

1916.
NEW ZEALAND.

PUBLIC WORKS STATEMENT,

BY THE HON. WILLIAM FRASER, MINISTER OF PUBLIC WORKS.

MR. SPEAKER.—

When the Public Works Statement of 1915-16 was being discussed by the House I made it quite clear that I had no intention of expending during that financial year the whole of the moneys which I was asking Parliament to entrust to me. On the contrary, I expressed my determination to endeavour to distribute the expenditure of these moneys over a period of two years instead of over one year. That I have succeeded in this endeavour is proved by the fact that after expending (inclusive of the cost of raising loan) £2,344,944 out of the Public Works Fund, I had still to the credit of that fund on 31st March, 1916, the sum of £1,838,201—viz., cash, £1,293,101; and balance of authorized loan-money still to be raised, £545,100. I feel confident that I am expressing the opinion of the whole community that this sum should suffice for the needs of the current year as far as public works are concerned, and the estimates are framed on that basis. To ensure this result the estimates for roads and bridges for 1916-17 will consist only of the unexpended votes on the estimates for 1915-16. To prevent misapprehension let me here state that the Public Works loan of £1,000,000 authorized under the Finance Bill, now before the House, is not intended to provide any further money for roads, bridges, railways, &c., during the current year; but some portion of it will be available, if necessary, to continue expenditure on such works from 31st March, 1917, until Parliament meets again, by which time we all hope and trust that peace will have been proclaimed. The provision I am making for roads and bridges is only about £4,500 less than what I expended last year, but the provision for railway expenditure has had in consequence to be reduced by £200,000.

Owing to the foregoing reasons I have been unable to make any provision on the estimates for applications for new grants for roads and bridges. I propose, however, to partially overcome this difficulty in the following manner: I am taking power in the Appropriation Act to transfer the sums now allocated on this year's estimates for such roads and bridges which a local body may deem of minor importance to other more urgently needed works which do not appear on the said estimates, but are situated in the same county; thus in reality providing money for new works. This will, I feel confident, help to meet the views of many local bodies.

The following table shows the brief particulars of the expenditure of the year, and also the total under each class of work from the inauguration of the public-works policy up to the 31st March last :—

TOTAL EXPENDITURE.

Class of Work.	Expenditure.	
	Expenditure for Year ended 31st March, 1916.	Total Expenditure to 31st March, 1916.
Railways—	£	£
New construction	662,919	24,845,907
Additions to open lines	402,252	9,253,993
Roads	424,494	11,040,253
Public buildings	335,774	6,624,550
Immigration	10,010	2,331,739
Purchase of Native lands ... ..	...	2,062,831
Lighthouses, harbour-works, and harbour-defences	13,673	1,136,308
Tourist and health resorts... ..	5,167	257,415
Telegraph-extension	249,554	3,207,722
Development of mining	6,602	891,422
Defence-works (general)	37,619	1,027,235
Departmental	111,489	1,062,953
Development of water-power ... ..	...	18,451
Irrigation and water-supply ... ..	...	4,356
Payment to Midland Railway bondholders ... ..	...	150,000
Lands-improvement	5,936	140,501
Minor works and services ... ..	...	312,607
Plant, material, and stores	74,418	74,418
Cost and discount, raising loans, &c.	5,037	1,253,037
	2,344,944	65,695,698
Wellington-Hutt Railway and Road Improvement Account {	Railway ...	228,374
	Road ... 142	101,658
Railways Improvement Account	Cr. 4	641,275
Railways Improvement Authorization Act 1914 Account ...	139,754	139,754
Loans to Local Bodies Account—Roads to open up Crown lands ...	...	697,408
Opening up Crown Lands for Settlement Account—Roads to open up Crown lands ...	...	206,626
Land for Settlements Account—Roads to open up Crown lands ...	47,974	140,949
National Endowment Account—Roads to open up endowment lands ...	13,344	46,614
Aid to Water-power Works Account	*55,410	307,538
Irrigation and Water-supply Account	29,874	110,255
Waihou and Ohinemuri Rivers Improvement Account.. ...	9,225	42,185
Totals	2,640,663	68,358,334

*Including £1, cost of raising loan.

WAYS AND MEANS.

On the 1st April, 1915, the available ways and means for public-works purposes were £ 695,762

And further funds were received as under :—

Under the Aid to Public Works and Land Settlement Act, 1914	929,900
Under the Finance Act of 1915	2,000,000
Under the Finance Act, to cover expenses of raising	5,030
Other receipts and recoveries	7,353

Making a gross total of £3,638,045

The ordinary expenditure of the year amounted to £2,339,907, plus the expenses of raising loans £5,037, thus bring the total disbursements up to £2,344,944

This leaves a balance to the credit of the Ways and Means Account at the end of the year of	£ 1,293,101
For the current year it is proposed to provide additional funds as under :—	
Balance of authorized loan-money still to be raised	545,100
Making the total ways and means for 1916-17	<u>£1,838,201</u>

The estimated expenditure for public works for the current year (excluding separate accounts having their own ways and means) amounts to £1,838,000, leaving an estimated balance of £201 to be carried forward to next year (1917-18).

In addition to the amounts described above, we have authority to raise, outside the Public Works Fund, the following sums :—

	£
Under the Aid to Water-power Act, 1910	191,000
Under the Waihou and Ohinemuri Rivers Improvement Act, 1910	50,000

RAILWAY-CONSTRUCTION.

Only two lengths of railway—one in each Island—were actually handed over and opened for regular traffic during the financial year which closed on the 31st March last. The opened sections were—

	M.	ch.	
Huntly to Awaroa ..	7	20	20th December, 1915.
Ward to Wharanui ..	7	76	4th December, 1915.
	15	16	

Several sections are, however, almost complete as far as construction is concerned, but remain in the hands of the Public Works Department in order to avoid the interference with construction-work which occurs when such has to be carried on over a section which has been handed over to the Railway Department. Meanwhile traffic is being worked by the Public Works Department as required. These sections are as follow :—

	M.	ch.
Otamatea to Huarau	6	20
Mount Maunganui to Pongakawa	23	10
Whangamomona to Kohuratahi	4	54
Makaraka to Ngatapa	10	29

The total expenditure on railway construction and improvement work during last financial year amounted to £1,204,921, as under :—

	£
Construction of new lines	662,919
Addition to open lines	402,252
Railways Improvement Accounts	139,750

The following is a summary of the works which have been in progress during the year just closed :—

KAIHU VALLEY EXTENSION.

At the beginning of the year construction-work was in progress upon the extension from Tarawhati to Donnelly's Crossing, four miles and a half in length. Formation and culverts were finished over about half the length when operations were suspended in November last, and have not since been resumed.

KAWAKAWA-HOKIANGA.

The section under construction at the beginning of the year commences at Kaikohe, the termination of the opened line, and ends at Okaihau, over eight miles

distant. Of this length the formation of three miles and a quarter has been completed, with the exception of the removal of some slips. Work has been commenced on a further length of some three miles and a half, but the number of men employed gradually dwindled until it became necessary to suspend operations and remove the few remaining men to other works.

WHANGAREI — NORTH AUCKLAND MAIN TRUNK.

This is an important new line, which was recommended by the North Auckland Railway Commission. It is nearly twenty miles in length, and will link up the existing Whangarei system with the North Auckland Main Trunk Railway at a point $23\frac{1}{2}$ miles north of the present terminus at Otamatea, on the Otamatea River, a branch of the Kaipara Harbour. Construction-work is in progress over the whole length, the first four miles under a contract, which is approaching completion, and the remainder by co-operative parties. The earthworks, on the whole, are not very heavy, but slips in the bigger cuttings give some trouble and interfere with progress. A small wharf has been built near Oakleigh Station, eight miles south of Whangarei, and is connected by a siding with the railway, for the purpose of landing construction materials. Owing to the very great scarcity of a suitable material for ballasting, roadmaking, and concrete-work throughout this district, advantage is being taken of a suitable volcanic deposit in the vicinity of Maungakaramaea. A quarry has been opened up, and crushing machinery is being installed. It is proposed to concentrate upon the construction of this line, and also the adjacent portion of the Main Trunk line, in order to take advantage of the cheaper and better material than those available at present. The quarry is situated some seven miles inland from Oakleigh Station, from which point the laying of the rails is proceeding.

NORTH AUCKLAND MAIN TRUNK.

Works are completed as far as Maungaturoto Station, a length of four miles and a quarter, to which a temporary goods and passenger service has been maintained during the year, and which has been extended to Huarau, two miles further on, during the past three months. Construction-work is in progress over a length of seven miles from Huarau northwards, including two tunnels of 297 yards and 550 yards respectively, both in difficult material, which limits the rate of progress.

Much of the country traversed is of an unstable nature, and slips are frequent in the winter months. Ballast has to be hauled from the Department's quarry at Hoteo, on the opened line, a distance of twenty-six miles from the present railhead.

On the section from Kirikopuni southwards light earthworks were carried out over a length of about two miles, but no tunnels or bridges were undertaken. It became necessary to suspend work in October last.

WAIUKU BRANCH.

Formation-work along nine miles of the branch line has continued during the year, and steady progress has been made, sufficient to permit of rails being laid from the junction to Patumahoe, four miles distant.

HUNTLY—AWAROA BRANCH.

This branch, starting from the Main Trunk line at Huntly, was completed to Pukemiro Station, a length of 7 miles 20 chains to the west, and was handed over to the Railway Department on the 20th December, 1915.

EAST COAST MAIN TRUNK.

Northern Section.—Work on the section between Waihi and Athenree, about eight miles and three-quarters in length, has been steadily carried on during the past year, and considerable progress has been made.

Tauranga Section.—On the important section commencing at Tauranga Harbour formation-work is completed as far as Pongakawa, nearly twenty-four miles to the east, and the goods service which is run by the Public Works Department to this point is well patronized by the settlers along the route. Passengers are carried between the starting-point at Mount Maunganui and Te Puke, thirteen miles

distant. There will be some delay in completing the steel bridge over the Kaituna River, owing to the difficulty in obtaining material, but a temporary structure permits of the train passing over the stream in the meantime. The Department works a stone-quarry at Te Puke for ballast, and also supplies the requirements of neighbouring local bodies from the same source. Beyond Pongakawa earthworks are in progress over a length of fifteen miles to Matata.

Efforts were made during the year to obtain supplies of steel for the superstructure of the large bridge which is to carry the railway across Tauranga Harbour in front of the town, but owing to the extraordinary conditions prevailing in the steel industry in England, due to the war, it is at present impossible to obtain supplies, and the construction of the bridge will therefore be deferred until the return of normal conditions. At the present time the policy is being pursued of only completing the line sufficiently to enable traffic to be worked safely, in order that the funds available may be utilized in extending the line as far as possible, so as to serve the maximum amount of country at the earliest possible date.

Gisborne Northward.—From Matawai, the terminus of the opened line, to Kowhai Road Station, near Motu, the formation-work has been completed, the rails have been laid, and the line is partly ballasted. A temporary bridge carries the line over the Motu River, as completion of the permanent steel structure is delayed owing to the difficulty of procuring materials. A goods service is carried on between Matawai and the railhead, timber comprising the principal freight. Construction-work beyond Kowhai Road Station cannot be put in hand until the route of the main line towards the Bay of Plenty is definitely located.

Gisborne Southwards.—Construction-work of a varied character has been carried on to a point fourteen miles from the junction at Makaraka. The steel bridge over the Waipaoa River has been completed. Rails are laid up to and a mile and a half beyond Ngatapa (11½ miles from the junction), to which point a temporary goods and passenger service is carried on. Beyond Ngatapa some heavy cuttings are well advanced, and one tunnel-heading driven; but the funds available would not permit of this section being fully manned throughout the year.

Napier Northwards.—Construction-work has been restricted to the large reinforced-concrete bridge and approach banks, which are to carry the railway and road over the Inner Harbour. Necessary plant and supplies of steel and concrete materials have been brought to the site, piles made and seasoned, and driving in position commenced. The erection of the bridge is being carried out by the Department's staff, and the construction of the approach-banks at either end by the Napier Harbour Board under contract. The bank on the Westshore side is almost finished.

STRATFORD – MAIN TRUNK.

At the western end the section from Whangamomona to Tahora, nearly ten miles in length, has fully occupied the available staff during the whole of the past year. On this length tunnels, bridges, heavy cuttings, banks, stream and road diversions, platelaying, and ballasting have been in progress, and half the section is practically ready for traffic. From the railhead at Kohuratahi, four miles and a half from the terminus of the open line, a service tramway is in operation up to the next station-site at Tahora. The larger of two tunnels on the section is finished, and the second one is approaching completion. Beyond Tahora the line follows a recently selected route through some rough country where considerable survey-work will have to be carried out before construction can be commenced.

At the eastern end of the line the Department is constructing the concrete piers of the important bridge which will carry the line over the Ongarue River near the junction with the Main Trunk line. As steel material is still unobtainable, a temporary wooden superstructure will probably be built to permit of the bridge being used for traffic as early as possible. The new contractors for the Okahu Tunnel have got through with the bottom heading and commenced enlarging and lining the tunnel. Other small tunnels towards Matiere Township are being enlarged and lined with bricks, which are made at the works established in the locality by the Department. Earthworks are in progress by contract and co-operative party up to 10½ miles from Okahukura, but this section cannot be opened until the tunnels are finished.

OPUNAKE BRANCH.

Construction-work has been in progress principally over the first seven miles between the junction at Te Roti and Kapuni Station. Earthworks are well advanced, culverts constructed, piers and abutments for two bridges built, and preparations being made for constructing concrete piers to carry a substantial bridge over the Waingongoro River. From Kapuni towards Auroa the route has been cleared and some culverts put in. Clearing and fencing along the five-mile branch line from Kapuni to Manaia have also been carried out.

RAETIHI BRANCH.

Very little formation remains to be done on this branch. Rails have been laid for half the length, and ballasting is now in hand. Progress during the year has been slow, principally owing to efficient labour not being available in the district.

SOUTH ISLAND MAIN TRUNK.

At the north end on the eight-mile section between Ward and Wharanui, platelaying and ballasting were finished under contract towards the end of 1915. Station buildings were erected under another contract, and the completed section was taken over by the Railway authorities and opened for traffic on the 4th December last. Beyond the new terminus formation is complete, rails laid, and the line partly ballasted for a distance of three miles and a quarter; but two small steel bridges on this length are unfinished, owing to difficulty experienced in obtaining steel material for their manufacture.

WESTPORT-INANGAHUA.

The three unfinished contracts for rock-cuttings and short tunnels along the north bank of the Buller River have been completed during the year, but all other work has been suspended. It is not proposed to resume construction-work for the present.

NELSON—WESTLAND.

At the Nelson end earthworks and culvert-construction were continued, principally during the winter months, on the three-mile section between Glenhope and Kawatiri. Formation is completed for about half the length, but there is some heavy work ahead before the rails can be laid to Kawatiri.

ARTHUR'S PASS TUNNEL.

The driving of the Arthur's Pass Tunnel continued steadily during the whole period under review, by day labour in three shifts at the Otira end, and under co-operative contract on a lesser scale at the Bealey end. From Otira on the western side the bottom heading in slate rock was advanced 26 chains during the nine months, and the excavation and lining was carried over 17 chains during the same period. From the Bealey end only moderate progress was made, the results being about $11\frac{1}{2}$ chains of heading and $13\frac{1}{4}$ chains of excavation and lining. There has been a shortage of efficient labour during the whole period, the average number of men working being thirty-five at the Otira end and fifteen at the Bealey end. The tunnel when completed will be 5 miles 25 chains in length. The present position is that the bottom heading has been driven 3 miles 78 chains and the tunnel excavated and lined for 40 chains less. The untouched distance between the headings from the eastern and western sides of the tunnel at the end of March was 1 mile 27 chains. There are some grounds for hoping that the wettest of the material has been traversed, and that an improvement in working-conditions at the face may be looked for.

CULVERDEN—WAIKAI.

Formation-work over the whole length is almost complete; bridges and culverts are in hand; necessary fencing has been done and rails laid over seven miles and a half. Ballasting is proceeding, and the line is expected to be ready for traffic early in the current year.

WAIMATE BRANCH EXTENSION.

Some rock-cuttings, culverts, stream-diversions, and fencing had been carried out over the first four miles before work on this extension was suspended early in December.

OTAGO CENTRAL.

Formation-work on the extension from Clyde to Cromwell is practically completed. Rails have been laid over half the distance, and ballasting closely follows the railhead. Two small bridges have yet to be completed and a few culverts constructed, and fencing erected.

TUAPEKA MOUTH BRANCH.

The interrupted trial survey to locate the best route for a line to connect Tuapeka Mouth with the main system was resumed in the middle of March, but no construction-work was done on either of the suggested routes during the year.

WAIKOU-ORAWIA.

Bushfelling and a little formation-work were started on this extension in May, 1915, but were suspended in November following. Over one mile of earthwork was completed, and after the works were stopped the fallen bush was burnt off while weather-conditions were favourable. No further work has been done on the line.

TOTAL APPROPRIATIONS FOR RAILWAY-CONSTRUCTION.

OTHER RAILWAY-WORKS.

The expenditure out of the Public Works Fund under the heading "Additions to Open Lines" amounted during the past financial year to £402,252. Of this sum £324,551 was spent on rolling-stock, workshops, machinery, Westinghouse-brake equipment, and the installing of a Thomas transmission car. The balance covered expenditure on improvements to station accommodation and yards, engine-depots, wharves, tunnel-duplication, installation of telegraph, telephone, and tablet facilities, signalling and interlocking and other material, and the purchase of land required for station purposes.

ROADS ON GOLDFIELDS (MINES DEPARTMENT).

The total allocation under this head last year amounted to £63,511, on account of which a vote of £40,000 was taken. The expenditure during the year was £24,432, and the sum proposed to be allocated for the current year is £41,766, on account of which a vote of £30,000 is asked for.

DEVELOPMENT OF MINING.

The value of the mineral output for the year is less than the value of the output of the previous year. This was only to be expected, however, in view of the prohibition of the export of certain materials during the term of war.

The output of coal was maintained, being 2,208,624 tons, a slight decrease as compared with the output of the previous year.

In order to obtain suitable marble for the new Parliament Buildings the Department undertook, by arrangement with the contractors, the construction of a line of tramway from the seashore to a new quarry over three miles distant, and at an elevation of 1,500 ft. The line, with necessary bridges, sidings, and crossings, has been completed and is now in regular use. A new wharf at the sea end of the tramway is in course of construction. The Government holds security for the ultimate repayment of the outlay.

The expenditure under the heading of "Development of Mining" during last year was £6,602, and a vote of £6,000 is proposed to be taken this year.

PUBLIC BUILDINGS.

The total amount voted and expended on construction of public buildings during the last financial year amounted to—

	Voted. £	Expended. £
New buildings (Class XVIII, Public Works Fund)	429,325	335,774

For the current year the following appropriation is proposed :—

New buildings (Public Works Fund) ..	£ 364,000
--------------------------------------	-----------

GENERAL.

The new Parliament Buildings still accounts for the heaviest item of expenditure under this heading. The contract-time expired in December last, and although the building is still far from completion the principal cause of delay—the difficulty experienced in obtaining suitable blocks of marble—is being overcome, and there seems no reason to anticipate any further interference with the steady progress of the work. The four-story brick structure for Police Headquarters in Wellington is well advanced, and substantial additions to the Government Printing Office in the same city are approaching completion.

JUDICIAL.

Courthouses.—During the past year buildings were erected at Waipu and Chatham Islands, and additions made to the existing Courthouse at Lawrence.

Prisons.—Extensions of buildings at Auckland and Invercargill have been carried to completion. An important section of the new establishment at Waikeria has been finished and equipped, and a start has been made with projected prison buildings at Paparua, near Christchurch. The proposed works for the current year include an administration block at Waikeria and a new building at Wellington.

Police-stations.—New buildings were erected at Darfield, Geraldine, Hamilton, Kaponga, Marton, and Wellington (Taranaki Street), and sites for police-stations were acquired at Houhora, Tuakau, and Eastbourne. A contract was let for a new central police-station at Wellington, and the erection of the building is now in progress.

POST AND TELEGRAPH.

During the year post-offices were erected at Patumahoe, Mamaku, Ohingaiti, Methven, Arrowtown, and Glenorchy, and an automatic telephone exchange built at Hamilton. Substantial additions are being made to the office building at Palmerston North.

In addition to the appropriations previously authorized but not expended, it is proposed to make provision for new buildings at Aria, Dannevirke, Heretaunga, Ranfurly, Turua, and Waitoa ; for a Postmaster's separate residence at Rakaia ; also for alterations and additions at Hanmer Springs, Invercargill, Kaitaia, Te Awamutu, and Wanganui.

MENTAL HOSPITALS.

At Tokanui a third unit (for fifty patients) has just been completed and electric light installed throughout. Reception houses and hospitals at Porirua and Sunnyside were delayed for a time owing to a shortage of artisans, but are now progressing satisfactorily. The Nurses' Home at Sunnyside is finished and ready for occupation

A brick addition at Seacliff for women and a receiving cottage for men have been completed. An addition has been made to the annexe at Nelson to accommodate patients during the gradual rebuilding of the main institution.

The current year's estimates provide for a substantial increase of accommodation and for other urgent works at each of the principal institutions.

AGRICULTURE.

The works undertaken during the past financial year were not very extensive or costly, consisting of additional accommodation at Weraroa and Moumahaki. The proposals for the current year include two residences for Inspectors in localities where suitable accommodation is unobtainable, and some necessary improvements to buildings at the experimental farms.

HOSPITALS.

An expenditure of £1,000 was incurred in connection with Blenheim Hospital, and £426 was spent in providing accommodation for special cases at several hospitals. For the latter purpose a vote appears on the current year's estimates.

WORKERS' DWELLINGS.

Last year's vote of £55,000 was fully expended, and for the current year a vote of £50,000 is proposed, about one-third of which will be required to complete works in hand at the 31st March. The balance will be expended on thirty-eight dwellings for which arrangements have been made, and will also permit of about thirty additional dwellings being undertaken.

DEVELOPMENT OF WATER-POWER.

The Lake Coleridge power scheme, designed and carried into effect by the Government, has been in continuous operation for one complete year, and the results attained have justified the most sanguine anticipations of the advocates of the utilization on a large scale of our water-powers for the development of electrical energy. Three units of generating machinery were originally installed, capable of an output of 6,000 horse-power. Twelve months ago the demand for current warranted the installation of a fourth unit of 2,000 horse-power, and the expanding business now necessitates the addition of a fifth unit, comprising pipe-line, turbine, and generator, of 4,000 horse-power, which will bring the total capacity of the plant up to 10,000 horse-power. During the year the maximum load on the plant reached 1,770 horse-power, which is less than the capacity of one of the three units installed. Under these circumstances the business could not be expected to show a profit. At the same time, at the end of the year the plant was earning sufficient to cover working-expenses. Contracts to the extent of 8,000 horse-power have already been entered into, and when the power under these contracts is being supplied it can confidently be stated that the plant will be earning sufficient to pay interest in full as well as working-expenses, and possibly leave a small surplus towards sinking fund and depreciation. The scheme is capable of much greater expansion, and as the load increases there will be an increased surplus out of which the debit balance incurred in the earlier stages of the undertaking will be repaid. The current has up to the present been utilized mainly for lighting, domestic, public, and industrial motors, for which purposes experience proves that it is a cheap, convenient, and reliable form of energy. Arrangements are, however, now in train for utilizing the current during the present year for tramway traction, and for the operation of machinery in the principal meat-works, flour-mills, tanneries, dairy factories, and other established industries in and around Christchurch.

During the year feeder-lines have been extended to Belfast, and arrangements are being made for a further extension in this direction to Kaiapoi. Other extensions in the direction of Southbridge, Leeston, and Akaroa, and also the establishment of high-tension lines between the power-house at Coleridge and Timaru in order to

serve the South Canterbury district, have had to be postponed owing to the cost and difficulty of obtaining material for the purpose. The Department during the year inaugurated a number of local distribution services, which in some cases have been taken over by the local authorities in whose districts the reticulation has been carried out, and the Department has been reimbursed.

In addition to supplying energy for present known requirements the Department is in touch with manufacturers in many branches of industry with a view to introducing new processes or improving existing ones where such possibilities are opened up by the large supply of energy available. It is probable that one result will be the establishment of new industries for the local manufacture of electro-chemicals in common use, and possibly something in the way of steelmaking.

The whole installation is running smoothly and efficiently, and it is satisfactory to record that the cost of the development, machinery, and equipment has been kept very close to the estimates submitted by the Government experts. The capital expenditure on the Lake Coleridge scheme up to the 31st March last amounted to £329,719.

During the past year some progress has been made by survey and investigation towards the formulation of a comprehensive scheme to provide a general supply of electricity for the North Island. There are several schemes showing some promise, but careful investigation at the sources and a good deal of survey along prospective transmission-lines have to be completed before the most economical and effective method of serving the Island can be determined.

IRRIGATION.

A small expenditure was made during the year, in connection with the Otekaieke Settlement scheme, on a concrete intake and repairs to siphon, but three miles of new race were surveyed, and construction-works are in progress.

In Central Otago the concrete dam in the Manorburn has been brought up to the desired level, and race-construction along both sides of the Ida Valley has been continued and fair progress made. The old Bonanza Water-race has required a good deal of strengthening and repair to prevent leakage, but only a portion of this work has been completed. Following the custom of recent years, water for irrigation in a modified form was supplied to the settlers in the valley during December and January.

It has been ascertained that a total area of 10,000 acres of irrigable land can be served by the proposed scheme from the Manuherikia River, and survey work in connection with the distributory race lines has been in progress during the year. The position of the intake from the river has not yet been definitely settled, but is under consideration. The construction of the main race is in progress under contract in two places and by co-operative parties in another.

WAIHOU AND OHINEMURI RIVERS IMPROVEMENT.

The dredge designed and built for work on these rivers has been in use throughout the period under review excavating the new Koutou cut to bed-level and full width, also improving the steamer berthage at the new Netherton Wharf near Paeroa, with satisfactory results at both places. A further instalment of stop-bank construction is just being started under two contracts which will cover nearly a mile along the left bank of the Waihou southward of the Ngararahi cut. Much more of this class of work remains to be done before the improvement scheme is carried to completion.

TOURIST AND HEALTH RESORTS.

