

REPORT ON ESTABLISHMENT OF
GRAPHIC INFORMATION BASE PROJECT
OF THE NATIONAL CAPITAL REGION
REPUBLIC OF THE PHILIPPINES

(SECOND YEAR WORK)

Contoured Map & Planimetric Map
Field Completion
Drafting & Printing

Land Condition Map
Field Identification
Leveling

MARCH 1987

JAPAN INTERNATIONAL COOPERATION AGENCY

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ESTABLISHMENT OF GRAPHIC INFORMATION BASE PROJECT OF NCR, THE PHILIPPINES (2nd YEAR)

MARCH 1987

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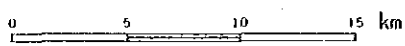
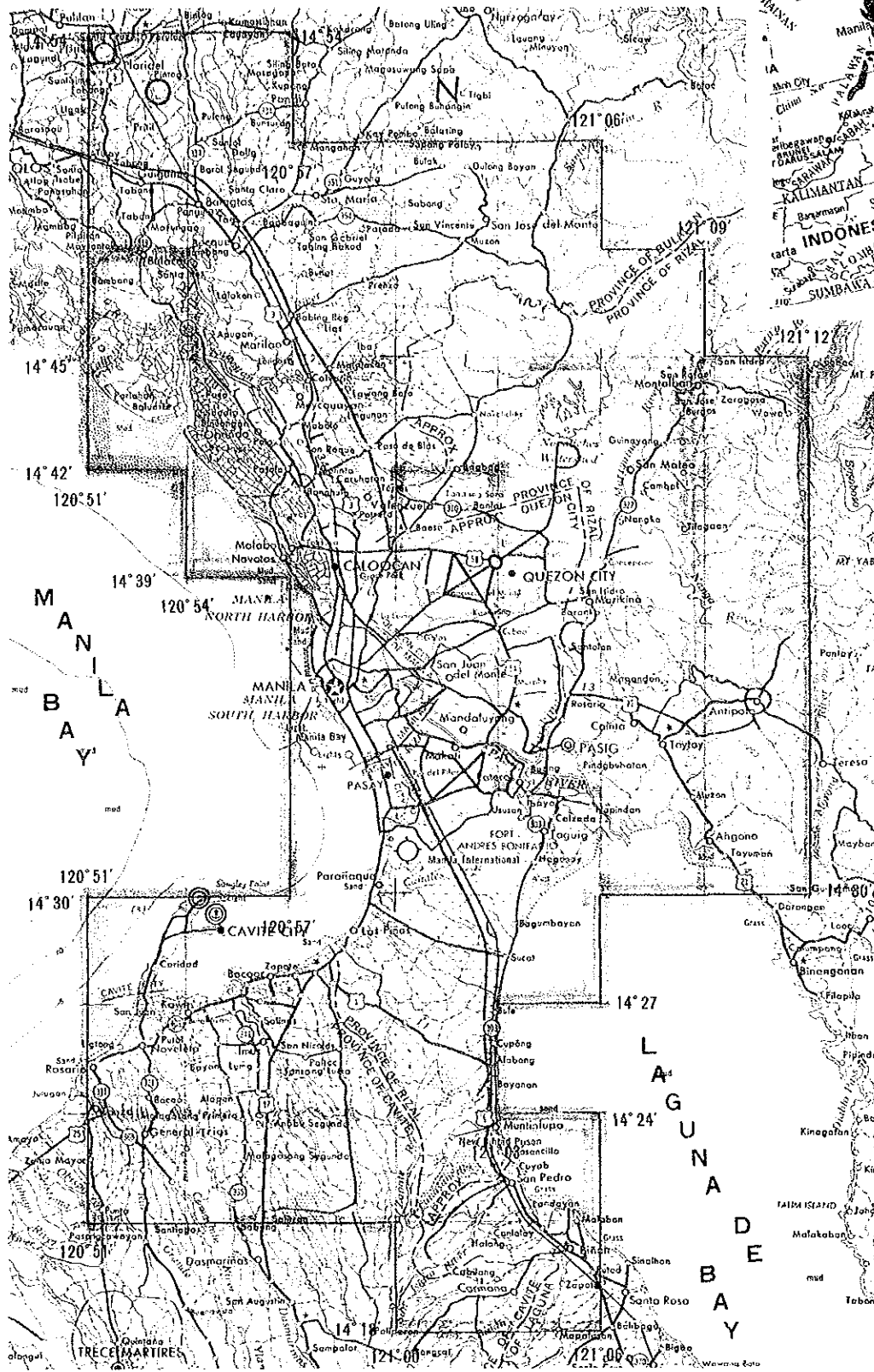


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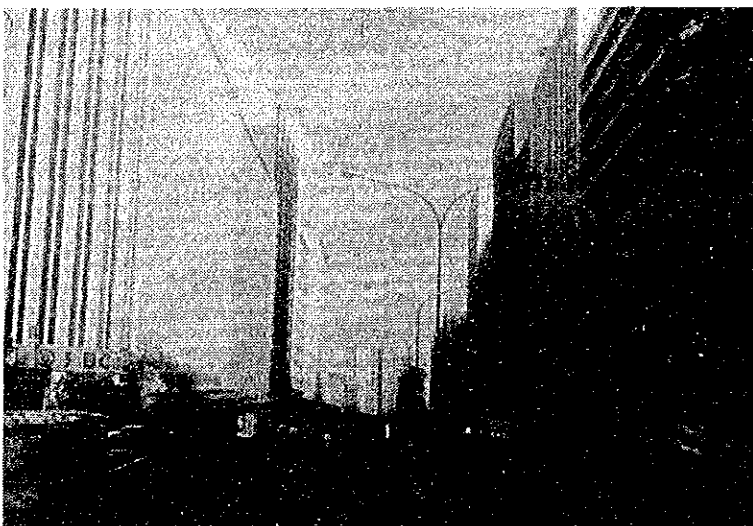
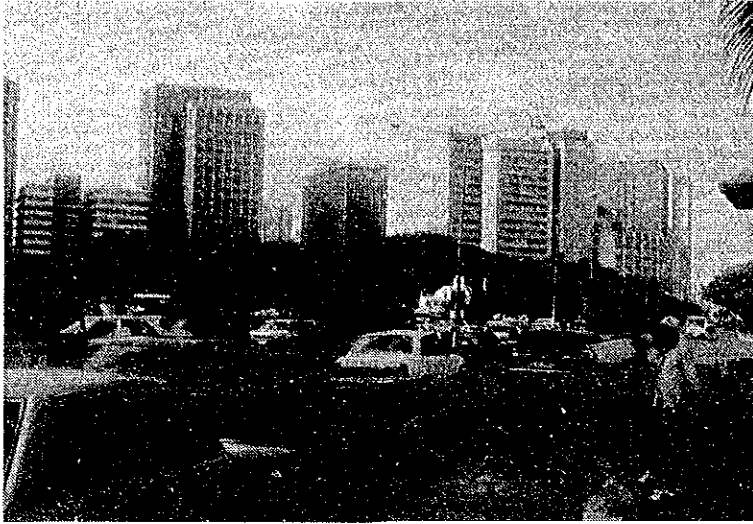
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Location Map for Establishment of Graphic Information Base Project of National Capital Region

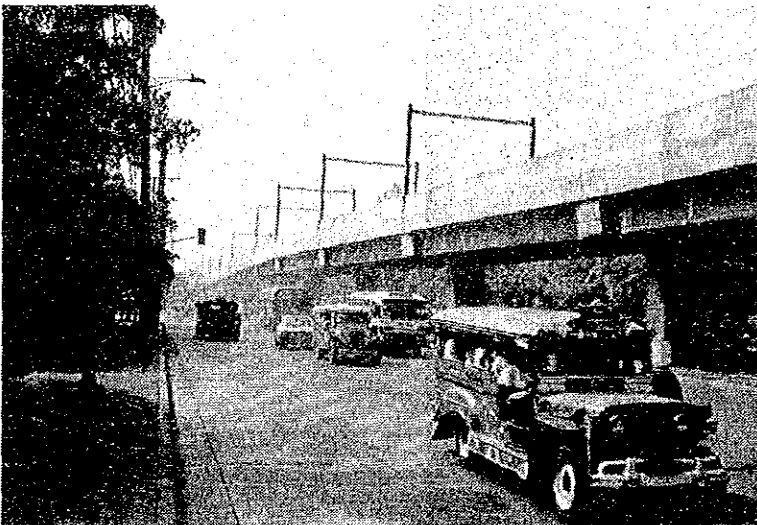
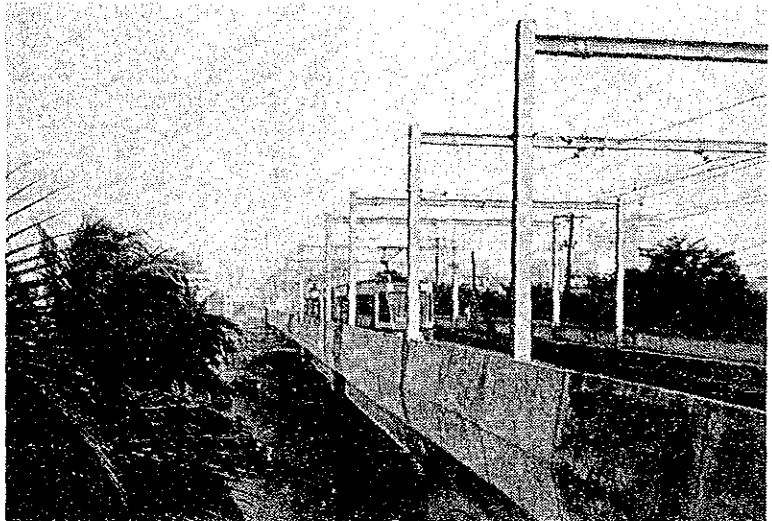
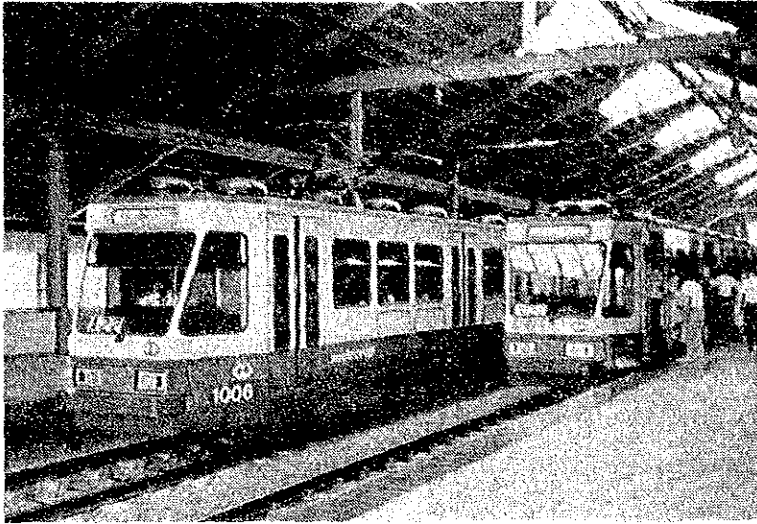


