

TR12-74-77

18. GEOLOGICAL SURVEY - NICHOLLS RIVULET DAM SITE

by D. E. Leaman

INTRODUCTION

It is proposed to build a 50 feet high concrete arch or rock fill dam in the upper reaches of Nicholls Rivulet, some six miles E of Cygnet, Southern Tasmania. Nicholls Rivulet has a small but perennial flow and is subject to large flows over short periods. The dam site is probably less than two miles from the headwaters of the rivulet. At the site the rivulet has a gradient of approximately 1 in 25. The pond produced by the dam will be very narrow and considerably less than 1,000 feet long. The area surrounding the dam site is of moderately high relief, with streams occupying narrow, youthful valleys. The topography is controlled to a great extent by geological structure, particularly that of dolerite.

GENERAL GEOLOGY

The geology of the area is shown in fig. 20. The sedimentary rocks present are Upper Permian and Lower Triassic in age, both groups being extensively faulted and intruded by Jurassic dolerite. The faults in the area are pre-dolerite and there is no evidence of post-dolerite movement. The dolerite has utilised these zones of weakness and intruded along many of them. The dolerite in the W of the area is in the form of large dykes or plugs whereas that in the E is in the form of a transgressive sheet dipping SE.

GEOLOGY OF THE DAM SITE

The dam site is completely in dolerite. The western abutment lies approximately 150 to 200 feet N of a contact along old faults. As a result the Ferntree Mudstone to the S is extensively metamorphosed, very hard and brittle and extremely jointed. The joints are random but are generally less than one foot long and one inch apart. The dolerite in the contact zone is very fine grained and also highly jointed. The dominant joints appear to be transverse to the rivulet (approximately E-W). One set has a southerly dip of about 30°. Near the contact the joint density is about 12 per foot, but decreases to 2 per foot in the bed of the rivulet at the dam site.

Some 250 feet upstream from the site there is a small inclusion of Ferntree Mudstone. Similar comments apply to the mudstone and dolerite near the contacts. This inclusion is probably connected beneath the dolerite to the mass of mudstone to the NW but not to that in the S.

Since dolerite occurs along the contact trending NNW along Nicholls Rivulet, then, as the areas to the N and S of the contact were obviously fault zones, the contact area was a fault prior to the dolerite intrusion. As a consequence of the intrusion it has been obliterated in the region of the dam site. There are no major N-S or NNW trending joints present in the dolerite outcropping in the creek at this point suggesting that there were no later movements on the fault.

750 feet upstream from the dam site, in the creek, Ferntree Mudstone outcrops beneath the dolerite. It is unlikely that there is any direct connection to the mudstone in the S.

The dolerite is not deeply weathered at the W abutment, but in places on the route of the spillway and E abutment there are zones in which the dolerite has weathered, and kernels or boulders are surrounded by clay. Three holes 5-6 feet deep in zone A (see map—fig. 20) where this condition of weathering is noticeable, failed to locate convincing outcrops.

CONCLUSIONS

(1) The dam would be built entirely on dolerite. The western abutment would need special consideration with respect to jointing in the dolerite, while the eastern abutment is uncertain due to weathering.

(2) Leakage is not expected to be serious, except possibly on parts of the western abutment—again due to jointing.

