

CHAPTER 13

FEASIBILITY STUDY OF ILOILO-STA.BARBARA ROAD

13.1 OBJECTIVES OF THE PROJECT

Iloilo-Sta.Barbara Road is an existing road and is planned to be widened for the objectives of the following:

Objectives of the Project

- To reduce traffic congestion due to normal and airport related traffic by expanding traffic capacity.
- To provide easy access to New Airport.
- To enhance international / domestic investment by providing easy access to Pavia Industrial Area.
- To contribute to the economic development of the Study Area as well as its hinterland.

13.2 PHYSICAL FEATURES OF THE PROJECT SITE

The terrain of the project site is flat with the ground elevation ranging from 2m to 20m above the mean sea level. Only small rivers cross the project site.

The geological condition is not so favorable for road construction, but better than those along C-1. Soft layer with N-value of 3 to 5 continues to the depth of 10 to 15m from the ground.

Roadsides of the section from the beginning of the project in Iloilo City to Pavia town proper are mostly developed with stores and residential houses. Roadsides of the rest of the section are not so developed yet. Areas around the project road are predominantly rice fields.

13.3 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 survey (50m interval)

- Profile survey (50m interval)
 - Cross-section survey (50m interval, width=60m)
 - River profile / cross section survey (large rivers only)
- 3) *Geo-technical survey and soils/material source survey*
- Bridge site geo-technical survey (depth = 30~50m)
 - Soils / material sources survey (3 locations)

13.4 TRAFFIC FORECAST

Traffic forecast result is shown in Table 13.4-1. Number of lanes required is shown in Figure 13.4-1.

New Iloilo Airport is scheduled to be completed in year 2008. This road provides major access to New Airport. Majority of airport related traffic will utilize this road.

With completion of the Circumferential Road No. 1 (C-1), traffic in C-1 is distributed to this road, particularly toward City Proper Side, thus Section-2 will carry the heaviest traffic, namely 61,100 pcu/day in 2016, and 69,900 pcu/day in 2022.

Traffic from Section-2 will be dispersed to Section-1 and Rizal-Lapaz CPU Road, therefore, traffic on Section-1 is lighter than Section-2.

High traffic is also attracted by Section-0, of which most traffic comes from the road accessing to the existing airport.

Year when volume/capacity ratio becomes 0.9 is shown below:

Section	Year when traffic volume exceeded traffic capacity	
	Existing 2-lane Road	2-lane road with loading/unloading lane
0	2008	2008
1	2009	2019
2	2008	2008
3	2008	2022
4	2010	After 2022
5	2017	After 2022
6	2022	After 2022

Traffic volume on Sections 0 to 3 exceeds traffic capacity of existing road soon after New Airport is completed in 2008. Even though, the road is widened by providing loading / unloading lane, these section will be congested after 2014. It is recommended to be widened to a 4-lane road.

Traffic volume in Sections 4 to 6 approaches traffic capacity of existing 2-lane road in about year 2016. It is recommended that these section be widened by providing loading / unloading lane which will accommodate expected traffic beyond year 2022.

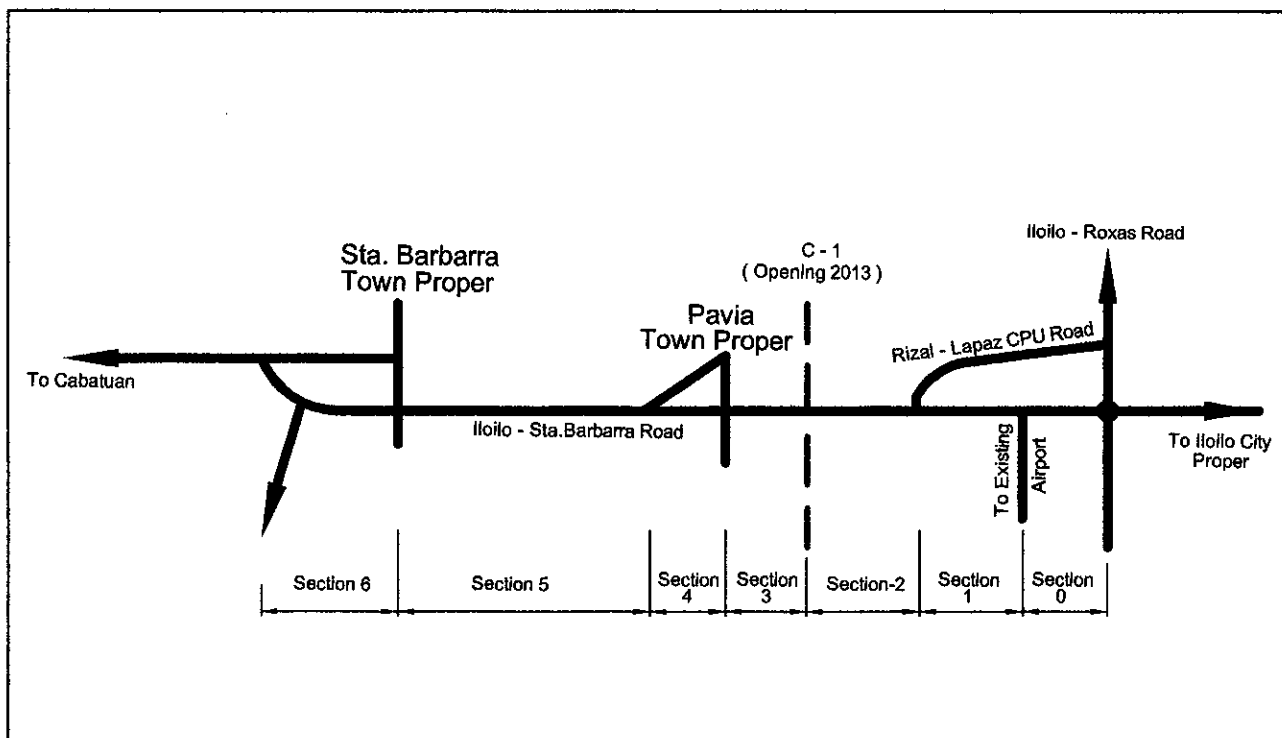


TABLE 13.4-1 ESTIMATED TRAFFIC VOLUME AND VOLUME/CAPACITY RATIO

Conditions & Section			Section-6	Section-5	Section-4	Section-3	Section-2	Section-1	Section-0
Traffic Volume in 100 pcu	Present		52 (3)	110 (5)	104 (5)	155 (4)	155 (4)	128 (9)	237 (19)
	2010		157 (76)	214 (56)	204 (55)	362 (60)	446 (50)	257 (31)	468 (31)
	2016		196 (96)	226 (61)	227 (60)	393 (67)	611 (55)	350 (32)	582 (32)
	2022		234 (105)	237 (65)	249 (64)	493 (71)	699 (54)	444 (32)	725 (32)
Volume / Capacity Ratio (V/C)	Existing Cross Section: 2-Lane + Gravel Shoulder (2.0m)	Present	0.21	0.44	0.42	0.62	0.62	0.51	0.95
		2010	0.63	0.86	0.82	1.45	1.78	1.03	1.87
		2016	0.78	0.90	0.91	1.57	2.44	1.40	2.33
		2022	0.94	0.95	1.00	1.97	2.80	1.78	2.90
	Widening-1: 2-Lane + Paved Loading / Unloading Lane (2.0m) + Sidewalk	Present	0.15	0.31	0.30	0.44	0.44	0.37	0.68
		2010	0.45	0.61	0.58	1.03	1.27	0.73	1.34
		2016	0.56	0.64	0.65	1.12	1.75	1.00	1.66
		2022	0.67	0.68	0.71	1.41	2.00	1.27	2.07
	Widening-2: 4-Lane + Paved Loading / Unloading Lane (2.0m) + Sidewalk	Present	0.09	0.20	0.19	0.28	0.28	0.23	0.43
		2010	0.29	0.39	0.37	0.66	0.81	0.47	0.85
		2016	0.36	0.41	0.41	0.71	1.11	0.64	1.06
		2022	0.43	0.43	0.45	0.90	1.27	0.81	1.32

Note: Figures in the bracket () indicate airport related traffic

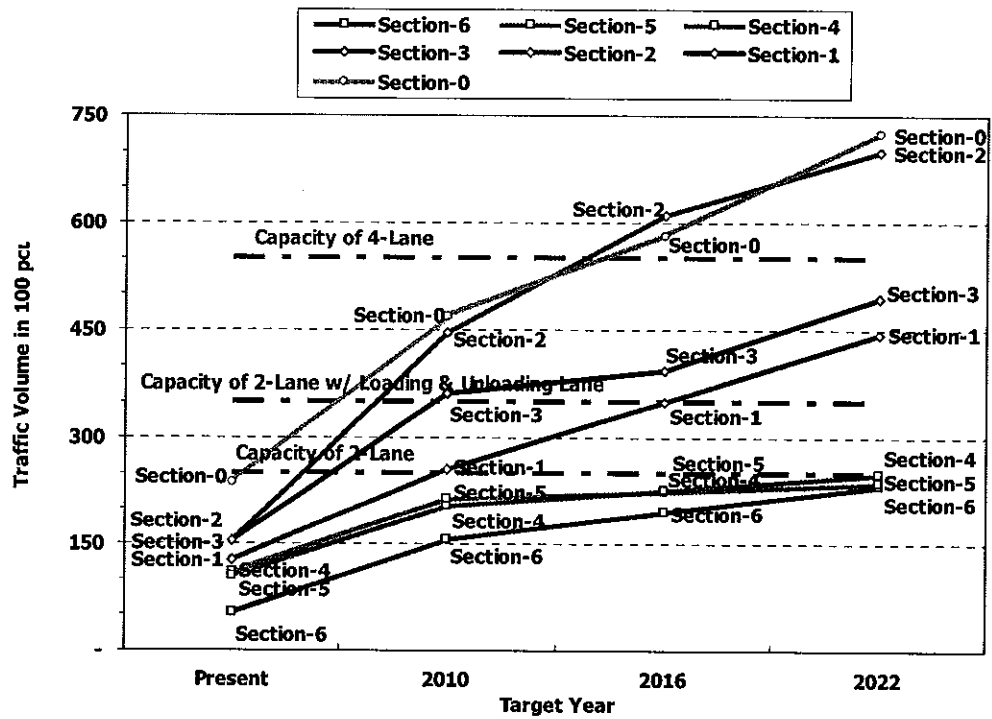


FIGURE 13.4-1 NUMBER OF LANES REQUIRED

13.5 SELECTION OF TYPICAL CROSS-SECTION

The project is to widen the existing carriageway width to cope with expected traffic growth. The alignment follows the existing one, therefore, to what extent the existing carriageway width be widened became alternatives in due consideration of traffic growth and roadside development condition.

13.5.1 History of Road Construction and Roadside Development

History of road construction of this road is shown in Figure 13.5-1.

- | | | |
|-----------------|---|---|
| Section - 1 | : | Newly constructed in 1979 as a diversion road under 3 rd /4 th IBRD Project. Design recommended 60m/ROW for future widening. It was constructed as a 2-lane road in 1979. |
| Section - 2 & 3 | : | Pavement of the existing 2-lane road was improved under 3 rd /4 th IBRD Project. Design recommended 60m ROW for future widening. Improvement was made within the property line limit. |
| Section - 4 | : | Newly constructed in 1979 as a bypass road under 3 rd /4 th IBRD Project. Design recommended 30m ROW. It was constructed as a 2-lane road. |
| Section - 5 | : | Pavement of the existing 2-lane road was improved in 1979 under 3 rd /4 th IBRD Project. Design recommended 30m ROW. Improvement was made within the property line limit. |
| Section - 6 | : | Newly constructed in 2000 as a bypass road by local fund. Design recommended 30m ROW. It was constructed as a 2-lane road. |

Roadside development is relatively dense along the Iloilo-Pavia Section and not so dense along the Pavia-Sta.Barbara Section. Roadside development condition of a part of Section-1 is shown in Figure 13.5-2. From the viewpoint of minimizing social impacts, widening of the Iloilo-Pavia Section should be limited to required minimum, on the other hand, traffic growth requires wider carriageway for the said section.

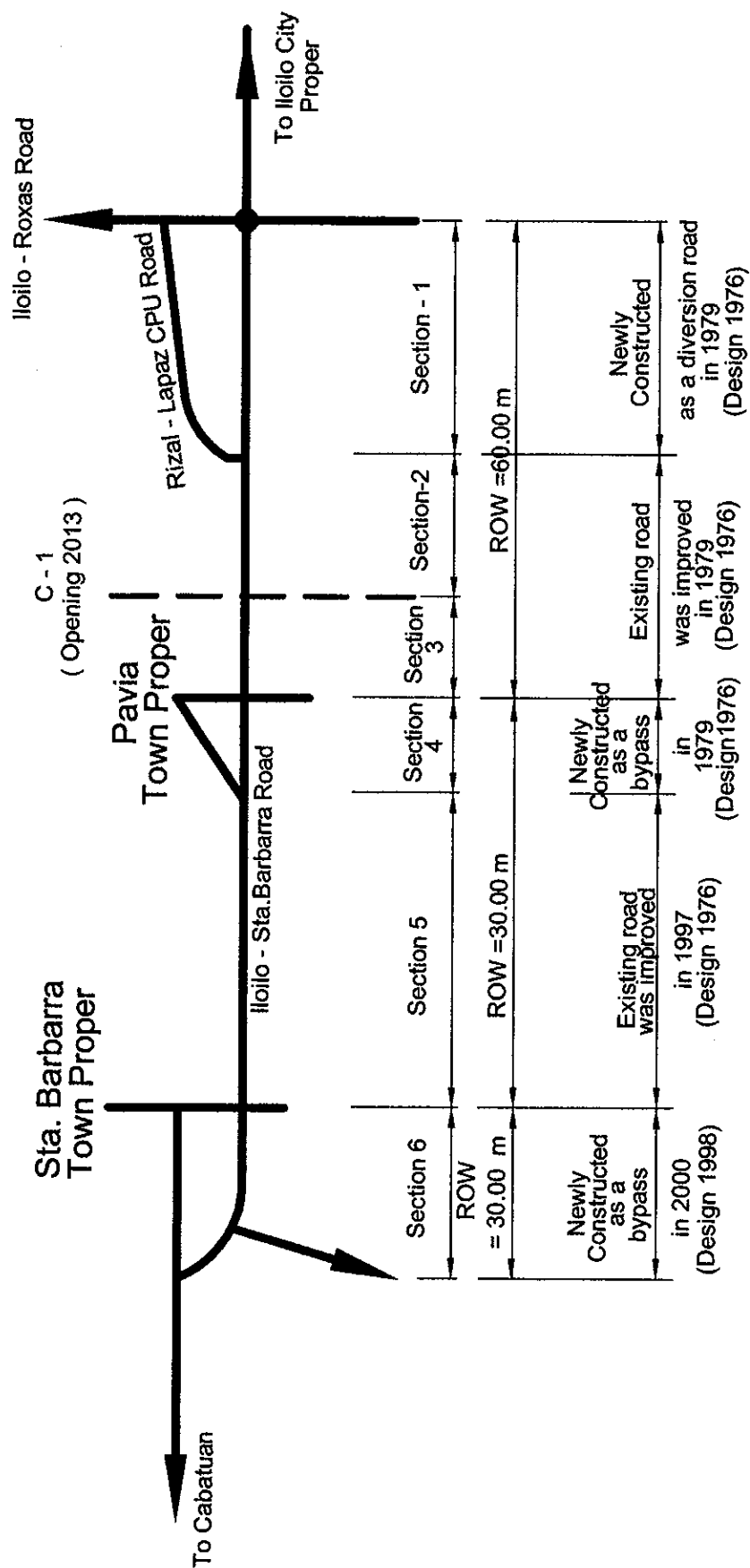


FIGURE 13.5 - 1 HISTORY OF ROAD CONSTRUCTION AND ROW

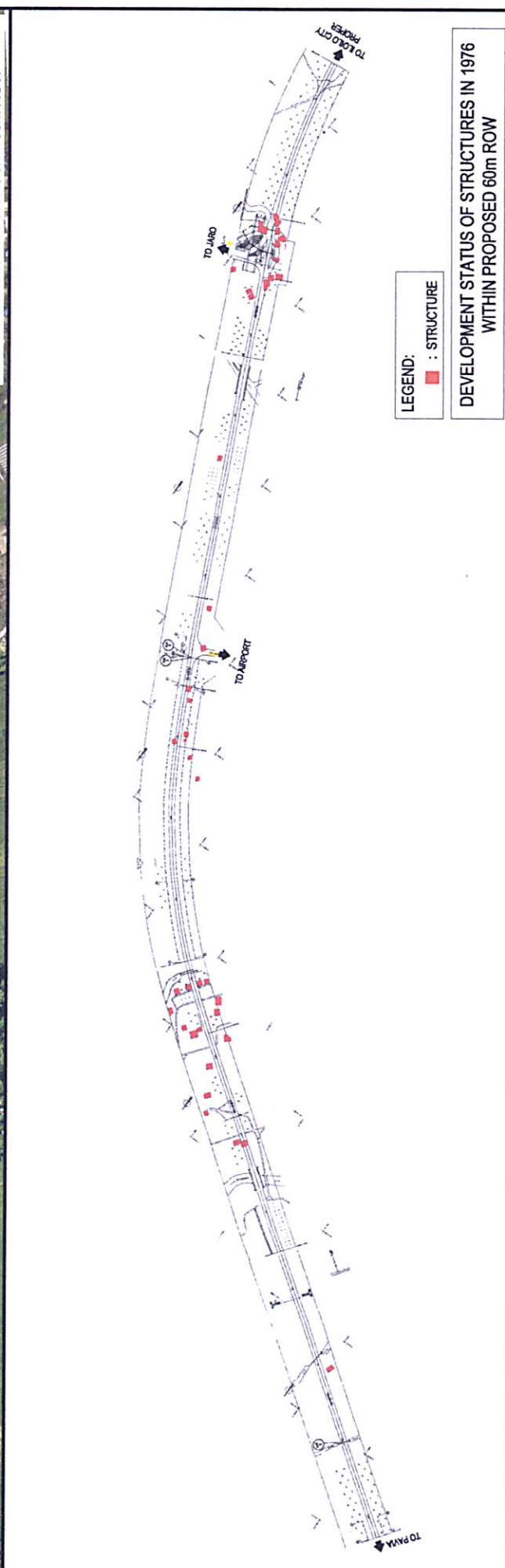


FIGURE: 13.5-2 ROADSIDE DEVELOPMENT STATUS: 1976 vs. 2003

13.5.2 Alternative Cross-Sections

1) Iloilo-Pavia Section (Sections 0, 1, 2 and 3)

In due consideration of existing road width, traffic demand and level of service, the following two alternatives were developed (see Figure 13.5-3):

Alternative - 1 : 2-lane (2 x 3.5m) + Loading / unloading Lane (2 x 2.0m) + sidewalk (2 x 1.5m).

