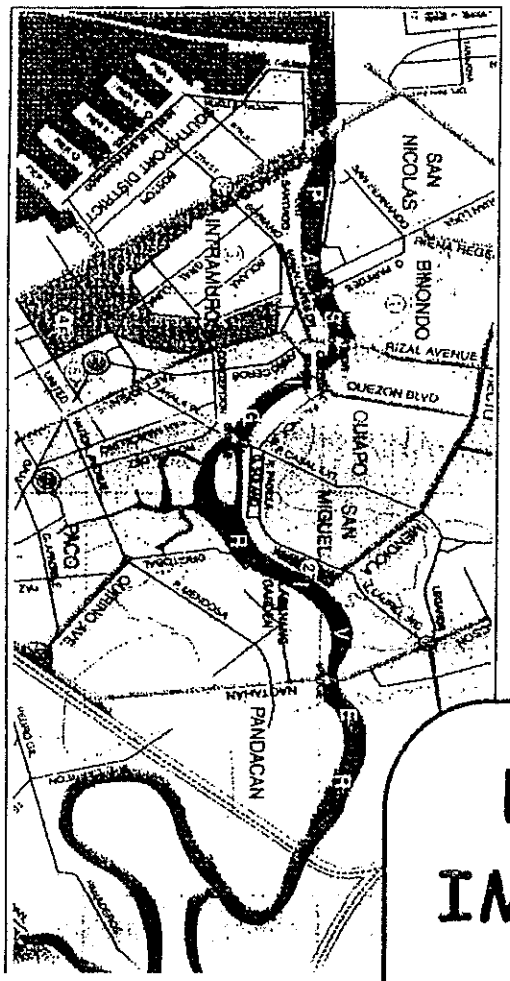
Annex 11-2

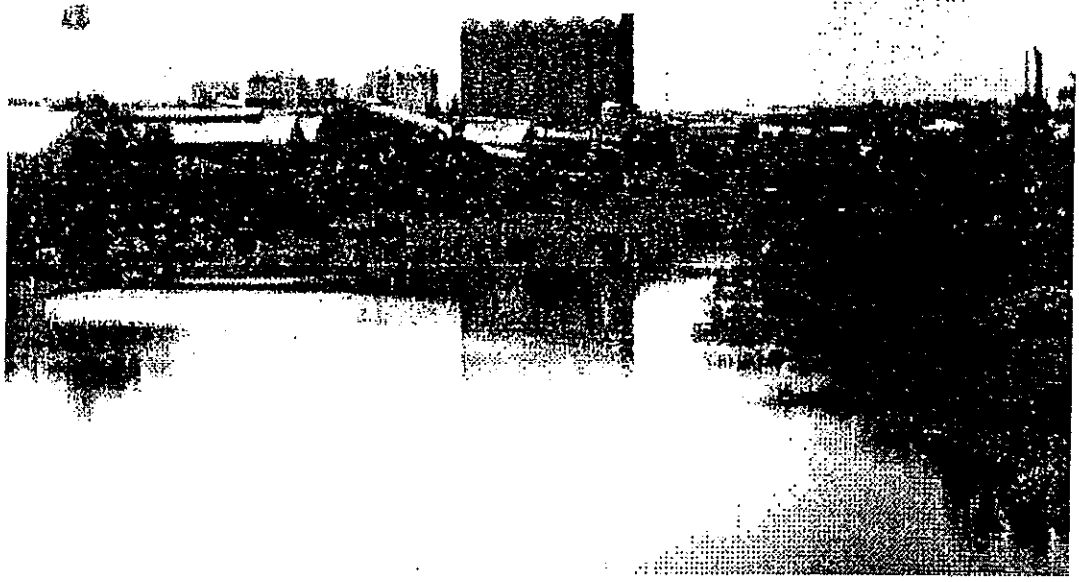


THE PASIG-MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT

ENVIRONMENTAL IMPACT STATEMENT

(FINAL REPORT)

June 1998



REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
Port Area, Manila

Annex II-3

Republic of the Philippines
Department of Environment and Natural Resources
NATIONAL CAPITAL REGION
AARONN II Building, 20 G. Araneta Ave. Ext., Q.C.
Tel. Nos.: 712 52-78 • 731-76-65 • 731-70-85 • 743-31-26

14 December 1998

The Director
Project Management Office
Major Flood Control Projects
Department of Public Works & Highways
2nd Street, Port Area, Manila

Sir:

This has reference to your ***Pasig-Marikina River Channel Improvement Project.***

After evaluation of the documents submitted on the aforesaid project, this Office has decided to grant the same an Environmental Compliance Certificate (ECC).

You may proceed with the project implementation after securing all the necessary permits from the pertinent government agencies. Please be advised, however, that this Office will be monitoring the project periodically to ensure your compliance with the stipulations cited in the attached ECC. Further, any expansion of currently approved operations will be subjected to the Environmental Impact Assessment (EIA) requirements.

Very truly yours,

CLARENCE L. BAGUILAT
Regional Executive Director

Republic of the Philippines
Department of Environment and Natural Resources
NATIONAL CAPITAL REGION
MARONN II Building, 20 G. Araneta Ave. Ext., Q.C.
Tel. Nos.: 712-52-78 • 731-76-65 • 731-76-85 • 743-31-26

ECC-98-NCR-381
9807-128-120

ENVIRONMENTAL COMPLIANCE CERTIFICATE

DENR-NCR hereby grants Environmental Compliance Certificate (ECC) for the proposed PASIG-MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT of Department of Public Works and Highways – PMO- Major Flood Control Projects, after complying with the Environmental Impact Statement (EIS) System requirements as prescribed in the guidelines of the Implementing Rules and Regulations of Presidential Decree no. 1586.

This Certificate is being issued subject to the following conditions:

I. **Pre-construction and Construction Stage:**

1. This Certificate covers only the improvement of Pasig and Marikina river channel including construction and operation of water front amenities and Marikina Control Gate Structures having the following project activities/components ;

River Stretch	Scope of Work
Pasig River : 6.84 km (river mouth to San Juan River)	Raising of existing parapet wall and rehabilitation of revetment
Pasig River: 9.76 km (San Juan Napindan Channel)	Raising of existing parapet wall and rehabilitation of revetment
Lower Marikina River: 5.58 km (Napindan to Marikina Control Structure [MCGS])	Dredging/excavation, provision of new parapet wall and rehabilitation of revetment
MCGS and Upper Marikina River: km (MCGS to Mangahan Floodway)	Construction of MCGS, dredging/excavation, raising of embankment
Upper Marikina River: 6.43 km (Mangahan Floodway to Sto.Nino	Excavation and raising of embankme

2. That all other permits from pertinent government agencies shall be secured before project implementation. Likewise, the proponent should submit a Memorandum of Agreement (MOA) with the Local Government Units (LGU's) pertaining to the preparation of maps identifying/showing the flood prone barangays, profile of the poor which include the families living in high risk location along the Pasig-Marikina Rivers, preparation of disaster management plan including response to flooding and greening and maintenance of project amenities as well as with the Pasig River Rehabilitation Project relative to the resettlement plan for the affected families;

3. That a detailed construction design and contract documents shall be submitted to this Office one (1) month prior to the start of construction;

4. That a Construction Contractor's Environmental Program (CCEP) shall be submitted to this Office for approval 30 days before the start of construction which should contain among others, definite mitigation measures such as proper disposal of spoils and waste materials, excess concrete and wash water from transit mixers and others;

5. That the project proponent shall conduct orientation for resident engineers and contracto ... will undertake and implement the project, to apprise them of the conditions/stipulations of this ECC and the necessary measures that will mitigate adverse environmental impacts, and submit reports of such orientation to this Office, copy furnished the Multipartite Monitoring Team (MMT);

6. That a multi-media information education campaign shall be implemented by the proponent covering the immediate areas as well as adjacent and affected cities; The target publics will include the local government unit officials and residents concerned, basic sectors which will include NGOs and POs;

7. That a billboard measuring 0.5 meters by 1.0 meter bearing "ECC-98-NCR-QC-301 Issued pursuant to P.D. 1586" shall be displayed in a conspicuous location at the project site for identification and guidance;

8. That in case that the construction of the project temporarily stopped due to financial reason or forced majeure, measures to protect and safeguard the adjacent properties and the general public should be strictly observed;

II. Operation Stage:

9. That all restoration works/grading of the exposed grounds shall be immediately undertaken after construction all in accordance with the Technical Specifications of the Contract;

10. That planting of trees/shrubs/ornamental plants or landscape activities shall be undertaken to contribute to the aesthetic value of the area and to compensate for the lost capability of the area to absorb carbon dioxide;

III. Others:

11. That a separate Initial Environmental Examination (IEE) or an Environmental Impact Statement (EIS) shall be prepared and submitted to this Office for the designated/chosen disposal site;

12. That the proponent shall set up/provide a Contractor 's All Risk Insurance (CARI) and Quick Response Fund (QRF) to compensate/ cover expenses for indemnification of damages to life, health, property and environment caused by the project and further environmental assessment. The QRF shall be established and committed through a Memorandum of Agreement (MOA) between and among the proponent, the LGU concerned, Non-governmental Organization's (NGO) and affected parties within sixty days (60) after the issuance of this ECC;

13. That the Department of Public Works and Highways (DPWH) Environmental Unit (EU) together with the Project Management Office and Technical Consultants shall supervise the contractors, implement the EMP and other measures that may be required by this Office during construction and operation phases;

14. That all the proposed environmental management measures contained in the submitted documents shall be effected (please refer to Annex A);

15. That project implementation and maintenance throughout its lifespan shall strictly conform with the submitted documents, any modification from the approved project scope shall be covered by another ECC application;

16. That should adverse impact occur as a result of project operations, all the activities causing the same, shall be immediately stopped, remedial measures shall be effected and all damages to life and property will be properly compensated to all aggrieved parties;

17. That the project proponent shall allocate funds or provide the financial requirements of the Multipartite Monitoring Team (MMT) and shall allow the same to conduct inspection/monitoring in the entire project area without prior notice to oversee compliance to ECC conditions and to determine the residual impacts to the environment;

18. That additional ECC condition(s) shall be imposed if findings to protect the environment warrants;

19. That any false information contained in the submitted documents and non-disclosure of vital information which led to the issuance of the ECC shall render the same null and void and a ground for filing of appropriate legal charges;

20. That this Certificate shall be posted in a conspicuous place in the Field Office for easy reference and guidance;

21. That the project proponent shall submit to this Office a quarterly environmental monitoring report based on the submitted/approved environmental monitoring plan; and

22. That in case the project proponent cannot comply with any of the conditions for technical reasons, a written approval from the DENR-NCR shall be secured first prior to implementation.

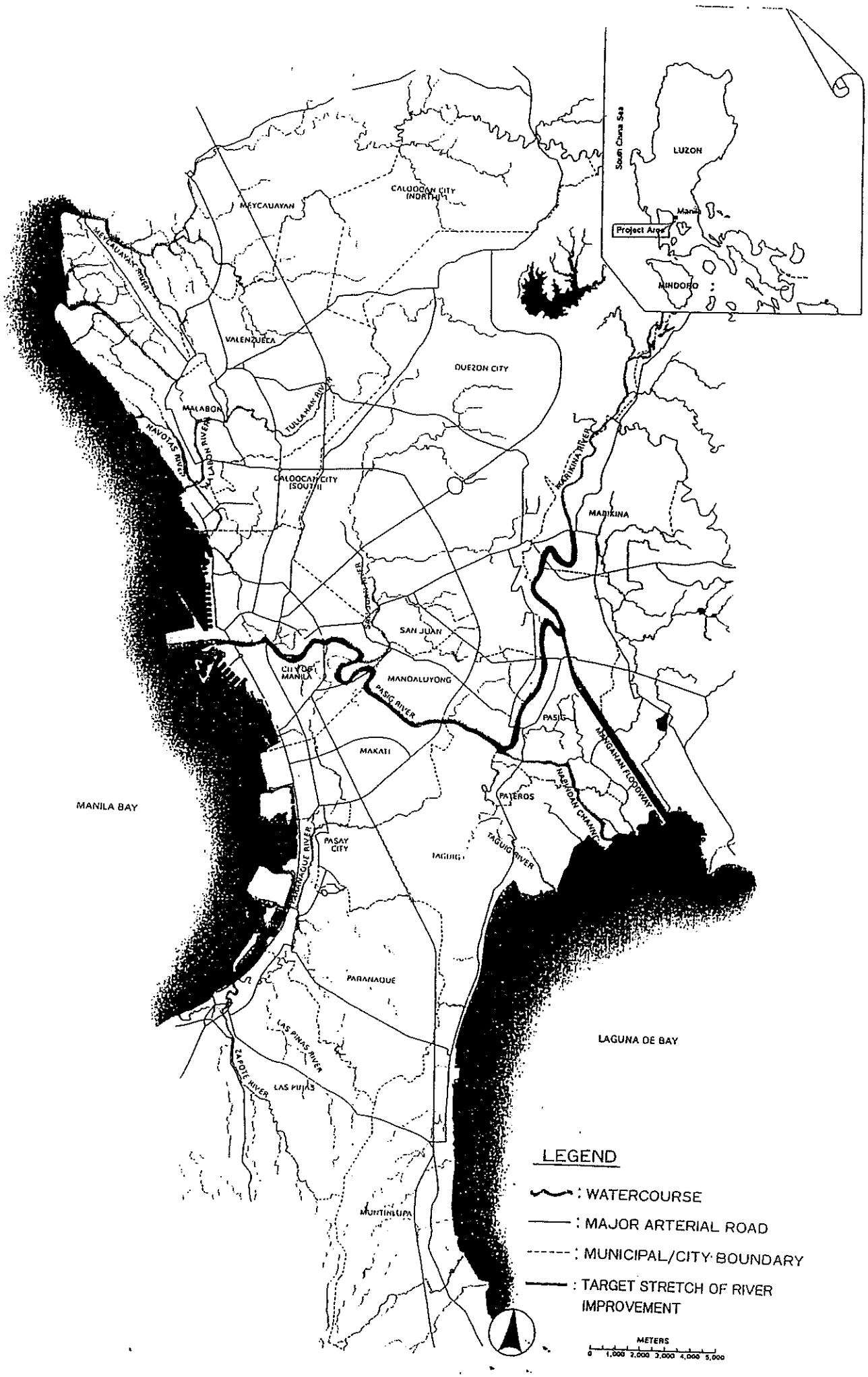
Non-compliance with any of the above stipulations will be sufficient cause for the suspension or cancellation of this Certificate and/or imposition of a fine in an amount not to exceed Fifty Thousand Pesos (P50,000.00) for every violation thereof pursuant to Article IX, Section 6.0, DENR Administrative Order No. 37, Series of 1996.

Given this 15th day of Dec. Nineteen Hundred and Ninety Eight.

CLARENCE L. BAGUILAT
Regional Executive Director

Recommending Approval:

SIXTO E. TOLENTINO, JR.
OIC, Regional Technical Director
Environment Sector
cc:pasig-marikina/ d-dc


South China Sea
LUZON
Manila
Project Area
MINDORO
CALOOCAN CITY (NORTH)
MEYCAUAYAN
MEYCAUAYAN RIVER
VALENZUELA
QUEZON CITY
MALABON
NAVOTAS RIVER
LABOY RIVER
TULLAHAN RIVER
CALOOCAN CITY (SOUTH)
MARIKINA RIVER
MARIKINA
SAN JUAN
CITY OF MANILA
MANDALUYONG
PASIG RIVER
PASIG
MAKATI
MANGAHAN FLOODWAY
NAPINDAN CHANNEL
PATEROS
TAGUIG
TAGUIG RIVER
PASAY CITY
PARAÑAQUE RIVER
PARAÑAQUE
LAS PIÑAS RIVER
ZAPOTE RIVER
LAS PIÑAS
MUNTINLUPA
MANILA BAY
LAGUNA DE BAY
LEGEND
: WATERCOURSE
: MAJOR ARTERIAL ROAD
: MUNICIPAL/CITY BOUNDARY
: TARGET STRETCH OF RIVER IMPROVEMENT
METERS
0 1,000 2,000 3,000 4,000 5,000

STUDY AREA

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EXECUTIVE SUMMARY

This report on the Environmental Impact Assessment (EIA) Study of the proposed **PASIG-MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT** is presented in the form of an Environmental Impact Statement (EIS) in accordance with the requirement of the revised rules and regulations for the EIS System embodied in DENR's DAO No.37 series of 1996. It covers about 30.0 km of the most significant portions of the Pasig-Marikina River which include the following: (1) Pasig River from the river mouth at Manila Bay to the confluence with the Napindan Channel; and (2) lower and a part of upper Marikina River from its confluence point with the Napindan Channel up to Sto. Niño - 6.4 km upstream from the diversion point of Mangahan Floodway.

Objectives of the report are to: (1) establish and analyze the relationship between the proposed project and its surrounding environment, (2) recommend mitigating measures for the adverse environmental impacts, (3) provide information for an informed decision-making process, and (4) help the project proponent (DPWH) comply with existing government regulations. This document shall therefore help ensure that the overall project benefits will be optimized by including the environmental considerations in project implementation.

This proposed river improvement project for the Pasig-Marikina River is an outcome of the study under a technical assistance by the Government of Japan (GOJ) to the Government of the Philippines (GOP) through the Japan International Cooperation Agency (JICA). Results of the said study revealed that despite implementation in 1970 of flood control works in the Pasig-Marikina River, Metro Manila is still facing the menace of flood damage caused by the inadequate flow capacity of the Pasig-Marikina River. The excess flood discharge of the Marikina River is not fully diverted to the Laguna Lake through the Mangahan Floodway.

The study then pointed to the necessity of constructing a control gate structure at the Marikina River and channel improvement works for both rivers to increase the flow capacity of the channel and improve its scenic view. The proposed construction of the Marikina Control Gate Structure (MCGS) is a major measure for flood control. It is expected to divert the design flood of 2,400 m^3/s to the Laguna Lake through the Mangahan Floodway.

The project should provide adequate protection against a 30-year flood to some 140 km^2 at the center of Metro Manila with a corresponding existing population of 450,000. It is estimated to have an average annual flood damage reduction of 1,041.1 million pesos with an economic internal rate of return (EIRR) of 17.0% and cost-benefit ratio (B/C) of 1.1. On a broader scale, ***this proposed project is considered as one of the vital infrastructure components of the Pasig River Rehabilitation Project (PRRP).***

The proposed project is still in the planning phase with the recent completion of the updating study under the Special Assistance for Project Formation (SAPROF) funded by the Overseas Economic Cooperation Fund (OECF) of Japan. The proponent should

secure an Environmental Compliance Certificate (ECC) in order to avail of funding under the 23rd OECF Loan.

Project Description

Planning and design considerations for this project is based on an overall flood control and drainage plan for Metro Manila. The plan was premised on a 100-year flood which is considered as the long-term flood control plan. However, the proposed project has a selected design flood discharge for a 30-year return period which is considered as the urgent flood control plan.

This is considered as the optimum flood control plan where the installation of the MCGS is indispensable together with the river improvement of the Upper Marikina River. The discharge towards the Pasig River could then be controlled at 500 m^3/s with this selected design flood discharge. The MCGS will only be operated when the discharge from the Sto. Niño is bigger than 900 m^3/s. Under this condition, the Rosario Weir shall be opened to allow the natural diversion of the excess flood water to the Mangahan Floodway.

The proposed development will include the following:

- River Stretch Improvement
- River Bank Works: Revetment, Parapet Wall, and Embankment
- Waterfront Amenity Structures
- Marikina Control Gate Structure

The river stretch improvement is necessary for improving the flow capacity. River bank works will be necessary for the sections where the design high water level exceeds the existing ground elevation, while restoration work will be carried out for the damaged revetment.

Waterfront amenity structures will be placed inside the channel as an environmental improvement works. These will be located near the river parks, ferry terminals, and roads with accessibility to the riverside.

Lock for ferry and barge operation is not necessary for the Marikina Control Gate Structure since it will normally be opened during non-flood periods and there is no serious change in the water level at the site that could obstruct the operation of ferry boats.

PROPOSED PROJECT COMPONENTS

RIVER STRETCH	WORK ITEMS
Pasig R.: 6.84 km (river mouth to San Juan R.	raising of existing parapet wall and rehabilitation of revetment
Pasig R.: 9.76 km (San Juan to Napindan C.)	raising of existing parapet wall and rehabilitation of revetment
Lower Marikina R.: 5.58 km (Napindan to MCGS)	dredging/excavation, provision of new parapet wall and rehabilitation of revetment
MCGS and Upper Marikina R.: 1.21 km (MCGS to Mangahan FW)	construction of MCGS, dredging/excavation, raising of embankment
Upper Marikina R.: 6.43 km (Mangahan FW to Sto. Niño)	excavation and raising of embankment

Data Gathering and Methodology

The EIS preparation relied on both primary and secondary data sources. A large amount of data was generated by the JICA Study on the flood control master plan for Metro Manila and the updated study on the flood control under the Special Assistance for Project Formation (SAPROF) funded by the Overseas Economic Cooperation Fund (OECF) of Japan. The SAPROF study is parallel to the EIA study which was conducted for a period of three months. Other sources of information are the various DENR and LLDA reports. Most of the physical and ecological data are therefore from secondary sources.

Primary data were generated in the sub-studies on river sediments study and dredged materials disposal. These sub-studies were conducted to determine the water quality effects of the sediments and the suitability of the dredged materials for land reclamation projects. Socioeconomic and perception surveys were also conducted. These are all presented in the appendix.

The primary data on socioeconomics were obtained through the conduct of a household survey, while the secondary data are mainly obtained from the National Statistics Office. The survey used a household questionnaire. The questionnaire was administered on the sample households. Because the population is distributed by barangay and all barangays regardless of size must have equal chance of being included in the sample, the study used

multi-stage sampling. In addition, a general public consultation and scoping meeting was conducted. A promotion and public awareness campaign for the proposed project was also done.

Project Environment

The most important issue on the project environment is the flooding situation. A previous study revealed that despite the implementation in 1970 of flood control works in the Pasig-Marikina River, Metro Manila is still facing the menace of flood damage due to the inadequate flow capacity of the Pasig-Marikina River. The excess flood discharge of the Marikina River is not fully diverted to the Laguna Lake through the Mangahan Floodway.

Based on the hydraulic analysis conducted by the SAPROF Team, some sections in the Pasig-Marikina River have much smaller flow capacity compared to the design flood discharges. It is therefore important that the flow towards the Pasig River should be controlled at 500 m^3/s. In addition, a hydraulic model test showed that only 1/2 to 2/3 of the flood discharge from Sto. Niño could be diverted naturally to the Mangahan Floodway without the presence of a control gate.

River improvement works necessitate a study of the sediments. The river sediments study showed that the concentration of toxic substances in the sediments are within the acceptable levels of the reference guidelines of some developed countries. These sediments can be safely dredged and used as filling materials in reclamation projects. Various DENR reports have already pointed to the presently poor ecological and water quality conditions of the river system.

A river survey by the proponent and the SAPROF Team revealed that squatters will not be displaced by the construction of the proposed structures. The important issue then on the socioeconomic environment is not the river system but the Mangahan Floodway where some squatters are illegally located inside the floodway channel.

Environmental Impacts and Environmental Management Plan

Potential environmental impacts of this project were comprehensively evaluated for the construction and operation. **Adverse impacts during the construction phase are those associated with the dredging activities and the major concern is the estimated generation of 3.8 million m^3 of dredged materials.** Fortunately, there are acceptable methods and sites identified for the proper disposal of these materials. All other impacts are short-term in nature and manageable. People will not be displaced during the construction period. There is therefore no cause for alarm. The significant construction phase impacts are presented below:

SIGNIFICANT CONSTRUCTION PHASE IMPACTS

DIRECT IMPACT	NATURE	MITIGATING MEASURES/ BENEFITS
increase turbidity of river	negative	use of special dredging technology
generation of dredged materials	negative	to be used for land reclamation projects
removal of sludge layer	positive	contributes to river ecology improvement
reclamation of disposal sites	positive	make lands available for productive use
socioeconomic - greater economic capability of workers	positive	provides economic benefits to workers

Based on the impact analysis of the operation phase for nine general impact areas covering 35 impact items, the proposed project has only four negative impacts with minimal magnitudes. These are: (1) increase sediment inflow to Laguna Lake, (2) increase lake water level near the discharge point of the Mangahan Floodway, (3) increase pollution to Laguna Lake, and (4) reduce aesthetic appeal of the landscape at the MCGS site. Impacts to Laguna Lake will be minimal since the MCGS will only be operated when the discharge from the Sto. Niño is bigger than 900 m^3/s. **There are no significant adverse environmental impacts on the physical and ecological aspects during the operation phase.** The significant operation phase impacts are all positive in nature as presented below:

SIGNIFICANT OPERATION PHASE IMPACTS

IMPACT AREA	DIRECT IMPACT	NATURE
HYDROLOGY / FLUVIAL HYDRAULICS/ EROSION	prevents flooding in the center of Metro Manila	positive
	improve river flow control during storm periods	positive
	improve river flow conditions	positive
	decrease in river bank erosion	positive
AESTHETICS	Improve the aesthetic appeal of the river banks	positive

The only major socioeconomic concern during the operation phase is the presence of the

squatters in the channel of the Mangahan Floodway since this is a danger zone. Fortunately, the proponent has some relocation plans. It should be noted that the proposed project is not a direct cause for the need to relocate the squatters since the Mangahan Floodway has been designed for a 100-year flood, while the proposed project is only for a 30-year flood.

Presence of the structures will have a significant influence on the economic and social activities of the area. With a safer place, the economic activities in the basin is expected to progressively increase in the future. Hence, future abandonment of the project is a remote possibility. However, any abandonment decision in the future for the removal of the structures can easily be carried out since the project's construction materials are only concrete, steel, and boulders. There will be no decontamination activities since toxic and hazardous wastes will not be present.

Environmental Monitoring Plan

There are no major environmental monitoring issues for this proposed project since its main intrusive activities are simply the river dredging in an ecologically poor river system and the construction of a control gate. However, water quality changes of the river will still be monitored during the construction phase.

Changes in the hydrology and water quality aspects will also be monitored during the operation phase despite the fact that the negative impacts during the operation phase are not of serious concern. Water quality monitoring activities are presently and continuously done by the DENR. The frequency and estimated costs of the hydrology and water quality monitoring is presented below:

HYDROLOGY AND WATER QUALITY MONITORING

PROJECT PHASE	PARAMETER	FREQUENCY
CONSTRUCTION	suspended solids, COD	twice a month
OPERATION	river flow, COD	when MCGS is operated (flow greater than 900 m^3/s
	suspended solids, COD	twice a year
Note: Annual monitoring cost is P50,000 during construction and P4,000 during the operation phase.		

Proper coordination between the project proponent, Local Government Units, and the DENR is very important for a smooth implementation of the project. This will ensure the

expeditious action on any environmental issues or problems that will arise during the construction and operation stages of the project. The proponent shall therefore designate an Environmental Coordinator who shall be responsible for all environmental matters regarding the project.

Conclusion

Finally, this assessment report concludes that the proposed project can be implemented in an environmentally acceptable manner. The total benefits to be derived will overwhelmingly outweigh the effects of the adverse impacts. ***Environmentally, the proposed project is beneficial since it is actually a mitigating measure against the annual adverse impacts of a natural hazard***

Summary Page: Environmental Management Plan

Project Activities	Impact Description	Mitigation/ Enhancement	Cost of Mitigation	Institutional Plan	Schedule	Guarantees
Construction Phase						
1. river dredging, river works improvement, and MCGS construction	<u>Physical</u> increase turbidity of river	use of special dredging technology		dredging contractor	during dredging operations	the construction methods which include the proposed mitigating measures will be defined in the construction contracts.
	generation of dredged materials	to be used for land reclamation		dredging contractor	during dredging operations	
	removal of sludge layer	selection of effective dredger		dredging contractor	during dredging operations	
	reclamation of disposal sites	selected sites are government lands		dredging contractor	during dredging operations	
	<u>Socio-Economic</u> greater economic capability of workers	local workers will be given priority in hiring		dredging contractor and MCGS contractor	during dredging operations and MCGS construction	

Summary Page: Environmental Management Plan

Project Activities	Impact Description	Mitigation/ Enhancement	Cost of Mitigation	Institutional Plan	Schedule	Guarantees
Operation Phase						
1. Presence of MCGS and river works improvement	prevents flooding in the center of Metro Manila improve river flow control during storm periods improve river flow conditions decrease in river bank erosion	these are all **significant positive impacts**		DPWH will operate the MCGS and maintain the river improvement works	during the entire existence of the project.	

Environmental Monitoring Program

Project Activities	Parameter	Location	Frequency	Responsibility	Cost
Construction Phase					
1. River dredging	suspended solids, COD (this will help determine the extent of sediment resuspension)	300 meters downstream of the site	twice a month	DPWH in coordination with DENR-NCR	P50,000 annually
Operation Phase					
1. Presence of MCGS	suspended solids, COD (this will provide a baseline data for the MCGS presence)	100 meters downstream of the site	twice a year	DPWH in coordination with DENR-NCR	P2,000 annually
2. MCGS operation	river flow, COD (this will help determine the effect of flow control by the MCGS)	at the MCGS site	when MCGS is operated (flow greater than $900m^3/s$)	DPWH in coordination with DENR-NCR	P2,000 annually

1.0 PROJECT PROPONENT

The Department of Public Works and Highways (DPWH) is the proponent of the proposed **PASIG-MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT.** Communications shall be addressed to:

Engr. Nonito F. Fano
OIC - Project Director
PMO - Major Flood Control Projects
DPWH, Port Area
Manila
Tel./Fax. No. 527-27-22

2.0 PROJECT TYPE

The proposed flood control project belong to the infrastructure category. Its implementation is therefore covered by Presidential Proclamation No.2146 and Presidential Decree No.1586. ***It is considered as one of the vital infrastructure components of the Pasig River Rehabilitation Project (PRRP).***

3.0 OVERVIEW SUMMARY

An environmental impact assessment was prepared with the aim of making project implementation an environmentally acceptable activity. This Environmental Impact Statement (EIS) will help ensure that overall project benefits will be optimized by including the environmental considerations during the planning, design, and operation phases of the project. It covers about 30.0 km of the most significant portions of the Pasig-Marikina River which include the following: (1) Pasig River from the river mouth at Manila Bay to the confluence with the Napindan Channel; and (2) lower and a part of upper Marikina River from its confluence point with the Napindan Channel up to Sto. Niño - 6.4 km upstream from the diversion point of Mangahan Floodway.

This proposed river improvement project for the Pasig-Marikina River is an outcome of the study under a technical assistance by the Government of Japan (GOJ) to the Government of the Philippines (GOP) through the Japan International Cooperation Agency (JICA). The river improvement plan was prepared under the study entitled "The Study on Flood Control and Drainage Project in Metro Manila". This was conducted from January 1988 to March 1990.

Results of the study revealed that despite implementation in 1970 of flood control works in the Pasig-Marikina River, Metro Manila is still facing the menace of flood damage caused by the inadequate flow capacity of the Pasig-Marikina River. The excess flood discharge of the Marikina River is not fully diverted to the Laguna Lake through the Mangahan Floodway. The study then pointed to the necessity of constructing a control

gate structure at the Marikina River and channel improvement works for both rivers. Map of the study area is presented at the end of this section.

Project components are intended to increase the flow capacity of the channel and improve its scenic view. The proposed construction of the Marikina Control Gate Structure (MCGS) is a major measure for flood control. It is expected to divert the design flood of 2,400 m^3/s to the Laguna Lake through the Mangahan Floodway.

The proposed project is intended to provide adequate flood protection for a significant portion of the Metro Manila against a 30-year flood. It will protect an area of 140 km^2 at the center of Metro Manila and a corresponding existing population of 450,000. It is estimated to have an average annual flood damage reduction of 1,041.1 million pesos with an economic internal rate of return (EIRR) of 17% and cost-benefit ratio (B/C) of 1.1.

Obviously, the proposed project has far-reaching benefits beyond the direct benefit of providing flood protection. However, the people and the local government units should be aware that the degree of protection to be provided by this project ***is based on a calculated risk and not an attempt to provide absolute flood control.*** It should be understood therefore that floods greater than the design flood (30-year flood) may also occur.

Potential environmental impacts of this project were comprehensively evaluated for the construction, operation, and abandonment phases. **Adverse impacts during the construction phase are those associated with the dredging activities and the major concern is the estimated generation of 3.8 million m^3 of dredged materials.** Fortunately, there are acceptable methods and sites identified for the proper disposal of these materials. All other impacts are short-term in nature and manageable. People will not be displaced during the construction period. There is therefore no cause for alarm.

Based on the impact analysis of the operation phase for nine general impact areas covering 35 impact items, the proposed project has only four negative impacts with minimal magnitudes. **There are therefore no significant adverse environmental impacts on the physical and ecological aspects during the operation phase.** The only major socioeconomic concern during the operation phase is the presence of the squatters in the Mangahan Floodway since this is a danger zone. Fortunately, the proponent has some relocation plans.

The proposed project is still in the planning phase with the recent completion of the updating study under the Special Assistance for Project Formation (SAPROF) funded by the Overseas Economic Cooperation Fund (OECF) of Japan. The proponent should secure an Environmental Compliance Certificate (ECC) in order to avail funding under the 23rd OECF Loan. A project endorsement which was earlier issued by the Metropolitan Manila Council (MMA) is presented in Appendix H.

During project implementation, the proponent will designate an Environmental Coordinator who shall be responsible for all environmental matters regarding the project. This will ensure the expeditious action on any environmental issues or problems that will arise during the construction and operation phases of the project.

Finally, this EIS report concludes that the total benefits to be derived from the proposed project will overwhelmingly outweigh the effects of the adverse impacts. Effective project management will help ensure that overall project benefits will be optimized and the proposed project can be implemented in line with the government's policy of promoting environmentally sustainable economic development.

4.0 PROJECT SETTING AND RATIONALE

This chapter presents the objectives of the proposed project and the need for its implementation. It also discusses the alternatives that were examined and the associated projects.

4.1 Declaration and Objective

The main objectives of the proposed project are to:

- Mitigate flood damage caused by channel overflows of the Pasig-Marikina River;
- Enhance the favorable environment along the river.

It is expected that a significant portion of the center of Metro Manila will be provided with adequate flood protection against a flood with a return period of 30 years (cited as "30-year" flood).

The project has far-reaching benefits beyond the direct benefit of providing flood protection. The reduce risk of flooding will facilitate urban development, encourage economic development, and improve the quality of life in the protected areas.

4.2 The Need

Eversince, man has always lived in fear of natural forces beyond his control. Although his existence has been nourished by the natural environment, it is also frequently threatened by the natural hazards. In relatively flat areas with big rivers, flooding hazards are always threatening. Humans have naturally sought to reduce the extent of this threat to their settlements.

The need to reduce the extent of the threat from floods has caused the implementation of various man-made solutions. In the case of the Pasig-Marikina River, this need is very important to the development of Metro Manila and improving the people's quality of life. Previous study revealed that despite the implementation in 1970 of flood control works in the Pasig-Marikina River Metro Manila is still facing the menace of flood damage due to the inadequate flow capacity of the Pasig-Marikina River. Figure 4.1 presents the comparative picture of the flooding situation before and after the implementation of the 1970 flood control works.

Based on the hydraulic analysis conducted by the SAPROF Team, some sections in the Pasig-Marikina River have much smaller flow capacity compared to the design flood discharges. It is therefore important that the flow towards the Pasig River should be controlled at 500 m^3/s. In addition, a hydraulic model test showed that only 1/2 to 2/3 of the flood discharge from Sto. Niño could be diverted naturally to the Mangahan Floodway

without the presence of a control gate. To prevent flooding, there is a need therefore to: (1) improve the flow capacity of the river and (2) control the flood discharge to the river. The planning condition for this approach is discussed in Section 5.1.

Flood Damage

Estimated (1998) total flood damage caused by river channel overflows ranges from 590 million pesos for a 2-year flood to some 5,548 million pesos for a 30-year flood. This means that flood damage for a 30-year flood is almost ten times that of a 2-year flood and will affect an area of 140 km^2 at the center of Metro Manila. This points out the necessity of protecting the area against a 30-year flood. Figure 4.2 presents the flood inundation areas of various return periods.

Trade-offs/Benefits

Overall, the beneficial impacts will easily outweigh the adverse environmental consequences. The benefits to be derived from this project cannot be over emphasized for an area that is annually flooded and constantly under the threat of large floods that could cause tremendous damages.

The estimated annual average benefit is 1,041 million pesos, while the estimated benefit from the environmental improvements such as the construction of the waterfront facilities is valued at 122.5 million pesos. On a broader scale, this proposed project is considered as one of the vital infrastructure components of the Pasig River Rehabilitation Project (PRRP).

There are no long-term adverse effects that could be taken as trade-offs against the expected benefits. All adverse impacts are within manageable levels. The project will not damage any resources nor will it destroy any irreplaceable resources. Environmentally, it is an acceptable scheme. ***It will benefit some 450,000 people.***

4.3 Alternatives

The overall flood control plan was based on the expected combined effect of the channel improvement and the construction of the Marikina Control Gate Structure (MCGS). Alternative studies were conducted to determine the necessity of using the MCGS. These were made considering the existing condition of the river channel and riparian structures such as the Mangahan Floodway and the Napindan Hydraulic Control Structure. The studied scenarios are the following:

Case I - Natural diversion through the Mangahan Floodway (without construction of the MCGS and without allowing the flood diversion into the Napindan River;

Case 2 - Natural diversion through the Mangahan Floodway and Napindan River (without construction of the MCGS and with flood diversion into the Napindan River;

Case 3 - Diversion through the Mangahan Floodway (with construction of the MCGS and without allowing the flood diversion into the Napindan River.

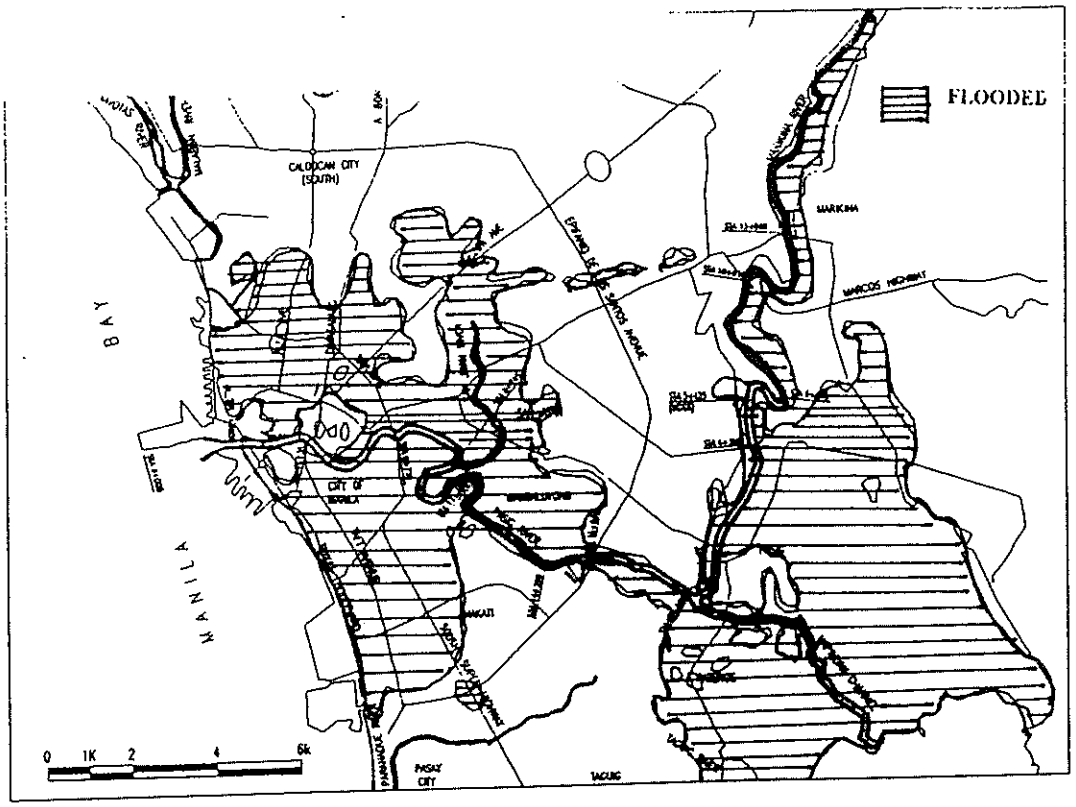
The alternative studies revealed that construction of the MCGS (Case 3) is the most advantageous. It has the least construction cost and operationally reliable. Successful flow diversion (Cases 1 and 2) cannot be assured without the control gate. After evaluating the other physical issues, Case 3 was deemed as the most viable option.

4.4 Associated Projects

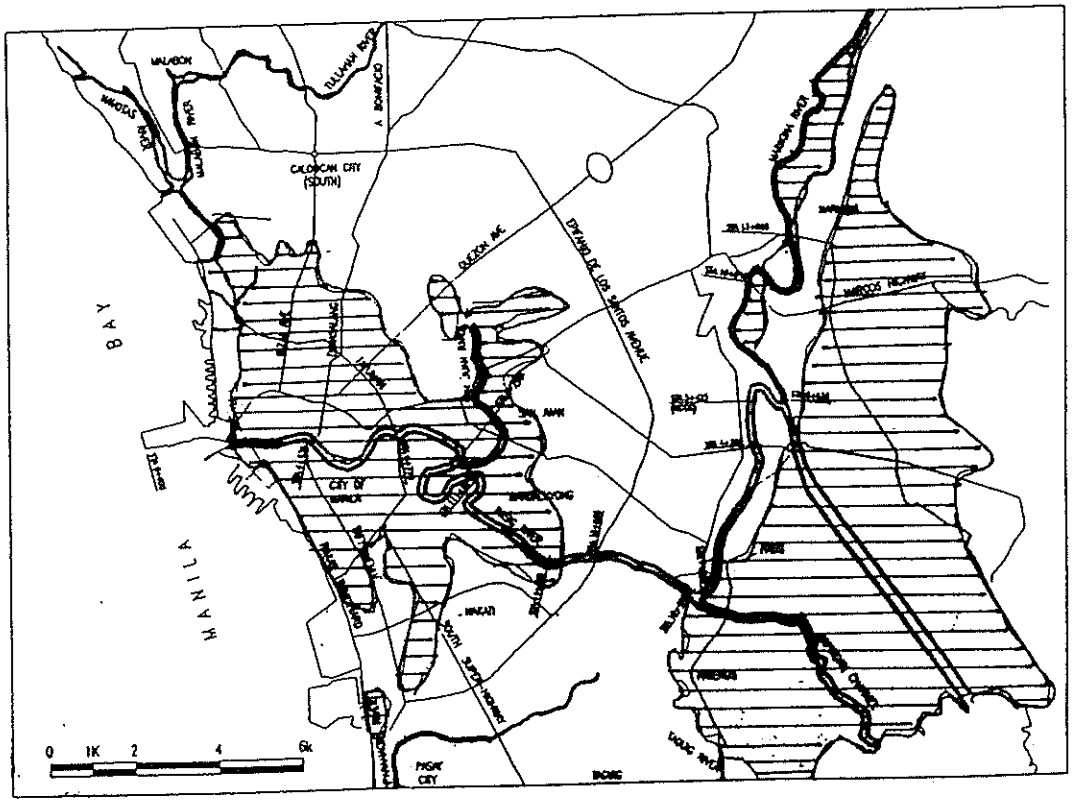
There are two operational projects associated with the proposed PASIG-MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT. These are the Rosario Weir (RW) and Napindan Hydraulic Control Structure (NHCS). Both projects are operated by the same project proponent of this proposed project.

The RW and NHCS are part of the overall flood control program for Metro Manila. The gate of the RW is closed in non-flood period. It is opened during floods to divert the excess flood discharge to Laguna Lake through the Mangahan Floodway.

The NHCS was constructed to regulate the Pasig River influence on the water quality of the Laguna Lake by controlling its backflows.

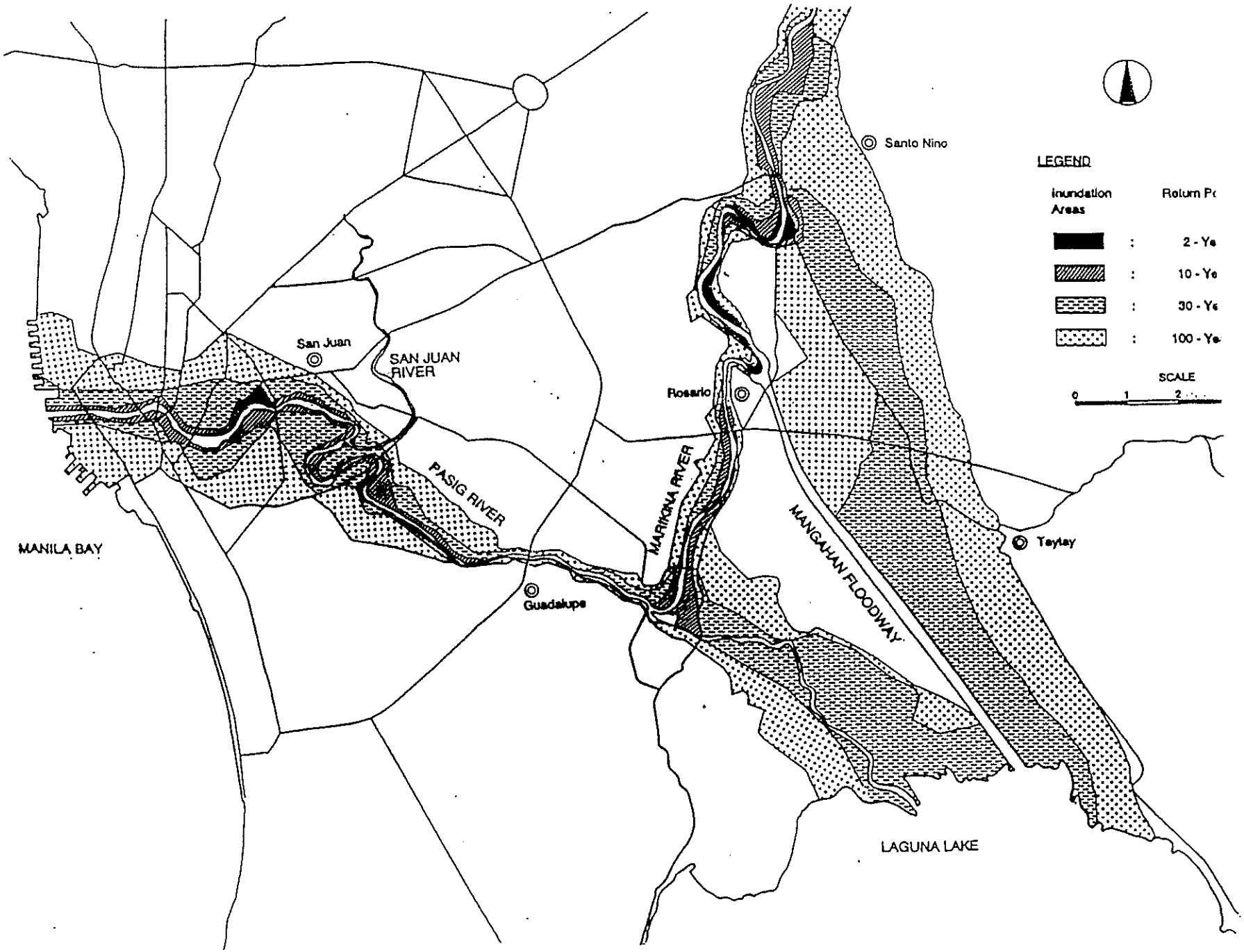


FLOOD AREA DURING THE 1970 FLOOD



FLOOD AREA DURING THE 1986 FLOOD

FIG. 4.1 FLOODING SITUATION BEFORE AND AFTER IMPLEMENTATION OF THE 1970 FLOOD CONTROL WORKS


Santo Nino
LEGEND
Inundation Areas
Return Pe
2 - Ye
10 - Ye
30 - Ye
100 - Ye
SCALE
0 1 2
San Juan
SAN JUAN RIVER
Rosario
PASIG RIVER
MARIKINA RIVER
MANGAHAN FLOODWAY
Taytay
MANILA BAY
Guadalupe
LAGUNA LAKE

5.0 THE PROPOSAL

The proposed project is the **PASIG-MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT.** It covers about 30.0 km of the most significant portions of the Pasig-Marikina River which include the following: (1) Pasig River from the river mouth at Manila Bay to the confluence with the Napindan Channel; and (2) lower and a part of upper Marikina River from its confluence point with the Napindan Channel up to Sto. Niño - 6.4 km upstream from the diversion point of Mangahan Floodway. Project components include the construction of the Marikina Control Gate Structure (MCGS) and the river improvement works. In addition, waterfront amenities will also be constructed. These components are described in Section 5.2.

Implementation Schedule

The project is still in the planning phase. Its implementation schedule will be dependent on the approval for funding under the 23rd OECF Loan. The ECC is part of the requirement for this approval.

5.1 Planning and Design Considerations

Planning and design considerations for this project is based on an overall flood control and drainage plan for Metro Manila. The plan was premised on a 100-year flood (JICA, 1990). This is considered as the long-term flood control plan.

The design flood discharge distribution at a 100-year return period is shown in Figure 5.1. The main feature of this master plan is the construction of a multipurpose dam in Marikina which should regulate the inflow flood of 2,100 m^3/s down to 1,500 m^3/s. River works for the San Juan river is included in this master plan. For a 100-year flood, the flow from the Sto. Niño would still be maintained at the 2,900 m^3/s level as seen in the figure.

The 30-year flood is the subject situation of the proposed project. It is considered as the urgent flood control plan. The San Juan River improvement works and the construction of a multipurpose dam are excluded from this urgent plan.

Design Flood Discharge

The selected design flood discharge probability for the urgent plan is the 30-year return period. It is considered as the optimum flood control plan where the installation of the MCGS is indispensable together with the river improvement of the Upper Marikina River. The discharge towards the Pasig River could be controlled at 500 m^3/s with this selected design flood discharge. The MCGS will only be operated when the discharge from the Sto. Niño is bigger than 900 m^3/s. Under this condition, the Rosario Weir shall be opened to allow the natural diversion of the excess flood water to the Mangahan

Floodway. The design flood discharge distribution at a 30-year return period is shown in Figure 5.2.

5.2 General Layout/ Project Components

Implementation of the proposed development will include the following as described in Table 5.1:

(a) River Stretch Improvement

(b) River Bank Works: Revetment, Parapet Wall, and Embankment

(c) Waterfront Amenity Structures

(d) Marikina Control Gate Structure

TABLE 5.1

PROPOSED PROJECT COMPONENTS

RIVER STRETCH	DESIGN DISCHARGE (m^3/s)	WORK ITEMS
Pasig R.: 6.84 km (river mouth to San Juan R.	1,150	raising of existing parapet wall and rehabilitation of revetment
Pasig R.: 9.76 km (San Juan to Napindan C.)	500	raising of existing parapet wall and rehabilitation of revetment
Lower Marikina R.: 5.58 km (Napindan to MCGS)	500	dredging/excavation, provision of new parapet wall and rehabilitation of revetment
MCGS and Upper Marikina R.: 1.21 km (MCGS to Mangahan FW)	500	construction of MCGS, dredging/excavation, raising of embankment
Upper Marikina R.: 6.43 km (Mangahan FW to Sto. Niño)	2,900	excavation and raising of embankment

The river stretch improvement is necessary for improving the flow capacity. River bank works will be necessary for the sections where the design high water level exceeds the existing ground elevation, while restoration work will be carried out for the damaged revetment.

Waterfront amenity structures will be placed inside the channel as an environmental improvement works. These will be located near the river parks, ferry terminals, and roads with accessibility to the riverside. Photographs of typical amenity facilities in an urban river are shown in Appendix F.

Lock for ferry and barge operation is not necessary for the Marikina Control Gate Structure since it will normally be opened during non-flood periods and there is no serious change in the water level at the site that could obstruct the operation of ferry boats.

The listed project components are indicated in Figure 5.3, while the details are presented in the tables and figures of Appendix A. Detailed design is scheduled on year 1999 up to year 2001. Total project cost is estimated to be P9,848 millions at 1998 prices.

5.3 Construction Details

Construction Schedule

Based on the volume of work and flood mitigation effects, construction shall be done in the following order:

a. Pasig River Improvement I (river mouth to San Juan River: 6,825 m)

b. Lower Marikina River Improvement and MCGS Construction (Napindan Channel to Mangahan Floodway: 6,790 m)

c. Upper Marikina River Improvement (Mangahan Floodway to Marikina Bridge: 6,425 m)

d. Pasig River Improvement II (San Juan River to Napindan Channel: 9,760m)

e. Construction of Waterfront Amenity Facilities

Phase 1 consists of items a and b, while the remaining items are under Phase 2.

