V. PROJECT ROAD

5.1 Proposed Tollway Network

In the highway network of Jakarta Metropolitan area, the Jakarta - West Java Tollway System is the backbone.

The following are the road elements of the Jakarta - West Java tollway system.

Table : 5-1 NAME OF TOLLWAYS

Jakarta - Tangerang Freeway	30 Km
Jagorawi Freeway	60 Km
Jakarta - Cikampek Freeway	80 Km
Jakarta Outer Ring Road	60 Km
Jakarta Harbour Road	35 Km
Jakarta Intra Urban Tollway	30 Km

In general, the following conceptional ideas or situations are the background to the above-mentioned road network.

(1) To prevent the in-migration to the special capital city of Jakarta, and encouraging the development of the satelite towns in the peripheral area.

(2) To promote the more efficient synchronization of JABOTABEK area as a Metropolitan area.

(3) To assist and improve the port activity functions of Tg. Priok port which from consideration of land access, serves not only DKI Jakarta but also West Java and some parts of South Sumatera.

(4) On the otherhand, DKI Jakarta should be reserved and maintained as the capital city and must be able to continue to function as such.

(5) To encourage an increase in the road density of the area as a whole as this density is felt to be too low at present.

(A) By respecting the policies (1), (2), (3) and (4) above, and clarifiing the land use zoning, it is hoped to encourage the manufactures to locate outside of DKI Jakarta. By guidance from the local Government, and provision of good access, manufacturers who relocate outside DKI will achieve faster access to the trading port and trunk highways.
This will result in reduced transportation costs and thus encourage other manufactures to locate far outside of the city, with confidence. The resultant increase in job opportunities in the peripheral area will work well to stop the inflow of population.

(B) On this concept, the idea of regional freeways was born. These freeway lead three directions from Jakarta, to South West and West.
The Jagorawi Freeway, going to the South, is now under operations the Jakarta - Tangerang Freeway, going to the West, has almost completed the land acquition and site works will commence versoon; and the Jakarta - Cikampek Freeway, going to the East has started the land acquisition.

As a result, in 1983 to 1985, by those regional freeways and other radial arteries, a vast amount of traffic will inflow to Jakarta.

(C) In order to allow Tanjung Priok Port which has DKI Jakarta and West Java as hinter lands, to function correctly and to make direct links with the peripheral area, Jakarta Harbour Road and Jakarta Outer Ring Road are being planned.

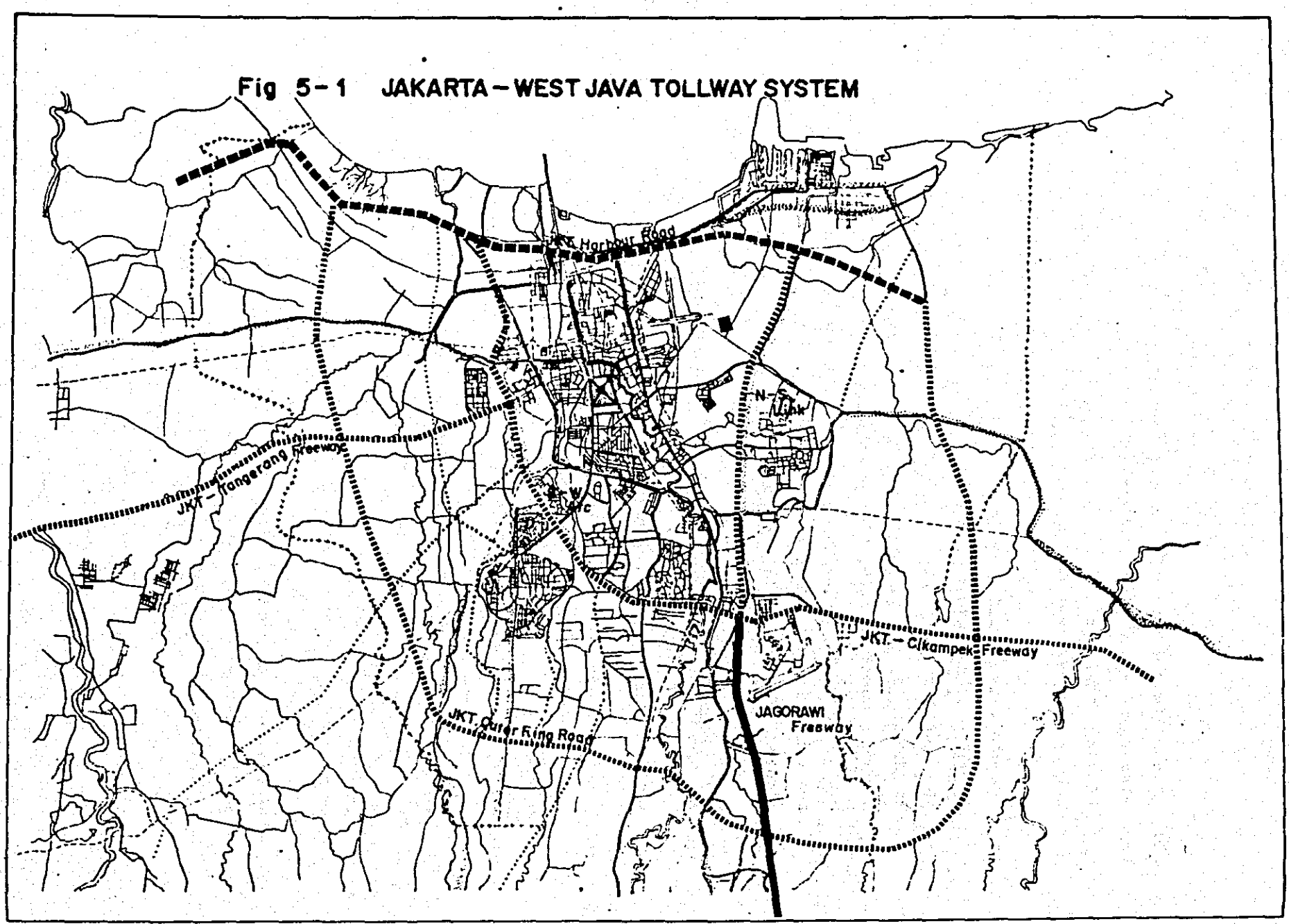
These roads will not only serve as by-passes, but will also give development impacts to the peripheral area.

(D) Thus it is now urgent to develop and strengthen the highways and streets in Jakarta to meet the target years of those regional freeways realization. To meet this need, the plan and idea of Jakarta Intra Urban Tollway was born.

(E) The above-mentioned development of highways will require a vast amount of the national budget.
The budget of the state should be allocated equally to all the regions in the state, but on the otherhand, from consideration of achieving higher economic grouth, the investments should be directed to the highly integrated area of Metropolitan Jakarta. As a result of the above-mentioned two considerations, the tollway concept has been adopted as a beneficial principal.

(F) Each element of the network has different functions but each has to be kept in harmony to result in strong mutual relations and to decide priority of investment.

Fig 5-1 JAKARTA – WEST JAVA TOLLWAY SYSTEM



5-2 Outline, Fuctions and Initial Route Study

5-2-1 Outline of the Project Roads

The Project Roads to be studied consist of:

- For Harbour Road	
Cilincing - Pluit	18.0 Km
Pluit - Cengkareng New Airport	14.3 Km
- For Arterial Street	
Tanjung Priok Access	3.0 Km
Total:	35.3 Km

These roads are located in the northern part of DKI Jakarta. The Harbour Road is an indispensable component of the Jakarta-West Java Toll System and runs from Cengkareng New Airport at the west end to Jakarta Ring Road at Cilincing in the east end. The Tg. Priok Access is a major arterial street connecting Tg. Priok Port and Tg. Priok Junction. The Pluit-Cengkareng New Airport section of Harbour Road started construction in 1981 as an access road to the Cengkareng New Airport and the road will be opened in 1985 as a toll road with 4-lane 2-way.

Further, the existing arterial streets from Pluit to Tg. Priok were also studied to some extent. Among these street sections the improvement work for Jl. Martadinata-Enggano should be urgently executed.

5-2-2 Function of the Project Roads

In the Project corridor there are many activity centers as already defined.

Among the Jakarta-West Java Tollways System, Jakarta Outer Ring Road is a circumferential tollway characterized by a high design speed and high standards.
The proposed route is in the periphery of DKI Jakarta, about 15 Km away from the city center, and the road is expected to function as the first distributor of the traffic from outside Jakarta. Jakarta Intra Urban Tollway is a inner circumferencial tollway and partially surrounds the C.B.D. area. It is expected to serve traffic to and from the C.B.D. area. Even on the completion of these two circumferential roads and the three rural freeways the effective tollway system can not be realized without the Harbour Road.
The Harbour Road is therefore a indispensable section of the Tollway System. It completes the circumferencial Tollway as a part of the Intra Urban Tollway as well as completing the Jakarta Ring Road. The Harbour Road is expected to serve the traffic to and from the activity centers as well as the C.B.D. and also complements the distribution functions of the other tollroads.

On the other hand Tg. Priok access road is a major arterial street. At the Tg. Priok junction it connects the N-S link of Jakarta Intra Urban Tollway with the Harbour Road.
It is expected to serve the traffic to and from Tg. Priok as well as the local traffic generated from the surrounding area.

5-2-3 Initial Route Study

The corridor of the Harbour Road is considered to run between Cengkareng in the West and Cilincing in the East.
The corridor of the Harbour Road is largely expected to be located within a band five kilometer inland from the shallow offshore area of the Java Sea, and to serve as a major transportation frame in the coastal area of DKI Jakarta.

The corridor must be selected from the view point of traffic efficiency, in distributing to the future street and tollway network the traffic generated from the Project influence area as well as the many development centers in the Project area.

Prior to determination of the sub-corridor, it was decided to study sub-corridors located on the boundaries of the Project Area. Thus the offshore route located in the shallow portion of the Sea and the inland route located more than five kilometer inland were studied as follows:

A. Study for the offshore route

The offshore route, located in the shallow portion of the Java Sea, has many demerits as listed below:

- The land development is limited to the southern side of the road, since according to the Jabotabek plan. there is no intention to develop a large scale reclamation area.
- The offshore route is located too far from the desire corridor of the traffic generated from the inland area.
- Efficiency for traffic distribution to the existing and future street network is less than that of the inland route.
- Environmental influence to the coastal fish ponds in Kanal Muara and Kapok Muara is unavoidable.
  It will need many openings to maintain the free flow of brackish water.
- Many bridges are required to provide openings for the numerous rivers and harbours located along the coastal line.

Therefore the offshore route will not be justified.

B. Study for the Inland route located more than five kilometer from the coastal line

The corridor located south of Jl. Pangeran would be very difficult for land acquisition due to the densely developed area.

This corridor is also too far from desire corridor of the traffic generated from the many development centers located in the coastal area.

These two corridors mentioned above are not recommended and the corridor, therefore should be located within the band five kilometer inland from the shallow offshore area.

5-3 Alternative Route Alignment

In this Study the field investigations using aerial photo mosaics and geographical map, both to the scale of 1 = 5,000, were carried out in detail, to provide a basis for the selection of the best route for the Project Road.

The Study also considered the needs for junctions and interchanges.

Tg. Priok access has no alternative route, since it is the improvement of existing streets.

The description of alternative routes is made by section as follows:

Section - I	Cengkareng - Kanal Muara	STA 0 + 0 - 8 + 0
Section - II	Kanal Muara - Mangga Dua - Utara	STA 8 + 0 - 17 + 300
Section - III	Mangga Dua - Utara - Pademangan Barat	STA 17 + 300 - 20 + 400
Section - IV	Pademangan Barat - Sunter	STA 20 + 400 - 22 + 400
Section - V	Sunter - Sukapura	STA 22 + 400 - 31 + 190

Alternative routes for each section are shown in Fig. 5-2.

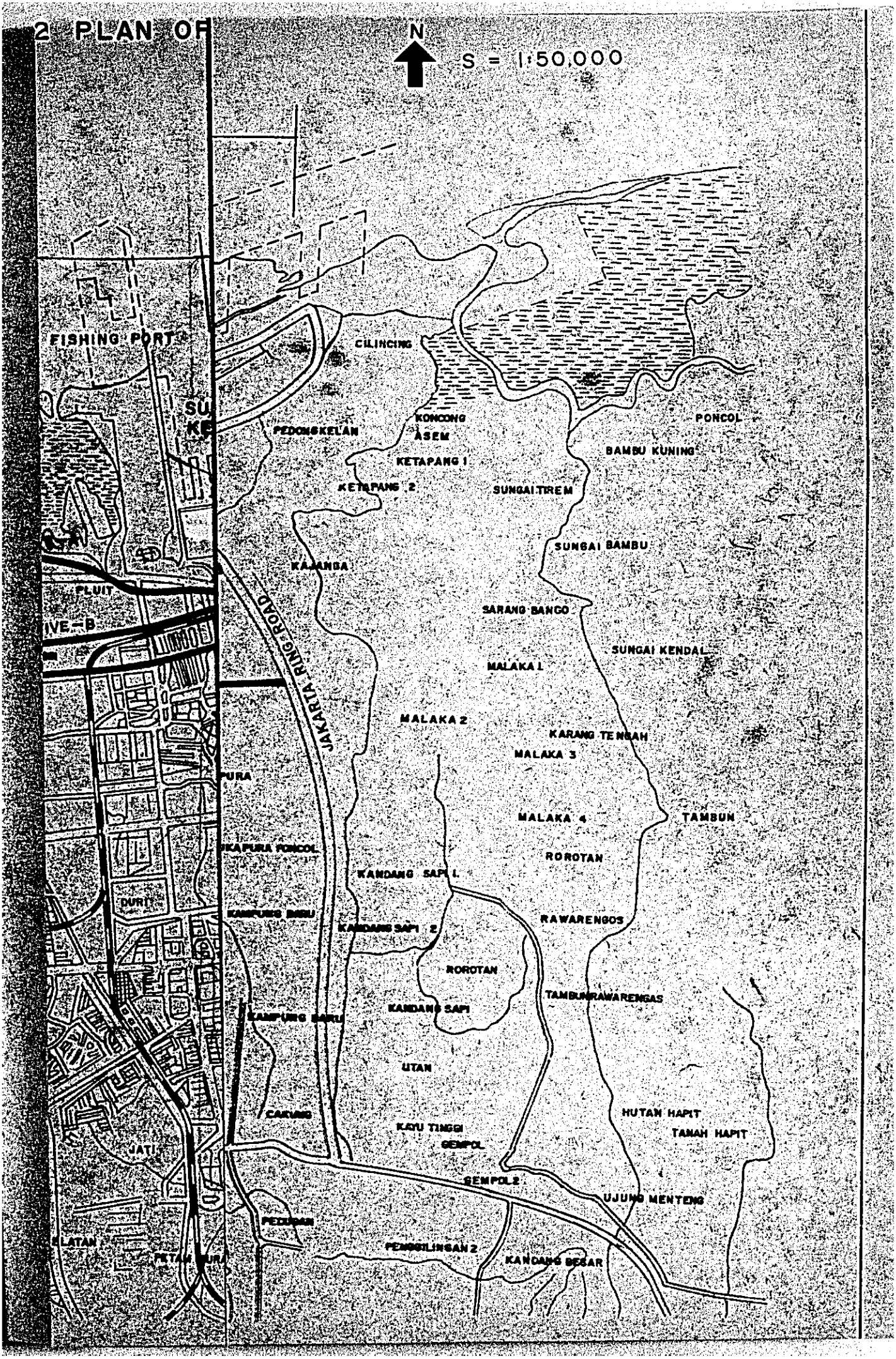

2 PLAN OF
N
S = 1:50,000
FISHING PORT
SU
KE
PLUIT
IVE-B
JAKARTA RING ROAD
DURI
JATI
CILINCING
PEDONGKELAN
KONCONG
ASEM
KETAPANG 1
KETAPANG 2
KAMANGA
SUNGAI TIREM
PONCOL
BAMBU KUNING
SUNGAI BAMBU
SARANG BANGO
SUNGAI KENDAL
MALAKA 1
MALAKA 2
KARANG TENGAH
MALAKA 3
MALAKA 4
TAMBUN
RORORAN
RAWARENGAS
KANDANG SAPI 1
KANDANG SAPI 2
KANDANG SAPI
TAMBUNRAWARENGAS
UTAN
KAYU TINGGI
CAKUNG
GEMPOL
GEMPOL 2
HUTAN HAPIT
TANAH HAPIT
UJUNG MENTENG
KANDANG BESAR
PENGGILINGAN 2

Fig.5－2 PLAN OF ALTERN

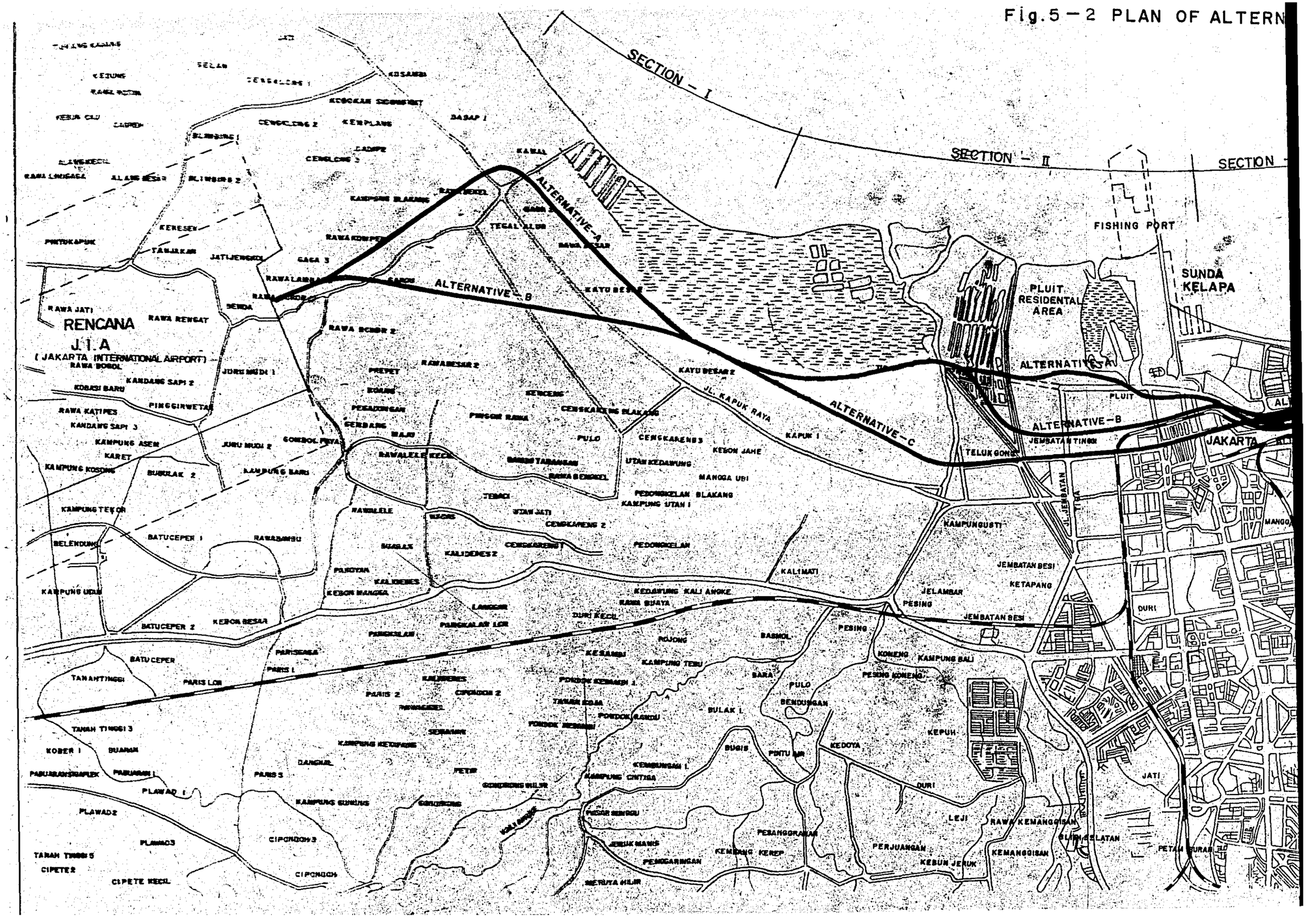
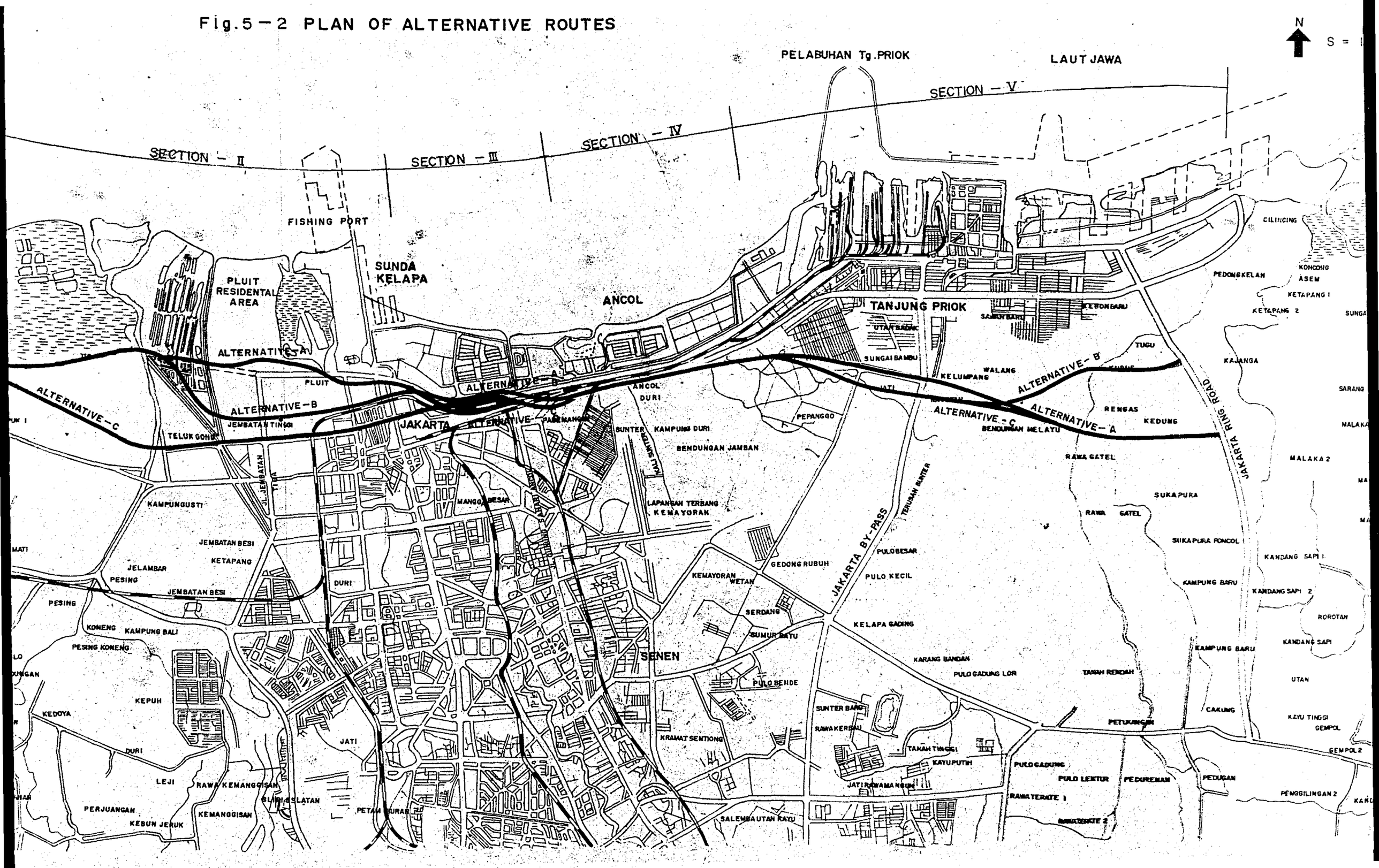