- Contoured map : [Symbol]
- Planimetric map : [Symbol]
- Land use map : [Symbol]
- Land Condition map : [Symbol]

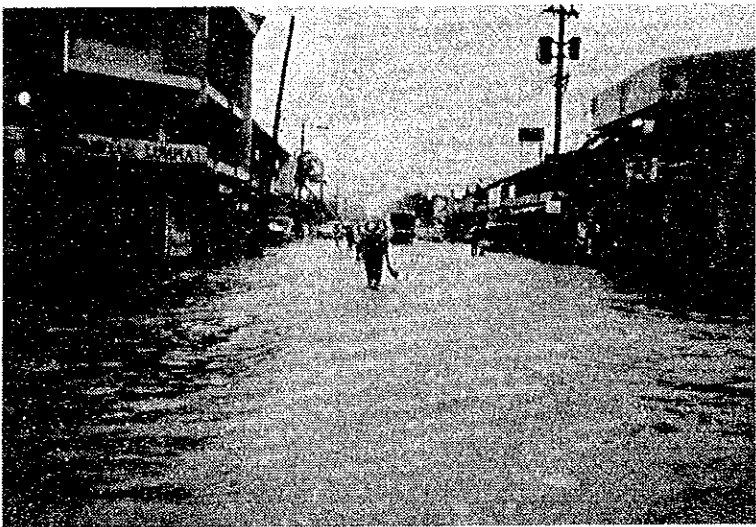
1. Modernized area, Makati business center



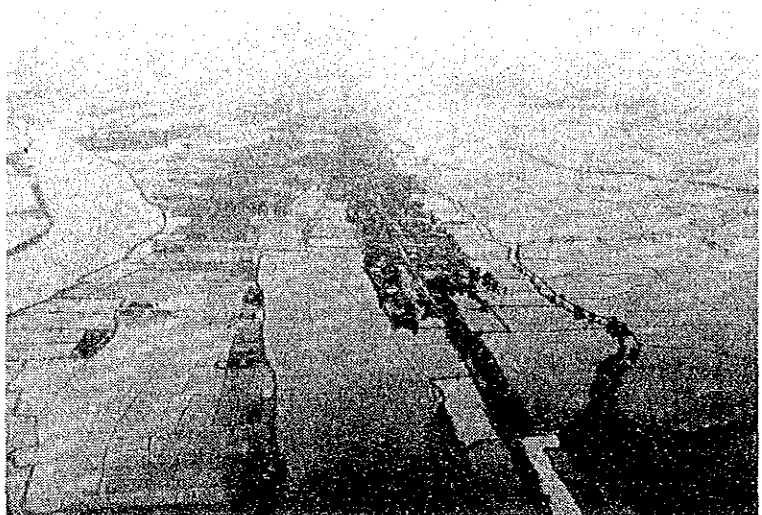
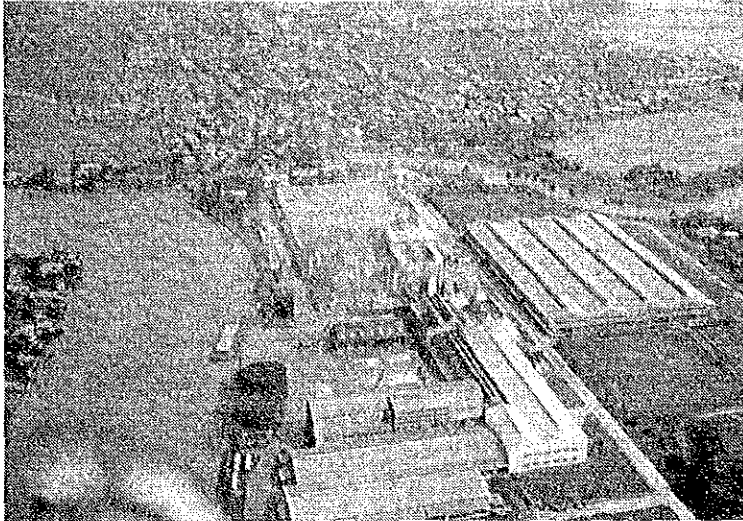
2. Light Rail Transit running north to south in Metro Manila



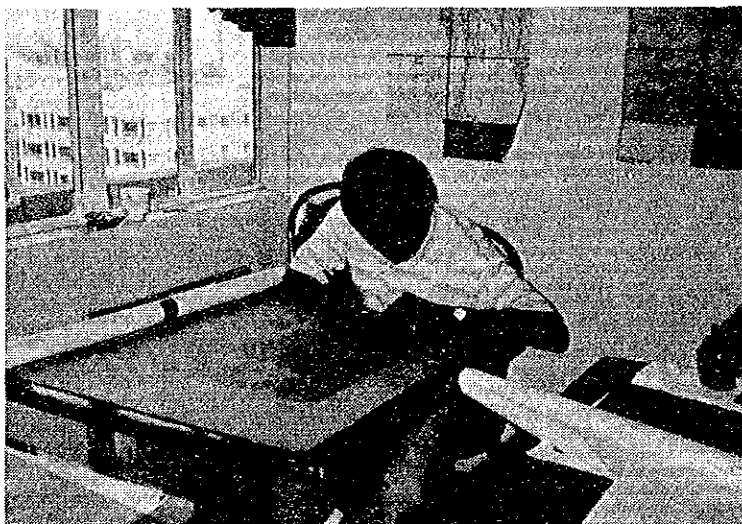
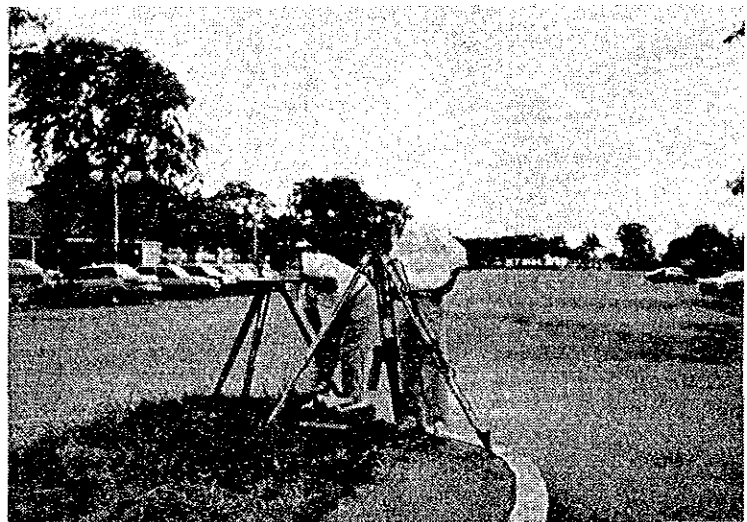
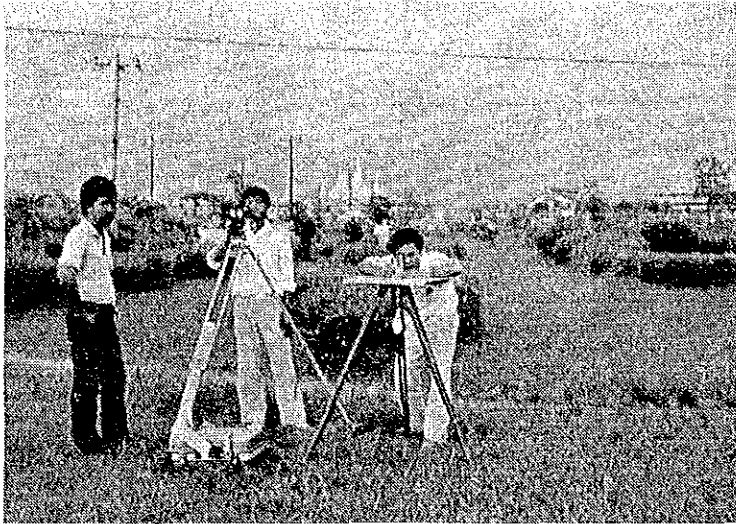
3. Flooded streets in urbanized area of Metro Manila during heavy rainfall (Oct. 6, '86)



