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DRAFT REPORT

STAFF STUDIES FOR PROPOSED WEST BAY INDUSTRIAL ESTATE

Philippines.

STAFF STUDIES

FC2

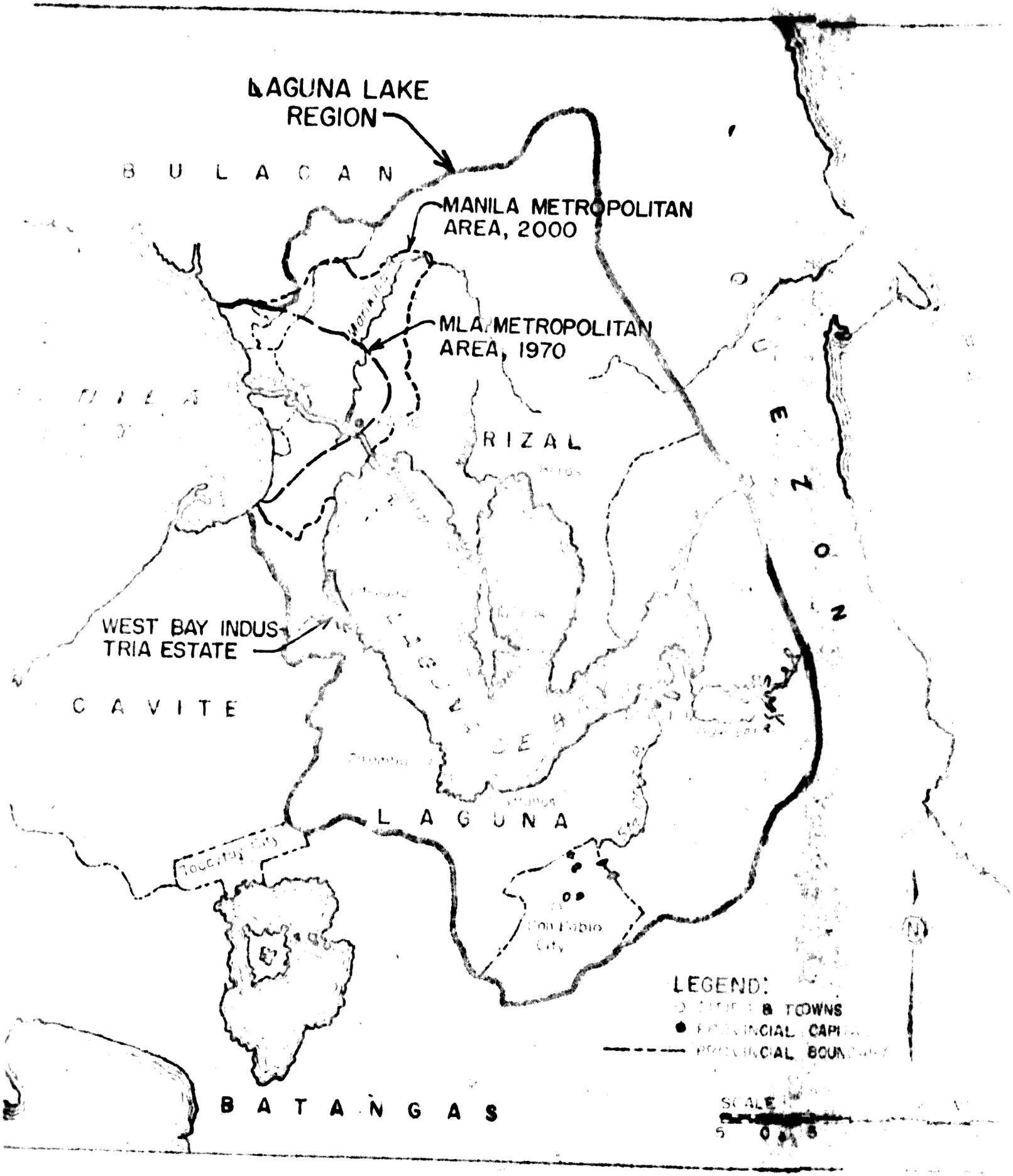
PROPOSED WEST BAY INDUSTRIAL ESTATE

1972

LAGUNA LAKE DEVELOPMENT AUTHORITY
May, 1972

TABLE OF CONTENTS

SECTION 1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RIZAL
QUEZON
WEST BAY INDUSTRIA ESTATE
CAVITE
LAGUNA
BATANGAS
LEGEND:
TOWNS
PROVINCIAL CAPITAL
PROVINCIAL BOUNDARY
SCALE
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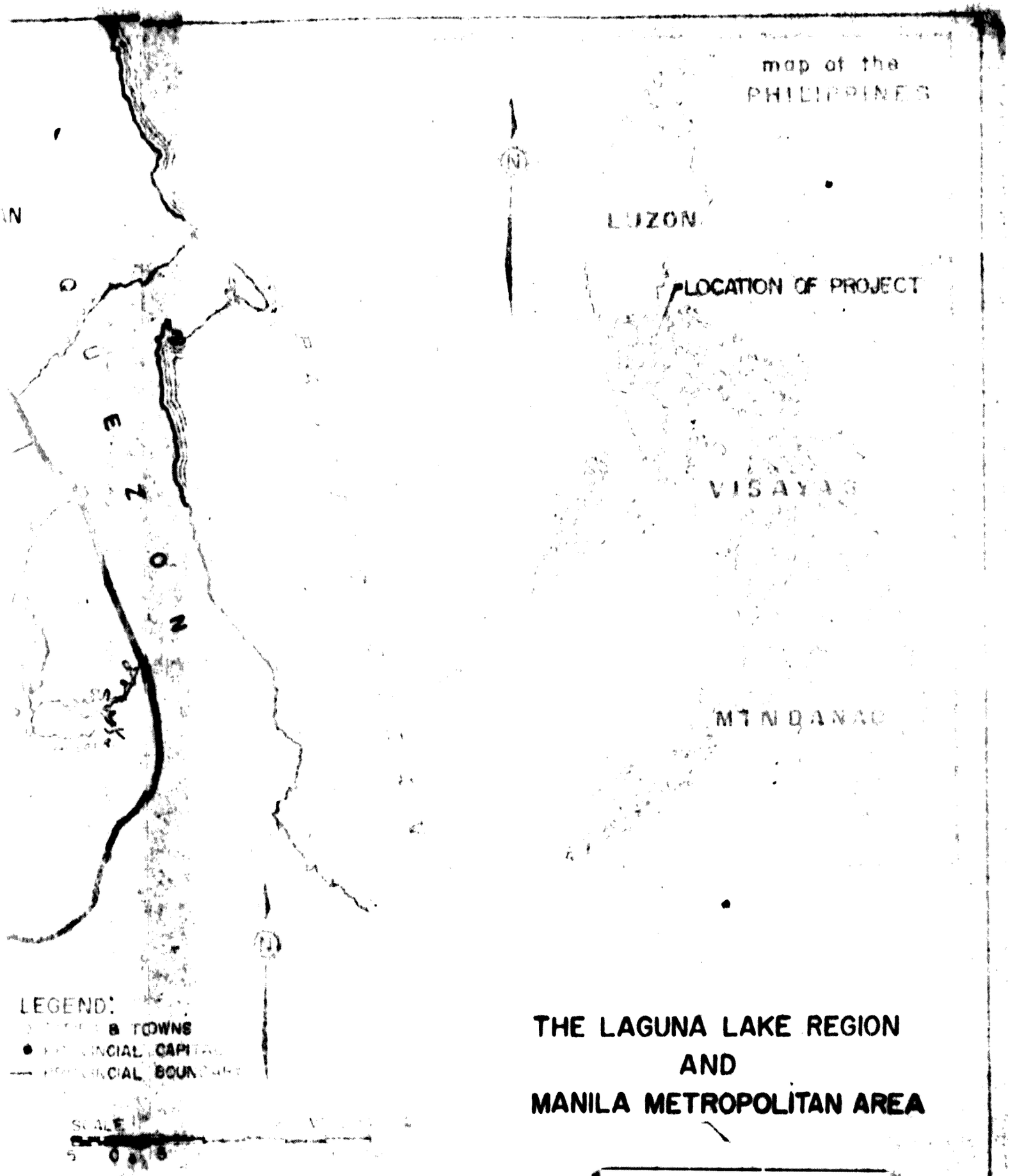

THE LAGUNA LAKE REGION AND MANILA METROPOLITAN AREA

SECTION 2

PART I

INTRODUCTION

1. Background Information

The Laguna Lake Development Authority (LLDA) has been empowered by the Philippine Government, through R.A. 4850, to lead, promote and accelerate the development and balanced growth of the Laguna Lake area. This area consists of the provinces of Laguna and Rizal and the chartered cities of Manila, Pasay, Quezon, Caloocan, and San Pablo.

As one step towards the development of this area a study was conducted jointly by the United Nations Development Programme (UNDP) and the Philippine Government with the LLDA as the Philippine Government cooperating agency. This study - a Feasibility for the Hydraulic Control of the Laguna de Bay Complex and Related Development Activities-was undertaken for UNDP by T. Ingledow and Associates LTD.(Canada). The report was completed in December 1970.

A pre-feasibility study on the establishment of a 360 hectare general purpose industrial estate through land reclamation in the western portion of the Laguna Lake was a part of this report. The study concluded that the industrial estate appeared to be technically and commercially feasible and recommended a detailed feasibility study.

For the purpose of preparing this detailed feasibility study the LLDA has sought the assistance of the United Nations Industrial Development Organization (UNIDO).

Meanwhile the LLDA has re-evaluated the need for the said estate within the context of its overall program of development for the Laguna Lake area.

2. The LLDA Initial Findings

2.1 The Region's Industrial Sector

2.1.1 A glimpse at the Regional Industrial Growth. An overall investigation of the regional economy shows that, through time, the industrial sector has emerged as the most important segment of the regional economy. This sector's contribution to regional income has grown from 26 percent in 1961 to about 35 percent in 1965. It is expected that this sector will again carry the bulk of the development task in the region. Hence, in the planning process, necessary attention has to be accorded to this sector. But before any regional industrial policy could be adopted it is imperative to analyze the problems besetting this sector.

The analysis of the problems, however, has not been limited to the regional sphere but has extended to cover the national sphere. This is because of the fact the development in this regional economic sector has always been strongly affected by national developments. It is strongly sensitive to national changes because national industrial activity is concentrated within the region. In 1961 about 46 percent of national industrial income has originated from the region. By 1965 this regional contribution rose to 53 percent.

2.1.2 The Regional Industrial Problems

A glimpse at the development of the country would show that the Philippines has always relied upon industrialization as a vital vehicle of development. The last 25 years have seen the emergence of the industrial sector, more specifically the manufacturing sector, as an important

segment of the Philippine economy. This development has been achieved through a series of policies geared towards encouraging the establishment of industries.

However, investigation of the manufacturing sector would reveal that most activities which have been promoted are import-dependent especially in raw material inputs. These activities would have been economically justified had they generated enough incremental foreign exchange earnings to offset their propensity to spend foreign exchange. These activities also happened to be fairly unsophisticated versions of more intricate manufacturing processes not yet established locally. Furthermore the type of protectionism that was afforded manufacturing favored final consumer industries thereby hampering the development of full-scale background integration in the manufacturing industries.

Due to the effects of previous policy that cheapened foreign exchange and laws that overpriced labor, capital intensive industries were also encouraged which relegated the development of labor intensive industries to the background.

The emergency of these activities have led to a number of problems which have perenially burdened the Philippine economy. Among these problems are unemployment, deterioration in the country's foreign exchange reserves and overcapacity. Nevertheless most of these activities remained profitable because of the artificial protection accorded them.

Economics of location has favored the Laguna Lake region, specifically the Greater Manila Area, as the most ideal neighborhood for most of these industries. The attractiveness of the region as a favorable industrial neighborhood has been further intensified by the "concentrated oriented policies" that had been adopted by the national

government. This over-concentration of industries in the region is the major reason for the enormous disparity between the region's per capita income and the national per capita income. From the national point of view this situation is a major concern as this indicates a very inequitable distribution of income on geographical basis and pollution-wise.

From the regional point of view this development is also a major concern. Partly as a result of the massive regional industrial growth and the absence of any physical plan, the problems of pollution and congestion are now being felt in the region. The present state of pollution is one of the reason why fishing and agricultural activities, specifically in the lake area, have not been so productive. Congestion, particularly in the Greater Manila area, is certainly one of the major reasons for the manifested desire of businessmen to transfer offices and factories to outlying areas not so far from the city. This development is in a way one of the reason for the substantial increase of real estate values at the outskirt of the city. This high cost of real estate is one reason hampering the growth of medium and small scale industries in the region.

2.1.3 Present Policies of the National Government

Recently there has been some drastic change regarding policies affecting industries. In the past the industrial program relied heavily on the policy of protectionism. Through experience the Philippines has learned that protection is necessary but if carried too far, it can lead to economic inefficiency and waste. What is needed is the proper inducement to businessmen to invest in the desired priorities where their business could remain viable while

still being subjected to market risks. This need led to the creation of the BOI or the Board of Investments. The main activity of the BOI concerns the formulation of an annual Investment Priority Plan (IPP) and the evaluation of applicants for registration as preferred enterprises.

The IPP is a listing of the types of industrial activities eligible for special incentives. On the basis of several criteria the BOI decides whether or not an activity is to be included in this list. Among these criteria are: (1) foreign exchange effect; (2) linkage effect; (3) use of the country's indigenous resources; (4) employment generation; (5) industrial location. One of these criteria is industrial location. The objective in applying this criteria is to encourage industrial dispersal. There is no doubt that the last criteria would in some cases work to the disadvantage of the region. On the other hand, even with the existence of this criterion there will still be a horde of industries which, due to their nature, would be attracted to the region.

Among these industries would be the market oriented industries and of course, industries which find it beneficial to join an industrial agglomeration. This expected industrial growth, if again left unplanned, could further aggravate the problems mentioned earlier.

3. LLDA's Contribution to the Solution of the Problems

Since the industrial sector has already proven itself as a major source of regional development, growth in this sector must be sustained. This could be effected through a series of policies, both national and regional. The national government has already formulated policies which could help solve the problems discussed in section 2.1.2. The

LLDA is pledged to assist the national government in this undertaking within the sphere of regional planning.

As part of its regional development plan, the LLDA has selected the following regional industrial development objectives:

1. Increase utilization of the region's indigenous resources;
2. Increase utilization of the region's industrial agglomeration;
3. Increase job opportunities to the region's unemployed (about 7 percent of its labour force);
4. Induce an orderly expansion of industrial and commercial space to minimize pollution and congestion.

To achieve these objectives the Authority has considered several projects, amongst which, is the industrial estate. Through the industrial estate the rational expansion of industries within the region will be facilitated thus minimizing the ills effects of industrialization such as pollution and congestion. Through the application of certain criteria in the selection of industries to be located in the estate, the LLDA will be able to achieve the other above-mentioned objectives. At the same time it will be able to assist the national government in its task of aiding the country in its development path.

4. The Need for a Feasibility Study

As earlier mentioned, the pre-feasibility study of the industrial estate has concluded that the project appears to be technically and commercially feasible. However, this detailed feasibility study is being done to confirm these findings and also to develop a manual of operating procedures for the implementation of the project.

This feasibility study covers the following topics as stipulated in the UN Terms of Reference (See Appendix I):

1. Location Decision
2. Market Study
3. Reclamation Study

4. Labour Study
5. Tax and Legal Study
6. Size of the Industrial Estate
7. Master Plan and Development Programs
8. Incentives
9. Management and organizational Study
10. Financial Study
11. Economic Contribution

The first five topics are being assigned to LLDA personnel whose final work will be evaluated by the UNIDO experts. The last seven portion of the study will be done by the UNIDO experts with the assistance of LLDA personnel. All the LLDA studies have been presented separately except for the Reclamation Study and the Location Decision which have been merged as one study because of the very close connection between these two aspects.

PART II

MARKET STUDY

1. Introduction

1.1 Purpose and Limitation of the Study

The purpose of this study is to assess the market potential for industrial sites in the Laguna Lake Region. This study will however concentrate on the analysis of market conditions in the Metropolitan Manila area and environs[1/] because it is assumed, that most industries, if they desire to locate themselves within the region, will prefer to settle within the Metropolitan Manila area and its immediate surroundings. Past pattern of industrial settlement in the region would justify this assumption. It is further assumed that such pattern will continue in the future because of three major reasons:

a. Metropolitan Manila will continue to be a major market for industrial as well as agricultural products;
b. Metropolitan Manila has the necessary infrastructure such as ports, roads and airports which facilitate exportation of industrial goods to other parts of the country as well as to other countries;
c. Metropolitan Manila has a relatively developed industrial sector which means that any industry can be easily linked with the existing industries either backwardly or forwardly.

1/ Metropolitan Manila Area and Environs include:
a. North Manila includes portions of Manila and Quezon City, Caloocan, Malabon and Navotas
b. South Manila includes portions of Manila, Pasay, Pateros, and Makati
c. Parañaque includes Parañaque, Pasay and Las Piñas
d. Malabon includes portions of Quezon City, Navotas, Quezon City, Malabon and Valenzuela
e. San Juan includes portions of Quezon City, Mandaluyong, Pasig, San Juan, Manila and Caloocan
f. Marikina includes portions of Quezon City, Marikina, Montalban, San Mateo, Cainta, Pasig, and Taytay
g. Upper Laguna includes Taguig, Pateros, Parañaque and Pasay
h. Guadalupe includes portions of Makati and Pateros

The major sources of supply for industrial space identified in this study are the open land spaces which are still abundant in the suburbs of Metropolitan Manila and expected reclamations on the shores of Manila Bay and existing fishponds in the Navotas area. The study also considered the possible competition that might arise between the proposed West Bay Industrial Estate and the proposed or established industrial estates in New Town, Bulacan, Sangley Point, Cavite, and Mariveles, Bataan. It is believed that only the latter estates can offer competition to the potential industrial areas in the Laguna Lake Region.

This market study also compares the prices of existing land in the vicinity of the proposed location of the industrial estate and the prices of the reclaimed lands. Furthermore it was analyzed the best way of disposing the parcels of land in the estate (i.e. lease or sale).

1.2 Previous Studies

The present study took into consideration the information and findings presented in the reports of two international consulting firms, namely, Black and Veatch International ("Master Plan for a Sewerage System for the Metropolitan Manila Area" conducted for the World Health Organization) and T. Ingledew and Associates Limited and Aero Service Corporation (Feasibility Survey for the Hydraulic Control of the Laguna de Bay Complex and Related Development Activities" under the sponsorship of the Philippine Government and the United Nations).

2. The Theoretical Framework

2.1 The Demand Projection. Assuming that there are no data constraints, there are a number of indicators which can be used to estimate the changes in the requirements for industrial land. Among these indicators are:

a. the historical area increase or growth trends of industrial land;

b. the relationship between industrial land use and fixed assets;

c. the intention of business establishments to acquire lands for future expansion; and

d. the relationship between industrial growth and population.

Some arguments for the validity of such indicators are as follows:

a. the historical area increase of industrial land is the result of the interplay of several forces, economic and/or social, which can be assumed to have the same effect on the future increase in industrial land area;

b. technically and financially, the amount of fixed assets of a firm reflect the amount of land occupied by the firm;

c. additional land requirement of business establishments depend on their expansion plans;

d. population growth is a function of development and demand for industrial land is also a function of development. In the early stage of the development of an economy, there usually exists a direct and positive relationship between population growth and economic development.

Due to data constraints, indicators, "b" and "c" cannot be used. Indicator "b" cannot be used because the statistics available are the annual increase in fixed assets or fixed investment (a flow concept) and the estimated industrial land area (a stock concept.). A ratio between the available estimate of land for industrial uses and total fixed investment if used to derive future increase in industrial land, will tend to overestimate the projected industrial land areas. The reason for this is that the denominator of the ratio would be underestimated by an amount equal to existing stock of fixed capital of the base period (using the stock concept), the numerator would be overestimated by an amount equal to the existing land area of the base period (using the flow concept).[1/]

1/ The report prepared by T. Ingledew and Associates Limited and Aero Service Corporation made used of this method. The resulting projection in this report appeared to be overstated precisely because of the reasons stated above.

Indicater "c" can be estimated. However, this estimation would involve time and capital which would entail additional cost to the project.

The method chosen for projecting the demand or requirement for land in this study made use of both indicaters "a" and "d". Fortunately, the MHC/NAMASA study by Black and Veatch International which had similar objectives and area scope as this study, used indicater "a" for its projections.