Fig.5－2 PLAN OF ALTERNATIVE ROUTES



2 PLAN OF ALTERNATIVE ROUTES

N

S = 1:50.000

PELABUHAN Tg.PRIOK

LAUT JAWA

SECTION – V

SECTION – IV

SECTION – III

FISHING PORT

SUNDA KELAPA

ANCOL

TANJUNG PRIOK

UTAN BARAT

SUNGAI BAMBU

SAMPAH BARU

KEBON BARU

TUGU

WALANG

KELUMPANG

ALTERNATIVE – B

ALTERNATIVE – A

ALTERNATIVE – C

ALTERNATIVE – D

ANCOL DURI

PEPANGGO

SUNTER KAMPUNG DURI

BENDUNGAN JAMBAN

BENDUNGAN MELAYU

RENGAS

KEDUNG

RAWA GATEL

JAKARTA RING ROAD

TERUSAN SUNTER

JAKARTA BY-PASS

PLUIT

JAKARTA

PASAR MANGGA

MANGGA BESAR

DURI

LAPANGAN TERBANG KEMAYORAN

GEDONG RUBUH

KEMAYORAN WETAN

SERDANG

SUMUR BATU

PULO BESAR

PULO KECIL

KELAPA GADING

KARANG BANDAR

PULO GADUNG LOR

PULO BENDE

SENEN

SUNTER BARU

RAWA KERBAU

KRAMAT SENTIONG

TANAH TINGGI

KAYU PUTIH

JATI RAWAMANGUN

PULO GADUNG

PULO LENTUR

PEGUREMAN

RAWA TERATE 1

RAWA TERATE 2

SALEMBA UTAN KAYU

PETAMBURAN

JATI

PETUKANGAN

TANAH REMBAH

CAKUNG

PEDONGKELAN

CILINCING

KONCONG

ASEM

KETAPANG 1

KETAPANG 2

SUNGAI TIREM

PONCOL

BAMBU KUNING

SUNGAI BAMBU

KAJANGA

SARANG BANGO

MALAKA 1

SUNGAI KENDAL

MALAKA 2

KARANG TENGAH

MALAKA 3

MALAKA 4

TAMBUN

RORORAN

KANDANG SAPI 1

KANDANG SAPI 2

RAWARENGOS

RORORAN

KANDANG SAPI

TAMBUNRAWARENGAS

UTAN

KAYU TINGGI

GEMPOL

GEMPOL 2

HUTAN HAPIT

TANAH HAPIT

UJUNG MENTENG

PENGGILINGAN 2

KANDANG BESAR

PEDUNGAN

SUKAPURA

SUKAPURA PONCOL

KAMPUNG BARU

KAMPUNG BARU

A. Section - I

i) Alternatives

Two alternative routes were considered in Section - I, with both routes starting from the entrance of the new Cengkareng Airport.

Alternative -(A) By-pass route at Kanal Muara and passing mainly through a rice paddy area.

Alternative -(B) Direct route.

ii) Comparison

The comparison for both routes is made in Table 5-2.

iii) Conclusion

Alternative -(B) is not recommended because it entails more social problems and since the total cost is almost the same as that of alternative -(A)

Alternative -(A) is therefore recommended as the route of Section - I.

B. Section - II

i) Alternatives

Within the selected sub-corridor, three alternative routes were identified as follows.

Alternative -(A) Most northern route using Jl. Pluit Selatan.

Alternative -(B) Middle route passing Penjaringan Kampung just north of the Western railway line.

Alternative -(C) Most southern route using Jl. Bandungan Utara and Selatan.

ii) Comparison

At present it is proposed that the S-W Arc extension of Jakarta Intra Urban Tollway will be located on the

Table 5 – 2 COMPARISON OF ALTERNATIVE ROUTES

SECTION – I STA 0+00 — STA 8+300

Item / Alternative	Length (Km)	No., Length and Area of Bridge (No, M, M²)	Connection with Other Roads	Affected Existing Fasilities				Problem on Traffic Treatment during Constanction	Total Cost
				Factory	School	Sand Stratum (M)	Residence (M)		
Ⓐ 0—8+300	8,30	Br – 1 No L = 25 M A = 500 m² Box 6 x 6 – 1 No 6 x 5 – 2 Nos 5 x 5 – 1 No 4 x 4 – 2 Nos	Modified "Y" Type – 1 No	–	Environmental Influence –5 Nos	L = 900	L = 920	Almost none	almost same as Alternative-Ⓑ
Ⓑ 0—6+670	6.70	Br – 4 Nos L = 50 m A = 1,000 m² Box 6 x 5 – 4 Nos	Modified "Y" Type – 1 No	Cinema – 1 No	Environmental Influence –4 Nos	L = 2,000	L = 1,970	Almost none	

Note : 1. Area of bridges is calculated on the basis of 20 meter width of throughway.

2. Quantities under the columns "Residence" and "sand stratum" give the length of either residential area or sand layer traversed by the planned road.

existing Jl. Latumeten and Jl, Jembatan Tiga. The study for the alternative extension of Jakarta Intra Urban Tollway is made in Appendix 5-10. The three alternative routes are compared in Table 5-3.

Alternative -(C) is not recommended because it entails social problems to the facilities along the existing street and involves a high cost for compensation, land acquisition and Construction.

Furthermore, as a result of a meeting with PJKA at Kota Station it is apparent that it will not be possible for the road to cross the yard of Kota Station, for the following reasons:

- Problem of the future arrangement of the yard.
- Problem of the existing operation of the direct loading and un-loading work from the cargo trains to trucks waiting between railwaylines.

It is very difficult to chose the best route between alternative (A) and (B)

iii) Further Study of Section - II

According to the study result in the previous paragraph, the section from Kali Angke to Ciliwung Kota Drain is the most difficult for determining the route location.

Further study for this section is therefore made in this paragraph based on the Pluit junction location studied in Appendix 5-10. The plan of the two alternatives in shown in Appendix 5-1.

Table. 5 – 3 COMPARISON OF ALTERNATIVE ROUTES

Section – II STA. 8+000 ~ STA. 17+300

Item / Alternative	Length (Km)	No, Length and Area of Bridges (No, M, M^2)	Connection with Other Roads	Effected Existing Facilities: Factory.etc	Effected Existing Facilities: Residence (Kampung)(M)	Effected Existing Facilities: Electric Tower	Problems, etc.	Construction Cost of Bridges (Billion Rp.)
(A) STA. 8+0 ~ 17+80	0.91	Throughway Br. L = 3,025 m, A = 77,440 m^2 J.C-Br.(including street ramps) L = 2,390 m, A = 16,730 m^2	Modified "Y" type -1 No Split Diamond -1 No	Factory – 4 Nos Ware house – 9 Cinema – 1 Contractor Build – 1 DKI Branch Build. – 1 Hospital – 1	L = 510	—	1) In case of split diamond I.C with Jl. Gedung Panjang and Jl. Tongkol both ramps are located close to the existing Intersection 2) Pluit Junction. a) Necessary improvement for existing street b) Difficulty of construction c) Enviromental problem for existing Pluit Residential Area d) Juntions toll gate must be located on the extention of S – W Arc.	Throughway Br. 31.7 Rampway Br. 14.3 Total 46.0
(B) STA. 8+0 ~ 17+80	0.93	Throughway Br. L = 2,095 m, A = 53,632 m^2 J.C-Br.(including street ramps) L = 1,840 m, A = 12,880 m^2	Ditto	Factory – 5 Nos. Warehouse – 30 Nos. Army – 1 No.	L = 950	1 No.	1) Environmental problem for the residential in Kel. Penjaringan 2) Pluit Junction a) Toll gate can be located on the Junction ramp way	Throughway Br. 21.1 Rampway Br. 9.2 Total 30.3
(C) STA. 8+0 ~ 17+80	0.94	Throughway Br. L = 2,465 m, A = 63,104 m^2 J.C-Br.(including street ramps) L = 1,070 m, A = 7,490 m^2	Ditto	Factory. — FOOD – 2 NOS — HOSPITAL – 1 NO. — PLY-WOOD – 2 — SCHOOL – 1 NO. — PLASTIC – 11 — TEMPLES – 1 — LUMBER – 1 — ELECTRIC – 1 — GLASS – 1 — BANK, OFFICE, — MOBIL REPAIR – 2, RESTAURANT – — PAINT – 2 — MANY NOS. — BISCUIT – 1 — SOCKS – 1 — STEEL – 1 — BEER – 1 — PRINTING – 1 — NAIL – 1	L = 1500	—	1) Major problem due the many facilities along the existing streets 2) Almost impossible to locate junction at the Intersection of Jl. Jembatan Tiga. 3) Effects on for some Historical Buildings 4) Difficulties of Construction	Throughway Br. 32.3 Rampway Br. 5.4 Total 37.7

Note : 1) Area of bridges is calculated on the basis of 25.6 meter width of throughway and 7 meter width of rampway.

2) Quantities under the colum of "Residence" indicate the length of residential area traversed by the planned road.

- Comparison

1. Cost

Table 5-4 shows the comparison for both alternatives. Considering in the additional cost for the re-arrangement of intersections and streets, alternative -(A) tends to higher than Alternative -(B)

2. Land development in Kel. Pejagalan

Most of the area in Kel. Pejagalan is now used as fish ponds. The alignment of Alternative -(A) separates the area into north and south, while that of Alternative -(B) runs in the south end of the area, along Bnajir Kanal..

From the view point of future development in the area, an arterial street should be located at the same location as Alternative -(A) as an extension of Jl. Raya Pluit Selatan.

3. Commitment on land use

There is a open space between Pluit residential area to the north and its industrial area to the south. This space will be used for public buildings and facilities as a buffer zone between the two areas. It is therefore difficult to realize Alternative-(A)

4. Re-development of the area

The area is characterized as the mixed area composed of many warehouses and lowgrade houses.

Fig. 5-4 COMPARISON OF SECTION - II ALTERNATIVES

(KALI ANGKE - CILIWUNG KOTA DRAIN)

Item / Alternative	Length (KM)	Length and Area of Bridges (M, M^2)	Affected Facilities (M^2)		Cost	Remarks
Ⓐ STA 12 + 0 17 + 200	0.52	L = 2,690 A = 68,344	Land Compensation Housing Industry & Offices Parking	279,000 36,000 81,600 31,800	Rather expensive	
Ⓑ STA 12 + 0 17 + 400	0.54	L = 1,485 A = 47,400	Land Compensation Housing Industry & Office Parking	332,300 71,100 107,300 -	Rather cheap	

It is apparent that the area lacks influstructure such as suitable streets supporting commercial/ every day activities and also has the problem on safety for fire due to narrow and few streets existed.

The re-development plan for the area should be planned as soon as possible.

The area will be redeveloped upon the realization of the Harbour Road, as this is expected to have an impact on the Kampung area as well as the warehouse area.

The Harbour Road should be planned so as to promote the future development in the area.

Finally Alternative -(B) is recommended under the subject to the DKI's committment to the redevelopment of the area along Alternative -(B).

C. Section - III

This section must be located around Ancol canal since the area to the north of the canal has already been established as Ancol industrial and residential area and the area to the south of the canal contains two railway lines; Tanjung Priok line and the eastern line to Bekasi.

The alternative routes were also selected from the necessity to locate Ancol Interchange connecting with Jl. Gunung Sahari Ancol.

i) Alternatives

Four alternative routes were selected as follows:

Alternative -(A) Located to the north of Ancol canal, using Jl. Lodan.

Alternative -(B) Located in Ancol canal near its South bank.

Alternative -(C) Located to the south of Ancol canal between Jl. Kampung Bandan and the railway to Tg. Priok.

Alternative -(D) Located between the railways of Tg. Priok line and Central line.

For economical reasons, it was desirable to place embankment on the reclaimed land, thus narrowing the existing canal. As a result of the meeting with Directorate General of the Water Resources, the Ministry of Public Works, this alternative was abandoned because narrowing the canal was not possible.

Therefore the alternatives will be mainly constructed as bridge structures.

ii) Comparison

The comparison is shown in Table 5-5.

Table 5-5 COMPARISON OF ALTERNATIVE ROUTES IN SECTION III

Unit: Billion Rp.

Main Item / Alternative	Construction Cost of Bridge	Land Acquisition and compensation cost	Total
Alternative -(A)	23.9	-	23.9
Alternative -(B)	20.8	-	20.8
Alternative -(C)	17.3	1.7	19.0
Alternative -(D)	17.8	1.0	18.8

According to the intermediate report of Jabotabek Railway Master Plan Study conducted by the Ministry of Communications and Tourism/JICA, there is a necessity to strengthen the western railway (the section between Kampung Bandan and Tg. Priok) and grade separation for the Central railway line is also recommended.

It is therefore not possible to recommend Alternative -(C) and (D) since they use the P.J.K.A. land necessary for the above rail improvements. Alternative -(D) is located entirely in the P.J.K.A. land and Alternative -(C) uses part of the land.

Furthermore it is a problem that Alternative -(C) requires relocation of many warehouses and industries.

In connection with traffic management during construction, it is necessary for Alternative -(A) to control strictly the existing traffic on Jl. Lodan. Alternative -(B) has less problem on the traffic management, due to maintaining traffic on Jl. Kampung Bandan during the contruction.

Finally Alternative -(B) is recommended due to fewer traffic problems during construction, less effect on existing commercial facilities and better land utilization.

D. Section - IV

The area is characterized as fish ponds and partially as a housing area. The route is located south of the railway to Tg. Priok, as close to the railway as possible.
In this section there is no alternative route as the route is controlled by the following points:

- Railway to Tg. Priok to the north;
- P.J.K.A. electric transmision station to the north;
- Canal saluran Sentiong to the south; and
- Space required for the Sunter interchange.

E. Section - V

i) Alternatives

The alternative routes must be located at the south border of the existing residential area, which is within the influencing area of Tg. Priok. In this corridor, three alternative routes were selected as described below.

Alternative - (A) Located to the south of 150 KV transmision line to Bekasi.

Alternative - (B) Passing Kel. Pepanggo, just north of Pertamina and 150 meter north of the triangular intersection at Kel. Tugu.

Alternative - (C) Using Alternative -(B) for the western section and Alternative -(A) for the eastern section.

ii) Comparison

The three alternatives are compared in Table 5-6.

Alternative - (A) has a big problem as it requires the relocation of many houses located to the south of the 150 KV transmission line in Kel. Sungai-Bambu and Kebon-Bawang.

Table 5-6 COMPARISON OF ALTERNATIVE ROUTE

SECTION - V, STA 22 + 400 ~ STA 31 + 19

Item / Alternative	Length (Km)	No. Length and Area of Bridges (No, M, M^2)	Connection With Other Roads	Affected Existing Facilities					Problem of Traffic Treatment during Construction	Construction Cost
				Factory	School	Sand Stratum (M)	Electric Tower	Residence (M)		
Ⓐ STA 22 + 400 ~ 31 + 190	8.79	Br - 9 Nos. L = 415 m A = 8,330 m^2	Modified Trumpet Type - 1 No Modified Clover - leaf - 1 No	Factory - 4 No Cinema - 1 No Passar - 1 No Warehouse - 1 No	Environmental Influence - 7 Nos.	L = 2300 + 700 + 3,000	2 Nos.	L = 3,720	Arterial street ramp intersection of Tg. Priok J.C is located close to the relocated Intersection of Jl. However this is not a major problem.	Most Expensive
Ⓑ STA 22 + 400 ~ 30 + 440	8.05	Br - 7 Nos. L = 400 m A = 8,000 m^2	Modified Trumpet Type - 1 No Modified Clover - leaf - 1 No	Army - 1 No	Environmental Influence - 8 Nos.	L = 350	2 Nos.	L = 2,400	- Arterial street ramp intersection of Tg. Priok J.C. is located close to the Jl. Plumpung Semper Interscection. - Passing through Residential area located at Kel. Semper planned by DKI.	Medium
Ⓒ STA 22 + 400 ~ 30 + 440	8.05	Br - 7 Nos. L = 255 m A = 5,100 m^2	Modified Trumpet Type - 1 No Modified Clover - leaf - 1 No	Army - 1 No	Environmental Influence - 8 Nos.	L = 350 + 700 1,050	2 Nos.	L = 2,140	- Arterial street ramp intersection of Tg. Priok J.C. is located close to the Jl. Plumpung Semper intersection.	Cheapest

Note : (1) Area of bridges is calculated on the basis of 29 m width of road.

(2) Quantities under the column of "Residence" indicate the length of residential area traersed by the Planned road.

(3) Quantities under the column of "Sand Stratum" indicate the length of sand stratum traversed by the planned road.

On the other hand Alternative - (B) has less problem on re-location of houses in the same Kelurahan due to its location at the border of the housing area and industrial area to the south.

Alternative - (B) however also has a problem on community separation in Kel. Tugu and traverses a residential area in Kel. Semper planned by DKI Jakarta.

Alternative - (C) is recommended as section - V of the Project Road due to fewer problems on the relocation of facilities and land separation. It has also less construction, land acqusition and compensation cost.

