

1950
NEW ZEALAND

DEPARTMENT OF LANDS AND SURVEY
SURVEYS
(ANNUAL REPORT ON)

Presented to Both Houses of the General Assembly by Command of His Excellency

Wellington, 30th June, 1950.

The SURVEYOR-GENERAL to the Hon. the MINISTER OF LANDS.

SIR,—

I have the honour to present herewith my report on the survey operations of the Department for the year ending 31st March, 1950.

I have, &c.,

R. G. DICK,

Surveyor-General.

The Hon. Minister of Lands.

REPORT

YOUR attention is drawn to the detailed report of the activities of the Survey Division of the Department summarized under various headings in the body of the report. These set out the work executed during the year and generally indicate that there has been little opportunity of extending our operations to deal with other than routine surveys. It is, however, noticeable that while there has been a steady increase in land title survey work for the past four years this year's returns indicate that such work has reached its maximum, there being if anything a slight drop from the peak figures of last year.

CONTRACT SURVEYS

To meet departmental and inter-departmental demands for land title surveys the maximum use has been made of the services of the private practising surveyor, the sum of £19,987 having been expended on contract surveys representing the full-time over-all services of approximately fifteen surveyors, sixty-seven individual private surveyors having been employed on contract. In spite of this it has only been possible to deal partially with the large arrears of survey works required to maintain the survey system of the Dominion and the extension of topographical mapping, triangulation, and precise levelling to keep pace with the requirements of national development.

LAND SETTLEMENT

An endeavour is being made to supplement the field staff engaged on the preliminary investigation of land suitable for settlement in the Bay of Plenty, Rotorua, and Taupo districts. In this regard it is proposed to concentrate survey parties on selected blocks to draw up in the first place maps illustrating the essential topographical and physical features of the area concerned and then, after consultation with field and development officers, draw up a farm-subdivision pattern, having due regard to access, the arable nature of the land and the availability of water-supply. These schemes of subdivision will then be the basis for future land-settlement or land-development operations. The mapping party located at Reporoa will be increased by the addition of survey cadets attached for training in the specialized work of triangulation and topographical mapping from aerial photographs. To supplement this party a staff of surveyors and survey assistants is to be attached to the Land Development Office at Rotorua to prepare schemes of subdivision for land-settlement.

HYDROGRAPHIC SURVEY

Mention has been made in the report of the assistance being given to the Navy Department in the supply of control data and the beaconing of trigonometrical stations along the coast for the hydrographic survey being carried out by H.M.S. Lachlan. This work will be a continuing responsibility for a number of years and will be handled through Head Office by each district office as the survey ship proceeds with the coastal survey. The signals being erected for this purpose are built of permanent materials and will thus supplement land-survey control.

LAND TITLE SURVEYS

For many years the Department has applied a most rigid and in many respects an unnecessary check on survey plans lodged for the approval of the Chief Surveyor. During the past twelve months a modified form of survey plan examination has been adopted without detriment to the accuracy of survey records, placing on the surveyor the full

and legal responsibility for the accuracy and correctness of his survey. This modified form of plan examination is proving a great saving in the man-hours of the office staff. While arrears in this work are still evident, there is every prospect of a reduction in these arrears during the ensuing year.

To ensure accuracy of survey and compliance with the land law requirements the surveyor's work is subject to field inspection by the Department. Two inspecting surveyors are engaged part time on this work. The surveyor is subject to reprimand by the Chief Surveyor for minor discrepancies in his survey and, where defective work has been carried out, may be subject to discipline by the Survey Board in accordance with the provisions of the Surveyors Act, 1938.

GEODETIC TRIANGULATION

This year marked the completion of the geodetic triangulation of the Dominion which was commenced in 1910 and progressed intermittently, because of war and depression periods, throughout the intervening years. Thus the initial recommendation of Major Palmer, R.E., made in his report to the New Zealand Government in 1876 on the New Zealand survey system, has been established as a co-ordinated basis and datum for land surveys and all forms of map and chart production. It is still essential in most districts to break down from the first order geodetic framework in order to establish second and third order triangulation for use in normal survey practice. These triangulation break-downs are being carried out as required for special purposes, linking up with the older triangulation established on the old circuit system. It is proposed that a full and complete record of this survey should be published for local and overseas use in the near future. The datum entitled "Geodetic Datum, 1949" is defined in the body of the report.

LAND SUBDIVISION

It will be noted that there has again been an increase in the number of allotments dealt with on scheme plans of subdivision submitted for approval under the provisions of the Land Subdivision in Counties Act, 1946. The Department has worked in harmony with the local authorities and has endeavoured, in accordance with the letter and the spirit of the legislation, to implement the requirements of the local authorities. There are cases, however, where local authorities are operating on interim extra-urban planning schemes which impose restricted zoning requirements to the detriment of the rights of the landowners. It cannot be too strongly emphasized that such schemes should be submitted under the Town Planning Act, 1926, to the Town Planning Board for approval, thus giving the owners of land detrimentally affected the right to lodge objections to such interim zoning proposals for determination by the statutory authority. There are also cases where other Departments propose to acquire lands for special purposes, which, because of protracted negotiations for purchase or the lack of finality in the decision to purchase, is causing owners of land suitable for residential development financial loss and inconvenience.