The expenditure under this heading amounted to £5,167, compared with £8,232 for the previous year. The largest item was £2,266 on improvements at Mount Cook Hostel, including a residence for the guides and several outbuildings. A new laundry was provided at the Waitomo Caves Hostel, and the erection of a bathhouse at Te Puia Hot Springs commenced. There are no other building-works of any importance in hand at present.

TELEGRAPH EXTENSION.

The extension of telegraph and telephone lines has steadily proceeded during the year. Twenty-seven new offices were opened and ten new exchanges.

The expenditure during the year amounted to £249,554.

Among the larger works undertaken were the construction of the following lines: Auckland–Dargaville, Cambridge–Rotorua, Hamilton–Auckland, Taumarunui, Ohura, Te Kuiti–Hamilton, Blenheim–Nelson, Gisborne–Opotiki, Kahukura–Tokomaru Bay, Wellington–Masterton, Christchurch–Little River, and Lawrence–Roxburgh.

Two hundred and fifty miles of line and 1,274 miles of wire were added to the telegraph system, and 408 miles of line and 15,046 miles of wire to the telephone-exchange system.

Fifty-nine new slot telephones were installed, bringing the total up to 198 now in use.

On account of the abnormal conditions caused by the war the erection of automatic exchanges is being unduly delayed, but goods are now expected to come forward from America, and the amount originally provided will be required.

In the large centres underground cable has been substituted for serial cable, and the necessary buildings provided for automatic exchanges at Blenheim, Hamilton, Ponsonby, Mount Eden, and Remuera.

LIGHTHOUSES.

The Karori Rock Lighthouse in Cook Strait has been completed, and the light was first exhibited on the 20th October last. This light is giving satisfaction to mariners.

The necessary automatic light and tower for erection on Okuri Point, to indicate the position of the dangerous Beef Barrel Rocks near the French Pass, have been obtained, and it is proposed to commence the erection during this month.

An automatic light has also been obtained for placing on Flat Rock, in the Hauraki Gulf, but owing to the necessity for economy during the war no steps have yet been taken to provide the necessary tower, which it is estimated will cost about £650.

DEPARTMENTAL.

Mr. H. J. H. Blow, I.S.O., Under-Secretary and principal administrative officer of the Department, is retiring on superannuation, after forty-three years' service. He has occupied this position for the past twenty-five years with credit, and the vacant position has been filled by the promotion of Mr. W. S. Short, who has been Assistant Under-Secretary since the amalgamation of the Public Works and Roads Department in 1908.

CONCLUSION.

In conclusion, let me express my great regret at the necessity that exists during the continuance of the war to curtail expenditure on roads, bridges, and railways. Much has been done in the past in regard to roading, but much more still requires to be done in order to enable the produce of the land to be brought to market, especially as settlement is progressing so rapidly. New Zealand is incurring enormous responsibilities in connection with the war, and the only way in which the consequent burden of taxation can be borne will be by increasing the quantity of our products from the land, and the facilities for transport of same to ports of shipment. This will have to be the chief consideration after peace has been proclaimed. Meantime everything must give way to the imperative necessity of assisting the Empire to emerge victorious from the present gigantic struggle to maintain our freedom untrammelled by German domination.

PUBLIC WORKS STATEMENT, 1916.

INDEX.

TABLES.

Page

No. 1.—TOTAL EXPENDITURE: Summary showing Total Expenditure out of Public Works Fund to 31st March, 1916, and Liabilities at that Date	2
No. 2.—YEARLY EXPENDITURE OUT OF PUBLIC WORKS FUND, 1894 TO 1916	3
No. 3.—RAILWAYS: Statement showing Expenditure on Construction of Railways to 31st March, 1916, and Liabilities at that Date	7
No. 4.—EXPENDITURE OUT OF SEPARATE ACCOUNTS UNDER THE CONTROL OF THE PUBLIC WORKS DEPARTMENT	10
No. 5.—DEVELOPMENT OF WATER-POWER: Statement of Accounts as at 31st March, 1916	11

APPENDICES.

Appendix A.—EXPENDITURE FOR THE YEAR: Audited Statement of Expenditure out of the Public Works Fund for the Year 1915-1916	16
" B.—ANNUAL REPORT ON PUBLIC WORKS, by the Engineer-in-Chief	18
" C.—ANNUAL REPORT ON PUBLIC BUILDINGS, by the Government Architect	41
" D.—ANNUAL REPORT ON ELECTRICAL WORK AND POWER SCHEMES, by the Chief Electrical Engineer	44

TABLE NO. 1.
SUMMARY SHOWING THE TOTAL EXPENDITURE ON PUBLIC WORKS AND OTHER SERVICES OUT OF PUBLIC WORKS FUND TO 31ST MARCH, 1916, AND THE LIABILITIES ON THAT DATE.

Number of Table containing Details.	Works.	Total Net Expenditure to 31st March, 1915.	Expenditure during Twelve Months ended 31st March, 1916.	Recoveries on Account of Services of Previous Years.	Total Net Expenditure to 31st March, 1916.	Liabilities on 31st March, 1916.	Total Net Expenditure and Liabilities.	Works.
3	Railways*..	£ 33,039,362	£ 1,065,171	£ 4,633	£ 34,099,900	£ 293,522	£ 34,393,422	Railways.
..	Roads ..	10,615,759	424,494	..	11,040,253	174,220	11,214,473	Roads.
..	Development of mining ..	834,820	6,602	..	841,422	..	841,422	Development of mining.
..	Telegraphs ..	2,958,168	249,554	..	3,207,722	..	3,219,190	Telegraphs.
..	Public buildings ..	6,288,791	335,774	15	6,624,550	188,640	6,813,190	Public buildings.
..	Lighthouses, harbour-works, and harbour-defences	1,122,635	13,673	..	1,136,308	53	1,136,361	Lighthouses, harbour-works, and harbour-defences.
..	Departmental ..	951,464	111,489†	..	1,062,953	710	1,063,663	Departmental.
..	Development of water-power†	18,451	..	..	18,451	..	18,451	Development of water-power.
18 of 1878	Coal-exploration and mine-development	10,835	..	..	10,835	..	10,835	Coal-exploration and mine-development.
11 of 1877	Aiding works on Thames goldfields ..	50,000	..	..	50,000	..	50,000	Aiding works on Thames goldfields.
..	Immigration ..	2,321,739	10,010	10	2,331,739	..	2,331,739	Immigration.
..	Purchase of Native lands ..	2,063,803	..	972	2,062,831	..	2,062,831	Purchase of Native lands.
..	Defence ..	989,616	37,619	..	1,027,235	..	1,027,235	Defence.
..	Charges and expenses of raising loans ..	1,253,030	7§	..	1,253,037	..	1,253,037	Charges and expenses of raising loans.
..	Interest and sinking fund ..	218,500	..	..	218,500	..	218,500	Interest and sinking fund.
..	Rates on Native lands ..	68,672	..	..	68,672	..	68,672	Rates on Native lands.
..	Thermal springs ..	14,600	..	..	14,600	..	14,600	Thermal springs.
..	Tourist and health resorts ..	252,748	5,167	500	257,415	1,217	258,632	Tourist and health resorts.
..	Lands improvement ..	134,565	5,936	..	140,501	35	140,536	Lands improvement.
..	Payment to Midland Railway bond-holders	150,000	..	..	150,000	..	150,000	Payment to Midland Railway bond-holders.
..	Irrigation and water-supply†	4,356	..	..	4,356	..	4,356	Irrigation and water-supply.
..	Plant, material, and stores ..	..	74,418	..	74,418	7,801	82,219	Plant, material, and stores.
..	Totals ..	63,361,914	2,339,914	6,130	65,695,698	677,666	66,373,364	Totals.

* Exclusive of expenditure on Hutt Railway and Road Improvement, and Railways Improvement Accounts
† Includes £67 charged to "Unauthorized."
‡ Expenditure subsequent to 1911-12 is under separate special accounts.
§ Expenditure has been reduced by £5030, Debiture issued under the Loans Act, 1908.

TABLE NO. 2.
GENERAL SUMMARY.

Showing NET YEARLY EXPENDITURE out of PUBLIC WORKS FUND, 1894-95 to 1915-16.

N.B.—The figures in italics, prefixed by "Cr.," are either recoveries on account of services of previous years or receipts-in-aid applied in reduction of expenditure.
Expenditure from 1892-93 to 1896-97, inclusive, includes expenditure under Native Lands Purchase Account; and from 1894-95 to 1896-97, inclusive, expenditure under Lands Improvement Account.

Description of Services.	Total Net Expenditure to 31st March, 1894.	Expenditure.										
		1894-95.	1895-96.	1896-97.	1897-98.	1898-99.	1899-1900.	1900-1.	1901-2	1902-3.	1903-4.	1904-5.
Immigration	£ 2,146,553	£ 101	£ Cr. 10	£ 301	£ 70	£ 105	£ 385	£ 214	£ 139	£ 142	£ Cr. 7	£ 6,481
Public Works (Departmental)	376,161	8,680	14,300	14,892	9,689	10,090	12,572	12,932	17,771	13,949	16,088	12,814
Development of Water-power .. .. .	..	..	..	..	..	..	..	..	..	..	..	468
Irrigation and Water-supply .. .. .	..	..	..	..	..	..	..	..	..	..	..	..
Railways	14,655,027	247,545	197,105	207,231 Cr. 334	351,600	374,192	417,937	717,723	1,333,940	759,752	828,704	779,891
Payment to Midland Railway Bondholders .. .. .	..	..	..	..	..	..	..	..	..	..	150,000	..
Roads :—												
Miscellaneous Roads and Bridges	3,661,818	50,544 Cr. 7,050	45,261 Cr. 573	15,691 Cr. 365	241,209 Cr. 365	248,934 Cr. 365	237,351 Cr. 347	267,374	354,687	230,349	316,248	202,850
Roads on Goldfields	223,636	17,577	21,513	32,578	49,569	46,550	48,039	48,417	47,573	51,690	45,594	26,112
Development of Thermal Springs and Natural Scenery .. .. .	..	..	..	16,023	..	..	..	..	..	..	..	..
Lands Improvement Account* .. .. .	..	89,207	108,168	103,555	..	..	..	..	..	..	..	..
Total, Roads	3,885,454	150,278	174,369	167,482	290,413	295,119	285,043	315,791	402,260	282,039	361,842	228,962
Development of Mining	572,441	5,865	9,345	10,508	33,117	17,355	21,815	15,907	15,326	24,213	16,278	6,258
Purchase of Native Lands	1,297,517	349 Cr. 12	..	Cr. 37	61,503	53,182 Cr. 225	32,025	28,688	18,261	15,782	5,352	6,281
Native Lands Purchase Account	98,560	101,009	163,411	129,000	..	..	..	..	..	..	..	..
Total, Land Purchases	1,396,077	101,346	163,411	128,963	61,503	52,957	32,025	28,688	18,261	15,782	5,352	6,281
Telegraph Extension	679,793	19,229	35,538	36,791	29,384	28,551	26,771	50,101	31,729	68,578	47,228	79,298

* Subsequent expenditure under separate class "Lands Improvement," see next page.

Continued on page 4.

TABLE NO. 2—continued.
GENERAL SUMMARY—continued.
Showing NET YEARLY EXPENDITURE out of PUBLIC WORKS FUND, 1894-95 to 1915-16—continued.

Description of Services.	Total Net Expenditure to 31st March, 1894.	Expenditure.											
		1894-95.	1895-96.	1896-97.	1897-98.	1898-99.	1899-1900.	1900-1.	1901-2.	1902-3.	1903-4.	1904-5.	
Public Buildings :—													
General (including Miscellaneous)	£ 196,358	£ 2,551	£ 3,724	£ 8,178	£ 14,797	£ 8,764	£ 3,957	£ 5,594	£ 12,513	£ 9,031	£ 10,964	£ 9,021	
Parliamentary ..	14,171	6,822	..	9	466	20,636	9,883	3,039	4,424	1,503	10,602	697	
Judicial ..	283,345	11,487	27,341	14,806	12,727	11,109	19,682	29,630	28,728	33,224	25,978	13,083	
Post and Telegraph..	154,592	3,542	6,194	7,504	5,888	5,168	13,483	20,954	40,361	74,686	53,918	16,008	
Customs ..	5,860	12	647	16	385	..	107	875	2,066	6,630	8,719	13,018	
Quarantine-stations ..	3,528	306	..	..	..	..	..	2,607	424	..	..	..
Mental Hospitals ..	349,499	13,633	10,935	16,404	14,130	17,667	17,712	18,872	16,743	10,167	15,812	15,949	
Public Health ..	..	..	..	..	..	..	..	..	..	..	6,315	4,265
Hospitals and Charitable Institutions ..	41,183	..	6,561	700	..	..	899	5,141	1,200	3,540	4,291	1,204
School Buildings ..	842,014	15,000	20,000	22,143	23,864	43,403	49,256	33,681	38,606	57,790	87,089	42,721	
Agricultural ..	160	837	1,127	819	1,328	520	447	971	535	883	2,504	1,362	
Workers' Dwellings ..	..	..	..	..	..	..	..	..	..	..	..	..
Total, Public Buildings ..	1,890,710	54,190	76,529	70,579	73,585	107,267	115,426	121,364	145,600	197,454	216,192	117,328	
Lighthouses, Harbour-works, and Harbour-defences :—													
Lighthouses ..	128,820	..	234	6,067	2,180	3,727	3,333	1,017	2,060	6,082	6,206	2,167	
Harbour-works ..	310,107	650	3,861	866	568	1,777	365	1,540	3,421	1,373	1,773	1,308	
Harbour-defences ..	468,032	2,495	3,314	4,667	2,547	10,158	5,328	3,960	6,678	6,126	2,885	2,515	
Total, Lighthouses, &c. ..	906,959	3,145	7,409	11,600	5,295	15,662	9,026	6,517	12,159	13,581	10,864	5,990	
Rates on Native Lands ..	61,073	561	340	332	156	347	744	673	571	471	666	631	
Contingent Defence ..	429,719	..	5,000	10,554	10,360	13,867	42,810	37,650	146,875	37,005	38,723	46,588	
Tourist and Health Resorts ..	..	..	..	..	..	..	..	..	11,260	10,949	15,643	17,508
Lands Improvement* ..	..	..	..	..	..	..	..	..	1,741	2,349	2,019	2,248
Charges and Expenses of raising Loans ..	1,026,828	..	..	943	5	224	28,322	1,460	5,620	88,180	87,249	10,764
				<i>Cr. 6</i>	<i>Cr. 5</i>				<i>Cr. 516</i>				
Interest and Sinking Funds ..	218,500	..	..	..	..	..	..	..	..	..	..	..
Coal-exploration and Mine-development ..	10,835	..	..	..	..	..	..	..	..	..	..	..
Thermal Springs ..	14,600	..	..	..	..	..	..	..	..	..	..	..
Total Ways and Means Credits ..	7,062	573	705	705	370	590	347	..	516	..	7	..	
Grand Total—Net Expenditure ..	28,270,730	590,940	683,336	659,836	865,172	915,736	992,876	1,309,020	2,142,736	1,514,444	1,796,841	1,321,510	

* For previous expenditure see Roads Class.

Continued on page 5.

TABLE NO. 2—continued.
GENERAL SUMMARY—continued.
Showing NET YEARLY EXPENDITURE out of PUBLIC WORKS FUND, 1894-95 to 1915-16—continued.

Description of Services.	Expenditure.											Total Net Expenditure to 31st March, 1916.
	1905-6.	1906-7.	1907-8.	1908-9.	1909-10.	1910-11.	1911-12.	1912-13.	1913-14.	1914-15.	1915-16.	
Immigration	£ 8,753	£ 14,353	£ 9,132	£ 15,075	£ 17,003	£ 9,441	£ 11,681	£ 14,694	£ 33,914	£ 33,219	£ 10,010 <i>Cr. 10</i>	£ 2,331,739
Public Works (Departmental)¶ ..	13,517	16,710	18,219	24,512	41,176	42,733	49,864	57,426	66,650	100,719	*111,489	1,062,953
Development of Water-power¶¶ ..	2,901	4,664	315	..	..	1,021	9,082	†	†	†	†	18,451
Irrigation and Water-supply† ..	..	..	..	..	..	1,562	2,794	§	§	§	§	4,356
Railways	1,021,265	1,227,880	1,093,535	1,116,184	1,128,400	1,104,071 <i>Cr. 652</i>	1,125,905 <i>Cr. 6,987</i>	1,148,832 <i>Cr. 29,528</i>	1,104,897 <i>Cr. 5,485</i>	2,146,753 <i>Cr. 6,022</i>	1,065,171 <i>Cr. 4,633</i>	34,099,900
Payment to Midland Railway Bondholders ..	..	..	..	..	..	..	..	..	..	..	..	150,000
Roads :—												
Miscellaneous Roads and Bridges ..	306,065	308,500	285,248	422,174	297,932	229,537	383,511	337,584	{ 353,836 <i>Cr. 515</i>	484,365	400,062	..
Roads on Goldfields ..	45,139	38,970	38,494	47,375	40,830	25,626	41,067	36,761	24,143	30,065	24,432	..
Development of Thermal Springs and Natural Scenery ..	..	..	..	..	..	..	..	..	..	..	..	..
Lands Improvement Account ..	..	..	..	..	..	..	..	..	..	..	..	..
Total, Roads	351,204	347,470	323,742	469,549	338,762	255,163	424,578	374,345	377,464	514,430	424,494	11,040,253
Development of Mining	18,533	11,064	8,633	32,859	18,597 <i>Cr. 1,000</i>	10,845 <i>Cr. 1,000</i>	21,244 <i>Cr. 30</i>	10,644 <i>Cr. 1,015</i>	4,889	2,384 <i>Cr. 255</i>	6,602	891,422
Purchase of Native Lands	13,777	9,135	2,190	2,099	30,567	2,976 <i>Cr. 2,286</i>	<i>Cr. 2,466</i>	<i>Cr. 917</i>	<i>Cr. 857</i>	<i>Cr. 1,060</i>	<i>Cr. 972</i>	..
Native Lands Purchase Account ..	..	..	..	..	..	..	..	..	..	..	..	..
Total, Land Purchases	13,777	9,135	2,190	2,099	30,567	690	<i>Cr. 2,466</i>	<i>Cr. 917</i>	<i>Cr. 857</i>	<i>Cr. 1,060</i>	<i>Cr. 972</i>	2,062,831
Telegraph Extension	77,186	114,068	155,491	163,033	123,423	111,867	147,692	251,375	392,648	288,395	249,554	3,207,722

* Includes "Unauthorized," £67.

† Previously included under Lands Improvement.

‡ Expenditure from 1912-13 is under the Aid to Water-power Works Account.

§ Expenditure from 1912-13 is under the Irrigation and Water-supply Account.

¶ Includes £1,000,000 expended 1908-9 and 1909-10 under Wellington-Manawatu Railway Purchase Account.

¶¶ Expenditure on Development of Water-power, 1903-4, £2,561; 1908-9, £101 included in Class Public Works (Departmental).

TABLE NO 3.

EXPENDITURE ON RAILWAYS TO 31ST MARCH, 1916, AND LIABILITIES ON THAT DATE.

Lines of Railway.	Total Expenditure by General Government to 31st March, 1915.	Recoveries on Account of Expenditure of Previous Years.	Expenditure out of Public Works Fund during Year 1915-16.						Land Claims and other Old Liabilities.	Expenditure under Special Acts during Year 1915-16.	Amounts previously charged to "Surveys of New Lines," now charged to Individual Lines.	Total Expenditure by General Government to 31st March, 1916.	Valuation of Works constructed by Provincial and Midland Railway Company.	Liabilities.	Total Expenditure and Liabilities, 31st March, 1916.	
			New Works.			Works on Open Lines.										
			Construction and Surveys.	Permanent way.		£	£	£								£
				£	£											
Kaihu Valley ..	90,954	..	12,858	301	13,159	..	..	..	..	..	104,113	..	..	2,700	104,113
Otiria to Hokanga ..	169,413	..	18,639	15	18,654	..	..	..	..	..	188,067	..	..	..	190,767
Opua Wharf to Whangarei and Onerahi ..	521,795	..	..	..	..	114	..	179*	..	..	522,088	..	..	..	522,088
Whangarei to North Auckland Main Trunk ..	19,352	..	64,321	4,280	68,601	..	..	..	..	..	87,953	..	..	8,183	96,136
Helensville Northwards ..	736,979	..	45,949	8,145	54,094	1,388	..	..	..	..	792,461	..	..	1,969	794,430
Waipou Branch ..	..	..	289	..	289	..	..	..	..	80	792,461	..	..	..	792,461
Helensville to Te Awamutu ..	1,841,528	..	..	..	..	29,558	..	110,438*	..	..	1,981,524	..	..	..	1,981,524
Waikou Branch ..	19,487	..	20,301	659	20,960	..	..	..	..	..	40,447	..	..	428	40,875
Huntly to Awaroa ..	85,224	..	14,590	4,510	19,100	..	..	..	..	..	104,324	..	..	60	104,384
Cambridge Branch ..	51,384	..	..	..	..	116	..	..	..	..	51,500	..	..	..	51,500
Waikato to Thames—	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Frankton to Te Aroha ..	151,713	..	..	..	..	900	..	121*	..	..	152,724	..	..	..	152,724
Te Aroha to Thames ..	206,263	..	..	..	..	1,386	..	..	..	..	207,649	..	..	..	207,649
Paeroa to Waikato and Tauranga ..	162,398	..	14,356	..	14,356	..	..	..	..	..	176,754	..	..	1,475	178,229
Thames Valley to Rotorua—	..	..	..	..	..	..	..	68*	..	..	..	..	..	..	..
Morrinsville to Lichfield..	166,682	..	..	..	..	155	..	..	..	..	166,750	..	..	..	166,750
Putaruru to Rotorua ..	199,636	..	..	..	..	..	..	..	..	..	199,791	..	..	..	199,791
Marton to Te Awamutu ..	2,713,450	3,318	..	..	..	Cr. 646	..	4,022*	..	..	2,713,508	..	..	..	2,713,508
Raetihi to Ohakune ..	30,948	..	20,314	1,293	21,607	..	..	..	..	..	52,555	..	..	900	53,455
Tauranga to Taneatua ..	194,459	..	48,000	13,260	61,260	..	..	..	..	..	255,719	..	..	2,500	258,219
Gisborne to Motu ..	596,092	..	4,827	1,810	6,637	112	..	..	..	..	602,841	..	..	1,500	604,341
Gisborne to Ormond Tramway ..	4,975	..	..	..	..	..	..	..	..	..	4,975	..	..	..	4,975
Napier to Gisborne—	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Gisborne Southwards ..	114,136	..	47,316	2,067	49,383	..	..	..	..	..	163,519	..	..	2,729	166,248
Wairoa Northwards ..	..	..	990	..	990	..	..	..	..	..	990	..	..	55	1,045
Napier Northwards ..	16,675	..	17,249	..	17,249	..	..	..	..	..	33,924	..	..	18,654	52,578
Wellington to Napier—	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Napier to Woodville and Palmerston North ..	912,778	..	..	..	..	3,964	..	1,490*	..	..	918,232	..	..	..	918,232
Wellington to Woodville, including Te Aro Extension ..	1,608,469	..	..	..	..	8,805	..	542*	..	..	1,617,816	..	..	..	1,617,816
Featherston to Martinborough ..	398	..	1	..	1	..	..	..	..	..	399	..	..	..	399
Wellington to Waitara—	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wellington to Longburn ..	978,021	..	..	..	..	4,223	..	5,075*	..	..	987,319	..	..	..	987,319
Foxton to Waitara ..	1,543,736	1,149	..	..	..	2,580	4	9,327*	..	..	1,554,498	..	..	..	1,554,498
Mount Egmont Branch ..	72,333	..	Cr. 230	..	Cr. 230	..	..	..	..	..	72,103	..	..	..	72,103
Opunake Branch ..	6,112	..	24,274	872	25,146	..	..	..	..	..	31,258	..	..	2,911	34,169
Manatua Branch ..	..	..	931	..	931	..	..	..	..	200	1,131	..	..	..	1,131
Rangitikei River Quarry Line ..	206	..	..	..	..	..	..	..	..	..	206	..	..	..	206
Stratford to Okahukura (East End) ..	95,828	..	37,622	..	37,622	..	..	..	..	..	133,450	..	..	51,635	185,085
Stratford to Okahukura (West End) ..	624,470	..	34,004	3,858	37,862	131	..	..	..	..	662,463	..	..	5,631	668,094
Nelson to Roundell ..	199,117	..	..	..	..	390	..	234*	..	..	199,741	..	..	..	199,741

* Railways Improvement Authorization Act, 1914, Account.

TABLE NO. 3—continued.

EXPENDITURE ON RAILWAYS TO 31ST MARCH, 1916, AND LIABILITIES ON THAT DATE—continued.

