MAPPING SUDBURY BRECCIA IN THE NORTH RANGE OF THE SUDBURY IMPACT STRUCTURE, CANADA. C. L. Marion[1], G. R. Osinski[1], R. A. F. Grieve[2], J. Bailey[3], A. Péntek[3], D. Smith[3] and J. Clayton[1], [1] University of Western Ontario, Dept. of Earth Sciences, 1151 Richmond St. London, Ontario, N6A 5B7, cmarion3@uwo.ca, [2]Earth Sciences Sector, Natural Resources Canada, Ottawa, ON, K1A 0E4. [3]Wallbridge Mining Company Limited, 129 Fielding Road, Lively, Ontario, Canada P3Y 1L7.

Introduction: Sudbury Breccia is a term applied to various breccia units at the 1.85 Ga, ~200 km diameter Sudbury impact structure, Ontario, Canada. One sub-type of Sudbury Breccia is interpreted as pseudotachylyte, which has a clast-poor to clast-rich dark aphanitic matrix and occurs in the form of veins or in large anastomosing bodies within the crater floor (Fig. 1). The leading formational hypotheses include in-situ frictional melting during crater modification such as along large displacement superfaults [1-2]; shock-induced cataclasis and comminution of the target rocks during propagation of the shock wave [3]; or impact melt injection from the overlying melt sheet into dilational fractures in the crater floor [4]. The large bodies of pseudotachylyte at Sudbury occur in a variety of shapes and sizes as well as matrix and clast content and textures [5].

Sudbury Breccia has been reported to occur up to 80 km away from the footwall contact with the Sudbury Igneous complex. The research community generally encounter outcrops in limited areas in public spaces, along road cuts such as along HWY 144 and in the mining districts where permitted. However these occurences may not be representative of the many tens of km^2 in the forested areas in between. Recently, ore mineralization within the Sudbury Breccias in the North Range footwall [e.g. 6] has drawn attention to industry to enable efficient localization of the mineralized occurences.

Objective: In collaboration with Wallbridge Mining Company Limited, we are systematically mapping the extent of Sudbury Breccia in the North Range footwall in addition to many small-scale maps of individual outcrops to identify any major changes in texture with distribution, and presence of mineralization. Here we present a preliminary map and results of an outcrop visited in Summer 2012.

Methodology: Grid mapping was completed to include cm-scale clasts hosted by the breccia and identify any and all host and clast lithologies. Sampling was completed with a Pomeroy Core Drill and 1" diamond drill bit. Petrography and analysis of these samples is ongoing and will include X-ray Fluorescence to determine if the composition of the melt matrix at this site is of local origin.

Results: The Ministic Lake Road turnoff outcrop is part of a km-scale series of Sudbury Breccia outcrops mapped along the regional contact between the Levack gneiss complex and the Cartier batholith. It is truncated by a pre-impact diabase dyke. Both vein and large bodies of Sudbury Breccia are present in this outcrop, although no ore mineralization has been observed. In each of the large breccia bodies, all of the above mentioned target rocks are represented in the clast population. Of particular interest are diabase clasts hosted by a breccia body apparently 28 m from the dyke, indicating moderate displacement. There is no exposed link between these bodies. In outcrop, both actinolite and epidote alteration were observed along with microfaults that may be pre-impact. The outcrop is approximately 37 m long by 5 m high and is dipping between 45° and 80° away from the road. A grid map was completed to include clasts > 5 cm and converted to digital format. Six 1-inch cores were collected from the various lithologies, and made into thin sections for petrographic analyses.

Future Work: Further petrographic analysis are required to identify all mineral phases within the matrix and target rocks as well as bulk geochemical analyses to compare wall rock and breccia composition. We plan to map many more of these outcrops, well off the beaten trail.

References: [1] Spray J. G. and Thompson L. M. (1995) *Nature*, 373, 130-132. [2] Spray J. G. (1998) Geological Society, London, Special Publications, 140, 195-204. [3] Lafrance B. and Kamber B. S. (2008) *Precambrian Res.*, 180, 237-250. [4] Riller U. et al. (2010) *Geology*, 38, 619-622. [5] Rousell D. H. et al. (2003) *Earth Sci. Reviews* 60, *147*–174. [6] Péntek A. et al. (2013) *Econ. Geol*. 108, 59-78.

Figure 1. Sudbury Breccia at the Ministic Lake Road turnoff outcrop. A glassy to aphinitic dark coloured matrix with clasts of multiple lithologies. Pen for scale.