Construction Activities

Construction activities are expected to last for five (5) years between 2002 to 2006. Required activities during construction are the usual activities associated with river works

and horizontal concreting projects. These activities include the following:

- dredging
- hauling of dredged materials
- excavation
- concreting
- sheet pile driving

Specific timing and duration of each activity will be determined during the detailed design phase.

Dredging and excavation activities will be limited only in the Marikina River. There will be no such activities in the Pasig River. Revetment and dredging works will be carried out separately to avoid affecting the ferry and barge operations in the river.

Construction Methods/ Materials

Construction activities will be executed with care to avoid unnecessary inconvenience to the public. Activities in the water will be coordinated with the concerned sectors to avoid hampering their activities.

Riverbed dredging activities will be done in such a way that sediment resuspension will be avoided. Special dredging methods, such as the suction dredger and closed-type dredge bucket, will be used whenever applicable. These are shown in Photographs Nos. 7,8,9, and 10 of Appendix F.

All construction materials will be hauled to the site. The largest concrete structure is the MCGS which will require some 22,000 m^3 of concrete.

5.4 Operation and Maintenance

Optimum flood control is the basis for an integrated operation plan for both the MCGS and the existing Rosario Weir.

Proposed Flood Operation Rule

The diversion discharge through the Mangahan Floodway and the discharge into the lower Marikina River will be controlled by the Rosario Weir and the MCGS based on the flood discharge at the Sto. Niño.

The operation rule provides that the discharge leaving the MCGS should not exceed 500 m^3/s under all flood conditions. River navigation is only possible during small scale

floods. In cases where the design discharge range (500 m^3/s to 2,900 m^3/s) will be exceeded but smaller than the 100-year flood (3,500 m^3/s), the whole setup will still be effective with the Mangahan Floodway diverting the flows in excess of 500 m^3/s. The minimum freeboard height of the Mangahan Floodway will be 20 centimeter during a 100-year flood.

More details of the gate operation, flood discharges, and navigational condition are presented in Appendix A.

Maintenance

Maintenance will not be a problem since the project components are all passive structures. Periodic inspection of all structures will be made to insure the early detection of any problems. The frequency, nature, and extent of inspections will be described in an inspection manual to be prepared by the proponent.

Structural integrity of the concrete structures, particularly the MCGS, will be examined annually. The inspections will not be limited to the following items:

- Abnormal settlements, heaving, deflections, or lateral movement of concrete structures
- Cracking or spalling of concrete and opening of contraction joints
- Deterioration, erosion, or cavitation of concrete joints
- Abnormal leakage through foundation or concrete surfaces, construction joints, or contraction joints
- Possible undermining of the downstream toe or other foundation damage
- Unusual of inadequate operational behavior.

Responsible Office

The constructed structures will be maintained by a Project Management Office (PMO) of the DPWH.

Jobs Availability

There will be very few jobs directly associated with this type of project during operation. The necessary personnel will be provided by the proponent.

5.5 Contingency

The construction and operation of the project will not create or lead to significant environmental hazards. However, it will be explained clearly to the people and the local government units in the flood-prone areas to be protected by this project that the degree of protection to be provided by this project ***is based on a calculated risk and not an attempt to provide absolute flood control.*** They will be made to understand that floods greater than the design flood may also occur. They should be aware on the limits of the project in solving the problems confronting them regarding the annual floods. The local government units shall therefore prepare their contingency plans on the basis of this information.

5.6 Abandonment

Future abandonment of the project is a remote possibility. It is part of the long-term flood control master plan for Metro Manila. The project will have a significant influence on the economic and social activities of Metro Manila. Its operation is expected to progressively increase the economic activities in the central part of Metro Manila. Considering the magnitude of these future economic activities, the huge project investment, and the need for which the project was proposed, it is unlikely that the project will be abandoned in the future. The proponent's long-term aim is therefore to sustain the operation of the system.

However, any abandonment decision in the future can easily be carried out since the project's construction materials are only concrete, steel, and boulders. There will be no decontamination activities since toxic and hazardous wastes will not be present.

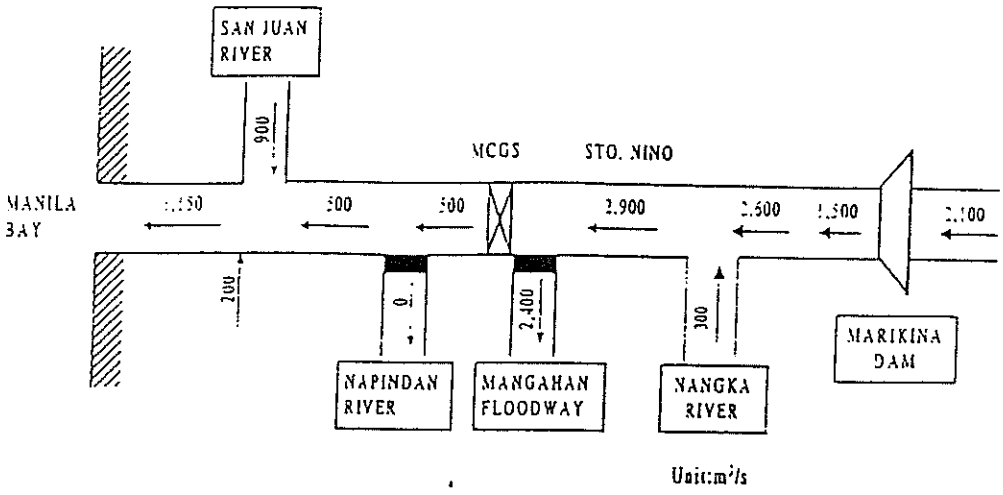


FIG. 5.1 DESIGN FLOOD DISCHARGE DISTRIBUTION AT A 100-YEAR RETURN PERIOD

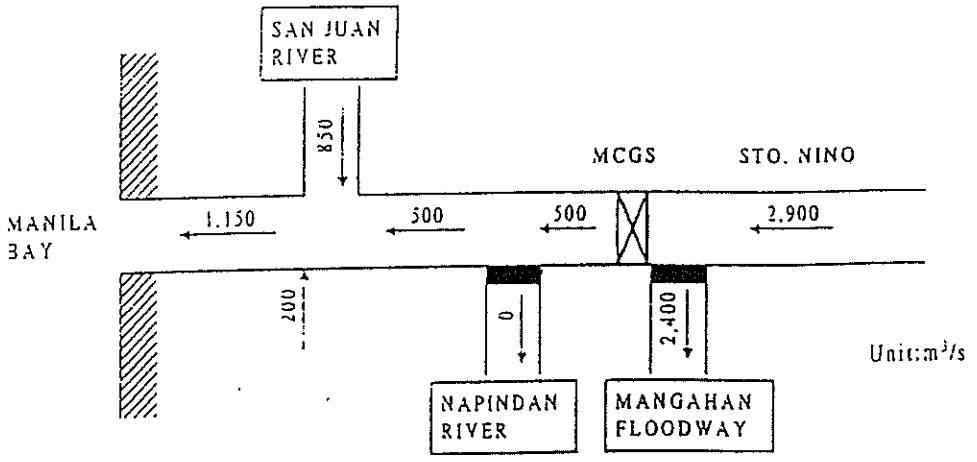
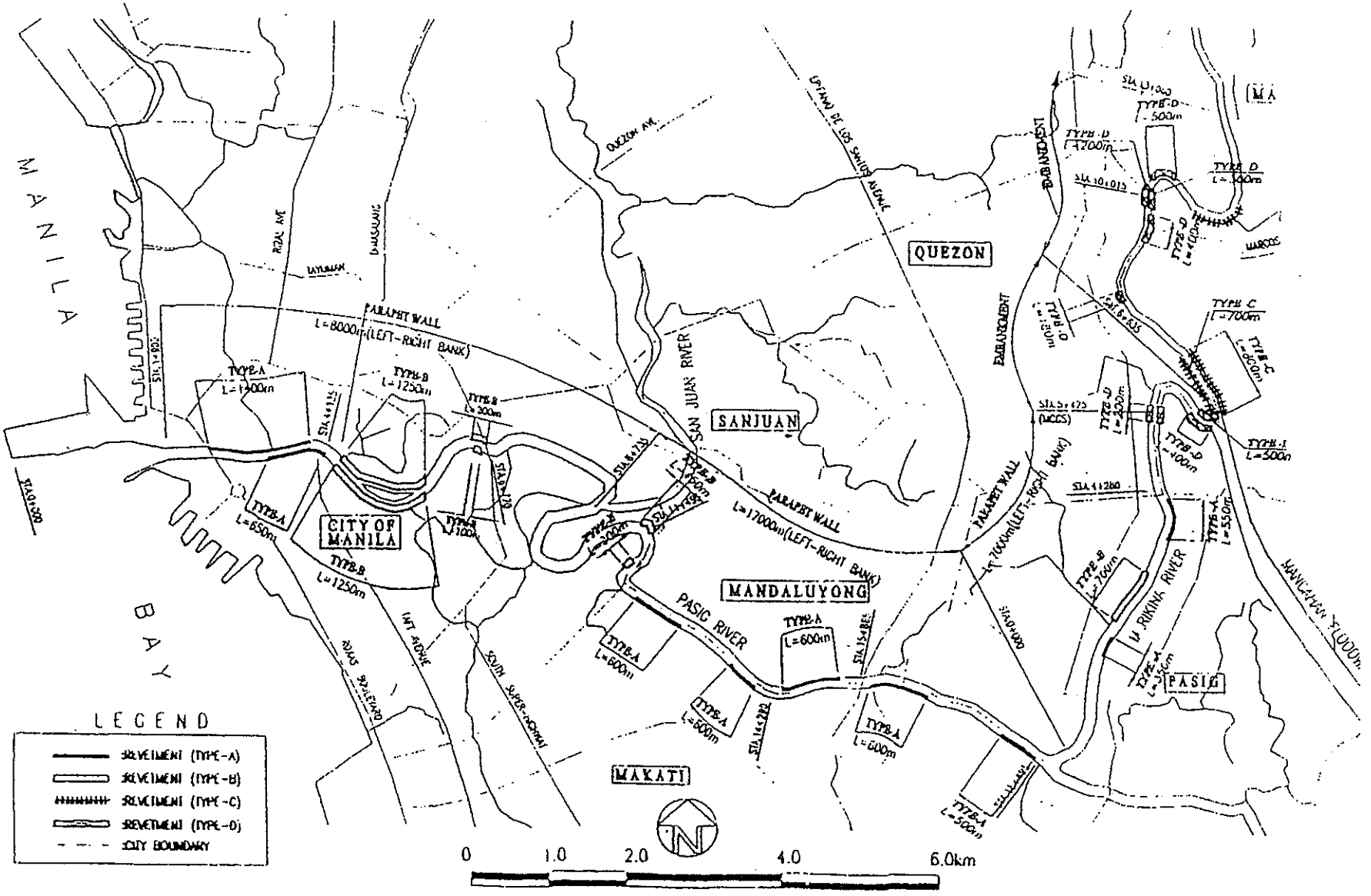


FIG. 5.2 DESIGN FLOOD DISCHARGE DISTRIBUTION AT A 30-YEAR RETURN PERIOD


MANILA BAY
CITY OF MANILA
SAN JUAN RIVER
SANJUAN
QUEZON
MANDALUYONG
PASIG
MAKATI
PASIG RIVER
MARIKINA RIVER
QUEZON AVE.
EDSA
ROXAS BOULEVARD
1ST AVENUE
SOUTH SUPER HIGHWAY
PARAPET WALL
L=8000m(LEFT-RIGHT BANK)
L=17000m(LEFT-RIGHT BANK)
L=7000m(LEFT-RIGHT BANK)
TYPE-A
TYPE-B
TYPE-C
TYPE-D
LEGEND
REVETMENT (TYPE-A)
REVETMENT (TYPE-B)
REVETMENT (TYPE-C)
REVETMENT (TYPE-D)
CITY BOUNDARY
0
1.0
2.0
4.0
6.0km

6.0 PAST AND EXISTING ENVIRONMENTAL CONDITIONS

This chapter presents a description of the present and historical trends of the environment at the project site. Its objective is to provide the necessary baseline information regarding the natural environment and the socio-economic setting of the project area.

6.1 Climate

Climate of the project area belongs to the Type I climatological region which is characterized by a dominant rainy season from May to October and a dominant dry season for the rest of the months. The average annual rainfall of the project area is around 2,000 mm, while that of the Marikina River's basin head is 3,000 mm. Rainfall data are shown in Appendix B.

6.2 Geology

The project area is within a large area which lies on the southeast periphery of the Central Plain of Luzon. It touches on the following geological formations: the Guadalupe Plateau, the Coastal Margin, and the Marikina Valley.

The Guadalupe Plateau is volcanic tuff overlain by waterlaid sediments. The Coastal Margin is relatively flat strip of land about 30 kilometers (km) long and has a maximum width of 6 km along the Pasig River. It is fluvial deposits of loosely consolidated saturated sand, silt, gravel, and clay. The Marikina Valley is a broad alluvial plain formed as a result of river deposition. The alluvium is made up of unconsolidated mixture of sand and gravel together with considerable amounts of silt and clay.

6.3 Hydrology and River Systems

The important water bodies for this study is the Pasig-Marikina River system and the Laguna Lake. The river system has an estimated catchment area of 635 km^2. Twenty percent of this catchment is in Metro Manila. The upper reaches from the confluence with the Napindan River is known as the Marikina River, while the lower reaches is Pasig River. Laguna Lake has a total surface area of 90,000 hectares and a total water volume of 3.2 billion m^3. It is presently receiving diversion flows from the Pasig-Marikina River system through the Mangahan Floodway with a design discharge of 2,400 m^3/s.

Various sections of the Pasig-Marikina River system have different bankfull capacities. At mean spring high tide, bankfull capacity of the Pasig River up to the confluence with the San Juan River is around 100 to 800 m^3/s. Further to the Napindan junction, it is around 100 to 600 m^3/s. From the Napindan junction to diversion point of the Mangahan Floodway, bankfull capacity is around 50 to 500 m^3/s. The lowest bankfull capacity is

the Napindan River which is around 500 m^3/s.

Water Quality

Water quality of the Pasig-Marikina River is presently monitored by the Pasig River Rehabilitation Project (PRRP), while the Laguna Lake is monitored by the Laguna Lake Development Authority (LLDA). The river system is presently in a poor water quality condition.

Water quality data depicting the river system condition are presented in Appendix B.

6.4 Oceanography

The oceanographic information relevant to the project is the tidal water levels of Manila Bay since the Pasig River is affected by tidal variations. Based on the NAMRIA information, tidal water level of Manila Bay usually varies between - 0.25 m to 1.00 m. However, the most important data is the Mean Spring High Tide which is at EL.11.30 m. This is used in the hydraulic analysis as the initial water level in confirming the flow capacity of the Pasig-Marikina River.

6.5 Air Quality

Air quality of the project area is essentially the air quality of Metro Manila. It is monitored by the DENR. Based on the environmental quality report (EMB, 1996), particulate matter concentration in ambient air has been increasing. Total suspended particulate levels were above the standard of 90 ug/NCM. On the other hand, the sulfur dioxide (SO_2) levels in ambient air have a lowering trend.

Air pollution were identified by DENR as those coming from mobile, stationary, and area sources. Motor vehicles emit the largest amount of carbon monoxide, total organic gases, and nitrogen oxides.

6.6 Vegetation

Presently, the entire stretch of the Pasig River has an ecologically poor condition since it is situated in a highly urbanized region. The river banks are immediately adjacent to areas which are considered as residential, commercial, and industrial. Vegetation on land is now limited only to the usual vegetation in a highly urbanized city.

Aquatic vegetation consists mostly of Eichornia crassipes (water hyacinth) which occurs in patches in Laguna Lake and flows out in substantial amounts to Manila Bay via the Pasig

River. Pistia stratiotes (water lettuce) - another floating macrophyte, is also present in small amounts.

6.7 Fish and Wildlife

The prolonged human impact over the years has practically removed the habitats for wildlife. The area is no longer in a rural setting. There is therefore little aquatic life in the Pasig River. The pollution of the Pasig River has prevented the migration of many commercially important fish into Laguna Lake including Caranx marginatus (talakitok); Mugil spp. (mullet/banak); Megalops cyprinoides (buan-buan)/ox-eyed tarpon) and Chanos chanos (milkfish/bangus). Fauna, such as fishes, are only confined to the upper reaches of the Marikina River.

6.8 Land and Resources Use

The project area is in a highly urbanized zone. Its land use is mainly residential, commercial, industrial, and a little open space along the upper reaches of the Marikina River. The river system itself has been actively used for navigational purposes by various commercial and industrial facilities. Information on this activities are presented in Appendix B.

6.9 Socio-economic Aspects

Baseline information on the socio-economic aspects were obtained from various sources such as (1) interviews with key informants who are persons considered knowledgeable on the social services and environmental problems in the area, (2) various government agencies, and (3) the conduct of a sample survey using a household questionnaire in various barangays of the direct impact area. Results of the detailed socio-economic study are presented in Appendix E.

The most interesting socio-economic data is the flood experience of the people. Only 15% of the interviewed households in the barangays along the Marikina-Pasig River experienced the flood in 1997. The flood lasted an average of 5 days. The average depth of the flood waters in front of the house of the respondent-household was 1.75 meters. Warning against the flood was reportedly issued and reached 65% of the households. Among the households who heard the warning, 42% identified the barangay captain as the source. The radio is credited by 29 percent. The warning is effective in prompting the households into taking a precautionary measure against the flood. A measure was undertaken by 80 percent. Around 59% evacuated and 54% vaguely mentioned flood preparation.

The children were affected by flood with 17% of the households having at least one child

absent from school. The average duration of the absence is 5 days. The flood also prevented the working members of 19% of the households from going to work. The average duration of absence from work is 1.5 days.

Only 30% of the respondents are aware of the proposed project. But even among those who are aware, many have incorrect or vague information about the project. Only 30% mentioned activities or components associated with the proposed project.

7.0 FUTURE ENVIRONMENTAL CONDITIONS WITHOUT THE PROJECT

A good picture on the future environmental situation without the proposed project is essential for the effective impact analysis of the proposed project. This will serve as a basis for comparative analysis. Comparing the future conditions without the project against those conditions with the project is essential for weighing the project's benefits against its impacts. Hence, the future environmental conditions without the proposed project are presented in this section.

7.1 Climate

Climatology has shown that sudden climatic changes in the microclimate is always unlikely. Based on the historical climatic data, no sudden changes in the microclimate could therefore be expected in the project area for the next five years.

The dominant land uses of the project area are expected to remain the same. Hence, no significant changes in the environment is expected which may result in changes in temperature, wind direction and speed, etc.

7.2 Geology and Terrain

The present topographic and geologic characteristics in any part of the globe are products of two major energy systems that have been operating since the creation of the planet. These are the hydrologic and tectonic systems. The hydrologic system involves the circulation of water, while the tectonic system involves movement of material powered by heat from the Earth's interior.

The complex processes of the hydrologic and tectonic systems have operated over a very long time period to produce the present topographic and geologic characteristics of the project area. Since changes in topographic and geologic aspects will proceed in a very slow rate, it is therefore expected that these changes will not be noticeable in the next five years. Hence, the stratigraphy and seismicity condition will still be the same.

7.3 Hydrology/Fluvial Hydraulics

Conditions of the river basins are expected not to change significantly within the next five years if the present land use will not drastically change. This is also true with the surface slope of the area since the natural process of slope adjustment usually proceeds at a very slow rate. Hence, the area covering the proposed project site and its drainage basins will still be sloping gently towards the sea.

Rainfalls always exhibit an annual cycle of low and high values. However, in the field of

rology, no one has ever been successful in using these cycles for forecasting the fall several years in advance. In view of this, it would be safe to assume that within next five years the range of rainfall values will not drastically change from its orical figures.

hout the proposed project, the threat of flooding by a river discharge with a 30-year rn period will therefore not diminish.

Water Quality

er quality conditions and issues of the Pasig River have been studied thoroughly by PRRP as discussed in Chapter 6. In terms of BOD loads, the PRRP study has ıtified the major sources of pollution as those coming from the domestic wastewater, ıstrial wastes, and the solid domestic wastes. The estimated 1990 total BOD load to river system was 327 tons/day.

:P's 1997 assessment using their recalibrated water quality model showed that the al BOD load to the river for 1996 was much less than originally estimated. The sed estimate was 230 MT BOD/day. Although this figure represents a significant ıction, the water quality still has not satisfied the Class "C" requirements.

:P also reported that domestic wastewater is now the major BOD contributor - nated at 60%. It is therefore obvious that within the next five years, improvement in water quality will be dependent on the government's ability to construct the necessary n environmental infrastructures since domestic wastewater is presently contributed by e 3.8 million people who are not served by a piped sewerage system. The problem is pounded by the San Juan River. Its pollution load to the Pasig River was estimated to ıore than 25%. Its drainage basin is reported to be one of the most difficult to sewer.

Oceanography

in the next five years even without the proposed project, there are no activities or :cts that are expected to alter the oceanographic situation. No significant changes in ography is therefore expected.

Air Quality

quality of the project area is essentially the air quality of Metro Manila since it is ed at the center of the metropolis. EMB (1996) reported that Metro Manila is facing us air pollution problems. Although some air quality parameters such as lead have asing trend, signs of air quality deterioration are still present. Without adequate

government intervention, the air quality situation will continue to deteriorate within the next five years primarily due to the increasing number of motor vehicles.

7.7 Vegetation

Within the next five years, vegetational status in the project site is likely to remain the same without the proposed project since there are no expected changes in land use that will be favorable to an increase in available area for vegetational growth. The river banks which are immediately adjacent to residential, commercial, and industrial areas will continue to be unfavorable to plant growth and diversity. In addition, aquatic vegetation such as the water hyacinth will continue to dominate the aquatic areas.

7.8 Fish and Wildlife

Future situation on fish and wildlife within the next five years is also expected to remain the same without the proposed project since the prolonged human impact over the years has practically removed the habitats for fish and wildlife. There are no indications that the present ecological situation will be altered drastically. Presently, the entire stretch of the Pasig River has an ecologically poor condition since it is situated in a highly urbanized region.

7.9 Land and Resource Use

The project area is already in a highly urbanized setting. It is therefore expected that within the next five years the residential, commercial, and industrial areas will remain as the dominant land uses. Navigational activities in the river are also expected to continue. Without the proposed project, urban development will be under threat by flooding from the channel overflows of the Pasig-Marikina River.

7.10 Socioeconomic Aspects

The population of the project area is expected to continue growing even without the proposed project. The surging growth will occur in Cainta and Taytay. Both municipalities will continue to take the spillover from Metropolitan Manila and will socially and economically become more integrated with it. These municipalities will initially host bedroom communities being mainly used as residential. But as the population stabilizes, commerce and services are expected to follow. The population in the cities within the metropolis are reaching near saturation point and are expected to taper off. The barangays along Marikina-Pasig River in the side of the Metropolis will experience increasing out-migration.

Many riverside communities are not the most pleasant in the metropolis being besieged by flooding and pollution. As household income increases, people will move out from these communities. There will be no drastic change expected in population composition, age distribution, dependency ratio and educational attainment.

Only a serious urban renewal project and strict implementation of land use plan can improve the existing housing distribution, ownership, and quality along the river. The riverbank will always be vulnerable to squatting and the weak local government units will always be almost helpless to prevent it. Thus, the present situation is not expected to improve in the future unless the local government units will perform their duties.

The water supply and toilet ownership rate in the barangays along the Marikina-Pasig River may improve. This is due to the privatization of the water industry which is expected to make water distribution more efficient and the volume more adequate. Readily available water usually has corresponding improvement in toilet ownership. Access between geographical points may improve due to the installation of light rail services. The future improvement of health services will again depend on the local government unit being a devolved function. The increase in population means more enrollment but the provision of more teachers and classroom may lag behind the demand.

Employment will remain largely in services, trade and manufacturing and this trend will not be reversed with or without the proposed project. Being largely a low income area, unemployment will remain a problem which must be dealt with in the barangays along the Marikina-Pasig River. Flood-caused disruption of school, work and business operation will continue without the project. The households along the river will continue to sustain damages in terms of injury, sickness and destruction of properties.

8.0 PREDICTION AND ASSESSMENT OF IMPACTS

A systematic identification, prediction, and evaluation of the project's potential impacts to the environment is presented in this chapter. Analyses were made on the potential impacts during construction and operation phases. Although project abandonment is quite remote, any abandonment decision in the future can easily be carried out since the project's construction materials are mostly concrete and steel. There will be no decontamination activities since toxic and hazardous wastes will not be present in the proposed structures.

8.1 Assessment Approach

Analysis of the project's possible impacts to the environment was made by recognizing that the construction phase would mainly be dredging activities, construction of a control structure, and improvement of the river banks, while the operation phase would be the use of the control structure and the waterfront amenities. **The analysis presents the effects of the unmitigated impacts.** The necessary measures to reduce or eliminate the impacts will be discussed later under the Environmental Management Plan (EMP).

Identification of the potential environmental impacts was done comprehensively by evaluating the project's features and operations against the known list of potential impacts identified by various sources for this type of project. These sources include the environmental assessment guidelines prepared by international financing institutions such as the Asian Development Bank (ADB, 1990) and the World Bank (WB, 1991). Other information sources were also consulted (Canter, 1977; Carpenter and Maragos, 1989; IMC, 1982; Rau and Wooten, 1980). A guideline using an impact network analysis for bank stabilization projects (USDD, 1977) was also consulted.

Results of the impact analysis are presented in the form of a scaling checklist which indicates the nature of likely unmitigated impacts and their predicted significance.

An important consideration in the assessment of the impacts of the proposed project is its specific objectives which are as follows:

- To mitigate flood discharge caused by channel overflow of the Pasig-Marikina River;
- To enhance the favorable environment along the river as well as to facilitate the urban development, specifically to provide waterfront amenity facilities as well as to improve river quality by dredging works.

8.2 Construction Phase Impacts

Potential impacts during the construction phase are associated with the construction of the

various structures. Most of these are short-term in nature.

8.2.1 Physical and Ecological Impacts

Identified potential unmitigated impacts are presented in Table 8.1. Socioeconomic impacts are presented in the last section.

TABLE 8.1

UNMITIGATED CONSTRUCTION PHASE IMPACTS

ACTIVITY	DIRECT IMPACT	NATURE	MAGNITUDE
Construction of the MCGS, new embankments, raising of parapet wall, rehabilitation of bank protection, dredging, and excavation	fish and wildlife disturbance	no effect	---
	vegetation loss	no effect	---
	air pollution	negative	minimal
	water quality change		
	(a) increase turbidity	negative	moderate
	(b) release of substances from sediments	negative	minimal
	(c) removal of sludge layer	positive	significant
	generation of dredged materials	negative	significant
	soil erosion	no effect	---
	noise generation	negative	minimal
	impair river navigation	negative	minimal
	impair other projects in river	no effect	---
	reclamation of disposal sites	positive	significant

Fish and Wildlife Disturbance

Construction activities for the MCGS and river bank improvements will have no effect on fish and wildlife of the river since the activities are limited to small areas at a time. In addition, the river is already in a very poor ecological state.

Vegetation Loss

Same with the fish and wildlife situation, the construction activities will have no effect on vegetation since the area is no longer in a rural setting.

Air Pollution

Air pollution would come from the use of heavy equipment which is expected to be minimal. Nevertheless, this will not be a nuisance to the public since construction activities are limited to small areas at a time.

Water Quality

Water quality changes of the river would be due to the dredging activities. However, its impact relative to increase in turbidity is expected to be moderate since the dredging methods will cause a very minimal release or resuspension of sediments.

The impact relative to the release of toxic subtances from the river bed sediments is expected to be minimal. This impact is discussed in the Appendix C (River Sediments Study).

A significant positive impact of the dredging operation is the removal of the sludge layer for an estimated volume of 480,000 m^3. This sludge layer contains silt, solid wastes, and organic materials. The presence of the biodegradable components has greatly affected the river condition. A detailed discussion of this topic is presented in Appendix D (Dredged Materials and Disposal Areas).

Generation of Dredged Materials

The river dredging activities are expected to generate some 3.8 million m^3 of dredged materials. Without any mitigating measures, these large volume would cause some significant environmental problems.

Soil Erosion

Soil erosion such as due to various earth moving activities are not expected. Erosion consequent to vegetation loss is also not expected.

Noise Generation

Operation of the various construction equipment will be the major source of noise pollution during construction. However, the noise are within tolerable levels.

Impair River Navigation

Construction activities are not expected to significantly impair river navigation. These activities, particularly dredging, will be conducted and scheduled in such manner that will cause the least obstruction to navigation.

Impair Other Projects of the Pasig-Marikina River

Construction activities are not expected to affect any ongoing or other planned projects of the Pasig-Marikina River. These activities will be scheduled and executed with other concerned agencies.

Reclamation of Disposal Sites

The identified disposal sites are low-lying areas and uninhabiated public lands. These are flooded annually during rainy seasons. Reclamation of these areas using the dredged materials will significantly help the government make large tract of lands available for development.

8.2.2 Socioeconomic Impacts During Construction

Population

The proposed project will employ workers during the construction phase. If they are brought in from outside, or in-migrants are attracted by work opportunities, the population size of the barangays hosting the project will expand. The increase will be also felt at the municipal level. Their temporary residence in the construction site may have short-term impact although there are many cases wherein workers stay permanently in the site.

The population expansion will be greater if the outside workers will bring in their respective households into the site. There will be four additional migrants for every worker because an average household has about five members. They will increase the municipality's population. Such number of in-migrants will readily overwhelm the host barangays.

If the workers from outside will not take residence in or near the construction site, and they commute from their present residence, they would merely add to the daytime, but not to the nighttime population of the area. In any case, the increase in population will automatically increase the population density in the impact area. This will translate to higher demand for resources and service per square kilometer during the construction phase.

Furthermore, the workers who will be brought in, particularly during the construction phase, will alter the sex ratio in the direct impact area. There will be a preponderance of males over females with an all-male construction crew from outside brought in. The alteration of the sex ratio will be strongly felt in the barangays where the construction crew will be domiciled. Drastic wide imbalance in the sex ratio can create conflicts between the outside workers and the local residents.

Housing Characteristics and Utilities

If the outside workers who are employed during the construction phase will reside in the site, the demand for housing and associated facilities (such as toilets and water supply) will increase. This means that the number of temporary housing structures near the site will increase. The existing sanitation level may deteriorate. Furthermore, the occupants of these new structures may compete for such resources as water and land. This problem will be avoided or much reduced if the workers are recruited from the site.

Social Services

The outside workers and their household members will increase the number of users of the existing social services in and near the site. The increase of the population without a corresponding provision of additional housing and services will certainly lower the existing health and sanitation levels. The problems that will be generated from employing outsiders will have long-term negative impact if these outsiders will decide to stay in the area even after the completion of the construction phase.

Employment and Income

The project can employ local residents during the construction phase. It can provide enough work to substantially reduce the unemployment in the host barangays. During the construction phase, the project offers work opportunities to women by selling food to workers. This has impact in terms of enabling women to earn their own money, ability to support their family and instilling a sense of efficacy.

If local residents will be employed, a transfer of funds, in the form of salaries and wages, from the project to the local economy will occur. An average family spends half of their income on food. This means that about half of the total amount paid in the form of salaries and wages will redound to the food-producers and distributors, if local labor is

utilized by the project. The salaries and wages paid will subsequently create a second wave of positive economic impact in the municipality. The other half of the amount will go to an assortment of expenses such as housing, transport, clothing and education, which may or may not be spent within the barangay.

TABLE 8.2

SCALING CHECKLIST FOR SOCIOECONOMIC IMPACTS
(CONSTRUCTION PHASE)

IMPACT AREA	IMPACT	NATURE	MAGNITUDE
Population size	Influx of outside labor and their households	negative	minimal
	Displacement of people	no effect	---
Dependency burden	Greater capability to support dependents due to wages earned	positive	significant
Education	Greater capability to support schooling due to wages earned	positive	significant
Sex ratio	Imbalance favoring male due to outside construction crew	negative	minimal
Housing and utilities	Increase demand for housing and associated utilities	negative	minimal
Health and Sanitation	Greater capability to afford food and medical care due to wages earned	positive	significant
	Deterioration of sanitation level due workers presence	negative	minimal
Employment and Income	Reduction of unemployment	positive	significant
Women s welfare	Employment in services catering to workers	positive	minimal

8.3 Operation Phase Impacts

Potential impacts during the operation phase will be primarily due to the presence of the MCGS and its operation during storm periods.

8.3.1 Physical and Ecological Impacts

The proposed project is checked against the list of potential impacts for this type of project as discussed previously. This approach makes a comprehensive evaluation of the impacts that the project are likely to generate. Results of the evaluations are presented in Table 8.3.

Table 8.3

SCALING CHECKLIST FOR OPERATION PHASE IMPACTS

IMPACT AREA	DIRECT IMPACT	NATURE	MAGNITUDE
HYDROLOGY / FLUVIAL HYDRAULICS/ EROSION	prevents flooding in the center of Metro Manila	positive	significant
	improve river flow control during storm periods	positive	significant
	improve river flow conditions	positive	significant
	decrease in river bank erosion	positive	significant
	reduction of groundwater recharge	no effect	---
	increase sediment inflow to Laguna Lake	negative	minimal
	increase lake water level near the discharge point of the Mangahan Floodway	negative	minimal

WATER QUALITY	improvement in the water quality of the Pasig and Marikina River	positive	minimal
	contributes to long-term eutrophication of Pasig-Marikina River	---	no effect
	increase pollution to Laguna Lake	negative	minimal
AIR QUALITY/ MICROCLI-MATE	generation of air pollutants	no effect	---
	alteration of microclimate	no effect	---
	reduction in foul odor emitted by the river	no effect	---
NOISE	Increase in noise levels	no effect	----
GEOLOGY / SEISMOLOGY	Induced seismicity	no effect	---
ECOLOGY	Loss of wildlands and wildlife habitat	no effect	---
	Improvement in the spawning grounds for fisheries	no effect	---
AESTHETICS	Reduce the aesthetic appeal of the landscape at the MCGS site	negative	minimal
	Visual impairment of any historical, archaelogical, and cultural resources	no effect	---
	Improve the aesthetic appeal of the river banks	positive	significant
NATURAL RESOURCE USE	Loss of fishing area	no effect	---
	Impairment of navigation	no effect	---
	Damage to economically valuable natural resources	no effect	---

Fluvial Hydraulics

Operation of the MCGS will greatly improve the river flow control during storm periods. This should result to a significant prevention of flooding in the center of Metro Manila.

Channel and environmental improvement works will significantly improve the river flow conditions and decrease river bank erosion. These include new embankments, raising of parapet wall, and rehabilitation of bank protection.

Increase of annual sediment inflow to Laguna Lake is considered minimal since the estimated increase of sediment with the MCGS over that without the MCGS is only 1.4% for a probable flood discharge of 2-year return period. In addition, the MCGS will only be operated when the discharge at Sto. Nino is bigger than 900 m^3/s.

Increase of lake water level near the discharge point of the Mangahan Floodway will be minimal since it is estimated to be only two (2) cm when the MCGS is operated for a storm with a 30-year return period.

Water Quality

Initially, the minimal improvement in the water quality of the Pasig-Marikina River will be due to the removal of the riverbed sediments. However, this impact will be insignificant compared to the long term pollution caused by the municipal solid wastes and wastewater from domestic and industrial sources.

The structures will not contribute to any long-term eutrophication of the rivers. Operation of the MCGS has no effect on nutrient control in the river.

Increase pollution to Laguna Lake is considered minimal since the COD load is estimated to be only 1% compared to the other tributaries of the lake.

Air Quality/Microclimate

The MCGS and river banks improvement works will not generate any air pollutants nor lead to the alteration of the microclimate.

During summer, the MCGS will have no effect on river flow. Consequently, it will have no effect on the foul odor emitted by the river due to the low river flow.

Noise

The project components are passive concrete structures. These will not therefore increase

the sound levels of the surrounding areas. Operation of the MCGS is also expected not to increase the sound levels.

Geology/Seismology

There are no structures whose weight can induced seismicity in the area. The passive structures are also not expected to alter the geology.

Ecology

In general, the proposed structures will not cause the loss of wildlands and wildlife habitat since there are none in the proposed sites of the river. It has no effect on improving the spawning grounds for fisheries in the river since its long term impact on river water quality is insignificant.

Aesthetics

The MCGS may reduce the aesthetic appeal of the site landscape. However, the aesthetic appeal of the river banks will improve through the presence of the various banks protection works and riverfront amenity facilities.

There will be no effect on the visual aspects of any historical, archaelogical, and cultural resources since there none in the proposed sites.

Natural Resource Use

The project will not lead to the loss of fishing areas since it ecologically it has no effect on the spawning grounds for fisheries. No valuable natural resources will be damaged.

It is not expected to impair river navigation since the MCGS will be opened during non-flood periods and the gates can easily accomodate the ferries and barges.

8.3.2 Socioeconomic Impacts During Operation

In general, the socioeconomic impacts will be positive during the operation phase. The proposed river improvement for the Pasig-Marikina River will increase the flow capacity of the channel, while the proposed construction of the MCGS will divert the design flood of 2,400 m^3/s towards the Mangahan Floodway. This flood control project will protect an area of some 140 km^2 at the center of Metro Manila against a flood with a return period of 30 years, relieving 450,000 people from flood damage. The average annual flood damage reduction is estimated at 1.0411 billion pesos, while the economic benefits from the construction of waterfront facilities are estimated at 122.5 million pesos. These waterfront facilities will not only serve as recreational facilities for the people living near the river but also improve the river environment and its scenic view.

The project will have a positive impact on the health status during the operation phase. This positive impact will be realized through less expense on flood-related injuries and illness and greater accessibility of health services. Higher income due to increased productivity will enable the beneficiary population afford better food and medical care.

The only major socioeconomic concern during the operation phase is the presence of the squatters in the Mangahan Floodway. Their relocation is a positive activity since it will remove them from a danger zone. The floodway is design to receive a large amount of flow. The squatters houses within the floodway will easily be swept by a major flood event. The succeding discussions are therefore focused on their relocation. Mitigating measures for this problem are discussed in Section 9.1.2.

Population

The resettlement of the squatter households in the Mangahan Floodway will alter population size and composition in the barangay if they are relocated outside of it. But if the relocation site will be within the same barangay, there will be no demographic alteration of the barangay. This means that they will retain their membership in the same political constituency and belongingness in the same social system.

Housing Characteristics and Utilities

The impact of resettlement of the affected population will depend on the housing characteristics and distribution in the resettlement site. If the national government will construct uniform houses roofed with GI sheet and walled with concrete, these will replace the squatter houses, which are usually of diverse and lower quality construction and materials. Houses lined up along the road in geometric pattern will also replace the haphazard and hazardous distribution of houses in their existing location.

The housing utilities will also improve if the resettlement site is fitted with running water, toilets and electricity. The result is the increase in the number of users of safe drinking

water, greatly improved access to water source and better sanitation due to more widespread use of toilet facilities. The most significant impact is the ownership of home-lot among potential resettlers because these resettlers presently do not own their home-lot.

Social Services

If the resettlement site is provided with facilities (roads, drainage, health center and a basketball court), it will certainly upgrade the access of the resettled population to these services.

Health

The provision of running water and toilets to the resettled population is a big boost to the health status of the population. This should decrease the incidence of water-borne and insect-borne diseases. The incidence of water-borne diseases is usually high in the squatter community. Provision of running water and toilets can reduce cholera incidence by 76 percent. If only toilet is provided, the reduction is only 68 percent.

TABLE 8.4

SCALING CHECKLIST FOR SOCIOECONOMIC IMPACTS
(OPERATION PHASE)

IMPACT AREA	IMPACT	NATURE	MAGNITUDE
Population Size	Increase population due to intensification of use in formerly flooded areas	positive	minimal
	Resettlement of squatters from Mangahan Floodway	positive	significant
Dependency burden	Greater capability to support dependence due to increased productive time	positive	significant
	Reduction of squatter communities	positive	significant
Education	Reduced loss of school days	positive	significant
Sex ratio	none	---	---
Housing and utilities	Lesser flood-related damage in housing and utilities	positive	significant
Social services	Intensification of use of services located in formerly flooded areas	positive	significant
Health	Lesser expenses on flood related injuries and illness	positive	significant
Employment and Income	Reduction of unemployment and increase in income due to more productive days	positive	significant
Women's Welfare	Less time used by women to cope with the flood	positive	significant
Land Values	Increase LGU income due to appreciation of land	positive	significant

8.4. Abandonment Phase Impacts

The people of the Pasig-Marikina River system will surely wish for the permanent presence of the proposed structures since these will be constructed to protect them from the annual flooding. Presence of the structures will have a significant influence on the economic and social activities of the area. With a safer place, the economic activities in the basin is expected to progressively increase in the future. Hence, future abandonment of the project is a remote possibility. However, any abandonment decision in the future for the removal of the structures can easily be carried out since the project's construction materials are only concrete, steel, and boulders. There will be no decontamination activities since toxic and hazardous wastes will not be present.

8.5 Environmental Risk

Environmental risk assessment hinged on the existence of an environmental hazard. Environmental hazards are defined as the situations that directly threaten human life by means of acute physical or chemical trauma. In river projects, this is associated with the sudden release of energy which are greatly in excess of normal levels and could result to acute bodily trauma plus any related damage to property or the environment.

Based on this definition, the proposed project will not create any environmental hazards. In fact, ***it is actually a mitigating measure*** against flooding - an environmental hazard. The channel improvement works will not be a cause for flooding since its function is to improve the flow capacity.

The MCGS is just a river flow regulating structure. It will not operate like a dam where a large energy is stored by the impounded water. There is therefore no source of large energy that could suddenly be released due to the presence of the proposed project.

The MCGS is a structure that will only be operated during flooding periods when the discharge from the Sto. Niño is bigger than 900 m^3/s. Hence, most of the time it will not interfer with the river flow.

Without the proposed project, the environmental hazard of flooding from a 30-year flood will persist.

9.0 ENVIRONMENTAL MANAGEMENT PLAN

This section deals with the Environmental Management Plan (EMP). It is the plan on what to do with the potential impacts identified and discussed in Section 8.0 (Prediction and Assessment of Impacts). The purpose of the EMP is to enhance the beneficial impacts and to lessen the adverse impacts. The EMP is broken down into the following components:

- Impact Management
- Impact Monitoring
- Institutional Plan

Discussions on residual impacts and contingency plans are presented at the end of the section for impact management.

9.1 Impact Management

Management of the impacts will be implemented through the proposed impact mitigating measures.

9.1.1 Mitigating/Enhancement Measures for the Construction Phase

Construction activities for the MCGS, new embankments, raising of parapet wall, and rehabilitation of bank protection are not expected to cause significant adverse impacts as previously discussed. Ecological impacts such as vegetation loss, fish and wildlife disturbance are not expected. Same situation is expected of soil erosion. Mitigating measures are therefore not necessary for these construction activities insofar as ecological impacts and soil erosion are concerned.

The only impact that raises strong concern during the construction phase is water quality change due to dredging activities. However, duration of this impact is short-term in nature and can easily be mitigated. Mitigating measures for the negative significant impacts are tabulated in Table 9.1.

Water Quality Change

Dredging for the upstream section of the river will be land-based, when applicable, using cranes with buckets. Release or resuspension of sediments in this section due to the dredging activities can be minimized through the use of special dredging buckets which are watertight when raised from the water. Diffusion into the lake can also be prevented by conducting the dredging only during low tide conditions when the net water direction is towards Manila Bay.

Whenever necessary, dredging near the mouth and downstream sections of the river will be through the use of a suitable suction dredger. The sediments will be unloaded to the dumping site through the use of pipes and compressed air to minimize mixing with river water. Photographs of this technology are presented in Appendix F.

TABLE 9.1

SIGNIFICANT CONSTRUCTION PHASE IMPACTS

DIRECT IMPACT	NATURE	MITIGATING MEASURES/ BENEFITS
increase turbidity of river	negative	use of special dredging technology
generation of dredged materials	negative	to be used for land reclamation projects
removal of sludge layer	positive	contributes to river ecology improvement
reclamation of disposal sites	positive	make lands available for productive use
socioeconomic - greater economic capability of workers	positive	provides economic benefits to workers

Generation of Dredged Materials

The 3.8 million m^3 of dredged materials will be distributed to various disposal sites and uses. Some will be used as backfill materials for the waterfront amenity facilities, while the rest will be used for the reclamation of low-lying lands. It is therefore expected that the problem of dredged materials disposal will be handled satisfactorily. The entire scheme is detailed in Appendix D.

Air Pollution

During construction, the extent of air pollution would also be minimal and temporary. For the MCGS, dust discharges associated with cement storing and handling at the site will be eliminated through the use of ready mixed concrete.

Heavy dust generation is not expected in the construction activites along the river banks. Mitigating measures are therefore not necessary for these construction activities.

Equipment and vehicles used during construction that show excessive emissions of exhaust gases due to poor engine adjustments and operating conditions shall not be operated unless corrective repairs of adjustments are made.

Noise Generation

Noise levels as previously discussed will be tolerable. Nevertheless, equipment with less noise generation will be used during construction.

Environmental Pollution by Human Wastes from the Construction Workers

Human wastes if not properly manage could not only cause pollution, but also spread communicable diseases. The workers will be provided therefore with temporary decent housing, potable water, and excreta management. Adequate number of sanitary pit latrines will be used for excreta management. These latrines will be closed down properly after the construction period.

Local Labor Employment

Beneficial impact on local labor employment will be enhanced by requiring the constructors to give priority to the local workers in hiring the required construction work force. Close coordination between the constructors and the local officials will be made.

Socio-related Issues

There will be no houses to be displaced during the construction period. Proposed structures are located in vacant areas. However, the project proponent will start working on the relocation of the squatter families living within the Mangahan Floodway. This is discussed in Section 9.1.2.

Although the construction activities are not expected to significantly affect the people, the project proponent and its constructors shall quickly address any construction related issues or problems to be raised by the people. This shall be done with the help of the concerned barangay officials. The Environmental Coordinator of the proponent shall actively participate in the resolution of the issues/problems.

Construction Contractor's Program

The proponent shall require the construction contractor to implement the above mitigating measures and enhancements during the construction phase. These mitigating measures shall be part of the general conditions of the contract between the proponent and the would-be contractor.

The Construction Contractor's Program shall contain not only the mitigating measures and enhancements but also the other environment-related general conditions of a standard government contract:

- Compliance to environment-related statutes, ordinances, laws, decrees, and executive orders which are applicable to the execution of the contract;
- Reasonable precautions to prevent removal or damage of all fossils, coins, articles of value or antiquity, structures, and other remains or paleonthological, geological or archaeological findings discovered at the site;
- Responsibility for the adequacy, stability and safety of all site operation and methods of construction and any damage to public and private property and the environment resulting from construction operations;
- Reasonable precautions and steps to prevent any unlawful, riotous or disorderly conduct by or among construction employees for preservation of peace and protection of persons and property and the environment in the neighborhood of the works;
- Responsibility for the safety, protection and security of construction personnel, third parties, the public at large;
- Inspection of all possible routes to the site with the purpose of ascertaining the safety of transporting construction equipment and materials over public roads, bridges, culverts and other structures at the least inconvenience and discomfort to the public;
- Responsibility for the management of solid wastes generated by construction workers and construction operations; and
- Clean up of site upon completion of the works.

See Appendix I for details.

9.1.2 Mitigating Measures for the Operation Phase

There are no significant long-term negative physical and ecological impacts. The proposed project will not generate any wastes. The only project component that will be operated is the MCGS. Nevertheless, it will be passive most of the time and will only be operated when the discharge at Sto. Nino is bigger than 900 m^3/s. In view of this expected situation, mitigating measures for the operation phase are therefore not necessary insofar as the physical and ecological impacts are concerned.

The only major concern is the presence of the squatters within the Mangahan Floodway. The housing structures should be removed before the operation of the MCGS.

Squatters in Mangahan Floodway

The proposed solution to the squatters problem in the Mangahan Floodway is outlined in the SAPROF Team report (OECF, 1998). The report cited the DPWH's Work Program on Relocation and Resettlement of the squatters along the Mangahan Floodway. The said program was supposed to start in the last quarter of 1997 and to be completed until the fourth quarter of 1998 for some 10,787 families which did not materialized due to non-availability of resettlement sites.

A Presidential Memorandum Order No. 191 (dated 12 February 1994) was issued for the creation of an Inter-agency Task Force on Socialized Housing in the Mangahan Floodway. One solution is the NHA Mangahan Socialized Housing Project. This housing project will cover the municipalities of Cainta and Taytay and the City of Pasig parallel to the Mangahan Floodway. Under Presidential Proclamation 458 (dated 20 August 1994), a 140-hectare property was transferred to the NHA for this purpose.

The proposed developments are:

- On-site Upgrading - this will develop the already densely populated east and west embankment areas along the floodway. The area will be subdivided into homelots ranging from 50 m^2 to 150 m^2. The squatter families along the berm area will be relocated to suitable sites at the embankment;
- Medium Rise Housing - this will be constructed at the less densely populated sites along the east embankment. The 5-storey buildings with 45 units each are expected to accommodate 7,920 families.

Unfortunately, only 60% out of the censused households of 10,787 are qualified for housing allocation. The remaining 40% will face summary eviction. DPWH and NHA are still exploring other options to ensure the peaceful relocation of these families.

9.1.3 Residual Impacts

Residual impacts are those negative impacts whose magnitudes remain a concern after implementation of the mitigating measures.

The expected adverse residual impact during the construction phase is the water quality change due to the dredging activities. However, this is considerably not alarming as it will be temporary and on manageable levels.

Long-term adverse impacts are all minimal in magnitude as previously discussed. It is therefore expected that any residual magnitudes during the operation phase will also be at acceptable levels. Diligent monitoring will ensure that these levels will be maintained.

9.1.4 Contingency Plans

A large-scale contingency plan due to the presence of the MCGS is not necessary since the proposed structure will not create or lead to hazardous conditions. It is also not a potential direct source of pollutants. The structure is simply a control gate design for a flood with a 30-year return period. Any flooding conditions beyond the design capacity will not be due to the presence of the structure.

However, the people of Metro Manila and the local government units should be aware that the degree of protection to be provided by this project is based on a calculated risk and not an attempt to provide absolute flood control. It should be understood therefore that floods greater than the design flood (30-year flood) may also occur. The local government units shall therefore prepare their contingency plans on the basis of this information.

9.2 Impact Monitoring and Reporting Plans

The proposed impact monitoring and reporting plans are intended for the continued observation and evaluation of the mitigated impacts during the construction and operation phases. The proponent will closely coordinate with the DENR and the LGUs on the monitoring and reporting activities. It shall provide the DENR with a quarterly environmental status report during the construction period and an annual report during the operation phase. For a smooth implementation of the project, the proponent will appoint an Environmental Coordinator for proper coordination with the DENR and the LGUs.

9.2.1 Construction Phase

Water quality change of the river will be the main focus of the monitoring activities during construction phase. All impacts and the identified mitigating measures will be

closely monitored by the local government officials and other interested groups. The project proponent will closely monitor its constructors to ensure the implementation of the mitigating measures.

In addition, the project proponent shall regularly inform the DENR Regional Office on the progress of the construction activities. Any new environmental issues that will arise and associated with the project shall promptly be referred to the DENR.

9.2.2 Operation Phase

Negative impacts during the operation phase will also be monitored although these are not of serious concern. Changes in the hydrology and water quality aspects will be the main focus of the observations. However, the project proponent will not perform the required water quality monitoring activities since these are presently and continuously done by DENR.

TABLE 9.2

HYDROLOGY AND WATER QUALITY MONITORING

PROJECT PHASE	PARAMETER	FREQUENCY
CONSTRUCTION	suspended solids, COD	twice a month
OPERATION	river flow, COD	when MCGS is operated (flow greater than 900 m^3/s
	suspended solids, COD	twice a year
Note: Annual monitoring cost is P50,000 during construction and P4,000 during the operation phase.		

9.3 Institutional Plan

This institutional plan discusses the necessary organizational and human resources components in implementing the environmental aspects of the project. Proper coordination between the project proponent, Local Government Units (LGUs), and the DENR is very important for a smooth implementation of the project. This will ensure the expeditious action on any environmental issues or problems that will arise during the construction and operation stages of the project. The proponent shall therefore appoint an Environmental Coordinator (EC) who shall be responsible for all environmental matters regarding the project.