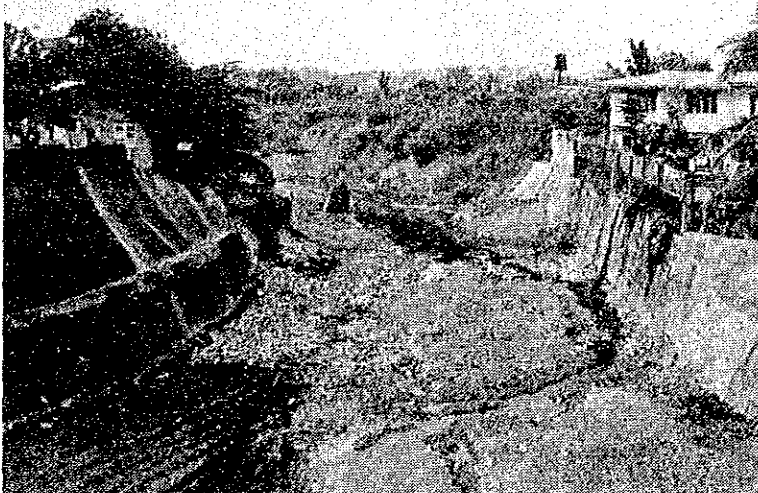
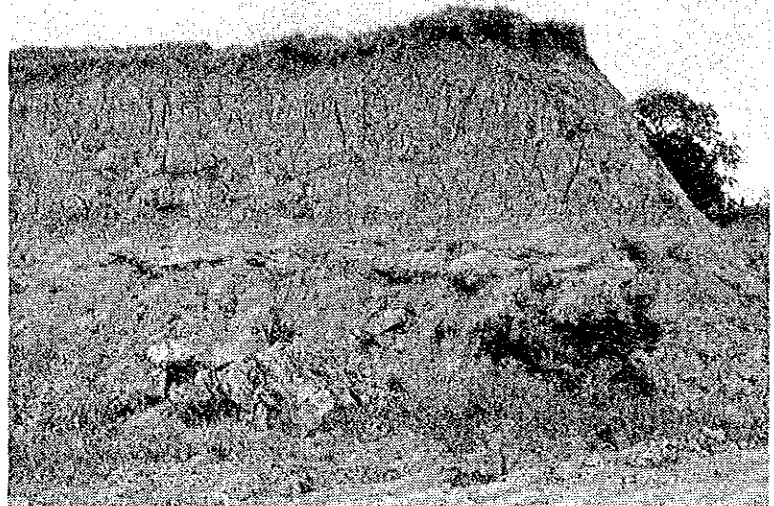
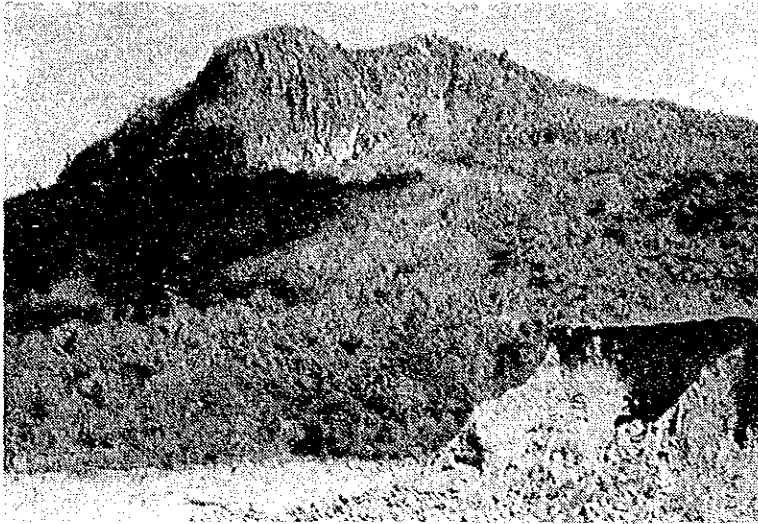
4. Flooded suburban area of Metro Manila after heavy rainfall (Sep. 5, '86)



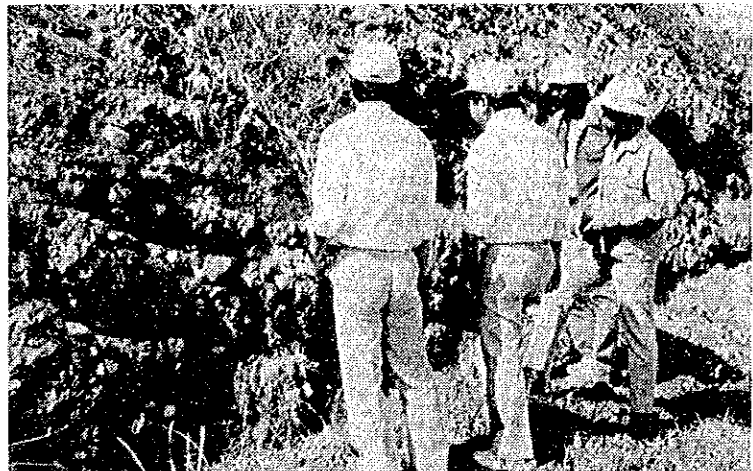
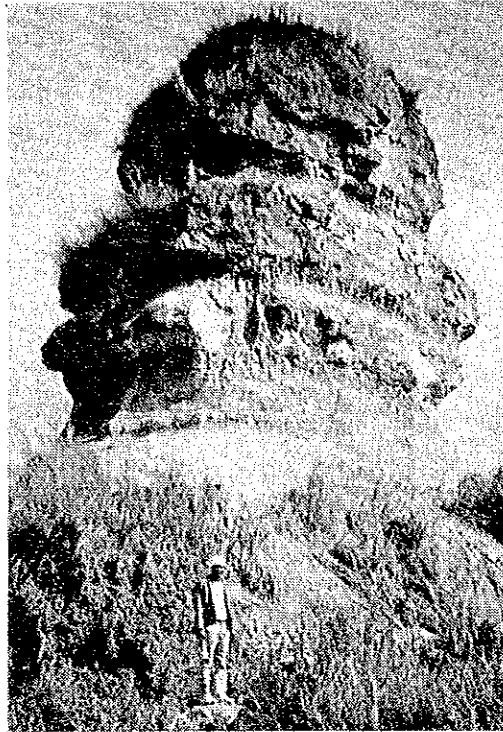
5. Field completion survey (Contoured Map)



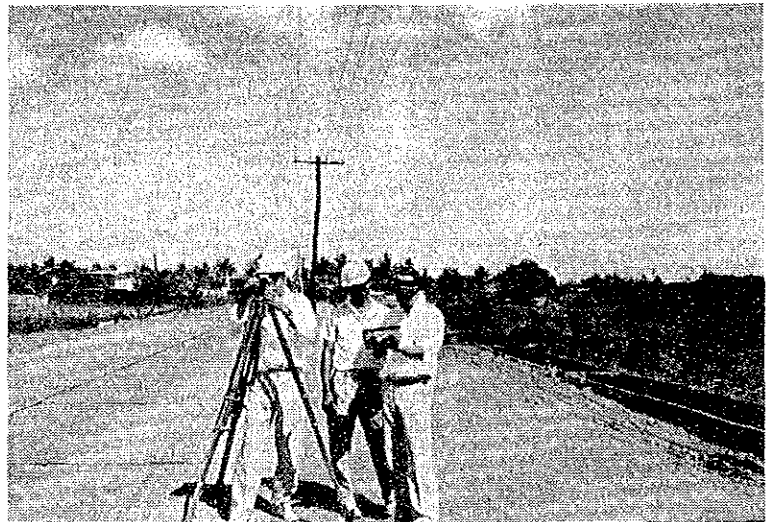
6. Some land features observed in the survey area
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1. Background of Project

The Metro Manila Region, political, economic and cultural center of the Philippines, has been overcrowded by drastic influx of population in the present inadequate urban infrastructures such as road system and housing facilities, and the circumstances of the region has become rapidly worsen as observed in increases of illegal inhabited areas, chronicle inundation caused by heavy rainfalls.

The Philippine Government has been making efforts to solve the problems through the Metro Manila Commission (MMC) by formulating an urban redevelopment program, enforcing restrictions on land use and taking measures against flooding on a priority basis.

Faced with so many urban problems, in order to systematically solve them in terms of urban policy, it is necessary firstly to prepare base map to correctly ascertain the present condition in the Metro Manila Region and its environs. However, the maps available of the metropolitan area, which are the basic material necessary for carrying out various urban plans, are inadequate. Therefore, an urgent task is to prepare contoured, planimetric, land use and land condition maps which accurately express the present condition of the urban structure of the metropolitan area. The Philippine Government requested the Japanese Government in March 1984 for technical cooperation in mapping the Metro Manila Region.

In response to the request for technical cooperation, the Japanese Government sent a contact mission in January 1985 and a preliminary survey team in March the same year to the Phillipines to discuss with the Bureau of the Coast and Geodetic Survey (BCGS), the survey organization of the Philippine Government, on the proposed technical cooperation as well as to conduct field survey and data collection. As a result, based on Implementing Arrangement (I/A) concluded in March 1985 between the two Governments concerned, it was decided that technical cooperation be carried out under a four-year program starting in 1985 for the establishment of graphic information base project of the National Capital Region.

(1) Outline of the project

Contoured map	1:10,000	1,500 km ² (57 sheets)
Planimetric map	"	1,500 km ² (")
Land use map	"	823 km ² (33 sheets)
Land condition map	"	429 km ² (16 sheets)

(2) Outline of the first year work (F.Y. 1986) is as follows:

(Field work)

Ground control point survey		12 points
Leveling		300 km
Pricking (ground control point)		25 points
" (leveling)		100 points
Field identification (contoured map)		1,500 km ² (57 sheets)
" (land use map)		823 km ² (33 sheets)

(In-door work)

Aerial triangulation		120 models
Stereo plotting		1,500 km ² (57 sheets)

2. Outline of Project

2-1 Outline of Second Year Work

In the Second Year Work, following the First Year, the contoured and planimetric maps have been completed, and the field identification for land condition mapping has also been carried out for the preparation of criteria for expression.

- (1) Regarding the contoured map, the printed maps (57 sheets, 1,000 copies each) have been completed after a series of work: compilation, field completion, drafting (scribing) and color printing.
- (2) As for the planimetric maps, the printed maps (57 sheets, 1,000 copies each) have also been completed in combination of the color separation plates produced in the color separation drafting of the contoured map.
- (3) In the field identification for the land condition mapping, the leveling, landform classification and outcrop survey & sampling as well as data collection have, according to the specifications concerned, been carried out using aerial photos, copies of the contoured map original manuscripts, etc..

2-2 Outline of Project Area

The project area (approximately 1,500 km²), extending around Manila, borders in the east on the southern end of the Sierra Madre mountain range which runs from the northeast of Luzon and on Manila Bay in the west. It is adjacent to the central plain of Luzon and the river delta area in the northwest. The Laguna de Bay lies in the southeast. The area is also adjacent to foot of the volcanic mountains which include Mt. Taal in the south.

The National Capital Region, the project area, includes 4 cities, Manila, Quezon, Caloocan and Pasay, and 13 municipalities such as Makati, Malabon, Valenzuela and Paranaque. The so-called urban area, where government agencies, public buildings, shopping and residential areas are concentrated, lies inside EDSA (EPIFANIO DE LOS SANTOS AVE.) of the National Capital Region. The roads and buildings become fewer outside EDSA with the scenery of gradual pastoral tone, where new housing areas are being developed.

