1948

NEW ZEALAND

MINISTRY OF WORKS STATEMENT

(BY THE HON. R. SEMPLE, MINISTER OF WORKS)

MR. SPEAKER,—

I submit my report for the year ended the 31st March, 1948, together with a statement of expenditure (Appendix A) certified by the Controller and Auditor-General as provided for under section 8 of the Public Works Act, 1928.

Post-war difficulties as they affect the building and construction industry have continued during the year under review and naturally have had an adverse effect on the desired progress on some of the most important projects. As a result of the manner in which essential industries in almost every corner of the world were geared up to the highest degree of efficiency and greatest possible production during the war, it may have been anticipated by many that when the time came to change over from war production to the normal peacetime requirements of the immediate post-war years, much benefit would be derived from the production potential of those war years. Unfortunately, the benefits which may have been expected from the record high-level capacity of many industries have been lost in the phenomenal demands from all parts of the world, particularly by the belligerent nations, in their efforts to overtake the accumulated arrears of developmental works.

New Zealand, in common with other countries, is experiencing these problems. Not only does this state of affairs affect post-war development for the Government, but also for local bodies and private enterprise. All are confronted with unprecedented arrears for which demands are now being made on the building and construction industry. Many of these demands are for works which are truly vital; the great bulk of them for works which are highly essential in the interests of the future prosperity and standard of living of this Dominion.

The excess of demand over the present potential of the works industry has necessitated the continuance of the Building Control Emergency Regulations beyond the special needs of war for which they were originally designed. During the year, the implementation of these regulations has apparently given cause for criticism from some quarters, but, having regard to the necessity in the national interests of ensuring that certain classes of constructional work should be pursued in preference to others considered of lower priority, or, in other words, of lesser importance to our national economy, I am satisfied beyond doubt that the measures of control exercised by the Government in this direction have been warranted. To have pursued an unrestricted programme of work, both State and private, would have without question resulted in those with the most spending-power achieving the greatest amount of work, regardless

of its nature and desirability. Further, the problem of increasing costs, regarding which we are all concerned, would have been considerably aggravated by an amazingly unrestricted demand for man-power and materials. It is not the intention of the Government, as a matter of policy, to enforce building control measures any longer than is necessary. The degree of control will be eased from time to time as circumstances permit until the gap between supply and demand no longer exists and the need for further control will be non-existent. Admittedly, legislation which inflicts controls is as a rule unpopular. Nevertheless, in spite of this, it is the first duty of any Government to legislate in the best interests of the Dominion as a whole.

In my last report I referred to the need for preparing annually works programmes for State and State-subsidized works as a means of implementing the ten-year schedules of works for all districts. Each annual programme will be prepared realistically according to the estimated finance, man-power, and materials available for each particular year, and also giving due attention to the essentiality of works in the various districts throughout the Dominion.

The studies which were of necessity made in connection with the 1947–48 programme have proved invaluable. The levels of that programme were fixed to provide for the full and best utilization of all the resources of the building and construction industry, after making due allowance for a reasonable proportion of those competing demands of similar priority which would be made upon the industry by local authorities and private-enterprise works. The programme levels for that year as approved by Cabinet were arrived at only by the most careful pruning of demands made by State Departments and local authorities for subsidized works down to that proportion of the essential demands which it was estimated the industry might effectively undertake during the year. The total demands received amounted to £37,337,000 and the approved programme including capital and maintenance works involved an estimated expenditure of £26,005,000.

I am pleased to report that this systematic and realistic approach to prosecuting our post-war works development, which restricts the number of projects to be commenced during any financial year, has resulted in a greater proportion of the potential of the building and construction industry available to State and State-subsidized works being concentrated on works of the highest priority, thereby shortening the period of construction from commencement to completion. Such remarks must not be interpreted to indicate that I am satisfied with the progress achieved on post-war works development. The work completed to date is far short of that necessary to satisfy the pressing essential demands and to permit the desirable more rapid approach to fulfilling the needs of full expansion and development so vital to a prosperous young country such as ours, with its vast natural resources.

Everything reasonably possible is being done to accelerate the rate of construction. More engineers and skilled men, more machines, and a much greater supply of key materials are urgently required. The total labour force of the building and construction industry during the past year increased by only 5·8 per cent, and according to the latest figures available the increase during recent months represents not more than 0·7 per cent. Competition for labour is keen, and will continue whilst there are over thirteen thousand registered vacancies for males in various local industries and only twenty-one fully employable males are registered as unemployed, as is revealed in the latest official returns. Therefore, the Dominion cannot depend on local man-power for recruitment to the building and construction industry. Assisted passages are now available to suitable immigrants who are prepared to accept employment in the works industry, and every encouragement is being given by the Government to those who are prepared to settle in New Zealand.

The latest modern machinery is urgently required to ensure the most economical methods of construction and early commencement of several projects of national

importance. For this reason the Commissioner of Works is at present overseas to study the latest engineering methods of construction and investigate the availability of machines suitable for use in this country. Mr. McKillop will also investigate the possibility of obtaining experienced engineers, and will also discuss our problems with some of the leading British engineering contracting firms with a view to claiming their interest in taking up contracts in New Zealand. However, an increased number of engineers, skilled workmen, and modern machines must also be balanced with the requisite increase in the supply of essential materials. Unfortunately, the building and construction industry continues to be harassed by the scarcity of key materials. Availability of steel in 1947 was greater than in 1946 to the extent of some 11,000 tons. Cement-production showed little change from the previous year, and where other lines showed an increase, these were insignificant. So desperate was the outlook for steel at the commencement of the present year that at Government direction I visited Australia for the purpose of seeing what extra supplies of steel for the construction industry could be secured. Australia has been the major supplier of steel in its various forms to New Zealand for some years. Structural shapes, reinforcing-rods, and plates come almost entirely from Australia for our constructional requirements; supplies from United Kingdom, Europe, United States of America, Canada, South Africa, and India are either very small or non-existent. Therefore, our only hope of some increased deliveries lay in the good will of the Broken Hill Pty., Ltd., and of the Australian Government towards this country.

My visit was made with the knowledge that Australia was itself facing a critical position through coal shortage, labour difficulties in the steel plants, and transport problems which had caused a loss of over 450,000 tons in steel-production. As in New Zealand, Australia has a huge back-log of projects requiring steel, the orders for which would take over three years to satisfy. I soon found that, despite the great handicaps attending steel-production to-day and the enormous local demand for its products, the Broken Hill Pty., Ltd., was most anxious to assist New Zealand. While the company could not meet any very substantial portion of this country's accumulated demand, it met my request to provide extra steel to the extent that our available shipping tonnage would permit us to lift over the present year 1948. That means some 13,000 tons additional of structural steel and other B.H.P. products, and while no one would claim that the quantity is large, it is not inconsiderable and is very real evidence of the co-operation of the B.H.P. authorities to help New Zealand. It will be readily understood that fulfilment of the company's undertaking depends upon maintenance of its productive capacity and of shipping availability; if this country can take in the additional tonnage of steel, much relief will be afforded to industry, both public and private. However, at the moment of writing this report, some months after my visit to Australia, the problems, such as adequate coal deliveries, surrounding steel-production make it somewhat doubtful whether the target which we had hoped to see achieved will be met by the end of the year. The Ministry is maintaining very close contact with the Broken Hill Pty., Ltd., and is also regularly obtaining the latest information regarding availability from other overseas markets in endeavouring to minimize the existing acute shortage of steel.

Legislation enacted during the 1947 session which directly affected the Department comprised the Public Works Amendment Act, 1947, which dealt with motor-ways; section 23 of the Statutes Amendment Act, 1947, which enables the Minister of Works to execute documents on behalf of the Crown for the purposes of the Housing Act, 1919; Part III of the Finance Act (No. 2), 1947, which amended the Soil Conservation and Rivers Control Act, 1941, dealing particularly with certain questions of rates, unauthorized expenditure, dwellings for employees of Catchment Boards, and the date of annual meetings of Catchment Boards. The Mining Amendment Act, 1947, by section 7, included provisions having the effect of continuing in existence mining rights acquired by the Crown for public undertakings.

The Tramways Carriage Regulations 1947 were enacted for the purpose of securing improvement in facilities and services in this form of public transport. The regulations are not yet fully operative in respect of overcrowding because of the difficulties of providing the additional transport that is necessary.

The Housing Improvement Regulations 1947 were made in order to improve residential amenities.

In collaboration with the Solicitor-General, negotiations were undertaken for the acquisition of the rights of the Auckland Harbour Bridge Co. under the Auckland Harbour Bridge Act, 1931. A satisfactory agreement was reached, the terms of which will enable the Act of 1931 to be repealed, and legislation proposals in this connection have been prepared for consideration.

FINANCE

The payments and receipts in connection with the Public Works Account and other associated votes and accounts for the year 1947–48 are shown in the tabulation following.

The expenditure administered through the Department for the year reached a total of £23,779,896. In addition, a sum of £1,065,870 was expended from the Public Works Account by the Education Department on school buildings, &c. The miscellaneous receipts totalled £6,406,794.

Class of Work.	Expenditure, 1947–48.
EXPENDITURE, PUBLIC WORKS ACCOUNT	£
Railway-construction	122,776
Housing construction	6,639,018
Public buildings	2,136,422
Education buildings	1,065,870
Lighthouses and harbour-works	9,803
Roads, &c.	325,534
Soil conservation and rivers control	326,914
Irrigation, water-supply, and drainage	417,312
Highways construction	1,333,303
	12,376,952
Electric Supply Account: construction (public works)	2,525,890
	14,902,842
EXPENDITURE, OTHER VOTES AND ACCOUNTS	
Consolidated Fund—	
Highways—	
Maintenance, repairs, and renewals	2,859,037
Administration, plant, and miscellaneous expenditure	268,316
Permanent appropriations (rate subsidies, &c.)	276,728
Salaries and expenses, Public Works Department and Ministry of Works	933,533
Maintenance, public buildings, roads, &c.	922,377
Plant, material, and miscellaneous services	4,549,324
Other accounts (expenditure by Public Works Department): Amounts not included above	133,609
Total, other votes and accounts	9,942,924
Grand total of expenditure, Public Works Account and other votes and accounts, for the year ended 31st March, 1948	24,845,766

Class of Work.	Receipts.
RECEIPTS,* PUBLIC WORKS DEPARTMENT	
Ordinary Revenue Account—	£
Departmental receipts, vote—Maintenance of Public Works and Services	4,310,366
Irrigation receipts for year	40,022
Miscellaneous receipts for year—	
Public works	175,056
Housing	11,981
Electric Supply Account: miscellaneous receipts (public works)	151,397
Main highways maintenance: miscellaneous receipts	167,482
Public Works Account—	
Sale linen-flax assets, &c.	142,911
Miscellaneous receipts	1,407,579
	6,406,794

* Excludes motor-spirits tax, registration fees, &c., collected by other Departments.

Summary

——	Public Works Department.	Other Departments.	Total.
	£	£	£
Expenditure	23,779,896	1,065,870	24,845,766
Recoveries and receipts	6,211,777	195,017	6,406,794

The ratio which the various classes bear to the whole is shown below—that is, expenditure plus receipts :—

	£		Per Cent.
Roads, including construction and maintenance of main and State highways	5,062,918	=	16·20
Hydro-electric (construction by Public Works Department)	2,525,890	=	8·08
Railway-construction and improvements to open lines	190,562	=	0·61
Housing construction	6,639,018	=	21·24
Public buildings, including schools	3,202,292	=	10·25
Soil conservation and rivers control	326,914	=	1·05
Irrigation, water-supply, and drainage	417,312	=	1·33
Public buildings and roads, &c. (maintenance)	922,377	=	2·95
Plant, material and services, other Departments	4,549,324	=	14·56
Miscellaneous	943,336	=	3·02
War expenses expenditure	65,823	=	0·21
Miscellaneous receipts, &c.	6,406,794	=	20·50
	£31,252,560	=	100·00

Summary of Votes under the Control of the Minister of Works and Proposed Ways and Means of raising the Necessary Funds, Year ending 31st March, 1949

Vote.	Public Works Account: Loans.	Consolidated Fund.	Total.
	£	£	£
Railway-construction	180,000	..	180,000
Housing construction	8,024,926	..	8,024,926
Public buildings	1,350,000	250,000	1,600,000
Lighthouses and harbour-works	25,000	..	25,000
Roads &c.	415,000	..	415,000
Soil conservation and rivers control	375,000	75,000	450,000
Irrigation, water-supply, and drainage	370,000	..	370,000
Highways construction	1,750,000	..	1,750,000
Highways maintenance	..	3,661,089	3,661,089
Maintenance of public works and services	..	6,607,986	6,607,986
	12,489,926	10,594,075	23,084,001

The miscellaneous receipts estimated to be credited to the Public Works Account for the year ending 31st March, 1949 (excluding £250,000 on account of public buildings, and £75,000 on account of soil conservation and rivers control works), amount to £878,900, and it is estimated that a sum of £3,763,100 will be recovered on account of votes—Maintenance of Public Works and Services, and Highways Maintenance.

HOUSING

The Government's policy of giving priority to housing over all other classes of building has continued, and this will be its accepted policy until every family, pakeha and Maori, is properly housed. Reasonable and adequate shelter for families is a prime necessity. It is most gratifying that the Government's efforts in this direction resulted in a record number of houses being completed during the year ended 31st March, 1948. Hereunder are quoted the official figures:—

State rental houses	2,875		
State departmental houses	693		
Maori houses	200		
Private and local-body houses	8,966		
		12,734	
Transit housing—			
Local bodies' units	164		
Public Works Department units	113		
Post and Telegraph Department units	172		
State Hydro-electric Department units	8		
State Forest Service units	10		
		467	
Hostels—			
Miners' Hostel, Reefton: accommodation for	58	persons.	
Post and Telegraph hostels: accommodation for	473	,,	
Immigrants' hostels: accommodation for	1,062	,,	
State Forest Service Hostel: accommodation for	12	,,	
Total hostel accommodation completed for	1,605	,,	

The total number of houses completed in 1946-47—a record year—was 9,612 (State and private); therefore, the total for 1947-48 exceeds that number by 3,122, which represents an increase of 32·5 per cent.

Considering the conditions prevailing within the industry, this is a remarkable performance, and I take this opportunity of personally thanking all those who have contributed towards this record achievement. I desire also to make special reference to the work of the 2,431 rehabilitation trainees who are employed on the erection of State rental houses. I have personally inspected their work in the many centres where they are engaged, and from every source has come unqualified praise of their workmanship. As at the 31st March, 1948, 12,339 houses (State, 3,491; private, 8,827) were under construction.

The continuing shortage of certain materials has necessitated much attention being given to the use of suitable substitutes. State houses are being erected using specially designed concrete bearing-walls which permit the use of a minimum amount of steel. Other types adopted include total brick, cell concrete, and pumice concrete. Contracts have been prepared for both sun-dried brick and pise-de-terre houses and dwellings have been erected with sheathings of brick veneer, plaster on metal lath or cement fibre sheets, asbestos-cement sheets, and asbestos sidings.

A prefabricated house has been imported from Sweden, and when erected will be studied to see whether this type of house is suitable for New Zealand conditions and requirements. The Housing Division has given particular attention to the study of overseas house-building methods, and no opportunity will be lost in adopting any features which are considered acceptable to our needs. The Commissioner of Works, Mr. E. R. McKillop, will also undertake a close examination of overseas methods and designs during his visit to Great Britain, Europe, and United States.

The need for rural housing is fully appreciated by the Government, and although considerable progress has been made in the erection of houses and farm buildings for the rural settlement of ex-servicemen and for timber-workers, much difficulty has been experienced in securing contractors for work in country districts.

Additional land located in 77 towns and sufficient for 3,494 State rental houses was purchased during the past year. To meet the needs of ex-servicemen desiring to build their own homes, 160 building sections were transferred to the Lands and Survey Department.

Detailed scheme plans were completed for a block of 1,000 units at Mount Roskill and for additional development at Tamaki. Other major schemes included Fairfield (Hamilton), Riccarton (Christchurch), Mosgiel, Reefton, Palmerston North, Pahiatua, Masterton, and Hastings. Several schemes are at present being investigated and negotiations for the purchase of the land are in hand. Preliminary and detailed planning also includes the Porirua - Titahi Bay area, which will constitute the largest housing settlement yet undertaken by the Government. In some localities blocks of shops and flats were erected.

In his annual report (Appendix G) the Director of Housing Construction records very fully the operations of the Housing Division for the year ended 31st March, 1948.

Public Buildings

Although naturally pleased with the housing record achieved during the past year, the Government is fully aware that the performance in house construction has been attained to a great extent at a sacrifice to other building projects. This has been deliberate policy, because the available man-power and materials must of necessity be directed to works on the highest priority, and highest of these is housing. Nevertheless, high priority has been given to hydro-electric projects, education buildings, and hospitals.

The concentration of the available resources on the above-mentioned types of building projects has resulted in an extensive back-log of building-works which, although in many instances considered highly essential, must be relegated to a lesser priority. Buildings which come under this category include post-offices, police-stations, and departmental offices, &c.

The buildings programme has been carefully studied to ensure that the materials and man-power available are being utilized to the maximum extent possible, thus mitigating against the commencement of projects which, having regard to the resources available, would be under construction for indefinite periods.

Education Department.—Hostel accommodation for rehabilitation students at Massey Agricultural College has been completed, as have also the Lower Hutt Intermediate School and the gymnasium and assembly hall at the Southland Technical College. Class-room additions are continuing at this latter college. A domestic-science block is under construction at the King Edward Technical School, Dunedin. In addition, class-room and recreational accommodation and many works of lesser magnitude have been provided throughout the Dominion.

It is acknowledged that the present rate of construction in education buildings will have to be considerably accelerated to provide the additional class-rooms required to meet the expected increase in the attendance rolls during the next five years. As a result of a recent comprehensive survey, it is estimated that to meet the requirements of primary and intermediate, post-primary, and Maori schools an additional 1,823 class-rooms will be required by 1952.

In addition, during the same period the University colleges will have an extensive building programme.

Health Department, including Mental Hygiene Division.—Work is proceeding steadily on the St. Helens Hospital, Christchurch, staff residences having been completed. The nurses' home kitchen, Nelson Hospital, is almost completed, and work progresses favourably on the main kitchen at this hospital. Shortage of steel has caused delays on this work.

Progress continues on the villas and cottages at Lake Alice Hospital and on the villas at Porirua Hospital. During the year, the occupational-therapy block at Tokanui Hospital was commenced.

Police Department.—New police-stations have been completed at Grey Lynn and Waitangi, Chatham Islands, and a start has been made on the new station at Dobson.

Public Works Department.—Work progresses favourably on the mechanical plant depot and the bulk stores, Christchurch.

Post and Telegraph Department.—During the year, the Karori Telephone Exchange was completed; the post-office at Te Kuiti is almost finished, and work continues on the Feilding Post-office. Many other works have been undertaken. To meet the needs of this Department, extensive use has been made of surplus defence buildings.

Labour and Employment Department.—Conversion to an immigration hostel at Fort Dorset and the erection of the Reefton Miners' Hostel has been completed. An immigration Hostel at Wigram and miners' hostels at Ohai, Huntly, and Ohura have been commenced.

Miscellaneous.—The maintenance, repair, and renovation of Government buildings has presented a heavy programme of work, and engineering services, including heating, refrigeration, air-conditioning, and fire-protection equipment, have been installed in many buildings throughout the country.

HYDRO-ELECTRIC DEVELOPMENT

Hydro-electric development has again been given very high priority, with the result that, in spite of continued difficulty in obtaining a sufficient number of skilled workmen and an adequate supply of materials, there has been a substantial achievement in both construction and investigation for future work.

Construction of the Waikaremoana Upper Development is so near completion that the headworks were flooded in March to enable the first unit to be started up. Excavation of the intake channel (the last remaining portion of the job) had been planned to permit earlier use if required. This was not necessary, however, and advantage was taken of the opportunity to carry on excavation in the open behind a coffer-dam right up to March; the floor of the excavation is some 50 ft. below normal lake-level. Lake-level has varied greatly according to the rainfall, and at periods of high lake much effort was needed to keep the coffer-dam intact. The balance of the rock in the intake channel was broken up by controlled blasting, and under-water excavation will be continued to improve the channel to the greatest practical extent.

The next stage of the work at Lake Waikaremoana is to control leakage through the barrier at the lake outlet in the vicinity of Onepoto. This leakage water emerges from the barrier as a series of springs, all of which surface between Onepoto and Lake Kaitawa. The inlets to the leaks have nearly all been located on the lake-bed, and steps are being taken to have them sealed by blanketing with clay.

Now that all three machines at Karapiro are operating, there is only a small amount of construction activity going on; this is in the nature of finishing work. A careful watch was kept on the Tunakawa-Karapiro ridge, which forms a natural dam between Karapiro Lake and Karapiro Stream. Ground-water level through the ridge is being checked continually by means of bore-holes drilled before the lake was filled. The observations show that the toe-drain at the foot of the ridge on the Karapiro Stream side is having the desired effect of holding down the water-table.

Construction of Mangakino Village is progressing. Cottages for married workmen have been erected at the rate of 3 a week; 310 workmen's cottages and 28 staff cottages had been built up to 31st March, all of them connected to electric power, water-supply, and sewerage services. Other village buildings completed were 10 school class-rooms; a hall; fire-brigade station; post-office; bus terminal office; grocery shop; prefabricated hospital hut; and a public garage and service station. A third camp, to accommodate 200 men, was also finished. A number of works buildings, large and small, have been erected. The sawmill at Mangakino is producing ample timber to supply the needs of the works.

Considerable progress was made with excavation and concreting of the 25-ft.-diameter diversion tunnel at Maraetai; but even greater progress would have been made if a seven-day roster system for tunnellers could have been introduced. The strike that occurred in March is likely to cause some delay in the completion date of the tunnel. In addition to work on the tunnel, the gate shaft was excavated and a heading driven down the sloping leg of the spillway tunnel. A considerable amount of excavation has been done at the dam and power-house sites.

A great deal of investigation work has been carried out at Whakamaru to obtain information on the conditions underground in order that a decision can be made and designs prepared for the power-station there.

A start has been made with the new 220 kV. substations at Otahuhu and Bunnythorpe. These will be needed for transmitting power from Maraetai and future power-stations on the Waikato River.

Large-scale excavation at Cobb River disclosed that a gravity-type dam is unsuitable for the site: an earth dam with a concrete spillway structure will therefore be built. To provide more power for the Nelson and Marlborough districts during critical periods until the main scheme is finished, a low earth dam has been constructed up-stream from the main dam-site. The new earth dam provides storage that can be released to increase production from the existing power-house during times of low flow in the Cobb River.

The tunnel at Lake Tekapo is well advanced and its completion is expected within a few months. Excavation for the draught-tube has been completed and work on the power-house foundations is proceeding.

At Lake Pukaki the outlet sluices are complete, and some storage of lake water has been achieved as a result of construction of the up-stream coffer-dam behind which the main dam will be built. The stored water is being released as required during the winter for the Waitaki Power-station. A large quantity of overburden has been stripped from the dam-site and 80,000 cubic yards have been excavated from the spillway-site.

Lower down on the Waitaki River, investigation work is going ahead at the proposed site for a dam at Black Jack's Point.

Investigations have been prosecuted vigorously in the Clutha River Gorge immediately above Roxburgh with the object of proving a suitable site for the dam and ancillary construction for the proposed Clutha River Development.

HIGHWAYS

Last year's Budget gave details of the financial position of the Main Highways Account, and indicated the Government's intention of granting relief to the Main Highways Board from payment of interest and loan repayment, interest alone having reached over £486,000 per annum on the then existing debt, apart from interest on any further loan-moneys required for new capital works. To give effect to this proposal, legislation was passed during the year abolishing the Main Highways Account, and in future highways are to be maintained by funds provided by a vote out of the Consolidated Fund, and moneys for capital work are provided by a separate vote out of the Public Works Account. The powers of the Main Highways Board regarding control of expenditure out of the two new votes has not been varied in any way.

Further legislation passed during the year in the form of the Public Works Amendment Act, 1947, made provision for the declaration of motor-ways, and these limited-access highways, some of which are already under construction, will be of great benefit to the community and one of the most important milestones in the development of the road transport of the Dominion. They will provide safe and more economic transport, and will in this way pay for themselves in a few years after being brought into use.

With a view to assisting some local authorities and in order to help round off the State highways system, the Main Highways Board, with my approval, classified 1,330 miles of main highways as State highways as from 1st April, 1948. As a result of this further length of State highways the whole of the cost of construction and maintenance, in accordance with the standard prescribed by the Board, will from the date of classification be the sole responsibility of the State.

The activities of the Main Highways Board for the past financial year are described in its annual report, which is attached to this statement.

Considerable progress has been made in overtaking the arrears of maintenance that occurred during the war years and in carrying out improvements to the existing highways system. I am pleased to be able to record an extension of dustless surfacing during the year over a length of 205 miles, and this work will be continued on the more heavily trafficked highways where the dust nuisance creates danger conditions, especially during the holiday season.

The heavier and larger vehicles now being used to transport goods and passengers and the increasing numbers of such vehicles are causing great concern to the Board and the Engineers of my Department. Previously, highways foundations and surfaces were not constructed to cater for such heavy transport, which was generally carried by rail or coastal steamer. Except on the very best of our foundations, this heavy and continuous haulage of goods is severely damaging the surface of our highways, and the cost per mile of new construction to cater for this extra loading will naturally show a substantial increase in future highway costs. There is need for greater co-operation between the roading authorities and the transport-controlling authorities, and it is my intention to foster this co-operation as much as possible in the future.

I regret to say that bridge-building materials, particularly steel, are still in very short supply, and it has not been possible to proceed with the renewal of bridges at a sufficient pace to meet requirements. Many large structures have been given extended life at the expense of high maintenance costs, and extensive use has had to be made of Bailey bridging-material which the Main Highways Board was fortunate in securing from the United Kingdom.

As is the case with other works, shortages of man-power and materials continue to be limiting factors in highways construction and maintenance. Nevertheless, it is interesting to record that, chiefly due to an acceleration of the Board's sealing programme, particularly in rural areas, the volume of work completed is reflected in the fact that the Board's expenditure during the year was the third largest in the history of the Board.

ROAD-CONSTRUCTION

Road-construction has been on the same scale as during the previous year, restricted by shortage of man-power. Nevertheless, I am pleased to say that progress has been made with back-country roading, including access to ex-servicemen's farms.

Eighty-three miles of new formation, 154 miles of new metalling or reconstruction and metalling, and 21 bridges of a total length of 1,291 ft. have been completed.

The roading programme in the Chatham Islands, mentioned in my last Statement, has proceeded satisfactorily, in spite of the difficulties attendant on operating mechanical plant so far from workshops facilities. The season was unusually wet, and it was shortened because the final trip of the steamer to the mainland was earlier than usual. Nevertheless, 18½ miles of formation and 13¼ miles of metalling have been done during the year. The work will be continued during the coming summer months.

RAILWAYS: CONSTRUCTION AND SURVEY

In the metropolitan areas, investigations for improved rail access have been continued. At Auckland, further surveys have been made in an endeavour to improve the northern outlet. Near Wellington a suitable route for the extension of the Hutt Valley Railway beyond Taita has been surveyed; there will be two crossings of the Hutt River. The alignment of the Sockburn–Styx industrial loop in the Christchurch suburban area has been fixed and pegged on the ground.

A trial survey has been made for a branch railway from Edgecumbe (Bay of Plenty) to Murupara, 39 miles up the Rangitaiki River valley. The construction of this railway, if approved, will provide an outlet for the products of the extensive exotic forest areas of the Kaingaroa Plains as well as for the product of private sawmillers and it will also give improved access to settlers.

My Department has maintained and operated the tram-line between Putaruru and Tokoroa which was purchased last year from the Taupo-Totara Timber Co. The alignment and gradients are below Railways Department standards; and a survey has been completed with a view to reconstructing the line.

Relining and grouting of the Fordell Tunnel was completed, and platelaying and ballasting through the tunnel followed immediately. This operation closed the last phase of the work. The Turakina–Okoia Deviation has been carrying traffic since 7th December.

The Commissioner of Works, in consultation with the General Manager, Railways Department, and the Engineer-in-Chief, has re-examined the various routes surveyed for the Rimutaka Deviation, and a decision has been made. In recommending a suitable route, account has been taken of construction costs, operating-costs, gradients,

curvature, and tunnel length. On the route decided upon, the main tunnel will be 5·45 miles long, with up-gradients 1 in 300 from the west portal in the Mangaroa Valley and 1 in 211 from the east portal. The ruling gradient outside the tunnel will be 1 in 70. The distance between Upper Hutt and Featherston by this route will be 15 miles 32 chains, as against 24 miles 65 chains by the present route. Because of the topography it was necessary to examine several possible routes, each having some merit not possessed by the other. As a result, a decision has been more difficult to reach than for any other railway of comparable length in New Zealand.

The Government has authorized an expenditure of £272,900 sterling on the purchase of plant for the Rimutaka Deviation; and orders have already been placed in Great Britain and New Zealand. It is likely that only a small proportion of the expenditure on plant will be in dollar areas. My Engineers are now considering methods whereby the tunnel can be constructed rapidly and economically.

Work on the South Island Main Trunk Railway is practically finished: only a few cleaning-up jobs remain.

AERODROMES

An Aerodrome Committee, comprising representatives of the Air Department, National Airways Corporation, Ministry of Works, and Public Works Department, has been appointed by the Government to decide on policy matters affecting civil aerodromes. One function of the Committee is to decide priorities for the various works being planned.

Consequent upon the decision to close Rongotai Aerodrome to commercial traffic, it was essential to improve the Paraparaumu landing-ground and facilities and to provide amenities for passengers at very short notice. As a result of excellent planning, co-ordination, and expeditious construction work, Paraparaumu Aerodrome was ready to handle all air traffic on the closing of Rongotai. In co-operation with representatives of the Wellington City Council, my officers are now giving much attention to the proposed plans for the new airport at Rongotai.

Site investigations for a new Auckland City Airport were recommenced during the year, and two proposals are under review: enlargement of the existing Mangere Aerodrome, and a completely new site at East Tamaki.

Good progress has been made with construction of the main landing-strip on the new Hokitika Aerodrome at Seaview.

In accordance with an agreement with the Air Department, the Public Works Department is now maintaining in New Zealand 65 civil aerodromes and landing-grounds, 5 seaplane-alighting areas, and 10 R.N.Z.A.F. stations, and in the Pacific 4 civil aerodromes, 2 alighting-areas, and 3 R.N.Z.A.F. stations.

The New Zealand Government, with the British and Australian Commonwealth Governments, is vitally interested in the site of the international airport in Fiji. Nandi, constructed during the recent war as a military aerodrome, has been used since as a civil airport for the trans-Pacific services; while Nausori, also constructed during the war period, has continued to be used by the R.N.Z.A.F. During last February and March a Commission representing the three Governments named inspected these two aerodromes in an endeavour to determine which should become the permanent international airport. Their recommendation has been forwarded to the South Pacific Air Transport Council, which, I understand, will be meeting at an early date. The New Zealand representative on the Commission was Mr. R. H. Packwood, District Commissioner of Works, Auckland. Much of the data required for consideration by the Commission was assembled by my Department.

SOIL CONSERVATION AND RIVERS CONTROL

Progress in soil conservation work during the past year has been most encouraging. The Soil Conservation and Rivers Control Council has acquired several properties in major problem areas and experimental conservation work is in progress. Results of both long- and short-term experiments undertaken on these properties will permit the Council to determine the nature of assistance required to enable remedial work to be undertaken by Catchment Boards and farmers concerned. Soil conservation subsidies relating to tree-planting and gully control inaugurated during the previous year have been fully availed of by farmers, particularly in the Poverty Bay district. This type of work, unfortunately, is affected by the serious shortage of fencing-wire required for the protection from stock of areas treated. This has necessitated investigation into alternative fencing methods, including the use of aluminium wire. The depredations of opossums is also causing much concern.

One additional catchment district embracing the remainder of the Otago Province was constituted during the year, and arrangements for the first election of the new Board have been completed. Proposals for catchment districts covering Wellington, Bay of Plenty, and Waikato districts have been submitted to the Local Government Commission for action in accordance with the Local Government Commission Act, 1946. The eleven operating Catchment Boards have continued to function in a most creditable manner, and I wish to record my appreciation of their efforts to date.

In common with all projects of national importance, river-control work is still being retarded by shortages of plant, material, and man-power. Several major schemes are proceeding slowly, while investigations for new works are in progress. Mechanical plant shortage is serious, and the Soil Conservation Council has, by means of loans, enabled Catchment Boards to procure a minimum of the necessary plant in order to relieve the pressure on public-works plant, much of which has been withdrawn from river-control work for other work of a higher priority. It is essential that Catchment Boards have sufficient plant not only to undertake urgent major and minor works, but also to help stabilize plant hire rates generally which is necessary to enable works being undertaken on a more economical basis.

Numerous river works of a minor nature have been undertaken during the year, and Boards are ensuring that all such work will, as far as possible, conform to permanent overall schemes for each river concerned. This class of work has resulted in the saving of many acres of high-fertility land and in many instances has avoided the necessity for major work in the meantime.

During the year, arrangements were completed whereby the Soil Conservation and Rivers Control Council will assist Catchment Boards by subsidizing expenditure on maintenance on certain work. The assistance to be provided is to enable internal local authorities to undertake a higher standard of maintenance which it is hoped will considerably reduce the necessity for and cost of future capital work.

Several minor amendments to the Soil Conservation and Rivers Control Act were passed during last session of Parliament, the most important of which made provision for the erection of dwellings for Catchment Board employees. A number of further amendments will be necessary for the better operation of the Act, and these will be submitted at first opportunity.

IRRIGATION AND WATER-SUPPLY

In Central Otago the irrigation season was again exceptionally dry and the use of water in some areas had to be restricted. Fortunately, there was not the usual amount of hot dry wind, and good rains fell in March. Production was therefore maintained on most irrigated areas.

In Canterbury the low summer rainfall last season created a greater demand for water than previously. A further 1,066 acres of land on the Ashburton-Lyndhurst scheme have been prepared for irrigation by the border-dyke method, bringing the total completed up to 4,229 acres. Construction work on the Mayfield-Hinds scheme has slowed down because of the shortage of plant and labour.

Work on the Wellington water-supply scheme has been continued. The longest tunnel (9,000 lineal feet) has been driven for two-thirds of its length and good progress has been made with the remaining tunnel work. On the Haywards–Paremata Main Highway, much of the alignment and width have been improved to modern highway standards on the length where the pipe-line will be placed; 4 miles of pipe-bench have been formed between Judgeford and Takapu Road. Tenders have been called for fabricating and laying the pipe-line (34 miles of 30 in. and 36 in. pipe). Only one tender was received, and this has been declined because it was considered too high. Discussions are proceeding between officers of my Department and the Wellington City and Suburban Water Board in an endeavour to solve the difficulty presented. Unfortunately, the root of the problem is the world shortage of steel plate, of which 10,000 tons are needed for the pipe-line. If the delivery rate remains as at present, and there appears little hope of improvement for some time, it is anticipated that work on this project, which, under normal conditions, would have been completed in three years, will now take six or seven years.

LAND IMPROVEMENTS

Further progress has been made with sand-dune reclamation by tree-planting in the North Auckland and Manawatu districts.

Land-clearing by machinery has been continued in the Ohakune, Westport, and Southland districts. Stumping forms the major part of this work, but in Southland $16\frac{3}{4}$ miles of access roads have been formed and a similar length of swamp drainage channel have been excavated for farmers under the scheme, in addition to a large acreage cleared.

COAL-PRODUCTION

The Public Works Department, with its heavy mechanical plant, has assisted materially in the production of opencast coal. The Department's plant has continued to work at Glen Massey, Waitawhenua, Stockton, Ohai, and Wangaloa, and is now also being used at Kapuka, in Southland.

LIGHTHOUSES AND HARBOUR-WORKS

The usual maintenance work on lighthouses and Diesel-electric lighthouse plant has been carried out. The necessary equipment for the electrification of North Cape, Chickens Island, Channel Island, Cape Egmont, and Motuara Lighthouses was delivered during the year and the work of electrification is proceeding.

Wharves on Hokianga Harbour were repaired.

A slipway for fishing-vessels at Karitane was completed.

PLANT AND MACHINERY

Repair and maintenance of construction plant constituted a major portion of the past year's work, and the new repair depots at Mangere and Sockburn are now operating. Some idea of the magnitude of the repair work undertaken at the Department's plant depots can be gauged by the fact that it has 9,250 plant items in use. The mechanization of the Public Works Department during the last decade has not only revolutionized the methods of construction, but has also shortened the period of construction on most projects and made work less costly than hitherto.

During the year, orders were placed for a number of new machines, in the main to replace worn-out plant. Much difficulty is being experienced in obtaining plant from overseas, and for this reason many items are being used beyond their economical life, thus placing a heavy burden on the staff at the repair depots.

The mechanical design staff at Head Office has done good work in designing numerous plant items for special types of work, and manufacture has been undertaken by local firms. Manufacture has been slowed up owing to the shortage of certain materials and parts.

SERVICES TO OTHER GOVERNMENT DEPARTMENTS AND LOCAL BODIES

In my last report I referred to the numerous services rendered by the Ministry of Works and the Public Works Department for other Government Departments and local authorities. In this direction the volume of work has been exceptionally heavy during the past year. This is only natural, considering the accumulated arrears of work which Government Departments and local bodies are most anxious to overtake with the least possible delay. For this reason, investigations have been numerous and the collation of data for the preparation of the necessary reports has intensified the work of the engineering, architectural, planning, and legal staffs. Much of this work has been undertaken at the request of Treasury.

My Department has continued to be responsible for the general maintenance of departmental and other Government buildings throughout the country, much of which work had, of necessity, been held over during the war years.

PUBLIC WORKS WORKERS' AGREEMENT

Last year I reported that the Public Works Workers' agreement had been renewed for a further period of two years, and an indication was given that the agreement regarding the conditions of employment for workers engaged on the maintenance of highways and roads would shortly come under review. The latter agreement has since been revised and renewed with amendments. The principal adjustments relate to improved provisions, particularly in reference to allowances, travelling-time, overtime, country work, and accommodation.

Over the many years that I have been privileged to serve the Dominion as Minister of Works, it has been most gratifying to have witnessed the whole-hearted appreciation expressed by many thousands of workers of the vastly improved working-conditions and wages which have been provided by my Government. The consideration shown by the Government in this direction is no doubt also mainly responsible for the co-operative and reasonable manner in which the executives of the union have approached me on matters affecting their members and their working-conditions.

During the past year, with the exception of the Mangakino hydro-electric project, works were exceptionally free from industrial disputes. It can therefore be understood how disappointing to the Government was the serious loss of working-time which occurred at Mangakino, and which would have been avoided but for the actions of one irresponsible individual. From the outset it was clear to me that at Mangakino there was in the making an effort by the Communistic element to gain control of that work, and if successful there, no opportunity would have been lost by them to achieve similar control over other works. As the uncompromising attitude of the Communists persisted, to ensure a speedy settlement there was no alternative but to appoint a Tribunal to investigate and adjudicate on those matters in dispute. The Tribunal upheld the actions of the Engineer in Charge at Mangakino, and the man responsible for the trouble was transferred from the works.

I have already referred to the harmonious relations which have existed between the union executives, the Department, and myself. However, it is certain that these good relations cannot exist if the Communists gain control of the union. The Communists' doctrine is foreign to us; their ways do not harmonize with our democratic system of arbitration. We as a community are traditionally British, and the free life which this tradition has given to us must be jealously safeguarded. Therefore, as long as I am able, no opportunity will be lost to denounce Communism, which is a complete abnegation of our way of life.

Once again I take the opportunity of expressing thanks to the Young Men's Christian Association National Council for the recreational and other facilities provided on many works, which have been appreciated by the staff and workers during their leisure hours.

