Report on Topographic Mapping Project for Musoma Area, Republic of Tanzania

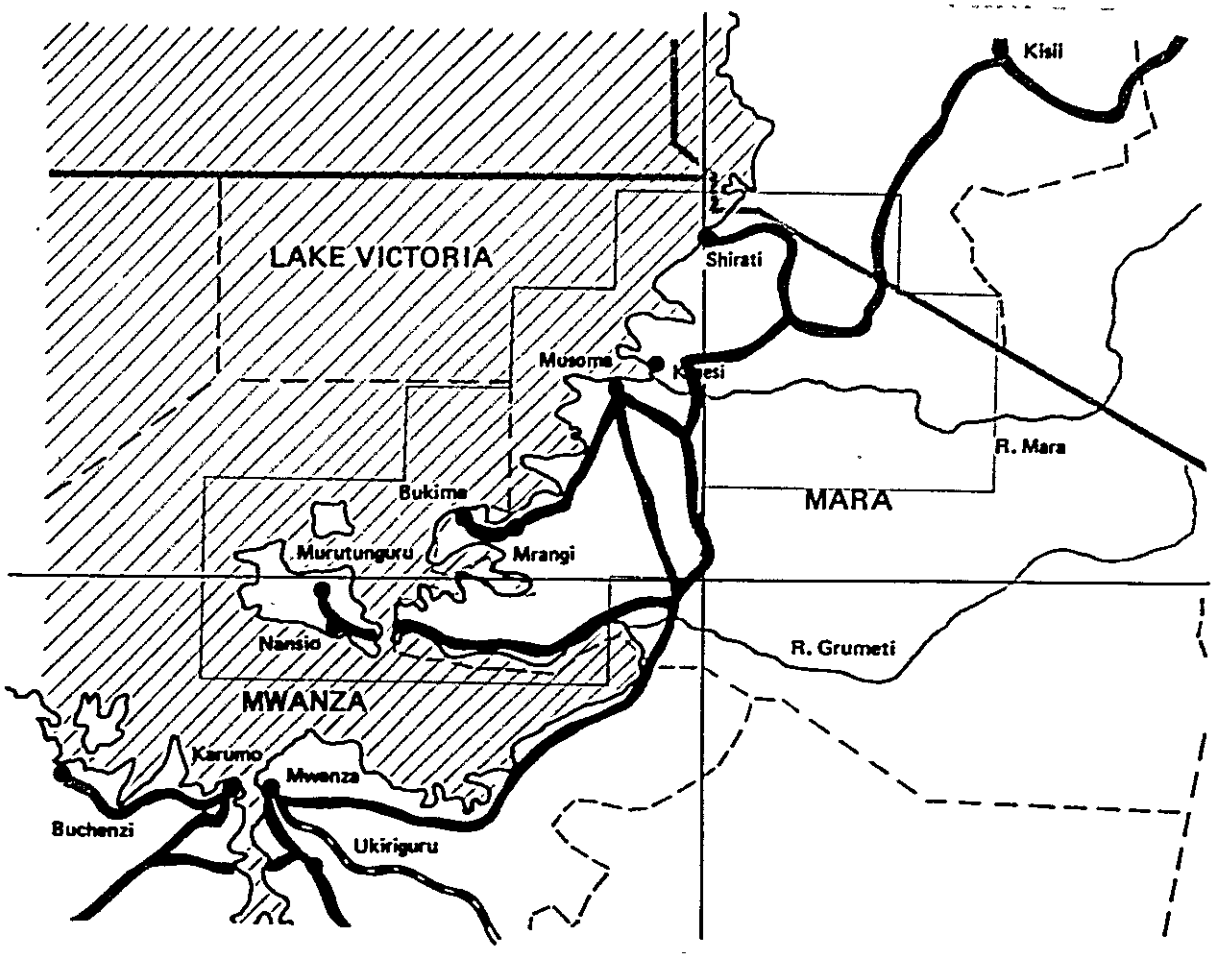
(Third Year)

(Part I) Field Operations
Field Completion Work
(Part II) Mapping Work Conducted in Japan
Stereo Plotting and Compilation
Scribing
Reproduction
(Part III) Record of Work for Each Fiscal Year

March 1976

Japan International Cooperation Agency

Location Map of Project Area



LETTER OF TRANSMITTAL

Mr. Shinsaku Hogan,
President Japan International Cooperation Agency

The Report on the Third (and Final) Year Survey Work of the Musoma Area of Tanzania Topographic Mapping Project, initiated in 1973 in compliance with your request, is herein submitted to you.

In this report are clarified the contents of the Third Year Survey Work (stereo plotting, compilation, field completion work, scribing and reproduction). Also included is a general description of the work carried out from the First Year through the Final Year.

This year sees the completion of all the work for the project extending over nearly three years. I feel confident that the numerous data and survey results obtained during the period will greatly contribute to future development of the Musoma Area, and that the Japanese survey techniques reflected in field operations and displayed by the technical staff will enhance improvement of the Tanzanian survey techniques.

Mr. Juhei Kobayashi, former Project Leader and I are pleased that, through the guidance of the Geographical Survey Institute, Japanese survey techniques have been able to play a vital role in contributing to the success of the project.

I hereby express my heartfelt gratitude to Mr. J. Daniel, Director of the Survey & Mapping Division, Ministry of Land, Housing & Urban Development of the Republic of Tanzania, the Division's personnel, the officials of the Japanese Embassy in Tanzania, the Japan Overseas Cooperation Volunteers and all others involved in this project who kindly extended to us appreciable guidance and substantial assistance in the implementation of this large-scale project. At the same time, I do hope that the results of the project will be fully utilized in the future.

