

**REPORT
OF
THE SECOND YEAR'S WORK
FOR
THE TOPOGRAPHIC MAPPING OF SOUTH KENYA
IN
THE REPUBLIC OF KENYA**

**GEODETTIC CONTROL SURVEY
MINOR ORDER LEVELING
FIELD VERIFICATION
AERIAL PHOTOGRAPHY
AERIAL TRIANGULATION
PLOTING
COMPILATION**

MARCH 1989

JAPAN INTERNATIONAL COOPERATION AGENCY

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89-054

ERRATA

Page	Line	Errata	Correct
viii	11	Jana	Jena
(iii)	20	Nairobi, 9th August, 1988.....	(Delete.)
2	5	Japanese	Japan
10	2	ordinategraph	coordinategraph
12	5	photographing	photography
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47	15	Tabls.	Tabls.
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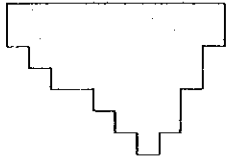
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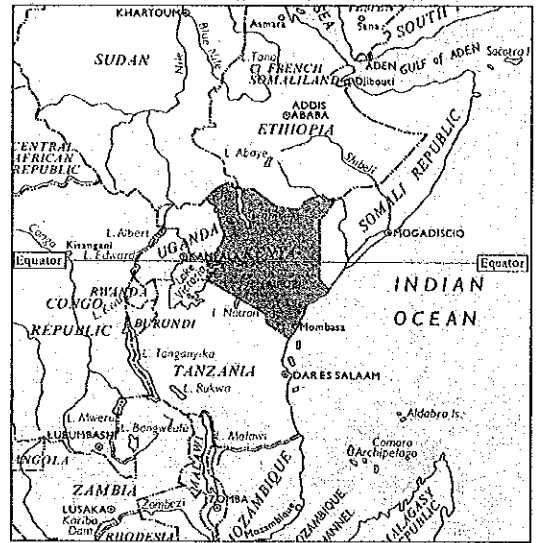
ケニア南部地区
国土基本図作成事業対象地域

TOPOGRAPHIC MAPPING
OF SOUTH KENYA



1 : 50,000国土基本図作成地域

Mapping Area



LOCATION MAP OF PROJECT AREA

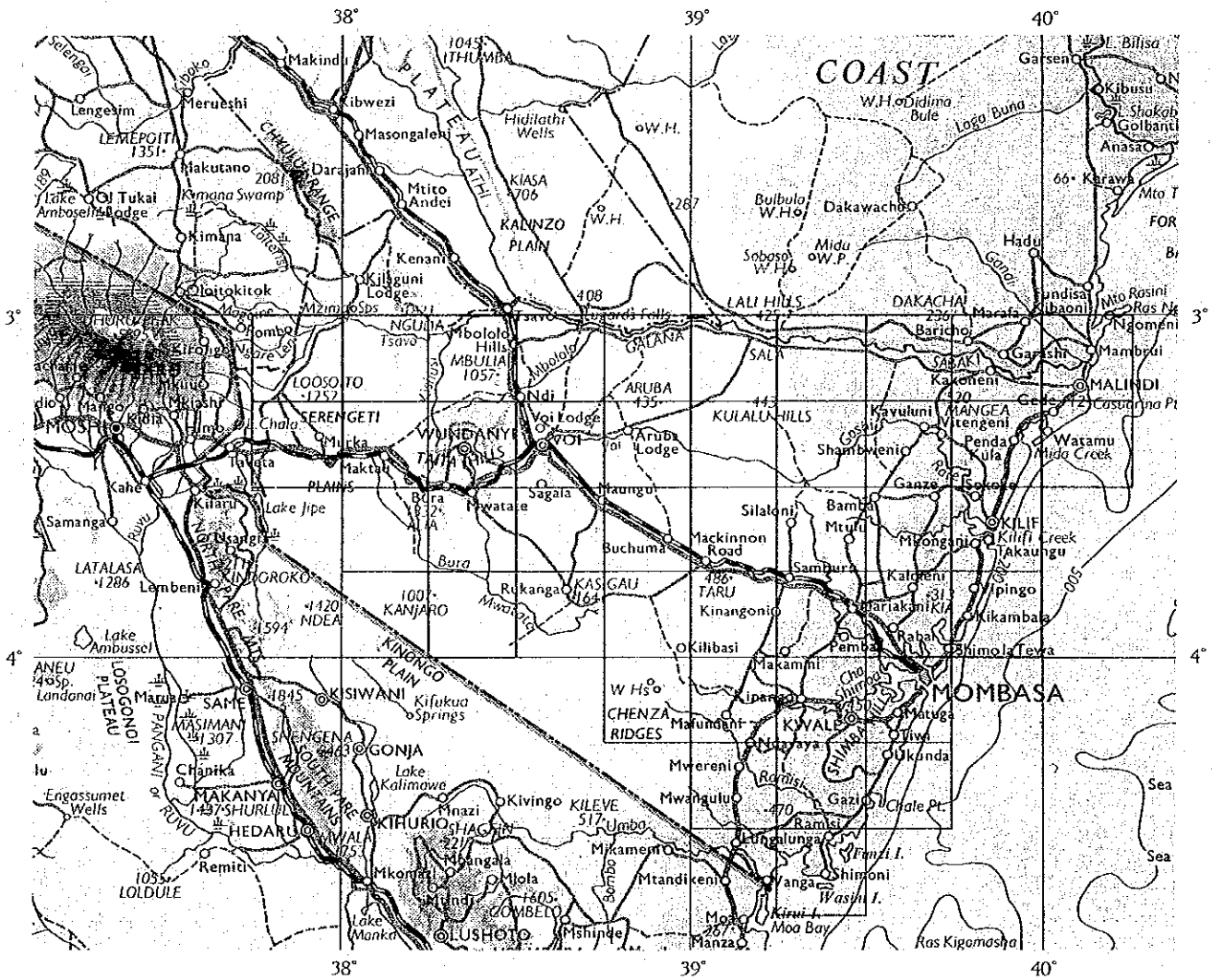


Photo - 1 Meeting with SK

- 1) Meeting at the Ministry of Lands and Housing, Nairobi. (The second from the left being the Director of Surveys, SK.)



- 2) Meeting on P/O prior to the start of the field work at the Field HQ, SK, Ruaraka.



- 3) Meeting on the map symbols and their applications prior to the start of the field work at the Field HQ, SK, Ruaraka.



4) Signing on the Minutes of Meetings prior to the start of the field work at the Field HQ, Ruaraka.



