JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF SETTLEMENT AND REGIONAL DEVELOPMENT
THE REPUBLIC OF INDONESIA

THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

FINAL REPORT

COMPONENT A:
WEST FLOODWAY / SEMARANG DEVELOPMENT

VOLUME II MAIN REPORT

AUGUST 2000

CTI ENGINEERING INTERNATIONAL CO., LTD.
IN ASSOCIATION WITH
PACIFIC CONSULTANTS INTERNATIONAL
AND
PASCO INTERNATIONAL INC.

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ESTIMATE OF PROJECT COST

Price Level	:	As of July 1999		
Currency Conversion Rate	:	US$1.00	=	Rp. 6,885
		1 Yen	=	Rp. 60.39

CONSTITUTION OF THE REPORT

1. SUMMARY
2. COMPONENT A : WEST FLOODWAY/GARANG RIVER IMPROVEMENT

VOLUME I	MAIN REPORT
VOLUME II	DESIGN CRITERIA
VOLUME III	DESIGN NOTES
VOLUME IV	WORK QUANTITY CALCULATION
VOLUME V	CONSTRUCTION PLANNING
VOLUME VI	COST ESTIMATE
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3. COMPONENT B : JATIBARANG MULTIPURPOSE DAM CONSTRUCTION

VOLUME I	MAIN REPORT
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PREFACE

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct the Detailed Design of Flood Control, Urban Drainage and Water Resources Development in Semarang and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. TOMIOKA Yoshiyuki of CTI Engineering International Co., Ltd. and constituted of members of CTI Engineering International Co., Ltd., Pacific Consultants International and Pasco International Inc., six times between August 1997 and June 2000. In addition, JICA set up an advisory committee, which examined the study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of Indonesia and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Indonesia for their close cooperation extended to the Team.

August 2000

Kimio Fujita
President
Japan International Cooperation Agency

August, 2000

Mr. FUJITA Kimio
President
Japan International Cooperation Agency
Tokyo, Japan

LETTER OF TRANSMITTAL

Sir:

We are pleased to submit herewith the Final Report on the Detailed Design of Flood Control, Urban Drainage and Water Resources Development in Semarang in the Republic of Indonesia.

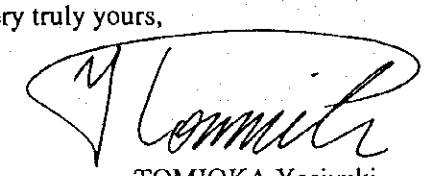
Under a contract with the Japan International Cooperation Agency, the Study was conducted by CTI Engineering International Co., Ltd., in association with Pacific Consultants International and PASCO International, Inc., during the period from August 1997 to August 2000.

This Final Report presents the results of the detailed design of the following three (3) components, which consist of (1) West Floodway/Garang River Improvement including reconstruction of Simongan Weir, (2) Construction of Jatibarang Multipurpose Dam, and (3) Urban Drainage System Improvement. It also presents the pre-qualification and contract documents, and general and technical specifications necessary for the construction stage. In the course of the Study, much attention was given to the particular issues on the present situation in Semarang, and reflected them in the proposed facilities.

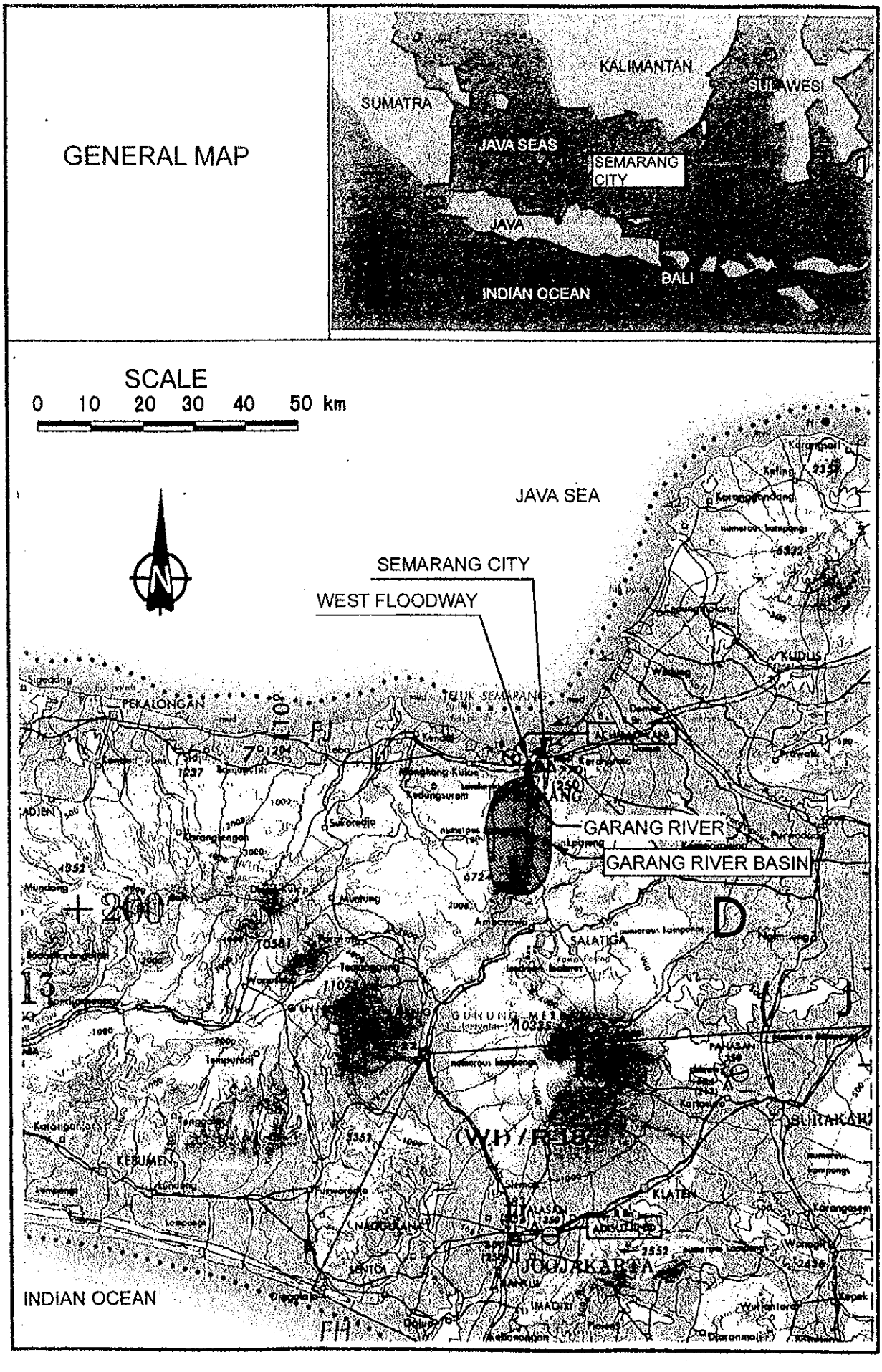
We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, the Ministry of Foreign Affairs, and the Ministry of Construction. We would also like to extend our deep appreciation to the officials concerned of the Government of the Republic of Indonesia, Jratunseluna Project Office in Semarang, the JICA Indonesia Office, the Embassy of Japan in Indonesia for their cooperation and assistance throughout our field survey.

