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REPUBLIC OF THE PHILIPPINES

FEASIBILITY STUDY

FOR


**MANILA - BATAAN COASTAL ROAD AND
ITS RELATED ROADS (C-5, C-6) PROJECT**

PROGRESS REPORT

MARCH 1979

**JAPAN INTERNATIONAL
COOPERATION AGENCY**

**MINISTRY OF
PUBLIC HIGHWAYS**

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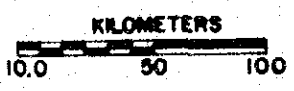
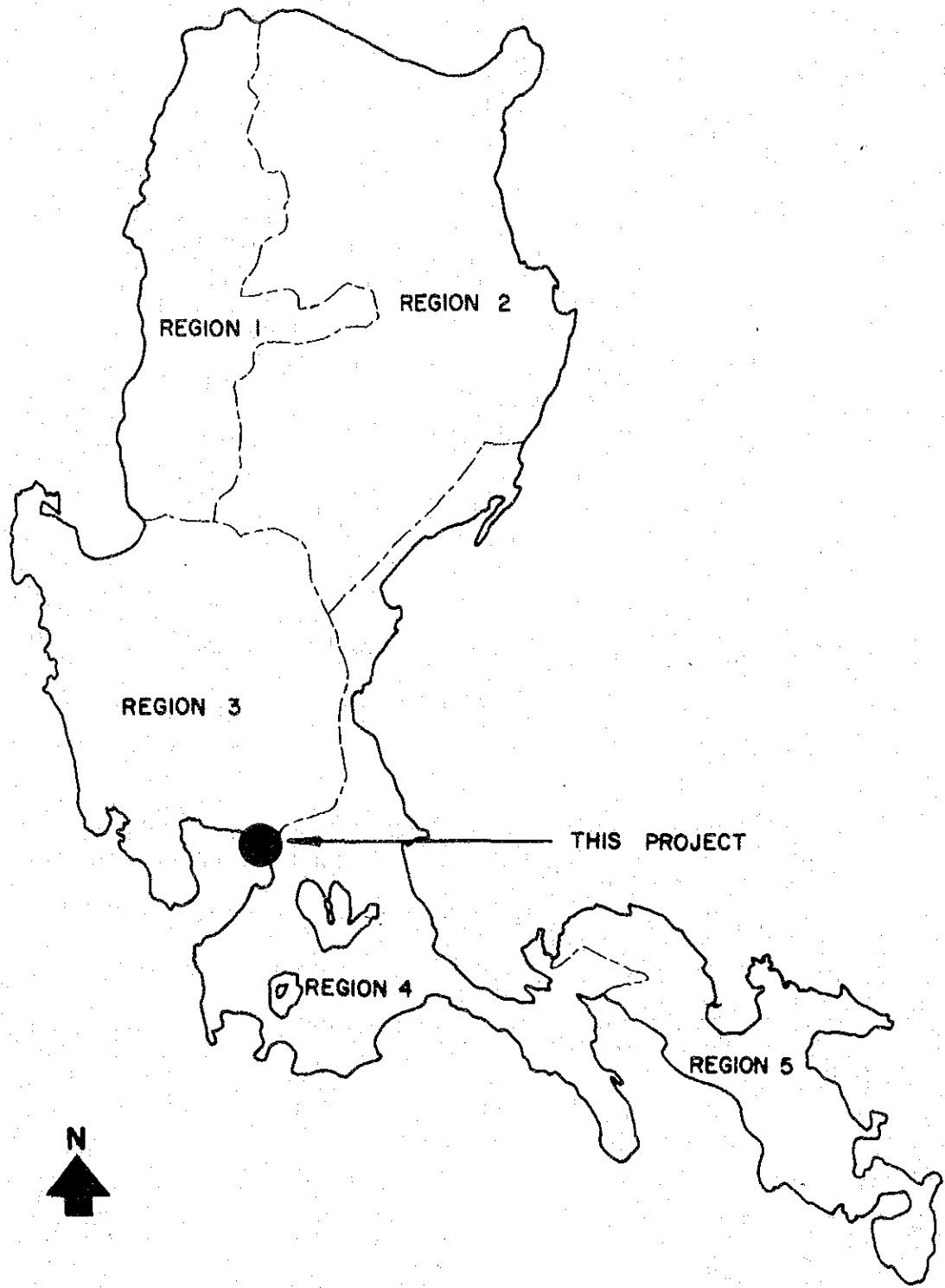
MARCH 1979

**JAPAN INTERNATIONAL
COOPERATION AGENCY**

**MINISTRY OF
PUBLIC HIGHWAYS**

国際協力事業団	
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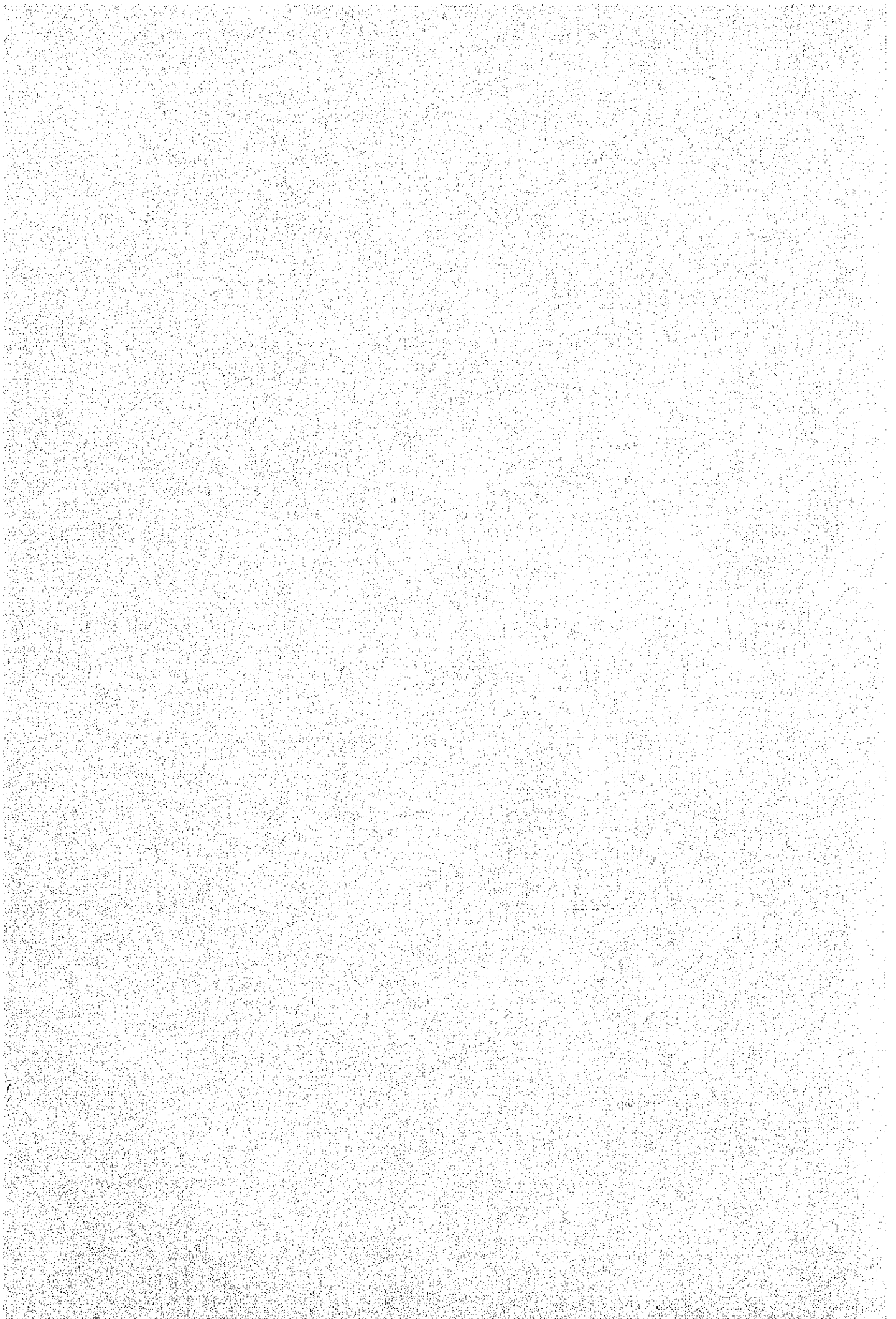
PROJECT LOCATION MAP



C O N T E N T S

	PAGE
PROJECT LOCATION MAP	
CHAPTER 1 INTRODUCTION	
1.1 General	1 - 1
1.2 Conduct of the Study	1 - 4
1.3 Staffing List	1 - 4
CHAPTER 2 MAIN ACTIVITIES	
2.1 General	2 - 1
2.2 Collection of Relevant Data	2 - 1
2.3 Land Use and Socio-Economic Studies	2 - 3
2.4 Traffic Study	2 - 37
2.5 Reclamation Study	2 - 47
2.6 Hydrological Study	2 - 55
2.7 Soils and Geotechnical Studies	2 - 58
2.8 Topographic Study	2 - 70
2.9 General Study of Manila-Bataan Coastal Road	2 - 75
APPENDIX	
1. Survey Record	1 - 1
2. List of Data Collected	2 - 1
3. Fishery Information	3 - 1

CHAPTER 1 INTRODUCTION



CHAPTER I INTRODUCTION

1.1 General

The Government of Japan, in compliance with the request of the Government of the Republic of the Philippines (hereinafter called the "Government") has agreed to extend technical assistance to the Government on the Feasibility Study for the Manila-Bataan Coastal Road and Its Related Roads (C-5 and C-6) Project (hereinafter called the "PROJECT").

Based on this decision, the Japan International Cooperation Agency (hereinafter called the "JICA"), an official agency responsible for the execution of the technical cooperation programs of the Japanese Government commenced the said Feasibility Study jointly with the Government.

On February 5, 1979 the survey team of JICA (hereinafter called the "Team") started their activities.

Prior to the discussion on the study approach for the Feasibility Study, a general familiarization investigation was undertaken by the Team and members of the Japanese Government Supervisory Committee (hereinafter called the "Supervisory Committee") accompanied by staff from the Ministry of Public Highways (hereinafter called the "MPH")

using a plane for the entire stretch of Manila-Bataan Coastal Road and C-5 and C-6 peripheral roads on February 6, 1979.

On the same day, an on-the-ground reconnaissance was also made by passenger cars to grasp the general situation of the Project area.

On February 7, 1979, the Supervisory Committee members and the Team consisting of experts on highway planning, town planning/environment, reclamation and hydrology, briefed the MPH concerning the Inception Report for the Project which was submitted by the Japanese Government.

Following the briefing made for the said Inception Report, on February 8, 1979, the MPH held a joint agency meeting inviting the members of the Steering Group, the Supervisory Committee members and the Team. In the meeting the Team explained the outline of the Feasibility Study.

During the stay of the Team in the Philippines, the sincere cooperation of the Government and private sectors made it possible for the works to be carried out very smoothly. The activities for Stage I scheduled in the Philippines are now duly completed and this report has been prepared to summarize the result of this work.

In accordance with the work items specified in the Inception Report, this report summarizes the work carried out in Stage I as follows:

- i) Determined scope and schedule of field surveys (Engineering, soils and materials, and traffic) to be performed at Stage II;
- ii) Listed and analyzed results of data collected; and
- iii) Conducted general study of Manila-Bataan Coastal Road.

The Team sincerely wishes that this Study will contribute towards the successful development of Metro Manila and towards the promotion of international friendship between Japan and the Republic of the Philippines.

1.2 Conduct of the Study

The PROJECT is being carried out jointly by the JICA and the MPH of the Government in coordination with various ministries and agencies.

For Stage I work, the Team stayed 49 days in Manila and vicinity starting from February 5, 1979, for fact-finding, data collection and discussion with the officials of various relevant ministries and agencies of the Government.

1.3 Staff List

The full list of staff for the first stage of the PROJECT is as follows:

A. Supervisory Committee Members of the Japanese Government

Shoji Miyazaki	Ministry of Construction, Japan
Takayuki Inoue	Ministry of Construction, Japan
Akio Namiki	Ministry of Construction, Japan
Masahiro Yabe	Ministry of Construction, Japan
Keiichi Tanaka	Ministry of Construction, Japan
Ichiro Kubota	Japan International Cooperation Agency

B. Steering Group of the Government of the Philippines

Antonio I. Goco	Ministry of Public Highways (MPH)
Jesus Sunga	National Economic and Development Authority (NEDA)

Jose R. Valdecanas	Ministry of Public Works, Transportation & Communication
Nathaniel Von Einsidel	Ministry of Human Settlements
Theron V. Lacson	Public Estate Authority
Francisco D. Corona	Ministry of Finance
Pedro P. Viray	National Pollution Control Commission
Rouel Lanche	Ministry of Agriculture
Honorato Santos	Bureau of Fisheries and Aquatic Resources
Cireneo Punzalan	National Housing Authority

C. JICA Survey Team

Akira Shikichi	Project Manager (PCI)
Toshio Kimura	Asst. Project Manager (JOC)
Teruhiko Horie	Transport Planner/Economic (PCI)
Isamu Watanabe	Fishery Planner (PCI)
Hidemoto Nojima	Highway Engineer (PCI)
Masayuki Hasegawa	Structural Engineer (PCI)
Hiroyuki Shiraiwa	Hydrological Engineer (PCI)
Hiroaki Furuya	Reclamation Engineer (PCI)
Yoshihiro Daicho	Soils and Materials Engineer (JOC)
Iehiro Noda	Surveyor (JOC)

PCI Pacific Consultants International

JOC Japan Overseas Consultants

D. Counterpart Staff

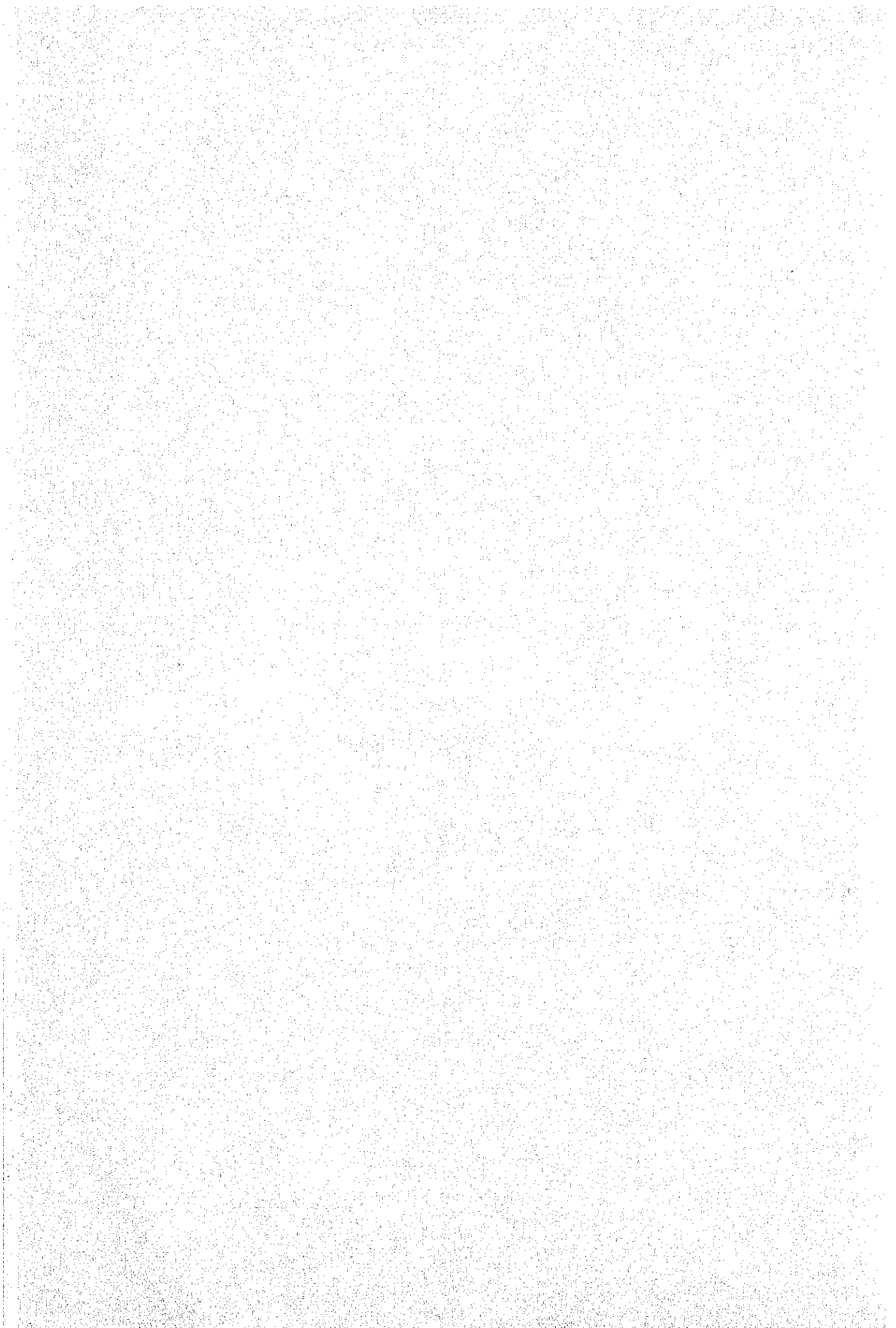
Teodulo M. Kasala	Project Manager (SPO, MPH)
Milardo D. Salvador	Asst. Project Manager (SPO, MPH)
Egardo Semilla	Location Engineer (SPO, MPH)
Teofilo Landicho	Reclamation & Location Engineer (SPO, MPH)
Virgilio Alagar	Highway Engineer (SPO, MPH)
Ignacio Gallego	Structural Engineer (SPO, MPH)
Bienvienida Firmalino	Structural Engineer (SPO, MPH)
Dominador Pajela	Hydrological & Drainage Engineer (MPWTC)
Godofredo Galano	Transport Planner (MPH)
Generoso Crisostomo	Civil Engineer (MPH)

SPO Special Project Office

MPH Ministry of Public Highway

MPWTC Ministry of Public Works, Transportation
& Communication

CHAPTER 2 MAIN ACTIVITIES



CHAPTER 2 MAIN ACTIVITIES

2.1 General

The Team and the Governments counterpart staff (hereinafter called the "TEAM") started their activities in the Philippines by submitting the Inception Report to the Government.

The formal meeting for discussion on the contents of the Inception Report was conducted on February 7 and 8, 1979.

After the meeting, the TEAM conducted the Stage I work such as collection of necessary data, initial field investigations, fishery study, general study of Manila - Bataan Coastal Road and preliminary analysis on the collected data.

The survey record of the Team during their stay in the Philippines is attached in this Report as Appendix I.

In this chapter, the summary of the studies conducted in the Philippines and the findings by the TEAM are briefly introduced.

2.2 Collection of Relevant Data

The TEAM collected the relevant data and information necessary for the study through the Governmental authorities, agencies and firms concerned.

During these activities, full assistance and cooperation were given to the Team by the Government's counterpart staff.

Data and information collected are listed and presented in Appendix 2 List of Data Collected.

2.3 Land Use and Socio-Economic Studies

A. Progress to Date

i) Data Collection Concerning Land Use and Socio-Economic Study

The Data lists as shown in Appendix 2 have all proved useful and informative in the fields of land use including land development for the reclamation area and socio-economic studies.

ii) Review of the Data and Preliminary Analysis

For the preparation of land uses including land development and socio-economic indices for the project area and the planned reclamation area, the following work items have been carried out:

- Review of the previous data and studies
- Preliminary analysis of population and labour force
- Preliminary analysis of income structure
- Review of the government policies for the project area

B. Findings at this Stage

i) Government Policies for the Project Area

The framework plans for the Metropolitan Manila Region (MMR)

and the Metropolitan Manila Area (MMA) have been presented in the "1978 Budget and General Appropriations Ordinance" and "Toward the City of Man", both prepared by the Ministry of Human Settlements (MHS).

