

The evidence and their own investigations have convinced your Commissioners that they are justified in stressing the question of navigation, even though it is not specially mentioned in the order of reference.

REFERENCE NO. 1.

To inquire into the best means of controlling the Waihou River below the Ngahina Bridge so as to mitigate or prevent, either partially or entirely, the flooding of adjacent lands.

After full consideration your Commissioners conclude that a combination of dredging and stop-banking will be most advantageous. The Commission advocates placing the stop-banks within approximately 2 chains of the river-bank. This distance may be less in places, but must be sufficient to enable material to be excavated and the bank built to the ultimate dimension. The works should be constructed in stages, as below :—

Stage 1: Very temporary stop-banks with natural batters approximately $1\frac{1}{2}$ to 1 and a top width of 4 ft. should be constructed on both sides of the river from borrow-pits along the river-side of the proposed final levees. These would give temporary partial protection at the earliest possible date; the banks so formed would be part of the final banks, and would serve to retain the dredgings by which these latter would be made. At the same time their cross-section would be such that there would be no chance of the impression getting abroad that it was a finished work. The temporary bank would be graded from a top level of 108.25 at Ngahina Bridge to a top level of 100.00 at a point twelve miles below. These levels are in terms of the Ngahina Bridge datum—B.M. 30 on left bank of river 2 chains above bridge, $1\frac{1}{2}$ chains from bank, reduced level 102.14. The banks should be aligned as shown approximately on plan numbered (1) herewith, the distance apart of the two stop-banks being about 440 ft. just below Ngahina Wharf, and gradually diverging down-stream. The minor irregularities of the natural bank would not be followed.

The present bridge at Ngahina, particularly the central pier of the swing span, offers such an obstruction to the flow of the water that it would not be possible to bring in the banks to the spacing of 440 ft. recommended until a short distance below the new Ngahina Wharf. Unless ample width of waterway is allowed at this bridge by considerably lengthening the present structure a further raising of the flood level of the river above Ngahina cannot be avoided.

Culverts with flood-gates must be provided where necessary to deal with the drainage of adjacent lands. Pending the final construction of the stop-banks to their ultimate heights, widths, and slopes these sluice-boxes or culverts may be of a temporary character, and constructed of timber at a small cost. If no delay to the rapid construction of the temporary banks will thereby be occasioned these culverts and gates could be built of a reduced length, but of full cross-section and of permanent material. If, however, any delay is likely, then they should be built in a temporary manner as above.

As the whole essence of your Commissioners' recommendations is the provision of rapid temporary protection, all available ploughs and scoops should be started at the down-stream end on the low banks, and two small (18-ton) steam shovels of 50-cubic-yards-per-hour capacity and with a working radius of 25 ft. should be ordered at once by cable, and on arrival should be started at the Ngahina end, working down-stream to meet the scoop gangs. These steam shovels should have traction wheels or caterpillars; otherwise they should be similar to those now successfully being used on railway-construction. When their work at Waihou is done they should be good value for transfer to other construction-works.

The work indicated above, provided the steam shovels are delivered within six months, should easily be completed in two years. These banks would give fair protection against floods not exceeding 20,000 cubic feet per second, but would not be of nearly sufficient strength to be secure against breaching in places, even if not actually overtopped.

The witnesses who appeared before the Commission expressed their readiness to give, free of cost, the land for the stop-banks if these were placed as suggested herein, and your Commissioners consider that it would not be unreasonable to expect all the riparian owners to do likewise.