2.1.3 Present state of station areas

There are five stations in this project district, including Jakarta–Kota and Manggarai Station.

The characteristics of each station are shown as follows, judging from the state of existing land use in the surrounding area of the station.

1) Jakarta–Kota Station

Jakarta–Kota Station has filled the role of a core terminal supporting a central commercial, business and financial area of not only DKI Jakarta but also Jabotabek area, which is long-standing.

The town around Jakarta–Kota Station was developed early in the history of the city growth, and has encompassed many urban functions; retail shops, business, financial and administrative offices especially related to the shipping trade, industrial factories, warehouses, social-cultural amusement facilities, etc.

Besides these characteristics this station has the central function of West Region Railway system and a large yard has been established at this station.

2) Sawah Besar Station

Sawah Besar Station is located in the mixed area of commercial, business, industrial and residential land use.

On the east side area of this station, there is the large scale redeveloped market which seems to have a function as commercial distribution facilities, moreover, some shopping centers and theatres exist near this station. The growth of the surrounding area of this station seems to have gradually emphasized the commercial function, and it is assumed that accordingly a business function could be formed.

Therefore, this station is evaluated to present the possibility of development as a sub-central station supporting a new commercial and business area.

3) Gambir Station

Gambir Station is located in the symbolic area of DKI Jakarta where there are central government and administrative offices, and some major companies are concentrated in this region.

The west side of the station front area occupies part of Merdeka Park and has a comfortable and rich open space.

This terminal would fill a significant role not only as one of the symbolic facilities but also a terminal to support the central administrative and business functions.

4) Cikini Station

Cikini Station is located in a mainly residential area, but some commercial facilities such as retail shops, restaurants and shopping centers exist around this station. However, it would characterize this station to present it as giving access services to the high class housing area and some public facilities of education, research and administration. Account must be taken of the possibility of future development of the Surrounding area, due to the following factors:

i) The degree of present accumulated commercial and business facilities would be sufficient to provide the appropriate neighbourhood commercial function.

ii) Suitable reserved land for future development could be obtained along the railway between Cikini Station and J1. Diponegoro.

5) Manggarai Station

The surrounding area of Manggarai Station has some interesting characteristics from an urban planning point of view.

One is that a considerable wide area of about 35 hectares is occupied by related railway facilities, which means that Manggarai Station would have capacity for railway transportation development in the future; moreover, this station could function as a central terminal of the expanding town.

The second is that the accumulated commercial facilities of retail shops, markets and open-air stalls are attractive and well-supported, especially on the road side area between the bus terminal and Manggarai Station. Accordingly, consideration should be given to the possibility that Manggarai Station could become functionally significant in supporting the commercial and consumer activities for the inhabitants of lower than middle class.

The third is that the station front area of about 4 hectares presents a necessity for redevelopment as a commercial zone. It is currently utilized as a vegetable and fruit market and the rear of the market to Kali Ciliwung is an area of high-density low income housing.

These facilities are very old and it is recommended that redevelopment or renewal should be given serious consideration.

2.1.4 State of station utilization

The study team carried out "survey of station facilities" in parallel with the study of traffic volume, for the purpose of examination of the present state of station utilization. The kinds of the survey of station facilities related to the study for planning of facilities are the following three.

- Survey of the station parking area
- Survey of passengers getting on and off buses in the station front area
- Survey of transportation means of passengers incoming/outgoing to/from the station

(1) Present State of Parking Area Utilization

The number of parked vehicles was checked by time in this survey. The result will become a basic material for study of the scale of transportation facilities to be required in relation to passengers getting on and off trains at each station. The result is shown in Table 2.1.2.

Table 2.1.2 Result of Parking Survey at Station

(Unit: Vehicle)

Station	Modes	Public Transportation Means						Individual Transportation Means				Total
		Beca	Kendaraan rodatiga	Taxi	Mini-Bis	Bis	Sub-total	Sepeda-Motor	Mobil-Penumpang	Truck	Sub-total	
Jakarta Kota	Peak Time	–	–	1	6	1	8	27	20	2	49	57
	All Day	–	–	4	25	1	30	88	90	10	188	218
Sawah Besar	Peak Time	6	3	–	3	–	12	3	7	1	11	23
	All Time	33	9	–	4	–	46	33	49	1	83	129
Gambir	Peak Time	4	75	53	24	12	168	86	102	7	195	363
	All Day	5	179	116	145	27	472	649	521	19	1,189	1,661
Cikini	Peak Time	–	5	1	1	1	8	5	2	2	9	17
	All Day	–	13	1	3	1	18	15	6	3	24	42
Manggarai	Peak Time	27	25	4	8	–	64	8	11	16	35	99
	All Day	215	169	15	24	–	233	45	47	141	233	466

As is evident from this table, the number of traffic vehicles parking differs according to the attached facilities; Jakarta–Kota Station has no public parking for passengers, so the number of individual vehicles was only 20 vehicles at peak time, while at Gambir Station the number was counted as more than 100 vehicles at peak time because of the existing parking space at the front of the station.

(2) Present State of Bus Utilization in Station front area

The state of number of passengers getting on and off buses at the bus stops in front of each station was checked as classified by time band. As a result, about 10,000 passengers were observed in front of Jakarta–Kota Station and about 8,600 passengers were observed in front of Gambir Station in the period of 12 hours from 7 o'clock in the morning to 7 o'clock in the evening.

It is worth paying attention that the number of bus passengers is relatively large at Cikini Station (about 2,400 passengers) among intermediate stations.

The figures classified by station are as shown in Table 2.1.3 and Fig. 2.1.6. But it is not always true that all passengers indicated here make use of the railway, but it is estimated that approximately one half of them make use of the railway.

(3) Characteristics of Use of Feeder Transportation Means

The result of the survey of utilization of feeder transportation means of passengers arriving at each station is shown in Table 2.1.4 and Fig. 2.1.7.

Each station has its specific characteristics depending on road conditions and operating conditions of bus services, but the stations at which use of mini buses, oplets and similars is conspicuous are Jakarta–Kota Station and Sawah Besar Station, and the station at which use of general buses is conspicuous is Cikini Station. Although the public transportation means supplements the railway at the stations stated above, the individual transportation means such as passenger cars supplements Gambir Station as a main feeder transportation means. Consolidation of these feeder transportation means will become a more important subject in the future accompanying consolidation of the railway. It is desired in particular that means of mass transportation such as buses are secured at each station.

Table 2.1.3 Present State of Bus Utilization in Front of Each Station

Station	Number of Bus Passengers	
	12 hours (7 A.M. ~ 7 P.M.)	2 hours at peak (7 A.M. ~ 9 A.M.)
Jakarta Kota	9,973	2,025
Sawah Besar	315	112
Gambir	8,568	1,192
Cikini	2,422	391
Manggarai	2,110	400
Total	23,388	4,126

Notes: This survey was carried out in August 1981.

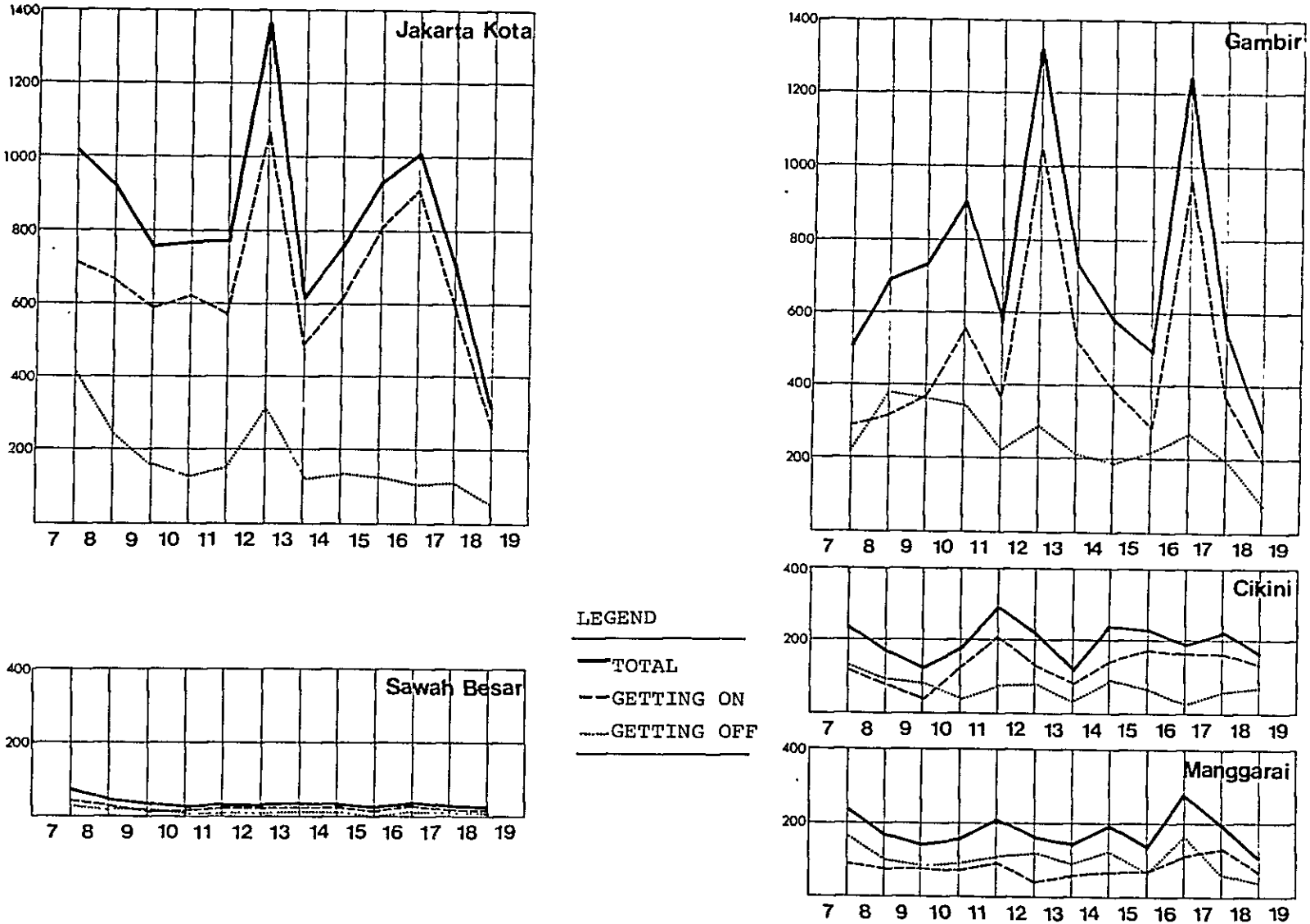


Fig. 2.1.6 CHARACTERISTICS OF BUS UTILIZATION BY TIME BAND

Table 2.1.4 FEEDER TRANSPORTATION MEANS AT EACH STATION

– Arrival to Station –

(Unit: Vehicle (%))