5-4 Junction/Interchange

5-4-1 General

Interchanges are the vital connecting facilities for the roadway system. There should be an adequate number of them in order to attain the maximum traffic efficiency and to aid in future regional development.

In the study "Junction" defines a facility connecting a tollway and a tollway and an "Interchange" defines a facility connecting a tollway and an arterial street.

For junctions with tollways, Jakarta Intra Urban Tollway and Jakarta Ring Road, are studied in this chapter as well as interchanges with arterial streets.

5-4-2 Location of Interchange

There are many existing and planned streets traversed by the Harbour Road. Among these streets some arterial streets were selected for connection with the Harbour Road from consideration of the future urban highway network.

The locations of junction/interchange and selected arterial streets are listed as follows :

Name of JC./IC.	Number of Legs	Crossing Road
1) Cengkareng JC.	3	Jakarta Ring Road
2) Pluit JC.	4	S-W Arc Extension of Intra Urban Tollway
3) Kota IC.	4	Jl. Gedung Panjang Jl. Tongkol
4) Ancol IC.	4	Jl. Gunung Sahari Ancol
5) Sunter IC.	4	Jl. Baru Sunter Jl. Martadinata
6) Tg. Priok JC.	4	N-S Link of Intra Urban Tollway (Jakarta By-Pass)
7) Cilincing JC.	3	Jakarta Ring Road

The spacing between connecting roads should safely accomodate weaving, diverging, and merging manoeuvres on the tollway and should be sufficient to provide good directional signing. The spacing between junctions and interchanges listed above was examined based on the AASHTO Standard shown in Table 5-7.

Table 5-7 SUGGESTED MINIMUM SPACING BETWEEN CONNECTING ROADS

Type of Highway	Minimum Spacing
Freeway	One mile (1.6 Km)
Other Principal Arterial	½ mile (0.8 Km)
Other Principal Arterial (Center Core)	500 feet (1.15 Km)
Minor Arterial	400 feet (0.12 Km)
Collector	300 feet (0.09 Km)

5-4-3 Selection of Junction and Interchange Type

The factors considered in deciding the type of Junction or Interchange are as follows :

- Type of connecting road and its design speed;
- Characteristics of future intersecting traffic;
- Terrain Conditions;
- Existing structure, building and land use;
- Safety and efficiency of traffic; and
- Cost.

The characteristics of an urban junction or interchange vary depending on the type of highways involved. For instance, at crossings with arterial streets, simple and compact forms, such as diamond or partial cloverleaf arrangements involving at-grade

ramp terminals on the arterial street are fitting since speeds are relatively low and interrupted flow at other intersections is not uncommon.
Junctions of two tollways nearly always involve some directional or semi-directional ramps for the major turning movements.
The layout at an junction of two tollways should be free of any restrictive weaving on the throughways.

The summary of junction/interchange criteria is presented in Table 5-8 for the purpose of selection of the type.

In many intersections on the Harbour Road, there are two types of connection, junction and interchange in one location. In such cases, these two connections will be separately located in order to avoid the complicated arrangement of rampways together in one location.
There are two significant factors in the study on selecting the type of junction/interchange and these are described as follows :

- The south bound traffic from Harbour Road is 50 percent larger than the north bound traffic.
- Harbour Road is located at the north end of the tollway network in Jakarta and no extension to the north is expected.

From these, it can be understood that the general shape of traffic frame is "T" even if there are existing arterial streets extending to the north.
From the economical view point and the characteristics mentioned above the following principles are adopted in determining the junction/interchange type.

For junctions

- "T" with directional and semi-directional ramps has an advantage for three leg connections.
- "Cloverleaf" with directional and semi-directional ramps is

Table 5-8 SUMMARY OF JUNCTION/INTERCHANGE TYPE

TYPE \ ELEMENT	CONNECTION BETWEEN	CAPACITY	RAMP	AREA	OTHERS
Three-Leg 1. Trumpet Partial Cloverleaf	Freeway - Major Street	Widely Used Type			Single structure
2. "T" or "Y"	Freeway - Freeway	High	High type of all movements		Sometimes requires three level structures
Four-Leg 1. Diamond	Major - Minor Crossing	- Depends on at-grade Intersection		Common in Urban Area	Narrow R.O.W. Simplest, most common type
2. Cloverleaf	Freeway - Divided arterial street	- Limited by one lane loop ramp - Weaving between adacent loops		Fitting Sub-urban or Outlying area	- Comparatively low design speed of the loops - Big R.O.W. Extra travel distance for all right turn - Confusion for some drivers
3. Directional	Freeway - Freeway	- High cap. for both through and turning traffic - Avoids the necessity for weaving.	High speed, for all movements	Common in Urban Area	- Costly due to many structures - Big R.O.W.

adopted for four-leg connections located in the outlying area.

- In special cases "Trumpet" may be adopted, subject to the following conditions being satisfied :
  - Location for tollgate is required.
  - Traffic demand on minor rampway is within one-lane capacity of loop ramp.

  In this case a design speed of 40 km/h is adopted as vehicles must stop at the tollgate.

For Interchange

- "Diamond" type is basically adopted if the traffic demand is within the capacity of the at-grade intersection.
  Sometime two grade separations, for tollway side and arterial street side, may be necessary due to the heavy traffic demand.
  In such case the grade separation located at the tollway side is called a "Tollway interchange" and the grade separation at the arterial street side is called an "Arterial interchange".

- For tollway Interchange "Trumpet" and "T" are adopted subject to the following conditions.
  - Trumpet type is adopted when the traffic demand is within the capacity of a one-lane loop ramp
  - "T" type is adopted if the traffic demand exceeds the capacity of one-lane loop ramp.

- For Arterial interchange

  If the traffic demand exceeds the capacity of an intersection with rampways, other ramp arrangements, such as partial cloverleaf, diamond, etc will be considered.

5-4-4 Description of Junction/Interchange

In this section the study for each junction/interchange is described. It is to be noted that, for some junctions/interchanges, studies are still on the midway. Therefore, the following may change subject to further study and the result of future traffic demand forecast.

A. Cengkareng Junction

1) General

Cengkareng junction is located in Kel. Kanal Muara. It is one of the major junctions in DKI Jakarta and connects Harbour Road with the West Arc of Jakarta Ring Road. It functions as the first distributor of the traffic from Cengkareng International Airport to Jakarta city.

2) Type of Junction

The conditions to determine the type of this junction are summarised as follows:

- Terrain and Land use : Flat, rice paddy and fish pond area,
- Number of legs : 3 legs,
- Design speed :
  - Jakarta Ring Road 100 Km/h
  - Harbour Road 80 Km/h
- Assumed traffic demand :
  - Total demand 30,000 veh/day in 2000 year
  - To and from Pluit
  - To and from Cengkareng

The traffic to and from Pluit is assumed to be predominant.

As the facility connects a tollway with a tollway, a directional type "T" is recommended even if the assumed traffic demand is comperatively small, since high speed movements are required for the junction.

Trumpet type has disavantages for use at freeway to freeway junctions due to the comparatively low design speed at the loops.

A design speed of 50 Km/h is adopted for the junction rampway according to the classification of interchanges discussed later.

3) Location of Junction

There are few control points, since the area is rice paddy and fish pond. The junction location was determined considering the approach alignment of Jakarta Ring Road and the factors listed below :

- Major direction of traffic flow
- Minimum affect on the Kampung located along Jl. Kapuk Raya
- The approach alignment to form a right-angle crossing with Jl. Kapuk Raya and approaching Harbour Road.

The junction plan is shown in Appendix 5-3

B. Pluit Junction

1) General

This is one of the major junctions in DKI Jakarta.
The location is controlled by the effective land use for the area, where is now used for fish ponds.

Pluit junction is located west of Kali Muara Karang, based on the Study of the S-W Arc extension of Intra Urban Tollway made in Appendix 5-10.

2) Type of Interchange

The conditions to determine the interchange type are listed as follows:

- Terrain & Land Use : Urban area, flat, fish pond area
- Number of legs : Three legs
- Related roads
  - Harbour road : Tollway,
    4 - 6 lanes,
    80 Km/h design speed.
- S-W Arc extension of
  Intra Urban Tollway : Tollway,
    4 lanes
    80 Km/h design speed.
- Assumed traffic demand :
  Total demand 30,000 veh/day in 2000 year
  To and from Tj. Priok
  To and from Cengkareng

  Future major traffic flow is assumed to be the direction between Tanjung Priok and S-W Arc extension.

The following is the case of a sectional toll system and rampways with tollgates.
It is necessary to provide the junction for tollways and the interchange for the arterial street Jl. Jembatan Tiga, separately.

For the tollway junction, it is possible to adopt two types, trumpet and "T".

The trumpet type may have more advantages than the "T" type due to the comparatively small traffic demand and high posibility of tollgate provision.

On the other hand for the arterial street a diamond type is tentatively adopted.

These two connecting facilities are mutually related since the two facilities are located closer than 1.6 Km.
The west bound ramps of the interchange must be located prior to that of the juction. These four west bound ramps including junction ramps will form the successive ramp pattern.

The junction/interchange plan is shown in Appendix 5-1.

For the further study the following will be made:

- the junction study without arterial street rampway under the toll system which the Harbour Road is regard as a component of Intra Urban Tollway.
- Study for the separate location of the junction and interchange rampway connected to Jl. Raya Pluit Selatan.

C. Kota Interchange

1) General

It is planned to locate this interchange arround Kota area, as a minor interchange.

In an Urban area with business activities, access to the tollway, which is operated by full-access control system, should be facilitated at certain intervals, for the convenience of users.

For this point of view one interchange should be allocated between Jl. Jembatan Tiga and Jl. Gunung Sahari Ancol since the street distance mentioned above is 4.2 km.

2) Selection of access road

Between Jl. Jembatan Tiga and Jl. Gunung Sahari Ancol there are only two streets with which it is possible to access. One is Jl. Gedung Panjang and the other is Jl. Tongkol.

The merits and demerits of these two streets are compared for their suitability as an access road, as shown in Table 5 - 9 .

As a result of the comparison shown in Table 5 - 9, it is not possible to specify access to only one of either Jl. Gedung Panjang or Jl. Tongkol, for the following reasons:

- Service area within each street is highly concentrated.
- Although the existing Jl. Tongkol is a very minor street, it should be an important and a direct access to the CBD.

Therefore it is recommended that these two streets be mutually connected by frontage roads provided on both sides of the tollway.

Table 5-9 COMPARISON OF ACCESS ROAD FOR KOTA INTERCHANGE

Item \ Jalan	Jl. Gedung Panjang	Jl. Tongkol
Street feature	4-lanes with median. Major arterial (Type-D W = 47 m) in future *	2-lanes with no median. Minor arterial (Type-G W = 30 m) in future *
Clearance for P.J.K.A West - Line	H = 5.0 m	H = 3.3 m
Adjacent Intersection	Jl. Pakin - 400 m Jl. Kopi - 350 m	Jl. Pakin - 350 m Jl. Kunib - 350 m
Distribution Efficiency	Higher street capacity and comparatively higher efficiency for traffic distribution.	Smaller street capacity and lower efficiency for traffic distribution.

Note : * Mark is based on DKI Jakarta Plan

3) Interchange type

Diamond interchange is the most common and simplest type with minimum right-of-way. Considering the function of the minor interchange and the situation of land aquisition in Jakarta, this type is adopted for this interchange.

Because of the relationship with the Pluit Junction, it is impossible to facilitate a full split diamond type interchange for these two streets.

It is recommended to prepare a half diamond interchange at Jl. Tongkol with direct connection only to and from Tg. Priok, while connections with Jl. Gedung Panjang is served by frontage roads.

The interchange plan is shown in Appendix 5-4.

Further the provision of this interchange will also be justified depending on the surrounding streets network to be constructed in future.

D. Ancol Interchange

1) General

The interchange should be located in the area surrounded by Jl. Gunung Sahari Ancol and two railway lines. Tg. Priok line to the north and a connecting line to the east between Tg. Priok line and a central line. The location is also controlled by the following points and facilities.

- Jl. Gunung Sahari Ancol to be a major access road to Ancol interchange.
- To locate as near as possible to Jl. Gunung Sahari Ancol, from the view point of the saving in vehicle operating costs.
- To avoid a youth-hostel of Grana Wisata Remaja Jaya Ancol;
- To avoid an army complex; and
- To ensure the location of Pademangan Polder (water - reservoir).

2) Type of Interchange

The conditions to determine the interchange type are listed as follows :

- Terrain & Land use	:	Urban area, flat, residential area
- Number of legs	:	Four legs
- Related roads	:	
- Harbour Road		Tollway, 4 - 6 lanes, 80 Km/h of design speed.

- Jl. Gunung Sahari Ancol — Arterial Street, 6 lanes, 60 Km/h of design speed
- Jl. Trobosan Gunung Sahari-Martadinata — Arterial Street, Planned 6 lanes, 40 Km/h of design speed

- Assumed Traffic Demand :

  Total demand — 60,000 veh/day in 2000 year
  To and from Tg. Priok
  To and From Cengkareng
  Percentage of trucks

  Future major traffic flow is assumed to be the direction from Tg. Priok to the south, through Jl. Gunung Sahari Ancol.

Two interchanges, for Harbour Road (so called "Tollway interchange") and Jl. Gunung Sahari Ancol (so called "Arterial interchange"), may be required in order to meet such a large traffic demand.

For the tollway interchange, it is possible to adopt two types of interchange, trumpet and "T".

It is therefore tentatively recommended to adopt a "T" type due to the heavy traffic demand.

The design speed of the rampways is 40 Km/h according to the interchange classification.

On the other hand for the arterial interchange two types of interchange are considered as follows :

- Modified diamond with a north-bound directional ramp
- Modified partial cloverleaf type with a north-bound directional ramp.

The north bound directional ramp is required to have a fly-over to the arterial street due to the heavy traffic demand.

The other ramps may have smaller traffic demand and this can be met within the capacity of an at-grade intersection.

In the case that a heavy traffic demand is anticipated for the other ramps as well as the south-bound directional ramp, a modified partial cloverleaf interchange will be adopted.

3) Study on the location of the tollway interchange

i) Alternative Locations

The tollway interchange is roughly in the area between Jl. Gunung Sahari Ancol and the access railway to Tg. Priok, since the arterial street interchange was fixed by Jl. Trobosan Gunung Sahari - Martadinata. In this section three alternative locations for tollway interchange are studied as follows :

Alternative - (A)	Located to the west of the area, just north-east of the army complex
Alternative - (B)	Located in the middle in the area
Alternative - (C)	Located to the east of the area just east of the Tg. Priok access railway line.

ii) Outline of Pademangan Polder

The area is subject to flooding every year due to lack of a drainage system. Due to this situation, a drainage plan for the area has been established by Directorate General of the Water Resources, Ministry of the Public Works.

The outline of the plan is as follows :

- Effective Volume 20,800 m^3

- Effective Depth 2 m
- Polders Area 10.4 ha
- Pumping station is located adjacent to the railway to Tg. Priok and water is drained to Ancol Canal.

Furthermore the following are required for the Polder Project.

- The water reservoir should be located to the south of the Harbour Road to collect water and thus avoid inefficiency in using many pipes installed under the Harbour Road if the polder is located north of the road.
- The polder should be located in one area in order to promote drainage efficiency.
- It is necessary to avoid the creation of land which cannot be drained.
- Minimum length of drainage pipe between the polder pumping station and Ancol canal is desirable.

iii) Comparison of alternative tollway interchange locations

The following items are compared to determine the location of tollway interchange for the Ancol interchange.

- The saving of vehicle operating cost
- Influence to the polder
- Effective usage of land
- Affected facilities

The comparisons are made in table 5-10 and the plans for alternative (A) and -(C) are shown in Appendix 5-5 and 5-6.

Table 5-10 COMPARISON FOR ALTERNATIVE LOCATION OF ANCOL TOLLWAY INTERCHANGE

Item \ Alternative	Alternative -Ⓐ	Alternative -Ⓑ	Alternative -Ⓒ
Saving of vehicle operating cost	Large	Medium	Small
Influence to the Polder	Less influence	Big problem for the location of polder and long drainage pipe to Ancol Canal.	Less problem
Effective usage of Land	Comparatively good usage of land for the area.	Large undrained land remains.	Comparatively bad usage of land for the area due to the separation of land by the access road location.
Affected facilities	- Rather less number of houses - Less affect on the youth hostel.	- Large number of houses - Big affect on the youth hostel	- Largest number of houses - Less affect on the youth hostel.
Construction cost	- Medium - Bridge { 4 Nos, 24,980 m^2 - Length of Access road L = 475 m	- Cheap - Bridge { 4 Nos, 24,030 m^2 - Length of Access road L = 880 m	- Expensive - Bridge { 4 Nos, 25,585 m^2 - Length of Access road L = 1,080 m

iv) Conclusion

According to the result of the comparison made above, the alternative - (B) is not recommended because of the problems on the polder location and on the effective land use for the area.

Alternative - (C) has also problems on increased vehicle operating cost and more houses are affected due to the long access road.

Alternative - (A) therefore is the best alternative location for the tollway interchange.

E. Sunter Interchange

1) General

The Sunter Interchange will have an important role for the related project areas and roads.

The related projects and roads are as follows :

- Sunter development project
- Jakarta Fair
- Jl. Martadinata
- A city planning road

The interchange also serves the traffic to and from Tanjung Priok.

In the area, Jl. Martadinata and Ancol canal run parallel to the Tg. Priok railway line.

It is also expected that Harbour Road will be located parallel and close to the Tg. Priok railway.

The interchange should be planned so as to promote traffic efficiency although there is a need for many connections and limited space for rampway arrangement.

2) Outline of the related projects and roads

The outline of the related projects and roads is described as follows :

- Sunter development project

  Sunter development project is now under construction by DKI Jakarta, and the project is scheduled to be completed in 1985.

  Upon completion, the Sunter area will become mainly a housing area with the exact land use being as follows :

Industrial & warehouse area	257 ha
Housing & shopping area	565

Polder area	160
Public facilities (road, green) area	118
Total	1,100 ha

According to the plan, main access to the outside area is limited to two sides, the north and west end of the area. In the north of the area Jl. Baru Sunter is the only access road to Jl. Martadinata.

- Jakarta Fair

  No information received yet.

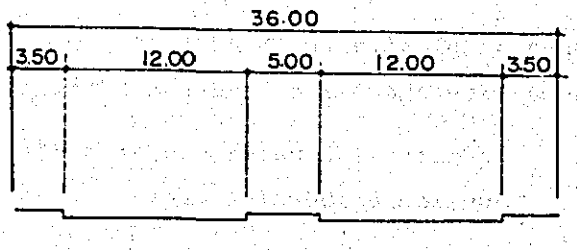
- City planning road

  The planning road will be located in the inland area parallel to Jl. Martadinata - Enggano - Cilincing Raya.

  It will function as the second inland route from the shore line and serve the traffic from Cilincing to Ancol, as well as the local traffic.

  Based on the DKI street plan the outline of the road is as follows :

  - Rank of road : Minor arterial street Rank-F
  - Number of lane : 6-lanes
  - Typical cross section



- Jl. Martadinata - Enggano

  The street will be improved to a 4 to 6 lane carriageway. The carriageway will be provided separately on both banks of Ancol canal as discussed in working paper.

3) Type of Interchange

The conditions to determine the interchange type are listed below :

- Terrain & Land use	:	Urban area, flat, fish pond but partially residential area
- Number of legs	:	3 or 4 legs
- Related roads :		
- Harbour roads		Tollway 4 - 6 lanes, 80 Km/h design speed
- Jl. Baru Sunter		Arterial Street 4 lanes 40 Km/h
- City planning road		Arterial Street 4 - 6 lanes 40 - 60 Km/h
- Assumed traffic demand (For Tollway) :		
Total demand		20,000 veh/day in the year 2000.

The limited space for rampway arrangement was already mentioned and a diamond type is therefore tentatively adopted for the Sunter interchange.

Due to the need for many connections a tollway interchange and an arterial interchange will be provided.

The tollway interchange should be separately located from the arterial interchange in order to avoid traffic inefficiency.

In the case of the interchange in one location, due to the close location of rampways on a fly-over bridge for Jl. Martadinata and the railway, traffic congestion will occur, thus influencing the tollgate on the rampways.

The tollway interchange will be provided on the extension of Jl. Baru Sunter, since Jl. Baru Sunter is defined as the major street in the Sunter project area. On the other hand a fly-over for the arterial interchange will be provided at the same location as the existing section of Jl. Baru Sunter to the at-grade intersection with Jl. Martadinata. On the provision of the flyover Jakarta Fair, Sunter area and Jl. Martadinata are mutually connected.