MAPS AND CHARTS: ARMED SERVICES

The Joint Services Mapping Committee responsible to the Chiefs of Staff Committee for the map and chart requirements of the three Armed Services and the Civil Aviation Branch of the Air Department has met regularly throughout the year.

The map catalogue recently issued by the Department, which was initiated by the Committee, will more adequately meet the needs of the Armed Services as well as the general public by having available a complete index of maps and charts issued by the Department for civil and service requirements.

Good progress has been made in the production of maps and charts for aeronautical purposes. The Department is now responsible for the accuracy of data shown on such charts as a safeguard to aeronautical operations in the Dominion.

As the availability of staff will permit, it is hoped to extend topographical mapping operations to cover military training areas. Any such extension of mapping will be part of the national map series and thus a useful addition for general national use.

AERIAL PHOTOGRAPHY

New Zealand Aerial Mapping, Ltd., Hastings, has continued to supply the Department with aerial photographs and mosaics for all purposes. The company has concentrated on filling in a number of gaps in aerial photographic cover in the North Island caused by unfavourable weather conditions at the time of initial photography or by the initial limitation of flying contracts. This has enabled the company to complete a full mosaic cover of the Bay of Plenty, Rotorua, and Taupo districts.

The usefulness of these mosaics for the patterning of land-settlement, land-utilization investigations, land classification and valuation, and soil, pasture, and geological surveys is becoming more and more evident. They are a valuable supplement to the existing map cover, particularly where no detailed mapping has been carried out.

The company's facilities are operating at full capacity, their standard of work being excellent, in fact, techniques have been developed which have not only speeded up the work but also improved the quality of the company's productions.

MISCELLANEOUS

A conference of Chief Surveyors was held in October, 1949, at which questions of administration and procedures were discussed at length. Consequent on the findings of this conference a direct benefit has been derived through the adoption of uniform practices and procedures and a more comprehensive grasp by district offices of the over-all survey requirements of the Dominion.

The Department is at present preparing maps for the census to be taken in 1951. This involves an immense amount of detailed work and will divert the services of approximately fifty draughtsmen from other work for a period of three months. The preparation of land holding maps which have proved to be indispensable in dealing with land-settlement problems is almost finalized. They will require to be kept up to date and can be adapted for many land-utilization and land-classification purposes.

CONFERENCE OF BRITISH COMMONWEALTH AND UNITED STATES OF AMERICA SURVEY AUTHORITIES

In November next two important conferences will be held in Wellington. In accordance with reciprocal arrangements entered into with the Australian States in 1892, the Australian State and New Zealand Survey Boards meet in conference at four- or five-year periods to discuss reciprocal surveyors' examination requirements and procedures. For the first time this conference will be held in Wellington at which twenty delegates from the Australian States will be in attendance.

Immediately following this conference a further conference of representatives of survey authorities of the British Commonwealth and the United States of America will meet to discuss the extension of this reciprocal arrangement, with the object of establishing a basis of reciprocity in the training, experience, and qualification of the land surveyor throughout the British Commonwealth and the United States of America.

Arrangements for these conferences are well in hand, and it is anticipated that the outcome of the deliberations of conference will permit of a free exchange of the surveyors between the countries concerned, and also establish the profession of surveying as an efficient agent in the development of national resources and projects throughout the English-speaking world. The contacts made with overseas survey authorities will also be of great benefit to the profession in New Zealand.

ROUTINE ACTIVITIES

The following schedule summarizes the field-work carried out by staff and contract surveyors for the year ended 31st March, 1950: -

SUMMARY OF FIELD-WORK, 1949-50

Class of Survey.	Area or Mileage, &c.	Average Cost.	Total Cost.
			£
Geodetic triangulation	(Longitude observations)		346
Second and third order triangulation ..	1,325 square miles	£5.48 per square mile	7,266
Topographical mapping (1 : 25,000 and 1 : 63,360)	292 square miles	£9 per square mile ..	2,629
Topographical survey for settlement ..	128,406 acres ..	8.64d. per acre ..	4,627
Topographical survey for housing ..	301 acres ..	43-45s. per acre ..	654
Rural and settlement surveys ..	125,198 acres ..	3.48s. per acre ..	21,833
Village and suburban surveys ..	668 acres ..	69-76s. per acre ..	2,330
Town and housing surveys ..	2,549 lots ..	£5.32 per lot ..	13,558
Maori land surveys ..	9,509 acres ..	1.87s. per acre ..	891
Road and railway surveys ..	90.4 miles ..	£53.47 per mile ..	4,834
Standard surveys ..	0.8 mile ..	£26.25 per mile ..	21
Precise levelling ..	181 miles ..	£30.49 per mile ..	5,518
Survey maintenance ..	..	..	778
Inspection and investigation surveys ..	..	..	3,140
Location of boundaries and compass surveys	..	..	1,511
Police surveys and Court attendance ..	..	..	249
Town and extra-urban planning ..	..	..	741
Hydrographic survey control ..	..	..	1,909
Aeronautical charting ..	..	..	150
Miscellaneous (reports, &c.) ..	..	..	3,493
Total cost .. ..	..	..	76,478

