1881.

NEW ZEALAND.

THE HARBOURS OF NEW ZEALAND

(FURTHER REPORTS ON, BY SIR JOHN COODE, C.E.).

[In continuation of H.–19.]

Presented to both Houses of the General Assembly by Command of His Excellency.

WAIROA RIVER (HAWKE'S BAY).

SIR,— 5, Westminster Chambers, London, S.W., July, 1881.

After inspecting the Port of Napier, and when proceeding therefrom in the s.s. "Hinemoa," Captain Fairchild, to Gisborne, in Poverty Bay, I called off the Wairoa entrance, but found the surf on the beach too heavy to admit of landing in any boat belonging to the steamer without serious risk: moreover, if I could have effected a landing it was considered by no means improbable that, during the time requisite for an inspection of the tidal compartment of the river, the surf might have increased to such an extent as to prevent my embarking again even for several days. In view of the necessity of my leaving for England within a week from that time, such an occurrence would have prevented my visiting either Gisborne, Tauranga, or the Thames, all of which I was able to accomplish before reaching Auckland.

Shortly after our arrival Mr. H. Williams, Secretary to the Wairoa County Council, came off in a pilot-boat, accompanied by the Maori pilot David Jones, who had acted in that capacity for about six years previously

By means of information obtained from Captain Fairchild and the pilot, and also from Mr. Burton, Chairman of the Wairoa County Council, and from Mr. Williams, I was enabled before leaving New Zealand to frame a memorandum showing the character and extent of the data (in the shape of a plan, sections, &c., &c.) which would be requisite to enable me to study this matter in all its bearings.

A complete and evidently very accurate survey, with sections, probings, and current observations, in accordance with my memorandum above referred to, has been made by Mr. Edgar Jones and forwarded to me. For convenience of study, I have had all the information thus supplied rearranged and condensed, and send herewith the plan portion, which is sufficient for the purpose of illustrating this report.

The pilot Jones stated that on three or four occasions within the previous six years, during which he had been in charge, he had known as much as 20 feet of water in the entrance after a "fresh." Captain Fairchild informed me that in the year 1863 he found about 18 feet of water at high water at the Wairoa entrance, and that this depth did not vary greatly for a period of two years. The navigation of the Wairoa entrance is however evidently subject to great fluctuations, seeing that, according to Mr. Williams's statement, the river, on the average of years of late, has been open only to steamers of very small draught—about 4 or 5 feet—for about nine months out of the twelve, although it had on some occasions been known to remain open for two or three years continuously

In a memorandum kindly furnished by Mr. Burton when I was in the colony, it is stated that the bed of the river immediately within the gravel-bank, and for a considerable distance above it, has been much raised of late years by the deposit of mud brought down the river by freshets. I may remark that the sections of the river-bed certainly appear to substantiate this view, and may add that some facts mentioned by Captain Fairchild serve to show that this deposit has become so tenacious that it is very doubtful whether the scouring action of the currents will alone suffice to restore the former depth.

The observations of Mr. Edgar Jones have established the fact that the normal current on the ebb-tide runs out at the rate of 4 knots per hour, and that the flood runs inward at the rate of 1½ knots per hour. As was remarked to me by Captain Fairchild, the Wairoa, in this respect, differs from the rivers on the west coast of the South Island—which I had then recently visited—inasmuch as at the Wairoa there is stated to be a strong ingoing current on the flood-tide for at least half the year, and during a great part of the remaining six months the inward current runs at a moderate rate during the flood-tide.

Having regard to the remarkable character of the material of which the beach is composed—namely, of small particles, round in shape, and very uniform in size, and, consequently, very easily moved—and bearing in mind that the entrance is exposed to the full force of the ocean swell, it will be obvious that, under these conditions, the mouth of the Wairoa, so long as it remains unaided by

artificial works, must of necessity be subject to obstruction to a serious extent, and sometimes to being absolutely blocked.

