1924.

NEW ZEALAND.

DEPARTMENT OF LANDS AND SURVEY.

SWAMP DRAINAGE.

REPORT FOR THE YEAR ENDED 31ST MARCH, 1924, TOGETHER WITH STATEMENT OF ACCOUNTS.

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

SIR,— Department of Lands and Survey, Wellington, 5th August, 1924.

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 all operations and transactions under his control.

The various projects have been vigorously prosecuted. The machinery is standing up well, and daily demonstrates the wise policy undertaken in 1920 to procure standard and up-to-date types.

Illustrative plans are also attached.

There is every reasonable chance of work upon the Poukawa area being undertaken within the next six months, and plans will be laid towards this end.

I have, &c.,
J. B. THOMPSON, Under-Secretary.

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

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. During the year the Harihari area in the Westland Land District was brought under the provisions of the Swamp Drainage Amendment Act, 1922, and a report on this area is included herein.

KAITAIA DRAINAGE AREA (39,665 ACRES), MONGONUI COUNTY.

On this area the main works have been carried on by the three floating dredges, and the end of the year shows a big improvement in the drainage of the swamp country situated to the south of Bell's Road. This is due to the completion of the Waihoe channel, and also the dredging of the Awanui River for about four miles below the junction with the above channel. Although these works will not complete the major scheme in the vicinity, the freedom from floods has been marked. Formerly any normal fall of an inch of rain would have caused the river to overflow its banks in the vicinity of Kaitaia, but now, even with the scheme incompleted, falls of 3 in. per day have been successfully carried by the newly dredged portion of the river.

The completion of the Waihoe channel has lowered the water in the Tangonge Lake so that during fine weather the bed is practically dry, whilst during periods of heavy rain the lake-bed acts as a storage reservoir for flood-waters and so reduces the height of the floods in the Awanui River. Now that the two Priestman dredges are engaged in improving the river it is anticipated that this work will be completed as far as Awanui within eighteen months. From this point out to Rangaunu Bay it is proposed to remove only the sand deposits near the Awanui Wharf, and also the willows along the river.

The dredging of the Whangatane spillway will take over two years, and until this is completed it is impossible to divert any flood-waters from the river down this channel. The concrete regulating-weir to be constructed at the junction with the river near Kaitaia has been designed, and the construction of same will be proceeded with. This structure will pass a maximum flow of 2,000 cusecs, which is equivalent to 1 in. of rainfall over all the watershed above the site.

As most of the swamp lands situated within the area have now received a direct benefit from the construction of the works, it is advisable that the rating clauses of the Swamp Drainage Act should be brought into operation, as at the present time the maintenance of completed works, as well as interest on the capital expenditure, are charged up to the Capital Account. This will necessitate the preparation of a valuation roll of the district and the appointment of arbitrators to carry out the classification, after which the necessary rates could be struck.

The principal works carried out during the year have been the straightening and deepening of the Awanui River, excavation of the Whangatane spillway to take overflow from this river, and excavation of the Waihoe channel to drain Lake Tangonge and provide outlet for the Pukepoto and Okahu watersheds. One dredge has been working on each of these channels throughout the year.

Rainfall records have been kept at Kaitaia, and readings taken daily on gauges showing the water-level in Awanui River. The total rainfall for the year was 49·23 in., the wettest month being October (7·92 in.) and the driest December (1·38 in.).

The following schedule shows details of rainfall for the past six 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 ..	8·02 (each)	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

The average annual rainfall for the past six years was 45·93 in.

The highest water-level recorded at Foster's Bridge was 69·80, and the lowest 54·80. At Church Road bridge the highest reading was 78·40 and the lowest 64·80.

Awanui River.—Dredger No. 7 (Priestman) was engaged in widening, deepening, and straightening this channel. 123 chains was dredged and 64,410 cubic yards of spoil removed, and a quantity of heavy timber taken out of the old river-bed. Cut No. 30 in Kaitaia Township was deepened by 5 ft., allowing the water to run through this diversion at all times. All timber removed by dredge was hauled clear with bullocks, and banks cleaned up as the dredging proceeded.

Waihoe Channel.—Dredger No. 10 (Priestmen) had practically completed this work by the end of the period. A channel has been excavated from the Awanui River to the middle of Lake Tangonge, and a branch from this channel taps stream leading into the Tangonge basin from the Okahu watershed. 102 chains of channel, 30 ft. wide, was excavated and 56,776 cubic yards of spoil removed. Dredging proved difficult owing to the country being inundated after heavy rain, and there was considerable delay in waiting for flood-waters to subside. In addition, portion of the pontoon was destroyed by fire, and repairs had to be effected in a difficult position, so that further time was lost for dredging, consequently cost of excavation on this job for the year is heavy.

Whangatane Spillway.—Dredger No. 22 (Bay City Floater) was employed on this work: 97 chains of channel 30 ft. wide was excavated, and 40,895 cubic yards of spoil and a quantity of timber removed by the dredge. A new engine was fitted on this machine during the year, and improvements effected in the hoisting-gear of bucket to give extra lifting-power required to effectively deal with the very hard clay encountered. Bullock teams were employed in scooping an opening in the high country to enable dredge to get through, and approximately 11,800 cubic yards of spoil was removed by this means. Bridges have been erected as required on properties severed by the spillway, and openings cut in the spoil-bank to tap all waterways which had been blocked by the spoil thrown up. Ahead of the dredge the partly constructed channel has been cleared of weeds, &c., and kept open to allow water to flow down to the outlet into the Pairatahi Stream.

