

1920.
NEW ZEALAND.

APARIMA RIVER

(REPORT OF RIVERS COMMISSION ON).

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

REPORT.

To His Excellency the Right Honourable Arthur William de Brito Savile, Earl of Liverpool, Member of His Majesty's Most Honourable Privy Council, Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George, Knight Grand Cross of the Most Excellent Order of the British Empire, Member of the Royal Victorian Order, Knight of Justice of the Order of Saint John of Jerusalem, Governor-General and Commander-in-Chief in and over His Majesty's Dominion of New Zealand and its Dependencies.

MAY IT PLEASE YOUR EXCELLENCY,—

Your Excellency's Commission, dated the 8th April, 1919, directed us to inquire into certain matters in respect of the Clutha, Orari, Rangitata, Waimakariri, Ashley, and Maerewhenua Rivers, and such other rivers as might be added thereto from time to time. Your Excellency's further Warrant, dated the 22nd July, 1919, added to the Commission the Waihi, Wairau, Waiau-uha, Taieri, and Aparima Rivers. The time within which your Commissioners were required to furnish their reports was extended by Your Excellency to the 7th June, 1920.

In the meantime the same individuals were appointed a Royal Commission, under a separate order of reference, to examine and report on the Waihou River. This was done, and the report duly submitted before resuming work under the present Commission.

The present report deals only with the Aparima River. The reports on the Maerewhenua and Clutha Rivers have already been presented to Your Excellency. The reports upon the remaining rivers will be submitted in due course when the requisite data have been collected.

Your Excellency's Commission directed us, in respect of each river:

- “(1.) To inquire into the cause or causes of the silting-up of the channel, the flooding of the adjacent lands by the said river, the erosion of its banks, and the damage to the surrounding country ;
- “(2.) To ascertain the nature and extent of the damage done to the lands adjacent to the said river, and what area of land is affected by such floods or erosion, or both, and whether it is practicable at reasonable expense to prevent such flooding or erosion, or both, either wholly or partially ;
- “(3.) To ascertain the best method of providing for the control of the said river and its tributaries so as to safeguard the lands affected, and to provide for the effective control and improvement of the said river and its banks ;

- “ (4.) To ascertain the nature and extent of any drainage-works that may be required, and the best method of carrying out such works ;
- “ (5.) (a.) To furnish estimates of the cost of such remedial measures as you may recommend should be taken for the effective control and improvement of the said river and its banks ;
- “ (b.) To report what area or areas of land should be constituted a district in respect of which a rate may be levied to secure and pay the interest on and provide a fund for the repayment of any loan that may be raised to carry out any river-improvement works which you may recommend should be undertaken ;
- “ (c.) To report your opinion as to what matters, if any, should be adjusted by legislation ; and
- “ (d.) Generally, to report your opinion on all matters arising out of or touching the premises, including the question as to whether or not one or more competent authorities shall be appointed to control the whole or any portion of the said river, and what statutory powers should be possessed by such authority.”

Your Commission also required us to report separately in respect of each river.

INVESTIGATIONS MADE.

Sittings, Evidence, and Inspections.—Your Commissioners proceeded to Otautau on the 15th March, 1920, and the same day inspected the right bank of the river for some miles above Otautau, and both banks of the river from Otautau to the sea. Measurements were made at all the bridges with a view to ascertaining whether there was any marked silting-up of the river-bed, and such plans as were in the hands of the County Council were examined. On these inspections your Commissioners were accompanied by representatives of the County Council and the River Board.

On the following day a duly advertised sitting of the Commission was held at the Courthouse, Otautau, when thirteen witnesses were examined, including representatives of the Wallace County Council, within whose district practically the whole of the river is situated, and the Otautau and Waimatuku River Boards, also representatives from Bayswater and the lower reaches of the river. The sitting occupied the whole day, and on the following day the river was examined on both banks and at all crossings for a distance of about forty miles above Otautau. The general character of the watershed was also inspected by your Commissioners.