March 1976

Sukeshige Buso

Sukeshige Buso
Leader, Topographical Mapping Group of the Musoma Area, TANZANIA
International Engineering Consultants Association

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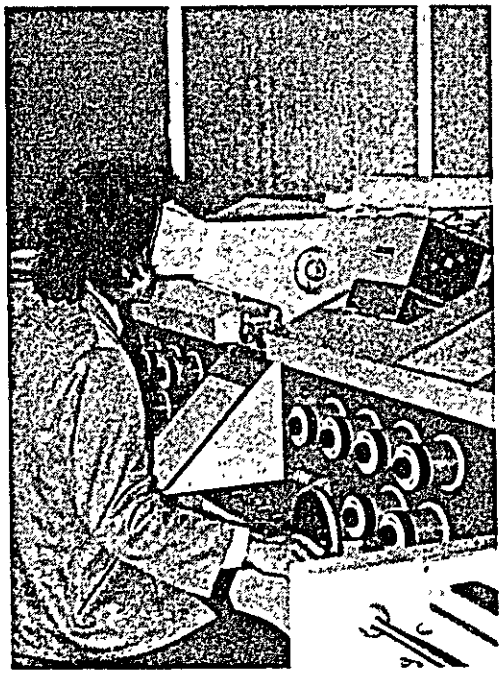
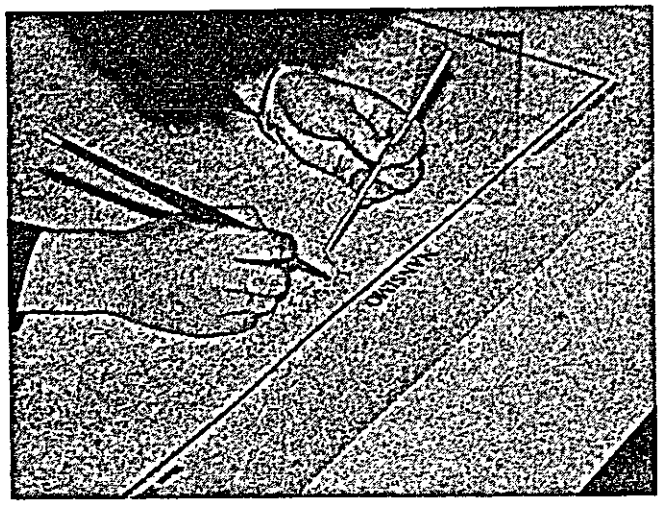


Plotting operation using a stereo metrograph

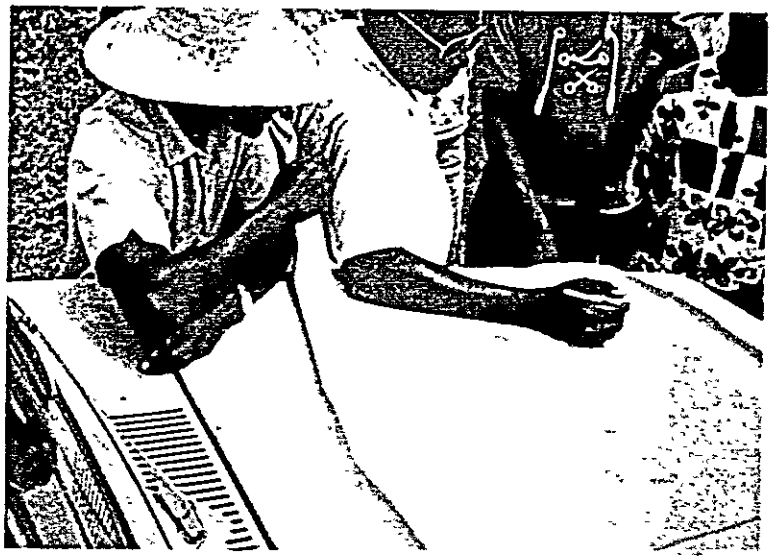


Phototypesetting operation in scribing process

Final inspection of scribing by Mr. Mikunde, staff member of the Survey & Mapping Division

Preliminary arrangement with the Director and staff members of the Survey & Mapping Division for launching operations (at the base camp in Musoma)

Addition of newly constructed road to the map during field survey conducted near Sirori-Simba



Identification of geographic names by Mr. Katuba, staff member of the Survey & Mapping Division (in the vicinity of Tarime)

(Part I)

Field Operations

Field Completion Work

1. SUMMARY OF FIELD OPERATIONS

1.1 Objective

Implementation of the field survey (Phase III) scheduled for the third year of the map preparation project for the Musoma Area of Tanzania (scale: 1:50,000). This project has been conducted since 1973 as a programme of technical co-operation between the Republic of Tanzania and Japan.

1.2 Project Area

Musoma and its environs (approximately 12,730 km^2)

1.3 Period

From: July 3, 1975
To: October 31, 1975
(Covers from date of the advance party's departure from Japan to date of the last element's return to Japan inclusive)

1.4 Work Classification and Workload

i) Field completion work

a. Identification of geographic names — 23 sheets (net) (sheet size: 15′ x 15′)
b. Boundary survey — 23 sheets (net)
c. Adjoining of newly prepared maps to existing ones — 9 sheets, 12 sides
d. Adjustment of secular change — 23 sheets (net)
e. Field inspection of original manuscript for plotting accuracy — Inspection of distances between 8 pairs of locations

1.5 Weather Conditions during Survey Period

	Jul.	Aug.	Sep.	Oct.	Total	%
Fair	24	26	26	29	105	86.8
Cloudy	3	4	4	2	13	10.7
Rain	2	1	0	0	3	2.5
Total	29	31	30	31	121	100

*Data based on daytime weather conditions at Musoma Base Camp.

