

and extending for some years past. The increased scour produced by the training of the channel at this point, aided by partial dredging, would remove this shoal, and thereafter the improved outgoing currents might be relied on to prevent its reformation.

*Works at Entrance.*—With respect to external works it is no more than reasonable to anticipate that the development of the coal trade of this district will, before a lapse of very many years, render it desirable still further to increase the capabilities of the port. This being so, I have shown on Drawings Nos. 1 and 2 future extensions of 300 feet in the case of each of the breakwaters, the termination of the first instalment of the north arm being adapted to admit of subsequent prolongation in a direction parallel to the work on the south side. The effect of these extensions, after a time, would be the formation of a navigable channel, having a depth of 13 feet at low water and 21 feet at high water of spring tides, sufficient for the navigation of vessels drawing 15 feet, allowing 6 feet for "scend" or undulation, but, as before mentioned, ordinarily a margin of from 3 to 4 feet will be sufficient.

*Improvement of Lagoon Channel.*—As tending to increase the scouring action through the sea-entrance, and at the same time to the opening up of a better water communication between Karoro Lake and the harbour, I regard an improvement of the lagoon channel as a very desirable work, and one that should not be long deferred. The suggested line of channel is shown upon Drawing No. 1, and I would recommend that the depth along it should be so increased as to give at least 3 feet at low water of spring tides at the junction of the rivers, and that the bottom thence into Karoro Lake should be dredged so far as may be necessary to form a gradient of 12 inches to the mile. A possible effect of this improvement in the channel might be to admit the water more freely into Karoro Lake in times of excessive floods. It will be desirable, therefore, to ascertain whether any of the land along its eastern margin would be below the flood lines; and, if so, a low protection bank should be provided. This could probably be done at a nominal outlay by means of the materials raised in the process of dredging the channel. By the execution of this channel the tidal volume in the Karoro Lake and Revell's Lagoon, taken together, would be increased to the extent of 5,400,000 cubic feet at every ordinary spring tide, equivalent to an addition of 8 per cent. of the total tidal volume passing inwards and outwards twice daily from the River Grey and the lagoons combined, or 21 per cent. of the quantity now passing into and out from the lake and lagoon, exclusive of the river, an important addition to the scouring power, more especially as it would be available when most required—viz., during periods of drought and scarcity of fresh-water discharge.

Before concluding, I may remark that, in view of the more than probable great future development of the coal mines of the surrounding district, the time may be anticipated when the trade of the port shall outgrow the quay accommodation which it is possible to provide along the river front. I would therefore suggest that all the land seaward of the eastern margin of the Karoro Lake, and channel leading thereto, which may not have already been disposed of, should be scrupulously reserved for the construction of docks when the necessity may arise.

In conclusion, I have great pleasure in acknowledging the cordial co-operation of Mr. Blackett, C.E., Chief Marine Engineer of the colony, who accompanied me during my inspection, and rendered all possible assistance in making the local inquiry. My acknowledgments are also due to Mr. O'Connor, C.E., under whose direction the observations and documents transmitted from the colony have been prepared in an able and painstaking manner; Mr. Johnstone, Resident Engineer, also assisted. Captain Allardyce, Harbourmaster, rendered me valuable assistance during my inspection of the port and river. My obligations are also due to Mr. Nancarrow, Mayor of Greymouth, who, at the time of my visit, kindly assisted in making arrangements for facilitating the requisite inspection.

I have, &c.,

The Secretary, Marine Department, Wellington.

JOHN COODE.

## HOKITIKA.

SIR,—

5, Westminster Chambers, London, S.W., August, 1879.

I have now the honor to forward my report upon the subject of the improvement of the entrance and tidal compartments of the Hokitika River, together with three illustrative drawings, viz.:—

No. 1, a general plan of the harbour, showing the entrance, and the respective low-water channels, about half-way to Kanieri. No. 2, a sheet containing a general plan of the Mahinapua River and Lake, with sections, hereinafter more particularly described. And No. 3, a drawing showing details of the works recommended for execution.

I need only remark further, by way of introduction, that the primary objects to be attained in this case are: First, the placing of the river entrance in such a position, and forming it in such a manner, as shall utilize to the fullest possible extent the scouring action of the tidal and fresh waters, by directing the currents in the most effective lines, and confining them to a permanent track through the sand-spit and across the bar; and, secondly, the restriction and training of the river channel within definite limits, so that the fresh water and tidal currents shall create and maintain, or at least that they shall assist to the fullest possible extent in creating and maintaining, deep water alongside the wharves already existing and hereafter to be constructed upon the river-frontage of the town.

To arrive at definite conclusions in this exceptional case, I found it necessary, after my inspection of the locality, to request that a special series of observations should be made, in order to ascertain the relative levels or gradients of the water surface at the different stages of the tide, and in times of fresh-water "floods," both within the tidal compartment of the Hokitika River proper, and throughout the entire length of the Mahinapua River, and for a short distance into the lake. It was also necessary to obtain a detailed plan with longitudinal and transverse sections of the Mahinapua River, a work of no small difficulty and labour; and I desire here to express my sense of the entirely satisfactory manner in which these services have been performed by Mr. O'Connor, District Engineer, and Mr. Campbell, the assistant acting under him.