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Summary of the regional geology of the Macquarie Harbour, Pt Hibbs, and Montgomery 1:50 000 map sheets

by A. V. Brown, R. H. Findlay and M. P. McClenaghan

Abstract

The Sorell Peninsula—Low Rocky Point region of south-western Tasmania contains two areas of Precambrian rock successions; six Eocambrian–Cambrian volcano-sedimentary associations; Tertiary graben-fill sediments; and Recent coastal deposits.

The rock successions in this area are considered to be the remnants of a collision zone between rocks formed within an Island Arc which was overthrust by continental material from the east, around the Middle to Late Cambrian boundary, followed by overthrusting of continental material from the west, during a mid-Devonian orogenic event.

An area of high prospectivity for base metals, a calc-alkaline, andesite-bearing succession, the Noddy Creek volcanics, runs south from Asbestos Point in Macquarie Harbour to the area around the mouth of the Mainwaring River. This succession is considered to be a southern extension of the Middle Cambrian, pyroxene-plagioclase phyric andesitic rocks of the Lynchford and Que River areas. As such, it is a correlate of one of the more mineralised parts of the Mt Read Volcanics.

INTRODUCTION

This report contains a synthesis of geological information obtained during the mapping of the Macquarie Harbour (McClenaghan and Findlay, 1989) and Montgomery (Brown, 1988) 1:50 000 map sheets, as well as unpublished work from geological mapping on the Pt Hibbs 1:50 000 map sheet. Full descriptions of the work will be found in the forthcoming explanatory notes for the Macquarie Harbour (McClenaghan and Findlay, in prep.) and Montgomery (Brown, in prep.) map sheets, as well as on the Pt Hibbs 1:50 000 map sheet and in the associated explanatory notes.

A summary of the work, with correlations to rock succession within the "Dundas trough" of western Tasmania, and North Victoria Land, Antarctica, along with a tectonic reconstruction, is contained in Findlay *et al.* (in press).

PRECAMBRIAN ROCK SUCCESSIONS

Two areas of Precambrian rocks, separated by a belt of rock sequences presumed to be of Cambrian age, occur on the Sorell Peninsula. The northern area consists of sequences of metamorphosed, interbedded, orthoquartzite, mudstone/siltstone and minor conglomerate units. Sedimentary structures indicate a probable shallow water origin for these rocks. In the central area, the rock successions consist of metamorphosed, impure, dolomite-rich sequences and metamorphosed quartzwacke and mudstone/siltstone sequences. The dolomitic sequences have characteristics indicating shallow water deposition, whereas sedimentary features in the quartzwacke sequence indicate that they were deposited by turbidity currents. The boundary between the two successions is gradational.

The northern area of Precambrian rock successions has been thrust over the presumed Cambrian rocks to the southeast. Several outliers of the thrust sheet overlie the Cambrian rocks. The central area of Precambrian successions has faulted contacts with rocks of Cambrian age both to the southeast and northwest.

EOCAMBRIAN–CAMBRIAN ROCK SUCCESSIONS

Rocks of Eocambrian–Cambrian age constitute six volcano-sedimentary associations (fig. 1). The ages of the successions are poorly constrained, as only one sequence is known to contain fossils. Estimates of the geological age of different successions are made by correlation with similar successions in the Queenstown–Que River region of western Tasmania. Relative ages within the area of interest are inferred from sedimentological and structural style, and metamorphic characteristics of units within the complexes.

The six volcano-sedimentary associations are separated on the basis of their igneous rocks. The associations are:

