



JAPAN INTERNATIONAL
COOPERATION AGENCY



Republic of the Philippines
DEPARTMENT OF
PUBLIC WORKS AND HIGHWAYS

THE STUDY
ON
THE IMPROVEMENT OF EXISTING BRIDGES
ALONG PASIG RIVER AND MARIKINA RIVER
IN
THE REPUBLIC OF THE PHILIPPINES

FINAL REPORT
MAIN TEXT (1/3)

JULY 2004



KATAHIRA & ENGINEERS INTERNATIONAL



CTI ENGINEERING INTERNATIONAL CO. LTD.

Mr. Kazuhisa Matsuoka
Vice President
Japan International Cooperation Agency
Tokyo, Japan

July 2004

Dear Mr. Matsuoka,

Letter of Transmittal

We are pleased to submit to you the report of “The Study on the Improvement of Existing Bridges along Pasig River and Marikina River in the Republic of the Philippines”. The report includes the advises and suggestions of the authorities concerned of the Government of Japan and your agency as well as the comments made by the Department of Public Works and Highways and other authorities concerned in the Republic of the Philippines.

This report studies and analyses the condition of seriously and heavily damaged and deteriorated existing seventeen (17) bridges along Pasig River and Marikina River and presents the improvement works of these bridges. The report also studies the construction of new bridge in line with improvement of traffic function of Ayala Bridge. Moreover, this report proposed the urgent improvement works of seven (7) bridges (existing six (6) bridges and new construction of one (1) bridge) to be implemented in the period 2004 – 2010. The Study concludes that these projects are technically, economically, financially and environmentally viable and will contribute the socio-economic development in Metro Manila. In view of the urgency of improving bridges in Metro Manila, we recommend the Government of the Philippines to implement the projects with top priority.

We wish to take this opportunity to express our sincere gratitude to your agency, the Ministry of Foreign Affairs and the Ministry of Land, Infrastructure and Transport. We also wish to express our deep gratitude to the Governmental Agencies concerned in the Republic of the Philippines for the close cooperation and assistance extended to us during the Study. We hope this report will contribute to the development of Metro Manila.

Very truly yours,

Mr. Tsuneo BEKKI
Team Leader
of the Study on the Improvement of Existing Bridges
along Pasig River and Marikina River
in the Republic of the Philippines

PREFACE

In response to a request from the Government of the Republic of the Philippines, the Government of Japan decided to conduct the Study on the Improvement of Existing Bridges along Pasig River and Marikina River in the Republic of the Philippines and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA dispatched a study team headed by Mr. Tsuneo Bekki of Katahira & Engineers International, and consisting of Katahira & Engineers International CTI Engineering International Co. LTD., to the Republic of the Philippines, five times between October 2002 and June 2004.

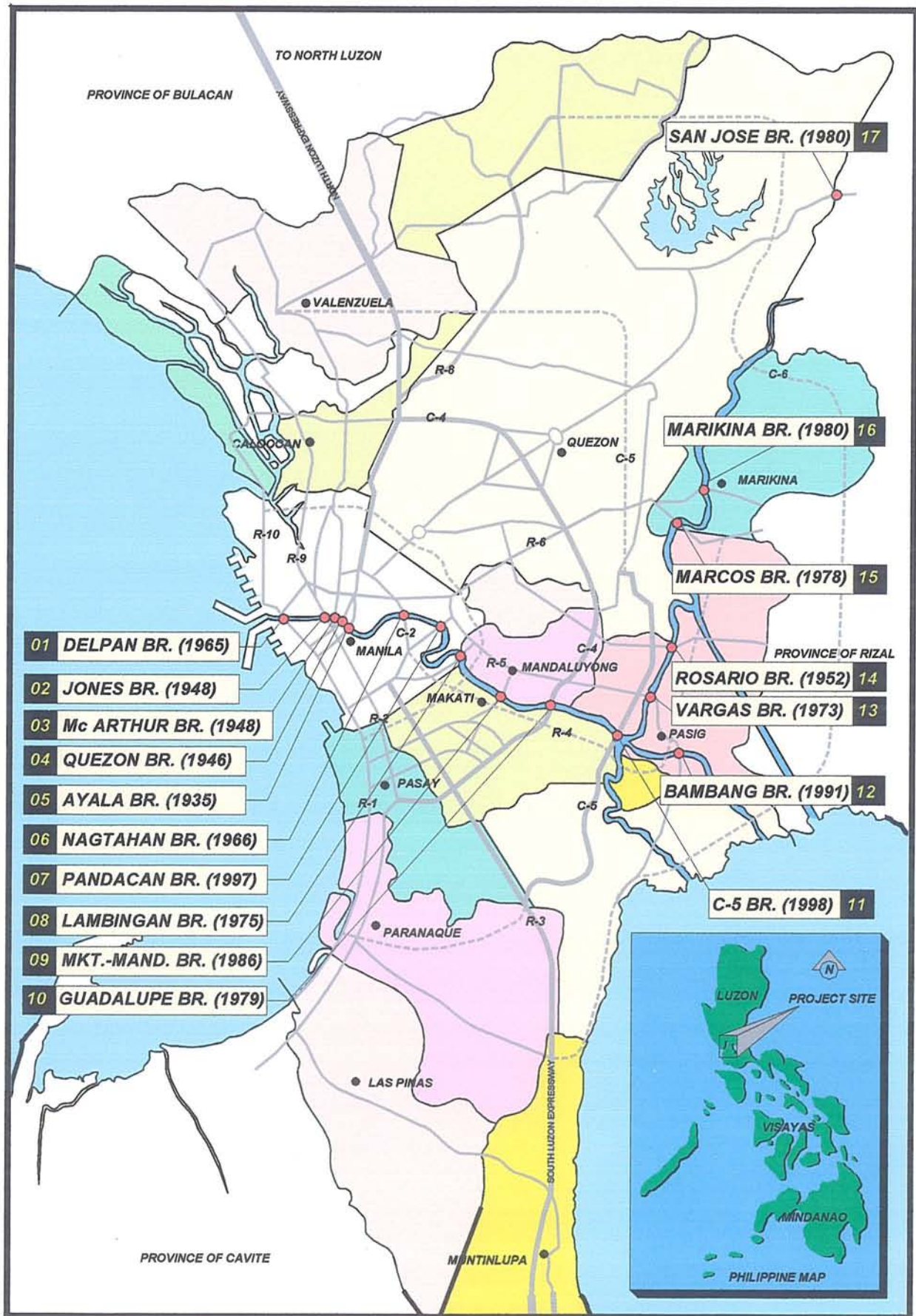
The team held discussions with the officials concerned in the Government of the Republic of the Philippines, and conducted field surveys on eighteen bridges (seventeen bridges : existing bridges, one bridge : a new bridge) . Upon returning to Japan, the team prepared this report.

