to weakly indurated surficial deposits. These include marine, glacial, glaciofluvial and glaciolacustrine deposits as well as more recent bog, fen, lake and river deposits. These surficial deposits are not shown on the geological map. The reader is referred to the recent work conducted by the Ontario Geological Survey on the surficial geology of the area summarized in Gao and Crabtree (2016).

PALEOZOIC

The eastern half of the study area covered by the 3 maps in this series (OGS Maps P.3804, P.3805, P.3806 and GSC Open Files OF8200, OF8201, OF8202, respectively) is overlain by Silurian and Ordovician sedimentary rocks. An approximation of the location of the Archean–Paleozoic unconformity is shown on the map based on the work of Armstrong (2011) and Ratcliffe and Armstrong (2013). Contacts between the various lithostratigraphic units within the Paleozoic are not shown.

Silurian rocks consist of the Severn River Formation. Ordovician rocks consist, from youngest to oldest, of the Red Head Rapids Formation, the Churchill River Group and the Bad Cache Rapids Group. Details on the character of these lithostratigraphic units can be found in Armstrong (2011) and Ratcliffe and Armstrong (2013).

Outcrop exposures of Paleozoic rocks are shown on the map and in the compilation of drill-hole data, and are coded as DPz, CPz, Pz, for Paleozoic rock in drill core, compiled Paleozoic outcrop, and observed Paleozoic outcrop, respectively. Outcrop locations coded as “Pz” are from Armstrong (2011) and Ratcliffe and Armstrong (2013) so as to distinguish them from older, possibly less accurately located data from older maps.

PROTEROZOIC

Kimberlites (unit 21)
The Kyle Lake “Kimberlites” were emplaced between *circa* 1123 ± 20 and 1076.2 ± 3.8 Ma (Heaman, Kjaarsgaard and Creaser 2004). Descriptions of the Kyle Lake Kimberlites are given in Sage (2000), but rock types present in the “kimberlites” are not well constrained from the descriptions in Sage (2000) or from the assessment reports filed with the Ministry of Northern Development and Mines.

It should also be noted that the locations of diamond-drill holes containing rocks of unit 21 are not well constrained. Drill logs obtained from companies and/or the assessment files do not specify the datum used for the location data. For the purposes of this map, locations of diamond-drill holes, assume that they are all located in UTM Zone 16 North American Datum 1983 (NAD83). Map users should verify location data for drill holes containing diamond-bearing unit 21 if it is critical for their intended usage of the data portrayed on the geological map.

Mafic Dikes (unit 20)
Linear positive or negative magnetic anomalies are interpreted to represent mafic dikes of Proterozoic age. Minor occurrences are noted in drill core and outcrop. Four major dike swarms are present: the Mackenzie dike swarm, emplaced at *circa* 1276 Ma (unit 20a); the Pickle Crow dike swarm, emplaced at *circa* 1878 Ma (unit 20b); the Marathon dike swarm, emplaced between *circa* 2126 and 2101 Ma (unit 20c); and the Matachewan dike swarm, emplaced at *circa* 2454 Ma (unit 20d). Mafic dikes that cannot be reliably assigned to a particular swarm are designated as unit 20e. Ages and most locations of the various dikes shown on the geological map are based on or modified from Stott and Josey (2009).

ARCHEAN

Intrusive Rocks (units 12 to 19)
Typically felsic to intermediate plutonic suites consist predominantly of rocks of granitic to dioritic composition but they also may contain volumetrically minor components of mafic and ultramafic rocks, usually as enclaves. These enclaves of mafic and ultramafic rocks are typically too small to be displayed on the geological map.

Plutonic rocks assigned to the late-tectonic to posttectonic intrusive suites (units 17, 18, 19) are thought to postdate most Neoarchean deformation based on dominantly nontectonically foliated texture. Rocks of these suites are also commonly observed to crosscut foliations in the rocks that they intruded.

Rocks of the syenite suite (unit 18) were not observed in outcrop or in diamond-drill core, but are included based on the compilation map of Buse et al. (2009), and are likely correlative with the Wapikopa pluton (*circa* 2698 Ma).