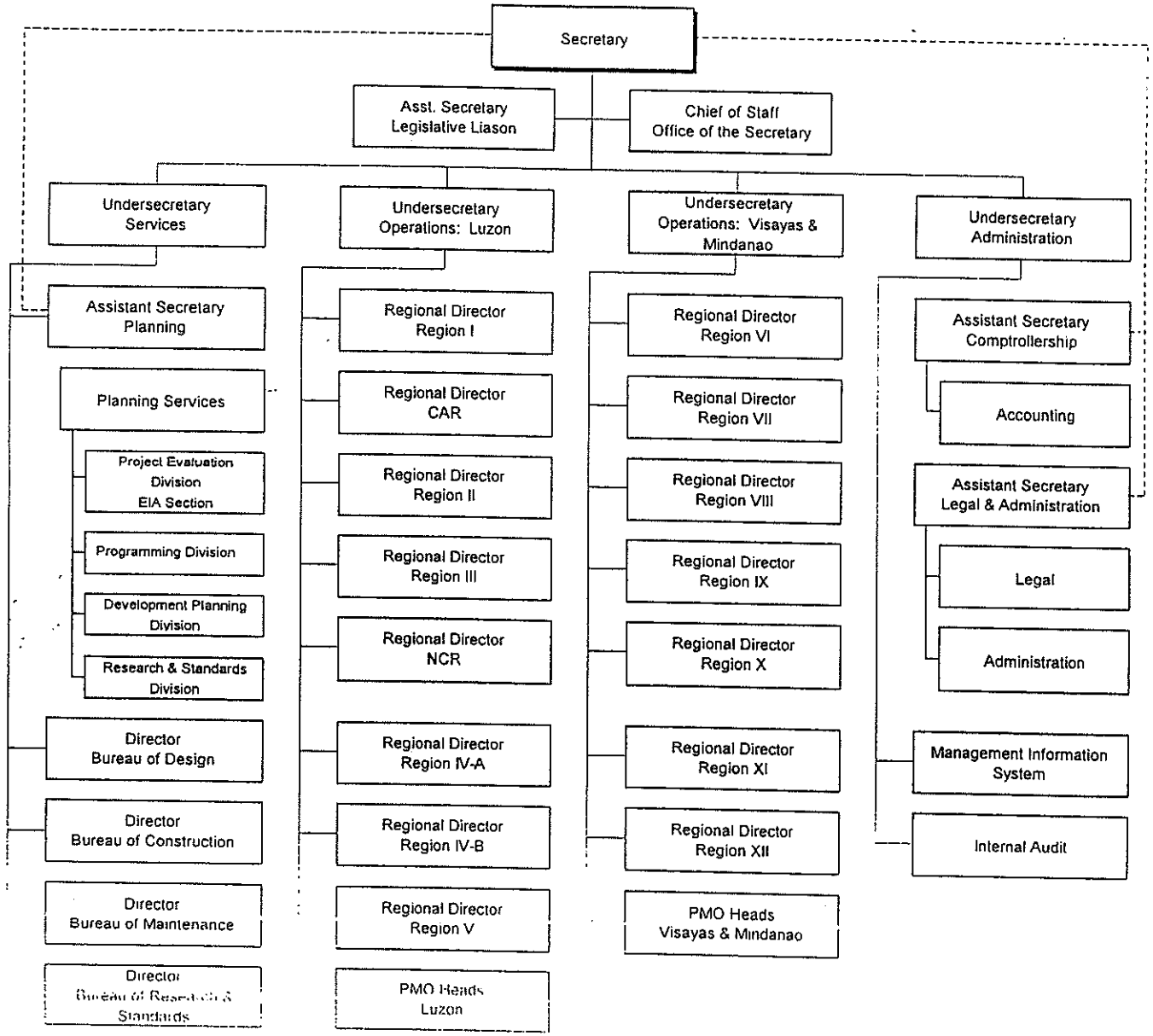
Environmental Coordinator

The EC shall be tasked with the following:

- coordinate with the LGUs and the DENR on the environmental aspects of the pre-construction and construction activities of the project
- monitor all activities relative to the Environmental Compliance Certificate (ECC) stipulations to ensure compliance of all requirements
- coordinate with the DENR on all environmental monitoring activities
- actively participate in the periodic consultations with all concerned sectors on the various environmental impact issues of the project
- maintain records on all matters concerning the environmental aspects of the project
- prepare a monthly environmental status report of the project during the construction phase and consolidate these reports for a quarterly submittal to the DENR
- prepare an annual environmental status report of the project during the operation phase.

To comply with Executive Order 291, entitled "Improving the Environmental Impact Statement System", the proponent established an EIA Section under its Planning Services as shown in Table 9.3. To develop the capacity to perform EIAs through a strong national program, initially aimed at consolidating capabilities at the central level, then expanding to regional and district offices, the proponent formulated a five-year EIA Capability Strengthening Program. The scope and schedule of this capability building program are shown in Appendix J. The program is now on its third year.

Table 9.3
DPWH Organization Chart



10. PUBLIC PARTICIPATION AND SOCIAL ACCEPTABILITY

The Philippine EIS System has been giving more emphasis on public participation and social acceptability. This policy is embodied in DENR's DAO No.37 series of 1996. In compliance to this requirement, the project proponent has conducted a number of activities concerning public information, scoping sessions, and public consultations. These were intended to ensure the social acceptability of the proposed project and pave the way for a smooth project implementation. These activities are described in detail in Appendix G - "Process Documentation Report (Scoping and Public Consultation)".

Stakeholders were clearly identified in this project for a meaningful process of public participation and social acceptability as defined in DAO 96-37. The major stakeholders are the people living in the areas to be protected against the annual flooding who are represented by the local government units. Concerned government agencies are also considered as stakeholders such as the Metro Manila Development Authority (MMDA), Pasig River Rehabilitation Project (PRRP), Philippine Ports Authority (PPA), and the Laguna Lake Development Authority (LLDA).

10.1 Public Participation

Public participation is defined in DAO 96-37 as the process which aim at giving the people of the project area the opportunity to influence major decisions that affect them. Its goal is to enable the people to take responsibility for environmental protection and management through active involvement in decision making. It will reduce the level of misinformation/distrust and help identify the concerns of affected groups.

The project proponent has conducted information dissemination and public consultations in order to effect a transparent process of public participation. The stakeholders were properly informed of the proposed project. Instances where project information was disseminated include:

- Presentation of the Inception Report
- Meetings with LGUs and other agencies
- First Steering Committee Meeting

Scoping sessions were also conducted with the DENR and the stakeholders. An initial scoping session was conducted last 26 February 1998 with the DENR-NCR Office after the Environmental Management Bureau (EMB) endorsed the EIS processing to the said office.

The most important activity concerning public participation was the ***public consultation and scoping meeting held at the DPWH Central Office last 27 February 1998***. The said meeting was attended by representatives of the stakeholders.

During the meeting, officials of the proponent asked the participants if they have any problems with the proposed project. Except for some clarificatory questions and

suggestions, there were no apparent objections to the proposed project. Details of this meeting are presented in Appendix G.

Another project information activity was conducted last 20 may 1998 at Bayview Hotel, Manila. This was a promotion and public awareness campaign for the proposed project which was attended by various sectors. A copy of the minutes of the said meeting is presented in Appendix G.

10.2 Social Acceptability

The social acceptability aspect is hinged on the fact that the public is convinced on the overall consequence of the project as beneficial to most people, directly or indirectly, affected by it. The activities on public information and consultation were therefore conducted in this direction.

The proposed project is actually a mitigating measure against an environmental hazard. Social acceptability is therefore not a problem since the project is primarily intended to provide the public with protection from floods or reduce the risks of flooding. Implementation of the project will significantly facilitate urban development and enhance the favorable environment along the river. Hence, the LGUs are supporting this proposed project. A project endorsement which was earlier issued by the Metropolitan Manila Council (MMA) is presented in Appendix H.

Acceptance of the project by the people in the project area was determined through the conduct of a perception survey last May 1998. Results of the perception survey in these areas showed a general positive attitude towards the project despite the fact that only 15% have experienced floods last 1997.

Of those surveyed, 83% have welcomed the proposed project, while only 17% are against. Those who are against the project are apprehensive that they might be affected if easements will be required. Fortunately, this project will not require additional easements. Details of the socioeconomic and perception surveys are presented in Appendix E.

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APPENDIX A

DEVELOPMENT DETAILS

TABLE A.1

PROPOSED PROJECT COMPONENTS BREAKDOWN

RIVER STRETCH	LENGTH (km)	MAJOR WORKS			
		DREDGING/ EXCAVATION (m^3)	EMBANKMENT (m^3)	PARAPET (km)	REVETMENT (km)
Pasig River (river mouth to San Juan R.	6.84	-	-	8.0	4.9
Pasig River (San Juan to Napindan C.)	9.76	-	-	17.0	3.2
Lower Marikina River (Napindan to MCGS)	5.58	450,000	-	7.0	0.2
MCGS and Upper Marikina River (MCGS to Mangahan FW)	1.21	300,000	100,000	-	0.3
Upper Marikina River (Mangahan FW to Sto. Niño)	6.43	2,960,000	700,000	-	-
Waterfront Amenity Facility	3.00	90,000	-	-	3.0

Note: The waterfront amenity facilities will be constructed in selected locations of the Pasig-Marikina River.

TABLE A.2

MCGS STRUCTURAL FEATURES

ITEM	STRUCTURAL FEATURES
Design Discharge	500 m^3/s
Design Water Level: - upstream side - downstream side	 EL. 17.20 m EL. 14.30 m
Design River Section: - bed width - side slope - bed elevation	 75.0 m 1:2 EL. 6.50 m
Design of gate: - gate span - gate height	Roller Gate 2 units x 15.5 m wide 11.1 m

PROPOSED FLOOD OPERATION RULE

Optimum flood control is the basis for an integrated operation plan for both the MCGS and the existing Rosario Weir. These structures will control the branching flows based on the flood discharge at the Sto. Niño. The proposed operation rule curve is presented at the end of the discussions.

For the succeeding discussions, the discharge from the Sto. Niño (upper Marikina River) will be designated as (Qs). The diversion discharge through the Mangahan Floodway will be designated as (Qm), while the discharge into the lower Marikina River will be designated as (Ql). Qs is the sum of Qm and Ql.

Based on the proposed flood operation rule, the discharge leaving the MCGS should not exceed 500 m^3/s under all flood conditions. This is the maximum discharge that will be allowed to enter the Pasig River in order not to cause flooding in the Manila area.

Gate operation, flood discharges, and navigational conditions are schematically presented in Table A.3.

TABLE A.3

SCHEMATIC OF FLOOD OPERATION RULE

OPERATION STEP	FLOOD DISCHARGE (m^3/s)			ROSARIO WEIR	MCGS	RIVER NAVIGATION
	Qs	Ql	Qm			
	0	0	0			
Step-1 small scale floods	↓	↓	↓	Close	Open	Available
2 to 3 times floods per year	500	500	0			
Step-2 medium scale floods	↓	↓	↓	Open	Regulation	Not Available
30-year flood (design flood)	2,900	500	2,400			
Step-3 exceeding flood	↓	↓	↓	Open	Regulation	Not Available
100-year flood	3,500	500	3,000			
Step-4 exceeding flood	↓	↓	↓	Open	Regulation	Not Available
	Qe	500	3,500			

a) Qe = flood discharge exceeding the design flood

b) Bankfull discharge of the Mangahan Floodway is 3,000 m^3/s.

(a) Step-1 (Small Scale Floods)

In case the flood discharge (Qs) of the upper Marikina River is less than 500 m^3/s which occurs 2 to 3 times a year, the Rosario Weir is closed and the MCGS is fully opened. Ferry and barge operations are available during small scale floods.

(b) Step-2 (Medium Scale Floods)

In case the flood discharge (Qs) ranges from 500 m^3/s to 2,900 m^3/s which is the design discharge, the Rosario Weir is fully opened and the MCGS is operated to limit the flood discharge at 500 m^3/s or less in the lower Marikina River. River navigation is not possible in this period.

(c) Step-3 (Discharge Exceeding Design Flood)

In case the flood discharge (Qs) is bigger than the design discharge and smaller than 3,500 m^3/s of the 100-year flood, the Rosario Weir is fully opened and the MCGS is operated to limit the flood discharge at 500 m^3/s or less in the lower Marikina River. It is possible to confine the 100-year flood in the Mangahan Floodway with a minimum freeboard height of around 20 centimeters considering the stability of the embankment and the safety of the structure.

(d) Step-4 (Discharge Exceeding Design Flood)

In case the flood discharge (Qs) is bigger than 3,500 m^3/s (100-year flood), the Rosario Weir is fully opened and the MCGS is operated to limit the flood discharge at 500 m^3/s or less in the lower Marikina River.

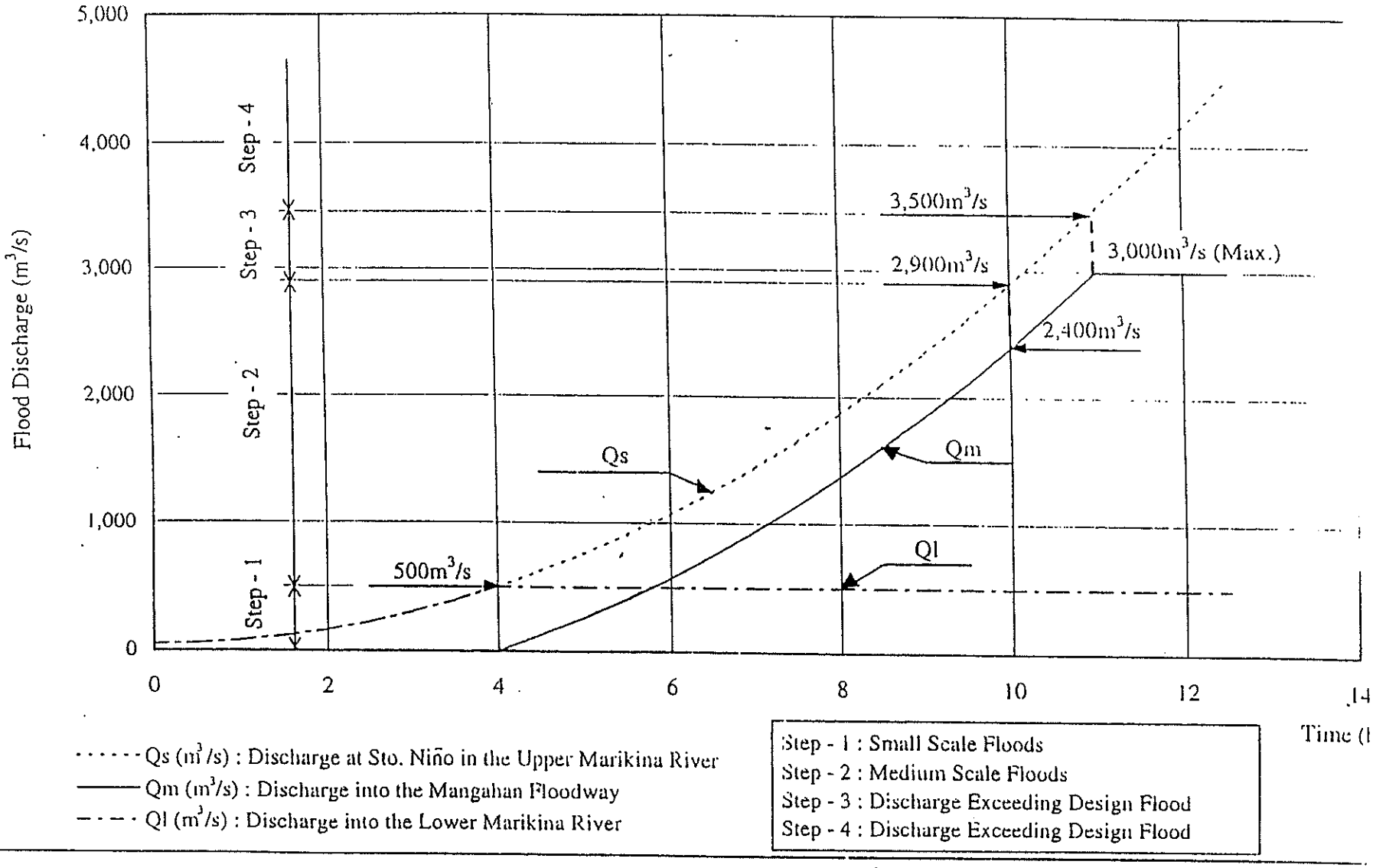


FIG. A.1 PROPOSED OPERATION RULE CURVE FOR FLOOD DIVERSION INTO THE MANGAHAN FLOOWAY AND THE PASIG-MARIKINA RIVER

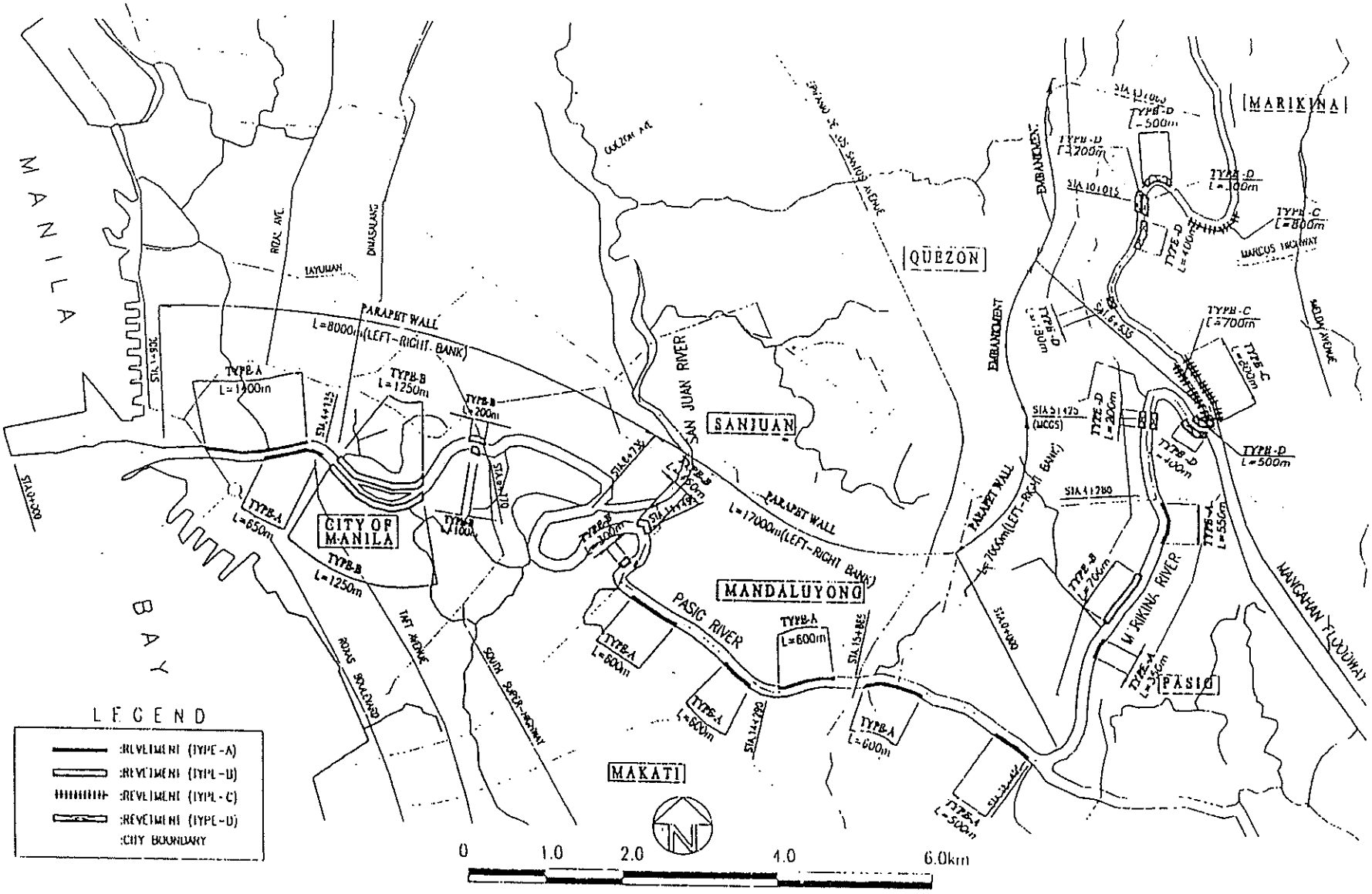
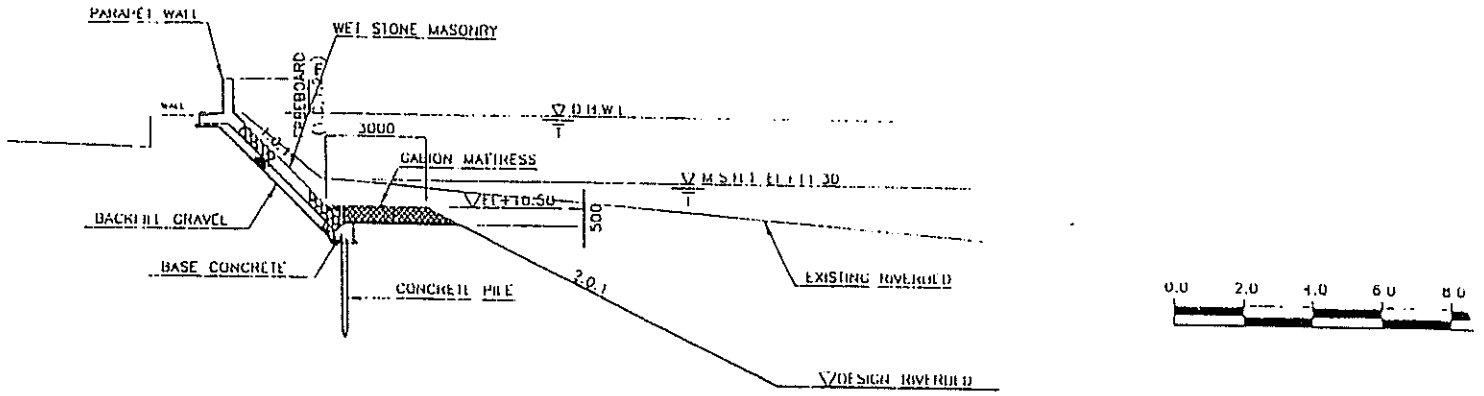
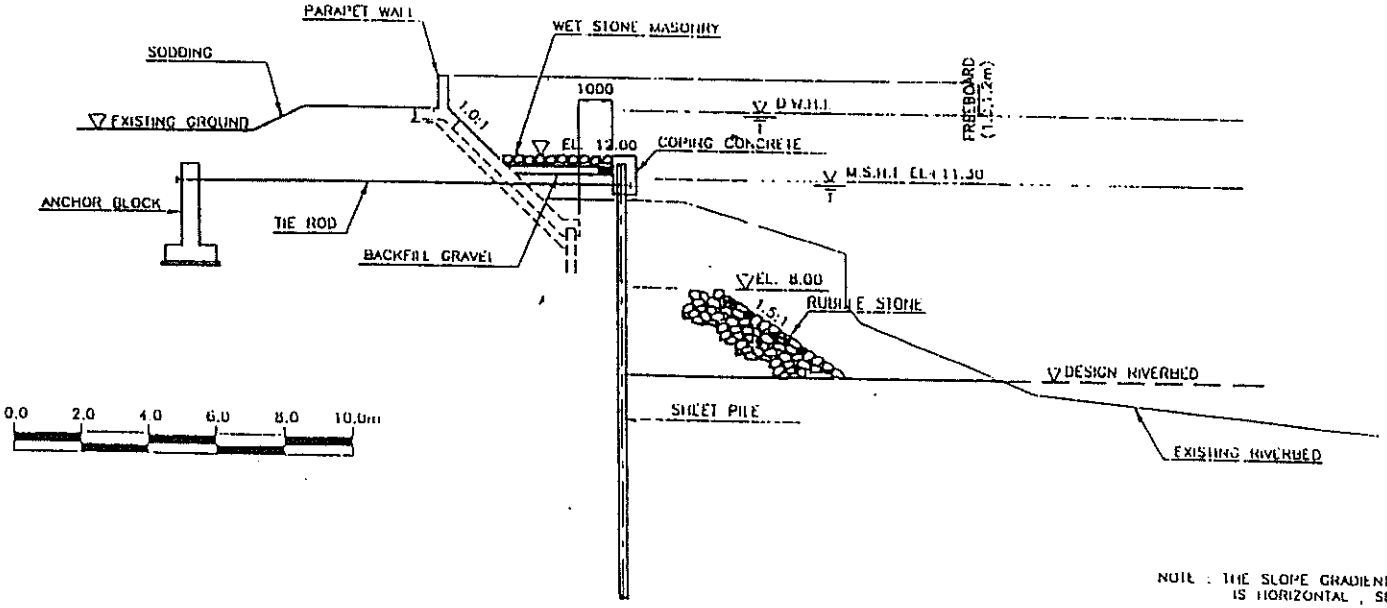


FIG. A.2 ALLOCATION OF PROPOSED RIVER BANK AND REVETMENT



PROPOSED REVETMENT (TYPE--A)



NOTE : THE SLOPE GRADIENT SHOWS THAT [illegible]
IS HORIZONTAL , SECOND NUMBER

FIG. A.3 CROSS SECTION OF PROPOSED RIVER BANK AND REVETMENT

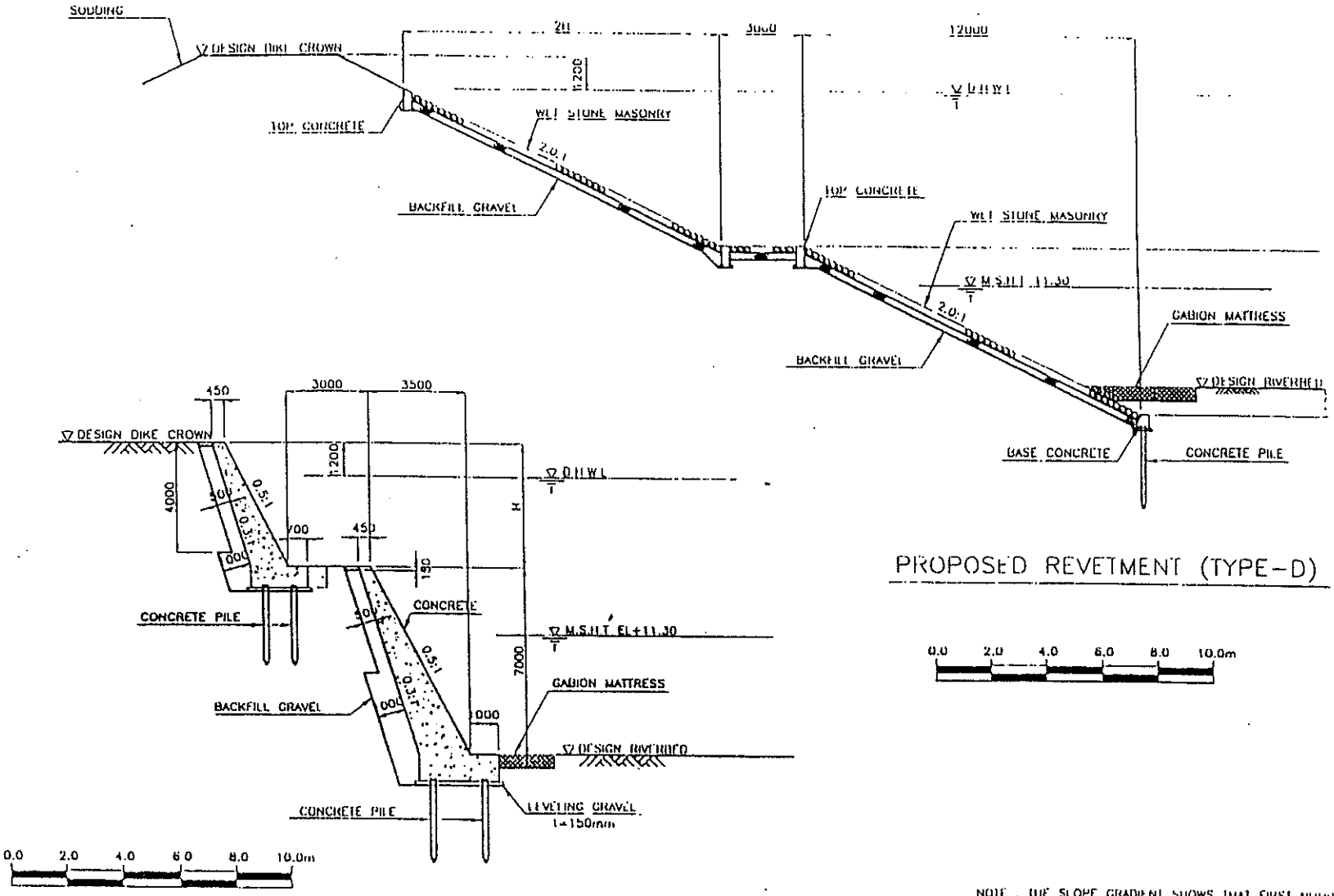
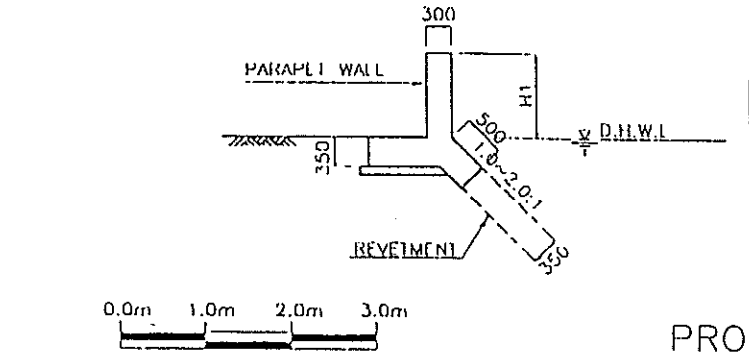
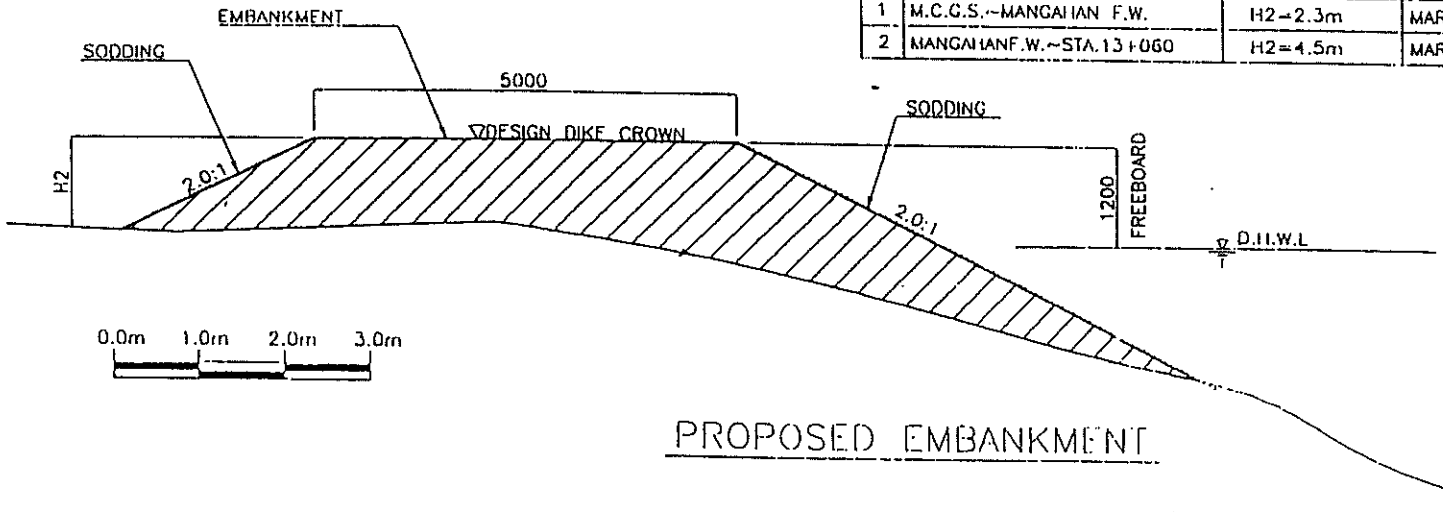


FIG. A.4 CROSS SECTION OF PROPOSED RIVER BANK AND REVETMENT



	SECTION	AVERAGE HEIGHT	NOTE
1	MOUTH~SAN JUAN RIVER	H1=1.5m	PASIG RIVER
2	SAN JUAN RIVER~NAPINDAN C.	H1=1.5m	PASIG RIVER
3	NAPINDAN C.~M.C.G.S	H1=1.4m	MARIKINA RIVER

PROPOSED PARAPET



	SECTION	AVERAGE HEIGHT	NOTE
1	M.C.G.S.~MANGAHAN F.W.	H2=2.3m	MARIKINA RIVER
2	MANGAHANF.W.~STA.13+060	H2=4.5m	MARIKINA RIVER

PROPOSED EMBANKMENT

NOTE : THE SLOPE GRADIENT SHOWS THAT FIRST [illegible]
IS HORIZONTAL , SECOND NUMBER IS VE[illegible]

FIG. A.5 CROSS SECTION OF PROPOSED RIVER BANK AND REVETMENT

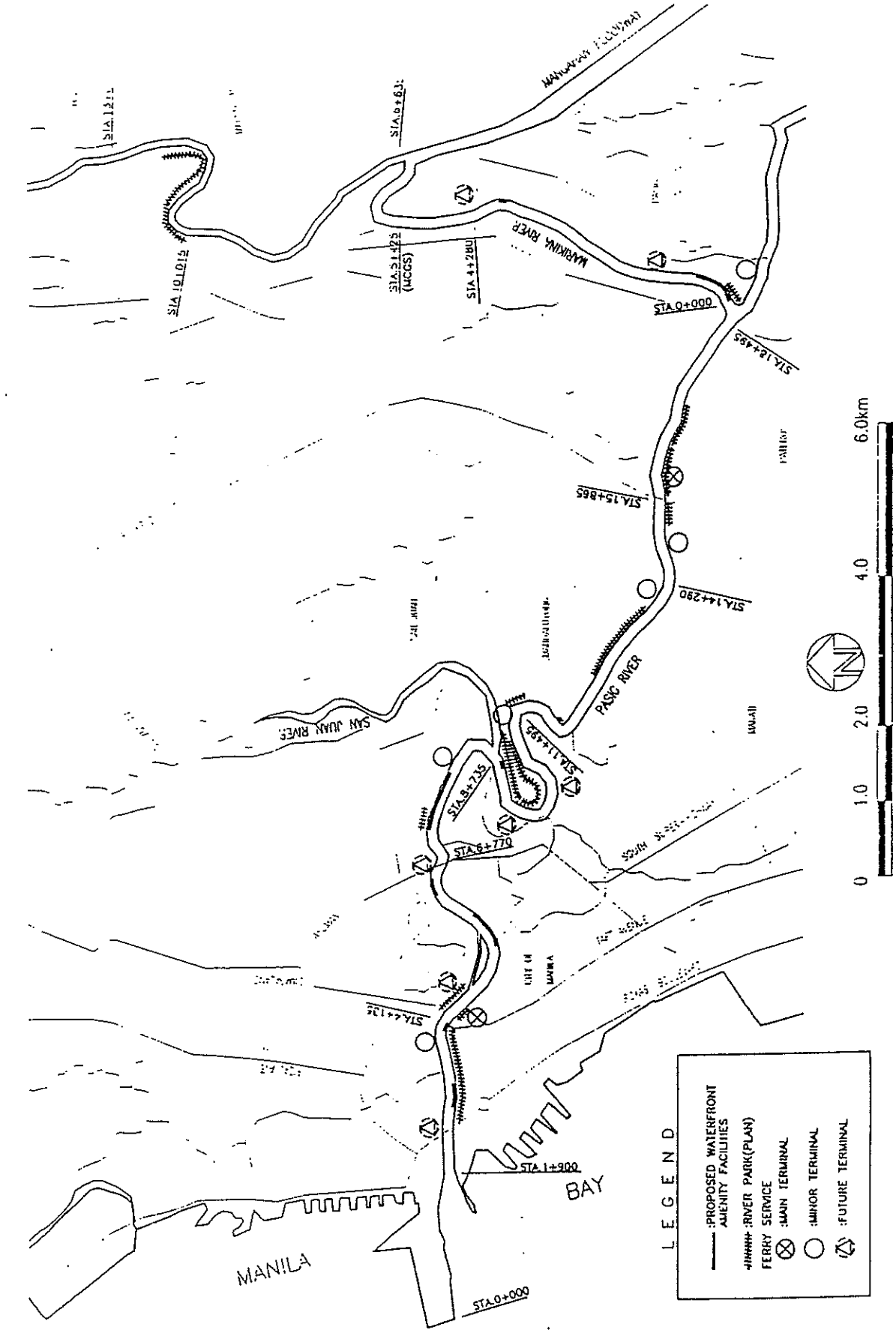
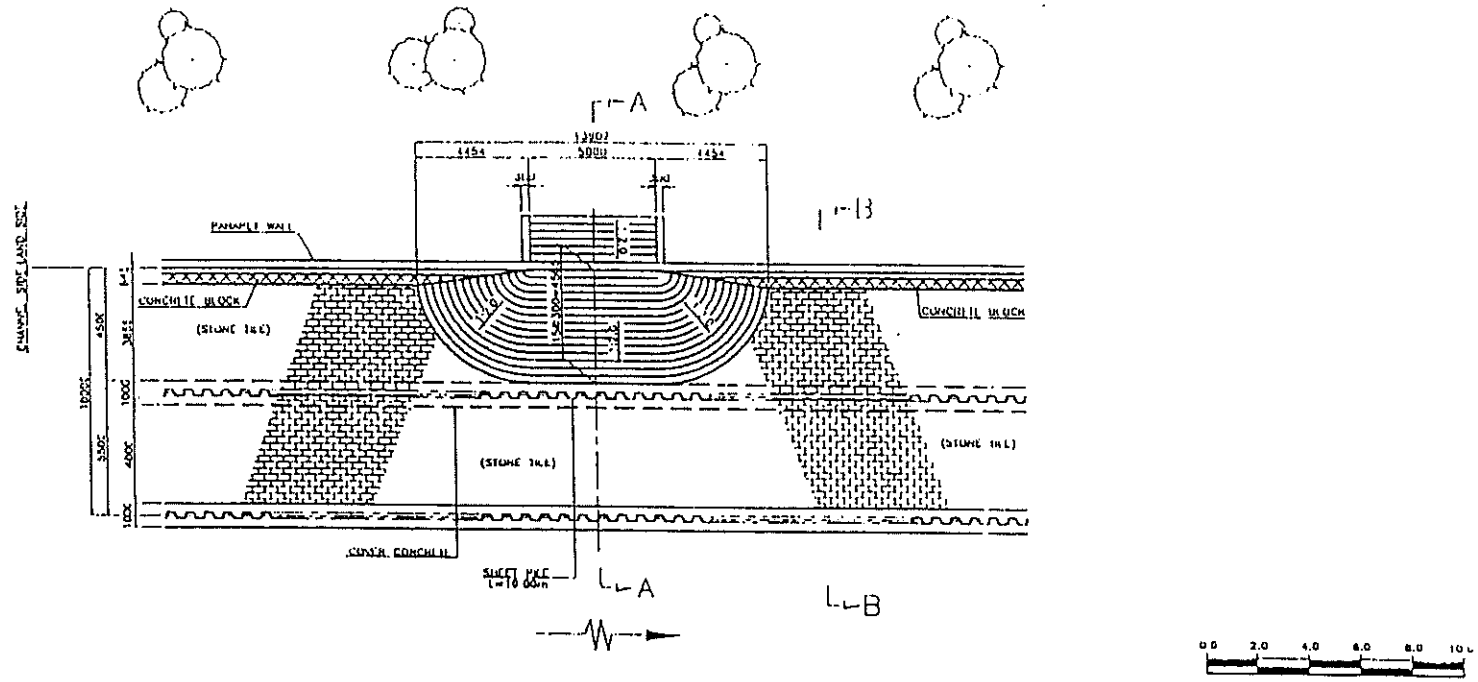
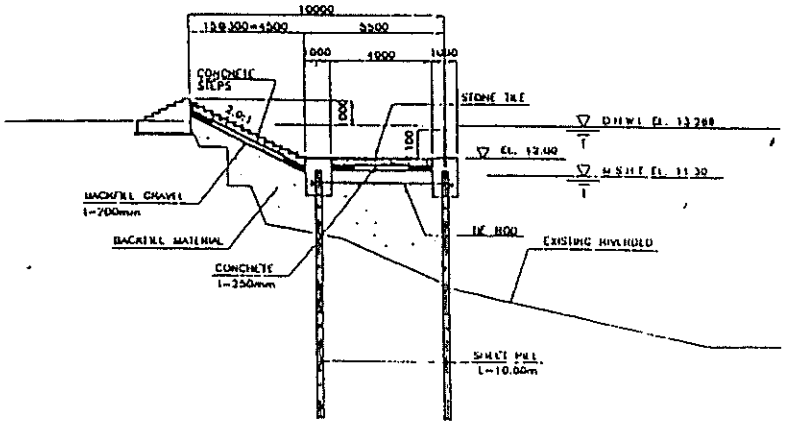


FIG. A.6 ALLOCATION OF WATERFRONT FACILITIES





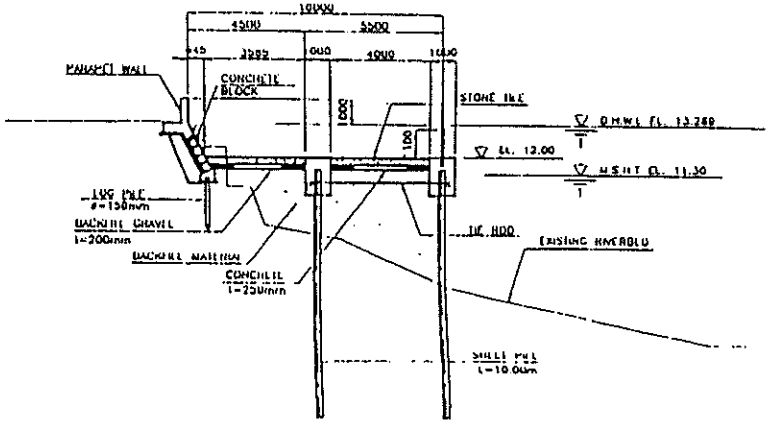


FIG. A.7 PLAN AND CROSS SECTION OF WATERFRONT FACILITIES

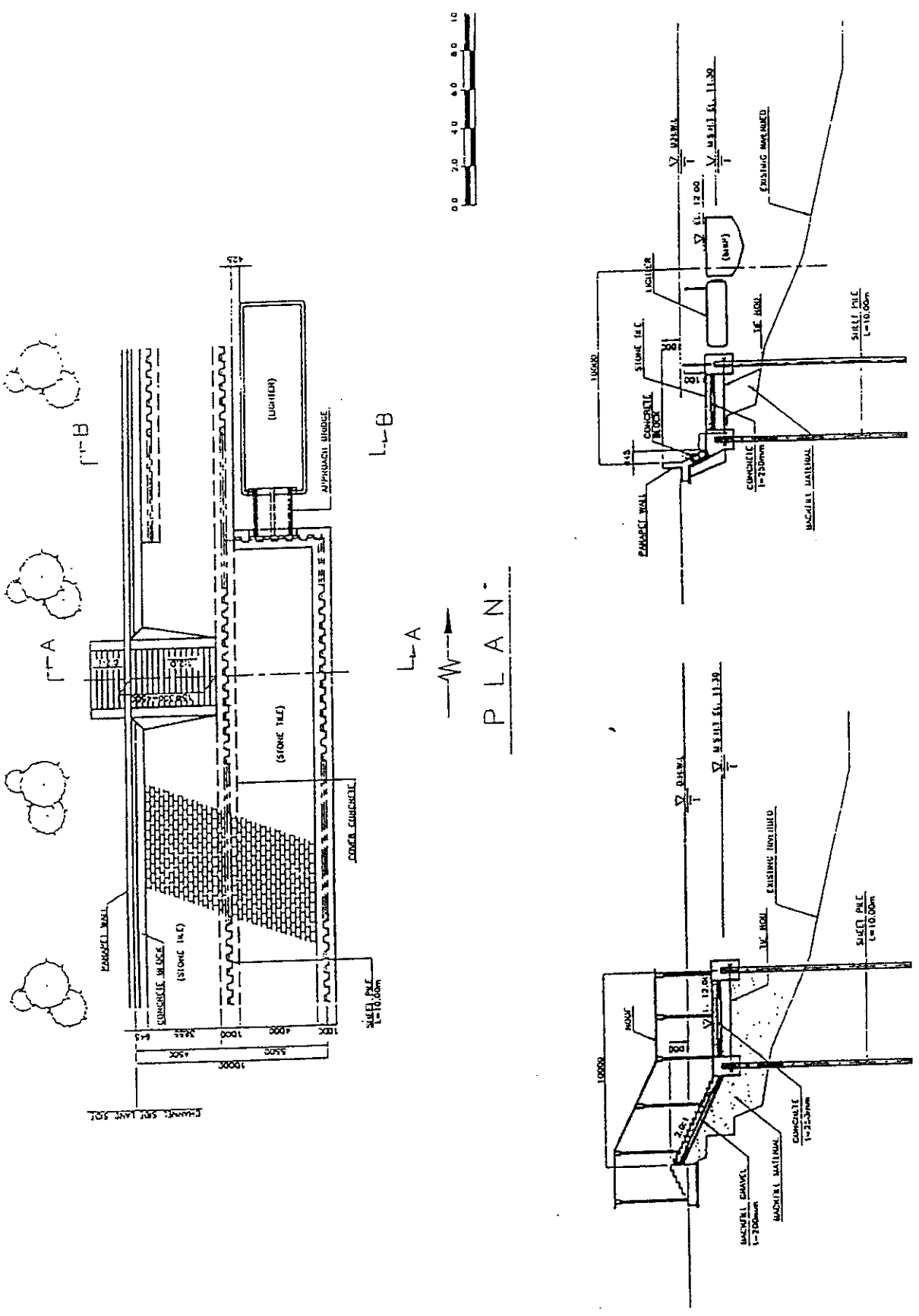
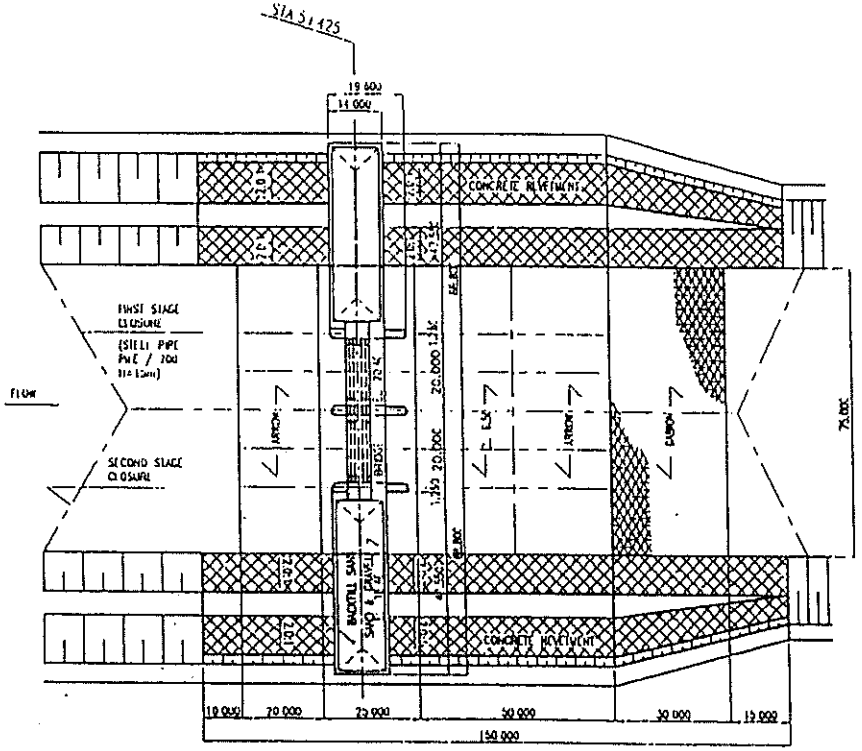
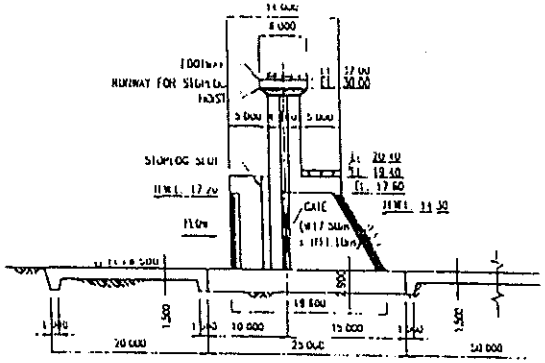