Lines of Railway.	Total Expenditure by General Government to 31st March, 1915.	Recoveries on Account of Expenditure of Previous Years.	Expenditure out of Public Works Fund during Year 1915-16.					Expenditure under Special Acts during Year 1915-16.	Amounts previously charged to "Surveys of New Lines," now charged to Individual Lines.	Total Expenditure by General Government to 31st March, 1916.	Valuation of Works constructed by Provinces and Midland Railway Company.	Liabilities.	Total Expenditure and Liabilities, 31st March, 1916.
			New Works.		Works on Open Lines.	Land Claims and other Old Liabilities.	£						
			Construction and Surveys.	Permanent way.										Total New Works.
	£	£	£	£	£	£	£	£	£	£	£	£	£
Midland Railway—													
Belgrove to Inangahua ..	251,495	..	8,382	..	8,382	..	33	..	259,910	78,307	205	338,422	338,422
Stillwater to Inangahua ..	203,460	..	196	..	196	109	..	..	203,765	543,574	6,486	1,472,282	1,472,282
Brunnerton to Bealey ..	644,240	..	74,173	..	74,173	..	..	44*	718,457	..	..	..	..
Springfield to Bealey ..	742,801	..	Cr. 576	..	Cr. 576	626	..	..	742,851	61,579	256	804,686	804,686
Westport to Ngakawau ..	188,009	..	..	..	..	..	..	..	188,009	..	..	188,009	188,009
Westport to Inangahua ..	143,385	..	9,034	..	9,034	..	..	..	152,419	..	120	152,539	152,539
Ngahere to Blackball ..	147,537	..	..	..	..	..	..	..	147,537	..	..	147,537	147,537
Greymouth to Point Elizabeth ..	254,980	..	76	..	76	..	..	..	255,056	..	..	255,056	255,056
Greymouth to Brunner ..	150,543	..	..	..	..	108	..	..	150,651	..	..	150,651	150,651
Greymouth to Ross and Mikonui ..	337,473	..	..	..	..	728	..	..	338,201	..	..	338,201	338,201
Picton to Waipara—													
Picton Southwards ..	625,544	87	13,466	4,893	18,359	59	..	..	643,875	..	1,138	645,013	645,013
Waipara Northwards ..	373,907	..	226	..	226	..	..	..	374,133	..	..	374,133	374,133
Culverden to Hammer (motor-cars and sheds)	3,834	..	..	..	..	..	..	..	3,834	..	..	3,834	3,834
Culverden to Waiau ..	3,561	..	9,653	12,809	22,462	..	..	..	26,023	..	240	26,263	26,263
Huruni to Waitaki—													
Main Line (Culverden-Waitaki) ..	1,834,325	..	..	..	..	12,428	3,934*	..	1,850,687	316,135	..	2,166,822	2,166,822
Oxford Branch ..	51,467	..	..	..	..	54	..	..	51,521	..	..	51,521	51,521
Eyreton Branch ..	44,277	..	..	..	..	..	..	..	44,277	..	..	44,277	44,277
Lyttelton Branch ..	80,908	..	..	..	..	..	..	..	80,908	340,500	..	421,408	421,408
Southbridge Branch ..	89,524	..	..	..	..	..	..	..	89,524	..	..	89,524	89,524
Springfield and Whitecliffs Branches ..	95,860	..	..	..	..	..	..	..	95,860	..	..	95,860	95,860
Fairlie Creek Branch ..	67,237	..	..	..	..	14	..	..	67,251	75,124	..	142,375	142,375
Waimate Branch ..	59,191	..	9,385	..	9,385	243	..	..	68,819	..	15	68,834	68,834
Ashburton Forks (Methven) Branch ..	74,610	..	..	..	..	30	..	..	74,640	..	..	74,640	74,640
Upper Ashburton (Springburn) Branch ..	61,639	..	..	..	..	..	..	..	61,639	..	..	61,639	61,639
Little River Branch ..	108,349	..	..	..	..	89	..	..	108,438	..	..	108,438	108,438
Canterbury Interior Main Line—													
Oxford to Malvern ..	53,649	..	..	..	..	..	..	..	53,649	..	..	53,649	53,649
Whitecliffs to Rakaia ..	542	..	..	..	..	..	..	..	542	..	..	542	542
Temuka to Rangitata ..	5,152	..	..	..	..	..	..	..	5,152	..	..	5,152	5,152
Waitaki to Bluff—													
Main Line, including Port Chalmers Branch ..	3,270,321	405†	..	..	..	4,291	4,159†	..	3,278,366	82,259	..	3,360,625	3,360,625
Duntroon Branch ..	97,099	..	..	..	..	..	..	..	97,099	37,500	..	134,599	134,599
Ngapara Branch ..	26,090	..	..	..	..	..	..	..	26,090	58,009	..	84,099	84,099

* Railways Improvement Authorization Act, 1914, Account.

† Includes £326, Railways Improvement Account.

‡ Railways Improvement Account, credit, £4; Railways Improvement

Authorization Act, 1914, Account, £4,163.

TABLE NO. 3—continued.

EXPENDITURE ON RAILWAYS TO 31ST MARCH, 1916, AND LIABILITIES ON THAT DATE—continued.

Lines of Railway.	Total Expenditure by General Government to 31st March, 1915.	Recoveries on Account of Expenditure of Previous Years.	Expenditure out of Public Works Fund during Year 1915-16.					Expenditure under Special Acts during Year 1915-16.	Amounts previously charged to "Surveys of New Lines," now charged to Individual Lines.	Total Expenditure by General Government to 31st March, 1916.	Valuation of Works constructed by Provinces and Midland Railway Company.	Liabilities.	Total Expenditure and Liabilities, 31st March, 1916.
			New Works.		Works on Open Lines.	Land Claims and other Old Liabilities.	Total New Works.						
			Construction and Surveys.	Permanent-way.									
	£	£	£	£	£	£	£	£	£	£	£	£	£
Waitaki to Bluff—continued.	1,415	..	..	..	..	..	..	..	..	1,415	..	..	1,415
Fernhill Railway Purchase	6,474	..	..	..	..	..	..	..	..	6,474	12,829	..	19,303
Brighton Road Branch ..	11,951	..	..	..	..	..	..	..	..	11,951	29,691	..	41,642
Outram Branch ..	304,293	..	1,000	..	..	..	..	..	..	305,293	..	..	305,293
Lawrence Branch ..	82,785	..	..	..	..	..	..	..	..	82,785	..	..	82,785
Livingstone Branch ..	33,191	..	..	..	..	..	..	..	..	33,191	..	..	33,191
Waihemo Branch ..	1,217	..	..	..	..	..	..	..	..	1,258	..	15	1,273
Balclutha—Tuapeka Mouth	461,597	..	1,223	..	..	..	..	..	..	462,840	..	..	462,840
Catlin's River Branch ..	123,456	..	..	..	..	..	..	..	..	123,788	..	..	123,788
Heriotburn Branch ..	67,821	..	..	..	..	..	..	..	..	67,821	..	..	67,821
Waikaka Branch ..	111,966	..	..	..	..	..	..	..	..	111,966	..	..	111,966
Waiuea Plains (Gore-Limesden) Branch	52,743	..	..	..	..	..	..	..	..	52,743	..	..	52,743
Toitois (Edendale-Glenham) Branch	82,058	..	..	..	..	..	246	..	..	82,304	..	..	82,304
Riversdale to Switzer's ..	602	..	..	..	..	..	..	..	..	602	..	..	602
Kelso to Gore ..	184,881	..	..	..	..	..	..	..	..	184,881	..	..	184,881
Seaward Bush to Catlin's	1,293,790	..	14,584	9,476	24,060	..	..	117*	..	1,318,013	..	1,678	1,319,691
Otago Central ..	358,554	..	..	..	..	..	..	..	..	358,842	91,937	..	450,779
Invercargill to Kingston—	27,217	..	..	..	..	288†	..	..	..	27,217	..	..	27,217
Main Line ..	231	..	..	..	..	..	..	..	..	231	..	..	231
Mararoa Branch ..	330,038	..	5,713	..	..	420	..	..	..	336,181	60,297	2	396,480
Winton to Heddon Bush	22,984	..	..	..	..	..	..	..	..	22,984	..	..	22,984
Makarewa to Orepuki and Waiau	10,337	..	..	..	..	..	..	..	..	10,337	..	..	10,337
Thornbury to Wairoa ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Forest Hill ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Expenses of Railway Commissions and other	..	..	..	..	..	..	..	..	..	..	..	..	..
Expenditure not chargeable to Individual Lines	..	..	..	..	..	..	..	..	..	..	..	..	..
Surveys of New Lines—	..	..	..	..	..	..	..	..	..	..	..	..	..
North Island ..	34,368	..	1,613	..	..	..	..	Cr. 280	..	35,701	..	50	35,751
Middle Island ..	5,752	..	..	..	..	..	..	..	..	5,752	..	..	5,752
Rolling-stock ..	5,975,207	..	..	..	..	328,981	..	..	..	6,304,188	..	109,995	6,414,183
Stock of Permanent-way Materials, 31st March, 1915	..	..	..	..	..	..	..	..	..	..	..	..	..
.. £98,592	..	..	..	..	..	..	..	..	..	..	..	..	..
Stock of Permanent-way increased by £19,598	33,810,748	..	..	..	..	..	..	..	..	..	..	..	..
Stock of Permanent-way Materials, 31st March, 1915	118,190	..	..	..	..	..	..	..	..	118,190	..	71,992	190,182
Total ..	33,928,938	4,959	574,790	68,248	643,038	402,252	283	139,750	..	35,109,302	1,787,741†	293,522	37,190,565

* Railways Improvement Authorization Act, 1914, Account. Midland Railway Petitions Settlement Act Amendment Act, 1903.

† Includes £47 expended on Slipway, Lake Wakatipu.

‡ Also includes value for £150,000 paid to debenture-holders under the

TABLE NO. 4.

EXPENDITURE OUT OF SEPARATE ACCOUNTS ON WORKS UNDER THE CONTROL OF THE PUBLIC WORKS DEPARTMENT.

Year.	Loans to Local Bodies Account. Roads to open up Crown Lands.	Opening up Crown Lands for Settlement Account. Roads to open up Crown Lands.	Land for Settlements Account. Opening up Crown Lands for Settlement Account. Roads to open up Crown Lands.	National Endowment Account. Roads to open up National-endowment Lands.	Aid to Water-power Works Account. Development of Water-power.	Irrigation and Water-supply Account. Irrigation and Water-supply.	Waihou and Ohinemuri Rivers Improvement Account. Waihou and Ohinemuri Rivers Improvement.
	£	£	£	£	£	£	£
1890-91 ..	25,000						
1891-92 ..	64,000						
1892-93 ..	800						
	89,800*						
1891-92 ..	8,000†						
1892-93 ..	29,833†						
1893-94 ..	30,000†						
1894-95 ..	6,114†						
1894-95 ..	42,971‡						
1895-96 ..	30,057‡						
1896-97 ..	31,017						
1897-98 ..	18,770						
1898-99 ..	16,972						
1899-00 ..	31,363						
1900-01 ..	37,390						
1901-02 ..	31,979						
1902-03 ..	18,578						
1903-04 ..	25,753						
1904-05 ..	28,895						
1905-06 ..	38,801						
1906-07 ..	47,371						
1907-08 ..	38,524						
1908-09 ..	54,713						
1909-10 ..	40,507	..	..	4,975			
	607,608§						
1910-11 ..	..	45,691	..	5,619	..	..	..
1911-12 ..	..	49,739	..	6,554	..	..	3,769
1912-13 ..	..	47,951	..	2,689	35,009	14,689	9,555
1913-14 ..	..	63,245	..	4,282	142,828	33,602	9,632
1914-15 ..	..	..	92,975	9,151	74,291	32,090	10,004
1915-16 ..	..	..	47,974	13,344	55,410	29,874	9,225
	697,408	206,626	140,949	46,614	307,538	110,255	42,185

* Payment to the Public Works Fund under section 31 of the Government Loans to Local Bodies Act, 1886, in reduction of expenditure under Class "Roads."

† Paid into the Public Works Fund, reducing the expenditure under Class "Roads."

‡ Paid into the Land Improvement Account (now included in Public Works Fund under Class "Roads"), reducing the expenditure on roads.

§ Expenditure under the Government Loans to Local Bodies Act Amendment Act, 1891.

Table No. 5.

DEVELOPMENT OF WATER-POWER.

STATEMENT OF ACCOUNTS AT 31ST MARCH, 1916

GENERAL BALANCE-SHEET AT 31ST MARCH, 1916.

			Liabilities.			Assets.		
	£	s. d.		£	s. d.		£	s. d.
Consolidated Fund—								
Interest at 4 per cent. per annum on Lake Coleridge expenditure to 31st March, 1916	25,331	18 3	Assets as per separate balance-sheet	..	332,450 17 4
Public Works Fund—						Profit and Loss Appropriation Account..	..	18,572 1 2
Expenditure under class "Public Works Departmental"	Accident Insurance Fund	..	86 14 0
Expenditure under class "Development of Water-power"	18,450	14 1			351,109 12 6
Aid to Water-power Works Account—						Other Schemes: Surveys and Investigation—		
Debentures issued	21,112	11 11	Clarence River	..	803 1 9
Lake Coleridge—						Huka Falls	..	368 9 6
Depreciation Fund Account	309,000	0 0	Hutt River (including purchase of dam-site)	..	2,915 8 6
Sundry creditors	8,584	15 4	Kanieri Lake	..	5 0 0
						Makuri River	..	38 9 0
						Mangahao River	..	335 7 8
						Opipi River	..	519 12 7
						Rotoiti-Kaituna	..	1,105 19 7
						Tauherenikau	..	879 16 8
						Toaroha	..	17 7 0
						Teviot	..	76 16 6
						Upper Taieri	..	11 19 0
						Wairua	..	236 6 8
						General expenditure not chargeable to any individual scheme	..	7,313 14 5
						Cash balance in the Aid to Water-power Works Account	..	4,144 4 6
								1,461 14 1
								£364,029 5 6

CHAS. E. BENNETT, Accountant.

LAKE COLERIDGE HYDRO-ELECTRIC-POWER SUPPLY.

PROFIT AND LOSS ACCOUNT FOR PERIOD FROM 1ST MARCH, 1915 (COMMENCEMENT OF OPERATIONS), TO 31ST MARCH, 1915.

D.—1.

		<i>Gross Revenue Account.</i>			
		£	s. d.	£	s. d.
To Generating and distributing and management expenses—					
Salaries .. ..	..	126	13 4	..	707 15 4
Wages .. ..	..	95	15 11	..	1 6 6
Supplies .. ..	..	109	0 8	..	..
Telephone subscriptions .. ..	..	1	12 8	..	709 1 10
Travelling-expenses .. ..	..	2	2 1	..	6 2 9
Balance to Net Revenue Account .. ..	..	335	4 8	..	..
		379	19 11		
		£715	4 7		£715 4 7

		<i>Net Revenue Account.</i>			
		£	s. d.	£	s. d.
To Depreciation at 2 per cent. per annum on completed work		449	0 0	..	379 19 11
Interest at 4 per cent. per annum .. ..	..	853	12 8	..	922 12 9
		£1,302	12 8		£1,302 12 8

PROFIT AND LOSS ACCOUNT FOR YEAR ENDED 31ST MARCH, 1916.

12

		<i>Gross Revenue Account.</i>			
		£	s. d.	£	s. d.
To Generating expenses, headworks and power-house—					
Salaries .. ..	..	2,071	14 9	..	7,722 19 9
Wages .. ..	..	452	18 6	..	532 18 8
Supplies .. ..	..	84	10 8	..	..
Maintenance and repairs—	..			..	8,255 18 5
Headworks .. ..	..	26	4 10	..	4 16 0
Pipe-lines .. ..	..	4	7 6	..	244 15 3
Power-house building .. ..	..	7	13 11	..	12 14 8
Power-house machinery .. ..	..	108	17 2	..	865 4 8
Roads and fences .. ..	..	226	14 11	..	..
Staff residences, &c. .. ..	..	214	15 6	..	..
Transmission-line—	..	3,197	17 9	..	..
Salaries .. ..	..	346	13 4	..	..
Wages .. ..	..	105	0 10	..	..
Transport, including upkeep of horses, traps, cars, and cycles .. ..	..	959	17 4	..	..
Repairs to power-lines .. ..	..	527	18 2	..	..
Repairs and alterations to telephone-system .. ..	..	119	18 11	..	..
Substation, Addingtong—	..	2,059	8 7	..	..
Salaries .. ..	..	659	12 10	..	..
Wages .. ..	..	274	3 11	..	..
Supplies .. ..	..	223	1 6	..	..
Maintenance and repairs—	..			..	..
Buildings .. ..	..	28	8 8	..	..
Machinery .. ..	..	37	17 10	..	..
		1,223	4 9		..

	£	s	£	s	d.
Distribution—					
Salaries	71	13	4		
Wages	3	7	4		
Supplies	18	14	4		
Transport, including upkeep of motor lorry and car	352	7	5		
Repairs to feeder cables	288	13	11		
	734	16	4		
Temporary supply cable from Christchurch Tramway station to city	41	9	4		
Management and general expenses—					
Salaries	1,255	6	8		
Wages	19	13	4		
Travelling expenses	153	8	4		
Office rent	150	0	0		
Postages and telegrams	92	0	8		
Telephone subscriptions	58	17	9		
Printing and stationery	152	11	2		
Advertising	31	8	5		
Accident insurance	137	17	2		
Fire insurance	12	16	6		
Legal expenses	3	13	3		
Meter-reading	10	13	4		
Commission on collection of accounts	3	14	11		
Electrical testing	15	3	2		
Miscellaneous trade expenses	29	7	7		
	2,126	12	3		
	£9,383	9	0		

Net Revenue Account.

	£	s	d.	£	s	d.
To Balance from Gross Revenue Account	865	4	8			
Depreciation at 2 per cent. per annum on completed work	5,386	5	7			
Interest at 4 per cent. per annum	11,397	18	2			
	£17,649	8	5			
By Balance to Profit and Loss Appropriation Account				17,649	8	5

PROFIT AND LOSS APPROPRIATION ACCOUNT.

	£	s	d.	£	s	d.
March 31, 1915. To Balance from Net Revenue Account	922	12	9			
„ 31, 1916. „	17,649	8	5			
	£18,572	1	2			
By Balance to balance-sheet				18,572	1	2

NOTE.—Electric undertakings of this nature cannot be expected to pay before the scheme can be brought into full operation, but a reference to Appendix D will show that when and so soon as the power under the contracts already entered into is supplied the revenue will be sufficient to pay working-expenses and interest on the outlay.

LAKE COLERIDGE HYDRO-ELECTRIC-POWER SUPPLY—*continued.*

		£	s.	d.		By Amount set aside in respect to workmen, &c., employed on—	£	s.	d.
To Payment of accident compensation ..	..	..	57	4	6	Operating and maintenance, as shown in Profit and Loss Account	137	17	2
Interest at 4 per cent. per annum ..	..	..	3	6	8	Capital extensions, and charged to Capital Account ..	306	0	0
						Balance to balance-sheet	443	17	2
							86	14	0
							<u>£530</u>	<u>11</u>	<u>2</u>

	£	s.	d.	
To Balance to balance-sheet .. .. .	..	5,853	4 10	March 31, 1915. By Amount set aside as per Profit and Loss Account Interest at 4 per cent. per annum. .. Amount set aside as per Profit and Loss Account ..
	..			" 31, 1916. " 31, " "
		<u>£5,853</u>	<u>4 10</u>	
		£5,853	4 10	

[illegible]

£	s.	d.	£	s.	d.
Addington Substation—					
Land, including cottages	2,189	17	11
Substation buildings	3,849	16	3
Machinery, &c.	12,312	15	11
Store buildings and workshop	786	9	11
					19,139 0 0
Primary distribution—					
Supply cables—					
Christchurch City					
Lyttelton	8,546	17	1
Northern	5,157	17	0
Southern	2,415	16	7
Lightning-arresters	5,655	18	1
Tools and equipment	622	9	9
Alterations to public telegraph-lines	835	4	8
			675	19	8
					23,910 2 10
Secondary distribution—					
Supply cables and reticulation					
Local substations	8,723	8	7
			2,871	12	0
					11,595 0 7
Motor cars, lorry, and cycles, &c.					
Public telephones to the lake	1,753	7	0
Telephones to Christchurch City Council and Tramway Board	1,854	6	2
Christchurch office—Furniture and fittings	191	12	6
Engineering, office, and general expenses on preliminary surveys and during construction	18	8	6
Salaries of Engineers and others on preliminary surveys and during construction	13,786	1	11
Interest during construction	6,731	7	5
Stocks of material, &c., on hand at date	13,095	0	0
Telephone subscriptions and fire insurance paid in advance	13,236	14	2
Sundry debtors for current, &c.	55	14	9
			2,361	5	2
					332,450 17 4
Balance from Profit and Loss Appropriation Account					
Balance from Accident Insurance Fund Account	18,572	1	2
Balance carried to general balance-sheet—			86	14	0
Depreciation Fund Account	5,853	4	10
Sundry creditors	2,731	10	6
					8,584 15 4
					£359,694 7 10

CHAS. E. BENNETT, Accountant.
E. PARRY, Chief Electrical Engineer.

APPENDICES TO THE PUBLIC WORKS STATEMENT, 1916.

APPENDIX A.

AUDITED STATEMENT OF EXPENDITURE ON PUBLIC WORKS
OUT OF THE PUBLIC WORKS FUND FOR THE YEAR 1915-16.*Prepared in compliance with Section 8 of the Public Works Act, 1908.*

SIR,—

Public Works Department, Wellington, 10th June, 1916.

In compliance with the 8th section of the Public Works Act, 1908, I enclose a statement of the expenditure during the preceding financial year on all works and services chargeable to the Public Works Fund.

I have, &c.,

W. FRASER,
Minister of Public Works.

The Controller and Auditor-General, Wellington.

STATEMENT OF NET EXPENDITURE ON ALL WORKS AND SERVICES CHARGEABLE TO THE PUBLIC
WORKS FUND FOR THE YEAR 1915-16.

Class.	Votes.	Summary.	Appropriation.	Expenditure.		Credits.		Net Expenditure.	
		PUBLIC WORKS FUND.	£	£	s. d.	£	s. d.	£	s. d.
XVI	89	Public Works, Departmental ..	116,351	124,620	17 6	13,199	5 5	111,421	12 1
XVII	90-91	Railways	1,200,000	1,165,525	1 6	100,354	1 8	1,065,170	19 10
XVIII	92-101	Public Buildings	429,325	348,101	8 7	12,327	4 4	335,774	4 3
XIX	102-104	Lighthouses, Harbour-works, and Harbour-defences	20,635	13,688	3 5	15 10	0	13,672	13 5
XX	105	Tourist and Health Resorts ..	7,500	5,218	13 7	52	5 0	5,166	8 7
XXI	106	Immigration	30,000	21,135	10 2	11,125	9 4	10,010	0 10
XXII	107-109	Roads, Bridges, and other Public Works	518,050	462,339	6 1	37,844	17 7	424,494	8 6
XXIII	110	Development of Mining	10,000	6,951	6 2	349	8 6	6,601	17 8
XXIV	111	Telegraph Extension	332,000	315,910	10 8	66,356	8 11	249,554	1 9
XXV	112	Contingent Defence	50,000	38,087	2 3	467	15 5	37,619	6 10
XXVI	113-114	Lands Improvement	20,000	9,501	3 8	3,564	19 4	5,936	4 4
XXVII	115	Plant, Material, and Stores ..	100,000	76,158	17 10	1,740	17 8	74,418	0 2
		Unauthorized .. ..	..	66	15 6	..	..	66	15 6
		Total Public Works Fund ..	2,833,861	2,587,304	16 11	247,398	3 2	2,339,906	13 9

CHAS. E. BENNETT,
Accountant.

W. S. SHORT,
Acting Under-Secretary.

Examined and found correct.

ROBERT J. COLLINS,
Controller and Auditor-General.

NOTE.—Charges and expenses of raising loans not included in above figures.
(Details on next page.)

APPENDIX A—continued.

	Name of Vote.	Appropriation.	Expenditure.	Credits.	Net Expenditure.
		£	£ s. d.	£ s. d.	£ s. d.
89	PUBLIC WORKS FUND.				
	Public Works, Departmental	116,351	124,620 17 6	13,199 5 5	111,421 12 1
	Railways—				
	Railway-construction—				
	Kailu Railway Extension	8,000	13,025 3 3	167 5 1	12,857 18 2
	Kawakawa-Hokianga	25,000	19,148 8 7	509 9 9	18,638 18 10
	North Auckland Main Trunk—				
	Kirikopuni, Southwards	8,000	5,370 5 10	69 11 7	5,300 14 3
	Kaiwaka, Northwards	40,000	44,733 7 1	4,085 4 1	40,648 3 0
	Whangarei—North Auckland Main Trunk	60,000	65,884 6 6	1,563 4 6	64,321 2 0
	Waipū Branch	2,000	289 5 9	..	289 5 9
	Waikuku Branch	20,000	20,302 10 9	1 16 0	20,300 14 9
	Huntly-Awaroa	20,000	16,265 17 0	1,676 4 7	14,589 12 5
	East Coast Main Trunk—				
	Waihi-Tauranga	20,000	14,356 7 3	0 3 0	14,356 4 3
	Tauranga—Te Maunga	20,000	6,201 4 11	1 15 0	6,199 9 11
	Maunganui-Tancatua	40,000	62,991 8 2	21,190 2 0	41,801 6 2
	Gisborne-Motu	12,000	11,892 16 8	7,065 7 5	4,827 9 3
	Napier-Gisborne—				
	Gisborne-Wairoa	33,000	51,517 10 4	4,201 18 9	47,315 11 7
	Wairoa-Gisborne	12,000	989 13 8	..	989 13 8
	Wairoa-Napier	5,000	..	..	..
	Napier-Wairoa	20,000	18,567 18 7	1,319 0 6	17,248 18 1
	Mount Egmont Branch	1,000	Cr. 225 6 4	4 12 6	Cr. 229 18 10
	Opunake Branch	40,000	26,870 14 9	1,665 16 5	25,204 18 4
	Stratford—Main Trunk	80,000	77,358 2 11	5,731 15 5	71,626 7 6
	Raetihi—Main Trunk	20,000	21,038 10 9	725 0 0	20,313 10 9
90	Stone Quarry Line, Rangitikei River	3,000	..	..	..
	Featherston—Martinborough	5,000	1 7 3	..	1 7 3
	South Island Main Trunk	15,000	15,604 2 0	1,912 4 8	13,691 17 4
	Midland Railway—				
	Nelson End	15,000	8,395 10 9	13 3 2	8,382 7 7
	Reefton End	2,000	230 5 5	34 3 2	196 2 3
	Otira-Bealey	70,000	74,710 18 3	537 17 9	74,173 0 6
	Broken River—Bealey	6,000	1,194 5 2	1,770 0 0	Cr. 575 14 10
	Westport-Inangahua	10,000	9,095 16 11	61 11 6	9,034 5 5
	Greymouth—Point Elizabeth	1,000	76 12 1	0 4 8	76 7 5
	Culverden-Waiatu	15,000	9,702 9 0	50 0 0	9,652 9 0
	Waimate Branch Extension	10,000	9,432 2 7	47 7 6	9,384 15 1
	Lawrence-Roxburgh	4,000	1,271 19 6	271 19 9	999 19 9
	Otago Central	15,000	16,457 4 1	1,873 1 2	14,584 2 11
	Balclutha—Tuapeka Mouth	5,000	40 13 0	..	40 13 0
	Catlin's—Waimahaka	2,000	2,973 0 2	1,750 8 10	1,222 11 4
	Winton—Heddon Bush	8,000	..	..	..
	Orepuki—Waiatu Extension	10,000	5,734 0 5	21 0 2	5,713 0 3
	Land Claims, &c.	1,000	286 16 9	3 15 0	283 1 9
	Surveys, New Lines of Railways	5,000	1,612 10 10	..	1,612 10 10
	Permanent-way Materials	100,000	88,536 17 2	690 8 11	87,846 8 3
	Total	788,000	..	..	..
	Total Vote, Railway-construction	700,000	721,934 17 9	59,015 12 10	662,919 4 11
91	Additions to Open Lines	500,000	443,590 3 9	41,338 8 10	402,251 14 11
	Public Buildings—				
92	General	*64,100	50,641 1 7	11,458 4 7	39,182 17 0
93	Courthouses	5,500	4,955 4 6	53 9 10	4,901 14 8
94	Gaols	18,450	17,814 1 5	27 12 8	17,786 8 9
95	Police-stations	37,600	25,529 8 2	45 0 0	25,484 8 2
96	Postal and Telegraph	66,675	35,281 0 11	23 9 2	35,257 11 9
97	Agricultural	4,000	2,980 3 8	8 1 0	2,972 2 8
98	Mental Hospitals	†56,500	55,012 8 3	114 14 2	54,897 14 1
99	Hospitals and Charitable Institutions	1,500	1,434 16 9	8 16 8	1,426 0 1
100	School Buildings	120,000	98,556 16 2	584 18 5	97,971 17 9
101	Workers' Dwellings	55,000	55,896 7 2	2 17 10	55,893 9 4
	Lighthouses, Harbour-works, and Harbour-defences—				
102	Lighthouses	2,500	1,415 2 0	..	1,415 2 0
103	Harbour-works	16,635	9,370 2 6	15 10 0	9,354 12 6
104	Harbour-defences	1,500	2,902 18 11	..	2,902 18 11
105	Tourist and Health Resorts	7,500	5,218 13 7	52 5 0	5,166 8 7
106	Immigration	30,000	21,135 10 2	11,125 9 4	10,010 0 10
	Construction and Maintenance of Roads, Bridges, and other Public Works—				
107	Roads, &c.	317,125	321,870 7 5	26,508 13 2	295,361 14 3
108	Backblocks Roads, &c.	160,925	114,060 19 9	9,360 6 1	104,700 13 8
109	Road and other Works on Goldfields and Mineral Lands	40,000	26,407 18 11	1,975 18 4	24,432 0 7
110	Development of Mining	10,000	6,951 6 2	349 8 6	6,601 17 8
111	Telegraph Extension	332,000	315,910 10 8	66,356 8 11	249,554 1 9
112	Contingent Defence	50,000	38,087 2 3	467 15 5	37,619 6 10
	Lands Improvement—				
113	Improved-farm Settlements	11,610	4,916 13 1	3,553 10 7	1,363 2 6
114	Lands, Miscellaneous	8,390	4,584 10 7	11 8 9	4,573 1 10
115	Plant, Material, and Stores	100,000	76,158 17 10	1,740 17 8	74,418 0 2
	Unauthorized—Services not provided for .. .. .	..	66 15 6	..	66 15 6
	Total Public Works Fund	2,833,861	2,587,304 16 11	247,398 3 2	2,339,906 13 9

* Exclusive of £6,500 transferred to Vote 98 under order of the Governor, 24th December, 1915.