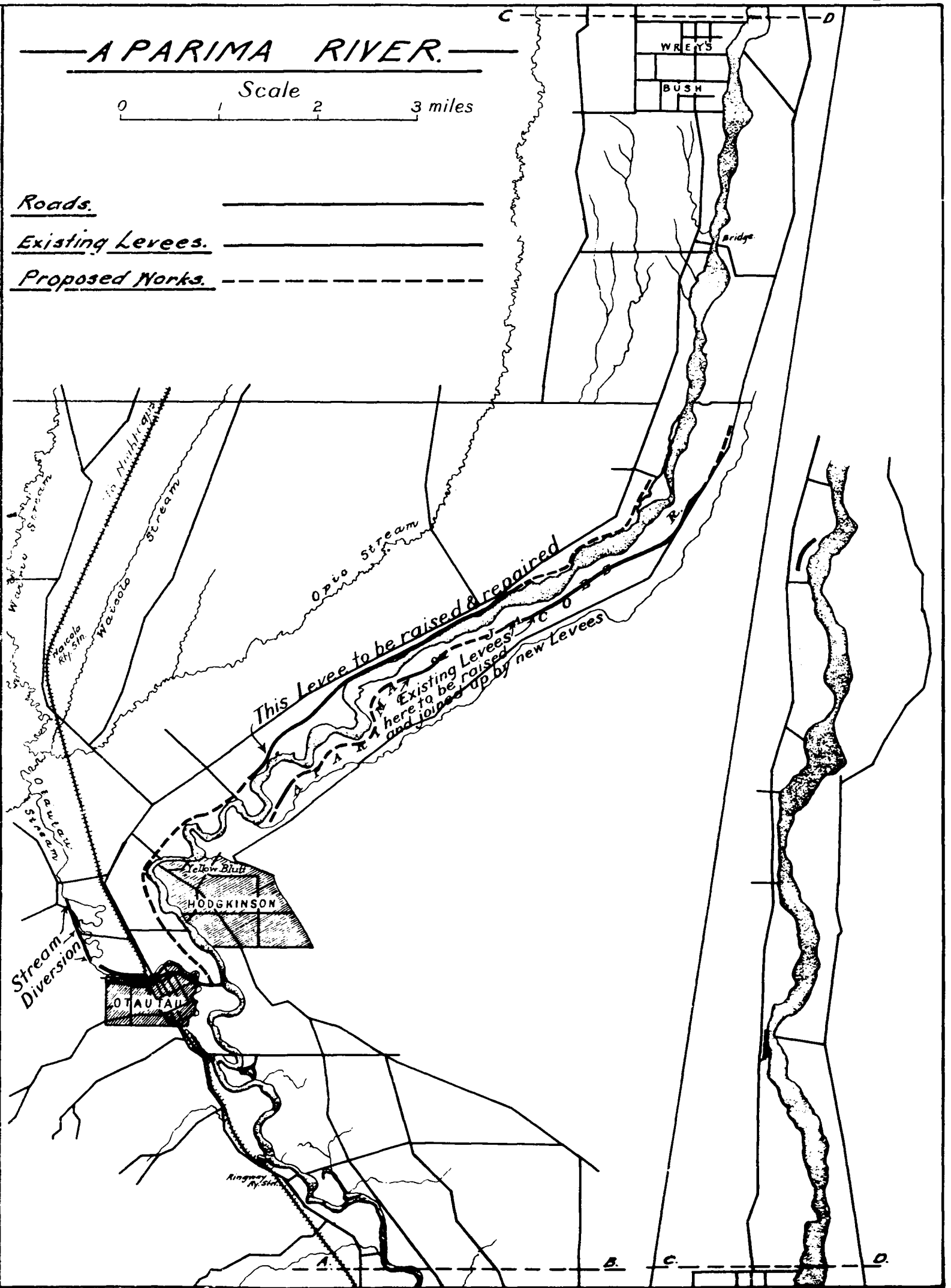
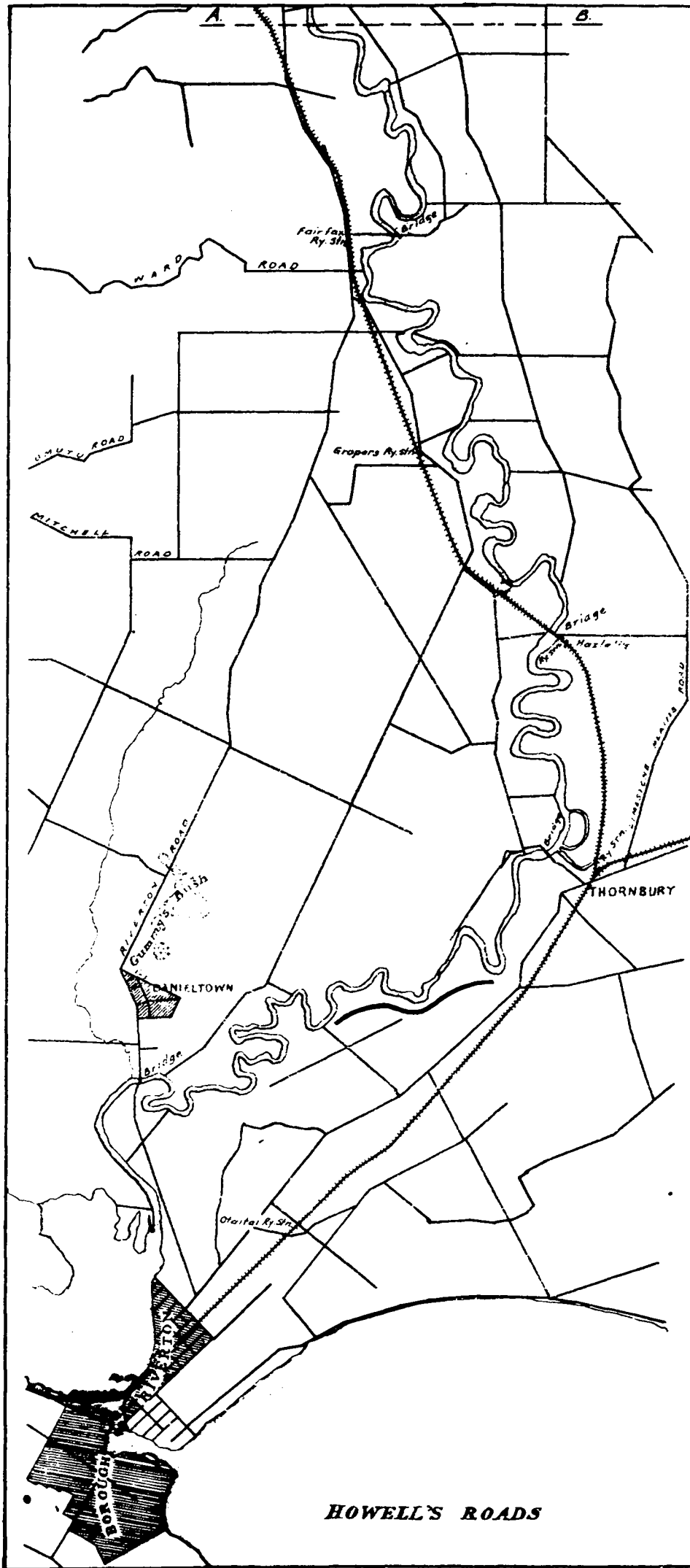
Plans showing the river at the time of its first survey, and also at the time of the latest survey, were obtained from the Commissioner of Crown Lands, Invercargill, in order to ascertain whether any important changes had taken place in the course of the river.