- In order to secure 2-lane capacity, loading/unloading lane for jeepneys shall be provided.
- To reduce effect of jeepneys' maneuvering from a carriageway lane to a loading/unloading lane or vis-à-vis, carriageway lane width shall be 3.5m.
- Sidewalk shall not be mount up to avoid investment for surface water drainage, thus when further widening becomes possible, demolition of surface water drainage facility can be avoided.

Alternative - 2 : 4-lane (4 x 4.0m) + Loading / unloading Lane (2 x 2.0m) + sidewalk (2 x 1.5m).

- Carriageway lane width shall be minimum at 3.0m.
- Center median shall not be provided to minimize road width.
- In order to secure 4-lane capacity, loading/unloading lane for jeepneys shall be provided.

Alternatives were assessed as shown in Table 13.5-1.

It is recommended that this section be improved with the typical cross-section of Alternative-2.

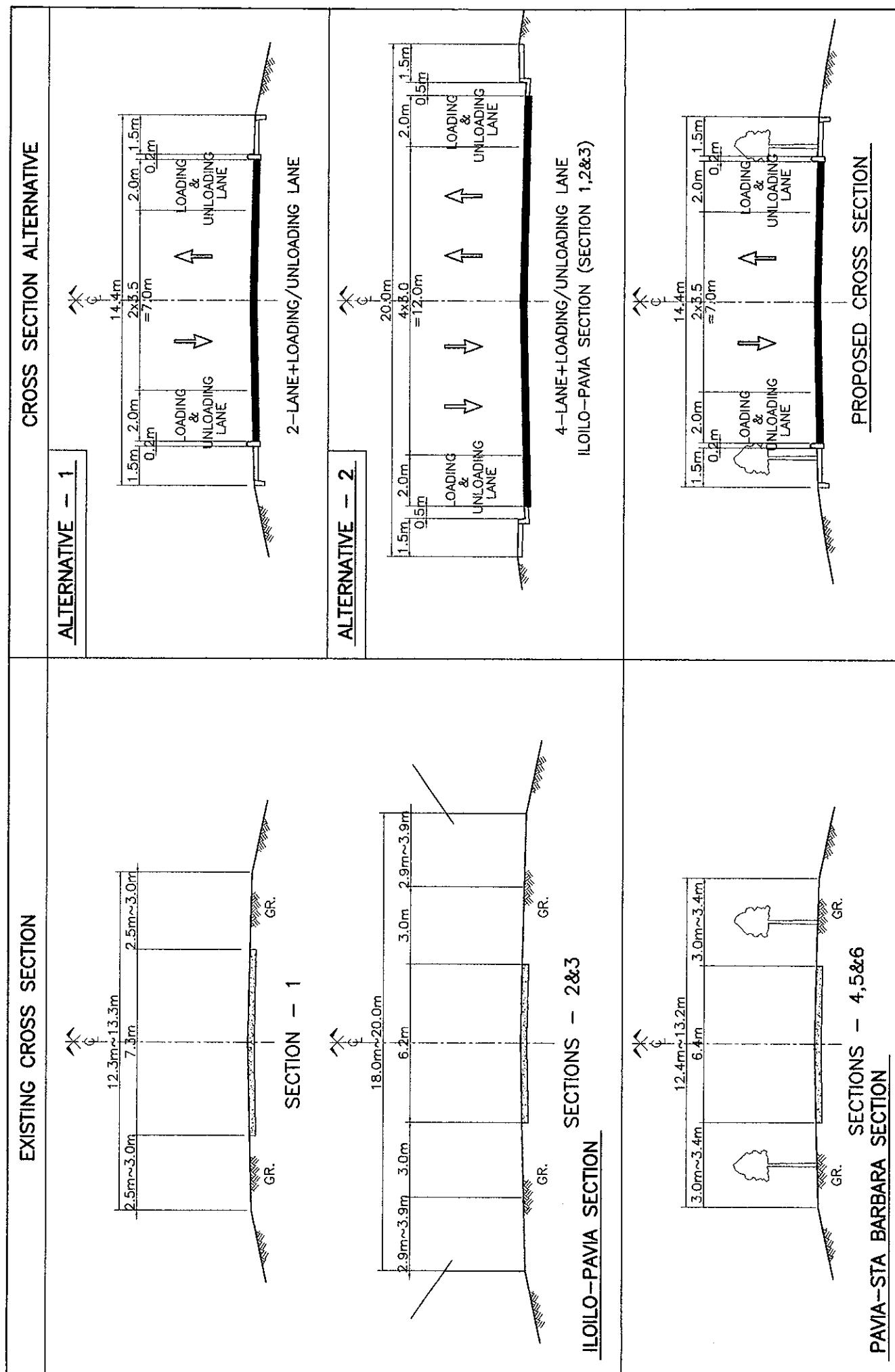


FIGURE 13.5-3 ALTERNATIVE CROSS SECTIONS

TABLE 13.5-1 ASSESSMENT OF ALTERNATIVES

		Do Nothing Case	Alternative-1 (W=14.4m)	Alternative-2 (W=20.0m)
1) Existing Road Width (m)	Section-0	12.3 ~ 13.3	12.3 ~ 13.3	12.3 ~ 13.3
	Section-1	12.3 ~ 13.3	12.3 ~ 13.3	12.3 ~ 13.3
	Section-2	18.0 ~ 20.0	18.0 ~ 20.0	18.0 ~ 20.0
	Section-3	18.0 ~ 20.0	18.0 ~ 20.0	18.0 ~ 20.0
2) Required Widening Width (m)	Section-0		1.1 ~ 2.1	6.7 ~ 7.7
	Section-1	—	1.1 ~ 2.1	6.7 ~ 7.7
	Section-2	—	0	0 ~ 2.0
	Section-3	—	0	0 ~ 2.0
3) No. of Structures Affected	Section-0		40	50
	Section-1	—	28	44
	Section-2	—	20	31
	Section-3	—	4	12
	Total	—	92 (0.00)	137 (+45)
4) Construction Cost (Million P)		—	201.4 (0.00)	272.5 (+71.1)
5) Traffic Efficiency				
5-1) Year when V/C Ratio becomes 0.9	Section-0	2008	2008	2014
	Section-1	2008	2014	After 2022
	Section-2	2008	2008	2014
	Section-3	2008	2008	2022
5-2) Travel Speed (km/hr) in year 2016	Section-0	15.6	16.9	24.1
	Section-1	25.1	28.0	34.0
	Section-2	15.8	16.7	23.1
	Section-3	24.8	35.4	44.4
Travel Speed (km/hr) in year 2022	Section-0	13.1	15.5	20.1
	Section-1	22.8	25.2	30.0
	Section-2	14.7	16.1	20.7
	Section-3	19.8	32.3	40.3
5-3) Travel Time Section 0~3 (L = 6.2 km)	2010	13.8 min.	10.7 min.	9.6 min.
	2016	15.1 min.	13.6 min.	10.6 min.
	2022	18.4 min.	14.8 min.	12.0 min.
5-4) PCU-hour/day (Section 0~3)	2010	8,100 (1.49)	6,170 (1.14)	5,420 (1.00)
	2016	10,920 (1.44)	9,800 (1.30)	7,560 (1.00)
	2022	16,400 (1.54)	13,240 (1.24)	10,650 (1.00)
6) Economic Aspect				
6-1) Vehicle Operating Cost (2010-2022)	(Million P)	157,305 (+2,824)	156,647 (+1,866)	154,481 (0.00)
6-2) Time Cost (2010-2022)	(Million P)	24,256 (+576)	24,751 (+1,071)	23,680 (0.00)
Assessment			<ul style="list-style-type: none"> • Due to encroachment of structure within roadway, 92 structures are affected. • Additional widening and investment will be required by 2010. • Travel speed will be less than 20 km/hr. in Sections 0 and 2 before 2016. • VOC is higher by 1,866 Million Pesos than Alternative-2. • Time cost is higher by 1,071 Million Pesos than Alternative-2 	<ul style="list-style-type: none"> • Increase of affected structures compared with Alternative-1 is 45. Not drastic increase. • Since Sections 0 & 2 are short sections, additional widening and investment will be required after 2022. • Travel speed will not be less than 20 km/hr. until 2022. • Less traffic accidents. • Less noise and air pollution.
Recommendation			—	• Recommended

Alternative - 2 is recommended for Sections 1, 2 and 3.

2) Pavia – Sta. Barbara Section (Sections 4, 5 and 6)

Traffic forecast indicates that a 2-lane road with loading / unloading lane can accommodate future traffic demand.

A 2-lane road with loading / unloading lane for jeepneys and 1.5m sidewalk requires a total width of 14.4m. Existing road width varies from 12.4 to 13.2m, this widening of 1.2m to 2m is required. Of the section length of 7.1km, 4.9km (or about 70%) are still rural sections and remaining 2.2 km are urban section with moderate roadside development, thus proposed widening is not difficult.

Another factor to be considered is that trees are planted along the edge of existing gravel shoulder. Road cross section for this section needs to be so designed that removal of trees be avoided.

Proposed cross-section is shown in Figure 13.5-3.

- Carriageway width shall be 7.0m (2 @3.5m).
- Loading / unloading lane (2.0m) on each direction shall be provided to reduce side friction due to jeepney stoppings.
- Trees along the existing shoulder shall be maintained within the sidewalk.
- Sidewalk shall not be mount up to avoid investment for surface water drainage, thus when further widening is required in future, demolition of surface water drainage facility can be avoided.

13.6 CONSTRUCTION PHASING

Proposed widening of this road should be implemented in one time in consideration of the size of project and urgency of the project.

13.7 PRELIMINARY DESIGN

13.7.1 Design Concepts and Criteria

1) Design Concepts

This project is to widen existing road, thus road alignment follows existing one.

Design concepts were established as follows:

- Road alignment follows existing one. Improvement of road alignment is not required with the design speed of 60 km/hour.
- Widening is designed within the proposed right-of-way of 20m from Iloilo to Pavia and 14.4m from Pavia to Sta. Barbara. To achieve this objective, retaining walls are provided for a where existing ground elevation is lower than proposed elevation.
- Intersections are so designed to accommodate left turn lanes.
- Where the existing drainage facility has insufficient capacity, additional facility is provided.

2) Road and Intersection Design Criteria

Highway design criteria and intersection design criteria are shown in Table 13.7-1 and Table 13.7-2, respectively.

Typical cross-sections for Iloilo-Pavia Section and Pavia-Sta. Barbara Section are shown in Figure 13.7-1.

3) Bridge and Structures

The same criteria discussed in 3) of Section 12.7.1 were used.

4) Drainage and Cross Drainage Facilities

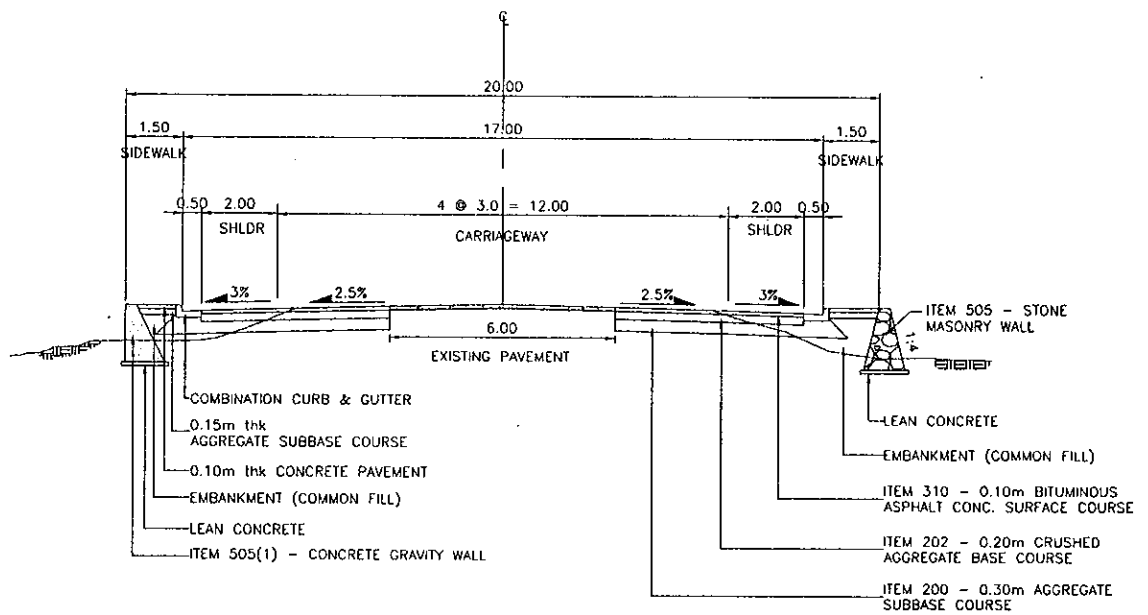
The same criteria discussed in 4) of Section 12.7.1 were used.