† Inclusive of £6,500 transferred from Vote 92 under order of the Governor, 24th December, 1915.

APPENDIX B.

ANNUAL REPORT ON PUBLIC WORKS BY THE ENGINEER-IN-CHIEF.

(1ST JULY, 1915, TO 31ST MARCH, 1916.)

The ENGINEER-IN-CHIEF to the Hon. the MINISTER OF PUBLIC WORKS.

SIR,—

Public Works Office, Wellington, 11th May, 1916.

I have the honour to submit the following report upon the various works completed and in progress throughout the Dominion during the period from the 1st July, 1915, to the 31st March, 1916.

In view of the early session of Parliament this report covers a period of only nine months instead of twelve, consequently the progress to be recorded is less than usual. Moreover, the activities of the Department have been greatly curtailed owing to circumstances arising out of the war. The necessity for economy in the expenditure of public funds has led to the cessation of work on several lines of railway, as well as a gradual reduction in the number of men employed on the other lines and on road-construction. The erection of various important structures has been deferred owing to the impossibility of obtaining structural steel and other materials, while nearly all works have been hampered and delayed owing to difficulty in obtaining plant or material. It has not even been practicable to proceed with survey-work owing to lack of engineering assistance, practically the whole of the members of our professional staff who are fit and eligible having volunteered for active service. The draughting and clerical staff is also well represented in the New Zealand Expeditionary Forces. On the other hand, our staff of overseers, gangers, tradesmen, &c., which includes a larger proportion of elderly or ineligible men, has not been depleted to the same extent, and there has been some little difficulty in providing suitable employment for all permanent officers, although the position in this respect is by no means acute.

RAILWAYS.

ABSTRACT.

The following table shows the expenditure and liabilities on Government railways in New Zealand up to the 31st March, 1916:—

Name of Railway.	Total Length of Railway or Section.	Open for Traffic.	Expenditure to 31st March, 1916.	Liabilities on 31st March, 1916.
	M. ch.	M. ch.	£	£
Kaihu Valley	24 30	19 58	104,113	..
Kawakawa-Hokianga	45 25	16 25	188,067	2,700
Opua Wharf - Grahamtown (Onerahi)	58 6	58 6	522,088	..
Whangarei southward	19 77	..	87,953	8,188
North Auckland Main Trunk Railway (from Helensville)	86 22	47 77	792,830	1,969
Helensville - Te Awamutu, with Branches	162 74	158 21	2,177,795	488
Hamilton-Thames, with Branches	115 33	75 18	537,137	1,475
Thames Valley - Rotorua	69 33	69 33	366,541	..
Tauranga-Opotiki, with Branches	138 27	..	255,719	2,500
Gisborne-Opotiki	93 45	44 34	602,841	1,500
Napier-Gisborne	206 39	..	198,433	21,438
Wellington-Napier and Palmerston North (including Te Aro Extension and Greytown and Martinborough Branches)	249 44	233 12	2,536,447	..
Wellington-Waitara, with Branches	350 11	285 59	2,646,515	2,911
Stratford - Okahukura	101 27	37 53	795,913	57,266
North Island Main Trunk (Marton - Te Awamutu), including Raetihi Branch	218 42	209 69	2,766,063	900
Picton-Waipara (South Island Main Trunk Railway)—				
Picton southwards	92 38	56 6	643,875	1,138
Waipara northwards	90 45	44 14	374,183	..
Nelson-Belgrove	22 73	22 73	199,741	..
Midland Railway*	239 75	179 67	1,924,983	6,947
Westport-Ngakawau	19 56	19 56	188,009	..
Westport-Ngakawau Extension to Mokihinui†	7 12	7 12	..	..
Mokihinui Colliery Line‡	3 69	3 69	..	..
Westport-Inangahua	26 0	5 74	152,419	120
Ngahere-Blackball	3 40	3 40	147,537	..
Greymouth - Coal Creek	8 70	8 70	255,056	..
Greymouth-Brunner	7 51	7 51	150,651	..
Greymouth-Waitaha	50 32	38 68	338,201	..
Culverden-Hammer Motor-cars and Sheds .. .. .	..	..	3,834	..
Hurunui-Waitaki, with Branches	501 52	443 8	2,619,587	255
Canterbury Interior Main Line—Oxford-Temuka	83 0	11 44	59,343	..
Waitaki-Bluff, with Branches	600 21	546 16	4,930,867	15
Otago Central	182 51	134 78	1,318,013	1,678
Invercargill-Kingston, with Mararoa Branch	117 4	97 44	386,290	..
Forest Hill Railway—Winton-Hedgehope§	12 40	12 40	22,984	..
Western Railways	94 8	70 31	336,181	2
Preliminary Surveys .. .. .	..	..	41,453	50
Miscellaneous .. .. .	..	..	10,337	..
Stock of Permanent-way on hand .. .. .	..	..	118,190	71,992
Rolling-stock .. .. .	..	..	6,804,188	109,995
Total	4,103 72	2,970 46	35,104,327	293,522

* The amount shown as expenditure represents the net amount charged against the Dominion.

† The funds for this extension—namely, £35,501 2s. 11d.—were provided by the Westport Harbour Board.

‡ The funds for purchase of this line, £15,745, were provided by the Westport Harbour Board.

§ The expenditure on this line as a tramway was made by the Lands Department.

|| Includes expenditure on railways under Hutt Road and Railway Improvement, Railway Improvement Authorization Act and Railway Improvement Authorization Act 1914 Accounts.

ABSTRACT—continued.

Name of Railway.	Total Length of Railway or Section.	Open for Traffic.	Expenditure to 31st March, 1916.	Liabilities on 31st March, 1916.
	M. ch.	M. ch.	£	£
PROVINCIAL GOVERNMENT LINES, ETC.				
Canterbury (lengths included above) .. ..	..	..	731,759	..
Otago and Southland .. ..	..	..	372,522	..
Gisborne to Ormond Tramway .. ..	..	..	4,975	..
Midland Railway, valuation of works constructed by company .. ..	..	..	*683,460	..
Grand total	4,108 72	2,970 46	36,897,043	233,522

* Includes value for £150,000 paid to debenture-holders under the Midland Railway Petitions Settlement Act Amendment Act, 1903.

During the period under review only two sections of railway, totalling 15 miles 16 chains in length, as shown in the following table, were handed over to the Railway Department for general traffic:—

Plan Mileage.	Railway.	Section.	Length.	Date.
M. ch. M. ch.			M. ch.	
48 9 to 56 5	South Island Main Trunk ..	Mirza and Wharanui ..	7 76	4 Dec., 1915.
0 0 to 7 20	Huntly-Awaroa	Pukemiro	7 20	20 Dec., 1915.

Several other sections, totalling approximately 40 miles, are approaching completion.

KAIHU VALLEY RAILWAY.

The work in hand on this line comprises an extension from 19 m. 22 ch. to 23 m. 70 ch., a distance of 4 miles 48 chains. Operations were suspended in November last. Up to that date good progress had been made with the formation and culverts, more than half the earthwork having been done. Rails were laid to 19 m. 50 ch., where there is an outcrop of good stone, and a stone-crusher was installed to provide broken stone for the concrete culverts and other purposes. Fortunately the earthwork on this line has not been hampered by the frequent slips which are a constant source of trouble on all works in the North Auckland district.

KAWAKAWA-HOKIANGA RAILWAY.

Omapere Section—16 m. 25 ch. (Kaikohe) to 24 m. 42 ch. (Okaihau).—The length from 16 m. 25 ch. to 18 m. 64 ch. was completely formed last year, and nothing has been done since, but several slips will have to be removed before platelaying can be commenced.

The section from 18 m. 64 ch. to 19 m. 44 ch. is comprised in the Tahuna contract, and includes a tunnel between 19 m. 2 ch. and 19 m. 9 ch., and several heavy cuttings and banks. The contract is practically completed, but slips have been numerous, and there remains some 11,000 cubic yards of slipped material to be removed.

From 19 m. 44 ch. to 25 m. the work was in hand by co-operative contract, but the number of men employed was allowed to dwindle down until January last, when the few remaining were transferred to other works, and operations here were suspended. The principal work in hand was a large cutting between 19 m. 58 ch. and 19 m. 74 ch., but progress was slow owing to the very sticky nature of the clay and frequent slips. It will probably pay in this case to use large power-driven plant in order to take out the whole of this cutting during dry weather. A stone-crusher has been installed in a rock-cutting at 20 m. 76 ch. to provide material for culverts, several of which have been constructed, besides other incidental works. About 60 chains of light formation has been done beyond 21 m., while the earthwork up to that point is well advanced.

A railway-construction service road had been made between Kaikohe and Okaihau. This is being maintained, and will continue, as a public road.

WHANGAREI—NORTH AUCKLAND MAIN TRUNK RAILWAY.

Kioreroa Contract (0 m. to 4 m.).—The contract has been hampered to some extent by scarcity of suitable men and inability to obtain construction rails. It comprises a considerable length of bank across the mud-flats and tidal creeks of the Whangarei Harbour, with the necessary water openings. Two small bridges, at 0 m. 35 ch. and 2 m. 60 ch., are completed, and the larger Otaika River Bridge is well in hand. The long bank between 1 m. 77 ch. and 2 m. 72 ch. is now the principal obstacle to the completion of the contract, and is expected to take about three months.

Oakleigh Section (4 m. to 7 m. 60 ch.).—Co-operative parties were at work over the whole of this length until November last, but work has since been confined to the length from 4 m. to Otaika Station (5 m. 10 ch.), which is well advanced. A considerable amount of work has been done up to and including Oakleigh Station yard (7 m. 45 ch.). This yard is formed, and the approach

roads formed and metalled, also a back-shunt to the wharf. The wharf and approach viaduct have been erected by contract.

Tauraroa Section (7 m. 60 ch. to 15 m.).—This section has been fully manned by co-operative contract parties, and good progress has been made. The whole of the formation between 7 m. 60 ch. and 11 m. 5 ch. is completed, but numerous slips have delayed the work, and are now interfering with platelaying. Mangapai Station yard (10 m. 32 ch. to 10 m. 47 ch.) has been formed complete. The earthworks up to 14 m. 52 ch. should be completed within two months, and work is in hand up to 15 m., the end of the section, but not much has been done. Rails have been laid from Oakleigh to 9 m. 4 ch., and a considerable amount of road-formation, fencing, &c., has been done. A quarry is being opened up near Tauraroa, with a short siding leading thereto, and a stone-crushing plant is being installed to provide broken stone for ballast and other purposes. All culverts except one are completed to 15 m. Two platelayers' cottages have been erected at Tauraroa Station.

Waiotira Section (15 m. to 19 m. 78 ch.).—Work was commenced on this section in August, 1915, and some earthwork was done at various places up to 17 m. 7 ch., but owing to the gradual reduction in the number of men it was found necessary to concentrate on the Tauraroa Section, chiefly in order to obtain early access to the ballast-pit. A steam-navvy is, however, engaged in the cutting between 15 m. 10 ch. and 15 m. 25 ch., and showing excellent results, the nature of the work on this line being suitable for the employment of these machines.

NORTH AUCKLAND MAIN TRUNK RAILWAY.

Kirikopani Section (118 m. 40 ch. to 115 m.).—Bushwork and formation were continued until the beginning of November, 1915, when work was suspended. Sundry short lengths of formation are completed, including a considerable amount of stream-diversion, drainage, &c. The remaining works, over a length of about two miles, are in various stages of progress.

Bickerstaffe Section (83 m. 75 ch. to 88 m. 40 ch.).—The rails have been laid and ballasted, including the sidings in Maungaturoto Station. Goods and passengers have been carried to and from Maungaturoto throughout the period under review, and since Christmas the passenger traffic has extended to Huarau. The removal of slips from the various cuttings on this section has been a work of some magnitude.

Paparoa Section (88 m. 40 ch. to 92 m. 16 ch.).—The rail-head is at 91 m. 25 ch., and the first siding in the Huarau Station yard has been laid. Ballasting is being pushed on, the stone being obtained from the Hoteo quarry, distant about 26 miles by rail. The Pahi Stream Bridge (88 m. 61 ch.) has been erected, also an overbridge at 89 m. 28 ch. Formation at Paparoa Station yard is in hand. At the south end of the Huarau Tunnel a drive was put in for some distance, but was discontinued owing to heavy slips. An open cut was then commenced with a view to putting in a reinforced-concrete approach, of which about 33 ft. is completed. At the north end of the tunnel the approach cutting was taken out to 91 m. 54 ch., and stopped owing to slips. Timbering and sinking for the portal is being started. A tramway has been laid from the rail-head to the north side of the Golden Stairs Tunnel, with sidings to the tunnel portals.

Mareretu Section (92 m. 16 ch. to 96 m. 38 ch.).—Work is in hand at various places up to 94 m. 9 ch., but not much has yet been completed. Here also slips are troublesome. Culverts have been put in, with one exception, to 94 m. The north approach cutting to the Golden Stairs Tunnel is practically completed. At the tunnel the heading was commenced from both ends, work being suspended on that at the north end after it had been driven about 4 chains. The ground is not very favourable. At the south end it is better, and the south heading has been driven 9 chains. Piles are being driven in readiness for sinking for the portal, and stone has been quarried for use as loading over the portal, these measures being necessary owing to the treacherous nature of the ground.

HUNTLY-AWAROA RAILWAY.

Platelaying and ballasting were continued to Pukemiro Station, where two platelayers' cottages and sundry other structures were erected. The small amount of finishing-work required elsewhere was done, and the line was handed over to the Railway Department in December last, but a few men are still employed in connection with the access road to Pukemiro Station.

WAIUKU BRANCH RAILWAY.

Work is in hand over a length of about 9 miles of this line, which is about $12\frac{1}{4}$ miles in length. The formation carried out to date is equal to approximately $4\frac{1}{4}$ miles of completed line, including seventeen culverts, and about $6\frac{3}{4}$ miles of fencing and $\frac{1}{2}$ mile of roadway. Rails have been laid for a distance of 21 chains. A bridge has been erected at 0 m. 11 ch., and overbridges at 0 m. 18 ch. and 0 m. 67 ch. Two platelayers' cottages have been erected at Glenbrook Station.

EAST COAST MAIN TRUNK RAILWAY.

Waihi-Tauranga.

Athenree Section (0 m. to 12 m. 35 ch.).—Satisfactory progress has been made with the rock-cuttings on this section. Six small contracts were let for formation-work between 4 m. and 6 m., and of these five are completed, the remainder of the work being carried out under the co-operative system. The concrete piers for the Victoria Street Bridge (Waihi) are completed, and work has been commenced on those for the Waimata Stream Bridge at 0 m. 66 ch., and for an overbridge at 4 m. 55 ch. Seven girder spans have been manufactured under contract.

Tauranga-Opotiki.

Te Maunga Section (41 m. to 45 m.).—The length from Te Maunga Junction back to the site of the large bridge across an arm of Tauranga Harbour is completed with the exception of some ballasting and part of Te Maunga Station yard. The stone-faced approach banks are in hand, and part of the steel material for the bridge has been obtained, but it is impossible to procure the remainder at present. Stone facing is being placed along the Tauranga waterfront to enable land for railway purposes to be reclaimed by dredgings from the channel leading to the town wharves. This dredging will be carried out by the Department by arrangement with the Marine Department and the Tauranga Harbour Board.

Maunganui-Te Puke Section (Maunganui to Te Maunga Branch Line, 0 m. to 4 m. 27 ch.; Te Maunga to Te Puke, 45 m. to 54 m.).—Goods and passenger traffic has been handled on this section throughout the period, the works in hand being mainly of the nature of maintenance. The stone-crushing plant at Moturiki quarry has ceased operations, but stone is still obtained for facing the harbour embankments, &c. At Te Puke quarry three crushers have been installed, also compressed-air drills, and a steady output of crushed stone has been maintained, but difficulty has been experienced in obtaining skilled labour, so that the maximum output has not been approached nor could the bins be completed. Local bodies' requirements as regards road-metal are being supplied from this quarry. The growing traffic on the line has necessitated an extension of the wharf at Maunganui.

Paengaroa Section (54 m. to 59 m. 65 ch.).—This section is also practically complete, with the exception of the permanent bridge over the Kaituna River, which cannot be erected until steel is obtainable. A temporary bridge is in use in the meantime, and the section is under traffic. Station buildings were erected at Rangiora and Paengaroa.

Pongakawa Section (59 m. 65 ch. to 64 m. 10 ch.).—This section is completed with the exception of a culvert at 61 m. 13 ch. and a bridge at 63 m. 7 ch., which cannot be constructed until the drainage of the Waihi Swamp is completed. Strong temporary structures have been erected to enable our trains to use the line. The Maniatutu and Pongakawa station buildings have been erected under contract.

Otamarakau Section (64 m. 10 ch. to 71 m. 5 ch.).—Earthwork on this section is practically complete, with the exception of the length 67 m. to 68 m., where a narrow bank only has been formed with the materials available, to be widened later by means of the train. This will enable the platelaying to proceed. For the purpose of forming the long embankments across the numerous swamp areas on this line a steam-navvy is in use, borrowing material which is run out and distributed by means of a train fitted with unloader and spreader. The Pongakawa Stream Bridge has been completed, and concrete piles for the Otamarakau Bridge have been made. The girders for the latter bridge and for the small bridge at 67 m. 5 ch. are in stock.

Matata Section (71 m. 5 ch. to 79 m. 18 ch.).—Satisfactory progress has been made with the earthwork considering the small number of men available, formation being practically continuous to Matata Station yard (79 m.). Formation of Pikowai and Matata station-yards is in hand.

General.—The construction-work on the long length of line between Tauranga and Matata, and the handling of a considerable volume of traffic on the completed portions, involves the employment of a good deal of plant and rolling-stock. There being no local facilities for carrying out repairs, &c., a workshop has been established at the Mount, and equipped with machine tools, to enable the Department to undertake the necessary repairs, as well as the construction of certain items of rolling-stock, bridge ironwork, and sundries.

Gisborne-Motu.

Motu Section (44 m. 10 ch. to 49 m. 8 ch.).—This section comprises the length between Matawai, the terminus of the opened line, and Kowhai Road. All the formation-works are complete, except a portion of the filling in Kowhai Road Station yard. Most of the cuttings have been in solid rock, part of this material being used in the construction of culverts and for road-metal. All culverts are completed. Fencing is erected up to 47 m. 30 ch. Two road-deviations have been constructed and metalled. A contract was let for the erection of a bridge over the Motu River at 48 m. 36 ch., and all the 22 ft. spans have been completed, but the 62 ft. centre span cannot be finished until certain materials can be obtained—probably after the war. In the meantime a temporary bridge is in use to enable the filling in Kowhai Road yard to proceed, this work being carried out by a locomotive and trucks filled by a steam-shovel. In addition, large quantities of timber are hauled for the public between the rail-head and Matawai. Rails are laid throughout the section, and completely ballasted with the exception of about 1 mile, on which part of the ballast has been placed. A platelayer's cottage has been erected at Otoko, on the opened line, and the sites have been prepared for the Kowhai Road Station buildings.

Gisborne-Napier (North End).

Ngatapa Section (0 m. to 10 m. 40 ch.).—The formation is practically complete, and all culverts constructed. Fences, gates, cattle-stops, and notice-boards have been erected. The large steel bridge across the Waipaoa River has been completed, and a smaller bridge at 9 m. 66 ch. is in hand. Reinforced-concrete piles have been made for use in several small bridges on the section. Platelaying is practically complete, and ballasting partly so, most of the ballast having been obtained from the Waipaoa River bed by means of a drag-scoop working on an aerial cableway. A platelayer's cottage has been erected at Makaraka Junction, also four cottages at Repongaere and four at Ngatapa, besides the usual station buildings and structures at Patutahi, Repongaere, and Ngatapa. A passenger and goods service, under the control of the Public Works Department, has been in operation since December last, but the traffic is very light.

Waikura Section (10 m. 40 ch. to 22 m., approx.).—Formation between 11 m. and 14 m. is well advanced, part of the work having been done by a steam-shovel. In the tunnel between 13 m. 14 ch. 88 lk. and 13 m. 21 ch. 52 lk. the bottom heading is completed. In the tunnel at 13 m. 48 ch. the bottom heading has been driven 28 ft. Permanent-way is laid to 11 m. 55 ch., but no ballasting has been done. An 8 ft. concrete culvert, 153 ft. long, has been constructed at 12 m. 22 ch., 106 piles being required in the foundation. At 13 m. 48 ch. a drive was put in for a 3 ft. culvert. Small bridges over stream-diversions were erected opposite 11 m. 5 ch. and 11 m. 35 ch., also a temporary trestle bridge to carry the line over a road and a creek at 11 m. 56 ch. Overhead bridges were erected at 12 m. 30 ch. and 12 m. 48 ch., and approaches formed. Work on this section was suspended in October, 1915, in order to concentrate the few remaining men on the completion of the Ngatapa Section.

Gisborne-Napier (South End).

Eskdale Section (0 m. to 10 m., approx.).—The work in hand on this section comprises the construction of the Westshore Bridge and approach banks. The bridge, a very large reinforced-concrete structure, to carry both railway and road, is being erected by the Department. The banks are being constructed by the Napier Harbour Board under contract, in conjunction with the Board's harbour-improvement scheme.

The reinforcing-steel for the bridge having come to hand, it was straightened, checked, and placed in racks ready for use. The necessary plant and buildings have been erected, including a 5-ton travelling-crane on gantry for handling piles, &c., two jetties, office, cement-store and testing-room, concrete-mixer, steel-bending shed and machine, two sheds for storing bent steel reinforcement, screening plant for grading concrete aggregate, large pile-driving pontoon with derrick, steam-winch, boiler, pump for water-jet, &c., two smaller pontoons for transporting piles, and launch for towing same. From July, 1915, to January last the fabrication of the reinforcement and casting of piles has proceeded steadily, 399 pile reinforcements being fabricated and 300 piles made. This work was suspended in January owing to lack of space for stowing piles. 483 tons of steel reinforcement have been bent, labelled, and stacked. A water-supply has been laid on from the town main. The Harbour Board's tramway is being taken over for the purpose of hauling material from the works at Westshore to the end of the bank, where a complete concreting plant is being erected. Pile-driving was commenced on the 13th March, 1916, twelve piles having been driven in the abutment, as well as a number of temporary piles for staging.

The Harbour Board has almost completed the bank at the Westshore end by means of the dredge "Waikaka" and trucking material from the beach at Westshore. The total quantity put into the bank is about 73,000 cubic yards, of which 20,000 yards was trucked from the beach and the remainder dredged from the Inner Harbour. The Board also completed for the Department the construction of the bank from 2 m. 61 ch. to 2 m. 66 ch., with material from the beach. About 18 chains of stone pitching has been completed on the north side of the bank.

STRATFORD—MAIN TRUNK RAILWAY.

West End.

Whangamomona Section (31 m. 40 ch. to 37 m. 53 ch.).—Heavy slips came down on this section in July last, seriously affecting the Railway Department's traffic. A number of this Department's men were sent to assist in clearing the line.

Tahora Section (37 m. 53 ch. to 47 m. 40 ch.).—The line is practically complete and rails laid and ballasted to Kohuratahi (42 m. 28 ch.), while the cuttings and banks are complete to 44 m. 20 ch. Numerous culverts, water-tunnels, and stream-diversions have been constructed up to 47 m. 18 ch., also sundry road-deviations, while others are still in hand. No. 1 tunnel (44 m. 30 ch. 50 lk. to 44 m. 54 ch. 50 lk.) is complete except one face wall. At No. 2 tunnel (44 m. 76 ch. 50 lk. to 45 m. 9 ch. 50 lk.) the bottom heading is completed, and a length of $6\frac{3}{4}$ chains has been enlarged and lined, leaving $5\frac{1}{4}$ chains to complete. Permanent-way is laid beyond Kohuratahi to 44 m. 16 ch., and first lift of ballast has been put down. A horse tramway is laid from 44 m. 16 ch. to Tahora Station yard (47 m. 10 ch.), following the railway formation to 45 m. 42 ch., and thence following the main Ohura Road. Permanent fences are completed to Kohuratahi and for a total length of 157 chains beyond. Sites have been excavated for four platelayers' cottages at Tahora, and a contract has been let for their erection, which is making good progress.

