8.5.4 Selection of the Priority Sections

1) General

Prior to selection of the priority section of each axis, each corridor is divided into the following potential segments.

- East-West Axis : inside and outside of JORR
- North-South Axis : inside and outside of S-W Arc

The above-mentioned segmentation is set, considering such a reciprocal relationship as it will enable to absorb increase of demand and it will attain to desirable urbanization.

The evaluation is made based on the following criteria;

i) Consistency and inevitability on the realization of future arterial and tollway networks

ii) Inducement and stimulation to a desirable urbanization brought about the impact of road development

iii) Technical feasibility of project implementation

iv) Possibility of appropriation of fund

2) East-West Axis

Both Regional Planning Boards of Kabupatens and Kotamadya of Tangerang and Bekasi are now preparing their new structure plan which will be governed by the Jabotabek Metropolitan Development Plan Review.

The third planning report of the JMDPR primitively delineates a future arterial and tollway network in Jabotabek as a schematic level. Further, scheduled to be implemented in the third stage and Bina Marga has the plan to improve the existing primary collector roads of Bekasi Bypass and Jl. Raya Serpong in Tangerang.

On the contrary, DKI Jakarta has the structure plan and DPU intensively is implementing their improvement plans, such as widening of arterial roads and construction of new links and flyover.

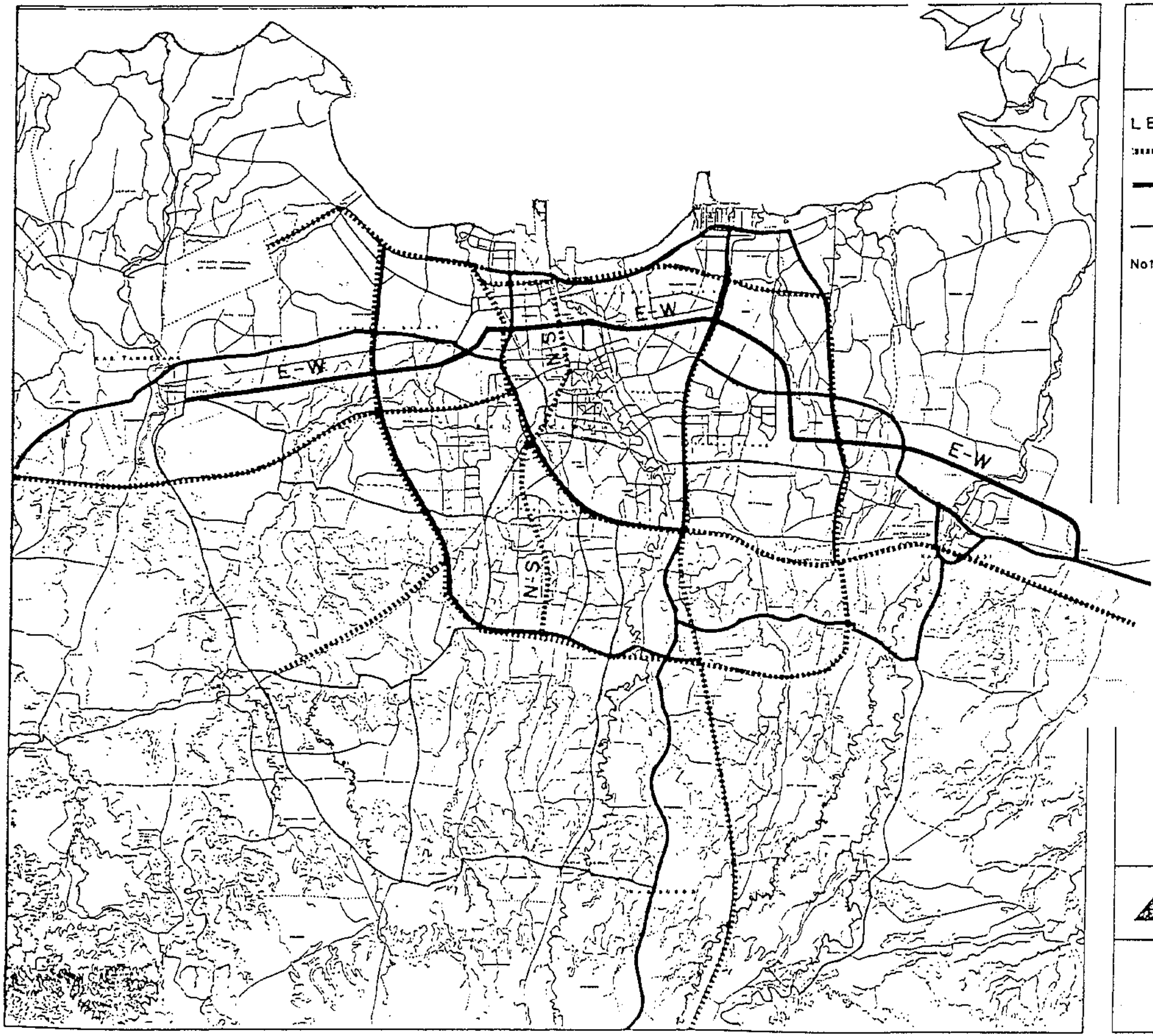
Therefore, it is obvious that the necessity of East-West Axis inside of JORR is superior and it will facilitate to made collaboration with DKI Jakarta structure plan 2005.

3) North-South Axis

Traffic volume on the corridor of S-W Arc demonstrates a sharp growth after the Jakarta Intra Urban Tollway has been developed. Simultaneously, number of office and buildings have been built along Jl. Gatot Subroto. Thus, land availability is found very limited to form an additional interchange with S-W Arc or Jl. Gatot Subroto, and it will be marginally possible to pass over this thoroughfare from technical view points.

Accordingly, it is sure that the priority should be given to the whole stretch so as to make the implementation of N-S Axis practical.

Fig. 8.5.6
PROPOSED PRIMARY ROAD NETWORK IN JABOTABEK



LEGEND:

- FREEWAY (TOLL)
- PRIMARY ARTERIAL ROAD
- PRIMARY COLLECTOR ROAD

Note. Please refer to Proposed Road Network in Jakarta within Jakarta Intra Urban Tollway.

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CHAPTER 9 ALTERNATIVE ROUTE STUDY

CHAPTER 9 ALTERNATIVE ROUTE STUDY

9.1 Basic Design Concept

The alternative route study is conducted to identify the optimum route in the selected optimum corridor within the priority sections. The preliminary engineering designs for the feasibility study are carried out along the selected routes based on the following design standard.

9.1.1 Design Standard

1) General

The design standard mainly consists of the following four standards :

- Geometric Design Standard;
- Design Standard for Highway Bridges and Structures;
- Pavement Design Standard; and
- Drainage Design Standard.

These design standards which are to be based on existing standards prepared by the Directorate General of Highways (Bina Marga), Ministry of Public Works are all related to technical feasibility as well as the cost estimates of the project at this preliminary engineering stage. However, since technical feasibility (such as in order to pass strict controls to determine required land at interchange and so forth), relies considerably on the geometric and structural design standard, only the said design is discussed in detail at this stage to clarify the type of project roads and to examine its technical feasibility.

2) Geometric Design Standard

(1) Design Controls

Since the geometric design standards of each classified road must reflect the desired goals identified by Bina Marga. It is preferable to apply uniformed standards.

Bina Marga has already prepared the following geometric design standards, i.e. :

- Standard Specifications for Geometric Design of Rural Highway in 1970;
- Standard Specifications for Geometric Design of Expressway and Freeway in 1976;
- Standard Specifications for Geometric Design of Urban Roads in 1992.

The recommended geometric design standards for throughway of freeway and arterial road and ramps at interchanges are described below.

(a) Road Classification

The recommended category of each project road is shown in Table 9.1.1.

Table 9.1.1 Category of Project Roads

Project Road	Design Classification			
	Area	Terrain	Type	Class
North-South Axis	Urban	Flat	I	II
East-West Axis	Urban	Flat	II	I

(2) Design Vehicles

The physical characteristics of vehicles and the proportions of variously sized vehicles using the roads are positive controls in geometric design. Design vehicles are selected motor vehicles with the weight, dimensions and operating characteristics used to establish highway design controls for accommodating vehicles of designated classes. For purposes of geometric design, each design vehicle has larger physical dimensions and smaller minimum turning radius than all vehicles in its class.

The designation of design vehicle for each road component is made considering the future landuse along the corridor of each road and the characteristics of future traffic.

Project Road	Design Vehicle	Symbol
North-south Axis	Semi trailer Combination	ST
East-West Axis	Semi trailer Combination	ST

(3) Design Speed

Design speed is the maximum safe speed that can be maintained over a specified section of road. The design speed selected will directly affect many geometric elements, i.e. horizontal and vertical alignments, sight distance, provision of superelevation, etc. Other features such as carriageway width and roadside clearances are also influenced by design speed but to a lesser degree.

(a) Throughway

Design speeds of relevant expressway and highway which will be connected to the project roads are assumed as follows :

Relevant Roads Connected to Project Road	Classification	Design Speed (km/h)
Jakarta Outer Ring Road	Freeway (Type-I Class-I)	100
South-West Arc	Freeway (Type-I Class-II)	80
North-South Link	Freeway (Type-I Class-II)	80

The recommended design speed of each project road is established by considering the road category, topography and landuse of area and the design speed of relevant roads. The recommended design speeds are shown in Table 9.1.2.

Table 9.1.2 Recommended Design Speed

Project Roads	Design Speed (km/h)
North-South Axis	80
East-West Axis	60

(b) Ramp at Interchange

AASHTO standard, 1984 recommends the following ramp design speeds :

Design Speed of Throughway	80 km/h
Ramp Design Speed	
- Upper range (85%)	68 km/h
- Middle range (70%)	56 km/h
- Lower range (50%)	40 km/h
Minimum Design Speed by Type of Ramp	
- Loops and diagonal	40 km/h
- Semidirect connection	48 km/h
- Direct connection	56 km/h

Semidirect ramps are usually adopted for expressway-to-expressway interchange (hereinafter referred to as "junction") and loops or diagonal ramps are often adopted for expressway-to-highway interchange (hereinafter referred to as "interchange"). Design speeds of 50 km/h and 40 km/h for junctions and interchanges respectively are adopted considering the availability of Right-of-Way (ROW) as well as the economical and functional viewpoints.

(4) Geometric Design Standards

The following geometric design standards are taken into account for the study.

Table 9.1.3 Geometric Design Standard for Throughway of North-South Axis

Item	Unit	Design Standard
Design Speed	km/h	80
Lane Width	m	3.50
Outer Shoulder Width	m	2.0 (1.5)
Inner Shoulder Width	m	0.75
Crossfall of Traveled Way	%	2.0
Crossfall of Outer Shoulder	%	4 (2.0)
Crossfall of Inner Shoulder	%	2.0
Type of Pavement	-	Asphalt Concrete
Maximum Superelevation	%	10
Minimum Radius	m	230
Maximum Gradient	%	4,7 *
Stopping Sight Distance	m	110

* absolute value
( ) values for bridge section

Table 9.1.4 Geometric Design Standard for Throughway of East-West Axis

Item	Unit	Design Standard
Design Speed	km/h	60
Lane Width	m	3.50
Outer Shoulder Width	m	2.0 (1.5)
Inner Shoulder Width	m	0.75
Crossfall of Traveled Way	%	2.0
Crossfall of Outer Shoulder	%	4.0 (2.0)
Crossfall of Inner Shoulder	%	2.0
Type of Pavement	-	Asphalt Concrete
Maximum Superelevation	%	6
Minimum Radius	m	150
Maximum Gradient	%	7,10 *
Stopping Sight Distance	m	45

* absolute value
( ) values for bridge section

Table 9.1.5 Geometric Design Standard for Ramp of Junction

Item	Unit	Design Standard
Design Speed	km/h	50
Lane Width	m	3.50
Outer Shoulder Width -		
One Lane	m	2.0
Two Lanes	m	0.75
Inner Shoulder Width	m	0.75
Crossfall of Traveled Way	%	2.0
Crossfall of Outer Shoulder	%	2.0
Crossfall of Inner Shoulder	%	2.0
Type of Pavement	-	Asphalt Concrete
Maximum Superelevation	%	10
Minimum Radius	m	80
Maximum Gradient	%	6, 9 *
Stopping Sight Distance	m	55

* absolute value
( ) values for bridge section

Table 9.1.6 Geometric Design Standard for Ramp of Interchange

Item	Unit	Design Standard
Design Speed	km/h	40
Lane Width	m	3.50
Outer Shoulder Width -	m	
One Lane		2.0
Two lanes		0.75
Inner Shoulder Width	m	0.75
Crossfall of Traveled Way	%	2.0
Crossfall of Outer Shoulder -	%	
One Lane		4 (2.0)
Two Lanes		2.0
Crossfall of Inner Shoulder	%	2.0
Type of Pavement	-	Asphalt Concrete
Maximum Superelevation	%	10
Minimum Radius	m	50
Maximum Gradient	%	7, 10 *
Stopping Sight Distance	m	40

* absolute value
( ) values for bridge section

(5) Type of Pavement

A rigid type pavement is suitable to adopt generally for high standard roads in earthwork section such as expressways and highways. This type meets the adverse subsurface soil and hydrological conditions. A rigid type pavement also has an advantage to prevent damage to the pavement at a toll gate caused by oil and repeated wheel loads in regulated paths at toll booths.

An asphaltic concrete surface course shall be placed on the concrete slab on viaduct to keep smooth profile and ensure rider's comfort.

A flexible type pavement is recommended to adopt to an arterial road and frontage road. This type meets the policy to utilize the existing pavement as much as possible as a component of the total structure of pavement where overlay method is applied.

(6) Crossfall of Carriageway and Shoulder

Considering the advantage in rapidly draining the pavement during rainstorms, a crossfall of 2.0% is adopted as a standard on expressway/ramp and other roads.

Normal crown arrangement is applied to the roads except at sections on bridges that require a good appearance from the side. Normally, no drainage pipes are to be located outside the bridge in maintaining a good aesthetic view. This is achieved by reversing the normal crossfall and providing drainage facilities on the inner sides of the two bridges.

A crossfall of 4% is adopted for the treated outer shoulders of expressway/ramp on embankment in order to use them effectively for surface rain water flow.

(7) Lane Width and Marginal Strip

(a) Lane width and Marginal strip of Expressway and Ramp

To accommodate desirable clearance between vehicles running in parallel or passing at a design speed of 80 km/h or more, a 3.50 m lane width is recommended considering a maximum vehicle width of 2.50 m.

0.50 m marginal strips on both sides of carriageway is also recommended to make the edge of carriageway obvious and to increase the safety and comfort to drivers.

(b) Lane Width of Frontage Road

A 3.25 m lane width is practicable due to a rather low design speed of 60 km/h, but a marginal strip of 0.5 m on both sides of carriageway is still required.

(8) Shoulders

(a) Shoulder Width of the Throughway

Considering the functions of the shoulder, as well as land acquisition condition and service level of expressway and highway, 2.0 m outer shoulders and 0.75 m inner shoulders are recommended in this study. In viaduct and bridge, of length more than 100 m, the effective outer shoulder may be reduced to 1.5 m wide.

(b) Shoulder Width of Ramps

The same shoulder widths as in expressways and highways are adopted to one lane one way ramp because in the one lane one way ramp, semi-trailer can manage to pass by even if a truck stops or parks on the left side of carriageway. However, a reduced width of 0.75 m for outer shoulder for 2-lane one way ramp is recommended from an economical viewpoint.

(9) Medians

The median width is expressed as the dimension between the through-lane edges and includes the inner shoulders, if any. The principal functions of a median are as follows :

(a) to provide the desirable freedom from the interference of opposing traffic;

(b) to minimize headlight glare;

(c) to provide open green space;

(d) to provide space for pier construction of grade-separation structures;

(e) to provide space for speed change and storage of right-turning and u-turning vehicles; and

(f) to provide a reserved width for future lanes.

A standard median of 3 m wide for North-South Axis and a standard median of 4 m wide with 3 m being raised for East-West Axis respectively are recommended.

(10) Outer Separation, Borders and Frontage Roads

The outer separation is the area between the through-carriageway and a frontage road. The border is the area between the through-carriageway or a frontage road and the right-of-way.

Frontage roads are often required to maintain local service and to collect and distribute ramp traffic entering and leaving the access-controlled highway/ expressway. The outer separation or border provides side slopes, drainage, quardrails, lighting standards, signs, planting space, access control faces, retaining wall or stone masonry, cycle tracks, ramps and toll gates, if any. The outer separation or border may also provide for noise abatement measures in sensitive areas.

In East-West Axis, an outer separation of 10 m wide is recommended to provide buffer zone between the highway and the adjacent area and to accommodate a high standard of ramp design.

Therefore, the exclusive cycle track is recommended to be provided to East-West Axis as a high rate and volume of motorcycles heading towards Jakarta is forecasted. However, in the vicinity of at-grade intersection, motorcycles should be merged with other traffic because the channelised at-grade intersection aims at decreasing conflicting points to keep safety and traffic capacity. Consequently, no cycle track will be provided if some at-grade intersections are located successively in short distance. Since the North South Axis is designated as a part of bypass to connect Kota with Jakarta Outer Ring Road, the number of motorcycles will be negligible. Motorcyclists will be restricted and be forced to use a public road from the economic viewpoint.

(11) Horizontal and Vertical Clearances

(a) Horizontal Clearance

Each case of horizontal clearance limit illustrated in Figure 9.1.1 indicates at least 0.25 m additional clearance beyond the outer edge of the shoulder except in the case where a 2.0 m width outer shoulder is provided.

(b) Vertical Clearance

As shown in Figure 9.1.1, 5.1 m headroom including future resurfacings is applicable for high standard roads.

(c) Horizontal and Vertical Clearance for Railway

The minimum horizontal and vertical clearance at electrified railway crossing is shown in Fig. 9.1.2.

(12) Typical Cross Section

The tentative typical cross sections are presented based on the recommended design standards.

Figure 9.1.3 thru 9.1.6 shows the proposed typical cross section for North-South Axis.

The East-West Axis is proposed to be built as shown in Figures 9.1.7 thru 9.1.10.

