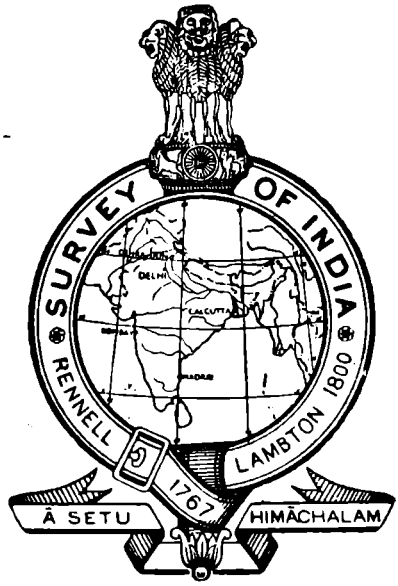
SURVEY OF INDIA

GENERAL REPORT

1962



From 1st April 1961

To 31st March 1962

PUBLISHED BY ORDER OF
BRIGADIER J. S. PAINTAL, M.I.S., M.I.E.
SURVEYOR GENERAL OF INDIA

PRINTED AT THE SURVEY OF INDIA OFFICES 103 (P.Z.O.) PRINTING GROUP,
DEHRA DŪN, 1967.

Price Rupees Sixtynine and Eightyfive paise.

HOW TO OBTAIN ASSISTANCE FROM THE SURVEY OF INDIA

1. Applications for surveys of any kind or aerial photography whether for private or government purposes should be made to one of the following officers :—

(*a*) The Surveyor General of India, Dehra Dūn. (*Telegrams "SURVEYS"*).

(*b*) The Director, Northern Directorate, Survey of India, Dehra Dūn. (*Telegrams "SURNORTH"*).

(*c*) The Director, Eastern Circle, Survey of India, Calcutta. (*Telegrams "SUREAST"*).

(*d*) The Director, Southern Circle, Survey of India Bangalore. (*Telegrams "SURSOUTH"*).

(*e*) The Director, Western Circle, Survey of India, Abu. (*Telegrams "SURWEST"*).

*States/Union Territories contained in each Survey Circle/ Directorate are as below :—

1. ***Northern Directorate***

Delhi
Himāchal Pradesh
Jammu & Kashmīr
Punjab
Uttar Pradesh
Part of Assam, Bihār, Madhya Pradesh and West Bengal.

2. ***Eastern Circle***

Andaman & Nicobar Islands
Assam
Bihār
Manipur
Orissa
Tripura
West Bengal.

3. ***Southern Circle***

Andhra Pradesh
Goa (of Goa, Damān and Diu)
Kerala
Laccadive, Minicoy & Amindīvi Islands
Madhya Pradesh (excluding erstwhile Madhya Bhārat and Vindhya Pradesh)
Madras
Mysore.

4. ***Western Circle***

Dādra and Nagar Haveli
Damān and Diu (of Goa, Damān and Diu)
Gujarāt
Mahārāshtra
Rājasthān.

In general, enquiries should be made to the Director in whose Circle/Directorate the area to be surveyed or photographed falls.

2. Applications for maps may be made to the Director, Map Publication, Survey of India, Hāthībarkala, Dehra Dūn (*Telegrams "SURPUB"*) or to either of the officers mentioned at (*c*) and (*d*) above, or to recognized map sales agents, a list of whom is given in

* Names of the States mentioned are according to the new political set up as on the 31st March, 1962.

the Survey of India Map Catalogue. There is also a departmental Map Sales Section at Janpath Barracks 'A' (near Cottage Industries Emporium), First Floor, New Delhi–1.

3. Applications for tide tables, survey data pamphlets or other departmental publications and enquiries on geodetic and geophysical subject are to be addressed to the Director, Geodetic and Research Branch, Survey of India, Dehra Dūn (*Telegrams* "*SURSEARCH*").

4. Applications for any kind of lithographic printing should be made to the following officers, as convenient :—

(*i*) The Director, Map Publication, Hāthībarkala, Dehra Dūn.

(*ii*) The Director, Eastern Circle, Calcutta.

Letterpress printing and block making and engraving work are also undertaken by the Officers mentioned at (*i*) and (*ii*) above, respectively.

Printing demands from Central Government agencies should be routed through the Chief Controller of Printing and Stationery, New Delhi.

5. Checking and correction of the external boundaries on maps of India produced by other government departments or by private firms is also done by the Director, Map Publication.

6. Correct names and spellings (in Roman or Devanāgri script) of villages, towns, etc., in India can be ascertained from the regional Directors mentioned in para 1 above or from the Director, Map Publication.

7. All enquiries regarding photogrammetry and training of government officers in survey methods should, in the first instance, be addressed to the Director, Northern Directorate (previously Director, Northern Circle), Survey of India, Dehra Dūn and the Senior Director, Pilot Production and Training Centre (*Telegrams* "*SURPROTRAIN*" (previously Air Survey and Training Directorate), Survey of India, Hyderābād, respectively.

SURVEY OF INDIA

GENERAL REPORT

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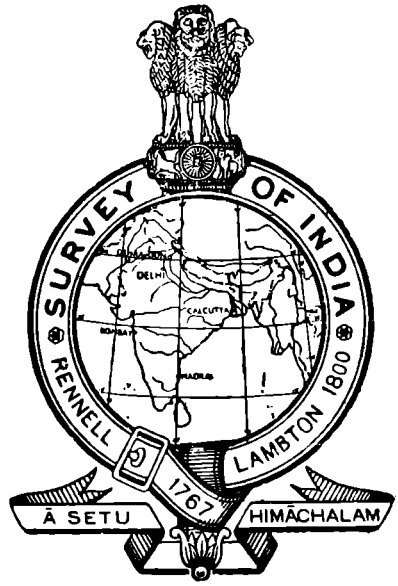

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Scales are referred to as follows :—

(*i*) *for scales which are multiples of 1 : 1,000,000*—"1 : M scale", "1 : 6 M scale", &c., which mean "1 : 1,000,000 scale", "1 : 6,000,000 scale", &c.,

(*ii*) *for scales smaller than 4 miles to one inch*—"50-mile scale", "8-mile scale" &c., which mean "scale of 50 miles to one inch", "scale of 8 miles to one inch", &c.,

(*iii*) *for scale of and larger than 4 miles to one inch*—"¼-inch scale", "½-inch scale", "4-inch scale", "16-inch scale", &c., which mean "scale of ¼-inch to one mile", &c.,

(*iv*) other metric scales, by their representative fraction, *e.g.*, "1 : 25,000", "1 : 50,000" and "1 : 250,000," &c.,

Serial Numbering of Survey of India maps—

Sheets NE-43, NF-44, &c., are sheets on 1 : M scale (International Numbering).
Sheets 65, 78, &c., are sheets on the 1 : M scale (on India and Adjacent Countries Series—now superseded by above).
Sheets 65 K, 78 F, &c., are ¼-inch sheets or sheets on the corresponding metric scale of 1 : 250,000.
Sheets 65 K/N.W., 78 F/S.E., &c., are ½-inch sheets.
Sheets 65 K/1, 78 F/16, &c., are 1-inch sheets or sheets on the corresponding metric scale of 1 : 50,000.
*Sheets 65 K/1/1, 78 F/16/2, &c., are 1 : 25,000 sheets.

The system of numbering is fully explained in the indexes at the end of this report.

Explanation of Abbreviations—

G.C.S.	.. General Central Service.
H.L.O.	.. Hāthībarkala Litho Office (Dehra Dūn).
P.L.O.	.. Photo-Litho Office (Calcutta).
P.Z.O.	.. Photo-Zinco Office (Dehra Dūn).
D.O.	.. Drawing Office.
M.R.I.O.	.. Map Record and Issue Office.
I.C.A.O.	.. International Civil Aviation Organization.
G.T.	.. Great Trigonometrical.
C.W. & P.C.	Central Water and Power Commission.
G.S.G.S.	.. Geographical Section, General Staff.
C.I.M.	.. Carte Internationale du Monde.
V.I.	.. Vertical Interval.
C.P.W.D.	.. Central Public Works Department.
D.G.S. & D.	Director General of Supplies & Disposals.

Definitions of Surveys—

Old Surveys are those carried out prior to 1905.
Modern Surveys are those carried out since 1905.
Original Surveys are Modern Surveys carried out for the first time on a specified scale.
Revision Surveys are those carried out in areas where the existing Original Survey is on the same or larger scale.
Verification Surveys are Revision Surveys directed towards the checking of specified items of detail reported to have undergone changes.
Blue-print Survey is one carried out on light blue-prints of the existing survey, old or modern.
Colour-print Survey is one carried out on coloured prints (usually dark grey outline and brown contours) of an area covered by Modern Survey.

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*1 : 25,000 SHEETS :—Each one-inch sheet is divided into six 1 : 25,000 sheets, numbered from 1 to 6 as shown in the diagram alongside. The number of a 1 : 25,000 sheet thus takes the form 65 K/1/1.

65 K/1

1	4
2	5
3	6

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VI. SURVEY REPORTS, WESTERN CIRCLE

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VIII. SURVEY REPORTS, GEODETIC AND RESEARCH BRANCH

PART II. MAP PUBLICATION AND OFFICE WORK

PART III. GEODETIC WORK

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PREFACE

The history and work of the Survey of India Department have been fully described in the *Prefaces* to the General Reports up to and for the year 1953 and are not, therefore, repeated here.

The current report has been arranged in almost the same sequence as in the General Report for the preceding year (1961), *viz.*, reports of the Topographical Circles/Directorates and Geodetic and Research Branch, together with Tables A, B and C in *Part I*; Map Publication and Office Work in *Part II*; Geodetic work together with Table C in *Part III*; and Index Maps at the end.

Sections I and *II* of the report are compiled in the Office of the Surveyor General of India, with the help of the data received from various Circles/Directorates whereas *Sections III* to *VII* are compiled by the regional Directors concerned and *Section VIII* by the Deputy Director, Geodetic and Research Branch. *Part II* is compiled by the Director, Map Publication and *Part III* by the Deputy Director, Geodetic and Research Branch. The report as a whole is edited in the Surveyor General's Office. If any further information, clarification and amplification regarding the work described in the various sections of this report is required by the readers, it will save time if they make a direct reference to the Director responsible for compiling the particular section.

The field survey work carried out during the year under report was in accordance with the programme assigned to the Department for the Third Five-Year Plan period by the Survey Priorities Committee. (See Appendix B at end of this report).

SURVEY OF INDIA

GENERAL REPORT
1962

From 1st April 1961

To 31st March 1962

I. INTRODUCTION AND SUMMARY

1. **Annual Report.**—The annual General Report of the Survey of India covers the period of the financial year, viz. from 1st April to 31st March.

The General Report includes an abstract as well as details of topographical and other surveys together with their areas, out-turns and cost-rates (in *Part I*) ; of fair drawing, printing, publications and map issues, both departmental and extra-departmental (in *Part II*) ; and a brief narrative of geodetic work together with their areas, out-turns and cost-rates (in *Part III*). The purpose of this report is to acquaint the various departments of the Central and State Governments of India, and others interested, with the activities of the Survey of India.

There is also a "Technical Supplement to the General Report" for departmental use. It contains a record of the out-turns, etc. of individual workers which is of little general interest outside the department. It is not, therefore, issued in printed form.

The progress of modern (i.e. post-1905) topographical surveys and compilation carried out by the department is illustrated in *Index A* at the end of this report while *Index B* indicates the relative modernity of modern surveys on 1-inch or 1 : 50,000 and ½-inch scales. *Index C* shows project surveys in hand and the remaining *Indexes D, E, F* and *G* show all the standard maps which have been published up to date on various scales. It will be seen from *Index D* that the areas within India which are blank on *Index A* are actually almost entirely covered by topographical maps. These maps are mostly uncontoured, drawn in the old style and many years out of date. They have hence been excluded from *Index A*.

It may be mentioned here that besides the standard maps shown in *Indexes D, E, F* and *G* this department also publishes Aeronautical Charts on the 1 : M scale, Landing and Approach Charts on scales of 1 : 30,000/1 : 50,000 and 1 : 250,000, respectively for all civil aerodromes in India, State maps on the 1 : M scale,

Town Guide maps on scales varying from 3 inches to 16 inches to one mile (scales in metric system being 1 : 20,000 in plains and 1 : 10,000 in hills), general maps of India on scales of 40, 70, 128, 192 and 250 miles to an inch (scales in metric system being 1 : 2,500,000; 1 : 4,000,000 (or 1 : 4,500,000); 1 : 8,000,000; 1 : 12,000,000 and 1 : 16,000,000), and other special maps such as the Railway Map of India and the Road Map of India.

2. **Surveyor General's Office.**—The post of the Surveyor General of India was held by the officers as shown below :—

Surveyor General of India	Brigadier Gambhir Singh, M.I.S., up to 30-4-61.
	Colonel R. S. Kalha, M.I.S., from 1-5-61 to 10-12-61.
	Shri E. R. Wilson, B.A., M.I.S., from 11-12-61.

The posts of the Deputy Surveyor General and Assistant Surveyor General were held by the officers as shown below :—

Deputy Surveyor General	Shri K. C. Gosain, B.A., M.I.S., up to 11-6-61.
	Shri L. J. Bagnall, B.Sc., from 12-6-61 to 23-7-61.
	Colonel J. N. Sinha, M.Sc., B.Sc. (Hons.), M.I.E., M.I.S., from 24-7-61.
Assistant Surveyor General	Shri G. C. Aggarwala, B.A., M.I.S., up to 30-11-61.
	Colonel J. N. Sinha, M.Sc., B.Sc. (Hons.), M.I.E., M.I.S., from 1-12-61 to 25-12-61.
	Major Y. Ramachandran, B.Sc. (Mining), Engineers, from 26-12-61.

3. **Cost of the Department.**—The total cost of the department for the year ending 31st March 1962, as compared with those for the previous two years, was as follows :—

	1959-60	1960-61	1961-62	Remarks
	Rs.	*Rs.*	*Rs.*	
Gross actual cost ..	1,98,78,993	1,80,42,345	**1,97,02,340**	
Deduct recoveries ..	47,59,585	55,65,004	**43,17,638**	
Nett actual charges ..	1,51,19,408	1,24,77,341	**1,53,84,702**	

4. Sanctioned strength of the Department.—A statement showing the total number of sanctioned posts in the Survey of India as on 31st March 1962 is given below :—

Designation of posts	Number	
	Permanent	Temporary
I. FIXED ESTABLISHMENT :		
(*a*) *Class I Service.*—		
Surveyor General	1	..
Directors	8*	..
Deputy Directors	6	1
Superintending Surveyors	34	9
Deputy Superintending Surveyors	22	9
Officer-in-Charge, Map Record and Issue Office	1	..
(*b*) *General Central Service Class I.*—		
President, Geodetic and Research Branch	1†	..
Superintendent, Instrument Repair Shop	1†	..
Managers, Reproduction Offices	4‡	..
Mathematical Adviser	1	..
Deputy Stores Officer	1	..
Senior Scientific Officer	1§	..
(*c*) *Class II Service.*—		
Officer Surveyors	105	4
(*d*) *General Central Service Class II.*—		
Head Engraver	1§	..
Registrars	2	..
Assistant Managers, Reproduction Offices	8‖	..
Electrical Engineer	1	..
Map Curator	1	..
Assistant Stores Officers	2	..
Medical Officers	3	..
Assistant Head Engraver	1¶	..
Labour Welfare Officer	1	..
(*e*) *Class III Service.*—		
(*i*) *Technical.*—		
Surveyors	85	..
Survey Assistants	43	14
Draftsmen	26	11
Engravers	7	..
Assistant Supervisor, Printing Office	1§	..
Technical Assistants	41**	..
Stores Assistants	8	1
Geodetic Computers	11	2
Security Supervisor	1	..
Scientific Assistants	7	1
(*ii*) *Ministerial.*—		
Superintendents	1	2
Assistants	6	7
Stenographers	1	1
Clerks, Upper Division	14	5
Clerks, Lower Division	7	15
Recordkeepers	1	1

* 1 post in abeyance.
† In abeyance.
‡ 1 Junior.
§ Post vacant.
‖ 2 posts in abeyance.
¶ Non-gazetted.
** 6 posts in abeyance.

Designation of posts	Number	
	Permanent	Temporary
(*f*) *Class IV Service.*—		
Class IV personnel	25	7
II. UNFIXED ESTABLISHMENT :		
Class III Service.—		
(*i*) *Technical.*—		
Surveyors, Grade II		55
Topo Trainees, Type 'A'		35
Plane-tablers	205	66
Air Survey Draftsmen ..	72	21
Draftsmen	298	147
Computers	41	85
Traversers	2	1
Levellers	1	1
Recordkeepers	48	15
Reproduction personnel ..	321	38
Engravers	13	..
Topo Trainees Type 'B' ..	..	394
Topo Auxiliaries	23	37
Storekeepers (Topo) ..	26	13
Motor Mechanics ..	11	6
Motor Drivers	16	51
Compounders	3	2
Telephone Operators ..	2	2
Electricians	2	..
Fitter Mechanic	1	..
Librarian	1	..
Head Artificer	1	..
Other Artificers	24	10
Head Packer	1	..
Instrument Mechanics ..	4	2
(*ii*) *Ministerial.*—		
Office Superintendents ..	9	..
Head Clerks and Head Accountants	9	1
Stenographers	2	2
Clerks, Upper Division ..	121	15
Clerks, Lower Division ..	96	219
(*iii*) *Class IV Service.*—		
Regular Establishment		2155
Contingent		2968

5. Raising, Transfer and Disbandment of Units.—

(*i*) No. 3 Party was transferred from the administrative control of the Director, Western Circle to that of the Director, Northern Directorate with effect from 15th March 1962.

(*ii*) No. 13 Party was transferred from the administrative control of the Director, Northern Circle to that of the Director, Western Circle with effect from 1st October 1961 and was again transferred from there to that of the Director, Training Directorate with effect from 1st March 1962.

(*iii*) Nos. 20 and 22 (Photogrammetric) Parties were transferred from the administrative control of the Director, Air Survey & Training Directorate to that of the Director, Northern Directorate with effect from 1st March 1962.

(*iv*) No. 23 Party was transferred from the administrative control of the Director, Northern Circle to that of the Director, Air Survey & Training Directorate with effect from 1st October 1961 and was again transferred from there to that of the Director, Northern Directorate with effect from 1st March 1962.

(*v*) No. 26 (Photogrammetric) Party was transferred from the administrative control of the Director, Air Survey & Training Directorate to that of the Director, Northern Circle with effect from 1st September 1961.

(*vi*) No. 29 Party was transferred from the administrative control of the Director, Southern Circle to that of the Director, Eastern Circle with effect from 1st October 1961.

(*vii*) *Northern Directorate.*—The Northern Circle was redesignated as Northern Directorate with effect from 1st March, 1962. For details, please see para 31.

Training Directorate.—The Air Survey & Training Directorate was redesignated as Training Directorate with effect from 1st March, 1962. For details, please see para 164.

6. Deputations.—Colonel R. S. KALHA, Surveyor General of India attended the First General Assembly of the International Cartographic Association at Paris between the 29th May to 4th June 1961.

MAJOR G. C. AGGARWAL, Superintending Surveyor proceeded for advanced training in Photogrammetry at the International Training Centre for Aerial Surveys, Delft (The Netherlands) on 4th September 1961.

COLONEL J. N. SINHA, Deputy Surveyor General attended the Third United Nations Regional Cartographic Conference for Asia and Far East at Bangkok (Thailand) from the 27th October to 10th November 1961.

MAJOR B. SARIN, Superintending Surveyor proceeded for advanced training in Photogrammetry at the International Training Centre for Aerial Surveys, Delft (The Netherlands) on 10th January 1962.

7. Distinguished Visitors.—DR. MONO MOHON DAS, Deputy Minister for Scientific Research and Cultural Affairs addressed a Conference of Survey Officers at Dehra Dūn on the 15th April 1961 in which, besides the Surveyor General, all the Directors and

Deputy Directors (except one) were present. The Ministry of Scientific Research and Cultural Affairs was represented by the following officers :—

(*i*) Shri M. G. RAJA RAM, I.A.S., Joint Secretary
(*ii*) ,, N. K. SREENIVASAN, Under Secretary
(*iii*) ,, B. N. CHADHA, Assistant Financial Adviser.

SHRI G. BHASKARAN NAIR, Deputy Secretary, Ministry of Finance, accompanied by SHRI P. SOMASEKHARAN, Under Secretary, Ministry of Scientific Research and Cultural Affairs visited the Surveyor General's Office between 11th to 13th April 1961 to assess the staff requirements of the Surveyor General's Office.

DR. MONO MOHON DAS, Deputy Minister visited the Eastern Circle Units at Shillong on the 18th May 1961.

Seven members of Parliament visited the Survey of India Offices at Dehra Dūn on the 13th May 1961.

DR. ING. A. M. GIORDANA, Delegate of Finmeccanica, Rome (Italy) and DR. T. A. ROOK, Commercial Manager, Officine Galileo, Florance (Italy) called on the Surveyor General of India on the 2nd May 1961 to explore the possibility of producing survey instruments locally.

DR. M. S. RANDHAWA, I.C.S., Adviser (Resources) and DR. K. P. BASU, O.S.D. (Scientific Research) of the Planning Commission visited Surveyor General's Office on the 29th June 1961 for on-the-spot study of the Survey of India Department and its activities.

SHRI M. G. RAJA RAM, Joint Secretary visited the Southern Circle and Units at Bangalore between the 27th 29th June 1961 and held discussions with the Director, Southern Circle, Survey of India and officials of the State Government regarding construction of Survey of India Offices in Bangalore.

SHRI M. M. KUSARI, Deputy Secretary and SHRI M. M. JAIN, Under Secretary, Ministry of Scientific Research and Cultural Affairs visited Surveyor General's Office on 23rd June 1961 for discussions.

MR. F. ACKERMANN, Scientific Member of the International Training Centre of Aerial Survey, Delft (The Netherlands) called on the Surveyor General of India on the 27th June 1961 and visited the Air Survey and Training Directorate.

MAJOR-GENERAL K. N. DUBEY, Director-General, Border Roads visited the Surveyor General's Office on the 21st July 1961 to discuss survey problems.

LT.-GENERAL SIR H. WILLIAMS, Director, Building Research Institute, Roorkee visited the Surveyor General's Office on the 10th August 1961 for discussions with the Surveyor General of India.

DR. A. N. KHOSLA, B.A., I.S.E., M.I.E., M. Am. Soc., C.E., Member, Planning Commission visited the Survey of India offices at Dehra Dūn on the 18th Spetember 1961.

LT.-COMMANDER V. RAMAN, I.N. visited the Western Circle Offices at Abu, on the 25th and 26th September 1961 and held discussions with the Director, Western Circle regarding the supply of topographical data and other matters of common interest.

SHRI M. M. KUSARI, Deputy Secretary visited the Survey of India Offices at Calcutta on the 11th October 1961.

SHRI N. K. SREENIVASAN, Under Secretary visited the Western Circle Office at Abu on the 24th and 25th October 1961 in connection with the Circle Departmental Promotion Committee. He also visited No. 3 Drawing Office (Western Circle) at Abu on the 25th.

MAJOR-GENERAL G. CHEETHAM, C.B., D.S.O., M.C., Chairman and SHRI DILDAR HUSSAIN, Member, Reviewing Committee for the Survey of India and the National Atlas Organisation visited the Survey of India Offices at Dehra Dūn between the 14th-17th November 1961.

LT.-GENERAL SIR H. WILLIAMS, Member of the Reviewing Committee visited the Eastern Circle Offices at Calcutta on the 27th November 1961.

SHRI M. M. KUSARI, Deputy Secretary accompanied by SHRI M. M. JAIN, Under Secretary visited Dehra Dūn on the 28th November 1961 in connection with the Departmental Promotion Committee meetings for the Offices of the Surveyor General of India and the Director, Map Publication.

SPMNT GENERAL NIR SHAMSHER JANG BAHADUR RANA, G.C.V.O., Commander-in-Chief of Nepāl Army, and a party of six officers visited the Survey of India Offices at Dehra Dūn on the 13th December 1961.

MR. RICHARD A. NEWSHAM, Acting Geographic Attache U.S. Embassy visited the Survey of India Offices at Dehra Dūn on the 15th December 1961.

LT.-GENERAL SIR H. WILLIAMS, C.B., C.B.E., and SHRI DILDAR HUSSAIN, B.E., M.I.E., M.I.A.H.R., Members of the Reviewing Committee visited Southern Circle Offices and Units at Bangalore between the 13th-15th. SARVA SHRI B. G. RAO, I.C.S. (Retired), Member and M. M. MALHOTRA, Member Secretary, Reviewing Committee visited the Eastern Circle Offices at Calcutta on the 19th December 1961.

SHRI M. M. KUSARI, Deputy Secretary visited the Eastern Circle Offices at Calcutta on the 20th December 1961 in connection with a meeting of the Departmental Promotion Committee.

A Burmese Military Goodwill Mission headed by Commodore THRAY SITHU THAN PE, Vice Chief of Staff (Navy) and consisting of seventeen officers visited the Survey of India Offices at Dehra Dūn on the 30th January 1962.

DR. TUZO WILSON, Director, Institute of Earth Sciences, University of Toronto (Canada) visited the Survey of India Offices at Dehra Dūn on the 12th January 1962.

LT.-GENERAL SIR H. WILLIAMS, Member, Reviewing Committee visited the Eastern Circle Offices on the 23rd January 1962.

MAJOR-GENERAL G. CHEETHAM, C.B., D.S.O., M.C., Chairman, Reviewing Committee visited the Eastern Circle Offices at Calcutta on the 7th, 8th and 9th February 1962. The Chairman accompanied by SHRI M. M. MALHOTRA, Member Secretary visited the Southern Circle Office and its Units at Bangalore between the 16th and 18th February 1962.

SHRI DILDAR HUSSAIN, Member, Reviewing Committee visited the Eastern Circle Offices at Calcutta on the 2nd, 3rd and 5th February 1962.

MR. R. O. THOMAS, Staff Engineer, U.S. Air Mission visited Nos. 20 and 22 (Photogrammetric) Parties of the Northern Directorate on the 20th March 1962.

BRIGADIER K. O. LAW, Director, Defence Security Corps, Army Headquarters visited the Survey of India Offices at Dehra Dūn and Mussoorie on the 6th and 7th and those at Calcutta on the 27th March 1962.

DR. S. V. GOVINDARAJAN, Soil Correlator, Indian Agricultural Research Institute accompanied by two officers visited the Surveyor General's Office on the 23rd and 24th March 1962.

SHRI M. M. KUSARI, Deputy Secretary visited the Surveyor General's Office on the 24th March 1962.

8. Conferences and meetings.—*Departmental Promotion Committee.*—A meeting of the Departmental Promotion Committee was held in the Surveyor General's Office on the 17th to 21st April 1961 under the Chairmanship of BRIGADIER GAMBHIR SINGH, Surveyor General of India to consider the selection of personnel for filling the vacancies in different trades in Class III Div. I and Div. II and Ministerial Establishments. The following officers attended :—

1. COLONEL R. S. KALHA, Director, Map Publication.
2. SHRI E. R. WILSON, Director, Southern Circle.
3. SHRI J. C. ROSS, Director, Western Circle.
4. SHRI K. C. GOSAIN, Deputy Surveyor General.
5. COLONEL J. S. PAINTAL, Director, Eastern Circle.
6. COLONEL S. K. S. MUDALIAR, Director, Air Survey & Training Directorate/Deputy Director, Geodetic and Research Branch.
7. COLONEL J. N. SINHA, Director, Northern Circle.

SHRI G. C. AGGARWALA, Assistant Surveyor General acted as Secretary.

Another meeting of the Departmental Promotion Committee was held in the Surveyor General's Office from 10th to 12th July 1961 under the Chairmanship of COLONEL R. S. KALHA, Surveyor

General of India to consider the selection of personnel for promotion to the next higher grades and confirmation of those officiating in Class III Div. I and Div. II and Ministerial Establishments. The following officers attended :—

1. SHRI M. M. KUSARI, Deputy Secretary (S.R.), Ministry of Scientific Research and Cultural Affairs.
2. LT.-COLONEL J. A. F. DALAL, Director, Air Survey & Training Directorate.
3. LT.-COLONEL C. M. SAHNI, Director, Northern Circle.
4. MAJOR K. L. KHOSLA, Deputy Director, Geodetic & Research Branch.
5. MAJOR N. K. SEN, Deputy Director, Map Publication (Representing Director, Map Publication).

SHRI G. C. AGGARWALA, Assistant Surveyor General acted as Secretary.

Reviewing Committee.—The Govt. of India appointed a Reviewing Committee to assess the work done in the Survey of India and the National Atlas Organisation and to recommend measures for their improvement. The Committee consisted of the following :—

1. MAJOR-GENERAL G. CHEETHAM, C.B., D.S.O., M.C., formerly Director General of Ordnance Survey in the United Kingdom .. *Chairman*
2. LT.-GENERAL H. WILLIAMS, C.B., C.B.E., Director, Central Building & Research Institute, Roorkee .. .. .. *Member*
3. SHRI B. G. RAO, I.C.S. (Retired) .. .. *Member*
4. SHRI DILDAR HUSSAIN, Consultant, Central Water & Power Commission .. .. *Member*
5. SHRI M. M. MALHOTRA, Deputy Secretary, Ministry of Scientific Research and Cultural Affairs } *Member-Secretary*

The Committee visited the Survey of India and other different Govt. offices at Dehra Dūn between the 15th–18th October 1961 for deliberations.

COLONEL R. S. KALHA, Surveyor General of India visited Bombay on the 3rd and 4th October 1961 to receive the Chairman of the Reviewing Committee. He visited Delhi between the 18th–25th November 1961 for discussions with the above Committee.

SHRI E. R. WILSON, Surveyor General of India visited Delhi on the 20th December 1961 for discussions with the Reviewing Committee. He visited Delhi again during January 1962 for similar discussions.

COLONELS S. K. S. MUDALIAR, Director, Northern Circle and J. N. SINHA, Deputy Surveyor General visited Hyderābād between the 5th–9th January 1962 for discussions with SHRI DILDAR

HUSSAIN, Member, Reviewing Committee regarding the setting up of a Central Training Institute for Survey Officers in India.

COLONEL J. N. SINHA visited Delhi from the 19th to 22nd February 1962 for discussions with the Reviewing Committee. He again visited Delhi during March 1962 for similar discussions.

SHRI J. C. ROSS, Director, Map Publication visited New Delhi on the 30th March 1962 for discussions with the Chairman, Reviewing Committee.

LT.-COLONEL K. L. KHOSLA, Deputy Director, Geodetic and Research Branch visited Delhi from 28th to 31st March 1962 for discussions with the Reviewing Committee.

Survey Priority Conference.—A meeting of the Survey Priorities Conference convened by the Government of India, Ministry of Scientific Research and Cultural Affairs was held at New Delhi on the 28th & 29th September 1961 under the Chairmanship of SHRI M. G. RAJARAM, Joint Secretary to decide the programme and priorities of work which the Survey of India would be required to carry out during the Third Five-Year Plan period, i.e., 1961–62 to 1965–66. The total load of survey required during Third Plan period was found to be equivalent to 591 Party-years of work. The available potential of the department, viz. 135 party-years, was allotted different survey tasks/indentors according to priorities. As the departmental work of the Survey of India had fallen into arrears, 107 Party-years were allotted for its normal and legitimate departmental work and the remaining 28 Party-years for extra departmental work.

The agenda for the Conference together with the minutes and its decisions is given in the Appendix B at the end.

Note.—A party-year represents the amount of survey and mapping which a normal-sized Survey Party can carry out in a year.

Indo-Pākistān Boundary Demarcation.—MAJOR K. L. KHOSLA, Deputy Director, Geodetic and Research Branch visited Delhi from the 22nd to 24th August 1961 for attending the Indo-Pākistān Conference in connection with the Punjab-West Pākistān Border Ground Rules. Accompanied by MAJOR T. S. BEDI, Officer-in-Charge, No. 27 Party, he attended a conference on 31st August 1961 at Jaipur in connection with Rājasthān-West Pākistān Boundary Demarcation work.

LT.-COLONEL KHOSLA visited Lahore (Pākistān) from the 15th to 17th March 1962 for attending a meeting with the Survey Officers of Pākistān.

Institution of Surveyors.—The Annual General Meeting of the Institution of Surveyors was held at New Delhi on the 29th April 1961. COLONELS R. S. KALHA, S. K. S. MUDALIAR, and J. N. SINHA and SHRI K. C. GOSAIN from the Survey of India attended the above meeting.

A council meeting of the Institution was held in the Surveyor General's Office on the 22nd July 1961. BRIGADIER GAMBHIR SINGH, COLONELS R. S. KALHA and O. P. ANAND and LT.-COLONEL J. A. F. DALAL from the Survey of India attended the meeting.

Indian Standards Institution.—MAJOR N. K. SEN, Deputy Director, Map Publication visited Delhi on the 27th and 28th July 1961 to attend a meeting of the Indian Standards Institution.

COLONEL R. S. KALHA, Surveyor General of India visited Delhi from 18th to 25th November 1961 to attend a meeting of the Indian Standards Institution.

LT.-COLONEL K. L. KHOSLA, Deputy Director, Geodetic and Research Branch visited Delhi on the 19th and 20th February 1962 to attend meetings of the Indian Standards Institution.

Planning Commission.—SHRI E. R. WILSON, Surveyor General of India visited Delhi on the 26th December 1961 for discussions with the Planning Commission. He visited Delhi again on 8th February 1962 for similar discussions.

COLONEL J. N. SINHA, Deputy Surveyor General attended a meeting of Land Use Committee of Natural Resources Council, Planning Commission, New Delhi on the 3rd January 1962.

Miscellaneous.—COLONEL R. S. KALHA, Director, Map Publication visited Delhi on the 6th April 1961 to attend a meeting on National Atlas.

LT.-COLONEL J. A. F. DALAL, Deputy Director, Geodetic and Research Branch visited Delhi between 23rd and 25th May 1961 to attend Working Group Meeting of the National Committee for Oceanic Research.

COLONEL J. S. PAINTAL, Director, Eastern Circle attended the 31st Annual Research Session of the Central Board of Irrigation and Power in Calcutta between the 4th-7th June 1961.

COLONEL S. K. S. MUDALIAR, Director, Northern Circle accompanied by MAJOR S. CHOUDHURI, Officer-in-Charge, No. 25 Party visited Kātmāndu (Nepāl) between the 14th and 22nd August 1961 for discussions with H.M. Government of Nepāl and the officials of the Indian Aid Mission and Indian Embassy.

LT.-COLONEL C. M. SAHNI, Deputy Director, Northern Circle accompanied by SHRI A. K. SANYAL, Officer-in-Charge, No. 13 Party visited Chandigarh on the 4th August 1961 for discussions with the Chief Engineer, Irrigation Works (Central), Punjab in connection with Bhākra Dam Project Survey.

A meeting of the Representatives of the Survey of India, Ministry of Food and Agriculture and Central Water and Power Commission was held in the Surveyor General's Office on the 3rd November 1961 to discuss regarding scale of aerial photographs suited for Soil Survey work; availability and supply of aerial photographs of the Catchment areas of River Valley Projects and other Priority areas; training of Soil Survey personnel in aerial photo interpretation and equipment required for aerial photo interpreta-

tion ; COLONEL R. S. KALHA, Surveyor General of India ; SHRI G. C. AGGARWALA, Assistant Surveyor General ; and MAJOR M. M. DATTA, Officer-in-Charge, No. 22 (Photogrammetric) Party from the Survey of India attended the meeting.

COLONEL J. A. F. DALAL, Director, Air Survey and Training Directorate visited Delhi on the 10th and 11th November 1961 to attend the meeting of the Central Flood Control Board.

COLONEL DALAL visited Howrah for discussions with the Chief Engineer, Floods and Flood Control, and the Superintending Engineer, Flood Control Circle, West Bengal on the 3rd and 10th February 1962.

SHRI E. R. WILSON, Surveyor General of India visited Delhi on the 20th March 1962 for attending a meeting in the Ministry of Irrigation and Power.

COLONEL J. N. SINHA, Deputy Surveyor General visited Delhi in March 1962 for attending a meeting of the Atomic Energy Commission.

COLONEL J. S. PAINTAL, Director, Eastern Circle attended a meeting of the Calcutta Metropolitan Planning Organisation on the 22nd December 1961 and 11th January 1962.

9. **New Maps published.**—The following new geographical and special maps of India were published during the period under report :—

Road Map of India (1st Edition), Outline Map of India and Adjacent Countries (2nd Edition, 1961), Railway Map of India (English Edition), Railway Map of India (Hindi Edition), Political Map of India (5th and 6th English Editions), School Atlas (Deluxe Edition) and School Atlas (Popular Edition).

10. **Appointments in the Committee on Natural Resources.**—

The Surveyor General of India (SHRI E. R. WILSON) has been appointed as a member of the Committee on Natural Resources of the Planning Commission as also a member of the Technical Committee on Land under that Committee.

The Deputy Surveyor General (COLONEL J. N. SINHA) has been appointed as a member of the Working Group of the Technical Committee and representative of the Ministry of Scientific Research and Cultural Affairs on Land under the Committee on Natural Resources of the Planning Commission.

11. **Personnel.**—Retirements, casualties, promotions, appointments, etc.

Class I Service.—SHRI K. C. GOSAIN, Director—retired.

LT.-COLONELS J. A. F. DALAL and C. M. SAHNI, Deputy Directors—promoted to officiate as Directors and granted the local rank of Colonel.

MAJORS D. N. SHARMA ATRI HARNAL, N. K. SEN, K. L. KHOSLA and M. M. DATTA, Superintending Surveyors—promoted to officiate as Deputy Directors and granted the local rank of Lt.-Colonel.

SHRI M. W. KALAPPA, Superintending Surveyor—retired.

CAPTAINS P. MISRA, P. M. LAKSHMAN, P. M. MANI and R. K. AGGARWALA, Deputy Superintending Surveyors—promoted to officiate as Superintending Surveyors and granted the local rank of Major.

SARVA SHRI N. GOPALAN, A. K. SANYAL, M. R. RAO, MUNEENDRA KUMAR, J. I. NARASIMHAN and R. M. GUPTA, Deputy Superintending Surveyors—promoted to officiate as Superintending Surveyors.

SARVA SHRI M. C. GOGIA and A. K. BHATIA, Officer Surveyors—appointed as Deputy Superintending Surveyors.

SHRI MANGROO RAM—appointed as Deputy Superintending Surveyor.

Class II Service.—SARVA SHRI J. N. KOHLI and S. K. GUHA, Officer Surveyors—retired.

SHRI M. N. KUTTY, Officer Surveyor—on foreign service with the Government of Irāq.

SHRI K. VENKATARAMAN, Officer Surveyor—joined the National Atlas Organisation.

SHRI J. C. CHAKRABARTTI, Registrar—retired.

SHRI A. S. GOSAIN—appointed as Officer Surveyor.

SHRI H. N. PANDE (on transfer from the Govt. of India Press, Nasik)—appointed as Labour Welfare Officer.

Class III Service.—SARVA SHRI S. K. DATTA, S. K. GHOSE, V. RAGHAVAN and J. K. CHATTERJEE, Surveyors (Selection Grade)—promoted to officiate as Officer Surveyors.

SHRI D. S. BHATTACHARYA, Office Superintendent—promoted to officiate as Registrar.

SARVA SHRI K. L. CHAKRABARTI, D. SEN, T. K. CHATTERJEE and S. N. SETLUR, Surveyors—promoted to officiate as Surveyors, Selection Grade.

SHRI M. K. BHASKARAN PILLAI, Scientific Assistant—promoted to officiate as Scientific Assistant, Selection Grade.

SHRI S. K. ROY, Survey Assistant—promoted to officiate as Survey Assistant, Selection Grade.

SARVA SHRI M. B. SINGH, S. K. MALLICK, C. L. JAISWAR and B. K. SARKAR, Draftmen (Div. I)—promoted to officiate as Draftsmen (Div. I), Selection Grade.

SHRI N. L. DAS, Stores Assistant—promoted to officiate as Stores Assistant, Selection Grade.

SARVA SHRI P. K. BHANDARI, P. N. SAWHNEY, S. S. SAHNI, RAM CHANDRA, NARESH KUMAR, T. M. SOMAIAH, P. R. SACHITHANANDAM, P. C. K. UNNI, K. B. APPACHU, M. M. MANDANNA and

N. L. HASIJA, Topo Trainees Type 'A'—Promoted to officiate as Surveyors, Grade II.

SARVA SHRI M. M. SOBTI, B. L. SHARMA, D. B. CHETTRY, T. SUSAIRAJ, K. GUPTA CHOWDHURY, K. L. SWANI, K. R. SALUJA and N. V. NAIR, Class III Div. II—promoted to officiate as Survey Assistants.

SARVA SHRI T. D. MAITHANI and K. S. RAWAT, Draftmen, Div. II—promoted to officiate as Draftsmen Div. I.

SARVA SHRI U. C. CHAKRABARTY and C. TINKU, Class III Div. II—promoted to officiate as Technical Assistants.

SHRI S. K. SARKAR, Storekeeper—promoted to officiate as Stores Assistant.

SHRI JASWANT SINGH, Scientific Assistant—Joined Geological Survey of India.

SARVA SHRI NASIB SINGH and I. S. RAWAT, Survey Assistants—re-employment terminated.

SARVA SHRI S. B. DAS and KASHMIRI RAM, Survey Assistant and Stores Assistant, respectively—retired.

SARVA SHRI V. BARRETO and SHRI KRISHAN, Surveyors (Gr. II)—resigned.

SHRI B. BANDYOPADHAY, Topo Trainee Type 'A'—deemed to have resigned.

SHRI RAM KUMAR, Topo Trainee Type 'A'—discharged from service.

SARVA SHRI S. D. CHATTERJEE, KEWAL KRISHAN, A. P. TRIPATHI, S. B. L. SHARMA. DEEP CHAND, K. K. KHERA, NIRMAL SINGH, S. S. PARDHAN, DHARAM PAL, P. S. CHOPRA and P. S. SANDHU —appointed as Topo Trainees Type 'A'.

Class III (Div. II) and Ministerial Staff.—

220 appointed.
83 resigned and discharged.
11 retired.
6 transferred.

12. **Deaths.—**

BRIGADIER SIR OLIVER WHEELER, M.C., ex-Surveyor General of India.

SHRI A. PONNURANGAM, Draftsman (Div. I).

SHRI R. N. CHATTERJEE, P.P. Operator.

SHRI ABDUL RASHID, Prover.

SHRI B. MUNIAPPA, Draftsman, Grade IV.

SHRI I. RAJARATNAM, Topo Trainee Type 'B' (Draftsman).

SHRI J. C. NAGPAL, Topo Trainee Type 'B' (Plane-tabler).

SHRI P. K. PALU, Topo Trainee Type 'B' (Plane-tabler).

Class IV personnel.—16.

PART I.—TOPOGRAPHICAL AND OTHER SURVEYS

II. ABSTRACT OF SURVEYS AND TOPOGRAPHICAL WORK

13. The following tables indicate the progress achieved in the topographical surveys in metric system :—

Table A.—Progress of Topographical Surveys in metric system since 1956

Survey years	1 : 50,000 and larger scales		TOTAL
	New surveys	Revision surveys of areas previously on 1-inch	
	sq. km	sq. km	sq. km
1956–61 ..	1,86,603	73,848	2,60,451
1961–62 ..	**32,873**	**21,187**	**54,060**
Total to **1962** ..	**2,19,476**	**95,035**	**3,14,511**
Balance ..	8,97,966*	20,55,613†	29,53,579‡
Total programme	**11,17,442**	**21,50,648**	**32,68,090†**

* 21,530 square kilometres of this balance have been surveyed on $\frac{1}{4}$-inch scale and 4,80,371 square kilometres on $\frac{1}{2}$-inch scale.

† 8,549 square kilometres of this balance were surveyed in F.P.S. System on 1-inch and larger scales during the period under report.

‡ Total area of the Indian Union excluding Sikkim (area 7,107 sq. km) and Bhutān (area 40,244 sq. km).

Table B.—Revision of above work

Survey year	1 : 50,000 and larger scales	TOTAL
1960–61 ..	Nil	Nil

Table C, which shows in detail the survey operations carried out during the period under report together with their cost rates, appears at the end of this section (pp. 21 to 49).

14. Although the primary responsibilities of the Survey of India are geodetic, topographical and geographical surveys, the department has to undertake a considerable amount of special

surveys in connection with irrigation, hydro-electric, land reclamation, flood control and similar development projects and to meet demands for large scale surveys of cities, cantonments and important industrial areas. It has also to advise and assist the State Governments in local and settlement surveys as may be required. Since World War II, surveys for irrigation and similar projects had largely occupied the resources of the Survey of India, but since the year 1954–55 a fair amount of the departmental resources is being employed on departmental work.