	Station \ Vehicle	Beca	Bajaj	Taxi	Mini-Bus Oplet Colt	Bus	Motor-cycle	Sedan Jeep	Truck	Total
12 Hours (7:00 ~ 19:00)	Jakarta–Kota	34	703	245	1958	781	184	168	242	4315
		(0.8)	(16.3)	(5.7)	(45.4)	(18.1)	(4.3)	(3.9)	(5.6)	(100.0)
	Sawah–Besar	97	175	7	333	28	12	30	1	681
		(14.2)	(25.7)	(1.0)	(48.9)	(4.1)	(1.8)	(4.4)	(0.1)	(100.0)
	Gambir	4	556	704	234	24	528	622	45	2717
		(0.1)	(20.5)	(25.9)	(8.6)	(0.9)	(19.4)	(22.9)	(1.7)	(100.0)
	Cikini	–	169	9	2	366	33	20	–	599
		(0.0)	(28.2)	(2.0)	(0.3)	(61.1)	(5.5)	(3.3)	(0.0)	(100.0)
	Manggarai	1984	581	57	530	12	77	30	108	3379
		(58.7)	(17.2)	(1.7)	(15.7)	(0.4)	(2.3)	(0.9)	(3.2)	(100.0)
Morning Peak (7:00 ~ 9:00)	Jakarta–Kota	8	192	41	411	146	29	25	18	870
		(0.9)	(22.1)	(4.7)	(47.2)	(16.8)	(3.3)	(2.9)	(2.1)	(100.0)
	Sawah–Besar	17	39	1	61	2	3	1	–	124
		(13.7)	(31.5)	(0.8)	(49.2)	(1.6)	(2.4)	(0.8)	(0.0)	(100.0)
	Gambir	1	209	133	37	6	79	136	3	604
		(0.2)	(34.6)	(22.0)	(6.1)	(1.0)	(13.1)	(22.5)	(0.5)	(100.0)
	Cikini	–	34	6	–	77	4	6	–	127
		(0.0)	(26.8)	(4.7)	(0.0)	(60.6)	(3.1)	(4.7)	(0.0)	(100.0)
	Manggarai	390	113	16	78	–	25	15	24	661
		(59.0)	(17.1)	(2.4)	(11.8)	(0.0)	(3.8)	(2.3)	(3.6)	(100.0)

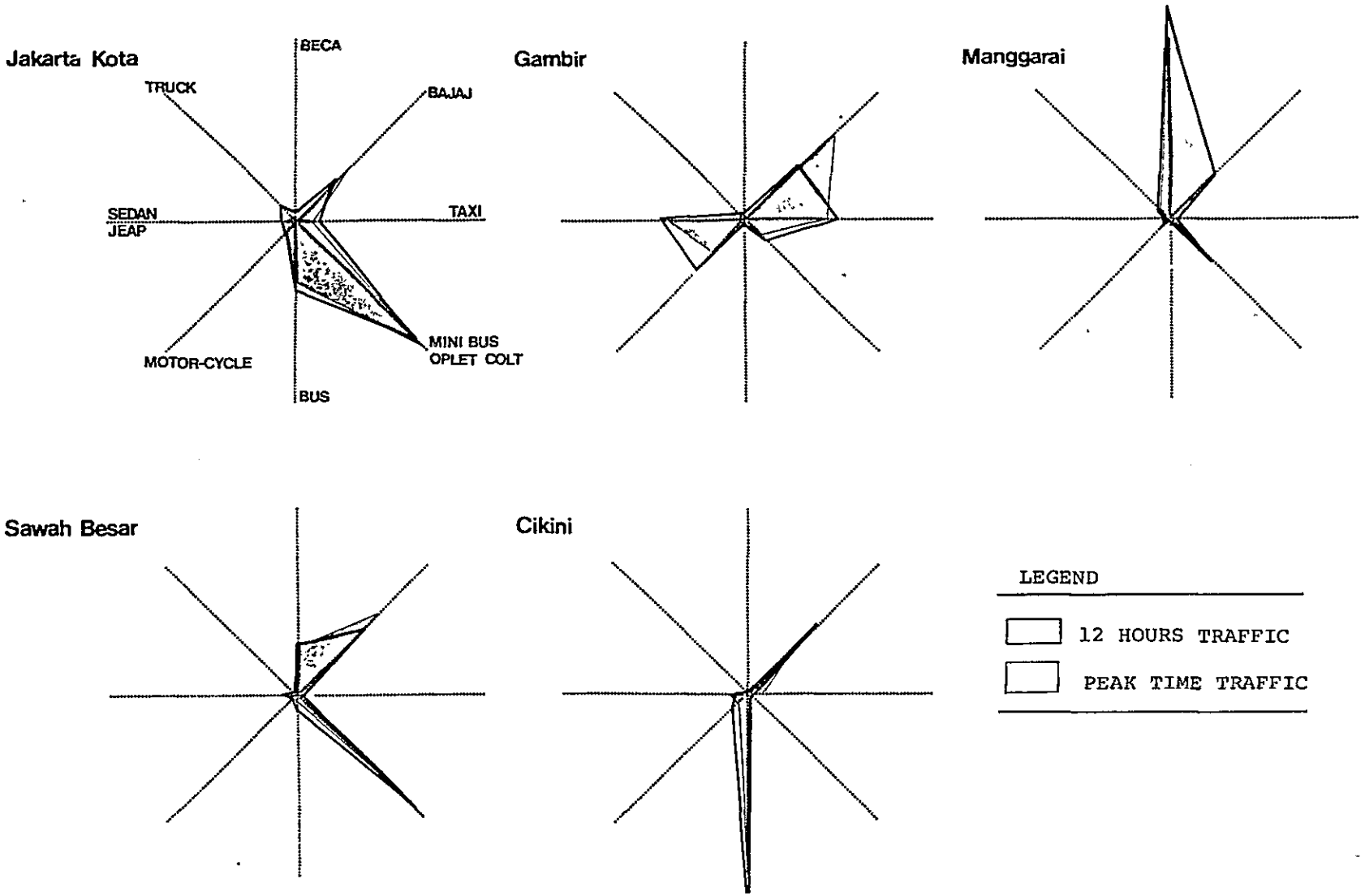


Fig. 2.1.7 UTILIZATION OF FEEDER TRANSPORTATION MEANS

2.2 Future Urban Prospect of Central Line Area

2.2.1 Urban planning road network

The urban planning road network agreed upon between the Road Bureau and DKI Jakarta Municipal Government in the related area along the Central Line is shown in Fgi. 2.2.1.

What requires particular consideration of the relation between roads and railway is that parallel urban planning roads have been planned along the Central Line.

These urban planning roads are considered to have the following significance in the urban planning.

i) To have the function as main trunk roads stretching in north-south direction, and to function as the new axis for town formation in the future.

ii) To provide the function as buffer zones for the way-side areas.

iii) To increase the possibility of consolidation of town area in way-side areas involving the possibility of leading to increase of railway passengers demand and to improvement of convenience for utilization of railway.

On the other hand, however, when the important functions of the railway to be provided in the future are considered, some adjustment of road alignment particularly in the vicinity of stations will become necessary for accomplishment of coexistence of railway and roads.

2.2.2 Station allocation

The station allocation is one of the most important factors in promoting the utility of mass transportation in the urban traffic system.

The stations should be allocated with sufficient consideration of the future land use and urban traffic demand from the urban planning point of view, but a convenience of passengers must be one of the prime factors.

Based on the above conditions, the study team propose herein the new allocation of stations of the long distance train terminal, and some intermediate stations between Jakarta Kota Station and Manggarai Station in connection with the track elevation of Central Line project.

(1) Terminal for Long-distance Trains

Regarding the allocation of a terminal for long-distance trains, two alternatives must be considered; one is to allocate it at Jakarta–Kota Station and at Gambir Station as of present. The second is to allocate it at Manggarai Station to conform with the railway development program.

The former is based on the consideration that the present pattern should be maintained and promoted more and more in future, and the latter means that the long distance train terminal should be formed separately to the intra urban transportation system to which the railway between Manggarai Station and Jakarta–Kota Station would contribute.