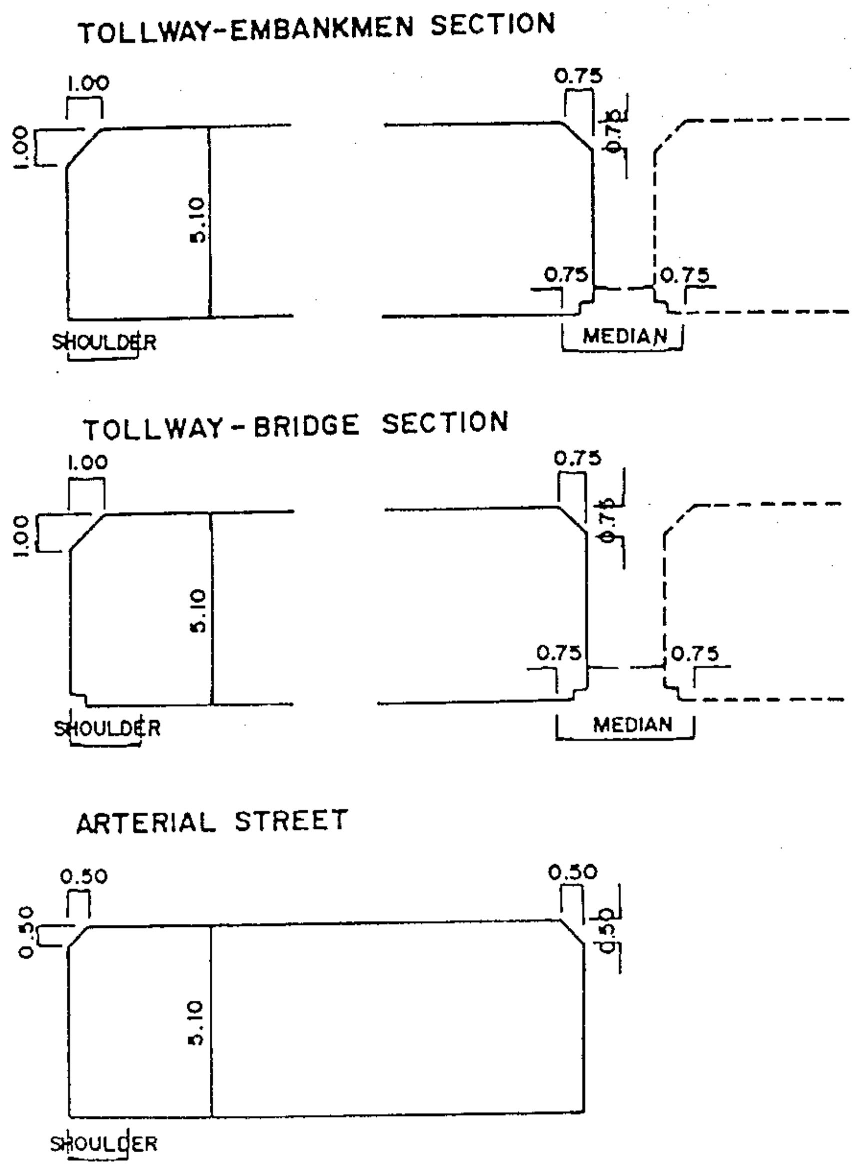
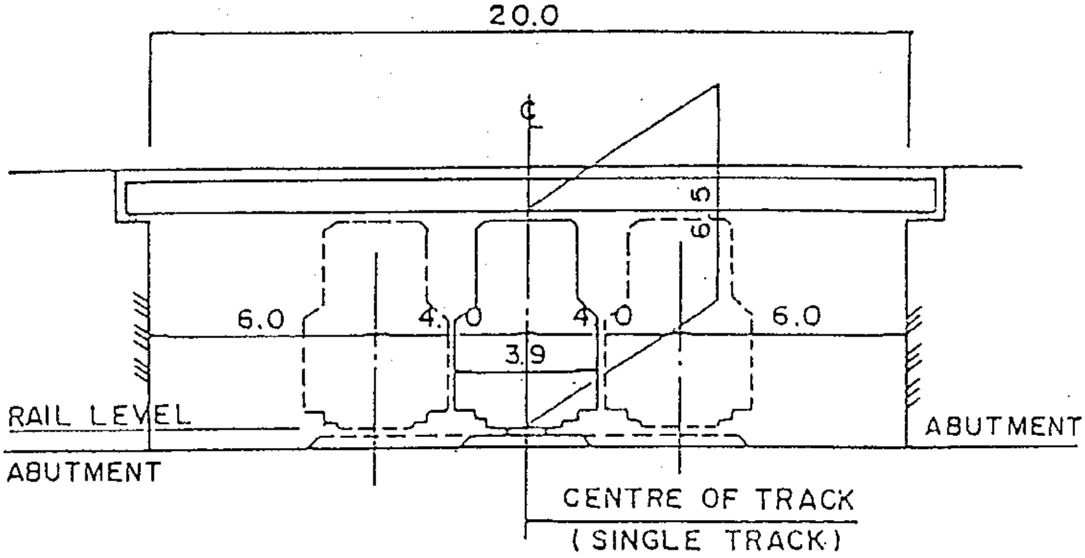
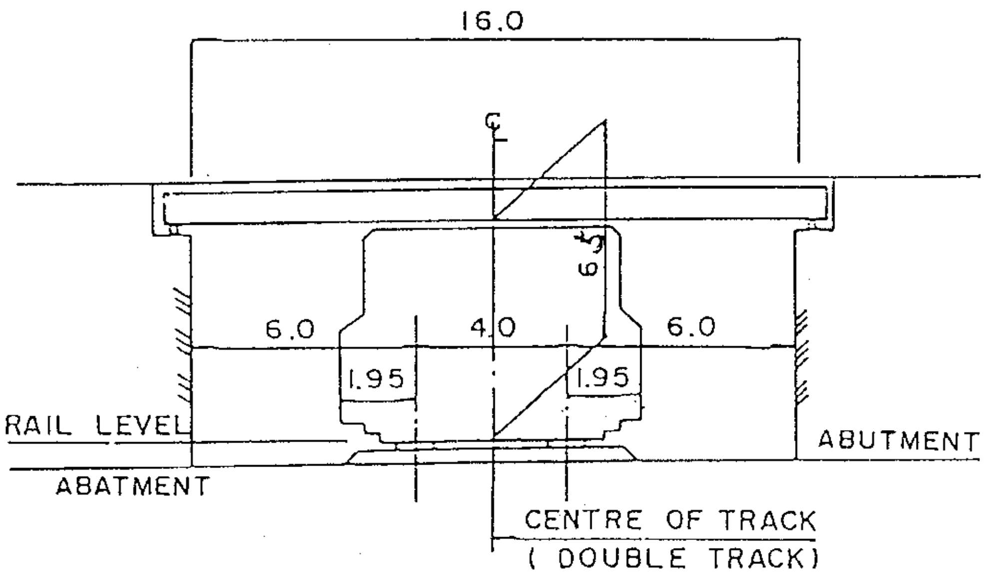


Fig. 9.1.1 Clearance Limits

FOR EXISTING SINGLE TRACK
(FUTURE DOUBLE TRACK)



FOR EXISTING DOUBLE TRACK



Unit : m

Fig. 9.1.2 Minimum Clearance at Railway Crossing

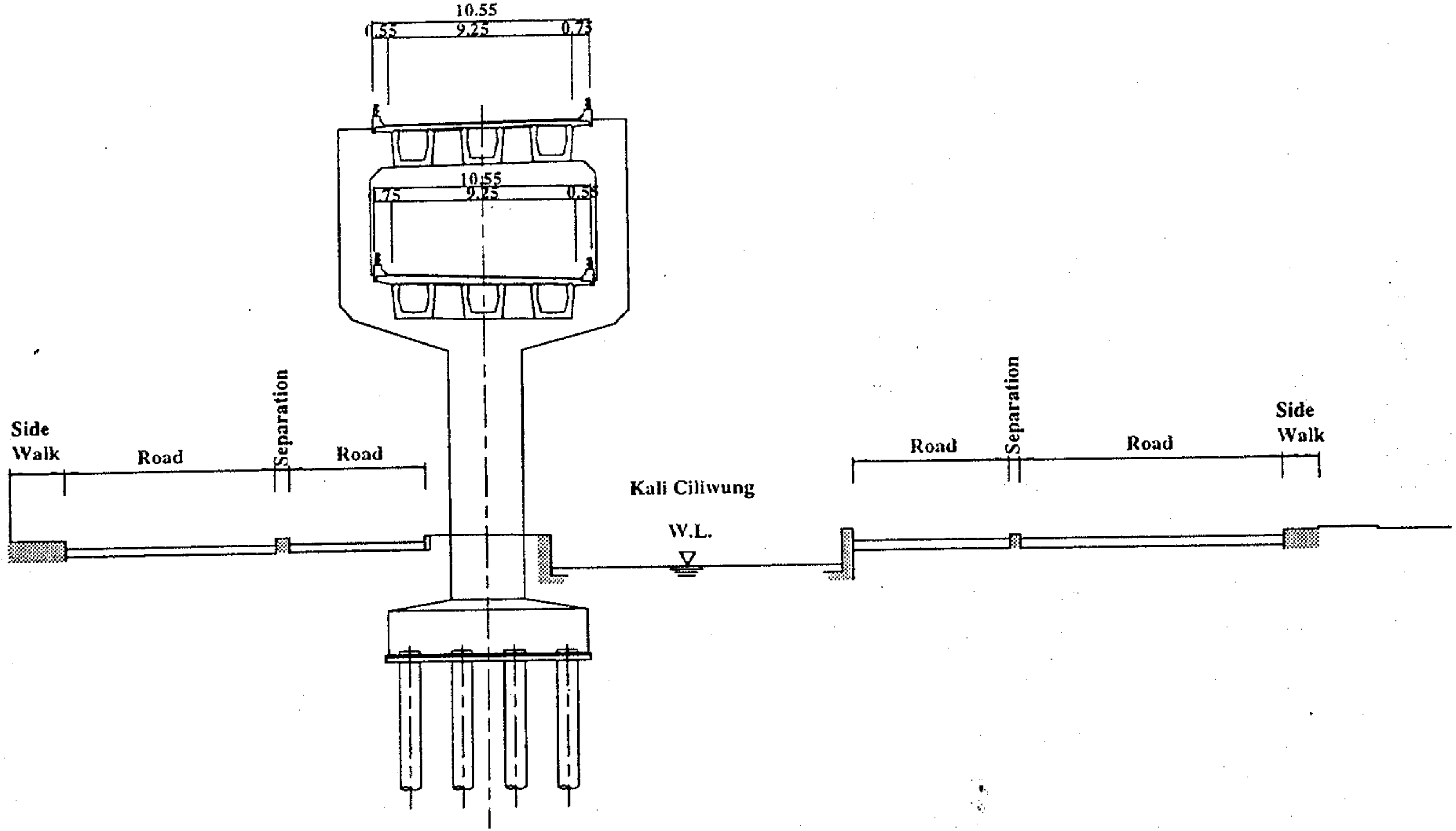


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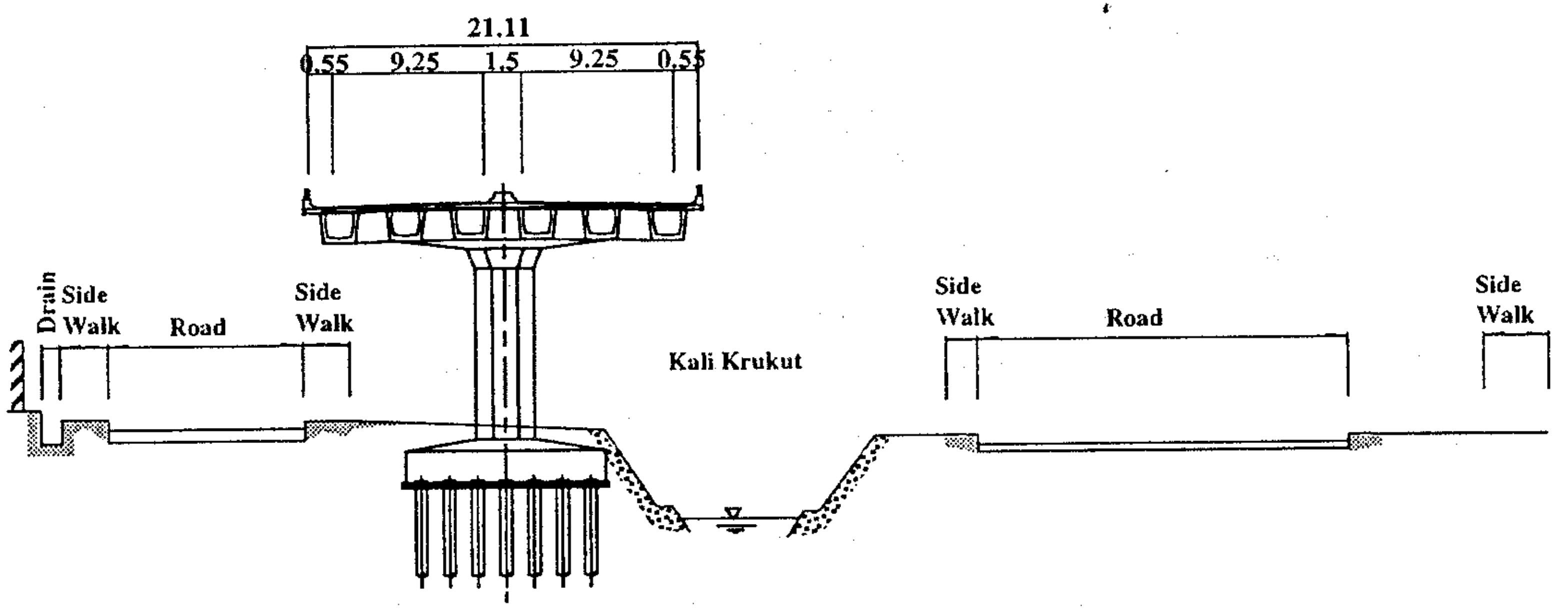
Fig. 9.1.3 Typical Cross Section for the North - South Axis
(4-lane, Double Deck with Racket Type Pier)



FEASIBILITY STUDY ON URBAN ARTERIAL ROAD SYSTEM DEVELOPMENT PROJECT IN JAKARTA METROPOLITAN AREA	Fig. 9.1.4 Typical Cross Section for the North - South Axis (4-lane, Single Deck)

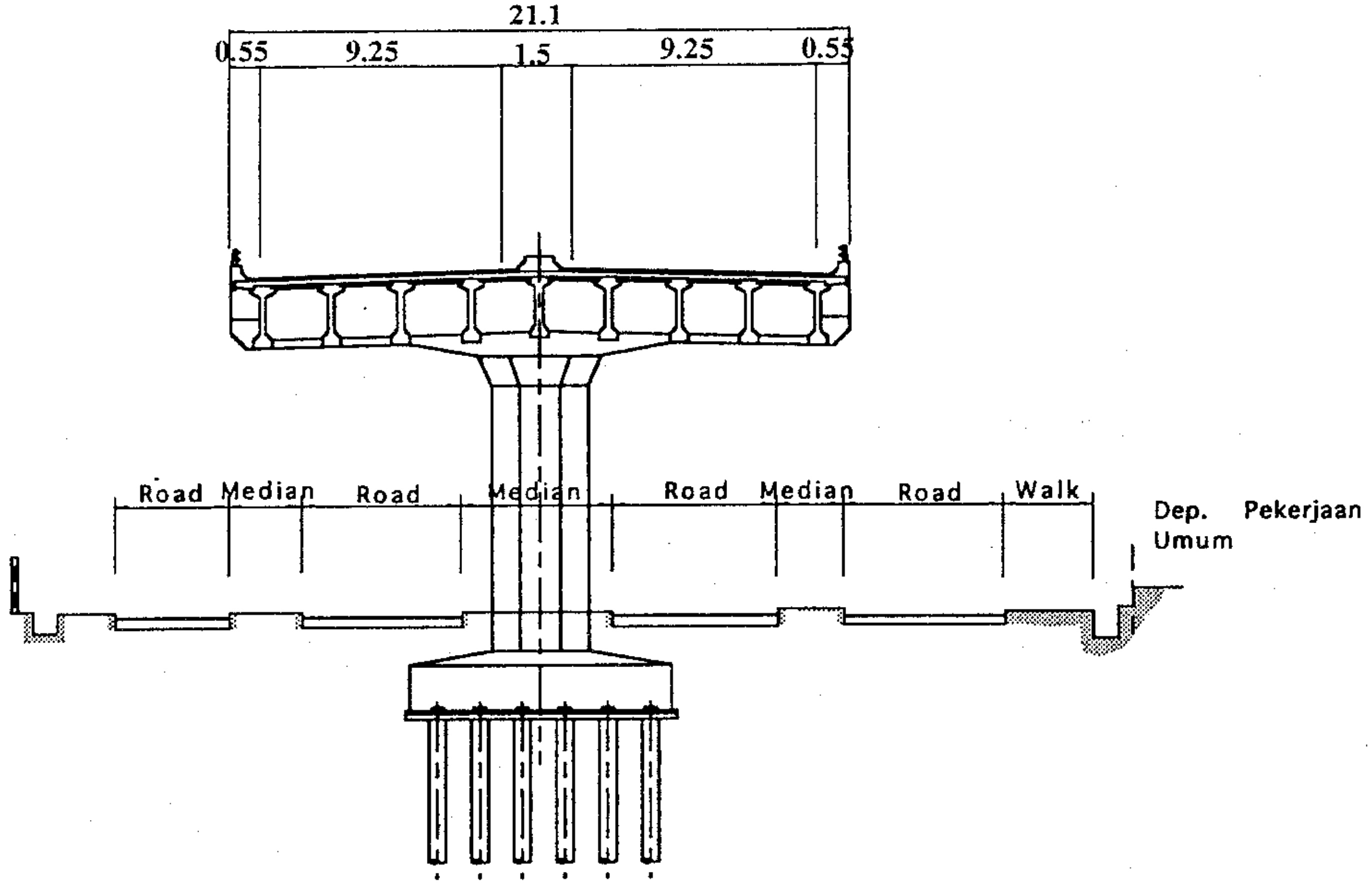


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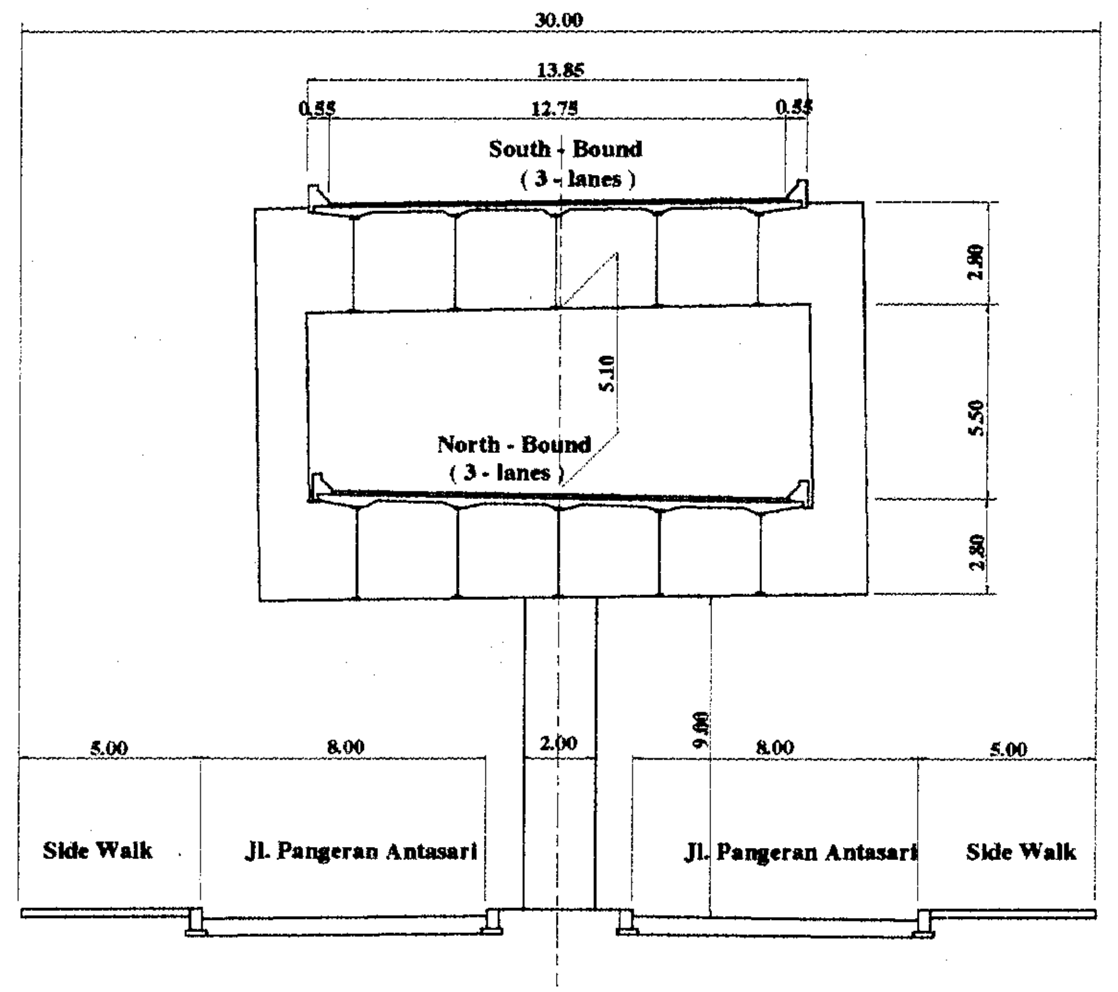
Fig. 9.1.5 Typical Cross Section for the North - South Axis
(6-lane, Single Deck)



