

CHAPTER 10

FUTURE ROAD NETWORK DEVELOPMENT PLAN

10.1 SUMMARY OF PROBLEMS OF EXISTING ROAD NETWORK

Problems of existing road network were discussed in Chapter 5 and summarized hereunder:

Problems of Existing Road Network

Study Area

- A comb Type of road network is formed. Iligan-CDO-Butuan Road in the east-west direction along the coast is the base of road network.
- A comb type is not a flexible road network. It highly relies on Iligan-CDO-Butuan Road for its transport efficiency.
- To convert a comb type to a ladder type of road network is quite difficult due to topographical constraints.
- Urban structure is also formed along the coast line in the east-west direction. Therefore, strengthening of the east-west transport axis is the key issue in the Study Area.
- Among the north-south direction roads which connect the coastal flat area with the hinterland plateau area where agricultural activities are intensive, Syre Highway is the most important one, however, it climbs up the steep slope with many sharp curves and steep gradient, its traffic capacity is limited.

Cagayan de Oro City

- The city center section of Iligan-CDO-Butuan Road is heavily congested due to traffic concentration and several intersections at short interval. Strengthening of this Road and/or additional alternative routes are needed.
- Although the 4th bridge was completed in 2003 and the 3rd bridge is under construction, traffic concentrates at Marcos Bridge and Carmen Bridge. Additional bridge crossings are needed to disperse traffic to/from CBD / Port areas.
- West Plateau Area, West Bank Area, and East Bank Area where rapid urbanization is progressing are served by only one 2-lane road in each area and inter-linkage between these roads is not made, all of them are congested at the entrance to CBD. Alternative route(s) accessible to CBD is (are) needed.
- West Coastal Area is served by only narrow streets, a trunk road needs to be formed.
- Blocked by Iponan River, both Iponan Area and Opol Municipality where urbanization is progressing rely on Iligan-CDO-Butuan Road. Additional access road to Cagayan de Oro City Center is needed.
- Construction of additional roads in CBD / Port Area is difficult. Traffic management measures need to be strengthened.

10.2 FUTURE PROBLEMS OF EXISTING ROAD NETWORK (ANALYSIS OF “DO-NOTHING” CASE)

In order to identify future problems of the existing road network, “Do Nothing” case analysis was undertaken. “Do-Nothing” case means that if no investment is made for road network improvement, but traffic grows as predicted, what would be the traffic situation on the road network. In other words, traffic demand in year 2022 was assigned to the 2003 road network. Traffic assignment result is shown in Figure 10.2-1.

Future Problems of Existing Road Network

- Iligan-CDO-Butuan Road will be heavily congested with V/C ratio of more than 1.2, except sections in Laguindingan and Gitagum in the west and Villanueva and Jasaan in the east.
- Most of roads in CBD / Port Area and its adjacent areas will also suffer heavy traffic congestion.
- Three roads accessing to East Plateau where large scale urban development is planned will experience traffic congestion. Development of the said area needs to be made harmoniously with road improvement.
- P.N. Roe Secured Valley Subdivision / CDO Resettlement Project area will generate high traffic and the access road to the area will have traffic capacity problem.
- The steep slope section of Syre Highway will suffer traffic congestion.

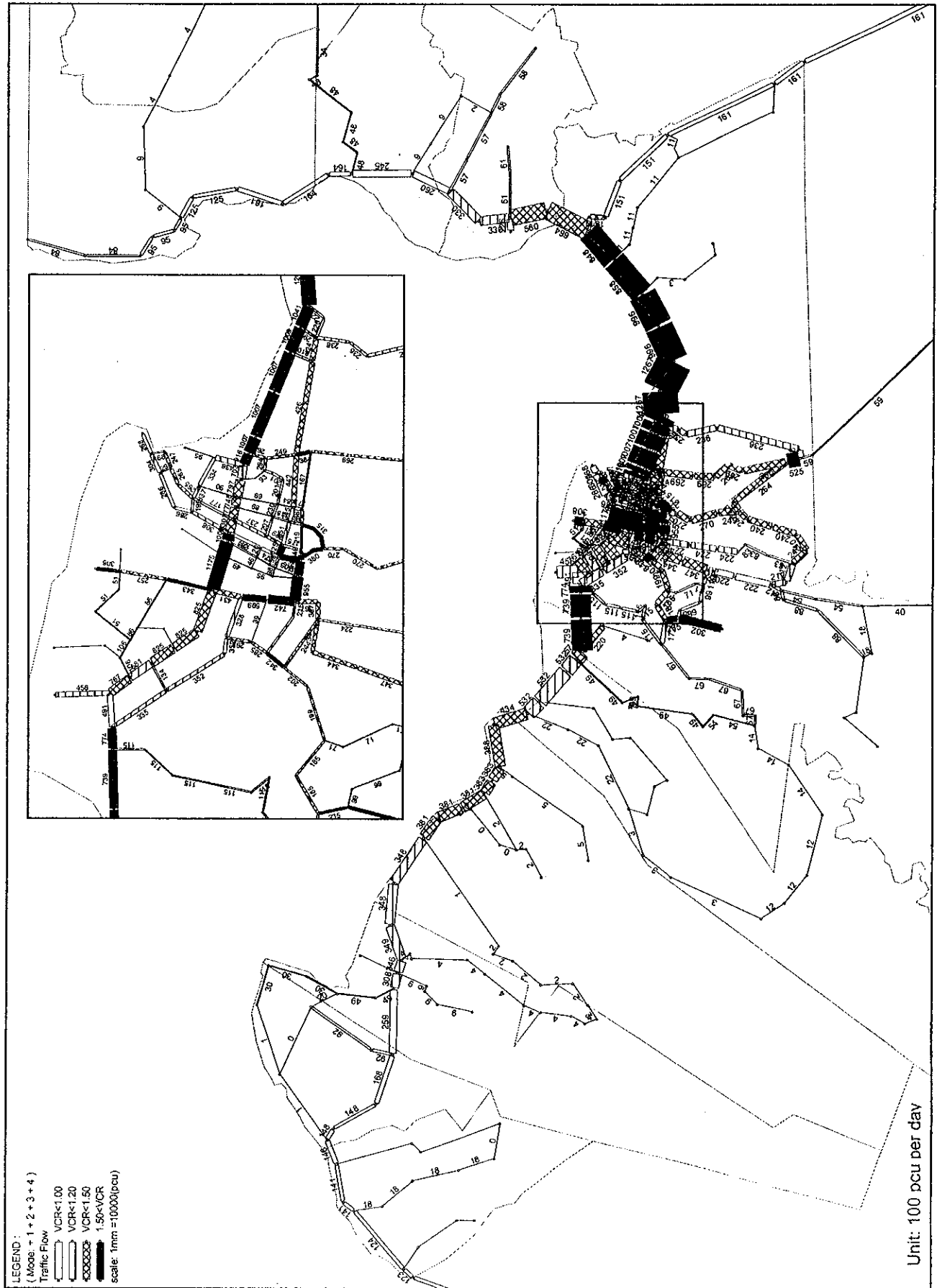


FIGURE 10.2-1 TRAFFIC ASSIGNMENT – 2022 – [DO NOTHING CASE]

10.3 ROAD NETWORK DEVELOPMENT OBJECTIVES AND STRATEGIES

10.3.1 Objectives

In due consideration of the present and future road network issues, physical constraints, future urban development issues and economic development targets in the Study Area as well as its surrounding areas, the following road network development objectives were established:

Road Network Development Objectives

- Reduction of traffic congestion of Iligan-CDO-Butuan Road and roads accessing to CBD / Port Area.
- Road network which will guide and support planned urban development.
- Formation of flexible road network which will provide alternative routes to road users.
- Road network which will contribute to the economic development of the Study Area as well as its hinterland.
- Road network which will enhance international and domestic investment in the Study Area as well as its hinterland.
- Road network which will realize expected investment effects of related projects.
- Road network development with environmental and social considerations.

10.3.2 Strategies

In order to achieve above objectives, the following strategies were established:

Road Network Development Strategies

- Strengthening of E-W transport axis.
- Improvement of accessibility to CBD.
- Full utilization of existing road stock in CBD / Port Area.
- Strengthening and improvement of transport efficiency of the routes which connect agricultural production area, agro-industrial area and export facility.
- Strengthening of accessibility to new airport and container terminal port.
- Avoiding road network development in the environmentally and socially critical areas.

TABLE 10.3-1 ROAD NETWORK DEVELOPMENT OBJECTIVES, STRATEGIES AND MEASURES

<u>Development Objectives</u>	<u>Development Strategies</u>	<u>Measures To Be Taken</u>
Reduction of traffic congestion of Iligan-CDO-Butuan Road and Roads accessing to CBD /Port Area.	Strengthening of E-W transport axis.	Capacity expansion of Iligan-CDO-Butuan Road (widening and/or Flyovers)
Road network which will guide and support planned urban development.	Improvement of Accessibility to CBD.	Construction of parallel road to Iligan-CDO-Butuan Road.
Formulation of flexible road network which will provide alternative routes to road users.	Full utilization of existing road stock in CBD / Port Area.	Construction of additional bridges over CDO River.
Road network which will contribute to the economic development of the Study Area as well as its hinterland.	Strengthening / improvement of transport efficiency of the routes which connect agricultural production area, agro-industrial area and export facility.	Strengthening of traffic management.
Road network which will enhance international and domestic investment in the Study Area as well as its hinterland.	Strengthening of accessibility to new airport, and container terminal port.	Improvement of existing roads and construction of new road.
Road network which will realize expected investment effects of related projects.	Avoiding road network development in the environmentally and socially critical areas.	Proper selection of road alignment and proper road design.
Road network development with environmental and social considerations.		

10.4 FUTURE ROAD NETWORK ALTERNATIVES AND RECOMMENDED PLAN

10.4.1 Procedure for Development of Future Road Network

Due to physical constraints and wide spread urban areas in the narrow coastal plain, a systematic road network such as a radial and circumferential road network cannot be formed, thus the road network configuration was planned focusing on how to remedy the weakness of the existing road network.

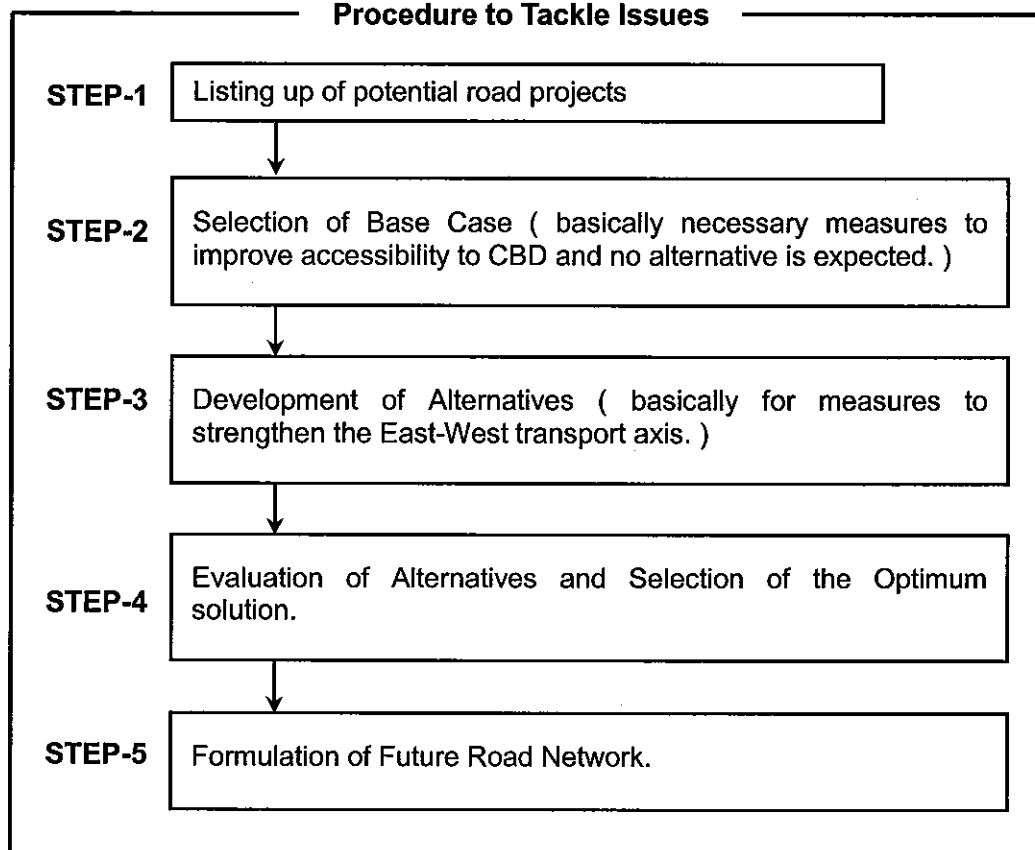
Key issues for road network development to cope with future traffic demand as well as future urban development are as follows:

Key Issues

- How to strengthen the East-West transport axis
- How to improve accessibility to CBD
- How to improve accessibility to Mindanao International Container Terminal and PHIVIDEC Industrial area
- How to improve accessibility to New Airport

In order to tackle above issues, the following procedure was adapted:

Procedure to Tackle Issues



The Study Team tried to formulate a radial-circumferential type of road network, however, it was found that formation of a circumferential road is not physically and socially feasible due to steep slopes and heavy residential development.

10.4.2 Listing Up of Potential Road Projects

Potential road projects (new construction) in the City Central Area are shown in Figure 10.4-1.

1) Strengthening of East-West Transport Axis

- Widening of existing Iligan-CDO-Butuan Road
(this measure is not possible for the section in the Central City area due to dense development of roadsides, and possible only outer sections of the City. See Figure 10.4-2.)
- Construction of New Parallel Road to Iligan-CDO-Butuan Road
 - New Western Coastal Road (refer to Figure 10.4-1)
 - Extension of J.R. Borja Street (see Figure 10.4-3)
 - Construction of new coastal reclamation road (see Figure 10.4-4)
 - Construction of a bypass road at plateau area (see Figure 10.4-5)
- Construction of Flyovers over Iligan-CDO-Butuan Road (see Figure 10.4-6)
- Construction of Opol Bypass (refer to Figure 10.4-1)

2) Improvement of Accessibility to CBD

In order to relief traffic congestion on Marcos Bridge and Carmen Bridge, additional bridges over Cagayan de Oro River and diversion road are needed as follows:

- 5th Bridge (the old national road in the west is extended to make access to CBD from Western Area)
- 6th Bridge (J.R. Borja Street in CBD is extended to link with the Western Area)
- 7th Bridge and an access road to CBD (CDO-Talakag Road is extended to the east to provide access to CBD from Western Plateau Area)
- 8th Bridge and an access road to CBD (to provide direct access from West Bank Area to CBD, new bridge with a new access road is constructed)
- CDO New West Diversion Road (P.N. Roe Secured Valley / CDO Resettlement Project Site will become large traffic generation sources. New West Diversion Road will provide access from the said area to CBD / Port Area as well as to West Plateau Area)

In the outside the City Central Area, potential road projects are as follows:

Strengthening of North-South Transport Axis (improvement of accessibility from Plateau Area or Bukidnon Province to the coastal flat area)

- Mindanao Container Terminal–Bukidnon Link Road (see Figure 10.4-7)
- Improvement of Syre Highway Parallel Road

In addition to above, many existing roads need to be improved.

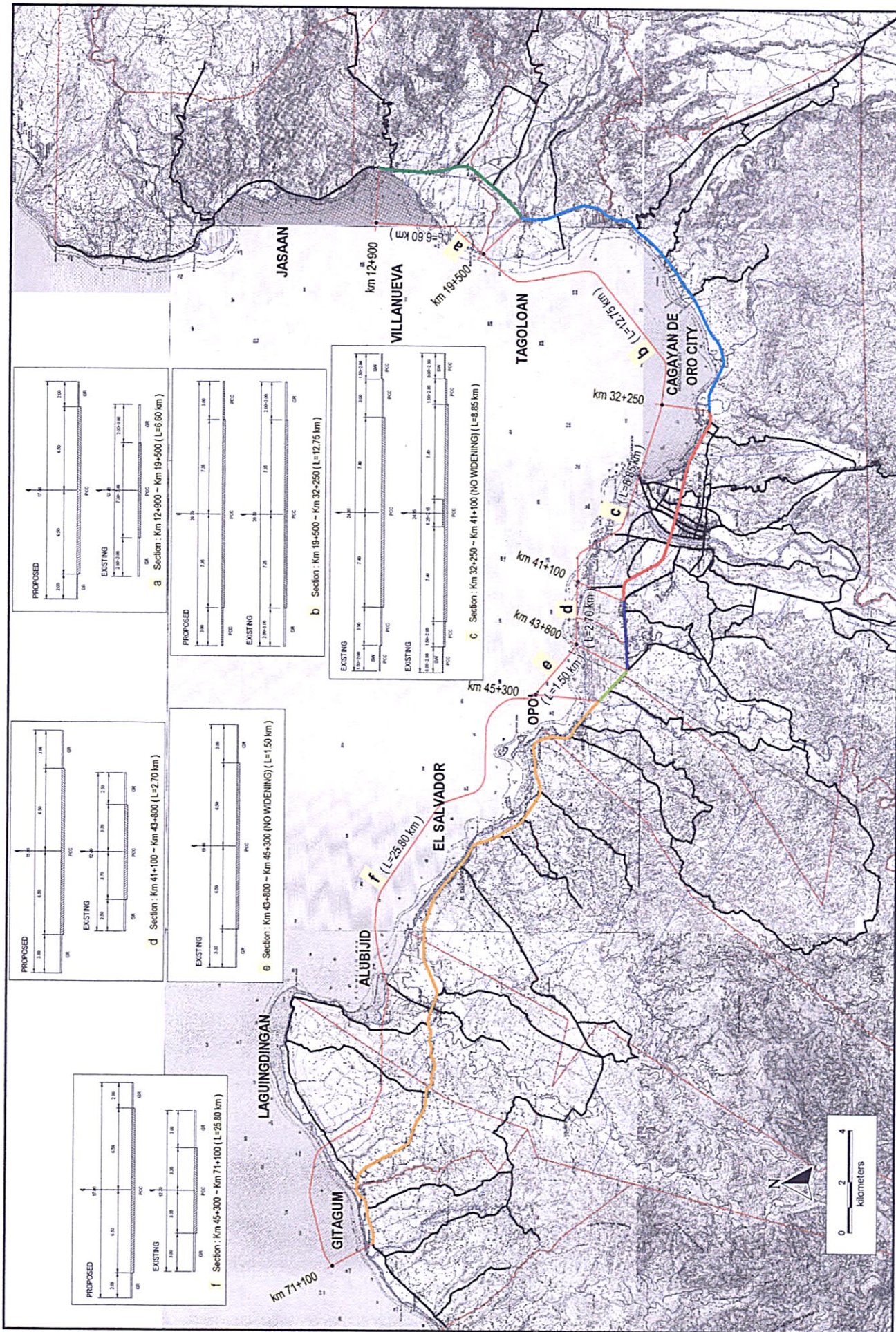
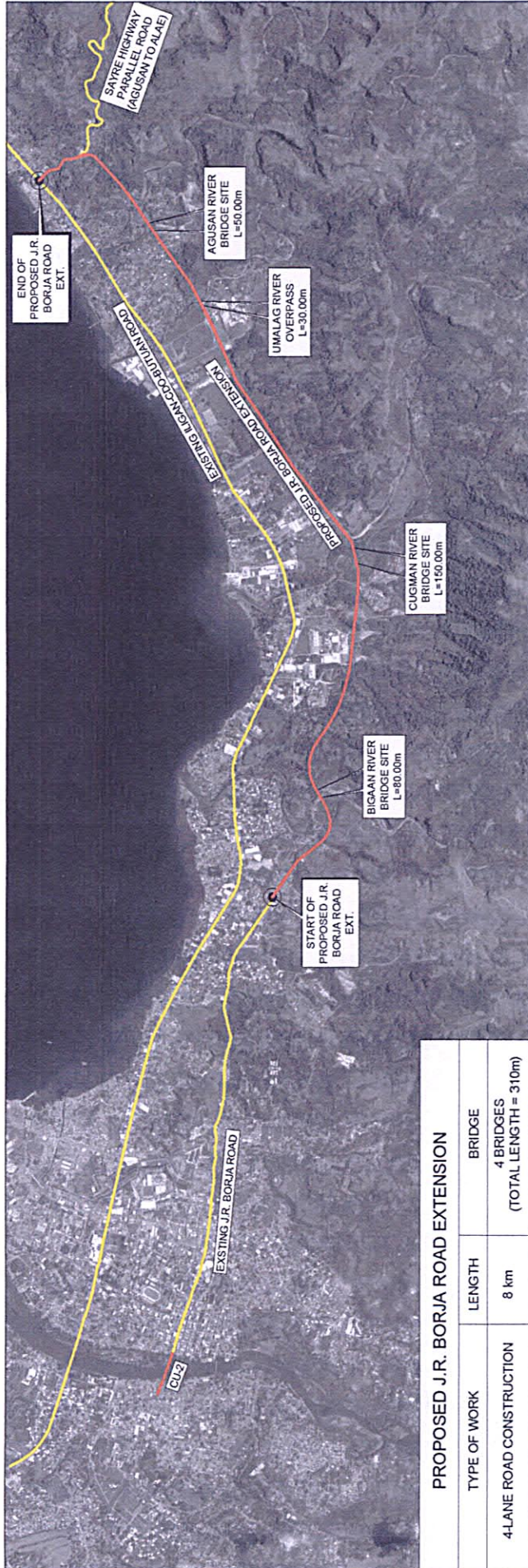
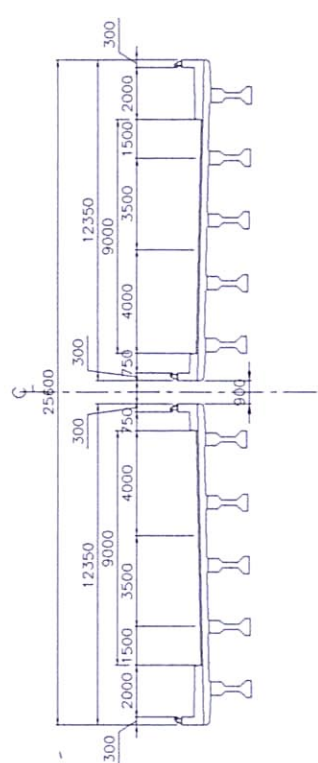