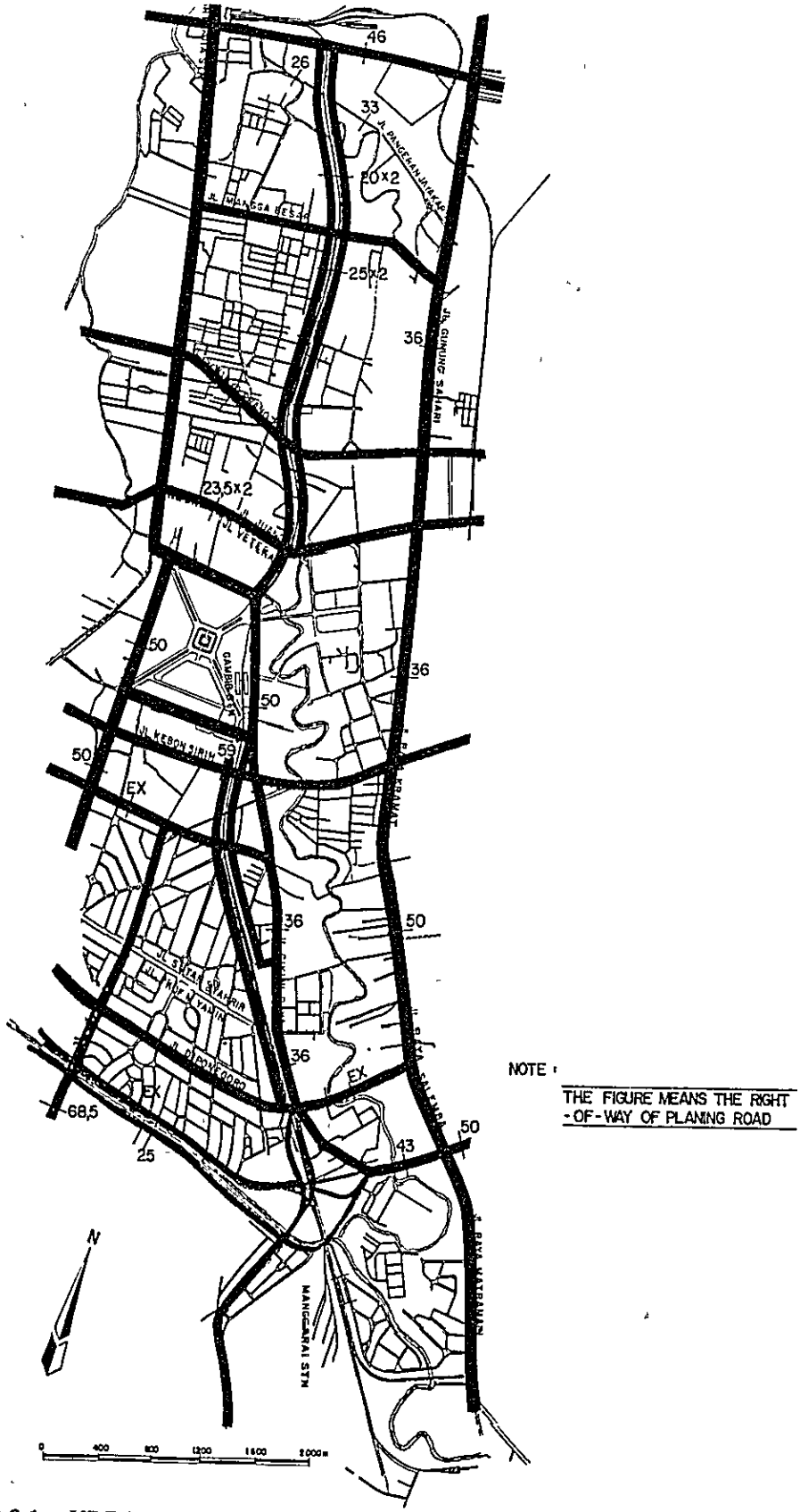


Fig. 2.2.1 URBAN PLANNING ROAD NETWORK IN RELATED AREA

Both ways have merits and demerits, however judging from the future urban structure of Jakarta which has expanded the town area year after year and the population of which is estimated to be approximately twice the present in the year 2000, it will be recommendable that the latter method will be adopted; i.e. Manggarai Station will be developed as a terminal for long-distance train.

The basis for judgement that the necessity for locating terminals for long-distance trains in the outer edge area of Central Business District will rise from a longterm vision is as follows:

i) It is necessary that Jakarta–Kota Station and Gambir Station make sufficient correspondence to the intra-urban traffic demand forecasted in the future, and it will become more important for these stations to fulfill this function. Judging from the situation of land use in the vicinity areas, the allowance in the expansion of facilities of these stations is not enough to fulfill the function to serve intra-urban traffic stated above.

ii) From the standpoint of urban development, the section around Jakarta–Kota and Gambir Stations, where has been the center of the town for a long time, plays the functions of the heart of the Metropolis. For a city having a population of over ten million in the metropolitan area, the necessity for establishment of an auxiliary heart-of the Metropolis will come to increase as examples in other advanced nations indicate.

In other words, it will not be possible to cope with the needs for expansion of heart of the Metropolis which is generated accompanying growth of the town by integration of conventional heart of the Metropolis functions alone, and it will be needed to establish an auxiliary heart of the Metropolis to supplement the urban functions.

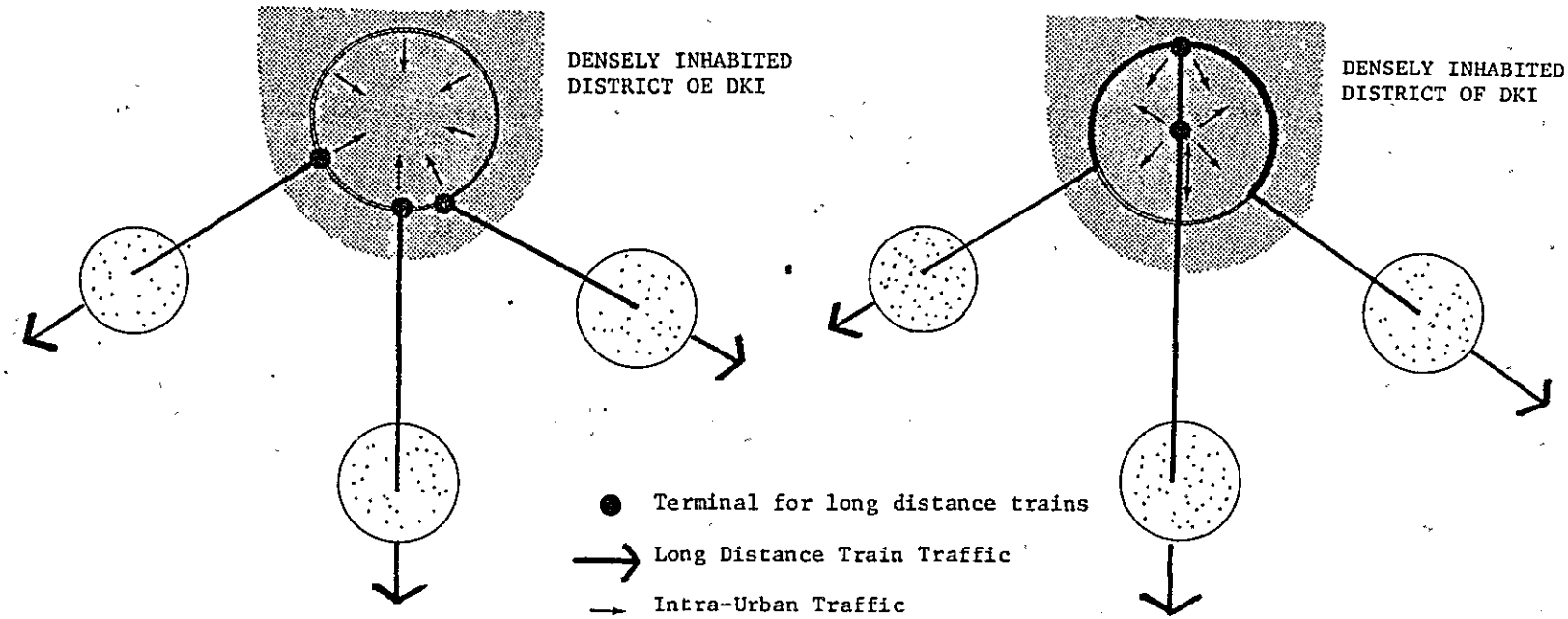
While conventional heart of the Metropolis is based on the integration of commerce, business, administration and so forth, there is a trend that auxiliary heart of the Metropolis is to be established based on the integration of living relevant functions for consumers, or distribution functions.

It is considered that establishment of an auxiliary heart of the Metropolis based on these urban needs is not made naturally, but the establishment should be rather achieved based on planned development and consolidation.

The terminal for long-distance trains will extremely effectively function as the uncleus for planned establishment of the auxiliary heart of the Metropolis, and in this sense, the feasibility and necessity for development in the vicinity of Manggarai Station are sufficiently evaluated.

It is needless to say, however, that this judgement should be made with other conditions such as the principle of railway transportation system, operation planning, and technical matters.

For example, from an operation planning point of view, the following considerations will come to an actual dicision, i.e. nowaday there exists fairly



In case of Terminal for Long-Distance Trains allocated at outside of CBD.

In case of Terminal for Long-Distance Trains allocated inside of CBD as it is.

Fig. 2.2.2 CONCEPTUAL SCHEMA OF TERMINAL FOR LONG-DISTANCE TRAINS

capacity of railway transportation on the present state because the use ratio of railway passengers is not so high comparing with those of the other advanced cities, so that it is enough possible to operate the long-distance train to come into the central business district by the near future. Moreover, considering the convenience of railway utilization, it is not always recommendable to stop operation of the long-distance train which has been enable to make direct approach to the heart of city.

Based on above considerations, it is one of the most desireable idea that the terminal for long-distance train is allocated at Jakarta–Kota and Gambir Station as it is till the urban traffic demand of railway is more over than the capacity up developed facilities, caused by the development of railway system.

(2) Intermediate Stations

It is considered that intermediate stations should be decided with convenience for urban transportation passengers, commuters, shopping passengers, commercial transportation and so forth as the primary planning factor.

(In other advanced nations, intermediate stations are provided at intervals of 1.0 to 1.5 km for improving convenience of use by passengers in general.)