The city planning road is connected through frontage roads to Harbour Road and other arterial streets.

The interchange plan is shown in Appendix 5-7.

In the case that the traffic demand exceeds the intersection capacity planned on the flyover bridges, other arrangements will be considered.

Further a alternative interchange will be studied for the location at around Kali Cipontang as trumpet type.
In this case the access road of the interchange may be located in Sunter area parallel to Tg. Priok railway with some distances.

F. Tg. Priok Junction

1. General

The juction which will be located in Kel. Kebon Bawang near PT. Pertamina oil station, connects the Harbour Road with the N-S link of Jakarta Intra Urban Tollway and the arterial streets.

It will be one of the major junctions in Jakarta and will serve the traffic to and from Tg. Priok.

The detail location is controlled by the items listed below:

- Kali Sunter
- Electric substation of Gardu Induk Plumpang
- Toyota Mobirindo Factory
- Necessary space for toll office and tollway traffic control center.
- Minimum effect on Kampung

The following is the case of a sectional toll system adopted for the Harbour Road.

It is necessary to provide an inter-tollway junction and a arterial interchange separately.

The tollway junction is for both tollways and the arterial interchange is for the connection between Harbour Road and the arterial street of Jakarta by-pass.

2) Type of Interchange

The conditions to determine the interchange type are listed as follows:

- Terrain & Land use: Urban area, flat, residential and industrial area
- Number of legs : Four legs
- Related roads :

- Harbour Road — Tollway
  4-6 lanes
  80 Km/h design speed

- N-S link of Jakarta Intra Urban Tollway — Tollway
  4-6 lanes
  80 Km/h design speed

- Tg. Priok Access — Arterial street
  6 - lanes
  60 Km/h design speed

- Assumed traffic demand (for tollway ramps)

  N-S Link West of Harbour Road — 30,000 veh/day in 2000 year

  N-S Link East of Harbour Road

  Future major traffic flow is assumed to be the direction from N-S link of Intra Urban Tollway, to the west of Harbour Road.

For the tollway junction it is possible to adopt two types of interchange, trumpet and "T".

It is tentatively recommended to adopt a trumpet type, considering the lower traffic flow on the minor rampway.

The rampway design speed of 40 Km/h is recommended as a special case, because of the existence of the tollgate.

On the other hand for the arterial interchange a diamond type is tentatively adopted.

The major traffic flow is assumed to be in two directions, Tg. Priok - Kota and Tg. Priok - Cilincing.

Two diamond ramps to be located north of Harbour Road will therefore cross over/under the Harbour Road and connect with

Tg. Priok Access.

In the case that the traffic demand is more than the capacity of the intersection, other arrangements will be made.

The existing intersection with Jl. Plumpang Semper, which is located north of the arterial intersection, will be relocated due to the short distance between two intersections.

As the result of the study discussed above, the junction and interchange plan is show in Appendix 5-8.

Further the junction without a tollgate will be studied in the case that Harbour Road is considered as a component of Intra Urban Tollway.

G. Cilincing Junction

1) General

Cilincing junction is located near Cakung warehouse.
It is one of the major junctions in DKI Jakarta and connects with Jakarta Ring Road at the east end of the Harbour Road. It is expected to serve the traffic from Tg. Priok to Cakung and Bekasi. Kali Baru and Marunda ports are also expected to be located at the east of Tg. Priok

2) Tollway plan for the extension (Cilincing-Cakung) of Jakarta Ring Road

The section of Cilincing-Cakung is now operated as a two-way, two-lane road without access control. A right of way of 100 meter will be prepared in future, and this will included allowance for an arterial street.

According to the inspection conducted at the begining of November 1980, there were 10 industries located on both sides of the existing road and 2 at-grade intersections.

The tollway section of Jakarta Ring Road will be extended to the junction. The cross section will also be expanded to 6-lanes, using the existing two-lane carriageway.

The function of the existing facilities and crossings mentioned above should be maintained. Some fly-over or diamond interchanges will be provided for mutual connection of areas and of the planned arterial street.

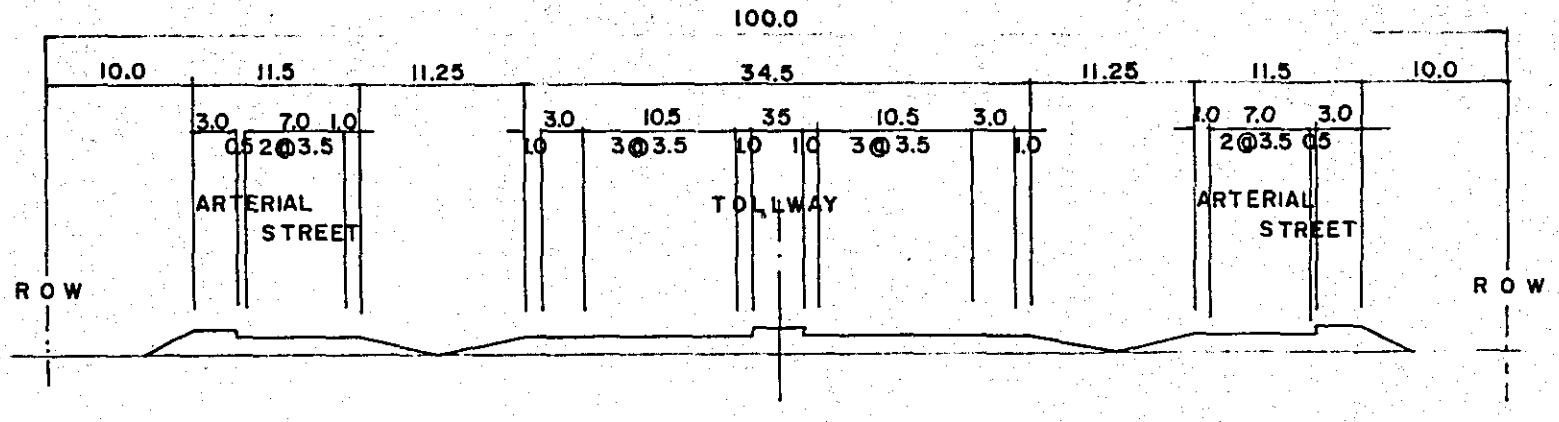
A tollway with 6-lanes is planned in the final stage.

The typical cross section is shown in Fig. 5-3.

The traffic of Cakung Warehouse will also be maintained through the frontage roads (Arterial street).

Fig 5 – 3 TYPICA CROSS-SECTION FOR CILINCING – CAKUNG.

S = 1:500



3) Type of junction

The conditions to determine the junction type are listed as follows:

- Terrain & Land use : Outlying area, flat, rice paddy area
- Number of legs : Three legs but consideration for the future extension to the east.
- Related roads :
  - Harbour Road : Tollway, 4-lanes, 80 Km/h design speed
  - Jakarta Ring Road : Tollway, 6-lanes, 80 to 100 Km/h design speed
- Assumed traffic demand :

  Cilincing ↔ Harbour Road 4,000 veh/day in 2,000 year
  Cilincing ↔ Cakung
  Cakung ↔ Harbour road
  Future major traffic flow is assumed to be the direction from Cakung to the west of the Harbour Road

In selecting the type of junction, a trumpet and a "T" type are not suitable due to the need for provision of the future extension to the east.

It is necessary for the major traffic flows to be provided with ramps of a high standard.

A partial clover leaf type with a semi-directional ramp is therefore recommended, due to the big difference in traffic demands between the rampways.

The design speed of rampway is 50 Km/hr for a directional and semi-directional ramp and 40 Km/h for loop ramps.

The junction plan is shown in Appendix 5-9, considering in the future possibility of east-bound extension of the Harbour Road.

4) Toll barrier

The junction connects two tollways as well as a toll-free road to Cilincing. It is desirable to locate it in one place, due to the toll levy system.

The toll barrier is therefore located on the toll-free road since Jakarta Ring Road and the Harbour road are assumed to adopt a sectional toll system.

VI. ENGINEERING

6.1 Topography

Topographical survey as well as setting out of the road centerline for the eastern section was conducted by PT. SEECONS, to facilitate further preliminary engineering.
Profile levels were established at 200 meter intervals along the centerline of the proposed routes.
This leveling included the taking of additional levels at the top and toe of slopes at fishponds and rice paddy dikes as well as at abrupt changes in terrain conditions.

Cross-sections were made at 200 meter intervals along the centerline of the proposed road based on the profile leveling survey and topographical maps to a scale of 1:1.000 (produced by DKI Jakarta in 1972).

In order to establish the alignment of the Project Road the following materials were used :

Material	Produced by	Scale
Aerial Photo	DKI Jakarta in 1978	1:5.000
Topographical Maps	DKI Jakarta in 1972	1:5.000
Working Mosaic	Study team in 1980	1:5.000

After the preliminnary design the drawings will be prepared in accordance with the Inception Report.

6.2 Soils and Material Survey

6.2.1. General

The purpose of the survey is to obtain the necessary data for the preliminary design and construction cost estimation for, among others, the pavement, structures, and embankment.

The soils survey was carried out during October, November and December 1980 by a local geotechnical company, P.T. SEECONS, Bandung. The materials survey was conducted during December 1980 by soil and highway engineers accompanied with Indonesian Counterparts. The field work and laboratory testings for the soils survey were planed and supervised by the team.

6.2.2. Topography and Soils Survey

A. Micro-topography

Usually in a alluvial plain, soil surveys are carried out through analyses of micro-topography. Jakarta area is situated on the delta at the mouth of the Ciliwung River.

The area on both sides of the delta, Tg. Priok area, and Cengkareng area are typical ridged beach planes and are composed of strips of beach ridges. In the Cengkareng area, where new Cengkareng Airport is under construction, the alluvial accumulation is deposited widely in old river courses.

The delta if the Ciliwung is mostly composed of clay and silt. The Batavia Castle which was located facing the sea in 1619 is now situated about 1.2 Kilometers inland from the coast. (Near Jakarta Kota railway station at present).

The natural levee of the old or existing Ciliwung River can be considered to have helped the spread of villages, which took place from north to south at first.

The natural levee is composed of flood accumulation material and is non-symmetric in section with a steep slope to the river side and slow slope to the outside. The grading of the accumulated material is finer in the back-slope of the natural levee than in the natural levee crest,

The hinter area of the natural levee is a marshy ground so called a backmarsh , and is composed of a rice fields and swamps. This occurs because the surface of the ground has been covered by fine mud and thus it is difficult for the surface water to penetrate into the ground. A beach ridge is made by fine sand which accumulates linearly at the range if surf and this ridge is usually laid down in strips parallel to the sea edge. Most existing roads and cillages are located on these strips. Intervals between ridges are marshy and composed of rice field or marsh ground similar to the backmarsh.

The geological composition in Jakarta area is as shown in the following table.

GEOLOGICAL PERIOD	STRATUM	EXPLANATION
Quaternary		
Holocene	Alluvium	In a flat plain, the upper layer of Genten Formation, includes a delta, a natural levee, a beach ridge and accumulation by an old river bed.
Pleistoncene	Diluvium	This consists of volcanic ash soil and a southern plateau made of this volcanic sediment. To a great extent it is weathered lateritically, depending on its depth.
Tertiary		
Pliocene	Genten Formation	Alternation of thin sandstone and mudstone layers

B. Soils survey

A soil survey was conducted at 14 Bore-holes as shown in Fig. 6-1. Standard penetration tests at 2 m intervals were also conducted for selected bore holes. The samples taken by thin-walled tube sampling were tested in the laboratory for specific gravity, moisture content, Particle size analysis, liquid limit, plastic limit, unconfined compression and consolidation.

As a result of the survey, the following information was received:

i) General condition of the sub-soil

The sub-soil conditions along centerline are comparatively complicated as shown in Fig. 6-2.

Kanal Muara-Kapuk Muara (BM-12 and BM-4)

Silty clay is predominant until 20 m depth below the surface. Beneath this layer is a layer of sand stratum with a tickness of 2.0 - 4.0 m.

BM-9

The bearing stratum here is the deepest among the bore holes. A complex of soils was inter-layed and they are mainly composed of Silty clay, silty sand and Sandy silt. Silty clay is prodominant among these layers. Thus it is assumed that this boring hole is located in the old river bed of Ciliwung River.

Ancol-Jakarta By-Pass (BM-6 to MB-18)

BM-10 (Tg. Priok railway access line) and BM-7 (Jl. Baru Sunter) have an unexpectedly good Sand layer at the depth of 6-10 m. On the other hand the sand layer of BM-6 (Jl. Kampung Bandan) and MB-18 (Jakarta By-Pass) is deeper than that BM-10 and 7. Sandy or dayey silt is predominant in the upper stratum.

Fig. 6 – 1

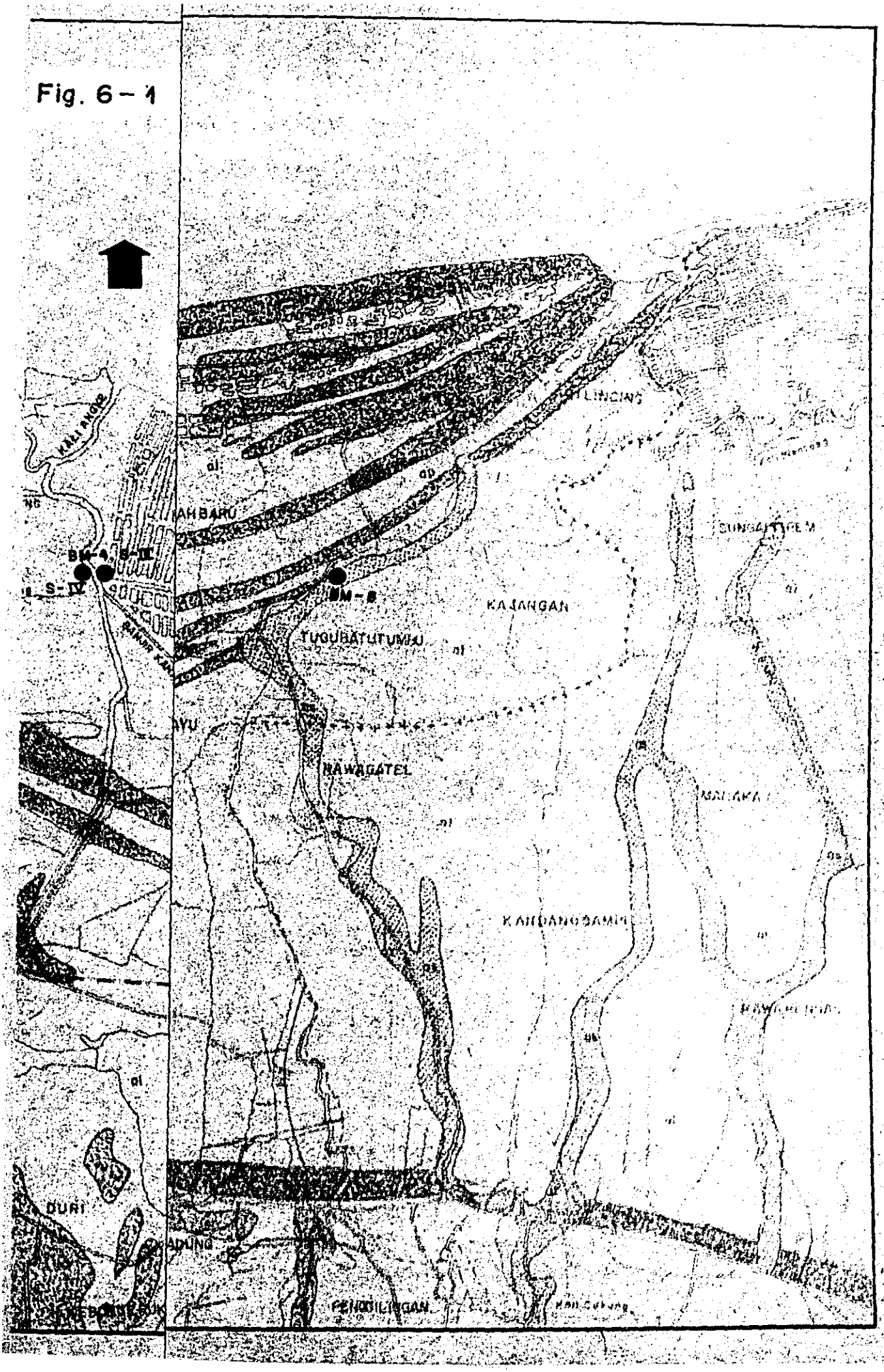

BM-A
S-III
S-IV
BM-B
KAJANGAN
TUGUBATUTUMU
NAWAGATEL
KANDANGSAMPI
DURI
PENGILINGAN

Fig. 6 – 1 GEOLOGICA

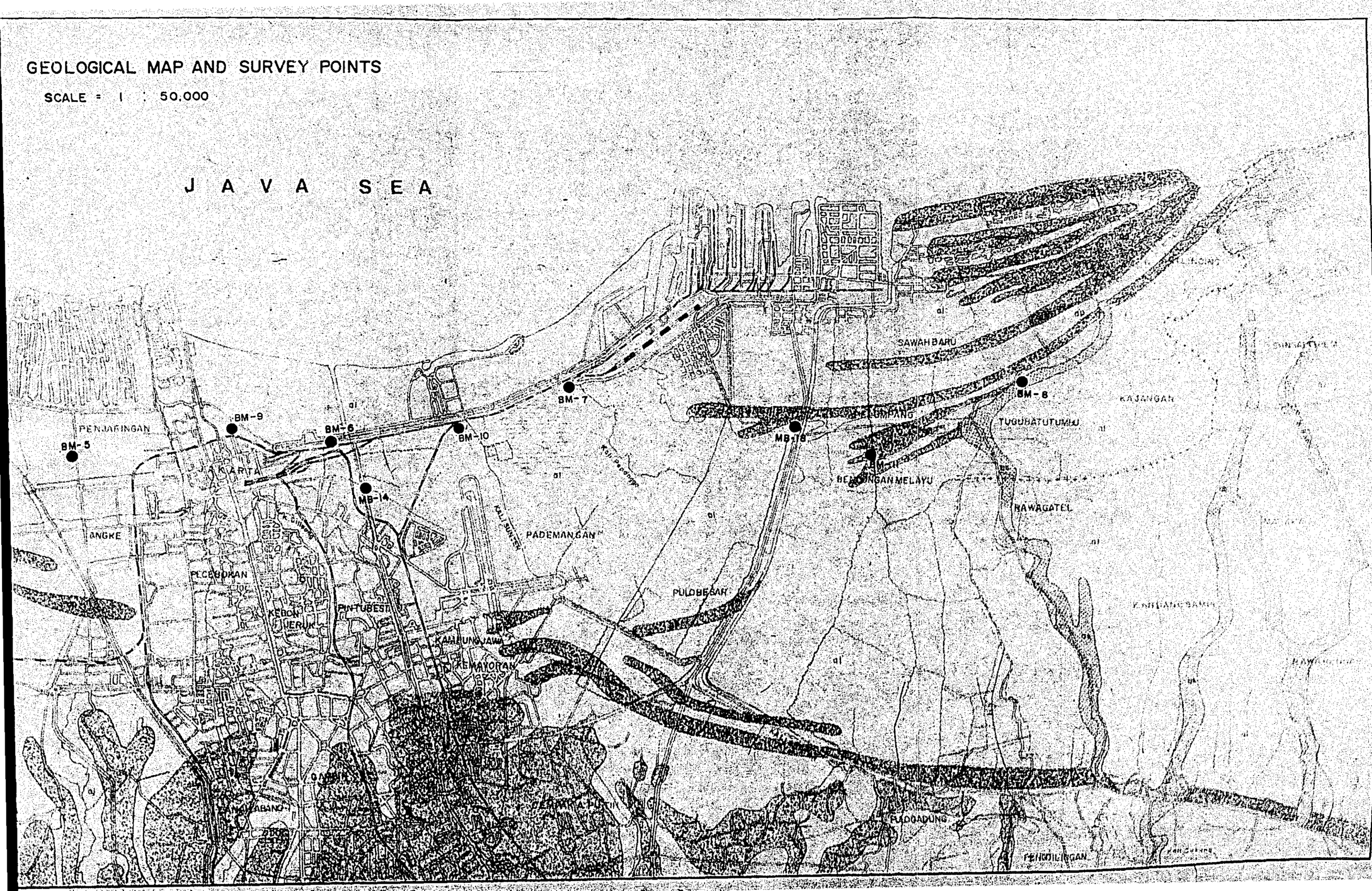
SCALE = 1

LEGEND

- BEACH RIDGE FINE SAND
- OLD RIVER DEPOSIT ANDESTIC TO BASALTIC SAND AND GRAVEL WELL SORTED
- ALLUVIUM CLAY
- DILUVIUM TUFFACEOUS–CLAY
- PLIOCENE–GRENTENG FORMATION ALTERNATION OF THIN SANDSTONE AND MUDSTONE LAYERS
- BM– BORE HOLE LOCATION FOR HARBOUR ROAD (1980)
- MB-18 BORE HOLE LOCATION FOR INTRA URBAN TOLLWAY (1980)
- MB-14 BORE HOLE LOCATION FOR INTRA-URBAN TOLLWAY (1978)
- CF-1 SOUNDING AND BORE HOLE LOCATION FOR CENGKARENG FLOODWAY (1980)
- S- SOUNDING LOCATION FOR JAKARTA-CENGKARENG ROAD (1980)