STAFF

On 31st March, 1947, the total was 3,239 officers, comprising 1,227 permanent and 2,012 temporary officers. In accordance with the policy of the Public Service Commission of granting permanent status to those who are eligible, 542 were during the year transferred to the permanent staff, and further transfers are contemplated during the current year. At the 31st March, 1948, the staff strength was, permanent, 2,016 and 1,406 temporary officers, making a total of 3,422, an increase of 183 over the previous year.

The death of Mr. T. G. G. Beck, Deputy Commissioner of Works, whom I regarded not only as an expert Engineer, but as a loyal friend, was a great blow to me personally. His outstanding ability and almost unlimited engineering knowledge had proved invaluable, and by his death there results a serious loss to the Government, the Ministry of Works, and all who sought his opinion on engineering matters.

Mr. A. P. Grant, Engineer to the Soil Conservation and Rivers Control Council, whose untimely death in the prime of life also occurred during the past year, will be long remembered, by all who were privileged to be associated with him, for his untiring service and professional ability. To their relatives the Government has already conveyed its deepest sympathy. However, I now take the opportunity of placing it on record in my annual Statement to Parliament.

During the year, Mr. G. W. Albertson, Director of Housing Construction, and Mr. T. A. Johnston, District Engineer, Wellington, retired on superannuation. The former had previous service over many years as District Engineer, Gisborne and Taumarunui, and Engineer to the Main Highways Board. The latter officer was previously District Engineer at Greymouth and Nelson. Mr. Albertson, in addition to his engineering service, contributed materially to the success of the Government's State housing policy, and Mr. Johnston's service was associated with many major projects throughout the Dominion. I desire to place on record the Government's appreciation of their loyal and efficient service.

ORGANIZATION

The need for a separate organization to undertake those functions which up to the end of last year had been entrusted to the Ministry of Works was first envisaged towards the end of the last war. It was unmistakably evident that during the immediate post-war years New Zealand would be, in common with other countries, faced with an unprecedented accumulation of capital works, and to this must be added works of considerable magnitude which would be included in the Dominion's post-war constructional development programme. These works were ultimately named in the ten-year schedules of works prepared for all districts. It was known at that time that associated with the Government's post-war works policy would be the necessity for an assessment and analysis of the potential demand and the potential capacity of the building and construction industry during the early post-war years, to which must also

be allied the need for works planning, physical and economic planning, town and metropolitan planning. Comprehensive investigations as would be involved would enable the Government to prepare a long-term programme of work.

The nucleus of the required organization to undertake such functions already existed at that time and was under the direction of the Commissioner of Defence Construction. Having in mind the long period of great stress to which the building and construction industry would be subjected, it was very clear to the Government that it would be unwise to remove the existing central control vested in that office. Therefore, as is generally known, the Government decided to establish the Ministry of Works, and appointed Mr. (now Sir) James Fletcher, then Commissioner of Defence Construction, to the position of Commissioner of Works, who at a later date was succeeded by the present Commissioner, Mr. E. R. McKillop.

During the past three years the Ministry of Works has made a most valuable contribution towards the formulation and implementation of the Government's post-war construction policy. However, there is a very strong case invariably for an organization charged with investigating and planning functions to face equal responsibility in execution. For that reason the Government saw the necessity for merging the Ministry of Works and the Public Works Department into one organization. It is the considered opinion of the Government that the combined organization will make a greater contribution towards accelerating the implementation of the Government's works programme than would be the case if these organizations continued as two separate Departments. The combined organization, with Mr. McKillop as its Permanent Head, will be known as the Ministry of Works.

CONCLUSION

I submit with my statement the annual report of the Commissioner of Works (Appendix B), together with annual reports prepared by the Engineer-in-Chief (Appendix C), the Government Architect (Appendix F), and the Director of Housing Construction (Appendix G). In addition, there are submitted, in compliance with section 24 of the Main Highways Act, 1922, the annual report of the Main Highways Board (Appendix D), and also, in accordance with section 33, subsection (2), of the Soil Conservation and Rivers Control Act, 1941, the annual report of the Soil Conservation and Rivers Control Council (Appendix E), for the year ended 31st March, 1948.

In conclusion, Mr. Speaker, I desire to place on record my personal appreciation, and the Government's of the loyal and efficient services rendered by both staff and workmen during another difficult year, and to assure this House that the needs of all districts will receive equal consideration and that works approved by the Government will be included in the annual works programme only after the relative demands of the various districts are appraised in the light of the most satisfactory and economical development of the Dominion as a whole.

R. SEMPLE,
Minister of Works.

APPENDICES

TO THE

MINISTRY OF WORKS STATEMENT, 1948

APPENDIX A

AUDITED STATEMENT OF EXPENDITURE ON PUBLIC WORKS OUT OF THE PUBLIC WORKS ACCOUNT FOR THE YEAR 1947–48

Prepared in compliance with Section 8 of the Public Works Act, 1928

Ministry of Works, Wellington,
18th June, 1948.

SIR,—

In compliance with the eighth section of the Public Works Act, 1928, I enclose a statement of the expenditure during the preceding financial year on all works and services chargeable to the Public Works Account.

I have, &c.,
R. SEMPLE,
Minister of Works.

The Controller and Auditor-General, Wellington.

STATEMENT OF EXPENDITURE ON ALL WORKS AND SERVICES CHARGEABLE TO THE PUBLIC WORKS ACCOUNT FOR THE YEAR 1947-48

——	Appropriation.	Expenditure.
	£	£ s. d.
Railway construction	145,000	122,775 18 10
Housing construction	7,490,622	6,638,991 11 5
Public buildings	2,400,000	2,136,421 19 2
Education buildings	1,250,000	1,065,870 9 4
Lighthouses and harbour-works	32,060	9,802 15 11
Roads, &c.	412,000	325,534 4 1
Soil conservation and rivers control	400,000	326,913 15 10
Irrigation, water-supply, and drainage ..	400,000	417,311 18 1
Highways construction	947,000	1,333,302 15 4
Unauthorized expenditure: services not provided for	..	26 16 3
Totals	13,476,622	12,376,952 4 3

NOTE.—This statement includes only the expenditure on works, and does not include expenditure such as interest, sinking funds, and charges and expenses of loans.

J. W. SCOTT, A.R.A.N.Z.
Chief Accountant.

F. LANGBEIN, M.I.C.E., Acting Permanent Head.

The Statement of Expenditure charged to the Public Works Account has been examined and found correct.—J. P. RUTHERFORD, Controller and Auditor-General.

APPENDIX B

ANNUAL REPORT OF COMMISSIONER OF WORKS

The COMMISSIONER OF WORKS to the Hon. MINISTER OF WORKS.

SIR,—

I have the honour to submit the annual report of the Ministry of Works for the year ended 31st March, 1948.

In the light of post-war conditions, I deem it advisable at the commencement to quote the functions of the Ministry of Works as outlined by you at the time the Ministry of Works Act was introduced in March, 1943 :—

(1) To ensure that during the period of the war and the post-war reconstruction era all proposals for construction (whether or not these involve the direct expenditure of Government moneys or carry Government subsidies) are ranked in order of essentiality from the point of view of man-power and materials available. In other words, to ensure that, whilst the building and constructional potential of the country is limited by war and immediate post-war conditions, it is assembled and utilized in the most efficient manner from the point of view of the national interest.

(2) To ensure that all schemes for construction involving expenditure of Government funds are thoroughly examined, independently of the source from which they originate, both from an economic and technical point of view. In this connection not only to examine proposals coming to Government Departments, but also the proposals of local bodies or of private interests where such carry with them Government subsidies.

(3) To ensure that projects approved for construction involving the direct expenditure of Government moneys or Government subsidy are executed efficiently and economically, whether such works be carried out by the Government itself or by the subsidized authority.

(4) To ensure that no work is undertaken in conflict with the national interest; or, in other words, to relate proposals for construction to an established national plan.

It is very appropriate that I should refer to these functions, as the setting-up of the Ministry of Works was virtually dictated by post-war conditions as envisaged at that time. Conditions within the building and construction industry which have prevailed during those years, such as insufficiency of man-power, excess of demand over supply of key materials of both local and overseas production, non-availability of suitable plant, and accumulation of deferred works, State and private, are in keeping with the difficulties foreseen and have demanded the exercise of the over-all control vested in the Ministry of Works and referred to above. Without doubt, the setting-up of the organization has been justified, and the necessity for its continued existence is even greater to-day than at any time hitherto.

BUILDING AND CONSTRUCTION INDUSTRY

MAN-POWER

The labour force strength of the works industry has increased during the past year by 5·8 per cent., whereas the labour force employed on State and State-subsidized works (all classes) has increased by 8·7 per cent. during the same period. The following statistical information will no doubt be of interest to you :—

——	1947.	1948.	Increase.	Decrease.
			Per Cent.	Per Cent.
Works industry (excluding professional and clerical)—				
Housing	12,476	14,015	12·3	..
Other buildings	6,041	6,020	..	0·3
Engineering works	8,865	9,561	7·8	..
Maintenance (all classes)	5,327	5,007	..	6·0
State forest development	1,078	1,128	4·6	..
	33,787	35,731	5·8	..
State and State-subsidized works (excluding professional and clerical)—				
Housing (State rental, departmental, small-farm settlement, and Maori, including site development)	5,006*	6,047*	20·8	..
Other buildings	1,892	1,992	5·3	..
Engineering works	8,626	8,888	3·0	..
State forest development	1,078	1,128	4·6	..
	16,602	18,055	8·7	..
*Includes rehabilitation trainees	1,913	2,431	..	..

The total labour force, including clerical and professional employees, is approximately 38,450, of whom approximately 19,950 are employed on State and State-subsidized works. The labour force employed in the works industry is still far short of the pre-war level of approximately 47,000, including professional and clerical services, of whom approximately 28,500 were employed on State and State-subsidized works.

Immigration has benefited the works industry very little, as up to the end of February, 1948, only 270 immigrants had become available to the industry, and losses during the same period resulting from departures to overseas destinations totalled 155, making a net gain of 115. Assisted passages for building and construction workers recently instituted by the Labour and Employment Department should produce more favourable figures. A steady flow of immigrants into the works industry is very necessary, particularly in view of the accumulated demands on the industry for housing, education, and hospital buildings and hydro-electric works. The works named are regarded as having highest priority. However, in addition, there exists pressure for postal and police buildings, industrial buildings, river control and soil conservation, railway construction, electrification, and improvements, and works of almost all types which are regarded as urgent and essential.

Concerning immigrants for the building and construction industry, it is necessary to emphasize that the real demand is for skilled tradesmen, and this should not be overlooked by those responsible for the selection of immigrants.

The overall increase in man-power during the past year is 1,944, which indicates that, in addition to the increases resulting from immigration—115—and additional rehabilitation trainees—518—there has been a further gain of 1,311, which suggests that the last-named increase resulted mainly by transfer from other avenues of employment.

In stressing the demand for an increased labour force, I have made particular reference to those classes of works in which the Government is directly interested. However, I am aware that the Government is fully knowledgeable of and interested in the over-all man-power requirements of the whole industry, in that private-enterprise projects of importance to the Dominion have also been deferred because of prevailing conditions within the industry.

It must be understood, however, that any increase in man-power in the building and construction industry must be a balanced one and also accompanied by a balanced increase in the associated production industries.

Material Supply

The year under review has been a difficult one in so far as material supply is concerned. Despite the intensive efforts made by this office, "bottlenecks" in supply have occurred, and continue to occur, through shortages of shipping, raw materials, coal, and labour. Overseas markets are constantly being explored to obtain supplies vital to the building industry, although the necessity of limiting purchases to "sterling areas" as much as possible has restricted availability to some extent. Through this medium and the steps taken to increase production within the Dominion, it is considered that material supply can be maintained for the current year. Factors outside the direct control of the Government make immediate prospects of a substantial improvement unlikely, but to the extent that these can be overcome the position for 1948–49 as it affects the principal building materials is forecast under the following headings:—

Cement

Demand considerably exceeds supply, production being limited by recurring coal shortages. The slow turn round of shipping and adverse weather conditions during the winter months are the principal factors causing embarrassment to the building industry through sufficient supplies failing to come forward in regular quantities. Rationing, through the establishment of local end-use committees, has been extended, and should continue to operate to ensure equity in distribution. Importation of limited quantities is in hand, but is governed by availability from sterling sources and shipping. The position this year will be aggravated by a substantially increased demand from hydro-electric schemes.

Bricks

The building industry cannot avail itself of this medium to any greater extent than in the past, because production continues to be seriously affected by the supply of coal being far short of requirements and a lack of suitable labour. Because of high transportation costs, large-scale usage is generally limited to districts where bricks are manufactured. Plant capacity is adequate, but only a portion of this capacity is utilized owing to the above-mentioned shortages. The situation is likely to remain difficult.

Timber

Production continues to increase, assisting factors being an increase of man-power resulting mainly from immigration and the provision of satisfactory housing-accommodation under the timber workers' housing scheme and adjacent to cutting operations, thereby attracting suitable labour into the bush. Other contributing factors are the coming to maturity of exotic forests in readily accessible areas and more efficient logging operations by the use of modern plant.

The widespread and increasing acceptance of suitably seasoned and treated exotic timbers is alleviating the demand upon indigenous species. However, supply of the latter falls far short of demand, particularly in respect to grades suitable for joinery

and finishing lines. Stocks of imported Oregon are satisfactory, and Government policy requires the use of this species in construction such as schools, hospitals, and public buildings in order that indigenous timbers may be conserved for purposes where alternatives cannot be used.

Structural and Reinforcing Steel

Supplies are conditioned by availability from Australia, where production is hampered by industrial unrest. Increasing domestic consumption in Australia also reduces the quota available for export, and the tonnage made available for New Zealand is far short of requirements. Every opportunity is taken of shipping space offering. Limited relief will be afforded by orders placed in the United Kingdom and Belgium, but delivery is uncertain on account of the world-wide demand for steel.

Wallboards

The position in respect of wallboards is fairly satisfactory, although the production of Gibraltar board is limited by the availability of plaster. Supplies of gypsum from overseas for manufacture into plaster are short, shipping again being a difficulty, and the output of fibrous-plaster wallboard is seriously reduced. Some alleviation will be afforded by the importation of manufactured plaster, but rationing in accordance with the man-power employed by each consumer will require to continue. Supplies of both imported and locally manufactured hardboard are fairly satisfactory.

Sanitary Earthenware

Production by local manufacturers falls considerably short of demand. Manufacturing capacity is inadequate, and the position is accentuated by transportation and labour difficulties. The shortage of W.C. pans is retarding house completions and pans of metal construction are in some cases being approved by local authorities. The position is assisted to some degree by importations, limited quantities coming to hand at irregular intervals.

Roofing-materials

(1) *Asbestos Cement: Corrugated and Flat Sheets.*—Because of difficulty in obtaining supplies of asbestos from overseas, production of both corrugated and flat sheets is seriously curtailed, the South Island plant having ceased manufacture. The Auckland factory is operating to half capacity only. Import licences have been issued for manufactured sheets, but the quantity available through this source is inadequate to bridge the gap between local manufacture and demand.

(2) *Galvanized Corrugated Iron.*—Reconstruction in war-damaged countries is creating an abnormal demand, and production overseas is far short of world requirements. The prospect of increasing importations is remote and the tonnage available is only 20 per cent. of actual requirements.

(3) *Cement and Earthenware Roof Tiles.*—Apart from recurring shortages of cement, which temporarily slow down the manufacture of cement tiles, the output of roofing-tiles is generally satisfactory. Use is mainly restricted to urban areas on account of their bulky and fragile nature, necessitating transportation being kept to the minimum. This also ensures a greater measure of availability of corrugated asbestos roofing for rural areas.

(4) *Fabric and Aluminium Corrugated Sheets.*—The stock position of fabric roofing is buoyant, while the importation of aluminium corrugated roofing is increasing. Greater use of these materials will assist in offsetting the shortage of asbestos-cement sheets.

Builders' Hardware ; Plumbers' Supplies ; Electrical Fittings

Although intermittent " bottlenecks " occur in various lines, the overall supply position keeps abreast of the demand, which can usually be satisfied by substituting articles in fuller supply.

Enamel Baths

Supplies of imported raw materials for the manufacture of enamel baths are inadequate for full-capacity production. A further contributing factor is the difficulty in retaining suitable labour owing to the unattractive nature of the work. Limited numbers of imported baths are coming forward at high cost, and various substitutes, such as concrete lined with glazed tiles, vitreous-enamelled sheet steel, &c., are being manufactured locally in a small way. The installation of a shower-room only or a galvanized-iron bath has been adopted as an expedient in many cases to allow houses to be occupied, provision being made for the installation of a bath when available.

Galvanized Wrought-iron and Steel Tubes

The shortage of steel has seriously affected the supply of associated products, particularly wrought-iron and galvanized tubes for water-services, supplies of the larger sizes required for water schemes in new development areas being particularly difficult. Deliveries of these sizes have only been on a " hand to mouth " basis and some works have been held up for long periods. Supplies of the smaller sizes of pipes have been a little better, delays occurring to a lesser extent than when larger sizes were involved. It is not anticipated that there will be any decided improvement in pipe stocks until the general steel position improves.

BUILDING CONTROL

Despite supply difficulties and restrictions imposed upon construction, of necessity, by the Building Controller, the value of work completed during 1947–48 exceeded the previous year's figure by £5·314 millions, the total being £25·763 millions (housing, £19·639 millions ; other works, £6·124 millions). Anticipating that the supply position can be maintained or improved, it is estimated that a similar volume of work will be completed during 1948–49.

For various reasons, but principally because of material shortages, building permits which have been issued and upon which operations have not been commenced have accumulated to a total of £21·5 millions in value, and a considerable portion of this work will not only become a load on the building industry during 1948, but will also produce a carry over for 1949.

Deferred applications have increased in value and now aggregate £11·2 millions.

The number of permits authorized during 1947–48 totalled 42,650, classified as follows :—

(*a*) Building projects other than housing	17,979
(*b*) State and other Government housing	3,491
(*c*) Private housing	11,897
(*d*) Housing additions	9,283
	42,650

A detailed classification of applications dealt with during the year is set out in the table below :—

Type of Work.	Permits approved.		Permits deferred.	
	Number.	Value.	Number.	Value.
		£		£
Engineering	62	297,129	1	24,000
Hospitals	138	559,048	13	91,039
Schools	298	685,350	48	111,017
Other Government	435	1,461,500	37	114,204
Local bodies	322	754,209	42	177,936
Commercial	3,072	1,951,159	1,523	2,486,657
Factories	633	1,133,743	372	1,693,467
State housing	2,993	5,417,090	..	..
Other Government housing	498	678,601	..	..
Rehabilitation housing	350	574,221	..	..
Private housing	11,547	16,925,774	678	1,074,178
Housing additions	9,283	1,834,854	669	187,528
Community buildings	546	313,652	252	271,209
Farm buildings	3,455	652,722	80	20,863
Miscellaneous	9,018	553,323	1,839	186,889
Totals	42,650	33,792,375	5,554	6,438,987

It will be seen that the value of permits issued for housing and housing additions totalled £23,495,686, this representing 69·7 per cent. of the value of all permits issued.

In terms of Building Control districts, the following table sets out the number and value of permits uplifted during the year on which work was commenced :—

District.	Private Houses.		State Houses.		Other Works.	
	Number.	Value.	Number.	Value.	Number.	Value.
		£		£		£
Auckland	4,039	5,909,057	1,128	1,969,893	3,394	1,845,952
Hamilton	1,599	2,339,337	519	906,174	2,274	1,015,532
Palmerston North	1,021	1,493,723	374	653,004	209	433,991
Napier	627	917,301	209	364,914	585	339,058
Wellington	1,561	2,283,743	523	913,158	2,924	1,186,356
Christchurch	1,771	2,590,973	482	841,572	3,206	1,891,970
Dunedin	1,054	1,542,002	256	446,976	2,943	1,070,213
Totals	11,672	17,076,136	3,491	6,095,691	15,535	7,783,072

Prosecutions for breaches of the Building Emergency Regulations instituted by the Building Controller during the year resulted in 188 convictions.

PERMANENT HOUSING

The implementation of the Government's policy in giving housing priority over all other classes of building was further examined early in the year for the purpose of making available to housing an even greater portion of the building industry potential. This was necessitated by the exceptionally large number of housing permits issued during the previous year on which work had not commenced at 31st March, 1947, plus the increased monthly demand for permits during the first quarter of 1947–48 and the approved increased programme for State rental houses. It was unmistakably evident

that to build an increased number of houses during a given period there must be a corresponding reduction in other classes of building. This was effected by a still further tightening up of the issue of building permits for public, commercial, and industrial buildings.

In so far as housing is concerned, the decision arrived at has produced the desired results. During the past year 12,734 houses comprising 8,966 private, 2,875 State rental, 693 departmental, and 200 for Maoris were completed, as compared with a total of 9,612 for the previous year, which represents an increase of 3,122 houses, or 32·5 per cent.

In view of the acute housing shortage it is imperative that at least 12,000 houses per annum should be built, and even at that rate, when the increased birth-rate, the increasing number of immigrants coming to the Dominion, and the large number of sub-standard homes that have accumulated during the war years and need replacing are taken into account, it will be many years before the shortage will be satisfactorily overtaken.

PUBLIC BUILDINGS

Such is the position in regard to housing. However, building requirements in other directions have now reached a peak hitherto unknown in this Dominion. The expenditure on public, commercial, and industrial buildings since 1939 has been lower in comparison with total expenditure within the industry than during any previous decade.

In almost every locality there exists a demand for new public buildings. Principal amongst these are education buildings, hospitals, post-offices, telephone exchanges, police-stations, and departmental offices. Despite urgency, many are deferred, and commencement will be according to the priority determined by investigation of the needs of each and every district.

The present position calls for a long-term programme to prevent the existing unavoidable unbalanced state of the building industry developing to a state where the failure to provide such buildings as named, and to which must be added commercial and industrial buildings, has serious repercussions to our national economy. It is a simple matter to make reference to the difficulties arising from the prevailing conditions, but the task of overcoming them is great. I am satisfied that by the continuance of the Building Control Emergency Regulations we are, to the greatest extent possible, using the existing limited availability of man-power and materials to the best advantage.

The extent of the problem is determined by the potential of the building industry; therefore, it is necessary to be knowledgeable not only of the present potential, but also reliably informed in regard to both the desirable and possible potential at given future dates. Only by this means is it possible to determine a long-term programme for State, State-subsidized, and private works in correct order of priority both in regard to desirability and practicability. Unfortunately, some of the determining factors are outside the control of this Dominion, as we are dependent on overseas markets for machinery and numerous key materials.

ENGINEERING WORKS

Consequent upon the continually increasing demand for electricity and the extent to which all local industries, primary and secondary, are dependent on electric power, every effort was made to step up the rate of construction on hydro-electric works, which have been given priority over other engineering projects. Almost without exception those factors mainly responsible for retarding progress on the building-construction programme have had the same undesirable effects on hydro-electric works. Failing a much improved supply of steel, it is doubted whether progress on these works will be in keeping with the programme to satisfy the demand for electricity during the next five years.

The shortage of steel is having a serious effect on the fabrication of steel towers for transmission lines. At the present unsatisfactory rate of delivery, work contemplated to be completed in three years will take at least six years to complete. Major water-supply schemes are similarly affected.

During the past year weather conditions were most favourable for work on highways, particularly sealing, and work completed represents one of the best years on record since the inception of the Main Highways Board. This must not be interpreted to imply that the Board has undertaken a major construction programme, as work has been almost entirely confined to sealing and normal maintenance and repairs of damage due to excessive wear during the war years.

Numerous other engineering works, although regarded as highly essential but rated with a lower priority, have of necessity been deferred, as it is desirable that a minimum of effort within the industry lies dormant in uncompleted projects.

TOWN-PLANNING

During the year the staff of the Town-planning Division has been strengthened, but has been unable to cope with the increasing demands for their services. While primarily the responsibility of the Division is the administration of the Town-planning Act, 1926, relating to town-planning generally, and the Town-planning Amendment Act, 1929, relating to regional planning, many specific problems of physical development, both within the Ministry and originating from other Departments, are referred to the Division for investigation and report. Legally, the responsibility for planning throughout New Zealand falls upon the local bodies concerned, and the Division, in effect, operates both to assist the local bodies with their planning schemes and to ensure that Government development proposals fit in with the local-body plans.

Pursuant to the requests of the Municipal Association, planning officers have been made available when asked for by individual local bodies to assist with their town-planning schemes. There is a general recognition throughout New Zealand of the need for town-planning and the requests for assistance are in excess of the resources of the present staff.

During the year plans have been prepared or have been commenced for Richmond, Ashburton, Mosgiel, Gisborne, Te Awamutu, and Upper Hutt Borough Councils and for the Johnsonville Town Board. Extra-urban planning schemes are also in course of preparation for urban areas within the Ashburton, Hauraki Plains, Coromandel, Waimea, Matamata, and Cook Counties. The costs of this work are recoverable from the local authorities concerned.

In addition to this, a number of local authorities have themselves prepared plans which have been submitted for provisional approval to the Town-planning Board. These are referred to the Division for investigation and report back to the Board. Amongst the plans have been the Palmerston North, Napier (Marewa), Napier (Onekawa), Rotorua, and Timaru Borough planning schemes and the Huntly-Pukemiro (Raglan County) extra-urban planning scheme.

A number of appeals have also been made to the Town-planning Board under the interim development-control provisions of the Town-planning Act against decisions of local authorities refusing permission to erect buildings and carry out works not in conformity with planning schemes. Here again the staff of the Planning Division has been called upon to provide the necessary technical reports to assist the Board in reaching decision.

In the purely Government sphere, plans have been prepared for the location and layout of Government industrial estates at Taita, Naenae, and Seaview, and for the redevelopment of various other concentrations of storage and other buildings erected during the war. In addition, the Division investigates and reports upon the location and layout of Government administrative and office centres in the main metropolitan areas and in the various provincial towns for the Government Centres Committee and

also the location of individual departmental premises in relation to the plans of the various local bodies concerned. Similarly, the Division is required to investigate and report upon the location and layout of community centres which are being prepared for subsidy as war memorials throughout the country. Specific problems of development have been referred from other Departments, including major forestry proposals and the replanning of an existing Maori village to serve as a model for the redevelopment of other settlements.

The Division has been at a disadvantage in its day-to-day work owing to the absence of up-to-date standards for town-planning practice in New Zealand.

Until recently no research has been done on the problems of planning arising in New Zealand, and as conditions here are in very many respects so different from those in other countries it has been necessary to conduct original researches. It is expected that bulletins will be ready for publication on subdivisional practice and on roading standards at an early date. Bulletins on other aspects of planning are in course of preparation. These bulletins will be a reflection of the continuous research on outstanding planning problems, and their publication will illustrate the social and economic implications of the problems in a practical way for those engaged in the technical and administrative fields.

In view of the fact that there is no University School of Planning in New Zealand, opportunities for experience in the planning field are provided, as far as possible, for students and graduates in allied professions. Several servicemen who were granted bursaries to study in England have joined the staff, but continuity of accessions to the staff in the future is not assured unless suitable people are encouraged to interest themselves in planning-work with the view to their taking in New Zealand the necessary English examinations to qualify in the profession. As has been stated, even now there are not sufficient qualified people available in New Zealand to meet the urgent demands for planning assistance. Until there is a Dominion-wide coverage of outline plans, development work cannot proceed with any assurance, and the progressive extension and reasonable limitation of urban development is purely a matter of guess-work. The lack of plans particularly affects the administration of boroughs and counties, and there is clear evidence of uneconomic scattered development and ribboning along main roads, which is already a serious problem. The Local Government Commission, whose responsibility is the review of local-body administration, has commented upon their inability to give rational decisions without the assistance of planning information.

In Britain and other countries these problems are now being attacked with vigour, and with the increasing demand for their services more and more people are becoming qualified in the profession. Our problems in New Zealand, though similar in principle, differ in kind. The policy of encouraging students and graduates in allied professions to gain experience in the planning field with a view to qualification will be continued.

WORKS PLANNING AND PROGRAMMING

Following the completion of the announcement of the ten-year schedules of works covering the whole Dominion, the next step has been commenced. This, as previously stated, takes the form of a clearer definition of the works brought together for the first time in the schedules so as to be able, with confidence, to refer these to local authorities as a basis of regional development plans. You will appreciate that this involves a considerable effort in investigation and survey before tangible results are produced, for very few of the proposals contained in the schedules had been subjected to critical analysis.

In view of the urgency of the major works in the vicinity of the main centres, this procedure has naturally progressed more rapidly in such areas. The setting-up of Inter-departmental Committees (under the Chairmanship of District Engineers of the Public Works Department) has proved of considerable value in resolving the sometimes conflicting interests of Government Departments at district level. Regular meetings of

representatives of the Departments mainly concerned, augmented by the attendance of representatives of other Departments when needed for the consideration of any specific problem, has resulted in much quicker decisions than would be possible by the interchange of memoranda between Departments. There are indications, too, that the regular pooling of information by Departments in the process of works planning is leading to an appreciation of the collective responsibility of all branches of the Government Service which must prove of inestimable value in increasing the efficiency of administration.

As plans for individual works or associated works mature, it becomes apparent in most cases that the purchase of land should be effected as early as possible, both to protect Government and local-authority interests on the one hand and at the same time to avoid unnecessary interference with private interests contemplating building or development. This will be effected by Land Acquisition Committees acting in close collaboration with the inter-departmental Committees previously mentioned. A preliminary appreciation of their responsibilities has already been made by Committees in Christchurch and Wellington, the personnel in each case comprising the District Engineer, Public Works Department, as Chairman, the Land Purchase Officer, Public Works Department, and representatives of the Lands Department and the Housing Division.

Regional Councils have contributed to effective co-ordination between Government and local bodies on planning of both national and regional works, and much benefit is to be seen in the activities of the Inter-departmental Committees as combined with the efforts of the Regional Councils through the District Engineers who control the Committees and are also members of the respective Councils.

In the past year the planning of work and the carrying into effect of approved programmes has been dominated more than ever before by the material supply position. Development of first priority has been subordinated to availability of steel and cement, and other essential developments have had to be delayed both as to consideration and execution because of the lack of vital commodities. Indeed, so much time has to be spent in effecting ways and means of obtaining these commodities to carry out top-priority projects that the wider and long-term aspects of planning have not received adequate attention. It is probable that this state of affairs may continue for some time because of the need to plan forward the constructional industry over at least the next three years in relation to material supplies over that period. An annual works programme carefully prepared in the light of available labour and materials is an excellent thing, but it is not regarded as adequate in itself. It is perhaps timely to say here that, while labour and materials supply will continue to enforce a strictly pragmatic consideration of works-planning, the factor of available finance, more particularly overseas funds, will possibly become an increasing influence upon the limitation of capital-works expenditure to " bread and butter " items.

Simultaneously with the submission of the 1947–48 State and State-subsidized works programme, I reported to you on the complete review of the works industry which had been undertaken by the Ministry of Works in compliance with Cabinet direction. The results of that review were very convincing in so far as the support accorded to the opinion previously expressed by me that, to ensure that low-priority works were not proceeded with at the expense of high-priority projects, it was very essential that State and State-subsidized works should be programmed annually on realistic lines and in true relation to the availability of finance, man-power, and materials, and after taking into consideration the prevailing conditions of the industry as a whole.

Associated with the preparation of annual works programmes is the submission by all Government Departments concerned of schedules of projects they desire to undertake during the year under consideration. The Ministry of Works has consultations with these Departments for the purpose of determining the urgency of works submitted by them. Further, the Department of Labour and Employment submits to

the Ministry detailed information concerning the labour force available to the works industry, both on a locality and occupational classification. Desirable information relating to material supply is also obtained from within the Service and direct from industry. It was against this background that the 1947–48 works programme was prepared, and a similar approach has been made to the State and State-subsidized works programme for the current year.

The works programme prepared for the financial year which ended on 31st March, 1948, was the first of its kind. Hitherto, Government Departments were permitted to make independent representations to Cabinet through their respective Ministers and the Treasury. Such methods are now replaced by a more orderly procedure for preparing the financial estimates, thus ensuring that the money appropriated by Parliament each year for works is more in keeping with the capacity of the industry to undertake the works provided for in the annual estimates during the same year as that for which the money is appropriated. Further reasons which support the present method is the necessity of preventing undesirable competition between Government Departments for the limited availability of man-power and material resources available to the building-construction industry

Having carefully examined our physical achievements under the 1947–48 works programme, my views in favour of the preparation of annual works programmes are considerably strengthened, as not only has it assisted in applying the man-power and material resources available for State and State-subsidized works to those works of highest priority, both in regard to desirability and practicability, and also in regard to national and regional requirements, but it has also prevented State works of a comparatively low priority competing with private-enterprise works which are regarded by the Building Controller as urgent and essential. Hence it will be agreed that benefits to be derived by systematic programming of State and State-subsidized works annually according to priority and in relation to the availability of man-power and materials are not limited to those works. Therefore, programming on this basis is beneficial to the whole industry. Such results could not be achieved by the old method, under which the preparation of the annual estimates for works expenditure had little or no relation to the capacity of the building and construction industry.

GENERAL INVESTIGATIONS

In so far as investigations are concerned, the past year was a very busy one. Several major Government Departments having produced their plans for post-war development, the Ministry of Works was called upon to investigate these proposals and report thereon to Treasury and Cabinet. These plans include many individual projects involving the expenditure of very large sums of Government funds; therefore, investigations are not limited to the examination of their desirability and physical practicability, but must include a thorough study of the economics of such proposals. These investigations are closely associated with the ten-year schedules of works announced by you, as the development plans of the Departments concerned form an integral part of those schedules.

To this end the Ministry's functions have developed an even closer association with the Treasury than hitherto, as during the past year the requisite qualified staff were appointed in the latter Department to investigate the economics of developmental expansion as proposed by various Government Departments. Not only will the economic and physical investigations be confined to specific plans for these Departments, but the first step has been taken in the preliminary work associated with the necessary comprehensive investigation into all classes of developmental undertakings envisaged for all parts of the Dominion.

STORAGE

During the year many applications were received from Government Departments and private firms for storage space. The demand for space to store wool still continues. Assistance in this direction was given to wool brokers in Auckland, Wanganui, Wellington, and Christchurch. No doubt further demands will be received from various firms during the next wool season, and it is confidently anticipated that the storage space available will meet the demand.

The leases of many buildings leased by the Government during the war for storage purposes have now been cancelled. To a great extent this has been accomplished by re-warehousing Government stores in buildings constructed during the war and now set aside for storage. The Ministry exercises a firm control over storage space, and it is hoped in the near future that additional buildings will become available either for Government purposes or for leasing to private firms.

WORKS: PROGRESS AND COSTS

The new system for reporting progress on major works which was referred to in my last report has continued to provide progress information which is valuable to Head Office, where it permits the keeping of control records of works completed and in hand.

During the year the calculation and recording of costs by machines was developed sufficiently to permit the placing of orders for the necessary machine equipment, which is being purchased from Great Britain. The formulation of the detailed system and procedure received much attention, and has advanced to the stage where on arrival the machines can be used to full advantage with a minimum of delay. In the interim new manual costing systems similar to that to be provided by the machines were introduced on several major works so that a maximum of experience could be gained prior to the arrival of the machines.

CONCLUSION

During the next decade it is unlikely that there will be any lessening of the demands on the building and construction industry. Provided the essential material, man-power, and financial resources are available, we will witness during these years developmental changes which will have far-reaching effects on the economic and social structure of this country. With this in view the Ministry of Works and the Public Works Department, by Cabinet direction, are being merged into one organization, as it is considered that under a unified control the whole resources of the combined organization will work for greater economy and more effective administration than by continuing as separate Departments.

It is again my pleasing duty to record appreciation of the co-operation received from all those Government Departments, local bodies, and private organizations with which the Ministry has been associated during a most difficult year. I am confident of receiving their continued help, as only by the assistance of all will it be possible to speed up the completion of the big programme of developmental works referred to in the ten-year schedules.

During the year the Ministry suffered a great loss through the death of Mr. T. G. G. Beck, Deputy Commissioner of Works, who by his zeal and engineering ability and experience was recognized as a distinguished personality in the engineering profession. The Ministry suffered another serious loss in the death of Mr. A. P. Grant, Engineer to

the Soil Conservation and Rivers Control Council. He, too, by his engineering skill and professional ability, had during the many years which he served in the Public Works Department rendered outstanding service to the Government.

The retirements of Mr. G. W. Albertson, Director of Housing Construction, and Mr. T. A. Johnston, District Engineer, Public Works Department, Wellington, took place during the year. Both officers had proved themselves most loyal and efficient and knowledgeable of the intricate problems associated with their responsible positions. They were highly respected by all who were privileged to work with them during their long terms of faithful service.

In conclusion, I record my sincerest thanks for the efficient service rendered by the staffs of both the Public Works Department and the Ministry of Works, and to the Government I am deeply grateful for the consideration and assistance which has been available to me during the whole year.

E. R. McKillop, M.I.C.E.,
Commissioner of Works.

APPENDIX C

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

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

SIR,—

I have the honour to submit the following report upon the various works completed and in progress throughout the Dominion during the year ended 31st March, 1948.

RAILWAYS: CONSTRUCTION AND SURVEY

Auckland–Morningside Deviation and Auckland Waterfront Railway.—Preliminary investigations for the Auckland–Morningside Deviation were concluded and preliminary investigations and surveys for a route between Auckland and Kumeu via the waterfront have now been completed.

Edgecumbe–Murupara Railway.—A trial survey for a railway branching off the East Coast Main Trunk Railway at Edgecumbe, and following the Rangitaiki River valley to Murupara, was started in December. The line will be 39 miles long. Field-work is complete, including a possible deviation from the trial line, and paper location is in hand.

Results of the survey indicate that construction is feasible within the permitted curvature and maximum gradient. However, there would be very heavy earthworks and some bridging.

Putaruru–Reporoa Railway.—The trial survey between Putaruru and Tokoroa (18¾ miles) is complete; and the route has been fixed and the permanent alignment pegged. The permanent-line plans are being prepared.

Pending construction of the new railway between Putaruru and Tokoroa, the Public Works Department has taken over the old tramway from the Taupo–Totara Timber Co. and is operating a through freight service in collaboration with the Railways Department. The track has been improved and ballasted as necessary, and has been maintained throughout the year.

Turakina–Okoia Deviation.—Relining and grouting of the Fordell Tunnel was completed during the year, and the Railways Department completed platelaying and ballasting; they also installed the signal system. On the 7th December, 1947, the deviation was opened to traffic.

Rimutaka Deviation.—Surveys in an endeavour to find the most satisfactory route were continued; the preliminary field-work is now complete. The search has been an exhaustive one, but it narrowed down the choice to six alternative routes. By the end of the year the Commissioner of Works, in consultation with the General Manager, Railways Department, approved No. 5 route as the most suitable.

The distance between Upper Hutt and Featherston by No. 5 route will be 15 miles 32 chains, as against the present distance of 24 miles 65 chains. The main tunnel will be 5·45 miles in length. The ruling gradient outside the tunnel in both directions will be 1 in 70, and gradients in the tunnel will be 1 in 300 rising from the west portal and 1 in 211 rising from the east portal.

A number of the main items of plant for construction of the tunnel have been ordered already in Great Britain and New Zealand; and steps are being taken to obtain the remainder of the plant and equipment required. A specification for construction of the tunnel is being prepared.

As the east portal of the tunnel has been fixed in Lucena Creek gully, it has been possible to carry out preliminary work at that end. A 2-acre site for a depot and yard is being levelled. Some of the present alignment has been pegged on the ground. A culvert has been built and others are in hand. Portion of the military camp at Featherston is being developed as a construction camp to serve the Wairarapa end of the railway.