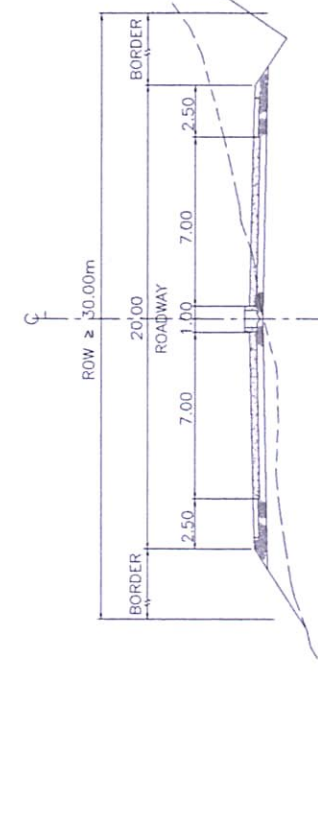
FIGURE 10.4-2 WIDENING OF EXISTING ILIGAN-CDO-BUTUAN ROAD



PROPOSED J.R. BORJA ROAD EXTENSION		
TYPE OF WORK	LENGTH	BRIDGE
4-LANE ROAD CONSTRUCTION	8 km	4 BRIDGES (TOTAL LENGTH = 310m)



TYPICAL BRIDGE CROSS SECTION



TYPICAL ROAD CROSS SECTION

Figure 10.4-3 J.R. BORJA ROAD EXTENSION

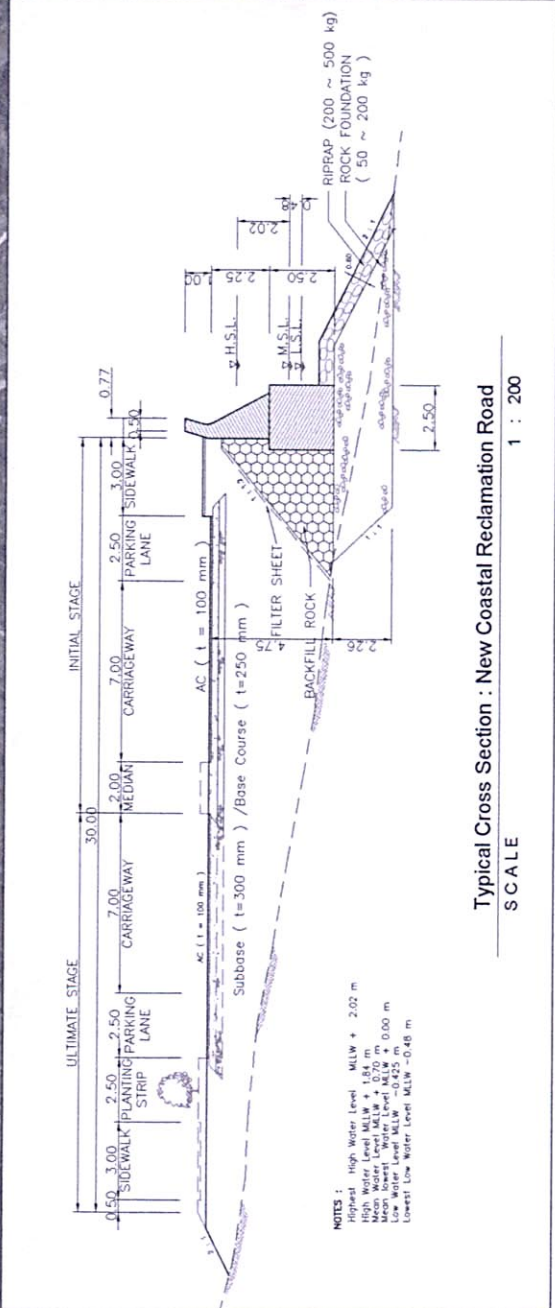
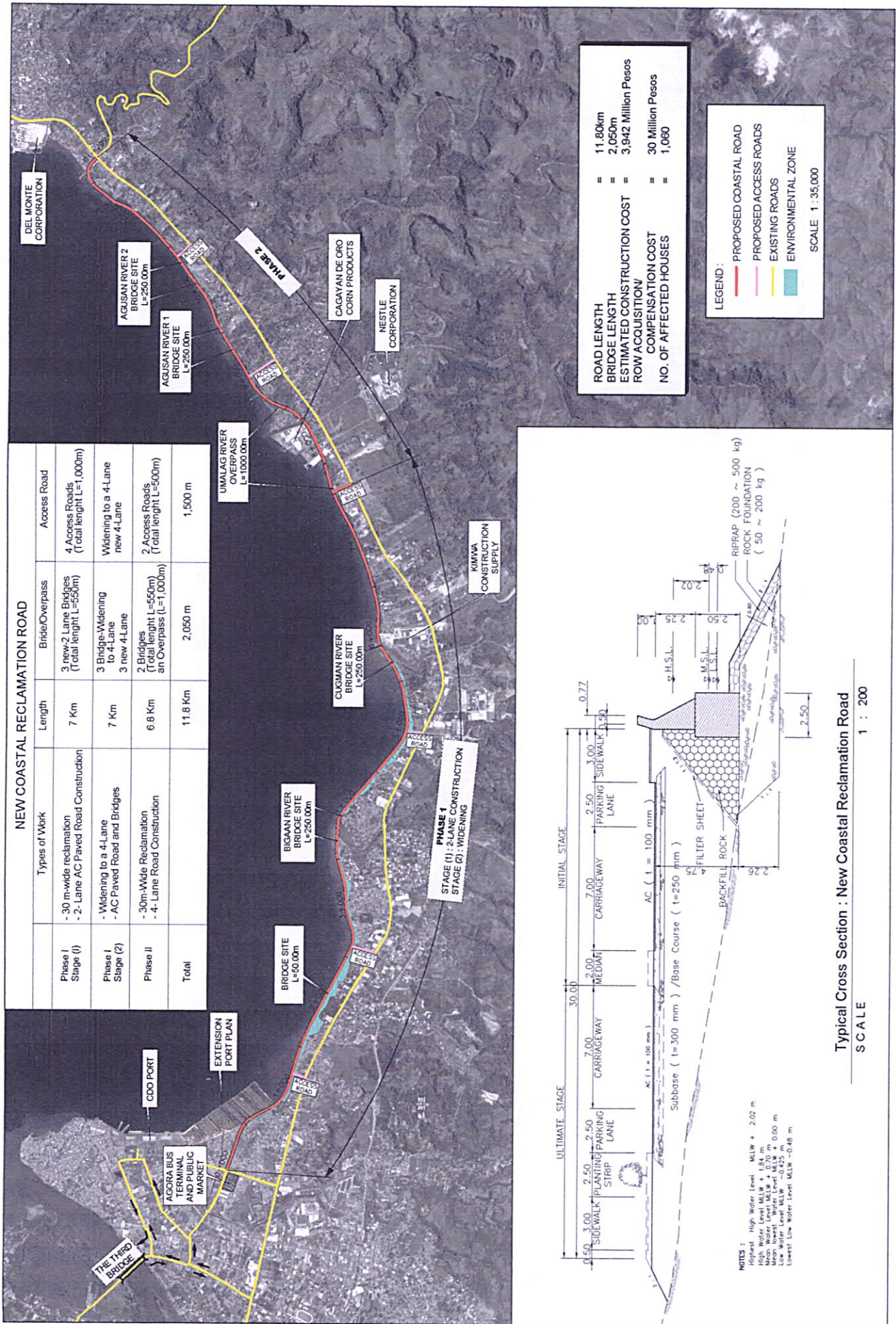


FIGURE 10.4-4 NEW COASTAL RECLAMATION ROAD

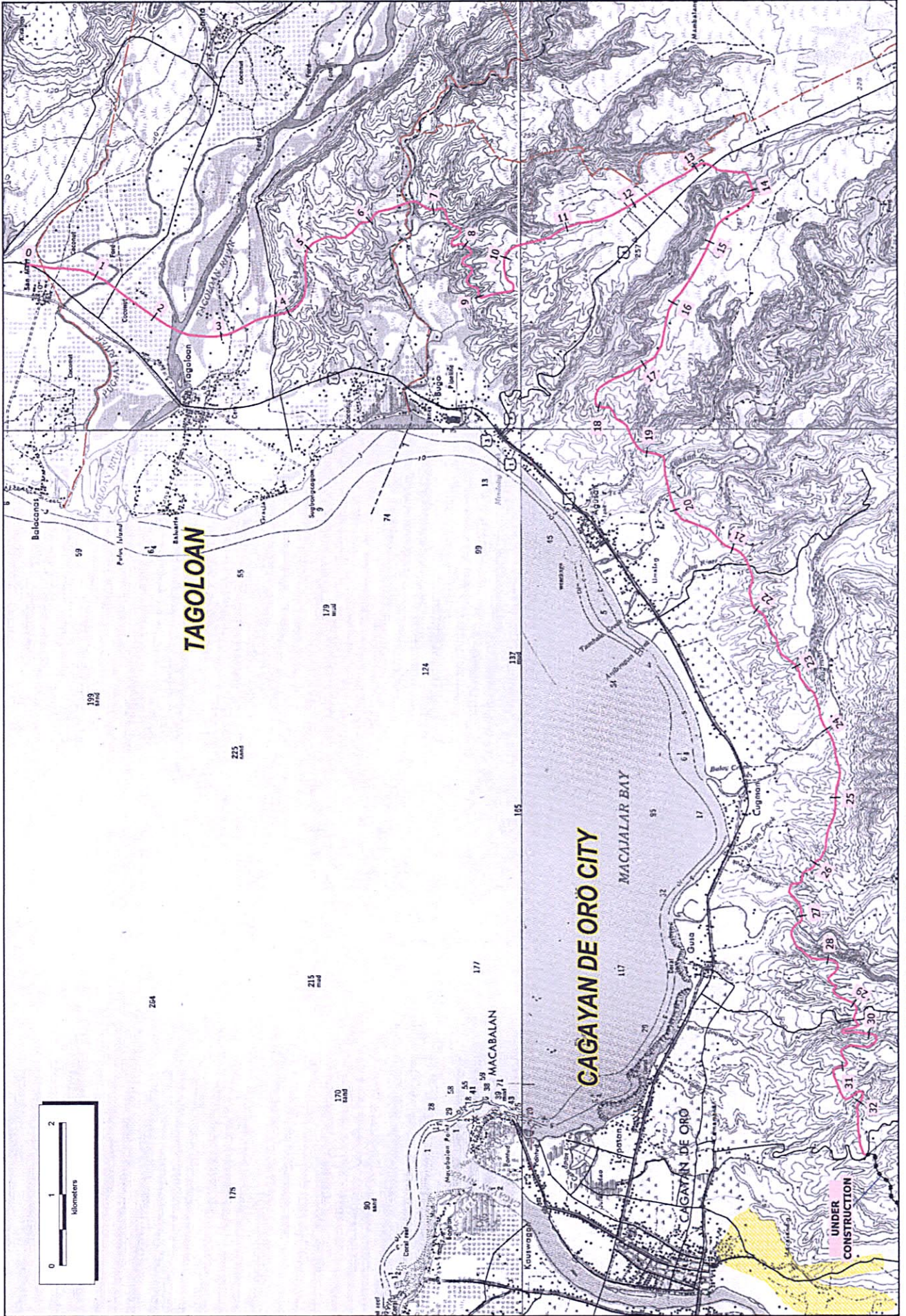


FIGURE 10.4-5 (1/2) CONSTRUCTION OF A BYPASS ROAD AT PLATEAU AREA : ALIGNMENT

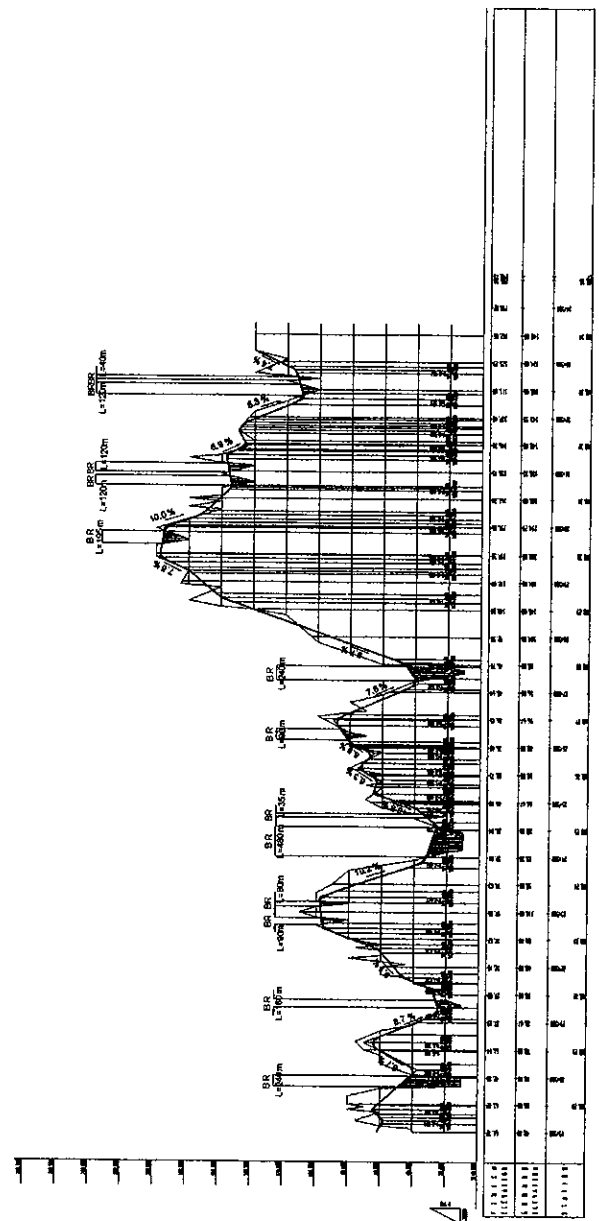
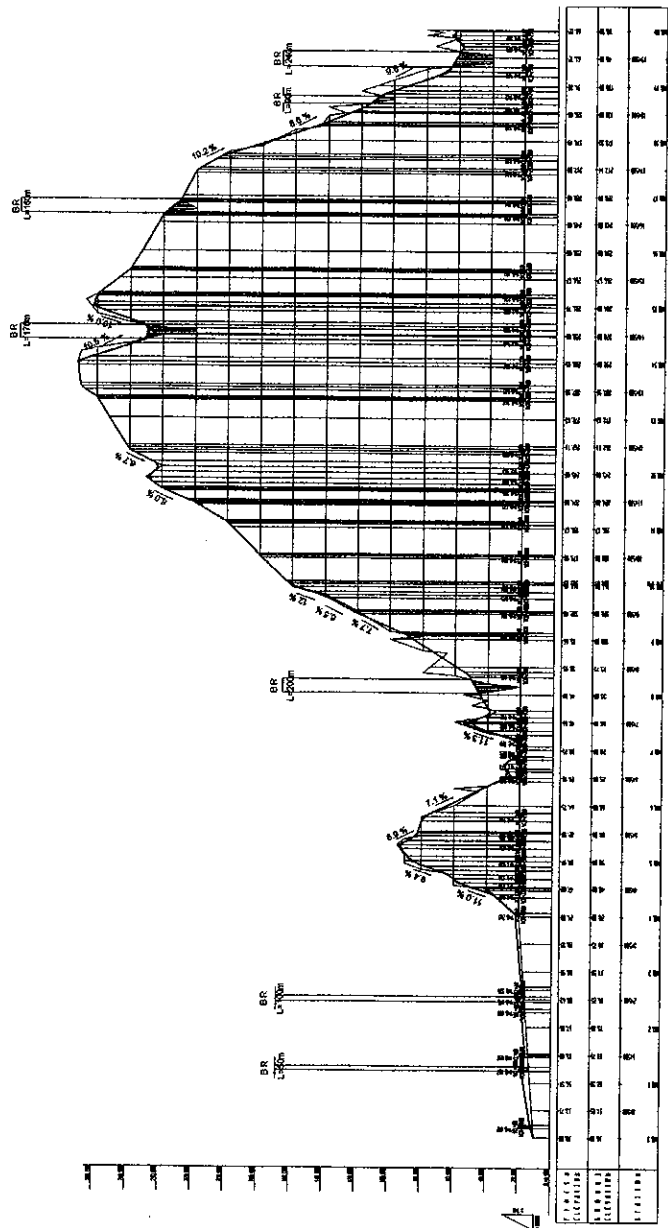
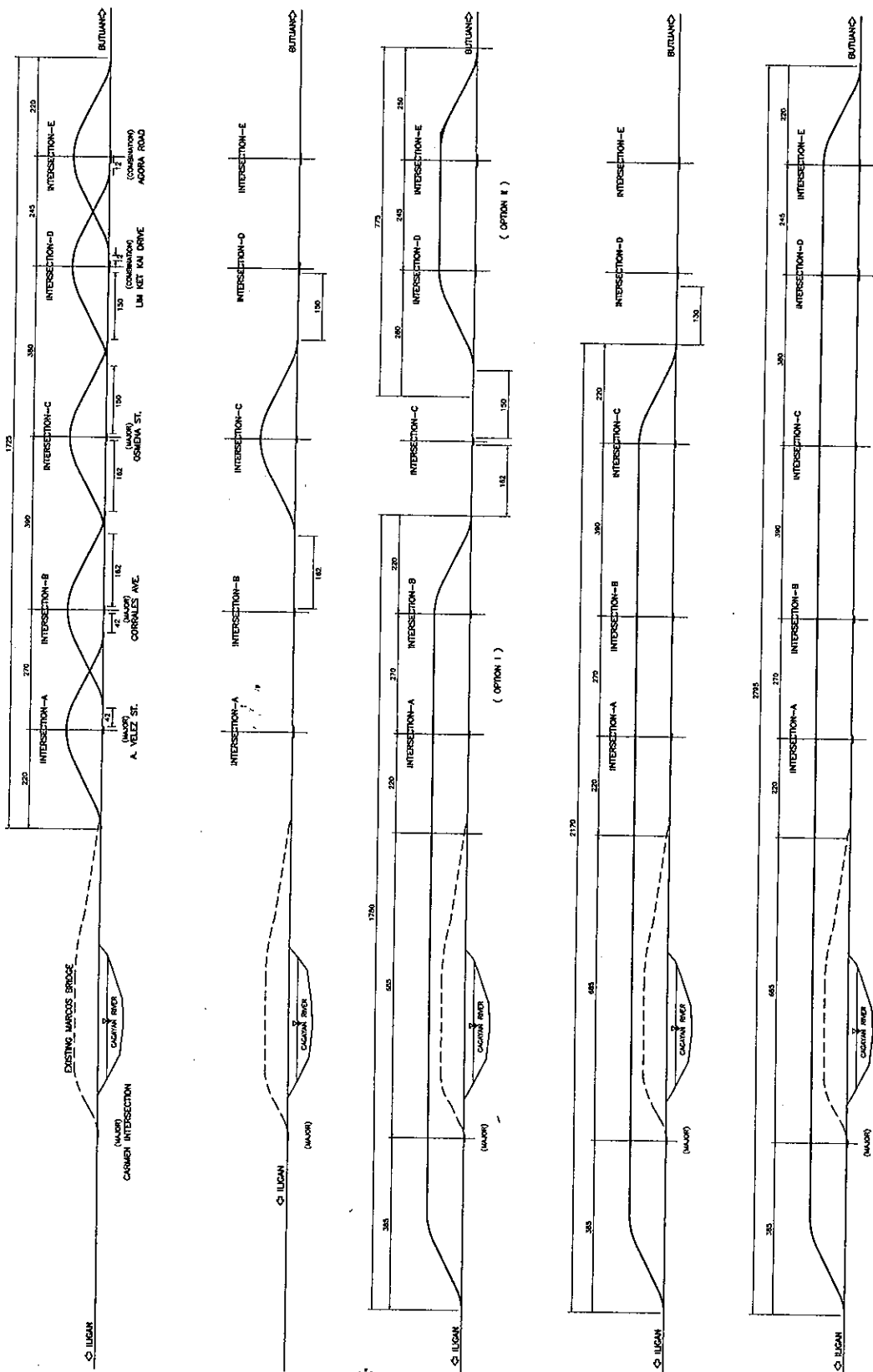


FIGURE 10.4-5 (2/2) CONSTRUCTION OF A BYPASS ROAD AT PLATEAU AREA : PROFILE



SCHEME - 1
 TO PROVIDE AN INDIVIDUAL OVERPASS FOR EACH STATION.
 IN CASE OF A FLYOVER AT EACH INTERSECTION, ONLY INTERSECTION 'C' CAN BE POSSIBLE

SCHEME - 2
 TO PROVIDE ONLY ONE OVERPASS FOR THE INTERSECTION 'C'. BECAUSE APPROACHES OF OTHER INTERSECTIONS WILL OVERLAPPED EACH OTHER

SCHEME - 3
 TO PROVIDE TWO CONTINUOUS OVERPASSES FOR CONGESTED INTERSECTIONS CARMEN 'A', 'B', 'D', & 'E'. OPTION I FOR INTERSECTIONS CARMEN 'A', 'B' OR OPTION II FOR INTERSECTIONS 'D' & 'E'

NOTE:
 ALL TRAFFIC WILL BE CONCENTRATED AT INTERSECTION 'C', WHICH WILL CAUSE SERIOUS CONGESTION AND LEAD ALONG QUEUE OF TRAFFIC ON THE FLYOVER.

