APPENDIX-C

PRE-FEASIBILITY STUDY FOR OUTER RING ROAD

Appendix C Pre-feasibility Study for Outer Ring Road

C-1 Route Selection and Development Concept

(1) Pre-feasibility Study for Outer Ring Road

The Study Team conducted a pre-feasibility study (the Pre-F/S) for the Outer Ring Road in accordance with an agreement between Japan International Cooperation Agency (JICA) and the Directorate General of Highways (DH) and South Province Government.

(2) Arterial Road Network Plan for the Mamminasata Metropolitan Area

JICA conducted the "Ujung Pandang Highway Development Study" in 1989 for the target year of 2009. The trunk arterial road system in the Makassar Metropolitan Area was configured with five radial roads and three ring roads. The Outer Ring Road is one of these trunk arterial roads. The route of Outer Ring Road was a route connecting KIMA/Jl.Tol.Ir.Sutami (Jl.Tallo) and Sungguminasa (Kabupaten Capital of Gowa) crossing Jl.Perintis Kemerdekaan and the central radial road.

Figure C-1 shows the route of the Outer Ring Road in the 2005 - 2016 Spatial Plan of Makassar City. The Outer Ring Road branches off approximately 2.5km before the Daya intersection and turns to the west through BTP (Perumahan Bumi Tamalan Rea Permai), a new residential area and connects KIMA and Jl.Tol.Ir.Sutami.

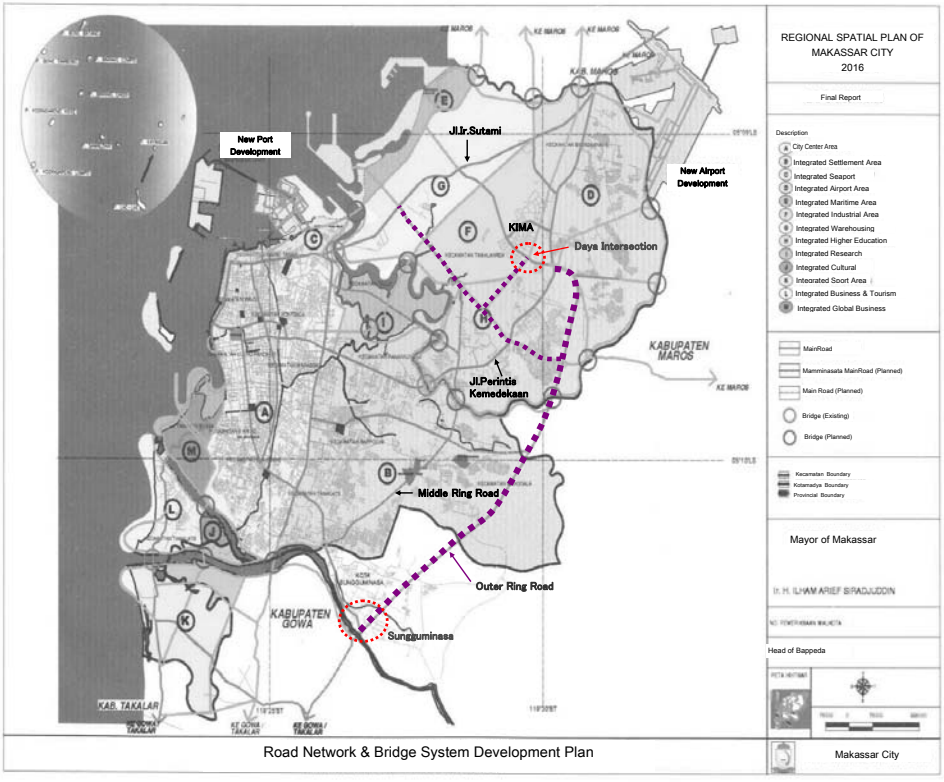


Figure C-1 Road and Bridge Development Plan of Makassar City

(3) Recommended Urban Arterial Road Network System for Mamminasata Metropolitan Area

The JICA Study Team reviewed the Mamminasata Study on engineering and implementation aspects and recovered the Outer Ring Road with some modification to the JICA 1989 Study on environmental considerations.

(4) Traffic Demand Forecast

The year 2023 traffic was estimated at 25,000 pcu/day (south of Sungguminasa) and 30,000 - 40,000 pcu/day at the middle part of the Outer Ring Road.

(5) Development Concept and Alternative Route Planning

1) Role and Function of Outer Ring Road

The Outer Ring Road is one of the important links in the Mamminasata Metropolitan arterial road network system and its expected roles and functions are as follows:

- Ring road to contribute to harmonizing urban development
- Bypass for the traffic from/to the northern part and to/from the southern part of Makassar City
- Logistic route for the coming in and out traffic from/to the southern area of the South Sulawesi Province to/from KIMA, Makassar Port, new industrial areas along Jl.Ir.Sutami
- Reduction of traffic burden on Jl.Perintis Kemerdekaan, the Middle Ring Road and Jl.Sultan Alauddin.
- Connection between the north educational center (Hasanuddin University, Institut Agama Islam Negeri, etc) and the south educational center (Hasanuddin University Technology Faculty, Universitas Islam Negeri Alauddin Makassar).

The Outer Ring Road and Mamminasa Bypass share the same road at their southern part to connect to Tj Bunga Development Area.

2) Alternative Plan

A 2-lane 2-way highway is the basic concept required for the Outer Ring Road based on traffic demand and envisaged road functions. The Outer Ring Road consists of three parts. The northern ring is the part accessing to KIMA, Jl.Tol.Ir.Sutami and Makassar Port. The middle ring is a straight road section parallel with the Middle Ring Road, and the southern ring is a connection to Sungguminasa and Mamminasa Bypass.

Development concept, alternative route plans and major issues for the Outer Ring Road are shown in the following **Table C-1** and **Figure C-2**. Three alternative routes for the north section, four routes for the middle section and four routes for the south section were established for comparison (refer to Attachment C.1 as to the detailed alternative route map).

Table C-1 Development Concept and Alternative Plans for Outer Ring Road

Section	Alt.	Development Concept	Length (km)	Location	Number of Lanes		Measures for Major Issues			
					Existing	Plan	Support of KIMA/ New Industry	Support of Logistics	Flood Control	Land Acquisition & Resettlement
North	1	Access through BTP to KIMA (Makassar City Plan)	2.2+5.5+ 1.6	Makassar	-	4	O	O	△	O
	2	Access through Jl. Daya to Jl.Ir.Sutami (Original Plan)	3.3		-	4	O	O	△	△
	3	Access through Jl. Daya to Jl.Ir.Sutami (New Plan)	3.8		-	4	△	O	O	O
Middle	1	Road construction with Flood control works / dykes (West Bank Route)	7.3	Makassar & Gowa (and partly Maros)	-	4			O	O
	2	Pass through wet land in Makassar （West Bank Route)	7.5		-	4			△	△
	3	Pass in flood retarding area (East Bank Route)	8.6		-	4			△	O
	4	Pass avoiding flood retarding area (East Bank Route)	11.8		-	4			O	O
South	1	New road passing through the 3-3.5km east of Sungguminasa and connect to M.Bypass	9.8	Gowa	-	4		O		
	2	Connection to Sungguminasa through Malino Road	8.5		2	4		△		
	3	Connection to Sungguminasa through developed area	7.7		-	4		△		
	4	Original Plan (connection to Sungguminasa)	7.2		-	4		△		

Notes: Proposed function of the road is Arterial (Secondary)
O Positive Direct Effects △ Some positive effect − No direct influence Recommeded Plan