FEASIBILITY STUDY ON URBAN ARTERIAL ROAD SYSTEM DEVELOPMENT PROJECT IN JAKARTA METROPOLITAN AREA	Fig. 9.1.6 Typical Cross Section for the North - South Axis (6-lane, Double Deck with Racket Type Pier)

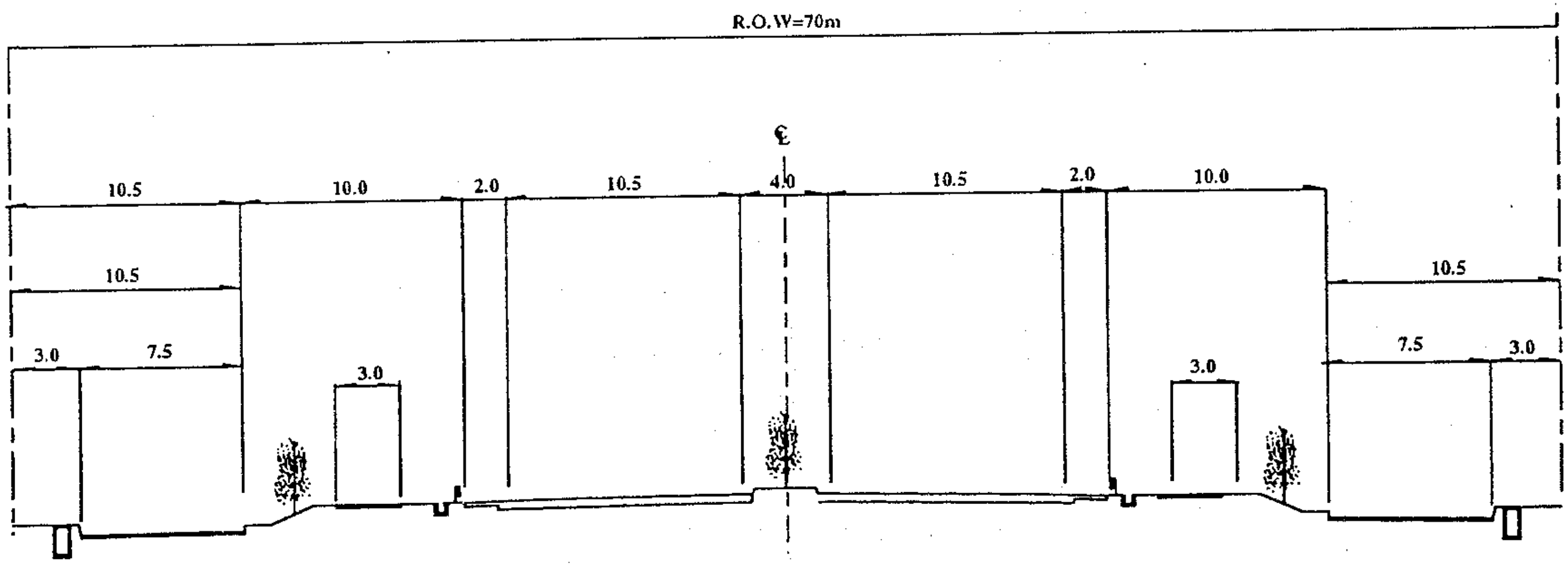


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Fig. 9.1.7 Typical Cross Section for the East - West Axis
(ROW = 70 m, 10-lane At-grade)

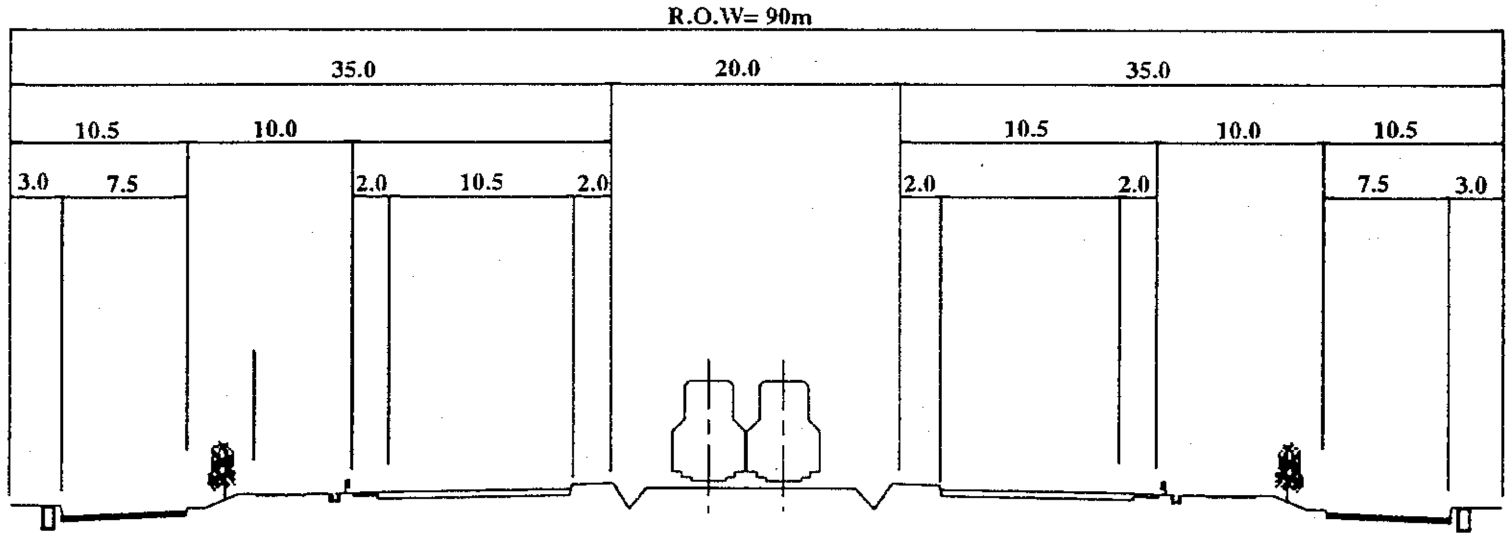

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Fig. 9.1.8 Typical Cross Section for the East - West Axis
(ROW = 70 m, Along Railway)

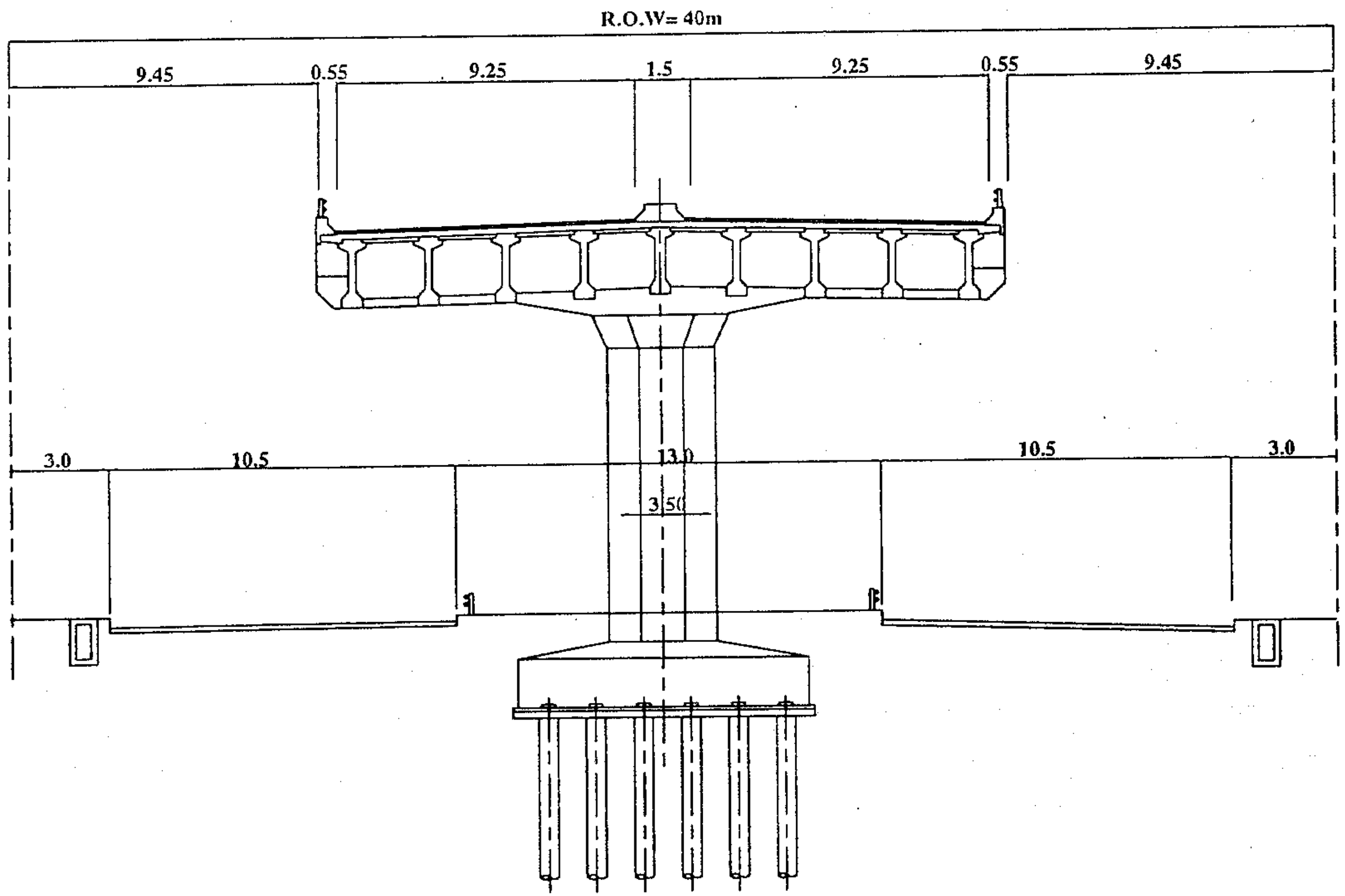

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Fig. 9.1.9 Typical Cross Section for the East - West Axis
(ROW = 40 m, 6-lane At-grade and 4-lane Viaduct)

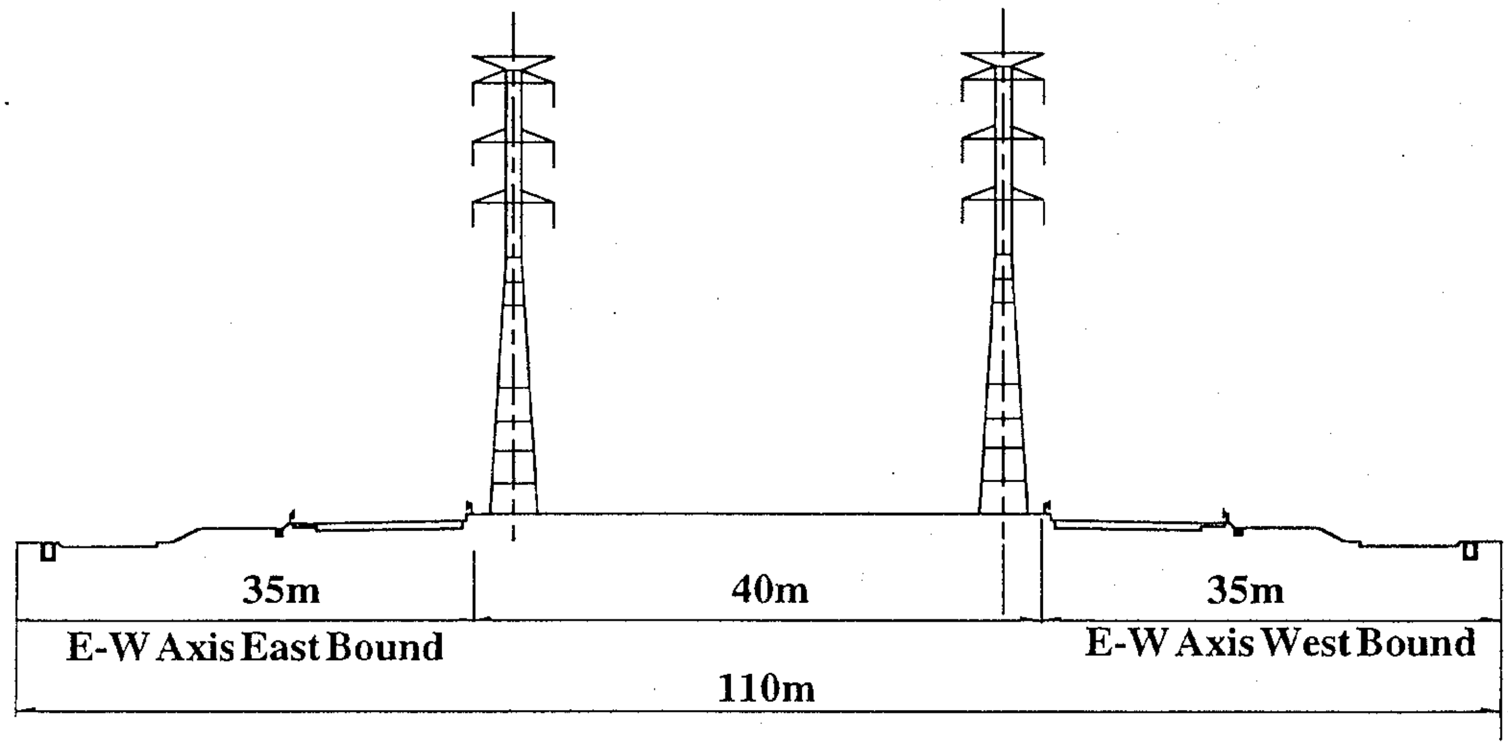

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Fig. 9.1.10 Typical Cross Section for the East - West Axis
(ROW = 70 m, Along High Voltage Transmission Line)

3) Bridge Design Standard

(1) Loading Specifications

The "Loading Specifications for Highway Bridges (No. 12/1970)", published by Bina Marga in March 1970, was revised in February 1988 (the "Loading Specifications for Highway Bridge Design") and this together with the following addenda are currently in use in Indonesia.

- General Explanation and Interim Guide for Using Loading Specifications for Highway Bridges (No. 12/1970), 1974, by Bina Marga;

- Explanation and Supplemental Specifications of Loading Standard for Highway Bridges (No. 12/1970), February 1977, by Bina Marga; and

- Revision to Loading Specifications, 1980, Bina Marga, Draft.

The bridge design in the Project will be executed based on these specifications, more specifically, the following loads and are to be applied in computing the stresses;

- Primary Loads
- Secondary Loads
- Special Loads

Bina Marga intends to modify the above loading specifications to reflect recent changes of variables (i.e. axle load limit, etc.) and review of the present loading specifications together with the formulation of bridge design notes is under way. For requirements of design not covered by the above specifications, AASHTO or Japanese Specifications for Highway Bridges and Pedestrian Bridges will be applied.

(2) Primary Loads

(a) Loading Classifications

Class I Loading, 100% "T" Load and 100% "D Load (BM-SPC, 1977) will be applied.

(b) Application of "D" Loading

The reduction in "D" load intensity is illustrated in Fig. 9.2.11 for computing the maximum positive and negative bending moments due to "D" load on a continuous beam with multi-supports, the loading is as illustrated in Fig. 9.2.12. Only one (1) line load shall be applied to each bridge.

(c) Sidewalk Loading

Sidewalk floors are designed for a live load of 500 kg/cm². However girders and other members are designed for a live load of 300 kg/m².

(d) Impact

To provide the dynamic strength and vibration influence, stresses produced by the "D" loading shall be multiplied by an impact coefficient. The impact coefficient is applied only to the line load P = 12 ton per load lane width (2.75 m). "T" loading and uniform load "q" of "D" loading are not applied for impact.

