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M.B. McClenaghan[1], R.C. Paulen[1] G. Duso[2], and S.A. Averill[3]

[1] Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario K1A 0E8
[2] MMG Limited, 2600-1177 West Hastings Street, Vancouver, British Columbia, V6E 2K3
[3] Overburden Drilling Management Limited, 107-15 Capella Court, Ottawa, Ontario, K2E 7X1

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ABSTRACT
Fifteen till samples and 2 bedrock samples from around the Izok Lake Zn-Cu-Pb-Ag volcanogenic massive sulphide deposit in Nunavut were collected 2012. These samples complement samples collected in 2009 and 2010 as part of an indicator mineral study to determine the indicator minerals and their trace element signatures that are indicative of the Izok deposit. The purpose of this open file is to report the raw indicator mineral weight and abundance data for these 2012 till and bedrock samples. Samples were processed by the commercial lab Overburden Drilling Management Limited using a combination of tabling, panning, and heavy liquids to recover potential indicator minerals. Sample locations, weights of various fractions produced during sample processing, and indicator mineral grains identified are reported in this open file.

INTRODUCTION
Fifteen till samples (12-MPB-901 to -915) were collected 2012 near the Izok Lake Zn-Cu-Pb-Ag volcanogenic massive sulphide (VMS) deposit in Nunavut (Fig. 1) to complement published data for 64 till samples collected in 2009 and 2010 around the deposit as part of an indicator mineral study (Hicken et al., in press). Also in 2012, two gossanous bedrock samples (09-MPB-R114, -R115) were collected 1 km southwest of the deposit (Fig. 1) to recover and study the indicator mineral gahnite (Zn spinel) and complement bedrock data published by Hicken et al. (2013). The overall purpose of the Izok Lake study is to determine the indicator minerals and their trace element signatures that are indicative of glacial dispersal from the Izok Lake VMS deposit. This open file reports the raw indicator mineral weight and abundance data for the samples collected in 2012. Data for the 2009 and 2010 till and bedrock samples have been reported in GSC Open File 7029 (McClenaghan et al., 2012a).

METHODS
Field sampling
All 2012 till and bedrock sample locations are listed in **Appendix A1.** Methods of sampling were similar to those reported in Hicken et al. (2013, in press). Till samples were collected from hand-dug holes in frost boils because this method is cost effective and pits can be dug to >0.75 m depth into less oxidized till from sites accessed by helicopter (e.g. Shilts, 1978; McMartin and Campbell, 2009). Striation data, when available, were also measured and are in listed in **Appendix A1**. Colour photographs taken at each till sample site are included in **Appendix A2**. Bedrock samples were collected from the surface of gossanous gahnite- bearing bedrock at two locations approximately 1 km southwest of the deposit (Fig. 1) to study gahnite composition in rocks distal from the mineralization. A photo of a polished slab of each bedrock sample is included in **Appendix A2**.

Sample processing and indicator mineral picking
Samples were shipped to Overburden Drilling Management Ltd. (ODM) for processing, production of heavy mineral concentrates and indicator mineral picking. In 2012, 15 till samples plus one quality control sample for a total of 16 samples were processed at ODM. The <2.0 mm till fraction of till was processed to produce a non-ferromagnetic heavy mineral concentrate for selection of indicator minerals using methods described in detail in McClenaghan et al. (2012a).

One blank sand sample, informally referred to as the “Bathurst blank”, was inserted into the till batch prior to processing to monitor the quality of processing and picking at the lab: 12-MPB-900. The blank sample is weathered Silurian-Devonian granite (grus) of the South Nepisiguit