2. OPERATIONAL CONDITIONS OF PROJECT AREA

2.1 Encampment

Through the good offices of Mr. Sikukuu, Chief of the Musoma Branch of the Survey & Mapping Division, the Base Camp was set up in the same park, located at the north-western end of Musoma City, as employed in the 1st and 2nd years. The survey team was allowed the use as its office/warehouse of the prefabricated structure constructed by the Musoma Branch last year for the project near the Regional Government Building, approximately 200m from the camp site. This year, Tarime and Nansio were selected as sites for the sub-camps. At Tarime, water was supplied from the common hydrant about

150m away; at Nansio, a private hydrant was available nearby upon payment of an indemnity. Although a sub-camp was established last year at Migori, in Kenya, for survey activities in that country, this year the party commuted between survey points in Kenya and the Tarime Camp, located about 30-minutes' driving distance from the Kenyan border. This change was due to the extremely high accommodation exprenses for employees working abroad. Although sub-camps were set up last year also at Kibara and Majimoto, camps were not set up this time at these locations because encamping and decamping were expected to be uneconomical, requiring excessive time for so short a period of operation. Instead, the surveys around Kibara and Majimoto were conducted from the nearby camp sites.

2.2 Co-operation Rendered by Local Tanzanian Government Agencies

Mr. Sikukuu, a Land Development Officer of the Mara Region, again rendered the survey team all possible assistance, as he so kindly did last year, in all aspects of the survey work. The consideration paid by the Regional Development Director, equivalent in station to a deputy-governor, enabled them to conduct their work smoothly, without complication. A Regional Game Officer extended great assistance in the task of entering on the map the game reserve in the National Park. The Musoma Police are also to be praised for posting patrolmen around the camp sites for nighttime protection.
A vessel belonging to the Regional Fisheries was provided for the field survey of the islands in the Lake of Victoria, since the boat rented from the Regional Commissioner last year was not available due to engine trouble. TANU, the one and only political party in Tanzania having an organisation and offices in each administrative area, afforded substantial assistance in geographic name identification and in setting up sub-camps.

2.3 Understanding and Co-operation of Local Inhabitants Regarding the Mapping Project

Since the project has been underway for three years, the local residents seem to have become familiar with the Japanese survey party. Originally, the local inhabitants generally showed little recognition of the importance of the 1:50,000-scale map or the significance of technical co-operation. However, upon learning the objective and importance of the survey by observing the positives of the original manuscript for field completion work, they voluntarily co-operated in identification of geographic names and logistic support at camp sites.

2.4 Conditions inside Kenya

When the survey party first entered Kenyan territory by way of Sirari on August 18, entry procedures consumed considerable time, apparently due to insufficient advance notification to the immigration office concerning the party's mission. Upon entry into Kenya, the party met with the Sub-District Commissioner and the Chief Constable at Migori to request their co-operation. Thereafter, the party had no difficulty in its almost daily entry into and exit from Kenyan territory. The survey area in Kenya revealed almost no secular changes and presented no major obstacles to the survey work.

2.5 Communications

Air mail communications took 8 to 15 days to travel from Japan to Musoma, and 12 to

20 days vice versa, while telegrams required five to seven days. The overall situation this year was worse than last year. In one extreme example, two months were required for one mere correspondence. Owing to interruption of telephone service between the Base Camp and the Japanese Embassy at Dar es Salaam, all liaison activities had to be conducted by means of telegrams or the mail. Some air mail letters took more than 10 days to travel between the two points. Worse still, there was no effective means of communication between the Base Camp and sub-camps, or between field survey crews on site and their camps.

2.6 Hiring of Field Assistants

Since the survey party cabled a request from Dar es Salaam to Mr. Sikukuu in Musoma that arrangements for hiring field assistants be made, the party members arrived at the site to find field assistants, who had been selected from among local residents, waiting for them. Most had worked with the project last year. They therefore understood the nature of the work to be performed, and communication between the assistants and Japanese party members was smooth. Also, their familiarity with local conditions was called into play in various aspects of the survey.

Although legal working hours in Tanzania are from 7:30 a.m. till 2:30 p.m. (12:30 p.m. on Saturdays), the local personnel were willing to engage in over-time work with the Japanese staff, working until as late as 5:00 to 6:00 p.m. almost daily. Allowances for night duty at the sub-camps were paid out in accordance with the legal rate. In conformity with Tanzanian tax law, individual income taxes payable by employees were deducted from their wages and remitted to the tax office in Dar es Salaam. This year, a formal labour contract was implemented only for the months of August and September, as actual operations were conducted for only a relatively short period. As early as the end of August, prior written notice was delivered to the effect that the contract be terminated at the end of September. Field assistants whose services were required prior and subsequent to the formal contract period were hired on a temporary basis. In response to a request from the employees, work certificates were prepared and delivered to them at the beginning of October.