A topographical survey of the west end has been made to assist in planning the layout of plant and service buildings.

Surveying and planning of the approaches at both ends of the tunnel is going ahead.

Hutt Valley Railway Extension.—Following on the decision that the extension of the railway beyond Taita will involve crossing to the west bank of the Hutt River and recrossing to the east bank above the existing railway bridge, survey work for this location is in hand. An 800 ft. bridge will carry the railway over the Hutt River at Taita, and this is being designed. Test piles are being cast for checking pile-driving conditions in the river-bed.

Close attention has been given to the question of eliminating the numerous level crossings; either overbridges or subways will be used. A subway has been completed at Epuni Station. Foundation tests and designs have been completed for overbridges at Waterloo Road, Park Avenue, and Wingate (near Cemetery Road), and for subways at Porutu Street, Breeze Street, Nae Nae Station, Wingate Station, Taita industrial area, and Taita Station. Unfortunately, the construction programme is being delayed by the current scarcity of materials.

In order to reduce the hazard to the public, roads have been built parallel to the railway connecting Waterloo Road and Park Avenue, and the two intervening level crossings at Porutu Street and Breeze Street have been closed. Warning signals have been erected at Waterloo Road and Park Avenue.

The design of an overbridge to eliminate the Petone level crossing is in course of preparation.

South Island Main Trunk.—The stop-banks on the north and south banks of the Hapuku River are finished, and 30 chains of willow planting have been completed on each bank.

The concrete sea wall at 64 m. 50 ch. is complete, including the coping. During the year 2,171 cubic yards of concrete were placed in the wall, 14,467 cubic yards of sand filling have been placed, and 7,290 cubic yards of rubble facing on the sand fill.

Grouting and pea-gravel filling under pressure behind the linings of the three tunnels, where this was considered necessary, is now complete, and the top cover has been removed to 20 ft. above the arch of one tunnel.

The girder bridge at Puketa Ballast Siding has been replaced by a pipe culvert. A flag station has been built at Puketa, where 1,000 trees have been planted for the Hundalee Scenic Board.

A dam for the permanent water-supply at Oaro has been completed, but the permanent water-supply for railway purposes at Kaikoura is held up through lack of materials.

Thirty-eight chains of the Claverley Access Road have been metalled.

One and one-quarter miles of permanent fencing have been erected, and 1 mile of fencing-materials dismantled and transferred for re-erection on the Claverley Access Road.

Sockburn–Styx Railway.—The survey for this railway has been completed and the permanent-line plans have been submitted for checking, together with an estimate of construction cost.

HYDRO-ELECTRIC DEVELOPMENT: CONSTRUCTION WORKS AND INVESTIGATIONS

Otahuhu Substation.—Work has been started at the site. Forty-six chains of road formation and metalling have been done; 6,500 cubic yards have been excavated in levelling operations; and 5,593 ft. of pipes have been laid for the storm-water and sewerage systems. A contract has been let for the foundations of the main substation building, and 86 reinforced-concrete piles, 18 in. square and 70 ft. long, have been cast.

Karapiro Development.—The diversion-tunnel gate was lowered on 4th April, 1947, and the lake started to form; this marked the end of a major phase of construction.

The first 30,000 kW. generator was under load in April, 1947, and the second was generating power in September. The third machine was started up in May of this year.

After the filling of the lake, 2,000 cubic yards of rock were excavated from the tail-race. An area of about 2 acres has been levelled adjacent to the left abutment of the dam, involving the shifting of 10,000 cubic yards of spoil. Two thousand cubic yards of rock have been placed to protect the up-stream face of the core wall at the left abutment. At the right abutment 4,500 cubic yards of back-filling have been placed on the down-stream side.

Formation of the high-level road to the dam is now complete, 10,300 cubic yards having been excavated. Stone pitching of the batter adjacent to the siphon spillway is complete: 700 square yards were pitched. The pipe handrails to the staircase at the spillway are finished, and the concrete handrail over the dam is also complete. The lamp standards on the dam have been placed and reticulated.

Nos. 2 and 3 machines have been concreted in, 2,330 cubic yards of concrete having been placed; and the scroll cases have been sand-blasted and painted with five coats of special coal-tar paint. The generators have also been painted. The galleries round Nos. 1, 2, and 3 machines have been painted. Pump chambers have been grouted and sealed. Interior finishing work and rubber floor-covering for office block in the power-house has been completed, and the air-conditioning plant installed.

Concreting of the auxiliary-pump house at the left abutment is complete and the pump is assembled. Cable trench covers to the extent of 830 lineal feet have been placed.

In the village 2¼ acres have been levelled, top-soiled, and grassed; and 4,500 square yards of batters in the village and near the dam have been turfed. The water reticulation is now complete and tested to 120 lb. per square inch: 900 ft. of 6 in. main were laid during the year. Storm-water drainage has been installed during the year to the extent of 310 ft. of 6 in. and 320 ft. of 9 in. pipe complete with sumps and gratings. The village substation is finished.

Roads, kerbing, and channelling at the outdoor station are in hand. Fourteen chains of 24 ft. road between the Public Works Office and the dam and 25½ chains of 18 ft. road in the village have been shaped, metalled, and sealed.

On the Hauoira Deviation, 1,500 cubic yards of rock fill have been placed for wave protection, and 1,200 cubic yards were excavated on the Pairere Deviation in regrading a 10 chain length. Both deviations have been maintained, 1,080 cubic yards of metal being placed. As additional wave protection at the outlet of the Hauoira culvert, ten 3-ton concrete blocks have been placed. Falsework and shuttering on the Maungatautari Bridge have been removed, the steel girders painted, and 1,650 ft. of concrete handrail erected.

The surface of the deviation of the Hamilton–Rotorua State Highway in the Maungatautari Gorge was maintained until completion of sealing, and 78 chains of safety fence have been erected.

All construction buildings at Karapiro have now been dismantled and transported to Mangakino with the exception of the fitting-shop and two mill buildings.

With only finishing work left, the number of men working on the job has been reduced to 90, although the average number employed during the year was 200. A large number of men and families were transferred to Mangakino Camp.

Mangakino Village and Road Access.—The Tokoroa–Maraetai Access Road (16 miles) has been top-course metalled and primed for an additional 7½ miles, and a further 8¼ miles of sealing has been completed.

Four miles of base-course metalling has been done on the Whakamaru access road (right bank).

The Whakamaru access road (left bank) has been formed for 2 miles to Mangakino Stream, and base-course metalling has been completed over this length. At Mangakino Stream bridge a start has been made with piers B and C, and falsework for span BC is under erection.

At Mangakino, construction of the village is now well advanced. One mile of streets has been formed, 4 miles of streets have been metalled, and ½ mile of light sealing has been completed during the year. Twenty-eight staff cottages and 156 married workmen's cottages have been built; the total number of married men's quarters completed is now 310. All cottages have been connected to water, power, and sewerage services.

Community buildings finished during the year are as follows: five two-roomed school class-rooms; one hall shifted from Karapiro and re-erected; fire-brigade station shifted from Karapiro and re-erected; post-office; bus terminal office; grocery shop; 36 ft. by 20 ft. prefabricated hospital hut; and a garage and service station. Buildings in course of construction are a shopping block, cottage hospital, and the departmental office.

A third camp, to accommodate 200 single men, complete with cookhouse, recreation-hut, bathhouse, ablutions, &c., has been finished; and a fourth single men's camp is in hand.

Works buildings have been transferred from Karapiro and re-erected at Mangakino as follows: electricians' shop, 60 ft. by 24 ft.; plumbers' shop, 60 ft. by 24 ft.; Adams' truss for steel-fabrication shop, 100 ft. by 60 ft.; works office, 40 ft. by 24 ft. (at Maraetai Dam site); works garage; investigation core shed; and job workshops.

The foundations and concrete floor for a large unloading-shed at Tokoroa rail-head are complete, and the steel frame is being erected.

Maraetai Development.—Very considerable progress has been made, although the strike that commenced in March last retarded the work.

Main effort has been concentrated on the 25-ft.-diameter diversion tunnel, where work is proceeding from both inlet and outlet ends. Tunnelling-conditions have been unusually difficult because of the inflow of water (which has all to be pumped out into the river) and the broken nature of the country, especially in some lengths of the tunnel. At present 7,000 gallons per minute are being pumped from the outlet end and 1,500 gallons per minute from the inlet end, though flow from the outlet end was much greater at one stage, when the provision of adequate pumping plant was a source of anxiety. Grouting the surrounding country extensively, using cement and bitumen, has proved effective in reducing the inflow of water. In spite of these difficulties, 685 ft. of tunnel have been excavated to full size and 450 ft. of concrete lining have been completed (except for invert), and an additional 100 ft. of arch lining have been concreted.

The excavation of the tunnel-gate shaft, 12 ft. 6 in. by 31 ft. 6 in. and 118 ft. deep, is complete and concreting is in hand.

A heading down the sloping leg of the spillway has been excavated to its junction with the diversion tunnel, and the junction is being excavated and concrete-lined.

Excavation for the dam abutment on the left bank of the river is now complete above river-level and excavation of the right abutment has been started.

Curtain walls of cement grout injected into the crevices of the country rock are to extend for some distance out from the wings of the dam. The effectiveness of such

grout curtains for sealing the country has been demonstrated in the vicinity of the diversion tunnel, where extensive drilling and grouting has been carried out at the intersection of the tunnel and grout curtain line on the left bank. On the region being opened up during tunnelling-operations, good penetration of grout into the rock crevices has been observed.

Excavation in rock for the unloading-bay and workshop sections of the power-house on the right bank of the river has been completed to floor-level. The excavated rock has been stacked ready to place in the down-stream coffer-dam later.

Excavation for the lift-shaft and adits at power-house floor and roof levels is complete. Concrete lining of the shaft and construction of the superstructure above ground-level are under way.

Excavation is complete for the head and tail tower tracks for the two 7½-ton cableways required for dam and power-house construction. The concrete track pads and the piers for the tail-tower bridge are finished.

The sawmill started cutting in May, 1947, and already 1,100,000 superficial feet of timber have been produced. The logs for milling are obtained from pinus plantations situated below the level of the future Maraetai Lake. Thirty acres have been cleared so far. The sawn timber is being used for accommodation, works buildings, and general purposes; and having the mill on the job has been a great asset.

The number of men employed has increased to 802, the average for the twelve months being 704.

Waikato River Hydro-electric Development Investigations.—Again during the past year investigation work has been largely concentrated at Whakamaru, 6 miles up-river from Maraetai. The Whakamaru area is complicated geologically, which fact has necessitated subsurface investigations extending over an area of 900 acres and has required an extensive rotary drilling programme of 400 holes averaging 170 ft. in depth. In addition, over 30 shafts have been sunk, one to a depth of 120 ft.

Two possible dam-sites at Whakamaru have been investigated previously, and a third site (down-stream of the other two) has been investigated during the year. The work has resulted in a fairly detailed picture of subsurface conditions not only at the proposed site for the dam, but also in the areas likely to be adopted for diversion tunnel, cut-off walls, head-race, and power-house. Holes are now being drilled from a barge covering the whole area of the river-bed for a length extending 200 ft. up-stream from the third dam-site and 400 ft. down-stream.

During the year, 3 miles of temporary road have been completed, giving access to the area to be investigated for the Waipapa Development. Waipapa is at the head of Arapuni Lake, 5 miles down-stream from Maraetai. A camp has been built to accommodate 30 men engaged on the investigations. Preliminary drilling locations have been set out and a barge for river drilling has been brought in.

The preliminary geophysical survey of the area in which the Atiamuri Development will be sited has reached an advanced stage. A 2½-mile access road has been formed to connect two dead-end roads and so provide a direct line of communication between Atiamuri and Whakamaru and Mangakino. A camp has been established at Atiamuri to accommodate personnel of the investigation and geophysical survey parties. Preliminary drilling locations have been set out and access tracks are being formed to these positions.

Waikaremoana Upper Development.—Construction has been pushed ahead against natural difficulties, and the intake channel was flooded in March when water was supplied to turn over the first generator.

The main work during the year has been the excavation of the intake channel. Excavation was started at the tunnel entrance and proceeded towards the lake. The excavation area was surrounded by a coffer-dam consisting of spoil removed from above lake-level, but, due to the open nature of the country being excavated, leakage up to 200 cusecs has had to be dealt with. Nevertheless, very considerable progress has been

made: the intake channel has been cut to practically full depth for some 200 ft. in front of the tunnel, and excavation farther out is going on under-water. Behind and at the sides of the tunnel entrance the high batters have been protected from wave action by concrete and stone paving in 5 ft. steps. The concrete and stonework protection is now being extended further towards the lake. Excavation of rock and earth during the year amounted to 56,700 cubic yards; and concrete protective work for the year amounted to 3,148 square yards.

All tunnelling-work is complete, including the intake structure, placing of steel liners, and painting, except for the inverts, and concreting-in the liners.

The first 7-ft.-diameter pipe-line has been erected and painted inside, and the second pipe-line is almost completely erected.

In the power-house minor concreting jobs have been done and machine foundations have been concreted as required. The internal and external plastering is complete. There still remains all the inside painting and much inside finishing work to be done. Outside the power-house concrete slabs have been completed at front and rear of the building; and concrete paths, steps, and minor walls have been made. Access roads have been graded and are approaching completion, and lawn areas have been prepared.

The number of men employed fell to 150 in March. As buildings become surplus they are being dismantled and removed to other jobs.

Bunnythorpe Substation.—The site for the condenser and control buildings has been excavated ready for their erection. Two thousand two hundred square yards of batter on the transformer area have been top-soiled and sown.

The railway siding is now complete to the unloading-banks on the spur line to the existing substation. Thirty-eight chains of track have been laid during the year and 30 chains have been ballasted.

A storage yard, 132 ft. by 66 ft., near the existing substation has been metalled. Thirty-eight chains of 18 ft. road have been formed round the transformer area and metalled 6 in. deep. Kerbing and channelling for a length of 1,214 ft. have been constructed along the toe of the batter on the north-east side of the transformer area. All roads have been maintained with a grader.

An unloading-bank and two pairs of pads for the stators have been built near the existing substation.

During the year 3,500 cubic yards of clay have been excavated for the traverser-track formation, and some of the material has been used to widen the Redmayne Street fill for a footpath. A length of 279 ft. of traverser track has been built, but the work has been retarded by cement shortage.

Good progress has been made with the storm-water drainage. Temporary drains, 4 ft. 6 in. deep, have been excavated for a length of 5,000 ft. The following permanent drainage has been completed: 15 in. concrete pipe, 620 ft.; 12 in. concrete pipe, 1,620 ft.; 6 in. earthenware pipe, 2,063 ft.; 52 manholes; and 7 sumps.

Construction of the Imhoff tank is in progress, and 350 cubic yards have been excavated on the sewage-treatment-plant site.

Twelve foundations for the 110 kV. oil circuit-breakers have been made.

An average of 30 men has been employed throughout the year.

Cobb River Development.—Investigation work at the dam-site has continued: 270 ft. of 6 ft. by 4 ft. inspection tunnels were driven and 45 ft. of 12 ft. by 6 ft. shafts were sunk during the year. At the right abutment large-scale excavation disclosed the rock surface, much of which is considered unsuitable for supporting a concrete gravity-type dam. A decision has therefore been made to construct an earth dam.

A water-drive is being driven to drain water from the dam-site out to the gorge; and 1,210 ft. have been driven already. This drive will be useful during dam-construction and will be lined with concrete to serve as a permanent drain from the dam area.

During the year 1½ miles of two-way access road to the quarry have been formed and metalled. The quarry-site was stripped and tunnelled for blasting. Four tons of explosive were fired in the quarry and brought down 27,000 cubic yards of rock.

Progress has been made with the erection of construction buildings. One 126 ft. by 30 ft. office, one 60 ft. by 20 ft. store, one 20 ft. by 20 ft. fuel-store, one 50 ft. by 25 ft. fitting-shop, one 50 ft. by 18 ft. compressor-shed, 34 cottages, 200 single men's huts, a staff mess, and 2 bathhouses (one 132 ft. by 20 ft.) have been built. All buildings except one have been obtained from other works for re-erection.

Consideration was given to the question of augmenting the water available for power-production at the existing power-house during periods of low river. Survey showed that there was a suitable site for an earth dam 2 miles up-stream from the proposed main dam and that 51,000,000 cubic feet of storage would be available from which water could be released as required. Construction of a dam 750 ft. long and 31 ft. maximum height was authorized in August, and the dam was finished in December, complete with spillway and sluice culvert for controlling release of the water. The work included 50,000 cubic yards of earth fill, 5,000 cubic yards of boulder protection on the up-stream face, and the placing of 176 lineal feet of 5-ft.-diameter reinforced-concrete sluice culvert and control gate.

An average of 60 men has been employed throughout the year.

Lake Tekapo Development.—While the main effort has been concentrated on the tunnel, progress has also been made at the power-house site and on the tailrace.

At the south end of the tunnel 1,444 lineal feet have been excavated and lined with concrete blocks during the year, and at the north end 1,255 lineal feet. Up to the end of March, 18,335 reinforced-concrete tunnel-lining blocks had been produced at the concrete factory.

Excavation below power-house-floor level for the draught-tube is now complete and some preliminary concrete has been placed in the bottom. The shingle country is very permeable and, because the base of the excavation is well below river-level, heavy inflow of water has made the job difficult.

The bulk of the tailrace excavation has been completed.

Thirty-seven cottages, 36 single men's huts, and a staff mess and quarters have been erected during the past year. By March, 300 departmental employees and 22 contractor's men were engaged on the works.

Lake Pukaki Control.—Following excavation of the site, construction was started in April, 1947, of the five-barrelled reinforced-concrete sluice structure with gates for controlling outflow from the lake. The structure was finished in October. Excavation of the inlet and outlet channels amounting to 120,000 cubic yards has been completed behind coffer-dams comprising 35,000 cubic yards of fill. Compacted and stabilized back-filling placed round the sluice structure amounted to 9,000 cubic yards.

On completion of the sluices, coffer-dams were built up-stream and down-stream of the dam-site, the up-stream coffer-dam serving the purpose of closing off the natural lake outlet, raising the lake, and so providing storage water for power-production at Waitaki Power-station and also of diverting lake flow through the sluices. One hundred and twenty thousand cubic yards of fill have been placed in the up-stream coffer-dam and 30,000 cubic yards in the down-stream coffer-dam. The river closure was made last January, and the up-stream coffer-dam had been raised to the height required for winter storage by February.

Stripping of the dam-site to the extent of 50,000 cubic yards has been done, and 6,000 cubic yards of compacted fill have been placed in the dam. On the site of the spillway, 80,000 cubic yards have been excavated.

The highway bridge at the lake outlet, which fouled the dam construction, has been removed, and in its place a temporary highway traverses the coffer-dam. About 5 miles of highway deviations round the lake have been completed.

A number of works buildings have been erected, including office, store, fitting-shop, and carpenters' shop. Accommodation erected includes 4 cookhouses, 23 cottages, 270 single men's huts, a Y.M.C.A. hall and post-office, a recreation-hall, and shower, ablution, and latrine blocks.

An average of 220 workmen has been employed throughout the year.

Black Jack's Point Investigations.—Fabrication and erection of a foot suspension bridge over the Waitaki River at the site is finished and the bridge is being used for access between No. 1 camp and the work.

A contract has been let for the exploratory tunnel under the ridge.

Accommodation at No. 1 camp (on the Canterbury side of the river) has been increased and the amenities improved. A start has now been made with No. 2 camp, on the Otago side.

Clutha River Investigations.—Investigations have been continued for the purpose of finding the best possible dam-site in the lower gorge some 5 miles up-stream from Roxburgh. During the year the Pleasant Valley and Tamblyn's orchard areas have been investigated closely and much survey work has been done.

Detailed geological investigations and checking of river-flood levels at various points have been continued. Gutters and crush-zones have been investigated by boring and by open cuts.

In Pleasant Valley a number of shafts and bores have been sunk to establish rock bottom and the overlying strata.

Rock profiles have been established over the line of the lower No. 4 site, and all rock faults found on the surface have been checked and located underground. An exploratory drive, 520 ft. long has been driven from the face above the river into the dividing ridge between the river and Pleasant Valley. On the same site a drive 183 ft. long has been taken across under the river from a shaft on the right bank 80 ft. deep.

Trial boring and grouting with neat cement grout under high pressure has also been done.

Camp accommodation has been increased as necessary and a start has been made with a camp for 200 single men. The average number of men employed was 40.

IRRIGATION

Central Otago.—In common with some other areas, the summer in Central Otago has been particularly dry : the rainfall at Alexandra for the year 1947 was only 10·23 in. the third lowest in the last thirty-one years. As a result, most streams were exceptionally low by the end of January, and on schemes such as Tarras, Ardgour, and Hawkdun, where there are no storage dams, supplies had to be restricted for periods of several weeks.

The light winter snowfall on the high country had an adverse effect on the Manorburn storage, which is a main feeder for the Ida Valley and Galloway Schemes. The Manorburn Dam was practically empty at the end of the irrigation season, and advantage was taken of this to carry out some necessary repair work. The Poolburn Reservoir fared better and still retained 18·5 per cent. of its storage at the end of the season.

Fortunately, there was a comparative lack of hot, drying winds during the summer and there were good rains in March. As a result, production on most irrigated areas was maintained in spite of some restriction of supplies.

There was no shortage of water on the Teviot and Earnscleugh Schemes.

In the case of the Manuherikia Scheme, supplies were restricted for four weeks, but irrigated areas showed no sign of deterioration.

On the Omakau Scheme, where water is sold on demand, sales for the year ending 31st March, reached 14,080 acre feet, as against 14,720 acre feet for the previous year.

The financial statement for the Central Otago schemes shows revenue as £29,656 and working-expenses as £34,261, a loss of £4,605. There has been little change in the area irrigated on all schemes, this being 53,000 acres distributed among 510 irrigators.

Normal maintenance and renewals have been carried out and the recording of stream flows and meteorological data have been continued.

Parties have been engaged surveying the proposed Maniototo and Upper Clutha irrigation schemes.

Canterbury.—Because of the low rainfall during the season, much better results have been obtained on all schemes in operation. There has been no increase in the area brought under irrigation, but 2 miles of race-formation have been completed that required 54,257 cubic yards of excavation. Sixty-nine reinforced-concrete structures and $1\frac{1}{4}$ miles of fencing have been erected.

Levels Plain Scheme—commanding 12,000 acres—has been in operation ten years. This year the revenue was £573.

Redcliff Scheme—commanding 4,600 acres—has been in operation ten years. This year the revenue was £74.

Ashburton-Lyndhurst Scheme—commanding 34,000 acres—has been in operation three years. A total area of 4,229 acres is now prepared for irrigation by the border-dyke system. During the year 1,066 acres have been prepared. The revenue was £1,400.

Rangitata Diversion Race: Apart for a shut-down from 25th to 31st March, 1948, a full maximum flow of 1,000 cusecs has been maintained throughout the year. Two hundred cusecs were used for the Ashburton-Lyndhurst Scheme from September to March, and the remainder has been used for power purposes at the Highbank Power-station.

WATER-SUPPLY

Rehutai Water-supply.—Renewal of pumping and delivery mains has been completed, 4,500 ft. of galvanized pipe and 3,430 ft. of asbestos-cement pipe having been laid.

Oturei Water-supply.—The alternative scheme to supply the Maori population has been completed. An automatic pump has been installed, a 10,000-gallon reservoir built, and 4,255 ft. of pumping main and 12,145 ft. of delivery mains laid.

Ngamahunga Farm Settlement Water-supply.—A reservoir has been built, and new piping and an electrically driven pump has been installed.

Downlands Water-supply.—All construction work is complete and normal maintenance only is required.

Wellington Water-supply.—The three reinforced-concrete bridges on the access road to the headworks are now complete. The flume bridge between Nos. 1 and 2 tunnels is under construction.

No. 1 tunnel was started during the year and 700 ft. have been driven, working from one heading only. Work on No. 2 tunnel has progressed a further 3,625 ft., working from both ends. No. 4 tunnel, 726 ft. long, was also started during the year; driving is complete and 360 ft. have been lined. All three tunnels are excavated to a nominal size of 7 ft. by 5 ft.

The work of improving alignment and width of the Haywards–Paremata Main Highway is continuing. To date 300,000 cubic yards of earth and rock have been moved.

Formation of the pipe-bench, 24 ft. wide, between Judgeford and Takapu Road (a distance of 4 miles) has been completed, and cattle-stops have been installed at fence-lines.

COAL-PRODUCTION

Work on opencast mines has been continued at Glen Massey, Waitewhenua, Stockton, Ohai, Kapuka, and Wangaloa.

At Glen Afton stripping was completed during March, 1947, and extraction of coal ended in May following. The mine was then closed down. During the whole period of its operation 55,093 tons of coal were extracted, necessitating the removal of 454,080 cubic yards of overburden.

Additional plant was procured for Glen Massey towards the end of the year, and stripping is now well ahead. For the year stripping amounted to 595,250 cubic yards and coal output was 58,715 tons.

Work at Wangaloa has resulted in an increased output. Stripping for the year amounted to 397,305 cubic yards and coal output to 41,616 tons.

In the Southland area, overburden totalling 95,000 cubic yards has been removed from State and privately owned mines.

Lighthouses and Harbour-works

Maintenance of lighthouses has been carried out as usual; routine maintenance work on all Diesel-electric lighthouse plant has also been carried on.

Electrification of Moeraki and Nugget Point lights is nearly complete, and electrification is in hand at North Cape, Chickens Island, Channel Island, and Cape Egmont. A new light is being constructed at Motuara Island, and erection and installation are nearly complete. New lights and equipment are on order for Gibson Point and Slope Point.

A well has been bored at Cape Egmont to provide an assured water-supply.

The access road to Waipapapa Lighthouse has been formed and gravelled.

Repairs are being made to the Opononi, Rawene, Horeke, Kohukohu, and Karaki Point Wharves, in Hokianga Harbour.

A slipway for fishing-vessels at Karitane is finished.

AERODROMES

During the year the Government appointed an Aerodromes Committee comprising representatives of the Air Department, National Airways Corporation, Commissioner of Works, and Public Works Department to decide on policy matters affecting civil aerodromes. The Committee has decided the priorities of a number of new works which are now being planned.

The maintenance of all civil and R.N.Z.A.F. aerodromes and establishments has been carried on as usual, the total number in New Zealand at present being 65 civil aerodromes and landing-grounds, 5 seaplane-alighting areas, and 10 R.N.Z.A.F. stations, and in the Pacific, 4 civil aerodromes, 2 alighting areas, and 3 R.N.Z.A.F. stations.

Because of the general increase in air traffic in New Zealand, additional safety precautions have become necessary. Consequently, radio ranges have been constructed at New Plymouth, Porirua, and Harewood, with associated fan markers at Mangere and Kaiapoi, and homer beacons at Rukuhia and Wanganui. A new aeradio station has been installed at Kaikoura.

Construction items of importance on R.N.Z.A.F. stations include the shifting of three large dormitory blocks from Ardmore to Te Rapa and a timber hangar from Rukuhia to Whenuapai. These works are almost complete.

Ohakea.—A number of buildings have been converted to provide additional accommodation for single and married staff.

Palmerston North (Milson).—All work in connection with the new apron and taxi-way has been completed.

Paraparaumu.—Following on the exclusion of commercial traffic from Rongotai, much urgent work had to be done at Paraparaumu. The main runway has been stabilized and sealed. New buildings erected include passenger-handling terminal, administration block, control-tower, housing for fuelling equipment, railway-freight building, and two staff cottages. The hard standing area and surround of the passenger block have been sealed and a water-supply, sewerage system, and storm-water drains have been installed.

Hokitika.—Good progress has been made with the construction of the new aerodrome at Seaview, in spite of natural difficulties. The centre strip of the main north-east to south-west runway has been completed.

Nelson.—Concrete and log protection has been placed as required to prevent wave erosion. A 1,000-gallon fuel-tank has been installed for National Airways Corporation and three 500-gallon tanks have been installed for Nelson Aero Club.

Invercargill.—A fuel-tank has been installed and 710 ft. of storm-water drain have been constructed for the proposed new hangar.

Pacific Islands.—Pending finality being reached regarding the site for the international aerodrome in Fiji, the reorganization of Nandi Airport is almost complete. Runway sealing was finished early in the year, together with the conversion of existing buildings to provide accommodation for transient passengers and for technical purposes. Twenty-eight flats for married staff have been built out of existing barrack blocks.

LAND IMPROVEMENTS

Kaipara Harbour Reclamation.—Activity on the Kukutango and Oyster Point Blocks consisted in the main of repairs to stop-banks damaged by the high tides and storms of June, 1947. One cottage has been built at Kukutango Block and 2 single quarters at Oyster Point. On the Glorit Block extensive repairs to drains have been effected and a single man's accommodation has been built.

Sand-dune Reclamation.—At Woodhill, work carried out during the year has been: line-clearing, 703½ miles; line-cutting, 292¾ miles; marram replanting, 152 acres; lupin-seed collecting, 1,320 lb.; foredune fixation, 94 chains; firebreak clearing, 749 square chains of land clearing and 3,125 square chains of machine disking; rabbits trapped, 6,390 In the nursery, work done includes: seed sown, 90 lb.; radiata seed extracted, 12 lb.; trees lined out, 358,731. Tree-planting has been done as follows: blanking, 36,138; virgin, 245,664; and trees sold, 2,500.

At Rimmers Nursery a water-supply has been installed, comprising dam, pipe-line, reservoir, pump, and pump-house. Six acres have been cultivated and internal tracks have been formed, culverted, and metalled. One cottage and 4 single huts have been built.

At Muriwai Quarry the work has generally consisted of maintenance, together with a small amount of virgin planting. A considerable amount of internal roading has also been carried out.

At Maioro, work has been done as follows: marram grass—new planting, 331 acres, and blanking, 96 acres; yellow lupin sown, 200 acres (597 lb.); foredune fences, 68 chains; line-cutting—for tree-planting, 150 acres, and maintenance, 1,605 miles; seedlings raised and lined out, 252,345; new tree planting, 148 acres; firebreak clearing, 8¾ miles; planting firebreaks with ice-plant, 3 miles; new roading, 3 miles; trees sold, 30,350. A 30 ft. steel tower has been erected for fire-watching, and fire-fighting depots have been placed at suitable points and equipped.

Land-clearing.—Land clearing and drainage, using the Department's mechanical plant, still continues to assist farmers in bringing in non-productive land.

In the Ohakune area three tractors have been employed, mainly when not needed on other work. The area stumped was 990 acres, of which 238 acres have been rooted.

At Westport the work has been continued on a small scale. Nevertheless, 77½ acres have been cleared, 14½ acres heavy disk-ploughed, 30½ acres light disk-ploughed, 4 acres harrowed, and 2 acres of swamp have been filled.

The greatest demand and greatest effort has been in Southland, where 2,551½ acres have been stumped and cleared of second growth, 16¾ miles of farm access roads have been formed, and 16¾ miles of channel have been cut to drain swamps.

HOUSING SERVICES CONSTRUCTION

Kaikohe.—Roading, kerbing, and channelling of Buxton's and Dignan's Blocks is complete. Road-formation is complete and sewerage and water reticulation is in hand on the Purdie and Yukich area.

Bayswater.—On the Early Block all roading and services are now complete, 2,830 ft. of 4 in. field tile and scoria drains along all road cuttings having been finished in May.

Takapuna.—On Bull Block the roading and services have been completed.

Mount Roskill.—On College Trust Block "C" construction of roading services has continued to progress, and work has been completed as follows: 450 cubic yards of topsoil to dumps; 16,800 cubic yards of clay and rock excavated; 27,488 cubic yards of scoria filling placed; 14,440 ft. of kerbing and channelling laid; 27,746 ft. of storm-water and sewerage pipes (from 4 in. to 42 in. diameter) laid; 115 manholes constructed; 2,500 ft. of 4 in. and 6 in. field tiles laid and 2,442 cubic yards of scoria back-filling placed; 10,708 ft. of water-pipe (from ½ in. to 4 in. diameter) laid.

Mount Albert.—On Carrie Block the roading and services are now complete. Verge areas amounting to 2,000 square yards have been cultivated and sown and 105 square yards of scoria paths have been laid.

Titahi Bay.—A start has been made with site preparation and services. Some 50 chains of roads have been roughly formed, and laying of a culvert has allowed construction of a 20 ft. high filling, the completion of which provides access to the block.

Johnsonville.—Work has been completed during the year as follows: 20½ chains of roading; 46 chains of kerbing and channelling; 820 ft. of storm-water drains; 927 ft. of sewers; and 8,528 ft. of water reticulation.

Ngaio Gardens.—Work has been completed during the year as follows: 21½ chains of roading; 44 chains of kerbing and channelling; 2,084 ft. of storm-water drains; 2,015 ft. of sewers; and 2,300 ft. of water reticulation.

Wellington City and Johnsonville Blocks.—Sealing has been completed as follows: streets, 11,450 square yards; and footpaths, 11,300 square yards.

Hutt Valley.—Site-preparation has been completed for 600 housing units, mainly in the Epuni and Waddington areas. Three miles of new road (27,000 square yards) have been formed and metalled.

Roads formed in the Taita and Nae Nae areas last year have been sealed. Seven miles (100,000 square yards) have been primed and 5½ miles (77,000 square yards) have been sealed.

Ten miles of kerbing and channelling have been laid.

Up to the time the Housing Division took over construction of storm-water drains and sewers, 2½ miles of storm-water drains and 3½ miles of sewers had been laid during the year.

Four miles of water reticulation have been completed.

At Waddington, a 17-acre recreation reserve has been graded and prepared for grassing.

Nelson.—Access roading and footpaths 19 chains long have been completed and 3,000 ft. of 6 in. sewer mains have been laid.

CONSTRUCTION AND IMPROVEMENT OF ROADS

Further progress has been made with reconstruction and improvement of roads, and a considerable mileage of new roading has been added providing access to farms and soldiers' settlement blocks in back-country areas. Maintenance and remetalling of existing roads has been continued.

During the year 83 miles of new formation have been constructed and 154 miles of new metalling or reconstruction and metalling have been completed. Twenty-one bridges, of a total length of 1,291 ft., have been erected.

In the Waitomo County, 3 miles 26 chains of formation and 5 miles 19 chains of metalling have been done during the year on the Mangapeehi–Maraeroa Road, making nearly 7 miles completed to date. The road provides access to State forests.

The new road from Haast to Haast Pass has been completed for 2½ miles, and surveys are in hand for the uncompleted section of the Paringa–Haast Road.

The access road from Seddonville to Charming Creek Coal-mine has progressed well: 4½ miles are complete, leaving only 25 chains to be finished.

Considerable progress was made on the construction of roads at the Chatham Islands. Waitangi - Te Ngaio Road (6 miles 40 chains); 50 per cent. of the work has been done and this road now serves four major farms. Waitangi–Kairakau Road (10 miles): formation and drainage was completed to 8 miles. Waitangi–Owenga (12½ miles): formation between 0–8 miles and 11–12¼ miles was completed. Seven miles of this road have been metalled. Police Access Road: except for fencing and metalling of odd patches, the work has been finished. Township–Wharf Road (1½ miles): this road has been formed and metalled excepting the last 16 chains and a sea wall 120 ft. long was erected.

PLANT AND MECHANICAL EQUIPMENT

During the year some 9,250 items of construction plant, valued originally at about £4,850,000, have been employed on hydro-electric construction, highways, aerodrome-maintenance, land-clearing, water-supply schemes, State housing settlements, and opencast mining.

New machines have been purchased, mostly as replacements for plant worn out in service. These comprise heavy power graders, Diesel crawler and wheeled tractors and allied equipment, Diesel compressors (portable and stationary), large Diesel generators, Diesel excavators, Diesel transporters of up to 40 tons capacity, pumping equipment, road-rollers, elevators and conveyors, loaders, road-brooms, bitumen sealing plants, crushers, battery locomotives, tunnel muckers, air-tool equipment, heavy Diesel dump wagons, Diesel dumptors, workshop machine-tools and equipment, welding-sets, and concrete-mixers; the cost of these machines was about £780,000.

Heavy machine-tools, acquired as German war reparations, have been of great assistance in equipping the plant depots at Mangere, Gracefield, and Sockburn, and also the smaller workshops established in districts where running repairs are effected.

The Mechanical Design Office has been fully occupied in designing equipment such as cableways, concrete-batching plant, gravel crushing and screening plant, cranes, and tunnelling plant for hydro-electric-construction works. Design has also been carried out for other Departments.

The Department has arranged the purchase of plant and equipment on behalf of the Departments of Agriculture, Mines, Maori Affairs, Health, and Air, and the State Forest Service, and Catchment Boards and other local bodies.

Repair and maintenance work has been done for a number of these Departments; and power-generating plants have been equipped and installed on behalf of the State Forest Service and the Rarotonga Administration.

DEFENCE WORKS

Restoration work has been completed at a number of camp-sites in city and rural areas, and the properties have been handed back to their owners.

Maintenance of camps and establishments belonging to the Armed Services has been continued.

Construction work has been confined again almost solely to the Devonport Naval Base, where all major works except the fire-fighting installation are complete.

The first two bulk-fuel-oil tunnels have been handed over to the Navy, and all reservoirs have been in continuous use throughout the year without sign of leakage. All equipment has been installed and it is functioning satisfactorily.

Except for the final seal coat over a small area, roading in the south yard is complete. A small area has still to be sealed in the north yard. During the year 1,630 square yards of heavy base course, 6,251 square yards of 1½ in. penetration, and 2,433 square yards of seal coat have been laid.

The new Stanley Bay entrance has been completed, including sea wall, fencing, guard-hut, and street lights. The new ferry wharf was brought into use in August.

Fire-fighting facilities are well in hand. The sprinkler system has been installed in the administration building and in the clothing and victualling store. Cable work for the automatic-alarm system is 75 per cent. complete. The salt-water mains have been laid in the north yard.

The remainder of the fixed boom defence has been demolished and the materials salvaged handed over to the War Assets Realization Board for disposal.

The fixed boom defence in Wellington Harbour is being dismantled.

DESIGN OFFICE

The principal work undertaken in the Chief Designing Engineer's Office has been the design and preparation of plans for bridges for the Main Highways Board, hydro-electric works, and the State Forest Service. The longest bridge is the Kokatahi River Bridge, in Westland, 1,015 ft. long. Plans of several steel bridges of different types have been completed, and tenders for the fabrication of two of these have been invited in the United Kingdom.

An interesting structure for which plans have been completed is a reinforced-concrete arch bridge, with a main span of 225 ft., for the Maraetai hydro-electric development. The bridge will be built down-stream from the dam to give access to the power-house, and it has been designed for specially heavy loading.

Other bridges designed include the Rangitaiki River Bridge, at Edgecumbe, 600 ft. long, in reinforced concrete, with provision for raising the spans and lengthening the bridge at some future date when the Rangitaiki River flood-control scheme is developed; the Mohakatino River Bridge, 280 ft. long, to be renewed in timber with concrete deck; Lake Pukaki Spillway Bridge, a series of reinforced-concrete arch spans over the spillway control-gate structure; and the new railway bridge for the Hutt Valley railway extension crossing over the Hutt River at Taita.

Many bridge proposals have been received from district offices, County Councils, and consulting engineers for examination and approval. Numerous proposals have been examined and checked for the Local Government Loans Board. These include water-supply, sewer drainage, storm-water drainage, bridge, and street proposals.

A series of standard plans of cableways and foot-bridges have been completed for current meter gauging stations for the Soil Conservation and Rivers Control Council.

Specifications for the Wellington water-supply pipe-line (34 miles of 30 in. and 36 in. steel pipe) were completed and tenders were invited in January in New Zealand and overseas for its fabrication and erection. A study was undertaken of a design suitable for the intake weir and other structures for the waterworks.