I hope that this report will contribute to the improvement of the bridges in the Republic of the Philippines and to the enhancement of friendly relations between our two countries.

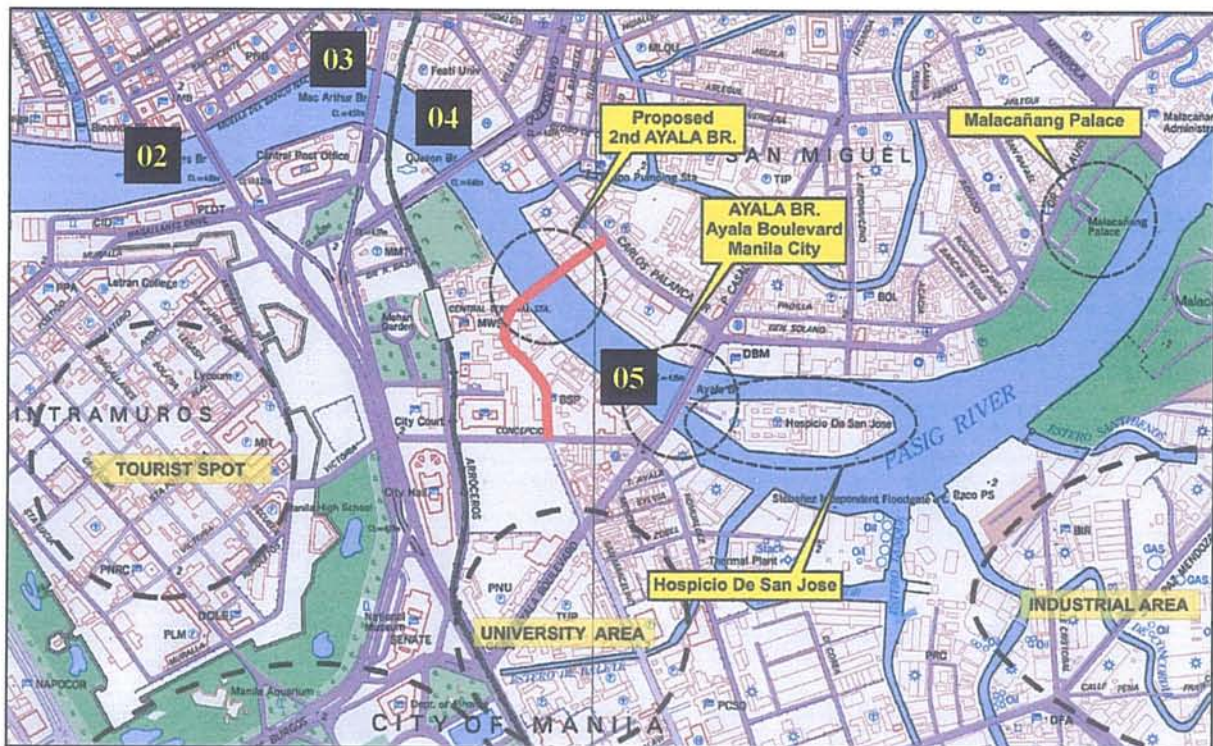
Finally, I wish to express my sincere appreciation to the officials of the Government and those concerned in the Republic of the Philippines for the close cooperation they extended to the study.

