1977/17. Examination of a proposed dam site on Camp Creek, Wynyard.

W.L. Matthews

The Rivers and Water Supply Commission requested a preliminary report on a possible dam site on Camp Creek, about 3 km south of Wynyard [CQ922580]. The dam is being considered by the North West Regional Water Authority as an alternative to a pipeline from Somerset to Wynyard. The dam, of some 15 m height, would impound about 1.58 x 10^6 m^3 of water, enough to supply the town of Wynyard for one year. It is expected the dam would be of earth fill construction, with or without a clay core. The existing supply for Wynyard comes from further upstream on Camp Creek.

RELIEF AND GEOLOGY

The dam site is about 30 m above sea level and is just inland from the coastal plain on which Wynyard is built. In the storage and dam area (fig. 1), the stream is entrenched into land which rises to about 180 m above sea level. It is surrounded by narrow flood plains which widen where small tributaries enter Camp Creek. The dammed water will extend about 3 km upstream from the dam in a long narrow strip of water.

The storage and dam area are underlain by the Wynyard Tillite of late Carboniferous to early Permian age. Tertiary basalt occurs at higher levels on the ridges surrounding Camp Creek. The flood plain is underlain by recent erosional material from the weathering of the tillite and basalt.

The Wynyard Tillite exposed in the dam area consists of horizons of tillite and interbedded fine grained sediments, which are probably varves. The tillite is composed of pebbles and boulders in a fine matrix. The boulders occur up to 1.5 m in diameter, but are usually much smaller. The fine grained sediments are dark grey or occasionally red where weathered. The rhythmic bedding of varves is not easily visible to the naked eye. They are relatively thinly bedded and sometimes fissile.

The Wynyard Tillite is deeply weathered in the proposed dam area and exposures only occur in road cuttings and at some points along Camp Creek. Soil containing a few pebbles as residual material from tillite horizons occurs on most slopes surrounding the stream. Some of the slopes are underlain by clayey soil only, these areas probably being underlain by fine grained horizons of the Wynyard Tillite.

In general, as with other areas in Tasmania, the Carboniferous-Permian rocks are flat-bedded or dip at a shallow angle. Two exposures of the fine grained member of the tillite sequence dip more steeply (about 45° W and 25° W) than is usual for these beds. The tillite sequence is gently folded along the foreshore at Wynyard but with much shallower dips. The steeper dips have probably been caused by faulting and from the direction of dip, it is probable that the fault strike is north-south and thus may extend through the dam site.

The recent alluvium underlying the flood plain consists of pebbly clay and silt, the depth of which is unknown from surface examination.

The proposed dam site has no outcrop of basement rock at any point along the dam axis. It is important to know the depth of unconsolidated material overlying bedrock and its composition. If deep clean gravel occurs at any point, there could be serious leakage.