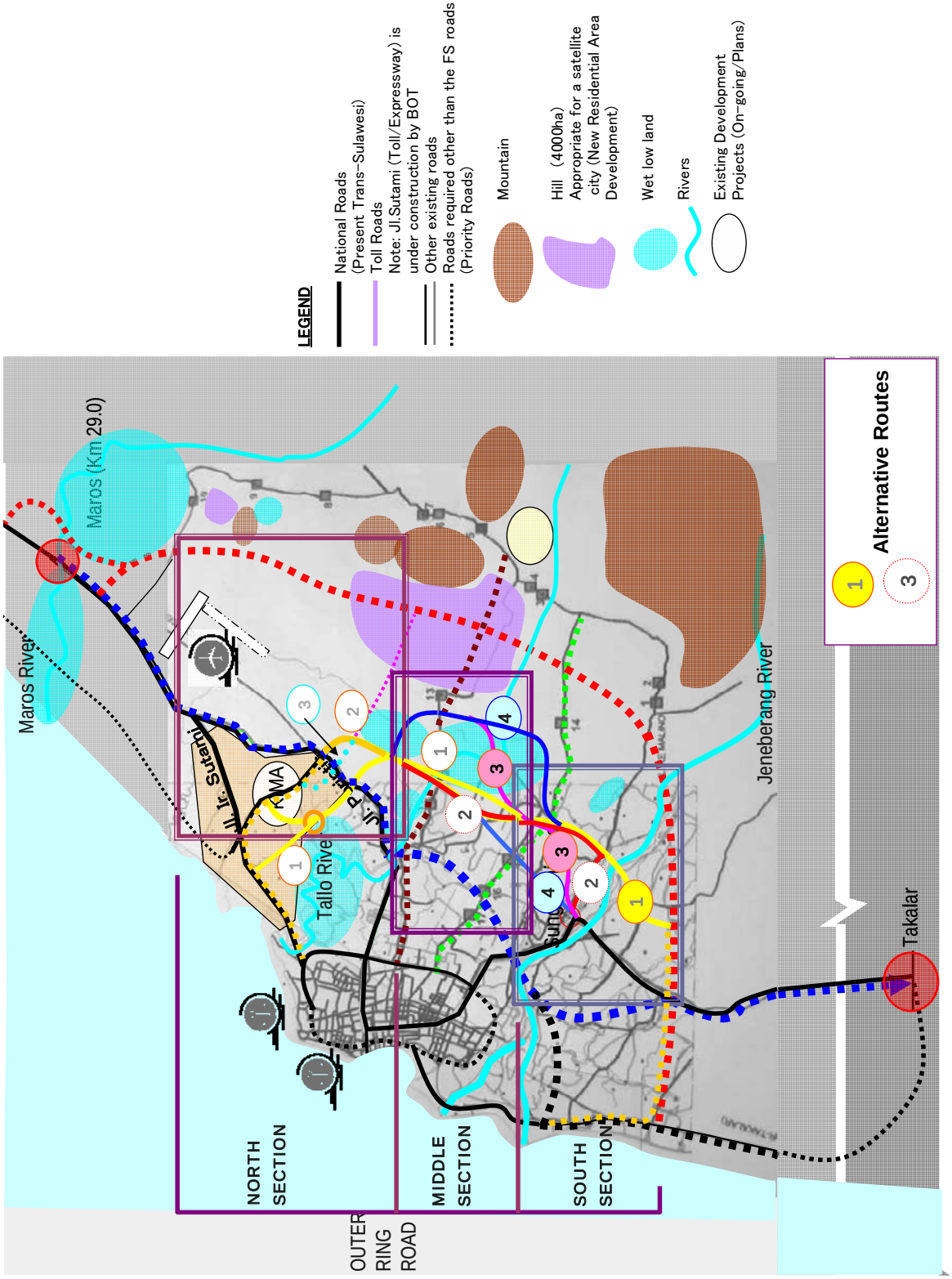


Figure C-2 KEY MAP FOR PRE-FEASIBILITY STUDY ROAD (OUTER RING ROAD)

3) Standard Cross Sections

The proposed standard cross-section for the north section and part of the middle section consists of 2 lanes, 2 ways with either two drainage canals on both sides or a large drainage canal at the median as illustrated in **Figure C-3**.

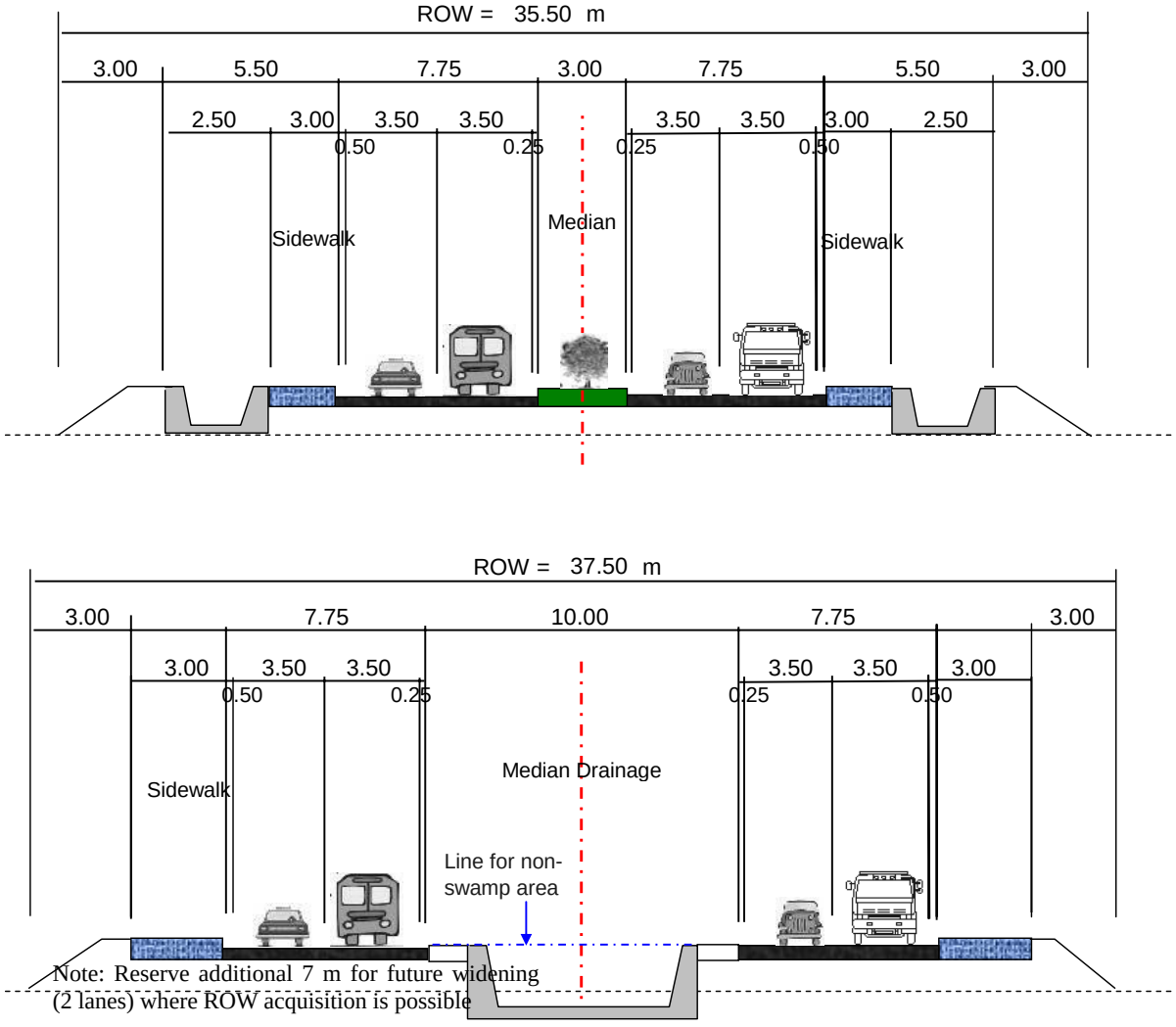


Figure C-3 Typical Cross Section for Swamp Area (Types 1, 2 and 3)

Figure C-4 shows the standard cross section for the Tallo River flood area. A river dike and the roadway may be constructed together. Where the road is subject to attack by flood water flow, concrete sheet piles will be required to protect the roadway from scouring.

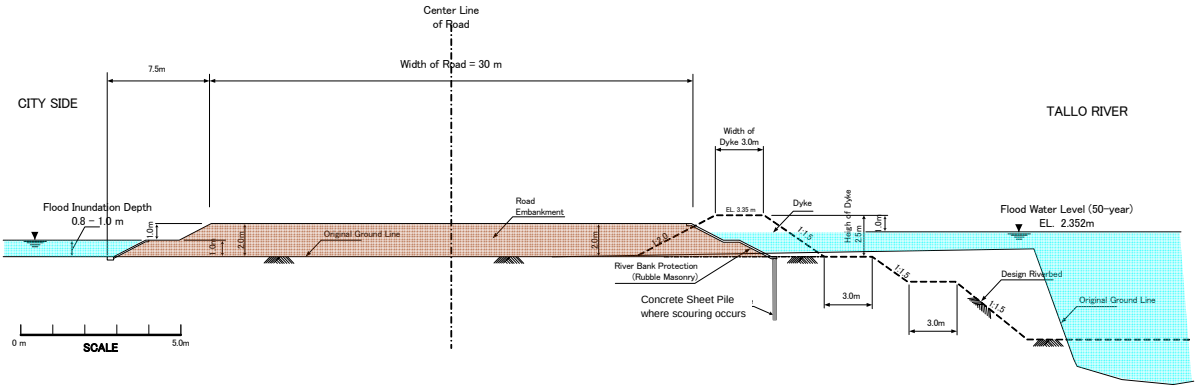


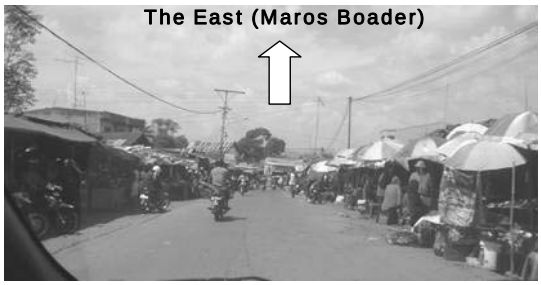
Figure C-4 Typical Cross Section for Tallo River Flood Area (Type 4)

4) North Section

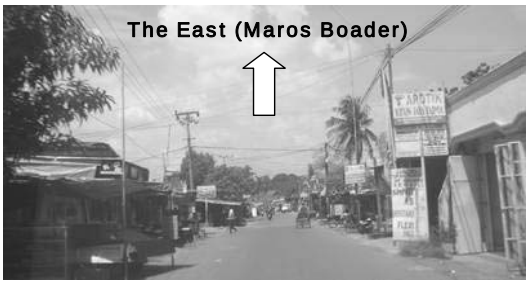
The north section of the Outer Ring Road is located at the north-east of the Tallo River. Three alternative routes were planned for this section. A connection from the Middle Ring Road and/or the Outer Ring Road to KIMA, Jl.Tol.Ir.Sutami and Makassar Port was also envisaged.