TABLE 13.7-1 HIGHWAY DESIGN CRITERIA
- Iloilo-Sta. Barbara Road -

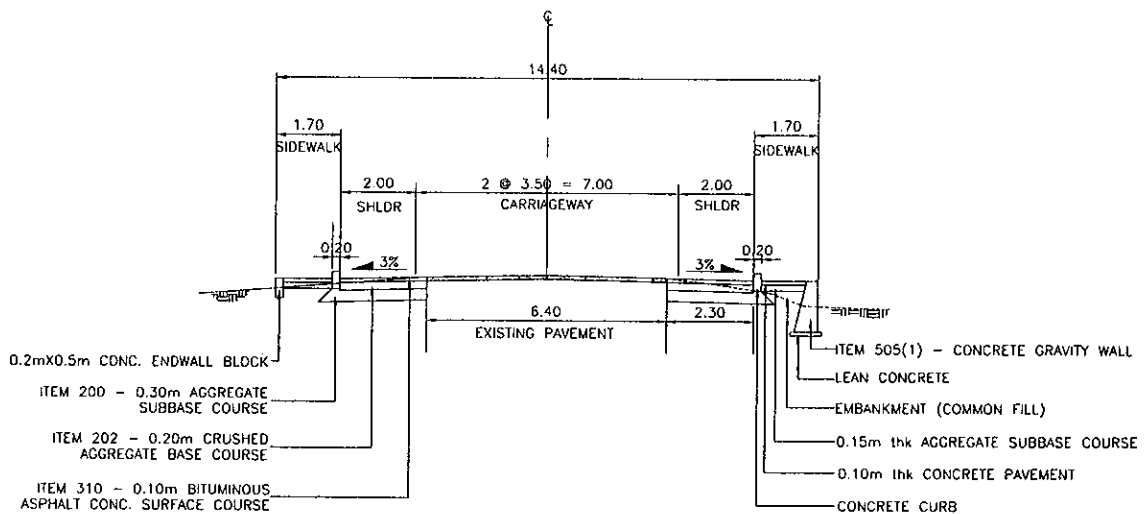
Classification	Unit	Pavia-Sta. Barbara Section	Iloilo-Pavia Section
Design Speed	Km/h	60	
Number of Lane		2	4
Type of Pavement		AC	
Lane Width	m	3.5	3.0
Loading / Unloading Lane Width	m	2.0	2.0
Median	m	-	-
Side Walk	m	1.5	1.5
Stopping Sight Distance	m	85	
Passing Sight Distance	m	420	
Minimum Radius	m	120	
Minimum Radius for Normal Cross Slope	m	1,500	
Maximum Grade	%	5	
Minimum Length of Vertical Curve	m	60	
Minimum "K" for Crest		14	
Minimum "K" for Sag		16	
Maximum Superelevation	%	6	
Normal Cross Slope	%	25	

TABLE 13.7-2 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	



4 - LANE (WIDENING)
ILOILO - PAVIA SECTION (Sta. 2 + 232 - 8 + 400)



2 - LANE (WIDENING)
PAVIA - STA. BARBARA SECTION (8 + 400 - 15 + 328)

FIGURE 13.7-1
TYPICAL CROSS-SECTION
ILOILO - STA. BARBARA ROAD

13.7.2 Road and Intersection Design

1) Horizontal Alignment

Horizontal alignment was determined following the existing alignment. Horizontal alignment is shown in Figure 13.7-2. Among various horizontal curves, minimum one is 340m in radius with super elevation of 6%.

2) Vertical Alignment

Vertical alignment was determined following the existing alignment.

3) Intersection Design

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

- Intersection with Iloilo-Roxas Road at Jaro (see Figure 13.7-3)
- Intersection with C-1
- Intersection with the road going to Pavia Town Proper
- Intersection with the road going to Sta. Barbara Town Proper

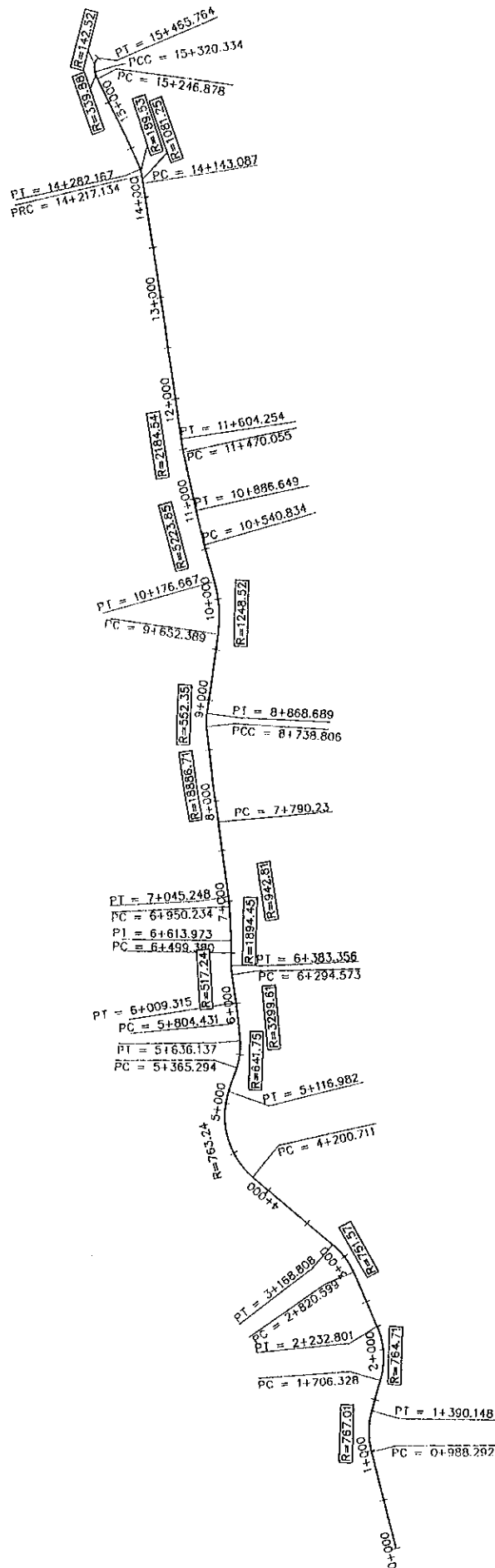
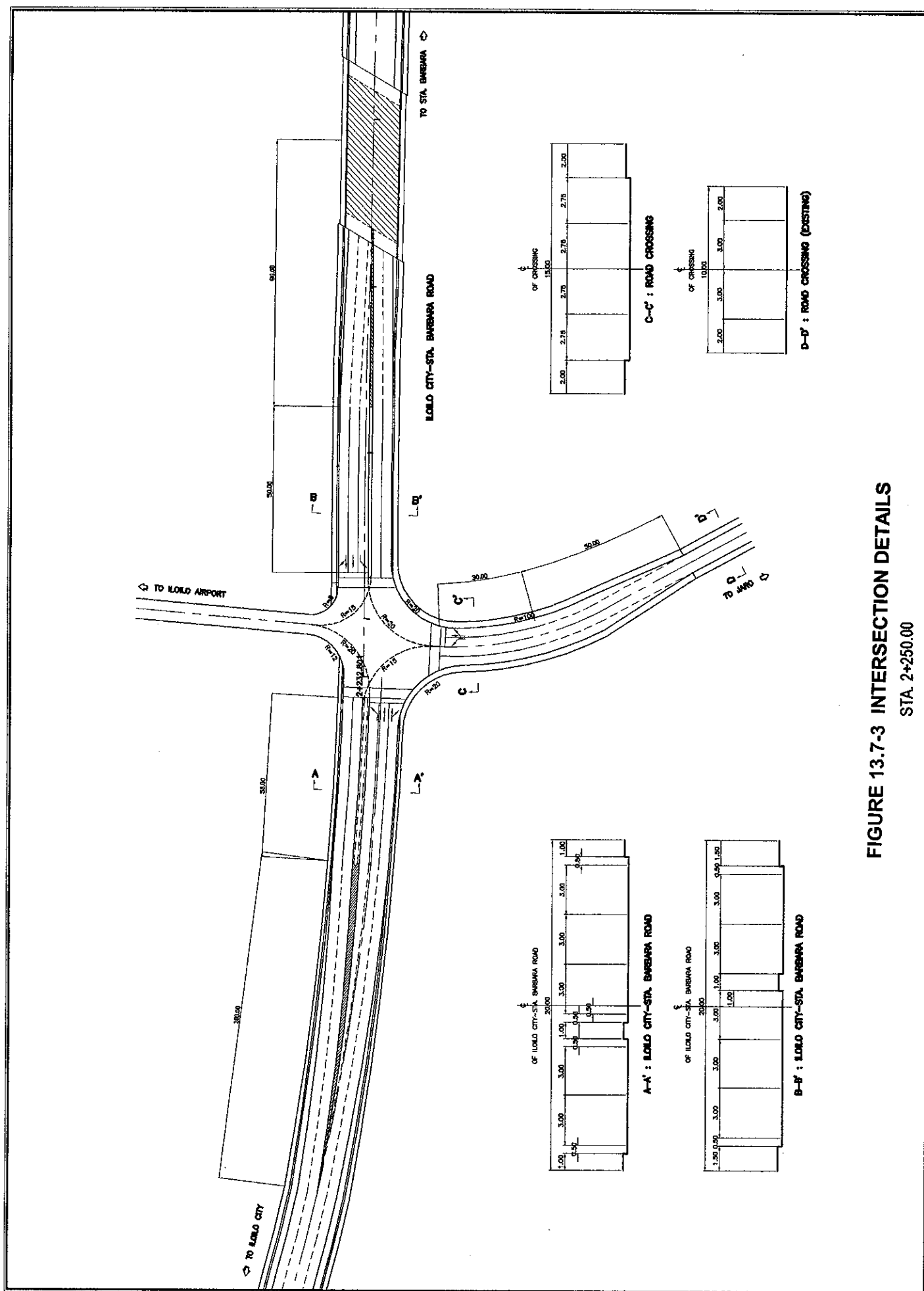


FIGURE 13.7-2

ILOILO-STA. BARBARA ROAD HORIZONTAL ALIGNMENT



13.7.3 Pavement Design

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

Table 13.7.3-1 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 13.7.3-2 shows traffic loading. Cumulative ESAL is 3.44 Million for 10 years for Iloilo-Pavia Section and 4.19 Million for 10 years for Pavia-Sta. Barbara Section.

Required pavement thickness is as follows:

AC Pavement : 10cm
Aggregate Base Course : 20cm
Subbase Course : 30cm

TABLE 13.7.3-1 DESIGN REQUIREMENT (Iloilo-Sta.Barbara)

Category	Description
a. Design Variable	
a.1 Time Constraints - Time Period	AC : 10 years
a.2 Traffic Loading	Directional Distribution Factor : 0.5 Lane Distribution Factor : 0.6
a.3 Bus and Truck Factor	Bus : 0.8 Truck : 1.8
a.4 Reliability	$Z_R = 1.037$ for 85% Reliability $S_o = 0.45$ (Flexible)
b. Performance Criteria	
b.1 Serviceability	(Flexible) $PSI = P_o - P_t = 4.2 - 2.0 = 2.2$
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 (4.20×10^6 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	$t = 10\text{cm}$
d2. Aggregate Base Course	$t = 20\text{cm}$
d3. Subbase Course	$t = 30\text{cm}$

**TABLE 13.7.3-2 (1/2) TRAFFIC LOADING (Iloilo-Pavia Section)
(4-lanes)**

Year	AADT		Cumulative ESAL
	Bus	Truck	
2012	146	1,663	340,539
2013	151	1,665	681,935
2014	156	1,667	1,024,204
2015	162	1,669	1,367,361
2016	167	1,671	1,711,410
2017	170	1,673	2,056,104
2018	172	1,676	2,401,448
2019	175	1,678	2,747,447
2020	178	1,680	3,094,105
2021	181	1,682	3,441,426
TOTAL	1,657	16,724	3,441,426

**TABLE 13.7.3-2 (2/2) TRAFFIC LOADING (Pavia-Sta.Barbara Sect.)
(2-lanes)**

Year	AADT		Cumulative ESAL
	Bus	Truck	
2012	267	1,088	396,266
2013	271	1,101	797,661
2014	276	1,115	1,204,251
2015	281	1,129	1,616,105
2016	285	1,143	2,033,191
2017	294	1,154	2,455,137
2018	304	1,165	2,882,020
2019	313	1,176	3,313,918
2020	323	1,187	3,750,909
2021	334	1,198	4,193,074
TOTAL	2,948	11,454	4,193,074

13.7.4 Structure Design

The Iloilo-Sta. Barbara Road is an existing road proposed to be widened and improved. Due to right-of-way problems, only the section from Iloilo to Pavia is proposed to be widened to four (4) lanes while the section from Pavia to Sta. Barbara is proposed to be improved but maintains two lanes of travelway.

Under this condition, only four (4) existing bridges, Dungon Bridge I to IV, will be widened from two (2) lanes to four (4) lanes. Aganan Bridge, located after the Pavia intersection will not be widened but treatment for pier scour protection and slope protection will be done.

This section discusses the preliminary design aspects of the proposed widening of bridges crossing waterways along the Iloilo-Sta. Barbara road.

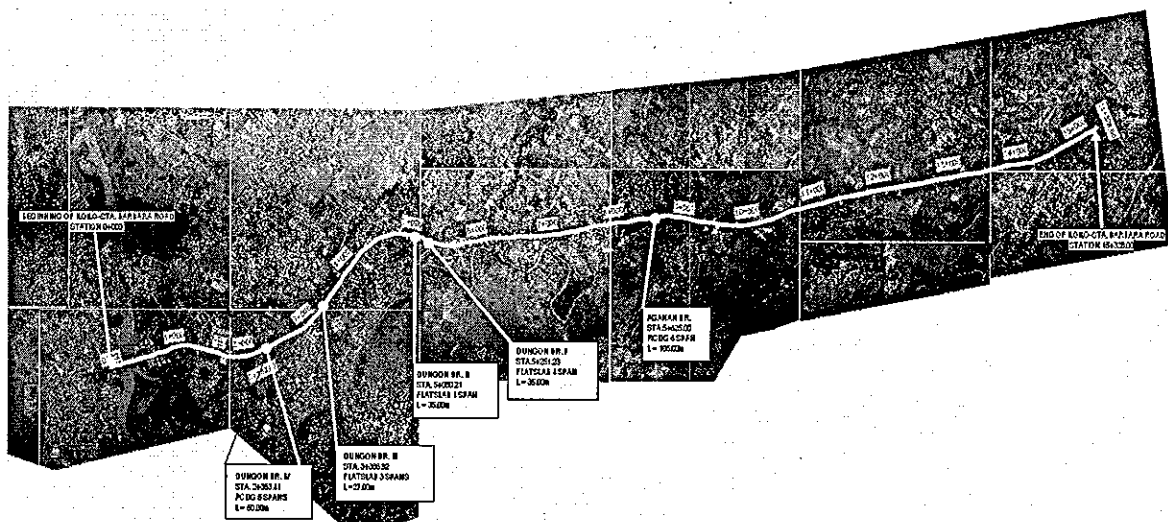


FIGURE 13.7.4-1 BRIDGE LOCATION MAP

13.7.4.1 Present Condition of the Proposed Bridge Sites

Site investigation was carried-out to verify the conditions of bridges and waterways along the alignment and determine the appropriate bridge widening scheme suitable for each site. Figure 13.7.4-1 shows the locations of existing bridges along the proposed alignment while Figure 13.7.4-2 presents the conditions of the five bridges along the Iloilo-Sta Barbara Road.

The following features describe briefly the proposed bridge sites:

Topography

- Although the alignment is located on a relatively flat terrain, the maximum flood levels observed on bridge sites are still below the girder soffit with clearance of 750mm or more, as experienced by persons living near the bridge.
- Under this condition, the bridge spans and height are considered sufficient for maximum flood level.

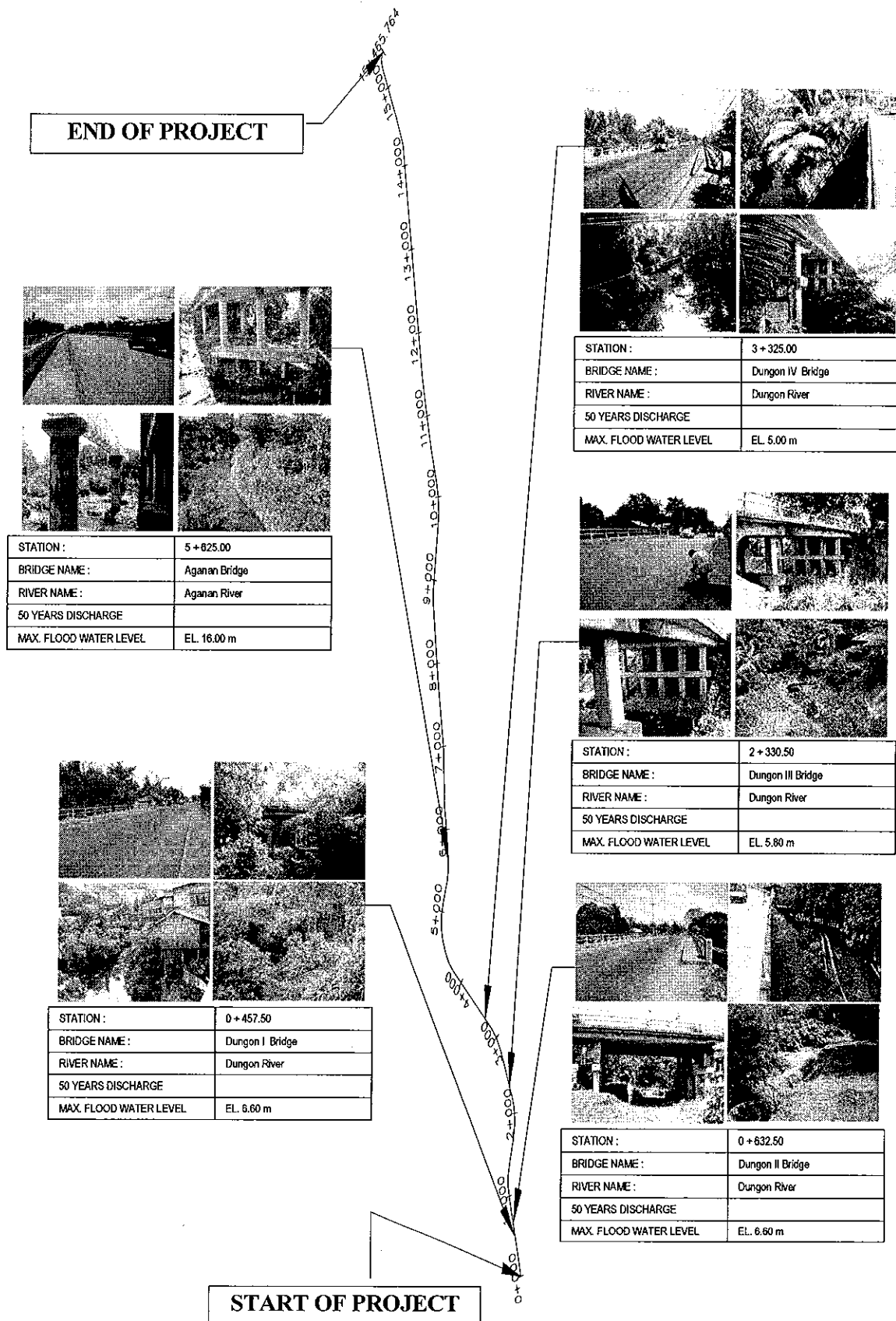


FIGURE 13.7.4-2 BRIDGE AND RIVER CONDITION ALONG THE PROPOSED ALIGNMENT

Rivers/Streams

- River conditions along Dungon Bridges I to IV are observed to be stable with minimal signs of bank scouring.
- On the other hand, Aganan river bed is observed to have undergone a general scour of more than 2.0m exposing the pile cap and piles of Pier 3. Banks on the upstream side of the bridge especially next to Pier 2 is observed to be scouring progressively.