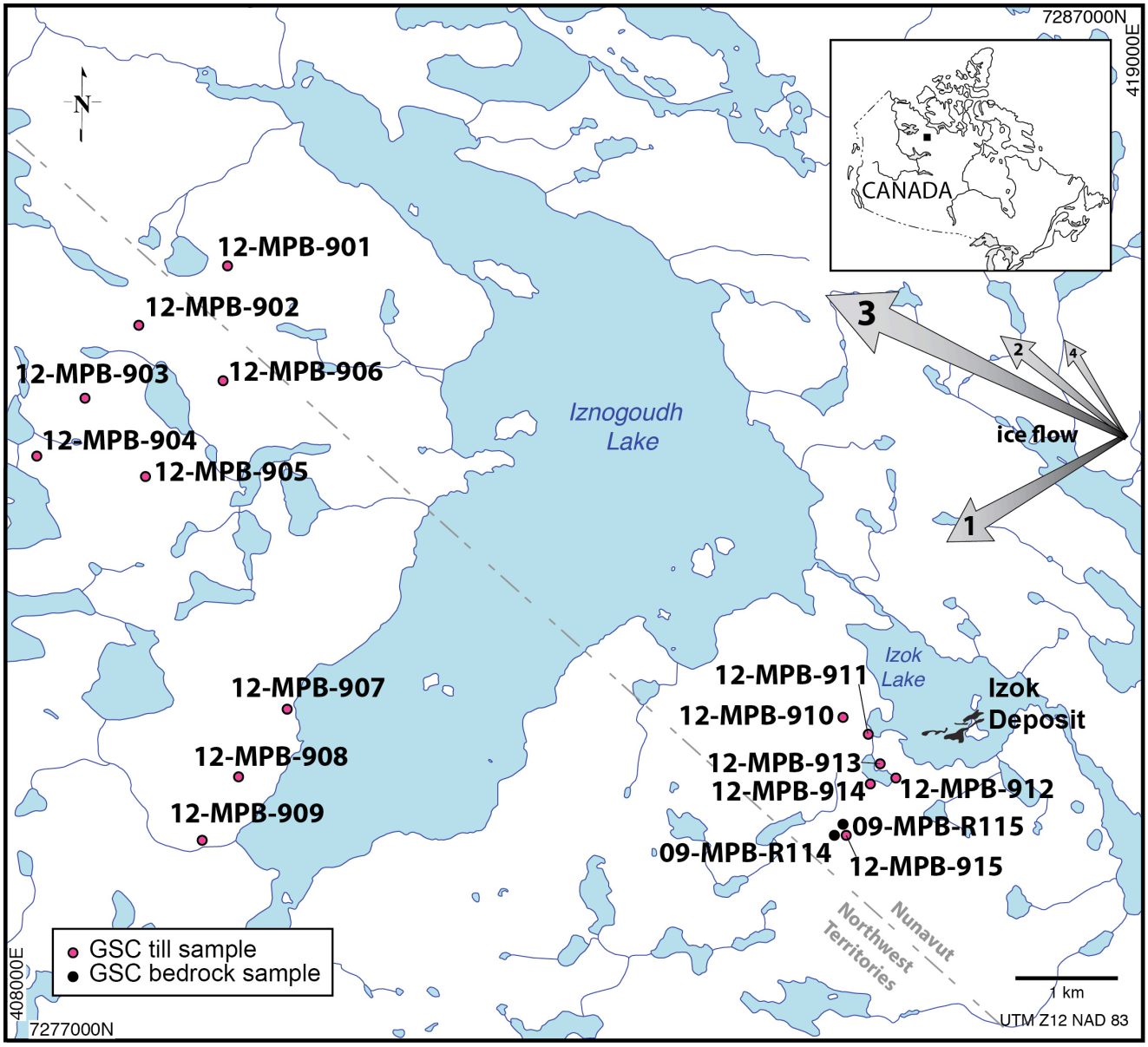

Figure 1. Location of the Izok Lake VMS deposit in northern Canada and the GSC till and bedrock samples collected in 2012.

River Plutonic Suite (Wilson, 2007) collected in the Miramichi Highlands approximately 66 km west of Bathurst, New Brunswick (McClenaghan et al., 2012b; Plouffe et al., in press). The blank material is unconsolidated and has the appearance of a moderately sorted fluvial or littoral sand. It does not contain any precious or base metal indicator minerals. Results for the blank sample are reported along with the till samples.

The two bedrock samples were also processed at ODM using methods described in McClenaghan et al. (2012a). First, hand specimens of both bedrock samples were examined under binocular microscope and described (**Appendix C**). Three quartz blank bedrock samples were inserted into the batch prior to processing at the beginning (Blank1), and after each bedrock sample (R114BLK, R115BLK) to monitor and limit cross contamination between samples. The results for the blank samples are reported along with the bedrock samples (**Appendix B2**).

The digital data reported by ODM consist of several worksheets for the sample batch. For the till samples, the weights of the fractions produced during sample processing are reported in four worksheets in **Appendix B1**: "Tabling Data", "KIM data", "Paramag" (weights for the paramagnetic fractions) and "HMC Processing" (<0.25 mm table concentrate weights). Gold grain data generated from panning each till sample are reported in two worksheets: "Gold Summary" and "Detailed VG", which describe the abundance, size and shape of the visible gold and sulphide grains observed during panning. Indicator minerals (0.25-2.0 mm in size) of massive sulphide deposits are listed in worksheets "MMSIM" and "Pyrrhotite" (pyrrhotite counts for the 0.25-2.0 mm ferromagnetic fraction). Indicators of kimberlite (0.25-2.0 mm) are listed in worksheet " KIM Data". Minerals present in a random 100 grain point count of the 0.25-0.5 mm non-ferromagnetic fraction of each till sample are listed in worksheet "Summary Table".

For the two bedrock samples, the weights of the fractions produced during sample processing are reported in three worksheets in **Appendix B2**: "EPD weights", "Processed weights", and "Paramag" (weights for the paramagnetic fractions). Gold grain data generated from panning each till sample are reported in two worksheets: "Gold Summary" and "Detailed VG", which describe the abundance, size and shape of the visible gold and sulphide grains observed during panning. Indicator minerals (mainly 0.25-2.0 mm in size) of massive sulphide deposits are listed in the worksheet "MMSIM".