5) Reporting of the work at the end of the field work by JST at the Field HQ, Ruaraka.

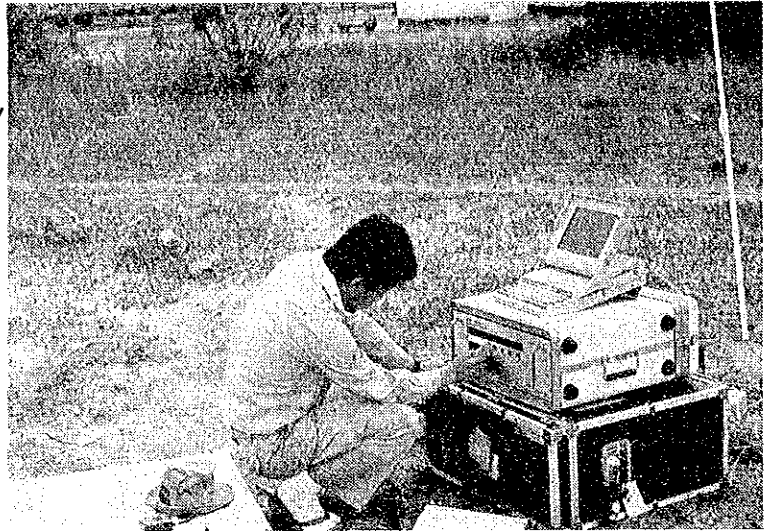


6) Signing on the Minutes of Meetings at the end of the field work at the Field HQ, Ruaraka.



Photo - 2 Geodetic control survey (GPS)

- 1) Receiver and recorder parts at BM I/21, Haungu, at the center of the survey area.



- 2) Antenna at BM R9-47A, about 5 km to the south of Mombasa.



- 3) Antenna set above the ground to get over tall trees near-by at SKP 62, Kilifi.

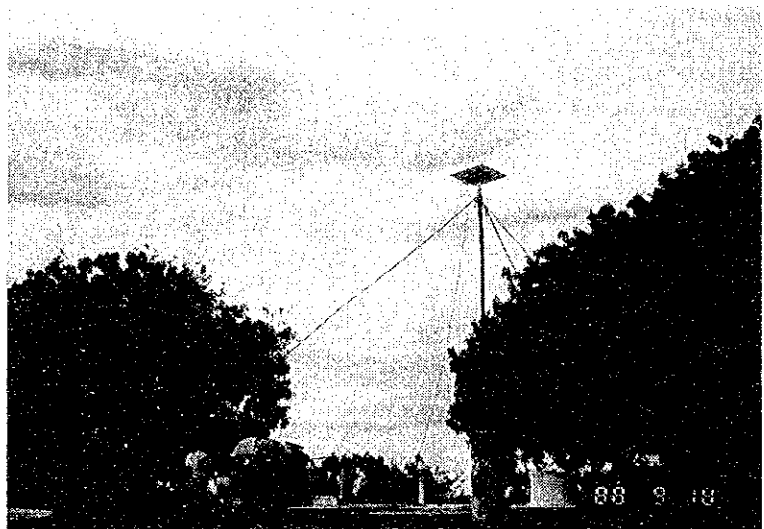
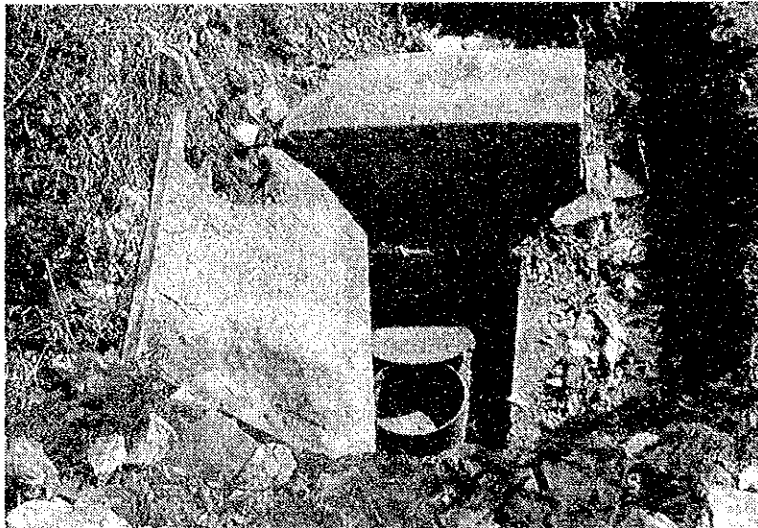


Photo - 3 Minor order leveling and cross-sea leveling

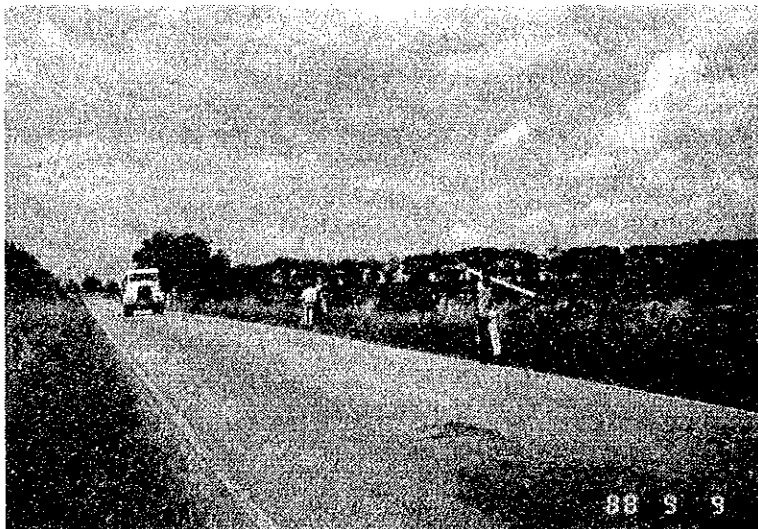
1) Fundamental BM in Mombasa.



