

1927.  
NEW ZEALAND

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DEPARTMENT OF LANDS AND SURVEY.

# SWAMP DRAINAGE.

REPORT FOR THE YEAR ENDED 31st MARCH, 1927, TOGETHER WITH STATEMENT OF ACCOUNTS.

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*Presented to both Houses of the General Assembly pursuant to Section 13 of the Swamp Drainage Act, 1915.*

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SIR,—

Department of Lands and Survey, Wellington, 30th June, 1927.

In pursuance of section 13 of the Swamp Drainage Act, 1915, I have the honour to forward the report of the Chief Drainage Engineer covering operations on lands proclaimed under the Swamp Drainage Act and amendments.

The spoil dealt with comprised over 291,000 cubic yards, including a great deal of rock. The various machines have naturally been subject to severe wear-and-tear, but have been maintained in good working-order.

Dredging-work in the Kaitaia area will probably be completed at an early date. In the Waihi area the drainage scheme has been practically completed, and maintenance of constructed works is now the principal work.

Illustrative plans are also attached.

I have, &c.,

J. B. THOMPSON, Under-Secretary.

The Hon. A. D. McLeod, Minister of Lands.

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## REPORT BY CHIEF DRAINAGE ENGINEER.

SIR,—

I have the honour to submit my annual report on the areas proclaimed under the Swamp Drainage Act, 1915, and amendments.

### KAITAIA DRAINAGE AREA (61,430 ACRES), MONGONUI COUNTY.

In May, 1926, a departmental committee was set up to investigate this district, the most important items on which it was requested to report being (1) the capacity of the district to bear the charges leviable under the Swamp Drainage Act, (2) the amount of assistance by way of a grant or subsidy that the area should receive, (3) the future control of the area. As a result of this report an amendment to the Swamp Drainage Act was passed by Parliament whereby the capital cost of the works was fixed at £125,000, of which amount £15,000 is to be a charge against the Kaitaia Town Board area, the balance of £110,000 to be a charge against the county portion of the drainage district. This writing-down is practically equivalent to a pound-for-pound subsidy, and the fact that the capital cost is now fixed should assist in stabilizing the finances of the district.

Dairy-farming, which is the main source of income, has, unfortunately, not yet reached a very high standard. This is evident, as the average butterfat production of the district is low, being only 150 lb. per cow. There should not be any great difficulty in increasing this figure, and if farming methods are improved at the same time the district will become quite prosperous.

In anticipation of drainage rates being struck at an early date, the area has been classified under the provisions of the Swamp Drainage Act. At present a revaluation is being carried out by the Valuation Department, as it was considered there were too many anomalies under the old valuation.

Rainfall records have been kept at Kaitaia, and readings taken daily showing water-level at Kaitaia in the Awanui River. The total rainfall for the year was 64.91 in., which is the heaviest recorded since the works were commenced, the average over that period being 48.9 in. The wettest month was October, when 9.62 in. were recorded, whilst the driest was December, with 1.51 in. Rain was recorded as having fallen on 167 days during the year. The lowest level obtained in the river at the Waikuruki Bridge was 53.9 ft., whilst the highest was 72 ft., this latter following a fall of 3.34 in. in twenty-four hours, causing severe floods, which inundated a large area of low-lying country.

The Whangatane spillway has not so far been opened, as it was considered inadvisable to do so until the channel constructed by the Bay City dredge was enlarged. A Marion caterpillar drag-line has now been purchased for this purpose, and by June this machine should be in operation. When opened this channel will relieve a large portion of the area from flooding, and every effort will be made during next summer to work a double shift on this machine so as to hasten the date of opening.

The following schedule shows details of rainfall for the past eight years:—

Year.	Rainfall for Year.	Wettest Month, and Rainfall.		Driest Month, and Rainfall.	
	Inches.		Inches.		Inches.
1918-19 ..	47·30	Oct., 1918 ..	9·06	Aug., 1918 ..	1·39
1919-20 ..	31·71	July, 1919 ..	7·37	Dec., 1919 ..	0·62
1920-21 ..	53·11	May and Aug., 1920 (each) ..	8·02	Mar., 1921 ..	1·13
1921-22 ..	49·42	Mar., 1922 ..	5·84	Jan., 1922 ..	2·24
1922-23 ..	44·81	Oct., 1922 ..	7·46	Jan., 1923 ..	2·02
1923-24 ..	49·23	Oct., 1923 ..	7·92	Dec., 1923 ..	1·38
1924-25 ..	48·89	May, 1924 ..	10·34	Mar., 1925 ..	0·51
1925-26 ..	57·90	May, 1925 ..	10·43	Feb., 1926 ..	0·88
1926-27 ..	64·91	Oct., 1926 ..	9·62	Dec., 1926 ..	1·51

The principal works carried out during the year have been the completion of dredging in the Awanui River and Whangatane spillway as far as possible with the floating plant in use; maintenance and improvement of existing drains; and extension and improvement of stop-bank and flood-gate system in the tidal area.

