

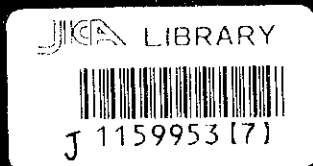
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

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

SUMMARY



AUGUST 2000

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

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1159953 [7]

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
 - VOLUME VII DATA BOOK
3. COMPONENT B : JATIBARANG MULTIPURPOSE DAM CONSTRUCTION
 - 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
 - VOLUME VII DATA BOOK
 - VOLUME VIII ANNEX
4. COMPONENT C : URBAN DRAINAGE SYSTEM IMPROVEMENT
 - VOLUME I MAIN REPORT
 - VOLUME II DESIGN NOTES
 - VOLUME III WORK QUANTITY CALCULATION
 - VOLUME IV CONSTRUCTION PLANNING
 - VOLUME V COST ESTIMATE
 - VOLUME VI DATA BOOK

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).

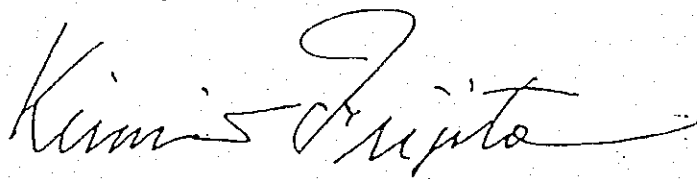
JICA selected and dispatched a study team headed by Mr. TOMIOKA Yoshiyuki of CTI Engineering International Co., Ltd. and constituted of members of CTI Engineering International Co., Ltd., Pacific Consultants International and Pasco International Inc., six times between August 1997 and June 2000. In addition, 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.

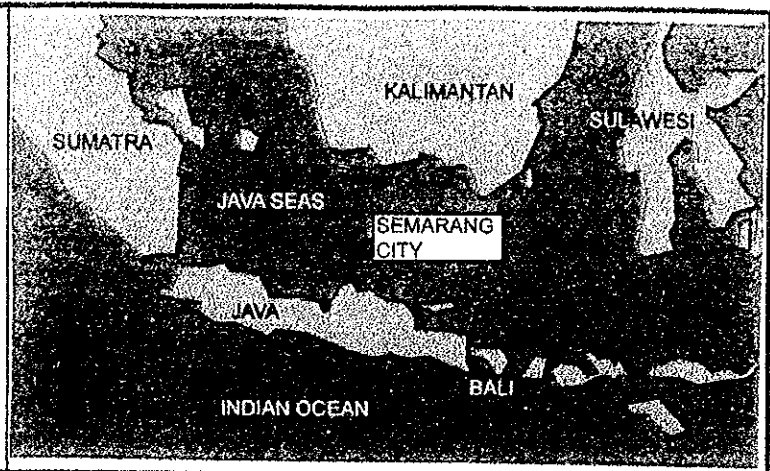
Very truly yours,



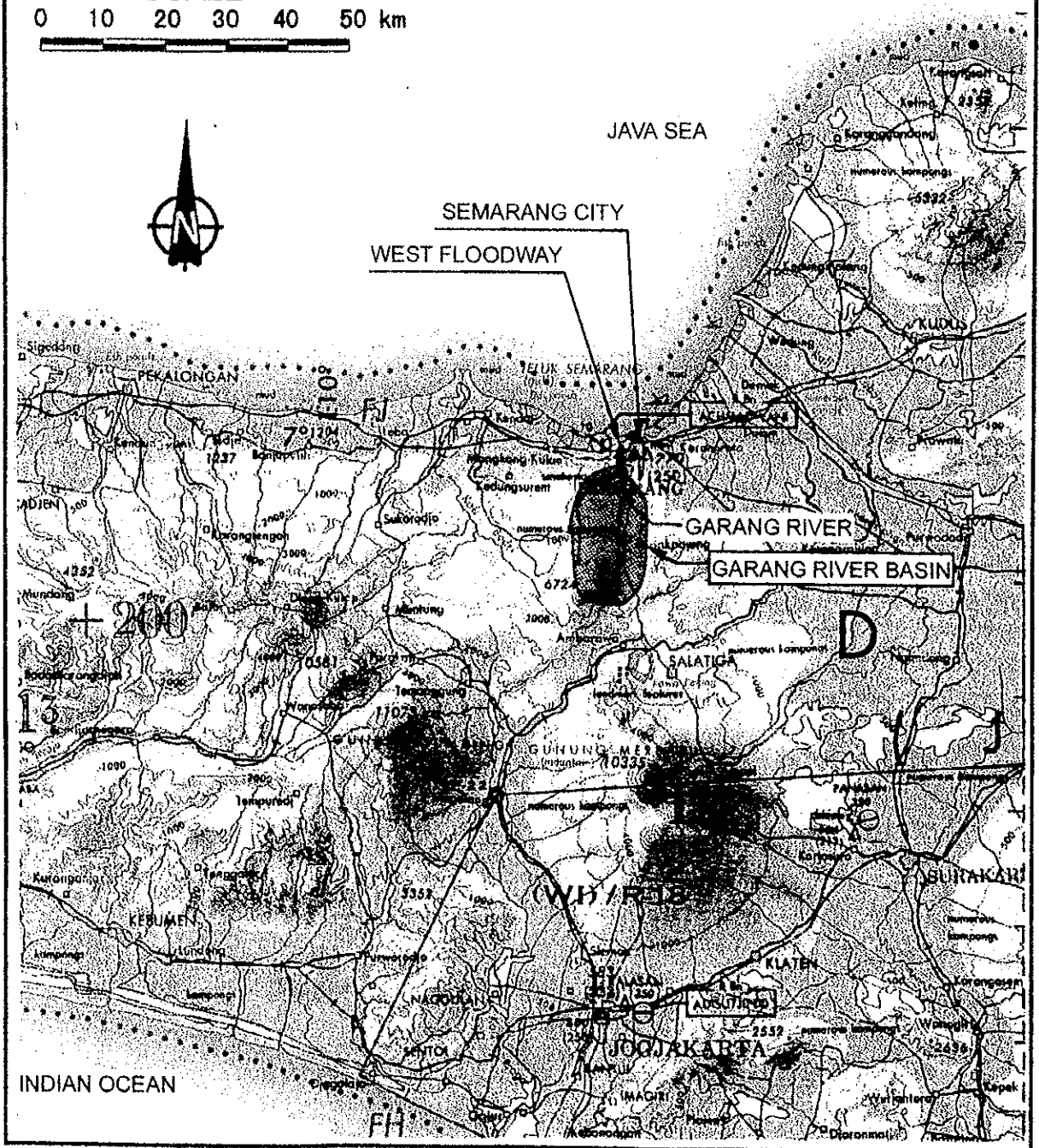
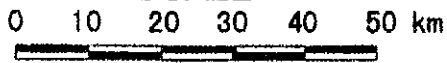
TOMIOKA Yosiyuki
Team Leader