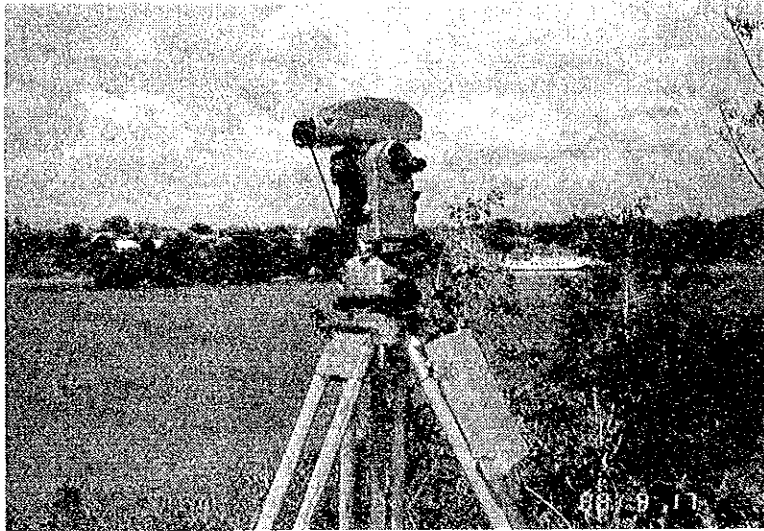
2) Observation near Vipingo about 30 km to the north-east of Mombasa.



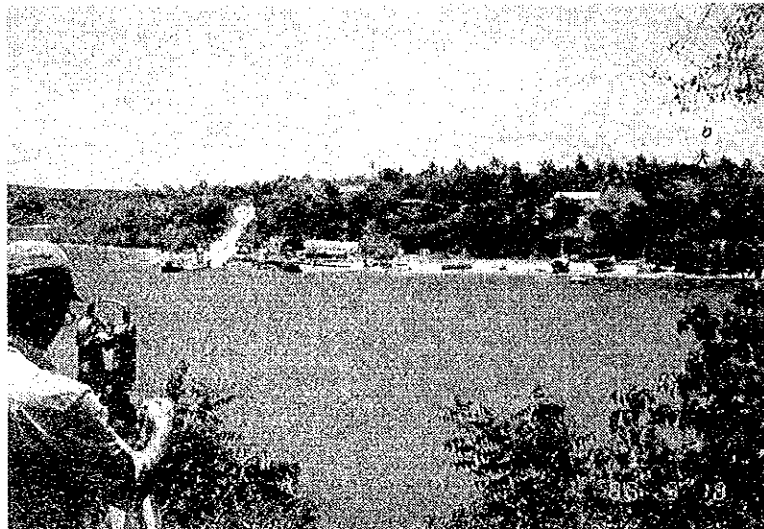
3) Observation with a big vehicle passing by near Vipingo.



- 4) Instruments for cross-sea leveling. Wild T2 theodolite with Wild DI-3000 distance meter at Kilindini Harbor, Mombasa.



- 5) Cross-sea leveling at Kilifi Creek.



- 6) Bench mark (rivet) driven onto the traverse monument.



- 7) Permanent monument of
BM at Kilindini Harbor,
Mombasa.



Photo - 4 Field verification

- 1) Field verification in
Mombasa.



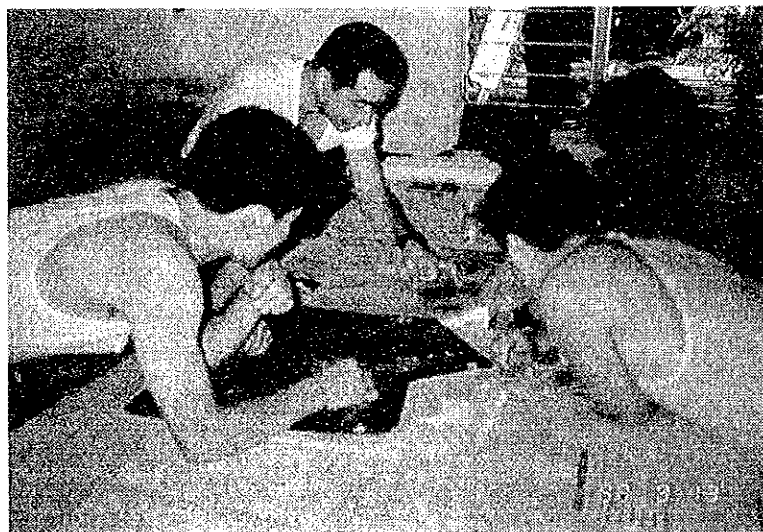
- 2) Field verification of
roads in Mombasa.



- 3) Field observation of the JICA supervisor near Pemba about 10 km to the west of Mombasa.



- 4) Discussion on the operation at Mombasa base camp.



- 5) Working on photo-interpretation at Mombasa base camp.



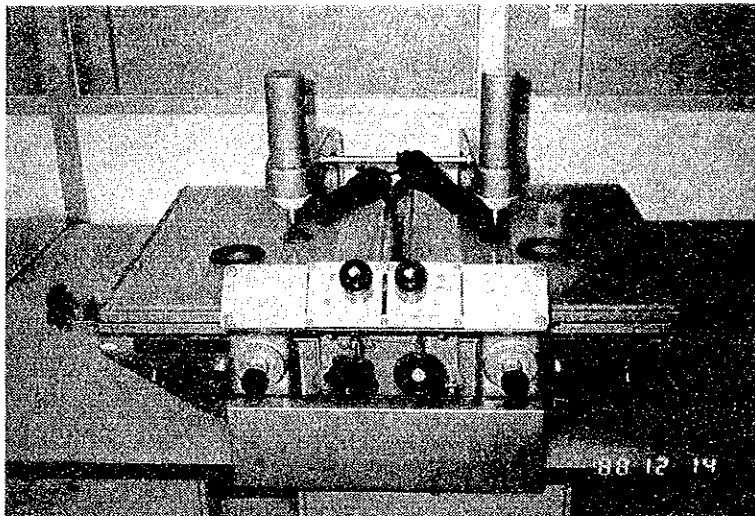
Photo - 5 Aerial photography

- 1) Air base for aerial photography, Malindi Airport.



Photo - 6 Aerial triangulation

- 1) Pricking device Wild PUG-4.



- 2) Observing device, stereo comparator, Stecometer Zeiss Jana.