July 2004

Kazuhisa Matsuoka
Vice President
Japan International Cooperation Agency



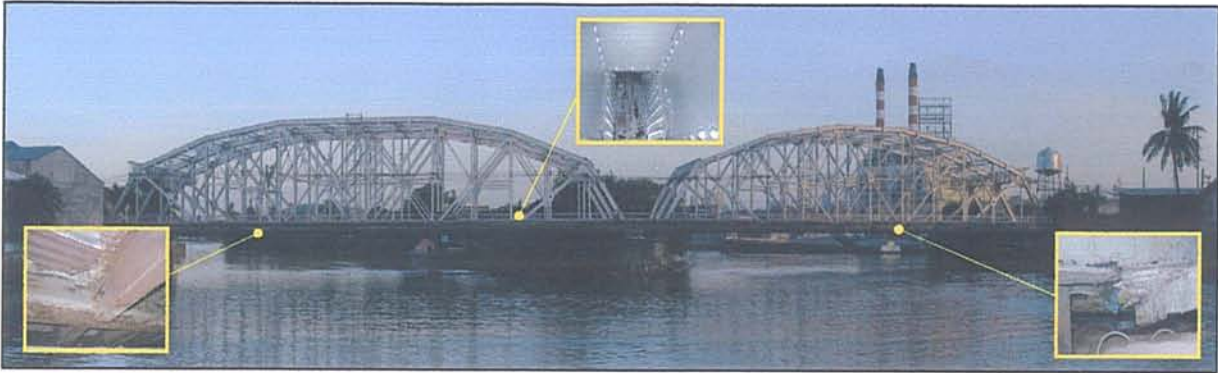
LOCATION MAP OF THE PROJECT



VICINITY OF PROPOSED SECOND AYALA BRIDGE

- 02 – JONES BRIDGE (1948)
- 03 – Mc ARTHUR BRIDGE (1948)
- 04 – QUEZON BRIDGE (1946)
- 05 – AYALA BRIDGE (1935)

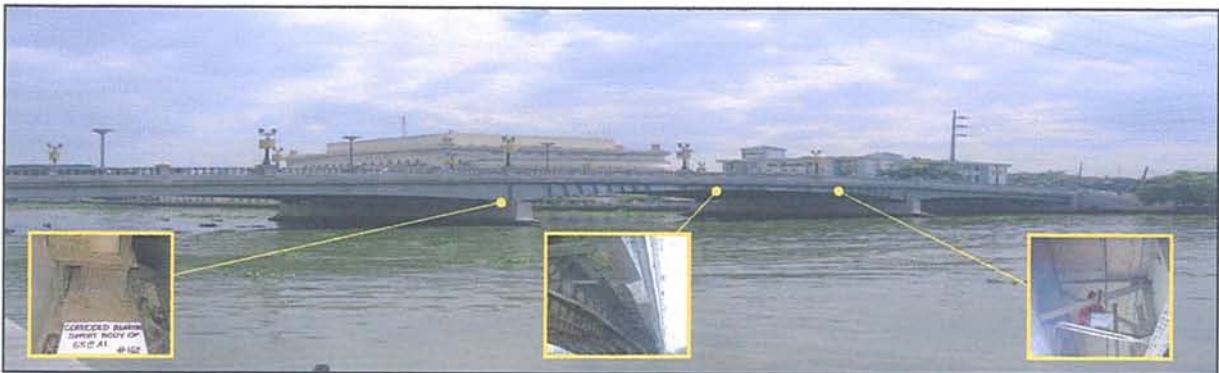
PHOTOGRAPH OF MAIN BRIDGES



Ayala Bridge



Proposed Second Ayala Bridge



Jones Bridge



Quezon Bridge



Lambingan Bridge



Guadalupe Quezon



Vargas Bridge

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ABBREVIATIONS

AADT	: Average Annual Daily Traffic
AASHTO	: American Association of State Highway and Transportation Officials
ADB	: Asian Development Bank
ADT	: Average Daily Traffic
AIP	: Annual Infrastructure Program
AMSL	: Above Mean Sea Level
APL	: Adaptable Program Loan
AS	: Allowable Stress
ASD	: Allowable Stress Design
BCA	: Benefit / Cost Analysis
BCGS	: Bureau of Coast and Geodetic Survey
BMS	: Bridge Management System
BOC	: Bureau of Construction
BOD	: Bureau of Design
BOE	: Bureau of Equipment
BOM	: Bureau of Maintenance
BORS	: Bureau of Research and Standards
BOT	: Built, Operation and Transfer
BPH	: Bureau of Public Highways
BRP	: Bridge Retrofit Project
BRS	: Bureau of Research and Standard
BSP	: Boy Scout of the Philippines
BSWM	: Bureau of Soils and Water Management
CGS	: Coast Guard Station
COD	: Chemical Oxygen Demand
COE	: Certificate of Exemption
CLUP	: Comprehensive Lands Use Plan
CPDO	: City Planning and Development Office
Danida	: Danish International Development Assistance

