

I must draw your particular attention to the formation of mud flats and sand banks now going on on the southern side of the lake, the cause of which formation, I venture to suggest, will be found in the partial deposit, by the combined action of the west and north-west winds, and flood tide of earth washed down by the Tutaekuri River when in flood; the accumulation added to by the great disturbance created on the bar outside, and upon the whole of the lake exposed to the action of those winds and which are the prevailing winds during the spring of the year, when freshets are most frequent. It is worthy of remark that, during a heavy north-west gale, the water in the mouth of the harbour, on the bar, and in all the exposed parts of the lake is discoloured, as in a fresh, owing to the stirring up of the bottom by the action of the wind; and there can be no doubt that the effect produced by the accumulation of matter thus thrown by the aid of the flood tide on the banks of the southern bight of the lake, is sensibly felt in the course of time. It is to the gradual action of these causes to which I beg to draw your attention, as they appear to be the great and primary principles at work, in the slow, but sure, filling up of the lake. For it would seem that the process is going on, not from the bottom upwards, as might be inferred, but from the side inwards, possibly, but not perceptibly assisted by the upheaval of earthquakes.

There does not appear to me to be any particular channel in any part of the lake, that piece of water being, as I said before of a nearly uniform depth. It is now possible to cross at high water to the western side from Napier, in almost any course from Battery Point in from 3 feet to 9 feet of water. Some ten years ago this could be done by taking Onepoto for the starting point. It will also be observed that the Tutaekuri River used, about that time, to cross the mud flats on the line marked K.

The water round the small island lying off the Eastern Spit shoals gradually away on either side, until it attains its greatest depth, but where the channel is confined between "Long Point" and the Sand Spit just off that point on the west side, there by the increased force of the tide, the water deepens to 10 feet, for a short distance, until it again expands. It is to be noted that in all cases where the flow of the tide is confined between obstructions as in the above instance, there will be found a deeper channel.

There are numerous sand spits, or shell spits forming off Charlton's Spit, although the tide just there runs stronger than anywhere else inside the lake.

It will be seen by reference to the charts, that the ebb and flow of the tide is from south to north and from north to south in the bay, and that its greatest force is felt just where the mouth of the lake now is; and that so long as the tide ebbs and flows in that direction, so long will a great force of water press upon the sand spit, forming the lake, at about that particular spot; and as the rate of the flow of the tide through the entrance is from $6\frac{1}{2}$ to 7 knots, it is clear that the action of the flood and ebb tides upon the entrance must be something like that of a force pump, the rush of water being so tremendously strong; and I have no doubt that that force may be used to any extent, for the purpose of opening new channels and of keeping open old ones.

Secondly, the Ahuriri Roadstead and Entrance to Port Napier, illustrated on a scale of 10 chains to 1 inch on Chart No. 2.

The Rangitira Sand-bank, which is the particular feature of this harbour entrance is subject to great changes shifting its position under the influence of heavy gales of wind. It has been known to extend right across the entrance, so as to render the passage of vessels exceedingly dangerous, but its general position I believe to be about where it is marked on the chart.

The rise and fall of the tide ranges from three feet four inches to three feet seven inches; ordinary springs from four feet to four feet four inches; occasional high spring tides produce a rise of four feet six inches. The highest tides recorded by Mr. Murray (to whom I am indebted for these figures) is four feet eight inches, the rate of flow being as before stated, from $6\frac{1}{2}$ to 7 knots per hour at the narrowest part of the entrance.

It will appear by comparing the chart now submitted to you, made by myself with that made by Mr. Park in 1850 and with that made by Captain Drury of H.M.S.S. Pandora in 1855, that the entrance to Port Napier is undergoing great and rapid changes; for according to the charts made by those gentlemen, the width of the entrance was in their time from 6 to 7 chains: now according to the