On planning of station arrangement, the feeder services which also constitute the urban transportation system must be maintained and must be consolidated simultaneously with consolidation of the railway. Therefore, it is necessary that planning of intermediate stations is fully matched with the future urban road planning.

With condition such as land use in way-side area, traffic volume and urban planning roads taken into account, the study team proposes establishment of seven intermediate stations. The locations of these intermediate stations are shown in Fig. 2.2.3. Each one of these intermediate stations will have its own characters and functions because of differences in the land use in the peripheral areas.

Although it is necessary to determine the timing of opening of new stations for playing the roles as pioneers for urban development, the time of opening of new stations should be judged based on the idea to create the opportunity of utilization of the railway so that the degree of convenience will increase, instead of decision based on the existing demand level, in order that the railway is firmly positioned in the urban transportation system and that it functions as what is capable of fully corresponding to the convenience of urban transporters. In this sense it is desirable that all of these six intermediate stations are opened at same time from the beginning.

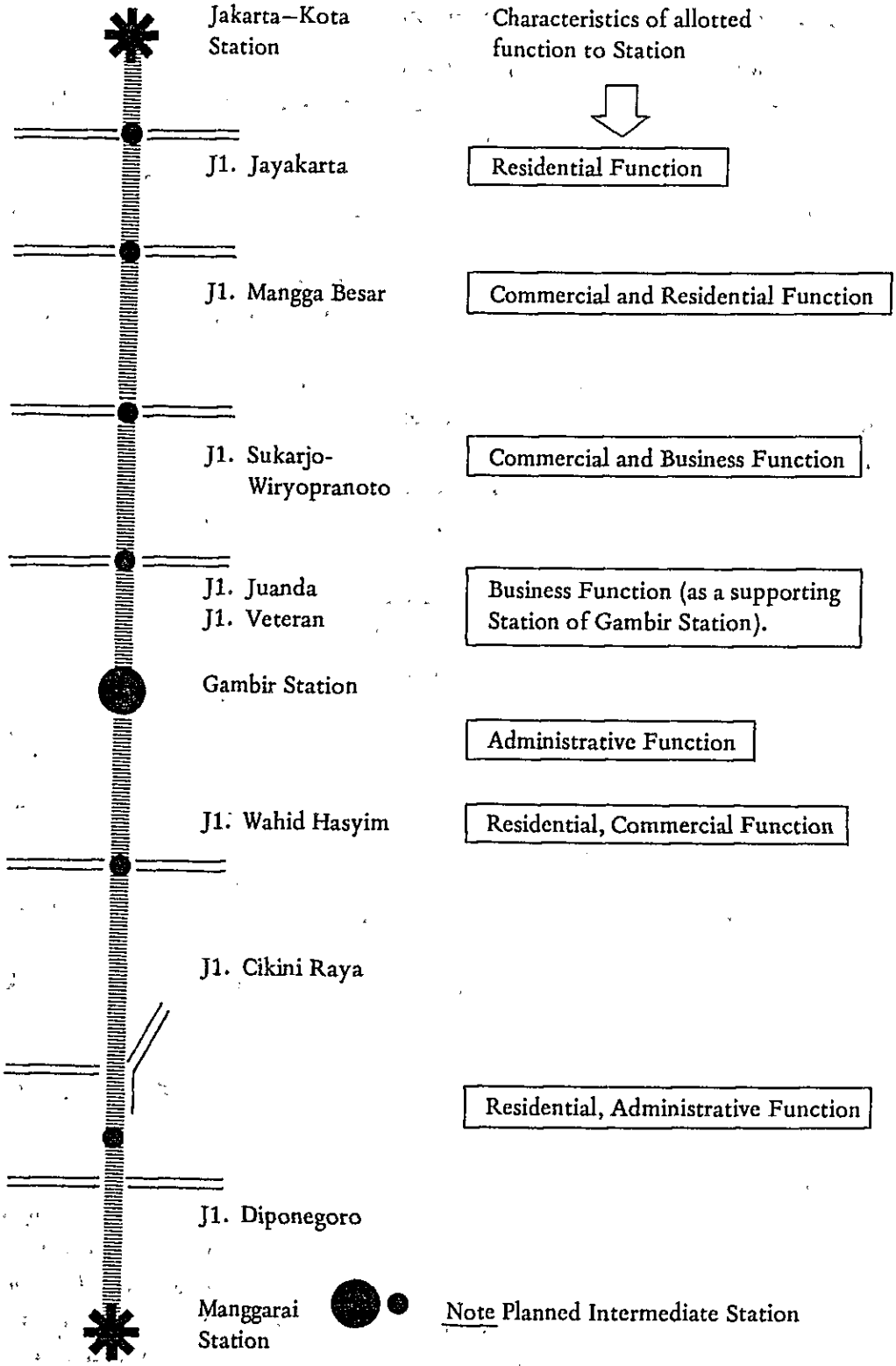


Fig. 2.2.3 ALLOCATION PLANNING FOR INTERMEDIATE STATION

2.2.3 Land utilization planning after track elevation

(1) Concepts on Land Utilization after Track Elevation

One of the major benefits of track elevation is that the land under the track can be utilized not only for station facilities but also for the provision of urban facilities..

The land under the track, however, has the limitations of being of a linear shape with a width of approximate 20 meters and the space height of 5 meters, with many concrete piers at intervals of 8 or 10 meters.

Therefore, it is important in planning the utilization to establish suitable facilities for such a limited space and to consider positively the relationship and characteristics of access-road to the planned facilities.

In consideration of above conditions, there would appear to be at least six patterns for land utilization after track elevation, as follows:

1) For station facilities
2) For commercial facilities; retails shops or markets
3) For material distribution facilities; warehouse or truck yard
4) For parking space
5) For community facilities; park, play-ground, etc.
6) For open space; green, accident-proof buffer zone.

The utilization of this land for housing purposes should not be considered due to the noise level; moreover, basically it should be specified for public use.

Fig. 2.2.4 shows the tentative utilization planning of the land under the track between Jakarta–Kota Station and Manggarai Station.

Regarding the form of utilization of the land under the elevated track, a policy to use it as open space as much as possible and to minimize planning of construction of facilities was established with facts that this project area is located in the center of the city and that spaces functioning as city parks and open spaces are extremely limited except for the area around Gambir Station.

However, it was decided to positively plan utilization of the land under elevated track for commercial and physical distribution facilities around Sawah Besar Station and Cikini Station, where it is considered as viewed from the form of town area and the degree of integration of commercial and business functions that the effect of utilization of land under elevated track is increased in multiplication.

(2) Land under Elevated Track Utilization Planning

Linear land of about 100,000 m^2 is produced under the elevated structure of a length of about 8,500 m. Because of the fact that this land may be used in dual layers at Sawah Besar Station and Gambir Station, as proposed in Engineering Study "Facilities Planning" in a later chapter, when this additional floor space of about 13,700 m^2 is added, it will become possible to utilize a space of about 113,700 m^2 in total under the elevated track.

This area is what can be used under the structure (the area that can be regarded as construction facilities), and the sections of track site outisde of the structure are excluded.