Alternative 1 is one of the current plans of Makassar City. The planned route is a connection from the middle section to Jl.Perintis Kemerdekaan through the BTP (Bumi Tamalanrea Permai) road. This route will be extended crossing over Jl.Perintis Kemerdekaan up to Jl.Tol.Ir.Sutami through paddy fields and fish farming ponds. Approximately 1.2 km of the 5.6 km road from Jl.Tol.Ir.Sutami has already been constructed by a developer and he is able to provide a 30-34 m wide ROW for the road space.

Alternatives 2 passes through an open band of wetland located in the housing development area and is connected to the KIMA entrance. This open band has a ROW already provided by Perumahnas (National Housing Corporation) for about 2.5 km in length. Alternative 2 is the original plan in which the road is directly connected to KIMA through Jl. Daya (**Figure C-5**). However, it will not be easy to acquire the required ROW as a local market exists and many houses are densely located along this road for about 400-500 m long.



Entrance of Jl.Daya (Local Market)



Residential Houses along Jl.Daya

Figure C-5 Entrance to Jl.Daya (Outer Ring Road Intersection)

Alternative 3 is an alternative route which passes behind the shopping building (Pusat Niaga

Daya) and connects KIMA and Jl.Ir.Sutami without requiring much resettlement. However, as this is too near to the Jl.Daya Intersection, it will not be appropriate from the engineering viewpoint.

5) Middle Section

This is the section between the Tallo River and Jl.Hertasning. The road passes through or near the flood retarding area of the Tallo River**.** Four alternative routes were planned for this section.

Alternative 1 route crosses over the Tallo River and runs along its west bank to the south. It is influenced by the flood control work planned for the Tallo River. The new roadway embankment and river dyke for flood control could share their functions as indicated in the standard cross sections. **Alterative 2** is same as Alternative 1 but it goes to the south passing through the wetland and new residential areas. Some resettlements are unavoidable. The route in **Alternatives 3 and 4** passes through the east bank of the Tallo River flood basin (Kabupaten Maros and Gowa). Alternative 3 crosses at the middle of the flood retarding basin to the west bank while that of Alternative 4 bypasses it.

6) South Section

There are several control points to be considered for selection of the appropriate route for this section, including lakes/swamps, Chinese cemetery, State Islam University under construction, crossing point of the Jeneberang River, traffic congestion and dense residential area around Sungguminasa. Four alternative routes were planned.

Alternative 4 is the original plan in the JICA 1989 study. The Outer Ring Road was planned to connect Sungguminasa (Jl.Gowa Raya). However, as the access area to Sungguminasa is densely occupied by residential houses, it will be very difficult to acquire the required ROW. **Alternative 3** is a plan to connect the Outer Ring Road to Sungguminasa by reducing resettlement. **Alternative 2** is to make a ring road system by using the existing provincial road (Jl. Malino). Widening of Jl. Malino from 2 lanes to 4 lanes is necessary considering the future traffic demand. This route seems to be appropriate for the medium term. **Alternative 1** is a plan to locate the Outer Ring Road at approximately 3.0 km east of the Sungguminasa / Jl.Malino intersection where resettlement requirement is far less compared with other alternatives. It extends to the south passing over the Jeneberang River and is connected to the Mamminasa Bypass. From where it uses the Mamminasa Bypass then joins the national road and ends at the Tj.Bunga – Takala Road near the west coast. This plan will contribute to reducing traffic jam at Sungguminasa and Alternative 1 is the most appropriate plan in the long term from the engineering viewpoint.

(6) Evaluation and Recommendation on Alternative Routes

An Initial Environmental Examination (IEE) was carried out based on the existing data, the data collected for the FS roads, and site reconnaissance survey. Multi Criteria Analysis (MCA), which comprises engineering, economic and environmental elements (IEE results), was used for evaluation of alternatives (see **Table C.2**).

Table C-2 Summary of Evaluation and Recommendations by MCA

North Section

Item	Alternative 1	Alternative 2	Alternative 3	Zero Option
	Access through BTP to Jl.Ir.Sutami/ KIMA	Access through Jl. Daya to Jl.Ir.Sutami (Original)	Access through Jl. Daya to Jl.Ir.Sutami (New Plan)	No Outer Ring Road Construction
	9.3km	3.1km	3.8	-
Engineering Aspects	53	45	37	25
Economic & Financial Aspects	36	36	33	14
Environmental Aspects	30	28	31	31
Total	**120**	**109**	101	70
Recommendation*	**Short-term**	**Long-term**		

Middle Section

Item	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Zero Option
	Road construction with Flood control works / dykes (West Bank Route)	Pass through wet land in Makassar （West Bank Route)	Pass in flood retarding area (East Bank Route)	Pass avoiding flood retarding area (East Bank Route)	No Outer Ring Road Construction
	6.3km	6.5km	7.6km	10.8km	-
Engineering Aspects	58	51	35	33	23
Economic & Financial Aspects	32	37	31	24	27
Environmental Aspects	30	29	30	30	31
Total	**121**	117	95	86	81
Recommendation	**Recommended**				

South Section

Item	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Zero Option
	New road passing through the 3.5km east of Sungguminasa and	Connection to Sungguminasa through Malino Road	Connection to Sungguminasa through developed area	Original Plan (connection to Sungguminasa)	No Outer Ring Road Construction
	6.3km	6.5km	7.6km	10.8km	-
Engineering Aspects	49	41	39	46	25
Economic & Financial Aspects	29	39	33	33	16
Environmental Aspects	37	25	25	26	37
Total	**116**	**105**	97	105	77
Recommendation*	**Short-term**	**Long-term**			

Note: * both Alternative 1 and Alternative 2 are implemented.

C-2 Preliminary Design of Roadway and Intersections

(1) Roadway Design

The JICA Study Team has made preliminary designs for roadways, intersections, bridges, pavement and other structures for the Outer Ring Road in accordance with the design standards, road development concept, and route alignments. The engineering design was based on the results of natural condition survey (topography) and hydrology study and geological condition analysis.

The design results are reflected to the Drawings in Volume 2-2 (Preliminary Design Drawings) of the Feasibility Study Report.

(2) Intersection Plan and Preliminary Design

A total of 7 intersections have been identified as shown in the figure, which are named OR-1 through OR-7 on the Outer Ring Road. An intersection for Jl.Tol.Ir Sutami through the new Parangloe Warehouse and Industrial Area should be constructed by the BOT investor. Alternative intersections were studied and evaluated. At-grade intersection with signal control was recommended for the above major intersection under the pre-F/S except the interchange for Jl Tol

Ir Sutami constructed by the BOT.

(3) Pavement Design

Since geological engineering survey for the Outer Ring Road was not carried out because of pre-F/S, the pavement structure design was made referring to the Mamminasa Bypass as both site conditions are similar. The pavement structure in the following Table F-5.2 was adopted for the Outer Ring Road. The asphalt concrete pavement with AC(W) 4cm and AC(B) 6cm was used on the aggregate base and subbase.

C-3 Bridge Plan and Preliminary Design

(1) List and Location of Bridges

On the Outer Ring Road alignment, there are two major bridges crossing the Tallo River and the Jeneberang River as listed in **Table C-3**.

Table C-3 Bridge List on Outer Ring Road

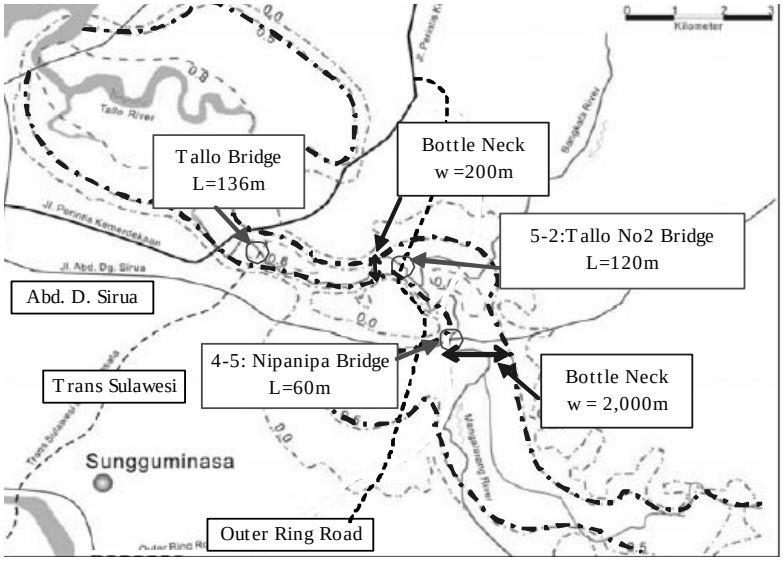
Bridge No.	Survey No.	Section	Station	Across Object / Width (m)			Existing Lane	Request Lane
				Description	Length	Span		
5-1	---	5-A	3+600	Drainage Culvert	3	1	---	4
5-2	---	5-A	3+950	Tallo No.2 Bridge	120	4	---	4
5-3	---	5-A	4+600	Drainage Culvert	3	1	---	4
5-4	---	5-A	7+400	Drainage Culvert	3	1	---	4
5-5	---	5-A	9+300	Drainage Culvert	3	1	---	4
5-6	---	5-A	13+850	Drainage Culvert	3	1	---	4
5-7	---	5-B	15+400	Jeneberang No.3 Bridge	210	7	---	4
5-8	---	5-B	16+000	Canal	3	1	---	4
5-9	---	5-B	17+400	Canal	10	1	---	4
5-10	---	5-B	19+450	Bontoreo River	16	1	---	4
Total					371			

Source: JICA Study Team

(2) Major Bridges

1) Site Condition

Three bridges planned on Tallo River under the F/S and Pre F/S roads are shown in Figure C-3.3. The length of Tallo Bridge is 136 m.