Detailed water-supply and sewage-treatment proposals for large mental hospitals are being prepared. Plans of two 750,000-gallon reservoirs for Cherry Farm Hospital are almost complete. Plans of the sewage-treatment plant at Cherry Farm are well advanced.

A series of plans of small sewage-treatment plants for hydro-electric substations, a prison, an Air Force station, and departmental camps and depots, to serve populations ranging from 20 to 250, are in hand.

STAFF

It is with deep regret that I have to record the death of my predecessor in office, Mr. T. G. Beck, and of Mr. A. P. Grant, Engineer to the Soil Conservation and Rivers Control Council. Both officers passed away while in the prime of life; their gentlemanly personalities and the professional knowledge and ability they displayed during long years of service in the Public Works Department were outstanding.

During the year a most respected officer in the person of Mr. T. A. Johnston, District Engineer, Wellington, retired from the Department's service. This officer has left his monument in the many important works which came under his charge in many parts of the Dominion.

I desire, too, to place on record my appreciation of the loyal and efficient service given by my staff during the past year.

I have, &c.,

F. LANGBEIN, M.I.C.E.,
Engineer-in-Chief.

APPENDIX D

TWENTY-FOURTH ANNUAL REPORT OF THE MAIN HIGHWAYS BOARD

The Hon. MINISTER OF WORKS, Wellington.

SIR,—

In accordance with the requirements of section 24 of the Main Highways Act, 1922, the Main Highways Board has the honour to submit its twenty-fourth annual report for presentation to Parliament. The report covers the period 1st April, 1947, to 31st March, 1948.

GENERAL

The present length of main highways maintained or subsidized by the Board is 12,468 miles, and particulars of expenditure for the year ended 31st March, 1948, as well as a detailed statement of the position of various works, are shown later in this report. Of the total length of main highways, 3,978 miles have been classified as State highways.

The total expenditure under vote "Highways Maintenance," which includes bridge renewals and fixed charges, amounted to £3,157,889.

Under vote "Highways Construction" the total expenditure was £1,411,030, giving a grand total of £4,568,919, as compared with a total expenditure of £3,031,250 for the year immediately preceding.

The registration of motor-vehicles showed an increase over the previous year's figures, and the petrol consumption was the highest yet recorded for any one single year.

The length of new sealing is 182 miles, together with 64 miles of priming coats, making a total of 246 miles of new work. Part of this was carried out on deviations and reconstructed sections of the older sealed highways, so that in consequence the net increase in dustless surfacing is 205 miles. This makes a Dominion total of 3,923 miles, or 31·5 per cent. of the highway system. In addition to the above, a length of 340 miles of existing sealed surfaces received a maintenance coat.

The length of new bridging was 2,664 lineal feet, compared with 3,102 lineal feet for the previous year. Additional Bailey bridging-material which the Board had on order arrived during the year and helped materially to restore communications that had been severed by storm damage or other causes.

LEGISLATION

Section 3 of the Finance Act (No. 2), 1947, caused an alteration in the accounts and financial liability of the Board, having removed the liability for interest on past loans totalling £12,159,168, and made further expenditure over and above revenue free grants—that is, amounts on which no interest is payable by the Board.

The Government has agreed that the amount to be provided each year to the Board will not be less than the amount that would have been available under the old system.

The Public Works Amendment Act, 1947, made provision for the declaration as a motor-way of any public highway, whether then actually constructed or not. This is expected to prove of great benefit to the community in the years that lie ahead. More information regarding these motor-ways appears in a later part of this report.

HIGHWAY DISTRICTS

For administration purposes it was found necessary during the year to alter the boundaries of Highway Districts Nos. 2, 6, and 9, and the alterations also involved increasing the number of highway districts by two, now making a total of twenty highway districts.

The new boundaries are as follows :—

Highway District No. 2A

All that area comprised within the counties of Rodney, Waitemata, Manukau, and Franklin, and the boroughs of New Lynn, Henderson, Helensville, Birkenhead, Northcote, Newmarket, Ellerslie, Manurewa, Papakura, Pukekohe, and Papatoetoe, and the town districts (not forming part of a county) of Warkworth, Glen Eden, Howick, Tuakau, and Waiuku, and the road districts of Mount Wellington, Panmure, and Ostend.

Highways District No. 2B

All that area comprised within the counties of Raglan, Waikato, Piako, Waipa, Matamata, Otorohanga, Hauraki Plains, Coromandel, Thames, Ohinemuri, Kawhia, and Waitomo, and the boroughs of Huntly, Cambridge, Ngaruawahia, Te Awamutu, Te Aroha, Morrinsville, Matamata, Paeroa, Thames, Waihi, and Te Kuiti, and the town districts (not forming part of a county) of Leamington, Putaruru, and Otorohanga.

Highway District No. 6

All that area comprised within the counties of Taumarunui, Ohura, and Kaitieke, and the Borough of Taumarunui, and the town districts (not forming part of a county) Manunui and Ohura.

Highway District No. 9A

All that area comprised within the counties of Kairanga, Kiwitea, Manawatu, Oroua, and Pohangina, and the boroughs of Foxton and Feilding.

Highway District No. 9B

All that area comprised within the counties of Horowhenua, Hutt, and Makara, and the boroughs of Shannon, Levin, Otaki, Upper Hutt, Eastbourne, and the Town District (not forming part of a county) of Johnsonville.

PROGRESS REPORT

The following statement shows the more important works carried out under the control of the Board during the year :—

Whangarei District

Maintenance

A heavy programme of work was carried out under this heading, particularly on State highways. Arrears brought about by abnormal weather conditions in 1945–46 and 1946–47 have been overtaken and running surfaces generally are now in good order.

Resealing completed totalled 27½ miles, and it is expected that a further 15 miles will be carried out before the season closes.

Thirty-one State highways bridges were repaired, some of the work being of a fairly extensive nature.

Renewals

Owing to the steel shortage the bridging programme was much lighter than in former years, and although a total length of 1,085 ft. was completed, the Tangiteroria Bridge of 610 ft., which has been under construction for the past two years, accounts for the greater percentage of this total.

The only bridge actually in hand at present is the Kaihu River Bridge at Dargaville of 270 ft., although tenders for the erection of two culverts and two bridges on the Pamapuria–Oruru Main Highway are being called shortly.

Improvements and Construction

Activities under this heading showed considerable improvement in comparison with last year's efforts. A total length of 6 miles 31 chains of new formation was completed with several other fairly extensive works in hand. Widening to 30 ft. with attendant base-course metalling was carried out over sections totalling 5 miles 76 chains, and the bulk of this, together with the new construction, should be consolidated and ready for sealing next year.

New sealing actually completed totalled 4 miles 49 chains, and several contracts for the supply of chips for next season have been let.

Details of work completed are as follows :—

No. 1 State Highway, Whangarei–Awanui via Kawakawa.—Whangarei–Hikurangi (resealing) : A total length of 3 miles 47 chains was resealed with medium road oil.

Hikurangi Township (Resealing) : 24 chains resealed with medium road oil.

Whakapara Overbridge (three 30 ft. spans ; 24 ft roadway) : This bridge was completed.

Whakapara Deviation (Construction), 1 mile 62 chains : Earthworks, culverting, and base-course metalling complete.

Whakapara–Waiotu (Reconstruction and Seal) : A contract for metal-supplies is almost completed.

Mitchell's Flat – Waiomio (Reconstruction and Seal), 1 mile 36 chains : Arrangements made for metal-supplies.

Waiomio (Resealing) : 24 chains resealed with medium road oil.

Waiomio–Kawakawa (Reconstruction and Seal), 1 mile 72 chains : Foundation, base, and top course metalling. Primed with T.C. 1 and sealed with heavy road oil.

Kawakawa–Moerewa (Reconstruction and Seal), 1 mile 46 chains : Foundation, base, and top course metalling. Primed with T.C. 1 and sealed with heavy road oil.

Moerewa (Resealing) : 1 mile 56 chains resealed with medium road oil.

Kawakawa Township and Embankment (Resealing) : 53 chains resealed with medium road oil.

Moerewa – Turntable Hill (Reconstruction and Seal), 1 mile 11 chains : Foundation, base, and top course metalling. Primed with T.C. 1 and sealed with heavy road oil.

Watercress Creek Bridge Deviation : 30 chains earthworks, base and maintenance coat metalling completed.

Faithfull's Deviation (Reconstruction), 40 chains : Earthworks, culverting, and base-course metalling completed.

Junction No. 593 Main Highway – Okaihau (Reconstruction and Seal) : Widening to 30 ft. and base-course metalling completed over 70 chains.

Robinson's Deviation, 1 mile 10 chains : Widening to 30 ft. formation width in hand.

Graham's Flat – Horeke Road Junction : Widening to 30 ft. and base-course metalling completed for 1 mile 20 chains.

Templeton's Hill (Reconstruction), 1 mile 48 chains : Contract let for earthworks.

Kaitaia Southwards (Reconstruction and Seal) : 43 chains widening to 30 ft. Base and top course metalling completed.

Kaitaia–Awanui (Resealing), 5 miles 46 chains : Resealed with medium road oil.

No. 2 State Highway, Whangarei–Dargaville.—Whangarei Borough Boundary – Stephen's Hill (Resealing), 5 miles 30 chains: Resealed with medium road oil.

Tangiteroria Bridge (one 60 ft., three 80 ft., one 90 ft., one 100 ft., one 120 ft. spans): This bridge was completed.

Tangiteroria Deviation (Construction), 2 miles 3 chains (Western Approach): Earthworks and culverting completed.

Ihaka Culvert (10 ft. by 8 ft. by 39 ft.): This culvert is completed.

Dargaville Borough (Resealing) 1 mile 46 chains: Resealed with medium road oil.

No. 3 State Highway, Dargaville–Maungaturoto.—Dargaville–Turiwiri (Resealing), 1 mile 71 chains: Resealed with medium road oil.

Ruawai–Maungaturoto (Resealing): Four small sections totalling 1 mile 60 chains were resealed with medium road oil.

Rintoul's Deviation (Reconstruction), 3 miles: Activities have been confined to fencing.

No. 4 State Highway, Whangarei–Maungaturoto.—Te Wai Iti Bridge – Dwyer's Quarry (Reconstruction and Seal), 1 mile 7 chains: Base and top course completed ready for priming and sealing this season.

Long's Corner–One Tree Point (Reseal), 15 miles: A contract has been let for this work, which is in hand.

Brynderwyn Slip: This major subsidence over 7 chains of highway has been repaired by altering the highway alignment at this point.

No. 5 State Highway, Birkenhead–Maungaturoto.—Highways Junction – Topuni (Reseal), 4 miles 60 chains: Resealed with medium road oil.

Kaiwaka–Topuni (Reconstruction and Seal), 3 miles 43 chains: A further 2 miles 3 chains were reconstructed to 30 ft. width, making a total of 2 miles 78 chains to date. This section will be ready for sealing next season.

No. 301 Main Highway, Whangarei–Taumaterau.—Whangarei–Onerahi (Reconstruction), 3 miles: A contract has been let for earthworks on the first section from Whangarei. Fifty-six chains were completed.

No. 303 Main Highway, Kamo – Hikurangi River Bridge.—Thorburns Bridge (one 45 ft. span; 24 ft. roadway): This bridge is completed.

No. 308 Main Highway, Pakaraka – Awanui via Mangonui.—Te Keene Bridge (one 60 ft. span; 24 ft. Roadway): This bridge is completed.

Rataroa Deviation (Reconstruction), 1 mile: This deviation is completed.

No. 481 Main Highway, Kaitaia – Motukaraka via Broadwood.—Mansbridge's Bridge (two 48 ft., one 64 ft. spans; 24 ft. roadway): This bridge is completed.

Broadwood Bridge (two 37 ft., one 46 ft. spans; 24 ft. roadway): This bridge is completed.

No. 840 Main Highway, Whangaroa – Kaeo Bridge.—Culvert No. 671 (6 ft. by 6 ft. by 53 ft.): This culvert is completed.

Auckland District

General

New sealing was carried out over a total length of 5 miles 41 chains of State highways. Resealing and plant-mix surfacing, including that carried out on both State and main highways, amounted to approximately 38 miles 59 chains, making a total for the year of 44 miles 20 chains. In addition, 10 miles 21 chains of highway were primed as a preliminary to sealing.

On No. 5 State Highway, foundations for the new bridge at Silverdale were completed and a contract has been let for the remainder of the construction of this bridge,

and also a contract for the formation and base-course metalling of approaches. For the Te Hana Overbridge, also on No. 5 State Highway, fifteen concrete piles have been cast.

On No. 6 State Highway the Coronation Bridge, a structure of 103 ft. in length, was completed over the Opanuku Stream, in Henderson Borough.

Surveys

Northern Outlet.—Survey of the Oakley Creek to Lincoln Bridge section, a length of 4 miles 50 chains, which is in effect a deviation of No. 5 State Highway, aimed to reduce its existing length by 4 miles 55 chains, was commenced in September, 1947. At 31st March permanent pegging from Lincoln Bridge was 60 per cent. completed.

Southern Outlet.—Permanent pegging of approximately 5 miles from the Harp-of-Erin to Otahuhu was continued, and the 3 miles 40 chains to the junction with the proposed south-eastern outlet at Sylvia Park was completed.

Four short deviations on the No. 7 Auckland–Hamilton State Highway have been surveyed between Bombay Hills and Mercer, designed to fit in with the general scheme for improvement to this highway.

No. 5 State Highway, Birkenhead–Maungaturoto.—Between Birkenhead and Albany a total length of 3 miles 54 chains of shoulder widening and metalling was carried out by the Public Works Department, and of this length 1 mile 40 chains has been covered by top course.

At Dairy Flat, formation widening, together with improvements to drainage, has been carried out by the Public Works Department over a length of 1 mile 51 chains.

On the Albany – Dairy Flat section 1 mile 43 chains of priming has been completed and a length of 1 mile 21 chains sealed by the Public Works Department.

Between Orewa and Waiwera two sections, totalling 1 mile 60 chains, were resealed by the Public Works Department. A private contract was let for plant mix on four sections between Silverdale and Hatfield's Beach, a total of 4 miles 70 chains being completed.

Drainage and footpath improvements are in hand at Orewa.

Between Waiwera and Puhoi, 2 miles 39 chains of road were resealed, and plant mix was laid over a length of 2 miles 4 chains at Puhoi. Resealing was also completed over 3 miles 52 chains in Dome Valley and 78 chains at Te Hana. Between Te Hana and Topuni 4 miles 44 chains were resealed.

In Warkworth Township, 1 mile 18½ chains of highway were treated with plant mix. Mill Lane junction in this town has been covered with top course and is now ready for sealing.

No. 6 State Highway, Auckland–Helensville.—In Henderson Borough the new bridge over the Opanuku Stream was completed and is now open for traffic. Formation and metalling of approaches is in hand.

In Waitemata County area, resealing was carried out at Waimauku over a length of 12 chains, and between Waimauku and Huapai a length of 2 miles 23 chains was completed by contract. Formation of a parking area at Kumeu Saleyards has been completed.

On Woodhill–Ohirangi section, 28 chains of reconstruction were completed at Woodhill, and top course laid. One mile 77 chains of this section has been primed ready for sealing. At Te Pua, widening of shoulders is progressing, top-course metal being added.

In Helensville Borough a length of 8 chains was primed and sealed.

Plans are being prepared for the realignment of 47 chains of highway at the northern end of the Borough.

No. 7 State Highway, Auckland–Hamilton.—The work of widening the existing Great South Road from the Harp-of-Erin to Green Park Road junction involved the

excavation and formation of 10 ft. on each side, necessitating the adjustment of section frontages, power and telegraph lines, and underground services. Reconstruction was commenced along the eastern side during August and has been in progress on this side only, very fair progress having been made.

On Manukau County section, plant-mix smoothing coat was applied as a trial on the concrete surface, a length of 44½ chains being involved. On this section also 80 chains of resealing were effected on shoulders.

In Manurewa Borough fourteen bus stops were formed and metalled.

Maintenance in Papakura Borough included a plant-mix smoothing coat on sealed shoulders in the business area 50 chains by 12 feet in width.

Reconstruction and widening of shoulders on Bombay Deviation has been in progress from the junction with Razorback–Jericho Road to Pokeno. A total length of 5 miles 20 chains of shoulders has been re-formed and metalled 7 ft. 6 in. in width, and 2 miles 30 chains primed.

No. 14 State Highway, Pokeno–Paeroa via Ngatea.—In Franklin County, reconstruction, including remetalling and widening of 4 miles 20 chains, was completed between 2 m. 25 ch. and 6 m. 45 ch. Priming and road-oil sealing has been completed over this length. Between 8 m. 30 ch. and 12 m. 19 ch., widening of formation has been completed and 67 chains of tile drains laid. Redecking was carried out on Grattan's Bridge. Repairs to failed sections were carried out covering approximately 3,000 square yards.

In Waikato and Hauraki Plains Counties extensive repairs were effected to old seal, totalling 8,500 square yards and 1,000 square yards respectively.

No. 310 Main Highway, Mangere Bridge – Papatoetoe.— In Manukau County a length of 1 mile 60 chains was resurfaced with plant mix, and the whole of this highway is now in good condition.

No. 317 Main Highway, Mount Albert – Royal Oak.—Mount Roskill Road Board carried out metalling and sealing over a length of 66 chains of shoulders each side of the central sealed roadway to a width of 10 ft. 6 in. This highway has now been revoked.

At the junction of this highway with the Manukau Road and four other roads a monument was removed in connection with an improvement scheme for the purpose of overcoming traffic difficulties; setting back of kerbs, signposting, and road marking was completed, and it is proposed, when labour is available, to erect medial islands at this point to divide the intersecting roadways.

No. 383 Main Highway, Beach Road.—Waitemata County carried out resealing over a length of 45 chains between 0 m. and 2 m. on this highway. Slipping occurred on the length between 2 m. and 4 m., and in order to hold back the earth a retaining-wall was constructed in most serious places.

No. 384 Main Highway, Henderson–Swanson via Kumeu.—Resealing was effected over 3 miles 43 chains of this highway in Waitemata County. A definite improvement was effected in the alignment from Swanson to Waitakere. This highway has been maintained in good order.

No. 387 Main Highway, Waikumete – West Coast.—In Glen Eden Town District reconstruction over a length of 1 mile 14 chains has been carried out and base-course metal laid. Also 72 ft. of 9 in., 175 ft. of 12 in., and 52 ft. of 15 in. concrete pipes were laid and two cesspits constructed.

No. 406 Main Highway, Papatoetoe–Howick.—Reshaping and metalling of 40 chains from Chapel Road corner was completed, and from Papatoetoe Borough boundary to East Tamaki factory the county completed 1 mile 40 chains of plant-mix smoothing coat.

No. 407 Main Highway, Howick–Manurewa.—In Howick Town 58 chains of road-oil sealing were completed, and in Manukau County extensive remetalling of worn-out sections, including restoration of cants and cambers, was attended to.

No. 531 Main Highway, Buckland's Beach.—Manukau County applied a smoothing coat over a length of 40 chains of this highway. Preliminary proposals have been approved for the construction of a sea wall near the end of this highway to combat erosion.

No. 575 Main Highway, Waitakere Scenic Drive.—Various lengths of this highway totalling 3 miles 55 chains were resealed. This work was carried out by contract.

No. 578 Main Highway, Mangere Aerodrome.—Plant-mix resurfacing was completed over a length of 72 chains at the northern end of this highway.

No. 804 Main Highway, Papakura–Kawakawa.—Restoration work on sealed section has been carried out by Manukau County, 2 miles of resealing being completed, and a further length of 1 mile 40 chains is ready for sealing.

No. 583 Main Highway, Brigham's Creek – Hobsonville.—A contract for resealing 3 miles 55 chains of this highway was completed.

No. 873 Main Highway, Drury–Waiuku–Kohekohe.—The length of this highway from Waiuku to Kohekohe, 8 miles 24 chains, has been primed preparatory to sealing, for which a contract has been let. Between Drury and Wesley College extensive repair work has been effected, approximately 1 mile 60 chains of road being entirely reconstructed in isolated sections.

No. 876 Main Highway, Onewa.—Northcote Borough completed resealing of 42 chains of this highway to a width of 24 ft.

Hamilton District

State Highways

Maintenance resealing has been carried out as under:—

	M.	CH.
No. 7 State Highway, Auckland–Hamilton	7	18·50
No. 9 State Highway, Te Kuiti – New Plymouth ..	6	20
No. 14 State Highway, Pokeno–Paeroa	4	60
No. 15 State Highway, Thames–Paeroa	4	56
No. 17 State Highway, Hamilton–Paeroa	2	54
No. 18 State Highway, Hamilton–Rotorua	8	9·50

Reconstruction: State Highways

On the No. 8 State Highway, Hamilton – Te Kuiti, reconstruction work between Te Kuiti and Hangatiki has been proceeded with. One hundred and sixty-one chains of heavy formation completed, 223 chains base course, 143 chains top course, and 143 chains sealing. Forty-two culverts, of a total length of 2,124 ft., placed. Sub-drains amounted to 1,700 ft. of perforated pipes and field tiles.

On the No. 18 State Highway, Hamilton–Rotorua, reconstruction between Hamilton and Cambridge has been completed for 9 miles, and of this length 1 mile 14 chains have been primed and sealed. A further 2 miles 56 chains have been primed only.

On the same State highway a deviation of 119 chains, necessitated by the filling of the new Karapiro Lake, has now been completed. This length has also been primed and sealed.

On the No. 14 State Highway, Pokeno–Paeroa, 2 miles 45 chains of dust-laying seal were laid, and 72 chains on the No. 16 State Highway, Paeroa–Whakatane.

Reconstruction: Main Highways

In the Waipa County a length of 7 miles 62 chains of the No. 869 Main Highway, Te Awamutu – Pirongia, has now been reconstructed and 5 miles 62 chains have been sealed with No. 1 tar.

In the same county, 4 miles 57 chains of No. 319 Main Highway, Te Awamutu–Cambridge, is being reconstructed, mainly across peat swamp. The contractor is doing very good work.

In the Matamata County, reconstruction and re-alignment of 5 miles 25 chains of the No. 802 Main Highway, Matamata–Tauranga, has been completed up to base course.

In the Waitomo County the Department has commenced the reconstruction of 46 chains of No. 818 Main Highway, Hangatiki–Caves.

Bridges and Culverts: State Highways

No. 8 State Highway, Hamilton–Te Kuiti.—Waipa Bridge, Otorohanga: A start has been made driving test piles on the site of the proposed bridge.

No. 16 State Highway, Paeroa–Whakatane.—To temporarily replace the Waitekauri Bridge, 145 ft. of Bailey bridging were placed.

Main Highways

Test piles have been driven at the following sites:—

Piako County.—No. 311 Main Highway, Ohinewai–Tahuna: Mangawhara Stream.
Waipa County.—No. 466 Main Highway, Frankton–Pirongia: Mangapiko Stream.
Otorohanga County.—No. 869 Main Highway, Te Awamutu–Pirongia: Whatiwhatihoe Bridge, Waipa River.

Bridge-construction is in hand as follows:—

No. 802 Main Highway, Matamata–Tauranga (*Matamata County*).—Waiomou Stream Bridge, 103 ft. 4 in. by 24 ft.; and Omahine Stream Bridge, 103 ft. 4 in. by 24 ft.: Pile-driving on both of these almost completed.

No. 447 Main Highway, Ngatea–Waharoa.—Matamata County: Mangapapa Bridge, 32 ft. by 24 ft.

Hauraki Plains County: Nelson's Bridge, 25 ft. by 24 ft.

In the Raglan County, tenders have been called for the Okete Stream Bridge (100 ft.) on the No. 801 Main Highway, Hamilton–Raglan.

In the same county on the No. 573 Main Highway, Bryant Home, a contract has been let for the approaches and tenders invited for the Opotoro Bridge (286 ft.) over an inlet of the Raglan Harbour.

No. 465 Main Highway, Waihi Beach.—Waione Bridge, which collapsed in September last, has been replaced by a 30 ft. by 12 ft. R.S.J. bridge; Cascade Creek Bridge replaced by 60 ft. of 5-ft.-diameter R.C. pipes; and Township Bridge, having become unsafe, was replaced by a temporary 25 ft. span bridge 12 ft. wide.

No. 600 Main Highway, Thames–Coromandel.—Keretu No. 7 Bridge renewed by a 7 ft. by 7 ft. R.C. box culvert 35 ft. long.

Keretu No. 8 Bridge renewed by a 7 ft. by 7 ft. box culvert 50 ft. long.

TAURANGA DISTRICT

No. 16 State Highway, Paeroa–Whakatane.—With the opening-up of Woodlands Quarry a considerable improvement has taken place in the running surface, and 5,800 cubic yards of crushed metal were spread on the metal length between Athenree and Tauranga. The Waipapa Bridge has become dangerous, and a temporary bridge is being erected to take the traffic while the extensive repairs are effected. A contract has been let for the erection of the Judea Bridge, and steel is on the site. On the Tauranga–Te Puke section, two old narrow bridges have been replaced with culverts.

No. 18 State Highway, Hamilton–Rotorua.—Heavy seal patching has been required on this highway throughout the year; 3 miles 6 chains of resealing have been completed.

No. 19 State Highway, Rotorua–Whakatane.—Reconstruction and widening has been in hand from Tikitere round the shores of Lake Rotoiti, 150,000 cubic yards of material being excavated during the year. A new quarry at Rotoehu has been opened up.

The Edgecumbe Bridge, which is long overdue for replacement, was again damaged by floods, and new temporary piles had to be driven. A length of 20 chains through Te Teko Township was sealed with emulsion surface treatment.

No. 20 State Highway, Whakatane–Gisborne via Waioeka.—The Taneatua Deviation was completed, metalled, and opened for traffic, thus cutting out a portion of the highway subject to interruption by flooding. In the Waimana Gorge, widening has been continued. Ninety-eight chains adjacent to Whakatane have been primed, as part of 2 miles of sealing to be carried out this season. In Opotiki Borough, 20 chains of highway were given a maintenance-seal coat, and preparation of 4 miles from Opotiki towards Waioeka for sealing at an early date is in hand. In the Waioeka Gorge, widening has been carried out between 6 m. and 6 m. 65 ch., bridges repaired, slips cleared, and the large retaining wall at 20 m. is nearing completion. The survey of the gorge for realignment is in hand, and some 10 miles of field-work completed.

No. 21 State Highway, Rotorua–Taupo.—Shoulders on the sealing, damaged by heavy timber traffic, are being strengthened, and patching of the sealed length has been a constant job. During the year, four miles of maintenance sealing were carried out. On the Hickey's Flat–Reporoa section, 4½ miles of Taupo grit bituminous plant mix were placed. At the Control Gates, Taupo, 60 chains have been primed ready for Taupo grit bituminous mix surfacing.

No. 22 State Highway, Taupo–Napier.—The 20½ miles of this pumice highway to the Rangitaiki River is subject to heavy traffic, suffers from frost in winter and dust in summer, and is difficult to keep up to standard.

No. 23 State Highway, National Park–Taupo.—Taupo–Jellicoe Point Section: 2 miles in Taupo Township have been resealed, and the whole unsealed length to Waitahanui of 5¼ miles has been primed and is ready for grit-mix surfacing coat.

No. 411 Main Highway, Papamoa–Mount Maunganui.—Heavy maintenance, including stabilizing sandy sections with clay, has been carried out, and 2 miles prepared for sealing.

No. 413 Main Highway, Wainui.—The Whakatane Borough has sealed 15 chains of this highway to the borough boundary.

No. 802 Main Highway, Matamata–Tauranga.—Between Barke's Corner and the Omanawa River, several lengths have been considerably improved, and 40 chains at Tauriko sealed.

No. 810 Main Highway, Opotiki–Te Araroa.—In widening and improving by Maori gangs, over 21,000 cubic yards of material have been excavated. Over 5,000 cubic yards of screened shingle have been applied as maintenance. Floods at Kereu damaged the bridge approaches, necessitating groyne work and willow protection. Retaining-walls have been built at several narrow places on the Motu Bluffs.

No. 844 Main Highway, Te Ngae–Paengaroa.—This section, nearly all pumice, has been improved and corners cut back, and crushed metal from Hamurana Quarry placed as available on deviations and hill sections.

Gisborne District

State Highways

No. 20 State Highway, Whakatane–Gisborne via Waioeka.—On the Trafford's Hill reconstruction (51½ miles to 56 miles), 3½ miles are now completed, the earthwork quantities shifted being 89,720 cubic yards.

On the reconstruction and sealing, 15·1 miles to 19 miles, work was commenced and 15,000 cubic yards of earthwork completed, 7½ chains of creek diversion constructed, 62 chains of fencing shifted, and a contract let for the supply of 10,000 cubic yards of Waipaoa shingle.

On general maintenance, 6,769 cubic yards of metal and shingle were used.

No. 24 State Highway, Gisborne - Te Araroa.—On maintenance 12,990 cubic yards of metal were used.

Bridge repairs were carried out to the Hikuwai River bridges and Waiputaputa Bridge.

Groynes were constructed at 61 m. and 78 m. to arrest erosion.

A new surfaceman's cottage was erected at Te Puia.

On tree-planting, effected to protect the highway, 17,000 *Pinus* and 18,000 gums, mostly *viminalis*, were planted out, together with willow, silver-poplar, and prickly acacia. The shipmast locust that were imported from America were planted out in the nursery and 225 are now growing. Twenty-three thousand *Pinus* and gums were in the Te Puia Nursery for this season's sowings.

No. 25 State Highway, Gisborne–Napier via Hangaroa.—A maintenance-seal coat was applied between 8½ m. and 10½ m., 137 chains in all.

Shoulders and batters were repaired between 18½ m. and 22 m. by seasonal labour, 6,000 cubic yards of earthwork being removed.

Main Highways

No. 330 Main Highway, Gisborne–Ormond via Waiohika.—Patching-work was carried out with 5,000 gallons of bitumen, and 2,000 cubic yards of gravel were used on the shoulders.

No. 331 Main Highway, Patutahi–Rere.—Cook County Section: 1,000 gallons of bitumen were used for extensive patching and 1,200 cubic yards of gravel used for repairs to shoulders. On the unsealed portion, 5,000 cubic yards of gravel were used.

Waikohu County Section: For top-dressing 642 cubic yards of shingle were used, and 155 lineal feet of 12-inch pipe culverts were installed. Repairs to shoulders and batters were carried out between 17·6 m. and 18·6 m. where subsidences had occurred.

No. 336 Main Highway, Mangakino–Waiomatatini.—For top-dressing, 1,959 cubic yards of maintenance shingle were used, and Ruatoria Township was given a maintenance seal coat over 27 chains.

No. 541 Main Highway, Manutuke–Wairoa via Mangapoike Valley.—The bitumen surfacing was patched and 4,000 gallons of bitumen were used. On the shoulders, 1,600 cubic yards of gravel were spread.

No. 810 Main Highway, Opotiki - Te Araroa.—For top-dressing, 3,330 cubic yards of shingle were used.

A reinforced-concrete slab bridge was constructed over the Punaruku Stream and groynes put in at the Mangaomeka Ford.

No. 811 Main Highway, Tokomaru Bay Wharf.—For top-dressing, 584 cubic yards of shingle were used.

Waima Township: 40 chains of road were reconstructed and metalled in readiness for sealing.

No. 813 Main Highway, Gisborne–Wairoa via Morere.—6·63 m. to 10·3 m.: Extensive bitumen repairs were carried out, 1,800 gallons being used. One thousand cubic yards of shingle were used for shouldering. 10·3 m. to 32·5 m.—Reconstruction and Sealing, 10·3 m. to 16 m.: Reconstruction was completed over the whole section, 5 miles 37 chains, and 268 chains primed.

Wharerata Hill Improvement: Twenty chains of widening were completed between 26 m. and 27 m., 4,450 cubic yards of earthwork being shifted by seasonal workers.

HAWKE'S BAY DISTRICT

New Sealing (25 miles 40 chains)

No. 25 State Highway, Gisborne–Napier via Hangaroa.—Wairoa–Ohinepaka: Minor improvements over this section of 6 miles involved some 24,000 cubic yards of earthworks; 13,500 cubic yards of metal were placed. Six miles were primed and 4½ miles sealed.

Waikare River – Waikoau River: Minor improvements were undertaken and 17,000 cubic yards of metal spread over the full length of this section of 14¾ miles. The whole length was primed, 14½ miles were sealed with road oil and ¼ mile was sealed with No. 1 tar.

Tangoio Lagoon Bridge – Whirinaki: This section of 1 mile 68 chains was metalled, primed, and sealed.

Esk River Bridge Approaches and Esk Overbridge Approaches: These two approaches form a continuous length of 1 mile 45 chains and the whole was primed and sealed with road oil.

No. 22 State Highway, Taupo–Napier.—Metalling, priming, and sealing were completed over two gravelled sections totalling 2 miles 65 chains, thus providing a continuous sealed surface to Mistletoe Hill, approximately 25 miles from Napier. These two sections were between Dillon's Hill and Munn's Bridge.

Maintenance Sealing (23 miles 44 chains)

The following sections received maintenance-seal treatment, proceeded in some cases by extensive metalling:—

No. 25 State Highway, Gisborne–Napier via Hangaroa:—

	M.	ch.	
Frasertown–Wairoa	1	24	M.C. 3 and pea gravel.
Wairoa Borough	0	22	M.C. 3 and grit.
Whirinaki South	0	40	M.C. 3 and pea gravel.

No. 813 Main Highway, Gisborne–Wairoa via Morere:—

	M.	ch.	
Wairoa Borough	0	19½	M.C. 3 and grit.

No. 30 State Highway, Napier – Palmerston North:—

	M.	ch.	
Paki Paki – Te Aute	0	60	No. 1 tar and pea gravel.
Takapau Plains	11	40	M.C. 3, 9 miles; No. 1 tar, 2½ miles.
Mangatewai-iti Hill	2	20	M.C. 3 and chips.
Maharahara	0	12	Road oil and chips.
Matahiwi South	0	27	Road oil and chips.
Daveys Road	0	26	No. 1 tar and chips.
Mangapapa Bridge approaches	0	14	Road oil and chips.
Mangamanaia Overbridge	0	6	Road oil and chips.

No. 341 Main Highway, Woodville–Tamaki:—

	M.	ch.	
Dannevirke County	0	66	Plant mix.

	M.	ch.	
No. 567 Main Highway, Farndon – Paki Paki	2	22	Reconstruct, metal, and reseal (tar).

	M.	ch.	
No. 495 Main Highway, Waiohiki–Pakowhai	0	13	No. 1 tar and chips.

In addition to the above, extensive reconstruction and metalling was completed over 192 chains of the Woodville County section of the Woodville–Masterton State Highway, and this has been treated with No. 1 tar and grit.

No. 570 Main Highway, McLean Street North.—Twenty-seven chains were reconstructed and metalled.

No. 567 Main Highway, Farndon–Paki Paki.—Raise, Metal, and Seal: A low-lying section has been raised from 2 ft. to 4 ft. over a distance of approximately 1½ miles preparatory to metalling and sealing. A total length of 3 miles is involved, and 35,000 cubic yards of spoil were placed during the year.

Bridges and Culverts

Progress on respective highways was as follows:—

No. 22 State Highway, Taupo–Napier.—Ninety feet of 8 ft. by 7 ft. R.C. culvert were constructed, and 20 chains of approaches involving 7,000 cubic yards formation, together with metalling were completed.

No. 31 State Highway, Woodville–Masterton.—On the Woodville County section, Sinclair's Bridge was replaced with a 10 ft. 6 in. by 7 ft. R.C. culvert 38 ft. 6 in. in length. A 9 ft. by 6 ft. by 35 ft. R.C. culvert replaced the Manga-atua Overflow Stream bridge, and a 6 ft. by 6 ft. culvert to replace Anson's Bridge is 50 per cent. complete.

No. 848 Main Highway, Dannevirke–Waipukurau via Porangahau.—In the Dannevirke County the Pene Pene Culvert of 74 ft. by 9 ft. by 9 ft. was constructed, together with 17½ chains of approaches.

In the Weber County, Morgan's Bridge, a single 45 ft. two-way concrete bridge, was completed with 6 chains of approaches.

In the Patangata County a 6-ft.-diameter concrete culvert was constructed to replace Geenty's Bridge, and approximately 15 chains of formation and metalling of the approaches were completed.

No. 814 Main Highway, Waipawa–Tikokino.—The Manga-o-nuku River Bridge, a two-way concrete structure 447 ft. in length, was completed.

No. 845 Main Highway, Napier–Hastings via Fernhill: Ngaruroro River Bridge at Fernhill (fifteen 80 ft. spans, two 60 ft. spans; total length, 1,320 ft.; roadway, 24 ft.; footpath, 4 ft. 6 in.): Piles driven for year, 4,279 ft., a total of 8,063 ft. (driving completed).

Piers and Abutments: Nine constructed during year (684 cubic yards), making a total of 14 (988 cubic yards).

Girders, Beams, and Deck Slab: Three hundred and sixty lineal feet constructed during year (701 cubic yards).

Falsework, staging, &c., is well in hand over the remaining sections, and the whole work was 59 per cent. complete as at 31st March, 1948.

Afforestation for Highway Protection: Tangoio Conservation Reserve

Twenty-five thousand trees were planted out on reserves adjacent to the highway and a further 33,000 lined out in the nursery for this winter's planting. Planting of willows and poplars on eroding stream-banks was continued with promising results.

TAUMARUNUI DISTRICT

No. 23 State Highway, National Park–Taupo.—For repairs, 1,358 cubic yards of crushed metal were used.

The Manuia Stream Bridge was strengthened and handrails repaired. Both the Whakapapanui and Whakapapiti truss bridges were strengthened by placing Bailey panels on each side of the bottom chords and fastening the transoms to the bottom chord of the Bailey panels.

No. 27 State Highway, Te Kuiti–National Park.—For maintenance, 2,003 cubic yards of crushed ¾ in. running-course metal were carted out.

On the Ongarue-Okahukura section, for the reconstruction of 6½ miles, contracts have been let for metal-supplies and are well in hand.

A twin 6 ft. concrete culvert 100 ft. in length has been completed to replace the Roto Stream Bridge.

An old 5 ft. by 5 ft. wooden box culvert on the Manunui Town District section was replaced with a 6-ft.-diameter concrete culvert. At the southern approach to the Matapuna combined road and railway bridge, 250 lineal feet of highway guard fence has been erected.

Manunui–Owhango (Reconstruction), 5 miles: A contract has been let and is in hand for the supply of 3,500 cubic yards of top-course aggregate and 1,500 cubic yards of sealing-chips.

No. 350 Main Highway, Mangatupoto–Ohura.—In the restoration of flood damage, 4,800 cubic yards of crushed metal and gravel were carted out for 12 miles of top course.

No. 502 Main Highway, Kururau–Taumarunui.—Okohua Bridge Renewal: This bridge, 61 ft. in length with a 12 ft. roadway, concrete abutments, and pier, with a reinforced-concrete deck constructed on R.S.J.s, together with approaches, was completed.

No. 543 Main Highway, Taumarunui–Ongarue.—Altogether, 1 mile 25 chains of stabilized top course was completed and 55 chains of it sealed 13 ft. wide.

No. 823 Main Highway, Stratford–Taumarunui.—For 5 miles of top-dressing, 1,802 cubic yards of crushed metal and gravel were used, and 1,370 cubic yards for general repairs. Three high papa corners were cut back to improve visibility, and corners improved last year were metalled.

Tarata Bridge Renewal: Plans have been approved and tenders called.

No. 870 Main Highway, Pio Pio – Tatu.—Waitewhena Section: Access to open-cast mine has been carried out during the year. Banks over approximately 40 per cent. of the 12 miles of this highway, which is used by the Mines Department, have been graded off and widened; sections have been metalled. During the year, 3,601 cubic yards of metal were spread.

On the Ohura County section, 6 miles of top-course metalling were laid.