The major items of expenditure with relative output over the past three years are as follows: -

	1948.	1949.	1950.
	Ares.	Ares.	Ares.
Topographical survey for settlement	227,639	196,698	128,406
Rural and settlement survey	132,271	172,461	125,198
	Lots.	Lots.	Lots.
Town and housing surveys	2,149	3,506	2,549
	£	£	£
Second and third order triangulation	1,136	3,447	6,742
Precise levelling, first order	64	2,537	5,518

The first three items show a falling off in the quantity of completed work during the year, owing to shortage of surveyors. There is a large amount of work on hand, and yet to be put in hand, as will be noted from a subsequent table. However, it has been possible to keep all settlement surveys sufficiently up to date to avoid any delay in placing settlers on their holdings. It has been possible to increase the amount of work for the year under the last two headings by keeping one party fully employed on each class of work. Further reference to these surveys is made later in the report.

SURVEYS FOR LAND-SETTLEMENT FOR YEAR ENDING 31ST MARCH, 1950

District.	Chief Surveyor.	Preliminary Topographical Surveys.	Final Land Title Surveys.	Number of Units.
		Aeres.	Aeres.	
North Auckland and South Auckland	T. S. Roe ..	23,725	8,291	71
Gisborne	C. L. Cox ..	31,337	6,784	20
Hawke's Bay	A. J. Wattie ..	4,609	7,626	59
Taranaki	J. S. Strawbridge ..	1,611	712	6
Wellington	W. G. Nelson ..	43,169	12,769	53
Marlborough	J. C. Meale ..	3,615	21,616	14
Nelson	J. W. McIntyre ..	460	461	11
Westland	E. M. Morilleau ..	462	1,967	3
Canterbury	T. S. McMillan ..	2,836	19,330	45
Otago	H. A. Adams ..	13,394	11,573	14
Southland	H. M. Smith ..	3,188	2,446	9
Totals .. .. .	..	128,406	93,575	305
Totals—				
1949 .. .. .	..	196,698	156,333	447
1948 .. .. .	..	227,631	98,492	305

This table sets out the areas dealt with in each district for land-settlement purposes only. It represents the actual area of land surveyed for this purpose and does not include land units settled which have not required survey.

COST OF WORK APPORTIONED TO VARIOUS DISTRICTS

District.	By Staff Surveyors.	By Contract Surveyors.	Totals.	Percentage.	Number of Surveyors.	
					Staff.	Contract.
	£	£	£			
Head Office ..	8,462	..	8,462	11.0	2	..
North Auckland and South Auckland	13,832	4,110	17,942	23.4	10	30
Gisborne ..	2,218	46	2,264	3.0	2	1
Hawke's Bay ..	2,544	603	3,147	4.2	2	4
Taranaki ..	1,663	329	1,992	2.6	2	4
Wellington ..	7,645	8,721	16,366	21.4	7	14
Marlborough ..	2,053	1,932	3,985	5.2	1	3
Nelson ..	1,734	86	1,820	2.4	1	2
Westland ..	597	120	717	1.0	1	1
Canterbury ..	7,450	836	8,286	10.8	3	2
Otago ..	6,589	3,064	9,653	12.6	3	5
Southland ..	1,704	140	1,844	2.4	1	1
Last year ..	56,491 46,187	19,987 20,358	76,478 66,545	100.0 ..	35 32	67 69

It will be noted that the amount of work carried out by contract is approximately the same as last year. Again slightly more than 50 per cent. of the survey work in the Wellington district was carried out by contract surveyors.

The services rendered by contract surveyors, which is much greater than is normally required, has materially assisted in coping with the land-settlement and housing-survey requirements of the Department. It has enabled the Department to divert staff to other urgent work required for general development operations such as land-settlement, State hydro-electric development, &c.

FIELD-WORK IN HAND AT 31ST MARCH, 1950

The following is a summary of the main survey operations which are either in hand or under action, and does not include those requirements which cannot be undertaken until more field staff are available.