Finally, we hope that this Report will contribute to the improvement of the flood control and urban drainage facilities, and water resources development in Semarang.

Very truly yours,



TOMIOKA Yosiyuki
Team Leader
Detailed Design of Flood Control, Urban Drainage
and Water Resources Development in Semarang
in the Republic of Indonesia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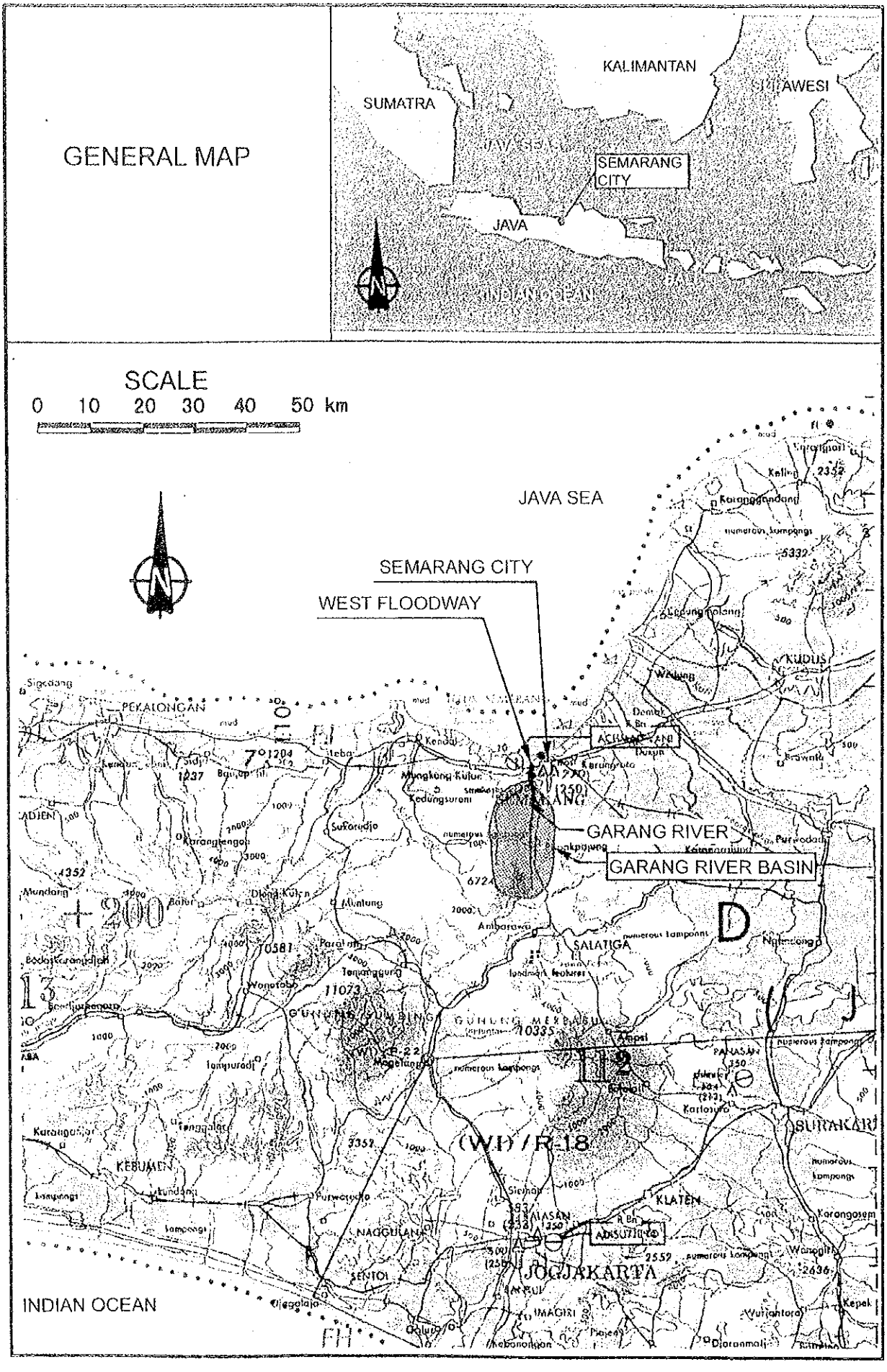