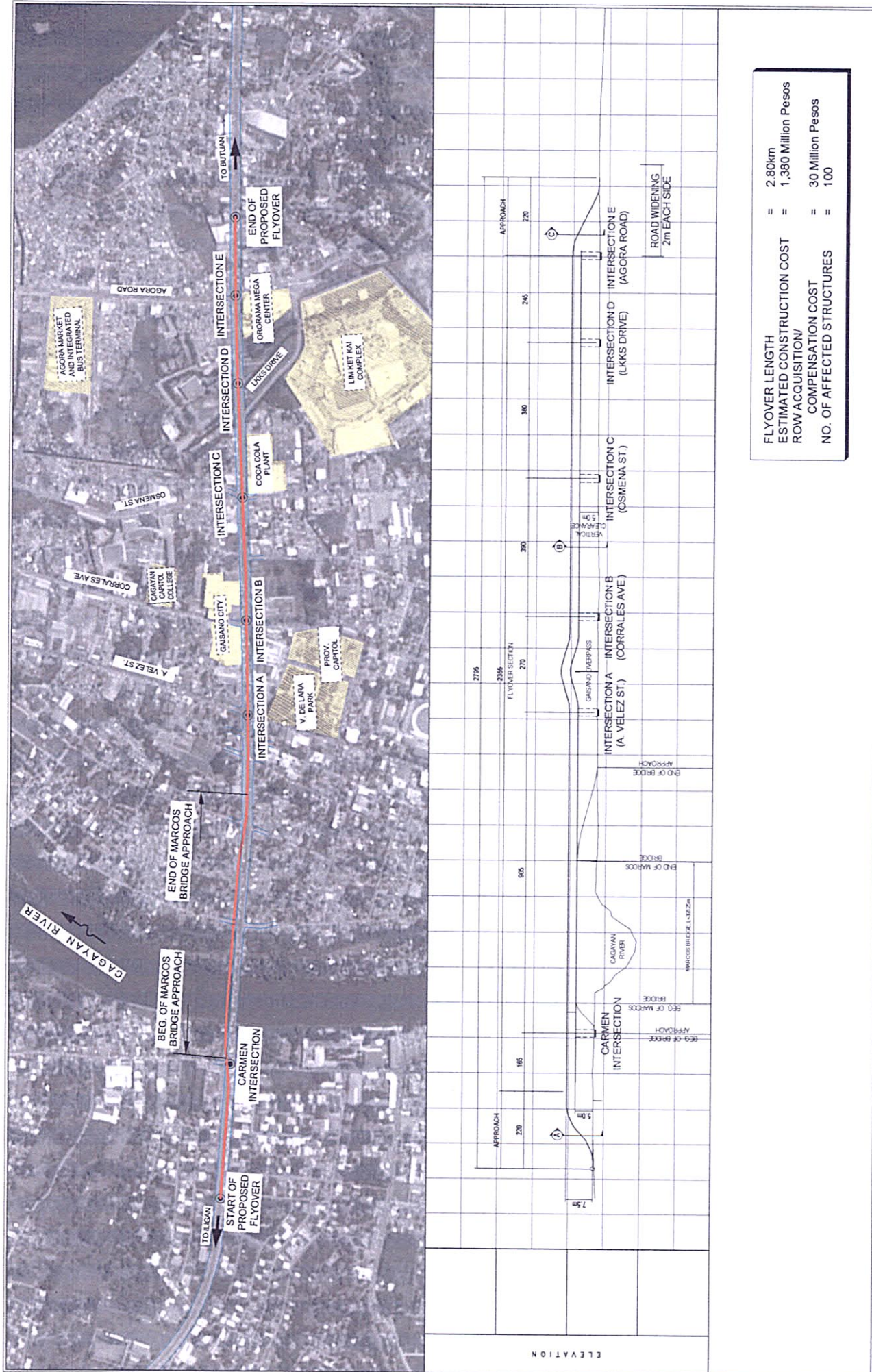
SCHEME - 4
 TO PROVIDE A CONTINUOUS OVERPASSES FROM CARMEN INTERSECTION OVER CAGAYAN RIVER TO INTERSECTION 'C'.

NOTE:
 ALL TRAFFIC WILL BE CONCENTRATED AT INTERSECTION 'D' AND 'E', WHERE TRAFFIC FROM INTERSECTION 'C' WILL TRAFFIC FROM THE 3RD BRIDGE WILL CONGEST AND HENCE LEAD TO SERIOUS TRAFFIC CONGESTION AT INTERSECTION 'D' AND 'E'

SCHEME - 5
 TO PROVIDE A FLYOVER FROM CARMEN TO AGORA ROAD, BEYOND AGORA ROAD NO MAJOR INTERSECTION.
 THIS SCHEME IS RECOMMENDED.

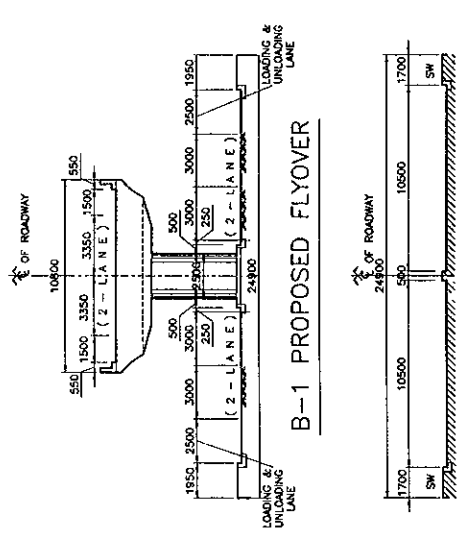
NOTE:
 H = 7.5m, i = 5%, v = 60km/hr, D = 220m. (AASHTO A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS)

FIGURE 10.4-6(1/3) CAGAYAN DE ORO FLYOVER PROJECT : ALTERNATIVES



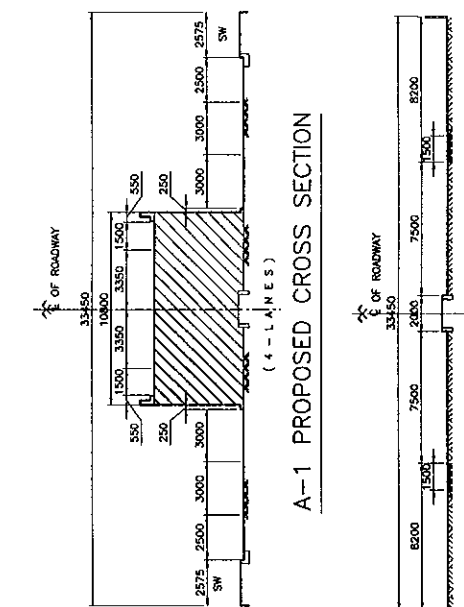
FLYOVER LENGTH	=	2.80km
ESTIMATED CONSTRUCTION COST	=	1,380 Million Pesos
ROW ACQUISITION/COMPENSATION COST	=	30 Million Pesos
NO. OF AFFECTED STRUCTURES	=	100

FIGURE 10.4-6(2/3) CAGAYAN DE ORO FLYOVER PROJECT (PLAN)



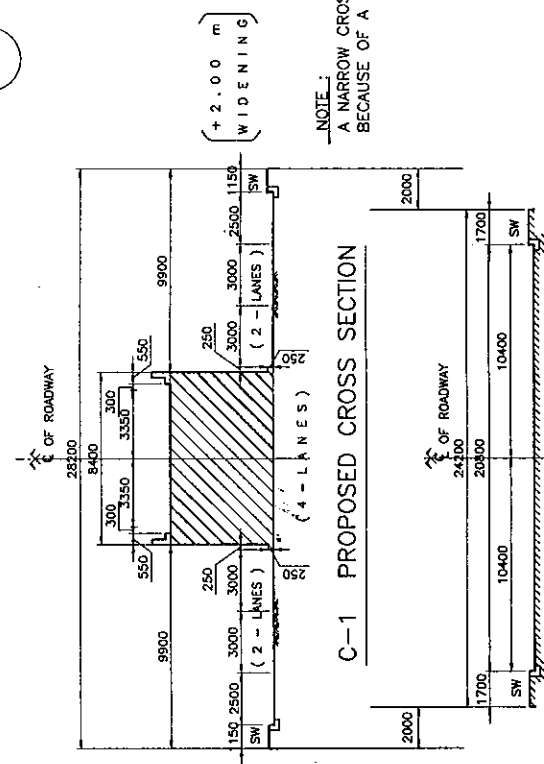
B SCALE 1:300

A SCALE 1:300



A SCALE 1:300

C SCALE 1:300



NOTE:
A NARROW CROSS SECTION WILL BE ADOPTED BECAUSE OF A LIMITED ROAD RIGHT OF WAY.

FIGURE 10.4-6(3/3) CAGAYAN DE ORO FLYOVER (CROSS SECTION)