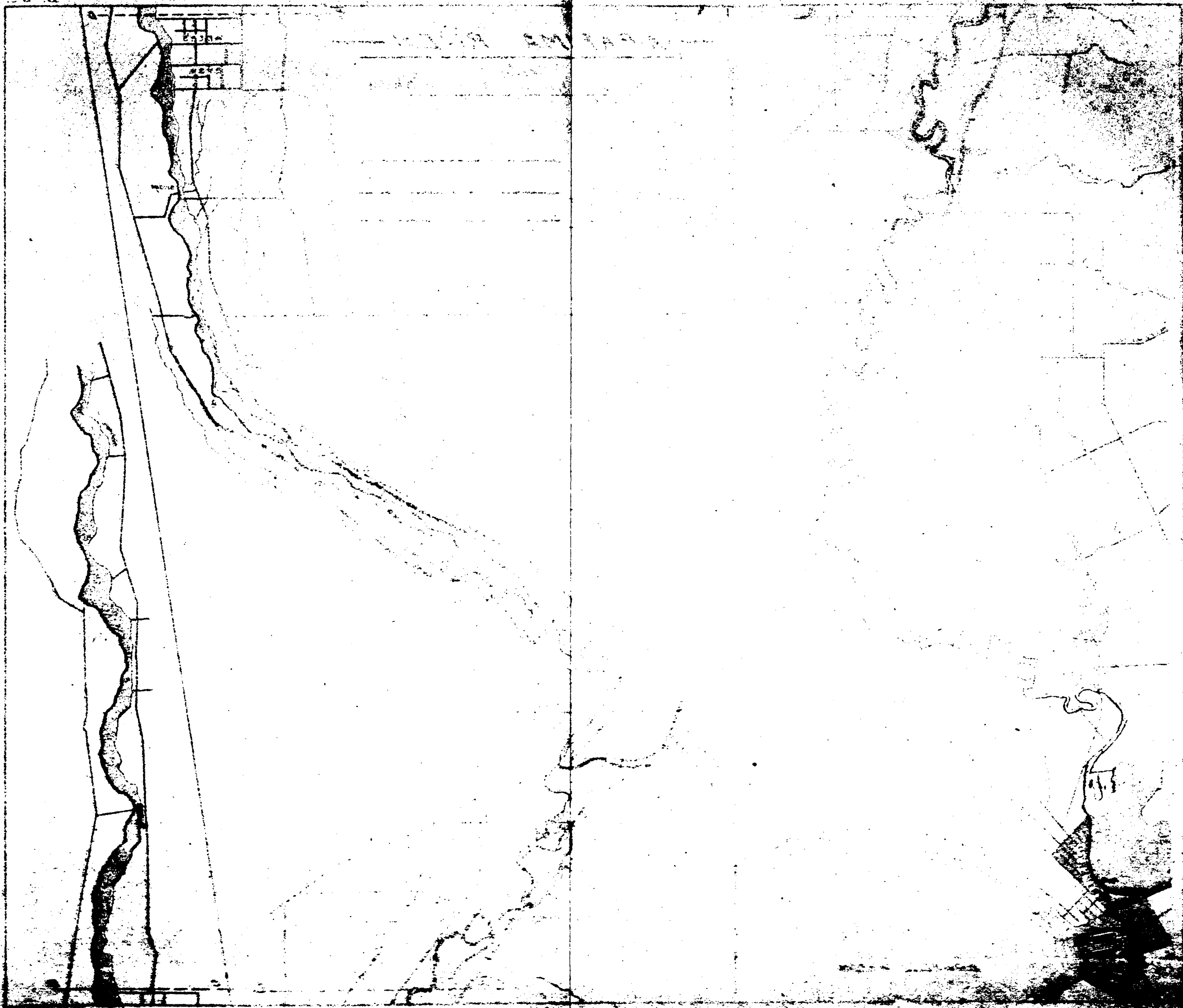
After hearing the evidence and inspecting the river and its watershed, your Commissioners formed the impression that the problem was not such as would justify them in delaying their report in order to have special surveys made in connection with this river.