East End.

Matiere Section (0 m. to 11 m.).—The erection of the ferro-concrete piers for the Ongarue River Bridge at 0 m. 7 ch. is in hand. Owing to the impossibility of obtaining steel a temporary wooden superstructure will be erected to enable rails to be laid across. On the Okahu contract (1 m. 40 ch. to 4 m.) progress has been greatly handicapped by shortage of labour, but the tunnel heading has been driven right through, and the contractor has commenced breaking down and lining. During the period the amount of earthwork done in the open cuts on the contract was 18,000 cubic yards. Nothing has been done to the tunnels at 4 m. 65 ch. and 6 m. 12 ch. during the period. A contract has been let for enlarging and lining the tunnels at 7 m. 55 ch. and 8 m. 35 ch., the Department supplying bricks for lining. This work is proceeding satisfactorily. The brickworks at 7 m. are turning out a serviceable article for use in tunnel-lining, culverts, &c. Other works carried out by the Department include some earthwork, drainage, papa-burning for roadmaking purposes, and the completion of two small concrete culverts.

RAETIHI BRANCH RAILWAY.

The length of this branch is about 8½ miles. Little work has been done on formation and culverting during the period owing to shortage of labour, but not much remains to be done. Concrete piers for the bridge at 4 m. 75 ch. were built, and the superstructure is in course of erection. Permanent-way has been laid up to this bridge, including the sidings in Rochfort Station yard. Ballasting was commenced in November last, with material from the Railway Department's scoria-pit at Ohakune. Much time has been lost through lack of men, but the first lift is completed to 4 m. 20 ch.

OPUNAKE BRANCH RAILWAY.

Kapuni Section (0 m. to 7 m.).—Clearing is completed throughout, and good progress has been made with the earthwork. A steam-navvy was used to take out the cutting between 1 m. 1 ch. and 1 m. 33 ch., and has now been moved ahead. All concrete and pipe culverts are completed, eleven being constructed during the period. Concrete piers have been constructed for the bridge over the Mangatoki River (1 m. 48 ch.), and those for the Waingongoro (0 m. 25 ch.) and Kapuni (4 m. 69 ch.) bridges are being commenced. An overbridge has been constructed at Hastings Road (2 m. 15 ch.). Practically the whole length has been fenced, and four platelayers' cottages and an office have been erected at Kapuni.

Auroa Section (7 m. to 12 m.).—Clearing and fencing are completed to within about half a mile of the end of the section. A number of culverts have been constructed during the period.

Manaia Branch (0 m. to 5 m. 50 ch.).—A start was made during March with the clearing and fencing of this line, and a road-deviation at 0 m. 36 ch.

SOUTH ISLAND MAIN TRUNK RAILWAY.

North End.

Mirza and Wharanui Sections (48 m. 9 ch. to 56 m. 5 ch.).—At the date of last report contracts were in hand for the completion of the formation, platelaying, and ballasting, and for the erection of the station buildings at Mirza and Wharanui. These contracts were completed in 1915, a few works not included therein being carried out by the Department, and the line from Ward to Wharanui was handed over to the Railway Department on the 4th December, 1915.

Kekerangu Section (56 m. 5 ch. to 60 m.).—Formation is completed to 59 m. 29 ch. Rails have been laid to 59 m. 25 ch., and ballasting is well in hand. A new ballast-pit was opened at 57 m. 30 ch. Most of the formation during the period has been in sand, and all slopes of banks and cuttings and adjacent sand-drifts are planted with marram-grass, with excellent results. This planting is the only thing that would enable the line to be taken directly across the sand-drifts, the alternative being a devious and comparatively expensive line along the hillside farther inland, and its success is highly gratifying. Piles have been driven for the bridge over Woodside Creek (56 m. 50 ch.), and three gabion groynes built to protect the approaches. The superstructure has been delayed by difficulty in obtaining steel. Work has been commenced on the pile bridge over Waima Creek (59 m. 27 ch.).

WESTPORT-INANGAHUA RAILWAY.

Cascade Section (5 m. 74 ch. to 10 m.).—The three small contracts which were in progress at date of last report have since been completed, and no further work has been put in hand, the formation being now complete to 10 m. with the exception of the bridges.

MIDLAND RAILWAY.

Nelson-Westland (North End).

Kawatiri Section (59 m. 17 ch. to 63 m. 10 ch.).—Earthwork and culvert construction have been in progress during the period, with a small and decreasing force of men. The first mile is ready for platelaying, and the next two well advanced. Concrete piers for the bridge at 61 m. 36 ch. are in hand, and a cottage has been erected at Kawatiri Station yard.

Arthur's Pass Tunnel.

At the Otira end day labour is employed. The rock changed from greywacke to slate, and has continued in slate, which is easier to bore and not so wet. This change, together with improved drilling machinery, has enabled better progress to be made in the bottom heading, 26 chains 7 links being driven in the nine months, as compared with 23 chains 19 links in the previous twelve months. In the enlargement and lining very little dry time has been worked, and timber has had to be used. This work has also been hampered by difficulty in obtaining skilled labour, so that the progress made compares rather unfavourably with that for the previous period.

At the Bealey end the work has been continued on the co-operative system, but the progress has been poor, 11 chains 33 links of bottom heading and 13 chains 20 links of lining being done in the nine months, as compared with 16 chains 19 links and 19 chains 82 links respectively in the previous twelve months.

The total length of heading driven (both ends) is now 3 miles 78 chains 3 links, and the length of tunnel completed 3 miles 38 chains 82 links. The distance between the headings is 1 mile 27 chains 15 links, and between the completed portions 1 mile 66 chains 36 links, the length of the whole tunnel being 5 miles 25 chains 18 links.

CULVERDEN-WAIAU RAILWAY (Length, 13 miles).

Formation has been completed up to 12 m. 30 ch., and is in progress for the remaining length. Station-yards have been formed at Achray (5 m. 15 ch.) and Rotherham (7 m.). Practically all concrete-work of bridges and culverts is completed. Fencing has been erected throughout, and all public and private crossings constructed. Rails are laid to 7 m. 45 ch., and first lift of ballast completed to 4 m. This work has been hampered by lack of suitable labour, and is not yet in full swing. A ballast-pit has been opened up at Culverden (0 m. 20 ch.). Stock-yards are being erected at Rotherham, and a temporary engine-shed, coal-store, &c., have been provided for the use of the locomotive.

WAIMATE BRANCH RAILWAY EXTENSION (Length, 4 miles 60 chains).

Work on this line was suspended in December last. Prior to that date good progress had been made with formation, culverts, road and creek diversions, fencing, &c. A quantity of stone had been crushed and delivered at the bridge-sites for use in the concrete piers.

OTAGO CENTRAL RAILWAY.

Cromwell Section (44 m. 52 ch. to 57 m., approx.).—The railway-formation and road-widening is completed to 54 m. 77 ch., and well in hand on the remaining 2 miles. Pipe culverts totalling 478 lineal feet have been constructed. A concrete arch bridge at Leaning Rock Creek, and a 10 ft. arch culvert at Brewery Creek, are in course of construction. Rails are laid to 50 m. 61 ch., and ballasted to 50 m. 55 ch. A temporary siding has been laid at 50 m. 50 ch. A new telephone-line extends to 51 m. 28 ch., and a quantity of fencing has been done.

OREPUKI-WAIAU RAILWAY EXTENSION.

Work beyond Tuatapere, the terminus of the opened line, was put in hand in May, 1915, and carried on until November last, when work ceased, with the exception of clearing and burning timber, which it was necessary to carry out in the summer months. The work done during the above period comprised 3 miles 25 chains of bush clearing, $2\frac{1}{4}$ miles of stumping, $1\frac{1}{4}$ miles formation and fencing, three culverts, and the erection of two additional cottages at Tuatapere Station.

SANDY BAY TRAMWAY.

In order to obtain suitable building-stone for the new Parliamentary Buildings, Wellington, it was found necessary to open up a new quarry inland from Sandy Bay, and to give access thereto the Department is constructing, on behalf of the stone suppliers, a tramway 3 miles 17 chains in length from the quarry-site to a new wharf. The work is approaching completion, and some stone is now coming forward.

SURVEYS OF RAILWAYS UNDER CONSTRUCTION, NEW LINES OF RAILWAY, LAND PLANS, ETC.

KAWAKAWA-HOKIANGA RAILWAY.

The permanent line has been pegged to 30 m., and plans prepared up to 28 m. A small party is still engaged in the pegging of the line beyond 30 m., Okaihau Station being at 24 m. 31 ch.

MANGAPAI-WAIPU RAILWAY.

This line was surveyed, and the permanent line pegged, between Oakleigh (Mangapai) Station, on the Whangarei-North Auckland Main Trunk Railway, and Waipu Township, a distance of 16 miles.

HUNTLY-AWAROA RAILWAY.

A survey was made from 7 m. 22 ch. to 8 m. 34.79 ch. for the purpose of relocation. The proposed Waitawhara Valley Road, from Pukemiro Station to the Huntly-Raglan Road, was surveyed for a distance of 63 chains.

WAIUKU BRANCH RAILWAY.

Deviations from the permanent line, totalling 1 mile 24 chains in length, were surveyed and plans prepared.

A land-plan survey from 0 m. to 4 m. was made and the land proclaimed, and field-work is in progress on a further length up to 12 m. 20 ch.

EAST COAST MAIN TRUNK RAILWAY.

A trial line was surveyed across the Hauraki Plains, between Kopu and Waitakaruru, and plans and report prepared.

On the Tauranga-Opotiki portion of the line the final location between Matata and the Rangitaiki River is proceeding. The permanent survey was continued from 92 m. 71 ch. to 95 m. 57 ch., when work had to be suspended owing to there being no Engineer available. In the vicinity of Tauranga the permanent survey was completed from 35 m. to 41 m. 60 ch., and plans were plotted but not quite finished.

On the Motu Section a land-plan survey from 44 m. 20 ch. to 47 m. 8 ch. has been completed, also surveys in connection with water-supply to various stations.

On the Waikura Section a deviation between 14 m. 42 ch. and 19 m. 30 ch. was permanently pegged, after about 10 miles of trial lines had been surveyed.

In the vicinity of Wairoa (Hawke's Bay) about 14½ miles of trial lines and 14 miles of permanent lines have been surveyed with a view to locating the line north and south of Wairoa, also a branch line to the wharf and a ballast-siding to the beach.

TE ROTI—OPUNAKE—MOTUROA RAILWAY.

Land-plan surveys of the Kapuni and Auroa Sections and of the Manaia Branch have been completed, but the plans have not yet been passed by the Survey Department.

A deviation between 16 m. and 20 m. 25 ch. was surveyed and permanently pegged, and the plans are nearly finished.

The permanent line has been extended from 38 m. 60 ch. to 46 m., and about 17 miles of trial surveys have been made. Permanent plans beyond 23 m. are in hand.

WELLINGTON—WAIRARAPA RAILWAY.

In connection with the proposed deviation through the Rimutaka Range a trial line was surveyed from a point on the existing line near Pigeon Bush, along the western shore of Lake Wairarapa to the Wairongomai River, thence up the river for a short distance, and striking through to the Wainui-o-mata Valley, and down this valley to connect with a former trial line from Petone. This work was plotted, and the approximate centre-line located on paper, with the exception of former trial line. Quantities were taken out but no estimate was made, as it appears that, owing to the costly and almost impracticable nature of the Petone to Wainui-o-mata location, further exploration between the Wainui Valley and the existing line will be required. On the Wairarapa side of the range the location can probably be improved by further survey-work. On the Tauherenikau route no further field-work has been done, but that already done has been plotted. Further survey-work is required before an estimate can be prepared. It would appear that practically a new trial line will have to be surveyed from Upper Hutt almost to the Summit Tunnel. More information is also required to enable the line down the Tauherenikau Gorge to be located and the cost estimated. Unfortunately, we were compelled to suspend operations in August last, the staff being utilized for urgent works in connection with the military camps.

SOUTH ISLAND MAIN TRUNK RAILWAY (NORTH END).

The location survey has been completed from 60 m. to 61 m. 22 ch., and plans prepared.

MIDLAND RAILWAY (NELSON—WESTLAND).

Some trial-line work was done, completing the length 65 m. to 66 m. The permanent pegging is complete from 63 m. to 64 m., and in progress from 64 m. to 65 m.

WAIMATE BRANCH RAILWAY EXTENSION.

A land-plan survey (4½ miles) has been made, and plans prepared and approved by the Survey Department.

TUAPEKA MOUTH BRANCH RAILWAY.

A start has just been made with trial surveys for a line connecting the district of Tuapeka Mouth with the South Island Main Trunk Railway in the vicinity of Lovell's Flat or Crichton as an alternative to the proposed line from Balclutha.

OREPUKI—WAIU RAILWAY EXTENSION.

The permanent survey has been extended to 55 m., and trial line to 61 m.

ROADS, BRIDGES, ETC.

The construction of roads and bridges has been curtailed to some extent in the interests of economy. Of the very large number of works carried out the following are selected for special mention:—

Motu—Opotiki Road.—This road has been widened to 16 ft. for a distance of 3 miles between Motu and Toatoa, and between Toatoa and Papamoa. A large amount of work has been done on Papamoa Hill, a considerable portion being widened to 16 ft. Sundry improvements have been made elsewhere, and 16 miles of the road maintained by the Department.

Mangapoike Road.—A considerable amount of widening has been done. The dray-road formation now extends for 33 miles from Gisborne and 25 miles from Wairoa, leaving about 7 miles of bridle-track to be widened to complete the road throughout. Maintenance expenditure has been heavy owing to storms.

Te Kuiti to Mokau.—About 1 mile of new metalling has been done near Te Kuiti. Various gaps between Mangaotaki and Mahoenui have been metalled, and some metalling has been done in Mokau Township. Two small bridges are being renewed.

Ohura Road.—Flood damages have been repaired, and the Tangarakau Top Crossing Bridge has been completed. Papa has been burnt for use as road-metal, and sundry short sections of road have been metalled, besides ordinary maintenance-work.

Rotoaira to Waimarino.—Satisfactory progress is being made with the formation of this road by prison labour. The erection of the bridges over the Whakapapa streams is in hand.

Kohatu-Westport-Reefton.—In addition to the usual maintenance-works a considerable sum has been expended on re-formation, new metalling, metal-patching, &c. Bridges were erected at Deep Creek (a concrete arch, 46 ft. span), Deep Creek No. 22 (one 34 ft. and one 24 ft. rolled-steel joist spans), and Eight-mile (similar to No. 22). A deviation of the road at Four Rivers Plain is in course of construction.

Arthur's Pass-Kumara-Ross-Waiho.—This road has been maintained for a distance of about 160 miles, and in addition a considerable amount of metalling and improvements has been carried out.

Waiho to Karangarua.—Dray-road formation has been carried out for a distance of 166 chains; also 153 chains metalling, 141 chains bushwork, clearing of slips, &c.

Parnassus to Kaikoura.—The improvement of alignment and grades and the widening and metalling of this road are in hand. The section between Kaikoura and the Conway River is practically completed, 25 miles having been re-formed and metalled. A contract has been let for the erection of three bridges (Goose Bay, Oaro, and Okaralia), which will avoid the interruption of traffic owing to floods in the rivers. The Conway and Hundalee bridges are completed, and the approaches are in hand. South of the Conway the work is practically finished, with the exception of the bridge over the Leader River and its approaches, which are in hand.

Tokatoka Swamp Stop-banks, Drainage, and Tramway.—The stop-banks have been repaired and are now in good order. Stone protection has been carried out, and is being continued. The tramway has been completed.

Helensville Swing-bridge.—The Waitemata County Council has completed the erection of a reinforced-concrete bridge consisting of seven 30 ft. spans. The total length of the bridge is 217 ft., and the width 18 ft.

Taikata Creek Bridge.—The Waitemata County Council has in hand the erection of a reinforced-concrete bridge, comprising two 27 ft. 6 in. and one 30 ft. spans, also 36 chains of approaches.

Waikato River Bridge (Rangiriri).—A bridge 438 ft. long is being erected under contract. Thirty-nine reinforced-concrete piles have been driven, and several piers completed.

Wairoa River Bridge (Tauranga).—This ferro-concrete structure, of eleven 45 ft. spans, was completed last year, but a subsidence in the river-bank caused the bridge abutment to settle down about 1 ft. Additional piles have therefore been driven, and the end span is being raised to its proper level.

Rangitaiki River Bridge (Te Teko).—A reinforced-concrete bridge, of seven 45 ft. spans, on the Whakatane-Te Teko Road, has been erected by the Department.

Te Reinga Falls Bridge (Wairoa River, Hawke's Bay).—This bridge, comprising one 151 ft., two 41 ft., one 20 ft., and one 15 ft. spans, on concrete and pile piers, has been completed during the period.

Awakino River Bridge.—A bridge comprising one 81 ft. and one 18 ft. spans, with 12 ft. roadway, was completed.

Kiwi Road.—The improvements on this road include the construction of a tunnel 314 ft. long, with approaches.

Manganui-a-te-ao River Bridge (Hoihenga).—The erection of this bridge was commenced in December last. Two concrete abutments have been constructed, and the necessary falsework and plant fitted up. The timber is being worked up.

Opawa River Bridge.—The construction of this reinforced-concrete bridge, consisting of eight 70 ft. bowstring spans, is well under way, the piers for six spans having been completed, and one span erected. The work has been hampered owing to the unusual height of the water in the river.

Branch River Bridge.—This structure, comprising fourteen 25 ft. spans on pile piers, has been erected under contract, and the approaches are now being formed.

Kowhai River Bridge.—This bridge, which is similar to the Branch River Bridge, has been completed, including the approaches.

Hurunui River Bridge (Lower).—A contract has been let by the Waipara County Council for the erection of a bridge comprising three 52 ft., one 51 ft., one 25 ft., and one 11 ft. spans, on pile piers.

IRRIGATION.

OTEKAIKE SETTLEMENT.

A new concrete intake was constructed for the stock-race, and the siphon at 3 m. 69 ch. was repaired. Three miles of race were surveyed, and construction is in progress.

IDA VALLEY SCHEME.

Manorburn Dam.—This dam has been brought up to finished level, and all lifting gear has been fitted up. The concrete placed during the year was 402 cubic yards, making a total for the dam of 8,190 cubic yards.

Race-construction.—In the German Hill race some 5 miles 66 chains was constructed during the year, and of the Black's No. 3 race 66 chains was completed. The Lower Bonanza race was deepened for a distance of 1 mile 4 chains. On the Upper Bonanza race dry stone walls have been constructed in many places to prevent scour. This race will be lined with concrete for about 3½ miles, to prevent leakage through artificial stone walls and broken-rock formation. The work is in hand.

Water-supply.—A limited amount of water was supplied to settlers during the summer months for irrigation.

Poolburn Dam.—Borings have been taken here, and investigations are in progress with a view to carrying the irrigation head-race across the Poolburn by means of a flume or an inverted siphon to obviate the construction of the proposed dam.

MANUHERIKIA—ALEXANDRA—CLYDE SCHEME.

Survey-work was continued during the year, comprising chiefly the setting-out and pegging of distributary race-lines. The total mileage now set out on both sides of the Manuherikia River is about 55 miles, which, however, includes some alternative race-lines. For the period 32 miles of distributary races were surveyed, and the long cross-sections, trial and check lines total close on 130 miles. A main distributary race has been set out from 6 m. 59 ch. on the main-race line, and taken across the river to the Galloway side. Definite calculations give the area of irrigable land which can be served on the Moutere side of the Manuherikia River at 9,000 acres. On the Galloway side 1,000 acres are available.

Race-construction.—One small contract has been completed and another is in hand, the work done to date comprising about 50 chains of completed race between 0 m. 15 ch. and 1 m. The Department's co-operative workers have completed the next mile, and have commenced work beyond 2 m.

Intake.—The exact character and location of the intake are still undecided. Some further investigation has been made during the year.

Rainfall Data.—Five new rainfall-recording stations have been established in connection with this scheme.

WAIHOU AND OHINEMURI RIVERS IMPROVEMENT.

Dredging.—The new dredge was completed by the contractors on the 21st May, 1915, and the excavation of the Koutou cut to bed-level was commenced the following month. This cut straightens out a meander about $\frac{3}{4}$ mile long on the Waihou River, the length of the cut being 9½ chains. It was deepened to the extent of 11 ft. on a width of 145 ft., the work being completed in February last. The material is fairly stiff clay, which was deposited at a distance of 5 chains from the dredge. Earthen dykes were constructed to retain the dredged material. The dredge then deepened the berthage at the new Paeroa Wharf. Experiments are now being made to determine the most economical method of constructing the large amount of stop-banks required. A large coal-pontoon was built locally for use in connection with the dredge.

Dredge Slip Reserve, Paeroa.—A road was made to this reserve, and a store, 30 ft. by 20 ft., erected.

Willow Clearance.—Some difficulty was experienced owing to decayed willow-tree stumps floating down-stream, and, as a large number of these trees, which had been killed by poisoning during the past four years, showed signs of falling into the stream, all overhanging trunks for a length of about 8 miles were removed and stacked ashore.

Silting of Rivers.—A considerable amount of data has been obtained monthly and tabulated.

Snagging.—A barge, 36 ft. long by 18 ft. wide, with crane and fittings, is being constructed for use in snagging and for general purposes.

Stop-bank, Junction to Thorp's Bend.—This work was resurveyed and working plans prepared, the total length being 66 chains, of which 12 chains has been constructed by means of the dredge.

Tirohia—Ngararahi Stop-bank.—Tenders have been received for two contracts comprising the construction of 67 chains of stop-bank immediately northward of the Ngararahi Cut. Further contracts are being prepared for advertising.

Surveys have been carried out at Hikutaia Creek and elsewhere as required.

TRAMWAYS.

Auckland.—The construction of a double line of tramway from the junction of Queen and Wellesley Streets along Queen Street to Karangahape Road has been authorized. An alteration to the track in Customs Street West in connection with street-improvement is nearing completion.

New Plymouth.—This undertaking is now practically completed. All permanent-way has been laid, and the power plant and overhead gear are almost completed. Two sections have been passed as fit for traffic, and five cars have also been passed.

Wanganui.—At the beginning of the period the Wanganui electric tramways were extended for about a mile along the river-bank road from the railway at Aramoho.

Wellington.—The Constable Street duplication and extension has been completed and passed for traffic, also sundry loops and cross-overs, and several new cars.

Christchurch.—The Sockburn, Coronation Street, and Barbadoes Street extensions have been completed and passed. A deviation across the estuary, from the Shag Rock to the Sumner Tramway Bridge, is under construction. Two new trailers have been inspected and passed.

Dunedin.—The City Council's proposals for alteration of curves to suit improved rolling-stock have been approved, also the designs for the new cars, and an amended layout of tracks at the car-depot.

MARINE.

Kohukohu Reclamation.—The erection of the timber breastwork was completed, and the saw-dust backing filled in. Clay filling was placed behind the timber breastwork along the County Wharf, reclaiming an additional area, but the wall has given way at one place, and repairs will be required.

Hokiangā.—A new residence and office for the Harbourmaster were erected at Rawene, and the boatman's cottage was shifted from the Heads to Rawene and re-erected, with sundry improvements.

Whangapara Wharf.—The Great Barrier Island County Council has submitted plans and specifications for repairs and extension.

Mahurangi Heads Wharf.—Proposals for repairing and strengthening this structure have been submitted by the Rodney County Council.

Silverdale Wharf.—The new wharf has been completed by the Waitemata County Council.

Needles Wharf, Manukau Harbour.—The Franklin County Council has let a contract for the erection of a new wharf at The Needles, Manukau Harbour.

Turanga Creek Wharf.—A survey of the proposed wharf-site has been made and a plan prepared.

Te Aroha Wharf.—A survey was made during the period for the purpose of fixing the position of a groyne in the Waihou River with the object of deepening the berthage at the wharf.

Netherton Wharf and Goods-shed.—This wharf and shed were completed, the road approach formed, and the reserve fenced in.

Piako River.—Two leading-beacons have been erected on the western side of the Piako River to indicate the fairway as observed at low water.

Tiritiri Lighthouse.—Material was obtained for the erection of two dwellinghouses and out-buildings. The material was taken to the island and stacked, but the erection of the buildings has not yet been put in hand.

Waikato River.—Information was obtained in connection with the proposed snagging of the river.

Tauranga.—Arrangements have been made to commence immediately the dredging of a portion of the channel leading up to the town wharves, the spoil to be used in connection with the railway-formation along the foreshore.

Cape Egmont Lighthouse.—A petty contract has been let for the manufacture of a revolving cowl for this lighthouse.

Karori Rock Beacon.—This new lighted beacon has been completed. Progress has been slow and difficult owing to the fact that work was possible only during very fine weather.

Beacon Reach Buoy, Kaipara.—The manufacture of this buoy has been delayed through difficulty in obtaining materials, but is now about completed.

Karamea Harbour.—The contracts in hand were completed during the period, but unfortunately a great deal of damage was done during October and November by floods. Since then maintenance-work has been carried out from time to time in order to safeguard the remaining works. The depth of water on the bar at high water is now about 10 ft.

Taiaroa Head Lighthouse.—The fog-signal has been repaired.

Cape Saunders Lighthouse.—The derrick crane has been repaired.

Nuggets Boat-landing.—The extension of the small breakwater was completed in December last.

Tautuku.—A report was prepared in connection with a proposed breakwater at this place.

DEFENCE WORKS.

