MGS activities in the Thompson Nickel Belt, Manitoba: investigations at Phillips Lake and revisiting the Pipe II open-pit mine

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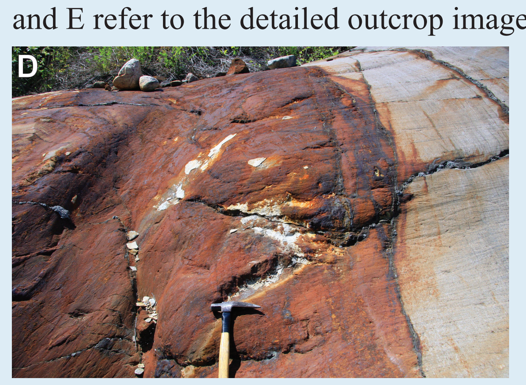
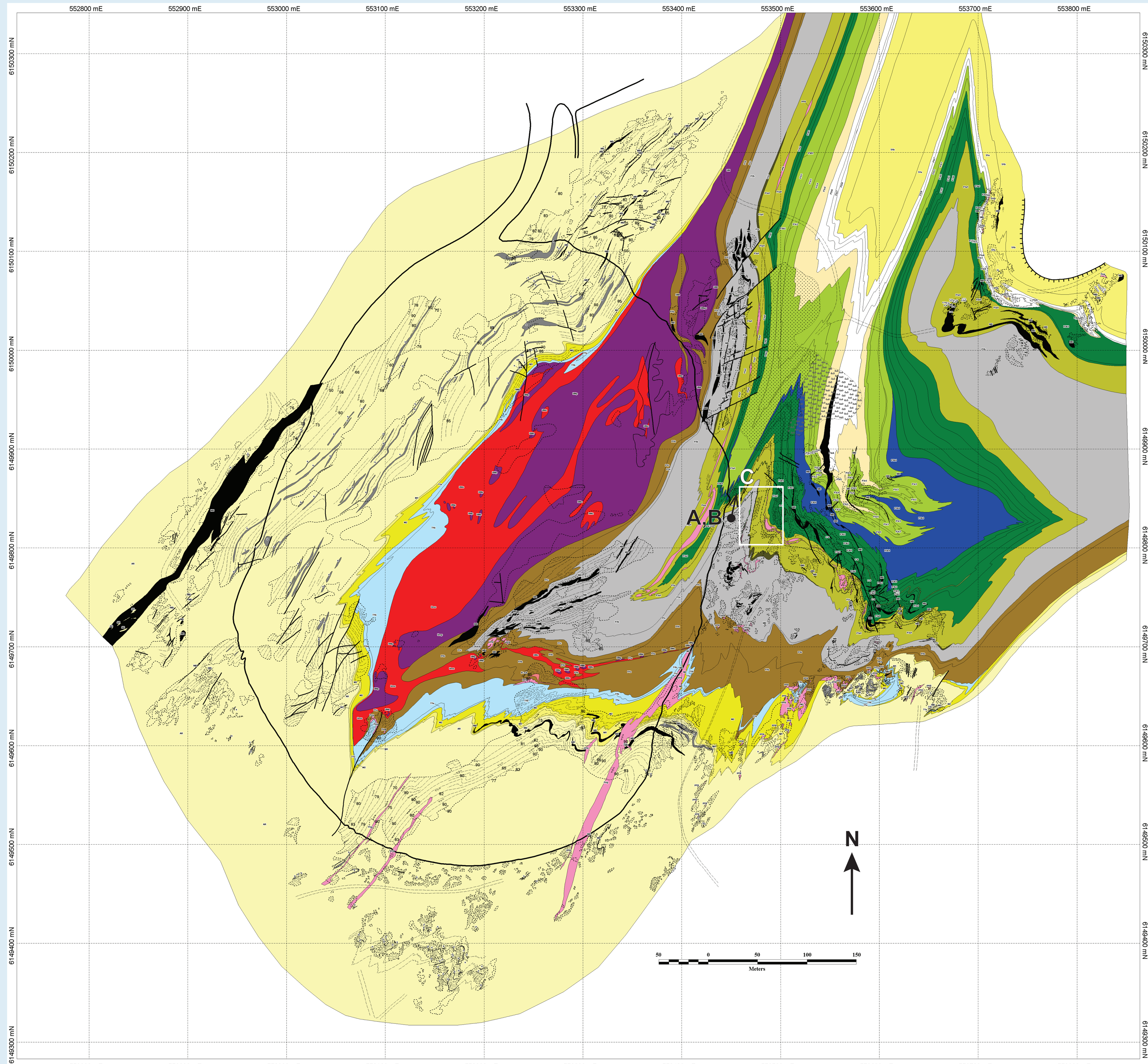
Digital preservation of the Ospwagan Group stratigraphy at the Pipe II open-pit mine