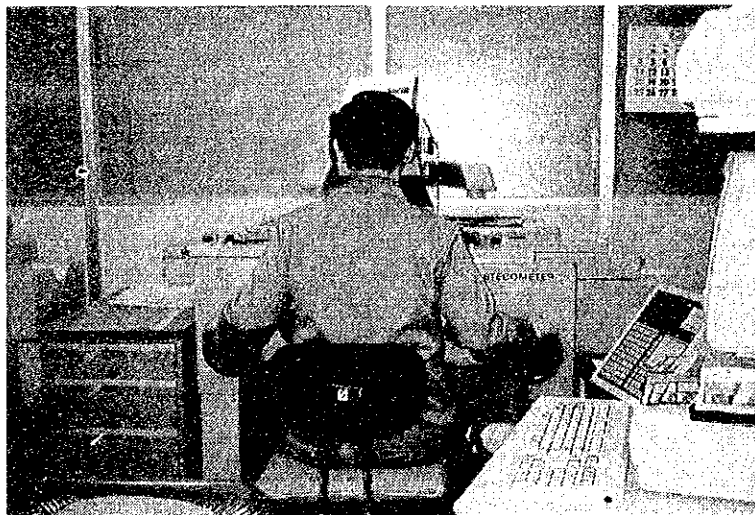
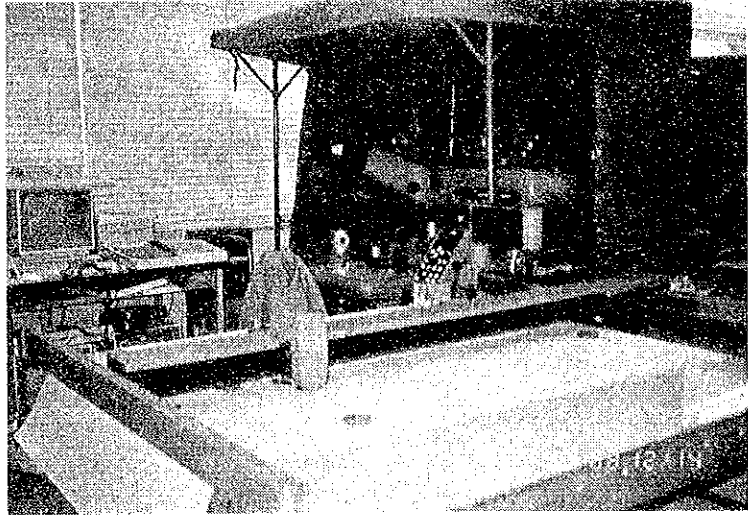
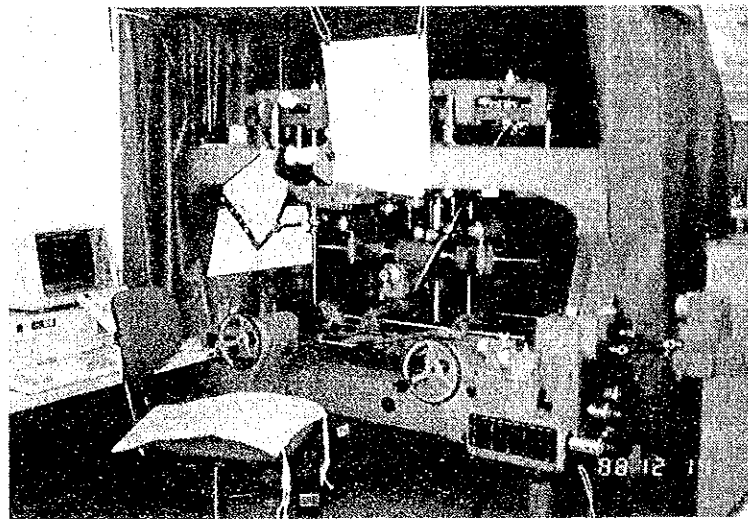


Photo - 7 Plotting

- 1) Plotting machine, AMH, Wild.



- 2) Plotting machine, Autograph A-7, Wild.



- 3) Computer for aerial triangulation, FACOM M-360R.



Photo - 8 Observation of GPS survey by Director of Surveys, SK

At Mombasa base camp.



Photo - 9 Miscellaneous

- 1) Savannah in Voi National Park.



- 2) Elephants in Voi National Park.



- 3) Kenyatta Beach, near Mombasa, crowded with tourists.



- 4) A distant view of Mt. Kilimanjaro from 188 PFI in the north-western part of the survey area.



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I. Background

The Government of the Republic of Kenya has been undertaking the development of key areas under the Fifth National Development Plan, and, in order to pursue their efforts most efficiently, it is essential for them to be equipped with maps of high accuracy covering the present project area. Hence preparation of such maps is urgently needed.

The southern parts of the Republic, with such old port cities as Mombasa and Malindi located along the coast of the Indian Ocean, have high potential for development and, once developed, for growth, and therefore the region is designated as a priority area in the Fifth National Development Plan.

Basic maps were made for the region in 1950 - 1963 by Britain but nothing has been done since then to update these maps despite the substantial changes that have taken place over the years with new roads built and lands cultivated for farming. Also the elevations are shown in feet in these maps whereas the metric system is in common use in every field in the country today. Thus the situation as such calls for the up-to-date basic maps that accurately reflect the region as it actually exists.

From 1975 through 1984, Japan prepared the national base maps of Eastern Kenya under its international technical cooperation program. In addition, since 1981, Japanese surveying experts have been sent to the Survey of Kenya, Ministry of Lands and Housing, to help improve their technology.

Against this background, the Government of the Republic of Kenya made a request to the Japanese Government to provide technical cooperation for preparation of the national base maps.

Subsequently, the feasibility study on the requested project was conducted by the Japanese Technical Cooperation Agency (referred to as JICA hereinafter), which sent two missions to Kenya for that purpose, the first from January 25 to February 10, 1987, and the second from February 20 to March 23, 1987. After consultations based on the findings of the feasibility study, the two governments signed the Scope of Work (referred to as S/W) for the captioned project.

According to the S/W, the Project is designed to be conducted for the 4-year period from 1987 to 1990.

The outline of the project is as follows.

1. Area to be mapped: Kenyan territory east of $35^{\circ}45'$ E. longitude and south of 3° S. latitude, not including the sheets containing the border with Tanzania. (See the map on the front page.)
2. Size of Project Area: Approx. $29,800 \text{ km}^2$
3. Number of 1:50,000 topographic map sheets to be made: 43
4. Number of prints to be made of the sheets: 1,000 of each

The yearly work schedule is given in Table 1. The first year was already concluded and in view of the actual progress made during the first year, some changes have been made in the original schedule for the second year.

The changes include:

a. Aerial photography:

About 3,000 km² (approximately 10% of the entire survey area) originally scheduled for the first year but remaining yet to be covered will be photographed at a scale of 1:60,000.

b. Control point survey:

Of the existing 40 points chosen for use in the surveying, 5 were found to be missing or damaged and need to be surveyed for horizontal positions and elevations and another 4 points for elevations. The observations will be made by means of the Global Positioning System (GPS).

c. Leveling:

A distance of approximately 200 km running along the coastal road from Lunga-Lunga to Malindi will be surveyed by minor order leveling because most of the existing first order bench marks along the route are lost or damaged.

d. Field verification:

Field verification will be conducted with respect to the area of about 26,800 km² (approximately 90% of the entire survey area) covered by aerial photography during the first year. The remainder will be covered using compiled manuscript at the time of the field completion.

