CHAPTER 14
FEASIBILITY STUDY OF R-4 BYPASS

14.1 Objectives of the Project

Iloilo-Roxas Road is congested in the sections of Iloilo City, Leganes town proper and Zarraga town proper. The project is to construct a new road which bypasses traffic congested sections of Iloilo-Roxas Road. The objectives of the Project are as follows:

Objectives of the Project

- To reduce traffic congestion of Iloilo-Roxas Road in the sections of Iloilo City and Leganes/Zarraga town proper.
- To form flexible road network which provides alternative routes to road users.
- To contribute to the economic development of the Study Area as well as its hinterland.

14.2 Physical Features of the Project Site

The terrain of the project site is flat with the ground elevation ranging from 4m to 15m from the mean sea level. Small and medium scale rivers cross the project site. The Zarraga section is located at low land and subjected to flood almost every year.

The geological condition is not so favorable for road construction. Soft layer with N-value of 1 to 4 continues to the depth of 10 to 15m from the ground.

The project site is predominantly irrigated rice field. There are scattered small residential areas.

14.3 Engineering Surveys Conducted

The following three surveys were undertaken.

- Aerial Photography and Orthophoto Mapping
- Road Alignment Survey
- Geo-technical survey and Soils/Material Sources Survey

1) Aerial Photography and Orthophoto Mapping

Aerial photography	:	Photo scale = 1/15,000 Coverage = 2km width along the route
Orthophoto mapping	:	Scale = 1/5,000

2) Road Alignment Survey

- Control points survey
- Center line surey (50m interval)
- Profile survey (50m interval)
- Cross-section survey (50m interval, width=60m)

- River profile / cross section survey (large rives only)

3) *Geo-technical survey and soils/material source survey*

- Bridge site geo-technical survey (depth = 30~50m)
- Soils / material sources survey (3 locations)

14.4 Selection of Route Alignment

Future urbanization is planned up to about 1 km west of the existing Iloilo-Roxas Road. In order to maintain high mobility of this bypass road, its alignment was planned to be selected at outside of planned urban area. The alignment of the bypass road was planned at about 1.5 km west of the existing Iloilo-Roxas Road.

The bypass road starts from the proposed Circumferential Road No. 1 and ends at about 1.5 km north of Zarraga town proper where it merges with the existing Iloilo-Roxas Road.

There is no major control points for route alignment selection except the following:

- Not to affect scattered residential area as much as possible.
- To minimize river crossing as much as possible.
- To cross intersecting roads and rivers at right angle as much as possible.
- To avoid swampy area located at about 1.7km West of Zarraga Town Proper.

Based on above considerations, three alternatives were established as shown in Figure 14.4-1.

Alternatives		Main Objective
Alternative – 1	:	To minimize dislocation of houses and cross intersecting roads and rivers at almost right angle.
Alternative – 2	:	To select away from swampy area.
Alternative - 3	:	To attain smooth horizontal alignment or almost straight alignment.

All alternatives have practically no big difference and achieves project's objectives, therefore, these were compared by financial and social aspects as shown in Table 14.4-1.

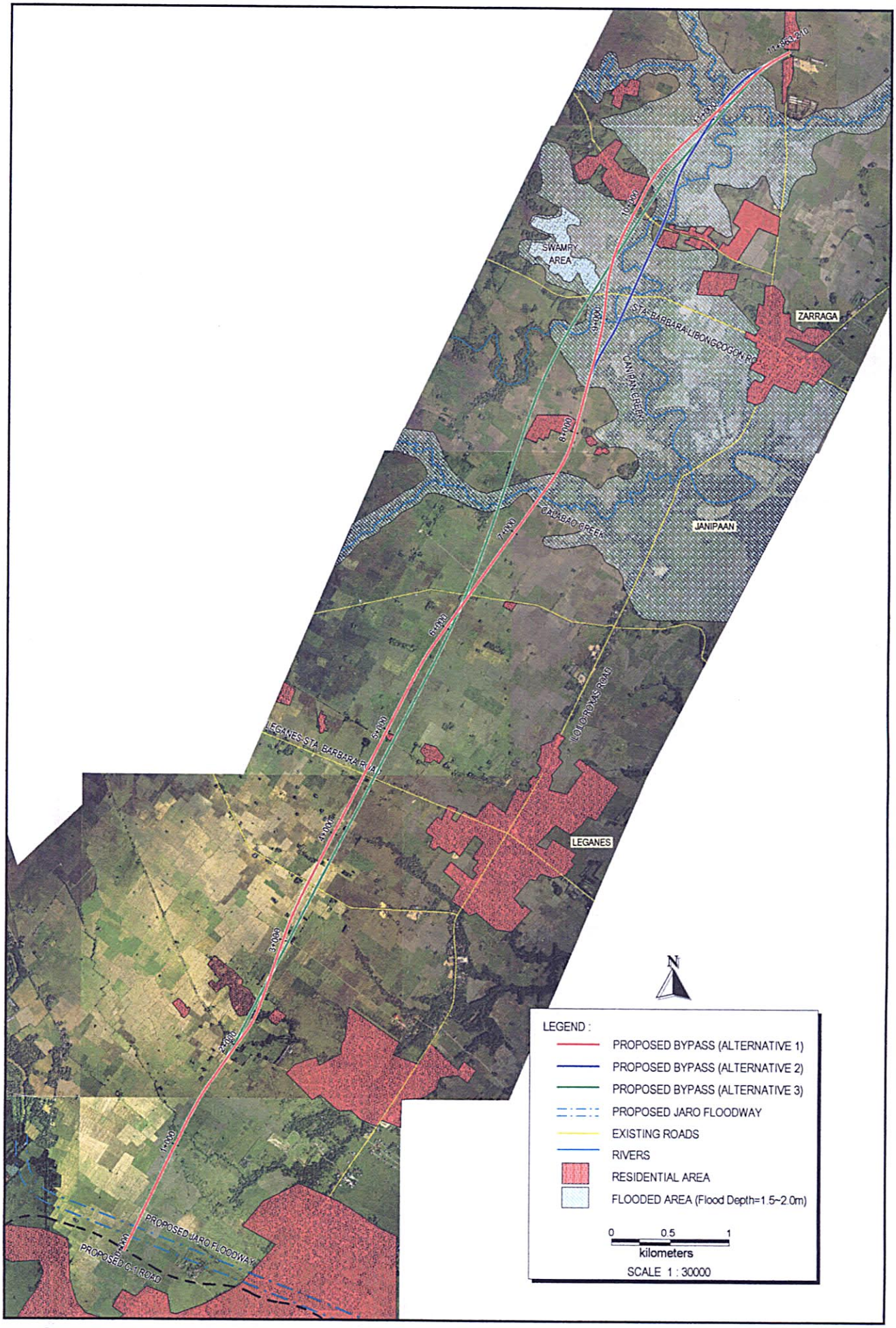


FIGURE 14.4-1 : R-4 BYPASS ALTERNATIVE ALIGNMENTS

TABLE 14.4-1 EVALUATION OF ALTERNATIVES

	Alternative-1	Alternative-2	Alternative-3
Scope of Civil Work			
• Road Length (km)	11.67	11.55	11.43
• Bridge Length (km) and number of bridge	0.19 (n=3)	0.25 (n=6)	0.19 (n=3)
• Total Length (km)	**11.86**	**11.80**	**11.62**
Construction Cost (Million Pesos)			
Road	334.7	331.2	345.8
Bridge	85.5	112.5	85.5
Total	420.2	443.7	431.3
	(1.00)	(1.06)	(1.03)
No. of Houses Affected	**6**	**9**	**43**

In view of lowest construction cost and least number of affected houses, Alternative-1 was selected for the alignment of R-4 Bypass.

14.5 TRAFFIC FORECAST

Traffic forecast result is shown in Table 14.5-1. Number of lanes required is shown in Figure 14.5-1.

In the Master Plan, it is scheduled to be completed by the end of year 2015, as this bypass is planned to be connected with Circumferential Road No. 1 (C-1) of which completion is expected to be in year 2012.

In year 2022, this bypass attracts about 19,300 pcu/day and about 25,300 pcu/day will remain on the existing Iloilo-Roxas Road in Section-1. Section-1 attracts the highest traffic volume and a 2-lane road can accommodate estimated traffic volume. Traffic volume on Section-1 slightly reduced from year 2016 to year 2022, this is because some traffic will be diverted to Circumferential Road No. 2 (C-2) which is scheduled to be completed by the end of year 2018.

As shown in Table 14.5-1, when this bypass is completed, major traffic is diverted from the existing Iloilo-Roxas Road to this bypass, traffic congestion problem of the exiting Iloilo-Roxas Road will be relieved.

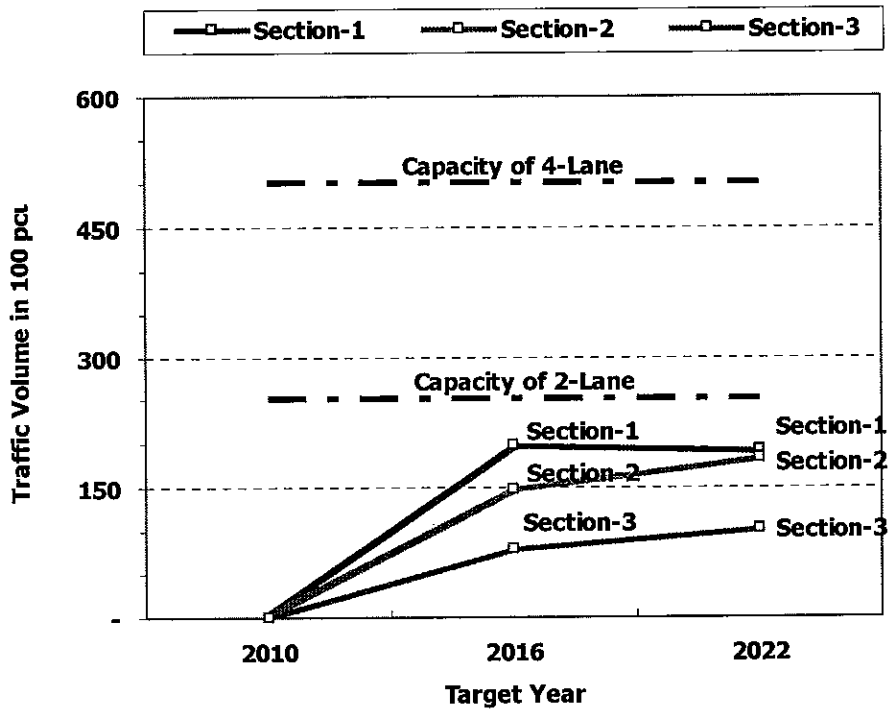


FIGURE 14.5-1 NUMBER OF LANES REQUIRED

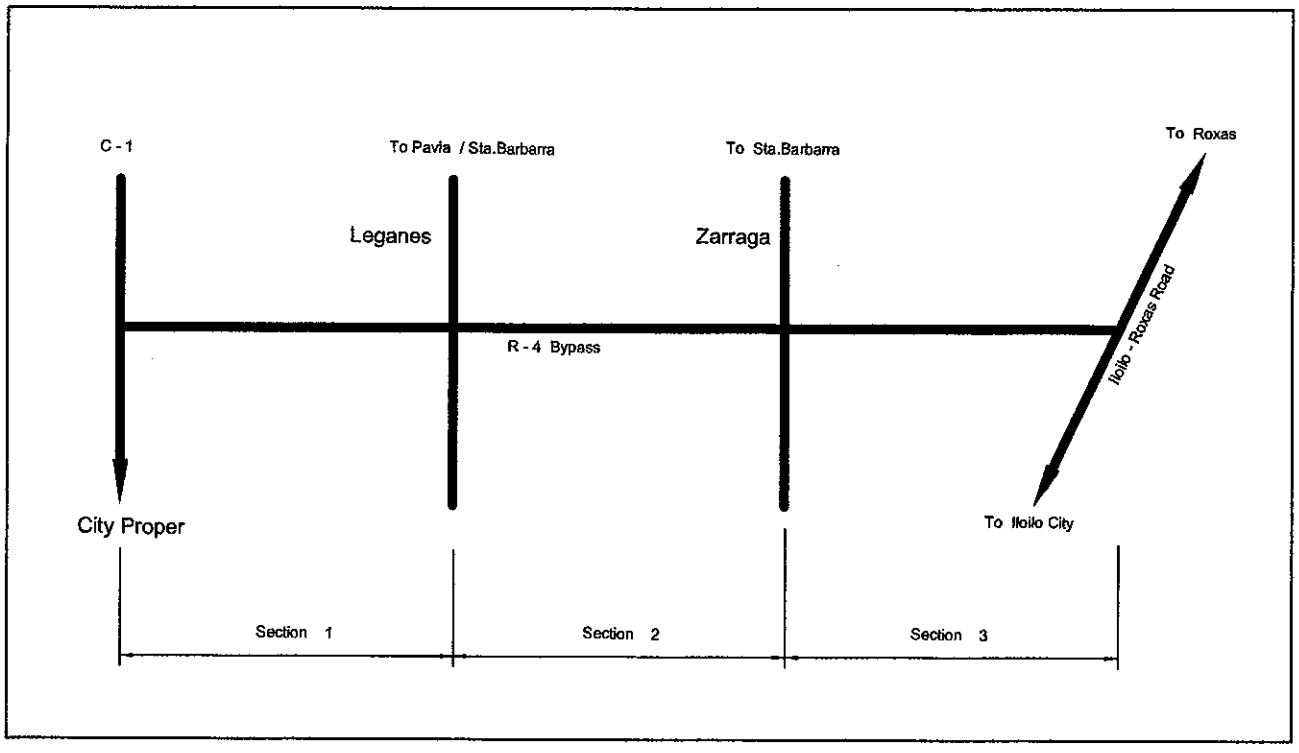


Table 14.5-1 Estimated Traffic Volume and Volume/Capacity Ratio

Conditions & Section			Section-1		Section-2		Section-3	
			B-2	R-4	B-2	R-4	B-2	R-4
Traffic Volume in 100 pcu	2010		-	*219*	-	*143*	-	*48*
	2016		**199**	*196*	**149**	*101*	**79**	*17*
	2022		**193**	*253*	**183**	*162*	**103**	*15*
Volume / Capacity Ratio (V/C)	2-lane	2010	-	*0.88*	-	*0.57*	-	*0.19*
		2016	**0.80**	*0.78*	**0.60**	*0.40*	**0.32**	*0.07*
		2022	**0.77**	*1.01*	**0.73**	*0.65*	**0.41**	*0.06*
	4-lane	2010	-	*0.44*	-	*0.29*	-	*0.10*
		2016	**0.40**	*0.39*	**0.30**	*0.20*	**0.16**	*0.03*
		2022	**0.39**	*0.51*	**0.37**	*0.32*	**0.21**	*0.03*

14.6 Construction Phasing

Once this project is completed as a 2-lane road, it will accommodate future traffic demand beyond 2022. Therefore, a 2-lane bypass road should be implemented at one time.

14.7 Preliminary Design

14.7.1 Design Concepts and Criteria

1) Design Concepts

The road functions as a bypass road of existing Iloilo-Roxas Road. To attract traffic from the existing road, this road needs to be designed with priority on mobility.

The design concepts were established as follows:

Design Concept

- Design speed of 80 km/hour is selected to achieve mobility oriented design.
- Intersections are so designed to accommodate left-turn lanes.
- Countermeasures against soft ground is properly selected.
- For flood sections, embankment elevation is properly selected and proper bridge / culvert openings are planned.
- Existing irrigation system is maintained.

2) Road and Intersection Design Criteria

Highway design criteria and intersection design criteria are shown in Table 14.7-1 and Table 14.7-2, respectively.

Typical cross-sections are shown in Figure 14.7-1.

3) Bridge and Structures

The same criteria as shown in 3) of Section 12.7.1 were adopted.

4) Drainage and Cross Drainage Facilities

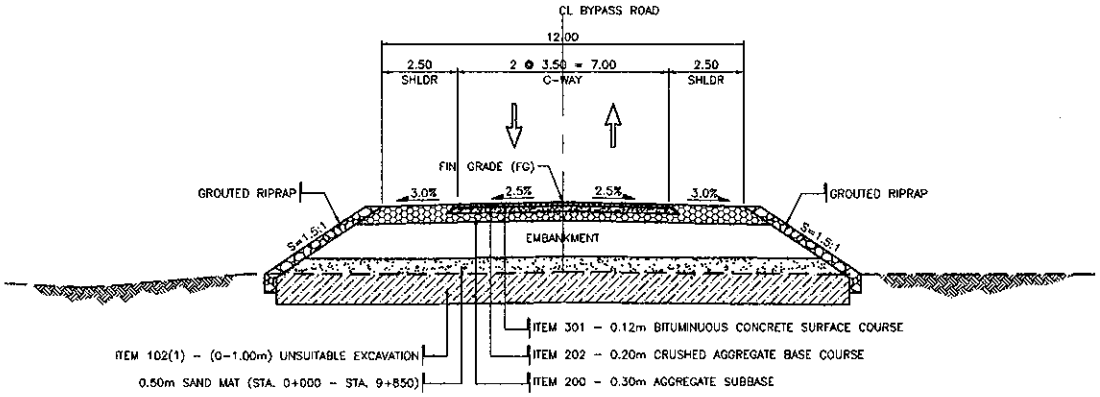
The same criteria as shown in 4) of Section 12.7.1 were adopted.

TABLE 14.7-1 HIGHWAY DESIGN CRITERIA
- Iloilo-R-4 Bypass -

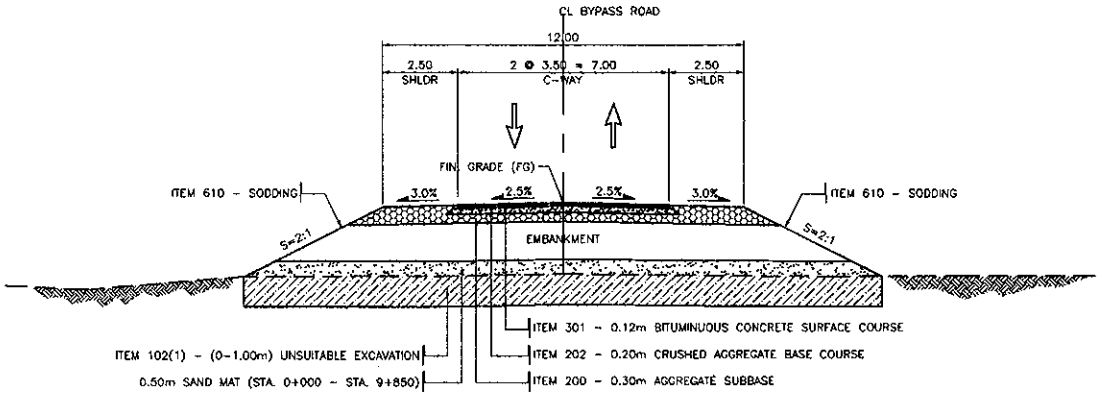
Classification	Unit	Flat Terrain
Design Speed	Km/h	80
Number of Lane		2
Type of Pavement		AC
Lane Width	m	3.50
Shoulder Width	m	2.5
Median	m	-
Stopping Sight Distance	m	110
Passing Sight Distance	m	560
Minimum Radius	m	230
Minimum Radius for Normal Cross Slope	m	2500
Maximum Grade	%	4
Minimum Length of Vertical Curve	m	60
Minimum "K" for Crest		30
Minimum "K" for Sag		24
Maximum Superelevation	%	6
Normal Cross Slope	%	2.5
Vertical Clearance	m	4.3

TABLE 14.7-2 INTERSECTION DESIGN CRITERIA

Classification	Unit	Intersection	
		Signal Control	
		Urban	Rural
Design Speed	Km/h	40	60
Sight Distance	m	100	240
Minimum Radius	m	60	150
Maximum Grade	%	2.5	
Width of Left Turn Lane	m	3.0 ~ 3.5	
Length of Teper	m	50 ~ 100	
Length of Storage Lane	m	30 ~ 50	
Minimum Radius Curve	m	12	15
Width of Pedestrian Crossing	m	3	



NORMAL SECTION WITH RIPRAP



NORMAL SECTION

FIGURE 14.7-1

TYPICAL CROSS-SECTION
ILOILO R-4 BYPASS ROAD

14.7.2 Road and Intersection Design

1) Horizontal Alignment

Horizontal alignment was designed to satisfy the design speed of 80 km/hour. Horizontal alignment is shown in Figure 14.7-2. Among various horizontal curves, minimum one is 1,000m in radius with super elevation of 3%.

2) Vertical Alignment

Control points for vertical alignment design were as follows:

- Elevation of existing intersecting road
- Proposed bridge elevation
- Minimum depth of 0.6m from road surface to the top of pipe culvert to avoid reinforcement of pipe culvert.
- For flood section, bottom of subbase course is higher by 30cm from high water level at 10 year return period to protect pavement structure.

