

In regard to the quantity of material to be removed, the following side slopes were suggested as a basis of calculation: 1 in 3, 1 in 5, 1 in 10, and 1 in 200. On these figures the widths of channel where the water is shallowest would be, taking depths of cutting as 14 ft. 6 in. to obtain 34 ft. of water,—

				1 in 3. Ft.	1 in 5. Ft.	1 in 10. Ft.	1 in 200. Ft.
Top width	..	..	..	687	747	890	6,400
Bottom..	..	..	..	600	600	600	600
Average	..	..	..	644	674	759	3,500

We are of the opinion that to avoid the danger of an inconvenient amount of siltation taking place after the desired width of 600 ft. has been obtained and during the construction of the channel, and also subsequently to avoid constant maintenance dredging, the side slopes would have to be not less than 1 in 40. The quantity of material to be removed to provide for this at a depth of 34 ft. at low water would be 1,673,198 cubic yards. We use Mr. Holmes's unit price of 1s. 3d., which under the circumstances we do not consider high. The resultant cost would be £104,575.

However, in conclusion, we would say that, in our opinion, moles are required, as the only sure and safe way to protect a dredge employed upon constructing the channel, to economize in width of channel required, to reduce to a minimum possible maintenance dredging, to ensure the channel always remaining navigable, to protect the Inner Harbour from inconvenient range, to facilitate navigation of the channel by large vessels, and to allow of the present entrance being opened sufficiently to reduce the velocity so that vessels drawing at least 26 ft. could enter or leave at any stage of the tide, day or night. To afford this measure of protection these moles would have to extend into 34 ft. of water, they would be some 6,000 ft. long, and so placed that they would dissipate the range before it reached the Inner Harbour entrance. The approximate cost of these moles would be £500,000, plus the cost of dredging whatever width of channel is finally decided upon.

DREDGING BETWEEN MOLES.

The moles protecting the present entrance channel to the Inner Harbour are 400 ft. apart, and the velocity of the tidal current between high and low water and slack water varies from nil to from 5 to 6 knots. The channel is 1,450 ft. long, and the least depth at low water is 15 ft. From approximately the north end of the freezing-works to the end of the west mole, about 800 ft., the borings taken by Mr. Pengelly show that from the present bottom, 15 ft. to 18 ft. below low water, the material to be dredged to provide 34 ft. or 35 ft. of water largely consists of boulders and some shingle. From the north end of the Iron Pot to the north end of the freezing-works the borings show some 5 ft. of shingle overlaying silt.

The chief difficulty in dredging this channel is that the velocity of the current precludes a dredge from being moored without the mooring-chains extending the whole width across the channel, rendering it useless for navigation by any boat or vessel. Mr. Pengelly states (on page 85) that to keep his boring-punt in position he had to use five moorings. Sometimes one and at other times two of these were fixed on shore (page 82). He mentions that his anchors dragged, and that, in his opinion, it would be very difficult indeed to hold a dredge of any size in the channel between the moles. Mr. Pengelly (on page 80) stated that the boulders would be up to about 1 ton in weight. Mr. T. W. Martin, dredge superintendent, was examined in reference to dredging the channel between the moles. On page 370 he states that the captain of the "Whakarire" refused to come in close to the pier-heads at the Inner Harbour unless at slack water; and on page 371, in reply to the Chairman, he stated, "if leaving the moorings in the channel with load, the lines would have to be slipped ashore; if chains used, you could slip and get away in twenty minutes. (Dredge-chains could not be used in this channel.) It depends upon the tide as to the time taken to pick up moorings again; it might take all day or a week to pick up moorings with a 6-knot current. I do not know how I could do it."

Mr. Nicholson, foreman and leading carpenter to the Napier Harbour Board, described the attempt made by the Board about 1922 to dredge this channel with a grab dredge erected on a timber pier which extended towards the centre of channel at right angles to the eastern mole. The result of the experiment was a hole 10 ft. deep by 80 ft. by 108 ft. The outer edge of this hole when dredging was discontinued was about 138 ft. out from the west mole. On page 166 Mr. Nicholson stated that he believed that the reason the work was stopped was that it interfered with navigation.

Your Commissioners consider that the class of dredge required to remove the boulders, which form some four-sevenths of the whole of the dredging required, is a powerful grab or ladder bucket dredge, and that unless the dredging were delayed until the contemplated widening has taken place the entrance to the Inner Harbour would have to remain closed during the dredging operations. Quite recently, when the Porpoise Rock was being removed in the Tamar River, Launceston, the "Loongana" and other passenger-vessels between Melbourne and Launceston had to be diverted during the time the rock's removal was in progress. The velocity of the current at the Porpoise Rock is 7 knots.

To dredge this channel to 34 ft., having a bottom width of 300 ft. and side slopes of 1 in 2.5, as shown on Cullen and Keele's plan, and using Mr. J. D. Holmes's unit price of 2s. per cubic yard (for which figure we think it possible the work could be done), the quantity of material to be removed would be 429,629 cubic yards, and the cost £42,963. Mr. J. D. Holmes estimates the cost of this dredging at £46,175.

In addition to the dredging, one mole has to be built 100 ft. from its present position. Some 400 ft. of the new slopes on each side of the channel will require protecting with stonework, as the borings show that the last 15 ft. of the dredging is through silt. We estimate the cost of these works, using the contract price the Board is now paying for stone—viz., £1 14s. 1d. per cubic yard—at—