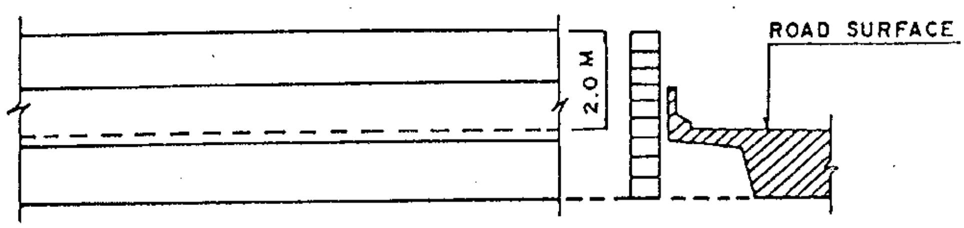
(e) Load Distribution

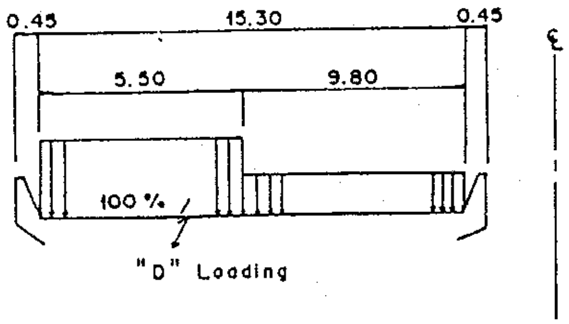
The load distribution shall be calculated by the orthotropic plate or grid girder method whenever detailed structural analysis is necessary.

(3) Secondary Loads

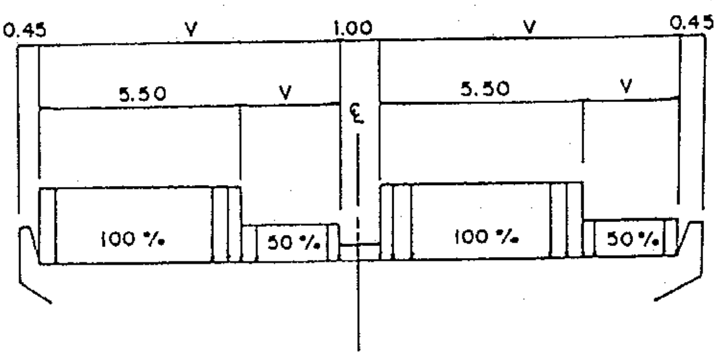
(a) Wind Load

- 100 kg/m² wind load will be applied to the vertical exposed area
- When consideration of the wind load on vehicles is necessary, such additional exposed area is determined in accordance with the following condition (BM-SPC, 1988) :

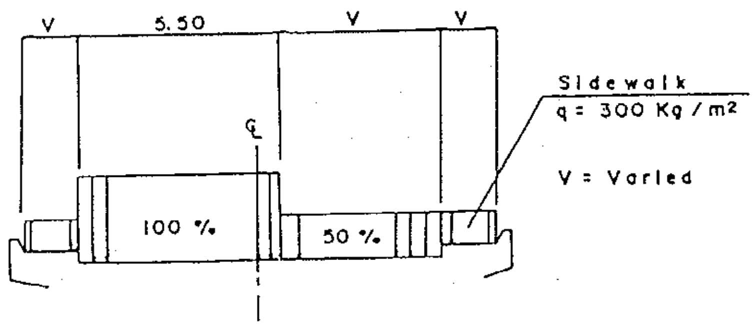




THROUGHWAY BRIDGE



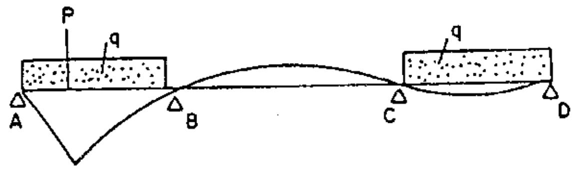
OVERBRIDGE (WITH MEDIAN)



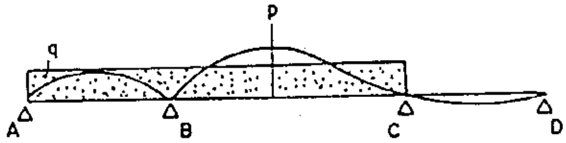
OVERBRIDGE (MITHOUT MEDIAN)

Fig. 9.1.11 Reduction of "D" Loading

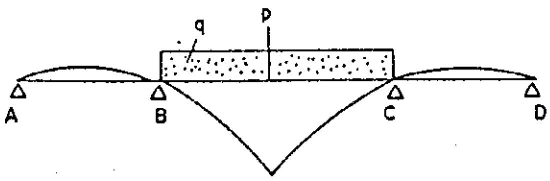
At Side Span



At Support B



At Center Span



Note : P denotes Line Load and q denotes Uniform Load

Fig. 9.1.12 Loading for Maximum Positive and Negative Bending Moment

(b) Thermal Forces

The assumed ambient temperature for design purposes is 28°C. Steel structures will be checked for a temperature variation of 30°C and concrete structures for a variation of 15°C.

(c) Brake and Traction

Provision will be made for the effect of a longitudinal force of five percent (5%) of the "D" loading, without impact, for all lanes carrying traffic headed in the same direction. All lanes will be considered as loaded for bridges likely to become one directional in the future. The longitudinal force will be assumed to be located 1.80 meters above the bridge surface (BM-SPC, 1988).

(d) Earthquake Forces

The earthquake forces on the bridge are to be computed according to "Buku Petunjuk Perencanaan Tahan Gempa Untuk Jembatan Jalan Raya 1986) published by the Road Research Centre of the Ministry of Public Works.

The horizontal seismic coefficient Kh shall be calculated based on the Sub-section 2.2 of the "Manual of Earthquake Resistant Design for Highway Bridges, 1986", hereinafter called the "Manual".

Horizontal Seismic Coefficient (Kh)

Kh value is calculated by the following formula.

$$Kh = Kr \cdot f \cdot k \cdot b$$

where,

Kr : Combined Response Coefficient

f : 1.00 (superstructure and substructure are not in an unity)

k : 1.00 (bridges in urban roadway)

b : 1.00 (reinforced concrete)

Combined Response Coefficient (Kr)

Kr value is determined by the Period of Natural Vibration (Tg), Seismic Zone and Soil Condition.

i) Seismic Zone Number
The Seismic Zone Number for Jakarta is 4. (by the "Manual")

ii) Soil Condition
The Soil Condition is (b) and (c) at Table 2-a of the "Manual". The thickness of sedimentary (alluvial) layers greater than twenty five

iii) Period of Natural Vibration (Tg)

Tg value is calculated by the following formula for the structural type of bridge as a simple beam.

$$Tg = 2\pi \sqrt{\frac{0.3\,Mp + Ma}{3\,E\,I\,g}\,h^3}$$

where,

Mp	:	Weight of pier (Ton)
Ma	:	Weight of superstructure (Ton)
E	:	Modules of Elasticity of concrete (2.95×10^6 Ton/m^2)
I	:	Moment of Inertia of pier (m^4)
g	:	Gravitational acceleration (9.8 m/sec^2)
h	:	Height of pier (m)

iv) Combined Response Coefficient (Kr)

Kr value is determined with the figure in Table 2-a of the "Manual" as follows:

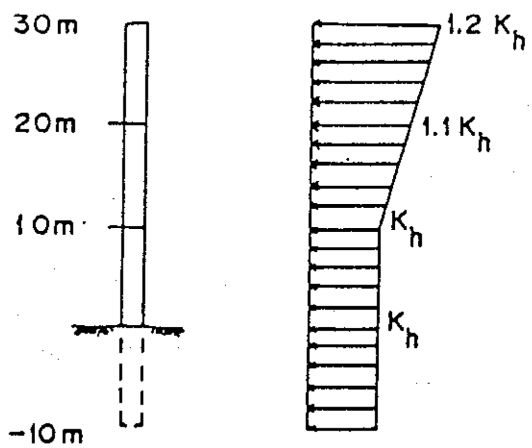
Soil Condition (b)

$Tg < 0.4$ second	$Kr = 0.15$
$0.4 < Tg < 0.75$ second	$Kr = 0.207 - 0.143\ Tg$
$Tg > 0.75$ second	$Kr = 0.10$

Soil Condition (c)

$Tg < 0.6$ second	$Kr = 0.15$
$0.6 < Tg < 0.95$ second	$Kr = 0.236 - 0.143\ Tg$
$Tg > 0.95$ second	$Kr = 0.10$

Distribution of Kh along the substructure height as follow.



(e) Longitudinal Forces induced by Friction at movable bearings

The friction forces shall be considered as induced by the dead load only and the following friction coefficients shall be used.

- Roller bearing in steel	
i) With 1 or 2 rollers	0.01
ii) With 3 or more rollers	0.05
- Friction bearing	
i) Between steel and copper alloy steel	0.15
ii) Between steel and cast iron	0.25
iii) Between rubber pad and steel/concrete	0.15 - 0.18

4) Special Loads

(a) Centrifugal Forces

Structures on curves will be designed for a horizontal centrifugal force equal to a percentage of the "D" loading, without impact, in all traffic lanes. The centrifugal force shall be applied 1.80 meters above the bridge floor and be determined by the following formula (BM-SPC, 1988) :

$$S = 0.79 \frac{V^2}{R}$$

Where
S : The centrifugal force percentage of "D" loading without impact (%)
V : The design speed in kilometers per hour (Kz/hr)
R : The radius of the curve in meters (m)

(b) Collision Force

To calculate the collision forces on a pier due to a vehicle, each of the following two horizontal collision force criteria will be applied (BM-SPC, 1988).

- Longitudinal to the traffic lane : 100 ton
- At 90 degrees to the traffic lane : 50 ton

The collision forces are considered as being applied at a height of 1.20 meters above the roadway surface.

All piers and other members of the structure which are subject to forces caused by flowing water shall be designed to resist the maximum stresses induced thereby. The effect of flowing water on piers shall be calculated by the following formula :

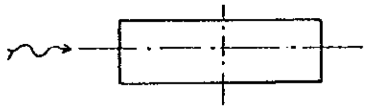
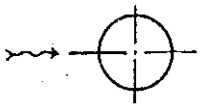
$$pa = k \times va^2$$

Where

pa = flowing water pressure (ton/m²)

va = velocity of water in accordance with hydraulic analysis (m/sec.)

k = coefficient depending on the shape of the pier which is determined from the following table :

Shape of Pier	Shaper of Pier	k
Square section		0.075
Angle end < 30°		0.025
Circular section		0.035

The forces induced by floating materials shall be determined from the result of site research. The force induced by navigational traffic shall be determined by special consideration.

(5) Other Design Loadings

For other design loadings relevant specifications of Bina Marga will be applied. For those aspects of loading details not covered by the specifications of Bina Marga, the following specifications will be referred to :

- Specifications for Highway Bridge, Japan
- Standard Specifications for Highway Bridges adopted by the American Association of State Highway and Transportation Officials (ASTHMA).

(6) Combination of Loads

The members of the roadway bridge structure shall be designed to withstand all groups of the combination of possible working loads and forces. In accordance with the loading possibilities and characteristics of each stress combination under consideration, the allowable stresses of the structure may be increased.

The applicable stresses, expressed as a percentage of the allowable stresses for some combinations of loads and forces, are as follows :

Combination of loads/forces		The applicable stresses expressed as a percentage of the allowable stresses.
I.	M + (H + K) + Ta + Tu	100 %
II.	M + Ta + Ah + F + A + SR + Tm	125 %
III.	Comb. (I) + Rm + F + A + SR + Tm + S	140 %
IV.	M + Gh + Tag + F + AHg + Tu	150 %
V.	M + Pl	130 %
VI.	M + (H = K) + Ta + S + Tb	150 %

Where :

A : Wind load
Ah : Water flow & floating materials forces
AHg : Water flow & floating material forces due to earthquakes
F : Friction force at expansion bearing
Gh : Equivalent horizontal force due to earthquakes
(H+K) : Live load with impact
M : Dead load
Pl : Forces during construction
Pm : Braking force
S : Centrifugal force
SR : Shrinkage force & creep
Tm : Thermal force
Ta : Earth pressure
Tag : Earth pressure due to earthquakes
Tb : Collision force
Tu : Buoyancy

7) Materials and Basic Strengths

(a) Concrete

The use of each class of concrete and required strengths are as shown in Tables 9.1.7 and 9.1.8 respectively.

(b) Reinforcing Steel

Type, designation and yield strength of reinforcing steel for concrete structures are specified in Table 9.1.9.

(c) Prestressing Steel

Notation, nominal diameter and yield and breaking strengths of prestressing steel are as shown in Table 9.1.10.

(d) Steel Pipe Pile

Class, designation and minimum yield point and tensile strength of steel pipe piles are as shown in Table 9.1.11.

(e) Structure Steel

Designation and yield point and tensile strength of structure steel are as shown in Table 9.1.12.

Table 9.1.7 Concrete Classes and Their Use

Class of Concrete	Use of Each Class of Concrete
A - 1	Segmental precast prestressed concrete box girders Precast prestressed concrete box girders Precast prestressed concrete I - girders Precast prestressed concrete U - girders Precast prestressed concrete hollow core slab units
A - 2	Prestressed concrete box girders Prestressed concrete hollow slabs beam and columns of portal pier
B - 1	Reinforced concrete slabs and cross beams of prestressed concrete I - girder, U-girder and steel I-girder bridges Reinforced concrete for pier columns and cantilevered pier heads except for pedestrian bridge
B - 2	Cast - in - place reinforced concrete piles
B - 3	Pipe culverts
B - 4	Approach and Transition slabs for rigid pavement
C - 1	Abutments, piers (except for columns), approach slabs, retaining walls, stairs on embankment and foundation of street lighting pole
C - 2	Box culverts (including wing walls) and encasement of pipe culverts
C - 3	Curbs (reinforced)
C - 4	Stairs of pedestrian bridge
C - 5	Piers for pedestrian bridge
D	Gravity - type retaining walls, concrete footpaths, head walls, curbs (non-reinforced) and cradles of pipe culverts
E	Leveling concrete, backfill concrete in masonry structures, and as specified on the drawings
AA	Prestressed concrete piles

Table 9.1.8 Strength of Concrete

Class of Concrete	Minimum Compressive Strength at 28 days	
	by Cube Test	by Cylinder Test
A - 1	450	400
A - 2	400	346
B-1 to B-3	350	290
C-1 to C-5	250	210
D	150	130
E	100	80
AA	600	500

Table 9.1.9 Type, Designation and Yield Strengths of Reinforcing Steel

Type	JIS G 3112		ASTM A 615		Indonesian Standard
	Designation	Yield Strength	Designation	Yield Strength	
Round Bar	SR 295	24	Grade 40	28	As applicable
Deformed Bar	SD 295	30	Grade 60	42	As applicable

Table 9.1.10 Notation, Nominal Diameter and Strength of prestressing steel

Notation	Utilization	Nominal Diameter (mm)	Yield Strength (kg/mm2)	Breaking Strength (kg/mm2)	Applicable Standard	
					JIS	ASTM
PC Wire SWPR 1	PC Pile and PC T-Girder	∅ 7	135	155	G 3536	A 421
PC Wire SWPR 1	Diaphragm for PC Box Girder	∅ 8	130	150	G 3536	A 421
PC 7 - Wire Strand SWPR 7A	PC I - Girder and PC Hollow Slab	T 12.4	150	175	G 3536	A 416
PC 7 - Wire Strand SWPR 7B	PC Box Girder and PC Hollow Core Slab Unit, PC I - Girder	T 12.7	160	190	G 3536	A 416
PC 19 - Wire Strand SWPR 19	Diaphragm for PC I -Girder, Diaphragm for PC T - Girder	T 19.3	162	189	G 3536	A 416
PC Bar SBPR 785/930	Diaphragm for PC Box Girder	∅ 23	80	95	G 3109	A 722

Table 9.1.11 Class, Designation and strengths of Steel Pipe Pile

JIS G 3444				ASTM A 500			
Class	Design-nation	Yield Point Kg/mm2	Tensile Strength Kg/mm2	Design-nation	Yield Point Kg/mm2	Tensile Strength Kg/mm2	Indonesian Standard
2	STK 400	24	41	Grade B	29	41	As applicable

Table 9.1.12 Designation and Strengths of Structure Steel

Designation	Yield Point Kg/mm2	Tensile Strength Kg.mm2	Applicable Standard
SS 400	22 - 25	41 - 52	JIS G 3101
SM 400	22 - 25	41 - 52	JIS G 3106
SM 400	30 - 33	50 - 62	JIS G 3106
SM 490 Y	34 - 37	50 - 62	JIS G 3106
SM 520	34 - 37	53 - 65	JIS G 3106

8) Allowable Stresses

(a) Concrete
The allowable stresses of each concrete class are as shown in Tables 9.1.13 and 9.1.14.

(b) Reinforcement
The allowable stress for each type and designation of reinforcing steel is as shown in Table 9.1.15.

(c) Prestressing Steel
The allowable stresses for each type of prestressing steel are as shown in Table 9.1.16.

(d) Steel Pipe Pile
The allowable stresses for steel pipe pile are as shown in Table 9.1.17.

(e) Structure Steel
The allowable stresses for sructure steel are as shown in Table 9.1.18.