3) Intersection

All major intersections were provided with left turn lane. Major intersections are as follows:

- Intersection with C-1
- Intersection with Iloilo – Roxas Road (see Figure 14.7-3)

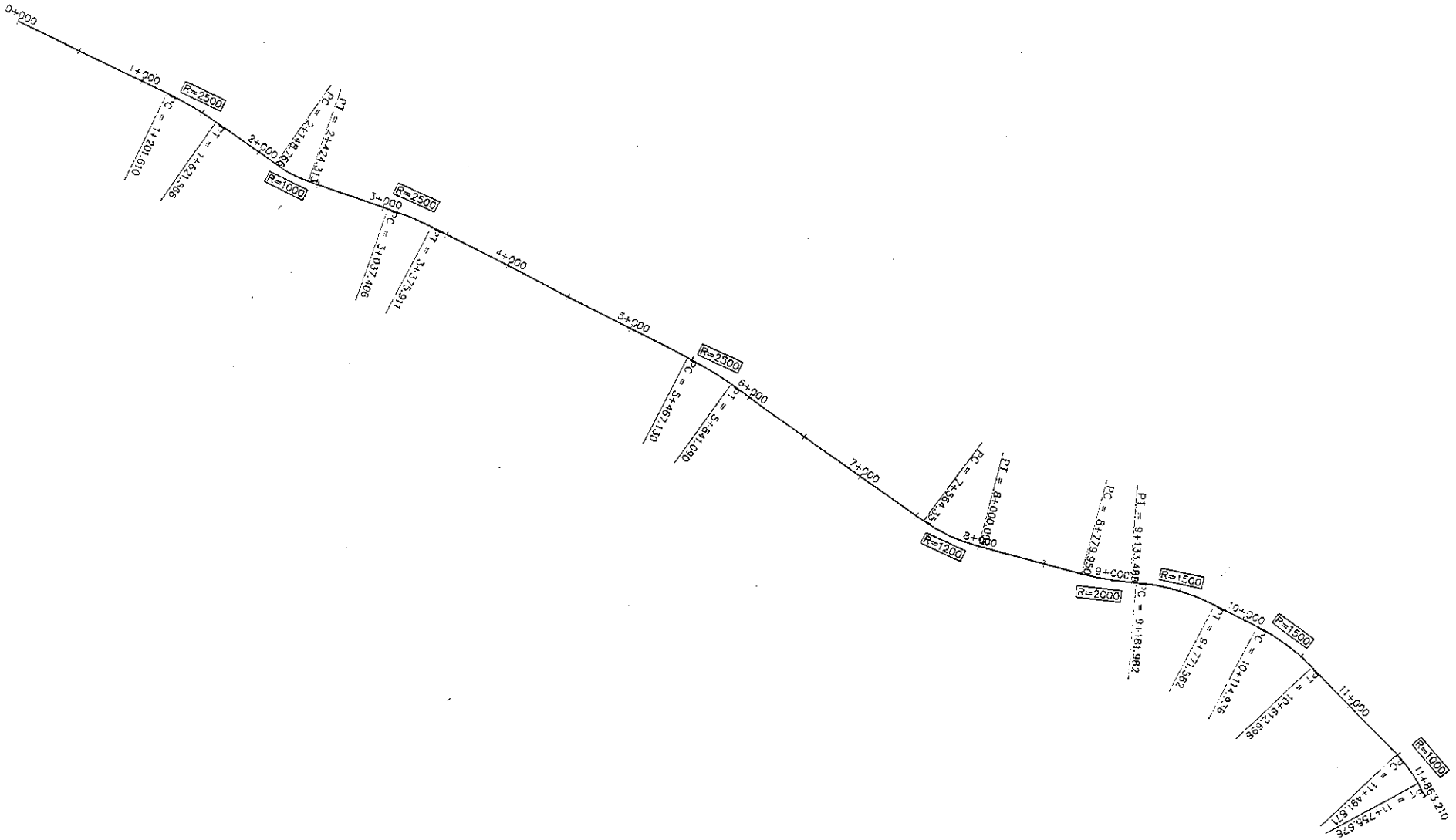


FIGURE 14.7-2

ILOILO R–4 BYPASS ROAD HORIZONTAL ALIGNMENT

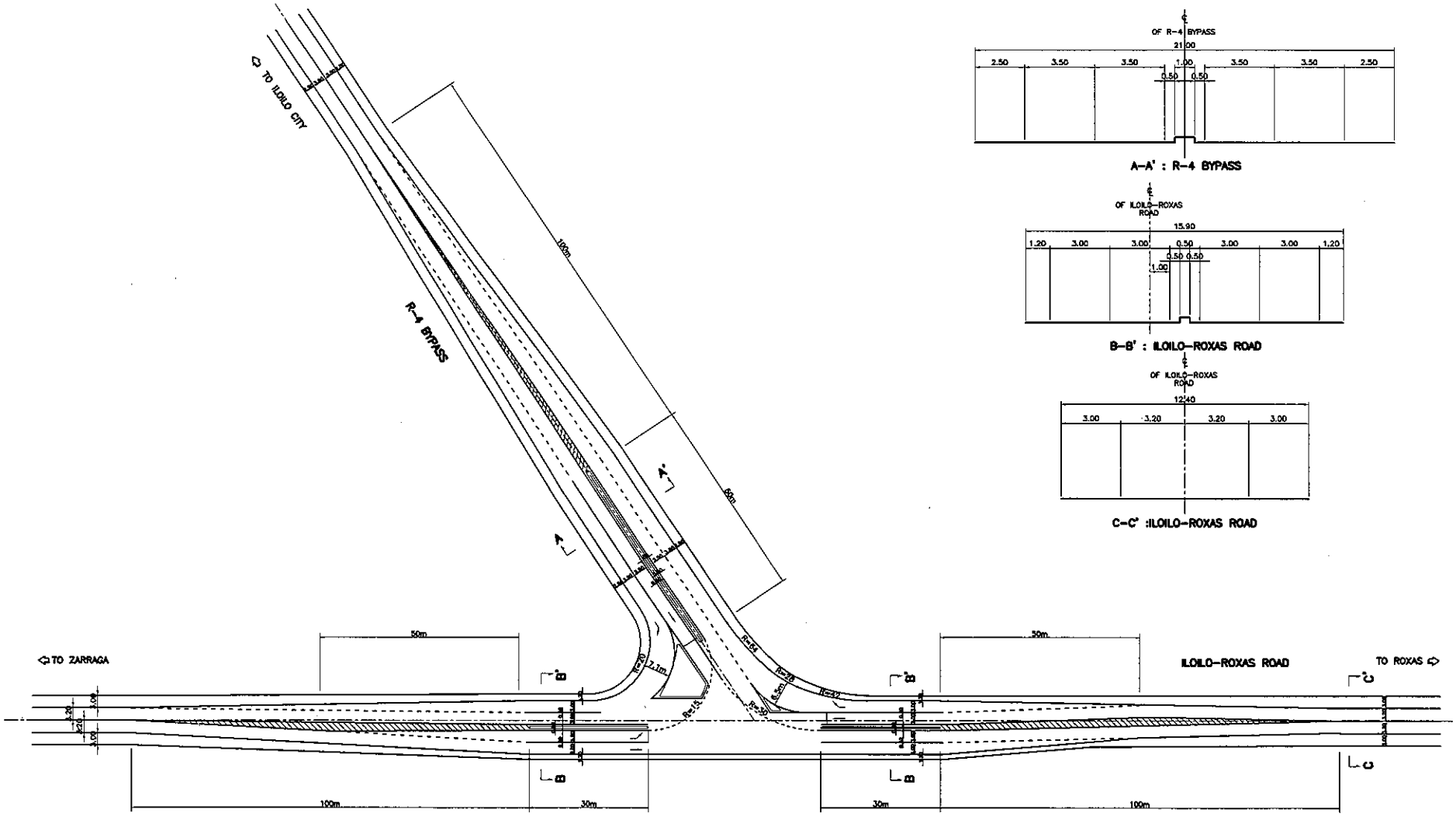


FIGURE 14.7-3 INTERSECTION WITH ILOILO CITY-ROXAS ROAD (TYPE H)
STA. 11+863.21, END OF ILOILO R-4 BYPASS ROAD

14.7.3 Pavement Design

Pavement design was made in accordance with the AASHTO Guide for Design of Pavement Structures, 1993.

Table 14.7.3-1 shows the design requirements. Bus and truck factors were assumed as follows:

Bus factor (number of ESAL per bus) : 0.8
Truck factor (number of ESAL per truck) : 1.8

Soft ground is found along the project road, and settlement after construction of pavement is anticipated. For this kind of ground condition, flexible type of pavement is preferred to cope with expected settlement. AC pavement was selected.

Table 14.7.3-2 shows traffic loading. Cummulative ESAl is 4.62 Million for 10 years.

Required pavement thickness is as follows:

AC Pavement : 12cm
Aggregate Base Course : 20cm
Subbase Course : 30cm

TABLE 14.7.3-1 DESIGN REQUIREMENT (Iloilo-R4 Bypass)

Category	Description
a. Design Variable	
a.1 Time Constraints - Time Period	AC : 10 years
a.2 Traffic Loading	Directional Distribution Factor : 0.5
a.3 Bus and Truck Factor	Bus : 0.8 Truck : 1.8
a.4 Reliability	Z_R = 1.037 for 85% Reliability So = 0.45 (Flexible)
b. Performance Criteria	
b.1 Serviceability	(Flexible) PSI = Po - Pt = 4.2 - 2.0 = 2.2
c. Material Properties for Structural Design	
c.1 Effective Modulus of Subgrade Reaction	M_R (pci) ; 7,500pci
c.2 Pavement Layer Materials Characterization	E_C = Modulus of Elasticity of PCC (4.20 x 10^6 psi)
c.3 Structural Layer Coefficient (Flexible)	Asphalt Concrete Layer Coefficient ; 0.38
	Crushed Gravel Base ; 0.15
	Subbase ; 0.11
e. Required Pavement Thickness	
d1. AC	t = 12cm
d2. Aggregate Base Course	t = 20cm
d3. Subbase Course	t = 30cm

TABLE 14.7.3-2 TRAFFIC LOADING (Iloilo-R4 Bypass)

Year	AADT		Cumulative ESAL
	Bus	Track	
2017	603	992	413,855
2018	671	995	838,708
2019	748	998	1,275,704
2020	833	1,001	1,726,118
2021	928	1,004	2,191,369
2022	1,033	1,007	2,672,977
2023	1,038	1,010	3,156,264
2024	1,043	1,013	3,641,239
2025	1,049	1,015	4,127,906
2026	1,054	1,018	4,616,273
TOTAL	**8,999**	**10,053**	**4,616,273**

14.7.4 Structure Design

The proposed R-4 Bypass Road is a 2-lane new road construction 11.86km long. The alignment traverses mostly rice fields crossing small streams and rivers. However, the bypass beginning crosses the proposed 82m wide Jaro Floodway which forms part of the Iloilo Flood Control Project and becomes a major crossing in this alignment.

This section discusses the preliminary design aspects of the proposed bridges crossing waterways along the alignment.

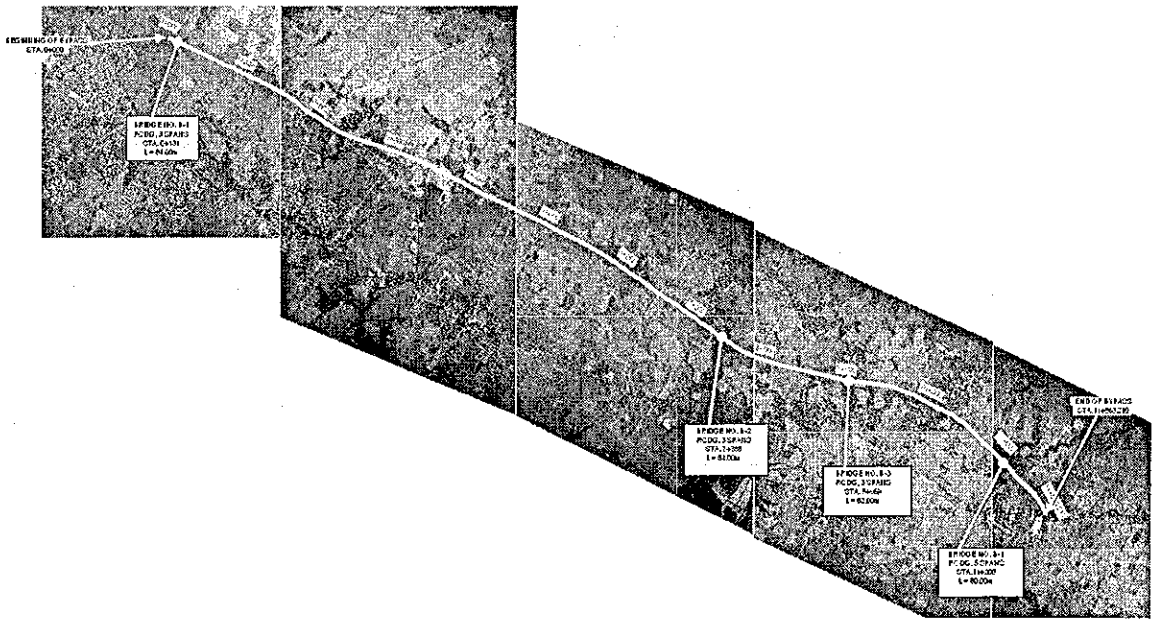


FIGURE 14.7.4-1 BRIDGE LOCATION MAP

14.7.4.1 Present Condition of the Proposed Bridge Sites

Site investigation was carried-out to verify the conditions of waterways along the alignment and determine the appropriate type and span of bridge suitable for each site. Figure 14.7.4-1 shows the location of proposed bridges along the alignment while Figure 14.7.4-2 presents the conditions of the three (3) rivers and streams along the proposed R-4 Bypass road alignment.

The following features describe briefly the proposed bridge sites:

Topography

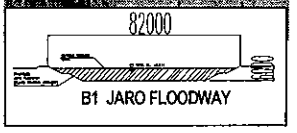
- Since the alignment is located on a relatively flat terrain, the 50-year return flood tends to overflow the river with flood heights more than 1.0m above the river banks,
- Under this condition, the river sections are found insufficient to the design discharge,
- The area near the end of the alignment is low lying and swampy on the western side of bridge B-2.
- At the end point of the bypass, flood reached to 0.40m above the national highway in the town of Zarraga last May of 2003.

STATION :	11 + 120.00
BRIDGE NO. :	B4
RIVER NAME :	Canipaan River
50 YEARS DISCHARGE	460.82 cu.m/sec
MAX. FLOOD WATER LEVEL	EL. 8.300m

END OF PROJECT

STATION :	8 + 969.00
BRIDGE NO. :	B3
RIVER NAME :	Canipaan Creek
50 YEARS DISCHARGE	207.26 cu.m/sec
MAX. FLOOD WATER LEVEL	EL. 6.600m

STATION :	7 + 388.00
BRIDGE NO. :	B2
RIVER NAME :	Calaboa Creek
50 YEARS DISCHARGE	92.15 cu.m/sec
MAX. FLOOD WATER LEVEL	EL. 7.800m



B1 JARO FLOODWAY

START OF PROJECT

FIGURE 14.7.4-2 RIVER CONDITION AT PROPOSED BRIDGE SITES

Rivers/Streams

- The bypass road will pass three existing waterways requiring bridge crossings - the Calaboa Creek with 5m wide waterway, the Canipaan Creek with 17m wide waterway and the Canipaan River with 22m wide waterway. The river depths from bed to bank are shallow ranging from 1.5m to 3.0m.
- At the beginning of the alignment, the bypass is will cross the proposed Jaro Floodway which form part of the Iloilo Flood Control Project, as shown in Figure 14.7.4-3. The proposed floodway is 82m wide at banks and has a depth of 6m.

The river discharge for a 50-year return period is calculated for each proposed bridge site and presented in Table 14.7.4-1.

TABLE 14.7.4-1 RIVER DISCHARGE FOR PROPOSED BRIDGE SITES

BRIDGE NO.	RIVER NAME	50-YEAR DISCHARGE (cu.m/sec)	MFWL (EL. +m)	VELOCITY (m/s)	BRIDGE SPAN (m)	
					Minimum	Provided
B-1	Jaro Foodway	FLOOD CONTROL PROJECT	8.89	FLOOD CONTROL PROJECT	-	28
B-2	Calaboa	92.15	7.80	2.23	-	22
B-3	Canipaan Creek	207.26	6.60	1.96	21	22
B-4	Canipaan	460.82	8.30	1.57	22	22

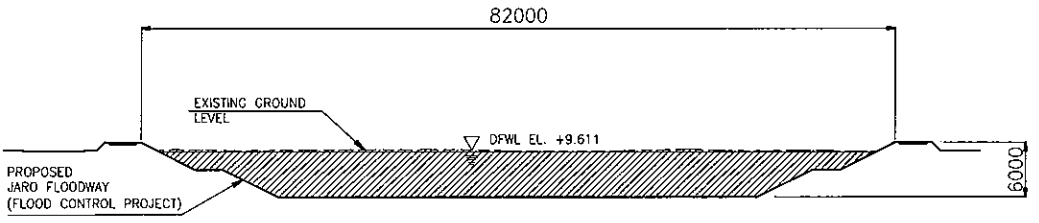


FIGURE 14.7.4-3 PROPOSED JARO FLOODWAY

Geotechnical

- Geotechnical investigations carried-out for the proposed bridge sites indicate that the subsoil condition along the proposed bridges for the bypass alignment is composed predominantly of thick layers of clay with higher N-values than the C-1 road alignment. Traces of silt, sand and gravel are found in borehole for bridge B-2.
  - The soil condition at the beginning of the bypass where the Jaro Floodway bridge crossing is located varies from soft to very soft clays with N-values of 0 to 6 until 29m deep and becomes stiff to very stiff and hard from 30m to 36m with N-values from 13 to 31. However, the N-values revert to an average of 12 from 37m to 47m.
  - For bridge B-2, top soil until 3m is medium stiff clay with N-values of 6 and 7, lower soil profiles are alternating layers of silt, sand, gravel and clay with N-values of more than 10 to 21. This condition is much better

than the beginning of bypass

- The borehole near bridges B-3 and B-4 is predominantly clay with silty/sandy clay in the upper 16m. N- values ranges from 9 to 21.

14.7.4.2 Design Concept for Structures

(1) Superstructure

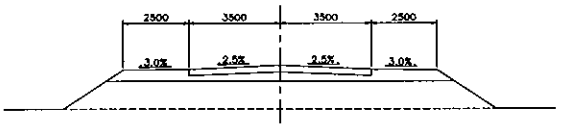
The superstructure preliminary design basically adheres to the following concepts:

Bridge Deck Section

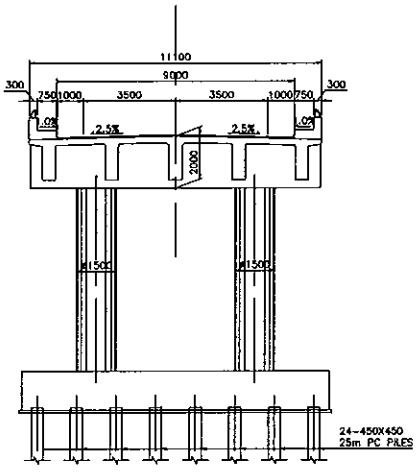
- The bridge deck section should conform with the travelway/carriageway width of the highway. Typical bridge section is illustrated in Figure 14.7.4-4. The bypass road is proposed to be a 2-lane road without provision for widening to four lanes. Thus, the bridge structure will be planned for only one-stage construction with normal cross-slope.

- The deck will have a clear roadway width of 9m from curb-to-curb providing two 3.5m wide carriageway and 1.0m wide shoulders.

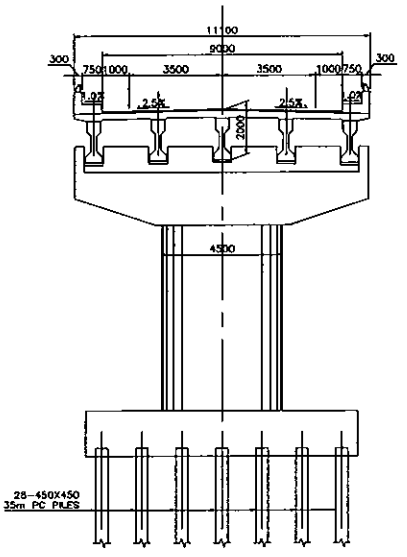
- Since the bypass does not pass thru urbanized area, the standard 0.75m wide sidewalk is provided.



TYPICAL R-4 BYPASS ROAD SECTION



TYPICAL RCDG BRIDGE SECTION



PCDG BRIDGE SECTION
FOR JARO FLOODWAY

FIGURE 14.7.4-4 TYPICAL R-4 BYPASS BRIDGE SECTION FOR INITIAL STAGE

Girder Types

- Two types of superstructures are proposed for the bridges:
  - Prestressed Concrete (PCDG), AASHTO Girder type for spans greater than 22m, and
  - Reinforced Concrete Deck Girder (RCDG) for spans less than or equal to 22m
- To enhance seismic performance, PCDG are made continuous over the intermediate piers allowing transfer of superstructure forces directly to the substructure. On the other hand, RCDG are made rigid with the pier columns to minimize the depth of superstructure.
- RCDG is used to minimize structure height by integrating the pier columns with the deck and eliminating the need for a coping.

Vertical Clearance

- Since debris are not expected on bridge sites, a minimum flood water vertical clearance of 1.0m is provided.

(2) Substructures

Piers

- Preliminary design for substructures considers the seismic design requirements based on the AASHTO Div. I-A Seismic Design recommendations.
- Plastic hinges are expected to form at pier substructures so that design forces of foundations will utilize the said forces.
- Single column wall piers are proposed for the Jaro Floodway (oval shape) since the girders are precast AASHTO girders.
- On the other hand, two-column piers are used for the RCDG superstructure (as recommended by BOD) of bridges B-2 to B-4. Since the columns are rigidly connected with the girders, plastic hinging is expected at the top and bottom of the columns. The two-column pier will result in a cheaper substructure cost.

Pile Foundation

- Driven pile foundation is proposed to support the bridge structures due to the nature of soil at the bridge site. A 450mm x 450mm precast driven pile is proposed with 60ton - 65ton allowable bearing capacity (compression). Since it is difficult to find a competent bearing layer, the piles are considered friction piles.
- Likewise, foundation for the abutment utilizes precast driven friction piles.

Abutments

- Abutment type is the inverted T cantilever wall seat type abutment. This type, being a closed type abutment is more reliable since it is difficult to guarantee the stability of slope in front of the abutment.
- Abutment preliminary design basically follows the AASHTO Div. I-A

recommendations using Mononobe-Okabe formulation to calculate seismic forces due to retained earth.

- Expansion joints for the superstructures are provided at abutment locations.

14.7.4.3 Proposed Bridges

Details of he proposed bridges crossing rivers and streams, with a total length of 280m, are presented in Table 14.7.4-2 below.