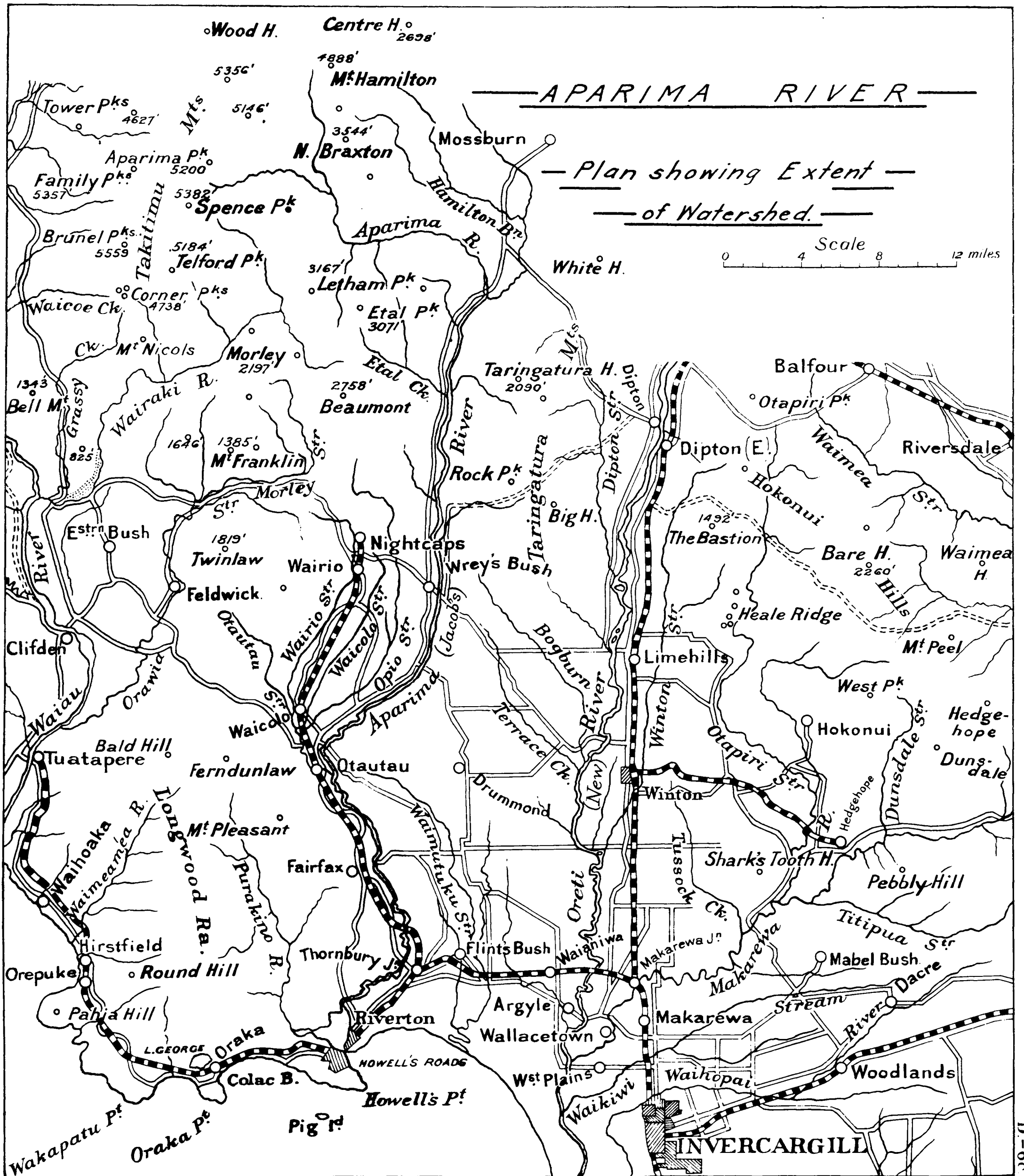
PHYSICAL FEATURES.