We are thus led up to the important question whether the entrance, and the river within up to the second reach opposite the Marine Parade, can be so far improved at a reasonable outlay as to be rendered uninterruptedly and permanently navigable by such small coasting steamers as might be expected to frequent the port were the requisite facilities afforded.

After careful consideration, I am of opinion that this question may be answered in the affirmative, and that it will be quite practicable, by the execution of the works about to be described, to form and keep open a permanent entrance, having such a depth as will meet all the reasonable requirements of the case.

Works Recommended.

The works I have to put forward for execution are shown by red colour on the accompanying drawing. They may be carried out in two instalments: the first with the object of confining, training, and fixing the run of the tidal and fresh-water currents, and thus of utilizing them in scouring and permanently keeping open a channel and entrance through the shingle spit; the second instalment, to be undertaken hereafter when the requirements of the locality may justify the further expenditure required, would consist of the prolongation seawards of the training and controlling works, with a view to the creation of an increased depth in the entrance channel.

First Instalment of Proposed Works.

These would consist of a training-bank of fascine works, having its top about 2 feet above flood-level, commencing at the point A on the west side of the entrance, and extending therefrom for a length of 2,400 feet to B; from this latter point to C, a length of 500 feet, the works on this side of the channel would consist of two parallel rows of close piling driven about 15 feet apart, having battered faces, and connected at each bay by suitable diagonal and horizontal ties. This structure would be generally similar to the inner portions of the east and west moles at Napier; except that at Wairoa, in the absence of rubble-stone, I would fill in between the piling with faggots and clay up to low-water level, and with clay and shingle, well rammed and consolidated, above that level.

On the east side the works would commence at the point E, starting from the left margin of the river, and extending therefrom as a training-bank of fascine work similar to that on the west side for a length of 2,450 feet. There would then be an opening of 160 feet in width to drain the bight inside or to the northward of the shingle spit, and the low lands which discharge their drainage waters therein. Seaward of this opening there would be a further length of 350 feet of fascine embankment, terminating at the point F; but the top, in this case, would be carried to half-tide level only, to aid the opening just described in the drainage of the bight. From F, for a length of 400 feet seaward to G, the work would consist of a piled structure formed and filled in as described for the corresponding portion on the opposite side of the channel. In this manner a permanent entrance would be formed of 530 feet in width between points C and G on the plan, being the outer terminations of the works recommended for construction as a first instalment of the proposed improvements.

I estimate the cost of the foregoing as follows:—

	£	£
Works West Side of Entrance—		
Fascine training-bank, 2,400 feet in length . ..	15,177	
Inner portion of pier B to C, 500 feet in length	15,323	
		30,500
Works East Side of Entrance—		
Two fascine training-banks, together 2,800 feet in length ...	16,612	
Inner portion of pier, F to G, 400 feet in length ...	12,366	
		28,978
		£59,478

For the expenditure of, say, £59,500 upon the works I have described above and shown on the accompanying drawing, it will thus be possible to form a permanent entrance to the river having a depth of from 12 to 14 feet at high water of spring tides, assuming the rise of those tides to be 7 feet 3 inches. Such an entrance would be ample for all the present requirements of the locality, and could not fail to be of immense service in the development of the fertile tracts of land which abut on the Wairoa and its tributaries. Upon the completion of the first instalment of the improvements, the depth in the entrance would inevitably be subject to some fluctuations; but, nevertheless, I am of opinion that the scour of the tidal and fresh waters could be relied upon for the maintenance of a depth in the opening to about the extent above named.

The embankments of fascines would be deposited in layers, each weighted down by clay and grass sods, and would form compact and thoroughly satisfactory training-barriers on the silt and shingle bottom existing at the mouth of the river; moreover, they would be far more economical than any other satisfactory form of embankment, in the absence of suitable rubble-stone in the locality.

Second Instalment of Proposed Works.