Sundry buildings have been erected, and the existing works have been maintained and improved. For obvious reasons no details of these works can be included in this report, but there can be no objection to the inclusion of some particulars of the work at the military camps which has been carried out by the Department, a considerable amount of descriptive matter having appeared in the public Press. The work was one of considerable magnitude, and it was carried out with a depleted staff and in the face of many difficulties in a manner which reflects great credit upon those officers immediately concerned. The following summary will give some idea of the nature and extent of the work :—

Trentham Camp.—The following structures have been erected: Seventy men's huts, sixteen officers' huts (two containing forty cubicles each, and fourteen containing ten cubicles each), nine cookhouses with wash-ups, two guard-rooms, six orderly-rooms, two power-houses, and one boiler-house, six latrines, three bathhouses, sixteen ablution-stands, one disinfectant-house, six A.S.C. stores, three regimental stores, one hospital store, four drying-rooms, one dining-room for officers' mess, one medical-inspection building, one chiropodist's hut, one dental surgery, one mortuary, one fire manual shed, one brick incinerator. Extensive alterations were made to officers' mess, headquarters, dental surgery, and A.S.C. stores. The road-construction comprised 110 chains of formation and metalling, 150 chains of concrete channelling, and 346 chains of open channelling. Water-supply and drainage involved the construction of a reservoir (450,000 gallons), seven 5,000-gallon concrete fire-service tanks, two large concrete tanks for sewage, two septic tanks at hospital, one 3,000-gallon water-tank on 30 ft. stand, 200 chains of water-piping laid, 121 chains of 6 in. steel drainpipes, and nearly 2 miles of earthenware pipes of various sizes, 150 chains of new canal cut, and 50 chains old canal cleaned out; also a great variety of minor and incidental works.

A hospital building was erected under contract, but all the other works above mentioned were carried out by day labour.

Featherston Camp.—This camp has been constructed practically in its entirety by this Department. Work was commenced in August, 1915, but practically no building-work was done until September. The permanent camp, designed to accommodate 4,500 men, was handed over to the military authorities for occupation on the 25th January last. The camp as at first designed was intended to accommodate 2,500 men, but ultimately it was extended to contain 7,000. Since the 25th January building operations have been continued, and practically the whole of the camp has been maintained. In the permanent camp the buildings erected to date total 233 in number, besides nineteen in the canvas camp adjacent. The Department was also called upon to supervise the erection of twenty-nine private buildings. The permanent camp buildings include ninety men's huts, sixteen officers' huts, eight large dining-halls, twenty stables, and a great variety of other buildings and structures, generally similar to those at Trentham. Over 3,000,000 superficial feet of timber and $27\frac{1}{2}$ tons of nails have been used by the Department. In the permanent camp 241 chains of streets and 204 chains of footpaths were formed and metalled, 23,000 cubic yards of gravel being used. In the canvas camp 26 chains of road was formed and metalled. Two systems of drainage have been installed. Surface water from streets, roofs, &c., is collected in open concrete channels in the streets and conducted away from the camp partly in pipes and partly in an open race after passing through a suitable mud-tank. All polluted water from ablution-stands, cookhouses, latrines, wash-ups, showers, &c., is collected by an underground drainage system, converging into a 12 in. gravity sewer 50 chains long, discharging into the Tauherenikau River. A septic tank has been installed at the hospital block, the effluent being discharged into the main sewer. The surface-drainage system necessitated the construction of 263 chains of open concrete channelling and $10\frac{1}{2}$ chains of 18 in. pipe. The foul-drainage system includes a total length of 321 chains, or over 4 miles, of pipes. There are two water-supply systems, one for drinking and cooking purposes, the other for ablutions, latrines, stables, &c. The former is derived from two wells which have been sunk and lined with concrete to a depth of 40 ft., and connected by an underground drive about 1 chain in length, which has been extended 80 ft. eastward to drain additional country. The water is pumped by centrifugal pumps into a 13,000-gallon vat mounted on a stand 30 ft. high, whence the camp is reticulated. The pumps can be driven by either an oil-engine or an electric motor. The other supply is derived from the Tauherenikau River by means of a water-race, being diverted into pipes at a point some 30 chains from the north-east corner of the camp. The pipes used comprised 124 chains of 6 in. spiral steel main and 410 chains of galvanized-iron pipes of various sizes, making a total length of 6 miles 54 chains of water-pipes laid. 680 taps have been connected. Electric lighting has been installed throughout the permanent camp, about 2,300 points having been connected. The electric power is derived from two 125 h.p. suction-gas engines, each driving a 75 kw. dynamo. For fire-prevention purposes nine 6,000-gallon underground concrete water-tanks have been constructed in suitable positions throughout the camp, and boxes to contain chemical extinguishers, also fire-buckets and stands for same, have been provided where necessary. A railway-siding, 1 mile 45 chains in length, has been constructed from Featherston to the camp, and a large station-yard has been made at the camp. A considerable amount of wire and picket fencing, with gates, has been erected in and about the camp, and an area of 5 acres was planted with trees to form a shelter-belt. The maximum number of men employed by the Department was 1,050. Owing to the impossibility of obtaining board and lodging for such a number at a small place like Featherston, the Department was called upon to provide accommodation and food for its employees, and for this purpose a large number of cooks and orderlies had to be engaged and organized. The number of meals served by the Department up to the 31st March was 373,120; the quantity of meat used was 231,617 lb.; bread, 100,800 lb., and other provisions in proportion.

Although the work at the camps is nearing completion we have still about 250 men employed, mostly in connection with the numerous additions and improvements which are found necessary or desirable from time to time.

I have, &c.,

R. W. HOLMES, M.Inst., C.E.,
Engineer-in-Chief.

The Hon. the Minister of Public Works.

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1916—continued.
NORTH ISLAND—continued.

Appropriation.	Division.	Mileage.	Section.	Main Line.	Siding.	Total.	State of Line.											Total.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
							Under Formation.	Under Plate-laying.	Opened.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
									Date.	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	—	—		—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											

* Trial survey. † Completed all but Te Maunga yard.

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, (CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1916—continued.)
NORTH ISLAND—continued.

Appropriation.	Division.	Mileage.	Section.	Main Line.	Stations.	Total.	State of Line.												Total.			
							Surveyed.	Under Formation.		Under Plate-laying.	Opened.											
								8	9		10	Date.										
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		
East Coast Railway— <i>contd.</i>	Waihi-Opotiki— <i>ctd.</i>	M. ch.	Mataua-Taneatua ..	20 0	M. ch. ..	M. ch. 20 0	M. ch. { 13 0 Perm. 7 0 Prelim.	M. ch. ..	M. ch. ..	..	..	..	..	..	..	..	..	..	..	..
			Taneatua-Opotiki ..	30 0	Prelim. Survey 0 67	5 14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Branch Lines	..	Mount Maunganui - Te Maunga Junction	4 27	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
			Te Puke Quarry ..	3 0	0 20	3 20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Thames Valley-Rotorua	Thames Valley-Rotorua	69 33	Moturiki Quarry ..	1 0	0 10	1 10	..	..	1 10	..	..	..	..	..	..	..	..	..	..	..
			Morrinsville-Rotorua	69 33	5 27	74 60	..	..	..	..	..	..	..	..	..	..	..	..	..	..	69 33
	Gisborne-Opotiki	93 45	Gisborne Wharf-Kaiteratahi	13 10	2 45	15 55	..	..	..	..	..	..	..	..	..	..	..	..	..	..
			Kaiteratahi-Karaka	5 5	71	5 76	..	..	..	13 April, 1905	..	..	..	..	..	..	..	..	..	..	..
New survey	Napier-Gisborne	206 39	Karaka-Puha ..	1 75	24	2 19	..	..	..	20 May, 1907	..	..	..	..	..	..	..	..	..	..
			Puha-Waikohu Bridge	3 29	..	3 29	..	..	..	28 May, 1908	..	..	..	..	..	..	..	..	..	..	..
			Waikohu Bridge-Waikohu	0 35	0 32	0 67	..	..	..	1 April, 1909	..	..	..	..	..	..	..	..	..	..	44 34
			Waikohu-Otoko ..	7 75	0 32	8 27	..	..	..	6 April, 1912	..	..	..	7 75	..	..	..	..	..	..	..
			Otoko-Rakauora ..	6 60	0 32	7 12	..	..	..	2 Nov., 1914	..	..	..	..	..	6 60	..	..	..	..	..
			Rakauora-Matawai ..	5 65	0 50	6 35	..	..	..	2 Nov., 1914	..	..	..	..	..	5 65	..	..	..	..	..
			Matawai-Kowhai Road	5 79	0 55	6 54	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
			Kowhai Road-Motu	2 10	..	2 10	2 10	..	..	..	..	..	..	..	..	..	..	..	..	..	..
			Motu-Opotiki ..	41 2	..	41 2	41 2	Estim.	..	..	..	..	..	..	..	..	..	..	..	..	..
			Napier-West Shore ..	3 37	..	3 37	3 12	2 67	..	..	..	..	..	..	..	..	..	..	..	..	..
			West Shore-Petane ..	3 57	..	3 57	..	3 57	..	..	..	..	..	..	..	..	..	..	..	..	..
			Petane-Eskdale ..	3 35	..	3 35	0 35	3 0	..	..	..	..	..	..	..	..	..	..	..	..	..
			Eskdale-Wairoa ..	47 31	..	47 31	47 31	Prelim.	..	..	..	..	..	..	..	..	..	..	..	..	..
			Wairoa River-Gisborne	72 0	..	72 0	43 0	2 17	12 67
			Gisborne Station - Makaraka	3 5	..	3 5
			Makaraka-Patutahi	4 54	0 40	5 14	4 54
			Patutahi-Ngatapa ..	6 50	0 53	7 23	6 50
			Ngatapa-Waikura ..	12 0	..	12 0	12 0	2 17	1 43

44 34

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1916.—continued.

NORTH ISLAND—continued.

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line.															Total.	
							Surveyed.			Under Formation.	Under Plate-laying.	Opened.											
							8	9	10			Date.	11	12	13	14	15	16	17	18	19		20	21
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
New survey —contd.	Napier-Gisborne— <i>ctd.</i>	M. ch.	Waikura-Waterfall	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	..	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.			
			Waterfall-Hangaroa	5 0	5 0	5 0	5 0	5 0	5 0	5 0	5 0	5 0	5 0	5 0	5 0	5 0	5 0	5 0	5 0	5 0	5 0	5 0	
			Hangaroa-Te Reinga	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	
			Te Reinga-Marumaru	17 11	17 11	17 11	17 11	17 11	17 11	17 11	17 11	17 11	17 11	17 11	17 11	17 11	17 11	17 11	17 11	17 11	17 11	17 11	
			Marumaru-Wairua River	12 40	12 40	12 40	12 40	12 40	12 40	12 40	12 40	12 40	12 40	12 40	12 40	12 40	12 40	12 40	12 40	12 40	12 40	12 40	12 40
Napier-Woodville	Napier-Woodville ..	96 65	Wairoa Wharf Siding	1 64	1 64	1 64	1 64	1 64	1 64	..	..	..	..	..	..	..	..	..	..	..
			Wairua-Napier	2 55	2 55	2 55	2 55	2 55	2 55	2 55	2 55	2 55	2 55	2 55	2 55	2 55	2 55	2 55	2 55	2 55	2 55	2 55	
			Napier Spit-Woodville	96 65	96 65	96 65	96 65	96 65	96 65	96 65	96 65	96 65	96 65	96 65	96 65	96 65	96 65	96 65	96 65	96 65	96 65	96 65	96 65
			Woodville-Palmerston North	17 21	17 21	17 21	17 21	17 21	17 21	17 21	17 21	17 21	17 21	17 21	17 21	17 21	17 21	17 21	17 21	17 21	17 21	17 21	17 21
			Woodville-Wellington	115 79	115 79	115 79	115 79	115 79	115 79	115 79	115 79	115 79	115 79	115 79	115 79	115 79	115 79	115 79	115 79	115 79	115 79	115 79	115 79
Rimutaka Incline Deviation surveys	Greytown Branch .. Featherston - Martin- borough Greytown - Martin- borough Coach road Route .. Tauherenikau Route Wainui-o-mata Route Coast Route .. Coast Route ..	3 7 11 50 4 62 9 0 21 30 31 40 52 0 70 0	Woodside-Greytown	3 7	3 7	3 7	3 7	3 7	3 7	..	..	..	..	..	..	..	..	..	..	..
			Featherston - Martin- borough	11 50	11 50	11 50	11 50	11 50	11 50	11 50	11 50	11 50	11 50	11 50	11 50	11 50	11 50	11 50	11 50	11 50	11 50	11 50	
			Greytown - Martin- borough	4 62	4 62	4 62	4 62	4 62	4 62	4 62	4 62	4 62	4 62	4 62	4 62	4 62	4 62	4 62	4 62	4 62	4 62	4 62	
			Coach road Route ..	9 0	9 0	9 0	9 0	9 0	9 0	9 0	9 0	9 0	9 0	9 0	9 0	9 0	9 0	9 0	9 0	9 0	9 0	9 0	9 0
			Tauherenikau Route	21 30	21 30	21 30	21 30	21 30	21 30	21 30	21 30	21 30	21 30	21 30	21 30	21 30	21 30	21 30	21 30	21 30	21 30	21 30	21 30
Foxton-New Plymouth	Wellington-Manawatu Foxton-Patea .. Route Improvement Surveys	83 37 120 44 26 7	Petone-Pigeon Bush	52 0	52 0	52 0	52 0	52 0	52 0	..	..	..	..	..	..	..	..	..	..	..
			Coast Route ..	70 0	70 0	70 0	70 0	70 0	70 0	70 0	70 0	70 0	70 0	70 0	70 0	70 0	70 0	70 0	70 0	70 0	70 0	70 0	
			Wellington-Manawatu	83 37	83 37	83 37	83 37	83 37	83 37	83 37	83 37	83 37	83 37	83 37	83 37	83 37	83 37	83 37	83 37	83 37	83 37	83 37	83 37
			Foxton-Patea ..	120 44	120 44	120 44	120 44	120 44	120 44	120 44	120 44	120 44	120 44	120 44	120 44	120 44	120 44	120 44	120 44	120 44	120 44	120 44	120 44
			Route Improvement Surveys	26 7	26 7	26 7	26 7	26 7	26 7	26 7	26 7	26 7	26 7	26 7	26 7	26 7	26 7	26 7	26 7	26 7	26 7	26 7	26 7

* Trial survey. † Date of purchase.

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1916—continued.
NORTH ISLAND—continued.

Appropriation.	Division.	Mileage.	Section.	Main Line.	Stations.	Total.	State of Line.															
							Surveyed.	Under Formation.	Under Plate-laying.	Opened.												
										Date.										—	—	Total.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20				21
North Island Main Trunk Railway	Marton-Te Awamutu	M. ch. 209 69	Marton Junction - Mangaweka	M. ch. 31 67	M. ch. 4 61	M. ch. 36 48	M. ch. ..	M. ch. ..	M. ch. ..	..	10 Sep., 1904	..	..	..	..	..	..	..	..	..	..
			Mangaweka-Taihape	13 1	1 61	14 62	..	..	..	..	1 June, 1907	..	..	..	..	..	..	..	..	..	..	..
			Taihape-Mataroa	5 70	0 61	6 51	..	..	..	..	30 June, 1908	..	..	..	..	..	..	..	..	..	..	..
			Mataroa-Waiouru	18 10	..	..	..	..	..	..	13 Feb., 1909	..	..	..	..	..	..	..	..	..	..	..
			Waiouru-Erua	30 63	12 50	97 28	..	..	..	..	9 Nov., 1908	..	..	..	..	..	..	..	..	..	..	..
			Erua-Taumarunui	35 65	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
			Taumarunui-Te Awamutu	74 33	6 20	80 53	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
		8 53	Raetihi Section	8 53	1 7	9 60	8 53	3 56	4 77	..	..	..	..	..	..	..	..	..	..	..	..	..
		30 0	Ohakune to Mokau-Retaruke Divide	30 0	..	30 0	30 0	Prelim.	..	..	..	..	..	..	..	..	..	..	..	..	..	..
		34 0	Makatote Gorge-Marae-Kowhai Valley	34 0	..	34 0	34 0	Prelim.	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ngaire-Ongarue	..	20 0	Marae-Kowhai-Ohura	20 0	..	20 0	20 0	Explor.	..	..	..	..	..	..	..	..	..	..	..	..	..
		103 58	Ngaire Section	38 73	..	38 73	38 73	..	..	..	..	..	..	..	..	..	..	..	..	..	..
			Tangarakan Section	26 0	..	26 0	26 0	..	..	..	..	..	..	..	..	..	..	..	..	..	..
			Heao Section	10 70	..	10 70	10 70	..	..	..	..	..	..	..	..	..	..	..	..	..	..
			Ohura Section	27 75	..	27 75	27 75	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Waitara-Tangarakan Urenui Route	..	46 75	Waitara Section	46 75	..	46 75	46 75	..	..	..	..	..	..	..	..	..	..	..	..	..
		12 0	Urenui to Tangitutu River	12 0	..	12 0	12 0	Prelim.	..	..	..	..	..	..	..	..	..	..	..	..	..
Hastings-Te Awamutu	..	170 0	Hastings-Te Awamutu	170 0	..	170 0	170 0	Prelim.	..	..	..	..	..	..	..	..	..	..	..	..	..
		2689 46	..	2689 46	198 13	2887 59	1251 17	102 52	93 24	..	1144 53	14 54	23 68	25 35	39 75	7 20	..	..	..	1255 65		
Totals ..																						

NOTE.—Taonui and Lichfield Branches not mentioned above, as the rails have been taken up.

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1916—continued.
SOUTH ISLAND—continued.

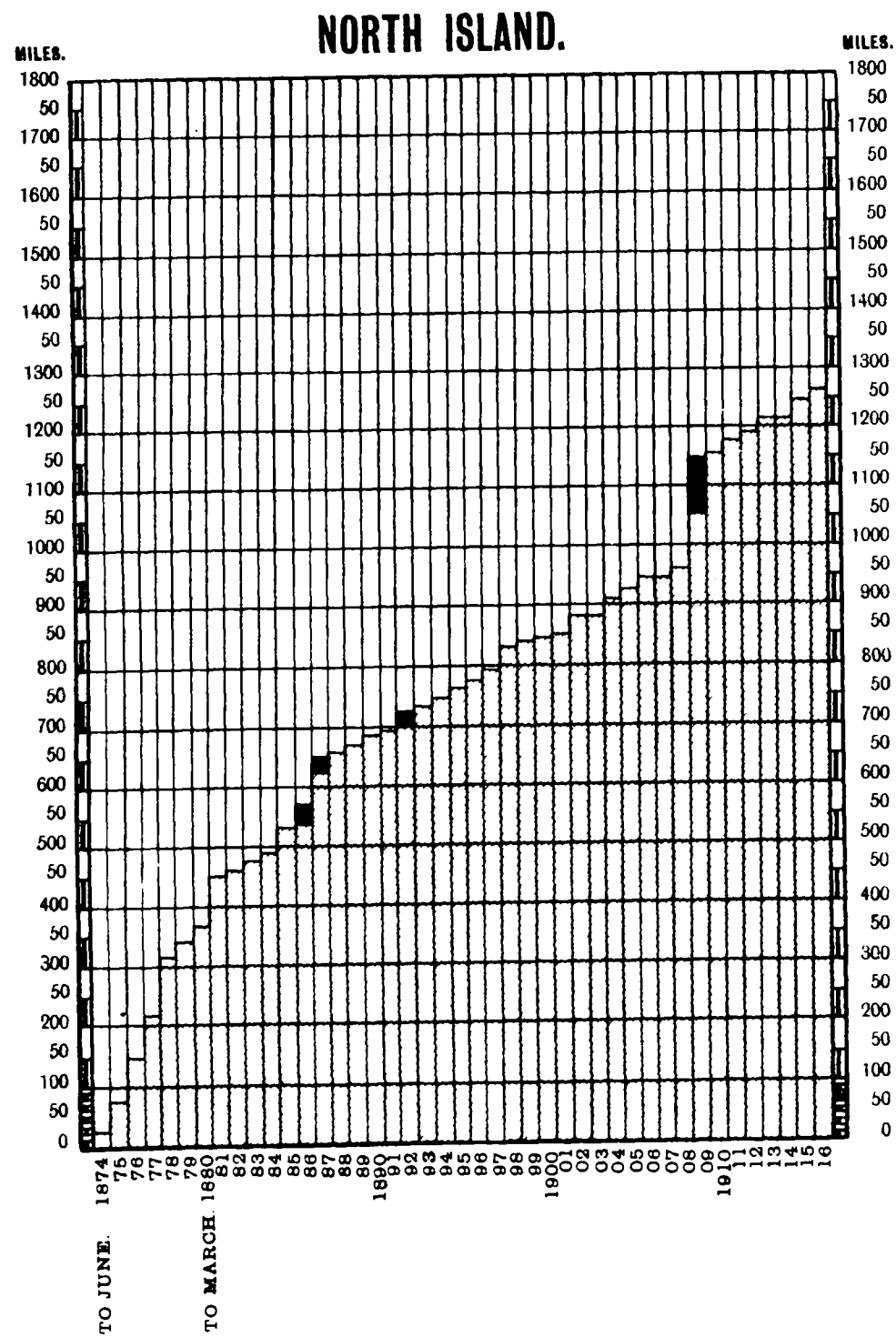
Appropriation.	Division.	Mileage.	Section.	Main Line.	Stidings.	Total.	State of Line.													
							Sur-veyed.	Under For-mation	Under Plate-laying.	Date.	Opened.									
											12	13	14	15	16	17	18	19	20	Total.
		M. ch.			M. ch.	M. ch.	M. ch.	M. ch.	M. ch.		M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Waitaki-Bluff and Branches—contd.	Branches—contd.	Inch Valley Rail-way	Inch Valley-Lime Kiln	2 29	0 23	2 52	..	..	..	..	..	..	..	..	..	..	..	..	..	2 29
	Port Chalmers..	1 9	Glendernid - Port Chalmers	1 9	3 40	4 49	..	..	..	..	..	..	..	..	..	..	..	..	..	1 9
	Green Island ..	2 44	Burnside-Saddle Hill	2 44	0 52	3 16	..	..	..	..	..	..	..	..	..	..	..	..	..	2 44
	Green Island to Brighton	4 65	Surveyed ..	4 65	..	4 65	4 65	..	..	..	..	..	..	..	..	..	..	..	..	..
	Fernhill Colliery Line	1 60	Abbotsford to Fernhill Colliery	1 60	0 24	2 4	..	..	..	..	..	..	..	..	..	..	..	..	..	1 60
	Kaikorai Valley Railway	2 60	Surveyed ..	2 60	..	2 60	2 60	..	..	..	..	..	..	..	..	..	..	..	..	..
	Outram ..	8 78	Mosgiel-Outram	8 78	0 68	9 66	..	..	..	..	..	..	..	..	..	..	..	..	..	8 78
	Lawrence ..	21 76	Clarksville-Lawrence	21 76	2 2	23 78	..	..	..	..	..	..	..	..	..	..	..	..	..	21 76
	Lawrence-Roxburgh	37 10	Big Hill-Beaumont..	7 83	0 44	7 77	..	..	..	1 Aug., 1910	..	7 33	..	..	..	5 36	..	..	..	7 33
	Lovell's Flat - Tuapeka Mouth	2 0	Surveyed ..	2 0	..	2 0	24 21	24 21	..	15 Dec., 1914	..	..	..	..	..	..	..	..	..	5 36
	Balclutha - Tuapeka Mouth	22 0	Surveyed ..	7 0	..	7 0	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Balclutha-Appleby Junction, or Catlin's - Seaward Bush	105 49	Trial Survey	15 0	..	15 0	..	..	..	..	..	..	..	..	..	..	..	..	..	..
			Balclutha-Owaka	19 20	1 63	21 3	..	..	..	1 Aug., 1904	..	..	..	..	..	..	..	..	..	19 20
			Owaka-Catlin's	3 38	0 30	3 68	..	..	..	17 Dec., 1909	..	..	..	..	..	..	..	..	..	3 38
			Catlin's-Houipapa	2 30	0 9	2 39	..	..	..	..	..	..	..	..	..	..	..	..	..	2 30
			Houipapa-Puketiro..	7 11	0 43	7 54	..	..	..	1 Feb., 1915	..	..	..	..	..	7 11	..	..	..	7 11
			Puketiro-McLennan	5 29	0 59	6 8	..	..	..	1 Feb., 1915	..	..	..	..	..	5 29	..	..	..	5 29
			McLennan-Tahakopa	5 19	0 38	5 57	..	..	..	1 Feb., 1915	..	..	..	..	..	5 19	..	..	..	5 19
			Tahakopa-Marinui ..	23 63	..	23 63	23 63	Prelim.	..	..	..	..	..	..	..	..	..	..	..	..
			Marinui-Tokanui ..	6 0	..	6 0	6 0	..	..	..	..	..	..	..	..	..	..	..	..	..
			Tokanui-Waimahaka	8 27	0 64	9 11	..	..	..	20 Sept. 1911	..	..	8 27	..	..	..	..	..	..	8 27
			Waimahaka-Appleby	24 52	1 50	26 22	..	..	..	..	..	..	..	..	..	..	..	..	..	24 52
	Waipahi - Heriot Burn	20 3	Waipahi-Heriot ..	20 3	2 3	22 6	..	..	..	..	..	..	..	..	..	..	..	..	..	20 3
	Heriot Extension	6 20	Heriot-Edievale ..	6 20	0 45	6 65	..	..	..	15 Feb., 1905	..	..	..	..	..	..	..	..	..	6 20
	Extension to Roxburgh, via Rae's Junction and Ettrick	28 10	Surveyed	28 10	..	28 10	28 10	Prelim.	..	..	..	..	..	..	..	..	..	..	..	..
	Via Syllaw ..	25 70	Surveyed	25 70	..	25 70	25 70	Prelim.	..	..	..	..	..	..	..	..	..	..	..	..

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1916—continued.