The TEAM scrutinized the framework plans recommended and proposed in such previous studies as Metro Manila Transport Land Use and Development Planning Project (MMETROPLAN) and the Manila Bay Metropolitan Region Strategic Plan (MBMRSP).

This study adopts the said plans as premises for the project area.

A brief description of government policies is presented below:

a) Basic Policies *

For M M R

- For population distribution, the policy is to disperse the population to growth poles in selected urban centers.
- For the primary sector, the major consideration is continued growth to promote regional development.
- For urban expansion, the policy is basically to limit, control and redirect it to other growth centers and

* Source: 1978 Budget and General Appropriations Ordinance.

existing urban modes which are being developed into multi-functional clusters to ensure a desired level of self-sufficiency.

- Natural scenic areas and historical places are preserved to meet recreational and tourist needs.
- Development control is emphasized for critical areas.

For M M A

- In land use allocation, inefficient concentrations are decentralized, and inefficient dispersions are integrated.
- Employment opportunities are promoted in selected alternative growth centers.
- Support services and facilities are provided for and/or improved in the new projects and are also strengthened in the existing center.
- In transportation and communication, the objective is to improve accessibility between and among vital development centers.

b) Structure Plan *

For M M R

1. Growth centers identified:

- San Fernando and Angeles City, Pampanga
- Olongapo City, Zambales

* Source : 1978 Budget and General Appropriations Ordinance.

- Baliuag, Bulacan
 - Balanga, Bataan
 - Infanta, Quezon
 - San Pablo City, Laguna
 - Silang, Cavite
 - Lucena City, Quezon
 - Batangas City, Batangas
2. Potential agricultural/marine sectors are Bulacan-Pampanga areas. Sources of fresh water fish are the Pampanga Delta Candaba Swamp area and the Laguna de Bay.
 3. Socio-economic activities are dispersed to selected growth centers to act as counter-magnets to attract population and thereby to redistribute it.
 4. A 50-kilometer radius ban was instituted, forcing industries to locate their plants and factories outside of the 50-kilometer radius from Manila.
 5. Within the regional context, resources have been channelled to identified growth centers providing job opportunities.

For M M A

1. Major Land Development:
 - North of MMA is characterized by the expansion of linear development along major transport routes

up to Malolos and the coalescence of road towns along transport spines into a multi-nucleated urban complex and eventually into a multi-functional activities center.

- Development patterns in the eastern section shall be marked by the continuation of existing rapid industrialization while maintaining ecological balance, and other environmental objectives.
- Urban sprawl is being discouraged in the South and the alternative remedies are encouraging concentrations on existing activities centers and selective industrialization in the coastal towns adjacent to the Laguna Lake.

2. Metro Manila Area shall be divided into development intensity zones: low, medium and high.

Selected types of development shall be encouraged for these intensity zones.

3. Special Activity: Designated industrial districts are the following:

To the West - North Harbor Areas (expanded)

To the East - Marikina, Pasig, and Mandaluyong
on the EDSA-Pioneer Area

To the South - Parañaque, the strip along the
South Superhighway, the Alabang-

Las Piñas area.

4. New Urban Settlements:
 - Manila-Cavite Reclamation Area
 - Lungsod Silangan in Antipolo
5. Special Location Action Areas or Urban Development Areas and Special Project Sites.
6. Transportation System
 - Six Circumferential Roads and Ten Radial Roads.
 - Water transportation for Metro Manila.
7. Environmental Urban Design System

C. Study Area Defined

The principal criterion in the choice of the study area is the degree of influence to be given by the project in fields of urban and regional development and traffic demand. The project was divided into two phases, namely:

Phase I Manila-Bataan Coastal Road from C-4 to C-6 and its Related Roads (C-5 and C-6) are defined as the direct zones of influence.

Phase II Manila-Bataan Coastal Road from C-6 to Balanga is referred to as the influence area of the entire project or the project area.

Fig. 2-2 shows the area defined above. The provinces and/or jurisdictions in the study area are shown in the table 2-2.

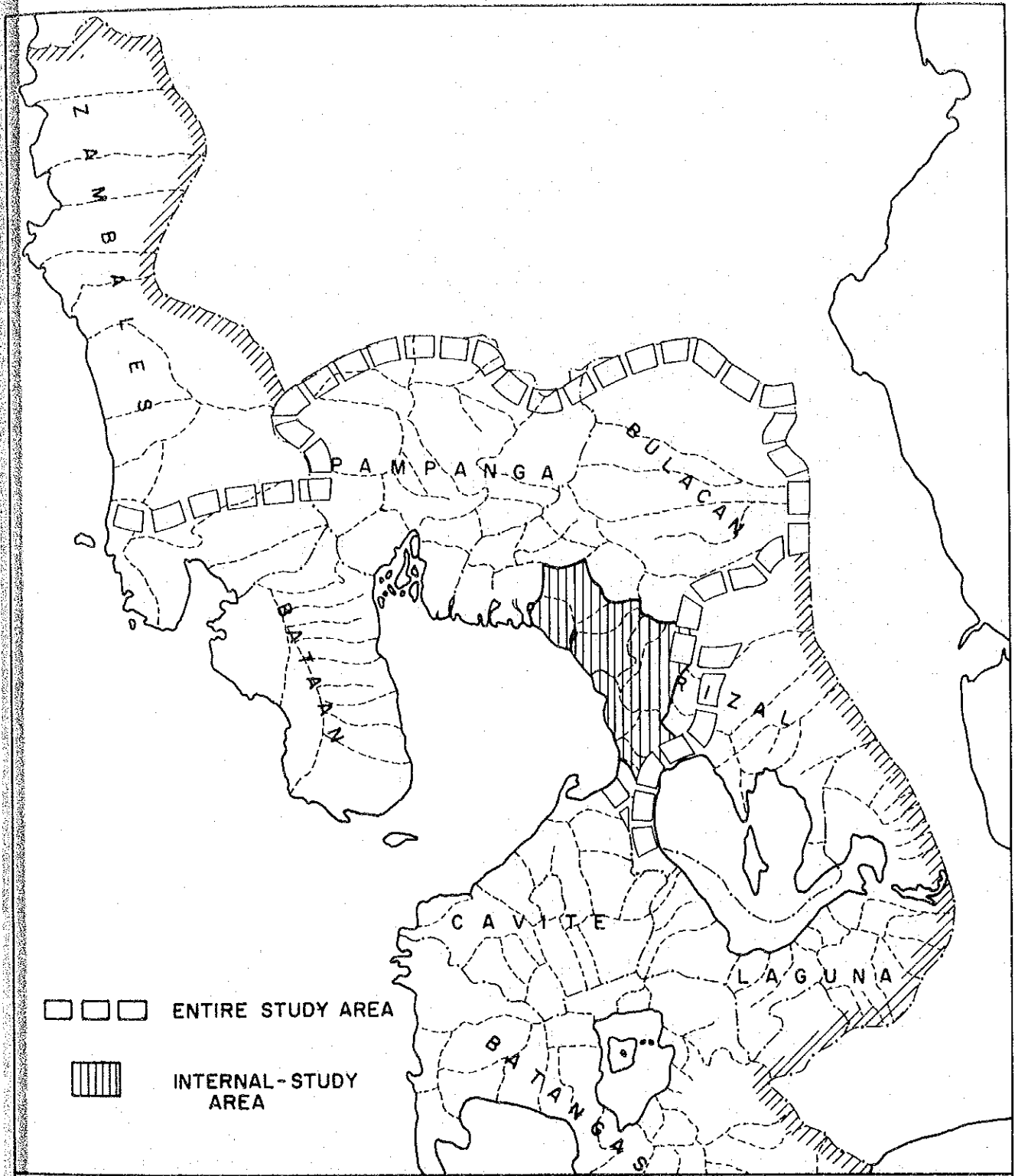
Table 2-1 PROVINCES IN THE ENTIRE STUDY AREA (PROJECT AREA)

DESCRIPTION	MBMRSP *	ENTIRE STUDY AREA
Zambales	0	0
Bataan	0	0
Pampanga	0	0
Bulacan	0	0
Metropolitan Manila	0	0
Rizal	0	
Cavite	0	
Laguna	0	
Batangas	0	

* Manila Bay Metropolitan Region Strategic Plan.

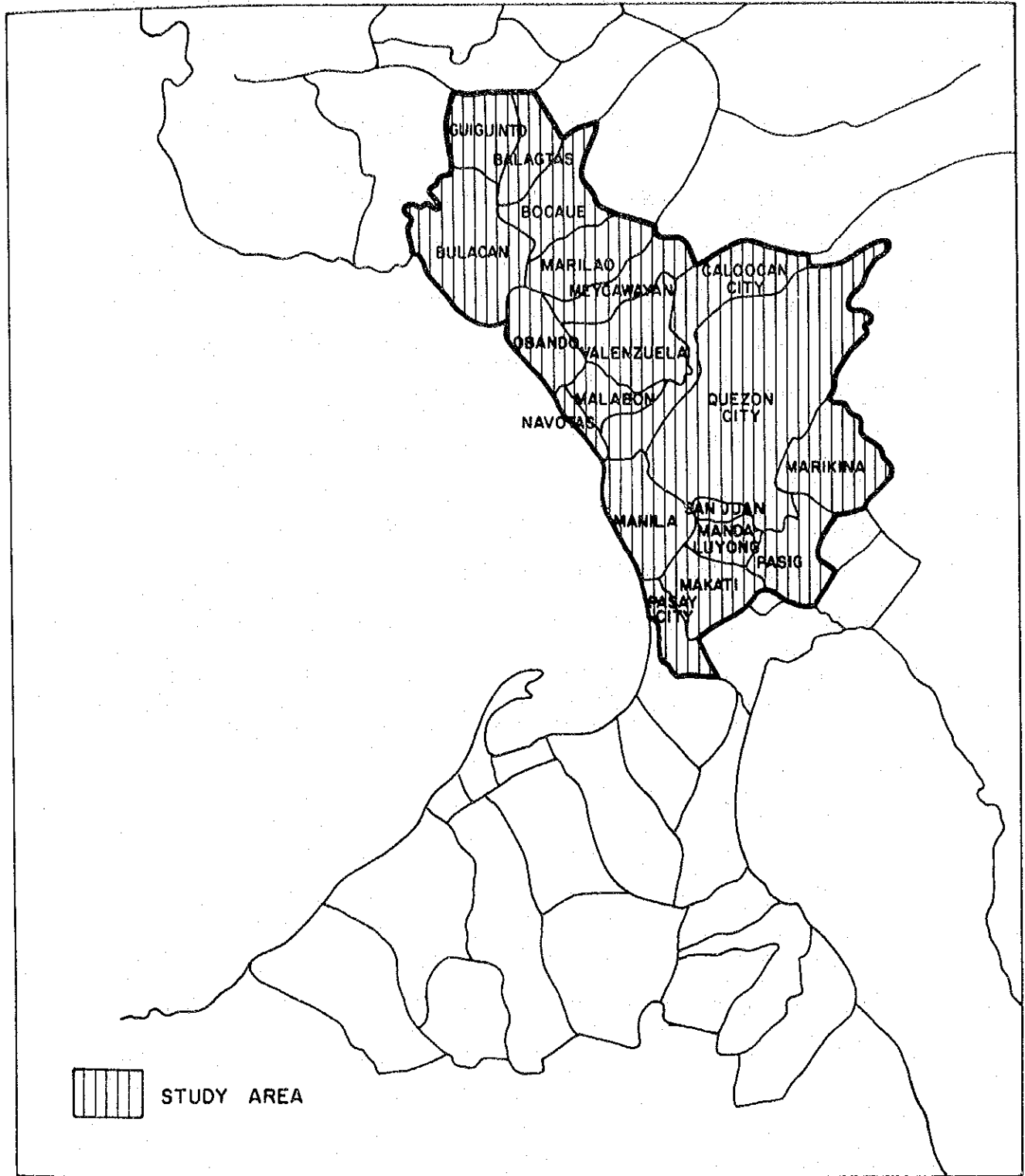
Table 2-2 JURISDICTIONS IN THE INTERNAL STUDY AREA

DESCRIPTION		INTERNAL STUDY AREA	M M A
Bulacan	Bulacan	0	
	Guiguinto	0	
	Balagtas	0	
	Bocaue	0	
	Marilao	0	
	Meycauayan	0	
	Obando	0	
Metro Manila	Valenzuela	0	0
	Navotas	0	0
	Malabon	0	0
	Caloocan City	0	0
	Manila	0	0
	Quezon City	0	0
	San Juan	0	0
	Mandaluyong	0	0
	Makati	0	0
	Pasay City	0	0
	Marikina		0
	Pasig		0
	Pateros		0
	Tagig		0
	Parañaque		0
	Las Piñas		0
Muntinlupa		0	



STUDY AREA Figure 2-1

JICA
MPH



STUDY AREA INTERNAL AREA Figure 2-2

JICA
MPH

D. Population Growth

The Philippines is noted as having rapid population growth.

The country's population in 1975 reached a total of 42.1 million. Since the census of 1948, the country has added 21.9 million to its population, at an average rate of 2.9 per cent during 1948-1960, 3.1 per cent during 1960-1970, and 2.8 per cent during 1970-1975.

Compared to the population growth in the country, the rate in the project area has been much faster. The project area's population increased from 4.0 million 1960 and 6.3 million in 1970 to 7.7 million by 1975 or 4.6 per cent for 1960 to 1970 and 4.3 per cent for 1970 to 1975.

Based on a medium projection, it is estimated that the population of the project area will reach 9.3 million in 1980, 13.0 million in 1990 and 16.8 million in 2000.

Translated as an annual growth rate, this means 4.0 per cent during 1975 to 1980, 3.4 per cent during 1980 to 1990 and 2.6 per cent during 1990 to 2000.

Table 2-3

POPULATION STATISTICS

1948 - 1975

Descriptions	1948	1960	1970	1975
<u>Population (Million)</u>				
Philippines	19.2	27.1	36.7	42.1
Project Area	2.6	4.0	6.3	7.7
Project Area/Phil. (%)	13.5	14.8	17.2	18.3
<u>Annual Growth Rate (%)</u>				
Philippines	-	2.9	3.1	2.8
Project Area	-	3.6	4.6	4.3

Source: NCSO

Table 2-4

POPULATION PROJECTIONS

1975 - 2000

Descriptions	1975 'Existing'	1980	1990	2000
<u>Population (Million)</u>				
Philippines	42.1	49.1	65.0	83.4
Project Area	7.7	9.3	13.0	16.8
<u>Annual Growth Rate (%)</u>				
Philippines	-	3.1	2.8	2.5
Project Area	-	4.0	3.4	2.6

Source: NEDA

Table 2-5

POPULATION BY PROVINCE
1948 - 1975

Province	Population				Percentage Change		
	1948	1960	1970	1975	1960 / 1948	1970 / 1960	1975 / 1970
Zambales	138,536	213,442	343,034	416,280	54.1	60.7	21.4
Bataan	92,901	145,323	216,210	263,269	56.4	48.8	21.8
Pampanga	416,583	617,259	907,275	1,041,164	48.2	47.0	14.9
Bulacan	411,382	555,819	836,431	1,050,134	35.1	50.5	25.5
Metro Manila	1,569,128	2,462,489	3,966,695	4,970,006	56.9	61.1	23.5
Study Area	2,628,530	3,994,332	6,269,645	7,740,853	51.9	56.9	23.5
MEMR	3,810,389	5,658,432	8,624,651	10,468,520	48.5	52.4	21.4
Philippines	19,234,182	27,087,685	36,684,486	42,070,660	40.8	35.4	14.7

Source: NCSO

E. Family Income Structure*

Table 2-6 presents the average family income by region in 1975. The average family in the Philippines was earning an estimated P5840 in 1975, which is P2104 or 56.3 per cent more than the P3736 average in 1971. In 1975, the average income in the MMA was double the national average. There appears a continuing dispersal of economic activities from the MMA to the selected growth centers.

Fig. 2-3 illustrates the family income distribution by income class. In Region III, about 44 per cent of 662 thousand families are in or below the P3000 to P3999 income bracket. But MMA has about 27 per cent of its families in the same income bracket. It is evident in Region IV that the income of families earning below P4000 yearly should be raised by providing more job opportunities, (See Table 2-7). Table 2-8 shows the average family income by the province in the study areas.

* Source: Special Release No. 190.

Table 2-6
 AVERAGE FAMILY INCOME BY REGION
 1971 and 1975

Region	1975	1971
Philippines	5,840	3,736
Region I	5,525	2,937
Region II	5,102	2,505
Region III	5,773	4,778
Region IV	7,775	5,577
Metro Manila	10,469	-
Region V	4,280	2,784
Region VI	5,484	3,214
Region VII	5,172	2,773
Region VIII	4,834	3,078
Region IX	5,662	2,943
Region X	3,803	2,786
Region Xi	6,307	3,960
Region XII	5,025	3,755

Source: Special Release No. 190

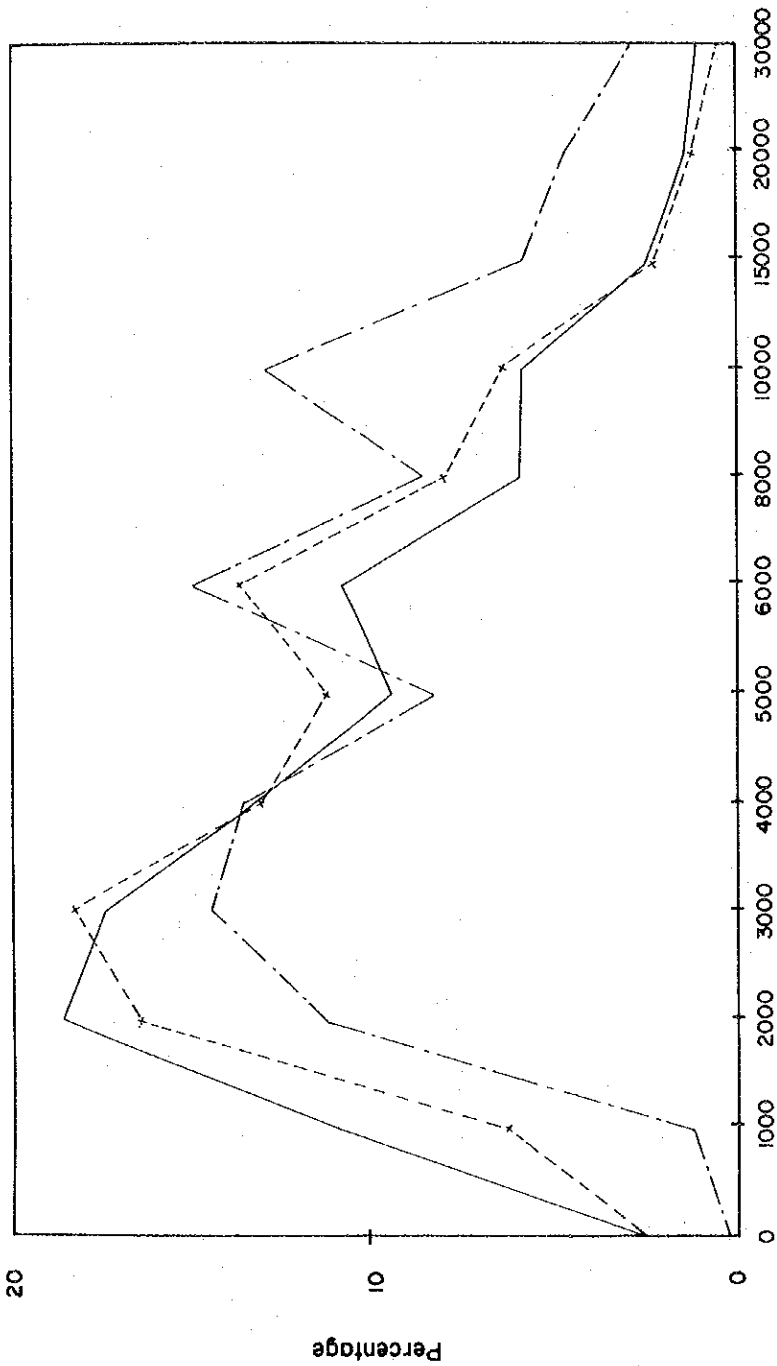
Table 2-7

FAMILY INCOME DISTRIBUTION BY REGION

(1975) (Unit: %)

	PHILIPPINES	REGION III	REGION IV	METRO MANILA
Total Population (In thousand)	6,859	662	1,658	770
Percent	100	100	100	100
Less than P1,000	2.7	2.6	2.1	0.2
P1,000 - P1,999	11.0	6.3	6.4	1.2
P2,000 - P2,999	18.6	16.4	15.2	11.3
P3,000 - P3,999	17.4	18.2	16.1	14.5
P4,000 - P4,999	13.2	13.1	13.1	13.6
P5,000 - P5,999	9.5	11.3	8.7	8.4
P6,000 - P7,999	10.9	13.7	12.8	14.9
P8,000 - P9,999	5.9	8.0	6.8	8.6
P10,000 - P14,999	5.9	6.4	9.7	12.9
P15,000 - P19,999	2.4	2.3	4.0	5.8
P20,000 - P29,999	1.4	1.2	3.0	4.7
P30,000 and over	1.1	0.5	2.0	3.9
Average Family Income (Pesos)	5,840	5,773	7,775	10,469

Source: Special Release No. 190



LEGENDS:
 Philippines
 Region III
 Metro Manila

Family Income Class (₱/Year)

Fig. 2-3

Family Income Distribution in 1975

Table 2-8
AVERAGE FAMILY INCOME BY PROVINCE
 1971 and 1975

Province	1 9 7 5		
	Number of Families '(In thousand)'	Total Family Income '(In Million Pesos)'	Average Family Income '(In Pesos)'
Zambales	74.7	537	7,188
Bataan	42.1	195	4,632
Pampanga	152.1	1,113	7,317
Bulacan	148.8	864	5,806
Metro Manila	769.7	8,063	10,475
Study Area	1,187.4	10,772	9,972
Philippines	6,859.3	40,059	5,840

Source: National Census and Statistics Office, 1971 & 1975

F. Land Use in MMR and MMA

i) Land Use in MMR*

The total area of the region excluding MMA is distributed as follows:

Table 2-9
LAND CAPABILITY CLASSIFICATION BY PROVINCE
1976

Province	A B C	D	L M	N	X	Y	TOTAL
Bataan	18,376	4,078	111,298	-	3,544	-	137,296
Bulacan	75,691	30,452	140,830	-	15,530	-	262,503
Pampanga	146,744	2,956	44,357	-	24,011	-	218,068
Zambales	68,696	2,051	297,943	-	2,750	-	371,440
T O T A L	309,507	39,537	594,428	-	45,835	-	989,307

Source: Land Capability Classification of the Bureau of Soils.