Table 9.1.13 Allowable Stresses of Concrete (Prestressed Concrete Structures)

Allowable Stress in kg/cm2

	AA	A - 1	A-2-1	A-2-2	B-1
Allowable Compressive Stress due to Bending					
- Temporary Stress Before Losses due to Creep and Shrinkage	210	180	152	162	143
- Stress at Service Load After Losses have Occurred	170	140	119	129	117
Allowable Axial Compressive Stress					
- Temporary Stress Before Losses due to Creep and Shrinkage	160	145	121	121	107
- Stress at Service Load After Losses have Occurred	135	110	93	93	83
Allowable Tensile Stress due to Bending					
- Temporary Stress Before Losses due to Creep and Shrinkage	-	15	12.9	12.9	11.7
- Due to Dead Load and Superimposed Load	-	0	0	0	0
- Due to Dead, Superimposed and Live Loads	-	15	12.9	12.9	11.7
Allowable Shearing Stress					
- Stress at Service Load	-	5.5	4.8	4.8	4.4
- Stress at Ultimate Load, due to Shear Force or Torsional Moment	-	53	44	44	39
- Stress at Ultimate Load, due to Shear Force and Torsional Moment	-	61	52	52	47
Allowable Diagonal Tension Stress					
- Stress at Service Load, due to Shear Force or Torsional Moment	-	10	8.6	8.6	8.4
- Stress at Service Load, due to Shear Force and Torsional Moment	-	13	11.6	11.6	10.0

Table 9.1.14 Allowable Stresses of Concrete (Reinforced and Plain Concrete Structures)

Allowable Stress in g/cm2

Designation	Class of Concrete			
	B-3	B-1 ; B-3	C-1 - C-5	D
Allowable Compressive Stress due to Bending	77	97	70	31
Allowable Axial Compressive Stress	63	82	55	31
Allowable Shearing Stress	3.8	4.4	3.6	-

Table 9.1.15 Allowable Stress of Reinforcement

Allowable Stress in kg/cm2

Designation	SR 235	SD 295
Allowable Tensile Stress		
General use	1400	1800
Under water	1400	1600
Deck slab	1400	1400
Allowable Compressive Stress	1400	1800

Table 9.1.16 Allowable Stresses of Prestressing Steel

Allowable Stress in kg/mm2

Designation	Initial Prestressing	Immediately after Prestressing Work	Stress at Service Load after Losses have Occurred
PC Wire SWPR 1 ∅ 7	122	109	93
PC Wire SWPR 1 ∅ 8	117	105	90
PC 7-Wire Strand SWPR 7A T12.4	135	123	105
PC 19-Wire Strand SWPR 7B T12.7	144	133	114
PC 19-Wire Strand SWPR 19T19.3	144	133	114
PC Bar SBPR 789/930 ∅ 23	72	66.5	57

Table 9.1.17 Allowable Stress of Steel Pipe Pile

Description	Designation	
	JIS G 5525 STK 400	JIS G 3444 STK 490
Allowable Stress (kg/cm2)	14 00	19 00

Table 9.1.18 Allowable Stress of Structure Steel

Designation	Allowable Stress (Kg/cm2)
SS 400, SM 400	1400
SM 490	1900
SM 490 Y, SM 520	2100

9.1.2 Toll Levy System on North-South Axis

1) General Considerations

A toll levy system can be classified as either a closed or an opened system depending on the operation for toll collecting. In the closed system, toll is collected from every vehicle using the tollway. As such toll gates are erected at all interchanges so that no driver escapes from paying toll. On the other hand, in the open system, some road users will be exempted from paying toll, that is, there will be no toll gate at certain locations where traffic volume is low. The resulting toll revenue in the open system may be lower than that of the closed system, but considerable savings in operation and maintenance costs can be expected. In addition, there will be less time loss at the interchanges.

There are several methods used in determining the toll payable under both closed and opened systems.

The following three methods of toll levy system may be considered, that is :

(1) Flat tariff system
(2) Zone tariff system
(3) Distance proportional tariff system

A flat tariff system is whereby a fixed tariff is applied to be collected at on-ramp only. A zone tariff system is defined as one in which a fixed tariff is applied to be collected at toll barriers set across the throughway. In a distance proportional tariff system, a driver receives a magnetic ticket on entering the tollway and pays a tariff proportional to the distance traveled on leaving the tollway.

Generally, the toll levy system for tollway inside the city in most cases is a flat tariff system for the road segment within the city central area and for the outer areas, a zone tariff system or distance proportional tariff system is usually adopted. One of the reasons for adopting a flat tariff system for the city central area is that most of the car trips using the tollway are intra-city trips and their trip length is relatively short. Therefore, it is conceivable that the distance traveled on the tollway is almost uniform for most users.

Another reason for adopting a flat tariff system in this case is in order to reduce the time taken for toll collection and hence ensuring a smooth traffic flow on the tollway. The shorter the trip length, the greater is the time loss incurred due to the stop at the tollgate and this could influence the utilization rate of the tollway.

Therefore, under the flat tariff system, in order to handle the large urban traffic volume, toll gates are usually located on the on-ramps. There is no toll gate on the off-ramps because of ensuring a smooth traffic flow and no time loss to users at the off-ramp.

On the principle of fairness to all users, the distance proportional tariff system should be imposed. If the application of a flat tariff system is expanded to a vast area unlimitedly, then the flat tariff charged will be seen as unfair to some road users as compared with others. Hence, it is necessary to establish an appropriately sized area for the flat tariff system. Beyond this range in the outer area, it may be necessary to impose the distance proportional tariff system, while in between, the zone tariff system may be applicable.

2) Alternative Toll Levy System on North-South Axis

The study road between the intersections with Jakarta Outer Ring Road and Kota measures about 19 km in length. Eight interchanges are proposed on this highway and the average distance between two adjacent interchanges is about 2.4 km.

North-South Axis is planned as a tollway serving diverted traffic from existing Jl. Gajah Mada/Hayam Wuruk and Jl. Thamrin/Sudirman. It is very important that North-South Axis is connected to the road network in Jakarta in an organized manner. Thus interchange locations are also selected from this viewpoint. Owing to its function as a tollway, priority must be given to its service to the surrounding area.

In planning for the most appropriate toll levy system for this tollway, the following considerations are necessary :

(1) The assignment of intra-regional traffic onto North-South Axis and the expectation that most of these assigned trips have relatively short trip length.

(2) Road users must not be made to feel as being treated unfairly.

3) Ensuring convenience and mobility.

If the distance proportional tariff system is presumed under the closed system then, the road user will receive a magnetic ticket at the entrance and pay at the exit, but from the considerations of intra-regional traffic assignment onto North-South Axis and that the road length is only 19 km, this will cause a loss in user's convenience and make the tollway unpopular. The toll levy system which can be considered here is either flat tariff or zone tariff under the closed system. The basic concepts may be summarized in the three alternatives given below.

<u>Alternative 1 : On-Ramp Toll</u>

Intra-urban road users will be made to pay a flat tariff. In principle, tariff will be collected at the on-ramps. Since the tariff is based on average trip length, it would appear as if short trip length makers are subsidizing the benefits of those making longer trips.

Alternative 2 : Toll Barrier Plus On-Ramp Toll

All road users will be made to pay one tariff or two times. A different tariff will be charged to short trip length makers and long trip length makers respectively. Tariff will be collected at on-ramp toll plaza as well as a toll barrier.

Alternative 3 : Toll Barriers

One or three toll barriers will be set on throughway of North-South Axis to levy a toll. In any cases, some On and Off ramps will not be provided in order to impose a toll on all road users under the closed system.

4) Proposed Toll Levy System on North-South Axis

In this study based on the overall considerations of project implementation, toll levy system operations and functionality of North-South Axis the alternatives for toll levy system have been evaluated by the Study Team.

It is proposed that for sake of conformity the final type of toll levy system on North-South Axis will be similar to that used on South-West Arc and North South Link, i.e. a closed system by On-Ramp toll.

This system has the following advantages;

1) Tollway users on Jakarta Intra Urban Tollway are used to this system

2) Potential users will be able to divert to public roads or other toll gate in the event of traffic congestion on North-South Axis.

3) Additional Off-ramps may be constructed as required in the future.

Fig. 9.1.14 presents the proposed On-Ramp Toll with selected ramps, based on the assumption that anticipated traffic within two zones of northern and southern parts of S-W Arc of JIUT would prefer to select public road due to barrier effect of toll. This scheme aims to make it practical to achieve the role and function of North-South Axis intensively and simultaneously facilitates to avert excessive land acquisition and property compensation.

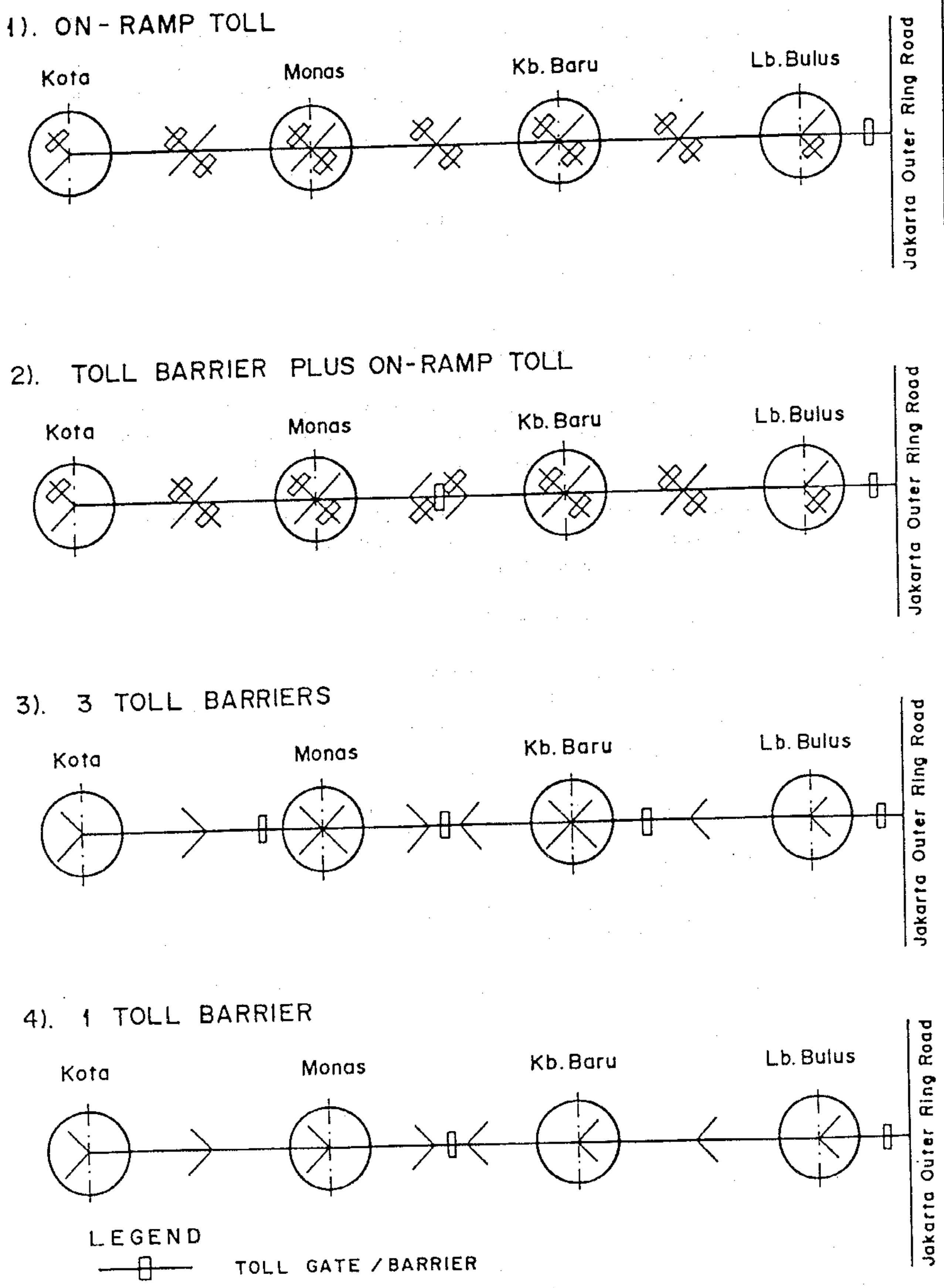


Fig. 9.1.13 Alternative Toll Levy System

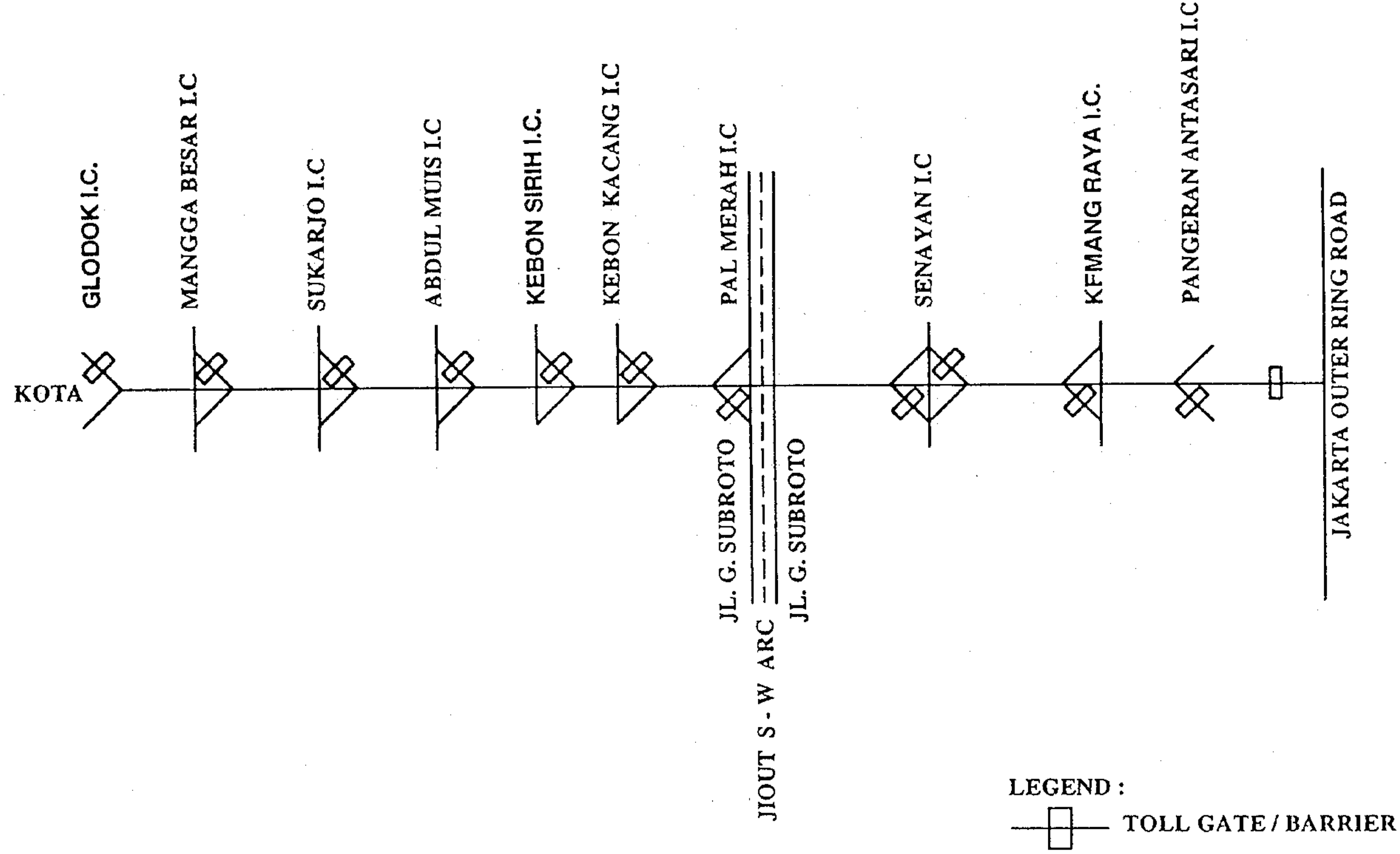


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Fig. 9.1.14 Proposed On-Ramp Toll with Toll Barrier

9.2 Alternative Route Study

9.2.1 Corridor Description

1) North-South Axis

The selected corridor for North-South Axis starts in Kota where Jl. Pintu Besar/Jl. Gajah Mada/Hayam Wuruk and Jl. Moch. Mansyur are designated as existing north-southward arterial roads. East-westward arterial roads in the north of Monas are Jl. Bandengan from Teluk Gong, Jl. Pangeran Tubagus Angke/Jl. Mangga Dua, Jl. Mangga Besar, Jl. Zainul Arifin/Jl. Sukarjo Wiryopranoto, Jl. Kyai Tapa/Jl. Hasyim Asyhari from Grogol, Jl. Tomang Raya/Jl. Suryo Pranoto/Jl. Juanda/Veteran from Tomang to Pasar Baru.

The corridor runs southward in the west of Monas to cover the area where Jl. M.H. Thamrin and Jl. Mas Mansyur are designated as existing north-southward arterial roads.

In the south of Kali Malang/Banjir Kanal, the corridor covers the area where Jl. Aipda K. Sasuit Tubun and Jl. Jend. Sudirman encompass.
Jl. Pejompongan/Jl. Matraman is being improved and recently opened Jl. Mas Mansyur with Sudirman Flyover are designated east-westward arterial roads and are supposed to be main access to North-South Axis.

To encompass Senayan sports complex and Gelora legislative and administrative complex, the corridor crosses Jl. Gatot Subroto and toward Kebayoran Baru Subcenter. Existing north-southward arterial roads are Jl. Pejompongan-Pondok Pinang (Simpruk Bypass), Jl. Asia Afrika and Jl. Jend. Sudirman.

In the vicinity of Kebayoran Baru Subcenter, Jl. Singamangaraja/Jl. Panglima Polim and Jl. Pattimura/Jl. Prapanca are the north-south arterial roads and Jl. Kyai Maja/Jl. Trunojoyo/Jl. Wolter Monginsidi is the east-westward arterial road. These cross arterial roads are connected each other by Jl. Senopati, Jl. Wijaya, Jl. Gandaria/Jl. Kramat Pela and Jl. Pakubuwono 6 clockwise to form a circumferential road.

In the south of Kebayoran Baru Subcenter, four arterial roads comprise the corridor, namely Jl. Ciputat Raya, Jl. Metro Pondok Indah, Jl. Fatmawati and Jl. Pangeran Antasari from west. No major arterial road except Jl. Kemang exists in the east-westward connection.

The corridor terminates in the section between Lebak Bulus and Cilandak on Jakarta Outer Ring Road. There are three planned interchanges, namely Pondok Pinang IC, Cilandak IC and Pasar Minggu IC in the vicinity of the terminus. Pondok Pinang IC will be a Diamond type and is formed with Jl. Metro Pondok Indah with four directions, while Cilandak IC will be a half Diamond type and provides On/Off ramp to Jl. Fatmawati in the west. Pasar Minggu IC is also a half Diamond type and provides On/Off ramp to Jl. Ampera Raya/Jl. Kemang in the east.

2) East-West Axis

The selected corridor for the East-West Axis starts in the western section of Jakarta Outer Ring Road (JORR), of which the frontage roads have been completed and are open to the public but the toll road is not constructed yet. It will be completed by the year 1996. To keep good access to West primary center and to follow the city planning road (Route K) in principle, the corridor is located in the north of built-up housing complex of Taman Permata Buana, where the expansion of Taman Permata Buana is planned.

Generally, mixed landuse of industry and commerce is predominant along Jl. Daan Mogot and densely developed residential landuse is widely spread in the corridor.
In the east of the Cengkareng Drain, there are many large-scaled established housing complex such as Green Garden, Sunrise Garden and Taman Ratu Indah. Although the masterplan of Jakarta 2005 has an arterial road to penetrate these housing complex to connect with Jl. S. Parman, the city planning road terminates on Jl. Kedoya Raya (Route F), according to District Plan (RBWK) of Kec. Kebon Jeruk presented in Fig. 9.2.1 and city planning road map in 2005 issued by City Planning Bureau of DKI Jakarta. Therefore, the East-West Axis should find its own route in this area.

There are five north-southward arterial roads in between JORR and South-West Arc (S-W Arc). Among them, Jl. Perjuangan (Route D) which connects Jl. Daan Mogot with Jakarta-Merak Freeway (Tollway) and Kebayoran Baru sub-center is designated as north-southward major arterial road. No major arterial road except Jl. Daan Mogot and Jakarta-Merak Freeway exists in the east-westward direction.

