1888.

NEW ZEALAND.

NEW PLYMOUTH HARBOUR WORKS

(REPORT ON), BY THE ENGINEER-IN-CHIEF.

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

MEMORANDUM for the Hon. the MINISTER having Charge of the MARINE DEPARTMENT.

SIR,— Marine Department, Wellington, 10th April, 1888.

I have the honour to forward herewith a report on the harbour works at New Plymouth, in accordance with directions contained in a letter from the Assistant Secretary, Marine Department, dated the 27th March. These directions were, "to proceed to New Plymouth for the purpose of examining and reporting upon the alleged accumulation of sand near the breakwater there, and of stating whether, in my opinion, the sand is likely to increase, and whether it is probable that it will be a permanent injury to the harbour; and, if so, the best means of removing it and preventing it again accumulating: furnishing at the same time an estimate of the cost of doing this."

I will first shortly describe the general features and extent of the harbour works which have been executed to date. These consist of a concrete breakwater of a total length of 1,950ft., the top of which is about 8ft. above the level of high-water spring-tides. This structure for about 1,200ft. projects into the sea in a north-easterly direction, then for the remainder of its length its direction is altered by a very easy curve to east-north-east, thus partially enclosing a sheltered area of harbour lying between it and the shore to the east of it. Within this sheltered area has been erected a landing-wharf extending to about 1,300ft. from the shore-line, not alongside of the breakwater, but at a distance from it of about 150ft. The wharf itself is about 350ft. long, and is joined to the root of the breakwater by a curved gangway carrying a railway for the passage of locomotive engines and trains of wagons. It is also fitted with cattle-yards and race, &c., for the loading of cattle and sheep. At times when it would be impossible for vessels to lie alongside of the breakwater owing to the sea breaking over it in large volumes, vessels can lie in smooth water alongside the wharf on either side of it, thus permitting the safe and easy discharge or loading of goods, &c., at all times. The depths of water at this wharf are—at the outer end 15ft., at the middle 12ft., and at the inner end 10½ft., at low water, the rise and fall of tide being about 12ft.

In a north-north-west direction from the root of the breakwater, and at a distance from it of of about 450ft., lies the rocky island of Mikotahi, itself being also about 450ft. long in the same direction. Before the harbour works were begun Mikotahi was at the time of high water an island joined to the mainland by a rocky reef, swept clean by the passage of the tidal waters, and offering at time of low water an easy means of access to the island. After the erection of a portion of the breakwater, sand began to accumulate on this reef, and as the works progressed the accumulation increased in width and height up to the present time, when it presents the appearance of a broad bar or bank of sand, extending from the root of the breakwater to the island, the top of the bank being considerably above high-water level, and the sides of it, respectively, forming flat, sloping beaches to the east and west. That to the west extends along the boundary or sea-wall of the block-yard, against and over which the sand is heaped up by the action of the wind. That to the east extends along the outer line of the breakwater, where it has gradually shallowed the water to such an extent that the sand forming it has found for itself a passage round the end of the breakwater, whence it has formed a narrow spit across the entrance to the harbour, extending for a distance of about 450ft. in a direction nearly at right angles to that of the breakwater, and thus barring to a certain extent the direct approach of vessels proceeding to the wharf.

This sandspit is pear-shaped in plan, with the narrow end next the breakwater; and the broad end, which is about 50ft. wide, was lately visible at low water of spring-tides, where before there was a depth of about 14ft. of water. The height of this spit has, however, of late been observed to be variable, there being at present about 18in. more water on it than was observed a fortnight ago.

A further deposit of sand, which has apparently come over the breakwater during heavy storms, has taken place along the inner face of the breakwater, covering a length of about 900ft., and a width varying from about 100ft. at the outer end to about 70ft. or 80ft. at the inner end, or nearly

opposite to the inner end of loading-wharf. This deposit is several feet in depth, being generally greatest next the breakwater, and decreasing towards the wharf, at which it has not yet affected the facilities for loading.

An opinion has been expressed that the accumulation of sand above described is due to the manner in which the works connected with the quarries and the roads leading to them were carried out—that is, that a large amount of excavated material from the roads and of *débris* from the quarries was thrown into the sea, thus forming material from which sand was produced, and which has thus caused the evils now under consideration.

It would be well for the interests of the harbour that this were the extent of the evil, but it is a view of the question with which I do not agree: not that the *débris*, &c., above mentioned did not produce a certain amount of sand, &c., but the quantity was insignificant, and has long since been carried away, and has ceased to bear its part in the operations now going on. These are far more extensive, and the supply of sand threatening the existence of the harbour comes without doubt from the long stretch of sandy beach lying to the south and west of Paritutu and the adjoining islands, which, from their rocky character and the deep water existing outside of them, were, when the works were designed, thought to form a barrier sufficient to prevent the passage of sand from the southern beaches.