Dredges.—The three dredges, Nos. 7, 10, and 22, employed on works as above have removed 162,081 cubic yards of spoil, the cost being 10·72d. per cubic yard.

The following figures show comparison of output and cost per cubic yard for the past three years :—

	Spoil removed. Cub. yd.	Cost per Cubic Yard.
1921–22	61,309	10·20d.
1922–23	138,900	10·47d.
1923–24	162,081	10·72d.

Drains and Roads.—127 chains of new drains were constructed, 70 chains of double road-drain were deepened, and 70 chains of road-bank formed up with the spoil; 150 chains of fencing was erected along roads. Maintenance of existing drains was attended to, and 22 miles 75 chains of drain was cleared of growth and slips.

Stop-banks.—50 chains of bank with drain alongside was constructed along tidal flats, and one concrete flood-gate placed in position. Near Unahi 4 chains of protective wall, consisting of large stones with outer face grouted, was constructed. Seven miles of stop-banks were kept in repair, and flood-gates on same inspected and repaired when required.

Bridges.—Five sill bridges were erected over drains severing properties, and two pile bridges erected over the Whangatane spillway.

The following summary shows the particulars of works completed during the year:—

	M.	ch.
New drains	1	47
Cleaning drains	22	75
Deepening drains	1	60
Dredge cuts	4	2
New stop-banks	0	54
Repairs to stop-banks	7	0
Fencing	1	70
Road-formation	1	60
Spoil excavated by dredges	cubic yards,	162,081
Spoil excavated by scoops	,,	11,800
Flood-gates erected	(number)	1
Pile bridges	,,	2
Sill bridges	,,	5

Works Expenditure.—The total expenditure for the year as shown in the books at Auckland Office was £13,428, the principal items being—day labour, £4,689; piecework contracts, £2,261; and hire of teams, £326.

The local Engineer in charge is Mr. T. S. McMillan, Assistant Engineer, who has carried out the year's operations in a capable manner.

Waihi Drainage Area (22,720 Acres), Tauranga County.

The development of the drainage scheme on this area has reached a point where practically every portion of the swamp has received some direct benefit from the operations. The only exception to this statement is portion of the Upper Pongakawa Swamp, which is situated to the south of East Coast Main Trunk Railway. This portion is now the subject of investigation, and it is quite probable that operations will be commenced in this area during the coming year.

In view of the direct benefits derived from the works, it is advisable that the area should be classified by arbitrators, as provided under the Swamp Drainage Act, so that the necessary rates can be struck to cover the cost of construction and maintenance.

It is of interest to record that the seven sections thrown open for selection in 1922 have taken grass satisfactorily, and there is no question that these sections will make good farms.

Although no further land was thrown open for subdivision during the period, the various works on the Crown area have been pushed vigorously forward, and some twenty-six sections, containing upwards of 1,000 acres, were recently valued with a view to early disposal. Operations were extended during the year to the Waewaetutuki Block, where an abnormal amount of timber was encountered in the various drains, and also to the block of Crown land between the Wharere Canal and the Pongakawa Stream. Portion of the latter block, comprising some 500 acres, will be available for selection early in the coming period.

A rain-gauge was installed at the office at Pongakawa in May, 1923, and the rainfall from the 1st June, 1923, to the 31st March, 1924, totalled 43·75 in.—the wettest month being September, 1923, with a fall of 8·22 in., and the driest November, 1923—fall, 1·92 in. The heaviest daily fall was 2·96 in. for twenty-four hours ending at 8 a.m. on the 27th October, 1923.

Wharere Canal.—Deepening of this canal was continued northwards until the beginning of September, 1923, when dredge was brought back up-stream to a point some 20 chains south of Tainui Road, where repairs to pontoon were carried out. Redredging of the canal, especially at intersections of side drains, where large deposits of silt had lodged, was proceeded with, and by the end of the period 110 chains had been completed. Spoil from this canal is being deposited on either bank for future use in forming roads.

Upper Pongakawa Stream.—This work, comprising the cutting of a new channel in the general direction of the old stream, was advanced to a point some 160 chains north of the main road by the end of November, and a suitable place having then been found, dredge was turned and taken back up-stream. As the canal progressed northward the depth of soft peat gradually diminished, sand and grey mud being found much nearer the surface. Although this was harder digging, it was compensated for by affording a more stable foundation for the side spuds of dredge. Completion of canal to this point caused a drop in water-level of 5 ft. at the main road, and when the dredge later returned up-stream and dredged portion between erection-site and main road the water dropped a further 2 ft. In January, 1924, the plant was again headed down-stream, and by the end of the period had completed some 12 chains of widening and deepening.

Lower Pongakawa Stream.—Steady progress was maintained on this work, and by the middle of February a channel carrying 8 ft. of water at low tide had been completed up to the turning-point of top dredge. The plant then backed down-stream, filling up low parts of banks *en route*.