DAO	: Department Administrative Order
DBM	: Department of Budget and Management
DENR	: Department of Environment and Natural Resources
DEO	: District Engineering Office
DIA	: Direct Impact Area
DO	: Department Order
DO	: Dissolved Oxygen
DOTC	: Department of Transportation and Communications
DPH	: Department of Public Highways
DPWH	: Department of Public Works and Highways
DPWTC	: Department of Public Works, Transportation and Communications
ECA	: Environmental Critical Area
ECC	: Environmental Compliance Certificate
EIA	: Environmental Impact Assessment
EIAPO	: Environmental Impact Assessment Project Office
EIRR	: Economic Internal Rate of Return
EIS	: Environmental Impact Statement
EMB	: Environmental Management Bureau
EMK	: Equivalent Maintenance Kilometer
EO	: Executive Order
EUAC	: Equivalent Uniform Annual Cost
EVF	: East Valley Fault
FCA	: First Cost Analysis
FTI	: Flood Terminal Incorporated
FYBCR	: First Year Benefit Cost Ratio
GAA	: General Appropriate Act
GMA	: Greater Manila Area
GNP	: Gross National Product
GOJ	: Government of Japan
GOP	: Government of the Philippines

GRDP	: Gross Regional Domestic Product
HDSJ	: Hospicio de San Jose
HPD	: Historical and Preservation Division
HTL	: Highest Tide Level
IBRD	: International Bank for Reconstruction And Department
ICC	: Investment Coordinating Committee
ID	: Inspectorate Division
IEE	: Initial Environmental Examination
IIA	: Indirect Impact Area
IRR	: Implementing Rules and Regulations
ISD	: Inventory Statistics Division
JBIC	: Japan Bank for International Corporation
JICA	: Japan International Cooperation Agency
JRA	: Japan Road Association
LBCR	: Laguna de Bay Coastal Road
LCA	: Lifecycle Analysis
LF	: Load Factor
LFD	: Load Factor Design
LGUs	: Local Government Units
LOS	: Level of Service
LR	: Load Rating
LRF	: Load and Resistance Factor
LRFD	: Load Resistance Factor Design
LTFRB	: Land Transportation Franchising and Regulatory Board
LTO	: Land Transportation Office
LTPBMC	: Long Term Performance Based Maintenance Contract
MARINA	: Maritime Industry Authority
MBA	: Maintenance By Administration
MBC	: Maintenance By Contract
MBE	: Manila Bay Expressway

MCGS	: Marikina Central Gate Structure
MCTE	: Manila-Cavite Toll Expressway
MGB	: Mines and Geosciences Bureau
MHHW	: Mean Higher High Water
MMDA	: Metro Manila Development Authority
MMD	: Monitoring and Method Division
MMETROPLAN	: Metro Manila Transport, Land Use and Development Planning Project
MMUEN	: Metro Manila Urban Expressway Network
MMUESS	: Metro Manila Urban Expressway System Study
MMUSTRAP	: Metro Manila Urban Transportation Strategy Planning Project
MMUTDP	: Metro Manila Urban Transportation Development Plan
MMUTIP	: Metro Manila Urban Transportation Improvement Project
MMUTIS	: Metro Manila Urban Transportation Integration Study
MMUTPS	: Metro Manila Urban Transportation Planning Study
MNT	: Manila North Tollway
MOOE	: Maintenance, Operations and Other Expenses
MPH	: Ministry of Public Highways
MPW	: Ministry of Public Works
MPWH	: Ministry of Public Works and Highways
MRT	: Metro Rail Transit
MSHW	: Mean Springs High Water Level
MSL	: Mean Sea Level
MTC	: Ministry of Transportation and Communication
MTDP	: Medium-Term Transportation Development Plan
MTPDP	: Medium-Term Philippine Development Plan
MVFS	: Marikina Valley Fault System
MVUC	: Motors Vehicle Users Charge
NAIA	: Ninoy Aquino International Airport
NAPOCOR	: National Power Corporation
NEDA	: National Economic Development Authority

NEPC	: National Environmental Protection Council
NG	: National Government
NHA	: National Housing Authority
NHI	: National Historical Institute
NLE	: North Luzon Expressway
NLEE	: North Luzon Expressway East
NPV	: Net Present Value
NRIMP	: National Roads Improvement and Management Program
NSCB	: National Statistical Coordination Board
NSCP	: National Structural Code of the Philippines
NSO	: National Statistics Office
NCR	: National Capital Region
NHI	: National Historical Institute
OD	: Origin Destination
OSG	: Office of Solicitor General
PAF	: Project Affected Families
PAGASA	: Philippine Atmospheric Geophysical Astronomical Services Administration
PAP	: Project Affected Person
PAR	: Philippine Area of Responsibility
PCB	: Polychlorinated Biphenyls
PCG	: Philippine Coast Guard
PCU	: Passenger Car Unit
PHIVOLCS	: Philippine Institute of Volcanology and Seismology
PHMMS	: Philippine Highway Maintenance Management System
PIAM	: Participatory Impact Assessment Method
PIP	: Public Investment Program
PLDT	: Philippine Long Distance Telephone Company
PMO	: Project Management Office
PMP	: Preventive Maintenance Program
PNCC	: Philippine National Construction Corp.