Source: JICA Study Team

Figure C-6 Bridge Location Map on Tallo River

The Jeneberang Bridge No.3 is planned at a stable river section and at where the least resettlement is required. The bridge location is at semi-urban area, approximately 2.5 km from the Sungguminasa Town. The planned bridge length is 210m.

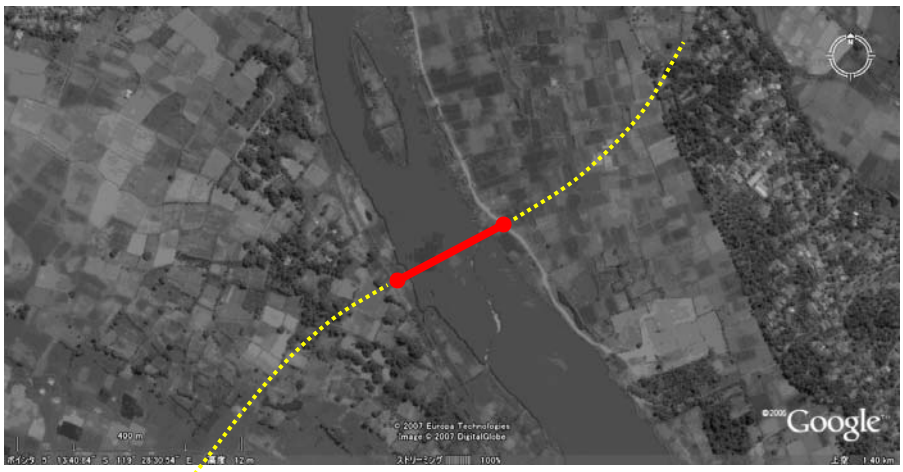


Figure C-7 Plane Photo of Jeneberang No.3 Bridge

2) Comparative Study of Bridge Type

Three alternatives were set up for each Tallo No.2 Bridge planning and Jeneberang No.3 Bridge

planning. Based on the comparison study, the PC-I girder bridge type was selected as the most appropriate for both rivers on the economic and construction efficiency aspects as shown in **Table C-4**.

Table C-4 Summary of Bridge Type Evaluation for Major Bridges

Tallo Bridge No.2
Bridge Length: 120m

Area / Alternative	Structure Types	Span	Stability	Construction	Maintenance	Aesthetics	Cost	Total
Rural Area			20%	20%	10%	10%	40%	100%
Alternative 1	PC I Girder	30m x 4	12%	16%	8%	4%	40%	80%
Alternative 2	PC I Girder	40m x 3	12%	12%	8%	5%	34%	71%
Alternative 3	Steel I Girder	40m x 3	14%	14%	6%	5%	27%	66%

Jeneberang Bridge No.3
Bridge Length: 210m

Area / Alternative	Structure Types	Span	Stability	Construction	Maintenance	Aesthetics	Cost	Total
Rural Area			20%	20%	10%	10%	40%	100%
Alternative 1	PC I Girder	30m x 7	12%	16%	8%	4%	40%	80%
Alternative 2	PC I Girder	42m x 5	12%	12%	8%	5%	34%	71%
Alternative 3	Steel I Girder	42m x 5	14%	14%	6%	5%	26%	65%

Source: JICA Study Team

(3) Minor Bridges

The most economical and common structure types in Indonesia are box-culverts for less than 10m span, PC hollow slab bridge for span length of 10-16m and PC I Girder Bridge for 16 - 35 m span. Those common types of structures are used for the minor bridges on the Outer Ring Road. Abutments of reversed T type were applied for the substructure of minor bridges. Pile foundation was selected because the depth of the bearing stratum is approximately from 10 to 30 m. PC pile was selected as the type of foundation.

C-4 IEE for Route Selection

The environmental study was conducted in accordance with the JICA guidelines. The JICA guidelines require the IEE for pre-F/S but there is no legal framework of IEE in the planning stage (route selection) in Indonesia. The Study Team and concerned agencies of Indonesia have agreed to conduct IEE for the alternative route selection on environmental consideration.

The objective of Initial Environmental Examination (IEE) is conducting an initial impact assessment on the alternative plans of the Pre-F/S routes. IEE has been carried out based on the existing data, the data collected for the F/S roads, and site reconnaissance survey. It evaluated both negative and positive environmental impacts without prejudice. Multi Criteria Analysis (MCA), which is comprised of engineering, economical and environmental elements (IEE results), was used for evaluation of the alternatives.

The stakeholder meetings for environmental considerations were held 3 times in total. The 1st stakeholder meeting was organized for selection of the most appropriate route on 15th June 2007 at Kabupaten Gowa, 24th June 2007 at Kota Makassar, and 31st June 2007 at BAPEDA of South

Sulawesi Province with participation of Bina Marga (central office), Bappeda, Dinas Praswil and other concerned regional government offices. The 2nd Stakeholder Meeting was held on 11th September 2007 in the 2nd workshop in Makassar. The 3rd Stakeholder Meeting was held on 13th December 2007 at the time of the 2nd seminar in Makassar.

The results of IEE and stakeholder meetings were reflected to route selection and preliminary designs.

C-5 Cost Estimate

(1) Composition of Project Cost

The project cost consists of construction cost, detailed design and supervision costs, land acquisition and compensation costs and administration cots. The construction cost was estimated based on the result of the preliminary engineering design, quantities of major work items, unit prices including assumed percentages of overhead and profit of the contractor and physical contingency. The value added tax (VAT) of 10% and inflation (price escalation) were excluded for the economic evaluation but included in the financing plan. The maintenance cost for periodic maintenance and routine maintenance was also estimated.

(2) Project Cost

The estimated major construction quantities are shown in **Table C-5.**

Table C-5 Major Construction Quantities

Item	Unit	Section 5-A	Section 5-B	Total
Mortared Stonework	m3	53,065	21,618	74,683
Common Excavation	m3	261,070	100,582	361,652
Common Embankment	m3	867,974	484,941	1,352,915
Selected Embankment	m3	3,363	5,755	9,118
Aggregate Base Class A	m3	43,952	17,522	61,474
Aggregate Base Class B	m3	68,496	27,307	95,803
Asphalt Concrete -Wearing & Binder Course (5cm)	m2	432,420	178,318	610,738
Structural Concrete Class K250	m3	14,158	9,693	23,851
Precast Unit Type I Girder (16-35m)	nos	44	86	130
Reinforcing Steel	ton	525	810	1,335

Source: JICA Study Team design

(3) Cost Estimate for the Implementation Plan

Based on the unit prices and estimated construction quantities, the project cost and its distribution was estimated at as shown in **Table C-6.**

Table C-6 Cost Distribution for Implementation Schedule

Item	Estimated Amount	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	(M. Rp.)		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Outer Ring Road	**20.4 km**																		
Jl.Perintis-Jl.Malino (North)	**14.7 km**																		
Land Acquisition and Compensation									30%	40%	30%								
Detailed Design and Supervision Services										25%	25%	25%	25%						
Construction											30%	40%	30%						
Administraition									20%	20%	20%	20%	20%						
Maintenance Routine																			
Maintenance Overlay per 5 Years																			
Jl.Perintis-Jl.Malino (North)																			
Land Acquisition and Compensation	58,805								17,642	23,522	17,642								
Detailed Design and Supervision Services	13,505									3,376	3,376	3,376	3,376						
Construction	192,923										57,877	77,169	57,877						
Administraition	3,858								772	772	772	772	772						
Maintenance Routine	3,556													593	593	593	593	593	593
Maintenance Overlay per 5 Years	11,853																	11,853	
Total	**284,500**								**18,413**	**27,670**	**79,666**	**81,317**	**62,025**	**593**	**593**	**593**	**593**	**12,445**	**593**
	100%								**6.5%**	**9.7%**	**28.0%**	**28.6%**	**21.8%**	**0.2%**	**0.2%**	**0.2%**	**0.2%**	**4.4%**	**0.2%**
Jl.Malino-M. Bypass Section (South)																			
	5.7 km																		
Land Acquisition and Compensation															30%	40%	30%		
Detailed Design and Supervision Services																25%	25%	25%	25%
Construction																	30%	40%	30%
Administraition															20%	20%	20%	20%	20%
Maintenance Routine																			
Maintenance Overlay per 5 Years																			
Land Acquisition and Compensation	11,723														3,517	4,689	3,517		
Detailed Design and Supervision Services	8,061															2,015	2,015	2,015	2,015
Construction	115,157																34,547	46,063	34,547
Administraition	2,303														461	461	461	461	461
Maintenance Routine																			
Maintenance Overlay per 5 Years																			
Total	**137,244**														**3,978**	**7,165**	**40,540**	**48,539**	**37,023**
	100%														**2.9%**	**5.2%**	**29.5%**	**35.4%**	**27.0%**

C.6 Economic Evaluation

The results of evaluation are summarized in **Table C-7**.