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

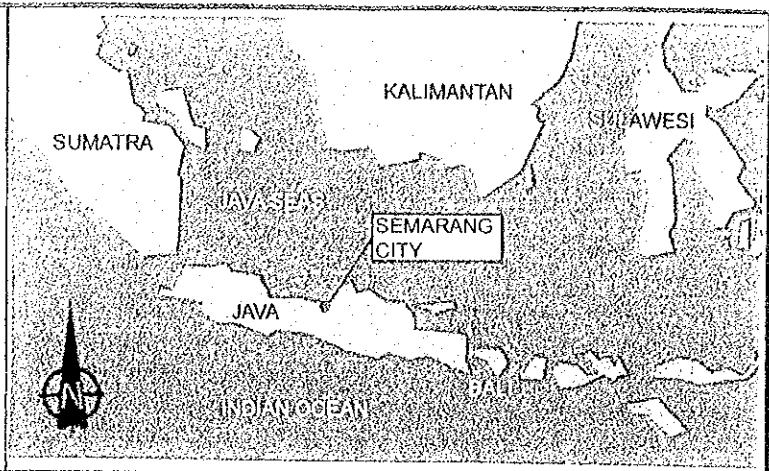
GENERAL MAP



SCALE

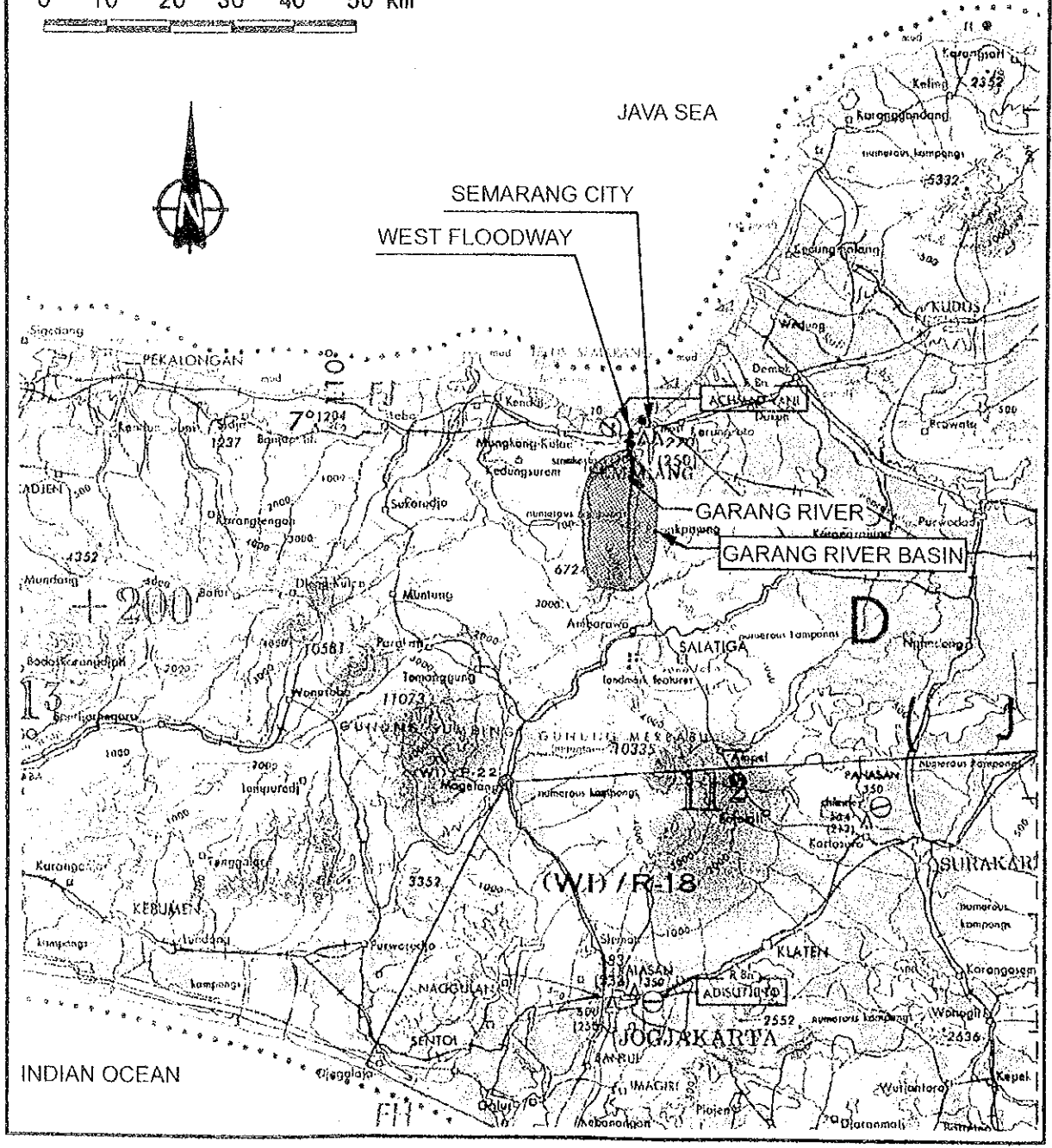


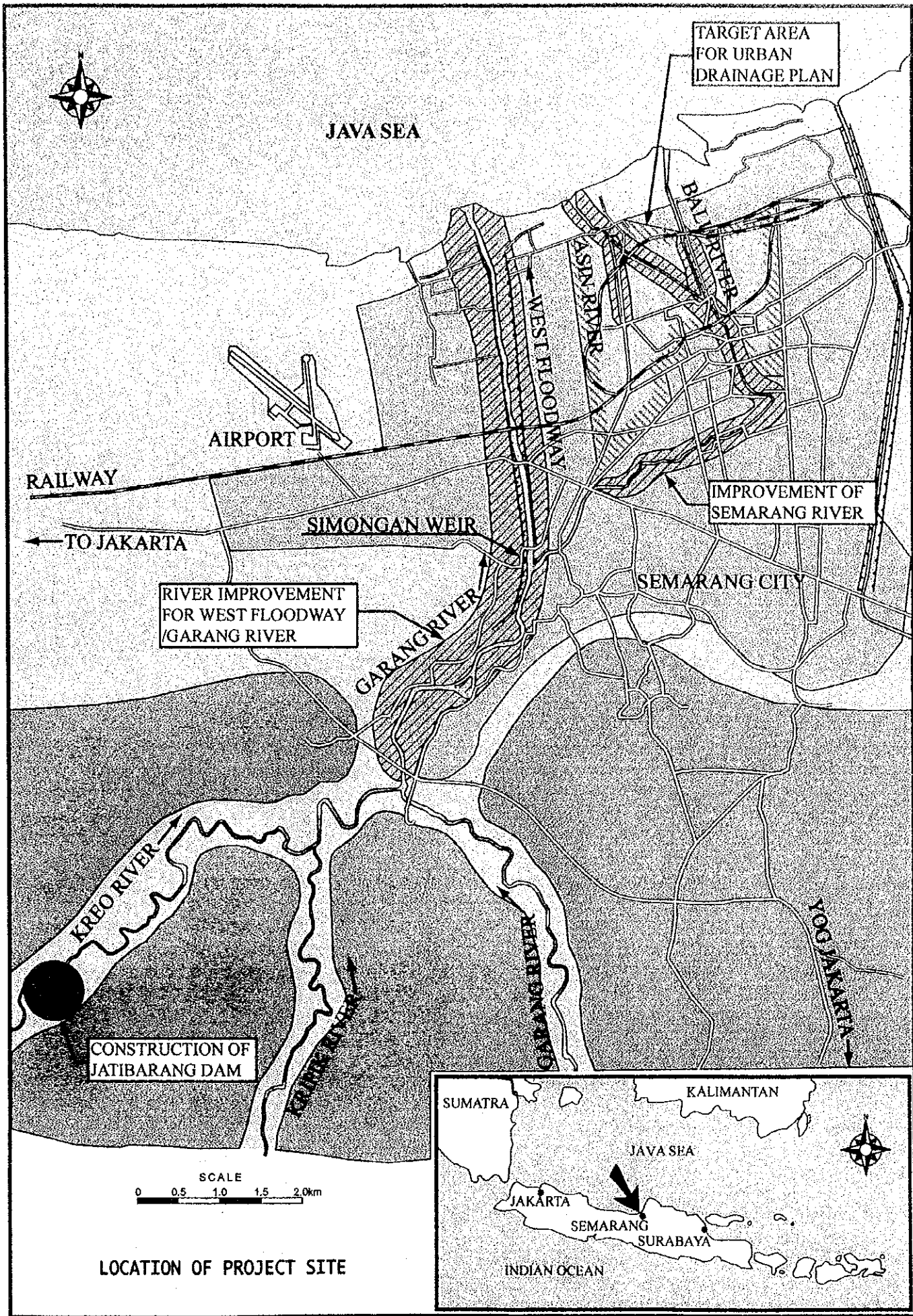
GENERAL MAP



SCALE

0 10 20 30 40 50 km





TARGET AREA FOR URBAN DRAINAGE PLAN

JAVA SEA



AIRPORT

RAILWAY

← TO JAKARTA

SIMONGAN WEIR

RIVER IMPROVEMENT FOR WEST FLOODWAY / GARANG RIVER

IMPROVEMENT OF SEMARANG RIVER

SEMARANG CITY

GARANG RIVER

WEST FLOODWAY

ASIN RIVER

BALLIK RIVER

KREO RIVER

CONSTRUCTION OF JATIBARANG DAM

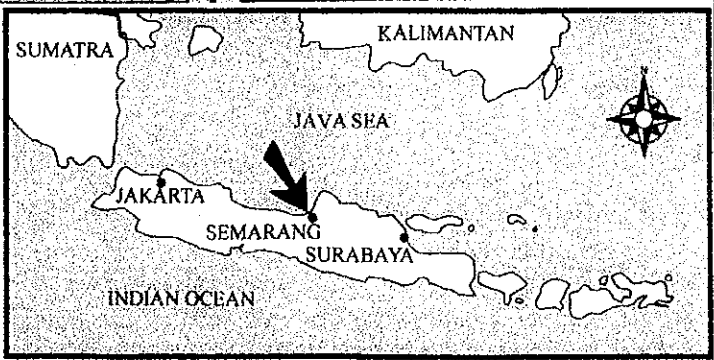
CEPAK RIVER

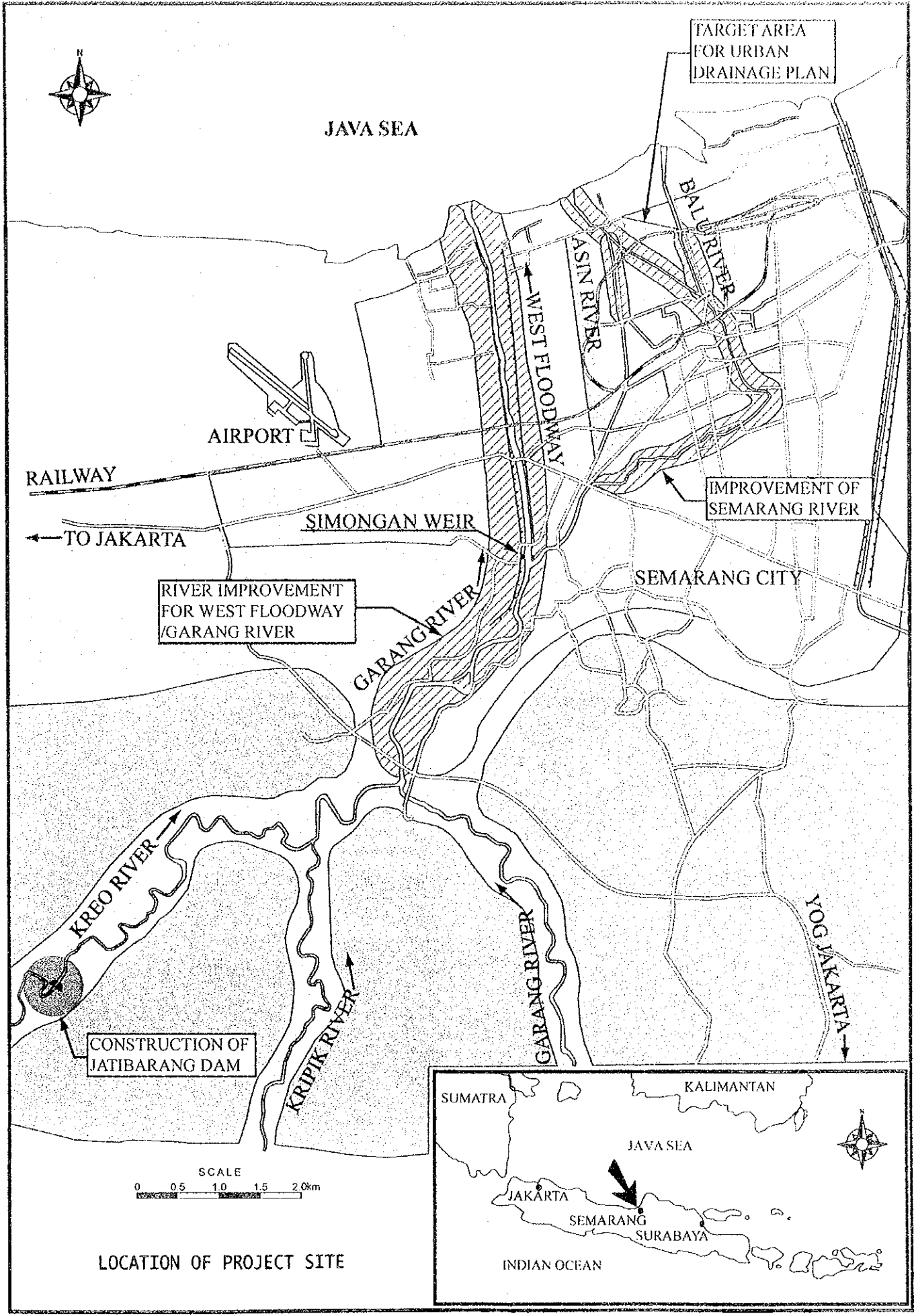
SEMARANG RIVER

BOG JAKARTIA

SCALE
0 0.5 1.0 1.5 2.0km

LOCATION OF PROJECT SITE





TARGET AREA FOR URBAN DRAINAGE PLAN

JAVA SEA



AIRPORT

RAILWAY

← TO JAKARTA

SIMONGAN WEIR

RIVER IMPROVEMENT FOR WEST FLOODWAY / GARANG RIVER

IMPROVEMENT OF SEMARANG RIVER

SEMARANG CITY

KREO RIVER

GARANG RIVER

ASIN RIVER

BALU RIVER

GARANG RIVER

KRIPIK RIVER

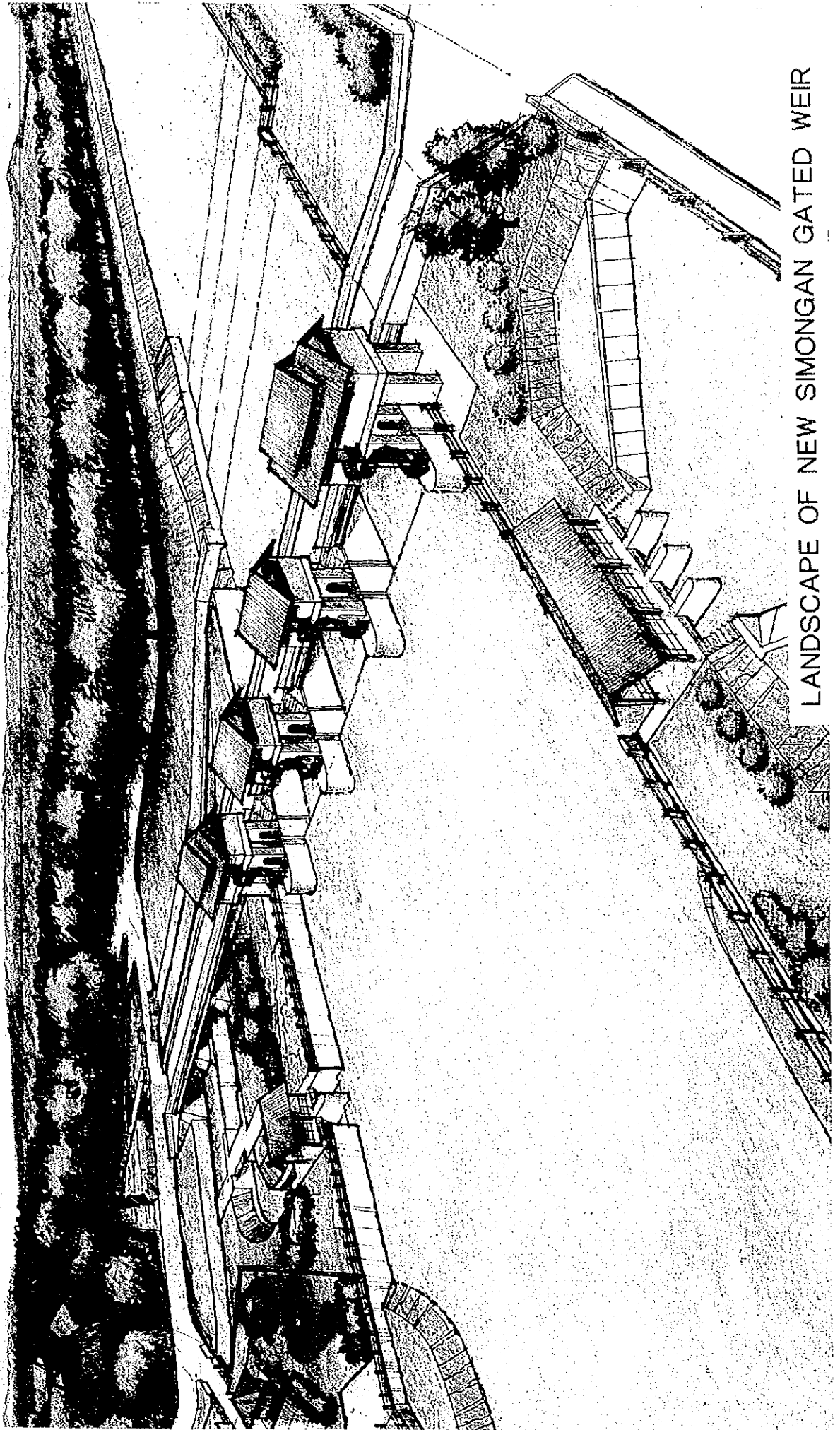
YOOG JAKARTA

CONSTRUCTION OF JATIBARANG DAM

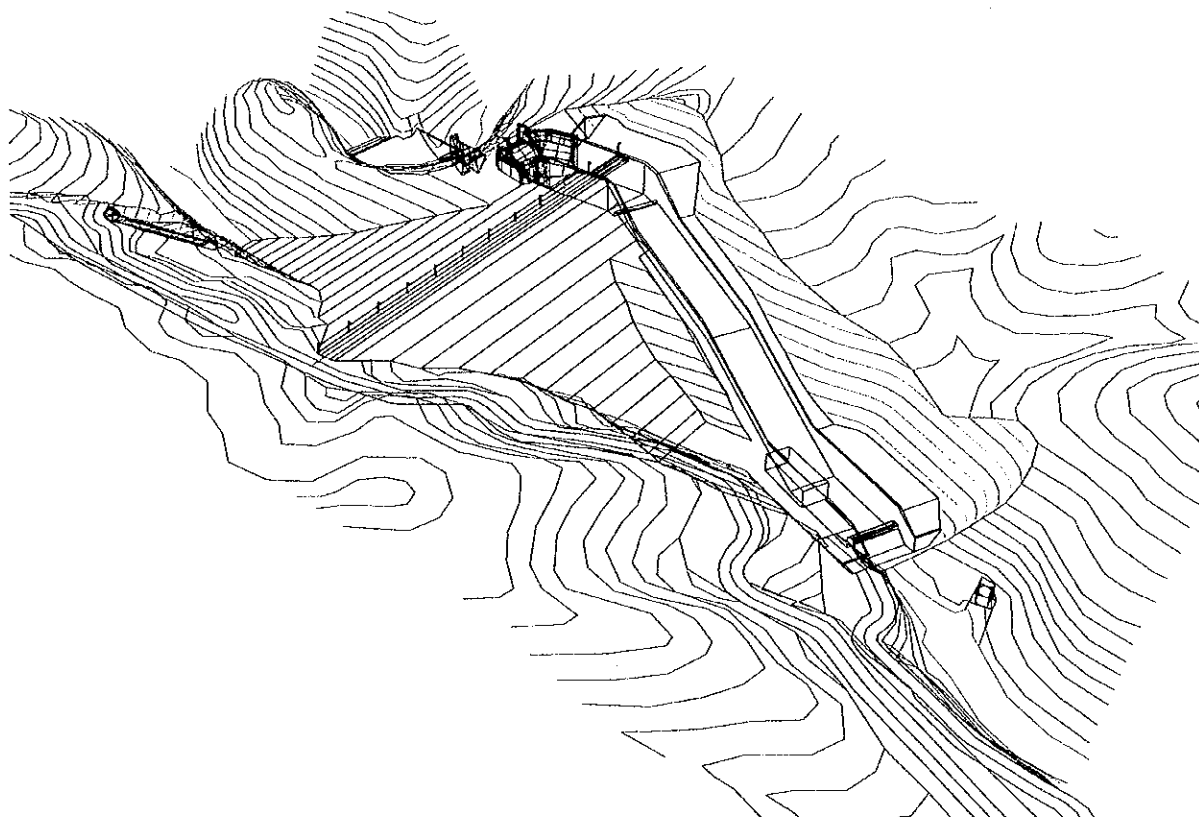
SCALE
0 0.5 1.0 1.5 2.0km

LOCATION OF PROJECT SITE

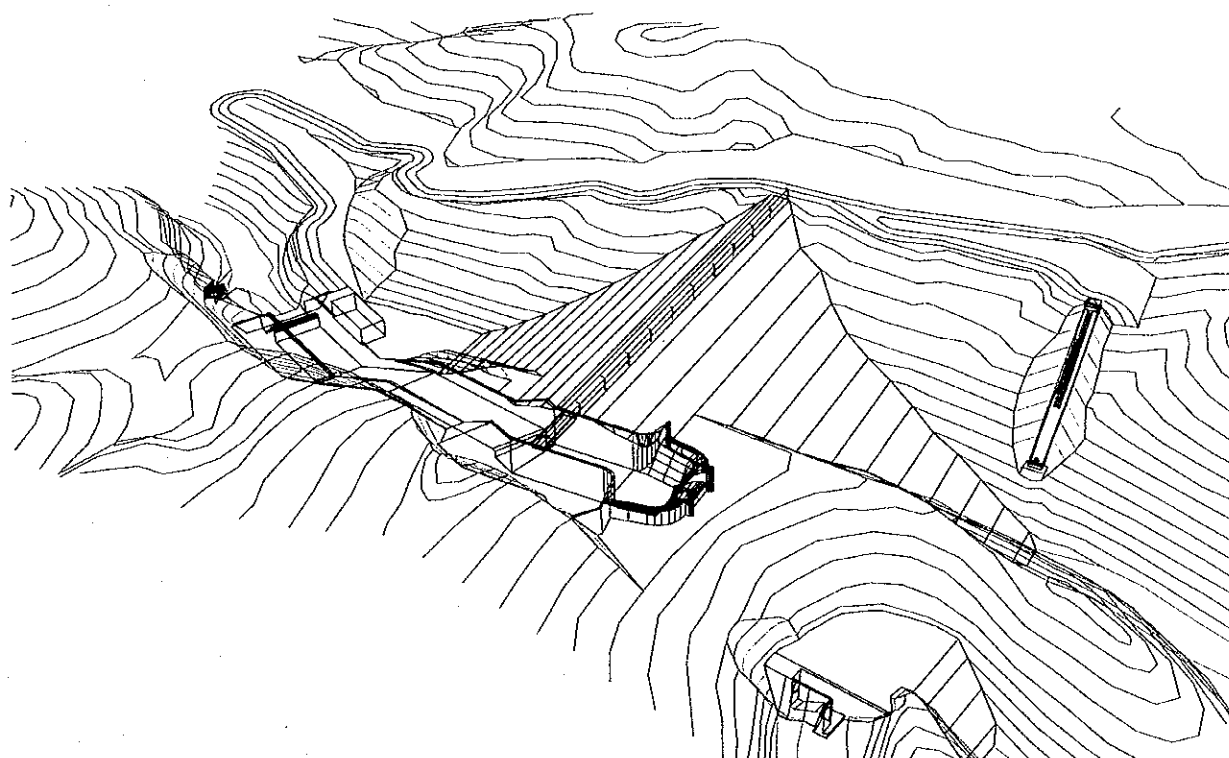




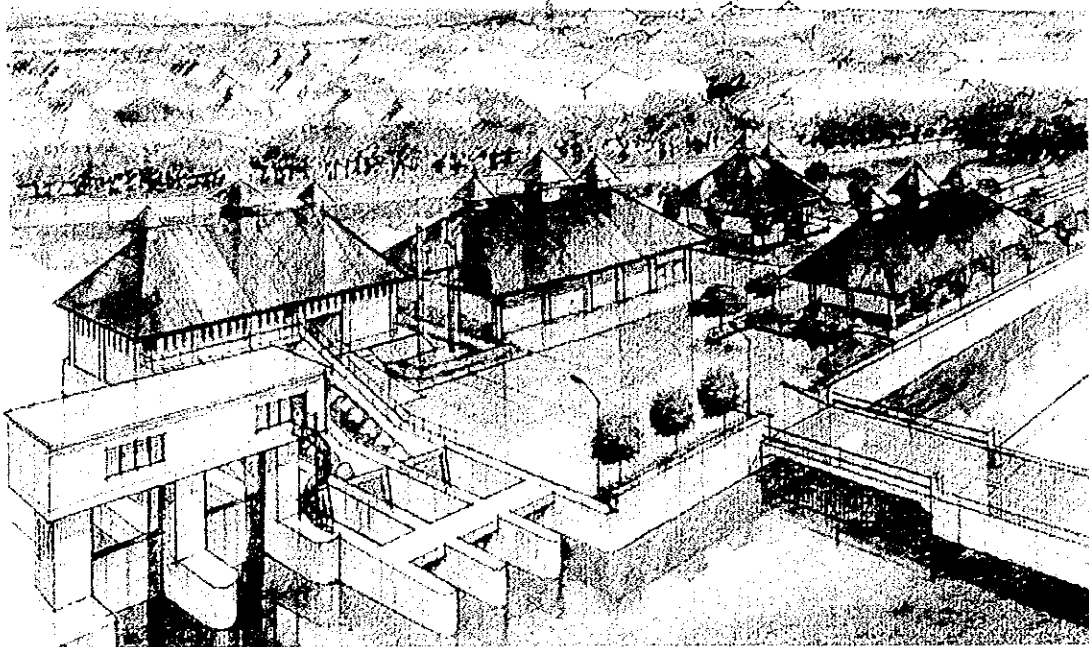
LANDSCAPE OF NEW SIMONGAN GATED WEIR



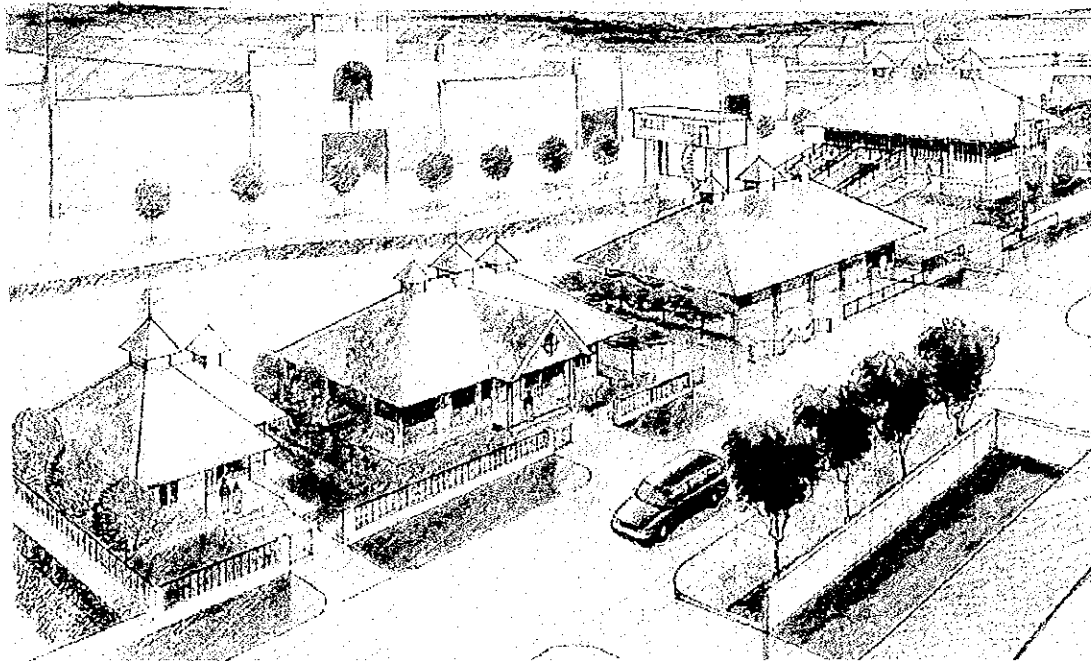
Downstream View of Jatibarang Multipurpose Dam



Upstream View of Jatibarang Multipurpose Dam



ASIN PUMPING STATION



BARU PUMPING STATION

EXECUTIVE SUMMARY

1 General

1.1 Background of Project