The following sub-heads show the various types of work and field operations carried out by the department during the period :—

Boundary Surveys	Topographical framework
Photo-mosaics	Topographical surveys by air-cum-ground methods
Geodetic framework	Flood Control Surveys
Rectangulation	Training.
Levelling	

During the current year, a good amount of progress has been made in the departmental topographical surveys in metric system.

An abstract of surveys in each state/union territory of the Indian Republic, alphabetically arranged, is given below. Where a state is not mentioned, no work has been done in it during the period under report.

15. Andhra Pradesh.

Topographical surveys by photogrammetric methods.—8-inch survey Nāgārjunakonda Excavation Sites in Guntūr and Nalgonda Districts (p. 57).

16. Assam.

Topographical surveys by ground methods.—2-inch original ground survey for Umiām Umtru Hydel Project and Upper Umiām (Mawphlang) Hydel Project in United Khāsi-Jaintia Hills District (pp. 62 & 63).

Topographical surveys by air-cum-ground methods.—Air-cum-ground survey on 2-inch scale in United Khāsi-Jaintia Hills District for part of Umiām Hydel Project-Stage III (p. 62).

Topographical framework.—Supplementary triangulation for the above (p. 63).

Boundary surveys.—Ground verification on air photographs and height control for 4-inch air survey of Assam-East Pakistān Boundary in Mizo Hills District (p. 60). Ground verification on air photographs for 16-inch air survey of Assam-East Pakistān Boundary in United Khāsi and Jaintia Hills Districts (p. 60).

17. Bihār.

Topographical surveys by photogrammetric methods.—4-inch survey of details only on stereotope for the Son High Level Canals Project in Shāhābād and Gaya Districts (p. 54).

Levelling.—Single tertiary levelling for the above in Shāhābād and Gaya Districts (p. 54).

18. Delhi.

Topographical surveys by photogrammetric methods.—Ground verification on 1 : 10,000 grey prints for 6-inch Delhi Regional Plan Survey (p. 55). 1 : 10,000 and 1 : 20,000 air survey for Delhi Regional Plan (p. 57).

19. Goa, Damān and Diu.

Topographical framework.—Supplementary triangulation and post-pointing for 1 : 50,000 scale survey in Diu (p. 82).

20. Gujarāt.

Topographical surveys by air-cum-ground methods.—Original 1 : 50,000 and 2-inch scale surveys in Ahmadābād, Banās Kāntha, Kutch, Mehsāna, Rājkot and Surendranagar Districts (pp. 82, 86 & 89).

Original and revision 2-inch scale surveys for 4-inch project 'Reclamation of the Little Rann of Kutch' in Kutch District (pp. 89 and 90) and Ghed Project in Jāmnagar and Junagadh Districts (pp. 93 and 94).

Topographical surveys by ground methods.—Revision survey on 1 : 50,000 scale and verification survey on 1 : 250,000 scale for Landing and Approach Charts (I.C.A.O.) surveys of Baroda, Bhaunagar and Bhuj Aerodromes in Amreli, Baroda, Bhaunagar, Kaira, Kutch and Pānch Mahāls Districts (p. 94).

4-inch scale survey for Narmada Project Reservoir Area in Baroda and Broach Districts (pp. 72 & 73).

Boundary verification survey on 4-inch scale of a portion of inter-state boundary between Gujarāt and Mahārāshtra States (touching The Dangs, Nāsik and West Khāndesh Districts) (p. 94).

Topographical surveys by air methods.—Ground verification and heighting on 2-inch air photographs for survey of the Narmada Commanded Area in Ahmadābād and Kaira Districts (p. 68) and Baroda and Broach Districts (pp. 75 & 76).

Topographical framework.—Triangulation and post-pointing for 1 : 50,000 scale survey in Amreli and Junagadh Districts (p. 82).

Supplementary triangulation, theodolite traverse and post-pointing for 1 : 50,000 scale survey in Ahmadābād, Amreli, Banās Kāntha, Baroda, Junāgadh, Kutch, Mehsāna, Pānch Mahāls, Sābar Kāntha and Surendranagar Districts (pp. 82, 86 and 89).

Theodolite traversing for 2-inch scale survey for the project 'Reclamation of the Little Rann of Kutch' in Kutch District (p. 89).

Theodolite traversing for 2-inch air survey of Narmada Commanded Area in Baroda District (p. 75).

Post-pointing of plan control on 2-inch air photographs for 1 : 50,000 scale survey and Ghed Project in Jāmnagar, Junagadh, Rājkot and Surendranagar Districts (p. 94).

Reconnaissance and post-pointing of old control points on 2-inch photographs for Narmada Commanded Area survey in Ahmadābād and Kaira Districts (p. 68).

Levelling.—Double and single tertiary levelling for 2-inch scale project survey in the Little Rann of Kutch in Kutch District (p. 89) and Ghed Project in Junagadh District (p. 94).

Double and single tertiary levelling for Narmada Commanded Area survey in Ahmadābād and Kaira Districts (p. 68) and Baroda and Broach Districts (pp. 75 & 76).

Single tertiary levelling in Baroda and Bhaunagar Districts and double tertiary levelling in Kutch District for Aerodrome Landing Charts (p. 94).

21. Himachal Pradesh.

Topographical Surveys by photogrammetric methods.—Air survey on 1 : 2,500 scale of Mandi Salt Mines in Mandi District (p. 55).

22. Madhya Pradesh.

Topographical surveys by ground methods.—1 : 4,000 scale survey for Dalli-Rajhāra Iron Ore Area in Durg District (p. 68).

4-inch scale survey for Narmada Project Reservoir Area in Dhār, Jhābua and West Nimār Districts (pp. 72 & 73).

Topographical surveys by air-cum-ground methods.—Original survey on 1 : 50,000 scale in Bastar District (p. 74).

Topographical framework.—Triangulation and theodolite traversing for 1 : 4,000 scale survey of Dalli-Rajhāra Iron Ore Area in Durg District (p. 68).

Triangulation for 4-inch scale survey of Narmada Project Reservoir Area in Dhār and Jhābua Districts (p. 72).

Levelling.—Double and single tertiary levelling for 1 : 4,000 scale survey of Dalli-Rajhāra Iron Ore Area in Durg District (p. 68).

23. Madras.

Topographical surveys by ground methods.—Verification of office copy corrections on 1-inch scale in Rāmnād and Tirunelveli Districts (p. 68).

Topographical framework.—Triangulation and theodolite traversing for 1 : 50,000 scale survey of Landing Chart of Madurai Aerodrome in Madurai District (p. 73).

Levelling.—Double tertiary levelling for the above (p. 73).

24. Mahārāshtra.

Topographical surveys by ground methods.—4-inch scale survey for Narmada Project Reservoir Area in West Khāndesh District (pp. 72 & 73).

1-inch scale verification of office copy corrections for 1-inch reissue sheets in Akola, Buldāna and East Khāndesh Districts (p. 94).

25. Mysore.

Topographical surveys by ground methods.—1 : 50,000 scale original survey for Landing Chart and 1 : 250,000 scale verification survey for Approach Chart of Mangalore Aerodrome in South Kanara District (p. 73).

Topographical surveys by air-cum-ground methods.—Original and revision surveys of Bangalore Guide Map on 1 : 20,000 scale in Bangalore District (p. 74) and 2-inch survey in Bijāpur, Gulbarga and Raichūr Districts (p. 64).

Topographical framework.—Triangulation for 1 : 25,000 scale air-cum-ground survey in Belgaum District (p. 68).

Triangulation for 1 : 50,000 scale survey for Landing Chart of Mangalore Aerodrome in South Kanara District (p. 73).

Levelling.—Double tertiary levelling for 1 : 50,000 scale survey for Landing Chart of Mangalore Aerodrome in South Kanara District (p. 73).

26. Punjab.

Topographical surveys by air-cum-ground methods.—Original 1 : 50,000 and 1 : 40,000 scale surveys in Hissār District (p. 79).

Topographical surveys by ground methods.—1-inch scale verification survey for Bhākra Project in Gurgaon, Hissār, Mahendragarh and Rohtak Districts (p. 100).

Topographical surveys by photogrammetric methods.—Ground verification on 1 : 10,000 grey prints for 6-inch Delhi Regional Plan Survey in Rohtak District (p. 55).

Levelling.—Double and single tertiary levelling to 25-acre rectangles for Bhākra Project in Bhatinda, Ferozepore, Gurgaon, Hissār, Ludhiāna, Mahendragarh, Rohtak and Sangrūr Districts (p. 100).

Rectangulation.—100-acre sub-rectangulation for Bhākra Project in Ferozepore, Gurgaon, Hissār, Ludhiāna and Mahendragarh Districts (p. 100).

27. Rājasthān.

Topographical surveys by air-cum-ground methods.—Original 1 : 50,000, 1 : 40,000 and 2-inch scale surveys in Bīkaner, Churu, Gangānagar, Jodhpur and Nāgaur Districts (pp. 79 & 82).

Topographical surveys by ground methods.—Revision survey on 1 : 50,000 scale and verification survey on 1 : 250,000 scale for Landing and Approach Charts (I.C.A.O.) surveys of Jaipur Aerodrome in Jaipur District (p. 94).

Topographical framework.—Triangulation for 1 : 50,000 scale original surveys in Churu, Nāgaur and Sīkar Districts (p. 78).

Boundary surveys.—Traversing, demarcation and 4-inch original survey of India—West Pākistān Boundary in Jaisalmer District (p. 106).

28. Tripura.

Topographical surveys by ground methods.—1 : 50,000 original ground survey for Landing Chart surveys of Agartala, Khowai, Kamalpur and Kailāshahar Aerodromes (p. 62).

$\frac{1}{4}$-inch verification surveys for Approach Chart surveys of the above 4 aerodromes (p. 62).

Topographical framework.—Supplementary triangulation and theodolite traverse for the above (p. 62).

Levelling.—Single tertiary and double tertiary levelling for the above (p. 62).

29. Uttar Pradesh.

Topographical surveys by photogrammetric methods.—Ground verification on 1 : 10,000 grey prints for 6-inch Delhi Regional Plan Survey in Meerut District (p. 55).

30. West Bengal.

Levelling.—Single tertiary and double tertiary levelling for flood control investigations in Burdwān, Hooghly, Howrah and Midnapore Districts (p. 98).

TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 1 Party.—		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**NORTHERN DIRECTORATE**
	Rājasthān Canal Project—4-inch scale, contours at 1 foot V.I. in flat areas.					
Undulating and cultivated area with numerous sand mounds	Fair mapping	2,040	..	13·6	18·5	
	Bhākra Dam Project—4-inch scale, contours at 1 foot V.I.					
Flat and undulating area with numerous sand dunes	Fair mapping	826	..	30·6	41·7	
No. 2 Party.—						
	Sindh River Project—4-inch scale, contours at 10 feet V.I.					
Hilly and jungle covered	Fair mapping	155	16·8	15·1	19·5	
No. 3 Party.—						
	Departmental Surveys—1 : 50,000 scale, contours at 20 metres V.I.					
Sandy area with dunes	Air survey compilation of details only	6,172	138·3	2·4	3·1	
	Fair mapping	7,252	27·2	12·2	15·8	
	Computations	13,691	668·1	0·3	0·4	

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 20 (Photo) Party.—	**Son High Level Canals Project Survey, 4-inch scale, contours at 1 foot V.I.**	sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**NORTHERN DIRECTORATE.—Contd.**
Cultivated plains with scattered trees, fairly well populated	Fair mapping	945	11·1	18·6	24·2	
	Plotting of details only on stereotope	984	56·2	5·8	7·5	
	Compilation of contours ..	1,204	151·8	5·1	6·6	
	Delhi Regional Plan Survey—3-inch scale, contours at 10 feet V.I.					
Densely populated cultivated plains ..	Fair mapping	596	33·2	6·2	8·0	
	Poona and Kirkee Guide Map—3-inch scale, contours at 5 metres V.I.					
Densely populated township	Fair mapping	24	6·5	49·2	64·0	
No. 22 (Photo) Party.—	**Delhi Regional Plan Survey—6-inch scale, contours at 5 feet V.I.**					
Partly built-up and partly open with cultivated plains	Air survey	213	16·3	28·4	36·9	
	Ground verification	247	30·6	22·0	34·4	

* Net cost represents the cost actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 22 (Photo) Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	NORTHERN DIRECTORATE.—*Contd.*
	Mandi Salt Mines Survey—1:2,500 scale, contours at 4 metres V.I.					
Steep wooded hills interspersed with terraced cultivation	Air survey	14	1·0	375·6	489·3	
	Fair mapping	14	1·0	397·8	516·4	
No. 23 Party.—						
	Rājasthān Canal Project—4-inch scale, contours at 1 foot and 5 feet V.I.					
Desert area with sand	Fair mapping	4,790	51·8	13·1	17·1	
	Levelling computations ..	4,790	156·4	3·2	4·2	
No. 26 (Photo) Party.—						
	Nāgārjunakonda Excavation Sites Survey—1 : 8,000 scale, contours at 5 feet and 25 feet V.I.					
Open and undulating	Air survey	31	13·3	40·0	52·1	
	Delhi Regional Plan Survey—6-inch scale, contours at 5 feet V.I.					
Built-up city area	Air survey (Details only) ..	188	23·6	16·0	20·8	

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TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 26 (Photo) Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**NORTHERN DIRECTORATE.—*Concld.***
	Delhi Regional Plan Survey—3-inch scale, contours at 10 feet V.I.					
Open, undulating outskirts of city area ..	Air survey	324	22·1	16·3	21·2	

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TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 12 Party.—		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**EASTERN CIRCLE**
	Indo-Pākistān Boundary Survey on 4-inch scale with contours at 10 feet V.I. up to 130 feet and at 25 feet V.I. above 150 feet up to a depth of 1 mile on either side of the boundary in Mizo District—Chittagong Hills Tract Sector.					
***Intricate** hills covered with dense jungle **mainly** bamboos*	Height control and ground verification on air photos	447·7	26·8	145·51	212·44	
	Air survey	225·3	7·1	84·22	108·50	
	Indo-Pākistān Boundary Survey on 16-inch scale					
***Heavily** wooded low hills with orange groves **and** scattered cultivated patches*	Ground verification on air photos and post-pointing in U.K. and J. Hills—Sylhet Sector ..	45·3	6·5	124·30	159·67	
No. 18 Party.—	**Agartala, Khowāi, Kamalpur and Kailāshahar Aerodromes**					
	1. Landing Charts—1 : 50,000 scale, contours at 20 metres V.I.					
***Partly** flat with open jungle and partly **undulating** hills with fairly dense jungle*	Triangulation	131	67·8	31·2	42·7	

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TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 18 Party.—*Contd.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**EASTERN CIRCLE.—*Contd.***
	Traversing	102 linear km	16·8 linear km	118·8 per linear km	159·2 per linear km	
	Double tertiary levelling ..	49 linear km	15·1 linear km	117·7 per linear km	157·3 per linear km	
	Single tertiary levelling ..	24 linear km	23·7 linear km	75·1 per linear km	106·3 per linear km	
	Plane-tabling	150	12·4	143·0	196·1	
	Computation and miscellaneous ..	150	37·3	15·8	20·5	
	2. Approach Charts—1 : 250,000 scale, contours at 100 metres V.I.					
Undulating and hilly areas with dense jungle, mainly bamboos	Ground verification on ¼-inch maps	3,489	548·0	3·2	4·3	
	Umiām Hydel Project (Stage III)—2-inch scale, contours at 20 feet V.I.					
Densely wooded and intricate, hilly and sparsely populated	Plane-tabling (original) ..	3	2·3	373·4	560·6	

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TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 18 Party.—*Contd.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**EASTERN CIRCLE.—*Contd.***
	Plane-tabling (Air surveyed blue-prints)	31	8·9	158·3	212·2	
	Upper Umiām (Mawphlang) Hydel Project—2-inch scale, contours at 20 feet V.I.					
Open jungle, undulating and hilly with steep gorges astride Umiām river	Triangulation	31	66·6	39·5	55·5	
	Plane-tabling	26	7·7	129·2	173·0	
	Computation and miscellaneous ..	31	66·6	9·1	11·8	
	Kangsabati & Dwārkeswar Valley Projects & Lower Kangsabati Reservoir—2-inch scale, contours at 10 feet V.I.					
Open undulating country	Computation and miscellaneous ..	1,352	349·7	3·1	4·1	
	Air survey	1,352	95·7	6·3	8·2	
	Fair drawing	883	28·0	18·4	24·0	
	Kopili Reservoir—2-inch scale, contours at 20 feet V.I.					
Dense jungle with low intricate hills ..	Computation and miscellaneous ..	129	62·4	9·6	12·5	

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TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 18 Party.—*Contd.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**EASTERN CIRCLE.—*Contd.***
	Air survey	129	34·2	15·4	20·0	
	Fair drawing	129	19·5	27·9	36·2	
	Umiām Umtru Hydel Project—2-inch scale, contours at 25 feet V.I.					
Dense jungle with steep gorge across river ..	Computation and miscellaneous ..	17	4·7	100·5	130·6	
	Fair drawing	17	4·2	136·3	177·3	
	Barāk Flood Control—2-inch scale, contours at 1 foot V.I.					
Open and flat	Computation and miscellaneous ..	78	122·7	4·2	5·6	
	P.O.P. corrections	78	116·6	5·8	7·5	
	Gumti Reservoir—4-inch scale, contours at 20 feet V.I.					
Low intricate hills with dense bamboo growth	Computation and miscellaneous ..	98	2,947·4	0·1	0·2	
	P.O.P. corrections	98	294·7	3·5	4·5	

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TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 18 Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**EASTERN CIRCLE.—*Concld.***
	Jamuna Reservoir—4-inch scale, contours at 20 feet V.I.					
Low intricate hills with dense jungle ..	Computation	233	368·1	2·0	2·6	
	Sālandi Irrigation Project & Orissa Coast Canal—2-inch scale, contours at 1 foot and 2 feet V.I.					
Open and flat coastal areas with numerous villages	Computation and miscellaneous ..	181	175·5	2·4	3·1	
	Fair drawing	215	38·2	25·4	32·3	
No. 29 Party.—	**Topographical Survey—1 : 50,000 scale, contours at 20 metres V.I.**					
Partly cultivated plains and undulating ground with occasional low, open hills and partly jungle covered hills	Fair mapping	4,424	126·4	5·9	7·6	
	Air survey compilation of outline only	3,691	356·1	2·0	2·6	
	Triangulation computation ..	2,217	..	0·7	0·9	

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TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 8 Party.—		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE**
	Narmada Commanded Area—2-inch scale, contours at 2 feet V.I.					
Mostly open, gently undulating and cultivated plains	Air survey and fair mapping ..	1,985	22·3	24·3	31·6	
	Ground verification and height control	1,283	42·2	35·5	58·0	
	Reconnaissance and post-pointing	1,336	1,603·7	1·4	2·2	
	Double tertiary levelling ..	108 linear km	75·2 linear km	27·9 per linear km	50·4 per linear km	
	Single tertiary levelling ..	928 linear km	138·4 linear km	13·8 per linear km	22·8 per linear km	
	Field computations	1,283	256·7	1·7	2·7	
	Dalli-Rajhāra Iron Ore Area—1 : 4,000 scale, contours at 2 metres V.I.					
Intricate low hill, heavily wooded ..	Ground survey	3,434 hectares	93·2 hectares	17·5 per hectare	24·0 per hectare	

TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 8 Party.—*Contd.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—*Contd.***
	Traverse	135 linear km	17·4 linear km	175·6 per linear km	241·4 per linear km	
	Double tertiary levelling ..	88 linear km	27·7 linear km	77·0 per linear km	106·1 per linear km	
	Single tertiary levelling ..	94 linear km	35·4 linear km	57·0 per linear km	78·5 per linear km	
	Field computations	34	8·5	55·8	77·1	
	Fair mapping	3,434 hectares	286·2 hectares	1·4 per hectare	1·8 per hectare	
	Complete job	3,434 hectares	65·8 hectares	32·3 per hectare	44·2 per hectare	
	Topographical Surveys—1-inch scale, contours at 50 feet V.I.					
Open, undulating, cultivated plains, with numerous scattered villages	Verification of office copy corrections	1,519	500·9	3·89	5·50	

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TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate *Net	Cost rate †Overall	Remarks
No. 8 Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—*Contd.***
	Topographical Survey—1 : 25,000 scale, contours at 10 metres V.I.					
Undulating, open plains, low mounds and hills, patches of open jungle, large cultivated areas with scattered trees and numerous villages	Triangulation	1,480	224·2	9·51	13·08	
No. 17 Party.—						
	Pārbati Project; Reservoir Area—2-inch scale, contours at 10 feet V.I., Dam Site—8-inch scale, contours at 5 feet V.I.					
Open and gently undulating country, mostly cultivated, with scattered trees in reservoir area and 40% open and undulating ground and 60% fringes of hills covered by dense forest in dam site area	(*a*) Reservoir Area.—					
	Computations	393	318·8	2·1	2·7	
	Fair drawing	393	14·8	31·4	40·8	
	Complete job	393	9·1	133·4	196·7	
	(*b*) Dam Site.—					
	Computations	4	6·5	57·2	74·4	

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TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 17 Party.—*Contd.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—*Contd.***
	Fair drawing	4	1·3	395·9	514·6	
	Complete job	4	0·5	1,719·7	2,426·4	
	Srisailam Project, Reservoir Area—4-inch scale, contours at 20 feet V.I.					
Densely wooded hills and narrow valleys infested with wild life, mainly tiger and bear	Computations	107 linear km	535·8 linear km	0·4 per linear km	0·6 per linear km	
	Fair drawing	122	3·6	108·1	140·5	
	Complete job	122	1·6	648·9	863·1	
	Narmada Project, Dam Site—8-inch scale, contours at 10 feet V.I.					
	Narmada Project, Reservoir Area—4-inch scale, contours at 20 feet V.I.					
Partly undulating and partly hilly with fairly dense jungle with scattered patches of cultivation	(*a*) Dam Site.—					
	Fair drawing	14	1·0	715·5	938·1	
	Complete job	14	0·5	1,743·7	2,433·4	

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TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 17 Party.—*Contd.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—*Contd.***
	(*b*) Reservoir Area.—					
	Triangulation	91	57·8	26·3	41·7	
	Plane-tabling	265	4·2	497·2	698·8	
	Fair drawing	104	7·5	181·3	235·7	
	Computations	824	144·5	5·6	7·4	
	Madurai Aerodrome, Landing Chart—1 : 50,000 scale, contours at 20 metres V.I.					
Open plains and undulating ground with cultivated areas, thickly populated and having good communications	Triangulation	881	528·4	4·3	6·1	
	Traverse	15 linear km	87·0 linear km	26·0 per linear km	36·6 per linear km	
	Double tertiary levelling ..	28 linear km	65·1 linear km	34·8 per linear km	49·7 per linear km	

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TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 17 Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—*Contd.***
	Mangalore Aerodrome, Landing Chart—1 : 50,000 scale, contours at 20 metres V.I. Approach Chart—1 : 250,000 scale, contours at 100 metres V.I.					
Maint, undulating, with deep valleys having intensive cultivation and plantations of palm, coconut and cashewnut	(*a*) Landing Chart.—					
	Triangulation	129	111·0	13·9	19·0	
	Double tertiary levelling ..	20 linear km	49·0 linear km	31·5 per linear km	42·9 per linear km	
	Plane-tabling	52	26·8	37·6	78·7	
	Complete job	52	14·8	104·2	142·5	
	(*b*) Approach Chart.—					
	Plane-tabling	1,295	792·9	1·9	2·7	Verification survey.
	Topographical Survey—1 : 50,000 scale, contours at 20 metres V.I.					
Wild, hilly tract covered by dense jungle with scattered villages. The area abounds in wild life, chiefly tiger and bison. Cart-tracks and foot-paths are the only communications	Air survey compilation for field blue-prints	725	73·8	7·0	9·0	
	Computations	2,802	154·4	4·0	5·3	

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TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 21 Party.—		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—** *Contd.*
	Bangalore Guide Map—1 : 20,000 scale, contours at 10 metres V.I.					
Partly built-up and partly open and undulating area	Ground verification and contouring on the ground	404	24·7	45·3	58·9	177 sq. km of original survey. 227 sq. km of revision survey. Fair mapping work transferred to No. 4 D.O. (S.C.).
	Topographical Survey—1 : 50,000 scale, contours at 20 metres V.I.					
Partly intricate, low hills and partly undulating and flat areas covered with dense jungle	Ground verification and contouring on the ground	1,454	40·6	50·3	73·1	Work done mostly by topo trainees.
No. 24 Party.—						
	Narmada Commanded Area—2-inch scale, contours at 2 feet V.I. (area covered in 1960–61 field work)					
About 70% of the area consists of very undulating country with deep nālās and extensive broken ground. The remaining area consists of open cultivated plains	Air survey compilation ..	2,100	28·5	10·5	13·1	
	Fair drawing	2,100	14·0	22·7	28·3	
	Levelling computations ..	2,100	46·4	6·5	8·0	
	Triangulation and traverse computations	790	182·3	2·5	3·1	

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TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 24 Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—*Concld.***
	Narmada Commanded Area—2-inch scale, contours at 2 feet V.I.					
Partly flat and partly undulating ..	Double tertiary levelling ..	487 linear km	73·0 linear km	33·5 per linear km	48·3 per linear km	
	Single tertiary levelling ..	1,144 linear km	162 linear km	12·2 per linear km	17·8 per linear km	
	Supplementary heighting and ground verification on air photographs	1,839	49·5	32·3	48·6	
	Levelling computations in the field and photo chalking	1,839	183·9	7·7	11·4	
	Traversing	64 linear km	83·6 linear km	52·5 per linear km	81·9 per linear km	

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TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 4 Party.—		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE**
	Departmental Surveys—1 : 50,000 scale, with contours at 20 metres V.I.					
Cultivated plains and undulating areas with out-crop of hills	Triangulation and post-pointing ..	6,155	866·9	4·1	5·6	
Desert and semi-desert areas	Original air survey of detail (2-inch scale)	6,093	76·5	3·6	4·7	
Desert and semi-desert areas	Ground verification of detail and contouring on the ground for original survey	6,093	74·6	20·3	27·9	
	Fair mapping	4,059	33·3	10·1	13·2	
	Computations	7,463	670·2	0·2	0·3	
No. 6 Party.—						
	Departmental Surveys—1 : 50,000 scale, contours at 20 metres V.I.					
Densely wooded hills of Girnar Range and broken undulating country	Triangulation and post-pointing ..	2,155	615·7	4·1	5·5	

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TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 6 Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE—*Contd.***
Hilly and wooded; undulating ground with small hillocks; coastal plains; flat mud partly dry and partly wet	Subsidiary triangulation and post-pointing	3,856	856·9	3·0	4·0	
Featureless plains bordering Rann of Kutch	Theodolite traverse	40 linear km	86·3 linear km	28·3 per linear km	38·6 per linear km	
Flat mud, partly dry and partly wet and interspersed with salt beds and low islands; undulating plains	Original air survey of detail (2-inch scale)	11,406	325·6	2·0	2·6	
Sand dunes with large patches of flat sand and some low hills; plain areas bordering Rann; flat mud partly dry and partly wet	Ground verification and contouring on the ground for original survey	6,649	105·9	15·4	20·8	
Flat mud partly dry and partly wet and flooded	Ground verification and contouring on air photographs (2-inch scale) for original survey	528	2,264·4	1·0	1·3	
Plain area including parts of Little Rann ..	Fair mapping	5,568	102·5	9·8	12·8	

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TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 7 Party.—		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE.—Contd.**
	Departmental Surveys—1 : 50,000 scale, contours at 20 metres V.I.					
Gently undulating plains with small hillocks, mostly cultivated	Supplementary triangulation, post-pointing and computations ..	4,703	438·2	7·9	10·5	
Plains with and without cultivation, roads, railways and canals, etc.	Tertiary traverse (to supplement existing triangulation and traverse), post-pointing and computations	338 linear km	119·3 linear km	36·7 per linear km	48·8 per linear km	
	Original air survey of detail (2-inch scale)	6,146	166·8	2·1	2·7	
Gently undulating plains with fairly dense vegetation, mostly cultivated areas	Ground verification and contouring on the ground for original survey..	6,351	94·5	17·2	23·3	
Open plains, mostly cultivated, with low hills and with fairly dense vegetation	Fair mapping	3,735	59·1	13·8	18·0	
No. 31 Party.—						
	Departmental Surveys—1 : 50,000 scale, contours at 20 metres V.I.					
Open plains with small undulations and low hills at places	Original air survey of detail (2-inch scale)	1,365	130·6	4·6	6·0	

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TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 31 Party.—*Contd.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE.—*Contd.***
	Ground verification of detail and contouring on the ground for original survey	1,121	102·4	31·0	42·1	
	Ground verification of detail and contouring on 2-inch air photographs for original survey ..	236	142·0	9·9	13·4	
	Supplementary triangulation ..	73	78·0	116·0	157·2	
	Irrigation Project—Reclamation of the Little Rann of Kutch—4-inch scale, contours at 2 feet and 10 feet V.I.					
Flat, featureless salt waste, mostly dry in the east and wet in the west, with poor communications and no habitation. Except for some thorny undergrowth in the bets, the entire Rann is barren	Ground verification of detail (2-inch scale) for original/revision survey	3,618	319·5	5·6	7·5	
	Secondary traverse with stone-laying	76 linear km	38·5 linear km	125·9 per linear km	170·7 per linear km	
	Tertiary traverse with stone-laying	1,098 linear km	129·7 linear km	42·4 per linear km	57·6 per linear km	

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.

† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 31 Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE.—*Contd.***
	Double tertiary levelling ..	415 linear km	50·4 linear km	43·4 per linear km	58·8 per linear km	
	Single tertiary levelling ..	1,849 linear km	107·6 linear km	31·3 per linear km	42·4 per linear km	
	Forest Survey—4-inch scale, contours at 25 feet V.I.					
Wasteland, half a mile wide, for afforestation, along the eastern, southern and western peripheries of the Little Rann of Kutch, fairly undulating with thorny undergrowth and numerous estuaries	Fair mapping	272	13·7	76·4	99·3	
	Chambal Hydel and Irrigation Project Bhind Canal Area—4-inch scale, contours at 1 foot V.I.					
Flat canalised plains, largely cultivated and fairly well populated, with broken ground along streams and extensive ravines along the southern bank of the Kunwāri River and northern banks of the Besuli and Sind Rivers	Air survey compilation (2-inch scale)	376	28·7	22·7	28·1	

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 32 Party.—		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE.—** ***Contd.***
	Jaipur Aerodrome					
	1. Landing Chart—1 : 50,000 scale, contours at 20 metres and 50 feet V.I.					
Mostly plain area	Revision survey	52	37·8	38·5	54·9	
	2. Approach Chart—1 : 250,000 scale, contours at 100 metres V.I.					
Plains with scattered hills	Verification survey	2,073	2,143·5	0·8	1·1	
	Baroda Aerodrome					
	1. Landing Chart—1 : 50,000 scale, contours at 20 metres and 50 feet V.I.					
Plain area	Revision survey	44	25·4	67·4	96·1	
	Single tertiary levelling ..	5 linear km	75·0 linear km	18·0 per linear km	24·0 per linear km	

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 32 Party.—*Contd.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE.—*Contd.***
	2. Approach Chart—1 : 250,000 scale, contours at 100 metres V.I.					
Flat plains	Verification survey	1,994	1,014·0	1·7	2·4	
	Bhaunagar Aerodrome					
	1. Landing Chart—1 : 50,000 scale, contours at 20 metres and 50 feet V.I.					
Flat plains	Revision survey	41	65·5	26·2	37·3	
	Single tertiary levelling ..	4 linear km	120·0 linear km	12·0 per linear km	15·0 per linear km	
	2. Approach Chart—1 : 250,000 scale, contours at 100 metres V.I.					
Plains with scattered hills	Verification survey	1,373	895·4	1·9	2·7	
	Bhuj Aerodrome					
	1. Landing Chart—1 : 50,000 scale, contours at 20 metres and 50 feet V.I.					
Undulating ground interspersed with hills ..	Revision survey	39	64·0	36·8	52·4	

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 32 Party.—*Contd.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE.—*Contd.***
	Double tertiary levelling ..	6 linear km	90·0 linear km	10·0 per linear km	14·0 per linear km	
	2. Approach Chart—1 : 250,000 scale, contours at 100 metres V.I.					
Undulating ground interspersed with hills ..	Verification survey	2,020	1,044·8	1·6	2·3	
	Ghed Flood Control and Reclamation Project—4-inch scale, contours at 1 foot and 25 feet V.I.					
Flat plains interspersed with low sand dunes and rocky mounds	Double tertiary levelling ..	519 linear km	87·0 linear km	19·9 per linear km	26·4 per linear km	
	Single tertiary levelling ..	3,731 linear km	98·3 linear km	18·6 per linear km	24·6 per linear km	
	Stone-laying	885 stones	85 stones	19·6 per stone	26·0 per stone	
	Ground verification on air photographs (2-inch scale) for original/ revision survey	2,657	114·5	14·8	19·7	

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.

† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 32 Party.—*Concld.*		sq. m.	sq. m.	Rs. per sq. km	Rs. per sq. km	WESTERN CIRCLE.—*Concld.*
	Post-pointing of plan control on 2-inch photographs (for Departmental 1 : 50,000 scale surveys and Civil Project)	3,496	1,719·5	1·0	1·4	
	Verification surveys—1-inch and 4-inch scales.					
Densely populated plains	Verification of office copy corrections on 1-inch scale ..	1,440	608·4	1·4	2·2	
Steep hills with open jungle	Verification of inter-state boundary between Gujarāt and Mahārāshtra on 4-inch scale	48 linear km	65·7 linear km	20·5 per linear km	30·2 per linear km	

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per-man per month	Cost rate		Remarks
				*Net	†Overall	
No. 11 Party. —	**Flood Control Investigation Survey.**	sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**TRAINING DIRECTORATE**
Flat cultivated plains with fairly dense vegetation, remaining water-logged and swampy up to end of December	Preparation of spot-heighted photo-mosaics on 4-inch scale ..	2,849	68·9	7·4	9·2	Work includes marking of abreast heights.
	Computations	5,414 linear km	145·1 linear km	4·0 per linear km	4·9 per linear km	Includes computations of abreast heights.
	Compilation of levelling data ..	13,942	427·6	0·5	0·7	
	Double tertiary levelling ..	1,020 linear km	70·8 linear km	27·5 per linear km	34·7 per linear km	
	Single Tertiary levelling ..	4,934 linear km	84·8 linear km	22·4 per linear km	28·3 per linear km	Includes abreast levelling.
	Check levelling	33 linear km	140·6 linear km	13·8 per linear km	17·1 per linear km	
	Field computations	5,987 linear km	526·6 linear km	0·9 per linear km	1·2 per linear km	

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 13 Party.—		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**TRAINING DIRECTORATE.—*Concld.***
	Bhākra Project—4-inch scale, contours at 1 foot V.I.					
Flat plains, largely cultivated and fairly densely inhabited, in Bhatinda, Ferozepore, Gurgaon, Ludhiāna and Sangrūr Districts; undulating ground with numerous sand dunes with thinner population and lesser cultivation in Hissār and Mahendragarh Districts of the Punjab	100-acre rectangulation ..	650	37·6	49·8	63·0	
	Double tertiary levelling ..	1,143 linear km	128·8 linear km	6·3 per linear km	9·8 per linear km	
	Single tertiary levelling and its computations	4,325	46·4	36·3	47·4	
	Compilation and rapid drawing ..	4,372	35·2	22·4	28·0	

* Net cost represents the cost actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	GEODETIC AND RESEARCH BRANCH
No. 27 Party.—	**Rājasthān-West Pākistān Boundary demarcation.**					
Undeveloped desert area with sand dunes ..	Triangulation	7,511	1,295·0	2·1	4·0	
	Boundary demarcation ..	376 linear km	29·4 linear km	78·7 per linear km	155·0 per linear km	
	Initial traverse	456 linear km	17·6 linear km	157·3 per linear km	309·8 per linear km	
	Final traverse	400 linear km	36·0 linear km	90·1 per linear km	176·5 per linear km	
	Original survey on 4-inch scale ..	223·5	15·8	102·5	201·4	
	Fair drawing, etc.	185	..	193·6	308·0	

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.

† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. SURVEY REPORTS, NORTHERN DIRECTORATE

DIRECTOR:—
- Colonel J. N. Sinha, M.Sc., A.M.I.E., M.I.S., to 22-5-61.
- Lt.-Colonel M. L. Chopra, B.Sc., B.E., Engineers, from 23-5-61 to 4-6-61 (current duties).
- Lt.-Colonel C. M. Sahni, B.A., Engineers, from 5-6-61 to 31-7-61.
- Colonel S. K. S. Mudaliar, B.A., M.I.E., M.R.S.H., M.I.S., from 1-8-61.

DEPUTY DIRECTOR:—
- Lt.-Colonel M. L. Chopra, B.Sc., B.E., Engineers, to 1-7-61, again from 24-7-61 to 31-7-61 and from 20-12-61.
- Lt.-Colonel C. M. Sahni, B.A., Engineers, from 2-7-61 to 23-7-61 (in addition to his duties as Director) and again from 1-8-61 to 20-10-61.
- Colonel S. K. S. Mudaliar, B.A., M.I.E., M.R.S.H., M.I.S., from 21-10-61 to 20-11-61 (in addition to his duties as Director).
- Shri L. J. Bagnall, B.Sc., from 21-11-61 to 19-12-61.

ADDITIONAL DEPUTY DIRECTORS AND OFFICERS ON SPECIAL DUTY:—
- Lt.-Colonel N. K. Sen, B.Sc., A.M.I.E., from 5-3-62.
- Lt.-Colonel M. M. Datta, B.Sc. (Hons.), B.E. (Civil), M.Sc., Ph.E. (I.T.C.), A.M.I.E., M.I.S., Engineers, from 6-3-62.
- Major S. Choudhuri, A.M.I.E., Engineers, from 14-3-62.
- Major Y. L. Khular, B.Sc. (Engg.), Engineers, from 14-3-62.

31. Summary.—The Northern Circle was redesignated as Northern Directorate with effect from 1st March, 1962 and existing field, photogrammetric and drawing potential was regrouped. The following units were placed under the control of the Northern Directorate:—

Nos. 1, 2, 3 (from 15-3-62), 20 (Photogrammetric), 22 (Photogrammetric), 23, 26 (Photogrammetric) Parties and No. 2 Drawing Office.

32. Areas Surveyed.—

14 square kilometres of air survey on 1 : 2,500 scale.

31 square kilometres of air survey on 1 : 8,000 scale.

401 square kilometres of air survey on 6-inch scale.

247 square kilometres of ground verification on 6-inch scale.

984 square kilometres of 4-inch survey of details only on stereotopes.

324 square kilometres of air survey on 3-inch scale.

6,172 square kilometres of 2-inch original air survey of detail.

1,204 square kilometres of compilation of contours from spot heights provided by tertiary levelling for 4-inch scale survey.

No. 1 PARTY

Officer in charge :—Major D. M. Gupta, B.Sc., B.E. (Hons.), A.M.I.E., Engineers.

33. **General.**—During recess the party was mainly employed on fair drawing of Rājasthān Canal Project and Bhākra Dam Project sheets.

Party headquarters remained at Mussoorie up to 23-3-62. Thereafter, it was opened at Srinagar in Jammu & Kashmīr on 30-3-62 for summer 1962 field work.

34. **Personnel.**—The average strength of the party was 1 Class I Officer, 2 Class II Officers, 2 Surveyors and 29 other Class III personnel including 4 Clerks and 2 M.T. Drivers.

35. **Recess Duties.**—Up to October 1961, the party was organised for fair drawing into three sections, with an average strength of 8 Class III personnel each, supervised by Sarva Shri A. C. Chawla (Class II), O. P. Bakshi (Class II) and R. C. Sachdeva (Surveyor). The Sections of Shri A. C. Chawla and Shri O. P. Bakshi were later on taken over by Shri B. R. Jain (Class II) and Shri R. C. Grover (Surveyor), respectively. From November 1961 to February 1962, there was, however, only one fair drawing Section under Shri R. C. Grover (Surveyor) with an average strength of 5 other Class III personnel.

In all, 21 sheets of Rājasthān Canal Project and 17 sheets of Bhākra Dam Project were fair drawn and submitted for publication.

No. 2 PARTY

Officer in charge :—{ Major Y. L. Khular, B.Sc. (Engg.), Engineers, to 27-7-61. / Captain G. M. Kamra, B.Sc. (Civil Engg.), A.M.I.E., Engineers, from 28-7-61.

36. **General.**—During recess the party was employed on fair mapping of 4-inch scale sheets of Sindh Reservoir Project and computations.

The party had its headquarters during recess at Mussoorie and field headquarters at Jullundur.

37. **Recess Duties.**—Shri T. C. Jyoti (Class II), assisted by by Shri N. K. Saxena (Survey Assistant) and an average strength of 6 other Class III personnel, completed fair mapping of 4 sheets, comprising an area of 155 square kilometres, of Sindh Reservoir Project on 4-inch scale.

Two Computers under the supervision of Shri Hans Raj (Survey Assistant) were employed on computations of triangulation, traverse and levelling carried out during 1960–61 and other miscellaneous jobs.

No. 3 PARTY

Officer in charge :— Shri V. B. Mudkavi, M.Sc., to 9–6–61 and from 17–7–61 to 7–2–62.
Shri H. H. Phillips, B.Sc. (Hons.), from 10–6–61 to 16–7–61.
Major M. G. Arur, B.Sc., B.E. (Hons.), Engineers, from 8–2–62.

38. **General.**—The party was employed on the departmental surveys on 2-inch scale for publication on 1 : 50,000 scale.

Party headquarters remained at Abu.

39. **Personnel.**—The average strength of the party was 1 Class I Officer, 2 Class II Officers, 1 Surveyor, Selection Grade, 2 Surveyors, 1 Survey Assistant and 34 other Class III personnel including Clerks.

40. **Areas Surveyed.**—

6,172 square kilometres of original air survey of detail on 2-inch scale.

41. **Recess Duties.**—During recess the party was organised as follows :—

(*a*) One section under Shri C. Sivaraman (Class II), later replaced by Shri R. Sivarama Krishnan (Class II), with 9 Class III personnel was employed on the fair mapping of four 1 : 50,000 departmental sheets of which three were completed. The same section also completed the air survey compilation of details only on 2-inch scale of three 1 : 50,000 departmental sheets.

(*b*) One section under Shri Daya Nand (Surveyor, Selection Grade) with 9 other Class III personnel was employed on the fair mapping of five 1 : 50,000 departmental sheets of which four were completed. The same section also completed the air survey compilation of details only on 2-inch scale of three 1 : 50,000 departmental sheets.

(*c*) One section under Shri C. S. Ojha (Survey Assistant) – later replaced by Shri Udai Singh and then by Shri Kishan Ram (Surveyors) – with 9 other Class III personnel was employed on the fair mapping of three 1 : 50,000 departmental sheets of which two were completed. The same section completed the air survey compilation of details only on 2-inch scale of three 1 : 50,000 departmental sheets and also carried out triangulation computations.

42. **Field Work.**—As the unit was earmarked for priority work during summer 1962, no field work was allotted.

No. 20 (PHOTOGRAMMETRIC) PARTY

Officer in charge :— Major M. M. Datta, B.Sc. (Hons.), B.E. (Civil), M.Sc., Ph.E. (I.T.C.), A.M.I.E., M.I.S., Engineers, to 11-6-61, from 21-8-61 to 19-12-61 and again from 11-1-62.
Major S. R. Kishore, Engineers, from 12-6-61 to 20-8-61.
Major B. Sarin, B.Sc., Engineers, from 20-12-61 to 10-1-62.

43. **General.**—The headquarters of the unit remained at Dehra Dūn throughout the period under report. The party was engaged mainly on the training of officers and operators on the photogrammetric instruments and the training of Topographical Trainees Type 'B' (Draftsmen) for No. 6 Drawing Office. A certain amount of productive work was also carried out.

44. **Personnel.**—The average strength of the party was 1 Class I Officer, 2 Class II Officers, 1 Survey Assistant, 1 Surveyor, 20 Topographical Trainees Type 'A' and 27 other Class III personnel including Clerks, Storekeeper and Recordkeeper.

45. **Area Surveyed.**—

984 square kilometres of 4-inch survey of details only on Stereotopes.

1,204 square kilometres of compilation of contours from spot heights provided by tertiary levelling for 4-inch scale survey.

46. **Recess Duties.**—

(*a*) *Training.*—A regular course of training in air survey and in the operation of photogrammetric instruments, viz., Multiplex, Wild Autographs A7, A8, and Stereotopes was conducted by Shri Ratna Singh (Class II) assisted by Shri D. D. Mehta (Surveyor). 19 Topographical Trainees Type 'A' completed their training and 1 Class II Officer and 5 Topographical Trainees Type 'A' continued their training in the operation of photogrammetric instruments. 1 Class I Officer was also on training in photogrammetry but he did not complete the course. 2 Topographical Trainees Type 'B' completed their training and 3 Topographical Trainees Type 'B' were under training in the operation of Stereotopes.