TABLE 14.7.4-2 PROPOSED BRIDGES FOR R-4 BYPASS ROAD

BRIDGE NO.	RIVER NAME	STATION		BRIDGE LENGTH (m)	SUPERSTRUCTURE			SUBSTRUCTURE			
								PIER		ABUTMENT	
		BEG.	END		TYPE	SPAN	SKEW (deg)	COLUMN TYPE	FOUNDATION	TYPE	FOUNDATION
B1	Floodway	Sta. 0+131.00	Sta. 0+215.00	84.00	PCDG AASHTO Type IV-B	3 @ 28	3.5	Wall Type 1500x4500	450x450 PC Piles N=28 ; L=35m	Closed Inverted-T Cantilever	450x450 PC Piles N=24 ; L=35m
B2	Calaboa Creek	Sta. 7+388.00	Sta. 7+442.00	54.00	RCDG	16+22+16	-	2-Column ϕ1500	450x450 PC Piles N=24 ; L=30m	Closed Inverted-T Cantilever	450x450 PC Piles N=21,24 ; L=25m
B3	Canipaan Creek	Sta. 8+969.00	Sta. 9+031.00	62.00	RCDG	20+22+20	-	2-Column ϕ1500	450x450 PC Piles N=27 ; L=25m	Closed Inverted-T Cantilever	450x450 PC Piles N=21 ; L=25m
B4	Canipaan Creek	Sta. 11+120.00	Sta. 11+200.00	80.00	RCDG	16+22+22+ 22+16	-	2-Column ϕ1500	450x450 PC Piles N=27 ; L=25m	Closed Inverted-T Cantilever	450x450 PC Piles N=24 ; L=30m

TOTAL BRIDGE LENGTH : 280 m

14.7.5 Drainage Design

1) Principle and Methodology

Refer to Sub section 12.7.4.1 for the principle and methodology

2) Hydrological and Hydraulic Analyses

Refer to Sub section 12.7.4.2 for the hydrological and hydraulic analyses. Table 12.7.5-1 Rainfall Intensity – Duration – Frequency Data for Iloilo was also used for this road.

3) Results of Hydrological Analyses

The hydrological analyses reveal that there are fourteen (14) catchment areas for this proposed road .See Figure 14.7.5-1 for the catchment areas map of Iloilo R-4 Bypass Road. The analyses also reveal that there is only one (1) location where the area is greater than twenty (20) sq km. More over there are three (3) areas where the design discharge is more than forty (40) cu m per sec. The result of the hydrological analyses is shown in Table 14.7.5-1.

4) Results of the Hydraulic Analyses

The hydraulic analyses reveal that there are four (4) bridges and forty five (45) culverts needed for the road. The bridge schedule is shown in Section 14.7.3 and the list of proposed culverts is shown in Table 14.7.5-2.

5) Flood Flow Analysis

The flood flow analysis is conducted for the three (3) catchment areas where the discharge is more than forty (40) cu m per sec. The results of the analysis are shown in Table 14.7.5-3.

6) Flooding Condition

The city of Iloilo experiences flooding due to Iloilo and Jaro River which passes into the city proper and overflowed its banks during heavy rain. Previous detailed design made by other agency proposed channel improvements and cut off channel to relieve the inadequacy. The proposed Jaro floodway passes into the road at Sta. 0+173.The floodway channel is 82 m wide and 6 m deep and will discharge into the Iloilo Strait. This cut off channel will be spanned by an 84 m bridge proposed in this project.

The road passes at a flooded section in the Janipaan-Zarraga area. The extent of the flooding shown in Figure 14.7.5-2 is gathered through interviews and validated by flood flow analysis.

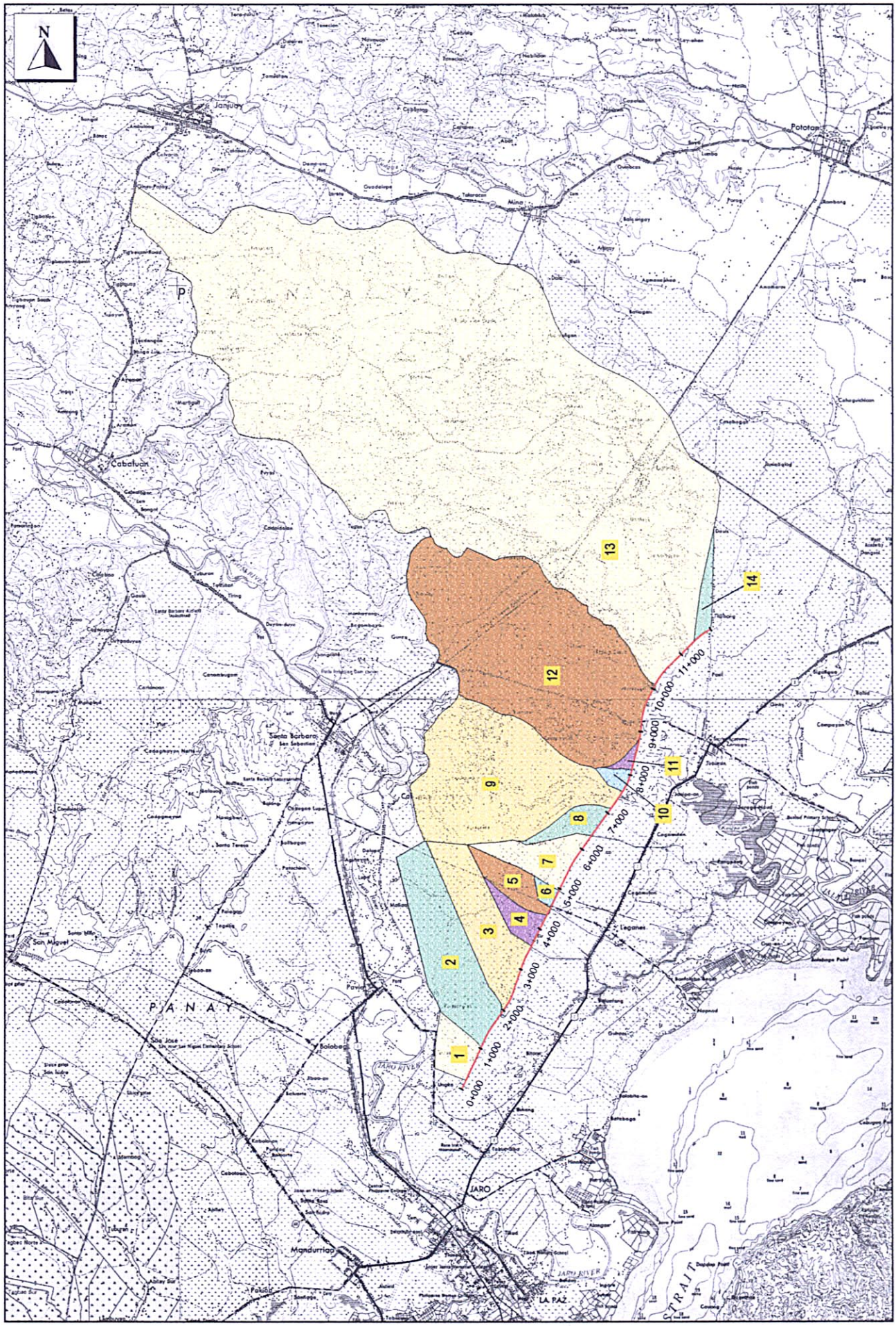


FIG. 14.7.5-1 ILOILO R-4 BYPASS ROAD CATCHMENTS AREA MAP

TABLE 14.7.5-1
HYDROLOGICAL ANALYSIS

Road Section: ***ILOILO R-4 BYPASS ROAD***

Basin Number	STATION		DISCHARGE			
	BEGINNING	END	2 year	10 year	25 year	50 year
			m^3/sec.	m^3/sec.	m^3/sec.	m^3/sec.
1	0 + 000.00	0 + 950.00	8.13	11.89	13.81	15.20
2	0 + 950.00	1 + 900.00	22.06	32.35	37.58	41.42
3	1 + 900.00	3 + 600.00	17.92	26.26	30.49	33.60
4	3 + 600.00	4 + 150.00	5.53	8.08	9.38	10.32
5	4 + 150.00	4 + 600.00	10.98	16.03	18.59	20.46
6	4 + 600.00	4 + 950.00	1.28	1.87	2.17	2.39
7	4 + 950.00	6 + 350.00	11.43	16.72	19.41	21.37
8	6 + 350.00	7 + 280.00	4.71	6.87	7.98	8.78
9	7 + 280.00	7 + 550.00	49.15	72.00	83.63	92.15
10	7 + 550.00	8 + 080.00	1.90	2.77	3.21	3.54
11	8 + 080.00	8 + 550.00	2.33	3.40	3.94	4.33
12	8 + 550.00	10 + 040.00	110.88	162.12	188.23	207.26
13	10 + 040.00	11 + 650.00		394.48	425.57	460.82
14	11 + 650.00	11 + 863.00	3.19	4.66	5.40	5.94

TABLE 14.7.5-2
HYDRAULIC ANALYSIS

ILOILO R - 4 BYPASS ROAD

BASIN NUMBER	STATION (km)	SIZE		LENGTH	REMARKS / RECOMMENDATION
		RCPC	RCBC		
		mmØ	SPAN X HEIGHT	(m)	
1	0 + 100.00	1 - 910		21.00	
	0 + 420.00	2 - 1220		15.00	
	0 + 600.00	2 - 1220		16.00	
	0 + 800.00	2 - 1220		16.00	
2	1 + 120.00		3 - 2.40 X 2.40	14.00	
	1 + 300.00	2 - 1220		16.00	
	1 + 670.00	2 - 1220		15.00	
3	2 + 000.00	1 - 910		16.00	
	2 + 350.00		3 - 3.0 X 3.0	25.00	
	2 + 650.00	1 - 910		16.00	
	2 + 950.00	1 - 910		15.00	
	3 + 250.00	2 - 910		16.00	
4	3 + 532.00	1 - 910		35.00	
	3 + 550.00	2 - 1220		25.00	
	3 + 780.00	1 - 1220		15.00	
	3 + 970.00	1 - 910		16.00	
	4 + 057.00	1 - 1220		15.00	
5	4 + 345.00		2 - 2.40 X 2.40	14.00	
	4 + 500.00	1 - 910		22.00	
	4 + 550.00	1 - 910		24.00	
6	4 + 885.00	2 - 910		16.00	
	4 + 922.00	1 - 910		15.00	
7	5 + 050.00	1 - 910		16.00	
	5 + 350.00		3 - 1.50 X 1.50	15.00	
	5 + 700.00		3 - 1.50 X 1.50	15.00	
	6 + 100.00	2 - 1070		15.00	
	6 + 300.00	1 - 910		15.00	
	6 + 333.00	1 - 910		25.00	
8	6 + 490.00	2 - 910		16.00	
	6 + 700.00	2 -1220		16.00	
	6 + 920.00	1 - 910		16.00	
	7 + 120.00	1 - 910		16.00	
	7 + 225.00	1 -910		15.00	
10	7 + 680.00	1 - 910		16.00	
	7 + 985.00	2 - 1070		16.00	
11	8 + 160.00	1 - 910		20.00	
	8 + 410.00	2 - 1220		16.00	
12	8 + 650.00	1 - 910		16.00	
	9 + 250.00		3 - 2.40 X 2.40	14.00	
	9 + 650.00		3 - 2.40 X 2.40	14.00	
13	10 + 140.00	1 - 1070		16.00	
	10 + 550.00		3 - 1.50 X 1.50	14.00	
	10 + 850.00		3 - 1.50 X 1.50	14.00	
	11 + 160.00				
	11 + 450.00		3 - 1.50 X 1.50	14.00	
14	11 + 700.00	2 - 1220		15.00	

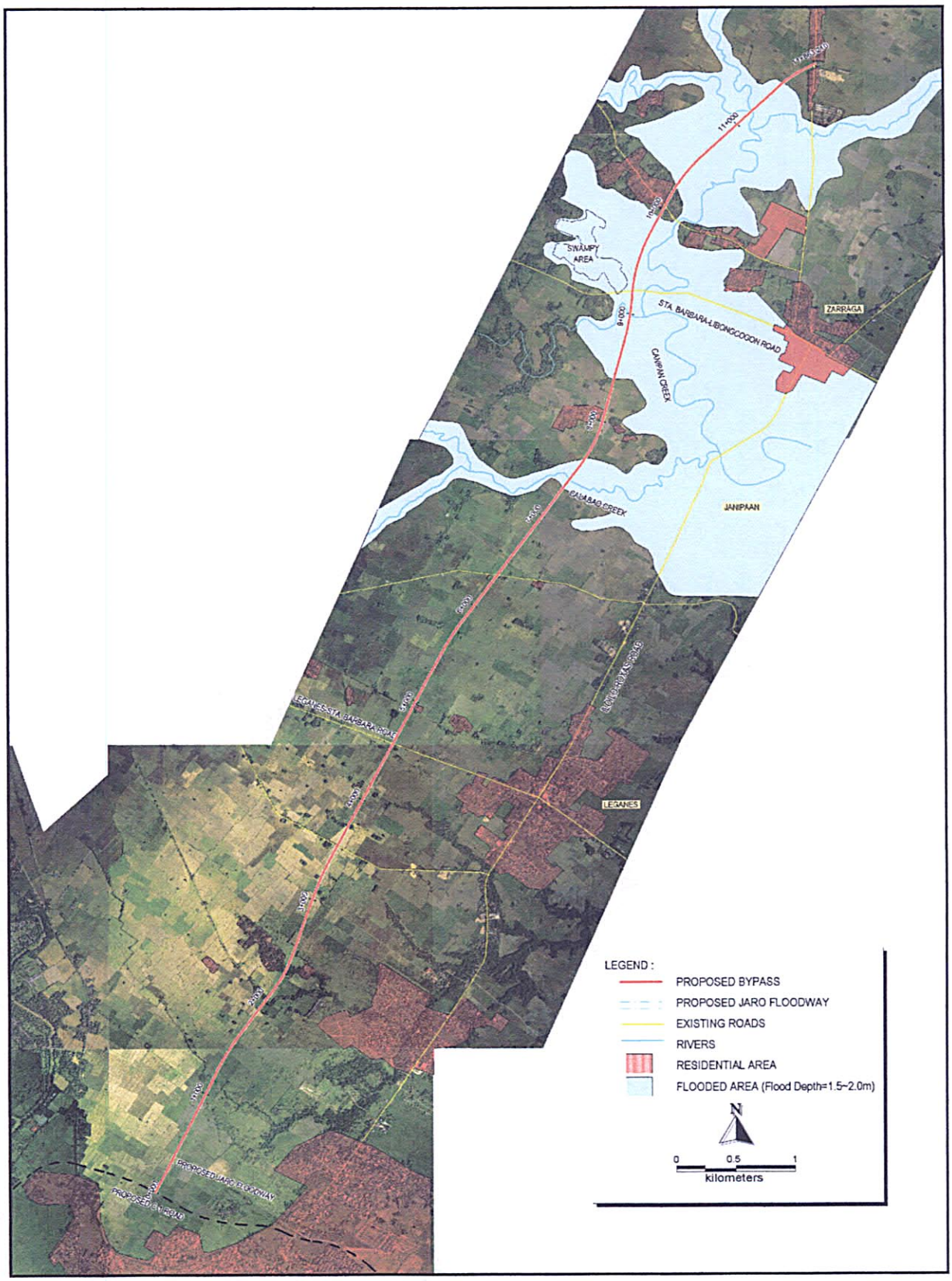


FIGURE 14.7.5-2 R-4 BYPASS ROAD FLOODED AREA

TABLE 14.7.5-3 FLOOD FLOW ANALYSIS

ILOILO R-4 BYPASS ROAD , METRO ILOILO

HIGHWAY STATION (km)	BRIDGE NUMBER	BRIDGE NAME	CATCHMENT AREA (km2)	DISCHARGE 50 YEARS (cms)	VELOCITY (mps)	DFL (m)	M.F.L. FROM FIELD SURVEY (m)	WATER WIDTH (m)	REMARKS
0+173	B-1	Jaro Floodway		850.00		8.89	8.70	78.00	Cut Off Channel
7+415	B-2	Calaboa	9.55	92.15	2.23	7.80	8.06	48.70	
9+000	B-3	Bitaog	16.26	207.26	1.96	6.60	6.70	56.86	
11+160	B-4	Canipaan	67.42	460.82	1.57	8.30	8.85	94.20	

14.7.6 Soft Ground Analysis

(1) Procedure of Analysis

The Procedure of Analysis is shown in the Figure 14.7.6-1

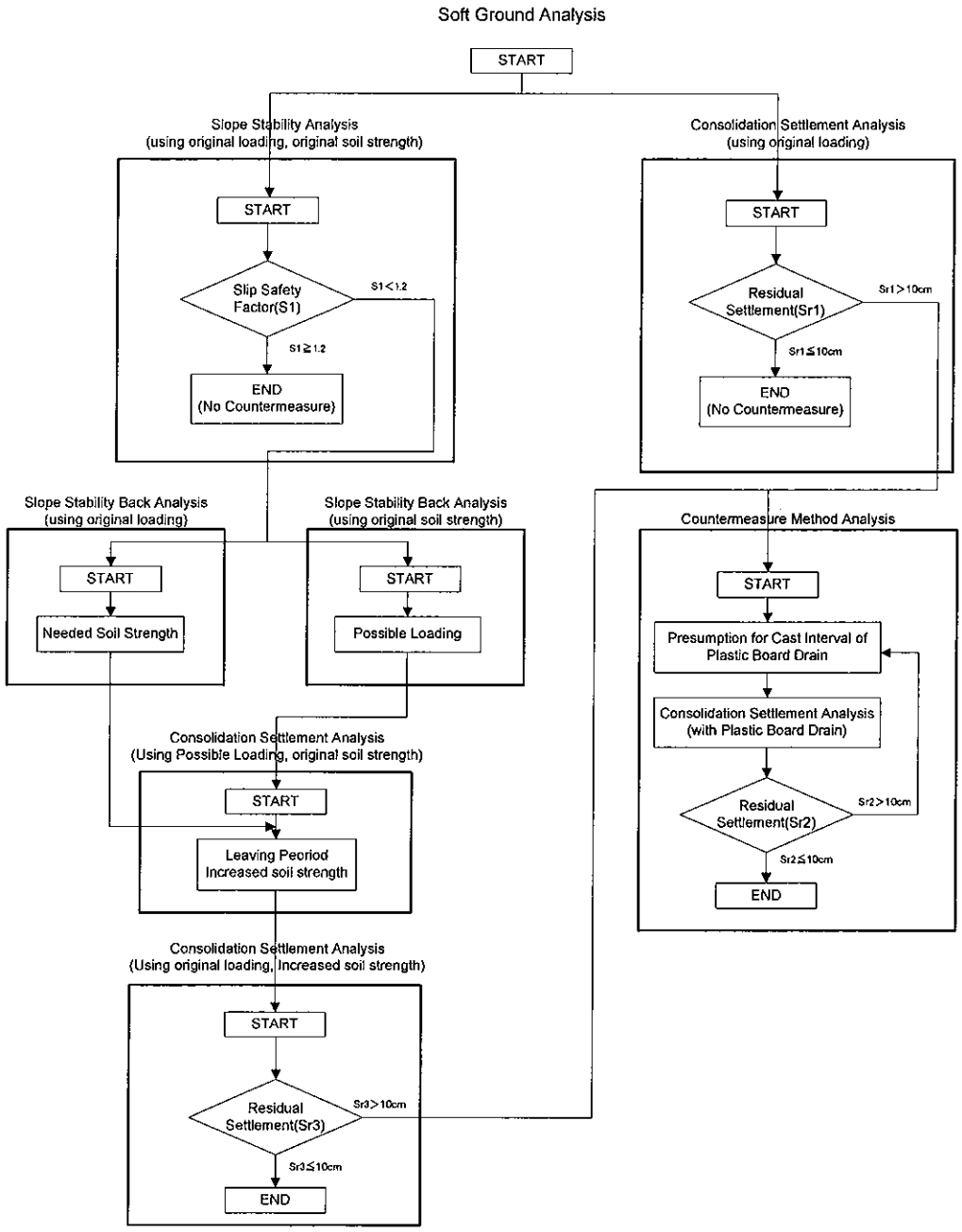


FIGURE 14.7.6-1 PROCEDURE OF ANALYSIS

Soft Ground Analysis was conducted to study the stability of embankment on the soft ground. Main problems of embankment on soft ground are both consolidation settlement and shear deformation. Shear deformation is composed of settlement and deformation of embankment itself and upheaval of side land of embankment mainly caused by slope slip.

Soft Ground Analysis consists of a consolidation settlement analysis and a slope stability analysis. Analysis method of the former and the latter analyses are one-dimension consolidation analysis and slip circle analysis respectively.

The analyses were conducted based on the soil data of the GEOTECHNICAL INVESTIGATION REPORT and the shape of the embankment proposed in 14.7.2 Road and Intersection Design.

(2) Analysis Sections

The Analysis Sections are shown in the Figure 14.7.6-2. And the chainage of each Section and applied Borehole No. for analysis are shown in the Table 14.7.6-1.

The Section is divided into 9 Sections from A to N. The Analysis Sections and locations of boreholes are expressed in this figure.

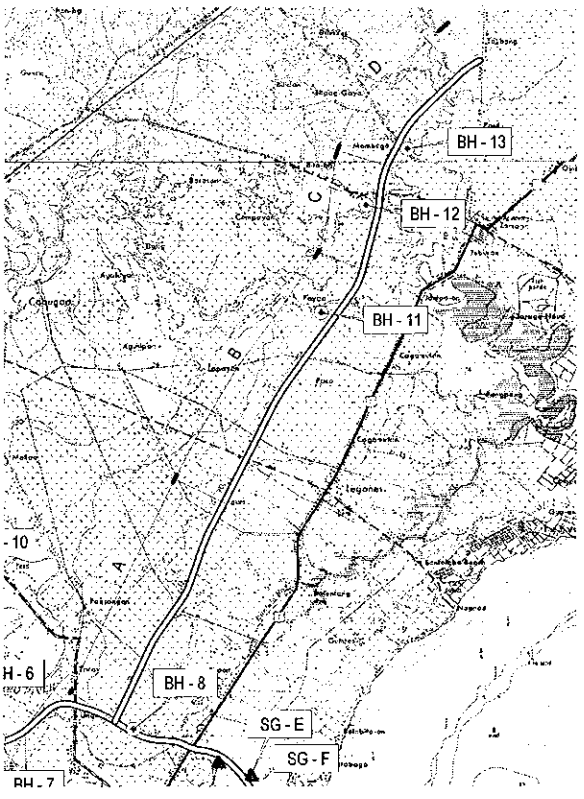


FIGURE 14.7.6-2 ANALYSIS SECTIONS

TABLE 14.7.6-1 ANALYSIS SECTIONS AND BOREHOLE NO.

