INCEPTION REPORT (II)

FOR

SEWERAGE AND DRAINAGE SYSTEM PROJECT IN BUTTERWORTH/BUKIT MERTAJAM METROPOLITAN AREA IN MALAYSIA

SEPTEMBER, 1977

Japan International Cooperation Agency

Inception Report (II)

Table of Contents

PART I GENERAL STATEMENT

Chapter 1. Introduction

The Japan International Cooperation Agency (JICA), official agency responsible for implementation of technical cooperation programmes of the Government of Japan, has been undertaking master plan study of sewerage and drainage development project since October 1976, in accordance with the agreement of the Government of Japan to the request of the Government of Malaysia for the technical cooperation on sewerage and drainage project in Butterworth and Bukit Mertajam Metropolitan area in Penang State, Malaysia. JICA submitted the interim report of Master Plan to the Government of Malaysia in April, 1977, and dispatched the mission to have joint meetings with the steering committee and the technical committee of the Government of Malaysia in May, 1977.

The comments on the interim report and the terms of reference of subsequent feasibility study were sent to the Government of Japan from the Government of Malaysia at the end of July.

The Inception Report submitted herewith contains necessary major activities to be carried out for finalizing the Master Plan and all activities required for the Feasibility Study, reflecting the comments and terms of reference mentioned above.

All activities referred above are provided in this report both in narrative and diagramatic form, including work schedule and work diagram indicating proposed approach to the Project.

It is confirmed herewith that all activities in connection with the Project will be carried out in principle in accordance with the scope of work acknowledged by the Government of Malaysia before commencement of the Master Plan study.

Chapter 2. Scope of Work

1. Master Plan Study.

1-1 Outline of the work.

The Master Plan report will be finalized reflecting all comments of the Government of Malaysia on interim report with the understanding that those comments are basically acceptable.

The study for organizational, managerial, financial and legislative aspects will be conceptual provided that detailed study will be performed during the course of the Feasibility Study.

1-2 Details of work.

The details on schedule of work, major items for finalization and personnel organization for the work are described in PART II MASTER PLAN STUDY of present document.

2. Feasibility Study.

2-1 Outline of the work.

The Feasibility Study will be performed pursuant to the basic plan recommended in the Master Plan report with due considerations on basic requirements of the Government of Malaysia. The activities to be carried out in the Feasibility Study will include field works, discussion with members of the Malaysian Technical and Steering Committees, alternative study to select the plan technically and economically feasible for the system, and preliminary design work for

the selected priority areas. All results of the above study will be compiled in the final report of the Feasibility Study and submitted to the Government of Malaysia for selection of optimal implementation of the Project.

The areas for sewerage work to be covered by the Feasibility Study will be Butterworth Zones Nos. 1, 2, 3 & 4, Bukit/Mertajam Zone No. 3, and Seberang Jaya Zones Nos. 1 & 2, according to the data available during the course of the study. The areas for drainage work in this study will be Sub-basins Nos. 2-2, 2-3, 2-4, 2-5, 2-7, 2-12, & a part of 2-1, 2-10 2-11, 2-13 and 2-14 in Basin II, and all Sub-basins in Basin IV. The above areas are indicated in Figures 1 & 2 attached herewith.

2-2 Work schedule.

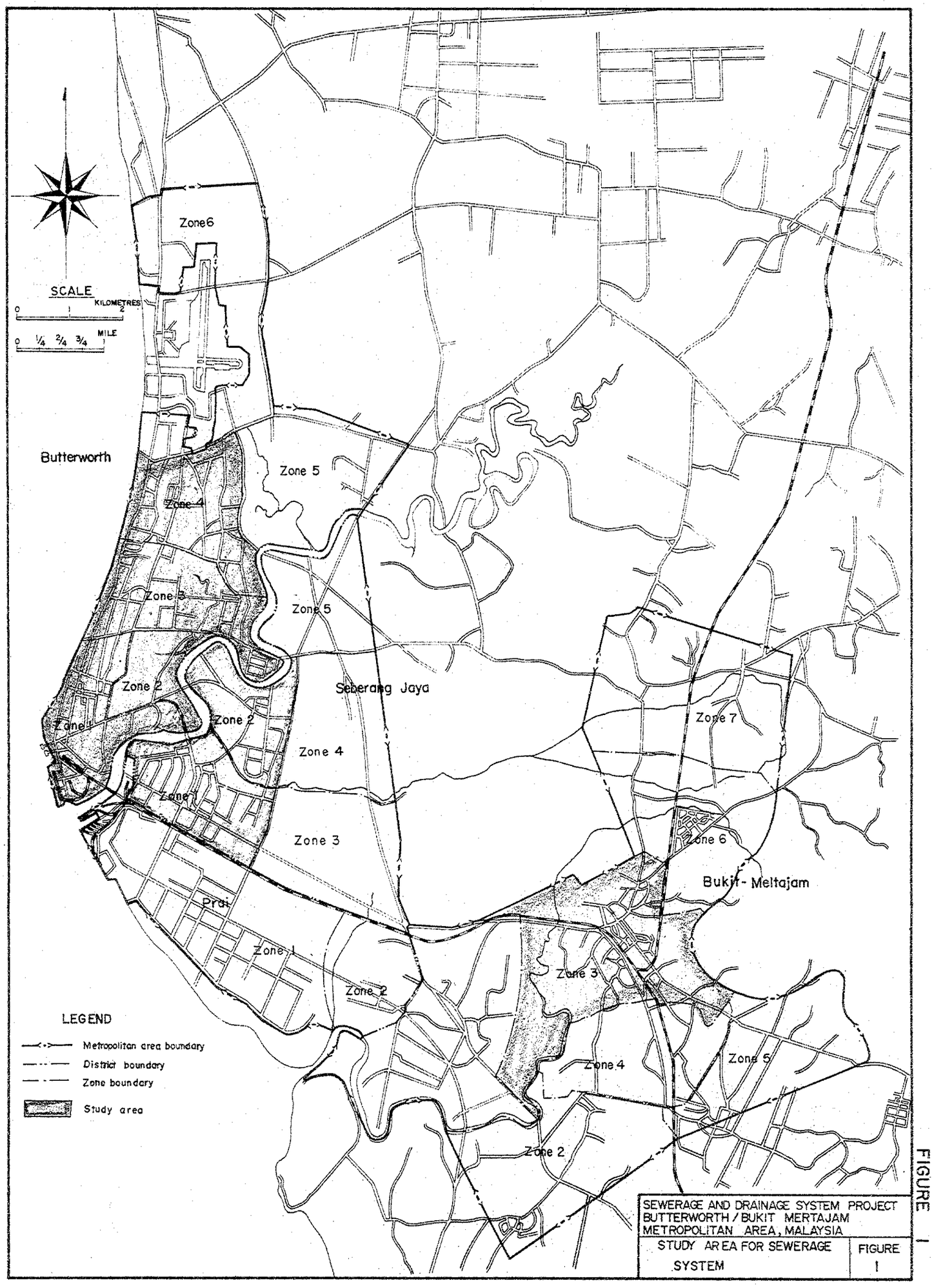
The details are described in subsequent pages 13 to 16.