(*b*) *Air Survey and Mapping.*—

(*i*) One section under Shri J. S. Moorthy (Class II) assisted by Shri Jai Prakash (Survey Assistant), with an average strength of 3 Air Survey Draftsmen and 10 Topo. Trainees Type 'B' carried out the following jobs :—

(*a*) Survey of details only on Stereotope of 984 square kilometres on 4-inch scale for the Son High Level Canals Project in Shāhābād and Gaya Districts.

(*b*) Compilation of contours from spot heights provided by tertiary levelling of 1,204 square kilometres of 4-inch survey of the Son High Level Canals Project in Shāhābād and Gaya Districts.

(*ii*) One section under Shri Jai Prakash (Survey Assistant), with an average strength of 8 Topo. Trainees Type 'B' carried out the following jobs :—

(*a*) Fair drawing of 945 square kilometres for 4-inch Son High Level Canals Project Survey.

(*b*) Fair drawing of 596 square kilometres for 3-inch Delhi Regional Plan Survey.

(*iii*) One section under Shri Bhola Datt (Survey Assistant. Selection Grade) with an average strength of 4 Class III personnel was engaged for seven months on the fair drawing of 24 square kilometres for 4-inch Poona and Kirkee Guide Map.

47. **Field Work.**—No field work was carried out by the party.

48. **Description of Country.**—The area of Son High Level Canals Project Survey consists of cultivated plains with numerous small tanks, interspersed with mango orchards. The area is thickly populated.

The area of Delhi Regional Plan Survey consists of densely populated cultivated plains.

The area of Poona and Kirkee Guide Map consists of thickly populated townships.

No. 22 (PHOTOGRAMMETRIC) PARTY

Officer in charge :—
- Major G. C. Agarwal, B.E. (Hons.) Civil, A.M.I.E., Engineers, to 3-9-61.
- Major M. M. Datta, B.Sc. (Hons.), B.E. (Civil), M.Sc., Ph.D. (I.T.C.), A.M.I.E., M.I.S., Engineers, from 4-9-61 to 8-10-61 and from 1-3-62 [in addition to his duties as Deputy Director (Photogrammetry), Northern Directorate].
- Major B. Sarin, B.Sc., Engineers, from 9-10-61 to 19-12-61 (Officer on Special Duty) and from 20-12-61 to 10-1-62 [in addition to his duties as Officer in charge No. 20 (Photogrammetric) Party].
- Major D. P. Hajela, B.Sc., B.E. (Civil), Engineers, from 11-1-62 to 28-2-62 (in addition to his duties as Officer in charge No. 15 Party).

49. **General.**—The headquarters of the unit remained at Dehra Dūn throughout the period under report. During the first half of the year, the party was employed on various air survey tasks. In the latter half of the year, the party undertook field work in addition to the air survey tasks.

50. **Personnel.**—The average effective strength of the party was 1 Class I Officer, 1 Class II Officer, 12 Surveyors, 1 Survey Assistant and 27 other Class III personnel including 5 Clerks, 1 Storekeeper and 1 Recordkeeper.

51. **Areas Surveyed.**—

14 square kilometres of air survey on 1 : 2,500 scale.

213 square kilometres of air survey on 1 : 10,000 scale.

247 square kilometres of ground verification on 1 : 10,000 scale.

52. **Recess Duties.**—The party was organised into one drawing section under Shri Kulwant Singh (Surveyor) and two air survey sections under Sarva Shri A. K. Bhatia (Class II), assisted by Shri B. L. Sharma (Survey Assistant) and R. L. Taneja (Surveyor). In the latter half of the year the party was reorganised into one drawing section under Shri Ishar Singh (Surveyor) and three air survey sections under Sarva Shri A. K. Bhatia (Class II), Resham Singh (Surveyor) and B. L. Sharma (Survey Assistant).

(*a*) The Air Survey sections carried out the following work :—

(*i*) Plotting of 213 square kilometres on 1 : 10,000 scale for 6-inch Delhi Regional Plan Survey.

(*ii*) Plotting of 14 square kilometres for 1 : 2,500 scale Mandi Salt Mines Survey.

(*b*) The drawing sections completed the following :—

(*i*) Fair drawing of 18 sheets of 6-inch Delhi Regional Plan Survey.

(*ii*) Fair drawing of 7 sheets of 1 : 2,500 scale Mandi Salt Mines Survey.

53. **Field Work.**—Shri T. R. Kothiyal (Air Survey Draftsman, Grade III) carried out ground verification on 1 : 10,000 scale grey prints of 247 square kilometres in Delhi, Rohtak and Meerut Districts in connection with 6-inch Delhi Regional Plan Surveys.

54. **Description of Country.**—The area surveyed for Delhi Regional Plan is partly built-up and partly cultivated plain.

55. **Technical Methods.**—

(*a*) *Delhi Regional Plan Survey.*—Plotting was carried out on 1 : 10,000 scale, with contours at 5 feet vertical interval, on Wild A/8 machines. Plan positions of points, required for scaling of the models, were obtained from aerial triangulation carried out on Wild A/7. The aerial triangulation, itself, was based on control points of the triangulation and theodolite traverse carried out during the field work 1957–58. Heights provided by spirit levelling during field work 1957–58 were accepted. In areas covered by the 4-inch Bhākra Dam Project map of 1932–34, and 6-inch Delhi Contour Survey maps of 1957–58, the 5 feet contours were accepted

from the existing maps after necessary corrections. Grey prints obtained from air survey sections were verified on the ground. Built-up areas already covered by 1 : 20,000 scale Delhi Guide Map Survey were not verified on the ground, but were only compared with the latest edition of the Guide Map.

(*b*) *Mandi Salt Mines Survey.*—Plotting for Mandi Salt Mines Survey on scale 1 : 2,500 was done on Wild A/7. All the individual models were independently controlled by topo triangulation carried out during field work 1960–61. Ground verification on air photographs was carried out prior to commencement of plotting.

Three separate originals on Astrafoil for outline, contours, and vegetation were prepared for each sheet and for publication in three colours, i.e., black, brown and green. In thickly wooded areas where it was not possible to observe the ground due to thick growth of vegetation, features were depicted by broken contours at approximately 4 metre vertical interval, with the consent of the indentor, to distinguish these from the rigorously surveyed contours.

56. **Miscellaneous.**—The health of the personnel remained good throughout the field work.

No. 23 PARTY

Officer in charge :—Major P. M. Lakshman, B.E. (Highways), A.M.I.E., Engineers.

57. **General.**—During recess 1961, the party was mainly employed on fair drawing of Rājasthān Canal Project sheets.

58. **Recess Duties**—Three drawing sections with Sarva Shri Muneendra Kumar (Class I), B. S. Rattan (Class II) and N. B. Chowdhury (Surveyor) as Section Officers completed fair drawing of 55 sheets on 4-inch scale.

One computing section under Shri T. Rangarajan (Surveyor) completed the compilation of old Assam Flood Survey Party's tertiary levelling volumes. This section also completed the scrutiny and computations of all field records.

No. 26 (PHOTOGRAMMETRIC) PARTY

Officer in charge :—
- Major M. M. Datta, B.Sc. (Hons.), B.E. (Civil), M.Sc., Ph.E. (I.T.C.), A.M.I.E., M.I.S., Engineers, to 30-6-61.
- Major P. Misra, B.Sc., B.E. (Civil), M.R.S.H., Engineers, from 1-7-61 to 2-3-62.
- Shri U. D. Mamgain, B.Sc., M.I.S., from 3-3-62.

59. **General.**—The party was employed on the following extra-departmental jobs :—

(*a*) Nāgārjunakonda Excavation Sites Survey for the Archaeological Survey of India.

(*b*) Delhi Regional Plan Survey for the Town Planning Organisation of the Ministry of Health, Government of India

The headquarters of the party remained at Dehra Dūn throughout the period under report.

60. **Personnel.**—The average strength of the party was 1 Class I Officer, 2 Class II Officers, 7 Surveyors and 36 other Class III personnel including Clerks.

61. **Areas Surveyed.**—

31 square kilometres of original air survey on 1 : 8,000 scale.

188 square kilometres of original air survey on 1 : 10,000 scale.

324 square kilometres of original air survey on 1 : 20,000 scale.

62. **Recess Duties.**—The party was organised as follows :—

(*a*) *Air Survey.*—An air survey section initially under Shri A. N. Gossain (Class II) and later under Shri D. N. Sharma (Class II) completed 31 square kilometres of 1 : 8,000 scale air survey for Nāgārjunakonda Excavation sites, 188 square kilometres of 1 : 10,000 scale air survey and 324 square kilometres of 1 : 20,000 scale air survey for the Delhi Regional Plan.

(*b*) *Fair Drawing.*—There were two drawing sections, to start with, under Sarva Shri Bhola Datt (Survey Assistant, Selection Grade) and Nasib Singh (Survey Assistant). On the transfer of the unit to the Northern Directorate and consequent reshuffling of personnel the two sections were merged into one under Shri A. N. Gossain (Class II).

The drawing section completed the fair mapping of two sheets of the Delhi Regional Plan area and 6 sheets of the Rājasthān Lead-Zinc Zone, in addition to completing, in part, 19 other sheets on various scales.

63. **Technical Methods.**—Normal departmental methods were employed.

IV. SURVEY REPORTS, EASTERN CIRCLE

DIRECTOR:—Colonel J. S. Paintal, M.I.E., M.I.S., to 12-10-61 and from 6-11-61.
Shri J. C. Sikka, B.A., A.M.I.S., from 13-10-61 to 5-11-61 (current duties).

DEPUTY DIRECTOR:—Shri P. S. Shinghal, C.E. (Hons.), A.M.I.E., to 5-8-61.
Colonel J. S. Paintal, M.I.E., M.I.S., from 6-8-61 to 20-8-61 (in addition to his own duties as Director).
Shri J. C. Sikka, B.A., A.M.I.S., from 21-8-61.

64. **Summary.**—The following units and offices were administered by Eastern Circle :—

Nos. 5, 9, 30 (Photogrammetric) Parties (up to 28th February 1962), No. 29 Party (from 1st October 1961), Nos. 12, 18 Parties, No. 5 Drawing Office, Engraving Office and Photo-Litho Office. Reports on the working of the last three offices appear in Part II of this report.

Usual departmental original and revision surveys were carried out by Nos. 12 and 29 Parties. No. 18 Party carried out extra-departmental surveys sponsored by the different departments of the Central and State Governments.

65. **Areas Surveyed.**—

162 square kilometres of supplementary triangulation.

102 linear kilometres of theodolite traverse.

49 linear kilometres of double tertiary levelling.

24 linear kilometres of single tertiary levelling.

135 square kilometres of original survey on 1 : 50,000 scale.

15 square kilometres of revision survey on 1 : 50,000 scale.

3,489 square kilometres of verification survey on $\frac{1}{4}$-inch scale.

29 square kilometres of original survey on 2-inch scale.

31 square kilometres of verification and contouring on the ground on air surveyed planimetry.

45·3 square kilometres of ground verification on air photographs for air survey on 4-inch scale.

444·7 square kilometres of ground verification and provisioning of height control for air survey on 4-inch scale.

3,691 square kilometres of air survey compilation on 2-inch scale.

225·3 square kilometers of air survey compilation on 4-inch scale.

No. 12 PARTY

Officer in charge :—Shri T. K. Guruswamy, M.A.

66. **General.**—The party was employed on triangulation, traverse and air survey work in connection with the demarcation of Indo-Pākistān boundary between Assam-East Pākistān.

The headquarters of the party remained at Shillong throughout the pariod.

67. **Personnel.**—The average strength of the party was 2 Class I Officers, 4 Class II Officers, 4 Class III Division I Officers, and 37 Class III Division II personnel including Clerks.

68. **Areas Surveyed.**—

444·7 square kilometres of ground verification and provisioning of height control for subsequent air survey on 4-inch scale for areas falling up to a depth of one mile astride Indo-Pākistān Boundary between Mizo District, Assam and Chittagong Hills Tracts Districts, East Pākistān.

45·3 square kilometres of ground verification on air photographs for subsequent air survey on 16-inch scale astride Assam-East Pākistān Boundary in United Khāsi and Jaintia Hills – Sylhet Sector.

225·3 square kilometres of air survey on 4-inch scale for the Assam-East Pākistān Boundary.

69. **Recess Duties.**—Recess work was organized as follows :—

Air Survey Section.—This section under Shri D. Sen (Surveyor, Selection Grade) with an average strength of 6 Class III Division II

personnel completed 225·3 square kilometres of air survey on 4-inch scale for areas falling up to a depth of one mile astride the Assam-East Pākistān Boundary in Mizo District – Chittagong Hills Tracts Sector. The Pākistān team of similar strength completed 176·1 square kilometres of air survey in the aforesaid area. The work was carried out by Indian and Pākistāni team at Dacca, East Pākistān under the immediate supervision of the Officer-in-Charge, No. 6 Party, Survey of Pākistān.

70. **Field Work.**—The field work was organized as follows :—

Shri D. B. Chettry (Survey Assistant) with an average strength of 3 Class III Division II personnel completed 444·7 square kilometres of ground verification on air photographs and height control for subsequent 4-inch air survey of the areas falling up to a depth of one mile astride the Assam-East Pākistān Boundary in Mizo District – Chittagong Hills Tracts Sector.

Shri S. K. Bhattacharjee, Air Survey Draftsman Grade IV, completed 45·3 square kilometres of ground verification on air photographs for subsequent 16-inch air survey of area astride Assam-East Pākistān Boundary in United Khāsi and Jaintia Hills District – Sylhet District Sector.

71. **Description of Country.**—The area in Mizo District – Chittagong Hills Tracts Sector comprises of low intricate hills covered with dense jungle mainly bamboo. Boats and rafts are the only means of communication in the area when there is water in the streams. At other times when the streams are dry, communication is by rugged paths following river banks and in some areas through the bed of the streams. Camping facilities are very meagre and the necessities of life are scarce.

The area along the foot hills of Khāsi and Jaintia Hills where photo verification was carried out comprises of heavily wooded low hills with orange groves and cultivated patches scattered over the area. Communications are very poor.

72. **Technical Methods.**—In the United Khāsi and Jaintia Hills District – Sylhet Sector, 16-inch enlargements of the photographs were verified jointly with Survey of Pākistān. Boundary pillars and theodolite traverse control points established jointly by personnel of Land Records and Surveys, Assam and East-Pākistān, were also post-pointed on these enlargements during the course of joint photo verification.

In Mizo District – Chittagong Hills Tracts Sector ground verification on air photos and height control were carried out jointly with Survey of Pākistān on vertical air photographs taken in 1961. Height control charts were maintained on 1-inch scale to facilitate provision of height control point of requisite density.

No. 18 PARTY

Officer in charge :— { Major D. P. Hajela, B.SC., B.E. (Civil), Engineers, to 30-6-61.
Shri M. R. Rao, M.A., from 1-7-61.

73. **General.**—The party was employed on the following extra-departmental mapping and surveys which were sponsored by the Director General, Civil Aviation, New Delhi and the Governments of Assam, West Bengal and Orissa, in widely scattered areas of this Circle :—

(*a*) Landing and Approach Chart surveys on I.C.A.O. specifications for Agartala, Khowai, Kamalpur and Kailāshahar aerodromes in Tripura.

(*b*) Upper Umiām (Mawphlang) Hydel Project.

(*c*) Umiām Hydel Project (stage III).

(*d*) Kopili Reservoir Surveys (mapping only).

(*e*) Kangsabati and Dwārakeshwar Valley Project (mapping only).

(*f*) Lower Kangsabati Reservoir Project (mapping only).

(*g*) Sālandi Irrigation Project (mapping only).

(*h*) Orissa Coast Canal Project (mapping only).

(*i*) Wah Umiām (Barapāni) Hydel Project (mapping only).

The party headquarters remained at Shillong throughout the period under report.

74. **Personnel.**—The average strength of the party was :—

(*a*) *During recess.*—1 Class I Officer, 2 Class II Officers, 2 Surveyors, 1 Survey Assistant, and 24 Class III Division II personnel including Clerks.

(*b*) *During the field work.*—1 Class I Officer, 2 Class II Officers, 1 Surveyor, 1 Survey Assistant, 1 Topo. Trainee Type 'A' and 29 Class III Division II personnel including Clerks, etc.

75. **Areas Surveyed.**—

131 square kilometres of supplementary triangulation for I.C.A.O. surveys.

102 linear kilometres of theodolite traverse for the above.

49 linear kilometres of double tertiary levelling for the above.

24 linear kilometres of single tertiary levelling for the above.

135 square kilometres of original ground survey on 1 : 50,000 scale for the above.

15 square kilometres of revision surveys on 1 : 50,000 scale blue-print reductions from 16-inch survey for the above.

3,489 square kilometres of verification survey on $\frac{1}{4}$-inch scale for the above.

31 square kilometres of supplementary triangulation for Upper Umiām (Mawphlang) Hydel Project.

26 square kilometres of original ground survey on 2-inch scale for the above.

3 square kilometres of original ground survey on 2-inch scale for Umiām Hydel Project (stage III).

31 square kilometres of verification and contouring on the ground on 2-inch scale blue prints of air survey planimetry for the above.

76. Recess Duties.—During recess, the party was organised into three sections under Sarva Shri I. C. Deb (Class II), C. L. Kapur (Class II) and K. R. Choudhry (Surveyor, Grade II) for air survey, fair drawing and computations. The air survey and fair drawing of 4 Lower Kangsabati Reservoir sheets, 3 Kopili Reservoir sheets, 8 Sālandi Irrigation Project sheets and 1 Orissa Coast Canal sheet were completed. Computations of 1960-61 field work were checked.

During the field work, a drawing section under the supervision of Shri S. Guha Roy (Surveyor) was engaged on the fair mapping of 7 sheets of Kangsabati and Dwārakeshwar Valley Project and completed the fair drawing of 4 sheets.

77. Field Work.—The field work was organised and completed as below :—

(*a*) *I.C.A.O. Surveys.*—Shri B. R. Bose (Class II) with an average strength of 6 Class III Division II personnel completed.—

131 square kilometres of supplementary triangulation.

102 linear kilometres of theodolite traverse.

49 linear kilometres of double tertiary levelling.

24 linear kilometres of single tertiary levelling.

135 square kilometres of original plane-tabling on 1 : 50,000 scale.

15 square kilometres of revision survey on 1 : 50,000 scale blue-print reductions of 16-inch maps.

3,489 square kilometres of verification survey on $\frac{1}{4}$-inch scale.

(*b*) *Umiām Hydel Project, Stage III.*—2 Class III, Division II personnel under the supervision of Shri B. R. Bose (Class II) and the Officer-in-Charge, No. 18 Party completed.—

3 square kilometres of original plane-tabling on 2-inch scale.

31 square kilometres of verification and contouring on the ground on blue-prints of 2-inch scale air survey planimetry.

(*c*) *Upper Umiām (Mawphlang) Hydel Project.*—Shri S. Guha Roy (Surveyor) along with one Class III Division II, completed.—

31 square kilometres of supplementary triangulation.

2 Class III, Division II personnel under the supervision of Shri B. R. Bose (Class II) and the Officer-in-Charge No. 18 Party completed.—

26 square kilometres of original plane-tabling on 2-inch scale.

78. Description of Country.—

(*a*) *I.C.A.O. Surveys.*—The areas fall along the Indo-Pākistān border areas and portions of the charts cover Pākistān areas. The surveys were, however, restricted within the India side of the boundary. The areas are connected with the Assam-Tripura road. Except for the Landing Chart areas, which are open and plain, the area is hilly with dense jungle mainly bamboo. There are a number of tea gardens in the foot hill regions. There are scattered villages with cultivation, and colonies are growing up.

(*b*) *Umiām Hydel Project. Stage III.*—The area is hilly, densely wooded and sparsely populated with practically no communications. River Umtru forms the western limit of the area and is flanked by deep gorges on either side. One fair-weather, unmetalled road, leading from Umsnuing on Shillong-Gauhāti road, passes through the southern portion of the area and is under construction by the project authorities. Another fair-weather, unmetalled forest road, leading from a point three miles south of Nongpoh on Shillong-Gauhāti road, passes through the northern portion of the area. Most of the area is covered by Nongkhyllem reserved forest. The area abounds in wild life viz. tigers, boars, bears and snakes.

(*c*) *Upper Umiām (Mawphlang) Hydel Project.*—The area is hilly and jungleclad with open cultivated plain in the middle. The villages are scattered and the only means of communication is by foot. There are paddy cultivations in the plains and potato cultivations mainly along the hill slopes. River Umiām flows in the eastern region of the area and is flanked by steep gorges and cliffs on either side.

79. Technical Methods.—The technical methods were chosen in accordance with the requirements of the surveys and the nature of terrain ; the more conspicuous aspects are outlined below :—

(*a*) *I.C.A.O. Surveys.*—For determining the heights of hazards and obstructions to air-navigation, vertical angles were observed by theodolite from bench-mark positions and the heights were computed by scaling off distances from the plane-table Sections.

Most of the plane-tabling was carried out by P.T. traverse methods, based upon theodolite traverse stations. Indo-Pākistān Boundary pillars were generally fixed by radiation method.

Part of the Landing Chart area for Agartala was covered by 16-inch scale surveys of 1944–45, based upon local origin. For this portion, plane-tabling was carried out on a blue-print obtained on 1 : 50,000 scale by photographic reduction from 4-inch scale compilation of the old survey.

Original plane-tabling on blank P.T. sections was carried out for the Landing Chart surveys of Khowai, Kamalpur and Kailāshahar aerodromes.

(*b*) *Umiām Hydel Project, Stage III.*—The area of survey during the year under report adjoins the areas surveyed in 1959-60 and 1960–61. Most of this area is covered by photography. Blue-prints of the air survey planimetry of the area covered by photography have been prepared based on the plan control provided during the previous field works. The same plan control has been utilised for surveying on blue-prints/blank P.T. section on 2-inch scale. Normal plane-tabling methods and mostly P.T. traverses have been adopted.

(*c*) *Upper Umiām (Mawphlang) Hydel Project.*—Supplementary triangulation based on the existing G.T./Topo triangulation was carried out and plan control points 2 to 3 miles apart were provided.

Plane-tabling on 2-inch scale was carried out.

No. 29 PARTY

Officer in charge :—Major L. R. A. Narayan, B.Sc., B.Sc. (Met.), A.M.I.E., Engineers.

80. **General.**—During recess the party carried out fair mapping and air survey compilation of departmental sheets on 1 : 50,000 scale.

The headquarters of the party was at Bangalore during recess and at Shillong during field work.

81. **Personnel.**—The average strength of the party during recess was 2 Class I Officers, 2 Class II Officers, 3 Surveyors (Grade II) and 28 other Class III personnel including Clerks.

82. **Areas Surveyed.**—

3,691 square kilometres of air survey on 2-inch scale.

83. **Recess Duties.**—The party was organised for recess work into two fair drawing sections and one air survey and computing section.

Section I.—Shri P. R. Datta (Class I), with two Surveyors (Grade II) and 5 other Class III personnel carried out air survey compilation on 2-inch scale of 3,691 square kilometres and triangulation computations in sheet No. 56 D in Bijāpur, Gulburga and Raichūr Districts of Mysore State.

Section II.—Shri T. K. Visvanathan (Class II), with 1 Surveyor (Grade II) and 8 other Class III personnel, carried out fair mapping of 2,212 square kilometres on 1 : 50,000 scale in sheets Nos. 56 H and 65 C.

Section III.—Shri T. M. G. Nambisan (Class II), with 8 Class III personnel carried out fair mapping of 2,212 square kilometres on 1 : 50,000 scale in sheet No. 56 H.

V. SURVEY REPORTS, SOUTHERN CIRCLE

DIRECTOR :—
- Shri E. R. Wilson, B.A., M.I.S., to 5-12-61.
- Shri P. S. Shinghal, C.E. (Hons.), A.M.I.E., from 6-12-61 to 3-1-62 (current duties in addition to his own duties).
- Shri L. J. Bagnall, B.Sc., from 4-1-62.

DEPUTY DIRECTOR :—
- Lt.-Colonel C. M. Sahni, B.A., Engineers, to 27-5-61.
- Shri E. R. Wilson, from 28-5-61 to 27-8-61 (in addition to his own duties).
- Shri P. S. Shinghal, from 28-8-61 to 18-1-62.
- Shri L. J. Bagnall, from 19-1-62 to 4-3-62 (in addition to his own duties).
- From 5-3-62 the post of Deputy Director was temporarily transferred away from this Circle.

84. Summary. The units administered by this Circle during the period under report were Nos. 8, 10, 17, 21, 24 and 29 Parties and No. 4 Drawing Office. No. 29 Party was transferred away to the administrative control of the Director, Eastern Circle, with effect from 1st October 1961.

85. Areas Surveyed.—

3,434 hectares of 1 : 4,000 scale original ground survey.

1,454 square kilometres of 1 : 50,000 scale original air-cum-ground survey.

177 square kilometres of 1 : 20,000 scale original air-cum-ground survey.

227 square kilometres of 1 : 20,000 scale revision air-cum-ground survey.

1,295 square kilometres of 1 : 250,000 verification survey.

1,519 square kilometres of 1-inch scale verification survey of office copy corrections.

4,085 square kilometres of 2-inch scale original air survey compilation and fair mapping.

3,122 square kilometres of ground verification and height control on 2-inch photographs.

52 square kilometres of 1 : 50,000 scale original ground survey.

265 square kilometres of 4-inch scale original ground survey.

2,615 square kilometres of triangulation.

1,336 square kilometres of reconnaissance and post-pointing of existing control.

214 linear kilometres of theodolite traversing.

731 linear kilometres of double tertiary levelling.

2,166 linear kilometres of single tertiary levelling.

No. 8 PARTY

Officer in charge :—Shri V. K. Pai, B.A. (Hons.).

86. **General.**—The party carried out the following departmental and extra-departmental surveys and mapping during the year :—

(*a*) *Departmental.*—

(*i*) Triangulation for 1 : 25,000 scale original air-cum-ground survey in Mysore State.

(*ii*) Verification of office copy corrections of 2 topographical sheets on 1-inch scale in Madras State.

(*b*) *Extra-departmental.*—

(*i*) Ground verification and height control on 2-inch air photographs for Narmada Commanded Area in Gujarāt.

(*ii*) Planimetric control, height control and original ground survey on 1 : 4,000 scale for Dalli-Rajhāra Iron Ore Area in Madhya Pradesh.

The headquarters of the party remained at Bangalore throughout the year.

87. **Personnel.**—The average strength of the party was 1 Class I Officer, 1 Class II Officer, 6 Class III Division I Officers and 29 Class III Division II personnel including 4 Clerks and 1 M.T. Driver.

88. **Areas Surveyed—**

3,434 hectares of 1 : 4,000 scale original ground survey.

1,985 square kilometres of original air survey compilation and fair mapping on 2-inch scale with contours at 2 feet vertical interval.

1,283 square kilometres of ground verification and height control on 2-inch air photographs.

1,519 square kilometres of verification of office copy corrections.

1,514 square kilometres of triangulation.

1,336 square kilometres of reconnaissance and post-pointing of existing control.

135 linear kilometres of theodolite traversing.

196 linear kilometres of double tertiary levelling.

1,022 linear kilometres of single tertiary levelling.

89. **Recess Duties.**—Recess work was organised as under :—

Sectoin I.—Shri M. R. Rao (Class I), and later, on his transfer, Shri V. Ramakrishnan (Surveyor), assisted by 9 other Class III personnel carried out the air survey of 10 sheets of Narmada Commanded Area.

Section II.—Shri K. Ranga Rao (Class II), assisted by 10 Class III personnel completed the air survey of 13 sheets of Narmada Commanded Area.

90. **Field Work.**—The field work was organised as follows :—

(*a*) *Camp I.*—Shri P. S. Bains (Class II), with an average strength of 12 Class III personnel for two months completed 160 square kilometres of height control and ground verification, 1,336 square kilometres of reconnaissance and post-pointing of existing control, 74 linear kilometres of double tertiary levelling and 385 linear kilometres of single tertiary levelling for Narmada Commanded Area in Ahmadābād and Kaira Districts of Gujarāt. For the remaining part of the field work, with an average strength of 18 Class III personnel, he completed 3,434 hectares of original ground survey on scale 1 : 4,000, 34 square kilometres of triangulation, 135 linear kilometres of theodolite traversing, 88 linear kilometres of double tertiary levelling and 94 linear kilometres of single tertiary levelling in Durg District of Madhya Pradesh.

(*b*) *Camp II.*—Shri K. Ranga Rao (Class II), with an average strength of 7 Class III personnel completed 1,123 square kilometres of height control and ground verification, 34 linear kilometres of double tertiary levelling and 543 linear kilometres of single tertiary levelling in Ahmadābād and Kaira Districts of Gujarāt.

(*c*) *Independent detachments.*—Shri V. B. Potdar (Surveyor) completed 740 square kilometres of triangulation for 1 : 25,000 scale original air-cum-ground survey in Belgaum District of Mysore State.

Shri V. Ramakrishnan (Surveyor) completed 740 square kilometres of triangulation for 1 : 25,000 scale original air-cum-ground survey in Belgaum District of Mysore State.

Shri P. E. Mathew (Surveyor Grade II) completed 1,133 square kilometres of verification of office-copy corrections in Rāmnād and Tirunelveli Districts of Madras State.

Shri B. K. Appanna (Surveyor Grade II) completed 386 square kilometres of verification of office copy corrections in Tirunelveli District of Madras State.

(*d*) *Headquarters Section.*—A small section consisting of 12 Class III Division II personnel, for a period of one month, directly under the supervision of the Officer-in-Charge, completed the fair mapping of 16 sheets of Dalli-Rajhāra Iron Ore Area.

91. **Technical Methods.**—The technical methods employed for Narmada Commanded Area have been explained in General Report 1961.

1 : 4,000 scale survey of Dalli-Rajhāra Iron Ore Area with contours at 2 metres vertical interval was required by Hindustan Steel Limited, Ranchi, for planning the geological prospecting, mechanical installations and civil works connected with the

mechanised mining operations in connection with the expansion scheme of the Bhilai Steel Project.

The plan control for this survey was carried out by triangulation and traversing and the height control by double and single tertiary levelling. The survey was carried out by the usual plane-tabling methods. With a view to treat the plane-table sections – each of which constituted a sheet – themselves as one of the originals, the sections in which detail was heavy were drawn in black with contours in pure blue and in the remaining sections, the contours were drawn in black with detail in pure blue. The second original was prepared on Kodatrace by tracing either the detail or the contours, whichever appeared in blue.

92. **Description of Country.**—The area of survey for Narmada Commanded Area is mostly open, being gently undulating with fairly well cultivated plains with high cactus hedges except for a small portion in the north, where the capital city of Gujarāt, Ahmadābād is situated. The area is well provided with communications and further roads are under construction. A considerable amount of lift irrigation from wells by power pumps is a common feature here, which also speaks for the development of this area.

Dalli-Rajhāra Iron Ore Area consists of an intricate, low hill, heavily wooded except for a few patches of cultivation in the north and south of the area for survey. There is a great dearth of drinking water in the area, especially during summer, and survey personnel who worked here had to get water from villages 3 to 4 miles away from their camps. The climate is that of extremes, the temperature rising to over 46° C in summer and falling to almost 2° C in winter.

No. 10 (TRAINING) PARTY

Officer in charge :— Major Y. Ramachandran, B.Sc. (Mining), Engineers, to 18-6-61.
Captain L. R. A. Narayan, B.Sc., B.Sc. (Met.), A.M.I.E., Engineers, from 19-6-61 to 31-7-61.
Shri R. S. Chugh, M.A., A.M.I.S., from 1-8-61.

93. **General.**—The party was engaged in training Topographical Trainees Type 'B', of the Class III Service, with its headquarters at Bangalore.

During office work the unit had a total of 51 trainees including 2 trainees from the Orissa Forest Department. Of these, 19 completed the course and were posted away to other units, 1 was discharged, 4 resigned and 1 was transferred to No. 24 Party. The two Forester trainees completed their preliminary training in traversing and were posted to No. 24 Party for further training in traversing and plane-tabling in forest areas. The remaining 24 trainees continued their training in fair mapping and air survey and took the field in October 1961. Of these, one was discharged at the end of his training in March 1962.

12 new trainees recruited in Southern Circle joined the unit between July 1961 and February 1962. They did their training in fair mapping and plane-tabling on 1/1,000 scale. Of these, 1 resigned during the preliminary training.

94. Personnel.—The average strength of the party was 1 Class I Officer, 7 Class III Division I & II (Instructors) – including one who was re-employed – 1 Storekeeper, 5 Clerks and an average of 39 Topographical Trainees Type 'B'.

95. Recess Duties.—The 19 trainees in their second year of training completed the course in air survey. The 24 trainees in their first year of training were trained in fair drawing and air survey up to combination stage. The two trainees from the Orissa Forest Department were given training in fair drawing, theodolite traversing and its computations. The batch of 12 new trainees was trained in fair drawing.

96. Field Work.—The 24 trainees in their second year of training completed a course of plane-tabling on the scale of 1 : 50,000 and height control and ground verification of detail on air photographs on 1 : 30,000 scale for air survey compilation.

The batch of 12 trainees in their first year of training completed a course of plane-tabling on the scale of 1 : 1,000.

97. Description of Country.—The area for plane-table training on the 1 : 25,000 and 1 : 50,000 scales lies 65 kilometres north of Bangalore in Bangalore and Kolār Districts of Mysore State. The country consists of open and undulating cultivated valleys with a moderately high hill range.

98. Miscellaneous.—Except for minor cases of illness, the health of the personnel, in general, was satisfactory.

No. 17 PARTY

Officer in charge :— Shri K. Satyanarayana, M.A., to 17-6-61.
Shri V. K. Pai, B.A. (Hons.), from 18-6-61 to 10-8-61.
Shri Muneendra Kumar, M.Sc., from 17-8-61.

99. General.—During recess the party was engaged mainly on the following jobs :—

(*a*) Fair mapping of 4-inch Srīsailam Reservoir sheets for the Government of Andhra Pradesh.

(*b*) Fair mapping of 8-inch Narmada Dam Site sheets and 4-inch Narmada Reservoir sheets for the Government of Gujarāt.

(*c*) Fair mapping of 8-inch Pārbati Dam Site sheet and 2-inch Pārbati Reservoir sheets for the Central Water & Power Commission, Government of India.

(*d*) 2-inch air survey compilation of outline only for future 1 : 50,000 scale surveys in Madhya Pradesh.

During the field work the party carried out the following extra-departmental surveys :—

(*a*) Triangulation and 4-inch original ground survey of Narmada Project Reservoir for the Government of Gujarāt.

(*b*) Triangulation, theodolite traversing and levelling for 1 : 50,000 scale survey for Landing Chart of Madurai Aerodrome for the Government of India.

(*c*) Triangulation, levelling, 1 : 50,000 scale original survey for Landing Chart and 1 : 250,000 scale verification survey for Approach Chart of Mangalore Aerodrome for the Government of India.

The party headquarters remained at Bangalore throughout the period under report.

100. **Personnel.**—The average strength of the party during office work was 1 Class I Officer, 3 Class II Officers, 1 Surveyor (Selection Grade), 1 Surveyor (Grade I), 3 Surveyors (Grade II) and 31 other Class III personnel including 4 Clerks, 1 Storekeeper and 1 Recordkeeper. During the field work the strength was 1 Class I Officer, 2 Class II Officers, 1 Surveyor (Grade I), 2 Surveyors (Grade II) and 21 other Class III personnel including 4 Clerks, 1 Storekeeper, 1 Recordkeeper and 2 M.T. Drivers.

101. **Areas Surveyed .—**

265 square kilometres of original ground survey on 4-inch scale.

52 square kilometres of original ground survey on 1 : 50,000 scale.

1,295 square kilometres of verification survey on 1 : 250,000 scale.

91 square kilometres of triangulation for 4-inch scale survey.

1,010 square kilometres of triangulation for 1 : 50,000 scale survey.

48 linear kilometres of double tertiary levelling.

15 linear kilometres of theodolite traversing.

102. **Recess Duties**—The party was organised into two fair-mapping sections, one air survey compilation section and one computing section as follows :—

Section I.—Shri K. N. S. K. Pillai (Class II), with one Surveyor (Grade II) and 11 plane-tablers completed the fair mapping of four 8-inch sheets of Narmada Dam Site covering an area of 14 square kilometres in Broach District of Gujarāt and five 4-inch sheets of Narmada Reservoir covering an area of 104 square kilometres in Broach and Baroda Districts of Gujarāt and West Khāndesh District of Mahārāshtra. The section also completed the fair-mapping of two 4-inch sheets of Srīsailam Reservoir covering

an area of 26 square kilometres in Kurnool and Mahbūbnagar Districts of Andhra Pradesh.

Section II.—Shri S. N. Setlur, Surveyor (Selection Grade), with one Surveyor (Grade II) and 11 Plane-tablers completed the fair mapping of seven 4-inch sheets of Srīsailam Reservoir covering an area of 96 square kilometres in Kurnool and Mahbūbnagar Districts of Andhra Pradesh. This section also completed the fair mapping of one 8-inch sheet of Pārbati Dam Site covering an area of 4 square kilometres in Rājgarh and Sehore Districts of Madhya Pradesh and eight 2-inch sheets of Pārbati Reservoir covering an area of 393 square kilometres in Rājgarh, Sehore and Shājāpur Districts of Madhya Pradesh.

Section III.—Shri P. S. Bains (Class II) with one Surveyor (Grade I), one Surveyor (Grade II), two Computers and one Topographical Auxiliary carried out the computations of

(*i*) Triangulation and levelling in Rāmapādasāgar Project Area.

(*ii*) Triangulation in Mula Reservoir and Commanded Area.

(*iii*) Triangulation and levelling in Narmada Dam Site and Reservoir Area.

(*iv*) Triangulation in Sharāvati Project Area.

(*v*) Triangulation and levelling in Pārbati Dam Site and Reservoir Area.

(*vi*) Traversing in Srīsailam Project Area.

(*vii*) Traversing in Sheet Nos. 46 B and C.

Section IV.—Shri V. P. Goel (Class II) with one Surveyor (Grade I), one Surveyor (Grade II) and 4 Plane-tablers, in a period of about 2 months, completed air survey compilation of outline only, on 2-inch scale, of departmental Sheet No. 65 E/4 covering an area of 725 square kilometres in Bastar District of Madhya Pradesh. Blue-print reductions on 1 : 50,000 scale of these outline sections will be used for 1 : 50,000 scale departmental surveys in this area.

103. **Field Work.**—Field work was organised and completed as under :—

Camp I.—Shri K. N. S. K. Pillai with one Surveyor (Grade II) and 6 Plane-tablers competed 91 square kilometres of triangulation for 4-inch original ground survey and 132 square kilometres of 4-inch original ground survey with 20-feet contours of the reservoir area of the Narmada Project for the Government of Gujarāt. The areas surveyed fall in Baroda and Broach Districts of Gujarāt, West Khāndesh District of Mahārāshtra and Dhār and Jhābua Districts of Madhya Pradesh.

Camp II.—Shri V. Raghavan (Class II) with 6 Plane-tablers completed 133 square kilometres of 4-inch original ground survey

with 20-feet contours of the reservoir area of the Narmada Project for the Government of Gujarāt. The area surveyed falls in West Khāndesh District of Mahārāshtra and Dhār, Jhābua and West Nimār Districts of Madhya Pradesh.

Individual Detachments.—Shri V. B. Potdar, Surveyor (Grade I), completed 881 square kilometres of triangulation, 15 kilometres of theodolite traversing and 28 kilometres of double tertiary levelling for control of 1 : 50,000 scale survey of Madurai Aerodrome. The area surveyed falls in Madurai District of Madras.

Shri N. Srinivasa, Surveyor (Grade II), completed 129 square kilometres of triangulation, 20 kilometres of double tertiary levelling and 52 square kilometres of original 1 : 50,000 scale survey for the Landing Chart of Mangalore Aerodrome. He also completed 1,295 square kilometres of 1 : 250,000 scale verification survey for the Approach Chart of Mangalore Aerodrome. The area surveyed falls in South Kanara District of Mysore.

104. **Description of Country.**—

(*a*) *Narmada Reservoir.*—The area is a wild, inaccessible, hilly tract covered with fairly dense jungle and small patches of cultivation near the banks of the Narmada River in the western portion and open, cultivated patches with fairly dense jungle towards the eastern region. The area is infested with wild life such as bear and tiger. Foot-paths are the main means of communication in the area. There are a few unmetalled roads fit for vehicular traffic during the dry season, entering the area from nearby towns. These roads are constructed and maintained by the Forest Department for transportation of forest produce. Except for a country boat ferry across the Narmada River at Hāp, no ferry is available in the up-stream portion.

(*b*) *Madurai Aerodrome.*—The area surveyed is well populated. Communications are good.

(*c*) *Mangalore Aerodrome.*—The area is mainly undulating with deep valleys having intensive cultivation and plantations such as palm, coconut and cashewnut. The area is infested with snakes. Communications are good.

105. **Technical Methods.**—

(*a*) *Narmada Project Reservoir Surveys.*—The 4-inch original ground survey with contours at a vertical interval of 20 feet was carried out by usual plane-tabling methods.

(*b*) *Madurai Aerodrome Surveys.*—Normal methods were used.

(*c*) *Mangalore Aerodrome Surveys.*—The 1 : 50,000 scale original ground survey with contours at a vertical interval of 20 metres for Landing Chart was carried out by usual plane-tabling methods. For surveys of the Approach Chart, a blue-print on 1 : 250,000 scale was prepared from existing ¼-inch maps and 100-metre contours were interpolated on the blue print with reference

to the contours on the component 1-inch maps. This blue print was taken to the field and detail and contours verified by usual plane-tabling methods.

No. 21 PARTY

Officer in charge:—Major P. M. Mani, B.Sc. (Civil Engg.), A.M.I.E., Engineers.

106. General.—The party was employed on the following departmental work :—

(*i*) 1 : 50,000 scale original air-cum-ground surveys in Madhya Pradesh.

(*ii*) 1 : 20,000 scale original and revision air-cum-ground surveys in Mysore State.

The party headquarters remained at Bangalore throughout the period under report.

107 Personnel.—The average strength of the party was 1 Class I Officer, 3 Class II Officers, 1 Topographical Trainee Type 'A' and 34 Class III Division II personnel including 4 Clerks.

108. Areas Surveyed.—

1,454 square kilometres of 1 : 50,000 scale air-cum-ground original survey.

177 square kilometres of 1 : 20,000 scale air-cum-ground original survey.

227 square kilometres of 1 : 20,000 scale air-cum-ground revision survey.

109. Field Work.—The field work was organised as follows :—

Camp I.—Shri S. N. Mathur (Class II) with 1 Topographical Trainee Type 'A' and 9 other Class III Division II personnel completed 1,454 square kilometres of original air-cum-ground survey on 1 : 50,000 scale of sheets 65 E/15 and 16 in Bastar District, Madhya Pradesh.

Camp II.—Shri P. G. B. Menon (Cass II) with 13 Class III Division II personnel completed 177 square kilometres of original and 227 square kilometres of revision air-cum-ground surveys on 1 : 20,000 scale for Bangalore Guide Map in Bangalore District of Mysore.

110. Description of Country.—The area of original survey on 1 : 50,000 scale consists of some intricate, low hills, with the remainder of the area undulating and flat, largely covered with dense jungle with some open portions.

The Bangalore Guide Map area is partly built-up and partly open and undulating.

111. Technical Methods.—All the surveys were done by normal ground and air survey methods.

112. **Miscellaneous.**—The health of all personnel remained satisfactory.

No. 24 PARTY

Officer in charge :—Major A. S. Iyer, B.E., A.M.I.E., Engineers.

113. **General.**—During recess, the party carried out 2-inch air survey and fair mapping of part of Narmada Commanded Area.

During the field work, the party completed plan control, heighting and ground verification on 2-inch contact prints for part of Narmada Commanded Area.

114. **Personnel.**—The average strength of the party was 1 Class I Officer, 2 Class II Officers, 3 Class III Division I Officers including 1 Selection Grade Surveyor and 24 other Class III personnel including 4 Clerks and 2 M.T. Drivers.

115. **Areas Surveyed.**—

2,100 square kilometres of air survey and fair mapping on 2-inch with contours at 2 feet vertical interval.

1,839 square kilometres of supplementary heighting and ground verification on 2-inch contact prints.

64 linear kilometres of theodolite traversing.

487 linear kilometres of double tertiary levelling.

1,144 linear kilometres of single tertiary levelling.

116. **Recess Duties.**—

Section I.—This section, under Shri M. R. Subramanian (Class II) assisted by Sarva Shri K. N. Ramanathan and K. V. Krishnamurthy (both Class III Division I) with an average strength of 11 Class III Division II personnel, completed the air survey compilation and fair mapping of Narmada Commanded Area sheets covering an area of 900 square kilometres.