The MHC/NAMASA study employed photogeometric maps taken 1954 and 1967 to estimate the actual expansion rates of the built up areas in the Metropolitan Manila area. This study also broke up the built up areas into residential, commercial, institutional and industrial areas. After adjusting this historical expansion rates to take into account the expected future developments in the study area, the MHC/NAMASA study was able to estimate the demand or requirement for land by built up area categories from the base year 1970 to year 2010. The study, however, did not phase the demands for land, say, by decades between 1970 and 2010.

The assumptions used by the MHC/NAMASA study were found to be valid especially after analyzing the implications of its projections on land/man ratios (indicater "d").

This market study therefore assumes that the MHC/NAMASA projections are feasible and that there is no need to do a separate projection of various land requirements. This present market study, however, estimated the projected demands for 1980, 1990 and 2000 using the geometric growth rates between 1970 and 2010 computed from the MHC/NAMASA projections.

2.2 The Supply Projection

The potential sources of land supply for industrial purpose which have been identified in this study are:

a. open land spaces,

b. reclaimed land, and

c. other land use

The MHO/ NAMASA study had these same sources of supply of industrial land.

3. The Projected Demand for Industrial Use

Table 2.1 shows the changing distribution of demand for land by use in the Metropolitan Manila area and environs. It may be observed that the total demand for land has increased by about 656 hectares from 4[illegible],427.7 hectares to 49,084.2 hectares. Since the present geographical area of metropolitan area and environs is only 4[illegible],427.7 hectares, these additional 656 hectares needed can only be satisfied through reclamation.

Table 2.1. THE PROJECTED DEMAND FOR LAND BY LAND USE AND ENVIRONS, 1970 TO 2010

Land-Use Type	ESTIMATED AREA (Hectares)				
	1970	1980	1990	2000	2010
Residential	12,74[illegible].5	17,442.9	22,130.0	2[illegible],076.6	35,621.6
Commercial	52[illegible].0	796.[illegible]	1,202.4	1,[illegible]15.4	2,740.5
Industrial	1,775.2	2,196.9	2,71[illegible].[illegible]	3,364.7	4,164.9
Institutional	1,391.7	1,73[illegible].3	2,171.3	2,712.1	3,3[illegible].[illegible]
Open	30,9[illegible]9.3	26,421.7	20,54[illegible].[illegible]	12,967.3	3,16[illegible].9
	4[illegible],427.7	4[illegible],596.6	4[illegible],766.[illegible]	4[illegible],926.1	49,0[illegible]4.2
	Percent Distribution				
Residential	2[illegible].4	35.9	45.4	57.4	72.6
Commercial	1.0	1.6	2.4	3.7	5.6
Industrial	3.7	4.5	5.6	6.9	[illegible].5
Institutional	2.9	3.6	4.5	5.5	6.9
Open	63.9	54.4	42.1	26.5	6.4
	100.0	100.0	100.0	100.0	100.0

Table 3.1 also indicate that the total area needed for industrial use will increase by 2,3?9.7 hectares between 1979 and 2010. By decades this increase is broken down as follows:

1970-19?0	421.7 hectares
19?0-1990	521.9 hectares
1990-2000	645.9 hectares
2000-2010	?00.2 hectares
	2,? 9.7 hectares

4. The Projected Supply of Land Available for Industrial Use

4.1 The WHO/NAWASA Supply Projection

To meet the increase in the demand for land for industrial use, the WHO/NAWASA study has identified several feasible sources.

Table 4.1. POSSIBLE SOURCES OF INCREASE IN INDUSTRIAL AREA BY MAJOR SOURCES AND BY DRAINAGE BASINS, 1970-2010, (In Hectares)

	1970	2010	Increase Hectares	Increase Percent
North Manila	149.3	447.9	29[illegible].6	2.[illegible]
South Manila	176.2	274.6	9[illegible].4	1.1
Parañaque	162.5	397.5	234.0	2.2
Upper Laguna	1[illegible].0	217.0	199.0	6.4
Guadalupe	22.5	47.0	24.5	1.9
San Juan	766.0	1,059.0	293.0	0.[illegible]
Marikina	210.5	1,137.0	926.5	4.3
Malabon	269.2	5[illegible]4.9	315.7	2.0
	1,775.2	4,164.9	2,3[illegible]9.7	2.2
	Percent Distribution			
North Manila	[illegible].4	10.[illegible]	12.5	
South Manila	9.9	6.6	4.1	
Parañaque	9.2	9.5	9.[illegible]	
Upper Laguna	1.0	5.2	[illegible].3	
Guadalupe	1.3	1.1	1.0	
San Juan	43.1	25.4	12.3	
Marikina	11.[illegible]	27.3	39.[illegible]	
Malabon	15.2	14.1	13.2	
	100.0	100.0	100.0	

Table 4.2. PROJECTED SUPPLY OF LAND AVAILABLE FOR INDUSTRIAL USE BY MAJOR SOURCES AND BY DRAINAGE BASINS, 1970-2010, (In Hectares)

Drainage Basins	Increase in Area (Total)	Sources of Increase Hectarage: Shifts from Other Land Use	Utilization of Open Space	Reclamation and/or Land-fills
North Manila	29[illegible].6	16[illegible].3	115.[illegible]	14.5[a/]
South Manila	9[illegible].4		9[illegible].4	b/
Parañaque	234.0		234.0	
Upper Laguna	199.0		199.0	
Guadalupe	24.5		24.5	
San Juan	293.0		293.0	
Marikina	926.5		926.5	
Malabon	315.7			315.7
TOTAL INCREASE (Hectares)	2,3[illegible]9.7	16[illegible].3	1,291.2	330.2
PER CENT	100.0	7.1	79.1	13.[illegible]

a/ The projected amount of reclaimed area along the North Harbor vicinity is expected to be around 52.5 hectares. Of this amount only 14.5 hectares will likely be utilized as industrial site, with the remaining 3[illegible].2 hectares used for residential and commercial purposes.

b/ The estimated landfill or reclaimed area along Roxas Blvd. will amount to 210 hectares. However, said area is expected to be utilized as follows:

a. Residential Uses - 100 hectares
b. Commercial Uses - 35 hectares
c. Institutional and/or Open Spaces - 75 hectares

It would be noticed from Table 4.1 that the area in the vicinity of the proposed industrial estate (Parañaque and Upper Laguna) tapped for a supply of 433.0 hectares for industrial purposes. Table 4.2 would indicate that these 433.0 hectares would have to come from the increase utilization of open spaces. The rest of the 2,3 9.7 hectares needed for industrial use in the area covered in this study would have to be supplied through increase utilization of open spaces in the rest of the study area, through reclamation in North Manila and Malabon, and through shifting of land from other use to industrial use in the whole study area.

5. The Need for an Industrial Estate

The quantity of land demanded for industrial use has been quantified in Section 3 of this study. In this section, it has been shown that between 1970 to 2010 some 2,3 9.7 hectares will be needed for industrial purposes. Considering the fact that there are a lot of open spaces in the study area, reclamation may only be resorted into after the available open spaces have been exhausted or industrial land have been consolidated. But to facilitate a rational expansion of industries and at the same time maximize the use of these available open spaces, a physical plan needs to be implemented. This endeavor would require an enormous amount of capital and drastic changes in the administrative and legislative set-ups. Such changes would involve a long time to materialize. In the meantime, the demand for industrial spaces would be growing. If this growth in demand is left unmatched by the actual supply of industrial land, industrial growth as well as regional growth would be curtailed.

Since the time element involved is crucial, the only alternative left therefore is to reclaim land, if it proves to be at least economically and technically feasible. Technical and economic considerations point to the West Bay area of the Laguna Lake as the most ideal location of the industrial estate.

6. Competitive Position of the Proposed West Bay Industrial Estate

It is believed that only other organized industrial estates might offer competition with the Proposed West Bay Industrial Estate. As of this date, these are known proposals to establish industrial estates in New Town, Bulacan, Sangley Point, Cavite and Mariveles, Bataan.

Location-wise, the West Bay Industrial Estate has a slight advantage over the other proposed estates. It is easily connected by existing infrastructure to the present major market, which is the city of Manila. (See Appendix 3). Currently the South Superhighway, the highway which connects Manila to the proposed site of the estate, is experiencing rapid strip development. It is anticipated that such strip development will even extend further south of the proposed industrial estate.

The existing land along the strip development path would therefore be offering competition to the industrial site within the estate. Current prices of existing developed land along the strip development path range from P64 to P72 per square meter (1970 prices). The cost of fully developed land in the proposed estate is P23 per square meter (1972 prices). On the assumption that the lots in the estate are sold at a 100% mark-up on its construction cost the prices of lots in the estate would still be lower by no less than P15 per square meter than the prices of existing developed lands in the estates immediate surroundings.

An alternative site for the reclaimed estate (considering engineering aspects) would be Taguig, Rizal. To develop this site would mean extra expenditures on infrastructure as it is about 6 kilometers from the South Superhighway. Furthermore, because of certain engineering considerations, the total cost of this alternative site is about P25.50 per square meter or P2.50 higher than the per square meter cost of land in the proposed estate.

7. Alternative Ways of Disposing Industrial Plots in the West Bay Industrial Estate.

Administration of an industrial estate comprises a host of activities which among others include the supervision, specifically the implementation of zoning regulations to be followed by industrialist occupant. Lease is favored over sale because it assures the application of controls necessary for the fulfillment of the conditions of tenancy and the restrictive covenances of occupancy. Furthermore industrial estate are primarily designed to cater to small and medium scale industries which have limited capital. Considering the high cost purchasing on industrial lot (relative to these industries' total cost) these industrialists would be better off if they rent rather than buy industrial spaces for their factories.

PART III

LOCATION AND RECLAMATION STUDIES

1. Summary:

1.1 This part of the present West Laguna Industrial Estate Study Report presents details of engineering as well as location studies associated with the land reclamation project for the West Laguna Industrial Estate. Findings show that the suggested site at Muntinglupa is most favorable. The choice of a suitable site for a 400-Ha. industrial site is confined to the Napindan-San Pedro sector of the west shore where preliminary sub-soil exploration had been conducted by the LLDA Staff. This sector was also defined in the UNDP West Laguna Industrial Estate Study as potential locations of such undertakings. Two possible locations worthlooking into have been suggested in that study, namely: The Muntinglupa site and the Taguig site. From the obtained soil profile, the Muntinglupa site is confirmed to have the best foundation characteristics compared with equivalent sites along the Napindan-San Pedro stretch of the west shore including the Taguig site. The thickness of soft compressible clay layers ranges from 9 to 10 ft. at the Muntinglupa-San Pedro sector and 30 to 35 ft. at the Napindan-Bagumbayan sector. Cost comparison based on fill reclamation for a 400 hectare site (Table 3.3) shows the Muntinglupa site a better location. This is due to the higher cost of filling at the Taguig site on account of greater land settlement expected (1.5 M. as against 0.30 m. at Muntinglupa)

and greater distance of proposed source of suitable fill materials. Other location considerations such as accessibility, availability of labor, etc. also point to the Muntinglupa site as more worthwhile.

1.2 Polder method of land reclamation is less expensive than the hydraulic fill method as comparative cost estimates also show but the choice of the latter method, although more expensive is primarily based on land use and required safety by land-users. Industrial sites must be free from excessive dampness which is a problem in polder construction. Likewise, a high degree of safety is required. Polder construction involves a high degree of risk and this may not be acceptable to land-users no matter how adequately constructed the polder dikes are, in view of the land-user's high investments.

2. Introduction:

2.1 A detailed engineering study involving 360 hectares of land reclamation for industrial site at Muntinglupa was carried out by the UNDP in 1970. An alternative site at Taguig involving 1,000 hectares, although not costed in same detail as the Muntinglupa site, was also studied. It was shown that the rawland cost of the latter site is less expensive. In both cases, the reclamation method is basically polder construction.

2.2 The selection of the Muntinglupa site in that study was

preliminary idea on the suitability of the lake bed for the proposed reclamation project, and to arrive at a decision as to the choice of a suitable location, a preliminary subsoil exploration offshore from Napindan to San Pedro was undertaken by the LLDA Staff. Results of 10 cone penetrometers tests and 5 soil sampling test holes performed in the lake bed showed 5 different soil layers encountered in the subject area, ranging from mud at the surface to silty clay, sandy clay, sand layers and tuff in that order. Relatively dense and firm clay soils with approximate bearing capacity in the order of 2,000 lbs./sq. ft. is encountered in the Napindan-Bagumbayan sector. This layer is overlain by approximately 30 to 35 ft. of the soft compressible clay layers. Very dense layer of sand and gravel is also encountered in the Muntinglupa-San Pedro sector which is also overlain by approximately 9 to 10 ft. of clay layers. Details of field procedures, soil description and soil profiles in Annex "B" demonstrate the relative thickness of the various soft clay layers along the lake bed from Napindan to San Pedro, Laguna. The clay layers increase in depth to as deep as 50 ft. as you go towards Sucat north of Alabang and from there begin to decrease to about 35 ft. at Napindan area.

For lack of time, soil laboratory tests on undisturbed samples have not yet been undertaken to determine the physical properties of the soil at the site for consolidation and settlement

predictions of the proposed reclamation works. For settlement calculations, a liquid limit of 100%, compression index of 0.30 and initial void ratio of 1.9 are tentatively assumed. These assumptions are inferred from previously obtained results of laboratory analysis made on similar samples taken below the lake bed at East Bay during the UNDP Laguna de Bay feasibility studies and from tables in Soil Mechanics Textbook 1/ on various properties of similar soils. While it is true that the use of these information in assuming the properties of the underlying soil in the proposed reclamation site may not be acceptable at this time, we are constrained to do so for lack of actual data. It is essential therefore that the LLDA take action to undertake these tests at the early stage of the study for a more realistic approach to the problems not only in settlement and consolidation but also on other problems pertaining to the soil mechanics aspects of the project. Applying the available information and assumptions, the predicted total settlement after completion of reclamation works is approximately 0.30 meters within a 5-year period, 70% of which occurs during the first year at the Muntinglupa site and 1.50 meters in a 10-year period at the

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1/ Soil Mechanics in Engineering Practice by Terzaghi and Peck

Taguig site based on soil mechanics methods:

$$S = \frac{H\,Cc}{1+Eo} \log \frac{Po + \Delta P}{Po}$$

Where S = Settlement in cm.

H = thickness of clay layers in cm.

Cc = compression index

Eo = original void ratio

Po = original pressure in N/cm^2

ΔP = increase in pressure N/cm^2

The settlement values constitute the height of overfill in the calculations of fill quantities for the hydraulic fill reclamation scheme. An initial displacement of 1.00 meter in the upper mud layer is, in addition to the calculated settlement, accounted for in the volume calculations of fill quantit lt is believed that with these allowances, the estimated volumes are considered conservative enough.

Major structures built on the industrial estate are to be founded on end bearing piles. From the soil profile, foundation work of building structures built at Muntinglupa site is expected to cost less than any equivalent site along the Napindan-San Pedro stretch of the shoreline.

4. Locational Considerations:

4.1 In the choice of the best location for the proposed reclamation for industrial site, the following factors are considered:

a. Favorable sub-soil condition for economical

construction of reclamation and foundation works and consequently less maintenance cost resulting from settlement and consolidation.

b. Proximity to available sources of suitable fill materials.

c. Accessibility to economical means of transport such as highways, railways and water transport

d. Proximity to industrial and community infrastructure.

e. Availability of a good supply of trained labor

f. Political considerations - The judgement of higher authorities may override all other considerations.

g. Social considerations - The project must enjoy the people's acceptance:

4.2 The foregoing considerations seem to favor the suggested site at Muntinglupa for the following reasons:

a. It has a more favorable subsoil condition than the Taguig site or any other site between Napindan and San Pedro. Settlement expected is less and consequently, cost of fill materials is less.

b. There is a sizeable sand deposit most suitable for fill materials at the vicinity of the reclamation site confirmed in the recent subsoil exploration.

c. It is very accessible to the South Superhighway, oil pipeline, railway and the Manila International Airport. (Figure 4 - 1).

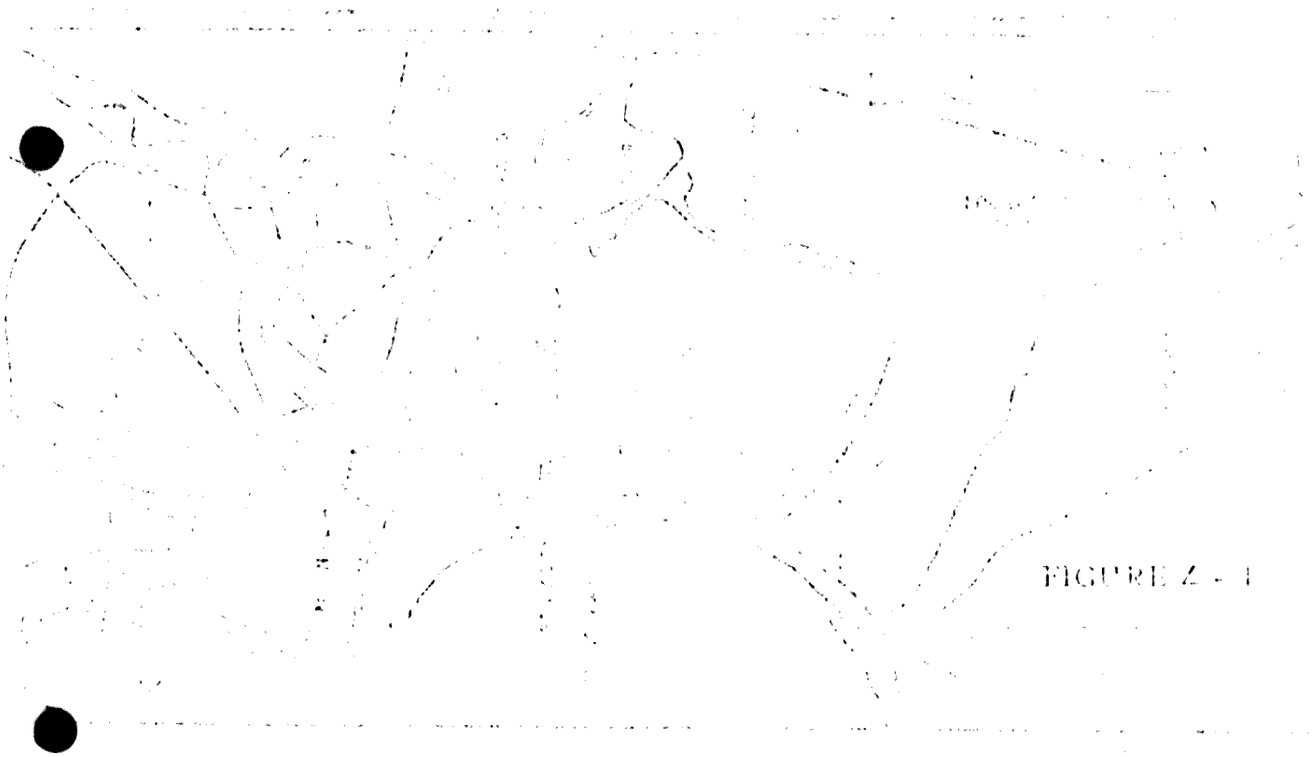


FIGURE 4 - 1

d. The San Pedro area has also been identified as a regional growth center in the TIAL "Report on Regional Reference Structure - Laguna Region". A labor force is expected to be available to match the growth of the estate.

e. As the estate will occupy a part of Rizal and a part of Laguna, it will probably enjoy favorable endorsement from the top officials of the 2 provinces, they being both members of the LLI A board of directors.

5. Land Reclamation Alternatives:

5.1 There are two methods of reclaiming the 400 hectares industrial site from the lake: by hydraulic filling and by polder construction. The choice between the two methods depends on: 1/

a. Use of Reclaimed Land - For agricultural purposes, depending on the suitability of the subsoil and if groundwater table can be controlled, polder construction is preferable to the higher cost of filling. For industrial purposes, filling is preferable to polder construction to increase the required safety and eliminate dampness.

1/ Reclamation and Polders, Lecture Notes
by W. James
International Course in Hydraulic Engineering,
Delft, Netherlands.

b. Depth and Area of Land to be Reclaimed - The larger the area to be reclaimed the greater the cost of filling. Without a suitable borrow pit near the site, reclamation by impoldering is more economical.

c. Required Safety - Polders are not completely safe and involve greater risks than filled reclamation. In a small polder such as the proposed project, breach of dike means sudden rise of water level in the polder with little opportunity of evacuation. The required safety therefore depends on the land user's requirement. There is no question that to many people, it is more pleasant and satisfying to work in a situation where there is greater security against loss of life and property and where there is no worry about rainfall conditions, emergency dikes, evacuation, etc.

d. Subsoil Conditions - In general, where the land is of poor subsoil conditions and is to be used for agriculture, polder construction is preferred. For industrial purposes, filling shall be resorted to.