The Pipe II open-pit mine has been filling with water since the mid-1980s and is beginning to flood classic outcrops of the Ospwagan Group along the northeast shoulder of the pit. These important outcrops have been the focus of geological studies and countless informal and formal field trips for students, academics, industry, and government geologists. It is the type locality for the Pipe Formation of the Ospwagan Group, and where geologists are initiated into the geology of the Thompson Nickel Belt. The scale of flooding can be appreciated from these images taken in 2007 (A) and 2018 (B), looking northeast of the open pit.

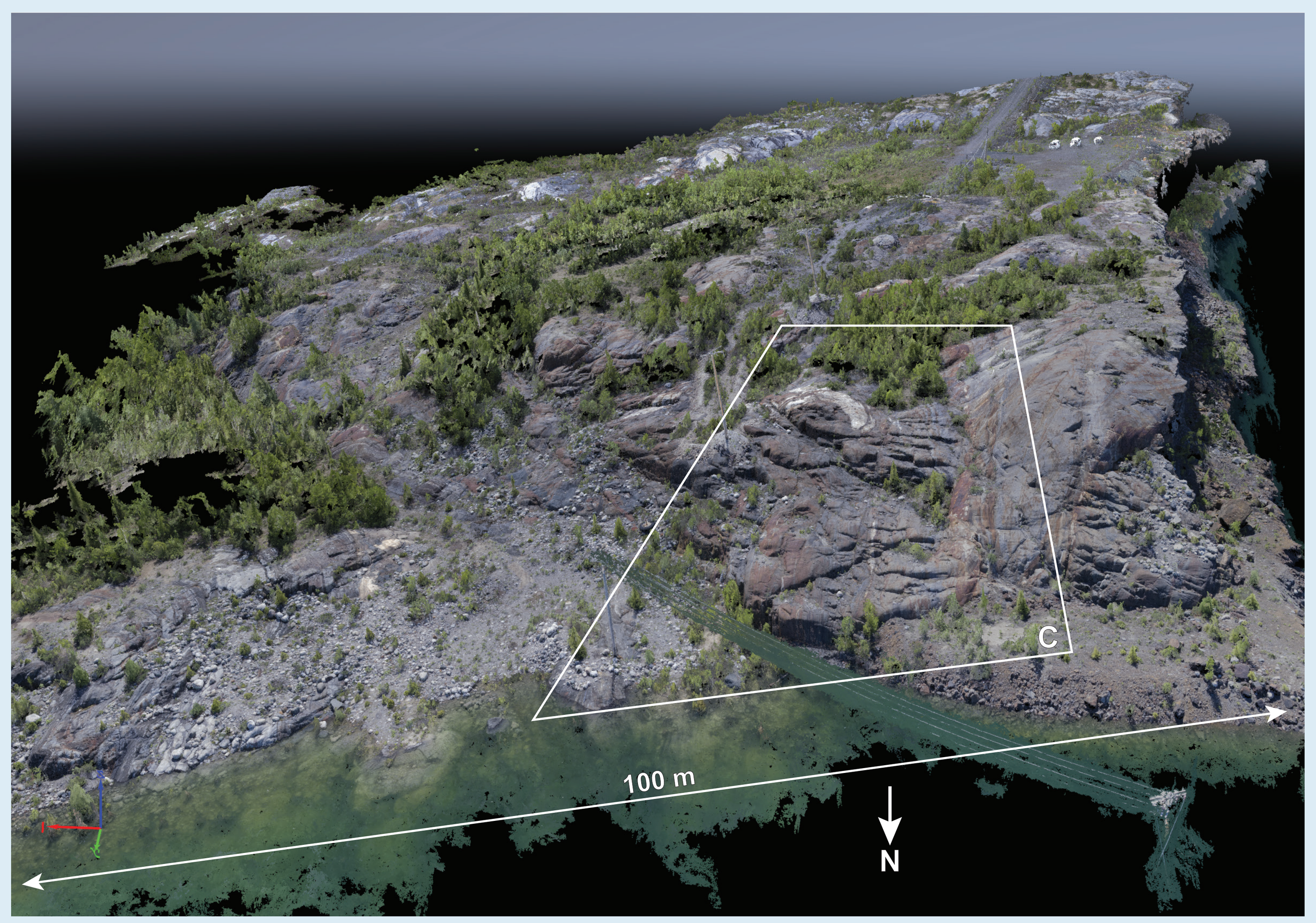
An unmanned aerial vehicle (UAV, drone) was used to collect detailed aerial imagery (C) of the of the outcrops east and northeast of the open pit. The imagery was used to generate a high-resolution orthomosaic of the area. Boxes D and E refer to the detailed outcrop images below.