In contrast, plutons assigned to the syntectonic and/or synvolcanic suites (units 12, 13, 14, 15, 16) are tectonically foliated intrusive and metamorphosed intrusive rocks. Unit 14 is likely synvolcanic based on geochronology. Other units do not have known volcanic equivalents. Units 13 and 14, and inferred older portions of unit 12, may have been emplaced prior to regional tectonism.

Unit 13 is defined as a separate unit, as age constraints in the central map area suggest that a body of tonalite, *circa* 2773 Ma, exists to the northwest of units 9 to 11. The extent of this unit is poorly known and speculative. Units 12 and 13 comprise very similar rock types and both may represent several distinct generations of granodiorite- to tonalite-dominated bodies that are characterized by low magnetic susceptibility.

Mafic and Ultramafic Intrusive Rocks (units 6 to 11)
These map units encompass Neoarchean or Mesoarchean metamorphosed, intrusive rocks of anorthositic to dunitic composition, including oxide dominated rocks, namely chromitite (a rock dominated by the mineral chromite) and magnetitite (a rock dominated by the mineral magnetite). They have been subdivided into 3 subsuites (units 9, 10 and 11) based on rock type, geological relationships, regional distribution and mineralization styles. Variably deformed, ultramafic rocks are typically serpentinized or talc-

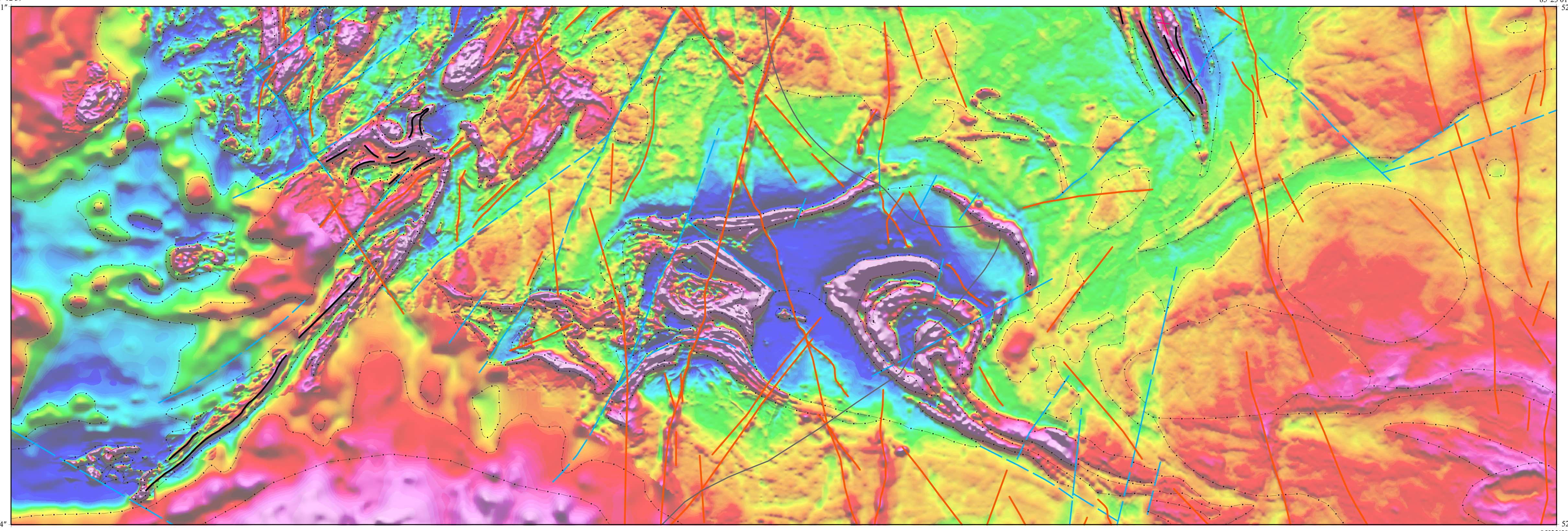


Figure 1. Remnant magnetic intensity image of the area, at 1:200 000 scale, showing interpreted geophysical contacts, dikes, geophysically defined faults and the Archean–Paleozoic unconformity. Symbology is the same as on the map face. Aeromagnetic data are from OGS (in press).

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