1977/44. Notes on groundwater and dam sites, south-eastern coastal streams area.

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The following notes have been compiled at the request of the Rivers and Water Supply Commission.

GENERAL GEOLOGY AND GROUNDWATER POTENTIAL

Detailed geological information regarding rock types and their distribution is not available for most of this area. Major rock types comprise Jurassic dolerite, Tertiary basalt and Triassic, Permian and Tertiary sediments.

There is limited information concerning the groundwater prospects of the area. Dolerite is considered to be an unreliable aquifer in most areas. Permian and Triassic sediments have generally been found to be fairly good aquifers elsewhere. In this region only a few bores have been drilled in Permian rocks. These yield moderate to good quantities of moderate to poor quality water. Triassic rocks show similar results with maximum yields of approximately 20 *l*/min with 1000-2000 ppm of total dissolved solids. Water from Triassic rocks is often rich in sodium chloride. Tertiary basalts have been found to be good aquifers in this region, yielding up to 1000 *l*/min of moderate to good quality water. Groundwater in these rocks is commonly associated with joints and fractures, and vesicular zones in the case of the Tertiary basalt. Water can be located by shallow bores generally no deeper than 30-50 m. Deeper bores tend to encounter closed fractures.

Coastal sands are often reliable aquifers producing moderate quantities of moderate to good quality water. Spear bores are in operation in the Seven Mile Beach, Dodges Ferry and Carlton areas. Other pockets of coastal sands are potential suppliers of good qualities of water especially the Rheban and Marchwiel Marsh areas.

DAM SITES

These comments are based on a brief geological field examination of the proposed dam sites (fig. 1).

Site 1 [EN485700] *Pawleena Reservoir*

A reservoir and concrete dam are already established here. Medium-grained Jurassic dolerite crops out in the stream bed and at both abutments. Higher on the abutment hillslopes a thin veneer of dolerite-derived talus consisting of angular boulders of dolerite in a weathered dolerite-derived matrix overlies bedrock. Three major sets of joints can be observed. Two of these are approximately vertical and strike at 320° and 100°, a third set dip at approximately 50° SE and strike at 40°. Some closely spaced joint zones strike at 40° with a joint spacing of about 4 cm. These zones are spheroidally weathered whereas the remainder of the dolerite outcrops show minimal weathering.

Site 2 [EN495654]

Basalt is exposed on the steep slopes at each abutment. Basalt boulders in a thin silty basalt soil veneer the abutments. Some zones of vesicular basalt occur but the majority of the outcrop appears massive - although some hillsope boulders show closely spaced joints. Overall jointing patterns are not visible. The flat floor of the valley is composed of alluvial floodplain deposits of fine silt with layers and lenses of basalt boulders and