(1) Second and third order triangulation—							
Rotorua-Taupo	..	..	..	..	2,000	square miles	
Marlborough	..	..	..	..	1,200	square miles	
Canterbury	..	..	..	..	60	square miles	3,260 square miles.
(2) Precise levelling—							
Bay of Plenty and Hauraki Plains	..	..	..	..	80	miles	
Waikato	..	..	..	..	4	miles	
Canterbury	..	..	..	..	7	miles	
Wellington	..	..	..	..	50	miles	141 miles.
(3) Topographic mapping—							
Rotorua-Taupo	..	..	..	..	190	square miles	
Waiouru	..	..	..	..	50	square miles	240 square miles.
(4) Topographical survey for settlement	..	..	..	..	..	..	42,000 acres.
(5) Title surveys for settlement	..	..	..	..	..	..	206,000 acres.
(6) Town and housing lots	..	..	..	..	..	..	4,900 lots.
(7) Maori land surveys	..	..	..	..	..	..	91,000 acres.
(8) Road surveys	..	..	..	..	..	..	200 miles.

Most of the survey work under (6), (7), and (8) above will be carried out by contract and where necessary surveys under (5) will be carried out in like manner.

TOWN SCHEME SUBDIVISIONS, 1949-50

(Land subdivision in Counties Act, 1946)

District.	Number of Plans.	Number of Saleable Lots.	Cash Received in Lieu of Reserves.	Areas Set Aside.		Area of Roads.	Total Area.
				Crown Land.	Reserves.		
North Auckland and South Auckland	210	4,221	£ 4,203 s. 13 d. 11	A. 26 R. 0 P. 09	A. 113 R. 0 P. 32	A. 166 R. 2 P. 21	A. 1,839 R. 3 P. 15
Gisborne	15	224	154 9 8	..	20 3 03	13 2 24	114 3 32
Hawke's Bay	41	319	256 6 11	1 3 16	9 3 06	15 2 14	171 3 22
Taranaki	22	84	479 6 10	..	0 3 12	1 0 39	46 2 64
Wellington	74	1,070	637 4 3	2 1 01	43 3 31	65 1 38	450 3 03
Marlborough	26	198	94 3 0	5 3 36	2 3 00	0 3 31	143 3 08
Nelson	78	421	576 15 9	3 0 22	4 3 24	10 2 08	186 2 25
Westland	9	107	41 17 4	0 3 20	2 3 38	4 0 31	37 2 06
Canterbury	119	828	3,013 6 11	5 2 11	5 2 21	20 2 26	424 1 12
Otago	31	336	270 4 2	2 2 04	11 1 15	11 1 29	150 3 39
Southland	10	85	61 4 9	0 3 07	2 1 23	3 0 36	63 1 39
Totals	635 (690)	7,893 (7,601)	9,788 13 6 (11,542 6 8)	49 0 06 (29 3 34)	218 2 05 (231 0 15)	313 2 17 (301 1 23)	3,630 3 05 (3,726 2 09)

(Last year's figures are shown in parentheses.)

It will be noted that there was a slight falling off from the peak number of scheme plans received in the previous year, though there is a small increase in the number of saleable lots.

A lesser amount of cash was received in lieu of reserves, but an increase is shown in Crown land set aside in place of reserves. These Crown sections are sold, and the proceeds along with the cash received in lieu of reserves is available for the purchase of further land for public reserves or the improvements of the existing ones. During the year 807 applications for exemption from the provisions of the Act were dealt with. These exemptions comprise the cutting out of single allotments, generally situated in isolated localities, and are subject to the approval of the local authority.

OFFICE-WORK (PLAN EXAMINATION)

The following table summarizes the number of plans approved and instruments of title prepared for the year ended 31st March, 1950 :—

District.	Plans Placed on Instru- ments of Title.	Survey Plans Examined and Approved.				
		Crown.	Other Depart- ments.	Maori.	Land Transfer.	Totals.
North Auckland and South Auckland	19,557	187	245	76	1,094	1,602
Gisborne	925	28	10	2	76	116
Hawke's Bay	2,159	43	31	25	188	287
Taranaki	1,221	31	21	11	142	205
Wellington	7,193	100	96	13	417	626
Marlborough	745	27	20	3	78	128
Nelson	1,748	27	29	..	190	246
Westland	785	16	7	..	26	49
Canterbury	5,385	54	52	5	472	583
Otago	3,164	68	54	..	196	318
Southland	1,159	18	17	..	132	167
Totals	44,031	599	582	135	3,011	4,327
Last year's figures	(38,689)	(537)	(531)	(91)	(2,826)	(3,985)

Notwithstanding an increase in the numbers of plans examined and approved during the year, it has been impossible to reduce the arrears of plans awaiting action. Without the benefit of the modified form of plan examination instituted just over a year ago, the arrears would have been greater, owing to the increase in new plans received during the year. Auckland and Wellington are the two districts most affected, and every effort is being made to reduce the arrears in these two districts.