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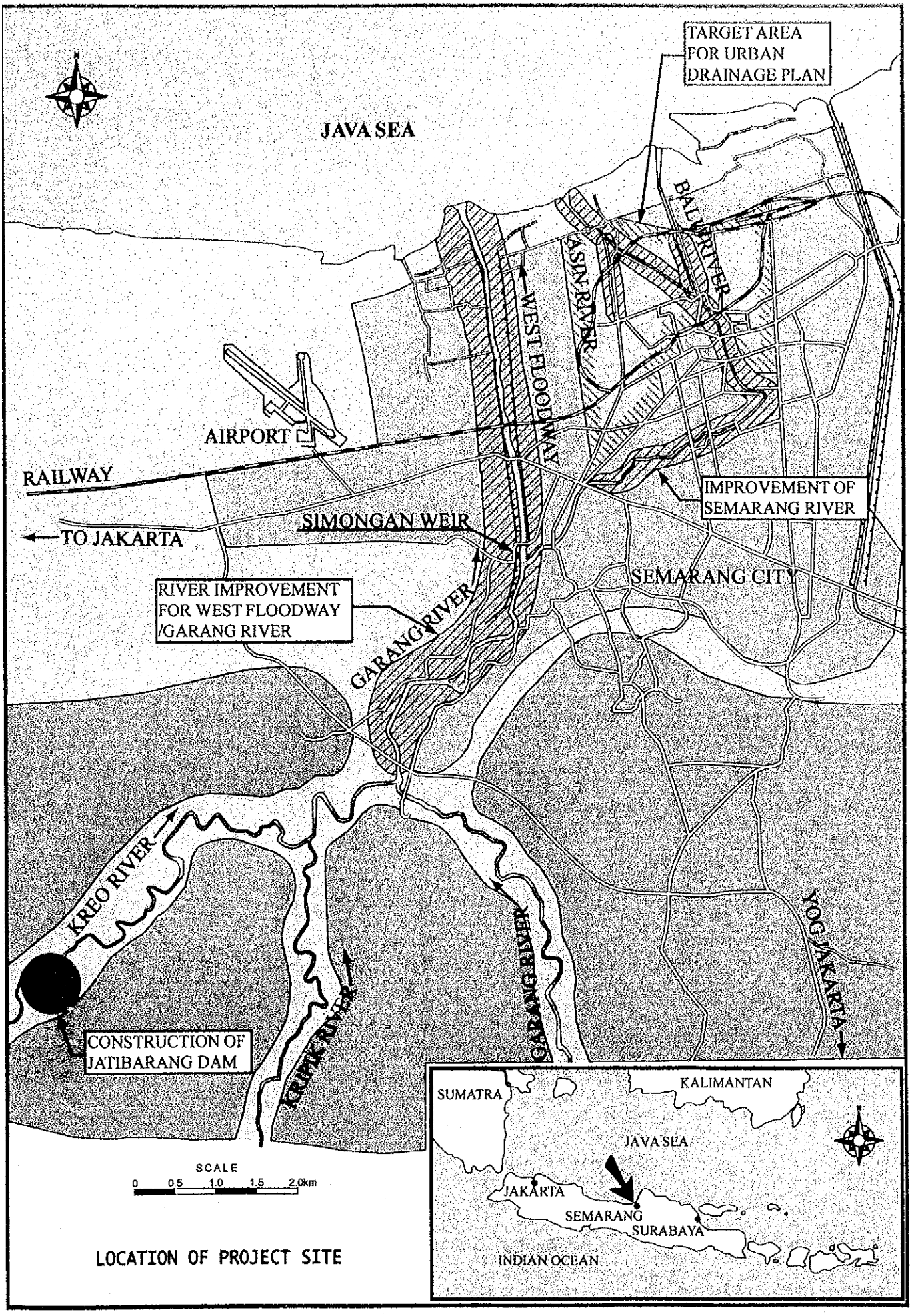
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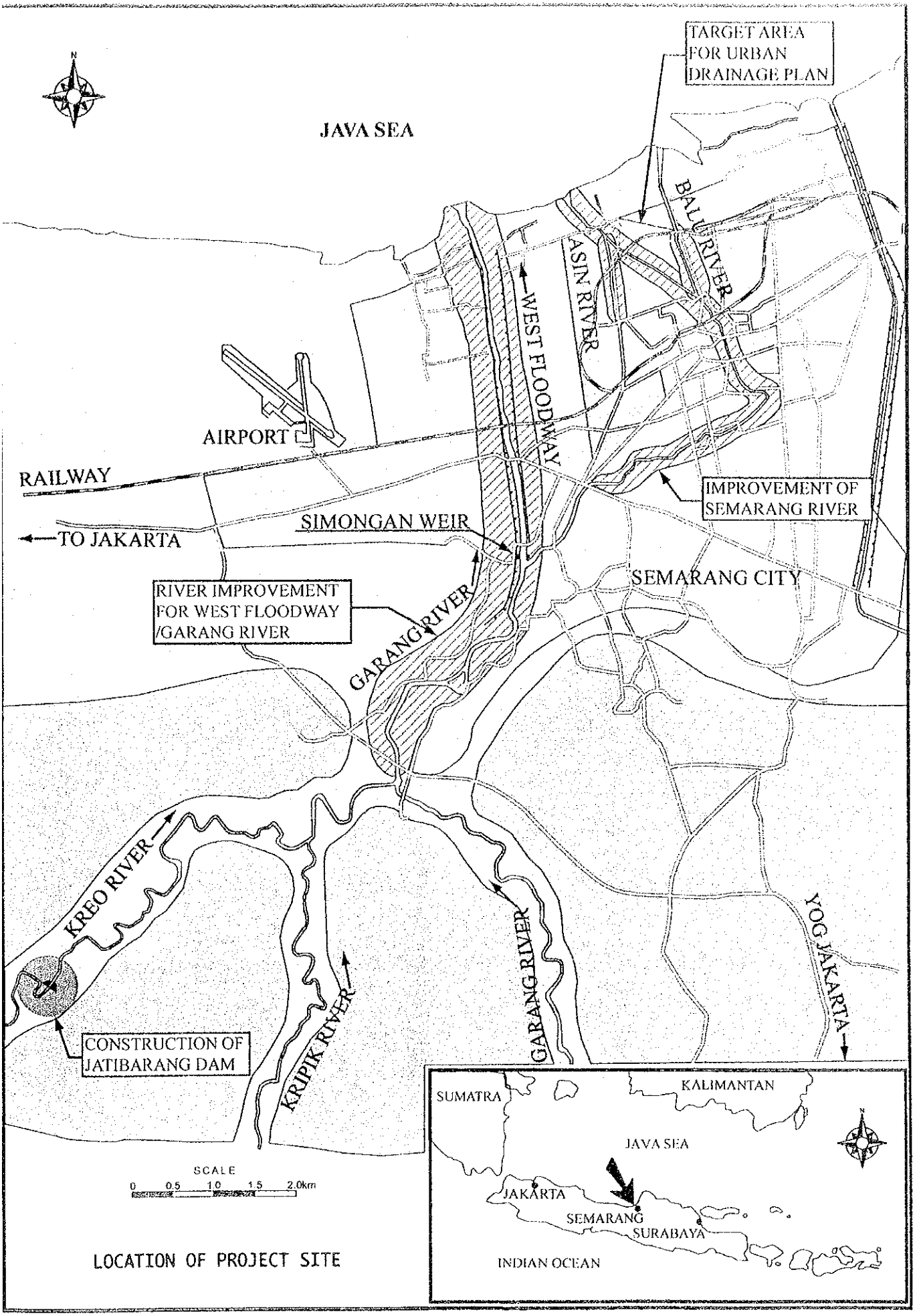
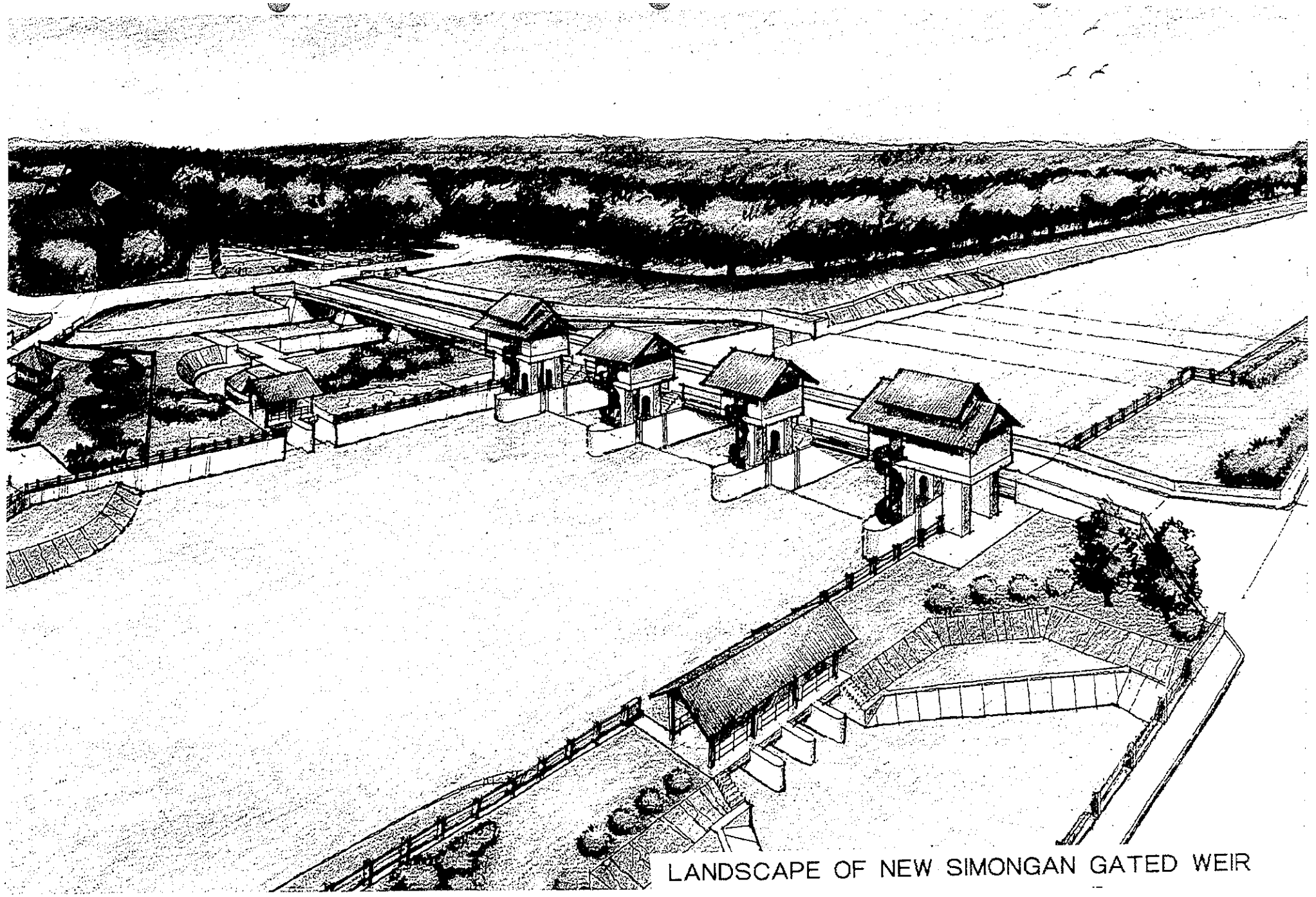


