

already done, would probably be more than value for that expenditure, it is scarcely probable that they would be commensurate with the total expenditure which would then have been incurred—namely, say, £102,600, if machinery is sold, or £114,000 if it is not sold. The constructed works being, however, practically useless as they stand, their cost—£81,600—may reasonably be left out of the question in considering the justifiableness, or otherwise, of expending a further sum to get some practical result.

*Possibility, or otherwise, of utilising the existing Work, by Means of some Reasonable Expenditure on Further Works.*

The fact that the existing works are practically useless, and likely, if left to themselves, to remain practically useless, being apparently evident, the question was: Could these works be in any way utilised by some reasonable expenditure on further works? and the vital point underlying this question was, as to whether or not there is at Gisborne what is generally known as “a sand-travel” from the westward.

I confess that when I first saw the spit at Gisborne, I thought it was the result of actual sand-travel, by which, I should explain, is meant not a mere local shifting of a limited quantity of sand, but a continuously progressive travel of sand in one direction, for a long distance, from a practically inexhaustible source. If this latter were the state of the case at Gisborne, the mischief would, I conceive, be incurable by any expenditure within reason. Under those circumstances, in fact, the sand would not alone be packed up against the mole, but would overlap and go completely round it, the volume of the Turanganui River being entirely insufficient to keep a clear passage of any considerable depth through even a very slight sand-travel.

Having devoted considerable time and care to investigating the question, however, I eventually came to the conclusion (to which Mr. Thomson and other engineers who had similarly examined into the question, had also come before me) that there was *not* an actual sand-travel from the westward. The principal facts which led me to this conclusion are as follows:—

(I.) The spit at west side, when I saw it, had made out almost to end of mole, but not quite to the end of it, and there was no sign of any appreciable quantity of sand having gone round the mole. I may here also mention that I was very anxious to be sure that this state of things continued for a lengthened period, the time during which it had continued, up to the date that I saw it, not being sufficiently long to render the evidence about it quite conclusive. This was especially so in view of the then coming summer months, when the opposing forces of the sea from the south-east would probably be at their minimum. A further reason therefore for failing to report on this question until now, in addition to the reason already stated, was in order to get fully satisfactory evidence on this point. Having kept myself informed on the subject in the meantime, I now find that the conclusions I came to on the ground are fully borne out by later evidence.

(II.) The total quantity of sand in the spit, taking the most extreme figures of all the various soundings, did not, when I saw it, exceed 70,000 cubic yards, and the measurements and soundings which I got taken in the immediate vicinity of the spit to the westward, when compared with measurements and soundings previously taken, showed that quite that quantity of sand, or more, had recently been removed from there. It was reasonable, therefore, to conclude that the spit was the result of merely local disturbance. It was also reasonable to conclude from these facts, and from observations of the set of the waves and currents in the vicinity, that this recent local disturbance, carrying the sand off the beach and forming it into a spit, was due, *inter alia*, to two causes—first, the inward curl of the waves on west side of breakwater, consequent upon the construction of the breakwater itself; and, second, the increased current in the sea along west beach in vicinity of entrance to river, caused by the tide having to get into the river entirely from one side, instead of from both sides, as formerly.

(III.) The evidence which I obtained, and the observations and measurements of currents, &c., which I made myself, all go to show that the preponderating force of the sea is distinctly from the south-east. This supplies the reason why the spit cannot travel round the breakwater. The forces from the west, being sheltered from the opposing south-easterly forces, are sufficient to pile it up against the mole on west face, but the south-easterly forces are apparently too strong to let it come round. This would point to there being a tendency to sand-travel from the south-east, which, in fact, is the case. Fortunately, however, there is practically no sand to come from that direction. A travel would only be practicable from Tuamotu Island, and between there and the breakwater the beach is practically bare of sand. There is also the fact that the promontory reaching from Gisborne to Tuamotu Island is a narrow ridge, having no considerable area of watershed on sea side, and, consequently, no room for any large stream to bring down *débris* into the sea. The results of this tendency to sand-travel from the south-east are therefore chiefly to be found on the other side of the bay, where the tendency is to make ground in the pocket or end of the bay, in the vicinity of the Waipaoa River. The same forces act on the sand coming out of the Waipaoa River itself, piling it on the shore in the vicinity of the river-mouth. This is further evidenced by information kindly furnished to me by Mr. Gold-Smith, Chief Surveyor of Gisborne, who is of opinion that the whole of the area coloured pink on map herewith (sheet 4) is sand-formation, and that a considerable portion of it has been made up by the sea, within, geologically speaking, a comparatively recent period.

*Question as to whether the Funds at the disposal of the Board, are sufficient to enable the necessary Additional Works to be done.*

The state of the case, as regards the possibility of improving the existing condition of things, being as above described, the next question was, as to whether the funds at the disposal of the Board would admit of the necessary additional work being done.

As already stated, the amount of loan originally authorised was £200,000, but of that sum £25,000 can never be available at all, being held in trust towards a sinking fund, and £70,000 of