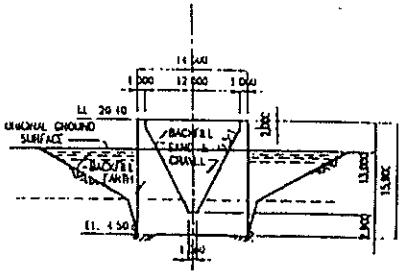
FIG. A.8 PLAN AND CROSS SECTION OF WATERFRONT FACILITIES



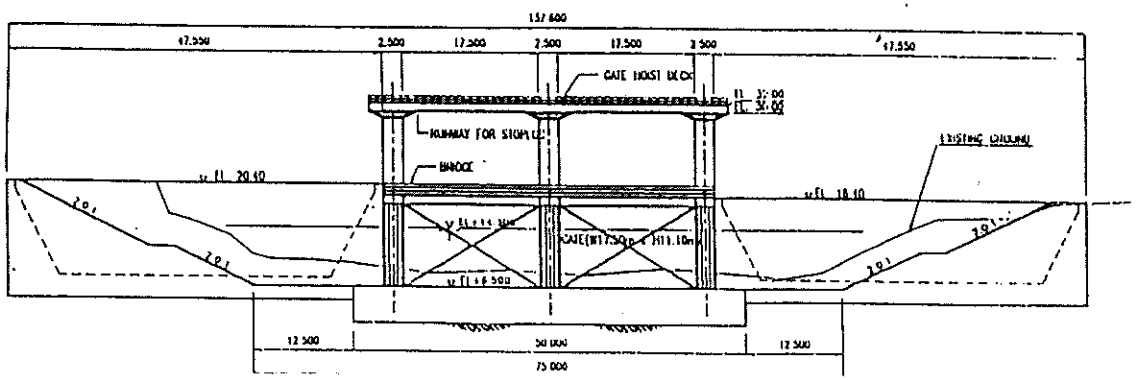
PLAN
SCALE : A



CROSS SECTION OF PIER
SCALE : B



TYPICAL SECTION OF ABUTMENT
SCALE : B



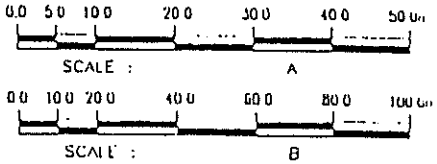


FIG. A.9 PLAN AND CROSS SECTION OF MCGS

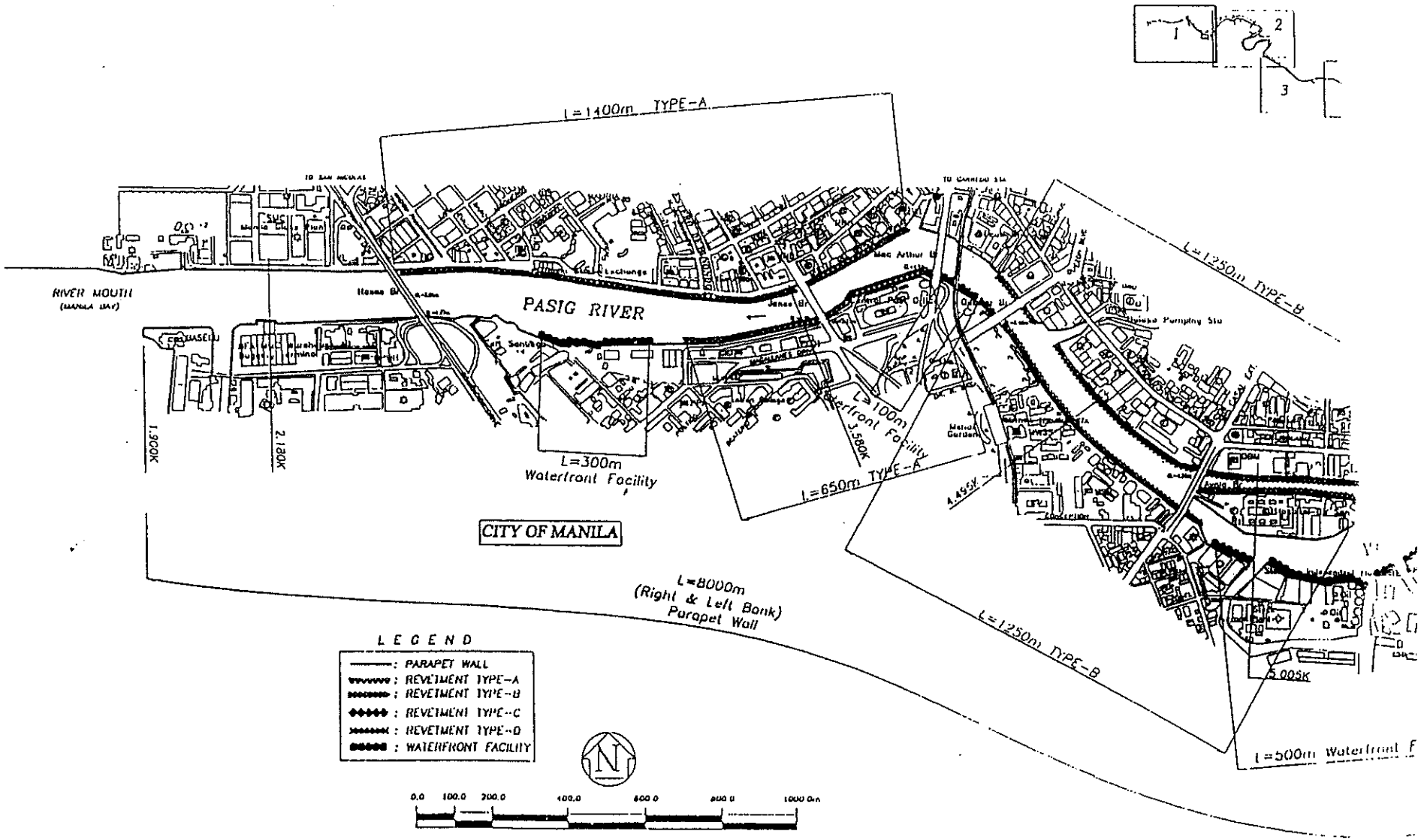


FIG. A.10 ALIGNMENT OF RIVER IMPROVEMENT

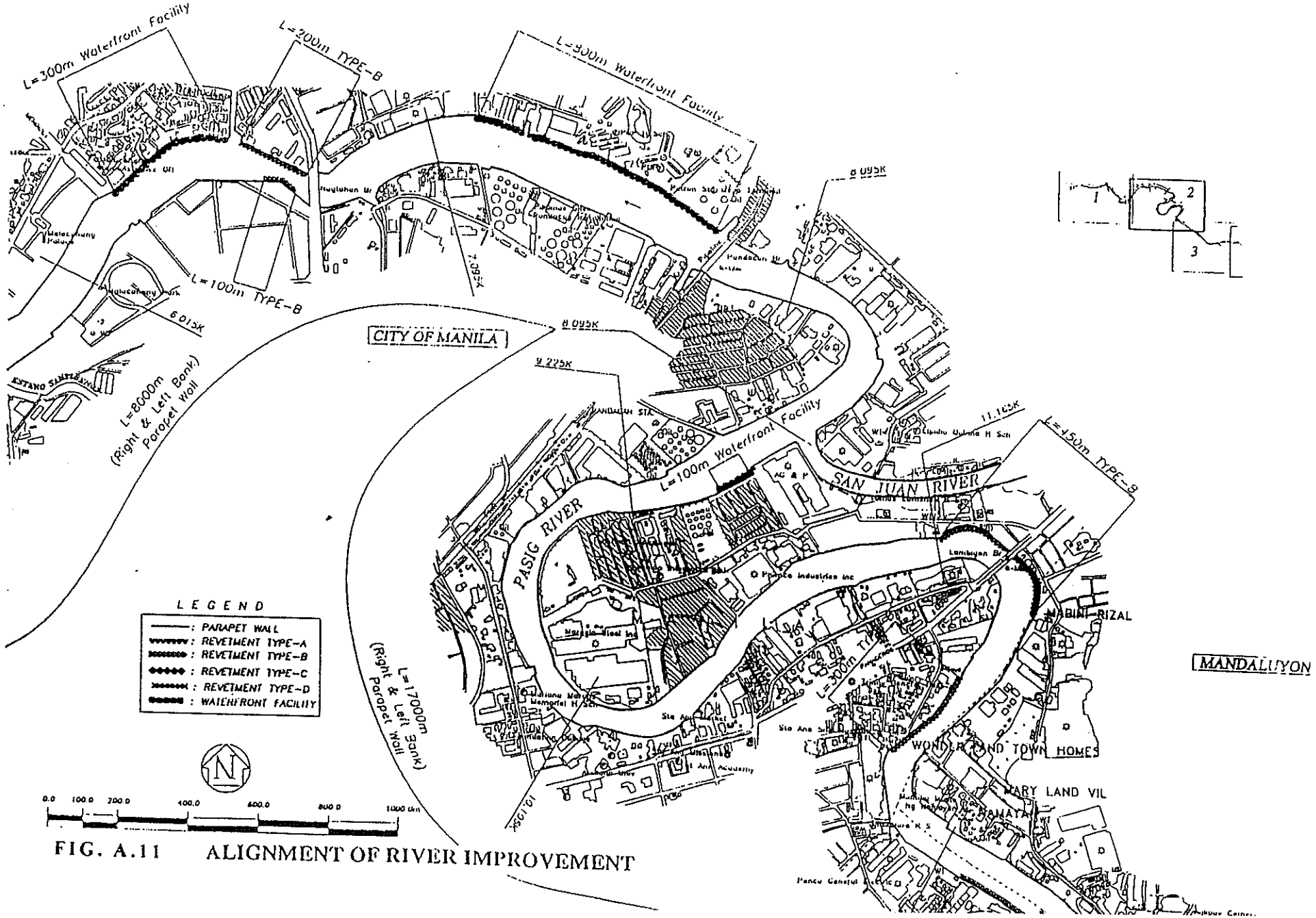


FIG. A.11 ALIGNMENT OF RIVER IMPROVEMENT

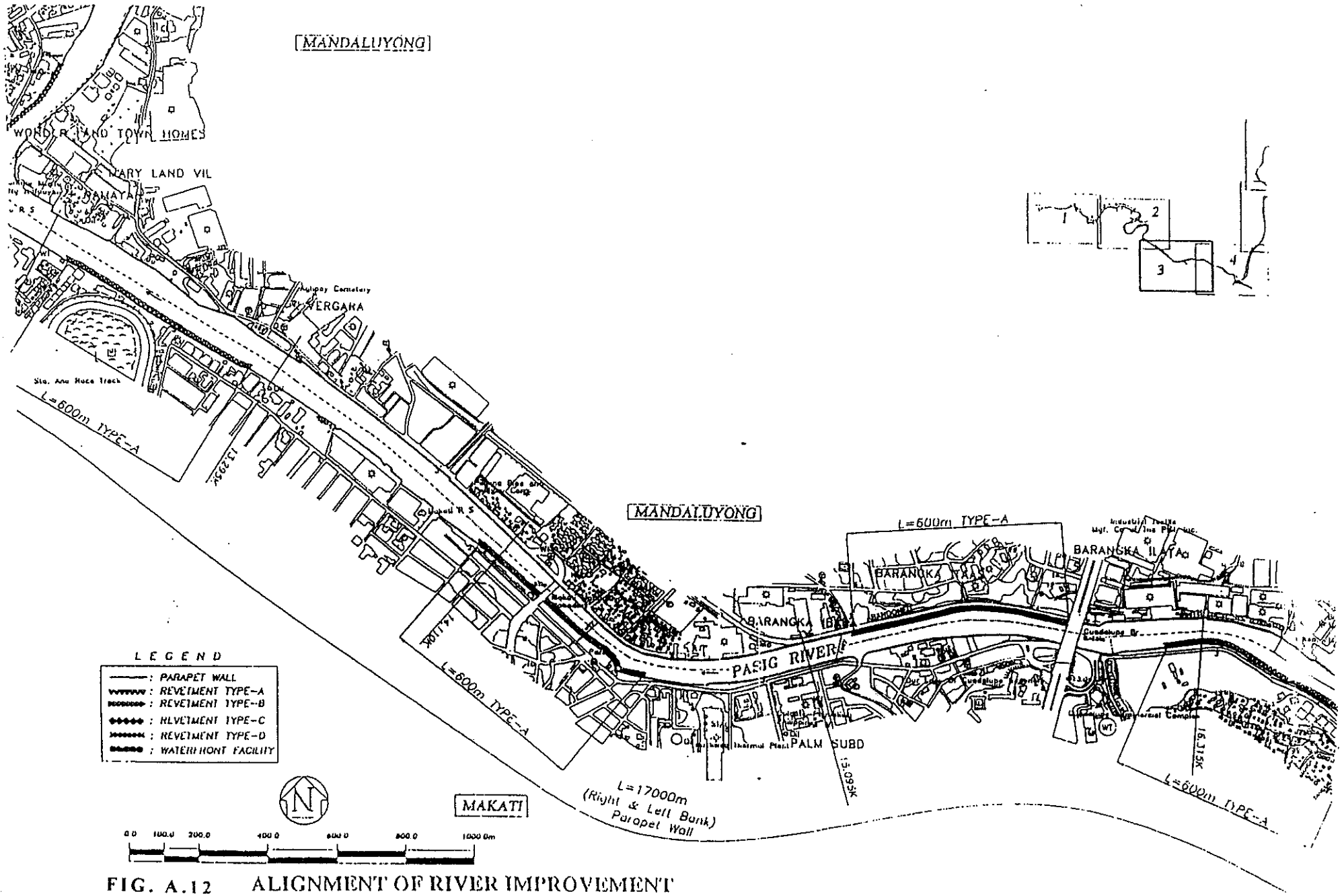
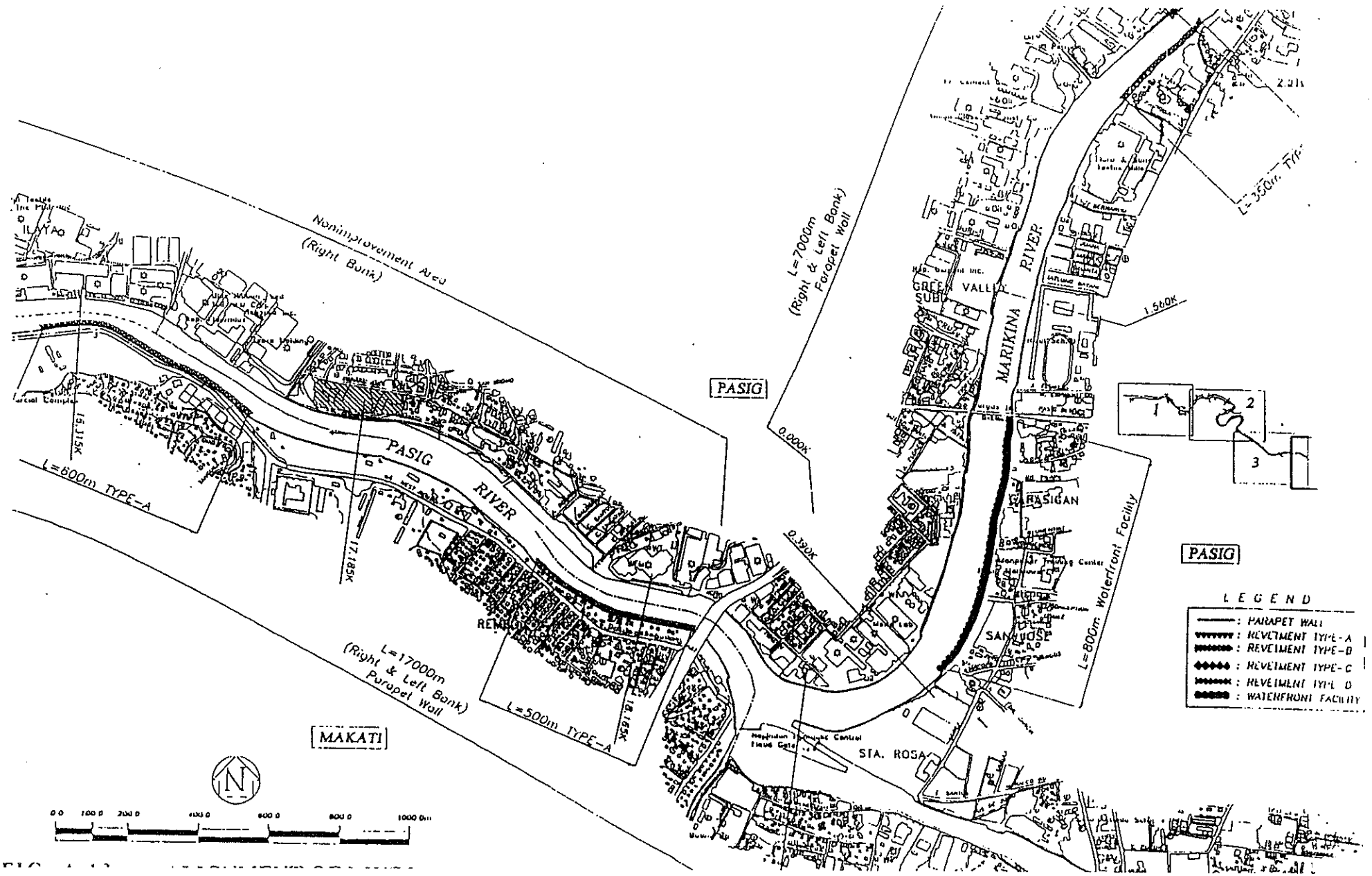


FIG. A.12 ALIGNMENT OF RIVER IMPROVEMENT


Nonimprovement Area
(Right Bank)
L=7000m
(Right & Left Bank)
Parapet Wall
PASIG
MARIKINA RIVER
L=360m Type
1.560K
0.000K
0.330K
PASIG RIVER
17.615K
17.185K
16.185K
L=600m TYPE-A
L=500m TYPE-A
L=17000m
(Right & Left Bank)
Parapet Wall
MAKATI
L=800m Waterfront Facility
PASIG
STA. ROSA
1
2
3
LEGEND
: PARAPET WALL
: REVETMENT TYPE-A
: REVETMENT TYPE-B
: REVETMENT TYPE-C
: REVETMENT TYPE-D
: WATERFRONT FACILITY
0.0 100.0 200.0 400.0 600.0 800.0 1000.0m

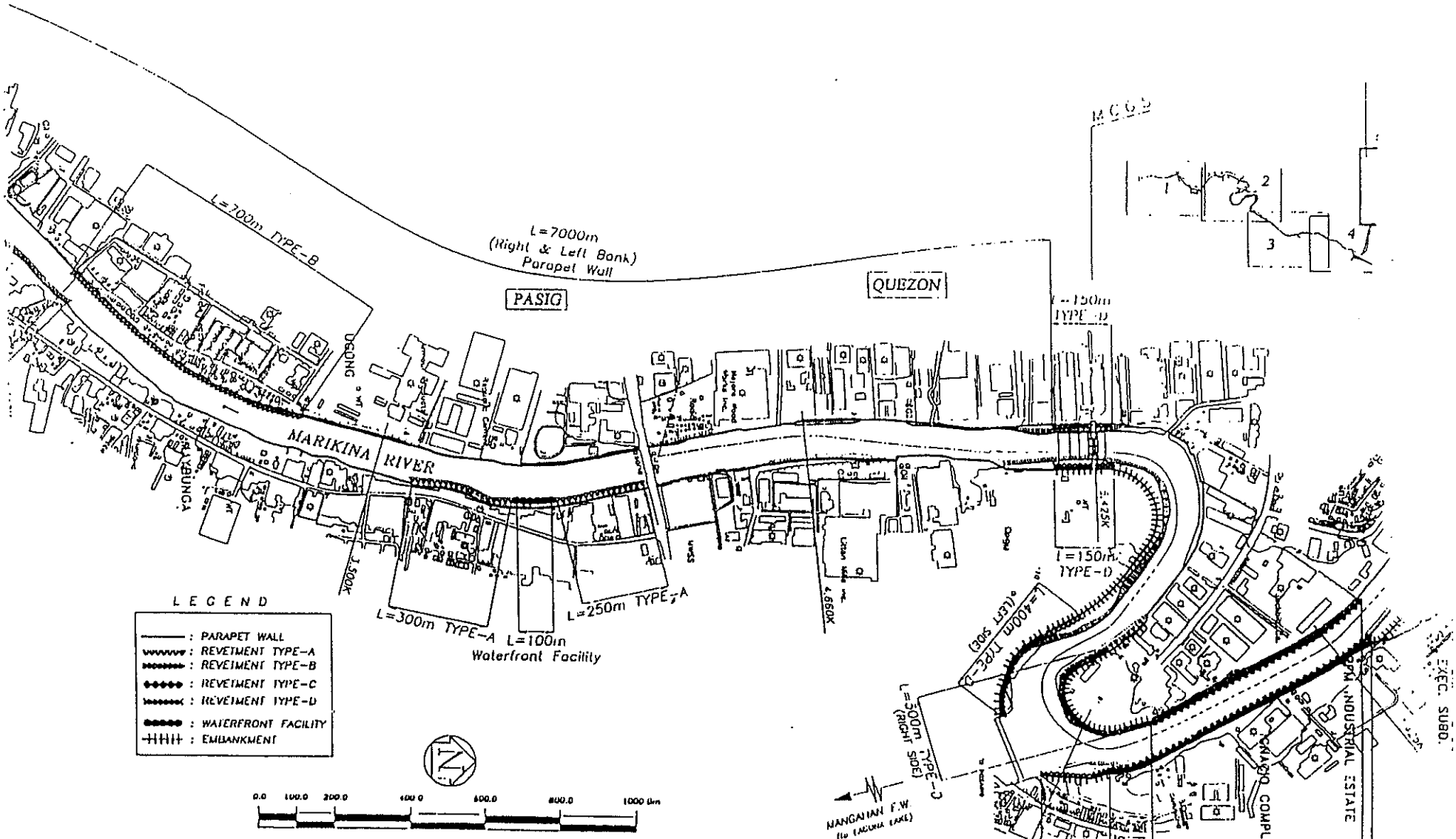
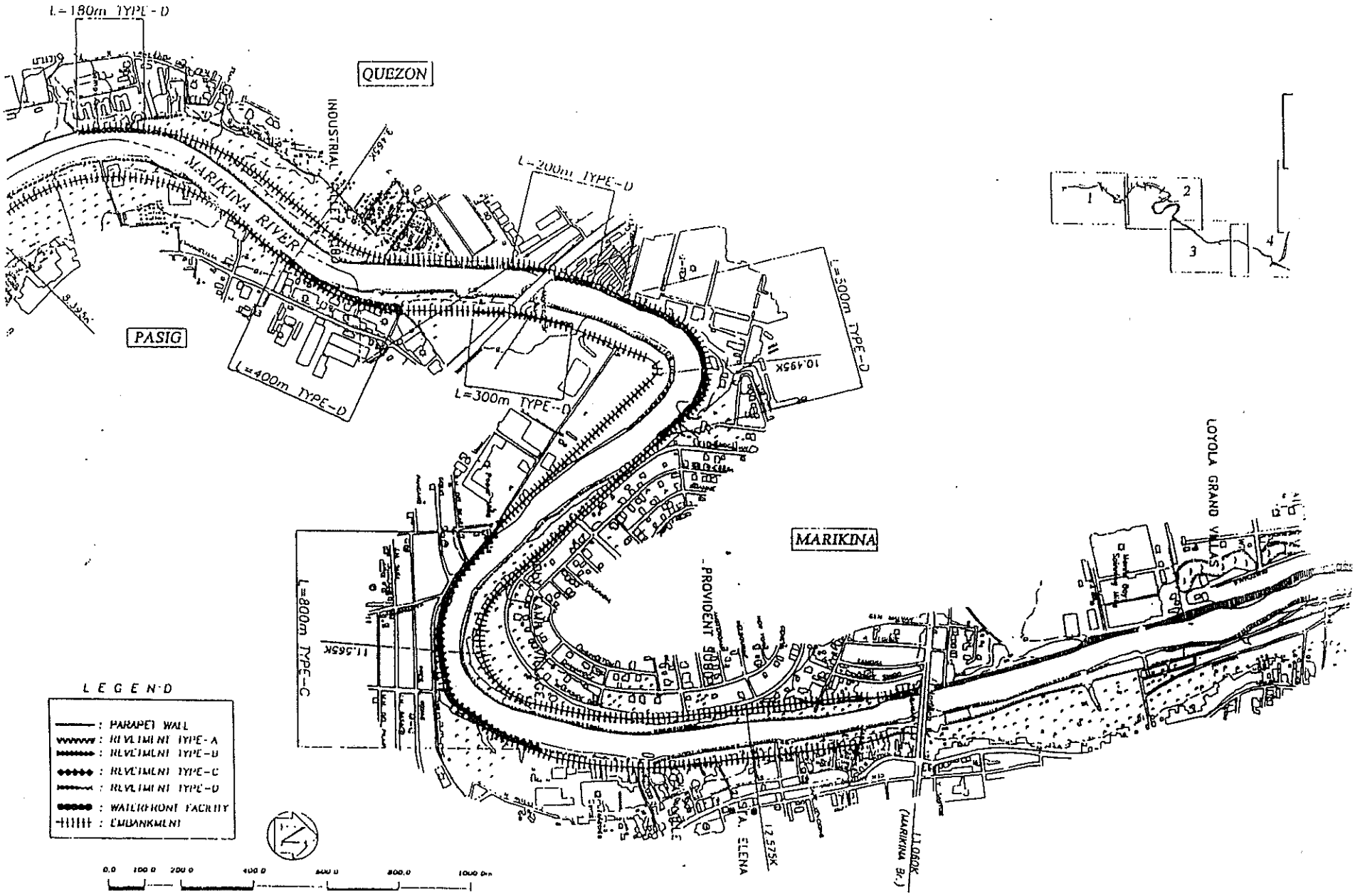


FIG. A.14 ALIGNMENT OF RIVER IMPROVEMENT


L=180m TYPE-D
QUEZON
INDUSTRIAL
MARIKINA RIVER
PASIG
L=400m TYPE-D
L=200m TYPE-D
L=300m TYPE-D
L=300m TYPE-D
L=800m TYPE-C
MARIKINA
PROVIDENT VILLAGE
LOYOLA GRAND VILLAS
STA. ELENA
J.J. BANOK (MARIKINA Br.)
LEGEND
: PARAPET WALL
: REVETMENT TYPE-A
: REVETMENT TYPE-B
: REVETMENT TYPE-C
: REVETMENT TYPE-D
: WATERFRONT FACILITY
: EMBANKMENT

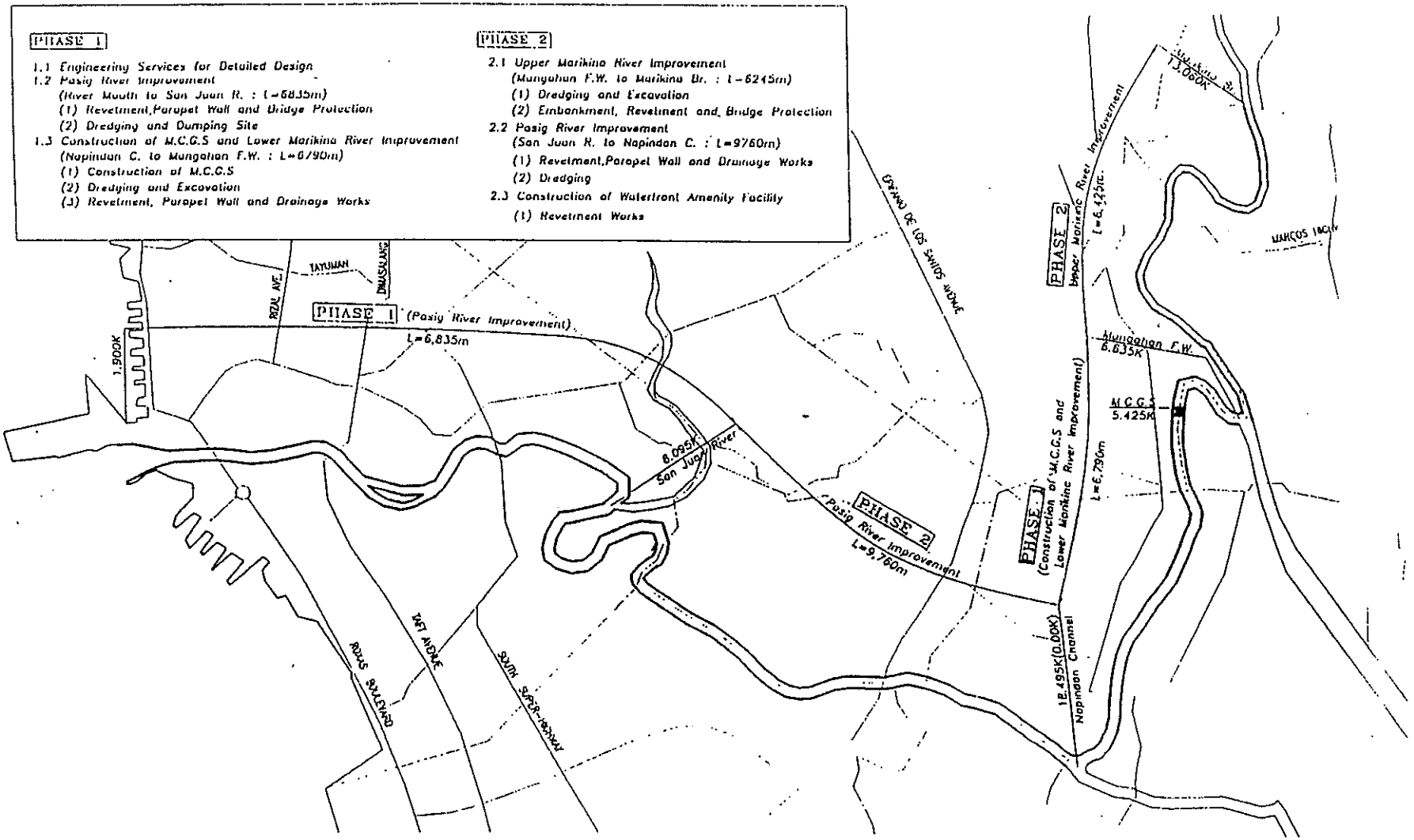


FIG. A-16 STAGE OF WORK FOR PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT

APPENDIX B

BASELINE DATA

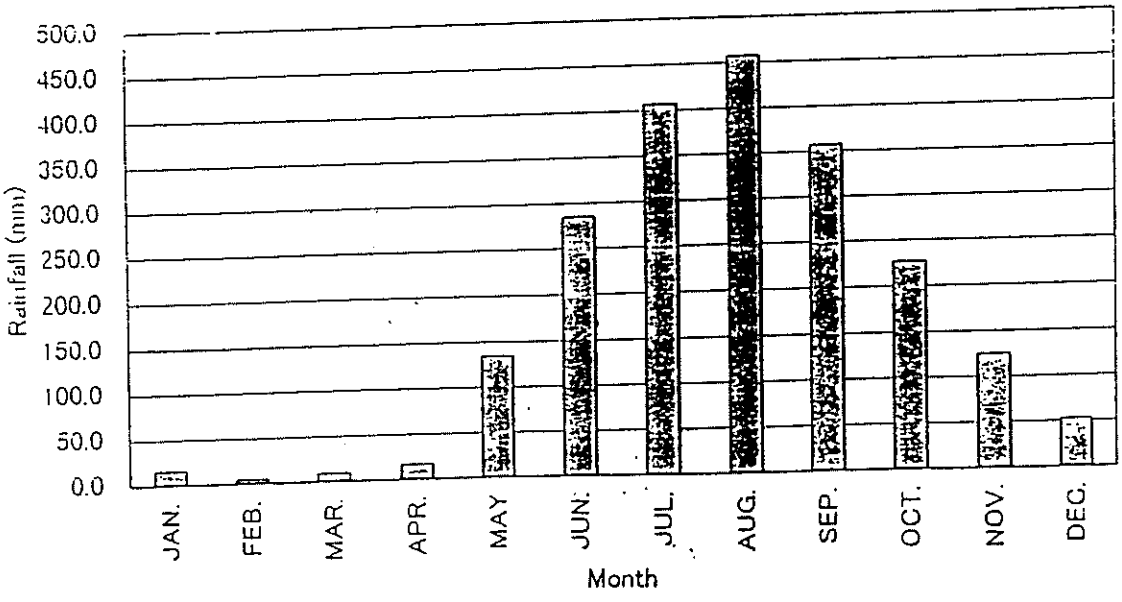
- WATER QUALITY
- HYDROLOGY
- RIVER CONDITIONS
- ECOLOGY

Unit : mm

	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	Annual
1961	72.	.9	2.	2.9	52.3	314.2	387.2	438.3	324.5	225.2	117.4	4.1	2,261.4
1962	3.3	0.3	14.6	64.2	50.3	108.5	999.0	352.3	562.5	31.0	91.5	7.9	2,285.4
1963	0.5	0.5	0.3	1.3	15.7	546.6	379.3	226.1	502.9	97.1	44.4	40.2	1,854.9
1964	9.3	1.3	42.5	21.0	102.6	439.2	240.5	482.1	244.3	209.2	272.2	102.7	2,166.9
1965	10.7	9.3	2.3	67.5	221.1	206.4	403.5	398.1	285.6	131.4	92.8	36.4	1,865.1
1966	4.2	4.8	-1	0.0	468.6	96.1	270.3	365.4	741.4	77.4	235.7	35.0	2,358.9
1967	23.7	3.7	1.0	1.8	39.3	725.0	225.5	362.4	343.8	166.7	36.1	5.6	1,989.6
1968	3.3	-1	7.1	0.0	35.6	110.4	420.5	467.5	312.5	99.5	12.9	-1	1,532.3
1969	5.9	0.0	15.7	5.6	14.9	169.0	334.7	384.7	390.2	219.1	47.0	36.0	1,672.9
1970	5.9	0.3	2.6	1.8	44.5	163.7	425.4	358.6	885.1	258.5	97.0	6.2	2,259.6
1971	3.0	3.9	45.0	32.0	116.6	303.1	333.3	211.0	145.8	309.5	270.0	145.4	1,938.6
1972	39.4	-1	42.2	1.8	162.6	417.8	1,743.3	535.1	211.7	93.1	74.7	15.3	3,337.0
1973	3.1	2.9	4.6	-1	54.0	189.3	302.6	277.1	145.3	276.3	170.5	75.2	1,506.9
1974	0.8	-1	-1	57.1	36.3	411.3	287.6	1,188.1	30.4	319.6	352.5	130.0	2,863.7
1975	6.7	3.3	0.5	28.4	58.0	196.3	100.1	505.9	260.7	310.7	100.6	113.6	1,694.8
1976	56.2	2.0	3.5	1.0	322.7	167.9	-2	-2	-2	-2	32.8	37.9	*
1977	59.2	3.2	4.4	2.9	265.5	190.8	-2	525.6	821.0	-2	76.6	5.6	*
1978	0.2	6.0	1.6	12.4	167.7	164.4	206.6	885.3	435.1	626.9	124.1	46.6	2,676.9
1979	-2	0.2	-1	-2	-2	-2	-2	-2	-2	-2	-2	-2	*
1980	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	*
1981	-2	-2	-2	-2	31.5	480.5	268.6	193.8	172.0	194.3	150.7	74.0	*
1982	.6	4.0	5.5	27.5	27.5	132.2	492.3	349.5	243.7	58.7	28.2	60.8	1,481.5
1983	25.4	7.1	0.0	1.4	-1	31.0	177.1	409.8	250.1	239.0	9.4	4.6	1,148.9
1984	25.3	-1	7.6	12.5	169.1	443.2	218.6	500.1	139.9	311.3	55.8	10.1	1,893.6
1985	1.2	0.9	5.7	5.5	3.4	367.3	239.2	301.1	291.1	299.6	132.5	45.1	2,268.6
1986	0.7	48.3	-1	16.6	254.2	149.0	632.3	710.8	545.4	623.0	250.3	53.0	3,283.6
1987	3.9	0.0	0.0	2.4	27.4	224.1	147.0	236.1	294.6	170.6	95.2	71.2	1,272.5
1988	96.2	3.6	0.8	12.5	116.0	367.7	426.5	279.5	341.0	573.4	135.9	1.5	2,360.7
1989	10.9	15.8	64.3	0.7	153.2	158.7	377.6	765.2	185.2	180.8	31.1	1.2	1,944.7
1990	5.6	-1	5.6	3.2	152.1	366.6	561.4	501.3	520.0	140.9	151.9	76.8	2,485.4
1991	22.5	5.6	12.7	2.9	29.6	203.3	366.5	713.9	305.4	79.6	76.6	9.2	1,834.7
1992	4.6	-1	0.0	-1	104.6	160.6	319.0	562.7	324.1	231.0	126.9	3.6	1,837.1
1993	-1	0.2	1.0	0.5	7.0	219.2	217.3	437.6	284.2	249.4	206.2	146.0	1,768.6
1994	41.2	1.6	12.0	22.4	168.7	241.8	761.7	367.8	276.4	80.7	44.7	96.3	2,115.3
1995	2.4	29.0	6.8	4.0	110.8	225.8	342.1	538.2	493.6	335.5	264.7	142.7	2,490.6
1996	6.6	-1	4.9	30.6	172.7	156.2	413.7	257.5	483.8	54.0	150.1	12.0	1,742.1
Total	523.7	180.7	320.0	554.3	4,571.1	9,697.2	13,020.3	15,088.5	11,793.3	7,273.0	4,259.0	1,797.9	69,079.0
Years	33	34	34	33	34	34	32	33	33	32	34	34	31
Average	15.9	5.3	9.4	16.8	134.4	285.2	406.9	457.2	357.4	227.3	125.3	52.9	2,094.0

NOTE: -2 = Missing Data
-1 = Trace

MONTHLY AVERAGE RAINFALL



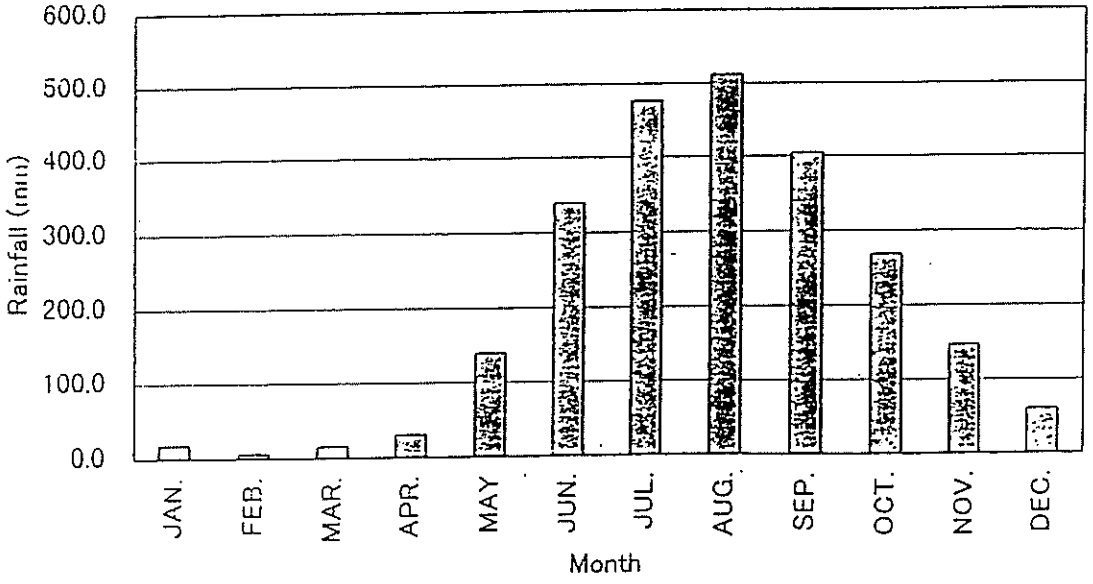
...E (SCIENCE GARDEN, QUEZON CITY)

Unit : mm)

	JAN	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	Annua
1961	-1		55.6	58.8	124.8	580.6	418.4	593.5	383.8	272.5	109.4	1..	2604.
1962	31.9	0.5	7.6	33.4	94.3	189.0	989.8	343.5	484.8	50.4	92.3	10.8	2378.
1963	3.1	-1	3.7	0.5	87.5	579.8	349.3	442.3	494.7	153.5	50.7	94.9	2263.
1964	22.2	2.1	15.5	20.1	178.1	511.4	373.2	693.7	253.2	221.0	256.1	116.9	2673.
1965	23.9	12.0	-1	15.2	246.1	390.2	525.9	337.0	366.9	58.5	142.4	37.3	2155.
1966	16.4	34.5	3.6	8.7	570.1	27.7	308.8	279.1	660.0	107.2	356.7	94.6	2570.
1967	33.3	7.9	5.7	4.8	100.7	936.6	509.4	489.6	378.3	125.1	73.6	8.3	2673.
1968	7.1	1.3	1.1	0.8	133.7	188.8	412.3	708.7	379.8	154.7	10.7	0.0	1999.
1969	0.0	0.6	-1	11.1	44.3	151.4	213.4	462.7	417.0	233.7	64.2	48.9	1647.
1970	3.0	-1	5.0	46.5	38.5	146.8	445.1	514.5	372.9	435.3	-2	-2	*
1971	-2	-2	-2	36.0	199.7	250.5	436.1	238.7	111.3	386.8	235.0	159.8	*
1972	39.5	2.6	10.3	42.4	176.8	492.7	1885.3	583.7	256.5	65.2	100.8	18.5	3704.
1973	5.8	1.9	0.6	0.5	22.7	387.2	285.2	402.7	261.7	348.9	198.9	69.8	1985.
1974	0.3	41.9	2.1	34.6	39.5	456.1	277.9	1129.8	60.0	301.0	372.3	107.5	2873.
1975	16.2	0.5	0.5	29.2	72.1	290.7	144.9	551.4	242.8	507.8	70.2	167.0	2093.
1976	30.9	2.0	19.1	6.9	-2	-2	-2	-2	-2	-2	-2	-2	*
1977	36.4	3.5	25.5	5.1	68.5	160.3	398.6	539.8	502.8	54.1	337.4	-2	*
1978	2.0	7.4	-1	31.2	196.1	174.4	269.7	712.6	562.1	576.0	78.4	47.6	2657.
1979	2.8	-1	-1	72.3	213.2	152.1	518.6	549.8	279.9	124.0	29.2	23.0	1964.
1980	-1	-1	31.7	-1	157.1	171.9	406.4	257.5	449.3	346.7	202.0	25.0	2707.
1981	0.1	9.0	-1	29.3	81.1	589.2	403.2	335.5	251.8	292.0	181.1	87.4	2259.
1982	1.5	0.7	28.6	48.0	75.9	191.3	512.0	423.9	321.4	107.0	109.2	50.0	1969.
1983	34.9	2.1	0.1	-1	27.8	132.6	307.2	575.8	257.0	292.9	25.7	-1	1656.
1984	15.4	1.7	23.0	61.0	134.4	498.3	233.9	613.2	252.7	433.0	101.4	3.6	2371.
1985	1.0	10.6	61.3	143.2	28.3	880.4	311.0	249.4	474.2	325.4	101.2	43.0	2629.
1986	0.2	3.0	0.0	25.0	242.6	161.6	757.3	796.4	616.8	649.8	241.6	74.8	3609.
1987	3.8	-1	-1	12.6	93.6	230.2	164.3	328.6	403.6	160.8	127.7	102.7	1627.
1988	35.5	38.4	1.2	23.4	153.6	482.7	493.1	157.1	373.2	629.1	165.4	1.8	2604.
1989	14.6	14.6	72.4	39.4	220.2	296.0	491.3	708.3	271.7	241.9	55.5	-1	2455.
1990	5.1	1.6	2.4	18.6	194.4	468.9	582.7	603.0	580.9	252.5	303.8	99.2	3113.
1991	12.3	8.3	5.8	24.9	50.4	260.1	530.8	724.8	373.4	146.5	104.0	2.1	2244.
1992	5.2	1.0	-1	-1	87.6	147.0	520.0	768.8	385.3	209.1	143.4	7.3	2274.
1993	-1	1.0	16.2	15.8	1.4	325.3	496.9	474.7	518.3	351.2	224.2	165.4	2590.
1994	39.4	24.7	42.2	29.9	184.7	421.9	799.6	345.4	426.5	155.7	7.8	113.0	2600.
1995	17.4	8.1	2.2	6.6	302.5	392.8	359.7	646.9	748.6	349.1	184.8	189.7	3208.
1996	19.4	-1	10.6	80.3	115.5	142.4	399.9	339.9	485.5	276.7	162.0	13.1	2045.
Total	635.5	251.1	560.1	1076.1	4907.8	11858.9	16671.2	17922.3	14158.7	9395.1	5019.1	1994.7	77612.
Years	35	35	35	35	35	35	35	35	35	35	34	33	3
Average	18.2	7.2	16.0	30.7	140.2	338.8	476.3	512.1	404.5	268.4	147.6	60.4	2425.

NOTE : -2 = Missing Data
-1 = Trace

MONTHLY AVERAGE RAINFALL

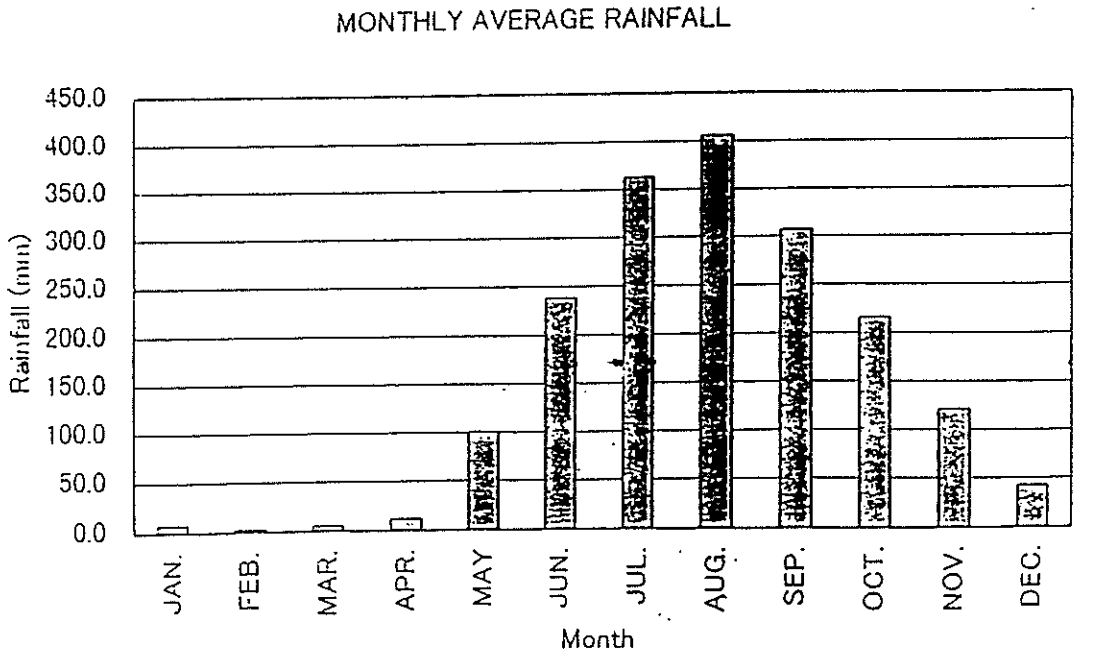


MONTHLY AVERAGE RAINFALL (NAIMA(MIA) , PASAY CITY)

(Unit : mm)

	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	Annual
1961	0.5	5.0	5.2	3.7	162.8	523.1	279.0	444.2	304.8	391.7	130.2	5.4	2263.6
1962	2.6	-1	2.9	53.8	76.9	144.9	561.5	360.6	544.2	20.1	91.8	0.8	1960.1
1963	0.3	0.6	-1	1.1	3.4	172.5	319.5	289.7	476.0	43.4	32.1	114.2	1652.8
1964	12.1	5.4	1.3	11.8	52.0	437.3	270.4	409.9	261.4	197.7	208.1	77.0	1945.4
1965	2.7	0.3	2.0	16.8	176.4	206.9	353.9	320.5	241.3	59.9	101.9	30.8	1513.4
1966	12.1	10.9	-1	1.0	436.8	700.5	242.0	195.0	675.2	61.5	190.1	105.8	2030.9
1967	40.2	5.6	0.5	1.0	48.5	478.8	239.6	583.9	260.5	141.7	134.3	3.6	1944.2
1968	4.8	-1	2.6	-1	7.6	128.3	440.6	430.3	325.2	101.9	16.3	-1	1457.6
1969	0.3	-1	7.9	0.2	6.9	124.0	385.5	284.4	335.9	172.8	71.3	93.4	1472.6
1970	58.6	0.8	1.9	-1	45.9	218.7	397.4	292.1	642.0	248.5	145.0	59.5	2110.4
1971	3.0	0.5	44.5	13.0	117.0	349.0	350.0	164.4	120.4	371.0	158.0	-2	*
1972	-2	-2	18.3	-1	206.4	391.9	1814.2	504.6	206.8	55.5	38.8	24.3	*
1973	1.6	-1	2.3	3.6	25.6	154.6	229.1	444.6	148.5	301.7	236.0	77.7	1622.3
1974	0.0	0.8	3.7	0.5	110.1	374.7	268.7	713.6	55.5	194.1	272.2	111.6	2110.5
1975	5.3	-1	0.5	47.4	7.7	159.7	96.1	462.5	206.8	432.2	146.5	139.4	1705.1
1976	2.8	-1	7.4	-1	360.4	205.4	165.1	558.3	302.4	46.4	45.0	66.1	2059.3
1977	34.9	10.4	8.9	-1	105.9	78.9	419.4	347.2	591.3	66.4	240.1	18.1	1921.5
1978	-1	-1	-1	5.8	155.9	796.4	320.5	737.0	688.4	554.3	86.4	23.3	2766.0
1979	-1	0.8	0.0	30.3	161.3	167.9	298.7	373.5	251.0	89.0	32.3	-1	1434.8
1980	-1	-1	43.9	-1	41.9	37.5	364.6	212.0	312.4	162.5	260.4	21.6	1456.8
1981	1.0	3.0	-1	3.3	26.3	419.4	344.4	247.7	230.4	188.5	175.1	48.0	1687.1
1982	-1	-1	0.1	50.0	3.6	39.2	279.2	277.8	231.4	26.3	34.8	33.4	1038.8
1983	19.0	-1	0.0	-1	10.0	87.8	113.1	229.9	183.5	296.8	23.4	2.0	965.5
1984	4.4	5.2	3.6	1.5	49.5	412.2	141.4	577.3	164.3	329.3	23.0	5.8	1717.5
1985	-1	4.8	-1	23.6	4.0	300.2	372.8	139.8	274.5	235.4	27.2	27.9	1910.2
1986	-1	2.4	-1	20.2	128.5	108.1	574.5	552.7	401.2	727.3	211.1	40.8	2766.8
1987	3.8	0.0	0.0	-1	16.8	280.9	218.4	313.1	266.1	171.3	107.3	127.1	1504.8
1988	25.4	3.2	-1	15.8	174.8	399.7	273.3	154.1	88.4	617.2	148.8	-1	1900.7
1989	18.7	30.3	17.4	-1	180.6	112.9	285.4	399.3	158.0	266.9	36.2	1.0	1506.7
1990	2.4	-1	13.4	0.0	197.0	340.6	341.9	549.4	360.9	243.1	161.6	33.6	2243.9
1991	2.2	5.0	16.9	15.5	11.5	32.3	304.1	945.3	386.3	32.7	71.7	14.2	1837.7
1992	4.4	1.0	-1	58.2	39.3	98.8	451.9	635.0	318.0	246.5	168.0	9.0	2040.1
1993	-1	-1	-1	3.0	1.0	34.2	-2	-2	-2	-2	-2	-2	*
1994	0.0	0.0	0.0	0.0	-2	-2	-2	-2	-2	-2	-2	-2	*
1995	-1	-1	-1	-1	-1	-2	-2	-2	186.8	211.2	174.2	36.6	*
1996	15.3	-1	3.5	14.1	82.0	37.0	377.5	159.5	244.5	128.5	5.5	1106.9	
Total	279.4	99.0	213.7	448.2	3537.3	8104.3	11993.7	13409.2	10442.3	7343.3	4127.7	1404.5	55654.0
Years	35	35	36	36	35	34	33	33	34	34	34	33	31
Average	8.0	2.8	5.9	12.5	101.1	238.4	363.4	406.3	307.1	216.0	121.4	42.6	1795.3

NOTE : -2 = Missing Data
-1 = Trace



BASELINE WATER QUALITY

1.0 PASIG-MARIKINA RIVER

The National Pollution Control Commission (NPCC) monitored the water quality of the Pasig-Marikina River from 1982 to 1986. When the NPCC and National Environmental Protection Council (NEPC) were merged to form the EMB on June 10, 1987 under EO 192, the water quality monitoring activity was done by the latter in 1987 and transferred to DENR-NCR in 1988. In 1990, the Pasig River Rehabilitation Program (PRRP) started its own sampling and analysis separately from the DENR-NCR.

As shown in Fig. B.1, seven (7) sampling stations of PRRP and DENR-NCR are on the same locations: Bonifacio, Vargas, Bambang, Guadalupe, Lambingan, Sanchez and Jones. PRRP has stations in Manila Bay and Laguna Lake.

Aside from the seven (7) stations mentioned above, the DENR-NCR has ten (10) more stations: Rosario, Nangka, Montalban along Marikina River and Del Pan Bridge, Palanca, Espinosa, Beata, Nagtahan, West Rembo, Buting, and Kalawan along Pasig River.

Table B.4 shows the water quality parameters being monitored by DENR-NCR and PRRP for the Pasig-Marikina River. Sampling is done monthly. Depths of sampling being done by PRRP are surface and bottom, while DENR-NCR is surface only.

1.1 Pollution Sources and Loads

In terms of BOD loads, the 1991 PRRP study has identified the major sources of pollution as those coming from the liquid domestic wastes, industrial wastes, and the solid domestic wastes. According to this report, the liquid domestic load is contributed by some 3.8 million people who are not served by piped sewerage system, while the solid domestic wastes are those uncollected wastes which eventually end up in the Pasig River. The squatters generated most of these uncollected solid wastes. The industrial wastes are those coming from the industrial facilities within the drainage basins emptying into the Pasig River. As presented in the table below, there was not much difference in the estimated total BOD loads between 1990 and 1996. And the major source of pollution is the liquid domestic waste.

The increase in liquid domestic waste was due to the continued increase in population plus the ineffective treatment of poorly maintained septic tanks. The successful effort to collect solid domestic waste along the river contributed to the change shown above. While the decrease in industrial liquid waste was due to (1) reduction of industrial activities in the center of Metro Manila as many industries have been relocated and (2) industrial waste minimization programs which aimed at enforcing existing regulations through closer monitoring and harsher penalties for non-compliance.

