The Porter Puddle Complex, petrology and geochemistry of the Marmot Formation (Group II), Northern Canadian Cordilleran Miogeocline

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The Porter Puddle Complex (PPC) is located in the southeastern Bonnet Plume map sheet (NTS 106B/SE) in the northern Canadian Cordillera (Northwest Territories). The region, according to published reconnaissance-scale maps, is underlain by Lower Paleozoic Road River Group basinal strata, undivided Silurian-Devonian platformal carbonate rocks, and Middle Devonian Earn Group turbiditic siltstone and sandstone. The Lower Paleozoic strata were deposited in the Misty Creek paleo-embayment, an embayment of the Selwyn Basin thought to have formed by incipient rifting. Ordovician-Silurian volcanic rocks of the Marmot Formation have been identified and their extent is approximately mapped in several areas of southern NTS 106B.

The PPC has previously been interpreted as a submarine volcanic edifice that records shoaling, pertaining to the Marmot Formation. It consists of potassic-ultrapotassic and alkalic volcanic rocks. Previous studies of the geochemistry of these rocks are limited, and were summarized by grouping the rocks according to geographic and not stratigraphic location.

New mapping, carried out as part of the Northwest Territory Geoscience Office (NTGO) Selwyn-Mackenzie Shale Basins project during the 2009–2012 field seasons, has applied the newer stratigraphy to mapped areas, and better delineated the various horizons of the PPC. The purpose of this study is to expand the understanding of the Porter Puddle Complex, through detailed petrological,

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mineralogical, and geochemical analyses.

Eleven samples of mafic flows from various parts of the complex were collected for polished-thin section, whole rock major and trace element geochemical analysis. Initial examinations of these mafic rocks reveal euhedral-subhedral seriate to subophitic phenocrysts of olivine, zoned pyroxenes, and biotite or phlogopite set in a pilotaxitic fine-grained altered chloritic matrix. Local carbonate alteration of the groundmass is present, originating from late-stage quartz and calcite veining associated with tectonism, and/or from seawater-sourced fluids close to the time of deposition.