5.2 Whatever the alternative is, subsidence of land is expected to take place and structures built thereon should be founded on piles driven down to firm soil layers. In most cases, reclamation by polder construction is less expensive compared to hydraulic fill construction. Comparative cost estimates

between the two methods is in Annex A-4.

5.3 From the basis of land use, safety requirement and land area to be reclaimed, the choice of a hydraulic fill construction for the reclamation project is believed justified. Detailed studies of engineering works and costs based on this method is discussed further below.

6. General Design:

6.1 Layout of the Project - The reclamation project encompasses a long and narrow stretch of the shoreline having a gross area of 400 hectares. The northern and southern ends, approximately 5 kms. apart, are bounded by the Bayanan and San Pedro rivers respectively. The eastern and western limits are bounded by contours elevation 9.10 and 10.50 meters respectively. It is assumed that all land below elevation 10.50 meters is a public domain. Elevations used in this study are referred to M.L.L.W datum as Elevation 10.00 meters. The location of the inshore limit of the reclaimed area at El. 10.50 will leave open a small channel with minimal earth excavation needed for facilitating conveyance of inland drainage to the lake. The estate is by necessity divided into 3 sub-areas by outlet channels for existing rivers that are draining directly at the back of the project. This arrangement will prevent or minimize harmful backwater effects upstream. (See Drawing 6-1).

6.2 Scheme of Reclamation - The project will consist of:

a. Hydraulic filling to El. 13.50 meters as final

grade after consolidation of the subsoil.

b. Construction of revetments of loose rock riprap at the exposed slopes of the reclaimed land.

c. Provision of outlet channels thru the reclaimed land for existing rivers.

d. Excavation or deepening for drainage canals along the inshore limits of the reclaimed land to route run-off from the inland catchment to the outlet channels of directly to the lake.

e. Construction of access roads connecting the estate to the existing road networks in the vicinity.

6.3 Design Assumptions:

a. The designed height of the rawland fill is Elevation 13.50 meters after settlement of the subsoil has occurred. With a calculated settlement of 0.30 meters (Section 3.2), the construction grade will reach up to El. 14.30.

With the design elevation of El. 13.50 meters after consolidation ample protection is expected under conditions characterized by:

- Two-year high lake stage (El. 12.50) plus allowance for wave height of about 1 meter resulting from a wind velocity of 50 mph (Fig. 6-2, UI DP Report, Vol. 7).

- Ten year high lake stage (El. 13.50) without allowance for wind effects.

Coastal engineering studies of west bay is included in Annex C.

The rawland fill elevation of 12.50 meters is as high as the ground elevation of the two adjacent townsites of Muntinglupa and San Pedro. This will have a favorable psychological effect on the prospective land users.

b. The revetments are designed with a minimum slope of 3 horizontal to 1 vertical. The top of the structure has a berm of 3 meters and is flush to the top of the fill. Allowance for eventual settlement of the structure is also considered.

Like polder construction, the hydraulic fill construction is also subject to certain risks. To insure stability of the reclaimed land, the revetments at the slopes of the fill must be able to resist wave effects and internal erosion of the underlying fine soil particles underneath the revetments under conditions above-mentioned.

The front revetment has a thickness consisting of 0.70 meter thick outer layer of 2000 kg. rocks and 0.30 meter thick inner layer of 200 kg. rocks resting on a 0.30 meter thick gravel filter layer. The weight and thickness of the rock layers are

expected to be more than what is theoretically required (formulas of Irribaren and Beaudevin) under the prevailing conditions. The trapezoidal rockfill toe of the rock facing, with top elevation at 10.50 meters, serves as a dam at the early stage of reclamation to hold back the main sand body of the revetment. It is also a strong support at the toe of the revetment to prevent sliding of the rock cover particularly under conditions of low lake level and high ground water in the reclamation area.

The backshore and channel revetments at the back of the reclaimed land and at the sides of the drainage outlet channels respectively, consist of a single layer of approximately 0.50 meters thick facing resting on a trapezoidal rockfill toe. The 200 kg. rock size facing is deemed sufficient for the protection of the backshore slopes of the reclamation project due to minimal wave effects.

c. Drainage System - The drainage of run-off from the catchment behind the reclamation will be effected by means of the 10 meter wide trapezoidal canals located behind and through the reclaimed area. The size are similar to the existing river widths.

Onsite drainage resulting from a 24-hour design rainfall of 300 m.m. will be drained by

buried storm drains that discharge into the lake by gravity. The detailed cost of the scheme is accounted for in land improvements (Annex A-3).

7. Timetable of Construction

7.1 Assumptions: The basic land reclamation is estimated to require about 11½ years to complete based on the following assumptions: 1/

a. Number of dredging equipment - One (1) unit of 18" Dredger

b. Capacity - 450 cubic meters per hour

c. Working hours per day - 20 hours

d. Working days per year - 250 days

Full land development is expected to be reached at the end of 12½ years.

7.2 Schedule of reclamation and land development: For purposes of quantifying, costing and scheduling, the project is divided into six (6) stages of construction involving areas ranging from 59 hectares to 76 hectares (Annex A-1). From the above assumptions, the following schedule is proposed:

Year 1 - Completion to the construction grade and completion of other works for 40 hectares of Stage 1.

1/ IHC Holland Dredging Equipment

Year 2 - Completion to the construction grade and of other works for 21 hectares of Stage 1 and 16 hectares of Stage 2, totalling 37 hectares. Land improvement of 40 hectares of the previous year.

Year 3 - Completion as above of 37 hectares of Stage 2 and land improvement of 37 hectares reclaimed in previous year.

Year 4 - Completion as above 9 hectares of Stage 2 and 26 hectares of Stage 3 totaling 35 hectares. Land improvement of 37 hectares of the previous year.

Year 5 - Completion as above of 39 hectares of Stage 3 and land improvement of 35 hectares of the previous year.

Year 6 - Completion as above of 13 hectares of Stage 3 and 24 hectares of Stage 4 totaling 37 hectares. Land improvement of 39 hectares of the previous year.

Year 7 - Completion as above of 40 hectares of Stage 4 and land improvement of 37 hectares of the previous year.

Year 8 - Completion as above of 10 hectares of Stage 4 and 26 hectares of Stage 5 totaling 36 hectares. Land improvement of 40 hectares of the previous year.

Year 9 - Completion as above of 40 hectares of Stage 5 and land improvement of 36 hectares of the previous year.

Year 10 - Completion as above of 36 hectares of Stage 6 and land improvement of 40 hectares of the previous year.

Year 11 - Completion as above of 21 hectares of Stage 6 and land improvement of 36 hectares of the previous year.

Year 12 - Land improvement of the final 21 hectares reclaimed in the previous year.

The schedule of construction of improvements are based on the actual start of the said improvement on an area one year after that area is completely filled. A reduction of the construction period to half can be done with the use of two (2) 16" dredgers.

7.3 Land improvement : In the planning and scheduling of proposed improvements within the reclaimed land, the settlement due to the hydraulic fill must be taken into account. As already pointed out in Section 3.2, it appears logical to start land improvement on any area not earlier than 1 year after the completion of the filling on an area when greater part of the expected settlement has already occurred. This does not preclude earlier start of construction of the initial phase of the improvements which are not sensitive to settlement problems, such as the use of interim and low cost works until the

construction of the final works are possible. An example are gravel roadways which will later become the subgrade of concrete pavements. Open drainage canals can finally become the ditch for burried drainage pipes..

Similarly, the possibility of occupancy, development and use of the reclaimed land is not completely precluded prior to the initial settling period of 1 year. Planning and engineering alone of the structure of a prospective occupant to a lot will require at least one year before the same is constructed and this lead time might as well be the settlement period of the reclaimed area, which for reason desireable to the LLDA should already be at the disposal of the owner. Likewise, acceptable and field-tested methods of accelerating stabilization of the foundation soils at places where the structures are to be built can shorten the waiting time for land use. An example is the use of adequately spaced sand drains bored throughout the thickness of the clay layers. However, this will entail additional cost which are not presently covered in this study.

8. Cost Studies

8.1 Cost Estimates - The unit cost of materials in this report are based on the recent UNDP study on the West Laguna Industrial Estate, but revised by about 25% to reflect present costs. Estimates of quantities and costs protrays the recommended design details and plan shown in Drawing 6-1.

The height versus cost curves for the front revetment is shown in Figure 8-2.

The cost per lineal meter of other works are presented in Annex A-2. These are the backshore and channel revetments and drainage canals.

The land improvement costs is also revalued by 25% over the UNDP cost. Detailed estimate is also in Annex A-3.

The following table is the summary of cost for the reclamation project based on hydraulic fill construction. The detailed estimate is also included in Annex A-1.

TABLE 3.1 SUMMARY OF CAPITAL COST

WEST LAGUNA INDUSTRIAL ESTATE
(Gross Area - 400 hectares)

1.	Direct Costs		₱ 55,172,250
	a. Hydraulic fill	₱45,340,000	
	b, Front revetment	4,254,750	
	c. Backshore revetment	2,076,000	
	d. Channel revetment	1,700,000	
	e. Drainage canal	104,000	
	f. Access roads	140,000	
	g. Interior bridges	360,000	
	h. End protection	697,500	
2.	Indirect Costs		₱ 11,030,000
	a. Overhead and contingencies	5,515,000	
	b. Engineering & supervision	5,515,000	
	Subtotal		₱66,202,250
3.	Land improvement		₱ 25,600,000
	Total Capital Cost		₱ 91,302,250

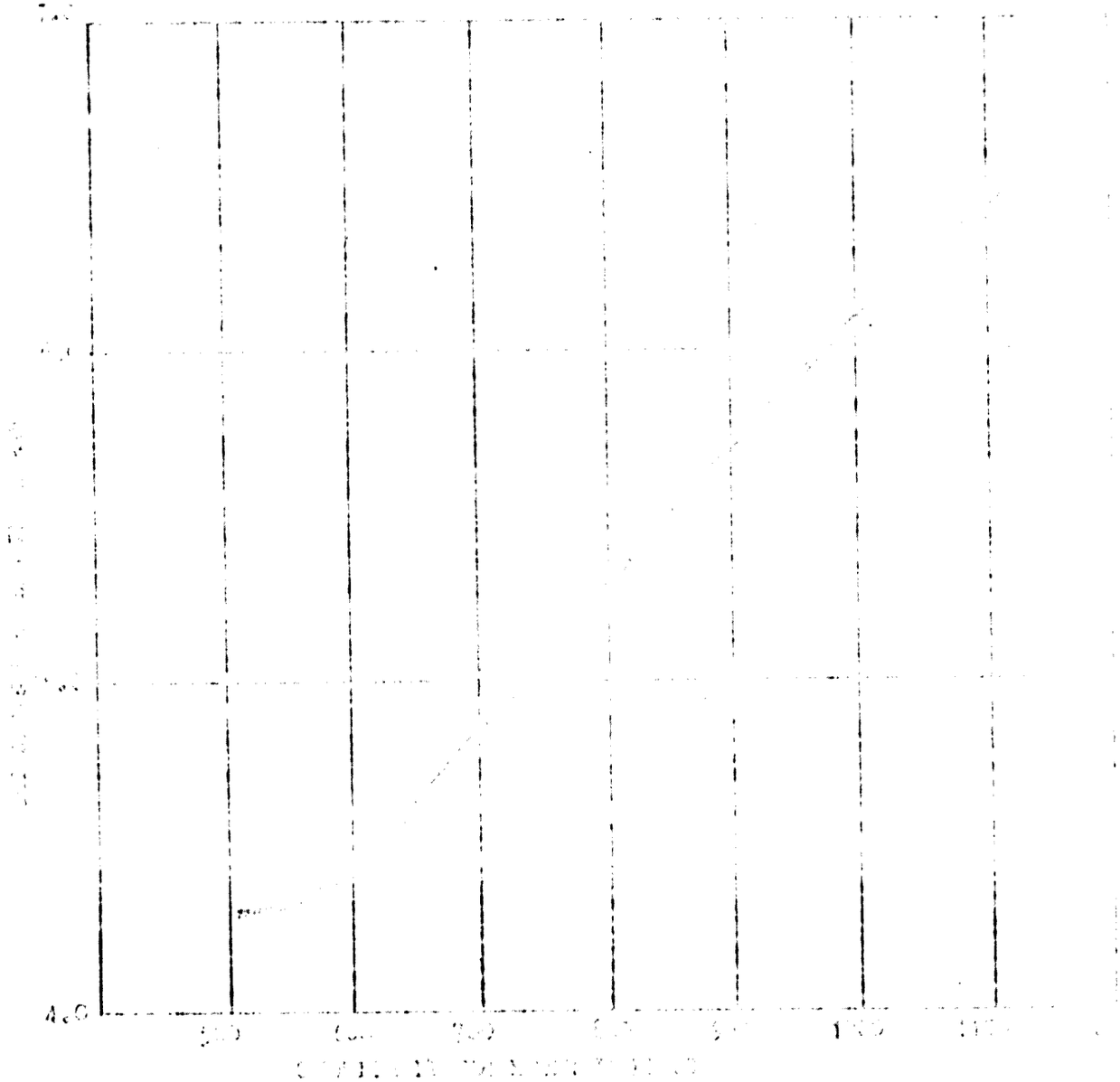


FIGURE 2

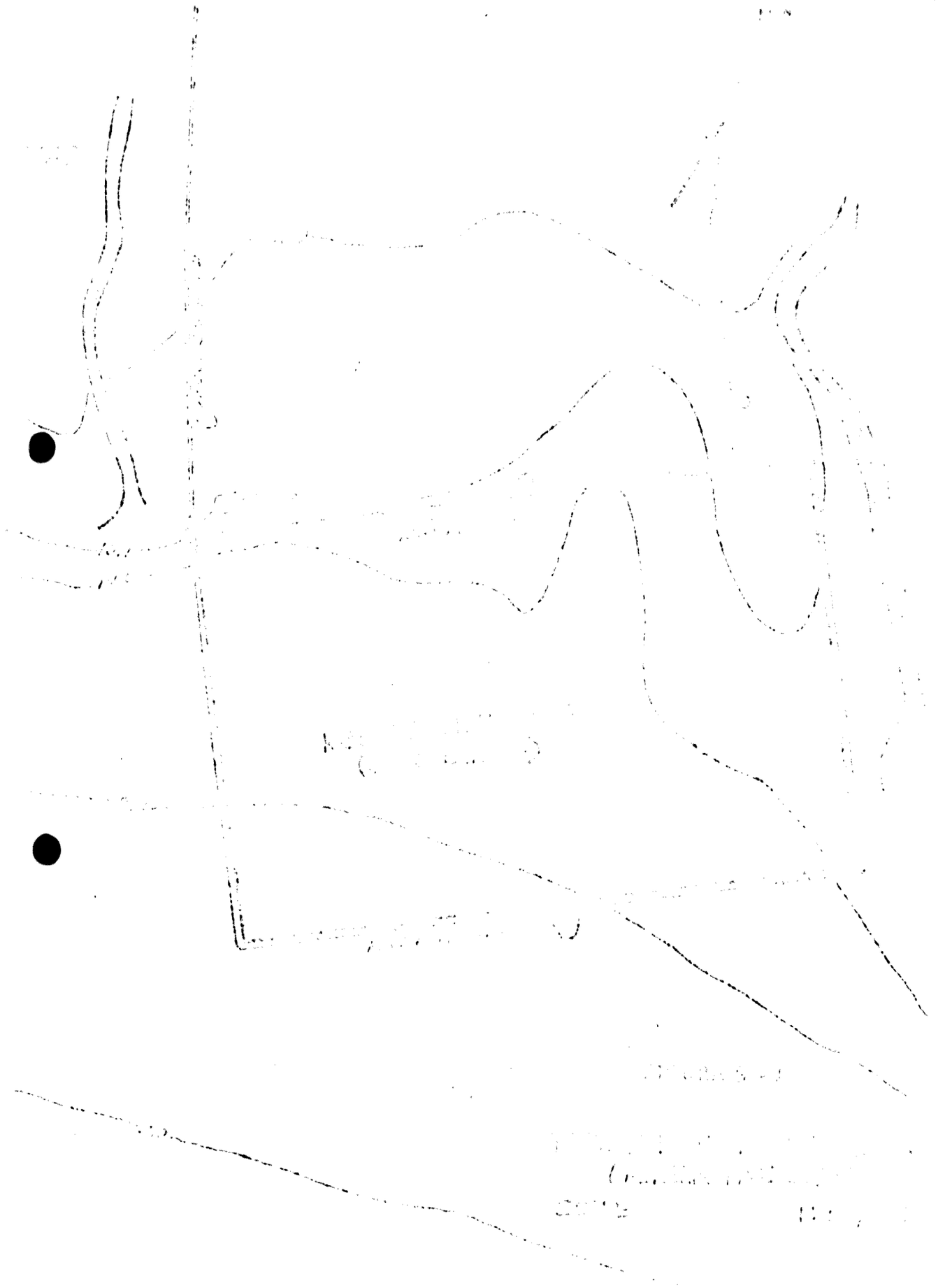
6.2 Annual Costs - The average costs of operation, repair and maintenance of the project, exclusive of financial charges and overhead costs vary from year to year during the period of construction depending on the work accomplished. Its value is assumed to be constant after the reclaimed land has reached full development and this value is summarized below. The calculations are based on the following percentages of capital costs of the following items: Earthworks -1%, Drainage canals - 2%, revetments - 2%, access roads - 2%, bridges - 3% and land improvement - 2%.

TABLE 2 - ANNUAL COST OF PROJECT

a.	Filling ----------	145,400
b.	Revetments ----------	160,615
c.	Drainage canals -------	2,030
d.	Access roads ----------	2,300
e.	Interior bridges -------	10,300
f.	Land improvement -----	512,000
	Total Annual Cost -----	₱1,146,695

9. The Taguig Alternative Site

9.1 Description: From the locational considerations discussed in Section 4, the Taguig site as shown in Figure 9-1 is a second choice although the overall topography is relatively more gentle than at the Muntinglupa site. It has the disadvantage that the underlying soft clay strata is



3 times as much thicker than that at Muntinglupa, with consequent greater settlement when subjected to additional load of hydraulic fill. In fill reclamation such as that proposed in Muntinglupa, the fill cost comprises about 60 to 70% of the rawland cost of the project. The absence of suitable fill materials at the vicinity of the Taguig site is also a limiting factor.

The Taguig reclamation project is also of fill construction rectangular in shape, 400 hectares in gross area and of the same design criteria as the Muntinglupa site. The same limiting contour lines are followed in the delimitation of the reclamation area. One marked difference in the plan is the absence of outlet channels due to the absence of rivers that drain directly at the back of the site.

9.2 Design Considerations: The following considerations are adopted for the Taguig alternative site:

a. Finished grade of rawland fill is El. 13.50 meters after primary settlement has occurred. The same design criteria established for the Muntinglupa scheme is adopted.

b. A settlement of 1.50 meters is assumed for the reclaimed land, based on preliminary calculations by soil mechanics methods (Section 3.2) To allow for this settlement, construction grade of rawland fill must be El. 13.50 plus 1.50 meters or El. 15.00 meters.

c. The design section of revetment works are the same as in the Muntinglupa scheme.

d. Two access roads and access bridges connect the proposed estate to the existing road networks in the vicinity.

9.3 Capital Cost: The capital cost of the Taguig scheme on the foregoing design considerations is detailed in the following table.

TABLE 9.1 - TAGUIG ALTERNATIVE SITE -CAPITAL COST

Item	Quantity	Unit	Unit Cost	Total Cost
a. Filling	27,500,000	M	₱2.00	₱ 55,000,000
b. Front revetment	5,700	M	350	4,345,000
c. Backshore revetment	2,500	M	465	1,162,500
d. Drainage canal	2,500	M	20	50,000
e. End protection	5,000	M	250	1,250,000
f. Access road	4,500	M	250	1,125,000
g. Access bridge	40	M	9,000	360,000
			Subtotal ------	₱ 63,792,500
			Overhead and contingencies, 10% ---	₱ 6,379,000
			Engineering & supervision, 10% ----	₱ 6,379,000
			Total Rawland Cost ----------	₱ 75,550,500
h. Land improvement	4,000,000	M	₱6.40	₱ 25,600,000
			Total Capital Cost ----------	₱102,150,000

9.4 Annual Cost - The basis of calculation is the same as these established in the Muntinglupa scheme.

TABLE 9.2 - SUMMARY OF ANNUAL COST

(Full Land Development)

a.	Filling	₱ 550,000
b.	Revetments	120,150
c.	Drainage canal	1,000
d.	Access road	22,500
e.	Access bridge	10,300
f.	Land improvement	512,000
	Total Annual Cost --	₱1,216,450

9.4 Comparison of Costs - Muntinglupa and Taguig Alternative Sites

Summarized in Table 9.3 is the comparison of cost between the 2 alternative sites based on hydraulic fill construction. The rawland costs represent the total construction cost needed to bring the basic reclaimed land and associated works to completion. The improved land costs represent the total rawland cost plus the cost of bringing the land to full development.