Semarang City, the capital of Central Java Province, had the population of 1,252,000 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 of water shortage will be aggravated 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. "The Master Plan on Water Resources Development and Feasibility Study for Urgent Flood Control and Urban Drainage in Semarang City and Suburbs" was prepared by Japan International Cooperation Agency (JICA) upon the request of the Indonesian Government in the period of 1992 to 1993.

For the urgent realization of the proposed priority projects selected in the Master Plan, 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. The study is named as "The Detailed Design of Flood Control, Urban Drainage and Water Resources Development in Semarang in the Republic of Indonesia"

1.2 Objectives of the Study

The objectives of the Study are to carry out the detailed design of the following three (3) components, (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 of which total area is estimated at about 217 km². (refer to Fig. ES-1)

2 Constitution of the Project

The project consists of three components, Component A: West Floodway/Garang River Improvement, Component B: Construction of Jatibarang Multipurpose Dam and Component

C: Urban Drainage System Improvement. (refer to Fig. ES-2)

3 Component A : West Floodway/Garang River Improvement

3.1 Flood Control Scheme

Garang River flows from Mt. Ungarang to the north, meeting its two (2) major tributaries, Kripik and Kreo rivers, about 12 km and 10 km upstream from the river mouth, respectively. (refer to Fig. ES-3)

The flood control for West Floodway/Garang River is composed of two schemes; (a) the improvement of West Floodway/Garang River including the reconstruction of Simongan Weir, and (b) the construction of Jatibarang Multipurpose Dam on Kreo River.