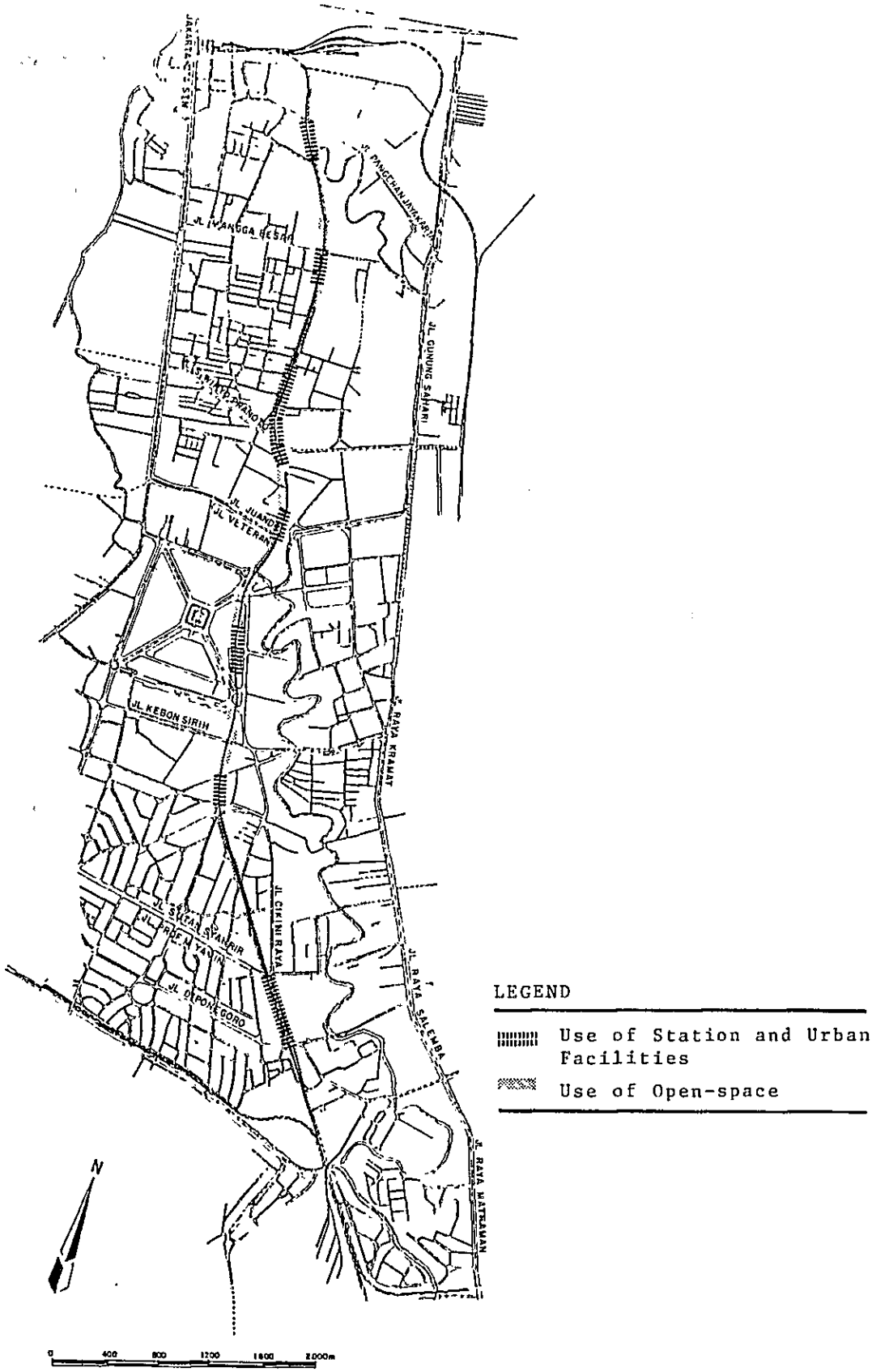


Fig. 2.2.4 CONCEPTS ON LAND UTILIZATION UNDER TRACK ELEVATION

Accordingly, it is possible to use the track site outside of the structure for front yard, service yard and so forth which are attached to the facilities under the structure.
In the sections in which the land under the structure is not utilized for facilities, the track site outside of the structure may be used as open spaces or streets.
Table 2.2.1 indicates planned areas of the land under the elevated track structure for facilities, and Fig. 2.2.5 proposes the configuration of land use with relationship with the future urban planning roads taken into consideration. Regarding station facilities, the area corresponding to the number of passengers expected in the future are taken into account as studied in "Station Facilities Planning" in a chapter to appear later.
The station plaza is used as pedestrians space, as a part of the functions of station front area or as facilities supporting station functions, and essentially it should be planned in relation with the development planning of the vicinity of the station.
Commercial facilities within the station plaza are provided with provision of services to station passengers as the prime object, and they are to cope with activation of commercial activities to be generated as one of advantages brought by the track elevation project. The scales of commercial facilities were determined from the number of station passengers expected in the future.
Regarding warehouses and physical distribution facilities around Sawah Besar Station, proposal were made as the facilities which make contribution to increase of the potential of commerce in this area with the relationship with commercial facilities located in the vicinity of this station, especially the large scale market redeveloped on the west side of the station was taken into account on this planning as one of the remarkable commercial accumulations. It is considered that the necessity for urban physical distribution facilities such as warehouses, delivery centers and truck centers will come to increase in this area in the future.
Use of land under the elevated track structure for constructed facilities was limited in this project to the range stated above, that is, about 45% of the total available area. It is desirable that planning of utilization of the remaining land (open space) is sequentially planned in correspondence to the land utilization in the way-side area, for parking areas, parks, play grounds and so forth.

Table 2.2.1 Utilization Planning after Track Elevation

		Station Facilities	Station Plaza	Commercial Facilities	Distribution Facilities	Sub-total	Open* Space
Jayakarta Stn. and Surroundings (m^2)		1,400	2,300	1,440	–	5,140	62,100
Manggarai Stn. and Surroundings (m^2)		1,400	–	900	–	2,300	
Sawah Besar Stn. and Surroundings (m^2)		1,700	900	6,440	3,700	12,740	
Juanda Stn. and Surroundings (m^2)		1,400	–	1,080	–	2,480	
Gambir Stn. and Surroundings (m^2)		6,000	3,000	4,800	–	13,800	
Gondangdia Stn. and Surroundings (m^2)		1,400	–	1,940	–	3,340	
Cikini Stn. and Surroundings (m^2)		1,700	2,000	8,100	–	11,800	
Total	Area	15,000	8,200	24,700	3,700	51,600	62,100
	%**	13.2	7.2	21.7	3.3	45.4	54.6

Note: * OPEN SPACE includes the uses for paking space, neighbourhood park, play-ground, etc.

** The percentage means the rate of each use to the total available area of approximately 11.37 hectares under the track structure.

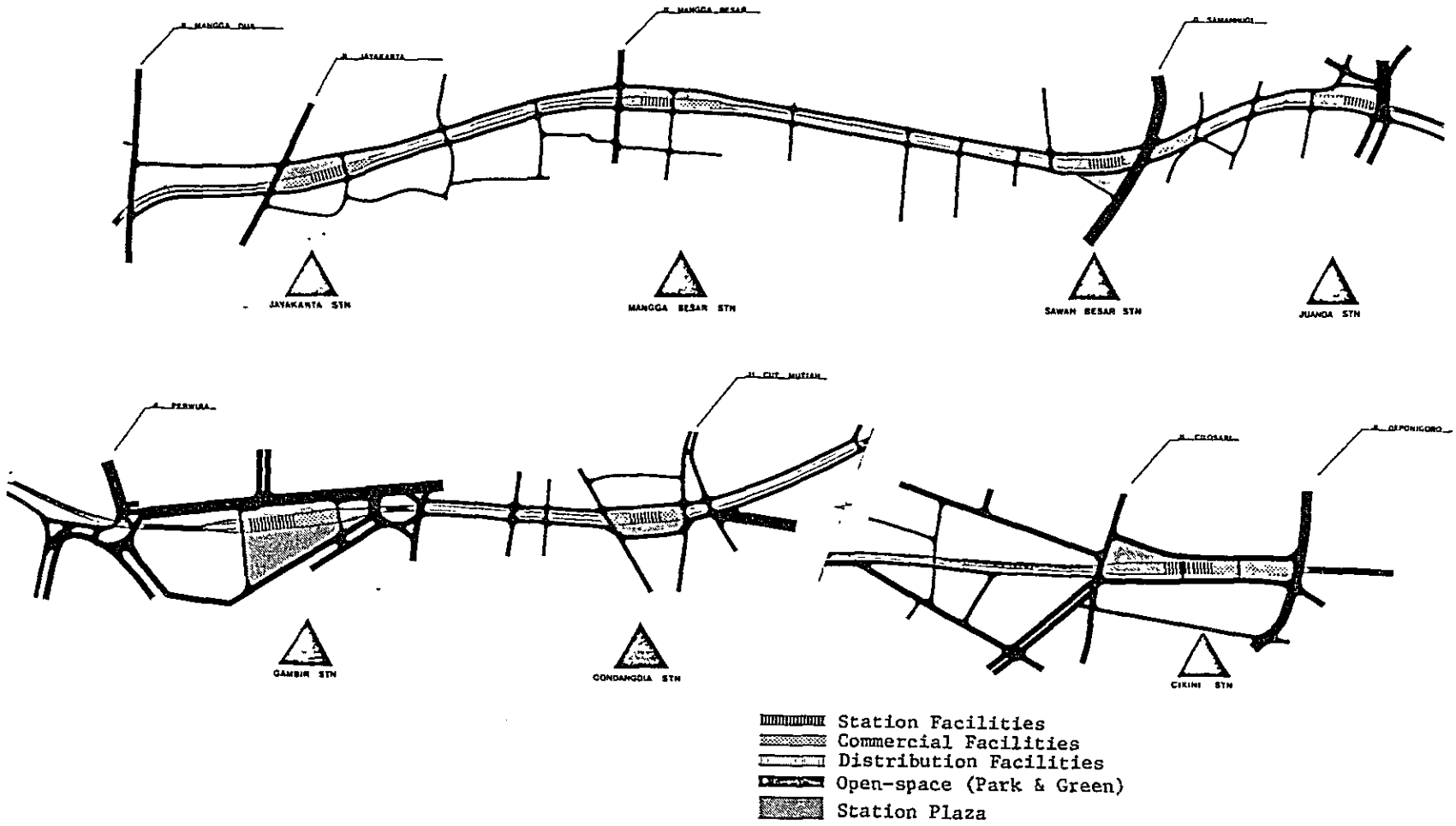


Fig. 2.2.5 CONCEPTUAL PLAN FOR LAND UTILIZATION UNDER ELEVATED TRACK

2.2.4 Planning for station plaza

(1) Basic Concepts for Station Plaza

Formation of each station plaza can be classified into three patterns as shown in Table 2.2.2. The pattern suitable for each station should be judged with the number of station passengers expected in the future, the future land use planning in the vicinity and other external factors taken into account.

Planning the station plaza should be made with particular care exercised with the following matters.

i) Improvement of bus services in particular should be considered as the prime object among feeder transporation means for each station to be attached to establishment of a bus – raiway connection system at each station.

ii) Consideration should be given to secure a park as well as spaces for pedestrians, in order that each station will become to function as an urban environmental facilities in the surrounding area.

iii) Adjustment with future urban planning roads should be made with smooth processing of automobile traffic lines as the key point.

iv) Traffic path of pedestrians should be separated from the traffic of automobiles blow as much as possible.

(2) Estimation of Planning Conditions

Consolidation of feeder transportation means is essential together with consolidation of railway facilities.

Improvement of bus services as means of mass transportation is an important subject.

The required number of bus berths, space that allows parking and stay of bajaj, taxi and so forth and the space for the parking area attached to the station were estimated for each station based on the result of forecasted number of passengers in the future and on the result of the survey of present situation carried out this time. The result is shown in Table 2.2.3.

When the required number of bus berths at Gambir Station, which is one of the main stations, is observed, it is necessary to secure about 13 berths in 2000 and about 19 berths in 2010 within the station plaza.

At Sawar Besar Station, which is positioned as a station of medium scale among intermediate stations, 4 berths are required in 2000 and 6 berths are required in 2010. At Cikini Station, 4 berths are required in 2000 and 6 berths are required in 2010.