Leasehold Block East of Pongakawa Stream.—In March, 1924, a start was made excavating a canal through this property, and by the end of the period 2½ chains were completed. A dam will be erected behind dredge to do away with tidal influence, and with this held progress should be considerably augmented.

Dredges.—Three dredges—No. 5 Priestman and Nos. 25 and 26 American Steel—have been kept working continuously during the period.

No. 5 Priestman dredge was employed on the Wharere Canal, which it has now practically completed. During September and October the plant was idle while pontoon was being repaired,

but apart from that it has worked continuously, shifting a total of 58,674 cubic yards of spoil over a distance of 191 chains.

No. 25 American Steel dredge was engaged in straightening the upper Pongakawa Stream. Plant was thoroughly overhauled in February, 1924, and is in good order with the exception of the engine main crank-shaft, which carried away towards the end of March, 1924. This plant shifted a total of 104,638 cubic yards for the period, over a distance of 120 chains.

No. 26 American Steel dredge was engaged in the lower Pongakawa Stream, working southwards. Towards the end of April, 1923, the bucket was found to be badly cracked owing to continual bumping on the hard sandy material in the bottom of canal, and some delay ensued while a new bucket was being obtained. In August the engine main crank-shaft carried away where it had been welded after previous break, and reserve shaft was brought down and fitted. However, the dredge had been working only ten days when this shaft also carried away, the welded break again being the trouble. By the middle of November a new shaft was procured and fitted, and since then good progress has been maintained. Work on the Lower Pongakawa Stream was completed in March, 1924, and the dredge was then transferred to proposed canal through leasehold block east of the Pongakawa Stream. During the year this plant shifted a total of 78,192 cubic yards over a distance of 168 chains.

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

	Cubic Yards.	Cost per Cubic Yard
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.

Roads.—The formation and ballasting of roads on the subdivided Crown land between the Wharere Canal and the Kaikokopu Stream was pushed ahead during the year, with the result that the Kaikokopu Road is now complete as far as the Waerenga drain, Tainui and Arawa Roads are complete throughout, and Wharere West Bank Road is complete from the Main Road to the junction with Waerenga drain. In addition the Wharere East Bank Road was formed for a distance of 86 chains from the Main Road northwards.

Drains.—New drains have been cut along the Kaikokopu Road southwards from the Waerenga drain, along Wharere West Bank Road southwards from Waerenga drain to the Punene drain, and along the Wharere East Bank Road southwards from the Waihi Estuary to the Main Road. Deepening of existing drains has been carried out where necessary, notably Sections 23–28 drain, in which considerably more fall was available after dredge had lowered water-level in the Wharere Canal. Eastwards from the Wharere Canal a new drain was commenced opposite Waerenga drain, and this will junction with the Central drain where a start has been made deepening and widening. South of the railway Sections 14–15 drain has been continued southwards for 64 chains, and the widening and deepening of the Mangatoetoe Stream has been completed practically to the boundary of the drainage area. Maintenance work, clearing growth and slips, has been carried out on the Punene and lower Mangatoetoe drains, and a small amount of willowing has been done on the upper reaches of the Kaikokopu Stream. In the Waewaetutuki Block No. 2 drain has been widened and deepened from the Kaikokopu Stream westwards to the eastern boundary of Section 7, Block IV, Maketu Survey District, and Wilson's drain has been deepened from the Kaikokopu Stream westwards to about the middle of Section 8, Block IV, Maketu Survey District. Mend's drain, which branches off Wilson's drain, has been completed as far as the Main Road. A large quantity of timber has been encountered in all these drains, necessitating a free use of explosives.

Bridges.—During the year six sill bridges were erected on the works.

Buildings.—A store-shed, 25 ft. by 20 ft., and an explosives magazine, 6 ft. by 6 ft., were built at headquarters during the year.

The following is a summary of the various works performed during the year :—

	M.	ch.	Cub. yd.
Canal dredges	5	78	241,704
New drains	8	75	41,332
Drains widened and deepened	11	3	29,853
Cleaning drains	4	51	..
Clearing road-lines	1	72	..
Carting and spreading spoil on roads	1	10	10,458
Roads formed	2	51	..
Fencing	1	6	..
Sill bridges erected	(number)		6

The major works proposed to be carried out during the coming year are—(1) Deepening Kaikokopu Stream ; (2) widening and deepening upper Pongakawa Stream ; (3) excavation of canal through leasehold block ; (4) completion of drainage system on block between Wharere Canal and Pongakawa Stream ; (5) stop-banking Waihi Estuary.

The total expenditure for the year was £15,973 ; of this amount £3,851 was expended in day labour (which includes dredge hands), and £7,694 in piecework contracts. The local officer in charge is Mr. D. S. B. Heather, Acting Engineer, a capable and energetic officer.

Poukawa Drainage Area (13,567 Acres), Hawke's Bay County.

The dredge pontoon has been inspected, and was found to be in fair order.

The rainfall at the site of the works was 32·27 in., which is slightly more than the average for the past seven years, which is 29·27 in.

The expenditure for the year was £111 10s. 4d., which was entailed in paying the wages of the caretaker and a few incidentals.