PPA	: Philippine Ports Authority
PPD	: Planning and Programming Division
PPP	: Public-Private Partnership
PPP	: Piso Para sa Pasig
PRDP	: Pasig River Development Program
PRRC	: Pasig River Rehabilitation Commission
PRRP	: the Pasig River Rehabilitation Program
PS	: Planning Service
PSCG	: Pre-stressed Concrete Girder
PSG	: Presidential Security Group
PTFRPR	: Presidential Task Force on the Rehabilitation of the Pasig River
PTM	: Philippine Transverse Mercator
PUB	: Public Utility Bus
PUJ	: Public Utility Jeep
PW	: Present Worth
PWA	: the Public Works Act
QA	: Quarterly
RA	: Republic Act
RBIA	: Road and Bridge Information Applications
RDC	: Regional Development Council
RF	: Rating Factor
RHT	: Recorded Highest Tide
RIS	: Road Information System
RMS	: Root-Mean-Square
RO	: Regional Office
ROW	: Right-of-Way
RRS	: River Rehabilitation Secretariat
SAPROF	: Special Assistance for Project Formation
SLE	: South Luzon Expressway
STTC	: Saving Travel Time Cost

SVOC	: Saving Vehicle Operating Cost
TCM	: Traffic Capacity Manual
TD	: Tropical Depression
TSC	: Transportation Systems Center
TSP	: Total Suspended Particulate
TSS	: Total Suspended Soil
TT	: Tropical Typhoon
TTC	: Travel Time Cost
TWG	: Technical Working Group
UFG	: Ultrasonic Flaw Detection Test
UP-NCTS	: National Center for Transportation Study
UPV	: Ultrasonic Pulse Velocity
URPO	: Urban Road Projects Office
UTG	: Ultrasonic Thickness Gauging
UTSMMA	: Urban Transport Study in the Manila Metropolitan Area
VFC	: Vehicle Fixed Cost
VOC	: Vehicle Operating Cost
WDDT	: Daily Traffic Volume at Weekday
WEDT	: Daily Traffic Volume at Weekend
WVF	: West Valley Fault

PART I

GENERAL

CHAPTER 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Metro Manila, is the center of social, economic and political activities of the country. And because of this, Metro Manila's population is growing at the rate of 3.31% from year 1990 to year 2000, higher than the national average of 2.25%. Similar to other metropolitan areas of developing countries, this expansion has continued to produce far-reaching and complex problems, namely; disorderly development of urban areas, aggravation of urban environment and progressive traffic congestion.

Although the Philippines is a country that is frequently subjected to natural disasters such as earthquakes, typhoons, volcanic eruptions, flood, etc., Metro Manila has not yet been struck by a major destructive natural disaster. However, life line transport facilities like bridges over the two major rivers (Pasig river and Marikina river) must be prepared against any possible destructive natural disaster to protect over eight (8) million people and the socio-economic activities in Metro Manila.

As shown in the Location Map, Pasig River and Marikina River physically divide Metro Manila into three areas, namely Northern, Southern and Eastern areas. There are 12 bridges crossing Pasig River which connect the Northern with the Southern areas. On the other hand, crossing Marikina River are 5 bridges connecting the Northern with the Eastern areas. Most of the bridges are old and antiquated structures.

There are three major problems identified on the existing bridges over Pasig and Marikina Rivers:

- Most bridges are seriously and heavily deteriorated due to aging and increasing truck axle loads.
- Existing bridges are major traffic bottlenecks in Metro Manila due to their insufficient traffic capacity.
- The damages caused by the vessel collisions with these bridges are very serious, which can be attributed to large sized vessels, insufficient navigation clearances and inadequate protection facilities.

The existing bridges represent major traffic bottlenecks due to their limited traffic capacities. The improvement of the traffic function of these bridges, including the abutting intersections, is urgently needed in order to provide reliable river crossing facilities with enough capacity.

In addition, vessel collisions causes serious damages to those bridges. This would require an improvement of navigation clearance to prevent such collisions.

These bridges must be physically repaired, rehabilitated, strengthened or replaced. Although simple repair works for critical bridges have been conducted, these are only stopgap measures owing to low recognition of the importance of timely rehabilitation coupled with insufficient budget. Thus, more effective and permanent measures are urgently pursued.