Table 2.2.2 CONCEPTUAL COMPOSITION BY STATION TYPE

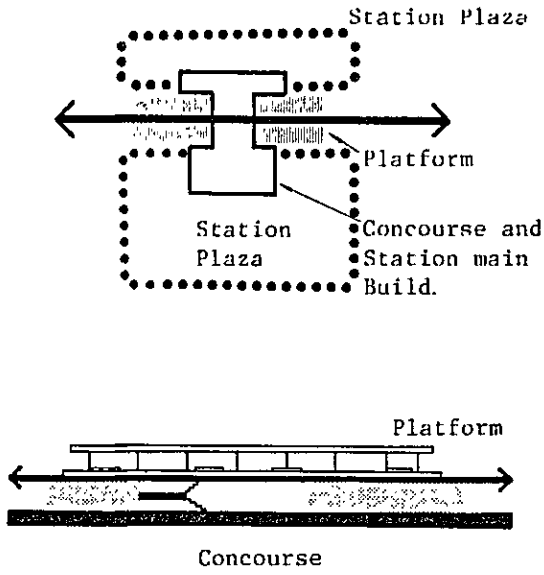
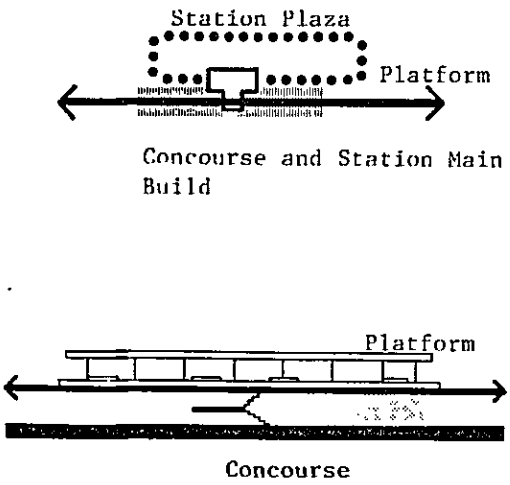
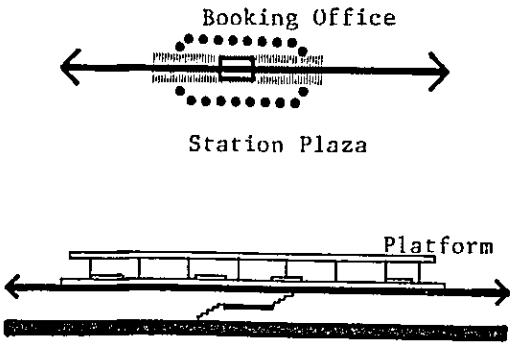
SCHEMA	CHARACTERISTICS
	Large Station • This type would be suitable for the station with a large demand of passengers. • Station Plaza consist of a bus, taxi terminal, parking space, park, etc. • Gambir Stn. will be suitable for this type.
	Medium Station • This type should be adopted for the station estimated to have fairly demand of passengers. • Station plaza consists of a bus, taxi stop and some space for parking and the area of 6,000 – 8,000 m^2 is necessary. • This type will be suitable for some main intermediate stations like Sawah Besar Stn. and Cikini Stn.
	Small Station • This type has not any large station facilities besides booking office and a little concourse. • The area of station plaza must be provided about 3,000 m^2 for the feeder service facilities and the pedestrian sapce • This type will suitable for the other intermediate stations

Table 2.2.3 ESTIMATION OF PLANNING CONDITIONS FOR STATION PLAZA

STATION \ DIVISION / YEAR		Planning Area (m^2)	No. of Bus Berth	Taxi, Bajaj, etc. Parking Space		Parking Space	
				Number of Taxi Stand	Parking Space (m^2)	(m^2)	(Vehicles)
JAYAKARTA	2000	3000	2	2	200	150	5
	2010	3,000	2	2	200	240	8
MANGGA BESAR	2000	3,000	2	2	210	330	11
	2010	3,000	3	2	310	480	16
SAWAH BESAR	2000	6,000	4	2	400	620	21
	2010	8,000	6	3	590	930	31
JUANDA	2000	3,000	2	2	200	300	10
	2010	3,000	2	2	260	420	14
GAMBIR	2000	10,000	13	10	2,640	3,810	127
	2010	15,000	19	15	3,600	5,760	192
GOMDANGDIA	2000	3,000	2	2	200	300	10
	2010	3,000	3	2	300	450	15
CIKINI	2000	6,300	4	2	420	660	22
	2010	8,000	6	3	590	930	31

(3) Conceptual Plannning of Station Plaza

Conceptional drawings indicating composition of the station plaza for Gambir Station and Sawar Besar Station are shown in Fig. 2.2.6 and Fig. 2.27 respectively.

Proposals made in these drawings are only examples, but they are what indicate the basic thoughts for examination of other planning.

On planning the physical facilities of station plaza, it is recommendable to provide "three types of feeder system" in consideration of a relation between the railway and the road traffic, i.e.; one is a so-called "Ride and Ride System", which makes a changing from train to bus or taxi easy and smooth. The second type is a so-called "Park and Ride System" that a passenger comes to the station by his car and rides on the train after parking it at the station. The last type is "Kiss and Ride System" that a passenger riding on the train is brought to the station by an individual mode but any parking space is not necessary for it.

These systems have been adopted in order to improve the feeder service system at the station in many cities all over the world.

Based on the characteristics of passengers and land use of Central Line, it is desirable that all of these three systems are achieved. Ride and Ride System must be most recommendable system at each station.

Now then, three considerations must be taken into the physical planning for the station plaza to develop the above systems.

One is that the size of bus terminal, which is one of the most significant equipment, must be planned to meet the future passenger demand at the morning peak.

Another is that the line of flow of each mode such as bus, taxi and ordinary car must be isolated mutually in order to avoid the traffic confusion.

The other is that the exclusive space and path of flow for pedestrians must be provided in separation from vehicles.

Concretely, the station plaza consists of the following facilities:

i) Pedestrian Plaza, Pedestrian Path
ii) Bus Terminal, Bus Pool
iii) Taxi (Bajaj) Berth, Taxi Pool
iv) Carriage Porch
v) Parking Space
vi) Park and Green
vii) Commercial Facilities for Passengers Use and Others.