It is anticipated that within a few months' time it will be possible to transfer one of the dredges from other works to take up work on the Poukawa area. A dredge has already been selected for this purpose, and will be made available as indicated.

Hikurangi Drainage Area (50,000 Acres), Whangarei County.

As during the previous year, all work has been confined solely to the diversion and the lowering of the Wairua River bed at the "Rapids." At the close of last year's operations No. 1 cut was completed by two of the machines, and the river was let through this diversion channel. Up to this time the third machine had been engaged on No. 4 cut, but very early in this period was moved from there preparatory to operating on No. 2 cut. During the present year the three machines have been engaged wholly on No. 2 cut. By means of this concentration the work has been carried forward systematically, and boiler-feed problems, access for repairs and renewals, and suchlike difficulties are lightened considerably. Unfortunately, some delay was encountered in making a fair start on this cut. This was primarily due to very necessary overhaul and strengthening (the outcome of work in hard country during the latter part of the previous year) of the excavating-machines. It took some six weeks to get the machines in good running-order again, and about the end of May they were moved over to the cut by crossing fords on the river.

No. 2 Cut.—During the previous year this cut had been stripped to an average depth of about 5 ft. over its length and breadth. Pending the arrival, on the site of the cut, of the excavating-machinery, at the commencement of this year it was found necessary to open up the cutting, driving in from the bottom lagoon, by means of barrow gangs. The machinery being in position, Nos. 13 and 14 machines excavated by means of drag-line buckets, using slings to hoist out the massive boulders. No. 14 machine, equipped as a shovel, was engaged wholly (chiefly in the river side, but also on the uphill side) in moving back the spoil-banks from the previous stripping, so as to afford necessary dumping-room. This mode of operation remained in vogue till the end of September. By this time No. 12 machine had moved over towards the river the whole of the spoil-banks on the river side, and also a good proportion of the spoil on the uphill side had been moved farther away. Nos. 13 and 14 machines had then reached a face at about peg 8c. At this chainage the face had lost its boulder formation entirely, and merged into a solid wall of rock stretching right across the cut and below the grade level. The direct consequence was that the face was shooting out far too rough to be handled by the drag-buckets. It was therefore deemed advisable to put No. 12, equipped as a shovel, in the bottom of the cut to load into skips to be hoisted out by the drag-lines.

When this latter scheme was instituted it was found necessary—owing to the reach of the 35 ft. drag-line boom being insufficient to take all the spoil on one side of the cut—to use both Nos. 13 and 14, hoisting from No. 12. The scheme was therefore further elaborated by means of fitting a 15 ft. extension to the jib of No. 14 machine, and by means of this all the spoil from No. 12 is being dumped on the river side. To perfect the scheme further, the skip that No. 14 is using has been rigged so that the driver can lower the skip to be filled by No. 12, hoist it up over the spoil-bank, and tip it—both operations being simply controlled from the driving-seat. This method, of course, frees No. 13 machine to work elsewhere. This machine has therefore been engaged—using the drag-bucket with slings for the heavy boulders—on the same cut, and ahead of the other two machines. To the end of the year No. 13 has met with very heavy going, encountering a large percentage of rock and boulders, but there is every indication that there is pug underneath once the top layer can be broken through.

At the end of the year the main face is at peg 14c, with a considerable amount of excavation done ahead of this by No. 13 machine. Between pegs 6·50c and 14c the material to be moved has been a solid wall of rock, except for a slight easing-up about peg 13c, averaging 15 ft. to 18 ft. in depth across the entire face. This solid wall of rock is likely to continue as far as peg 16·50c, and then drop into the heavy boulder formation. From the entrance of the cut in to peg 5c, on the uphill side, the wall of the cut has unfortunately slipped in badly: it is quite likely that the major portion of this slip will have to be excavated (which undertaking will not, I think, be at all difficult) before the river is turned through.

From pegs 5c to 14c the cut is being excavated about 1 ft. below the plan grade; between these chainages the rock floor of the cut has been well shattered for a depth of another 2 ft. After the water is turned through, with its attendant scouring-action, material assistance is expected (from the above provisions) in affording protection from flooding when the fourth cut is under way.

Excavating Plant.—In view of the extremely hard nature of the excavation during the latter two-thirds of the year, it is only to be expected that the wear-and-tear on the machinery has been very great. With outside assistance in getting castings, &c., and keeping our own fitting and repair shops going steadily, we have fortunately been able to keep up with the breakages and prevent any really serious breakdown of the excavating plant.

Drilling Plant.—During the latter part of the year it has been necessary to keep three, and sometimes four, of the air-compressors daily in action for drilling on the main face. In order to shoot out the face at all successfully it has been necessary to put in 12 ft. holes, both vertical and

lifters. The compressors themselves are standing up well in view of their extremely heavy task, though, of course, the petrol-consumption is somewhat severe. The replacement of worn and of broken parts of the jack-hammers is, as can only be expected, a problem that has to be faced continuously.

Accommodation.—Previous to the commencement of this year the workmen had been quartered in tents. A start was made early in this year to replace this accommodation with corrugated-iron huts; by the end of June all the men were so housed. A small rent is paid by all men occupying huts. A similar structure, large enough to take both the Thorneycroft truck and the Ford car, has also been erected.

