

island of Inch Clutha if the river had been diverted through the isthmus before the bridge was erected, but, as it would have involved interference with so many conflicting interests, it was impracticable.

The objects for which any new works would be required are to reduce the undue quantity of water in the Matau branch and prevent the possibility of the flood again forcing its way in that direction, to prevent the scouring of the banks at the head of the island, and by diverting the main body of the river into the Koau to restore it to its original depth and width. The whole of the peninsula on which the town is built, together with the isthmus up to the foot of the hills, was formerly an outlet for the waters of a heavy flood. As the works proposed for the protection of the isthmus and the town, if successful, will have the effect of closing this outlet, it will be perceived that the next high flood will present increased difficulties in confining it within safe bounds, and under these circumstances any works which are undertaken must be of a very substantial character.

Mr. H. P. Higginson, in his report to the Chairman of the Board of Conservators of the Clutha river, dated the 12th March, 1879, has indicated the method which, we think, would be the most feasible for the protection of the Matau branch from the effects of floods breaking into it, and to exclude much of the stream which at present flows down it, so as to restore the Koau to its original depth and width. This work should be extended far enough to protect the head of the island from being overtopped and breached by the floods.

Mr. Higginson describes this work as being the construction of a training bank composed of rocky material placed in a certain position at the bifurcation of the two branches of the river. Where constructed along the river bank it would take the form of a rock-faced protection wall, backed up behind with an earthen bank. As this work reaches the main stream, it curves into and up the same until the desired effect is produced. Such portion would be a simple embankment of rocky material faced with the largest of the stone allowed to settle into the bed of the river, the nose or extreme point being well protected with harder rock or concrete blocks as a defence against the scour of the river when in flood. This rock-faced bank should be extended as far as necessary to protect the head of the island, or to the end of Section 10 Block XIII.

Anything like a complete protection for the township of Balclutha, Inch Clutha, and the railway must embrace all the works proposed by the Public Works Department, as well as those proposed by Mr. Higginson. Furthermore, unless the whole is carried out, it will be inadvisable to do certain portions, for safety to one place may only be secured by endangering another. The protection of the slopes above Balclutha will not harm any other place, neither will the works at the head of the Matau branch proposed by Mr. Higginson; but the construction of the embankment round Balclutha will certainly necessitate the extension of the railway flood openings, and possibly the construction of Matau protective works. On the other hand, if the bank is not made at the isthmus, it would be advisable to make flood openings in the railway embankment south of the station, where the breach was made by the last flood.

The following is an approximate estimate of the cost of the works above described :—

Completing protection of slopes ...	...	...	...	...	£7000
Embankment round Balclutha ...	...	...	...	...	500
Extending Railway Flood openings ...	...	...	...	...	3500
Total for works proposed by Public Works Department					11,000
Matau Protective Works ...	...	...	...	...	20,000
Total for complete protection					<u>£31,000</u>

The cost of making the necessary flood openings south of the station, should the other alternative works not be carried out, will be about £3,500. We also think, that under any circumstances, it would be advisable to extend the present flood openings on to the ferry flat by say eight chains, which will cost about £2,500.

We have, &c.,

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H. P. HIGGINSON, M. Inst. C.E.
W. N. BLAIR, M. Inst. C.E.

The Hon. the Minister for Public Works, Wellington.