2-3 Period of Survey Work

(In-door work)

Compilation	early Jun - mid-Aug. '86
Drafting	mid-Oct. - late Dec. '86
Printing	early Jan. - mid-Mar. '87

(Field work)

Technical meeting (General aspect)	Jun. 16 - 25, '86
Field completion (Contoured map)	Aug. 18 - Oct. 7 '86
Field identification (Land condition map)	Jan. 11 - Mar. 14 '87

2-4 Formation of Survey Team

Field completion (Contoured map)

Leader (General)	Masayoshi Takasaki	Jun. 16 - 25 '86 Sep. 28 - Oct. 7 '86
Deputy Leader (Deputy General)	Kenzo Motojima	Jun. 16 - 25 '86 Aug. 18 - Oct. 7 '86
Headquarters (Coordinator)	Hiroshi Kimura	Jun. 16 - 25 '86 Aug. 18 - Oct. 7 '86
Member (Chief Surveyor)	Isao Furukawa	Jun. 16 - 25 '86 Aug. 18 - Oct. 7 '86
Member (Surveyor)	Tomotaka Kamakura	Aug. 20 - Oct. 3 '86
Member (Surveyor)	Masumi Ikuno	"
Member (Surveyor)	Yasuo Furukawa	"
Member (Surveyor)	Tatsujiro Kubo	"
Member (Surveyor)	Shozo Shimoda	"
Member (Surveyor)	Masanobu Ishii	"

Member (Surveyor)	Masataka Miyazaki	"
Member (Surveyor)	Shingo Niijima	"
Member (Surveyor)	Mitsuo Hasegawa	"
Member (Surveyor)	Atsushi Okuizumi	Aug. 18 - Oct. 7 '86
Member (Specs. on Printing)	Tomoyuki Nakano	Sep. 28 - Oct. 4 '86
<u>Field identification (Land condition map)</u>		
Leader (general)	Masayoshi Takasaki	Mar. 5 - 14 '87
Deputy Leader (Deputy General)	Kenzo Motojima	Jan. 11 - Mar. 14 '87
Headquarters (Coordinator)	Hiroshi Kimura	"
Member (Chief Surveyor)	Keikichi Yoshida	"
Member (Surveyor)	Tomotaka Kamakura	Jan. 15 - Mar. 8 '87
Member (Surveyor)	Tsutomu Moriiwa	"
Member (Surveyor)	Mitsuo Saito	"
Member (Surveyor)	Yasuo Furukawa	"
Member (Surveyor)	Masanobu Ishii	"
Member (Surveyor)	Tatsujiro Kubo	"
Member (Surveyor)	Takeshi Toyooka	Jan. 11 - Mar. 14 '87
Member (Surveyor)	Naoya Yunohara	Jan. 15 - Mar. 8 '87

2-5 Volume of Work

(1) Contoured map		
Compilation	1,500 km ²	57 sheets
Field completion	1,500 km ²	57 sheets
Original manuscript	1,500 km ²	57 sheets
Drafting (scribe)	1,500 km ²	57 sheets
Printing (5 colors)	57 sheets	1,000 copies each
(2) Planimetric map		
Printing (2 colors)	57 sheets	1,000 copies each
(3) Land condition map		
Field Identification	429 km ²	16 sheets
Leveling	about 150 km ²	

2-6 Survey Equipment

(Field survey)

Auto level	1 set
Distance Meter	1 set
Theodrite	1 set
Plane table	1 set
Slidax	1 set
Transceiver	1 set
Soil auger	1 set
Typewriter	1 set

(In-door work)

Plotting Machine	1 set
Contact printer	1 set
Copying machine (large type)	1 set
Offset proof printer	1 set
Offset printer	1 set

2-7 Plan and Result

Item of work	Plan	Result	Remark
Contoured map			
Compilation	1,500 km ²	1,500 km ²	57 sheets
Field completion	1,500 km ²	1,500 km ²	57 sheets
Original manuscript	1,500 km ²	1,500 km ²	57 sheets
Drafting (scribe)	1,500 km ²	1,500 km ²	57 sheets
Printing (5 colors)	57 sheets	57 sheets	1,000 copies /sheet
Planimetric map			
Printing (2 colors)	57 sheets	57 sheets	1,000 copies /sheet
Land condition map			
Field Identification	429 km ²	429 km ²	16 sheets
Leveling	150 km	150 km	

2-8 Survey Schedule

Outline of the survey schedule of the Second Year field work is shown in the Appendix - 1.

2-9 Technical Meeting with BCGS

This project aims at producing four kinds of map; contoured map, planimetric map, land use map and land condition map, of the National Capital Region at the scale of 1:10,000. Each cartographic representation differs according to the purpose of each map. Therefore, specifications of each map including symbols and color scheme were discussed with BCGS and finalized during the field survey.

During the technical discussions with BCGS, BCGS proposed additional features to be expressed. The Japanese side considered the map users standpoint and accepted the proposal on the condition that necessary data for expression of possible items would be provided by BCGS.

2-10 Undertaking of BCGS

BCGS made close cooperation to the Japanese survey team at the time of the field completion for contoured map as well as the field identification for land condition map. Qualified BCGS counterparts were appointed and undertook a part of the field work.

2-11 Supervision of the Field Work

During the Second Year field work, the following advisors were despatched by JICA to Manila for technical meeting with BCGS and supervision of the field work:

Mr. Tadao Dohi Head of Planning Div., Topographic Dept., GSI, Ministry of Construction

Preliminary meeting : Jun. 16 - Jun. 25 '86

Field completion : Sep. 29 - Oct. 4 '86

Mr. Masatoshi Nagaoka Head of Second Geographic Div., Geographic Dept., GSI, Ministry of construction

Field identification: Mar. 2 - 10 '87

Mr. Yoshikazu Yamada Staff, Social Development Cooperation Dept., JICA

Preliminary meeting : Jun. 16 - 25 '86

Field completion : Sep. 29 - Oct. 4 '86

Field identification: Mar. 2 - 7 '87

3. Preliminary Meeting (General Aspect)

3-1 Outline of Work

Prior to the implementation of Second Year survey work, preliminary meeting was held with BCGS after the 1986 Revolution of the Philippines in order to carry out smoothly and accurately the Second Year work which includes completion of the contoured and planimetric maps, the field identification for land condition map, etc. on rather tight schedule. During the meeting, technical discussions were made on the following items:

- (1) Work schedule
- (2) Specifications of each map
- (3) Progress of the work undertaken by BCGS
- (4) Suspended matters related to the BCGS proposals made at the end of the field work last year

Concerning the project areas for land condition and land use mapping, field reconnaissance was also made for planning of their survey work.

3-2 Period of Work

June 16 - 25, 1986

3-3 Technical Discussion with BCGS

Following items were discussed and confirmed between JICA team and BCGS during the meeting (See Appendix - 2-1):

- (1) Contents and schedule of the Second Year work were briefed, and data to be provided by BCGS and their time limits were confirmed.
Some of the survey data completed by BCGS were checked and received by JICA team.
- (2) BCGS proposal regarding technical matters including classifications of road surface and plantation (6 items), which has been made last year at the time of the identification and suspended since then till the Second Year work, were accepted by the Japanese side on the condition that BCGS would provide necessary data and materials by September '86.

- (3) Regarding the contoured and planimetric maps, expression of details, color tone, marginal information, etc. were discussed and finalized based upon the sample maps prepared by the Japanese side.
- (4) Discussions were also made on the matters including corrections of the major changes after aerial photography, possible measures for changes of names of roads, public facilities, administrative organizations which might be taken place due to the 1986 Philippine Revolution.

3-4 Result of Discussion

- (1) As the result of technical discussion based upon the sample maps of the contoured and planimetric maps, symbol specification, color tone, expression of topography, land features, annotations, etc. of maps were able to be confirmed the both sides.
- (2) Contents and work progress of BCGS' undertakings were also able to be confirmed.
Data completed by BCGS were received by JICA team and able to make use for compilation work.
- (3) Data and materials to be prepared by BCGS by the time of commencement of the field completion in August '86, were confirmed in respect of the following items:
 - . Data of classification of plantation
 - . Data of magnetic north and true north (for 57 sheets)
 - . Route number and names of new roads
 - . Aerial photos taken in 1986

4. Compilation (Contoured Map)

4-1 Outline of Work

Utilizing plotting manuscripts, results of the field identification and related data prepared in the First Year work as well as according to the specifications and symbols for Metro Manila Contoured Map 1:10,000, compilation manuscripts were developed together with preparation of other materials necessary for the subsequent work (drafting and printing work).

(1) Outline

Scale	:	1:10,000
Number of sheet	:	57 sheets (for 1,500 km ²)
Scale of photos used for		
field identification	:	approximately 1:10,000
Time of aerial photography:		February - April 1982
Map format	:	3' x 3'
Accuracy	:	Horizontal B class (+1.0 mm on map)
		Vertical A class Spot Height $\Delta h/3$
		Contour $\Delta h/2$

(2) Paper

Shrink-proof papers were used for compilation as follows:

- Compilation manuscript: polyester base #A500
- Data sheet : polyester base #A300

(3) Mechanical plotting

Neatlines, ground control points, grid lines, longitudinal & latitudinal lines, etc. were plotted by using automatic plotting machine. Discrepancy of neatlines and diagonal lines in length were limited less than 0.3 mm and 0.4 mm respectively.

4-2 Compilation

- (1) Compilation manuscripts were made based upon the specifications of Geodetic and Photogrammetric Surveying for Overseas (hereinafter to be referred to as JICA Specifications for Overseas Surveying) and the Specifications and Symbols for Metro Manila Contoured Map 1:10,000. For uniformity of map expression, operational instructions were prepared for the compilation work. Compilation was made by overlay method. Planimetric features and contoured lines were drawn on the same sheet.
- (2) For efficiency of the subsequent work such as field completion and drafting (scribing) work, ground control point data sheet, annotation data sheet and road data sheet were prepared. Regarding annotation data sheet which contains so many features to be expressed, two kinds of data sheets: general annotation data sheet (administrative names, geographic names, building names, destinations, etc); and road annotation data sheet (road names) were separately prepared.
- (3) Assignment of colors for compilation was as follows:
 - Red : symbol roads, administrative boundaries, small features, fence/wall, function symbols
 - Black : roads drawn to scale, railways, buildings (prominent buildings, isolated building in generalized area), spot heights, contour lines in mountainous area, depth curve, topography
 - Purple: sea and rivers, water body such as lake and pond, marine pond, salt bed
 - Green : vegetation, vegetation boundaries, park, cemetery
 - Orange: contour lines in flat area
- (4) Compilation work was carefully carried out not so as to make any mistake or omission. In case uncertain items found, necessary instructions were made on the overlay for reference of the field completion work.