Section	A	B	C	D
Chainage(STA.)	0+000 ～3+100	3+100 ～7+800	7+800 ～9+900	9+900 ～11+870
Borehole No.	BH-8	BH-11	BH-12	BH-13

(3) Soil Strata

The Soil Strata of the nearest Borehole Data from a Section is applied to each Section to analyze. And Soil as shown in the Table 14.7.6-2 is defined as Soft Ground.

Table 14.7.6-2 Definition of Soft Ground

Soil	Clay		Sand
Layer Thickness (m)	under 10	10 and over	-
N Value	4 and under	6 and under	10 and under
qu (kPa)	60 and under	100 and under	-

(4) Soil Value for Analysis

Shear Strength of Soil

Clay

Cohesion (c_u) of Clay is calculated from the below formula.

$c_u = q_u/2$

Where:

q_u = unconfined compressive strength

In case that unconfined compression test is not implemented, cohesion is supposed by the Table 14.7.6-3.

Table 14.7.6-3 Cohesion of Clay

Consistency	c_u (tf/m^2)	N Value
Hard	>20	>15
Very Stiff	10~20	7.5~15
Stiff	5~10	4~7.5
Medium	2.5~5	2~4
Soft	1.25~2.5	1~2
Very Soft	<1.25	<1

Internal friction angle(φ) of Clay is 0 degree.

Sand

Cohesion of Sand is 0.

Internal friction angle (φ) of Sand is calculated from below formula.

$\varphi(\text{degree}) = 15 + \sqrt{(15N)}$

Where:

N = N Value

Consolidation Test Data

Consolidation Test Data such as e-log P curve and coefficient of consolidation are shown in the Table App.- .

As a representative Soil Value, soil value of borehole No. BH-8 is shown in the Figure 14.7.6-3.

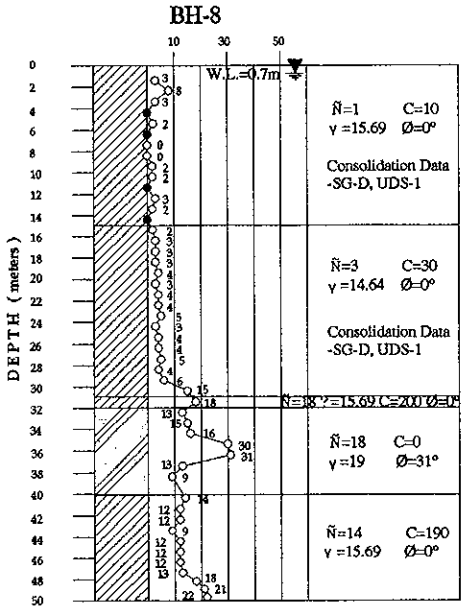


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FIGURE 14.7.6-3 SOIL VALUE (BH-8)

(5) Analysis Result

The Summary of Analysis results are shown in the Table 14.7.6-4.

TABLE 14.7.6-4 THE SUMMARY OF SOFT GROUND ANALYSIS RESULTS

Section	A	B	C	D
Chainage(STA.)	0+000 ~3+100	3+100 ~7+800	7+800 ~9+900	9+900 ~11+870
Borehole No.	BH-8	BH-11	BH-12	BH-13
Max. embankment height(m)	4	3	5	4
Max. final settlement (cm)	102	12	22	Soft Ground is not existing
Max. residual Settlement (cm)	79	4	2	
Slope Slip Slip Safety Factor [Fs] > 1.2 is needed	Not Safe (Fs=0.816)	Safe	Safe	

: ···Countermeasure Method is needed.

(6) Countermeasure method against residual consolidation and slope slip

At Section A, the residual consolidation is over 10 cm and Slope Slip Factor is under 1.2 on original soil condition analysis. Applying both accelerated consolidation method and slow construction, Clay strength will increase and slope slip will not occur.

Vertical drain method

Appling Vertical drain method as accelerated consolidation method, the drainage distance of consolidation layer will shorten and consolidation settlement will terminate earlier. Plastic Board Drain Method is applied as vertical drain method,. Layout of Plastic Board Drain is shown in the Figure 14.7.6-4.

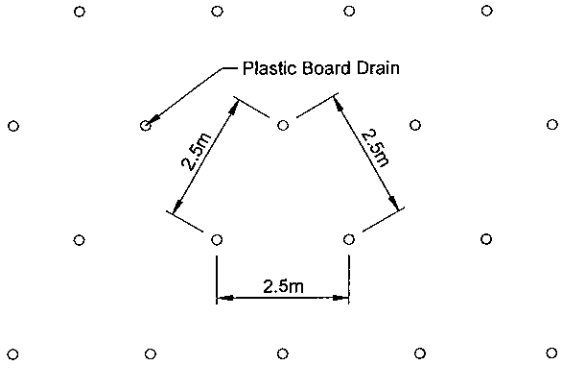

FIGURE 14.7.6-4 LAYOUT OF PLASTIC BOARD DRAIN

Consolidation Settlement Analysis with Plastic Board Drain

Harmful residual settlement occurs only at Section A and also land slip occurs only at Section A (See Table 14.7.6-4). Therefore this analysis was implemented using the condition of Section A.

The condition of this analysis is as follows:

Soil Strata = Borehole No. BH-8
First step embankment construction period = 40 days
First step embankment height = 2.0 m
Period of leaving the first step embankment = 320 days
Second step embankment height = 2.0 m (The first + the second = 4.0 m)
Period of leaving the second step embankment = 513 days

The result of this analysis is shown in the Figure 14.7.6-5.

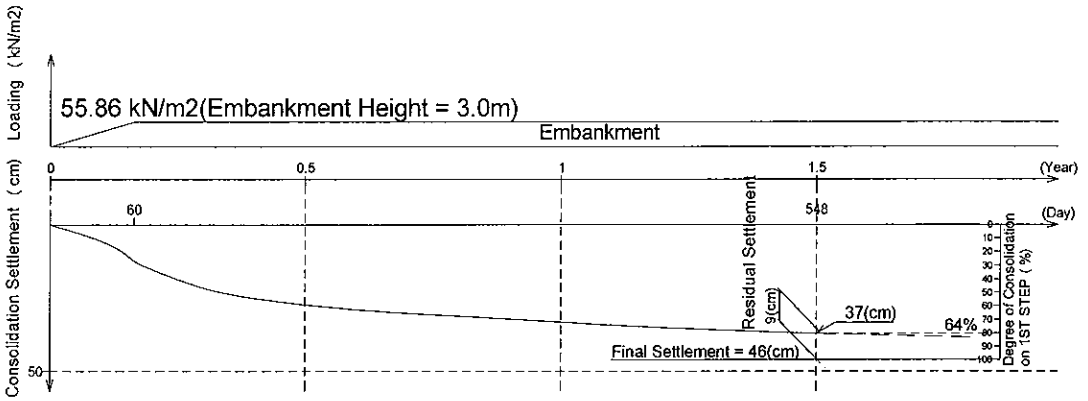

FIGURE 14.7.6-5 RESULT OF CONSOLIDATION SETTLEMENT ANALYSIS WITH PLASTIC BOARD DRAIN

At the time 913days (2.5 year) passed from the starting time of embankment construction, the residual settlement is 7 cm.

The results of Slip Circle Analysis on original condition and on the condition using increased soil strength are shown in the Figure 14.7.6-6 and in the Figure 14.7.6-7 respectively.

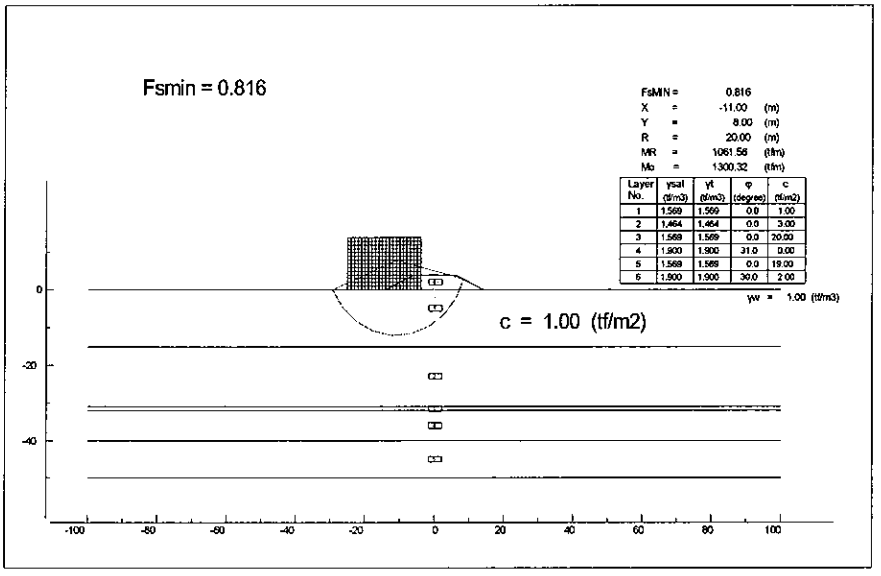

FIGURE 14.7.6-6 RESULTS OF SLIP CIRCLE ANALYSIS AT SECTION K
(Slip Circle Analysis on original condition (Fs_{min}=0.816))

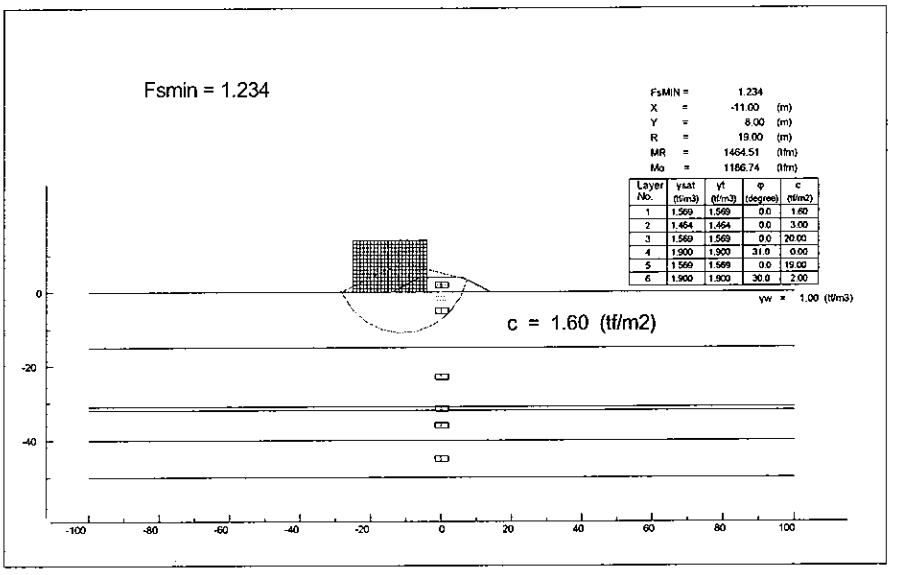

FIGURE 14.7.6-7 RESULTS OF SLIP CIRCLE ANALYSIS AT SECTION K

(Slip Circle Analysis on the condition using increased soil strength (Fs_{min}=1.234))

(7) The construction amount of Plastic Board Drain

The construction amount of Plastic Board Drain depends on both of the width of embankment and the depth of the bottom of the deepest clay layer. The construction amount of Plastic Board Drain is estimated in the Table 14.7.6-5.

Table 14.7.6-5 Construction Amount of Plastic Board Drain

Section	A
Chainage(STA.)	0+000 ~3+100
Distance(m)	3,100
Depth of the bottom of the deepest clay layer(m)	25
Width of Embankment(m)	40
Amount of Target Soil(m3)	3,100,000
Amount of Soil Casting Drain per meter(m3)	5.4125
Casting Length(m)	572,750
Borehole No.	BH-8

14.8 COST ESTIMATES

14.8.1 Construction Cost

(1) Unit Cost Analysis

The project cost was estimated based on the January 2004 prices with breakdown of foreign and local currency components and a tax component.

The foreign exchange rates used were as follows:

1 US $ = 55.36 P = 106.85 Yen

A market price survey was conducted to obtain information on market or prevailing prices of construction materials, labor cost and equipment cost. Based on these prices, a unit cost analysis was conducted to develop unit costs for construction items. Unit prices of major construction items are presented in Tables 14.8-1, 2, 3 and 4, respectively.

(2) Construction Cost

Estimated construction cost is presented in Table 14.8-5. Detailed cost estimate is presented in Appendix 14.8-1. The construction cost of R-4 Bypass was estimated at 523.5 Million pesos, composing of 55.0% a foreign currency component (or 287.9 Million pesos), 29.3% of a local currency component (or 153.6 Million pesos) and 15.7 % of a tax component (or 82.0 Million pesos).

TABLE 14.8-5 CONSTRUCTION COST

(Million Pesos)

	Foreign	Local	Tax	Total
Amount	287.9	153.6	82.0	523.5
	55.0%	29.3%	15.7%	100.0%

TABLE 14.8-1 MARKET PRICE OF CONSRUCTION MATERIALS IN ILOILO

(January 2004 Prices)

Price No.	Description	Unit	Unit Price (P)
1	Portland Cement	bag	182.00
2	Reinforcing Steel Bar, Gr. 40	kg.	25.00
3	Reinforcing Steel Bar, Gr. 60	kg.	27.00
4	Gasoline, Premium	lit.	23.94
5	Gasoline, Regular	lit.	22.40
6	Diesel	lit.	18.11
7	Lumber	bd.ft.	36.00
8	Ordinary Plywood 1/2"	pc	580.00
9	Emulsified Asphalt SS-1	tonne	23,500.00
10	Asphalt Cement Pen. 85-100	tonne	21,500.00
11	Thinner	gal.	137.00
12	Tie Wire #16	kg.	60.00

SOURCE:

- *Study Team Survey*

TABLE 14.8-2 LABOR COST

(January 2004 Prices)

Labor Category	Hourly Rate (Pesos)	Daily Rate (Pesos)
Foreman	46.00	368.00
Operator	41.00	328.00
Driver	38.00	307.00
Carpenter	41.00	328.00
Re-Bar Worker	43.00	340.00
Masonry	45.00	358.00
Blaster	40.00	320.00
Welder	47.00	376.00
Painter	40.00	320.00
Mechanic	40.00	323.00
Electrician	41.00	325.00
Skilled Labor	40.00	320.00
Unskilled Labor	32.00	252.00

SOURCE:

- *DPWH - Iloilo City District Engineering Offices*
- *National Health Insurance Program*
- *Social Security System*

TABLE 14.8-3 HOURLY (OR DAILY) COST OF CONSTRUTION EQUIPMENT

(January 2004 Prices)

	Construction Equipment	Unit	Cost (P)
1	Tractor, crawler w/dozer (Bulldozer, 15t)	hr	2,243.00
2	Tractor, crawler w/dozer (Bulldozer, 21t)	hr	3,623.00
3	Backhoe, hydraulic, crawler, 0.61m3	hr	1,295.00
4	Backhoe, hydraulic, crawler, 0.80m3	hr	1,766.00
5	Dump Truck, 6.0-9.0 cu-yds (4.6-6.9m3)	hr	807.00
6	Motor Grader, 3.71m	hr	1,748.00
7	Vibratory Tandem Smooth Drum 10.6t	hr	1,622.00
8	Four Tamping Foot Wheels (Tire Roller) 16t	hr	1,583.00
9	Water Wagon/Pump Truck 500-1000 gal	hr	968.00
10	Asphalt Paver/Finisher, 4.7m	hr	1,974.00
11	Truck Mixer 5.0-6.0 cu-yds	hr	1,066.00
12	Concrete Batch Plant 40m3/hr with silo	hr	1,990.00
13	Crawler Drill	hr	428.00
14	Concrete Vibrator *(operator not included)*	day	456.00
15	Concrete Cutter *(operator not included)*	day	1,080.00
16	Concrete Paver/Finisher	hr	870.00
17	Truck Crane, Hydraulic 21-25t	hr	1,297.00
18	Concrete Pump Vehicle 100cu-yds/hr (76.5m3/hr)	hr	1,668.00
19	Air Compressor 456-500 cfm	hr	876.00
20	Aggregate Crusher 100t/hr *(operator not included)*	hr	2,730.00
21	Trailer 20t	hr	1,588.00
22	Welding Machine 250A	hr	300.00
23	Generator 51-100 kW *(operator not included)*	day	3,310.00
24	Bar Bender *(operator not included)*	day	1,310.00
25	Electric Bar Cutter	day	1,310.00

SOURCE: Associated Construction Equipment Lessors (ACEL)

TABLE 14.8-4 UNIT COST OF MAJOR CONSTRUCTION ITEM (1/2)

Item No.	Description	Unit	Unit Cost (Peso)	Component(%)		
				Foreign	Local	Tax
	PART C - EARTHWORK					
100(1)	Clearing and Grubbing	ha.	51,000.00	57	27	16
101	Removal of Existing Sidewalk, Railings, Etc. for Bridge Widening	LS		48	28	24
102(1)	Unsuitable Excavation	m3	176.00	59	17	24
102(2)a	Surplus Common Excavation	m3	176.00	60	24	15
103(2)a	Bridge Excavation, Common (AWL)	m3	200.00	53	31	16
103(2)b	Bridge Excavation, Common (BWL)	m3	750.00	51	34	15
104(1)a	Embankment from Excavation	m3	194.00	54	20	26
104(1)b	Embankment from Borrow	m3	390.00	56	30	15
104(1)c	Selected Borrow for Backfilling	m3	547.00	54	20	26
105(1)	Subgrade Preparation (Common Material)	m2	17.00	57	27	16
	Plastic-board drain (@2.5m * 2.5m triangle, Depth 20.0m)	m2	148.00	65	20	15
	PART D - SUBBASE AND BASE COURSE					
200	Aggregate Subbase Course	m3	550.00	54	32	14
201	Aggregate Base Course	m3	650.00	53	33	14
202	Crushed Aggregate Base Course (AC)	m3	750.00	54	32	14
	PART E - SURFACE COURSE					
301(1)	Bituminous Prime Coat (MC-70 Cut-Back Asphalt)	t	25,000.00	65	17	18
302(2)	Bituminous Tack Coat (Emulsified Asphalt Grade SS-1)	t	25,000.00	65	18	18
310	Bituminous Concrete Surface Course, Hot Laid	t	3,500.00	64	18	18
311(1)a	PCC Pavement(Plain) (t=0.10m)	m2	450.00	62	23	15
311(1)c	PCC Pavement(Plain) (t=0.23m)	m2	770.00	62	23	15
311(1)d	PCC Pavement(Plain) (t=0.25m)	m2	820.00	62	23	15
311(2)	PCC Pavement(Reinforced) for Approach Slab, t=300mm	m2	4,480.00	62	23	15
	PART F - BRIDGE CONSTRUCTION					
400(4)	Precast Concrete Piles (0.45m×0.45m), Furnished and Driven	m	3,200.00	52	28	20
400(15)	Test Piles (0.45m×0.45m)	m	364.00	52	35	13
400(16)a	Cast-in-Place Concrete Bored Piles, φ1000mm	m	23,900.00	38	45	17
400(16)b	Cast-in-Place Concrete Bored Piles, φ1200mm	m	32,500.00	38	45	17
400(19)	Piles Shoes for 0.45m×0.45m Piles	ea	1,740.00	55	30	15
401	Concrete Railings	m	2,240.00	38	49	13
404(1)	Reinforcing Steel, Grade 40 (Fy=275Mpa)	kg	38.00	50	37	13
404(2)	Reinforcing Steel, Grade 60 (Fy=415Mpa)	kg	40.00	50	37	13
405(1)	Structural Concrete Class"A1" for Substructure (f'c=24Mpa)	m3	3,500.00	34	50	16
405(2)	Structural Concrete Class"A2" for Superstructure (f'c=24Mpa)	m3	5,240.00	34	50	16
405(3)	Structural Concrete Class"A3" for Others (f'c=21Mpa)	m3	4,500.00	34	50	16
405(6)	Structural Concrete "Lean Concrete" (f'c=17 Mpa)	m3	2,750.00	43	37	20
406(1)a	Prestressed Concrete Girder, AASHTO Type IV-B, L=22m	ea	331,400.00	22	62	16
406(1)b	Prestressed Concrete Girder, AASHTO Type IV-B, L=25m	ea	391,250.00	25	59	16
406(1)c	Prestressed Concrete Girder, AASHTO Type IV-B, L=26m	ea	405,480.00	22	62	16
406(1)d	Prestressed Concrete Girder, AASHTO Type IV-B, L=27m	ea	419,645.00	22	62	16
406(1)e	Prestressed Concrete Girder, AASHTO Type IV-B, L=28m	ea	441,755.00	20	65	15
406(1) f	Prestressed Concrete Girder, AASHTO Type V, L=30m	ea	505,185.00	20	65	15
406(1)g	Prestressed Concrete Girder, AASHTO Type V, L=31m	ea	520,815.00	20	65	15
406(1)h	Prestressed Concrete Girder, AASHTO Type V, L=34m	ea	622,080.00	17	69	14
406(1)i	Prestressed Concrete Girder, AASHTO Type VI, L=36m	ea	672,500.00	19	67	14
406(1)j	Prestressed Concrete Girder, AASHTO Type VI, L=40m	ea	815,870.00	17	69	14
407(1)a	Elastomeric Bearing Pad, 400×350×60 (Duro 60)	ea	18,000.00	21	64	15
407(1)b	Elastomeric Bearing Pad, 500×350×60 (Duro 60)	ea	21,100.00	21	64	15
407(2)	Expansion Joint, 50mm Gap	m	46,300.00	21	64	15
407(4)	Metal Drain (φ150mm G.I. Drain Pipe)	m	965.00	21	64	15
	PART G - DRAINAGE AND SLOPE PROTECTION STRUCTURES					
500(1)a	Reinforced Concrete Pipe Culvert, 610mmφ (Extra. Str.)	m	2,720.00	57	28	16
500(1)b	Reinforced Concrete Pipe Culvert, 910mmφ (Extra. Str.)	m	6,630.00	57	28	16
500(1)c	Reinforced Concrete Pipe Culvert, 1070mmφ (Extra. Str.)	m	10,000.00	57	28	15
500(1)d	Reinforced Concrete Pipe Culvert, 1220mmφ (Extra. Str.)	m	10,600.00	57	28	15
500(1)e	Reinforced Concrete Pipe Culvert, 1520mmφ (Extra. Str.)	m	18,800.00	57	28	15
500(3)a1	Reinforced Concrete Box Culvert 1-1.5m x 1.5m	m	16,400.00	42	43	15
500(3)a2	Reinforced Concrete Box Culvert 2-1.5m x 1.5m	m	26,100.00	42	43	15
500(3)a3	Reinforced Concrete Box Culvert 3-1.5m x 1.5m	m	36,500.00	42	43	15
500(3)b1	Reinforced Concrete Box Culvert 1-2.4m x 2.4m	m	27,700.00	42	43	15
500(3)b2	Reinforced Concrete Box Culvert 2-2.4m x 2.4m	m	47,300.00	42	43	15
500(3)b3	Reinforced Concrete Box Culvert 3-2.4m x 2.4m	m	67,100.00	42	43	15
500(3)c1	Reinforced Concrete Box Culvert 1-3.0m x 3.0m	m	37,900.00	42	43	15
500(3)c2	Reinforced Concrete Box Culvert 2-3.0m x 3.0m	m	66,600.00	42	43	15
500(3)c3	Reinforced Concrete Box Culvert 3-3.0m x 3.0m	m	93,900.00	42	43	15
500(3)d1	Reinforced Concrete Box Culvert 2-4.0m x 2.5m	m	81,400.00	42	43	15
502(2)b1	Reinforced Concrete Headwall,Wingwall,Bottom Slab, 1-910mmφ RCPC	ea.	19,300.00	28	57	15
502(2)b2	Reinforced Concrete Headwall,Wingwall,Bottom Slab, 2-910mmφ RCPC	ea.	25,900.00	28	57	15