OTHER OFFICE-WORK

Again there has been little opportunity of dealing with other than the most essential routine work, and large arrears of record and cadastral map production remain untouched. It is not possible to itemize the many and varied works carried out by the draughting staff, but the following schedule sets out the main classes undertaken during the year (last year's figure where available in parentheses) :—

Record maps revised or redrawn	..	..	171	(209)
Cadastral maps revised or redrawn	..	..	69	(55)
Tracings supplied	..	..	6,693	(7,446)
Photostats and sun prints supplied	..	..	63,688	(57,504)
Mosaic maps for which control data supplied	..	..	162	..
Survey plans compiled from records	..	..	369	..
Survey plans drawn from field notes	..	..	282	..

WARRANTS

During the year 286 (210) warrants for certificates of title comprising 994 (789) items, and 18 (15) proclamations of road-lines under the Maori Land Act, 1931, were dealt with (last year's figures are given in parentheses).

MAP SALES

The following table sets out the total map sales for the year ended 31st March, 1950 :—

Class of Map.	Sold for Cash or Credit.	Free Issue and Office Use.	Totals.
	£	£	£
Cadastral	1,430	1,005	2,435
General and miscellaneous	1,231	972	2,203
Topographical	2,613	444	3,057
Mosaics	3,336	2,295	5,631
Totals	8,610	4,716	13,326
Last year	4,770	1,492	6,262

This year the above schedule has been tabulated according to the Department's new map catalogue issued in October last.

There has been an increase in all map sales but the new mosaic series have proved extremely popular as illustrated by the sales figures.

SUMMARIZED EXPENDITURE

The following table sets out the salary expenditure of both field and office staff for the year ended 31st March, 1950, apportioned to various classes of field and office work. Relative figures for the previous year are also given :—

	1949-50.	1948-49.
	£	£
General (Crown surveys, records, tracings, investigations, diagrams, and general office work)	79,808	80,755
Triangulation	8,844	6,034
Topographical mapping	7,107	4,209
Standard traverse	21	165
Survey maintenance	764	804
Precise levelling	2,792	2,785
Inspection and investigation surveys	2,801	1,886
Town scheme plans	5,328	5,647
Land-settlement (topographical and schemes)	10,009	13,854
Tidal calculations	18	48
Aeronautical charting	3,050	..
Control data for mosaics N.Z.M.S. 3 and 4	2,000	..
Hydrographic survey control and cartographic services	2,164	..
Cadastral mapping	2,722	..
Work for—		
Maori Affairs Department	2,706	2,499
Lands and Deeds Department	24,553	24,038
Ministry of Works	4,800	5,355
Housing Division	4,123	3,043
Other Departments	6,778	8,728
	170,388	159,850

The above expenditure apportioned among the various district offices and Head Office is as set out below.

District.	Expenditure.	Percentage.
	£	
Head Office	26,030	15.3
North Auckland and South Auckland ..	42,430	24.9
Gisborne	6,356	3.7
Hawke's Bay	9,559	5.6
Taranaki	7,647	4.5
Wellington	21,326	12.5
Marlborough	5,514	3.2
Nelson	5,595	3.3
Westland	2,969	1.8
Canterbury	21,552	12.6
Otago	14,110	8.3
Southland	7,300	4.3
	170,388	100.0

Head Office expenditure is now the second largest in the above table, due to the increase in work carried out in the Photogrammetric and Cartographic Branches and to the fact that one field party has been engaged for the full year on topographical and trigonometrical surveys in the Rotorua, Taupo, Bay of Plenty areas.

HEAD OFFICE AND SPECIALIZED ACTIVITIES

1. GEODETIC TRIANGULATION

Observations for La Place longitudes at three stations in the South Island were made during the year. This work brought to a conclusion the field-work necessary for the geodetic triangulation survey of New Zealand, and during the year it has been possible to complete the main adjustments of the triangulation network and to establish and define a geodetic datum for New Zealand.

The defining of this datum titled "Geodetic Datum, 1949," will enable all surveys and maps in New Zealand to be correlated to a common datum, and this work will be put in hand as the need occurs and opportunity offers.

Prior to the completion of the adjustment of the first order geodetic triangulation, the geographical co-ordinates of trig. stations were expressed in terms of the initial of the meridional circuit in which they were situated. The values of these initial stations were based largely on local determinations of geographical positions, and the relative positions of different meridional circuits were not known with any certainty.

In conjunction with the geodetic triangulation, astronomical observations for latitude, longitude, and azimuth were made at over 70 of the stations, and the results of as many as possible of these were utilized in order to determine the new datum as accurately as possible.

The figure of the earth used for the computation of geodetic positions is the International Spheroid, recommended at the Madrid meeting of the International Geodetic and Geophysical Union in 1924. The fundamental elements of this spheroid are :—

Major semi-axis $a = 6,378,388$ metres.
 Compression $(a-b)/a = 1/297$.

The "Geodetic Datum, 1949" is defined by the following elements :—

Papatahi Trig. Station :—

Latitude, $41^{\circ} 19' 08''$.9000 S.