*Awanui River.*—Excavation of cut No. 1 below Awanui was completed early in the year. Bullock teams had been employed for the scooping of top soil, which was practically completed by the end of last period. Priestman dredgers Nos. 7 and 10 were used to carry the excavation to 6 ft. below low-water mark. A distance of  $14\frac{1}{2}$  chains was dredged, comprising the cut and approaches thereto, and approximately 8,900 cubic yards of spoil removed. One dredge has also been intermittently employed in removing sand and silt which is continually being deposited in the navigable portion of the river. Approximately 22,400 cubic yards, deposited since the channel was first dredged, have been removed in the past ten months. Some 70 chains of this river in the vicinity of Kaitaia has been cleared of “snags” which had lodged in the bed of the stream or been exposed by the scouring of the channel. Overhanging trees were removed from the banks where, owing to erosion, there was the danger of same falling inwards.

*Whangatane Spillway.*—13 chains of this cut was excavated by dredger No. 22, Bay City plant, and approximately 3,000 cubic yards of spoil removed. The cut was carried into a tidal creek for some chains, but could not be taken as far as required owing to the hard sandstone bottom not allowing sufficient depth at low tide to float the pontoon on which machine is carried. The dredge was therefore laid up for some time, and has lately been dismantled. A regulating-weir, constructed of timber with stone filling on sides and bottom, was placed in position at the intake to the Awanui River to restrict the flow of flood-waters when channel is opened.