Design drawings prepared in 1976 for the Third and Fourth IBRD Highway Project for Panay Roads indicate the design flood level for the existing bridges as presented in Table 13.7.4-1.

TABLE 13.7.4-1 DESIGN FLOOD LEVEL OF EXISTING BRIDGE SITES

BRIDGE NAME	STATION		RIVER NAME	CARRIAGEWAY WIDTH (m)	MFWL (EL. +m)
	BEG	END			
DUNGON IV	2+363.41	2+413.41	Dungon	8.1	5.00
DUNGON III	3+386.82	3+413.82	Dungon	8.1	5.80
DUNGON II	5+086.21	5+115.21	Dungon	8.1	6.60
DUNGON I	5+251.23	5+286.23	Dungon	8.1	6.60
AGANAN	8+562.91	8+667.47	Aganan	8.1	16.00

Geotechnical

- Geotechnical investigation was carried-out along the Iloilo-Sta. Barbara road right next to Dungon bridge. Since the site is next to an existing road, the upper 4m (sand and clay) are medium dense and medium stiff but N-values of 3 to 5 persists until 18m deep. However, the soil condition is relatively better than C-1 Road.

13.7.4.2 Design Concept for Structures

(1) Superstructure

The superstructure preliminary design basically adheres to the following concepts:

Bridge Deck Section

- The existing Iloilo-Sta. Barbara Road is proposed to be widened to four lanes under a limited right-of-way of 20.0m. In this regard, the lane width considered for the highway is 3.0m per lane with 2.0m shoulders on each side.
- The existing bridges along this road is 8.0m clear (curb to curb) which will be widened to 16.0m clear following the same section as the roadway. Typical bridge section is illustrated in Figure 13.7.4-3.
- The existing deck is a flat slab continuous type with depth of about 500mm on 5-450mmx450mm pile bents. The end span is a 3.0m cantilever type with link slab on sleeper beams. The deck has a 2.5% cross slope in one

- Widening will be done on each side of the bridge by extending the deck 4.0m each following the same cross slope. The new deck will be connected to the existing deck continuously by exposing the rebars of the existing slab and connecting with the new rebars of the new deck. Rotational movement will be allowed at this joint.



- The existing bridge has a reinforced concrete flat slab deck with depth of 500mm.
- To be consistent with the existing structure and to maintain the existing road profile as well as the maximum floodwater freeboard, bridge widening will utilize the same deck slab configuration following the existing cross-slope (see Figure 13.7.4-3).

Vertical Clearance

- The floodwater vertical clearance will be the clearance left after the deck slab has been extended. In most cases, this will be greater than 1.0m except Dungon IV bridge which has 0.685m freeboard on the upstream side.

(2) Substructures

Piers

- Although it is desirable to utilize a similar substructure for the bridge widening to maintain similar structural behavior as the original, basic investigations on the substructure capacity indicated a C/D ratio (capacity-demand ratio) less than 1.0 ($C/D < 1$) following the AASHTO Div. I-A Seismic Design recommendations.
- Since these bridges are constructed in 1979, they do not comply with the present seismic code requirements. In which case, it is necessary to retrofit the bridge to comply with the recent seismic code requirements.
- Therefore, the substructure scheme chosen for bridge widening will resist partially the seismic force demand of the existing pile bents. Figure 13.7.4-3 presents the substructure scheme using $\phi 1000\text{mm}$ columns on multiple driven piles.

Pile Foundation

- Driven pile foundation is proposed to support the new bridge widening 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.

13.7.4.4 Proposed Bridge Widening

The proposed bridge widening for the Iloilo-Sta. Barbara road improvement are presented in Table 13.7.4-2 below with a total bridge widening length of 147m.

TABLE 13.7.4-2 PROPOSED BRIDGE WIDENING AT ILOILO-STA. BARBARA ROAD

BRIDGE NO.	RIVER NAME	STATION		BRIDGE LENGTH (m)	SUPERSTRUCTURE				SUBSTRUCTURE	
		BEG.	END		EXISTING	PROPOSED	SPAN	SKEW (deg)	EXISTING	PROPOSED
Dungon IV Bridge	Dungon	Sta. 2+363.41	Sta. 2+413.41	50.00	Flatslab D=500mm	Flatslab D=500mm	7.5+10+15 +10+7.5	30	Pile Bent 5-450x450, L=22m	$\phi 1000$ Single Column 6-450x450, L=20m
Dungon III Bridge	Dungon	Sta. 3+386.82	Sta. 3+413.82	27.00	Flatslab D=500mm	Flatslab D=500mm	7.5+12+7.5	-	Pile Bent 5-450x450, L=22m	$\phi 1000$ Single Column 6-450x450, L=20m
Dungon II Bridge	Dungon	Sta. 5+080.21	Sta. 5+115.21	35.00	Flatslab D=500mm	Flatslab D=500mm	7.5+10+10 +7.5	-	Pile Bent 5-450x450, L=22m	$\phi 1000$ Single Column 6-450x450, L=20m
Dungon I Bridge	Dungon	Sta. 5+251.23	Sta. 5+286.23	35.00	Flatslab D=500mm	Flatslab D=500mm	7.5+10+10 +7.5	30	Pile Bent 5-450x450, L=22.5m	$\phi 1000$ Single Column 6-450x450, L=20m
Aganan Bridge	Aganan	Sta. 8+562.91	Sta. 8+667.91	105.00	RCDG D=1600mm	NO WIDENING	12.5+4@20 +12.5	45	Multi-Column 3 - $\phi 920$ mm	NO WIDENING

TOTAL BRIDGE LENGTH : 147m

13.7.5 Drainage Design

1) Principle and Methodology

Refer to Sub section 12.7.4.1 for the principle and methodology. The AASHTO Guidelines for Storm Drain Systems is also used as an additional standard in the urban section study of the road.

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 seven (7) catchment areas for this proposed road. See Figure 13.7.4-1 for the catchment areas map of Iloilo-Sta. Barbara Road. The analyses also reveal that there is one (1) location where the area is greater than twenty (20) sq km. Moreover there are five (5) areas where the design discharge is more than forty (40) cu m per sec. The result of the hydrological analyses is shown in Table 13.7.5-1.

4) Results of the Hydraulic Analyses

The hydraulic analyses reveal that there are five (5) bridges and thirty seven (37) culverts needed for the road. The bridge schedule is shown in Section 13.7.3 and the list of proposed culverts is shown in Table 13.7.5-2.

5) Flood Flow Analysis

The flood flow analysis is conducted for the four (4) catchment areas where the discharge is more than forty (40) cu m per sec. The results of the analysis are shown in Table 13.7.5-3. The fifth area was not considered since the existing drainage structure is a reinforced concrete box culvert.

**TABLE 13.7.5-1
HYDROLOGICAL ANALYSIS**

Road Section **ILOILO - STA. BARBARA 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	2 + 232.00	3 + 232.00	45.51	66.90	77.71	85.74
2	3 + 232.00	5 + 032.00	28.41	41.77	48.52	53.53
3	5 + 032.00	6 + 732.00	35.76	52.39	60.84	67.04
4	6 + 732.00	8 + 232.00	7.69	11.22	13.02	14.33
5	8 + 232.00	8 + 732.00				800.00
6	8 + 732.00	14 + 132.00	61.16	89.91	104.44	115.24
7	14 + 132.00	15 + 328.00	5.45	7.96	9.24	10.17

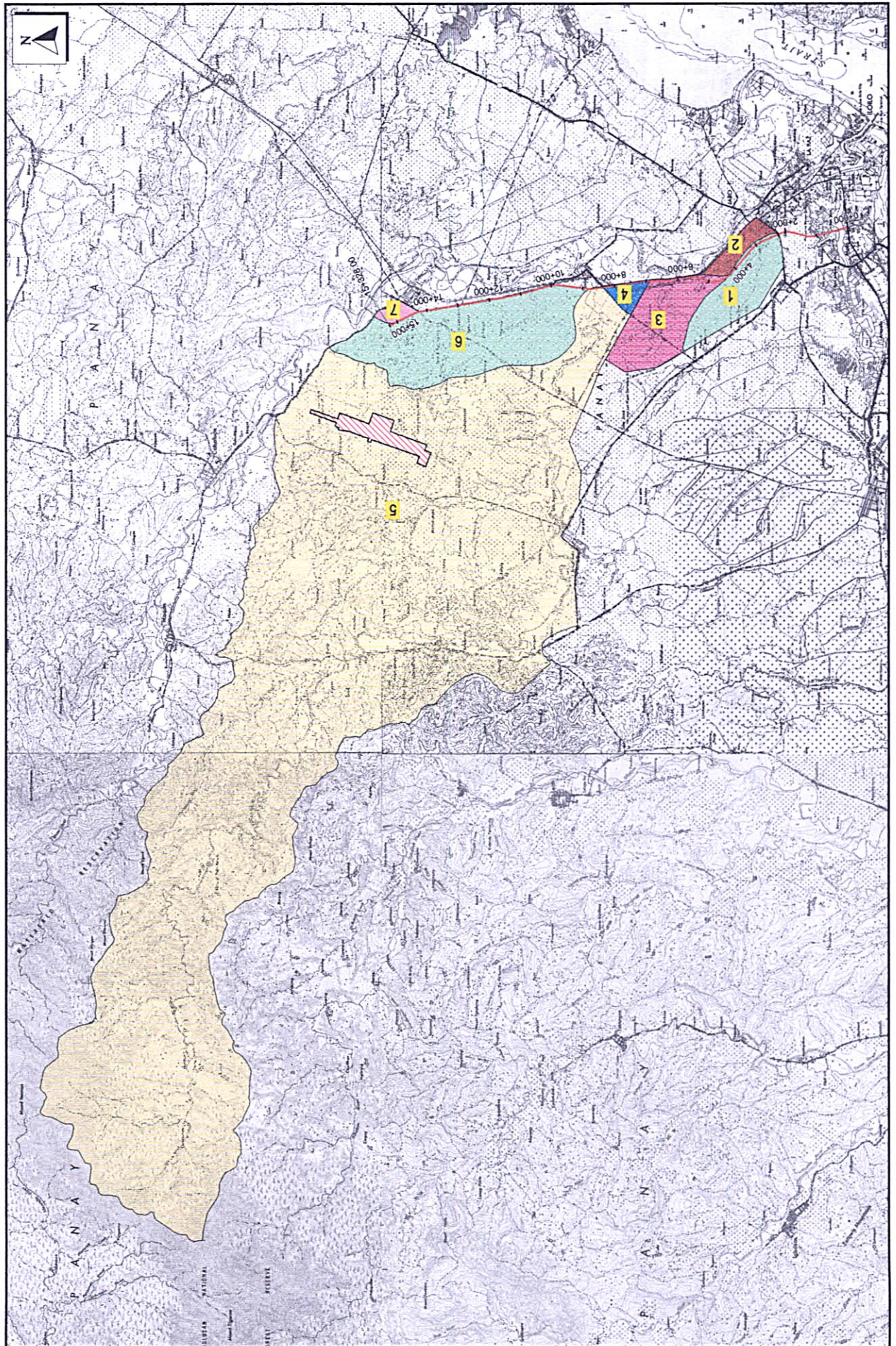


FIG. 13.7.4-1 ILOILO-STA. BARBARA ROAD CATCHMENTS AREA MAP

**TABLE 13.7.5-2
HYDRAULIC ANALYSIS**

ILOILO - STA. BARBARA ROAD

BASIN NUMBER	STATION (km)	S I Z E		LENGTH	REMARKS / RECOMMENDATION
		RCPC	RCBC		
		mmØ	SPAN X HEIGHT	(m)	
1	2 + 774.00	1 - 910		25.00	
	3 + 127.00		1 - 2.50 X 2.50	24.00	EXTEND 5.0 m
2	3 + 621.00	1 - 1070		25.00	EXTEND 2.0 m
	3 + 731.00	1 - 910		25.00	EXTEND 9.0 m
	4 + 301.00		1 - 1.50 X 0.60	27.00	
	4 + 417.00		1 - 1.50 X 0.60	25.00	
	4 + 656.00	1 - 910		25.00	EXTEND 9.0 m
3	5 + 467.00	1 - 910			CLEAN AND MAINTAIN
	5 + 538.00	1 - 910			CLEAN AND MAINTAIN
	5 + 549.00		1 - 1.50 X 1.50	29.00	EXTEND 2.0 m
	5 + 596.00		1 - 1.50 X 1.50	24.00	EXTEND 2.0 m
	5 + 900.00		1 - 1.50 X 0.60	24.00	
	6 + 250.00		1 - 1.50 X 0.60	24.00	
	6 + 538.00	1 - 910		25.00	
4	6 + 930.00		1 - 1.50 X 0.60	23.00	
	7 + 180.00		1 - 1.50 X 0.60	23.00	
	7 + 503.00		2 - 1.50 X 1.00	25.00	
	7 + 983.00		2 - 1.50 X 1.00	25.00	
	8 + 183.00		2 - 1.50 X 1.00	25.00	
6	9 + 105.00		3 - 4.00 X 2.50	19.00	ADD 1 BARREL AND EXTEND EXISTING
	9 + 400.00		1 - 1.50 X 0.60	18.00	
	9 + 665.00		1 - 1.50 X 0.60	18.00	REPLACE EXISTING 610 mmØ AND CONSTRUCT HEADWALL
	10 + 240.00		1 - 1.50 X 0.60	16.00	REPLACE EXISTING 610 mmØ AND CONSTRUCT HEADWALL
	10 + 450.00		1 - 1.50 X 0.60	18.00	
	10 + 764.00		1 - 1.50 X 0.60	16.00	REPLACE EXISTING 610 mmØ AND CONSTRUCT HEADWALL
	11 + 040.00		1 - 1.50 X 0.60	18.00	REPLACE EXISTING 610 mmØ AND CONSTRUCT HEADWALL
	11 + 265.00		1 - 1.50 X 0.60	16.00	REPLACE EXISTING 610 mmØ AND CONSTRUCT HEADWALL
	11 + 484.00		1 - 1.50 X 0.60	16.00	REPLACE EXISTING 610 mmØ AND CONSTRUCT HEADWALL
	11 + 900.00		1 - 1.50 X 0.60	18.00	
	12 + 302.00		1 - 1.50 X 0.60	17.00	REPLACE EXISTING 610 mmØ AND CONSTRUCT HEADWALL
	12 + 490.00		1 - 1.50 X 0.60	15.00	REPLACE EXISTING 610 mmØ AND CONSTRUCT HEADWALL
	12 + 764.00		1 - 1.50 X 0.60	16.00	REPLACE EXISTING 610 mmØ AND CONSTRUCT HEADWALL
	13 + 050.00		1 - 1.50 X 0.60	17.00	
	13 + 320.00		1 - 1.50 X 0.60	18.00	
	13 + 728.00	1 - 1220		17.00	EXTEND 2.0 m
7	14 + 290.00	2 - 910		18.00	EXTEND 4.0 m
	14 + 649.00	2 - 1220		18.00	
	14 + 949.00	2 - 1220		17.00	
	15 + 300.00	2 - 910		16.00	

TABLE 13.7.5-3 FLOOD FLOW ANALYSIS

ILOILO - STA. BARBARA ROAD , METRO ILOILO

HIGHWAY STATION (km)	BRIDGE NUMBER	BRIDGE NAME	CATCHMENT AREA (km ²)	DISCHARGE 50 YEARS (cms)	VELOCITY (mps)	DFL (m)	M.F.L. FROM FIELD SURVEY (m)	WATER WIDTH (m)	REMARKS
2+388	1	Dungon IV	8.22	85.74	0.54	5.00	4.75	44.57	Extng 50 m bridge
3+400	2	Dungon III	6.76	53.53	1.21	5.80	5.90	18.11	Extng 27 m bridge
5+098	3	Dungon II	0.82	33.52	0.49	6.60	7.00	25.15	Extng 35 m bridge
5+269	4	Dungon I	0.82	33.52	0.49	6.60	6.90	23.12	Extng 35 m bridge
8+615	5	Aganan	200.62	800.00	1.79	16.00	16.35	48.00	Extng 60 m bridge

Notes:

1. DFL of Dungon I to IV are taken from NR - 5DR ILOILO - JARO DIVERSION ROAD VOLUME II CONTRACT DRAWINGS of Certeza Surveying Company Incorporated.
2. DFL of Aganan is taken from NR - 5 JARO - CALINOG CONTRACT DRAWINGS of Trans-Asia (Philippines) Inc.