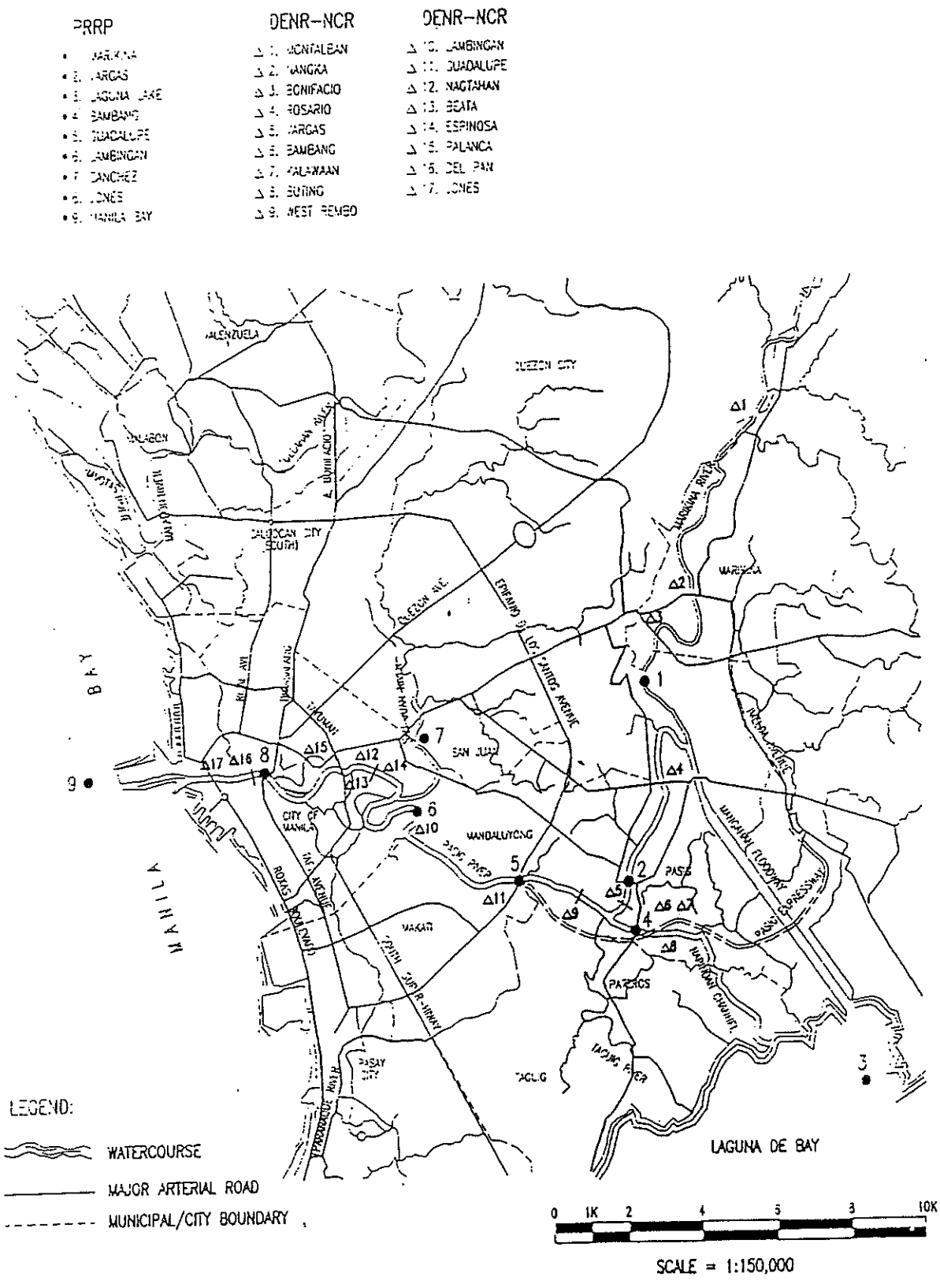


FIG. B.1 WATER QUALITY MONITORING STATIONS

TABLE B.4 WATER QUALITY PARAMETERS BEING MONITORED

Items	DENR-NCR	PRRP	LLDA
Physico-Chemical Parameters			
Temperature	√	√	√
pH	√	√	√
Salinity		√	
Turbidity			√
Transparency			√
Alkalinity			√
Dissolved Oxygen	√	√	√
Biochemical Oxygen Demand	√	√	√
Chemical Oxygen Demand			√
Secchi Depth		√	
Nitrate		√	√
Ammonia		√	√
Inorganic Phosphate		√	√
Total Dissolved Solids			√
Total Suspended Solids	√		√
Total Hardness			√
Calcium Hardness			√
Chloride			√
Oil and Grease			√
Heavy Metals			
Chromium			√
Copper		√	√
Iron			√
Lead		√	√
Nickel			√
Mercury		√	
Cadmium		√	
Zinc		√	√
Biological Parameters			
Phytoplankton			√
Zooplankton			√
Benthos			√
Microbiological Parameter			
Total Coliform (MPN/100mL)		√	√
Net Primary Productivity			√

TABLE B.5

ESTIMATED BOD LOADS

Load Category	1990		1996	
	BOD load (tons/day)	Percentage (%)	BOD load (tons/day)	Percentage (%)
Liquid Domestic Waste	148	45.3	220	60
Solid Domestic Waste	34	10.4	15	5
Liquid Industrial Waste	145	44.3	115	35
Total	327	100	330	100

Source: PRRP Feasibility Report (1991) and ADB's Interim Report for PREMRP (1997)

1.2 Water quality of the Pasig-Marikina River

A brief description of the water quality in the Pasig-Marikina River is given below based on the PRRP data monitored over the past seven years (1991-1997).

BOD (Fig. B.2)

In the upper reaches of the Marikina River, the BOD of the river is within the DENR limit. After passing through Marikina and Quezon City, the BOD begins to rise until the confluence of the Napindan Channel and the Marikina. The high flow from Laguna Lake that has a relatively low BOD causes the Pasig River BOD to drop. From Napindan down to Manila Bay, the BOD rises steadily. The highest BOD in the lower Pasig is found at the Jones Bridge after the confluence with the heavily polluted San Juan River.

pH (Fig. B.3)

There is no pronounced spatial variation in the pH. On an average the pH is varying between 7.5 and 8.0. In some months, the station in Laguna de Bay shows a pH of more than 9. This is a natural diurnal variation that is due to the intense phytoplankton photosynthesis.

DO (Fig. B.4)

During the dry season months the oxygen concentration in most of the Pasig River system is varying between 0.1 and 2 mg/L. In the Manila Bay station the oxygen concentration on an average was about 4.5 mg/L and in Laguna de Bay about 5 - 6 mg/L. In the upper part of the Marikina River oxygen concentration of about 5 mg/L was observed. Due to the phytoplankton photosysntesis the oxygen concentration shows pronounced diurnal variations.

As a general the whole river system suffers from oxygen depletion and is far from reaching the DENR standards of 5 mg/L.

During the wet season months the oxygen condition in the whole river is significantly improved and reaches on an average values up to about 4 - 5 mg/L.

Total Coliform (Fig. B.5)

The concentration of total coliform bacteria is extremely high in the whole Pasig River system during both the dry and the wet season. On an average the concentration exceed 1,000,000 MPN/100 mL. The most pronounced polluted river is the San Juan River with concentrations of total coliform bacteria up to 35,000,000 MPN/100mL. Compared with the DENR standards of 5,000 MPN/100mL, it is obvious that the whole river system is extremely polluted with pathogenic domestic discharges.

Heavy Metals

A PRRP report on the "Preliminary Assessment of the Water Quality of Laguna de Bay with and without Flushing of Pasig River" prepared by the Water Quality Institute (1993) revealed that heavy metals were not found in suspended and bed sediments in any significant concentrations. In addition, the study concluded that the concentrations of the heavy metals, such as cadmium, chromium, copper, nickel, lead, zinc, and mercury are low. These concentrations correspond to normal background values in slightly polluted sediments.

2.0 THE LAGUNA LAKE

Since 1982, the Laguna Lake Development Authority (LLDA) has been undertaking monthly water quality monitoring to determine the levels and trends of pollution (if ever) in the Laguna Lake. The monthly water quality records available at LLDA are from 1982 up to 1997. However, published Annual Water Quality Reports cover only 1982-1987 and 1996. Reports from 1988 to 1995 have yet to be published and may be available in late-1998. Fig. B.6 shows the locations of the five (5) sampling stations inside the lake. Table B.4 also presents the water quality parameters being monitored by LLDA.

A summary of the lake water quality tabulated in Table B.6 is shown below: The results of 1996 Water Quality Monitoring activities indicate that the bays (East, Central, West and South Bays) yielded no significant difference with regard to the different parameters being examined. Apparently, the water quality of Laguna de Bay is within Class "C" criteria, hence, the water is suitable for fishery and aquaculture. Some parameters such as Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Dissolved Solids (TDS), and Chloride were within the permissible levels and were even comparable to the criteria for Class A waters (drinking water). The improved water quality of the lake reflects the effective pollution control measures and environmental management program done in the watershed

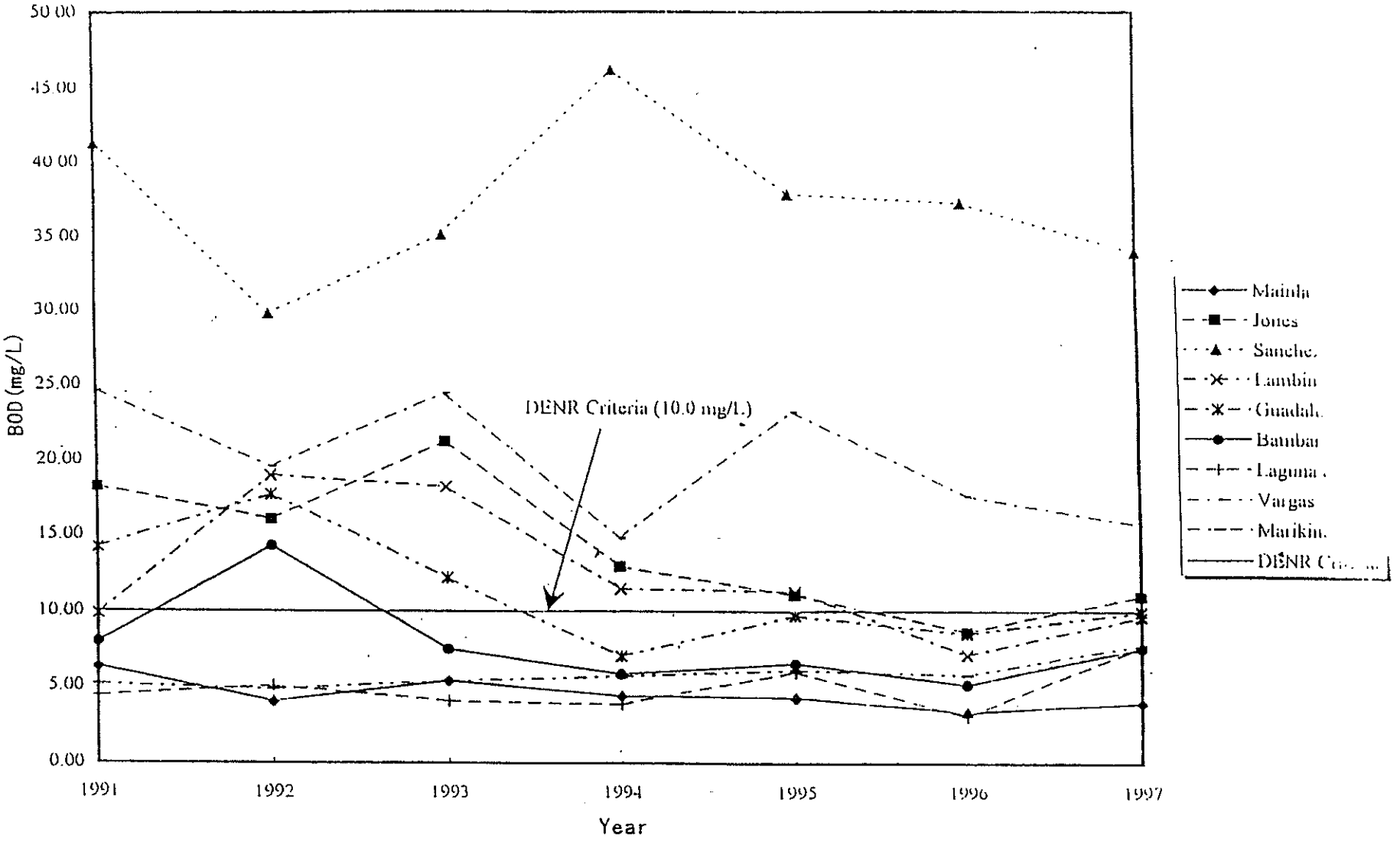


FIG. B.2 WATER QUALITY OF PASIG -MARIKINA RIVER
(PASIG - MARIKINA RIVER BOD CONCENTRATIONS)

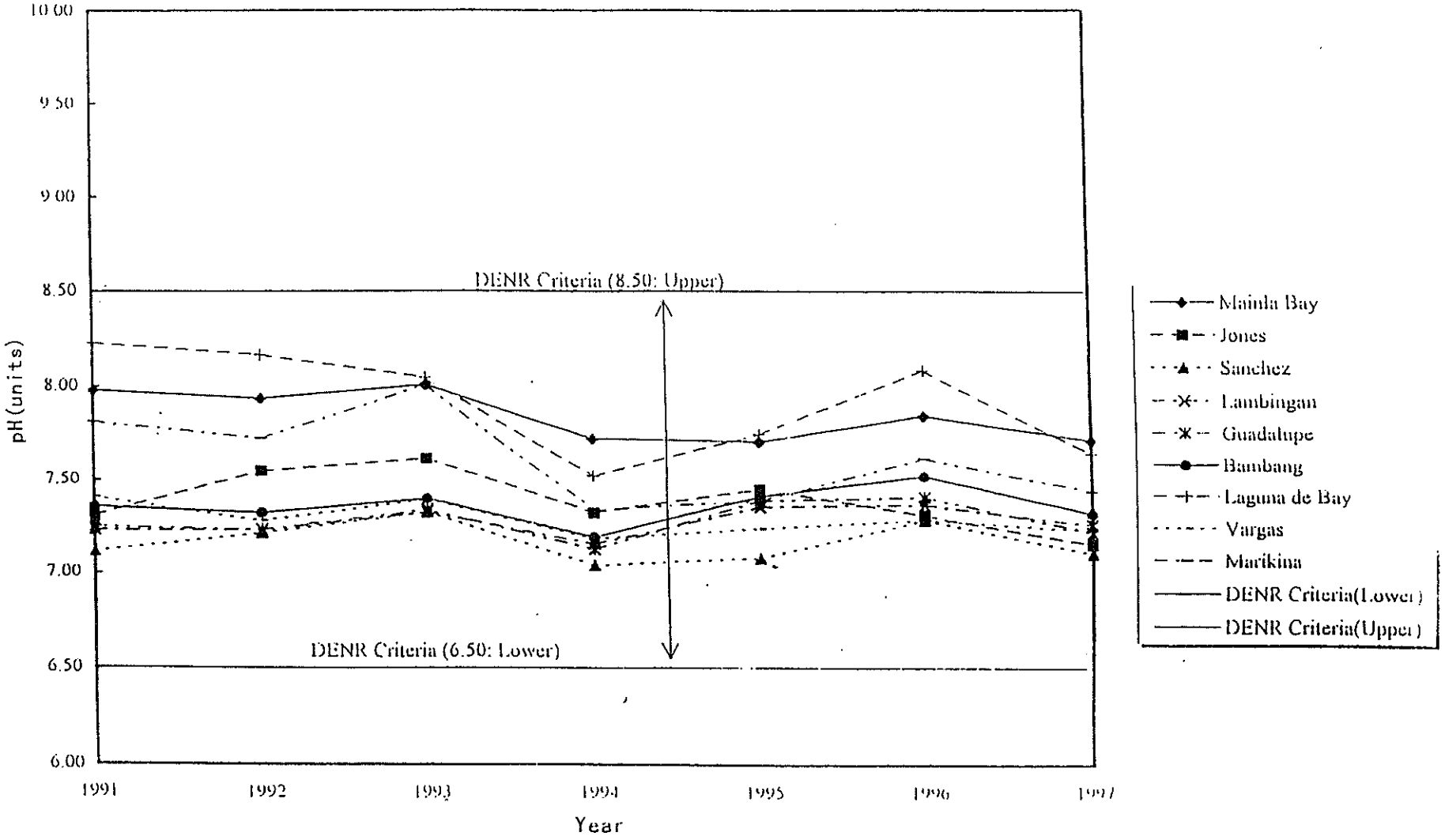


FIG. B.3 WATER QUALITY OF PASIG - MARIKINA RIVER

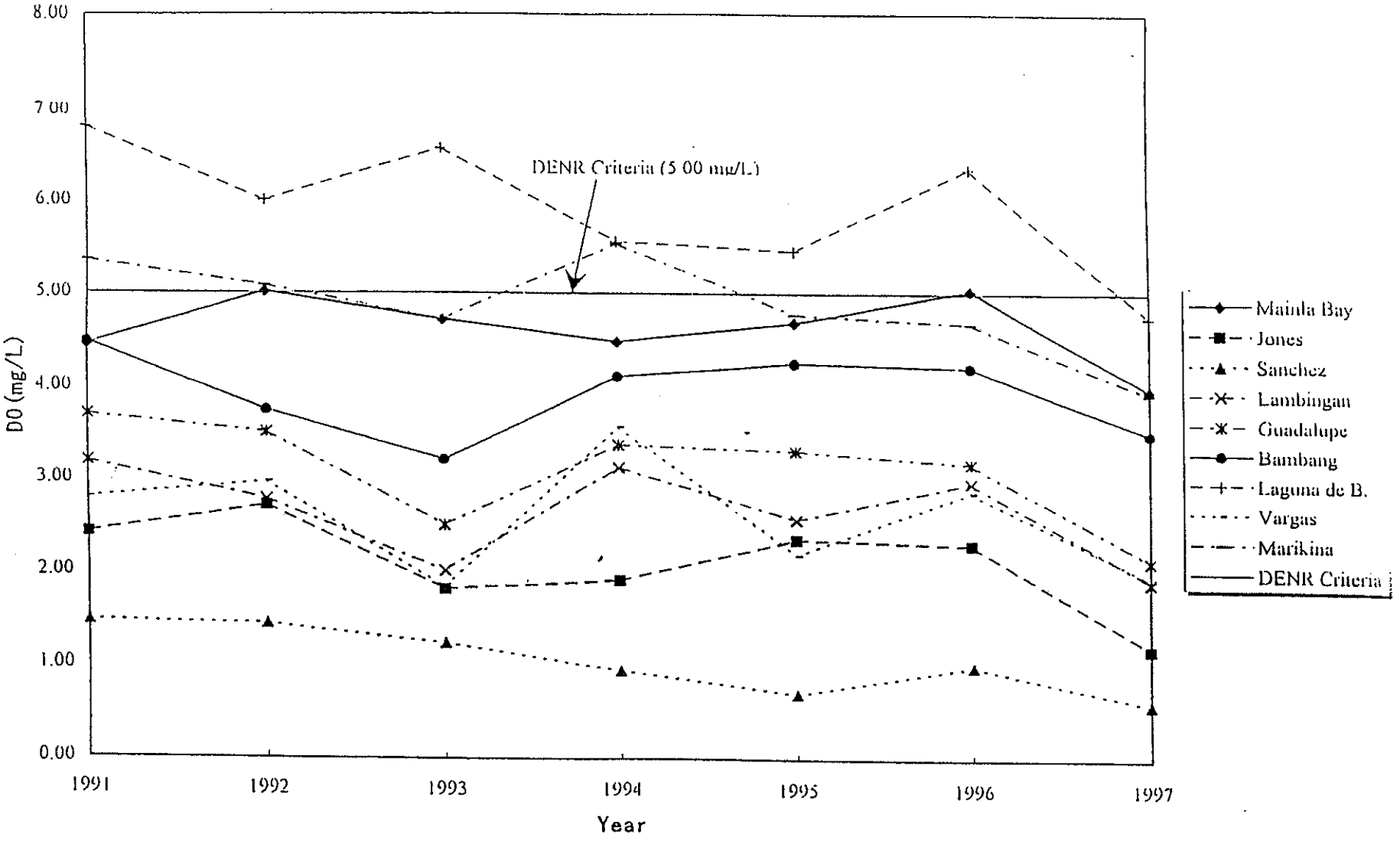


FIG. B.4 WATER QUALITY OF PASIG - MARIKINA RIVER
(PASIG - MARIKINA RIVER DO VALUES)

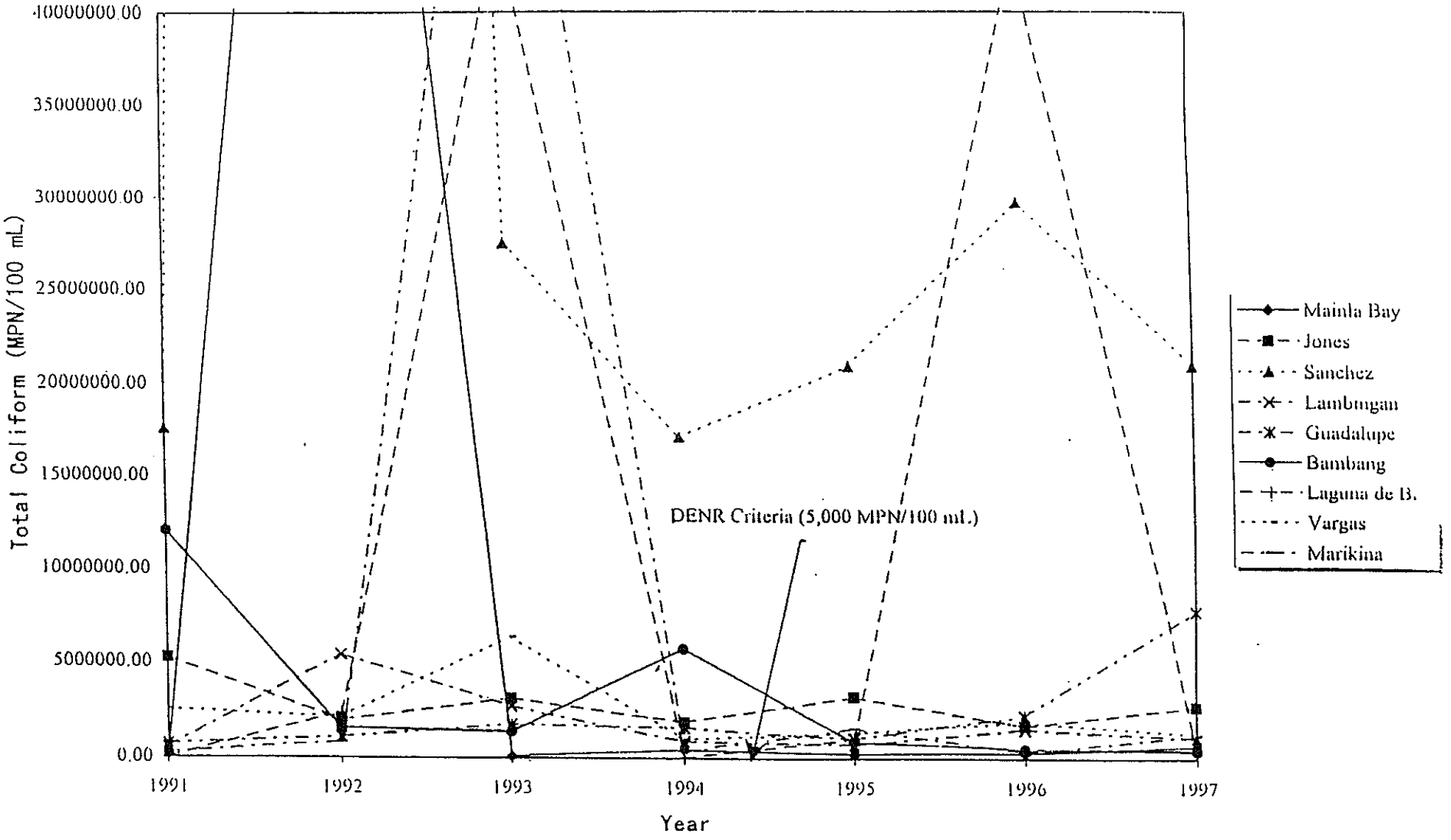


FIG. B-5 WATER QUALITY OF BASIC MARIKINA RIVER

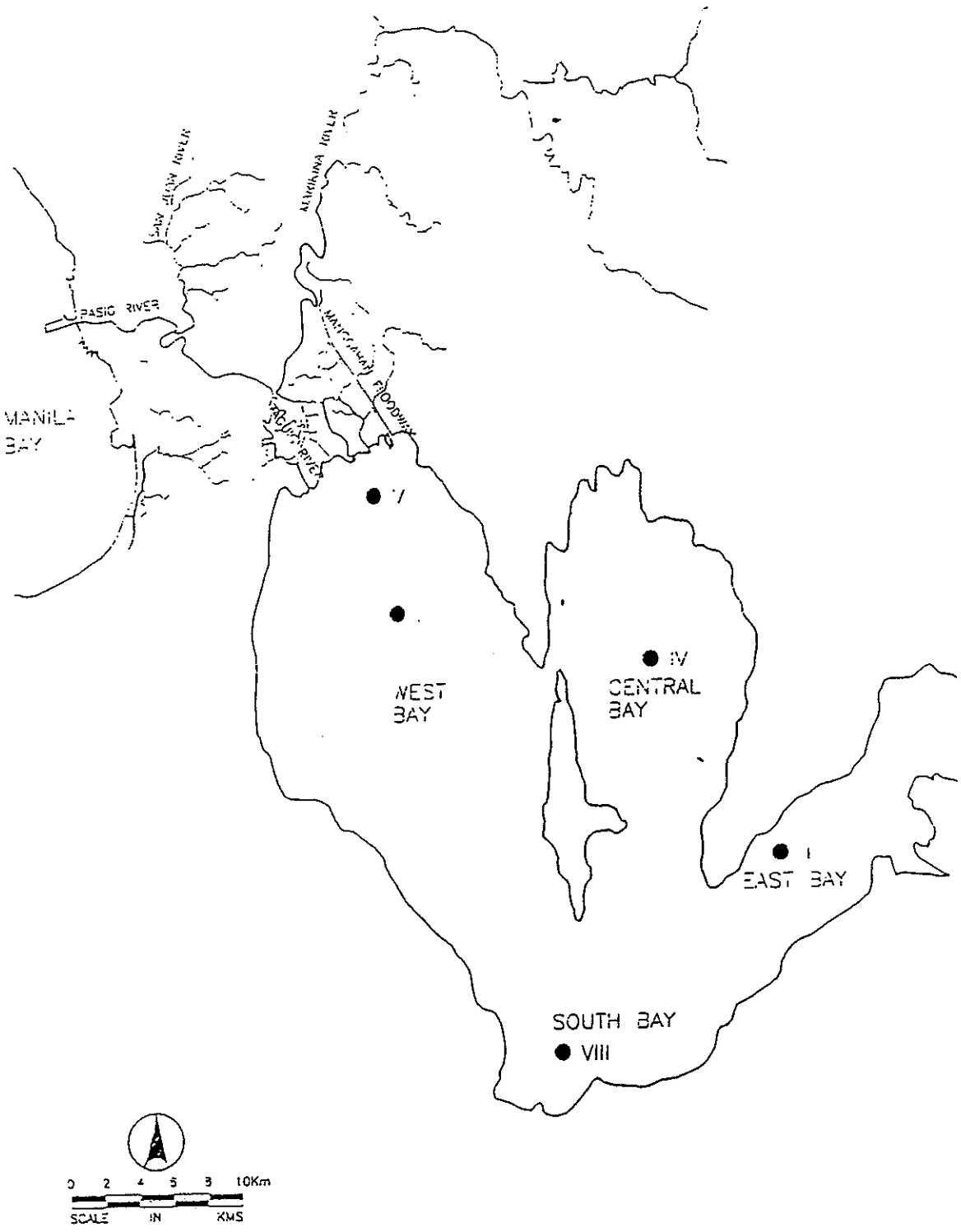
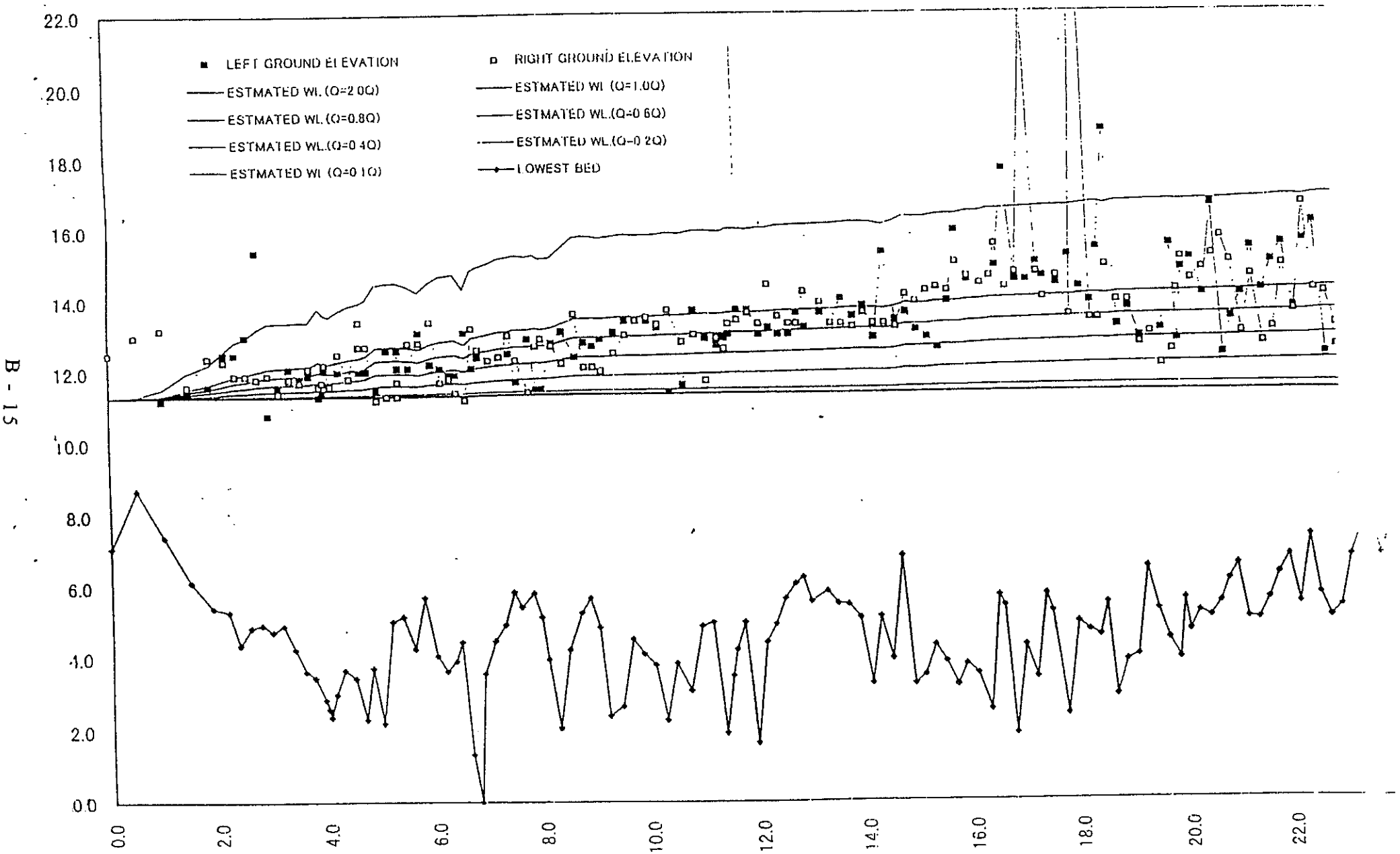
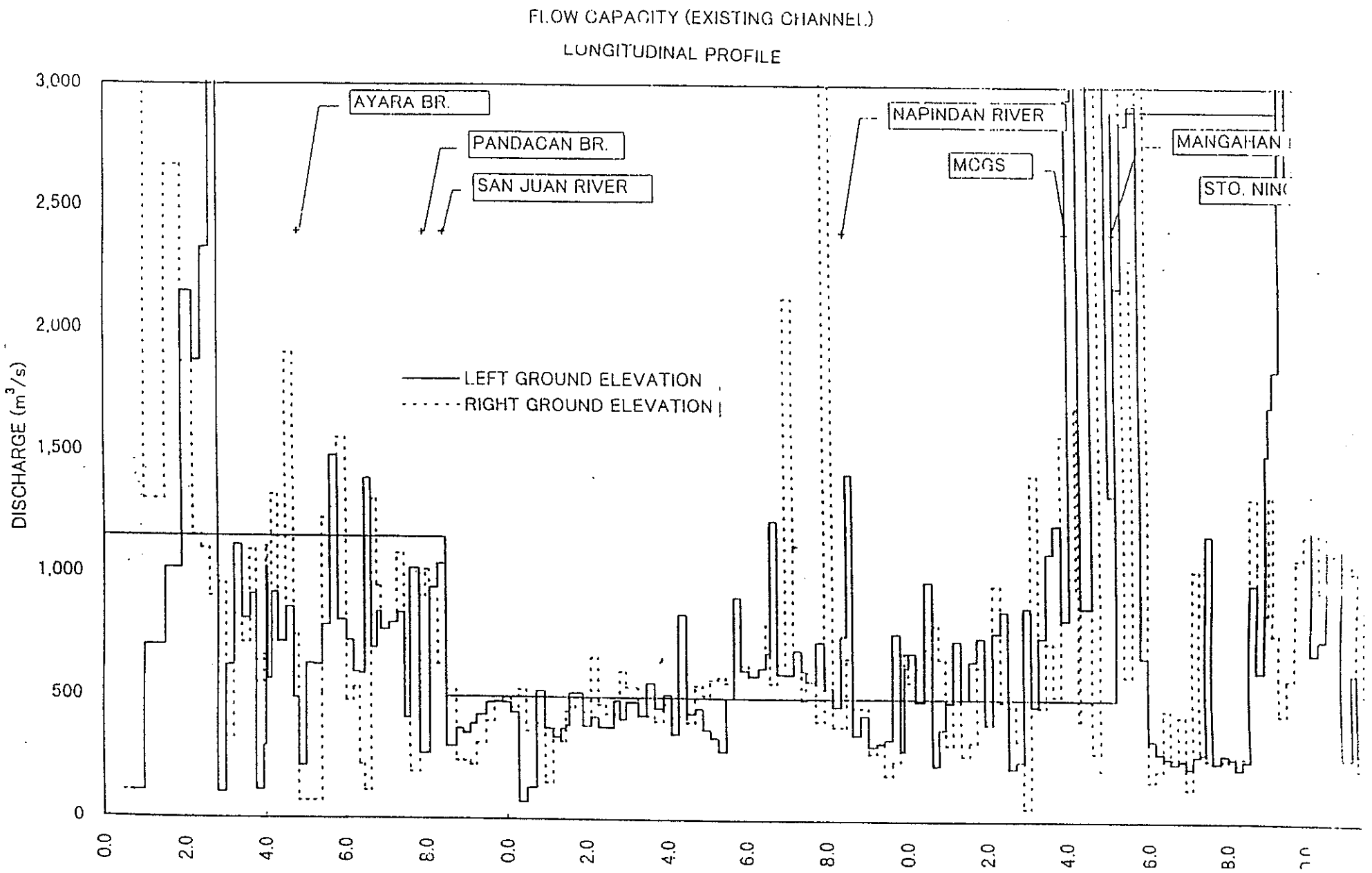


FIG. B.6 LAGUNA LAKE SAMPLING STATIONS

TABLE B.6 LAGUNA LAKE WATER QUALITY IN 1996

Items	I West Bay	II East Bay	IV Central Bay	V West Bay*	VIII South Bay	DENR Criteria
Physico-Chemical Parameters						
Temperature, °C	29	28	28	29	29	3
pH, units	8.2	8.1	8.3	8.3	8.2	6.5 - 8.5
Turbidity, mg/L SiO_2	44	27	20	46	32	
Transparency, cm	44	49	53	34	53	
Alkalinity (mg/L $CaCO_3$)	76	66	71	73	72	
Dissolved Oxygen, mg/L	8.3	8.8	9.1	8.5	8.4	5.0
Biochemical Oxygen Demand, mg/L	1.7	1.3	1.9	1.8	1.3	10.0
Chemical Oxygen Demand, mg/L	35	23	18	21	18	
Nitrate, mg/L	0.033	0.039	0.063	0.062	0.031	10.0
Ammonia, mg/L	0.084	0.082	0.037	0.105	0.076	
Inorganic Phosphate, mg/L	0.069	0.056	0.076	0.083	0.100	0.4
Total Dissolved Solids, mg/L	389	318	402	390	339	1000
Total Suspended Solids, mg/L	60	39	29	69	45	30
Total Hardness, mg/L $CaCO_3$	90	80	92	95	87	
Calcium Hardness, mg/L $CaCO_3$	30	25	32	31	37	
Chloride, mg/L	159.7	126.8	165.8	155.9	128.8	350.0
Oil and Grease (mg/L)	1.04	1.44	1.92	1.95	1.16	2.0
Heavy Metals						
Chromium (VI), mg/L	0.006	0.009	0.010	0.012	0.012	0.05
Copper, mg/L	0.02	0.02	0.01	0.02	0.02	0.05
Iron, mg/L	5.43	3.85	3.25	6.35	4.11	
Lead, mg/L	0.07	0.10	0.08	0.04	0.06	0.05
Nickel, mg/L	0.011	0.008	0.007	0.099	0.013	
Zinc, mg/L	0.013	0.010	0.014	0.013	0.014	
Biological Parameters						
Phytoplankton, counts/mL	2752	2154	2628	474	294	
Zooplankton, counts/liter	15	19	15	20	16	
Benthos, individual/m^2	1605	303	1397	4169	1806	
Microbiological Parameter						
Total Coliform (MPN/100mL)	1614	2261	889	1316	3196	5000


LEFT GROUND ELEVATION
RIGHT GROUND ELEVATION
ESTMATED WL.(Q=2.0Q)
ESTMATED WL.(Q=1.0Q)
ESTMATED WL.(Q=0.8Q)
ESTMATED WL.(Q=0.6Q)
ESTMATED WL.(Q=0.4Q)
ESTMATED WL.(Q=0.2Q)
ESTMATED WL.(Q=0.1Q)
LOWEST BED
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0


FLOW CAPACITY (EXISTING CHANNEL)
LONGITUDINAL PROFILE
DISCHARGE (m^3/s)
3,000
2,500
2,000
1,500
1,000
500
0
AYARA BR.
PANDACAN BR.
SAN JUAN RIVER
NAPINDAN RIVER
MCGS
MANGAHAN
STO. NIN
LEFT GROUND ELEVATION
RIGHT GROUND ELEVATION
0.0
2.0
4.0
6.0
8.0
0.0
2.0
4.0
6.0
8.0
0.0
2.0
4.0
6.0
8.0

(Unit : m^3/s)

STO. NINO	FLOODWAY
1,600	900
2,050	1,200
2,400	1,450
2,800	1,750
2,900	1,850
3,200	2,000
3,500	2,250

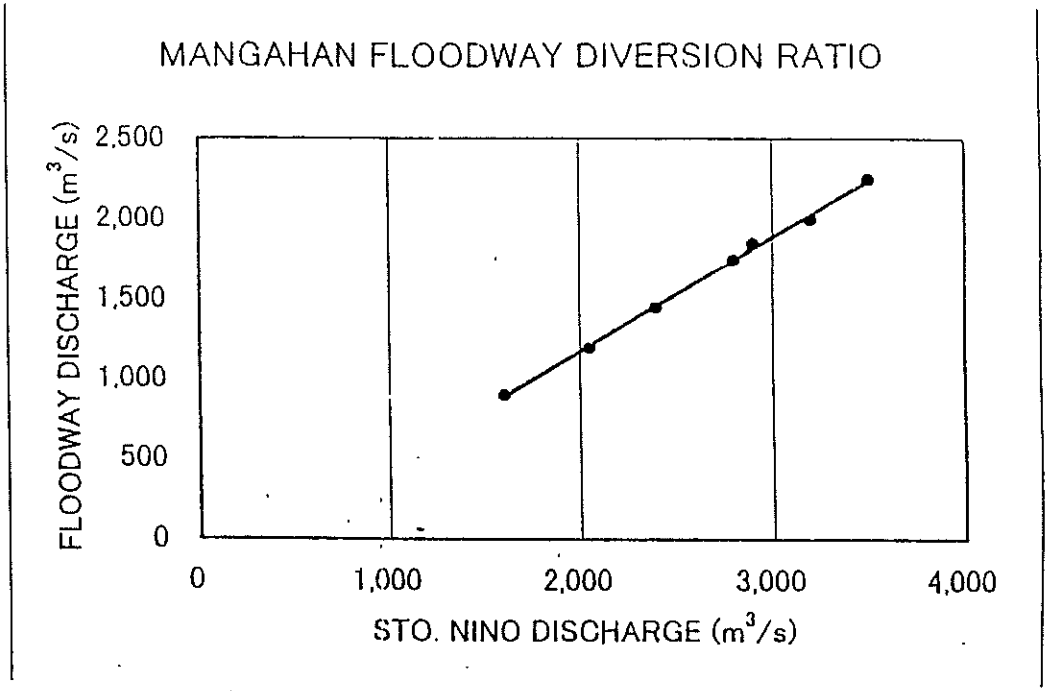


FIG. B.9 FLOOD DIVERSION RATIO FROM HYDRAULIC MODEL TEST

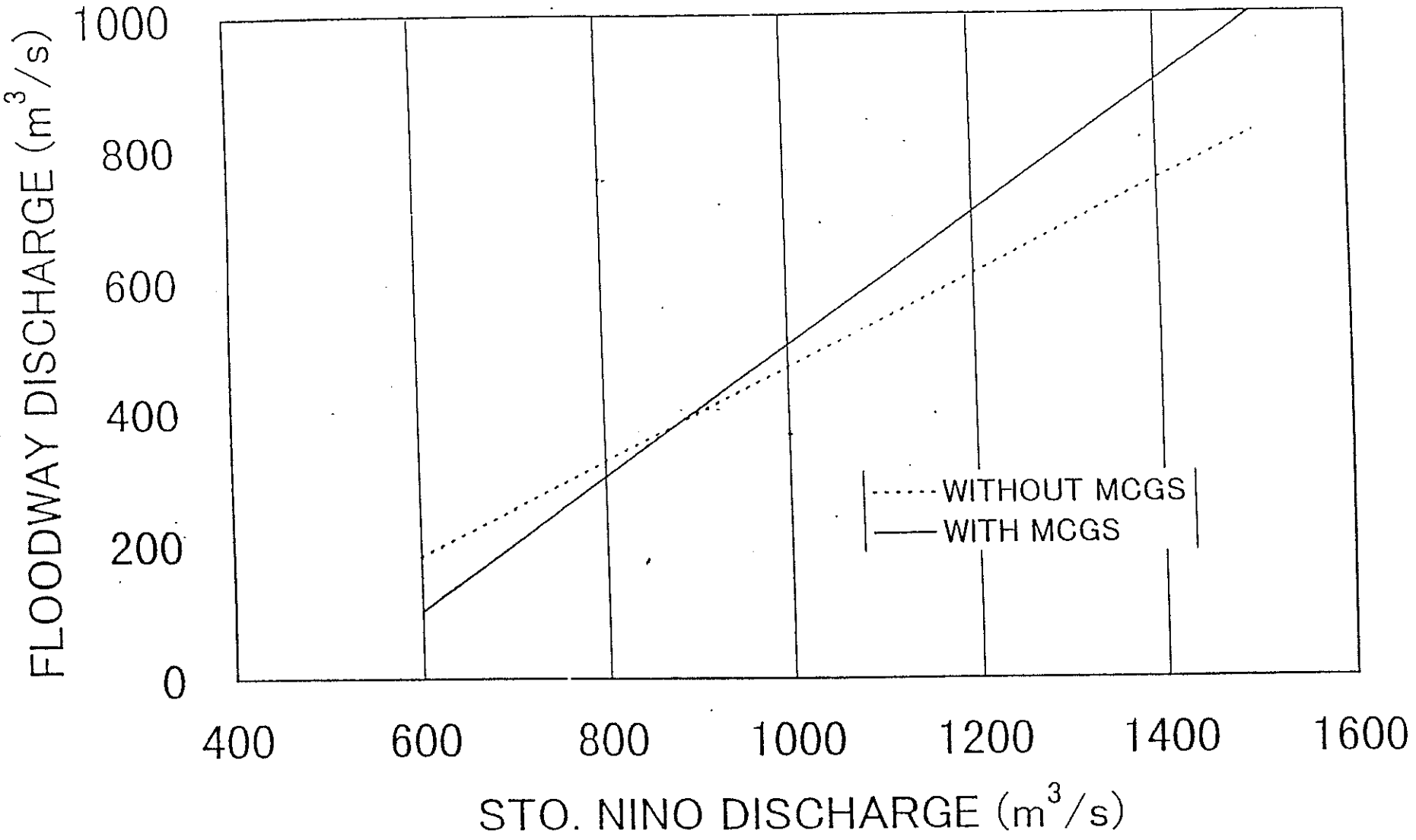


FIG. B.10 FLOOD DIVERSION RATIO WITH/WITHOUT MCGS

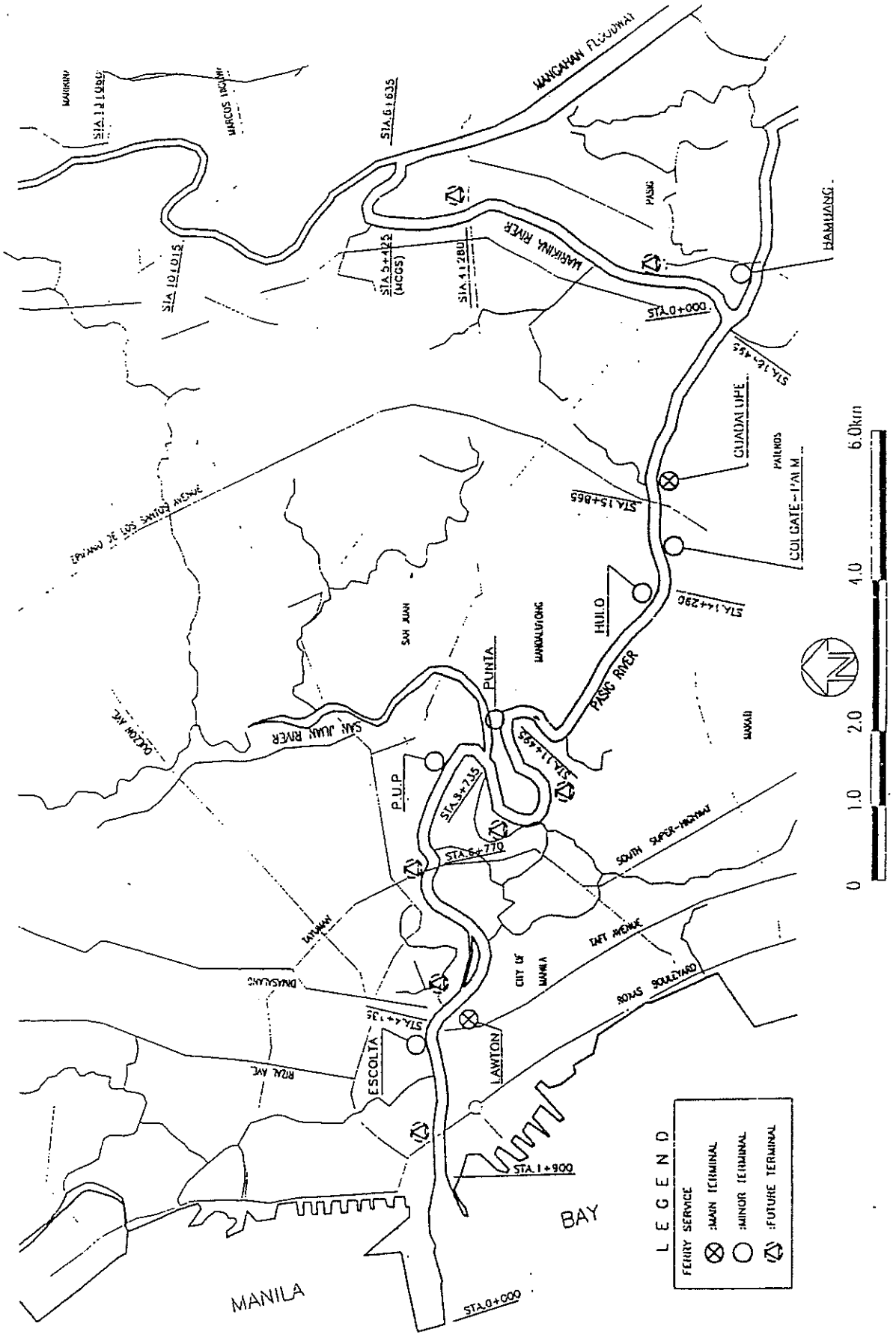


FIG. B.11 LOCATION OF FERRY TERMINALS

FLORA AND FAUNA

1.0 INTRODUCTION

Presently, the entire stretch of the Pasig River has an ecologically poor condition since it is situated in a highly urbanized region. The riverbanks are immediately adjacent to areas that are considered as residential, commercial, and industrial. The prolonged human impact over the years has practically removed the habitats for wildlife. The area is no longer in a rural setting.

No species of plants in the project area are considered endangered, threatened, or rare species. Vegetation is now limited only to the usual vegetation in a highly urbanized city. Fauna, such as fishes, is only confined to the upper reaches of the Marikina River. Likewise, no endangered, threatened, or rare species of animals are identified in the project area.

A report entitled "A Directory of Philippine Wetlands" and compiled by the Asian Wetland Bureau Philippines Foundation Inc. provides the following information on flora and fauna in the Pasig-Marikina River and Laguna Lake.

2.0 PASIG-MARIKINA RIVER

Principal Vegetation

Aquatic vegetation consists mostly of Eichornia crassipes (water hyacinth) which occurs in patches in Laguna Lake and flows out in substantial amounts to Manila Bay via the Pasig River. Pistia stratiotes (water lettuce) - another floating macrophyte, is also present in small amounts.

Fauna

There is little aquatic life in the Pasig River. The pollution of the Pasig River has prevented the migration of many commercially important fish into Laguna Lake including Caranx marginatus (talakitok); Mugil spp. (mullet/banak); Megalops cyprinoides (buan-buan)/ox-eyed tarpon) and Chanos chanos (milkfish/bangus).

3.0 LAGUNA LAKE

Principal Vegetation

The turbidity of the lake prevents extensive growth of submerged macrophytes, although some Hydrilla verticillata is present. Eichornia crassipes forms large floating mats which drift across the lake according to wind direction. Some emergents such as Phragmites and Typha are present along the south-eastern shores. Other macrophytes include Nymphaea sp. and Ipomoea reptans. Blue-green algal blooms of Anabaena and Nostoc occur.

Fauna

The lake is known to support at least 23 native species of fish belonging to sixteen families and a lot of introduced species. The most common are: -

Glossogobius giurus	white goy/biyang puti
Clarias batrachus	catfish/hito
Ophicephalus striatus	mudfish/dalag
Therapon plumbeus	grunt/ayungin
Arius manilensis	Manila sea catfish/Kanduli
Cyprinus carpio	common carp/Karpa
Chanos chanos	milkfish/bangus
Oreochrornis nilotica	Tilapia
O. mossambicus	Tilapia
Trichogaster pectoralis	plasalit/gourami

A Macrobrachium sp. (lanceifrons?) is also present. The benthic molluscan fauna is abundant, being mainly composed of Vivipara angularis; Ampullaria luzonica and Corbicula manilensis. Recently, the giant golden apple snail or kuhol has spread into the lake.

A wide variety of waterfowl occurs, the most common being Ixobrychus sinensis; I. cinnamomeus, Ardea cinerea, Rallus mirificus (endemic to the Philippines), Porphyrio porphyrio, Fulica atra, Himantopus himantopus and Sterna albifrons.

4.0 AQUACULTURE IN LAGUNA LAKE AND INLAND FISHERIES ALONG THE PASIG-MARIKINA RIVER SYSTEM

Before the development of the fishpen industry, the lake was a vital source of livelihood for approximately 8,000 full-time fishermen (as of 1968). Species of low commercial value were caught, mainly ayungin (Therapon plumbeus) and white goby/ biyang puti (Glossogobius giurus), although migratory fish of higher commercial value which entered the lake via the

Pasig River were also caught, including bangus/milkfish (Chanos chanos); banak/mullet (Mugil spp.) and talakitok/jack (Caranx marginatus). Collection of snails for the local duck-raising industry was also very important, as was the collection of tulya/freshwater clam (Corbicula manilensis) for human consumption. Quantities of freshwater shrimp (Macrobrachium lanceifrons) were also caught. Fish corrals (baklad) and gill net (pante) were the main fishing methods.

By the end of the 1960's, however, catches had fallen drastically due to a combination of over fishing and pollution. This prompted the Laguna Lake Development Authority (LLDA) to introduce fishpen culture using Chanos chanos. Many entrepreneurs entered this new industry and by 1983, fishpens covered an area of 35,000 ha, and cages of tilapia (Oreochromis nilotica), bighead carp (Aristichthys nobilis) and silver carp (Hypophthalmichtys molitrix) has been gaining popularity.

APPENDIX C

RIVER SEDIMENTS STUDY

RIVER SEDIMENTS STUDY

1.0 INTRODUCTION

There is a need to study the sediments of the river due to some concerns on the proposed dredging activities. Water quality effects and the suitability of the dredged materials for dumping on land are the major concerns.

The river sediments study was conducted with due consideration to the following established fact in dredging engineering:

- Total concentration of a contaminant or indicator parameter in a dredged sediment is not related to the release of the contaminant in available forms to the water column during open-water disposal or to the toxicity of the sediments to aquatic life (Lee and Plumb, 1974);

- Contaminant uptake and release in sediment-water systems are controlled by a variety of physical, chemical, and biological factors, principally sorption, reactions with the iron system, and hydrodynamics (Lee and Jones, 1987).

The uppermost layer of the riverbed is composed of sediment or sludge that includes solid waste, organic matter and silt. Compared with the lower clay and sand layer, the uppermost layer is expected to have more contaminants or toxic substances. However, concentrations of toxic substances alone cannot be used directly to estimate the impact of dredging and excavation works on water quality, aquatic life or other beneficial uses of the river water.

2.0 PREVIOUS STUDIES

Sediments of the Pasig and Marikina Rivers have been studied by the PRRP-DENR. A PRRP-DENR report entitled "Preliminary Assessment of the Water Quality of Laguna de Bay with and without Flushing of Pasig River" prepared by the Water Quality Institute (1993) concluded that the concentrations of the heavy metals, such as cadmium, chromium, copper, nickel, lead, zinc and mercury, in the sediments from the rivers are low.