Table 1. Yearly work schedule

Year	Job classification	Work volume	Remarks
First year 1987	Signalization	40 control points	5 points missing
	Aerial photography	Scale: 1/60,000 3,000 km 21 courses Strip photography: 1,500 km over leveling routes	90% covered (out of 29,800 km ² in total)
	Minor order leveling	731.3 km (Pricking) Existing routes - 700 km Minor order - 731.3 km leveling routes	500 km covered
Second year 1988	Aerial photography	Scale: 1/60,000 780 km 14 courses	
	Control point survey	9 points, GPS observation	
	Minor order leveling	200 km (Pricking included)	Missing parts of existing first order leveling route, connections to control points
	Field verification	26,800 km ²	Area covered by 1st year aerial photography
	Aerial triangulation	725 models	
	Plotting	11,475 km ² (15 sheets)	
	Compilation	11,475 km ² (15 sheets)	
Third year 1989	Plotting	18,325 km ² (28 sheets)	
	Compilation	18,325 km ² (28 sheets)	
	Field completion	29,800 km ² (43 sheets)	
Fourth year 1990	Cartography (scribing)	29,800 km ² (43 sheets)	
	Printing	43 sheets, 1,000 copies each	

Note: The first year work was already finished.

II. Outline of Second Year Work

II-1 Objective

The objective of this project is to prepare, at the request of the Kenyan Government, the 1 : 50,000 scale topographic maps which accurately reflect Southern Kenya in its actual conditions to provide basic information for multi-purpose use.

For the second year, geodetic control survey, minor order leveling, aerial photography, and field verification will be conducted at site and, in Japan, aerial triangulation, plotting, and compilation work will be undertaken.

II-2 Work Periods

Field Work	<u>From</u>	<u>To</u>
(Headquarters)	July 25, 1988	October 27, 1988
(Geodetic control survey)	August 17, 1988	October 14, 1988
(Minor order leveling)	July 25, 1988	October 27, 1988
(Field verification)	July 25, 1988	October 21, 1988
(Aerial photography)	January 29, 1989	February 27, 1989
Work in Japan		
(Aerial triangulation)	September 1, 1988	March 20, 1989
(Plotting)	November 1, 1988	January 31, 1989
(Compilation)	December 1, 1988	March 20, 1989

II-3 Organization of the Study Team and Periods of Dispatching

Responsibility	Name	Period		
		From	To	Total
Leader	Sho Saito	Jul. 25, '88	Aug. 13, '88	(20 days)
"	"	Oct. 13, '88	Oct. 27, '88	(15 days)
Deputy Leader	Kazuo Muraoka	Jul. 25, '88	Oct. 27, '88	(95 days)
Mapping Planner	Mitsuo Yoshida	"	"	(")
Mechanician	Hironori Kobayashi	"	"	(")
Chief Engineer	Yutaka Kyakuno	"	"	(")
"	Tadashi Hidaka	"	Oct. 21, '88	(89 days)
Geodetic Control Survey	Katsuhiko Yamashita	Aug. 17, '88	Oct. 14, '88	(59 days)
"	Kiyofumi Tamari	"	"	(")
"	Tomio Hakoiva	"	"	(")
"	Kenji Nakamura	"	"	(")
Minor Order Leveling	Michimasa Nakai	Jul. 25, '88	Oct. 27, '88	(95 days)
"	Kenichi Miyakawa	"	"	(")
Field Verification	Yoshio Yoshitome	Aug. 8, '88	Oct. 21, '88	(75 days)
"	Yoshiro Azuma	"	"	(")
"	Minori Ohnaka	"	"	(")
"	Sadao Matsumoto	"	"	(")
"	Minoru Arai	"	"	(")
"	Koji Yanagimachi	"	"	(")
Inspection of Aerial Photography	Hideto Hosoda	Jan. 29, '89	Feb. 27, '89	(30 days)

II-4 Work Volume

The work volume for this year is as follows:

- (1) Geodetic control survey : 9 points (Newly established 5 points, height measurement 4 points). Carried out by GPS.
- (2) Minor order leveling : 200 km
- (3) Aerial photography : Scale 1/60,000, 14 courses, Flight distance 780 km
- (4) Aerial triangulation : 725 models
- (5) Field verification : 26,800 km²
- (6) Plotting : 1/50,000 11,475 km² (15 sheets)
- (7) Compilation : 1/50,000 11,475 km² (15 sheets)

II-5 Plan and Progress

II-5-1 Work Periods

All the field work except for aerial photography was completed as originally scheduled. The field work was started on July 25, 1988, and concluded as the study team returned to Japan on October 27, 1988. Aerial photography was flown successfully during a period from July 29 to February 27, 1989.

	Original Schedule		Implementation
	From	To	
Leader	Jul. 25, 1988	Aug. 13, 1988	The same as originally scheduled
"	Oct. 13, 1988	Oct. 27, 1988	"
Headquarters	Jul. 25, 1988	Oct. 27, 1988	"
Geodetic control survey	Aug. 23, 1988	Oct. 21, 1988	"
Minor order leveling	Jul. 25, 1988	Oct. 27, 1988	"
Field verification	Jul. 25, 1988	Oct. 21, 1988	"
Aerial photography	Jul. 25, 1988	Oct. 27, 1988	"
"	Jan. 29, 1989	Feb. 27, 1989	"

II-5-2 Work Volume

	Original volume	Implementation	
Geodetic control survey	9 points	10 points	Newly established 6 points (original schedule 5 points) Height measurement 4 points
Minor order leveling	200 km	245.1 km	Including pricking
Aerial photography	14 courses 780 km	13 courses 760 km	Scale 1/60,000
Field verification	26,800 km ²	26,800 km ²	For the area flown in the first year
Aerial triangulation	725 models	755 models	
Plotting	11,475 km ²	11,475 km ²	
Compilation	11,475 km ²	11,475 km ²	

II-6 Instruments Employed

The major survey instruments employed for the second year work are listed below.

- (1) Control point survey
 - GPS (Trimble, Navigation 4000SX) 3 units
 - Radiotelephone (JRC-JSB 20) 7 units
- (2) Minor order leveling
 - Level (Nikon AS automatic level and Carl Zeiss NI2 automatic level) 2 units
 - Metal staff 2 sets, (4 staves)
 - Staff stand 4
 - Theodolite (Wild T2) 2 units (including one loaned from SK)
 - Electro-optical distance meter (Wild DI-3000) 1 unit
- (3) Field verification
 - Plane table (Tamura type) 1 set
 - Steel tape 1 set
 - Cloth tape 1 set
 - Pole 1 set
 - Compass 1 set
- (4) Aerial triangulation
 - Pricking device PUG4 (Wild) 2 units
 - Stereocomparator Stecometer (Zeiss Jena) 2 units
 - Computer FACOM M340 (Fujitsu) 1 unit

In a meeting at the SK Field Headquarters, the JICA Study Team (referred to as JST) and SK had the following discussions prior to the start of field work.