TABLE 9-3 - COMPARISON OF COSTS

Item	Muntinglupa	Taguig
a. Gross areas reclaimed	400 hectares	400 hectares
b. Rawland costs	₱66,202,250	₱76,550,500
c. Improved land costs	₱91,302,250	₱102,150,500
d. Unit Cost (rawland)	₱16.55/sq. m.	₱19.13/sq. m.
e. Unit cost (improved land)	₱22.93/sq. m.	₱25.53/sq. m.
f. Annual costs	₱ 1,146,695	₱ 1,216,450

ANNEX "A"

A-1. DETAILED COST ESTIMATE - WEST LAGUNA INDUSTRIAL ESTATE

Gross Area : 400 Hectares Location: Muntinglupa, Rizal

A-1.1 Stage 1 - 61 Hectares

Item	Qty.	Unit	Unit Cost	Total Cost
a. Dredged Fill	3,441,000	M^3	2.00	P 5,882,000
	780	M	775	604,500
b. Front Revetment	520	M	700	364,000
c. Backshore Revetment	870	M	400	348,000
d. End Protection	950	M	250	237,500
e. Drainage Canal	370	M	20.	17,400
f. Access Road	320	M	250.	80,000
			Subtotal ------	P 7,533,400
		Overhead and Contingencies, 10%		650,000
		Engineering & Supervision, 10% --		353,000
		Subtotal ------		P10,233,400
g. Land Improvement	610,000	M^2	P6.40/m^2	3,904,000
		Total Cost		P14,143,400

A-1.2 Stage 2 - 62 Hectares

Item	Qty.	Unit	Unit Cost	Total Cost
a. Dredged Fill	3,726,000	M^3	2.00	P 7,452,000
b. Front Revetment	590	M	775	457,250
c. Backshore Revetment	630	M	400	252,000
d. Channel Revetment	1120	M	400	448,000
e. Drainage Canal	630	M	20.	12,600
		Subtotal		P 8,621,850
		Overhead & Contingencies, 10% --		862,000
		Engineering & Supervision, 10%		862,000
		Subtotal ---------		P10,345,850
f. Land improvement	620,000	P6.40 ----------		P 3,968,000
		Total Cost -------		P14,313,850

A-1.3 Stage 3 - 74 Hectares

Item	Qty.	Unit	Unit Cost	Total Cost
a. Dredge	4,433,000	M^3	2	P 8,[illegible]6,000
b. Front Revetment	540	M	775	41[illegible],500
c. Backshore Revetment	750	M	400	300,000
d. Channel Revetment	1140	M	400	456,000
e. End protection	1220	M	250	305,000
f. Drainage Canal	750	M	20	15,000
g. Internal Bridge	20	M	9,000	1[illegible],000
			Subtotal - - - - - - -	P10,540,500
			Overhead and contingencies, 10% -	1,054,000
			Engineering and Supervision, 10% -	1,054,000
			Subtotal - - - - - - -	P12,646,500
h. Land improvement,	740,000	M^2	06.40/M^2 - -	4,992,000
			Total Cost - - - - - -	P17,640,500

A-1.4 Stage 4-74 Hectares

Item	Qty.	Unit	Unit Cost	Total Cost
a. Dredged Fill	4,[illegible]2,000	M^3	2	P 8,364,000
b. Front Revetment	620		775	[illegible],500
c. Backshore Revetment	720		400	2[illegible],000
d. Channel Revetment	1,000		400	400,000
e. Drainage Canal	730		20	14,600
f. Access Road	100		250	25,000
			Subtotal - - - - - - -	P 9,572,100
			Overtime & Contingencies, 10% ---	957,000
			Engineering & Supervision, 10% -	957,000
			Subtotal - - - - - - - - - -	P11,486,100
g. Land Improvement	740	M^2	06.40/M^2	4,736,000
			Total Cost	P16,222,[illegible]00

A-1.5 Stage 5 - 66 Hectares

Item	Qty	Unit	Unit Cost	Total Cost
a. dredged Fill	3,863,000	M^3	2	₱ 7,726,000
b. Front Revetment	810	M	775	627,750
c. Backshore Revetment	890	M	400	356,000
d. Channel Revetment	990	M	400	396,000
e. End Protection	620	M	250	155,000
f. Drainage Canal	890	M	20	17,800
g. Internal Bridge	20	M	9,000	180,000
		Subtotal - - - - -		₱ 9,458,550
	Overhead & Contingencies, 10%			945,000
	Engineering & Supervision, 10%			945,000
		Subtotal - - - -		₱11,348,550
h, Land Improvement	660,000	M^2 @ 6.40/M^2		₱ 4,224,000
		Total Cost - - - -		₱15,572,550

A-1.6 Stage 6 - 59 Hectares

Item	Qty	Unit	Unit Cost	Total Cost
a. Dredged Fill	3,275,000	M^3	2	₱ 6,550,000
b. Front Revetment	1,310	M	775	1,015,250
	410	M	700	287,000
c. Backshore Revetment	1,330	M	400	532,000
d. Drainage Canal	1,320	M	20	26,600
e. Access Road	140	M	250	35,000
		Subtotal - - - - -		₱ 8,445,950
	Overhead & Contingencies, 10% -			844,000
	Engineering & Supervision, 10% -			844,000
		Subtotal - - - - - -		₱10,133,850
f. Land Improvement,	590,000	M^2	@ 6.40/M^2	3,775,000
		Total Cost		₱13,909,850
GRAND TOTALS -- Rawland Cost - - - - - - - -				₱66,202,250
Land Improvement Cost - - -				₱25,600,000
GRAND TOTAL COST - - - -				₱91,802,250

A-2 COST PER LINEAL METER OF RECLAMATION WORKS

A - 2.1 Backshore and Channel Revetments

a. Basis of Estimate: Lake Bed - El. 9.50 meters
Top of Revetment - El. 13.50 meters

	Item	Quantity	Unit Cost	Cost
1.	Boulder facing	8.4 M^3	123/M^3	₱193.20
2.	Boulder fill	3.5 M^3	18/M^3	63.00
3.	Gravel backing	3.40 M^3	10/M^3	34.00
4.	Sandfill	34.00 M^3	2/M^3	68.00
5.	Removal of soft	20. M^3	2/M^3	40.00
TOTAL				₱ 398.20
SAY				₱ 400.00

A-2.2 Drainage Canal

a. Basis of Estimate: Bottom Width - 10.00 meters
Depth of Excavation - 1.00 meter

	Item	Quantity	Unit Cost	Cost
1.	Excavation	10 M^3	2/M^3	₱ 20.00

A - 2.3 Temporary End Protection

a. Basis of Estimate: Lake Bed - El. 9.50 meters
Top of Protection - El. 13.50 meters

	Item	Quantity	Unit Cost	Cost
1.	Boulder facing	8.40 M^3	₱ 18	₱151.20
2.	Boulder fill	3.5 M^3	18	63.00
3.	Gravel backing	3.4 M^3	10	34.00
TOTAL COST PER LINEAL METER				₱248.20
SAY -c-				250.00

A-3. LAND IMPROVEMENT COST FOR A UNIT DESIGN AREA [1]

Basis of Estimate: 2 Lots of 2 Hectares each and 0.25 hectare infrastructure.

Item	Quantity	Unit	Unit Cost	Total Cost
a. Concrete Road 10 m.	1,250	M	₱43.75	₱ 54,687.50
b. Concrete Curb & Gutter	250	L.M.	17.50	4,375.00
c. Storm Sewer 36" R.C. Pipe	250	L.M.	75.00	18,750.00
d. Sanitary Sewer 14" R.C. Pipe	125	L.M.	50.00	6,250.00
e. Water Supply Line 12" Pipe	125	L.M.	178.75	22,343.75
f. Manholes	7	Units	312.50	2,187.50
g. Electrical Installation	42,500	M^2	1.25	53,125.00
h. Water Supply Treatment Plant	1	Unit	4,375.00	4,375.00
i. Sewage Treatment Plant	1	Unit	4,375.00	4,375.00
			Subtotal - - - - -	₱170,468.75
			Overhead & Contingencies, 10%	35,234.00
			Engineering & Supervision, 10%	17,047.00
			TOTAL COST	₱272,749.75

UNIT COST OF LAND IMPROVEMENT = $\frac{₱272,749.75}{42,500}$ = ₱6.40/sq. m.

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[1] Updated from TIAL Report, Dec., 1970, Vol. 7

ANNEX "A"

A-4. COST ESTIMATE - POLDER CONSTRUCTION (Cont'd.)

Gross Area - 400 Hectares Location: Buntingluna

Item	Quantity	Unit	Unit Cost	Total Cost
a. Lake Dike	4,770	L.M.	₱2,700	₱12,879,000
b. Lake Dike	940	L.M.	2,400	2,256,000
c. Inshore Dike	5,300	L.M.	850	4,505,000
d. Pumping Facility	14	Cumecs	75,000	1,050,000
e. Access Roads	L.S.			150,000
f. Access Bridges	L.S.			360,000
g. Service Roads	L.S.			110,000
h. Interior Drainage ditches	L.S.			220,000
i. Exterior Canal	L.S.			104,000
			Subtotal - - - - -	₱21,634,000
			Overhead & Contingencies, 10%	₱ 2,163,000
			Engineering & Supervision, 10%	₱ 2,163,000
			Subtotal - - - - - -	₱25,960,000
j. Land Improvement	4,000,000 M^2		6.40 - - -	₱25,600,000
			TOTAL CAPITAL COST - - - -	₱51,560,000

CAPITAL COST PER SQUARE METER = $\frac{₱51,560,000}{4,000,000}$ = ₱12.89 1/

1/ For the same site and area, using fill construction method of reclamation, Table 9.3 shows a capital cost per square meter of ₱22.95 which is 78% more.

ANNEX "L"

PRELIMINARY SUBSOIL EXPLORATION

West Bay

SUMMARY:

Aimed to obtain preliminary idea regarding the lake bed condition in West Bay in connection with the projected reclamation, 10 cone penetrometer tests and 5 soil sampling test holes were conducted offshore from Napindan to San Pedro. Five soil layers were encountered, namely: mud, silty clay, sandy clay, sand and tuff (bedrock). Firm ground, consisting of sand layer with an approximated bearing capacity of 2,000 lbs/sq. ft., was found at depth 30 to 35 ft. in Sucat-Alabang area and at 9 to 10 ft. in Muntinglupa-San Pedro sector.

1. Purpose and Scope:

An offshore subsoil exploration in West Bay from Napindan, Taguig, Rizal to San Pedro, Laguna, was prosecuted from October 5 to 20, 1971. The purpose of this exploration is to obtain preliminary idea regarding soil condition and to determine the engineering characteristics of the upper strata of the lake bed for decision making on their suitability for reclamation project. A total of ten (10) cone penetrometer tests were conducted at locations indicated on the attached map. In addition, five (5) soil sampling test holes were driven at strategic points for purposes of correlation and interpretation of the sounding probe.

2. Field Procedure:

The penetration resistance tests were conducted using non-expendable steel cone 2½ inches base diameter (see accompanying sketch) attached to a string of AW drill rods and driven into the lake bed by a 33-pound hammer freely dropping from 30 inches fall. The 33-lb hammer was used in this field exploration in the absence of standard 140-lb AW weight. A continuous log of the number of blows required to drive the cone for every foot of penetration was recorded (see attached field data). The tests were carried on until "refusal", that is when it required at least 100 blows to attain a penetration of one foot.

Soil sampling was effected either using the 10-foot EX drill casing or the AW split spoon sampler. The use of drill casing was limited to the sampling of top layers of the lake bed. In the case of soil sampling at desired depth other than the top layers, an expendable cone was attached to the tip of the split spoon. The sampler with the cone was then driven down to the desired depth. At this point the cone was allowed to detach from the sampler by pulling the sampler 5 to 6 inches accompanied by a little twisting and sidewise movement of the rod. After detaching the cone, the sampler was again driven into the ground until the desired length of sample was obtained.

3. Geologic Soil Condition:

Five (5) soil layers were recognized within the study area down to depth of 76 feet (see attached log of soil sampling

test holes 3-1 to 3-5). These layers, arranged in the order of increasing depths are:

a) mud

b) silty clay

c) sandy clay

d) clayey sand

e) fine tuff (bedrock)

Only the first 3 layers were actually penetrated during the soil sampling. The lower two being inferred from the geologic log of drill hole numbers 4, 26, and 27 drilled during the UNET feasibility study. While the upper 3 clay layers may be generalized to a single layer owing to the difficulty in drawing line between them, such attempt would not serve the purpose of this report because of their varying engineering characteristics.

a) The mud as classified in this report refers to a mixture of water with clay and/or silty materials without or with very negligible degree of consolidation. Mud particles therefore, under ordinary circumstances would easily be in suspension or colloidal form when disturbed from its natural immobile condition. The mud layer generally covers the first 3 to 4 feet of the lake bed within the study area. Its thickness varies from nothing near the shoreline to about 4 feet at 2 kilometers offshore.

b) The silty clays are made up of plastic and compressible fines with about 10 to 15% silt and minor amount of

fine sand. Fresh water shell fragments ranging from 20 to 30% are normally present. Some, such as those recovered in soil samplings S-2 and S-5 are rich in decayed organic matter characterized by spongy feel. The silty clays are very soft in place and generally underlie the sand. The thickness of the layers widely vary from 22 to 2[illegible] ft. at the Napindan-Sucat sector to as thin as 4 ft. in Alabang-Muntinglupa area - the abrupt change being located beneath stages 1 & 2 of the projected area to be reclaimed.

c) Directly underlying the silty clays are the sandy clays, whose components are very much similar to the silty clays from which they usualyy grade. The only significant difference on the physical characteristics that may have bearing on the engineering properties are the presence of relatively greater percentage of sand particles in the sandy clays and their being slightly compacted. The sand-silt constituents of the sandy-clay layers usually range from 10 to 20% although percentage as much as 40% was recovered at depth 2[illegible] ft. in soil sampling hole S-1 in Bicutan. The upper limits of the layers were encountered at depth 2[illegible] ft. in S-1 (Bicutan), 30 ft. in S-2 (sucat) and 7 ft. in S-3 (Alabang). The sandy

clays normally overlie the sense sand layers in these localities.

d) The clayey sand contains about 10 to 15% clay fraction and about 10% fresh water shell fragements. Sand particles are predominantly fine to medium-grained and compose mostly of quartz, feldspar, and volcanic rocks. The clayey sand is slightly plastic and shows moderate degree of compaction. Soil sampling test holes S-2 (Sucat) and S-3 (Alabang) reached the upper limit of the clayey sand layers at depths 33 ft. and 10 ft. respectively, but failed to penetrate deeper. In Sucat-Muntinglupa area, the inferred thickness of the layers, based from earlier drill holes in the vicinity (B li-4, 26, and 27), may vary from 5 ft. at about one kilometer from the shoreline to about twice as much along the shore. The clayey san encountered in Alabang-Muntinglupa sector grades to very dense sand and gravel at depth 15 ft. in S-3 and 32 ft. in S-4 (see section Y-Y[1]). On the other hand, the clayey sand layer in Sucat sector is underlain by about 25 ft. thick of silty clay. (See section X-X[1]).

e) The tuff referred to in this report as bedrock is well consolidated, hard, fine-grained tuff containing interbeds of lapilli and tuffaceous sandstone. The bedrock may be encountered within the study area at depth

between 60 and 70 ft. below the lake bed. The thickness of tuff layer, based on drilling explorations, may vary from 10 ft. to 20 ft.

Soil Density:

The relative firmness of saturated clay soils was determined by penetration tests. Section PQRS (see attachment) shows the relationship of blow-count to relative soil density. While the values obtained for these soils are only qualitative, the penetration resistance in blows per foot for various soil densities, can be used to provide an approximate evaluation of the soil condition in the area under study. The relative density of soils according to results of penetration resistance tests may be divided into 5 zones tabulated as follows:

Zone	Blow Count	Relative Density or Consistency
A	0	Very soft
B	0 - 20	Soft
C	20 - 50	Medium
D	50 - 60	Dense/Firm
E	Above 60	Very dense/Very firm

Relatively dense or firm clay soils were encountered at depths ranging from 30 to 35 ft. below the lake bed in the Napindan-Baguhbayan sector. The same clay soil condition was hit by PR#6 in Sucat at 50 ft. and again by PR#7 and PR#8 in Sucat-Alabang area at depths 40 ft. and 20 ft. respectively.

Very dense layer of sand and gravel was reached at depth 7 to 9 ft. by PR#9 and PR#10 in Muntinglupa-San Pedro area.

Similar layer may be expected at much shallower depths in places closer to San Pedro and also towards the shore. This firm material which could not be penetrated offshore correlates with the gravelly sand exposed along the shores of Alabang-Muntinglupa area. This layer gradually dips into the lake with a slope of .5 ft. or 2.5 meters per kilometer as indicated in section Y-Y^1.

4. Evaluations and Recommendations:

a) The saturated clay soils indicate consistencies ranging from very soft to medium, which suggest that they may undergo considerable consolidation and consequent settlement. The presence of some colloidal organic matters in some clay layers particularly those characterized by spongy feel, would invariably increase the liquid limit of the clay and also its compressibility characteristics.

A 10-foot thick clay layer underlying the central and southern portion of the proposed area to be reclaimed would result to 0 cm. settlement, about 70% of which may be expected during the first year after the fill shall have been completed to elevation 13.5 meters. If we consider the thickness of 30 to 35 ft. stratum occurring at the northern end of the proposed reclamation area, then the expected settlement would be about 3 times as much. This

calculation was based on assumed 100% liquid limit or compression index of 0.40 referred from the physical properties of clays of similar field descriptions analyzed during the UMTP studies. This does not include settlement within the fill itself, due to its clay content, which may vary considerably depending on the nature of fill materials. The expected total period of settlement may cover 5 years.

The silty fine sand that may be dredged as fill materials may contain varying amounts of clay in the matrix. Vibratory stresses set off by traffic movement, machineries and earthquake shocks can cause further consolidation of the clayey materials and consequent settlement of the structure that may be superimposed.

b) Bearing Capacity:

The standard penetration test conducted in the upper soils in drill hole DH-4 during the UMTP feasibility study showed an average N value of 15, equivalent to an allowable bearing capacity of 2,000 lbs. per sq. ft. The drill hole was located along the shore in Sucat about 1 km. north of Meralco plant site. In the preliminary subsurface exploration conducted by Geotechnics Philippines for Meralco plant site in Barrio Buli, Muntinglupa, an average of 20 blow-count was recorded in the upper strata for an estimated allowable

bearing pressure up to 4,000 lbs/sq. ft. But the Meralco sounding probe was performed on shore where soil condition was relatively dense compared to offshore sounding of the LLDA in this exploration. For this matter, it would be reasonable to assume an allowable bearing capacity of 2,000 lbs/sq. ft. for the dense soil layers in Muntinglupa-San Pedro area.

c) Recommendations:

a) It appears from the foregoing soil studies that the dredge method of filling the proposed reclamation area would be feasible. For this purpose, the cutter-head suction type of dredger may be recommended.

b) The sizeable sand deposit offshore of San Pedro is worth exploring as a possible source of most suitable dredge materials. The distance, however, of this source from the fill area might be a limiting factor.

c) Another source of dredge materials that may be recommended, although not very desirable, is located from 500 meters to 1,500 meters lakeward of the fill area. These materials consist of clay with 10 to 20 % sand-silt mixture.

d) To avoid possible adverse consequences due to the artificial change of the natural slope of the lake bed, fill materials shall be excavated from a distance of at least 500 meters from the reclamation area.

e) A more detailed subsoil exploration and soil sampling for laboratory analysis may also be recommended.

LOG OF SOIL SAMPLING TEST HOLES

West Bay

Note: Measurement of depths are referred from surface of lake bed.

Hole No. S-1; Location: Bicutan; Lake bed at elev: 9.5 mts.

0 - 3' - MUD ; dark greenish gray; contains about 10% silt with some decayed leaves.

3' - 5' - SANDY CLAY: yellowish brown; sand silt mixture about 20%; sand is generally fine-grained; contains about 15% very coarse fragments of fresh water shells; very soft in place; medium dry strength; low to medium plasticity (CL)

5' - 9' - SILTY CLAY: greenish to yellowish brown; contains about 10% silt and 5% fine-to-medium-grained sand; fresh water shell fragments about 30% with maximum size of 3 cm.; soft in place; medium dry strength; low plasticity (CL).