2-3 Juru River.

The objective of study for the Juru River will be limited to the reserve requirements estimation based on standard prepared by the Government of Malaysia. The additional studies on water quality and flood controls will not be included, because these are beyond the scope of work normally required for the sewerage & drainage project.

2-4 Transfer of knowledge.

The transfer of technical knowledge will be performed for the counterpart personnel nominated by the Government of Malaysia during the course of field work and home office work.



SEWERAGE AND DRAINAGE SYSTEM PROJECT
BUTTERWORTH / BUKIT MERTAJAM
METROPOLITAN AREA, MALAYSIA

STUDY AREA FOR SEWERAGE SYSTEM	FIGURE 1

FIGURE 1

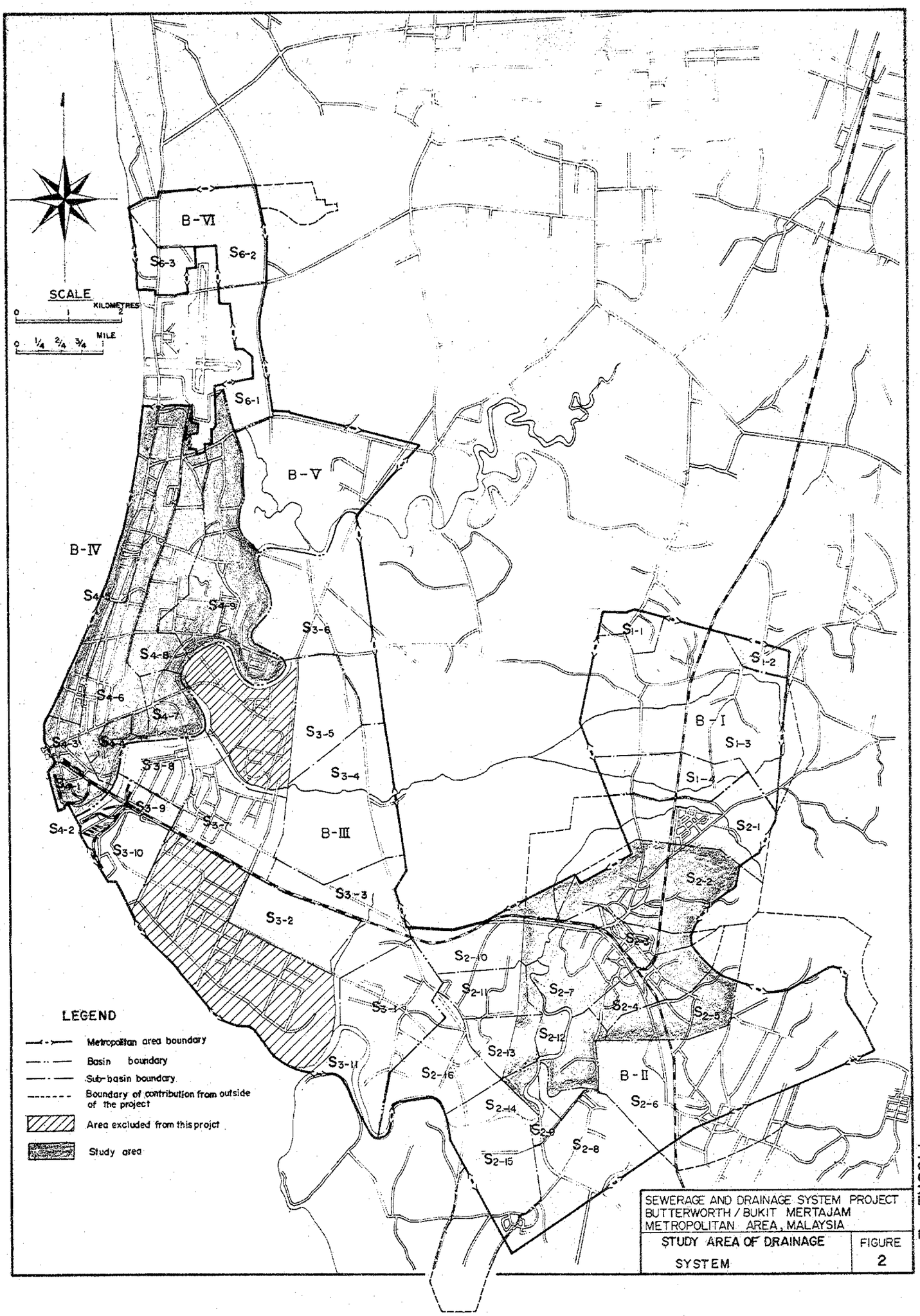

SCALE
0 1 2 KILOMETRES
0 1/4 2/4 3/4 1 MILE
B-VI
S6-3
S6-2
S6-1
B-V
B-IV
S4-5
S4-4
S4-8
S4-6
S4-7
S4-3
S4-1
S4-2
S3-6
S3-5
S3-4
S3-8
S3-9
S3-7
S3-10
B-III
S3-3
S3-2
S3-1
S3-11
S1-1
S1-2
B-I
S1-3
S1-4
S2-1
S2-2
S2-3
S2-10
S2-11
S2-7
S2-4
S2-5
S2-12
S2-13
S2-16
B-II
S2-6
S2-14
S2-9
S2-8
S2-15
LEGEND
Metropolitan area boundary
Basin boundary
Sub-basin boundary
Boundary of contribution from outside of the project