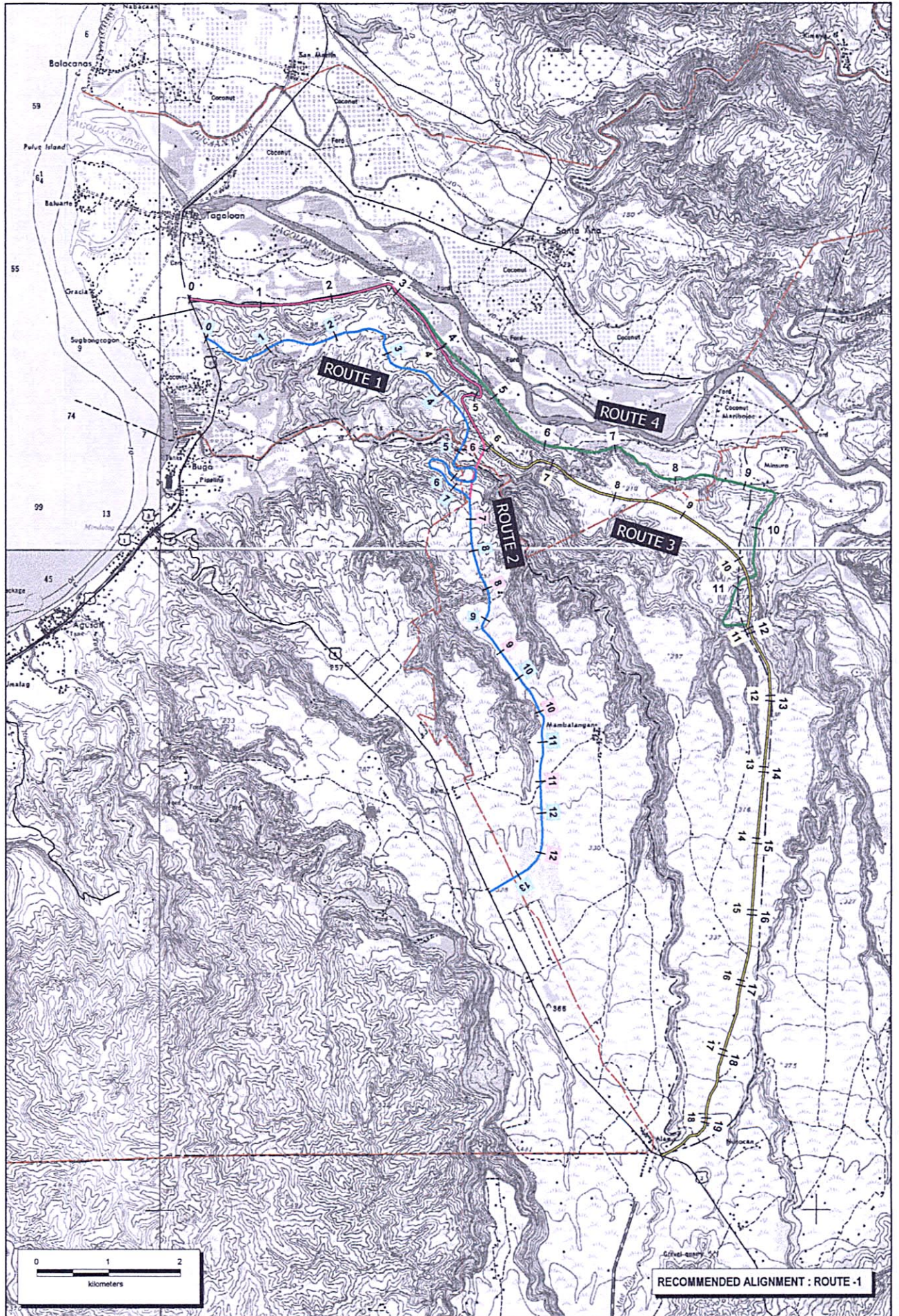


FIGURE 10.4-7 (1/5) MINDANAO CONTAINER TERMINAL - BUKIDNON LINK ROAD : ALTERNATIVE ALIGNMENTS

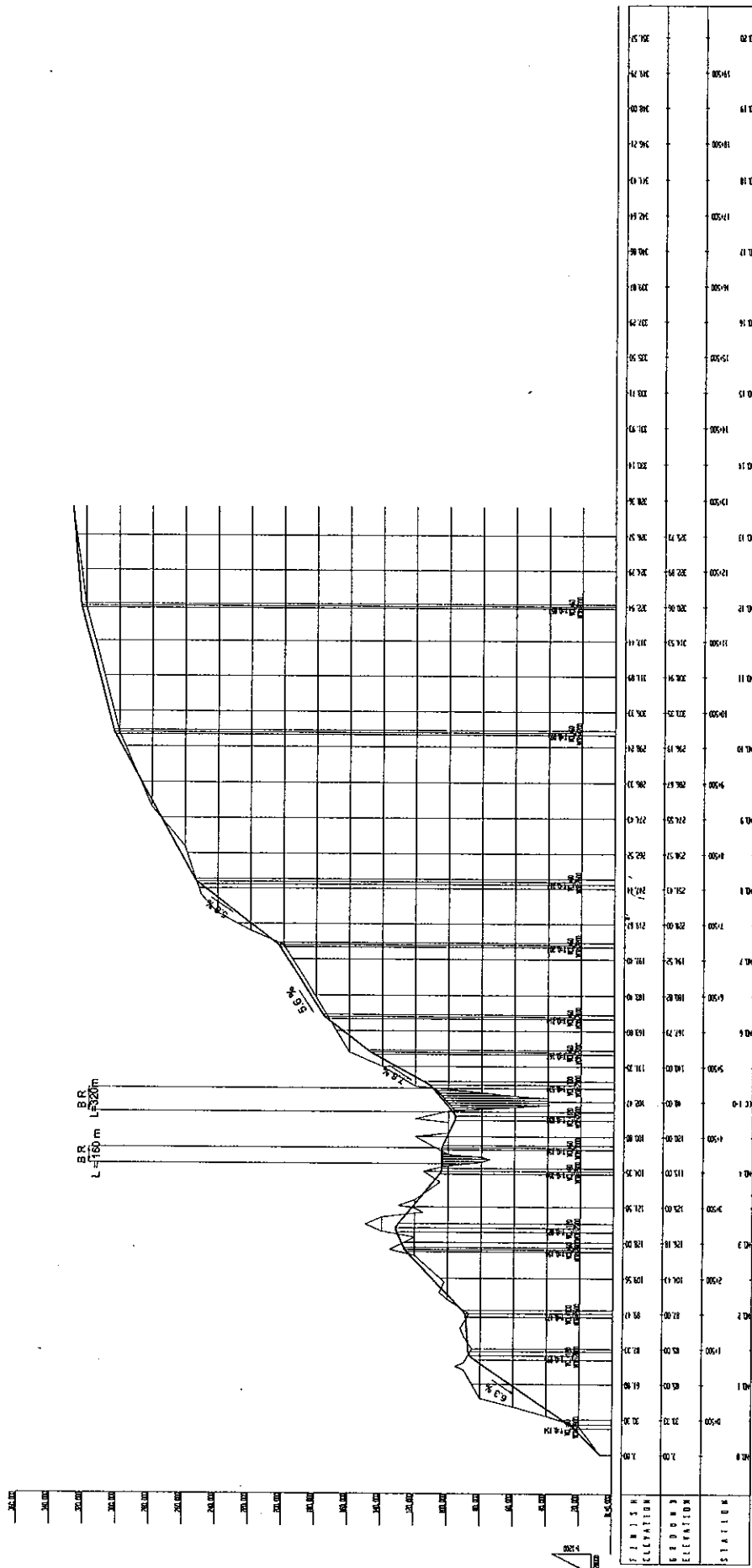


FIGURE 10.4-7 (2/5) MINDANAO CONTAINER TERMINAL - BUKIDNON LINK ROAD: PROFILE OF ALTERNATIVE-1

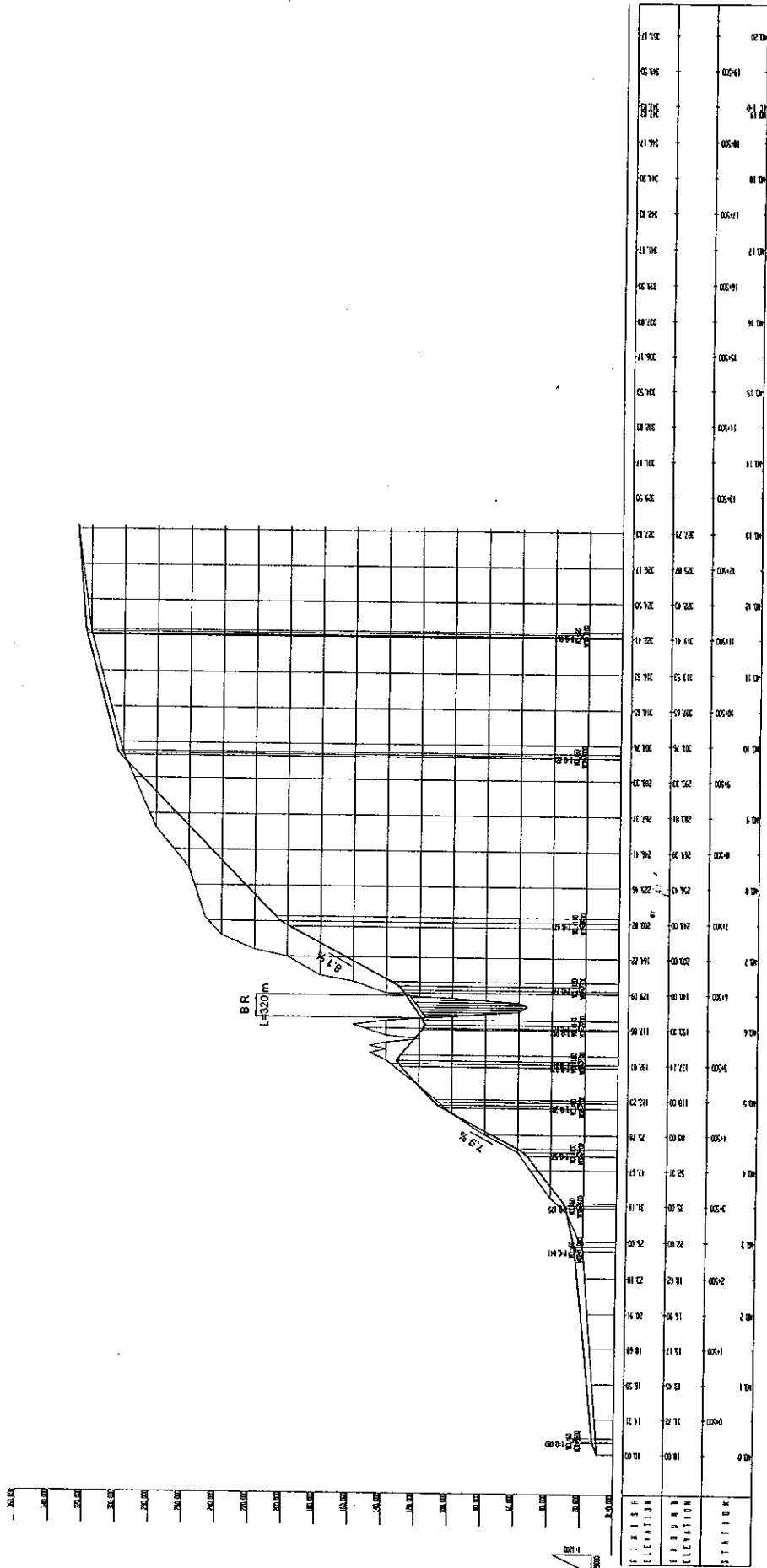


FIGURE 10.4-7 (3/5) MINDANAO CONTAINER TERMINAL - BUKIDNON LINK ROAD: PROFILE OF ALTERNATIVE E-2

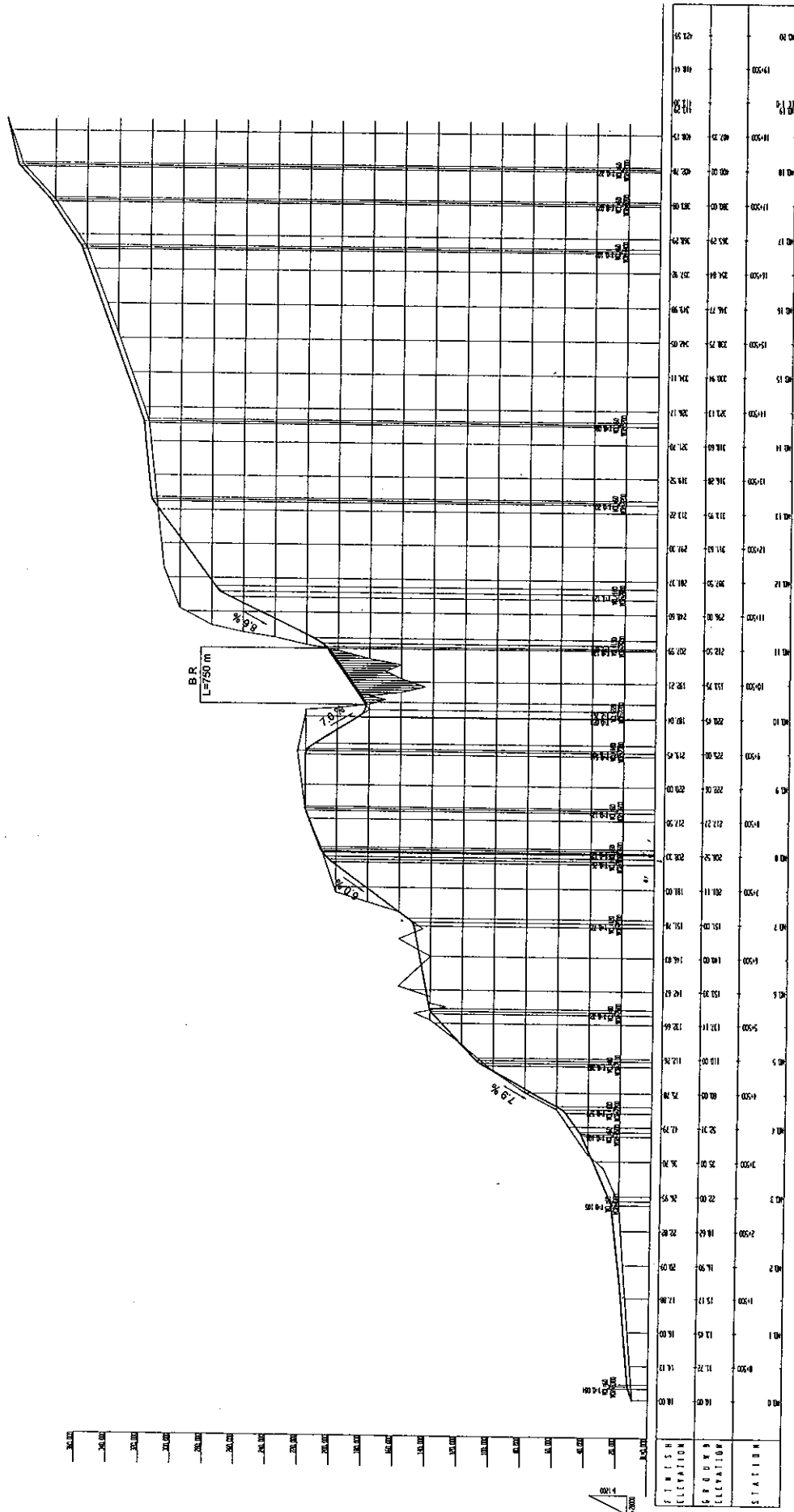


FIGURE 10.4-7 (4/5) MINDANAO CONTAINER TERMINAL - BUKIDNON LINK ROAD: PROFILE OF ALTERNATIVE-3

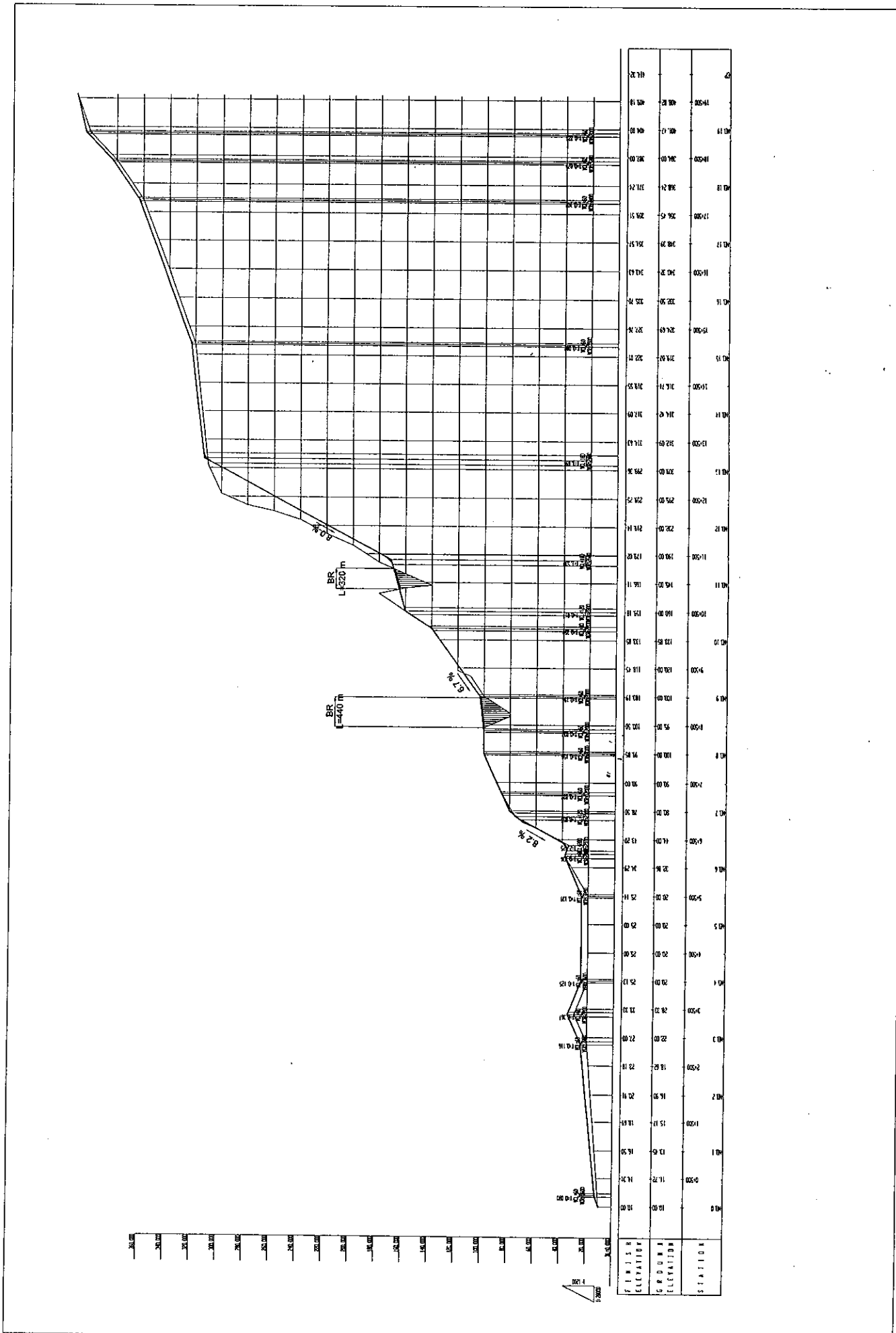


FIGURE 10.4-7 (5/5) MINDANAO CONTAINER TERMINAL - BUKIDNON LINK ROAD: PROFILE OF ALTERNATIVE-4

10.4.3 Selection of Base Case

In the Study Area, new road links cannot be freely developed due to physical constraints such as steep slopes, therefore, traffic problems need to be solved area by area except the east-west transport axis.

The base case road network is formed by existing roads and new road links which are definitely needed to solve traffic problem and to support sound urbanization in a specific area and their alternatives are hard to consider.

New road links which are included in the base case road network are as follows:

- New Western Coastal Road : construction of the 3rd Bridge is on-going. An access road to this bridge is definitely needed.
- Opol Diversion Road : the area traversed by this road is being developed as residential area. In order to support sound urbanization in the area, this road is definitely needed.
- New West Diversion Road : traffic generated in the area traversed by this road need to be distributed to Iligan-CDO-Butuan Road, New Western Coastal Road, CDO-Talakag Road and Carmen-Calaanan Road. Existing West Diversion Road is narrow and widening is quite difficult due to roadside development, particularly section near Iligan-CDO-Butuan Road.
- Bridge Crossing Over Cagayan de Oro River : Traffic crossing Cagayan de Oro River is estimated at about 240,000 pcu (or 184,000 vehicles) per day in 2022 as shown in Table 10.4-1.

There are four bridges (including one under construction) of which traffic capacity is estimated at 170,000 pcu. Additional bridges with a 2-lane capacity needed are 3 to 4.

Potential bridge crossing locations are shown in Figure 10.4-1, namely 5th to 8th Bridges. To relief traffic concentration on Carmen Bridge, 7th Bridge which mainly serves traffic from West Plateau Area and 8th Bridge which serves traffic from West Bank Area are needed.

With regards to 5th and 6th Bridges, following two cases were evaluated:

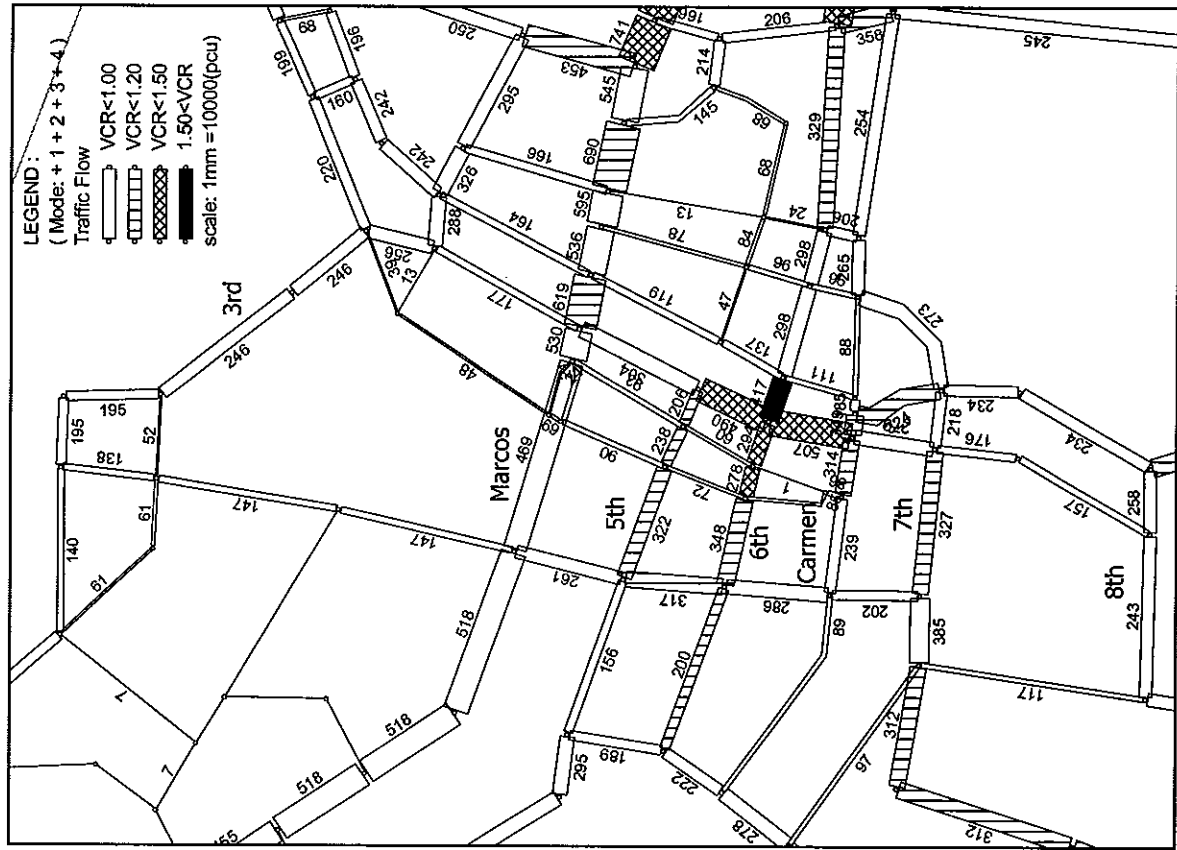
- Base Case-1 : Only 6th Bridge
- Base Case-2 : Both 5th and 6th Bridges

Traffic assignment result is shown in Figure 10.4-8 and is summarized below:

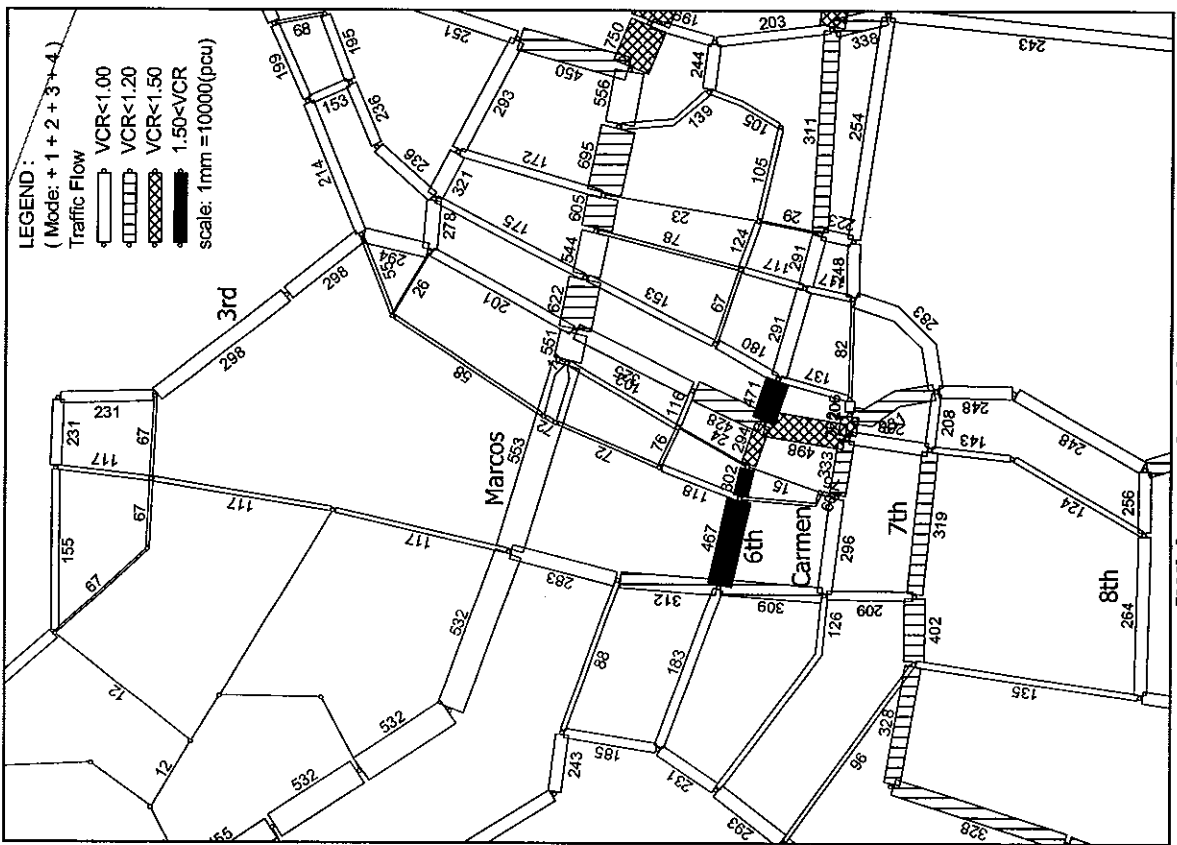
Bridges	V / C Ratio	
	Base Case - 1	Base Case - 2
Marcos Bridge	Less than 1.0	Less than 1.0
5 th Bridge	-	Less than 1.0
6 th Bridge	More than 1.5	Less than 1.5
Carmen Bridge	Less than 1.2	Less than 1.0
7 th Bridge	Less than 1.2	Less than 1.2
8 th Bridge	Less than 1.0	Less than 1.0

Table 10.4-1 Traffic Volume Crossing Cagayan de Oro River

Volume		Present	2010	2016	2022	Base-1	Base-2	Link
Bridge	No.3	0	0	0	0	29,800	24,600	F1055
	Marcos	54,400	78,400	96,600	120,500	55,300	46,900	N1240
	N0.5	0	0	0	0	0	32,200	F1120
	N0.6	0	0	0	0	46,700	34,800	F1110
	Carmen	35,800	49,100	65,900	99,000	29,600	23,900	N4070
	No.7	0	0	0	0	31,900	32,700	F1210
	No.8	0	0	0	0	26,400	24,400	F5650
	No.4	10,300	14,800	17,900	20,800	20,700	20,900	C1290
	Total-PCU	100,500	142,300	180,400	240,400	240,400	240,400	
	Total-VEH	77,700	108,100	137,700	184,100	184,100	184,100	
	Index	1.00	1.39	1.77	2.37	2.37	2.37	
Capacity								
Bridge	No.3	0	0	0	0	50,000	50,000	F1055
	Marcos	60,000	60,000	60,000	60,000	60,000	60,000	N1240
	N0.5	0	0	0	0	0	30,000	F1120
	N0.6	0	0	0	0	30,000	30,000	F1110
	Carmen	20,000	20,000	20,000	20,000	30,000	30,000	N4070
	No.7	0	0	0	0	30,000	30,000	F1210
	No.8	0	0	0	0	30,000	30,000	F5650
	No.4	20,000	20,000	20,000	20,000	30,000	30,000	C1290
	Total-CAP	100,000	100,000	100,000	100,000	260,000	290,000	
	Ave.VCR	1.01	1.42	1.80	2.40	0.92	0.83	



[With 5th Bridge Case]



[Without 5th Bridge Case]

Figure 10.4-8 Traffic Assignment in 2022 without & with 5th Bridge

Both 5th and 6th Bridges are needed to provide easy access to CBD. Base Case-2 was adopted as the base road network and new road links included in Base Case-2 are shown in Table 10.4-2.

TABLE 10.4-2 NEW ROAD LINKS INCLUDED IN BASE CASE-2

	Road Project Name
E – W Transport Axis	<ul style="list-style-type: none"> • New Western Coastal Road • Opol Diversion Road
Improvement of Accessibility to CBD	<ul style="list-style-type: none"> • New West Diversion Road • Bridge Crossings <ul style="list-style-type: none"> - 5th Bridge - 6th Bridge - 7th Bridge - 8th Bridge
N – W Transport Axis	<ul style="list-style-type: none"> • Mindanao Container Terminal-Bukidnon Link Road

10.4.2 Development of Alternatives

Alternatives of future road network were developed focusing on measures to strengthen the east-west transport axis. Candidates road projects for the said purpose are as follows:

- A : J.R. Borja Street Extension (east side)
- B : Construction of Flyover over Iligan-CDO-Butuan Road
- C : New Coastal Reclamation Road
- D : Bypass Road at plateau area in the east

Among above four candidate road projects, project D was excluded from the candidates, since it requires huge investment, but only substandard alignment with sharp curves and steep gradient can be possible.

Future road network alternatives were developed as shown below:

Candidate Road Project	Future Road Network Alternatives						
	Alt.-1	Alt.-2	Alt.-3	Alt.-4	Alt.-5	Alt.-6	Alt.-7
A : Borja Extension	○	—	—	○	○	—	○
B : Flyover	—	○	—	○	—	○	○
C : Reclamation Road	—	—	○	—	○	○	○

10.4.3 Evaluation of Alternatives and Recommended Plan

Traffic assignment results for Base Case-2 and Alternatives 1 to 7 are shown in Figure 10.4-9 to 16. Traffic condition indicators are shown in Figure 10.4-17.

Base Case – 2 (Figure 10.4-9) : Base Case-2 will solve traffic problems of CBD / Port Area and Western Areas. Eastern Area remains un-solved.

Alternative – 1 : Borja Extension (Figure 10.4-10) : This alternative more or less solves traffic problems in Eastern Area, though some sections remain with V/C ratio of 1.5 or less.

Alternative – 2 : Flyover (Figure 10.4-11) : This alternative alone cannot solve traffic problems in Eastern Area.

Alternative – 3 : Reclamation Road (Figure 10.4-12) : Almost the same as Alternative – 1.

Alternative – 4 : Borja & Flyover (Figure 10.4-13) : Flyover Project attracts more traffic to Iligan-CDO-Butuan Road, thus heavy traffic congestion at the approach section of Flyover is expected.

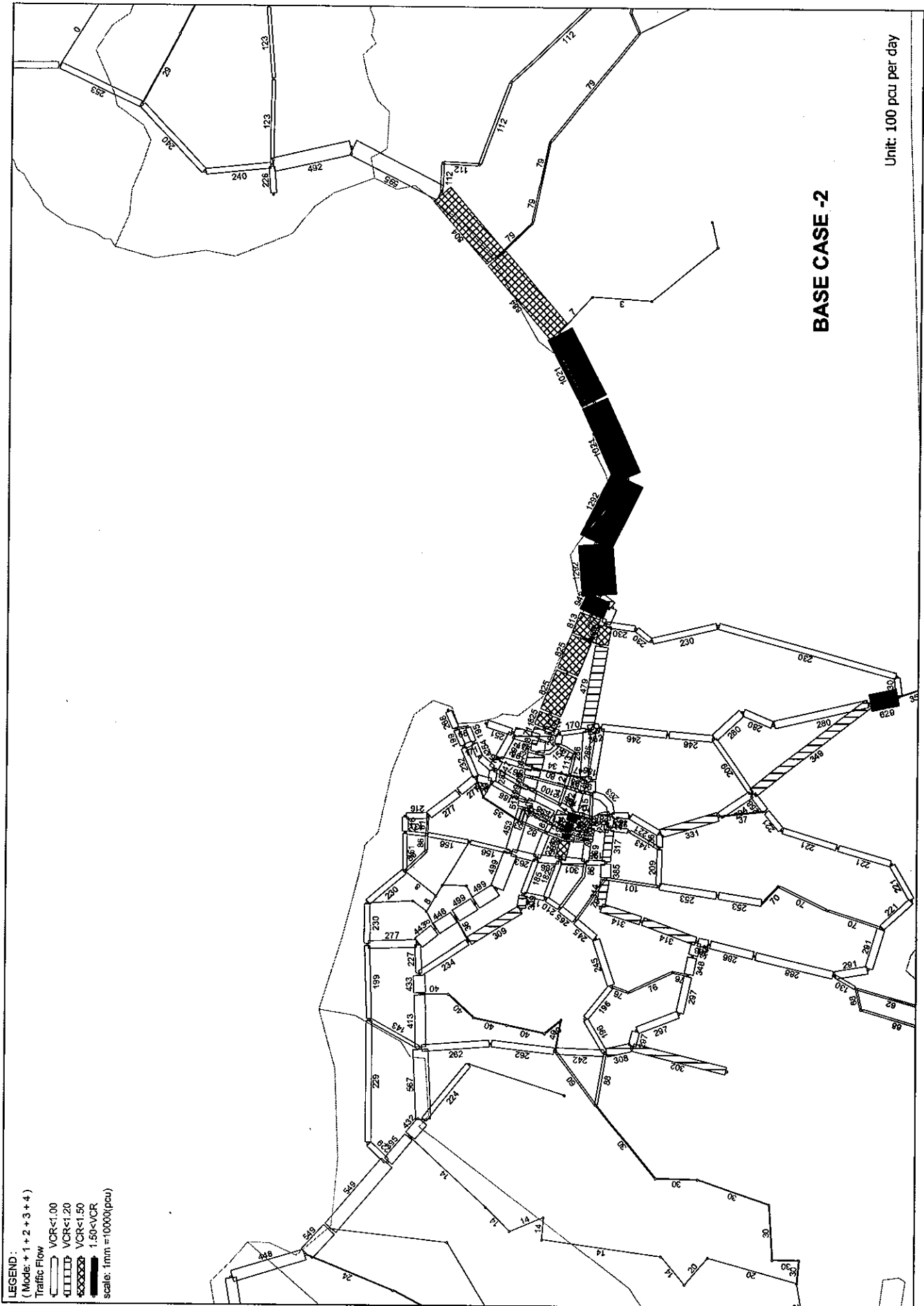
Alternative – 5 : Borja Extension & Reclamation Road (Figure 10.4-14) : Traffic problems in Eastern Area will be mostly solved.

Alternative – 6 : Flyover & Reclamation Road (Figure 10.4-15) : Traffic condition improvement is almost same as Alternative-3.

Alternative – 7 : All three project (Figure 10.4-16) : Traffic condition improvement is almost same as Alternative-5.

In view of above, *Alternatives 2 and 4* were removed from detailed comparison of Alternatives. Remaining five alternatives were compared in detail as shown in Table 10.4-3.

Alternative – 1 was recommended for the future road network, and shown in Figure 10.4-18.