In evidence of the fact that the sand does travel from the southern beaches around Paritutu and the other rocky islands, and proceeds thence northwards, it may be stated that gradually, since the breakwater was commenced, its formation barred the movement of the sand to the east and north, and thus cut off the supply which kept the beach covered with sand between the breakwater and the Town of New Plymouth; the effect of this being that between these points the beach has been denuded of sand almost entirely, the sand having travelled northwards, and all the reefs are laid bare; the foreshore, being thus deprived of its natural protection, has at certain points been attacked by the sea, rendering necessary extensive protection works, particularly in the vicinity of the new railway-station at New Plymouth.

Had the weather of the past twelve months been of an ordinary character it is doubtful whether the sand-difficulty would have yet made its appearance; but an almost uninterrupted course of strong westerly and south-westerly winds has doubtless precipitated the result. As an evidence of this, it may be stated that, in the opinion of the Engineer to the Harbour Board, it would not have been possible to have constructed more than one or two 18ft. sections of the breakwater during that time had it been desired to do so. The first appearance of the sand beyond the end of the breakwater was in September, 1887, and since then the formation of the spit has been continuous and is still slowly progressing, the rate of progress depending on the direction and force of the wind and sea: as before said, these have been such as to accelerate the formation of the sandspit.

As far as this has already extended, it is of very slight detriment to the easy and safe navigation of the harbour, but, should its growth proceed at the same rate as heretofore, it will, at no very distant date, render it difficult for vessels to enter or leave the harbour with ease or safety in bad weather.

To avert such a contingency it will be necessary to prevent the further passage of sand around the end of the breakwater; and this can be temporarily secured by the construction of a groin or wall to connect the Island of Mikotahi with the mainland, which work could be performed at a moderate cost, and should at once be undertaken. This work would have the practical effect of interposing a barrier of about 900ft. long against the movement of the sand (that is, 450ft. of artificial work and 450ft. of the island itself), but there is little doubt that sand would still find its way round the end of the island, and a further means must be sought, by which, after this minor work is done, a complete stoppage of the sand could be effected: this could be accomplished by a prolongation of such groin or wall beyond Mikotahi to the Lion Rock, a distance of about 1,400ft., and eventually from thence to Moturoa, a rocky island about 250ft. farther, thus making a protective groin, including the island last mentioned, of about 3,000ft. long.

Such a groin would form a complete barrier against the movement of the sand, and would indefinitely postpone the occurrence of any further trouble from such a cause.

The groin between the islands would rise from the bottom to about high-water level, and would be composed of heavy rockwork tipped from a staging. It would have the additional effect of sheltering the breakwater itself from the heavy seas rolling in from the west.

I have made an approximate estimate of cost of the various works enumerated, as follows, viz.:—

	£
1. Erection of rubble-stone groin or wall between the block-yard and Mikotahi, including the laying of a line of rails to connect with the present line leading to the quarries	1,000
2. Construction of heavy rubble-stone groin from Mikotahi to the Lion Rock, including road and line around Mikotahi, staging, &c. ...	56,000
3. Construction of heavy rubble-stone groin from Lion Rock to the Island of Moturoa	10,000
4. Wagon stock (additions to), cranes, &c.	4,000
Contingencies, say	7,000
Total	£77,000

Of the above items, No. 1 is the first that should be carried out, and the work could be completed out of funds now in the hands of the Harbour Board, viz., £1,838. The works under the heads 2 and 4, amounting to £60,000, might be spread over several years—say, for the year after No. 1 is completed £10,000, and for each succeeding year, say, £6,000 to £8,000—until the gap was

closed up to the Lion Rock, the work between which and Moturoa would be undertaken only if found absolutely necessary. The effect of this work should be well watched as it proceeded, as it might be found that a partial closing of the gap would answer the intended purpose, and thus save further expenditure; or, at any rate, it might be found that a smaller expenditure per year would be sufficient.

Further work would be needed in the removal of the sandspit already formed in the harbour, or as much of it as would permit of direct access to the wharf. This will not be a serious matter. The Harbour Board has an excellent small dredge, which, however, needs a stronger crane than the one now fitted. This could be supplied for, say, £250 to £300; and probably a similar amount or a little more would secure all the necessary dredging.

To summarise the results of my observations, I may say that at New Plymouth the Harbour Board has expended on all works a total sum of about £220,000. For this expenditure they have (besides certain plant and material on hand) an excellent harbour of moderate but good capacity, where vessels such as trade between the provincial ports have every convenience necessary for loading and discharging while lying in safety at a good wharf. It seems desirable that such a favourable state of things should, in the interests of the country, be conserved, and this can be done, as has been shown above, by the expenditure of a moderate sum of money per year, the funds being already available for the first necessary piece of work, which should at once be undertaken. The importance of maintaining a harbour of such a character is great, and, in my opinion, would justify even exceptional measures to secure the necessary amount required per year.