4-3 Details of Compilation

- (1) Administrative boundaries and names were shown based upon data provided by BCGS.
- (2) Roads with more than 4 m in width were drawn to scale and those with less than 4 m were symbolized. Road surface classification were also made.
- (3) Railways were shown in single line for the both of single track and double track.
- (4) Buildings were classified into generalized area and isolated buildings. Generalized area was further classified into congested area and temporal housing area. Even in generalized area, moreover, prominent buildings and buildings with function symbol were shown as isolated building.
Regarding expression of isolated buildings and generalized area, particularly, much efforts were exerted not so as to spoil the harmony of urban landscape.
- (5) All of vegetation were expressed with boundaries and specified symbols. Plantations were classified into 6 categories based upon BCGS data.
- (6) Intermediate contour lines and supplementary contour lines in flat area were shown in orange color, and those in mountainous area were made in black.
- (7) Matching was made directly on the compilation manuscripts.
- (8) As for marginal information, sheet name, sheet number, magnetic north, true north, boundary diagram, index to adjoining sheets, latitude and longitude, etc. were shown according to the specifications.
- (9) Data sheet

On the control points data sheet, triangulation points, newly established control points, leveling points, spot heights etc. were shown.

On the annotation data sheet, names or abbreviations were shown in consideration of the type of building and space availability.

Letter style, letter height, letter space, etc. of annotation were specified with marks.

On road data sheet, administrative and road surface classification were shown.

(10) Water sphere

Marine pond, salt bed, tidal flat, fish pen, etc. were symbolized in purple color according to the symbol specifications.

Depth curve, wreck, fish pen, reef, etc., particularly requested by BCGS based upon its data, were also expressed.

4-4 Inspection

After completion of the compilation work, compilation manuscripts were checked and corrected on the overlaid sheet (White Uniper #150) in regard to the collation of the field identification photos with collected data, the relation between contour lines and spot heights, the conformity with specifications concerned, etc..

At the same time, uncertain items were marked for the convenience of confirmation to be made in the field completion.

5. Field Completion (Contoured Map)

5-1 Outline of Work

In the field completion, checking and correction were made on important items regarding topography, land features, annotations and function symbols to be expressed on the compilation manuscripts as well as on uncertain items unable to confirm during the course of the compilation work. Further, supplementary survey was conducted on major changes after aerial photography using transit, plane table and aerial photographs taken in 1986.

(1) Specifications

Scale : 1:10,000 contoured map
Coverage : 1,500 km²
Number of sheet: 57 sheets
Contour : flat area 2 m (supplementary)
mountainous area 4 m (intermediate)

(2) Data and materials

Data and materials prepared for the field completion are mainly as follows:

Compilation manuscript: polyester base copies (green)
Compilation manuscript: blue prints (Delmina SSP)
Ground control data sheet
Annotation data sheet (2 kinds: general and road name)
Road source map
Photos used for field identification
Specifications and Symbols for Metro Manila Contoured Map
Data provided by BCGS

5-2 Preparatory Work in Japan

(1) Plan of the field completion work was established in consideration of the contents of work, the amount of changes after aerial photography, the work period, the schedule of subsequent work, etc.. The survey team was organized mainly with the members who had participated in the field identification conducted in 1985.

- (2) Preliminary study was made precisely on the compilation manuscripts, and uncertain items found in the course of plotting and compilation work as well as items to be confirmed in the field were all marked.
- (3) Major changes after aerial photography for which supplemental survey was considered necessary were marked.
- (4) Matching to adjacent sheets was checked.
- (5) Sample maps were prepared for confirmation of detailed specifications for drafting and printing, color tone, etc. as reference materials for the technical discussions with BCGS.
- (6) Four (4) extension sample sheets (No. 27, 32, 43 and 50) were prepared as a draft of the Japanese side.
- (7) Work plan of the field completion was prepared in consideration of the above mentioned items.

5-3 Preparation of Field Work

For the preparation of field work, 4 members of Headquarters arrived in Manila on August 18 '86. The team initiated meetings with the Japanese organizations concerned as well as BCGS for its preliminary arrangements. At the same time, the team made arrangements for accomodation, take-over of the survey equipment, hiring of vehicles and laborers, etc..

(1) Headquarters and accomodation

Headquarters and accomodation were set up at the following:

Manila Manor Hotel (Tel. 573055-58)
1660, J. Bocobo St. Malate
Metro Manila, Philippines

Hotel is situated nearly in the center of the survey area and occupies convenient location for transportation to the survey organizations concerned as well as for assembly of BCGS counterparts.

(2) Communications

For business communications between Tokyo - Manila, telephone and telex were used. Communications within the project area were made by public telephone.

(3) ID cards

ID cards were issued to all the survey team members same as last year and always carried with them during the survey period.

5-4 Formation of Field Party

Each field party consisted of the survey team member, counterpart and laborer with one vehicle.

5-5 Method of Work

- (1) The survey work was carried out by the way of extending its work coverage from the center of Metro Manila Region to the suburban area.
- (2) For the field completion, the compilation manuscripts and their copies were carried into the project area, and checking and confirmation proceeded, based on the detailed work plan, on the features which had been plotted and compiled.
- (3) As for major changes after photography, frame work of changes was surveyed by traversing and plane table method and supplemented on diapositives using 1:10,000 aerial photos taken by Philippine side in 1986. Small changes were supplemented using the aerial photos.

5-6 Details of Field Completion

- (1) The field work proceeded, with emphasis placed on the central part of the Metro Manila region, to verify topography and land features within the entire project area.
- (2) Changes after aerial photography supplemented based on the aerial photos (1986) were confirmed in the field.
- (3) Features shown based on BCGS data were also checked and confirmed in the field.
- (4) As for the Light Rail Transit shown based on data of the field identification, checking and confirmation were conducted.
- (5) Origin and destination of main roads as well as abandoned railway were confirmed.

- (6) Boundaries of squatter area, park, cemetery and military facilities were also confirmed.
- (7) Single line roads in urban area were corrected and expressed in double line in consideration of harmony in presentation of map. Trees planted in a row were also supplemented in case necessary.
- (8) There had often been mis-plotting of function symbols, indication points and small objects because of so much complicated expression needed in the congested or semi-congested area. These were all corrected in this survey.

In order to attain satisfying map presentation, correction of changes after aerial photography was precisely checked and confirmed so that number of corrections became as many as 50 or more.

5-7 Technical Meeting with BCGS

At the time of preliminary meeting in June 1986, outline of the contoured, planimetric and land use mapping work had been discussed and agreed by both sides. Based upon this results, more detailed specifications of the contoured, planimetric and land use maps were finalized through a series of technical discussions in this survey.

As for land condition mapping, only preliminary discussion was conducted and cooperation of BCGS was requested in providing data necessary for land condition mapping according to the list proposed by the Japanese side.

(1) Contoured map

As for the contoured map as a urban base map, Specifications (1986 Edition) of the symbols and their application were finalized. Regarding annotation, specifications including letter size, letter style, etc. were also discussed and agreed between both sides.

Further, specifications regarding extension sheets, color scheme (5 colors), marginal information and others were discussed and finalized for the contoured map.

(2) Planimetric map

Discussions were made and agreed by both sides that the planimetric map would be produced only by combination of color separation plates of the contoured map. On this premise, specifications of marginal information, color scheme (2 colors), printing and other details were finalized.

(3) Land use map

Specifications for land use map (Draft) which had been made at the time of field identification in 1985, were further discussed. Definition and application of specifications including classification, applicable landmarks and minimum area are finalized.

As for color scheme for land use classification, discussions were made only as preliminary and concluded to be continued at the time of field completion.

(4) Land condition map

Outline of the land condition mapping and its purposes were discussed between both sides, and categorization and definition of the landform (Draft) made by the Japanese side was also discussed.

(5) Survey schedule of the field identification for land condition mapping was confirmed between both sides. It was also decided that collection of data necessary for the land condition mapping would be made by BCGS.

(6) Correction of the changes after aerial photography (1982) was agreed to be made by surveying using plane table and transit as well as by transfer from the aerial photos (1986). Route number was also agreed to be shown with the existing number because of non-availability of new number.

(7) Survey data assigned to BCGS for collection were all completed and provided to the Japanese side by September 30 '86.

(8) It was confirmed that the Japanese side would carry out the succeeding work including drafting and printing and complete production of the contoured and planimetric maps by the end of F.Y. 1986.

5-8 Undertaking of BCGS

- (1) BCGS made close cooperation to the field completion together with the JICA survey team as follows:
 - 1) BCGS counterparts specialized in field completion were assigned.
 - 2) Survey and data collection were mostly completed by September 30 '86.
 - 3) Annotation data sheets (one sheet for administrative names, geographical names, building names, etc. and another one for road names, destination, etc.) were completed after checking and selection of abbreviations, spelling, etc. of annotation data sheets prepared by the Japanese side.
 - 4) BCGS offered active and effective opinions at the technical meeting for preparation of map specifications.
- (2) BCGS had completed its undertakings by the commencement of field completion as follows:
 - 1) Administrative boundaries, administrative names and geographical names
 - 2) Road names and route numbers
 - 3) Road surface classification and administrative classification
 - 4) Classification of plantation
 - 5) Clearances of pedestrian overpass, overpass, bridge and Light Rail Transit
 - 6) Temporary housing area
 - 7) Names of railway, station, river and bridge
 - 8) Depth curve, lighthouse, reef, rock awash, wreck and sewerage outfall
- (3) The following work was carried out by BCGS at the time of field completion:
 - 1) Computation of magnetic north and true north
 - 2) Check and confirmation of annotation data sheets
 - 3) Acquisition of aerial photographs (1986)
 - 4) Confirmation of administrative boundaries
 - 5) Confirmation of road destination

5-9 Succeeding Work in Japan

Correction of the compilation manuscripts based upon results of the field completion had been unable to complete due to the priority placed on the field work. Therefore, remaining correction work was continued and completed in Japan as follows:

- (1) Results of the field completion were incorporated in the compilation manuscripts for preparation of original manuscripts.
- (2) Proof correction of ground control data sheets and annotation data sheets was carried out for the succeeding drafting work.
- (3) Inspection
 - (a) Matching between each sheet
Matching between each sheet on which results of the field completion had been incorporated, was inspected.
 - (b) Inconsistency which might exist among the related data obtained during field completion, was also inspected.
 - (c) Possible omission of features to be expressed on the compilation manuscripts was checked.

6. Drafting (Contoured Map)

6-1 Outline of Work

Scribing was done for each color using completed compilation manuscript to develop original drafting manuscript.

Scribing was carried out in accordance with the map symbols and lines shown in the specifications of map symbol and their application. (See Appendix 3-2, 3-3.)

6-2 Specifications of Map Symbols and Their Application

Map symbol, marginal information, annotation, etc. employed for drafting are subject to the Specification and Symbols for Metro Manila contoured Map 1:10,000, specifications of annotation and sample maps, all of which were agreed by both of JICA survey team and BCGS through technical discussions. Work was conducted according to the method and order specified in the JICA Specifications for Overseas Surveying and the detailed specifications for drafting. (See Table-1 and Table-2.)