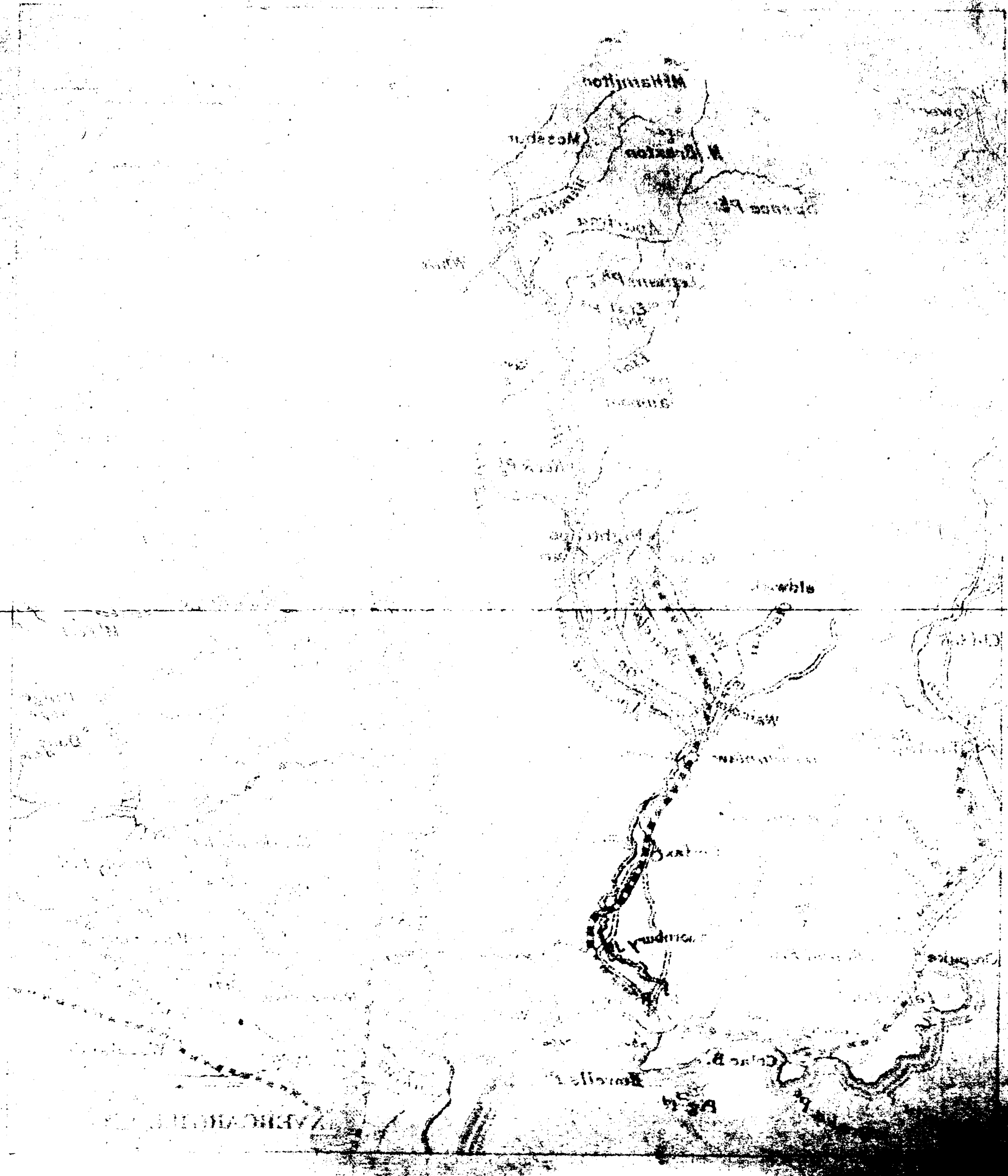
The Aparima or Jacob's River takes its rise partly in the northern extension of the Takitimo Range, but in the main the water comes from hills of low altitude. Except for the presence of isolated patches of bush in the gullies and on the hillsides, the whole of the drainage area of the river was open tussock country. Although a considerable portion of this country is cultivated, the cultivated area does not bear a very large ratio to the total, being mostly confined at the present time to the immediate river-flats.

The fall in the river is not excessive, particularly in the lower forty miles of its course, and in the last twenty miles might be considered as very moderate. As a result, under normal conditions it has not the great carrying and eroding capacity of many of the Canterbury rivers. At the same time, the material composing its banks is of such a very friable nature and so easily eroded that in flood-time acute bends tend to cut considerably. The removal of the protective covering of flax and other natural vegetation on the banks as the result of settlement has increased









the opportunity for lateral erosion to take place. An approximate longitudinal section of the river is attached hereto (plan No. 2).

The intensity of the flood-discharge in this river is, if anything, less than the average for rivers with an equal catchment area, on account of the favourable nature of the watershed and the comparatively low rainfall. The denudation of the hills, which is so marked in the Clutha watershed, has no counterpart in any portion of the watershed of the Aparima. Most of the shingle-beds forming in the river are caused by the erosion of the banks, and do not consist of detritus brought down the river by floods. This fact has largely contributed to the popular belief that the bed of the river is rising. There was a diversity of opinion, however, on this point, some witnesses stating that the water now runs at a higher level, while others said that it is lower than in the past. While it is admitted that measurements taken at bridge crossings are not the most satisfactory, nevertheless all the measurements taken by your Commissioners went to show that there has been no perceptible alteration in the level of the river-bed.

There are no lakes within the watershed of this river, and few large tributaries, but there are some very considerable areas of swamp lands, which would, of course, have a regulating effect upon the streams running through them.

The watershed down to Wrey's Bush Bridge is 326 square miles. Down to the point where the main tributary, the Otautau, joins the Aparima the drainage area is 445 square miles, including the Otautau drainage area of 111 square miles, and the whole watershed of the Aparima River to its estuary is 500 square miles.

There is no gold-mining within the watershed of the Aparima River, and the coal-mines have had no effect in increasing the amount of detritus carried by the river.

LOCAL BODIES INTERESTED.

At present the only Board actively engaged in river-protective works is the Otautau River Board, which controls the right banks of the river for about seven miles, including the reach above and through the town, and the Otautau Stream and its tributaries. This Board's district contains approximately 9,000 acres of country land and the town of Otautau, comprising 900 acres. The total valuation of the district is approximately £203,000, that of the town subdivision being £84,000 and of the country subdivision £119,000.

The only other local body interested is the Wallace County Council, which has not been constituted a River Board in respect of this river, but which, as mentioned later, has carried out certain works for the protection of its roads and bridges, and has also assisted the Bayswater settlers in the construction of protective levees.

