

The original owners should be given grazing-rights and access to the river, but should not be permitted to plant trees or erect anything which might obstruct the flood-waters. Nothing but the very lightest of boundary-fences should be allowed.

Stage 2: As soon as the temporary work indicated above is completed, or simultaneously with its construction (if this can be done without the chance of any delay to the temporary work), the raising of the banks to the permanent levels and dimensions could be put in hand. The permanent levels are as follows: Top level at Ngahina 112.00, and top level at a point thirteen miles below Ngahina Bridge 100.00. This work should be done by dredging from the present river-bed as uniformly as possible in such a way as to increase the central depth without unnecessarily widening the channel. This is indicated on the cross-section herewith. The dredged material should be deposited at the back of the temporary banks by hydraulic filling, and carried to the heights and slopes necessary to form the ultimate stop-banks. As a large amount of material has to be dredged, no economy would result from skimping the cross-section of the bank. If constructed with a top width of 20 ft. and side batters of 3 to 1, the material required for them will practically balance the amount to be moved by the dredges. Where, owing to the amplitude of the present cross-section of the river, less dredging is required, the banks might be reduced to 8 ft. on top, with the same batters. In order that the work of erecting the final banks should be completed within a reasonable time two pump dredges should be obtained and worked continuously from the Ngahina end. Before commencing the continuous dredging-work referred to one or both of the dredges should be employed for a short time, and at as early a date as possible, in deepening the worst of the shoals which exist at the present time, more especially just below Ngahina Bridge, and at points seven, eleven, and fifteen miles below the bridge. This work is not in the interests of navigation only, because these shoals are obstacles to the free flow of flood-waters, and if they are removed and an approximately even bottom grade of the river thus obtained a great deal more natural detritus and mining tailings will be carried to sea than is now the case.

In addition to the benefit which the dredging will afford to navigation and flood-discharge, there is another aspect which, although not coming under the head of flood-discharge, is a matter of vital importance to the district—that is, the necessity for maintaining an adequate low-water-discharge level for land-drainage. If by reason of shoals or otherwise the low-water level rises to such an extent that an adequate outfall cannot be obtained for the purpose of draining the land, then the value of the flood-protection works would be practically negligible. Evidence was given that shoaling had already caused a rising of the low-water level which was perceptible in the past ten years.

As the main dredging proceeds, the permanent culverts and flood-gates should be installed ahead of the work, if not done under the preliminary stage, and all regrading of roads necessary to give crossings over the stop-banks, &c., should be done as much as possible with the dredged material. Although the Commission's order of reference does not touch on the drainage-works and the floods in the tributaries of the river below Ngahina Bridge, it will be necessary to deal with these questions as the final work proceeds down-stream.

Temporary stop-banks as recommended for the main river should be carried up the sides of Komata and Hikutaia Creeks as far as may be necessary to prevent flood-waters backing over the land through the openings presented by the outlets of these streams.

As the permanent river levees are raised, the same should be done with the temporary banks along these streams; but this work could probably best be done with ploughs and scoops or the small steam shovels previously referred to. The material to be used being entirely different from the loose river-sand, these banks would be adequate if built with a width of 5 ft. on top and side slopes of 2 to 1.

It may be argued that the cross-sectional area obtained by the dredging referred to will fill up with natural detritus and tailings coming down the river, but your Commissioners consider that the regrading of the river to an even grade, and the confining of the flood-waters to a regular width, combined with the deeper midstream channel obtained, will so improve the transporting-power of the river