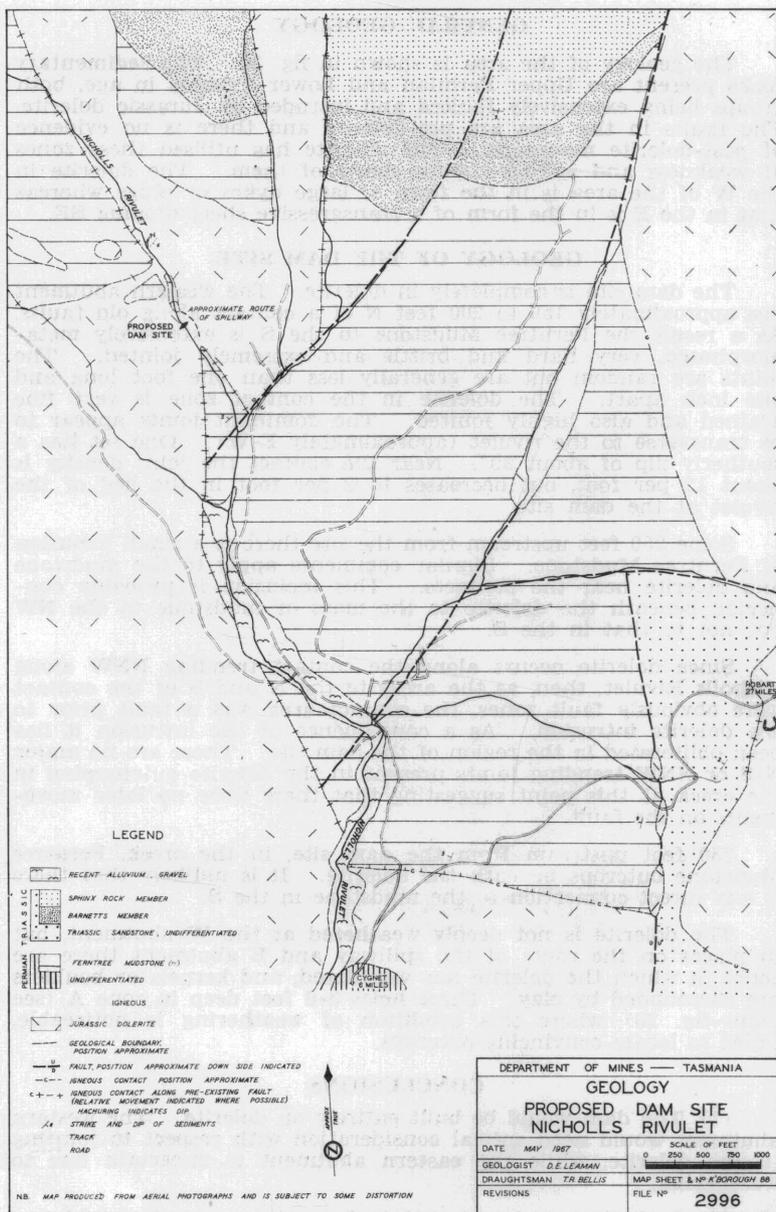


FIGURE 20

5 cm

(3) Leakage through the Ferntree Mudstone upstream to that downstream is unlikely since there is probably no N-S connection beneath the dolerite of the dam site. There may, however, be some leakage through the saddle, along the contact, upstream of the dam. The depth of water across the contact will determine the extent of any loss.

(4) There is no evidence of a shatter zone along the rivulet.

(5) The storage capabilities may be improved by removal of the gravel and boulders in the small flat behind the dam. The thickness of this deposit is unknown but a trench shows it to be deeper than three to four feet.

(6) A significant quarrying job is expected along the route of the spillway, which will have a maximum depth of about 15 feet in dolerite. Only in zone A is there expected to be softer rock and odd clay zones.

(7) There is no major clay deposit available for use as a clay core.

It may be possible to improve conditions (1) and (2) by moving the dam slightly upstream.

RECOMMENDATIONS

(1) Quarry a small amount of the western face, to check joints, particularly the S dipping ones, and fully expose the dolerite.

(2) Wash down to bedrock on the eastern abutment, again to check jointing and weathering.

(3) Determine the thickness of gravel in the flat upstream of the dam, either by completing the trench or by blasting.

(4) Wash down and test drill the route of the spillway, to fully determine the character of rock to be quarried. Three or four holes are required, one of which should be in zone A. Approximately one hole per 50 feet of spillway is required. As the route, depth and length of the spillway is undecided at present, no further specifications can be given as to tests required.

(5) If rock, other than that recovered from the spillway, is required there should be at least two to three holes at any likely quarry site.