Total prime agricultural land (land classes A, B, C) in the northern part of the MBR measures 309,507 hectares.

Fertile agriculture lands in the region lie within the Pampanga River Basins. The major agriculture crops are palay, sugar cane and watermelon.

Approximately 60 per cent of the total land area is suitable for forestry and pasture (land classes L, M).

Bataan and Zambales lie along the coast with an aggregate

* Source: Realizing the Vision of a New Society.

marine coastal area of about 6,221 hectares. The region produces 6,576 metric tons of fish, most of which come from two fish landing sites in Bataan. It also produces 26,482 metric tons from brackish fishponds with an area of 30,620 hectares. It has 343 hectares of freshwater lake. Within Bulacan and Pampanga, an additional 37,424 hectares of swampland can be further developed for fishing.

ii) Land Use Plan in the MMR *

The projected population is expected to require additional lands for various uses. To meet this requirement, it is imperative to consider the land capability of each region and its resources and potentials. In Region III, which includes Nueva Ecija and Tarlac, it is envisioned that land uses by the year 2000 will be allocated as follows:

Table 2-10
LAND USE ALLOCATION - REGION III
1976 and 2000
(In thousand Has.)

Descriptions	1976	2000
Agriculture	590	842
Food & Commercial crops	(562)	(742)
Pasture	(28)	(100)
Forestry	416	792
Urban/Rural Settlements	87	143
Inland Fisheries & Marine Life Conservation	31	46
T O T A L	1,124	1,823

Source: Ministry of Human Settlements

* Source: Realizing the Vision of a New Society.

iii) Land Use in MMA *

a) Residential Areas

Residential areas are concentrated in the area within C-4, but residential development within the last five years has taken place mainly on the outskirts of the inner core, to the north in Caloocan and Quezon Cities, to the east in the Marikina Valley and to the south in Las Piñas and Parañaque.

Slum and squatter areas are mainly localized in certain parts of MMA such as Tondo and Caloocan City.

b) Commercial Area

Fig. 2-4 shows the distribution of commercial land uses. It indicates that these are spread widely throughout the urban area, especially along the major thoroughfares.

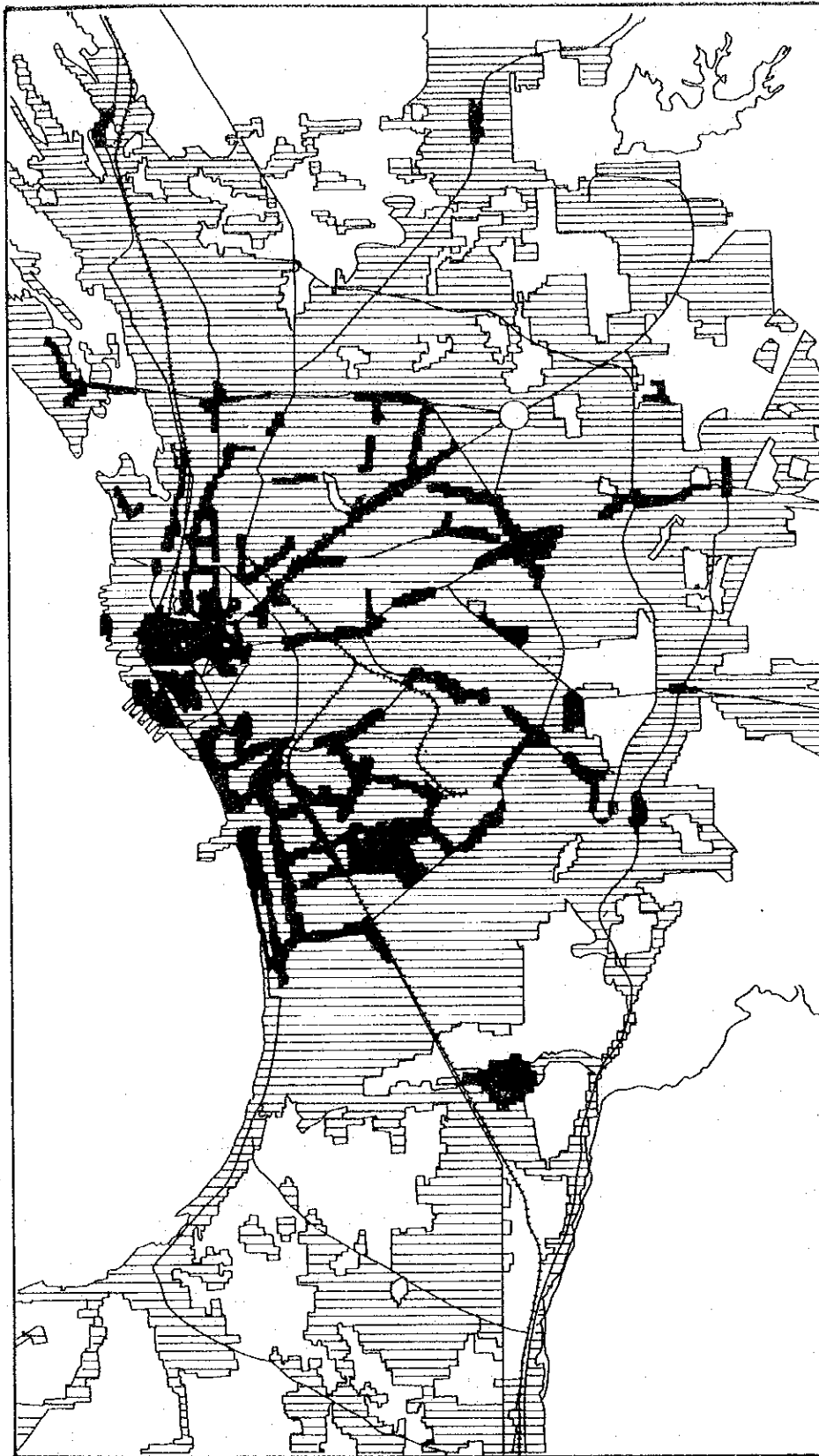
There are two major concentrations in the Central Business District (CBD) and in Makati, and smaller concentrations in Ermita, Pasay, Cubao, Caloocan, etc. There is an increasing trend to rely on the newer centers in Makati and Cubao rather than in the CBD.

c) Industrial Area

Fig. 2-5 shows the distribution of industrial land use.

The main concentrations of industrial activity are along

* Source: MMETROPLAN.



DISTRIBUTION OF COMMERCIAL LAND USE Figure 2-4

Source: MMETROPLAN

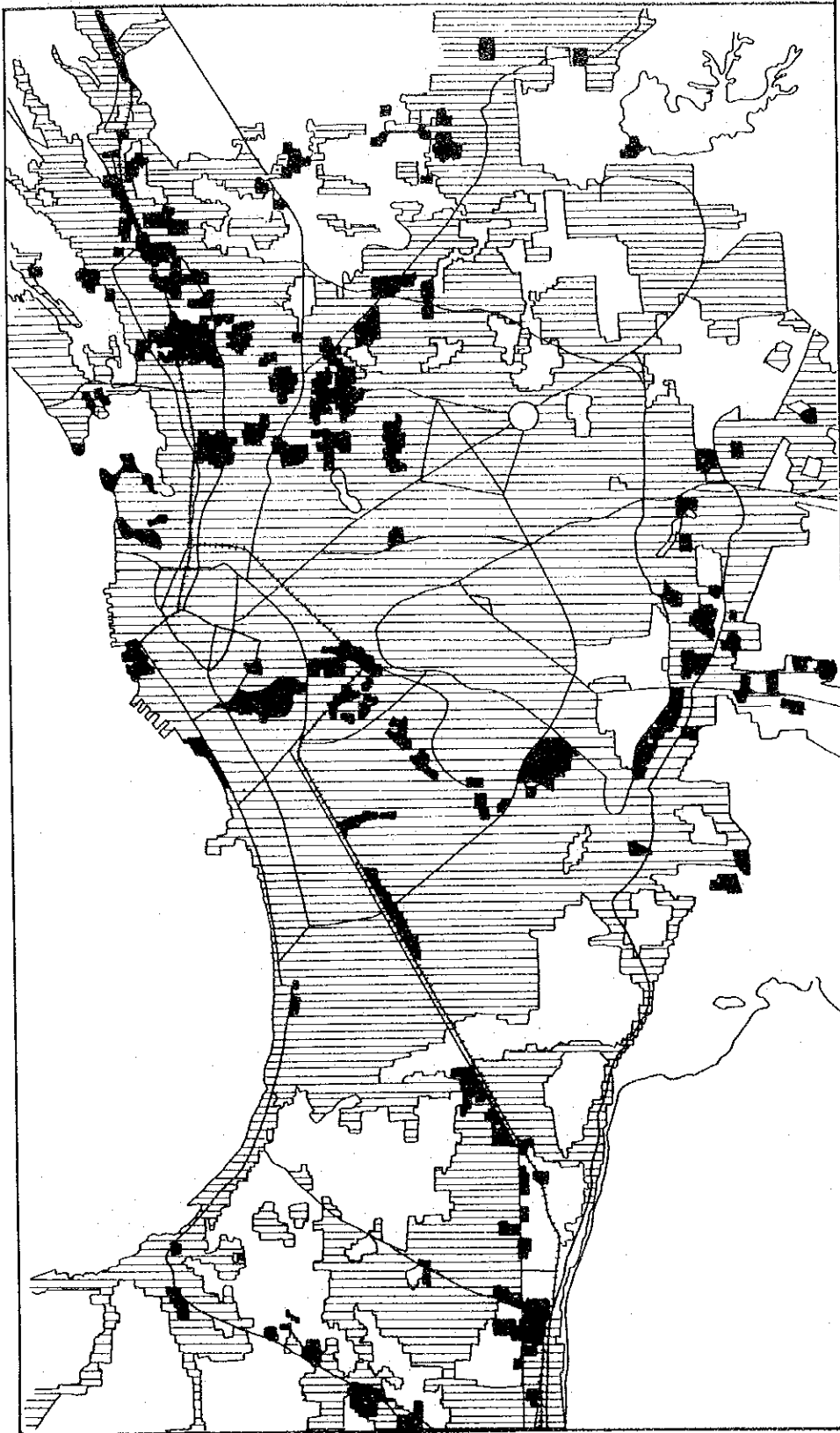
the Pasig and the Marikina Rivers, to the north in Caloocan, Malabon and Valenzuela and to the south along the major highways, particularly the South Superhighway and the Zapote-Alabang Road.

In recent years, industrial development has moved away from the center, where hitherto it has relied on water for transport. The preference for industrial sites is towards deeper land on the periphery which are served by major new highways.

G. Major Problems in the MMA and the MMR

Metro Manila Area and Metro Manila Region manifest many of the urban problems common to rapidly developing areas where the concept of controlled development is just beginning to take hold.

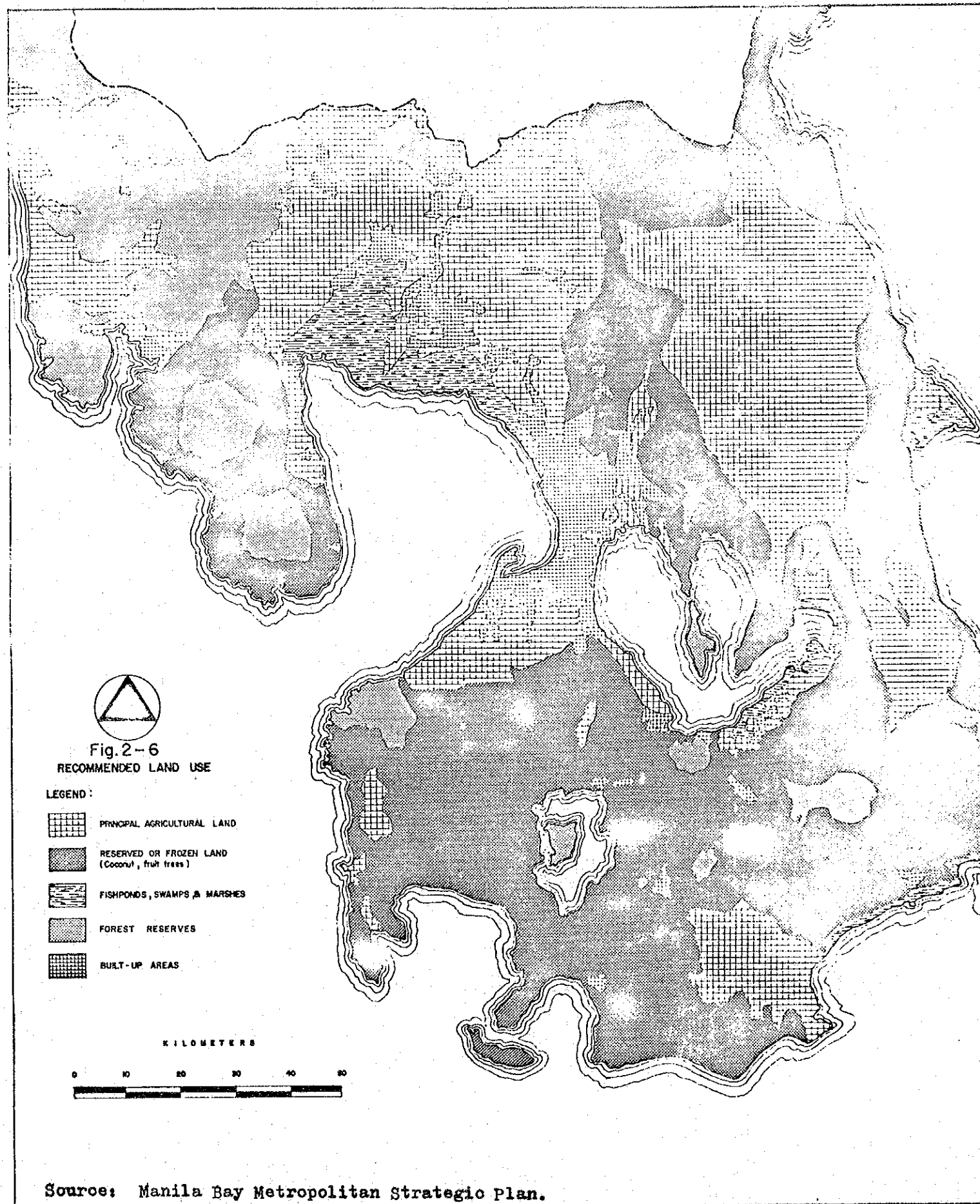
Population growth is one of these problems. Both MMA and MMR exhibit extremely high population growth. Based on medium projection, an annual growth rate of 4.1 per cent is expected during the period 1980 to 1990. However, towards 1990 to 2000, the rate will decline to 2.6 per cent. This increase in population will result in a soaring demand for housing. By the year 2000, approximately twice the existing residential areas will be needed. Increasing family



DISTRIBUTION OF INDUSTRIAL LAND USE

Figure 2-5

Source: MMETROPLAN



income will add to the demand for better housing facilities, further aggravating the housing problem which at present is already serious.

Another social problem that requires serious and long term solution is the imbalance of family income. The average family in the Metro Manila Area earns ₱10,475 yearly while its counterpart in the Metropolitan Manila Region has a much lower share ranging from ₱4,000 to ₱7,000 annually. The proximity of the region to the city influences its inhabitants to cultivate high social expectations.

In the inner core of the Metro Manila Area there are depressed areas such as slums and squatter settlements. Recently, the government has been undertaking a more comprehensive development of these depressed urban areas.

Still, some of these depressed areas are located near industrial sites. One of these factories is the P.O.L. tank firm in Pandacan, along the Pasig River.

As can be expected, the demand for adequate waste disposal has been rapidly increasing with the steady increase in population and in economic activities. Disposal areas for refuse and waste should be distributed to serve other areas.

The major transport network in the northern part of the

MMA consists of the McArthur Highways and North Diversion Road. The corridor of the McArthur Highway which is identified as Radial Road R-3 by the UTSMMA is congested. At peak hours, traffic volume between C-4 and C-5 on McArthur Highway exceeds its capacity. There is an urgent need to reduce the traffic load in this section.

Domestic and international commodity movements are fast saturating the capacity of cargo storage and distribution facilities.

H. Preliminary Development Scheme

Based on existing government policies for the MMA and MMR, preliminary development alternatives have been identified in this study, as shown in Figs. 2-7 and 2-8. Brief description of these alternatives is presented below.

i) General Development Guidelines Considered *

- a) The physical growth for MMA and MMR will make maximum use of existing development trends, conditions and special projects with minimum drastic relocation.
- b) The identified growth center should be developed
 - a. San Fernando and Angeles City, Pampanga
 - b. Olongapo City, Zambales
 - c. Baliuag, Bulacan
 - d. Balanga, Bataan
 - e. Infanta, Quezon
 - f. San Pablo City, Laguna
 - g. Silang, Cavite
 - h. Lucena City, Quezon
 - i. Batangas City, Batangas
- c) The process of industrialization should not slow down and/or hamper the development of the primary sector, particularly crop, livestock and fish

* Source: 1978 Budget and General Appropriations Ordinance.

production.

- d) Areas with existing infrastructure, utilities and services within the region will serve as nucleus for urban expansion and the necessary infrastructure and utilities support will be provided in the identified growth centers within the region to hasten industrial, commercial and related developments.
- e) The Marikina-Infanta Road is a critical development project that will link the MMA with the Pacific Coast, and thus, facilitate access to the rest of the Pacific Basin.
- f) The Manila-Bataan Coastal Road that will link the MMA and the Bataan Peninsula is critical to the development of agriculture and marine industries.