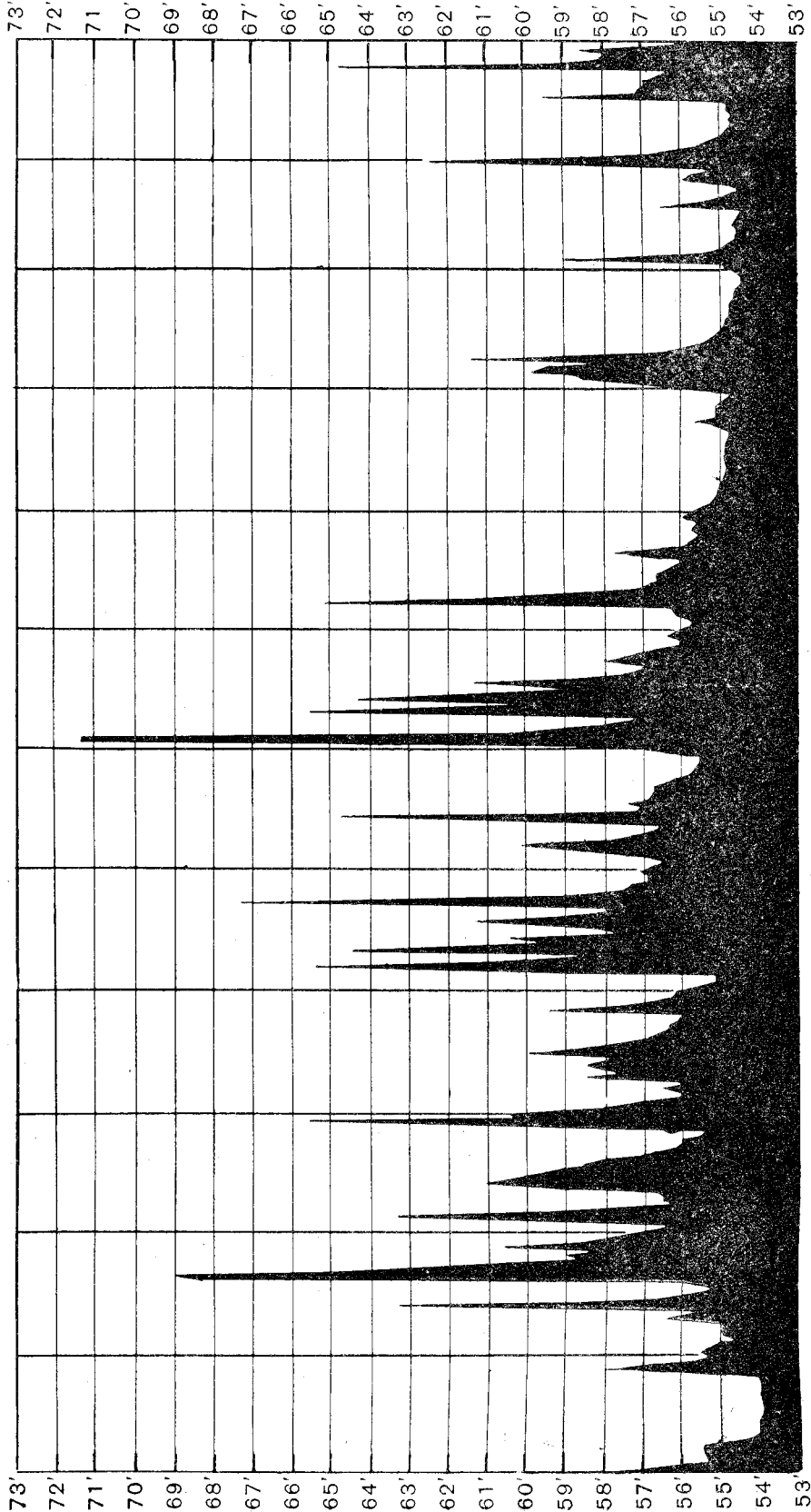
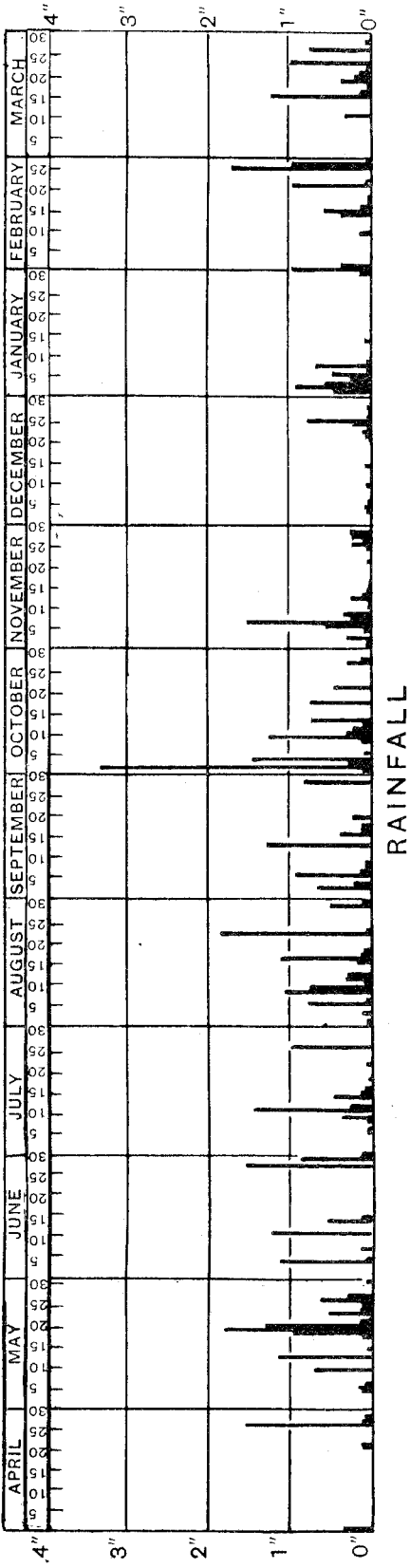
*Dredges.*—The three dredges, Nos. 7, 10, and 22, employed on above works have removed a total of 34,358 cubic yards at an average cost of 22·06d. per yard. Two of the dredges were laid up for ten months of the year, and one was employed intermittently during this period, so that costs have been increased by interest, depreciation, and caretaking charges while machines were idle. In addition, a large amount of spoil had to be handled twice to avoid blocking the old channel for navigation while the diversion below Awanui was being excavated.