Detailed outcrop images were collected of structures, mineral assemblages, and stratigraphy, such as the P2 member sulphide-facies iron formation (D), and P3 member silicate-facies iron formation with fine chert laminations (E).

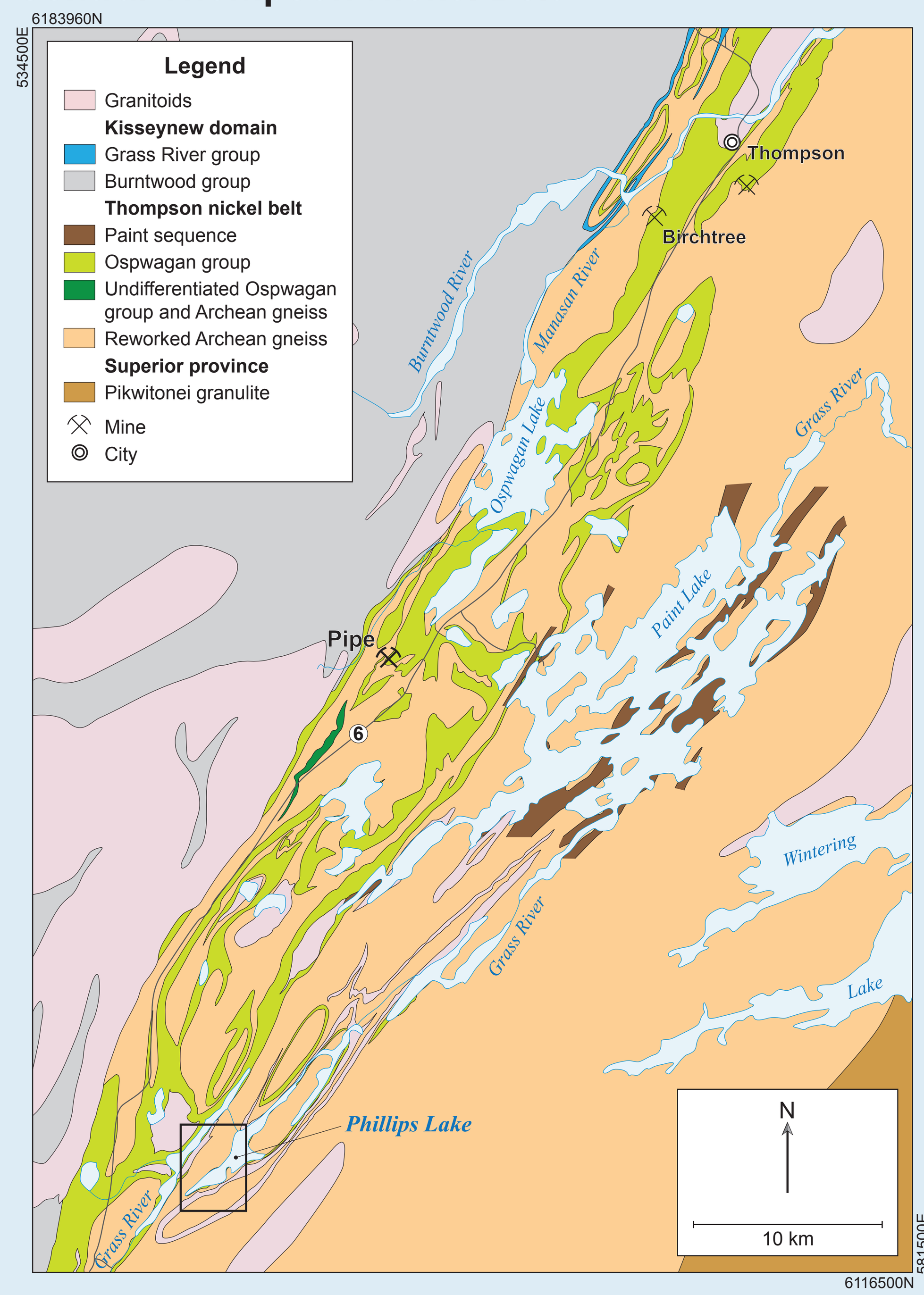


Geology map of the Pipe II open-pit mine, courtesy of Vale S.A. - Manitoba Operations. Arrow A,B indicates the vantage point of photos A and B. Box C indicates the location of the detailed UAV image (C).