2.7 Conversion of Operating Funds

Since the experience of the past two years revealed the difficulties involved in replenishment of operating funds during the survey work, the survey party this year brought with them enough funds to cover the entire period outside of Japan so as to avoid running short. While this eliminated anxiety concerning operating funds throughout the work period, an exceptionally long time was required to convert the money into Tanzanian shillings.

2.8 Maintenance and Repair of Vehicles

Six Toyota Land Cruisers and two Isuzu trucks were sufficient for the small group of survey members this year. Upon arrival at Dar es Salaam, the advance party made adjustments and purchased necessary parts for the vehicles after subjecting them to a test run for two weeks. When the party reached Musoma, it established an area of ground at the Base Camp site for maintenance and repair of the vehicles. Unfortunately, difficulty was encountered in obtaining necessary parts. The engines were generally in good

operating condition despite the mileage accumulated during the past two years and the severe road conditions. Flat tires were frequently caused by the many thorny shrubs at the work sites. Fortunately, no serious accidents requiring all-out repair work at the factory occurred with vehicles this year. However, some having cracks in the frame were sent to a repair shop in Musoma for inspection and exterior repairs.

2.9 Sanitary Conditions

Since the survey members, before entry into Musoma, were told by the Japanese Embassy staff to take precautions against virulent malaria currently prevailing in the district, all members of the party voluntarily took drugs as a precaution. Two members came down with malarial fever, but it was eventually discovered that they had merely developed a recurrence of the disease contracted in the past. Although not a word was heard about the prevalence of virulent malaria in Musoma, a substantial number of local inhabitants were suffering from the disease. Previously informed, by Mr. Sikukuu, of the existence of contaminated water caused by schistosomes living in the coastal area of the Lake of Victoria, all the members avoided direct use of untreated water whenever possible. An exceptional number of vipers (more than 10) appeared near the Base Camp this year. Fortunately, they caused no harm. Not a single green-snake, said to have a lethal poison, could be observed this year.

The members attacked with malarial fever underwent a blood test at a national hospital in Musoma. The party members were generally in healthy condition throughout the work period.

3. ARRANGEMENTS FOR OPERATION WITH TANZANIAN SURVEY & MAPPING DIVISION

The survey party met with Mr. Daniel, Director of the Tanzanian Survey & Mapping Division, seven times (July 4, 8, 19, September 3, 14, 15, and October 17), and with Mr. Andrew, Chief Cartographer, three times (September 2 and 17, October 21). Below, the excerpts:

(1) The full powers for inspection for approval by the Tanzanian Government prior to reproduction of the map shall be conferred upon Mr. Mikunde, who will visit Japan to attend the training programme in f.y. 1976.

(2) The Tanzanian Government shall send Mr. Katuba of the Survey & Mapping Division to the survey area for the purpose of investigation and approval of geographic name representations.

(3) The Tanzanian Survey & Mapping Division shall also be responsible for approval of geographic name and boundary representations inside Kenyan territory.

(4) Approval of representations of boundaries

(5) Receipt of existing maps required for adjoining, confirmation of the results of adjoining, and approval of the adoption of the version of the map prepared by the Japanese party for adjoining.

(6) The Tanzanian Government agreed that major items of Ujamaa villages be represented in the map as much as possible at the time of the survey.

(7) Unified interpretation of the method of indicating control points and bench marks on the map. Since bench marks, though excluded from the symbols and system of

representation, play a vital role in the use of the map, it was mutually agreed after careful discussion that the letters 'BM' be affixed to the figure indicating spot height.

(8) Receipt of marginal data and arrangements for representation thereof

(9) Borrowing of negative films of various symbols as well as specification of symbols

(10) Approval of lettering style for photocomposition

(11) Printing paper shall be 120 g/m² or more. Determination of the quality of paper was left up to the Japanese party. Also discussed were the cutting dimensions for the printed map.

4. VISIT BY DIRECTOR OF TANZANIAN SURVEY & MAPPING DIVISION AND TECHNICAL ADVISOR

Last year, other business prevented Mr. Daniel from visiting the project area. As this was the final year of the project, Mr. Daniel took time out from his busy schedule to stay in Musoma from September 13 to 17 for field observation. Upon arrival at Musoma by plane on September 13, Mr. Daniel examined the process of the project at the Base Camp, and a discussion was held concerning his observation schedule. Next day, though it was Sunday, he checked the maps of those areas whose field completion work was completed, and checked the adjoinment thereof with existing maps. The day's business ended after making arrangements for subsequent operations. In the morning of September 15, he and other staff members observed the field in the Butiama area for field verification of the map thereof. Based on the results of this observation, subsequent operations were re-arranged. When asked what requests he would make of the Japanese survey team both in terms of desk work and field operations, Mr. Daniel stated that he was completely satisfied with the results and had no requests. On September 16, he met with several local officers not connected with the work of the survey party. On September 17, he was accompanied by the team leader to Mwanza, and from there left for Dar es Salaam by air on September 18.

Mr. Seino of the Geographical Survey Institute, who was dispatched by the Japanese Government as Technical Advisor, was greeted by the members of the Japanese survey team at the Dar es Salaam Airport on August 31. From September 1 to September 3, he paid a courtesy call to the Japanese Embassy, greeted Mr. Daniel and Mr. Andrew, and made necessary arrangements. On September 4, he flew to Mwanza, and from there drove into Musoma. From September 5 to 12, he conducted desk inspection of the results of the field completion work and examined the adjoinment of maps, and accompanied the survey team members to the site to give operational instructions. September 13 to 15, he attended Mr. Daniel's field inspection. On September 16, he flew from Mwanza back to Dar es Salaam accompanied by the leader of the Japanese survey group. On September 17, he visited the Japanese Embassy to make a report and joined the meeting with Mr. Andrew. On September 18, he returned to Japan. As a result of his observation, Mr. Seino expressed satisfaction regarding the work under way.