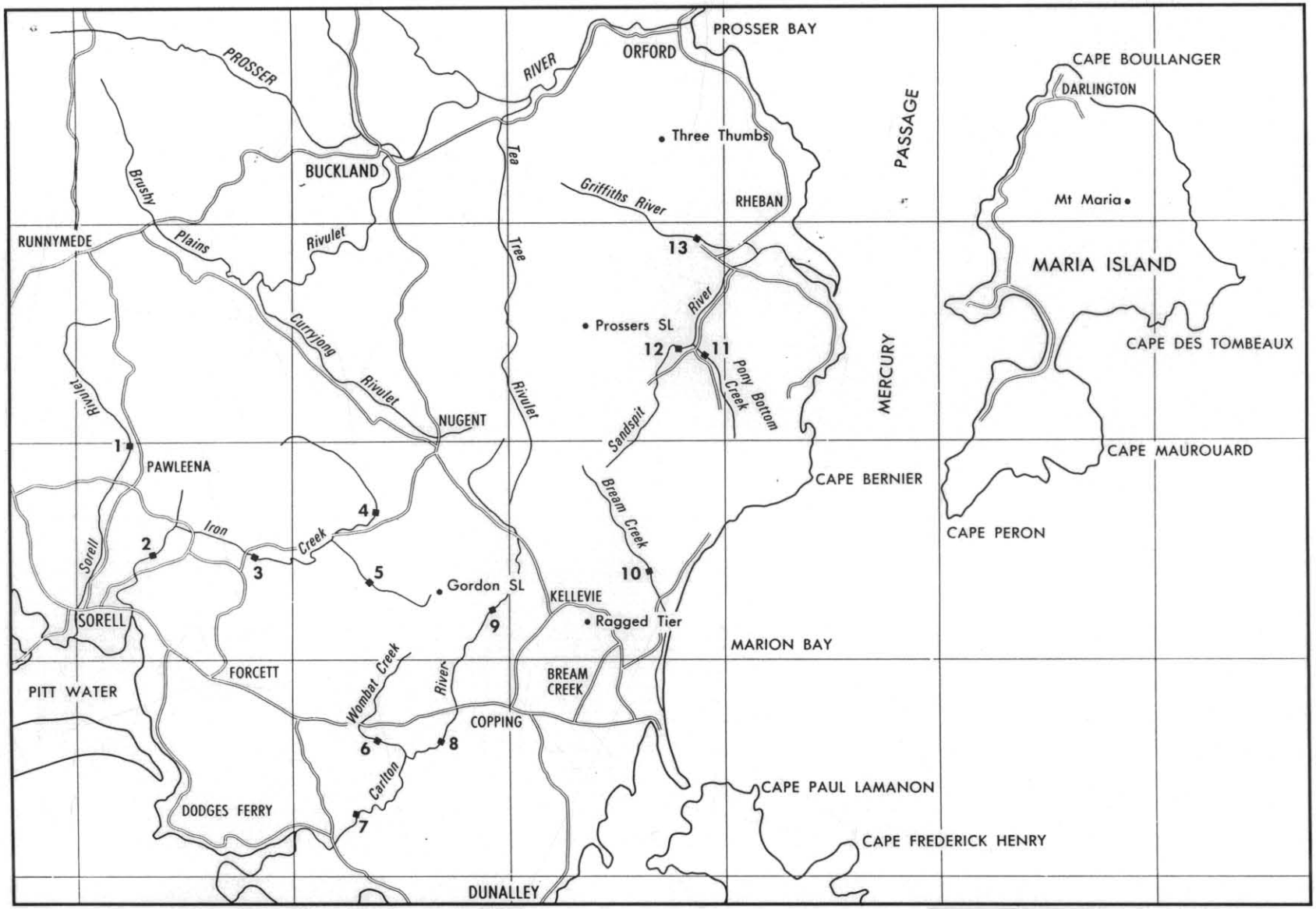

Figure 1. *Location of proposed dam sites.*

pebbles. The depths of these deposits is unknown but the width of the alluvial plain could indicate that these alluvial deposits are filling a stream-cut valley in the basalt. Drilling and seismic interpretation are required to confirm foundation conditions.

Site 3 [EN537654]

Tertiary basalt is exposed here. The north-eastern abutment is very steep with exposures of massive columnar jointed basalt. Joints are vertical with a spacing of approximately 0.5-1 m. Few horizontal joints are evident and a basalt boulder scree mantles the lower slopes. The south-western abutment slopes are covered by a veneer of basalt boulders in a weathered basalt-derived silty matrix. No exposures are present but basalt bedrock is probably at shallow depth. Some drilling and seismic refraction work is required to determine foundation conditions in this area.

Site 4 [EN587671]

This site is underlain by Jurassic dolerite. No exposures are evident but on the surface dolerite boulders occur in a brown doleritic soil. Hillslopes are not steep and dolerite bedrock is believed to be at moderate depth. The jointing and weathering state of the dolerite is unknown. Alluvial floodplain deposits containing some dolerite pebbles and siliceous concretions occur on the valley floor. The thickness of these deposits is unknown.

Site 5 [EN581646]

This site is similar to Site 4. Abutment slopes are veneered by slope deposits of dolerite boulders in a brown soil and weathered dolerite matrix. Minor floodplain deposits also occur.

Site 6 [EN589577]

Jurassic dolerite underlies this site. The northern abutment of the dam site is steep with a blocky talus of dolerite boulders interspersed with dolerite outcrops. Vertical to subvertical joints trending approximately N-S and E-W with a joint spacing of approximately 0.2-0.5 m have been observed in outcrops. The southern abutment is not as steep and is covered by a veneer of weathered dolerite and blocky dolerite talus with a brown dolerite soil profile. Solid dolerite bedrock is considered to be at shallow depth. Floodplain deposits are not extensive.

Site 7 [EN581545]

Dolerite is exposed in the floodplain. Alluvial floodplain deposits are undoubtedly thin. Adjacent hillslopes are covered with a blocky dolerite talus with solid bedrock at shallow depth. Joints are vertical to subvertical with two major sets striking 340° and 65°. Joint spacing is between 0.2 m and 0.5 m and weathering appears minimal.

