

whole filled in solid, as the work proceeds, with boulder stones from Kanieri, the latter being capped or paved with blocks of Portland-cement concrete. Full details of this structure are shown on Figures 4 and 5, Drawing No. 3. To protect the feet of the piles from abnormal scour on the river sides of both the east and west piers I propose to form an apron of bags of concrete, as indicated in the drawings; but a coating of this character will not be required along the footings at the back of these works, at all events not in the case of the west pier, southward of which the beach may be expected to accumulate with rapidity. It will be observed that the west pier overlaps the east to the extent of 300 feet: this will be necessary in order to provide for the permanence of the depth in the entrance, which, under ordinary conditions, should be about 10 to 12 feet at low water of spring tides.

The east pier will be subjected to very heavy seas striking it at an unfavourable angle, hence I have considered it necessary to proportion the strength of that work accordingly. To prevent undue scouring of the beach seaward of this pier by "run" and rebound, I have provided for the formation of a "wave-breaker" of blocks of cement-concrete, deposited pell-mell on the foreshore immediately seaward of the main structure.

To "fix" the beach northward of the entrance, and to prevent the encroachment of the sea in front of the town, I have laid down on the plan and shown in detail on Drawing No. 3 a series of wood groynes, which, although not of an expensive character, will be found of material service in securing the foreshore.

I have already alluded to the fortunate circumstance that the riverside frontage of the town presents a concave curve, along which the currents would insure the maintenance of the deepest water. For this reason it appears unnecessary to provide a training bank along the south margin of the channel, seeing that the concave curve will compel the current, in its passage seaward, to set hardest along the navigable track, and hence but little (if any) further improvement of depth would result from the formation of a second bank on the south side parallel to the existing face.

The only other works which I have to recommend are those necessary for the training of the river and tidal currents under ordinary conditions. They are shown on Drawing No. 1, and need no detailed description, except that they might, with advantage, be protected on the up-stream side by brushwood, embedded in the material of which the banks proper are to be formed. It will be observed that the top of the training bank opposite Sale Street is described as at the level of high water of spring tides: thus, whilst this bank will be of service in training and concentrating the currents under ordinary conditions, it will admit of the ready escape seaward of flood waters.

Estimates.

I estimate the cost of the proposed works as follows:—

	£
1. East pier, 660 feet in length, with wave-breaker of pell-mell concrete blocks, and apron of concrete bags, as described	86,750
2. Six groynes along the sea-front, northward of the east pier	3,500
3. Training sheeting south side of entrance, 680 feet in length, with wing-groin complete	8,100
4. West pier, 500 feet in length, with apron formed of bags of concrete on the river-side	28,450
Total estimated cost of works in connection with the improvement of the river entrance	£126,800
Training banks near Wadeson's Island, and at the Ferry	3,600
Gross total of estimate	£130,400

The foregoing estimates include a fair allowance for contingencies and supervision, as well as for the provision of plant. The quantities of work of the respective kinds have been computed from the detailed views shown on Drawing No. 3, and the rates at which the quantities thus arrived at have been moneyed out, are based upon the local prices of labour and materials furnished from the colony.

The mode of construction contemplated is certainly not extravagant; and the works proposed, if carried out as recommended, would be found well adapted to meet the requirements of the case. I am of opinion that less substantial structures would give rise to constant anxiety and expense; nor could training-works of less length be relied upon for the maintenance of a deep-water entrance. Whilst, therefore, I can say with confidence that the works suggested are neither stronger nor more substantial than experience has shown to be necessary, it is my duty to point out that the rates furnished to me from the colony (upon which, as I have stated, the estimates have been based) are such as to render it not improbable that the piers and works could be executed for a less total sum than hereinbefore stated.

The observations made at my request have shown, as I anticipated at the time of my examination of the locality, that the present very restricted navigation of the Mahinapua River may be materially improved by a comparatively small outlay. Having regard to the fact that the Harbour Board's endowment land is situated at the extreme southern end of the lake, that the communication by road between the harbour and this endowment land and the neighbouring town of Ross is circuitous, and that the levels of the country are such as to render the cost of conveyance from the harbour very heavy, it certainly is desirable, in my opinion, that the navigation of the Mahinapua River should be improved, seeing that it would greatly enhance the value of the Board's property, and would have the further advantage of placing the whole of the land around the margin of the lake (which is six miles in circumference) in direct communication with the harbour, by means of barges of considerable tonnage.

The works for the attainment of this object are shown by red colour on Drawing No. 2. The quantity of dredging would not be large, and, as will be seen, there would be a navigable depth, after completion, of from 5½ to 5½ feet at high water of neap tides, and not less than 6 feet in any part at high water of spring tides, and when the water in the lake is at its ordinary level. The plan, Figure 1, shows the improved lines of river course, and it will be seen that provision is made for a towing-path