Section II.—This section, under Shri V. Raghavan (Class II) for part of the office work and under Shri T. R. Santhanaraman (Class II) for the remaining period, assisted by Shri B. S. Thiyagaraj (Class III Division I) and with an average strength of 11 Class III Division II personnel, completed the air survey compilation and fair mapping of Narmada Commanded Area sheets covering an area of 1,200 square kilometres.

117. **Field Work.**—

Camp I.—Shri T. R. Santhanaraman with 1 Class III Division I Officer and 8 Class III Division II personnel completed 1,010 square kilometres of ground verification and heighting on air photographs, 64 linear kilometres of traverse, 255 linear kilometres of double tertiary levelling and 693 linear kilometres of single tertiary levelling for survey of Narmada Commanded Area in Baroda and Broach Districts of Gujarāt.

Camp II.—Shri S. N. Setlur (Surveyor, Selection Grade) with one Class III Division I Officer and 6 Class III Division II personnel completed 829 square kilometres of ground verification and heighting on air photographs, 232 linear kilometres of double tertiary levelling and 451 linear kilometres of single tertiary levelling for survey of Narmada Commanded Area in Baroda and Broach Districts of Gujarāt.

118. **Description of Country.**—The area surveyed is partly flat and partly very undulating, communications being good in the former and poor in the latter. The area on the whole is fertile, cotton being the main product.

119. **Miscellaneous.**—The health of the personnel in the field remained good.

120. **Technical Methods.**—*Ground verification and heighting on air photographs for Narmada Commanded Area.*—Double tertiary levelling lines were run about 13 kilometres apart, based on secondary levelling. Single tertiary levelling lines about 10 to 13 kilometres long and about 2·5 kilometres apart were run, based on double tertiary B.Ms. During the course of single tertiary levelling all three stadia readings were booked to ·01 foot.

Subsidiary heighting was done mainly by levelling. This levelling was based on B.Ms. established during the course of secondary, double tertiary or single tertiary levelling. During subsidiary heighting by levelling all three stadia readings were booked to 0·1 foot. The clinometer was used to provide offset heights to features such as stream junctions and tops of mounds. Distances were computed by using readings to a clinopole or were accepted as measured on the photographs. Ultimately, heights were provided on the photographs for contouring, about $\frac{1}{4}$ kilometre apart.

VI. SURVEY REPORTS, WESTERN CIRCLE

DIRECTOR:— Shri J. C. Ross, A.R.I.C.S., M.I.S., to 31-10-61.
Colonel C. M. Sahni, B.A., from 1-11-61.

DEPUTY DIRECTOR:— Lt.-Colonel J. A. F. Dalal, B.A. (Hons.), p.s.c., M.I.S., Engineers, to 10-5-61.
Shri J. C. Ross, A.R.I.C.S., M.I.S., from 11-5-61 to 31-5-61 (in addition to his duties as Director).
Lt.-Colonel D. N. Sharma Atri Harnal, Engineers, from 1-6-61.

121. **Summary.**—The units administered by the Circle were Nos. 3 (till 14-3-62), 4, 6, 7, 13 (from 1-10-61 to 28-2-62), 31 and 32 Parties and No. 3 Drawing Office. The headquarters of No. 31 Party remained at Poona and that of 13 Party at Mussoorie (during recess) and Charkhi Dādri (during field). The headquarters of other units remained at Abu.

The Circle was employed on both departmental and extra-departmental surveys.

122. **Areas Surveyed.**—

25,386 square kilometres of original air survey of detail on 2-inch and 1 : 40,000 scales.

20,214 square kilometres of ground verification and contouring on blue prints on 1 : 50,000 scale.

764 square kilometres of ground verification and contouring on air photographs on 2-inch scale.

2,657 square kilometres of ground verification on air photographs (with ground contouring at a few places) on 2-inch scale for Ghed Project.

3,618 square kilometres of ground verification of detail on blue prints on 2-inch scale for the project 'Reclamation of the Little Rann of Kutch'.

176 square kilometres of revision survey on 1 : 50,000 scale for Aeronautical Charts.

7,460 square kilometres of verification survey on blue/colour prints on 1 : 250,000 scale for Aeronautical Charts.

1,440 square kilometres of verification survey on 1-inch scale for reissue sheets and verification survey in 1 full and 6 part 1-inch sheets on 1-inch scale for Bhākra Project.

48 linear kilometres of verification survey of inter-state boundary on 4-inch scale.

8,310 square kilometres of triangulation and post-pointing.

8,632 square kilometres of supplementary triangulation and post-pointing.

1,552 linear kilometres of theodolite traverse.

3,496 square kilometres of post-pointing of trig. control on 2-inch air photographs.

940 linear kilometres of double tertiary levelling.

5,589 linear kilometres of single tertiary levelling.

123. **Training.**—During the year under report, 2 Topo. Trainees Type 'A' and 14 Topo. Trainees Type 'B' were recruited at Abu for training in various branches of survey work either here or in other Circles.

No. 4 PARTY

Officer in charge :—{ Major P. Rout, B.Sc. (Engg.), Engineers, to 1-7-61 and from 7-8-61. Shri V. Krishnamurty, M.A., A.R.I.C.S., A.M.I.S., from 2-7-61 to 6-8-61.

124. **General.**—The party was employed on departmental surveys on the 1 : 50,000, 1 : 40,000 and 2-inch scales in the Punjab and Rājasthān, for publication on the 1 : 50,000 scale.

Party headquarters remained at Abu.

125. **Personnel.**—The average strength of the party was 1 Class I Officer, 2 Class II Officers and 39 Class III Division II personnel including Clerks.

126. **Areas Surveyed.**—

4,742 square kilometres of original air survey of detail on the 2-inch scale.

1,351 square kilometres of original air survey of detail on the 1 : 40,000 scale.

6,093 square kilometres of ground verification and contouring on the ground on the 1 : 50,000 scale for original survey.

6,155 square kilometres of triangulation and post-pointing.

127. **Recess Duties.**—The party was organised into 3 sections, as follows :—

(*a*) One section under Shri T. R. Viswanathan (Class II), with 8 Class III personnel, carried out the fair mapping of two 1 : 50,000 departmental sheets.

(*b*) One section initially under Shri K. K. Rampal (Class II) and then under Shri L. M. Khanna (Class II), with 9 Class III personnel, carried out the fair mapping of one 1 : 50,000 departmental sheet and air survey compilation of detail on the 2-inch scale of three 1 : 50,000 departmental sheets.

(*c*) One section under Shri Gindi Lal (Survey Assistant), with 9 other Class III personnel, carried out the fair mapping of

one 1 : 50,000 departmental sheet and air survey compilation of detail on the 2-inch scale of four 1 : 50,000 departmental sheets.

(*d*) One computing section under Shri L. M. Khanna, with 2 Class III personnel, completed the triangulation computations of eleven 1 : 50,000 sheets.

128. Field Work.—During the field work the party was organised as follows :—

(*i*) *Ground verification and contouring.*—

(*a*) *Camp I.*—Shri C. S. Ojha (Survey Assistant) up to 12-2-62 and then Shri Gindi Lal, from 13-2-62 onwards, with an average strength of 11 other Class III personnel, completed 3,383 square kilometres of ground verification of air surveyed detail and contouring on the ground on 1 : 50,000 scale blue-prints in Churu, Gangānagar and Hissār Districts in Sheets 44 L and P.

(*b*) *Camp II.*—Shri Gindi Lal, up to 19-2-62 and then Shri T. R. Viswanathan, from 20-2-62 onwards, with an average strength of 8 Class III personnel, completed 2,710 square kilometres of ground verification of air surveyed detail and contouring on the ground on 1 : 50,000 scale blue-prints in Bīkaner, Churu and Gangānagar Districts in Sheet 44 L.

(*ii*) *Triangulation and post-pointing.*—

(*a*) Shri K. R. Ramu (Surveyor, Grade II) carried out 3,412 square kilometres of triangulation and post-pointing in Churu and Nāgaur Districts in Sheet 45 I.

(*b*) Shri P. K. Bhandari (Surveyor, Grade II) carried out 2,743 square kilometres of triangulation and post-pointing in Nāgaur and Sīkar Districts in Sheet 45 I.

(*iii*) *Fair Mapping and Air Survey.*—One section under Shri T. R. Viswanathan, with an average strength of 7 Class III personnel, was engaged on the fair mapping of three 1 : 50,000 departmental sheets and air survey compilation of detail of four 1 : 50,000 departmental sheets—two on the 1 : 40,000 scale and two on the 2-inch scale. Of these, the fair mapping of one sheet and the air survey compilation of detail of two sheets, on the 1 : 40,000 scale, were completed.

129. Description of Country.—The area surveyed and controlled falls into three categories :—

(*a*) Cultivated plains and undulating areas with outcrops of hills.

(*b*) Desert area.

(*c*) Semi-desert area.

(*a*) *Cultivated plains and undulating areas with outcrops of hills.*—The area falling in Sheets 45 I/11, 12, 15 and 16 is marked by gently sloping and undulating country interspersed with small hillocks. The south-eastern extremity contains rocky hills rising

to about 600 metres above the general ground level. The hills are covered with sparse vegetation and the plains are heavily cultivated and covered with *khejri* trees. A portion of the famous salt lake, Sāmbhar, falls in the south-east portion of Sheet 45 I/16. The country is not infested with wild animals but peacocks are found in plenty. The main crop is *bājra*. Drinking water is obtained mostly from wells. The main occupations of the people are cultivation and sheep rearing.

(*b*) *Desert area.*—The area falling in Sheets 44 L/1, 3, 4, 5, 6 and 10 is a sandy tract, characterised by the lightness of its sandy soil and covered by sand hills varying in height from 5 to 35 metres. Most of the wells contain brackish water. Sweet water is only available from a few wells and *kunds* and this hampers the progress of survey, especially after the months of February or March when there is scarcity of sweet water. The main crops in the area are *bājra* and *moth*. The area is covered with scattered *jāl* and *khejri* trees and *phog* bushes. Deer are found in plenty. The main occupations of the people are cultivation and cattle rearing. The area is sparsely populated. The well laid out town of Dūngargarh falls in Sheet 44 L/4.

(*c*) *Semi-desert area.*—The area falling in Sheets 44 L/14, 44 P/1, 5, 45 I/1, 2, 5, 6 and 9 is covered with dunes and mounds of fairly stabilized sand, of relative heights varying from 5 to 20 metres, interspersed with wide patches of plain ground. The plains are generally cultivated and the main crops are *bājra*, *moth* and gram. People drink rain-water collected in *kunds* and tanks. The area is sparsely populated. Deer are found occasionally. *Khejri*, *neem* and *jāl* trees and *phog* and *kher* bushes grow abundantly.

130. Technical Methods.—*Verification and contouring on the ground.*—Air survey sections of detail on the 2-inch and 1 : 40,000 scales were compiled from air photographs on approximately the same scale. These were then reduced to the 1 : 50,000 scale by photography and blue-prints obtained for verification and contouring on the ground. Details of the successive stages of the method were similar to those described under the same heading in the General Report of this unit for 1959 except that the planimetric and height control were provided by No. 4 Party (N.C.) in 1955–56 and No. 4 Party (W.C.) in 1958–59 and 1960–61.

131. Miscellaneous.—

Climate.—The climate is dry and healthy. In sandy areas sand storms commence during March, after which the weather grows intensely hot.

Communications.—In Sheets 44 L/1, 3, 5, 6, 10, 14 and 44 P/5 communications are poor. In the other sheets, especially in 44 L/4 and 44P/1, means of communication are fairly good, mostly by rail. Camel is the only means of transport in the desert portions.

Health.—No disease of any kind was reported.

No. 6 PARTY

Officer in charge :—{Shri K. S. Singh, B.A. (Hons.), to 19-7-61 and from 21-8-61.
Shri V. B. Mudkavi, M.Sc., from 20-7-61 to 20-8-61.

132. **General.**—The party was employed on departmental surveys on the 1 : 50,000 and 2-inch scales in Gujarāt and Rājasthān, for publication on the 1 : 50,000 scale.

Party headquarters remained at Abu.

133. **Personnel.**—The average strength of the party was 1 Class I Officer, 2 Class II Officers and 37 Class III Division II personnel including Clerks.

134. **Areas Surveyed.**—

4,057 square kilometres of original air survey of detail on the 2-inch scale.

5,729 square kilometres of original air survey from ground verified and contoured photographs on the 2-inch scale.

1,620 square kilometres of original air survey on the 2-inch scale for which ground verification was neither possible nor was considered necessary.

6,649 square kilometres of ground verification and contouring on the ground on the 1 : 50,000 scale for original survey.

528 square kilometres of ground verification on 2-inch air photographs for original survey.

2,155 square kilometres of triangulation and post-pointing.

3,856 square kilometres of supplementary triangulation and post-pointing.

40 linear kilometres of theodolite traverse and post-pointing.

135. **Recess Duties.**—The party was organised into 3 sections as follows :—

(*a*) One section under Shri L. M. Khanna (Class II) – later replaced by Shri G. B. Das (Class II) – with 9 Class III personnel, carried out air survey compilation of detail on the 2-inch scale of two 1 : 50,000 sheets. It was also engaged in the fair mapping of one 1 : 50,000 departmental sheet and air survey compilation of detail on the 2-inch scale of four 1 : 50,000 sheets.

(*b*) One section under Shri Jagan Nath (Class II), with 9 Class III personnel, carried out the fair mapping of two 1 : 50,000 departmental sheets and air survey compilation of detail on the 2-inch scale of four 1 : 50,000 sheets.

(*c*) One section under Shri R. L. Sharma (Surveyor), with an average strength of 10 other Class III personnel, was engaged on the following tasks :—

(*i*) Computations of control work executed during the field work 1960-61.

(*ii*) Fair mapping of three 1 : 50,000 departmental sheets.

136. Field Work.—During the field work the party was organised as follows :—

(*i*) *Ground verification and contouring.*—

(*a*) *Camp I.*—Shri Jagjit Singh (Survey Assistant), with 6 other Class III personnel, completed 2,743 square kilometres of ground verification of air surveyed detail and contouring on the ground on 1 : 50,000 scale blue-prints in Bīkaner, Churu and Nāgaur Districts in Sheet 45 E.

(*b*) *Camp II.*—Shri R. L. Sharma, with 7 other Class III personnel, completed 3,906 square kilometres of ground verification of air surveyed detail and contouring on the ground on 1 : 50,000 scale blue-prints in Banās Kāntha, Kutch, Mehsāna and Surendranagar Districts in Sheets 41 E, I and M.

Shri Sharma with two other Class III personnel also completed 528 square kilometres of ground verification of detail on 2-inch scale air photographs, mostly in the *rann* area of Kutch District in Sheets 41 E and I.

(*ii*) *Triangulation and post-pointing.*—

(*a*) Shri R. J. Rana (Surveyor) carried out 1,235 square kilometres of supplementary triangulation and post-pointing in Amreli and Junagadh Districts in Sheets 41 K and L.

(*b*) Shri T. Keshavamurthy (Surveyor, Grade II) carried out 2,155 square kilometres of triangulation and post-pointing in Amreli and Junagadh Districts in Sheet 41 K and also 2,621 square kilometres of supplementary triangulation and post-pointing in Diu in Sheet 41 L and Amreli, Junagadh and Kutch Districts in Sheets 41 E, I, K and L.

Shri Keshavamurthy also completed 40 linear kilometres of theodolite traverse (to supplement existing triangulation) and post-pointing in Kutch District in Sheet 41 E.

(*iii*) *Fair mapping.*—One section under Shri C. Sivaraman (Class II), later replaced by Shri R. Sivaramakrishnan (Class II), with 11 Class III personnel, at party headquarters, carried out the fair mapping of three 1 : 50,000 departmental sheets and air survey compilation of detail on the 2-inch scale of eight (one being part sheet) 1 : 50,000 sheets from ground verified photographs. This also completed original air survey compilation of five (2 being part sheets) departmental sheets for which no ground verification was considered necessary.

137. **Description of Country.**—The areas surveyed during the year under report pertain to different regions—one around Nāgaur in Bīkaner, Churu and Nāgaur Districts of Rājasthān, another around the periphery of Little Rann of Kutch in Banās Kāntha, Mehsāna and Surendranagar Districts of Gujarāt, while the third—divided into two parts—forms parts of Great Rann with its islands and high land around it in Kutch District.

The southern half of the area around Nāgaur is mostly plain with small rocky hills and patches of stony waste. The northern half contains sand dunes varying in relative height from 5 to 40 metres, patches of flat sand and areas clear of sand. On the whole, this region is semi-desert with numerous tanks depending on rain water. The depth of wells is about 50 metres. Vegetation consists of open scrub and scattered *khejri* trees. The area is fairly well-populated.

The area along the periphery of Little Rann is dead plain, being cultivated all over except only a few patches of dry *rann* or salt waste and scrub. The area is well-populated. Castor, ground nuts, gram, wheat, *bājra*, cotton, etc. are the main crops. The vegetation consists of scrub, scattered trees and cactus.

The Great Rann region is composed of low lying *rann* or salt desert and high ground. The former is water logged during greater part of the year due to floods during the monsoon. There are a few islands here and there and also belts of salt beds along the edges. As the heat increases, the ground, baked and blistered by the sun, shines over large tracts of salt with dazzling whiteness, the distance dimmed and distorted by an increasing mirage. Except for low grass on islands, there is no other vegetation. The area is not inhabited as no drinking water is available.

The high ground is composed of pasture-lands of Banni and western rocky foot hills of Pachham island in Sheet 41 E/9, and Khadir island, Gāngta Bet and plains intercepted between *rann* and western extremity of Vāgad hills in Sheet 41 I. The ground is undulating and the rocky hills rise up to 284 metres above mean sea-level. Vegetation consists of high open scrub, scattered trees, cactus and grass. The high ground area is fairly well-populated.

In all the inhabited regions of the above areas, cattle (and camels also in Rājasthān area) are reared and form the main wealth of the rural population. While deer are found in plenty, *nilgais* are also occasionally seen. Wild asses, wolves and wild boars were also seen along the edges of *rann* and in islands inside it. The staple food of the people is *bājra*, while milk—though not abundantly available in Gujarāt area as in Rājasthān—is an important constituent of the diet.

The area triangulated during the year consists of coastal plains bordering the Arabian Sea towards South and West, ending

into rising mass of hills of the beautiful Girnar Range towards North and East in Amreli and Junāgadh Districts of Gujarāt and a part of Diu. The height of the hills rises up to 642 metres above mean sea-level. The famous Gir Forests—the abode of and sanctuary for Indian lions and spotted deer—fall in this area.

138. Techhical Methods.—

Ground verification and contouring.—Air survey sections of detail on the 2-inch scale were compiled from air photographs on approximately the same scale. These were then reduced to the 1 : 50,000 scale by photography and blue-prints obtained for verification and contouring on the ground. Details of the successive stages of the method were similar to those described under the same heading in the General Report of this unit for 1961. The planimetric and height control were provided by triangulation/subsidiary triangulation/traverse by (*i*) No. 3 Party (W.C.) in 1960–61, (*ii*) No. 4 Party (W.C.) in 1957–58, (*iii*) No. 6 Party (S.C.) in 1954–55 and 1955–56 and (*iv*) No. 7 Party (W.C.) in 1957–58.

In respect of air survey sections prepared from ground verified/chalked photographs, mosaicing was obviated and drawing blue-prints were obtained directly.

139. Miscellaneous.—

Climate.—The climate is dry and generally healthy in all the regions. Days are very hot and nights are cold. By about the beginning of March, sand/dust storms set in, when field work becomes difficult and sometimes impossible. Increasing heat aggravates this difficulty all the more.

Communications.—In the Nāgaur region, a metre-gauge railway line passes right across the area from North-west to South-east and many metalled and unmetalled roads cover the area. In addition, there are a number of bus services along tracks radiating from Nāgaur.

The eastern portion of the area adjoining Little Rann is served by a metre-gauge railway line which runs for about 10 kilometres inside the area from East side. There is a metalled road in the North-east and two others bifurcate from this towards the North and South. A couple of unmetalled roads also exist in the same portion.

There are two unmetalled roads in the main land area adjoining Great Rann. Bus services run along many tracks in the whole area during fair weather.

There are some metre-gauge railway lines and metalled roads in the area triangulated. This area is served by buses which run along some tracks during fair weather only.

On the whole, country cart is the main mode of transport though camels are also used frequently in Rājasthān. No means

of transport are available in the *rann* area except for camels of the camel contractor or motor vehicles. The latter can ply only when the *rann* is dry.

Health.—Except for a few minor cases of illness, the health of personnel remained good throughout the period under report.

No. 7 PARTY

Officer in charge :—{ Major M. G. Arur, B.Sc., E.E., Engineers., to 7-2-62. / Shri V. B. Mudkavi, M.Sc., from 8-2-62.

140. **General.**—The party was employed on departmental surveys on the 1 : 50,000 and 2-inch scales in Gujarāt for publication on the 1 : 50,000 scale.

Party headquarters remained at Abu.

141. **Personnel.**—The average strength of the party was 1 Class I Officer, 2 Class II Officers and 36 Class III Division II personnel including Clerks.

142. **Areas Surveyed.**—

6,146 square kilometres of original air survey of detail on the 2-inch scale.

6,351 square kilometres of ground verification and contouring on the ground on the 1 : 50,000 scale for original survey.

4,703 square kilometres of supplementary triangulation.

338 linear kilometres of traverse and post-pointing.

143. **Recess Duties.**—The party was organised into 4 sections as follows :—

(*a*) One section under Shri S. P. Gupta (Class II) to 3-9-61 and Shri P. R. Datta (Class II) from 4-9-61 to 2-10-61 and Shri S. P. Gupta from 3-10-61, with an average of 7 Class III personnel, carried out the fair mapping of three and air survey compilation of detail on the 2-inch scale of another three 1 : 50,000 departmental sheets.

The section was also engaged on the fair mapping of one more 1 : 50,000 departmental sheet.

(*b*) One section under Shri P. R. Datta, with an average of 7 Class III personnel, carried out air survey compilation of detail on the 2-inch scale of one 1 : 50,000 departmental sheet.

The section was also engaged on the fair mapping of three 1 : 50,000 departmental sheets.

(*c*) One section under Shri Jagjit Singh (Survey Assistant) to 8-9-61 and Shri P. R. Datta from 9-9-61 to 15-10-61 and Shri Jagjit Singh from 16-10-61, with an average of 8 Class III Div. II

personnel, carried out the fair mapping of one and air survey compilation of detail on the 2-inch scale of another two 1 : 50,000 departmental sheets.

The section was also engaged on the fair mapping of one more 1 : 50,000 departmental sheet.

(*d*) One computing section under Shri Shiv Datta (Surveyor, Grade II), with an average of 3 other Class III personnel, was engaged on the triangulation computations of nine 1 : 50,000 departmental sheets.

144. **Field Work.**—During the field work the party was organised as follows :—

(*i*) *Ground verification and contouring.*—

(*a*) *Camp I.*—Shri G. B. Das (Class II), with an average of 8 Class III personnel, completed 2,688 square kilometres of ground verification of air surveyed detail and contouring on the ground on 1 : 50,000 scale blue-prints in Ahmadābād, Mehsāna and Surendranagar Districts in Sheet 46 A.

(*b*) *Camp II.*—Shri S. P. Gupta, with an average of 10 Class III personnel, completed 3,663 square kilometres of ground verification of air surveyed detail and contouring on the ground on 1 : 50,000 scale blue-prints in Banās Kāntha, Kutch and Mehsāna Districts in Sheets 41 M and 46 A.

(*ii*) *Supplementary Control and Post-pointing.*—

(*a*) Shri K. C. N. Rao (Surveyor, Grade II) carried out 2,631 square kilometres of supplementary triangulation, 139 linear kilometres of traverse (to supplement existing triangulation) and post-pointing in Ahmadābād, Bānas Kāntha, Mehsāna and Surendranagar Districts in Sheets 46 A and 46 B.

(*b*) Shri Shiv Datta carried out 2,072 square kilometres of supplementary triangulation, 199 linear kilometres of traverse (to supplement existing triangulation) and post-pointing in Banās Kāntha, Baroda, Mehsāna, Pānch Mahāls and Sābar Kāntha Districts in Sheets 46 A and 46 F.

(*iii*) *Fair mapping, Air Survey and Computations.*—

A section at party headquarters under Shri Jagjit Singh to 30-11-61, Shri L. M. Khanna (Class II) from 1-12-61 to 3-1-62, Shri K. N. Saxena (Class II) from 9-1-62 to 28-2-62 and Shri Naranjan Singh (Plane-tabler, Grade III) from 1-3-62, with an average of 7 Class III personnel, carried out the fair mapping of three and air survey compilation of another three 1 : 50,000 departmental sheets.

The section was engaged on the fair mapping of one more 1 : 50,000 departmental sheet and it also carried out triangulation computations of seven departmental sheets.

145. **Description of Country.**—The major portion of the area surveyed consists of very gently undulating plains with fairly

dense vegetation, mostly mango, *neem* and other trees. This area is well irrigated and the main crops are those of *Jowār*, Castor and *Jeera*. The people in general are prosperous and keep large herds of cattle. Their main occupation is farming.

The remaining small portion of the area surveyed consists of *rann* and is devoid of any vegetation and habitation.

146. Technical Methods.—

Ground verification and contouring.—Air survey sections of detail on the 2-inch scale were compiled from air photographs on approximately the same scale. These were then reduced to the 1 : 50,000 scale by photography and blue-prints obtained for verification and contouring on the ground. The successive stages are outlined below :—

(*a*) *Planimetric and height control.*—This was provided by triangulation carried out by No. 7 Party in 1960-61.

(*b*) *Combination.*—This was carried out by the slotted template method. The trigonometrical control post-pointed in the field during 1960-61 was used.

(*c*) *Air survey compilation.*—The air survey compilation of detail was carried out on the 2-inch scale by the graphical method. The principal points were inked up so that they would appear on the resultant blue prints and facilitate the insertion of detail.

(*d*) *Verification and contouring on the ground.*—The detail appearing on the blue-prints was verified and inked up in the field in colours normally used for plane-tabling. In case of two departmental 1 : 50,000 sheets partly covered by the Banās and Sipu River Project Survey and Sarswati commanded area Project survey, blue prints were obtained on 1 : 50,000 scale from the project survey on the 2-inch scale and the same were rapidly verified on the ground, incorporating the vegetation, contours and other changes in the area. Colour and height traces, and name lists were maintained as usual.

(*e*) *Mosaicing.*—The completed plane-table sections were sent, as usual, to the reproduction office for obtaining black prints on the same scale. The mosaicing was carried out at party headquarters.

147. Miscellaneous.—

Climate.—The climate is cold during winter and very hot during summer.

Communications.—There are several motorable roads. All cart-tracks are motorable in 4-wheel drive vehicles. Portions of roads connecting Ahmadābād to Pālanpur and Mehsāna to Deesa fall in the area surveyed. Parts of the railway lines connecting Ahmadābād to Delhi, Ahmadābād to Viramgām, Mehsāna to Harij, Mehsāna to Viramgām and Pālanpur to Gandhi Dhām also fall in this area.

Health.—The health of the party personnel remained satisfactory.

Supplies.—Buses and carts form the main mode of transport. Labour is not readily available.

No. 31 PARTY

Officer in charge :—Shri G. S. Oberoi, M.A.

148. General.—The party was employed on the fair mapping of sheets of the Chambal Hydel and Irrigation Project for the Government of Madhya Pradesh, and of Forest sheets required by the Conservator of Forests, Junagadh Circle, Junāgadh, and on surveys for the Project 'Reclamation of the Little Rann of Kutch' for the Government of Gujarāt.

Party headquarters remained at Poona.

149. Personnel.—The average strength of the party was 2 Class I Officers, 1 Class II Officer and 28 Class III personnel including Clerks.

150. Areas Surveyed.—

3,618 square kilometres of ground verification on 2-inch scale.

1,365 square kilometres of original air survey of detail on the 2-inch scale.

1,121 square kilometres of ground verification and contouring on the ground on the 1 : 50,000 scale for original survey.

236 square kilometres of ground verification and contouring on air photographs on the 2-inch scale for original survey.

73 square kilometres of supplementary triangulation (for Project 'Reclamation of the Little Rann of Kutch').

76 linear kilometres of secondary theodolite traverse with stone laying.

1,098 linear kilometres of tertiary theodolite traverse with stone laying.

415 linear kilometres of double tertiary levelling.

1,849 linear kilometres of single tertiary levelling. (for the Project 'Reclamation of the Little Rann of Kutch').

376 square kilometres of original air survey on the 2-inch scale.

151. Recess Duties.—During recess the party was organised into 4 sections as follows :—

(*a*) One drawing section under Shri C. S. Joshi (Class I), with 4 Class III personnel, was engaged in the fair mapping of

six forest sheets and air survey compilation of detail of 683 square kilometres on the 2-inch scale for subsequent blue-print verification.

(*b*) One drawing section under Shri R. I. Sivaramakrishnan (Class II), with 4 Class III personnel, was engaged in the fair mapping of six forest sheets. The same section completed 2-inch air survey compilation of three sheets of the Bhind Canal Area and fair mapping on the 2-inch scale of two sheets of the Gāndhisāgar Reservoir.

(*c*) One drawing section under Shri R. Agor (Surveyor), with 3 other Class III personnel, was engaged in the fair mapping of six forest sheets and air survey compilation of detail of 682 square kilometres on the 2-inch scale for subsequent blue-print verification.

(*d*) One computing section under Shri N. Kothandaraman (Surveyor, Grade II), with 4 Computers, completed the computations of traverse done during field work 1960–61 for 'Reclamation of the Little Rann of Kutch'.

152. Field Work.—During the field work the party was organised as follows :—

(*a*) *Camp I.*—Shri C. S. Joshi, with 14 Class III personnel, completed the following tasks :—

(*i*) For the Project – Reclamation of the Little Rann of Kutch – in Kutch District in Sheets 41 I and M.

1,098 linear kilometres (including offset lengths) of tertiary theodolite traverse with stone laying.

415 linear kilometres of double tertiary levelling.

(*ii*) For departmental 1 : 50,000 surveys in Banās Kāntha, Kutch, Mehsāna, Rājkot and Surendranagar Districts :—

1,121 square kilometres of ground verification of air surveyed details and contouring on the ground on 1 : 50,000 scale blue-prints for original survey in Sheets 41 M/2, 3, 4, 6, 8.

236 square kilometres of ground verification and contouring on 2-inch air photographs for original survey in Sheets 41 M/2, 3.

73 square kilometres of supplementary triangulation.

(*b*) *Camp II.*—Shri L. M. Khanna (Class II) up to 3-4-62 and Shri C. S. Joshi from 4-4-62, with 7 Class III personnel, completed 3,618 square kilometres of ground verification on 2-inch scale blue prints (original and revision survey) and 428 linear kilometres of single tertiary levelling for the Project 'Reclamation of the Little Rann of Kutch' in Kutch District.

(*c*) *Camp III.*—Shri R. Agor from 12-3-62, with 14 other Class III personnel, completed 1,421 linear kilometres of single tertiary levelling for the project 'Reclamation of the Little Rann of Kutch' in Kutch District.

(*d*) *Traverse Detachment.*—Shri N. Kothandaraman completed 76 linear kilometres of secondary theodolite traverse with stone laying for 'Reclamation of the Little Rann of Kutch' project in Kutch District.

(*e*) *Headquarters Section.*—A section under Shri R. Agor up to 7-3-62 (and thereafter under the direct supervision of the Officer-in-Charge) with 5 Draftsmen was engaged in the fair mapping of 32 forest sheets.

153. **Description of Country.**—

(*a*) *Area surveyed on the 1 : 50,000 scale.*—Part of the area lies to the north-west of the Little Rann of Kutch and part of it to the south-west. A small area lying to the north-east of the Little Rann of Kutch was also surveyed.

In the south-western part, the area consists of open plains with small undulations and low hills. Halvad Taluka in this region, is mosty canalised. Main crop grown is cotton, though *bājra*, groundnuts, etc. are also grown. Halvad and Dhrāngadhra, in this area, are connected by a railway line and a road which is partly metalled. Regular bus services link the various villages of this region.

Water is scarce in these parts, more so in the north-western parts of the area.

Climate over these parts is usually dry and generally healthy, though it is characterised by extremes of temperature. Dust storms are experienced in the area from about the end of March when the field work becomes very difficult.

The inhabitants of the area are generally co-operative. Their main occupation is agriculture.

(*b*) *Area surveyed on the 2-inch scale for Reclamation of the Little Rann of Kutch.*—The area falls in the Little Rann of Kutch and its description appears in the General Report of the unit for 1961. A further report is given below :—

The *khar* which covered vast areas of the *rann* in field work 1960-61 was found virtually absent in field work 1961-62 and it is ascribed to the comparatively heavy rainfall in 1961. The *rann*, except for its western parts near the sea and areas near the out-fall of rivers, which were covered by water, was almost completely dry by about end of February and constituted ideal ground for motoring from end to end. At a few places in the *rann*, some very soft and slushy spots were seen which could be fatally dangerous to careless motorists. These spots could, however, be easily distinguished on the ground by their peculiar appearance.

Some wild boars are met with in the forests of the south-western fringe of the *rann*. Deer exist in plenty near the fringes and the *bets*, in the western part of the *rann*, and are seen leaping high in the morning sun with sheer joy, apparently carefree from the onslaught of hunters.

Mardakh Bet is the highest in the *rann* and is visible from long distances and constitutes a useful landmark. It contains some sort of semi-precious stone which is being extracted by a contractor who has taken lease for the purpose. Some of the *bets* are very thickly wooded and according to local information they are supposed to have some leopards, tigers and bears, but their existence was not witnessed by the survey personnel.

154. **Technical Methods.**—

(*a*) *Departmental surveys.*—

(*i*) *Ground verification and contouring on the 1 : 50,000 scale.*—Air survey sections of detail on the 2-inch scale were compiled from photographs on the same scale, combination having being done by the slotted template method. These were then reduced to the 1 : 50,000 scale by photography and blue-prints obtained. Ground verification of detail and contouring at 20 metres V.I. was carried out on these blue-prints by the normal methods.

(*ii*) *Photo verification on 2-inch air photographs.*—For part of the area under departmental survey, which could not be covered by 1 : 50,000 survey due to dearth of control and consequent lack of blue-prints from air survey sections, photo verification was resorted to. Normal methods were employed from the photo verification of detail and contours at 20 metre vertical interval were delineated on photos, with the help of height charts on the 2-inch scale.

(*iii*) *Supplementary triangulation.*—This was carried out by normal methods in part of sheet 41 M/2 to supplement the existing control which was insufficient for air survey combination of the photos of the area.

(*b*) *Survey of the Little Rann of Kutch.*—The indentor's requirements are contoured maps of the area on the 4-inch scale with contours at a vertical interval of 2 feet in the plains and 10 feet in *bets*. To meet this demand it was planned to provide planimetric control by secondary and tertiary theodolite traverse and height control by double tertiary and single tertiary levelling. It was intended to carry out the verification of detail on blue prints of the area by the usual plane-tabling methods; contours would be interpolated later, in the office, from spot heights.

A detailed description of the technical methods employed for the provision of control (Secondary and Tertiary Traverse and Levelling) appears in the General Report of the unit for 1961. Ground verification was carried out on 2-inch scale blue-prints—obtained from air survey sections or old 1-inch maps or 1-inch

Kandla Port Survey Sheets (Auxiliary Area) or 1 : 50,000 scale P.T. Sections whichever was available for the area. Form-lines were drawn on *bets* to facilitate the correct shaping of contours which were to be drawn later in the headquarters. Colour traces and village lists were maintained where necessary.

(*c*) *Fair mapping of Forest Sheets.*—Mosaics were prepared by the usual methods and drawing blue-prints obtained. The sheets, as in the case of all forests sheets, were bounded by $7\frac{1}{2}'$ in longitude and $3\frac{3}{4}'$ in latitude. Two originals on cartridge paper, one for outline and names including the north marginal items and the other for contours, were prepared on the 2-inch scale. Separate applique slips were prepared for the south marginal items. For sheets, in which the contours were few, the brown details were incorporated on the outline original itself. The maps were to be printed on 4-inch scale in black, brown and yellow.

155. **Miscellaneous.**—

Climate.—The climate in the area surveyed during the field work is dry and fairly healthy. Days are usually hot and summer is very severe; but nights are mostly pleasant. Strong dust storms, thick haze and unusual lateral refraction manifest themselves in the area after the middle of February and thereafter no instrumental work is possible between 10 a.m. and 4 p.m.

Communications.—The area other than *rann* is well connected by rail and road. There are hardly any good means of communication in the *rann*. The *rann* is fit for wheeled traffic when dry; but in many places, the apparently hard upper surface may conceal mud underneath, and in such areas vehicles are liable to get bogged. Camels are not available for transport in the *rann* due to difficulty in procuring fodder and water; nor are they suitable because during the day the scorching salty earth is likely to develop sores in their feet and cripple them. Lastly, there is the impending fear of the camelman losing his bearing in the interior of the *rann*.

Health.—Health of the personnel remained satisfactory till end of February. Thereafter there were frequent cases of dysentery and fever.

No. 32 PARTY

Officer in charge :— Shri V. Rangan, M.A., to 17-6-61.
Shri V. Krishnamurty, M.A., A.R.I.C.S., A.M.I.S., from 18-6-61 to 27-3-62.
Lt.-Colonel D. N. Sharma Atri Harnal, Engineers, from 28-3-62.

156. **General.**—The party was employed on the following work :—

(*a*) Surveys for the preparation of the Approach and Landing Charts of Baroda, Bhaunagar, Bhuj and Jaipur Aerodromes to I.C.A.O. specifications.

(*b*) Surveys for Ghed Flood Control and Reclamation Project in sheets 41 G/5, 6, 9, 10, 14, 15, 16 and 41 K/2, 3, 4, 7.

(*c*) Verification of office copy corrections in sheets 55 D/5 and 55 H/6.

(*d*) Verification of inter-state boundary in sheets 46 H/13 and H/14.

(*e*) Post-pointing of trigonometrical control on the ground on 2-inch photographs for departmental surveys in sheets 41 J/9, 13, and 41 N/1, and for Ghed Project in sheets 41 K/2, 3, 4 and 7.

The headquarters of the party remained at Abu throughout the period under report.

157. **Personnel.**—The average strength of the party was 1 Class I Officer, 2 Class II Officers and 30 Class III personnel including Clerks.

158. **Areas Surveyed.**—

176 square kilometres of ground verification and contouring on the ground on the 1 : 50,000 scale for revision survey of Landing Charts.

7,460 square kilometres of verification survey on the 1 : 250,000 scale for Approach Charts.

1,150 square kilometres of 2-inch ground verification of air photos for original survey for Ghed Project.

1,507 square kilometres of 2-inch ground verification of air photos for revision survey for Ghed Project.

1,440 square kilometres of 1-inch verification survey of office copy corrections for departmental sheets.

3,496 square kilometres of post-pointing of plan control on 2-inch photographs for departmental surveys (2,331 sq. km) and Ghed Project (1,165 sq. km).

3,740 linear kilometres of single tertiary levelling.

525 linear kilometres of double tertiary levelling for Ghed Project and Landing Charts.

48 linear kilometres of ground verification of inter-state boundary on 4-inch maps.

159. **Recess Duties**—One computing section under Shri K. L. Puri (Surveyor, Selection Grade) completed the computations of supplementary triangulation done for Landing Charts of Juhu, Kandla, Santa Cruz and Udaipur Aerodromes.

160. **Field Work.**—The field work was organised as under :—

(*i*) *Ghed Flood Control and Reclamation Project.*—Two camps, one under Shri S. S. Chabbra (Class II), with 10 Class III personnel, with headquarters at Keshod and another under Shri P. R. Datta (Class II), with 11 Class III personnel, with headquarters at Porbandar, were employed on levelling and ground verification of 2-inch air photographs. On transfer from the unit of these two Camp Officers on 10-2-62 and 22-2-62 respectively, these

two camps were combined into one, with headquarters at Porbandar, under Shri K. L. Puri, assisted by Shri C. S. Ojha (Survey Assistant). These camps completed 2,657 square kilometres of photo verification, 3,731 linear kilometres of single tertiary levelling (excluding levelling in abreast directions) and 519 linear kilometres of double tertiary levelling in Jāmnagar and Junagadh Districts.

(*ii*) *Aerodrome Surveys.*—One camp under Shri K. L. Puri, with 6 other Class III personnel, completed the following :—

(*a*) For Landing and Approach Charts of Baroda, Bhaunagar, Bhuj and Jaipur Aerodromes :—

9 linear kilometres of single tertiary levelling.

6 linear kilometres of double tertiary levelling in Baroda, Bhaunagar and Kutch Districts.

176 square kilometres of revision survey on 1 : 50,000 scale blue-prints for the Landing Charts in Baroda, Bhaunagar, Jaipur and Kutch Districts.

7,460 square kilometres of verification survey on 1 : 250,000 scale blue/colour prints for the Approach Charts in Amreli, Baroda, Bhaunagar, Jaipur, Kaira, Kutch and Pānch Mahāls Districts.

(*b*) Verification of communications and office copy corrections of 1,440 square kilometres in 1-inch sheets 55 D/5 and 55 H/6 for departmental reissue sheets in Akola, Buldāna and East Khāndesh Districts.

(*c*) Ground verification on the 4-inch scale of 48 linear kilometres of inter-state boundary demarcating Gujarāt and Mahārāshtra States and touching the Dāngs, Nāsik and West Khāndesh Districts.

(*iii*) *Independent Detachment.*—Shri Sewa Singh (Surveyor, Grade II) completed the post-pointing of trigonometrical control on 2-inch photographs of 2,331 square kilometres in and around sheets 41 J/9, 13 and 41 N/1 for departmental surveys in Jāmnagar, Rājkot and Surendranagar Districts and 1,165 square kilometres in sheets 41 K/2, 3, 4 and 7 for Ghed Project in Junagadh District.

161. **Description of Country.**—The country around Baroda consists of plains covered with a network of railways and roads.

The country around Bhaunagar consists of undulating ground with scattered hills and open or marshy plains with several rivers that drain into the Gulf of Cambay. The area in the north has scanty means of communication but the southern portions are fed by a railway line and a few roads. One third of the area of the Approach Chart is covered by the Gulf of Cambay and the islands therein.

The country around Bhuj consists of undulating ground interspersed with hills except for the dry *rann* in the north and north-east. Bhuj is connected by a railway line and several roads.

The country around Jaipur consists of plains with scattered hills, mostly around Jaipur, rising to about 250 metres above the surrounding plains. The area has a network of roads and railway lines.

The Ghed Irrigation and Reclamation Project area falling in sheets 41 G/5, 6, 9, 10, 14, 15, 16 and 41 K/2, 3, 4, 7 mostly comprises the deltas of numerous rivers and considerable stretches of *rann*, abutting the sea shore.

There are numerous low sand dunes along the sea shore with rocky mounds towards mainland. The area in the north-west beyond Vartu River is mostly hilly.

The area is covered by a network of roads and is connected by railways also. There are several big villages in the area.

162. Technical Methods.—

(*a*) *Aerodrome Surveys.*—For the Landing Charts, blue prints on 1 : 50,000 scale were obtained by photography from the existing landing charts or from mosaics obtained by the previous modern surveys on 1 : 50,000 or larger scales as available and the revision survey was carried out on these blue-prints by the normal plane-tabling methods. Both the foot and metre contours were surveyed at 50 feet and 20 metres vertical intervals respectively.

The verification survey on 1 : 250,000 scale for Approach Charts was carried out on colour (steel grey) prints except in the case of Baroda Aerodrome for which it was done on a blue-print. These prints were obtained by photography either from the existing approach charts or from the mosaics of the latest available $\frac{1}{4}$-inch maps of the areas concerned. Normal plane-tabling methods were used. The 100 metre contours were interpolated with the help of existing foot contours and verified on the ground.

(*b*) *Ghed Project.*—Indentor's requirements are 4-inch maps of the area in black and brown with contours at a vertical interval varying from 1 foot in plains to 25 feet in hills. On low sand dunes bordering the sea only spot heights are required. To meet this demand, height control was provided with levelling. Verification of detail and 25 feet contouring on hills was done on 2-inch air photographs while contours in plains were intended to be interpolated later, in the office, from spot heights provided by levelling. The various operations are described below :—

Double Tertiary Levelling.—This was carried out along main roads and tracks in the area at an interval of 7 to 10 miles. *En-route*, bench-marks were established every $\frac{1}{2}$ mile approximately.

Single Tertiary Levelling.—Level lines were run nearly $\frac{1}{2}$ mile apart, starting from and closing on double tertiary bench-marks, and all staff positions were pricked on a set of photographs. On alternate lines, at about 1 mile interval, stones of size 36 inches by 6 inches by 6 inches were embedded leaving about 8 inches protruding above general ground level and connected by levelling

so as to serve as bench-marks for future use of the indentor. Almost every 10 chains, abreast heights were also observed, 10 to 13 chains away, at right angles to the direction of tertiary lines alternately to the left and the right.