Huiatahi Culvert: Reinforced-concrete culvert, 12 ft. by 10 ft. by 43 ft 4 in. long, with reinforced parallel wing walls 14 ft. 6 in. long, 90 per cent. completed, and formation 45 per cent. completed.

No. 884 Main Highway, Ahititi–Ohura.—For the top-course metalling of 10 miles, 6,248 cubic yards of crushed gravel were used.

Taranaki District

No. 9 State Highway, Te Kuiti – New Plymouth.—Plans have been completed and material ordered for the replacement of the Mohakatino Stream Bridge. Construction of the approach to the south end is in hand. The Mokau Quarry has been opened up to supply stone for the protection of the approach fillings where subject to tidal wash.

At Ahititi a smoothing coat of road mix was applied over a length of 1 mile 8 chains.

Widening of two bad corners on Mount Messenger has been completed, and the roadway primed. A road-oil seal coat has been applied to an 8-mile-length of highway from near Okau Road over Mount Messenger and joining the previous season's work from Mount Messenger to Uruti.

To the immediate north of the proposed 1½-miles-long Uruti–Mangamaio reconstruction, a length of 1 mile 8 chains has been laid in dust-seal as a temporary measure.

Resealing from Okoke to Ohanga consisted of 1 mile 70 chains of S.R.M.C. 3 and local chips. One mile of widening at Waipapa was done to give 22 ft. width and the widening was sealed with No. 1 tar and local chip. The same kind of work was carried out by contract in the Waitara Borough to a finished width of 24 ft., the widening being sealed with S.R.M.C. 3 and local chip.

No. 10 State Highway, New Plymouth – Hawera.—A maintenance seal coat was applied from the New Plymouth Borough boundary to near the Mangorei Stream and a short length near Mangamahoe Stream Bridge, a total distance of 3 miles 16 chains.

On the 1 mile 23 chains section in Inglewood Borough the length outside the shopping area was trimmed at the edges and straightened on the shoulders to bring the finished width to 24 ft. In part of the shopping area the shoulder was shaped up and sealed. A smoothing coat of plant mix has been applied over the whole length for a width of 24 ft., improving one of the roughest lengths in the district.

Reconstruction to a 34-ft-wide formation from Durham Road to Norfolk Road, a distance of 1 mile, was started, and to date all earthworks and base-course metalling have been completed. Numerous culverts were renewed and a water-drive lined with concrete.

In Stratford Borough from Flint Road to Seyton Street, a length of 68 chains, the shoulders have been trimmed and metalled beyond the existing seal to give a sufficiently wide roadway to allow for a 24 ft. finished sealed surface.

A contract has been let for and work commenced on the reconstruction of 1 mile 11 chains of highway from Stratford Borough to south of Bird Road.

No. 11 State Highway, Hawera–Wanganui.—At Tongahoe Bridge and on Manawapou Hill a total of 1 mile 70 chains of reseal has been completed.

No. 26 State Highway, New Plymouth–Hawera via Opunake.—A contract has been let for metal to be used to widen the existing sealing from New Plymouth to Oakura. The formation has been widened from Patua Hill to Leith Road in readiness for widening the existing sealing to 22 ft. and a contract for the supply of metal has been completed.

Sealing to 22 ft. width was completed from Leith Road to Stoney River.

Widening of the sealing to 22 ft. from Taikatu Road to Manaia, a distance of 5 miles, has been completed, regrading being carried out at Otakeho Factory and Otakeho Stream Bridge.

No. 823 Main Highway, Stratford–Taumarunui.—Whangamomona County Section: The full length of this from the Stratford County boundary to Whangamomona Township, a distance of 21 miles, has been surfaced with metal railed from Midhirst or carted by road from the Public Works Department quarry at Te Wera.

Widening of the highway has been done on the west side of Whangamomona Township to give material to raise a low-lying section above flood-level.

Depots: Four acres of land in the Stratford Borough has been acquired for a highway depot. Two Quonset huts have been erected for stores purposes and a temporary shelter put up for housing plant whilst under repair.

No. 354 Main Highway, Ihaia.—Egmont County Council has resealed 1 mile 40 chains in No. 1 tar and local chips.

No. 356 Main Highway, Ngatimaru.—Clifton County Council has sealed 1 mile 40 chains in road oil and local chips.

No. 358 Main Highway, Okato–Puniho.—Taranaki County Council has tar primed the length of 1 mile 40 chains. Delivery of materials for completion of sealing has been completed.

No. 359 Main Highway, Skeet.—Eltham County Council laid a maintenance seal of 40 chains in M.C. 3 and Kakariki chips from Hunter Road westwards.

Waimate West County Council laid 2 miles 4 chains in plant-mix smoothing coat and 33 chains of No. 1 tar and local chips between Palmer Road and Glen Road.

No. 362 Main Highway, Hawera–Mokoia.—Hawera County Council let a contract for reconstruction of 1 mile 40 chains in 1946–47. The completion of laying of 208 ft. of 48-in.-diameter pipe has taken place this year. Also a commencement was made on the earthwork. Ninety per cent. of this has been done. Forty chains of base course were laid.

No. 425 Main Highway, Inland North.—Clifton County Council has completed the survey, but has been held up on agreement to enter on Maori land in connection with a deviation and reconstruction of part of this highway. Fifty chains of maintenance reseal has been completed in road oil and local chips.

No. 426 Main Highway, Carrington.—Taranaki County Council has tar primed the reconstructed length of 68 chains.

No. 429 Main Highway, Eltham–Hawera via Keteonetea.—Eltham County Council placed a maintenance seal of S.R.M.C. 3 and Kakariki chips over 40 chains of this highway.

No. 506 Main Highway, Rahotu–Kahui.—Egmont County Council has completed a resurfacing in road mix for a distance of 80 chains and has reshaped, metalled, and resealed in road oil and local chips a distance of 80 chains.

No. 508 Main Highway, Cheal.—Stratford County Council has reconstructed and tar primed a length of 1 mile 40 chains.

No. 820 Main Highway, Inglewood–Purangi.—Inglewood County Council has completed a maintenance reseal over a distance of 1 mile 28 chains with S.R.M.C. 2 and Kakariki chips.

The Waitara River bridge at Tarata, a wooden truss bridge 244 ft. long, forty-nine years old, was found to be in a bad state, and a loading restriction of 5 tons gross was placed on it. Survey of site has been completed and preliminary design for replacement is in hand.

The Waitara River Bridge at Purangi, on which a loading restriction has been placed for some time, is also under consideration for renewal. Again survey of site has been completed and preliminary design for replacement is in hand.

No. 821 Main Highway, Devon Road – North Egmont Hostel.—Taranaki County Council has let a contract for the reconstruction of 2 miles 20 chains of this. Work on alteration of fences has commenced.

Inglewood County Council has completed a maintenance seal of 75 chains in S.R.M.C. 2 and Kakariki chips.

No. 822 Main Highway, Opunake–Rawhitiroa.—Egmont County Council has resealed 2 miles 21 chains in tar and local chips.

Eltham County Council has reconstructed and metalled at Sangster Road a distance of 37 chains, and has placed a maintenance reseal coat in S.R.M.C. 3 and Kakariki chips for 82 chains.

No. 823 Main Highway, Stratford–Taumarunui.—Stratford County Council has completed the improvement and metalling of a bad corner on Strathmore Saddle. This is over a length of 7 chains.

No. 824 Main Highway, Manaia – Dawson Falls.—Waimate West County Council has completed a maintenance seal over a distance of 76 chains in No. 1 tar and local gravel.

Eltham County Council has completed a maintenance seal over a distance of 72 chains in S.R.M.C. 3 and Kakariki chips at Kaponga and south of Kaponga.

Stratford County Council has commenced and half completed the work of improving visibility on the $3\frac{3}{4}$ miles of highway within the Mountain Reserve.

No. 825 Main Highway, Normanby–Manaia.—Waimate West County Council has completed 52 chains of maintenance reseal in No. 1 tar and local chips.

No. 826 Main Highway, Stratford–Kaponga.—Stratford County Council has completed the maintenance reseal of 3 miles 2 chains in four lengths in S.R.M.C. 4 and Kakariki chips.

Wanganui District

Construction

No. 11 State Highway, Hawera–Wanganui (Patea–Wanganui).—Whenuakura Deviation: Very little progress was made, the contractors abandoning their contract in July after having excavated approximately 3,000 cubic yards. A fresh contract has been let.

Nukumaru Flat Reconstruction: During the year earthworks and reconstruction have been completed and sealed (approximate length, 4 miles).

No. 28 State Highway, National Park – Wanganui.—Raetihi to 31 m. Reconstruction: During the year further work has been carried out in the direction of improving grading and alignment, quantities as under having been handled: Earthwork, 30,228 cubic yards; metalling, 5,444 cubic yards; fencing, 158 chains; side drains, 27 chains; culverts, 376 ft.

No. 29 State Highway, Horopito–Bulls via Taihape.—Tohanga Road: 5 miles of this road have been strengthened and dust-lay sealed or primed.

Ohakune–Waiouru (Reconstruction and Sealing): A length of 11 miles 66 chains has been completely reconstructed, ½ mile sealed, balance partially primed, and further work is in hand. Approximately 10,000 cubic yards of river metal and 33,000 cubic yards of volcanic grit have been placed as surfacing. A mass concrete culvert at foot of Waiouru Hill has been completed, replacing a small existing bridge.

Winiata Deviation: During the year the mass concrete culvert has been completed.

Cliff Road – Norwood Corner (Reconstruction): This work has been put in hand. A metal-pit has been opened and 1 mile of reconstruction completed.

Cliff Road – Greatford: 4 miles tar sealed following reconstruction.

Ohingaiti Township Footpath: The reconstruction of this item has been completed.

No. 366 Main Highway, Curl's Bridge – Upper Tutaenui.—From Marton Borough to Tutaenui, 2 miles 66 chains of this highway were reconstructed and sealed.

No. 472 Main Highway, Wanganui Airport.—Realignment has been carried out at junction of this highway with No. 12 State highway, improving safety and visibility.

No. 827 Main Highway, Pipiriki–Raetihi–Ohakune.—Reconstruction of 3 miles 15 chains of this highway was completed and sealed in December last.

No. 831 Main Highway, Greatford–Ashhurst.—Reconstruction of the first 40 chains from Greatford was completed ready for sealing, and a start has been made with reconstruction of the remaining 1 mile 30 chains to the Kakariki Bridge.

Renewals

No. 12 State Highway, Wanganui–Levin.—During the year work on the Rangitikei River Bridge at Bulls has progressed to the stage where the fabrication of girders is 72 per cent. complete and the deck contract is 38 per cent complete. The whole work is now 68 per cent. complete.

No. 28 State Highway, National Park – Wanganui.—Renewal of Upokongaro Stream Bridge is in hand, all piles having been cast, and driving is about to commence.

Local-body resealing was carried out as follows:—

Highway.	Location.	Length.	Type.
		M. CH.	
No. 367, Turakina – Cliff Road ..	Marton Borough Council ..	0 60	Plant mix.
No. 432, Ongo	Hunterville Town Board ..	1 5	Road oil.
No. 549, Patea Beach	Patea Borough Council	0 60	Road oil.
No. 850, Ball	Patea County Council	1 10	Road oil.
No. 851, Kaharoa	Patea County Council	2 0	Road oil.
No. 852, Kohi	Patea County Council	0 60	Road oil.

New work sealing by local bodies was carried out as under:—

Highway.	Location.	Length	Type
		M. CH.	
No. 368, Taihape – Murray's Track ..	Taihape Borough Council ..	0 32	Road oil.
No. 852, Kohi	Patea County Council	1 0	Tar primer; road oil.
No. 853, Moumahaki–Mangawhio ..	Patea County Council	0 60	Tar primer; road oil.

The total length of dustless highways has been increased from 227 miles 48 chains to 261 miles 6 chains.

PALMERSTON NORTH DISTRICT

No. 12 State Highway, Wanganui–Levin.—Manawatu County: On the Sanson-Himitangi section, 50 chains of emulsion water-proofing seal were completed using $\frac{1}{4}$ in. to $\frac{1}{8}$ in. chips.

Between Rangitikei River Bridge and Sanson, including the Sanson Township, 60 chains of plant mix were laid as a smoothing coat of $2\frac{1}{2}$ cubic yards to the chain.

Foxton Borough: A total length of 60 chains of plant mix was laid as a smoothing coat at the rate of 2 cubic yards per chain. A strip approximately 8 ft. wide has been tar sealed, carrying the paved carriageway to the kerbing for a distance of 35 chains.

No. 30 State Highway, Napier – Palmerston North.—On the 28th June the highest flood since 1941 caused a serious washout on the highway just north of the Ballance Bridge, Manawatu Gorge. Sixty feet of Inglis bridge has been erected over this washout as a temporary measure, pending proposals for permanent repairs. Twenty chains of old seal were scarified, remetalled, and sealed.

On the Oroua section, the reconstruction of Currie's Hill has been commenced, a start being made with fencing and digging out peat in readiness for back-filling with gravel as a foundation for road-formation.

On the Kairanga section from James Line intersection to Kairanga – Oroua County boundary, 2 miles of plant mix were laid as a smoothing coat at from $\frac{3}{4}$ to $2\frac{1}{2}$ cubic yards to the chain.

No. 33 State Highway, Sanson – Palmerston North.—On the Kairanga section, 25 chains of old seal between the Mangaone Bridge and Whiskey Creek Bridge were scarified, remetalled, primed, plant mix laid at the rate of 5 cubic yards per chain, and the grade raised 6 in. through the lowest portion to ease flooding.

From the Whiskey Creek Bridge to the Kairanga-Bunnythorpe intersection, a distance of 1 mile 18 chains, a smoothing coat of plant mix was applied at the rate of 2 cubic yards per chain.

On the Manawatu section, plant-mix surfacing was laid between the Oroua Bridge and Awahuri for a distance of 40 chains at the rate of 3 cubic yards per chain. Sixty chains of plant-mix surfacing were also laid at deceptive bend north of Mount Stewart and a further 100 chains were given a plant-mix application.

No. 375 Main Highway, Longburn–Tangimoana.—Kairanga County: 1 mile 50 chains between No. 1 Line and Kairanga–Bunnythorpe Main Highway has been reconstructed, remetalled, and primed and 1 mile 20 chains sealed.

No. 376 Main Highway, Bunnythorpe–Kairanga.—One mile of this highway from Gillespies Line towards Kairanga was plant-mix surfaced during November.

No. 377 Main Highway, Feilding–Hunterville.—Kiwitea County: Extensive repairs to the concrete foundation of Jamieson's Bridge have been carried out and protective groynes constructed. Thirty chains of highway at Davis' Cutting have been prepared for sealing.

No. 439 Main Highway, Pohangina–Apiti.—On the 25-chain Coal Creek Deviation, culverts and 50 per cent of the earthwork are completed. Reconstruction of the highway through Apiti Township was in hand at the end of the period.

No. 553 Main Highway, Cheltenham – Mackay's Line.—Kiwitea County: The whole length of this highway, 2 miles 1 chain, has been reconstructed, metalled, and prepared for sealing and a tar-sealing contract let.

No. 582 Main Highway, East Street.—Feilding Borough: 30 chains of this highway were surfaced with plant mix.

No. 829 Main Highway, Awahuri–Mangaweka.—Feilding Borough Section: The Kiwitea Bridge approaches, totalling 28 chains, were formed and primed.

No. 830 Main Highway, Feilding – Cliff Road via Stanway.—Feilding Borough Section: The Borough Council has primed 19 chains of this highway.

No. 831 Main Highway, Greatford–Ashhurst.—Oroua County Section: Between Bunnythorpe and Taonui railway crossing, 2½ miles of plant-mix surfacing were completed.

Feilding Borough Section: 43 chains of plant-mix surfacing were completed between West Street and Manchester Street.

No. 856 Main Highway, Kimbolton–Apiti.—Pohangina County: The reconstruction of 3 miles of this highway in Apiti Township and southwards has been completed.

No. 859 Main Highway, Levin – Palmerston North via Shannon.—Two sections of this highway (at Ngaturoa Bridge and Hewitt's Road intersection) totalling 1½ miles were resealed.

Wellington District

No. 12 State Highway, Wanganui–Levin.—Horowhenua County: The Whirokino Deviation, 1 mile 7 chains long, was formed and metalled, but not sealed.

No. 13 State Highway, Levin–Paekakariki.—Between Kuku and Manakau bituminous-mix maintenance surfacing completed for 1 mile 10 chains. Similar work completed for 1 mile between Waikawa Bridge and Manakau, also between Manakau and Otaki for 1 mile 25 chains.

In the Otaki Borough the ½-chain road reserve was widened to 1 chain and hedges, fences, &c., moved back for a length of 40 chains.

Between Waikanae and Paraparaumu bituminous road-mix maintenance surfacing completed for 1 mile 40 chains using M.C. 2, and similar work in Paraparaumu Township for 48 chains using M.C. 3. From Paekakariki northwards maintenance seal completed for 54 chains.

No. 32 State Highway, Masterton–Wellington.—Between Akatarawa and Rimutaka Hill, maintenance seal using M.C. 3 and ½ in. chips completed for 1 mile 67 chains, also 30 chains using medium road oil and ¾ in. chips.

Between St. Patrick's College and Hulls Bridge, road widened for 40 chains to take four-lane traffic from Trentham Racecourse. Hulls Bridge (one 26 ft. by 18 ft. concrete span) has been widened to 66 ft. overall, including two 6 ft. footpaths.

On the Main Hutt Road, maintenance sealing using S.R.M.C. 3 and ½ in. chips completed for 4 miles 74 chains. On the centre parting strip, trees were planted to obviate headlight glare by passing vehicles.

No. 34 Centennial State Highway, Wellington–Paekakariki.—From Pukerua northwards maintenance sealing using road oil and ⅝ in. chips completed for 16 chains.

Between Porirua and Paremata, bituminous road-mix maintenance surfacing completed for 10 chains using M.C. 2. In Tawa Flat Township the 18 ft. pavement was widened to 24 ft. over a length of 30 chains using M.C. 3 pre-mixed aggregate. Bad corners at Porirua were widened and realigned over a length of 15 chains.

Work is in progress between Johnsonville and Tawa Flat on the new "limited-access motor-way" over a length of 5½ miles. Work completed to date comprises culverts, 5,190 lineal feet; excavation, 259,000 cubic yards; and permanent fencing 133 chains. Work completed to date is equivalent to about 1 mile of new unmetalled formation of four-traffic-lane width. In the Ngahauranga Gorge, maintenance sealing using M.C. 2 pre-mix was completed for 24 chains.

No. 371 Main Highway, Upper Hutt – Waikanae.—Near the Upper Hutt end of this highway, maintenance sealing comprising 39 chains of emulsion and sand was completed on first-coat work done last year. New sealing was carried out on metalled surface for a length of 2 miles 64 chains, 16 ft. wide, using No. 1 tar and ½ in. chips.

No. 374 Main Highway, Levin–Hokio.—Horowhenua County: Reconstruction completed for 40 chains, but not sealed.

No. 458 Main Highway, Porirua – Titahi Bay.—Makara County: Maintenance sealing using M.C. 3 and ⅜ in. chips completed for 36 chains. A parking area was constructed and sealed at Titahi Bay.

No. 473 Main Highway, Heatherlea–Foxton via Koputaroa.—Horowhenua County: Reconstruction completed for 1 mile, but not yet sealed.

No. 512 Main Highway, Paraparaumu Beach.—Hutt County: Road-mix maintenance seal using M.C. 2 completed for 20 chains.

No. 552 Main Highway, Shannon–Mangahao.—Horowhenua County: Reconstruction for sealing over a length of 1 mile 20 chains half completed.

Shannon Borough: Similar work for a length of 68 chains to be done by county on behalf of borough just being commenced.

No. 569 Main Highway, Western Hutt.—Hutt County: Maintenance sealing using M.C. 3 and $\frac{3}{8}$ in. chips completed for 1 mile 8 chains.

No. 574 Main Highway, Haywards–Paremata.—Hutt County: Work is in hand on a 60-chain deviation of Hayward's Hill being constructed to four-lane standard in conjunction with the laying of the Wellington City water-supply pipe-line (3 ft. diameter). This 60-chain length comprises 402,000 cubic yards and is 75 per cent. completed. A further 2 miles 12 chains from Haywards' Hill to Judgeford is to be constructed to the same standard and has just been commenced—earthworks comprise approximately 725,000 cubic yards.

Wairarapa District

No. 31 State Highway, Woodville–Masterton.—The Ngawapurua Overbridge, 217 ft. long by 24 ft. wide, in reinforced concrete, is completed, and the approaches, containing approximately 40,300 cubic yards, are 90 per cent. completed. The Board's contractor is also carrying out for the Railways Department the approaches (16,000 cubic yards) to the new railway bridge over the Manawatu River, and these are 60 per cent. completed.

Between Pahiatua and Manawatu River maintenance seal using M.C. 3 and $\frac{1}{2}$ in. chips completed for 60 chains.

From Pahiatua Borough southwards similar maintenance sealing was completed for 2 miles 32 chains.

In Eketahuna, maintenance sealing using M.C. 2 and $\frac{3}{8}$ in. chips was completed for 20 chains in the business area. At the north end of the borough 40 chains of footpath reconstructed by the local authority.

A contract has been let, but work not yet commenced, for the renewal of the Ruamahanga River Bridge at Mount Bruce, comprising one 112 ft. reinforced-concrete arch span, plus six 16 ft. shore spans, by 24 ft. roadway, and 1 mile 20 chains of new road deviation. All reinforcing-steel is on the site, also contractor's buildings.

No. 32 State Highway, Masterton–Wellington.—For 62 chains from Masterton Borough to Waingawa River old 18 ft. sealing has been widened to 24 ft. carriageway, plus 3 ft. on each side for safety of cycle traffic. An evener course of M.C. 3 and $\frac{1}{2}$ in. down aggregate has been applied to 24 ft. width, and the additional 6 ft. will have a dust-laying seal coat applied next season.

From Waiohine Bridge southwards for 85 chains similar widening and maintenance seal work as the preceding item was completed. Between Carterton and Waiohine River the carriageway was widened to 24 ft. over a length of 55 chains, but no maintenance sealing carried out. Immediately up-stream from Waiohine Bridge heavy bank protections comprising boulders and weighted willows completed for 20 chains along the right bank.

In the business area of Carterton an emulsion and sand maintenance-seal coat was applied for a length of 47 chains. Existing 18 ft. sealing was widened 10 ft. on one side to the kerb for 78 chains using tar primer and M.C. 2 and $\frac{3}{8}$ in. chips. Further widening of sealing held up by lack of concrete kerbing, 47 chains of which were constructed by the borough during the year.

On Rimutaka Hill smoothing-course maintenance surfacing using M.C. 2 and ¼ in. down aggregate completed for 16 chains, and two-course armour-coat maintenance seal for 5 chains.

Maintenance sealing in Featherston was completed for 27 chains using road oil and ¾ in. chips.

No. 381 Main Highway, Ponotahi.—Featherston County: Maintenance sealing completed for 66 chains using road oil and ½ in. chips.

No. 477 Main Highway, Eketahuna–Nireaha.—Eketahuna County: Reconstruction completed for 67 chains and contract let for new sealing, but latter work not started at end of season.

No. 816 Main Highway, Masterton–Weber.—Masterton County: Maintenance sealing using M.C. 2 and grit completed for 2 miles 38 chains.

Mauriceville County: Work is in hand by contract on three bridges in concrete at 21·75 m. (one 25 ft. span), 23·5 m. (one 25 ft. span), and 23·75 m. (one 35 ft. span). All bridges have 24 ft. roadway, and piles are driven for bridge at 21·75 m. Approaches are to be carried out by County Council.

Eketahuna County: For the purpose of obtaining access to further metal-supplies and at the same time improve the tortuous highway alignment, 18 chains of improvements were completed and metalled.

Akitio County: For the purpose of avoiding a moving slip which continually blocked traffic, Thomas' Deviation, 1 mile 14 chains long, is 40 per cent. completed as regards formation.

No. 835 Main Highway, Masterton–Castlepoint.—Masterton County: Maintenance sealing using M.C. 2 and grit completed for 60 chains. Kahumingi Deviation, 50 chains long, was formed and metalled.

Castlepoint County: Reconstruction and widening of 41 chains of road near Tinui completed.

No. 836 Main Highway, Masterton–Stronvar.—Masterton County: Maintenance sealing using M.C. 2 and grit completed for 67 chains. Reconstruction work in hand between 3 m. 51 ch. and 6 m. 31 ch. is 60 per cent. completed.

No. 838 Main Highway, Carterton–Gladstone.—Wairarapa South County: Reconstruction of Carter's Road section, 1 mile 62 chains, is 90 per cent. completed.

No. 839 Main Highway, Martinborough – Lake Ferry.—Featherston County: Maintenance sealing (16 ft. wide) complete for 2 miles at Pirinoa using road oil and ½ in. chips.

No. 860 Main Highway, Eketahuna–Alfredton.—Eketahuna Borough: Six chains of new footpath constructed.

No. 861 Main Highway, Martinborough–Masterton.—Wairarapa South County: Tender accepted for renewal of Taueru River Bridge, comprising three 55 ft. and two 40 ft. reinforced-concrete spans by 24 ft. roadway.

Masterton County: Maintenance sealing using road oil and ¾ in. chips completed for 28 chains, and for 2 miles 9 chains using M.C. 2 and grit.

No. 862 Main Highway, Carterton–Longbush.—Wairarapa South County: The renewal of the Ahiaruhe Bridge, comprising one 50 ft. by 24 ft. reinforced-concrete span, is in progress and is completed to the girder stage. Approaches are excluded from the contract.

No. 863 Main Highway, Greytown – Bidwill's Cutting.—Greytown Borough: Maintenance sealing using emulsion and sand completed for 36 chains.

No. 865 Main Highway, Kahautara.—Featherston County: Maintenance sealing using road oil and ½ in. chips completed for 1 mile 60 chains.

No. 868 Main Highway, Featherston–Martinborough.—Featherston County: Maintenance sealing using road oil and ¾ in. chips completed for 2 miles.

No. 871 Main Highway, Pahiatua Station.—Pahiatua Borough: Footpath reconstruction, kerbing, and channelling, and sealing completed for 35 chains.

Nelson District

A further 31 miles of State highways have been made dustless during 1947–48.

Restoration of flood damage has been attended to as required during the period, the only major work being the Wairau River Bridge bank protection on the Picton–Christchurch State Highway, which has been completed.

No. 51 State Highway, Picton–Christchurch.—Para-Tuamarina Section: 1 mile 57 chains of formation and 1 mile 32 chains of gravelling completed. This is heavy improvement work to remedy a badly flooding section of highway.

Randall's Culvert in reinforced concrete is almost complete.

Wairau River Bridge: Heavy stone bank protection completed.

Dashwood – Awatere Bridge Section: 72 chains of formation and 72 chains gravelling completed.

Seddon–Ward Section: Seddon – Blind River, 3 miles 67 chains tar primed for road-oil seal coat. Tetley Brook – Blind River, 1 mile 35 chains tar primed for road-oil seal coat.

No. 52 State Highway, Nelson–Blenheim.—Wairau River – Havelock Section: 10 miles 28 chains preparation and sealing completed.

Havelock–Pelorus Section: 9 miles 8 chains preparation and sealing completed.

Whangamoa Hill Section: 3 miles 24 chains preparation and sealing completed.

It is anticipated that the whole of the highway from Blenheim to Nelson, with minor improvements, will be sealed by the end of next paving season.

No. 53 State Highway, Richmond–Collingwood.—Upper Takaka – Payne's Ford Section: 60 chains of road-oil sealing completed and 70 chains tar primed for road-oil seal. A total of 3 miles 50 chains engineering survey completed.

Payne's Ford Deviation: Formation completed. Base course 20 per cent. completed. Filling to bridges 90 per cent. complete. Culverts 60 per cent. complete. Three test piles have been cast for Payne's Ford Bridge.

Takaka Hill Section: Preparation for sealing in hand. Engineering survey of 5 miles 7 chains completed.

Riwaka Bridge to Foot of Takaka Hill Section: 1 mile 40 chains dust-laying seal completed.

Appleby Bridge: Renewal by a reinforced-concrete bridge 681 ft. long (thirteen 47 ft. and two 35 ft. spans) and 24 ft. wide is proceeding steadily. Nearly all the piles have been driven, and piers are being commenced.

No. 54 State Highway, Nelson–Westport.—Tahunanui–Appleby Section: Engineering survey of 1 mile 18 chains completed.

Motupiko–Korere Section: 2 miles 20 chains of engineering survey completed.

Kawateri–Claybank Section: 2 miles of formation completed. Renewal of two timber culverts and repairs to longitudinal decking of Matakitaki, Longford, and O'Sullivan bridges. Maintenance seal on the Wakefield–Belgrove section, 1 mile 40 chains, completed.

No. 172 Main Highway, Dashwood–Upcot.—Awatere County: A concrete ford and culvert at Cow Creek has been completed.

No. 295 Main Highway, Nelson–Stoke via Jenkins' Hill.—Sixty chains of drag seal at Bishopdale and Wakatu were completed.

No. 154 Main Highway, Takaka–Tarakohe.—Takaka County: Preparations in hand for dust-laying seal of 3 miles 60 chains.

West Coast District

No. 54 State Highway, Nelson–Westport.—Eight-mile Creek – Westport: 2,991 cubic yards of metal have been placed.

A grouted stone wall 40 ft. long by 12 ft. high was built at 15 m. 40 ch.

Two Hume-Thompson crib walls have been built. One at 15 m. is 26 ft. long by 14 ft. high. The other at 15 m. is 52 ft. long by 21 ft. high.

Dee Creek, Omanu Creek, and at Ten-mile Creek bridges have been redecked and new handrail systems erected.

Section of highway from Inangahua Camp to Inangahua Junction Post-office has been resealed.

Four-mile Creek water-drive approaches have been completed.

Island Creek Bridge in reinforced concrete and approaches have been completed.

Bituminous mix surfacing, Buller Bridge, has been completed and has proved very satisfactory. Length, 1,040 ft., by 12 ft. wide.

One additional cottage was erected for surfaceman's accommodation at Inangahua Camp.

Two cottages were re-erected, replacing cottages to be removed from railway reserve at Buller.

Work has been started on improvements at Windy Point, but a major slip has developed. Two D8 bulldozers were engaged on clearing, and road was blocked at intervals during March.

No. 55 State Highway, Inangahua Junction – Greymouth.—Sealed section of highway from Inangahua Junction – railway-station and through Cronadun Township has been resealed.

The creek deviation at York Creek No. 2 has been completed, the old bridge dismantled, and a temporary bridge at new higher level has been erected. Building up of approaches is in hand.

York Creek Bridge No. 3 replaced by 32 lineal feet of 36-in.-diameter H.P. culvert.

York Creek Bridge No. 1 replaced by 32 lineal feet of 18-in.-diameter H.P. culvert.

Preparation for sealing the section of highway from Reefton–Waitahu has been completed, and contract for sealing this section is 95 per cent. complete. Length of new seal is 2 miles 37 chains. Balance of section from Waitahu Bridge to Cronadun—*i.e.*, 3 m. 63 ch. to 6 m. 73 ch. is 85 per cent. complete from 5 m. to 6 m. 73 ch.

Preparatory work for the 70 chains of footpath, Reefton Railway-station – Post-office, is almost completed.

The contractor has made fair progress with the improvements from Ikamatua–Mawheraiti over a length of 5 miles in preparation for sealing.

Resealing of 1 mile of highway between Springs Creek Bridge and Arnold River Bridge was completed.

A raised footway was constructed over the Inangahua River Bridge at Reefton. Calcium-chloride treatment was temporarily successful at Omoto as dust-laying agent on metalled surfaces.

No. 56 State Highway, Greymouth–Waiho.—One hundred and thirty-five chains of resealing with R.C. 2 were carried out.

Donnelly's Creek Bridge, 200 ft. long by 24 ft. roadway reinforced-concrete structure, was completed. The formation and metalling of the approaches, 15 chains long, in hand.

Evans' Creek Bridge: Major repairs, including the driving of new piles, replacement of timber superstructure and decking, also new handrails, were completed.

Hercules Creek Bridge: The construction of a new 20-ft.-span timber bridge to replace old bridge which collapsed was completed.

Duffer's Creek Bridge approaches were completed.

Deviation at Little Waitaha, 48 chains long, formation and metalling were completed.

Mirror Creek Deviation, 26 chains long, was completed.

A large slip on Mount Hercules necessitated the construction of 90 lineal feet of half bridge to keep the road open. Permanent cribbing carried out to restore road.

Rocky Creek Bridge was raised to conform to improved road grading.

No. 57 State Highway, Christchurch – Kumara Junction.—The section of road and half bridge adjacent to the Bridal Veil Falls deteriorated to such an extent that major repairs became a necessity. This involved the closing of the road for some weeks whilst

the rubble and overburden along a section 2 chains long was completely removed to ascertain the nature and disposition of the underlying rock. So that the road could be opened for traffic until such time as permanent works are carried out, a very substantial timber bridge with half-bridge approaches was constructed. This was opened for the Easter traffic and is giving good service.

From Kumara Township to Dillmanstown, 131 lineal chains of new sealing were carried out.

Some 36 lineal chains of the Kumara straight surface were resealed.

Scott's Creek Culvert, 6 ft. by 4 ft. reinforced-concrete culvert 34 ft. 6 in. long, and the formation and metalling of the approaches, 9 chains long, was completed.

No. 69 State Highway, Waiho–Karangarua.—A deviation 30 chains long to avoid erosion by the Waiho River was surveyed.

No. 105 Main Highway, Westport–Karamea.—Improvements: 7 miles to 10 miles formation and metalling work has been completed. Forty-four lineal feet of 48-in.-diameter reinforced-concrete pipe placed at 7 m. 12·50 ch.

Mokihinui Bridge – Karamea Bridge: 7,886 cubic yards of metal placed and 128 lineal feet of 12-in.-diameter reinforced-concrete pipe placed.

Karamea Bridge – Karamea Post-office section has been prepared for sealing.

Granite Creek Bridge in hand, one pier and one abutment completed.

Tidal Creek Bridges and Approaches: Contract let for bridges. Temporary bridge erected and raising of approaches in hand.

No. 166 Main Highway, Westport–Greymouth (Coast Road).—Between Charleston and Punakaiki 755 cubic yards of maintenance metal placed. Two hundred and twelve lineal feet of reinforced-concrete pipe culvert laid, and 1,192 ft. of cable and gabion netting fence erected at Gentle Annie Bluff and Sandy Point.

Twenty-four feet of crib wall 13 ft. high erected at Westport abutment of Fox River Bridge.

Seven-mile Creek Bridge: Contract let for the erection of reinforced-concrete bridge 130 ft. long with 24ft. roadway, and fair progress made.

Raleigh Creek Diversion Cut: Contract let.

No. 171 Main Highway, Reefton – Hanmer Junction.—Reefton – Garvey's Creek Improvements: Approximately 1,800 cubic yards excavated and moved to fill by co-operative parties.

Rahu Saddle Improvements: Survey for $5\frac{3}{4}$ miles of improvements completed.

Accommodation at Reefton:—

Workmen's Cottages: Eight completed and occupied. One other completed except interior painting, but occupied. Erection of final 6 cottages in hand.

Water-supply and Roading: Complete.

No. 168 Main Highway, Kanieri–Koiterangi.—Considerable repairs to the Kokatahi River Bridge have been carried out.

No. 604 Main Highway, Forks–Okarito.—This road has been practically remetalled throughout, chiefly for timber traffic.

No. 603 Main Highway, Ngahere – Haupiri Junction.—Five miles remetalled.

No. 674 Main Highway, Ngahere–Blackball.—Blackball footpath constructed for 37 chains and prepared for sealing.

North Canterbury District

No. 51 State Highway, Picton–Christchurch.—Weka Creek Bridge: A reinforced-concrete structure 200 ft. in length, 24 ft. wide, was completed during the year.

Ohau Stream Culvert: A three-cell box culvert completed during the year.

Irongate Bridge: A start has been made on the construction of this bridge.

Kaikoura–Hapuku Section: 6 miles improvements to alignment and reconstruction.

Motunau–Hurunui Section: 4 miles reconstruction, priming, and sealing completed; 8 miles reconstruction and priming.

Waipara–Omihi Section: 6 miles 3 chains maintenance sealing completed.

No. 72 State Highway, Waipara–Reefton via Lewis Pass.—Deep Creek: A double-truss, single-story Bailey bridge, 120 ft. span, has been erected over this creek as an emergency measure.

Gorge Creek: A 120 ft. D/S Bailey bridge has been erected to take traffic temporarily.

Waikari Bridge: Preliminary investigations have been commenced on this site with test bores.

No. 107 Main Highway, Red Post – Kaikoura.—Kahautara Bridge: Test piles being driven.

No. 142 Main Highway, Waikari–Motunau.—Waipara County: In Scargill Township – School section, 1 mile 10 chains maintenance sealing completed.

No. 143 Main Highway, Waikari–Waitohi.—Waipara County: In Hawarden–Hurunui section, 2 miles 10 chains maintenance sealing completed.

Christchurch District

No. 51 State Highway, Picton–Christchurch.—Northern Access to Christchurch, Tutton's Road: This work is well in hand. Fencing completed, culvert pipes on site, and extensive stripping has been carried out for a distance of 32 chains.

No. 57 State Highway, Christchurch – Kumara Junction.—Springfield–Sheffield Section: 5 miles 60 chains reconstruction, priming, and sealing completed.

Darfield – Sheffield Section: 8 miles 35 chains maintenance sealing completed.

No. 58 State Highway, Christchurch–Timaru.—Selwyn River Bridge: Weak concrete on the underside of this bridge was repaired by stripping, sand-blasting, and guniting.

Southern Access to Christchurch, Blenheim Road: The taking of land for this deviation is almost completed.

Selwyn–Rakaia Section: 10 miles 61 chains maintenance sealing completed.

No. 75 State Highway, Summit.—Kiwi – Evans Pass Section: 4 miles maintenance sealing completed.

No. 114 Main Highway, Sockburn – Rakaia Huts.—Southbridge Town Board Section: 1 mile 25 chains maintenance sealing completed.

Leeston–Southbridge Section (Ellesmere County): 2 miles 72 chains maintenance sealing completed.

No. 202 Main Highway, Waikuku – Waikuku Beach.—Rangiora County: 1 mile 51 chains maintenance sealing completed.

No. 188 Main Highway, Christchurch – Selwyn Huts.—Springs County: In Lincoln – Lincoln College railway crossing section, 1 mile 5 chains reconstruction, priming, and sealing completed.

No. 200 Main Highway, Harewood Aerodrome.—Waimairi County: In Rossall Street – Clyde Road section, 1 mile 29 chains maintenance sealing completed.

No. 204 Main Highway, Masham–Belfast.—Waimairi County: A short length of 11 chains maintenance sealing completed.

No. 669 Main Highway, Burwood–Marshlands.—Waimairi County: A short length of 21 chains maintenance sealing completed.

No. 195 Main Highway, Coal-gate – Hororata.—Selwyn County: 4 miles 56 chains reconstruction, priming, and sealing completed.

No. 197 Main Highway, Aylesbury – Lake Coleridge.—Selwyn County: From junction Main Highway No. 196 – Hororata section, 1 mile 20 chains reconstruction, priming, and sealing completed.

South Canterbury District

No. 58 State Highway, Christchurch–Timaru.—Rakaia–Chertsey–Gordon's Corner Section: 9 miles completed in plant-mix surfacing.

Rangitata Bridges: Resurfaced in plant mix.

Washdyke–Timaru Section: 2 miles completed in plant mix.

No. 59 State Highway, Timaru–Dunedin.—Otaio, Waihao, and Makikihi Bridges: Extensive repairs were effected to these bridges during the year.