TABLE 14.8-4 UNIT COST OF MAJOR CONSTRUCTION ITEM (2/2)

Item No.	Description	Unit	Unit Cost (Peso)	Component(%)		
				Foreign	Local	Tax
500(3)b3	Reinforced Concrete Box Culvert 3-2.4m x 2.4m	m	67,100.00	42	43	15
500(3)c1	Reinforced Concrete Box Culvert 1-3.0m x 3.0m	m	37,900.00	42	43	15
500(3)c2	Reinforced Concrete Box Culvert 2-3.0m x 3.0m	m	66,600.00	42	43	15
500(3)c3	Reinforced Concrete Box Culvert 3-3.0m x 3.0m	m	93,900.00	42	43	15
500(3)d1	Reinforced Concrete Box Culvert 2-4.0m x 2.5m	m	81,400.00	42	43	15
502(2)b1	Reinforced Concrete Headwall,Wingwall,Bottom Slab, 1-910mmφ RCPC	ea.	19,300.00	28	57	15
502(2)b2	Reinforced Concrete Headwall,Wingwall,Bottom Slab, 2-910mmφ RCPC	ea.	25,900.00	28	57	15
502(2)c1	Reinforced Concrete Headwall,Wingwall,Bottom Slab, 1-1070mmφ RCPC	ea.	22,000.00	30	55	15
502(2)c2	Reinforced Concrete Headwall,Wingwall,Bottom Slab, 2-1070mmφ RCPC	ea.	32,100.00	30	55	15
502(2)d1	Reinforced Concrete Headwall,Wingwall,Bottom Slab, 1-1220mmφ RCPC	ea.	27,400.00	31	54	15
502(2)d2	Reinforced Concrete Headwall,Wingwall,Bottom Slab, 2-1220mmφ RCPC	ea.	38,600.00	31	54	15
502(2)f1	Reinforced Concrete Headwall,Wingwall,Bottom Slab, 1-1520mmφ RCPC	ea.	37,300.00	33	52	15
502(2)f2	Reinforced Concrete Headwall,Wingwall,Bottom Slab, 2-1520mmφ RCPC	ea.	53,200.00	33	52	15
502(10)a1	Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 1-1.5m x 1.5m	ea.	51,200.00	44	41	15
502(10)a2	Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 2-1.5m x 1.5m	ea.	61,400.00	45	40	15
502(10)a3	Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 3-1.5m x 1.5m	ea.	72,700.00	45	40	15
502(10)b1	Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 1-2.4m x 2.4m	ea.	104,000.00	44	41	15
502(10)b2	Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 2-2.4m x 2.4m	ea.	126,000.00	45	40	15
502(10)b3	Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 3-2.4m x 2.4m	ea.	145,000.00	45	40	15
502(10)c1	Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 1-3.0m x 3.0m	ea.	152,000.00	44	41	15
502(10)c2	Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 2-3.0m x 3.0m	ea.	183,000.00	45	40	15
502(10)c3	Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 3-3.0m x 3.0m	ea.	207,000.00	45	40	15
502(10)d1	Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 2-4.0m x 2.5m	ea.	203,000.00	45	40	15
502(3)a1	Catch Basin for RCPC 1-φ610	ea.	16,800.00	38	47	15
502(3)b1	Catch Basin for RCPC 1-φ910	ea.	24,700.00	38	47	15
502(3)b2	Catch Basin for RCPC 2-φ910		38,700.00	39	46	15
502(3)c1	Catch Basin for RCPC 1-φ1070	ea.	28,900.00	38	47	15
502(3)c2	Catch Basin for RCPC 2-φ1070		46,500.00	39	46	15
502(3)d1	Catch Basin for RCPC 1-φ1220	ea.	37,800.00	38	47	15
502(3)d2	Catch Basin for RCPC 2-φ1220		62,300.00	39	46	15
502(3)e1	Catch Basin for RCPC 1-φ1520	ea.	48,400.00	38	47	15
502(3)e2	Catch Basin for RCPC 2-φ1520		82,200.00	39	46	15
504(5)	Grouted Riprap, Class "A"	m3	2,250.00	48	36	15
505(1)	Stone Masonry	m3	2,360.00	55	30	15
505(2)	Gravity Type Retaining Wall(H=1.0～1.5m)	m3	5,560.00	44	41	15
507	Steel Sheet Pile (85×400×8mm), Furnished and Driven	m	1,430.00	55	30	15
509	Gabions	m3	3,510.00	51	34	15
510	Rubble Concrete Slope Protection, t = 350mm	m3	2,010.00	51	34	15
511(a)	Concrete Side Dicth (0.5 x 0.5)	m	2,270.00	38	47	15
	PART H - MISCELLANEOUS STRUCTURES					
600(1)a	Concrete Curb, Type A (200x450mm)	m	640.00	58	27	15
600(1)c	Concrete Curb for Edge of Sidewalk(200*500)	m	760.00	58	27	15
600(3)a	Combination Concrete Curb & Gutter/Side Strip, Type A (675x364mm)	m	1,095.00	58	27	15
602(2)	Maintenance marker post	ea.	1,070.00	24	64	12
602(3)	Kilometer post	ea.	1,490.00	24	64	12
602(4)	Guide post	ea.	1,250.00	24	64	12
603(3)a	Metal Guardrail	m	2,300.00	58	27	15
610	Sodding	m2	182.00	58	27	15
611(1)	Trees (Furnishing and Transplanting)	ea.	1,220.00	58	27	15
SPL620(1)	Traffic Signal (3-way intersection)	ea.	2,024,400.00	65	20	15
SPL620(2)	Traffic Signal (4-way intersection)	ea.	2,205,700.00	65	20	15
	Other Miscellaneous Fascilities (Road Signs, Pavement Stud, etc.)	km	1,500,000.00	70	20	10
	PART A,B - ENGINEER'S FACILITY AND MOBILIZATION / DEMOBILIZATION					
	(5% of PART C to H)					
	CONTINGENCY					
	(10% of PART A to H)					

14.8.2 ROW Acquisition and Compensation Cost (Iloilo R-4)

1) Unit Price

Unit prices for road right-of-way acquisition and compensation were obtained from respective municipality/city Assessor's Offices and regional office of BIR. The Republic Act 8974 provides that compensation cost for land shall be BIR zonal value which is normally far lower than prevailing market prices. Since the agricultural land around the study area has strong potential demand for residential use, price of the land currently transacted around area is fairly higher than zonal value. For the purpose of practical cost estimate for the project, prevailing market prices are adopted in this study.

Prices of structures are determined based on schedule of prices available in the Assessor's Office. The Unit prices of structures are set without any depreciation to obtain replacement cost of structures. Unit prices are summarized in **Table 14.8-6.**

TABLE 14.8-6 UNIT PRICES OF LAND ACQUISITION AND COMPENSATION

Item	Zonal Value Assessed Value (P/m^2)	Prevailing Market Price (P/m^2)
Land Acquisition	Zonal Value	
Residential	1,200 - 2,000	2,000 - 3,500
Rice Filed	25 - 32	250
Fruit Orchard	3.5 – 9.0	100
Structures (floor area in m^2	Assessed Value	
Concrete House	6,000 – 6,300	
Semi Concrete House	4,800 – 5,000	
Light Material House	3,000 – 3,500	

2) Compensation Cost

Land area to be acquired by present land uses were computed based on aerial photo-map and verified by field survey. Number of houses by materials was computed based on field investigations. Summary of compensation is presented in **Table 14.8-7.** Detailed cist estimate is presented in Appendix 14.8-2.

TABLE 14.8-7 UNIT PRICES OF LAND ACQUISITION AND COMPENSATION

Item	Quantity	Amount (Million ₱)
Land Acquisition	355,800 m^2	118.7
Residential	13,850	34.2
Rice Filed	323,200	80.8
Fruit Tree	18,750	3.7
Structures	31 structures	4.7
Other compensation		3.5
Total		126.9

14.8.3 Detailed Engineering and Construction Supervision Cost

Engineering services cost for a detailed design ranges form 3 to 5% of construction cost, and a construction supervision from 5 to 9%. An average of 4% of construction cost was adopted for the detailed design and 8 % for the construction supervision for this project.

TABLE 14.8-8 ENGINEERING SERVICE COST (Million Peso)

Unit: Million Pesos

	Component			TOTAL
	Foreign	Local	Tax	
Detailed Design	11.5 (55%)	7.3 (35%)	2.1 (10%)	20.9 (100%)
Construction Supervision	23.0 (55%)	14.7 (35%)	4.2 (10%)	41.9 (100%)
Total	**34.5 (55%)**	**22.0 (35%)**	**6.3 (10%)**	**62.8 (100%)**

14. 8.4 Summary of Project Cost

Summary of Project Cost is shown in Table 14.8-9.

TABLE 14.8-9 SUMMARY OF PROJECT COST

Unit: Million Pesos

	Component			TOTAL
	Foreign	Local	Tax	
Detailed Design	11.5	7.3	2.1	20.9
Row / Resettlement	-	114.2	12.7	126.9
Construction	287.9	153.6	82.0	523.5
Construction Supervision	23.0	14.7	4.2	41.9
Total	**322.4**	**289.8**	**101.0**	**713.2**

14.8.5 Maintenance Cost for R-4 Bypass

(1) Road and Bridge Conditions

Road and bridge conditions and EMK factors are determined as follows.

Item	Conditions	EMK Factor
Road Length (km)	11.6	-
Traveled Way Width (m): AC	2-lane < 7.5m	1.0
Bridge Length (total) (l.m)	276	0.01
AADT (2016)	8,400	1.08
Opening Year	2017	

Note: AADT is estimated by PCU divided by 1.3. EMK factor is limited at 1.38 for 2-lane and 1.48 for 4-lane road. Total EMK=Road Length (km) x (Width F. x Surface Type F.) + Bridge Length x (Bridge F.)

(2) Base Cost

See Chapter 12.8.5

(3) Maintenance Cost Estimate

Maintenance cost is estimated based on EMK and base costs of routine and periodic maintenance, and shown in Table 14.8-10.

TABLE 14.8-10 MAINTENANCE COST OF R - 4 BYPASS

	Calendar	Factors			EMK	Financial Cost (x1000Peso)			Economic Cost (x1000Peso)		
	Year	ADDT	Lane	Bridge	(km)	Routine	Periodic	Total	Routine	Periodic	Total
1	2017	1.09	1.00	2.76	15.40	1,461	0	1,461	1,104	0	1,104
2	2018	1.10	1.00	2.76	15.48	1,468	0	1,468	1,110	0	1,110
3	2019	1.11	1.00	2.76	15.56	1,476	0	1,476	1,116	0	1,116
4	2020	1.11	1.00	2.76	15.65	1,484	0	1,484	1,122	0	1,122
5	2021	1.12	1.00	2.76	15.73	1,492	0	1,492	1,128	0	1,128
6	2022	1.13	1.00	2.76	15.81	1,500	0	1,500	1,134	0	1,134
7	2023	1.13	1.00	2.76	15.90	1,508	0	1,508	1,140	0	1,140
8	2024	1.14	1.00	2.76	15.98	1,516	0	1,516	1,146	0	1,146
9	2025	1.15	1.00	2.76	16.06	1,523	0	1,523	1,152	0	1,152
10	2026	1.16	1.00	2.76	16.14	1,531	0	1,531	1,158	0	1,158
11	2027	1.16	1.00	2.76	16.23	1,539	40,149	41,688	1,164	31,611	32,774
12	2028	1.17	1.00	2.76	16.31	1,547	0	1,547	1,170	0	1,170
13	2029	1.18	1.00	2.76	16.39	1,555	0	1,555	1,175	0	1,175
14	2030	1.18	1.00	2.76	16.48	1,563	0	1,563	1,181	0	1,181
15	2031	1.19	1.00	2.76	16.56	1,571	0	1,571	1,187	0	1,187
16	2032	1.20	1.00	2.76	16.64	1,578	0	1,578	1,193	0	1,193
17	2033	1.21	1.00	2.76	16.72	1,586	0	1,586	1,199	0	1,199
18	2034	1.21	1.00	2.76	16.81	1,594	0	1,594	1,205	0	1,205
19	2035	1.22	1.00	2.76	16.89	1,602	0	1,602	1,211	0	1,211
20	2036	1.23	1.00	2.76	16.97	1,610	0	1,610	1,217	0	1,217

14.9 ENVIRONMENTAL IMPACT ASSESSMENT

14.9.1 General Characteristics of the Project Road

The project road is proposed to be constructed parallel to existing Iloilo-Roxas Road as a bypass road where most land use is rice field with spotted residential areas at intersection of feeder road and creeks. Groves of fruit trees not for commercial purposes are observed along creeks and minor tributaries. The proposed project is a construction of new two-lane highway named "R-4 Bypass Road". Required right-of-way (ROW) is estimated at 30m. Five (5) bridges with total length of 280m are proposed to be constructed over major creeks and tributaries.

The Initial Environmental Examination conducted in July 2003 reported that there were no significant environmentally critical spots, such as historical structures, religious institutions and other environmentally critical areas, along the proposed road alignment.

14.9.2 Social Acceptability

The criterion provided by the DENR DAO 96-37[1] for evaluating the social acceptability of a project has been considered during the course of the study to a certain extent. **Table 14.9-1** shows the action taken to ascertain social acceptability at the feasibility study level.

TABLE 14.9-1 ACTION TAKEN BY THE STUDY TEAM TO ASCERTAIN SOCIAL ACCEPTABILITY

Criteria	Action Taken
1) Consistency with land use plan	. Provincial and municipal land use plans and infrastructure development plan are obtained and examined. The proposed widening project is confirmed with the local infrastructure development plan.
2) Public Participation	. Officials from regional offices of national government (NEDA, DENR, DOTC), local government units and private sector were consulted during selection the project road and its improvement level. • Public consultation meeting involving the
3) Promotion of Social Equity	. Preferential hiring of local labor and provision of alternative means of livelihood are included in this report as mitigating and enhancement measures to address adverse socio-economic impacts.
4) Mitigating and Enhancement Measures	• Included in **Table 14.9-4**
5) Involve Women and Vulnerable Groups	• Active participation of women and vulnerable groups, such as informal settlers and tenants/renters are considered as mitigating and enhancement measures to address adverse socio-economic impacts.
6) Environmental Monitoring and Evaluation	• Included in **Table 14.9-5**

[1] Department of Environment and Natural Resources, Administrative Order No.37, Series 1996. This Administrative Order provides the detailed procedures for the EIA system.

14.9.3 Data Gathering for Baseline Information

The parameters of baseline data needed to establish historical trends and present condition of the physical, biological and socio-economic environment of project area were agreed during Level I Scoping Meeting (Technical Scoping) with EMB[2] held at the EMB conference room. Based on the agreed parameters, the collection of baseline information has been carried out in February 2004. Result of the baseline survey is discussed in the next section.

14.9.4 Description of Existing Environmental Condition

1) Physical Environment

Climate

The nearest synoptic meteorological station in the project area is located in Iloilo City. The Climatic characteristics of the project road are identical to Circumferential Road (C-1) as discussed in **Section 12.9.4.**

Terrain

Terrain of the project area is generally flat (0-2%). The elevation of the road varies between 5 and 12m without any abrupt changes in terrain condition. There are several creeks cross the proposed alignment that require construction of bridges. Jaro River Floodway will be constructed at the beginning of the road that is expected to lessen overflow from Jaro River. Elevation of new road is designed 2 to 3m higher than exiting ground level to avoid flooding during rainy season, hence entire stretch of the road is embankment.

Air Quality

One sampling site for ambient air quality measurement was established in Barangay Magancina, Municipality of Sta. Barbara for the measurement of the ambient air quality specifically for total suspended particulates (TSP). Results of the sampling activity indicate that the concentration recorded was only 76.0 micrograms per normal cubic meter. This concentration is way below the standard established by the Department of Environment and Natural Resources at 230.0 micrograms per normal cubic meter.

Noise Level

Noise level measurements were done also at Barangay Magancina, Sta. Barbara using a Noise Level Meter. Readings were taken for evening, nighttime, morning, and daytime. The average readings taken at the time of sampling is as follows:

	Time		Reading	DENR Standard
Morning	(5:00 AM – 9:00 AM)	:	48.6 db	50
Daytime	(9:00 AM – 6:00 PM)	:	57.6 db	55
Evening	(6:00 PM – 10:00 PM)	:	57.6 db	50
Nighttime	(10:00 PM – 5:00 AM)	:	57.6 db	45

By comparing with the standards established for the purpose, all readings, except in the morning, are above standards, meaning that the ambient noise level in the area is already high.

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[2] EMB: Environmental Management Bureau of DENR

Land Use

Land use along project road is mainly agricultural composed of rice field, coconut orchard. Some residential areas are spotted at intersection of exiting feeder roads, creeks and tributaries. There are no major commercial establishments along the project road alignment and no development plan is proposed.

2) Biological Environment

The Iloilo-Roxas Road Bypass (B-2) traverses mainly rice fields, idle lands, and swamps including minor tributaries (creeks and a river system). Thick vegetation mainly bamboos (*Bambusa blumeana*) abound swampy areas and creeks particularly near the Zarraga area. Three major vegetation areas (bamboo thickets) can be seen on aerial photos and one was selected for extensive plant and animal identification and assessment at coordinates 455696 E and 119646 N, Barangay Bitaog, Zarraga, Iloilo. Along the highway passing creeks and streams, one can observed Nipa palms (*Nypa fruticans*) and "Buri palms" (*Corypha elata*) interspersed with coconut palms (*Cocos nucifera*) which are characteristics of coastal areas. The rest of the vegetation are cogonal (*Imperata cylindracea* and *Saccharum spontaneum* of the Grass Family) and various weeds of the family Poaceae, Cyperaceae, Amaranthaceae, Compositae, Euphorbiaceae, Leguminosae, and Sapindaceae thriving on rice paddies and idle lands.

A sampling station was established on coordinates 455696 E and 119646 N with altitude of 30 masl. The area is characterized by bamboos (*Bambusa blumeana*) and other palms (*Nypa fruticans*, *Licuala sp.* and *Corypha elata*) and secondary growth trees mainly of *Nauclea orientalis* locally known as "Bangkal" and *Clerodendron sp.* A small swampy area south of the station can be seen with Ipomoea reptans (swamp cabbage). The five to ten year old woody trees and other shrubs inside the thickets had been cut down and have grown tall branches after two to three years particularly the dominant *Nauclea orientalis* (Bangkal) and several species of *Leea guineensis*, *Adenanthera intermedia*, *Clerodendron quadriloculare*, *Aleurites moluccana*, *Premna odorata*, *Ficus pseudopalma*, *Alstonia macrophyla*, *Callicarpa cana*, *Barringtonia asiatica*, *Syziygium cuminii*, *Syzigium samarengense*, *Diospyros discolor*, and *Morinda sp.* These are remnants and characteristics of secondary growth forests.

As one enters the bamboo thickets, one can hear the chirping of the birds mainly thrushes, warblers, and robins (*Copsychus saulari*, *Gerygone sp.*, and *Cisticola exilis*). The rice fields are frequented by migratory birds such as the common egret (*Casmerodicus albus*) locally known as "tulabong". Several species of butterflies can be found and dozens of insects (butterflies, dragonflies, moths and bees), spiders, and other species of arthropods, mollusk, and nematodes. Amphibians and reptiles such as *Varanus salvator* commonly known as "Halo" and *Lepinia quadrivitatum* or locally known as "Tambalihan"), toads (*Bufo marinus*), frogs (*Rana erythraea* and *R. everetti*) and snakes (*Dendrelaphis caudolineatus*, *Chrysopelea paradisi*) can still be found in the area.

The edge of the bamboo thickets are lined up with several stands of *Ehretia micropyhlla* (Tsaang Gubat), *Macaranga tanarius*, *Jasminium bifariaum* (Wild Sampaguita), *Antidesma bunius*, *Justicia gendarusa*, *Indigogera suffroticosa*, *Ervatamia divaricata*, *Pittosporum pentadrum*, *Quisqualis indica*, and *Phyllanthus niruri*. These are still characteristics of secondary growth forest. Near the rice paddies are weeds and grasses such as *Agrostis elmeri*, *Chloris barbata*, Paspalum conjugatum, Imperata cylindrace, *Eleusine indica*, and *Dimeria ornithopoda*. These form the buffer zone to the rice fields.

No ferns, gymnosperms, lichens, bryophytes and other lower plants are seen in the area.

Aquatic Fresh/Marine Environment

There are no local account of freshwater fish present in the Calajunan River bordering Barangay Pakiad, Municipality of Oton with Barangay Calajunan, Mandurriao, Iloilo City. But it has to be established preferably before the start of construction. But it is unlikely that there could be species of importance considering that it is too shallow when observed at the time of the field work.