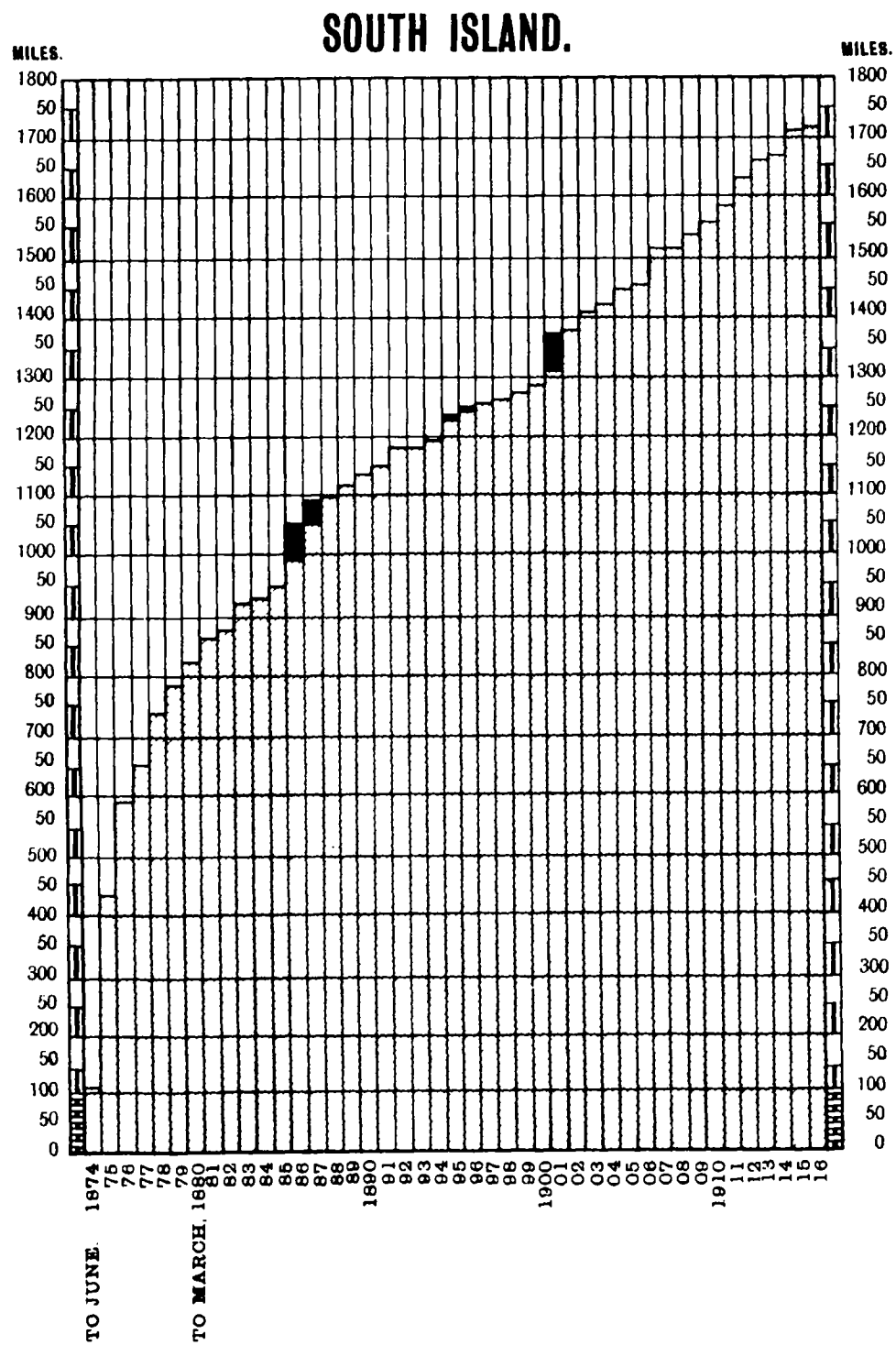
SOUTH ISLAND—continued.

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line.														Total.
							Sur-veyed.	Under For-mation.	Under Plate-laying.	Date.	Opened.										
											1910-11.	1911-12.	1912-13.	1913-14.	1914-15.	1915-16.	—	—	—	—	
Waitaki-Bluff and Branches— <i>contd.</i>	2	3 M. ch.	4	5 M. ch.	6 M. ch.	7 M. ch.	8 M. ch.	9 M. ch.	10 M. ch.	11	12 M. ch.	13 M. ch.	14 M. ch.	15 M. ch.	16 M. ch.	17 M. ch.	18 M. ch.	19 M. ch.	20 M. ch.	21 M. ch.	
	Branches— <i>contd.</i>	36 39	Gore-Lumsden	36 39	1 34	37 73	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Waimea Plains District Ry.	24 0	Surveyed	9 58	..	9 58	9 58	..	..	..	..	..	..	..	..	..	..	..	..	..
	Kelso-Gore	12 65	Preliminary survey	14 22	..	14 22	14 22	Prelim.	..	26 Nov., 1908	..	..	..	..	..	..	..	..	..	..
	Gore-Waikaka	13 70	Waikaka Section	12 65	1 51	14 36	..	..	..	1 Oct., 1909	..	..	..	..	..	..	..	..	..	..
	Riversdale-Switzers	19 30	Riversdale-Waikaka	13 70	1 40	15 30	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Edendale-Toitosis	182 51	Edendale-Glenham	9 36	0 72	10 28	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Waitaki Bluff	7 36	Surveyed	9 74	..	9 74	9 74	..	..	..	..	..	..	..	..	..	..	..	..	..
	Main Line to Lake Hawea	10 39	Wingatui-Ida Valley	98 18	5 62	104 0	..	..	..	1 Sept., 1904	..	..	..	..	..	..	..	..	..	..
		7 36	Ida Valley-Omakau	13 20	1 16	14 36	..	..	..	14 July, 1906	..	..	..	..	..	..	..	..	..	..
		10 39	Omakau-Chatto Creek	7 36	0 34	7 70	..	..	..	15 Dec., 1906	..	..	..	..	..	..	..	..	..	..
		5 45	Chatto Ck-Alexandra	10 39	1 6	11 45	..	..	..	27 Mar., 1907	..	..	..	..	..	..	..	..	..	..
		12 35	Alexandra-Clyde	5 45	0 77	6 42	..	6 25	6 10	..	..	..	..	..	..	..	..	..	..	..
		35 18	Clyde-Cromwell	12 35	0 79	13 34	..	..	..	..	..	..	..	..	..	..	..	..	..	..
		87 4	Surveyed	35 18	..	35 18	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Invercargill-Kingston	30 0	Invercargill-Kingston Wharf	87 4	5 15	92 19	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Lumsden-Maraeroa	11 0	Lumsden-Moesburn	10 40	1 0	11 40	..	..	..	..	..	..	..	..	..	..	..	..	..	..
		8 20	Surveyed	8 20	..	8 20	8 20	..	..	..	..	..	..	..	..	..	..	..	..	..
		11 0	Reconnaissance	11 20	..	11 20	11 20	Prelim.	..	..	..	..	..	..	..	..	..	..	..	..
	Winton - Heddon	12 40	Surveyed	11 0	..	11 0	11 0	..	..	..	..	..	..	..	..	..	..	..	..	..
	Bush	35 41	Winton - Hedgehope	12 40	0 65	13 25	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	hope	22 15		35 41	6 37	64 13	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Orepuki Branch	11 0	Makarewa-Orepuki	35 41	..	64 13	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Otautau Branch	25 32	Thornbury-Wairoa	22 15	..	11 0	11 0	..	..	..	..	..	..	..	..	..	..	..	..	..
	Orawia Branch	4 48	Surveyed	11 0	..	11 0	11 0	..	..	..	..	..	..	..	..	..	..	..	..	..
		8 7	Orepuki-Waihoaka	4 48	0 58	5 26	..	..	..	1 Oct., 1909	..	..	..	..	..	..	..	..	..	..
		8 17	Waihoaka-Tuatapere	8 7	1 10	9 17	3 40	4 57	..	..	..	..	..	..	..	..	..	..	..	..
		4 40	..	4 40	..	4 40	4 40	..	..	..	..	..	..	..	..	..	..	..	..	..
	Tuatapere-Orawia	2304 11	..	2304 11	257 64	2561 75	461 28	40 54	19 41	..	1,571 54	29 78	22 72	27 16	3 69	51 16	7 76	..	..	..
	Orawia-Clifden	Totals	..	2304 11	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1714 61

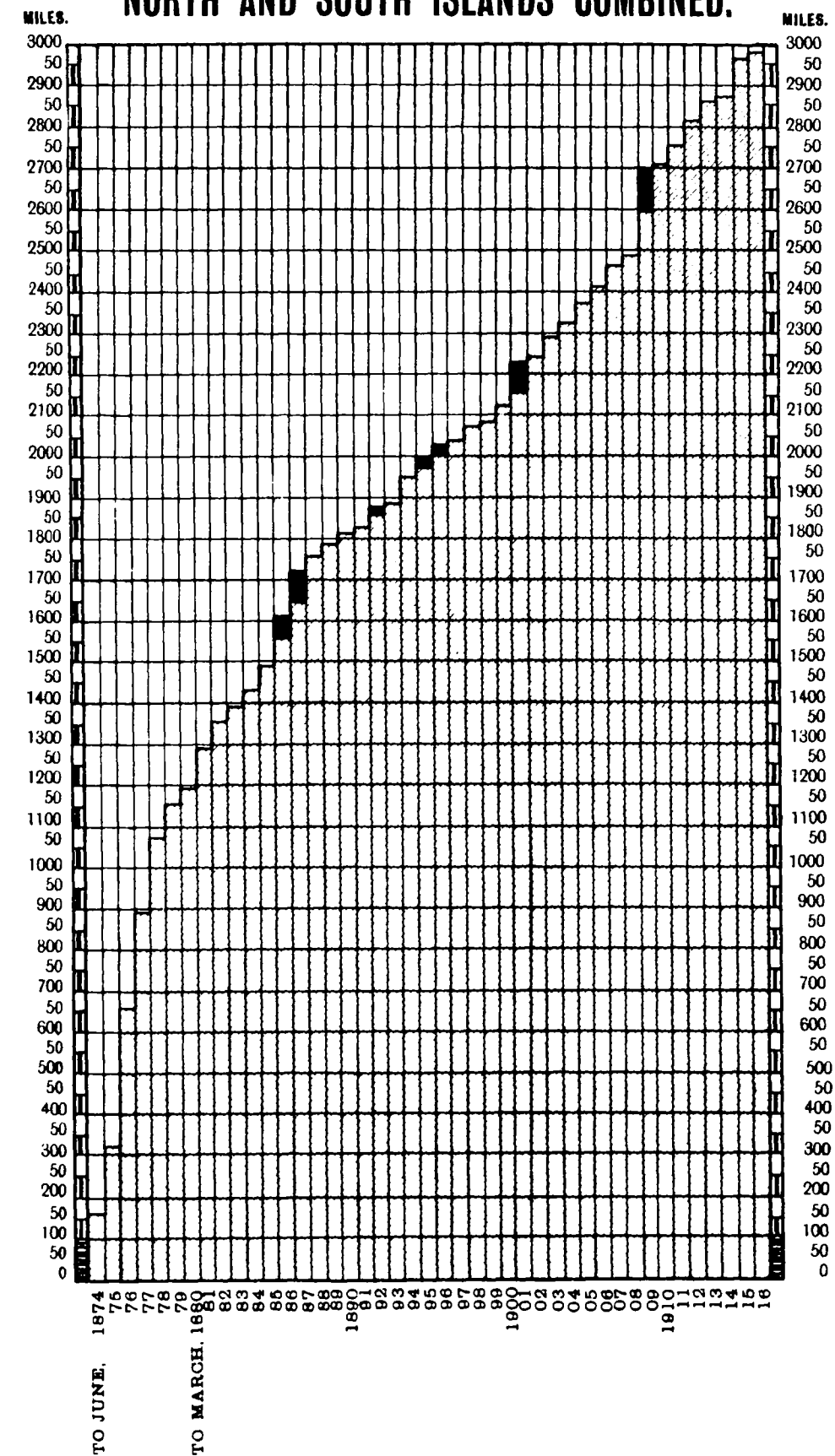
NUMBER OF MILES OPEN
OF
GOVERNMENT LINES.



NUMBER OF MILES OPEN
OF
GOVERNMENT LINES.



NUMBER OF MILES OPEN
OF
GOVERNMENT LINES.
NORTH AND SOUTH ISLANDS COMBINED.



PRIVATE RAILWAYS ACQUIRED BY THE GOVERNMENT SHOWN ████████

APPENDIX C.

ANNUAL REPORT ON BUILDINGS BY THE GOVERNMENT ARCHITECT.

The GOVERNMENT ARCHITECT to the Hon. the MINISTER OF PUBLIC WORKS.

SIR,—

Public Works Office, Wellington, 1st April, 1916.

I have the honour to submit the following report on the various building-works throughout the Dominion carried out by the Department during the nine months ended 31st March last :—

NEW PARLIAMENT BUILDINGS.

The slow progress made has been due to the delay in obtaining suitable marble for the exterior facing of the walls. The completion of a substantial tramway from the quarry to the sea put an end to the delay, and the steady delivery of marble is now enabling the works to be energetically pushed on. Probably there will be no further slackening of the work, although some difficulty is still being experienced in obtaining certain steel sections from Great Britain. The brickwork of the chambers, lounge-lobby, and internal rooms and corridors has been carried up nearly to wallheads, and some portions of the buildings have received their concrete-roof coverings.

GENERAL.

Government House, Wellington.—Renovations, painting, and improvements in the grounds were carried out by the staff.

Tauranga Departmental Buildings.—Extensive additions in brick have just been completed under contract, and are now occupied.

Gisborne Departmental Buildings.—Fittings and equipment were made and installed.

Te Puia Springs.—A new bathhouse was built by day labour.

Wanganui State Coal Depot.—Additional accommodation was provided under contract.

Weraroa Experimental Farm.—Further accommodation for learners was provided.

Government Printing Office, Wellington.—A contract for substantial additions in brick is still in progress.

Hector Observatory, Wellington.—Concrete foundation for seismograph was put in and the instrument bedded.

Somes Island Quarantine Station.—A cottage for the caretaker was erected.

Nelson Departmental Buildings.—A contract was let for the erection of a residence for the caretaker.

Special School, Richmond.—The erection of two large cottage homes was completed under contract.

Provincial Buildings, Christchurch.—Additions to strong-rooms in brick have been completed under contract.

Mount Cook.—Quarters for the chief guide were erected, also a building for the other guides. Materials for the Haast Memorial Hut were carried to the site and the building erected.

Otekaike Special School.—The new school, three cottage homes, and clubhouse were carried to completion under contract. Some of the timber used was sawn on the site.

Chatham Islands.—A combined post-office and Courthouse building was erected, also a residence for the Magistrate.

POST-OFFICES.

Awanui Radio Station.—Tenders are in for the erection of an Engineer's residence.

Kohukohu.—A contract for extensive additions was arranged.

Auckland.—Fire service was installed and improvements to the lighting carried out.

Waipu.—Substantial additions were made and the buildings renovated.

Thames.—The mail-room was considerably enlarged and renovations carried out.

Cambridge.—Alterations and additions were carried out under contract.

Frankton.—Electric light was installed.

Hamilton.—An automatic-telephone exchange in brick and concrete was erected under contract, and alterations made to the post-office.

Patumahoe.—A new building in wood was erected by contract.

Mamaku.—A new office in wood was erected under contract.

Rotorua.—A battery-room and minor conveniences were added.

Whakatane.—A tender for the erection of a wooden building has been accepted.

Gisborne.—A temporary money-order office was erected.

Ohingaiti.—A new office in wood was erected under contract.

Kaponga.—Extensive additions were carried out under contract.

Wanganui.—Some alterations and renovations were carried out.

Palmerston North.—A contract was let for substantial additions in brick, including automatic-telephone exchange.

Weber.—Additions and alterations were completed.

Martinborough.—Additions and alterations in wood were made under contract.

Masterton.—Repairs and renovations are in hand. A new destructor has been provided.

Wellington.—A new entrance was provided and some interior alterations made.

Nelson.—Extensive interior renovations and drainage-work were carried out and a destructor built.

Blenheim.—An automatic-telephone exchange was completed under contract.

Upper Moutere.—A contract for the erection of an office building in wood was let.

Dennistown.—Substantial additions were made under contract.

Christchurch.—Separate workshops for postal and telegraph mechanics were erected, also a garage.

Sydenham.—A turret clock was installed.

Woodend.—Additions to residence were carried out.

Methven.—A new office building in wood was erected under contract.

Timaru.—Steel ceilings have been installed in place of plaster.

Mornington.—A small addition to quarters was made and the whole building renovated.

Arrowtown.—A new office building was erected under contract.

Glenorchy.—An office building was completed under contract.

COURTHOUSES.

Dunedin Law Courts.—Accommodation for the caretaker was provided under contract.

Chatham Islands.—A combined Courthouse and post-office building was erected, also a residence for the Magistrate.

POLICE-STATIONS.

Kawakawa.—Substantial additions were carried to completion.

Hamilton.—A two-story wooden building, with plaster finish, was erected by contract.

Kaponga.—A station and residence of wood was erected under contract.

Marton.—A sergeant's residence, office, and lock-up were erected under contract.

Wellington Headquarters.—The contractors for this large building have carried the brick-work up to the third story. The non-arrival of steel girders is causing some delay.

Wellington (Taranaki Street).—A substantial station building in brick was completed and occupied.

Coalgate.—A new station was built under contract.

Darfield.—A new station building was completed.

Ashburton.—A lock-up in wood was erected.

Geraldine.—A new station was built of wood under contract.

Caversham.—A new station, with quarters, is being erected under contract.

PRISONS.

Auckland.—A new south wing in stone was completed by prison labour at Mount Eden, and its equipment is in progress.

Gisborne.—Electric light was installed and concrete wall erected.

Waikeria.—The main wing, kitchen, and power-house were completed under the Gaoler's direction, and the erection of the administrative wing started. Electric-lighting plant was installed.

Paparua.—A start has been made with the erection of extensive prison buildings at Paparua by prison labour. Quarters have been provided, and the manufacture of concrete blocks commenced.

Invercargill.—Extension of the main building by the addition of a wing was completed by prison labour. Plumbing and finishing work is in hand.

MENTAL HOSPITALS.

Avondale.—Auxiliary buildings Nos. 2 and 3 have been satisfactorily completed under contracts. Walls and floors of the main building have been repaired.

Tokanui.—The erection of No. 3 unit was practically completed during the year by day labour. Electric-lighting plant has been installed and is in use.

Porirua.—The new brick receiving-ward is approaching completion. The work is being done by day labour.

Sunnyside.—The large new receiving-block is approaching completion.

Seacliff.—A cottage for male patients was erected under contract.

Waitati.—A new main and fire service were installed under contract.

MILITARY BUILDINGS.

Featherston and Trentham Training-camps.—Construction-work on a large scale has been in progress since August last, and is described in detail in the Engineer-in-Chief's annual report.

Wellington Base Records Office.—Premises leased for this office have been fitted up and

equipped. More suitable premises of wood framing and corrugated iron have been erected by day labour alongside the main Departmental Buildings, and are being occupied by the large Record and Pensions staff.

Defence Stores, Wellington.—A new two-story building of wood and iron has been erected and equipped, and preparations are in hand for another similar structure.

Devonport.—The Maori Military Camp at Narrow Neck, comprising eighteen buildings, was erected and equipped by day labour.

Hamilton.—A two-story wooden office building was added to the drill-hall.

Morrinsville.—A drill-hall of wood and iron was erected under contract.

Thames.—A drill-hall of brick and iron has been completed under contract, and electric light installed.

Opotiki.—At the drill-hall stables were erected and fencing carried out.

Napier.—An ammunition-store was erected at the Artillery Barracks.

Wanganui.—Alterations to Defence offices were made.

Christchurch.—Orderly-rooms at King Edward Barracks to replace those destroyed by fire have been erected.

Hanmer.—A military convalescent home to accommodate 400 soldiers is approaching completion.

In addition to the works specially mentioned in the foregoing report, a large number of minor works, comprising small buildings, additions, alterations, installation of lighting, water, and drainage services, have been carried out by petty contract, day labour, or the Department's artisans. Renovations, painting, and repairs to buildings throughout the Dominion owned by the Government have been attended to as required, and fittings and furniture supplied, mostly from the Department's workshops in the principal centres. The Wellington workshops have turned out a large and varied quantity of equipment for the military camps at Featherston and Trentham.

I have, &c.,

JOHN CAMPBELL,
Government Architect.

APPENDIX D.

ANNUAL REPORT ON ELECTRICAL WORK AND POWER-SUPPLY UNDERTAKINGS BY THE CHIEF ELECTRICAL ENGINEER.

The CHIEF ELECTRICAL ENGINEER to the MINISTER OF PUBLIC WORKS.

SIR,—

Public Works Department, Wellington, 31st May, 1916.

I have the honour to submit the following report respecting the development of water-power by the State, the issue of licenses for the utilization of water-power by other parties, and for the distribution of electricity:—

LAKE COLERIDGE WORKS.

This plant first started regular running on the 1st March, 1915, so that the period covered by this report is the first year of operation. In view of this, the results which have been attained are eminently satisfactory. Not only has the plant reached the stage of paying working-expenses within the first year, but the financial success of the undertaking has been fully assured.

The plant now installed at Lake Coleridge consists of three generators each of 2,000 horse-power capacity, but during the past year the maximum load has only reached 1,770 horse-power, and has thus been easily carried by one of the three generators. Nevertheless this one generator, running for the greater portion of the year only partially loaded, has earned £8,260—i.e., £4 13s. 4d. per horse-power of maximum load. At the end of the year it was earning at the rate of £5 2s. 6d. per horse-power per annum. The existing plant has a working-capacity, with one unit in reserve, of 4,000 horse-power, and, at the same rates, an earning-capacity of £18,667 to £20,500 per annum.

The capital liability at the beginning of the year was £275,631. The additional liability incurred on capital during the year was £54,088, making the total capital liability at the end of the year £329,719.

Contracts already entered into but not yet in operation include commitments which will bring up the demand considerably in excess of the above 4,000 horse-power, and it has therefore been necessary at this early stage of operation to increase the plant capacity, and an order has been placed for a unit of 2,000 h.p. which, when installed, will increase the plant from 6,000 h.p. to 8,000 h.p., and will increase the working-capacity from 4,000 h.p. to 6,000 h.p., leaving one unit in reserve in each case. Moreover, orders have recently been placed for a fifth unit of 4,000 h.p., together with pipe-line and accessories, which will increase the working-capacity of the plant to 8,000 h.p. The following is a list of the contracts already entered into:—

	Horse-power.
Christchurch City Council	2,500
Christchurch Tramway Board	2,000
Christchurch Meat Company (meat-works)	700
Borthwick and Sons (meat-works)	300
North Canterbury Freezing Company (meat-works)	300
Lyttelton Harbour Board	250
Wood Bros. (flour-mill)	150
Riccarton Flour-mill	75
Woolston Tanneries	600
Walter Hill's Tanneries	75
G. L. Bowron and Co.	50
Central Dairy Company	75
Tai Tapu Dairy Company	50
Wright, Stephenson, and Co. (seed-cleaning)	50
Canterbury Seed Company (malt-house)	30
Sunnyside Hospital	50
Cashmere Sanatorium	25
Local authorities (for distribution)—	
Tai Tapu	120
Lincoln	50
Waimairi County	180
Heathcote County	100
Paparua County	80
Riccarton Borough	80
Spreydon Borough	60
Lyttelton Borough	100
Sumner Borough	50
New Brighton Borough	50
Kaiapoi Borough	50
Christchurch Brick Company	50
Other consumers (say)	150

8,400

Allowing for the diversity between the demand of various consumers, this will require a maximum power-station output of, say, 6,000 h.p., corresponding to the four-unit stage, with three units in service.

When all are connected this will yield a revenue of at least last year's rate of £4 13s. 4d. per horse-power—*i.e.* £28,000 per annum.

The expenditure for the year has been as follows: Working-expenses, £9,383 9s.; interest charges, £11,397 18s. 2d.: total, £20,781 7s. 2d.

The working-expenses will be somewhat increased by reason of the provisions made for maintaining a standby supply in Christchurch, and it is estimated that this and other charges will bring up the working-expenses to £10,500, whilst the estimated interest charges will amount to £13,500, making a total charge of £24,000 against a revenue of £28,000, or a surplus of £4,000 towards sinking fund, depreciation, and reserve. It is evident that as the business grows the financial position will become still more favourable and its success assured. Thus, as far as the Department's aspect of the work—*viz.*, the supply of power in bulk—is concerned, a successful financial result is assured.

A very important aspect is that of the consumer—the ability of Lake Coleridge power to meet and satisfy the public requirement. In this direction the success of the undertaking has been even more marked. The distribution is carried out, as far as possible, through the local authorities, who are raising their own loans for installing the necessary reticulation, and the following outlay by such local authorities has been authorized:—

	£
Christchurch City Council	155,000
Waimairi County Council	19,250
Heathcote County Council	6,200
Spreydon Borough Council	6,000
Riccarton Borough Council	3,500
Tai Tapu Dairy Company	2,000
	<hr/> £191,950

Within the City of Christchurch the immediate effect of the introduction of hydro-electric power has been to reduce the retail price for domestic lighting from 6d. to an average of 3d. per unit, the retail price for power from 3d. to 1½d., and the price for power in bulk from 2½d. to ½d. These reductions resulted in popularizing the supply to such an extent that the number of consumers increased from 1,623 at the beginning of the year to 2,860 at the end—an increase of over 80 per cent. This increase is being maintained at the rate of 125 consumers per month, in spite of the shortage of men and materials caused by the war.

The form of bulk charge to the city based only on the maximum load taken has resulted in the city authorities doing their utmost to maintain a high average load even at very low rates, down to ½d. at "off load" hours. As a result the city load factor has increased during the year from 25 per cent. to 50·8 per cent. This achievement is a direct result of the favourable form of the contract made between the city and the Department.

The popularity within the city is indicated by the following approximate analysis of the retail consumers according to the amount of their average monthly account:—

	Number.	Per Cent.
Under 3s.	700	24·5
From 3s. to 4s.	400	14·0
From 4s. to 5s.	380	13·3
From 5s. to 10s.	400	14·0
From 10s. to £1	275	9·6
Over £1	705	24·6
	<hr/> 2,860	

Of these, about 700 are commercial consumers, leaving 2,160 domestic consumers; and it will be noted that in the case of 1,100 of these—*i.e.*, more than one-half—the monthly account does not exceed 4s.

In the suburban areas the Department has started the retail reticulation in various centres, but arrangements have been made to sell these reticulations to the local authorities so soon as they can raise the necessary loan. In this way the initial difficulties have been overcome and the local authority will take over a going, and in most cases a paying, concern.

Remarkable results have attended the extensions to country districts, notably in the case of Tai Tapu and Lincoln, obtained with the assistance of the Tai Tapu Co-operative Dairy Company. Even within the city and suburbs, with ten to twenty consumers per mile of main, the capital outlay in distribution is heavy compared with the capital outlay in the whole system. But in the country, with one or two consumers per mile of line, the difficulty of successful distribution is increased tenfold, and the organization of a separate distribution business would also be much more expensive. By taking advantage of an existing local organization, such as a co-operative dairy company or local authority, and sharing the proceeds, the distribution in country areas is rendered possible, as has been demonstrated in the Tai Tapu district, and as a result the farmers and settlers of the whole Peninsula to Akaroa are clamouring for similar advantages.