13.7.6 Soft Ground Analysis

(1) Procedure of Analysis

The Procedure of Analysis is shown in the Figure 13.7.6-1

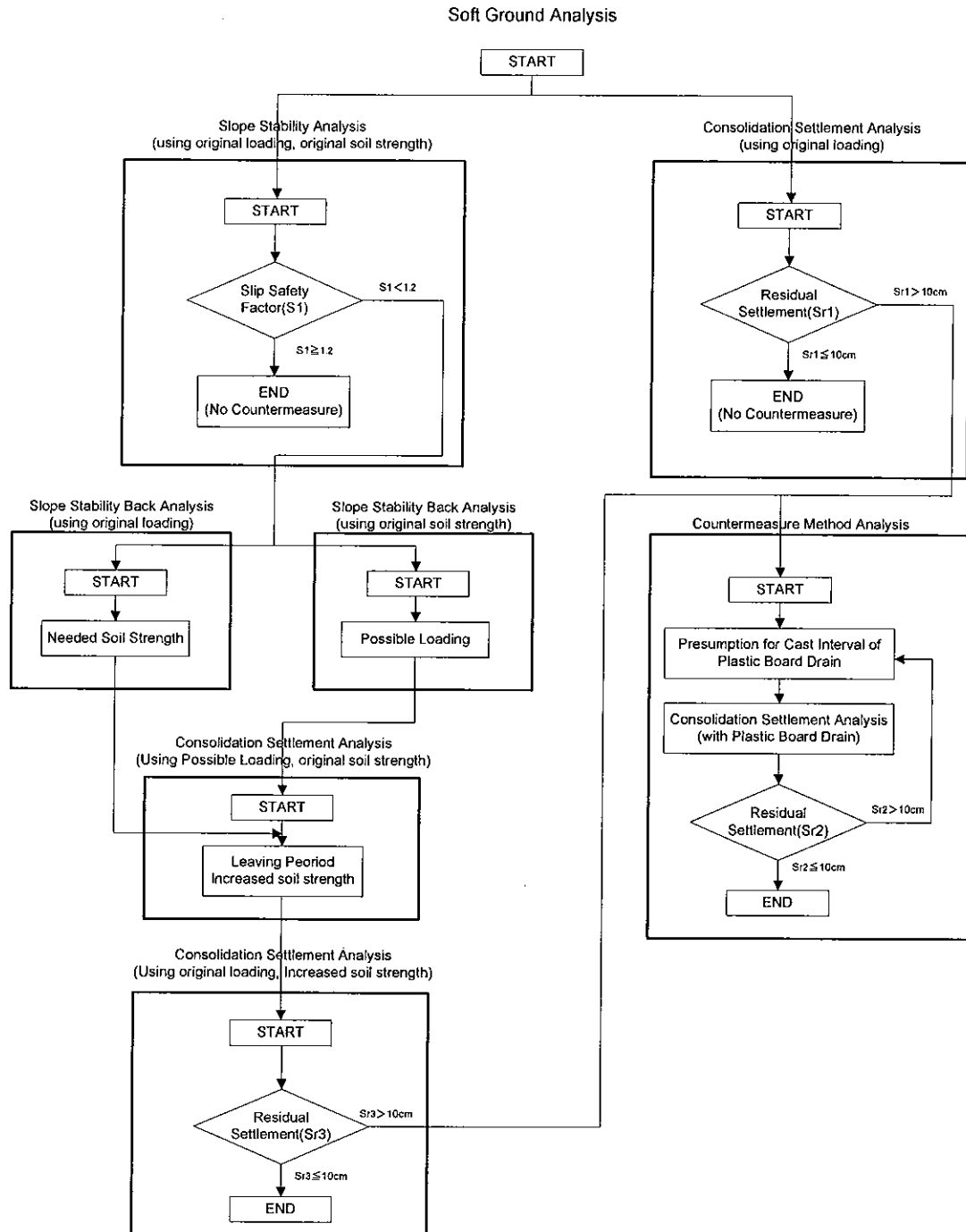


FIGURE 13.7.6-1 PROCEDURE OF ANALYSIS

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 13.7.2 Road and Intersection Design.

(2) Analysis Sections

The Analysis Sections are shown in the Figure 13.7.6-2. And the chainage of each Section and applied Borehole No. for analysis are shown in the Table 13.7.6-1.

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

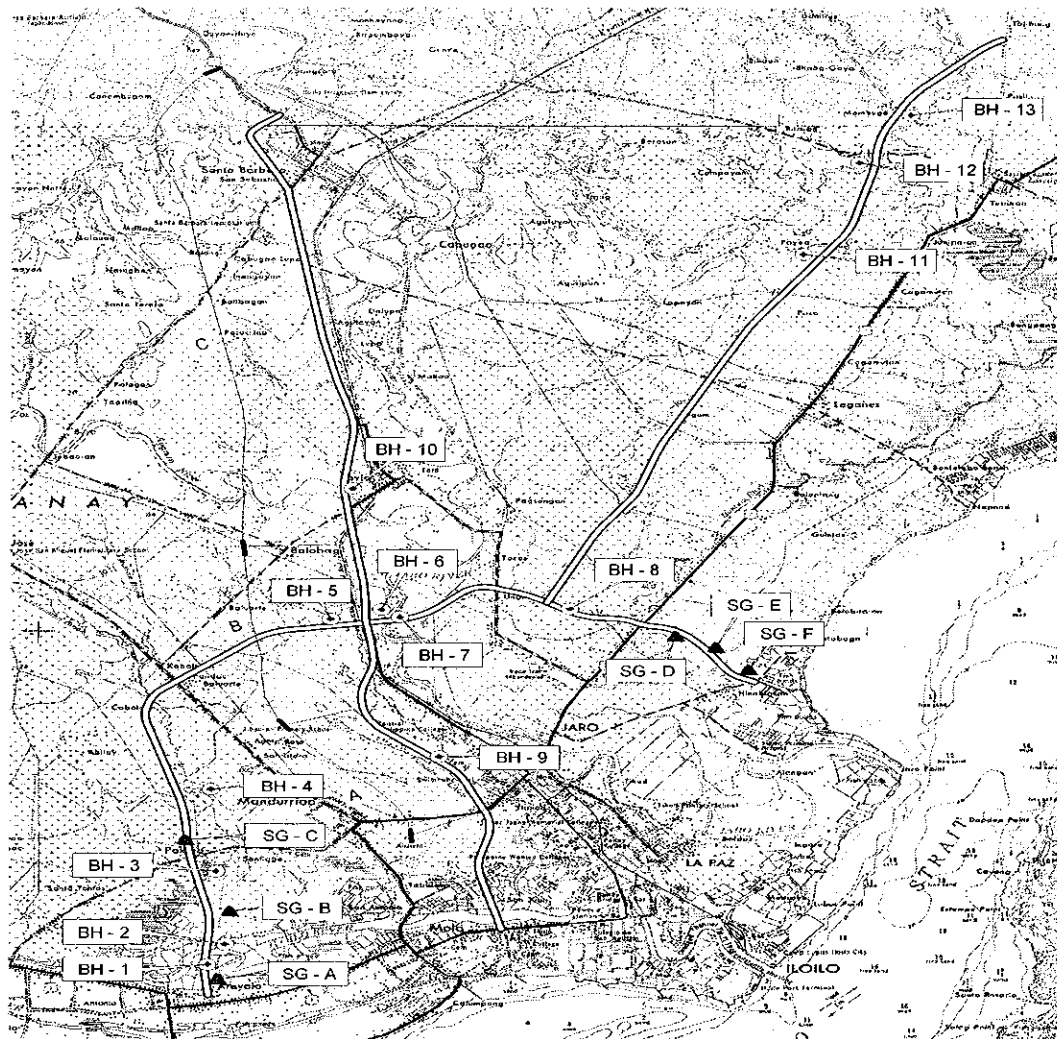


FIGURE 13.7.6-2 ANALYSIS SECTIONS

TABLE 13.7.6-1 ANALYSIS SECTIONS AND BOREHOLE NO.

Section	A	B	C
Chainage(STA.)	2+232 ~4+400	4+400 ~7+200	7+200 ~15+300
Borehole No.	BH-9	BH-6	BH-10

(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 13.7.6-2 is defined as Soft Ground.

TABLE 13.7.6-2 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 13.7.6-3.

TABLE 13.7.6-3 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.

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

Where:

N = N Value

Consolidation Test Data

Consolidation Test Data such as e-log P curve and coefficient of consolidation are in GEOTECHNICAL INVESTIGATION REPORT.

As a representative Soil Value, soil value of borehole No. BH-10 is shown in the Figure 13.7.6-3. (Other data are shown in the Figure App.-)

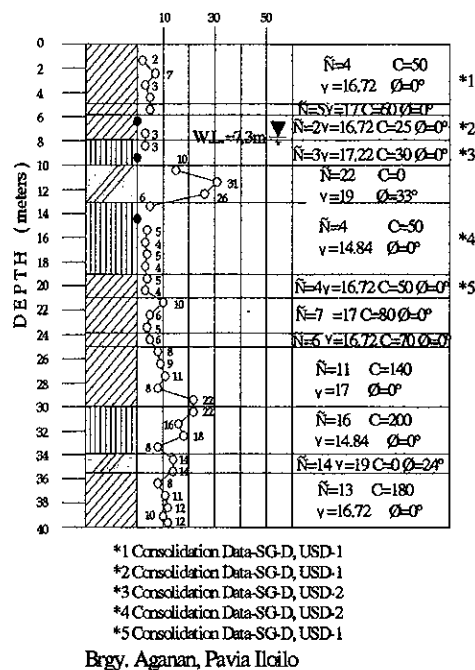


FIGURE 13.7.6-3 SOIL VALUE (BH-10)

(5) Analysis Result

The Summary of Analysis results are shown in the Table 13.7.6-4.

TABLE 13.7.6-4 SUMMARY OF SOFT GROUND ANALYSIS RESULTS

Sta.Barbara

Section	A	B	C
Chainage(STA.)	2+232 ~4+400	4+400 ~7+200	7+200 ~15+300
Borehole No.	BH-9	BH-6	BH-10
Max. embankment height(m)	1.5	1.5	1.5
Max. final settlement (cm)	16	25	28
Max. residual Settlement (cm)	5	3	10
Slope Slip Slip Safety Factor [Fs] > 1.2 is needed	Safe	Safe	Safe

Countermeasure method against residual settlement and slope slip is not required because Max. residual settlements are under 10 cm and Slip Safety factors are over 1.2 at all Analysis Sections.

13.8 COST ESTIMATES

13.8.1 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:

$$1 \text{ US \$} = 55.36 \text{ P} = 106.85 \text{ Yen}$$

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 13.8-1, 2, 3 and 4, respectively.

(2) Construction Cost

Estimated construction cost is presented in Table 13.8-5. Detailed cost estimate is shown in Appendix 13.8-1. The construction cost of Iloilo - Sta. Barbara Road was estimated at 441.9 Million pesos, composing of 57.4% a foreign currency component (or 253.8 Million pesos), 26.2% of a local currency component (or 115.8 Million pesos) and 16.4 % of a tax component (or 72.3 Million pesos).

TABLE 13.8-5 CONSTRUCTION COST

(Million Pesos)

	Foreign	Local	Tax	Total
Amount	253.8	115.8	72.3	441.9
	57.4%	26.2%	16.4%	100%

TABLE 13.8-1 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 13.8-2 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 13.8-3 HOURLY (OR DAILY) COST OF CONSTRUCTION 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, 0.61m ³	hr	1,295.00
4	Backhoe, hydraulic, crawler, 0.80m ³	hr	1,766.00
5	Dump Truck, 6.0-9.0 cu-yds (4.6-6.9m ³)	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 40m ³ /hr with silo	hr	1,990.00
13	Crawler Drill	hr	428.00
14	Concrete Vibrator (<i>operator not included</i>)	day	456.00
15	Concrete Cutter (<i>operator not included</i>)	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 (76.5m ³ /hr)	hr	1,668.00
19	Air Compressor 456-500 cfm	hr	876.00
20	Aggregate Crusher 100t/hr (<i>operator not included</i>)	hr	2,730.00
21	Trailer 20t	hr	1,588.00
22	Welding Machine 250A	hr	300.00
23	Generator 51-100 kW (<i>operator not included</i>)	day	3,310.00
24	Bar Bender (<i>operator not included</i>)	day	1,310.00
25	Electric Bar Cutter	day	1,310.00

SOURCE: Associated Construction Equipment Lessors (ACEL)

TABLE 13.8-4 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 (fc=24Mpa)	m3	3,500.00	34	50	18
405(2)	Structural Concrete Class"A2" for Superstructure (fc=24Mpa)	m3	5,240.00	34	50	18
405(3)	Structural Concrete Class"A3" for Others (fc=21Mpa)	m3	4,500.00	34	50	18
405(6)	Structural Concrete "Lean Concrete" (fc=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 13.8-4 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	ea.	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	ea.	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	ea.	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	ea.	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 Ditch (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 Facilities (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)						

13.8.2 ROW Acquisition and Compensation Cost (Iloilo R-3)

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 13.8-6.

TABLE 13.8-6 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	2,000 – 2,500	3,000 - 3,500
Rice Field	25 - 32	250
Fish Pond	15 - 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

Cost of compensation for the project is shown below. Detailed estimate is presented in Appendix 13.8-2.

TABLE 13.8-7 ESTIMATED LAND ACQUISITION AND COMPENSATION COST

Item	Quantity	Amount (Million P)
Land Acquisition		
Residential	—	—
Structures	514	59.9
Other Compensation		13.3
Total		73.2

Proposed right-of-way for the project is less than exiting ROW acquired in late 1970s. Hence, no land acquisition is involved and cost for land is not included. However, as discussed in **Section 13.10**, it is revealed during barangay consultation meeting that the exiting ROW has not fully acquired yet. Survey on the land acquisition status is still on the way. Additional land acquisition cost may be needed if significant part of exiting ROW has not been acquired yet.

13.8.3 Detailed Engineering and Construction Supervision Cost

Engineering services cost for a detailed design ranges from 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 13.8-8 ENGINEERING SERVICE COST

Unit: Million Pesos

	Component			TOTAL
	Foreign	Local	Tax	
Detailed Design	9.7 (55%)	6.2 (35%)	1.8 (10%)	17.7 (100%)
Construction Supervision	19.5 (55%)	12.4 (35%)	3.5 (10%)	35.4 (100%)
Total	29.2 (55%)	18.6 (35%)	5.3 (10%)	53.1 (100%)

13.8.4 Summary of Project Cost

Summary of Project Cost is shown in Table 13.8-9.

TABLE 13.8-9 SUMMARY OF PROJECT COST

Unit: Million Pesos

	Component			TOTAL
	Foreign	Local	Tax	
Detailed Design	9.7	6.2	1.8	17.7
Row / Resettlement	-	65.9	7.3	73.2
Construction	253.8	115.8	72.3	441.9
Construction Supervision	19.5	12.4	3.5	35.4
Total	283.0	200.3	84.9	568.2

13.8.5 Maintenance Cost for Iloilo-Sta. Barbara

(1) Road and Bridge Conditions

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

Item	Conditions	EMK Factor
Road Length (km)	13.0	-
Traveled Way Width (m): AC	(0.0~ 6.2km) 4-lane 12.0m (6.2~13.0km) 2-lane < 7.5m	1.3 1.0
Bridge Length (total) (lm)	147	0.01
AADT (2010)	23,000	1.28
Opening Year	2012	-

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 13.8-10.