3) Socio-Economic Environment

Demography

Settlement and Population Distribution

The settlement and population distribution of the province as well as those of the project-hosting local government units typically follows either along roads or rivers and coasts where transportation is easily accessible and convenient. In the case of the Iloilo Roxas Road Bypass Project, the settlements are still observed clustered along intersections of existing roads. The road once constructed will exhibit the same characteristics especially so if no regulatory interventions are set in place.

Population and Population Growth Rate

The population growth rates of these local government units vary from a very high percentage of 4.06% (Leganes) to a very high percentage of 0.8 (Municipality of Zarraga). With the exception of the Municipality of Zarraga, these growth rates are higher than that of the region and the Province of Iloilo.

TABLE 14.9-2 POPULATION AND POPULATION GROWTH RATE

Region/ Province/ Iloilo City/LGU	Total Population		HH Population	No. of HH	Average HH Size	Annual Growth Rate*	Population Density (persons/ha)
	2000	1995	2000	2000	2000	1995-2000	2000
Region VI	6,208,733	5,776,938		1,211,647	5.12	1.56	3.07
Iloilo Province	1,559,182	1,415,022		298,593	5.22	2.10	3.34
Iloilo City	365,820	334,539	363,667	72,218	5.04	1.93	52.2
Leganes	23,475	19,235	23,473	4,533	5.18	4.06	7.29
New Lucena	19,490	16,873	19,490	3,744	5.21	2.93	4.4
Zarraga	18,252	17,519	18,243	3,507	5.20	0.823	2.3

Sources: Socio-Economic Profiles, Census in Housing and Population 1995 and 2000

Number of Households and Household Size

The comparative number of households and household sizes are shown in **Table 14.9-2** above. Of the local government units affected by the project, Iloilo City has the most number of households (72,218) followed by the Municipality of Leganes (4,533).

Population Densities

The comparative population densities are shown in **Table 14.9-2**. Of the local government units traversed by the project, Iloilo City is the most dense (52.2 persons/hectare), while the Municipality of Zarraga is the least (2.3 persons per hectare).

Literacy and Highest Educational Attainment

The simple literacy rate for Iloilo City was 98.62% for both sexes for ages 10-64 years old. Simple literacy refers to the ability of a person to read and write with understanding of a simple message in any language or dialect. The functional literacy[3] rate was 86.94 % for both sexes in 1994.

Main Sources of Income

Most business establishments are found in Iloilo City where there are 4,072 wholesalers and retailers, 1,726 community, social and personal service providers, 1,050 financing, insurance, real estate and business companies, and 10 agriculture, fishery and forestry companies and a water company. Tourism is a major industry in Iloilo Province. Hotels and motels can be found in Iloilo City, which registered a tourist arrival figure of 570,898 in 2000. Among the attractions in Iloilo City include old churches, museums, and old houses.

Employment Status

By working population, Iloilo City had a working age group figure that ranged from 244,000 to 248,000 in 2002. Its labor force participation rate for that year was from 58.6 to 65.8 while its employment rate ranged from 85.8 to 88.1%. In the same year, the Province of Iloilo had a working age group between 1,017,000 to 1,033,000 with an employment rate of between 81 to 91.9%. For the year 2000, its total dependency ratio was computed at 36%.

Health and Other Social Services/Utilities

Characteristics of health and other social services/utilities along the project road are identical to Circumferential Road (C-1) as discussed in **Section 12.9.4**.

14.9.5 Perception Survey

The Perception Survey was conducted in the twelve (12) barangays that will be traversed by the proposed road. The respondents were disaggregated into two major identification (unless specified otherwise in the rest of the tables): (1) respondents within the barangays traversed by the alignment that are directly affected, and (2) respondents within the barangays that are not directly affected by the alignment.

A total of 300 respondents were identified during the survey. Most of these respondents (93.3%) were randomly selected within the barangays while the rest (6.7%) were directly selected within the barangay since they are most likely along the project alignment.

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[3] Functional literacy refers to a significantly higher level of literacy which includes not only reading and writing skills but also numerical skills (1994 Functional Literacy, Education and Mass Media Survey NSO-DECS).

TABLE 14.9-3 DISTRIBUTION OF RESPONDENTS BY BARANGAY

City/Barangay	Directly Affected		Indirectly Affected		Total	
	Number	%	Number	%	Number	%
Iloilo City						
Buhang	0	0	50	17.9	50	16.7
Camalig	0	0	35	12.5	35	11.7
Lanit	6	30.0	20	7.1	26	8.7
Sub-total	**6**	**30.0**	**105**	**37.5**	**111**	**37.1**
Municipality of Leganes						
Guihaman	1	5.0	29	10.3	30	10.0
San Vicente	0	0	22	7.9	22	7.3
Calaboa	0	0	24	8.6	24	8.0
Sub-total	**1**	**5.0**	**75**	**26.8**	**76**	**25.3**
Sta. Barbara						
Magancina	2	10.0	20	7.1	22	7.3
Tuburan	1	5.0	8	2.9	9	3.0
Bitaog-Taytay	3	15.0	12	4.3	15	5.0
Sub-total	**6**	**30.0**	**40**	**14.3**	**46**	**15.3**
New Lucena						
Pasil	7	35.0	20	7.1	27	9.0
Jelicuon Oeste	0	0	20	7.1	20	6.7
Sub-total	**7**	**35.0**	**40**	**14.3**	**47**	**15.7**
Municipality of Zarraga						
Inagdangan Norte	0	0	20	7.1	20	6.7
Sub-total	**0**	**0**	**20**	**7.1**	**20**	**6.7**
Total	**20**	**100.0**	**280**	**100.0**	**300**	**100.0**
% Distribution		6.7		93.3	100	

1) Awareness about the Project

Four-fifths (80.3%) of the total number of respondents already heard of the plan for the implementation of the project. The percentage of directly affected respondents who have already heard of the project is very high (100%) and the highest can be found in Barangay Pasil.

More than three-fourths (78.3%) of the respondents heard about the project just recently. But more than a tenth (13.3%) have already heard about it 1 or 2 years ago.

2) Agreement for the Project

More than four-fifths (87.3%) of the respondents are in favor of the implementation of the project. More than a third (35.7%) said that the project will offer safe and efficient transport of people, goods and services. More than a fifth (23.3%) also said that the project will give way to development of the area and the province as a whole. More than a fifth (23%) did not provide any response.

3) Effect on Source of Income

About three-fourths (74.7%) of the respondents said that their livelihood will not be affected. Less than a fifth (16.7%) said that there will be loss of livelihood, employment and property.

4) Good Things Seen about the Project

More than half (51.3%) of the respondents believed that with the project, there will be easy and fast access to the region while more than a tenth (12.3%) said that the city or barangay will improve or develop. About a fifth (19%) said that there will be also benefit for the majority including opening of new business. About a tenth on the other hand said that there will be less traffic in the main highway.

5) Benefits Expected from the Project

More than two-thirds (69.0%) of the total number of respondents said that travel time will become shorter (including faster and convenient transport of people and goods). According to more than a tenth (16.0%) of the respondents, there will be also opening of new industries along the alignment and consequent offer of employment. The rest did not provide any response or comment or do not know at all what to expect from the project.

6) Bad Things about the Project

More than a third (37.3%) of the total number of respondents said that there will be loss of livelihood/relocation and compensation problem of affected families. On the other hand, more than a fifth (27.7%) said that there will be no bad things that can be seen resulting from the project. About a tenth (10.7%) said that there will be increase in noise and air pollution level. Also less than a tenth (9.7%) said that fast moving vehicles may cause accidents. The rest are spread to other responses such as strangers will be coming into the barangays (1.3%); disruption of regular activities of barangay residents (2%); and increased crime rate (0.3%).

7) Problems Foreseen for the Community as a Whole

More than a fifth (27.7%) of the respondents believe that the project will not bring any problems to the community as a whole. But more than a fifth (20.7%) said that there will be loss of properties/livelihood problems (lack of jobs). In addition, more than a tenth (15%) said that there will be increased pollution/problem of flooding/heavy erosion and landslide.

14.9.6 Identified Impacts and Mitigation Measures

The predicted environmental impacts, along with the mitigation (for negative impacts) and enhancement (for positive impacts) measures are presented in **Table 14.9-4**, Impacts and Mitigation/Enhancement Matrix.

14.9.7 Environmental Management and Monitoring Plan

The Environmental Management and Monitoring Plan is presented in **Table 14.9-5**.

14.9.8 Resettlement Plan for Affected People

The survey on Resettlement Plan for affected people is currently being undertaken. Status of survey is discussed in **Section 14.10**.

TABLE 14.9-4 SUMMARY MATRIX OF IMPACTS AND MITIGATION AND ENHANCEMENT MEASURES (1/3)

Impacts	Type		Mitigation/Enhancement Measures
	Negative	Positive	
CONSTRUCTION PHASE			
Physical Environment			
Air Quality and Noise Levels			
Increase in levels of Total Suspended Particulates (TSP) such as dust, dirt, and oil soot.	Low		Use of water trucks equipped with horizontal spray jets located on the aft end and perpendicular to the direction of travel.
Increase in exhaust gas emission levels due to the operation of various heavy equipment and vehicles.	Low		Regular maintenance of heavy equipment and other smoke emitting machinery must be strictly complied with.
Increase in noise levels and vibration due to the operation of heavy equipment and vehicles.	Low		Use of mufflers and appropriate noise suppressors for heavy equipment and machinery.
			Scheduling of high noise generating activities during the daytime.
Temporary stockpiles of excavated and surplus materials as well as fill and embankment materials may also add to the present TSP levels.	Low		Excavate unsuitable materials and contraction spoils will be regularly hauled and disposed to DENR approved disposal site.
			Temporary stockpiles of fill and embankment materials will be covered with tarpaulin canvass or sack materials to prevent re-suspension of particulate matters.
Water Quality			
Increase in the amount of suspended solids of receiving natural water ways due to the deposition of high volumes of exposed, loose sediments transported by surface run-off.	Low		Since wetlands have the natural ability to filter and purify water, some areas, particularly those which have low agricultural productivity can be used as natural treatment facilities.
Possible contamination of surface and ground water due to borrow pits and quarries and other excavation activities.	Low		Contamination of surface and ground water due to borrow pits and quarries and other excavation activities may be minimized by carefully studying the substances profiles before any disturbance is started.
Increase in the bacteriological content of local surface water bodies due to domestic wastewater generated by construction personnel. This may eventually transmit diseases.	Low		Sanitation facilities should be provided by the Contractor to ensure that local water bodies are not polluted.
Washing of construction vehicles and other mobile equipment such as cement mixers, chutes, and related equipment will pollute the surface waters.	Low		Washing of construction vehicles and other mobile equipment along the waterways should be prohibited.
Improper storage and handling of chemicals such as lubricants, fuel, paint, and other solutions for routine vehicular operation may contaminate local surface and ground water.	Low		Chemicals such as lubricants, fuel, paint, and other solutions for routine vehicular operation must be handled with care and properly stored.
Biological			
As a result of an increase in noise levels and vibration, natural wildlife activates such as mating, nesting, and migratory patterns, particularly of birds will be disrupted/disturbed.	Low		Disruption/disturbance to natural wildlife activities such as mating, nesting, and migratory patterns is inevitable but reversible.
As a result of an increased turbidity of surface waters, the sediments will block light penetration into the rivers and creeks and inhibit both natural and algal photosynthesis and visibility of aquatic fauna required for location of food.	Low		Increased turbidity of surface waters is a short term and reversible type of adverse impact.

TABLE 14.9-4 SUMMARY MATRIX OF IMPACTS AND MITIGATION AND ENHANCEMENT MEASURES (2/3)

Impacts	Type		Mitigation/Enhancement Measures
	Negative	Positive	
Socio-Economic Environment			
Loss of Structure			
Number structures affected: 41	Moderate		Government must ensure that the affected structures are properly compensated based on 'Replacement Cost" method as provided by laws and regulations.
Loss of Land			
Ricefield 323,200 m^2 Residential 13,850 Fruit Tree 18,750 **Total 355,800 m^2**	High		The affected land shall be compensated with fair market value.
Loss of Other Improvement			
- Trees and other perennials - Irrigation canals - Other public structures	Moderate		Trees and other perennials with commercial values shall be compensated based on schedule of prices available in municipal/city assessor's office. Other structures shall be compensated based on "Replacement Cost" method.
Agricultural Tenants and Informal Settlers			
Agricultural tenants residing within the proposed ROW will be displaced but no place to settle.	Moderate		Government, through the help of the LGUs, must provide a sustainable resettlement area with all the basic social services such as water supply, electricity, health facilities, and means of transportation and communications.
Some of the farmers rely on planting rice as their means of livelihood. Damage to or loss of these agricultural lands would surely hamper their capacity to support their family.	Moderate		Government must implement a sound Social Development Program (SDP) that will ensure that affected agricultural tenants get compensated for the disturbance to their normal lives.
			Government must relocate tenant-farmers at a resettlement site or area they prefer where they can access to their agricultural land.
Limited Accessibility to Farmlands			
During the construction phase, farmers may experience temporal difficulty in terms of accessibility to the land they are cultivating.	Low		Contractors must provide a safe alternative route to farmers who need to cross the land they are cultivating (during and after construction phase).
Generation of temporary employment opportunities.		Moderate	Contractor must give priority to available local labor.

TABLE 14.9-4 SUMMARY MATRIX OF IMPACTS AND MITIGATION AND ENHANCEMENT MEASURES (3/3)

Impacts	Type		Mitigation/Enhancement Measures
	Negative	Positive	
OPERATIONAL PHASE			
Physical Environment			
Increase in vehicular gaseous emissions and noise level along the highway as a result of increase in vehicles due to increase in number of lanes.	Moderate		To improve air quality and noise level along the highway, LTO shall regulate operation of vehicles that emit smokes and make noise beyond limit provided by law. LGUs shall enforce strict traffic regulations to regulate speeding vehicles.
Socio-Economic Environment			
Means of livelihood of the dislocated people may not be restored properly as planned in Resettlement Plan.	Low		External and internal monitoring shall be regularly conducted to verify status of income restoration of dislocated people.
Improved accessibility to basic social services such as schools, hospitals, markets, churches, and communication facilities.		Moderate	DPWH must regularly maintain the bypass sections.
			DPWH must improve/construct access roads to the road so that more people can have better access to basic social services.
Reduction of transport costs due to improved traffic flow.		Moderate	DPWH must regularly maintain the road.
Better flow of industrial, commercial, and agricultural commodities.		Moderate	DPWH must regularly maintain the road to ensure continuous, undisrupted flow of agricultural products.
Urbanization and commercial development of non-agricultural and non-prime agricultural areas.		Moderate	Concerned LGUs must work hard towards achieving the development plans.
Increase in land values of areas traversed by and in the vicinity of the bypass sections.		Moderate	Landowners will benefit from increase of land values in areas traversed by or near the bypass sections.
Increase in employment opportunities as a result of commercial development.		Moderate	Government must ensure that qualified measures of the host community are given priority in the hiring of local labor force.

TABLE 14.9-5 ENVIRONMENTAL MANAGEMENT AND MONITORING MATRIX (ILOILO, B-2)

Parameters to be Monitored	Stations to be Monitored	Frequency of Monitoring	Methods of Analysis/Execution	DENR Standard	Implementor
CONSTRUCTION PHASE					
PHYSICAL					
Water quality BOD, TSS, and oil and grease of surface water	All major bridges and RCBC sites	Quarterly during construction	Standard EMPASS-EQD water quality analysis	Class "C" BOD - <10 mg/L TSS - <30 mg/L increase Oil & Grease - <3mg/L	DENR-Region 6
Air quality TSP, NO_2, and SO_2	Barangay Magancina, Municipality of Sta. Barbara	Quarterly during construction	Standard EMPASS-WQD air quality analysis	TSP: 430; NO_2: 470; SO_2: 375	DENR-Region 6
BIOLOGICAL					
Tree cutting	Entire alignment where there are trees to be cut	Daily	Monitoring team must ensure that tree cutting is limited within the required ROW only	N. A.	MMT
Waste management and disposal	All portions with excavation and fill activities	Weekly during construction	Site inspection	Based on EMP	DENR-Region 6
SOCIAL					
Relocation of project affected families	All stretch of the project road and relocation site	Monthly	Monitoring team must ensure that affected families are properly compensated and their means of livelihood is maintained or restored	Based on RAP	MRIC External Monitoring Agent
Compliance of Contractor to occupational health and safety rules and regulation	All construction areas	Weekly	Site inspection of work areas including sanitation facilities	Based on EMP	MMT
Road Safety	Signalized intersections, merging lanes	Quarterly	Site inspection	Based on DPWH Standard Operating Procedures	DPWH
OPERATIONAL PHASE					
BIOLOGICAL					
Tree planting and its maintenance on both sides of the highway	Designated environmental belts/zones	Monthly	Site inspection	Based on EMP	DENR-Region 6 MMT
SOCIAL					
Livelihood restoration	Resettlement site	Monthly	Interview with relocated families	Based on RAP	External Monitoring Agent
Informal settling/squatting/encroaching	Acquired ROW	Weekly	Site inspection	Based on EMP	LGUs, MMT
Road condition	Pavement and bridge, including drainage system and embankments	Based on standard DPWH maintenance procedures	Standard DPWH road and bridges maintenance works	Based on DPWH Standard Operating Procedures	DPWH

MMT : Multi-Partite Monitoring Team
MRIC : Municipal RAP Implementation Committee

14.10 SOCIAL IMPACT ASSESSMENT AND RESETTLEMEN ACTION PLAN

14.10.1 Measures Taken to Mitigate Negative Impacts

The project is the construction of a new two-lane bypass road that runs parallel to the Iloilo-Roxas Road. The road will provide alternative access to Metro-Iloilo from adjacent provinces to lessen traffic congestion on the existing Iloilo-Roxas Road. Required ROW is set at 30 m.

The alignment selected for the proposed road is 1.0 km away from the existing road to avoid residential houses and other major establishments. The beginning of the project road is not connected to existing major roads to avoid relocation of residents within the proposed alignment, but it is connected to the proposed Circumferential Road-1 (C-1) where there are no residential houses and other establishments at present.

14.10.2 Barangays Affected by the Project

The following city and municipalities and their corresponding barangays are affected by the project:

Iloilo City

1. Buhang
2. Camalig
3. Lanit

Leganes

1. Guihanan
2. San Vicente
3. Calaboa

Sta. Barbara

1. Magancia
2. Tuburan
3. Bita-og Taytay

New Lucena

1. Pasil
2. Jelicuan Este

Zarraga

1. Inagdangan Norte

14.10.3 Community Consultation and Participation

Series of community consultation meetings have been held since the beginning of the study. The topics discussed in these meetings are presented below.

1) Workshops

The JICA Study Team has conducted workshops, whenever major study outputs are made, to present the process of the master plan and feasibility study to all concerned agencies and residents. The location of the final alignment and the extent of land acquisition and social impacts are also presented to the public and their comments and suggestions are incorporated in the study.

SUMMARY OF WORKSHOPS

	1st Workshop	2nd Workshop	3rd Workshop	4th Workshop
Date	20 April 2003	29 October 2003	28 July 2004	18 August 2004
Venue/Location	Iloilo City	Iloilo City	Iloilo City	Iloilo City
Topics Discussed	1. Outline of the study 2. Projects proposed by LGUs	1. Proposed road network plan	1. Selected road alignments 2. Social Impact Survey results	1. Presentation of Draft Final Report

Details of the workshops are presented in **Section 12.10.3.**

2) Meeting with City / Municipal Officials

Prior to the Social Impact Survey, the Study Team visited the offices of the mayors and the planning and development offices of the affected city and municipalities, as discussed in **Section 12.10.3**.

3) Meetings with Barangay Captains

Meetings with the Barangay Captains of each of the affected city and municipalities were held after coordination with their respective officials.

The dates of meetings with the Barangay Captains and the date of "**Barangay Endorsement**" in acceptance of the proposed project is summarized in **Table 14.10-1**.

TABLE 14.10-1 SUMMARY OF MEETINGS WITH BARANGAY CAPTAINS AND DATE OF ISSUANCE OF BARANGAY ENDORSEMENT

City / Municipality	Date of Meeting	Venue / Location	Date of Issuance of Barangay Endorsement	
Iloilo City	04 Feb. 2004	Iloilo City Hall	Buhang Camalig Lanit	13 Feb. 2004 18 Jan. 2004 24 Jan. 2004
Leganes	29 Jan. 2004	Leganes Municipal Hall	Guinaman San Vicente Calaboa	08 Feb. 2004 01 Feb. 2004 05 Feb. 2004
Sta. Barbara	29 Jan. 2004	Sta. Barbara Municipal Hall	Magancia Tuburan Bita-og Taytay	08 Feb. 2004 11 Feb. 2004
New Lucena	30 Jan. 2004	New Lucena Municipal Hall	Pasil Jelicuan Este	01 Feb. 2004 01 Feb. 2004
Zarraga	30 Jan. 2004	Zarraga Municipal Hall	Inagdangan Norte	01 Feb. 2004

4) Barangay Consultation Meetings

Consultation meetings with residents that could be possibly affected were held in each barangay as summarized in **Table 14.10-2**.

An aerial photomap that indicates the proposed right-of-way boundary and structures inside the ROW was presented to the residents during the meeting. The residents raised their concern over a minor shift on the alignment which can save their lots and avoid divisions/fragmentations of their land.

According to the DPWH a shift of alignment to save the land of a certain owner may have a corresponding loss to another and this does not give a fundamental solution in totality.

14.10.4 Identified Impacts

Identified impacts and corresponding compensation costs are summarized in **Table 14.10-3**.