9' - 27' - No sample(presumably same as 5' - 9')

27' - 30' - SANDY CLAY: greenish gray; sand-silt mixture about 40%, sand particles mostly fine - to medium-grained; slightly compacted; medium dry strength; low plasticity (CL).

Hole No. S-2; Location: Sucat; Lake bed elevation: 9.5 mts.

0 - 3' - MUD: dark greenish gray; contains about 10% silt.

3' - 10' - SILTY CLAY: contains about 10% silt, decreasing in percentage towards the bottom; fresh water shell about 20%; rich in decayed organic matter at the bottom which is characterized by spongy material; very soft in place; low to medium plasticity (CL).

10' - 30' - No sample (presumably same as 3'-10')

30' - 33' - SANDY CLAY: greenish to yellowish gray; sand silt mixture about 35%; sand particles are generally

fine-to-medium-grained; contains about 10% fresh water shell fragments; slightly compacted low plasticity (CL).

Hole No. S - 3; Location: Alabang; Lake bed elevation: 9.0 mts.

0 - 3' - MUD: yellowish gray; contains about 15% silt.

3' - 7' - SILTY CLAY: yellowish brown; contains about 15% silt or non-plastic fines, 5% fine sand and 10% fresh water shell fragments (maximum size of 2 cm); very soft in place.

7' - 5' - SANDY CLAY: greenish gray to yellowish brown, sand silt mixture about 15%; slightly compacted; low plasticity (CL).

5' - 10' - CLAYEY SAND: yellowish brown; clay content about 15%; sand particles are generally fine-to medium grained and compose mostly about 10% fresh water shell fragments; slightly plastic, moderately compacted (SC).

Hole No. S - 4; Location: Alabang; Lake bed elevation: 7.9 mts.

0 - 4' - MUD: dark yellowish gray; contains about 10% silt or non-plastic fines.

4' - 12' - SILTY CLAY: yellowish brown; contains about 10% silt: fresh water shell fragments about 20%; fine-to-medium-grained sand about 5%; very soft in place; medium dry strength; low plasticity (CL)

12' - 30' - No sample (presumably same as 4' - 12')

Note: Loose sand and gravel (GP) compose of pumiceous material, may be expected at depth between 30 and 40 feet below lake bed.

Hole No. S-5; Location: Sucat; Lake bed elevation: 5.3 mts.
(Note: Strata below 14' were inferred from log of LH - 27)

0 - 4' - MUD: dark gray; contains about 10% silt and occasional fresh water shell fragments.

CONE PENETRATION TEST
(Field Data)
West Bay

Weight of drive hammer - 15 kgs (33 lbs)
Height of fall - 30 inches
Height of Aw rod - 3.4 lbs/ft.
Weight of guide rod - 17 lbs.
Weight of collar - 5 lbs.

Hole No. FR - 1
Date: October 6, 1971
Depth of Water - 7 feet

Location: 1 km due South of Napindan Light House;
4.5 km. S 70° E of Taguig Church

Depth	No. of Blows per foot
0 - 23'	wt. of 40 ft. Aw rod
23 - 24'	10 blows
24 - 25'	25
25 - 26'	22
26 - 27'	31
27 - 28'	29
28 - 29'	25
29 - 30'	35
30 - 31'	36
31 - 32'	43
32 - 33'	36
33 - 34'	40
34 - 35'	40
35 - 35¼'	100 (refusal)

Rods Used: 4 pcs. of 10 feet and 2 pcs. of 5 feet.

Hole No. TR - 2
Date: October 7, 1971
Depth of Water - 6½ feet

Location: S 46 W of Napindan Lighthouse;
S 40 E of Taguig Church

Depth (ft.)	No. of Blows per foot
0 - 1.5'	wt. of 15 ft. Aw pipes (1, 10' & 1 of 5')
1.5 - 2.25'	0 blows
2.25 - 3.75'	1 blow
3.75 - 13.50'	wt. of 30 ft. Aw rod (2 of 10' & 2 of 5') + hammer, collar and guide rod
13.50 - 14.50'	16 blows
14.50 - 15.50	8
15.50 - 16.50	13
16.50 - 17.50	13
17.50 - 18.50	17
18.50 - 19.50	23
19.50 - 20.50	13
20.50 - 21.50	17
21.50 - 22.50	33
22.50 - 23.50	24
23.50 - 24.50	30
24.50 - 25.50	53
25.50 - 26.50	45
26.50 - 27.50	62
27.50 - 28.50	60
28.50 - 29.50	75
29.50 - 30.00	100 (refusal)

Rods Used:

(2 pcs. of 10' + 5 pcs. of 5')

Hole No. PR - 3
Date: October 7, 1971
Depth of Water - 3'

Location - S 40 S Meralco Stack
N 1[illegible] W Taguig Church

Depth (ft)		No. of Blows per foot
0 - 14		wt. of 30' Aw rod
14 - 22		wt. of 35' Aw rod, & hammer
22 - 23		24 blows
23 - 24		16
24 - 25	(no blows)	wt. of 40' Aw rod & hammer
25 - 26		23
26 - 27		27
27 - 28		20
28 - 29		21
29 - 30		21
30 - 31		45
31 - 32		57
32 - 33		63
33 - 33.5		100

Rods Used:

(3 pcs of 10' and 3 pcs. of 5')

Hole No. PR - 4.
Date: October 6, 1971
Depth of Water - 7 feet

Location: Tue South of T.C. (Taguig Church)
S 20° W of Meralco Stack

Depth (ft)	No. of Blows per foot
0 - 12	wt. of 30' Aw rods
12 - 12 2	2 blows
12'2 - 20'2	1 blow
20'2 - 21'2	15
21'.2 - 22'2	3
22' 2 -23 '2	4
23'2 - 24'2	5
24' 2 - 27' 2	wt. of 40' Aw rods, 33 lbs. hammer, 5'Aw rod as guide and collar
27'2 - 2[illegible]'2	22
2[illegible]'2 - 29'2	26
29'2 - 30'2	23
30'2 - 31'2	90
31' 2 - 31'7	100 blows (refusal)

Rods Used:

(3 pcs. of 10', 3 pcs. of 5')

Hole No. PR - 5
Date: October 5, 1971
Depth of Water - 7 '

Location: Due South of Taguig Church
S 31° W of Meralco Stack

Depth (ft)	No. of Blows per foot
0 - 13	wt. of 3 of 10' or 30' Av rods
13 - 13.5	3 blows
13.5 - 21	1
21 - 22	29
22 - 23	16
23 - 24	9
24 - 25	11
25 - 26	22
26 - 27	25
27 - 28	20
28 - 29	28
29 - 30	62
30 - 30.5	100 (refusal)

Rods Used:

(2 pcs. of 5', 3 pcs. of 10')

Hole No. PR - 6
Date: October 9, 1971
Depth of Water - 9'

Location: S 53 W of Meralco Stack
N 35 E of Navindan Light House

Depth (ft)	No. of Blows per foot
0-31	wt. of 45' Aw rods (4 of 10' + 1 of 5') + 5' Aw rods as guide + hammer + collar
31 - 32	35
32 - 33	27
33 - 34' 9	wt. of 50' Aw pipe, guide, hammer, collar
34' 9 - 35'9	36
35'9 - 36'9	31
36'9 - 37'9	49
37'9 - 38'9	30
38'9 - 39'9	33
39'9 -40'9	29
40'9 - 41'9	25
41'9 - 42'9	33
42'9 - 43'9	40
43'9 - 44'9	37
44'9 - 45'9	38
45'9 - 46'9	39
46'9 - 47'9	37
47'9 - 48'9	38
48'9 - 49'9	105
49'9 - 50'9	108
50'9 - 50'11	10 (using 140 lbs. hammer) (refusal)

Rods Used:

(5 pcs. of 5' and 4 pcs. of 10')

Hole No. BR - 7
Date: October 13, 1971
Depth of Water - 10 feet

Location - N 21.5° W of Meralco Stack
S 60.5° E of Mt. Susong Dalaga

Depth (ft)	No. of Blows per foot
0 - 31	wt. of 45' Aw rod (4 of 10' + 1 of 5') + 33 lbs hammer + guide (sampling rod) + collar.
31 - 32	555
32 - 33	42
33 - 34	40
34 - 35	27
35 - 36	23
36 - 37	30
37 - 38	101 (Note : we had a rest of about 15 minutes)
38 - 39	53
39 - 40	56
40 - 41	55
41 - 42	95
42 - 42½	100

Rods Used:

(4 pcs. of 10' + 3 pcs. of 5')

Hole No. PR - 5
Date: October 14, 1971
Depth of Water - 0'

Location: N- 30° W of Meralco Stack
S 65° E of Mt. Susong Dalaga

Depth (ft)	No. of Blows per Foot
0 - 13.5	wt of 25' Aw rods + guide + collar
13.5- 15.0	6 blows
15.0- 16.0	39
16 - 17.0	54
17 - 18.0	13
18 - 19.0	23
19 - 20.0	37
20 - 21.0	19
21 - 22.0	14
22 - 24.0	9
24 - 25.0	23
25 - 26.0	117
26.0- 26.4	115 (refusal)

Rods Used:

(2 pcs. of 10' and 5 pcs. of 5')

Hole No. FR - 9
Date: October 13, 1971
Depth of Water - 6½'

Location: N 4° W to Meralco Stack
S 71° E to Mt. Susong Dalaga

Depth (ft)	No. of Blows per foot
0 - 5½	wt. of 20' Aw rods, guide, collar and 33 lbs. hammer.
5½ - 6½	31
6½ - 7½	70
7½ - 8½	103
8½ - 9½	208 (refusal)

Rods Used:

(1 pc. of 10' and 3 pcs. of 5')

Hole No. PR - 10
Date: October 15, 1971
Depth of Water - 0'

Location: N 5.5 W of Meralco Stack
S 75.5 E of P. t. Susong Dalaga

Depth (ft.)	No. of Blows per foot
0 - 7	wt. of 25' AW rods + guide + collar + 33 lbs. hammer
7 - 8	77
8 - 9	130
9 - 9 - 6"	201 blows (refusal)

Rods Used:

(1 pc. of 10' and 3 pcs. of 5')

COASTAL ENGINEERING STUDY AT WEST BAY

Recent Studies

Studies in coastal engineering for the lake during the recent UNDP Feasibility Survey were intended for prospective reclamation projects along the Angono-Napindan-Taguig sector. Data regarding storm wind velocities, wave heights, wind set-up (increase of water level at shore due to wind blowing towards it) and breaker's zone were evaluated based on a fetch along the axis of West Bay, the longest possible fetch for wave propagation. The findings of said studies, upon subsequent evaluation, can be applicable to the site of the proposed reclamation in Muntinglupa due to the following:

a) Coastal topography at the two sites are nearly similar.

b) The same design depth of the West Bay applies to both.

c) Storm wind at a direction towards either site is possible.

d) Design fetch at both sides are nearly equal. While the fetch for Napindan-Angono can be measured up to the opposite coast somewhere near Los Baños and that of Muntinglupa would extend up to Binangonan the longer fetch of the former has to be corrected for wave analysis purposes by a so-called channel correction (Saville Method) considering that West Bay is in effect, a channel of limited width. The resulting design fetch of 21 kilometers is only slightly longer than the unrestricted and design fetch of about 16 kilometers for the Munting-

In the case of wind set-up, some earlier studies on measured changes of lake levels at Lake Erie and Lake Okeechobee during storms resulted in semi-empirical analytical methods for hindcasting of of the effects, which are increase of water level at the shore toward which the wind is blowing and decrease of water level at the opposite shore.

The method would involve length of the lake along at an axis along the wind direction, the depth of water, intensity and direction of wind at various segments of the lake at a certain time. Some difficulty in evaluation would be experienced if the body of water would have an irregular shape, the direction of wind varies within the lake, or some barriers to relative continuity of the water mass exist. The Laguna lake would be such body of water considering its shape, the varied adjacent topography, and the presence of Talim Island at mid-center. Results of computations of wind set-up in the lake assuming an idealize shape of the lake may not be valid as the barrier effects of the Jala-jala peninsula and Talim Island can not be assessed. A qualified opinion in the effects of said barrier against wind set-up is that these barriers may tend to attenuate the effects. It would be noted in the computed values based on the idealized lake, that at wind velocities of 50 mph or lower wind set-up is negligible, although at 75 mph a set-up of more than 4 feet can be expected.

lupa site.

Only in the wind set-up are the earlier findings not believed applicable for the Muntinglupa site because this site is nearly at middle West Bay shoreline where wind set-up is less severe if any, that at the extreme limit of the Bay. Extreme limits are the site of maximum set-up effects.

In the absence of recorded data on observed wave heights wave hindcasting had to be resorted, using the Thysse-Schiff method for shallow water waves. Parameters needed for this method are depth of water, fetch length, and wind velocity. Where the fetch involves a channel, reduction of the fetch length for channel correction is necessary, as earlier mentioned. Another and more familiar method of wave analysis by Sverdrup-Munk-Bretschneider (SMB) which is for deep-water waves was found out to be not suitable for the lake as a sample computation showed that the resulting wave heights would exceed the design depth of the lake.

Changes in wave configuration as the waves approach the coast were likewise analyzed and computed by use of wave refraction diagrams. The diagrams are, in effect, the paths of the wave fronts in their travel toward the shore. Convergence or divergence of the paths indicates that the waves converge or diverge. Convergence means that wave heights will further increase until the waves break at the shore, divergence implies decrease of wave heights.

Selected storms for wind velocities used in the computations are Fading (1954) - [illegible] mph, Olive (1960) - 50 mph, and an assumed wind velocity of 70 mph. Results of the analysis are as follows:

Wind Velocity	Ht. of waves (ft) at lake Bed contour (MTRS)			Wind Set-up
	8.5	9.10	9.50	
60 MPH	5.1 ft.	5.0 ft.	5.0 ft.	4.4 ft.
70 MPH	4.9	4.[illegible]	4.[illegible]	2.[illegible]
50 MPH	4.3	4.2	4.2	neglig.

Height of waves at lake bed contours higher than Elevation 9.5 meters were not anymore considered as the waves are most probably already breaking at the shore zone at that contour.

Basis of Design of Bulkhead and Height of Fill

The reclamation although dredged filled, will still be vulnerable to flooding by relatively high lake levels and by erosion of the bulkhead and frontal area by wave action if these are no realistically anticipated. For reference, the findings of the recent UNDP studies on recorded lake levels show maximum lake stages and frequencies as follows:

Frequency	Maximum Lake Stage
2- year	Elevation 12.5 meters
5 - year	Elevation 13.0 meters
10 - year	Elevation 13.5 meters

20 - year	Elevation 13.9 meters
25 - year	Elevation 14.1 meters
100 - year	Elevation 14.6 meters

Average annual maximum lake level is Elevation 12.50 m., average annual minimum lake level is Elevation 10.50 m., and average lake level is Elevation 11.3 m. Datum of the elevations is mean lower low water (MLLW) of Manila Bay at Elevation 10.0 meters.

Flooding of the area would be minimized by selecting a grade elevation which will be flooded only by lesser frequent high lake stages. Limited flooding along the area immediately behind the bulkhead or seawall due to wave uprush and overtop will be obviated by providing a parapet wall or deflector atop the bulkhead. Immediately along the rear of the parapet a scheme of paving and return drainage is necessary to strengthen further the bulkhead against the effects of infrequent larger waves and the over topping.

Sizes of cover or armor stones and the scheme of layering for the bulkhead are determined by the Hudson formula for rubble mound structures.

References:

Shore Protection Planning and Design, Technical Report No. 4, US Army Coastal Research Engineering Center.

Reports on Tropical Cyclones in the Philippines - Weather Bureau Pamphlets.

"West Laguna Industrial Estate", UNDP Reports, Feasibility Survey for the Hydraulic Control of Laguna de Bay, Vol. 7

"Laguna de Bay Water Levels" FWP, TIAL (UNDP)

SOME FIGURES
OF THIS DOCUMENT
ARE TOO LARGE
FOR MICROFICHING
AND WILL NOT
BE PHOTOGRAPHED.

PART IV

LABOUR STUDY

1. Introduction

Undoubtedly, the West Bay Industrial Estate will have an economic impact on the Laguna Lake Region, particularly on the areas immediately surrounding the estate. Employment opportunities will be generated by the Estate in addition to these opportunities to be generated by existing activities and new activities to be located outside of the estate. The purpose of this study is therefore to assess the present and future conditions with respect to regional human resources and to place them within the perspective of the industrial estate.

2. The Regional Population

2.1 Present Population

Based on preliminary releases of the population census by the Bureau of Census and Statistics, the country's population has already reached the 37 million level of which about 13% or 4.8 million are living in the region. This share is an increase of 1.7% over the regional share in the country's population during the preceding census year, 1960. Table 2-1 would show this comparison.

TABLE 2.1 REGIONAL AND NATIONAL POPULATION

	1960	1970	Annual Growth Rate Per Cent
	Thousands		
PHILIPPINES	27,088	37,008	3.2
LAGUNA LAKE REGION	3,067	4,840	4.7
Manila	1,139	1,323	1.5
Rizal	1,456	2,819	6.8
Laguna	472	698	4.0
Percentage Share of Region to Total Philippines	11.3%	13.0%	

As the above figures indicate the average annual growth in the region's population between the two census years is 4.7% or 1.5% higher than the national experience for the same period. What could account for this higher regional population growth as compared to the national population growth is the fact that the region continually attracts migrants from other regions because of its higher economic status as compared to that of other regions.

The age structure of the population of the Laguna Lake Region is strongly weighted toward the younger age groups. This is the result of the high birth rate in the region apart from its being the nation's center for schools and training institutions.

Table 2.2 provides the population structure of the region as of 1970 census year.

TABLE 2.2. REGIONAL POPULATION STRUCTURE, 1970

Age	Number Thousand	Present Distribution
Under 10	1,351	27.90
10 - 14	488	10.08
15 - 19	536	11.07
20 - 24	580	11.98
25 - 29	452	9.33
30 - 34	360	7.44
35 - 39	270	5.57
40 - 44	197	4.07
45 - 49	161	3.33
50 - 54	130	2.69
55 - 59	109	2.25
60 - 64	82	1.70
65 - 69	54	1.12
70 - 74	33	0.68
75 and over	37	0.76
Not stated	1	0.03
TOTAL POPULATION 10 YEARS AND OVER	3,490	72.10
TOTAL REGIONAL POPULATION	4,841	100.0

2.2 Projected Population

Past population trends indicate that the growth rate of the regional population increases by about 0.3 per cent every decade. Assuming that this trend will persist in the future the projected regional population at the end of each decade may be seen in Table 2.3, below:

TABLE 2.3. PAST AND PROJECTED REGIONAL POPULATION[1/]

	Population
1970 (actual)	4,[illegible]40,944[2/]
Projected	
1980	7,[illegible]35,365
1990	13,216,10[illegible]
2000	22,7[illegible]9,857

1/ Assumed growth rates:

- 1970 to 1980 ---------- 5[illegible]% annually
- 1980 to 1990 ---------- 5.3% annually
- 1990 to 2000 ---------- 5.6% annually

2/ Actual average population growth rate between 1960 to 1970 is 4.7% annually.

3. The Regional Labour Force

3.1 Present Status

Preliminary 1970 census figures reveal that out of the regional population of 4,240 thousand about 1,674 thousand belong to the labour force. The distribution of this labour force by major industrial groups is as follows:

TABLE 3.1. REGIONAL LABOUR FORCE BY MAJOR INDUSTRIAL GROUP, 1970

	Number	Percent
Services	579,430	34.6
Manufacturing	360,653	21.5
Commerce	223,466	13.3
Transportation, Communication and Storage	149,919	8.9
Agriculture Forestry and Fishing	135,051	8.1
Construction	103,996	6.2
Electricity, Gas, Water and Storage Services	12,001	0.7
Mining and Quarrying	6,135	0.4
Activities not adequately described	36,455	2.2
Looking for work for the first time	67,349	4.0
TOTAL[1/]	1,674,335	100.0

1/ Of this total, 116,601 are estimated to be unemployed

As the above table will indicate the distribution of the regional labour force is lopsided in favor of the service, manufacturing and commerce sectors. Unemployed in the region number 116,601 or about 7% of the labor force. The available labor data however fall short of quantifying the unemployed in each of the industrial groups.