Jl. Daan Mogot which is classified primary arterial road caters considerable volume of east-westward traffic together with Jakarta-Merak Freeway.
Since Grogol intersection on Jl. Daan Mogot and Tomang intersection at the terminus of Jakarta-Merak Freeway are located close each other, chronic traffic congestion take place on Jl. S. Parman.

In the vicinity of Grogol intersection, number of public facilities such as universities, hospital, hotels shopping centers governmental buildings and bus terminal exist to spur traffic congestion.
City planning roads are planned in both sides of the Tangerang railway line to collect and distribute local traffic.

There are rather old housing complex with poor public facilities in Kec. Grogol Petamburan (Fig. 9.2.2). However, the Jakarta 2005 categorizes the landuse along the corridor as urban betterment with the first priority and a city planning road is planned to pass the center of this area to connect Jl. Daan Mogot with Jl. Latumeten. Some redevelopment of old housing complex are found along Jl. Pangeran Tubagus Angke.

The corridor is planned to pass densely populated area in Kec. Tambora on Mangga Besar Extension. However, the District Plan of Kec. Tambora presented in Fig. 9.2.3 claims public space and facilities, commerce and office buildings so much that it is very necessary to create such land area by certain land readjustment techniques.

The DKI's road improvement plan in Kota area consists of widening of existing roads, construction of new links and flyovers as shown in Fig. 9.2.4. According to the simulation of future traffic, the East-West Axis, Jl. Mangga Besar, Jl. Mangga Dua, Jl. Pangeran Tubagus Angke and Jl. Bandengan Utara/Selatan will become major arterial roads in the east-westward direction and Jl. Jembatan Dua, the new road link along the Western railway line, Jl. KH. Moch. Mansyur, Jl. Gajah Mada/Hayam Wuruk, the new road link along the Central railway line and Jl. Gunung Sahari will work as major arterial roads in Kota area. In particular, the East-West Axis including Jl. Mangga Besar will cater heavy traffic in the east-westward.

The central railway line has been elevated in the section from Kota to Manggarai but city planning roads along the railway are not developed yet. The Northern Extension of S-W Arc is to be completed by 1998 and simultaneously the improvement of Jl. Latumeten is planned.

Ex-Kemayoran Airport is designated the special area to be developed as an intensive sub-center of commerce and housing complex where north-south and east-west runways are converted to arterial roads as shown in Fig. 9.2.5 and 120,000 population will work and live in the area of 454 ha. In the east of Ex-Kemayoran Airport, large-scaled housing complex of Sunter Agung in the north and Sunter Jaya in the south are established. A city planning road is located in the north of Sunter Jaya housing complex and is partially developed such as Jl. Taman Sunter Indah and Jl. Danau Indah Raya.

Elevated North-South Link (N-S Link) and its On/Off ramps are located at the intersecting point between Jl. Danau Indah Raya/Raya Barat Boulevard and Jl. Yos Sudarso.
The corridor passes Kelapa Gading housing development on Raya Barat/Timur Boulevard. The road has enough wide ROW and commercial buildings along the road have been set back. In the east of Kelapa Gading housing development, medium industry has been settled along Jl. Pegangsaan Dua. High voltage transmission line and its pylons are also located along Jl. Pegangsaan Dua.

There are two city planning roads in the east of Pulogadung Industrial Estate, namely a new road along new freight railway line and the northern extension of Jl. Buaran Indah Raya (Route EE). Existing divided Jl. Pulogadung has 40 m ROW and large-scaled factories have been established along the road, while the extension of Jl. Buaran Indah Raya is partially under construction and will be located along Jl. Swadaya where densely populated area and large-scaled factories exist. High voltage transmission line and its pylons along Jl. Pegangsaan Dua run southward in parallel to Jl. Pulogadung in undeveloped industrial estate. According to the District Plan of Kec. Cakung presented in Fig. 9.2.6, new freight railway line is presented along the transmission line but no plan is given in the masterplan of Jakarta 2005.

Along east-westward transmission lines towards Bekasi, two city planning roads (Route AA) are planned in both sides of the transmission line. These city planning roads will pass in between Taman Pulo Indah and Concord 2000.

The eastern section of Jakarta Outer Ring Road (JORR) is operating temporary two ways on north-bound lanes of toll road in the stretch between Cikunir IC on Jakarta-Cikampek Freeway and Cakung IC with Jl. Bekasi Raya.

At the intersecting point with JORR, the selected corridor of East-West Axis will end. In the vicinity of intersecting point, a new bus terminal is planned to relocate the present Pulogadung bus terminal located at the intersection between Jl. Bekasi Raya and Jl. Perintis Kemerdekaan. The East primary center is located at the corner encompassed by JORR and Jl. I. Gusti Ngurah Rai and has own access road to JORR in the north. To keep good access to the East Primary Center, existing Jl. Penggilingan and frontage roads of JORR will be utilized.

9.2.2 Physical Constraints

1) North-South Axis

Jl. Gajah Mada/Hayam Wuruk is located in the CBD with 60 m ROW and which is divided by the 15 m wide Kali Ciliwung in the center namely the north bound is Jl. Gajah Mada and the south bound is Jl. Hayam Wuruk. Since there exist densely developed commercial area along the road and the widening was taken place in a few decades ago, it is rather difficult to acquire additional land for the Project in the whole stretch. However, the space above the Kali Ciliwung seems available provided that the consent is obtained from the agencies concerned. It seems to be possible to acquire a localized area where a toll gate is deemed necessary. Nevertheless, an elevated toll gate would be constructed on viaduct.

The bed rock in Kota area lies 40 to 50 m in depth, according to soil investigations conducted through projects in Kota area such as Jakarta Harbour Road, Northern Extension of S-W Arc and Pasar Pagi Viaduct. However, 6 m to 8 m thick sandy soil strata with N-value of 40 sometimes are found 20 m in

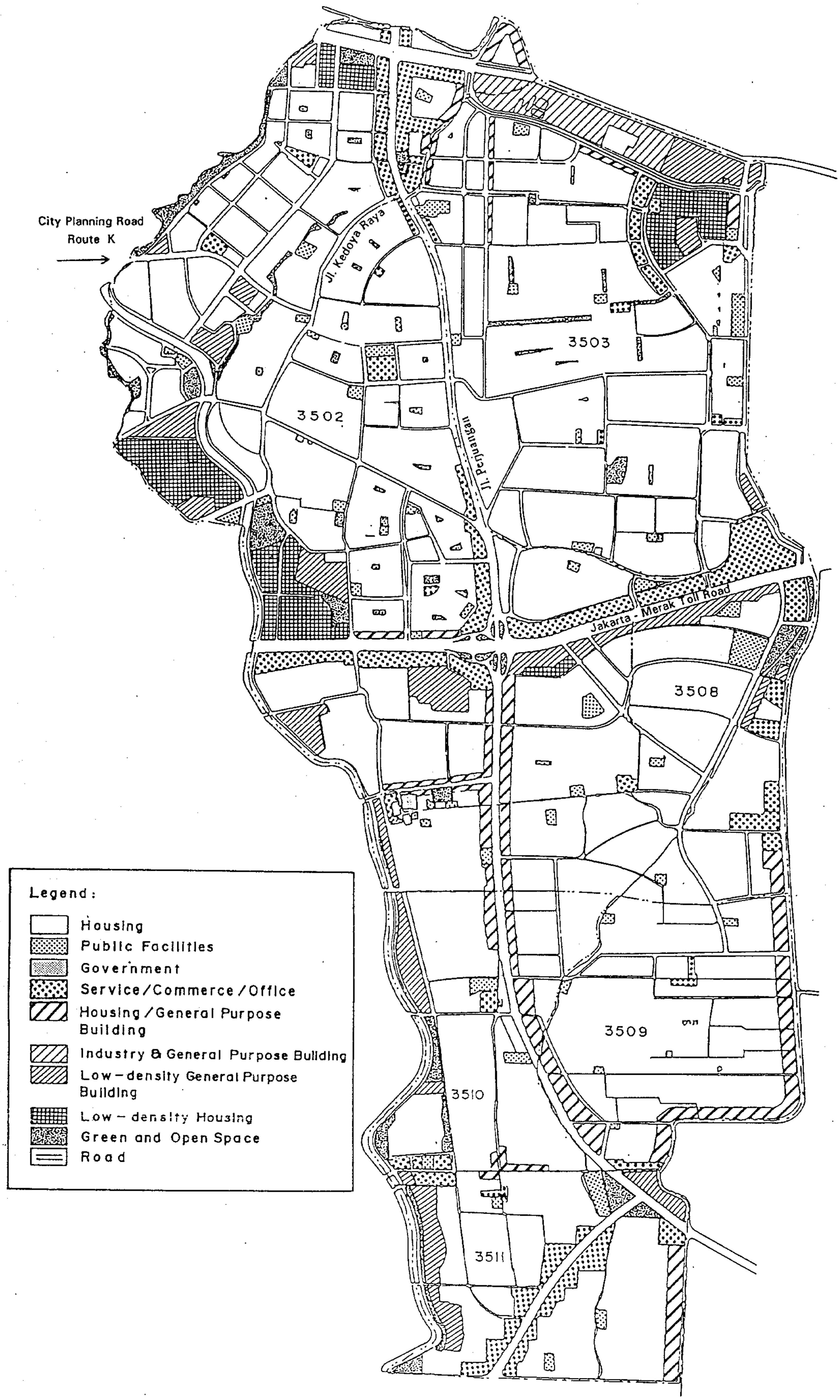

Fig. 9.2.1 District Plan of Kecamatan Kebon Jeruk

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Fig. 9.2.2 District Plan of Kecamatan Grogol Petamburan

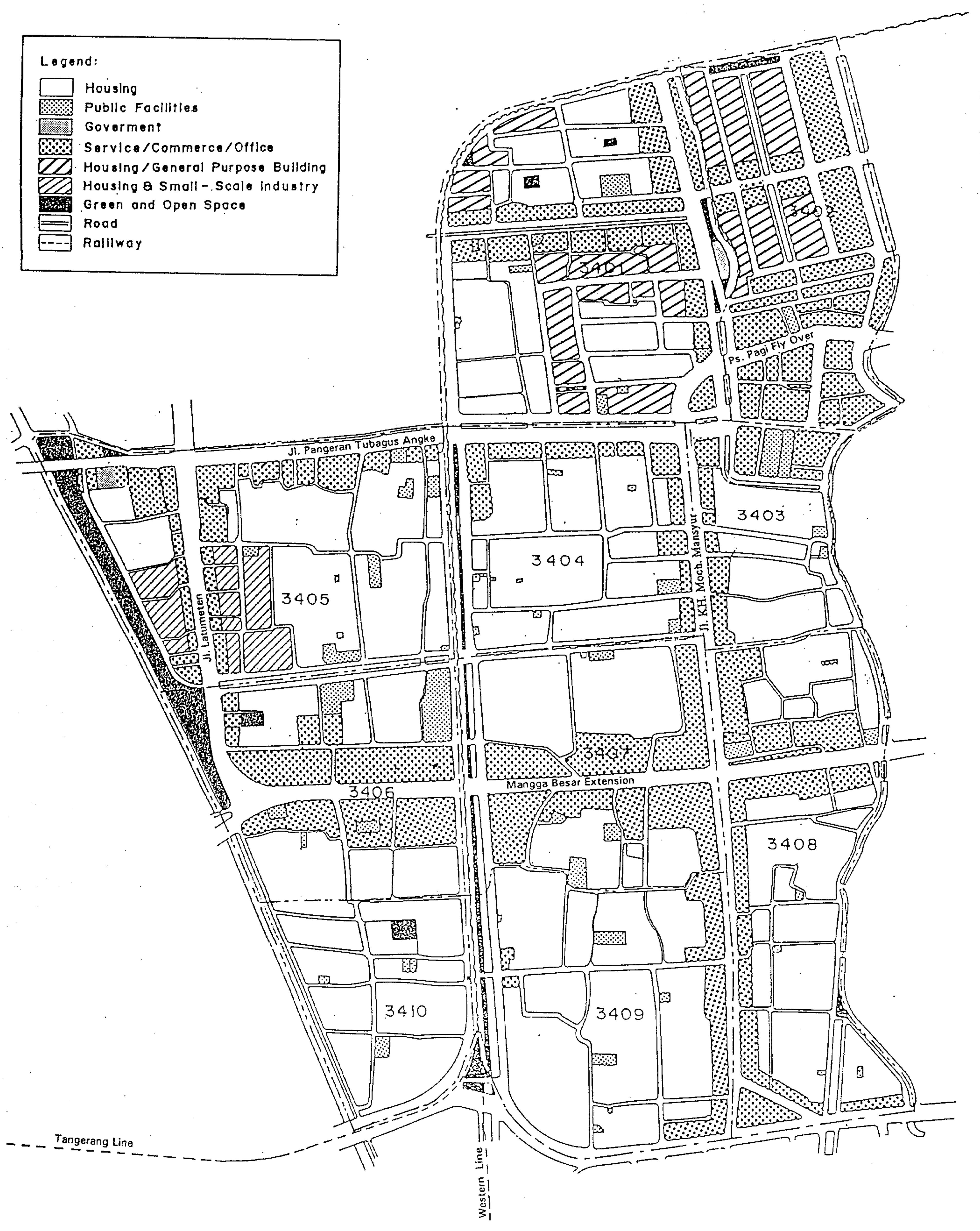

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Fig. 9.2.3 District Plan of Kecamatan Tambora

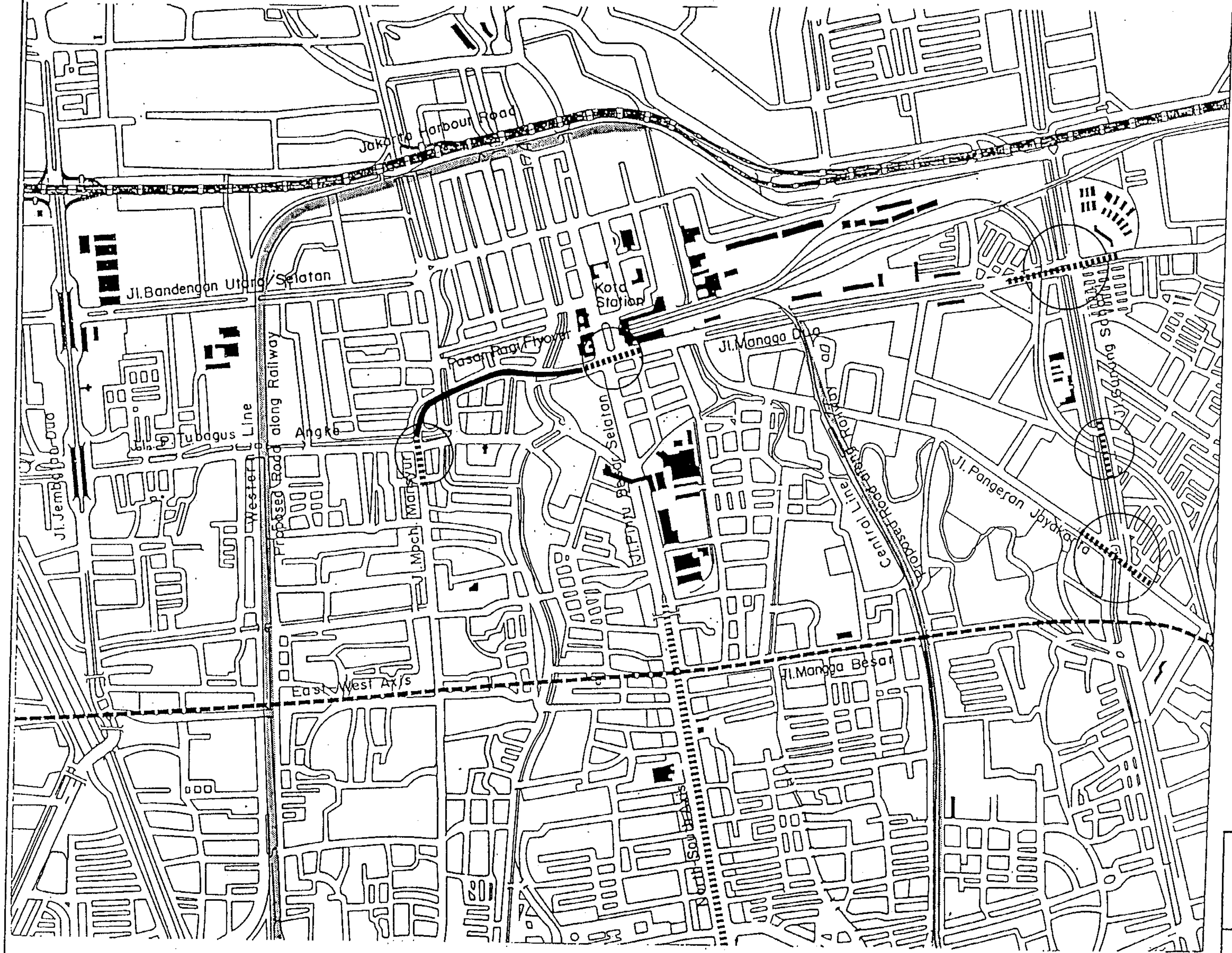

Fig. 9.2.4 Road Network in Kota Area

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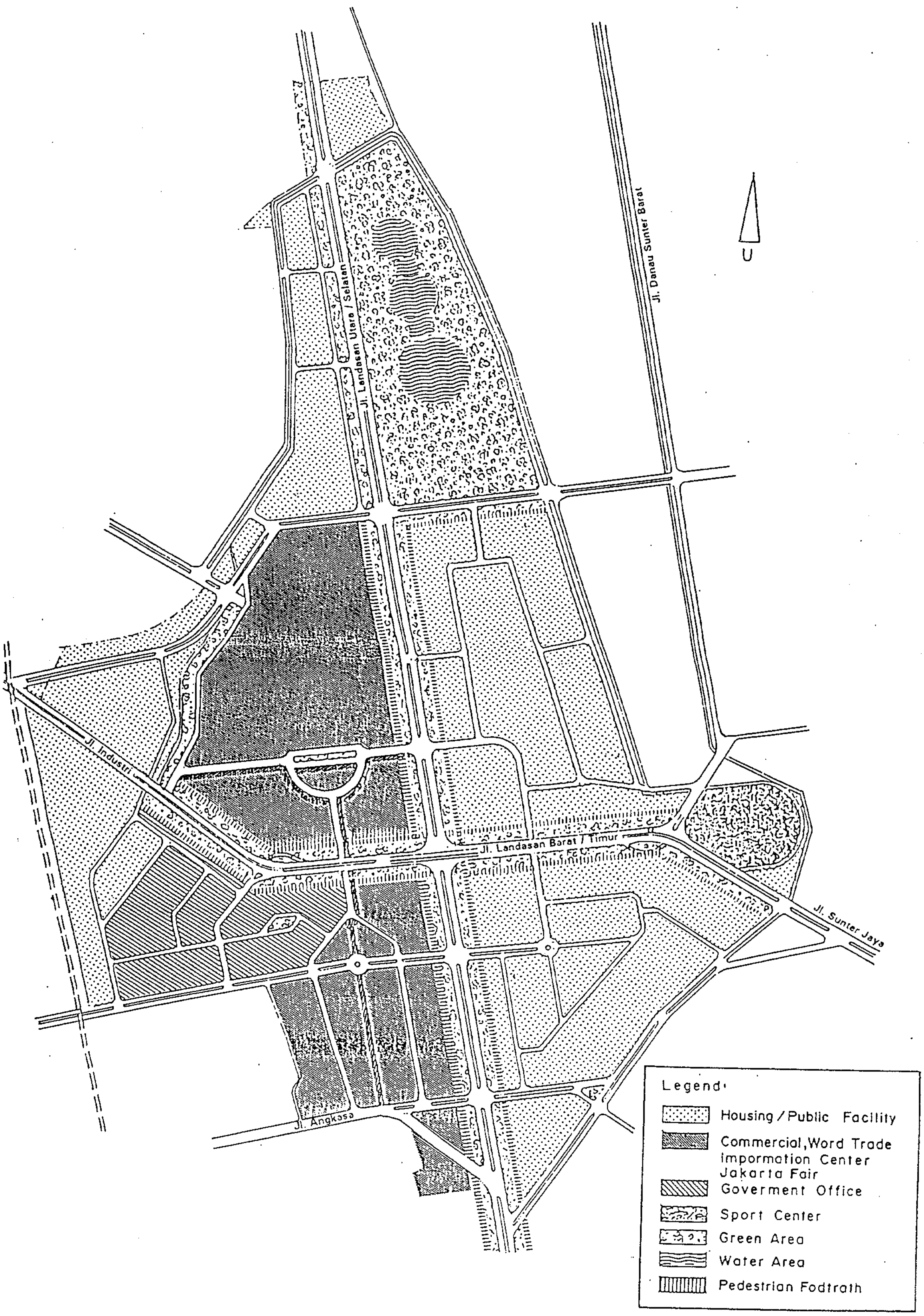