To cope with the above issues, the Government of the Philippines (hereinafter referred to as "GOP") through the Department of Public Works and Highways (hereinafter referred to as "DPWH") sought a technical assistance from the Government of Japan (hereinafter referred to as "GOJ") to conduct a study entitled "The Study on The Improvement of Existing Bridges along Pasig River and Marikina River in The Republic of The Philippines" (hereinafter referred to as "the Study"). In response to the request of GOP, GOJ decided to conduct the Study through the Japan International Cooperation Agency (hereinafter referred to as "JICA"), which is the official agency responsible for the implementation of the technical cooperation program of GOJ. JICA organized and dispatched the JICA Study Team on October 21, 2002, which is scheduled up to the end of May of 2004, in accordance with the Implementing Arrangement signed on June 26, 2002 between DPWH and the JICA Preparatory Study Team.

1.2 OBJECTIVES

The objectives of the Study are:

- To conduct a study on the improvement of existing bridges along Pasig River and Marikina River, and
- To transfer technology on the improvement of existing bridges through the Study.

1.3 SCOPE OF THE STUDY

In order to achieve the objectives, the Study shall cover the following items:

(a) Existing Data Collection and Bridge Condition Survey

- Existing Data Collection and Review
- Social Condition Survey
- Bridge Condition Survey
- Assessment of Bridge Soundness

(b) Survey of Ayala Bridge

- Existing Data Collection and Review
- Detailed Bridge Survey and Assessment
- Natural Condition Survey
- Establishment of Design Criteria and Standards
- Comparative Study on Improvement Measures and Construction Method
- Preliminary Design of Improvement Measures of Bridge and Approach Road
- Preliminary Design of Prevention Measures for Vessel Collision
- Study on Construction Plan and Traffic Management during Construction
- Environmental Impact Assessment (EIA)
- Establishment of Maintenance and Management System
- Preliminary Cost Estimate
- Economic and Financial Analysis
- Preparation of Project Implementation Program

(c) Formulation of Master Plan on Bridge Improvement

- Formulation of Master Plan on Bridge Improvement
- Selection of Bridges for Feasibility Study
- Study on Prevention Measures for Vessel Collisions

(d) Feasibility Study on Selected Bridges

- Natural Condition Survey and In-Depth Bridge Survey
- Establishment of Design Criteria and Standards
- Comparative Study on Improvement Measures and Construction Method
- Preliminary Design of Improvement Measure of Bridges and Approach Roads
- Preliminary Design of Prevention Measures for Vessel Collision
- Study on Construction Plan and Traffic Management during Construction
- Environmental Impact Assessment (EIA)
- Establishment of Maintenance and Management System

- Preliminary Cost Estimate
- Economic and Financial Analysis
- Preparation of Project Implementation Program

(e) Overall Evaluation and Recommendation

1.4 EXECUTION OF THE STUDY

1.4.1 Study Schedule

Figure 1.4.1-1 presents the work schedule and flow of the Study, which commenced at the middle of October 2002 and completed at the end of May 2004 for a total duration of about 20 months.

1.4.2 Organization for Executing the Study

JICA organized a Study Team to carry out the Study and an Advisory Committee to review the findings of the Study. DPWH organized a Counterpart Team to collaborate with the JICA Study Team in carrying out the Study and a Steering Committee to ensure smooth conduct of the Study and to review and oversee the progress of the Study. The Organization Chart is shown in Figure 1.4.1-2