Photo verification and contouring.—Photo verification was carried out by the normal methods. Administrative boundaries, names, vegetation, etc. were rigorously surveyed/picked up in areas falling in sheets 41 K/2, 3, 4 and 7 which were not covered previously by modern surveys. 25 feet contouring on hills was done under fusion on the air photographs on the ground with the help of clinometric heights taken from the surrounding double or single tertiary bench-marks and existing trigonometrical control.

Air survey and mapping.—Air survey combination is proposed to be done by the slotted template method with the help of existing trigonometrical control which was post-pointed in the field. Two originals will be prepared on koda trace on 2-inch scale for enlargement to 4-inch scale—one for outline and names and the other for contours which will be interpolated in plain areas with the help of spot levels pricked in the field.

163. Miscellaneous.—The general health of the field personnel was satisfactory till mid-April. Thereafter, there were a few cases of sickness due to the advance of summer. There was one case of death of a Class III Officer in the field on account of typhoid.

VII. SURVEY REPORTS, TRAINING DIRECTORATE

DIRECTOR :—
- Colonel S. K. S. Mudaliar, B.A., A.M.I.E., M.R.S.H., M.I.S., to 22-5-61.
- Colonel J. A. F. Dalal, B.A. (Hons.), P.S.C., M.I.S., from 23-5-61 to 20-8-61 and again from 14-9-61.
- Shri K. C. Gosain, B.A., M.I.S., from 21-8-61 to 13-9-61.

DEPUTY DIRECTOR :—
- Shri J. C. Sikka, B.A., A.M.I.S., to 11-6-61.
- Lt.-Colonel M. M. Datta, B.Sc. (Hons.), B.E. (Civil), M.Sc., Ph.E. (I.T.C.), A.M.I.E., M.I.S., Engineers, from 12-6-61 to 20-8-61 and again from 20-12-61 to 5-3-62.
- Colonel J. A. F. Dalal, B.A. (Hons.), P.S.C., M.I.S., from 21-8-61 to 13-9-61 and 14-9-61 to 24-9-61 (in addition to his duties as Director).
- Lt.-Colonel M. L. Chopra, B.Sc., B.E., A.M.I.E., Engineers, from 25-9-61 to 19-12-61.

164. Summary.—The Air Survey and Training Directorate was redesignated as Training Directorate, with effect from 1st March, 1962. The following units were under the administrative control of the Training Directorate :—

Nos. 11, 13 (from 1-3-62), 15 (Training), 16 (Training), 20 (up to 28-2-62), 22 (up to 28-2-62), 23 (from 1-10-61 to 28-2-62) and 26 (up to 30-8-61) Parties. Work of Nos. 11, 13, 15 and 16 Parties is described in this Directorate's report, that of Nos. 20, 22, 23 and 26 Parties appears under the Northern Directorate's report.

165. Areas Surveyed.—

2,163 linear kilometres of double tertiary levelling.

24,025 linear kilometres of single tertiary levelling.

33 linear kilometres of check levelling.

650 square kilometres of 100-acre sub-rectangulation for Bhākra Project.

No. 11 PARTY

Officer in charge :—
- Captain G. M. Kamra, B.Sc. (Civil Engg.), A.M.I.E., Engineers, to 16-7-61.
- Shri K. Satyanarayana, M.A., from 17-7-61.

166. General.—The party continued to be employed on surveys regarding flood control investigations in West Bengal.

The headquarters of the party remained at Rānchi throughout the period under report.

167. **Personnel.**—The average strength of the unit during the period under report was 1 Class I Officer, 1 Class II Officer and 32 Class III personnel including 4 Clerks and 3 Drivers.

168. **Areas Surveyed.**—

1,020 linear kilometres of double tertiary levelling for flood control investigations.

4,934 linear kilometres of single tertiary levelling for flood control investigations.

33 linear kilometres of check levelling.

169. **Recess Duties.**—3 technical sections under Sarva Shri B. K. Satpathi and J. K. Chatterjee (Class II), and Shri S. C. Ghosh (Surveyor) completed preparation of 39 spot heighted mosaics on 4-inch scale comprising an area of 2,849 square kilometres in Birbhūm, Burdwān, Midnapore, Murshidābād and 24-Parganas Districts of West Bengal.

A computing section under Shri B. K. Satpathi (Class II) completed computation of heights in an area of 3,263 square kilometres, surveyed during the field work 1960-61. 2 computers continued their work regarding compilation of levelling data under Shri S. C. Ghosh (Surveyor) at party headquarters throughout the field work.

170. **Field Work.**—Two field camps under Shri J. K. Chatterjee (Class II) and Shri T. Rangarajan (Surveyor, Grade II), with an average total strength of 16 Class III Division II personnel, completed 1,020 linear kilometres of double tertiary levelling, 4,934 linear kilometres of single tertiary levelling (including identification and pricking of heighted positions on 2-inch air photographs) and 33 linear kilometres of check levelling, in an area of 3,626 square kilometres in Burdwān, Hooghly, Howrah and Midnapore Districts of West Bengal. Specified items of detail like main drainages and protective bunds were verified on the ground and marked on the photographs. Also, names of main water channels, large *'bils'* and prominent villages were picked up for incorporation on the mosaics. Computations in the field were handled by two computers, one in each camp.

171. **Description of Country.**—The area consists of flat cultivated plains with fairly dense vegetation and numerous water channels and tanks. Most of the area is likely to be under water in the monsoon period, and up to the end of December the areas continue to be water-logged and swampy. There are no good communications in the area excepting for a railway line and a few metalled roads. Rickshaws on the protective bunds and boats plying along the tidal creeks in the area provide the means of access to the interior places.

172. **Technical Methods.**—Three main double tertiary lines of total length 258 kilometres were run along the limits of the

area based upon the existing precision levelling bench-marks remaining intact. Two levellers worked in opposite directions on these lines, each leveller taking two sets of observations at each station. Bench-marks were established at approximately 0·8 kilometre interval along these lines.

Other double tertiary lines based upon the bench-marks of the above main double tertiary and precision lines were run only in one direction taking two sets of observations at each station and establishing bench-marks at about 0·8 kilometre interval. These bench-marks provided the control for single tertiary lines run approximately 0·8 kilometre apart all over the area. Abreast heights at a distance of about 0·2 kilometre were taken on both sides of these tertiary lines at interval of about 0·2 kilometre along them. All the heighted positions including the staff positions at interval of 0·2 kilometre along the tertiary lines were identified and pricked on the 2-inch air photographs, thus producing a network of heights at intervals of 0·2 to 0·4 kilometre throughout the area.

173. **Miscellaneous.**—The health of all personnel remained satisfactory during the period under report.

No. 13 PARTY

Officer in charge :— Major S. R. Kishore, Engineers, to 8-6-61.
Captain R. K. Aggarwala, B.Sc., B.E. (Elec.), Engineers, from 9-6-61 to 18-6-61.
Shri A. K. Sanyal, B.Sc. (Hons.), from 19-6-61.

174. **General.**—The party continued to be employed on rectangulation and levelling in the commanded areas of Bhākra Dam Project in the Punjab State.

Headquarters of the party during recess remained at Mussoorie ; field headquarters opened at Charkhi Dādri on 13th November 1961 and closed thereon 11th April 1962.

175. **Personnel.**—The average strength of the party was 1 Class I Officer, 2 Class II Officers and 47 Class III Division II personnel including Clerks.

176. **Areas Surveyed.**—

19,091 linear kilometres of single tertiary levelling to 25-acre corners (covering 4,325 square kilometres of area).

650 square kilometres of sub-rectangulation to 100-acre corners.

1,143 linear kilometres of double tertiary levelling.

One inch verification survey of office copy corrections in 1 full and 6 part one-inch sheets.

177. **Recess Duties.**—During recess the party was organised into 3 sections, supervised by Sarva Shri K. C. Saxena (Class II), K. K. Tyagi (Class II) and S. L. Behal (Surveyor) as Section Officers.

In all, 90 sheets of Bhākra Dam Project survey, covering about 4,372 square kilometres were mapped and submitted for publication. 3 sheets of Rājasthān Canal Project, covering nearly 243 square kilometres and fair drawn during 1960 recess were also submitted for publication after final corrections.

178. **Field Work.**—The field work was organised and completed as under :—

No. 1 Camp.—Shri A. C. Chawla (Class II), with an average of 12 Class III personnel, with camp headquarters first at Mahendragarh and later at Gurgaon, completed 412 square kilometres of sub-rectangulation to 100-acres, 444 linear kilometres of double tertiary levelling and 7,066 linear kilometres of single tertiary levelling to 25-acre rectangle-corners (covering 1,657 square kilometres area) in Gurgaon, Mahendragarh and Rohtak Districts of the Punjab.

In addition to the above, verification of office copy corrections in parts of 1-inch sheets 53 D/7, 8, 15, 16 and 53 H/3 was also done in those districts. A few major details were also picked up in the area of work.

No. 2 Camp.—Shri T. K. Maitra (Surveyor), with an average of 8 other Class III personnel, with camp headquarters at Lohāru, completed 44 square kilometres of sub-rectangulation to 100-acres, 340 linear kilometres of double tertiary levelling and 5,099 linear kilometres of single tertiary levelling to 25-acre rectangle-corners (covering 1,114 square kilometres area) in Hissār and Mahendragarh Districts of the Punjab.

No. 3 Camp.—Shri N. K. Saxena (Survey Assistant), with an average of 11 other Class III personnel, with camp headquarters first at Charkhi Dādri and later at Bāgha Purāna, completed 194 square kilometres of sub-rectangulation to 100-acres, 359 linear kilometres of double tertiary levelling and 6,926 linear kilometres of single tertiary levelling to 25-acre rectangle-corners (covering 1,554 square kilometres) in Bhatinda, Ferozepore, Ludhiāna, Mahendragarh, Rohtak and Sangrūr Districts of the Punjab.

In addition to the above, verification of office copy corrections in sheets 53 D/2 and part of 53 D/6 was done in Hissār and Mahendragarh Districts.

179. **Description of Country.**—The area can be described as of three types as below :—

(*a*) *Kot Kapūra area.*—The area is generally flat, irrigated and cultivated but with occasional sand mounds. The cultivation is extensive and the area is densely populated. Numerous metalled roads have been constructed in recent years and more are under construction.

(*b*) *Lohāru area.*—The area is almost desert-like with more of sand mounds than flat area and with poor cultivation. Communications are poor with only one metalled road for the

vast area. There is no irrigation facility in the area and drinking water is not readily availabe. The area is rather thinly inhabited.

(*c*) *Dādri, Gurgaon, Mahendragarh area.*—The topography of the area is in between those of the areas mentioned above. The desert-like character is less prominent. Some amount of irrigation facility by wells exists. Density of population is medium and communication system is moderately developed.

180. Technical Methods.—

(*i*) *Rectangulation.*—3000-acre rectangulation was already done in previous years.

For the sub-division of these 3000-acre rectangles into 100-acre (2,200 feet × 1,980 feet) rectangles, in the cases where this was not already done by Consolidation of Holdings Department, Punjab, normal methods were applied.

Stones of size 6 inches × 6 inches × 30 inches were embedded with about 10 inches projecting above the surface of the ground, at each corner of 100-acre rectangles.

(*ii*) *Levelling.*—Double tertiary levelling based on Primary and Secondary bench-marks was done along the east-west boundaries of each Bhākra sheet. Single tertiary levelling lines were run providing heights to the corners and to the middle points of each side of 25-acre rectangles.

(*iii*) *1-inch Verification survey.*—To provide, as far as possible, a latest base of outline to the Bhākra Dam Project Survey sheets, verification of office copy corrections of departmental 1-inch sheets was done in respect of such area where such verification or rigorous revision were not done recently or are not being done concurrently by any other unit.

No. 15 (TRAINING) PARTY

Officer in charge :—
- Major N. K. Sen, B.Sc. (Hons.), A.M.I.E., M.I.S., Engineers, to 11-6-61.
- Major G. C. Agarwal, B.E. (Hons.) (Civil), Engineers, from 12-6-61 to 30-7-61.
- Major Y. Ramachandran, B.Sc. (Mining), Engineers, from 31-7-61 to 25-12-61.
- Major D. P. Hajela, B.Sc., B.E. (Civil), Engineers, from 26-12-61.

181. General.—The party continued to be employed on training the officers of the department of and above the grade of Topographical Trainees Type 'A' of Class III Division I Service on their first appointment. To meet the urgent requirement of trained personnel for important survey tasks, the period to be spent in the training party by Class II Officers and T.Ts.T. 'A' (Topographical Trainees Type 'A' of Class III Division I) Service was reduced from 2 years to 1 year. The period of training of Class I Officers continued to be 2 years. The first 1-year course commenced in October 1961. Special courses were also run for training extra-departmental officers.

The headquarters of the unit remained at Dehra Dūn through out the period under report.

182. Personnel.—The average strength of the instructional staff was 1 Class I, 1 Class II and 4 Class III (Division I) Officers.

183. Training.—The following courses of instruction were run during the period :—

(*a*) *1959-61 Course.*—

1 Corps of Engineer Officer,
6 Class II Officers and
11 Class III Officers (T.Ts.T.'A')

completed their training and were relieved for posting to other units.

(*b*) *1960-62 Course.*—

4 Corps of Engineer Officers,
2 Class II Officers and
1 Class III Officer (T.T.T.'A')

continued their training. However, due to the immediate requirement for survey tasks, the training of 2 Class II Officers was curtailed and they were relieved in March 1962.

(*c*) *1961-62 Course.*—

1 Class II Officer and
7 Class III Officers (T.Ts.T.'A')

commenced their training. This was the first 1-year condensed course, which was run for Class II Officers and T.Ts.T.'A', commencing in October 1961.

(*d*) *1961-63 Course.*—

3 Corps of Engineer Officers, on attachment and
1 Class I Officer (Civil)

commenced their training in December 1961.

(*e*) *Special Courses for Officers from States.*—One officer from the Department of Land Records and Surveys, Bihar State, reported for training during November 1961 for 6 weeks and was then attached to the Map Publication Offices for further training for 6 weeks.

Two officers from the Department of Land Records and Surveys, Madhya Pradesh State, reported for a comprehensive training course (9 months) in December 1961. One of them was, however, withdrawn from training after two months, at his own request.

184. Recess Duties.—During recess, the trainees were given theoretical instructions in survey subjects, and practical training in air survey and drawing.

On completion of their training, 1 Class I Officer and 6 Class II Officers of the 1959-61 course sat for the Intermediate Examination of the Institution of Surveyors at the end of September 1961. 5 Class II Officers qualified in this examination. 11 Class III

Officers (T.Ts.T.'A') of the 1959–61 course also sat for the prescribed departmental examination at the end of September 1961 and eight of them qualified.

185. **Field Work.**—The trainees of the 1960–62 course received training in topographical triangulation, Hunter Short Base traverse, plane-tabling on 1 : 50,000 scale, ground verification on colour prints and on air photographs, astronomical observations and barometric levelling. Due to urgent requirement of survey tasks, 2 Class II Officers were given accelerated training in barometric levelling, astronomical observations, and ground verification on colour prints and on air photographs, after their regular training up to plane-tabling on 1 : 50,000 scale and were relieved from this party in March 1962. The remaining officers were given training in rectangulation and carried out individually a survey scheme of one week's duration.

The trainees of the 1961–62 course received training in chain survey and plane-tabling on 1 : 1,000 scale, plane-tabling on 1 : 25,000 and 1 : 50,000 scales, tertiary levelling, tertiary and secondary theodolite traversing, Hunter Short Base traverse, topographical triangulation, astronomical observations and barometric levelling, ground verification on colour prints and on air photographs and carried out individually a survey scheme of one week's duration.

The trainees of the 1961–63 course, received training in plane-tabling on 1 : 1,000, 1 : 4,000 and 1 : 25,000 scales, tertiary levelling and tertiary and secondary theodolite traversing.

The trainee from the State of Madhya Pradesh, received training in all items of the 1961–62 course and was also given training in rectangulation. The trainee from Bihār State was given accelerated training in plane-tabling on large scales and in tertiary theodolite traversing.

186. **Miscellaneous.**—The health of all personnel remained satisfactory.

No. 16 (TRAINING) PARTY

Officer in charge :—Captain Prabhakar Misra, B.SC., B.E. (Civil), Engineers, to 20–8–61.
Captain S. R. Kishore, Engineers, from 21–8–61 to 7–9–61.
Shri R. M. Gupta, M.SC., from 8–9–61 to 25–12–61.
Shri N. N. Dhawan, B.A., from 26–12–61.

187. **General.**—The headquarters of the party remained at Dehra Dūn throughout the year and the party continued to function as a training unit for Topographical Trainees Type 'B', Class III Service. Due to the urgency of requirements, the normal two years course was condensed to that of one year.

188. **Personnel.**—The average strength of the instructional staff was 1 Class I Officer, 1 Class II Officer, 1 Surveyor and 9 Survey Assistants.

189. **Training.**—20 Topographical Trainees Type 'B' on 2 years course and 17 Topographical Trainees Type 'B' on 1 year condensed course completed their training.

10 Topographical Trainees Type 'B' joined the unit for training in plane-tabling and air survey, from Northern Circle. Of these, 6 completed the training during the period under report and were posted out, 2 could not complete the training due to sickness and the remaining 2 did not prove suitable.

69 Topographical Trainees Type 'B' joined this unit in batches for training in the condensed course of plane-tabling and air survey.

2 Nepalese trainees joined the unit for training under the auspices of the Colombo Plan.

190. **Recess Duties.**—The training was organised under Shri G. N. Dubey (Class II) assisted by 6 Survey Assistants. The trainees of the two years course completed their air survey training and the trainees of the one year course completed rapid training in draftsmanship for 4 weeks and in air survey for 12 weeks, before final postings.

The new batches of trainees were put on preliminary drawing practice before taking the field.

191. **Field Work.**—The field work was organised under Shri G. N. Dubey (Class II) assisted by 9 Survey Assistants. The trainees completed training in plane-tabling on 1 : 1,000, 1 : 25,000 and 1 : 50,000 scales in Dāk Pathar, Kata Pathar and Chakrāta areas followed by post-pointing and photo-verification in Nāgal-Rājpur areas in Dehra Dūn District.

192. **Description of Country.**—Plane-tabling and chain survey on 1 : 1,000 scale were carried out in partly built-up area and partly open country containing well defined details. The country covered by survey on scale of 1 : 25,000 consisted of river valley terraces flanked by hills partly covered with fairly dense vegetation. The country surveyed on scale of 1 : 50,000 comprised high bare hills sloping down to steep narrow valleys.

193. **Miscellaneous.**—Health of the personnel remained generally satisfactory.

VIII. SURVEY REPORTS, GEODETIC AND RESEARCH BRANCH

PRESIDENT :—*In abeyance.*

DEPUTY DIRECTOR:—
- Colonel S. K. S. Mudaliar, B.A., A.M.I.E., M.R.S.H., M.I.S., to 12-5-61.
- Lt.-Colonel J. A. F. Dalal, B.A. (Hons.), p.s.c., M.I.S., Engineers, from 13-5-61 to 1-7-61.
- Lt.-Colonel K. L. Khosla, B.Sc., B.E. (Civil), A.M.I.E., M.A.S.C.E. (U.S.A.), Engineers, from 2-7-61.

194. **Summary**.—The normal function of the Geodetic and Research Branch are purely geodetic and geophysical work for the department which is described in Part III of this report. No. 27 Party of this branch was, however, employed on India-West Pākistān Boundary demarcation surveys.

195. **Areas Surveyed.**—

223·5 square kilometres of original survey on 4-inch scale.
376 linear kilometres of boundary demarcation.
7,511 square kilometres of triangulation.
456 linear kilometres on initial theodolite traverse.
400 linear kilometres of final theodolite traverse.

No. 27 PARTY

Officer in charge :—Major T. S. Bedi, B.Sc., A.M.I.E., Engineers.

196. **General.**—This unit in conjunction with No. 5 Party, Survey of Pākistān, was engaged on demarcation of India–West Pākistān Boundary between Rājasthān and West Pākistān.

197. **Personnel**—The average strength of the party was 1 Class I Officer, two Class II Officers, 4 Surveyors, 1 Survey Assistant, 4 Scientific Assistants, 2 Geodetic Computers and 37 other Class III personnel including 5 Clerks, 2 Recordkeepers, 1 Storekeeper and 4 Motor Drivers.

198. **Areas Surveyed.**—

223·5 square kilometres of original survey on 4-inch scale.
376 linear kilometres of boundary demarcation.
400 linear kilometres of final theodolite traverse.
456 linear kilometres of initial theodolite traverse.
7,511 square kilometres of triangulation.

199. **Recess Duties**—Fair drawing of thirty eight boundary sheets and examination of 73 preliminary proofs (35 drawn by

Pākistān and 38 by India) was carried out under Shri H. K. Chopra (Class II) with Sarva Shri R. S. Chhabra, P. N. Puri and D. N. Saha (Surveyors) and 12 Draftsmen.

Checking of field computations and arrangement of field records and computations were done under Shri P. C. Dutt (Survey Assistant) with two Computers.

200. **Field Work.**—Field work was organised and carried out as follows :—

(*a*) *Triangulation.*—

(*i*) Shri P. N. Puri (Surveyor) carried out triangulation in the north sector in Rājasthān. The average length of ray was 13·8 kilometres.

(*ii*) Shri H. G. Dhingra (Geodetic Computer) carried out trianguation in the south sector in Rājasthān. The average length of ray was 17·9 kilometres.

(*b*) *Traversing and Demarcation of Boundary.*—

(*i*) *Camp North* (*Pokaran*).—Shri H. K. Chopra (Class II) with Sarva Shri P. G. Mukherjee and P. N. Puri (Surveyors), Sarva Shri A. N. Singh, M. L. Johar and M. S. Nagarajan (Scientific Assistants), 5 Computers, 5 Plane-tablers and 1 Topo. Auxiliary carried out theodolite traversing and demarcation of Rājasthān-West Pākistān Boundary in the districts of Jaisalmer (India) and Bahāwalpur, Rahīmyār Khān and Sukkur (West Pākistān).

(*ii*) *Camp South* (*Khuiala and Jaisalmer*).—Shri N. N. Joshi (Class II) and later Shri P. G. Mukherjee (Surveyor) with Sarva Shri R. S. Chhabra and D. N. Saha (Surveyors), Sarva Shri H. G. Dhingra and Sidh Gopal (Geodetic Computers), Shri M. K. B. Pillai (Scientific Assistant), 8 Computers and 7 Plane-tablers carried out theodolite traversing and demarcation of Rājasthān-West Pākistān Boundary in the districts of Jaisalmer (India) and Sukkur and Khairpur (West Pākistān).

(*c*) *Plane-tabling Detachments.*—One detachment under Shri H. K. Chopra (Class II) with 2 Surveyors, 5 Plane-tablers, 1 Topo. Auxiliary and the other detachment under Shri P. G. Mukherjee (Surveyor) with 5 Plane-tablers in the north and south sectors, respectively carried out the original survey on 4-inch scale of a strip $\frac{1}{4}$-inch astride the boundary in Jaisalmer District of Rājasthān.

(*d*) *Computing and Record Section.*—Computing and Record section at party headquarters was established under Shri P. C. Dutt (Survey Assistant) with one Topo, Computer and one Record-keeper.

201. **Description of Country.**—The area is a part of desert with sand dunes. Absence of water sources near the area of work at certain places caused considerable hardships to survey personnel. Soaring temperatures and sand storms during the day time from February onwards were a great hindrance to the progress of work. At some places snakes were a menace.

202. **Technical Methods.**—

(*a*) *Triangulation.*—Control for theodolite traverse was provided by triangulation of second order precision. The triangulation was run along and astride the boundary. Each control point was 12·9 kilometres to 25·7 kilometres (8 to 16 miles) apart. Observations were made on eight zeros and the triangular error was limited to 6 seconds. Wild T3 theodolite was used for this purpose.

(*b*) *Initial Traverse.*—Initial traverse with Wild T2 theodolite and crinoline chain was run between control points along the boundary. At certain places where the ground was too undulating Hunter Short Base was used in traversing.

(*c*) *Demarcation.*—Many old state boundary pillars were in existence. The same positions were accepted after verification and new pillars were constructed in their places by the P.W.D. and also in between along the boundary, wherever necessary. For checking of old pillars and location of additional pillars revenue records and pre-partition Survey of India Maps were used.

(*d*) *Final traverse.*—Final traverse was run to connect up all the pillars. The co-ordinates thus obtained were plotted on Survey of India Maps, to have a direct check on the accuracy of the pillar positions.

203. **Miscellaneous.**—

Health.—Health of the field personnel remained satisfactory. Medical units were attached to camps to look after the health of personnel.

Communications.—The mode of transport was by vehicles or by camels. Vehicles with 4-wheel drive were particularly useful. Inter communication between Officer-in-Charge, camp officers and individual members was by wireless. Police radiograms were used for this purpose. Each demarcator and triangulator was provided with a W.T. set.

Receiving and transmitting stations were set up at the party headquarters and also at camp headquarters.

Supply of Water.—Tractors fitted with water tanks were found useful for supplying water to our detachments in areas where water was not available locally. Camels were used for supply of water to places inaccessible to tractors.

PART II.—MAP PUBLICATION AND OFFICE WORK

IX. INTRODUCTION

204. Progress of Map Publication.—Index maps *D*, *E*, *F* and *G* at the end of this report, show the progress of publication to date for all standard series of modern maps, the maintenance of which is a departmental commitment of the Survey of India.

205. Work of Map Drawing and Printing Offices.—The work of drawing and printing offices of the department for the period under report is described in three sections as follows :—

Section XI (page 115) gives statistics of departmental maps published, extra-departmental printing and map issues.

Section XII (page 119) describes the work of drawing offices and includes two tables which quantitatively summarize this work.

Section XIII (page 121) describes the work of printing offices.

206. Map Publication Policy.—The Map Publication Directorate continued to be responsible for the departmental series of geographical mapping and for those maps which formed the international mapping commitments, such as the World Aeronautical Charts (I.C.A.O.) and the 1 : M Carte Internationale du Monde series. The work on these map series progressed steadily.

The 1 : 16 Million Outline Map of India, 1961 English edition ; the 1 : 2½ Million Road Map of India, 1960 edition ; the 70-Mile Political Map of India, 1960 and 1961 English editions and the 67-Mile Railway Map of India, 1961 English and Hindi editions were published during the year. The first 1961 edition of the School Atlas (Deluxe and Popular) was also published.

The new Maps of India and Adjacent Countries on scale 1 : 12 Million and 1 : 8 Million, English and Hindi editions corresponding to the former 192-mile and 128-mile Maps and the 1 : 3½ Million Railway Map of India, English and Hindi editions, corresponding to the former 67-mile Railway Map, remained under publication. New editions of the 40-mile Wall Map of India and Adjacent Countries, the 2½ Million Road Map of India and the 70-mile Political Map of India, Hindi edition also remained under publication.

A steady progress was maintained in the printing of the maps for the National Atlas of India in English. 10 maps were published during the year and 44 maps were under various stages of proving and printing.

Work on the reissue of the Map Catalogues ; on the maps of the 1 : M Carte Internationale du Monde Series and on the 1 : 2 M Southern Asia Series was continued.

The departmental topographical maps based on fresh surveys for publication in full colours and in metric terms, continued to be fair drawn by the field units concerned. Map compilation was done in the regional drawing offices. 5 maps on the metric scale 1 : 50,000 corresponding to the former 1-inch scale, were published during the year.

In addition to the departmental work summarized above, a large number of mapping and printing jobs were also undertaken for various departments of the Central and State Governments.

X.—PERSONNEL OF THE MAP PUBLICATION DIRECTORATE AND OF HEADQUARTERS OFFICES EMPLOYED ON MAP DRAWING AND PRINTING

Dehra Dūn. **Director, Map Publication**

Colonel R. S. Kalha, M.I.S., to 10-12-61.

Shri E. R. Wilson, B.A., M.I.S., from 11-12-61 to 22-12-61.

Shri J. C. Ross, A.R.I.C.S., M.I.S., from 23-12-61.

Deputy Director, Map Publication

Shri L. J. Bagnall, B.SC., to 11-6-61.

Lt.-Colonel N. K. Sen, B.SC. (Hons.), A.M.I.E., M.I.S., Engineers, from 12-6-61 to 4-3-62.

Shri J. C. Ross, A.R.I.C.S., M.I.S., from 5-3-62 to 19-3-62 (in addition to his duties as Director).

Shri P. S. Shinghal, C.E. (Hons.), A.M.I.E., from 20-3-62.

Assistant Director, Map Publication

Shri N. N. Dhawan, B.A., to 16-9-61 and from 13-11-61 to 25-12-61.

Shri R. L. Ghei, B.A. (Hons.), M.I.S., from 17-9-61 to 12-11-61 and from 26-12-61 to 18-1-62 (in addition to his duties as Officer in Charge, Map Record and Issue Office).

Shri G. C. Aggarwala, B.A., M.I.S., from 19-1-62.

Attached to Headquarters Office

Class II	..	Officer Surveyors	.. 2 (one up to 7-8-61).
.. III	Division I	Draftsmen	.. 2
.. III	.. II	Draftsmen	.. 9
.. III	.. II	Plane-tabler	.. 1

No. 1 Drawing Office

Officer in charge—

Shri J. Chatterjee, B.SC., M.I.S.

Class II Officer Surveyors .. .. 6 (one from 10-5-61, one up to 27-4-61 and one from 21-2-61 to 2-7-61).

Class III	Division I	Surveyor	..	1
,, III	,,	I Draftsmen	..	9 (Two from 12-7-61).
,, III	,,	II Draftsmen (including trainees)	..	103
,, III	,,	II Plane-tablers	..	2

Photo-Litho Office (Hāthībarkala)

Managers—

Shri B. C. Datta, B.A., Dip. (Tech.), (Leeds), A.R.P.S. (London), to 31-1-62 and from 13-3-62.

Shri K. L. Dev, from 1-2-62 to 12-3-62.

Class II	..	Assistant Managers	..	2
,, III	Division I	Reproduction Assistants	..	15
,, III	,, II	Reproduction Personnel	..	140

Photo-Zinco Office

Manager—

Shri K. L. Dev

Class II	..	Assistant Manager ..	..	1
,, III	Division I	Reproduction Assistants	..	6
,, III	Division II	Reproduction Personnel	..	67

Letterpress Printing Section

(Under the technical control of Manager, P.Z.O.)

Class II	..	Assistant Manager ..	..	1
,, III	Division I	Reproduction Assistants	..	2
,, III	.. II	Reproduction Personnel	..	41

Map Record and Issue Office

Officer in charge—

Shri R. L. Ghei, B.A. (Hons.), A.M.I.S., to 9-2-62 and from 16-3-62.

Shri G. C. Aggarwala, B.A., M.I.S., from 10-2-62 to 15-3-62 (in addition to his duties as Assistant Director, Map Publication).

Works Office (Hāthībarkala)

Electrical Engineer—

Shri A. L. Sood, Dip. in Elec. Engg.

Calcutta. **Director, Eastern Circle**

Colonel J. S. Paintal, M.I.S., to 12-10-61 and from 6-11-61.

Shri J. C. Sikka, B.A., A.M.I.S., from 13-10-61 to 5-11-61 (in addition to his duties as Deputy Director).

Deputy Director, Eastern Circle

Shri P. S. Shinghal, C.E. (Hons.), A.M.I.E., to 5–8–61.

Colonel J. S. Paintal, M.I.S., from 6–8–61 to 20–8–61 (in addition to his duties as Director).

Shri J. C. Sikka, B.A., A.M.I.S., from 21–8–61.

Attached to Headquarters Office

Class II	..	Officer Surveyor	1
,, II	..	Map Curator	1
,, III	Division I	Surveyor (Selection Grade) ..	1
,, III	,, I	Survey Assistant	1
,, III	,, I	Reproduction Assistant ..	1
,, III	,, II	Reproduction Personnel ..	16

No. 5 Drawing Office

Officer in charge—

Shri N. L. Gupta, C.E., M.I.S., to 8–12–61 and from 29–1–62.

Shri J. C. Sikka, B.A., A.M.I.S., from 9–12–61 to 28–1–62 (in addition to his duties as Deputy Director, Eastern Circle).

Class II	..	Officer Surveyors	2
,, III	Division I	Surveyors	4
,, III	,, I	Draftsmen	8
,, III	,, II	Air Survey Draftsman ..	1
,, III	,, II	Plane-tabler	1
,, III	,, II	Draftsmen (including trainees)	87

Photo-Litho Office

Manager—

Shri P. N. Kirpal, B.A., Dip. in printing (London).

Class II		Assistant Managers ..	2
,, III	Division I	Reproduction Assistants ..	9
,, III	,, II	Reproduction Personnel ..	118

Engraving Office

Class II (Non-Gazetted)		Assistant Head Engraver ..	1
,, III	Division I	Engraver	1
,, III	,, II	Engravers	13
,, III	,, II	Reproduction Personnel ..	6

Dehra Dūn. **Director, Northern Directorate**

Colonel J. N. Sinha, M.SC., A.M.I.E., M.I.S., to 22–5–61.

Lt.-Colonel M. L. Chopra, B.SC., B.E., Engineers, from 23–5–61 to 4–6–61 (in addition to his duties as Deputy Director).

Lt.-Colonel C. M. Sahni, B.A., Engineers, from 5–6–61 to 31–7–61.

Colonel S. K. S. Mudaliar, B.A., A.M.I.E., M.R.S.H., M.I.S., from 1–8–61.

Deputy Director, Northern Directorate

Lt.-Colonel M. L. Chopra, B.SC., B.E., Engineers, to 1–7–61, from 24–7–61 to 31–7–61 and again from 20–12–61.

Lt.-Colonel C. M. Sahni, B.A., Engineers, from 2–7–61 to 23–7–61 (in addition to his duties as Director) and from 1–8–61 to 20–10–61.

Colonel S. K. S. Mudaliar, B.A., A.M.I.E., M.R.S.H., M.I.S., from 21–10–61 to 20–11–61 (in addition to his duties as Director).

Shri L. J. Bagnall, B.SC., from 21–11–61 to 19–12–61.

No. 2 Drawing Office

Officer in charge—

Shri U. D. Mamgain, B.SC., M.I.S., to 10–11–61 and from 13–12–61.

Major P. Misra, B.SC., B.E. (Civil), M.R.S.H., Engineers, from 11–11–61 to 12–12–61.

Class II	.. Officer Surveyors	.. ..	4
,, III Division I	Surveyors	.. ..	2
,, III ,, I	Draftsmen	.. ..	6
,, III ,, II	Draftsmen	.. ..	78

Bangalore. **Director, Southern Circle**

Shri E. R. Wilson, B.A., M.I.S., to 5–12–61.

Shri P. S. Shinghal, C.E. (Hons.), A.M.I.E., from 6–12–61 to 3–1–62 (in addition to his duties as Deputy Director).

Shri L. J. Bagnall, B.SC., from 4–1–62.

Deputy Director, Southern Circle

Lt.-Colonel C. M. Sahni, B.A., Engineers, to 27–5–61.

Shri E. R. Wilson, B.A., M.I.S., from 28–5–61 to 27–8–61 (in addition to his duties as Director).

Shri P. S. Shinghal, C.E. (Hons.), A.M.I.E., from 28-8-61 to 18-1-62.

Shri L. J. Bagnall, B.Sc., from 19-1-62 to 4-3-62 (in addition to his duties as Director).

The post of Deputy Director was transferred away from this Circle, w.e.f. 5-3-62.

No. 4 Drawing Office

Officer in charge—

Shri M. W. Kalappa, B.A., M.I.S., to 22-7-61.

Shri J. Narasimhan, B.Sc. (Hons.), from 23-7-61.

Class II	..	Officer Surveyors	3
,, III	Division I	Surveyors	4
,, III	,, I	Survey Assistant	1
,, III	,, I	Draftsmen	5
,, III	,, II	Draftsmen (including trainees)	70
,, III	,, II	Plane-tablers	2
,, III	,, II	Trig. Computer	1

Abu.

Director, Western Circle

Shri J. C. Ross, A.R.I.C.S., M.I.S., to 31-10-61.

Colonel C. M. Sahni, B.A., from 1-11-61.

Deputy Director, Western Circle

Lt.-Colonel J. A. F. Dalal, B.A. (Hons.), p.s.c., M.I.S., Engineers, to 10-5-61.

Shri J. C. Ross, A.R.I.C.S., M.I.S., from 11-5-61 to 31-5-61 (in addition to his duties as Director).

Lt.-Colonel D. N. Sharma Atri Harnal, Engineers, from 1-6-61.

No. 3 Drawing Office

Officer in charge—

Shri H. H. Phillips, B.Sc. (Hons.), M.I.S.

Class II Officer Surveyors			.. 3	(One from May '61 and one from Dec. '61).
Class III	Division I	Surveyors	.. 3	(One up to Oct. '61 and one up to Dec. '61).
,, III	,, I	Survey Assistants	2	
,, III	,, I	Draftsmen	.. 7	(One from Nov. '61 and one from Dec. '61).
,, III	,, II	Draftsmen (including trainees)	72	
,, III	,, II	Plane-tabler	.. 1	(up to June '61).

PUBLICATIONS AND ISSUES

Table I(*d*)—Photographic Work

	Number of items printed				Number of copies printed				Value in Rupees			
	Dehra Dūn		Calcutta		Dehra Dūn		Calcutta		Dehra Dūn		Calcutta	
	Map Publication Office		Eastern Circle	Total	Map Publication Office		Eastern Circle	Total	Map Publication Office		Eastern Circle	Total
	H.L.O.	P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.	
DEPARTMENTAL												
Kodalines ..	20	2	2	24	116	14	41	171	3,114	543	1,314	4,971
Bromide Prints ..	6	72	7	85	595	9,348	502	10,445	5,710	82,895	8,585	97,190
Glass Prints ..	140	..	..	140	385	..	..	385	3,435	..	..	3,435
Diapositives ..	..	27	..	27	..	1,101	..	1,101	..	24,699	..	24,699
Total of Departmental work ..	166	101	9	276	1,096	10,463	543	12,102	12,259	1,08,137	9,899	1,30,295
EXTRA-DEPARTMENTAL												
Kodalines ..	27	1	..	28	208	2	..	210	4,972	117	..	5,089
Bromide Prints ..	7	47	..	54	209	1,810	..	2,019	2,361	15,128	..	17,489
Glass Prints ..	176	..	..	176	434	..	..	434	2,972	..	..	2,972
Diapositives ..	..	16	..	16	..	619	..	619	..	13,492	..	13,492
Total of Extra-departmental work ..	210	64	..	274	851	2,431	..	3,282	10,305	28,737	..	39,042
Grand Total ..	376	165	9	550	1,947	12,894	543	15,384	22,564	1,36,874	9,899	1,69,337

Table I(*c*)—Litho-printing other than maps

	Number of items printed				Number of colours printed			Number of copies printed				Value in Rupees			
	Dehra Dūn		Calcutta	Total	Dehra Dūn		Calcutta	Dehra Dūn		Calcutta	Total	Dehra Dūn		Calcutta	Total
	Map Publication Office		Eastern Circle		Map Publication Office		Eastern Circle	Map Publication Office		Eastern Circle		Map Publication Office		Eastern Circle	
	H.L.O.	P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.	H.L.O.	P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.	
EPARTMENTAL WORK															
s	..	2	..	2	..	2	..	..	98	..	98	..	37	..	**37**
ts	25	..	..	25	4	..	..	20,570	..	..	20,570	95,841	..	..	**95,841**
laneous	3	39	22	64	1	5	3	17,153	22,678	21,212	61,043	1,907	15,063	11,355	**28,325**
Total ..	28	41	22	91	..	..	..	37,723	22,776	21,212	81,711	97,748	15,100	11,355	**1,24,203**
A-DEPARTMENTAL WORK OTHER CENTRAL AND E GOVERNMENT DEPARTTS															
rs	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
lets	..	25	..	25	..	4	..	..	10,737	..	10,737	..	28,188	..	**28,188**
llaneous	78	20	437	535	6	5	2	1,49,585	2,527	45,80,315	47,32,427	21,171	1,729	1,08,735	**1,31,635**
Total ..	78	45	437	560	..	..	..	1,49,585	13,264	45,80,315	47,43,164	21,171	29,917	1,08,735	**1,59,823**
A-DEPARTMENTAL WORK COMMERCIAL FIRMS AND PUBLIC															
rs	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
lets	..	6	..	6	..	3	..	..	1,152	..	1,152	..	10,804	..	**10,804**
llaneous	3	65	1	69	4	5	1	50,224	5,322	100	55,646	996	1,314	177	**2,487**
Total ..	3	71	1	75	..	..	..	50,224	6,474	100	56,798	996	12,118	177	**13,291**
Grand Total ..	109	157	460	726	..	..	..	2,37,532	42,514	46,01,627	48,81,673	1,19,915	57,135	1,20,267	**2,97,317**

Table I(*b*)—Extra-Departmental Maps printed

ss of Maps	Scale	New Publications				New Editions and Reprints				Number of copies printed				Value in Rupees			
		Dehra Dūn		Calcutta	Total	Dehra Dūn		Calcutta	Total	Dehra Dūn		Calcutta	Total	Dehra Dūn		Calcutta	Total
		Map Publication Office		Eastern Circle		Map Publication Office		Eastern Circle		Map Publication Office		Eastern Circle		Map Publication Office		Eastern Circle	
		H.L.O.	P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.	
OR THE OTHER ENTS OF THE AND STATE ENTS																	
aphical Maps																	
naps	1:1 Million	..	..	..	..	11	..	..	11	30,097	..	..	30,097	27,254	..	..	27,254
naps	1:5 Million	..	..	..	..	1	..	..	1	2,550	..	..	2,550	7,530	..	..	7,530
aphical Maps																	
maps ..	1″ = 4 miles	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ps ..	1″ = 2 miles	..	..	..	..	..	2	..	2	..	7,004	..	7,004	..	7,004	..	7,004
s ..	1″ = 1 mile	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
s on Special Layout	1″ = 1 mile	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
cial Maps																	
aps	Various	24	..	..	24	19	..	..	19	6,928	..	..	6,928	36,331	..	..	36,331
rrigation, Hydro- other Projects ..	64″ = 1 mile	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Do. ..	16″ = 1 mile	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Do. ..	8″ = 1 mile	..	..	2	2	..	..	..	..	..	..	444	444	..	..	2,456	2,456
Do. ..	4″ = 1 mile	132	115	26	273	32	..	..	32	45,400	30,753	4,722	80,875	1,42,679	69,645	32,814	2,45,138
Do. ..	2″ = 1 mile	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Do. ..	Various	61	19	6	86	..	..	..	..	8,295	8,059	750	17,104	41,361	7,866	4,163	53,390
.. ..	Various	24	..	..	24	22	..	..	22	5,159	..	..	5,159	37,835	..	..	37,835
naps, plans, charts s	Various	178	13	4,471	4,665	59	18	..	77	3,80,437	1,82,908	55,28,024	60,91,369	1,78,488	74,746	1,95,426	4,48,660
Total ..		419	147	4,508	5,074	144	20	..	164	4,78,866	2,28,724	55,33,940	62,41,530	4,71,478	1,59,261	2,34,859	8,65,598
OR COMMER- IS AND THE																	
naps, plans, charts s	Various	..	..	14	14	13	..	..	13	55,487	..	6,792	62,279	11,086	..	14,257	25,343
Total ..		..	..	14	14	13	..	..	13	55,487	..	6,792	62,279	11,086	..	14,257	25,343
Grand Total ..		419	147	4,522	5,088	157	20	..	177	5,34,353	2,28,724	55,40,732	63,03,809	4,82,564	1,59,261	2,49,116	8,90,941

N.B.—3,028 black or blue-prints of various departmental and extra-departmental sheets, printing cost of which comes to Rs. 79,610, were also supplied during the year.