LOCATION OF PROJECT SITE



LANDSCAPE OF NEW SIMONGAN GATED WEIR

VOLUME I MAIN REPORT

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TERMS AND ABBREVIATIONS

1. INDONESIAN GOVERNMENT AGENCIES AND ORGANIZATIONS

GOI	:	Government of Indonesia
BAPPENAS	:	Badan Perencanaan Pembangunan National (National Development Planning Board)
BAPPEDA	:	Badan Perencanaan Pembangunan Daerah (Provincial Development Planning Board)
BINAMARGA	:	Directorate General of Road and Bridge, Ministry of Public Works
BAPEDAL	:	Badan Pengendalian Dampak Lingkungan (Environmental Impact Assessement Board)
BPN	:	Badan Pertanahan Nasional (National Land Agency)
BPP	:	Balai Penyuluhan Pertanian (Agricultural Extension Center)
DPU	:	Departemen Pekerjaan Umum (Ministry of Public Works)
DGWRD	:	Directorate General of Water Resources Development, Ministry of Public Works
DGCK	:	Directorate General of Cipta Karya (Housing, Building and Urban Development, Ministry of Public Works)
DGRD	:	Directorate General of Research and Development, Ministry of Public Works)
DOR	:	Directorate of Rivers
DPUP	:	Dinas Pekerjaan Umum Propinsi (Provincial Public Works Services)
IHE	:	Institute of Hydraulic Engineering (Bandung)
PJKA	:	Perusahaan Jawatan Kereta Api (Railway Company, Old Name)
PERUMKA	:	Perusahaan Umum Kereta Api (Indonesian Railway Public Corporation, New Name)
PDAM	:	Perusahaan Daerah Air Minum (Water Works Company)
PMG	:	Pusat Meteorologi dan Geofisika (Center of Meteorology and Geographysics)
PLN	:	Perusahaan Listrik Negara (State Electricity Corporation)
P3SA	:	Proyek Pengembangan dan Penyelidikan Sumber-Sumber Air (Water Resources Development and Investigation Project)

2. JAPANESE GOVERNMENT / INTERNATIONAL ORGANIZATIONS

GOJ	:	Government of Japan
JICA	:	Japan International Cooperation Agency
JBIC	:	Japan Bank for International Cooperation
MOC	:	Ministry of Construction, Japan

JEM	:	Japan Electric Machine Industry
ADB	:	Asian Development Bank
IBRD	:	International Bank for Reconstruction and Development (World Bank)
UNDP	:	United Nations Development Program
WMO	:	World Meteorological Organization
ASTM	:	American Society for Testing and Materials
ASME	:	American Society of Mechanical Engineer
USASI	:	United States of America Standards
IEC	:	International Electrotechnical Committee
NEMA	:	National Electrical Manufacturers Association

3. MEASUREMENT UNITS

(Length)			**(Weight)**		
mm	:	millimeter(s)	g, gr	:	gram(s)
cm	:	centimeter(s)	kg	:	kilogram(s)
m	:	meter(s)	t, ton	:	tonnage (s)
km	:	kilometer(s)			
(Area)			**(Time)**		
mm^2	:	square millimeter(s)	sec., s	:	second(s)
cm^2	:	square centimeter(s)	min	:	minute(s)
m^2	:	square meter(s)	h (hrs)	:	hour(s)
km^2	:	square kilometer(s)	d (dys)	:	day(s)
ha(has)	:	hectare(s)	y, yr(yrs)	:	year(s)
(Volume)			**(Discharge)**		
cm^3	:	cubic centimeter(s)	l, ltr	:	liter(s)
m^3	:	cubic meter(s)	EL., El.	:	Elevation

(Combined Units)

Speed/Velocity

cm/sec, cm/s	:	centimeter per second
m/sec, m/s	:	meter per second
km/hr, km/h	:	kilometer per hour

Stress

kgf/cm^2	:	kilogram per square centimeter
tf/m^2	:	ton per square meter
N/mm^2	:	newton per square millimeter

Mpa	:	mega pascal

Discharge

ltr/sec, l/s	:	liter per second
m^3/sec, m^3/s	:	cubic meter per second
m^3/yr, m^3/y	:	cubic meter per year

(Note : Other combined units may be constructed similarly as above)

Electricity

MW	:	megawatt	GW	:	gegawatt
MWh	:	megawatt hour	GWh	:	gegawatt hour
kV	:	kilovolt			