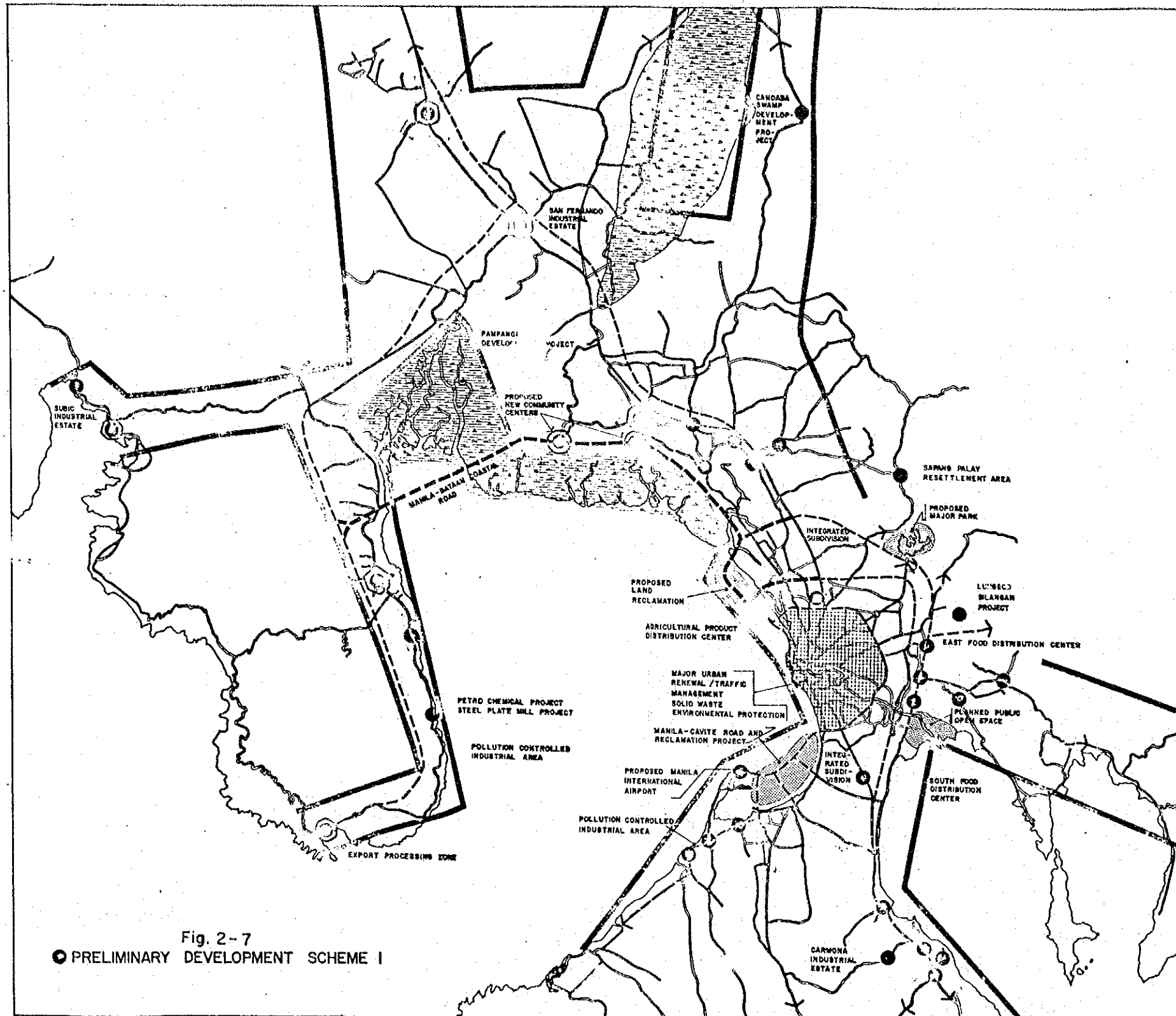
ii) Special Projects Considered *

The following special projects in the northern part of the MMR were considered in the development scheme:

- a) Inner Core in the MMA
 - Major Urban Renewal Project
 - Solid Waste Management Project
 - Traffic Management Project
 - Major Road Construction/Improvement Projects
 - Environment Protection

* Source: 1978 Budget and General Appropriations Ordinance.

- Manila Marine Port Project
- b) Intermediate Area and Outer Area
 - Integrated Subdivision
 - Agriculture Product/Cargo Distribution Center in the north
 - East Food Distribution Center in the east
 - South Food Distribution Center (existing in the south)
 - Manila-Cavite Road & Reclamation Project
 - Lungsod Silangan Project
 - Sapang Palay Resettlement Area
 - Proposed Major Park at Novaliches
 - Integrated Commercial Districts
 - Dasmariñas-Silang Complex
 - Muntinlupa-Biñan-Sta. Rosa-Cabuyao-Carmona Complex
 - Southwest Urban Complex
 - Southeast Urban Complex
 - Northern Urban Complex
 - Pampanga Delta/Candaba Swamp Area Development
 - San Fernando Industrial Estate
 - Petro Chemical/Steel Plate Mill Project
 - Export Processing Zone



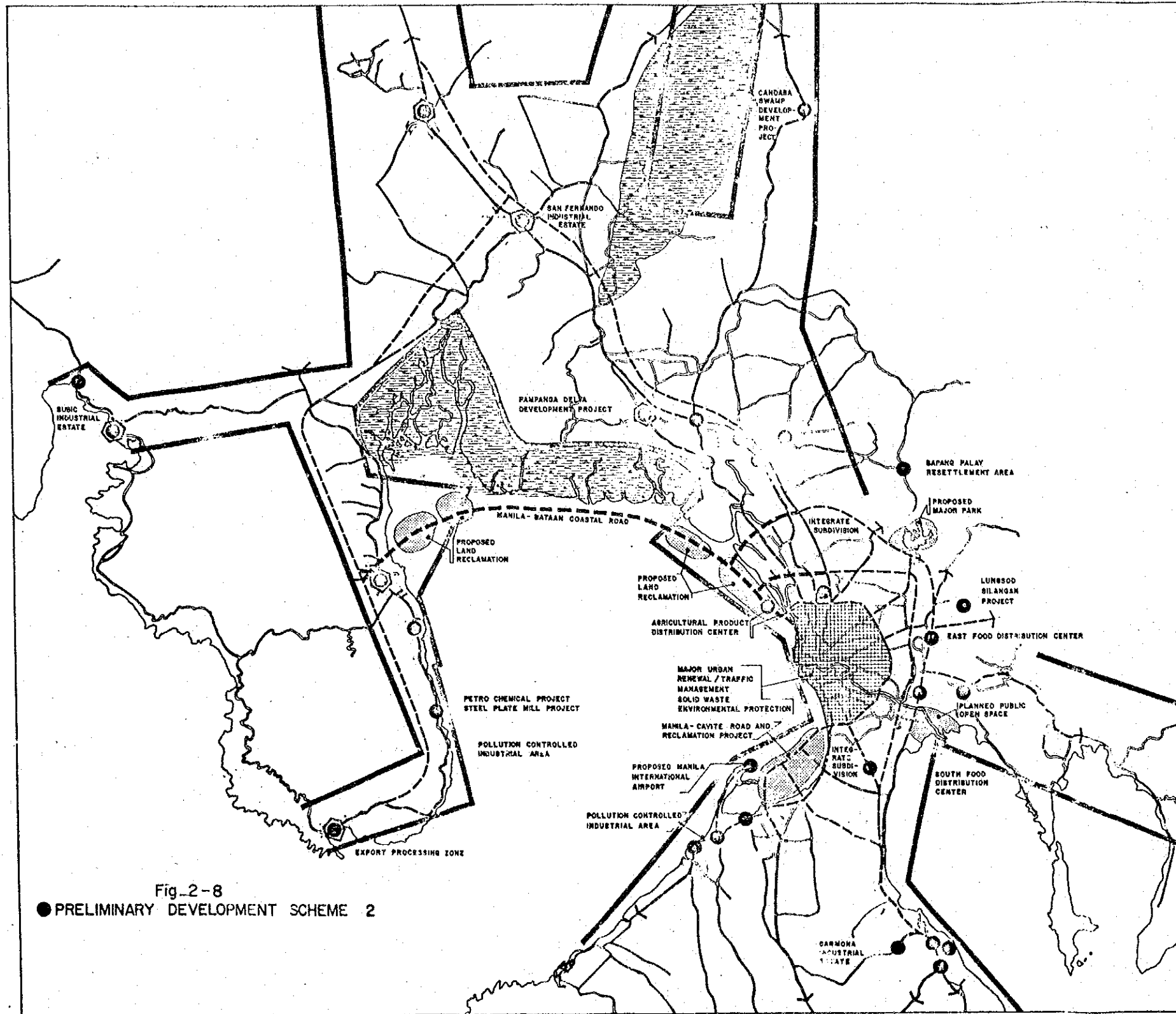


Fig. 2-8
 ● PRELIMINARY DEVELOPMENT SCHEME 2

I. Work Program

The main emphasis on this stage was to make a preliminary development scheme based on the available information.

In Stage 2, the activities as shown in Fig. 2-9 will be undertaken.

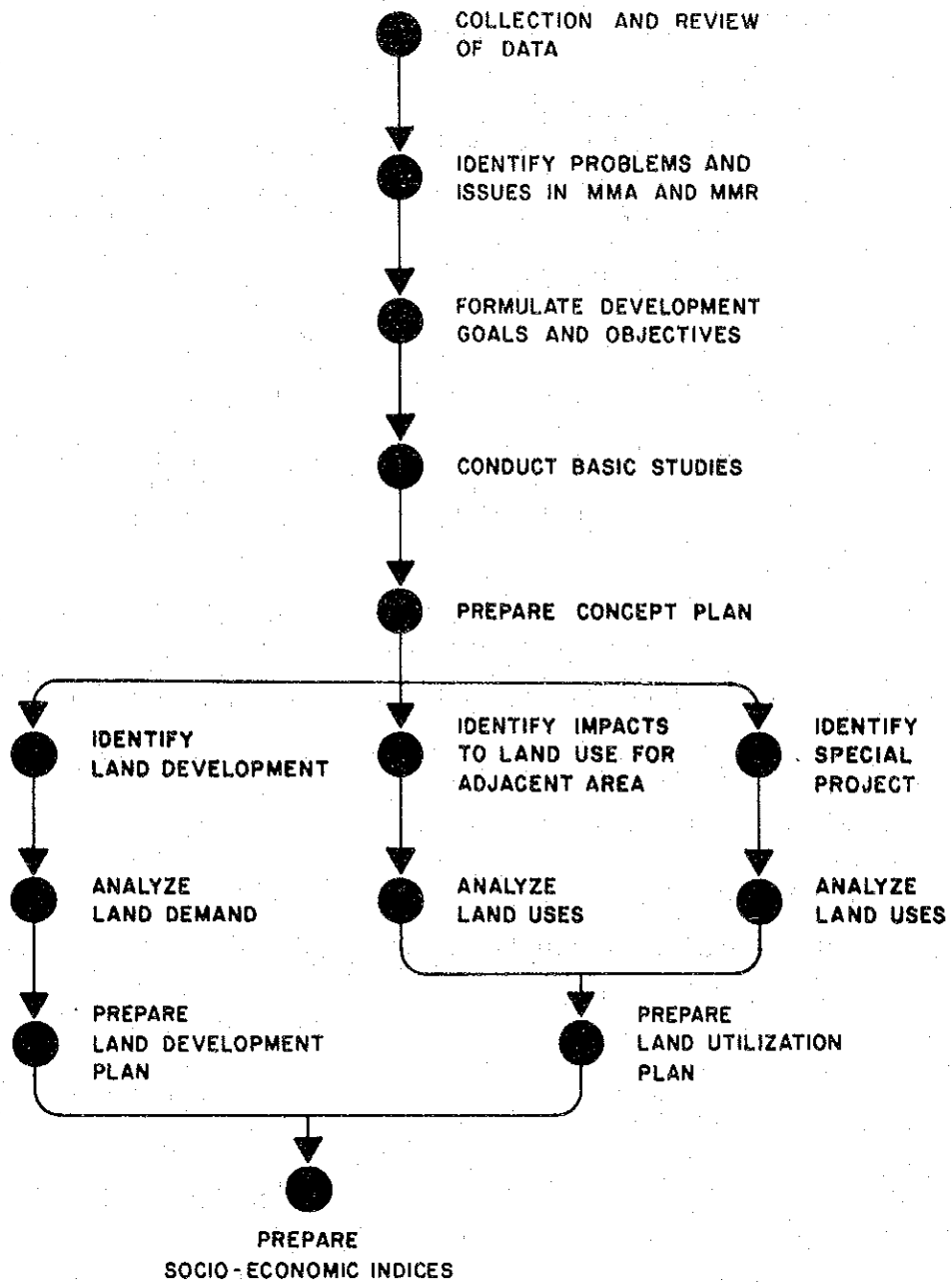


Fig.2-9

STUDY APPROACH FOR LAND USE AND DEVELOPMENT PLANS AND SOCIO-ECONOMIC INDEX PROJECTION

2.4 Traffic Studies

A. Roads in the Direct Influence Zones

The roads subject for traffic studies are shown in Fig. 2-10. Traffic survey points for counting and O.D. interviews shall be set up on the designated points on the roads. The locations of these points will be determined by the TEAM consulting with staff in MPH (PPDO) as well as the results obtained by actual visits on these roads made in March 1979.

B. Traffic Volumes on Existing Roads

The MPH (PPDO) has edited the results of traffic counting on nation wide road network in 1976 and 1977. The result of the counting in 1978 is still being processed. ADTS for 1976 and 1977 on selected sections of roads are shown in Table 2-11 and the traffic flows estimated for 1979 are shown in Fig. 2-11.

C. Traffic Surveys

i) OD Interview

a) OD Interviews will be conducted on the following locations:

- Manila North Expressway: at the entrance of the

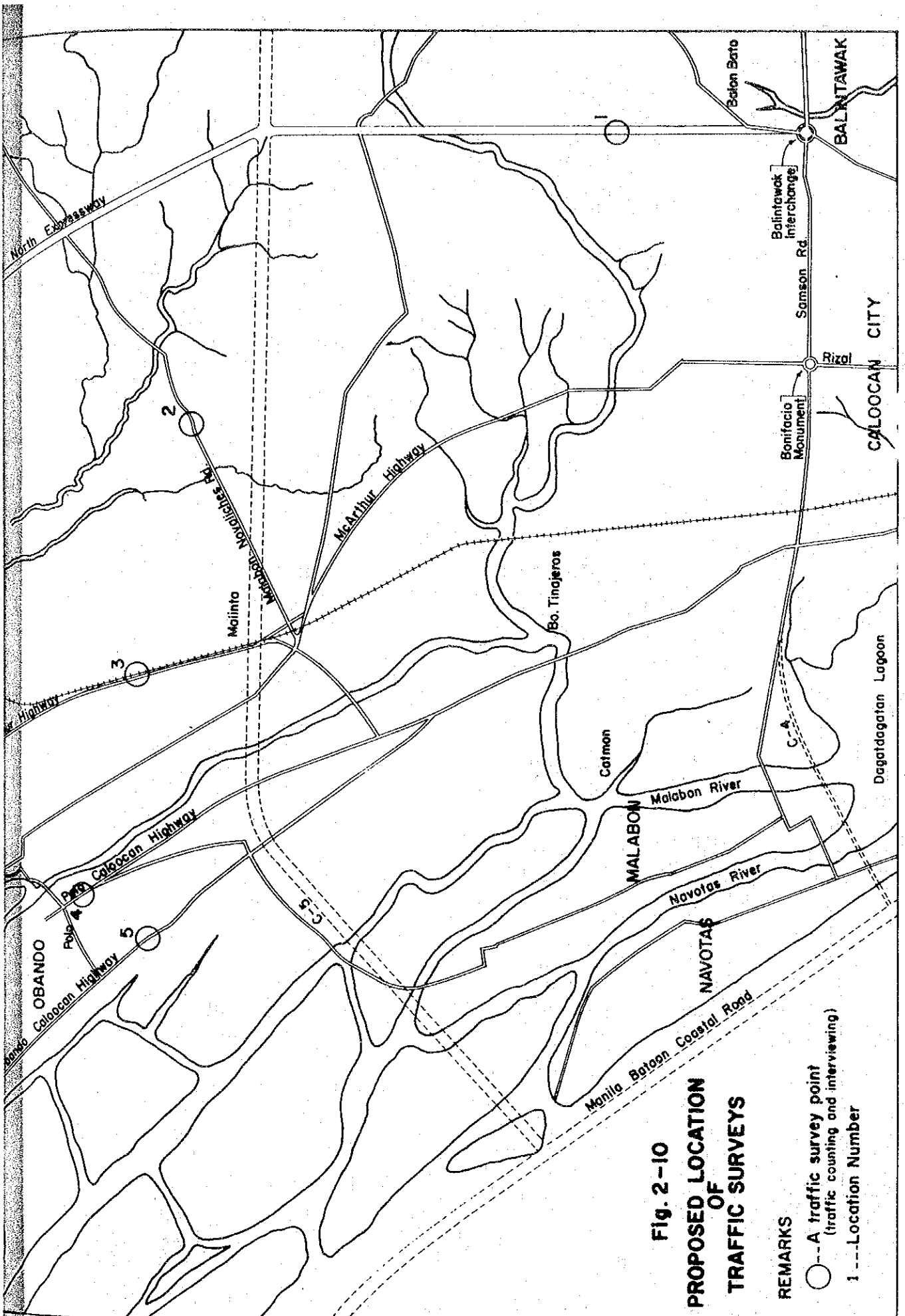


Fig. 2-10
PROPOSED LOCATION
OF
TRAFFIC SURVEYS

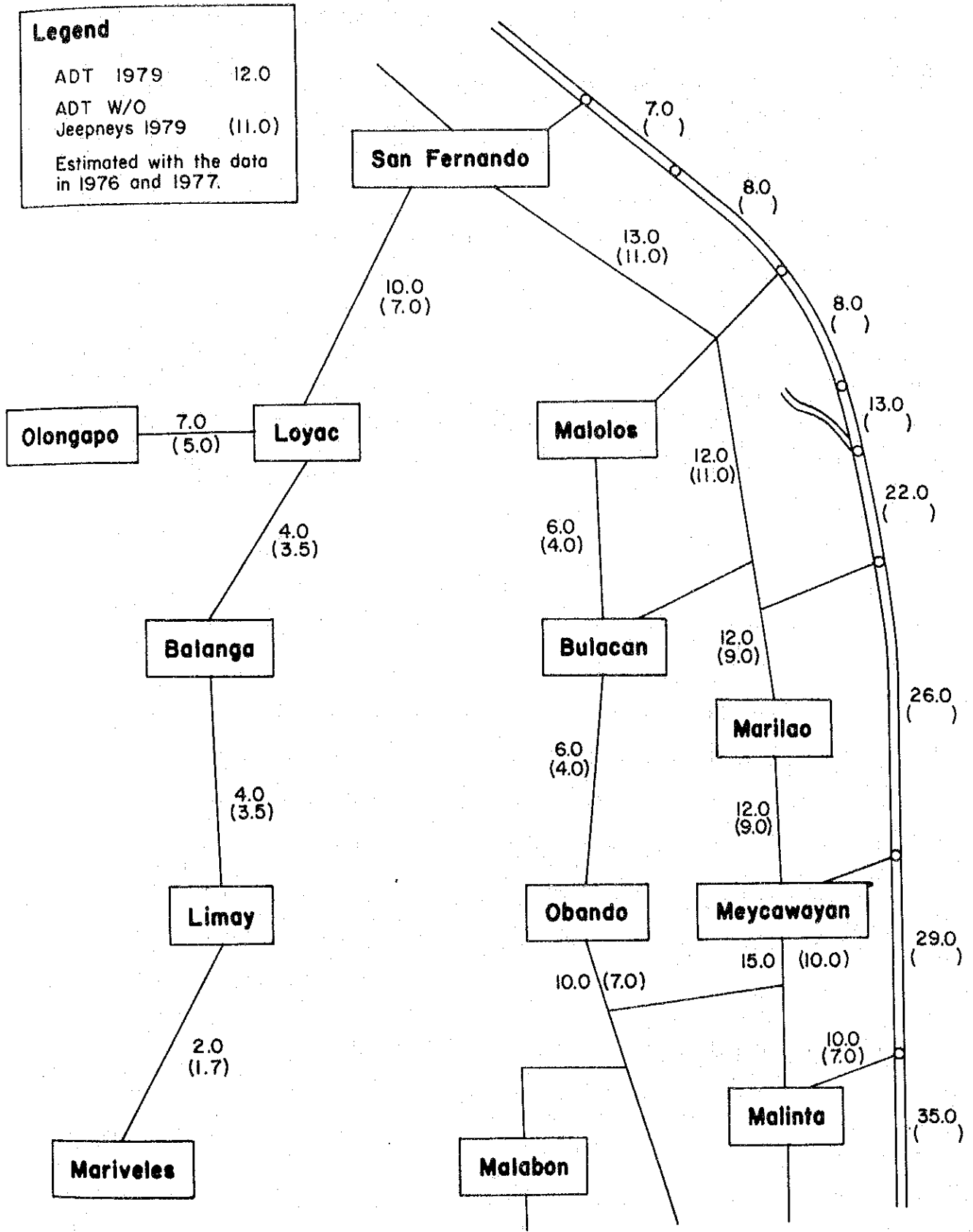
REMARKS

○ --- A traffic survey point
 (traffic counting and interviewing)

1 --- Location Number

Fig. 2-11

**Traffic Flows on the Roads
(Estimated ADT in 1979)**



Expressway (in Caloocan City).