By major occupation the regional labour force is broken down as follows:

TABLE 3.2. REGIONAL LABOUR FORCE BY MAJOR OCCUPATION, 1970

	Number	Percentage
Craftsmen, Production Process Workers and Laborers, NEC 1/	377,561	22.5
Services, Sport and Related Workers	267,272	16.0
Professional, Technical and Related Workers	180,519	10.8
Sales Workers	180,145	10.8
Clerical Workers	175,467	10.5
Workers in Transport and Communications Occupation	143,389	8.6
Farmers, Fishermen, Hunters, Loggers, and Related Workers	131,771	7.9
Stewardes and Related Freight Handler and Laborers, NEC 1/	64,544	3.8
Administrative, Executive and Managerial Workers	47,342	2.8
Miners, Quarrying and Related Workers	4,622	0.3
Workers not classified by Occupation and Members of the AFP	34,354	2.0
Looking for Work for the First Time	67,349	4.0
TOTAL	1,674,335	100.0

1/ NEC means not elsewhere classified.

This above table shows that a sizeable portion of the regional labor force belongs to the categories of professionals, technicians, craftsmen, and service workers.

3.2 Regional Manpower Projection

For the purpose of projecting the regional manpower, it has been assumed that the percentage of the regional labor force as compared to the regional population will decrease from 34.6 per cent in 1970 to 31.6 per cent in 2000. The rationale behind this assumption is the fact that it has been assumed earlier that the growth in regional population will follow an increasing trend during the same period. This trend would naturally result in the increasing ratio of young people to the total regional population, thus reducing the actual employable people as a ratio of the total regional population.

Table 3.3 shows the projection of the regional labor force using the above assumptions.

TABLE 3.3. PROJECTED REGIONAL LABOUR FORCE

	Population	Ratio of Labour Force to Population	Labour Force
1970 (actual)	4,840,944	34.6	1,674,335
Projected			
1980	7,885,365	33.7[1/]	2,657,369
1990	13,216,102	32.7[1/]	4,321,667
2000	22,799,057	31.6[1/]	7,201,595

1/ Assumed ratios

4. Projected Regional Employment Level

4.1 Limitation of the Projection

Future employment conditions in the region has been evaluated to determine whether it would support the establishment of the industrial estate. This projection is limited to the qualitative aspect of labour because of two reasons:

1. The available basic data divide the regional labour force by major occupation but falls short of segregating skilled workers from unskilled workers, and
2. The industrial estate to be established is a general purpose industrial estate, hence it would be difficult to ascertain what kind of skills or occupation would be demanded of workers to be employed in the factories or plants to be located thereat.

Another limitation of the projection is that it does not include migrant workers from other regions.

4.2 The Model for the Employment Projection

The mechanics of the model for the employment projection starts with the quantification of the growth rate in employment. The determined growth rate is then applied to the employment figure of the base year.

Mathematically the growth rate in employment is defined as:

$$L_{1/L_o} = \frac{V_{1/V_o}}{\frac{V_{1/L_1}}{V_{o/L_o}}}$$

Where L_1/L_o is the growth in employment

V_1/V_o is the growth in value added, and

$\frac{V_1/L_1}{V_o/L_o}$ is the growth in labour productivity

4.3. Projected Total Employment in all the Regional Economic Sectors

The following table shows the computation of the projected regional employment level at the end of each decade starting with the year 1970.

TABLE 4.1. COMPUTATION OF THE PROJECTED TOTAL REGIONAL EMPLOYMENT LEVEL[1/] AT THE END OF EACH DECADE

	Actual 1970	Projected 1980	1990	2000
1. Assumptions				
a. V_1/V_o in Index form[2/]		106.0	107.0	108.0
b. $\frac{V_1/L_1}{V_o/L_o}$ in Index form[2/]		102.0	102.5	103.0
2. Derived Growth Rate in Total Regional Employment				
a. Annual average percentage increase[2/]		3.9	4.4	4.9
b. Annual growth in Index form[2/]		103.9	104.4	104.9
c. 10 year equivalent in ratio form		1.46606	1.53216	1.61344
3. Total Regional Employment Level	1,557,734	2,283,732	3,512,745	5,667,603

1/ Figures are for the regional household population only and do not take into account migrant workers from other region.

2/ Base year for each year is the preceding year.

The projected total regional level by decade would result in the increase of the regional unemployment rate from 6.96 per cent in 1970 to 21.30 per cent in 2000 (see the following Table 4.2).

TABLE 4.2. PROJECTED UNEMPLOYMENT IN THE REGION AT THE END OF EACH DECADE

	Actual 1970	Projected 1980	1990	2000
Regional Labour Force	1,674,335	2,657,369	4,32 ,667	7,201,595
Regional Employment Force	1,557,734	2,2 3,732	3,512,245	5,667,603
Unemployment:				
Number	116,601	373,636	90 ,922	1,533,992
Rate 1/	6.96	14.06	1 .72	21.30

1/ Rate is equal to unemployment divided by labor force.

4.4 Projected Regional Employment in Manufacturing

The basic data fall short of ascertaining what portion of the regional labour force engaged in manufacturing is unemployed. Since the activities to be located in the industrial estate belong to the manufacturing category it would be worthwhile anticipating how many of the region's employed will be employed in the manufacturing sector. Table 4.3 shows the projected regional employment in the manufacturing sector.

TABLE 4.3. PROJECTED REGIONAL EMPLOYMENT IN MANUFACTURING[1] BY DECADE

	Given 1970	Projected 1980	1990	2000
1. Assumptions				
a. MV_{1/MV_0} in Index Form		110.0	112.0	114.0
b. $\frac{MV_{1/ML_1}}{MV_{0/ML_0}}$ in Index Form		105.0	106.0	107.0
c. Actual employment in manufacturing	335,551[3]	-	-	-
2. Derived Growth in Regional manufacturing employment				
a. Annual Average percentage increase		4.?	5.7	6.5
b. Annual Growth in Index Form[2]		104.?	105.7	106.5
c. 10 year equivalent in Ratio Form[2]		1.59?12	1.74020	1.?7713
3. Projected Regional Employment in Manufacturing	-	536,251	933,506	1,752,312

1/ Figures are for the regional household population only and do not take into account migrant workers from other region.

2/ Base year for each year is the preceding year

3/ Derived on the assumption that 6.96 percent of the 360,653 regional labour force in manufacturing are unemployed.

A comparison of the projections in this table with the projections in Table 4.2 indicates that the employed in the manufacturing sector will increase as a percentage of the total employed household population of the region from an estimated 21.54 per cent in 1970 to 30.92 percent in 2000 (see Table 4.4).

TABLE 4.4. TOTAL REGIONAL EMPLOYMENT AND REGIONAL MANUFACTURING EMPLOYMENT AT THE END OF EACH DECADE

	Actual	Projected		
	1970	1980	1990	2000
Total Regional Employment	1,557,734	2,203,732	3,512,745	5,667,603
Regional Manufacturing Employment	335,551[1/]	536,251	933,506	1,752,312
Percent Regional Manufacturing Employment to Total Regional Employment	21.54	23.43	26.57	30.92

1/ Estimated; see footnote 3 Table 4.3

Employment Impact of the Industrial Estate

It is envisioned that the West Bay Industrial Estate will be a general purpose industrial estate to be opened for occupancy to almost all kinds of manufacturing activities except obnoxious industries.[1/] At this stage, it is therefore difficult to ascertain what activities will be located in the estate. Consequently, it will be equally difficult to estimate, with some degree of certainty, the actual number of job opportunities to be generated by the industrial estate. It will also be difficult to anticipate what skills will be required by the manufacturing activities which will eventually settle in the estate. At best what can be done is approximate the number of employment opportunities that could probably be generated by the estate.

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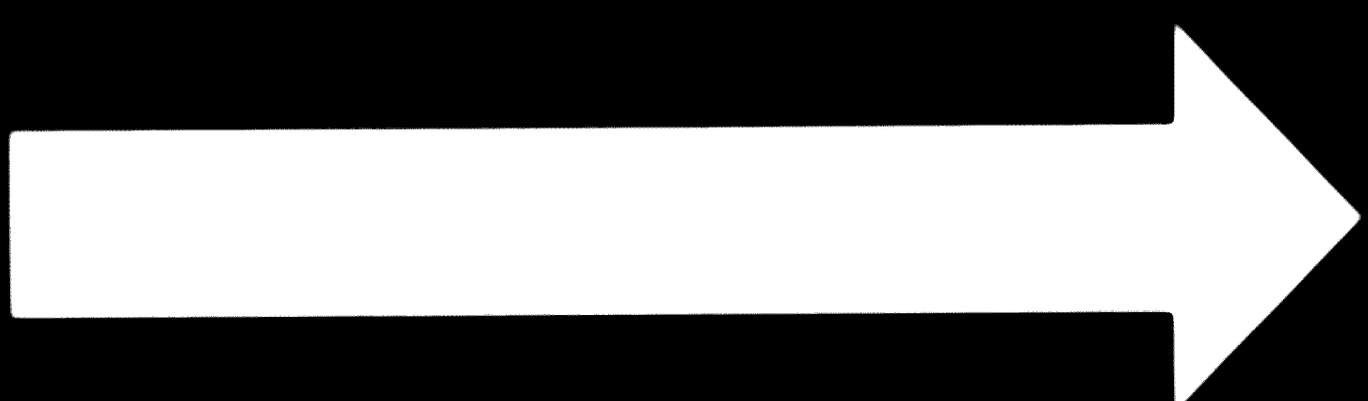

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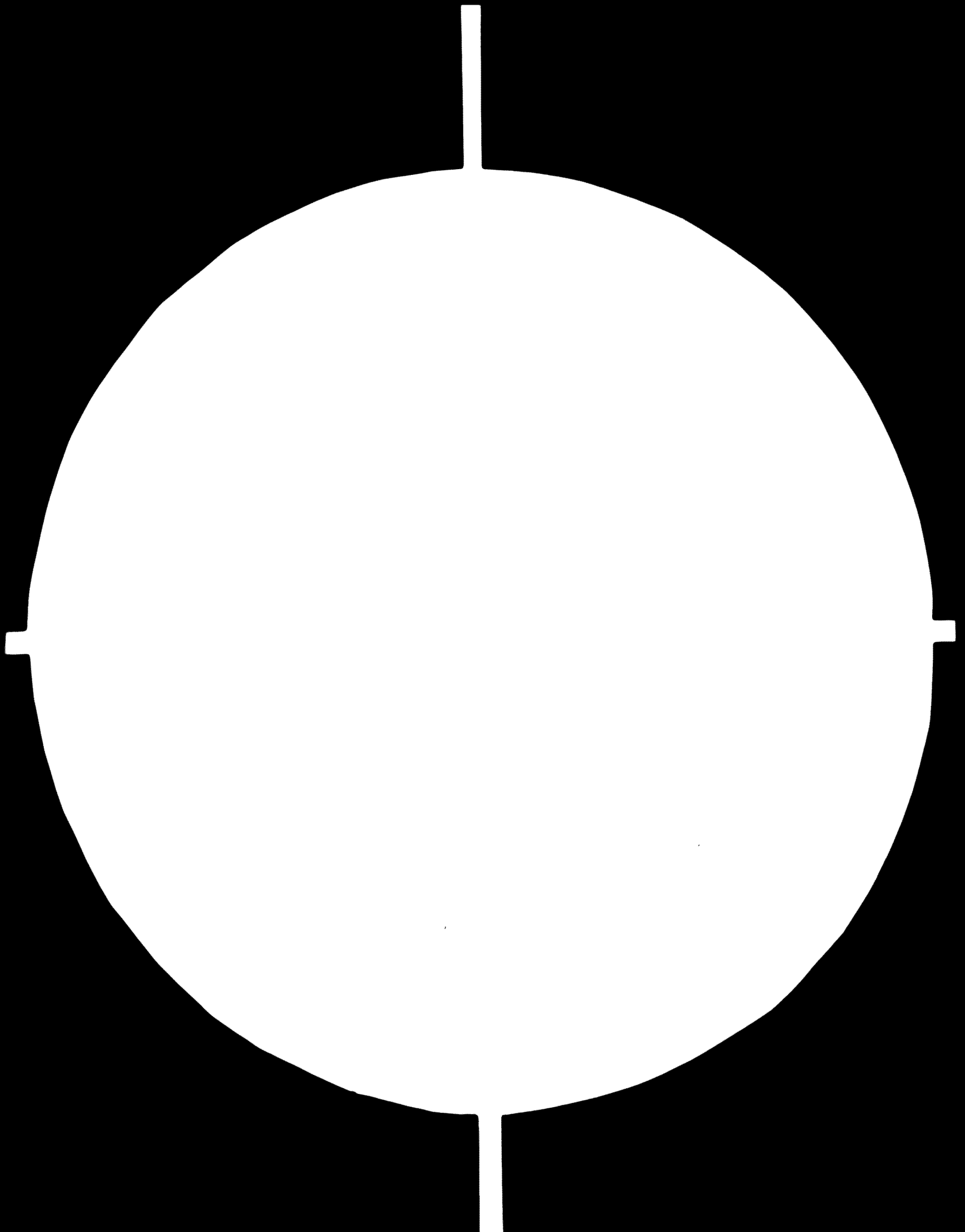


On the assumption that 65 per cent or 260 hectares of the 400 hectares to be reclaimed will be available for occupany and each plant site will have an approximately area of 3 hectares, the estate will be able to accommodate 76 plants. Assuming further that each plant will directly employ about 127 persons[2/] the industrial estate would directly generate roughly about 10,922 employment opportunities.

Undoubtedly the direct effect of the estate in terms of employment opportunities to be generated is not enough to substantially reduce the projected unemployed in the region. However, the activities to be located in the estate are bound to have linkage effects, backward and/or forward. Through these effects the estate would be able to strengthen its impact on the regional employment situation.

6. Education and Training of Manpower for the Estate

It was earlier mentioned that at this stage it will be difficult to anticipate what skills will be needed by the activities to be located in the estate (see/V for further explanation). Therefore at the early stage of the estate, the advance training of manpower will have to be undertaken by the firm themselves. These firms will have to rely on the existing educational institutions for basic education and for vocational and technical training at the secondary level and beyond.

The Laguna Lake Development Authority (LLDA) is however, in touch with the Rizal Youth and Development Foundation and with the National Manpower and Youth Council for the purpose of designing a manpower program in connection with the industrial estate and other development projects of the LLDA.

1/ Obnoxious industries would generally refer to industries which are extremely hazardous such as amunition plants, nuisance to the general run of industries such as tanneries or generally out-of-place in the estate relative to pre-determinal goals, supporting facilities, etc.

2/ The 1965 Annual Survey of Manufacturing by the Bureau of Census and Statistics reveals that each manufacturing establishment with 20 or more employees employs about 127 persons on the average.

LEGAL ASPECTS -V

1. Power of the LLDA to Establish an Industrial Estate

Section 4 (e) of Republic Act No. 4850, otherwise known as the Laguna Lake Development Authority Act empowers the LLDA to establish industrial estates. Under this section, the LLDA can "engage in agriculture, industry, commerce, or other activities within the region which may be necessary or directly contributory to the socio-economic development of the region, and, for this purpose, whether by itself or in cooperation with private persons or in cooperation with private persons or entities, to organize, finance, invest in, and operate subsidiary corporations: Provided, That the Authority shall engage only, unless public interest requires otherwise, in those activities as are in the nature of new ventures or are clearly beyond the scope, capacity, or interest of private enterprises due to consideration of geography, technical or capital requirements, returns on investment and risk."

Admittedly, an industrial estate project is a new venture. Risk capital may not be available from the private sector. It is the responsibility of LLDA in the pursuit of its objectives to demonstrate the effectiveness of industrial estate as a vehicle for meeting the challenge for fast but rational industrial growth in the light of congestion and pollution problems which normally accompanies industrialization.

2. Modes of Acquisition of the Industrial Estate Site

There are three alternatives open to LLDA in the acquisition of the industrial estate site:

a. By Direct Purchase

The LLDA as a corporate body has the power "to acquire, buy, purchase, hold or lease, such personal and real property as it deems necessary or convenient in the transaction of its business and/or in relation with the carrying out of its purposes under this Act; and to lease, mortgage, sell, alienate, or otherwise encumber or dispose any such personal and real property held by it. The land which would be developed as an industrial estate could therefore be purchased by LLDA from private landowners. (See Section 3 (f), R.A.4850).

b. By Reservation through Presidential Proclamation

If there is public land available within the Laguna Lake region suitable for industrial estates purposes, this land may be reserved in favor of the Laguna Lake Development Authority for industrial use including the establishment of an industrial estate through a Presidential Proclamation issued by the President of the Philippines pursuant to the provisions of Section 83 of Commonwealth Act No. 141, as amended, otherwise known as the Public Land Law. (See Opinion of the Department of Justice dated April 24, 1970).

c. By Reclamation

Under Section 4 (i) of Republic Act No. 4850, the LLDA is authorized "to reclaim or undertake reclamation projects and/or acquire such body of lands from the lake as may be necessary to accomplish the aims and purposes of the Authority."

3. Taxation

With respect of taxation, the charter of the LLDA states as follows:

"Exemption from tax - The Authority shall be exempt from all taxes, licenses, fees, and duties, incidental to its operations. This exemption shall extend to its subsidiary corporations: Provided, That its subsidiary corporations shall be subject to all said taxes, licenses, fees, and duties five (5) years after their establishment under a graduated scale as follows: twenty (20) per centum of all said taxes during the sixth year, forty (40) per centum of all said taxes during the seventh year, sixty (60) per centum of all said taxes during the eight year, eighty (60) per centum of all said taxes during the ninth year, and one hundred (100) per centum of all said taxes during the tenth year, after said establishment. Such exemption shall include any tax or fee imposed by the government on the sale, purchase or transfer of foreign exchange. All notes, bonds, debentures and other obligations issued by the Authority shall be exempt from all taxes both as to principal and interest, except inheritance and gift taxes" (Section 12, Republic Act No. 4850)

The management of the industrial estate may be undertaken by the LLDA itself or by its subsidiary. In accordance with the above-cited provision of R.A. No. 4850, if the LLDA should directly manage the Industrial Estate, then, it is exempt from all taxes, licenses, fees, and duties incidental to its operations. However, should the LLDA form a subsidiary corporation to manage the industrial estate, then, its exemption shall be as provided in the above-quoted provision of law.

As a consequence of the provision of law quoted above, the LLDA shall be exempt from payment of the real estate

tax for the land comprising the industrial area. With respect to the realty tax for the buildings on the industrial estate, if the same were built by the LLDA or its subsidiary, then the exemption as provided for by law shall apply. If the buildings are built by the lessee firm, then there shall be no exemption from payment of the realty tax The same rules as above still apply to machineries permanently attached to the land or buildings in the industrial estate.

With respect to other taxes for which the industrial firms are liable, they shall still be liable for its payment although they are located within the industrial estate.

4. Labor Laws

Labor laws such as the Eight-Hour Labor Law, Minimum Wage Law, Workmen's Compensation Law and others, especially those which were enacted for the protection of women and children are all applicable to industrial firms which would be established in the estate.

UNITED NATION INDUSTRIAL DEVELOPMENT ORGANIZATION
UNITED NATIONS DEVELOPMENT PROGRAMME

Special Industrial Services
Project Data Sheet

Reference No.: Country: Philippines

1. Project title: Study of West Laguna Industrial Estate
2. Date formal request recorded:
3. Government Department submitting request: National Economic Council
4. Specific Government Agency concerned with the project: Laguna Lake Development Authority
5. Description of the project: Twelve man months of services of a consulting firm are required in connection with a general purpose industrial estate proposed to be built on reclaimed land of the west shore of the Laguna de Bay. The consultant shall: A. Review the plans and studies of the LLDA; B. Prepare a report on the feasibility of the project; and C. Presuming feasibility is shown, study and recommend; planning and organizational procedures; physical layout; and operation and management, to serve also as a supporting document for domestic and/or foreign financing. A drawing showing location and plan of the proposed industrial estate is enclosed.

   A. The studies which LLDA will conduct prior to arrival of the consultant will consist of the following, with the function of the consulting firm in each case indicated:

      1. Location Decision - LLDA shall study and evaluate the proposed site indicated in the UNDP report on the basis of the site's land-use structure, accessibility and communication (land and water transport), infrastructure base (power lines and water sources, etc.), market opportunities for occupants, presence of nuclei industries and general suitability for industry. LLDA shall compare and rank alternative reclamation sites in the

order of their potentialities and shall compare them with alternative sites on unused land in the Manila area. The consultant shall review these studies and confirm or comment on their validity with particular reference to the optimization of industrial locations in the Manila-Laguna area.

2. Market Studies - To determine the demand for industrial sites specifically in the Laguna Lake area and to identify potential industries and/or industrial firms which may be located in the estate. LLDA shall conduct a survey of existing industries; their relocation and expansion plans as well as of new industries preferably those registered with the Board of Investments. Applicable tests shall be done to determine suitable industries for the industrial estate taking into consideration the nature of the industry, the estimate of demand for space, and the estimate of infrastructure requirements. The consultant shall review these studies and confirm or comment on their validity.