Site 8 [EN616577]

Triassic sandstone underlies this site. There are large outcrops of quartz sandstone on the steep hillslopes of the eastern abutment. The beds are up to 2 m in thickness and display abundant cross-bedding and ripple marks. Approximate bedding readings measured from the outcrops indicate a bedding strike of 065° and a dip of 15° SE. The hillslope on the western side is not as steep and there are no exposures. Bedrock is covered by a thin mantle of weathered sandstone and sandstone boulders. The floor of the

river valley is underlain by fluvial deposits derived from the sandstone and from dolerite which crops out upstream. The thickness of the floodplain deposits is unknown but could be determined by seismic and drilling techniques.

Site 9A [EN636633]

This site is underlain by Jurassic dolerite which is only exposed at one place on the eastern abutment. This outcrop shows two main sets of vertical to subvertical joints striking 10° and 120°. Some of the joint faces are curved, suggesting columnar jointing . Large joint blocks up to 5 m in diameter litter the stream bed. Joints are close in places with a separation of between 0.1 m and 0.25 m. Elsewhere, the western and eastern hillslopes are covered with a scree of dolerite blocks embedded in a matrix derived from weathered dolerite. Solid bedrock in these areas is at shallow depth.

Site 9B [EN642632]

There are no exposures. The abutment hillslopes are covered by a thin veneer of angular blocky dolerite fragments in a thin brown dolerite soil. The dolerite is likely to be closely jointed in this region producing the tabular dolerite fragments exposed at the surface.

Site 10 [EN703648]

Dolerite is only exposed in the 8 m cliff at the western abutment and in the stream bed. *In situ* dolerite is overlain by a slope deposit of angular boulders of dolerite in a silty weathered dolerite-derived matrix. The eastern abutment is not as steep and the hillslope is covered by the usual slope deposit containing blocks of dolerite. The stream floodplain is composed of silty alluvium with lenses and beds of dolerite pebbles and cobbles. The depth of these floodplain deposits is unknown but dolerite bedrock is probably at shallow depth. Exposures of dolerite show three main sets of vertical to subvertical joints striking 360°, 120° and 60°. A set of horizontal joints can also be seen. Joint spacing is approximately 0.25 m.

Site 11 [EN726740]

This site is underlain by dolerite, which crops out higher up the abutment hillslopes. The abutments consist of a veneer of dolerite slope deposits overlying dolerite bedrock. This material could be of considerable thickness and consists of small platey fragments of dolerite in a grey-brown mottled clay which has been produced by the weathering of the dolerite. This material is undoubtedly thicker on the floor of the valley and at the base of the abutment hillslopes. The platey nature of the dolerite fragments indicates that the dolerite bedrock could be closely jointed in some areas. The southern abutment is not as steep as the northern abutment and the thickness of weathered dolerite and associated slope deposits is likely to be greater. Slope deposits on the northern slope contain much larger blocks of dolerite.

Site 12 [EN715743]

This site is located in a stream gorge incised in dolerite, which is exposed in the stream bed and at the foot of the southern abutment slopes. The higher abutment slopes are covered by a coarse blocky dolerite talus in a very thin silty brown dolerite soil. The northern abutment hillslope

is not as steep and the dolerite-derived slope deposits are likely to be thicker. Floodplain deposits consist of dolerite gravel and fine silty alluvium, exposed in the northern river bank. Two main sets of vertical joints striking 350° and 80° can be seen in the outcrops, and also a horizontal to sub-horizontal set. Joint spacing is about 0.2 m.

Site 13 [EN725788]

This is also underlain by dolerite. The southern abutment hillslope is covered by a thin veneer of dolerite-derived blocky slope deposits with isolated *in situ* dolerite outcrops. The northern abutment is not as steep with a greater cover of slope deposits over the dolerite bedrock. Dolerite crops out on the valley floor together with floodplain deposits of silty alluvium and beds and lenses of imbricate dolerite pebbles. Joint directions and spacing are identical to those measured at Site 12.

SUMMARY

All dam sites except sites 2, 3 and 8 are on Jurassic dolerite and should generally prove suitable. Further investigation is required where dolerite slope deposits mantle the underlying bedrock. Obviously the nature and degree of jointing and weathering cannot be determined from brief inspection. Where exposed, the dolerite appears to be little weathered and only moderately jointed. Drilling is required to determine the consistency of these observations if construction of large dams is envisaged. Locality 8 requires further investigation to determine the state of weathering of the sandstone beneath the floodplain deposits and also the porosity of the rock encountered. This is important as exposures indicate the sandstone dips under the proposed dam site in a downstream direction. Further investigation including drilling is required at sites 2 and 3 to determine the nature of the basalt and thickness of the floodplain deposits. Vesicular or fractured basalt zones could cause considerable leakage if present.

[30 September 1977]