- Malabon-Novaliches Road: Approximately 1 km.
east of Malinta Junction
- McArthur Highway: At the northern side of Malinta
(11 km. from Manila)
- Polo-Caloocan Highway : Approximately 1 km.
south of Polo
- Obando-Caloocan Highway: Approximately 1 km.
south of Obando

b) The drivers to be interviewed

The drivers of motorized vehicles will be interviewed with the assistance of traffic policemen who will stop the vehicles. Due to the heavy traffic on narrow roads, interviews will be conducted on a sample of vehicles. The sampling ratio will be between 1/10 and 1/5 depending on the traffic volume and road conditions. In order to confirm the total vehicles, normal traffic counting will be conducted at the same point simultaneously.

The interviewers will cover only a questionnaire sheet since posing many questions will take time causing

further traffic jam on the roads. The questionnaire sheet will have such items as follows:

Descriptions	: Private Car	: Bus, Jeepney	: Truck, Trailer
	: Jeep, Motor	: Taxi & Motor	: and pick-up
	: Cycle	: Tricycle	: Truck
O. D.	:	:	:
Trip Purpose	:	N/A	N/A
Number of Passengers	:	:	N/A
Loading Capacity	: N/A	: N/A	:
Loaded Items and	: N/A	: N/A	:
Type of Fuel Used	:	:	:

c) Date and Hours

A weekday in July, for 24 hours

d) Cooperation by Traffic Police

The foregoing survey cannot be conducted without the full cooperation of traffic policemen. It is requested that the MPH will obtain assurance from concerned authorities to have at least two policemen on the sites continuously during the interview period.

ii) Traffic Counting

Besides traffic counting at the interview point as proposed in Fig. 2-10, supplementary traffic counting is planned as follows:

a) Location

At the junction of San Fernando-Olongapo road and the roads towards Balanga (100 km from Manila)

b) Vehicles to be Counted

All motorized vehicles

c) Date and hours

A weekday in July, for 24 hours

iii) Seasonal Changes in Daily Traffic

It is not possible to conduct a monthly traffic survey through the year to find the seasonal fluctuation because the study period will not cover fully one year. Instead, the necessary factors applicable for the traffic in the project area to determine AADT will be obtained from the traffic data on control stations through the MPH (PPDO).

D. Analysis of the Data

The survey sheets will be coded numerically and processed through a computer system resulting in the presentation of existing status of traffic flows with the movement of goods and passengers and other characteristics along the Project roads.

E. Estimate of Future Traffic

i) Factors to be Considered

The relevant factors in determining increase in traffic on the roads of the project area will be studied. They will cover studies in such sectors as population, household income and expenditure, employment, number of vehicles registered, regional economy, GNP and development strategy of Metro Manila and its suburbs.

ii) Future traffic volume will be presented in OD tables for cars, jeepneys, buses, vans and trucks in 1990 and 2000.

From the above estimates, annual growth rates will be estimated for every five or ten years during the project life. The project life will be 20 or 30 years after the completion of construction.

Table 2-11

TRAFFIC VOLUMES ON THE ROADS, 1976 and 1977

ROADS	DISTANCE FROM MANILA IN KMS.	ADJACENT TOWNS	1976		1977		CHANGES	
			A A D T	W/O JEEPNEYS	A A D T	W/O JEEPNEYS	Total	1977-1976
			TOTAL	TOTAL	TOTAL	TOTAL	Total	1977-1976
McArthur Highway	10.1	Malinta Malanday Caruhatan	39,088	25,466				
	28.0	Marilao Bocaue	11,787	8,065	11,470	7,647	.973	.948
	31.0	Bigaa Giguinto	8,404	5,896	8,846	5,854	1.052	.993
	45.0	Calumpit Malolos Paombong	12,879	12,008	10,980	9,989	.852	.832
	53.0	Calumpit Apalit	11,899	10,665	10,977	10,133	.922	.950
	61.7	Apalit San Fernando	13,452	12,146	12,327	11,410	.916	.939
Pampanga, Bataan Road:	68.3	San Fernando Bacolor	9,326	7,279	9,906	7,408	1.062	1.018
	75.0	Bacolor Guagua	14,418	12,285	11,640	10,194	.807	.830

TRAFFIC VOLUMES ON THE ROADS, 1976 and 1977

- Cont'd -

ROADS	DISTANCE FROM MANILA IN KMS.	ADJACENT TOWNS	A A D T 1976		A A D T 1977		CHANGES	
			TOTAL	W/o JEEPNEYS	TOTAL	W/o JEEPNEYS	Total	W/o Jeepneys
Pampanga Bataan Road:	79.5	Bacolor Gnagua	8,186	4,885	10,327	7,759	1,261	1,588
Layac- Mariveles Road, Bataan	95.0	Olongapo Layac	4,709	3,832	6,859	5,740	1,456	1,498
Layac- Mariveles Road, Bataan	101.5	Layac Hermosa	2,860	2,213	2,133	1,480	.746	.669
	109.0	Hermosa Orani	2,854	2,211	2,883	2,432	1,010	1,100
	110	Orani	2,936	2,670	3,002	2,809	1,022	1,050
	117	Samal Abucay	3,154	2,147	2,668	1,640	.846	.764
	122	Abucay Balanga	3,980	2,437	4,532	3,122	1,139	1,281
	135.0	Orion Limay	2,559	2,369	3,465	2,978	1,354	1,257
	137.0	Orion Limay	387	255	1,804	1,430	4,661	5,608
	148	Cabcaben Tabang	1,150	1,104	1,807	1,718	1,571	1,556
Layac- Mariveles Road	163	Cabcaben Mariveles	970	935	1,472	1,417	1,517	1,515

TRAFFIC VOLUMES ON THE ROADS, 1976 and 1977

- Cont'd -

ROADS	DISTANCE FROM MANILA IN KMS.	ADJACENT TOWNS	1		2		3		4		5		6	
			A A D T 1976		A A D T 1977		TOTAL		TOTAL		TOTAL		TOTAL	
			TOTAL	W/O JEEPNEYS	TOTAL	W/O JEEPNEYS	TOTAL	W/O JEEPNEYS	TOTAL	W/O JEEPNEYS	TOTAL	W/O JEEPNEYS	TOTAL	W/O JEEPNEYS
	183	Mariveles	34	31	14	11					.412			.355

2.5 Reclamation Study

To identify the suitable areas in terms of environmental, hydrographical and hydrological criteria, an initial reclamation study was conducted.

A. Physical Characteristics of the Preliminary Reclamation Area

Fig. 2-12 presents the locations of the probable reclamation area as well as the layout of the reclamation projects completed and on-going.

The probable reclamation areas tentatively layed out at this stage were made based on the normal water depth at bulkhead and other considerations listed on page 2-53.

Among the reclamation projects undertaken in recent year, the Manila-Cavite Coastal Road and Reclamation Project (MCCRPP) is the largest and covers a vast area of about 3,000 hectares. Compared with the MCCRPP, the scales of other reclamation projects are rather small. Their combined land area totals to around 200 hectares. They are scattered in the east coast of the Manila Bay. Table 2-12 outlines the physical features of major reclamation projects in Metropolitan Manila.

The preliminary reclamation area is situated in the northwest of Manila. This proximity facilitates the absorption by the reclaimed area of development activities from the Metro Manila Area.

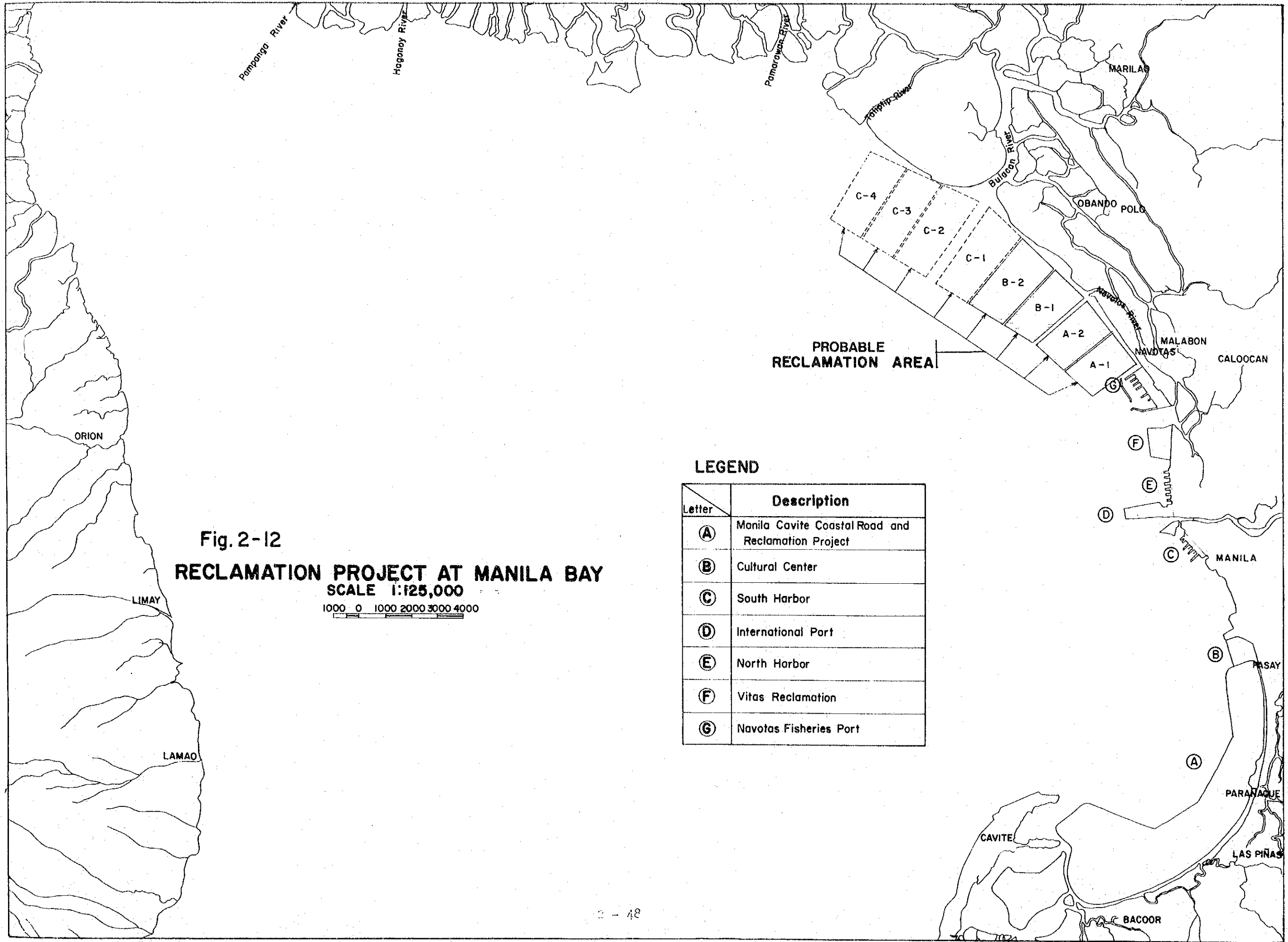


Fig. 2-12
RECLAMATION PROJECT AT MANILA BAY
 SCALE 1:125,000
 1000 0 1000 2000 3000 4000

LEGEND

Letter	Description
(A)	Manila Cavite Coastal Road and Reclamation Project
(B)	Cultural Center
(C)	South Harbor
(D)	International Port
(E)	North Harbor
(F)	Vitas Reclamation
(G)	Navotas Fisheries Port

Table 2-12

PHYSICAL FEATURES AND DESIGN CRITERIA ON
MAIN RECLAMATION PROJECTS AT MANILA BAY

NAME OF PROJECT	MCCRRP	INTERNATIONAL PORT	NAVOTAS FISHERY RECLAMATION	R-10 PROJECT
1. AREA	3000ha		67 ha	
2. CONSTRUCTION PERIOD	1976 - 2000	1978 - 1993	1973 - 1976	1979 -
3. LAND USE	MULTI PURPOSE	CONTAINER TERMINAL	FISHERY SHED	ROAD
4. FINISHED ELEVATION				
RECLAIMED LAND	+3.000	+3.000		+1.600
BULKHEAD	+3.000		+3.300	+2.530
5. WAVE HEIGHT				
SIGNIFICANT W.H	2.5m	1.7m	2.8m	
1 YR. RETURN PERIOD		30 to 3.5m		
20 YR. RETURN PERIOD				
6. TIDE				
MHHWL	+1.01m	+1.02		
MHWL	+0.85	+0.87		
MSL	+0.47	+0.48		
MLWL	+0.00	+0.10		
LLW (LOWEST)	-0.67	-0.53		
7. WIND SPEED (MAX)	33m/sec			
8. CURRENTS	0.2m/sec	0.05m/sec (short period survey)		
9. SOIL CONDITION				
EXISTING SEA BED	-0 to -8m	-2m to -5m	-1m to -3m	-1m to -2m
THICKNESS OF SOFT SOIL	4 to 9m	4 to 7m	5m	10m
10. SLOPE OF BREAK	1:1.5 (sea-side)	1:2 (sea-side)	1:1.5 (sea-side)	
WATER	1:1.5 (land-side)	1:1 (land-side)	1:1.2 (land-side)	
11. DREDGING VOLUME	200 M. cum		2.4 M. cum	
12. YIELD RATIO	0.6 - 0.8		0.7	
13. PILE LOADING	PC 350, SP 500 Ø	MONOTUBE PILES Ø406		
TEST	200 T (YIELD)	95 T (YIELD)		
14. SOIL IMPROVEMENT METHOD	SAND DRAIN, WELL POINT, ETC.		SAND DRAIN	

In addition, the soils and hydrographical conditions of the coast of Manila Bay are favorable to reclamation as evidenced by the following characteristics:

i) Soils Condition of the Area to be Filled

The preliminary reclamation site is located in alluvial deposits developed at the seabed. Subsurface soil investigations have yet to be conducted for the Project. Based on the results of soils surveys made for R-10 Road, Navotas Fishery Port and other projects, the possible stratification of subsurface soils is as follows:

- Alluvium loose silt and clay with thin sand layers (from seabed to approximately 10 meters below seabed).
- Diluvium silty sand and sandy silt layers (approximately 10 meters to 25 meters below seabed).
- Tertiary bedrock, tuff (approximately 25 meters below seabed). Further descriptions are contained in section 2.7 Soils and Geotechnical Studies.

ii) Soils Condition of the Borrow Area

The borrow area is normally located in front of the area to be filled and separated from the bulkhead by

a distance of about two to three kilometers. The exact location of such borrow area will be determined mainly by the capacity of dredger to be used and the existing soils conditions. Based on the data collected, the soil conditions of the borrow area are quite similar to that of the area to be filled up. Consequently, the settlement of soft soils would require further study since it is well known that reclamation with soft soils causes a settlement after filling. If these soft soils are used as fill, countermeasures such as compaction and consolidation of soils have been adopted for the Manila Bay reclamation projects.

iii) Hydrographical Condition of the Reclamation Area

Based on the journal of the Geological Society of the Philippines, VOL. XXIII, the general features of the coastal deposits of Manila Bay is primarily due to the characteristics of the bay current. The bay opens to the southwest facing the South China Sea and the eastward and northward currents are commonly observed in the vicinity of the project site.

In the case of Parañaque river which is located south of the Project site, no major river sediment forms near its estuary.

On the other hand, Bulacan river experiences small velocity of the bay current due to its location in the inner part of

Manila Bay. Heavy deposits are found in the area and the portion of the sea which is a good distance away from the shoreline is considerably shallow.

B. Land Use of the Planned Reclaimed Area in Manila Bay

In general, the reclamation projects have the following objectives:

- To facilitate the commodity movements in the city.
- To mitigate land use problems by developing new lands.
- To relocate specific types of industries from the congested urban areas to a well-planned safe areas (reclaimed areas)
- To improve the urban transportation system through provision of land necessary for the development of highways and railways.
- To improve the environs of the cities by providing space for sanitary fill.

MCCRFP is decidedly the biggest reclaimed areas planned in Manila Bay area in the past years. The project is aimed mainly at urban development since industrial development does not receive high priority in the effort. The land use allocation in MCCRFP is as follows:

Residential area	-----	21.0%
Service center	-----	12.1%
Institutional area	-----	11.3%

Industrial area - - - - -	2.9%
Utility area - - - - -	3.0%
Parks, open spaces, water and recreational area - - - - -	31.6%
Roads - - - - -	13.1%
	100 %
Total	

The final land use and the size of the reclaimed area to be proposed in the Project will be determined in the Stage 2 of the feasibility study.

C. Conceptual Size of the Reclamation Area

i) Desirable Reclamation Area to be Attained

Taking the following elements into account, the desirable reclamation area for the project size in the preliminary study is estimated to be about 1,500 hectares.

- Normal water depth at bulkhead
- Capacity of pump dredgers
- Effects of silting for flood
- Effects of silting for fishery

Refer to Table 2-13 for a tentative location and size.

Table 2-13

PHYSICAL FEATURES ON MBCRP (FROM NAVOTAS TO BULACAN)

NAME OF THE ZONE	LAND AREA (HA)	FILL VOLUME : (NET)(M.CU.M.)	LENGTH OF BULKHEAD (KM)	CHANNEL
		SEA SIDE	LAND SIDE	
A - 1	310.5	18.48	1.4	4.5
A - 2	333.5	19.60	1.3	5.0
B - 1	429.0	25.44	1.7	5.4
B - 2	455.0	26.85	1.6	6.2
SUB-TOTAL	(1528)	(90.37)	(6.0)	(21.1)
C - 1	513.0	30.16	1.6	7.1
C - 2	520.0	30.42	1.6	7.2
C - 3	494.0	28.95	1.5	6.8
C - 4	481.0	28.23	1.5	6.5
SUB-TOTAL	(2008)	(117.76)	(6.2)	(27.6)
TOTAL	3536	208.13	12.2	48.7

OTHER DATA :

- Slope of sea bed 0 and -1.8 (MLW) : 1.8/1000, -1.8 and -5.4m 1.9/1000, -5.4 and -9.0m : 1.6/1000,
- Characteristic of sub-surface soil at estuaries Navotas River : Silty fine sand Bulacan River : Silt

2.6 Hydrological Study

The Hydrological studies were aimed at identifying the effects foreseen by the Coastal Road construction from a point of view of hydrology.