No. 60 State Highway, Timaru–Cromwell.—McIntosh Bridge: A reinforced-concrete bridge 50 ft. in length completed during the year.

Rona Bridge: A reinforced-concrete bridge 30 ft. in length completed during the year.

Bain's Crossing: Contractor has commenced work on this culvert.

Pukaki Township: A short length of 17 chains reconstructed and sealed.

No. 611 Main Highway, Chertsey–Kyle.—Ashburton County: In Chertsey Township section, 16 chains maintenance sealing completed.

No. 224 Main Highway, Waimate–Studholme.—Waimate County: Bathgate's Road – No. 59 State Highway section, 2 miles 60 chains reconstruction, priming, and sealing completed.

No. 640 Main Highway, Morven–Waihao.—Waimate County: No. 59 State Highway – Morven Township section, 2 miles 5 chains reconstruction completed.

No. 217 Main Highway, Pukaki – Tasman Glacier.—Forty-three chains reconstruction and sealing completed at Pukaki Hydro-works.

No. 207 Main Highway, Ashburton–Wakanui.—Ashburton County: Cochrane's Road – Chertsey Road section, 6 miles maintenance sealing completed.

North and Central Otago District

No. 59 State Highway, Timaru–Dunedin.—Widening of the seal width to 22 ft. and improvement of curvature over the 4½ miles Maheno to Herbert section were continued and completed.

The first application of smoothing coat, amounting to 2½ tons per 100 square yards, to this length was also completed.

Widening and improvement to curvature of a 3½-mile-length north of Hampden are in hand, and approximately 3 miles has the earthwork completed.

Plans have been approved for the deviation (length, 1 mile) and new 700 ft. bridge at Maheno to replace two old bridges and avoid a flood area.

A fill was completed at the Waianakarua River (North Branch) Bridge to improve the sight distance, a 12 ft. timber bridge at Waitati was replaced with a double-barrel pipe culvert, and plans and materials are ready for a start on a 10 ft. by 7 ft. 6 in. culvert at Goodwood to overcome frequent flooding.

No. 60 State Highway, Timaru–Cromwell.—Ohau–Cromwell Section: In the establishment of the Omarama Depot, the foreman's cottage has been shifted into Omarama and single men's quarters have been set up.

The Omarama Stream Bridge, an 85 ft. three-span reinforced-concrete structure, was completed early in the year.

A deviation of 60 chains length has been completed over the Locharburn to replace a tortuous length of highway. Between Locharburn and Lowburn 7¼ miles of preparation, priming, and sealing have been completed.

No. 64 State Highway, Milton–Queenstown.—Roxburgh–Alexandra Section: Work on a deviation 1½ miles in length between Shingle and Gorge Creeks is in hand; 41 chains of formation completed.

Immediately south of Alexandra, 11 miles 44 chains of preparation, priming, and sealing and 40 chains of preparation and dust-laying seal coat have been completed.

Victoria Bridge – Gibbston: 2 miles of preparation and dust-laying seal coat have been completed.

Frankton–Queenstown: A deviation of 10 chains, together with 3½ miles of preparation and priming, has been completed.

No. 122 Main Highway, Pukeuri–Kurow–Omarama.—Four miles of dust-laying seal were completed between Kurow and Waitaki Village.

Waitaki County is preparing proposals and driving test piles for the replacement of the Awamoko Bridge, which was washed out in the 1946 flood.

No. 123 Main Highway, Waiareka–Ngapara–Duntroon.—The Queen's Flat Bridge, a reinforced-concrete structure of three spans totalling 75 ft., was completed late in the year.

South Otago District

No. 61 State Highway, Dunedin–Gore.—A new reinforced-concrete culvert has been completed at Saddle Hill.

On the 14-mile Clinton–Arthurton section, 3 miles of formation have been completed, and at the Arthurton end a seal coat of No. 1 tar was laid for 1 mile 12 chains. Progress on the reconstruction has been delayed through the lack of crushing plant for metal-supply.

No. 64 State Highway, Milton–Queenstown.—The work of raising the 3 miles of road between Clarksville and Glenore was commenced. Light formation and reconstruction work has been done on the 12¼-mile length between Glenore and Waitahuna, where a stabilized top course has been laid for 6 miles and a dust-laying seal coat for 2 miles 57 chains.

Reconstruction work between Island Block and Ettrick was commenced and top course has been laid for 7 miles 60 chains out of a length of 8 miles. A total of 4 miles 60 chains of this has been sealed.

At Manuka Creek, twin diversion tunnels, total length 317 ft., were completed. This will obviate the necessity for renewing two bridges.

At Slaughterhouse Creek a reinforced-concrete box culvert has been built to replace an old timber bridge.

No. 151 Main Highway, Balclutha–Lawrence.—Buchanan's Creek Bridge: This work was commenced and excavation and concrete in footings are in hand.

No. 269 Main Highway, Balclutha – Kaka Point.—In the Balclutha Borough a length of 20 chains of sealing with No. 1 tar was completed.

Southland District

No. 65 State Highway, Queenstown–Invercargill.—One-mile length in Athol Township was reconstructed and gravelled. On the Caroline–Benmore section 4 miles of strengthening top course were placed ready for sealing and 400 cubic yards of chips were produced. On the Lorne–City boundary section 22 chains were widened from 18 ft. to 50 ft. width, and footpaths were constructed for 34 chains. Telephone poles were shifted to correct positions along 2 miles of the work, enabling consolidation and final shaping to be proceeded with. The decayed short bridge at Racecourse Creek was replaced with a 60 in. culvert haunched in concrete.

No. 68 State Highway, Lorne–Riverton.—The unsealed Wallace section from Thornbury to Waimatuku was reconstructed and gravelled over a length of 4 miles 12 chains. A decayed narrow bridge on this section was replaced with a 72 in. concrete pipe haunched in concrete, and the Taunamau Stream Bridge, of narrow width and decayed condition, was replaced with a R.C. slab structure of 18 ft. length and R.C. abutments.

The reconstruction and gravelling was extended into the Southland section, and 30 chains were completed. Piles were cast for the Makarewa River Bridge.

No. 61 State Highway, Dunedin–Gore.—For a reseal, 31½ chains at Otikerama Overbridge were strengthened.

Main Highways

On the main highways the Public Works Department completed the construction in reinforced concrete of the 60-ft.-long Camp Creek Bridge and the formation and base-course gravelling of the 43-chain approach deviation to it.

On the Lumsden – Te Anau – Milford Sound Main Highway (No. 134) the sawmill for cutting bridge timbers commenced work at the beginning of January and enabled a start to be made in repairing the bridges on this road, and to date 43,479 superficial feet have been cut, including scantling and planks from offcuts of the bridge timbers. The bridges in the Eglinton Valley were restored to safe condition to allow the carting of timber. This involved the replacement of much decking and some beams. In the Hollyford Valley the 80 ft. Cinques Bridge was completely renewed, and the timber is on the site for the adjacent similar bridge. On the Milford side, six bridges, commencing from the tunnel, have been renewed, and two temporary bridges have been eliminated by completing the permanent structures, making it now possible to transport the R.S.J.s to their respective sites.

New sealing-work totalling 6 miles 23 chains and reseals totalling 13 miles 3 chains were completed on the State highways, and reseals within minor local-body areas totalling 4 miles 45 chains on main highways were carried out.

Sealing

Dunedin–Gore State Highway, 31 chains; Queenstown–Invercargill State Highway, Lorne–City boundary, widening 18 ft., sealing to 50 ft., 1 mile 50 chains; Lorne–Riverton State Highway, Wallace County section, 4 miles 22 chains.

Resealing

Dunedin–Gore State Highway, 1 mile 51 chains; Gore–Invercargill State Highway, 4 miles 67 chains; Invercargill–Bluff State Highway, 3 miles 74 chains; Queenstown–Invercargill State Highway, 2 miles 51 chains. In Wyndham Town Board on Edendale–Wyndham–Mokoreta and Mataura–Wyndham–Letterbox Main Highways, 1 mile 24 chains; in Mataura Borough on Mataura–Waiariki and Mataura–Wyndham–Letterbox Main Highways, 1 mile 58 chains; and in Nightcaps Town Board on the Winton–Ohai–Orawia Main Highway, 1 mile 46 chains.

MOTOR-WAYS

Legislation by means of the Public Works Amendment Act, 1947, made provision for the declaration of limited-access highways or, more shortly, motor-ways. It is emphasized that motor-ways are not glorified all-purpose highways. Work is continually in progress to improve the arterial roads of the country, but these improvements will not create the characteristics or allow of the functions of a motor-way.

In addition to providing the most efficient and economic transport service, the main distinguishing characteristics of a motor-way are the control of access and the total elimination of ribbon development, both of which will go far to improve road safety and prevent obsolescence.

Except for North America, the proportion of motor-vehicles to population in New Zealand is greater than in any other country of the world, and since the end of the war there has been a further upward trend of motor-vehicles on the highways. This has been particularly the case with passenger-buses and heavy haulage trucks. It has

become apparent that the capacities of the existing main routes adjacent to the chief cities are already being overtaxed, thus leading to much loss in direct transportation costs, and, of even greater importance, the accident potential of these roads is rising at an alarming rate.

In the past when a route was becoming overtaxed it was a common practice to build an ordinary new highway to by-pass the town or other congested area. This new highway immediately attracted mushroom settlement, as did so many of the by-passes in England. It was realized that unless measures were adopted to prevent the development of these conditions it would be found that the values of existing townships would be depreciated by the attraction of the movement of whole communities in haphazard fashion to the by-pass routes, with the result that the high accident rate and congestion would start all over again. These mistakes of the past have to be avoided. This will be achieved by means of the special motor-ways legislation, until the passing of which there has never been the legal authority in New Zealand to prevent ribbon development along new roads, nor have we had the right to build highways for the exclusive use of motor-vehicles.

By keeping access to specially designed junctions and by prohibiting any building development fronting and stretching out along the by-pass motor-ways, the legislation ensures that the present community balance is not disturbed. In many respects a motor-way resembles a railway, which provides no property frontage and has access limited to stations located at intervals as will best serve the townships and settlements.

Motor-ways will be constructed generally as four-lane routes, with a central hedge or a wide grass plot separating the two up lanes from the two down lanes. This type of layout almost eliminates side-swiping accidents, head-on crashes, and collisions caused by glare from opposing headlights. Also, when overtaking and passing another vehicle travelling in the same direction on a divided motor-way there is no danger of meeting head-on with a third vehicle coming round the curve from the opposite direction. This is not only a very important safety feature, but it also prevents congestion caused by a slow-moving truck or car holding up the column of traffic.

All roads, ordinary highways, and railways will be separated from motor-ways by overbridges or subways, thus eliminating the prolific source of accidents resulting from intersection collisions.

There will be no need for pedestrians or cyclists on a motor-way any more than they would enter upon a railway, and since between 40 per cent. and 50 per cent. of road accidents involve pedestrians or cyclists, there will be a great saving of life by the building of these special motor roads. Further, with the removal of all but local vehicles from the ordinary streets and roads, pedestrians and cyclists will be able to move about their business in their residential areas and townships without being continually menaced by increasing volumes of fast-moving through traffic. There will be no droving of stock along the new motor roads, and fences will exclude straying beasts, again just as is the case with a railway; and there will be no power or telegraph poles adjacent to any traffic lane. Every design feature of a motor-way, while leading to smoother, more expeditious, and more economic transport, will, at the same time, have far-reaching results in halting the distressing slaughter on the highways. Motor-ways will reduce the accident potential by some 75 per cent.

Where the density of traffic exceeds 3,000 vehicles per day, the construction of a motor-way will effect tremendous savings in transport costs. If and when, for example, a motor-way can be completed for, say, 30 miles from the centre of Auckland to by-pass and skirt the industrial towns to the south, in travelling time and cost of travel this will be equivalent to only 20 miles of travel along the present Great South Road. The equivalent reduction of 10 miles for 5,000 vehicles per day in and out of Auckland represents an annual saving in vehicle-operation costs of nearly £500,000, which means

that the 30 miles of motor-way, although expensive in construction, could be paid for from a few years' savings in the cost of haulage. Keeping these facts, together with the safety factor, in mind, it becomes clear that motor-ways adjacent to our chief cities would not be luxuries. It is obvious that they are overdue and urgently necessary.

Unfortunately, works of even higher priority, such as housing and hydro-electric development, are absorbing most of the materials and man-power at the present time, and it is therefore not possible to push ahead with the construction of motor-ways as the Board would wish.

Construction has started to the south from Auckland to by-pass Penrose, and to the north from Wellington between Johnsonville and Porirua, but the chief activity in regard to motor-ways for the moment lies in the carrying-out of surveys and the purchase of the necessary land. There is no intention to build motor-ways throughout the length and breadth of the North and South Islands. Except as some special circumstances may modify the position, motor-ways are not justified until traffic intensities reach an average of 3,000 vehicles per day, and very considerable sections of any route extending for the length of either Island will carry only a small proportion of such a traffic volume.

With the increasing road travel, motor-ways will be required in not so many years for much of the distance between Auckland and Hamilton, from Auckland north-west to Whenuapai, between Wellington and Levin and perhaps farther north, and between Napier and Hastings. Preliminary investigations and surveys are now in hand over these sections. A few other short lengths may be required in the North Island, and investigations will be made as survey staff becomes available. As far as the South Island is concerned, investigations and surveys are now in hand on the northern and southern outlets from Christchurch, the outlets from Dunedin, between Nelson and Richmond, and for a few miles to the north from Invercargill; and consideration will be given to any other route where the traffic volume may justify a motor-way.

In the cases of Auckland to Hamilton, Auckland to the north-west and Wellington to Levin, the land for the routes is being purchased as land surveys can be made, but construction of the motor-ways will not necessarily proceed continuously outwards from either Auckland or Wellington. Before construction has proceeded so far it will almost certainly be necessary to build sections of motor-ways to by-pass places like Huntly and Otaki, but these by-passes will be so laid out as to fit in with the final through motor-ways between Auckland and Hamilton and Wellington and Levin.

As surveyors, engineering staff, man-power, and materials become available, it is the intention to expedite the construction of the more urgently required motor-ways, and in the meantime the routes are being planned so that the necessary land can be acquired before it is too late and the land in its turn becomes developed and built out.

The efficiency and safety of the motor-ways will be far ahead of any road communication which has been previously constructed in New Zealand. Just as the new divided four-lane Hutt Road between Ngahauranga and Petone is far safer and more efficient than the old undivided two-lane Hutt Road, so a modern motor-way will show impressive improvements over the present divided Hutt Road.

HIGHWAY ENGINEERING AND DESIGN

During the recent war and post-war years there has been a severe increase in the demands made by modern transport on highway foundations and surfaces. Formerly the railways carried a much greater proportion of heavy freight, but to-day more and more goods and passengers are transferring from rail to road, and heavier and larger vehicles are being introduced to carry these goods and passengers. The use of multiple-wheeled

and multiple-axled trucks and truck combinations by the road transport industry is now common practice, and such vehicles are being widely and increasingly used for the carriage of produce and freight of almost every kind.

The rapid development of these more severe loadings has imposed in all countries an excessive strain on many existing highways. Progressive modifications in highway-construction have been made in the past to reasonably meet and provide for the development of motor transport, and our traditional lightly sealed surfaces constructed on flexible pavements of stabilized aggregates have given, as a class of road, highly satisfactory service. Particularly on some types of country, however, it has become increasingly apparent that past methods will not fully meet the accelerated growth and demand of modern heavy transport vehicles. Except on very favourable formations, the cost of constructing to the new standards required must inevitably substantially increase.

Engineering design must have regard to many factors, both technical and economic, and solutions must frequently be based on compromise. While the Board has, within its resources, endeavoured to provide for modern trends, there is, on the other hand, in order to maintain a reasonable balance, a strong case for the review of certain of our loading regulations. Unless our pavements are to suffer undue damage with consequent high maintenance costs, heavy gross loads can obtain only by rationalizing axle spacing, distribution of load, and tire pressures.

Modern highway engineering calls for a specialized scientific approach, and overseas research, on which New Zealand has to rely almost wholly at present, has been very intensively directed towards the development of sound and economic methods. The conditions and circumstances of the particular country naturally influence such investigations, and the time seems overdue for road-engineering research to be conducted in New Zealand. With its wide variations of topography, fluctuating climatic conditions, and wide range and frequently rapid change of soil types, this country presents many particular problems in road-construction.

To provide for the development and trend of road transport, increasing attention has been given by the Board in the post-war years to the design and construction technique of highway foundations. A load is transmitted with diminishing pressure intensity from the road surface, through the metal or other reinforcing courses, to the foundation of the natural soil. It is evident that the more stable the natural soil and the better its bearing value, the less will be the thickness of reinforcing necessary over it to sustain a given load.

A soil which contains a high percentage of void space is relatively open to the entry of water. The stability of a soil is improved by reducing its void space, and the most practical means of accomplishing this is densification by compaction.

The subgrade, or upper layers of the prepared foundation of natural soil on which the pavement reinforcing is placed, is nearer to ground-surface level and is thus more exposed to climatic changes and variations of moisture content. Compaction of a subgrade therefore requires to be more intensive than the compaction of the body of an embankment. Further, since the density of an undisturbed soil is usually considerably less than the maximum density which can be obtained, the portions of the subgrade through cut sections in such soils should be also intensively compacted to a sufficient depth. In addition, it must be remembered that it is in cuts, even those of negligible depths, where the surface shape presents water with the best opportunity of penetrating the ground.

Consideration of pavement stresses also indicates that the necessary bearing value required of a road surface for a particular load may be built up progressively from the foundation soil by using successively stronger materials for the layers of the pavement reinforcing. At any particular level in the road structure the reinforcing material

should be only of sufficient quality to satisfactorily withstand the bearing pressure imposed at that depth by the loads on the road surface. The best hard metal available is required only at and near the road surface to withstand wear and the high upper pavement pressures.

With design views on these lines the Board has revised its Standard Specifications to ensure improved construction to meet the requirements of heavier loadings. More particular attention is being paid to the consolidation of all earthwork, and compaction of subgrades has been greatly intensified. Cuttings are now in general being undercut, or excavated to an additional depth so that the subgrade can be rebuilt and be more densely compacted. With some soils, where sub-drainage is adequate, bearing-power only may require improvement, and a much lesser depth of excavation to permit compaction will suffice. Again, with solid rock, conglomerate, and similar foundations, a blanket course only may be necessary to minimize unevenness in the finished pavement. Wherever practicable, the best earthwork materials available on a work are being reserved for the construction of the subgrade.

Emphasis has been placed on the fact that, in road design, grading to ensure a balance of cut and fill quantities is, although usually desirable, a completely secondary consideration to the main requirement of grading to ensure a sound road. Unless there is adequate natural sub-drainage of the soil, a road across flat country should be built on a low embankment, so as to safeguard the subgrade against the rise of capillary moisture. This applies particularly over formations of heavy clay and silt, where the subgrade-surface level should be kept at least 3 ft. above winter ground-water level.

With some soils, particularly the heavy clays of certain districts, there are practical difficulties in accomplishing satisfactory densification. If there is no reasonable alternative to using such soils, then the flexible pavement, including the sub-base of sand or other fine-grained, non-cohesive material required over clay subgrades, must be strengthened.

In the direction of road safety, the Board has for some time insisted that all highway curves be transitioned. Previously some latitude was given in this respect, but the Board has published standard curve data providing a logical path for a turning vehicle, and permitting the rational introduction of superelevation. Care is taken to maintain relative consistency of speed value design, wherever possible, being kept to a safe and gradual variation. Carriageway widths have been increased, while formation standards generally have been improved.

DECLARATION OF NEW MAIN HIGHWAYS AND CLASSIFICATION OF EXISTING MAIN HIGHWAYS AS STATE HIGHWAYS

In pursuance of section 11 of the Main Highways Act, 1922, the usual annual review of main highways was made during the year ended 31st March, 1948. Recommendations of District Highways Councils were carefully considered, but owing to the heavy commitments against highways funds arising from the requirements of the existing highways system the Board was unable to recommend any general extension.

Several minor adjustments were made, however, to date from the 1st April, 1948, and these involved an extension of the main-highways system by 84 miles. At the same time, and with a view to assisting some local authorities and in order to round off the existing State-highways system, the Board, with the approval of the Minister of Works, classified 1,330 miles of main highways as State highways.

VISIT OF INSPECTION TO THE NORTHERN PORTION OF THE NORTH ISLAND AND CONTACT WITH LOCAL BODIES AND AUTOMOBILE ASSOCIATIONS

Last year's report advised that the Board had made a complete tour of the Dominion since the cessation of hostilities, and in early April, 1948, the Board paid a further visit to North Auckland, Auckland, Coromandel, and Waikato areas. Many improvement works had been completed, and others were in progress, especially in the direction of dustless surfacing. General approval was expressed regarding the Board's policy to provide for an extension of sealing wherever possible.

The special needs of the areas visited were brought to the notice of the Board, and it was pleasing to note the spirit of co-operation that existed between the local-body officials, the automobile associations, and the Board's district representatives.

The Board appreciates the assistance and helpful suggestions received from local bodies and automobile associations.

SIGNPOSTING, CENTRE-LINE MARKING, ETC.

The amount expended by the Board during the year in subsidizing the erection and maintenance of road signs by the automobile associations of New Zealand was £5,250. The marking of centre-lines on paved surfaces and the lettering of standard warning notices on pavements adjacent to railway crossings and other dangerous localities has been continued.

ADVANCES TO LOCAL AUTHORITIES

During the year ended 31st March, 1948, the Board entered into five agreements with local bodies in regard to advancing to them their shares of the cost of works carried out on main highways. The principal of these advances amounted to £6,117 8s. 4d. The total of principal advanced to local authorities since the inception of the Board is £357,134 0s. 0d. of which the sum of £23,617 7s. 6d. was outstanding at 31st March, 1948.

PLANT

The facilities provided by the Board to enable local authorities to acquire plant under the hire-purchase system were again taken advantage of to a considerable extent. The purchases for 1947–48 amounted to £42,325 5s. 9d. The total value of plant purchased under this system since its inauguration is £473,634 18s. 3d., of which sum £75,125 5s. 11d. remained outstanding at the 31st March, 1948.

OPERATIONS OF MAGNETIC TRUCK AND TRAILERS

During the year the magnetic truck and one trailer-type magnet operated in the North Island, and the other trailer-type operated solely in the South Island. These machines, which are utilized for clearing main highways of iron or steel puncture-producing articles, cleared 5,699 miles in the North Island and 4,086 miles in the South Island. The weight of material picked up was 26,068 lb. in the North Island and 2,570 lb. in the South Island. The average yield per mile of highway in the North Island was 4·57 lb. and the South Island 0·63 lb., compared with 3·68 lb. and 1·604 lb. respectively for the previous year.

EXAMINATION FOR FOREMEN AND OVERSEERS OF ROAD CONSTRUCTION

The twenty-first examination for Foremen and Overseers of Road Construction was held on 19th November, 1947, when seventeen candidates presented themselves for examination.

Fifteen papers on general road construction and maintenance, and four papers on tar, bituminous, and concrete road construction, were returned. Eleven candidates were successful in passing paper No. 1, and three passed paper No. 2. One candidate passed the full examination, eight secured a partial pass, and four who had previously secured a partial pass completed the examination.

The Board acknowledges the continued co-operation of the Public Works Department in matters relating to main-highways administration, and records its appreciation of the valuable services rendered by officers of the Department in carrying out the Board's programme during the period under review. It also greatly appreciates the loyal and efficient work of its engineering and clerical staff in carrying out the policy of the Board.

Signed on behalf of the Main Highways Board :

F. LANGBEIN, M.I.C.E., Chairman.

MAIN HIGHWAYS STATEMENT OF ACCOUNTS

STATEMENT SHOWING PARTICULARS OF NET EXPENDITURE ON CONSTRUCTION, RENEWALS, MAINTENANCE, ETC., FOR THE YEAR ENDED 31ST MARCH, 1948, AND TOTAL TO DATE

—	Construction and Improvement of Main Highways.		Renewals of Main Highways.		Maintenance, Repairs, &c., of Main Highways.		Totals.	
	Total for Year 1947–48.	Total since Inception of Main Highways Act, 1922, to 31/3/48.	Total for Year 1947–48.	Total since 1/4/36 to 31/3/48.	Total for Year 1947–48.	Total since Inception of Main Highways Act, 1922, to 31/3/48.	Total for Year 1947–48.	Total since Inception of Main Highways Act, 1922, to 31/3/48.
Highway District—	£	£	£	£	£	£	£	£
No. 1	125,657	*1,624,481*	58,712	*452,192*	196,222	*1,682,972*	380,591	*3,759,645*
No. 2A	70,419	*3,173,872*	14,613	*227,225*	282,678	*3,318,701*	367,710	*6,719,798*
No. 2B	134,129		12,123		220,416		366,668	
No. 3	138,829	*1,140,171*	2,788	*70,982*	192,490	*1,861,076*	334,107	*3,072,229*
No. 4	26,481	*688,209*	3	*81,897*	114,615	*1,235,140*	141,099	*2,005,246*
No. 5	101,647	*1,011,682*	86,490	*202,035*	120,939	*1,750,726*	309,076	*2,964,443*
No. 6	3,366	*840,911*	2,640	*29,004*	56,533	*1,166,500*	62,539	*2,036,415*
No. 7	23,373	*963,396*	17,176	*57,463*	136,239	*1,212,781*	176,788	*2,233,640*
No. 8	162,730	*1,217,510*	33,592	*160,504*	142,334	*1,348,619*	338,656	*2,726,633*
No. 9A	15,789	*1,666,751*	64	*114,148*	50,686	*1,441,448*	66,539	*3,222,347*
No. 9B	98,060		*Cr.* 12		92,448		190,496	
No. 10	22,565	*453,251*	5,559	*105,242*	64,465	*983,294*	92,589	*1,541,787*
Totals for North Island ..	923,045	*12,780,234*	233,748	*1,500,692*	1,670,065	*16,001,257*	2,826,858	*30,282,183*
No. 11	143,046	*1,217,285*	26,438	*68,495*	103,338	*1,281,335*	272,822	*2,567,115*
No. 12	57,872	*1,150,979*	19,288	*168,322*	102,063	*1,942,151*	179,223	*3,261,452*
No. 13	39,754	*395,507*	14,399	*63,014*	48,702	*606,065*	102,855	*1,064,586*
No. 14	36,663	*902,763*	899	*28,671*	96,947	*894,142*	134,509	*1,825,576*
No. 15	2,798	*566,161*	7,016	*36,141*	100,682	*965,095*	110,496	*1,567,397*
No. 16	78,884	*976,679*	5,096	*27,581*	106,052	*848,497*	190,032	*1,852,757*
No. 17	91,853	*937,394*	1,411	*18,038*	75,343	*725,446*	168,607	*1,680,878*
No. 18	37,115	*1,075,454*	8,541	*55,202*	83,089	*955,479*	128,745	*2,086,135*
Totals for South Island ..	487,985	*7,222,222*	83,088	*465,464*	716,216	*8,218,210*	1,287,289	*15,905,896*
Totals for Dominion ..	1,411,030	*20,002,456*	316,836	*1,966,156*	2,386,281	*24,219,467*	4,114,147	*46,188,079*

MAIN HIGHWAYS STATEMENT OF ACCOUNTS—*continued*

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 1948, AND TOTAL TO DATE

EXPENDITURE.		Total for Year 1947-48.	Total since Inception of Main Highways Act, 1922, to 31/3/48.
		£	£
Net expenditure on construction, renewals, maintenance, &c. (see separate statement)		4,114,147	*46,188,079*
Administration—			
Administration expenses (including salaries, travelling-expenses, office rents, printing, stationery, postages, and miscellaneous expenses) ..	£ 228,244	..	*1,940,554*
Fees and travelling-expenses of members of the Main Highways Board other than Government members ..	1,040	..	*26,138*
Miscellaneous expenses—			
Advertising, maps, rent of halls, traffic tallies, transport of samples, depreciation of furniture, &c. ..	503	..	*6,482*
Compassionate grants to widows and relatives of deceased employees	..	..	*4,000*
Compensation under section 3, Public Works Amendment Act, 1925	..	..	*1,015*
Exchange on remittances ..	..	..	*9,887*
Grant to Transport Department towards Traffic inspection ..	..	..	*42,906*
Petrological laboratory and other experimental work, expenses of..	2,102	..	*22,804*
Total, administration ..	———	231,889	*2,053,786*
Loan charges—			
Charges and expenses of raising loans, management charges of Consolidated Stock on account of Construction Fund, &c.		..	*88,080*

INCOME.			Total for Year 1947-48.	Total since Inception of Main Highways Act, 1922, to 31/3/48.
			£	£
Public Works Account: Capital			1,308,204	*14,693,372*
Securities redeemed, Loans Redemption Account			..	*1,313,613*
Consolidated Fund—Public Debt Repayment Account			..	*55,720*
			1,308,204	*16,062,705*
		£		
Revenue from the Consolidated Fund		3,055,669		
Less Commission on collection by Post and Telegraph Department—				
Motor-registration fees and licences ..	£ 32,809			
Fees for registration and change of ownership ..	7,423			
		40,232		
			3,015,437	*41,660,522*
Interest from investments			..	*218,444*
Interest from local authorities on plant purchased on their behalf			3,116	*45,047*
Interest on advances to local authorities ..			816	*49,245*
Miscellaneous receipts			3,487	*41,051*
Rent of and tolls from ferries			..	*2,082*

Interest on amount appropriated out of Public Works Fund and paid into Main Highways Account Construction Fund	..	..	*796,900*	Balance, being liability of Public Works Account and Consolidated Fund	237,858	*Cr. 95,028*
Interest on loans, recoupment to Consolidated Fund (section 4, Finance Act, 1919)	..	..	*2,803,201**			
Transfer to reserve for redemption of main highway securities ..	..	..	*1,252,130*			
Payment to local authorities in commutation of toll-gate charges (Finance Act, 1925, section 20) ..	1,518	..	*42,343*			
Payment to Wellington City Council in commutation of fees chargeable in respect of motor-vehicles using Hutt Road (Hutt Road Act, 1939, section 6)	12,569	..	*449,541*			
Total, loan charges ..	———	14,087	*5,432,195*			
Subsidies, &c., in respect of other than main highways—						
Municipal Corporations (Municipal Corporations Act, 1933, section 71)	29,612	..	*531,325*			
County Councils and other local authorities (Finance Act, 1930, section 37)	179,183	..	*3,114,985*			
Subsidies to County Councils for rebate to ratepayers (Finance Act (No. 4), 1931, section 45)		..	*253,893*			
Subsidy on rates levied on farming land (Finance Act (No. 3), 1934, section 28)		..	*363,887*			
Maintenance and construction of roads giving access to outlying areas (Finance Act (No. 3), 1931)		..	*45,918*			
Total, subsidies ..	———	208,795	*4,310,008*			
		£4,568,918	*£57,984,068*		£4,568,918	*£57,984,068*

* No interest charged after 30th June, 1944.

MAIN HIGHWAYS STATEMENT OF ACCOUNTS—*continued*

GENERAL BALANCE-SHEET AS AT 31ST MARCH, 1948

LIABILITIES.	——	Total.	ASSETS.	——	Total.
	£	£		£	£
Accumulated Revenue Account—					
Balance at 1/4/47	..	*332,886*	Sundry debtors	..	*17,665*
Sundry creditors	..	*441,385*	Advances to local authorities (Main Highways Amendment Act, 1926, section 2)	..	*23,617*
			Interest due and accrued	..	*1,337*
			Buildings and land	..	*110,793*
			Stocks of materials, tools, &c.	..	*277,377*
			Furniture, fittings, &c.—		
			Expenditure to 31/3/48	927	..
			Less depreciation to 31/3/48	863	
					64
			Plant and equipment—		
			For Main Highways Board—		
			Expenditure to 31/3/48	615,273	
			Less depreciation charged to works ..	584,838	
					30,435
			Purchased for local authorities—		
			Expenditure to 31/3/48	473,635	
			Less repayments of principal	398,510	
					75,125
			Liability of Public Works Account and Consolidated Fund	..	*237,858*
		£774,271			*£774,271*

NOTE.—The Main Highways Account was abolished by Finance Act (No. 2), 1947, and has been replaced by votes in the Consolidated Fund and the Public Works Account.

J. W. SCOTT, A.R.A.N.Z., Chief Accountant, Public Works Department.
F. LANGBEIN, M.I.C.E., Chairman, Main Highways Board.

I hereby certify that the Income and Expenditure Account and Balance-sheet have been duly examined and compared with the relative books and documents submitted for audit and correctly state the position as disclosed thereby, subject to the departmental notes enfaced thereon.—J. P. RUTHERFORD, Controller and Auditor-General.

APPENDIX E

SIXTH ANNUAL REPORT OF THE SOIL CONSERVATION AND RIVERS CONTROL COUNCIL

The Hon. the MINISTER OF WORKS.

SIR,—

In accordance with the requirements of section 33 of the Soil Conservation and Rivers Control Act, 1941, the Soil Conservation and Rivers Control Council has the honour to submit its sixth annual report for presentation to Parliament.

The report covers the period 1st April, 1947, to 31st March, 1948.

THE COUNCIL

During the year the Council entered into its second five-yearly term of office. Messrs. G. A. Monk and J. W. Andrews, who represented the New Zealand Counties' Association and Municipal Association of New Zealand respectively, resigned to take up their appointments as members of the Local Government Commission, and were replaced of Messrs. W. A. Lee and J. A. C. Allum. On the retirement of Mr. J. Callesen, Mr. J. R. Hair was appointed as representing Catchment, Drainage, and River Boards.

The Council wishes to record its appreciation of the services rendered by the retiring members.

The Council met on ten occasions during the year, and visits of inspection were made to Westland, Nelson, Poverty Bay, and Hawke's Bay Catchment Districts.

LEGISLATION

A number of minor amendments to the principal Act were passed during the last session of Parliament, the most important of which made provision for the erection of dwellings for Catchment Board employees.

As indicated in previous reports, further amendments will be required from time to time to enable the Act to be fully and efficiently administered.

GENERAL

The activities of the Council during the past year, in common with the previous four years, have been restricted to a large degree, particularly in respect to river control and drainage improvements, by the Dominion-wide shortage of man-power, materials, and plant. While expenditure has increased each year, as instanced by the undermentioned figures, much additional work could have been undertaken if plant and engineering resources had been greater.

On the soil-conservation side, progress has been substantial. The Council has acquired and taken possession of several properties in problem areas, where experimental work has been put in hand. In co-operation with other interested Government Departments, detailed experimental and research work is being undertaken.

Expenditure referred to above is as follows: 1943–44, £59,455; 1944–45, £101,845; 1945–46, £212,271; 1946–47, £270,864; 1947–48, £326,914.

CATCHMENT BOARDS

Catchment Boards have continued to function in a most satisfactory manner. In common with other local authorities and Government Departments, their activities have been restricted by staff and plant shortages. Much valuable work has been done, and the Council wishes to record its appreciation of their work.

CATCHMENT DISTRICTS

During the year under review proposals for the constitution of additional catchment districts in Clutha, Wellington, Bay of Plenty, and Waikato were submitted to the Local Government Commission in terms of the Local Government Commission Act, 1946. A final scheme was approved by the Commission embracing the Otago Province, excluding Southland Catchment District and the Waitaki River Catchment, and the Otago Catchment District was constituted on 17th March, 1948. Arrangements have been completed for the first election of the Board in September next.

A public inquiry relating to the proposed Wellington Catchment District was held by the Commission in March. Additional public inquiries relating to the proposed Bay of Plenty and Waikato Districts have been arranged for later in the year.

SOIL CONSERVATION DISTRICTS

The Waitaki Soil Conservation District was constituted on 17th December, 1947, and the first meeting of the District Committee, which is responsible for administering the Soil Conservation Regulations 1945, was held on 17th March, 1948.

STATISTICS

The following is a complete list of Catchment and Soil Conservation Districts constituted as at 31st March, 1948. For comparative purposes the statistics have been obtained from the "Local Authorities Handbook, 1941–42," as subsequent to this period a number of local authorities have been revalued :—

Name.	Area (Approximate) (Square Miles).	Rateable Capital Valuation. (Approximate) (£ Million).			Population (Approximate).	Headquarters of Board.
		Rural.	Urban.	Total.		
Catchment Districts—						
Hauraki	1,500	13·9	3·4	17·3	45,000	Te Aroha.
Rangitikei	2,756	13·0	3·2	16·2	26,470	Marton.
Manawatu	2,680	29·6	12·9	42·5	75,800	Palmerston North.
Hawke's Bay	3,070	18·3	10·3	28·6	57,800	Napier.
Wairarapa	2,230	13·8	4·0	17·8	26,250	Masterton.
Poverty Bay	2,097	10·8	4·3	15·1	31,500	Gisborne.
Nelson	2,460	5·1	4·4	9·5	30,570	Nelson.
Westland	6,254	2·3	2·2	4·5	26,820	Greymouth.
North Canterbury ..	4,290	21·6	35·1	56·7	162,750	Christchurch.
South Canterbury ..	4,326	21·0	8·5	29·5	61,850	Timaru.
Southland	11,000	17·4	9·9	27·3	71,850	Invercargill.
Otago	13,210	18·0	29·8	47·8	27,460	Not fixed.
Totals, twelve catchment districts	55,873	184·8	128·0	312·8	644,120	..
Soil Conservation District—						
Waitaki	4,600	3·0	0·0	3·0	4,750	Kurow.
Totals, catchment and soil conservation districts	60,473	187·8	128·0	315·8	648,870	..
Totals, New Zealand, 1st April, 1941	103,416	311·9	310·8	622·7	1,616,070	..
Percentage cover by catchment and soil conservation districts	58	60	41	50	40	..

SOIL CONSERVATION

Soil-conservation work has to date been directed towards educational publicity, demonstration, and experimental work, while through the Catchment Boards direct assistance to farmers in the control of erosion has been undertaken on a subsidy basis.

The following is an outline of these activities :—

1. Information

(*a*) *Press.*—Articles have been contributed to the daily papers and farmers' periodicals on the various aspects of the Council's problems and activities.

(*b*) *Bulletins.*—To date, seven bulletins have been published and circulated widely through Federated Farmers, schools, and Catchment Boards. The most recent one—"Willows and Poplars for Conservation and River Works"—indicates the trend toward technical information on the control of erosion and conservation measures that may be undertaken by the farmer.

(*c*) *Film Strips.*—Six film strips with a typed description of each frame and lecture notes have been circulated widely and have proved popular in schools and colleges. The trend in these is toward regional topics and technical ways and means of conserving the soil.

(*d*) *Lantern-slides.*—Sets of these are available on loan from District Conservators for lecturing purposes to those who may need them in districts.

(*e*) *Agricultural and Pastoral Show Displays.*—During the past year the Council has continued its policy of co-operating with the respective Catchment Boards in arranging displays of interest to farmers at the principal shows in the North and South Islands. Displays consist of comparable models of wise and unwise land use ; erosion-control measures ; photographic studies of local examples of soil erosion and soil conservation in each district ; information on types of trees useful under various conditions ; and revelant information on the assistance Catchment Boards can give. Considerable interest has been evinced, and it is intended to progressively modify the displays and keep them up to date.

(*f*) *Mobile Cinema Unit.*—During the past year the mobile cinema unit has been made available to all Catchment Boards for screenings throughout each individual catchment area. The Catchment Boards have organized these tours within their districts, and in most cases have deputed one of their members to chair the screenings.

Where no Catchment Boards are at present in existence, the screenings were organized by the Public Works Department in co-operation with Federated Farmers and Young Farmers' Clubs.