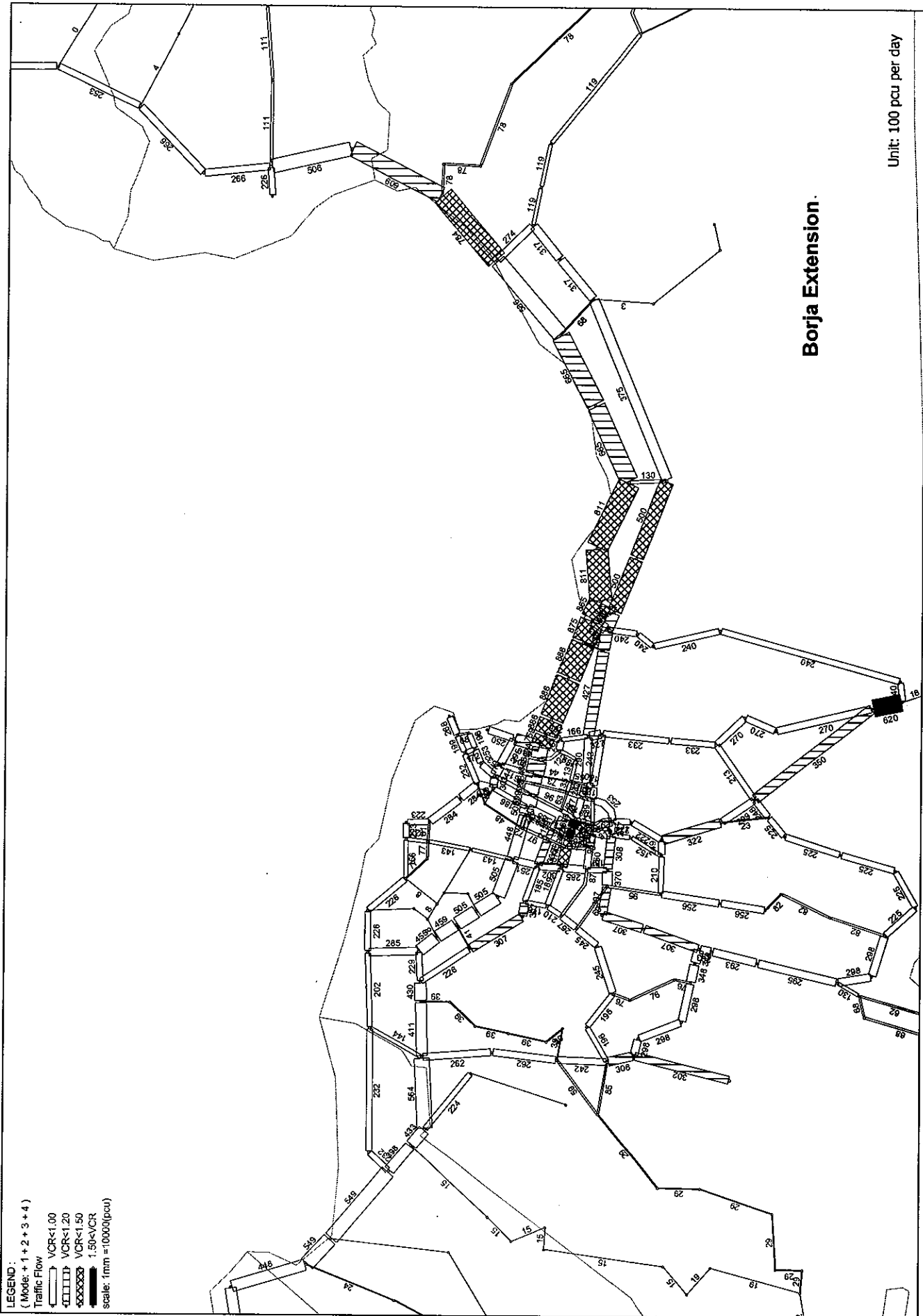


FIGURE 10.4-10 TRAFFIC ASSIGNMENT 2022 (ALTERNATIVE-1)

Part-D (Metro Cagayan de Oro)

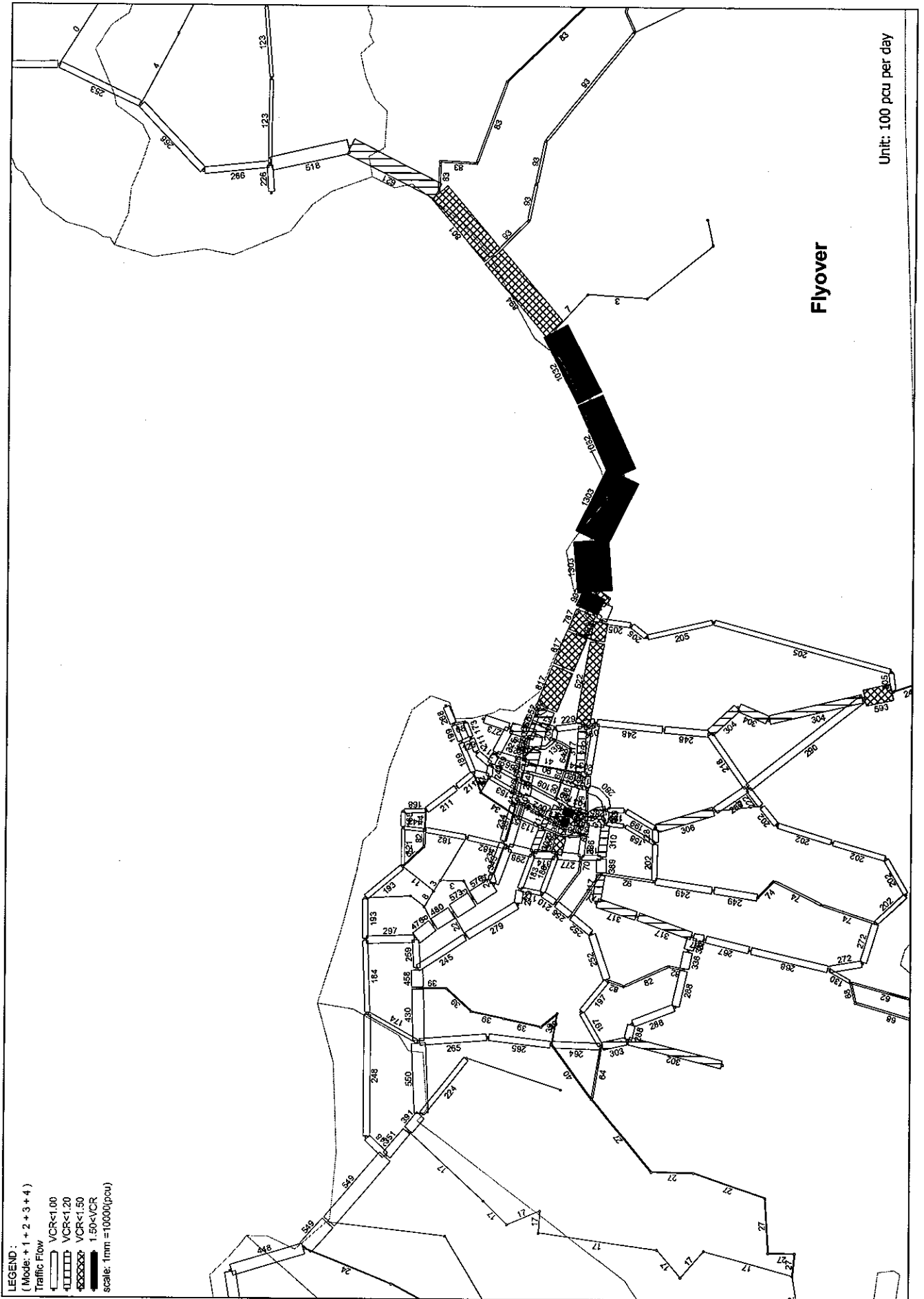


FIGURE 10.4-11 TRAFFIC ASSIGNMENT 2022 (ALTERNATIVE-2)

Part-D (Metro Cagayan de Oro)

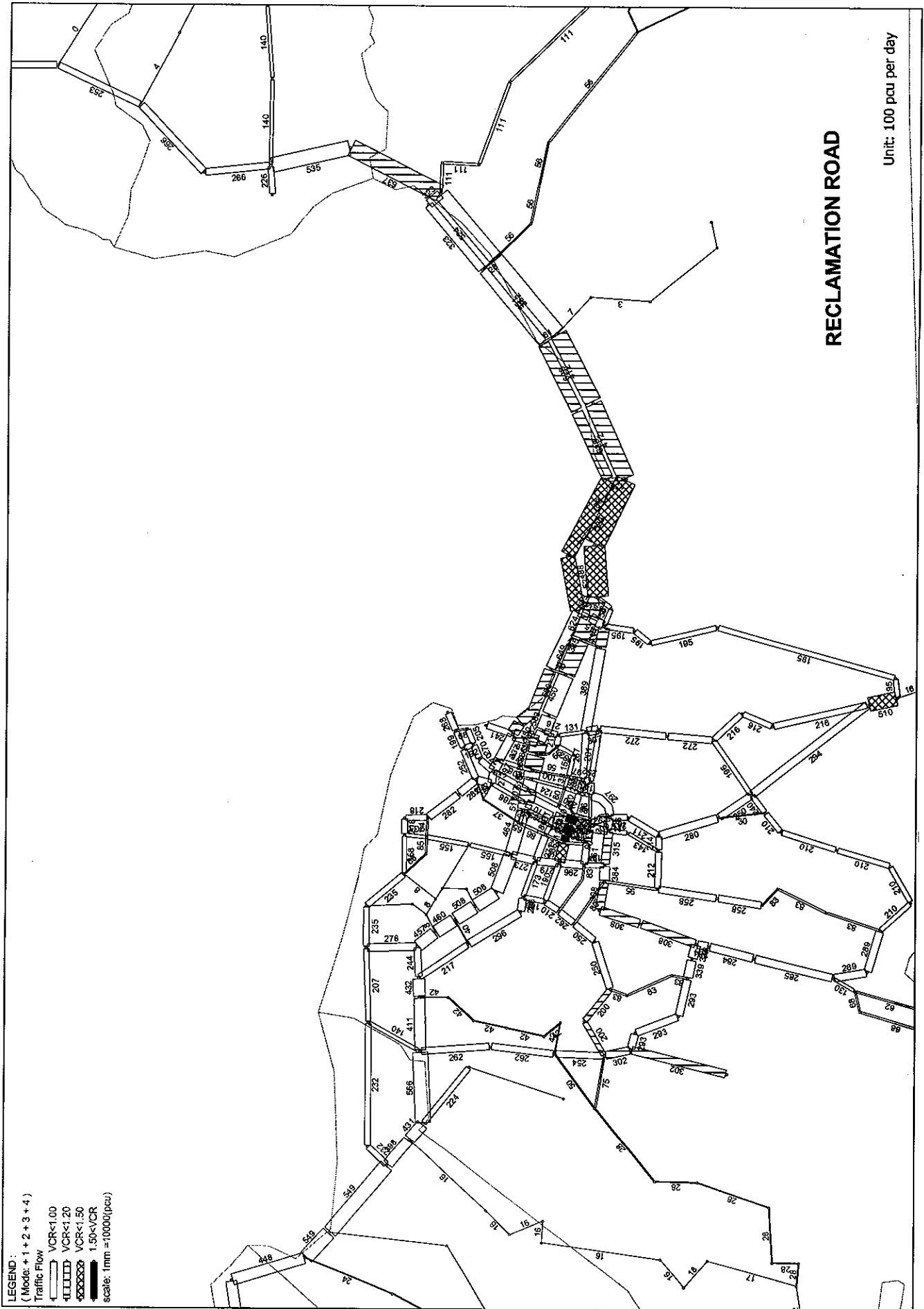


FIGURE 10.4-12 TRAFFIC ASSIGNMENT 2022 (ALTERNATIVE-3)

Part-D (Metro Cagayan de Oro)

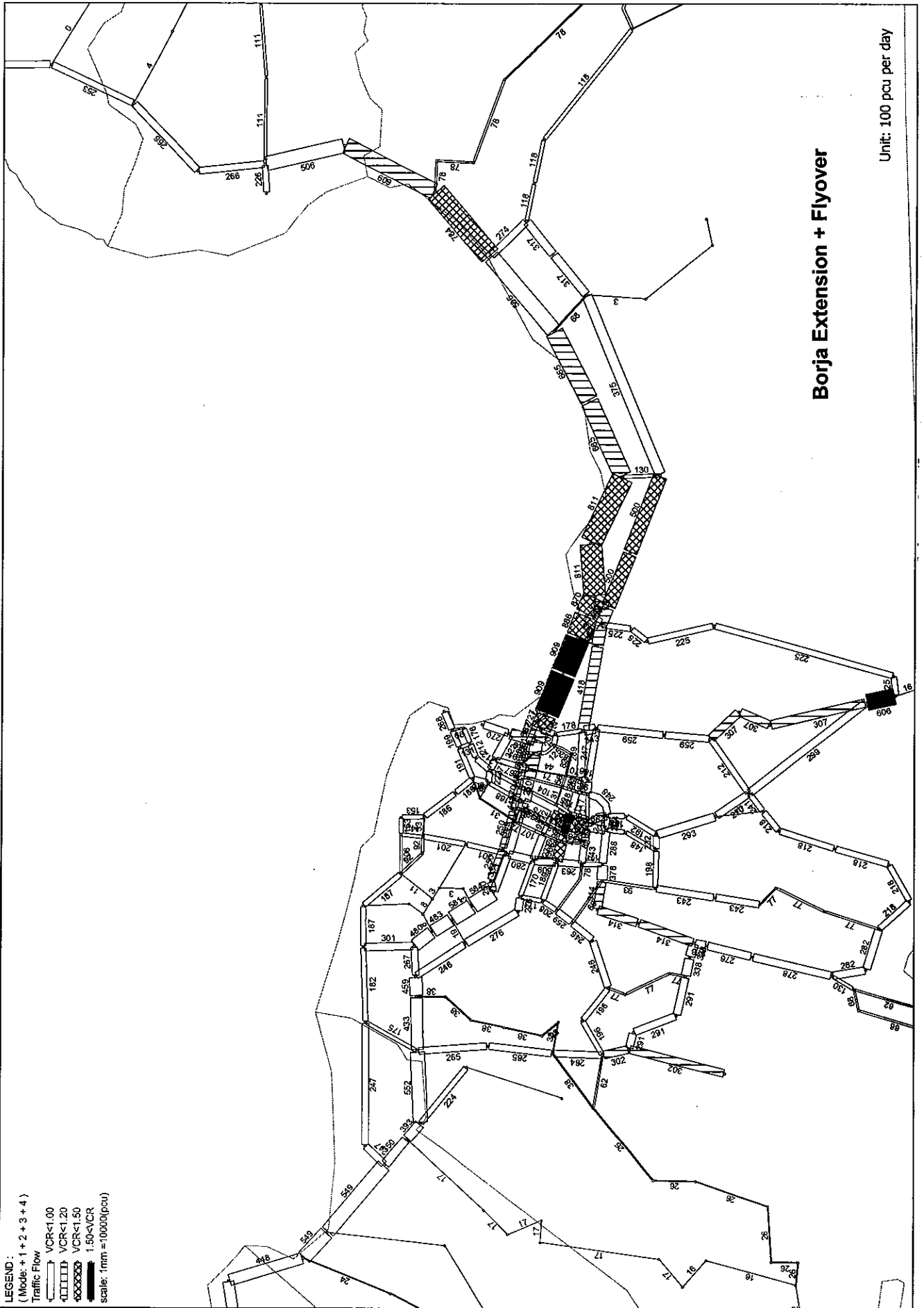


FIGURE 10.4-13 TRAFFIC ASSIGNMENT 2022 (ALTERNATIVE-4)

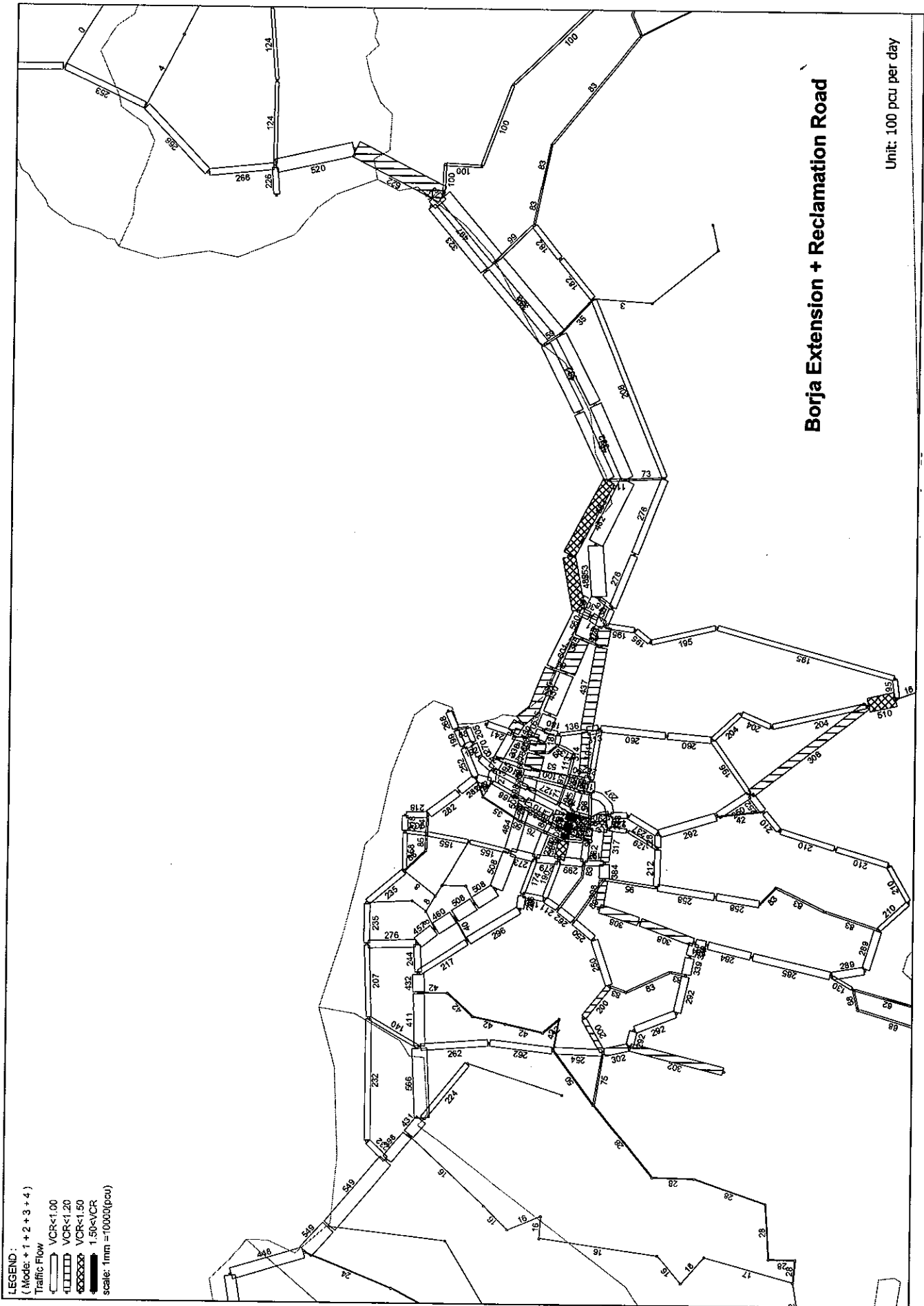


FIGURE 10.4-14 TRAFFIC ASSIGNMENT 2022 (ALTERNATIVE-5)

Part-D (Metro Cagayan de Oro)

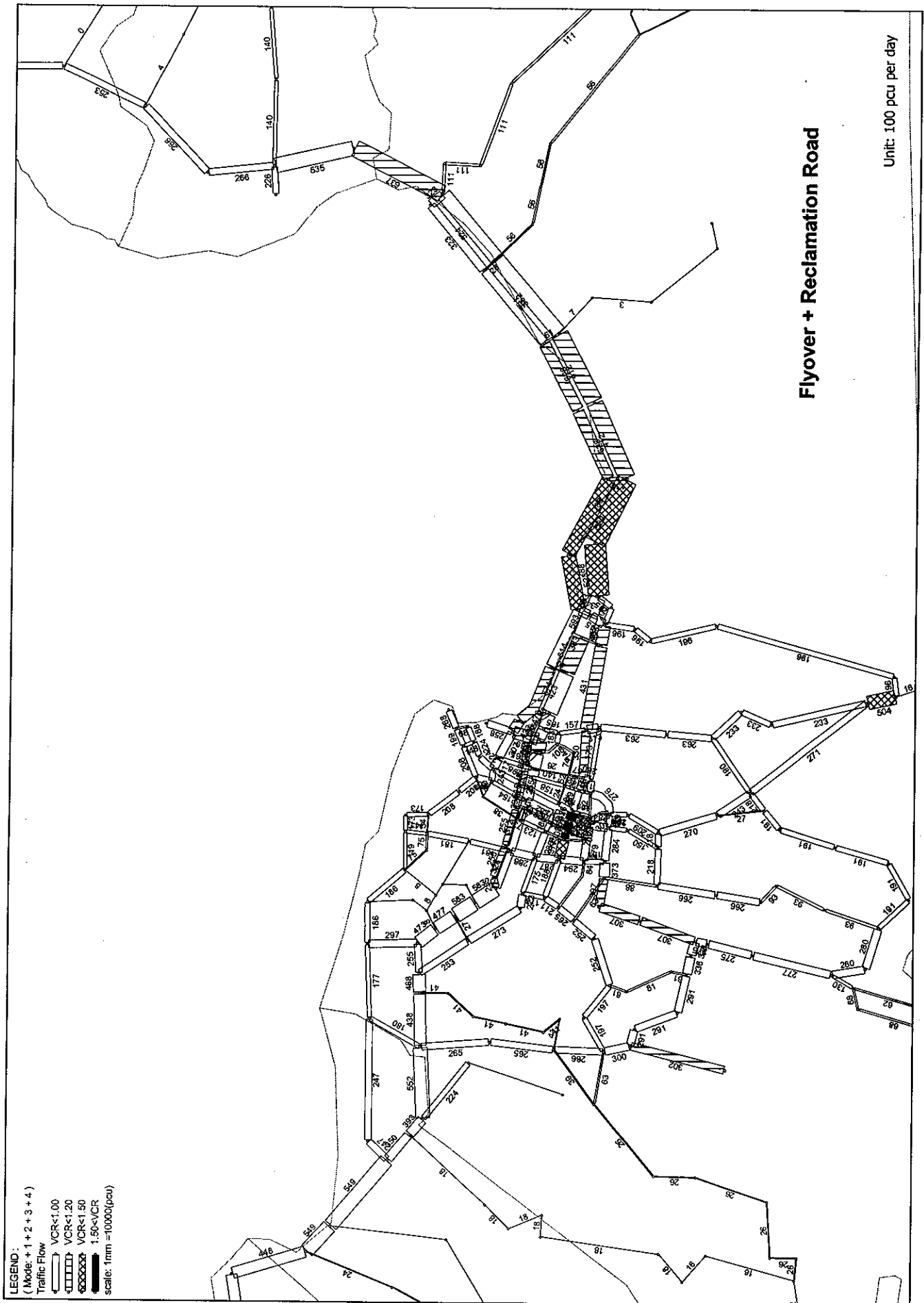


FIGURE 10.4-15 TRAFFIC ASSIGNMENT 2022 (ALTERNATIVE-6)