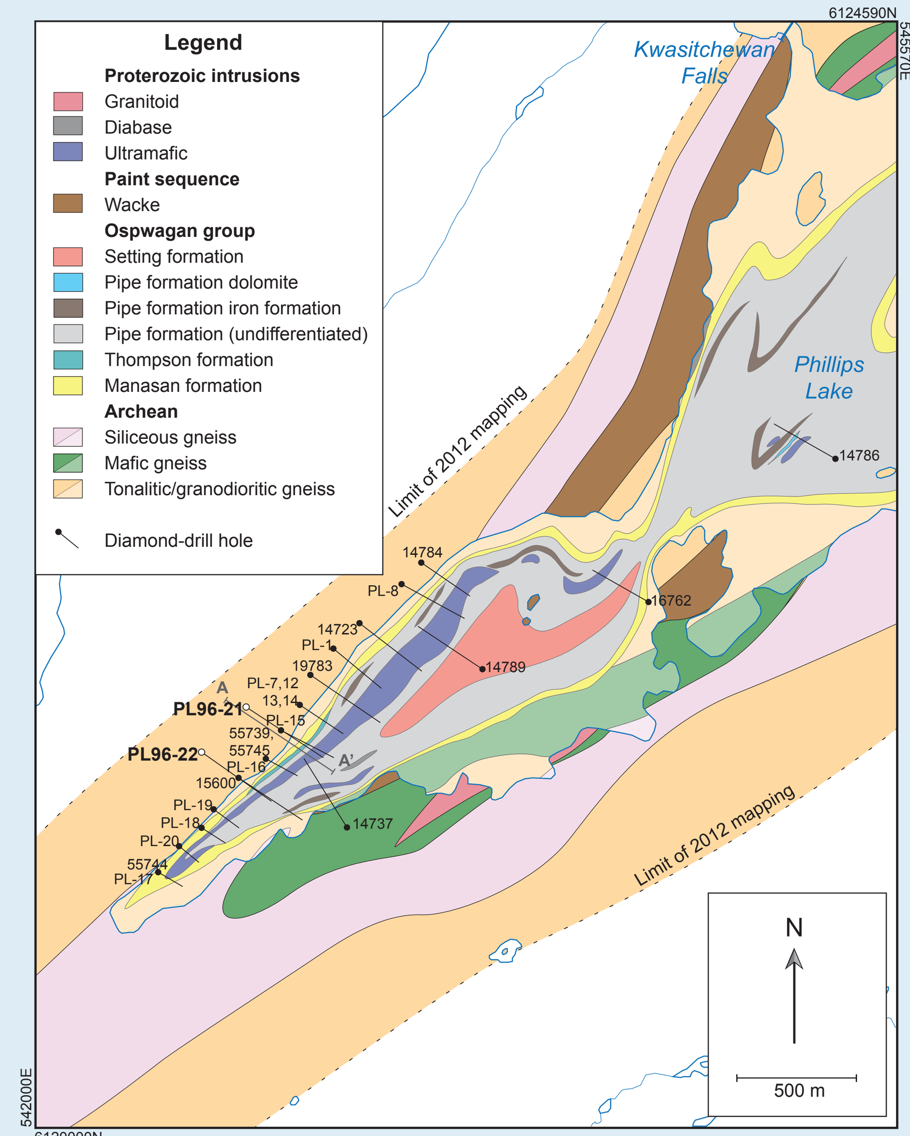


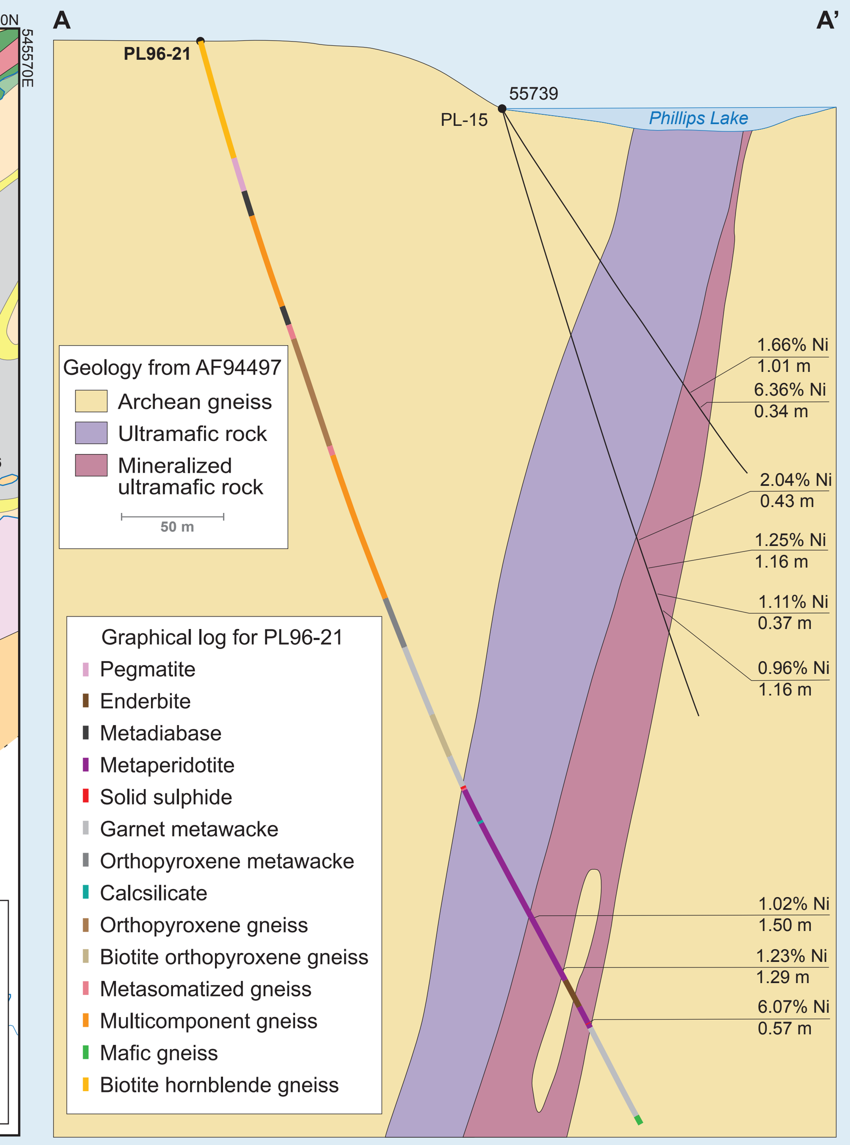
Dense point-cloud image of the eastern pit shoulder looking towards the south. The point cloud has an effective resolution of approximately 10 cm, and is derived from the UAV imagery using a process called structure-from-motion (SfM) photogrammetry. It will be used to generate a 3D digital outcrop model (DOM) of the area. The geology map can then be overlain on the 3D surface. Box C outlines the approximate area of the detailed UAV image (C). A final product will likely consist of a digital Open File report integrating the geological map, high-resolution orthomosaic, DOM, and detailed outcrop images.