In the North Island the following districts were visited : Hauraki, Waikato, North Auckland, Bay of Plenty, Hawke's Bay, Wairoa, Manawatu, Rangitikei, and Wairarapa ; while in the South Island screenings were made in Nelson, Westland, Clutha, South Canterbury, North Canterbury, Marlborough, and Southland. During this tour there were 153 public screenings to 10,142 people. In addition to this, there were 99 screenings at schools to a total audience of 22,411 pupils, a grand total of 252 screenings to 32,543 people.

During its present circuit the unit is showing the following films :—

(1) *Assets to Ashes.*—A colour film portraying the damage done by fire at Taupo and leading on to the part fire plays in soil erosion. An appeal to citizens to take all possible precautions with fire, and to farmers to take adequate safeguards when burning off their land.

(2) *We Live by Water.*—This film is based on the cycle of water in nature. Under natural control it is beneficial to man, but once out of control, due to man-made factors, it becomes a menace to our very existence. The national importance of wise use of farm land to control its waters, and of prudent forest management to safeguard them against fire, is then portrayed.

(3) *Soil Conservation Work at Te Awa.*—Located in the Manawatu district is an experimental area named Te Awa. On this property experiments are being undertaken to arrive at effective control measures for slip, gully, and stream erosion. A visit is paid to the area and a composite picture of all features of the work is presented in a straightforward, concise manner.

(4) *Bringing Back the Balance* (Colour).—This film portrays the problems associated with a catchment area out of balance with nature. On a trip up-stream to the head-waters of a South Island river, features of poor drainage, river and soil erosion, are amply dealt with. On the return trip down-stream conservation measures are shown for the high country, downlands, and plains.

(5) *Farmers Tackle River, Gully, and Slip Erosion.*—An outline of farmers' conservation activities in the Manawatu and Rangitikei district. The part played by the Catchment Boards in providing technical assistance and arranging financial aid.

(6) *Poverty Bay—To-day and To-morrow.*—Within a few weeks the programme will include this colour film, which traces the source of agricultural wealth to the productive hill country and, in a lesser degree, to the rich river flats. The theme then changes to show how the productive country is being threatened by soil erosion—chiefly in the form of gullies and earthflows. Having defined the problem, the film gives specific information on combating erosion. It is presented in a simple manner and should serve as a fundamental guide to farmers throughout the country.

(*g*) *Publicity Committee.*—At the 1947 annual meeting of the Catchment Boards Association a committee of three Catchment Board representatives was set up to collaborate with the officers of the Council in an advisory capacity in educational publicity. Two meetings were held during the year and much constructive discussion on films, bulletins, and information generally took place.

2. Soil Conservation Reserves and Demonstration and Experimental Farms

The Council is endeavouring to overcome soil erosion and conservation problems on a practical farm basis in typical problem areas by purchasing farms and running them directly for demonstration purposes. In addition, portions of the farms are being set aside for purely experimental and research purposes, and work is done in co-operation with other Departments especially interested in various phases of the problem.

(*a*) *Wither Hills.*—An area of 400 acres of the worst sheet and gully eroded land on the Wither Hills, and in New Zealand for that matter, was taken over in 1944. The treatment on this poor land consisted of sowing subterranean clover and mixed pasture on the ploughable flat land, and of spelling completely the hill country for one year to ensure generous natural reseeding. After a year cattle were used (30) to control the roughage and spread the clover from the flats to the hills in their droppings.

Trees were planted on small areas of the most severely gullied slopes and these were fenced off, while small debris and brush dams were erected in the actively eroding gullies that were spewing out a large quantity of silt and stones.

The treatment in four years has controlled the sheet erosion, reduced run-off, and stopped active gully erosion.

Now that the erosion problem has been largely overcome, the new one of the best future utilization is being tackled.

The lower ploughable slopes (80 acres) have been contour ridged and the land giant-disked, fallowed, and sown to mixed pasture. Liming and top-dressing have been carried out and a good pasture has been established. The contour ridges prevented loss of rain by run-off during the recent heavy rains (the heaviest for twenty-five years), and run-off from the whole area was much less than that from adjoining properties and, more important, there was little soil and shingle carried in the streams.

On the two comparable valleys on the farm, cattle only will be tried out against a cattle and sheep economy, while run-off and soil loss are being measured from comparative plots, improvement in the grass cover is being measured, the run-off from the comparable gullies is being measured, and the live-weight increases of cattle and sheep are being recorded.

(*b*) *Waerenga-o-Kuri.*—A farm of 998 acres was taken over recently near Gisborne as it was typical of the slipped and gullied mudstone country of the east coast from Wairarapa to Poverty Bay.

On this farm the best present-day information will be applied to controlling erosion while the land is being farmed, in order to determine practicability and economic feasibility. To stabilize the hillsides, spaced willow and poplar trees, improved pastures, dominantly cattle and sheep farming, and debris dams will be used, while supplementary feed will be grown to minimize overgrazing.

On the experimental area, run-off and soil loss will be measured, soil movement will be recorded, combinations of improved pastures, spaced trees, drainage, debris dams, and grassed waterways will be put under trial to determine the best means of stabilizing eroded hillsides and those liable to erosion. Trials to determine the best cattle/sheep ratio, the best methods of revegetating slip and flow eroded areas, and the best and cheapest methods of gully control are being established.

Control structures to stabilize the head of the main gully have been established, while log, brush, and pole dams with netting have been built lower down in this gully.

Careful records of climate, carrying-capacity, costs of all projects, and the overall benefits of conservation practices are being kept and will be made available to all concerned.

(*c*) *Tara Hills.*—A typically eroded South Island high-country run of approximately 8,000 acres was recently taken over near Omarama. The lower sunny slopes, which comprise the winter country, are severely depleted of vegetation and actively eroding. A recuperative farming programme has been drawn up, sheep have temporarily been reduced to half, spelling and reseeding (natural and artificial) are being undertaken on blocks in rotation, rabbits are being eradicated, and supplementary feed is to be grown under irrigation to reduce the grazing burden on the winter country. On the experimental area the causes of erosion are being investigated, while practical measures of revegetating the eroded land are put under comparative trial.

Run-off and soil loss, and improvement in swards, are being investigated under varying conditions of management.

(*d*) *Mid Dome.* An area of (800 acres approximately) severely sheet and gully eroded high country that supplies debris to the tributaries of the Oreti River was obtained practically gratis from the owner by the Southland Catchment Board, and the Council is prepared to carry out repair measures and do experimental work on the practical aspects of revegetating the area. Already a botanical survey has been carried out, and marked plots have been photographed and recorded.

(*e*) *Adair.*—An overcropped, depleted, and eroded cropping farm of 80 acres on the downlands five miles from Timaru has just been acquired with the definite objective of investigating the benefits of contour tillage, strip cropping, and terracing on soil and water conservation, and of comparing them with standard practice under the ruling crop rotations and farm-management of the district.

(*f*) *Tangoio.*—This reserve was procured by the Highways Board and the Council primarily to stabilize the slopes above and below the highway, owing to the costly maintenance due to frequent slipping. In addition, 400 acres approximately of severed farm land in a badly slipped condition is being treated by spelling, seeding, top-dressing, and space planting. This affords an opportunity in this badly slipped area of obtaining information on a practical scale of the prevention and control of slipping. An additional 25,000 trees were planted last year on steep slopes above the road (half were eucalypts, and the remainder macrocarpa, redwoods, elms, poplars, and willows).

The nursery at Waikoau for the above project has been fully established and has 33,000 trees ready for 1948 plantings and 22 beds of yearling plants to be lined out.

Three thousand rabbits and 340 goats have been destroyed on this reserve to date.

(*g*) *Esk.*—An area of 7,000 acres approximately of abandoned farm land was taken over by the Council in the headwaters of this erodible catchment. Spelling has brought back natural cover to stabilize the land, and now the utilization of the land is being tackled. The land unsuitable for farming is being planted by the State Forest Service.

Four thousand rabbits were destroyed on the property last season.

(*h*) *Ihungia.*—This area of 195 acres is badly slipped and gullied and the headwater erosion of the gullies threatens to undermine the only road over a distance of several chains. The area was purchased, fenced, and spelled from grazing, while the slips are being stabilized by spaced tree-planting and the gullies stabilized by debris dams.

3. Experimental and Research Work in Co-operation with Catchment Boards and Departments

(*a*) *Te Awa.*—The Manawatu Catchment Board, working in co-operation with local farmers, is undertaking stream, gully, slip, and pasture control work on an area of upwards of 100 acres. The Grasslands Division is closely associated with the work and much of it has been done by their staff. Their intensive experimental work on pasture improvement, slip planting, gully control, and stream control work is well in hand and is providing valuable data on soil-conservation measures.

(*b*) *Mangaweka.*—In co-operation with a local farmer, the Rangitikei Catchment Board has, with the Council and the Grasslands Division, laid down pasture-improvement trials and spaced-tree-planting trials to determine the effect of trees and grass on stabilizing mudstone hill country and of the number needed per acre.

(*c*) *Waiouru.*—The Rangitikei Board has arranged for quite extensive revegetation trials on wind-eroded pumice tussock country, and these trials were put down by the Grasslands Division and State Forest Service. Thirty-eight thousand *Pinus murrayana* and 19,000 *Pinus laricio*, native grasses, exotic grasses, and clovers were sown and planted.

(*d*) *Gisborne.*—In association with the Grasslands Division and the Department of Agriculture, the Poverty Bay Catchment Board has arranged for the extensive sowing of trials on the slip and flow eroded areas in their district.

(*e*) *Wairarapa.*—The Wairarapa Catchment Board has organized slip sowing trials with the Grasslands Division in their worst slip-eroded area.

4. Operations

In order to assist farmers in controlling erosion, the Council makes subsidies available, through Catchment Boards:—

(*a*) A subsidy of £1 for £1 for spaced tree-planting to stabilized eroded hillsides and this includes the cost of fencing. In addition, in order to prevent erosion, the subsidy can be used to fence and protect existing bush on steep hillsides likely to suffer from severe erosion if cleared and grassed.

(*b*) A £3 for £1 subsidy is available for gully, slip, and bank erosion where structures such as debris dams are necessary, and covers the cost of trees needed and fencing.

The Council has also organized and financed aerial seeding trials and aerial top-dressing trials, about both of which it hopes to have factual information within six months.

Willow poles for conservation work were dropped successfully from the air in an inaccessible area in the Gisborne district in a trial carried out on the Council's behalf by the Air Department. The transport costs per pole compared favourably with the cost of motor transport and packing by horse, had this alternative been possible.

Contour furrowing trials and gully control work, in co-operation with farmers, have also been carried out in South Canterbury.

5. Surveys

Preliminary conservation surveys are under way in one district, and this will pave the way to well-organized and comprehensive conservation surveys to be undertaken in each region by the various Departments interested, the whole of which will be collated by the Soil Conservators.

HYDROLOGY

The Council has been able, during the year, to give consideration to the question of assisting Catchment Boards and other local bodies in the establishment of rainfall and run-off stations. Briefly, the Council has decided that the only stations which will be subsidized will be those local stations, outside the agreed national skeleton network, whose situation and derived data will be such that they will be of national as well as of local utility. Rainfall and run-off stations within the national network will be wholly paid for by Meteorological Services or the Council. Subsidies will only be available where instruments, siting, exposure, construction, and maintenance are to the Council's requirements and where the local body agrees to hand on to Meteorological Services or to the Council copies of all original records for later analysis and publication. By the end of the year no local body had availed itself of these provisions.

Further considerable advance has been made by Meteorological Services, in intensifying their national skeleton network of rainfall stations, although during the year none of the 100 additional automatic rain-gauges ordered had come to hand. At the beginning of the year there were in the national network some 688 manual and 32 automatic rain-gauges, whereas by the end of the year these numbers had been increased to 766 manual and 32 automatic rain-gauges.

Considerable investigations have been carried out concerning a suitable type of rain and snow gauge which could be installed in the remote headwaters of the important river catchments for the purpose of obtaining precipitation data essential to the analysis of storms producing flood run-off. The sites will usually be difficult of access and would therefore require a gauge which will operate six months or so without attention under extremes of temperature, with snow common, and be able to handle up to 200 in. of precipitation over a six-monthly period. These investigations are being continued. During the year, however, arrangements have been made with the Wild Life Section of the Internal Affairs Department to read periodically large-capacity manual gauges at each of their alpine huts, and this data will be of help in filling in a considerable blank in the knowledge of New Zealand's annual precipitation in remote localities.

Agreement has been reached with Meteorological Services as to how rainfall data for each station should, in future, be published monthly and annually. It is hoped that the first volume of rainfall data, analysed in accordance with this agreement, will be published during the next year.

Very little progress is reported upon the establishment of additional run-off stations, due to staff shortages and difficulty in procuring steel. No stations authorized were constructed, but at least 4 should be completed during the coming year. During the year 24 current meters arrived from England, and these have been distributed, 19 to the Department and 5 sold to Catchment Boards.

Approval was given to the formation of two survey parties, one for the North Island and one for the South Island, which would work continuously on selection and survey of run-off gauging sites before construction, periodic survey after construction, and the making of water and silt-discharge measurements at various stages. At the end of the year the parties were being equipped, and at least one will be in full operation next year.

Council authorized the printing of a handbook entitled "Gauging of Rivers in New Zealand" and of miscellaneous forms to be used in the maintenance and recording of run-off station levels and discharges.

WORKS

In spite of very serious plant and labour shortages, an increasing amount of work has been done by Catchment Boards, other local bodies, and the Public Works Department under subsidy from the Council. Nearly 60 miles of rivers have been excavated as diversion cuts or, as at Otaki, as new and enlarged channels. Twenty-four miles of actively eroding banks have been protected, thereby saving several times that length of riparian lands from damage. Twenty-five miles of rivers and smaller streams have been cleared of willows to save rich flats from flooding. Eighteen miles of stop-banks have been built. Over 100 miles of main drains have been excavated.

Two soil-conservation schemes have been launched whereby the Council grants subsidies to farmers for works carried out by them under the guidance of Catchment Board officers. As yet farmers have not availed themselves of this type of assistance to any great degree except in the Poverty Bay Catchment District, where 40 farmers have been assisted in space planting of trees and another 32 in the construction of debris dams and other methods of gully control. A number of applications for work during the coming year are in the hands of the Catchment Boards.

In the past much capital expenditure on river and drainage works has been lost through lack of effective maintenance. The Council has now been authorized to subsidize maintenance in catchment districts with the object not of relieving settlers of the responsibility for this work, but to enable it to be carried out with greater efficiency.

Surveys have been carried out, or are in hand, for major river-control schemes, particularly the Whakatane, the Waipaoa, the Rangitikei, the Manawatu, the Ruamahanga, the Motueka, the Selwyn and other rivers in the North Canterbury Catchment District, the Orari in South Canterbury, and the Clutha.

Auckland District

Uwhiroa Stream Clearing, Herekino.—A further 34 chains of stream were cleared, widened, and willows removed.

Kikowhiti Stream: Willow Clearing.—The Otamatea County Council is endeavouring to arrange a contract.

Raupo Drainage Board's District.—Although several works have been approved, the Board has not yet been able to lift the subsidies and has confined its activities to maintenance.

Aka Aka Swamp.—The Aka Aka Drainage Board has reconditioned a further 3 miles 60 chains of drains with its drag-line.

Acclimatization of Plants.—Kudzu plants have been established on one property and are flourishing. Shipmast locust trees have not been so satisfactory, though six trees on the same property as the Kudzu have shown remarkable growth.

Waikato District

Mangaorongo Stream, Otorohanga County.—Willow clearing was delayed during the war years and has resulted in a strong regrowth over the first section of 8 miles 35 chains. This will be removed before handing over to the County Council. So far 1 mile 20 chains have been cleared and poisoned and a further 60 chains cleared. Up-stream of this old work a further virgin 4 miles 2 chains have been cleared and poisoned.

Ohote Outlet, Te Rapa Drainage Board.—A length of 1 mile 10 chains has been deepened and widened.

Koromatua Stream, Waipa County.—A length of 1 mile 35 chains has been surveyed in connection with the flooding of 170 acres of flat land. To date, 1 mile has been deepened and widened.

Te Onetea Stream, Waikato County.—The contract let for clearing 1 mile 31 chains of willows is nearing completion. A further contract for 25 chains has been let to open up the channel into Lake Waikare.

Taupiri Drainage Board.—The Board has continued its programme of opening up rivers and drains with its two drag-lines and with hired plant. The following works have been completed :—

Mangawara River	.. ..	Widened and deepened for 1 mile 69 chains.
Mangawara Outlet	.. ..	Widened and deepened for 1 mile 6 chains.
One-mile Drain	.. ..	Widened and deepened for 1 mile 46 chains.
G. Drain ..	.. ..	Widened and deepened for 2 miles 30 chains.
Murchie's Drain	.. ..	Widened and deepened for 2 miles 46 chains.
Paranui Canal	.. ..	Widened and deepened for 1 mile 7 chains.
Central Drain	.. ..	Willow clearing for 1 mile.

Hauraki Catchment Board.—This Board, not yet having had time to recruit its full staff, has not been able to undertake much work. In conjunction with the Thames Valley Drainage Board the following works have been completed :—

Waitoa River : This river is being choked by a regrowth of willows throughout its length. Starting from its confluence with the Piako, a distance of 7 miles 40 chains has been cleared.

Otway Canal : 1 mile 20 chains of main drain have been opened up and the spoil used for the formation of a road.

Ahikope Outlet : Two 4 ft. pipes with floodgates have been installed under the Waihoa River stop-bank. A pumping plant consisting of a Diesel-driven 10,000 g.p.m. pump has been set up to deal with surplus water during the winter when the river is too high for the floodgates to operate.

Kopuroa and Papamoa Drains.—The Te Puke Drainage Board has deepened and widened 3 miles 25 chains of the Kopuroa Drain and 2 miles of the Papamoa system through the low-lying land of the Kaituna River basin. Two further projects are in hand to similarly treat the Raparapahoe and Ohineangaanga Streams.

Whakatane River Survey.—A detailed engineering survey of 28 miles of the river has been completed. On this a comprehensive scheme for control will be planned. Air photos of the river were taken in March, 1944. It is recommended that where erosion and flooding are constantly occurring as on rivers such as this, the valley should be photographed at intervals of about five years.

Whakatane River Erosion (above Whakatane Bridge).—Additional stone protection work to the value of £1,000 covering a length of 10 chains was carried out below that completed last year.

Whakatane River Erosion (Whakatane Paper-mills).—Sixteen chains of rock bank revetment is being carried out by the Public Works Department where an eroding bank is threatening the pipe line supplying the paper-mills.

Whakatane River Erosion (Ewart).—Fifteen chains of heavy willow bank-protection has been satisfactorily completed by Mr. Ewart under the Council's supervision.

Whakatane River Erosion (Soutar).—Seven chains of heavy willow bank-protection has been similarly carried out.

Whakatane River Erosion (Richardson).—Nine chains of similar work has been completed.

Whakatane River Erosion (Yeoman and McGouger).—A length of similar work to the foregoing has been approved by the Council and will be carried out by the settlers this winter.

Whakatane River Erosion (Ruatoke).—Serious erosion has taken place in valuable farming-land worked under the Maori development scheme. In conjunction with the Department of Maori Affairs, remedial measures will shortly be put in hand.

Ohope Hill Slip.—Fears were entertained by residents of Ohope that serious slips might occur endangering houses at this seaside resort. Investigations were made and the location has been closely watched, but no further movement has taken place.

Waimana and Rangitaiki River Stage Recorders.—Sites have been selected, but the erection of these recorders has been held up pending receipt of special steelwork which is being fabricated in Auckland.

Wairere Stream, Whakatane Borough.—This stream runs through the borough, floods frequently, and causes damage to business premises in the main street. It is proposed, with financial assistance from the Council, to widen the channel and line 6½ chains of it with concrete. The work of increasing the waterway at the bridge is being subsidized by the Main Highways Board. The work will be undertaken by the Whakatane Borough Council, but has not yet been put in hand.

Waiotahi River, Opotiki County (Wilson).—Clearing of 15 chains of willows has been completed.

Waioeka River Erosion (Murray).—Heavy willow protection was carried out by Mr. Murray last year, but was delayed owing to difficulty in obtaining fencing-wire. The work is to be completed during the coming winter, the most suitable season for willow-planting.

Waioeka River Erosion (Maxwell).—Heavy willow bank-protection will be carried out during the coming winter.

Otara River Erosion (Mesdames Wingate and Steele).—A small amount of work was done last year, but the remainder has been deferred till a suitable season for willow-planting.

Otara River Erosion (Thompson).—This work was mostly completed last year, but some willow-planting remains to be done when fencing-wire can be obtained.

Huntress Creek, Opotiki County.—The County Council has been granted financial assistance to strengthen stop-banks and to restore floodgates, but has not yet been able to start the work.

Nurseries.—Shipmast locust planted at Whakatane are doing well and a considerable amount of propagation has been successfully undertaken. About 250 rooted plants will soon be ready for planting out. Plantations of bitter willow and poplar have also been established.

Napier District

Hikuwai River: Willow Clearing (Poverty Bay Catchment District).—A further 4 miles of river has been cleared of willows, bringing the total to 8¼ miles. Local farmers and the main highway have been given a large measure of relief from flooding. Experiments have shown ring-barking to be effective after two years, and poison has been used effectively to control second growth. Maintenance of this scheme will probably be taken over by the Poverty Bay Catchment Board.

Waipaoa River: Te Wairau Bend (Poverty Bay Catchment District).—The severe flood of July, 1947, destroyed a large portion of the protective work then under construction. Repairs have been carried out.

Waipaoa River: Groyne near Mouth (Poverty Bay Catchment District).—One hundred feet at the end of the groyne has been restored and has brought about the steady retreat of the bank opposite. Tides have had a tendency to scour the land on the back of the groyne, but this has been successfully countered by placing scrub on each section of the groyne affected. This groyne worked very satisfactorily during the flood of May, 1948, but requires extending a further 250 ft.

Waipaoa River Improvement Survey.—A survey has been carried out on behalf of the Poverty Bay Catchment Board to the north of Tietjen's Bend.

Meeanee Drainage (Hawke's Bay Catchment District).—Practically no additional work has been carried out during the year. Plans for the necessary reinforced-concrete culverts are being prepared by the Hawke's Bay County Council, and it is anticipated that they will be available during the current year. Investigations are still being made into the discharge into the Inner Harbour area.

Tuki Tuki River Control (Realignment Tennant's Bend), (Hawke's Bay Catchment Board).—Started last year, the new channel was opened in May and June, 1947, but owing to floods did not function efficiently during the winter months. Work began again early in 1948 on reopening the channel and constructing protective works. It is anticipated that this will be completed shortly.

Tuki Tuki River Control at Waipukurau (Hawke's Bay Catchment Board).—The first section of this work from the Tukipo River junction to Pah Flat has been completed except for the settlement of land compensation. Work has begun on the second section from Pah Flat to Tamuma Bridge, and good progress was made during the summer months. The work consists of channel improvement, willow-planting, and incidental works. Of the first length of 7 miles, 3 miles 35 chains were completed during the year under review and 30 chains of the second section.

Kumeti Drain.—Two concrete weirs were each raised 3 ft. and one damaged weir was repaired. From the stream-bed 3,000 cubic yards of river shingle were removed.

Sinclair's Drain.—The Manawatu Catchment Board has deepened 54 chains of this drain.

Minor River Protection Works.—Poverty Bay Catchment Board: Minor works all comprised willow and poplar planting and anchored-tree protection. The number of jobs completed was 12.

Hawke's Bay Catchment Board: None.

Manawatu Catchment Board: A total of 7 jobs were completed on the upper Manawatu and tributaries.

Minor Stream and Gully Control Works.—Poverty Bay Catchment Board: This Board's area contains much gullied country which, if not allowed to go too far, can be held by gully blocks and tree-planting. This work is done by the farmers concerned under Catchment Board guidance and a subsidy granted by the Council. During the year 32 of these schemes were approved, 92 log and brush dams were built, and 12,800 trees planted.

Conservation Tree-planting Scheme.—Poverty Bay Catchment Board: To stabilize slopes subject to earth movement the Council grants farmers a subsidy for tree-planting. Forty schemes were approved and 24,458 trees planted.

Nurseries.—A nursery was established at Te Puia for the Poverty Bay Catchment District and an allocation of shipmast locust trees was planted out, of which 15 survived and are now growing vigorously. Some 300 root cuttings have been taken and are now well established. Willows, poplars, and other trees have also been grown for conservation planting.

The Hawke's Bay Catchment District's nursery is established on the Tangoio Conservation Reserve, and eucalypts, *Cupressus macrocarpa*, sequoias, elms, willows, and poplars planted.

Wanganui District

No soil-conservation or river-control work has been carried out in Taranaki.

Tongariro River: De Latour's Pool.—Willows have been planted and fenced in order to protect the right bank.

Ohura River.—Investigation of flood levels and survey of this river is in hand with a view to the design of a scheme for its control.

Wanganui River.—An old groyne and a shingle deposit were removed from the right bank opposite Brown's Orchard 1 mile below the confluence with the Ongarue River.

Wanganui River Protection Work at Taumarunui.—The tipping of rhyolite boulders to protect the bank which was well advanced last year, has been completed, the length being 12 chains.

Wanganui River at Taumarunui.—A survey, 40 chains in length, has been made through Winter's Island for a proposed cut to reduce erosion in the Taumarunui Borough.

Rangitikei River: Tangimoana Foreshore Protection.—This work, consisting of a scrub and torpedo-net mattress, was well in hand last year and has now been completed.

Rangitikei River, near Flock House.—Work of opening up a channel through shoals, begun last year, has been completed.

Rangitikei River Control Scheme.—The Rangitikei Catchment Board has prepared a scheme for the control of the lower river into which all future work will be fitted. It comprises channel improvement by cut-offs, bank revetment in places, and willow clearing and planting. Approximately 10 per cent. of the work involved has been carried out.

Rangitikei River Erosion (Fraser Estate).—Work involving willow clearing, a diversion cut, and protective willow-planting has been completed by the Rangitikei Catchment Board, the total length being 10 chains. Similar work was done at Petersens to protect 5 chains of bank.

Tutaenui Stream Clearing.—Six miles of this choked meandering stream have been cleared of willows and straightened by the Rangitikei Catchment Board.

Minor River Protection Works.—Rangitikei Catchment Board: Three minor river works have been completed and a fourth is half done.

River Gauging.—Low flows have been gauged in the Mangatepopo, Mapiu, Marakopa, Mokau, Mokauiti, Ohura, Ongarue, Otinui, Pautu, Punga, Taringamotu, Kairimu, Tongariro, and Wanganui.

Sites for river gauging were fixed on the Mokau, Ongarue, Pautu, and Wanganui (2).

Wellington District

Manawatu Catchment Board.—The following works have been carried out in the Board's district:—

Manawatu River.—Bank-protection at Stewart's Bend has been completed at a cost of £4,500. It consists of 45 chains of continuous scrub mattress weighted with stone gabions.

Bank-protection work has also been carried out in the Makerua Drainage Board's area on Hansen's, Barrow's, Allright's, and Whitanui Bends, as well as on the Old Foxton Road. The work at Whitanui Bend is only 50 per cent. complete.

A small amount of protection work has been done on two properties above and one below Palmerston North, together with other minor jobs at isolated points.

The total length of bank protected aggregates approximately 1 mile 65 chains.

A deflecting groyne was built in the vicinity of the Taupunga Cut at a cost of £1,265.

At Brotherstone's, on the Upper Manawatu River, an anchored cable and tree deflecting-groyne was built in conjunction with a small cut. Owing to insufficient anchorages along the cable, the deflector carried away in a flood and the entrance to the cut shoaled. Remedial measures are to be tried.

Oroua River.—Small protection works have been carried out at Thevenard's, Bartlet's, Hocken's, McEwan's, Fraser's, and Aldis' by bulldozing small cuts and tree-planting. Bank-protection was carried out at Ruawai Road.

Pohangina River.—Tree groynes, planting of willows, and a small stop-bank were completed at Totara Reserve.

Kahuterawa Stream.—In order to protect the Palmerston North water-supply mains, bank-protection work was carried out for some 1½ miles. Tree-planting has yet to be done.

Kawau Stream.—The deepening of this stream has been in progress for some time and is now 75 per cent. complete. During the year 7,500 cubic yards were excavated.

Mangaore Stream (Manawatu-Oroua River Board).—Flood damage to stop-bank and floodgate at a point known as Te Maire Break has been repaired at a cost of £2,550.

Koputaroa Stream.—Stop-bank repairs have been completed.

Mangahao River (Marima Bridge).—Heavy bank-protection of boulders and anchored trees backed by 12 chains of overflow stop-bank have been completed by the Pahiatua County Council.

At Makaretu Settlement 20 chains of willow and poplar planting backing brushwood mattress bank-protection has been completed.

Mangatainoka River.—At Bibby's Erosion weighted anchored tree bank-protection, together with a stop-bank and willow plantation, has been completed. Similar work has also been completed at Harvey's.

Town Creek, Pahiatua.—This creek is to be widened and cleaned, culverts improved, and a spillway enlarged, the total cost being estimated at £2,245. Negotiations between the contributing bodies have been satisfactorily completed and the work started.

Minor river protection works in the Manawatu Catchment District have mostly been situated in the Upper Manawatu and tributaries and have consisted of anchored-tree protection, small stop-banks, &c. Eight jobs have been completed.

Makerua Drainage Board.—Only a small amount of work has been carried out (chiefly bank-protection and relocating a stop-bank on the Mangaore Stream), as all this Board's works have been taken over by the Manawatu Catchment Board.

Buckley Drainage Board.—Activities of this Board have been limited, the only work being the extension of the Upper Buckley Drain, which is still in progress.

Ohau River.—Work on Kilby's Erosion is still only about 75 per cent. complete and requires additional planting and some groyne work. Further improvements are to be carried out at the mouth of the river, and work will start shortly.

Otaki River.—Excavation of the new channel below the highway bridge was completed in December, 1947. Approximately 551,300 cubic yards were removed by tower excavator, making the total for the job 672,000 cubic yards. The length of the new channel is 2 miles 9 chains. The stop-bank on the left has been extended almost to the end of the new cut, being 1 mile 70 chains long. The quantity of material in this length is 80,000 cubic yards, of which 60,000 cubic yards were placed during the year under review. Bank-protection is going ahead steadily and 2,500 ft. of rail groynes have been built both above and below the highway bridge. Approximately 10,400 willows and 1,300 poplars have been planted on both berms. A start has been made with the permanent fencing, and to date some 40 chains of posts and strainers have been erected, but so far no wire is available.

Rangiuru Stop-bank was started in January, 1948, and 15,000 cubic yards placed to date. It is now awaiting the construction of a floodgate.

Chrystalls Erosion, above the highway, has been checked at a cost of £1,000. More willow-planting is required.

Waikanae River.—Efforts were made last year to open up a new mouth, but met with no success. A flood in January, 1948, however, successfully opened up a new channel, which has so far remained satisfactory. Bank-protection has been carried out on four properties.

Hutt River.—Floods occurred in February, June, August, and September, 1947, and the damage suffered was repaired by the Public Works Department. This consisted of restoring the breached stop-banks and strengthening and repairing bank revetment and groynes. The work so far carried out has been of a scattered and minor nature to maintain the *status quo* until a Catchment Board assumes control. A major flood-control scheme will then be required, and, to this end, surveys and investigations have been made.

Ruamahanga River and Lake Wairarapa Flood Control.—A committee of Government and Catchment Board representatives has been set up to consider aspects of engineering, land-development, and finance for a scheme for flood-relief in the Lower Wairarapa Valley. Three schemes have been considered in detail. Some of these were again subdivided into major and minor schemes, the major one to give immunity from flooding and permit of closer settlement, while the minor scheme gave limited relief to the present inhabitants. If storage in Lake Wairarapa is relied upon, a diversion at Pukeo appeared to be the most promising, but might not be so if a more permanent opening to the sea could be maintained for Lake Onoke. This aspect is now being investigated.

Wairarapa Catchment Board.—The following works have been carried out in this Board's district :—

Ruamahanga River.—In the Te Ore Ore River Board's district bank-protection has been completed at Burley's, Moore's, Cole's, and Savage's, and 10 chains of stop-bank has been built near the Masterton sewer outfall, 22 chains of bank having been built there the previous year. A comprehensive river-improvement scheme has been prepared by the Catchment Board, which will in future carry out all work in the area.

At Carter's Bush 4 chains of anchored-tree protection backed by a willow plantation has been completed. This was damaged by flood, but has since been repaired. Similar work over a length of 10 chains has been carried out at Rutherford's (Ahiaruhe). At Luckie's, 12 chains of this type of work was completed.

At Renall's property the Main Highways Board, the Soil Conservation and Rivers Control Council, the South Wairarapa County Council, and the property-owner have all contributed to protect 12 chains of bank with anchored and weighted trees. Further work to protect valuable farm flats and a main highway is to be undertaken in this locality during the next two years.

Two works were in hand on Mrs. Budd's property, both of the anchored-tree type backed by a willow thicket each 15 chains long. One was half finished and the other well started when they were severely damaged by a flood in May, 1948.

Brushwood and stone gabion protection was used on Tilson's. This work has not yet been completed.

Waiohine River.—Two small stub groynes of stone gabions have been built and a contract let for 15 chains of stop-bank. Work on the stop-bank had not started at the end of the financial year. At another site 5 chains of brushwood and stone gabion bank revetment were completed.

Waipoua River.—The first 4 miles of a 12-mile channel-improvement scheme have been completed. The work consists of removal of obstructions and willow growth, channel straightening by cuts, and the removal of some shingle deposits. Progress was much delayed by plant breakdowns.

Flood Damage.—Heavy flooding occurred in June and July, 1947, particularly in the Lake Wairarapa area. Stop-banks in the Kahautara River Board's area were demolished to release flood-waters and, due to conflicting opinions amongst the settlers, have not been replaced. Repairs in other areas have been carried out.

Allsop's Bay : Setting back Stop-banks.—To provide greater outlet capacity in the Lower Ruamahanga River between Lakes Wairarapa and Onoke, stop-banks are being set back below Allsop's Bay as the first stage of the improvement of The Narrows. Forty-one chains of stop-bank on the east side have been completed and the old banks cut down. On the west side the contractor did not get started before the rains came, and this work will be postponed till next summer.

Tauherenikau River Diversion.—Proposals for the stop-banking and diverting of the lower Tauherenikau River were prepared, but were held up pending a decision on the site for a diversion of the Ruamahanga River, one scheme for which involved a cut to the Tauherenikau. This particular scheme has now been abandoned, and it is hoped to start work next summer.

Minor River Protection Works.—In 11 minor bank-protection works 38 chains of bank were planted with willows, 27 chains protected with anchored trees, 17 chains by weighted brushwood thatching, and a 3-chain diversion cut dug.

Minor Stream and Gully Control Works.—One farmer was granted a subsidy for constructing debris dams.

Conservation Tree-planting.—One farmer was subsidized under this scheme for space planting of trees to stabilize a slip.

Nelson Catchment Board.—As is so generally the case, this Board was handicapped in its activities by lack of plant. The following works have been carried out during the year :—

Takaka River : Jenkins' Point and Page's Cut.—The removal of Jenkins' Point has been completed and the material used to form a stop-bank. Further work in clearing deposits from Page's Cut has been carried out. The cuts are developing reasonably well ; a further extension of the stonework on the left bank may be required. Land compensation has not yet been finalized.

Wairoa River : Fennel Island and Pugh's Cuts.—Further extensive erosion has occurred on the right bank at Pugh's. Work has started on widening Pugh's Cut and deepening it by the removal of hard shingle bars.

Wai-iti River.—A small cut 6 chains long was made at Line's to cut an acute bend.

Repairs were carried out to the groynes at Wai-iti Domain.

Along Best's and Wilkinson's properties 25 chains of willows were cleared and the channel improved.

Tadmor River.—At Kinzett's, two lengths of heavy willow protection totalling 12 chains were completed. The bed was cleared for 15 chains.

Riwaka River.—General clearing of willow growth and cutting of bad shingle bars has been completed over a length of 2¾ miles, greatly improving the capacity of the channel. Further work will be required later, and eventually a complete stop-banking scheme will be necessary.

A diversion cut 10 chains long has been made on Harris' property.

Anatoki River.—Eight chains of the right bank on Benseman's property have been cleared of willows.

Waimea River.—Seven chains of heavy willow bank revetment were carried out on the property of A. Russ.

Eighty-eight Valley.—Willow cleaning and channel improvement were carried out over lengths of 26 chains and 36 chains on the properties of C. C. Parkes and Claydon's respectively.

Motueka River.—At Tapawera 14 chains of stop-bank, 8 chains of willow thicket protection, and 15 chains of willow clearing in the bed were carried out.

At Curnow Bros. 28 chains of stop-bank were built and 4 chains of willow thicket protection planted. A further 40 chains of temporary stop-bank were thrown up.

At Wilkinson's 10 chains of heavy willow bank revetment were completed.

Tobacco lands suffered heavily from a flood in October, 1947. Investigations have been carried out and a scheme prepared to prevent a recurrence.

Whakapuaka Drainage Board.—New gates have been assembled for No. 2 Drain.

CHRISTCHURCH DISTRICT

Surveys and Investigations.—A scheme has been prepared for protection work in the Fernleigh Dip, Kowhai River, Kaikoura. A survey has been made for a gauging station in the Conway River. In Amuri County, surveys have been completed for the drainage of Lowry Peaks and Waipuna Farm. Similar work has been done in Waipara County for the drainage of Symond's property. On the Kakahu River, plans have been prepared for protection work near Sharp's Bridge.

The North Canterbury Catchment Board has prepared proposals for lateral protection in the Ashley River near Waikuku, including the Taranaki Culvert, a large concrete structure. The Board has also prepared preliminary plans for flood-control at Kowhai Bush and Springfield, and is working on a survey of the Selwyn River.

Kowhai River, Kaikoura County.—Fifteen chains of stop-bank protected by a willow thicket have been completed at Shand's.

Waiau River, Spotswood.—Protection works were extended 12 chains and 36 chains of washouts were repaired

Taumutu Culverts, Ellesmere County.—Forsyth Culvert, of a total length of 288 ft., has been completed. Abrasion of McEvedy's Culvert by the shingle of the beach has been very severe, and difficult repair work is in hand.

Waitaki River.—At Ross's 7 chains of willow bank-protection and a 15-chain diversion channel have been completed.

Halden Station, McKenzie County.—A stream diversion 85 chains long has been completed.

North Canterbury Catchment Board.—The following works have been carried out in the Board's district :—

Eyre River, Oxford County.—Ten chains of stop-bank have been built.

Kowhai River, Kowai County.—Sixty chains of drains have been cut through Blyth's property.

Ashley River.—Ten acres of trees have been planted above the Rangiora Highway bridge. General maintenance of river-control works has been carried out.

Waimakariri River.—The bed below the State highway has been cleared of growth and the control works maintained.

Spencer's Drain, Waimairi County.—Two and a quarter miles of channel have been cleared.

Halswell River.—The channel has been cleared and regraded for a distance of 2 miles from its outlet into Lake Ellesmere.

Sprinys County Drains.—Sixty chains of new drains have been dug and $4\frac{1}{4}$ miles of existing drains cleared.

Lake Ellesmere has been opened to the sea on three occasions. Gauging the lake-levels has been continued.

L1 and L2 Rivers, Ellesmere County, have been cleared and regraded over a length of 2 miles, completing the scheme for their improvement.

Selwyn River Control Scheme.—A pilot channel 40 chains long has been completed at the outlet to Lake Ellesmere.

Irwell Creek, Ellesmere County.—Willows have been cleared for a length of 1 mile.

Homebrook Creek, Ellesmere County.—One and a half miles of willows have been cleared and 45 chains of channel cut.

Taumutu Creek, Ellesmere County.—One and three-quarter miles have been widened and regraded.

South Canterbury Catchment Board.—Works carried out by this Board are as follows:—

Ashburton River.—Maintenance, comprising clearing of willows, and repairing of stop-banks has been carried out continuously.