Longitude, $175^{\circ} 02' 51''$.0000 E.

Geodetic azimuth, Papatahi to Kapiti No. 2, $347^{\circ} 55' 02''$.500.

The latitude is based on a mean of the latitude determinations at 60 stations, and the longitude on that determined for the Dominion Observatory transit pier by Messrs. R. C. Hayes and I. L. Thomsen in 1933, but corrected for deflection of the vertical. The initial azimuth is a mean value based on azimuth observations made at 22 North Island stations.

2. SECOND AND THIRD ORDER TRIANGULATION

Second and third order triangulation established during the year was confined mainly to the Rotorua-Taupo district where extensive topographic mapping is in hand as a preliminary to the development of unproductive lands and other national projects in this area. Work was started in October, 1948, and up to March, 1950, the area covered by new triangulation is approximately 2,400 square miles. The number of stations beaconed is 259 of which 177 have been finally fixed.

Triangulation was also carried out in the Southland district where a number of stations were fixed as control for the hydrographic charting of the Foveaux Strait area.

3. PRECISE LEVELLING

In the Wellington district the precise level traverse between the portals of the proposed Rimutaka Railway Tunnel was completed. This traverse is a portion of the Wellington - Hutt Valley - Wairarapa geodetic level net, and it is hoped to complete the traverse to the Wellington tide-gauge during 1950 so that level datums can be finalized in the Hutt Valley and southern Wairarapa.

In the Auckland district the traverse along the Waikato River for the control of hydro-electric development was continued. At the end of the year 106 miles of this 110-mile traverse had been completed. In the Bay of Plenty district bench-mark monuments were established for the Whakatane-Tauranga traverse and observational work will start during 1950. An automatic tide-gauge for the determination of mean sea-level was established at Tauranga during the year.

4. STANDARD TRAVERSE SURVEY

With the exception of a few miles of traverse carried out for revision and maintenance purposes, no standard traverse surveys were made during the year. There are many miles of both city and rural standard traverse urgently required in all districts for the control of title surveys, but the acute shortage of survey staff in the Department has dictated a complete cessation of this work for some years. It is hoped, however, that staff can be made available in 1950 to carry out some of the most urgent surveys.

5. TOPOGRAPHIC MAPPING

Mapping operations were continued in the Rotorua-Taupo region, but progress has been disappointing as the shortage of survey staff has restricted operations to establishing preliminary control and the actual mapping of areas urgently required for current land-development operations. During the year 62 square miles of mapping was completed, 80 square miles is in hand, and mapping control has been established for a further 110 square miles.

In general, the area being mapped is covered with dense bracken fern and second growth, and progress is not as rapid as could be expected in more open country. However the Department has now received delivery of additional photogrammetrical plotting equipment and it is hoped that most of the difficult access country will be mapped in the future with the aid of these machines.

6. HYDROGRAPHIC CHARTING

In October, 1949, the survey ship, H.M.S. Lachlan, arrived in New Zealand to continue with the complete resurvey of the New Zealand coast which was suspended in 1939 at the outbreak of war.

The establishing of control points on the land is a necessary preliminary to hydrographic survey, and at the request of the Chief of Naval Staff the Department agreed to assist the Captain of the survey ship, Commander J. M. Sharpey-Schafer, R.N., by accepting the responsibility for beaconing and fixing the main shore control stations. During the year beacons were erected in the Cook Strait area and in the Foveaux Strait - Stewart Island area. Other work of assistance to the ship has been the supply of aerial photographs and maps, and the computation of the geographical co-ordinates of control stations.

The Department has also agreed to do any drawing needed for the production of charts which are required for urgent printing in New Zealand, and during the year a cartographic officer was seconded to the ship for training in hydrographic cartography.

7. AERIAL PHOTOGRAPHY

The services of New Zealand Aerial Mapping, Ltd., Hastings, have been employed during the year on the production of aerial photographs for all State Departments. This company still maintains a high standard of production, and is now engaged in photographic coverage of more difficult terrain where suitable weather conditions are limited.

During the year the company photographed an area of 6,242 square miles at a cost of £17,722. This photography was mostly on a basic scale of 4 in. to 1 mile, but some miles of coastal strip photography were carried out for hydrographic charting in areas when basic photography was not available. Since the company commenced operations in 1939, an area of 58,900 square miles has been covered with vertical aerial photographs.

8. MAP HOLDING AND DISTRIBUTION

The cataloguing and reclassification of all maps published by the Department was completed during the year and a map catalogue for general distribution published. This catalogue lists general and miscellaneous maps, cadastral maps, topographic maps, aerial photographs, and mosaics which are available for sale and should assist greatly all map users.

A start has been made in cataloguing all "record" maps held by this Department and the Services in the Central Map Library and it is anticipated that this work will be completed during 1950. The Map Library is at present located in unsuitable and insecure accommodation, but it is hoped that permanent and secure accommodation for the Library will be available before 1951.