TABLE 13.8-10 MAINTENANCE COST OF ILOILO – STA. BARBARA

	Calendar Year	Factors			EMK (km)	Financial Cost (x1000Peso)			Economic Cost (x1000Peso)		
		AADT	Lane	Bridge		Routine	Periodic	Total	Routine	Periodic	Total
1	2012	1.30	1.14	1.47	20.70	1,963	0	1,963	1,484	0	1,484
2	2013	1.31	1.14	1.47	20.84	1,977	0	1,977	1,494	0	1,494
3	2014	1.32	1.14	1.47	20.99	1,991	0	1,991	1,505	0	1,505
4	2015	1.33	1.14	1.47	21.13	2,004	0	2,004	1,515	0	1,515
5	2016	1.34	1.14	1.47	21.28	2,018	0	2,018	1,526	0	1,526
6	2017	1.34	1.14	1.47	21.40	2,030	0	2,030	1,535	0	1,535
7	2018	1.35	1.14	1.47	21.53	2,042	0	2,042	1,544	0	1,544
8	2019	1.36	1.14	1.47	21.65	2,054	0	2,054	1,553	0	1,553
9	2020	1.37	1.14	1.47	21.78	2,066	0	2,066	1,562	0	1,562
10	2021	1.38	1.14	1.47	21.90	2,077	0	2,077	1,571	0	1,571
11	2022	1.39	1.14	1.47	22.03	2,089	60,296	62,386	1,579	47,473	49,053
12	2023	1.39	1.14	1.47	22.15	2,101	0	2,101	1,588	0	1,588
13	2024	1.40	1.14	1.47	22.28	2,113	0	2,113	1,597	0	1,597
14	2025	1.41	1.14	1.47	22.40	2,125	0	2,125	1,606	0	1,606
15	2026	1.42	1.14	1.47	22.53	2,137	0	2,137	1,615	0	1,615
16	2027	1.43	1.14	1.47	22.65	2,148	0	2,148	1,624	0	1,624
17	2028	1.44	1.14	1.47	22.77	2,160	0	2,160	1,633	0	1,633
18	2029	1.44	1.14	1.47	22.90	2,172	0	2,172	1,642	0	1,642
19	2030	1.45	1.14	1.47	23.02	2,184	0	2,184	1,651	0	1,651
20	2031	1.46	1.14	1.47	23.15	2,196	0	2,196	1,660	0	1,660

13.9 ENVIRONMENTAL IMPACT ASSESSMENT

13.9.1 General Characteristics of the Project Road

The project road that traverses Metro Iloilo from south to north passes through Iloilo City and the municipalities of Pavia and Sta. Barbara where terrain is generally flat. Land use along the road is mainly residential with isolated commercial areas in Iloilo city and Pavia while land use in Sta. Barbara is a combination of agricultural and residential. The proposed project is a widening of the existing two-lane road to four-lane up to municipality of Pavia. Required right-of-way (ROW) for the widening is estimated at 20m. The proposed project for the road section between Pavia and Sta. Barbara is paving of gravel shoulders where required ROW is 14.4m.

The Initial Environmental Examination conducted in July 2003 reported that there were no significant environmentally critical spots, such as historical structures, religious institutions and environmentally protected areas, along the project road. But fairly large number of residents currently residing within the present road ROW may be dislocated by the widening project.

13.9.2 Social Acceptability

The criterion provided by the DENR DAO 96-37¹ for evaluating the social acceptability of a project has been considered during the course of the study to a certain extent. **Table 13.9-1** shows the action taken to ascertain social acceptability at the feasibility study level.

TABLE 13.9-1 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 13.9-4
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 13.9-5

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

13.9.3 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 EMB² held at the EMB conference room. Based on the agreed parameters, the collection of baseline information has been carried out in February 2004. The result of baseline survey is discussed in the next section.

13.9.4 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 (0-3%) with very limited rolling terrains with 3-8% only. The elevation of the road steadily goes up from 3.4m at beginning of the project road in Jaro (Sta 2+ 230) to 13.0m at the end of the project in Sta. Barbara (Sta 15+900) without any abrupt change in terrain condition. Jaro River that traverses Metro Iloilo north to south runs parallel to the project road. Aganan River crosses the road at Barangay Aganan (Sta 8+600) in the Municipality of Pavia. Both rivers frequently inundate study area during tropical cyclones. However, with completion of on-going flood control project assisted by JBIC, such inundations are expected to be mitigated significantly hence, elevation of the project road is proposed to be maintained at present level.

Air Quality

One sampling site was established in Barangay Duyan-duyan, 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 39.0 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 Duyan-duyan 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:

	<u>Time</u>		<u>Reading</u>	<u>DENR Standard</u>
Morning	(5:00 AM – 9:00 AM)	:	65.4 db	50
Daytime	(9:00 AM – 6:00 PM)	:	74.4 db	55
Evening	(6:00 PM – 10:00 PM)	:	64.0 db	50
Nighttime	(10:00 PM – 5:00 AM)	:	61.1 db	45

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

² EMB: Environmental Management Bureau of DENR
Part-B Feasibility Study of Selected Road Projects in Metro Iloilo (R-3)

Land Use

Land use along project road is mainly residential. Remarkable number of residential houses is observed from beginning of the project up to Barangay Aganan (Sta 8+600) in the Municipality of Pavia. Most residential houses have small size stores engaged in family owned retailing businesses. From Barangay Aganan to end of the project (14+900) the number of houses gradually decreases where few structures are observed along Sta. Barbara Bypass (L=1,700m) constructed in 2000. Width of residential area varies 50 to 100m both sides of the road. Outside the residential belt along the project road is agricultural land mainly rice field.

2) Biological Environment

Vegetation and Wildlife

The sampling site near the Maliao Bridge at coordinates 449251 E and 1191260 N is located in Barangay Maliao, Pavia, Iloilo at an altitude of 24 masl near the bridge. The relatively dry area is characterized by tall grasses *Sacchararum spontaneous* (Tigbau) and *Imperata cylindracea aleuritoides*. There are remnants of Bangkal (*Nauclea orientalis*) and dead *Philodendron* vines. The area is characterized mostly by small shrubs such as *Ocimum sanctum*, *Macaranga tanarius*, *Jatropha curcus*, *Ricinus communis*, *Solanum* sp. *Malvas* sp. *Abutilon* sp., herbs such as Hagonoy (*Chromolaena odorata*), *Hyptis suaveolens*, *Phyllanthus niruri*, *Ruellia* sp. *Stachytharpeta jamaicensis*, *Elephantopus mollis*, *Amaranthus spinosus*, *Colocasia esculentum* and *Alocasia* sp. and vines such as *Cardiospermum halicacabum* (Parol-parolan), *Ipomoea reptans*, and *Clitorea tematea*. A few bamboo strands (*Bambusa blumeana*) exist. The common weeds are grasses like *Eleusine indica*, *Paspalum conjugatum*, and *Chloris barbata*, and composite flower *Vernonia cinerea*.

Major animal groups identified in the area include invertebrates as well as vertebrate taxa. A total of 85 species were recorded; only 14 of which are vertebrates. Animals belonging to Phylum Arthropoda and Phylum Nematoda were the most common inhabitants in the area sampled. Insects of common species (Class Insecta) were most numerous and widely spread over the eight stations. A total of sixty-three species of insects were identified and recorded to occur in the sampling site. In the order of abundance, dragonflies and fruitflies were the most abundant, followed by black and red ants, bowflies, plant hoppers, bees and wasps, beetles, bugs, grasshoppers, crickets, katydids, butterflies and moths, praying mantis, mosquitoes, dragonflies, damselflies and termites, respectively. Five species of spiders (Class Arachnida) and one species representative of Phylum Mollusca and Phylum Annelida were recorded and identified. Eight species of birds were identified from the four sampling sites. Cows, goats, dogs, cats (Class Mammalia) toads and tree frogs (Class Amphibia) and green and monitor lizard (Class Reptilia) were also noted.

Aquatic Fresh/Marine Environment

There are no local account of freshwater fish present in the Aganan River at Barangay Maliao, 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 and Cultural 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 – Sta. Barbara Road Widening Project, settlements can be seen putting pressure on the road right-of-way (RROW) where there are observed high densities in some barangays, and few and far in between as one approaches the end of the project road.

Population and Population Growth Rate

Iloilo City has a total population of 365,820 distributed over its five districts, and lone congressional district while the Municipality of Pavia and the Municipality of Sta. Barbara has 32,824 and 46,076, respectively. The population growth rates of these local government units vary from a low percentage of 1.93% (Iloilo City) to a very high percentage of 4.17% (Municipality of Pavia). The Municipality of Sta. Barbara on the other hand has a population growth rate of 3.04%. These growth rates are higher than that of the region, and the province of Iloilo (except Iloilo City).

TABLE 13.9-2 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	1.560	3.07
Iloilo Province	1,559,182	1,415,022		298,593	5.22	2.100	3.34
Iloilo City	365,820	334,539	363,667	72,218	5.04	1.930	52.20
Leganes	23,475	19,235	23,473	4,533	5.18	4.060	7.29
New Lucena	19,490	16,873	19,490	3,744	5.21	2.930	4.40
Oton	65,374	56,821	65,364	12,907	5.06	2.840	7.70
Pavia	32,824	26,756	32,756	6,553	5.00	4.170	9.40
Sta. Barbara	46,076	39,667	45,969	8,821	5.21	3.040	5.90
Zarraga	18,252	17,519	18,243	3,507	5.20	0.823	2.30

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 13.9-2** above. Of the three local government units affected by the project, Iloilo City has the most number of households (72,218) followed by the Municipality of Sta. Barbara (8,821) and the Municipality of Pavia (6,553).

Population Densities

The comparative population densities are shown in **Table 13.9-2**. Of the three local government units traversed by the project, Iloilo City is the most dense (52.2 persons/hectare), while the Municipality of Sta. Barbara is the least (5.9 persons per hectare).

Literacy and Highest Educational Attainment

The simple literacy rate 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 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.

In the case of Sta. Barbara, business establishments found in the town are mostly sari-sari stores. Other commercial establishments include refreshment parlors, bakeries, tailoring shops, drug stores among others. But Sta. Barbara in recent years has attracted a lot of local and foreign tourists. Its tourists attractions include the monuments of the Cry of Santa Barbara and Gen. Martin T. Delgado, the MIWD reservoir that was constructed in 1925 and the first waterworks system in the Visayas and Mindanao, the Tigum Irrigation Dam which is the oldest irrigation system in the country constructed in 1926, and the oldest golf course in Asia that is the Iloilo Golf and Country Club.

Pavia's designation as the Regional Agro-Industrial Center (RAIC) in 1991 has resulted to the influx of industries in the town. Aside from the existing companies like San Miguel Corporation, Coca Cola Bottlers Phils., Inc. and Jaspe Light Steel Industries, a number of corporations have also relocated in Pavia. Among them are the Basic Fruits Corp., Pryce Gas, Pre-Stress International, Kimwa Construction, Mandaue Foam and Vitarich Corporation.

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%.

In the case of Sta. Barbara, the number of employed persons were 26,588 with 11,738 engaged in non-agricultural activities and 6,347 were into agriculture. The unemployed reached 1,765 persons.

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.**

13.9.5 Perception Survey

The Perception Survey was conducted in the 22 barangays traversed by the existing road for widening. 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 1,277 respondents were identified during the survey. Most of these respondents (73.1%) were randomly selected within the barangays while the rest (26.9%) were directly selected within the barangay since they are most likely along the project alignment.

TABLE 13.9-3 DISTRIBUTION OF RESPONDENTS BY BARANGAY

City/Barangay	Directly Affected		Indirectly Affected		Total	
	Number	%	Number	%	Number	%
Iloilo City						
San Rafael	0	0	21	2.2	21	1.6
Bolilao	0	0	94	10.1	94	7.3
Bakhaw	0	0	99	10.6	99	7.6
Taytay Zone II	0	0	21	2.2	21	1.6
Calubihan	28	8.1	31	3.3	59	4.6
Cuartero	51	14.8	44	4.7	95	7.4
Dungon A	34	9.9	19	2.0	53	4.1
Dungon B	27	7.8	20	2.1	47	3.7
Sambag	53	15.4	75	8.0	128	10.0
Ungka, Jaro	26	7.6	50	5.3	76	5.9
Buhang, Taft North	13	3.8	35	3.8	48	3.8
Sub-total	232	67.4	509	54.6	741	58.0
Municipality of Pavia						
Ungka II	8	2.3	30	3.2	38	2.9
Ungka I	11	3.2	34	3.6	45	3.5
Aganan	22	6.4	27	2.9	49	3.8
Malia-o	31	9.0	16	1.7	47	3.7
Cabugao Sur	4	1.2	41	4.4	45	3.5
Sub-total	76	22.1	148	15.9	224	17.5
Sta. Barbara						
Cabugao Sur	13	3.8	30	3.2	43	3.4
Bolong Este	3	0.9	48	5.1	51	3.9
Bolong Oeste	16	4.6	58	6.2	74	5.8
San Sebastian	0	0	50	5.3	50	3.9
Gen. M. T. Delgado	0	0	50	5.3	50	3.9
Duyan-duyan	4	1.2	40	4.3	44	3.4
Sub-total	36	10.5	276	29.6	312	24.4
Total	344	100.0	933	100.0	1,277	100.0
% Distribution		26.9		73.1	100	

1) Awareness about the Project

Majority of the respondents (96.5%) of the total number of respondents already heard of the plan for the widening of the project.

More than three-fifths (61.5%) of the respondents heard about the project 1 or 2 years ago. More than a fifth (21.5%) heard about it recently while more than a tenth (15.6%) heard about it more than 2 years ago.

2) Agreement for the Project

More than four-fifths (82.4%) of the respondents are in favor of the implementation of the project. More than two-fifths (43.3%) said that the project will give way to development of the area and the province as a whole, and offer safe and efficient transport of people, goods, and services (18.3%). More than a tenth (12.1%) did not provide any response.

3) Effect on Source of Income

Less than half (49.3%) of the respondents said that their livelihood will not be affected. More than two-fifths (43.5%) said that there will be loss of livelihood, employment, and property.

4) Good Things Seen about the Project

Nearly a third (28.7%) of the respondents believed that with the project, there will be less traffic in main highway. More than a fifth (26.2%) added that the city or barangay will improve or develop while nearly the same percentage (22.3%) said that there will be easy and fast access to the region.

5) Benefits Expected from the Project

More than two-fifths (46.2%) of the total number of respondents said that travel time will become shorter (including faster and convenient transport of people and goods). According to nearly a fourth (24%) 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 two-fifths (46.8%) 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 tenth (13%) said that there will be no bad things that can be seen resulting from the project. Nearly a tenth (8%) said that there will be increase in noise and air pollution level. Also less than a tenth (7.5%) said that fast moving vehicles may cause accidents. The rest are spread to other responses such as strangers will be coming into the barangays (0.5%); disruption of regular activities of barangay residents (7.4%); and increased crime rate (0.3%).

7) Problems Foreseen for the Community as a Whole

More than a fifth (25.7%) of the respondents believe that the project will not bring any problems to the community as a whole. But more than a fifth (22.9%) 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.

13.9.6 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 13.9-4**, Impacts and Mitigation/Enhancement Matrix.

13.9.7 Environmental Management and Monitoring Plan

The Environmental Management and Monitoring Plan is presented in **Table 13.9-5**.

13.9.8 Resettlement Plan for Affected People

The survey on Resettlement Plan for affected people is currently being undertaken. Status of survey is discussed in **Section 13.10**.

TABLE 13.9-4 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 13.9-4 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: 514	High		Government must ensure that the affected structures are properly compensated based on "Replacement Cost" method as provided by laws and regulations.
Loss of Land			
Existing ROW (30-60m width) is supposed to be acquired during previous improvement project. However, landowners have not received compensation.	Moderate		Region 6 Office shall dissolve such ROW acquisition backlog in close coordination with Central Office as soon as possible.
Loss of Other Improvement			
<ul style="list-style-type: none">- Trees and other perennials- Waiting sheds- 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.
Informal Settlers			
There are a significant number of informal settlers around bridge site, classified as danger zone. Such settlers have nowhere to transfer.	High		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.
			Government must implement a sound Social Development Program (SDP) that will ensure that affected informal settlers get compensated for the disturbance to their normal lives.
			The SDP should also include a plan that will encourage the active participation of women and other vulnerable groups (physically challenged, indigenous cultural communities, etc.).
Loss of/Damage to Means of Livelihood			
Most residents have small scale shops along the road. Relocation of affected houses may disturb their business activities for a certain period of time.	Low		Government must compensate their temporal income loss due to disturbance of their businesses during relocation phase.
Generation of temporary employment opportunities.		Moderate	Contractor must give priority to available local labor.