Central Thompson Nickel Belt



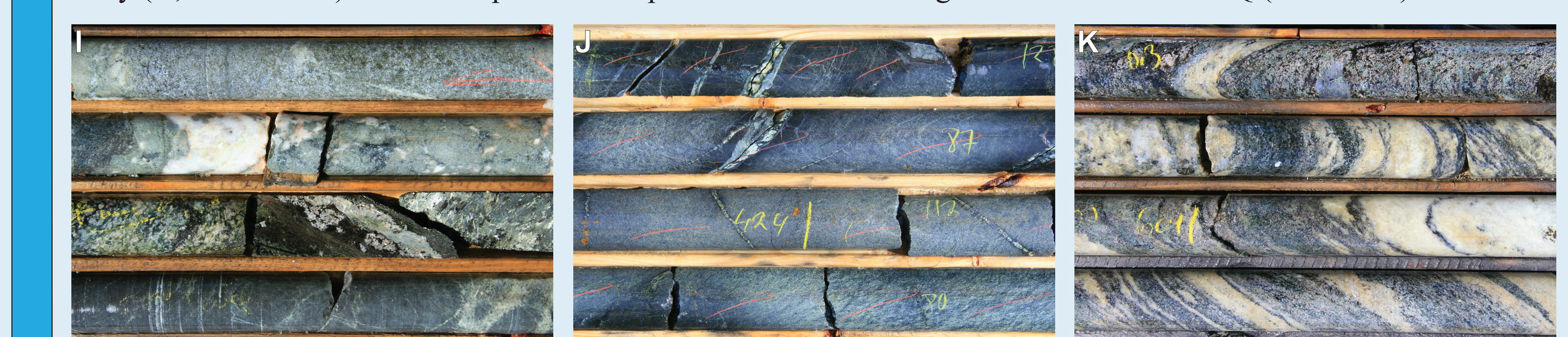
Phillips Lake: A new host sequence for Ni-mineralized ultramafic bodies?