6-3 Outline of Specifications

Size of neat line: 3' x 3'

Scale: 1 : 10,000

Plate separation: 5 colors (black, blackish blue, blue, brown, green)

Map specifications and symbols:

Specifications and symbols for Metro Manila Map
1:10,000

Contour line: Index contour 20 m, Intermediate contour 4 m,
supplementary contour 2 m

Work volume: 57 sheets (1,500 km²)

Table 1 Flow Chart of Drafting (scribing) (1)

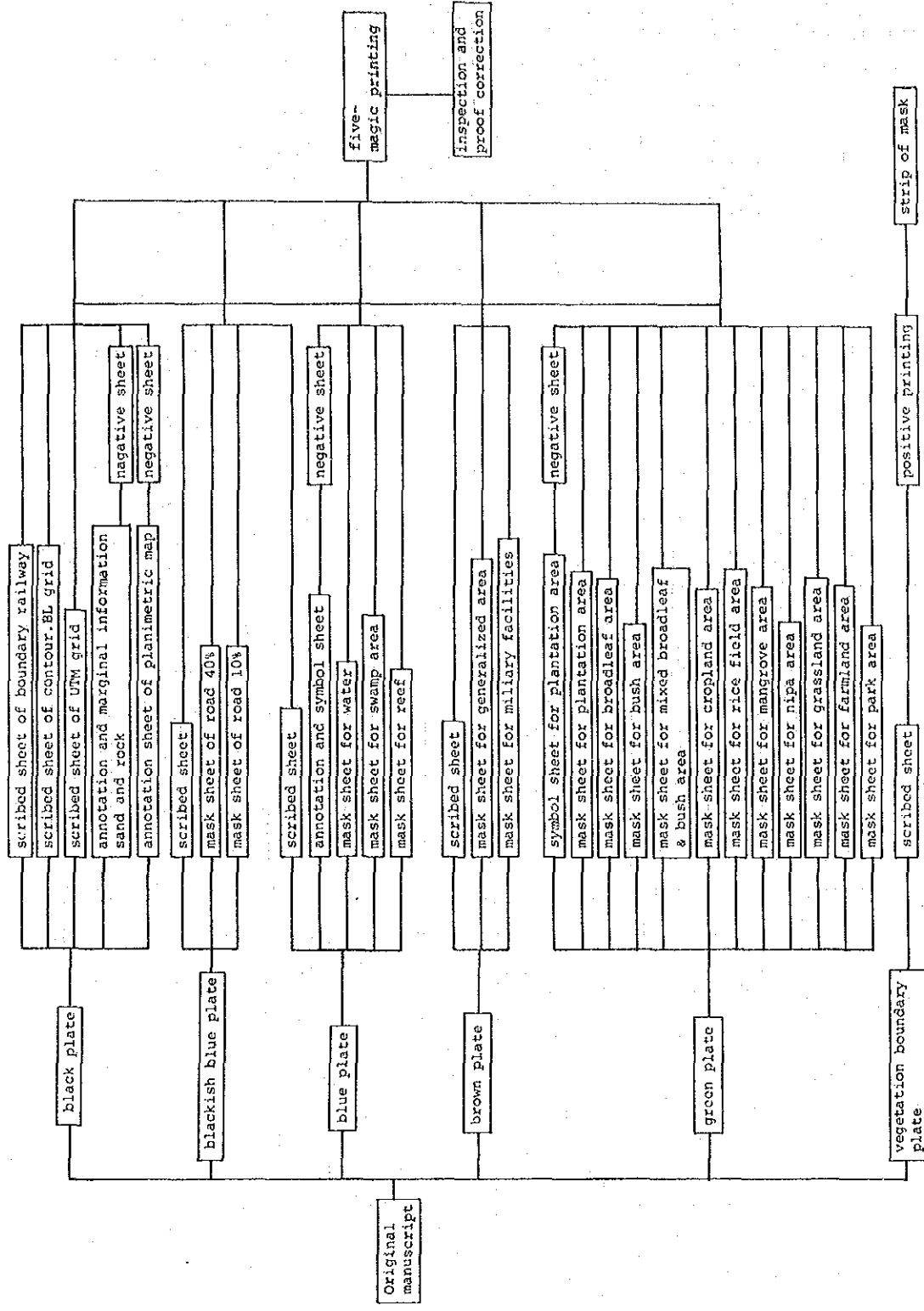
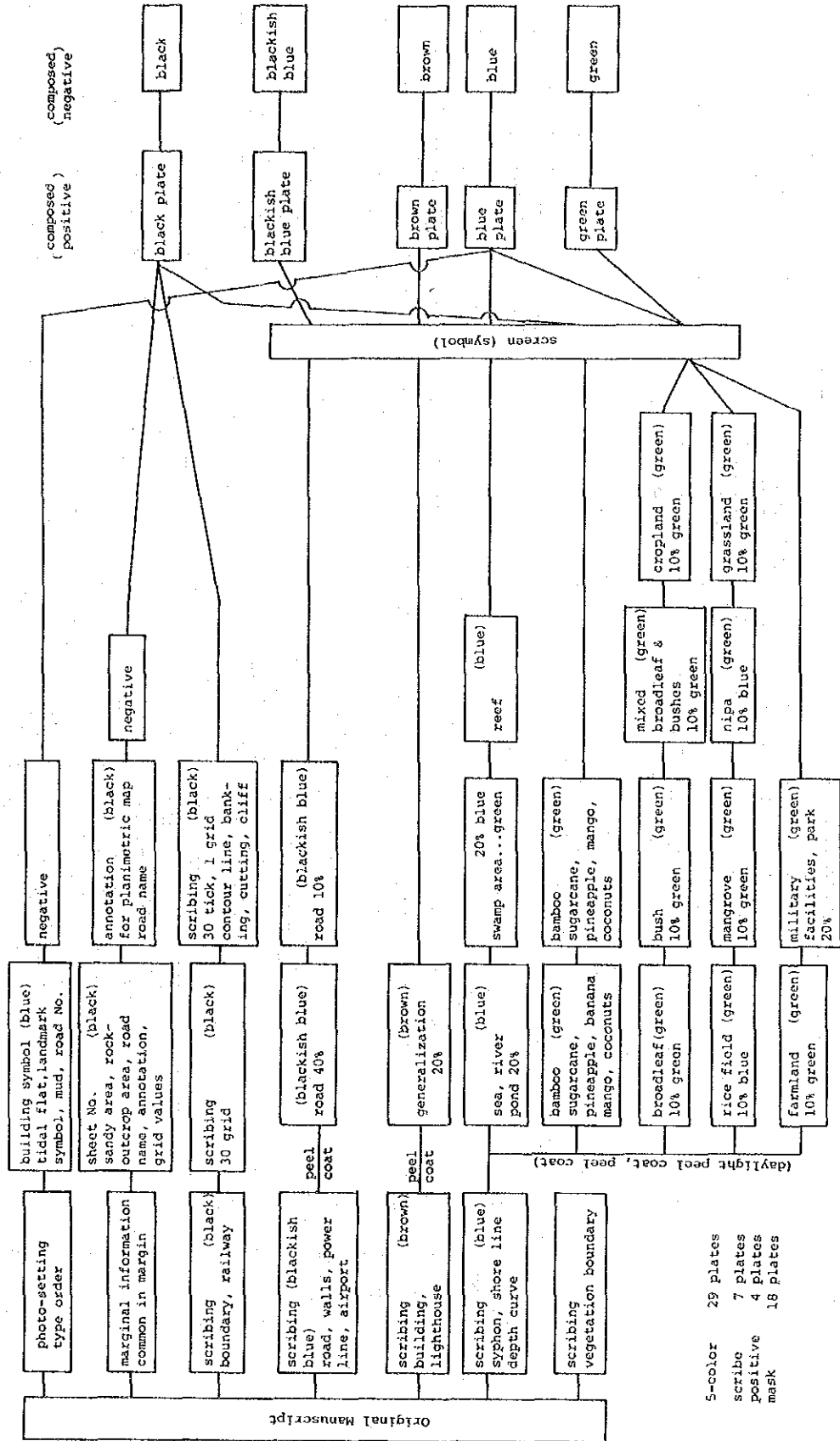


Table 2 Flow Chart of Drafting (scribing) (2)



6-4 Materials

Polyester base and scribe base, whose expansion ratio is less than 0.05% and thickness is more than 0.12 mm at normal temperature, were employed for scribing. Daylight peel coat and peel coat were used for masking.

- i) Scribe base (0.12 mm thick) Yellow base of K & E
- ii) Mask base (") Red daylight peel coat K & E
- iii) " (") Red peel coat of Kimoto
- iv) " (negative) (0.10 mm thick) Vo. 100 of Fuji Film
- v) Negative film (") "
- vi) Annotation sheet base (0.08 mm thick) Diamat of Kimoto

6-5 Detailed Description of Separation Plate

Separation plates for five-color press printing were developed as original manuscripts in the course of scribing. Black, blue, brown, blackish blue and green plates were developed as the separation plates by punching system. (See Table-3)

(1) Scribe plate

(Plates)	(Features)
1) Black	: Railways, Administrative boundary, Contour line, Latitudinal and Longitudinal line, grid line, Unstable land
2) Blackish blue:	Roads, Fence, Power transmission line, Military facilities, Air fields
3) Brown	: Buildings, Lighthouses
4) Blue	: Shore line, depth curve, Siphon

(2) Mask plates

(Plates)	(Features)
1) Water sphere:	Water surface
2) Congested housing area:	Generalized buildings
3) Road:	Road concreted and asphalted

- 4) Park, Military facilities:
Park, Military facilities
- 5) Marsh, reef: Marsh, Reef
- 6) Broadleaf, Mixed scrub and broadleaf:
Forest, Woods
- 7) Orchard, Plantation:
Banana, Pineapple, Mango and other fruit trees
- 8) Cropland, Agricultural land:
Cropland, rice field and other cultivated areas
- 9) Grass: Grass
- 10) Mangrove, Nippa:
Mangrove, Nippa

(3) Annotation plates

(Plates)	(Features)
1) Black:	Marginal information (black), value of longitude and latitude, Road and railway destination, Administrative name, Road name, Building name and other features to be shown in black
2) Blue :	Marginal information (blue), Symbol of buildings, Symbol of small objects, River name, Name of bay, Pond and other features to be shown in blue