*Drains.*—55 chains of new drain was constructed to give better outlet for Pukepoto drains emptying into the Tangonge basin, and 30 chains constructed at Awanui to facilitate stop-banking for prevention of overflow during floods. 10 miles 5 chains of drain was cleaned and deepened, and 20 miles 6 chains cleared of weeds, slips, &c.; 100 chains of the Tarawhakaroa Stream was snagged, and all willows and other timber removed from the channel.

*Stop-banks.*—1 mile 75 chains of new bank and drain was constructed, including the filling of some deep inlets previously open to tidal water; two iron flood-gates were placed in position as outlets with concrete foundation and wing walls; sixteen flood-gates were inspected and kept in repair, most of the concrete doors being replaced with iron flaps; 8 miles of stop-bank and drain was cleaned and repaired as required; and 40 chains of bank on the Pairatahi Stream was raised 2 ft. and enlarged to withstand increased pressure due to opening of lower end of Whangatane spillway and consequent congestion of flood-waters at the point where dredging was discontinued.

*Bridges.*—Seven sill bridges were erected over outlet drains to give access to properties severed. One sill bridge at road-crossing over the Kareponia Creek was taken up and replaced with a pile bridge with larger span, and an extra span was built on to the Waikuruki Bridge over the Awanui River at Kaitaia. This work was done in consideration of the fact that the existing structures had become inadequate, partly because of the drainage work carried out in the channels concerned.

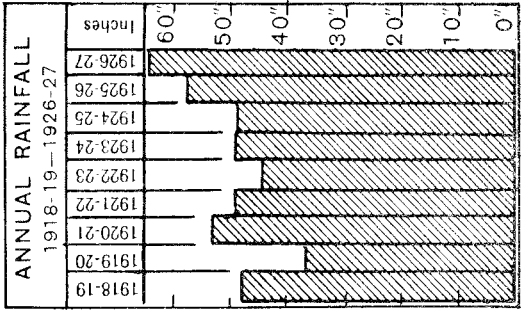
Summary of the year's operations is as under: Channels dredged,  $27\frac{1}{2}$  chains; spoil excavated by dredges, 34,358 cubic yards; spoil excavated by scoops, 500 cubic yards; new drains constructed, 1 mile 5 chains; drains deepened and improved, 10 miles 5 chains; drains cleaned, 20 miles 6 chains; stop-banks kept in repair, 8 miles; stop-banks constructed, 1 mile 75 chains; flood-gates erected, 2; road-bridges improved, 2; sill bridges erected, 7; regulating-weir erected, 1; channels snagged, 2 miles 10 chains.



# RAINFALL AND RIVER GAUGE RECORD.

WAIKURUKI BRIDGE  
(FOSTER'S),  
KAITAIA RIVER.

1st APRIL, 1926 — 31st MARCH, 1927.



The principal work proposed for the ensuing year is the widening of the Whangatane spillway, for which plant has been procured. Some outlet drains require enlarging to more effectively deal with the flood-waters, and additional flood-gate outlets have to be installed in the tidal area.

*Works Expenditure.*—The amount expended during the year was £10,699 17s. 10d., of which the principal items were—day labour, £5,196 13s. 8d.; and piecework contracts, £2,479 12s. 11d.

A graph is attached hereto showing the rainfall record at the office gauge at Kaitaia, as well as the readings of the gauge in the river at the Waikuruki Bridge (sometimes known as Foster's).

The local officer in charge is Mr. T. S. McMillan.

#### HIKURANGI DRAINAGE AREA (50,000 ACRES), WHANGAREI COUNTY.

Throughout the year the weather conditions have not been quite so favourable as in former years for the prosecution of the excavation work in the Wairua River, owing to the period of average summer level being considerably shortened by floods in the early summer. Rain fell on 143 days, the total fall for the year being 53·87 in. May was the wettest month, with a fall of 8·30 in. spread over eighteen days, whilst April was the driest, when only 1·34 in. were recorded.