Table I(*a*)—Departmental Maps published

Class of Maps	Scale	New Publications				New Editions and Reprints					Number of copies printed				Dehra
		Dehra Dūn		Calcutta	Total	Dehra Dūn		Calcutta	Total		Dehra Dūn		Calcutta	Total	
		Map Publication Office		Eastern Circle		Map Publication Office		Eastern Circle	New Editions	Reprints	Map Publication Office		Eastern Circle		Map Publicati
		H.L.O.	P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.			H.L.O.	P.Z.O.	P.L.O.		H.L.O.
GENERAL MAPS															
Maps of India	Various	..	..	..	..	7	..	..	6	1	75,855	..	..	75,855	1,79,506
GEOGRAPHICAL MAPS															
Southern Asia Series.. ..	1 : 2,000,000	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Carte Internationale du Monde ..	1 : 1,000,000	..	..	..	..	..	..	2	2	..	..	..	1,400	1,400	..
World Aeronautical Charts (I.C.A.O.)	1 : 1,000,000	4	..	..	4	..	..	..	..	..	2,008	..	..	2,008	6,024
TOPOGRAPHICAL MAPS															
1 : 25,000 ..	1 : 25,000	..	..	2	2	..	..	..	..	..	..	..	3,212	3,212	..
1 : 50,000 ..	1 : 50,000	3	2	..	5	..	..	..	..	..	14,863	11,217	..	26,080	29,726
Quarter-inch (Modern) ..	1″ = 4 miles	..	..	..	..	11	8	7	4	22	27,548	26,162	21,028	74,738	38,223
,, ,, (Preliminary) ..	,,	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,, ,, (Provisional) ..	,,	..	..	..	..	3	..	..	..	3	9,000	..	..	9,000	13,500
Half-inch (Modern) ..	1″ = 2 miles	..	..	..	..	6	1	1	..	8	12,187	2,150	1,600	15,937	12,187
One-inch (Modern) ..	1″ = 1 mile	8	2	..	10	28	33	31	26	66	1,40,407	1,04,870	87,689	3,32,966	2,06,569
,, ,, (Preliminary) ..	,,	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,, ,, (Provisional) ..	,,	..	..	..	..	7	6	..	2	11	29,236	22,020	..	51,256	29,236
Old Style maps (1″ & ½″ Primary)	,,	..	..	..	..	1	..	..	..	1	6,000	..	..	6,000	9,000
SPECIAL MAPS															
Maps of States	1 : 1,000,000	..	..	..	..	..	..	..	..	..	..	..	..	..	..
City and Town Guide Maps ..	Various	..	..	..	..	..	..	..	..	..	..	..	..	..	..
School Atlas (Deluxe Edn.) ..	..	1	..	..	1	..	..	..	..	..	5,000	..	..	5,000	40,000
School Atlas (Popular Edn.) ..	..	1	..	..	1	..	..	..	..	..	15,150	..	..	15,150	75,750
Index Maps	Various	1	..	..	1	4	..	..	..	4	2,104	..	..	2,104	6,013
Miscellaneous Maps, Charts and Diagrams	,,	2	5	..	7	5	..	..	..	5	797	6,050	..	6,847	1,704
Total ..		20	9	2	31	72	48	41	40	121	3,40,155	1,72,469	1,14,929	6,27,553	6,47,438

Note.—In addition to the printing summarized above, the following miscellaneous printing was done during the year:—

	Office		Number of originals for litho reproduction	Number of prints	Number of originals for half-tone reproduction, etc.	Number of prints
Dehra Dūn	Map Publication Office	H.L.O.	1,251	6,969	84	102
		P.Z.O.	1,456	5,871	..	..
Calcutta	Eastern Circle	P.L.O.	310	1,892	26	76

The above includes prints prepared for use in surveying and mapping, e.g., black prints for mosaics, blue-prints for fair Mapping, etc.

partmental Maps published

Number of copies printed			Value in Rupees				List of First and New Edition Sheets printed					
. Dūn	Calcutta		Dehra Dūn		Calcutta							
ation Office	Eastern Circle	Total	Map Publication Office		Eastern Circle	Total	Scale	Sheet No.	Edition Number and Date	Scale	Sheet No.	Edition Number and Date
P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.							
..	..	75,855	1,79,506	..	..	1,79,506	1 : 25,000	41 E/12/3	1st 1957	1″ = 4 mile	45 P	7th 1957
								72 H/15/2	1st 1957		56 F	4th 1960
							1 : 50,000	40 J/15	1st 1959		64 P	2nd 1957
								40 M/11	1st 1959		73 N	4th 1960
..	..	..	..	..	..	..		40 N/9	1st 1959			
..	1,400	1,400	..	..	3,400	3,400				1 : 1 Million	NC 44	7th 1960
								44 K/7	1st 1959		NE 45	7th 1959
..	..	2,008	6,024	..	..	6,024		45 A/15	1st 1959			
							1″ = 1 mile	40 J/13	1st 1958		World Aeronautical Charts (I.C.A.O.):	
..	3,212	3,212	..	..	6,436	6,436		41 A/16 & B/13	1st 1960			
11,217	..	26,080	29,726	22,434	..	52,160		41 E/7	1st 1960		2552 Allahābād	1st 1961
26,162	21,028	74,738	38,223	39,243	31,542	1,09,008		41 E/14	1st 1960			
..	..	..	..	..	..	..		41 I/9	2nd 1960		2560 Ahmadābād	1st 1961
..	..	9,000	13,500	..	..	13,500		41 K/1	2nd 1960			
2,150	1,600	15,937	12,187	2,150	1,600	15,937		41 M/8	2nd (Provl.) 1960		2681 Madras	1st 1960
1,04,870	87,689	3,32,966	2,06,569	1,32,918	94,921	4,34,408		44 O/12	4th 1957		2795 Trivandrum	1st 1960
..	..	..	..	..	..	..		45 A/1	1st 1958			
22,020	..	51,256	29,236	22,020	..	51,256		45 A/7	1st 1958			
..	..	6,000	9,000	..	..	9,000		45 A/13	1st 1959	1 : 2·5 Million	Road map of India English Edn. (in 2 sections)	1st 1960
								45 A/14	1st 1959			
								45 G/16	1st 1956			
								46 C/10	2nd 1960			
..	..	..	..	..	..	..		46 G/9	3rd 1961			
..	..	..	..	..	..	..		46 H/14	2nd (Provl.) 1960			
..	..	5,000	40,000	...	..	40,000		47 K/3	2nd 1960	1 : 16 Million	Outline Map of India and Adjacent Countries	2nd 1961
..	..	15,150	75,750	..	..	75,750		47 K/12	3rd 1960			
..	..	2,104	6,013	..	..	6,013		47 K/14	2nd 1960			
								48 P/7	2nd 1959			
6,050	..	6,847	1,704	13,214	..	14,918		54 E/10	4th 1960			
								55 B/14	1st 1957	1″ = 67·08 miles	Railway Map of India (Corrected up to 31st March 1961) English Edn.	1961
1,72,469	1,14,929	6,27,553	6,47,438	2,31,979	1,37,899	10,17,316		57 G/12	7th 1958			
								65 D/9	2nd 1959			
								72 B/9	2nd 1958			
								72 O/11	4th 1960			
								72 O/15	4th 1960			
								73 D/2	2nd 1961			
								73 G/1	4th 1959		Railway Map of India (Corrected up to 31st March 1961) Hindi Edn.	1961
								73 J/5	3rd 1960			
								73 K/10	2nd 1960			
								73 M/2	2nd 1958			
								78 A/4 & 72 M/16	2nd 1956			
								78 F/15	2nd 1961	1″ = 70 miles	Political Map of India (English Edn.)	5th 1960
								78 J/3	2nd 1960			
								82 P/11	2nd 1961			
								83 A/12	2nd 1961			
								83 B/6	2nd 1958			
											Political Map of India (English Edn.)	6th 1961
											School Atlas (Deluxe Edn.)	1st 1961
											School Atlas (Popular Edn.)	1st 1961

ng the year :—

ALS TC.	Number of prints
	102
	..
	..
	76

blue-prints for fair

XI.—PUBLICATIONS, EXTRA-DEPARTMENTAL PRINTING AND MAP ISSUES

207. **Publications and extra-departmental printing.**—The publications of the department and the printing done for other government departments and for the public during the period under report are summarized in the following tables :—

Table I(*a*) Departmental maps.

Table I(*b*) Extra-departmental maps.

Table I(*c*) Litho-printing, other than maps.

Table I(*d*) Photographic work.

The total progress made up to the end of the period under report in respect of the publication of the main series of topographical and geographical maps produced by the department is given in Table II. Table III shows the letterpress publications for the period.

Table II—Progress of Publication of Modern Topographical and Geographical Maps

	India						India and Adjacent Countries			
							1 : 1 M			1 : 2 M
	1″ = 1 mile	1 : 50,000	1″ = 2 miles	1 : 100,000	1″ = 4 miles	1 : 250,000	Carte Internationale du Monde	World Aeronautical Charts (I.C.A.O.)	State Maps	Southern Asia Series
Maps Published										
Primary	3,079‡	6	16*	..	8	..	..	..	..	..
Compiled	..	..	..	..	241†	..	29(*a*)	10	1	24(*b*)
Remaining (Approx.)										
Primary	1,554		124		..		..	..	..	..
Compiled	..		..		140		..	13	25	..
Total (Approx.)	4,639		140		389		29	23	26§	24

* 232 half-inch sheets in addition are also current which previously formed the departmental responsibility. These are in the course of being replaced by 1 : 50,000 sheets gradually.

† In addition, 102 quarter-inch sheets have been published in modern style, but based wholly or partly on old surveys.

‡ In addition, 51 one-inch sheets have been published in modern style, but based wholly or partly on old surveys.

§ Hindi and English editions of 13 State Maps.

(*a*) Total number allotted to India.

(*b*) Cover allotted as departmental responsibility.

Table III—Letterpress Publications

Departmental—

(*a*) PUBLISHED AT DEHRA DŪN

(1) Tide Tables Bombay - 1962.
(2) Tide Tables Kandla - 1962.
(3) Tide Tables Rangoon - 1962.
(4) Tide Tables Indian Ocean - 1962.
(5) Tide Tables Hooghly River - 1962.
(6) Addendum to Gravity data in India.
(7) Addendum to metric conversion table.
(8) List of officers in the Survey of India for 1960, 1961 and 1962.
(9) Auxiliary tables, Part II, 7th edition.

(*b*) PUBLISHED AT CALCUTTA

Miscellaneous departmental forms, etc.

Extra-departmental—

About 26 extra-departmental publications were printed in Letterpress Section at Dehra Dūn, including Notices to Mariners, the journal of the Institution of Surveyors and a number of pamphlets for the Forest Research Institute, Dehra Dūn. In Calcutta, a large variety of Agmark lables were printed.

Out-turn of Letterpress Sections

Sections	Items or pages published	Copies printed	Impressions pulled
Dehra Dūn ..	898	21,82,635	29,00,795
Calcutta ..	181	37,41,079	23,91,061
TOTAL ..	1,079	59,23,714	52,91,856

208. Map Issues.—Table IV summarizes the sale and issue of both departmental and extra-departmental maps by the various offices of the Survey of India, during the period under report. Table V, which follows, gives the stocks held on 31st March 1962 of all departmental maps and of those extra-departmental maps which are normally stocked for sale.

Table IV—Maps issued by Survey of India Offices

	Central and State Government Departments		Public		Total		Free Issues	
	Number of copies	Sale value Rupees	Number of copies	Sale value Rupees	Number of copies	Sale value Rupees	Number of copies	Sale value Rupees
DEPARTMENTAL								
Dehra Dūn	6,22,009	6,75,728	71,396	1,34,556	6,93,405	8,10,284	83,187	1,27,966
Calcutta	1,59,961	1,66,013	16,381	26,661	1,76,342	1,92,674	46	85
Bangalore	5,479	7,592	6,482	14,240	11,961	21,832	..	..
Delhi	4,515	5,860	7,828	16,649	12,343	22,509	56	102
Total (Departmental) ..	7,91,964	8,55,193	1,02,087	1,92,106	8,94,051	10,47,299	83,289	1,28,153
EXTRA-DEPARTMENTAL								
Dehra Dūn	1,22,14,768	11,78,876	1,636	26,207	1,22,16,404	12,05,083	4	12
Calcutta	55,01,357	2,73,079	338	768	55,01,695	2,73,847	153	345
Bangalore	163	183	4	122	167	305	..	..
Delhi	..	..	..	..	..	..	..	..
Total (Extra-departmental) ..	1,77,16,288	14,52,138	1,978	27,097	1,77,18,266	14,79,235	157	357
Grand Total ..	1,85,08,252	23,07,331	1,04,065	2,19,203	1,86,12,317	25,26,534	83,446	1,28,510

Note :—Total mounting charges during the period.

Dehra Dūn	**.. Rs. 25,539**
Calcutta	**.. Rs. 10,066**
Total	**.. Rs. 35,605**

Calcutta

Stock transfer of :—

(*a*) Departmental copies	..	8,562
	value .. Rs.	12,843
(*b*) Extra-departmental copies	..	250
	value .. Rs.	250

Table V—Stock of Maps

(This table gives the stock as on 31st March 1962 of Departmental maps and of those Extra-Departmental maps of which stocks are held for sale)

	CALCUTTA		DEHRA DÜN		BANGALORE		DELHI		TOTAL	
	Eastern Circle Office		Map Record and Issue Office		Southern Circle Office		Map Sales Office			
	Number of copies in stock	Present face value Rs.	Number of copies in stock	Present face value Rs.	Number of copies in stock	Present face value Rs.	Number of copies in stock	Present face value Rs.	Number of copies in stock	Present face value Rs.
DEPARTMENTAL MAPS										
1 : 2 M Southern Asia Series	8,212	16,424	2,565	5,130	250	500	..	..	11,027	22,054
1 : 1 M Carte Internationale du Monde ..	9,245	16,441	15,392	46,176	661	1,322	235	705	25,533	64,644
1 : 1 M World Aeronautical Charts (I.C.A.O.)	599	1,797	9,089	27,267	601	1,803	..	..	10,289	30,867
1 : 1 M India & Adjacent Countries Series (Abandoned)	7,546	11,319	..	..	..	..	..	..	7,546	11,319
1 : 25,000 topographical maps	5,001	10,002	15,676	29,784	280	560	676	2,028	21,633	42,374
1 : 50,000 topographical maps	..	..	3,454	6,908	..	..	27	54	3,481	6,962
Quarter-inch topographical maps ..	38,530	45,295	1,55,823	2,18,153	3,409	3,910	6,003	8,254	2,03,765	2,75,612
Half-inch topographical maps (Primary & Compiled)	1,03,810	1,05,715	1,54,570	1,66,935	4,010	4,270	13,999	15,748	2,76,389	2,92,668
One-inch topographical maps	4,96,814	6,00,750	11,08,368	11,52,703	43,115	58,115	58,784	73,480	17,07,081	18,85,048
General Maps of India	3,193	5,232	41,767	48,032	1,365	1,924	1,076	2,225	47,401	57,413
Maps of States	1,855	4,187	2,029	4,768	67	201	46	138	3,997	9,294
City & Town Guide Maps	10,248	21,862	18,350	28,993	122	275	2,745	6,082	31,465	57,212
Miscellaneous maps, charts, diagrams and School Atlases	4,815	6,888	47,000	74,178	2,034	6,999	1,832	3,804	55,681	91,869
TOTAL ..	6,89,868	8,45,912	15,74,083	18,09,027	55,914	79,879	85,423	1,12,518	24,05,288	28,47,336
EXTRA-DEPARTMENTAL MAPS STOCKED FOR SALE										
Large scale maps	1,940	3,880	67,517	1,35,034	108	216	..	..	69,565	1,39,130
Forest maps	..	..	1,44,694	4,34,082	..	..	..	..	1,44,694	4,34,082
Topographical maps on special layout ..	1,918	4,094	988	2,957	127	190	..	..	3,033	7,241
Instrument Approach & Landing Charts (I.C.A.O.)	..	..	..	..	..	..	..	..	..	..
Miscellaneous maps, charts and diagrams ..	..	..	8,142	16,284	42	63	78	154	8,262	16,501
TOTAL ..	3,858	7,974	2,21,341	5,88,357	277	469	78	154	2,25,554	5,96,954
EXTRA-DEPARTMENTAL MAPS STOCKED FOR SALE ON BEHALF OF THE NATIONAL ATLAS ORGANIZATION										
National Atlas, Deluxe Edition (in Hindi)	..	..	628	78,500	11	1,375	5	625	644	80,500
National Atlas, Popular Edition (in Hindi)	5	500	7	700	19	1,900	5	500	36	3,600
Loose sheets (in Hindi)	..	..	694	3,470	..	..	1,226	5,650	1,920	9,120
Introductory Notes (in English), sets ..	..	..	..	..	..	..	..	..	..	..
do. (in Hindi), sets ..	..	..	18	9	..	..	..	..	18	9
TOTAL ..	5	500	1,347	82,679	30	3,275	1,236	6,775	2,618	93,229

XII.—WORK OF DRAWING OFFICES

209. **No. 1 Drawing Office, Dehra Dūn.**—This office was organised in various sections, dealing with the following types of maps :—

(*i*) World Aeronautical Charts of the International Civil Aviation Organisation, and Approach and Landing Charts and Obstruction Charts for the Director General of Civil Aviation, Government of India.

(*ii*) General maps of India.

(*iii*) 1 : 1 Million Carte Internationale du Monde Series.

(*iv*) 1 : 2 Million maps of Southern Asia Series.

(*v*) Forest maps.

(*vi*) Extra-departmental maps for other Government departments, on payment.

(*vii*) The School Atlas and Map Catalogue.

One section was engaged on scrutiny of the external boundary of India on all departmental and extra-departmental maps printed in the department. This section also scrutinised maps for the correct depiction of the external boundary of India that were printed elsewhere by Government or private agencies.

For maintaining maps, up to date detailed information continued to be collected from the departments of the Central and State Governments.

A considerable amount of correspondence relating to the correct spellings of Geographical and place names was also handled.

210. **No. 2 Drawing Office, Dehra Dūn.**—This office was mainly engaged on its normal work of reprint, reissue and compilation of topographical maps, and examination of primary sheets and project maps submitted by field parties.

Map maintenance was done by collecting corrections from State Government Departments. Correct spellings of place names in English and Hindi were also collected and supplied to the Railway and Postal authorities.

211. **No. 3 Drawing Office, Abu.**—This office was mainly engaged in mapping of the departmental standard sheets. It was also responsible for examination of 1-inch primary sheets and project maps submitted by the field parties. Maintenance of office copies of sheets of Western Circle area was also done by this office.

212. No. 4 Drawing Office, Bangalore.—This office was primarily engaged on mapping of departmental standard sheets, reprints/reissues of existing sheets, State Maps and map maintenance. It was also responsible for examination of 1-inch primary sheets and other project sheets submitted by the field units.

Maintenance of all technical records for Southern Circle continued to be the responsibility of this office.

213. No. 5 Drawing Office, Calcutta.—This office was mainly engaged on the normal work of compilation, reissue and reprint of topographical maps and map maintenance.

A number of extra-departmental jobs for other Government departments and private indentors was also completed.

The following miscellaneous jobs were also done :—

(*i*) Supply of correct spellings of towns, villages and railway stations, in English and Hindi, to the Postal and Railway authorities.

(*ii*) Testing of stationery items, like water colours waterproof inks, drawing papers, etc., for the Central Stationery Office, Calcutta.

(*iii*) Supply of distance certificates to transport firms in Calcutta, on payment of fees.

214. Engraving Office, Calcutta.—In addition to the work of bringing the 1 : 1 Million Carte Internationale du Monde series up to date, this office also undertook the work of corrections and fresh engraving of symbol tables, foot-notes, scales, both linear and diagonal in metric system, etc. for departmental use.

A few extra-departmental jobs like engraving of dies, certificates, charts, etc. were also completed.

215. Summary of Drawing Work.—Table VI, which follows, gives the number of new maps completed in the various drawing offices and field parties during the period under report and also the number of maps in hand at the end of the period.

Table VII shows the present state of progress of work involving few editions and reprints of departmental maps and the progress of extra-departmental maps.

WORK OF DRAWING OFFICES

Table VI—New Maps

(*a*) denotes work completed and (*b*) denotes work in hand

	DEPARTMENTAL																																E			
	Topographical Maps												Geographical Maps						General and Special Maps								Acces-sory		Miscellaneous						Total man-days' work in year under report	Topo-graphical maps		Geogra-phical maps	
	1: 25,000		1: 50,000		1-inch		½-inch or 1:100,000		1:250,000		¼-inch		Carte Interna-tionale				World Aeronautical Charts (I.C.A.O.)		City and Town, etc. Guide maps		District Maps		State Maps		India and Adjacent Countries		Hill shading Sheets		Indexes		Charts		Various						
													Helio		En-graved																								
	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)
MAP PUBLICATION OFFICE																																						
No. 1 Drawing Office ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	13	..	..	..	..	..	..	1	8	4	1	3	5	..	..	..	76	2,248	..	16	..	..
NORTHERN DTE.																																						
No. 2 Drawing Office ..	..	..	9	13	3	1	..	..	..	2	..	..	..	..	..	..	..	..	1	1	1	1	..	1	..	..	17	3	..	..	..	..	..	..	3,023	..	..	..	..
Field Parties ..	15	3	33	13	10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	17,831	..	..	..	..
EASTERN CIRCLE																																						
No. 5 Drawing Office ..	..	..	3	..	2	..	..	..	4	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	6	..	..	..	..	..	..	5,292	..	..	..	..
Engraving Office ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	103	12	2,830	..	..	..	..
Field Parties ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
WESTERN CIRCLE																																						
No. 3 Drawing Office ..	..	..	23	7	11	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	7	..	..	..	..	..	..	9,139	..	..	..	..
Field Parties ..	..	..	20	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5,660	..	..	..	..
SOUTHERN CIRCLE																																						
No. 4 Drawing Office ..	..	..	..	..	..	..	..	..	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	3	..	..	..	..	..	..	738	..	..	..	..
Field Parties ..	..	..	5	18	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2,006	..	..	..	..
Total ..	15	3	93	55	26	1	..	..	4	12	..	..	..	..	..	..	1	13	1	1	1	1	..	1	1	8	41	20	3	5	..	..	103	88	48,767	..	16	..	..

WORK OF DRAWING OFFICES

Table VI—New Maps

(*a*) denotes work completed and (*b*) denotes work in hand

DEPARTMENTAL																			EXTRA-DEPARTMENTAL (FOR OTHER DEPARTMENTS OF THE CENTRAL AND STATE GOVERNMENTS)																		EXTRA-DEPARTMENTAL (FOR COMMERCIAL FIRMS AND THE PUBLIC)			
ICAL MAPS			GENERAL AND SPECIAL MAPS								ACCESSORY		MISCELLANEOUS																														
	World Aeronautical Charts (I.C.A.O.)		City and Town, etc. Guide maps		District Maps		State Maps		India and Adjacent Countries		Hill shading Sheets		Indexes		Charts		Various		Total man-days' work in year under report	Topographical maps		Geographical maps		General maps		Maps of surveys for irrigation and other engineering projects		Large scale and Town maps		Forest maps		Miscellaneous maps, plans and diagrams, etc.		Engraved commission forms and certificates, etc.		Total man-days' work in year under report	Miscellaneous maps, plans, charts and diagrams		Total man-days' work in year under report
(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)		(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)		(a)	(b)	
..	1	13	..	..	..	..	..	..	1	8	4	1	3	5	..	..	..	76	2,248	..	16	..	..	2	44	2	..	2	..	4	11	190	79	..	..	6,434	..	..	..
..	..	..	1	1	1	1	..	1	..	..	17	3	..	..	..	..	..	..	3,023	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	17,831	..	..	..	..	..	..	173	44	..	9	..	..	..	..	..	..	14,818	..	..	..
..	..	..	..	..	..	..	..	..	..	..	10	6	..	..	..	..	..	..	5,292	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	103	12	2,830	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	6	79
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	18	11	5	10	..	..	..	..	..	..	3,049	..	..	..
..	..	..	..	..	..	..	..	..	..	..	2	7	..	..	..	..	..	..	9,139	..	..	..	..	..	..	..	..	..	..	..	..	12	15	..	..	384	..	..	..
..	..		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5,660	..	..	..	..	..	..	118	97	9	..	..	36	6	..	..	..	4,975	..	..	..
..	..	..	..	..	..	..	..	..	..	..	8	3	..	..	..	..	..	..	738	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2,006	..	..	..	..	..	..	63	41	23	20	3	..	..	..	..	..	6,173	..	..	..
..	1	13	1	1	1	1	..	1	1	8	41	20	3	5	..	..	103	88	48,767	..	16	..	..	2	44	374	193	39	39	7	47	208	94	..	..	35,833	8	6	79

XIII.—WORK OF PRINTING OFFICES

216. **Photo-Litho Office, Hathibarkala, Dehra Dūn.**—Besides printing the standard departmental maps, a large number of extra-departmental and commercial jobs were printed during the period under report, which included :—

(*i*) Maps, drawings and plans for development schemes like hydro-electric, irrigation and construction projects.

(*ii*) Forest maps, weather charts and maps for Railway Time Tables, etc.

In addition to the above, printing of maps for the School Atlas and the National Atlas of India was also undertaken.

217. **Photo-Zinco Office, Dehra Dūn.**—In addition to standard departmental maps and miscellaneous departmental charts, various maps for hydro-electric, irrigation and construction projects, maps for Railway Time Tables, and maps of rainfall studies were also printed.

Twenty-eight other ranks from the Corps of Engineers were trained in the various reproduction processes during the period under report. Besides this, Shri M. P. Singh, Special Officer, Bihār State Government was also given training in the various reproduction methods for about $1\frac{1}{2}$ months.

218. **Photo-Litho Office, Calcutta.**—In addition to the printing of standard departmental maps and miscellaneous departmental forms, scales, charts, etc., a number of extra-departmental maps were also printed for various Central and State Government departments, commercial firms and the public. These included :—

(*i*) Maps for flood control, hydro-electric, irrigation construction projects, including bromide prints of photo-mosaics.

(*ii*) Enlargements of topo. maps.

(*iii*) Agmark lables.

(*iv*) Miscellaneous forms for the Government of India Press and the Controller of Printing and Stationery.

(*v*) Maps for Railway Time Tables.

(*vi*) Patent lists, drawings and sketches.

(*vii*) Engraved diplomas, certificates, drawings and diagrams, etc. by lithography.

219. **Printing Statistics.**—Statistics relating to the various map printing offices of the department will be found in Section XI of this part of Report the (page 115 *et seq.*) and in the Table

VIII below. Tables IX and X which follow, give information regarding the out-turn of the process Engraving and Copper Plate Printing Sections, respectively.

Table VIII—Out-turn and Cost of the Photo-Litho Offices

Name of office	Maps printed (departmental and extra-departmental)	Work other than maps (number of items)	Number of negatives prepared	Number of zinc plates prepared	Number of impressions pulled	Value of out-turn at office rates	Total expenditure of the printing offices during year under report excluding overhead charges
						Rupees	Rupees
1. *Dehra Dūn*							
Map Publication Office							
(*a*) Hāthibarkala Litho Office ..	430	88	6,200	6,830	1,15,78,175	12,47,150	6,19,740
(*b*) Photo-Zinco Office	206	66	2,626	2,790	42,21,664	6,25,896	3,15,714
2. *Calcutta*							
Eastern Circle Photo-Litho Office ..	159	450	3,113	3,014	23,65,570	6,46,090	4,64,421
Total ..	795	604	11,939	12,634	1,81,65,409	25,19,136	13,99,875

Table IX—Out-turn of Process Engraving

Name of the Printing Office	Process Engraving Section			
	Half-tone work		Line work	
	Blocks prepared	Impressions pulled	Blocks prepared	Impressions pulled
Dehra Dūn				
Map Publication Office ..	Nil	Nil	Nil	Nil
Calcutta				
Eastern Circle ..	18	36	Nil	Nil

Table X—Out-turn of Engraving Office Copper Plate Printing Section (Calcutta)

Impressions pulled			
Chromo paper	Transfer	Miscellaneous	Total
8,985	Nil	2,704	11,689

PART III—GEODETIC WORK

XIV.—ABSTRACT OF GEODETIC OPERATIONS

220. **General.**—Purely geodetic operations include miscellaneous computations and research, preparation and publication of records, observatory work (astronomical, magnetic, seismological and meteorological), measurement of geodetic bases, principal triangulation, geodetic levelling, determination of precise latitudes, longitudes, azimuths, gravity and predictions of tides.

A complete account of all geodetic work is published regularly in Geodetic Reports.

The following is a brief *résumé* of the geodetic operations from 1st April 1961 to 31st March 1962—full details of which will be published in Geodetic Report 1962.

221. **Base Measurement and Triangulation.**—The programme of triangulation remained in abeyance due to demands for other priority assignments for projects. A precise base was measured to provide control for geodetic rectangulation for the Indian Refineries Limited at Barauni Project site in Bihār.

222. **Metrology.**—Lengths of 24-m and 8-m wires and 4-m tape have been standardised on the 24-m Comparator.

223. **Levelling.**—172 linear km of high precision levelling was carried out in Himāchal Pradesh, Punjab and Uttar Pradesh for the study of Tear-Faults by the Geological Survey of India.

Precision levelling for 959 linear km was carried out in Bihār, Madhya Pradesh, Mahārāshtra and Rājasthān for river valley projects, aerodrome survey and for the Indian Refineries Limited.

224. **Gravity.**—Observations were taken at 282 stations with Worden Gravimeter in Madhya Pradesh and Rājasthān, in order to establish a 15-km gravity net-work within the distance of 160-km radius from Kaliānpur, to ultimately determine the absolute deflection of the vertical by gravity methods at Kaliānpur H.S.—the origin of Indian triangulation.

225. **Geomagnetism.**—The Magnetic Observatory at Sabhāwāla (Dehra Dūn) has not yet started functioning.

Observations in connection with detailed magnetic survey during the minimum sun-spot activity period (as part of the

deferred programme of I.G.Y.) were taken at 408 field stations in the states of Andhra Pradesh, Madhya Pradesh, Mahārāshtra, Mysore and Orissa.

In this connection 7 Repeat Stations were re-occupied in the states of Andhra Pradesh, Mysore and Orissa.

The instruments were calibrated at Alībāg Observatory, before commencement of field work.

226. **Precise Traverse.**—11·8 km of precise traverse in an area of 1·68 sq. km was carried out, in connection with 200-metre rectangulation for the Indian Refineries Limited—Barauni Refinery Project.

227. **Astronomical Observations in continuation of the International Geophysical Co-operation Programme.**—Precise latitude and longitude observations were continued at the Dehra Dūn Observatory on clear nights, twice a week throughout the year.

228. **Tidal Work.**—Tidal predictions for 39 ports between Suez and Singapore have been carried out as usual at Dehra Dūn and Tide Tables were published. . The automatic registration of tides at 13 ports were carried out.

The touring Tidal detachment carried out 31-day tidal observations at 6 secondary ports on the coast of Mahārāshtra. Harmonic analyses and harmonic shallow water analyses of tides were carried out for some ports.

229. **Observatory and Workshop.**—Siesmological and meteorological observations, calibrations, testing, repairs, adjustments, issue and receipt of survey instruments, and maintenance of standard of length, clocks, optical and other precision instruments, etc. have been carried out as usual.

230. **Computations and Publications.**—Scrutiny and recomputation of data ; adjustment of triangulation heights in terms of spirit levelling heights ; conversion and revision of tables into metric system and of data from spherical to grid and vice versa ; computation of topo. data for publication of complete data pamphlets ; reduction of levelling, gravity, magnetic and astronomical observations ; designing of tables, forms, nomograms to aid survey computations ; study about projections and their applications ; study about deviation of vertical, investigations into the effect of change of spheroid on computations, surveying and mapping ; adjustment of level-net, etc. ; were carried out.

In addition to the above, a number of H.P. and Secondary Levelling Pamphlets, Tide Tables, Tables in Metric System, Auxiliary Tables for Survey Computations, Gravity Tables and Triangulation Pamphlets were printed.

231. **Technical Publications.**—Addenda 4 and 5 to Technical Paper No. 10 (Gravity Data in India), and Addendum to Metric Conversion Tables for Length and Area, were printed.

232. **Training.**—Training was given in geodetic and tidal computations and observations to both departmental and extra-departmental officers.

233. **Library and Museum.**—The Survey of India Library and Museum which are attached to this Branch, functioned as usual.

234. **Forms and Publication Section.**—Issue of technical and administrative forms, books, etc., was continued as usual. Action for printing of new forms and reprinting of old forms have been taken whenever necessary.

235. An abstract of geodetic and geophysical surveys carried out in each State of the Indian Republic is alphabetically arranged and given below :—

Andhra Pradesh.

Geophysical work.—Magnetic observations at 169 field stations and 5 repeat stations (p. 141).

Bihār.

Levelling of precision for 26 km in connection with the layout of 200-m grid for Indian Refineries Limited at Barauni (p. 142).

Precise traverse.—In an area of 1·68 sq. km at Barauni Refinery site for the Indian Refineries Limited (p. 141).

Himāchal Pradesh.

Levelling of high precision for 20 km in connection with the study of tear-faults at Konch Dam site for the Geological Survey of India (p. 142).

Madhya Pradesh.

Geophysical work.—Magnetic observations at 23 field stations (p. 141) and gravity observations at 230 stations for determining deflections of the vertical (p. 141).

Levelling of precision for 185 km to provide heights for aerodrome reference point at Udaipur (p. 142) and 259 km for the Sindh River Project (p. 142).

Mahārāshtra.

Geophysical work.—Magnetic observations at 4 field stations (p. 141).

Levelling of precision for 39 km to re-establish bench-marks at Kurduvādi Railway Station (p. 142).

Oceanographic work.—Tidal observations at 6 secondary ports (p. 137).

Mysore.

Geophysical work.—Magnetic observations at 147 field stations and 1 repeat station (p. 141).

Orissa.

Geophysical work.—Magnetic observations at 65 field stations and 1 repeat station (p. 141).

Punjab.

Levelling of high precision for 30 km for the study of tear-faults at Konch Dam Site for the Geological Survey of India (p. 142).

Rājasthān.

Geophysical work.—Gravity observations at 52 stations for determining deflections of the vertical (p. 141).

Levelling of precision for 450 km to provide heights for aerodrome reference point at Udaipur (p. 142).

Uttar Pradesh.

Geophysical work.—at Sabhāwāla (p. 141).

Levelling of high precision for 122 km in connection with the study of tear-faults at Konch Dam Site for the Geological Survey of India (p. 142).

Time and Latitude Variation Observations at Dehra Dūn (p. 137).

TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per detachment per month	Cost rate		Remarks
				*Net	†Overall	
Tidal Party.—				Rs.	Rs.	**GEODETIC AND RESEARCH BRANCH**
Rocky and sandy	Tidal Observation on the coast of Mahārāshtra	6 ports	0·9 ports	2,731·0 per port	3,993·0 per port	Departmental.
No. 19 Party.—						
Mostly plain and partly hilly ..	High precision levelling for Konch Dam (Line Dehra Dūn–Saharanpur) (Fore)	172 linear km	125·9 linear km	21·9 per linear km	28·5 per linear km	Departmental—For Geological Survey of India.
	Precision levelling to provide height control for Udaipur Aerodrome Reference Point					
Partly plain and partly hilly ..	Precision levelling from Jhālawār to Sirohi Road, R.S. (Pindwara) (Fore)	450 linear km	139·5 linear km	29·8 per linear km	38·7 per linear km	Extra-departmental.
Partly plain and partly hilly ..	Jhālawār–Sirohi Road, R.S. (Pindwara) Portion Sirohi Road R.S. (Pindwara) to Minar (Back) ..	185 linear km	103·6 linear km	37·5 per linear km	48·8 per linear km	Extra-departmental.

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per detachment per month	Cost rate		Remarks
				*Net	†Overall	
No. 19 Party.—*Contd.*				Rs.	Rs.	**GEODETIC AND RESEARCH BRANCH—*Contd.***
Partly plain and partly undulating ..	Precision levelling for Sind River Project, Jhānsi–Gwalior (Fore)	259 linear km	134·1 linear km	28·7 per linear km	37·3 per linear km	Extra-departmental.
	Jhānsi–Gwalior (Back) ..	259 linear km	169·0 linear km	20·8 per linear km	27·1 per linear km	Extra-departmental.
Plain	Precision levelling for re-establishment of bench-mark Kurduvādi Junction R.S.	39·0 linear km	39·0 linear km	700·0 per linear km	700·0 per linear km	Total cost incurred for re-establishing bench-marks involving 39 linear km of levelling.
Plain	Precise traverse and levelling for Indian Oil Refineries Ltd., Barauni (including 26 linear km of levelling)	1·68 sq. km	..	20,500·0 per sq. km	28,200·0 per sq. km	Extra-departmental. Total cost incurred for percise traverse and levelling (26 linear km) in an area of 1·68 sq. km carried out in the project area.

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per detachment per month	Cost rate		Remarks
				*Net	†Overall	
No. 19 Party.—*Concld.*				Rs.	Rs.	**GEODETIC AND RESEARCH BRANCH—*Concld.***
Partly undulating, partly hilly and partly plain	Detailed magnetic surveys in Andhra Pradesh, Orissa, Madhya Pradesh and Mysore	7 Repeat stations and 408 field stations	1·4 Repeat stations and 75 field stations	29·1 per station	37·9 per station	
Partly undulating and partly plain ..	Gravity observations for establishing 15 km gravity net around Kaliānpur H.S. in Madhya Pradesh and Rājasthān	282 stations	116 stations	24·5 per station	31·9 per station	

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

XV.—SURVEY REPORTS, GEODETIC AND RESEARCH BRANCH

PRESIDENT :—In abeyance.

DEPUTY DIRECTOR :—
- Colonel S. K. S. Mudaliar, B.A., A.M.I.E., M.R.S.H., M.I.S. to 12-5-61.
- Lt.-Colonel J. A. F. Dalal, B.A., (Hons.), P.S.C., M.I.S., Engineers, from 13-5-61 to 1-7-61.
- Lt.-Colonel K. L. Khosla, B.Sc., B.E. (Civil), A.M.I.E., M.A.S.C.E. (U.S.A.), Engineers, from 2-7-61.

236. Summary.—The Geodetic and Research Branch comprises Computing, Tidal, and Nos. 14, 19 and 27 Parties.

237. Duties carried out.—The Geodetic and Research Branch deals with the geodetic and geophysical activities of the department. The functions are :—

Provision of precise framework to control Topographical, Cadastral, and Engineering Surveys. This involves geodetic operations of base measurement, triangulation, traverse, astronomical observations, high precision and secondary levelling, magnetic gravity and tidal observations and the elaborate computations accompanying them.

Pari passu with the above operations, Provision of valuable scientific data for studies of the figure, shape and structure of the earth and for studies of various geophysical problems such as the magnetic and gravity fields of the earth, subsidence of land, steric rise of sea-level, isostasy, crustal movements, atmospheric refraction, etc.

Making use of the available scientific data for various utilitarian purposes in the country, such as determination of mean sea-level; tidal predictions and current surveys for shipping; magnetic tables and charts for land, sea and air navigation; gravity tables and charts. This highly technical work is vitally needed and utilised also by several other departments such as the Meteorological Department, Geological Survey of India, Public Works Departments, various Ministries of the Government of India, Indian Bureau of Mines, Oil and Natural Gas Commission, the Indian Navy, Civil Aviation and the Shipping Departments, etc.

Preparation of technical reports and other technical and professional papers, auxiliary tables for projection of maps, grids and for other purposes; designing of computation forms; adjustment of both geodetic and topographical triangulation and other survey data; preparation of pamphlets giving triangulation and levelling data and editing and proof-reading of technical publications of the department.

Maintenance of all geodetic and exploration survey records of the department and issue of all types of data.

Training of departmental and extra-departmental officers in observations and computational techniques.

Designing, repairing, testing and calibration/standardisation of precision survey instruments.

This Branch is also responsible for the work of the Tidal Office, which prepares and publishes annual tide-tables of the Indian Ocean containing predictions of times and heights of high and low waters at 39 ports between Suez and Singapore.

This Branch further deals with the designing, preparation and examination of draft specifications of surveying instruments for the Indian Standards Institution.

At present this Branch is mostly engaged on provision of precise control required for multipurpose Project Surveys for the 5-Year Plans. The International Geophysical Year/International Geophysical Co-operation/Indian Quiet Sun Year, Indian Oceanic Research Expedition and World Magnetic Survey programmes on latitude variations, tidal observations, geomagnetism, gravity and glaciology have also been taken up.

Research work in so far as it concerns our activities is carried *pari passu* with productive work in geodesy and allied subjects and is a continuous process. This research work has been organised on a collective basis, not in the nature of pure or fundamental research, but as applied research for improving the methods of geodetic, geophysical and topographical surveying including the observational techniques and computations. This also includes the collection of data and their continuous review and study of significant trends and developments with a view to achieving maximum accuracy consistent with economy and efficiency.

In addition, during recent years the demarcation of the Indo-Pākistān Boundary along the Punjab-West Pākistān and Rājasthān-West Pākistān Sectors has also been carried out by this Branch.

A detailed narrative of the work carried out by the units during the period under report is given in the following pages.

COMPUTING PARTY

Officer in charge :— Shri A. N. Ramanathan, M.A., A.R.I.C.S., A.M.I.S., to 28-6-61.
Shri V. Rangan, M.A., from 29-6-61 to 9-3-62.
Lt.-Colonel K. L. Khosla, B.Sc., B.E. (Civil), A.M.I.E., M.A.S.C.E. (U.S.A.), Engineers, from 10-3-62 (in addition to his own duties as Deputy Director).

238. General.—The headquarters of the party remained at Dehra Dūn throughout the year. The unit was primarily engaged on the following tasks :—

(*a*) Conversion and revision of Auxiliary Tables to Metric System.

(*b*) Computations and compilation of topographical data for publication of complete data pamphlets.

(*c*) Adjustment of topographical triangulation data in terms of G.T. data.

(*d*) Computations of projection data.

(*e*) Assessment of accuracy of topo. data.

(*f*) Proof-reading of different publications.

(*g*) Supply of triangulation, levelling, etc. data to departmental and extra-departmental indentors.

(*h*) Drawing of various charts and diagrams for different publications.

(*i*) Maintenance of geodetic and other survey records.

(*j*) Preservation and maintenance of Geodetic Triangulation Stations and Primary Protected Bench-Marks.

(*k*) Training of Computers.

239. **Personnel.**—The average strength of the party was 2 Class I Officers, 2 Class II Officers, 4 Survey Assistants and 53 other Class III personnel including Draftsmen and Clerks.

240. **Work at Headquarters.**—The personnel were mainly employed on the following tasks :—

(*a*) *Computations and Compilation.*—

(*i*) Compilation of Auxiliary Tables Part II (Mathematical Tables).

(*ii*) Conversion and revision of Auxiliary Tables to Metric System continued for Part I (Graticules of Maps), Part III (Topographical Survey Tables), Part IV Geodetic Tables) and portion of Part V (Lambert Grid Tables).

(*iii*) Compilation of press copies of Auxiliary Tables Part I and IV.

(*iv*) Adjustment and compilation of data for complete data pamphlet for sheet 47 E.

(*v*) Computations and compilation of projection data (*a*) for 13 sheets on Polyconic Projection ; (*b*) for area covering parts of Africa, Asia, Europe, etc. on Lambert Conformal Conical Projection with two standard parallels ; and (*c*) for area covering Indian Ocean, Africa, etc. on Mercator Projection.

(*vi*) Assessment of accuracy of topo. data in certain sheets for supply of information to topo. circles and units, for planning their field programmes.

(*vii*) Adjustment of topo. triangulation data in sheets 41 I and E, in terms of G.T. data.

(*b*) *Charts.*—Fair drawing of charts including those showing G.T. series in India ; magnetic declination ; magnetic inclination ; magnetic vertical force ; etc.

(*c*) *Training.*—19 Trig. Computers and 3 Topographical Trainees Type 'B' were trained in departmental computations and 2 Trig. Computers and 2 Topographical Trainees Type 'B' were imparted refresher course training.

(*d*) *Records and Supply of Data.*—Records of geodetic triangulation, traverse, levelling and those of astronomical, gravity and magnetic observations were maintained in the party and the supply of data to both departmental and extra-departmental agencies was continued as usual.

(*e*) *Preservation and Maintenance of G.T. Stations and Primary Protected Bench-Marks.*—Annual reports on the condition of about 3,000 G.T. Stations and 2,000 Primary Protected Bench-Marks were received and exmained.

Repairs were carried out to 141 G.T. Stations and 21 Primary Protected Bench-Marks at a cost of Rs. 2910·00.

TIDAL PARTY

Officer in charge :—{Shri R. S. Chugh, M.A., A.M.I.S., to 13-6-61.
Shri A. N. Ramanathan, M.A., A.R.I.C.S., A.M.I.S., from 14-6-61.

241. General.—The headquarters of the party remained at Dehra Dūn throughout the year. The party, comprising of three sections, viz., Tidal, Observatory and Astronomical, carried out the following tasks :—

(*a*) *Tidal Section.*—

(*i*) Prediction of tides at 39 ports between Suez and Singapore and publication of tide-tables.

(*ii*) Prediction of tides at 2 secondary ports on the coast of Madras and 16 secondary ports on the coast of Mahārāshtra for the years 1961 and 1962, respectively.

(*iii*) Automatic registration of tides at 13 ports.

(*iv*) 31-day tidal observations at 6 secondary ports.

(*v*) Harmonic analyses and investigations.

(*vi*) Calculation and supply of tidal data to indentors.

(*vii*) Training of personnel in tidal work.

(*b*) *Observatory Section.*—

(*i*) Comparison and maintenance of standards of length.

(*ii*) Calibration of various instruments.

(*iii*) Test, repair and adjustment of survey instruments.

(*iv*) Issue and maintenance of optical and precision instruments.

(*v*) Routine meteorological and seismological work.

(*vi*) Maintenance of observatory instruments.

(*c*) *Astronomical Section.*—

(*i*) Observations for latitude and longitude at Dehra Dūn Observatory and their computations.