Table C-7 Results of Economic Evaluation

Evaluation Indicators	Value
EIRR (%)	26.8%
NPV (Rp. million) (*)	114,227
B/C (*)	2.44

Source: JICA Study Team
(*): Discount Rate = 15%

The above results indicate that implementation of the Outer Ring Road is economically feasible with values of EIRR sufficiently higher than the opportunity cost of capital (discount rate) (>15%), positive NPV (>0) and higher B/C ratio than unity (>1).

The robustness of economic feasibility of the Outer Ring Road was tested by changing related factors within a probable range. Results of the three tests are summarized as below:

Table C-8 Results of Sensitivity Analysis

Test Cases	EIRR (%)	NPV (*) (Rp. million)	B/C (*)
Original Case	26.8	114,227	2.44
Test 1: Cost 10% up & Benefit 10% down	23.7	86,915	1.99
Test 2: Cost 20% up & Benefit 20% down	20.9	59,603	1.63
Test 3: Evaluation Period: 20 years	26.4	93,085	2.18

Source: JICA Study Team
(*): Discount rate = 15%

C-7 Conclusion and Recommendations

(1) The Outer Ring Road is one of the important links in the Mamminasata Metropolitan Area arterial road network and its expected functions are as follows:

- Ring road to contribute to harmonizing urban development
- Logistic route for the coming in and out traffic from/to the southern area of the South ulawesi Province to/from KIMA, Makassar Port, new industrial areas along Jl.Tol.Ir.Sutami
- Connection between the north educational center and the south educational center.

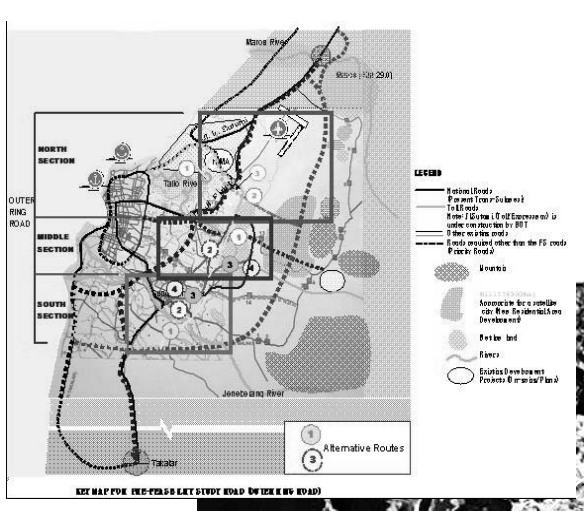
(2) The Outer Ring Road consists of three parts. The north section is the part accessing to KIMA, Jl.Tol.Ir.Sutami and Makassar Port. The middle section runs along the Tallo River and the south section is a connection to Sungguminasa and Mamminasa Bypass. The Outer Ring Road and Mamminasa Bypass share the same road at their southern part to connect to Tj. Bunga Development Area.

(3) The northern section between Jl.Tol.Ir.Sutami and Jl. Perintis Kemerdekaan through New Industrial Area (Kawasan Pergudangan dan Industri Parangloe Indah) is under construction by a private investor and be completed as it planned.

(4) Intersections for Jl.Tol.Ir.Sutami and the Outer Ring Road should be constructed under the on-going BOT project.

(5) The route of on-going north section should keep a 500-700 m buffer zone from the Tallo River to avoid negative effects to the Tallo River environment.

(6) As the project is vital on both technical and economic aspects (EIRR: 27%), it is recommended to conduct a feasibility study for implementation including EIA.



KECAMATAN MARUSU

Ir.Sutami Toll Road

New Airport and Runway

Golf Course

KECAMATAN MANDAI

M1

Parangloe New Industrial Area

KIMA

KECAMATAN BIRINGKANAYA

Daya Bus Termina

Stadion

PDAM Canal

Original Outer Ring Road Route

KECAMATAN TALLO

KECAMATAN MAKASSAR

Hasanuddin University

KECAMATAN PANAKKUKANG

Secured ROW (L=2.5km)

KECAMATAN TAMALANREA

Abdullah Daeng Sirua Road

Perintis Kemerdekaan Road

Tallo River

New Tallo Bridge

Flooding Area

Bypass Mamminasa

Mountain Moncongloe

Boulevard Panakukang Road

Central Ring Road

Border of Makassar City/ Kab.Maros

Hertasning Road

Middle Ring Road

KECAMATAN MONCONGLOE

Planned New Satellite Town

KECAMATAN RAPPOCINI

AP. Pettarani Road

KECAMATAN MANGGALA

KECAMATAN TAMALATE

Hertasning Total Length =15.7km

Border Makassar / Gowa

Gowa Industrial Area Planned (KIWA)

Flood Retarding Area

Middle Ring Road

KECAMATAN SOMBA OPU

Pond

Sultan Alauddin Road

Chinese Cemetery

Islam University

KECAMATAN PATTALLASSANG

Sungguminasa Bridge

Terminal Bus

Islamic Cemetery

Lake Mawang

KECAMATAN PALLANGGA

New Jeneberang Bridge

KECAMATAN BONTOMARANNU

Ex Paper Industry of Gowa (Engineering Faculty of Unhas)

KECAMATAN BAJENG

BOKA IC

Jeneberang River

To Takalar

Ke Malino

Legend :
Kabupaten Border
Kecamatan Border

N
W
E
S

Attachment C.1 Alternative Route Study for Outer Ring Road

APPENDIX-D

A SUPPLEMENTAL STUDY FOR TJ. BUNGA – TAKALAR ROAD (JALAN LINTAS BARAT MAKASSAR)

Appendix D A Supplemental Study for Tj. Bunga – Takalar Road (Jalan Lintas Barat Makassar)

D-1 General

The existing Tj. Bunga – Takalar Road passes through Makkassar City, Kabupaten Takalar and Kabupaten Gowa. The existing road is mostly 4.5 m wide paved road. The Takalar Regency proposed to Japan International Cooperation Agency (JICA) through the South Sulawesi Province to conduct a pre-feasibility study for the Tj. Bunga – Takalar Road, which is an alternative route from the Makassar City to Takalar and the southern part of South Sulawesi. JICA has accepted the proposal and the Study Team has conducted a supplemental study in addition to the F/S roads. **Figure D-1** shows Tj. Bunga – Takalar Road (Jalan Lintas Barat Makassar).

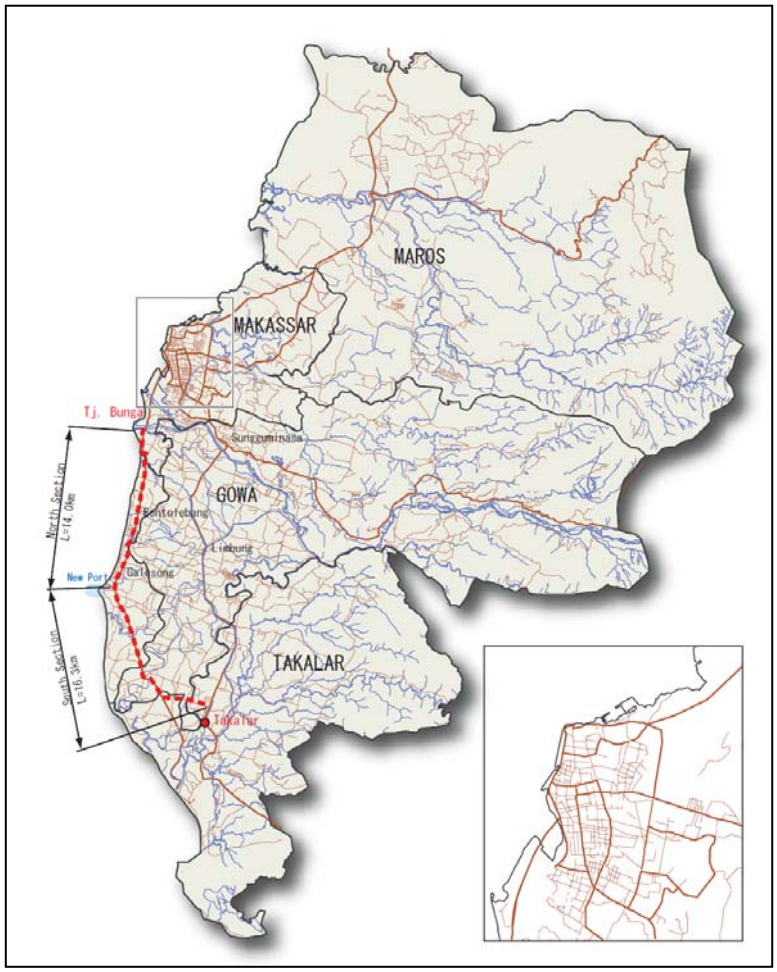


Figure D-1 Location Map of Tj. Bunga – Takalar Road

D-2 Development Concept and Route Selection

(1) Arterial Road Network Plan for the Mamminasata Metropolitan Area

JICA conducted the "Ujung Pandang Highway Development Study" in 1989 ("the 1989 JICA Study or Plan") for the target year of 2009. The trunk arterial road system in the Makassar

Metropolitan Area was configured with five radial roads and three ring roads. The Takalar − Jl.Tj.Bunga road is one of the radial roads in that plan.