Table 14.10-3 Summary of Impact and Compensation Cost

Iloilo – Roxas Road Bypass

Description	No. of HHs	Unit	Rate/Unit	Quantity	Amount (Php)	Remarks
Compensation for Land and Other Assets						
1. Land						
1) Residential-1	-	m^2	2,500	12,950	32,375,000	Name of land owners to be identified by parcellary survey
2) Residential-2	-	m^2	2,000	900	1,800,000	
3) Agricultural (Rice field)	-	m^2	250	323,200	80,800,000	
4) Agricultural (Others)	-	m^2	200	18,750	3,750,000	
Subtotal				**355,800**	**118,725,000**	
2. Structures						
1) Shanty (Bamboo & nipa)	13	m^2	1,000	375.44	375,440	
2) Wood with GI sheet	8	m^2	1,140	229.09	375,163	
3) Concrete with wood	7	m^2	6,000	395.40	2,372,400	
4) Concrete	3	m^2	8,000	200.60	1,604,800	
Subtotal	**41**			**1,200.53**	**4,727,803**	
3. Other Fixed Structures						
1) Wood Fence	2	m	100	420	42,000	
2) Concrete/Steel Fence	2	m	200	108	21,600	
Subtotal	**4**			**528**	**63,600**	
4. Repair Cost	-	-	-	-	-	None
5. Electric Post Relocation	-	-	-	-	-	None
6. Perennials						
Various types	-	Nos.	various	750	262,500	
Subtotal					**123,778,903**	
Other Compensations						
1. Disturbance Allowance						
1) Severely affected land owners	-	-	-	-	-	None
2) Agricultural lessees	-	-	-	-	-	None
3) Temporary land users	-	-	-	-	-	None
4) Severely affected structural owners	18	-	10,000	18	180,000	
2. Subsistence Allowance						
1) Income loss for shop owners	2	-	20,000	2	40,000	
2. Financial Assistance						
1) Land users w/o title	-	-	-	-	-	Not identified
3. Rehabilitation Assistance						
1) Severely affected land owners	-	-	-	-	-	Not identified
2) Agricultural lessees	-	-	-	-	-	Not identified
3) Severely affected structural owners.	-	-	-	-	-	Not identified
4. Transportation Allowance						
1) Relocating PAPs	18	-	3,000	18	54,000	
2) Shanty dwellers go back to province.	-	-	-	-	-	None
5. Transitional allowance						
1) Renters of affected structures	7	-	3,000	7	21,000	None
Subtotal					**295,000**	
Total					**124,053,903**	
RAP Implementation					**2,823,400**	
GRAND TOTAL					**126,897,303**	

TABLE 14.10-2 SUMMARY OF BARANGAY CONSULTATION MEETINGS

Barangay	Venue / Location	Date of Meeting	
Iloilo City			
Buhang	Barangay Hall	06 Feb. 2004	1:00 – 2:00 PM
Camalig	Barangay Hall	06 Feb. 2004	5:00 – 6:00 PM
Lanit	Barangay Hall	07 Feb. 2004	9:00 – 10:00 AM
Leganes			
Guinamas	Barangay Hall	06 Feb. 2004	8:00 – 9:00 PM
San Vicente	Barangay Hall	05 Feb. 2004	4:00 – 5:00 PM
Calaboa	Barangay Hall	05 Feb. 2004	9:00 – 10:00 PM
Sta. Barbara			
Magancia	Barangay Hall	03 Feb. 2004	9:00 – 10:00 PM
Tuburan	Barangay Hall	09 Feb. 2004	2:00 – 3:00 PM
Bita-og Taytay	Barangay Hall	01 Feb. 2004	2:00 – 3:00 PM
New Lucena			
Pasil	Barangay Hall	31 Jan. 2004	3:00 – 4:00 PM
Jelicuan Este	Barangay Hall	31 Jan. 2004	2:00 – 3:00 PM
Zarraga			
Inagdangan Norte	Barangay Hall	31 Jan. 2004	9:00 – 10:00 PM

1) Impact on Land

The required right-of-way width is 30m over entire stretch of the project road. Affected areas by land use are summarized as follows:

Land Use	Affected Lands (m^2)	Share (%)
Rice field	323,200	90.8
Fruit trees	18,750	5.3
Residential	13,850	3.9
Total	**355,800**	**100.0**

More than 90% of the affected land is agricultural mainly rice field. Bunch of fruit trees mostly non-productive are observed near residential areas, riverbanks, irrigation canals and feeder roads.

2) Impact on Structures

A total of **43** structures, mostly residential houses, were identified along the proposed alignment, as follows:

Structure Use	Number	Floor Area (m^2)
Residential	22	1,027.59
Residential cum Shops	-	-
Independent Shop	2	26.00
Farmhouse	13	187.65
Other Buildings	4	19.29
Sub-total	**40**	**1,208.53**
Other Fixed Structures	3	-
Total	**43**	**1,260.53**

3) Impact on Residents

The impact on affected families is summarized as follows:

Type of PAF	Number
Severely Affected PAFs - Renters - Agricultural Tenants Marginally Affected PAFs	18.0 (7.0) (-) 5.0
Total	**23.0**
Average Household Size	4.89

Most of the affected families are farmers and laborers; only two (2) are engaged in business while four (4) are currently unemployed. The average monthly household income of most of these families (73.9%) is below ₱10,000.

4) Impact on Trees and Other Perennials

Grove of fruit trees, mostly non-productive (for domestic consumption) with low commercial values, are observed around residential areas and riverbanks. A total of **4,424** trees of various types are observed along the proposed road.

14.10.5 Valuation of Losses

The sources of unit prices used to determine values of each type of loss as well as the valuation method(s) are discussed **Section 12.10.5**.

14.10.6 Resettlement Site

The presence of informal settlers has not been observed, hence, provision of resettlement site is basically not necessary.

14.10.7 Income Restoration Program

An income restoration training will be given to PAPs who will be obliged to shift from their present occupation or income generating activity due to relocation. The details of this are discussed in **Section 12.10.7**.

14.10.8 Institutional Arrangements

The DPWH, through an appropriate Project Management Office (PMO), shall be the lead agency responsible for the implementation of the Project and the compliance requirements of this RAP. The institutional arrangement to implement the RAP is discussed in more detail below.

1) Department of Public Works and Highways (DPWH)

A PMO shall be designated by the DPWH as the overall responsible unit of the DPWH in the implementation of the Iloilo-Roxas Road Bypass Project. It will manage and supervise the project including its resettlement activities and land acquisition requirements in coordination with concerned agencies. To ensure smooth implementation of the project, the PMO shall facilitate the availability of funds including those required for RAP implementation on a timely manner.

Regional and District Engineering Offices of the DPWH

The City District Engineering Office (DEO) of the DPWH based in Iloilo City shall be the lead implementing arm for the Resettlement Action Plan (RAP) for project affected persons within the territorial boundary of Iloilo City. On the other hand, the Fourth DEO of the Department based in the Municipality of Sta. Barbara shall be responsible for implementation of the RAP for project affected persons within the territorial boundaries of the Municipalities of Leganes, Sta. Barbara, New Lucena, and Zarraga.

The District Engineers (DEs), upon receipt of the appropriate Department Order (DO) for the RAP's implementation, shall appoint an adequate number of staff to perform the necessary activities under the plan. Should the number fall short of that required, the DE shall seek assistance from the DPWH Regional Office.

2) Local Government Units (LGUs)

The resettlement requirements of the project shall be coordinated by the DPWH and its regional and district engineering offices with the LGUs, namely: Iloilo City and the Municipalities of Leganes, Sta. Barbara, New Lucena, and Zarraga. This is especially critical insofar as implementation of the provisions of Republic Act 7279 (the Urban Development and Housing Act of 1992) and its implementing rules and regulations are concerned to ensure the observance of proper and humane relocation and resettlement.

3) RAP Implementation Committee (RIC)

The DEO RAP Staff shall be assisted in the implementation by a City Resettlement Implementation Committee (CRIC) which, consistent with the Resettlement Policy, shall be composed of the following:

RAP Implementation Committee (RIC) – A

Chairman and Convenor:		City District Engineer (DPWH), Iloilo City
Co-Chairman	:	City Mayor of Iloilo (or designated representative)
Members	:	

Barangay Captain – Barangay Buhang, Jaro
Barangay Captain – Barangay Camalig, Jaro
Barangay Captain – Barangay Lanit, Jaro

Representative of PAPs – Barangay Buhang, Jaro
Representative of PAPs – Barangay Camalig, Jaro
Representative of PAPs – Barangay Lanit, Jaro

Representative(s) from a Non-Government Organization (NGO) or People's Organization (PO) active in all the traversed barangays

RAP Implementation Committee (RIC) – B

Chairman and Convenor:		District Engineer (DPWH), Fourth DEO Municipality of Sta. Barbara
Co-Chairman	:	Municipal Mayor of Leganes (or his designated representative) Municipal Mayor of Sta. Barbara (or his designated representative) Municipal Mayor of New Lucena (or his designated representative) Municipal Mayor of Zarraga (or his designated representative)

Members :

Barangay Captain – Barangay Guihaman, Leganes
Barangay Captain – Barangay San Vicente, Leganes
Barangay Captain – Barangay Calaboa, Leganes

Barangay Captain – Barangay Magancia, Sta. Barbara
Barangay Captain – Barangay Tuburan, Sta. Barbara
Barangay Captain – Barangay Bita-og Taytay, Sta. Barbara

Barangay Captain – Barangay Pasil, New Lucena
Barangay Captain – Barangay Jelicuan Este, New Lucena

Barangay Captain – Barangay Inagdangan Norte, Zarraga

Representative of PAPs – Barangay Guihaman, Leganes
Representative of PAPs – Barangay San Vicente, Leganes
Representative of PAPs – Barangay Calaboa, Leganes

Representative of PAPs – Barangay Magancia, Sta. Barbara
Representative of PAPs – Barangay Tuburan, Sta. Barbara
Representative of PAPs – Barangay Bita-og Taytay, Sta. Barbara

Representative of PAPs – Barangay Pasil, New Lucena
Representative of PAPs – Barangay Jelicuan Oeste, New Lucena

Representative of PAPs – Barangay Inagdangan Norte, Zarraga

Representative(s) from a Non-Government Organization (NGO) or People's Organization (PO) active in all the traversed barangays

The NGO(s) or PO(s) in the Resettlement Implementation Committee (RIC) should be active in the communities traversed by the alignment and registered organization(s) with the Securities and Exchange Commission (SEC). In addition, it should be duly recognized by the LGU through a process of accreditation and recognition by the Sangguniang Panlungsod (SP) of Iloilo City and the Sangguniang Bayan (SB) of the Municipalities of Leganes, Sta. Barbara, New Lucena, and Zarraga.

The functions of the RIC shall be as follows:

a) Assist the DPWH DEO in validating the list of PAPs, the assets of PAPs that will be affected by the project (using a prepared compensation form), and in implementing the RAP;

b) Assist the DPWH DEO in public information campaign, public participation and consultation;

c) Assist the DEO in the payment of compensation to PAPs;

d) Receive complaints and grievances from PAPs and other stakeholders and act on them accordingly;

e) Maintain record of all public meetings, complaints, and actions taken to address complaints and grievances;

f) In coordination with concerned government authorities, assist in the enforcement of laws/ordinances regarding encroachment into the project road corridor.

4) Internal Monitoring and Evaluation Requirement

The Environmental Social Service Office (ESSO) of the DPWH shall be responsible for the internal monitoring and evaluation requirement of the RAP. Prior to the RAP implementation, however, the ESSO shall provide the DEO RAP Implementation Staff with the proper orientation in the implementation of the RAP and the DPWH Resettlement Policy.

5) External Monitoring and Evaluation Requirement

An external monitoring agency (EMA) or institution shall be engaged by the DPWH upon the donor agency's concurrence of this RAP. The EMA shall perform independent third party monitoring of DPWH's compliance to its own Resettlement Policy and the implementation of the provisions of this Resettlement Action Plan. Selection of this institution shall be in accordance with DPWH's selection process, which shall be concurred by the donor agency before its eventual engagement.

The scope of services of the EMA shall be governed by a Terms of Reference which shall spell out in detail the indicators to be measured among other important aspects of the external monitoring work. The main objectives of conducting an independent external monitoring and evaluation for each of the RAPs implemented are the following:

a) To determine whether or not the implementation of the RAP is carried out according to the Department's Resettlement Policy, and

b) To determine whether or not the main objectives of the RAP (i.e. to improve or at least restore the living standards, income-earning capacity and production levels of affected people) have been achieved.

6) Control of Land Speculation and Illegal Encroachment

To deter the proliferation of project affected persons (PAPs) that have not been censused or inventoried during the socio-economic survey as well as the inventory of affected assets, the RAP implementation team shall be guided during the validation work of the "**Cut-off Date**" as **March 10, 2004** (conclusion of the socio-economic survey for affected persons). Any PAPs identified during the validation work, except those which have not been interviewed but who had already been earlier identified, may not be entitled for compensation. The same restriction shall apply for additional assets built and/or improvements made on existing assets of identified PAPs after the cut-off date. Photographs earlier taken of these assets shall be used to validate any variances made after the cut-off date.

14.10.9 Grievance Redress Measures

Grievance redressal is one of the main functions of the RIC. The Resettlement Policy provides that grievances related to any aspect of the project will be handled through negotiations aimed at achieving consensus following the procedures discussed in **Section 12.10.8**.

14.10.10 Monitoring and Evaluation

The procedures for monitoring and evaluation of RAP implementation during the project implementation stage are discussed in detail under **Section 12.10.10**.

14.10.11 RAP Implementation

1) Preparation of Final RAP

The social impacts identified in this study shall be verified and validated during detailed design stage after establishing exact extent of construction limits and corresponding ROW limits required. The following RAP updating surveys shall be carried out to update the preliminary RAP prepared under this study after fixing the final ROW limits.

TABLE 14.10-4 RAP UPDATING SURVEYS TO BE UNDERTAKEN

Impact Item	Surveys to be Undertaken
Land	- **Parcellary survey** shall be carried out to identify the names of lot owners and area to be acquired from each lot owner.
Structure	- **Tagging and picture taking** must be carried to identify the PAPs eligible for compensation. - **Cut-off-Date** must be set and informed to the residents prior to tagging.
Perennials	- **Validation survey** shall be carried out to identify the names of owners of perennials with commercial values.
Tenants/Renters, Informal Settlers	- **Socio-economic survey** shall be carried out to identify the presence of agricultural tenants, renters of structures, and informal settlers who need special consideration by providing relocation site, financial assistance, and other assistance.

A final RAP shall be prepared based on the preliminary RAP and the results of the RAP updating surveys.

2) RAP Approval

The final RAP will have to be presented to the DPWH for approval and for concurrence by the donor agency by the scheduled period in 2007. The salient points of the final RAP will have to be reiterated with concerned officials of Iloilo City and the Municipalities of Leganes, Sta. Barbara, New Lucena, and Zarraga upon its approval prior to implementation. The RIC that will be organized for the purpose shall provide the necessary assistance to the DPWH DEOs during the implementation process. Any technical assistance, when required by the RIC, will be extended by the DPWH Regional Office upon request.

3) MOU with LGU and the Establishment of the RIC

Within a reasonable period of time from the approval of this RAP, a Memorandum of Understanding (MOU) will be executed between the DPWH and the LGUs of Iloilo City and the Municipalities of Leganes, Sta. Barbara, New Lucena, and Zarraga. The MOU will provide the mandate for the formation of the RIC and will likewise spell out the required cooperation and commitment of the LGUs in ensuring that the right-of-way is sustainably free from encroachments and illegal squatting even after project completion.

4) Orientation and Training of the RIC

The members of the RIC will be given orientation on the scope and coverage of their work under the final RAP. In addition, the same RIC members will be trained on the implementation requirements of the RAP, including the scope and coverage of the DPWH policy framework that will be embodied in that RAP.

5) Stake-out

During the validation period, the RIC shall conduct a stakeout of the project corridor to determine the extent of the area required by the road project. The results of the alignment survey used during the detailed engineering design and the latest parcellary survey conducted in the area will be used as basis for this activity.

6) PAP Validation and Establishment of Detailed Compensation Rates

The RIC members will validate the census of PAPs and inventory of affected assets and review and update, where necessary, the compensation entitlements payable to these PAPs. This will be done at a pre-agreed period prior to the conclusion of the orientation training.

7) Conduct of Public Information Campaign

While the PAPs have already been informed about the project during the series of barangay consultations, perception survey, and socio-economic survey conducted during the preparation of the preliminary RAP, the RIC will again call for public meetings to explain further the details of the RAP upon its implementation. The RIC can, upon public information, improve materials prepared during the formulation of the RAP. The PAPs will be informed of the schedule of the RIC's validation work and will be requested to keep documents that would attest ownership of their affected assets as these may be requested by the RIC.

8) Finalization of Compensation and Other Entitlements of PAPs

The RIC shall finalize the entitlements and the total amount of compensation payable to each PAP following the updating of the unit prices that will be used, and after confirmation visit to each PAP to validate the inventory of affected assets. This shall be consistent with the entitlement matrix of the RAP. The possibility of additional PAPs who have not bee identified during the preparation of the RAP due to potential minor re-alignment remains high and the validated list is expected to reflect these changes. Those that are within the ROW but who came in after the cut-off period established for the RAP are excluded.

An "Inventory of Affected Fixed Assets Form" will have to be accomplished and signed by each PAP or his duly authorized representative to indicate concurrence with the estimates of the affected assets, entitlements, and total compensation amounts. A copy of the acknowledged form will be given to each of the PAPs for their reference.

9) Public Meetings

Public meetings will be held during the disclosure of compensation to the PAPs in the barangays traversed by the road project. These meetings will be conducted in a public place following conclusion of the finalization of the compensation entitlements to inform them of the results of the validation of impacts and

computation of compensation and other entitlements, other resettlement activities, and the schedule of payment to PAPs.

During this activity the PAPs are expected to register any disagreement on the validated results through the grievance redressal mechanism established in the policy framework that will be reiterated in the final RAP. The PAPs will be advised on the options that may be taken following the grievance redressal procedures of the same policy and the Policy Framework on Public Participation and Consultation of the DPWH. The result of the disclosure meetings shall be the basis for the preparation of payment vouchers and subsequent payments to the PAPs.

10) Payment of Compensation and Other Entitlements

The place, date, and time of the payment activity will be communicated to the City Mayor of Iloilo as well as the Municipal Mayors of Pavia and Sta. Barbara with a request that this be announced in advance to the barangay officials/RIC members. The announcement will likewise be posted by the barangay officials in a place accessible to the public to ensure that all PAPs within their administrative jurisdiction are informed. All payments of compensation will be also done in public.

The activity will be highlighted with the signing of a Pledge of Undertaking (POU) by the PAP, which states among others the demolition, removal or relocation of structures from the ROW within a specified period of time, the failure of which provides corresponding recourse of the DPWH to either carry out the stipulation at the PAPs expense or filing of criminal case in a court of law. In addition, the POU prohibits the rebuilding of such structures by the PAPs or their heirs within the DPWH's road right-of-way (RROW).

11) Reorganization and Relocation

The DPWH will not cause any demolition, reorganization or relocation along the ROW until all the PAPs are duly paid their compensation and other entitlements as disclosed during the public meetings.

12) Hand-over of the Site for Construction

The site may be handed over for the civil works construction at least a month following the conclusion of the RAP implementation and after the issuance of a "No Objection Letter" from the donor agency.

13) Monitoring and Supervision of RAP Implementation

The implementation of the RAP will be supervised by the Project Implementing Office in coordination with the ESSO. The ESSO will also carryout internal monitoring of the RAP implementation and will provide periodic progress reports to the donor agency. Supervision and monitoring of the RAP implementation will be done through the ESSO counterpart staff at the regional level.

An independent agency will be contracted to carry out external monitoring and post-evaluation study.

14.11 PROJECT EVALUATION

14.11.1 Economic Evaluation

1) Traffic Demand Forecast

Future traffic demand forecasted in a form of OD matrix (years 2010, 2016 and 2022) was assigned on the road network to estimate traffic volume on the R-4 Bypass Road. The estimated traffic volume on the R-4 Bypass Road for the case of "with" the project is summarized in Table 14.11-1.

TABLE 14.11-1 TRAFFIC VOLUME ON R-4 BYPASS ROAD

Unit: PCU / day

	2010	2016	2022	AAGR (%)	
				'10 - '16	'16 – '22
Section 1 (C-1 – Leganes Sta. Barbara Road)	9,400	11,800	22,300	3.9	11.2
Section 2 (Leganes Sta. Barbar Road – Sta. Barbara Libongcon Road)	11,500	13,800	18,000	3.1	4.5
Section 3 (Sta. Barbara Libongcon Road – Iloilo Roxas Road)	6,900	8,000	10,900	2.5	5.3

The estimated vehicle kilometers and vehicle hours in Metro Iloilo are shown in Tables 14.11-2 and 14.11-3, respectively. These tables are based on the benefit calculation.

TABLE 14.11-2 TOTAL VEHICLE KILOMETERS IN METRO ILOILO WITH AND WITHOUT R-4 BYPASS ROAD

Unit: PCU Km / day

	W/O Project	W/ Project	W/O – W/
2010	3,158,200	3,146,500	11,700
2016	4,025,300	4,001,400	23,900
2022	5,179,300	5,153,000	26,300

TABLE 14.11-3 TOTAL VEHICLE HOURS IN METRO ILOILO WITH AND WITHOUT R-4 BYPASS ROAD

Unit: PCU Hour / day

	W/O Project	W/ Project	W/O – W/
2010	111,300	109,000	2,400
2016	159,900	153,500	6,400
2022	236,300	229,800	6,400

2) Economic Evaluation

Evaluation Period

The evaluation period is assumed to be 20 years from 2017 to 2036 taking into account the service life of R-4 Bypass Road.

Implementation Schedule

The implementation schedule is assumed as follows:

- 2011 Detailed design
- 2012 – '13 Land acquisition
- 2014 – '16 Construction of R-4 Bypass Road
- 2017 - Open to public

Economic Indicators

The economic evaluation method is principally employed benefit cost analysis. The economic indicators used in this study are as follows:

- Net Present Value (NPV)
- Benefit Cost Ratio, (BCR), and
- Economic Internal Rate of Return (EIRR)

Estimation of Benefit

Basic Vehicle Operating Cost

The basic vehicle operating cost (BVOC) is estimated annually by PMO-FS Office in DPWH. The latest BVOC was estimated in April 2002. In this study, this VBOC with some modification by inflation between April 2002 and April 2003 is utilized in this study (See Table 14.11-4)

TABLE 14.11-4 BASIC VEHICLE OPERATING COST (EXCLUDING TAX)

Vehicle Type	Running (P/1000km)	Fixed [P/Min]	Time [P/Min]
Car /Taxi / Jeep	4,441	0.245	0.991
Jeepney	2,991	1.181	1.468
Bus	7,453	1.794	5.561
Track	9,622	2.107	0
Motor Cycle	822	0.082	0.586

Source: PMO-FIS, DPWH
Note: BVOC prepared by PMO-FIS is modified with inflation rate.