JST reconfirmed categorically the items of undertakings to be provided by the Kenyan side in the course of the work as specified in S/W. There was no misunderstanding about the Kenyan cooperation. JST then reaffirmed the overall 4-year plan based on the Plan of Operation, followed by a report on the progress of the first year work and explanation on the second year work schedule. After questions and answers, mutual understanding was reached.

Based on the above understanding, map symbols and their applications were discussed.

Discussions proceeded to such specific matters as the selection of Kenyan counterparts and availability of data to be provided by the Kenyan side, and mutual agreement was reached.

II-9-2 Meetings upon Completion of Field Work (See Attachment 2-2)

The document of the minutes was signed on October 21, 1988.

Upon completion of the field work, JST briefed the SK officials on the status of the project on the basis of the Progress Report, and SK agreed that the second year field work had been completed.

Based on the above report, discussion was made on the remainder of the second year work, map symbols and their applications, scheduled implementation of the third year work, and restoration at SK's responsibility of aerial signals required for aerial photographing to be undertaken from January to February 1988.

II-10 Cooperation by SK Counterparts

Cooperation was provided by SK in the form of SK counterparts to work with JST to help collect data guide and communicate with local residents in field verification and geodetic control survey.

Following counterparts joined JST in the field operation in Kenya:

Field verification:

Mr. Obuyu	August 17 - September 5, 1988
Mr. Patric K Nuema	ditto
Mr. John Mwaio	ditto

Geodetic control survey:

Mr. Peter Ndirango	September 12 - September 29, 1988
--------------------	-----------------------------------

Following counterparts participated in individual training in Japan:

Planning:

Mr. O.M. Wainaina,	July 4 - July 19, 1988
Superintending Surveyor Mapping	

Aerial triangulation:

Mr. J. Kibore,	November 8 - December 20, 1988
Chief Photogrammetrist	

III. Geodetic Control Survey

III-1 Outline

The control points as required for aerial triangulation and plotting were set up by satellite observations using GPS. Geodetic control survey was conducted with respect to those control points and bench marks that were found to be missing or damaged during the first year surveying in reference to the existing ones. (See Fig. 1)

As it became clear that aerial photography could not be completed on schedule due to its unexpected delay caused by unfavorable weather conditions, it was forced to split up aerial triangulation in two parts. To solve the problem another control point (R-2) was additionally established.

Planned number of control points:

9 (5 new points; 4 points for vertical positioning)

Actual number of control points surveyed:

10 (6 new points; 4 points for vertical positioning)

Specifically, the actually surveyed 10 points were as follows.

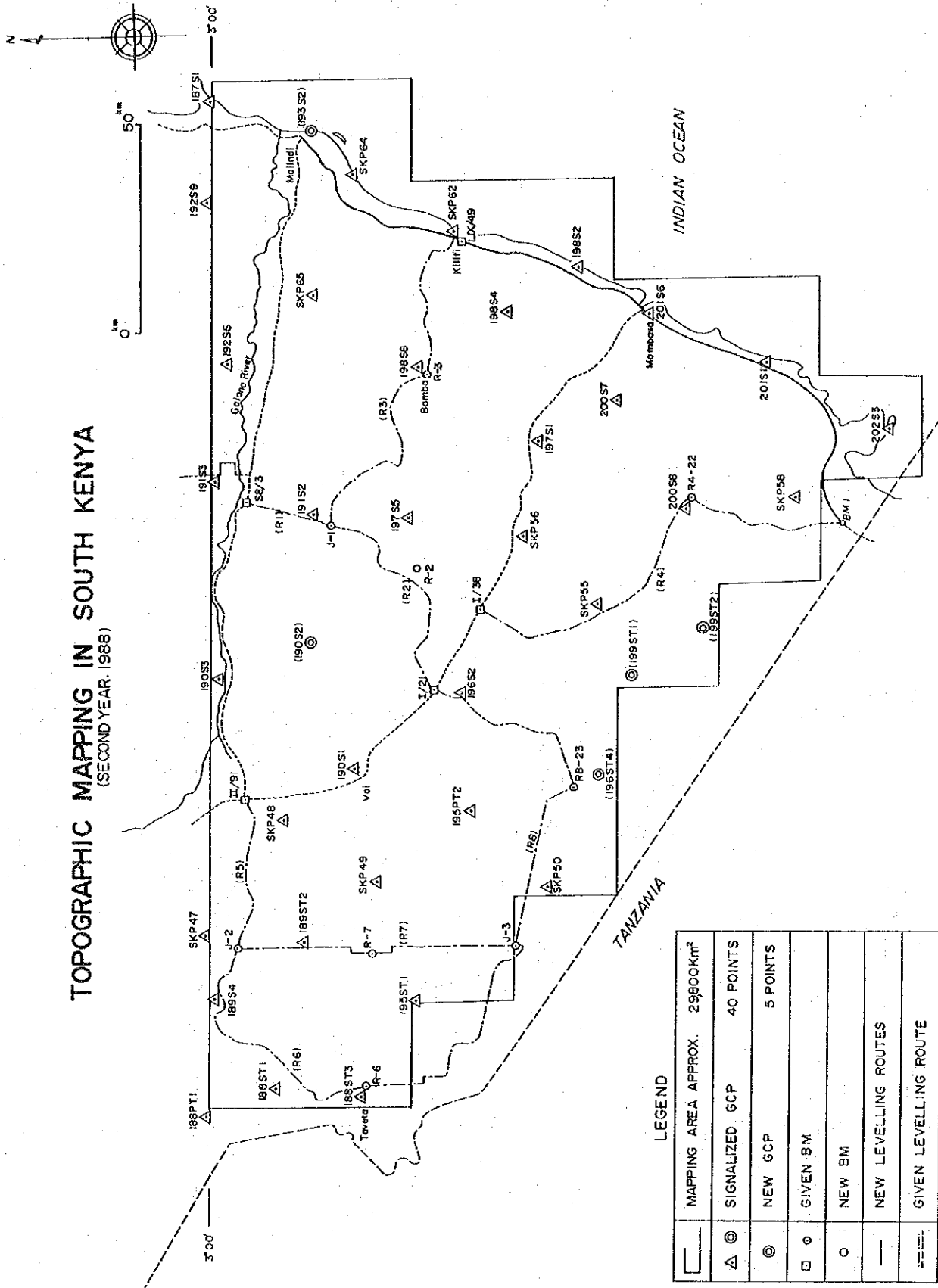
For horizontal positioning : 193S2, 196ST4, R-2

For horizontal and vertical positioning : 199ST1, 199ST2, 190S3

For vertical positioning : 188PT1, SKP49, 195PT2, 202S3

Vertical positioning of 193S2, 196ST4, and R-2, was made by direct leveling.