Table-3(1) Description of Plate Separation

Sheet No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Plates																												
black	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
blackish blue	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
brown	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
blue	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
grid	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
vegetation boundary	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
road 40%	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
road 20%	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
generalized feature									○		○		○	○	○		○		○	○	○	○	○	○	○	○	○	○
water surface 20%	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
marsh			○	○																	○	○						
reef	○	○	○	○	○	○	○	○														○	○	○			○	○
plantation	○	○	○	○	○	○	○	○														○	○	○			○	○
broadleaf	○	○	○	○	○	○	○	○		○	○	○	○		○	○	○	○	○	○		○	○	○	○	○	○	○
bush			○	○	○	○	○	○											○	○	○			○	○			
broadleaf & bush						○	○			○	○	○	○		○	○	○								○			
cropland	○	○	○	○	○	○	○	○				○	○				○		○	○				○	○			
rice field									○																			
mangrove																												
nipa																												
grass	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
farm land									●			●														●		
military facility	○		○	○	○			○	○					○								○	○	○	○			○
sand																						○						
black	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
blue	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
compiled vegetation sheet	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
surprint	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
grid (black)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
black annotation	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
blue annotation	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

○ Negatives

● Positives

Table-3(2) Description of Plate Separation

Sheet No.		29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57
Plates	black	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	blackish blue	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	brown	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	blue	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	grid	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	vegetation boundary	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Mask plates and positive films for vegetation, etc.	road 40%	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
	road 20%	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
	generalized feature	○			○	○	○			○	○	○			○	○	○	○	○			○	○	○	○	○	○	○	○	
	water surface 20%	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	marsh						○						○																	
	reef	○	○		○	○	○	○			○	○	○			○	○	○	○			○	○	○	○	○	○	○	○	
	plantation	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○	○
	broadleaf	○	○	○	●		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	bush			○						○				○										○			○	○	○	
	broadleaf & bush	○		○			○	○	○				○	○	○						○	○			○	○	○			
	cropland		○	○			○	○	○			○	○					○				○	○	○	○	○	○			
	rice field			○						○				○								○	○							
	mangrove																													
	nipa			○						○				○																
	grass	○	○	○		○	○	○	○			○	○			○	○	○	○	○	○	○	○	○	○	○	○	○	○	
	farm land																													
military facility	○			○	○	○	○			○	○	○			○	○	○	○	○			○	○	○	○	○	○	○		
sand																														
Annotation plates	black	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
	blue	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
Others	compiled vegetation sheet	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
	surprint	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
For planimetric Map	grid (black)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
	black annotation	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
	blue annotation	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		

○ Negatives

● Positives

6-6 Preparation of Scribed Sheet

(1) Image printing on scribing base

Scribe plates were prepared by photo-processing of scribing base coated with diazo solution, on which the reversed image of the original manuscript were printed.

(2) Preparation of scribe plates

Scribe plates were developed respectively for each color in accordance with the specification of map symbols and their application covering roads, railways, buildings, rivers, contour lines, longitudinal and latitudinal lines, etc.. For register on plate making and printing, cross mark was printed at each center of four sides of margin and "L" shape mark was printed at each of four corners of neat line.

To make the connection of features drawn by different color smooth, scribing was done in the following method:

- Scribing was done in the order of black, blue, blackish blue and brown sheets.
- Contents of already scribed sheet were printed in different color on the next sheet to be scribed.
- Then, scribing of the next sheet was done.

(3) Preparation of mask plates

To make accurate peeling, two kinds of materials were employed for masking, one was Daylight peel coat, on which vegetation boundary sheet of the original manuscript could be printed, and the other was the same but the vegetation boundary sheet could not be printed. The former was used for complicated vegetation boundary sheet. The latter was for not complicated one. And the marks for registration were printed at eight points as same as the scribe plates were printed.

(4) Preparation of Zip-a-tone sheet

Zip-a-tone sheets for crop land, rice field, broadleaf, etc., whose size is same as the size of map sheet (3' x 3'), were prepared, based on the specifications of map symbols, by photo-processing of enlarging original smaller size of zip-a-tone sheet.

(5) Preparation of marginal information sheet and annotation sheet

Marginal information sheets were developed, based upon the sample sheet finalized through a series of discussions between both sides, with polyester base using photo-lettering for presenting common items of marginal information as well as compiling legend, diagram, etc..

Annotation sheet for black were prepared by reproducing positive film of each marginal information sheet. The polyester base with eight marks for register was employed to produce the annotation sheet by stick-up of photo-typed symbols and letters for blue

6-7 Matching of Adjacent Sheet

Scribe plate, mask plate, grid plate, etc. of each sheet were tied with corresponding adjacent sheets for each color respectively. Five-color separation surprint was used for checking of vegetation boundary and final inspection of matching area to avoid unreasonable connection.

6-8 Inspection and Proof Correction

(1) In-office inspection

Inspection and proof correction were carried out on mistakes in writing and drawing, omission, deviation from the map format, etc. by using the color composite of whole color separations (surprint: polyester base printed by photo-processing with all color separation plates), which were able to be referred to the original manuscripts and annotation data sheets. Then, preparation of quality control sheets was followed.

(2) Checking by BCGS

Checking was conducted by BCGS Chief Counterpart on 17 sheets of contoured map and 3 sheets of planimetric map in December '86 in Tokyo as well as 40 sheets of contoured map in February '87 in Manila mainly using the surprints. As a result of the checking, correction, addition, etc. were made mainly with regard to the following items:

(see Appendix 5-1 (3))

- 1) Changes of sheet names (6 sheets)
- 2) Annotation of administrative names (city, town and district)
- 3) Addition of new names of subdivisions and barangays

(3) Inspection of Surveying Technical Center

After in-office inspection and BCGS checking, the final inspection was made by the Surveying Technical Center (Authorized public inspection organization).

Table 4 Sheet Name and Number Index of Contoured Map

54'	1 3130 I-13 PLARIDEL	2 3130 I-14 BUNSURAN					
51'	3 3130 I-18 GUIGUINTO	4 3130 I-19 BALAGTAS	5 3130 I-20 STA. MARIA	6 3230 IV-16 SAN JOSE DEL MONTE	7 3230 IV-17 STO. CRISTO		
49'	8 3130 I-23 BAMBANG	9 3130 I-24 MARILAO	10 3130 I-25 PRENZA	11 3230 IV-21 CONGRES- SIONAL	12 3230 IV-22 TUNGKONG MANGGA	13 3230 IV-23 HACIENDA REMEDIOS	
45'	14 3130 II-3 BALUARTE	15 3130 II-4 OBANDO	16 3130 II-5 MEYCAUAYAN	17 3230 III-1 NOVALICHES	18 3230 III-2 LA MESA DAM	19 3230 III-3 MONTALBAN	20 3230 III-4 SAN RAFAEL
42'		21 3130 II-9 NAVOTAS	22 3130 II-10 VALENZUELA	23 3230 III-6 TANDANG SORA	24 3230 III-7 DILIMAN	25 3230 III-8 SAN MATEO	26 3230 III-9 MT. MATABA
39'			27 3130 II-15 MANILA (North)	28 3230 III-11 KAMUNING	29 3230 III-12 MARIKINA	30 3230 III-13 SSS VILLAGE	31 3230 III-14 COGEO VILLAGE
36'			32 3130 II-20 MANILA (South)	33 3230 III-16 MANDALU- YONG	34 3230 III-17 PASIG	35 3230 III-18 CAINTA	36 3230 III-19 ANTIPOLO
33'			37 3130 II-25 BACLARAN	38 3230 III-21 MALIBAY	39 3230 III-22 TAGUIG	40 3230 III-23 MUZON	41 3230 III-24 ANGONO
14°30'	42 3129 I-3 CARIDAD	43 3129 I-4 CAVITE CITY	44 3125 I-5 LAS PIÑAS	45 3229 IV-1 SUN VALLEY	46 3229 IV-2 BAGUM- BAYAN		
27'	47 3129 I-8 NOVELETA	48 3129 I-9 IMUS	49 3129 I-10 SAN NICOLAS	50 3229 IV-6 ALABANG			
24'	51 3129 I-13 GEN. TRIAS	52 3129 I-14 MALAGAS- ANG SEGUNDO	53 3129 I-15 PAG-ASA	54 3229 IV-11 MUNTINLUPA	55 3229 IV-12 SAN PEDRO		
21'	120°51'	54'	57'	56 3229 IV-16 M. ALVAREZ	57 3229 IV-17 BINAN		
18'							
				121°00'	03'	06'	

7. Printing (Contoured Map and Planimetric Map)

7-1 Outline of Work

Printing of contoured maps was performed by off-set method of multi-color printing. Planimetric maps were printed by combining two colors of plate separation that were produced in the course of the contoured map printing.

As printing is the final stage for completing the entire work, proof prints were prepared to make the in-house quality inspection and BCGS checking for attaining perfection in prior to the final printing.

(see Table-5)

7-2 Specifications of Printing

- (1) Size of printing paper: 73 cm x 64 cm (standard size)
- (2) Color separation
 - 1) Contoured map : black, blackish blue, blue, brown, green (5 colors)
 - 2) Planimetric map: black, blue (2 colors)
- (3) Paper employed for printing
High quality printing paper 90 kg/1,000 sheets (see Appendix 4-1)
- (4) Work volume
Contoured map : 57 sheets x 1,000 copies/sheet (57,000 sheets)
Planimetric map: 57 sheets x 1,000 copies/sheet (57,000 sheets)