3.2 Objective Stretches to be Improved

The objective stretches to be improved on West Floodway/Garang River is 9.76 km between the river mouth and the confluence with Kreo River.

3.3 Design Scale and Design Discharge for Flood Control

After the completion of Jatibarang Multipurpose Dam, the design scale of West Floodway/Garang River Improvement is 100-year return period and the design discharge is 790 m³/s at Simongan Weir. The improved river channel will be able to accommodate floods of 25-year return period or less before the completion of Jatibarang Multipurpose Dam.

3.4 Reconstruction of Simongan Weir

Simongan Weir, which was constructed at the end of 19th century during the Dutch colonial period at about 5.3 km upstream from the river mouth, is the major river structure of Garang River diverting river water to Semarang River.

Since existing Simongan Weir is fixed type weir, it is an obstacle structure at the time of floods. In association with the improvement of West Floodway/Garang River, the weir is to be reconstructed to a gated weir so that the weir is able to pass flood discharge by lifting gate leaves. After the termination of flood discharge, the gate leaves are closed to keep water level in the upstream of the weir for water intake by PDAM or to divert flow to Semarang River.

3.5 Other Structures to be Constructed / Reconstructed

In accordance with the improvement works of the river course, such structures are designed to be constructed/reconstructed as railway bridge raising, revetment, groins, groundills and drainage sluices.