A. Description of Rivers to be Affected by the Coastal Road

The Pampanga river basin in the plains of Central Luzon drains to the south by a system of natural and man-made channels and finally discharges into the Manila Bay through a drastically wide and complex delta.

In addition to the above mentioned river, the following rivers are directly affected by the Coastal Road and total watershed area including the Pampanga river exceeds 12,000 Km².

- Rivers drained from Mt. Santa Rosa
- Orani and Pasag rivers systems
- Binangbang, Pamarawan, Bulacan and Navotas rivers systems

Based on the surface water study of the Pampanga Delta - Candava Swamp Development Project Report, the average mean annual rainfall observed in these watershed areas ranges from 1,800mm to 2,200mm. Since the area has a tropical rainfall, the type of rainfall is characterized by heavy showers.

Among the mentioned rivers, the Pampanga river is the largest, with a watershed area of about 10,500 Km² and a main stream length of about 260 Km.

Presence of gradual or intermittent uplifts are evident in the area due to the formation of terraces on loosely compacted recently deposits along the Pasag river. In the uplift process, river erosion results in the transportation of the relatively older deposits, redepositing them in the flood plains and the stream channels.

According to the Hydrogeologic Map of Central Luzon, the central plain of the area consists of alluvial deposits, and the mountainous areas are covered by volcanic rocks or pyroclastic rocks. The amount of soils supplied by the mountainous areas are therefore considered to be relatively large.

B. Sedimentation

Results of bed load analysis conducted in the interim report of Pampanga Delta Area Development Project indicate that the course of the wider and shallower Pasag river has a tendency to greater siltation than the narrower and deeper course of the Pampanga and other rivers. The composition of the samples collected from the Pasag river contain more silt while that of the Pampanga river contain more silt while that of the Pampanga river contain more sand.

According to the Pampanga delta area development study, an approximate average volume of $12,900,000\text{m}^3$ of sediment is being deposited annually throughout the courses of Pampanga and other rivers (total watershed area = $8,200\text{ Km}^2$), and in the bay as the flood waters rush out.

2.7 Soils and Geotechnical Studies

A. General

A policy on the soils and materials survey was established during the period from February 24, 1979 to March 25, 1979. The policy was made after a careful review of data and relevant soils and materials information collected in the Philippines and supplemented by a site reconnaissance survey.

In broad terms, the PROJECT covers Manila-Bataan Coastal Road with an approximate total length of 52 km and its related roads i.e., C-5 and C-6 roads with the lengths of about 9 km, and 13 km respectively.

This progress report presents some comments on the above project based on available data before conducting actual subsurface investigation and materials survey.

B. Geological Outline

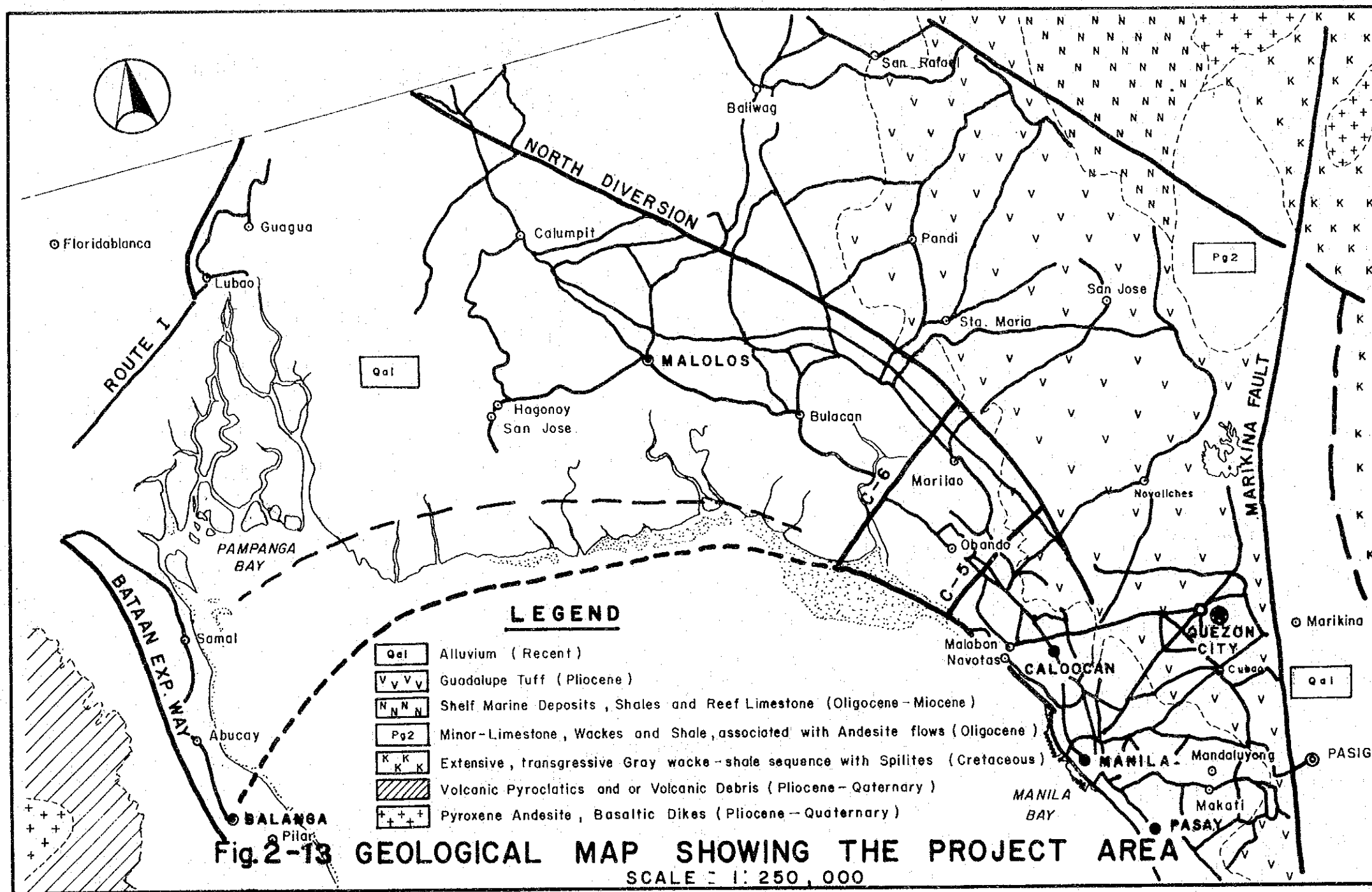
A geological map showing the project area is shown in Fig. 2-13. From this map, it is observed that wide-broaded deltas are spread along the northern side of the Manila Bay.

This delta complex is considered lowlands with an elevation of less than 10 m above mean sea level and is composed of deltaic sediments (alluvial deposits) originating from river tributaries and marine currents.

Tuffaceous formation belonging to the Pliocene epoch is exposed at the elevation of 10m at the outside eastern part of the delta which is locally known as Guadalupe Tuff (See Fig. 2-14). It is expected that this Guadalupe Tuff formation is composed of shaly-tuff, sandy tuff and pebby-tuff.

The tuff formation is generally horizontal and low dipping with westward orientation of 8° to 15° . The hinterlands at the east, 3 to 10 km beyond the boundary of the formation are mountainous areas which are composed of Wackes and Shales, Reef-limestone associated with Andesite flows originating from the Oligocene-Miocene epoch.

The hinterlands behind the western part of the deltas located in Mariveles Mountains in the Bataan Peninsula are volcanic debris (Volcanic Pyroclastic), Pyroxene Andesite and Basaltic dikes of the Pliocene-Quaternary epoch.



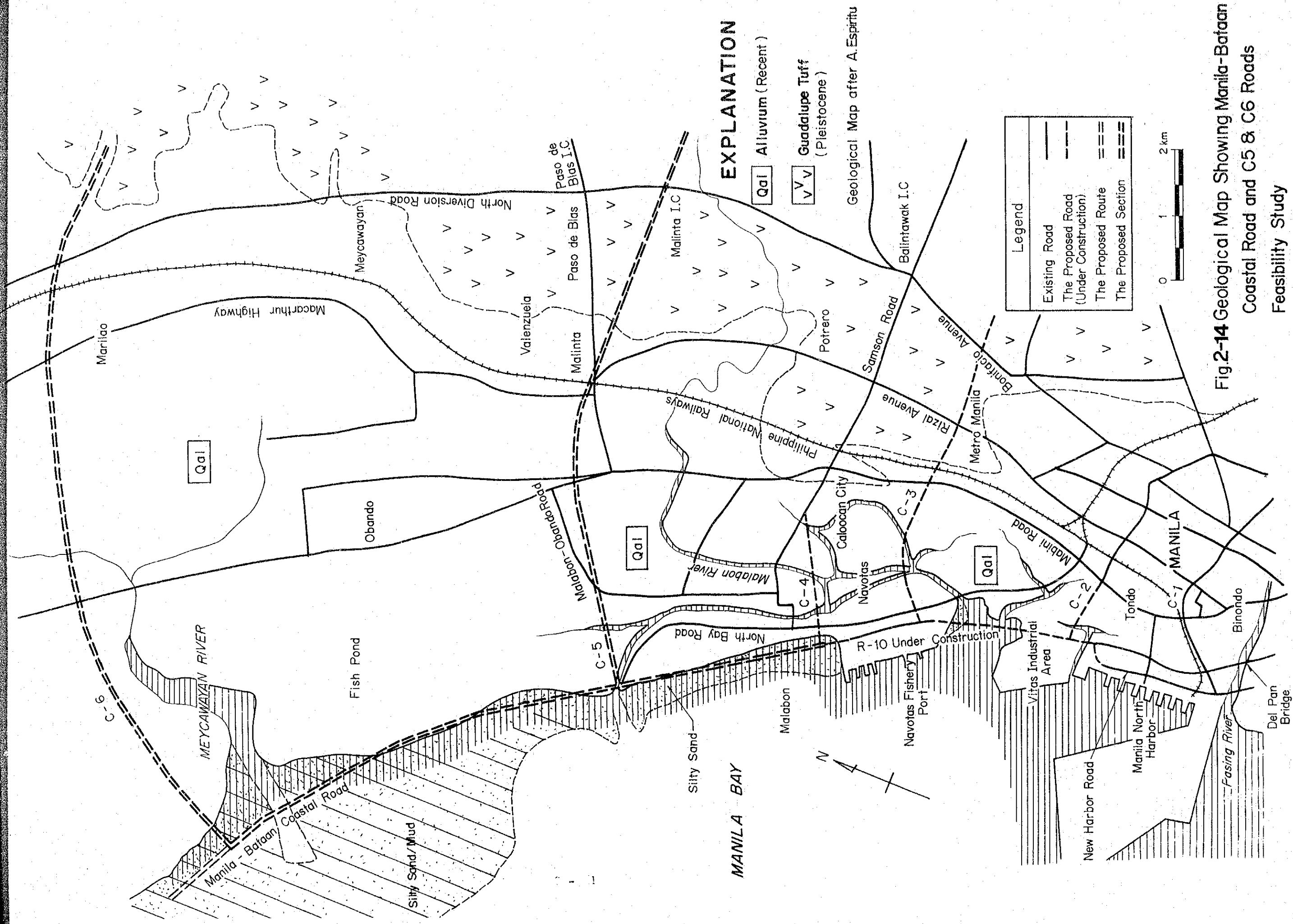


Fig 2-14 Geological Map Showing Manila-Bataan Coastal Road and C5 & C6 Roads Feasibility Study

C. Subsurface Soil Conditions

Based on available data and information concerning subsurface soil conditions, the probable soil profiles and cross sections along the proposed routes were drawn and are shown in Fig. 2-15. The Geological Map shown in Fig. 2-13 shows the general boundary between alluvial lowland plains (deltas) and diluvial upland formation (Guadalupe Tuff).

The deltaic deposits are intensively developed at variable depths of 10 to 30m and are composed of silty clay, sandy silt and fine sand. They predominate particularly in water-logged areas and fishponds.

Representative soils properties of each layer are summarized below:

<u>Epoch</u>	<u>Name of Layer</u>	<u>N-Value (SPT)</u>	<u>Unconfined Compressive Strength (qu)</u>	<u>Moisture Content (%)</u>	<u>Plasticity Index (Ip)</u>
Recent	Silty Clay	0 to 3 Nos	0.1 to 0.3 Kg/cm ²	40 to 50	15 to 20
ditto	Silty Sand	10 to 15 Nos	-	-	-
Recent/ Pleistocene	Alternating Silty Sand/ Sandy Silt	10 to 30 Nos	-	-	-
Pleistocene	Tuff	20 to 50 Nos	10 to 20 kg/cm ²	-	-

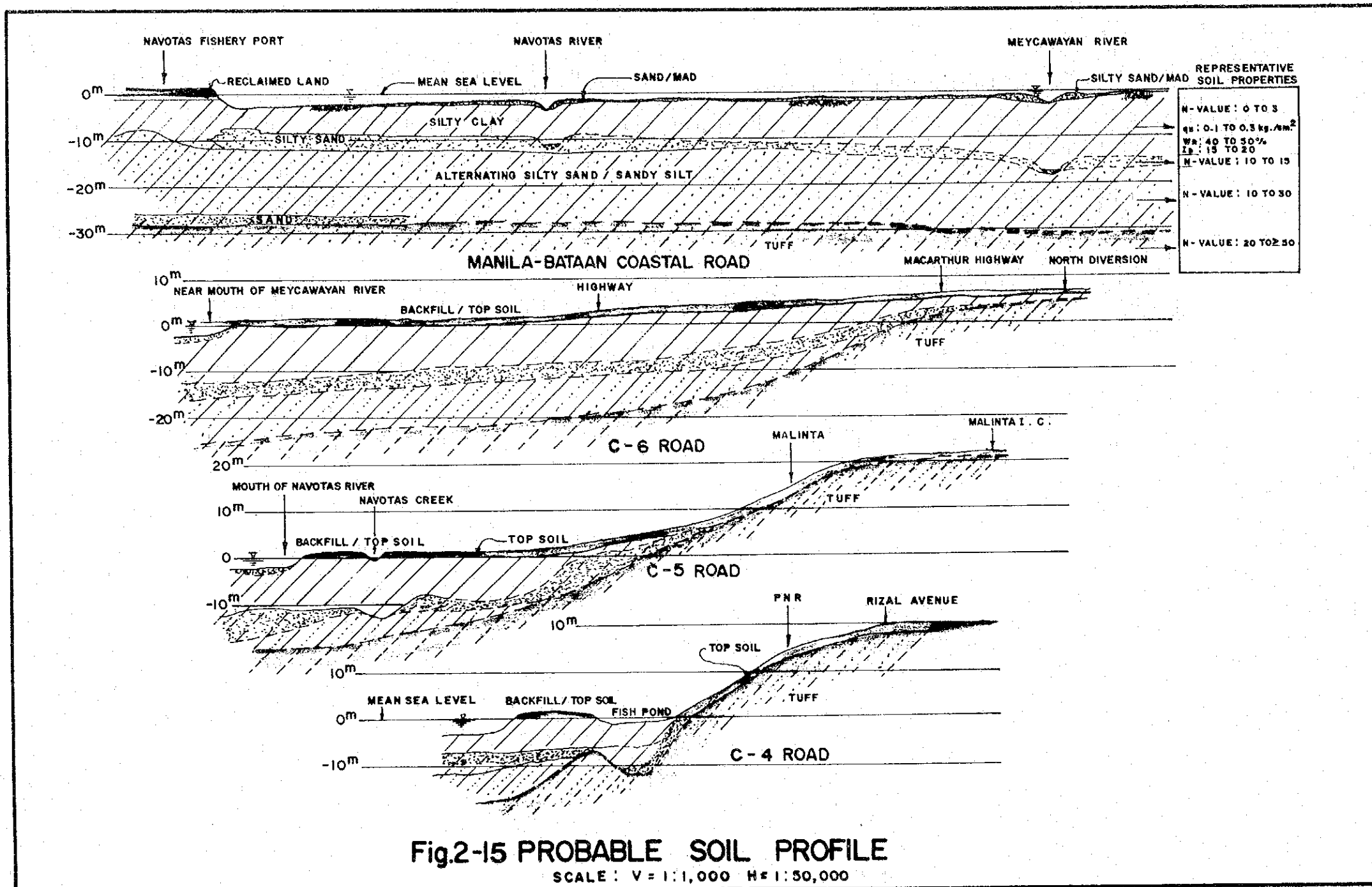


Fig.2-15 PROBABLE SOIL PROFILE

SCALE: V = 1:1,000 H = 1:50,000

During a reconnaissance survey, tube soil samples were obtained near the mouths of Navotas and Meycauayan Rivers. The samples were tested at the laboratory of Development and Technology Consultants, Inc. Results are shown on the page 2 - 65.

The soil profiles, cross sections, and soil properties presented were made on the basis of the following conditions.

- i) Limited data and information for the northern to western part of the project area, beyond Navotas fishery port.
- ii) From the viewpoints of geology, topography, past geotechnical experience and site reconnaissance survey.
- iii) Major References are:
 - a) Geological Map of the Philippines, Scale-1:1,000,000, Bureau of Mines
 - b) Journal of the Geological Society of the Philippines, Vol. XXIII, June 1969, No. 2, Noe L. Caagusan
 - c) The Philippine Geologist, Vol. XX, June 1966, No. 2 Froilan C. Gervasio
 - d) Final Report R-10 Road Project Feasibility Study, JICA, September 1975

SUMMARY OF TEST RESULTS OF SOIL SAMPLES FROM
THE MANILA BATAAN COASTAL ROAD

I. NAVOTAS RIVER : Sampled at a sandbar surface 0.5 km away
from the mouth of Navotas River

Description : Silty very fine SAND, light gray; contains
shell fragments; slightly plastic fines (SM)

Natural Moisture Content = 35.5%

Plasticity : Slightly Plastic

Gradation : 3/8" - 100
#4 - 99
#10 - 95
#40 - 92
#200 - 14

II. MEYCAUJAYAN RIVER: Sampled at the riverbed 0.8 km upstream of
the mouth of Meycauayan River

Description : Organic CLAY, black; moderate plasticity; with
finely divided organic matter (OH)

Natural Moisture Content = 126.3%

Plasticity : LL = 116
PL = 70
PI = 46

Gradation : #10 = 100
#40 = 99
#200 = 98

Hydrometer Analysis: Sand - 2%
Silt + 28%
Clay - 70%

Specific Gravity : 2.59

- e) Technical Note of the Soils and Materials Survey for C-3 and R-4 Project, JOC, August 1977
- iv) After discussion with Filipino geotechnical engineers, some modifications and correction were made.

D. Materials Sources

Preliminary studies made on the sources of materials for construction include the following:

1) Materials for Embankment and Reclamation

Based on the field reconnaissance and map study, it is apparently difficult to obtain good materials for embankment near the site. Riverbeds and hilly lands located 20 to 30 km away from the project site will be investigated for the quantity and quality of embankment materials. For reclamation, several numbers of off-shore boring 3 to 5 km away from the shoreline will be made to confirm borrow areas.

ii) Coarse Aggregates

Block stones for water front protection are available and will be transported by barges from Bataan quarry sites.

Coarse aggregates are available as crusher runs at commercial plants in operation. Otherwise, portable crushing and screening plants will be set up near the quarry sites investigated.

iii) Fine Aggregates

Beach sand can not be used for concreting because of salt contents and the predominance of very fine particles.

Upstream of each major river in the vicinity are known to be abundant fine and/or coarse aggregates. The quantity and quality of materials shall have to be investigated.

The fine aggregates may also be obtained from a number of commercial plants operating in Metro Manila.

iv) Cement

Several commercial cement plants around Manila have available ready-mixed concrete.

v) Bituminous Materials

In the Philippines, construction of concrete pavement has become more common than asphalt concrete pavement because it is believed to be a better. However, bituminous materials are also commercially available locally.