5. DETAILS OF OPERATIONS AND RESULTS OF IMPLEMENTATION THEREOF

5.1 Geographic Name Identification

The survey area covers the Mara Region, consisting of the North Mara, Musoma, and Serengeti Districts and the Ukerewe District in the Mwanza Region. Each of these has a district office, located in Tarime, Musoma, Mugumu, and Nansio respectively. Geographic name identification was conducted based on the lists of administrative names obtained by individual commissioners. These administrative names are classified by Mkoa (Region), Wilaya (District), Tarafa (Larger Block), Kata (Smaller Block), Kijiji or Vijiji (Village), and Kitongoji or Tawi Dogo (Hamlet) in diminishing order. The minimum unit for representation on the map was the Kijiji in response to a request from the Tanzanian Government.

5.2 Survey of Ujamaa Villages

The construction of Ujamaa villages, Tanzania's largest project currently under way, had at the time of the field completion work almost been completed in the project area, and the arrangement of geographic names had been initiated from the end of 1974. Consequently, newly built villages were entered in the map, and abandoned villages were deleted therefrom. Villages on Ukerewe Island showed the most conspicuous change among those in the project area. Since they were newly built, and the unified names had not been completely made known to the inhabitants, geographic name identification was difficult. Therefore, the adoption of geographic names to be represented in the map of this area was entrusted to the Tanzanian party. Thus a smaller unit than the aforementioned minimum unit, such as Kitongoji or Tawi Dogo, is adopted in several instances.

5.3 Selection of Annotating Position and Preparation of the Map for Field Completion Work

Based on the results of geographic name identification, the scope of each administrative unit was roughly determined and the annotating position was selected for geographic names and other notes. Then, the map for field completion work was prepared by arranging them on the positive of the original manuscript at a scale of 1:50,000.

5.4 Survey of the Border and the Boundaries of the National Park, Game Reserve, and Representation of Other Administrative Boundaries

As for the border line between Tanzania and Kenya inside the survey area, the border points were plotted on the original manuscript based on the data obtained from the photo identification conducted last year. (Although the survey team requested the coordinates of border points as it did last year, they were not available because the survey work which had been started from the eastern end did not reach the survey area.) By connecting the plotted points, a straight line could be obtained as the border line. Since this technique was approved by Mr. Daniel, Director of the Tanzanian Survey & Mapping Division during his inspection, it was represented as the border line on the map. (Since border points No. 1 to No. 3 near the Lake of Victoria are currently in Kenyan territory, the Survey & Mapping Division at Dar es Salaam conducted a fact-finding survey. Based on the results thereof, the border line was entered by Mr. Andrew, Chief Cartographer

of the Survey & Mapping Division.)
The boundaries of the National Park and the game reserve were entered after consultation with the staff of the Regional Game Office in Musoma, and were approved by the Survey & Mapping Division. The boundaries of the forest reserves were indicated after investigation at individual offices of the forest reserves. They were not, however, indicated on the map, as agreed upon in consultations held at Dar es Salaam. Instead, it was decided that the names of individual forest reserves alone were to be indicated on the map.
As for the boundaries other than the border line, it was agreed that the boundaries including those inside Kenyan territory be indicated on a district basis in compliance with the resolution and reconfirmation made when Mr. Daniel visited Japan in 1974.
Although delineation of the regions and districts was to be based on the data from the Tanzanian Survey & Mapping Division, as a result of the discussion with the Director of the Division held on September 3, it was decided that the boundaries not be shown on the map, but that they be indicated on the "Administrative Division" based on the 1/2,000,000-scale map.

5.5 Adjoinment with Existing Maps of Surrounding Areas

Nine sheets are required for adjoining; Kenyan-owned 4, Finnish-made and Tanzanian-owned 4, and Tanzanian-made and owned 1 (Total 9 sheets, 12 sides). From the initial stage of the 2nd-year survey work, we had repeatedly requested these existing maps for adjoining. Since, however, they could not be obtained either during the field operations or after the return of the survey party to Japan, the original manuscript was prepared based on the judgement that adjoining would be done in the future based on the version of the map prepared by the Japanese party. At the first meeting held at Dar es Salaam this year, a request was made by the Tanzanian party that the Japanese version be adjoined to the above-mentioned sheets since they stated that the drafting and reproduction thereof, except for those which are Kenyan-owned, had been already completed. The Japanese party explained to them that they had prepared the original manuscript independently because the adjoining sheets could not be obtained. However, in view of the fact that the general rule calls for adjoining of new maps to existing ones, it was decided that comparison be made of the adjoining sheets and the newly prepared sheets to look into the possibility of adjoining them. As a result of the comparative study, it was found that the Finnish-made sheets show high accuracy of horizontal and contour lines, and only slight differences in vegetation and differences regarding the presence or absence of small lanes due to differences of standards selected. It was also discovered that only one hamlet was omissioned at the adjoined section of the Japanese sheet. Considering the fact that these sheets were prepared entirely separately, it may be said that the results proved favourable for the subsequent adjoining operations. As for the Kenyan side, the Tanzanian party requested that sheets No. 6/3 and 6/4 be adjoined with the existing maps. In this respect, their Japanese counterpart explained to them that adjoining thereof was impossible because the area inside the Kenyan territory was not yet surveyed, and that the contour lines of the existing maps were represented in feet and only reproduced maps were available. Thus, it was agreed that the adjoining concerning this side be done based on the Japanese version. At any rate, good results were obtained with respect to horizontal accuracy when adjoining was conducted using UTM grid lines. All the other adjoining with the Kenyan-owned sheets were to be done using the