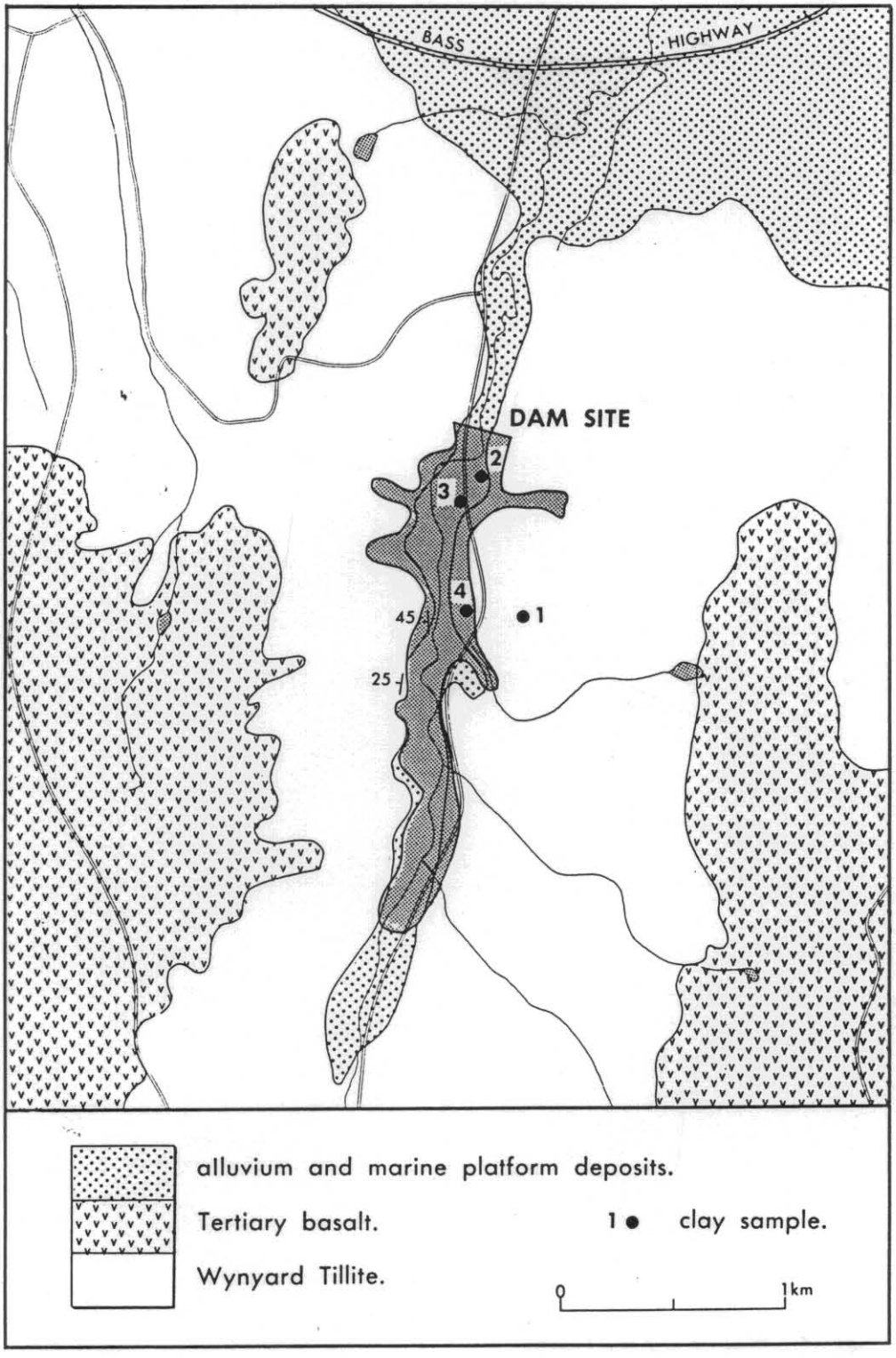
BASS
HIGHWAY
DAM SITE
2
3
4
45
25
1
alluvium and marine platform deposits.
Tertiary basalt.
Wynyard Tillite.
1 ● clay sample.
0
1km

Figure 1

5 cm

SEISMIC SURVEY

A seismic traverse was undertaken along the dam axis to gain an indication of the material underlying the site. Three main layers are present, the upper most has a seismic velocity of 300-400 m/s, the second has a velocity of 1550-1700 m/s while the deepest layer has a velocity of 3000-3200 m/s. The upper layer is interpreted as being soil and alluvium and the deepest layer relatively unweathered Carboniferous-Permian rock. The intermediate layer is most likely weathered Carboniferous-Permian rock but could be below water table alluvium, clay or a combination of all three. The thickness of the upper layer is about 2.5-4 m. The depth to the relatively unweathered rock was not precisely defined by the seismic survey but probably varies from about 7-20 m below the surface (fig. 2). The interface may be a little closer to the surface on the western side. A 5 m high tillite cliff occurs on the side of Camp Creek near the dam site. A narrow zone with a probable higher velocity occurs just west of the eastern road on the section. The seismic velocities are about 4000-4400 m/s which is high for the area and may represent a massive tillite bed.

The low points in the top of the highest velocity layer are probably due to deeper weathering of the underlying rock. This may be caused by differing lithology or possibly because of fracturing and weathering in fault zones.

CONSTRUCTION MATERIALS

Fine grained sediments which may be suitable for an earth fill dam occur within the storage area. The weathering of the Carboniferous-Permian fine grained sediments has resulted in accumulations of clay-like material on the surface. Samples from four locations (fig. 1) were tested for dispersion of clay minerals. No dispersion was noted either with water from Camp Creek or with distilled water. Although the materials are fine grained the actual clay mineral content may be low There was little or no expansion or slaking of the samples after placing in water and they did not become very plastic when worked with water. All of the samples were obtained on the eastern slopes around the storage area. Similar material may underlie the flood plain surrounding Camp Creek.