Output.—During the year 32,946 cubic yards of rock have been excavated, at a total cost of £11,929 18s., or 7s. 2·9d. per cubic yard. The total excavation to date amounts to 121,552 cubic yards, at a cost of £35,447 8s. 2d., or 5s. 10d. per cubic yard.

Draining Swamp Land.—The location of the necessary dredge-cuts in order to drain the swamp lands in Block IV, Purua Survey District, has been proceeded with, and the plans of same are practically completed.

This work will be carried out by a Priestman dredge, and for this purpose the necessary timber for the pontoon has been obtained and carted out on to the site selected for the erection of the plant. The punt will be constructed by day labour under the supervision of an officer of the Department. It is anticipated that the pontoon will be completed in August, 1924, and the erection of the machinery should not then be a lengthy process. The dredge machinery is being transferred from the Rangitaiki works, but before erection the whole plant will be overhauled, so as to have the machine in first-class order.

Rainfall.—A rain-gauge is installed at the local headquarters at Ruatangata. The total rainfall for the year was 51·40 in., rain falling on 156 days. The wettest month was May, 1923, with a fall of 8·54 in.; the driest month was December, 1923, the fall being 1·19 in.

Works Expenditure.—The total amount expended during the year, as shown in the books at Auckland, was £15,695. Of this amount the sum of £7,329 was paid out in wages.

The works were under the control of Mr. G. E. Tuck for the first six months of the period, when Mr. V. C. Bosselmann, B.E., took over local control. Mr. Bosselmann is now well established, and is proving a capable and energetic officer.

The following operations were carried on under the authority of the Swamp Drainage Amendment Act, 1922.

Mangawai Drainage (1,050 Acres) Rodney County.

No work has been carried out in this area during the year with the exception of completion of drain referred to in last report. The country has greatly benefited from the past expenditure, and a large part of the area is now subdivided into 3-acre lots, which are let for gum-digging purposes. These are, I understand, returning quite a satisfactory revenue. When the gum has been won the land will be disposed of for agricultural purposes. Expenditure, £113 15s. 4d.

Harihari Swamp (1,486 Acres), Westland County.

Construction work on this swamp was commenced in January, 1923. During the year two miles of catchwater drain and one mile of double drain and road formation have been constructed. The country is drying out and consolidating very well, but in order to ensure the maximum consolidation the above-mentioned drains require deepening on to the clay stratum lying below the peat. This work has just been commenced, and will be completed about August. In addition to this work a further 35 chains of small drain requires constructing, and the area will then be ready for settlement. The Chief Surveyor's approval has been obtained to a scheme of subdivision, and the survey will be put in hand in time to ensure the land being ready for selection next spring. The cost of the work during the year was £2,638 5s. 10d. This work s under the direct control of Mr. J. S. Strawbridge, who is engaged on exploration surveys of the many swamp areas in the Westland District.

I have, &c.,

O. N. Campbell,

Chief Drainage Engineer.

The Under-Secretary for Lands, Wellington.

SWAMP LAND DRAINAGE ACCOUNT.

RECEIPTS AND PAYMENTS ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 1924.

Receipts.	£	s.	d.
Balance at 1st April, 1923	3,713	19	8
Debentures issued under Swamp Land Drainage Act, 1915	63,000	0	0
Interest on surplus funds temporarily invested	30	11	5
Rent of buildings	132	6	2
	£66,876	17	3

Payments.	£	s.	d.	£	s.	d.
Kaitaia Drainage District—						
Drainage-works, &c. ..	9,208	14	8			
Loose tools	49	10	4			
Live-stock	40	0	0			
Fuel and stores ..	2,633	13	2			
Management and engineering expenses.. ..	823	19	10			
				12,755	18	0
Waihi Drainage District—						
Drainage-works, &c. ..	13,231	16	3			
Loose tools	58	4	6			
Live-stock	28	0	0			
Fuel and stores ..	1,916	8	4			
Management and engineering expenses.. ..	791	3	5			
				16,025	12	6
Poukawa Drainage District—						
Drainage-works, &c. ..	92	2	0			
Management and engineering expenses.. ..	19	8	4			
				111	10	4
Hikurangi Drainage District—						
Drainage-works, &c. ..	9,484	4	6			
Loose tools	106	4	8			
Fuel and stores ..	4,410	11	5			
Management and engineering expenses.. ..	907	9	6			
				14,908	10	1
Mangawai Drainage District—						
Drainage-works, &c. ..	105	16	8			
Management and engineering expenses.. ..	7	18	8			
				113	15	4
Harihari Drainage District—						
Drainage-works, &c. ..	2,893	12	11			
Management and engineering expenses.. ..	287	8	3			
				3,181	1	2
Plant and machinery ..	..			1,621	6	9
Interest on debentures ..	..			12,299	5	5
Cash in Public Account, 31st March, 1924				5,859	17	8
				£66,876	17	3

SWAMP LAND DRAINAGE ACCOUNT—*continued.*

BALANCE-SHEET AS AT 31ST MARCH, 1924.

