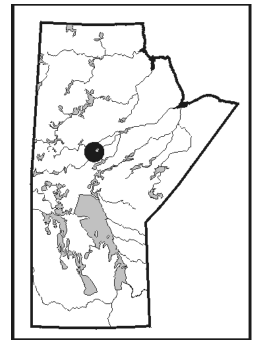
GS-11 STRATIGRAPHIC STUDIES ON UPPER AND LOWER OSPWAGAN LAKES, THOMPSON NICKEL BELT (PARTS OF NTS 63O/9)



by P. Theyer and C.C. Freund[1]

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SUMMARY

The geology of the Paleoproterozoic Ospwagan Group on Lower and Upper Ospwagan lakes was investigated as part of a multiyear, multidisciplinary investigation of the geology of the Thompson Nickel belt (GS-7, this volume). The current study reports new field and petrological observations obtained from outcrops of mafic to ultramafic volcanic rock at Upper Ospwagan Lake. The volcanic rocks exposed on Ospwagan Lake comprise pillowed and massive basalt flows and interlayered gabbroic sills, komatiite and komatiitic basalt, and layered picritic flow units. Our observations, when augmented by geochemical and geochronological data (analyses in progress), will place important constraints on the temporal and genetic evolution of "Ospwagan Group volcanic sequences". These constraints will aid in defining the relationships between mafic-ultramafic intrusions, volcanic suites and Ni sulphide mineralization in the Thompson Nickel Belt (TNB).

INTRODUCTION

Numerous geological reports for the Ospwagan lakes region have been published. Tyrrell (1902) described "greenstones" situated in a northeasterly trending syncline recognized on Ospwagan Lake, and Alcock (1921) produced the first geological map for the study area. Stephenson (1974) published a geological report and a map at a 1:50 000 scale. Scoates et al. (1977) were the first to define the stratigraphy of the Ospwagan Group. Macek and Russell (1978) presented a preliminary geological map (1:25 000 scale) and accompanying report for the study area. Bleeker and Macek (1996) provided a summary of the geology of the Ospwagan Lake area.

Subsequent to the discovery of the nickel sulphide deposits in the Thompson region, the extensive outcrops of Ospwagan Group rocks on Upper and Lower Ospwagan Lakes acquired a special significance because these rocks host most ultramafic nickel-bearing deposits in the Thompson Nickel Belt. Sulphidic units within the Ospwagan Group may have supplied external sulphur believed to be essential to the formation of large nickel sulphide deposits.

RESULTS

Upper Ospwagan Lake

Migmatitic Gneiss

The southeastern shore of Upper Ospwagan Lake is underlain by Archean felsic to intermediate gneisses and migmatites (Fig. GS-11-1) that contain disrupted mafic (amphibolitic) dykes. Many of the gneisses are quartz and plagioclase porphyroblastic and have lit-par-lit fabric structures involving alternating, tightly and asymmetrically folded grey restite and pale pink mobilizate layers.

Quartzite (Manasan Formation)

A ca. 250 m thick, steeply northwest-dipping quartzite sequence occurs in tectonic contact with picrite and basalt on the northwestern shore of Upper Ospwagan Lake. The sequence comprises thinly laminated quartzite, feldspar-bearing quartzite and pelitic schist.

Mafic Metavolcanic and Related Intrusive Rocks

The northwest shoreline of Upper Ospwagan Lake is dominated by outcrops of massive and pillowed basalt flows, related gabbroic bodies (sills ± thick flows) and picritic flows. Locally, well preserved pillow structures indicate that stratigraphic tops are to the northwest. The basalt-picrite-gabbro sequence is interlayered with centimetre-thick pelitic layers, and some of the flows display brecciated tops. Homogeneous, fine grained basaltic flows may, in places, be characterized by "pseudopillows". These are generally decimetre-sized, but in places form metre-sized oval to subrounded structures resembling pillows. We contend that these "pseudopillows" were produced by alteration (bleaching and epidotization) that took place along fractures in the rock. Plagioclase megacrystic basalt flows occur on the peninsula at the entrance of the Taylor River into Upper Ospwagan Lake.

Picritic Units

Ultramafic rocks that resemble picrite are well exposed on the northwest and north shores of Upper Ospwagan Lake and on the peninsula separating Upper and Lower Ospwagan lakes. Coarse-grained olivine crystals are preferentially weathered, resulting in a characteristic pitted surface on the outcrops. The picritic units can be subdivided into pillowed, brecciated, olivine megacrystic and massive flows. Many picritic flows, such as at Location 1 (Fig. GS-11-2) can be subdivided into the following textural zones (base to top): (1) a basal, fine-grained layer, several tens of centimetres thick, (2) a homogeneous olivine megacrystic layer, one to several metres thick; and (3) an olivine megacrystic autobreccia layer that comprises subrounded to rounded, centimetre- to decimetre-sized clasts. The contacts between successive picritic flow units is typically abrupt. This layering is repeatedly observed on Upper Ospwagan Lake and is interpreted to reflect primary flow features, including mechanical sorting of larger olivine primocrysts into the core of the flows and thermal fragmentation of the upper parts of the flows (autobreccia).

