

increasing or decreasing the height of the peak, but it results in a longer-sustained high river below while the flood-waters are re-entering the falling river through the mouths of the Silverstream, the new cut, and Owhiro Creek. This action accounts for the fact that at Otokia the flood may rise steadily long after it has commenced to fall at Outram. If this low area did not act as a regulator in this way the levees at Otokia would be breached more frequently, and the high water which has been known to burst the levees at Otokia after the flood had begun to subside at Outram would not be any lower, but would arrive and probably burst the banks somewhat sooner. In other words, the low area at the mouth of the Silverstream may be of great benefit to the land below, and cannot under any circumstances make its conditions worse.

The capacity of the lower gorge to discharge the water which has been known to pour on to the plain from the back hill country is inadequate. Various investigators have assessed its capacity at figures in the vicinity of 37,000 cubic feet per second, while the maximum flood has been probably in the vicinity of 60,000 cubic feet per second, and may even have been slightly more.

Prior to the erection of any levees along the river-banks below Outram the excess of flood-water which the river-channel was unable to carry overflowed the river-banks and spread over the plain in all directions. The excess flowed into and was stored in the Waihola and Waipori Lakes and the low-lying flood-plain. As the lakes rose, the water-slope from Henley Ferry Bridge down to the sea increased, and as a consequence increased the rate of discharge through the gorge, until the discharge on to and the outflow from the plains balanced.

Later on, after the levees were built, similar conditions obtained, except that the flood-waters being more confined to the river-channel it was only when the levees were breached in the vicinity of Allanton, or higher up, that the flood-waters invaded the plain on the western side, or when the Waihola Lakes became raised to such a height as to overtop the levees at the lower end of the plain, and so flood the plain by backwater from the lakes.

In order to induce more water to run through the lower gorge its fall must be increased. As the sea cannot be lowered, the water at the upper end must be raised; and if an adequate channel is provided to carry waters from the hills into the lakes, and if the levee protecting the plain from inundation either from the river or by backing up from the lakes is provided, the water of the lakes will rise possibly a little higher than heretofore; but the combined influence of this storage, together with the increased discharge through the lower gorge obtained by the greater fall, will enable the floods to be successfully conveyed from the hills to the sea under control and without damaging the region which it is so desirable to protect.

In connection with the discharging-capacity of the present river-channel special reference must be made to the existing bridges, practically all of which—and one or two to an extreme degree—are quite inadequate to cope with the maximum flood-discharge. The worst offender in this respect is the Otokia Railway-bridge, the discharging-capacity of which, based on the 1908 flood-level and flood-slope, amounts to about 25,000 cubic feet per second only, or less than half what is to be expected during high flood. From this instance alone it will be seen that breaching of the levees higher up, with consequent flooding of the plain, is inevitable under present conditions. The Otokia Traffic-bridge would offer a greater restriction still were it not for the fact that the excess flood-water can get round the ends of the bridge, whereas at the railway-bridge the railway embankments form an effective barrier to the flood-waters.

On looking into the works that have been done, and examining the previous reports and plans, your Commissioners ascertained that a comprehensive scheme for draining and controlling all the flood-waters from the Maungatua hillsides had been devised by the late Engineer to the Taieri Drainage Board, Mr. Michael Elliot, M.Inst.C.E., and had been approved by the Board and commenced. Unfortunately, it has not been executed in accordance with those plans. This is most regrettable, as the scheme appears to have been well conceived, and had it been carried out the occupiers of the plain would probably have been very much better off than they are to-day.