TOPOGRAPHIC MAPPING IN SOUTH KENYA (SECOND YEAR: 1988)



LEGEND

	MAPPING AREA APPROX. 29800Km ²
	SIGNALIZED GCP 40 POINTS
	NEW GCP 5 POINTS
	GIVEN BM
	NEW BM
	NEW LEVELLING ROUTES
	GIVEN LEVELLING ROUTE

Fig. 1 Distribution of Geodetic Control Points

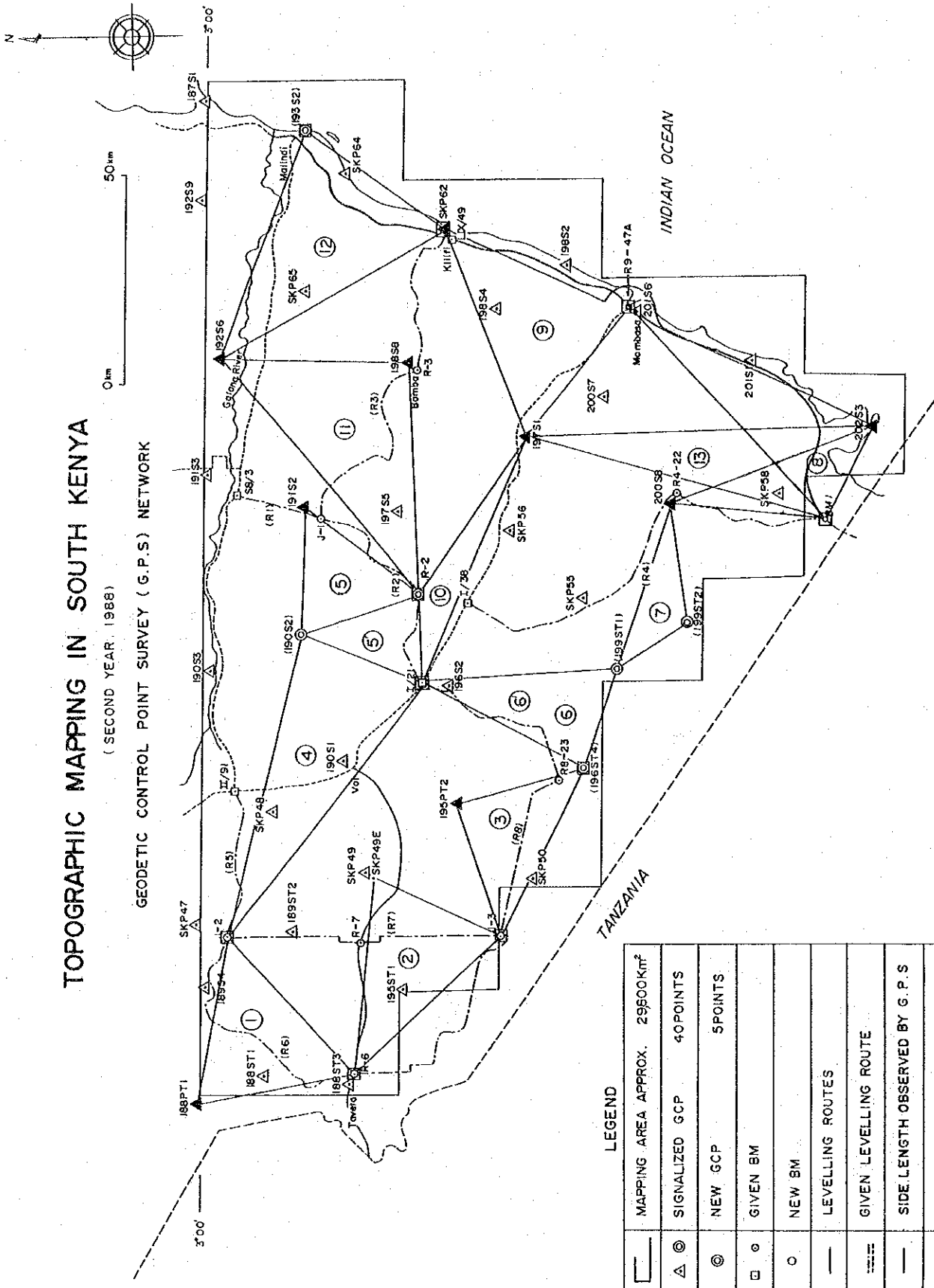
III-2 Observations

- (1) Observations were made by using 3 units of Trimble (USA) 4000SX as a receiving apparatus.
- (2) Starting from an existing point, observations were made simultaneously at 3 points, to close at another existing point. See Fig. 2 and Tab. 2 for combinations of the observation points.

TOPOGRAPHIC MAPPING IN SOUTH KENYA

(SECOND YEAR, 1988)

GEODETIC CONTROL POINT SURVEY (G.P.S) NETWORK



LEGEND

—	MAPPING AREA APPROX. 29600km ²
△ ⊙	SIGNALIZED GCP 40POINTS
⊙	NEW GCP 5POINTS
□ ⊙	GIVEN BM
○	NEW BM
—	LEVELLING ROUTES
—	GIVEN LEVELLING ROUTE
—	SIDE LENGTH OBSERVED BY G.P.S
▲	GIVEN GCP FOR PLANIMETRY
□	GIVEN BM FOR HEIGHT

Fig. 2 Geodetic Control Network

Tab. 2. Combination of a Triangle and its Coordinate Closures (1)