FLOODS AND FLOOD-DISCHARGES.

The heaviest flood in the Aparima River is recorded as having occurred in 1913, but, apart from that flood, the floods of the past appear to have left very little impression on the minds of witnesses, and it may be assumed from this that they were of minor importance. As far as your Commissioners have been able to ascertain from the very meagre data available, the flood of 1913 did not exceed 35,000 cubic feet per second at Wrey's Bush Bridge.

EXISTING WORKS.

The existing works on the river consist of—(1) A certain amount of levee-work carried out by private enterprise in the vicinity of Thornbury; (2) a considerable amount of levee-work on the main river above the town of Otautau, constructed in order to prevent the waters of the Aparima, when in flood, finding their way into the Opio Creek and thence into the Otautau Stream. The Otautau Stream has also been cleared and straightened and stop-banked on both sides for a considerable distance through the town of Otautau.

The cost of the original works done in the early days cannot now be ascertained, but since the resuscitation of the Otautau River Board in 1910 approximately £3,500 has been expended up to the 31st March, 1919. Since then no large works have been carried out, but rates to the extent of £400 have been expended.

Some miles of levee-construction work has been done to protect the country known as the Bayswater Estate, on the left bank above Otautau. The last work done on these banks has been carried out only recently, and witnesses admit that it is still incomplete. The total expenditure has been £1,200, £600 of which was raised by the settlers, and this sum was augmented by the County Council with a grant of £300, and the Government provided the balance.

An isolated levee has been built a short distance above Wrey's Bush to prevent the overflow of the river into a tributary in similar manner to that in which it overflowed into the Opio Creek. The area and quality of the land is not comparable with that which would be affected by the Otautau.

A levee was constructed on the Beaumont Settlement for a similar purpose to that just mentioned; it, however, has been breached, and at present is practically of no use.

In addition to the main levees referred to above, smaller banks have been thrown up by individual farmers in an attempt—which has proved more or less successful—to stay the erosion of their lands. The Wallace County Council has also erected isolated works to prevent damage to their bridge-ends and roads which border on the river.

The works at the town of Otautau were built by the Otautau River Board over thirty years ago, and were strengthened and enlarged during the years 1910–12. Though there was no direct evidence of this, it is probable that the resuscitation of the operations of the Board after it had been for many years in a moribund condition was brought about by a flood. The flood of 1913 damaged the works to a certain extent, and a very considerable amount of damage was done to property within the town. Since that flood the breaches in the levees which then occurred have been made good, and efforts have also been made by the River Board to cope with the erosions, more or less successfully. In the case of the property of Mr. George Seatter, Sections 29, 30, 31, and 32, Block II, Aparima Hundred, the erosion amounted to about 140 acres out of a total of 254 acres.

LAND SETTLEMENT AND TENURE.

The approximate area of land within the Aparima drainage area is 440 square miles, and of this amount some 30 square miles has been in the past, and is still to a greater or less extent, subject to damage by high floods.

Almost the whole of the land is freehold property, the only notable exception being the Beaumont Estate, which borders the river in its upper reaches.

While the land in the upper reaches is poor sheep-country, it increases in value up to £40 and over per acre in the lower reaches of the river.

REFERENCE NO. 1.

To inquire into the cause or causes of the silting-up of the channel, the flooding of the adjacent lands by the said river, and erosion of its banks and the damage to the surrounding country.

As previously stated, the only silting-up of the river-channel of which there is any evidence is that due to the erosion of the banks. When a portion of the bank is eroded, the harder and heavier materials composing the bank are deposited a short distance below, in the first slack water. Where the river has widened considerably this has given the settlers the impression that great accumulations of shingle are moving down the river. Your Commissioners' observations do not corroborate this belief. In the absence of any marked denudation in the upper portion of the river, there is no source from which any supply of heavy detritus or shingle could come.

It is admitted that some of the bridges are inadequate to pass floods, and as a consequence they cause a certain amount of ponding and deposition of material in the channel above the bridges. Apart from this, your Commissioners are of opinion that no appreciable silting-up of the river-channel has taken place.

The growth of gorse and broom in the river-bed in places has no doubt caused the deposition of shingle, and has tended to the formation of shingle-banks in certain parts of the river.

The flooding of the adjacent lands is due to the fact that at certain points on the river the present channel, unassisted by levees on the river-banks, is of insufficient sectional area and slope to discharge the flood-waters. The erosion of the banks is due to their very friable nature, and to the removal of the protective covering of natural vegetation, as already referred to.

REFERENCE NO. 2.

To ascertain the nature and extent of the damage done to the lands adjacent to the said river, and what area of land is affected by such floods or erosion, or both, and whether it is practicable at reasonable expense to prevent such flooding or erosion, or both, either wholly or partially.

In the case of the Aparima River, in common with that of other rivers, the damage is of a manifold nature :—

(a.) The actual erosion of the banks, causing a direct loss of land. On the Aparima it appears that this is the worst form of damage.