(2) Urban Arterial Road Network System for Mamminasata Metropolitan Area

The Takalar − Tj. Bunga road was planned as one of the radial roads for the southern bound in both the Mamminasata Spatial Plan and this F/S.

(3) Traffic Demand Forecast for Tj. Bunga – Takalar Road

The present traffic (2006) and the future traffic demand for the trunk road network in the Mamminasata Metropolitan Area are indicated in **Figure D-2**. The year 2020 traffic was estimated at 20,000 – 24,000 pcu/day for the northern section and 10,000 - 14,000 pcu/day for the southern section.

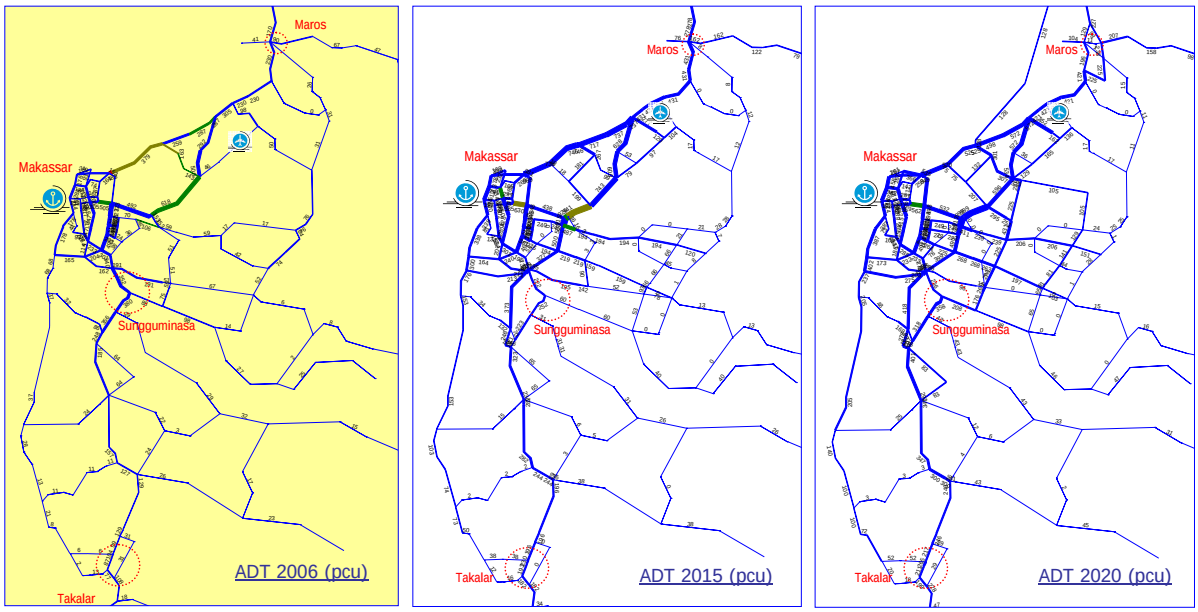


Figure D-2 Traffic Demand Forecast for Trunk Road Network in Mamminasata Metropolitan Area

(4) Alternative Development Concepts

Floods did not occur at the Jeneberang Rive estuary since the Bili-bili dam was constructed in the early 1990s. A bridge was constructed at the mouth of the Jeneberang River in 2005 and connected Tj.Bunga (GMTDC) and the Jeneberang River south plain. Therefore, development of the Jeneberang River south area is unavoidable. An earliest improvement of the Jl.Tj.Bunga – Takalar (Jalan Lintas Barat Makassar) is required to regulate sprawled urban development.

The expected functions of Tj. Bunga - Takalar Road are as follows:

- Radial road contributing to harmonized urban development
- Bypass for the traffic from/to Makassar City to/from the southern part of Mamminasata Metropolitan Area

- Access route for the coming in and out coastal road traffic (cargo and passenger) for the planned Galesong port.
- Reduction of traffic burden on the Trans-Sulawesi Mamminasata Road, especially around Sungguminasa
- Connection between the local activity center (maritime research, education center and regional fish market, etc) and the national activity center city (Makassar).

The Tj. Bunga - Takalar Road is divided into two sections. The northern section is the section between Makassar City access to Bontolebang sub-district, Galesong sub-district and the planned Galesong port. The southern section is that between the planned Galesong port and the Takalar Town.

The road development concept is established based on traffic demand and assigned road functions. The basic concept is widening of the existing 4.0m - 4.5m wide road to 7.0 m standard road. Only two alternatives are set up, widening or zero option (without project) for evaluation. The proposed typical cross-section is as illustrated in Figure G-3.

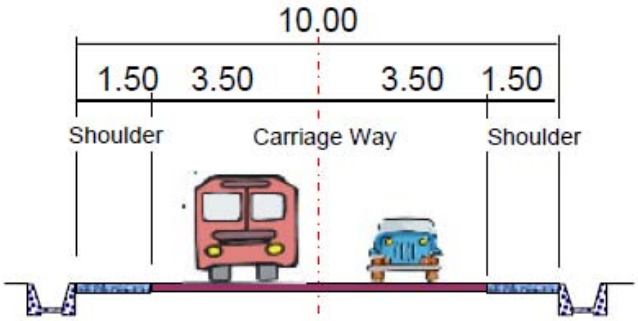


Figure D-3 Typical Cross Section of Tj. Bunga - Takalar

D-3 Evaluation and Recommendation on Alternative Plans

An Initial Environmental Examination (IEE) was carried out based on the existing data, the data collected for the FS roads, and site reconnaissance survey. Multi Criteria Analysis (MCA), which comprises engineering, economic and environmental elements (IEE results), was used for evaluation of alternatives.

North Section: The existing road is mostly 4.5 m wide and proposed improvement plan is widening to 7.0 m road. Alternative is without project case ("Zero option"). Those two plans are subjected to evaluation. The JICA Study Team recommends implementation of road widening as resulted in Multi Criteria Analysis (MCA).

South Section: The existing road of south section is 4.0 m – 4.5 m wide. There are two options, either "Zero Option" or widening. The JICA Study Team recommends widening to a 7.0 m standard road.

D-4 Designs

(1) Traffic Demand Forecast for Tj. Bunga – Takalar Road

The designs for Tj. Bunga – Takalar Road principally followed to the existing design of Perencanaan Teknis Jalan dan Jembatan Metro Makassar, KU. 08.08/SNVT/P2JJM-Bh/B/IX/253/ 2006, September 2006, Department Pekerjaan Umum Directorat Jenderal Bina Marga with a review based on site reconnaissance. Standard Specifications for Geometric Design of Urban Roads, MPW, Indonesia, 1992 is applied for the geometric design of which standard elements are tabulated in **Table D-1**. The proposed design classification for the Tj. Bunga- Takalar Road is Type-II, Class-I.

Table D.1 Geometric Design Standards

Road Classification		Type-I		Type-II		
		Class-I	Class-II	Class-I	Class-II	Class-III
Design Speed (km/h)		100 or 80	100 or 60	60	60 or 50	40 or 30
Cross-section	Carriageway Width	3.5m	3.5m	3.5m	3.25m	3.25m, 3.0m
	Median	2.5m	2.0m	2.0m (1.0m)	1.5m (1.0m)	1.5m (1.0m)
	Shoulder Width (Right)	1.0m	0.75m	0.5m	0.5m	0.5m
	Shoulder Width (Left without Side Walk)	2.0m (1.75m)	2.0m (1.75m)	2.0m (1.5m)	2.0m (1.5m)	2.0m (0.5m)
	Sidewalk Width	-	-	3.0m (1.5m)	3.0m (1.5m)	1.5m (1.0m)
Horizontal Alignment	Min. Radius	230m	120m	150m	100m	30m
	Min. Curve Length a; intersection angle (degree)	1,000/a (140m)	700/a (100m)	700/a (100m)	600/a (80m)	350/a (50m)
	Omission of Transition	>1,000m	>600m	>600m	>400m	>150m
Vertical Alignment	Max. Grade	4.0%	5.0%	5.0%	6.0%	8.0%
	Min. Vertical Curve (crest)	3,000m	1,400m	1,400m	800m	250m
	Min. Vertical Curve (sag)	2,000m	1,000m	1,000m	700m	250m

Note: ( ); Exceptional case

The proposed road starts at the south end of Jeneberang Bridge in Tj. Bunga, passing through Galesong and ends at the intersection with the Trans-Sulawesi Mamminasata Road in Takalar Town as shown in **Figure D-4**. Since the terrain is flat and the road alignment follows existing road, both horizontal and vertical alignments comply with design speed of 60 km/hr.