Fig. 9.2.5 District Plan of Kemayoran Complex

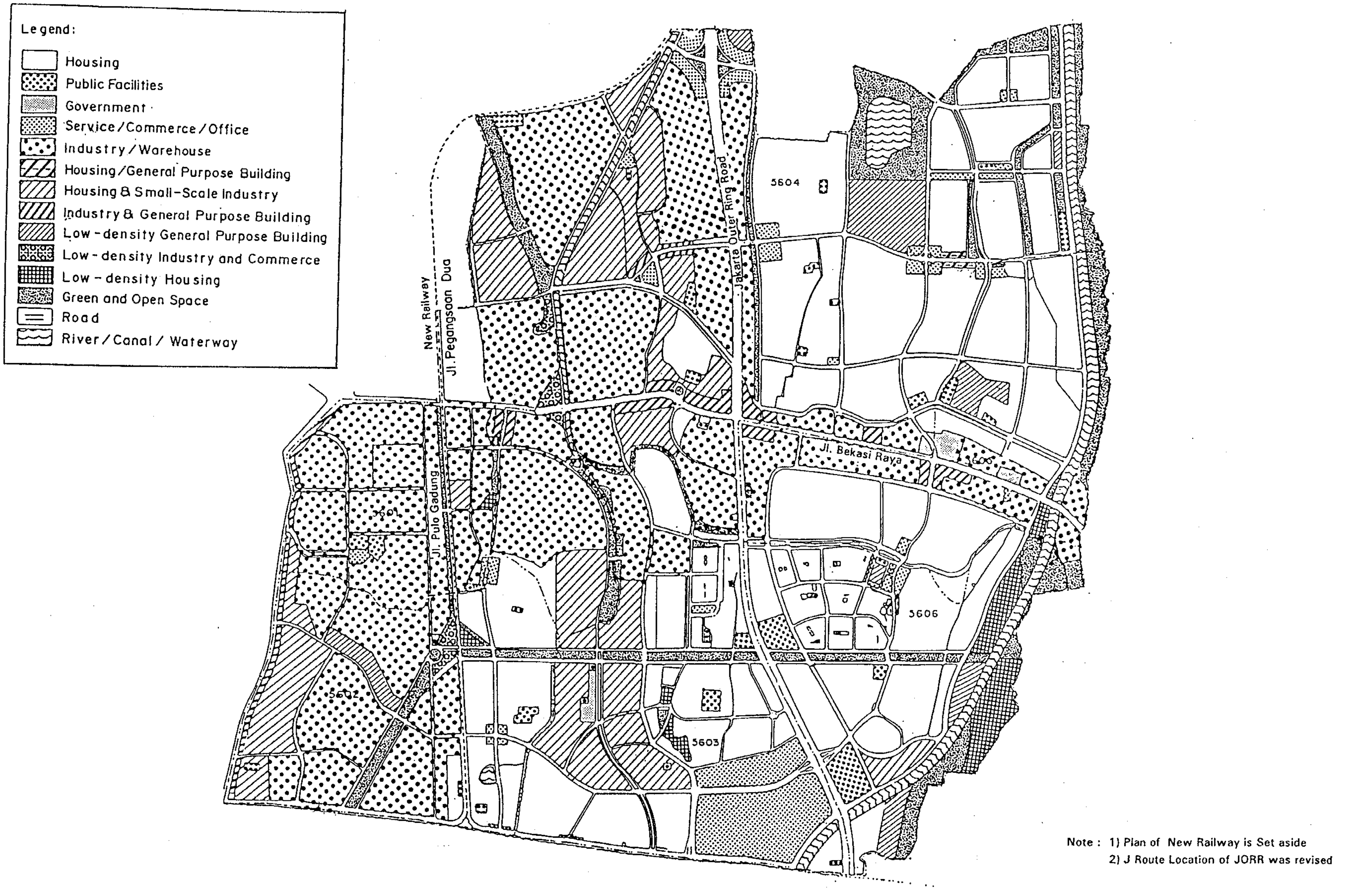

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Fig. 9.2.6 District Plan of Kecamatan Cakung

depth and such geological condition is regarded as structural bearing strata. Even though no intermediate bearing strata exists, cast-in-place concrete pile will be able to be constructed as bearing pile on the bed rock.

Jl. Abdul Muis is 4-lane undivided road and has the 10 m wide Kali Krukut and 20 m wide frontage road in the east. The land use along Jl. Abdul Muis is of governmental and institutional offices. A reconstruction of Jl. Abdul Muis will be able to create the space for elevated toll road and at-grade arterial road with On and Off ramps within the existing ROW.

Jl. Kebon Sirih is also 4-lane undivided road and has the 10 m wide Kali Cideng. This road will become a main access to and egress from Jl. M.H. Thamrin. A reconstruction of Jl. Kebon Sirih will be able to provide additional space for On and Off ramps, provided that the consent to utilize space above the Kali Cideng is obtained from the agencies concerned.

In the vicinity of intersection between Jl. Fakhrudin and Jl. Jati Baru, there are several plans of grade separation structure, such as Jl. Fakhrudin underpass and Jl. Jati Baru flyover. The eastern part of Jl. Jati Baru has been widened while the western in widening and Tanah Abang flyover which is overpassing Western Railway Line is under construction. In the west of Jl. Jati Baru, the Western Banjir Kanal, high voltage power transmission line and Western Railway Line disrupt community and densely urbanized area with low cost housing are found along its corridor. Both Western Railway Line and Serpong Railway Line have overhead structures including recent Slipi flyover and on-going Tanah Abang flyover and it seems rational that no elevated railway is planned in future.

The existing Pejompongan IC has presently at-grade railway crossing and a railway flyover will be provided by DKI's improvement plan. This flyover will create open space adjoining railway and make it available for On and Off ramps in the east of Jl. Gatot Subroto. In the west of Jl. Gatot Subroto, Simprug Bypass runs southward in both sides of the railway and Pal Merah railway station is located nearby the intersection with Jl. Gelora. In this stretch, the toll road will be strictly controlled by severe physical constraints such as Parliament Complex and relevant facilities. If the space above the railway is made available partially it will manage to pass this stretch by an elevated road on viaduct.

There exist senior high school, firing range and other institutional facilities along Jl. Gelora. The firing range has a plan to expand their field toward Graha Pemuda and it will make Jl. Gelora underpass. The toll road will also pass there by either underpass or overpass.

Statue Senayan is located in the center of the intersection between Jl. Jend. Sudirman and Jl. Senopati. This intersection is of socalled "round-about with multi legs" and seven connecting road links are Jl. Jend. Sudirman, Jl. Senopati, Jl. Pattimura, Jl. Singamangaraja, Jl. Hang Tuah, Jl. Hang Lekir and Jl. Asia Afrika clockwise. Furthermore, a new link is planned to connect this intersection with Simprug Bypass. The round-about has enough wide area and it is possible to form a modern channelized intersection in case that the statue shall be able to be relocated. In the surrounding, governmental offices and commercial buildings are found with sufficient setback.

Kebayoran Baru is established as Subcenter in Jakarta South, having Blok-M commercial center encompassed by residential area. Recent Kebayoran Baru is changing its structure as Metropolitan Jakarta commands its wider conurbation. Blok-M commercial center no more remains within Blok-M and expands toward its surrounding. Resulting convertion from residence to business and commercial building is ceaselessly in progress. Along Jl. Pattimura and Jl. Sultan Iskandarsyah, there are many offices converted from residence. Even along Jl. Prapanca new high-rise apartments with department store are under construction in residential area.

Jl. Pangeran Antasari is a divided 4-lane arterial road and has a future ROW of 30 m wide. The landuse along the road is few developed because it is either controlled by administration or discouraged physically due to its terrain. Therefore new development is limited outside of future ROW.

The terminus of toll road will be located at the intersection between Jakarta Outer Ring Road and Jl. Pangeran Antasari. In the east of the intersection, the Kali Krukut flows northward and its river side forms depressed wide area where open space remains undeveloped. Frontage roads of Jakarta Outer Ring Road have been open to public and are congested constantly. A toll road of Jakarta Outer Ring Road is scheduled to be completed by 1995. There will be two interchanges on Jakarta Outer Ring Road in the vicinity of the terminus, namely Cilandak IC and Pasar Minggu IC. Both ICs are planned to be On and Off ramp type interchange and are distant enough far from the intersection between Jl. Pangeran Antasari and Jakarta Outer Ring Road. On the contrary, Jl. Metro Pondok Indah and Jl. Fatmawati are supposed to be main access roads and On/Off ramps of JORR are planned in short interval.

2) East-West Axis

The beginning point of East-West Axis is at the intersecting point between Jakarta Outer Ring Road and the city planning road (Route K). The beginning point is located in the north of the Kali Angke and is enough far from future Kebon Jeruk junction on Jakarta-Merak Freeway. The Kosambi Baru housing complex which is located in the west of JORR has future ROW for this city planning road created by land subdivision development method.

Future Taman Permata Buana housing complex will have the same ROW for this city planning road as that of Kosambi Baru housing complex in the north of existing Taman Permata Buana housing complex. As future ROW of Route K is supposed to be of 26 m wide, certain countermeasure to incorporate the scheme of East-West Axis is deemed necessary. Although the city planning road comes to an end at Jl. Kedoya Raya, the East-West Axis should find its own route to avert number of established housing complex in Kec. Kebon Jeruk as shown in Fig. 9.2.1.

As discussed in Sub-section 9.2.1 Corridor Description, there are many severe physical constraints in Kec. Grogol Petamburan (Fig. 9.2.2) and Kec. Tambora (Fig. 9.2.3). Only two practical routes are found, namely city planning road along Tangerang Line and Mangga Besar Extension as well as city planning road in Jelambar.

Either routes are to necessitate considerable land acquisition and resettlement of inhabitants and it is unlikely practical to apply conventional acquisition method to create necessary space. Mixed industry and commerce landuse is well developed along arterial roads in Kota. Historical and monumental old buildings are reserved around Kota railway station in the north and Monas special area as well as presidential palace are protected in the south. Therefore it is only one way to enable the East-West Axis to pass in Kota to construct an elevated road on viaduct above existing arterial roads, taking heavy traffic demand into consideration.

Ex-Kemayoran Airport has very high development potential with enough wide arterial roads and its east-westward arterial road is to consist of a part of the East-West Axis.

Jl. Taman Sunter Indah and Jl. Danau Indah Raya which are city planning roads and have 36 m wide ROW have been partially completed but the remaining section is in densely populated area. At the intersecting point between Jl. Yos Sudarso and Jl. Danau Indah Raya/Raya Barat Boulevard, elevated North-South Link and its On/Off ramps exist and the Kali Sunter flows beside Jl. Yos Sudarso. Though these complicated facilities exist in 100 m long, it is technically feasible to fly them over.

The road which passes Kelapa Gading housing development on Raya Barat/Timur Boulevard has enough wide ROW and commercial buildings along the road have been set back.

High voltage transmission line and its pylons are located along Jl. Pegangsaan Dua where the District Plan of Kec. Cakung (Fig. 9.2.6) presents a new freight railway line with city planning roads in both sides. In the eastern part of Pulogadung Industrial Estate, Jl. Pulogadung and high voltage transmission line run north-southward. On the other hand, city planning road (Route EE) of the northern extension of Jl. Buaran Indah Raya is located in the eastern periphery of the Estate where densely populated area exist. The northern extension of Jl. Buaran Indah Raya has future ROW of 26 m wide and partially is under construction.

Two city planning roads run parallel to east-westward high voltage transmission lines in Penggilingan. These two city planning roads have 20 m wide ROW each and are located 40 m apart each other.

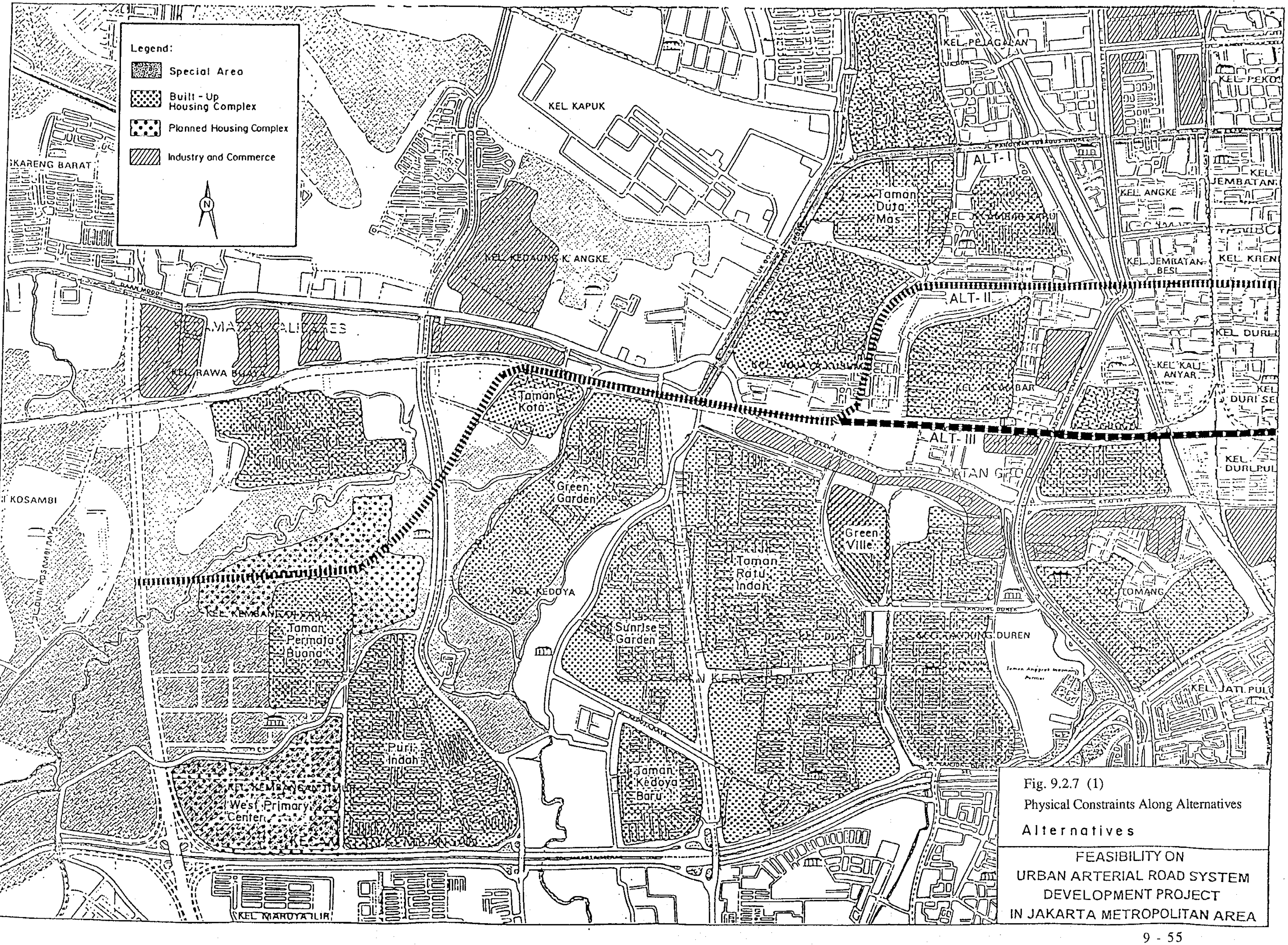

Fig. 9.2.7 (1)