Japanese version.
As to adjoining with the Tanzanian-made sheet (No. 23/2), though adjoining with sheet No. 23/1 showed a good horizontal accuracy, it was discovered that one contour line was too thick to allow for adjoining. Therefore, a contour check was conducted at the control point near the site using a plane table, a tellurometer and a T2 theodolite.
The check revealed that the contour line on the Japanese sheet was more suitable for adjoining. After the discussion with the Director of the Survey & Mapping Division, it was decided that the contour line of the Japanese sheet be adopted for adjoining. As for adjoining with sheet No. 12/4, the neatline was found to have an error of 1mm in length. The Japanese party made a request to the Tanzanian Survey & Mapping Division to reexamine this point; meanwhile, the computation results of the cordinate value of the neatline corner and neatline length obtained during the stereo plotting process were ordered from Japan for submission to the Tanzanian authorities. The result was that the error was attributable to the Tanzanian sheet. Therefore, it was decided that adjoining be based on the Japanese sheet. The result obtained by sliding the sheets based on the UTM grid line showed good horizontal and contour-line accuracy except for partial differences in small lanes and vegetation.

5.6 Entry of Newly Established Two-lane Roads

Two roads were newly constructed in the survey area after the field identification was completed. One is a two-lane road extending 11.5 km northward, which branches from Sirori-Simba at the southeastern corner of the sheet (No. 13/1). The other is an 11 km two-lane road branching from the road which runs from south to north, in the northern section of the sheet (No. 14/1), at a section near the crossing of the road and the upstream portion of River Mara, and reaching down the Lift Valley. Although these roads were still under construction at the time of the survey, those portions which had been completed were added to the map through planetable surveying.
Spreading over the adjoining section of sheets No. 13/4 and 14/3, a road had been completed extending about 31 km at the South Section of the sheets. Since this road lies across the adjoining section, addition thereof was conducted by carefully determining the position using a planetable, a tellurometer, and a T2 theodolite. All other replacements and new additions of short roads made necessary by construction of Ujamaa villages were performed using planetables.

5.7 Road Classification, and Inspection of Building Annotations and Simplified Annotations

Inspection and investigation were conducted to check for errors and omissions made during last year's field identification, as well as for amendments made necessary by construction of new roads, etc. this year. As for the road classification, no paved road existed in the survey area in the Tanzanian territory, as was the case last year. Since new roads were built due to the construction and expansion of Ujamaa villages, many old roads were deserted. As a consequence, some loose-surfaced and dry-weather roads were downgraded to dry-weather roads and main tracks, respectively. As for annotation of buildings, newly established schools and churches serving Ujamaa villages were added to the map together with a few omissions detected.

5.8 Study on the Status of Power and Communication Lines

Communication lines were available only between Musoma and Mwanza, and between Musoma and Butiama. Last year, the survey party was informed of the plan to extend the line to the Tarime quarters for telegraphic communication. However, this project had not got under way by the time the survey finished this year. There are two power stations: the one at Musoma covers the Musoma area, while the other at the coast of Lake Victoria to the west of Butiama feeds power to the Butiama area. There was no change from the survey conducted last year, since expansion of the power line to the Tarime quarters had not been carried out either.

5.9 Inspection of the Original Manuscript for Accuracy

For the purpose of the inspection, distances between eight paris of locations in the mapping area ranging from 6 km to 13 km in average were measured on the manuscript. One end was set at a control point having a coordinate and elevation, and the other end at a position that offered intervisibility, and allowed definite comparison between the field position and the map position (e.g., point of intersection of roads), as well as showing the height as measured by a machine plotter. One set of distance and a pair of elevation-angle measurements were conducted using a tellurometer and a T2 theodolite, respectively. The calculations were made in accordance with the picture-point survey.

Distance measurement on the reproduced polyester manuscript of the distance between the same two points was conducted separately by two operators using separate steel measures, and the averaged figure was adopted as a map distance. The maximum difference between the map distance and the actual value was 5 m, or 0.1 mm on the map. This difference was found in the distance between only one pair of locations. Others were virtually 0 mm as measured on the map, revealing high accuracy. The maximum variance between the height measured by a machine plotter and the actual height was 3 m. This measurement was performed for several spots and two contour lines.

5.10 Collation between the Results of Geographic Name Identification Conducted by the Japanese Survey Party and Its Tanzanian Counterpart

Based on consultation with Mr. Daniel, Director of the Survey & Mapping Division, Mr. Katuba stayed in Musoma from August 11 through October 11 to conduct geographic name identification for the Tanzanian survey party. Prior to the survey, Mr. Katuba and his Japanese counterpart selected a sample area for a half-day survey in order to determine a unified standard for indicating geographic names on the map. After the field operation was completed, the results he obtained were collated with those of his Japanese counterpart with respect to the position for annotations and the spelling of geographic names, though some of the sheets still required arranging. Field verifications were again conducted whenever necessary to adjust for discrepancies.

The map for field completion work prepared by Mr. Katuba, after necessary adjustments were made, was signed on behalf of Mr. Daniel by Mr. Andrew, Chief Cartographer, for approval, and then delivered to the Japanese party on November 22.