TABLE 13.9-4 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 13.9-5 ENVIRONMENTAL MANAGEMENT AND MONITORING MATRIX (ILOILO, R-3)

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 ROBC 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 Duyan-Duyan, 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
Illegal conversion of prime agricultural land	Areas adjacent to the road	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

Part-B. Road Network Development Plan for Metro Iloilo (R-3)

13.10 SOCIAL IMPACT ASSESSMENT AND RESETTLEMENT ACTION PLAN

13.10.1 Measures Taken to Mitigate Negative Impacts

The project is the widening of an existing two lane-highway to four lanes and paving of its gravel shoulders. A substantial number of residential houses and small-scale commercial establishments have been constructed within the acquired road right-of-way (ROW).

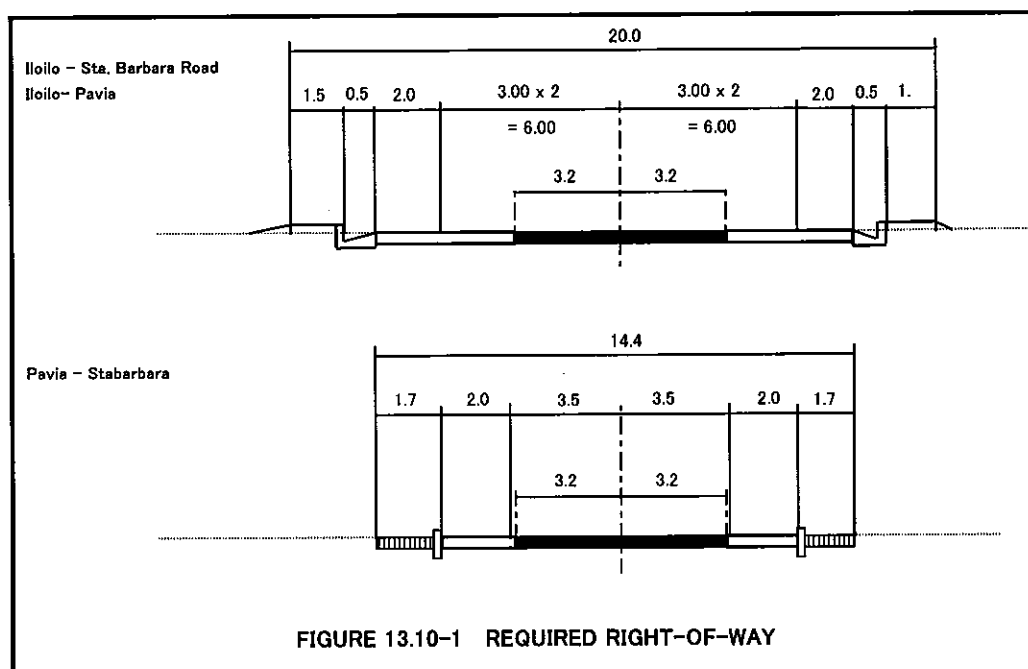
To avoid such structures, the following measures are taken:

- The median usually installed in a multiple-lane highway is omitted to narrow down the required ROW.
- The width of lanes in the four-lane section is narrowed to 3.0m.

A comparison of the required ROW for the improvement project and the present/existing ROW acquired by DPWH is shown below.

Station	Type of Improvement	Required ROW	Existing ROW
2+230 – 8+450	Widening to 4 lanes	20.0m	60.0m
8+450 – 14+100	Paving of shoulders	14.4m	30.0m

The final lane configuration of the project road is shown in **Figure 13.10-1**. The proposed ROW of 20m and 14.4m is considered the minimum. Any further reduction of the ROW widths will reduce the desired highway functions.



13.10.2 Barangays Affected by the Project

The project road runs north to south of Metro Iloilo traversing Iloilo City and the Municipalities of Pavia and Sta. Barbara. After fixing the required ROW, the Study Team visited these LGUs to identify their respective barangays affected by the project and to present exact extent of required ROW for their comments. The following barangays are identified to be affected:

Iloilo City

1. San Rafael, Mandurriao
2. Balilihan, Mandurriao
3. Bakhaw, Mandurriao
4. Taytay, Zone II
5. Calubihan
6. Cuartero
7. Dungon A
8. Dungon B
9. Sambag
10. Ungka

Pavia

1. Ungka II
2. Ungka I
3. Aganas
4. Malinao
5. Cabugao Sur

Sta. Barbara

1. Cabugao Sur
2. Balong Este
3. Bolong Este
4. San Sebastian
5. Gen. Matias T. Delgado
6. Duyan-duyan

13.10.3 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 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

	1 st Workshop	2 nd Workshop	3 rd Workshop	4 th 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 workshop are discussed 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 are summarized in **Table 13.10-1**.

TABLE 13.10-1 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 (Taft North) Taytay Calubihan Cuartero Dungon A Dungon B Sambag Ungka	07 Feb. 2004 07 Feb. 2004 15 Feb. 2004 Not yet issued 08 Feb. 2004 08 Feb. 2004 14 Feb. 2004 08 Feb. 2004
Pavia	29 Jan. 2004	Pavia Municipal Hall	Ungka II Ungka I Aganas Maliao Cabugao Sur	10 Feb. 2004 06 Feb. 2004 05 Feb. 2004 08 Feb. 2004 11 Feb. 2004
Sta. Barbara	29 Jan. 2004	Sta. Barbara Municipal Hall	Cabugao Sur Balong Este Bolong Este San Sebastian Gen. MT Delgado Duyan-duyan	01 Feb. 2004 08 Feb. 2004 09 Feb. 2004 02 Feb. 2004 07 Feb. 2004 08 Feb. 2004

4) Barangay Consultation Meetings

Consultation meetings with residents that could possibly be affected were held in each barangay as summarized in **Table 13.10-2**.

The meetings were held by presenting an aerial photomap that indicates the proposed ROW boundaries and affected structures. Residents were informed that DPWH's ROW is 60m up to Jct. Jaro (Sta. 5 + 350). Thereafter, all structures inside the ROW are classified as illegal and subject to ejections with compensation for structures at **Replacement Cost**.

TABLE 13.10-2 SUMMARY OF BARANGAY CONSULTATION MEETINGS

Barangay	Venue / Location	Date of Meeting
Iloilo City Buhang (Taft North) Taytay Cuartero Calubian Dungon A Dungon B Sambag Ungka	Barangay Hall Barangay Hall Barangay Hall Barangay Hall Barangay Hall Barangay Hall Barangay Hall Barangay Hall	06 Feb. 2004 1:00 – 2:00 PM Joint meeting with Cuartero 07 Feb. 2004 5:00 – 6:00 PM 10 Feb. 2004 5:00 – 6:00 PM Joint meeting with Dungon B 07 Feb. 2004 3:00 – 4:00 PM 08 Feb. 2004 11:00 – 12:00 PM 08 Feb. 2004 10:00 – 11:00 AM
Pavia Ungka II Ungka I Agasan Mali-ao Cabugao Sur	Barangay Hall Barangay Hall Barangay Hall Barangay Hall Barangay Hall	08 Feb. 2004 5:00 – 6:00 PM 05 Feb. 2004 2:00 – 3:00 PM 05 Feb. 2004 10:00 – 11:00 AM 08 Feb. 2004 3:00 – 4:00 PM 08 Feb. 2004 9:00 – 10:00 AM
Sta. Barbara Cabugao Sur Balong Este Bolong Este San Sebastian Gen. MT Delgado Duyan-duyan	Barangay Hall Barangay Hall Barangay Hall Barangay Hall Barangay Hall Barangay Hall Barangay Hall	08 Feb. 2004 2:00 – 3:00 PM 08 Feb. 2004 9:00 – 10:00 AM 07 Feb. 2004 3:00 – 4:00 PM 10 Feb. 2004 3:00 – 4:00 PM 02 Feb. 2004 9:00 – 10:00 AM 07 Feb. 2004 5:00 – 6:00 PM 05 Feb. 2004 10:00 – 11:00 AM

Residents are fully aware that their structures are inside DPWH's ROW and expressed the following concerns:

- a) They will vacate their houses as long as the government compensates their structures accordingly.

Government gave an assurance that all affected structures will be compensated at replacement cost.

- b) They understand the DPWH policy that land within the existing ROW is not compensated, however, they have not yet been paid/compensated for the land they offered in late 1970s.

Unpaid land compensation will be taken care of by DPWH Region 6 Office. Residents were advised to prepare the necessary legal documents that will prove their ownership of the land.

- c) Some residents expressed their fear that they have nowhere to transfer if they are ejected.

DPWH explained that relocation sites will be provided to residents who are considered as "urban poor" as defined under Republic Act 7279.

Generally, meetings were carried out and ended in a harmonious atmosphere. However, the unpaid compensation for lands on the existing ROW may be a critical issue during the RAP implementation stage.

13.10.4 Identified Impacts

Identified impacts and corresponding compensation costs are summarized in **Table 13.10-3**.

Table 13.10-3 Summary of Impact and Compensation Cost

Iloilo - Sta Barbara Road

Description	No. of HHs	Unit	Rate/Unit	Quantity	Amount (Php)	Remarks
Compensation for Land and Other Assets						
1. Land	-	m ²	-	-	-	ROW has been acquired.
Subtotal						
2. Structures						
1) Shanty (Bamboo & Nipa)	161	m ²	1,000	4,017.16	4,071,160	
2) Wood with GI sheet	111	m ²	1,140	3,310.00	3,773,400	
3) Concrete with wood	197	m ²	6,000	6,619.36	39,716,160	
4) Concrete	44	m ²	8,000	1,450.92	12,322,820	
Subtotal	513			15,397.44	59,893,540	
3. Other Fixed Structures						
1) Wood Fence	24	m	100	919.34	91,934	LGUs and public utility companies are included.
2) Concrete/Steel Fence	53	m	200	1,288.96	257,792	
3) Signboard	19	Nos.	3,000	19	57,000	
4) Water/Telephone Facility	7	Nos.	10,000	7	70,000	
Subtotal	103				476,726	
4. Repair Cost	-	-	-	-	-	None
5. Electric Post Relocation	-	Nos.	-	358	-	Relocation of the posts will be carried out by power supply firm.
6. Perennials						
Various types		Nos.	various	185	64,750	
Subtotal					60,435,016	
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	362	HH	10,000	362	3,620,000	
2. Subsistence Allowance						
1) Income loss for shop owners	279	HH	15,000	279	4,185,000	
2. Financial Assistance						
1) Land users w/o title	-	-	-	-	-	None
3. Rehabilitation Assistance						
1) Severely affected land owners	-	-	-	-	-	None
2) Agricultural lessees	-	-	-	-	-	None
3) Severely affected structural owners	105	HH	15,000	105	1,575,000	
4. Transportation Allowance						
1) Relocating PAI's	373	HH	3,000	373	1,119,000	
2) Shanty dwellers go back to province.	-	-	-	-	-	None
5. Transitional allowance						
1) Renters of affected structures	11	HH	3,000	11	33,000	
Subtotal					10,532,000	
Total					70,967,016	
RAP Implementation					2,247,900	
GRAND TOTAL					73,214,916	

1) Impact on Land

The present widths of the ROW for the project are summarized in **Table 13.10-4**.

TABLE 13.10-4 WIDTHS OF EXISTING RIGHT-OF-WAY

Section	Station	Acquired ROW	Year Acquired
Jct. Ylanod–Jct. Old Road	Sta 2+150-5+500	20m (left)+40m (right) = 60m	End of 1970s by 4 th IBRD Project
Jct. Old Road– Jct. Pavia	Sta 5+600-8+450	30m (left)+30m (right) = 60m	
Jct. Pavia–Jct. Sta. Barbara	Sta 8+450-14+200	15m (left)+15m (right) = 30m	
Sta. Barbara Bypass	Sta 14+200-15+900	15m (left)+15m (right)= 30m	2000 by Ramos Fund

The required ROW width for the project is 20m between the beginning of the project road (Sta 2+233) and Barangay Aganan (Sta 8+450), while the remaining segments of the road requires 14.4m. These required ROW widths fall within the existing ROW. Hence, new land acquisition for the project is, theoretically, not required. However, meetings with the residents revealed that the land acquisition process for said ROW has not yet been completed.

The following shows that the status of land acquisition, as identified during the consultation meetings:

TABLE 13.10-5 STATUS OF ROW ACQUISITION

Case No.	Land Acquisition Status	Possible Cause of Deficiency	Process to be Done
1	All land acquisition process has been completed	-	None
2	Compensation for land has been made but transfer of title has not yet been completed	<ul style="list-style-type: none"> • Extensive documentary and fieldworks required for the preparation of parcellary plans and transfer of title 	<ul style="list-style-type: none"> • Conduct of parcellary survey • Preparation of subdivision plan • Transfer of title
3	Purchase agreement has been made between DPWH and landowners but no payment has been made	<ul style="list-style-type: none"> • Landowners failed to submit pertinent legal documents • Lack of funds (DPWH) 	<ul style="list-style-type: none"> • Preparation of legal documents by landowner • Preparation of Deed of Absolute Sale • Payment to landowner • Parcellary survey and preparation of subdivision plan • Transfer of title

DPWH has created a Special Task Force at the Central Office to handle and complete the land acquisition process, as observed in almost all regions. DPWH Region 6 Office vowed to settle such ROW backlog in close coordination with the Task Force prior to implementation of the project.

2) Impact on Structures

616 structures, mostly residential and small scale shops with residential houses along the road, will be affected by the project.

358 electric posts installed along the shoulder of the road will have to be relocated outside the required ROW. The cost of relocation shall be shouldered by the power provider following the agreement made between DPWH and the firm.

The affected structures are summarized as follows:

Structure Use	Number	Quantity
Residential	143	4,385.90 m ²
Residential cum Shops	119	4,347.34 m ²
Independent Shop	160	4,450.40 m ²
Other Buildings	44	801.65 m ²
Shanties	5	37.90 m ²
Sub-total	471	14,073.19 m²
Barangay Outpost	44	475.50 m ²
Signboards	24	-
Fences	69	1,927.60 m
Water/Telephone Facilities	8	-
Sub-total	105	
Total	616	
Electric Posts	358	

Although almost all structures are built within the boundary of the existing ROW and are subject to forcible ejection as provided by law and related regulations, compensation shall be made to structure owners following the “**replacement cost**” method based on the revised DPWH policy.

3) Impact on Residents

The impact on affected families is summarized as follows:

Type of PAF	Number
Severely Affected PAFs	368.00
- Renters	(11.00)
- Agricultural Tenants	(105.00)
Marginally Affected PAFs	134.00
Total	502.00
Local Government / Public Utility Companies	17.00
Average Household Size	5.03

The occupation of affected families varies widely from farming, shop operations, laborer and employee. The average monthly household income of more than half of these families (58.3%) is below ₱10,000, but income level is fairly higher than affected families in the other two road sections.

4) Impact on Trees and Other Perennials

There is a high number of trees on the road shoulders planted by LGUs as part of their beautification (clean and green) efforts that will be potentially affected.

These trees are dominated by gemelinas and mahoganies. However, they are not included in the compensation package.

A permit shall be secured from DENR before trees will be cut.

750 trees planted by lot owners along the road are identified.

13.10.5 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**.

13.10.6 Resettlement Site

105 informal settlers who are qualified to be relocated to a resettlement site are identified along the road, mostly residing in Iloilo City. The City Government is developing a number of resettlement sites to accommodate displaced families, as discussed in **Section 12.10.6**.

13.10.7 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**.

13.10.8 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 the 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-Sta. Barbara Road Widening 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 and the Fourth District Engineering Office based in the municipality of Sta. Barbara shall be the lead implementing arms of the DPWH for the implementation of the Resettlement Action Plan (RAP).

The City DEO shall be responsible for RAP implementation for project affected persons within the territorial boundary of Iloilo City. On the other hand, the Fourth DEO shall be responsible for implementation of the RAP for project affected persons within the territorial boundaries of the Municipalities of Pavia and Sta. Barbara.