The following is a summary of the operations in hand during the year under review :—

*Wairua River Diversions.*—The diversions of the river at the rapids at Ruatangata have been concentrated on as far as possible, it being recognized that the lowering of water-level at this point will have a far-reaching effect on the sluggish reaches of the river above. No. 1 diversion has not necessitated any further work during the past twelve months, but the toe of the big slip at the lower end of No. 2 diversion had to be removed. The floods experienced during the winter have removed the clay from the lower portion of the slip, which is now practically a solid face of boulders. There now appears to be very little movement in the slip, and it is hoped that stability has been reached. No. 3 diversion was completed during the year, but in places large stones overlying the pug formation on the bottom have been dislodged from the batters by the winter floods. These will require to be removed before the last machine leaves the locality. It is anticipated that the removal of these obstructions will lower the ordinary water-level in the lagoon immediately above this cut by 2 ft., bringing the level down to 5 ft. above datum. The last diversion in this locality, No. 4, was opened out to the river above just before last winter, but not down to grade level. The river has been running through this cut since that date, but in spite of the excessive fall at this point there has been practically no scouring of the channel. The ordinary water-level in the river above cut No. 4 has fallen to 14·20 ft., which level will be lowered considerably by works now in hand. In order to achieve this object, which affects the river for miles above this point, the construction of further spillways was authorized during the year. The most important is the opening-up of the old bed of the river eliminated by the construction of cut No. 4. This channel has been constructed down to a grade of 9 ft. for a distance of 11½ chains, and this spillway should be completed before June if floods are not experienced. The excavation is completely through rock formation, requiring drilling and blasting. The spoil is then loaded by steam-shovel into trucks of 4 cubic yards capacity, which are hauled out from the face by a Plymouth gasoline locomotive and dumped in No. 1 lagoon. The other spillway authorized in this locality commences at No. 2 lagoon and follows the old river-bed to the upper end of cut No. 2, after which a new channel is to be constructed to the east of cut No. 3, joining lagoon No. 1 at the south-east corner. The lower portion of this channel is through rock country, of which 7 chains has been constructed to date. At the upper end some 4 chains of the new channel has been partially completed. This portion of the excavation will not be so expensive to construct, as the rock has in places dipped below the required grade level. At present excavation is not being carried out at this point, but this work will be taken in hand and pushed on to completion. The cost of this work was approximately £14,200, the amount of spoil excavated being 62,820 cubic yards, of which 75 per cent. was rock, the balance being clay. The unit cost was 4s. 6d. per cubic yard.

*Up-stream Diversions.*—These diversions have been taken in hand, and Nos. 1, 2, and 3 have been completed, whilst 1b and 4 are in progress. The channels in each case are being constructed to at least 100 ft. on top, with batters of 1 to 1, and bottom level of 10 ft. above datum. The country dredged has varied from soft and hard clay to papa and sand. The drag-lines, equipped with a 50 ft. boom and a ¾-cubic-yard bucket, have been used for this work, but on account of the great depth of excavation—up to 30 ft.—the work is necessarily slow. The amount of spoil excavated on this work was 89,100 cubic yards, at a total cost of £3,310, the unit cost being 9·1d.

*Ngararatunua Canal, Block IV, Purua Survey District.*—The excavation of this cut has been continued by dredge No. 3 (Priestman), which has completed a further 121 chains, the spoil dredged amounting to 62,675 cubic yards, at a unit cost of 9·27d. The country has generally been particularly hard, which has caused the costs to be higher than during the previous year. The excavation of this cut should be completed during the coming year, and will give improved drainage to an area of about 4,000 acres of swamp country.

*Surveys.*—When weather conditions permitted, levels were taken over the swamp areas, commencing from the southern end, and from the data obtained the preliminary location of the channels necessary to give relief from internal flooding was fixed. The location of these channels is shown on the accompanying lithograph. Several surveys in conjunction with borings were carried out along the Wairua River with the object of endeavouring to avoid the removal of rock bars, but in some cases these bars extend across the line of the proposed diversion, in which case it is advisable to remove the rock from the river itself. These surveys will be extended, and, as occasion demands, the final location will be completed.

*Plant and Machinery.*—The excavating plant on the works consists of three Bucyrus caterpillar machines, convertible to either drag-line or steam-shovel, as well as one floating Priestman dredge. These machines have been kept in repair, as far as possible, by work carried out at the shop on the works, but heavy repairs must of necessity be sent out to private shops. One drag-line was completely

overhauled before commencing on the up-river work, and is now in first-class order. As is only to be expected, the repairs on the machines are costly after working in heavy rock country for some years. The drilling and compressor plants have been overhauled in rotation, and have stood up to the work remarkably well. Now that the plant is becoming more scattered, repairs will not be able to be effected so rapidly, but the country to be excavated is very much easier, which should lessen the need for repairs.