The second instalment or extension of the proposed works of improvement would consist of the prolongation of the piers on each side of the entrance—viz., from C to D, for a length of 550 feet on the west side, and from G to H, 330 feet, on the east side. It will be observed that the western work would overlap the eastern to some extent, and that the clear width between the piers on the completion of the extensions would be 450 feet, the aspect or direction of the opening being south-south-east. There would be a small cast-iron lighthouse with argand burners and suitable reflecting apparatus at the end of the west pier.

Both extensions would consist of close whole-timber piling, the bays or distance apart of the braced frame being 8 feet from centre to centre, and 31 feet in width transversely to the respective lines of the piers from outside to outside of the piles at the top level. Three piles with suitable horizontal and diagonal ties would form each bay Between the outer main or "bay" piles, the sides of the piers would consist of close whole-timber sheeting, driven to a depth of about 8 feet below the future bed of the channel in the entrance, or to 17 feet below low-water level. The hearting or spaces between the piles should consist of rubble-stone, if suitable material can be obtained at a less cost than small concrete blocks, failing which the latter should be employed. The top of the piers would be battened down at intervals of 2 feet by the upper horizontal ties, and by special athwart half-timbers. I may mention that the above mode of construction is very similar to that which was successfully executed by Mr. Carruthers at Napier, but somewhat heavier to suit the altered conditions of exposure.

The depth in the entrance on the complete execution of the extensions would be about 9 feet at low water, or 16 feet at high water of spring tides, and the fluctuations in this depth in consequence of the disturbances of the shingle by gales would of course be less in extent, and of less frequent occurrence, than would be experienced upon the completion of the works contemplated under the first instalment.

It is desirable that I should here refer to the width of 450 feet being subject to some modification, either by increase or diminution, should experience show that a change is necessary The lines of the works have been so devised as to admit of the width of the opening being determined as may appear desirable, although calculation and the results of somewhat analogous cases point to 450 feet or thereabouts as being correct.

In view of the uncertainties which attend the procuring of suitable stone in the locality, I have not considered it desirable to name a sum as the estimated cost of the works comprising the second instalment of the improvements. Should these works be ultimately decided upon, it will be requisite that the district should be thoroughly explored, with a view to ascertain if rubble-stone for filling the piers cannot be obtained at a reasonable cost.

Future Channels.

I have shown upon the plan, by crossed red lines, the position of a future channel with half-tide training-banks on either side. These would not, of course, be executed until required and justified by the requirements of trade. It is highly probable that the scour of the currents would require some aid from dredging for the formation of a satisfactory channel throughout the length indicated, but its maintenance when once formed would, I believe, be effected by the scour alone.

Future Wharfage.

I have also indicated upon the plan the best position for a line of future wharfage along the face of a portion of the Marine Parade on the south bank of the Wairoa above the bend. The river at this point would always afford a sufficient depth of water in front of the wharves.

Protection of River-bank at Bend.

Should the river currents prove to be cutting into the concave face of the bank at the bend, which seems probable from the plans, then the bank where so affected should be protected at an early date by a facing of faggots weighted and backed by clay or other suitable material, the top of the fascine protection being carried above the highest recorded flood level.