The picritic flows are conformable with the stratigraphy in the basaltic flow units. Accordingly, we propose that picritic (ultramafic) and basaltic volcanism was coeval in this part of the TNB.

Peridotite and Pyroxenite

Outcrops of peridotite and pyroxenite are scarce despite the fact that part of Upper Ospwagan Lake and most of Lower Ospwagan Lake is underlain by a large ultramafic intrusion of peridotitic composition (Stephenson , 1974).

A 2 m long transect was cut across an outcrop of peridotite reputed to contain spinifex textures on Lower Ospwagan Lake (Location 5 on Fig. GS-11-1). Preliminary investigations of polished slabs obtained for this transect corroborated the existence of a variety of spinifex textures in this outcrop. These textures are commonly developed in supersaturated magmas, typically in response to rapid cooling. The potential genetic relationships between these ultramafic flows and the intrusive peridotite bodies lying beneath Ospwagan Lake will be investigated using new geochemical data (P. Theyer, in progress).

Outcrops of picrite, peridotite and pyroxenite that underlie the south shore of Lower Ospwagan Lake (Location 4 on Fig. GS-11-1) were identified as a potential source of carvable "soapstone". Particulars of this discovery are reported elsewhere (P. Theyer, Manitoba Energy and Mines, Open File OF 98-8, in preparation).

Mafic To Intermediate Sedimentary Rocks

Impure, grey- to beige-weathering feldspathic wacke underlies the western part of an island in Upper Ospwagan Lake (Fig. GS-11-1) and is in conformable contact with overlying massive and pillowed basaltic flows to the north. It is characterized by elongate, parallel to subparallel, northeast-striking, 1 to 2 m long by 20 to 30 cm wide structures vaguely resembling pillows, that are attributed to tight, polyphase isoclinal folding.

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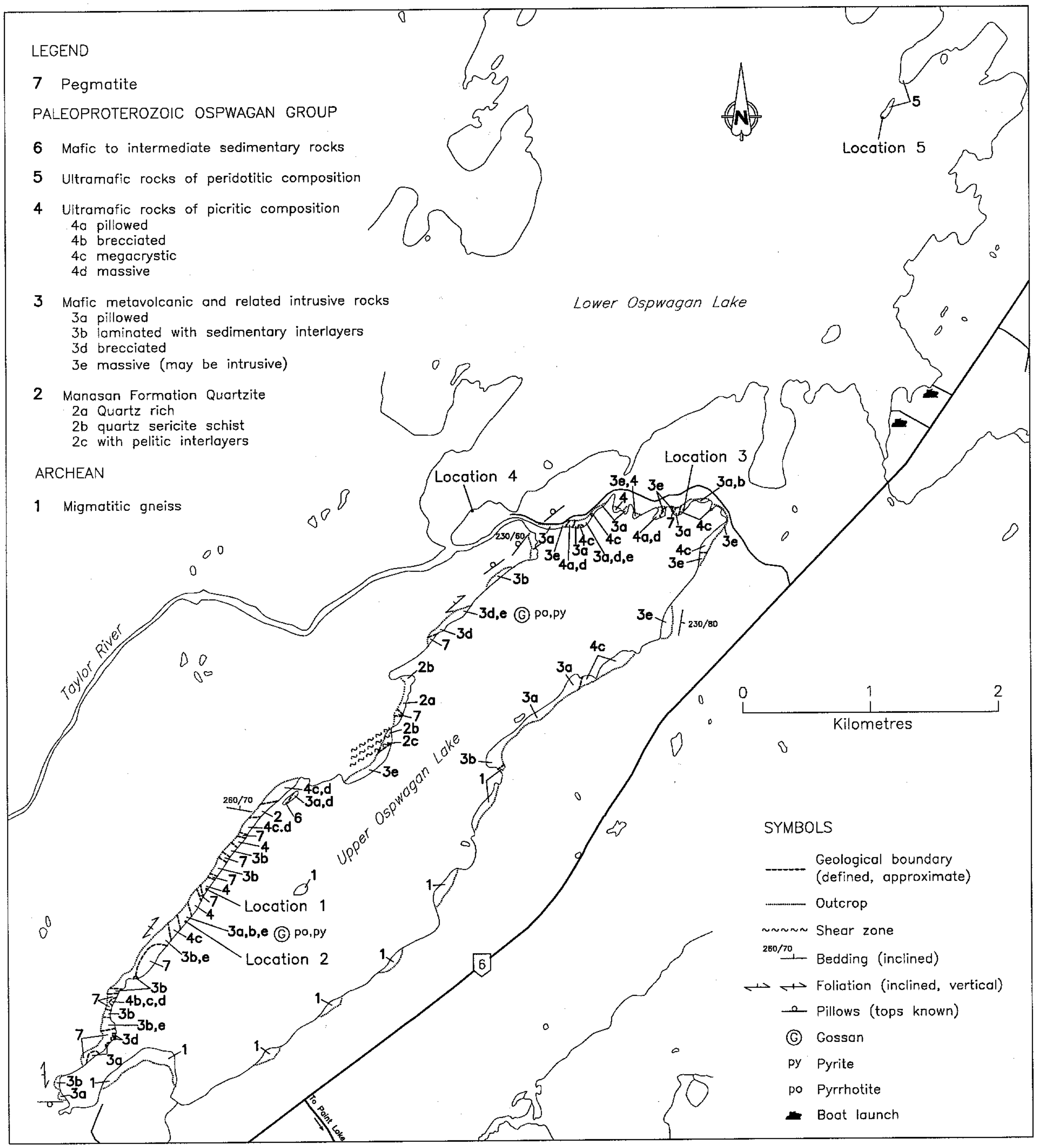