*Proposed Operations for Year 1927-28.*—The following is a schedule of the works proposed to be carried out during the coming year: (1) Prosecution of main diversion and spillways at rapids; (2) diversions of river above rapids; (3) completion of Ngararatunua Canal; (4) commencement of Mangahuhuru Stream diversions. This latter is contingent on an American steel dredge being transferred from the Waihi works.

*Works Expenditure.*—The total expenditure during the period under review was £24,018, and of this amount £11,550 was paid in wages.

The local Engineer in charge is Mr. V. C. Bosselmann, B.E.

#### WAIHI DRAINAGE AREA (20,237 ACRES), TAURANGA COUNTY.

This area was also investigated by a departmental committee, the order of reference being similar to that of the Kaitaia area. Following on the report, an amendment to the Swamp Drainage Act was passed by Parliament, whereby the area was divided into three wards or subdivisions, and the capital cost allocated as follows: (a) National Endowment or Central Ward, £50,000; (b) Pukehina Ward, £10,000; (c) Kaikokopu Ward, £15,000. Provision was also made that the rate for maintenance should be struck over the whole area, whilst the rate for capital cost should be struck over the wards, excluding the Central Ward, on the capital cost allocated against that particular ward. The reason for rates on capital cost not being struck on the Central Ward is that this area comprises solely Crown land, the rents from which are credited to the Swamp Drainage Account. The area has been classified into classes as required under the Act, and a revaluation completed, but the striking of rates cannot be proceeded with until objections are finally dealt with by the Assessment Court.

An area of approximately 2,400 acres in the Upper Pongakawa district has been excluded from the district, as it has not received benefits from the works carried out.

The scheme of works has now been practically completed, the main exception being the enlarging of the Upper Kaikokopu, which can only be carried out by a drag-line, which has not been made available up to the present time.

The greater part of the Crown area has now been disposed of for flax cultivation and milling, at rentals which are not quite sufficient to recoup interest on the expenditure on the drainage development. The balance of the area—about 1,100 acres—has been valued for flax-lease purposes, and recommendations made as to its disposal. The limited area opened for settlement, as well as the privately held swamp land, are rapidly being brought into permanent pasture.

The rain-gauge at Pongakawa recorded a total fall of 65.01 in. of rain during the year, the wettest month being October, with a fall of 13.96 in., and the driest January, with a fall of 2.59 in.

*Kaikokopu Stream.*—The redredging of this stream as far south as the Main Road was completed early in the year, after which the machine, No. 5 Priestman, was removed to the lower reaches of this stream so as to raise the stop-banks on both sides of the channel.

*Wharere Canal.*—The only work-construction carried out on this channel was the raising of the stop-banks, with the Priestman dredge, near the entrance to the Waihi Estuary.

*Dredges.*—The only dredge operating during the year was the Priestman, which removed 42,150 cubic yards. Both the American steel dredges were idle at the end of last year, and in July No. 25 was towed round to the Kaituna River, where it has been operating under hire to the River Board. It is proposed to transfer No. 26 to the Hikurangi works, where there is scope for a machine of this type.

The following table shows the amount of spoil dredged and the cost per cubic yard for the last ten years:—

					Cub. yds.	Cost per cub. yd.
1917-18	..	..	..	..	55,538	4.57d.
1918-19	..	..	..	..	20,780	7.67d.
1919-20	..	..	..	..	44,250	9.29d.
1920-21	..	..	..	..	63,495	7.77d.
1921-22	..	..	..	..	77,535	6.17d.
1922-23	..	..	..	..	164,527	6.97d.
1923-24	..	..	..	..	241,504	7.54d.
1924-25	..	..	..	..	252,618	6.90d.
1925-26	..	..	..	..	184,344	6.14d.
1926-27	..	..	..	..	42,150	7.50d.

*Drains.*—The only drain-construction carried out was the completion of Tapsell's drain in the Central district. The purpose of this drain was to release a large area of stagnant water, and this has resulted in a surprising growth of flax over the area affected.

*Buildings.*—These consist of an office, store-shed and workshop, two cottages, and one hut. Of these, both cottages and the hut are being rented.

*Fencing.*—The fencing of the fire-break along the Main Road was completed during the period.

*Stop-banks.*—The several lengths of stop-bank in the area have been repaired and maintained, and the bank between the Waewaetutuki Hills and Kaikokopu Stream was widened and raised throughout.

