

22. PROPOSED WATER STORAGE AT RACECOURSE LAGOON, NEAR ORFORD

by I. Jennings

INTRODUCTION

The Rivers and Water Supply Commission are investigating a proposal to create a water storage reservoir at "Racecourse" Lagoon, about 3 miles north of Orford, at co-ordinates 7616N 5703E. It is proposed to construct an earthfill dam, in two stages, ultimately 16 feet high, at the northern end of the lagoon. Water from the Prosser River will be pumped into the resulting reservoir and from there will gravitate to the townships of Orford and Triabunna. Preliminary investigations indicate that no other favourable storage site is available in the general vicinity.

The reservoir site and surrounding district was examined on the 26th and 27th June, 1962, to assess the geological problems involved in the proposal and to locate sources of suitable materials for construction. Regional geology of the area is shown on the Department of Mines geological map of Buckland, 1 mile = 1 inch prepared by F. Blake in 1958.

GEOLOGY

No bedrock outcrop could be found within a radius of $\frac{1}{2}$ mile of the proposed dam. However, the presence of sandy soil littered with sandstone rubble, the evidence of the regional geological survey, and the results of boring in the district, support Blake's view that the lagoon is underlain by Triassic sandstone. An examination of exposures in Prosser Bay, details of water bores at Triabunna and the presence of old drill core near the lagoon (probably relative to the 1891 coal bores) suggests that the sandstone is underlain at no great depth (about 100 feet) by dolerite but this will have no practical bearing on the proposal.

Blake's map indicates a fault traversing the centre of the proposed storage which would pass under the proposed dam and also intersect the ridge at the southern end of the reservoir. Examinations carried out in the area indicate that the evidence for the exact location and nature of the fault is inconclusive. The Triassic rocks in the area are known to be subject to transgressive dolerite intrusions which could initiate faults of this kind and the probable presence of an intrusive body at comparatively shallow depths beneath the lagoon suggests that post-Triassic faulting may well be present. Some exploratory work along the centre line of the proposed dam to test for the presence of faults is therefore necessary.

The Triassic rocks, where exposed, consist of thick units of medium grained quartz sandstone. They are characterized by the presence of large-scale crossbedding, abundant slump structure, washouts and thin bands of clay pellet conglomerate. Bedding and jointing are widely spaced but strongly developed and although the bedding is locally distorted by dolerite intrusions and masked by the sedimentary structures, the regional evidence indicates a dip of about 3° to the NE. Sand pits and preliminary augering around the margins of the lagoon indicate that surface weathering

locally reaches depths below 6 feet. The results of water boring in the district indicate that the depth to bedrock is variable and may be as much as 12 feet. A typical soil profile for the sandstone areas is set out below.—

	Thickness ft.
(1) Sandy soil with pebbles and much organic material	½ to 1½
(2) Clean quartz sand	1 to 6
(3) Yellow clayey sand grading into bedrock	1 to 6

The outcrop of shale bands within the sandstone sequence leads to the local development of clayey soils. The water bores in the district have intersected a few shaly bands but no outcrop of shale has been observed.

A single auger hole into the bottom of the lagoon encountered about 18 inches of sandy organic loam followed by a further 18 inches of clay and silt with much organic material. As it is reported that the water level of the lagoon does not fluctuate with seasonal conditions it seems that the lagoon has silted up sufficiently to prevent leakage under existing hydraulic conditions. It would be desirable to carry out a systematic programme of augering over the floor of the lagoon to determine the thickness and persistence of the silt layer so as to assess its effectiveness under an increased hydraulic head.

HYDROLOGY

Triassic sandstone forms the chief aquifer in this district and numerous water bores at Triabunna and Orford yield flows of up to 300 gallons/hour from 5 inch boreholes. Water seepages along bedding and joint planes may be examined along the north shore of Prosser Bay and are reported to occur at Double Creek. It must be expected therefore that considerable leakage will occur from a reservoir sited on these rocks, even in the absence of faulting, unless remedial measures are adopted. A regional dip of 3° to the NE would cause water seepages just above the road leading to the settlement at Double Creek and result in inconvenience and perhaps damage to property in that area. This figure agrees with the postulated dip of the beds in the area.

As noted earlier it is considered that the siltation which has already occurred in the lagoon will probably effectively seal the floor of the reservoir but provision must be made for laying a clay blanket over all the ground to be submerged which lies above the present water level.

Provided the initial leakage through the porous beds can be kept within acceptable limits progressive siltation should improve the water tightness of the reservoir with use. Faults and shattered zones in the foundation rocks would provide larger openings for percolation which would not be improved by siltation. The initial exploration must therefore be diverted towards outlining any such areas so that remedial measures may be taken. Severely crushed and open zones would require grouting and protection by clay blankets.

CONCLUSIONS

(1) The proposed reservoir is situated on porous rocks which are expected to cause serious leakage from the reservoir toward Double Creek.

(2) If no other suitable site is available provision should be made for a clay blanket to cover all the ground which will be inundated above the present water level.