Part-D (Metro Cagayan de Oro)

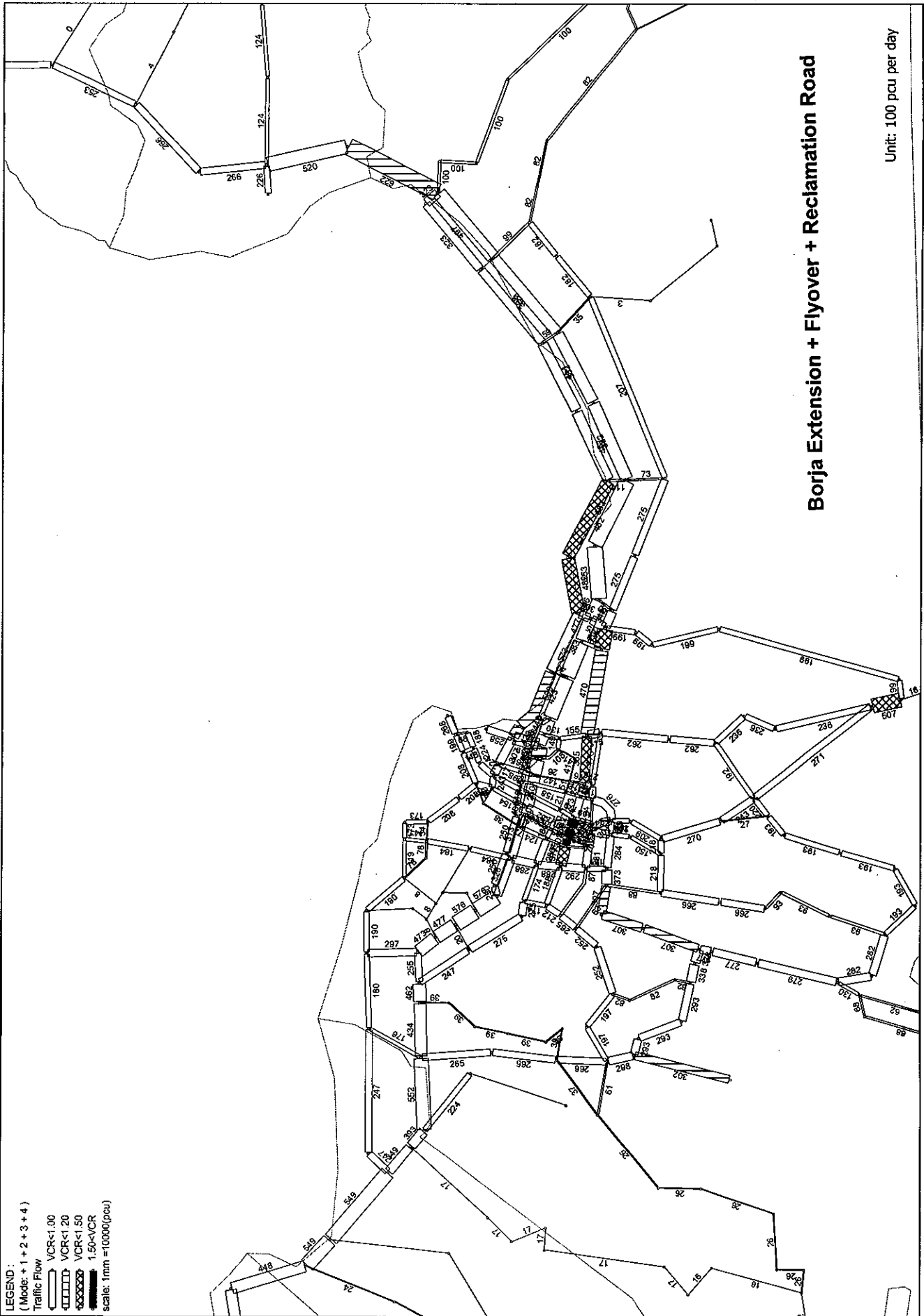


FIGURE 10.4-16 TRAFFIC ASSIGNMENT 2022 (ALTERNATIVE-7)

Part-D (Metro Cagayan de Oro)

Evaluation Index R

	Present	2010	2016	2022	Base-1	Base-2	Alt-1	Alt-2	Alt-3	Alt-4	Alt-5	Alt-6	Alt-7
No.4-7 Brdg.	-	-	-	-	Do	Do	Do	Do	Do	Do	Do	Do	Do
No.8 Brdg.	-	-	-	-	-	Do	Do	Do	Do	Do	Do	Do	Do
Extension Rd.	-	-	-	-	-	-	Do	-	-	Do	Do	-	Do
Skyway	-	-	-	-	-	-	-	Do	-	Do	-	Do	Do
Coastal Rd.	-	-	-	-	-	-	-	-	Do	-	Do	Do	Do
	Present	2010	2016	2022	Base-1	Base-2	Alt-1	Alt-2	Alt-3	Alt-4	Alt-5	Alt-6	Alt-7
pcu-km	2,234,496	3,500,234	4,640,607	6,252,218	6,370,745	6,361,170	6,436,341	6,322,268	6,341,594	6,423,876	6,382,625	6,320,131	6,370,318
pcu-hr	89,370	143,627	209,765	320,476	275,050	274,424	256,959	260,335	251,008	253,182	244,183	243,931	239,535
capacity-km	8,089,500	8,257,825	8,257,825	8,257,825	11,293,025	11,308,625	11,765,025	11,404,875	11,808,400	11,876,125	12,279,800	11,904,650	12,376,050
Total-Length	395.4	397.4	397.4	397.4	448.1	448.7	457.3	452.5	461.8	461.2	470.5	465.7	474.4
Ave. VCR	0.28	0.42	0.56	0.76	0.56	0.56	0.55	0.55	0.54	0.54	0.52	0.53	0.51
Ave. Speed	25.0	24.4	22.1	19.5	23.2	23.2	25.0	24.3	25.3	25.4	26.1	25.9	26.6
Speed Index	1.00	0.97	0.88	0.78	0.93	0.93	1.00	0.97	1.01	1.01	1.05	1.04	1.06

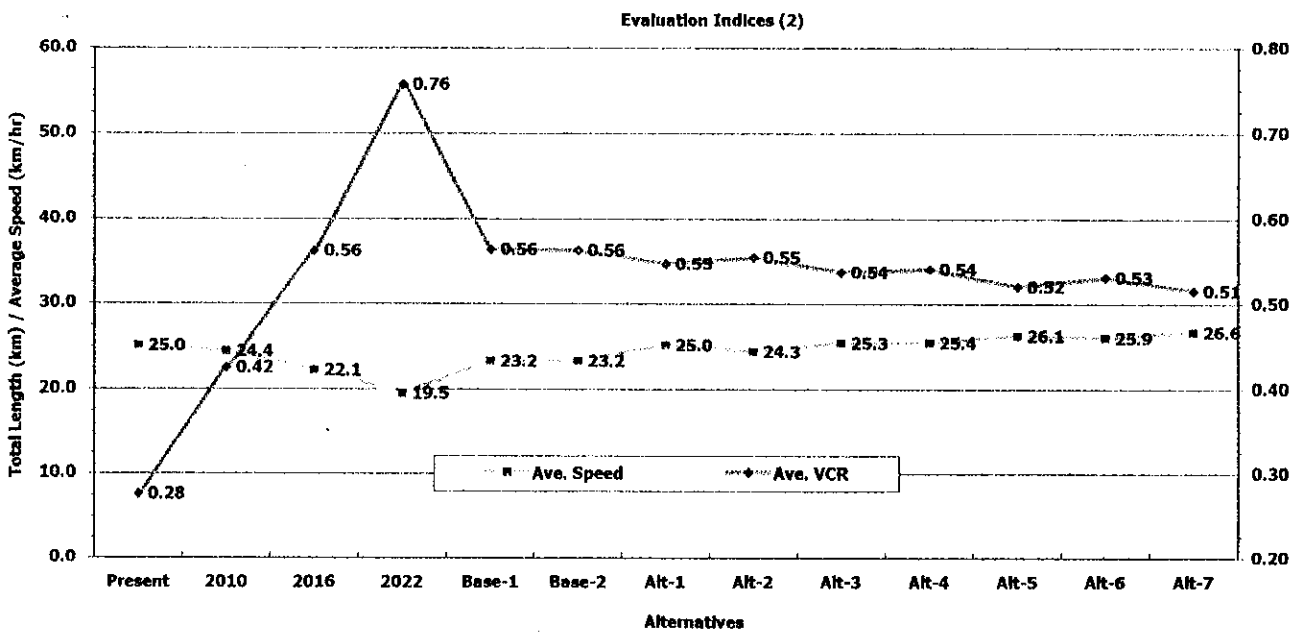
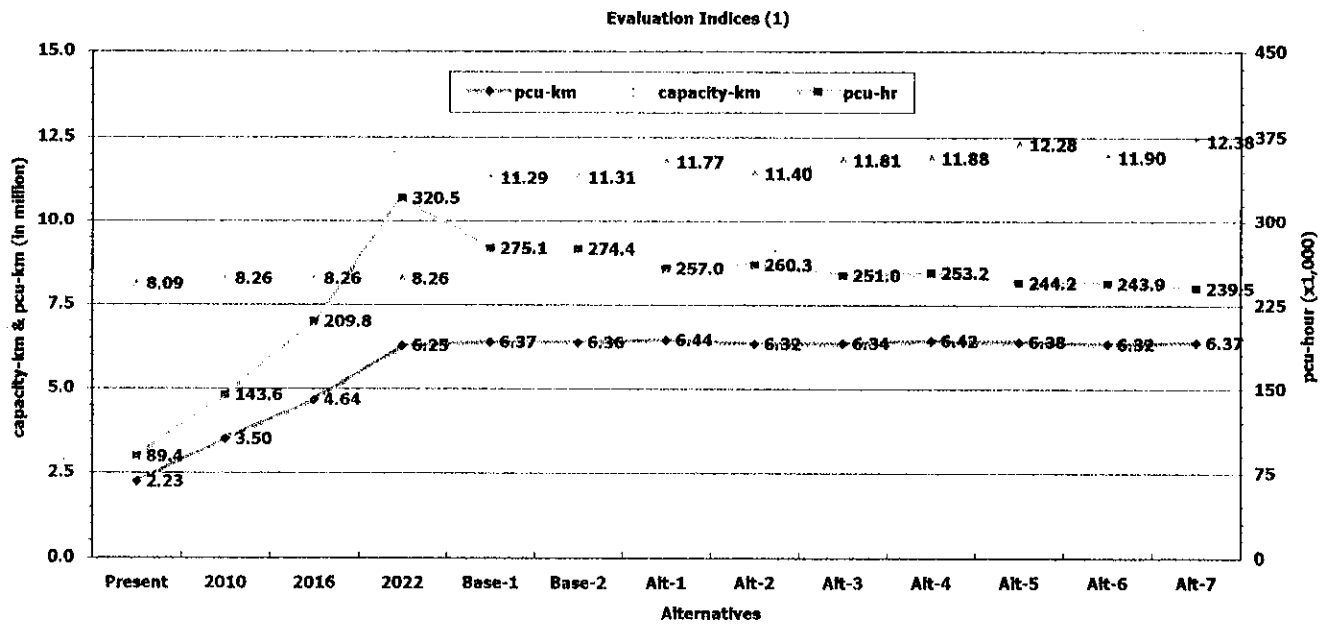


FIGURE 10.4-17 TRAFFIC INDICATORS OF ALTERNATIVES

TABLE 10.4-3 EVALUATION OF ALTERNATIVES

Project Component	Do Nothing Case	Alternative - 1					Alternative - 2					Alternative - 5					Alternative - 6					Alternative - 7				
		Borja Extension					Reclamation Road					Borja Extension + Reclamation Road					Flyover + Reclamation Road					Borja Extension + Flyover + Reclamation Road				
Scope of Civil	Road (km)	L = 8.69					L = 9.75					L = 18.44					L = 9.75					L = 18.44				
	Bridge (km)	L = 0.31					L = 2.05					L = 2.36					L = 5.05					L = 5.36				
	Total (km)	L = 9.00					L = 11.80					L = 20.80					L = 14.80					L = 23.8				
Project Cost (Million P)	Civil Work	806 (1.00)					3,942 (4.90)					4,748 (5.90)					5,322 (6.60)					6,128 (7.60)				
	ROW Acquisition Total	322 (1.00)					293 (0.91)					615 (1.91)					323 (1.00)					645 (2.00)				
Social Impact	No. of Houses/ Structures affected	1,128 (1.00)					4,235 (3.75)					5,363 (4.75)					5,645 (5.00)					6,773 (6.00)				
		160 (1.00)					1,060 (6.63)					1,220 (7.63)					1,160 (7.25)					1,320 (8.25)				
Traffic Efficiency	PCU-Km (x1,000)	6,436 (1.01)					6,342 (1.00)					6,383 (1.00)					6,320 (0.99)					6,370 (1.00)				
	PCU-Hr (x1,000)	257 (1.07)					251 (1.05)					244 (1.02)					244 (1.02)					240 (1.00)				
	Ave. Travel Speed (Km/Hr.)	25.0 (-1.6)					25.3 (-1.3)					26.1 (-0.5)					25.9 (-0.7)					26.6 (0.0)				
	Ave. V/C Ratio	0.55 (1.08)					0.54 (1.06)					0.52 (1.04)					0.53 (0.00)					0.51 (1.00)				
Overall Evaluation		• Lowest investment, but still achieves almost the same level of traffic efficiency as other alternatives.					• High investment. Traffic efficiency level is almost the same as Alt.-1.					• Third highest investment. Traffic efficiency level is almost the same as Alt.-1.					• Second highest investment. Traffic efficiency is almost the same level as Alt.-1.					• Highest investment but traffic efficiency improvement is only slightly better than Alt.-1.				
		• Negative social impact is high.					• Negative social impact is high.					• Negative social impact is high.					• Negative social impact is high.					• Negative social impact is high.				
Recommendation		• Recommended.					• Recommended.					• Recommended.					• Recommended.					• Recommended.				
		• Recommended.					• Recommended.					• Recommended.					• Recommended.					• Recommended.				

Note: Traffic efficiency = Base Case-2 + Respective Alternative

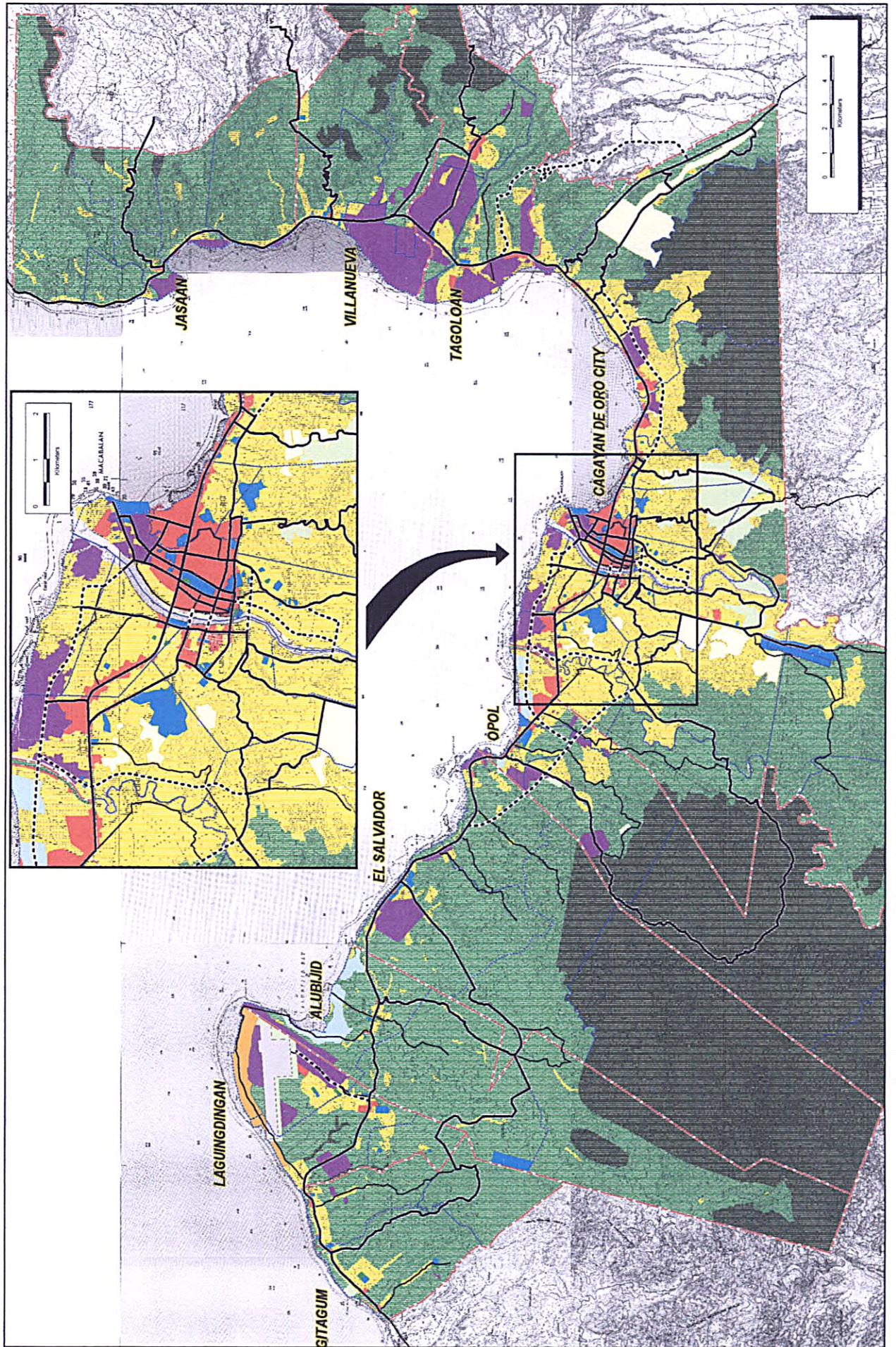


FIGURE 10.4-18 FUTURE ROAD NETWORK

10.5 FUNCTIONAL ROAD CLASSIFICATION AND STANDARD ROAD CROSS-SECTIONS

10.5.1 Present Road Classification in the Philippines

1) Administrative Classification

In the Philippines, the present road classification has been established by a series of Executive Orders, Republic Acts and/or Presidential Decrees. Of these the most fundamental was the Republic Act No.917 or "The Philippine Highway Act", which provided five categories of classification of roads.

- National Highway/Roads
- Provincial Highway/Roads
- City Roads
- Municipal Roads
- Barangay Roads

In 1955, the classification was more clearly re-defined by the Executive Order No.113 (EO). Under this EO, the Department of Public Works and Highways (DPWH) has responsibility of National Roads in terms of planning, construction and maintenance; whereas Local Government Units (Province, City, and Municipality) are responsible for provincial roads, city roads, municipality roads, barangay roads within their jurisdictions, respectively. The Provincial, City, or Municipality Engineers Offices execute the road planning, construction, and maintenance. Thus the administrative road classification is clearly defined and shown in Table 10.5 -1.

TABLE 10.5-1 ADMINISTRATIVE CLASSIFICATION

Road Category	Level of Responsibility	Definition
National Road	DPWH	Road continuous in extent that form part of the main trunk link system; all roads leading to national air ports, national seaports, parks or coast-to-coast roads.
Provincial Road	Provincial Government	Roads connecting one municipality with another; all roads extending from a municipality or from a provincial or national road to a public wharf or railway station; and any other roads to be designated by the Province.
City Road	City Government	Road/streets within the urban area of the city to be designated by the City.
Municipal Road	Municipal Government	Roads /streets within the poblacion (populated) area of a municipality to be designated by the Municipality.
Barangay Road	Barangay Road	Rural roads located either outside the urban area of city or outside industrial, commercial, or residential subdivisions that act as feeder farm-to-market roads, and which are not otherwise classified as national, provincial, city, or municipality road. Roads located outside the poblacion area of municipality and those roads located outside the urban area of a city to be designated as such by the Barangay Council concerned.

Source: DPWH, JICA, *Roads in the Philippines 2003*

2) Functional Classification for National Road

The DPWH adopts a functional road classification of the national roads; National Arterial roads and Secondary roads. The national arterial roads are sub-classified into three groups:(1) North –South Backbone; (2) East-West Laterals; and (3) Other Strategic Roads. These classifications are summarized in Table 10.5-2

TABLE 10.5-2 FUNCTIONAL CLASSIFICATION OF NATIONAL ROADS

Functional Classification		Arterial Road
Arterial Road	North-South Backbone	A backbone road network in consideration of road and sea (ferry) linkages. This covers also interconnection of primary centers and road leading to growth corridor.
	East-West Laterals	Arterial roads which inter-link the North-South Backbone road network in an east-west lateral orientation across the country with an interval of 50 to 200 kilometers.
	Strategic Road	Roads which connect other primary entries and all secondary and tertiary centers. These also interconnect the above category roads in an appropriate interval as well as forming a closed network and alternative roads. It includes also island circumferential and cross-island road.
Secondary National Road	National Roads Other than Above	

Source: DPWH, JICA, Roads in the Philippines 2003

As for the Provincial, City, Municipal, and Barangay roads, there is no clear functional road classification.

10.5.2 Functional Classification of Roads in the Study Area

1) Functional Road Classification Criteria

The Study Area consists of urban and rural areas. Majority area in Cagayan de Oro is urban and the rest of the Study Area is predominantly rural. Thus, most of roads pass through both urban and rural areas. Under such situation, functional road classification criteria under this Study were established as shown in Table 10.5-3.

TABLE 10.5-3 FUNCTIONAL ROAD CLASSIFICATION CRITERIA AND ADMINISTRATIVE RESPONSIBILITY

Road Classification	Criteria	Responsibility	
		DPWH	Provincial/City Government
Primary Arterial Road	<ul style="list-style-type: none"> Constitute a backbone in overall road network. Primarily carries through traffic with long trip length. Provides direct access to major transport facilities such as an airport and/or a port 	⊙	—
Arterial Road	<ul style="list-style-type: none"> Connects major sources of traffic generation with primary arterial roads. Carries relatively long trip traffic. 	⊙	⊙
Collector Road	<ul style="list-style-type: none"> Connects arterial roads with local roads for collection and distribution of traffic. Carries relatively short trip traffic. 	⊙	⊙
Local Road	<ul style="list-style-type: none"> Provides access to roadsides and local communities. Primarily carries local traffic and limits through traffic. 	—	⊙

Based on the criteria, the roads in the Study Area were classified by function as shown in Figure 10.5-1.