The supply has been utilized, so far, mainly for lighting (domestic and public) and industrial power. For these purposes, at the rates available, it is substantially cheaper than any other form of energy, although, apart from this, its claim to adoption would be fully justified on the grounds of convenience, safety, and reliability.

For industrial purposes the only serious competitor is the suction-gas engine, and already six such engines have been replaced by electric motors with substantial advantage. For temporary service, constructional and similar work, a van has been equipped as a 60-horse-power portable substation, which can be run rapidly into place, connected up, and put into service within an hour.

During the year contracts have been entered into with every power-user within economical range of the present substation at Addington with one or two exceptions, and the present year will be occupied largely in establishing connections with these customers.

One of the main considerations in pushing the industrial appliance of electric power on the large scale is that of reliability of service. As far as the power-house and headworks were concerned, this was amply provided for by the substantial nature of the installation. The transmission-lines, however, can never attain to the same standard of reliability owing to their long extent (sixty-two miles each), the fragile nature of the insulators (porcelain being the only material available for this purpose), the exposure to lightning troubles, the mischievous "sportsman," and to loose pieces of bark falling on the wires and short-circuiting them. This difficulty has been successfully met by the installation of the duplicate transmission-lines. Since the second line was put into operation on the 21st April, 1915, no interruption to service has occurred lasting more than a few minutes. The following is a complete record of the interruptions that have taken place from all causes since that date, and for the first year of operation is an eminently satisfactory record:—

Interruptions to Service.

Date.			Hour.	Period.	Cause.
1915.				Minutes.	
May	10	.. ..	11.47 p.m.	3	Obscure (one insulator broken).
"	26	.. ..	5.44 a.m.	3	Obscure (two insulators broken).
June	1	.. ..	8.1 p.m.	$\frac{1}{2}$	Obscure (one insulator broken).
"	4	.. ..	2.41 p.m.	9	Obscure (two insulators broken).
"	13	.. ..	4.15 p.m.	$\frac{1}{2}$	Snow on insulators (no damage).
"	20	.. ..	12.21 a.m.	$\frac{1}{2}$	Switching (no damage).
Aug.	6	.. ..	12.38 a.m.	$1\frac{1}{2}$	Short circuit on local feeder.
Sept.	16	.. ..	8.45 p.m.	2	Lightning (two insulators broken).
Oct.	12	.. ..	11.10 a.m.	1	Previous lightning (one insulator broken).
"	17	.. ..	11.57 a.m.	$\frac{1}{2}$	Bark blown on line (insulator broken).
1916.					
Jan.	7	.. ..	5.25 p.m.	$\frac{1}{2}$	Switching (no damage).
"	27	.. ..	2.29 a.m.	$\frac{1}{2}$	Heavy storm (three insulators broken).
Mar.	27	.. ..	3.9 p.m.	$\frac{1}{4}$	Obscure.

Total number of interruptions, 13; total time of interruption to service, 22 $\frac{3}{4}$ minutes.

It will be noted that the period of interruption is steadily falling to a minimum of one-quarter to half a minute, and as a result of the first year's operations a supply can now be offered with the confidence of experience to industries requiring such absolute reliability and continuity of service as the freezing-works and dairy factories.

For comparison, the following is the corresponding record for a similar line constructed under the best advice then available, and with the best possible apparatus—viz., the Niagara and Ontario Power Company (400 miles of line): First year of operation, 1907—85 interruptions to service; second year of operation, 1908—129 interruptions to service; third year of operation, 1909—47 interruptions to service.

For street-lighting the Lake Coleridge supply is now utilized or being installed as follows: City, 1,828 lamps; Riccarton, 110 lamps; Heathcote, 250 lamps; Waimairi, 350 lamps; Spreydon, 200 lamps. Moreover, lamps are now being erected in many places in which a year ago no lighting of any form was dreamt of.

The most striking effect of the introduction of electric power will undoubtedly, during the next few years, result from its use in domestic convenience. In connection with the accommodation of the staff at Lake Coleridge, a type of "all electric" house has been developed during the year which it is expected will be an important step in this direction. The house consists of five rooms, bathroom, and a large sleeping-porch built entirely of sheet asbestos (poultite) on a light timber framework, and equipped with electric lighting, cooking, and heating throughout. As a result all brickwork is omitted, the house is practically fireproof, and is designed entirely for comfort and convenience without the usual restrictions of these considerations involved in the use of coal or gas cooking and heating, and the cost is less than one-half that of a house of equal accommodation designed on the usual lines.

In the solution of the problem of street transport Lake Coleridge electric power is also taking a place. Three electric-battery vehicles are in service with very satisfactory results, one passenger-car, one light delivery-van, and one heavy wagon, the latter being engaged in the collection of the city refuse. At the rates which the City Council have fixed for charging these battery vehicles the cost of energy is less than one-half that of petrol, and, owing to the gradual starting effort and the steady driving-force, the cost of maintenance and renewals of tires and chassis is also less than one-half that of petrol-driven vehicles. This district, with its enormous

motor traffic and level roads, is particularly suited to the development of electric-battery traction, and its influence on local traffic problems will undoubtedly be vital and far-reaching. There are now more than 1,600 motor vehicles in the Christchurch District, consuming over 600,000 gallons of petrol, worth over £60,000 per annum, indicating generally the value of the business which is available, provided that charging-stations are established at required intervals. Such stations will become possible when the distribution of electricity becomes general throughout the Province of Canterbury.

In addition to the supply of energy, the Department has been in constant touch with manufacturers in various branches of industry with the object of assisting in introducing new processes and improving existing ones, either by electrical or allied methods. This aspect of the work is of especial importance just now owing to the necessity of manufacturing locally a large number of products drawn from countries now at war with Great Britain. For instance, a large number of locally made insulators have been tested from time to time to assist manufacturers to produce a satisfactory article. As far as the actual requirements of low tension and telephone insulators are concerned, there appears to be no difficulty in supplying what is required, and the only obstacle is a commercial one. In the local manufacture of electro-chemicals a considerable amount of investigation has been undertaken both by the Department and by the Christchurch City Electrical Engineer, which will result during the current year in several commercial products being manufactured to replace German imports.

The establishment of the Lake Coleridge works has an important bearing upon the national economy, and even the present small beginning has quite an appreciable value, which has fully justified the undertaking, and enables one in a measure to gauge the effect of water-power development on a large scale upon national efficiency. The output of energy for the last year was 4,128,000 units, and for the current year will be over 12,000,000 units. To supply this with coal or other fuel would require 27,000 tons, costing about £34,000 delivered in the bunkers, or over £40,000 in the fire. The result of one year's operation is therefore, even at this early stage, to conserve the coal-supplies to the extent of 27,000 tons per annum, and to economize labour to the extent of about a hundred men, after allowing for labour required for operating the plant, together with the labour equivalent of the capital charges, and which has been brought about by utilizing what is otherwise waste energy.

Considerable changes in staff have occurred during the year. Three men left to join the Expeditionary Forces, making, together with another man who left previous to the commencement of the financial year, four men out of a staff of nine engineers at the Lake Coleridge power-house. Three more left to take up employment elsewhere, and one was transferred to Head Office. Two men from the office staff at Christchurch have joined the Expeditionary Forces. Owing to the many changes in the staff during the year, and the fact that the plant is of a new and unusual type, and that a good deal of construction-work is in hand, the work has been carried out under the most exceptional difficulties, and has placed great strain upon the management and the staff generally, and great credit is due to them for the manner in which the service has been maintained and extensions carried out.

ELECTRICITY-SUPPLY IN THE NORTH ISLAND.

Considerable progress has been made towards determining the best methods of providing for a general supply of electricity throughout the North Island. The succession of dry seasons which has been experienced has caused serious shortage of water to several of the smaller water-power schemes which have been put in by various local authorities, and previous estimates of the power available at various sources in the North Island have had to be modified on this account. With the knowledge of the flows during the last two dry summers, the various schemes possible for a general supply to the North Island outlined in previous reports have been revised, and at present surveys and investigations are being made to decide the relative merits of two general systems of supply. One system involves the concentration of the whole generating plant in one large station at Lake Waikaremoana or one of the larger Waikato schemes. The other proposal is to supply the whole Island from three smaller conveniently situated sources for the time being, and ultimately, when the capacity of these stations is exceeded, to link up their various distributing systems with one of the large central generating schemes outlined above. These three stations would then become standby plants, and their possession would overcome the risk of interruption on the long transmission-lines, which is the chief objection to the adoption of the single generating-station from the outset.

With this object in view a survey of the Aratiatia Rapids and Huka Falls on the Waikato River has been made, a survey of the Mangahao River has just been completed, and surveys are being organized for work on the Waikato River above Cambridge, and at Lake Waikaremoana. In all these cases the surveys are being conducted on lines calculated to give the exact information required to fully outline a scheme in the most expeditious manner and with the least possible expense. These surveys and investigations have indicated that some of the schemes previously outlined require modification, and that others which had not been previously fully investigated are among the best in the Island. Further investigation of these sources, and a good deal of survey-work on transmission routes, is required before a definite pronouncement can be made as to the best scheme or schemes to be developed for the most economical method of supplying electric power to the North Island.

WATER-POWER LICENSES.

Water-power licenses have been issued to the following: Edward Parker, Blenheim; J. Gilbert, Hundalee; Moslyn Trevor, Ohakune; A. J. Cameron, Makuri; L. Jones, Wairakau, Te Aroha.

ELECTRIC LIGHT AND POWER LICENSES.

Licenses under the Public Works Act have been issued to the following: Wellington City Council (two—Revans Street and Molesworth Street); Christchurch Tramway Board (Lincoln Road); Sumner (two); Tokomaru Sheep-farmers' Freezing Company; Ellis and Burnand, of Manunui; Whangarei Borough Council (amending license); Tai Tapu Co-operative Dairy Company; Opotiki Borough Council (extensions); New Zealand Coal and Oil Company, Kaitangata (two); Otago Charitable Aid Board, Kaitangata; Winton Borough Council (extensions); H. J. Hodgson, Murchison; Auckland City Council (Epsom Road District); Ross Goldfields (Limited); Wanganui Borough Council (extensions); Hawke's Bay Farmers' Meat Company, Whakatu; Tinwald Town Board; C. G. Bouzaid, Greytown; W. Carr, Blenheim; Upper Ashburton Road Board; Napier Borough Council (extensions); Huntly Town Board; Oamaru Borough Council; F. Redwood, Spring Creek; J. Chambers, Havelock North; Spreydon Borough Council; Sumner Borough Council; Woolston Borough Council; Reefton Electric Light and Power Company.

The following installations have been inspected during the year: New Plymouth Borough Council, Waitara Borough Council, Inglewood Borough Council, Stratford Electric Light Company, Eltham Bacon Company, Hawera Electric Light Company, Patea Borough Council, Wanganui Borough Council, Feilding Borough Council, Wellington City Council, Havelock North Town Board, Napier Borough Council, Hastings Borough Council, Devonport Borough Council, Christchurch City Council, Tai Tapu Co-operative Dairy Company, Tauranga Borough Council, Te Aroha Borough Council, Stephenson and Cook (Port Chalmers), New Zealand Coal and Oil Company (Kaitangata), Otago Charitable Aid Board (Kaitangata), Winton Borough Council, Invercargill Borough Council, Tokomaru Sheep-farmers' Company (Tokomaru Bay), Tokomaru Farmers' Co-operative Association (Tokomaru Bay), J. F. Pettie (Waipiro Bay), Gisborne Borough Council, C. G. Bouzaid (Greytown), Hawke's Bay Meat Company (Whakatu). In addition to the above the electric lines belonging to the Department in the Christchurch District have been inspected.

The following licenses are under consideration: James Thomson, Murchison; Robert Ellis, Brightwater (extension); Wairoa Borough Council; Te Reinga Falls; Invercargill Borough Council (extensions, Southland County); Rising Sun Gold-mining Company, Waihi; Pahiatua Borough Council.

The regulations referred to in last year's report have fulfilled the purpose for which they were drafted, and have been found generally satisfactory, but as a result of a year's operation a few slight modifications and amendments to meet existing conditions have been found necessary, and the regulations are about to be reissued embodying these requirements.

I have, &c.,

EVAN PARRY,

Chief Electrical Engineer.

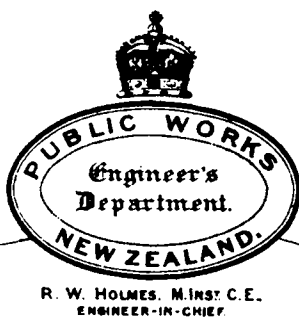
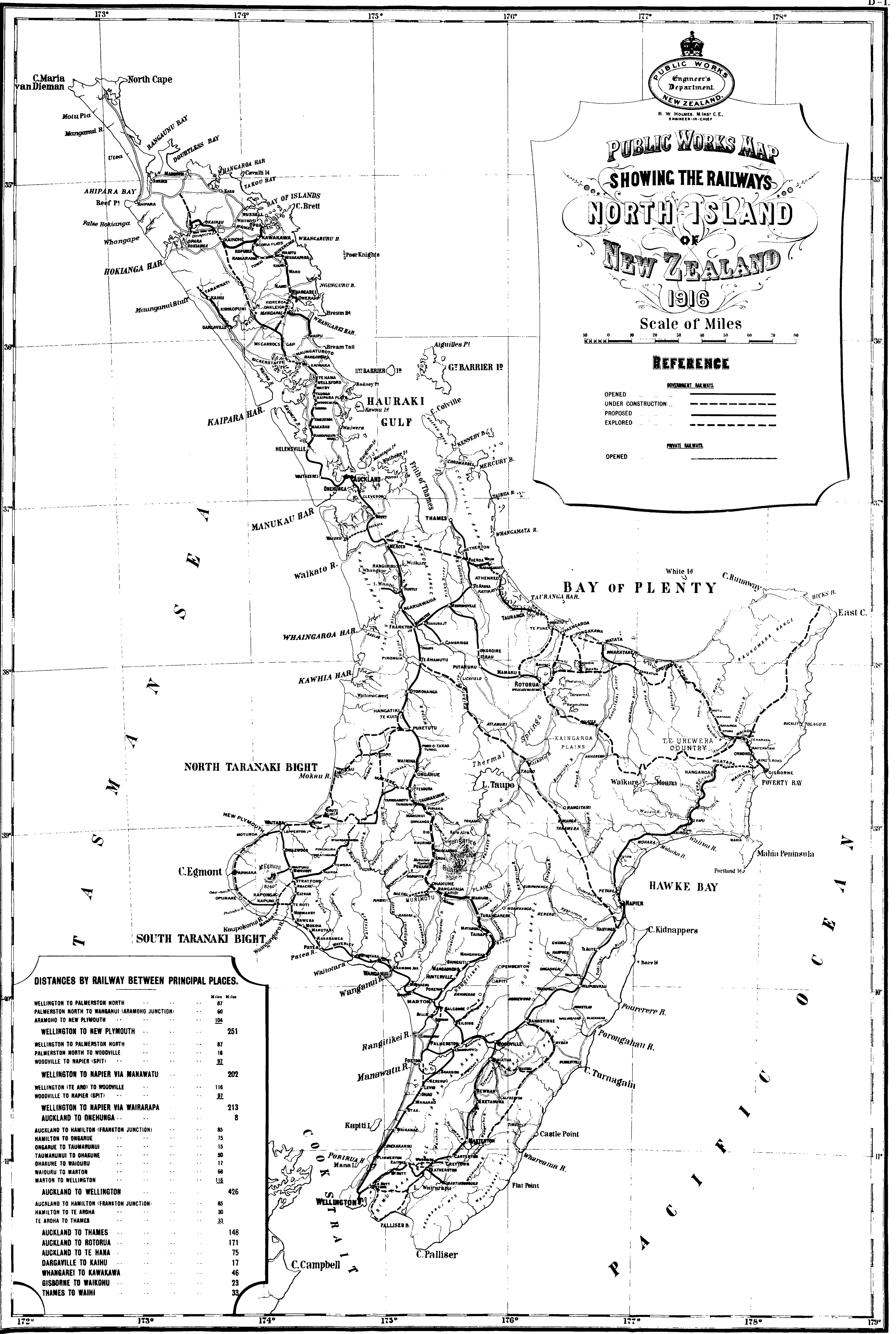
LAKE COLERIDGE ELECTRIC-POWER SUPPLY.—SUMMARY OF LOAD RETURNS FOR YEAR ENDING 31ST MARCH, 1916.

Maximum output—						
Power-house	..	..	..	..	..	1,328 kilowatts.
Substation	..	..	..	..	..	1,220 "
Average load—						
Power-house	..	..	..	..	..	555 "
Substation	..	..	..	..	..	471 "
Load factor—						
Power-house	..	..	..	..	..	41.8 per cent.
Substation	..	..	..	..	..	38.6 "
Units generated	..	..	..	..	..	4,860,260 units.
„ sold	..	..	..	..	..	3,994,757 "
„ lost in transmission	..	..	..	..	..	732,028 "
„ lost in distributing	..	..	..	..	..	135,465 "

Connected Load in Kilowatts on 31st March, 1916.

				Private Lighting.	Street-lighting.	Power.	Heating.
				Kw.	Kw.	Kw.	Kw.
City	..	..	..	2,184	150	2,593	1,000
Waimairi County	..	..	..	61	1	10	64
Heathcote County	..	..	..	18	3	5	30
Spreydon Borough	..	..	..	5	2	15	6
Riccarton Borough	..	..	..	20	1	2	18
Tai Tapu	..	..	..	21	1	61	28
Paparua County	..	..	..	21	..	20	22
Wholesale consumers	..	..	..	40	..	466	25
				2,370	158	3,172	1,193

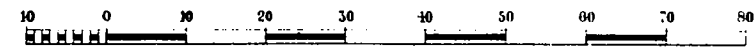
Total, 6,893 kw.; maximum load, 1,220 kw.; ratio 5.65.



R. W. HOLMES, M. Inst. C.E.
ENGINEER-IN-CHIEF

PUBLIC WORKS MAP SHOWING THE RAILWAYS NORTH ISLAND OF NEW ZEALAND 1916

Scale of Miles

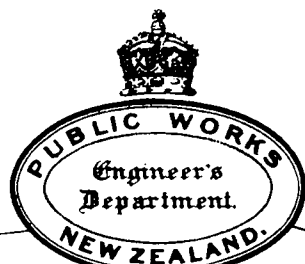


REFERENCE

GOVERNMENT RAILWAYS	
OPENED	—————
UNDER CONSTRUCTION	- - - - -
PROPOSED	.....
EXPLORED	.....
PRIVATE RAILWAYS	
OPENED	—————

DISTANCES BY RAILWAY BETWEEN PRINCIPAL PLACES.

	Miles	Miles
WELLINGTON TO PALMERSTON NORTH	87	
PALMERSTON NORTH TO WANGANUI (ARAMOHO JUNCTION)	60	
ARAMOHO TO NEW PLYMOUTH	104	
WELLINGTON TO NEW PLYMOUTH	251	
WELLINGTON TO PALMERSTON NORTH	87	
PALMERSTON NORTH TO WOODVILLE	18	
WOODVILLE TO NAPIER (SPIT)	37	
WELLINGTON TO NAPIER VIA MANAWATU	202	
WELLINGTON (TE ARO) TO WOODVILLE	116	
WOODVILLE TO NAPIER (SPIT)	37	
WELLINGTON TO NAPIER VIA WAIRARAPA	213	
AUCKLAND TO ONEHUNGA	8	
AUCKLAND TO HAMILTON (FRANKTON JUNCTION)	85	
HAMILTON TO ONGARUE	75	
ONGARUE TO TAUMARUNUI	15	
TAUMARUNUI TO OHAKUNE	50	
OHAKUNE TO WAIKOU	17	
WAIKOU TO MARTON	66	
MARTON TO WELLINGTON	116	
AUCKLAND TO WELLINGTON	426	
AUCKLAND TO HAMILTON (FRANKTON JUNCTION)	85	
HAMILTON TO TE AROHA	30	
TE AROHA TO THAMES	33	
AUCKLAND TO THAMES	148	
AUCKLAND TO ROTORUA	171	
AUCKLAND TO TE HANA	75	
DARGAVILLE TO KAIHU	17	
WHANGAREI TO KAWAKAWA	46	
GISBORNE TO WAIKOU	23	
THAMES TO WAIHI	33	



R. W. HOLMES, M. Inst. C.E.
ENGINEER-IN-CHIEF

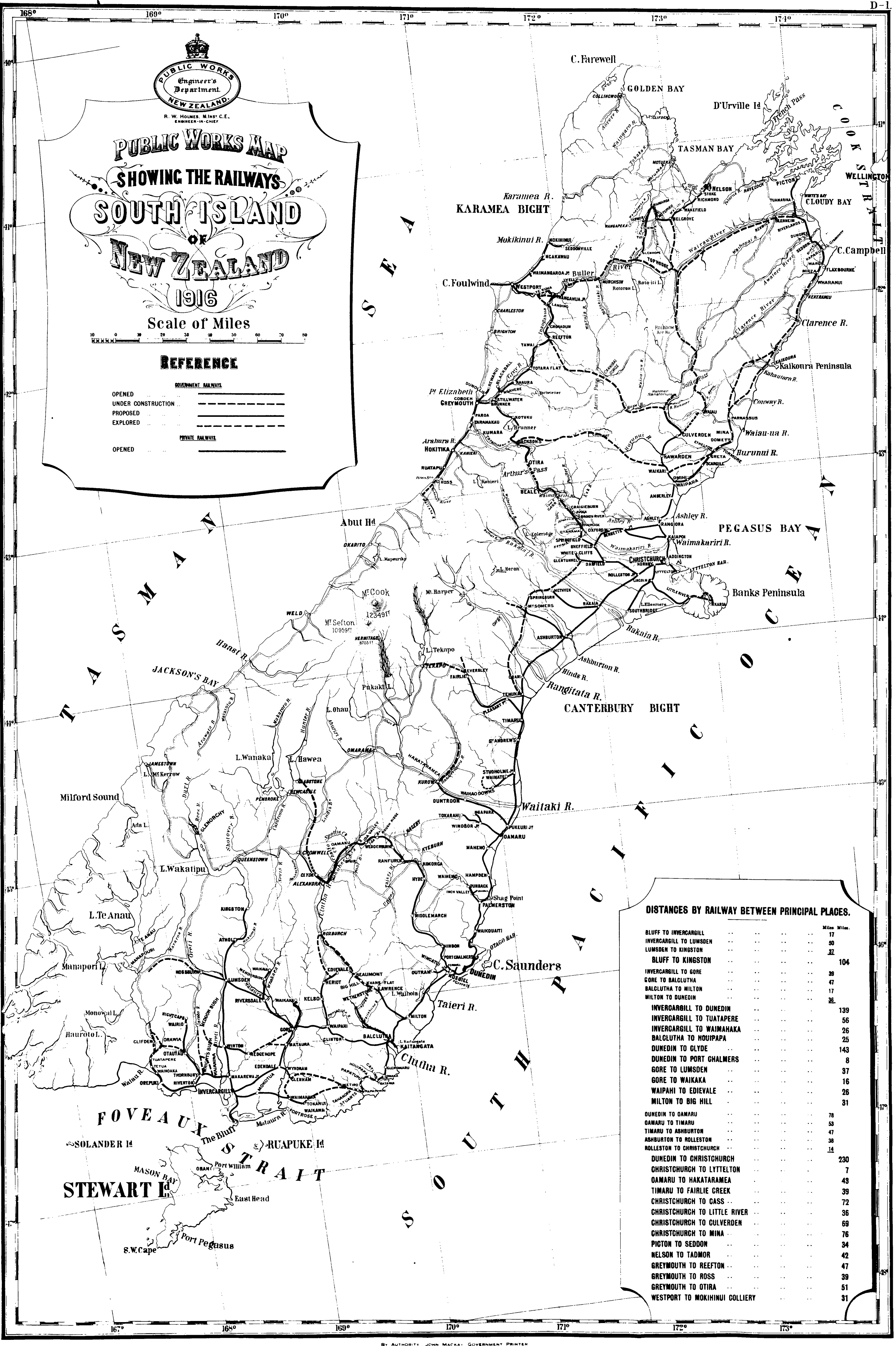
PUBLIC WORKS MAP SHOWING THE RAILWAYS SOUTH ISLAND OF NEW ZEALAND 1916

Scale of Miles



REFERENCE

GOVERNMENT RAILWAYS	
OPENED	
UNDER CONSTRUCTION	
PROPOSED	
EXPLORED	
PRIVATE RAILWAYS	
OPENED	



DISTANCES BY RAILWAY BETWEEN PRINCIPAL PLACES.

	Miles
BLUFF TO INVERCARGILL	17
INVERCARGILL TO LUMSDEN	50
LUMSDEN TO KINGSTON	37
BLUFF TO KINGSTON	104
INVERCARGILL TO GORE	39
GORE TO BALCLUTHA	47
BALCLUTHA TO MILTON	17
MILTON TO DUNEDIN	26
INVERCARGILL TO DUNEDIN	139
INVERCARGILL TO TUATAPERE	56
INVERCARGILL TO WAIMAHAKA	26
BALCLUTHA TO HOUIPAPA	25
DUNEDIN TO CLYDE	143
DUNEDIN TO PORT CHALMERS	8
GORE TO LUMSDEN	37
GORE TO WAIKAKA	16
WAIKAKA TO EDIEVALE	26
MILTON TO BIG HILL	31
DUNEDIN TO OAMARU	78
OAMARU TO TIMARU	53
TIMARU TO ASHBURTON	47
ASHBURTON TO ROLLESTON	38
ROLLESTON TO CHRISTCHURCH	14
DUNEDIN TO CHRISTCHURCH	230
CHRISTCHURCH TO LYTTELTON	7
OAMARU TO HAKATARAMEA	43
TIMARU TO FAIRLIE CREEK	39
CHRISTCHURCH TO CASS	72
CHRISTCHURCH TO LITTLE RIVER	36
CHRISTCHURCH TO CULVERDEN	69
CHRISTCHURCH TO MINA	76
PICTON TO SEDDON	34
NELSON TO TADMOR	42
GREYMOUTH TO REEFTON	47
GREYMOUTH TO ROSS	39
GREYMOUTH TO OTIRA	51
WESTPORT TO MOKIHIMU COLLIERY	31