3. Reclamation Studies - LLDA shall conduct the engineering studies for land reclamation based both on polder and fill construction, including determination of reclamation methods, cost estimates, estimates of value of reclaimed and surrounding land, and suitability of land for industrial purposes, including bearing strength, seepage and resistance to calamity. The consultant shall review the studies and confirm or comment on their validity.

4. Labour Studies - LLDA shall conduct studies on probable sources of labour, recruitment, training, compensation and labour laws affecting employer-employee relationships. The consultant shall review and comment on these studies.

5. Tax and Legal Studies - LLDA shall submit a legal feasibility study of the project with particular reference to land ownership and tax burdens involved, if any. The consultant shall review and comment on these studies.

B. After review of these studies and conduct of C below to the extent required, the contractor shall prepare an independent report of the feasibility of the project with particular attention to the issues mentioned under Background, below, and shall provide recommendation for and a description of further studies reqired, if any, to prove or disprove the project's feasibility. As practical, within financing available under the contract, the consultant shall assist in conduct of such studies.

C. Presuming the feasibility of the project is proven under B above, the consultant shall conduct the following studies with the assistance of LLDA counterpart personnel, including the full time services of one senior economist, one economic researcher, one civil engineers, and one secretary-stenographer; and the services of one draftsman available as required.

1. Size of the Industrial Estate - The consultant shall study the proposed industrial estate site and determine the immediate and long range optimum economic size of the estate to be established and its phased development, including a projection of the demand for sites over a five-year period.

2. Master Plan and Development Program- The consultant shall take full responsibility over this particular aspect of the project study. The master plan and development program will include a determination of the degree of planning and preconstructed facilities and services desirable, including the following as appropriate:

a) The use of the land;

b) The sizes of industrial plots;

c) The physical layout of the entire estate with particular reference to utilities and infrastructure designated below, to include the engineering basis for design and preparation of pre-construction design drawings adequate to serve as a basis for final contract drawing:

   i) Road network and access

   ii) Railway system

   iii) Water supply and fire extinguishing systems

   iv) Power supply system

   v) Drainage and sewage systems - industrial waste and effluent treatment

   vi) Telecommunication network

   vii) Illumination network for spaces of public use

d) The service centers and common facilities to be provided in the estate like banks, post office, wharf and water transport facilities, warehouses, training centre, chapel; display centre, tool room, etc.,

e) Dimension and design of open spaces,

f) Design criteria and architectural guidelines for factories, buildings, houses, or other structure to be constructed in the estate,

g) Space allocation for residential development for estate occupants to include corollary facilities,

h) Zoning rules and regulations to be enforced in the estate,

i) Phased development of the entire estate; the successive phases of construction of the above works using PERT-CPM techniques as appropriate.

An input to this study, LLDA shall develop the engineering for land reclamation, item A. 3, above.

3. Incentives - The consultant shall make a study on and recommend possible incentives to be provided for estate occupants, including common facilities and service centers.

4. Management and Organization Studies - The consultant shall undertake studies with LLDA assistance on the appropriate business organization to carry out the industrial estate project. The team shall draw an organization chart together with a statement of functions of each organization unit.

5. Financial Studies - The consultant shall conduct studies with LLDA assistance on the economic of investment and returns of the project, including a comparison between reclamation and non-reclamation schemes and the project recommended. The cost recovery scheme shall be formulated; possible sources of domestic and foreign financing shall be identified; and a financial proposal be made for consideration by domestic and/or foreign financing institutions.

6. Economic Contributions - The consultant shall make a study with LLDA assistance on the contributions of the project to the economy, e.g., employment generated, additional tax revenues, foreign exchange savings, and the like.

Note: The senior staff of the LLDA will be available for consultation and discussion at all times. The Authority will make all necessary arrangements for meetings with government agencies, financial institutions, private sector, etc., as may be requested. The Authority will furnish one (1) vehicle and driver, office space, facilities and other ordinary local logistic support.

6. Background information:

The Laguna Lake Development Authority is expressly empowered by law (R.A. No. 4850) to lead, promote and accelerate the development and balanced growth of the Laguna Lake area.* Toward these

* The Laguna Lake area consists of the provinces of Laguna and Rizal, and the cities of Manila, Pasay, Quezon, Caloocan and San Pablo.

ends, a study was conducted jointly by UNDP and the Philippine Government with LLDA as the government co-operating agency. A feasibility survey for the hydraulic control of the Laguna de Bay complex and related development activities was undertaken and the UN contractor's report was finalized on December 1970.

Among others, the report included a pre-feasibility study on the establishment of a 360 hectare general purpose industrial estate through land reclamation off the west Laguna shore (see map attached). The study concluded the industrial estate appeared to be technically and commercially feasible and recommended a detailed feasibility study. Important issues remaining are the economic and commercial justification of land reclamation (construction cost compared to the economic and commercial value of reclaimed and surrounding land); the suitability of land reclaimed for industrial purposes, considering both lower cost polder and higher cost fill construction; and the advisability of inducing formation of an industrial concentration away from the Manila fringe through investment of some US $10 million in site preparation.

The proposed LLDA industrial estate programme is intended to serve as a response to the growing awareness of the country's need to meet the challenging demand for rational industrial growth. The lack of planning in regional growth, the ineffective allocation of resources, and the deficiencies in basic infrastructure are retarding industrialization, alleviation of unemployment, and, in turn, the growth of the national economy. The task then is to plan for the most efficient spatial and economic organization to maximize economic and social growth. Industrial estates have come to be recognized as effective catalysts in these socio-economic pursuits.

The LLDA is undertaking some of the required study which will be completed by August 1971. In order to review these studies and conduct others, the assistance of UNIDO is being requested under this project.

7. Relationship with other technical assistance projects or requests: A regional industrial planner is to be provided the Presidential Economic Staff and an industrial geography planner is being provided the Institute of Planning of the University of the Philippines, but a concentrated full time effort is required on this specific project requiring urgent implementation.

8. Project components, duration and estimated costs:

Field of activity	Duration	Cost
Consulting firm	4 months	12 man months
Industrial economist/industrial location expert	as required	
Urban planner	as required	
Land reclamation engineer	as required	
Industrial estate planner	as required	

Date required - September 1971

9. Request approved:

for UNIDO date: for UNDP date:

Encl.: Plan of West Laguna Industrial Estate

APPENDIX 2

THE LAGUNA LAKE REGION

1. Physical Description

The Laguna Lake Region practically coincides with the watershed of Laguna de Bay. It has a total land area of about 365.3 thousand hectares.

In 1966, more than one-third or 39 percent of the total land area was utilized for agricultural purposes. Of the 142.0 thousand hectares devoted to the growing of agricultural crops, almost one-half or about 64 thousand hectares were planted to rice. Coconut plantations occupied the next larges area 45 thousand hectares, followed by sugar cane with 22 thousand hectares. The rest of the area amounting to 11 thousand hectares were utilized for other tree crops and vegetables.

More than 54 percent of the total agricultural area can be found in Laguna--majority of the rice, coconut and sugar cane lands are located in the said province. In contrast, Rizal province and Manila contain the largest share of the built-up areas consisting mainly of industrial, commercial and residential lands.

Based on preliminary releases of the Bureau of Census, the region has a population of 4.7 million or about 13 percent of the country's total population. The available population figures are shown in Table 1.1.

TABLE 1.1. POPULATION OF THE LAGUNA LAKE REGION AND THE PHILIPPINES, 1960 AND 1970

Region	1960 (thousand)	1970 (thousand)	Growth Rate (percent)
Philippines	27,087	37,000	3.2
Laguna Lake Region	3,067	4,740	4.7
Manila	(1,139)	(1,323)	1.5
Rizal	(1,456)	(2,919)	6.9
Laguna	(472)	(698)	4.0

Source of Basic Data:

1960 and 1970 Censuses of Population, Bureau of the Census and Statistics, Manila

The improvement of the road and transport networks in the region brought closer to Manila most of the surrounding cities and municipalities in Rizal province. Hence, the movement of people and industries towards the suburbs of Manila.

As a direct consequence of the above trend, the population of Rizal province showed a very high annual growth rate of 6.2 percent during the decade which was more than doubled the 3.2 per cent growth rate of the country. The province of Laguna experienced also a relatively high growth rate of 4.0 percent. While the city of Manila showed a minimal increase of only 1.5 percent per year.

The rapid expansion of population has brought about an increasing pressure on the intensity of land-use in the region. It is in Manila that this increasing pressure is felt most. Table 2.2 shows that the land-man ratio in this city has gone down from 300 square meters in 1960 to 200 square meters in 1970. Further reduction of the land-man ratio, particularly in Rizal will definitely generate a more intensive land-use for both urban and food production purposes.

TABLE 1.2. LAND-USE

Region	Land-Man Ratio (Hectares/Person) 1960	1970
PHILIPPINES	1'.1	7.9
LAGUNA LAKE REGION	'.2	0.'
Manila	0.03	0.02
Rizal	1.3	0.9
Laguna	3.7	2.6

2. The Regional Economy: An Overview

2.1 Growth Performance, 1961-1965

Preliminary studies undertaken by the LLDA estimated that the regional income in 1961 was ₱7.00 billion or about 56 percent of the country's national income of ₱12.50 billion in that year (See Table 2.1). By 1965, regional income rose to ₱10.00 billion, while the national income, to ₱17.92 billion. Although the relative share of the regional income in the country's national income remained almost the same (viz., about 56 percent), its annual growth rate was 0.2 percent lower than the 9.5 percent registered by the national economy.

TABLE 2.1. REGIONAL AND NATIONAL DOMESTIC PRODUCT AT CURRENT PRICES, BY MAJOR INDUSTRY GROUP, 1961 AND 1965

Industry Groups	Value (million pesos) 1961	1965	Percentage Distribution 1961	1965	Annual Growth Rate (per cent)
PHILIPPINES	12,499	17,917	100.0	100.0	9.5
Agriculture 1/	4,052	5,964	32.6	34.1	10.1
Manufacturing	2,349	3,213	18.9	17.6	8.1
Services	6,047	8,740	48.5	48.3	9.6
LAGUNA LAKE REGION	7,003	10,007	100.0	100.0	9.3
Agriculture 1/	46	124	0.7	1.2	28.0
Manufacturing	1,849	2,797	26.4	28.0	10.9
Services	5,108	7,086	72.9	70.8	8.5

1/ Includes Fisheries, Forestry and Mining

Source of Basic Data:

1. National Income and Product Accounts of the Philippines, 1961 and 1965, National Economic Council, Manila
2. Unpublished case studies on the Region's economy, Laguna Lake Development Authority, Pasig, Rizal.

2.2 Potential for Future Growth and Expansion

Both the Agriculture and the Manufacturing sectors in the region registered relatively higher growth rates than that in the national economy. In fact the 2[illegible].0 per cent growth rate of the agriculture sector in the region was almost 3 times that of the country's 10.[illegible] per cent during the first half of the last decade (see Table 2.2). Even the growth rate of the manufacturing output in the region (10.9 per cent) was comparatively much higher than that for the country (7.1 per cent).

TABLE 2.[illegible]. RELATIVE SHARES OF THE LAGUNA LAKE REGION ON THE COUNTRY'S OUTPUT, BY INDUSTRY GROUP, 1961 AND 1965

Industry Group	1961	1965	Annual Growth Rate
AGRICULTURE:			
Philippines ('000 pesos)	4,053	5,964	10.1
Laguna Lake ('000 pesos)	46	124	28.0
Per Cent Share of Region	1.1	2.1	21.0[a/]
MANUFACTURING:			
Philippines ('000 pesos)	2,349	3,213	7.1
Laguna Lake ('000 pesos)	1,849	2,797	10.0
Per Cent Share of Region	78.7	87.1	2.6[a/]
SERVICES:			
Philippines ('000 pesos)	6,047	8,740	9.6
Laguna Lake ('000 pesos)	5,10[illegible]	7,036	8.5
Per Cent Share of Region	84.5	8[illegible].1	(1.0)[a/]

a/ Per cent change in the region relative share of the country's output of the industry group.

In 1961, almost three-fourths or 72.9 per cent of the regional income came from the Service Industries. By 1965, the relative contribution of the Service Industries was reduced to only 70.[illegible] per cent. For the national economy, the share of Services was a little less than one-half or around 4[illegible].5 per cent in 1961, and remained almost the same (i.e., 4[illegible].3 per cent) in 1965.

The region and the country are in contrast with each other with respect to the relative importance of Agriculture and Manufacturing to their respective economies. For the region, Manufacturing is second in importance to the Service Industries, while Agriculture occupies a very insignificant role. The trend, however, was for both Manufacturing and Agriculture to increase their respective relative contributions to the regional economy.

On the other hand, the share of Agriculture is higher than that of Manufacturing in the national economy. The share of Agriculture, however, increased from 32.6 per cent in 1961 to 34.1 per cent in 1965, while that of Manufacturing, declined from 19.9 per cent to 17.6 per cent during the same period.

The growth rates of Agriculture and Manufacturing in the region were significantly higher than that for the country. Agriculture in the region expanded by about 28.0 per cent per year which is almost three times the 10.1 per cent growth rate registered by the whole country. The 10.9 per cent growth rate of Manufacturing in the region is also much higher than the 9.1 per cent growth rate of the nation's Manufacturing sector.

The slightly lower economic growth of the region as compared to that of the whole country, may be attibuted to the much lower growth rate of the Services sector in the region. Also, the Agriculture sector, although having a very high growth rate, contributes only a very samll proportion to the region's economy.

As a result of the above mentioned growth trends, the region's relative share of the nation's output of both the Agriculture and the Manufacturing sectors tended to increase. It may be expected that both industry groups will continue maintaining their respective observed growth rates. Proximity to Metropolitan Manila provides the region with a very large consumer base--a ready market for its agricultural and industrial products.

Rizal province, particularly the cities and municipalities surrounding Manila, is absorbing the increase land requirements of the industries and the attendant requirements for residential and commercial sites of its people. Such progressive expansion in industrial, residential and commercial lands were made possible at the expense of the area devoted to agricultural production. Hence, the burden of food crop production for the region has been increasingly shifting to Laguna province.

The region taken as a whole is an importer of all food crops except coconut and sugar. And even with the last two crops, the increasing demand is fast catching up with supply. Hence, the productivity of existing agricultural lands need to be increased so that it can support more number of people in the region.

In the main, the backbone of the region's economy will continue to be the manufacturing industries. The expansion of the manufacturing industries coupled with the fact that Metropolitan Manila is the center of commerce and trade in the country, assures a corresponding increase in the activities of the Services Sector. Agriculture, in spite of its minor contribution to the region's economy, will continue to increase its relative contribution to total regional output by increasing the productivity of existing agricultural land and by putting into productive uses the vast tracts of uncultivated open areas such as the denuded forest at the foot of the Sierra Madre ranges. Reclaiming lands from the lake will also be another source of agricultural, as well as industrial lands, in the region.

3. The Regional Industrial Sector: Structure and Growth Trends

3.1 Introduction

Notwithstanding the industrial dispersal program of the national government, the rate of expansion of the manufacturing sector continues to be much faster than the rest of the country. Hence, the region's relative share of the country's manufacturing output continues to increase. This was so because the region possesses practically all the necessary ingredients for industrial growth, namely:

a. A rapidly expanding consumer based (brought about by an extraordinary rapid population growth rate resulting mainly from migration from the provinces);
b. Availability of technical, managerial and skilled manpower (Metropolitan Manila being the main seat of higher learning in the country);
c. Presence of well-developed support services (in the fields of power, transportation, communications and credit facilities); and
d. The development of Manila as a major port of entry (advantageous to manufacturing industries completely dependent in imports for their raw materials).

The improvement of the national roads and highways cutting through Laguna and Rizal brought closer to Metropolitan Manila vast tracts of land in the region. Hence, the expansion of the industrial sector tended to "spill" toward the outlying areas of Metropolitan Manila. Also, more and more people establishes their residence in the suburbs, thereby simply commuting daily to and from their respective offices. And consequently, commercial centers sprouted within such industrial and residential areas.

TABLE 3.1. NUMBER OF ESTABLISHMENTS AND GROSS RECEIPTS OF MANUFACTURING ESTABLISHMENTS BY SIZE PHILIPPINES AND LAGUNA LAKE REGION, 1961

Sizes of Establishment	PHILIPPINES Total	PHILIPPINES Percentage Distribution	LAGUNA LAKE REGION Total	LAGUNA LAKE REGION Percentage Distribution	LAGUNA LAKE REGION Per Cent of Country Total
Number of Establishment					
All Sizes	37,369	100.0	11,542	100.0	30.9
Large Establishment	4,095	10.9	2,484	21.5	60.7
Small Establishment	33,274	89.1	9,058	78.5	27.2
Gross Receipts (Million pesos)					
All Sizes	4,852	100.0	2,913	100.0	60.0
Large Establishment	4,519	93.1	2,780	95.4	61.5
Small Establishment	332	6.9	133	4.6	40.0

Source of Basic Data:

1961 Census of Manufacturing Establishments
Bureau of the Census and Statistics
Manila

3.2 Growth Trends

In 19[illegible], there were [illegible],542 manufacturing establishments located in the region, registering gross receipts of $2.91 billion (see Table 3.1). Although the number of establishments in the region represented only about 30.9 per cent of the country's total of 37,36[illegible] establishments, their overall contribution to the total manufacturing output amounted to 60.0 per cent. Such a situation was brought about by the fact that majority of the large establishments (or around 60.[illegible] per cent of the country's total) were in the region.

For both country and the region, the contribution to total manufacturing output of small establishments were relatively insignificant as compared to that of large establishments. During the same year, the relative contribution of large manufacturing establishments to total output were 93.1 per cent for the country and 95.4 per cent for the region.

Of the total output of large manufacturing establishments in the country valued at $4.52 billion in 1961, almost two-thirds or $2.7[illegible] billion came from the region (see Table 3.2). By 1966, the region's manufacturing output (for large establishments) rose to $5.02 billion or about 63.6 per cent of the nation's total. This increased share was brought about by faster growth rate in the region, 1[illegible].5 per cent compared to [illegible]0.5 per cent in the rest of the country.

TABLE 3.2. DISTRIBUTION AND ANNUAL GROWTH RATES OF OUTPUT (GROSS RECEIPTS) OF LARGE MANUFACTURING ESTABLISHMENTS, LAGUNA LAKE REGION AND THE PHILIPPINES, 1961-1966

	VALUE (Million Pesos)		PERCENTAGE DISTRIBUTION		ANNUAL GROWTH RATE 1/ (Per Cent)
	1961	1966	1961	1966	
PHILIPPINES (Total)	4,519.2	7,893.7	100.0	100.0	11.8
Laguna Lake Region	2,780.3	5,023.6	61.5	63.6	12.5
Rest of the Country	1,738.9	2,870.1	38.5	36.4	10.5

1/ Compound growth rates

Source of Basic Data:

Same as in Table 4.1

The expansion of manufacturing industries has started to spill towards the outer fringes of Metropolitan Manila. This is shown by the increasing share of Rizal, from 1961 to 1966, of 19.7 per cent to 25.2 per cent, evidently due to the rapid growth rate of about 18.3 per cent per year (see Table 3.3). Although maintaining a constant proportion of the region's output, Laguna was also receiving the "spill" by exhibiting an annual growth rate higher than that of Metropolitan Manila (i.e., 14.0 per cent at against 12.5 per cent).

TABLE 3.3. DISTRIBUTION AND ANNUAL GROWTH RATES OF OUTPUT OF LARGE MANUFACTURING ESTABLISHMENTS, BY MAJOR AREAS, LAGUNA LAKE REGION, 1961-1966

	VALUE (Million Pesos)		PERCENTAGE DISTRIBUTION		ANNUAL GROWTH RATE 1/
	1961	1966	1961	1966	(Per Cent)
GROSS RECEIPTS -					
LAGUNA LAKE REGION	2,770.3	5,023.6	100.0	100.0	12.5
Metropolitan Manila 2/	2,171.0	3,635.6	78.3	72.4	10.9
Rest of Rizal 3/	546.9	1,267.9	19.7	25.2	18.3
Laguna	62.4	120.1	2.2	2.4	14.0

1/ Compound growth rate

2/ Manila, including the cities of Pasay, Caloocan and Quezon and the municipalities of Makati, Mandaluyong, Parañaque and San Juan.

3/ The province of Rizal excluding the cities and municipalities forming part of Metropolitan Manila

3.3 Structure of Industry

Within the first half of the previous decade, a "mild" shifting in the structural make-up of the manufacturing industries could be observed, to wit:

	OUTPUT DISTRIBUTION	
	1961	1966
	(In Per Cent)	
Heavy Industries	41.8	47.9
Light Industries	58.2	52.1
ALL INDUSTRIES	100.0	100.0

The relative contribution of the so-called "Heavy" Industries increased from 41.8 per cent in 1961 to 47.9 per cent in 1966. As a consequence, the contribution of the "Light" Industries decreased from 58.2 per cent in 1961 to 52.1 per cent in 1966.