GEOLOGICAL MAP AND SURVEY POINTS

SCALE = 1 : 50,000



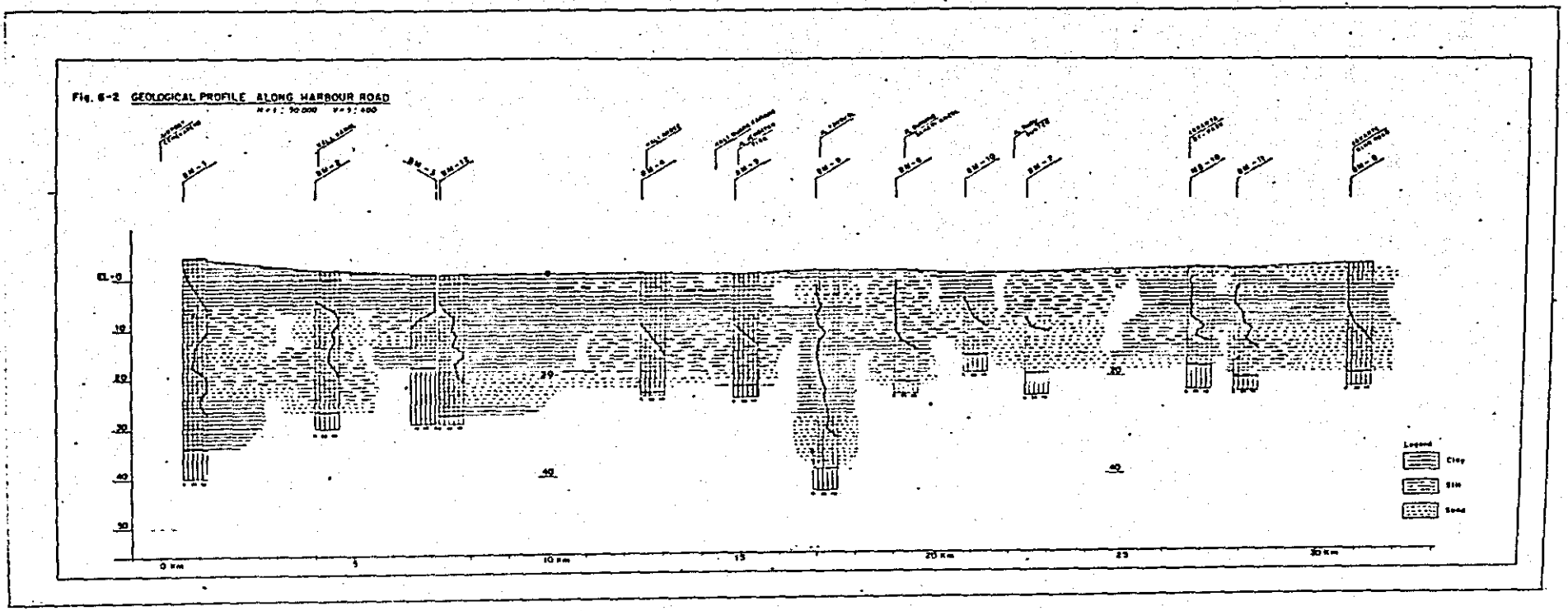


Fig. 6-2 GEOLOGICAL PROFILE ALONG HARBOUR ROAD
H = 1 : 50,000 V = 1 : 400
EL. 0
10
20
30
40
50
0 Km
5
10 Km
15
20 Km
25
30 Km
Legend
Clay
Silt
Sand

Jakarta By-Pass - Jakarta Ring Road (MB-18 to BM-8)

Mostly Sand and silty clay is inter-layed.

The sub-soil conditions therefore are comparatively good.

ii) Bearing stratum and depth of soft ground

Boring Number	Bearing Stratum (N ≧ 50) M	Depth of soft ground (M)
BM - 1	31.4	2.4
- 2	21.5	6.3
- 3	10.5	6.8
- 12	22.0	5.2
- 4	16.5	10.5
- 5	14.2	10.1
- 9	34.0	4.7
- 6	16.0	11.7
- 10	10.8	7.1
- 7	11.8	9.0
MB - 18	15.0	2.4
BM - 11	16.2	7.1
- 8	16.0	9.3

Note: 1) MB-18 is data taken from the Intra Urban Tollway Project.

2) Soft ground is defined by and APT value of N≦4 for fine soil and N≦10 for coarse soil.

iii) Beach ridge

According to the boring results (BM-2 & 11) conducted on the beach ridge, shown on the Engineering GEOLOGIC MAP OF JAKARTA-BOGOR AREA, no significant san layer was found, when the results are compared with those from the other bore holes.

6.2.3. Materials Survey

Contact with Bina Marga, DKI Jakarta and Department of Mining & Energy, Directorate of Geology Environmental Planning was made anddata and information collected regarding sources of construction material. Site investigations were also carried out by soil and highway engineers with reference to the topographic and geologic maps.

A. Aggregates & Sand

Fig. 6-3 shows the location of the quarry site and Table 6-1 shows the surveys results.

B. Embankment Borrow

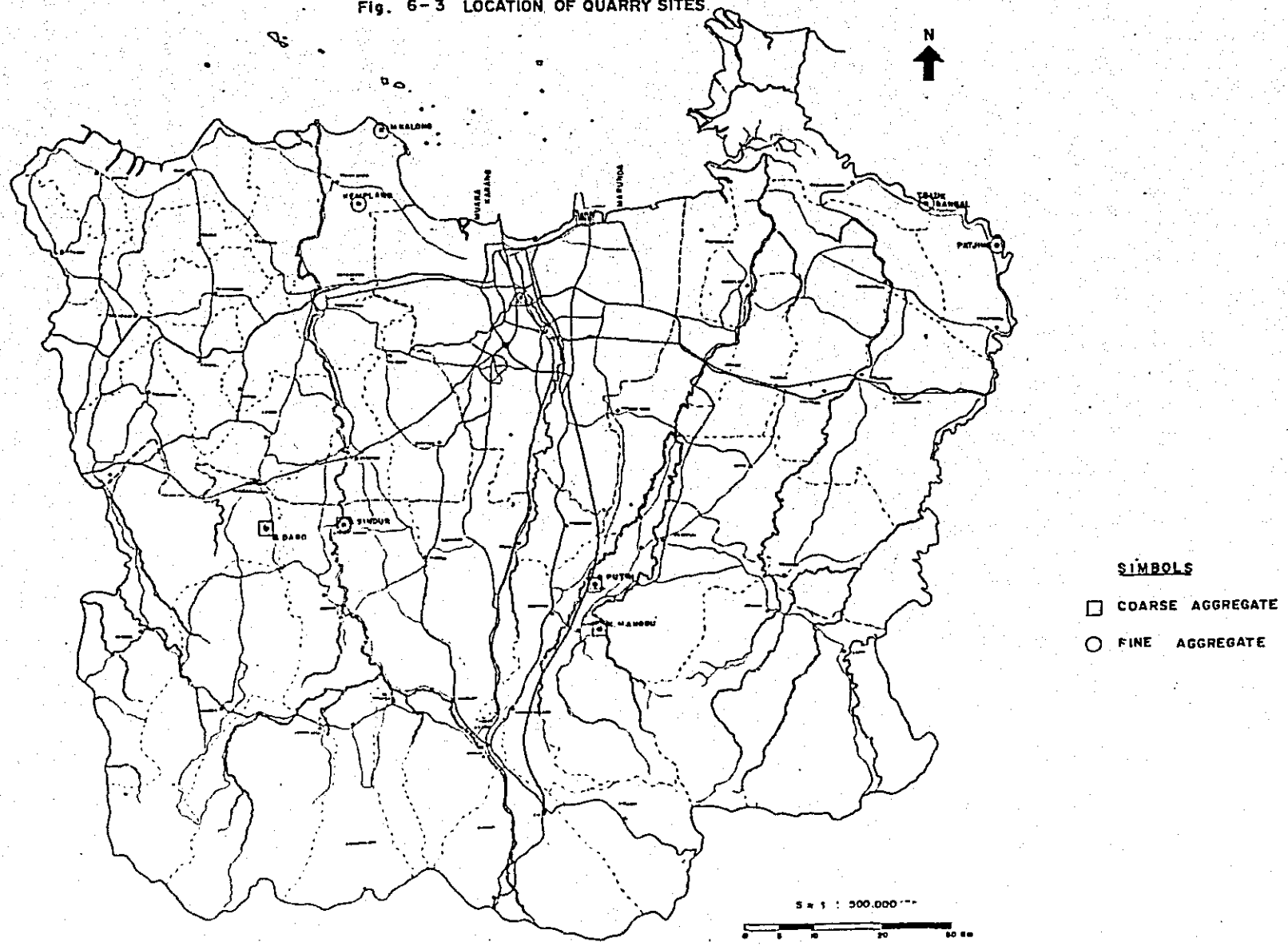
The volcanic origin soils covering the southern plateau will be classified A-2-7 and A-7-5 by ASSHTO Soil Classification. The former is coloured light grey and the latter, reddish brown, both being lateritic soils. Both are suitable as embankment material.

Table. 6-1 SURVEY RESULTS FROM QUARRY SITES

	Site	Material Deposit Feature	Assumed Deposit Volume	Mining Method	Transportation	Price at Quarry (Rp/M^3)	Remarks
Coarse Aggregate	G. Dago	Andesite Hill	Abundant	Blast & Machine	Truck	6,000	Good quality of Crushed stone
	G. Sindur	Terrace Deposit	Abundant	Man Power	Truck & Raft	1,000	Partially mixed soft stone, Necessary road improvement of 15 Km
	G. Putri	Basalt Hill	Limited	Man Power	Truck	4,200	•
	K. Manggu	River Bed	Limited	Man Power	Truck	4,000 - 4,200	(Gravel) (Cobbles)
Fine Aggregate	G. Sindur	Terrace Deposit	Abundant	Man Power	Truck & Raft	2,000	Screening excluded in the Price
	Krawang	River Bed	Abundant	Man Power	Truck & Boat	2,000	5,000 Rp/m^3 At Marunda Port
	M. Kalong	Shallow Sea	Abundant	Man Power	Sail Boat	H.Q 1,000 L.Q 600	H.Q 4,500 Rp/m^3 } At M. L.Q 2,500 " } Karang
	Kemplang	Old River Deposit	Limited	Man Power	Truck	3,000	Coarse grained, Bad condition.

Note: H.Q and L.Q mean high quality and low quality respectively.

Fig. 6-3 LOCATION OF QUARRY SITES



6.3 Hydraulic Study

6.3.1 General

The study was carried out to furnish hydraulic data for the design of the bridges and drainage structures, and to determine the minimum height of embankment at the river basins for the design of road profiles.

It also had the purpose of solving the hydraulic problems such as the effects of flooding.

For DKI Jakarta, the "MASTERPLAN for DRAINAGE and FLOOD CONTROL OF JAKARTA" was established by the Ministry of Public Works and Electric Power, Directorate General of Water Resources Development, in December 1973. The basic principles and recommendations made by the Masterplan are also adopted for this Study.

The river/canals and the Masterplan are shown in Fig. 6-4 and 6-5

6.3.2 Existing Situation

A. Characteristics of rain-fall in the Project Area

According to the Masterplan the characteristics of rain fall are described as follows.

Average yearly rainfall varies from about 2,000 mm near the coast to about 4,000 mm in the mountains. The greater part (approx.80%) of the yearly rainfall takes place during the wet season, generally from November 1 till May 31, with predominantly north-western winds. January generally is the wettest month with about 25% of the annual precipitation. The five months of the dry season, with predominantly north-eastern winds, are characterized by long dry spells, with the month of August on an average, receiving the minimum monthly rainfall (± 3.5% of the yearly total).

The rainfall is characterized by high intensities and low occurrence

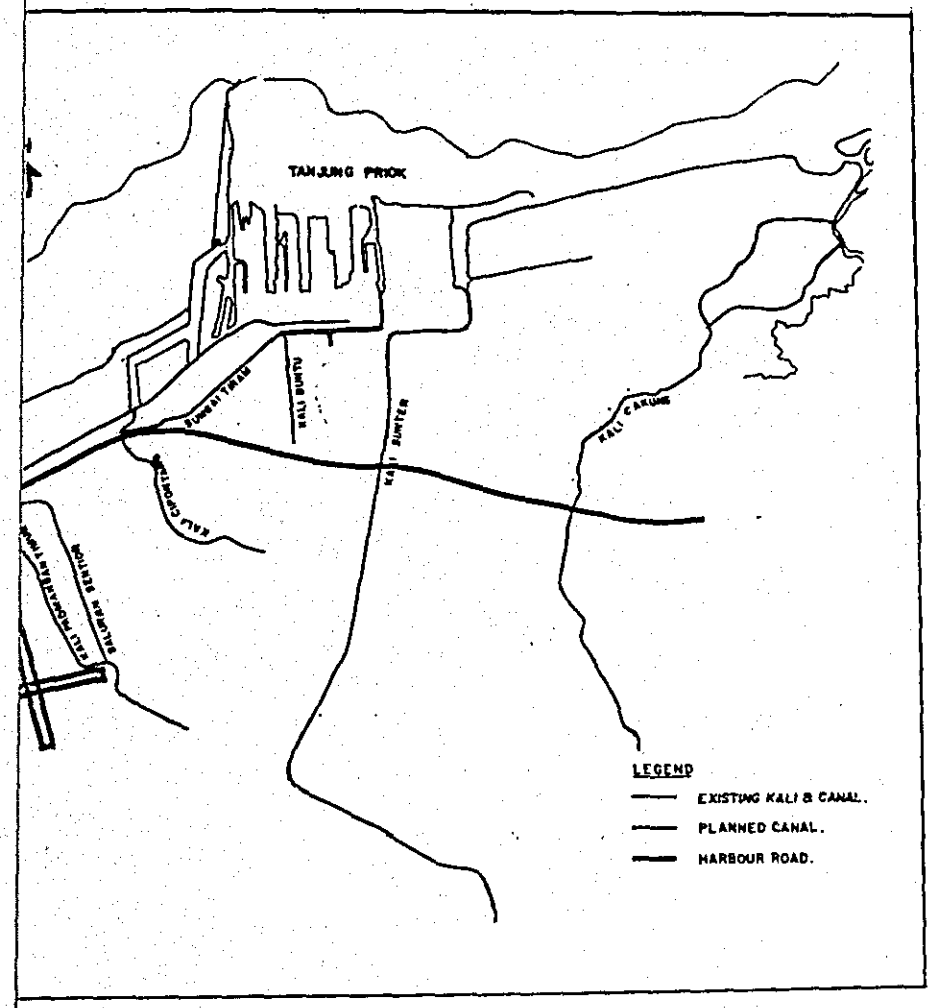

TANJUNG PRIOK
KALI BUNTU
KALI SUNTER
KALI CAKUNG
LEGEND
EXISTING KALI & CANAL.
PLANNED CANAL.
HARBOUR ROAD.

Fig 6 - 4 RIVER/CANAL RELATED TO THE PROJECT

S = 1 : 100,000

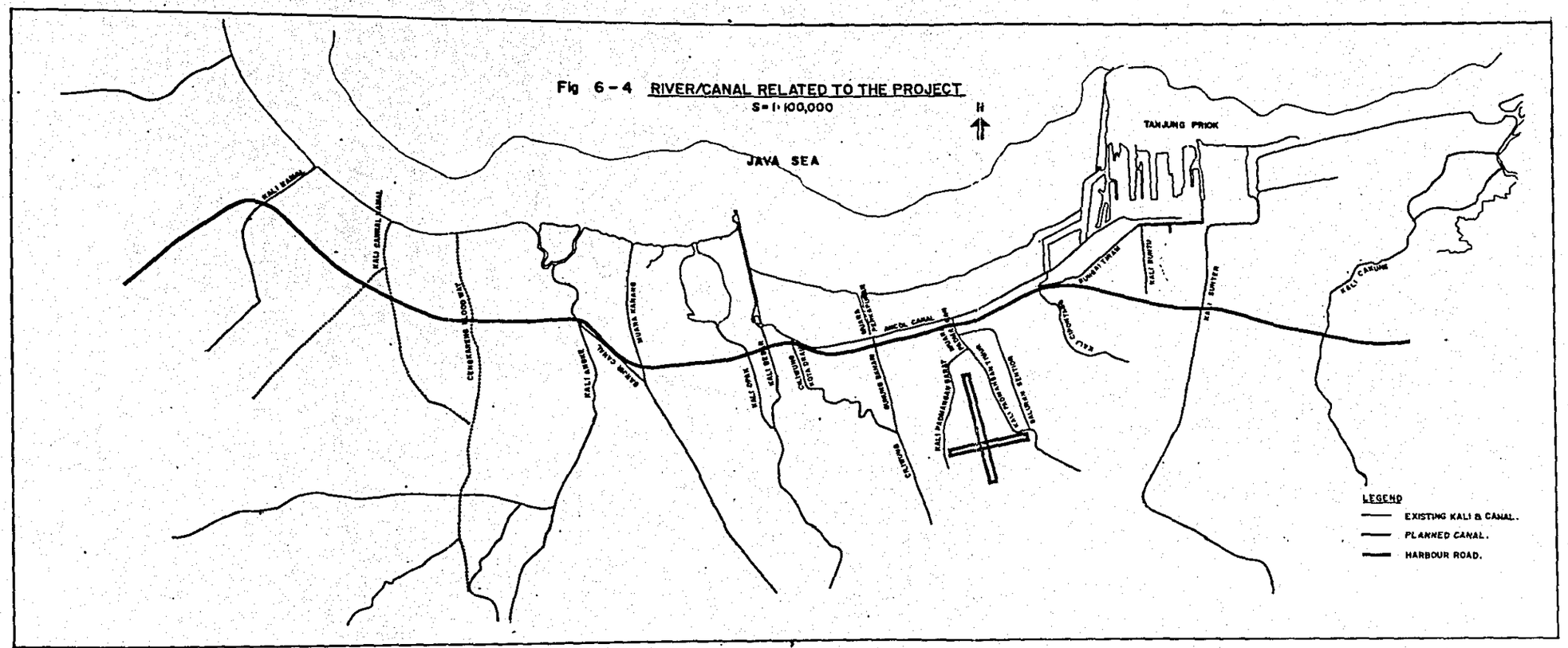
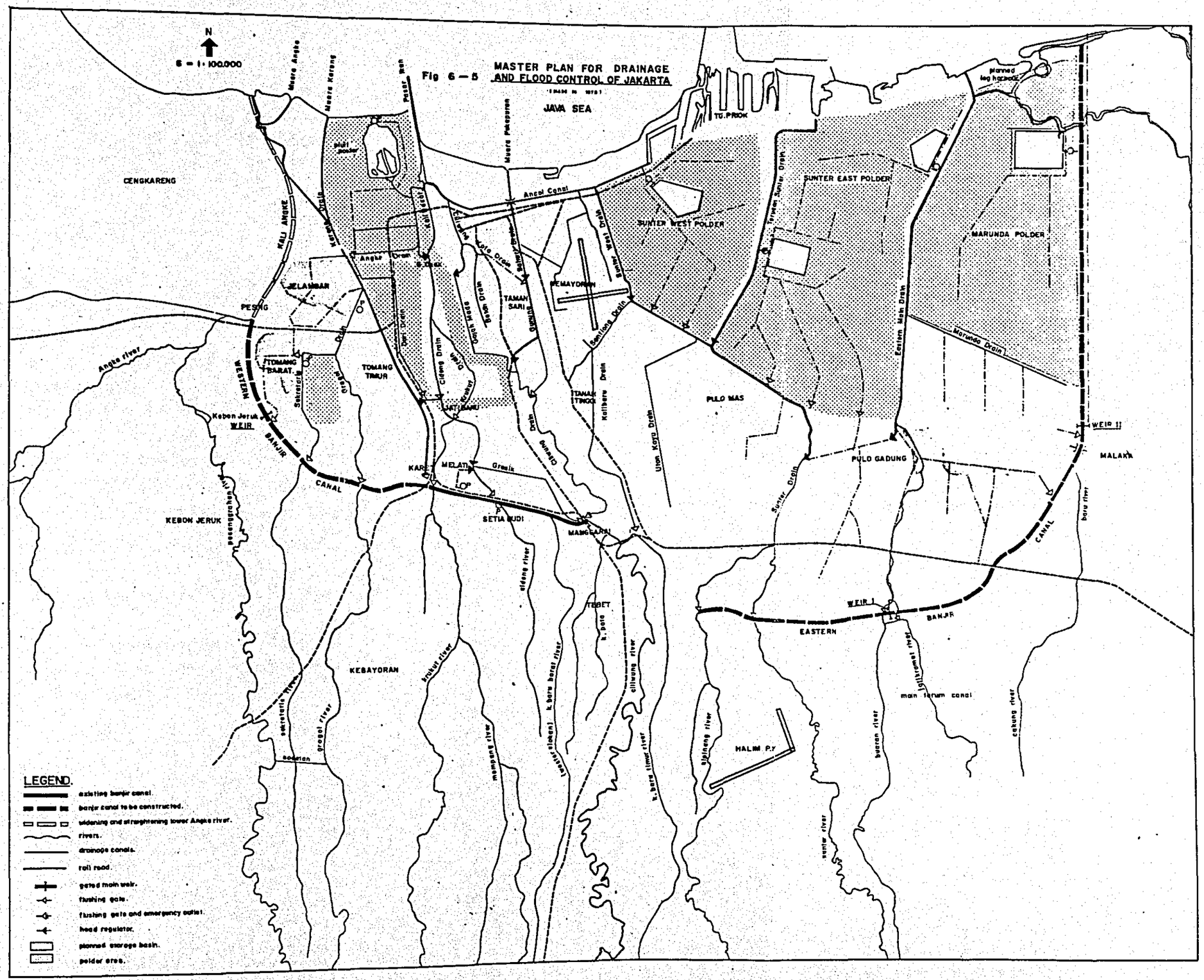


Fig 6 – 5 MASTER PLAN FOR DRAINAGE AND FLOOD CONTROL OF JAKARTA



probability, or in other words: heavy storms interspersed with long dry periods even in the wet season. The very high rainfall intensities during thunderstorms often are sharply localized. It has been observed that rainfall is generally concentrated in the afternoons and evenings, with 60 to 80% falling from 14.00 till 21.00 hours at some stations.