3.6 Construction Plan

Packaging

The works of West Floodway/Garang River Improvement are divided into three (3) contractual packages, namely West Floodway and Garang River Improvement Works (Package-1), Reconstruction of Simongan Weir (Package-2) and Raising of Railway Bridge over West Floodway (Package-3).

Construction Period

The all works of the West Floodway/Garang River Improvement, Reconstruction of Simongan Weir and Raising the existing Railway Bridge are executed with the construction period of 34 months.

4 Component B : Jatibarang Multipurpose Dam Construction

4.1 Functions of Jatibarang Multipurpose Dam

Jatibarang Multipurpose Dam aims at providing multiple functions of flood control, water supply and hydropower generation. The Jatibarang reservoir has a function of flood control to reduce the standard flood discharge of 1,010 m³/s to the design flood discharge of 790 m³/s at Simongan Weir which is equivalent to 100-year probability.

While the Jatibarang reservoir has another function of municipal water supply to Semarang City which amounts 2.69 m³/s including present use. When the reservoir water is released from the dam for water supply, the released water is used for hydropower generation with the installed capacity of 1,560 kW.

4.2 Location of the Dam

Jatibarang Multipurpose Dam is planned on Kreo River which is one of major tributaries of Garang River about 23 km upstream from the river mouth of West Floodway as shown in Fig. ES-3.

4.3 Dam Type

Taking topographical and geological conditions into account, the type of Jatibarang Multipurpose Dam is decided as the center core rockfill dam.

4.4 Major Dimensions of Dam and Reservoir

The major dimensions of Jatibarang Multipurpose Dam designed are summarized as below.

Crest Level	EL. 157.0 m
Foundation Level	EL. 80.0 m
Dam Height	77.0 m
Crest Length	200.0 m
Upstream Slope	1 : 2.6
Downstream Slope	1 : 1.8
Embankment Volume	800,000 m ³
Reservoir Capacity	20,400,000 m ³

4.5 Appurtenant Structures of the Dam

Spillway

A spillway which has capacities to regulate flood of 100-year probability by 790 m³/s at Simongan Weir and to discharge a probable maximum flood (PMF) of 1,600 m³/s is planned on the left abutment of the dam.

Diversion Tunnel

To divert floods to the downstream of the dam site during the construction period, a diversion tunnel is designed on the left bank of the dam. It has a capacity to discharge 280 m³/s equivalent to 25-year return period. The internal diameter of the tunnel is 5.6 m and the length is 441m.

Outlet Facilities for Water Use

To release reservoir water for municipal water supply, outlet facilities are planned on the right bank of the dam. The structures of the outlet facilities consist of an inclined intake and an steel outlet pipe with the diameter of 1.4 m and the length of 393 m. The outlet pipe is installed in the outlet tunnel whose internal diameter is 2.4 m.

4.6 Construction Plan

Packaging

The works of Jatibarang Multipurpose Dam Construction on Kreo River are divided into two (2) packages, namely Jatibarang Multipurpose Dam including Appurtenant Structures (Package-1) and Operation and Maintenance Buildings and Goa Kreo Bridge (Package-2).

Construction Period

The all works of Jatibarang Multipurpose Dam Construction are executed with the construction period of 44 months.

5 Component C : Urban Drainage System Improvement

5.1 Objective Area for Improvement

The objective area for the Urban Drainage System Improvement is the central Semarang City with the total area of 12.835 km² as shown in Figs. ES-2 and ES-4.

5.2 Urban Drainage System Improvement Scheme

The objective area is divided further into two areas by the topographical conditions, a gravity drainage area with 6.220 km² and a pump drainage area with 6.615 km². The storm water in the gravity drainage area is planned to be drained by gravity through Semarang River and the one in the pump drainage area be drained by pumps.

The main work items in this component are the improvement of the existing main drainage channels in the objective area and the construction of pumping stations and appurtenant structures.

5.3 Design Scale

The rainfall intensity-duration with 2-year and 5-year return periods are employed in accordance with the area of each sub-basin for the hydraulic design of channel improvement. Consecutive 12 hours rainfall with 5-year return period is applied as the design rainfall for the pump drainage plan.

5.4 Drainage Channel Improvement

The main drainage channels, Semarang, Asin and Baru rivers are to be improved. Semarang River drains storm water mainly from the gravity drainage area. Asin and Baru rivers collect storm water from the pump drainage area and introduce to pumping stations planned in this Project. The total length of the channels to be improved is 9.3 km.

5.5 Construction of Drainage Pumping Station

At the downstream end of Asin and Baru rivers, two pumping stations, Asin and Baru Pumping Stations, are planned to be constructed to drain storm water from the pump drainage areas. The installed capacities and the numbers of pump units of each station are:

	Installed Capacity	Pump Unit
Asin Pumping Station	9.0 m ³ /s	3 units
Baru Pumping Station	4.6 m ³ /s	2 units

Together with the pumping stations, retarding ponds are provided for each pumping station to reduce the capacity of pump equipment. The retarding ponds are designed to have enough

storage capacity in combination with pump capacity. The capacities of each retarding pond are:

Asin Retarding Pond	24,000 m ³
Baru Retarding Pond	9,000 m ³

5.6 Construction Planning

Packaging

The component of the Urban Drainage System Improvement consists of three (3) packages, the Semarang River Drainage System Improvement (package 1), the Asin River Drainage System Improvement (Package 2) and the Bandarharjo Drainage System Improvement (Package 3).

Construction Period

The all works of Urban Drainage System Improvement are executed with the construction period of 40 months.

6 Project Cost

6.1 Constitution of Project Cost

Project cost is composed of such items as follows:

- Construction Base Cost
- Engineering Service Cost
- Compensation Cost
- Administration Cost
- Physical Contingency
- Price Contingency
- Value Added Tax

6.2 Conditions of Project Cost Estimate

The cost estimate is made on the price level as of the end of July 1999. The foreign exchange rate applied to the cost estimate is US\$ 1.0 = Rp. 6,885 and ¥1.0 = Rp. 60.39 formally issued by the Bank of Indonesia at that time.

6.3 Result of Project Cost Estimate

The project costs of each component and total amount are shown in the table below.

Cost Item	Unit	Component A West Floodway/ Garang River Improvement	Component B Jatibarang Multipurpose Dam Construction	Component C Urban Drainage System Improvement	Total
Construction Base Cost	Rp.x10 ⁶	208,995	332,533	150,531	692,059
Engineering Service Cost	Rp.x10 ⁶	18,170	33,372	12,019	63,561
Compensation Cost	Rp.x10 ⁶	710	13,500	4,793	19,003
Administration Cost	Rp.x10 ⁶	14,679	24,222	10,873	49,774
Physical Contingency	Rp.x10 ⁶	13,673	37,940	10,041	61,654
Price Contingency	Rp.x10 ⁶	37,489	88,509	31,302	157,300
Value Added Tax	Rp.x10 ⁶	27,554	48,218	20,083	95,855
Total	Rp.x10 ⁶	321,270	578,294	239,642	1,139,206
	Yenx10 ⁶	5,320	9,576	3,968	18,864
	US\$x10 ³	46,662	83,993	34,806	165,461

7 Project Evaluation

The economic viability of the project is assessed in terms of Economic Internal Rate of Return (EIRR), Benefit Cost Ratio (B/C) and Net Present Value (NPV). The economic evaluation is made for the Flood Control, Water Resources Development, Urban Drainage and Hydropower Generation sectors and the results of the evaluation are summarized in the table below.

Sector	EIRR (%)	B/C	NPV (Rp.x10 ⁶)
Flood Control	19.77	1.78	72,201
Water Resources Development	22.14	2.08	51,963
Urban Drainage	15.13	1.29	15,317
Hydropower Generation	11.66	0.97	-339
Overall Project	18.81	1.68	139,142
Jatibarang Multipurpose Dam *1	18.53	1.66	58,938

Note *1: Sector of Jatibarang Multipurpose is composed of a part of Flood Control sector, Water Resources Development Sector and Hydropower Generation Sector.

8 Environmental Impact Assessment

8.1 Approval of Environmental Assessment

The study on environmental impact analysis was conducted taking account of the importance for the protection of natural and social environment during this detailed design (D/D) study period. The following reports were duly prepared and submitted to the Central Committee (KOMPUS) of the government of Indonesia and approved in August 1999.

- (1) Terms of Reference of the Environmental Impact Statement (KA-ANDAL)
- (2) Environmental Impact Assessment (ANDAL)
- (3) Environmental Management Plan (RKL)
- (4) Environmental Monitoring Plan (RPL)

8.2 Natural Environmental Aspect

The study area covers 204 km² as a whole catchment area of Garang River and about 13 km² for the urban drainage, of which most of the part lie in the jurisdiction of Semarang City (Kotamadya), so the area has been already developed in terms of social infrastructure due to the predominant influence of urban environment. In other word, natural forest no longer exists in the study area to provide for wild animals' habitat or refuge. Regenerated woods can be seen instead after natural vegetation covers have been intensively eliminated by cutting trees and fires. Under these circumstances, there is no endangered species of fauna nor protected flora.

8.3 Social Environmental Aspect

Land acquisition and resettlement are considered to be the most significant issues. The required land is scattered as the project is composed of three major components with different characteristics. River improvement and urban drainage schemes, for example, needs to consider resettlement plan for affected people resulting from house evacuation. Meanwhile, dam will affect wider area of farmland and woods in and around the proposed reservoir site. The area of land acquisition and number of houses to be resettled are summarized as below:

Component	Land Acquisition	House Evacuation
A: West Floodway/Garang River Improvement	2.6 ha	2 units
B: Jatibarang Multipurpose Dam Construction	150.0 ha	-
C: Urban Drainage System Improvement	4.7 ha	3 units
Total	157.3 ha	5 units

9 River Basin Management Plan

The concept of river basin management is essential to protect river courses from bank erosion or sediment and river structures from deterioration of their functions. Therefore, to maintain the functions of the proposed and the designed river and drainage channel courses and/or structures in the Project, the management of the Garang river basin is considerably important as well as the implementation of the Project.