9. AERIAL PHOTOGRAPH LIBRARY

The Central Photograph Library has now been established in more suitable accommodation for the convenience of other State Departments and the general public. Branch libraries have also been established at each of the district survey offices, but these libraries hold aerial photographs only of the land district in which they are situated. Map indexes showing the location of photographs are maintained in each library.

During the year 48,471 prints were taken into stock in the Central Library. The return from sales to State Departments and the general public was £18,874, comprising 25,333 contact prints, 201 enlargements, and 190 special mosaics.

10. MAP AND CHART PRODUCTION

During the year it has not been possible to meet in full all the demands made on the cartographic staff, it being possible to fulfil only the most urgent requirements for maps. The Cartographic Branch is now located in more suitable accommodation and this has greatly assisted map-production.

A summary of map and chart production for the year 1949-50 is as follows :—

	In Hand, 31st March, 1950.	Published	
		1949-50.	(1948-49.)
General and miscellaneous maps ..	26	31	(21)
Cadastral maps	32	51	(59)
Topographic maps	23	5	(5)
Aeronautical charts	29	97	(15)
Mosaic maps	263	89	(24)
	373	273	(124)

Cadastral Maps

The cadastral map cover of New Zealand is very nearly complete and has been for some years but many maps are long overdue for revision. It is intended that these maps will be brought up to date as soon as possible by the redrawing and revision of obsolete maps.

Topographic Maps

Both 1 : 25,000 and 1 : 63,360 (1 in. to 1 mile) mapping has progressed during the year and sixteen sheets are in the final drawing stage.

It has recently become apparent that the 1 : 63,360 maps should be extended to give complete cover of the country as soon as possible. While it will not be possible for many years to produce maps of the whole country to the same standard as existing maps, it is proposed to proceed with interim mapping. These interim maps will not in general show topographical relief but will show all roads and other cultural development and the drainage pattern. They will satisfy most of the user demands and fill a long-felt need.

Aeronautical Charts

A heavy commitment of the Department's cartographic service is the production of aeronautical charts for civil aviation. Work has progressed on the production of approach and landing charts for aerodromes and most of the main airports have been charted. Charts produced during the year are as follows :—

(1) Approach and landing charts	41
(2) Radio facility charts	22
(3) Services charts	27
(4) Plotting charts	3

93

In addition, work has progressed on the production of the new 1 : 500,000 aeronautical charts I.C.A.O. and it is hoped that these charts will be published by the end of 1950.

Mosaic Maps

In order to give map cover in areas where topographic maps are not available the production of mosaic maps was put in hand in 1948. These maps are of inestimable assistance in developmental works of all kinds and during the year eighty-nine maps were published, mostly in the Rotorua-Taupo area. The maps are being produced by New Zealand Aerial Mapping, Ltd., under contract to this Department. It is anticipated that production will increase to 120 sheets per year and that the present programme of approximately 1,160 sheets will be completed in about eight years.

11. PHOTOGRAMMETRICAL BRANCH (HEAD OFFICE)

The main work of this Branch has been the plotting and contouring of 1 : 25,000 maps. A number of special topographical mapping projects were also undertaken for other State Departments. Additional photogrammetrical plotting equipment was received during the year—namely, one Wild A.6 plotter from Switzerland and two Zeiss Multiplex machines (second-hand) from United States of America. The bringing of these machines into operation should increase output in the coming year.

Topographic Mapping

Planimetry and contours were plotted for a total area of 381 square miles during the year. A large part of the area mapped is in coalfield areas for which map cover was required for geological survey.

Special Projects

A number of special maps were made, mainly for other State Departments, for investigational and planning purposes. Work included a contour map of the George and Caswell Sounds area and contours and cross sections of the Waikato River for the State Hydro-electric Department, the preparation of timber-type maps for the State Forest Service ; and a large-scale contour map of a development area near Suva for the Fiji Government.

12. COMPUTING BRANCH (HEAD OFFICE)

This Branch has been fully employed during the year in the adjustment of triangulation and other survey control, the computation of map projections and tables, tidal analysis, and special computations for other State Departments.

Triangulation

During the year the chief event was the completion of the first order network of geodetic triangulation after many years' work. This consists of 284 stations and covers the greater part of the country, including outlying islands, but does not include Westland, south-west Nelson, and the western parts of Otago and Southland.

The adjustments consisted of eight base nets, four main figures, with 208, 169, 81, and 47 condition equations respectively, and a number of smaller figures.

The computations for latitude and azimuth from observations at all the North Island and at most of the South Island stations were completed.

The "Geodetic Datum, 1949" based on this work was established, and geographical and grid co-ordinates of all the stations were computed in terms of this datum.

A commencement has been made with the adjustment of the second order geodetic triangulation in the Southland Land District.