Area excluded from this project
Study area
SEWERAGE AND DRAINAGE SYSTEM PROJECT
BUTTERWORTH / BUKIT MERTAJAM
METROPOLITAN AREA, MALAYSIA
STUDY AREA OF DRAINAGE SYSTEM
FIGURE 2

FIGURE 2

Chapter 3. Undertakings of the Government of Malaysia

1. To provide the Japanese survey team with suitable office and laboratory with necessary equipment for the study.

2. To provide the Japanese survey team with available maps (1:2 chains) and latest aerial photos.

3. To exempt the Japanese survey team from taxes and duties for materails, equipment and personal effects brought into Malaysia by the team to the extent that it normally applies to Colombo Plan experts.

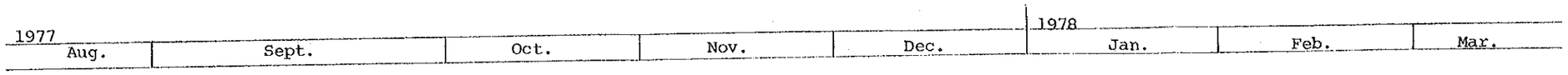
4. To make arrangements for the Japanese survey team to bring the data and materials required for the study to Japan.

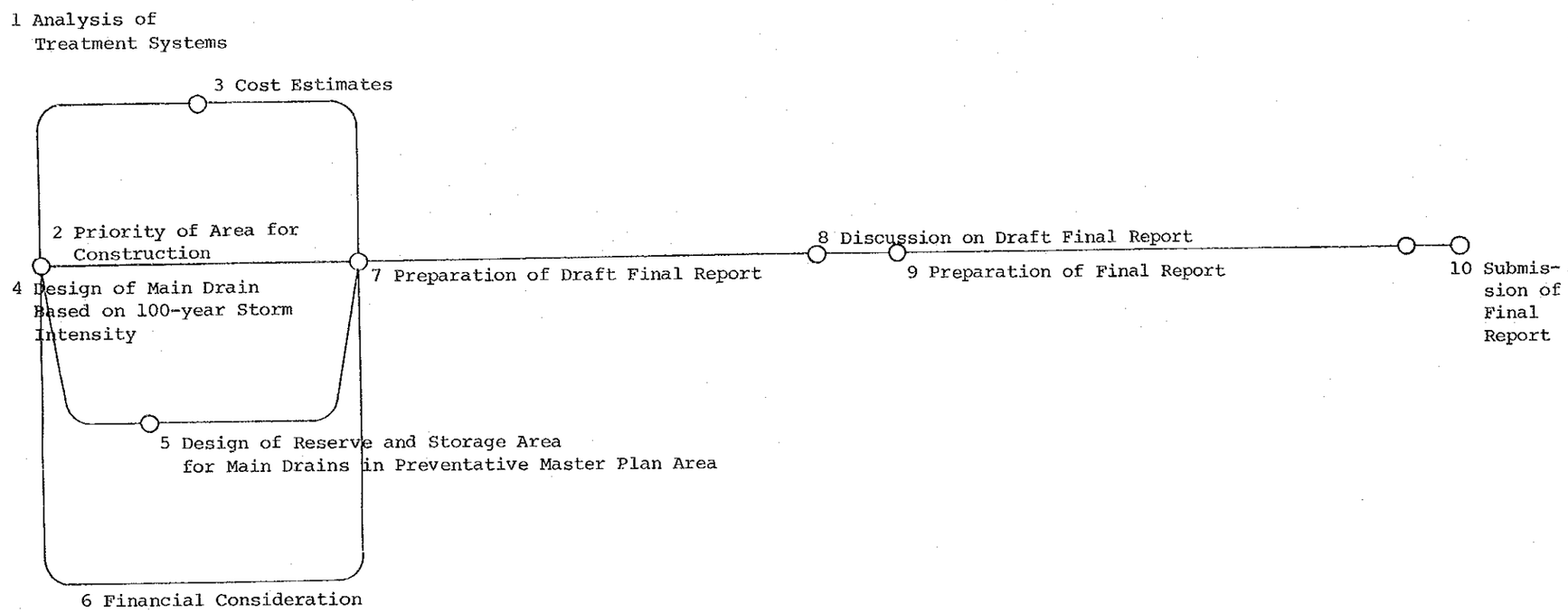
PART II MASTER PLAN STUDY

Chapter 1. Work Schedule

The work schedule is prepared for finalizing the Master Plan taking into account the comments provided by the Government of Malaysia and the Japanese Supervisory Committee. Details are described in the attached sheet of Work Diagram.