5.11 Receipt of Data Relating to Drafting Work

Symbols and other marginal data were received at the meeting held at the Survey & Mapping Division in Dar es Salaam, and were then forwarded to the Japanese party.

(Part II)

Mapping Work Conducted in Japan

Stereo Plotting and Compilation

Scribing

Reproduction

1. SUMMARY OF MAPPING WORK CONDUCTED IN JAPAN

1.1 Objective

Implementation of stereo plotting, compilation, scribing, and reproduction in Japan planned for the third-year (Phase III) of the topographic mapping project for the Musoma Area (scale: 1:50,000), a project initiated in 1973 as a technical co-operation programme between the Republic of Tanzania and Japan.

1.2 Period

From: June 3, 1975
To: March 20, 1976

1.3 Work Classification and Workload

i)	Stereo plotting and compilation	
	No. of sheets to be prepared	11 sheets actual (17.5 sheets net) sheet size: 15' x 15'
ii)	Scribing	16.5 sheets actual (23 sheets net) Colour separation necessary for 5-colour reproduction
iii)	Reproduction	
	No. of sheets to be reproduced	1000 copies each for 23 sheets 5-colour reproduction

2. STEREO PLOTTING AND COMPILATION

Stereo plotting and compilation were performed subsequent to the same processes conducted for 5.5 sheets during 1974. Compilation editing manuscripts obtained by these processes were used as basic data for the subsequent field completion work, and then finished as originals to be used for the scribing process after investigation and arrangement of necessary items were completed.

2.1 Preparation for Work

After carefully examining the expansion ratio, Teijin Mat (#500) was selected as the base for plotting and the compilation editing manuscript. After aligning the plotting base and the compilation editing base (one laid upon the other), neatline corners, control points, eccentric points, pass points and tie points were plotted concurrently using a co-ordinatograph. Plotted positions were marked with red chalk to avoid interfering with subsequent work. UNIPER (#500) overlay sheets (made in Japan) were used for plotting the elevation points.

2.2 Stereo Plotting and Compilation Work

"East Africa Tri-Country Common Specifications" was used for this work. Giving due consideration to the subsequent compilation editing process, five colours were used for delineating topographic features; red for roads and buildings, purple for water and swampy areas, black for intermediate contour lines, brown for index contour lines, and green for land classification boundaries, distorted surface areas, bare rocks, scattered

rocks, and so on. Upon completion of ground orientation, essential elements of orientation and other data were recorded on the orientation record sheet. Allowing a maximum of 0.4mm horizontal error (measured on the sheet) and 5m error in elevation as stipulated in the plotting regulations, the accuracy of all models was checked. All bench marks were plotted on the plotting sheet for checking the contour lines. All spot elevation points were measured and checked prior to detail plotting on the elevation point overlay.

2.3 Compilation Editing Work

After laying a compilation editing sheet on top of the plotting sheet, roads, buildings, land classification boundaries, water area and so on were delineated in accordance with "East Africa Tri-Country Common Specifications." Necessary data were delineated in three colours; black for two-lane roads, water and swampy areas, buildings, and curves, red for trunk roads, ordinary roads, and footpaths, and green for land classification boundaries.

The minimum area for indicating vegetation boundaries was established at 5mm x 5mm on the sheet, and any vegetation covering an area less than that was indicated as a single category. Swamp boundaries, though not appearing on the final map, were indicated by black broken lines so as to clarify those areas which are covered by symbols.

2.4 Accuracy Control

During the processes of preparation, plotting, and compilation, the persons responsible for each process heeded the following points to ensure the prescribed accuracy:

a. Preparation for stereo plotting work

   Using a co-ordinatograph, all plotted control points, pass points, tie points, neatline corners and so on were checked against respective survey results to determine whether plotting errors were less than 0.2mm on the sheet.

b. Plotting

   Using a plotter, plotted features were checked as to whether they were delineated exactly as shown on field identification photographs, and to see if contour lines and elevation values were within the required range of accuracy.

   Also, control points, pass points, and tie points were checked as to whether they were within the prescribed range of accuracy of the orientation record.

c. Compilation editing

   The compilation editing manuscript was checked as to the following items.

   i) Whether or not all necessary data were properly delineated through collation with the plotting manuscript
   ii) Whether or not all data were accurately transcribed on the manuscript as shown in the field identification photographs, and whether or not they were accurately represented as shown in the specifications
   iii) Whether or not elevation points were proportionate to curve lines.

3. SCRIBING

Scribing was performed for preparation of the 1:50,000-scale, five-colour national basic map in accordance with the specified symbol and system of representation on maps of topography, planimetric features, and annotations, etc. The edited manuscript, which

underwent corrections and additions based on the results obtained in the field identification conducted in 1974 and the field completion work executed in 1975 as well as data provided by the Tanzanian Survey & Mapping Division, was employed as the final manuscript for scribing.

3.1 Preparation for Work

The following preparations were made prior to scribing:

i) Preparation of positive-printed bases based on the final edited manuscript (4 bases for each sheet: for colour separation of black, red, brown and blue, while pillcoats were employed for green colour.)
ii) Preparation of pillcoats and translucent polyester base
iii) Checking of line weight of the scriber to be employed
iv) Explanation and thorough instructions concerning work specifications for persons in charge of scribing

Twenty-three sheet (net) were to be scribed, and scribing had to be performed by several groups of scribing personnel. Therefore, interpretation of the most detailed points of the work specifications was unified to avoid probable ununiformity in the quality of finishing.