PRRP-DENR has been monitoring from 1991 to 1994 the concentrations of cadmium, copper, lead, and zinc in the sediments. The concentrations obtained by PRRP-DENR are almost the same as or slightly higher than those measured by the SAPROF Study Team. The results are summarized below:

TABLE C.1

HEAVY METALS CONCENTRATIONS IN SEDIMENTS (SUMMARY FOR 1991 TO 1994)

(mg/kg)

Toxic Substance	Pasig River (River Mouth to San Juan R.)	Pasig River (San Juan R. to Napindan HCS)	Lower Marikina River	Upper Marikina River
1. Cadmium	0.61 to 2.40	0.45 to 3.30	na	0.48 to 2.10
2. Lead	16.73 to 60.59	8.14 to 573.98	na	5.01
3. Copper	9.36 to 155.86	13.0 to 222.0	na	39.1 to 92.0
4. Zinc	22.0 to 410.9	25.0 to 1224.0	na	92.4 to 148.0

3.0 PRESENT SEDIMENT AND ELUTRIATE STUDY

It is the sediment or sludge diffusing in the river water during dredging and disposal works that would affect water quality. The release of toxic element into the water column during sludge diffusion is an important factor in estimating the impact. The EPA elutriate test (with some variations) was conducted to mimic the release of the chemical contaminants during actual dredged sediment disposal operations and determine the amount of toxic substances released from the sludge and reintroduced into the water column.

The concentrations of toxic substances in the dried sediment samples were first verified or measured. Then the elutriate test was performed by mixing the dried sediment samples with distilled water for 18 hours, allowing the mixture to settle under quiescent conditions, and filtering and analyzing the filtrates or elutriates for the chemicals of interest.

Concentrations of Toxic Substances in the Dredged Sludge

Concentrations of ten (13) toxic substances in the river sediments from ten (10) sampling stations along the Pasig-Marikina River were examined by the SAPROF Study Team. Results of the tests are summarized below:

TABLE C.2

TOXIC SUBSTANCES IN THE SEDIMENTS

(mg/kg)

Toxic Substance	Pasig River (River Mouth to San Juan R.)	Pasig River (San Juan R. to Napindan HCS)	Lower Marikina River	Upper Marikina River
1. Alkyl Mercury	nd	nd	nd	nd
2. Total Mercury	0.013 to 0.184	0.002 to 0.088	0.07	0.002 to 0.155

3. Cadmium	1.40 to 1.89	1.48 to 1.65	1.07	1.56 to 1.89
4. Lead	26.45 to 84.80	42.33 to 53.70	27.51	26.3 to 29.1
5. Organophosphate	nd	nd	nd	nd
6. Chromium (hexavalent)	0.20 to 0.43	0.20 to 0.55	0.30	0.19 to 0.34
7. Arsenic	nd	nd	nd	nd
8. Copper	78.3 to 146.6	94.26 to 108.4	68.15	91.36 to 116.9
9. Zinc	97.4 to 556.5	228.2 to 271.0	116.5	168.8 to 374.3
10. PCB	0.05	0.02	na	0.01
11. Cyanide	nd	0.1	na	nd
12. Formaldehyde	nd	nd	na	nd
13. Flouride	30 to 50	30 to 60	20	20 to 30

nd = not detected; na = not available

Presently, the Philippine Government does not have an environmental quality criteria or guidelines for contaminated soils, sediments, and sites. However, the "Interim Canadian Environmental Quality Criteria for Contaminated Sites, Report CCME EPC-CS 34, 1991" published by the Canadian Council of Ministers of the Environment provides allowable concentrations of toxic substances for a specific land use, which can be used as reference:

TABLE C.3

INTERIM CANADIAN ENVIRONMENTAL QUALITY CRITERIA FOR CONTAMINATED SITES

(mg/kg)

Toxic Substance	Agricultural Area	Residential / Park Area	Commercial / Industrial Area
1. Total Mercury	0.8	2	10
2. Cadmium	3	5	20
3. Lead	375	500	1,000
4. Chromium (hexavalent)	8	8	
5. Arsenic	20	30	50
6. Cyanide	5	50	500
7. Copper	150	100	500
8. PCB	0.5	5	50
9. Zinc	600	500	1,500

The concentrations of toxic substances in the sediments from the Pasig-Marikina River satisfy this Canadian guideline.

Elutriate Test of Toxic Substance in the Dredged Sludge

An elutriate test (with some variations) was conducted on sampled sediments with the results presented below. The filtrates or elutriates are compared to some water quality standards.

The comparison showed that the concentrations of toxic substances in the filtrates satisfy the DENR effluent regulations as shown below. In addition, these concentrations are less than the standard values provided by the Japanese standard.

TABLE C.4

RESULTS OF ELUTRIATE TEST
(mg/liter)

Toxic Substance	Pasig River (River Mouth to San Juan R.)	Pasig River (San Juan R. to Napindan HCS)	Lower Marikina River	Upper Marikina River
1. Alkyl Mercury	nd	nd	nd	nd
2. Total Mercury	nd	nd	nd	nd
3. Cadmium	0.025	0.017 to 0.025	0.017	0.013 to 0.017
4. Lead	nd	nd	nd	nd
5. Organophosphate	nd	nd	nd	nd
6. Chromium (hexavalent)	nd	nd	nd	nd
7. Arsenic	nd	nd	nd	nd
8. Copper	0.016 to 0.032	nd	nd	nd
9. Zinc	0.367 to 2.226	1.252 to 1.554	0.298	0.928 to 1.948
10. PCB	nd	nd	na	nd
11. Cyanide	nd	nd	na	nd
12. Formaldehyde	nd	nd	na	nd
13. Flouride	0.05 to 0.16	0.07 to 0.09	0.07	0.05 to 0.07

nd = not detected; na = not available

TABLE C.5

JAPANESE STANDARD FOR DUMPING OF WASTE MATTER INTO RECLAMATION AREAS IN THE SEA
(mg/liter)

Toxic Substance	Japanese Standard on the Dumping of Waste Matter into Reclamation Areas in the Sea	Philippine Effluent Regulations	
		Inland Waters Class C	Marine Waters Class SD
1. Alkyl Mercury	P		
2. Total Mercury	0.005	0.005	0.01
3. Cadmium	0.1	0.05	0.2
4. Lead	0.1	0.3	
5. Organophosphate	1		0.5
6. Chromium (hexavalent)	0.5	0.1	0.5
7. Arsenic	0.1	0.2	
8. Copper	3		
9. Zinc	5		
10. PCB	0.003		
11. Cyanide	1		

12. Formaldehyde	-		
13. Flouride	15		

P = prohibited or not allowed

4.0 CONCLUSIONS

Results of the sediment study demonstrate the following :

- The Philippines does not have an environmental guideline on river sediments;
- The concentrations of toxic substances in river sediments are within the acceptable levels of the reference guidelines of some developed countries;
- The sludge or sediments to be dredged from this river can be dumped and used as filling materials in reclamation areas intended for residential, parks, commercial, and industrial uses;
- The impact of the dredging, excavation, and disposal works on the water quality of the Pasig-Marikina River , in terms of toxic substances, will be negligible.

APPENDIX D

DREDGED MATERIALS AND DISPOSAL SITES

DREDGED MATERIALS AND DISPOSAL AREAS

1.0 DREDGED MATERIALS

River bed materials are generally classified into the sludge layer and the in-situ soil. These are the **dredged materials** to be disposed during a dredging operation. The sludge layer contains silt, solid wastes, and organic matter. The solid wastes in the dredged sludge will be screened out and dumped in the selected disposal sites discussed in Section 2.0, while the soft sludge will be treated and utilized as embankment and reclamation materials. Soil admixtures will be added to the sludge to solidify and increase its strength. These materials are safe to be used as filling materials for reclamation projects as shown by the results of the elutriate test.

2.0 ESTIMATE OF DREDGED MATERIALS

Initial estimates on the volume and type of dredged materials were made by the SAFPROF Study through site reconnaissance survey, use of existing soil survey data and examination of available excavated and dredged materials. These estimates will be verified and refined during the detailed design stage. The data are presented below:

TABLE D.1

ESTIMATED DREDGED MATERIALS

(in million m^3)

Project Area	Sludge	Sand and Clay	Total
Pasig River	0.09	-	0.09
Lower Marikina River (NHCS to MCGS)	0.22	0.23	0.45
Upper Marikina River (MCGS to Marikina Br.)	0.17	3.09	3.26
Total	0.48	3.32	3.80

Disposal Distribution of Dredged Materials

Ninety thousand cubic meters (90,000 m^3) of dredged materials near the protection works along Pasig River will be utilized as backfill materials for the waterfront amenity facilities, as shown in the figure. The dredged materials from the Marikina River will be sent to the identified disposal areas. The average hauling distance from the project areas is less than 10 kilometers.

TABLE D.3

DISPOSAL DISTRIBUTION OF DREDGED MATERIALS

(in million m^3)

Project Area	Dumping Site					Total
	Waterfront Amenity Facilities	Calzada	Cainta	Doña Petra	Embank-ments	
Pasig River	0.09	0.00	0.00	0.00	-	0.09
Lower Marikina River (Napindan HCS to MCGS)	0.00	0.45	0.00	0.00	-	0.45
Upper Marikina River (MCGS to Marikina Br.)	0.00	0.00	1.50	1.00	0.76	3.26
Total	0.09	0.45	1.50	1.00	-	3.80

4.0 TREATMENT OF DREDGED MATERIALS AT DISPOSAL SITES

The dredged sludge, as discussed in Section 2.0, will be treated with soil admixtures and disposed as backfill materials for the proposed waterfront amenity facilities along the Pasig River., while the dredged materials from the Marikina River are physically stable and suitable as filling materials for reclamation projects. Special treatment is therefore not necessary for this kind of dredged materials which will be disposed inland in Calzada, Cainta, and Doña Petra.

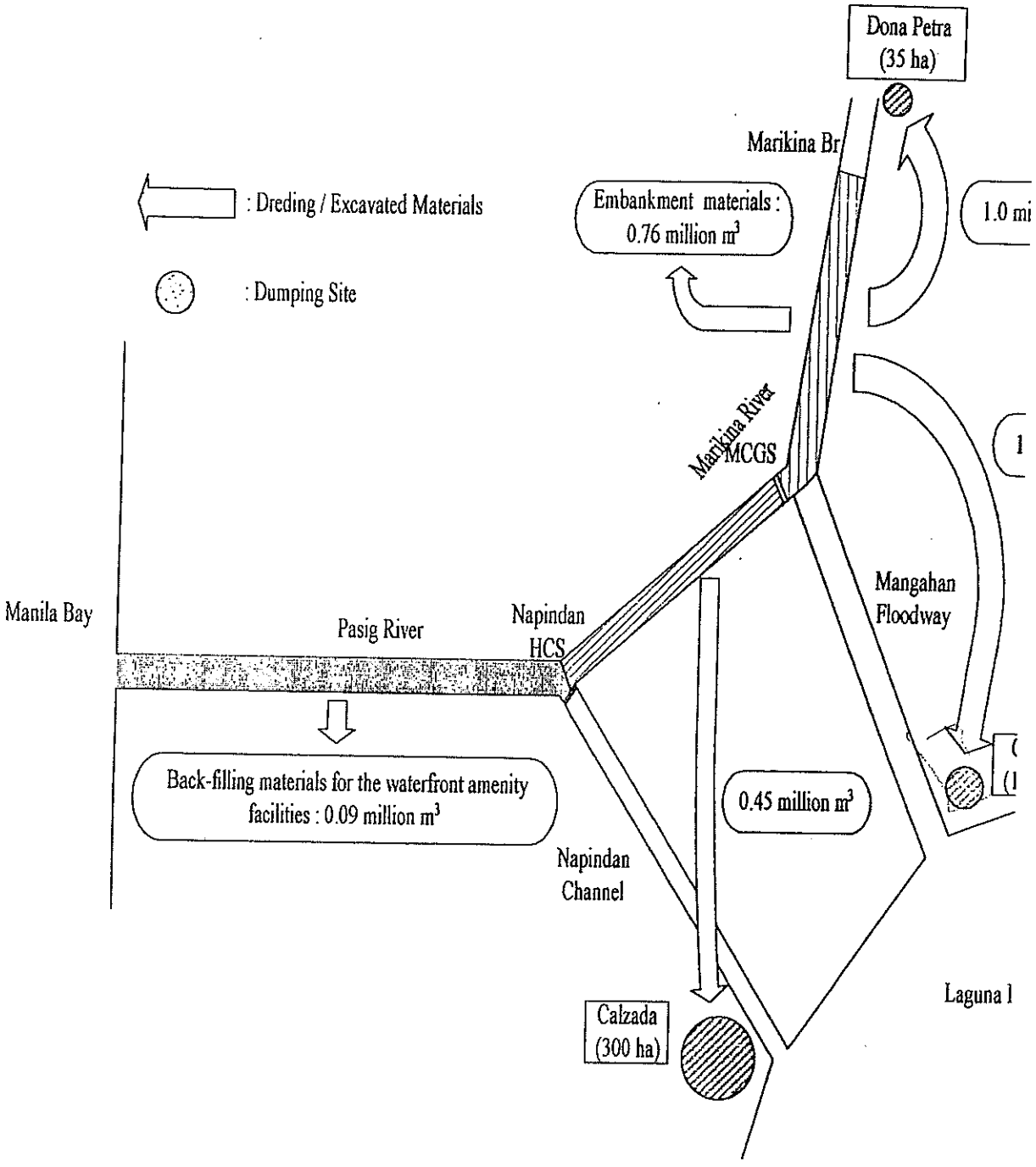


FIGURE D.1

DISPOSAL DISTRIBUTION OF DREDGED MATERIALS

APPENDIX E

SOCIOECONOMIC STUDY AND PERCEPTION SURVEY

SOCIOECONOMIC STUDY AND PERCEPTION SURVEY

1.0 INTRODUCTION

Previously, project implementation was only based on economic, engineering, and political factors. The environmental factor was rarely considered. Today, evaluation of the environmental aspects is legally required prior to the physical implementation of a project. A socioeconomic study is therefore necessary for an effective impact analysis.

Baseline information on the socioeconomic aspects were obtained from various sources such as (1) interviews with key informants who are persons considered knowledgeable on the social services and environmental problems in the area, (2) various government agencies, and (3) the conduct of a sample survey using a household questionnaire in the barangays of the direct impact area.

2.0 SOCIOECONOMIC SETTING

2.1 Demography

2.1.1 Population Size and Growth

The 82 barangays along Marikina-Pasig River serves as the project's impact area. These barangays are distributed among two municipalities and six cities. The two municipalities are in the province of Rizal and the six cities are in Metro Manila. The municipalities are Taytay and Cainta. The six cities are as follows: Marikina, Quezon City, Pasig, Makati, Mandaluyong, and Manila. Four barangays are part of two Rizal municipalities while the 78 barangays are within Metro Manila **(Table 1)**. Thus, Metro Manila can be considered as the main impact area of the project.

The four barangays are among the most populated in Rizal and their population comprise 13 % of the provincial total. While the 78 barangays within Metro Manila compose 8 % of the total metropolitan population. The 82 barangays along Marikina-Pasig River have a population of 826,425 in 1990 and 915,865 in 1995. Within the ten-year period, these barangays sustained a growth rate of only 2.0 % per year. This is lower than the growth rate of Metropolitan Manila which is 3.6% during the same period. The national population growth rate during the period is 2.3 percent.

TABLE 1
NUMBER OF BARANGAYS ALONG MARIKINA-PASIG RIVER AND THEIR POPULATION SIZE AND GROWTH: 1990-1995

MUNICIPALITY/ CITY	NO OF BARANGAYS	1990	1995	ANNUAL GROWTH RATE
Cainta	2	55,786	106,895	13.9
Taytay	2	45,056	69,457	9.0
Marikina	11	216,220	248,336	2.8

Quezon City	4	18,269	19,049	0.8
Pasig	13	184,129	190,118	0.6
Makati	10	175,857	176,379	0.6
Mandaluyong	8	56,161	64,378	2.7
Manila	32	74,947	84,401	2.4
Total	82	826,425	915,865	2.0
MetroManila	1,698	7,948,392	9,454,040	3.5

Source: National Sataistics Office

But the growth rate in 82 barangays widely varies among the various parts. The high growth areas are the exterme eastern part. The population growth of the barangays of Cainta surged by 13.9% and the barangays of Taytay, by 9.0 percent. Indeed, these barangays serve as the expansion area of Metro Manila and is apparently taking the spillover from the metropolis. The population of the barangays within Meto Manila have more or less stabilized. All have population growth rates less than the metropolitan rate of 3.5 percent. The lowest growth rates registered at Quezon City, Pasig and Makati. The growth rates of their barangays are less than 1.0 percent. Substantial growth is still being experienced in Marikina, Mandaluyong and Manila. Either their population density has not yet reached saturation point or their land use is not yet fully secured from conversion and reconversion.

The increase of population is a result of natural increase (number of birth minus number of death) and net migration (number of in-migrants minus number of out-migrants). There is no indicator that the natural increase in the 82 barangays along the Marikina-Pasig River widely varies from Metro Manila's natural increase of 24 persons per 1000 population. Thus, outmigration in certain barangays may be largely responsible for the lower population growth compared to the metropolis. This is in spite the fact that the cities where these barangays are located may be in-migration area. For instance, 20% of the population of Makati just moved ito the city in the last 5 years (**Table 2**). Only 12% in Quezon City and 11% in Manila did the same. But the Makati barangays along Pasig River registered lower population growth than those in Quezon City and Manila.

TABLE 2
SELECTED CHARACTERISTICS OF THE POPULATION OF QUEZON CITY AND METROPOLITAN MANILA

MUNICIPALITY/ CITY	PERCENTAGE OF PERSONS LIVING OUTSIDE 5 YEARS AGO (1990)	NO. OF PERSONS PER SQ. KM (1995)	MEAN HOUSEHOLD SIZE (1995)	NO. OF DEPENDENTS PER 100 PERSONS (1995)	AVERAGE NUMBER OF YEARS SPENT IN SCHOOL (1995)
Cainta	15	19,760	4.9	53	9
Taytay	14	4,295	4.7	53	9
Marikina	15	9,183	4.9	55	9
Quezon City	12	11,970	4.8	54	9
Pasig	18	36,237	4.5	54	9
Makati	20	16,193	4.8	49	9
Mandaluyong	13	11,033	4.7	50	9
Manila	11	43,205	4.7	50	9
Average	14	15,693	4.7	52	9

MetroManila	14	14,865	4.7	59	9

Source: National Statistics Office

2.1.2 Population Density

With a total land area of 356 sq km, the municipalities and cities along the Marikina-Pasig Rivers have an average population density of 15,693 persons per sq kilometer. This is higher than the population density of Metropolitan Manila with 14,865 persons per sq kilometer. This points out that the impact area of the project is among the densest in the metropolis. Cainta and Taytay are definitely the densest in Rizal province. In fact, Cainta is more dense than the metropolitan cities except Pasig and Manila. Manila is the densest in the impact area with 43,205 persons per sq kilometer. Taytay is the least dense in the impact area with only 4,295 persons per sq kilometer. It is still far from reaching the density level prevailing in the metropolis. But being an expansion area, it will still become more dense in the future.

2.1.3 Household Size, Dependency Ratio and Educational Attainment

The average household in municipalities and cities along the Marikina-Pasig River has 4.7 members. This household size is the same as the average for the Metropolitan Manila. The variation among the cities and municipalities is slight with a range from 4.5 household size in Pasig to 4.9 in Marikina and Cainta. Among the barangays itself along the Marikina-Pasig River, the everage household size is 4.9 members. The slight variation from the metropolitan average indicates that, indeed, the natural increase in these barangays does not widely varies from the metropolitan rate.

The household size in the 82 barangays along the Marikina-Pasig River indicates a shrinking household size where the dominance of children in the population is diminishing. Around 33% of its population are aged below 15 years. Those aged over 64 years compose 2 percent. Both age groups are considered dependents of the economically active population whose ages range from 15 to 64 years. The economically active persons constitute 65% of the population. Thus, every 100 economically active persons in the city has only 53 dependents. This means that for every dependent, there are about two economically active persons whose production capacity supports the dependent.

The dependency burden among the municipalities and cities along the Marikina-Pasig River only slightly varies from the barangays. The barangays along Marikina-Pasig River have 52 dependents per 100 economically active adults. At the metropolitan level, the dependency burden is slightly heavier with 56 dependents per 100 economically active adults. The national dependency ratio is 75 dependents per 100 economically active adults.

The average person aged seven years and over in the barangays along Marikina-Pasig River spent seven years in school or an average educational attainment of First Year High School. This is lower than the average number of years spent in school by an average person of municipalities and cities along Marikina-Pasig River. Such person spent an average of 9 years or has completed Third Year High School. This is also the average for the entire metropolis. The lower educational attainment among the population along Marikina-Pasig River may indicate their lower socio-economic status compared to the rest of the metropolis.

2.2 Housing Characteristics

2.2.1 House Ownership, Structure and Materials

Only 58% of the households in barangays along Pasig-Marikina own their houses (**Table 3**). This ownership rate in Metropolitan Manila as a whole is higher at 61 percent. This means that housing is more scarce and less affordable in barangays along Marikina-Pasig River than the metropolis as a whole.

The type of housing structures likewise reflects the level of housing affordability. The more affordable housing is, the more households live in a single house. Only 62% of the households in barangays along Pasig-Marikina River live in a single house. Metropolitan Manila as a whole has about the same percentage. This indicates that land values in these barangays is just as high as the average in the metropolis. Thus, more multiple-unit housing structures are used to save on land. .

TABLE 3
SELECTED DATA ON THE HOUSING CHARACTERISTICS IN BARANGAYS ALONG MARIKINA-PASIG RIVER AND METROPOLITAN MANILA

ITEM	BARANGAYS ALONG MARIKINA-PASIG RIVER	METROPOLITAN MANILA (1990)
Percentage of households by home tenure		
Owned	58	61
Rented	18	30
Occupied for free	24	9
Total	100	100
Percentage of houses by type of structure		
Single house	62	61
M ulti -unit structure	38	39
Total	100	100
Percentage of houses by type of roof		
Galvanized iron/aluminum	83	80
Cogon/nipa/anahaw	-	1
Makeshift	14	3
Others (tile, wood etc.)	3	16
Total	100	100
Percentage of houses by type of walls		
Concrete/brick/stone	40	30
Wood	41	25
Concrete with wood	7	30
Discarded materials	12	1
T otal	100	100

Source: May 1998 Survey and National Statistics Office

The housing materials used indicate the economic status of the population. The use of concrete and other permanent materials for housing is taken as an indicator of higher economic status. The material most widely used for roofing in barangays along Marikina-Pasig River is galvanized iron (GI) sheet. This material is used by 83% of the houses. In the

Metropolitan Manila as a whole, greater proportion of households use GI sheet at 80 percent. The other types of roofing materials are less widely used.

For walling, the most widely used materials barangays along Marikina-Pasig River and Metropolitan Manila as a whole are concrete and wood. Concrete is the wall of 40% of the houses in barangays along Marikina-Pasig River and and 30% in Metropolitan Manila. Wood is used in 41% of the houses in barangays along Marikina-Pasig River and 25% in Metropolitan Manila. Concrete combined with wood is used by only 7% in barangays along Marikina-Pasig River but 30% in the metropolis. The housing materials used in the barangays along Marikina-Pasig River can indicate that its standard of living more or less represents the average for the metropolis. However, the barangays along Marikina-Pasig River have more users of discarded materials as walls than Metropolitan Manila as a whole (12% versus 1%). This indicates that there may be more houses which are erected in areas where there should not be any structures in barangays along Marikina-Pasig River than in Metro Manila as a whole.

2.3 Toilet and Water Facilities

The ownership of toilet facility in barangays along Marikina-Pasig River is the same as the metropolitan rate. The households who use a toilet to dispose their waste constitute 96% in these barangays and the Metro Manila as a whole (**Table 4**). The most widely used toilet facility in both these barangays and the metropolis is the water sealed type. This is used by 92% of the households in barangays along Marikina-Pasig River and 90% in Metropolitan Manila. The other types of toilet facilities that are used by a lesser number of households are the closed and the open pit types.

TABLE 4
SELECTED DATA ON THE HOUSING UTILITIES IN BARANGAYS ALONG MARIKINA-PASIG RIVER AND METROPOLITAN MANILA

ITEM	BARANGAYS ALONG MARIKINA-PASIG RIVER	METROPOLITAN MANILA (1990)
Percentage of households by type of toilets used		
None	4	4
Water sealed	92	90
Closed Pit	4	2
Open pit	-	2
Others	-	2
Total	100	100
Percentage of households by source of drinking water		
Faucet	92	54
Pumpwell	5	39
Dug well	3	2
Others	-	5
Total	100	100
Percentage of households by garbage disposal method		

Picked -up by truck	88	70
Individual dumping	1	7
Burning	10	19
Others	1	4
Total	100	100

Source: May 1998 Survey and National Statistics Office

With regards to sources of drinking water, the households in barangays along Marikina-Pasig River is better-off compared to the average household in the metriopolis. Around 92% of the households in the city enjoys running water from a faucet. At the metropolitan level, only 54% draw their drinking water from the same source. There is a greater proportion of households in the metropolis who rely on a pumpwell. They constitute 39% but only 5% in barangays along Marikina-Pasig River draw water from this source.

A greater proportion of households in barangays along Marikina-Pasig River than in Metropolitan Manila as a whole is reached by a garbage collection system. They constitute 88% in barangays along Marikina-Pasig River but only 70% of the total number of households of the metropolis. Those who are outside the service area of the garbage collection system mostly burn their garbage. Those who use this mode of garbage disposal comprise 10% in barangays along Marikina-Pasig River and 19% in the metropolis as a whole.

2.4 Social Services

The barangays along Marikina-Pasig River are connected to the rest of the metropolis through a network of roads to have access to a range of services. Even those barangays in Cainta and Taytay use more frequently the services in Metro Manila than those in Rizal. Metro Manila has 143 hospitals. This provides a ratio of 369 persons per hospital bed. The health services in Metro Manila is beefed up by health stations. There are 370 health stations scattered all over the metropolis.

The metropolis hosts a total of 2,493,190 students, many of these are from other regions. Around 54% of these attends government schools. Students from other regions come to Metro Manila usually for tertiary education. Students taking tertiary education constitute 20% of the total number of students in Metro Manila.

Available in the metropolis are also the various public and private establishments catering a wide range of services. There are 39,489 service establishments in Metropolitan Manila. The number of establishments in the metropolis increases by 3% per year.

2.5 Health

The health situation in the metropolis is reflected in its mortality rate. Based on a four-year average, the top killer in Metropolitan Manila is pneumonia. There is an average of 65 cases per 100,000 population and its dominance as the first ranking cause of mortality is

unchallenged over the four-year period. At the national level, penumonia ranks only second as a cause of mortality and there are only 13 cases per 100,000 population.

Ranking second cause of mortality in the metropolis is vascular disease with 44 cases per 1000,000 population in a four-year average. At the national level, this is the first ranking cause of mortality but with only 15 cases per 100,000 population. Other high ranking causes of mortality are cancer (37 cases per 100,000 population), pulmonary tuberculosis (34 cases per 100,000 population), accidents (30 cases per 100,000 population), hypertension (31 cases per 100,000 population) and liver disease and cirrosis (9 cases per 1000 population).

Except for diarrhea which has disappeared, the other causes of mortality have not shown decreasing trend. The incidence rate is at best fluctuating. The ranking of the causes of mortality has also more or less stlabilized. Throughout the four-year period their position remained largely the same.

TABLE 5
CAUSES AND RATE (PER 100,000 POPULATION) OF MORTALITY IN METROPOLITAN MANILA:1991-1994

CAUSE	1991	1992	1993	1994	AVERAGE
Pneumonia	60	74	66	59	65
Cancer	37	38	35	38	37
Vascular Disease	36	39	56	44	44
TB all forms	34	36	35	32	34
Accidents	34	32	31	24	30
Hypertension	33	30	30	29	31
Liver Disease and cirrhosis	11	10	7	6	9
Diabetes	10	9	9	11	10
Kidney Disease	8	-	9	8	6
Septicemia	7	12	16	9	11
Diarrhea	-	7	-	-	2

Source: Department of Health

2.6 Employment and Income

Among the population of barangays along Marikina-Pasig River whose ages are 15 years old and over, 54% are employed in services (**Table 6**).. These include persons working in government services, trasport, education, health among others. At the metropolitan level, the industry group employs 58% of the total employed labor force. Such predominance reflects the heavy urban orientation of the economy. A rural economy have more in extractive activities such as agriculture, fishing and mining.

The second biggest concentration of workers in barangays along Marikina-Pasig River is in construction. It employs 23 percent. At the metropolitan level, only 8% are in constrution. The high percentage of workers in construction in barangays along Marikina-Pasig River means that many of them are earning only minimum wages. This is consistent with the earlier findings of lower educational attainment among the population in the barangays along the Marikina-Pasig River compared to the metropolitan average.

Manufacturing employs 11% of the workers in barangays along Marikina-Pasig River. In Metro Manila as a whole, the percentage of those employed in the same industry group is 17 percent. Trade employs 12% of the workers in barangays along Marikina-Pasig River. At the metropolitan level, its 14 percent.

TABLE 6
DATA ON EMPLOYMENT AND INCOME IN BARANGAYS ALONG MARIKINA-PASIG RIVER AND METROPOLITAN MANILA

ITEM	BARANGAYS ALONG MARIKINA-PASIG RIVER	METROPOLITAN MANILA
Employment by Industry Group		
Agriculture,hunting and forestry	-	1
Fishing	-	1
Mining and quarrying	-	-
Manufactutring	11	17
Electricity, Gas and Water	-	1
Construction	23	8
Trade	12	14
Services	54	58
Total	100 %	100 %
Percentage unemployed persons	13%	6 %
Average household income per month	P 4,358%	P14,467.00

Source: National Statistics Office

Unemployment in the metropolis stands at 6 percent. Its more than double in the barangays along Marikina-Pasig River registering at 13 percent. The barangays along Marikina-Pasig River has also much lower household income than the households in the metropolis as a whole. While the average family income in Metropolitan Manila is P14,467.00, it is only P4,358.00 in barangays along Marikina-Pasig River.

3.0 EXPERIENCE WITH FLOOD

Only 15% of the households in the barangays along Marikina-Pasig River experienced the flood in 1997 **(Table 7)**. The flood lasted an average of 5 days. The average depth of the flood waters in front of the house of the respondent-household is 1.75 meters. About 36% of the respondents said the flood came on August while 26% said October is the flood month. Other months mentioned are June and September. The flood is closely associated with river overflow. Around 42% of the respondents pinpointed it as the cause of flooding. Some 36% consider strong typhoons as the cause of flood while 22% believe that the it is only the drainage system which is clogged by debris.

Warning against the flood was reportedly issued and reached 65% of the households. Among the households who heard the warning, 42% identified the barangay captain as the source. The radio is credited by 29 percent. The warning is effective in prompting the households into

taking a precautionary measure against the flood. A measure was undertaken by 80 percent. Around 59% evacuated and 54% vaguely mentioned flood preparation. Another measure taken was road widening.

Only few households suffered damage brought about by the flood. The households with members who were injured constitute only 2% while those with members who were sick constitute only 3 percent. There were much more households with house damage at 16 percent. The children were affected by flood with 17% of the households having at least one child absent from school. The average duration of the absence is 5 days.

The flood also prevented the working members of 19% of the households from going to work. The average duration of absence from work is 1.5 days. Less percentage of households incurred furniture damage (5%),, appliance damage (2%) and business closure (5%).

TABLE 7
DATA ON FLOODING EXPERIENCE OF THE SAMPLE HOUSEHOLDS IN THE SIX BARANGAYS IN THE DIRECT IMPACT AREA FEBRUARY 1997

ITEM	DATA
Percentage of households experiencing flood 1997	15%
Average no of days of the last flood experienced	5.0
Average depth of food waters in housefront at its peak (in meters)	1.75
Percentage of respondents by month flood is experienced	
June	4%
July	14
August	36
September	10
October	26
Other months	10
Total	100%
Percentage of respondents by cause identified for flooding	
Strong typhoon	36%
River overflow	42
Clogged drainage	22
Total	100%
Percentage of households who heard flood warning	65%
Percentage of respondents by warning source	
Radio	29%
Television	10
Barangay captain	42
Others	19
Total	100%
Percentage of households who took precaution	80%
Percentage of households by type of preacution done	
Evacuation	59%
Flood preparation	54
Road widening	13
Total	100%
Percentage of households affected by flood (multiple response)	
Injury	2%
Sickness	3

House damage	16
Furniture damage	5
Appliance damage	2
School absences	17
Work absences	19
Business closure	5

4.0 AWARENESS AND PERCEPTION OF THE PROJECT

A survey among stakeholders was conducted to measure their awareness of the proposed project and their perception of its impact. The respondents are not yet widely aware of the proposed project. Only 30% of the respondents are aware of the project (**Table 8**). But even among those who are aware, many have incorrect or vague information about the project. Only 30% mentioned activities or components associated with the project. These activities and components are: drainage improvement (13%), river cleaning (10%) and a dike provision (7%). The other activities or components mentioned are either off tangent (e.g., bridge) or only vaguely related (e.g., easement provision) to the proposed project. The respondent's limited information on the proposed project indicates awareness level is rather low even among those who claim that they are aware of the project

TABLE 8
AWARENESS OF THE RESPONDENTS OF THE PASIG-MARIKINA CHANNEL IMPROVEMENT PROJECT: MAY 1998 (N=132)

ITEM	DATA
Percentage of respondents who are aware of the project	**30 %**
Respondents' information on the project	
Easement provision	**24%**
Drainage improvement	**13**
Local government project	**13**
Bridge	**13**
River cleaning	**10**
Dike	**7**
Others (e.g.demolition, commercial establishment)	**20**
Total	**100%**
Source of information	
Media	**3%**
National government	**14**
Local government	**59**
Informal sources	**24**
Total	**100%**

The lack of awareness about the project is partly explainde by the fact that it is not considered as an immediate problem. Only 7% of the respondents consider it a problem(**Table 9**). Problems seen by greater proportion of respondents are inadeaquate food and cleanliness

(26%), garbage (21%), lack of peace and order (20%) and lack of food, water and electricity (18%). But it must be emphasized that the survey was made during dry season and reality of a flood was not at the uppermost of the minds of the respondents. The urgency of flood as a problem is expected to register more among respondents if the survey was done during rainy season.

But among those who claim to be aware of the project, 83% of the respondents are for it The most frequently mentioned reason is that the project will improve their living conditions presumably as a result of flood reduction. This reason is cited by 67 percent. For 21%, flood reduction is already enough reason to have the project. Other reasons cited by less percentage of respondents are reduction of risks from flooding, relocation and resolution of an existing problem. Only 17 % are against the project and their only reason for their position is that the project might entail the provision of easement. They may be apprehensive that such activity will result to reduction of of their properties, demolition of houses or much worse relocation.

TABLE 9
PERCEPTION OF THE RESPONDENTS OF PASIG-MARIKINA CHANNEL IMPROVEMENT PROJECT: MAY 1998 (N=103)

ITEM	DATA
Perceived Barangays Problem	
Inadequate food and cleanliness	26%
Garbage	21
Lack of peace and order, water and rampant drug use	20
Lack of food, water and electricity	18
Flood	7
Money	7
Water Pollution	1
Total	100%
Position on the project	
For the project	83 %
Against the project	17
Total	100 %
Reasons given for the project	
Flood reduction	21%
Living condition improvement	67
Risk reduction	4
Others	8
Total	100%
Reason given against the project	
Easement provision	100%

5.0 METHODOLOGY

The data required by the study were gathered from primary and secondary sources. The primary data were obtained through the conduct of a household survey. The survey used a household questionnaire. The questionnaire was administered on the sample households. Because the population is distributed by barangay and all barangays regardless of size must have equal chance of being included in the sample, the study used multi-stage sampling. The total number of barangays along Marikina-Pasig River was determined and the number of sample barangays was drawn. At 10% sampling error and 95% reliability level, a sample size of 44 was obtained from a population of 82 barangays. The number of households of these barangay was determined using the same formula and the sample size of 141 household was obtained. The sample barangays and the number of households to be sampled are in Table 10. The secondary date used by the study are mainly obtained from the National Statistics Office.

TABLE 10
SAMPLE BARANGAYS AND NUMBER OF HOUSEHOLDS TO BE SAMPLED

{PRIVATE }	Municipality	Barangay	No of Households to Be Interviewed
Taytay		San Juan	13
Cainta		San Juan	13
Pasig		Bagong Ilog	5
		Bambang	5
		Buting	2
		Kalawaan	5
		Capasigan	2
		Pineda	5
		San Joaquin	3
		Sumilang	2
		Caniogan	6
		Managahan	14
Makati		Carmona	1
		Olympia	5
		Guadalupe Viejo	3
		West Rambo	7
Manila		Binondo Brgy 286	1
		Quipo Brgy 384	1
		Nagtahan Brgy 636	1
		Paco Brgy 662	1
		South Nagtahan Brgy 830	1
		Pandacan Brgy 839	1
		Sta Ana Brgy 888	1
		Sta Ana Brgy 890	1
		Sta Ana Brgy 892	1
		Sta Ana Brgy 894	1
		Punta Brgy 896	1
		Punta Brgy 897	1
		Sta Ana Brgy 898	1
		Sta Ana Brgy 900	2
		Sta Ana Brgy 901	1
		Sta Ana Bgy 902	1
		Sta Ana Brgy 903	1
		Sta Ana Brgy 905	2
Quezon City		Blue Ridge B	1
		Libis	2

Marikina	Barangka	5
	Industrial Valley	3
	Sto. Nino	6
	Calumpang	4
	Sta Elena	2
	Concepcion 1	13
Mandaluyong	Namayan	2
	Barangka Ibaba	2
Total		141