(b.) The overflowing of the banks, causing damage to the improvements on the land and the crops being grown thereon. Apparently such floods as have occurred in the past have not taken place usually at such a stage in the growth of crops as to lead to great loss, and the flood-waters do not lie on the ground for a length of time sufficient to kill vegetation. The general consensus of evidence was to the effect that the settlers did not object very much to the overflowing of their farm lands by flood-waters. The same view, however, was not held by householders in the town of Otautau regarding flood-waters overflowing the town.

(c.) The roads in the flooded area are liable to have a certain amount of the metal washed off them. This is not a very serious item, for according to the County Engineer £100 would cover all the damage from this source during the last nine years.

(d.) The railway-line has been submerged occasionally, and portions of the ballast washed off. The Railway Department has also found it necessary to increase the number of flood-openings. Apparently the Department is not at all exercised over the position at the present time.

The damage in the town of Otautau consists chiefly of injury to floors and foundations of buildings, and also to carpets and household goods which are not removed above the level of the floods. There is also the interruption of business, and the inconvenience and hardship to the residents and shopkeepers, who are compelled to remove their goods and merchandise to the habitations of more fortunate neighbours or into the upper stories of their own dwellings.

Loss by erosion : It was stated in evidence that several hundreds of acres of land had been lost by erosion. Without detailed survey it is impossible to ascertain the exact amount, but your Commissioners are inclined to the belief that 500 acres represents the full amount of land lost by erosion. Mr. George Seatter has lost 140 acres out of a holding of 254 acres ; Mr. W. Brown has lost considerably over 100 acres out of a holding of 190 acres ; while other settlers have lost smaller areas.

With reference to the question as to whether it is possible to prevent the flooding of the Aparima River and the erosion of its banks at reasonable expense, your Commissioners are of the opinion that on many portions of the river the flooding is not of sufficient importance to justify, from an economic point of view, the erection of any protective works, and that the erosion of the river-banks should be dealt with by the individual farmers on their own river-frontages. This has been done successfully by some of the settlers at reasonable cost, and there is no reason why the other farmers should not do likewise.

It will be necessary, however, for any works to be under the control of a proper authority, in order that the protective works may not take such a form as will tend to detrimentally affect other farmers.

There may be exceptional cases, however, where it would be advisable that the controlling authority should carry out the river-bank protective work in order to

better conserve the interests of a group of settlers. In such cases the controlling body should have authority to do the special work required, and to collect the cost of such work from the settlers concerned, in proportions to be mutually agreed upon before the work is undertaken.

With regard to such areas as the Bayswater Estate, the Otautau River Board's district, and the land in the wider portions of the valley at the lower end, these can be adequately protected against flooding at reasonable expense.

REFERENCE NO. 3.

To ascertain the best method of providing for the control of the said river and its tributaries so as to safeguard the lands affected, and to provide for the effective control and improvement of the said river and its banks.

The works recommended by your Commissioners are shown on plans marked 1 and 2, hereto attached, and consist generally of—

- (a.) The improvement and extension up-stream of the levees above the town of Otautau, to prevent the flood-waters from flowing into the Otautau Stream and its tributaries and so flooding the town of Otautau.
- (b.) The making continuous, and possibly in some places the raising, of the levees protecting Bayswater, in order to prevent the flood-waters from overflowing the left bank of the river into the low-lying swamp lands and thence into the Waimatuku Stream.
- (c.) The removal or destruction of all gorse, broom, willows, and other obstructions from the shingle-banks in the bed of the river.
- (d.) The protection of the river-banks from erosion. This can best be done by the use of willow, fir, or brushwood mattresses bound and held in position by fencing-wire anchored to posts driven some little distance back from the edge of the bank, the mattresses being weighted down at intervals by netted stones to prevent floating. These brushwood mattresses gradually get their interstices filled up with silt, and form a very efficient protection to the banks against erosion by scour. At points of concentrated attack it will be necessary to adopt rail, willow, and wire fence protection, backed by a growth of willows.

Whether levees other than those above recommended should be erected appears to your Commissioners to be a matter for future consideration by the controlling authority to be set up. In view of existing data and information available your Commissioners do not feel justified in advising that more than the limited amount of levee-work, as outlined above, should in the meantime be undertaken.

REFERENCE NO. 4.

To ascertain the nature and extent of any drainage-works that may be required, and the best method of carrying out such works.

It does not appear to your Commissioners that any drainage-works worthy of incorporation in this report are necessary.

REFERENCE NO. 5.

- (a.) *To furnish estimates of the cost of such remedial measures as you may recommend should be undertaken for the effective control and improvement of the said rivers and their banks.*

Your Commissioners estimate the cost of the remedial works recommended under reference No. 3, clauses (a), (b), (c), and (d), at £5,000.

In this connection your Commissioners do not consider that the Government should be called upon to contribute in any way towards the cost of construction of the remedial works so far recommended, either for the prevention of flooding or the erosion of the river-banks.

- (b.) *To report, in the case of each river, what area or areas of land should be constituted a district in respect of which a rate may be levied to secure and pay the interest on and provide a fund for the repayment of any loan that may be raised to carry out any river-improvement works which you may recommend should be undertaken.*

The area recommended to be constituted a district in respect of which a rate over the whole or any portion thereof may be levied to secure and pay the interest on and provide a fund for the repayment of any loan that may be raised to carry out the river-improvement works recommended by your Commissioners, and for the payment of administrative, maintenance, and other charges, is the whole of the watershed of the Aparima River above the point where it flows into the estuary.