3.2 Scribing

Colour separation was conducted by scribing for the representation of topography, planimetric features, annotations, etc. in specified manner on the map. Separation was made to prepare sheets for black, red, brown, green and blue colours.
Besides scribing bases, pillcoats and translucent polyester bases were used according to the suitability of each material.
The following explains the relationship between each colour and items to be represented thereby.

a. Black:
1. Two-lane roads, railroads, houses, boundaries, electric cables, control points etc.—(scribing base)
2. Grids, annotations—(Lithofilm)
3. Marginal data (land classifications, simplified annotations)—(translucent polyester base)

b. Red:
1. Two-lane roads, one-lane roads, etc.—(scribing base)
2. Boundaries, marginal data—(pillcoat)
3. Unpaved roads, unpaved runway—(pillcoat)

c. Brown:
1. Contour lines, coast sand— (scribing base)
2. Contour values, sand, soil, marginal scale—(translucent polyester base)

d. Green:
1. Vegetation (forest, plantation)—(pillcoat)
2. Vegetation (swamp)—(pillcoat)

e. Blue:
1. Rivers, shore lines—(scribing base)
2. Annotations, swamps, etc.—(translucent polyester base)
3. Water surface—(pillcoat)

In this scribing process, the maximum quantity of colour separation per sheet reached 13; black—3, red—3, brown—2, green—2, and blue—3. Based on the colour separation, plate-making for five-colour reproduction was conducted.

3.3 Accuracy Control

Before preparing plates for reproduction, accuracy control of the results achieved by scribing was conducted. The control was conducted twice—in-house inspection and final inspection by a staff member of the Survey & Mapping Division of the Tanzanian Government.

Diazo prints were prepared for each inspection.

The check points in each inspection were mentioned below. Errors discovered in the inspections were corrected properly.

a. Whether or not the "East Africa Tri-Country Common Specifications" was observed
b. Whether or not all the line weight met the specified thickness
c. Whether or not adjoining of each sheet was performed
d. Whether or not there were errors in spelling of geographic names, annotations, sheet names, etc.
e. Whether or not boundaries met the specified data
f. Whether or not adjoining with existing maps was done
g. Whether or not results of field completion work were correctly added
h. Whether or not alignment of color separation for each sheet was maintained

4. REPRODUCTION

Reproduction plates were prepared for five colours—black, red, brown, green and blue—by overprinting by colour the scribing bases, pillcoats and translucent polyester bases obtained by scribing on the same aluminum plate. For this overprinting process, the specified screen was employed.

The aluminum plate employed was 0.24mm thick, on the surface of which organic diazo compounds were applied as sensitive emulsion.

Before starting actual printing, a printing proof was made by an automatic lithographic press for the examination of colour tone and final proofing. Necessary corrections were made on the plates. A full-automatic lithographic 2-colour offset press was employed for reproduction. Each sheet of printing paper was run through the press repeatedly until the full five-colour reproduction was completed. In this process, black and blue plates were set first, and test printing was conducted until the register-mark positioning and colour-tone adjustments were completed. Actual printing was performed then for the simultaneous reproduction of black and blue colours after the completion of respective adjustments. As the next step, red- and brown-colour printing was conducted subsequent to similar adjustment procedures, and finally the green plate underwent printing for the accomplishment of a full five-colour reproduction. Paper used for the reproduction for this mapping project was map paper of 127 g/m^2. Printing inks employed were those manufactured by Tokyo Printing Ink Mfg. Co. which were specified by the Geographical Survey Institute for their fade-resistant property.

One thousand copies for each of the 23 sheets were reproduced.

(Part III)

Record of Work For Each Fiscal Year

1. SUMMARY REPORT ON THE MAP PREPARATION PROJECT FOR THE MUSOMA AREA, REPUBLIC OF TANZANIA

Year	Period	Work Classification	Quantity	Remarks
1st year	July 1973–December 1973	First-order levelling	162 km	Seronera--Bunda
	July 1973–December 1973	Second-order traversing	29 points	
	July 1973–December 1973	Picture point survey	21 points	
	July 1973–January 1974	Aerial photography	12,730 km²	1/50,000
	January 1974–March 1974	Computation & arrangement		
2nd year	June 1974–November 1974	Second-order levelling	704 km	
	June 1974–November 1974	Check of first-order bench marks	30 km	
	June 1974–November 1974	Differential levelling	4 points	
	June 1974–November 1974	Cross-water levelling	1 point	Between Kisoria and Ukerewe Is. (4 km)
	June 1974–November 1974	Water level observation	4 points	including installation of tide gauges
	June 1974–November 1974	Picture point survey	9 points	
	June 1974–November 1974	Eccentric pricking	73 points	
	June 1974–November 1974	Field identification	12,730 km²	23 sheets
	November 1974–March 1975	Computation & arrangement		
	November 1974–March 1975	Aerial triangulation	579 models	
	November 1974–March 1975	Stereo plotting & compilation	5.5 sheets	1/50,000; 15′ x 15′/sheet
3rd year	July 1975–October 1975	Field completion work	12,730 km²	23 sheets
	June 1975–August 1975	Stereo plotting & compilation	11 sheets	1/50,000; 15′ x 15′/sheet
	October 1975–February 1976	Scribing	16.5 sheets	Net 23 sheets
	February 1976–March 1976	Reproduction	23 sheets	1,000 copies each