APPENDIX F

PROJECT PHOTOGRAPHS

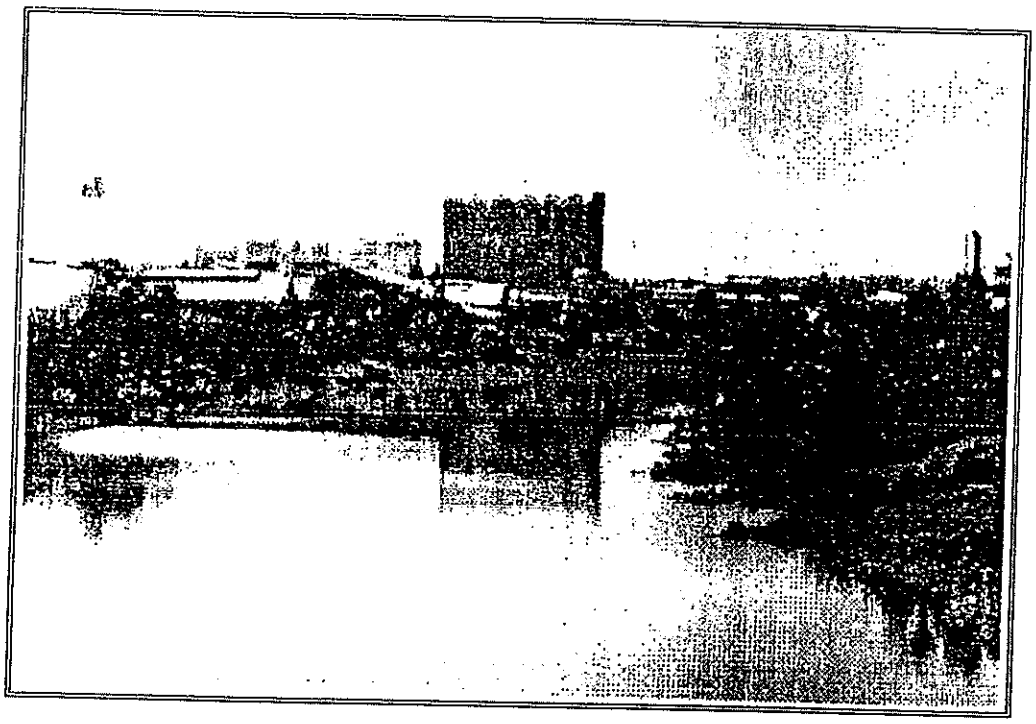


Photo No.1 - Proposed Site of the MCGS

Photo No.2 - Typical Damaged Revetment

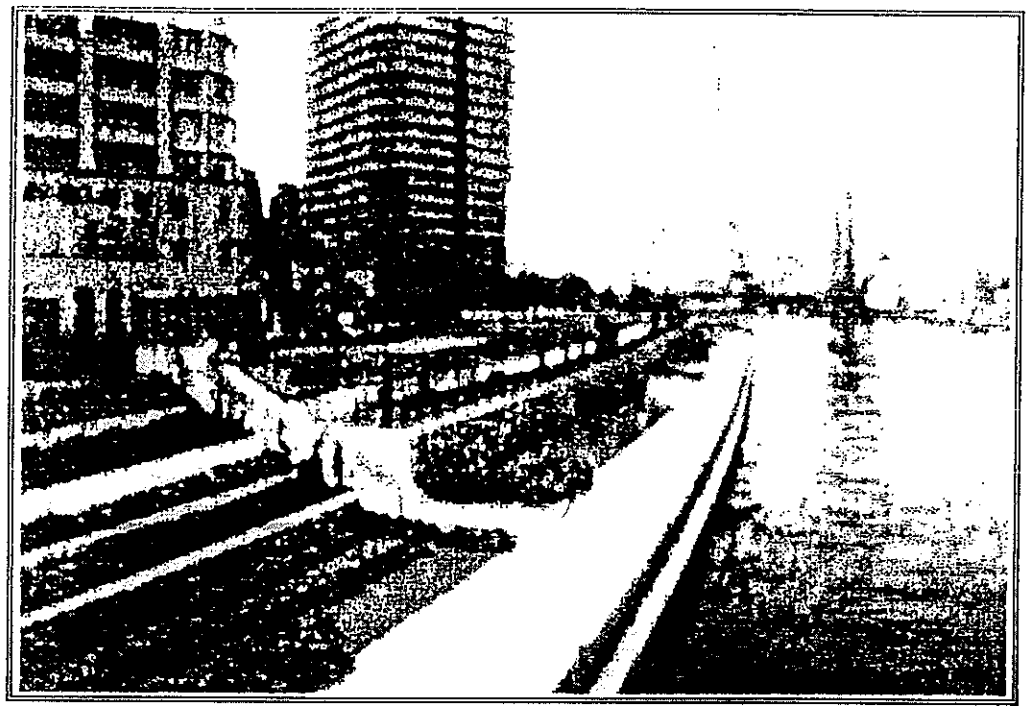


Photo No.3 - Typical Promenade in an Urban River

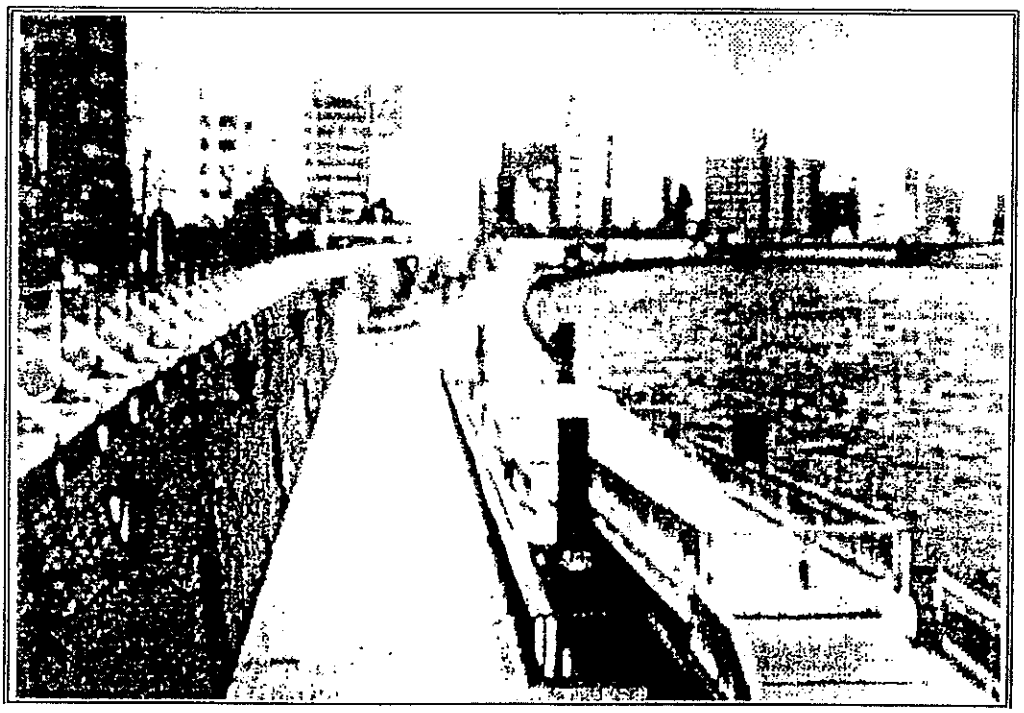


Photo No.4 - A Boat Stop in an Urban River

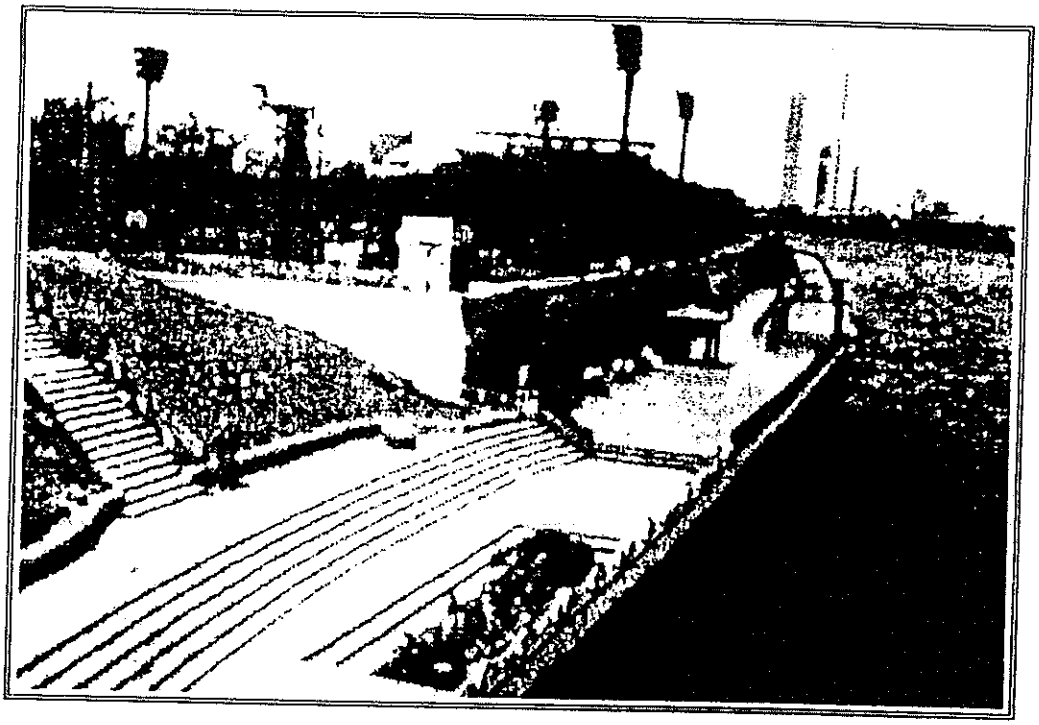


Photo No.5 - Typical Amenity Bank in an Urban River

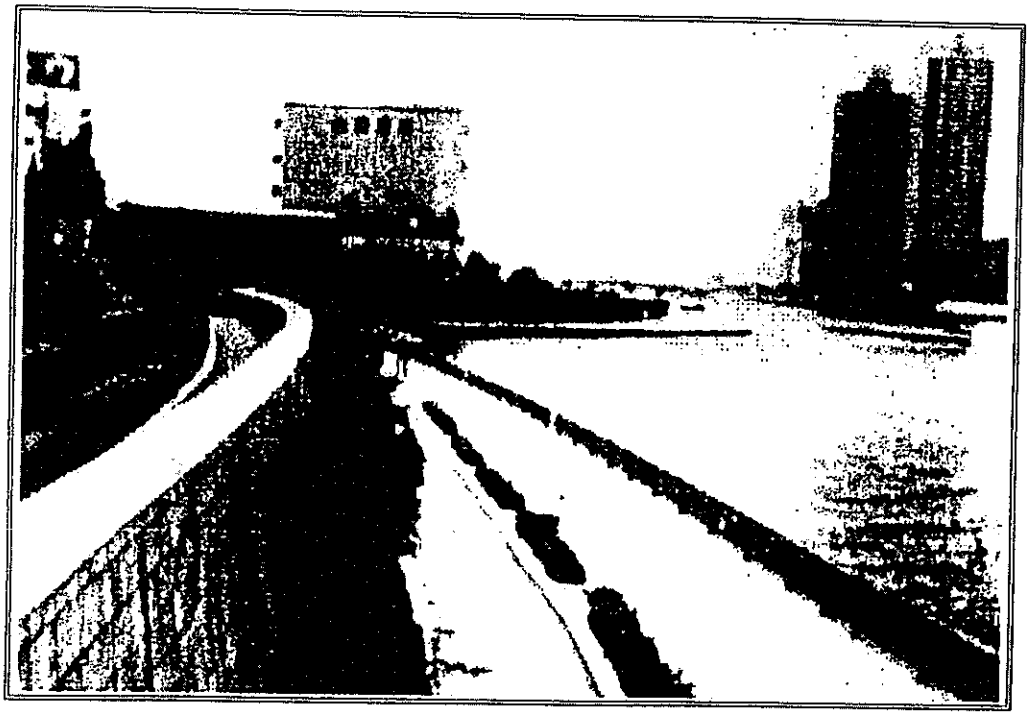


Photo No.6 - Dredge Sludge Used as Backfill for this Amenity Bank

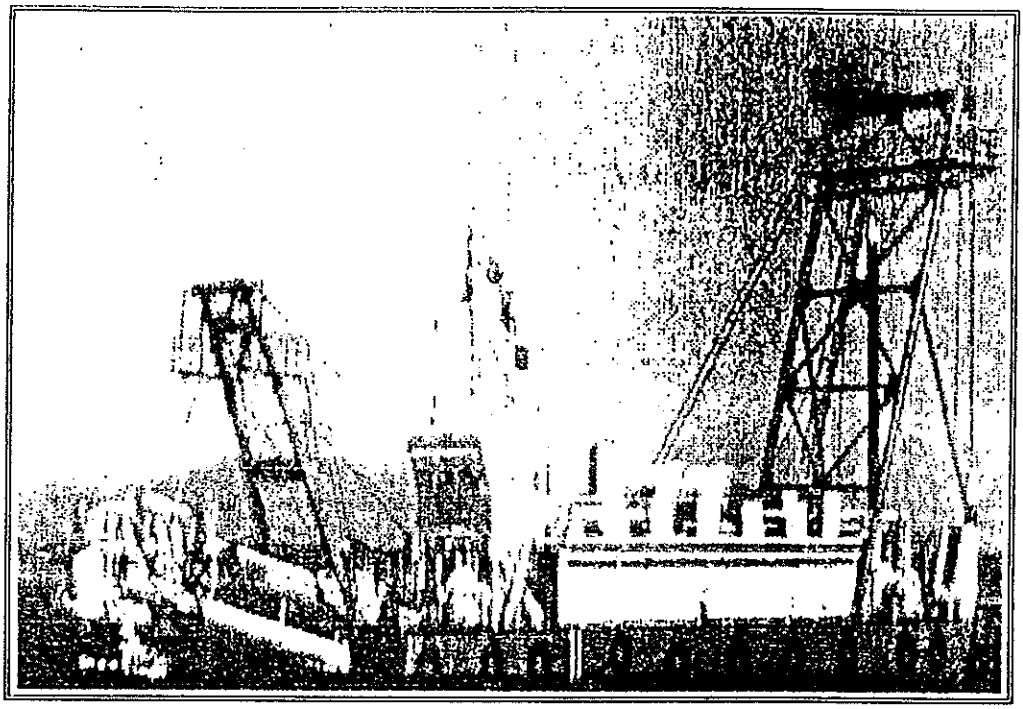


Photo No.7 - Suction Dredge Barge

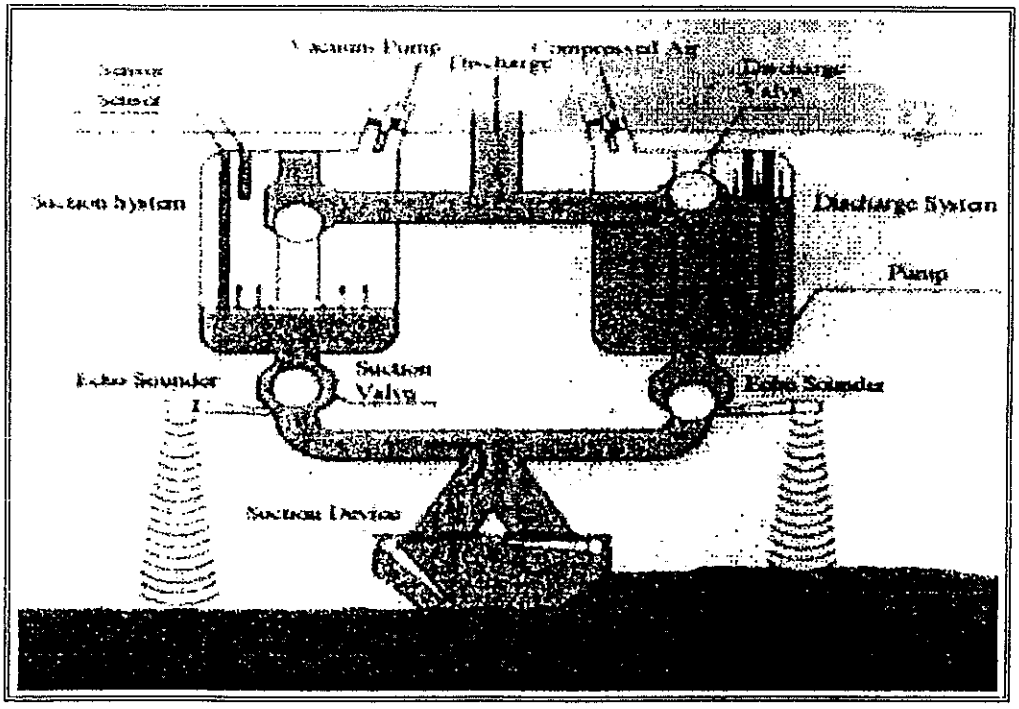


Photo No.8 - Schematic Diagram of Negative Pressure Type Suction Dredger

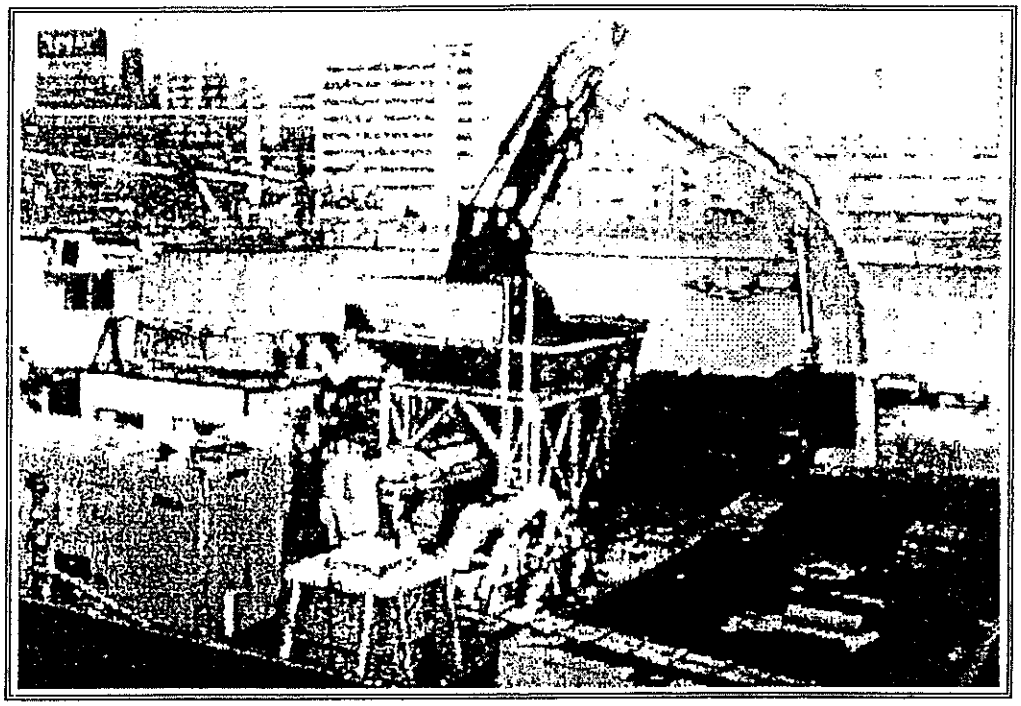


Photo No.9 - Treatment of Dredged Sludge for Backfill Use

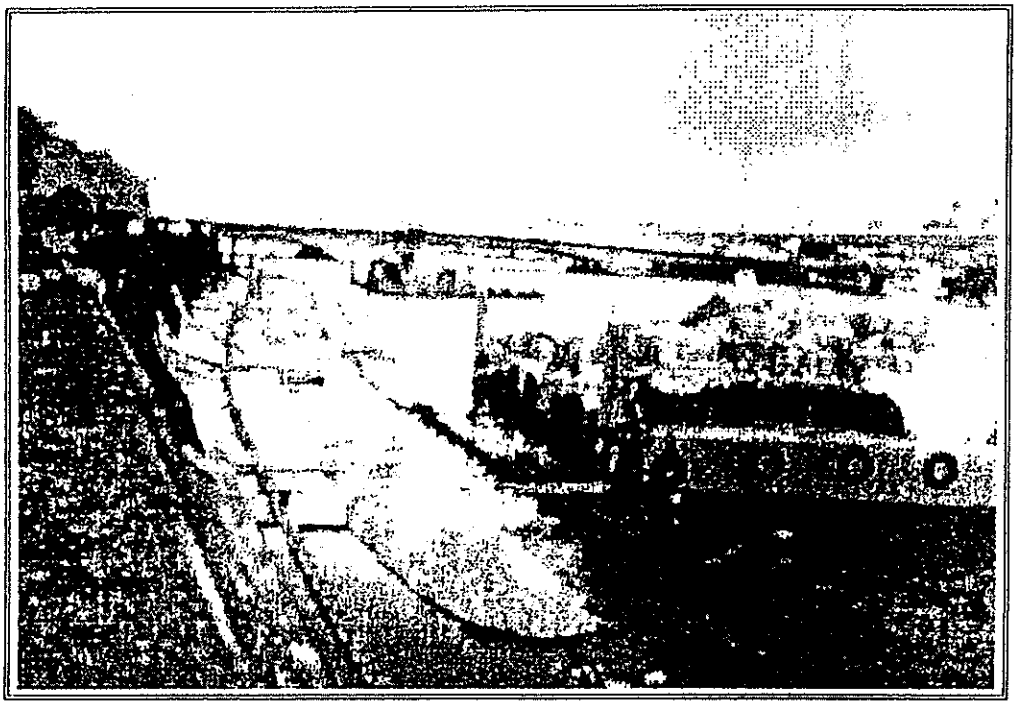


Photo No.10 - Treated Sludge Used as Backfill Material for Revetment Works

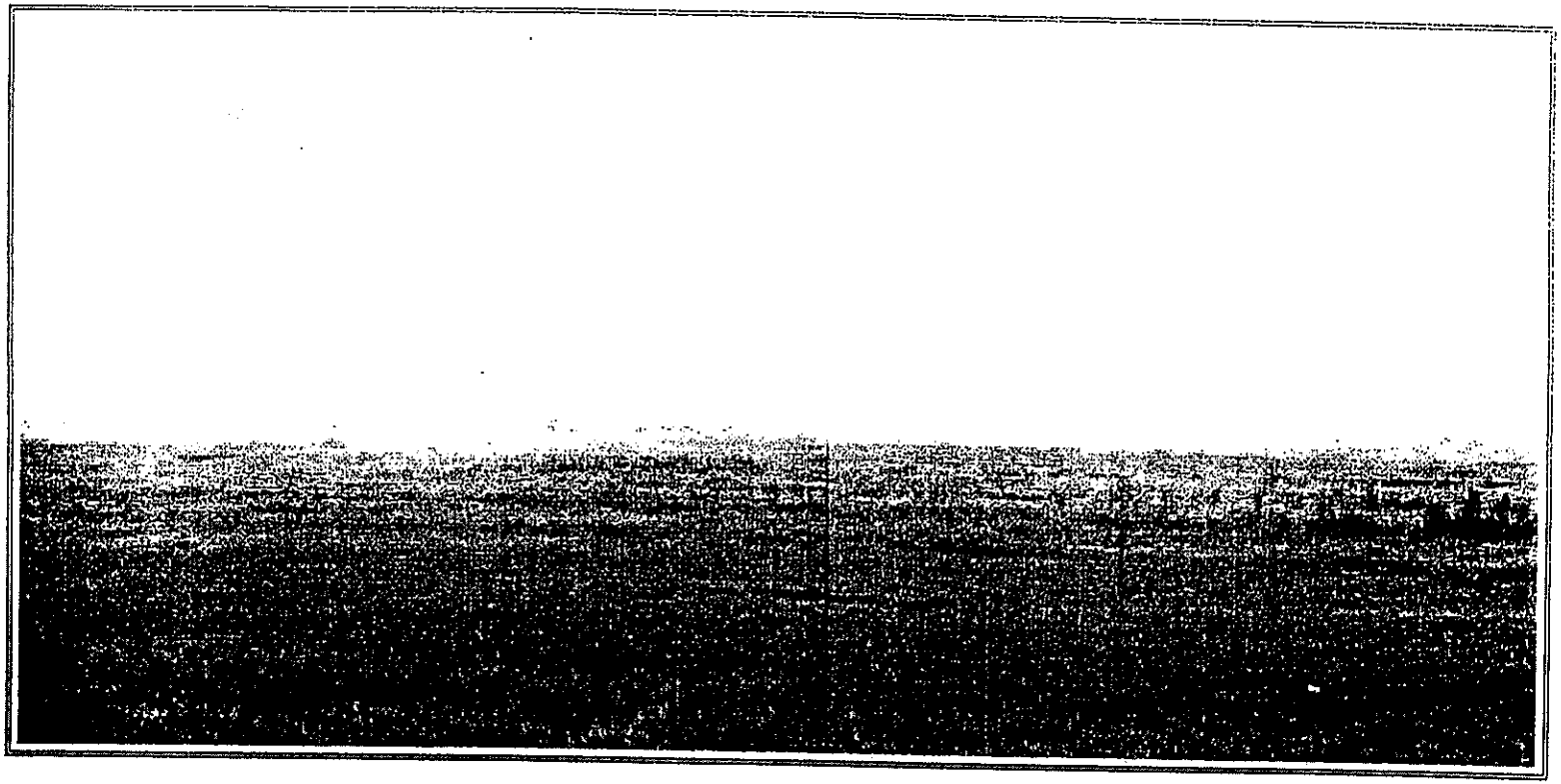


Photo No.11 - Proposed Disposal Area of Dredged Materials at the Calzada Area.

Photo No.12 - Typical low-lying area in Cainta which could be backfilled with dredged materials.

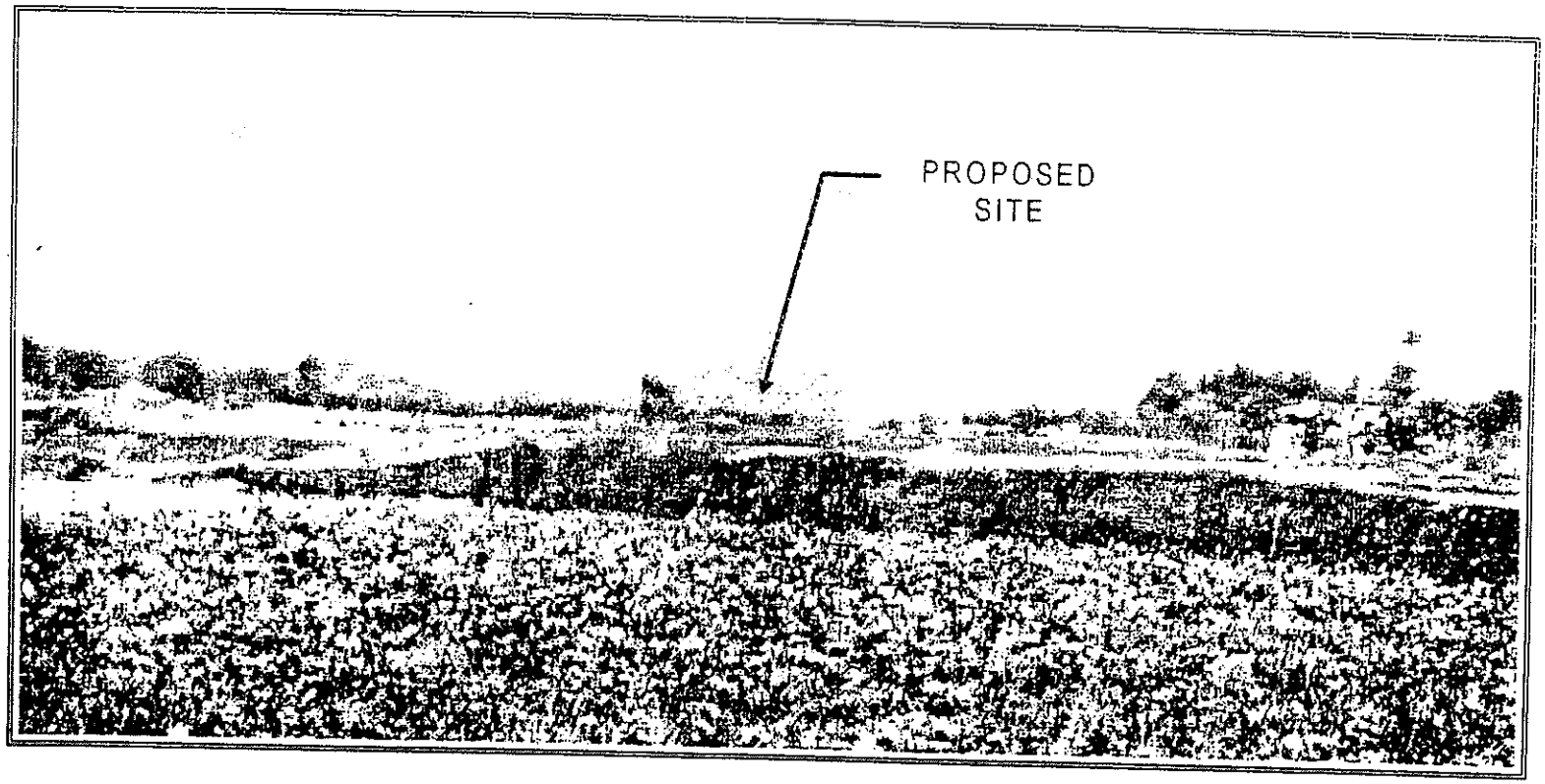


Photo No.13 - Proposed Disposal Area of Dredged Materials at Dona Petra, Marikina

APPENDIX G

PROCESS DOCUMENTATION REPORT

PROCESS DOCUMENTATION REPORT

1.0 INTRODUCTION

This "Process Documentation Report" refers to the documentation of the activities initiated by the project proponent concerning scoping and public consultation. Most of the activities, however, are documented by the attached "Scoping Report" which was earlier prepared as a stand-alone document. Discussions and resolutions of project issues are documented by the "Scoping Report".

2.0 PUBLIC INFORMATION

Since the start of the feasibility study, the public was informed both formally and informally about the proposed project. Instances where project information was disseminated include: (1) the project presentations and (2) the socioeconomic and perception survey.

2.1 Project Presentations

Project presentations are documented in Section 2.1 of the attached "Scoping Report".

2.2 Socioeconomic and Perception Surveys

Another set of informal information dissemination was initiated by the project proponent during the conduct of the socioeconomic and perception surveys last May 1998. Again, it was explained during these brief meetings that the proposed project is primarily intended to provide the public with protection from floods or reduce the risks of flooding. Implementation of the project will significantly facilitate urban development and enhance the favorable environment along the river.

Details of the socioeconomic and perception surveys are presented in Appendix E.

3.0 PUBLIC CONSULTATION

The most important public consultation activity was the same scoping meeting initiated by the project proponent last 27 February 1998 and held at the DPWH Central Office. This is properly documented by the attached "Scoping Report". Another project information activity was conducted last 20 may 1998 at Bayview Hotel, Manila. This was a promotion and public awareness campaign for the proposed project which was attended by various sectors. A copy of the minutes of the said meeting is presented at the last part of this appendix.

The Pasig-Marikina River Channel Improvement Project

SCOPING REPORT

APRIL 1998

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
PROJECT MANAGEMENT OFFICE - MAJOR FLOOD CONTROL PROJECTS

CONTENTS

1.0 INTRODUCTION

This report is prepared in compliance with the latest requirements of the Department of Environment and Natural Resources (DENR) concerning the preparation of an Environmental Impact Statement (EIS). It documents the public participation and social acceptability aspects of the proposed project.

1.1 DAO 96 - 37

The Philippine EIS System is based on a series of presidential decrees, executive orders, proclamations, letters of instruction, and implementing rules and regulations. Prominent of these are Presidential Decree (PD) 1586 and Proclamation 2146. The previous revision to the implementing rules and regulations of PD 1586 was DENR Administrative Order (DAO) No. 21 series of 1992 which provided the set of procedures for the whole process of securing an Environmental Compliance Certificate (ECC). This set of procedures has recently been replaced by DAO No. 37 series of 1996 (cited as DAO 96-37) which became effective in January 1997.

The DAO 96 - 37 gives higher importance on public participation and social acceptability in the processing of ECC applications. Public participation is giving citizens the opportunity to influence major decisions that affect them. Its goal is to enable the people to take responsibility for environmental protection and management through active involvement in decision making. DENR believes that public participation is the only process to promote and acquire social acceptability of a proposed project. It will reduce the level of misinformation and distrust. In addition, it will help identify the concerns of affected groups and help focus the planning activities on issues of concern. This is expected to result in an improved decision-making process.

1.2 Background of the Study

Metro Manila, which encompasses eight (8) cities and nine (9) municipalities with a total population of over 9,454 million in 1996, is the economic, political and cultural center of the Philippines. The Pasig-Marikina River that has a total catchment area of 635 km^2, is the main natural drainage that runs through the center of Metro Manila and flows out to the Manila Bay. Its main tributary, Napindan River, joins the main stream at about 18.5 km upstream from the Pasig River mouth at the Manila Bay. The upper stream starting from the confluence between the Napindan River and the Pasig River is the Marikina River

A flood control plan for the Pasig-Marikina River including the Metro Manila area was formulated in 1954. In line with the flood control plan, the improvement works of the Pasig River, consisting mainly of river walls and dredging of channel, were constructed in the 1970's. The Mangahan Floodway was completed in 1985 to provide protection to the center of Metro Manila against a

100-year return flood discharge of the Pasig–Marikina River by diverting the excess flood discharge of Marikina River into the Laguna Lake. However, despite the improvement works, Metro Manila is still facing the menace of flood damage caused by the inadequate flow capacity of the Pasig-Marikina River.

Under these circumstances, the Department of Public Works and Highways (DPWH) conducted a feasibility study ("The Study on Flood Control and Drainage Project in Metro Manila": the "F/S") on the river improvement plan for Pasig-Marikina River from January 1988 to March 1990. The study was funded through a technical assistance by the Japan International Cooperation Agency (JICA).

As part of its continuing effort to find viable solutions to flooding as well as environmental problems, the DPWH proposed a project entitled "**Pasig-Marikina River Channel Improvement Project**" (hereinafter referred to as the "Project") for the 22nd Yen Loan of OECF. However, this request was deferred because of the necessity to update the F/S, since there have been many changes in the circumstance of the Project.

The socioeconomic conditions and urban environment around the Pasig-Marikina River have changed so much in the past 10 years. The area surrounding the Marikina River has urbanized and the contamination of the river has worsened due to lack of sewerage systems.

There are now some constraints towards the implementation of the Project, namely:

- structural and construction plan inconsistent with the present condition;
- squatter relocation operations along the river;
- review of the Environmental Impact Assessment (EIA);
- public awareness on flood control and river management; and
- impact of the project to river water quality

1.3 Project Name or Title

PASIG-MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT

1.4 Name and Address of Proponent

Department of Public Works and Highways
Project Management Office, Major Flood Control Projects
Port Area, Manila

1.5 Project Description

A. Goal and Objectives

The objectives of the proposed **Pasig-Marikina River Channel Improvement Project** are to mitigate flood damage caused by channel overflow of the Pasig-Marikina River, to facilitate urban development, to enhance the favorable environment along the river and to improve river water quality by the dredging works. **The proposed project should be able to control and protect the center of Metro Manila against a flood with a return period of 30 years.**

B. Rationale

The Metro Manila is still facing the menace of flood damage because the flow capacity of the Pasig-Marikina River is inadequate and the excess flood discharge of Marikina River is not fully diverted to Laguna Lake through the Mangahan Floodway. This floodway was constructed in 1985 to protect the center of Metro Manila against a flood with 100-year return period.

The proposed river improvement project for the Pasig-Marikina River aims to increase the flow capacity of the channel and improve its scenic view, while the proposed construction of the Marikina Control Gate Structure (MCGS) is needed to divert the design flood of 2,400 m^3/s towards the Mangahan Floodway.

This flood control project will protect an area of some 140 km^2 at the center of Metro Manila against a flood with a return period of 30 years, relieving 450,000 people from flood damage. It is obvious that the project has far-reaching benefits beyond the direct benefit of providing flood protection.

C. Target Area and Major Works of the Project

The target area and major works of the Project are summarized as follows:

(1) River Channel Improvement

The objective river stretch for this Study covers the most significant portions of the Pasig-Marikina River, as follows:

(a) Pasig River, i.e. from the river mouth at Manila Bay to the confluence with Napindan Channel; and
(b) Lower Marikina River and lower reach of Upper Marikina River, i.e. from Napindan Channel up to Sto. Niño or 6.4 km upstream of the Mangahan Floodway.

See Figure 1.

(2) River Structures

In the river channel improvement, the river structures to be included in the Project are as follows:

(a) Parapet Wall and Embankment
(b) Marikina Control Gate Structure (MCGS)
(c) Bridge Protection Works

(3) Waterfront Amenity Facilities (Promenade)

D. Project Components

The major construction works of the project are as follows:

Stretch	Design Discharge	Work items
Pasig River: 6.84 km (River Mouth to San Juan River)	1,150 m^3/s	Raising of existing parapet wall and rehabilitation of revetment
Pasig River: 9.76 km (San Juan to Napindan Channel)	500 m^3/s	Raising of existing parapet wall and rehabilitation of revetment
Lower Marikina River: 5.58 km Napindan to MCGS	500 m^3/s	Dredging/excavation, provision of new parapet wall and rehabilitation of revetment
MCGS and Upper Marikina R. : 1.21 km (MCGS to Mangahan FW)	500 m^3/s	Construction of MCGS, dredging/ excavation and raising of embankment
Upper Marikina R.:6.43 km (Mangahan FW to Sto. Nino)	2,900 m^3/s	Excavation and raising of embankment

See Figure 2.

The structural features of the MCGS are given as follows:

Item	Structural Features
Design Discharge:	500 m^3/s (Lower Marikina River)
Design Water Level: - Upstream Side - Downstream Side	 EL. 17.20 m EL. 14.30 m
Design River Section: - Bed width - Side Slope - Bed Elevation	 75.0 m 1 (vertical):2 (horizontal) EL. 6.50
Design of Gate: - Gate Span - Gate Height	Roller gate 2 units × 15.5 m wide 11.1 m

E. Project Activities

- **Construction Period**

Aiming at increasing the flow capacity of the Pasig-Marikina River, the channel is to be improved for a stretch of about 30 km from the river mouth to Sto. Niño. For the urgent flood control project with the scale of a 30-year return period, construction of the MCGS is indispensable. River improvement of the upper Marikina River where the high water level would be affected by the construction of MCGS is likewise required. The stretch to be affected by the MCGS is 6.43 km upstream from the diversion point of Mangahan Floodway, in accordance with the hydraulic study.

The Pasig-Marikina River is divided into five (5) stretches relative to the site of the MCGS and its confluence with San Juan River, Napindan Channel and Mangahan Floodway. The work items of each stretch are given in the table above.

To create a better scenic view and a pleasant open space at the waterfront of the Pasig-Marikina River, steps and a promenade are to be provided. The promenade is on the base of the sheet pile foundation, not to encroach the river width as much as possible. The surface elevation of the promenade is set above the mean spring high tide level, EL. 11.3 m.

- **Operations and Maintenance Period**

Based on the flood discharge (Qs) or water level at Sto. Niño, the Rosario Weir and the MCGS control the discharge (Qm) diverted through the Mangahan Floodway and discharge (Q1) into the lower Marikina River. The operation rule is prepared not only for the design flood (30-year return period) but also for the exceeding and small/medium scale floods.

- **Abandonment Phase**

Future abandonment of the project is a remote possibility. It is part of the long-term flood control master plan for Metro Manila. The project will have a significant influence on the economic and social activities of Metro Manila. Its operation is expected to progressively increase the economic activities in the central part of Metro Manila. Considering the magnitude of these future economic activities, the huge project investment, and the need for which the project was proposed it is unlikely that the project will be abandoned in the future. The proponent's long-term aim is therefore to sustain the operation of the system.

However any abandonment decision in the future can easily be carried out since the project,s construction materials are only concrete, steel, and boulders. There

will be no decontamination activities since toxic and hazardous wastes will not be present.

2.0 SCOPING OF ISSUES AND IMPACTS

The DENR-NCR had granted an Environmental Compliance Certificate (ECC-94-NCR-MA-161 / 9406-144-120-O) to Phase I of this project on September 30, 1994, covering only the first four-km. stretch of the Pasig-Marikina River from the river mouth in Manila Bay. However, the present plan for implementation covers the 28-km stretch of the same river.

In view of the extent of the project area coverage, an EIS is required for a new ECC application, though this project is within an Environmentally Critical Area (ECA) under DAO 96-37. The DPWH-PMO-MFCP wrote to EMB last February 12, 1998, requesting official endorsement of the ECC application for the proposed project for processing at the DENR-NCR Office. Last February 26, 1998, the EMB responded by officially declaring that the proposed project is not classified as an Environmentally Critical Project (ECP). Therefore, the ECC application shall be processed at the DENR-NCR Office.

Regarding the first ECC that is still in effect up to this time, the initial stand of the DENR-NCR Office is to incorporate appropriate conditions in the new ECC.

2.1 Project Information Dissemination

Since the start of the SAPROF study, the stakeholders were informed both formally and informally. Instances where project information was disseminated include.

- Presentation of the Inception Report
- Meetings with Local Government Units (LGUs), PRRP, Star Craft Ferry Corporation, DENR-NCR Office, EMB, MMDA, etc.
- First Steering Committee Meeting

The OECF-SAPROF Study Team presented the Inception Report of the study last February 10, 1998 at the office of Undersecretary Teodoro T. Encarnacion. The DPWH, LGUs, PPA, EMB, LLDA, NHA, NEDA, OECF, and JICA attended the presentation. Attendance Sheet is shown in Annex A (1). Annex B (1) presents the minutes of the presentation.

The important issues raised during the presentation are as follows:

1. Evaluation and Checking by the Study Team on:
   - Possible inconsistency of the structural and construction plans with the prevailing actual site conditions;
   - The removal and relocation of squatter families living along riverbanks of Pasig-Marikina River affected by the Project;
   - EIA review of the project;
   - The formulation of programs and plans on public awareness regarding effective flood control and river management; and
   - Effect of the project on the water quality of Laguna Lake.
2. Possible disturbance/destabilization of hazardous heavy metal elements found in the riverbed that may be carried by inflow of Pasig-Marikina River during dredging activities and construction works for revetment walls.
3. Coordination by the Study Team with related line agencies, local government units (LGUs) concerned and some involved non-governmental organizations (NGOs) of their respective plans and programs for Pasig-Marikina River.

Moreover, the DPWH and the SAPROF Study Team visited several government agencies, LGUs, Star Craft Ferry Corporation, etc. and discussed with them the proposed project in relation to their present and future activities along the Pasig-Marikina River.

The first meeting of the Steering Committee for this project was held last April 20, 1998 at the office of Undersecretary Teodoro T. Encarnacion. The DPWH, LGUs, PPA, DENR-NCR, NHA, NEDA, OECF, NGO, MMDA and JICA attended the meeting. In this meeting, the SAPROF Study Team presented and explained the contents of the Interim Report and Inception Report (2). Attendance Sheet is shown in Annex A (2). Annex B (2) provides the minutes of the presentation.

The relevant issue raised during the meeting is the impact of the project on the squatters living inside the Mangahan Floodway.

2.2 Initial Scoping Session with DENR-NCR Office

An initial scoping session was conducted last 26 February 1998 with DENR-NCR Office in Quezon City after the Environmental Management Bureau (EMB) of the DENR has endorsed the EIS processing to the NCR Regional Office. The DPWH coordinator, the SAPROF Study Team, and a representative of the

DENR-NCR EIA Division attended the meeting. (Attendance Sheet is shown in Annex A (3).) The purpose of the session was to get DENR's concerns that should be addressed by the EIA study and to be included in the EIS. The SAPROF Study Team presented a scoping matrix for the purpose of identifying the potential significant environmental issues (SEIs).

The discussion with the DENR was very cordial and provided the SAPROF Study Team with the opportunity to explain the benefits of the project.

The DENR emphasized that the project proponent should follow the requirements of DAO 96 - 37 to ensure the social acceptability of the project and pave the way for a smooth project implementation in the future.

2.2.1 Issues and Concerns

DENR raised the following items during the discussion:

- Impacts to related projects of the Pasig River
- Impacts of the dredging activities
- Impacts on the various uses of the river
- Impacts on the towns situated near the floodway confluence with the Laguna Lake

DENR advised the DPWH and the consultants to:

1. check with the DOT projects for the Pasig River;
2. coordinate with the PEA for a possible dumping of the dredge spoils to their reclamation projects;
3. carefully check if any squatter houses will be removed; and
4. get a Sangunian Resolution, as project endorsement, for all cities and towns with jurisdiction of the project.

DPWH informed DENR that this project got an endorsement from the Metro Manila Development Authority (MMDA).

See Annex B (3) for the minutes of this scoping session.

2.2.2 Identification of Stakeholders

Stakeholders, as defined by DAO - 96 - 37, are persons who may be significantly affected by the project or undertaking, such as but not limited to, members of the local community, local government units, non-government organizations, and people's organizations.

The major stakeholders are supposed to be the people living in the areas to be protected against the annual flooding. Since the proposed project will traverse

various local political boundaries, the LGUs are considered representatives of the stakeholders. Concerned government agencies are also stakeholders such as MMDA, PRRP, PPA, LLDA, etc.

2.2.3 Scoping Matrix

Potential significant environmental issues (SEIs) were identified using a scoping matrix presented in Table 1. The major SEI identified during the construction period is the water quality effect of the river. Since the proposed project is actually a mitigating measure to protect the center of Metro Manila against a 30-year flood, the SEIs with expected major beneficial impacts would occur during the operation phase.

2.3 Scoping Session with the Stakeholders

The DPWH sent out invitations to various stakeholders for a scoping session regarding the proposed project. The meeting was conducted in the afternoon of 27 February 1998 at the DPWH-HRD Training Room B located in DPWH Central Office, Bonifacio Drive, Port Area, Manila. Representatives of the stakeholders attended the meeting.

The DENR-NCR Office had earlier informed the DPWH that for some reasons they could not attend the said meeting. Nevertheless, they gave DPWH the go signal to proceed with the scheduled meeting. A copy of the attendance sheet is also presented in Annex A (4). Annex C shows the pictorial records of the scoping session.

3.0 STAKEHOLDERS ISSUES AND CONCERNS

The stakeholders appreciated the importance of the project. The issues, concerns, and suggestions are listed in Table 2. Annex B (4) shows the minutes of the scoping session prepared by DPWH.

4.0 AGREED UPON SCOPE

Surveys and investigations to prepare the EIS will greatly rely on the requirements for impact analysis on the different project components and stages. The analysis will therefore focus on the (1) dredging activities, (2) construction of the river improvement works along the banks, (3) construction of the MCGS, (4) operation of the MCGS, and (5) operation of the Rosario Weir.

Based on the discussions with the DENR-NCR Office during the initial scoping session and the stakeholders during the public consultation, the following issues have to be investigated for the EIS preparation:

- Related projects of the Pasig River;

- Relation of the construction methods to the expected water quality conditions;
- Impact of construction activities and operation of the MCGS against the various uses of the river;
- Prospective dumping sites of the dredged materials and treatment of the dredged materials;
- Rising lake water level during high floods in the towns situated along the Laguna Lake;
- MCGS/Rosario Weir operation and the lake water quality;
- Situation of the squatters inside the Mangahan Floodway when the MCGS/Rosario Weir is operated during flooding times; and
- Socio-economic and public perception survey.

The Proponent should submit the following to DENR-NCR:

- Sangunian Resolution, as project endorsement, for all cities and towns with jurisdiction of the project
- Implementation Plan and Criteria for disposal of dredged/excavated materials

5.0 SUMMARY OF PROCEEDINGS

Engr. Resito V. David, Project Manager of DPWH-PMO-Major Flood Control Projects, and Engr. Emil K. Sadain, Project Coordinator of the same office, represented the project proponent. The SAPROF Study Team led by Mr. Hitoshi Kin was present. Representatives of various stakeholders were also present. The complete list of participants is presented in the Annex A (4).

Opening

The consultation meeting started at around 1:30 p.m. with Engr. David welcoming the public, LGUs, and the representatives of the various stakeholders. He then asked participants to introduce themselves individually.

Introduction of the project

Engr. David discussed the various details of the proposed project through the use of overhead transparencies. Earlier, the project information sheets were distributed to the participants before the start of the meeting.

It was mentioned that the benefits to be derived from the project are:

- floods of less than 30 year return period will be confined within the river;
- an area of about 140 sq. km will be free of flood damage;
- approximately 450,000 people will be relieved from flood damage; and
- waterfront amenities will be provided.

Discussions

Various issues, concerns, and suggestions were discussed during the meeting. All representatives of the stakeholders were appreciative of the project since its purpose is to reduce the flood damage in Metro Manila. The LGUs asked DPWH on how their organizations could help the project. The DPWH explained that project endorsements would be requested from the LGUs.

The issues cover river hydraulics, construction activities, dumping sites for the dredged spoils, water quality, and socioeconomics.

The Sagip sa Pasig, an NGO, raised the issue on squatters. The DPWH and SAPROF Study Team explained that this project would not displace any squatters (during construction).

The PRRP suggested that dredging should be up to Manila Bay considering the low bed elevation of the Pasig River. The Study Team explained that in the previous study prepared by JICA showed that dredging of the Pasig River alone will be sufficient to increase its capacity and accommodate the flood with a 30-year return period.

With regard to the impacts on water quality during construction, the Study Team explained that studies are ongoing to determine the best construction methods for this project.

The PPA suggested that DPWH should coordinate with the Philippine Coast Guard and explore the possibility of dumping the dredge spoils to a site far from the Manila Bay.

Some NGOs asked if OECF would help fund the resettlement activities for any squatters that will be displaced. The OECF expressed its support for the project. It further announced that if resettlement activities are necessary, these could be included as additional project components. OECF may fund the development of the resettlement sites, while the Philippine government has to acquire those sites.

Conclusion

After all the issues were discussed, the DPWH officials asked the participants if they have any problems with the proposed project. Since there were no apparent objections, Engr. David requested the LGUs for their official project endorsements.

Table 1
SCOPING MATRIX
FOR IDENTIFYING POTENTIAL SIGNIFICANT ENVIRONMENTAL ISSUES (SEIs)

ENVIRONMENTAL ATTRIBUTES			ACTIVITIES AND SOURCES OF IMPACTS										
			Construction Phase							Operation Phase			
			1	2	3	4	5	6	7	8	9	10	11
	1)	Meteorology											
	2)	Air Quality and Noise	0		+/-				+/-				
PHYSICAL	3)	River Hydraulics				+/-					+	+	+
RESOURCES	4)	River Water Quality		-	+/-	+/-	0				+	+	+
	5)	Lake Water Quality		+/-		+/-					+/-		
	6)	Terrain/Soils/Groundwater			+/-		+/-						
	7)	Oceanography											
ECOLOGICAL	8)	Terrestrial Flora/Fauna	0		0								
RESOURCES	9)	River Flora/Fauna		+/-									
	10)	Land Use Patterns											
	11)	Land Transportation											
	12)	Water Supply											
HUMAN USE	13)	Power Usage											
VALUES	14)	Housing/Squatters				+/-	+/-						
	15)	Industrial Pollution											
	16)	Mineral Resources											
	17)	River Fisheries		+/-									
	18)	River Navigation		+/-		+/-				0			+/-
	19)	Socioeconomics					0	0			+	+	+
QUALITY OF	20)	Public Health/Safety		+/-	+/-		0	0	0		+	+	+
LIFE VALUES	21)	Aesthetics/Recreation/Tourism		+/-	+/-		0			0		+	+
	22)	Cultural/Historic/Archeological											

ACTIVITIES AND SOURCES OF IMPACTS

Construction Phase

1 Transport of Construction Materials
2 River Dredging
3 Dredge Spoil Disposal or Reuse
4 Construction of MCGS
5 Construction of River Bank Improvements
6 Presence of Construction Work Force
7 Operation of Heavy Equipment

Operation Phase

8 Maintanance of MCGS
9 Flood Control by MCGS
10 Presence of River Bank Improvements
11 Increased River Channel Capacity

EXPECTED MAGNITUDES OF POTENTIAL IMPACTS

\+ Major Positive Impact
\- Major Negative Impact
+/- Minor Impact
0 Negligible Impact

Minor and negligible impacts could be either adverse or beneficial.

Table 2
SUMMARY OF ISSUES AND CONCERNS

STAKEHOLDER	ISSUES AND CONCERNS/ SUGGESTIONS	DPWH ACTION/REMARKS
Representative of Mandaluyong	What is the role of the Local Government Units in the project?	As per ECC application, endorsements from LGUs in the form of Sanggunian Resolution are required.
Mr. Taggueg of PPA	Will the dredging operation have an impact in the transport system in the river?	Dredging operations will be scheduled mostly at night. In Napindan, the flood control structure has navigation lock. Even the flood control gates are closed, the navigation lock can always be operated so as not to disturb the navigational traffic, and without any intrusion of polluted water into the lake.
Mr. Bert Aguda of PRRP	Considering the quality of water in the Pasig River, how could we prevent the bad smell caused by the operation?	The use of modern technology, i.e. by mixing the dredged materials with additives and use them as backfill and by using equipment that will minimize emission of bad odor during operation, is still under study.
Mr. Bert Aguda of PRRP	Where should we dump the dredged materials from the river?	The SAPROF Study Team is considering the use of treated dredged materials as backfill materials for the pedestrian pass, promenades and waterfront facilities. But, most of the dredged materials must be disposed. The Study Team is looking for a place near the operational site, like some place in MANAVA, along the shorelines of Manila Bay or along the shorelines of Laguna Lake, depending on the guidelines of the DENR.
Ms. Pearl Martinez of Sagip Pasig Movement	What about the issue in the current situation of the squatters?	The Study Team is working hand in hand with PRRP, but the project will not touch the squatters in the easements.
Mr. Bert Aguda of PRRP	What method will be used in order to prevent polluted water from Manila Bay to enter into Laguna Lake?	The Napindan Hydraulic Control Structure is used to prevent salt or polluted water from intruding into Laguna Lake from Manila Bay. Most probably during dredging operations, the gates and locks should be closed. The Manila Bay experiences high and low tides. During low tides, the flow is towards Manila Bay so dredging operations will be conducted. During high tide that is the time when

		there is backflow the Napindan Channel must be closed to prevent polluted water from entering. But when the tide in Manila Bay goes down, that is the time to resume operation and open the gate.
NGO	What is the effect of the project on the socioeconomic aspect?	The proposed project will reduce flood damage (to 450,000 people in 140 km^2 area). In addition, the river capacity will be increased that will lessen the load of existing pumping stations thus decreasing the operational cost of pumping.
Mr Bert Aguda of PRRP	Is there a possibility of having financial support/assistance given to the agency by the OECF especially on issues of resettlement/relocation of squatters?	The OECF is willing to finance as far as resettlement site development (is concerned), provided that there is a space for resettlement. Since the DPWH is the borrowing agency, a memorandum of agreement can be entered into with NHA. There should be a close coordination among DPWH, NHA and LGUs in addressing the issues on squatters' relocation/ resettlement.
OECF, Mr. Bert Aguda of PRRP, NGO	Should a steering committee be created for the project with the DPWH as the lead agency?	The creation of a steering committee will be one of the recommendations of the SAPROF study. The formation of a steering committee will bring a closer coordination among agencies involved in the project. The MMDA should be a member of the steering committee to lead the LGUs in whatever role they are going to take part in the project.

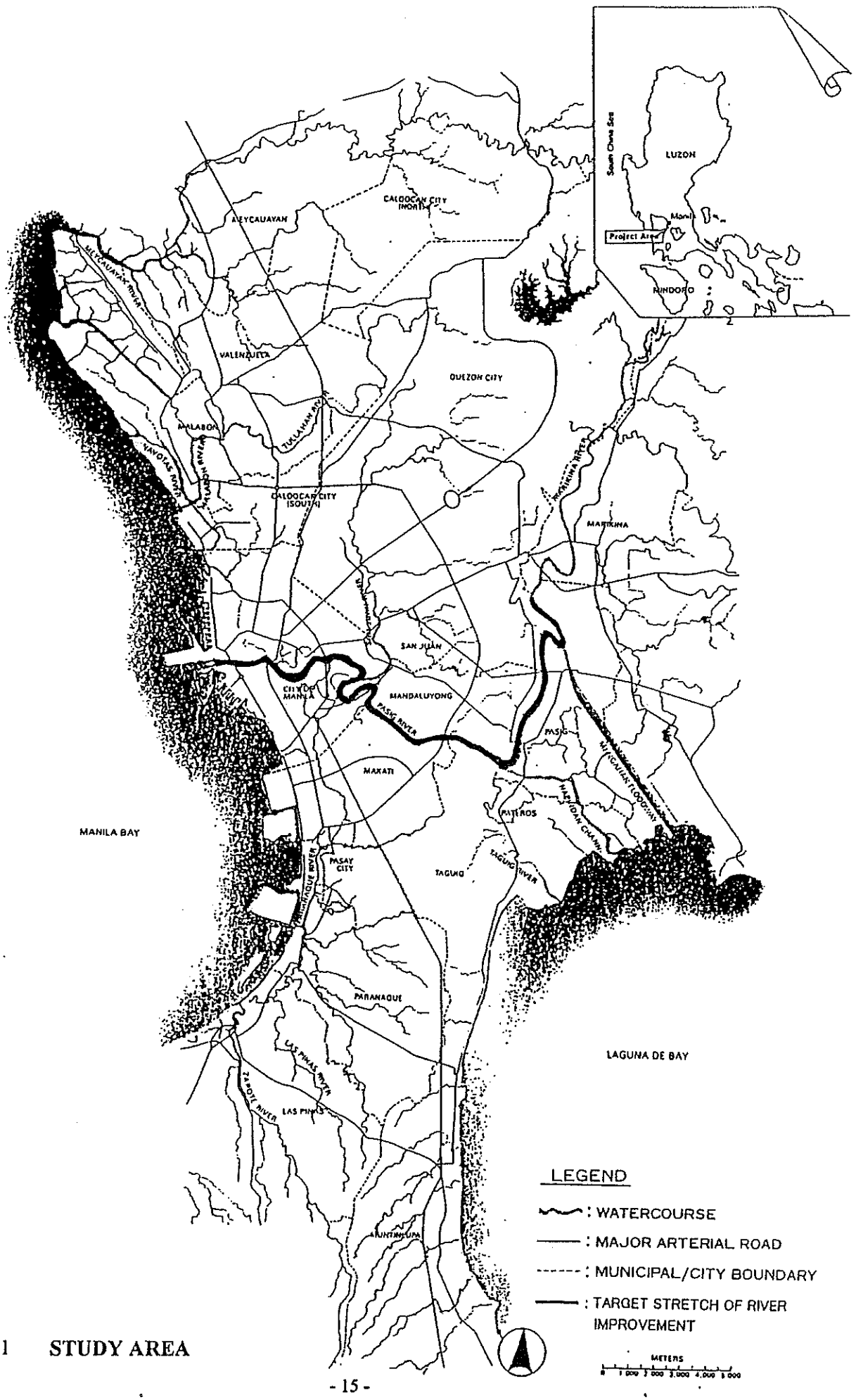


Figure 1 **STUDY AREA**

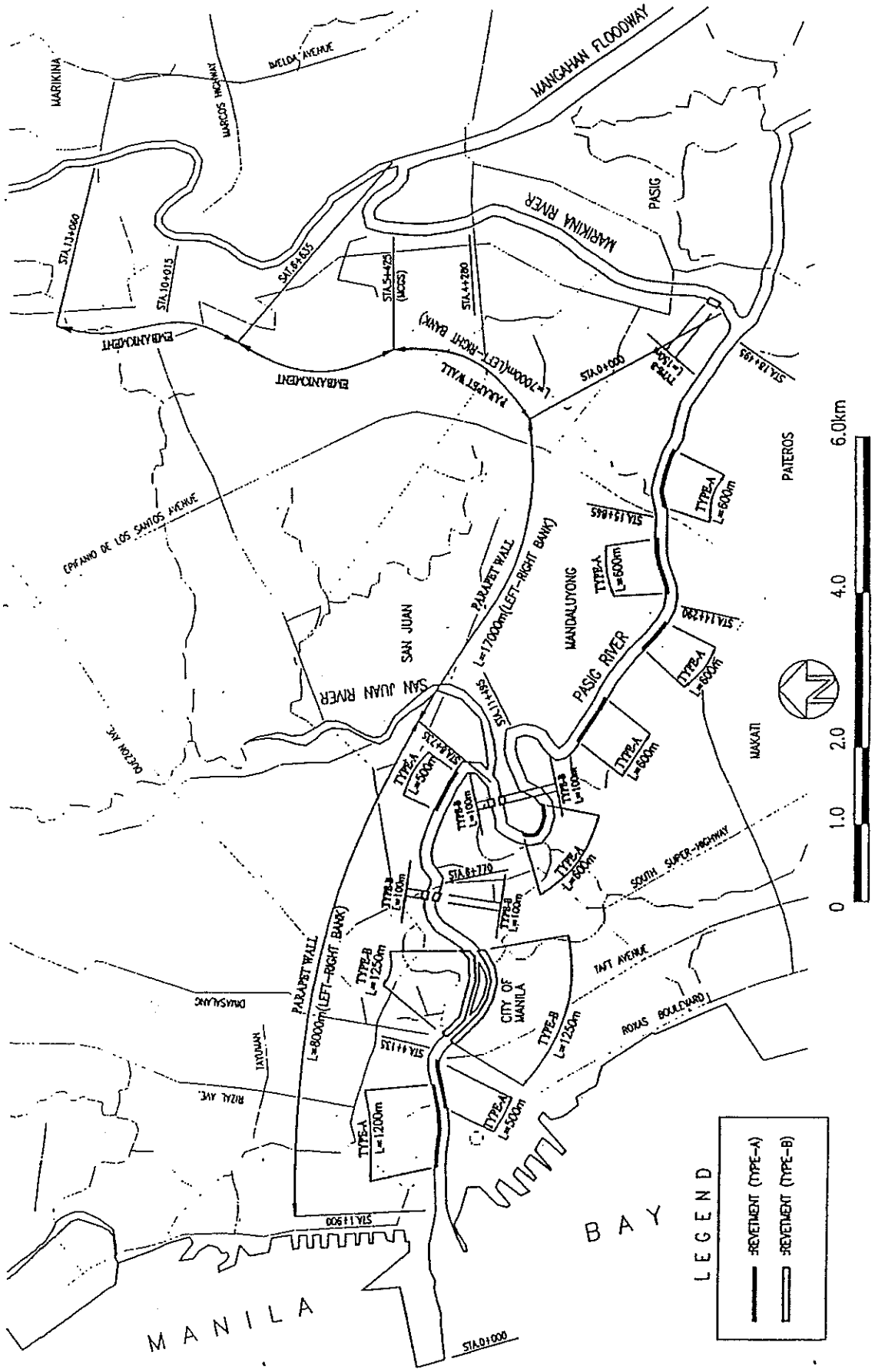


Figure 2 **PROPOSED RIVER CHANNEL AND ENVIRONMENT IMPROVEMENT**

MINUTES OF THE KICK-OFF MEETING
ON
THE REVIEW AND UPDATING OF THE
STUDY ON PASIG-MARIKINA RIVER CHANNEL AND
IMPROVEMENT PROJECT
IN
THE REPUBLIC OF THE PHILIPPINES

AGREED UPON BETWEEN
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
AND
OVERSEAS ECONOMIC COOPERATION FUND – SPECIAL
ASSISTANCE FOR PROJECT FORMATION
(OECF-SAPROF)

FEBRUARY 11, 1998

Date : 10 February 1998

Place : Conference Room of Undersecretary Teodoro T. Encarnacion
3rd Floor, DPWH Building, Port Area, Manila

Attendance : See Annex – 1

The OECF - SAPROF Study Team, headed by Mr. Hitoshi Kin, on Pasig-Marikina River Channel and Improvement Project, herein referred to as "the Project", has been undertaking, from 04 February 1998 to 22 March 1998, the review and updating of the feasibility study (F/S) for the Project completed under the JICA Study on Flood Control and Drainage Project in Metro Manila in March 1990. Activities that involved gathering of data/informations, field investigation and consultation with various line agencies, local government units (LGUs) and non-governmental organizations (NGOs) concerned will be carried out by the OECF-SAPROF Study Team with assistance from the GOP study counterpart personnel of DPWH, headed by Engr. Emil K. Sadain, as discussed and contained in the Implementation Programme for the Project study implementation agreed upon between the OECF and DPWH signed on 20 January 1998.

The Study Team submitted twenty (20) copies of Inception Report to the DPWH which mainly presents the background of the project, objective and approach of the study, plans of operation and the undertaking of both government towards the study.

An explanatory meeting on this Inception Report presided by Undersecretary Teodoro T. Encarnacion, was held on 10 February 1998 between the OECF-SAPROF Study Team and DPWH, attended by various line agencies and LGUs concerned.

Presentation of the Inception Report and other related plans and scheduling were conducted by the Study Team Leader. With the contents of the report were basically understood and accepted by the attendees, however, other important issues which were discussed and requested for further exploration by the OECF-SAPROF Study Team and consideration in the study, are as follows :

1. Evaluation and Checking by the Study Team on :

   i. possible inconsistency of the structural and construction plan with the prevailing actual site conditions ;
   ii. the removal and relocation of squatter families living along riverbanks of Pasig-Marikina River affected by the Project ;
   iii. EIA review of the Project ;
   iv. the formulation of programs and plans on public awareness regarding effective flood control and river management ; and
   v. effect of the Project on the water quality of Laguna Lake.

2. Possible disturbance/destabilization of hazardous heavy metal elements found in the river bed that may be carried by inflow of Pasig-Marikina River to Laguna Lake during dredging activities and construction works for revetment walls.

3. Coordination by the Study Team with related line agencies, local government units (LGUs) concerned and some involved non-governmental organizations (NGOs) of their respective improvement plans and programs for Pasig-Marikina River.

The OECF-SAPROF Study Team took note of the abovementioned requests and will consider the same for inclusion in the study.