E. Comments on Foundation Problems

Almost all of the proposed routes and reclamation areas are located in alluvial deposits (deltaic sediments) developed at the swampy areas and river/seabeds. Recent deposits of soft clayey soils and/or loose sandy soils (filled in the drowned valleys along the routes) have raised the questions of whether the subsurface soils can safely support the load of (approach) embankments to the bridges without causing excessive differential settlements of the pavement, and on whether they can support the foundations of structures during an earthquake and/or a rainy season.

To solve these problems the following activities must be

undertaken: first, mechanical and physical soils properties of the soft grounds will be investigated properly; second, detailed analysis of stability of foundations will be made. This analysis includes the studies on slopes, bearing capacities, and stabilization/improvement of soft grounds.

2.8 Topographic Survey

A. General

The major objective of survey is to make topographic and hydrographic map for the feasibility study by using aerial photos.

B. Outline of the Works to be Conducted in Stage 2

The work comprises the following:

- Reconnaissance
- Traverse survey
- Plan table survey
- Sounding
- Profile levelling and cross-sectioning
- Plotting and compilation

C. Detail Description of Works

i) Field Works

a) Reconnaissance

Reconnaissance is a general study to obtain sufficient information about the surveying area.

b) Traverse Survey

Traverse survey is done along the proposed road centerline between C-4 and C-6.

c) Plan Table Survey

A plan table survey shall be carried out along the proposed route by field checking using the aerial photo map. Especially, newly built buildings or demolished ones shall be checked.

d) Sounding

This survey is made for the purpose of determining the height of the bay bottom.

e) Profile Levelling and Cross-Sectioning

Concerning profile levelling, elevations will be taken to every 200 meters, while in cross-sectioning, 5 cross-sections of 500 meters wide each are needed for every one kilometer.

f) Accuracy

The accuracy of survey required shall be as follows:

- Traversing 1/5,000
- Levelling 20 mm L

Where L is measuring length in Km.

- Plan table survey 1/2,000
- Plotting accuracy 0.5 mm (max. error) on the maps

g) Equipment

The major equipment necessary for topographic surveys are as follows:

- Transits, levels, electro magnetic distance meter, steel tapes and plan tables.

ii) Office Works

a) General

The data of traverse, and plan table surveys, profile levelling, cross-sectioning, sounding data, etc., shall be drawn in ink on Mylar sheets or equivalent.

These data are in addition to the aerial photo mosaic.

b) Scales of Final Products

The scale of these final products are the following:

- Plan table survey 1:4,000
- Sounding 1:4,000
- Profile levelling 1:4,000 (H) and
1:400 (V)
- Cross Sectioning 1:200

D. Work Schedule

The entire work shall be accomplished in 60 days.

E. Products and Supporting Data

Final

The final products and supporting data of surveying are the following:

i) Traverse Survey

List of traverse survey data and field

books - - - - - 1 set

ii) Profile Levelling and Cross-Sectioning

- a) Traced sheets on Mylar in ink - - - - - 1 set
- b) Blue prints of the traced sheets - - - - 3 sets

iii) Plan Table Survey

- Plans and field survey data - - - - - 1 set

iv) Sounding (hydrographic maps)

- a) Traced sheets on Mylar in ink - - - - - 1 set
- b) Blue prints of the traced sheets - - - - 3 sets

2.9 General Study of Manila-Bataan Coastal Road (Between C-6 and Bataan)

A. Introduction

The general study at this stage deals only with the technical aspects of the Coastal Road. The aim of the study is to carry out the initial study to find out technical possibility of the said Coastal Road construction together with anticipated environmental and hydrological problems.

Field investigations were undertaken by the TEAM.

Topographical maps to a scale of 1:50,000 were mainly used in this study. The route selection was performed utilizing also hydrographical maps and aerial photo of the Pampanga Delta to a scale of 1:25,000.

B. Alternatives

The Coastal Road will be located in the Metro Manila and in the provinces of Bulacan, Pampanga and Bataan. Only three alternatives were studied based on the technical, and environmental view points.

The locations of the alternative routes are as shown on Fig. 2-16.

i) Alternative 1

This alternative is very similar to the one selected by the MPH several years ago. The road mainly consists of a causeway which was planned at 0.5 - 2 km off-shore from the existing coast lines. The location of this route was selected at the minimum water depth of about one fathom at mean lower low water to ensure the accessibility of the constructional fleet.

The planned route starts at the end of the phase I construction of the Manila-Bataan Coastal Road and runs to the northwest and west parallel to the existing coastal line.

Several bridges are considered to provide openings in front of the mouths of major rivers of the region.

From the point of the north fringe of the town of Mabatang, primarily the improvement of existing first class road is considered up to the existing Bataan expressway which is the west terminus of the coastal road.

The approximate total length of this alternative route will be 40.7 kilometers and consists of the following categories of constructions:

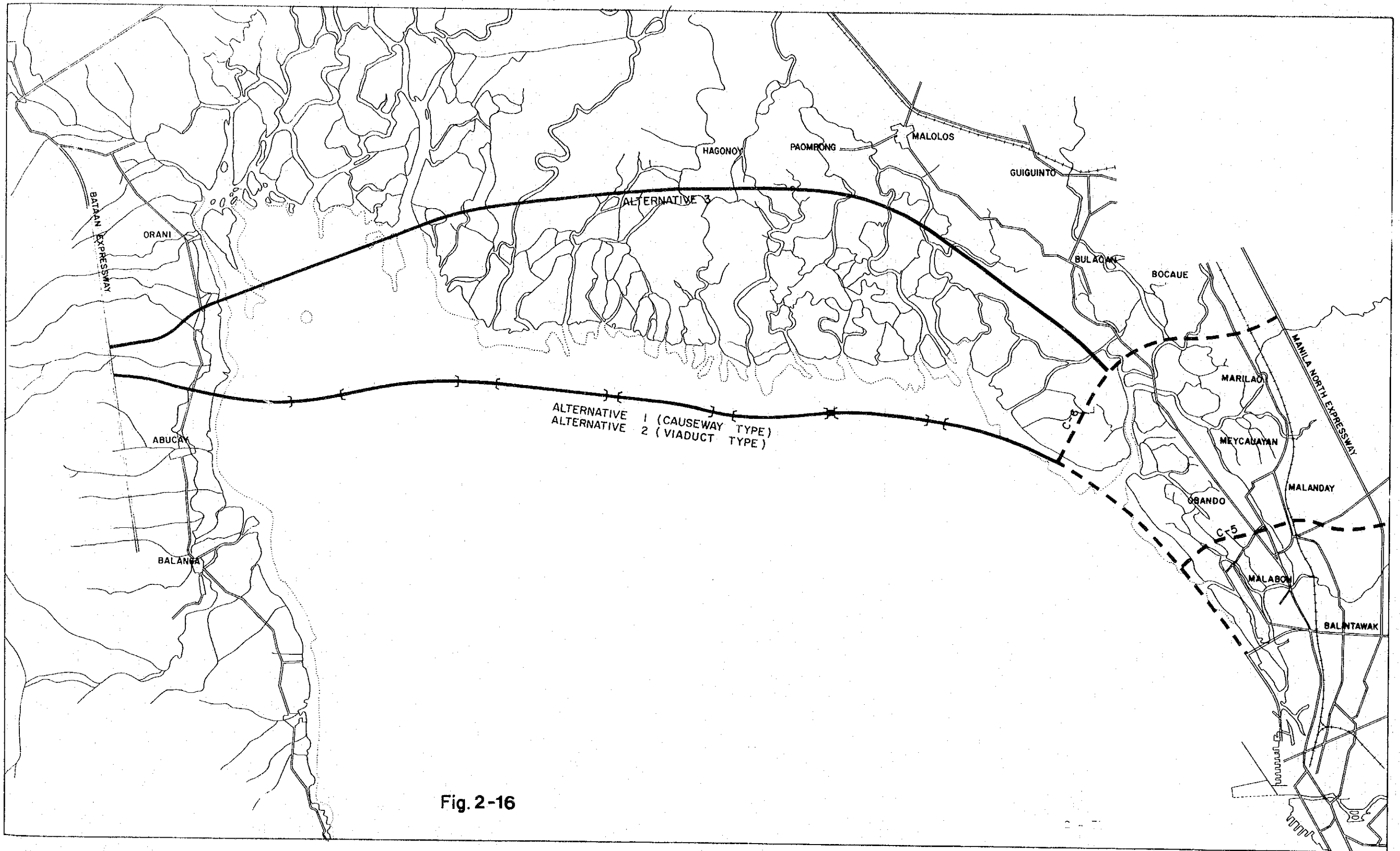


Fig. 2-16

- Causeway, new construction - - - - -	33.2 Km
- Road passing through wet lands, new construction - - - - -	--
- Road passing through rice paddy areas, new construction - - - - -	2.0
- Bridge/viaduct, new construction - - - - -	1.8
- Improvement of existing road on dry land - - - - -	3.7
<hr/>	
T O T A L	40.7 Km

ii) Alternative 2

The route of this alternative is identical with the location of Alternative I.

To avoid the environmental destruction especially for the fishery and other marine resources, an adoption of a viaduct is considered in lieu of a causeway.

The approximate total length of this alternative route will also be 40.7 kilometers and consists of the following categories of constructions :

- Viaduct, new construction - - - - - 31.6 Km
- Road passing through wet lands,

new construction - - - - -	---
- Road passing through rice paddy areas, new construction - - - - -	---
- Bridge/viaduct, new construction - - - - -	5.4
- Improvement of existing road on dry lands - - - - -	3.7
<hr/>	
T O T A L	40.7 Km

iii) Alternative 3

This alternative differs from the other two primarily planned at off-shore areas. Inland areas, bordering the rice paddy area and fishpond area, were chosen for Alternative 3 for the sub-corridor of the proposed new alignment, considering the following factors:

- Avoidance of the disturbance of existing fishponds
- Better access to the existing road network
- Future development for Pampanga delta area

A new coastal road starts at about 4 kilometers north of the junction of C-6 and Manila-Bataan Coastal Road, and runs to the northwest and westnorthwest parallel to the existing national route No. 369 up to near Malolos town.

From there, the route will head westward parallel to the

existing national route No. 314 for about 8 kilometers where it will meet the town of San Nicolas.

The total length of viaduct across floodway from the Candaba swamp is approximately 3 kilometers according to the past development study.

The next 4 kilometers to the Pampanga river passes through existing rice paddy areas frequently inundated during rainy seasons.

From the point of Pampanga river crossing, the construction of a viaduct is proposed up to the coastal line since the areas are predominantly covered by fishponds and drainage difficulties are anticipated.

The adoption of a causeway across Pampanga Bay is not justifiable because of the problems associated with siltation and flood. A total length of about 1.8 kilometers of viaduct is proposed in this study.

The approximate total length of this alternative route will be 45.7 kilometers and consists of the following categories of constructions :

- Road passing through wet land,
new Construction - - - - - 16.2 Km
- Road passing through rice paddy areas,
new Construction - - - - - 7.8

- Bridge/viaduct, new construction - - - - -	18.0
- Improvement of existing road on dry land - - - - -	3.7
<hr/>	
T O T A L	45.7 Km

G. Geometric Design Criteria

i) Terrain Conditions

All the alternative routes pass through very flat areas on land and shallow off-shores, except the portions passing through rolling terrain in the vicinity of the junction with the existing Bataan expressway.

ii) Road Design Criteria

Inasmuch as favorable terrain is predominant, deviations from current Government design standards are not expected.

Brief notes for each item of geometrical design criteria are presented below:

a) Design Speeds

The design speeds adopted for the future extension section of Manila-Bataan Coastal Road in all alternatives are 120 km/h and 100 km/h for the flat and the rolling terrain areas, respectively.

b) Lane Width

The 12-foot of lane width is adopted throughout the entire stretch of high type Manila-Bataan Coastal Road.

c) Shoulder Width

A 3.0 meter wide exterior shoulder is recommended for the entire stretch of the coastal road on the basis of ultimate construction which would be 4 lanes.

As for interior shoulder, a constant width of 1.5 meters is recommended.

The execution of the project will be done based on the staged construction. Therefore, the 2-lane 2-way operation would be needed initially and the available shoulder width on each side becomes 2.25 m.

d) Median Width

Since it was found that a foundation treatment cost (i.e. foundation replacement, construction of sand piles) is rather high in the area, a conservative median width of 5 meters is recommended.

D. Bridge Design Criteria

In general, all bridge design will be done in accordance with the pertinent provisions of the "Standard Specifications for Highway Bridges, 11th Edition, 1973" adopted by the American Association of State Highway Officials (ASSHO). The design live load to be adopted for the design of bridges will be HS 20-44.

Load due to earthquakes were considered modifying the MPH standard as follows:

i) Superstructure

20% of the dead load would act at the bearings.

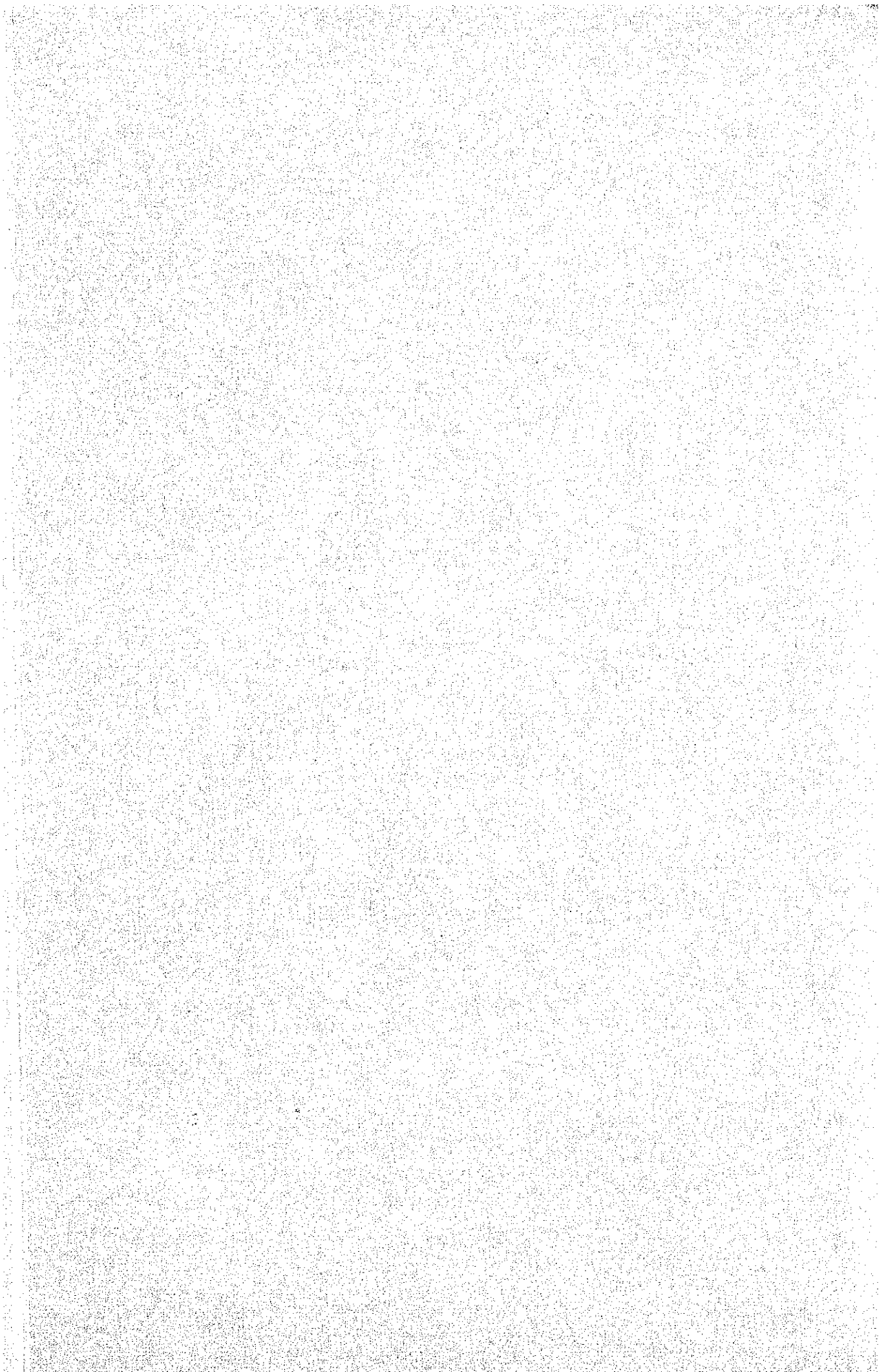
ii) Substructure

20% of the dead load would act at the center of gravity of the substructure.

E. Work Program

General study for Manila-Bataan Coastal Road will be developed further including the economic aspect in Stage II.

APPENDIX



APPENDIX I

SURVEY RECORDS

SURVEY RECORD

MONTH	DATE	ACTIVITIES
February	5 (Mon)	:First Team's Arrival (Tokyo-Manila) : Mr. Shikitchi, Mr. Kimura, Mr. Furuya, : Mr. Shiraiwa and Mr. Nojima. : Meeting with Supervisory Committee.
	6 (Tues)	:General Reconnaissance by Air with : Supervisory Committee. : :General Reconnaissance with MPH and : Supervisory Committee to Navotas
	7 (Wed)	:S/W Meeting with MPH and JICA. :Inception Report Discussion with MPH
	8 (Thurs)	:Inter-Agency Committee meeting at MPH :Preparation for Data Collection
	9 (Fri)	:Supervisory Committee Departure : (Manila-Tokyo) Mr. Miyazaki, Mr. Inoue : and Mr. Kubota :Arrangement of Project Office in MPH. :Contact with Certeza Re: Mosaic :Visit to MPWTC
	10 (Sat)	:Staff Meeting
	11 (Sun)	:Holiday

MONTH	DATE	ACTIVITIES
February	12 (Mon)	Data Collection in MHS, Bureau of Soils, NEDA and PPA Checking of Data List Contact with Aerotech System Re: Mosaic
	13 (Tues)	Data Collection in NEDA, Bureau of Soil PPA and MHS
	14 (Wed)	Data Collection in MPH, Bureau of Soils Meeting with Mr. Kosuge at JICA Office
	15 (Thurs)	Checking of Data List Meeting with Director of BPW Data Collection in MPWTC and Bureau of Soils
	16 (Fri)	Data Collection in BPW and MAR Hearing TTC Re: Soil of Manila Bay
	17 (Sat)	Staff Meeting Data Collection in CDCP
	18 (Sun)	Holiday
	19 (Mon)	Mr. Hasegawa Arrival (Tokyo-Manila) Field Reconnaissance (Candaba, Pampanga River, Bulacan River) Meeting with MAR, Re: Mosaic
	20 (Tues)	Inter Agency Committee meeting at MPH Data Collection in MPWTC

MONTH	DATE	ACTIVITIES
February	21 (Wed)	:Meeting with MAR; Re: Mosaic :Data Collection in CDCP, MPH, MHS, and BPW.
	22 (Thurs)	:Data Collection in Camp Aguinaldo, : PAGASA, BCGS and MHS. :Data Analysis
	23 (Fri)	:Reconnaissance by Boat of Manila Bay : Coastal Line (fr. Manila to Balanga) :Data Analysis
	24 (Sat)	:Second Team Arrival (Tokyo-Manila) : Mr. Watanabe, Mr. Horie, Mr. Daicho : and Mr. Noda. :Staff Meeting
	25 (Sun)	:Holiday
	26 (Mon)	:Staff Meeting :Data Collection (in LBDCC Office, Task : Force, TTC) and Analysis :Field Reconnaissance (from Manila to C-6)
	27 (Tues)	:Data Collection in(MPH, MHA, NHA, MPWTC, : LTC, NEDA) and Analysis :Report to TTC, JICA :Visit to Bureau of Mine Library, MAR and : BCGS
	28 (Wed)	:Field Reconnaissance (Navotas Fishery : Port)

MONTH	DATE	ACTIVITIES
		:Project Area by Surveyor
		:Data Collection (in BPW, PPA)and Analysis
		:Meeting at TTC and Bureau of Costumer
March	1 (Thurs)	:Field Reconnaissance (San Fernando, Balanga)
		:Data Collection in BCGS
		:Hearing DTCI
	2 (Fri)	:Reconnaissance by Boat of Manila Bay
		: Coastal Line and Main Rivers)
		:Preparation of Structure Plan
		:Data Analysis
		:Hearing from NEDA
	3 (Sat)	:Staff Meeting
	4 (Sun)	:Holiday
	5 (Mon)	:Setting of Alternative Routes
		:Meeting at MHS, CERTEZA and Region IV MPH
		:Preparation of Progress Report
		:Data Analysis
		:Field Reconnaissance by soil Engr.(C-5, C-6)
		:Preparation of Structure Plan
	6 (Tues)	:Reconnaissance by Small Boat (Navotas,
		: Bulacan River)
		:Field Reconnaissance (Project Area to
		: Bataan)
		:Discussion with Director of Soil and
		: Material Division.

