Section

DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY
PETROLEUM EXPLORATION DIVISION

OTWAY BASIN STUDY

THE IGNEOUS ROCKS OF THE PADTHAWAY RIDGE

by

K. ROCHOW
ASSISTANT SENIOR GEOLOGIST
PETROLEUM SECTION

28th November, 1967

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DESCRIPTION, OCCURRENCE, AND SEDIMENTARY COVER.

The Otway Basin in South Australia comprises a down-warped and down faulted area of Mesozoic and Tertiary sediments which straddles the south-eastern coast almost to Cape Jaffa, from where it extends across the present continental shelf in a westerly direction.

The northern boundary of The Otway Basin is formed by an area of shallow basement known as The Padthaway Ridge. This ridge is delineated approximately by a line between Kingston and Padthaway, north of which small and isolated outcrops of acid igneous rocks are exposed (Fig. 1). These rocks were studied by Mawson, D., and Parkin, L.W.,(1943), Mawson, D., and Dallwitz, W.B., (1944), and Mawson, D. and Segnit, E.R. (1945). On the basis of similarity of chemical composition, the above workers came to the conclusion that all these rocks are genetically related to each other as well as to the granites at Murray Bridge and elsewhere which were introduced into Cambrian sediments during the final orogenic phase of The Adelaide Geosyncline in the lower Ordovician.

Three main types of igneous rocks are exposed on The Padthaway Ridge; - adamellite in or near the Coorong between 10 and 25 miles north of Kingston, quartz keratophyre or soda rhyolite at Papineau Rocks, Didicoolum and near Gip Gip, and the remainder which range from granite through micro-granite to porphyritic microgranitic and quartz porphyry or rhyolite.

The adamellite is grey and locally porphyritic with large phenocrysts, many in excess of 40mm. in length, of potash feldspar and plagioclase. Biotite is the predominant ferromagnesian mineral.

Mawson and Segnit (1945) suggested that the green-grey quartz-keratophyre or soda-rhyolite at Papineau Rocks is genetically linked to the adamellite north of Kingston. These effusive rocks have phenocrysts predominantly of albite, up to 3mm. in length, in a ground mass of chlorite, quartz, feldspar, sphene, and sericite of grain size less than 0.1mm. Flow banding is common.

The remaining igneous rocks are reddish brown and consist of a series of potash-soda granite, micro-granite, porphyritic micro-granite and quartz porphyry. The granites may be divided into the biotite granite of the Kongal rocks area and the hornblende granite to the southwest in the Marcollat area. Northwest of these granites are outcrops of similar rocks which, however, grade into micro-granite and porphyritic micro-granite, especially in the Uncle Toms Cabin locality. Further to the northwest at Mt. Monster the effusive phase is represented by a porphyritic rhyolite with well developed flow banding.

Metamorphosed sediments referable to the Kanmantoo Group are known to be present in the subsurface on the Padthaway Ridge and it is assmued by analogy with the relationship between similar rocks in the Adelaide Geosyncline, that the above described granite and adamellite intrude the surrounding rocks. There are no outcrops however, with which to determine the relationship between the rhyolites and the metamorphosed sediments.

Several bores have intersected small sections of the metamorphosed sediments giving some information on the types of lithology present. In section 30 of the Hundred of Peacock, a bore encountered grey phyllitic slate beneath Tertiary sediments. Another bore near Kingston in Section 10B, Hundred of Murrabinna encountered slate, chloritic slate, and fine-grained sandstone, below 281 feet. A deep hole about 4 miles southeast of Kingston entered steeply inclined beds of grey limestone with bands of quartzite and veinlets of calcite and quartz containing disseminated

pyrite, between 484 feet and 2660 feet. Other bores have encountered basement in the area, but the above are representative indicating a sedimentary sequence which has not been severely metamorphosed, although this probably varies with distance from contact with the intruding granite as well as local variations in the regional metamorphism.

Generally, the depth to basement between the igneous outcrops on the Padthaway Ridge does not appear to exceed 3-400 ft. Of this sedimentary cover, the lower 200 feet comprises Tertiary sediments of the Knight Group, Lacepede Formation, and Gambier Limestone. Of these units the Knight Group appears to be widespread whereas the Gambier Limestone has a restricted distribution and does not overlap the areas of higher basement southwest of Keith, and in the Kingston area. The upper 100 to 150 feet of sedimentary cover is made up of Plio-Pleistocene marine limestones and aeolianites.

The only known exception to the generally thin sedimentary cover on the Padthaway Ridge is near Salt Creek where a bore penetrated 924 feet of sediment above slate bedrock. This sequence includes Pleistocene and Tertiary sediments to 503 feet, below which a tillite was drilled to 924 feet. The tillite consists of blue clay with boulders and is presumted to be of Permo-Carboniferous age. The only other reported occurrence of ?Permian sediments is at Blackford where a water bore passed at a depth of 255 feet, into blue-grey pyritic silt with poorly sorted pebbles, followed by grey clayey sand (Ludbrook 1961). Although a species of Trochammina was present in the above sediments, specific identification is not established to confirm the age at this stage.

