

UR 1963/83-85

INVESTIGATION ON PROPOSED BRIDGE FROM

83.

DOWSINGS POINT TO COURTOYS POINT

The general geological conditions likely to be encountered in this area have been outlined in a previous report which has been published (Jennings, 1963. p. 90). Since then six bore holes have been put down to determine the feasibility of establishing foundation conditions for a concrete pier for the lift span of a floating arch bridge. The results of this drilling are indicated on the enclosed plans and are summarized below.

Holes Nos. 1 and 2 were drilled near the Western shore at the most promising site with respect to the shipping channel. No. 1 hole encountered unconsolidated silts and muds to a depth of 143 feet and after passing through 2 feet of yellow clay ran into sandstone and shale bedrock at 146 feet. Hole No. 2 was in unconsolidated material to a depth of 161 feet before passing into sandstone and shale. These holes were drilled entirely with a percussion rig and no detailed information was obtained concerning the recent deposits. However, from general observations made together with the driller's reports it appears that this material is relatively unconsolidated and could not be considered as a foundation medium. Since it appeared impracticable to continue investigations in this area the plant was moved to the Eastern shore and further boring carried out in the vicinity of Courtoy's Point.

Hole No. 3 encountered soft unconsolidated material to a depth of 48 feet, from 48 to 59 feet the material was described as soft clay with shingle passing into a firmer sandy clay from 59 to 66 feet. Below 66 feet the hole was in bedrock consisting of sandstone and shale. No. 4 hole was in unconsolidated material to 46 feet and then ⁱⁿ clay and shingle to 55 feet at which point the hole was lost due to poor weather conditions. No. 5 hole was in recent silts etc. to 60 feet and clay and shingle to 75 feet after which sandstone and shales were encountered. A detailed log of the solid rock portion of this hole is appended. No. 6 hole was in silts etc. to 37 feet, clay and shingle to 45 feet and bedrock of sandstone - shale below this to at least 79 feet. A correction due to tidal influence of 3 feet for hole No. 5 and 2 feet for No. 6 has been incorporated in the section but not in the detailed logs.

To summarize the present position:- the drilling has disclosed that foundation conditions near the western shore are located between 145 and 160 feet below MTL whilst on the eastern shore bedrock has been established between 45 and 66 feet.

Geology of the bedrock.

In all cases the bedrock encountered was sandstone and shale of Triassic age. On the western shore the drilling has simply provided information as to the depth to the rock but no useful information as to the geological structure or detailed stratigraphy of the rocks is available.

On the eastern shore a section through portion of the Triassic sequence is exposed along the shoreline and

has been plotted on the accompanying map. The rocks consist of interbedded sandstones and shales which are faulted in places and also contain minor dolerite intrusions. In the sandstone beds the bedding is disturbed by large scale cross bedding but away from the faults the general dip of the bedding is to the west at angles between 7° and 12° . It may be noted that on Courtoys Point the dips are somewhat irregular. This could be due to one or more of the following conditions:-

- (1) The cross bedding mentioned previously which is particularly noticeable in that area.
- (2) Small faults not exposed on the shoreline section.
- (3) Minor dolerite intrusions at shallow depths.

The cores obtained in holes 5 and 6 bear out the general observations made along the shoreline. The dips are variable but average between 5 and 10 degrees. Cross bedding, slump structures, washout structures and clay pellet conglomerate bands were observed in the core. No correlation could be established between individual beds encountered in the drill holes and on the shoreline. This is to be expected as correlations in these particular rocks are notoriously unreliable and the beds vary in thickness and character over quite short distances. The general observation was made that the sandstone content of the sequence in the bore holes appeared to be somewhat thicker than that exposed along the shore. Shaly partings between sandstone beds were noted both along the shore and in the drill cores.

Engineering Geology.

(1) Western abutment.

On this side of the river it has been established that the shoreline around Dowsing Point is in dolerite and that fairly close in shore the bedrock consists of sandstone and shale at a depth of more than 150 feet below MTL. The simplest explanation is that the dolerite sill overlies the Triassic sediments conformably is tilted to the west.

The available information suggests that the bedrock may be eroded to considerable depths very close to the shore of Dowsing Point. Thus we may have a block of dolerite along a buried cliff face, underlain at depth by Triassic sandstone and shale. If the westerly dip from Courtoy's Point persists right across the river this would improve the stability of this area. At this stage it can only be said that it appears to be feasible to construct an abutment on this point but that a good deal more detailed investigation is still required.

(2) Courtoys Point.

The drilling and surface geology in this vicinity has established that the bedrock consists of interbedded sandstones and shales dipping to the west at angles between 7° and 12° and located between 45 feet and 66 feet below MTL. These rocks are expected to carry the loadings envisaged without difficulty. However, the shales and sandstones are comparatively weak parallel to the bedding planes due to the shaly partings between beds. Thus the dip of the beds will have a considerable effect on the stability of the rocks. The westerly dip would serve to increase the shearing resis-

tance to thrusts imposed by the arch due to the normal river currents or northerly winds. However, thrusts resulting from flood tides and southerly weather would produce stresses parallel to the bedding and directed down dip. An analysis of the stresses to which this pier is likely to be subjected is therefore indicated.

The present drilling program has indicated rock within an economic depth in the vicinity of the proposed pier. It will be necessary before final planning is proceeded with, to establish that the bedrock remains at a reasonable level for some distance to the west of the pier. This is particularly important in view of the influence of the dip of the bedding on the shearing resistance of these rocks, as noted earlier.

Summary.

The investigations have revealed that rock having adequate bearing capacity is available reasonably close to the surface near the eastern shore of the river. This establishes the feasibility of the project. However, it is clear that before planning and design can be carried much further a good deal more information will be required. This is needed to clarify the following points:-

- (1) The dip of the bedrock in the vicinity of Dowsing Point.
- (2) The sub surface rock profile from the shore at Dowsing Point out to Bore holes 1 and 2.
- (3) The sub surface rock profile for some distance to the west of the lift span pier off Courtoys Point.

A study should also be made of the stresses to which the lift span pier is likely to be subjected under extreme conditions of southerly weather combined with the largest incoming tide.


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