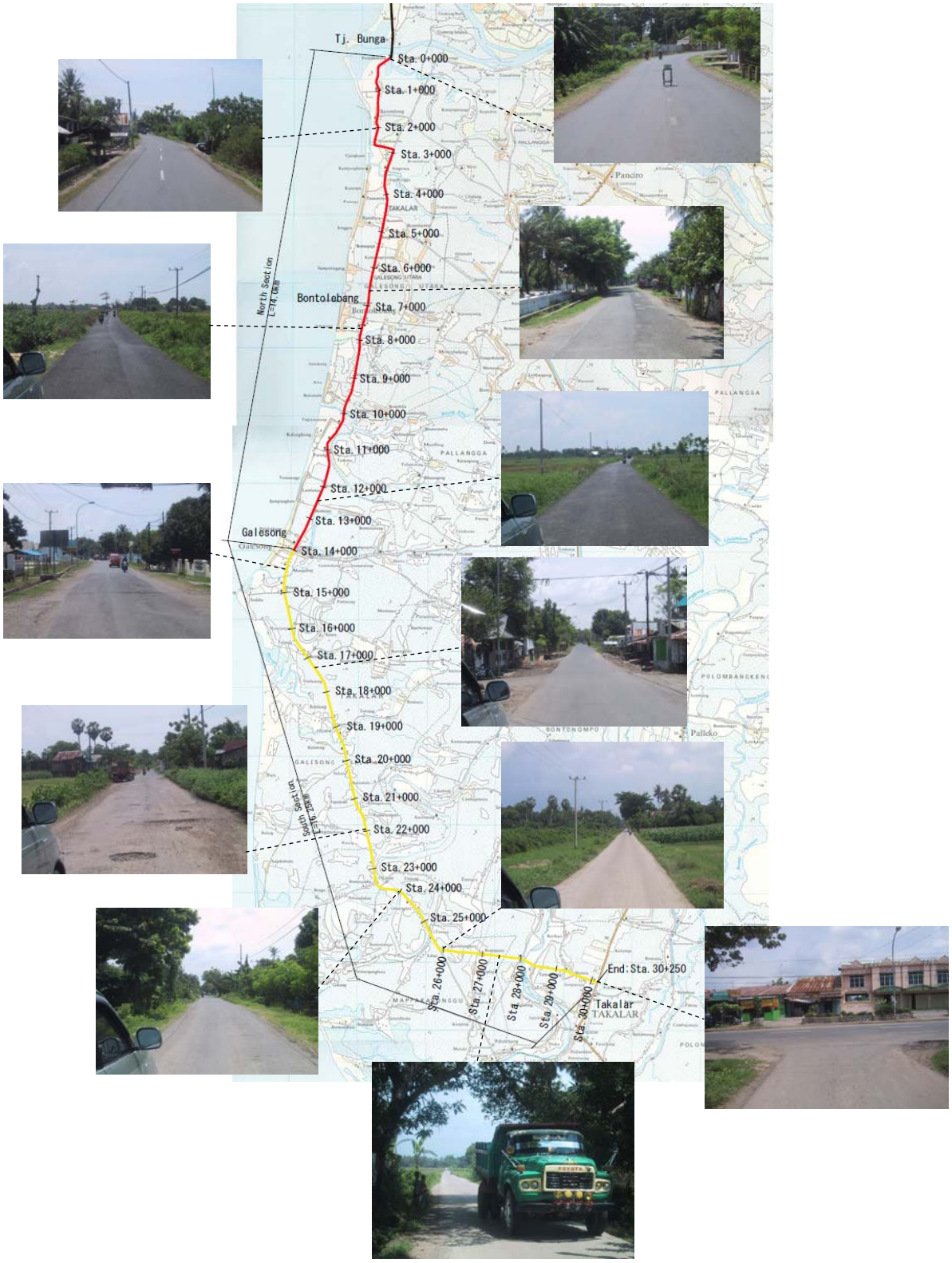


Figure D-4 Plan of Tj. Bunga - Takalar

(2) Pavement Design

The Study Team made the pavement design by referring to Perencanaan Teknis Jalan dan

Jembatan Metro Makassar, KU. 08.08/SNVT/P2JJM-Bh/B/IX/253/ 2006, September 2006, Department Pekerjaan Umum Directorat Jenderal Bina Marga, as shown in **Figures D-5 and D-6**.

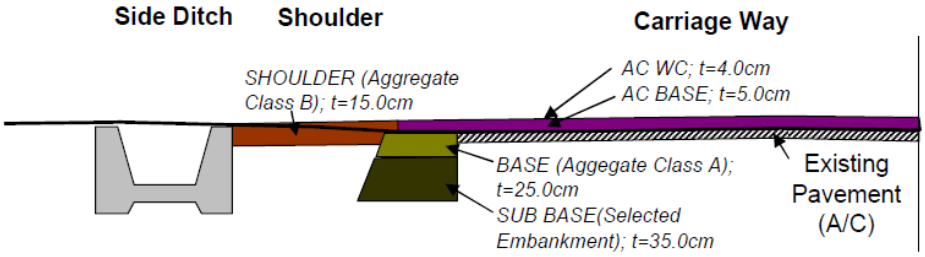


Figure D-5 Pavement Cross Section (A/C Section)

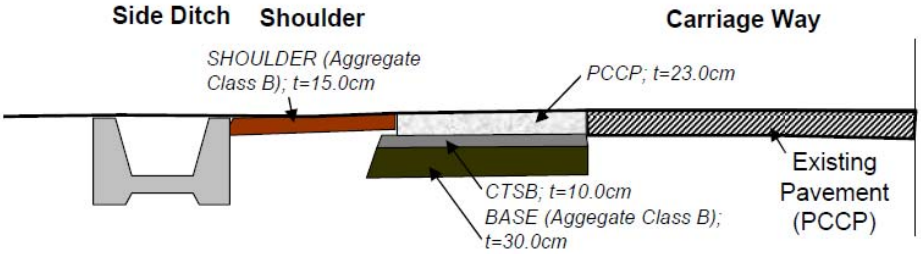


Figure D-5 Pavement Cross Section (PCCP Section)

(3) Bridge Design

The existing condition and proposed improvement measures for the bridges on the proposed road are shown in **Table D-2**.

Table D-2 Bridge List on Tj. Bunga – Takalar Road

Bridge No.	Station	Existing Condition (m)		Proposed Improvement Measure
		Length	Width	
BR-01	3+675	38.0	4.6	Replacement-PC
BR-02	6+910	5.0	4.0	Replacement-RC
BR-03	7+950	11.6	3.2	Replacement-RC
BR-04	9+950	34.0	2.4	Replacement-PC
BR-05	12+300	3.0	4.0	Replacement-RC
BR-06	14+600	20.0	3.5	Replacement-PC
BR-07	14+725	2.7	4.3	Replacement-RC
BR-08	17+750	3.1	4.2	Replacement-RC
BR-09	19+500	16.5	3.2	Replacement-PC
BR-10	19+975	5.5	4.0	Replacement-RC
BR-11	23+900	22.0	3.0	Replacement-PC
BR-12	25+850	2.5	4.0	Replacement-RC
BR-13	30+100	9.0	4.5	Replacement-RC
Total		172.9	-	

D-5 Cost Estimate and Economic Evaluation

(1) Composition of Project Cost

The project cost consists of construction cost, detailed design and supervision cots, land acquisition and compensation cots and administration cots. The construction cost was estimated

based on the result of the preliminary engineering design, quantities of major work items and assumptions on the percentages of overhead and profit of the contractor and physical contingency. The value added tax (VAT) of 10% and inflation (price escalation) were excluded for the economic evaluation. The maintenance cost for periodic maintenance and routine maintenance was also estimated.

(2) Conditions of Cost Estimate

Cost estimate was made based on the following conditions.

i) Time of cost estimate: November, 2007

ii) Foreign currency: US dollar

iii) Exchange rate: 1 US dollar = Rp. 9,376 (Bank Indonesia, 30 November 2007)

iv) Taxes: Not included for the economic evaluation.

The construction cost was estimated by multiplying construction unit prices and quantities calculated based on the preliminary design. Physical contingency was considered to be 10%. Estimation was made by major work items quoted from standard specifications of DGH, Indonesia, since it can be considered to be the most general categorization of work item in Indonesia.

Overhead and profit was assumed to be twenty (20) % of the estimated direct construction cost. Detailed design and supervision services cost was assumed to be seven (7) % of the estimated construction cost. Administration cost was assumed to be two (2) % of construction cost estimated. Fund sources for land acquisition and compensation would be beared by regional governments. Land acquisition and compensation costs were estimated as shown in the following tables.