In general therefore, the Padthaway Ridge comprises an area of shallow or outcropping genetically related granitic rocks emplaced in a metamorphosed sedimentary sequence; probably during the Lower Ordovician orogenic phase which resulted in intrusion of similar igneous rocks into sediments in the Adelaide Geosyncline.

Rhyolites are also present, but although chemically and probably genetically related to the granites, their exact relationship to the metamorphosed sediments is unknown.

During the Upper Jurassic and Cretaceous periods, the Padthaway Ridge remained a positive area contributing sediment to the Otway Basin until marine incursions deposited thin sedimentary sequences during the Tertiary and Pleistocene. The thin sedimentary cover of Tertiary and Pleistocene sediments averages several hundred feet in thickness. However, in one area near Salt Creek where the sedimentary cover approaches 1000feet, a 400 feet thick sequence of ?Permian tillite is preserved beneath the Tertiary dover.

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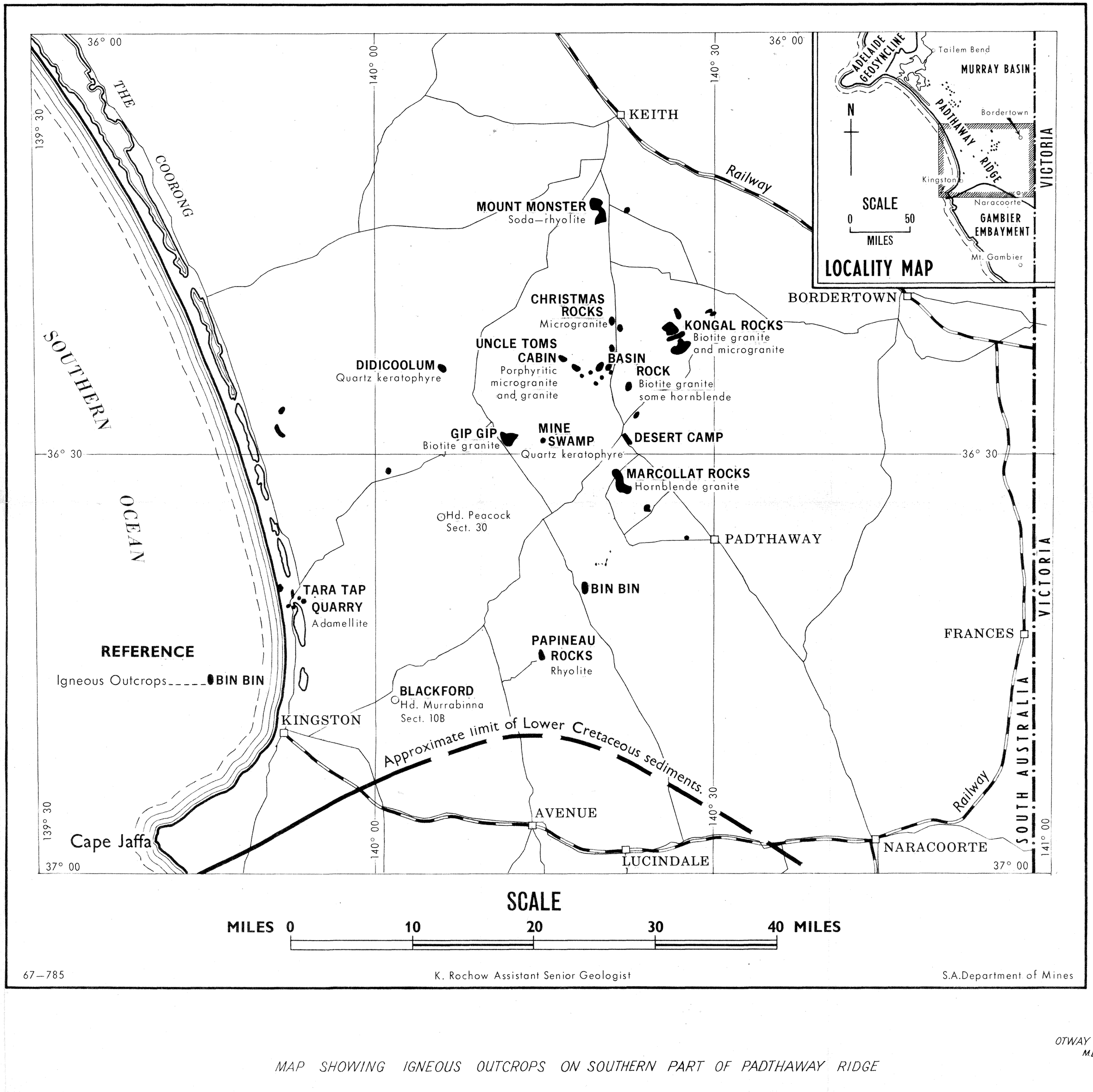
Reduce to inches



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MAP SHOWING IGNEOUS OUTCROPS ON SOUTHERN PART OF PADTHAWAY RIDGE

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