B. Hydrological situation in the Project area

Starting from Mt. Pangrunggo (3,019 m) in the southern range, the Ciliwung river and several other rivers flow into the Java Sea affecting the project area.

According to the histrical trend, once every two years a flood occurs, when rainfall exceeds 115 mm per day. It is considered that the reasons for the floods are as follows:

(1) Compared with the size of the catchment area and the rainfall volume, the discharge capacity of the rivers is too small.

(2) River slopes are too flat and the rivers meander.

(3) Each river is effected by tidal rises in the river-mouth.

This flooding problem of DKI Jakarta is common in the river mouth in an alluvium plain.
Related rivers and canals to the Project road are developed for banking improvement in the city area, but the discharge capacities are greatly hindered in the suburbs by the meandering nature of the rivers.

C. Introduction of the Masterplan

The MASTERPLAN for DRAINAGE and FLOOD CONTROL of Jakarta introduced the following three principles on the solution of the problems of drainage and flood control in the city:

- drain off the rainfall on the area itself.
- prevent run-off from the hill to the south to flooding the city area, and
- in the dry season, prevent stagnation of the water in the open canals in the city.

Based on upon these principles the PLAN recommended as follows:

- Flood control is to be achieved by the construction of two canals (Western Banjir Canal and Eastern Banjir Canal) enclosing a large part of the city and collecting the floods of the rivers coming down from the hills. After collection, the floods will be diverted around the low-lying city and towards the Java Sea.
- For the urbanised area the following four countermeasures were recommended:
  - Extensive rehabilitation of the existing open canals.
  - Incorporation of the lower part of the existing Western Banjir Canal into the drainage system of Central and West Jakarta.
  - Construction of two more major evacuation drains for the eastern urban area; the Sunter West Drain and the Eastern Main Drain.
  - Provision of polder area with pumping stations for the lowest parts.

Among the countermeasures, four polder projects were planned as follows:

- Pluit Polder
- Sunter West Polder
- Sunter East Polder
- Marunda Polder

The progress of the project

Since production of the PLAN, some revisions, further study and construction work have been made as described below:

- The Western Banjir Canal was cancelled due to the land acquisition problem. Instead of the canal, Cengkareng Flood Way was proposed and this is now under construction and due to open in 1982.
- The Pluit Polder is under construction and is expected to be completed by the end of 1981.
- A new polder, Pademangan Polder, was proposed in February 1976.
- The Sunter West Polder is under construction as a part of the Sunter Development Project and is expected to be completed by 1985.
- The Eastern Main Drain is under construction.

Further study will be done in Japan in order to accomplish the study purpose.

6-4 Geometric Design Standards

Road design Standards for arterial streets and urban tollways were already established by the Jakarta Intra Urban Tollway Project and they are basiccally adopted for this Project Road.

The standards for Harbour Road made reference to Bina Marga Standard (Standard Specification for Geometric Design of Expressway and Freeway - No. 13A/1976), AASHTO and Japanese Standards.

Brief description for each item of geometric design criteria and other standards and the reasons for making certain modification to Bina Marga design standards are presented below.

6.4.1. Harbour Road

i) Terrain Condition

The entire route of the Project Roads passes through flat land.

ii) Design Speed

The summary of surrounding conditions of the Project Roads is as follows:

a) Area classification and land use in direct influence Zone

According to the city planning map by DKI Jakarta the existing and future features are as follows:

Section	Area classification	Land Use
Cengkareng Kali Angke	Sub-Urban Area	Rice Field, fish pond, kampung green
Kali Angke Jakarta By-pass	Urban Area	Commercial, residential and industrial area
Jakarta By-pass Jakarta Ring Road	Sub-Urban Area	Kampung, rice field and some residential area

b) Design Speed of existing and planned tollways in Jakarta

The design speed of existing and planned tollways and freeways in Jakarta is shown in Fig. 6-6 and was established as follows.

	Design Speed
Jakarta Intra Urban Tollway	80 Km/h
Jakarta Ring Road	100 or 120 "
Jakarta-Tangerang Freeway	100 "
Jagorawi Freeway	120 "
Jakarta-Cikampek Freeway	120 "

The Harbour Road is located in the coastal area and forms a link of Jakarta Intra Urban Tollway and Jakarta Ring Road. The design speed of the Project Road must therefore be harmonised with that of these tollways.

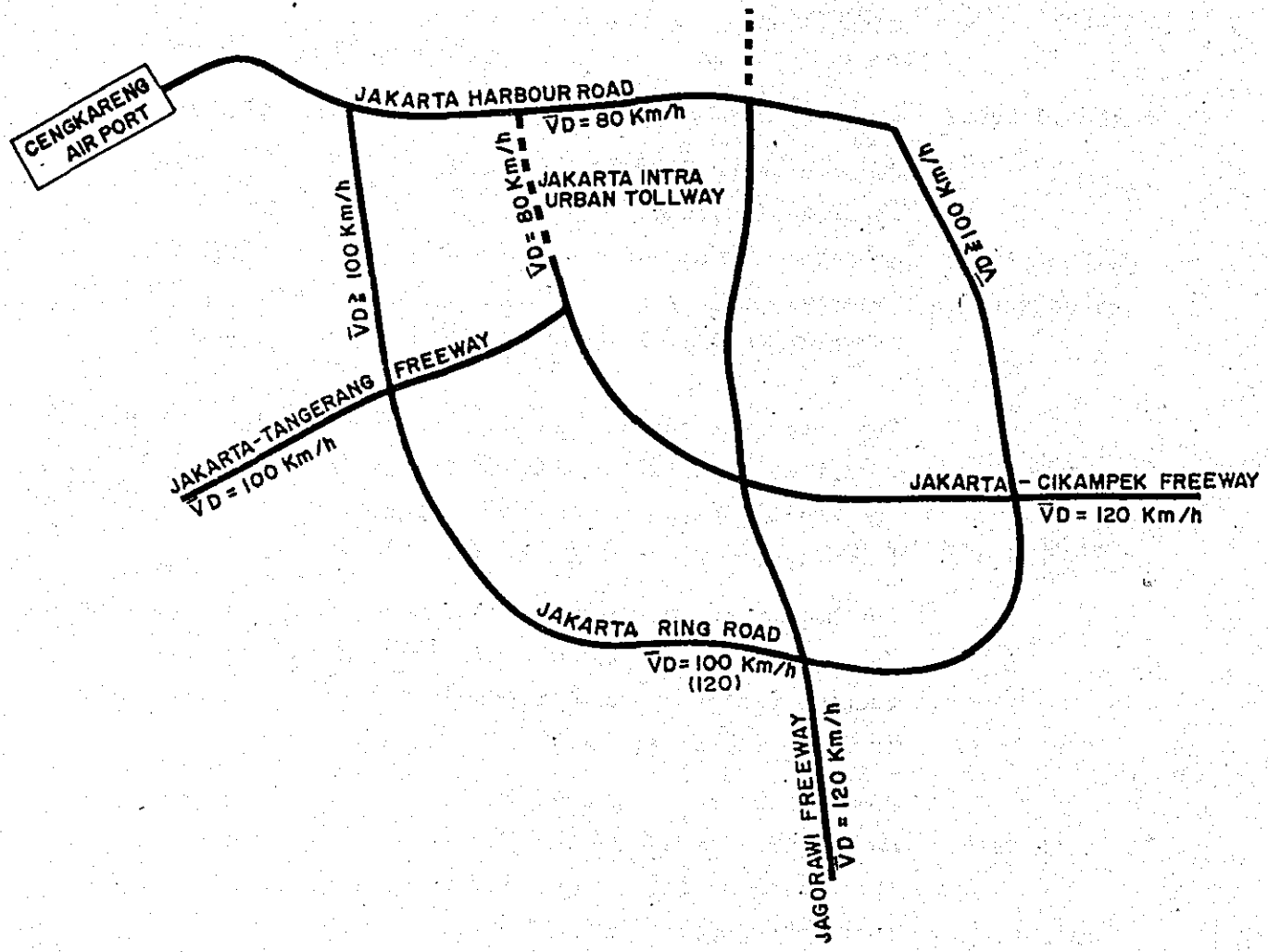
For both wings of Harbour Road, Cengkareng-Kali Angke and Jakarta By-pass - Jakarta Ring Road, it is possible to adopt a design speed of 100 Km/h considering the existing land use mentioned above.

However future prospects for the corridor based on recent development trends is also an important factor in deciding the design speed. Especially in Kel, Kanal Muara, Kapuk Muara and Kapur, many industries have been located supported by good accessibility, low cost land and available man-power.

In the Jabotabek Plan the future population of Jabotabek area is expected to be 20 million and it is inevitable that the existing out-lying area will thus be urbanised in future.

The design speed of Harbour Road is therefore recommended to be 80 Km/h for the whole stretch considering the future urbanisation and the short length of both wings.

Fig. 6-6 DESIGN SPEED OF RELATED TOLLWAY PROJECTS



Note : The design speed for the access sections of Jakarta Ring Road to Harbour Road is expected to be less than 100 Km/h.

In the case of 80 Km/h design speed of Harbour Road, the design speed of access sections of Jakarta Ring Road to Harbour Road will therefore be less than 100 Km/h.

iii) Right-of-way

Right-of-way widths assigned to the Harbour Road should anticipate all practical future expansions. The widths recommended for the Project Road are as follows:

RECOMMENDED RIGHT-OF-WAY WIDTH

Section	Number of Lane (Ultimate Construction)	Recommended Right-of-way width (m)
Cengkareng – Kali Angke – Jakarta By-pass – Jakarta Ring Road	Through lane-2x2 lane Frontage Road-2x2 lane	
Kali Angke – Jakarta By-pass	Through lane-2x3 lane Frontage Road-2x2 lane	

iv) Lane Width

The desirable lane width of 3.5 m is recommended considering lateral clearance and the standard vehicle width of 2.5 m.

v) Shoulder Width

Considering in the difficult situation for land acquisition in Jakarta, the following shoulder width are recommended:

Area	Outer Shoulder in meter	Inner Shoulder in meter
Sub-Urban area	1.75	0.75
Developed area	1.50	0.75

For a long bridge of more then 100 meter length the outer shoulder width of 1.25 meter is adopted.

vi) Median Width

Median width of 3.0 meter for sub-urban area and 2.25 meter for developed area are recommended considering the severe condition for land acquisition in Jakarta.

vii) Cross Slope of Pavement

A standard pavement cross slope of 2.0 percent is recommended based on the Bina Marga Standard.

viii) Maximum Superelevation

The outside edge of the road will be rotated with respect to the inside edge along the horizontal curves. In areas subject to flooding, care must be taken to ensure that lowest elevation of the roadway will maintain the required freeboard above the water surface.

A lower value of superelevation is desirable to ensure more comfort for the highway users.

ix) Minimum Horizontal Radii

The largest radius of curvature compatible with the existing facilities should be used whenever possible.

In view of the terrain, the use of larger horizontal radii is recommended for the alignment design.

Table 6-2 present recommended design criteria as well as the other standards. The typical cross-section for Harbour Road is shown in Fig. 6-7.

x) Other Road Design Elements

1) Frontage Road

Frontage Road is provided for local traffic. A one-way two-lane frontage road is recommended for both or either sides of Harbour Road in the developed areas in the light of the local situation .

However no frontage road will be provided during the initial stage, in the area where the existing land use is predominantly for fishponds and rice paddies.

However, the future construction of the frontage roads in the areas presently undeveloped is taken into account in determining the Right-of-way width to be reserved.

Table.6-2 HARBOUR ROAD GEOMETRIC DESIGN STANDARD

(VD = 80 Km/h)

Item	Unit	Recommended Standard	Intra Urban Tollway Standard	Bina Marga Design Standard (1976).(1970)	Design Standard in Japan
Terrain	-	Flat	Flat	Flat	Flat
Design Speed	km/h	80	80	80	80
Min. R.O.W. width	m			40 or 60	-
Lane width	m	3.50	3.50	3.50 or 3.75	3.50
Shoulder width					
Outer	m	1.75 or 1.50 (1.25)	2.00 (1.75)	2.50 or 3.00	1.75 or 1.50(1.25)
Inner	m	0.75	0.75	-	0.75
Median width	m	3.00 or 2.25	2.50 or5.00	5.00	3.00 or 2.25
Crossfall of Carriageway	%	2	2	2	2
Crossfall of Shoulder	%	4 (2)	4 (2)	4	2
Maximum Superelevation	%	10	10	10	10
Minimum Radii	m	230	230	210	230
Maximum Gradient	%	4 or 6	4 or 6	6	4
Stopping Sight Distance	m	115	115	115	110
Minimum Vertical Curve Length	m	See Figs 6-7,8	See Figs 6- 7,8	See Figs 6- 7,8	70
Minimum Horizontal Curve Length	m	140 or 1000/θ	140 or 1000/θ	-	140 or 1000/θ
Value of Super elevation on Curvature	-	See Fig 6- 9	See Fig 6- 9	See Fig 6- 9	See Fig 6- 9

Fig. 6 – 7 LENGTH OF CREST VERTICAL CURVE

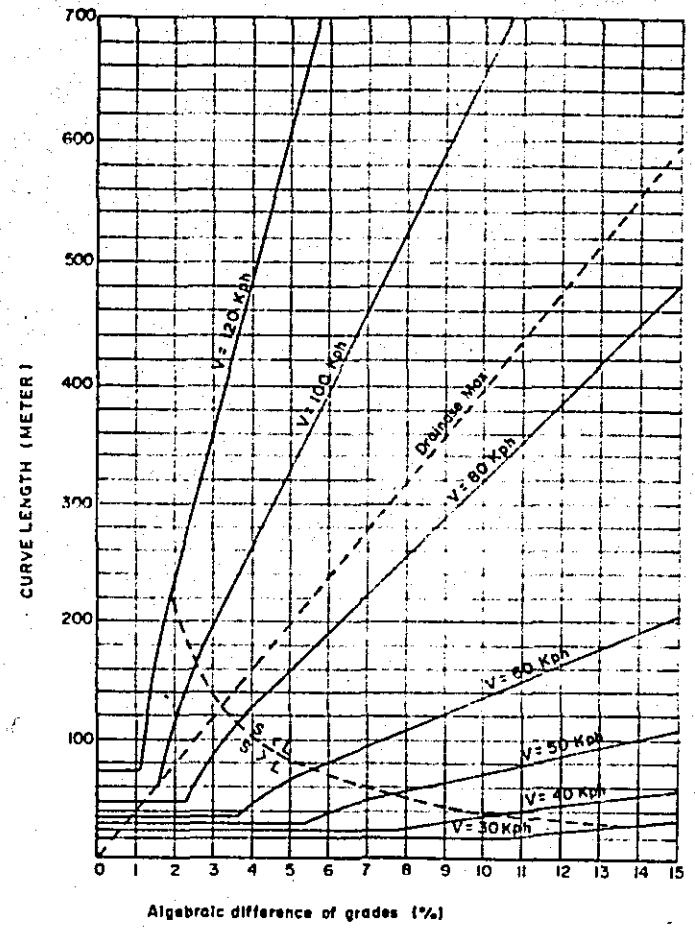


Fig. 6 – 8 LENGTH OF SAG VERTICAL CURVE

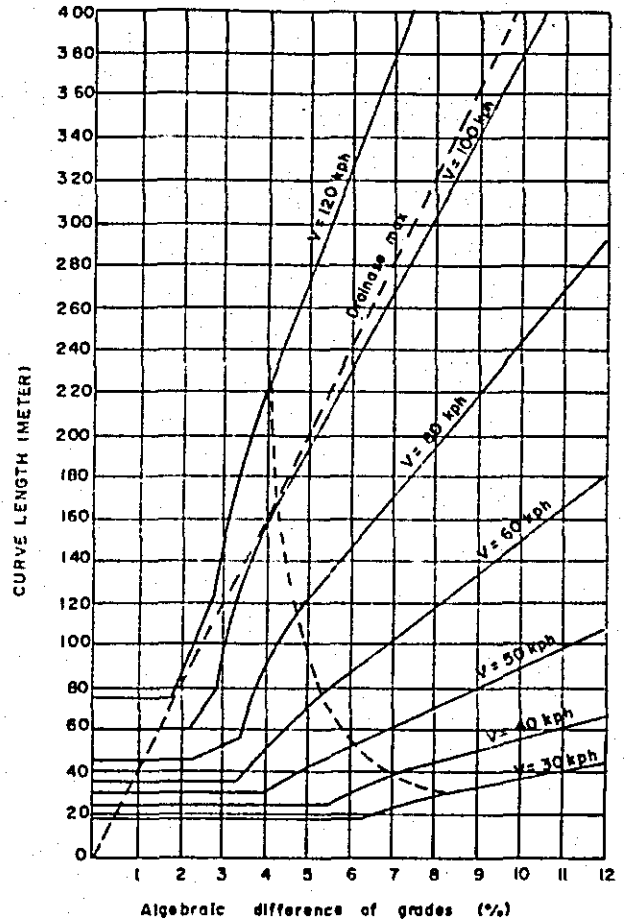
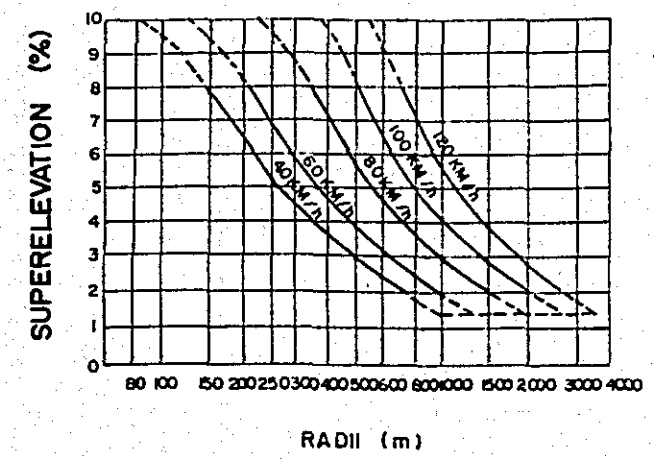


Fig. 6 – 9 SUPERELEVATION

DESIGN SPEED	80 KM/h	60 KM/h	50 KM/h	40 KM/h	SUPER. EL
RADII (m)	230 ABOVE	120 "	80 "	30 "	10%
	280 UNDER	150 "	100 "	65 "	
	280 ABOVE	150 "	100 "	65 "	9 %
	330 UNDER	190 "	130 "	80 "	
	330 ABOVE	190 "	130 "	80 "	8 %
	380 UNDER	230 "	160 "	100 "	
	380 ABOVE	230 "	160 "	100 "	7 %
	480 UNDER	270 "	200 "	130 "	
	450 ABOVE	270 "	200 "	130 "	6 %
	540 UNDER	330 "	240 "	160 "	
	540 ABOVE	330 "	240 "	160 "	5 %
	670 UNDER	420 "	310 "	210 "	
	670 ABOVE	420 "	310 "	210 "	4 %
	870 UNDER	560 "	410 "	280 "	
	870 ABOVE	560 "	410 "	280 "	3 %
	1.240 UNDER	800 "	590 "	400 "	
	1.240 ABOVE	800 "	590 "	400 "	2 %
	3.500 UNDER	2.000 "	1.300 "	800 "	



A lane width of (3.0 m) is recommended, which with 2 lanes, will give adequate space for stalled or disabled vehicles.