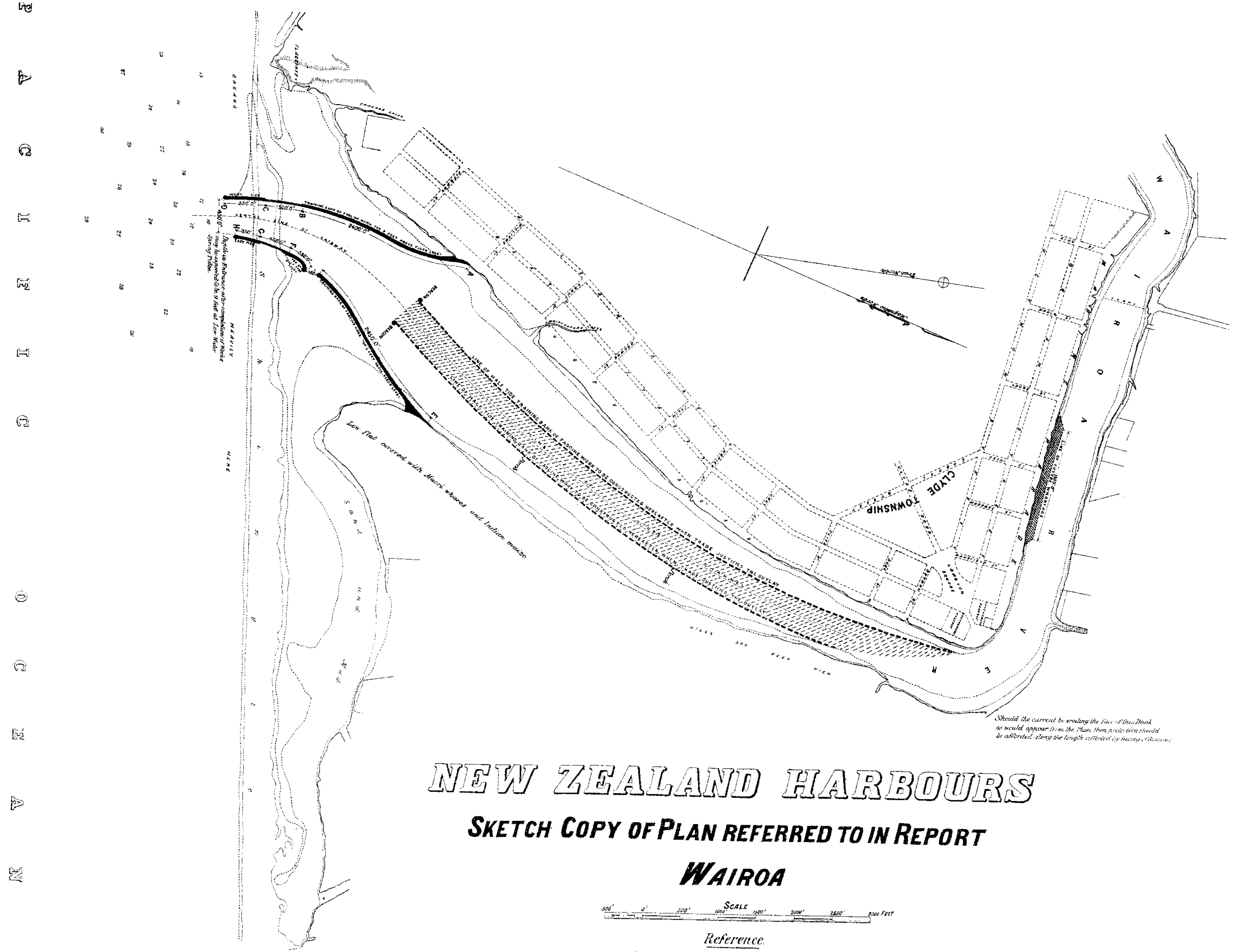
Modification of Bend.

I have not put forward any proposal for flattening or otherwise modifying the abrupt bend in the course of the river near Clyde Township. The requirements of the case certainly do not call for any remedial measures at present, nor are they likely to be required in the immediate future, especially as the observations taken by Mr. Jones clearly show that the bend does not interfere with the tidal development in the river, the seaward compartment of which is now perfectly filled each tide.

I have, &c.,

The Secretary, Marine Department, Wellington, New Zealand. JOHN COODE.

By Authority: GEORGE DIDSBURY, Government Printer, Wellington.—1881.



NEW ZEALAND HARBOURS

SKETCH COPY OF PLAN REFERRED TO IN REPORT

WAIROA

SCALE
500' 0' 500' 1000' 1500' 2000' 2500' 3000 FEET

Reference.

Shewn thus ▬ ▬ ▬ ////// *indicates red.*