(*ii*) Reception of wireless time signals from various world stations.

(*iii*) Computations of latitude variation at Dehra Dūn.

242. **Personnel.**—The average strength of the party during the period under report was 2 Class I Officers, 2 Class II Officers, 4 Surveyors, 3 Survey Assistants, 2 Scientific Assistants, 2 Geodetic Computers and 36 other Class III personnel including 4 Clerks and 6 Instrument Mechanics.

243. **Area Surveyed.**—6 ports on coast of Mahārāshtra for short period tidal observations.

Time and latitude variation observation at Dehra Dūn.

244. **Work at Headquarters.**—

Tidal Section.—

(*a*) *Tide-Tables.*—

(*i*) The Indian Tide-Tables and the four separate pamphlets for the port of Kandla, the port of Bombay, the Hooghly River, and the Rangoon River for the year 1962 were published.

(*ii*) Advance predictions for 14 ports for the year 1963 were despatched to the Hydrographic Departments of the U.S.A., U.K., and Japan and also to the Liverpool Tidal and the German Hydrographic Institutes and the Indian Navy, in accordance with the standing arrangements for the exchange of advance predictions.

Predictions for the remaining ports for 1963 as well as advance predictions for certain ports for 1964 are in hand.

(*iii*) Tidal predictions for 1961 for 2 ports on the coast of Madras were carried out and supplied to the State Ports Officer, Madras.

Tidal predictions for 1962 for 16 Konkan ports were also carried out and supplied to the Chief Ports Officer, Mahārāshtra State.

(*b*) *Analyses and Investigations.*—

(*i*) Intensive analyses by the method of Liverpool Tidal Institute of one full year's observations of the

following ports were completed for the years indicated in brackets :—

Muscat (1897), Port Albert Victor (1903), Minicoy (1895); and those of the following ports are in hand :—

Bombay (1960), Vishākhapatnam (1959–60) and Sāgar (1959).

(*ii*) Harmonic shallow water analyses were carried out for the following ports for the years given in brackets :—

Kandla (1960), Bhaunagar Concrete Jetty (1960), Bombay (1960) and Rangoon (1959).

(*iii*) Calculation of chart datums for the following ports were completed :—

Srīvardhan, Harnai, Pālshet, Boria Bandar, Tiwari, Purangad, Musākazi, Devgarh, Āchra and Vengurla.

(*iv*) Computations for assessing the accuracy of tidal predictions of 1961 were completed.

(*v*) Computations of monthly Mean Sea-Levels from hourly heights were carried out for the following ports for the years indicated in brackets :—

Kandla (1961), Verāval (1961), Bombay (1961), Mangalore (1961), Cochin (1960), Madras (1961), Vishākhapatnam (1961), Sāgar (1960, 1961), Diamond Harbour (1960, 1961), Garden Reach (1961), Tribeni (1961), Rangoon (1959, 1960) and Port Blair (1961).

(*vi*) Mean Sea-Level at Puri was interpolated and supplied to the Executive Engineer, Flood Investigation Division I, Government of Orissa, Bhubaneswar.

(*vii*) Monthly Mean Tide-Levels of all ports where tide-gauges and tide-poles are functioning were computed for the year 1961.

(*c*) *Miscellaneous.*—

(*i*) Hourly heights of tide levels were read off the tide-gauge diagrams for the following ports for the years indicated in brackets :—

Kandla (1961), Verāval (1961), Bombay (1961), Mangalore (1961), Cochin (1960), Madras (1961), Vishākhapatnam (1961), Sāgar (1960, 1961), Diamond Harbour (1960, 1961), Garden Reach (1961), Rangoon (1960), Port Blair (1961).

(*ii*) Tide-gauge diagrams of Rangoon (January 1959 to June 1960) were traced for record in the unit.

(*iii*) Earth Tide Curves of Hyderābād were run on the Tide Predicting Machine and supplied to the Head of the department of Geology, Osmania University, Hyderābād.

(*iv*) A student from Osmania University was given training in Earth Tide analyses and theory of tides. Training was also imparted to 17 departmental computers in tidal computations.

(*v*) Tidal data of the east coast of India from Krishnapatnam to False Point were computed and supplied to the Andhra University for the study of ecology of marine life.

(*vi*) Tidal data of Cuddalore and Pondicherry were supplied to the State Ports Officer, Madras.

Observatory Section.—

(*a*) *Metrology.*—Seven 24-metre invar wires, one 8-metre invar wire and one 4-metre invar tape were standardised on the 24-metre Comparator, the length of which was determined with the help of the 4-metre Invar Bar.

(*b*) *Repairs, test and calibrations of instruments.*—During the period under report 18 instruments of various kinds were tested, 423 instruments were calibrated and 832 instruments were repaired.

The 42-component Tide Predicting Machine, photogrammetric equipment, astronomical instruments, clocks, wireless sets, etc. were repaired from time to time and kept in working order.

(*c*) *Routine Work.*—Daily meteorological observations and supply of weather data; upkeep and storage of optical and other precision instruments; procurement and allotment of all precision instruments for the department and issue of instruments to various field detachments of this Directorate form part of the routine work.

Astronomical Section.—

(*a*) *Latitude and longitude Observations.*—Two groups of latitude on Zenith Telescope and one group of time on Wild T4, were observed generally twice a week on clear nights. Rhythmic time signals were also received from various world stations.

(*b*) *Computations.*—Computations for time, wireless signals, rating of clocks and latitude were continued.

245. Field Work.—

(*a*) Shri K. D. Mehta (Computer) with 4 Recorders, took 31-day tidal observations at each of the secondary ports of Tiwari, Purangad, Musākazi, Devgarh, Āchra and Vengurla in Mahārāshtra.

(*b*) Automatic tide-gauge registrations were continued at Kandla Verāval, Bombay (Apollo Bandar), Cochin, Mądras, Vishākhapatnam, Diamond Harbour, Garden Reach, Rangoon and

Port Blair. Tide-gauge observatories at Mundra and Ratnāgiri remained out of commission throughout the year. Visual observations round-the-clock were taken at Mangalore till the tide-gauge started functioning on the 7th May 1961.

Tide pole observations of high and low waters during day and night were continued at Bhaunagar Concrete Jetty by the port authorities.

Day light visual observations of high and low waters were taken at Amherst and Moulmein by the port authorities.

246. **Description of Country.**—The tidal work was carried out along the coastal strip of Mahārāshtra State.

247. **Miscellaneous.**—The health of the field personnel remained good.

No. 14 PARTY

Officer in charge :—Major B. B. S. Karki, B.Sc., A.M.I.E., Engineers, to 16-7-61 and from 26-12-61 to 4-3-62.
Major D. P. Hajela, B.Sc., B.E. (Civil), Engineers, from 17-7-61 to 25-12-61.
Shri R. M. Gupta, M.Sc., from 5-3-62.

248. **General.**—The headquarters of the party remained at Dehra Dūn. The office work activities of the party consisted of computations of high precision and secondary levelling, preparation of press copies of levelling pamphlets, examination of proofs of levelling pamphlets, and supply of levelling data to departmental and extra-departmental indentors. As this party was assigned to carry out top priority departmental survey work, all other jobs hitherto being carried out by this party, were transferred to No. 19 Party. However, personnel of this party were imparted training in field surveys.

249. **Personnel.**—The average strength of the party was 2 Class I Officers, 3 Class II Officers, 4 Surveyors, 1 Survey Assistant, 3 Geodetic Computers and 16 other Class III personnel including 4 Clerks.

250. **Recess Duties.**—The party was organised into three sections and carried out the following tasks :—

(*a*) Computations of high precision levelling lines from Nāgpur to Secunderābād and from Vijayawāda to Wādi executed during field works 1959-60 and 1960-61.

(*b*) Computations of all secondary levelling executed during field work 1960-61.

(*c*) Supply of levelling data to departmental and extra-departmental indentors.

(*d*) Preparation of press copies and examination of proofs, etc. of levelling pamphlets.

(*e*) Computations of Konch and Beas Dams Triangulation executed during field work 1960-61.

(*f*) Computations of Decca Chain Triangulation executed during field work 1960-61.

(*g*) Printing of Secondary Levelling Pamphlets Nos. 93 to 95, 98, 101 to 105 and 114 to 119 and reprinting of High precision Levelling Pamphlet No. 73 and Secondary Levelling Pamphlets Nos. 50, 52 and 53 was done.

251. Field Work.—Training in field work of officers was imparted at Rājpur and Mussoorie in field surveys by photogrammetric methods. Training in technique of high hill climbing of Officers at Himalayan Mountaineering Institute, Darjeeling was also arranged.

252. Description of Country.—The training area around Bhatta is hilly ; it is covered by light vegetation and scrub, with patches of cultivation. The metalled road from Dehra Dūn to Mussoorie runs through the area. The area around Rājpur consists of hills and undulating plains interspersed with roads, villages, and light vegetation. The hilly area is scrub covered. Banog and Hāthipaon are barren. The whole area was under snow at this time of the year with temperatures under freezing point at times.

253. Miscellaneous.—The health of the field personnel remained generally good.

No. 19 PARTY

Officer in charge :—{ Major B. B. S. Karki, B.SC., A.M.I.E., Engineers, to 25-12-61.
Shri R. M. Gupta, M.SC., from 26-12-61.

254. General.—The headquarters of the party remained at Dehra Dūn throughout the year. As No. 14 Party was earmarked for top priority departmental work, the field work previously assigned to that party was transferred to No. 19 Party. The party carried out the following tasks :—

(*i*) Magnetic observations in the states of Mysore, Andhra Pradesh, Madhya Pradesh and Orissa.

(*ii*) Preparation of Isomagnetic charts for epoch 1960·0.

(*iii*) Computations of H.F., V.F., and Declination observed in 1960-61.

(*iv*) Supply of magnetic and gravity data.

(*v*) Training of Topo. Trainees Type 'B' (Computers).

(*vi*) Jobs in the general workshop.

(*vii*) Gravimetric observations at stations in the states of Madhya Pradesh and Rājasthān.

(*viii*) Precise traverse at Barauni (Bihār) for the Barauni Refinery Project.

(*ix*) Computations of various gravity anomalies and barometric heights.

(*x*) Precise levelling in Rājasthān, Bihār, Madhya Pradesh, Mahārāshtra and Uttar Pradesh.

255. **Personnel.**—The average strength of the party was 1 Class I Officer, 2 Class II Officers, 1 Geodetic Computer, 3 Survey Assistants and 58 other Class III personnel including 5 Clerks.

256. **Areas Surveyed.**—

(*a*) *Magnetic.*—

(*i*) Andhra Pradesh	..	5 repeat stations and 169 field stations
(*ii*) Madhya Pradesh	..	23 field stations
(*iii*) Mahārāshtra	..	4 field stations
(*iv*) Mysore ..	..	1 repeat station and 147 field stations
(*v*) Orissa ..	..	1 repeat station and 65 field stations

(*b*) *Gravity.*—

(*i*) Madhya Pradesh	..	230 stations
(*ii*) Rājasthān ..	..	52 stations

(*c*) *Precise Traverse.*—

(*i*) Bihār (Barauni)	..	in an area of 1·68 sq. km

(*d*) *High Precision Levelling.*—

(*i*) Himāchal Pradesh	..	20 linear kilometres
(*ii*) Punjab ..	..	30 ,, ,,
(*iii*) Uttar Pradesh	..	122 ,, ,,

(*e*) *Precision Levelling.*—

(*i*) Bihār ..	..	26 linear kilometres
(*ii*) Madhya Pradesh	..	444 ,, ,,
(*iii*) Mahārāshtra	..	39 ,, ,,
(*iv*) Rājasthān ..	..	450 ,, ,,

257. **Work at Headquarters.**—The following tasks were undertaken during the period under report :—

(*a*) *Training.*—Training in survey computations were given to 27 Topo. Trainees Type 'B' (of which two were from Western Circle, 2 from Training Directorate, 2 from Northern Directorate, 21 from Geodetic and Research Branch), 2 J.C.Os. and 2 Havildars from 3 Field Survey Company.

(*b*) *Computations.*—(*i*) Magnetic observations carried out during field work 1960-61 in respect of H.F., absolute V.F. and

Declination were computed and Isomagnetic charts for epoch 1960·0 were drawn.

(*ii*) Estimation of heights and reduction of various gravity anomalies were carried out for 85 stations in Madras, 34 stations in Uttar Pradesh, 33 in Bihār and 22 in West Bengal.

(*iii*) Computations of Barometric heights for 282 stations observed in 1961–62 were completed.

(*iv*) Free air anomalies of 2,111 gravimetric stations observed during 1960-61 in connection with the determination of gravimetric deflection were also completed.

(*c*) *Sabhāwāla Magnetic Observatory.*—It was scheduled to be put in commission during the I.G.Y. period in order to supply magnetogram values to the world data centres for geomagnetic research and to serve as a regional control for magnetic observations in Northern India. No further progress has yet been made with regard to the actual operation of the Magnetic Observatory, because of non-availability of certain instruments and facilities.

(*d*) *Workshop.*—Job orders from various units were received and attended to in the general workshop.

(*e*) *Supply of Data.*—Magnetic and gravity data were supplied to the departmental and extra-departmental indentors.

258. Field Work.—

(*a*) *Magnetic.*—Only one magnetic detachment could be equipped with one Q.H.M., one B.M.Z. and one V.F. Variometer and this was sent out under Shri T. R. Joshi (Trig. Computer) who carried out detailed magnetic Survey in connection with the scheme for World Magnetic Survey—a deferred item of I.G.Y. Before starting the work, all the instruments were calibrated against the standards at Alibāg Observatory. In all, 147 field stations in Mysore, 169 in Andhra Pradesh, 65 in Orissa, 23 in Madhya Pradesh and 4 stations in Mahārāshtra were established. In addition, 5 Repeat Stations in Andhra Pradesh, 1 in Mysore and 1 in Orissa were also re-occupied during the period under report.

(*b*) *Gravity.*— A gravity detachment under Shri J. C. Bhattacharjee (Class II) observed 230 gravimetric stations in Madhya Pradesh and 52 stations in Rājasthān with the Worden Gravimeter in order to establish a 15-km gravity mesh within the distance of 160-km radius of Kaliānpur. This will determine the absolute deflection of the vertical at Kaliānpur H.S. the origin of Indian triangulation.

(*c*) *Precise Traverse.*—A detachment consisting of Shri S. L. Mallick (Senior Scientific Officer) in-charge, and assisted by Shri J. B. Mathur (Class II) and one Geodetic Computer carried out precise traverse work for the Indian Refineries Limited at Barauni in Bihār.

(*d*) *Precision Levelling.*—(*i*) Two detachments under Sarva Shri Chiman Lal and V. N. Oberai (Topo. Computers) carried out 259 kilometres of levelling in Madhya Pradesh in connection with the Sindh River Project.

(*ii*) One detachment under Shri Chiman Lal (Topo. Computer) carried out 26 linear kilometres of levelling in Bihār for the Indian Refineries Limited in connection with the Barauni Refinery Project. This detachment also did 39 linear kilometres of precise levelling in Mahārāshtra to re-establish bench-marks at Kurduvādi Railway Station (S.E. Railway).

(*iii*) Two detachments under Sarva Shri Manohar Lal (Trig. Computer) and Shri Balwant Singh (Topo. Computer) carried out 635 linear kilometres of precise levelling in one direction in Rājasthān and Madhya Pradesh, to provide height control for the Udaipur Aerodrome Reference Point.

(*iv*) A detachment under Shri Rampal Singh (Trig. Computer) carried out 172 linear kilometres of high precision levelling for the study of tear-faults at Konch Dam site by the Geological Survey of India in Uttar Pradesh, Himachal Pradesh and Punjab.

259. **Nature of the Country.**—The area where field work was carried out in Andhra Pradesh is undulating and dotted with hillocks, but leaving portions between the Krishna and the Godavari Rivers plain and fertile. The areas falling in Madhya Pradesh and Orissa are mostly hilly and covered with dense forests. There are few roads and the rivers and streams are generally unbridged. Mostly cross-country moves have to be made.

Precision levelling was done mainly in plain and partly undulating and hilly areas. Rations and transport were easily available.

260. **Miscellaneous.**—The health of the field personnel was in general excellent.

XVI.—APPENDIX A

Scale of survey of topographical mapping in India

The Government of India decided under Ministry's letters No. 19-67/55-S dated 14-1-60 and No. 19-67/55-S. II dated 4-8-61 the authorised scales for publication of topographical maps of India shall in future be as follows :—

(*i*) The whole of India including the High Himalayas, which may be defined as areas in which the general terrain is over 15,000 feet above M.S.L., will be mapped on the scale of 1 : 50,000.

(*ii*) These primary scale maps will be revised and kept up to date at regular intervals, the actual revision interval depending largely upon the available survey potential of the department for revision surveys. The target fixed for the revision survey is 25 years.

(*iii*) In addition to the primary scale maps mentioned above. 1 : 250,000 scale maps will be maintained covering the whole of India. These will be compiled from the primary scale maps and have a revision interval of 10 years.

(*iv*) Where this can be carried out without prejudice to the completion of the basic primary mapping programme the scale of 1 : 25,000 will be adopted for the survey of areas which are highly developed as well as those of importance from the Defence and Geological points of view.

The mapping on this scale will be in addition to the cover on 1 : 50,000 scale as mentioned in para (*i*) above.

N.B.—The maps to be printed on the above scales will be based on the metric system of measurement and consequently the process of changing over from the existing scales to the new ones will be slow and long. Hence during the transition period which may well be 30 years or more, maps of some areas will be available on the foot-pound system only, i.e., on scales 1-inch to 1 mile, 1-inch to 2 miles, 1-inch to 4 miles, etc.

XVII.—APPENDIX B

A. AGENDA FOR THE SURVEY PRIORITIES CONFERENCE TO BE HELD ON 28TH & 29TH SEPTEMBER 1961.

I. INTRODUCTION

1. During both the 1st and 2nd 5-Year Plan periods the Survey of India was faced with demands for surveys which required a potential much more than the capacity of the department. In a high level conference sponsored by the Government of India on both the occasions in 1953 and 1955, priorities were allotted to more important demands, keeping in view the essential needs for the development of the country as well as for the Defence and basic survey mapping of the country which is the normal role of the department, curtailing demands of lesser priority to enable Survey of India to cope with the balance work.

2. Now, before commencement of the 3rd 5-Year Plan period which for Survey of India Department actually commences from 1–10–61, the department is again faced with similar large and urgent demands for extra-departmental survey jobs from various Ministries, departments etc., etc. in addition to its own departmental commitments, which themselves are quite heavy due to various factors.

3. To enable some work capacity being made available for extra-departmental work of national importance, it has become necessary to convene the 3rd Survey Priorities Committee preferably at a high level (not below the rank of Joint Secretary) whose functions would be :—

(*i*) to make an appreciation of the volume of regular departmental work of the Survey of India fallen seriously into arrears and which requires completion including the work of revising maps preferably on a 25 years cycle ; and of conversion of maps to metric system.

(*ii*) to consider the demands of project and other special surveys from Ministries of the Government of India, State Governments and other indentors which fell outside the scope of the regular departmental work of the Survey of India, and to lay down an order of priority between all such extra-departmental jobs by which these can be taken up for execution during 1961–66 with the potential allotted for the same, and

(*iii*) to make available reserve potential in the hand of the Surveyor General of work of high importance and urgency for which no provision can be foreseen.

The 3rd Survey Priorities Conference will be held in Committee Room 'A', first floor North Block, New Delhi on 28th and 29th September 1961.

4. The load of work now faced by the Department and the potential available are given below :—

A. Departmental Surveys.—

(*i*) It must be appreciated when considering the need for dapartmental surveys, that the administration, planning and launching of various development projects depend upon the supply of adequate and up to date topographical maps. Many other kinds of surveys besides maps-making, though, are needed for planning and development, to provide basic information on such matters as geology, mineral resources, soil and vegetation, water resources, etc., yet none of those surveys can be displayed comprehensively without these basic topographical maps, preparation and maintenance of which should essentially precede any other surveys in connection with development, investigation etc.

For any modern country it is very essential to have her entire territory covered by modern topographical maps on 1 : 50,000 scale and of areas of tactical, geological and other importance on 1 : 25,000 scale.

(*ii*) Till the year 1956, the basic scale for topographical surveys adopted by Survey of India was 1″=1 mile for all areas in Indian Union excluding the high Himalayan regions which were scheduled to be mapped on 1″=2 miles scale. Since 1956, when changing over to metric system was decided, the basic scales adopted for the said areas were 1 : 50,000 and 1 : 100,000 respectively.

In a Conference held this year, the Ministry of Defence have demanded the whole of Indian Union to be mapped on scale 1 : 50,000 and also placed an urgent requirement of mapping of about 85,000 square miles on scale 1 : 25,000. Out of these total demands, their Top Priority requirements, of areas which are still un mapped, are about 1,86,000 square miles on 1 : 50,000 scale and about 53,000 square miles on 1 : 25,000 scale.

(*iii*) The Survey of India agreed to the adoption of 1 : 50,000 as a basic scale of Survey for the whole of Indian Union at the moment, with an aim to have 1 : 25,000 map coverage of the whole country in furture (which is likely to take over 50 years from now), and has already approached the Government for approval of mapping the whole territory on 1 :50,000 scale and selected areas of importance on 1 : 25,000 scale. (Government, approval received).

The conversion of all existing 1" maps to metric scales, revision of all 1" maps surveyed more than 25 years ago and surveying and mapping areas of importance on 1 : 25,000 scale for Defence, Geological Survey of India, etc., are also essential and have to be attended to.

It is expected that within the next 25 years, a demand of 1 : 25,000 map coverage of about 40% of our territory, i.e., about 5,12,000 square miles will essentially be required to meet the demands for Defence, Geological investigation, forest departments and for planning of various other land use and development schemes. Considering these future requirements as well, the load of departmental survey as estimated for the coming 25 years is given in *Annexure 'A'*.

The total load of Departmental Survey for the coming 5 years (i.e., the 3rd Plan period) comes to :—(See also Appendix 'A-1')

(*i*) *1 : 50,000 Survey.*—

(*a*) Original survey in Northern Region	..	93	Party years Priotriy I
(*b*) Original Survey in areas where no modern surveys exist	..	40	,,
(*c*) Original Survey where ½ inch Surveys exsist	..	10	,,
(*d*) Revision in metric terms of existing 1 inch Surveys	..	43	,,

(*ii*) *1 : 25,000 Surveys.*—

(*a*) Defence requirements, Priority I training area.	..	62	,,
(*b*) Priority II training area	..	37	,,
(*c*) Area expected to be developed and required by various indentors during the III Plan Period	..	100	,,
(*iii*) *Miscellaneous Surveys, e.g. Guide maps, etc.*—		10	,,
Total demands	..	395	Party years.

DEPARTMENTAL PROJECT & SPECIAL SURVEYS

Till now, full and detailed demands from all the extra-departmental indentors have not been received by the Survey of India, and these are still pouring in. However, from the demands received so far, and those already in hand, the total load of work placed before the Survey of India for completion within the next 5 years, is given below (For details – please see Annexure 'B').

B:—

(*a*) Recurring demand for cantonment surveys for Ministry of Defence	7	Party years
(*b*) Recurring demand for surveys of I.C.A.O. charts for the Director General of Civil Aviations. (Ministry of Transport and Communications)	2·5	,,
(*c*) Ministry of External Affairs Indo–Pākistān Boundary surveys and other jobs	4	,,
(*d*) Ministry of Scientific Research and Cultural Affairs	0·2	,,
(*e*) Ministry of Steel, Mines and Fuel ..	1·8	,,
(*f*) Ministry of Health	1·3	,,
(*g*) Ministry of Commerce	0·1	,,
(*h*) Ministry of Food and Agriculture (State Forest Surveys) ..	13·3	,,
(*i*) State Governments and other indentors..	67·8	,,
(*j*) Ministry of Irrigation & Power (C.W. & P.C.).—		
(*i*) For demands for which details have been received ..	42·6	,,
(*ii*) For demands placed without details about scales, etc. ..	30·0*	,,
	*Approximate only.	
Total load :	170·6	Party years
Say :	171	Party years.

C. The potential of Survey of India department, estimated available during the coming 5 years is 163 Party years (vide Annexure 'C' enclosed).

5. *Recommendation of the Survey of India Department.*—

(*a*) In the field programme for 1961–62, the Survey of India department has provisionally arranged to take up the extra-departmental jobs whose total load will be about 11 Party years. Most of these jobs proposed to be taken up are those carried over from the 2nd 5-Year Plan period and rest (about 3 Party years) are those required by the indentors very urgently. As the planning for the field work during 1961–62 is well advanced and major changes in the field programme of 1961–62 at this stage may result in non-utilization of the whole potential to the best advantage, it is considered desirable that the jobs already included may be allotted higher priorities alongwith other new demands of more urgent nature.

(*b*) While allotting the priorities to jobs and distributing the available potential of Survey of India, some provision (at least 15–20 Party years) has to be made for Revision/Original departmental work in addition to the high priority work in the Northern regions as this will not only give a scope to the Department to continue mapping of unmapped areas and revising maps which are over 50 years old but will also enable the Department to meet the requirements of up to date Topo maps so often indented by various indentors.

(*c*) It will be thus seen that the Survey of India with a potential of 135 Party years during the 3rd Plan period is faced with a work load of about 556 Party years. As immediate expansion to nearly 4 times its present strength is not possible in a very short time, the only solution lies in the Survey of India department being allowed to expand to its maximum capacity with maximum speed commensurate with maintenance of its existing standards and the requirements from various indentors be thoroughly scrutinised and curtailed to check up the really urgent demands which the survey of India should be asked to undertake. Lot of simple surveying jobs which can be tackled by Engineers themselves should *NOT* be passed on to the Survey of India, e.g. tertiary levelling and photo pricking for projects and flood control schemes. For a number of other construction works also the Engineers could carry out their own Engineering surveys, for which they are trained, and not try

to employ Surveyors from Survey of India whose normal role is to carry out mainly specialised survey tasks. There is no doubt the future demands for various land use, development projects, forest surveys and surveys for other Government departments and States will be on the increase. The Survey of India department could extend advice and technical assistance for training to State Officers, etc., to enable them to carry out simple survey tasks under their own supervision. It is the Survey of India's intention to assist in co-ordinating survey jobs in different States by augmenting their strength in the training establishment when necessary through a Co-ordination Branch under the Surveyor General. The achievement of uniformity in surveying practices throughout India is very essential.

(*d*) The proposed allotment of survey potential for various departmental and extra-departmental jobs during the Third Five Year Plan period is given below :—

	Party years
I. Departmental Surveys.—	
1. (*a*) 1:50,000 scale original surveys in the Northern region (Priority I area)	93
(*b*) 1 : 50,000 scale original surveys where no modern surveys exist (*c*) Original surveys where only ½-inch surveys exist .. (*d*) Revision in metric terms of existing 1-inch surveys	13
2. (*a*) 1 : 25,000 scale. The different requirements of Priority 1 training area	6
(*b*) Miscellaneous surveys, e.g. guide maps, etc. ..	4
II. *Extra-departmental Project and Special surveys.—*	
1. (*a*) Recurring demand for cantonment surveys for Ministry of Defence	4
(*b*) Recurring demand for surveys for I. C. A. O. charts for D. G. C. A. (Ministry of Transport & Communications) ..	2

(*c*) Indo-Pākistān boundary survey and other jobs for the Ministry of External Affairs ..	4
(*d*) Ministry of Scientific Research & Cultural Affairs (Archaeological Survey of India) ..	0·2
(*e*) Ministry of Food & Agriculture (State Forest Surveys) ..	5
(*f*) Extra-departmental surveys for C.W. & P.C. and States etc. carried over from the Second Five Year Plan period—Ministry of Irrigation & Power..	11
(*g*) Demands from C.W. & P.C. (Dam sites Tunnels Reservoirs etc.)—Ministry of Irrigation Power	8
(*h*) Demands from State Govts. ..	6
(*i*) Reserve for top priority demands placed during the plan period e.g. Ahmadabad, Hydro-Electric Schemes, Tapoban, etc. to be allocated by the Surveyor General of India ..	6·8
TOTAL :—	163

ANNEXURE A.—LOAD OF DEPARTMENTAL SURVEYS FOR THE NEXT TWENTY FIVE YEARS

	Area	Average out-turn per Party year	Party years required	REMARKS
	sq. m.	sq. m.		
A. 1 : 50,000.—				
(*a*) Original Survey in Northern Region	1,86,00	2,000	93	Desired completion in 3 years.
(*b*) Original Survey in areas where modern surveys do not exist	1,00,000	2,500	40	
(*c*) Original Survey in areas where Survey exists	1,45,000	3,000	48	
(*d*) Revision in metric terms of existing 1-inch Survey	7,40,000	3,500	212	
B. 1 : 25,000.—				
(*a*) Defence requirements Priority I	53,000	860	62	
,, II	32,000	860	37	
(*b*) Area expected to be developed by next 25 years and expected demands for Survey	4,27,000	860	497	
Total of (*a*) & (*b*)=40%				
C. Various Scales.— Miscellaneous Surveys, e.g., City and Town guide maps, Tourist, Railway maps, etc.		Say	50	
		Total	1039 Party Years	

ANNEXURE A-1.—LOAD OF DEPARTMENTAL SURVEYS FOR COMING 5 YEARS

Party Years

I.	1 : 50,000.—		
	(*a*) Original Survey in Northern Regions	93	Vide Annexure 'A'. All to be completed.
	(*b*) Original survey in areas where no survey exists	40	Do.
	(*c*) Original survey where ½-inch survey exists	10	1/5th of that shown in Annexure 'A'.
	(*d*) Revision in metric terms of existing 1-inch survey	43	Do.
II.	1 : 25,000.—		
	(*a*) Defence Requirements Priority I	62	Vide Annexure 'A'. All to be completed.
	,, .. ,, II	37	Do.
	(*b*) Area expected to be developed by next 25 years	100	1/5th of Annexure 'A'.
III.	Miscellaneous Surveys, e.g. City, Town Guide maps etc.	10	Do.
	Total	395	

ANNEXURE C.—PARTY YEARS AVIALABLE FOR THE III PLAN PERIOD

No. of Parties in Survey of India on 1–9–1961

A. 33 Parties—Nos. 1–33, out of which Nos. 10, 15, 16 and 20 are training parties and Nos. 14 & 19 being specialised Geodetic & Geophysical parties leaving 27 Field parties – whose potential during comming 5 years – will be 27×5 i.e. *135 Party years.*

B. In addition, there are Computing Party (which is engaged in departmental computation work) and Tidal Party (engaged in tidal observations) which will not add potential for the purpose.

C. It has been decided to raise 3 more new field parties from 1–10–62, after trained staff become available, mainly to cope with the urgent demand of departmental surveys in Northern border regions. This will add a potential of 3×4 i.e., *12 Party years.*

D. 4 more new field parties and 2 more photo parties will be raised in 1962 & 1963 respectively. This will add a potential of $4 \times 3 + 2 \times 2 = 12 + 4$ i.e. *16 Party years.*

Thus the total potential expected to be available during the 3rd 5-Year Plan is *163 Party years.*

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area sq. miles	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
				MINISTRY OF IRRIGATION & POWER							
1	Assam ..	Contour Survey in the hill districts of Garo, Cachar Hills, Khasi and Jaintia Hills, N.C. & Mikir Hills	Flood control	14,000	4″ to one mile, 50′ contour interval	Survey and mapping	4·0	Chief Engineer, Flood Control & Irrigation, P.W.D., Assam and C.W. & P.C.	No	No	Not immediate
2	Assam ..	Survey for Barapani Project (Umiām-Umtru)	Hydro-electric	58	4″ to one mile, 20′ contours	,,	0·5	Chief Engineer, Electricity Board, Assam & (C.W. & P.C.)	Yes	Yes	
3	Assam ..	Manas Valley Project ..	Multi-purpose	250	4″ scale, 20′ contour interval	,,	0·5	S.E., Investigation, Assam Circle, C.W. & P.C.	No	Yes	
4	Assam ..	Survey for Jamuna Hydel Project	Hydro-electric	Not yet known	Not yet known	,,	0·3	S.E., Investigation, Assam Circle, C.W. & P.C.	Yes	Yes	
5	Assam ..	Kopilli reservoir Survey, Phase III & IV	Multi-purpose	..	4″ to 1 mile; 20 ft. contour interval	,,	1·0	C.E., Investigation Circle, C.W. & P.C.	No	No	
6	Andhra Pradesh	Reservoir survey for Inchamapalli Project	Hydro-electric	1,200	4″ scale; 10 ft. contours in flat, 20 ft. contours in hills	,,	2·0	C.W. & P.C. ..	No	No	

(Continued)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area sq. miles	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		MINISTRY OF IRRIGATION AND POWER.—*Contd.*									
7	Reservoir ..	Reservoir Surveys for Pranhita	Hydro-electric	760	4″ scale; 10 ft. V.I., in flat, 20 ft. V.I. in Hills	Survey and Mapping	1·5	C.W. & P.C. ..	No	No	
8	Bihār ..	Son High Level Canal Project	Irrigation	465	4″ scale; 1 ft. V.I.	,,	0·30	C.E., Irrigation, Bihār & C.W. & P.C.	Yes	Yes	
9	Bihār ..	Chandan Reservoir Project	,,	100	2″ scale; 2 ft. contour in North, 10 ft. contour in South	,,	0·30	C.E., Irrigation, Bihār & C.W. & P.C.	No	Yes	1962.
10	Bihār ..	Mokameh Tal Project ..	,,	250	2″ survey; 4″ maps, V.I. 1 foot	,,	0·50	C.E., Irrigation, Bihār & C.W. & P.C.	No	Yes	1962.
11	Gujarāt ..	Air survey and preparation of contour maps in Ghed area in Saurashtra	Flood control	900	4″ scale	,,	2·00	Government of Saurashtra and C.W. & P.C.	No	Yes	

(*Continued*)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		MINISTRY OF IRRIGATION AND POWER.—*Contd.*									
12	Gujarāt ..	Reclamation of the little Rann of Kutch	Planning and Agriculture	sq. miles 1,700	4″ scale maps, 2 ft./10 ft. V.I.	Survey & mapping	0·5	S.E., Gujarāt Construction Circle & C.W. & P.C.	Yes	Yes	
13	Gujarāt ..	Narmada Project Commanded area	Irrigation	5,173	Survey on 2″ scale, maps on 4″ scale, 2 ft. V.I.	,,	5·00	Director, Engineering Research Institute, Baroda & C.W. & P.C.	Yes	Yes	
14	Gujarāt ..	Narmada Project Submergence Area	,,	102	4″ scale, 20/10 ft. V.I.	,,	0·3	Director, Engineering Research Institute, Baroda & C.W. & P.C.	Yes	Yes	
15	Kerala ..	Reservoir Survey for Azuthi-Kakkad Project on Pamba and Asu Thayon rivers	Hydro-electric Project	15	4″ scale, 20 ft. contour interval.	,,	0·1	C.E., Electricity Board, Kerala, and C.W. & P.C.	No	No	1961–62.
16	Kerala ..	Edamalayar Project Reservoir Survey	,,	10	do.	,,	0·1	C.E., Electricity Board, Kerala, and C.W. & P.C.	No	No	1962–63.

(*Continued*)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area sq. miles	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961-62	Remarks / Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		MINISTRY OF IRRIGATION AND POWER.—*Contd.*									
17	Madhya Pradesh	Reservoir survey for Chitrakot Project	Hydel Project	50	4" scale, 20 ft. contour interval	Survey & mapping	0·2	Govt. of Madhya Pradesh, through C.W. & P.C.	No	No	
18	Madhya Pradesh	Reservoir Survey for Bodhghat Project	,,	50	..	,,	0·2	Govt. of Madhya Pradesh through C.W. & P.C.	No	No	
19	Madhya Pradesh	Reservoir Survey for Gudra Project	,,	50	..	,,	0·2	Govt. of Madhya Pradesh through C.W. & P.C.	No	No	
20	Madhya Pradesh	Reservoir Survey for Kutru Project	,,	50	..	,,	0·2	Govt. of Madhya Pradesh through C.W. & P.C.	No	No	
21	Madhya Pradesh	Reservoir Survey for Maji Mendri Project	,,	50	..	,,	0·2	Govt. of Madhya Pradesh through C.W. & P.C.	No	No	
22	Madhya Pradesh	Reservoir Survey for Demba Project	,,	50	..	,,	0·2	Govt. of Madhya Pradesh through C.W. & P.C.	No	No	
23	Madhya Pradesh	Reservoir survey for Hurma Project	,,	50	..	,,	0·2	Govt. of Madhya Pradesh through C.W. & P.C.	No	No	

(*Continued*)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area sq. miles	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961-62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		MINISTRY OF IRRIGATION AND POWER.—*Contd.*									
24	Madhya Pradesh	Reservoir Survey for Kanhar Project	Hydel Project	50	..	Survey & Mapping	0·2	Govt. of Madhya Pradesh through C.W. & P.C.	No	No	
25	Madhya Pradesh	Dam Site Survey for Sindh Project	Multi-purpose Hydel Project	..	..	,,	0·1	S.E., Investigation Circle, C.W. & P.C.	Yes	Yes	
26	Mysore	Reservoir Surveys for Varahi Project	..	..	..	,,	..	Govt. of Mysore, through C.W. & P.C.	No	No	
27	Mysore	Survey for Kalinadi Project (consists of 5 reservoir areas—Supa, Nagjhiri, Kaneri, Taffihalba, Lower Kalinadi)	Hydel Project	98	4″ scale, 5 ft/10 ft. V.I.	,,	0·3	Executive Engineer, Kalinadi Hydel Electric Project, & C.W. & P.C.	No	No	
28	Mysore	Reservoir Survey for Bedti I & III stage	,,	..	..	,,	..	Govt. of Mysore, through C.W. & P.C.	No	No	

(*Continued*)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961-62	Remarks — Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		MINISTRY OF IRRIGATION AND POWER.—*Contd.*									
29	Mysore	Reservoir Survey for Aghanasini Project	Hydel Project	..	..	Survey & mapping	..	Govt. of Mysore, through C.W. & P.C.	No	No	
30	Mysore	Reservoir Survey for Shivapur project on Tungbhadra Canal	,,	..	..	,,	..	Govt. of Mysore, through C.W. & P.C.	No	No	
31	Mysore	Reservoir Survey for Thirumalpur Project on Tungabhadra Canal	,,	..	..	,,	..	Govt. of Mysore, through C.W. & P.C.	No	No	
32	Mysore	Tail race development of Sharavati	,,	..	..	,,	..	Govt. of Mysore, through C.W. & P.C.	No	No	
33	Orissa	Reservoir Survey for Upper Kolab Project	,,	25,000 acre	..	,,	0·5	Govt. of Orissa (C.W. & P.C.)	No	No	
34	Orissa	Reservoir Survey for Noapara Project on Baitarni	,,	1,50,000 acre	..	,,	0·5	Govt. of Orissa (C.W & P.C.)	No	No	

(*Continued*)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		MINISTRY OF IRRIGATION AND POWER.—*Contd.*									
35	Orissa	Reservoir Survey for Bhimkunda Project on Baitarni	Hydel Project	1,50,000 acres	..	Survey & Mapping	0·5	Govt. of Orissa (C.W. & P.C.)	No	No	
36	Orissa	Reservoir Survey for Upper Brahmani Project	,,	1,50,000 acres	..	..	0·5	Govt. of Orissa (C.W. & P.C.)	No	No	
37	Orissa	Reservoir Survey for Lower Brahmani Project	,,	1,50,000 acres	..	..	0·5	Govt. of Orissa (C.W. & P.C.)	No	No	
38	Orissa	Reservoir Survey for Lower Kolab	,,	30,000 acres	..	..	0·2	Govt. of Orissa (C.W. & P.C.)	No	No	
39	Orissa	Reservoir Survey for Indrawati Project	,,	30,000 acres	..	..	0·2	Govt. of Orissa (C.W. & P.C.)	No	No	
40	Orissa	Reservoir Survey for Salki Project	,,	30,000 acres	..	..	0·2	Govt. of Orissa (C.W. & P.C.)	No	No	

(*Continued*)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area sq. miles	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961-62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		MINISTRY OF IRRIGATION AND POWER.—*Contd.*									
41	Punjab	Reservoir Survey for Beās–Sutlej Link Unit II	..	65,000 acres	..	Survey & Mapping	0·2	Secretary to the Govt. of Punjab, Beās Project Admn. and C.W. & P.C.	No	No	
42	Punjab	Bhākra Nangal Project	Irrigation	9,200	4″ scale, 1 ft. V.I.	,,	0·0	C.E., Irrigation, Punjab	Yes	Yes	
43	Uttar Pradesh	Hydel Schemes in the Himalayas	Hydro-Electricity	23 320	16″ scale, 10 ft. V.I. 4″ scale, 50 ft. V.I.	,,	1·5	Secretary, Uttar Pradesh Electricity Board, Lucknow	No	No	
44	Uttar Pradesh	Ken Hydro-Electric Project	..	40	16″ and 4″ scale, 10 ft./50 ft. contours.	,,	1·2	Secretary, U.P. State Electricity Board, and C.W. & P.C.	No	No	
45	Uttar Pradesh	Tapoban-Gulabkoti Hydel Scheme	Hydro-electric	3 45	16″ scale, 10 ft. V.I. 4″ scale, 50 ft. V.I.	..	0·3	Secretary, U.P. State Electricity Board and C.W. & P.C.	Yes	Yes	1960–61.

(Continued)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area sq. miles	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks / Indenor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		MINISTRY OF IRRIGATION AND POWER.—*Contd.*									
46	Uttar Pradesh	Baramdeo (Poorangiri) Hydro-electric project on Sarda	..	40	4″ scale, 50 ft. V.I.	Survey & Mapping	0·3	Secretary, U.P. State Electricity Board and C.W. & P.C.	No	No	
47	Uttar Pradesh	Kotlibhel Hydro-electric project	..	60	,,	,,	0·3	Secretary, U.P. State Electricity Board and C.W. & P.C.	No	No	
48	West Bengal	Flood Control Project	Flood Control	900	4″ scale 1 ft. contours,	,,	2·0	C.E., I. & W. Deptt., ..	No	No	
				1400	4″ spot heighted mosaics	,,	..	West Bengal. Ex. Engineer, Flood Planning Division, Calcutta	Yes	Yes	
49	J. & K.	Aerial Survey in connection with Kishtwar Canal	,,	750	20 ft. content	,,	..	C.E. Flood Control J. & K. (C.W. & P.C.)	No	No	
50	J. & K.	Detailed Survey of Chenāb from Akhnoor downwards surveying 100′ on either bank and cross sections of the river at every 500 ft.	,,	75	..	,,	..	C.E. Flood Control J. & K. (C.W. & P.C.)	No	No	Provisonal.