The shoulder width of 0.75m is recommended for both sides of the frontage road.

The frontage road is an independent facility for inter-local traffic and is separated from Harbour Road. In case of connection with the diamond rampway from Harbour Road the frontage road also functions as an access rampway to street intersections.

2) Side Walk

Side walk is provided on one side of both of the frontage roads in view of the local situation.

The frontage road should be operated as one-way. Two lanes with a shoulder of 0.5 m are provided on both sides of the street.

viii) Outer separator

Outer separators are adopted for the section as follows:

Tg. Priok Junction - Melati	2.0 m
Jl. Melati - Raya Pelabuhan	1.0 m

The width of 1.0 m is adopted as a minimum width for Jl. Melati - Raya Pelabuhan since land adjoining the street is densely developed.

ix) Side walk

A side walk of 5.0 m is adopted for both sections since big demand for side walk exists in the section of Jl. Melati - Raya Pelabuhan.

The side walk is provided on both of the frontage roads. It should be a raised type with trees, and existing trees should be utilized as far as possible.

x) Typical Cross-Section

Table 6-3 presents recommended design criteria as well as the other standards.

As a result of cross-section plans, the section of Jl. Plumpang Semper - Melati still has open space.

Table.6-3 TANJUNG PRIOK ACCESS GEOMETRIC DESIGN STANDARD

DESIGN SPEED - 60 Km/h

Item	Unit	Recommended Standard	Bina Marga Standard	Japanese Standard
Terrain	-	F l a t	F l a t	F l a t
Design Speed	Km/h	60	60	60
R.O.W. Width	m	-	-	-
Lane Width	m	3.50	3.50	3.50
Outer Shoulder Width	m	0.50	2.50	0.50
Inner Shoulder Width	m	0.50	-	0.50
Median Width	m	4.00 or Existing Width	-	1.00
Crossfall of Carriageway	%	2	2	2
Crossfall of Shoulder	%	2	4	2
Maximum Super-elevation	%	10	10	10
Minimum Radii	m	120	115	120
Maximum Gradient	%	7	7	7
Stopping Sight Distance	m	75	75	75
Minimum Vertical Curve Length	m	See Figs. 6-7.8	See Figs. 6-7.8	50
Minimum Horizontal Curve Length	m	100 or 700/θ	-	100 or 700/θ
Minimum Transition Curve Length	m	50	-	50

Note: 1. θ Shows intersection angle for horizontal curve.

2. The Figures in brackets shows value for bridge section.

6.4.3. Junction/Interchange

1) Design Speed of Rampway

After the examination of junction/interchange planning conducted in the past in Jakarta, the following design speed for rampways is basically recommended based on the design speed of the two intersecting throughways and AASHTO Standard.

Type of Intersecting Highway	Design Speed of Highway (Km/h)	Recommended Design Speed of Rampway (Km/h)
Freeway-Freeway	120 - 120	60
(Tollway-Tollway)	120 - 100	
	100 - 100	
Ditto	100 - 80	50
	80 - 80	
Freeway (Tollway)	80 - 60	
- Arterial Street	80 - 50	40
	80 - 40	

The design speed of rampways listed above, is that for major rampways since the values to be applied depend on the various conditions and ramp types. For instance the application of loop design speed should be limited to the value of 40 Km/h.

In the case of 50Km/h design speed of rampway, the design speed is reduced to 40 Km/h in the special case where a tollgate is also provided. According to the guide line of rampway design speed indicated above, the following values are recommended for junction/interchanges in this project.

Interchange Highway		Design Speed of Rampway
Jakarta Ring Road, and Jakarta Intra Urban Tollway		50(40) Km/h
Other Arterial Street :	Tollway Interchange	40 "
	Arterial Interchange	25 "

ii) Lane Width

The land width of 3.5 m is adopted for all design speeds in compliance with that of the throughway.

iii) Shoulder Width

The left shoulder of a one-lane, one-way ramp for 50 Km/h and 40 Km/h design speeds is 2.5 m and 1.5 m respectively.

For a two lane ramp, the left shoulder width is 1.00 m and 0.75 m respectively.

The rampway geometric design standards are shown in Table 6-4 and 6-5 .

Table.6-4 RAMPWAY GEOMETRIC DESIGN STANDARD

ONE-LANE ONE-WAY

DESIGN SPEED - 50 Km/h

Item	Unit	Recommended Standard	Bina Marga Standard	Japanese Standard
Terrain	-	F l a t	F l a t	F l a t
Design Speed	km/h	50	-	50
R.O.W. Width	m		-	-
Lane Width	m	3.50	-	3.50
Outer Shoulder Width	m	2.50	-	2.50
Inner Shoulder Width	m	1.00	-	1.00
Crossfall of Carriageway	%	2	-	2
Crossfall of Shoulder	%	2	-	2
Maximum Superelevation	%	10	-	10
Minimum Radii	m	80	-	80
Maximum Gradient	%	6	-	6
Stopping Sight Distance	m	55	55	55
Minimum Vertical Curve Length	m	See Figs.6-7,8	See Figs.6-7,8	40
Minimum Horizontal Curve Length	m	80 or 600/θ	-	80 or 600/θ
Minimum Transition Curve Length	m	40	-	40
Minimum Parameter of Clothoid Curve	A	75	-	75
Value of Superelevation on Curvature	-	See Fig. 6-9	-	See Fig. 6-9

Note: 1. θ shows intersection angle for horizontal curve

2. The figures with asterisk shows value of absolute maximum

Table. 6 - 5 RAMPWAY GEOMETRIC DESIGN STANDARD

ONE-LANE ONE-WAY

DESIGN SPEED - 40 Km/h

Item	Unit	Recommended Standard	Bina Marga Standard	Japanese Standard
Terrain	-	F l a t	F l a t	F l a t
Design Speed	Km/h	40	40	40
R.O.W. Width	m			
Lane Width	m	3.50	3.50	3.50
Outer Shoulder Width	m	1.50	2.50	1.50
Inner Shoulder Width	m	0.75	-	0.75
Crossfall of Carriageway	%	2	-	2
Crossfall of Shoulder	%	2	-	2
Maximum Superelevation	%	10	10	10
Minimum Radii	m	50	50	50
Maximum Gradient	%	7 or 8	8	6 or 7
Stopping Sight Distance	m	40	40	40
Minimum Vertical Curve Length	m	See Figs. 6-7.8	See Figs. 6-7.8	35
Minimum Horizontal Curve Length	m	70 or 500/θ	-	70 or 500/θ
Minimum Transition Curve Length	m	35	-	35
Minimum Parameter of Clothoid Curve	A	35	-	35
Value of Superelevation on Curvature	-	See Figs. 6-9	-	See Figs. 6-9

Note: 1. θ shows intersection angle for horizontal curve

2. The figures with asterisk shows value of absolute maximum

6.5 Structure

6.5.1. General

The structural study is made, among others, for the purpose of estimating the construction cost of the Project.

Type and dimensions of structures, such as bridges, viaducts, box culverts and retaining walls, are determined based on the data collected during the site investigations, topographical survey and soils and materials survey in cooperation with hidrological study.

The structural study in the Project is characterized as discribed below :

- The Project road runs through a highly developed area in DKI Jakarta.
  Under this condition long elevated viaducts prevail.

- In junctions / interchanges with other tollways and arterial streets, bridges with small radii and high piers must be planned.

- The construction will therefore be more difficult than a similar project located in a rural area.

6.5.2 Loading Specifications

The design standards for bridges in Indonesia currently in use will be adopted for new bridges in this study. The main specifications are as follows :

(1) Loading Specifications for Highway Bridges No. 12/1970 by Bina Marga.

(2) General Explanation and Interim Guide for Using Loading Specifications for Highway Bridges No. 12/1974, 1974, 1977, by Bina Marga.

For the detailed aspects of deisgn, not covered by the specifications mentioned above, the following specifications are refered to :

(3) Specifications for Highway Bridge, Japan.

(4) AASHTO (Standard Specifications for Highway Bridges adopted by the American Assoiation of State Highway and Transportation Officials)

6.5.3 Materials for Sturctures

A. Concrete

Concrete is classified into the following five types

Table 6 - 6 CONCRETE

Class	Minimum Compressive Strength σck (kg/cm2)	Description
A	400	Cast in place concrete for prestressed concrete.
B	350	Cast in place concrete for diaphragms and deck slab (reinforced concrete).
C	250	Cast in place concrete for substructure and box-culvert (reinforced concrete).
D	150	Cast in place concrete (plain concrete).
E	100	Levelling concrete

Note: σck=Ultimate compressive strength of concrete as determined on a 15 cm cube at the age of 28 days.

B. Reinforcing Bars

Type and Strength of reinforcing bars are as follows:

Table 6 - 7 REINFORCING BAR

Type	JIS G 3112		ASTM A 615	
	Destination	Yield Point Km/mm2	Destination	Yield Point Km/mm2
Round Bar	SR 24	24	Grade 40	28
Deformed Bar	SD 30	30	Grade 60	41

C. Prestressing Tendon

Type and minimum strength of prestressing tendon are as follows:

Table 6 - 8 PRESTRESSING TENDON

Type	JIS STANDARD			ASTM STANDARD		
	Desig-nation	Yield Point kg/mm2	Tensile Strength kg/mm2	Desig-nation	Yield Point kg/mm2	Tensile Strength kg/mm2
PC Wire	G 3536	136	155	A 421	132	165
PC Strand	G 3536 SWPR 7A	155	175	A 416 Grade 250	149	176
	G 3536 SWPR 7B	160	190	A 416 Grade 270	161	190
PC Bar	G 3109 Type A	80	105	A 722 Type I	89	100

D. Steel Pipe Pile

Class and minimum Strength of steel pipe piles are as follows :

Table 6 - 9 STEEL PIPE PILE

CLASS	JIS A 5525			ASTM A 500		
	Desig-nation	Yield Point kg/mm2	Tensile Strength kg/mm2	Desig-nation	Yield Point kg/mm2	Tensile Strength kg/mm2
A	STK 41	24	41	Grade B	29	41
B	STK 50	32	50	Grade C	32	43

E. Structural Rolled Steel

Class and minimum strength of structural rolled steel are as follows :

Table 6 - 10 STRUCTURAL ROLLED STEEL

CLASS	JIS STANDARD			ASTM STANDARD		
	Desig-nation	Yield Point kg/mm2	Tensile Strength kg/mm2	Desig-nation	Yield Point kg/mm2	Tensile Strength kg/mm2
A	G 3101 SS 41	24	41	A 36	25	41 ~ 56
	G 3106 SM 41			A 242		
	G 3114 SMA 41	22~25	41~ 52	A 440 A 441	28~35	42~ 49
B	G 3106 SM 50	30~33	50 ~ 62	A 588		
C	G 3106 SM 50Y G 3114 SMA 50	34~37	50 ~ 62	A 572 Grade 55	39	49
	G 3106 SM 53	34~37	53 ~ 65	A 572 Grade 60	42	53
D	G 3106 SM 58 G 3114 SM 58	44~47	58 ~ 73	A 572 Grade 65	46	56

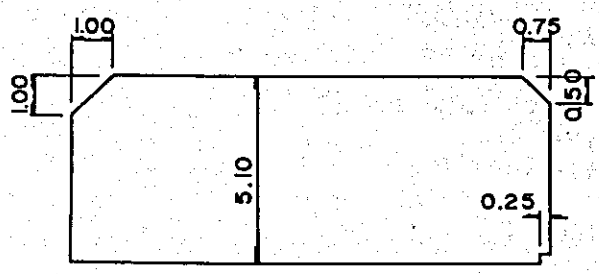
6.5.4 Clearance

A. Clearance of Roadway

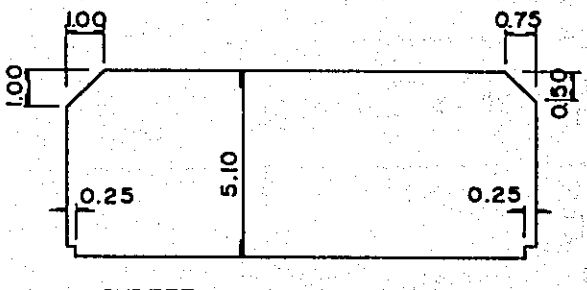
Vertical and horizontal clearances of roadway for design of bridges are summarized in Fig. 6 -10

Fig. 6 - 10 CLEARANCE OVER ROADWAY.

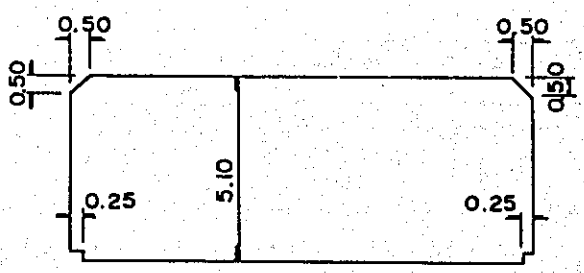
TOLLWAY - Bridge length is less than 50 m



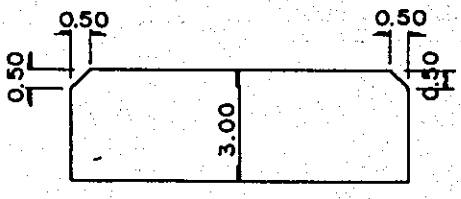
TOLLWAY - Bridge length is more than 50 m.



ARTERIAL STREET



MINOR STREET



PEDESTRIAN

B. Clearance at Railways

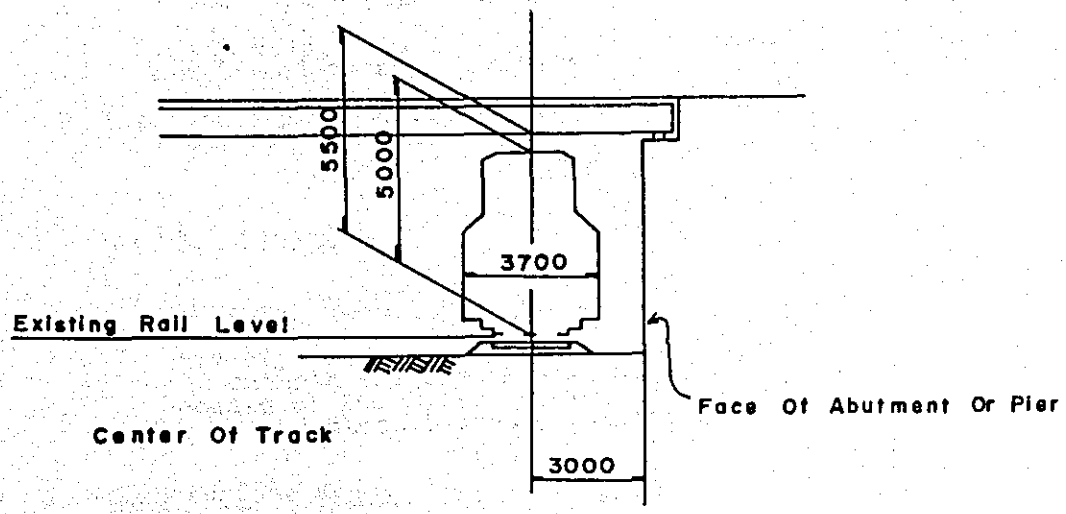
Vertical and horizontal clearance at railways for new viaduct is shown in Fig. 6 - 11

Vertical clearance of 5.50 m height from existing rail level is recommended by the JICA study team of URBAN/SUBURBAN RAILWAY TRANSPORTATION STUDY IN JABOTABEK AREA.

This height includes a track lifting height of 0.20 m to allow for renewal of track in the future.

Clearance at new bridges, which will be provided alongside existing bridges, will be equal to the minimum clearance available on the existing bridge.

Fig. 6 - 11 CLEARANCE AT RAILWAY.



6.5.5 Preliminary Design of Bridges

A. Functional Requirements

i) Span Length for existing facilities

In this project area, there are several canals, railways and streets which should be crossed over by the tollway bridges. The span length of these bridges is determined from the width of these canals, railways, or streets. As the result of side investigation, the following was found.

- The spans of the existing bridges which cross over the canals are all short and generally two or four piers are located in the canals.

- Most streets have two or four lanes and on some four lanes street with median, it will be possible to provide a pier for the tollway bridge within the median.

ii) Curved Bridge

In the throughway section, it is easy to adopt a precast-prestressed concrete girder bridge in curved areas.

However, in case of rampways at junctions/interchanges, it is generally impossible to adopt a long-span precast-prestressed concrete girder bridge, because of the small horizontal radius.

Therefore, short span precast concrete girder bridges or box girder bridges (both concrete and steel), are suitable for curved rampways.

iii) Skew Bridge

The project tollway, sometimes, must cross the existing railways or streets at excessive skew angles. In this case, a long span bridge is required wherever the relocation of the existing street is not possible.

iv) Variable Width

The width of carriageway varies near merging and diverging areas. If a bridge is located around these areas, a variable width beidge will be required. A prestressed T-beam bridge and a prestressed hollow slab bridge are inferior for variable width of bridges.

v) High Pier Bridge

A rampway bridge at a junction/interchange sometimes, requires very high piers and in this case a steel bridge is superior because of its loght weight.

B. Construction Requirement

In the case that the construction work must cross over existing roads and railways, it is necessary to maintain the existing traffic flow and operation. In many cases however, it is impossible to erect the staging of the bridge due to lack of space to relocate the existing facilities during the construction period.

Under these conditions, the precast method or the centilever method has some advantages in erection.

C. Maintenance

An important factor is to minimise future bridge maintanance cost when the bridge type is selected. Steel bridges result in high maintenance cost because of the need for painting. Especially as the Harbour Road is planned to be near the sea, a steel bridge will be liable to be corroded because of the saline wind.
Thus, if possible, prestressed concrete and reinforced concrete bridges should be used near the seaside.

D. Harmony with Environment

The bridge type which harminizes best with the environment should be adopted considering the easthetic point of view.
Slab bridges or box girder bridges are superior from this point of view because of the better appearance when viewed from the underside. On the other hand, I-sectioned girder bridges are inferior.

E. Foundation

Since the bearing stratun in the project area is situated at a depth which varies from 10 m to 40 m, piled foundation should be used.

VII. COST SURVEY

7.1 Construction Costs

7.1.1 *General*

The study team collected and surveyed the cost of basic materials, labour and equipments. A unit price for each construction item will be established using these materials, overhead and profit.
The unit prices will be computed in accordance with the following criteria.

1) The estimates is made in the assumption that all construction works will be contracted to general constructors by international tender.

2) The unit prices are computed under the economic conditions prevailing in December, 1980.

3) The cost is classfied into foreign currency (indicated in Dollar) and local currency (indicated in Rupiah) portions.

Foreign currency and local currency components of each unit price are computed based on the following classification of basic cost elements.

The foreign currency component consists of the costs of:

- Imported equipment, materials and supplies;
- Domestic materials of which the country is a net importer;
- Wages of expatriate personnel; and
- Overhead and profit of foreign firms.

The local currency componenet includes the cost of:

- Domestic materials and supplies of which the country is a net exporter;
- Wages of local personnel;
- Overhead and profit of local firms; and
- Taxes.

The rates of exchange used to convert the Indonedian Rupiah to Japanese Yen and US Dollar are Rp. 628 = US $1.00 = Yen 210.