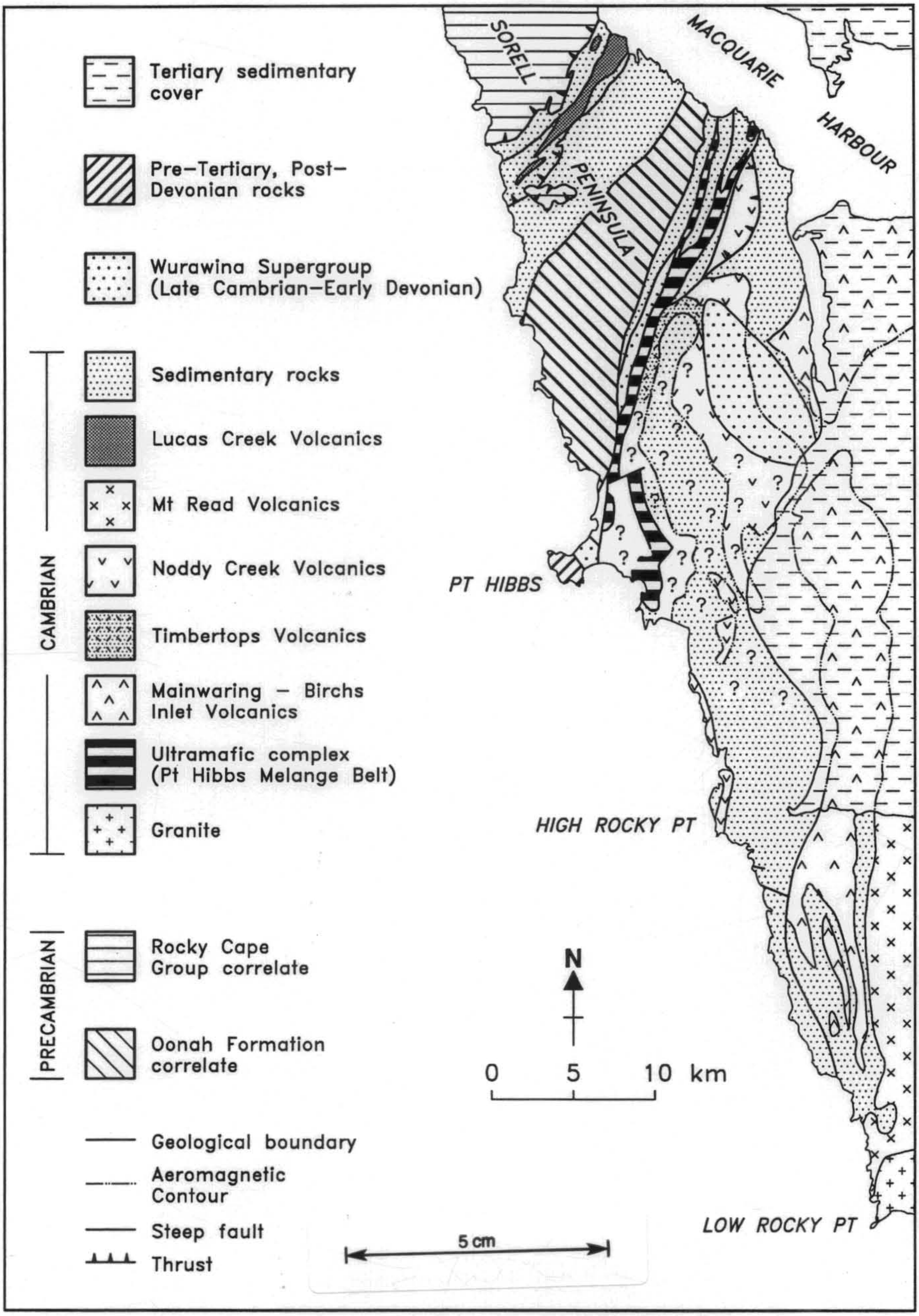

Figure 1. *Schematic geological map of the Sorell Peninsula–Low Rocky Point area (after Findlay et al., in press).*

(1) Alkaline to tholeiitic basalt association of intra-plate affinities (Lucas Creek volcanics)

(2) Boninitic association (Timbertops volcanics)

(3) Picritic basalt-Basalt association of island-arc origin (Birchs Inlet-Mainwaring volcanics)

(4) An island arc andesite-rhyolite association (Noddy Creek volcanics)

(5) An association of serpentinised peridotite incorporating sheared units derived from the boninite and andesite-rhyolite associations (Pt Hibbs Melange Belt)

(6) Felsic volcanic sequence (correlate of the Tyndall Group of western Tasmania)

ALKALI BASALT–THOLEIITE BASALT ASSOCIATION (Lucas Creek Volcanics)

Volcanic rocks within this sequence have mixed geochemical affinities (McClenaghan and Findlay, in prep.). Some carry a signature characteristic of an intra-plate volcanic environment and resemble the volcanic rocks within the Smithton Basin (Brown, 1989) and Crimson Creek Formation (Brown, 1986), whereas others resemble volcanic rocks from island arcs.

Associated with the volcanic rocks is a mudstone, siltstone, lithicwacke sequence which contains minor, thin dolomite beds. These sedimentary rocks are derived from a mixed volcanic–metamorphic source (McClenaghan and Findlay, in prep.).

BONINITIC ASSOCIATION (Timbertops Volcanics)

The boninitic rocks consist of vesicular lava and breccia flows which are interbedded with mudstone and siltstone units. Although highly altered, remnant textures, the presence of chrome spinel grains with Cr/(Cr+Al) [Cr#] ~90, and geochemical data for these rocks identify them as boninitic lavas (McClenaghan and Findlay, in prep.) and similar to other boninitic rocks in western Tasmania (Brown and Jenner, 1989).

Boninitic rocks in the Timbertops area are closely associated with the calc-alkaline Noddy Creek volcanics but the contact between the two associations is not exposed. However, outcrop distribution suggests a low angle thrust relationship, with the Noddy Creek volcanics being the upper plate (McClenaghan and Findlay, 1989).

PICRITIC BASALT–BASALT ASSOCIATION (Birchs Inlet – Mainwaring Volcanics)

Volcanic rocks from this association form vesicular, pillow and sheet flows of pyroxene phyric and pyroxene-plagioclase phyric lavas interbedded with hyaloclastite and breccia flows. Picritic samples contain pseudomorphed olivine and chrome spinel grains. Geochemically, these lavas contain samples which are similar to Island Arc tholeiite lavas as well as units similar to intra-plate basalts (Brown, in prep.; McClenaghan and Findlay, in prep.).