AGREED UPON BETWEEN

NONITO F. FANO
OIC, Project Director
PMO-Major Flood Control Projects
Department of Public Works
and Highways

HITOSHI KIN
Team Leader
OECF-Special Assistance for Project Formation
Study Team

CONFORME

TEODORO T. ENCARNACION
Undersecretary
Department of Public Works
and Highways

FEBRUARY 11, 1998
Manila, Philippines

EKS/Lhokla
Inception

LIST OF ATTENDANCE

Anne

I. PHILIPPINE SIDE

A. D P W H		
1. Teodoro T. Encarnacion	Undersecretary	D P W H
2. Nonito F. Fano	OIC, Project Director	PMO-MFCP, DF
3. Bernardo P. Aman	Asst. Project Director	PMO-MFCP, DF
4. Resito V. David	Project Manager I	PMO-MFCP, DF
5. Macariola S. Bartolo	Project Manager I	PMO-FAPs, DP
6. Emil K. Sadain	GOP-Counterpart Study Team Leader	PMO-FAPs, DP
7. Violenda B. Sucro	Engineer IV	PMO-FAPs, DP
8. Manuel C. Jawill	Engineer IV	DPWH-NCR
9. Prudenciana Ocampo	Engineer II	PMO-MFCP, DP
B. D E N R		
1. Arnold S. Bufil	Engineer III	EMB, DENR
C. N E D A		
1. Teresita C. Madamba	Supervising EDS	NEDA
D. P P A		
1. Alfonso D. Taggueg, Jr.	OIC, TMO Pasig River	PMO, PPA
2. Ben-hur Anicete	TMO Pasig River	PPA
E. L L D A		
1. Derlyn Gementano	Division Chief, ECD	LLDA
F. N H A		
1. Emma B. Angeles	OIC, East Sector Area	NCR, NHA
2. JB Coronel	Principal Engineer	NHA
G. L G Us		
1. Roy L. Sabornido	Planning Development Officer III	San Juan
2. Rolly P. Danila	Engineer IV	Mandaluyong Cit

II. JAPAN SIDE

A. O E C F		
1. Masahiro Kobayashi	Representative	OECF
B. J I C A		
1. Kenji Suzuki	JICA Expert	DPWH

III. OECF-SAPROF Study Team

1. Hitoshi Kin	Study Team Leader	SAPROF Team
2. Yuzo Mizota	River Engineer	SAPROF Team
3. Kenji Toyota	River Engineer	SAPROF Team
4. Yuichiro Hamada	Hydrologist	SAPROF Team
5. Antonio A. Alpasan	Flood Disaster Management Expert	SAPROF Team
6. Reynaldo R. Medina	Environmentalist	SAPROF Team
7. Nila I. Ingles	Social Impact Specialist	SAPROF Team

list/folder

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
PROJECT MANAGEMENT OFFICE
Major Flood Control Projects
MANILA

MINUTES OF THE FIRST STEERING COMMITTEE MEETING FOR THE STUDY ON PASIG-MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT

Date	:	*20 April 1998*
Time	:	*2:00 P.M. – 4:30 P.M.*
Venue	:	*Conference Room of Undersecretary Encarnacion*
Presiding Chairman	:	*Undersecretary Teodoro T. Encarnacion DPWH*
Presentor	:	*Mr. Hitoshi Kin OECF-SAPROF Study Team Leader*
Attendees	:	*Please refer to Attachment for the details*

After acknowledging the presence of other members of the committee and various representatives of different invited agencies, concerned LGUs and NGOs, Undersecretary Encarnacion open the presentation by welcoming all the attendees to the first steering committee meeting for the Study on Pasig-Marikina River Channel Improvement Project.

The meeting was called to ensure the effective and coordinated implementation of the Pasig-Marikina River Channel Improvement Project Study with the main functions of the committee are the formulation and coordination of flood control operational policies and guidelines; the establishment of priority area sectors for development; the provisions of available data for the conduct of the study; and the review of and recommendation on the findings in the progress and final report of the study.

Project and Study Presentation :

Mr. Hitoshi Kin, OECF-SAPROF Study Team Leader distributed copy of Interim Report and Inception Report II to each attending agency member and presented his outlines through the used of transparencies, as follows :

1. *Contents of the Final Interim Report on the review / updating of the Feasibility Study (F/S) for Pasig-Marikina River Channel Improvement Project undertaken under the OECF-SAPROF, Phase I (February 1998-March 1998).*

   i. Study on Optimum Flood Control Plan

   ii. Squatter Problems during Operational Phase of the Project

   iii. Review on Environmental Impact Assessment (EIA)

iv. *River Management and Publicity for Flood Control Project*

v. *Water Quality Improvement of Pasig River*

vi. *Project Cost and Economic Evaluation*

2. *Study / activities to be carried out under the OECF-SAPROF, Phase II (April 1998-June 1998).*

i. *Finalization of the Optimum Flood Control Plan*

ii. *Detailed Review of the EIA*

iii. *Detailed Study on Pasig River Water Quality Improvement Plan*

iv. *Preparation of Implementation Plan*

v. *Conduct of Information Campaign and Publicity*

Discussions :

1. *Assistant Secretary Manuel M. Bonoan inquired the Presentor on why there is consideration of compensation cost included in the project cost estimates despite there are no squatters affected during construction phase of the project. Mr. Hitoshi Kin clarified that such compensation cost shall be utilized for land acquisition, purposely for widening of narrow and constricted channel located in the upstream portion of Mangahan Floodway up to Sto. Nino, Marikina.*

2. *Undersecretary Encarnacion requested the Presentor to explain and clarify the necessity for the inclusion of Marikina Control Gate Structure (MCGS) in the project and its effect when constructed and operated. Mr. Kin mentioned that, considering the long and continuous stretch interlinking Pasig River and the Marikina River, huge volumes of water emanating from upstream side of Marikina River coming descending from neighboring and adjacent hilly areas during heavy rainfalls contributed largely to the excessive flows in the rivers stretch which eventually causes overflowing and inundation of river banks and subsequently causing flooding in low-lying areas of Metro Manila. Further, this is more aggravated with the natural occurrence and synchronized timing of high tide. The MCGS will regulate the volume of water flow coming from Marikina River to Pasig River. Study revealed that, with no MCGS, of the expected 2,900 m3/s volumes of water coming from upstream Marikina River, only 800 m3/s can be diverted to Laguna de Bay and with the 1,100 m3/s flowing to Manila de Bay through Pasig River. However, with MCGS, about 2,400 m3/s can be rerouted to Laguna de Bay with only 500 m3/s going to Manila de Bay, thereby avoiding the causing of flood occurrence in the Metro Manila Low-lying areas.*

3. *The Undersecretary further stressed that although there will be no squatters affected along the Pasig-Marikina River during construction phase of the project, however, about a significant portion of the 17,595 households residing on the east and west embankment of the Mangahan Floodway will definitely be affected by the project during its operation phase. Mr. Kin informed that there will be atleast 2,000 families residing along the berm of the riverbanks that need to be relocated to safe area when the MCGS will reach its operation stage. However, it was in this discussion that Engr. Juancho Corpuz, Principal Engineer of NHA, NCR sector, informed the committee that squatters residing along the berm of Mangahan Floodway river banks, with number of families nearing to 3,000 based on the latest NHA survey, are included for priority in the Boso-Boso Resettlement Area to be put up in Cainta, Rizal. Accordingly, the resettlement area which was recently awarded by NHA to the winning Contractor / Developer will start the land development activity and construction of housing units within this year.*

Director Nonito F. Fano of PMO-MFCP, DPWH, also confirmed that there is really a necessity to relocate the squatters, particularly those residing along the berm, because of the effect of flood flow when diverted to Laguna de Bay. The Bay can hold an elevation of water, atleast, to 12.50 m.

4.0 *The Undersecretary also asked the Presentor if dredging of the existing riverbed of Pasig-Marikina River is a major component of the project. Mr. Kin showed back the transparency on the actual siltation condition of the riverbed. Accordingly, about 1.90 million m3 of siltation will be dredged from the Pasig-Marikina River and that dredging is one of the major component of the project.*

5.0 *Director Pablo L. Bautista, Sr. of DPWH-NCR, suggested that service road should be provided along riverbanks to avoid and prevent some areas from being occupied by squatters. The Presentor informed that promenades shall be constructed in the areas that contained sufficient, open and wide space along riverbanks.*

6.0 *Engineer Emil K. Sadain of DPWH-NCR clarified with NEDA representatives attending the meeting if the ICC-Technical Board review for the project can be accommodated in the next earliest NEDA ICC-TB calendar. Engr. Rufino Guinto, Supervising Development Economist of NEDA, revealed that it will take atleast one (1) month for them to review and prepare the necessary documents prior to scheduling of ICC-TB for the project. However, accordingly, although no commitment, they will exert all efforts to have this reviewed by the Technical Board Secretariat and have this scheduled for deliberation at the soonest possible time.*

Undersecretary Encarnacion also pushed for NEDA's immediate consideration of the project under the next scheduled NEDA ICC-TB, considering the project being a high priority of the Department.

Ms. Miles Amacanin, Development Economist of NEDA, informed that NEDA is currently studying and working with the budgetary ceiling of all projects identified for priority under the different financing institutions namely, OECF, WB and ADB.

7.0 *With no more questions and / or clarifications to follow, the Presiding Chairman requested all attending members to submit, not later than 24 April 1998, their comments / suggestions, if they have any, on the Interim Report for the review / updating of F/S for Pasig-Marikina River Channel Improvement Project prepared by the OECF-SAPROF Study Team.*

The meeting was adjourned at 4:30 P.M.

Prepared by :

PRUDENCIANA A. OCAMPO
Engineer II

Reviewed / Checked by :

EMILY K. SADAIN
Engineer IV

Noted by :

NONITO F. FANO
OIC, Project Director
PMO – MFCP

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MINUTES
OF
THE INITIAL SCOPING SESSION WITH DENR-NCR OFFICE
FOR
THE PASIG-MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT

Date	:	**26 February 1998**
Time	:	**2:00 p.m. – 3:30 p.m.**
Venue	:	**DENR-NCR Office**
Presiding	:	**Engr. Diosdado Doctor,** ***DENR-NCR EIA Division***
Attendees	:	**Engr. Emil Sadain,** ***DPWH Coordinator***
		Mr. Hitoshi Kin, ***SAPROF Team Leader***
		Dr. Reynaldo Medina, ***SAPROF Team Environmentalist***
		Engr. Ruel Janolino, ***EIA Preparer Team Leader***
		Ms. Nila Ingles, ***SAPROF Team Social Impact Specialist***

An initial scoping session was conducted last 26 February 1998 with DENR- NCR Office in Quezon City after the Environmental Management Bureau (EMB) of the DENR has endorsed the EIS processing to the NCR Regional Office. The DPWH coordinator, the SAPROF Study Team, and a representative of the DENR-NCR EIA Division attended the meeting. The purpose of the session was to get DENR's concerns that should be addressed by the EIA study and to be included in the EIS. The SAPROF Study Team presented a scoping matrix for the purpose of identifying the potential significant environmental issues (SEIs).

The discussion with the DENR was very cordial and provided the SAPROF Study Team with the opportunity to explain the benefits of the project.

The DENR emphasized that the project proponent should follow the requirements of DAO 96 - 37 to ensure the social acceptability of the project and pave the way for a smooth project implementation in the future.

Issues and Concerns

DENR raised the following items during the discussion:

- Impacts to related projects of the Pasig River
- Impacts of the dredging activities
- Impacts on the various uses of the river

- Impacts on the towns situated near the floodway confluence with the Laguna Lake

DENR advised the DPWH and the consultants to:

- check with the DOT projects for the Pasig River;
- coordinate with the PEA for a possible dumping of the dredge spoils to their reclamation projects;
- carefully check if any squatter houses will be removed; and
- get a Sangunian Resolution, as project endorsement, for all cities and towns with jurisdiction of the project.

DPWH informed DENR that this project got an endorsement from the Metro Manila Development Authority (MMDA).

The meeting was adjourned at 3:30 p.m.

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
PROJECT MANAGEMENT OFFICE
Major Flood Control Projects
MANILA

MINUTES
OF THE SCOPING SESSION FOR THE PASIG-MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT

Date : 27 February 1998
Time : 1:30 P.M. to 3:30 P.M.
Place : DPWH Training Room B
Bonifacio Drive, Port Area, Manila

1. The Scoping Session was formally opened by Project Manager Resito V. David of the PMO-Major Flood Control Projects by introducing the members of the panel. The representatives of the different agencies / LGU's / NGOs concerned introduced themselves.

2. After the short introduction of the visitors, the Brief Project Profile was presented to the audience stating among others the Project Title. DPWH being the Implementing Agency and the objectives namely :

   a. to mitigate flood damage caused by channel overflow of the Pasig-Marikina River ;
   b. to facilitate urban development ; and
   c. to enhance the favorable environment along the river.

3. The location of the project as presented will be from the mouth of Pasig River at Manila Bay to the confluence with Napindan channel with a length of 24 km and the Lower Marikina River from its confluence point with Napindan channel up to 2.0 km upstream from the diversion point of Mangahan Floodway with a total of 26 kms.

4. The project component involves excavation and dredging which involves 2,884,000 cu.m (concentrated on the lower stretch of the Pasig River including its mouth). The revetment construction is totaling to 5 km. The third component is the construction of Marikina Control Gate Structure (MCGS). These are only preliminary design, but this scoping session's aims to get your comments and after the Feasibility Study (FS) which will go for four (4) months, the Detailed Design follows.

5. Benefits to be expected if the project will materialize :

   a. flood of less than 30 year return period will be confined within the river ;
   b. inundation of an area of 140 sq.km to lessen flood damage ;
   c. approximately 450,000 people will be relieved from flood damages ; and
   d. provision of waterfront amenity

PM RV David ended the presentation of the Project Profile and proceeded to the open forum.

1. The first question came from the representative of the Local Government Unit of Mandaluyong inquiring on their role in the project.

- The LGU's as stakeholders in the project should at least endorse the project in their area traversing Pasig River.
- Dr. Medina, a SAPROF team Member expounded on the role of the LGU's and informed the concerned LGUs that the a.) scoping session is the first step in the preparation of EIS for the ECC application and the study team wanted the LGU's concerns and/or issues needed in the preparation of the EIS to be submitted to DENR-NCR prior to the issuance of the ECC.

An example of the role of the LGU is if there are some projects of the municipality to be affected by the SAPROF Project, these issues can be addressed appropriately.

The DENR-Environmental Management Bureau endorsed the project to DENR-NCR and classified the project as Environmentally Critical Area (ECA) and not as Environmentally Critical Project (ECP). So the ECC application will be at the DENR-NCR.

The DENR-NCR mentioned in the first scoping the issues to be taken up in the EIA Study namely :

a. Impact on the projects related to Pasig River ;
b. Impact on the dredging activities
c. Impact on the general use of the Pasig River
d. Endorsement from LGU's in the form of Sanggunian Resolutions

I. PRRP-Bert Aguda

Question : How about including part of the Manila Bay to be a part of the program since the river bed itself, sometimes the Laguna Lake is higher and sometimes the Manila Bay is higher, so how far will be the dredging activities will be from the mouth of the river up to Manila Bay to accommodate floodwaters.

Answer : Based on the 1990 study by the JICA, as far as hydraulic analysis we have studied the master plan especially in the mouth of Pasig River. At this point, we are not concerned on the off-shore excavation but the dredging excavation will be only from the mouth to the Napindan Channel.

Question : The study was conducted 1990 and it's almost eight (8) years, we still have to investigate the real conditions of the Pasig River now, what will be the actual/approximate volume of materials to be dredged in the Pasig River

Answer : Volume of materials is almost 2,880 taken from the 1990 Master Plan for the Metro Manila Flood Control Project.

Question : Do you think that the present sedimentation is the same than what we had eight (8) years ago.

The PPA representative, Mr. Alfonso Taggueg, Jr. related that they are conducting annual maintenance dredging from Delpan Bridge to Manila Bay due to fast changes in the

river. This dredging operation is included in the PPA's Annual Program. The average volume dredged annually is about 330,000 to 350,000 cu.m. Dredging will be undertaken practically in the whole stretch of the river.

The design of the river bed in comparison to the average river bed was shown on the screen as explained by Mr. Hitoshi Kin.

As explained by Mr. Taggueg, there will be an impact in the transport system in the river since the dredging operation might affect the transport of raw materials to the industries located along the Pasig River or the project might be affected by these industries.

Mr. Kin reiterated that as per construction schedule dredging operations will be done mostly at night.

The scoping matrix was flashed on the screen showing the positive and negative impacts of the projects. This aims to generate comments/issues on the projects from the people.

Question from Mr. Bert Aguda :

Considering the quality of water in the Pasig River, how could we prevent the bad smell caused by the operation. Mr. Kin replied that the use of modern technology by mixing the dredged materials to other additives to be used as backfill and the use of equipment to minimize the emission of bad odor during operation is still under study. But this might cost two much. This method is our main subject in the design.

Question from Mr. Bert Aguda :

Where should we dumped the dredged materials from the River.

Answer from PM RV David :

Our Consultant is studying disposing off these dredged materials, mixing them with some binders.

From Mr. Kin :

The dredged and excavated materials, 2,884,000 cu.m, the team is considering the materials for filling up of pass channel, checking all the hydraulic and hydrological conditions of the river. But not all those dredged materials will be used for the purpose most of them must be disposed/dumped. We are looking for an area near the operational site and we are picking up like some place in MANAVA, along the shorelines of Manila Bay and along the shorelines of Laguna Lake depending on the guidelines of the DENR. We have not find out the exact site yet.

Regarding the dumping area, PM RV David stressed that the issue will be looked into the study scope abiding with all the rules and regulations.

As seen on the screen, Mr. Kin explained that most of the excavated materials will be used for backfilling those portions as pedestrian pass, etc.

POR MR. H. KIN

The group get back into the matrix to the scoping.

From Pearl Martinez of Sagip Pasig Movement :

What about the issue in the current situation of the squatters :

From PM RV David :

The team is working hand in hand with PRRP but according to Mr. Kin, the project will not touch the squatters in the easement. As of today, no squatters reside on the stilt, that is through the effort of the PRRP so the project will not deal on squatters on-the-stilt.

From NHA Representative :

In what aspect can NHA help in the project.

Answer from Dr. Medina :

The project is not touching on any squatters.

PM RV David thanked the NHA representative for the agencies concerns but was told that fortunately, the project will not touch any squatters.

The schedule of the project was told that if everything goes smoothly, the detailed engineering for the project will be proposed for inclusion in the 23rd OECF Yen Loan Packaged by the 2nd or 3rd quarter of 1999. The construction phase will be in 2001.

From an NGO Representative :

Will the project be affected by the change of political leadership.

PM RV David :

There will be no effect since it is an international commitment in scope.

From Bert Aguda :

What method will be used in order to prevent polluted water from Manila Bay to enter into Laguna Lake.

Answer from Mr. Alpasan :

From Manila Bay, we have the Napindan Hydraulic Control Structure to prevent introusing of salt or polluted water to the Laguna Lake. Most probably during dredging operations, the gates and the locks should be closed.

A question on the effect of the project on the socio-economic aspect was raised. And again, Dr. Medina answered that with the project, these would be a reduction of flood damage. PM RV David added that the river capacity would be increased lessening the load of existing pumping stations to pump water in its tributaries thus decreasing the operational cost of the pumping stations.

Going back to No. 17, issue of Napindan Channel while the dredging operation is on-going. Mr Alpasan answered that the Manila Bay experiences high and low tides. During low tides, we conduct dredging operations and the flow is towards Manila Bay. When there is high tide to prevent polluted water to enter Napindan, we have to close the Napindan Channel, but the tide is not continuously at high tide, so the dredging operation should be timed in such a way that during the backflow, then that is the time that we can close the gate but when the tide in Manila Bay goes down, that is the time we have to resume operation and open the gate.

In Napindan, we have this flood control gate. In addition to this, they have this navigation lock. This flood control structure can be closed and the navigation lock can always be operated so as not to disturb traffic. Close the lock, let the heat enter and then close the lock of the upstream portion once the boat has entered and there's no intrusion of polluted water into the lake.

Mr. Kenji Suzuki of The JICA inquired on the length of the revetment and river dike to be rehabilitated and reconstructed along the Pasig River. He was informed that of the 26 km stretch of the Pasig River, not the entire stretch of revetment will be reconstructed since some portions of the structure can still withstand the confined flood discharge while others need to be rehabilitated.

Mr. Bert Aguda inquired if there is a possibility of having financial support/assistance given to the agency by the OECF especially on issues on resettlement/relocation of squatters. PM RN David answered in behalf of the OECF that the lending institution is willing to finance as far as resettlement site development, provided that there is a space for resettlement. Since the DPWH is the borrowing agency, a memorandum of agreement can be entered into with the NHA.

The OECF informed in the previous meeting that there should be a creation of a steering committee for the project with the DPWH as the lead agency. That will be one of the recommendations of the Feasibility Study being done right now.

Mr. Bert Aguda suggested that there should be a close coordination between the DPWH, NHA and the LGU's to address the issues on squatter's relocation/resettlement.

The formation of steering-committee was brought-up for a closer coordination among agencies involved in the project.

An NGO representative would like to know how they could help in the project since the OECF mission would like to see them and would like to talk about the project.

The OECF is approaching the NGO's because they are well concerned of the environment and the OECF mission would like to know the stand of NGOs whether they are against or for the project.

Another NGO representative suggested that the MLG be included in the formation of the steering committee to lead the LGU's in whatever role they are going to take part in the project.

Having no further matters to be discussed, the scoping session was brought to a close at 3:30 P.M.

Minutes227/Lhoids*

. AND HIGHWAYS
PROJECT MANAGEMENT OFFICE
Major Flood Control Projects
MANILA

MINUTES OF MEETING
ON THE SEMINAR FOR PASIG – MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT

Date	:	May 20, 1998
Time	:	8:30 A.M. - 4:00 P.M.
Venue	:	Bayview Park Hotel, Roxas Boulevard, Manila
Presentors	:	* Dir. Nonito F. Fano, PMO-MFCP, DPWH Policy on Flood Control in Metro Manila
		* Mr. Hitoshi Kin, OECF-SAPROF Study Team The Pasig-Marikina River Channel Improvement Project
		* Ms. Elsie Trinidad, OIC, RDSD-NHA Squatter Relocation Program for Metro Manila
		* Mr. Renato T. Cruz, Deputy Program Coordinator RRS Pasig River Rehabilitation Program
Facilitators	:	* Mr. Resito V. David, Project Manager, PMO-MFCP, DPWH
		* Mr. Emil K. Sadain, Project Coordinator, PMO-FAPs, DPWH
Attendees	:	Please refer to Attachment for the details

Registration of participants started at 8:30 A.M.

The seminar was formally opened at 9:30 A.M. by PM Resito V. David by acknowledging the presence of every participating agencies, offices and LGUs. Welcome Remarks were delivered by Dir. Pablo L. Bautista, Sr., DPWH-NCR on behalf of the DPWH and Mr. Shigiya on behalf of the OECF.

The seminar, sponsored by the OECF-Special Assistance for Project Formation in coordination with the DPWH and other related government agencies, focused on the promotion and public awareness campaign regarding the government flood control programs in Metro Manila, the Project itself, the Pasig River Rehabilitation Program of DENR and the Squatters Relocation Programs of NHA in Metro Manila.

PRESENTATION OF TOPICS

1. Policy on Flood Control in Metro Manila

Director Nonito F. Fano, DPWH focused his discussion on the two (2) levels being followed in the implementation of flood control projects in the National Capital Region : The Government Level and the Local Government Level. He also elucidated the department general policy on flood control and the LGUs main responsibilities towards planning, implementation and maintenance of local drainage and flood control projects. Dir. Fano also mentioned the possible effect, with the enactment of RA No. 7160 also known as the Local Government Code, to the implementation of flood control projects and local drainage which can trigger some policy changes in the near future not only in the National Capital Region, but, nationwide. Already, sometime in 1996, official initial discussions initiated by DBM mainly among DPWH and MMDA were held on several occasions relative to the proposed devolution of flood control and drainage projects to MMDA. However, the plan has fizzled out. He also elaborated other concerns that usually aggravate the flooding situation in Metro Manila.

2. The Project : Pasig – Marikina River Channel Improvement Project

Mr. Hitoshi Kin, OECF-SAPROF Study Team Leader, with the aid of slides / transparencies, clearly elucidated the background of the Project. He also gave emphasis on the goals and objectives of the Project including the corresponding project features and components, costing and schedules. He also explained the extend of the enormity of construction works to be undertaken for the thirty-one (31) km. Stretch of Pasig-Marikina River. Mr. Kin also emphasized the need to divide the project into two phases, as suggested / recommended by the NEDA, so as to soften the impact of budgetary constraints prior to consideration of the Project under the OECF 23rd Yen Credit Package. The total cost for the entire project is about P13 Billion, while Phase I is entailing cost of about P5.57 Billion.

3. The Pasig River Rehabilitation Program

Mr. Renato Cruz, Deputy Program Coordinator of the River Rehabilitation Secretariat (RRS) of DENR, discussed the policy and the latest update on the Pasig River Rehabilitation Program (PRRP) being carried out by RRS. He presented the positive changes and improvements of the Pasig River caused by the implementation of all flood control related projects and programs of different agencies. Mr. Cruz also acknowledge the importance and contribution of the proposed Pasig-Marikina River Channel Improvement Project, when realized. The Project being one of the vital infrastructure components of the PRRP is a contributory project of DPWH to the development and improvement of Pasig River, with the department as one member agencies of RRS Task Force. He explained that the program's primary aim is on pollution reduction, riverside management, organizational and institutional aspects and public awareness and activation. Included in the pollution reduction aspect are solid waste management, commercial-industrial waste management and domestic liquid waste management. Mr. Cruz also added that the programs include development of parks within the Pasig River banks, relocation of informal dwellers to various resettlement sites which was undertaken since 1995, the conduct of livelihood and social development trainings at the relocation sites and the removal of sunken derelicts and overstaying

barges from the river. The PRRP also resulted to the formation of the Sagip Pasig Movement Inc. which organize community-based waste management, conduct community training courses and various information-advocacy activities. Mr. Cruz also cited the launching of the media campaign dubbed as "Piso Para sa Pasig" which resulted in a heightened awareness and concern for the Pasig River.

4. The Relocation Squatter Program of NHA for Metro Manila

The speaker from National Housing Authority, Ms. Elsie Trinidad, discussed their agency accomplishment on squatter resettlements. The NHA being a member of the RRS Task Force has also played a major role towards removal / relocation of squatters residing along river banks of Pasig River. She cited that they have relocated a total of 3,606 households to different resettlement sites from 1995 to 1997. Ms. Trinidad added that out of the five (5) affected LGU's of Phase I, three (3) cities (Makati, Mandaluyong, San Juan) were cleared of structures on stilts, 92% partial completion in Manila and no accomplishment in Pasig City. Their office, according to Ms. Trinidad, is also involved in census and tagging operations. With regards to the cleared areas, some LGU's introduced the development of mini parks but its maintenance continues to be a major challenge among the LGU's. Ms. Trinidad also mentioned the on-going developments for the identified relocation site for Phase II (Taytay Project). However, she also expressed apprehension that the site will be affected by the North Laguna Lakeshore Project's 70-meter wide dike and also by the proposed C-6, leaving only 12.125 hectares available for resettlement development.

After completion of the presentations by the four (4) Speakers, break time was called by PM RV David for the lunch.

The seminar resumed its session at 1:30 P.M.

DISCUSSIONS / OPEN FORUM : 1

1. Retired Col. Rueda of the Manila City Hall suggested that, if possible, a task force to be headed by MMDA with concerned government agencies and LGUs as members should be organized prior to project implementation. He proposed to name the task force "Ligtas Baha". Dir. Fano emphasized that the project is still under study period, hence, the proposed task force should be reserved to work effectivity during implementation stage.

2. Mr. Fernando Flores of MPDO, Cainta inquired if there is already the application for Environmental Compliance Certificate (ECC) by the proponent agency. Engr. Emil K. Sadain of DPWH explained that the application for ECC with DENR was requested on February 12, 1998 by DPWH. However, because of the new policy of DENR in granting ECC, additional requirements need to be complied by the proponent agency. The socio-economic survey conducted on households along riverbanks area by the DPWH Counterpart Study Group is just one of the requirements. Accordingly, other requirements that need also LGUs involvement is the endorsement of the project by the LGUs concerned to NEDA.

3. Engr. Darren Badion of DPWH-URPO inquire on the proposed change of elevation of Marcos Bridge by 3.0m from its original form which will surely affect the C5 and the LRT2 line which is 50.0m downstream of Marcos Bridge. Mr. Kin explained that the present elevation of the bridge is prone to flooding. Engr. Badion informed Mr. Kin that their consultants are aware of the possible flooding. Accordingly, the design of the bridge was coordinated with the LGU of Marikina. With this information, Ms. Sofia Santiago of BOD suggested to have a coordination meeting inviting the PMO-MFCP to discuss on the proposal of the OECF-SAPROF Study Team. She also informed the body that the discharge of the river even increased from 3,600 to 4,200m3.

Dir. Fano requested plans and specifications of the projects of URPO and LRT and also offered to furnish them the plans on the proposal of the OECF-SAPROF Study Team in order to have one common elevation of the Marcos Bridge with the primary concern of mitigating flood damage.

4. PM Patrick B. Galan proposed the inclusion of the San Juan River and East side of Mangahan Floodway in the study. He also verified with the Study Team if the backflow effect of the upstream of Marikina River with the construction of the MCGS was considered in the study. Mr. Hitoshi Kin explained that the study for San Juan River can be explored after the improvement of the Pasig River. He also reiterated that the backflow effect has been included in the study.

5. Ms. Elsie Trinidad of NHA inquired if the funding for the relocation of squatters was included in the proposed budget. PM RV David explained that DPWH usually provides the resettlement lot in past projects. Engr. Sadain explained that while removal / relocation of squatters along Pasig River is included in the NHA program for PRRP, however, no squatters will be affected along riverbanks by the construction of revetment walls. Dir. Fano also added that during the Flood Summit in 1997, the development of the resettlement site was vested on the HUDCC. He also added that 30,000 squatter families along the Pasig-Marikina River were primarily considered to be immediately relocated thereby clearing the easements of the Pasig-Marikina River. Mr. Shigiya of OECF also added that the relocation lot should be provided by the government agency concerned and NHA should coordinate with the OECF.

6. Ms. Sofia Santiago inquired if permits were furnished by DPWH to the LGU of Marikina before the construction / developments along the Marikina River were undertaken. Dir. Fano replied that there has been an order of the NCR Regional Director to remove as soon as possible the obstruction along the Marikina River to prepare for the La Nina phenomenon. He also suggested that LGU's should consider the easement requirement for the rivers as described in the Water Code.

7. An inquiry from PMO-Mangahan Floodway intended for DENR was raised regarding the encroachment of Concrete Aggregates located downstream of Marikina River. Mr. Bert Aguda of DENR replied that investigations were conducted by their office on the disposal of the spoils of cement from Concrete Aggregates to Pasig River. However, accordingly, the issue on the encroachment is under the jurisdiction of LLDA, hence the case was forwarded to LLDA.

8. Mr. Alfonso Taggueg of PPA asked on how can NHA properly address the relocation and resettlement of remaining squatters. Ms. Trinidad explained that NHA has identified and intend to develop lots in Batangas and Laguna. NHA will develop the site not only for the DENR's referral to LGU's but also for other agencies. She added that the sites will be ready by 1999.

9. An attendee inquired on the development of the Freedom Valley Resettlement. Ms. Trinidad replied that as of now, topographic survey has just started. The site however is not for squatters along the Pasig River. It is reserved for the squatters to be affected and displaced by the Metro Manila Flood Control Program.

10. Mr. Kin assured the attendees that as far as the implementation of the Pasig-Marikina River Channel Improvement Project is concern, no squatters will be displaced by the construction of the project along Pasig River.

With no more questions and issues to follow, PM RV David, in behalf of the DPWH and the OECF-SAPROF Study Team, say the closing remarks and express his sincere thanks to all participants attending the said seminar hoping mutual and fruitful coordination of all the agencies and LGUs involved for the success of the project. The seminar ended at 4:00 P.M..

Prepared by :

MIA B. PALENZUELA
Engineer II

Checked by :

EMIL K. SADAIN
Engineer IV

Noted by :

NONITO F. FANO
OIC, Project Director
PMO - MFCP

EKS/Lholds
minutes520h

APPENDIX H

PROJECT ENDORSEMENT

REPUBLIKA NG PILIPINAS
TANGGAPAN NG PANGULO
PANGASIWAAN NG KALAKHANG MAYNILA
(METROPOLITAN MANILA AUTHORITY)
METROPOLITAN MANILA COUNCIL

Resolution No. 2
Series of 1994

FAVORABLY INDORSING THE PROPOSED PASIG-MARIKINA RIVER SYSTEM IMPROVEMENT PROJECT OF THE DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)

WHEREAS, the DPWH has adopted the Pasig-Marikina River System Improvement Project whose main objective is to mitigate and/or restrain flood damages initiated by the silted condition of Pasig River and the lower Marikina River;

WHEREAS, the aforesaid Project is the DPWH's component in support of the on-going Pasig River Rehabilitation Project and the Ilog Pasig;

WHEREAS, the DPWH has submitted this Pasig-Marikina River System Improvement Project to the National Economic and Development (NEDA) for possible financing under the forthcoming JICA Grant Aid;

WHEREAS, the NEDA is requesting that the Pasig-Marikina River System Improvement Project be favorably indorsed by Metro Manila Council, Metro Manila Authority;

WHEREAS, the Council after deliberation in session duly assembled, finds the objective of the Project laudable and also believes, like the DPWH, that the Project is necessary as it will certainly reduce flood damage, enhance favorable environment, reduce obnoxious odor, and improve the aesthetic view of Metro Manila;

NOW THEREFORE, be it resolved, as it is hereby resolved, that the Council hereby favorably indorsed to the NEDA the Pasig-Marikina River System Improvement Project;

APPROVED, upon motion duly seconded, this 7th day of April 1994, in Mandaluyong, Metro Manila.

JUANITO A. MATHAY, JR.
Chairman
(Mayor, Quezon City)

Dredged materials from the Pasig River are expected to be mostly sludge containing silt, solid wastes, and organic matter. There will be minimal amount of soft clay and loose sand. This refers to the stretch from the river mouth up to the junction of Pasig River with the Napindan Channel. Very small amount of hard clay or unsolidified tuff may be excavated between Guadalupe and the Napindan Hydraulic Control Structure (NHCS).

In the Marikina River, the river bed materials consist of shallow sludge layer, upper sand and clay layer, and lower hard clay or unsolidified tuff layer. The riverbank slope materials to be excavated consist of sand, soft clay and hard clay.

3.0 DISPOSAL AREAS

Present practice in Dredging Engineering disposes the dredged material in either the sea or the land. Disposal on land is the selected alternative for this project. Both upland and lowland areas were considered. The dredged materials will facilitate the reclamation of these disposal areas for some other use.

The prospective disposal sites for the dredged materials are situated in low-lying areas as shown in the figure and the Photographs Nos. 11, 12, and 13 of Appendix F. The proposed disposal sites and their carrying capacities are as follows:

TABLE D.2

PROPOSED DISPOSAL SITES

Dumping Site	Location	Areas (ha)	Volume (million m^3)
Calzada	Junction of Napindan Channel and Laguna Lake	300	9.0
Cainta	Junction of Mangahan Floodway Laguna Lake	100	4.0
Doña Petra	Upstream of Marikina River	35	1.4

APPENDIX I

CONSTRUCTION CONTRACTOR'S PROGRAM

CONSTRUCTION CONTRACTOR'S PROGRAM

Aside from the mitigating measures and enhancements discussed in Chapter 9, the Construction Contractor's Program shall also include the following environment-related general conditions of the standard government contract:

GC-08 STATUTES, ORDINANCES, LAWS, DECREES, AND EXECUTIVE ORDERS

The Contractor shall comply in all respects to the statutes, ordinances, laws, decrees, and executive orders which are applicable to the execution of the Contract, including the Implementing Rules and Regulations of PD 1594, as amended, and shall indemnify the Owner against all penalties and liabilities of every kind for the Contractor's breach of such statutes, ordinances, laws, decrees, executive orders, rules and regulations.

GC-13 FOSSILS AND OBJECTS OF VALUE

All fossils, coins, articles of value or antiquity, structures, and other remains or paleonthological, geological or archaeological findings discovered at the site shall be deemed to be the absolute property of the Government of the Republic of the Philippines without exception. The Contractor shall take reasonable precautions to prevent his workmen or any other persons from removing or damaging any such article or object and shall immediately, upon discovery thereof and before removal, inform the Engineer of such discovery and carry out, at the expense of the Government, the Engineer's orders as to the treatment and disposal of the same.

GC-19 CONTRACTOR'S RESPONSIBILITY FOR THE WORKS

The Contractor shall and with due care and diligence, execute and maintain the Works and provide all labor, including supervision thereof, equipment, materials and other facilities, whether temporary or permanent in nature, required for such execution and maintenance of the Works. The Contractor shall take full responsibility for the adequacy, stability and safety of all site operations and methods of construction, provided that the Contractor shall not be responsible for any defects or failures that may arise due to the designs and specifications embodied in the Contract Documents or as so directed by the Engineer.

The Contractor shall limit the movement of his workmen and construction plant on rights-of-way, including access routes approved by the Owner/Engineer so as to

minimize damage to property. The Contractor shall be solely responsible for any damage to public and private property resulting from his operations, whether on rights-of-way, on land adjacent thereto, or on approved access roads. Whenever warranted, the Owner may take deductions from payments due to the Contractor to cover such damages as determined by the Engineer.

GC-20 CONDUCT OF CONTRACTOR'S EMPLOYEES

The Contractor shall at all times take all reasonable precautions and steps to prevent any unlawful, riotous or disorderly conduct by or among his employees for the preservation of peace and protection of persons and property in the neighborhood of the Works. The Contractor shall comply with the Government laws, regulations and orders being enforced as regards to the use of drugs. The Contractor shall not allow any of his employees to work when said employees are under the influence of alcoholic drinks or drugs.

GC-22 SAFETY, PROTECTION, AND SECURITY

Except for the "special risks", the Contractor is solely responsible for the safety, protection, and security of his personnel, third parties, the public at large, the works, equipment, installations, and the like. Accordingly, the Contractor shall comply faithfully with any and all pertinent laws, decrees, regulations, and ordinances and shall take all necessary safeguards to the end of preventing the occurrence of accidents, loss, or damage of any kind during the execution of the Works.

He shall provide, erect, and maintain all necessary and suitable barricades and sufficient warning lights, danger signals, and other signs and shall take all necessary precautions for the protection of the Works and the safety of his personnel and the public. Roads closed to traffic shall be provided with effective barricades and shall be properly illuminated at night. The Contractor shall adopt or apply these protections in accordance with the standards set by the Safety Organization of the Philippines, Inc. and the Bureau of Labor Standards. Detours shall be provided with detour signs conspicuous to motorists and the public.

Unfinished excavations, open holes, and others which may pose as dangers to the public shall be posted with warning signs and illuminated at night.

In connection with this clause, the Contractor shall, at his own expense, obtain and maintain for the duration of the Contract the following insurance coverage:

a) All Risks Builder's Risk Insurance to cover the entire works (permanent or

temporary) from any and all kinds of damages and losses arising out of any cause whatsoever. This insurance shall be in the joint names of the Contractors and the Owner.

b) Third Party Liability Insurance to cover injury or death to persons or damages to property caused by the works or by the Contractor's vehicles, tools and/or equipment or personnel. This insurance shall be in the joint names of the Contractor and the Owner.

c) Workmen's Compensation Insurance as required under the Social Security Law.

d) Other forms of insurance the Contractor may deem necessary to protect his interest and that of the Owner in connection with the contract work.

The insurance policies of the above shall be affected by the Contractor with any reputable insurance company acceptable to the Owner and shall be submitted to the Owner prior to the issuance of the Notice to Proceed.

If the Contractor fails to effect and keep in force the insurance referred to herein or any other insurance which he may be required to effect in connection with the Contract, the Owner may effect and keep in force any of such insurance and pay such premium or premiums as may be necessary for the purpose, and from time to time deduct the amount paid by the Owner from any monies due or which may become due to the Contractor.

In addition, the Contractor shall cooperate with the Engineer in all matters pertaining to prevention of accidents. In this regard, the Contractor shall fully acquaint himself with all regulations and instructions which the Engineer may, from time to time, issue during the performance of the Contract and shall closely coordinate with the Safety Inspector or related personnel of the Engineer in order to develop an effective program to promote safety practices and procedures in the execution of the Works.

In the event of the contractor fails to observe the above safeguards, the Engineer may, at the Contractor's expense, take whatever measure is deemed necessary for his protection and that of the Contractor's personnel and third parties.

Moreover, the Owner may at his own discretion ban the Contractor perpetually or for a certain period of time from entering into contract with the Owner, and may order the immediate rescission or termination of the Contract. In no case shall the exercise by the Owner of the prerogative referred to above diminish the Contractor's responsibility under the Contract.

GC-23 DAMAGE TO PERSONS AND PROPERTY

The Contractor shall render harmless and indemnify the Engineer/Owner in respect of all claims, demands, proceedings, damages, costs, charges and expenses whatsoever arising out of or in relation to any such matters insofar as the Contractor is responsible therefor. All operations necessary for the execution of the Works and for the construction of any temporary works shall, in so far as compliance with the requirements of the Contract permits, be carried out in order not to interfere unnecessarily or inconvenience the public in the use or access to public or private roads and footpaths or properties, whether in the possession of the Owner or of any other person.

GC-24 TRANSPORT TO AND FROM SITE

The Contractor shall inspect all possible routes to the Site with the purpose of ascertaining the safety of transporting his construction equipment and materials over public roads, bridges, culverts and other structures at the least inconvenience and discomfort to the public. If necessary, he shall strengthen these bridges and culverts and protect the roadways from possible damage during transit of his vehicles to and from the site. Where necessary, he shall construct detour roads. also, if it is necessary to cross private properties to gain entry to the Site or to the sources of aggregates and/or other construction materials, it is the responsibility of the Contractor to negotiate with the landowners for permission to pass through.

The Contractor shall repair and maintain these temporary roads, bridges, culverts and other structures throughout the duration of the Contract or for as long as they are used by the Contractor and the Engineer/Owner. All permanent works shall be restored to their original condition upon completion of the contract.

All costs pertinent to the above shall be at the expense of the Contractor and is understood to have been included in the Total Bid Price.

GC-47 CLEAN-UP OF SITE UPON COMPLETION OF WORKS

Upon completion of the Works, the Contractor shall clear away and remove from the site all construction plant, supplies, materials, rubbish and temporary works of every kind and leave the site and works clean and in a workmanlike condition to the satisfaction of the Engineer.

APPENDIX J

EIA CAPABILITY STRENGTHENING PROGRAM OF DPWH

EIA CAPABILITY STRENGTHENING PROGRAM OF DPWH

Scope of the Program

The objective of this program is to develop the capacity to perform EIAs through a strong national program, initially aimed at consolidating capabilities at the central level, then expanding to regional and district offices. The scope of this capability building program includes the following tasks:

a. Establishment of a specialized EIA group within the existing EIA Section of the Planning Service and the Project Management Offices involved in environmental impact assessment (EIA) implementation;

b. Training of the EIA group in all phases of Philippine environmental impact studies (EIS) requirements for infrastructure projects as well as the EIA requirements of the World Bank. The training should be performed along similar lines as, and in coordination with, the capability strengthening program being implemented within EMB and its regional offices;

c. Establishing a liaison between the DPWH EIA Group, Environmental Management Bureau (EMB) and the Project Management Office (PMO) for International Bank for Reconstruction and Development Bank-assisted projects (PMO-IBRD), the PMO for Asian Development Bank assisted projects and other concerned PMOs within DPWH in order that the capabilities developed as part of this program will be rapidly disseminated throughout the central DPWH offices. Encourage the, support and participation of ADB and bi-lateral financing institutions in the capability building program;

d. Organize training seminars and workshops facilitated by the EIA group for key management and implementation personnel from the design, construction and planning PMOs to enhance awareness and familiarize them with the EIS/EIA process and the function of the EIA group;

e. From the first year, formulation of a memorandum of agreement (MOA) between EMB and DPWH to authorize DPWH to screen infrastructure projects, categorize them in accordance to the World Bank Categories outlined in Operational Directive OD 4.01, review Project Descriptions/Initial Environmental Evaluations (PD/IEE) and request issuance of Environmental Compliance Certificates (ECC) from EMB for projects which are neither environmentally critical nor located in environmentally sensitive areas without further review by EMB. Thus

only sensitive projects would undergo a full EIS/EIA study at the order of DPWH, and the report would be submitted to EMB for review and approval. This approach would substantially expedite the EIA process and reduce the load of non-critical projects awaiting EMB review.

f. Coordinate with DENR and EMB on the formulation of common and acceptable guidelines, criteria, the periodic mapping out or the pinpointing of environmentally critical areas nationwide, and the establishment of criteria/standards to be used by DPWH in screening and evaluating its projects whether these are: (a) not environmentally critical or (b) environmentally critical.

g. Preparation of an overall institutional development plan for EIA and promoting environment consciousness concerns to DPWH staff especially those concerned in planning and design, implementation, and maintenance at Central Office, Bureaus, PMOs, regional and district office levels.

h. Assisting and undertaking the preparation of project proposals related to strengthening the long term capability of DPWH in EIA, negotiating such proposals with other Government agencies (e.g. NEDA, Investment Coordinating Committee, DENR, etc.) as well as international lending institutions and development organizations in order to have these pipelined and implemented at the earliest practicable time possible.

Schedule of the Program

This five year program is an part based on a plan formulated by DPWH for developing strong EIA capabilities within its central operations and then transferring these skills to its regional and district offices. Figure 1 shows the five-year program of activities. The emphasis of the program during the first year will be to develop EIA capabilities at headquarters, thus creating program momentum and establishing the EIA group as a recognized institution for performing and/or managing EIAs for infrastructure projects. The EIA training program should be based on, and coordinated with, similar capability projects currently being undertaken in EMB. The coordination between DPWH and EMB is vital since the program objective is for DPWH to perform screening of projects and request direct issuance of ECCs for non-critical projects from EMB.

During the second year the emphasis would be on further strengthening and expanding capabilities at headquarters while initiating capability development at regional and district DPWH offices. Discussions on formulating a MOA between DPWH and EMB should also be initiated during the second year while encouraging the development of coordination between the DPWH EIA group and EMB. During the third year emphasis should be on sustaining the DPWH central capability and expanding regional capacity

The MOA should be finalized during the period and the EIA group should begin full screening of projects with EMB coordination on a trial basis. During the fourth and fifth years of the program, the screening process should be streamlined and expanded to the regional offices and only environmentally sensitive project should undergo full EIS/EIA and be submitted to EMB for review.

The objective of the DPWH EIA Capability Strengthening Program is therefore to enhance the existing EIA Section of the Planning Service and the PMOs to develop a core of EIA team within the DPWH. The group will be organized by recruiting qualified personnel from within DPWH and training them with assistance from international consultants (Consultants) recruited by the World Bank and in coordination with the EMB capability development program. The intent of the program is to address a major portion of DPWH's program backlog during the five year term required for capability development.

In the first year of the program, a core team of approximately fifty (50) individuals should be trained in EIA techniques by the Consultants, of which 20 shall be retained to constitute a core of EIA team. The training should include screening techniques for the DPWH projects and performing detailed EIAs for projects found to have significant environmental impacts. The Consultants should develop a streamlined screening methodology to be used by the EIA group. The photocols for performing EIS/EIAs in accordance with EMB and World Bank requirements should be formulated with emphasis on performing assessments before or during the feasibility study stage of a project. All documents should be submitted to DPWH and EMB for formal approval. Following the completion of their training the trained EIA personnel, under the supervision of the Consultant will lead teams from key offices of DPWH in performing screenings and EIAs. The EIA team should also prepare the TOR for, and be given supervision and management responsibiltiy over EIAs perpared by local or international consultants for ongoing infrastructure programs.

Project managers from PMOs will also be the target of a significant number of training seminars as they have the authority and discretionary power to determine the degree to which the EIA process may be incorporated into feasibility studies. Similar training sessions will also be developed for Design and Construction Bureau Staff.

In the second year of the program, the core EIA team should be expanded to minimum of twenty five individuals. The additional personnel should be recruited from amongst those trained in the previous year. The core expanded team will then dedicate part of the year to training and consolidating EIA groups consisting of a minimum of six individuals at regional offices and thus transfer the major responsiblity for project screening to the regions. The training work should be accomplished where possible in coordination with the regional DENR/EMB offices. Projects requiring further in depth study will then be referred to the core team and an EIA will be performed in coordination with the regional EIA team. By this method, each member of the core team will be responsible for

coordinating the work in one region and will be the primary point of contact for the region's EIA team.

The initial discussions for formulation of the MOA between DPWH and EMB should also begin in the second year. The Consultant should facilitate these discussions by encouraging EMB's involvement in the DPWH capability development program and their approval of the techniques and standards adopted by the EIA team. The Consultant should also, with the aid of senior members of the EIA group, provide technical support to the DPWH officers leading the discussions of MOA formulation. The Consultant shall incorporate in the operational scheme the input of the environmental non-government organizations (NGOs) and private sector groups (e.g., Greenpeace affiliated and those with proven track records).

The third year of the program will be critical in many aspects. First, the MOA should be formally adopted, thus the responsibility for screening projects and providing clearance for issuance of the ECC by EMB will be entirely with the EIA group. Performance of EIS/EIAs will also be the responsibility of the EIA group or will be implemented by consultants under their supervision. Initial review and approval of EIS/EIAs will also be provided by the EIA group prior to submission to EMB. Therefore by this approach, in the third year of the program a substantial portion of the DPWH backlog would have been reduced and the central EIA group and those of the regions would have gained significant experience. The program would therefore enter a sustainability phase and the backlog of projects with significant impacts would have been reduced and the load on EMB's limited capacity would be substantially alleviated. During this period, the central EIA group with the assistance of consultants will train about 2 participants from each district, for a total of 200 participants.

The fourth and fifth year of the program should require minimal direct input from the Consultant. The EIA group would function independently with a supervisory and occasional review role by the Consultant. At this stage the officers of the EIA group would identify needs for expansion or streamlining the program personnel or implementation methodology and make adjustment as needed.

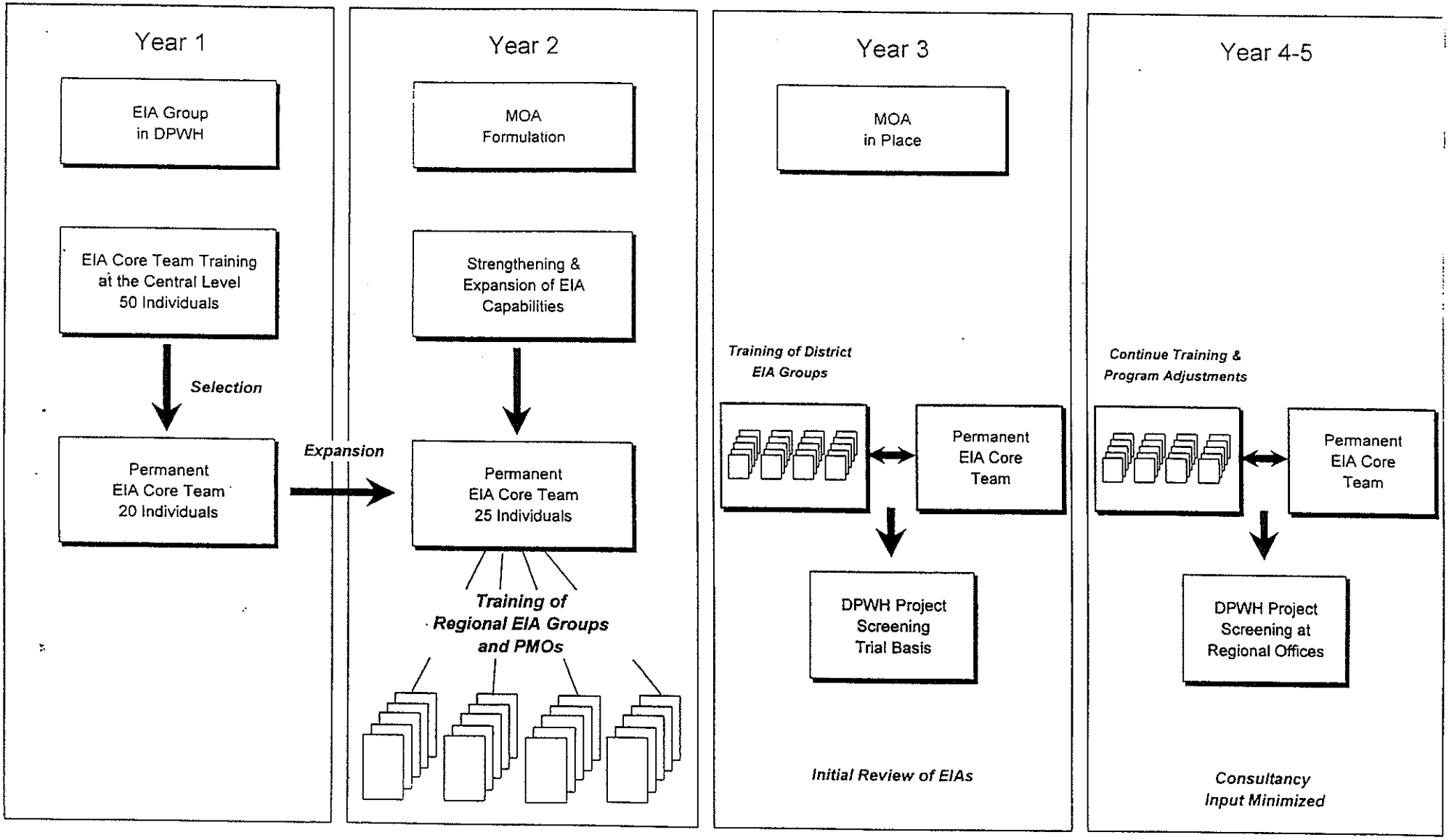

Figure 1 - PROGRAM SCHEDULE

APPENDIX K

ACCOUNTABILITY STATEMENTS