(3) Although no faults have been demonstrated in the immediate vicinity of the reservoir, regional evidence suggests that they may occur and appropriate investigation is warranted.

(4) Leakage from the reservoir may result not only in water losses, but also in damage to properties.

(5) The meagre evidence available indicates that siltation is advanced sufficiently to inhibit leakage through the floor of the reservoir but further investigations are recommended.

RECOMMENDATIONS

(1) *Damsite*

To check for faulting and assess excavation costs it will be necessary to have a series of closely spaced test pits or a continuous trench, carried to bedrock, along the centreline of the proposed dam.

(2) *Storage Area*

A grid of auger holes (initially on 200 foot centres) should be put down over the entire floor of the present lagoon to test the thickness and persistence of the silt layer.

(3) *General*

As underground leakage from the proposed reservoir could cause damage to nearby properties it would be desirable to place bore holes in places likely to be affected by seepage. Fluctuation in the level of the ground water table should be established before the dam is placed in service and a check made of any further fluctuations caused by leakage from the reservoir.

MATERIALS OF CONSTRUCTION

Clay

An area of suitable clay about $\frac{1}{2}$ mile NW of the dam has been located by officers of the Rivers and Water Supply Commission. Preliminary tests indicate that sufficient clay for the core-wall is available. As provision should be made for a clay blanket over the walls of the reservoir, a much greater quantity will now be required. The deposit already located is conveniently sited with respect to the proposed construction but no obvious surface indication of the clay is apparent. It would be advisable to continue scout augering in the same general area before searching elsewhere. If no further deposits are located in the vicinity of the proposed works the most promising area for prospecting is the paddocks alongside the old burnt out homestead on the end of Meredith Point.

Earth Fill

An area of sandy loam associated with the clay noted above has been tested by preliminary augering. Indications are that the quantity is sufficient for the dam. The material appears to be suitable for the required purpose provided precautions are taken to protect it from erosion. Stone pitching is specified for the upstream face and it is suggested that the top and downstream faces of the dam be protected by vegetation.

The area of clay and earth fill has been outlined roughly by means of auger holes. It would be desirable to test the area further with a series of test pits before final planning is completed. The relationship of the clay to the sandy loam is not clear from the available information and this further testing is needed before final estimates of the quantities available can be made.

Pitching Stone

In an area occupied by Triassic sandstone the obvious source of stone would appear to be slabs of sandstone from the vicinity of the proposed works. However, in the absence of outcrop nothing can be said regarding the quality and quantity of stone available.

An examination of the sandstone outcropping in the vicinity of Triabunna and Orford reveals that most of the sandstone is unsuitable due to poor quality and the lack of well defined closely spaced bedding planes. The small Public Works Department quarry at the northern end of Orford beach apparently yielded stone in the past but as it frets badly, it is not recommended. A small quantity of stone might be taken from the cliffs along the NE shore of Spring Bay but the quality is variable and access to the quarry site difficult. The stone in the old quarries south of Orford occurs in beds about 10 feet thick and would be extremely difficult to quarry satisfactorily by modern methods. Access to the quarry site is difficult and wastage would be high.

Two courses are recommended:—

- (1) Bulldozer cuts should be made into the hills surrounding the lagoon to assess the quality and quantity of stone available on the site.
- (2) If the stone at the lagoon is unsuitable it is suggested that a source of dolerite slabs be located.

It was noted that the Public Works Department used dolerite slabs for pitching around the abutments of the new bridge at Triabunna, probably on account of the difficulty in obtaining satisfactory sandstone. This stone came from road cuttings along the Tasman Highway at Paradise Gorge, a source which does not appear to be available at present. The most likely source located was a small quarry on the east bank of the creek about $\frac{1}{2}$ mile downstream of Jones and Company's dam at Rostrevor. The dolerite exposed here is fine grained, dense and suitably jointed and should yield good slabs. Although quarrying costs may be higher than in the sandstone, the quality of the stone is beyond doubt. Wastage in quarrying the dolerite could be compensated for by crushing the unsuitable stone for gravel.

Gravel

No deposit of natural gravel was located anywhere in the district. The Public Works Department obtain gravel for road-works and other construction by crushing hornfelsed Permian sedi-

ments at the top of Paradise Gorge, whilst the local council obtains weathered dolerite from a quarry near Rheban. The old quarries on Meredith Point were on weathered dolerite close to an intrusive contact with the Triassic sandstone but they have been worked out.

The only source of gravel therefore appears to be crushed rock. As noted above, this could be obtained by crushing waste dolerite obtained by quarrying for pitching stone. However, if an alternative source of pitching stone is found near the lagoon, dolerite cobbles suitable for crushing are available at Meredith Point. The cobbles form a small storm beach about 100 yards long and have accumulated to a depth of about 8 feet. A small pond behind the beach may be formed by an old dam or due to natural impounding by beach deposits. The beach is located about 100 yards north of the old homestead site. At least 1,000 cubic yards of cobbles ranging from 1 inch to 12 inches and averaging 3 inches in diameter is available without endangering the existing pond. If the entire deposit can be utilized, more than 2,000 cubic yards of material is available.