9.1 Present Basic Issues

The major issues with regard to the river basin management are abstracted as follows:

- (a) Land subsidence caused by uncontrolled deep well drilling,
- (b) Establishment of sewerage treatment system,
- (c) Establishment of treatment system for industrial waste water,
- (d) Solid waste disposal system,
- (e) Uncontrolled development of housing complex and other purposes,
- (f) Uncontrolled sand and gravel mining in the river courses, and
- (g) Disposal of sludge to Garang River by the purification plant of PDAM.

9.2 Countermeasures for Issues

Long term and short term approaches can be considered for effectively and economically viable measures, and strategically the management practice can be split into two types such as structural and nonstructural measures. Setting target years for 2003 for short term and 2008 for long term, measures and practices for the River Basin Management are described as follows:

Strategic Approaches and Measures (Short Term)

Structural Measures	Nonstructural Measures
<ul style="list-style-type: none"> - Installation of septic tanks - Construction of new sanitary land-fill site - Procurement of garbage collection equipment - Reforestation by rapidly growing vegetation - Soil erosion control by runoff collection basin - Improvement of PDAM sediment discharge system 	<ul style="list-style-type: none"> - Inter-institutional coordination and collaboration - Strengthening of solid waste control and management system - Enforcement of monitoring system for both river water quality and industrial waste discharge - Establishment of penalty law for waste disposal - Monitoring of land subsidence and groundwater level - Study on hydrological balance to determine optimum groundwater abstraction - Revision of regulation for Water Pollution Control PP20/1990 to include groundwater - Strict control and management for groundwater development - Control of land/housing development in the upper basin

Strategic Approaches and Measures (Long Term)

Structural Measures	Nonstructural Measures
<ul style="list-style-type: none"> - Surface water resources development - Installation of public sewerage system and treatment plant - Installation or improvement of treatment plants for industrial wastes - Reforestation and vegetation coverage in developed land - Construction of check dams (Sabo Dam) - Gully erosion control by means of terracing work 	<ul style="list-style-type: none"> - Enhancement of public awareness of environment - Improvement of raw water quality to clear the standards to full satisfaction - Upraising of garbage collection rate to 90 % - Establishment of law or regulation for "polluter's pay principle" - Government subsidy system for private companies or persons - Prohibition of quarry operation in the river - Dredging Work at an intersection point

10 Implementation of Project

10.1 Project Component

The Project consists of three (3) components, (1) West Floodway / Garang River Improvement, (2) Jatibarang Multipurpose Dam Construction and (3) Urban Drainage System Improvement.

10.2 Executing Office

The organization of the Central Government of Indonesia was drastically changed in October 1999. As of August 2000, the responsible offices for the implementation of the Project would be the Directorate General of Rural Development for components (1) and (2), and the Directorate General of Urban Development for component (3), Ministry of Settlement and Regional Development (KIMBANGWIL).

10.3 Executing Method

The implementation of the Project is expected to be undertaken under the financial assistance by a foreign developed country. Therefore, the procedure of the implementation will follow to a guideline of a financial assistance agency of the country as well as the laws and regulations of the Government of Indonesia.

10.4 Implementation Schedule of Project

The major process and its presumed schedule for the implementation is tabulated as below:

Component A: West Floodway/Garang River Improvement

Major Work Item	Period
1. Detailed Design	
1-1. Detailed Design including Tender Documents	Aug. 1997 - Mar. 2000
1-2. Approval on ANDAL and RKL/RPL	Aug. 1999
2. Construction of the Project	
2-1. Package 1	Apr. 2001 - Nov. 2003
2-2. Package 2	Feb. 2001 - Oct. 2003
2-3. Package 3	Apr. 2001 - Oct. 2002

Component B: Jatibarang Multipurpose Dam Construction

Major Process	Period
1. Detailed Design	
1-1. Detailed Design including Tender Documents	Aug. 1997 - Aug. 2000
1-2. Approval on ANDAL and RKL/RPL	Aug. 1999
2. Construction of the Project	
2-1. Package 1	Apr. 2001 - Dec. 2004
2-2. Package 2	Apr. 2002 - Apr. 2004

Component C: Urban Drainage System Improvement

Major Work Item	Period
1. Detailed Design	
1-1. Detailed Design including Tender Documents	Aug. 1997 - Aug. 2000
1-2. Approval on ANDAL and RKL/RPL	Aug. 1999
2. Construction of the Project	
2-1. Package 1	Jan. 2002 - Oct. 2003
2-2. Package 2	Jan. 2001 - Apr. 2004
2-3. Package 3	Jan. 2001 - Apr. 2004

10.5 Fund Requirement**Project Cost and Eligible Cost**

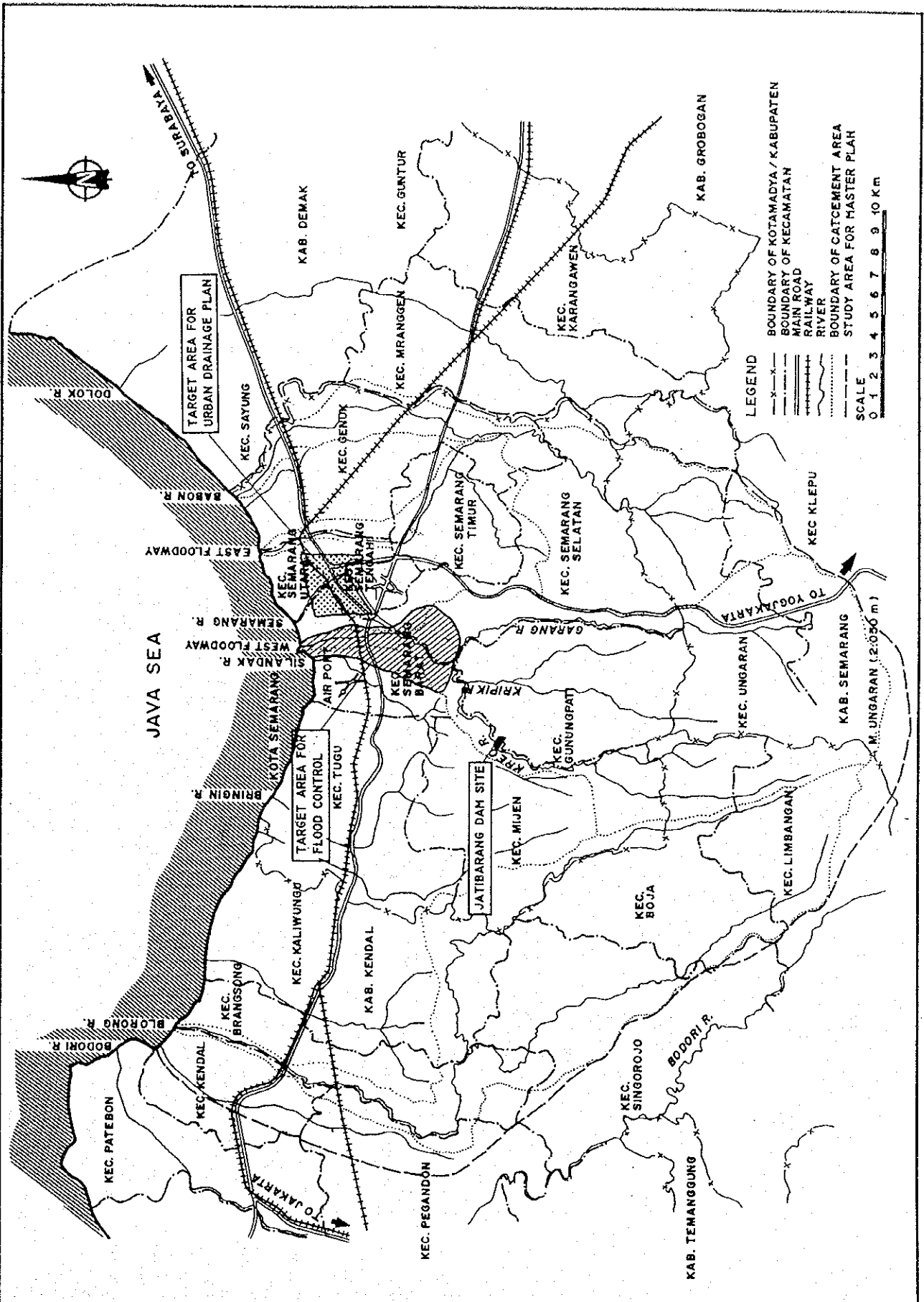
The project cost and the eligible cost of three (3) components are summarized as below:

Component	Project Cost		Eligible Cost		
	(million Rp)	(million ¥)	(million Rp)	(million ¥)	%
A West Floodway /Garang River Improvement	321,270	5,320	275,544	4,562	85.8
B Jatibarang Multipurpose Dam Construction	578,294	9,576	482,180	7,984	83.4
C Urban Drainage System Improvement	239,642	3,968	200,835	3,325	83.8
Total	1,139,206	18,864	958,559	15,871	84.1

Disbursement Schedule

Annual disbursement schedule for the Project is prepared in accordance with the implementation schedule as presented in the following table.