(*Continued*)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks / Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		MINISTRY OF IRRIGATION AND POWER.—*Contd.*									
51	J. & K.	Contours survey for Tawi Dam Project in Jammu	Multi-purpose	Details not known	..	Survey & Mapping	..	S.E. Investigation Circle, C.W. & P.C.	No	No	
52	Bihār	Basia I & II Project (on south Koel River)	Hydro-electric	,,	..	..	..	C.W. & P.C.	No	No	Not required by State Govt.
53	Bihār	North Karo II Project	,,	,,	..	..	..	C.W. & P.C.	No	No	,,
54	Bihār	North Karo III Project	,,	,,	..	..	..	C.W. & P.C.	No	No	,,
55	Bihār	Upper Sankh Project	,,	,,	..	..	..	C.W. & P.C.	No	No	,,
56	Bihār	Sarnbera Project (on Sankh River)	,,	,,	..	..	..	C.W. & P.C.	No	No	,,

(Continued)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		MINISTRY OF IRRIGATION AND POWER.—*Contd.*									
57	Bihār	Lower Sankh Project (on Sankh River)	Hydro-electric	Details not known	..	..	..	C.W. & P.C.	No	No	Not required by State Govt.
58	Kerala	Parinjakutti Project	,,	,,	..	..	..	C.W. & P.C.	No	No	,,
59	Kerala	Adirapalli Project (on Chalakudy)	..	,,	..	..	..	C.W. & P.C.	No	No	,,
60	Kerala	Kallar Project	,,	,,	..	..	..	C.W. & P.C.	No	No	,,
61	Kerala	Lower Pariyar Project	,,	,,	..	..	..	C.W. & P.C.	No	No	,,
62	Kerala	Chalipuzha Project	,,	,,	..	..	..	C.W. & P.C.	No	No	,,
63	Madras	Kodyar Project	,,	,,	..	..	..	C.W. & P.C.	No	No	,,

(*Continued*)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		MINISTRY OF IRRIGATION AND POWER.—*Contd.*									
64	Madras	Pandayar Project	Hydro-electric	Details not known	..	..	..	C.W. & P.C.	No	No	Not required by State Govt.
65	Mahārāshtra	Koyna tailrace	,,	,,	..	..	..	C.W. & P.C.	No	No	,,
66	Mahārāshtra	Bhira Project (on Mula River)	,,	,,	..	..	..	C.W. & P.C.	No	No	,,
67	Mahārāshtra	Vaitarna Project	,,	,,	..	..	..	C.W. & P.C.	No	No	,,
68	Rajasthān	Mahi Project	,,	,,	..	..	..	C.W. & P.C.	No	No	,,
69	Rajasthān	Kotah Project on Chambal River	,,	,,	..	..	..	C.W. & P.C.	No	No	,,
70	Uttar Pradesh	Harra Project (on Sone River)	,,	,,	..	..	..	C.W. & P.C.	No	No	,,

(Continued)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area sq. miles	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks / Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		MINISTRY OF IRRIGATION AND POWER.—*Contd.*									
71	Uttar Pradesh	Rajghat Project	Hydro-electric	Details not known	..	..	..	C.W. & P.C.	No	No	Not required by State Govt.
72	Uttar Pradesh	Dhurwara Project	,,	,,	..	..	..	C.W. & P.C.	No	No	,,
73	Uttar Pradesh	Kishan Project (on Tons/ Yamuna River)	,,	,,	..	..	..	C.W. & P.C.	No	No	,,
74	Punjab	Jamuna flood control	Flood Control	243	4″ scale, 1 ft. V.I.	Air svy. & Mapping	0·6	C.W. & P.C.	No	No	1961
75	Punjab	Beās Flood Control	Flood Control	150	4″ scale, 1 ft. V.I.	,,	0·4	C.W. & P.C.	No	No	1961
76	Bihār	Siktia barrage Irrigation scheme	..	Details not known	..	..	..	C.W. & P.C.	No	No	

(Continued)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area sq. miles	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		MINISTRY OF IRRIGATION AND POWER.—*Contd.*									
77	Bihār	Kamla Barrage Irrigation scheme	..	Details not known	..	..	..	C.W. & P.C.	No	No	
78	Punjab	Along the Rāvi River	..	,,	..			C.W. & P.C.	No	No	
79	Punjab	Investigations of the new schemes in Punjab	..	,,	..	..	..	C.W. & P.C.	No	No	
80	Uttar Pradesh	Run-off the river schemes near Joshimath	Hydel scheme	200	16″/4″ scale with 10 ft./50 ft. contours	Survey & Mapping	1·3	Ministry of Irrigation and Power (C.W. & P.C.)	No	No	
81	Uttar Pradesh	Utyasu Dam	,,	40	,,	,,	0·3	Ministry of Irrigation and Power (C.W. & P.C.)	No	No	
82	Uttar Pradesh	Dehra Dam	,,	25	,,	,,	0·2	Ministry of Irrigation and Power (C.W. & P.C.)	No	No	

(Continued)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area sq. miles	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks / Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
				MINISTRY OF IRRIGATION AND POWER.—*Concld.*							
83	**Andhra Pradesh**	Nāgārjunasagar Canal	Fixing of GTS BMS	Between Mile 111 to 151	..	H.P. Levelling	..	C.R. (P.W.D.) Nāgārjunasagar Canals, Hyderābād through C.W. & P.C.	No	No	
84	Bihār	Dam in Rāmgarh-Bokāro area in Upper Damodar Valley in connection with 4th Steel Plant at Bokāro	Water Supply scheme	225	6″ scale ; 10 ft. contour interval	Survey & Mapping	0·70	Dy. Secretary, D.V.C., Calcutta	No	No	High Priority.
85	Bihār	Upper Damodar Valley Survey for Soil Conservation	Soil Conservation	50	6″ scale ; 10 ft. contour interval	,,	0·3	Director of Soil Conservation, D.V.C., H. Bagh	No	No	
				MINISTRY OF EXTERNAL AFFAIRS							
86	**Manipur State**	Demarcation of disputed boundary between Khizakenoma in Kohīma District and Tongjai in Manipur State	Settlement of dispute	5	4″ scale strip	,,	0·1	Additional Commissioner, Nāgāland Administration	No	No	Immediate. Half mile astride boundary.

(*Continued*)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area sq. miles	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		MINISTRY OF EXTERNAL AFFAIRS.—*Concld.*									
87	..	Tripura-East Pākistān boundary	Border demarcation	..	..	..	0·3	Ministry of External Affairs	No	No	1961
88	..	Manipur–Kohīma (Assam) boundary	,,	..	..	..	0·3	Ministry of External Affairs	No	No	1961
89	..	Chittagong–Lushai Hills boundary	,,	..	..	..	0·3	Ministry of External Affairs	Yes	Yes	
90	..	India-West Pākistān Boundary	,,	..	..	..	1·0	Ministry of External Affairs	Yes	Yes	
91	Manipur State	Development of Manipur Valley	Development scheme	900	4″ scale, 10 ft. V.I.	Survey & Mapping	2·0	Manipur Administration	No	No	

(Continued)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					MINISTRY OF SCIENTIFIC RESEARCH & CULTURAL AFFAIRS						
92	Andhra Pradesh	Nāgārjunakonda Excavated site survey	Relief Maps of excavated site	sq. miles 24·5	16″ scale; contours at 5/10 ft V.I.	Mapping	0·2	Director of Archaeology	Yes	Yes	
					MINISTRY OF FOOD AND AGRICULTURE						
93	Gujarāt	Forest surveys in Junagadh and in Saurastra ..	Forest development	925	4″ scale	Survey & Mapping	1·3	Conservator of Forests, Junagarh ; and Ministry of Food and Agriculture	No	Yes	
94	Mahārāshtra	Forest surveys in Thāna District and other areas in State	,,	9,500	8″ and 4″ scale	,,	12·0	D.F.O., North Thāna, and Ministry of Food and Agriculture	No	No	
95	Andaman & Nicobar	Forest Surveys	,,	Not known	16″=1 mile 4″=1 mile	,,	..	Andaman & Nicobar Admn. Through Ministry of Food and Agriculture	No	No	

(*Continued*)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
				MINISTRY OF STEEL MINES AND FUEL							
96	Assam	Demarcation of Minining Leese	Oil Prospecting	sq. miles 510	..	Survey & Mapping	0·5	Oil India (P) Digboi, Assam	No	No	
97	Bihār	Topographical survey for Oil Refinery, Barauni	Fixing reference points	..	..	Laying of reference points and base line	0·7	Indian Refineries Ltd., New Delhi	No	No	Immediate.
98	Gujarāt	Topo. surveys of Baroda & Pānch Mahāls for Geological Survey of India	..	..	..	Survey & mapping	0·2	Geological Survey of India	No	No	
99	Bihār	Survey of Bokāro Steel Plant	Construction of Steel Plant	..	..	Triangulation Survey etc.	0·4	Hindustan Steel Ltd., Ranchi	No	No	High Priority.

(*Continued*)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		MINISTRY OF STEEL MINES AND FUEL.—*Concld.*									
100	Bihār	Sasangāda Iron Ore deposits in Singhbhum	Exploration maps	Not known	1:5000, 8 metres V.I.	..	..	Ministry of Steel, Mines and Fuel	No	No	
101	Madhya Pradesh	Bailadila and Kiriburu Iron Ore Deposits	..	,,	..	..	..	Director, Indian Bureau of Mines	No	No	
		MINISTRY OF HOME AFFAIRS									
102	Andaman & Nicobar Islands	Detailed survey maps of North and Middle Andamans & Nicobar	Development of roads, etc.	Details not known	..	Survey & mapping	..	Ministry of Home Affairs, (sponsored by Chief Comm. A. & N. Islands)	No	No	

(*Continued*)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					MINISTRY OF HOME AFFAIRS.—*Concld.*						
103	Andaman & Nicobar Islands	Detailed survey of North & Middle Andamans and Car Nicobar	Assessment of land and preparation of road planning	Not known	Not known	Survey & Mapping	..	Andaman Administration, Ministry of Home Affairs	No	No	
					MINISTRY OF HEALTH						
104	Delhi	Delhi Regional Plan survey	For planning and development	165·7 764 370	6″ scale, 5 ft. V.I. 3″ scale, 10 ft., V.I. 1″=400 ft., 5 ft. V.I.	Mapping	0·6 0·4 0·3	Chairman, Town Planning Organisation, Govt. of India	Yes	Yes	1962

(Continued)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
				MINISTRY OF COMMERCE & INDUSTRY							
105	Himachal Pradesh	Mandi Salt Mine Survey	Development of Salt Mine	sq. miles 5·0	1"=200 ft., 10 ft. V.I.	Mapping	0·1	Salt Commissioner, Government of India	Yes	Yes	1961–62
				STATE GOVERNMENTS AND OTHER INDENTORS							
106	Assam	Site for Fertilizer factory	Factory Planning	..	..	..	0·2	Secretary, Industries Department, Assam	No	No	
107	Assam	Reservoir area in Chachar district (Rukhi, Sonai, Singla River and Pipla and Longai N.)	Flood control & Irrigation	200	4" scale, 10 ft. V.I. in hills, 1 ft. V.I. in plains ..	Survey & Mapping	0·5	C.E., Flood Control and Irrigation, Assam	No	No	1960–61
108	Andhra	Nāgārjunasagar	Height Control	180 linear miles	H.P. Levelling	..	0·1	Executive Engineer. P.W.D., Nalgonda	No	No	

(Continued)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961-62	Remarks — Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		STATE GOVERNMENT AND OTHER INDENTORS.—*Contd.*									
109	Bihār	Kosi Irrigation (Area between Panar and Mahananda)	Irrigation extension	sq. miles 400	4" scale, 2 ft. contour	Survey & mapping	1·0	C.E., Kosi Project Patna	No	No	
110	Bihār	Bihār Mica Belt	Mica Prospecting	2,300	8" scale	,,	10·0	Director of Mines and Geology, Bihār	No	No	
111	Bihār	Irrigation Projects in South Bihār	Reservoir & Irrigation Planning	2,240	4" scale ; 1 ft. V.I.	,,	5·0	C.E., Irrigation, Bihār	No	No	
112	Kerala	Contour surveys for Poechi Reservoir	Study of rainfall yield	5	1"=500 ft., 5 ft. contour interval.	,,	0·2	S.E., Irrigation Central Circle, Trichur	No	No	

(Continued)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks — Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		STATE GOVERNMENTS AND OTHER INDENTORS.—*Contd.*									
113	Mysore	Upper Krishana Commanded area survey	..	sq. miles 3,200	2″ scale, 2 ft./5 ft. contour interval	Survey & Mapping	3·2	Executive Engineer, P.W.D., Raipur	No	No	
114	Mysore	Malaprabha Irrigation Project survey	..	800	..	,,	0·8	S.E. Malaprabha Project Circle, Nargund	No	No	
115	Mysore	Large scale survey for Bangalore Town Development	..	100	1 : 1000	..	4·0	Director of Town Planning, Bangalore	No	No	
116	Mahārāshtra	Irrigation Project, Koyna	Irrigation	265* 43†	2″ scale, 2 ft. contour in plains. 5 ft./10 ft. in hills	,,	0·4	S.E., Irrigation Project, Poona	No	No	
117	Mahārāshtra	Kurnoor Irrigation Project, Commanded area	,,	40	2″ scale, 2 ft. contour interval, maps on 4″ scale	,,	0·1	S.E., Marthwarda Project, Circle, Aurangabad	No	No	

* Commanded area. † Submerged area.

(*Continued*)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		STATE GOVERNMENT AND OTHER INDENTORS.—*Contd.*									
118	Mahārāshtra	Upper Tapti Project	Irrigation	sq. miles 947	2″scale, 2 ft. contours in plains, 5/10 ft. contours in hill, maps on 4″ scale	Survey & Mapping	1·0	S.E., Irrigation Project, Investigation Circle, Poona	No	No	
119	Mahārāshtra	Jayakwadi Project Stage I	,,	153* 10†	,,	,,	0·2	S.E., Irrigation Project Investigation Circle, Poona	No	No	
120	Mahārāshtra	Manjra Project	,,	68* 25†	,,	,,	0·2	S.E., Irrigation Project Investigation Circle, Poona	No	No	
121	Mahārāshtra	Upper Wardha Project	,,	300* 30†	,,	,,	0·4	S.E., Irrigation Project Investigation Circle, Poona	No	No	
122	Mahārāshtra	Dudhaganga Project	,,	410* 38†	,,	,,	0·6	S.E., Irrigation Project Investigation Circle, Poona	No	No	
123	Mahārāshtra	Pench River Project	,,	500* 5†	,,	,,	0·6	S.E., Irrigation Project Investigation Circle, Poona	No	No	

* Commanded area. † Submerged area.

(*Continued*)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		STATE GOVERNMENTS AND OTHER INDENTORS.—*Contd.*									
124	Godāvari Project	Godāvari Project, Part II, Stage I	Irrigation	sq. miles 2,900* 36†	2″ scale, 2 ft. contours in plains. 5/10 ft. contours in hills. Maps on 4″ scale	Survey & Mapping	3·0	S.E., Irrigation Project Investigation Circle, Poona	No	No	
125	Orissa	Flood Investigation surveys	Flood Control	2,400	4″ scale, 1 ft. V.I.	,,	5·0	C.E., Irrigation and Floods, Orissa	No	No	
126	Orissa	Triangulation along both banks of Baitarani and Dhāmra rivers	Hydrographic Survey	300	Fixing trig. station one mile apart	Triangulation	0·5	State Port Officer, Orissa	No	No	
127	Orissa	Irrigation Projects :—									
		(*a*) Sudari and Kondu Kut Project	Hydel Project	70	..	..	0·20	Secretary, Works Department, Orissa	No	No	
		(*b*) Bagh Nadi Project	,,	140		..	0·2	Secretary, Works Department, Orissa	No	No	
		(*c*) Subanarekha Project	,,	1,227		..	2·5	Secretary, Works Department, Orissa	No	No	
		(*d*) Udanti Project	,,	110		..	0·2	Secretary, Works Department, Orissa	No	No	

* Commanded area. † Submerged area.

(*Continued*)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area sq. miles	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks / Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		STATE GOVERNMENTS AND OTHER INDENTORS.—*Contd.*									
128	Punjab	Survey of Roads in Lahaul Spiti	Development of Hills area	Details not known	..	Survey & Mapping	..	Chief Secretary, Govt. of Punjab	No	No	
129	Punjab	Village Maps of Punjab	Removal of encroachment of Property	3,50,000 acres	16″ scale	,,	14·6	Director of Panchyats, Punjab	No	No	
130	Punjab	Minor Irrigation Projects in Punjab	Development of Irrigation in backward areas	8,000	2″ scale, 20 ft. contour	,,	8·0	C.E., North Irrigation Works, Punjab	No	No	

(Continued)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks — Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		STATE GOVERNMENTS AND OTHER INDENTORS.—*Contd.*									
131	Punjab	Ghaggar Dam and Reservior Surveys	..	sq. miles 12·5	..	Survey & mapping	0·2	Executive Engineer, Ghaggar Project Division, Chandigarh	No	No	
132	Rājasthān	Large scale survey of Udaipur city	..	..	..	,,	2·0	Executive Engineer, Improvement Trust	No	No	Guide map of Udaipur in W.C. Programme.
133	Uttar Pradesh	6″ photo-mosaics and line maps of Lucknow City	..	..	6″ scale	,,	0·5	Municipal Engineer, Lucknow	No	No	
134	Uttar Pradesh	Demarcation of Lime Stone quarries in Dehra Dūn	Demarcation of limits	No map required		..	0·1	Ziladhish, Dehra Dūn	No	No	
135	Uttar Pradesh	Survey of Municipal Area Anupshahr	Town Planning	1	16″ scale	..	0·1	President, Municipal Board, Anupshahr	No	No	
136	Uttar Pradesh	Master Plan of Khurja	Town Planning	2	16″ scale	..	0·1	President, Municipal Board, Khurja	No	No	

(Continued)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area sq. miles	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961-62	Remarks Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		STATE GOVERNMENTS AND OTHER INDENTORS.—*Contd.*									
137	J. & K.	Ujh Dam Project	Height control	70 linear miles	..	H.P. Levelling	0·1	Executive Engineer, Liaison and Investigation Division, Jammu	No	No	
138	Punjab	Sutlej Flood Control	Flood Control	800	4" scale, 20 ft. V.I.	Survey & mapping	2·0	Director, Irrigation and Power Research Institute, Amritsar	No	No	
139	Mysore	Ghataprabha Project	Irrigation	..	5 ft. V.I. contour survey	..	..	Secretary to the Govt. of Mysore, P.W.D. Department	No	No	
140	Mysore	Harangi	,,	..	,,	..	..	Secretary to the Govt. of Mysore, P.W.D. Department	No	No	
141	Assam	Rupa Project	Hydel scheme	75	4"=1 mile, 20 ft. V.I. contours	Survey & mapping	..	Chief Engineer (Civil), Assam State Electricity Board	No	No	

(Continued)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks — Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		STATE GOVERNMENTS & OTHER INDENTORS.—*Concld.*									
142	J. & K.	Kalkot Jangalgali Coal Area	Investigation for coal field, Rly. line up to Udhampur; Ropeway from Kalkot to Jangalgali and from Batote to Udhampur	sq. miles ..	Large scale	Aerial Surveys	..	Director of Geology and Mining, J. & K.	No	No	

(Continued)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					MINISTRY OF TRANSPORT AND COMMUNICATIONS						
143	Civil Aviation Organisation	Landing and Approach charts of various Aerodromes	..	sq. miles	1 : 25,000 1 : 250,000	Survey & Mapping	2·5	D.G.C.A.	Yes	Yes	Taken up as per DGCAO list of priorities
					MINISTRY OF DEFENCE						
144	Ministry of Defence	Cantonment Surveys	..	..	16″ or 64″ as required by the indentor	,,	7·0	Director of Military Survey	Yes	Yes	Recurring job taken up as per requirements of the indentor
145	Ministry of Defence	Topographical surveys in Northern Regions (Priority I Area)	Operational purposes	..	1:50,000 scale, 20 m contours	,,	93·0	Director of Military Survey	Yes	Yes	

(Continued)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks / Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
				MINISTRY OF DEFENCE.—*Concld.*							
146	Ministry of Defence	Topographical Survey (Priority I Area)	Training purposes	sq. miles ..	1:25,000 scale	Survey & Mapping	62·0	Director of Military Survey	..	..	
147	Ministry of Defence	Priority II Area	,,	..	,,	,,	37·0	Director of Military Survey	..	..	
				ADDENDUM TO ANNEXURE B							
148	Uttar Pradesh	Raipura Dam	Irrigation-cum-Hydel	2	16″ scale 10 ft. contours	,,	0·1	Secretary to U.P. Govt. through C.W. & P.C.	No	No	
				10	4″ scale, 50 ft. contours						

(*Continued*)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area sq. miles	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961–62	Remarks: Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					ADDENDUM TO ANNEXURE B.—*Contd.*						
149	Orissa	Balimela Commanded Area	Multi-purpose	358	4″ scale, 5 ft. contours	Survey & Mapping	0·9	C.W. & P.C.	No	No	
150	Geological Survey of India	Modern 1″ = 1 m. Topographical maps of the sheets, vide list attached	..	28,000* 55,000†	1″=1 mile (or 1 : 50,000)	..	22·0	The Director of Geological Survey of India, Calcutta	No	No	
151	Punjab	Beās Dam Reservoir Survey	..	120	4″ scale contours at 10 ft. and 20 ft.	Survey & Mapping	0·5	C.W. & P.C.	No	No	Sl. 18.
152	West Bengal	Berubari boundary survey	Survey and demarcation of boundary	..	..	,,	0·3	Ministry of External Affairs	No	No	

* Priority I. † Priority II.

(*Continued*)

ANNEXURE B.—LIST OF DEMANDS FOR THE THIRD PLAN

Sl. No.	State/ Department	Description of the Project	Purpose of Survey	Approximate area	Scale and contour interval	Work to be done	Load in party years	Indentor	Whether carried over from the IInd Plan programme	Whether included in the programme 1961-62	Remarks — Indentor's priority
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
153	..	Aerial photography	Pre-investment survey of forest resources	sq. miles 65,000	..	Interpretation of aerial photographs	..	Ministry of Food and Agriculture	No	No	
154	Andhra Pradesh	Ramapadasagar	Aerial Survey of water spread area	..	..	Survey	..	C.E., Andhra Pradesh through C.W. & P.C.	No	No	
155	Orissa	Survey in Tel River basin & Indravati River	..	..	..	,,	..	Irrigation Department, Orissa through C.W. & P.C.	No	No	
156	Punjab	Beās Dam-Survey of works area	..	..	..	Survey & mapping	..	General Manager Beās Dam through C.W. & P.C.	No	No	
157	Rājasthān	Rājasthān Lead Zinc Zone Survey	..	..	1 : 25,000	,,	4·0	..	Yes	Yes	Being treated as a departmental job

(Concld.)

B. MINUTES OF THE MEETING HELD AT NEW DELHI ON THE 28TH & 29TH SEPTEMBER, 1961.*

Minutes of the Survey Priorities Conference held at New Delhi on 28th & 29th September, 1961. Shri M. G. Raja Ram, Joint Secretary, Ministry of Scientific Research & Cultural Affairs, Chairman.

The following members attended :—

1. Shri M. G. Raja Ram,
   Joint Secretary,
   Ministry of S.R. & C.A. — *Chairman*

2. Shri M. M. Kusari,
   Deputy Secretary,
   Ministry of S.R. & C.A.

3. Shri N. K. Sreenivasan,
   Under Secretary,
   Ministry of S.R. &. C.A.

4. Col. R. S. Kalha,
   Surveyor General of India.

5. Col. S. K. S. Mudaliar,
   Director, Northern Circle,
   Survey of India.

6. Col. J. N. Sinha,
   Deputy Surveyor General,
   Survey of India.

7. Shri A. V. Venkateswaran,
   Financial Advisor (S.R. & C.A. Ministry),
   Ministry of Finance.

8. Dr. K. P. Basu,
   Officer on Special Duty,
   Planning Commission.

9. Shri Narendra Singh,
   Deputy Secretary,
   Ministry of External Affairs.

* Issued under Government of India, Ministry of Scientific Research and Cultural Affairs U.O. No. 20-131-61-S. II dated the 24th October, 1961.

10. Shri B. C. Gangopadhyay,
Deputy Secretary,
Ministry of Irrigation & Power.

11. Shri P. R. Ahuja,
Chief Engineer (Floods),
Central Water & Power Commission.

12. Shri K. R. Mehndiratta,
Director (T.E.),
Central Water & Power Commission.

13. Shri J. N. Goyal,
Deputy Secretary,
Ministry of Defence.

14. Shri Raj Pal,
Under Secretary,
Ministry of Defence.

15. Col. O. P. Anand,
Deputy Director, Military Survey,
Army Headquarters.

16. Brig. Shamsher Singh,
Director, Technical Administration,
Director General of Border Roads.

17. Shri N. D. Mirchandani,
Planning Officer,
Ministry of Transport & Communications.

18. Shri Balwant Singh,
Assistant Aerodrome Officer (Maps & Charts),
Directorate General of Civil Aviation.

19. Shri C. Ramaswamy,
Deputy Director General Observatories,
India Meteorological Department.

20. Shri T. S. Kunchithapatham,
Under Secretary,
Ministry of Commerce & Industry.

21. Shri J. Swami Nath,
Geologist,
Geological Survey of India.

22. Shri A. M. Hussain,
Indian Bureau of Mines.

23. Shri M. N. Deshpande,
Deputy Director General,
Archaeological Survey of India.

24. Shri J. K. Ganguly,
Deputy Advisor, Soil Conservation (Forests),
Ministry of Food & Agriculture.

25. Shri M. Riazuddin,
Deputy Inspector General Forests,
Ministry of Food & Agriculture.

26. Shri C. S. Gupta,
Architect, Town Planning Organisation,
(under Ministry of Health).

27. Shri P. B. Rai,
Associate Planner, Town Planning Organisation,
(under Ministry of Health).

2. The Chairman, after welcoming the delegates, stated that the last Survey Priorities Conference was held at Dehra Dūn on 24–9–1955 and was followed up by another meeting at New Delhi on 15th March 1966. For the Second Five-Year Plan period the Survey of India had a total available potential of about 127 party years including plan units which were to be raised. As against this, a toal programme of 140 party years was allotted to the Survey of India. The Department during the period could, however, complete work only in respect of about 103 party years. The shortfall was mainly due to the following reasons :—

(*a*) Unavoidable delay in raising plan units during the Second Plan Period due to the general ban on recruitment of staff.

(*b*) Non-availability of proper accommodation to house these units.

(*c*) Delay of about 2½ years in the installation of Photogrammetric equipment owing to the air-conditioning of building having been delayed due to various causes.

(*d*) Totally inadequate sanction of foreign exchange during the Second Plan Period which greatly handicapped the Department in working with outmoded instruments and machines. (About Rs. 5·4 lakhs only was sanctioned as foreign exchange for the Department as against its raquirements of many times that sum). The Department even to this date is woefully lacking in modern printing machinery and precision

instruments like Tellurometers, which seriously affect speed and accuracy of the work turned out.

(*e*) Delay in receipt of the aerial photographs.

Now, for the Third Five-Year Plan period, the load on the Survey of India has been estimated to be in the region of 395 party years for regular Departmental surveys and about 196 party years for extra-departmental surveys. As against this total demand of 591 party years, the available potential is estimated only to be in the region of 135 party years. It has further been estimated by the Surveyor General that even with the maximum possible expansions of the Department, commensurate with efficiency, during the Third Plan period and also subject to availability of trained technical personnel and adequate foreign exchange for procurement of essential equipment and machinery, the total party years may at best be raised to only about 163. However, under the conditions obtaining at present in the Department, the allocation of work load can only be up to about 135 party years, and on which basis only we can plan just now.

The Departmental work of the Survey of India has fallen into arrears which is rather a disquieting factor. It is, therefore, essential that the Department should fulfil its normal and legitimate work and for this purpose 80% of its available potential should be earmarked and the remaining 20% only can be spared for extra-Departmental work.

While suggesting this allocation between Departmental and Extra departmental work load it has to be stated that the importance of extra-departmental work is not minimised. The Estimates Committee in 1956 had observed that the Ministry should take action to relieve the Survey of India of some minor jobs like tertiary levelling, etc., which should normally be done by the indentors themselves. The Deputy Minister, Ministry of S.R. & C.A. held personal discussions with the Surveyor General and Senior Officers of the Department in Dehra Dūn on 15th April 1961. He observed with concern that the normal work of the Department had fallen into arrears because nearly 50% of the total potential had to be diverted for extra-departmental work like Project Surveys, Cantonment Surveys, etc. It was also brought to his notice that some of the work required to be done by the Survey of India like engineering surveys, should be handled by the Engineers-in-charge of the Projects themselves. Likewise it was also pointed out that work connected with Flood Control Surveys, Cantonment Surveys, etc., should be handled by the authorities concerned, with some assistance from the Survey of India. He observed that to saddle Department with responsibilities which did not legitimately belong to it (nor was the Department meant to undertake such minor jobs) was not justified and the position was most unsatisfactory. He directed that this aspect and present state of preparedness of the

Department should be kept in view when allocations were made by the Survey Priority Committees for the Third Five-Year Plan. While, therefore, it is realised that important Projects of national importance should certainly receive the attention they deserve from the Survey of India, it should be borne in mind that steps ought to be taken to relieve the Survey of India of certain minor jobs like tertiary levelling, etc. Survey of India will always be prepared, of course, to give assistance in running courses, etc., for survey training of Junior Engineers and Overseers, etc., employed on such Projects or in the State Governments. It will also be prepared to co-ordinate the work of the Projects, tender technical advice and generally act as consultants wherever necessary. It will also be possible for the Survey of India to consider deputing some of its officers for short periods to State Governments to help them organise their survey departments instead of taking upon itself simple jobs like Rectangulation and Flood Control Surveys, etc. It is essential that State Governments should build up (where they are not existing now) a potential of Engineers who are also trained in basic survey, so that they are able to tackle simple engineering surveying tasks and other surveys required for the Projects. Indeed after the Third Five-Year Plan period it may become necessary to gradually further reduce even this allocation of 20% of survey potential for extra-departmental work, as by that time the work load of the Survey of India for fulfilling its normal role and priority tasks would have increased to such an extent that any sparing of potential for outside jobs of a non-essential nature will be extremely difficult, if not impossible.

The printing machinery used by the Survey of India is over 30 years old and is almost on its last legs. The premises where they are installed are yet to be air-conditioned with the result that constant trouble is experienced in registration of colours, in printing multi-coloured jobs requiring a high standard of accuracy. Visitors who have come to see the working of the Department have been astonished to find that the Survey of India with its tradition of nearly 195 years is still working with outmoded machinery for printing in premises which are not air-conditioned, as is the case in most of the other advanced countries where speed and accuracy are ensured with modern equipment and machinery. It is, therefore, essential that if the Survey of India is to fulfil its responsibilities with speed and accuracy every step sould be taken to equip the Department with modern machinery and equipment including the latest precision instruments. Just to give an example of our slow speed in turn out, it may be said that the output capable of our old machines now is only about 2000–2500 cylinder revolutions per hour for a double colour machine, whereas about 5000–6000 can be achieved if these machines are replaced by modern ones and housed in air-conditioned premises. It is a pity that we are so far behind times.

Another disquieting feature is the inadequacy of foreign exchange for our tasks during the Third Plan Period. The Surveyor

General has estimated that if modernisation is to be introduced in machinery and equipment, etc., the total requirements will be in region of Rs. 176 lakhs. The Department of Economics Affairs consistently turn down our proposals for any additional foreign exchange on the ground that the schemes do not form part of the plan. If the work is required to be done by the Survey of India by Project Surveys of national importance and also the Border survey by the Defence Ministry, it stands to reason that they should also form part of the plan of the Survey of India. It would also be reasonable for the different Project authorities and the Defence Ministry which require the Survey of India to produce work for them to allocate a proportionate percentage of their allocation of foreign exchange and making it over to the Survey of India for utilisation in procuring machinery equipment, etc. While the Survey of India is groaning under the heavy burden of various commitments, there is no assistance at all from any source regarding foreign exchange. The proportionate allocation of foreign exchange from the quotas of the Indenting Departments and Ministries is, therefore, a necessity and must be accepted as a liability by them. It can be stated here that in asking for this intention is to help them, and get their work done with the utmost speed and accuracy without which they cannot proceed ahead with their plans of national importance.

Now we may consider in detail the various requirements of Ministries, Departments, etc., against the available survey potential as indicated above.

3. *Central Water & Power Commission Survey requirements.*— The Chief Engineer, on behalf of C.W. & P.C. paid tribute to the Survey of India for the excellent work done and which it is continuing to do for their organisation. While stressing the importance of the projects undertaken by the C.W. & P.C., he desired that Survey of India should take on the load of all essential Engineering Surveys required by the various projects, as the projects in the Third Five-Year Plan envisaged bringing under cultivation 13 million acres of additional land and production of 10 million kw of power for the country. The Survey of India officers while appreciating the heavy tasks with the C.W. & P.C. has to under take, stressed on the necessity of all Engineering Surveys to be carried out by the temporary survey establishments raised under the Project engineers themselves. It was further added that since surveying formed one of the most important items in the syllabus for training of all engineers and overseers this would not be a problem. In fact it would be speedier, and more economical to use the staff of the projects for 3rd order Engineering Surveys. The charter of the Survey of India was clearly explained that it was responsible for the topographical map coverage of the country and for certain types of specialised surveys which were beyond the scope of other organisations within the country to undertake. The latter role, the Survey of India would continue to execute *so long as its*

primary role for which it is organised is not overlooked which if done, would only be to the detriment of national interest and security. The Surveyor General assured the C.W. & P.C. and any other organisation which required survey help and assistance, to make available, suitable survey officers, if necessary with Engineering background, to solve their survey problems and help initiate the execution of essential survey tasks. It would be the responsibility of the Surveyor General to see that there is no unnecessary frittering away of the efforts of the highly technical potential of the Survey of India on simple project surveys.

The Chief Engineer, C.W. & P.C. later agreed that there was considerable scope for reducing the demands put up at present, e.g., the Flood Control Surveys which could be done by the engineers themselves. However, he felt that some essential Surveys, e.g., in respect of the 62 Hydel Schemes should still be carried out by the Survey of India.

For winding up the discussions on C.W. & P.C. tasks, the Chairman agreed to set up small sub-committee comprising of representatives of the Ministry of S.R. & C.A., Survey of India and C.W. &. P.C. to examine, in detail, the types of tasks which should be undertaken by the engineers themselves and the nature of the assistance that may be rendered by the Survey of India to complete the remaining tasks.

4. *Foreign Exchange Element.*—The Chairman pointed out that the Survey of India must have special allocation of foreign exchange from the agencies for survey jobs they would like carried out for these various projects. This foreign exchange is absolutely essential to make available to the Survey of India precision instruments and other equipment, which are not available in the country, as without such items in sufficient number, the maintenance of high standard of accuracy and speed would be adversely affected. The Chairman also pointed out that special budgetary allocation out of the projects should be made available to the Ministry of S.R. & C.A. so that the expenditure in respect of personnel, purchase of stores and equipment required to carry out all the survey tasks could be met from the plan projects, as it was not always possible for Survey of India to meet such demands from the sanctioned departmental budget for existing personnel and stores, etc. The proposal of the Chairman was agreed to by all concerned. In particular, the Chief Engineer, C.W. & P.C. assured the Chairman that out of the special U.N. Fund expected for the 62 Hydel Schemes, the C.W. & P.C. would certainly make appropriate allocation of foreign exchange to the Survey of India.

5. *Planning Commission views.*—While discussing the principle of allocation of engineering survey tasks, Dr. K. P. Basu, representative of the Planning Commission, stated that we would not think in terms of departmental and extra-departmental projects but that a realistic appraisal should be made of all the survey schemes pertaining to the Survey of India as well as the different

projects of the Ministries. These projects which are important, immediate and essential for the execution of the Third Five-Year Plan should be carried out. If this required additional allocation of funds for extra staff and equipment including foreign exchange, this could be provided by transfer of funds allotted to the Ministries sending the indents for the survey projects. He also suggested that a concrete proposal on these lines should be sent to the Planning Commission who could then discuss this at a meeting taken by Member (Education) with the representatives of the Ministries concerned and very probably arrive at a satisfactory procedure. He further suggested that there should be an effective co-ordination of surveys so that sometimes one survey could serve the purpose of many.

6. *Views of the Financial Adviser.*—The Financial Adviser, Ministry of S.R. & C.A. pointed out that such situations where the work load far exceeded the capacity of a department had arisen in the past. In this particular case, the Survay of India could not be expected to carry out the entire routine surveys required by the engineering projects. He also stated that the Surveyor General should be the final authority to decide on the specialised survey tasks to be undertakan by him for various projects. Regarding the instruments, equipment and personnel, the allocation of funds including foreign exchange, he stated, should be provided by the indentors themselves so that the department could adequately expand and help execute their tasks. As regards the equipment required for the Survey of India, he stressed the point that the Surveyor General's decision for procurement should be treated as final.

7. *Defence views.*—Representative of the Ministry of Defence stated that a very high priority should be given to the tasks already listed for the Survey of India to carry out during the coming 3 to 5 years. As these Survey operations are linked up with the national security and defence, it was unanimously agreed that all tasks required by the Defence Ministry should be undertaken by the Survey of India. The Chairman suggested that the Ministry of Defence should give all assistance in fulfilling this commitment and that air lifting of stores, supply of rations and provision of adequate medical facilities should be given to the Survey personnel operating in the difficult areas as a matter of right. The Chairman also stressed that unless sufficient foreign exchange was forthcoming from the Ministry of Defence, it might be difficult to carry out these tasks. He also suggested that the equipment worth about Rs. 7 lakhs on order by the Directorate of Military Survey may be given immediately on receipt to the Survey of India for their use for this project. When sufficient personnel in the Directorate of Military Survey are trained in operating such instruments and if required at that time by the Directorate of Military Survey, these could be retransferred. The representatives of Ministry of

Defence promised that the suggestions made by the Chairman would be duly considered in the Ministry of Defence. The Chairman stated that a formal reference would be made by Ministry of Scientific Research & Cultural Affairs to Ministry of Defence.

General discussion took place on the provisioning of stores instruments and equipment to the Survey of India and the Military Survey Directorate. It was unanimously agreed that sufficient men and material should be available with Survey of India which in times of an emergency is to be fully mobilised to meet such a situation. As such, there should be very closely integrated planning for provision and supply of instruments, etc. to the Survey of India and to the Directorate of Military Survey.

After discussion, it was decided that the requirement of 1:25,000 scale surveys for Defence should only be considered after completing the 1:50,000 cover in the priority areas.

8. *Procurement of indigenous Stores.*—Representatives of the Survey of India apprised the difficult situation concerning the procurement of clothing, equipment and necessaries to the survey parties which would be operating in the same regions as those of other organisations such as the Border Roads. The representative of the Border Roads assured that very close local co-operation will be established with the survey parties working in these areas. Survey of India representatives pointed out that the Director General Supplies and Disposals found difficulty in meeting the demands both of the border roads and the Survey of India in respect of clothing and equipment during the next 2 to 3 ye ars. D.G.S. & D. had suggested to the survey representative that provided D.G. Border Roads agreed some portion of the allocation could be made available for the Survey of India to ease up the existing acute situation. *It was clearly pointed out that the Survey of regions should take precedence over all other projects as without sufficiently accurate survey cover, it would be uneconomical and may involve avoidable and infructuous expenditure.* However, Border Roads representative could not commit himself to divert any part of their requirements for the use of survey parties working in border areas without orders from competent authority. The Chairman, agreed that the administrative arrangements and provisioning of stores and equipment, etc. for the survey parties will be taken at the highest level so that top priority is given for the survey parties to procure the essential items of stores and equipment within the short time available.

9. *Ministry of Food & Agriculture Demands.*—The representative of Ministry of Food & Agriculture requested for aerial photographs of about 65,000 square miles and also for training some of their officers in photo-interpretation as applied to forestry. The Surveyor General agreed to train some forest officers in topographical photo-interpretation (not indentifying tree species) at the estab-

lished Survey Training Schools at Dehra Dūn, but requested that he may be given adequate notice to organise such a course.

10. *External Affairs* .—Ministry of External Affairs representative pointed out that boundary demarcation work which could not be undertaken by the State Governments due to various reasons should be taken up by the Surveyor General of India. It was agreed by the Committee that the International Boundary being the responsibility of the Central Survey Organisation will be taken up as requested by the External Affairs Ministry.

11. *Items 84 and 85 of Appendix 'B' of the Agenda* :—After discussion the surveys required for Dam in Rāmgarh Bokāro area in the upper Damodar Valley it was stated by the Surveyor General that surveys from the Damodar Valley had been given in the past to Messrs. Air Survey Company, Dum Dum and suggested that these surveys may also be passed on to this Company by him.

12. *Item 101.*—Further details were given by representative of Indian Bureau of Mines regarding the areas to be surveyed. It was pointed out by the Survey of India representatives that the scale on which survey was required was too large and uneconomical and did not balance with the contour interval. The representative of the Indian Bureau of Mines agreed to re-examine whether the proposed scale of 1 : 25,000 with 10-metre contour interval would suffice, and agreed to inform the Surveyor General of India.

13. *Item 103.*—The Surveyor General pointed out that this job was to be taken up as a Departmental task at lower priority.

14. *Item 104* .—The Ministry of Health representative wanted the completion of Delhi Regional Plan surveys by the end of 1961. The Surveyor General pointed out that subject to the availability of further photogrammetric machines and personnel for drawing this job would be completed as early as possible.

15. *Item 138* .—Sutlej Flood Control. The C.W. & P.C. representative stated that this job had not been examined by them. The Survey of India representative pointed out that since it involved flood control surveys only, it may be done by the Engineers themselves which was agreed to by the C.W. & P.C.

16. *Item 142* .—Investigation of Coal Fields. etc. for sulphur deposits in Puga Valley and two other engineer projects for J. & K. Government were discussed. Owing to the strategic importance of these surveys it may be taken up as a high priority.

It was also decided by the Committee that all such *ad hoc* requests from State Governments should first be referred to the Ministry of S.R. & C.A. and the Planning Commission, before taking them up in the party-years allotted for State Government jobs.

17. *Item 150.*—The representative from the Geological Survey of India, Ministry of Steel, Mines and Fuel required latest 1 : 50,000 or 1″=1 mile maps of an area of 83,000 square miles. It was stated by the Survey representatives that an area of 28,000 square miles was already included for survey on 1 : 50,000 scale on Priority I basis. For the remaining areas, he was advised to use the existing topographical maps. In areas where one-inch maps did not exist, he was advised to use enlargments from existing ½-inch maps supplemented by aerial photographs where necessary. This was agreed upon by the Committee.

18. The representative of Ministry of Transport and Communications, raquested for extended maps for Indian Meteorological Department and stated the urgency of their completion to meet International commitments. The Committee agreed to include this in the programme. As this task involves only mapping without any field work, and in view of the urgency, the Surveyor General agreed to give it high priority; details will, however, be communicated to the Indian Meteorological Department.

D.G.C.A. representative was given the priorities of tasks that will be taken up in the 1·5 party-years allocation to I.C.A.O. work.

19. After discussion with the representatives of various Ministries, the Committee allocated survey party-years as shown below :—

I. *Departmental Surveys*	*Party-years*	*Remarks*
(*i*)		
(*a*) *1 : 50,000 scale* Original surveys in the Northern region (Priority I Area)	93	
(*b*) *1 : 50,000 scale* Original Surveys where no modern surveys exist (*c*) *1 : 50,000 scale* Original Surveys where only ½-inch survey exist (*d*) *1 : 50,000 scale* Revision in metric terms of existing 1-inch surveys.	9	
(*ii*)		
(*a*) *1 : 25,000 scale,* Priority I Training Areas for Defence.	3	
(*b*) Miscellaneous surveys e.g. guide map, etc.	2	

II. *Extra-Departmental Project and Special Surveys.*—

Ministry	*Department/State*	*Party-years*	*Remarks*
(*a*) Ministry of Defence	D. D. Military Survey	3	Cantt. Surveys.
(*b*) Ministry of Transport & Communications	D. G. C. A.	1·5	I.C.A.O. Surveys.
(*c*) Ministry of External Affairs	..	3	Boundary Surveys, etc.
(*d*) Ministry of Scientific Research & Cultural Affairs	Archæological Survey of India	0·2	
(*e*) Ministry of Steel, Mines & Fuel	Various	1·3	
(*f*) Ministry of Food & Agriculture	State Forest Surveys	2	
(*g*)	Extra-departmental surveys for C.W. & P.C. and States etc. carried over from 2nd Five-Year Plan period and those already in 1961–62 survey programme.	10	See para below.

(*h*) Ministry of Irrigation & Power.	C. W. & P. C.	3	C.W. & P.C. representative thought this was a very low allocation and after some discussion with the Chairman it was agreed that the C.W. & P.C. will again review their demands and try to effect reduction in respect of minor jobs and intimate additional requirements, if any, to the Surveyor General who will consider how best to accommodate.
(*i*)	State Govts.	2	
(*j*) Reserve for top priority *ad hoc* demands placed during the plan period to be allocated by the Surveyor General of India		2	
	Total	135 Party-Years.	

20. The Survey for the following jobs already included in the mapping programme for 1961–62 will be executed with reference to item II (g) of the foregoing para :—

S. No. of Annexure B	*Name of Job*	*Approximate load*
2.	Umiām Umtru (Assam) ..	0·5
3.	Manas Valley (Assam) ..	0·5
4.	Jamuna Hydel Scheme (Assam)	0·3
8.	Sone High level Canal Project (Bihār) ..	0·3
11.	Ghed Area (Gujarāt) ..	0·7
12.	Reclamation of Little Rann of Kutch ..	0·5
13/14	Narmada Project ..	2·0
25.	Sindh Dam Site Survey (M.P.)..	0·1
42	Bhākra Nangal Project (Punjab)	1·0
45	Tapoban Gulab Koti (U. P.) ..	0·3
48	Flood Control Survey (West Bengal) ..	1·0
93	Forest Survey in conjunction with item 12 above ..	0·3
100	Sasangada Iron Ore Deposits (Bihār) ..	0·02
104	Delhi ..	1·3
105	Mandi Salt Mine Survey ..	0·1
9	Chandan Reservoir (Bhiār) ..	0·3 *
10	Mokameh Tal (Bihār) ..	0·5 *

* These cannot be taken up in 1961–62 but will be taken up during the plan period.

Total 9·72 Party-years.

INDEX MAPS

A. Modern Topographical Surveys and Compilation on metric as well as F.P.S. systems.

B. Modern Topographical Surveys and Revision (1-inch, $\frac{1}{2}$-inch and 1 : 50,000 scales) by 10-year periods from 1905.

C. Index showing Project Surveys in hand.

D. Maps published on scales of one-inch and half-inch to one mile.

E. Maps published on scale of quarter-inch to one mile.

F. Index to the maps of the 1 : M Carte Internationale du Monde Series.

G. Index to the maps of the 1 : 2M Southern Asia Series.

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