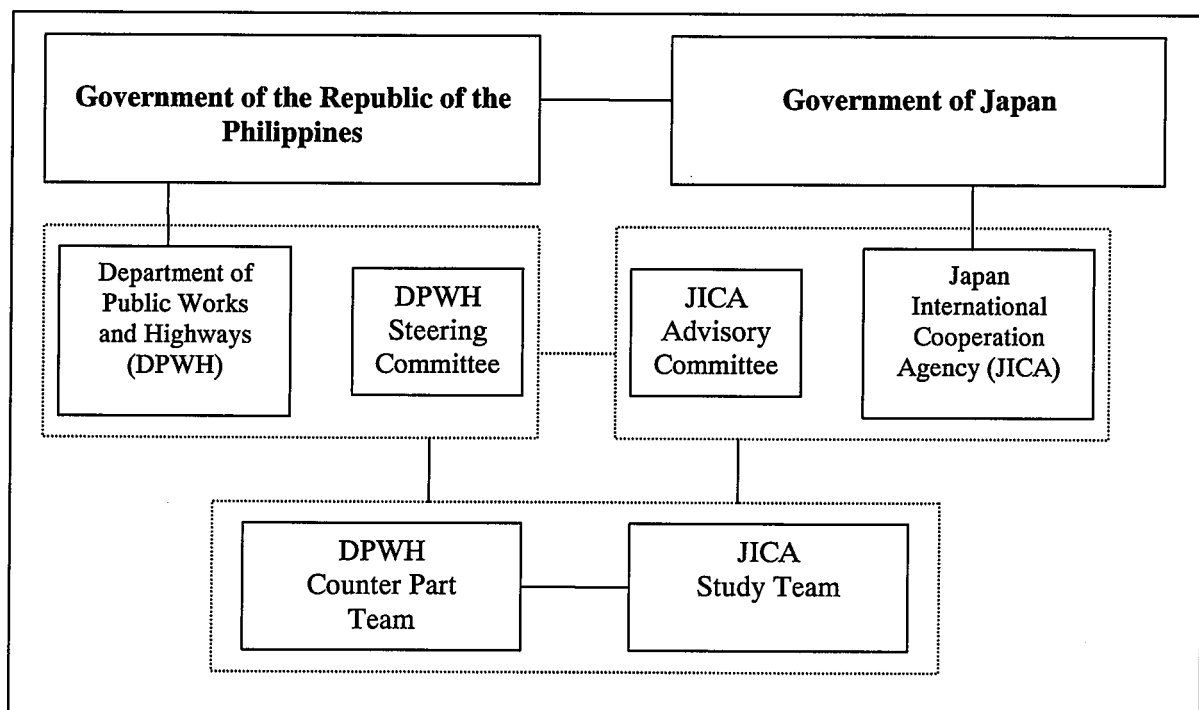


Figure 1.4.1-2 Organization Chart

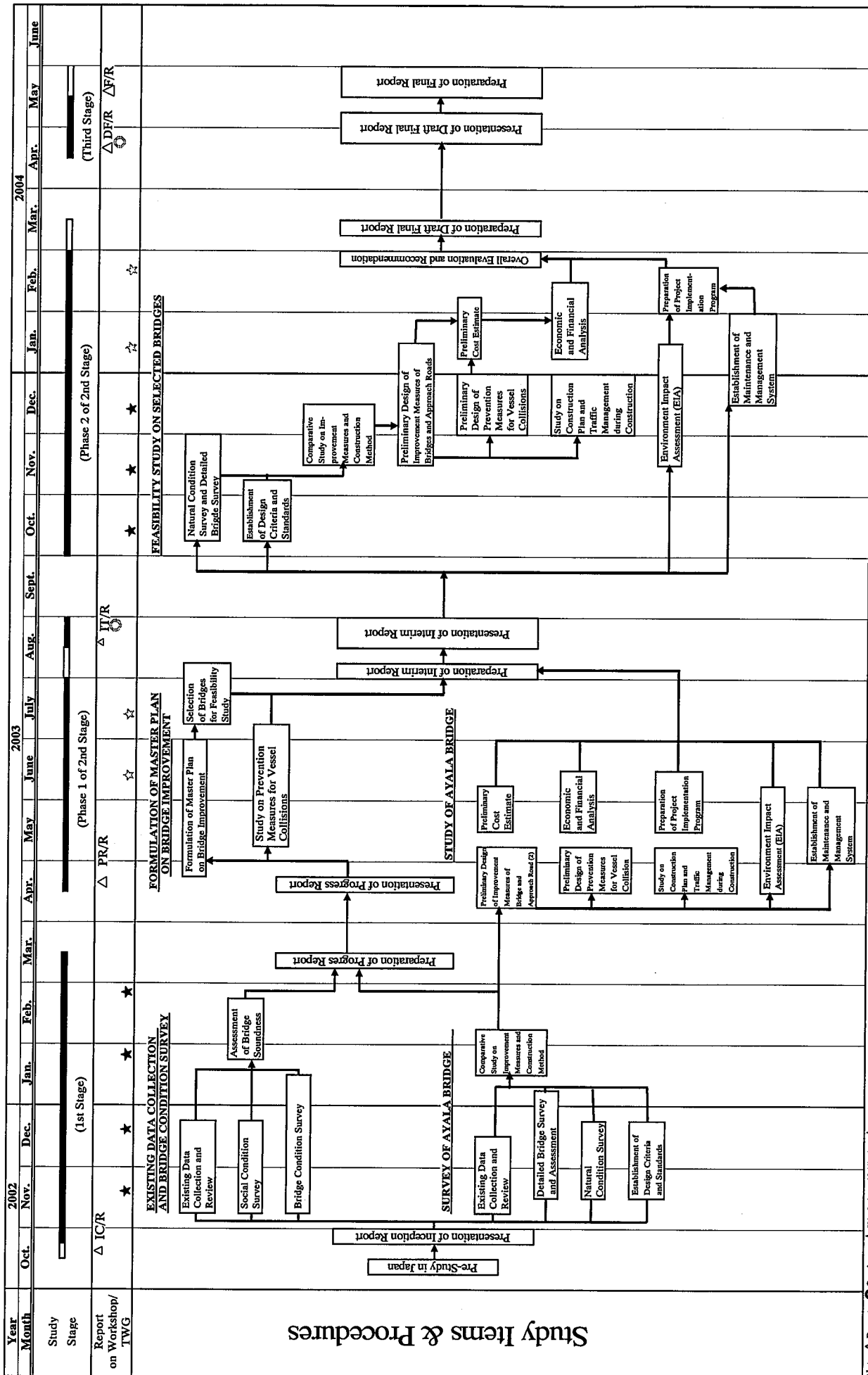


Figure 1.4.1-1 Study Flow Diagram

The JICA Advisory Committee:

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Mr. Tetsuhiro SHIMOZATO	Group Leader, Engineering Management Group, Maintenance Engineering Div., Maintenance and Facilities Dpt., Metropolitan Expressway Public Corporation

The JICA Head Office:

Mr. Akira NAKAMURA (Sep. 2003 - Present)	Director, First Development Study Division, Social Development Study Department
Mr. Toshiyuki KURONAYAGI (May 2003 – Sep. 2003)	Director, First Development Study Division, Social Development Study Department
Mr. Takeshi NARUSE (Oct. 2002 – May 2003)	Director, First Development Study Division, Social Development Study Department
Mr. Hideaki MARUYAMA (July 2003 – Present)	Deputy Director, First Development Study Division, Social Development Study Department
Mr. Yodo KAKUZEN (Oct. 2002 – July 2003)	Deputy Director, First Development Study Division, Social Development Study Department
Mr. Shinichi TANAKA	First Development Study Division, Social Development Study Department

The JICA Study Team:

Mr. Tsuneo BEKKI	Team Leader
Dr. Shingo GOSE	Deputy Team Leader/Bridge Engineer
Mr. Isao IGARASHI	Bridge Inspection/Evaluation Engineer
Mr. Nobutsugu CHIDA	Construction Planner/Cost Estimator
Dr. Takayuki TSUCHIDA	Traffic Engineer
Mr. Yuuzo MIZOTA	River Navigation Planner/Hydraulic Engineer
Ms. Annabelle HERRERA	Environmental Specialist
Mr. Toshio KIMURA	Economic/Financial Analyst
Dr. Jovito SANTOS	Bridge Inspection/Evaluation/Design Engineer

The Steering Committee:

Mr. Manuel BONOAN (Mach 1, 2003 – Present)	Chairman, Undersecretary for Planning and Technical Services, Department of Public Works and Highways (DPWH)
Mr. Teodoro ENCARNACION (Nov. 2002 – Feb. 28, 2003)	Chairman, Undersecretary for Planning Department of Public Works and Highways (DPWH)

Mr. Roberto CASTAÑARES (Jan. 03, 2003 – Present)	Member, Assistant Secretary for Planning, Department of Transportation and Communication (DOTC)
Mr. George ESGUERRA (Nov. 2002 – Jan. 02, 2003)	Member Assistant Secretary for Planning Department of Transportation and Communication (DOTC)
Ms. Corazon BAUSTISTA CRUZ	Member, Assistant General Manager for Planning, Metro Manila Development Authority (MMDA)
Ms. Bingle GUTIERREZ	Member, Executive Director, Pasig River Rehabilitation Commission (PRRC)
Mr. Arthur COSINGAN (Nov. 2003 – Present)	Member, Commandant, Philippine Coast Guard (PCG)
Mr. Reuben LISTA (Nov. 2002 – Nov. 2003)	Member, Commandant, Philippine Coast Guard (PCG)
Col. Delfin BANGIT (PA) (Feb. 2003 – Present)	GSC, Group Commander Presidential Security Group (PSG)
Mr. Hermogenes ESPERON Jr. (Nov. 2002 – Feb. 2003)	Member, Commanding General Presidential Security Group (PSG)

The DPWH Counterpart Team and Technical Working Group:

Mr. Carlos BADION*	Group Leader, Project Manager I (URPO)
Mr. Emmanuel SUPE*	Alternate, Engineer V (URPO)
Mr. Rogelio DAVID**	Member, Engineer III (BOD)/Road Engineer
Mr. Edwin MATANGUIHAN**	Member, Engineer IV (BOD)/Bridge Engineer
Mr. Leonardo LINGAN**	Member, Engineer III (BOD)/River Engineer
Mr. Antonio ELLIMA**	Member, Geologist II (BRS)/Geotechnical Engineer
Mr. Bibiano CALANOG**	Member, Engineer III (URPO)/Road Transport Supervisor
Mr. Rommel ROSALES**	Member, Engineer III (UPRO)/River Transport Planner
Mr. Rodrigo DE LEON**	Member, Engineer III (URPO)/Road Transport Planner
Mr. Romeo ABRIGO**	Member, Engineer III (URPO)/River Transport Planner
Ms. Jocelyn CORTEZ**	Member, Engineer II (URPO)/Economist
Ms. Belinda FAJARDO**	Member, Supervising Environmental Specialist (EIAPO)/Environmental Specialist
Ms. Sol ABASA**	Member, Community Development Officer (EIAPO)/Sociologist

Note: * - assigned on a full-time basis
 ** - assigned on a part-time basis

1.5 REPORTS

The following reports were prepared during the course of the Study:

- Inception Report (November 2002)
- Progress Report (March 2003)
- Interim Report (August 2003)
- Draft Final Report (March 2004)

The Final Report will be organized with the following:

- Executive Summary
- Main Text (1/3 to 3/3)
- Appendices