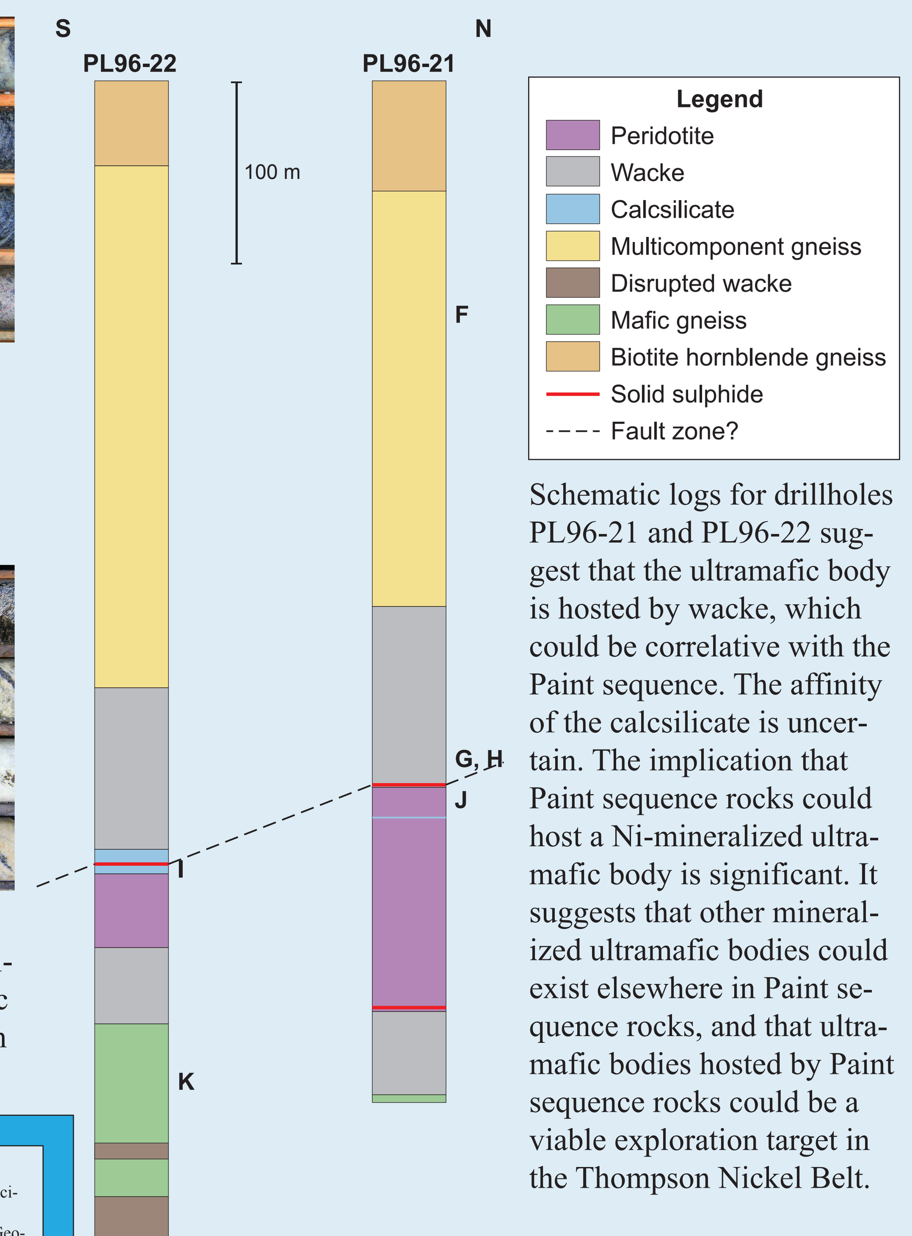


Geological mapping by Macek et al. (2006; portrayed in the map figure by the geology underlying the lake) suggests that the large ultramafic body of southern Phillips Lake is hosted by Ospwagan Group rocks; however, mapping by Couëslan (2016; portrayed by the shoreline geology) suggests that the sedimentary rocks at Phillips Lake are more likely related to the Paint sequence, a Paleoproterozoic sedimentary rock package that occurs along strike in the Paint Lake area. Diamond-drilling has demonstrated the presence of Ni-mineralization in the ultramafic body (section A-A'; modified from Assessment File 94497). The indicated drillholes were completed by Inco Ltd. (five digit numbers) and Falconbridge Ltd. (beginning with 'PL').

The multicomponent gneiss (F) likely represents a tectonic interleaving of various Archean and Paleoproterozoic gneissic phases, intruded by Paleoproterozoic diabase and granitoid intrusions. The wacke (G, H) consist of granulite-facies biotite-garnet and biotite-orthopyroxene gneisses that are petrographically and geochemically similar to wacke of the Paint sequence. An interval of barren, solid-sulphide breccia occurs in the hangingwall to the ultramafic body (H, bottom row) and is interpreted as sulphide remobilized along a fault. Drill core is BQ (~36.5 mm).



Calcsilicate (I, top two rows) of unknown affinity occurs in the hangingwall to the ultramafic body in drillhole PL96-22, and as a xenolith in the ultramafic body of hole PL96-21. The ultramafic body consists of serpentinized peridotite (I, bottom row; J). Ni-bearing sulphide generally becomes more abundant towards the footwall of the ultramafic body and forms an interval of solid sulphide in drillhole PL96-21. Mafic gneiss (K) occurs towards the bottom of both drillholes, and may represent Archean volcanic rocks. Drill core is BQ (~36.5 mm).



Schematic logs for drillholes PL96-21 and PL96-22 suggest that the ultramafic body is hosted by wacke, which could be correlative with the Paint sequence. The affinity of the calcsilicate is uncertain. The implication that Paint sequence rocks could host a Ni-mineralized ultramafic body is significant. It suggests that other mineralized ultramafic bodies could exist elsewhere in Paint sequence rocks, and that ultramafic bodies hosted by Paint sequence rocks could be a viable exploration target in the Thompson Nickel Belt.

References

Couëslan, C.G. 2016: Geology of the Paint and Phillips lakes area, Thompson nickel belt, central Manitoba (parts of NTS 63O1, 8, 9, 63P5,12); Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, Geoscientific Report GR2016-1, 44 p. and 1 colour map at 1:50 000 scale.

Macek, J.J., Zwanzig, H.V. and Pacey, J.M. 2006: Thompson Nickel Belt geological compilation map, Manitoba (parts of NTS 63G, J, O, P and 64A and B); Manitoba Science, Technology, Energy, and Mines, Manitoba Geological Survey, Open File Report, OF2006-33, digital map on CD.

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