*Flood-gates.*—During the year four concrete barrel flood-gates were put in hand. Of these, three were completed, and one was nearing completion at the end of the period. The beneficial effect of these gates in keeping out the tide-waters is already noticeable.



SWAMP LAND DRAINAGE ACCOUNT—*continued.*

BALANCE-SHEET AS AT 31ST MARCH, 1927.

<i>Liabilities.</i>			<i>Assets.</i>		
	£	s. d.		£	s. d.
Debentures issued under Swamp Land Drainage Act, 1915.. ..	476,000	0 0	Kaitaia Drainage District—		
Temporary advances from other accounts (section 40, Public Revenues Act, 1926)	15,000	0 0	Drainage-works ..	164,433	14 4
Consolidated Fund, for loans redeemed under Public Debt Repayment Act, 1925	5,000	0 0	Interest Account (proportion chargeable to district) ..	50,076	13 2
Public Works Fund—Land Improvements vote .. ..	4,563	19 7		214,510	7 6
Consolidated Fund—Accumulated interest on amounts expended out of Public Works Fund .. ..	2,332	15 2	Waihi Drainage District—		
Sundry creditors—			Drainage-works ..	79,349	18 2
Interest on debentures accrued but not due .. ..	7,532	17 7	Interest Account (proportion chargeable to district) ..	23,319	12 9
Interest on debentures due and unpaid	115	17 10		102,669	10 11
Miscellaneous .. ..	3,471	1 9	Poukawa Drainage District—		
Consolidated Fund—Interest on debentures paid but not recouped from Swamp Land Drainage Account ..	19,313	9 10	Drainage-works ..	3,495	15 11
Rent paid in advance .. ..	0	8 0	Interest Account (proportion chargeable to district) ..	1,557	5 4
				5,053	1 3
			Hikurangi Drainage District—		
			Drainage-works ..	109,452	19 1
			Interest Account (proportion chargeable to district) ..	25,518	8 0
				134,971	7 1
			Mangawai Drainage District—		
			Drainage-works ..	1,877	15 9
			Interest Account (proportion chargeable to district) ..	434	8 7
				2,312	4 4
			Harihari Drainage District—		
			Drainage-works ..	4,354	15 1
			Interest Account (proportion chargeable to district) ..	740	5 7
				5,095	0 8
			Buildings .. ..	2,592	17 1
			Wharves .. ..	94	5 6
			Plant and machinery .. ..	51,543	14 5
			Loose tools .. ..	687	19 5
			Live-stock .. ..	63	9 10
			Fuel, &c. .. ..	3,240	1 11
			Stores on hand .. ..	5,449	17 2
			Sundry debtors—		
			Advance on mortgage .. ..	260	0 0
			Interest on mortgage .. ..	3	5 0
			Rent .. ..	18	1 2
			Dredge-hire .. ..	346	10 0
			Flax royalty .. ..	0	2 6
			Miscellaneous .. ..	30	13 7
			Balance at end of year—Cash in Public Account .. ..	4,388	0 5
				£533,330	9 9
				£533,330	9 9

J. B. THOMPSON, Under-Secretary for Lands.  
J. H. O'DONNELL, Controller of Accounts.

I hereby certify that the Statement of Receipts and Payments 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.—J. H. FOWLER, Deputy Controller and Auditor-General.

*Approximate Cost of Paper.*—Preparation not given; printing (750 copies, including graph and maps), £45 10s.

By Authority: W. A. G. SKINNER, Government Printer, Wellington,—1927.

Price 1s. 6d.]