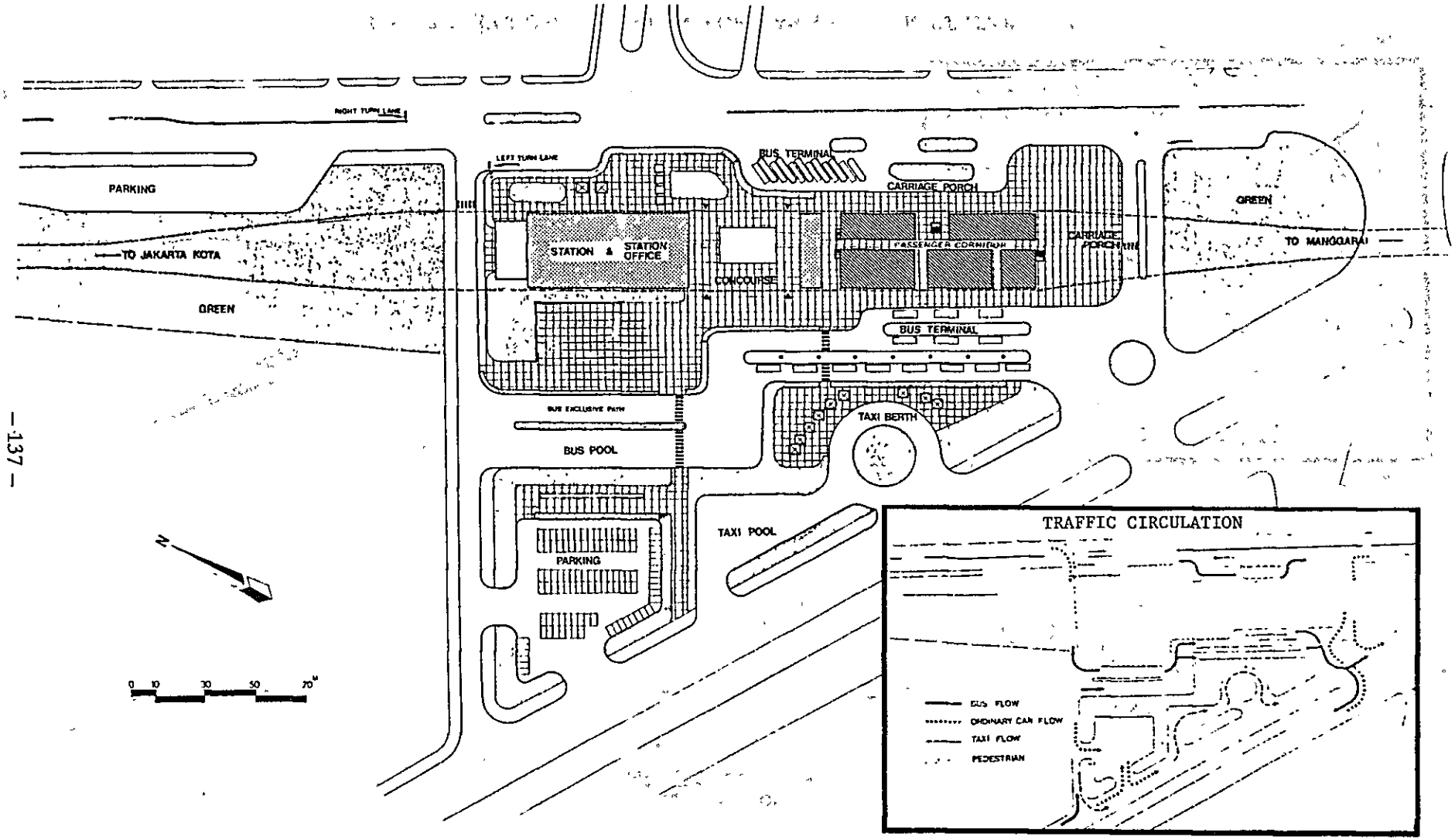


Fig. 2.2.6 CONCEPTUAL PLAN FOR GAMBIR STATION PLAZA

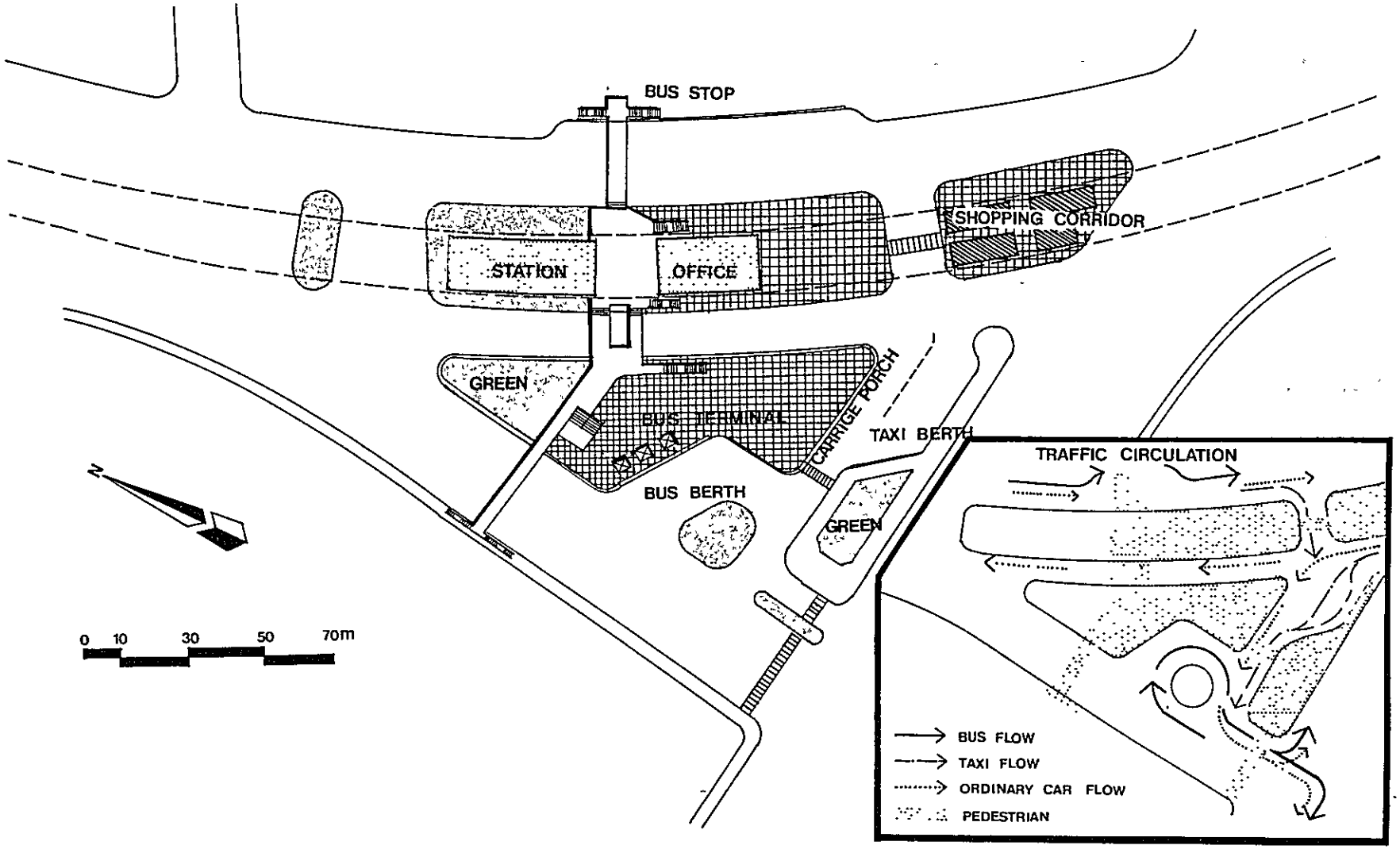


Fig. 2.2.7 CONCEPTUAL PLAN FOR SAWAH BESAR STATION PLAZA

2.3 Some Considerations from Urban Planning Aspects

2.3.1 Problems of compensation

On executing the construction of track elevation of Central Line, one of the most important factors would be that the clearance of slums which have occupied areas within the right-of-way, could be carried out without causing great social upheaval.

However the wayside between Jl. Mangga Dua and Jl. Mangga Besar is presumed to be the most difficult to perform the clearance.

Reulting from an observation survey, the number of households living within the area of the present right-of-way was counted to be approximately one thousand as shown in Table 2.3.1 and the distribution of those households to be removed is illustrated on Fig. 2.3.1.

It was learnt from the SUB-DIRECTORATE PENGELOLAAN in DIRECTORATE OF AGRARIA, DKI, which deals with adminstrative management related with real-estate properties, that the problems of compensative for forciable removal or clearance of house is a complicated matter and each case would differ in estimation purpose and would need to be dealt with individually. Therefore only a rough estimate of the compensation for these households has been possible and it shows that approximately over Rp. 60,000 per household at 1981 price would be necessary for the compensation of removing, excluding the evaluated amount of their real estate.

Additionally, some difficulty in removing all households by compensation alone was foreseen and it is recommended to provide some substitutive housing land for some of the households in order to ease this exercise.

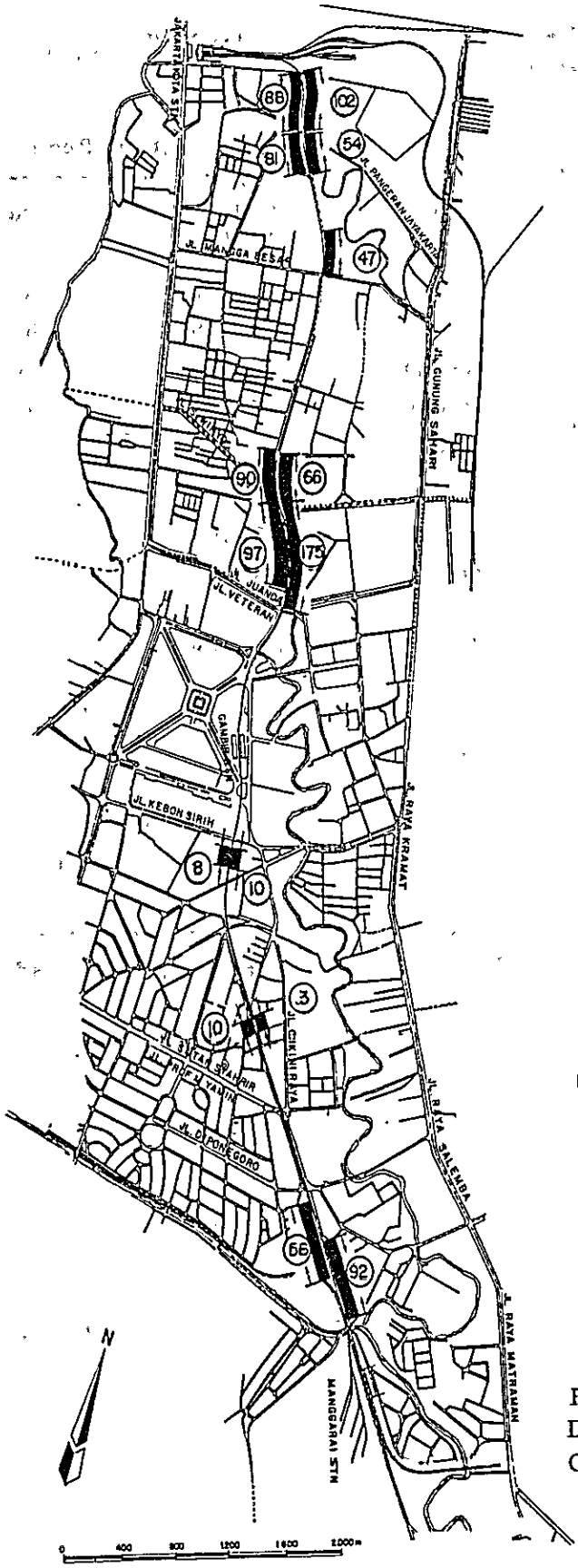
The area of substitutive land would be estimated to be about 7 hectares based on the hypotheses that half of the households would request housing land as substitution, and the density of population of the area to be provided would be 400 persons per hectare which is the standard adopted in the Kampung Improvement Programme.

Next, concerning the building and business compensation to be required accompanying with the land acquisition for the expansion of the right-of-way, Table 2.3.2 indicates the result of estimation of unit price, calculated based on the materials provided by AGRARIA.

Table 2.3.1 Supposed Number of Households Occupied within Right-of-way of Central Line

	Distribution	East Side	West Side	Total	Compensation Cost (x million Rupiah)
1	Jl. Mangga Dua Jl. Mangga Besar	203	169	372	22.3
2	Jl. Mangga Besar Jl. Sukarjo Wirjo-Pranoto (Sawah Besar Stn.)	66	90	156	9.4
3	Jl. Sukarjo Wirjo-Pranoto (Sawah Besar Stn.) Gambir Stn.	175	97	272	16.3
	Sub total				48.0
4	Gambir Stn. Gondangdia Stn.	10	8	18	1.1
5	Gambir Stn. Cikini Stn.	3	10	13	0.8
6	Cikini Stn. Manggarai Stn.	92	56	148	8.9
	Sub total				10.8
	Total	549	430	979	58.8

*Above data are based on the observation survey from outside.