4. MONETARY TERMS

¥	:	Japanese Yen
US$	:	United States Dollar
Rp.	:	Indonesian Rupiah

5. INDONESIAN TERMS

JKT	:	Jakarta
Jawa	:	Java
Propinsi	:	Province
Kabupaten, Kab.	:	District (Regency)
Kotamadya, Kodya	:	Municipality
Kecamatan, Kec.	:	Sub-District
Desa	:	Village (Rural Area)
Kampung, Kp.	:	Village (Rural Area)
Kelurahan	:	Village (Urban Area)
Kali, Sungai	:	River
Gunung	:	Mountain
Rawa	:	Swamp
Danau	:	Lake
Laut	:	Sea
PT.	:	Incorporated or Limited
PPT	:	Panitia Pembebasan Tanah (Land Acquisition Committee)
KOMPUS	:	Komisi Pusat (Central Committee for Environmental Impact Assessment)
KA-ANDAL	:	Terms of Reference of Environmental Impact Statement
ANDAL	:	Environmental Impact Statement

RKL	:	Environmental Management Plan
RPL	:	Environmental Monitoring Plan
AMDAL	:	Environmental Impact Assessment
BPPM2	:	Semarang Port Bench Mark
SPB	:	Semarang Peil Baru (New Semarang Level)
TTG	:	Tanda Tinggi Geodesi (National Bench Mark)

6. OTHERS

JRATUNSELUNA PROJECT : Water Resources Development Projects for Jragung, Tuntang, Serang, Lusi and Juwana Rivers

SSUDP	:	Semarang and Surakarta Urban Development Program
IUIDP	:	Integrated Urban Infrastructures Development Program
SWL	:	Surcharge Water Level
DFWL	:	Design Flood Water Level
PMP	:	Probable Maximum Precipitation
PMF	:	Probable Maximum Flood
EIRR	:	Economic Internal Rate of Return
JIS	:	Japanese Industrial Standard
USASI	:	United States of America Standards
SWR	:	Shadow Wage Rate
CIF	:	Cost, Insurance and Freight
VAT	:	Value Added Tax.

CHAPTER 1

INTRODUCTION

CHAPTER 1. INTRODUCTION

1.1 Background

Semarang City, the capital of Central Java Province, had the population of 1,250,000 in 1996. The city and its surrounding areas suffer almost every year from floods in rainy seasons and from shortage of water supply in dry seasons. The problem on water shortage will aggravate further in the future due to the recent trend of population concentration in the urban area.

To mitigate these chronic economic problems and to enhance the economic development and stabilization of people's livelihood, appropriate measures are indispensable for Semarang City and its surrounding areas. To this end, the Government of Indonesia requested technical assistance from the Government of Japan.

In response to the request of the Government of Indonesia, the Government of Japan dispatched a study team through the Japan International Cooperation Agency (JICA) to formulate a master plan and to carry out a feasibility study on the selected priority projects from 1992 to 1993. The study was named as "The Master Plan on Water Resources Development and Feasibility Study for Urgent Flood Control and Urban Drainage in Semarang City and Suburbs". (refer to Fig. 1.1.1)

In the final report of the above study, three priority projects were proposed from the viewpoint of economic viability and urgent necessity of project realization. The proposed priority projects are:

(1) West Floodway/Garang River Improvement (including reconstruction of Simongan Weir);

(2) Construction of Jatibarang Multipurpose Dam on Kreo River; and,

(3) Urban Drainage System Improvement.

For the urgent realization of the proposed priority projects, the Government of Indonesia requested further technical assistance from the Government of Japan in 1996. JICA then decided to dispatch another study team to carry out the detailed design of the priority projects, and the study is named as "The Detailed Design of Flood Control, Urban Drainage and Water Resources Development in Semarang in the Republic of Indonesia" (hereinafter referred to as "the Study").

1.2 Objectives of the Study

The objectives of the Study are: to carry out the detailed design of the following three (3) components of the Study, which consist of (1) West Floodway/Garang River Improvement, (2) Construction of Jatibarang Multipurpose Dam, and (3) Urban Drainage System Improvement, and to pursue transfer of technical knowledge to the counterpart personnel in the course of the Study.

1.3 Study Area

The study area is administratively covered by Semarang City and Semarang Regency (Kabupaten) in Central Java Province, and is topographically included in Garang river basin and the central area of Semarang City.

1.4 Description of Project Component : West Floodway/Garang River Improvement

Previous Study

The flood control master plan was formulated under the JICA Study mentioned above for the six (6) rivers of Blorong River, Bringin River, Silandak River, West Floodway/Garang River, East Floodway and Babon River. Feasibility Study was, then, conducted for the selected priority project namely, River Improvement of West Floodway/Garang River and Construction of Jatibarang Multipurpose Dam on Kreo River..

The flood of January 1990 caused overflow along West Floodway/Garang River resulting in the enormous flood damage in Semarang City and suburbs. With this as a turning point, improvement of West Floodway/Garang River including reconstruction of Simongan Weir was taken up as the Urgent Project to facilitate the immediate formulation and implementation of necessary river improvement works.

According to the previous study, the planning criteria of flood control scheme for West Floodway/Garang River is as shown below.

	Master Plan	Priority Project	Urgent Project
Project Works	River improvement of West Floodway/Garang River (9.57 km) Construction of Jatibarang Dam and Mundingan Dam	River improvement of West Floodway/Garang River (9.57 km) Construction of Jatibarang Dam	River improvement of West Floodway/Garang River (9.57 km)
Project Scale	100-Year	100-Year	25-Year
Target Year	2015	2005	2000

Necessity of the Project

West Floodway/Garang River pass through the urban area of Semarang City, the largest city and the center of economic and social development in Central Java Province. The urban area of Semarang City is expanding every year with the rapid urbanization and, correspondingly, the damage inflicted by river floods has become more serious, hampering development and giving an adverse environmental impacts to the area.