Liabilities.	£	s.	d.
Debentures issued under Swamp Land Drainage Act, 1915	331,000	0	0
Public Works Fund—Land Improvement vote	4,563	19	7
Sundry creditors, for interest on debentures	4	18	7
Sundry creditors, for interest on debentures accrued but not due	5,938	8	8
Sundry creditors—Miscellaneous ..	3,953	14	4
	£345,461	1	2

Assets.	£	s.	d.	£	s.	d.
Kaitaia Drainage District—						
Drainage-works ..	124,267	11	2			
Interest Account (proportion chargeable to district)	27,430	1	3			
				151,697	12	5
Waihi Drainage District—						
Drainage-works ..	51,109	10	10			
Interest Account (proportion chargeable to district)	8,347	18	5			
				59,457	9	3
Poukawa Drainage District—						
Drainage-works ..	2,727	12	2			
Interest Account (proportion chargeable to district)	807	17	9			
				3,535	9	11
Hikurangi Drainage District—						
Drainage-works ..	44,923	13	10			
Interest Account (proportion chargeable to district)	5,190	17	9			
				50,114	11	7
Mangawai Drainage District—						
Drainage-works ..	1,872	13	2			
Interest Account (proportion chargeable to district)	224	10	5			
				2,097	3	7
Harihari Drainage District—						
Drainage-works ..	3,181	1	2			
Interest Account (proportion chargeable to works)	187	15	5			
				3,368	16	7
Buildings				2,535	17	2
Plant and machinery				60,149	17	8
Loose tools				735	5	3
Live-stock				147	19	0
Fuel				2,324	6	2
Stores on hand				3,431	16	11
Sundry debtors for rent				4	13	0
Sundry debtors—Miscellaneous ..				0	5	0
Cash in Public Account				5,859	17	8
				£345,461	1	2

J. B. THOMPSON, Under-Secretary.
J. H. O'DONNELL, Chief Accountant.

Approximate Cost of Paper.—Preparation, not given; printing (675 copies, including plans), £66 15s.

By Authority: W. A. G. SKINNER, Government Printer, Wellington.—1924.

Price 2s. 3d.]

PLAN OF KAITAIA DRAINAGE DIST.

N. Z. LANDS AND SURVEY

O. N. CAMPBELL.
CHIEF DRAINAGE ENGINEER

REFERENCE.

- Boundaries of Kaitaia Drainage Area
- Drains now in operation
- Drains under construction
- Dredged channels
- Stop-banks

SCALE OF CHAINS

RANGAUNU BAY

TASMAN SEA

OMAIA

RANGAUNU

AHIPARA

TAKAHUE

KAREPONIA

OTURU

MANGATETE PH.

UPOKONUI SETTLEMENT

KONOTI

KAIAKA PH.

MAUNGATANIWHA PH.

KAITAIA

TANGONGE K.C.R.

LAKE TANGONGE

PT PUKEPOTO BLK

PUKEPOTO RD.

MATARAU

OMARAE

RUAROA BLK.

WAIMAMAKU

PUNEKAHIKAWA

WATIKE

TE MAROA

Awanui R.

Awaroa R.

Peria tahi R.