The vehicle operating cost by surface type and travel speed was set up since it varies by these factors as shown in Appendix Table 12.11-1.

Estimation of Benefits

The saving in vehicle operating costs and travel time cost were estimated and are shown in **Table 14.11-5**.

TABLE 14.11- 5 ESTIMATION OF BENEFITS

Unit: '000 Pesos/Year

Year	Saving in VRC	Saving in VFC	Saving in VOC	Saving in TCC	Total Saving
2010	18,364	39,993	58,356	58,533	116,889
2015	37,294	107,493	144,787	157,326	302,113
2020	41,187	108,307	149,554	158,605	308,158

Economic Cost

The project cost, which was already calculated in the previous section, is expressed as the financial cost. It is therefore to convert from financial cost to economic cost. In this study the economic cost was estimated to deduct from financial cost to government taxes and shadow prices of unskilled labor is shown in **Table 14.11- 6**.

TABLE 14.11- 6 ECONOMIC COST ESTIMATE

Unit: '000 Pesos

	Description	Economic Cost	Financial Cost
1	Construction Cost	441,500	523,500
2	Consultancy	56,500	62,800
2-1	Detailed Design	18,800	20,900
2-2	Construction Supervision	37,700	41,900
3	Land Acquisition	114,200	126,900
	Total	612,200	713,200

Maintenance Cost

According to the maintenance study in this study, the present maintenance cost for the road has estimated on the basis of the EMK method. In this study, therefore, the maintenance cost of the R-4 Bypass Road is estimated on the basis of the same EMK method.

Benefit Cost Analysis

Based on the above mentioned benefits and cost estimations, the economic analysis of the Project was made. **Table 14.11- 7** shows the benefit – cost analysis of the R-4 Bypass Road Construction Project during project life period of 20 years and **Table 14.11- 8** shows the benefit cost stream. The results of the economic analysis show that a Net Present Value (NPV) of ₱ 232 million and BCR of 2.56 over 20 years life of the Bridge using a discount date of 15% which is designated by the NEDA. The Economic Internal Rate of Return (EIRR) was compiled at 31.8%.

TABLE 14.11- 7 ECONOMIC INDICATIONS OF BENEFIT COST ANALYSIS

Net Present Value	P 232 million pesos
BCR	2.56
EIRR	31.8 %

Notes: 1) Project life is assumed to be 20 years
2) Discount rate ids 15%

TABLE 14.11-8 BENEFIT - COST STREAM OF R-4 BYPASS ROAD CONSTRUCTION PROJECT

Undiccounted BenefiT Cost Stream

000 Pesos

Sq	Year	Construction Cost	O & M Cost	Cost Total	Benefit	Cost-Benefit
1	2004	0.0	0.0	0.0	0.0	0.0
2	2005	0.0	0.0	0.0	0.0	0.0
3	2006	0.0	0.0	0.0	0.0	0.0
4	2007	0.0	0.0	0.0	0.0	0.0
5	2008	0.0	0.0	0.0	0.0	0.0
6	2009	0.0	0.0	0.0	0.0	0.0
7	2010	0.0	0.0	0.0	0.0	0.0
8	2011	18,800.0	0.0	18,800.0	0.0	-18,800.0
9	2012	57,100.0	0.0	57,100.0	0.0	-57,100.0
10	2013	57,100.0	0.0	57,100.0	0.0	-57,100.0
11	2014	167,720.0	0.0	167,720.0	0.0	-167,720.0
12	2015	167,720.0	0.0	167,720.0	0.0	-167,720.0
13	2016	143,760.0	0.0	143,760.0	0.0	-143,760.0
14	2017	0.0	1,104.0	1,104.0	326,173.0	325,069.0
15	2018	0.0	1,110.0	1,110.0	354,260.4	353,150.4
16	2019	0.0	1,116.0	1,116.0	387,064.1	385,948.1
17	2020	0.0	1,122.0	1,122.0	307,509.8	306,387.8
18	2021	0.0	1,128.0	1,128.0	308,476.3	307,348.3
19	2022	0.0	1,134.0	1,134.0	308,158.4	307,024.4
20	2023	0.0	1,140.0	1,140.0	308,642.0	307,502.0
21	2024	0.0	1,146.0	1,146.0	309,128.6	307,982.6
22	2025	0.0	1,152.0	1,152.0	309,618.3	308,466.3
23	2026	0.0	1,158.0	1,158.0	310,111.1	308,953.1
24	2027	0.0	32,774.0	32,774.0	310,607.0	277,833.0
25	2028	0.0	1,170.0	1,170.0	311,106.0	309,936.0
26	2029	0.0	1,175.0	1,175.0	311,608.3	310,433.3
27	2030	0.0	1,181.0	1,181.0	312,113.7	310,932.7
28	2031	0.0	1,193.0	1,193.0	312,622.3	311,429.3
29	2032	0.0	1,199.0	1,199.0	313,134.2	311,935.2
30	2033	0.0	1,205.0	1,205.0	313,649.4	312,444.4
31	2034	0.0	1,211.0	1,211.0	314,167.8	312,956.8
32	2035	0.0	1,217.0	1,217.0	314,689.6	313,472.6
33	2036	0.0	1,084.0	1,084.0	315,214.8	314,130.8

Diccounted BenefiT Cost Stream

000 Pesos

Sq	Year	Discounted	Construction Cost	O & M Cost	Cost Total	Benefit	Cost-Benefit
1	2004	1.000	0.0	0.0	0.0	0.0	0.0
2	2005	1.150	0.0	0.0	0.0	0.0	0.0
3	2006	1.323	0.0	0.0	0.0	0.0	0.0
4	2007	1.521	0.0	0.0	0.0	0.0	0.0
5	2008	1.749	0.0	0.0	0.0	0.0	0.0
6	2009	2.011	0.0	0.0	0.0	0.0	0.0
7	2010	2.313	0.0	0.0	0.0	0.0	0.0
8	2011	2.660	7,067.6	0.0	7,067.6	0.0	-7,067.6
9	2012	3.059	18,666.1	0.0	18,666.1	0.0	-18,666.1
10	2013	3.518	16,231.4	0.0	16,231.4	0.0	-16,231.4
11	2014	4.046	41,457.8	0.0	41,457.8	0.0	-41,457.8
12	2015	4.652	36,050.3	0.0	36,050.3	0.0	-36,050.3
13	2016	5.350	26,869.8	0.0	26,869.8	0.0	-26,869.8
14	2017	6.153	0.0	179.4	179.4	53,012.2	52,832.8
15	2018	7.076	0.0	156.9	156.9	50,067.1	49,910.2
16	2019	8.137	0.0	137.2	137.2	47,568.0	47,430.8
17	2020	9.358	0.0	119.9	119.9	32,862.0	32,742.1
18	2021	10.761	0.0	104.8	104.8	28,665.4	28,560.6
19	2022	12.375	0.0	91.6	91.6	24,900.8	24,809.2
20	2023	14.232	0.0	80.1	80.1	21,686.8	21,606.7
21	2024	16.367	0.0	70.0	70.0	18,887.8	18,817.8
22	2025	18.822	0.0	61.2	61.2	16,450.2	16,389.0
23	2026	21.645	0.0	53.5	53.5	14,327.3	14,273.8
24	2027	24.891	0.0	1,316.7	1,316.7	12,478.5	11,161.8
25	2028	28.625	0.0	40.9	40.9	10,868.3	10,827.4
26	2029	32.919	0.0	35.7	35.7	9,465.9	9,430.2
27	2030	37.857	0.0	31.2	31.2	8,244.6	8,213.4
28	2031	43.535	0.0	27.4	27.4	7,180.9	7,153.5
29	2032	50.066	0.0	23.9	23.9	6,254.5	6,230.6
30	2033	57.575	0.0	20.9	20.9	5,447.6	5,426.7
31	2034	66.212	0.0	18.3	18.3	4,744.9	4,726.6
32	2035	76.144	0.0	16.0	16.0	4,132.8	4,116.8
33	2036	87.565	0.0	12.4	12.4	3,599.8	3,587.4
		Total	146,343.0	2,598.0	148,941.0	380,845.4	231,904.4

Net Present Value	**231,904**
B/C Ratio	**2.557**
EIRR	**31.84**

(2) Sensitivity Analysis

The sensitivity analysis is conducted under a worse case scenario incorporating increase and/or decrease of the estimation of costs and benefits. **Table 14.11-9** shows the results of the sensitivity analysis.

TABLE 14.11- 9 SENSITIVITY ANALYSIS REGARDING COSTS AND BENEFITS OF R-4 BYPASS ROAD CONSTRUCTION PROJECT

		Indicator	Benefits		
			20% down	Base Case	20% up
Costs	20% down	NPV (Pmillion)	185.0	262.0	338.0
		B/C Ratio	2.56	3.20	3.84
		EIRR (%)	31.8	36.9	41.3
	Base Case	NPV (Pmillion)	156.0	232.0	308.0
		B/C Ratio	2.05	2.56	3.07
		EIRR (%)	27.2	31.8	35.9
	20% up	NPV (Pmillion)	120.0	202.0	278.0
		B/C Ratio	1.75	2.13	2.56
		EIRR (%)	23.7	28.0	31.8

Note: Project life of the project is assumed to be 20 years

(3) Summary of Economic Analysis

The implementation of the R-4 bypass Road construction project can be justified from view of national economic point since the economic indicators of all cases more than the over cut-off level which can be considered as 15% of EIRR in the Philippines.

14.11.2 Technical Evaluation

The results of the technical analysis of the R-4 Bypass Road show that the construction of R-4 Bypass road is technically feasible. However, the following technical notes shall be described:

- Ground condition from starting point of the R-4 Bypass road to 3 kilometer point is generally characterized as soft-ground. It is necessary to undertake soft ground treatment such as employment of plastic vertical drain (PVD), sand mat, etc when the R-4 Bypass road is constructed.
- Flooding is anticipated in the area of about last 3 kilometers along R-4 Bypass corridor. It is therefore necessary to undertake the flood control treatment when the R-4 Bypass road is constructed.

14.11.3 Other Impacts

1) On Traffic

Table 14.11-10 shows the transport efficiency of Metro Iloilo in cases of with and without the R-4 Bypass Road.

TABLE 14.11-10(1) TRAFFIC VOLUME WITH AND WITHOUT R-4 BYPASS ROAD CONSTRUCTION PROJECT

Unit: PCU/day

	2010				2022			
	W/O Project	W/ project		W/– W/O	W/O Project	W/. Project		W/ – W/O
	Existing R-4 Road	R-4 Bypass	Existing R-4 Road	W/O (%)	Existing R-4 Road	R-4 Bypass	Existing R-4 Road	W/O (%)
Section 1 (C-1 – Leganes Sta. Barbara Road)	22,300 14,500	9,400 9,400	17,200 9,000	19.3 26.9	34,600 21,400	22,300 22,300	23,700 16,200	32.9 79.9
Section 2 (Leganes Sta. Barbar Road – Sta. Barbara Libongcon Road)	15,000 14,900	11,500 11,500	7,700 7,600	28.0 28.2	17,500 17,400	18,800 18,800	11,900 11,700	75.0 75.3
Section 3 (Sta. Barbara Libongcon Road – Iloilo Roxas Road)	5,700	6,900	500	29.8	7,500	10,900	2,600	80.0

TABLE 14.11-10(2) TRAVEL SPEED WITH AND WITHOUT R-4 BYPASS ROAD CONSTRUCTION PROJECT

Unit: Km/Hr

	2010			2022		
	W/O Project	W/ project		W/O Project	W/. Project	
	Existing R-4 Road	R-4 Bypass	Existing R-4 Road	Existing R-4 Road	R-4 Bypass	Existing R-4 Road
Section 1 (C-1 – Leganes Sta. Barbara Road)	25.0 33.6	49.0 49.0	30.5 38.7	17.5 25.8	37.3 37.3	23.7 31.7
Section 2 (Leganes Sta. Barbar Road – Sta. Barbara Libongcon Road)	33.0 33.2	48.1 48.1	39.3 39.3	30.2 30.4	42.1 42.1	36.2 36.4
Section 3 (Sta. Barbara Libongcon Road – End of Project)	40.0	50.0	40.0	39.5	48.5	40.0

TABLE 14.11-10(2) TRAVEL TIME WITH AND WITHOUT R-4 BYPASS ROAD CONSTRUCTION PROJECT

Unit: Min

	2010			2022		
	W/O Project	W/ project		W/O Project	W/. Project	
	Existing R-4 Road	R-4 Bypass	Existing R-4 Road	Existing R-4 Road	R-4 Bypass	Existing R-4 Road
Section 1 (C-1 – Leganes Sta. Barbara Road)	5.7 4.2	4.7 3.6	2.5 3.1	8.2 5.5	3.2 4.1	6.1 4.5
Section 2 (Leganes Sta. Barbar Road – Sta. Barbara Libongcon Road)	3.6 5.0	3.0 4.2	2.2 3.6	3.9 5.5	2.5 4.2	3.3 4.6
Section 3 (Sta. Barbara Libongcon Road – End of Project)	3.9	3.9	3.2	3.9	3.3	3.8
Total	22.4	19.5	14.6	27.0	17.2	22.2

TABLE 14.11-11 TRANSPORT EFFICIENCY IN METRO ILOILO WITH AND WITHOUT R-4 BYPASS ROAD CONSTRUCTION PROJECT

			2010	2016	2022
PCU Kilometers ('000)	Whole Area	W/O Project	3,158 (1.00)	4,025 (1.00)	5,179 (1.00)
		W/ Project	3,156 (0.999)	4,022 (0.999)	5,175 (0.999)
PCU Hours ('000)	Whole Area	W/O Project	111.3 (1.00)	159.9 (1.00)	236.3 (1.00)
		W/ Project	108.9 (0.978)	154.5 (0.966)	230.6 (0.975)
Average Travel Speed (km / h)	Whole Area	W/O Project	28.4 (1.00)	25.2 (1.00)	21.9 (1.00)
		W/ Project	29.0 (1.02)	26.0 (1.03)	22.4 (1.02)
Vehicle Operating Cost (P '000 /day)	Whole Area	W/O Project	21,754 (1.00)	35,885 (1.00)	]49,686 (1.00)
		W/ Project	21,574 (0.99)	34,589 (0.96)	47,391 (0.95)

2) On Urban Amenity

Through traffic volume of the existing R-4 Road will be greatly reduced due to diverted to the R-4 Bypass Road. Therefore, noise level, air quality and vibration in the area within the R-4 Road will be greatly improved. Thus, urban amenity will be improved.

3) On Urbanization

Urbanization will be guided and supported by the R-4 Bypass Road. According to the urbanization index calculated in Section 11.2 of the Master Plan, urbanization index (RUa) along R-4 Bypass Road corridor will be able to calculate to be almost 80%. With the existing road network with the R-4 Bypass Road, sound urbanization will be achieved.

4) On Regional Economy

With the improved and reliable transport facility, economic activities within the influence area will be stimulated. The project will contribute to economic growth of not only Metro Iloilo but also region VI.

14.11.4 Overall Evaluation

As motioned above, the implementation of the R-4 Bypass Road construction project can be justified from view of economic, technical, and social impact points.

CHAPTER 15
RECOMMENDATIONS

15.1 IMPLEMENTATION SCHEDULE OF PROJECTS SELECTED FOR F/S

Implementation schedule of projects selected for F/S was planned within the financial framework as follows (see Figure 15.1-1):

Project	Detailed Design	ROW Acquisition	Construction
C-1	2007	2008-2009	2010-2012
Iloilo-Sta.Barbara	2007	2008-2009	2010-2011
R-4 Bypass	2011	2012-2013	2014-2016

PACKAGED PROJECT COST AND COST COMPONENT

Unit: Million Pesos

		Foreign	Local	ROW / Tax	Total
Metro Iloilo	C-1	419.4	236.8	366.3	1,022.5
	Iloilo-Sta.Barbara	283.0	134.4	150.8	568.2
Metro Bacolod	New Airport Access	229.9	150.5	262.8	643.2
	Bacolod Circum.	339.9	188.6	159.1	687.6
Metro CDO	Western Coastal	360.3	219.1	183.9	763.3
	7th Bridge	94.2	90.6	55.6	240.4
	Total	**1,726.7** (44%)	**1,020.0** (26%)	**1,178.5** (30%)	**3,925.2** (100%)

FIGURE 15.1-1 IMPLEMENTATION SCHEDULE OF PROJECT SELECTED FOR F/S

Project	Activities	Cost (Million P)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
C-1	Fund Preparation	-	▪▪▪▪											
	Consultant Selection	-		▪▪▪▪										
	Detailed Design	58.1			58.1									
	ROW / Resettlement	250.2				125.1	125.1							
	Contractor Selector	-					▪▪▪▪							
	Construction	661.3						220.4	220.4	220.5				
	Const. Supervision	52.9						17.6	17.6	17.7				
	Total	**1,022.5**	**-**	**-**	**58.1**	**125.1**	**125.1**	**238**	**238**	**238.2**				
Iloilo-Sta. Barbara	Fund Preparation	-	▪▪▪▪											
	Consultant Selection	-		▪▪▪▪										
	Detailed Design	17.7			17.7									
	ROW / Resettlement	73.2				36.6	36.6							
	Contractor Selector	-					▪▪▪▪							
	Construction	441.9						220.9	221.0					
	Const. Supervision	35.4						17.7	17.7					
	Total	**568.2**	**-**	**-**	**17.7**	**36.6**	**36.6**	**238.6**	**238.7**					
R-4 Bypass	Fund Preparation	-					▪▪▪▪							
	Consultant Selection	-						▪▪▪▪						
	Detailed Design	20.9							20.9					
	ROW / Resettlement	126.9								63.5	63.4			
	Contractor Selector	-									▪▪▪▪			
	Construction	523.5										174.5	174.5	174.5
	Const. Supervision	41.9										13.9	14.0	14.0
	Total	**713.2**	**-**	**-**	**-**	**-**	**-**	**-**	**20.9**	**63.5**	**63.4**	**188.4**	**188.5**	**188.5**

15.2 RECOMMENDATIONS

DPWH

- The proposed Road Network Plan should be authorized by agencies concerned as well as LGUs concerned.
- Priority projects should be included in the DPWH Medium-Term Public Investment Program.
- Funding of C-1 and Iloilo-Sta.Barbara Road needs to be sourced from international agency or bi-lateral aid. Negotiation with one of the agencies or countries should start immediately and concluded within 2005.
- ECC of priority projects should be secured as early as possible.
- DPWH should determine an implementing office of Regional Growth Center Projects as soon as possible.
- Memorandum of Agreement between DPWH and concerned LGUs should be exchanged concerning the securing of the proposed road ROW.
- For smooth implementation of priority projects, DPWH should start coordination with LGUs concerned with regard to ROW acquisition and relocation of project-affected persons.
- Road re-classification should be discussed with LGUs. Some roads should be reclassified from Provincial Road to National Road or vis-à-vis.
- DPWH should review and update proposed Road Network Plan periodically or at least every 6 years. This Plan was prepared under the present tight financial situation. When the financial situation improves, some of projects could be implemented ahead of the proposed schedule.

Concerned LGUs

- The proposed road network should be reflected in the land use plan as soon as possible. If necessary, land use along the proposed roads should be amended.
- Development within the proposed road ROW should be strictly controlled. City / municipal ordinance to control such development should be enacted as soon as possible.
- Maintenance of local roads should be intensified. Regular amount should be allocated yearly to road maintenance.
- Iloilo City Government should implement the proposed traffic management plan in the city proper area and its adjoining areas.
- Resettlement site for the project-affected persons should be secured as early as possible.

15.3 RECOMMENDATION ON PROJECT PACKAGING

Various projects were proposed in each Regional Growth Center. It is expected that most projects will be implemented with foreign financial assistance, and therefore, projects of the three Regional Growth Centers should be packaged under the name of "Regional Growth Center Road Network Development Project".

The following urgent projects of the three Metro Areas are recommended to be packaged for immediate foreign financing.

REGIONAL GROWTH CENTER ROAD NETWORK DEVELOPMENT PROJECT

URGENT PROJECT PACKAGE FOR IMMEDIATE FOREIGN FINANCE

Metro Iloilo	Metro Bacolod	Metro Cagayan de Oro
- C-1	- New Airport Access Road	- Western Coastal Road
- Iloilo-Sta.Barbara Road	- Bacolod Circumferential Road	- 7th Bridge

PACKAGED PROJECT COST AND COST COMPONENT

Unit: Million Pesos

		Foreign	Local	ROW / Tax	Total
Metro Iloilo	C-1	419.4	236.8	366.3	1,022.5
	Iloilo-Sta.Barbara	283.0	134.4	150.8	568.2
Metro Bacolod	New Airport Access	229.9	150.5	262.8	643.2
	Bacolod Circum.	339.9	188.6	159.1	687.6
Metro CDO	Western Coastal	360.3	219.1	183.9	763.3
	7th Bridge	94.2	90.6	55.6	240.4
	Total	**1,726.7** (44%)	**1,020.0** (26%)	**1,178.5** (30%)	**3,925.2** (100%)

RECOMMENDED PACKAGE OF IMMEDIATE FOREIGN FINANCE

Area	Project	Project Cost (Million Pesos)	Implementation 2005	2006	2007	2008	2009	2010	2011	2012	2013
Metro Iloilo	C-1	1,022.5	-----	////////	58.1	125.1	125.1	238.0	238.0	238.2	
	Iloilo-Sta. Barbara	568.2	-----	////////	17.7	36.6	36.6	238.6	238.7		
Metro Bacolod	New Airport Access	643.2	-----	////////	34.3	100.3	100.4	204.1	204.1		
	Bacolod Circumferential	687.6	-----	////////	22.1	34.9	34.9	148.9	148.9	148.9	149.0
Metro CDO	Western Coastal Road	763.3	-----	////////	24.1	43.6	43.7	163.0	163.0	163.0	162.9
	7th Bridge	240.4	-----	////////	7.7	23.7	104.5	104.5			
Total/Annual Investment (Million Pesos)		3,925.2	-	-	164.0	364.2	445.2	1097.1	992.7	550.1	311.9

Legend: ----- Fund Preparation; //////// Selection of Consultant; ▭ Detailed Design; ▭ ROW / Resettlement and Contractor Selection; ▭ Construction and Construction Supervision