MONTH	DATE	ACTIVITIES
March		:Data Collection in BCGS
		:Inter Agency Committee meeting
	7 (Wed)	:Staff Meeting on MPH Comments
		:Meeting at Bureau of Customs and MAR
		:Preparation of Progress Report
	8 (Thurs)	:Review of Existing Data
		:Preparation of Progress Report
		:Establishment of Policy on Soil and : Material Surveys and Engineering Survey
		:Visit to F.F. CRUZ
	9 (Fri)	:Data Collection in MPH
		:Preparation of Progress Report
10 (Sat)	:Staff Meeting	
11 (Sun)	:Holiday	
12 (Mon)	:Meeting with Japanese Embassy	
	:Field Reconnaissance (from Manila to : Bocaue)	
	:Preparation of Progress Report	
13 (Tues)	:Preparation of Progress Report	
	:Inspection Soil Laboratory of DTCE	
	:Visit to Bureau of Land	
14 (Wed)	:Filed Reconnaissance (C-5, C-6 Area)	
	:Visit to Philippines Soil Consultants	

MONTH	DATE	ACTIVITIES
March		Inc. and Gerdesy Services, Inc.
		:Preparation of Progress Report
		:Visit to Office of Manila North Exp.
		: and MPWTC.
	15 (Thurs)	:Preparation of Progress Report
	16 (Fri)	:Preparation of Progress Report
	17 (Sat)	:Staff Meeting
		:Preparation of Progress Report
	18 (Sun)	:Holiday
	19 (Mon)	:Hearing from MPH on Inseption Report
		:Final Quatation from M.A.R. Re: Mosaic
		:Preparation of Progress Report
		:Visit to Local Survey Contractor
	20 (Tues)	:Preparation of Progress Report
		:Filed Reconnaissance (Malolos, Hagonoy,
		: San Nicolas, Sto. Rosario, San Roque)
		:Visit to Local Survey Contractor
	21 (Wed)	:Preparation of Progress Report
		:Field Reconnaissance by Surveyor (C-5,C-6)
		:Field Reconnaissance (Pampanga, Abucay,
		: Balanga)
	22 (Thurs)	:Preparation of Progress Report

MONTH	DATE	ACTIVITIES
March	23 (Fri)	:Submission of Progress Report
	24 (Sat)	:Staff Meeting
	25 (Sun)	:Study Team's Departure (Manila-Tokyo)
		: Mr. Shikichi, Mr. Watanabe, Mr. Horie,
		: Mr. Kimura, Mr. Furuya, Mr. Shiraiwa,
		: Mr. Daicho, Mr. Noda, Mr. Hasegawa,
		: Mr. Nojima

APPENDIX 2

LIST OF DATA COLLECTED

CODE	DESCRIPTION	YEAR	SOURCE	AGENCY SUPPLIED	REMARKS
1.	<u>TOPOGRAPHIC MAPS AND AERIAL PHOTOS</u>				
1)	Topographical Map, 1:250,000 Scale with 100 meters Contour Interval	1973	BCGS		
2)	Topographical Map, 1:50,000 Scale with 20 meters Counter Interval	1962	BCGS		3063-1,II, 3064-1,II. 3065-II, 3163-I,II,III,IV
3)	Topographical Map, 1:25,000 Scale with 2 meters Contour Interval	1972	BCGS		3164-I,II,III,IV, 3165=III 3263-III,IV, 3264-IV
4)	Topographical Map 1:10,000 Scale with 2 meters Contour Interval	1966	BCGS		3265-III
* 5)	Aerial Photo Transparent, 1:25,000 Scale		M.A.R.		* denotes data under processing.
* 6)	Aerial Photo Mosaic , 1:10,000 Scale		M.A.R.		
* 7)	Aerial Photo Transparent, 1:8,000 Scale		M.A.R.		
* 8)	Aerial Photo Transparent, 1:4,000 Scale		M.A.R.		
9)	National Triangulation Data		BCGS		
10)	First-Order Levelling Data	1972	BCGS		
11)	Hydrographic Map, 1:125,000 Scale	1975	BCGS		
12)	Triangulation Station Data		BCGS		
13)	Bench Mark Data		BCGS		

CODE	DESCRIPTION	YEAR	SOURCE	AGENCY SUPPLIED	REMARKS
2.	<u>SOCIO-ECONOMIC, URBAN AND REGIONAL PLANS</u>				
a.	Existing Data				
1)	Integrated census of the Population and its economic Activities	1975	NCSO		
	- Philippines, Zambales, Bataan, Pampanga, Bulacan, Rizal, Metropolitan Manila, Laguna, Cavite, Batangas				
2)	Population Dimension of Planning	1975	NCSO		
	- Population Projections for the Philippines by Province, 1970-2000				
	- Population Projections of Cities and Municipalities in the Philippines 1970-2000				
	- Conference Highlights and Planning Guidelines				
3)	Regional Development Information,	1978	NEDA		
	- Region III Central Luzon				
	- Region IV Metropolitan Manila				
	- Region IV-A Southern Tagalog				
4)	Settlement Profiles by Province	1978	MHS		
5)	Family Income and Expenditures -	1975	NCSO		

CODE	DESCRIPTION	YEAR	SOURCE	AGENCY SUPPLIED	REMARKS
6)	Special Release No. 190 Family Income Distribution in the Philippines - Special Release No. 191	1975	NCSSO		
7)	Economic Status of the Primary Sector of the MBMR	1974	HSG MPWTC		
8)	1978 Philippine Statistical Yearbook	1978	NEDA		
9)	NCSSO Monthly Bulletin of Statistics - January to March 1978 - October to November 1978	1978	NCSSO		
10)	Philippine National Income Series Number 4 The National Income Accounts CY 1971-1975 Number 5 The National Income Accounts CY 1946-1975	1978	NEDA		
11)	1977 Budget and General Appropriations Ordinance	1977	MTC MHS		
12)	Philippine Development Vol. VI No. 10 Bataan Export Processing Zone	1978	NEDA		
13)	Philippine Economic Indicators Vol. VI No. 12	1978	NEDA		

CODE	DESCRIPTION	YEAR	SOURCE	AGENCY SUPPLIED	REMARKS
b.	Policy and Planning				
1)	Five-year Development Plan 1978-1982 including the Ten-year Development Plan 1978-1987	1977	Philippines		
	- Summary				
	- Profile of Selected Development Projects				
	- Central Luzon (Region III)				
	- Southern Tagalog (Region IV-A)				
2)	A Guide to Project Development	1978	NEDA		
3)	Philippine Development Report	1978	NEDA		
4)	Realizing the Vision of a New Society	1978	MMS		
	- National Multi-year Human Settlements Plan 1978-2000				
	- Central Luzon (Region III)				
5)	Manila Bay Metropolitan Region Strategic Plan	1975	PPDO MPWTC		
6)	Integrated Development of the Manila Bay Region-Overall Framework Plan	1973	PPDO MPWTC		
7)	Pampanga Delta Area Development Project	1974	MPWTC		
	- Interim Report I				
	- Preliminary Survey (Ecology)(Fisheries Development Studies)		NEDA UPIP		

CCODE	DESCRIPTION	YEAR	SOURCE	AGENCY SUPPLIED	REMARKS
8)	Pampanga Delta/Candaba Swamp Area Development Project	1977	PPDO MPWTC & TAHAL Consulting		
9)	Toward the City of Man		MMC MHS		
10)	1977 Budget and General Appropriations Ordinance	1977	MTC MMS		
11)	Population Analysis and Projections for Manila Bay Metropolitan Region	1974	MSGP MPWTC		
12)	The Second Feasibility Study of Dagat-Dagatan and Regional Centers	1977	NHA Kinhill Pty Ltd.		
3.	<u>TRANSPORT PLANNING AND STUDIES</u>				
1)	MMETRO PLAN Metro Manila Transport, Land Use and Development Planning Project		PPDO MPWTC		
	- Final Report, Summary and Recommendations	1977	Freeman		
	- Final Report, Main Volume	1977	Fox & Associates		
	- Interim Report	1976			
2)	Manila Bay Metropolitan Region Strategic Plan	1978	PPDO, MBWTC		

CODE	DESCRIPTION	YEAR	SOURCE	AGENCY SUPPLIED	REMARKS
3)	Transportation Development Planning for the Manila Bay Region	1974	MSPG, MPWTC		
4)	National Transportation Study - Interim Report - Volume 2 Highway and Road Transport - Volume 6 Drawings	1978 1978	Inter-Agency Technical Committee: (MPWTC, NEDA, MPH, MARINA, PPA, CAA) - do -		
5)	National Transportation Study	1975	PPDO, MPWTC		
6)	Road Feasibility Studies - Road Feasibility Studies - Road Feasibility Studies II		MPH Norconsult as with Hoff & Overgaard		
7)	Urban Transportation Study in the Metropolitan Manila Area	1973	JICA		
8)	Customs Tables in Selected Chapters Revision Orders 1978 No. 1 and 12 Revision Orders 1979 No. 1 and 2	1976 1978 1979	BOC BOC BOC		
9)	Radial Road R-10 Project - Feasibility Study of Radial Road R-10 Project - Drawings - Feasibility Study and Implementation Program of R-10 Project	1975 1975 1977	JICA JICA MPH		

CODE	DESCRIPTION	YEAR	SOURCE	AGENCY SUPPLIED	REMARKS
10)	<ul style="list-style-type: none"> - Radial Road R-10 Project-Manila Urban Development Project - C-3, R-4 and Related Roads Project - Feasibility Study of C-3, R-4 and Related Road Project - Drawings 	1978	Techniks & DTCL		
	<ul style="list-style-type: none"> - JICA MPH 	1978	JICA MPH		
	<ul style="list-style-type: none"> - JICA MPH 	1978	JICA MPH		
11)	<ul style="list-style-type: none"> - Manila Cavite Road and Reclamation Project - General Development Plan - Transportation System Planning Project - Traffic Study - Annex I Inventory and Traffic Survey of Selected Establishment in Greater Manila Area - Annex II Vehicle Movements, Parking Space Usage and Duration Survey - Annex V A Study on the Parking Area Requirements - Annex VI Criteria on Space Requirement - Annex VII Results of the Survey of Existing Commercial and Shopping Centers - Annex VIII Studies on the Environment 	1977	CDCP		
		1977	GM Overseas		
		1978	CDCP		
		1974	CDCP		
		1974	CDCP		
		1974	CDCP		
		1974	CDCP		
		1974	CDCP		
12)	<ul style="list-style-type: none"> - Proposal for the Manila-Bataan Coastal Road Project, Phase I 	1976	CDCP		

CODE	DESCRIPTION	YEAR	SOURCE	AGENCY SUPPLIED	REMARKS
13)	- Volume 1 Proposal - Volume 2 General Design Criteria Master Plan Study Port of Manila	1978	PPA Sulzgiitter Consult		
4.	<u>GEOLOGICAL, SOILS AND MATERIALS DATA</u>				
1)	Geological Map of the Philippines, 1:1,000,000 Scale	1962	Bureau of Mine		
2)	Geological Study of the Effects of the August 1968 Series of Earthquakes	1969	- do -		
3)	Soils Survey for Navotas Fishery Port Construction		ADB		
4)	Summarization Final Report and Supplement of Soil and Foundation Engineering on Manila-Cavite Coastal Road and Reclamation Project	1977	MPH/CDCP		
5)	Journal of the Geological Society of the Philippines, Vol. XXIII, June 1969, No. 2	1969	Bureau of Mine Library		"Geology of the Manila Delta"
6)	The Philippine Geologist Vol. XX, June 1966, No. 2	1966	- do -		"A Study of the Techtonics of the Philippine Archipelago"

CODE	DESCRIPTION	YEAR	SOURCE	AGENCY SUPPLIED	REMARKS
7)	Soil Survey of Bulacan Province Philippine Islands	1939	Dept. of Agriculture and Commerce		
8)	Soil Survey of Pampanga Province Philippines	1956	Dept. of Agriculture and Natural Resources		
9)	Semi-Detailed Soil Survey of Pampanga Delta Development Project	1975	Dept. of Agricultural and Bureau of Soils		
10)	Material Sources Map-Pampanga Province Scale 1:100,000	1978	Soil and Materials Div., MPH		
11)	Material Sources Map-Province of Bataan Scale 1:100,000	1978	Soil and Materials Div., MPH		
12)	The Philippine Geologist Vol. XXII December, 1968 "Crustal Unrest in the Philippines",	1968	Bureau of Mine Library		
5.	<u>HYDROLOGICAL DATA</u>				
1)	Pampanga Delta/Candaba Swamp Development Project, Reports.	1979	DPWTC		
2)	Pampanga Delta Area Development Project,				

CCDE	DESCRIPTION	YEAR	SOURCE	AGENCY SUPPLIED	REMARKS
	- Interim Report I	1976	DPWTC		All round Hydrological data about Pampanga Delta Area.
	- Interim Report II	1976	DPWTC		
3)	Rainfall and Typhoon Data	1970-1976	PAGASA		
4)	Flood Record	1972	BPW		
5)	Marine Chart for Manila Bay 91294, 91292, 91297, 91280	1976	BCGS		
6)	Tide and Current Tables, Philippines	1978, 1979	BCGS		
7)	Pilot Book for Manila Bay No. 31, 33		M.S.A. in Japan British A M Book 31		
8)	Hydrogeology of Central Luzon	1970	Bureau of Mine		
9)	Climatology and Wind Related Problems in the Philippines	1973	PAGASA		
10)	River Improvement Plan		BPW		
11)	Plan for Drainage of Manila and Suburbs	1952	BPW		
12)	Annual Report 1978	1978	B.F.A.R.		

CODE	DESCRIPTION	YEAR	SOURCE	AGENCY SUPPLIED	REMARKS
6.	<u>ROAD AND BRIDGE DESIGN DATA</u>				
1)	Geometric Design Standard		MPH		AASHTO A Policy on Design of Urban Highways and Arterial Streets 1973
2)	Loading Standard for Bridges		MPH		Use HS-20-44
3)	Standard Specification for Highways and Bridges	1972	EPH		
4)	Catalogue of Philippine Earthquakes (1585-1976)		PAGASA		
5)	The Earthquakes Design Criteria		MPH		
6)	Construction Cost		MPH		R-10, MSDDR-EDSA
7)	Prestrest Concrete Design Handbook		CONSTRESS		
8)	Pretresf Concrete Design Data		PHILSTRESS		
7.	<u>RECLAMATION DATA</u>				
1)	Master Plan Study Port of Manila Final Report (Volume 1, 2)	1978	DPWTC		
2)	Proposal for the Manila-Bataan Coastal Road Project, Phase I (Volume III)		MPH		North Manila Bay Area Province of Rizal and Bulacan)

CODE	DESCRIPTION	YEAR	SOURCE	AGENCY SUPPLIED	REMARKS
3)	A Study of the Tectonics of the Philippine Archipelago	1966	U P		
4)	Journal of the Geological Society of the Philippines Vol. XXIII	1969	U,P		The Philippine Geologist Vol. XX
5)	Vol. I Final Report on Philippine Fisheries Port Project	1976	BPW		Geology of the Manila Delta
6)	Philippine Fisheries Port Project Soil Investigation Report		ADB		
7)	Final Report of Soil Stabilization Test Work on MCCRRP	1977	DPH		
8)	Philippines, Luzon, Earthquakes of August 1968	1968	UNESCO		
9)	Recommended Earthquake Regulation for the Philippine		ASEP		

APPENDIX 3

FISHERY INFORMATION

1. General
2. Profile of the Fishing Industry in the
Influence Areas
3. Future Fishing in the Region

3. Fishery Information

1. General

This study was undertaken primarily as aid in planning the Manila-Bataan Coastal Road and its related road project. The discussions in this section are not intended for the development of fishing in the region but the subject is discussed rather as supplemental information on the planning of the said Project road.

Initial findings have confirmed that the region is the most important supplier of fisheries products, the chief source of animal protein in Metro Manila.

Due to the vital role of fishery to the economy, efforts will be made to preserve the existing fishing industry. Therefore, the fishery study was guided by the social situation in the coastal fishing areas and fishponds, as well as the environmental effect to the fishing industry.

2. Profile of Fishing Industry in the Influence Area

i) Influence Area

The exact locations of the Coastal Road's terminals in Manila and Bataan are still unknown.

Nevertheless, it is certain to run through Metro-Manila, the provinces of Bulacan and Pampanga and

to terminate at a point in Bataan. Thus, the influence area shall be restricted within Metro Manila and the above mentioned three provinces.

2. Outline of Fishing Industries in the Influence Area

To draw a clearer picture of regional fishery and its marketing, it is helpful to compare national fish production and consumption with those of the study area.

According to the 1975 statistic of the Fisheries and Aquatic Resources (BFAR), total fish products in the Philippines in 1975 was 1,393,500 tons. Given a total population of 42.7 million, it can be estimated that the fish consumption per capita per annum in the Philippines was about 32 kilograms.

Metro Manila, on the other hand, had five million people in 1975. Since the City's fishing grounds are very small, it is apparent that the bulk of this fish requirements would have come from the neighboring provinces of Bulaoan, Pampanga, and Bataan which produce about 41,700 tons yearly* in Municipal Fisheries and fishponds.

Considering that the combined population of the three provinces was estimated at 7.5 million, it is fair to

* Source: Pampanga Delta/Candaba Swamp Area Development Project, DPWTG.

assume that the above production did not even meet the demands of the three provinces. Clearly, there was very little surplus production which could be diverted to Metro Manila's market. The next possible source for Metro Manila was Commercial Fishing which was recorded to be about 500,000 tons yearly.* But due to the problem of accessibility not more than 25 percent of Commercial Fish productions were landed in Metro Manila.

The situation can only lead to a perennial shortage of fishery products in the country's Premier City. In recent years, unstable supply would have been the problem of the City Administration. The problem is reflected in the ever increasing fish prices. The index of consumer price for fish items in Metro Manila rose by 257 percent from 1971 to 1975 while those of other food items showed hikes of between 203 percent and 229 percent only for the same period.

* Source: Pampanga Delta/Candaba Swamp Area Development Project, DPWTC.

3. Future Fishing Industry in the Region

At present, a total of about 35,000 hectares of fishpond produce 32,391 tons of fish and other fauna.* It is estimated that from 85 to 90 percent of these production are milkfish. The fishponds have more potential for greater production and fairly wide ground for expansion. With better technology, total production can reach up to 2,000 kilograms per hectare per annum as was proven by the fishermen of Taiwan.

Furthermore, aerial survey data showed that this target is possible for a least 47,000 hectares. There is no known scientific or technical barrier to introducing several varieties of commercially valued species and in maximizing the use of less productive sweet-watered marshlands area in combination with brackish watered fishpond.

Metro Manila strongly needs a dependable and steady supply of the traditional species of fish from the fishing area in the region. At present, the regions cannot meet this demand.

The completion of the Coastal Road will facilitate the marketing of fish supplies to an ever increasing market which is Metro Manila. In return, a new transportation system and marketing facility will encourage more investments in fishing industries and the introduction of modern fishing technology.

*Source: Pampanga Delta/Candaba Swamp Area Development Project, DPWTC.

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