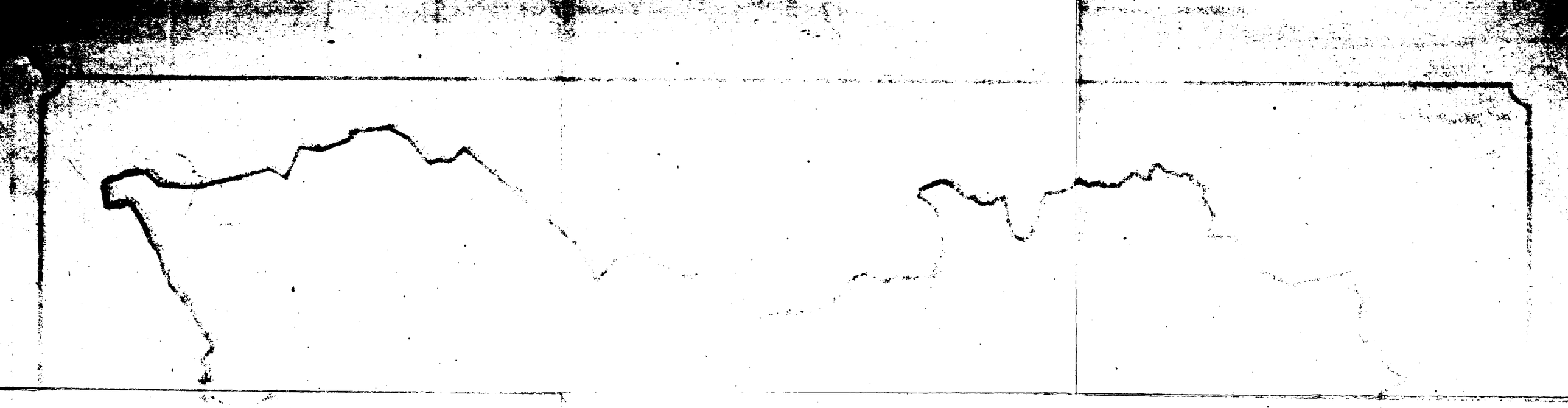
Victoria River

Oruaroa Stm

Shipping

Sand Hills

N.Z. Gazette No 32 March 16th 1916. p 781



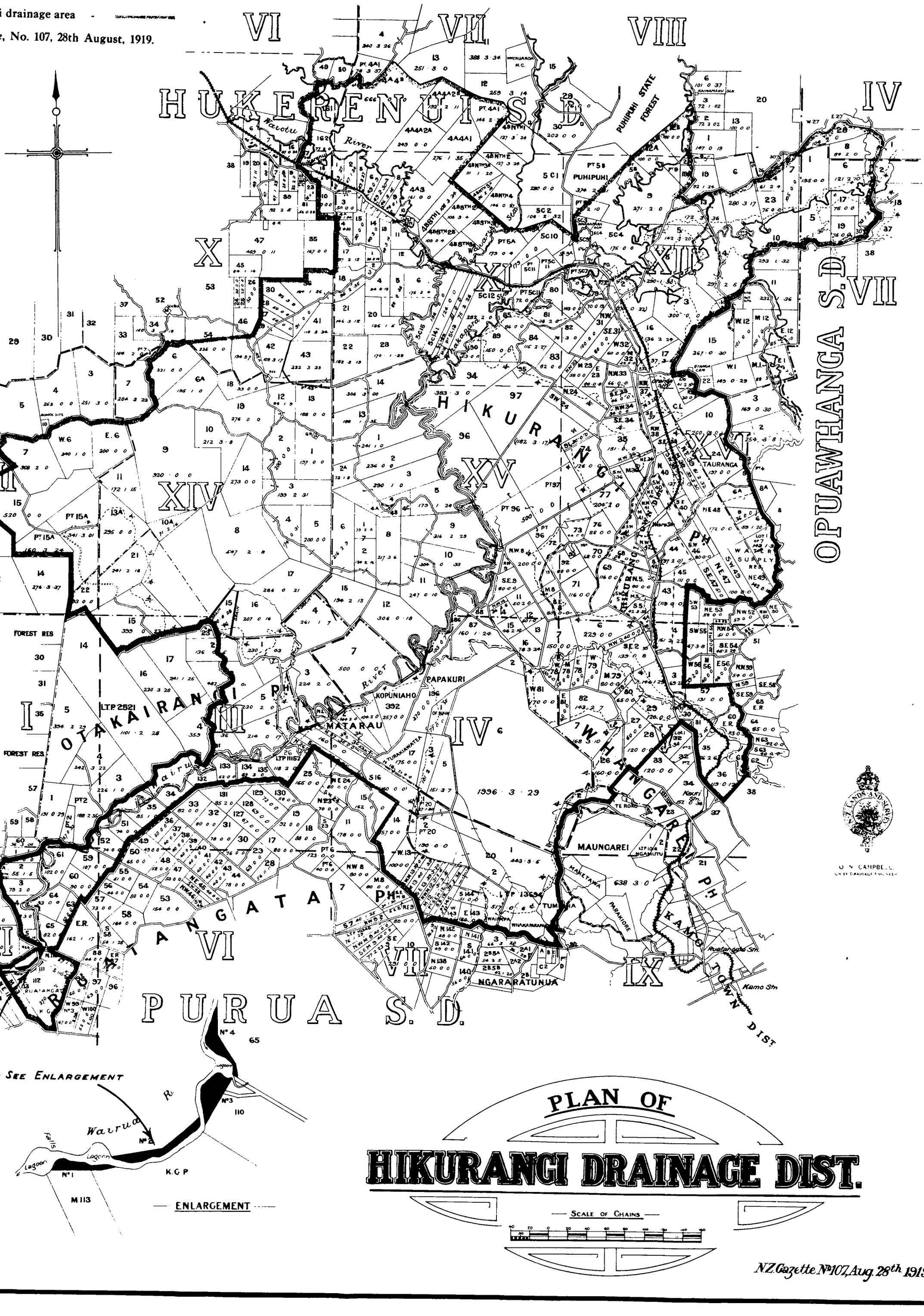
REFERENCE.