Work Diagram





Chapter 2. Work Items

The major items of work for completion of Master Plan report will be as follows:

1. Analysis of treatment systems.

   The studies on alternatives will be performed for various treatment processes without sedimentation and digestion tank in accordance with the comments of the Government of Malaysia, in addition to 3 other processes studied in Master Plan interim report. The design of treatment system will be based on the standard applied in sewerage system plan in Kuala Lumpur with the understanding that quality of effluent is less than 50 mg/l (BOD).

2. Priority of area for construction.

   Among the elements considered to be key factors in rating the priority area for implementation of sewerage construction, the element of "Housing and Industrial Development Programme" will be withdrawn and considered separately in accordance with the comment of the Government of Malaysia.

3. Cost estimates.

   3-1 The processes proposed by comment from the Government of Malaysia will be added in cost comparison of alternative treatment systems.

3-2 As the Government of Malaysia will basically be responsible only for the main sewers, treatment facilities and main drains, the costing will be done only for these facilities. However, the cost estimates for the rest of the investment will also be done separately for information purpose.

4. Design of main drain based on 100-year storm intensity.

The main drains will be planned in accordance with the basic principle that the drainage system shall ensure that there is no inconvenience flooding from the initial storm (2 or 5 year return period), and that there is no major damage from the major storm (100 year return period).

5. Design of reserve and storage area for main drains in preventative Master Plan area.

Estimation of required reserve and storage area will be performed based on runoff discharge at 100-year rainfall intensity, in accordance with the standard prepared by DID for the space required for discharge flow.

6. Financial consideration.

Preliminary consideration will be given to the financial viability based on the required costs estimated for whole project.

7. Preparation of draft final report.

Draft final report will be prepared, incorporating each work items mentioned in the previous pages, together with the comments and advice on presentation and editing of the report, drawings and maps by members of the Malaysian Technical and Steering Committees, and Japanese Supervisory Committee.

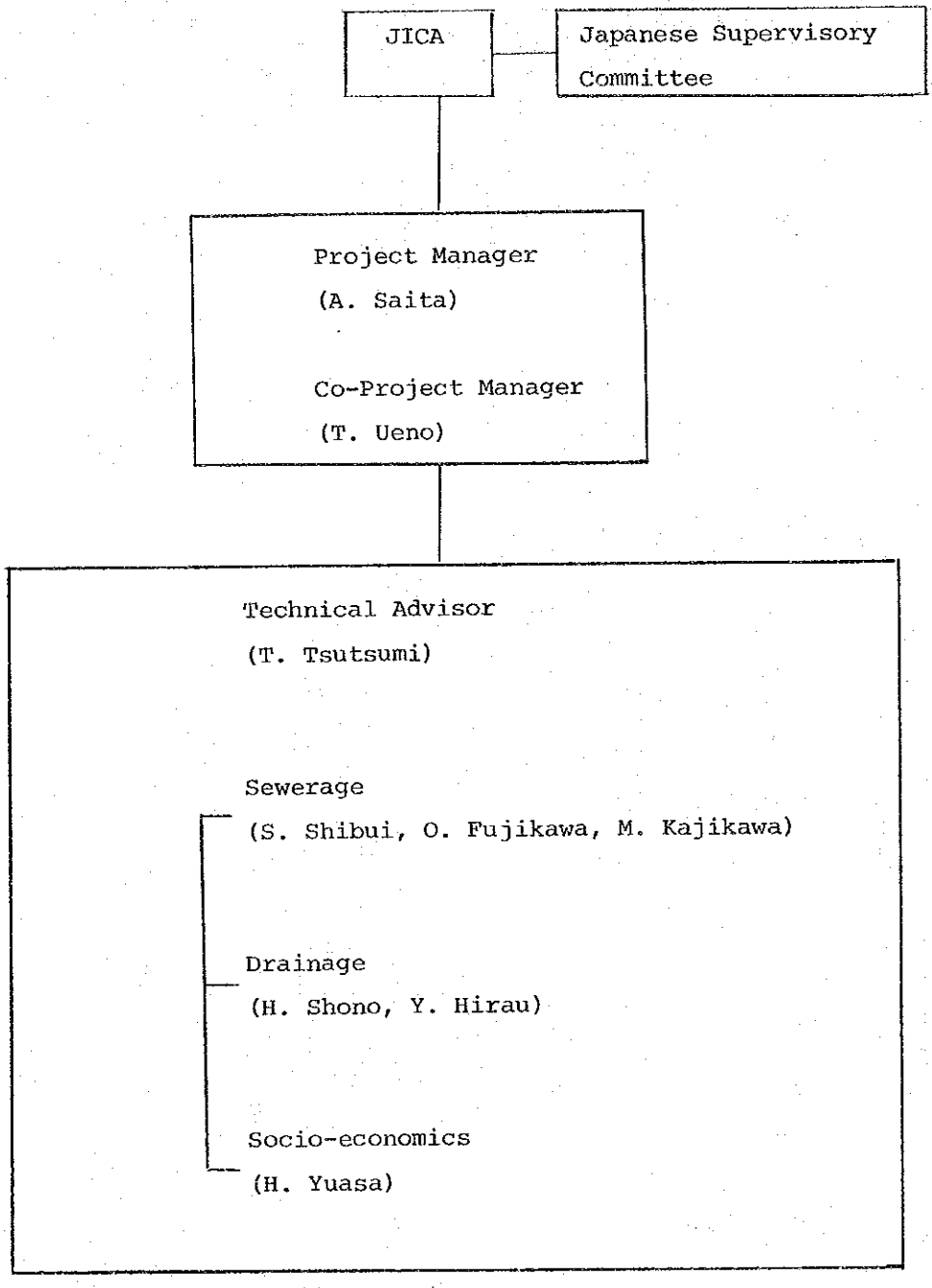
8. Discussion on draft final report.