CONCLUSIONS AND RECOMMENDATIONS

From surface observations, it is apparent that the dam site and storage area is underlain by the interbedded tillite and fine grained beds of the Wynyard Tillite. The fine grained sediments have weathered to produce a material which may be suitable for dam construction.

A preliminary seismic survey indicates that the bedrock is overlain by up to 20 m of what is probably weathered rock, but which could also be clay or below water table alluvium, or a combination of all three. This material is overlain by 2.5-4 m of soil, alluvium and, on the hill slopes, talus.

Because of steep dips on the fine grained units within the catchment area, there may be a fault extending through the dam site. Such a fault, if present, would be either Jurassic or Tertiary in age and there is little likelihood of reactivation during the life of a dam. Fault movement would have brecciated the rock and this may increase the permeability in a massive competent rock, but the fine grained content of the formation and increased weathering around such a feature may decrease the permeability in a fault zone as compared to the surrounding unbroken rock.

SEISMIC PROFILE - CAMP CREEK DAMSITE WYNYARD

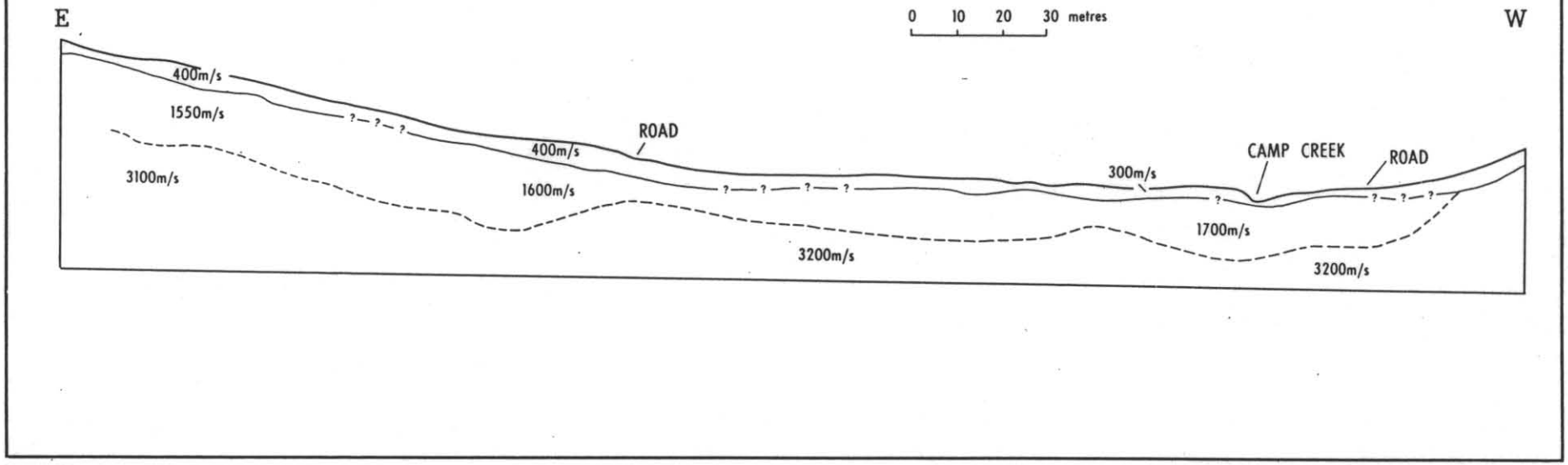

Figure 2

5 cm

From a preliminary inspection, it appears that the proposed dam site has good prospects of being a suitable site. Further investigations need to be undertaken and would best be arranged in two stages.

Stage 1. A more detailed seismic survey is required to locate the relatively unweathered bedrock position more accurately. Sharp local variations may be important in locating possible fault zones. Backhoe holes could be dug along the axis of the dam and in the storage area to examine the nature of the alluvium. These should extend into the material with the intermediate seismic velocity and determine its nature wherever possible. A backhoe could be used to prospect for dam construction material and extensive tests should be undertaken to determine the suitability of this material. The suitability has added importance because of some housing development downstream from the dam.

Stage 2. If the above investigations indicate that the dam site is suitable, diamond drilling should be undertaken. This should be used to examine the material with the intermediate seismic velocity and should extend into the relatively unweathered bedrock. Permeability tests should be undertaken on these holes. The number and location of the holes would depend largely on the results of the first stage investigations.

[5 May 1977]