ACKNOWLEDGMENTS

The Izok Lake study was conducted as part of the Geological Survey of Canada's Geo-mapping for Energy and Minerals (GEM) Program (2008-2013). This case study is a collaborative research effort between the Geological Survey of Canada, Minerals and Metals Group (MMG) and Queen's University. MMG is thanked for providing logistical support, access to the property, drill core samples, confidential geological information about the Izok Lake deposit and assistance with till and bedrock sampling. This open file was reviewed by Janet Campbell (Geological Survey of Canada).

REFERENCES

Hicken, A.K., McClenaghan. M.B., Layton-Matthews, D. and Paulen, R.C. 2013. Indicator mineral signatures of the Izok Lake Zn-Cu-Pb-Ag volcanogenic massive sulphide deposit, Nunavut: Part 1 bedrock; Geological Survey of Canada, Open File 7173.

Hicken, A.K., McClenaghan, M.B., Paulen, R.C., Layton-Matthews, D., Averill, S.A., and Crabtree, D. in press. Indicator mineral signatures of the Izok Lake Zn-Cu-Pb-Ag volcanogenic massive sulphide deposit, Nunavut: part 2 till. Geological Survey of Canada, Open File 7343.

McClenaghan, M.B., Hicken, A.K., Averill, S.A., Paulen, R.C. and Layton-Matthews, D., 2012a. Indicator mineral abundance data for bedrock and till samples from the Izok Lake Zn-Cu-Pb-Ag Volcanogenic Massive Sulphide Deposit, Nunavut. Geological Survey of Canada, Open File 7075.

McClenaghan, M.B., Budulan, G., Averill, S.A., Layton-Matthews, D., and Parkhill, M.A. 2012b. Indicator mineral abundance data for bedrock and till samples from the Halfmile Lake Zn-Pb-Cu volcanogenic massive sulphide deposit, Bathurst Mining Camp, New Brunswick. Geological Survey of Canada, Open File 7076.

McMartin, I. and Campbell, J.E. 2009. Near-surface till sampling protocols in Shield terrain, with examples from western and northern Canada. In: R.C. Paulen and I. McMartin (eds.),

Application of Till and Stream Sediment Heavy Mineral and Geochemical Methods to Mineral Exploration in Western and Northern Canada. Geological Association of Canada, Short Course Notes 18, p. 75-95.

Plouffe, A., McClenaghan, M.B., Paulen, R.C., McMartin, I., Campbell, J.E., and Spirito, W.A. In Press. Processing of unconsolidated glacial sediments for the recovery of indicator minerals: protocols used at the Geological Survey of Canada. Geochemistry: Exploration, Environment, Analysis.

Shilts, W.W. 1978. Nature and genesis of mudboils, central Keewatin, Canada. Canadian Journal of Earth Science, v. 15, p. 1053-1068.

Wilson, R.A. 2007. Bedrock geology of the Nepisiguit Lakes area (NTS 21O/7), Restigouche and Northumberland counties, New Brunswick. New Brunswick Department of Natural Resources, Minerals, Policy and Planning Division, Plate 2007-32.

Appendix C. Binocular Microscope Description of Two Rock Samples from Izok Lake, Nunavut

by Stuart A. Averill, Overburden Drilling Management Ltd.

09-MPB-R114 METAMORPHOSED ALUMINOUS ALTERATION ZONE. Sawn 10 cm hand specimen. 90% of sample is a dark grey, nonmagnetic, strongly foliated, metamorphically recrystallized, metacrystic, felsic volcanic or sedimentary rock consisting of fine-grained (0.1-0.3 mm), flaky biotite (30%) and sugary, recrystallized, undifferentiable quartz + plagioclase (60%) and coarse (1-2 mm) metacrysts of muscovite (10%; fibrous indicating derivation from sillimanite but SEM analysis indicates no remaining sillimanite). Other 10% of sample consists of similarly fine-grained silicified patches and streaks, possibly representing breccia cement, consisting subequally of quartz and green gahnite (SEM confirmed) with 1% coarser-grained (up to 1 mm) pyrite, mainly lining fractures.

09-MPB-R115 METAMORPHOSED SULPHIDIC ALTERATION ZONE. Sawn 8 cm hand specimen. Dark grey, nonmagnetic, strongly foliated, metamorphically recrystallized and weakly metacrystic felsic volcanic or sedimentary rock consisting of two phases: (a) 80% of sample fine-grained (0.2-0.5 mm), flaky biotite (30%), and sugary, recrystallized undifferentiable quartz + plagioclase (70%) with trace almandine as 1-2 mm metacrysts and local coarse biotite flakes to 5 mm; and (b) 20% of sample 1-5 mm thick bands and streaks (probably recrystallized beds) consisting of a thin, central, sulphidic, quartzose seam containing ~5% pyrite, up to 3% red-brown sphalerite and traces of chalcopyrite, galena and molybdenite bordered by a wider envelope consisting subequally of fine-grained (0.1-0.3 mm), sugary quartz and blue-green gahnite (SEM confirmed).