The final discussion will be undertaken with Government of Malaysia upon submission of the draft final report referred above.

9. Preparation of final report.

10. Submission of final report.

Chapter 3. Project Organization



PART III FEASIBILITY STUDY

Chapter 1. Work Schedule

It is proposed to classify the entire work for carrying out the Feasibility Study into the following two categories in order to ensure expeditious and orderly progress of the work required.

1. Field Work.

   The major works to be undertaken are data collection, preliminary analysis of the information, field survey and investigation, and discussion with members of the Malaysian Technical and Steering Committees.

2. Home Work.

   Home work to be performed will be the preparation of the draft Feasibility Study report, including the study on alternative plans of sewerage and drainage system, preliminary design, cost estimates, financial planning, and organization, management & legislation.

The details of all activities to be carried out are described in the succeeding chapters, and in the attached sheets of Work Plan and Work Diagram, identifying the components of work and their correlation.

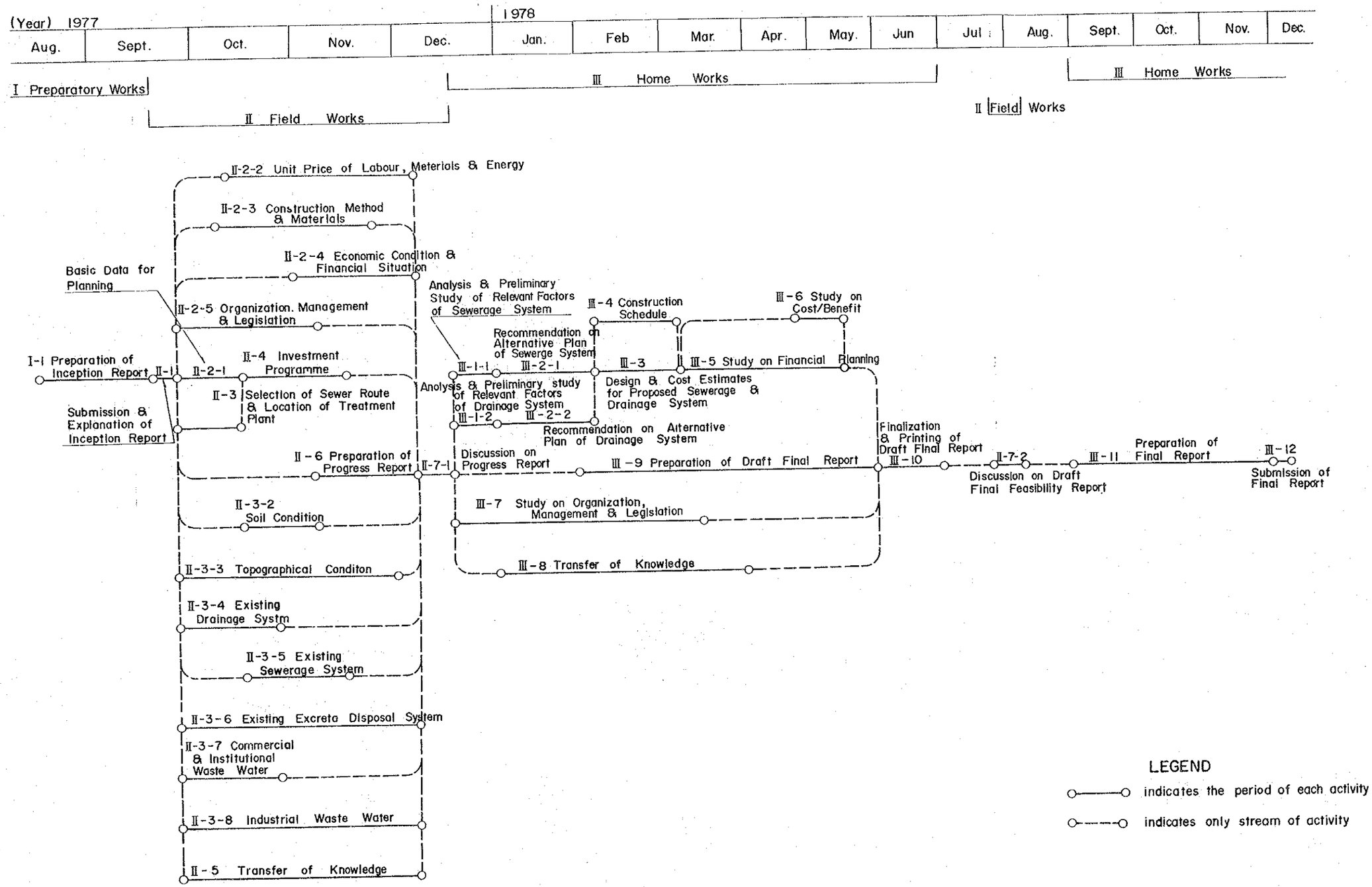
1-1 Work Plan for the Feasibility Study

Work Items	Month	1977 Aug.	Sept.	Oct.	Nov.	Dec.	1978 Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
I. Preparatory Works	1. Preparation of Inception Report																	
II. Field Works	1. Submission & Explanation of Inception Report																	
	2. Data Collection & Preliminary Analysis																	
	2-1 Basic Data for Planning																	
	2-2 Unit Price of Labour, Materials and energy																	
	2-3 Construction Method and Materials																	
	2-4 Economic Condition & Financial Situation																	
	2-5 Organization, Management & Legislation																	
	3. Field Survey & Investigation																	
	3-1 Selection of Sewer Route & Location of Treatment Plant																	
	3-2 Soil Condition																	
	3-3 Topographical Condition																	
	3-4 Existing Drainage System																	
	3-5 Existing Sewerage System																	
	3-6 Existing Excreta Disposal System																	
	3-7 Commercial & Institutional Waste Water																	
	3-8 Industrial Waste Water																	
	4. Investment Programme																	
	5. Transfer of Knowledge																	
	6. Preparation of Progress Report																	
	7. Discussion with members of the Malaysian Technical & Steering Committees																	

- continued -

Work Items / Month		1977 Aug.	Sept.	Oct.	Nov.	Dec.	1978 Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
	7-1 Discussion on Progress Report					—												
	7-2 Discussion on Draft Final Feasibility Report													—				
III. Home Works	1. Analysis & Preliminary Study of Data Collected																	
	1-1 Relevant Factors of Sewerage System					—												
	1-2 Relevant Factors of Drainage System					—												
	2. Recommendation on Alternative Plan of Sewerage & Drainage System																	
	2-1 Sewerage System					—	—	—										
	2-2 Drainage System					—	—	—										
	3. Design & Cost Estimates for Proposed Sewerage & Drainage System						—	—	—									
	(Preparation of Drawings)																	
	4. Construction Schedule							—	—									
	5. Study on Financial Planning								—	—	—							
	6. Study on Cost/Benefit										—							
	7. Study on Organization, Management & Legislation					—	—	—	—									
	8. Transfer of Knowledge						—	—	—	—								
	9. Preparation of Draft Final Report							—	—	—	—	—						
	10. Finalization & Printing of Draft Final Report											—	—					
	11. Preparation of Final Report														—	—	—	
	12. Submission of Final Report																	—

I-2 Work Diagram for the Feasibility Study



Chapter 2. Work Items

Field Work

1. Submission and explanation of inception report.

2. Data collection and preliminary analysis.

2-1 Basic data for planning.

Following data will be collected:

a) Maps (scale 1:2 chains)
b) Latest available aerial photos
c) Latest available information for present and future land use and population distribution
d) Design criteria

2-2 Unit price of labour, materials and energy.

To estimate construction, operation and maintenance costs of sewerage and drainage facilities, data of unit cost will be collected.

2-3 Construction method and materials.

Following data will be collected:

a) Possible method of construction, ability of local contractors and type of bedding.
b) Availability of materials and equipment.

2-4 Economic conditions and financial situation.

Data and information on revenue projection including households' incomes, willingness to pay for sewerage services, existing users charge system in the exemplary cities (George Town & Kuala Lumpur) and financial sources.

2-5 Organization, management and legislation.

a) Study on alternative organization plans, e.g. expansion of existing office, amalgamation with existing water supply authority, and establishment of new authority.

b) Definition of responsibility of respective departments relative to sewerage and drainage project in State Government, DID, PWD and others including developers to be responsible for construction of relative facilities and operation and maintenance.

c) Collection of data and information of existing organization responsible for sewerage and drainage operation in exemplary cities.

d) Collection of data and information on existing legislation relative to sewerage and drainage system in Project Area, and exemplary cities, including industrial waste control legislation and users charge system for industrial waste acceptance into sewer pipes.

3. Field survey and investigation.

3-1 Selection of sewer route and location of treatment plant.

To determine the sewer route and location of the treatment plant, the followings will be investigated:

a) Underground structure
b) Proposed treatment plant site and its surroundings
c) Possibility of land acquisition for facilities required
d) Land cost for facilities required

3-2 Soil condition.

To identify soil condition and ground water level, test boring and collection of existing boring data will be performed.

3-3 Topographical condition.

To identify the ground elevation, ground survey will be performed.

3-4 Existing drainage system.

To obtain the basic data for design work of proposed drainage system, the following items will be investigated:
a) Existing road-side ditch
b) Location and scale of frequent flooding and existing swamp area
c) Cross section and level of existing main drains

3-5 Existing sewerage system.

To obtain the basic data for design work of proposed sewerage system, the following items will be surveyed.
a) Peak flow rate
b) Infiltration
c) Sulfide production and corrosion
d) Ultimate BOD and first order rate constant for BOD removal
e) Type, Structures and equipment of treatment plant
f) Monitoring for waste water qualities

3-6 Existing excreta disposal system.

The existing excreta disposal system will be investigated for the following items.

a) Communal and individual septic tank
Location, population and area served, type, effluent quality, condition of disposal, and cost of operation and maintenance.

b) Bucket system
Surved population and/or served household distributed, and cost of operation and maintenance.

3-7 Commercial and institutional waste water.

To estimate quantities of effluent from area of commercial and institutional, sewage flow will be surveyed, while sewage flow will be estimated by daily and hourly water consumptions.

3-8 Industrial waste water.

To recommend the industrial waste water treatment process, the followings will be performed at factories selected in the areas of Mak Mandin, Butterworth and Bukit Mertajam:

a) Questionnaire and interview
The forms of questionnaire are attached herewith as appendix in this report.

b) Qualities of waste water will be surveyed for the major factories selected on the basis of data obtained in item (a).