Proposed work shown thus: ═══ —

Work in hand „ ━━━

Hikurangi drainage area - ·····

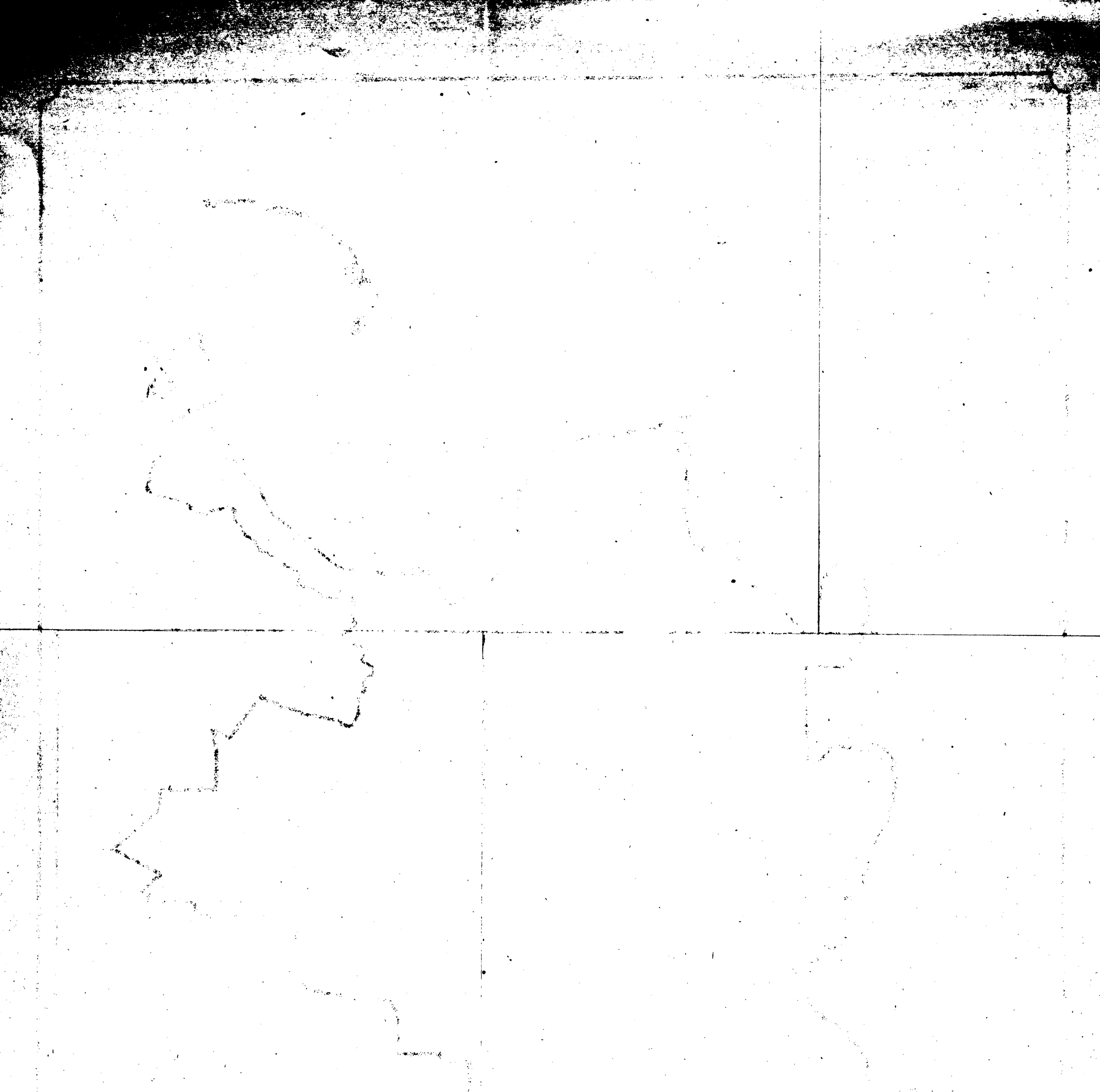
N.Z. Gazette, No. 107, 28th August, 1919.



PLAN OF
HIKURANGI DRAINAGE DIST.

SCALE OF CHAINS

N.Z. Gazette No. 107, Aug. 28th 1919.



N.Z. LANDS AND SURVEY

O. N. CAMPBELL,
Chief Drainage Engineer

REFERENCE.

Completed drains
Proposed new drains
Existing drains to be deepened
Proposed new roads
Existing roads

PLAN OF WAIHI DRAINAGE DIST.

SCALE OF CHAINS

0 10 20 30 40 50 60 70 80 90

MAKETU S. D.

WAIHI SOUTH S. D.

BAY OF PLENTY

Maketu

WAIHI ESTUARY

Pukehina Canal and Pukehina No 1 Drain

PUKEHINA BLOCK

URUPA

M1 M2 M3 M4B No4 M4B No3

Pongakawa River

Pongakawa IV. Drain

Wharere Road and Canal

Central Drain

Trunk Rly.

Main Coast Road

Trunk Rly.

Pongakawa Rly. Stn.

Maniatutu Rly. Stn.

Paengaroa Rly. Stn.

Arawa Road

Trinui Road

Wilson's Dr.

Mends Drain

Waewaetukituki Stream

Waewaetukituki Blk. No 2 No 3

Kaikokopu Stream

Mangaloetoe Stream

Paengaroa Village

Maniatutu Village

Paengaroa Nth B

Paengaroa Nth C 1

Paengaroa Nth C 2

I II III IV V VI VII VIII

Lot 1 D.P. 14207
Lot 2
Lot 1 D.P. 13467
Lot 2 D.P. 13526
Lot 1 D.P. 7422
Lot 3 D.P. 11998
Lot 1 D.P. 11991
Lot 2 D.P. 15207
Lot 1 D.P. 7738
Lot 2 D.P. 9638
D.P. 13053
D.P. 1427
D.P. 2801
D.P. 8855
D.P. 9513
D.P. 14838
D.P. 2787
D.P. 15299
D.P. 10387
D.P. 7345

Pt A1 Pt A2 Pt A3 Pt 1 Pt 2 Pt 3 Pt 5 Pt 8 Pt 11 Pt 12 Pt 13 Pt 22 Pt 23
Pt LN No 1 B Pt LN No 1 C Pt LN No 1 D Pt LN No 2

N.Z. Gazette No 69 June 22nd 1916 p 1967