Component	(million ¥)					
	2000	2001	2002	2003	2004	Total
A West Floodway /Garang River Improvement	18	1,782	2,112	1,408	0	5,320
B Jatibarang Multipurpose Dam Construction	14	1,381	1,662	2,680	3,839	9,576
C Urban Drainage System Improvement	7	712	2,040	1,209	0	3,968
Total	39	3,875	5,814	5,297	3,839	18,864

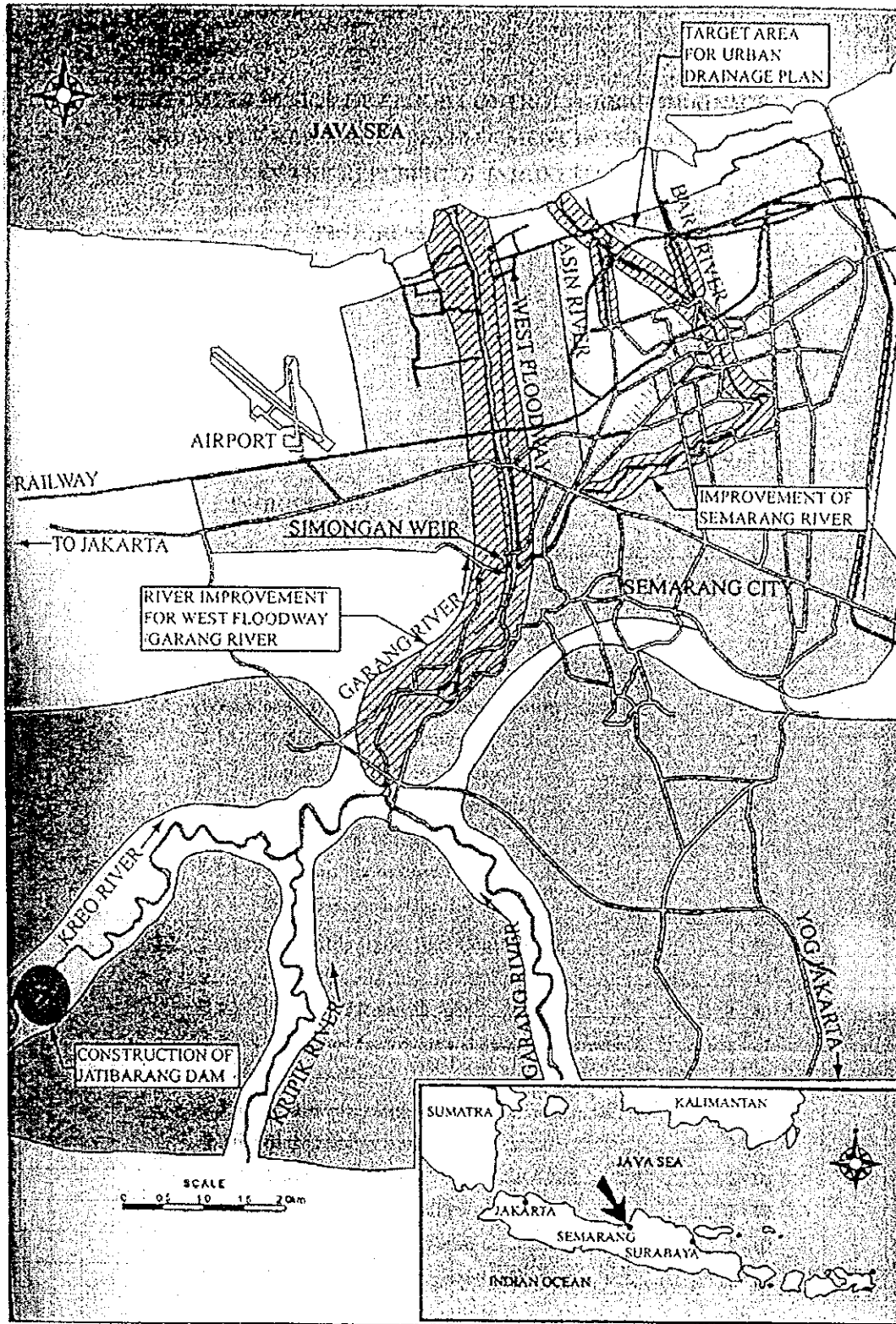


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. ES-1

Study Area for Master Plan and Feasibility Study on Flood Control and Urban Drainage in Semarang