4. Investment programme.

To emphasize the study on the order of magnitude of the investment for the areas included in the Feasibility Study, the followings will be peformed:

4-1 Preparation of possible alternative combinations for sewerage and drainage system, involving cost estimates for construction and operation and maintenance for each of alternative plans, based on proposed Master Plan.

4-2 Discussion with members of the Malaysian Technical and Steering Committees regarding consideration of priority, financial parameters, financial cost including the definition of the costs to be borne by Government, developer and owners of households and etc., to identify funding requirements and financial plans for implementation of the areas included in the feasibility study, on the basis of study result obtained by the item above.

5. Transfer of knowledge.

Basic knowledge necessary for sewerage and drainage work will be transferred to the counterpart staff at the project site by the members of the Japanese team for the Project.

6. Preparation of Progress Report.

7. Discussion with members of the Malaysian Technical and Steering Committees.

7-1 Discussion on Progress Report

7-2 Discussion on draft final Feasibility Report

Home Work

1. Analysis and preliminary study of data collected.

The following items will be studied:

1-1 Relevant factors of sewerage system

a) Present and future land use

b) Population distribution in each of sewerage sub-zone

c) Estimation of Quantities and Qualities in each of sewerage sub-zone and zone

1-2 Relevant factors of drainage system

a) Location and area of low lying area

b) Capacity of existing drains for discharge, and condition of existing drains for rehabilitation

2. Recommendation on alternative plan of sewerage and drainage system

On the basis of the result of the review services under the work mentioned above such as field work and preliminary analysis and studies, most suitable plan of sewerage and drainage system will be prepared with alternative studies, including engineering and economic analysis. Following items will be studied:

2-1 Sewerage system

a) Design criteria of sewerage facilities

b) Pipe material, type of pumping station, type of treatment plant, and etc.

c) Overall system
Trunk sewer route, location of pumping station, treatment plant and etc.

2-2 Drainage system.

a) Design criteria of drainage facilities
b) Type of drain and material
c) Storage system
Location and capacity of storage basin
d) Overall system

3. Design and cost estimates for proposed sewerage and drainage system.

On the basis of studies mentioned in Section 2 above, facilities of sewerage and drainage system will be designed for selected alternative plan, and also detailed cost estimates will be prepared defining the portion of the costs to be borne by the government, developer and owners of households.

During the course of preliminary engineering study, the following drawings will be prepared:

a) Plans of sewerage and drainage system (scale 1:5,000)
b) Profiles for both sewerage and drainage system
(scale: Horizontal 1:10,000 Vertical 1:200)
c) Pumping stations
d) Treatment plants
e) Storage basin
f) Outlet

4. Construction schedule

Preliminary implementation schedule of construction will be established for proposed sewerage & drainage system.

5. Study on financial planning.

Based on the preliminary engineering and cost estimates on construction schedule, including construction and operation and maintenance cost, a well balanced investment programme on the basis of viable financial planning with due consideration on capital requirements and funding sources, will be developed.

6. Study on cost/benefit.

To recognize the effect on sewerage and drainage system proposed, benefit will be analyzed based on quantifiable and/or nonquantifiable benefits such as economic, health and environmental benefits.

7. Study on organization, managment and legislation.

7-1 Preparation of the organizational plan optimal for the management of proposed sewerage and drainage system and its operation taking account of data and information obtained at field work.

7-2 Review of existing legislations relative to sewerage and drainage work and suggestion on the establishment of any new legislation if required.

8. Transfer of knowledge.

Basic knowledge necessary for sewerage and drainage works will be transferred to the counterpart staffs at the home office.

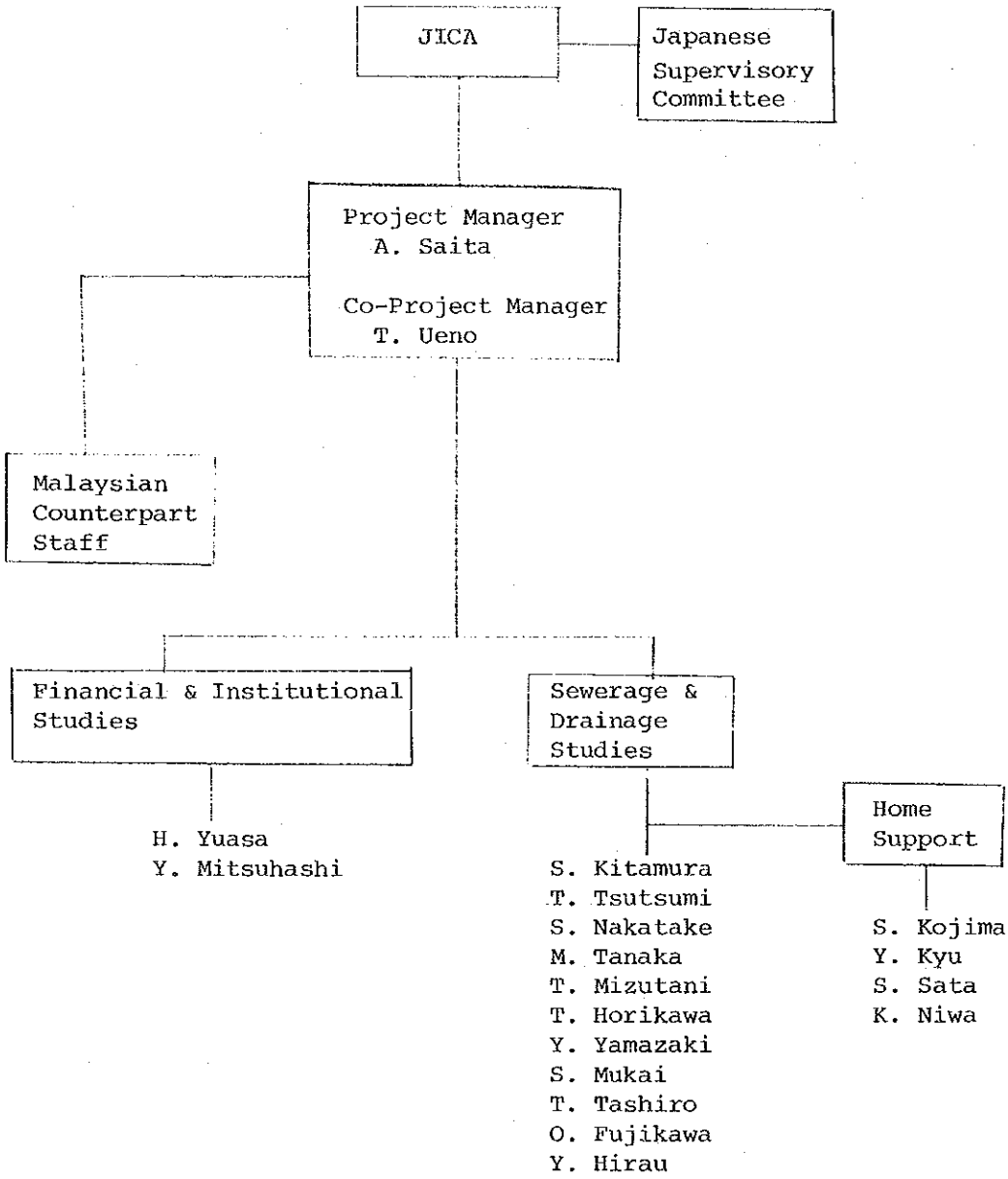
9. Preparation of draft final report.