Hinds River.—Protection work and stream diversion have been completed at Anderson's McDowell's, and Oakley's.

A general scheme for widening the channel and killing willows has been started, but shortages of men and plant have precluded the making of great progress.

Ashburton-Hinds Drainage.—During the year 77½ miles of drains have been widened and regraded. This involved the excavation of 254,000 cubic yards of material.

Orari River.—Eleven chains of stop-banks protected by willow plantings have been completed on McDonald's and Tavener's frontages.

Waihi River.—To protect five properties, 15 chains of willow bank-protection and 36 chains of stop-banks were completed.

Temuka River.—To protect Temuka Borough, 1 mile 29 chains of stop-banks have been built.

Te Moana River.—The protection of Gunning's and Morris' frontages has been completed.

Opihi River.—Tavener's and Lyon's frontages have been protected. Twenty-five chains of stream diversion and a 40 ft. bridge have been constructed in the scheme for protecting Fairlie Township.

Seadown Drainage.—The cleaning and extending of the main drains has been completed. This entailed the digging of 5 miles 54 chains of new drains, the laying of 1,650 lineal feet of culvert pipe, and the cleaning of 2 miles of drains.

Tengawai River.—The work of protecting O'Sullivan's and Kerr's frontages was completed.

Pareora River.—The protective work at Holme Station was completed.

In the Westport area there is no Catchment Board, though river problems are numerous. In the Inangahua County the County Council pays a fixed annual sum which is subsidized by the Soil Conservation and Rivers Control Council and expended on the improvement of the lower Inangahua River in accordance with a master plan.

Karamea River at Fosters.—Overflow channels on the left bank threatened to develop and to menace training-works. Tetrahedrons of old rails were used to retard flow and collect debris and have been successful in arresting development of the channels.

At the Karamea Memorial Park a culvert has been installed through a stop-bank and 7 chains of drain dug.

Little Wanganui River, Buller County.—River works over a length of 3 miles have been maintained. The work involves the removal of shingle bars and the repair of training-walls, which suffer a certain amount of damage during floods.

Orowaiti River.—Two small islands which formed and obstructed flood-waters have been removed.

Giles Creek.—The channel has been improved by removing shingle for a length of 10 chains.

Spring Creek.—A channel has been cut through a shingle deposit, successfully eliminating flooding of adjacent farm land.

Inangahua River Control.—Good progress has been made with this scheme. The diversion and stop-bank near Smith's were completed. Opposite McMahon's a stop-bank has been built and the river bank revetted with willow and scrub fascines. The willows here have done very well. A start has been made on similar work up-stream of Andrews' Bridge, Rotokuhu.

The Inangahua County Council has opened a flood channel at the Landing opposite Patterson's.

Westland Catchment Board.—The rivers in this district plunge from the Southern Alps across a short coastal plain into the sea and are particularly fierce. Strong works are required, which are relatively more expensive than elsewhere in the Dominion. The following works have been carried out:—

Grey River.—A strong point opposite Raupo Settlement has been repaired with stone gabions.

Teremakau River at Inchbonnie.—Fears have long been entertained that the Teremakau River might break through at this point into Lake Brunner, and several times in the past work has been undertaken to maintain the river in its present course. The largest work of this nature has been in progress during the last year: 1 mile 10 chains of stop-bank have been built, a quarry opened up, and danger points on the bank revetted with stone. The bank has been sown with grass, and willows are to be planted during the coming winter.

Ahaura River.—A strong point and stop-bank have been completed at Drayton's. The work has not yet been subjected to the full force of the river, which is at present hugging the opposite bank.

At Malfroy's Bridge fascining has been completed and is standing up well.

Hokitika River.—A stop-bank below the railway bridge has been built to protect the lower parts of the town from flooding.

Poerua (Little Wanganui) River, Westland County.—In the earlier part of the year the stop-bank built to prevent a break through towards Hari Hari was repaired and maintained. During the spring floods it became evident that further rock protection was required, and a new quarry was opened up on the north bank of the Big Wanganui River. The bank is now being faced with rock behind the stub groynes which have been damaged by floods. The work is proceeding slowly owing to lack of efficient plant reasonably free from breakdowns.

Waitangi River.—The existing stop-bank has been raised, enlarged, and extended a further 30 chains, making the total length 1 mile 20 chains. Fencing has been completed and torpedo nets laid in readiness for the construction of live-willow mats during the coming winter. The work has been much handicapped by lack of labour and by plant breakdowns. The Waitangi River is rapidly aggrading its bed, due to material coming down from a large slip above the highway bridge, and is now flowing on the crest of a fan above the surrounding country. The stop-bank was built to prevent a break through towards Lake Wahapo.

Dunedin District

The Otago Catchment District, covering some 13,000 square miles, was constituted during the year. An election will be held later, and it will be some time before the new Board recruits its staff and is able to undertake works. In the meantime river and drainage works have been carried out by local bodies and by the Public Works Department and subsidized by the Council.

Waitaki River.—Proposals have been prepared for improving the cut made near the south bank below the Timaru Dunedin State Highway bridge. However, plant was not available in time and the main flow of the river is now concentrated on the north bank.

Protection against further erosion near Duntroon has been deferred because of lack of suitable plant.

Taieri River.—The following works have been carried out by the Taieri River Trust:—

Lee Creek.—The work of widening and improving this channel, which has been in progress for some years, was continued.

Outer Area, Henley Locks.—A large floodgate and headworks have been repaired. This involved almost complete renewal. One flapgate is still awaited from overseas.

Taieri River Bank Protection.—Bank-protection and stop-banking have been extended and a small relief cut made near Riverside Bridge. Repairs have been carried out to the stop-bank at Otokia, where 30,000 cubic yards were placed.

Clutha River.—The Lower Clutha River Trust has been mostly concerned with flood-damage repairs. This has involved heavy work on stop-bank repairs, willow fascining, rip-rap revetment, and willow-planting. In Balclutha Borough, work is in hand protecting the bank with heavy rock pitching. The Trust has also been very active in cleaning its considerable mileage of drains and in maintaining its floodgates, culverts, and other structures in good order.

Picnic Gulley, a tributary of the Clutha near Clyde, has been straightened and a larger culvert installed under the main highway. This will relieve orchards of damage by sudden floods.

Hayes Creek.—Willows have been pulled out over a length of ½ mile to improve the flood-discharge from Lake Hayes near Arrowtown, giving relief to marginal lands at the upper end of Lake Hayes.

Riverton Harbour Board Endowment.—The Wallace County Council has completed the drainage scheme for the endowment and adjacent properties, 4 miles 59 chains of drains having been dug.

Southland Catchment Board.—The Board has carried out the following works:—

Waihopai Drainage Improvements.—A total of 1 mile 23 chains of tributary channel through Macassey's and McLeod's properties has been dug.

Awarua Drainage Improvements.—Altogether 1 mile 17 chains of flood channel have been widened and deepened through Bullings and adjacent owners.

Mataura River.—Twenty-seven chains of bank have been protected through Horrell's property. A further 16 chains were protected for Udy Bros.

Waikaia River.—Three cuts and part of a fourth totalling 73 chains were made to relieve erosion on properties held by Baird, Miller, and others. Another cut 18 chains long was made at Weller Bros.

Oreti River.—Thirty-eight chains of heavy bank-protection were carried out for Waitoru Farms, Ltd. Twenty chains of similar work on Beck's and 5 chains on Burgess' properties were also completed. On Kean's property 24 chains of cut, previously made, were cleaned out and the flow through it strengthened. In the Lumsden Town District 17 chains of bank-protection, 38 chains of thick willow-planting, and 72 chains of stop-banking and fencing were completed.

APPRECIATION

The Council desires to express its appreciation of assistance and information received from overseas agencies in Australia, India, Canada, South Africa, and the United States, and also from the Ministry of Agriculture in the United Kingdom. Without this exchange of data, progress in soil conservation in New Zealand would proceed at a very much slower rate.

Mention must also be made of the willing co-operation of other Departments of State, of Catchment Boards, and of local bodies. The Council records its appreciation of the very cordial relations which exist between its staff and those of the various Catchment Boards.

OBITUARY

It is with deep regret that the Council records the deaths during the year of Mr. T. G. G. Beck, original member and former Chairman of the Council, and of its Engineer, Mr. A. P. Grant.

STAFF

The Council again wishes to record its appreciation of the services rendered by its small and efficient staff.

Signed on behalf of the Soil Conservation and Rivers Control Council:

W. L. NEWNHAM, M.I.C.E., Chairman.

APPENDIX F

ANNUAL REPORT ON BUILDINGS BY THE GOVERNMENT ARCHITECT

The GOVERNMENT ARCHITECT to the Hon. MINISTER OF WORKS.

SIR,—

I have the honour to submit the following report on the activities of the Architectural Division for the year ended 31st March, 1948:—

The work of the Division has proceeded in spite of the continuation of the difficulties and shortages experienced in the previous year. The staff has been employed on many urgent departmental works.

Shortages of material and labour have caused long delays in finishing most works, and substitution of materials for those specified has not only entailed consequent variations to most contracts, but occupied a great deal of time in locating those substitutes. Wherever practicable, surplus defence buildings and steel huts ex the Pacific, &c., have been fully utilized.

There is an increased reluctance on the part of contractors to tender for works, especially in the outlying areas. In such cases my officers have to carry out the works themselves, and I wish to place on record my appreciation of their loyalty and zeal in keeping in view the Department's interests.

The steady exodus of experienced personnel, both office and field staff, is aggravating an already difficult situation, and, although there has been an intake, mostly juniors, there is that lack of experience in Government work and departmental procedure which increases the burden on the senior staff.

Professional and technical liaison with other Departments, Boards, Committees, &c., has been maintained to an increasing extent, and the advantages of this co-operation and interchange of views are of much benefit to all concerned.

An ever-increasing activity, which, on account of being unspectacular, is apt to be overlooked, is that of maintenance. The thousands of buildings owned by the Government must be kept in repair, and the conditions during the last two decades, particularly during the war years, have accentuated the problem. Modern practice also calls for greater efficiency in methods of heating, lighting, &c., termed "building services," and the multiplicity of the buildings occupied by the Government, especially in the larger centres, calls for a skilled and versatile staff.

Works completed and under construction during the year totalled £1,747,108.

Drawings were prepared for buildings of a total value of £835,601.

Sketch plans were prepared for buildings and ancillary work to the value of £6,684,364.

The Department's workshops executed work to the value of £214,000.

During the year the following works were carried out:—

DEPARTMENT OF AGRICULTURE

Massey Agriculture College.—Male students' accommodation, comprising two large dormitory blocks, kitchen, recreation, mess building, staff quarters, and laundry block are now completed and occupied.

Quarantine Station at Motutapu.—The stock lairage and cottage here has been partly completed.

Air Department

The transfer from Rongotai to Paraparaumu involved the provision of additional buildings and facilities.

Aeradio Station, West Shore.—Additions to the station and a new generator building are being constructed.

Internal Marketing Division

Dehydration Factory, Motueka.—Additional dormitory, recreation, and bathroom accommodation for the hostel is proceeding.

State Forest Service

Alterations have been made to the office at Taupo.

Education Department

Hutt Intermediate School.—This school was completed and the building occupied.

Stratford Technical High School.—A large Army recreation hall was shifted from Pahautanui to Stratford and re-erected.

Hawera Technical High School.—This school has benefited to the extent of a large physical-educational block, complete with dressing-room, stores, instructor's room, &c., and two additional class-rooms rebuilt from the Y.M.C.A. building ex Bell Block Aerodrome at New Plymouth.

Southland Technical School.—This school is under construction.

Dunedin King Edward Technical School.—Home-science block is nearly completed.

Sumner School for Deaf.—Laundry was completed.

Fire-escapes have been erected at the Receiving Home, Hamilton; also alterations at Whakatane, Omaio, and Oputere (Maori) Schools, including extensive renovations and repairs. Renovations to Maori School at Te Kaha have also been carried out.

Justice Department

Hamilton and Opotiki Courthouses have been renovated.

Labour and Employment Department

Immigration hostel accommodation—a major work—has been expeditiously carried out at Fort Dorset, and accommodation at Wigram is now almost completed.

Department of Maori Affairs

Major alterations have been undertaken at the Maori Girls' Institute, Wellington, and repairs have been carried out at Pendennis Hostel, Wellington. New office accommodation has been completed in Hamilton and new offices were erected in Rotorua.

Health Department

Health Division

The *Dental Nurses' Hostel, Glen Road, Wellington,* was completed, and assorted works were carried out at various hostels and clinics.

Nelson Hospital: Nurses' Home Kitchen.—Work has proceeded throughout the year and, although there has been a shortage of materials, it is hoped the job will be finished early in May.

Nelson Hospital: New Main Kitchen.—Work on this contract has been proceeding since last August and all excavation work has been completed. The boxing and reinforcing-steel has been placed to underside of the ground-floor slab; however, considerable delay has been caused through shortage of steel.

Auckland Hospital.—A complete sprinkler system has been installed in the three major risk buildings.

Christchurch St. Helens Hospital.—House B is now completely occupied. Houses A and C were completed. Blocks A, B, and D have vertical steel in position up to the ground floor.

Doctors' Residences, Denniston, Karamea, and Granity.—Alterations and renovations were carried out.

Division of Mental Hygiene

Kingseat Hospital.—A further six staff cottages are nearing completion, and a number of hose-reels have been installed in the main building.

Tokanui Hospital.—The two new occupational-therapy blocks are nearing completion. Various other works have been undertaken and general maintenance has been attended to on all farm buildings.

Sunnyside Hospital.—Additions to the nurses' home and office accommodation were completed.

Levin Farm.—At this institution conversion of surplus Air Force buildings into dormitories, day-rooms, sick-rooms, kitchens, and dining-room and lavatory facilities, &c., were completed.

Lake Alice Hospital.—The water-tower is now completed and in use. Eight staff cottages, ten eleven-patient villas, and two large fifty-patient villas are progressing steadily. Only the finishing work is required on four of the smaller villas and one of the large villas. Unfortunately, resulting from shortage of man-power, progress on this work is disappointing.

Porirua Hospital.—Work is proceeding on Villas 7 and 8 and is nearing completion.

Mines Department

Ohai Miners' Hostel.—The preparation of the new site has been completed. Single men's accommodation has been built, and a start has been made on the new hostel.

Huntly and Ohura Miners' Hostels.—Work is progressing favourably.

Reefton Miners' Hostel.—This work was completed and the building occupied.

Glen Massey.—Single men's quarters were erected.

Police Department

Grey Lynn police residence and office were erected during the year.

Waitangi police residence, Chatham Islands, was completed.

Maintenance and minor works have been carried out on the following stations: Waihi, Raurimu, Thames, Frankton, Hamilton, Kihikihi, Putaruru, Mokau, Paeroa, Opotiki, Huntly, Morrinsville, and Taneatua.

The police residence at Karamea is nearly completed, and the police-station at Dobson is under construction.

Post and Telegraph Department

Te Kuiti Post-office.—The new post-office is nearing completion.

Waimate Post-office.—Dismantling of tower was completed.

Addington Post-office.—Additions to office and removal of tower were completed.

Karori Automatic-telephone Exchange.—This building was completed during the year.

Feilding Post-office.—The new post-office is nearing completion.

Public Works Department

The major works in Wellington were the earthquake strengthening of the district office, also the erection of plan records and printing office, and the conversion of buildings in Masterton into flats.

The Christchurch Plant Depot is nearing completion, and work is progressing favourably on the Blenheim Road store.

General maintenance work has been carried out throughout all districts. The Frankton workshops have been partly renovated, and a new store building has been erected at Whatawhata. At Tikitere a Public Works Department construction camp has been completed, and numerous other works of a smaller nature have been carried out. Preliminary portions of the work on the Northern Plant Zone have been commenced.

Prisons Department

Single officers' quarters at Mount Eden are now completed. This also includes a dining-room to service a staff of eight. Seven cottages for warders were also commenced; one of these is now completed. Fire-alarm equipment has been installed at the Waikeria Borstal and also general maintenance work done.

Rehabilitation Department

A defence building ex Delta was re-erected at Miramar for use as a carpenters' training centre. Additions to the paint-shop, Lloyd Street, Wellington, were carried out, and a dust-extraction system installed.

For the Disabled Servicemen's Re-establishment League at the Training Centre, Napier, a 100 ft. by 20 ft. steel hutment ex the Pacific has been supplied, erected, and equipped.

Scientific and Industrial Research Department

In the Auckland District the laboratory building for testing timber was completed during the year. The erection of three buildings in Sydney Street ex Fort Opau was completed and minor works were done elsewhere.

State Hydro-electric Department

In order to accommodate the design office staff, Wellington, a major contract utilizing steel huts was let and is now nearing completion. A new substation was completed at Pahautanui.

Main Highways Board

Alterations have been made to numerous cottages. A new cottage and store buildings have been erected at Whangamata.

Marine Department

Stephens Island Lighthouse.—Much work has been carried out on this station during the year. All buildings have been completely repaired and repainted, both interior and exterior.

Railways Department

A new bus shelter was completed at Stout Street, and a temporary station completed at Taita.

Department of Tourist and Health Resorts

Major alterations and renovations to the Chateau Tongariro are now nearly completed, and at the Wairakei Hotel alterations and renovations are well in hand.

General

The Department's workshops at all centres have been extremely busy during the past year, principally on works for other Departments, including office furniture, additions to offices, &c., and various internal alterations.

In addition to services included under the above-mentioned works, building engineering services (including heating, electrical, air-conditioning, refrigeration, and mechanical installations) were carried out to the total value of £198,603. Fire-protection services to the value of £180,000 were installed.

In conclusion, I again wish to place on record my appreciation of the continued loyalty and efficient service of my staff. I would also like to thank the staffs of other Divisions and Departments, and the master builders and their organizations, for their co-operation during the past year.

I have, &c.,

R. A. Patterson, F.N.Z.I.A., F.I.A.A.,
Government Architect.

APPENDIX G

ANNUAL REPORT OF THE DIRECTOR OF HOUSING CONSTRUCTION

The DIRECTOR OF HOUSING CONSTRUCTION to the Hon. the MINISTER OF WORKS.

SIR,—

I have the honour to submit the following report on the Division's activities for the year ended 31st March, 1948 :—

1. GENERAL

I am gratified to be able to report that the Housing Division has shown a substantial increase in the production of houses over the previous year. The number of houses completed totalled 3,210, as against 2,595 for the preceding year, while a further 3,512 units were under construction at 31st March, 1948. In addition, the Division completed transit housing totalling 36 units, besides miscellaneous renovations and conversions, shops, farm buildings, &c.

Although the Division has made every effort to still further increase the rate of construction, it has been seriously hampered by the acute shortage of almost every type of building-material and to a lesser extent by the shortage of tradesmen in certain sub-trades. The increase over the previous year has not been the result of an improvement in the supply position, but is due almost solely to the activities of the Division in pushing ahead with construction, in the utilization of every possible alternative or substitute, and the utmost assistance given to contractors to locate and obtain materials in short supply. This latter phase of the work has become of greater importance than ever before in the completion of houses.

2. BUILDING CONSTRUCTION

The main difficulty confronting the construction of houses is still the shortage of building-materials. The situation in this respect has changed very little since my last report, although there has been improvement in some items. Recently, in some districts, cement has been slightly easier to obtain, but, against this, the supply of reinforcing-steel has become even more difficult, and measures have been adopted to reduce the quantity of steel required in all works.

Timber-supplies, while still difficult, have caused somewhat less trouble than was the case in the previous year, although the position is still far from satisfactory. The availability in Auckland of suitable pressure treatment for timber has helped in this regard by enabling non-heart timber to be used where normally heart timber would be specified. In the coming year a similar plant will be in operation in Christchurch, and this should further relieve the position.

During the year there has been a general shortage of bricks throughout the country. Although other factors, including a shortage of fuel, have had a bearing on this, the lack of labour in brickworks has probably been the main cause.

As previously, the shortage and intermittent supply of critical materials has caused house construction to be slow, the average time for completion being much longer than in pre-war years. For instance, when houses are near completion it is difficult to avoid delay in handing over for tenancy through lack of sanitary appliances, baths, W.C. pans, and hand-basins. Many galvanized-iron baths have been installed, and recently a considerable number of nickel-plated copper W.C. pans have been used as a temporary expedient to enable tenancy to be effected.

Where suitable materials are available in substitution for timber, they are used. Many of the alternatives to timber-frame construction involve the use of steel and cement, and the shortage of these has seriously reduced the possibilities. Houses are, however, being erected using concrete bearing-walls, the reinforcement of which has been specially designed to use a minimum amount of steel. "No-fines" concrete, using both normal and pumice aggregate, is also being used in several centres, and houses in total brick, cell-concrete, and pumice concrete panels are also being built in many places.

Concracts have been prepared for both sun-dried brick and pise-de-terre houses, but there has been difficulty in finding contractors to carry out the work.

Many types of sheathing other than weatherboard are being used on timber-frame houses. These include brick veneer, plaster on metal lath or cement fibre sheets, asbestos-cement sheets, and asbestos sidings.

The great difficulties of material supply have resulted in reluctance on the part of contractors to submit prices. The success of this Division in carrying out work, particularly on several major schemes, in remote areas has been due to the unremitting efforts of my officers in seeking out contractors and making a special appeal to them to undertake the work and also, in many cases, in assisting the contractors to locate the necessary supplies of materials and fittings.

The difficulties of obtaining certain materials have resulted in the Department taking active steps to arrange the distribution of certain products, such as baths, direct from the manufacturer to contractors or, alternatively, to purchase in bulk for more efficient distribution. In addition, steps have been taken to import from overseas certain essential materials which are estimated cannot be produced in sufficient quantities in New Zealand to meet the full requirements of the Division. These include cement, aluminium roofing, baths, wash-basins, lavatory-pans, &c.

House designs, details of construction, and specifications are constantly under review in order to ensure the most economical and advantageous use of the materials and components available.

A prefabricated house has been imported from Sweden and is at present under construction. A careful study is being made of this and many other overseas methods with a view to the adoption of any features considered suitable to the conditions in this country. It is, however, most unlikely that the importation of prefabricated houses will prove to be an economical and practical proposition in New Zealand.

3. SHOPS

Blocks of shops in Hamilton and at Wadestown in Wellington have been completed during the year. Several schemes for shops in both Auckland and the Hutt Valley areas have been designed, and the construction of shop schemes at Orakei and Taita has progressed well. In Invercargill and on the Marewa Block in Napier it is hoped that a contract for shops will be let soon.

4. FLATS

The shortage of cement and reinforcing-steel, particularly the latter, has hampered the Division's activities in flat-building, but during the year 154 flats were handed over for occupation, 95 being in Auckland and the remainder in Petone and Lower Hutt.

Contract documents for several blocks of flats (totalling 150 units) are ready for issuing when reinforcing-steel becomes available, and further schemes for 162 units are so well advanced that they could be issued at short notice. Other schemes involving approximately 300 flat units are in various stages of preparation.

5. SIZE OF HOUSES

Generally speaking, the size of houses built is largely determined by the size of the families seeking accommodation. There has been a tendancy over later years to build a higher proportion of larger-sized houses than formerly, as set out in the following table of houses built over the past year and to date. There is also added an analysis of contracts prepared over the past year as indicating the tendency of future contracts :—

	Completed, 1947–48.		Total to Date completed.		Contracts prepared.	
	Number of Units.	Percentage of Total.	Number of Units.	Percentage of Total.	Number of Units.	Percentage of Total.
Bed-sitting room	8	..	231	..	..	..
One bedroom	137	4	2,453	9	26	1
Two bedrooms	1,214	38	11,528	44	1,159	33
Three bedrooms	1,593	50	10,792	41	2,003	58
Four bedrooms	253	8	1,453	6	278	8
Over four bedrooms	5	..	74	..	1	..
	3,210	100	26,531	100	3,467	100

6. TYPES OF CONSTRUCTION

Owing to the acute shortage of all types of building-materials, it has been found necessary to erect or sheath houses in whatever material it is possible to obtain at the time and in the locality. The following table shows the analysis of types of houses for which contracts have been prepared over the past twelve months :—

Weatherboard		1,944
Brick veneer	485	
Total brick	31	
	—	516
Asbestos sheets		744
Concrete sheets		118
Concrete, concrete blocks, and veneer		122
Miscellaneous		23
		3,467

7. PRIVATE BUILDING

An analysis of the house-building carried out by private enterprise enables a comparison to be made between the relative volume of the Division's activities in the various districts. It should be noted, however, that the figures for the Housing Division cover only those houses, State rental and departmental, included in contracts let and supervised by the Division. The figures for houses erected by or covered by contracts arranged by other Government Departments numbering approximately 350 are included under " Private Housing " :—

District.	Houses completed, 1947–48.				Houses under Construction as at 31st March 1948.			
	Housing Division.	Private Housing.	Total, all Houses.	Percentage of State to Total.	State.	Private.	Total.	Percentage of State to Total.
Auckland	938	4,154	5,092	18	750	4,542	5,292	14
Hamilton	381	924	1,305	29	524	633	1,157	45
Palmerston North ..	273	804	1,077	25	335	572	907	37
Napier	145	471	616	24	279	391	670	42
Wellington	728	848	1,576	46	716	663	1,379	52
Nelson	49	386	435	11	96	214	310	31
Christchurch	476	1,145	1,621	29	545	1,057	1,602	34
Dunedin	220	792	1,012	22	267	755	1,022	26
Total	3,210	9,524	12,734	25	3,512	8,827	12,339	28

8. REHABILITATION TRAINEE CONTRACTS

An increasing number of contracts have been arranged with the Rehabilitation Department for the building-construction work to be done by trainees as part of their general trade training. The houses so constructed are equal to any built by private contract and are a credit both to the training and the efficiency of the trainees. Sub-contracts for all auxiliary trades and the supplies of materials are arranged by my Division.

In some districts, owing to the difficulty of securing private contractors, an increasing amount of work is being done by the trainees, and in a few areas this is the only available means of building State houses. Since the main purpose of the trainees' contracts is to enable the trainee to receive instruction in his trade, it follows that there is a greater man-hour content per unit than is the case on a private contract. It would also be expected that the building of a house would take somewhat longer than if built by a private contractor. This is, in fact, so, although on a Dominion over-all basis the average length of time taken by trainees is little more than a month longer than the average time taken by private contractors.

During the year, 688 units were completed by trainees, while at 31st March 1,145 more were under construction.

The number of trainees employed at 31st March was 2,431.

9. WORK FOR OTHER DEPARTMENTS

(*a*) This aspect of the Department's work continues to assume greater proportions. A considerable portion of such building is in comprehensive villages to house workers on hydro-electric construction, forestry schemes, &c. These villages involve, in addition to providing the houses, the design and erection of hostels, shops, halls, and other types of buildings to complete the whole scheme. In addition to the buildings, villages such as these require to be planned and all services such as water, drainage, roads, &c., installed.

The following is the analysis of construction other than State rental :—

Department or Service	Completed, 1947–48.	Completed at 31st March, 1948.	Under Construction at 31st March, 1948.
Agriculture	4	43	..
Dairy workers	17	17	..
Defence	..	99	..
Education	2	4	..
Forestry	8	39	29
Health	..	1	7
Hydro-electric	59	59	126
Internal Marketing	..	22	..
Land-settlement	145	297	66
Marine	..	1	1
Mental Hospitals	2	5	..
Mines	1	66	..
National Broadcasting	1	11	3
Post and Telegraph	12	53	16
Police	1	1	..
Public Works	16	125	16
Railways	14	26	27
Rehabilitation	..	1	..
Rural	8	148	..
Scientific and Industrial Research	1	3	..
Social Security	..	1	..
Timber-workers	44	44	81
Total	335	1,066	372

(*b*) *Rural Housing.*—(i) The erection of houses under the Rural Emergency Act, 1944, is now almost completed. Of the total of 155 houses approved, 148 have been completed, while tenders have been called for the remaining 7.

(ii) Housing for ex-servicemen under the land-settlement scheme continues to be one of the most important activities of the Department and holds first priority. During the year, 145 houses were completed, making a total of 297 to date, while at 31st March 66 were under construction. Contracts have been let for a further 75 units, and 90 units are available for tendering. In addition, 93 milk-sheds, 102 implement-sheds, and 13 other farm buildings were completed. No account is taken of the number of renovations and conversions of old farm houses into modern residences.

One of the most serious obstacles to the erection of rural houses is the great difficulty being experienced in persuading contractors and sub-contractors to undertake work in isolated areas while ample remunerative work is readily obtainable in the towns.

(*c*) *Timber-workers.*—Special mention must be made of the scheme for providing houses for timber-workers. Owing to the transient nature of the place of employment, which, of necessity, must move with the milling areas, difficulty has been experienced in providing suitable living-conditions for bush workers. In addition, it proved almost impossible to persuade builders to undertake work in the isolated back country where the mills were operating. To overcome this difficulty the Timber Advisory Committee has sponsored a scheme to provide prefabricated portable houses for the use of mill workers. These houses are built in the towns and transported in sections to the site. When necessary, they can be dismantled and re-erected elsewhere. The scheme is proceeding very satisfactorily and so far 44 have been completed and erected. Eighty-one more are being erected, while 49 are being prefabricated in the workshops. Contracts for 99 more have been let and contracts for 61 have been advertised.

10. LAND ACQUISITION AND DISPOSAL

During the past year there has been increased reluctance on the part of owners to sell their land. Negotiations with owners have, in many cases, been difficult and protracted, and offers to sell only obtained after a good deal of persuasion by departmental officers. General dealings in land are far from brisk and are confined for the most part to unused land and to deceased estates or absentee owners of tenanted properties desiring to realize.

In most municipalities there is very little serviced land available owing to the lack of normal extension of local-body services since the beginning of the last war. It has become increasingly necessary for the Department, after careful site selection, to undertake large compact development schemes in localities where it is economic to provide services. This has the effect of necessitating the acquisition of land in rural or semi-rural areas in one locality adjacent to urban areas. It often happens that a proportion of the owners in such a case do not desire to sell, and the difficulties resulting from hardships to such owners through dispossession by compulsory acquisition are very real and require careful consideration in each case.

During the year approval has been obtained to acquire, either by direct purchase or under the Public Works Act, sufficient land to provide an additional 3,494 houses in seventy-seven different towns.

In so far as has been possible consistent with the Department's requirements for State-housing contracts, including rehabilitation carpentry trainee schools, the transfer of building sections to the Lands and Survey Department for the purpose of sale to returned servicemen wishing to build their own homes has been accelerated as much as the progress or development and servicing of land will allow. During the year a total of 160 sections in fifteen towns have thus been approved for transfer, excluding sites for Church purposes, kindergartens, schools, and other Departments, &c., the provision of which is a normal part of the planning and development of a housing area.

11. HOUSING IMPROVEMENT REGULATIONS

These regulations, governing important qualitative and dimensional aspects of all houses, whether existing or new, were completed during the year. Their gazetting in December now makes effective the power of local authorities to compel the owners to effect any necessary improvements in physical conditions and standards of amenities and fittings in houses in compliance with minimum standards laid down by the regulations.

12. PLANNING

During the year there has been considerable activity in the preparation of outline and detailed planning schemes for the development of housing areas in towns throughout the country. Detailed scheme plans have been completed for a block of 1,000 units at Mount Roskill, and the planning of substantial parts of the Tamaki area has been completed. Other major schemes for which either outline or detailed plans have been prepared include Fairfield, Hamilton, a block of 54 units; Riccarton, Christchurch, 109 units; Mosgiel blocks totalling over 100 units; Reefton, 118 units; Palmerston North, 150 units; Pahiatua, 90 units; Masterton, 100 units; and Hastings, 60 units.

In New Plymouth, investigations have been concluded to ascertain the feasibility of the Department and the Borough Council sharing the cost of development of Frankleigh Park, a difficult area capable of being served by the existing services but by-passed in the borough's development. This area has great natural beauty.

In addition to the above, work is proceeding on preliminary and detailed planning of several other areas, including the Porirua - Titahi Bay district, which will constitute the largest housing settlement yet undertaken by the Division. An outline development

plan has been completed as the basis for discussion among the various Government and other authorities interested, and basic decisions are expected early in the ensuing year. In the meantime, final detailed plans have been completed for some 270 units in the Titahi Bay section. Further planning is in progress in connection with the extension and completion of operations in the Hutt Valley and at Bryndwr and Spreydon, Christchurch. Smaller planning schemes have been completed for areas at Huntly, Cambridge, Te Awamutu, Westport, and Timaru. Finally, a long-term housing scheme for Invercargill is under negotiation with the City Council.

13. PLANNING FOR OTHER DEPARTMENTS

During the year the Division has undertaken the layout and detailed planning of housing settlements and villages required by the State Forest Service, Public Works Division, State Hydro-electric Department, and the Army Department. For the State Forest Service plans were completed covering some 300 units in eleven villages and settlements. For the State Hydro-electric Department layout plans and working drawings were completed for further development of Mangakino Village, including provision for shop buildings, post-office, bus terminus, and other public amenities. Also completed were preliminary plans for a public-works construction village near Roxburgh, for the proposed Coal Creek hydro-electric scheme, and for a permanent village in the same district.

For the Army Department plans have been prepared for housing development at Linton and Waiouru Military Camps.

14. LAND-DEVELOPMENT

Although still handicapped throughout the past year by an acute shortage of field staff, nearly 500,000 cubic yards of earthworks were moved in constructing new roads and preparing house-sites.

Despite the acute shortage of pipes, particularly drainage pipes, 19½ miles of water-mains, 28¼ miles of sanitary sewers, and 10¼ miles of storm-water pipes were laid, apart from the house drains for over 3,000 houses. Notwithstanding the shortage of cement, 35 miles of concrete kerbing and channelling were constructed. The sealing of streets to the extent of 17½ miles was completed.

Excellent progress continues to be made on the large Auckland schemes at Mount Roskill and Tamaki, and the provision of serviced sections is well in advance of building contracts.

During the year construction work was commenced on roading at Titahi Bay. Further blocks there and at Porirua are now being surveyed, and some hundreds of sections will be available there for building during the next twelve months when the change-over from the Hutt Valley commences. Schemes for main drainage and water-supply for the Titahi-Porirua area are in hand, and will be ready for the completed houses, subject to promised deliveries of pumps and materials being realized.

In a number of large provincial towns where the activities of this Division are bursting through the borough boundaries, very close co-operation with the local bodies concerned has overcome many difficulties in the extension of their services.

In Christchurch, owing to the main sewers becoming overloaded, the drainage of housing blocks has become a very acute problem, which can only be solved with the allocation of suitable steel to permit the main sewer to be duplicated.

Owing to the acute demands for essential services, it has not been possible for house paths and fences to keep pace with house-construction, but every endeavour is being made to press ahead with construction as far as the available materials will permit.

The cumulative progress of the Division over the eleven years since its inception is as follows:—

STATEMENT SHOWING THE CUMULATIVE PROGRESS AS AT 31ST MARCH SINCE THE INCEPTION OF THE DEPARTMENT

	1937–38.	1938–39.	1939–40.	1940–41.*	1941–42.*	1942–43.*	1943–44.*	1944–45.*	1945–46.	1946–47.	1947–48.
	Units.	Units.	Units.	Units.	Units.	Units.	Units.	Units.	Units.	Units.	Units.
(*a*) Houses advertised	3,172	6,698	11,071	14,084	17,029	17,443	20,910	24,581	27,845	30,874	34,918
(*b*) Contracts let	2,507	6,188	10,353	13,647	16,522	16,799	19,487	22,349	25,331	28,424	32,128
(*c*) Houses under construction	1,560	2,326	2,847	2,444	2,033	1,209	2,078	3,442	3,253	3,631	3,512
(*d*) Houses completed and handed over for occupation—											
Housing Department	399	3,064	6,432	10,337	13,525	14,619	15,475	17,392	20,248	22,590	25,465
Other Government Departments	..	..	27	88	108	273	297	349†	478†	731†	1,066†
(*e*) House-unit sections acquired	9,296	13,949	20,421	23,953	28,990	36,613	40,184	42,061	45,838	48,751	50,510
	Towns, &c.	Towns, &c.	Towns, &c.	Towns, &c.	Towns, &c.	Towns, &c.	Towns, &c.	Towns, &c.	Towns, &c.	Towns, &c.	Towns, &c.
(*f*) Towns and localities, work conducted in	70	106	121	137	141	146	153	184	321†	379†	497†
	Con-tractors.	Con-tractors.	Con-tractors.	Con-tractors.	Con-tractors.	Con-tractors.	Con-tractors.	Con-tractors.	Con-tractors.	Con-tractors.	Con-tractors.
(*g*) Principal contractors engaged	145	240	291	326	345	346	406	506	634	699	778
(*h*) Payments—	£	£	£	£	£	£	£	£	£	£	£
Land and services	298,500	890,600	1,638,900	2,549,100	3,086,400	3,665,500	4,212,300	4,934,090	5,621,000	6,518,509	7,347,100
Dwellings-construction											
Housing Department	1,053,600	4,311,400	8,567,200	13,075,300	16,376,500	17,316,200	18,326,200	21,690,600	25,840,800	30,050,509	34,629,300
Other Government Departments	..	..	26,700	128,400	191,400	325,200	523,700	678,600	1,203,500	1,864,000	2,632,600
Joinery-factories, including machinery	48,900	50,500	52,600	49,400	45,900	46,700	46,700	45,700	45,700	42,100	46,200
Vehicles, plant and equipment, store buildings, and yards	2,600	6,200	12,900	17,200	19,100	21,600	23,100	30,600	42,800	63,700	101,900
Interest during construction	6,600	21,000	31,000	52,200	93,500	117,600	154,000	226,200	276,400	353,100	402,300
Administration	66,200	166,400	281,300	406,400	539,800	685,700	659,100	785,000	985,800	1,228,500	1,600,000
	1,476,400	5,446,100	10,610,600	16,278,000	20,352,600	22,178,500	23,945,100	28,330,700	34,016,000	40,120,400	46,759,400

* Work retarded due to the temporary diversion of contractors and the Department's organization to defence works.

† Includes rural housing

16. PROPOSALS FOR ENSUING YEAR

Lengthy consideration has been given to the Division's future activities and proposals have already been formulated for the acceleration of the housing programme for the ensuing year.

17. ADMINISTRATION AND STAFF

The staffing position over the past year has not been wholly satisfactory. The present difficulties of house-construction have placed added burdens on an already heavily loaded staff. The shortage of contractors and materials has meant that the Division must itself employ staff to procure materials or arrange sources of supply, and also to arrange contracts where the normal procedure fails.

The programme of decentralization which has been put into effect in the Division's seven housing districts has progressed as far as it is intended for the time being. While this has resulted in a demand for numerically greater staff in the district offices, it has enabled the Division to undertake its housing programme with much greater efficiency.

Total staff has shown a decrease over the past year, due to the difficulty of securing suitable appointees and also to the steady loss of staff both to other Departments and to private employment.

Nevertheless, in spite of this, all staff have worked enthusiastically and unsparingly and the satisfactory results of the year's operations can largely be placed to their credit. The total staff of 580 (excluding Building Control) at 31st March, 1948, was made up as under:—

Administrative and clerical (including stores supply)	245
Architects, draughtsmen, and quantity surveyors	100
Building overseers	87
Land selection, purchase, development, and engineering	122
Land-planning	26
	580

During the year, Mr. G. W. Albertson, who had been Acting Director of Housing Construction from 15th April, 1940, to 1st April, 1942, and Director since that date, retired from his position after forty years' service with the Government.

I also regret to record the death of Mr. J. L. Tennet, who held the position of Chief Quantity Surveyor since 1937.

In conclusion, I must again place on record the loyal and efficient service given by members of my staff in carrying out the housing policy. Relations with the building industry and general public continue to be excellent.

R. B. HAMMOND., F.N.Z.I.A., M.T.P.I.,
Acting Director of Housing Construction.

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