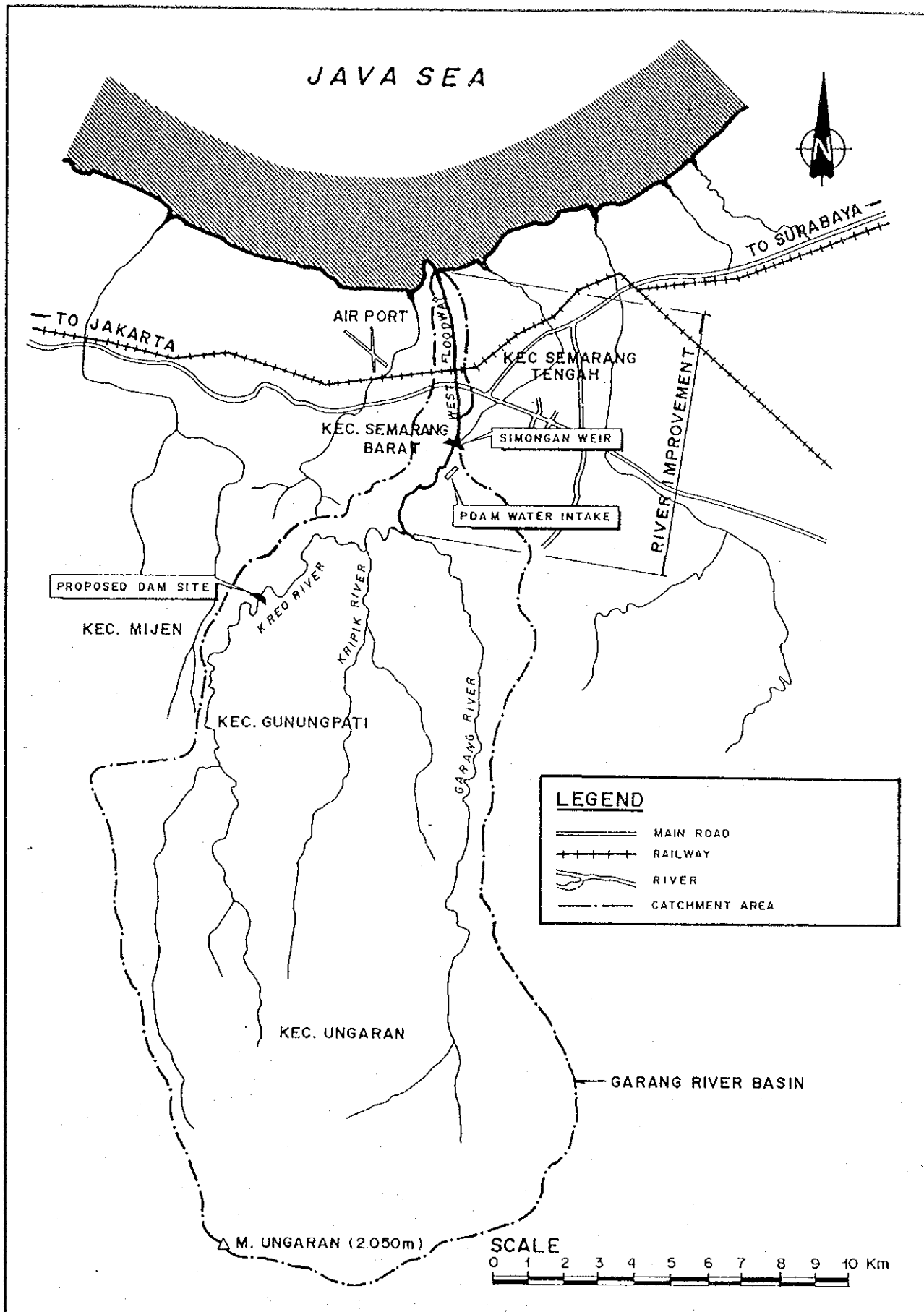


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

Fig. ES-2

STUDY AREA FOR DETAILED DESIGN

JAPAN INTERNATIONAL COOPERATION AGENCY

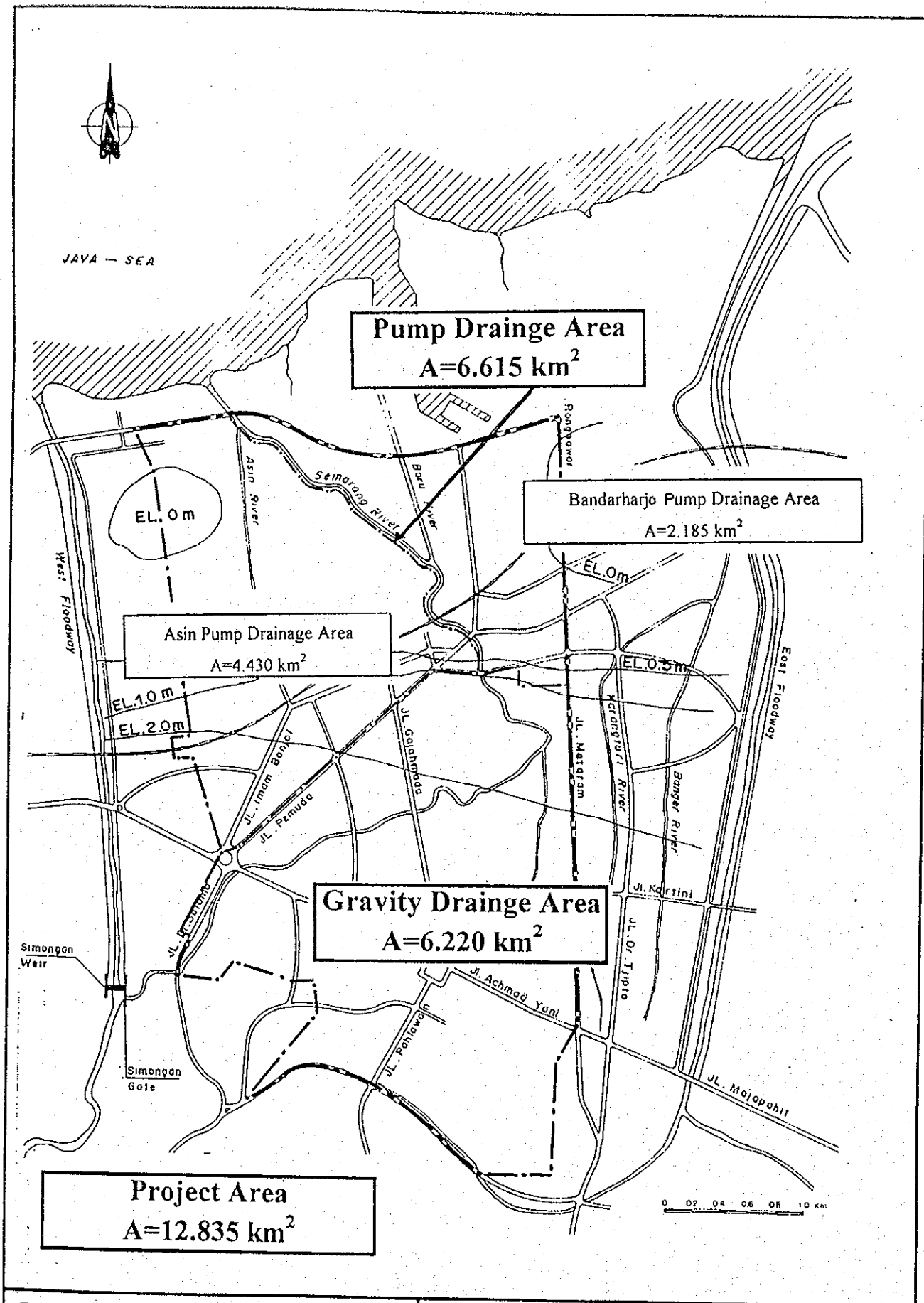


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. ES-3

Existing Garang River System



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

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. ES-4

STUDY AREA FOR URBAN DRAINAGE SYSTEM IMPROVEMENT

FINAL REPORT SUMMARY

TABLE OF CONTENTS

PREFACE

LETTER OF TRANSMITTAL

GENERAL MAP

LOCATION OF PROJECT SITE

SCENIC SKETCH

EXECUTIVE SUMMARY

	<u>Page</u>
CHAPTER 1 INTRODUCTION	
1.1 Background	1 - 1
1.2 Objectives of the Study	1 - 1
1.3 General Conditions of Study Area	1 - 2
CHAPTER 2 CONSTITUTION OF THE PROJECT -----	2 - 1
CHAPTER 3 COMPONENT A : WEST FLOODWAY / GARANG RIVER IMPROVEMENT	
3.1 Natural Conditions	3 - 1
3.2 Formulation of Definitive Plan	3 - 3
3.3 Detailed Design	3 - 6
3.4 Construction Plan	3 - 11
3.5 Operation and Maintenance	3 - 13
CHAPTER 4 COMPONENT B : JATIBARANG MULTIPURPOSE DAM CONSTRUCTION	
4.1 Present Condition of Study Area	4 - 1
4.2 Formulation of Definitive Plan	4 - 3
4.3 Detailed Design	4 - 11
4.4 Construction Plan	4 - 13
4.5 Operation and Maintenance	4 - 17

**CHAPTER 5 COMPONENT C : URBAN DRAINAGE SYSTEM
IMPROVEMENT**

5.1	Present Condition of Study Area	5 - 1
5.2	Formulation of Definitive Plan	5 - 4
5.3	Detailed Design	5 - 7
5.4	Construction Planning	5 - 10
5.5	Operation and Maintenance of Facilities	5 - 16

CHAPTER 6 PROJECT COST

6.1	Composition of Project Cost	6 - 1
6.2	Conditions of Project Cost Estimate	6 - 1
6.3	Result of Project Cost Estimate	6 - 1

CHAPTER 7 PROJECT EVALUATION

7.1	General	7 - 1
7.2	Methodology	7 - 1
7.3	Economic Evaluation	7 - 1

CHAPTER 8 ENVIRONMENTAL IMPACT ASSESSMENT

8.1	Clearance of Environmental Issue	8 - 1
8.2	Natural Environment Aspect	8 - 1
8.3	Social Environmental Aspect	8 - 2
8.4	Environmental Management Plan	8 - 4
8.5	Environmental Monitoring Plan	8 - 4

CHAPTER 9 ORGANIZATION FOR MAINTENANCE AND OPERATION

9.1	West Floodway / Garang River	9 - 1
9.2	Jatibarang Multipurpose Dam	9 - 1
9.3	Urban Drainage Facilities	9 - 1

CHAPTER 10 RIVER BASIN MANAGEMENT PLAN

10.1	Basic Issues and Problems	10 - 1
10.2	Key Ideas and Countermeasures	10 - 3
10.3	On-going Countermeasures and Practices	10 - 5
10.4	Land Subsidence	10 - 8

CHAPTER 11 IMPLEMENTATION OF THE PROJECT

11.1	Project Component	11 - 1
11.2	Executing Office	11 - 1
11.3	Executing Method	11 - 1
11.4	Implementation of Component (a) West Floodway / Garang River Improvement	11 - 1
11.5	Implementation of Component (b) Jatibarang Multipurpose Dam Construction	11 - 2
11.6	Implementation of Component (c) Urban Drainage System Improvement	11 - 2
11.7	Fund Requirement	11 - 3

LIST OF TABLES

Table 3.1	Construction Time Schedule of West Floodway/Garang River Improvement	T - 1
Table 3.2	Construction Time Schedule of Reconstruction of Simongan Weir	T - 2
Table 3.3	Construction Time Schedule of Raising of the Existing Railway Bridge	T - 3
Table 4.1	Jatibarang Multipurpose Dam Construction Schedule of Package 1	T - 4
Table 4.2	Jatibarang Multipurpose Dam Construction Schedule of Package 2	T - 5
Table 5.1	Construction Time Schedule of Semarang River Drainage System Improvement (Package 1)	T - 6
Table 5.2	Construction Time Schedule of Asin River Drainage System Improvement (Package 2)	T - 7
Table 5.3	Construction Time Schedule of Bandarharjo Drainage System Improvement (Package 3)	T - 8
Table 8.1	Environmental Management Plan	T - 9

LIST OF FIGURES

Fig. 1.1	Study Area for Master Plan and Feasibility Study on Flood Control and Urban Drainage in Semarang	F - 1
Fig. 1.2	Study Area for Detailed Design	F - 2
Fig. 3.1	Existing Garang River System	F - 3
Fig. 3.2	Existing Longitudinal Profile of West Floodway and Garang River Channels	F - 4
Fig. 3.3	Plan of West Floodway	F - 5
Fig. 3.4	Longitudinal Profile of West Floodway	F - 6
Fig. 3.5	Standard Cross Section of West Floodway	F - 7
Fig. 3.6	Plan of Garang River	F - 8
Fig. 3.7	Longitudinal Profile of Garang River	F - 9
Fig. 3.8	Standard Cross Section of Garang River	F - 10
Fig. 3.9	Plan of Simongan Weir	F - 11
Fig. 3.10	Upstream Elevation of Simongan Weir	F - 12
Fig. 3.11	Profile of Simongan Weir	F - 13
Fig. 3.12	Profile of Railway Bridge	F - 14
Fig. 3.13	General Plan for Packaging	F - 15
Fig. 3.14	Possible Spoil Bank Area	F - 16
Fig. 4.1	Proposed Damsite and Reservoir Area Map	F - 17
Fig. 4.2	Layout Plan of Jatibarang Multipurpose Dam	F - 18
Fig. 4.3	Profile along Jatibarang Multipurpose Dam Axis	F - 19
Fig. 4.4	Typical Cross Section of Jatibarang Multipurpose Dam	F - 20
Fig. 4.5	Profile of Spillway	F - 21
Fig. 4.6	Profile of Outlet Facilities	F - 22
Fig. 4.7	Profile of Diversion Facilities	F - 23
Fig. 4.8	General Plan of Powerhouse Area	F - 24
Fig. 4.9	Contract Packages of Jatibarang Multipurpose Dam Construction	F - 25
Fig. 5.1	Study Area for Urban Drainage System Improvement	F - 26
Fig. 5.2	Features of Semarang River and Topography of the Area	F - 27
Fig. 5.3	Design Discharge of Semarang River	F - 28
Fig. 5.4	Semarang River Plan	F - 29
Fig. 5.5	Semarang River Longitudinal Profile	F - 30
Fig. 5.6	Semarang River Design Cross Section	F - 33
Fig. 5.7	Asin River Longitudinal Profile	F - 36

Fig. 5.8	Asin River Design Cross Section	F - 37
Fig. 5.9	Baru River Longitudinal Profile	F - 38
Fig. 5.10	Baru River Design Cross Section	F - 39
Fig. 5.11	Semarang River Drainage System Improvement (Plan of Works for Package 1)	F - 40
Fig. 5.12	Asin River Drainage System Improvement (Plan of Works for Package 2)	F - 41
Fig. 5.13	Bandarharjo Drainage System Improvement (Plan of Works for Package 3)	F - 42
Fig. 5.14	Contract Packages of Semarang River, Asin River and Bandarharjo Drainage System Improvement	F - 43
Fig. 5.15	Location of Proposed Spoil Bank	F - 44
Fig. 9.1	Organization Chart for River and Dam Management	F - 45
Fig. 9.2	Organization Chart for Urban Drainage Management	F - 46

TERMS AND ABBREVIATIONS

1. **INDONESIAN GOVERNMENT AGENCIES AND ORGANIZATIONS**

GOI	:	Government of Indonesia
BAPPENAS	:	Badan Perencanaan Pembangunan Nasional (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 Assessment 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 Geophysiscs)
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
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)

mm	:	millimeter(s)
cm	:	centimeter(s)
m	:	meter(s)
km	:	kilometer(s)

(Weight)

g, gr	:	gram(s)
kg	:	kilogram(s)
t, ton	:	tonnage (s)

(Area)

mm ²	:	square millimeter(s)
cm ²	:	square centimeter(s)
m ²	:	square meter(s)
km ²	:	square kilometer(s)
ha(has)	:	hectare(s)

(Time)

sec., s	:	second(s)
min	:	minute(s)
h (hrs)	:	hour(s)
d (dys)	:	day(s)
y, yr(yrs)	:	year(s)

(Volume)

cm ³	:	cubic centimeter(s)
m ³	:	cubic meter(s)

(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.