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RANGAUNU BAY

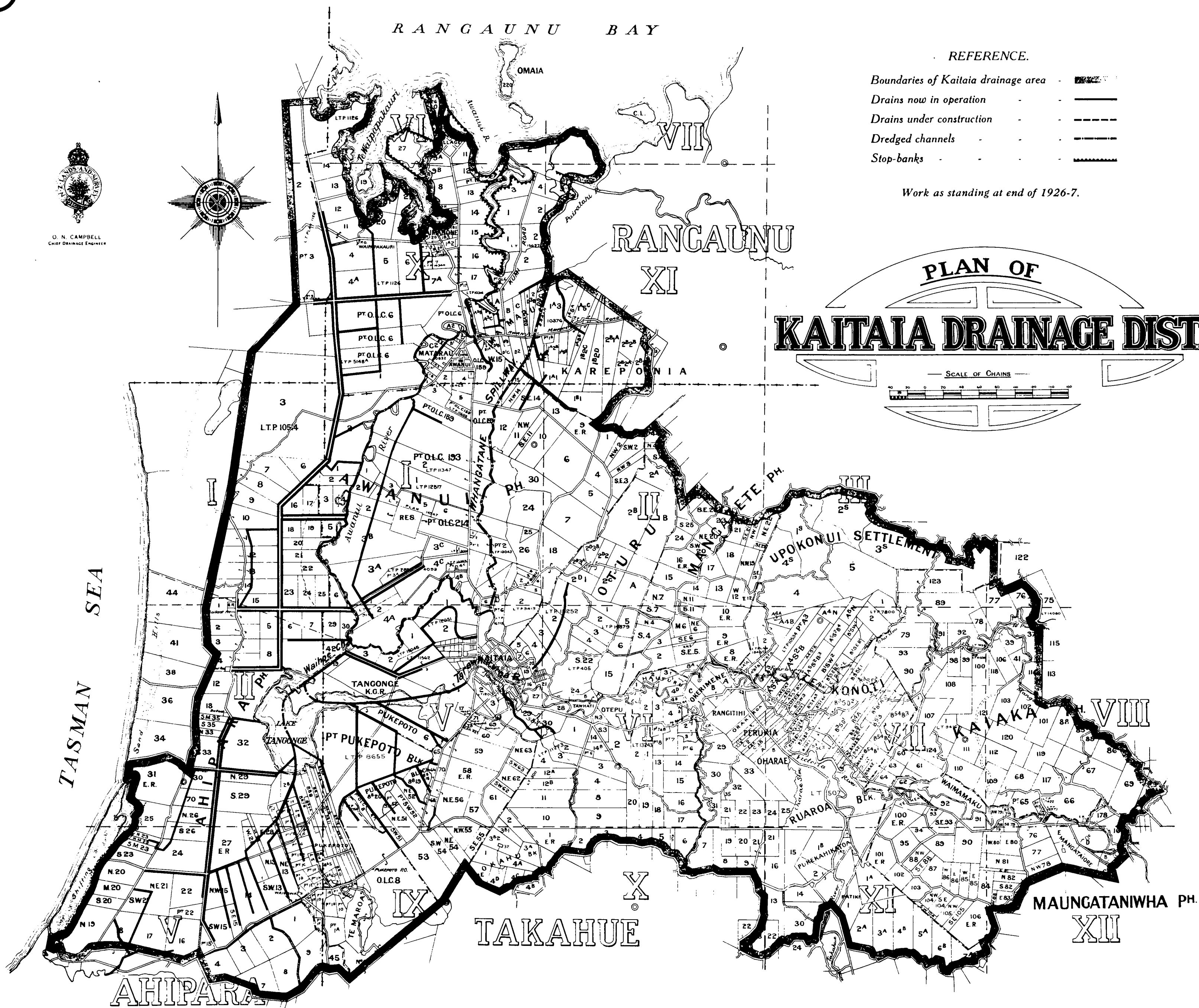
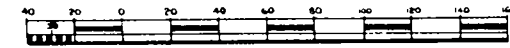
## REFERENCE.

- Boundaries of Kaitia drainage area -   
 Drains now in operation -   
 Drains under construction -   
 Dredged channels -   
 Stop-banks - 





Work as standing at end of 1926-7.

# PLAN OF KAITIA DRAINAGE DIST

SCALE OF CHAINS





<i>Proposed work</i>	shown thus :	
<i>Work in hand</i>	„	
<i>Work completed</i>	„	
<i>Hikurangi drainage area</i>	„	

OPUAWHANCA S. D. VIII 38



O. N. CAMPBELL  
CHIEF DRAINAGE ENGINEER

# PLAN OF HIKURANGI DRAINAGE DIST.









### - SCALE OF CHAINS



*N.Z. Gazette No 107, Aug. 28<sup>th</sup> 1919.*





<i>Completed drains</i>	-	-	
<i>Proposed new drains</i>	-	-	
<i>Existing drains to be deepened</i>	-	-	
<i>Proposed new roads</i>	-	-	
<i>Existing roads</i>	-	-	
<i>Existing stop-banks</i>	-	-	
<i>Excluded area</i>	-	-	
<i>Amended area</i>	-	-	

*Amended Boundaries, vide N.Z. Gazette, No. 10,  
24th February, 1927.*