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 local government units, namely: Iloilo City and the Municipalities of Pavia and Sta. Barbara. 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 San Rafael, Mandurriao
 Barangay Captain – Barangay Bolilao, Mandurriao
 Barangay Captain – Barangay Bakhaw, Mandurriao
 Barangay Captain – Barangay Buhang, Taft North, Mandurriao
 Barangay Captain – Barangay Taytay, Zone II, Jaro
 Barangay Captain – Barangay Calubihan, Jaro
 Barangay Captain – Barangay Cuartero, Jaro
 Barangay Captain – Barangay Dungon A
 Barangay Captain – Barangay Dungon B
 Barangay Captain – Barangay Sambag
 Barangay Captain – Barangay Ungka

Representative of PAPs – Barangay San Rafael, Mandurriao
 Representative of PAPs – Barangay Bolilao, Mandurriao
 Representative of PAPs – Barangay Bakhaw, Mandurriao
 Representative of PAPs – Barangay Buhang, Taft North, Mandurriao
 Representative of PAPs – Barangay Taytay, Zone II, Jaro
 Representative of PAPs – Barangay Calubihan, Jaro
 Representative of PAPs – Barangay Cuartero, Jaro
 Representative of PAPs – Barangay Dungon A
 Representative of PAPs – Barangay Dungon B
 Representative of PAPs – Barangay Sambag
 Representative of PAPs – Barangay Ungka

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 Pavia (or his designated representative)
 Members :

Barangay Captain – Barangay Ungka II, Pavia
 Barangay Captain – Barangay Ungka I, Pavia
 Barangay Captain – Barangay Aganan, Pavia

Barangay Captain – Barangay Maliao, Pavia
 Barangay Captain – Barangay Cabugao Sur, Pavia

Barangay Captain – Barangay Cabugao Sur, Sta. Barbara
 Barangay Captain – Barangay Bolong Este, Sta. Barbara
 Barangay Captain – Barangay Bolong Oeste, Sta. Barbara
 Barangay Captain – Barangay San Sebastian, Sta. Barbara
 Barangay Captain – Barangay Gen. Martin T. Delgado, Sta. Barbara
 Barangay Captain – Barangay Duyan-duyan, Sta. Barbara

Representative of PAPs – Barangay Ungka II, Pavia
 Representative of PAPs – Barangay Ungka I, Pavia
 Representative of PAPs – Barangay Aganan, Pavia
 Representative of PAPs – Barangay Maliao, Pavia
 Representative of PAPs – Barangay Cabugao Sur, Pavia

Representative of PAPs – Barangay Cabugao Sur, Sta. Barbara
 Representative of PAPs – Barangay Bolong Este, Sta. Barbara
 Representative of PAPs – Barangay Bolong Oeste, Sta. Barbara
 Representative of PAPs – Barangay San Sebastian, Sta. Barbara
 Representative of PAPs – Barangay Gen. Martin T. Delgado, Sta. Barbara

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 Pavia and Sta. Barbara.

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.

13.10.9 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 12.10.9**.

13.10.10 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**.

13.10.11 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 13.10-9 RAP UPDATING SURVEYS TO BE UNDERTAKEN

Impact Item	Surveys to be Undertaken
Land	<ul style="list-style-type: none"> - ROW backlog shall be cleared prior to project implementation.
Structure	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - Validation survey shall be carried out to identify the names of owners of perennials with commercial values.
Tenants/Renters, Informal Settlers	<ul style="list-style-type: none"> - 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 Pavia and Sta. Barbara 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 Pavia and Sta. Barbara. 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 been 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.

13.11 PROJECT EVALUATION

13.11.1 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 Iloilo - Sta. Barbara Road. The estimated traffic volume on the Road for the case of "with" the project is summarized in Table 13.11-1.

TABLE 13.11-1 TRAFFIC VOLUME ON ILOILO - STA. BARBARA ROAD

Unit: PCU / day

	2010	2016	2022	AAGR (%)	
				'10 - '16	'16 - '22
Section 1 (City Proper – Iloilo Roxas Road)	39,600	51,700	58,300	4.5	2.0
Section 2 (Iloilo Roxas Road – Jaro)	31,400	37,100	42,700	2.8	2.4
Section 3 (Joro – South Pavia)	35,200	41,700	47,100	2.9	2.0
Section 4 (South Pavia – Sta. Barbara)	20,900	22,800	24,500	1.5	1.2
Section 5 (Sta. Barbara - New Airport Access)	15,100	19,800	22,400	4.6	2.1

The estimated vehicle kilometers and vehicle hours in Metro Iloilo are shown in Tables 13.11-2 and 13.11-3, respectively. These tables are based on the benefit calculation.

TABLE 13.11-2 TOTAL VEHICLE KILOMETERS IN METRO ILOILO WITH AND WITHOUT ILOILO - STA. BARBARA ROAD IMPROVEMENT PROJECT

Unit: PCU Km / day

	W/O Project	W/ Project	W/O – W/
2010	3,140,500	3,144,200	△3,700
2016	4,018,400	4,005,400	13,000
2022	5,150,800	5,159,100	△8,400

TABLE 13.11-3 TOTAL VEHICLE HOURS IN METRO ILOILO WITH AND WITHOUT ILOILO - STA. BARBARA ROAD IMPROVEMENT PROJECT

Unit: PCU Hour / day

	W/O Project	W/ Project	W/O – W/
2010	109,800	99,600	4,200
2016	149,500	140,300	9,200
2022	219,000	209,300	9,700

2) Economic Evaluation

Evaluation Period

The evaluation period is assumed to be 20 years from 2012 to 2031 taking into account the service life of Iloilo - Sta. Barbara Road.

Implementation Schedule

The implementation schedule is assumed as follows:

- 2007 Detailed design
- 2008 – '09 Land acquisition
- 2010 – '11 Improvement of Iloilo - Sta. Barbara Road
- 2012 - 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 BVOC with some modification by inflation between April 2002 and April 2003 is utilized in this study (See Table 13.11-4)

TABLE 13.11-4 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
Truck	9,622	2.107	0

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.

Estimation of Benefits

The saving in vehicle operating costs and travel time cost were estimated and are shown in **Table 13.11-5**.

TABLE 13.11- 5 ESTIMATION OF BENEFITS

Unit: '000 Pesos/Year

Year	Saving in VRC	Saving in VFC	Saving in VOC	Saving in TCC	Total Saving
2010	19,865	70,592	90,457	53,731	144,188
2016	88,807	154,031	242,837	117,240	360,077
2022	94,616	162,214	256,830	123,469	380,299

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 13.11- 6**.

TABLE 13.11- 6 ECONOMIC COST ESTIMATE

Unit: '000 Pesos

	Description	Economic Cost	Financial Cost
1	Construction Cost	369,600	441,900
2	Land Acquisition	65,900	73,200
3	Consultancy	47,800	53,100
3-1	Detailed Design	15,900	17,700
3-2	Construction Supervision	31,900	35,400
	Total	483,300	568,200

Maintenance Cost

The maintenance cost was estimated in 12.8.5 on the basis of EMK method which is employed in DPWH. In this study, therefore, the maintenance cost for the Iloilo - Sta. Barbara is used as the economic maintenance cost estimated in 12.8.5.

Benefit Cost Analysis

Based on the above mentioned benefits and cost estimates, the economic analysis of the Project was made. **Table 13.11- 7** shows the benefit – cost analysis of Iloilo - Sta. Barbara Road Improvement Project during project life period of 20 years and **Table 13.11- 8** shows the benefit cost stream. The results of the economic analysis show that a Net Present Value (NPV) of ₱ 541 million and BCR of 3.51 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 39.1%.

TABLE 13.11- 7 ECONOMIC INDICATIONS OF BENEFIT COST ANALYSIS

Net Present Value	P 541 million
BCR	3.51
EIRR	39.1 %

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

Table 13.11-8 Benefit - Cost Stream of Iloilo - Sta. Barbara Road Project

Undiscounted Benefit Cost Stream

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	15,900.0	0.0	15,900.0	0.0	-15,900.0
5	2008	32,950.0	0.0	32,950.0	0.0	-32,950.0
6	2009	32,950.0	0.0	32,950.0	0.0	-32,950.0
7	2010	200,750.0	0.0	200,750.0	0.0	-200,750.0
8	2011	200,750.0	0.0	200,750.0	0.0	-200,750.0
9	2012	0.0	1,484.0	1,484.0	194,011.6	192,527.6
10	2013	0.0	1,494.0	1,494.0	225,584.3	224,090.3
11	2014	0.0	1,505.0	1,505.0	263,009.5	261,504.5
12	2015	0.0	1,515.0	1,515.0	307,357.1	305,842.1
13	2016	0.0	1,526.0	1,526.0	360,077.4	358,551.4
14	2017	0.0	1,535.0	1,535.0	383,485.7	381,950.7
15	2018	0.0	1,544.0	1,544.0	409,889.5	408,345.5
16	2019	0.0	1,553.0	1,553.0	439,702.7	438,149.7
17	2020	0.0	1,562.0	1,562.0	376,370.8	374,808.8
18	2021	0.0	1,571.0	1,571.0	379,907.9	378,336.9
19	2022	0.0	49,053.0	49,053.0	380,299.1	331,246.1
20	2023	0.0	1,588.0	1,588.0	382,087.0	380,499.0
21	2024	0.0	1,597.0	1,597.0	383,883.3	382,286.3
22	2025	0.0	1,606.0	1,606.0	385,688.1	384,082.1
23	2026	0.0	1,615.0	1,615.0	387,501.4	385,886.4
24	2027	0.0	1,624.0	1,624.0	389,323.4	387,699.4
25	2028	0.0	1,633.0	1,633.0	391,153.9	389,520.9
26	2029	0.0	1,642.0	1,642.0	392,993.0	391,351.0
27	2030	0.0	1,651.0	1,651.0	394,840.9	393,189.9
28	2031	0.0	1,660.0	1,660.0	396,697.5	395,037.5

Discounted Benefit Cost Stream

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	10,454.5	0.0	10,454.5	0.0	-10,454.5
5	2008	1.749	18,839.3	0.0	18,839.3	0.0	-18,839.3
6	2009	2.011	16,382.0	0.0	16,382.0	0.0	-16,382.0
7	2010	2.313	86,789.8	0.0	86,789.8	0.0	-86,789.8
8	2011	2.660	75,469.4	0.0	75,469.4	0.0	-75,469.4
9	2012	3.059	0.0	485.1	485.1	63,422.7	62,937.6
10	2013	3.518	0.0	424.7	424.7	64,125.2	63,700.5
11	2014	4.046	0.0	372.0	372.0	65,011.9	64,639.9
12	2015	4.652	0.0	325.6	325.6	66,064.3	65,738.7
13	2016	5.350	0.0	285.2	285.2	67,301.0	67,015.8
14	2017	6.153	0.0	249.5	249.5	62,327.1	62,077.6
15	2018	7.076	0.0	218.2	218.2	57,929.1	57,710.9
16	2019	8.137	0.0	190.9	190.9	54,037.0	53,846.1
17	2020	9.358	0.0	166.9	166.9	40,220.8	40,053.9
18	2021	10.761	0.0	146.0	146.0	35,303.3	35,157.3
19	2022	12.375	0.0	3,963.7	3,963.7	30,730.1	26,766.4
20	2023	14.232	0.0	111.6	111.6	26,847.5	26,735.9
21	2024	16.367	0.0	97.6	97.6	23,455.4	23,357.8
22	2025	18.822	0.0	85.3	85.3	20,491.9	20,406.6
23	2026	21.645	0.0	74.6	74.6	17,902.8	17,828.2
24	2027	24.891	0.0	65.2	65.2	15,640.8	15,575.6
25	2028	28.625	0.0	57.0	57.0	13,664.7	13,607.7
26	2029	32.919	0.0	49.9	49.9	11,938.2	11,888.3
27	2030	37.857	0.0	43.6	43.6	10,429.9	10,386.3
28	2031	43.535	0.0	38.1	38.1	9,112.1	9,074.0
		Total	207,985.0	7,450.7	215,385.7	755,955.8	540,570.1

Net Present Value	540,570
B/C Ratio	3.510
EIRR	39.14

(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 13.11-9** shows the results of the sensitivity analysis.

TABLE 13.11- 9 SENSITIVITY ANALYSIS REGARDING COSTS AND BENEFITS OF STA. BARBARA ROAD CONSTRUCTION PROJECT

		Indicator	Benefits		
			20% down	Base Case	20% up
Costs	20% down	NPV (Pmillion)	432.0	584.0	735.0
		B/C Ratio	3.51	4.39	5.27
		EIRR (%)	39.1	45.1	50.3
	Base Case	NPV (Pmillion)	389.0	541.0	692.0
		B/C Ratio	2.81	3.51	4.21
		EIRR (%)	33.8	39.1	43.9
	20% up	NPV (Pmillion)	346.0	497.0	649.0
		B/C Ratio	2.34	2.93	3.51
		EIRR (%)	29.8	34.7	39.1

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

(3) Summary of Economic Analysis

The implementation of the Sta. Barbara 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.

13.11.2 Technical Evaluation

The results of the technical analysis of the Iloilo - Sta. Barbara Road show that there are not much problems for implementation of the improvement project except ROW acquisition for widening section between Iloilo – South Pavia..

- Due to many houses located along Iloilo - Sta. Barbara Road, especially section between Iloilo – South Pavia, it is anticipated some difficulties to acquire ROW for the said widening section. However, it was employed a minimum level of cross - section for four (4) lane road in urban area.
- As mentioned in C-1 road construction project, it is impossible to construct full scale of the intersection because intersecting area of the C-1 Road with Sta. Barbara Road are limited,. It is proposed to employ a partial scale of the intersection at this point.

13.11.3 Other Impacts

1) On Traffic

Table 13.11-10 shows the transport efficiency in the Metro Iloilo in cases of with and without the Iloilo - Sta. Barbara Road Improvement Project.

**TABLE 13.11-10(1) TRAFFIC VOLUME WITH AND WITHOUT
ILOILO - STA. BARBARA ROAD IMPROVEMENT PROJECT**

Unit: PCU/day

	2010			2022		
	W/O	W/.	$\frac{W/-}{W/O}$ W/O (%)	W/O	W/.	$\frac{W/-}{W/O}$ W/O (%)
Section 1 (City Proper – Iloilo Roxas Road)	37,300	39,600	6.2	57,900	58,300	0.7
Section 2 (Iloilo Roxas Road – Joro)	20,900	31,400	50.2	29,100	42,700	46.7
Section 3 (Joro – South Pavia)	22,800	35,200	54.4	31,500	47,100	49.5
Section 4 (South Pavia – Sta. Barbara)	14,100	20,900	48.2	17,500	24,500	40.0
Section 5 (Sta. Barbara - New Airport Access)	12,800	15,100	18.0	17,400	22,400	28.7

**TABLE 13.11-10(2) TRAVEL SPEED WITH AND WITHOUT ILOILO - STA. BARBARA
ROAD IMPROVEMENT PROJECT**

Unit: Km/Hr

	2010			2022		
	W/O	W/.	$\frac{W/-}{W/O}$ W/O (%)	W/O	W/.	$\frac{W/-}{W/O}$ W/O (%)
Section 1 (City Proper – Iloilo Roxas Road)	19.1	28.1	47.1	13.1	20.6	57.3
Section 2 (Iloilo Roxas Road – Joro)	35.0	36.5	50.0	24.8	29.8	20.2
Section 3 (Joro – South Pavia)	19.8	28.0	41.1	14.7	20.6	40.1
Section 4 (South Pavia – Sta. Barbara)	30.6	37.3	21.9	19.8	29.1	47.0
Section 5 (Sta. Barbara - New Airport Access)	32.6	39.1	19.9	19.8	29.8	50.5

**TABLE 13.11-11 TRANSPORT EFFICIENCY IN METRO ILOILO WITH AND WITHOUT
ILOILO - STA. BARBARA ROAD IMPROVEMENT PROJECT**

		2010	2016	2022
PCU Kilometers ('000)	W/O Project	3,140 (1.00)	4,018 (1.00)	5,151 (1.00)
	W/ Project	3,144 (1.001)	4,005 (0.997)	5,159 (1.002)
PCU Hours ('000)	W/O Project	103.8 (1.00)	149.5 (1.00)	219.0 (1.00)
	W/ Project	99.6 (0.959)	140.3 (0.938)	209.3 (0.956)
Average Travel Speed (km / h)	W/O Project	30.2 (1.00)	26.9 (1.00)	23.5 (1.00)
	W/ Project	31.6 (1.05)	28.5 (1.06)	24.6 (1.06)
Vehicle Operating Cost (P '000 /day)	W/O Project	21,754 (1.00)	35,885 (1.00)	149,686 (1.00)
	W/ Project	21,574 (0.99)	34,589 (0.96)	47,391 (0.95)

2) On Urban Amenity

Pre-existing Iloilo-Sta. Barbara Road will be greatly improved. Therefore, noise level, air quality, vibration and traffic safety in the area of corridor of Iloilo-Sta. Barbara Road will be greatly improved. Thus, urban amenity will be improved.

3) On Urbanization

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

13.11.4 Overall Evaluation

As motioned above, the implementation of the Iloilo - Sta. Barbara Road construction project can be justified from view of economic, technical, and social impact points.