

Progress report on geological investigations at Risdon Brook dam site

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This dam site is situated on a block of Permian pebbly siltstone of the Ferntree Formation. The block is bounded upstream by a major fault bringing the Permian rocks against Triassic sandstone, and downstream by a small fault which does not have enough displacement to break the stratigraphic sequence. The bedding in the vicinity of the dam site dips at angles between 3° and 13° whilst the strike varies between 160° and 190°. These variations are due to drag on the faults and also to difficulties in recording accurate dips on irregular bedding planes.

The general rock type is a tough, dense, highly siliceous pebbly siltstone. It is made up of small lense like bodies of silty material in a clay size matrix. Probably little true clay minerals are present, the rock being composed of ground up quartz and feldspar. Although the rock itself is thoroughly competent it is divided into a system of irregular blocks by well defined bedding planes and by a strong joint system.

The presence of "clay" seams along the bedding planes, as well as the partings themselves, forms a series of potential shear planes which considerably reduces the shearing resistance of the rocks at the dam site. The "clay" seams are up to 2" thick and are discontinuous and appear to consist of quartz and feldspar without clay minerals.

The joint system is strongly developed and above the permanent water table has been leached allowing water movement along the joint planes.

This depth of weathering varies from about 60' on the western abutment to practically nothing at creek level. Grouting will be necessary to control leakage along these joints but this is not expected to be a major problem.

Faulting

The upstream fault has been exposed in a trench on the eastern abutment. There it is occupied by a thin dolerite dyke which at the surface has almost completely decomposed to clay and secondary minerals, tending to seal off the fault zone. Nothing is known as to the persistence of this dyke or its weathering characteristics at depth. The outcrop pattern of the fault indicates that it is near vertical but precise information is lacking.

Drilling carried out to date has confirmed earlier suggestions of a small fault downstream of the dam. Investigations are currently in hand to determine the position and trend of this fault which does not outcrop. The last drill hole indicates that the fault must have a displacement (downthrown to the north) of at least 60 ft and has limited the possible range of trends. In addition to this a shallow trench is being excavated along the centre line of the proposed dam in order to assure that this fault, or any other small faults, do not intersect the dam axis.

Since the dam is situated in a zone of strong faulting, minor breaks associated with the main fault systems should not be unexpected. In addition to this a detailed investigation of the joint systems is being made to try and relate the joints to the main fracture pattern. Such a study is also necessary in order to formulate the most effective grouting pattern.

Leakage

The possibility of leakage from the storage through the Triassic sandstone has been noted previously. No precise estimate of the amount of leakage, if any, is possible from the existing information. A study of the structural geology along the Grasstree Hill road is being made which may help but it appears that it will be necessary to allow for grouting in this area later, if or when leakage occurs. However, it may be desirable to delay building activity in the area where seepages are likely to emerge.

It is anticipated that the preliminary geological investigations will be completed in about five weeks. Detailed plans and sections together with logs of the bore holes up to date will be available in about three weeks.

General

1. The rock types present in the vicinity of the dam are capable of sustaining the loading imposed by the dam. However the main inhibiting factor is the presence of the thin clay seams along the well developed bedding planes. Ultimately the shearing resistance of the rocks is the shearing resistance of the weakest of these seams. Physical tests, planned on selected blocks, should give an indication of the magnitude of this problem.
2. At least one small fault whose displacement and direction is at present unknown, occurs downstream of the dam site.
3. Leakage from the reservoir is possible through the saddle to Grasstree Hill road but the possible magnitude of this is unknown. It is expected that this can be controlled by grouting.
4. If it is proposed to move the dam the general investigation as to regional structure and lithology would be valid within a restricted area but a new investigation for small scale faulting would be necessary.

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