Tidal Analysis

An inspection of the Auckland tide-gauge was carried out by the Chief Computer, but no analyses were completed owing to staff shortage and pressure of other work.

Mapping Control

Charts for the graphical transformation of co-ordinates from meridional circuit in links to national grid in yards were constructed for a number of districts, the total area covered being approximately 34,000 square miles. Latitudes, longitudes, circuit co-ordinates of sheet corners, convergences, and magnetic declinations, required for all maps in preparation for publication, were computed.

Hydrographic Survey

The co-ordinates of some 223 trig. stations and other points were supplied to H.M.S. Lachlan for use in connection with the hydrographic survey. This work involved a number of triangulation adjustments, and conversion of circuit co-ordinates to geographical co-ordinates for nearly all points.

General

The computation of bearings and distances of the rhumb lines from each of over sixty aerodromes in the South-west Pacific area to each of the others was carried out on behalf of the Civil Aviation Branch; over two thousand lines being computed in all.

The modern tendency to use circular arcs as boundaries in town subdivisions has introduced complications into the computation of boundary lengths, offsets, and areas. A set of tables to facilitate these computations has been prepared and will be published by the Department in due course. The work consists of five angular functions tabulated for every minute of arc from 0° to 180° , together with formulæ and full explanatory notes.

Other miscellaneous work performed included the computation of latitudes and longitudes for the geophysical survey and for other Departments and organizations, and various other sets of tables.

13. NEW ZEALAND - AMERICAN FIORDLAND EXPEDITION, 1949

Under the leadership of Colonel J. K. Howard, representing the Museum of Comparative Zoology of Harvard University, a combined New Zealand - American scientific expedition spent the early months of 1949 in the George and Caswell Sound area. Attached to the expedition was a survey party from the Lands and Survey Department. This party established control for the photogrammetrical mapping of the area which was primarily a requirement of the State Hydro-electric Department for investigational purposes, though the map will also serve as the best possible reference to supplement the reports of the scientific parties.

DRAUGHTING EXAMINATIONS

There were 102 entries this year for the Public Service Draughting Examination and 26 entered for the Draughting and Computing Examination. These examinations were held in November-December, 1949, and the results were as follows:

Public Service Draughting Examination: 14 passed the full examination and 25 passed Stage I.

Draughting and Computing Examination: 3 passed First Grade Draughting; 2 passed Second Grade Draughting; 1 passed First Grade Computing; 7 passed Second Grade Computing.

STAFF TRAINING

OFFICE

Staff training proceeded on the same lines as in 1948. Thirty-three draughting cadets and 9 draughting assistants were recruited and went through the course of training. Tests during the year showed that good progress was maintained. The technical staff losses in personnel this year were particularly high among the junior staff, and it therefore becomes a difficult task to build up a well-trained staff sufficient to meet the needs of the Department.

FIELD

During the year 11 survey cadets were appointed making a total of 30 at present under training for qualification as surveyors. A further 10 cadets will be appointed during the coming year in an endeavour to increase the present depleted field survey staff.

To ensure that these cadets obtain the full range of experience necessary for them to qualify as surveyors, a system of rotation training has been in operation whereby trainees are allocated for periods of training in specialized survey work such as topographical mapping from aerial photographs, triangulation, and precise levelling, in addition to normal land title survey work. This system of training is proving most successful and will be reflected in an increased efficiency and adaptability on qualification.

NEW ZEALAND SURVEY BOARD

The Survey Board conducted two examinations for the qualification of land surveyors during the year, the results being set out below :—

	September, 1949.	March, 1950.	Totals.
Number of candidates (various stages)	103	107	210
Completed full examination	5	11	16
Obtained credits in subjects	79	70	149

The number of pupils registered during the year was :—

Lands and Survey Department	11
Private Surveyors	28
Total	39

NEW ZEALAND GEOGRAPHIC BOARD

The annual meeting of the New Zealand Geographic Board appointed under the New Zealand Geographic Board Act, 1946, was held on the 13th July, 1949.

The Board considered 145 place and feature names of which 87 were approved, 43 deferred, and 15 disallowed. Objections to 4 names approved at the previous meeting were dealt with. Of these 2 were upheld and 2 disallowed.

The list of names dealt with by the Board was advertised in the *New Zealand Gazette* No. 51, of 1st September, 1949.

GENERAL

In conclusion I have to report that every endeavour has been made to supply the necessary technical survey and draughting services required by many agencies. The Department is short of staff, particularly field survey staff. There has been a steady loss of young qualified surveyors who have found conditions outside the service more attractive.

Technical services are essential in the initial stages of development either as field surveys or as plans and maps illustrating essential factors for subsequent patterning of development projects. No effort will be spared to organize our staff to supply these essential services.

THANKS

I wish to express my thanks to my staff who one and all have loyally and efficiently carried out their duties during the past year.

R. G. DICK, Surveyor-General

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