10.5.3 Proposed Design Criteria and Standard Road Cross-Section by Function

Table 10.5-4 presents proposed design criteria and Figure 10.5-2 shows standard road cross-section.

TABLE 10.5-4 RECOMMENDED ROAD CLASSIFICATION AND CROSS-SECTION

Road Function	Area		Design Speed	Lane Width	Right-of-Way
Primary Arterial	Urban	UG	80	3.50	40
		I	80	3.50	30
	Rural	I	80	3.50	30
		II	80	3.50	20+
Arterial	Urban	II	60	3.25	30
		III	60	3.25	20
		Rural	60	3.25	20+
	Collector	Urban	60,50,40	3.00	16
	Rural	60,50,40	3.00	10+	

Note: The above cross-section will be adopted taking the existing and possible ROW into consideration. Some variation in shoulder, sidewalk, median except lane width be applicable.

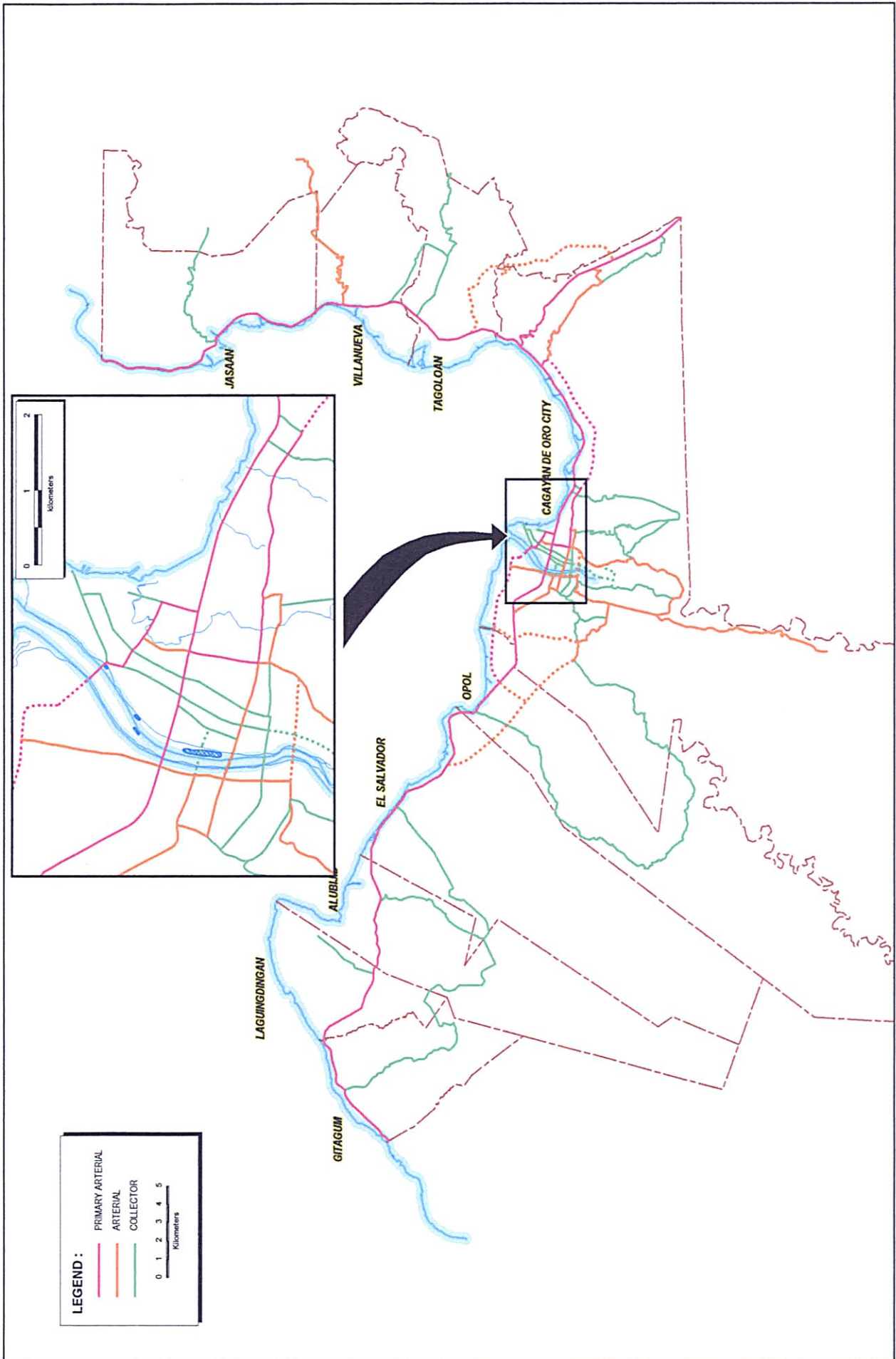


FIGURE 10.5-1 ROAD CLASSIFICATION BY FUNCTION (FUTURE)

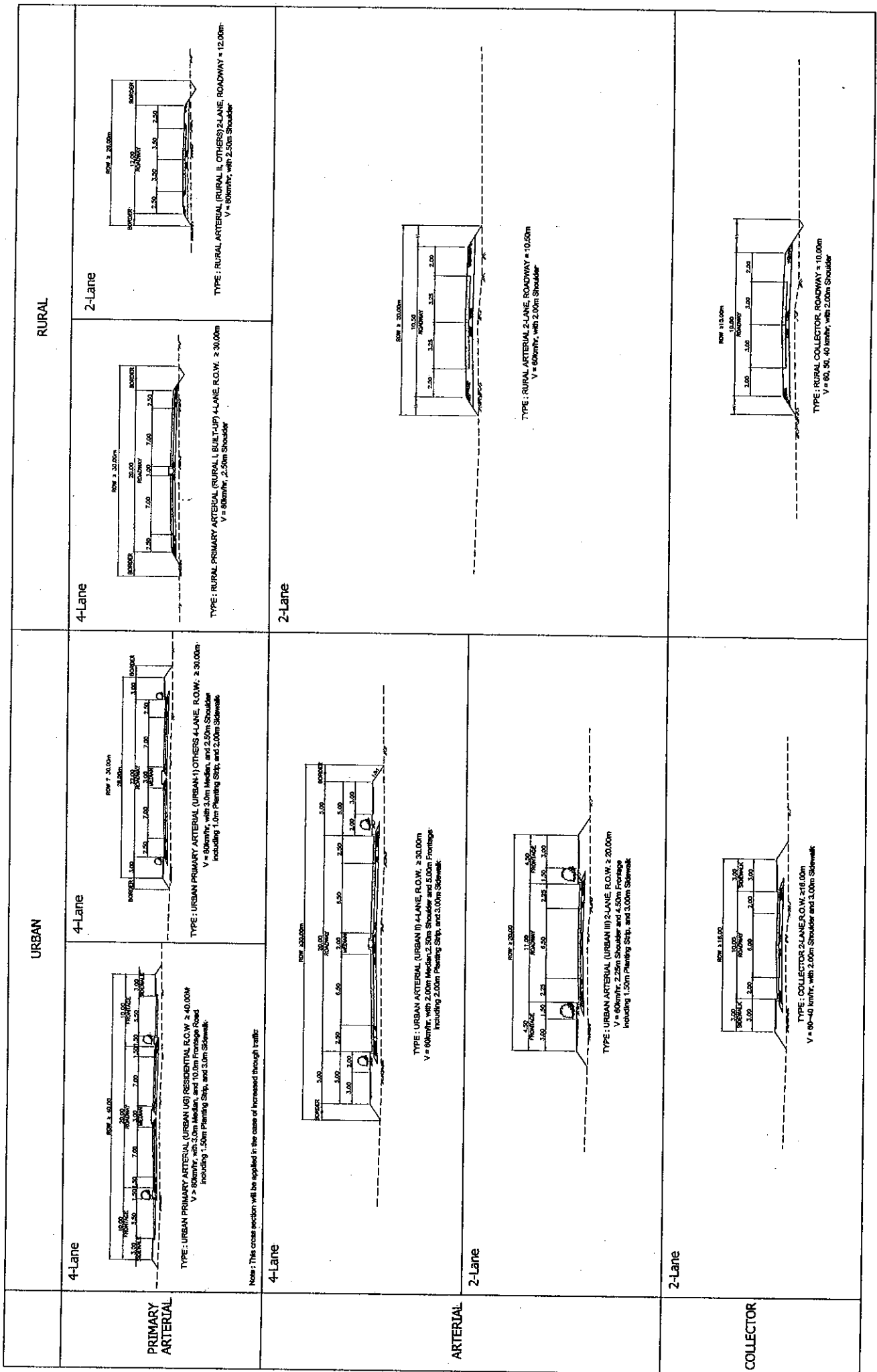


FIGURE 10.5-2 STANDARD CROSS SECTION

10.6 ROAD PROJECTS AND COST ESTIMATE

10.6.1 Road Projects

1) Road Project Identification Criteria

Road project identification criteria were established as follows:

<u>New or Existing Road</u>	<u>Identification Criteria</u>	<u>Type of Work</u>
New Road	<ul style="list-style-type: none"> Based on the future road network plan 	<ul style="list-style-type: none"> New construction
Existing Road	<ul style="list-style-type: none"> Existing pavement type is gravel or earth 	<ul style="list-style-type: none"> Improvement from gravel to PCC or AC pavement
	<ul style="list-style-type: none"> Existing pavement is PCC or AC, of which condition is bad or very bad. 	<ul style="list-style-type: none"> Rehabilitation of pavement
	<ul style="list-style-type: none"> Existing road will have traffic capacity problem 	<ul style="list-style-type: none"> Widening (see Note)
	<ul style="list-style-type: none"> Existing road has minor problems such as narrow shoulder, no sidewalk, no drainage, etc. 	<ul style="list-style-type: none"> Minor improvement

Note: Roadsides of most of existing roads in the urbanized area have been densely developed or built-up, therefore, widening needs to be planned to minimize adverse social impacts.

2) Identified Road Projects

Identified road projects are shown in Table 10.6-1. Type of road cross-section to be adopted is shown in Figure 10.6-1, together with applied cross-section to the future road network in Figure 10.6-2, and proposed bridge location map in Figure 10.6-3.

TABLE 10.6-1 ROAD PROJECTS FOR METRO CAGAYAN DE ORO

Objectives	Road No.	Road Name	Admi. Class	Road Length (km)		Existing Condition		Type of Improvement	Additional ROW	Type of Cross section	Remarks
				No. of Lane	Pavement Condition	No. of Lane	Pavement Condition				
Strengthening of E-W Transport Axis	EW-1 (1)	Iligan - CDO - Butuan Road (East) Jasaan - Tagoloan	NR	19.4	2	PCC Fair	Shoulder pavement (W=3.0m)	0	R-1	3 bridges widening (L=107m) & a bridge to 20T (L=530m)	
	EW-1 (2)	Iligan - CDO - Butuan Road (Center)	NR	8.9	4	PCC Fair	No work	0	R-1		
	EW-1 (3)	Iligan - CDO - Butuan Road (West) Opol - El Salvador - Alubijid - Gitagum	NR	30.0	2	PCC Fair	Shoulder pavement (W=3.0m)	0	R-1	7 bridges widening (L=228m) 4 bridges to 20T (L=120m)	
	EW-2	New J.B. Borja Extension	-	8.0	-	-	New construction (4-lane)	20	U-2	4 new 4-lane bridges (L=310m)	
	EW-3 (2)	New Western Coastal Road Phase I New Western Coastal Road Phase II	NR/City	7.5	-	-	New construction (4-lane) (Upto ICB Road)	30	U-2	3rd bridge is under construction. A new 4-lane bridge (L=150m)	
Improvement of Accessibility to CBD	EW-4	Opol Diversion Road	NR	9.1	-	-	New construction (2-lane)	20	R-2	A new 4-lane bridge (L=30m) 3 new 2-lane bridges (L=160m)	
	CU-1	New 5th Bridge	City	B: 300m	-	-	New construction (2-lane)	20	R-2	New approach (L=0.2km)	
	CU-2	New 6th Bridge	City	B: 280m	-	-	New construction (2-lane)	20	R-2	New approach (L=0.2km)	
	CU-3	New 7th Bridge and Access Road	NR	B: 300m	-	-	New construction (2-lane)	20	R-2	New approach (L=1.0km)	
	CU-4	New 8th Bridge and Access Road	City	B: 300m	-	-	New construction (2-lane)	20	R-2	New approach (L=3.5km)	
	CU-5	Camiloan - Carmen Link Road	City	1.5	2	-	Improvement from earth to PCC/AC pave (2-lane)	0	R-2		
	NS-1	Sayre Highway	NR	12.8	4	AC Fair but some bad areas	Overlay	0	R-1/R-2	On-going	
	NS-2	CDO - Tabakag Road	NR	9.3	4	PCC Fair	Shoulder pavement	0	R-1/R-2	On-going	
	NS-3 (1)	Syre Highway Parallel Road (Agusan - Babubal - Syre)	City	8.2	2	Gravel	Improvement from earth to PCC/AC pave. (2-lane: L=7.2km) / (4-lane: L=1.0km)	10	R-2	A new 2-lane bridge (L=400m)	
	NS-3(2)	Syre Highway Parallel Road (Baluhat - Alae)	City	5.0	2	Gravel	Improvement from earth to PCC/AC pave (2-lane)	10	R-3		
Strengthening of N-S Transport Axis	NS-4	Mindanao Container Terminal - Bukidnon Link Road (CDO Urban West Diversion Road) (Coast - Airport Road)	-	13.5	2/4	Gravel (2-lane: L=2.2km) / (4-lane: L=1.0km)	New construction (2-lane)	20	R-4	A new 2-lane bridge (L=400m)	
	NS-5	Balulang West River Bank Road	City	5.8	2	Gravel	Improvement from earth to PCC/AC pave (2-lane)	20	R-2	New road (L=5.0km)	
	PHIVDEC-1	Sta. Ana Road	Prov.	3.7	2	Gravel	Improvement from earth to PCC/AC pave (2-lane)	0	R-3		
	PHIVDEC-2	San. Martin - Sta. Ana Junction Road	Barangay	5.3	2	Gravel	Improvement from earth to PCC/AC pave (2-lane)	0	U-4		
	J-1	Jasaan Mountain Access Road	Prov.	8.9	2	Gravel	Improvement from earth to PCC/AC pave (2-lane)	0	U-4	A bridge widening and to 20T (L=36m)	
	V-1	Villaveva Mountain Access Road	NR	12.0	2	Gravel	Improvement from earth to PCC/AC pave (2-lane)	0	R-4	A bridge to 20T (L=58m)	
Improvement of Phivdec Roads	T-1	Tagoloan Mountain Road	Prov.	6.5	2	PCC Fair	Rehabilitation for PCC/AC pave (2-lane)	0	R-4		
	C-1	Guza - Camakawan - Indahag Road	City	4.8	2	Gravel	Improvement from earth to PCC/AC pave (2-lane)	0	R-4		
	C-2	Cannananan - Indahag Road	City	7.5	2	Gravel	Improvement from earth to PCC/AC pave (2-lane)	0	R-4		
	C-3	Jct. Macasandig - Jct. Indahag Road	City	3.2	2	Gravel	Improvement from earth to PCC/AC pave (2-lane)	0	R-4		
	C-4	Camitoan - Balulang Bridge Access Road	City	10.1	2	-	Improvement from earth to PCC/AC pave (2-lane)	0	R-4		
	O-1	Opol Mountain Road	Prov.	23.3	2	-	Improvement from earth to PCC/AC pave (2-lane)	0	R-3		
	L-1	Laguindingan Airport Access	-	4.1	-	-	New construction (4-lane)	20	R-1	A new 2-lane bridge (L=27m) To be included in the new airport project	
	E-1	El Salvador Mountain Access Road	Prov.	9.6	2	-	Improvement from earth to PCC/AC pave (2-lane)	0	R-4	A new 2-lane bridge (L=10m) & a bridge to 20T (L=19m)	
	A-1	Alubijid Mountain Access Road	Prov.	6.2	2	-	Improvement from earth to PCC/AC pave (2-lane)	0	R-4	A new 2-lane bridge (L=13m)	
	G-1	Gitagum Mountain Access Road	Prov.	6.4	2	-	Improvement from earth to PCC/AC pave (2-lane)	0	R-4		
Improvement of Sub-urban Roads	GE-1	Gitagum-El Salvador Mountain Link Road	Prov.	14.8	2	-	Improvement from earth to PCC/AC pave (2-lane)	0	R-4	2 new 2-lane bridges (L=57m) & a bridge to 20T (L=16m)	

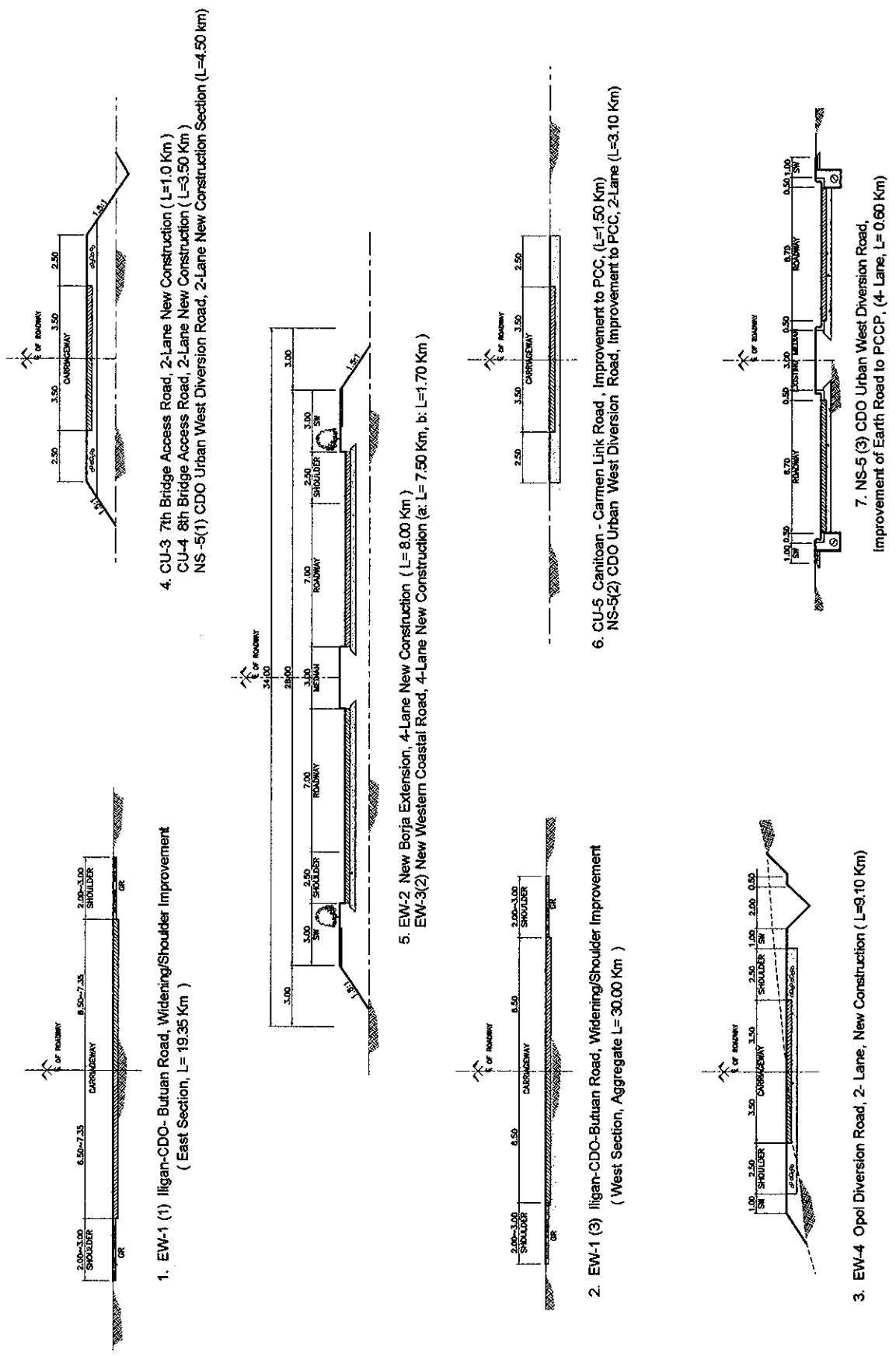
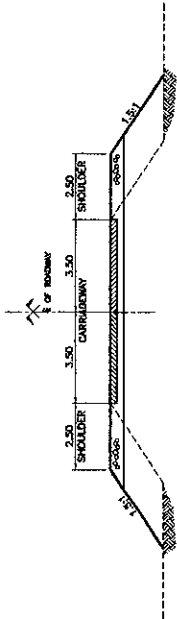
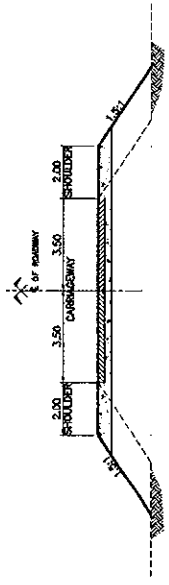


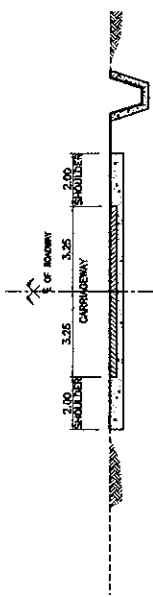
Figure 10.6-1(1/2) Metro cagayan de Oro : Proposed Cross-Section for Widening and New Roads



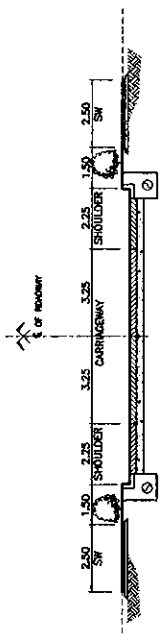
8. NS-3 (1) Syre Highway Parallel Road (Agusan-Balubal-Syre)
Improvement of Earth Road to PCCP, (2-Lane, L= 7.20 Km)



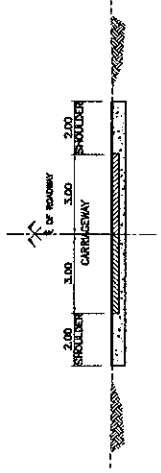
9. NS-3 (2) Syre Highway Parallel Road (Balubal-Alae)
Improvement of Earth Road to PCCP, (2-Lane, L=5.0 Km)