In conclusion, I most strongly recommend that this view of the subject should meet with serious and favourable consideration.

I have, &c.,

JOHN BLACKETT.

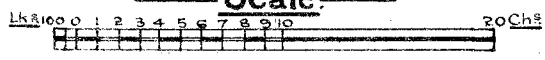
P.S.—Attached hereto is a plan (M.D. 1406) showing generally the features described in this report.

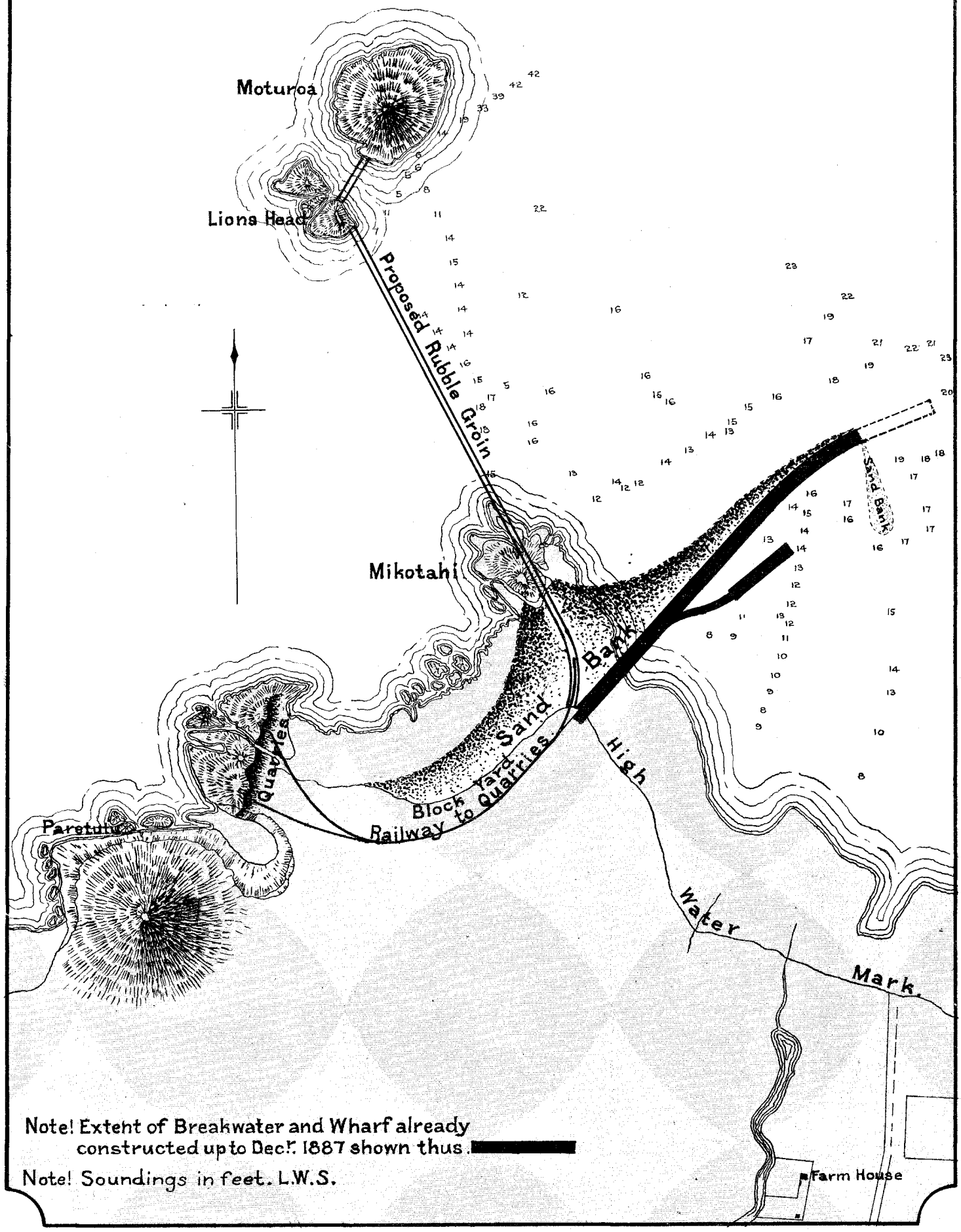
[*Approximate Cost of Paper.*—Preparation, nil; printing (1,425 copies), £2 1s. 6d.]

By Authority: GEORGE DIDSBURY, Government Printer, Wellington.—1888.

Plan accompanying Report of Engineer-in-Chief. Dated 10th April 1888.

Scale.





Note! Extent of Breakwater and Wharf already constructed up to Decr. 1887 shown thus ▬▬

Note! Soundings in feet. L.W.S.