10. Finalization and printing of draft final report.

11. Preparation of final report.

12. Submission of final report.

Chapter 3. Project Organization



Chapter 4. Reports

The following reports will be submitted to the Government of Malaysia in the course of the feasibility study.

1. Inception Report
   30 copies
   at the beginning of the field survey of the study

2. Progress Report
   30 copies
   at the end of the field survey of the study

3. Draft Final Report (including drawings)
   30 copies
   within 7 months after the completion of the field survey of the study

4. Final Report (including drawings)
   50 copies
   within 3 months after obtaining the comment from Government of Malaysia

PART IV. APPENDIX

Appendix 1. List of Member of Japanese Supervisory Committee

1) M. Kashiwaya
Head, Water Quality Control Division,
Public Works Research Institute,
Ministry of Construction

2) K. Inaba
Deputy head, Sewerage Planning Division
Sewerage and Sewage Purification Dept.
City Bureau, Ministry of Construction

3) H. Sookawa
Technical Officer, River Basin & Sewerage Division,
Sewerage and Sewage Purification Dept.,
City Bureau, Ministry of Construction

4) Y. Nakagawa
Senior Engineer
Construction Dept.,
Japan Sewage Works Agency

5) A. Shinbuchi
Senior Engineer
Planning Dept.,
Japan Sewage Works Agency

Appendix 2. Questionnaire of Industrial Waste Water

1. Physical Data

Name of Factory _____

Address _____ (phone) _____

Capital _____ unit

Factory Site Area _____ unit Floor Space _____ unit

2. Annual Variation of the Number of Employees

	Present		Future Projection (if available)
At start of factory operation	_____		
1970	_____	1980	_____
1972	_____	1985	_____
1974	_____	1990	_____
1976	_____	2000	_____

3. Major Products

a) List of Major Products

b) Annual Variation of Quantity of Major Products

1st year of production _____		Future Projection (if available)	
	_____		
1970	_____	1980	_____
1972	_____	1985	_____
1974	_____	1990	_____
1975	_____	2000	_____

4. Major Raw Materials and Chemicals such as acids, alkalines/ catalyzer

5. Water Consumption Data:

	Quantity (unit)	Source*	Recycle Use
for Boiler	_____	_____	_____
for Raw Material (process consumption)	_____	_____	_____
for Washing	_____	_____	_____
for Cooling	_____	_____	_____
Others	_____	_____	_____
Total	_____	_____	_____

*Note: Source of Water --- Municipal Water

6. Waste Water

1) Is there any facility/ies for waste water treatment in your factory?

YES / NO

2) If affirmative, what kind of wastewater is treated by the facility/ies?

Process Wastewater / Toilet Wastewater / Both

3) What kind of treatment is utilized?

	Process Waste Water	Toilet Waste Water	Sewage on open drain
Septic Tank without Filter Bed	_____	_____	_____
Septic Tank with Filter Bed	_____	_____	_____
Imhoff Tank	_____	_____	_____
Activated Sludge Process	_____	_____	_____
Waste Stabilisation Pond	_____	_____	_____

Others (Name of Facilities) _____

_____

_____

4) What components are treated by the Facilities?

Organic Matter / Suspended Solid / Turbidity / oils /

pH / Heavy Metals / Harmful Inorganics (As, CN^-, etc) /

Harmful Organics (phenols, etc) / Color / Odor

5) Have you data on wastewater quality of your factory?

YES / NO

6) If affirmative, please provide following information:

a) Name of Laboratory who analyzed sample

b) Date of Wastewater quality test

c) Results of wastewater quality test, if available

7. Working Hour

From _____ to _____

8. Schematic Diagram of Water Supply and Discharge

Date _____

Name of Person filling this QUESTIONNAIRE

_____

Position in Firm

_____

REFERENCE NO. _____