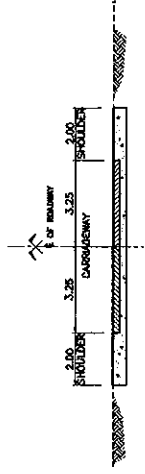
10. NS-6 Balulang West River Bank Road,
Improvement of Earth Road to PCCP, (2-Lane, L= 5.80 Km)



11. PHIVIDEC - 1 Sta.Ana Road, Improvement of Earth to PCCP
(2-Lane, L= 3.70 Km)
PHIVIDEC - 2 San Martin - Sta.Ana Junction Road
Improvement of Earth Road to PCCP, (2-Lane, L= 5.30 Km)



- 12. J-1 Jasaan Mountain Access Road, Improvement of Earth to PCC
(2-Lane, L= 8.90 Km)
- V-1 Villanueva Mountain Access Road, Improvement of Earth Road to PCC
(2-Lane, L= 12.00 Km)
- T-1 Tagablan Mountain Road, Improvement of Earth Road to PCC
(2-Lane, L= 6.50 Km)
- C-1 Guza - Camakawan - Indahag Road, Improvement of Earth Road to PCC
(2-Lane, L= 4.80 km)
- C-2 Camanman-an - Indahag Road, Improvement of Earth Road to PCC
(2-Lane, L= 7.50 Km)
- C-3 Jct. Macasandig-Jct. Indahag Road, Improvement of Earth Road to PCC
(2-Lane, L= 3.20 Km)
- O-1 Opol Mountain Road, Improvement of Earth Road to PCC
(2-Lane, L= 23.00 Km)
- E-1 El Salvador Mountain Access Road, Improvement of Earth Road to PCC
(2-Lane, L= 23.00 Km)
- A-1 Alubijad Mountain Access Road, Improvement of Earth Road to PCC
(2-Lane, L= 6.20 Km)
- G-1 Gitagum Mountain Access Road, Improvement of Earth Road to PCC
(2-Lane, L= 6.40 Km)
- GE-1 Gitagum-El Salvador Mountain Link Road, Improvement of Earth Road to PCC
(2-Lane, L= 14.80 Km)



13. C-4 Carritaoan - Balulang Bridge Access Road,
Improvement of Earth Road to PCCP (2-Lane, L= 10.00 Km)

Figure 10.6-1(2/2) Metro cagayan de Oro : Proposed Cross-Section for Widening and New Roads

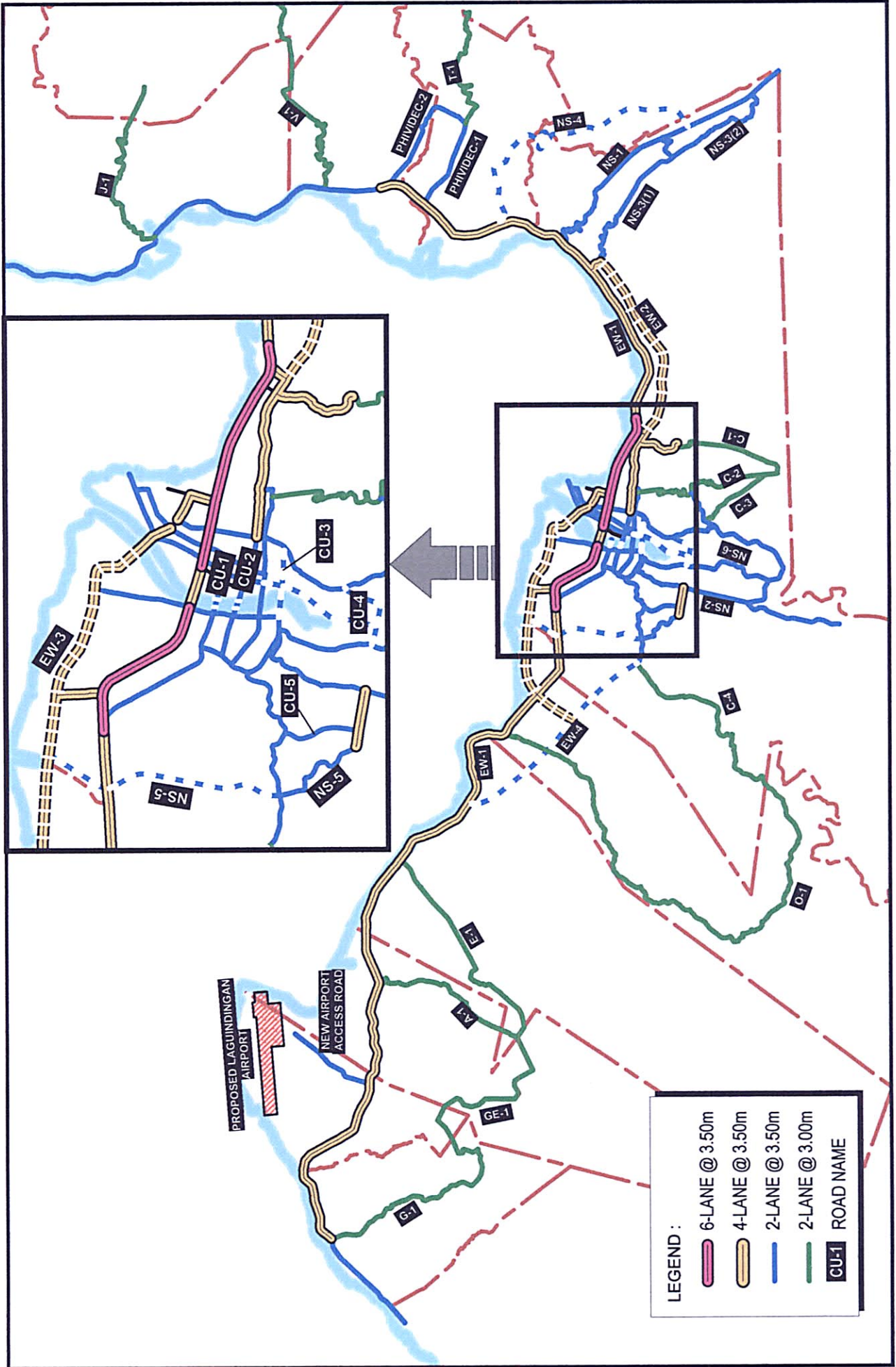


FIGURE 10.6-2 METRO CAGAYAN DE ORO APPLIED CROSS SECTION TO FUTURE ROAD NETWORK



FIGURE 10.6-3 METRO CAGAYAN DE ORO PROPOSED BRIDGE LOCATION MAP

10.6.2 Cost Estimate

1) Procedure of Project Cost Estimate

The procedure of project cost estimate is shown in Figure 10.6-4. Based on the collected unit prices of construction materials, labor costs and equipment costs, unit costs of major construction items were examined and compared with latest prices of on-going projects. Adopted quantity estimate for each type of work, a construction cost per km (or per meter for bridges) was estimated for each type of cross section based on the determined unit costs.

Engineering service cost was estimated by using the percentage (%) of construction cost. ROW acquisition costs for new roads and widening were estimated by the prevailing land cost.

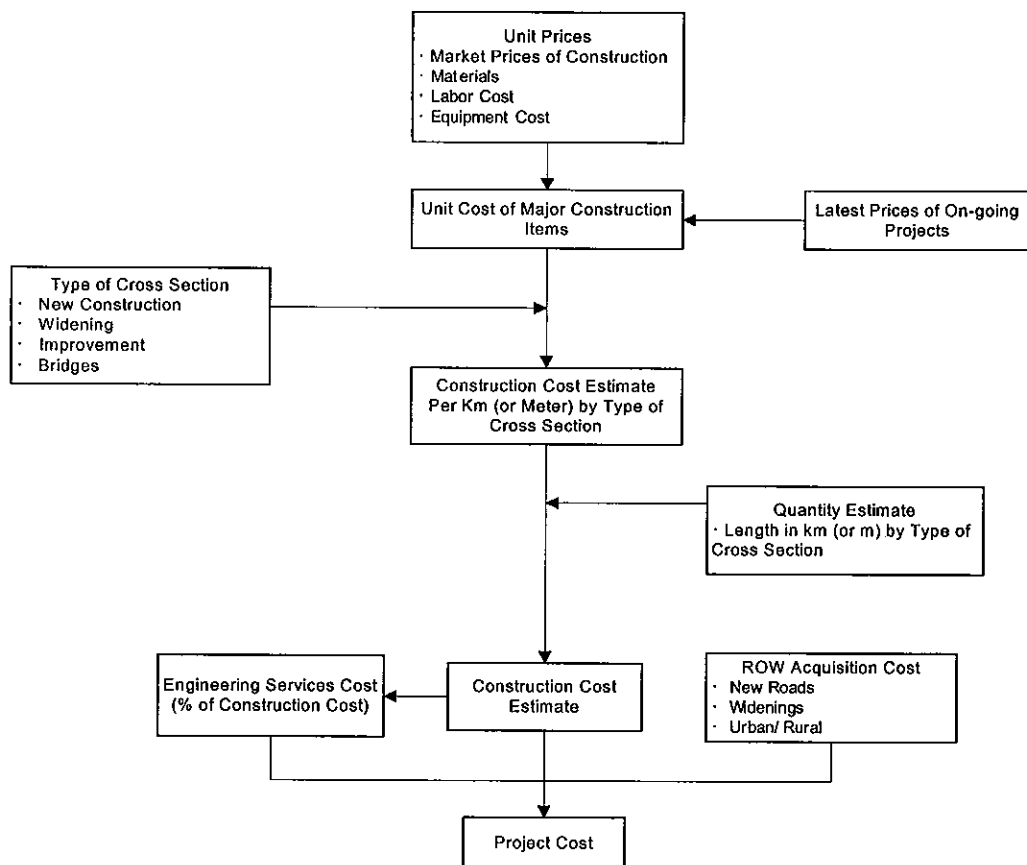


FIGURE 10.6-4 PROCEDURE OF PROJECT COST ESTIMATE

3) **Construction Cost per Km.**

Construction cost per km for each type of cross section was estimated (refer to Appendix 10.6-1) and summarized as shown in Table 10.6-3.

TABLE 10.6-3 CONSTRUCTION COST PER KM.

TYPE OF CROSS-SECTION	COST PER KM
Cagayan De Oro TYPE-501	11.9
Cagayan De Oro TYPE-503	13.8
Cagayan De Oro TYPE-1002	32.7
Cagayan De Oro TYPE-1002.1	20.8
Cagayan De Oro TYPE-1002.2	36.0
Cagayan De Oro TYPE-1003	28.0
Cagayan De Oro TYPE-1004	32.7
Cagayan De Oro TYPE-2002	79.6
Cagayan De Oro TYPE-2003	106.2
Cagayan De Oro TYPE-2006	89.5
Cagayan De Oro TYPE-3009	15.3
Cagayan De Oro TYPE-3014	34.6
Cagayan De Oro TYPE-3015	21.7
Cagayan De Oro TYPE-3017	20.1
Cagayan De Oro TYPE-3018	32.3
Cagayan De Oro TYPE-3019	15.9
Cagayan De Oro TYPE-3021	13.5
Cagayan De Oro TYPE-3022	14.5
Cagayan De Oro TYPE-3023	16.2
Cagayan De Oro TYPE-3024	13.5
Cagayan De Oro TYPE-5001	54.3
Cagayan De Oro TYPE-5002	30.5

4) Project Cost

Estimated civil work cost and the ROW acquisition cost were estimated for the identified road projects and shown in Table 10.6-4.

Engineering services cost was estimated as follows:

- Detailed Design ----- 4.0% of civil work cost
- Construction Supervision ---- 8.0% of civil work cost

Project cost of selected future road network plan is summarized as follows:

Civil Work Cost	-----	7,690.0 Million Peso
ROW Acquisition Cost	-----	1,031.0 Million Peso
Engineering Services Cost	-----	
- Detailed design	-----	307.6 Million Peso
- Construction Supervision	-----	615.2 Million Peso
Total Project Cost	-----	9,643.8 Million Peso

TABLE 10.6-4 ESTIMATED CIVIL WORK COST AND ROW ACQUISITION

Objective	Road No.	Road Name	Admin. Dist.	Type of Work				Target Bridge Length (ft or Equivalent)				Cost (Million \$)				Land				House						
				Length (ft)	Type of Section	Material	No.	Widening	Reconstruction to 2017	New Construction to 2017	New Construction to 2017	Widening	Reconstruction to 2017	New Construction to 2017	Local	State	Federal	Total	Acq.	Use	RW	RW	No.	Cost (Million \$)	Cost (Million \$)	Total
Strengthening of EM Transport Axis	EM-4 (1)	Bigan - CDO - Bulacan Road (East)	NR	19.40	19.35	SR1	119	230.1	4.0	4.0	186.7 (0.35)	510.0 (0.30)	199.0	205.2	132.1	69.2	426.4	-	-	-	-	260	0.88	21	21	
	EM-4 (2)	Bigan - CDO - Bulacan Road (West)	NR	0.00	-	-	0	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	EM-4 (3)	Bigan - CDO - Bulacan Road (West)	NR	30.00	30.00	SR0	50	13.6	419.0	7.0	182.5 (0.35)	60.0 (0.30)	45.8 (0.30)	10.0	60.0	536.4	-	-	-	-	560	0.98	31	32		
	EM-4 (2A)	Bigan - CDO - Bulacan Road (West)	NR	8.0	8.0	SR0	66.2	765.2	4.0	4.0	304.0 (0.30)	-	-	-	-	-	-	-	-	-	-	-	-	-		
	EM-4 (2B)	New Western Coastal Road	NR	7.5	7.5	SR0	106.2	796.8	2.0	2.0	120.0 (0.30)	-	-	-	-	-	-	-	-	-	-	-	-	-		
	EM-4 (2C)	New Western Coastal Road	NR	1.7	1.7	SR0	78.6	133.2	2.0	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	EM-4 (2D)	New Western Coastal Road	NR	5.1	5.1	SR0	102.1	20.8	3.0	3.0	160.0 (0.45)	-	-	-	-	-	-	-	-	-	-	-	-	-		
	EM-4 (2E)	Opol Diversion Road	NR	7.7	7.7	SR0	32.7	252.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	EM-4 (2F)	New 5th Bridge	City	0.2	0.2	SR0	32.7	6.5	1.0	1.0	300.0 (0.40)	-	-	-	-	-	-	-	-	-	-	-	-	-		
	EM-4 (2G)	New 10th Bridge	City	0.2	0.2	SR0	32.7	6.5	1.0	1.0	280.0 (0.40)	-	-	-	-	-	-	-	-	-	-	-	-	-		
Improvement of Accessibility to CDO	CU-3	New 7th Bridge and Access Road	City	1.0	1.0	SR0	35.0	36.0	1.0	1.0	350.0 (0.40)	-	-	-	-	-	-	-	-	-	-	-	-	-		
	CU-4	New 8th Bridge and Access Road	City	3.5	3.5	SR0	29.0	98.1	1.0	1.0	300.0 (0.40)	-	-	-	-	-	-	-	-	-	-	-	-	-		
	CU-5	Caraban - Carmen Link Road	City	1.5	1.5	SR0	15.2	23.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	NS-1	Saya Highway	NR	0.0	0.0	On-going	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	NS-2	CDO - Tabang Road	NR	0.0	0.0	On-going	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	NS-3 (1)	Straight Highway Parallel Road	NR	8.2	7.2	SR0	20.1	148.4	1.0	1.0	400.0 (0.45)	-	-	-	-	-	-	-	-	-	-	-	-	-		
	NS-3 (2)	Straight Highway Parallel Road	City	5.0	5.0	SR0	13.8	79.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	NS-4	Midwest Connector Terminal (Tuguecan - Alas)	City	13.5	6.5	SR0	54.3	231.1	2.0	2.0	480.0 (0.39)	-	-	-	-	-	-	-	-	-	-	-	-	-		
	NS-5	CDO (Urban West Diversion Road (East - Airport Road))	City	8.2	4.5	SR0	32.7	147.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Improvement of Private Roads	NS-6	Skulking West River Bank Road	City	5.8	3.3	SR0	16.2	53.4	-	-	15.0 (0.45)	-	-	-	-	-	-	-	-	-	-	-	-	-	
PHR00E-1		Straight Access Road	Prov.	3.7	3.7	SR0	32.2	119.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
PHR00E-2		San. Marlin - Sta. Ann Junction Road	Barangay	5.7	5.7	SR0	32.2	119.5	-	-	36.0 (0.30)	-	-	-	-	-	-	-	-	-	-	-	-	-		
J-1		Jasawa Mountain Access Road	Prov.	8.9	6.9	SR0	13.5	93.1	1.0	1.0	57.6 (0.30)	-	-	-	-	-	-	-	-	-	-	-	-	-		
V-1		Villanueva Mountain Access Road	NR	12.0	11.4	SR0	30.2	123.5	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T-1		Tuguecan Mountain Road	NR	6.5	5.8	SR0	13.5	75.6	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
C-1		Cruz - Camakawan - Inching Road	City	4.8	3.2	SR0	13.5	43.1	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
C-2		Camakawan - Inching Road	City	7.2	5.4	SR0	13.5	72.9	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
C-3		Leti-Itanday - Leti-Itanday Road	City	3.2	3.2	SR0	13.5	43.2	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Improvement of Division Roads		C-4	Caraban - Building Bridge Access Road	City	10.1	9.5	SR0	14.5	132.1	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	O-1	Opol Mountain Road	Prov.	23.3	22.8	SR0	13.5	107.7	1.0	1.0	27.0 (0.45)	-	-	-	-	-	-	-	-	-	-	-	-	-		
	L-1	Laguadigan Airport Access	City	9.6	5.6	SR0	13.5	75.6	2.0	2.0	18.2 (0.30)	10.0 (0.45)	-	-	-	-	-	-	-	-	-	-	-	-		
	E-1	El Salvador Mountain Access Road	Prov.	6.2	5.2	SR0	13.5	70.2	1.0	1.0	12.5 (0.40)	-	-	-	-	-	-	-	-	-	-	-	-	-		
	A-1	Alibuhid Mountain Access Road	Prov.	6.4	6.0	SR0	13.5	61.0	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	G-1	Guguan Mountain Access Road	Prov.	14.8	14.0	SR0	13.5	109.0	3.0	3.0	14.0 (0.30)	57.0 (0.45)	-	-	-	-	-	-	-	-	-	-	-	-		
	OE-1	Chapua-El Salvador Mountain Link Road	Prov.	24.1	23.5	-	-	-	-	-	5.437-1	52.0	42.0	352.2	718.3	2,341.5	515.0	113.8	215.5	1,411.9	481.5	2,252.7	4,006.6	2,404.8	1,201.4	2,698.0
	Total																									

Note: Line price of bridge and flyover construction
 2-Lane new bridge (PCC) = 400,000 P/m
 2-Lane new bridge (ASPH) = 600,000 P/m
 2-Lane new bridge (Road) = 800,000 P/m
 4-Lane new bridge (PCC) = 1,200,000 P/m
 4-Lane new bridge (ASPH) = 1,600,000 P/m
 4-Lane new bridge (Road) = 2,000,000 P/m

10.7 IEE OF ROAD PROJECTS

1) Project Screening

The types of environmental study that would merit an Environmental Compliance Certificate (ECC) for the Metro Cagayan de Oro study area are presented in **Table 10.7-1**. For projects that will not have significant adverse environmental impacts, a Certificate of Non-Coverage, or CNC shall instead be prepared. In assessing the type of EIA study, the DENR DAO 96-37 and IEE Checklist Guide to Proponents, and the Memorandum of Agreement between the DPWH and DENR was utilized as basis.

TABLE 10.7-1 SUMMARY RESULT OF PROJECT SCREENING FOR THE METRO CAGAYAN DE ORO AREA

Road No.	Road Name	No. of PAH*	Type of EIA Study
Improvement of Existing Roads			
EW-1 (1)	Iligan – CDO – Butuan Road (East)	260	IEE
EW-1 (3)	Iligan – CDO – Butuan Road (West) Opol – El Salvador-Alubijid-Gitagum	660	IEE
NS-3 (1)	Syre Highway Parallel Road (Agusan – Balubal – Syre)	5	IEE
NS-3 (2)	Syre Highway Parallel Road (Balubal – Alae)	10	IEE
NS-5	CDO Urban West Diversion Road (Coast – Airport Road)	7	IEE
NS-6	Balulang West River Bank Road	7	IEE
PHIVIDEC 2	San. Martin – Sta. Ana Junction Road	53	IEE
Proposed New Construction			
EW-2	New J.B Borja Extension	160	EIS Regional
EW-3 (2)	New Western Coastal Road	57	EIS Regional
EW-4	Opol Bypass	21	EIS Regional
NS-4	Mindanao Container Terminal – Bukidnon Link Road (Tagaloan – Alae)	123	EIS Regional
CU-1	New 5 th Bridge	80	EIS Regional
CU-2	New 6 th Bridge	60	EIS Regional
CU-3	New 7 th Bridge and Access Road	70	EIS Regional
CU-4	New 8 th Bridge and Access Road	20	EIS Regional
Note * : PAH – Project-Affected Houses			

2) Type of EIA Study

The Types of Environmental Impact Assessment (EIA) studies to be prepared are specified in **Table 10.7-2** below.

TABLE 10.7-2 TYPES OF ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Environmental Study	Major Criteria
1) Certificate of Non-Coverage (CNC)	<ul style="list-style-type: none"> The study area is outside ECA No resettlement is required
2) IEE Checklist - Project Description and Checklist	<ul style="list-style-type: none"> The study area is outside ECA New road construction - road length is less than 10 km Improvement or Rehabilitation - R-O-W acquisition is required for more than 50% of present R-O-W
3) IEE	<ul style="list-style-type: none"> ECA values are less than 5 Required resettlement population is less than 200 persons or 40 families
4) Environmental Impact Statement (EIS)	<ul style="list-style-type: none"> ECA values are 5 or more Required resettlement population is 200 persons or 40 families and more
Note: ECA: Environmental Critical Area	

Rating for Environmentally Sensitive/Critical Areas Values

National Parks/ watersheds/ sanctuaries	5
Aesthetic potential tourist spots	2
Endangered species	4
Unique historic/ archaeological/ scientific areas	3
Indigenous culture communities	5
High incidence of natural hazards	1
Critical slopes > 40%	5
Prime agricultural land	3
Recharge areas for aquifer	2
Protected water bodies	2
Mangrove areas	4
Coral reefs	5