Table D-3 Land Acquisition and Compensation Cost of Tj. Bunga - Takalar Road

No.	Item	North Section Makassar, Takalar (M Rp.)	South Section Takalar, Gowa (M Rp.)	Total (M Rp.)
1	Land Acquisition	17,850	18,050	**35,900**
2	Building Compensation	0	0	**0**
Total		17,850	18,050	**35,900**

Source: JICA Study Team estimation

(3) Construction Cost

Based on the unit prices and estimated construction quantities, the project construction cost was estimated at as shown in **Table D-4.**

Table D-4 Construction Cost of the Project

Division No.	Item	North Section (M Rp.)	South Section (M Rp.)	Total (M Rp.)	Percentage
1	General	561	670	1,230	1.8%
2	Drainage	1,320	3,010	4,331	6.3%
3	Earthworks	6,528	5,755	12,283	18.0%
5	Granular Pavement	4,082	5,173	9,256	13.5%
6	Asphalt Pavement	10,549	10,517	21,066	30.8%
6.5	Concrete Pavement	0	1,662	1,662	2.4%
7	Structures	4,638	6,311	10,949	16.0%
8	Reinstatement and Minor Works	705	816	1,522	2.2%
10	Routine Maintenance Works	204	239	443	0.6%
-	Public Utility Relocation	3,737	1,915	5,652	8.3%
Total		32,325	36,068	68,393	100.0%
Physical Contingency (10%)		3,232	3,607	6,839	-
Total of Construction Cost		35,557	39,675	75,233	-
Percentage		47.3%	52.7%	**100.0%**	-

Source: JICA Study Team estimation

(4) Maintenance Cost

Road maintenance activities are generally divided into two categories as listed below.

Routine Maintenance including;

* Inspection and patrol,
* Cleaning of road surface/drainage facilities,
* Trimming/cutting of trees/grass,
* Pothole patching and crack sealing for AC pavement, and
* Minor repairs of miscellaneous facilities.

Periodic Maintenance including;

* Overlay for AC pavement at 5-year interval.

(5) Cost Estimate for the Implementation Plan

The project cost distribution by fiscal year and two contract packaging, North Section (Section A) and South Section (Section B), in accordance with the planned implementation schedule are shown in **Table D-5**.

Table D-5 Cost Distribution for Implementation Schedule

Item	Estimated Amount	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	(M. Rp.)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Section A	**14.0km**																	
Land Acquisition and Compensation	17,850		40.0%	40.0%	20.0%													
Detailed Design and Supervision Services	2,489		24.0%	28.0%	24.0%	24.0%												
Construction	35,557			20.0%	40.0%	40.0%												
Administraition	711		25.0%	25.0%	25.0%	25.0%												
Maintenance Routine																		
Maintenance Overlay per 5 Years																		
Section A	**14.0km**																	
Land Acquisition and Compensation	17,850	0	7,140	7,140	3,570	0	0	0	0	0	0	0	0	0	0	0	0	0
Detailed Design and Supervision Services	2,489	0	597	697	597	597	0	0	0	0	0	0	0	0	0	0	0	0
Construction	35,557	0	0	7,111	14,223	14,223	0	0	0	0	0	0	0	0	0	0	0	0
Administraition	711	0	178	178	178	178	0	0	0	0	0	0	0	0	0	0	0	0
Maintenance	3,711						742	742	742	742	742	742	742	742	742	742	742	742
Maintenance Overlay per 5 Years	4,705										4,705					4,705		
Total	**65,024**	**0**	**7,915**	**15,126**	**18,568**	**14,998**	**742**	**742**	**742**	**742**	**5,447**	**742**	**742**	**742**	**742**	**5,447**	**742**	**742**
	(100%)	**(0.0%)**	**(12.2%)**	**(23.3%)**	**(28.6%)**	**(23.1%)**	**(1.1%)**	**(1.1%)**	**(1.1%)**	**(1.1%)**	**(8.4%)**	**(1.1%)**	**(1.1%)**	**(1.1%)**	**(1.1%)**	**(8.4%)**	**(1.1%)**	**(1.1%)**
Section B	**16.3km**																	
Land Acquisition and Compensation	18,050					25.0%	50.0%	25.0%										
Detailed Design and Supervision Services	2,777					24.0%	28.0%	24.0%	24.0%									
Construction	39,675						20.0%	40.0%	40.0%									
Administraition	794					14.3%	28.6%	28.6%	28.6%									
Maintenance Routine																		
Maintenance Overlay per 5 Years																		
Section B	**16.3km**																	
Land Acquisition and Compensation	18,050	0	0	0	0	4,513	9,025	4,513	0	0	0	0	0	0	0	0	0	0
Detailed Design and Supervision Services	2,777	0	0	0	0	667	778	667	667	0	0	0	0	0	0	0	0	0
Construction	39,675	0	0	0	0	0	7,935	15,870	15,870	0	0	0	0	0	0	0	0	0
Administraition	794	0	0	0	0	113	227	227	227	0	0	0	0	0	0	0	0	0
Maintenance	1,574									787	787	787	787	787	787	787	787	787
Maintenance Overlay per 5 Years	0													4,689				
Total	**62,870**	**0**	**0**	**0**	**0**	**5,292**	**17,964**	**21,276**	**16,763**	**787**	**787**	**787**	**787**	**5,475**	**787**	**787**	**787**	**787**
	(100%)	**(0.0%)**	**(0.0%)**	**(0.0%)**	**(0.0%)**	**(8.4%)**	**(28.6%)**	**(33.8%)**	**(26.7%)**	**(1.3%)**	**(1.3%)**	**(1.3%)**	**(1.3%)**	**(8.7%)**	**(1.3%)**	**(1.3%)**	**(1.3%)**	**(1.3%)**

(6) Economic Evaluation

Economic evaluation of the Tj. Bunga – Takalar Road was carried out with the same methodology and applying the same basic data for benefit estimation as explained in Chapter 9 (Section 9.2). The results of evaluation are summarized in **Table D-6**.

Table D-6 Results of Economic Evaluation

Evaluation Indicators	Value
EIRR (%)	41.4%
NPV (Rp. million) (*)	181,485
B/C (*)	4.18

Source: JICA Study Team
(*): Discount Rate = 15%

The above results indicate that implementation of the Tj. Bunga – Takalar Road is economically very optimistic as values of EIRR is sufficiently higher than the opportunity cost of capital (discount rate) (>15%), positive NPV (>0) and higher B/C ratio than unity (>1).

G-6 IEE for Route Selection

The objective of Initial Environmental Examination (IEE) is conducting an initial impact assessment on the alternative plans of the Tj. Bunga - Takalar Road. IEE has been carried out based on the existing data, the data collected for the F/S roads, and site reconnaissance survey. It evaluates both negative and positive environmental impacts without prejudice. The IEE was conducted in accordance with the JICA guidelines. Multi Criteria Analysis (MCA), which is comprised of engineering, economical and environmental elements (IEE results), is used for

evaluation of the alternatives.

D-7 Implementation Plan

The executing agency will be Praswil South Sulawesi Province as the Tj Bunga – Takalar Road will be upgraded from Kabupaten road to provincial road.

A recommended implementation schedule is as shown in Table D-5. The project is implemented in 2 phases; North Section (Section A) for phase 1 from Jeneberang River Bridge to Galesong and South Section (Section B) for Phase 2 from Galesong to Takalar Town. A series of steps will be required prior to the construction, including EIA (AMDAL), a detailed engineering design review, land acquisition and resettlement.

D-8 Conclusion and Recommendations

1) Floods did not occur at the Jeneberang Rive estuary since the Bili-bili dam was constructed in the early 1990s. A bridge was constructed at the mouth of the Jeneberang River in 2005 and connected Tj.Bunga (GMTDC) and the Jeneberang River south plain. Therefore, development of the south area is unavoidable. An earliest improvement of the Jl.Tj.Bunga – Takalar (Lintas Barat) is recommended to regulate sprawled urban development.

2) This road link constitutes one of the radial roads (south radial road) in the Mamminasata Urban Arterial Road Network System and access to Galesong Port.

   As the road passes Makassar City, Takalar Regency and Gowa Regency through Galesong (local activity center), it is recommended to upgrade road status from Kabupaten road to provincial road.

2) The economic analysis justified that the project is highly fairly feasible as EIRR is 41.4% and the project will support various regional development plans in the south Jeneberang River and Galesong Port.

3) As the project road is an alternative route between Takalar and Makassar, it will contribute reducing traffic jam at the Sungguminasa Area. As rapid inclement of traffic demand on the Tj. Bunga – Takalar road is forecasted, the project is recommended to implement in the short term.

4) Stage construction approach should be taken. The recommend road improvement is widening of the existing 4.5 m road to 7.0m carriageway, except dense residential section. However, ROW should be secured or development restriction should be made for the Mamminasa Bypass/ Outer Ring Road Section for 4 lanes widening in the future.

5) EIA (AMDAL) should be conducted prior to the project implementation in accordance with relevant laws and regulations.