When the manufacturing industries were classified according to the intended uses of their respective outputs, the following distributions were observed:

	OUTPUT DISTRIBUTION	
	1961	1966
	(In Per Cent)	
Final Use	46.1	45.6
Intermediate Use	53.9	54.4
ALL USES	100.0	100.0

INVENTORY OF ELECTRIC POWER, WATER SUPPLY AND HIGHWAYS IN THE VICINITY OF THE INDUSTRIAL ESTATE PROJECT AREA.

INTRODUCTION:

The surveys were conducted on August 17, 1971 and September --, 1971. The data are divided into three (3) parts:

I. Electric Power

II. Water Supplies

III. Highways and Roads

The areas concerned are the vicinity of San Pedro, Laguna and Muntinglupa, Rizal.

Data on Electric Power were furnished by the Supervisors of the Power Production Department of the Gradner/Snyder Station in Sucat, Muntinglupa, Rizal except for datas on service rates and conditions for power connection which were furnished by the Commercial Department of the Manila Electric Company at Ortigas Avenue, Pasig, Rizal.

Water supply in the vicinity of the project area (i.e. San Pedro, Laguna and Muntinglupa, Rizal) is not being covered by the NAWASA serving the Greater Manila Area. San Pedro, based on the survey taken, has its own water system serving the whole town proper and five (5) barrios. All sources of water for domestic use as well as for factories come from artesian wells and deep wells. The water system of San Pedro is owned

by the NAWASA. The sufficiency of capacity to the present demand in the town of San Pedro is questionable, although the caretaker intervied said it is sufficient, because in interviwing some household owner in the town proper, they said that the water flow in their faucet is merely a drop especially during the rush hours.

The town of Muntinglupa has no central type of water system. From the survey taken, artesian wells are use by the populace for domestic use and few subdivisions and factories are using deepwells. There are more factories and industries in the vicinity which are not surveyed as to their water supply, but it is assumed that the data obtained can give a good perspective of the underground water source.

Data on highways and roads were obtained from the Planning and Programming Division, and Designing Division of the Bureau of Public Highways main office. There are only tow (2) main route to reach the project area starting from Manila. The first route to reach is the old provincial road stretching from Pateros, Taguig, and Muntinglupa and the other is the National Road leading to the Manila South Expressway.

1. ELECTRIC POWER

1. Nearest Power Plant(s)

Name - Gardner/Snyder Station

Owner - Manila Electric Company

Location - Bo. Sucat, Muntinglupa, Rizal

Year Completed - August 1966 (Gardner 1)
December 1969 (Gardner 2)
January 1971 (Snyder 1)

Present KVA Capacity - 637 MVA

Proposed KVA Capacity - 970 MVA

Type of Plant - Thermal Fossil Fueled Fire Power Plant

Transmission Voltage - 34.5 KV and 115 KV

Method of Transmission - Overhead or underground
(depends on the nature of the power
to be connected)

Destination(s) or Market(s) of Power

LUZON POWER GRID

2. Nearest SErvice Line(s)

Location(s)	Service Voltage	Distance to Site
Approximately 500 m. West of National road	115 KV	Approximately 1300 meters

Method(s) of Transmission - Overhead

Local Franchise Holder - MERALCO

Name
Business Address
Jurisdiction

Service Time for Power (if not 24 hours)

3. Service Rates and Conditions

Power Rates:

Power rates were supplied by the Commercial Department of the Manila Electric Company at Ortigas Avenue in mimeograph form. (Appendix).

Conditions for Power Connections:

Some conditions for power connections are the following:

1) Submission of electrical inspection
2) Seposit (based on estimated monthly revenue)
3) Contract (long term contract with Meralco)
4) Posting of bond.

II. WATER SUPPLY

A. San Pedro, Laguna:

1. Present Water System -

Type of System - Deepwell (San Pedro Waterwork System)
Year Completed - 1960
Distribution Capacity - (15,000 gal. tank)
Treatment Capacity - none
Source of Water - Underground
Method of Distribution - 20 hours pumping service and 4 hours rest.

Service Area

Places	Population
San Pedro Town Proper	356 households
Five barrios	

Treatment Facilities - None

Service Rates

First 10 cubic meters -------₱4.50
For the next cubic meters --- 0.25

Expansion Program

Proposed additional capacity - one more deepwell

Target year - 1971 or after the Nawasa transfer the Authority of the Waterworks to the Municipal Government.

Sufficiency of capacity to demand (present):

- Yield is insufficient to the present demand.

2. Existing Underground Water System

Location - Rizal St., San Pedro, Laguna
Owner - NAWASA
Year Installed - 1961
Pumping Test Capacity - 125 gpm
Capacity - (9 p.m.) 125 gpm
Water Level - 400 ft. during summer
300 ft. during rainy season
Type of Pump and power used - 75 h.p. Electric Motor
Depth of Well - 550 feet
General Quality of Water - Potable
Sufficiency of Supply - Capacity is insufficient because of the low yield of the deepwell.
Uses of Water - Domestic Use

B. Muntinglupa, Rizal

Factories and Industries

1. Existing Underground Water System

Location - Alabang, Muntinglupa, Rizal
Owner - Nutritional Products Inc., and United Milk Products Incorporated
Year Installed - 1) 1953, 2) 1955 and 3) 1969
Pumping Test Capacity - 450 gpm for all wells
Capacity (Present) - 450 gpm for all wells
Water Level - 50 feet
Type of Pump and Power Used - Electric Motor
1) 40 h.p. 2) 40 h.p. 3) 50 h.p.
One (1) submersible and two (2) turbine with motor on ground level.

Depth of Well - 1) 1,000 ft. 2) 1,000 ft. 3) 1,000 ft.
General Quality of Water - Potable
Sufficiency of Supply - Sufficient
Uses of Water - Production of Instant Coffee, Evaporated and Condensed Milk and also for drinking.

2. Existing Underground System

Location - Sucat, Muntinglupa, Rizal
Owner - International Textile Mills Inc.
Year Installed - 1) 19 ? 2) 195? 3) 1960
4) 1967 5) 1971
Pumping Test Capacity (gpm) 1) 80-90 2) _____,
3) 40-60 4) 250 5) 1 0
Present Capacity (gpm) - approximate capacity of the four (4) combined deepwell excluding deepwell No. 2 is 20,000 to 25,000 gph or approximately 417 gpm.
Depth of well - 1, 2, and 3 are 900 feet, 4) 1,125 ft.
5) 600 feet
General Quality of Water - Potable
Sufficiency of Supply - Sufficient
Uses of Water - Industrial and Domestic

3. Existing Underground of Water Systems:

Location - Sucat, Muntinglupa, Rizal
Owner - Philippine Carpet Manufacturing Corporation
Year Installed - 1965
Pumping Test Capacity (gpm) - 1 0
Present Capacity (gpm) - 200
Type of Pump and power Used - 25 h.p. turbine pump
Depth of Well - 700 feet
General Quality of Water - Potable
Sufficiency of Supply - Sufficient
Uses of Water - General Use and Dyeing

III. HIGHWAYS AND ROADS

A. Taguig (KM 19+ 750) to Alabang (KM 30 + 923)

1. Classification - Provincial Road
2. General Usage - mixed traffic, both ways, ranging from horse drawn, motorized pedicabs, jeepneys, busses, passenger cars, trucks.
3. Description:

   Right of way width(s) -

   Roadway: width(s) - 5.00 meters

   Pavement type(s) - Asphalt

   Pavement condition - well paved and well maintained

   No. of traffic lanes - two (2)

   Shoulders: width(s) - varies from 1 to 3 meters

   type(s) - selected borrow or gravel

   Auxillary structures:

   Stations: 19-21 RCPG (Taguig)
   21-30 R.C.S.I. (Hagunoy)
   23-09 C.Pp. (Hagunoy)
   23-49 C.Pp. (Hagunoy)
   23-75 R.C.S.I. Cul. (Bicutan)
   26-69 RCPG (Bagumbayan)

4. Other Auxillary Structures or Facilities

   Traffic Signals - none

   Traffic Interchange (if any) or crossing- numerous barrios and provincial road crossings, no grade separation.

5. Year Completed -
6. Road Terminal Situation Assessment:

   Taguig terminus passes through business area of town and subject to traffic congestion during usual rush hours. Alabang terminus connects to the South Super Highway junction through a five meter wide municipal road (asphalted) but traffic condition is light.

B. Alabang (KM 30 + 920) to Rizal-Laguna Boundary (KM 35 + 500)

1. Classification - Provincial Road
2. General Usage - Mixed traffic, both ways, ranging from horse drawn, motorized pedicabs, jeepneys, busses, passenger cars, trucks.
3. Description:
   Right of way width(s) -
   Roadway: width(s) - 5 meters
   Pavement type - Pre-mixed intermediate type (asphalt)
   Pavement condition - well paved and well maintained
   No. of traffic lanes - 2 lanes
   Shoulders: width(s) - 1.20 meters
   type(s) - selected borrow or gravel
   Auxillary structures - various drainage culvers and small bridges.
4. Other auxillary structures or facilities
   Traffic signals - none
5. Year Completed -
6. Road Terminal Situation Assessment:
   Continuation of provincial road from Taguig and Alabang terminus.
   The Rizal-Laguna boundary terminus is of light traffic condition and connects farther south to Laguna along the shore for limited use only. Travelling speeds at this road is very limited.

C. Junction Alabang Cerum and Vac. Lab. Rd. (KM 24 +740) to Rizal-Laguna Boundary (KM 30 + 500)

1. Classification - National Road
2. General Usage - mixed traffic, both ways

3. Description:

Right of way width(s) -

Roadway : width(s) - 6[illegible] meters

Pavement type (s) - First class concrete surface

Pavement condition - well paved and well maintained

No. of traffic lanes - 2 lanes

Shoulders: width - 3.0 m.

type(s) - selected borrow or gravel

4. Other Auxillary Structures or Facilities

Traffic Signal - One at Muntinglupa town proper (policemanned)

Traffic Interchange (if any) or crossings - crosses many municipal roads particularly at town proper of Muntinglupa.

5. Year Completed -

6. Road Terminal Situation Assessment:

North terminus is the southern end of the South Super Highway with channelized traffic lanes and also connects with provincial road to Taguig and another national road to Zapote and Parañaque. Traffic congestion at this junction is nil. Southern terminus is the continuation of the national road to Laguna and Batangas.

D. E. delos Santos Junction (Jct. [illegible].97) to (KM 9 + 095.00) - (South Super Highway non-toll portion)

1. Classification - National Road
2. General Usage - Both ways, mixed traffic with a vertical allowance of 15 feet.
3. Description:

Right-of-way width(s) - 40.00 meters
Roadway - 14 meters and island ranging from
1 to 4 meters
Pavement type - First class concrete surface (0.20 M (8") portland cement, concrete pavement
(0.10 M (4") crushed gravel)
(0.20 M (8") selected borrow)
No. of traffic lanes - 6 lanes
Shoulders : width(s) - 3 meters
type(s) -selected borrow

4. Other Auxillary Structures or Facilities
Traffic Signals - one at the E. delos Santos Junction automatic
Traffic Interchange - Nichols or Sales Overpass (Diamond type, separate grade)
5. Year Completed -
6. Road Terminal Situation Assessment - The northern and terminus (i.e. E. delos Santos Junction) is often congested due to heavy traffic passing the E. delos Santos Highway. The southern terminus is the start o the Manila South Expressway and the traffic congestion is nil due to wide roadway and also to the presence of a service roads (west and east service roads) outside the expressway.

. KM + 095.00 to KM 23 + 120.00 (Manila South Expressway)
(Alabang Junction)

1. Classification - National Road
2. General Usage - Expressway and mixed traffic with a vertical allowance of 14 feet. Cargo

trucks esp ally those carrying snads
and gravel e required to cover their
cargo with nvass.

3. Description -

Right of way width(50 meters (including
west and service roads)
Roadway: width(14.00 meters and is
land rang from 1 to 4 meters.
Pavement type rst class concrete sur-
face
(0.20 M (Portland cement)
(0.16 M (crushed gravel)
(0.20 M (selected borrow)

Side Structures:

Kamalig Bridge 5.74 meters
Pasong Diablo dge - 23.400 meters
Pasong Pare B ge - 30.445 meters
6 Feet Fence

4. Other Auxillary Structure r Facilities

Traffic Signals - T gates at entrance and end
Traffic Interchange any) or crossing

Name of Cross reet	Type of Interchange
Sukat Interch	Grade Separation
Bikutan Interc ge	Grade Separation

5. Year Completed -

6. Road Terminal Situation / essment -

The north termi s which is the start of the Expressway is oll highway. Traffic congestion is nil d to wide roadway and also the presence of service roads, (west and east service ro e). A fence is provided between the exp essway and the service roads. The southern terminus is the end of the South Super Highway at Alabang, Muntinglupa,

Rizal, with channelized traffic lands and wide roadways. Traffic congestion at this junction is nil. The continuation of this road is the National Highway to the Province of Laguna and Batangas.

GENERAL POWER

AVAILABILITY:
Available in the territory served by the Company. Manila

APPLICABLE:
To customers who guarantee a billing demand of not less than 40 kilowatts for general power, heating, and/or lighting.

CHARACTER OF SERVICE:
Alternating current, 60 cycles, phase and voltage as available and appropriate.

RATE: (Per Month)

DEMAND CHARGE:
For each kilowatt of billing demand - ₱5.50 per kilowatt

PLUS ENERGY CHARGE:

First 200 hours use of billing demand at	₱0.065 per KWH
Next 200 hours use of billing demand at	0.060 per KWH
Next 100 hours use of billing demand at	0.045 per KWH
Next 100 hours use of billing demand at	0.035 per KWH
Excess KWH at	0.030 per KWH

MINIMUM CHARGE:
The demand charge but not less than ₱400.00 per month

BILLING DEMAND:
The billing demand shall be determined by measurement and considered as the highest average rate at which energy is consumed during any 15 consecutive minutes of the monthly period for which bill is rendered, and shall not be less than 40 kilowatts.

POWER FACTOR ADJUSTMENT:
The rates set forth above are based upon an average monthly power factor of 85% which the customer agrees to maintain. Should the customers average monthly power factor be less

or more than 85%, the kilowatthours metered during the monthly period shall, for billing purposes, be multiplied by the following constants:

POWER FACTOR ADJUSTMENT:

Average Monthly Power Factor	Constant
1.00	0.951
.95	0.965
.90	0.981
.85	1.000
.80	1.023
.75	1.050
.70	1.0835
.65	1.1255
.60	1.1785
.55	1.2455
.50	1.3335

For average monthly power factor between any two steps shown above, use the constant corresponding to the higher power factor.

PRIMARY METERING DISCOUNT:

A 5% discount on the combined demand and energy charge will be allowed when the customer owns the substation and energy is measured at or equivalently measured by compensation to the voltage level of the supply side of the substation.

BULK SALES DISCOUNT:

For each full hour in excess of 200 hours per month use of billing demand, the following discount on the combined demand and energy charge will be allowed when the billing demand exceeds 200 KW per month.

a) For number of hours exceeding 200 but not over 400 -

Discount (%) = (.06%) x (Hours - 200)

x (1 - $\frac{200}{\text{Demand}}$)

b) For number of hours exceeding 400 -

Discount (%) = 12% + (.025%) (Hours - 400

x 1 - $\frac{200}{\text{Demand}}$)

Where hours = meteres monthly KWH ÷ billing demand.

TERM OF CONTACT:

Not less than one year, automatically renewing.

MANILA ELECTRIC COMPANY

Approved by P.S.C.

Case No. 70-2066

Effective May 21, 1970

CURRENCY EXCHANGE RATE ADJUSTMENT

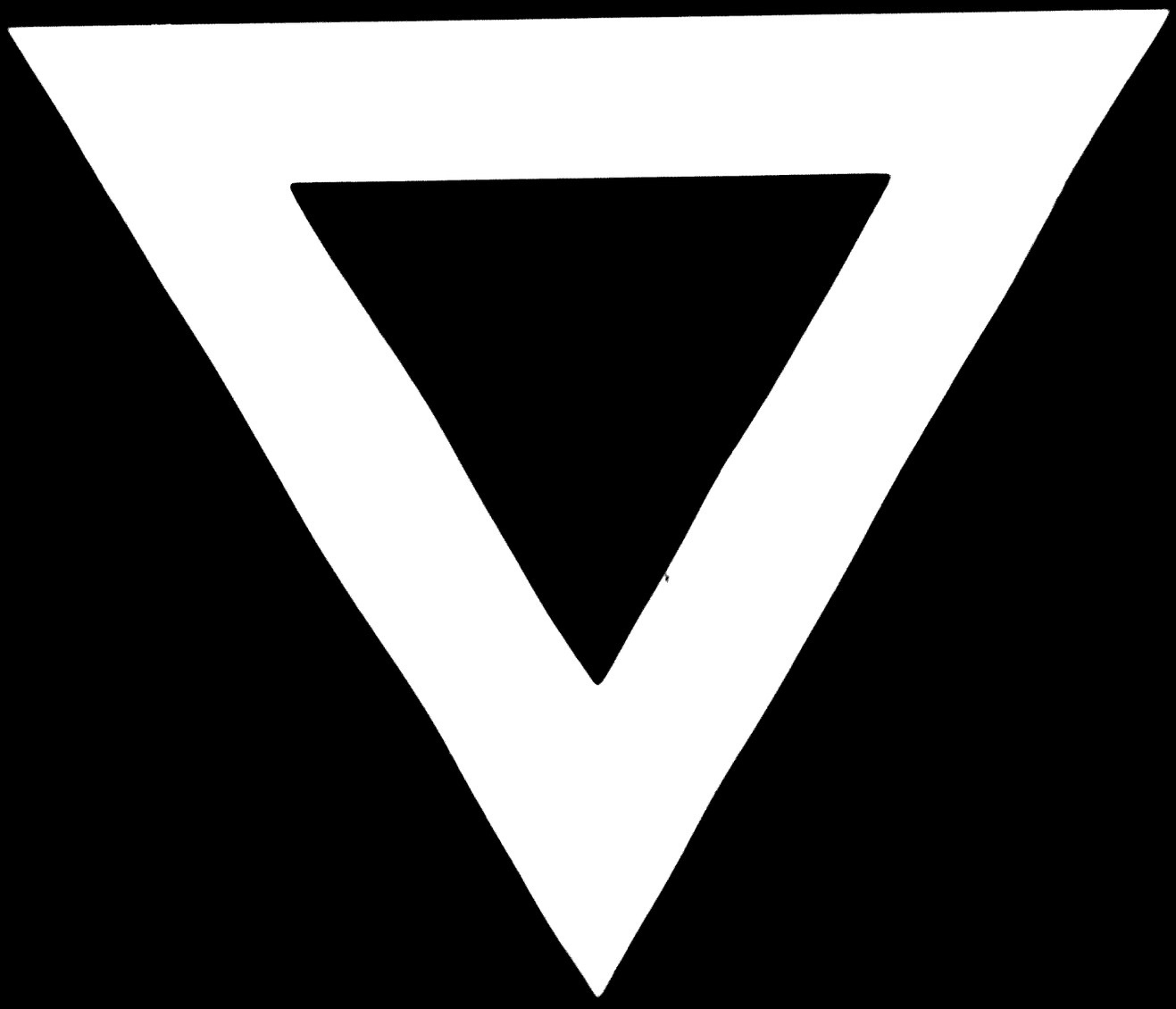
When the average of the daily U.S. dollar selling rate of the Philippine National Bank during a calendar quarter is less or more than 6.00 pesos to one (1) U.S. Dollar, a corresponding adjustment shall be made on all billings for the succeeding calendar quarter as computed under the Residential Meter (RM-5A), the General Service (GS-4) and the General Power (GP-4) rate schedules. Such adjustment shall be a reduction or an increase at the rate of 3.0 percent for each full 0.30 peso decrease below or increase above 6.00 pesos to one (1) U.S. dollar of the above-mentioned average of the daily selling rate of the U.S. dollar.

Residential and Commercial customers consuming up to but not more than 120 kilowatthours and 90 kilowatt hours, respectively, who do not receive any rate increase under the revised rates shall also receive the benefit of a downward adjustment in their rates should the exchange rate go down below ₱6.00 as specified above but shall, however, be exempted from any upward adjustment should the exchange rate go above ₱6.00 to U.S. $1.00.

MANILA ELECTRIC COMPANY

Approved by P.S.C. Case No. 70-2966

C-614



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