7-3 Printing of Contoured Map

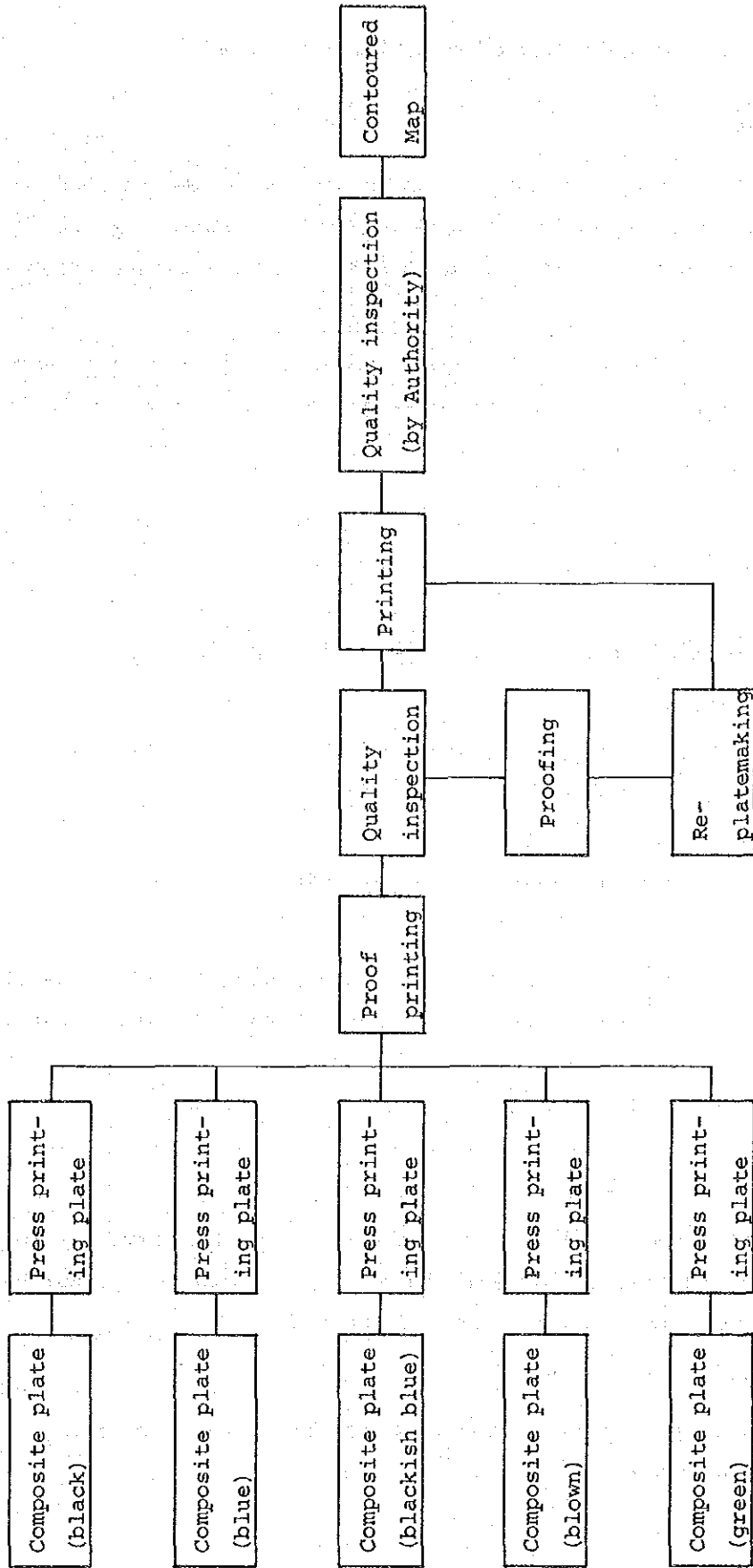
- (1) Preparation of printing plates

Scribe plates, mask plates and annotation plates were developed for each of five colors (black, blackish blue, blue, brown and green) by multi-printing of scribed bases on aluminum PS sheets.

- (2) Preparation of proof prints

Proof prints were prepared for each of five colors by using two-color lithographic printing press.

Table-5 Flow Chart of Printing



7-4 Printing of Planimetric Map

(1) Preparation of printing plates

Scribe plates, mask plates and annotation plates were combined by multi-printing into 2-color (black and blue) separation plates.

(2) Preparation of proof prints

Proof prints using 2 colors were prepared by 2-color lithographic printing press.

7-5 Inspection (Proof Prints)

(1) Inspection was carefully conducted on whether the results of printing met the specifications or not, regarding color tone, meeting points between differently colored lines, etc. by using the proof prints. Also, those were checked by the BCGS Chief Counterpart and Surveying Technical Center.

(2) At the time of checking made by BCGS Chief Counterpart in Tokyo, items pointed out with regard to the contoured map were as follows:

(see Appendix 4-1, -2)

- 1) Screen density of marine pond
- 2) Background color of golf courses and military facilities
- 3) Specifications of printing paper

In Manila, BCGS pointed out only minor corrections on annotations and issued a letter of approval for printing of the contoured and planimetric maps.

(see Appendix 5-1 (4))

7-6 Printing

Printing was carried out by off-set method using original plates to develop 5-color contoured maps and 2-color planimetric maps. Volume of printing of both maps are 1,000 copies per each sheet.

7-7 Inspection

After printing, in-house inspection was carried out for all printed maps, and then those were checked again by the Surveying Technical Center that is the authorized public surveying inspection organization.

7-8 Materials Employed for Printing

(1) Ink

- | | |
|-------------------|-----------------|
| 1) black: | Toyo ink No.88 |
| 2) blackish blue: | " special blend |
| 3) blue: | " No.32 |
| 4) brown: | " special blend |
| 5) green: | " " |

(2) Paper for printing

Paper used for printing was duly appropriate for required specifications in its characters on folding endurance, tensile breaking strength, tearing strength, etc. and had good nature of low expansion. Specifications of the paper is shown in Appendix 4-1.

7-9 Trimming and Cutting

According to the size of map which was discussed and agreed by both sides in the Minutes of Meeting, printed maps were trimmed and cut. As for paper size of the extended sheets of No.27, 32, 43 and 50, the length (East - West) of the papers were changed into longer than the others.

8. Field Identification (Land Condition Map)

8-1 Outline of Work

- (1) Land condition map is a thematic map showing landform, ground elevation, organization & facilities necessary for planning of urban development such as establishment of disaster prevention measures, selection of appropriate development area, etc..
- (2) Field survey was conducted on the following items:
 - 1) Confirmation of classification of microrelief of ground surface
 - 2) Survey of ground elevation in the lowland area (minor order leveling)
 - 3) Collection of data such as boring data, flood records, etc.

8-2 Preparatory Work in Japan

Following work was carried out in Japan for the preparation of field work:

- (1) Preparation of specifications for landform classification (draft)

Based on aerial photographs, contoured map, collected data, etc., draft specifications for landform classification which is considered to be suitable for the landform of Metro Manila Region, was prepared, taking into account the characters, geomorphologic process, ground condition of land in the survey area as well as reviewing the categorization and definition of the landform (draft) prepared in the preliminary discussion on land condition mapping in October '86.

- (2) Preliminary photo-identification

Based upon the afore-mentioned specifications for landform classification (draft), preliminary photo-identification was conducted using 2-time enlarged photos (about 1:16,000), and items to be verified in the field, items to be further studied, etc. were selected. These items were systematically incorporated in the field survey planning.

(3) Plan of minor order leveling route

Taking into the account results of analysis, based on the contoured maps, aerial photos and collected data, of characters and geomorphologic process of land in the survey area as well as condition of the flooded area, minor order leveling routes were selected in the north-western area (Malabon to Bulacan) and the eastern area (Pasig, Marikina, Taytay) of Manila in order to identify ground elevation and microrelief of the lowland of the survey area. (see Fig.-1)

(4) Preparation of source map

For efficient execution of the preliminary study and field work, the following source maps were prepared:

- | | |
|---|-----------------|
| 1) Classification of landform | (1 : 25,000) |
| 2) River system | (1 : 25,000) |
| 3) Classification of elevation distribution | (1 : 25,000) |
| 4) Classification of flooded area | (1 : 25,000) |
| 5) Topographic profile (sample map) | (1 : 25,000) |
| 6) Boring points and bedrock depths | (1 : 25,000) |
| 7) Distribution of seismic centers | (1 : 1,000,000) |

(5) Taking into the account results of the above work, the field work plan was prepared.

8-3 Preparation of Field Work

(1) Outline

For the preparation of the field work, Motojima, Deputy Leader, and other 3 members arrived in Manila on January 11, 1987. The team visited JICA Philippine Office, Japanese Embassy and BCGS, and started with preliminary arrangements such as take-over of survey equipment and materials, hiring of vehicles and laboreres, opening of bank accounts, setting up of headquarters and accommodation as well as confirmation of arrangements to be made by BCGS. The team also had meeting with BCGS regarding work schedule and contents of technical discussions. On January 15, Kamakura and other 6 members arrived in Manila and started with the preparation of the field work.

(2) Headquarters and accommodation

Headquarters and accommodation were set up at Manila Manor Hotel, which is the same hotel used at the time of the field completion last year.

Address: 1660, J. Bocobo St., Malate Metro Manila

Tel.: 573055 - 58

The hotel situated almost in the center of Metro Manila providing convenient access to the survey area, BCGS and JICA Office.

(3) Communication

Communications between Manila - Tokyo were made by telex and telephone, and those within the survey area were made by public telephone.

(4) ID card

ID cards were issued to the survey team members and always carried with the members.

8-4 Implementation of Field Work

(1) Technical meeting with BCGS

A series of technical meetings was held with BCGS regarding the contents of field work, work schedule, work method, formation of field party, etc. to obtain understanding and agreement about specifications for landform classification and other related matters from BCGS as well as its cooperation in providing the counterparts.

(2) During the survey period, the headquarters were mainly in charge of technical discussion with BCGS and coordination of the field work, while the field party conducted land condition survey, minor order leveling, data collection, etc..

(3) Leveling party participated in the land condition survey, data collection, etc. after completion of the leveling work.

(4) Formation of the field party

A field party consisted of surveyor, counterpart and laborer with 1 vegucke.

8-5 Field Identification (Details)

As for the field identification, detailed survey of landform classification, minor order leveling and data collection were carried out, based upon the specifications concerned, in cooperation of BCGS counterparts.

(1) With primary concern for the uncertain items which had been regarded in the preliminary study in Japan as items to be confirmed in the field, detailed survey such as observation of microrelief, outcrop survey, surface soil survey by auger boring were conducted to obtain data necessary for land condition mapping. Results of the survey were incorporated on the aerial photos with bounded of landform classification and marks.

(2) Minor order leveling

1) Field reconnaissance was carried out based on the leveling route plan prepared in Japan, and the route plan was finalized with confirmation of BCGS.

2) Minor order leveling was carried out according to the JICA Specifications for Overseas Surveying.

3) The leveling was made on the routes of about 115 km in the north-western area and about 50 km in the eastern area of Manila.

4) Leveling points were selected generally with 1 point at an interval of 160 m, but the intervals varied with the landform of the area. Observation points were selected on the general surface of the landform of the area.

5) Each observation point was numbered and pricked on the 2-time enlarged aerial photos.

6) The minor order leveling was carried out at the error of closure within $\pm 5 \text{ cm} \sqrt{S}$ (S: distance in km).

(3) Local investigation

The survey area is a suburban area extending to north and east of Manila City, where various developments are being made rapidly. Meanwhile, north-western and south-eastern parts of the survey area frequently suffer flood damages. Local investigation, together with data collection, was