Geochemically, the Birchs Inlet–Mainwaring volcanic rocks resemble the Miners Ridge basalt from near Queenstown. The Miners Ridge lavas have been taken as representing the base of the Middle to Late(?) Cambrian andesite-rhyolite succession of the Mt Read Volcanics (Corbett, 1979). However recent drilling of the succession indicates a thrust base to the Miners Ridge basalt (Everard, in prep.).

This association contains interbedded sedimentary rocks which increase in proportion south from Birchs Inlet to the Mainwaring River area. The sedimentary rocks contain one area of interbedded mudstone and chert, and other areas of volcaniclastic siltstone and lithicwacke with minor, interbedded, mudstone and carbonate units. Sedimentary features within this succession indicate a predominantly east-facing sequence. The petrography of the clastic rocks indicates a mixed volcanic, low-grade metamorphic source (Brown, in prep.; McClenaghan and Findlay, in prep.).

ANDESITE–RHYOLITE ASSOCIATION (Noddy Creek Volcanics)

This association contains calc-alkaline andesitic, dacitic and rhyolitic lavas with intercalated pyroclastic, volcaniclastic and epiclastic rocks (Brown, in prep.; McClenaghan and Findlay, in prep). Where the sequence is dominated by volcanic units it consists of autobrecciated flows or porphyritic flows with volcanic xenoliths interbedded with volcanic-wacke and thin vitric tuff or volcaniclastic siltstone beds. Where sedimentary rocks dominate the succession, the volcanic rocks occur as pillowed and sheet lavas, breccia flows and porphyritic flows with volcanic xenoliths. One sample of plagioclase phyric andesite, from the Montgomery Quadrangle, contains spinel grains with a Cr# of 76.6, a ratio similar to spinel grains in spinel-bearing andesite from the Que River area (Jack, 1989; G. R. Green, pers. comm., 1990). Geochemically, these calc-alkaline rocks represent the late evolution of an island-arc sequence (Brown, in prep.; McClenaghan and Findlay, in prep.).

Channelised sandstone to pebble-cobble conglomerate units occur within the sedimentary rock dominated part of the succession. These units contain numerous sedimentary structures and zones of slump folding. Granule to pebble conglomerate units contain clasts of locally-derived volcanic rocks and mudstone, however the main clastic component is derived from a quartz-rich acid volcanic terrane with a minor metamorphic rock component. In the Montgomery Quadrangle this sequence faces east.

One sample of pebble conglomerate from the Montgomery Quadrangle contains a clast of boninitic lava, indicating prior development of boninitic lavas in the area of formation of the Noddy Creek volcanic sequence. The sample now consists of chlorite and serpentine group mineral pseudomorphs with enclosed chrome spinel grains. The composition of the spinel grains in this sample is typical of boninitic lavas in general and western Tasmanian ones in particular (Brown and Jenner, 1989; Brown, in prep.).

ULTRAMAFIC AND ASSOCIATED ROCKS (Pt Hibbs Melange Belt)

The ultramafic rocks consist of massive and highly sheared serpentinised peridotite within highly sheared serpentinite. Rhythmic layering, suggestive of a cumulate origin, is present. In the Macquarie Harbour Quadrangle the ultramafic rocks occur in close spatial association with sheared talc-rich rocks containing flattened vesicles. These rocks were probably derived from boninitic lavas. The presence of these rocks together with boudins of gabbro suggests a correlation of rocks within the Pt Hibbs Melange Belt with both the Layered Pyroxenite-Gabbro and Layered Dunite-Harzburgite successions of Brown (1986) (McClenaghan and Findlay, in prep.).

In the Pt Hibbs Quadrangle the body of ultramafic rocks at Spero Bay consists of interlayered dunite and harzburgite (D. B. Seymour, pers. comm., 1990) with similarities to the 'osmiridum'-bearing, Layered Dunite-Harzburgite succession of Brown (1986).

FELSIC VOLCANIC ASSOCIATION (Tyndall Group Correlates)

Along the eastern boundary of the Montgomery Quadrangle, this sequence contains tectonically deformed quartz and/or plagioclase phyric, felsic volcanic rocks with associated tuffaceous rocks and interbedded sandstone, siltstone and mudstone. These rocks have a phyllitic character derived by tectonic modification of the original igneous rocks, to such an extent that original layering has been destroyed and a compositional banding formed.

To the east of the Montgomery Quadrangle the felsic volcanic sequence, the Hudson River Pyroclastics and Wart Hill Pyroclastics etc. of Large (1981) and Large *et al.* (1987), consist of calc-alkaline, quartz and plagioclase phyric lavas with interbedded felsic tuff and minor sedimentary rocks. They have been correlated with rocks in the upper part of the Mt Read Volcanics, the Tyndall Group, in western Tasmania.

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