For West Floodway/Garang River, the river improvement works focusing on earth dike and floodwall construction were almost completed in accordance with a 10 to 25-year return period floods. Still, fear of flood has not been overcome because of the potential high flood level of the channel. In addition, the possibility of recurrence of flood overflow of the river channel like the one in 1990 is still high.

Under the circumstances, the flood control project composed of improvement of West Floodway/Garang River and construction of Jatibarang multipurpose Dam has been given higher priority for implementation. Among the components, improvement of West Floodway/Garang River including Reconstruction of Simongan Weir is urgently required.

Study Area of the D/D

The river improvement work of West Floodway/Garan River is to be undertaken for the river stretch from the river mouth up to the confluence of Garang and Kreo rivers, amounting to about 9.6 km. Simongan Weir is located at about 5.4 km upstream point from the river mouth, and the downstream channel from the weir is called West Floodway.

1.5 Scope of the D/D Study

The D/D Study for the three (3) project components mentioned above was commenced in August 1997 and is scheduled to be completed in July 2000 with submission of the final reports for all components. Before the completion of the final reports, the draft final reports are to be prepared and submitted in accordance with the follow schedule.

Component	Date
(1) West Floodway/Gaarang River Improvement	Middle of September, 1999
(2) Urban Drainage System Improvement	End of November, 1999
(3) Construction of Jatibarang Multipurpose Dam	End of March, 2000

The D/D Study is divided into two phases, namely, (1) Definitive Plan and (2) Detailed Design.

The D/D Study is to consist of field and home office works. The flow of work is as illustrated in Fig. 1.5.1, and the details of scope of works are as outlined below.

Definitive Plan

The main study items of "Definitive Plan" are as follows:

(1) Data Collection and Compilation

(2) Review of Feasibility Study

(3) Aerophotograph/Mapping, Topographic and River Survey

(4) Geological and Soil Mechanics Survey

(5) Environmental/Social Impact Analysis, RKL, RPL and River Basin Management Plan

(6) Formulation of Basic Plan

(7) Basic Design

(8) Preliminary Construction Plan and Cost Estimate

(9) Socioeconomic Evaluation

(10) Preparation of Project Implementation Program

Detailed Design

The detailed design work includes the following items.

(1) Preparation of Design Criteria

(2) Detailed Design Work (Design Calculation and Drawings)

(3) Quantity Estimation

(4) Construction Plan

(5) Cost Estimate

(6) Operation and Maintenance Plan

(7) Organization and Institution

(8) Preparation of Prequalification, Tender Documents and Tender Drawings

Prequalification and tender documents are prepared after the preparation of detailed designs, and the tender documents includes the following:

(1) Invitation to Tender

(2) Instructions to Tenderers

(3) Form of Tender

(4) Form of Contract

(5) Specimens of Various Bonds

(6) Bill of Quantities

(7) General Conditions of Contract

(8) Special Conditions of Contract

(9) General Specifications

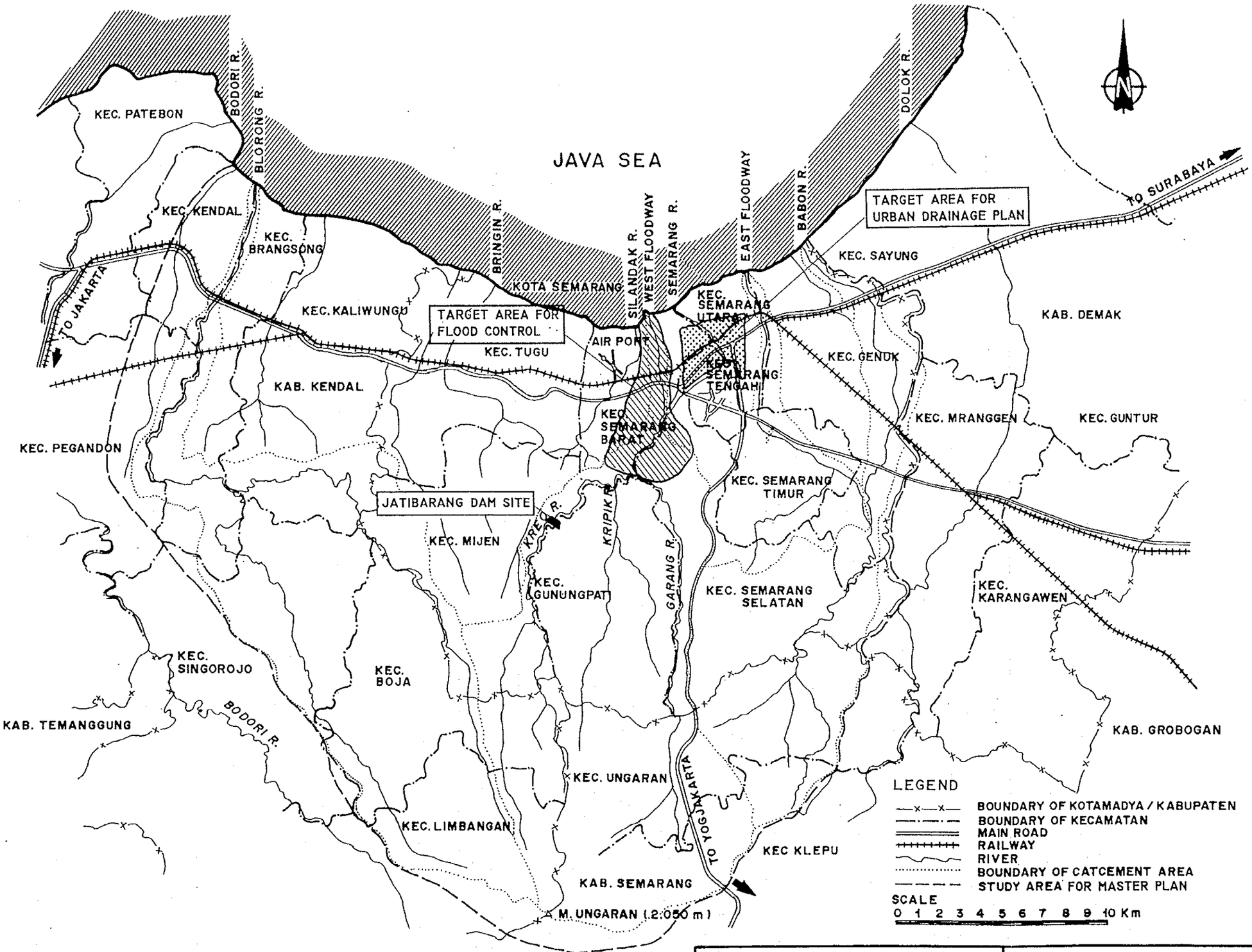
(10) Technical Specifications

(11) Tender Drawings

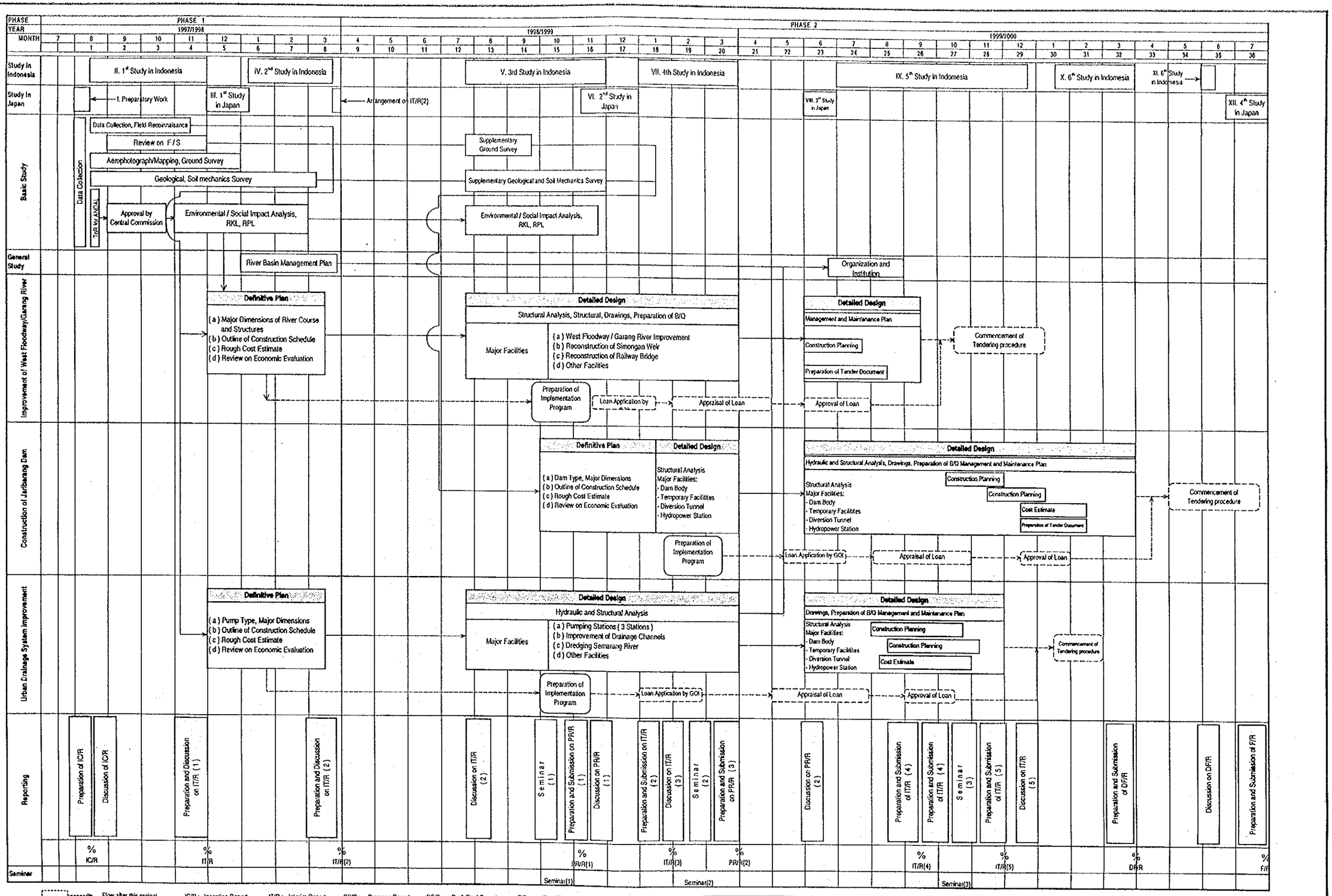
FIGURES

CHAPTER 1

INTRODUCTION



THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA	Fig. 1.1.1 STUDY AREA FOR MASTER PLAN AND FEASIBILITY STUDY ON FLOOD CONTROL AND URBAN DRAINAGE IN SEMARANG
JAPAN INTERNATIONAL COOPERATION AGENCY	



THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 1.5.1
FLOWCHART OF THE DETAILED DESIGN STUDY