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R E P O R T

ON THE GEOLOGICAL CONDITIONS AFFECTING DAM CONSTRUCTION AND WATER STORAGE AT THE GLENORCHY RESERVOIR SITES.

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GENERAL GEOLOGICAL STRUCTURE OF THE AREA.

The area which includes the present reservoir site and its proposed enlargement, together with the proposed site of the upper reservoir is geologically simple in structure. It consists of a series of Permo-Carboniferous mudstones, shales and limestones intruded in places by diabase and intersected by faults having a general north-south trend.

GEOLOGICAL CONDITIONS AT PRESENT RESERVOIR.

The site of this reservoir consists of Permo-Carboniferous interbedded mudstones and shales. Diabase occurs near the intake of the supply pipe line in the creek above the reservoir, but does not outcrop on the site itself. The mudstones and shales have a dip of 7° at right angles to the length of the dam and is directed upstream. Although therefore, sliding surfaces may develop on the mudstones consequent on water storage, there is no danger of slipping from this cause as the 7° slope upstream will ensure sufficient support for the dam structure.

Raising of the present dam may therefore be proceeded with, with perfect confidence.

GEOLOGICAL CONDITIONS AT THE UPPER RESERVOIR SITE.

The proposed site for the upper reservoir consists wholly of Permo-Carboniferous interbedded mudstones and shales. The mudstones are moderately compacted, but the shales are more or less fissile argillaceous beds of a very soft and crumbly character. The mudstone beds are from one to two feet thick and the shaly beds of about the same thickness.

Such a rock series is a very unsafe foundation for a concrete dam owing to the fact that the water stored behind such a dam will ultimately convert the argillaceous shaly beds into material of the consistency of soft clay and local collapse and slipping are very likely to take place. It would therefore be unsafe to erect a concrete dam unless very elaborate precautions and safeguards were adopted.

When, however, the question of erecting earth or masonry dams is considered, a definite conclusion is very difficult from the data available. The strike and dip of the strata at the dam site cannot at present be exactly ascertained. In the general vicinity of the reservoir site the beds seem to be practically horizontal

with however a slight variation of about 2° to 5° from the horizontal directed either upstream or downstream, but generally the latter. This matter of the amount and direction of the dip is the all important factor to be taken into consideration in view of the other conditions existing.

If the beds at the dam site are horizontal an earthen or masonry dam is feasible provided that in its design, the calaulation for the width of the base is founded on the figure of 0·3 as the coefficient of friction. This figure is the result of the fact that owing to the penetration of the mudstone and shaly beds by the stored water the latter will ultimately, in places at least, assume the character of soft clay.

If the beds dip upstream the conditions will be quite suitable for earthen or masonry dam construction of proper design, allowance being made in the case of a very low dip for a low coefficient of friction.

If the beds dip downstream it is doubtful whether earthen or masonry dams will be possible. This, however, is dependent on the amount of such dip.

I would therefore advise the sinking of at least three holes at the dam site - one on each slope of the valley towards the top of the dam, and one in the creek bed. Each hole should be about four or five feet wide (working width) in the direction of the length of the dam, but should be from fifteen to twenty feet in length, i.e. in a direction parallel to the stream. They should be sunk to bed-rock, and then continued for a depth of from five to eight feet according to the strata penetrated. In this way the dip of the beds parallel to the stream can be measured.

In view of the local variation in the thickness of the various beds of mudstones and shales, it would be a very difficult matter to obtain this information as to the dip from boring. Although more costly, the sinking of the holes would in this case be more efficient.

There is no danger of a fault plane occurring on the dam site, so there is no need for worry on that score.

The water-holding capacity of the site would be satisfactory.

Lofthus Hills

GOVERNMENT GEOLOGIST.

LAUNCESTON,

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