Number of a triangle	Point name	Date of observation	Time of observation (GMT)	Closure			Total length
				Δx	Δy	Δh	
1	188PT1	Aug. 31, 1988	6 ^h 24 ^m 45 ^s - 8 ^h 30 ^m 00 ^s	cm	cm	cm	139.5
	J-2		-8	+30	±0		
	R-6						
2	R-6	Sep. 1, 1988	6 ^h 21 ^m 45 ^s - 8 ^h 30 ^m 00 ^s				150.5
	SKP49E		-5	-48	-18		
	J-3						
3	195PT2	Sep. 3, 1988	7 ^h 32 ^m 45 ^s - 8 ^h 59 ^m 45 ^s				124.3
	196ST4N		-20	-45	+15		
	J-3						
4	J-2	Aug. 27, 1988	6 ^h 27 ^m 45 ^s - 8 ^h 36 ^m 30 ^s				204.1
	190S2N		-5	-34	+7		
	I/21T						
5	191S2	Sep. 9, 1988	6 ^h 26 ^m 45 ^s - 8 ^h 30 ^m 00 ^s				97.1
	R-2		-10	-6	+12		
	190S2N						

Tab. 2. Combination of a Triangle and its Coordinate Closures (2)

Number of a triangle	Point name	Date of observation	Time of observation (GMT)	Closure			Total length
				Δx	Δy	Δh	
5	190S2N	Oct. 5, 1988	4 ^h 34 ^m 30 ^s - 6 ^h 30 ^m 15 ^s	cm	cm	cm	87.0 km
	R-2		+1	+1	+1		
	I/21T						
6	I/21T	Sep. 8, 1988	6 ^h 23 ^m 45 ^s - 8 ^h 30 ^m 45 ^s				135.4
	196ST4N		-26	-56	+30		
	199ST1N						
6	I/21T	Oct. 7, 1988	3 ^h 58 ^m 45 ^s - 6 ^h 29 ^m 45 ^s				135.4
	196ST4N		-2	+30	-8		
	199ST1N						
7	200S8	Sep. 22, 1988	5 ^h 18 ^m 30 ^s - 7 ^h 30 ^m 00 ^s				90.4
	199ST2N		+9	+13	+2		
	199ST1N						
8	200S8	Sep. 23, 1988	5 ^h 24 ^m 00 ^s - 7 ^h 30 ^m 00 ^s				127.7
	202S3		+17	+49	-12		
	BM-1T						

Tab. 2. Combination of a Triangle and its Coordinate Closures (3)

Number of a triangle	Point name	Date of observation	Time of observation (GMT)	Closure			Total length
				Δx	Δy	Δh	
9	SKP62	Sep. 16, 1988	6 ^h 1 ^m 00 ^s - 8 ^h 30 ^m 00 ^s	cm	cm	cm	280.1 km
	202S3		6 ^h 12 ^m 30 ^s - 8 ^h 31 ^m 00 ^s	-19	+108	+26	
	197S1		5 ^h 42 ^m 00 ^s - 8 ^h 29 ^m 00 ^s				
10	197S1	Sep. 24, 1988	5 ^h 9 ^m 30 ^s - 7 ^h 30 ^m 15 ^s				146.9
	I/21T		4 ^h 59 ^m 00 ^s - 7 ^h 30 ^m 45 ^s	+1	+3	+19	
	R-2		5 ^h 34 ^m 30 ^s - 7 ^h 29 ^m 45 ^s				
11	192S6	Sep. 19, 1988	5 ^h 56 ^m 30 ^s - 7 ^h 59 ^m 15 ^s				195.3
	198S8		6 ^h 19 ^m 45 ^s - 8 ^h 01 ^m 00 ^s	+8	+76	+16	
	R-2		5 ^h 51 ^m 30 ^s - 8 ^h 00 ^m 00 ^s				
12	SKP62	Sep. 18, 1988	5 ^h 50 ^m 45 ^s - 8 ^h 0 ^m 15 ^s				192.0
	192S6		5 ^h 57 ^m 15 ^s - 8 ^h 3 ^m 45 ^s	-3	+5	+10	
	193S2		5 ^h 57 ^m 15 ^s - 8 ^h 2 ^m 45 ^s				
13	197S1	Sep. 25, 1988	5 ^h 01 ^m 45 ^s - 2 ^h 30 ^m 00 ^s				214.6
	R9-47A		5 ^h 28 ^m 00 ^s - 7 ^h 30 ^m 00 ^s	-4	-56	+25	
	BM-IT		4 ^h 56 ^m 45 ^s - 7 ^h 30 ^m 00 ^s				

The following points were used as given points.

a. For horizontal positioning:

188PT1, 191S2, 192S6, SKP49, 195PT2, 197S1, 198S8,
SKP62, 200S8, 202S3, -- a total of 10 points

b. For vertical positioning:

J-2, J-3, R-6, 196ST4, R-2, R9-47A, SKP62, 193S2 -- a
total of 8 points.

At the above points, observations were made on the monu-
ment. In addition, Points I/21 and BM-1 were also chosen
as given points but these points were not adequate for
observation on the top of their monuments. So that tem-
porary markers were set up close by and their heights
were measured by leveling, to make the above points serve
as given points. These latter points were designated as
follows, to be distinguished from the original points:

I/21T, BM-1T.

- (3) Observations were made of 3 - 5 satellites (Nos. 3, 6, 9,
12, 13) at the altitudes of 15° or higher for approximately
two hours from 9:30 a.m. to 11:30 a.m. (Kenyan local time)
for the first half of the survey period and from 7:00 a.m.
to 9:00 a.m. for the latter half.
- (4) SKP49 happened to be located on the compounds of a wireless
relay station. In order to avoid interference of radio
waves, a temporary marker was set up at a location about
two kilometers to the south for actual observation. This
marker was designated as SKP49E to distinguish it from

the original station. Only the relative height was measured between these points.

- (5) Seven control points (188PT1, 190S2, 193S2, 196ST4, 199ST1, 199ST2, 202S3) were monumented with concrete. With respect to 188PT1, 193S2, and 202S3, as above, the locations of the original monuments were identified and monumented accordingly. But the rest of the points were newly monumented at locations considered to be close to where their original monuments presumably existed, though they were not precisely located. Distinction was made of the latter 4 points by adding N at the end of their respective identification numbers. They, therefore, are referred to as 190S2N, 196ST4N, 199ST1N, 199ST2N, hereafter.

- (6) During the observations of August 27 (Triangle No. 4), Satellite No. 9 was found unhealthy and, therefore, this satellite was not used for computation.

Due to an orbital adjustment that took place during the period from 5:00 p.m. (GMT) September 7 to 10:30 p.m. September 14 to affect the accuracy of positioning, observations were repeated for Triangles No. 5 and No. 6, and they are identified as No. 5' and No. 6'. No. 6' is identical with No. 6, whereas No. 5' is different from No. 5. (See Fig. 2 and Tab. 2)

- (7) Mr. Walter J. Absaloms, Director of Surveys, SK, visited the Mombasa Base Camp for observation of GPS operations.