It is further recommended that the district should be divided into three areas, to be known as “river ridings,” as follows: The first area comprising all lands within the drainage area on both sides of the river extending from the Jacob’s River estuary up to the southern boundary of the town of Otautau; the second area to embrace all lands within the drainage area on the right bank of the river extending from and embracing the town of Otautau up to the limits of the northern extremity of the drainage area; and the third area to comprise all lands within the drainage area on the left bank of the river extending above the town of Otautau up to the northern extremity of the drainage area. These three areas to be known respectively as the Lower Aparima River Riding, the Right Bank Upper Aparima River Riding, and the Left Bank Upper Aparima River Riding.

As in each district certain portions receive more benefit from flood-protection works than others, and other portions receive no direct benefit at all, it is recommended that the rating be graduated, as defined in the River Boards Act, such areas as receive no benefit to pay no rates. The fixing of the rates in each area should be the duty of the controlling body hereinafter described.

- (c.) *To report your opinion as to what matters, if any, should be adjusted by legislation.*

Your Commissioners consider that the whole of their findings, as set forth in this report, should be enacted in special legislation, to be called the Aparima River Improvement Act.

- (d.) *Generally, to report your opinion on all matters arising out of or touching the premises, including the question as to whether or not one or more competent authorities shall be appointed to control the whole or any portion of the said river, and what statutory powers should be possessed by such authority.*

Your Commissioners consider that for the purpose of carrying out the works described generally under reference No. 3, and ensuring their proper maintenance in the future, also for the proper control of the river and for the better protection of the interests of the whole community, one controlling authority should be appointed.

The district to be represented and controlled should comprise the whole of the three river ridings already referred to and described under reference No. 5 (b), and this district should be termed “The Aparima River Trust District.”

The Trust controlling the district should be composed of three local representatives, one member being elected from each river riding, and also of two Government representatives, called “River Commissioners,” appointed for three years by the Minister of Public Works, one of the Government nominees being a person well versed in local-body work, and the other an engineer with expert knowledge of river-control.

Your Commissioners further recommend that the duties of this controlling authority be clearly set out as follows:—

- (1.) To have detail surveys, plans, estimates, and specifications made for carrying out the works recommended above. These plans should be subject to the approval of the Government nominees on the Trust before any works are undertaken.

- (2.) To assess the total sum to be derived from each riding or special area benefited in the proportion recommended, and to fix the rates on all properties in each river riding or portion thereof, in the ratios of the benefits to be derived, according to the principles laid down in the River Boards Act.
- (3.) To submit the proposals to the ratepayers and obtain their authority by poll to raise the necessary loan.
- (4.) To carry out the necessary work, either by contract or direct labour, in as expeditious a manner as possible.
- (5.) To maintain the works efficiently, and to do whatever extra work may be necessary to improve the regimen of the river, in order to secure the fullest protection for their district from floods.
- (6.) To take all necessary observations and keep records that will assist in the study of the hydrology of the river, changes in its regimen, heights, and duration of floods; &c.

The Trust should have all the powers of a local body, and, further, should have absolute jurisdiction over the channel and banks of the river, inasmuch as proposals for all drains emptying into the river, all locks, tide-gates, bridges, ferries, wharves, &c., should be submitted to and approved by the Trust before being carried out. No planting or cutting of willows to be done except by authority of the Trust.

Drainage : Any Drainage Board in existence or which may be formed for the purpose of carrying out drainage-works within the Aparima River Trust District should, before carrying out any such works, submit plans, specifications, and estimates of the proposed works to the River Trust for their approval and sanction. The River Trust might, at the request of any Drainage Board within the district, carry out and construct on behalf of such Drainage Board any scheme of drainage-works first submitted to and approved by the Trust, in which case the Drainage Board should pay to the River Trust the total amount of the cost of construction of such drainage-works, together with all charges incidental thereto. The subsequent maintenance of the drainage-works should be carried out and paid for by the Drainage Board.

Government nominees : The River Commissioners may be appointed as Government representatives on any other River Trust similarly constituted, and they should report progress to the Minister of Public Works after each meeting of the River Trust. It should also be their duty to see that all necessary data are collected and copies forwarded to the Minister of Public Works, Wellington, for record and future reference.

This our report, which has been unanimously adopted, we have the honour to respectfully submit for the consideration of Your Excellency, together with the transcript of the evidence taken by us in the course of our investigations, and the following plans illustrating our report :—

Plan No. 1 : Mounted lithograph showing proposed district embracing the watershed of the Aparima River, also showing works constructed and works recommended, and tenure of land along the river. (Scale, 1 mile = 1 inch.)

Plan No. 2 : Longitudinal section showing approximate river-slopes. (Scales—horizontal, 5 miles = 1 inch ; vertical, 100 feet = 1 inch.)

Given under our hands and seals, this 31st day of March, 1920.

F. W. FURKERT, Chairman.
 ASHLEY J. HUNTER, } Commissioners.
 F. C. HAY, }

Approximate Cost of Paper.—Preparation, not given ; printing (540 copies and maps), £20 15s.

By Authority : MARCUS F. MARKS, Government Printer, Wellington. 1920.

Price 1s.]