7.1.2 Unit Prices

A. Unit Costs of Materials

The unit cost data of material was collected. The imported materials are based on the CIF Jakarta price whereas those of local materials are based on the market prices in Jakarta. The unit costs of the major material items are as shown in Table 7-1.

Table 7-1 UNIT COST OF MAJOR MATERIALS

Major Material	Unit	Unit Cost (Rp)	
		F.C Component	L.C. Component
Fuel (Diesel oil)	Lit	-	52,5
Reinforcing Bar	Ton	-	230,000
Prestressing cable	Ton	-	-
Structural Steel	Ton	-	275,000
Fine aggregate	CU.M	-	6,050
Coarse aggregate	CU.M	-	7,300
Cement	Ton	-	52,500
Asphalt	Ton	-	27,400
Steel pipe pile	Ton		

B. Unit Costs of Labour

The unit labour cost is based on the actual cost prevailing in Jakarta. The following are the cost, by major labour classifications.

Class-I (Supervisory Staff)	
Supervisor, Foreman Heavy Equipment Operator	3,000 Rp/day
Class-II (Highly Skilled)	
Mechanic, Electrician Truck Driver (5-15ton)	2,500 Rp/day
Class-III (Skilled)	
Carpenter, Steel worker Mason Labour, Truck Driver (½ - 4 ton)	2,000 Rp/day
Class-IV (Semi-Skilled)	
Heavy Labour, Mechanic helper Tire Repairman, Clerk	1,750 Rp/day
Class-V (Unskilled)	
Common Labour	1,250 Rp/day

C. Land Aquisition and Compensation Costs.

The land acquisition and compensation costs are obtained from DKI Jakarta as shown belows:

Land Acquisition cost	25,000 Rp/m2
Land Compensation cost	
Parking lot	10,000 Rp/m2
Residential area	25,000 Rp/m2
Office, Factory area	25,000 Rp/m2

7.2 Economic and Financial Costs

7.2.1 General

For the economic and the financial studies of this tollway, the economic and financial conditions in Indonesia were surveyed as follows.

As for the economic study, the benefits will be calculated as the vehicle operating cost savings and the time cost savings.
As for the financial study, the repayment program for several alternatives will be examined.

Taxes, duties and subsidies are surveyed for certain commodities such as vehicles fuels and others.

Time values of the users of vehicles were variable by projects and reports available and in general, they are rather higher if compared with the arrage income.

The opportunity cost in Indonesia for the transport sector may be 12% to 15% per annum.

7.2.2 Unit prices of vehicles, tyres, fuel, oil and wages

(a) Vehicle

The current market prices in September, 1980 were determined through interviews with dealers in Jakarta. In Indonesia, the import duty wa changed in 1977 for locally assembled CKD (Completely Knocked Down) vehicles and is now 100% and 10% of the CKD price for sedans and commercial vehicles respectively.

Taking account of further taxes such as M.P.O., sales tax and corporate taxes it is assumed that the tax portion of the market price is 52.8% for sedans and motorcycles respectively. These calculation are shown as follows.
The figures for the tax component of commercial vehicles were obtained directly from dealers. The tax portion of the market price is 6.9% and 11.2% for Buses and Trucks respectively.

TABLE 7 - 2 CHARACTERISTICS OF REPRESENTATIVE VEHICLES

Type of Vehicle	PASSENGER CAR			BUS	TRUCK	MOTORCYCLE
Representative Vehicle	TOYOTA COROLLA 1200	TOYOTA CORONA 2000	TOYOTA CROWN 2600	MERCEDES BENZ 0306	MERCEDES BENZ L 911/42	HONDA GL 125/80
Length (m)	4.050	4.260	4.690	7.510	4.500	1.900
Width (m)	1.610	1.645	1.690	2.300	2.350	0.735
Hight (m)	1.395	1.395	1.430	2.655	2.500	1.017
Number of Axles	2	2	2	2	2	2
Number of Wheels	4	4	4	6	6	4
Weight (Kg)	1,260	1,495	1,915		4,200	99
Looding Capacity	5-passenger	5-passenger	5-6 passenger	50-passenger	5,100 Kg	2-passenger
Size of Tyre	6.00-12	6.45-13	6.95-20	8.25-20	8.25-20	2.50-18 front 2.75-18 Rear
Engine Capacity (cc)	1,166	1,968	2,563	5,675	5,675	124
Number of Cylinders	4	4	6	6	6	1
Cross Horsepower	64	100	130	130	130	14
Type of Fuel	Gasoline	Gasoline	Gasoline	Diezel	Diezel	Casoline
Vehicle Service Life (Year)	10	10	10	7	7	10
Average Year Round Speed (KM.P.H.)	50	50	50	40	40	40

TABLE : 7-3 : UNIT PRICE AND VALUES

Unit : Rp.

PRICE OF VEHICLE (EXCLUDING TYRE) (Depreciable Value of Vehicle)	FINANCIAL PRICE SEPTEMBER 1980	FINANCIAL PRICE APRIL 1978	ECONOMIC PRICE 1980
PASSENGER CAR TOYOTA COROLLA 1200^{cc}	9,085,000	4,290,000	3,866,010
PASSENGER CAR TOYOTA CORONA 2000^{cc}	11,725,000	5,185,000	5,003,640
PASSENGER CAR TOYOTA CROWN 2600^{cc}	18,885,000	8,350,000	8,119,530
BUS MERCEDES BENZ D 306	28,806,000	11,500,000	27,024,516
TRUCK MERCEDES BENZ 911/42	17,396,000	8,500,000	15,624,516
MOTORCYCLE HONDA 125	854,000	---	526,780

PRICE OF ONE TYRE		FINANCIAL PRICE 1980	FINANCIAL PRICE 1978	ECONOMIC PRICE 1980
PASSENGER CAR TOYOTA COROLLA 1200^{cc}	6.00-12	21,000	9,000	16,926
PASSENGER CAR TOYOTA CORONA 2000^{cc}	6.45-13	28,000	10,500	22,568
PASSENGER CAR TOYOTA CROWN 2600^{cc}	6.95-14	29,000	14,500	23,374
BUS MERCEDES BENZ D 306	8.25-20	102,000	44,000	82,212
TRUCK MERCEDES BENZ 911/42	8.25.20	102,000	44,000	82,212
MOTORCYCLE 125	2.50-18 2.75-18	8,100		6,529

FUEL AND ENGINE OIL PRICE (PER LITER)	FINANCIAL PRICE 1980	FINANCIAL PRICE 1978	ECONOMIC PRICE 1980
GASOLINE	150	70	150
DEISEL OIL	52.5	25	105
ENGINE OIL FOR PASSENGER CAR & MOTORCYCLE	1,350	1,100	1,080
ENGINE OIL FOR BUS & TRUCK	650	450	520

TIME VALUES (WAGE) (PER HOUR)	FINANCIAL PRICE 1980	FINANCIAL PRICE 1978	ECONOMIC PRICE 1980
MAINTENANCE LABOUR	550	566	550
DRIVER (BUS)	860	377	860
DRIVER (TRUCK)	500	377	500
DRIVER (PASSENGER CAR)	320	155	320
CONDUCTOR (BUS)	250	155	250
ASSISTANT (TRUCK)	200	155	200

SOURCE : INTERVIEWS WITH DEALERS

- Tax on vehicles

The following rate of taxes for each type of vehicle have been calculated using the assumptions given below.

i) Case of Sedan.

	Cost	Tax
- CIF price of the CKD parts =	A	
- Import duty 100% of CIF	A	A
- MPO import : 5% of 2A	0.1A	0.1A
- PPN import : 20% of 2.1A	0.42A	0.42A

It is assumed that the rate between total assembly material cost and the assembly cost at the manufactures plus general administration/sales cost including profit will be 62.5 : 37.5.

- Assembly cost	1.5A	
	Sub-total 4.02A	

It is assumed that the average net profit on the sales amount is at 10%, and the corporate tax at 45%.

- PPS : 4.02A x 0.1 x 0.45		0.181A
- PPN DN : 4.02A x 0.2	0.804A	0.804A
	Sub-total 4.824A	
- MPO WAPU : 20% of above sub-total	0.096A	0.096A
	Total 4.920A	Tax total 2.601A

Rate of Tax is : 2.601A/4.920A = 0.528.

ii) Motorcycle.

- CIF price of the CKD parts	A	
- Import duty : 30% of CIF price	0.3A	0.3A
- MPO import : 5% of 1.3A	0.065A	0.065A
- PPN import : 10% of above sub-total	0.137A	0.137A

It is also assumed that the rate between total assembly material cost and the assembly cost at the manufactures plus general administration/ sales cost including profit will be 62.5 : 37.5.

- Assembly Cost	1.5A	
	Sub-total 3.002A	

The average net profit on the sales amount is also assumed at 10% and the corporate tax at 45%.

- PPS ; 3.002 x 0.1 x 0.45		0.135A
- PPN DN : 3.002 x 0.1	0.300A	0.300A
	Sub-total 3.302A	
- MPO WAPU : 2% of sub-total	0.066A	0.066A
	Total 3.368A	1.003A

(b) Tyre

The market prices in June, 1980 were adopted.
PPN and MPO amount to 7.0%, but taxes will represent 9.4% of the market prices taking account of the import duty on materials.
Calculating figures are as :

Tax on Tyre.

	Cost	Tax
- Production cost including tax	1.0A	
- Rate of tax including import duty MPO import, PPN import & PPS was obtained from interview with manufacturer		0.03A
- PPN : 5% of production cost	0.05A	0.05A
	Sub-total 1.05A	
- MPO WAPU : 2% of above sub-total	0.021A	0.021A
	1.071A	0.101A

Rate of Tax : 0.101A/1.071A = 0.094.

(c) Fuel and Oil

Oil prices were increased from May 1980.
All the petroleum products marketed inside Indonesia are produced and supplied by PERTAMINA.
Before the increase, it was estimated that the tax component of gasoline was about 45% and diesel was subsidised.
No data base so far been disclosed regarding the costs or profits of the various petroleum products currently produced by PERTAMINA, and therefore it is extremely difficult the clarify the real economic price of those commodities. On the other hand Market fuel price Rp.150. Seems very close to the international market price and it is therefore assumed that the economic fuel price is equal to the market price.

(d) Wages

Wages for each type job were found by direct enquiryd to drivers, maintenance labour etc.

As can be seen from the following calculations, it is found that income tax is neligible.

- Tax on monthly income.

Assumption : Taxpayer has a wife and three children.

(a) Case of Bus Driver

- Monthly gross wages	Rp.120,000
- Deduction according to Article 5 paragraph (2) 10% x Rp.120,000	Rp. 12,000
- Gross income	Rp.108,000
- Deduction of tax free income according to Article 5 paragraph (8) 1st and 2nd :	
- for taxpayer himself	Rp. 20,000
- for wife	Rp 20,000
- for three children	Rp. 30,000
- Monthly balance of taxable income 12 x 38,000	Rp.456,000
- The annual income tax for the balance of taxable income Rp.456,000, the tax due is	Rp. 24,960

- Monthly income tax due — Rp. 2,080
  2,080/120,000 = 1.7%

(ii) Case of Truck Driver

- Monthly gross wages — Rp. 85,000
- Deduction according to Article 5 paragraph (2) 10% x Rp.85,000 — Rp. 8,500
- Gross income — Rp. 76,500
- Deduction of tax free income according to Article 5 paragraph (8) 1st and 2nd :
  - for taxpayer himself — Rp. 20,000
  - for wife — Rp. 20,000
  - for three children — Rp. 30,000
- Monthly balance of taxable income — Rp. 6,500
- Annual balance of taxable income 12 x 38,000 — Rp. 78,000
- The tax due is — Rp. 3,900
- Monthly income tax due — Rp. 325
  325/85,000 = 0.4%

7.2.3 Financial costs

In case, the Study proceeds to the financial study, the following items, should be examined and studied.

1) Costs during construction period

   - Construction costs with price contingency
   - interets on loans

2) Costs after opening of the tollway

   - Operation costs including overhead costs
   - Maintenance costs including some additional construction costs
   - taxes and other costs including compensation funds for unforeseen damages
   - Other specified costs such as amotizeetion costs

VIII. TOLLWAY SYSTEM

The project road has been studied on the basis of a tollway. The Jakarta Harbour Road is a tollway in the Jakarta-West Java Tollway System.

8.1 JAGORAWI Freeway

Jagorawi Freeway is the first tollway in Indonesia and was opened March, 1978.

JAGORAWI Freeway connects Jakarta, Bogor and Ciawi and is about 50 kilometers in length.

The traffic volume in December 1980 was 15,000 vehicle per day on average.

This freeway is operated by PT Jasa Marga (Indonesian Highway Corporation), who are the only responsible operation body for tollways in Indonesia.

The organization of PT Jasa Marga is shown in Fig. 8-1 in Appendix.

The toll charge for a vehicle less than 2.5 ton in weight, travelling the whole length of the tollway is 600 Rp., which is equivalent to Rp 11 or Rp 15 per kilometer, depending on the direction of travel.

The equivalent charge for a vehicle more than 2.5 ton is Rp 1,000, which is a rate of Rp 20 or Rp 25 per kilometer.

The Jagorawi Freeway operates under Presidential Decree No.3 of 1978, which was the determination of the Jakarta-Bogor-Ciawi Freeway becoming the Jagorawi Tollroad and the amount of toll-rate.

8.2 Future Tollway Network and Toll Levy System

8.2.1 Tollway network

The tollway network in Jakarta Metropolitan area is proposed to be as explained in chapter V. The current situation of each tollway is as follows :

1) Jakarta Tangerang Freeway

   - Right of way has been acquined and
   - Construction started in 1980.

2) Jagorawi Freeway

   - Opened partially in March 1978 and in March 1979 for the full stretch.

3) Jakarta-Cikampek Freeway

   - Construction funds will be loaned by the World Bank and Kuwait fund, and
   - Construction will start this year (1981).

4) Jakarta Outer Ring Road

   - Feasibility Study was completed, and
   - Some portion in the east will be realized soon together with Jakarta Cikampek Freeway.

5) Jakarta Harbour Road

   - Now under feasibility study, but construction of the western portion of the road is to start in 1981.

6) Jakarta Intra Urban Tollway

   - Engineering services have been continuing section by section, and
   - Some flyovers on the S-W Arc of the tollway are at the Tender stage.

8.2.2 Toll levy system

In general for the toll levy system, there are two systems i.e. one is an open system and the other, closed system.

Usually for regional freeways, a closed system is adopted and for urban tollways, an open system is adopted.

For the Jakarta-West Java Tollway System, the following toll levy systems will be alternatives to be studied :

1) A Closed System for the group of Jakarta-Tangerang Freeway, Jagorawi Freeway, Jakarta-Cikampek Freeway, Jakarta Outer Ring Road and Jakarta Harbour Road.

   An open system for the South-West Arc and North South Link of Jakarta Intra Urban Tollway.

2) A closed system for the group of Jakarta-Tangerang Freeway, Jagorawi Freeway, Jakarta Cikampek Freeway and Jakarta Outer Ring Road.

   An open system for the S-W Arc and N-S Link of Jakarta Intra Urban Tollway and Jakarta Harbour Road.

3) The western portion of Jakarta Harbour Road, which is called "Cengkareng Access", operates under the closed system.

   The others are the same as alternative 2).

The above three alternatives are the basic ones and the staging concept shall be added to them for study purposes.

The connections between a closed system and an open system shall be facilitated with a barrier type toll plaza.

8.3 Financial Scheme

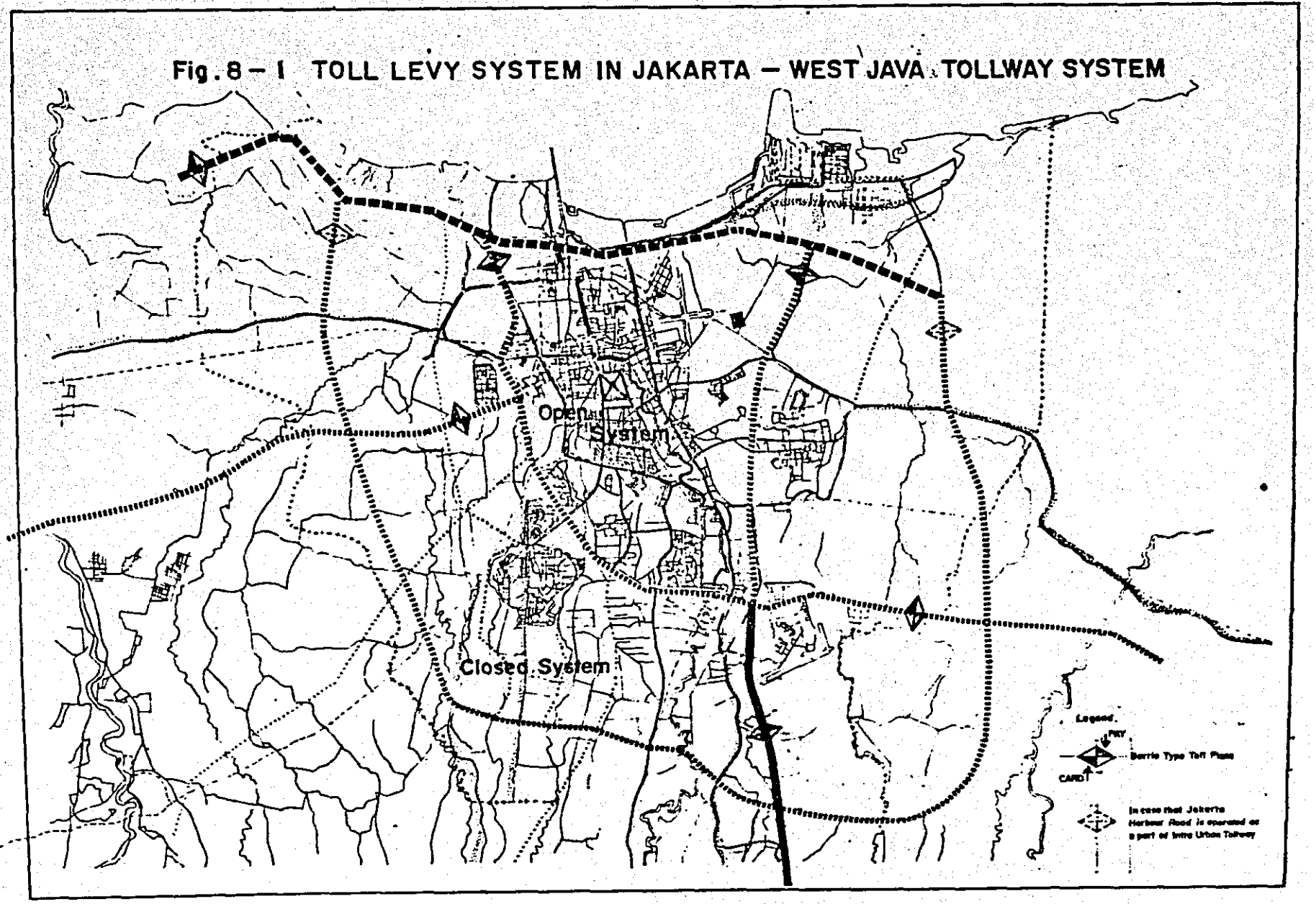
The construction of a tollway requires a very large expenditure and in any case, a tollway need not be constructed fully by the National Budget (APBN), because a tollway concept means that a user must pay for his benefit and as a total he can still receives a net benefit while at the same time providing income for the tollway operator.

Financing sources give a strong impact to the viability of a tollway realization. The government will seek financing sources on behalf of the tollway operation body and after opening of the tollway, the governments will recover its investment by repayments from the operation body.

8.4 Further Study

The study will be carried out further from now on in Japan on the tollway system as for the timing of completion of each element of the network, repayment items and conditions, tollrate and variation, influence of stage construction on a levy system etc.

Fig. 8 – 1 TOLL LEVY SYSTEM IN JAKARTA – WEST JAVA TOLLWAY SYSTEM



IX FURTHER STUDY TO BE CONDUCTED

9-1 Further Study Items

After the submission of this Interim Report, the Team will conduct the study further in Japan, based on the study results and the discussions in the joint Meetings.

The further study will cover the following items :

- Review of traffic demand forecast, and traffic assignment and analysis
- Preliminary design
- Construction costs estimates
- Preparation of Summary Draft Report
- Economic evaluation
- Financial evaluation
- Implementation program
- Impact study
- Total evaluation
- Preparation of Draft Final Report and Final Report.

The above items will be carried out as described in the Inception Report.

9-2 Study Schedule

The study schedule is as shown in the Inception Report.