Physical Constraints Along Alternatives

Alternatives

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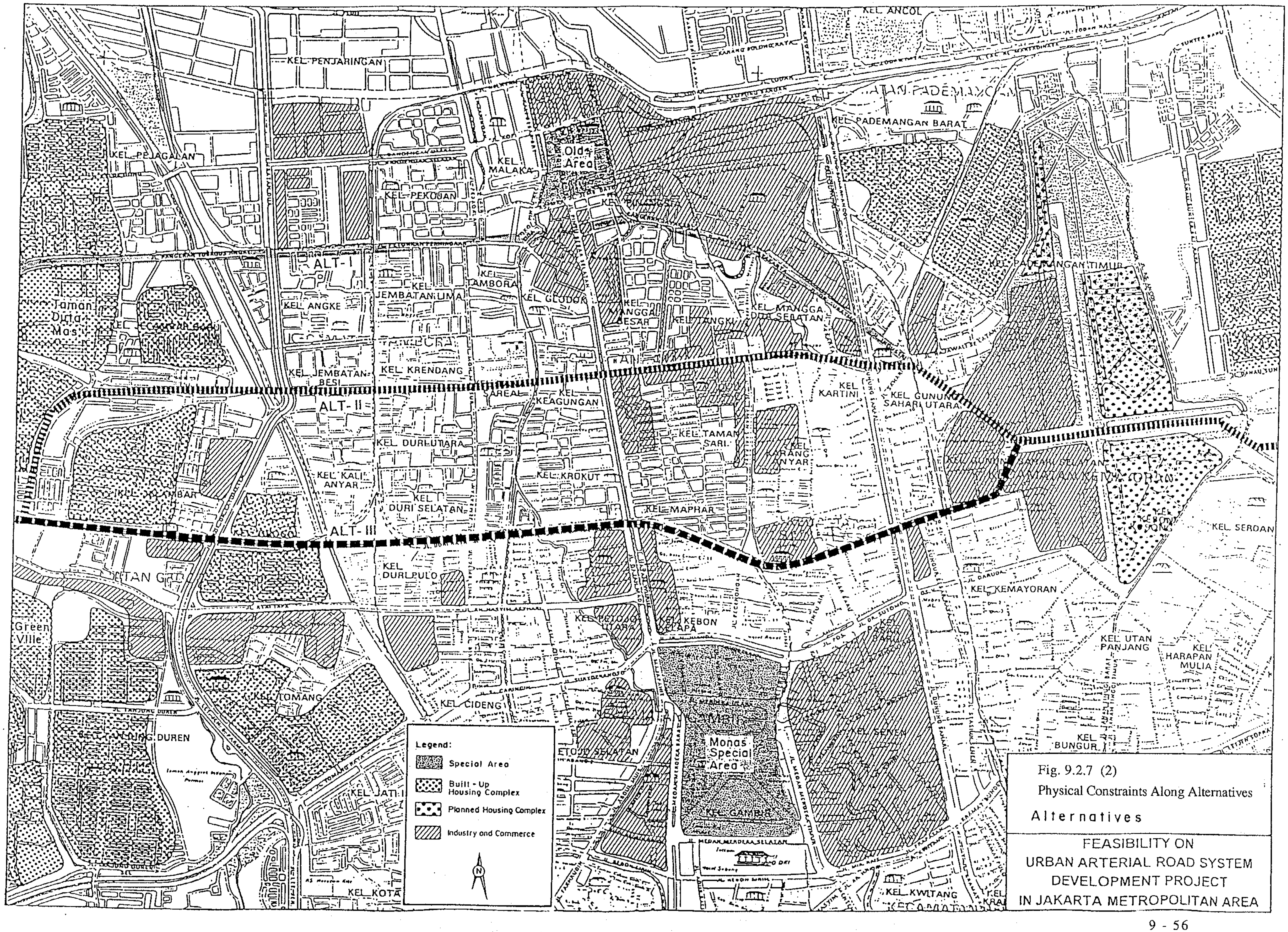

Fig. 9.2.7 (2)

Physical Constraints Along Alternatives

Alternatives

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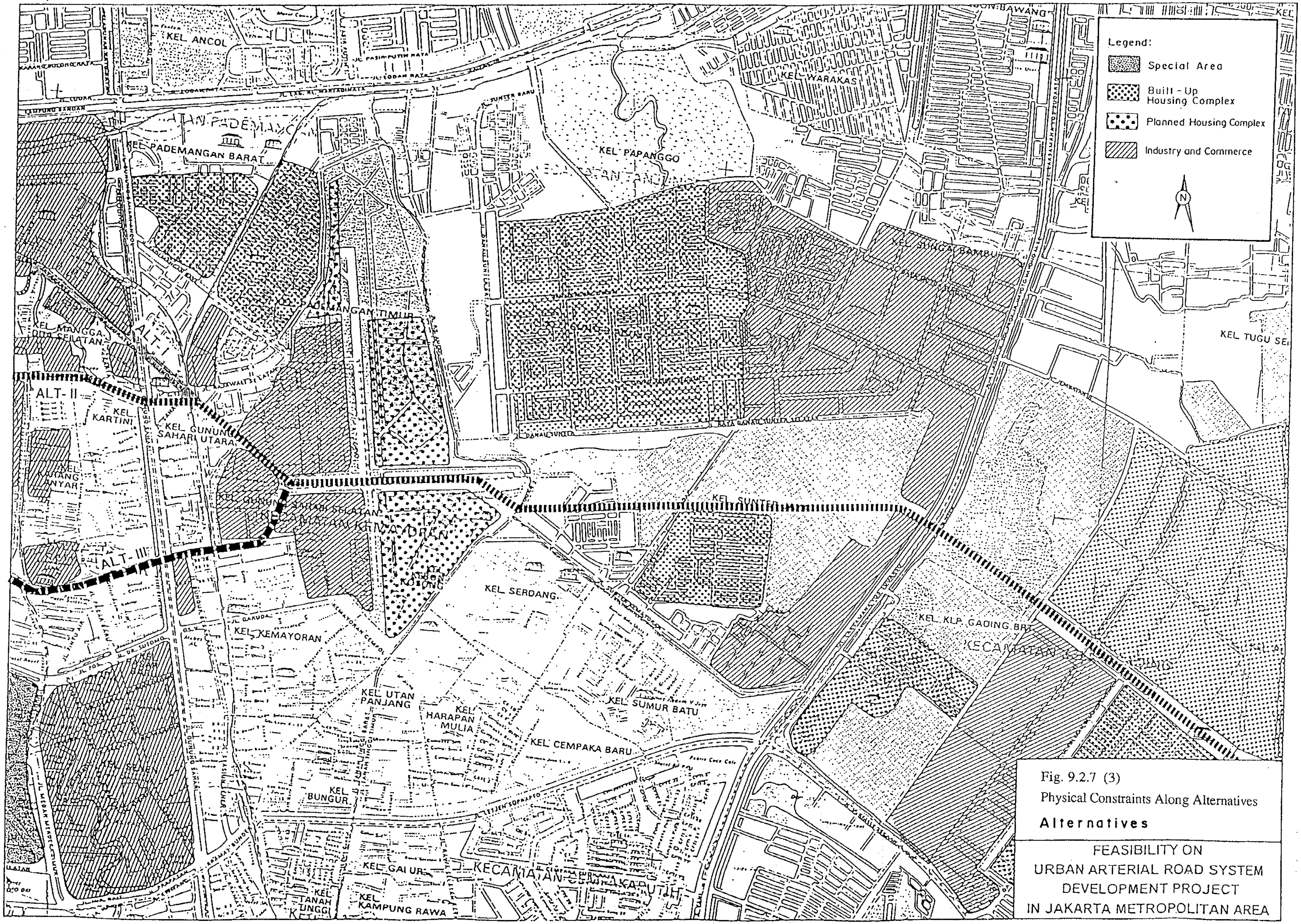

Fig. 9.2.7 (3)

Physical Constraints Along Alternatives

Alternatives

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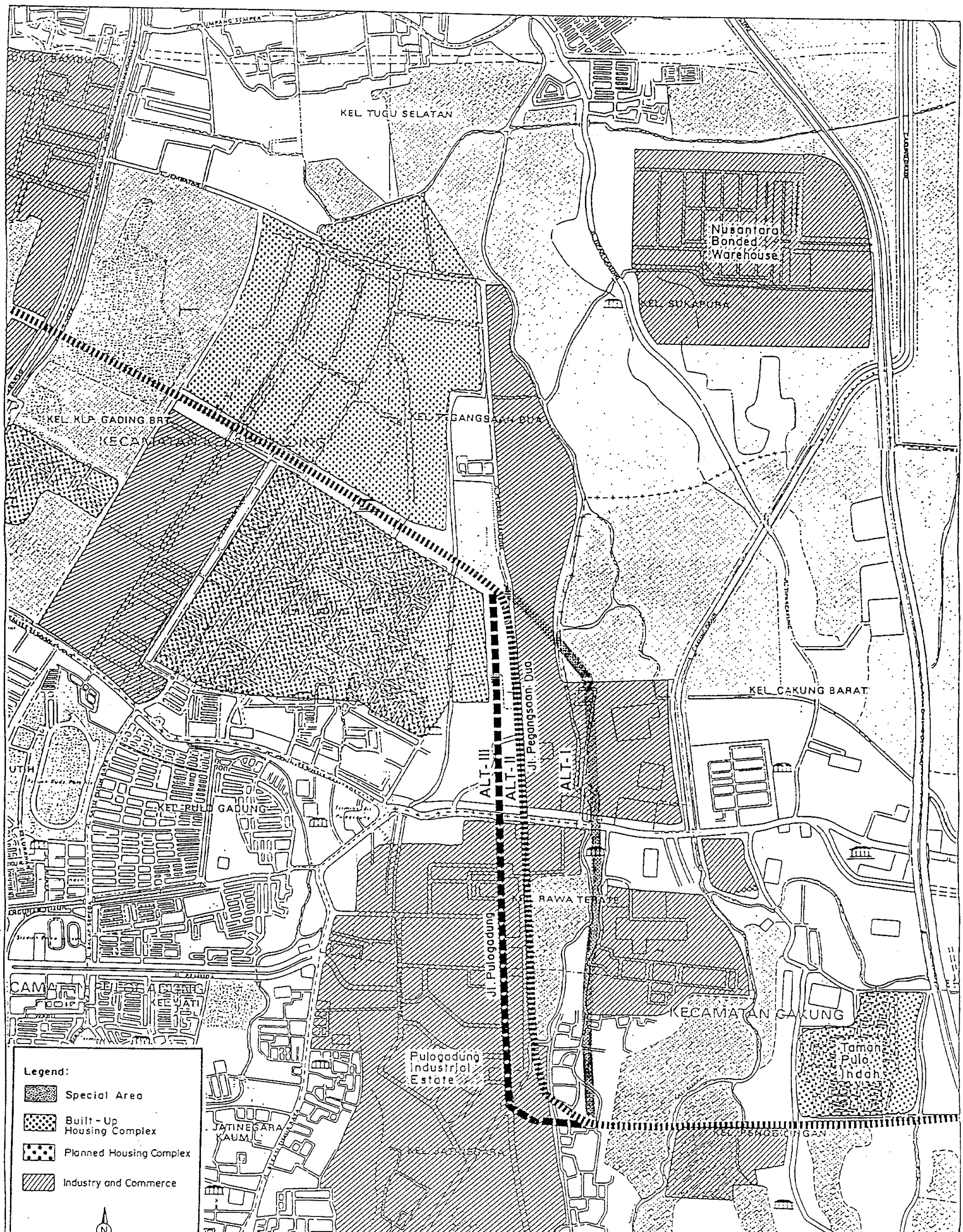

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Fig. 9.2.7 (4) Physical Constraints Along Alternatives

New bus terminal that is planned at the intersecting point with JORR should be incorporated in the design of interchange.

Fig. 9.2.7 1) thru 9.2.7 4) present physical constraints along the corridor.

9.2.3 Setting of Alternatives

1) North-South Axis

The following five (5) alternative routes are set in the selected corridor of the North-South Axis as shown in Fig. 9.2.8;

Alternatives	Route Location	Background
AL-I	Jl. Gajah Mada / Hayam Wuruk - Jl. M.H. Thamrin - Jl. Jend. Sudirman - Jl. Singamangaraja - Jl. Panglima Polim - Jl. Fatmawati	Original Scheme
AL-II	Jl. Gajah Mada / Hayam Wuruk - Jl. M.H. Thamrin - Jl. Jend. Sudirman - Jl. Pakubuwono 6 - Jl. Pejompongan - Pondok Pinang (Simpruk Bypass) - Jl. Metro Pondok Indah	Separation Scheme
AL-IIIa	Jl. Gajah Mada / Hayam Wuruk - Jl. Abdul Muis - Jl. Jati Baru - Jl. Pejompongan - Pondok Pinang (Simpruk Bypass) - Jl. Metro Pondok Indah	Western Scheme
AL-IIIb	Jl. Gajah Mada / Hayam Wuruk - Jl. Abdul Muis - Jl. Jati Baru - Jl. Pejompongan - Pondok Pinang (Simpruk Bypass) - City Planning Road	Additional Western Scheme
AL-IV	Jl. Gajah Mada / Hayam Wuruk - Jl. Abdul Muis - Jl. Jati Baru - Jl. Pejompongan - Pondok Pinang (Simpruk Bypass) - Jl. Gelora - Jl. Asia Afrika - Jl. Pattimura - Jl. Sultan Iskandarsyah - Jl. Prapanca - Jl. Pangeran Antasari	Central Scheme
AL-V	Kali Krukut - Jl. Tanah Sereal - Jl. Cideng Timur/Barat - Jl. Fakhrudin - Jl. Mas Mansyur - Kali Krukut	Eastern Scheme

The original Scheme was developed in the previous master plan study of ARSDS and had a public transport oriented corridor. The Separation Scheme was developed especially for a toll road separated from the public transport oriented corridor and terminates at Lebak Bulus. These routes were abandoned because of designated Protocol Road on Jl. M.H. Thamrin and Jl. Jend. Sudirman.

Four alternatives of Western Scheme, Additional Western Scheme, Central Scheme and Eastern Scheme are named by the location of each route at Kebayoran Baru Subcenter.

These four alternatives are set considering the role and function of North-South Axis, that is to divert medium to long trip from the existing north-south thoroughfare of Jl. M.H. Thamrin and Jl. Jend. Sudirman.

2) East-West Axis

The following three (3) alternative routes are set in the selected corridor of the East-West Axis as shown in Fig. 9.2.9;

Alternatives	Route Location	Background
AL - I	B.P (Western section of JORR)-City planning road (Route-K)-New route-City planning road along Tangerang line-Jl.Pangeran Jayakarta-Jl. Dr. Suratmo-Jl.Industri-Jl.Landasan Barat/Timur-Jl.Sunter Jaya-City planning road-Jl.Taman sunter Indah-Jl.Danau Indah Raya-Raya Barat/Timur Boulevard-New route-City planning road (Route E-E)-City planning road (Route A-A)-E.P (Eastern section of JORR)	Road priority scheme
AL - II	B.P (Western section of JORR)-City planning road (Route-K)-New route-City planning road along Tangerang line-Jl.Jembar Utama Sakti-Jl.Jelambar Selatan-City planning road-Jl.Mangga Besar-Jl.Industri-Jl.Landasan barat/Timur-Jl.Sunter Jaya-City planning road-Jl.Taman Sunter Indah-Jl.Danau Indah Raya-Raya Barat/Timur Boulevard-Jl.Pegangsaan Dua-City planning road-City planning road (Route A-A)-E.P (Eastern section of JORR)	Urban betterment scheme

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Fig. 9.2.8 Route Alternatives on North - South Axis

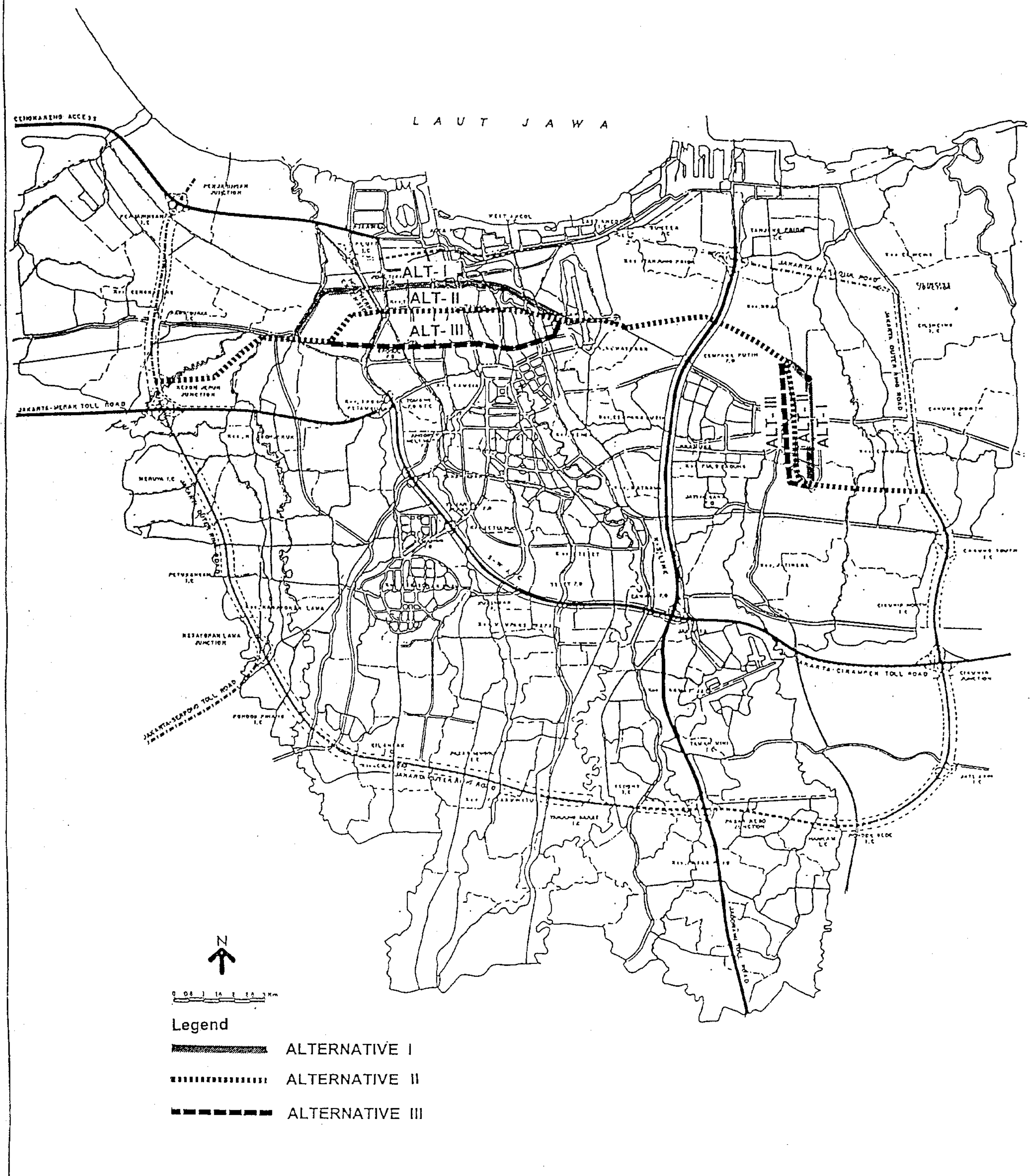

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Fig. 9.2.9 Route Alternatives on East - West Axis