Figure GS-11-1: Simplified geology of the study area on Ospwagan Lake. Geology by P. Theyer and C. Freund (unpublished).

Pegmatite

Abundant outcrops of granitic pegmatite occur on the northwest shore of Upper Ospwagan Lake. Microcline, oligoclase and quartz are the major components of the pegmatite and muscovite occurs as an accessory mineral (Stephenson, 1974). Potash feldspars that measure up to 50 cm long occur in some intrusions. That the pegmatites appear to have been emplaced during the late stages of deformation of the Ospwagan Group is evidenced by the absence of tectonic fabrics in many of the pegmatites and infolding of basalt into pegmatite dykes.

Sulphide Mineralization

Disseminated sulphide (pyrite, pyrrhotite) mineralization and sulphide concentrations in fractures and faults are common in the basaltic rocks. An approximately 25 m wide sulphide-bearing zone occurs in massive, laminated and pillowed basaltic rock on the northwestern shoreline of Upper Ospwagan Lake (Location 2 on Fig. GS-11-1). Minor amounts of disseminated pyrrhotite and pyrite occur in a complicated fracture network characterized by intense epidotization and alteration. It is suggested that these sulphides should be studied in more detail in order to assess their potential for base metal mineralization.

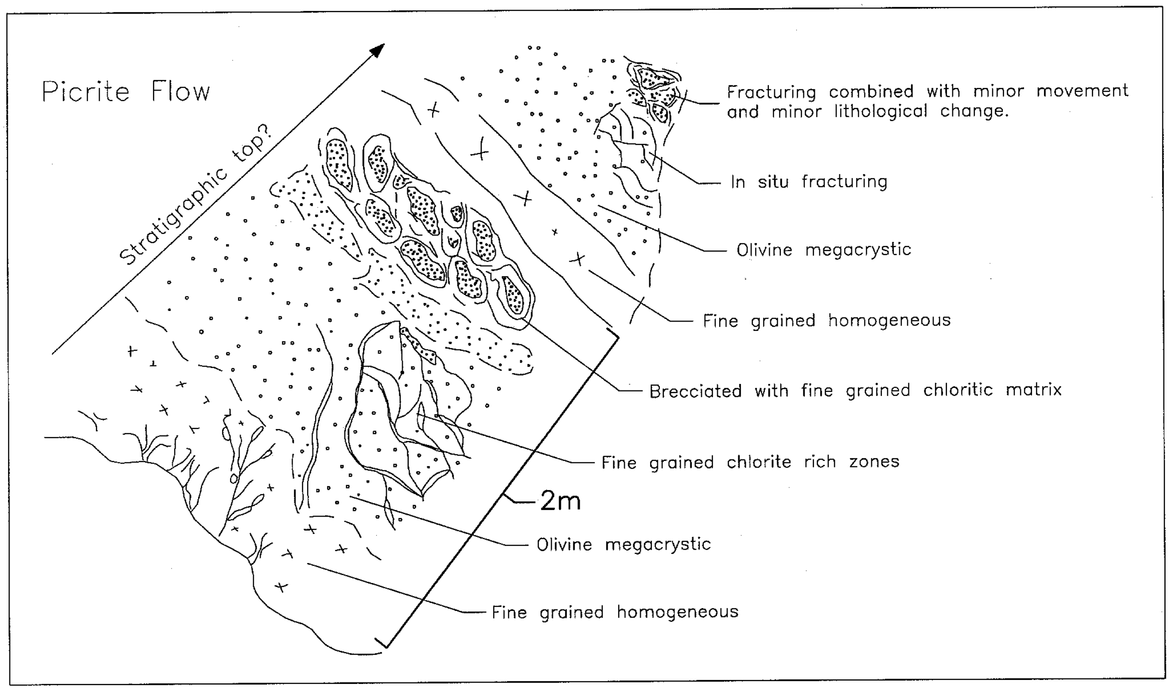

Figure GS-11-2: Textures in a picritic flow exposed on the northwest shoreline of Upper Ospwagan Lake (Fig. GS-11-1, Location 1).

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