NOTE :
THE FIGURE IN CIRCLE MEANS THE COUNTED NUMBER OF HOUSEHOLDS OCCUPIEDS WITHIN THE RIGHT-OF-WAY OF CENTRAL LINE

Fig. 2.3.1
DISTRIBUTION OF HOUSEHOLDS OCCUPIED WITHIN RIGHT-OF-WAY

Table 2.3.2 Estimated Unit Compensation Cost per Square Meters of Land Property

(Unit: Rupiah/m^2)

Landuse	Commercial & Business Area	Factory & Warehouse	Residential Area
A Building Compensation	21,600 (27,000)	13,000 (21,600)	16,000 (22,900)
B Other Equipment Comp.	43,300 (5,400)	2,600 (4,300)	3,200 (4,600)
C Business Compensation	9,500 (11,900)	5,000 (9,100)	–
Total	35,400 (44,300)	21,100 (35,000)	19,200 (27,500)

Notes:
1. The Figures in parentheses indicate the unit cost per one square meter of building area.
2. Other Equipment Compensation Cost was estimated to be about 20% of the Building Compensation Cost.
3. "Business Compensation Cost" was evaluated to be 50% and 10% of the building area price with license and without license respectively. And the composition ratio of with license to without license was assumed to be 4 to 1.
4. The above cost was estimated based on the cost at 1980 price presented by AGRARIA, and was changed into the 1981 price at the inflation rate of 8%.

2.3.2 Environmental problems

There are some environmental problems related to the track elevation to be considered from an urban planning aspect.

One of the major concerns is that noise pollution might be increased by the realization of track elevation. Basically the attitude of preserving environmental conditions should be maintained.

From land use point of view, the areas to be preserved especially are;

1) Exclusive residential area
2) Educational or medical facilities area
3) Vicinity of mosques or churches

The distribution of the areas to be taken into account from an environmental preservation viewpoint is shown on Fig. 2.3.2.

Generally the volume of noise caused by the track elevation depends on the kind of structure and facilities for sound proofing. Therefore most of such pollution will be able to be solved by engineering measures, and at the same time consideration must be given to allocation of an effective buffer zone along the wayside area in order to preserve the environment on land use planning.

2.3.3 Foreseeable impact on land use

(1) General

It can be forecasted that the railway will apply a large impact on utilization of land in the vicinity of railway stations when the railway fulfills a principal role in the urban transportation system.

In general, the forming capacity of town area in the vicinity of a terminal station is related to the number of passengers. Accordingly, the degree of impact over utilization of the land in the vicinity of a railway stations is higher when the number of passengers is larger.

When the scale of a terminal station increases (by increase of number of passengers), direct impact over land utilization appears as expansion of commercial and business floor and increase of integration degree of land use in the commer cial and business area. This can be observed as a change to the regional economic activities caused by the fact that passengers of the terminal station are linked with an important market force for establishment of commercial function. At the same time, the increase of land evaluation value will result to induce capital investment to gain the higher productivity. Concretely, retail stores and business offices will increase in number, and such an economic change will cause increase of the volume of gathering and scattering of the people. Accordingly, the quality of the town area will be gradually elevated.

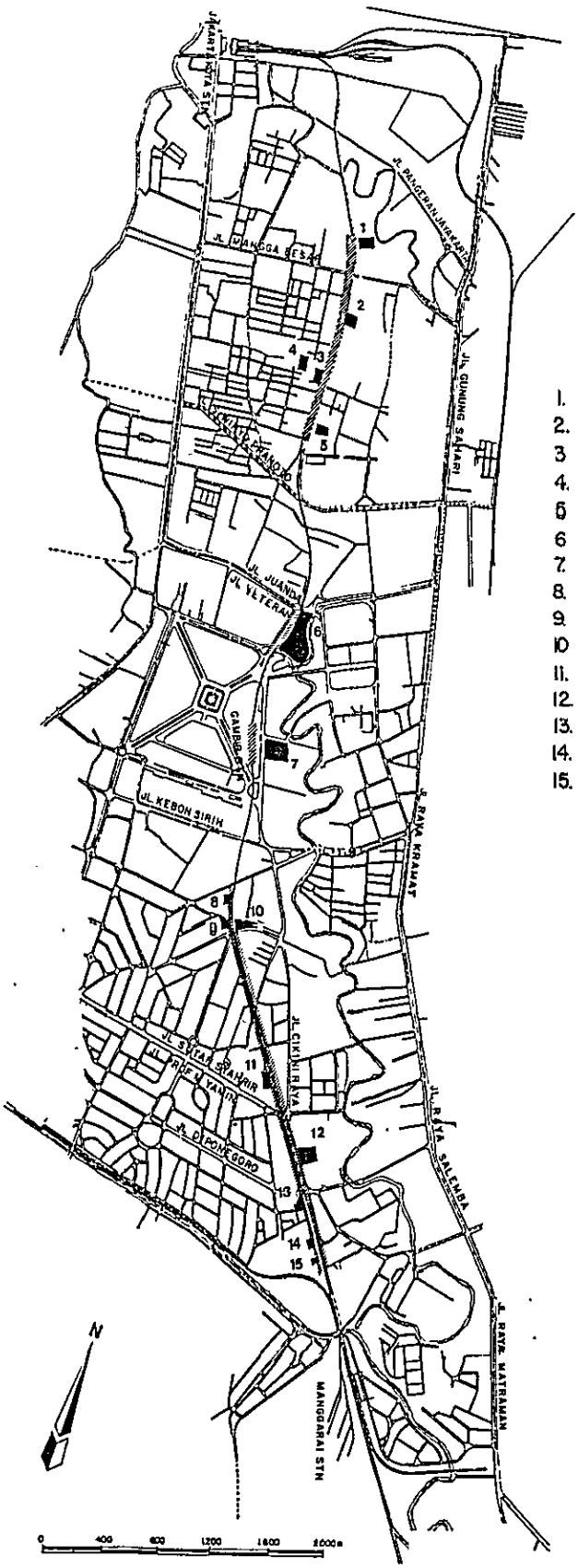


Fig. 2.3.2 DISTRICTS TO BE CONSIDERED ON ENVIRONMENTAL PROBLEMS

Judging from the cases in other advanced nations, it is said that the range impacted by the terminal directly is of about 500 m radius or 5 – 6 minutes on foot, although it varies by the scale of the terminal station.

It is ordinarily considered that integration of commercial facilities in the vicinity of the station is formed by the sum of the commercial power supported by the resident population in this range and the commercial integration supported by the purchasing power of passengers who make use of the station.

It was recognized a a result gained from the regional economic studies based on the samples of Japanese cities that the commerce integration volume supported by the resident population gets higher in proportionl to the increase of population, and that the commerce integration volume supported by the purchasing power of passengers increases with multiplier effect (It is conceptionally shown in Fig. 2.3.3).

Therefore, it can be evaluated that the impact over land use by consolidation of railway stations and increase of number of passengers is very large and important.

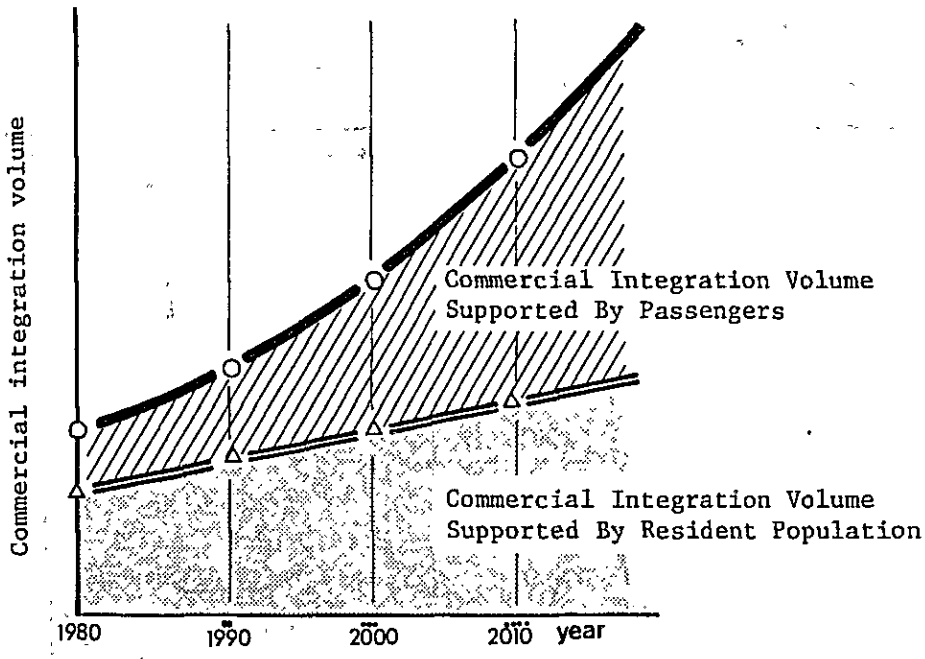
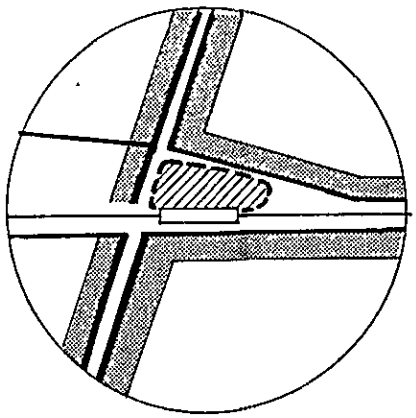
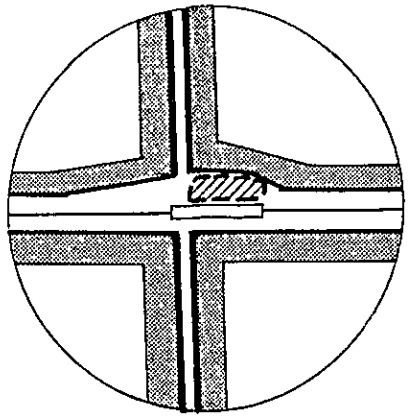


Fig. 2.3.3 IMPACT OVER COMMERCE INTEGRATION VOLUME IN THE VICINITY OF A RAILWAY STATION ACCOMPANYING CONSOLIDATION OF RAILWAY

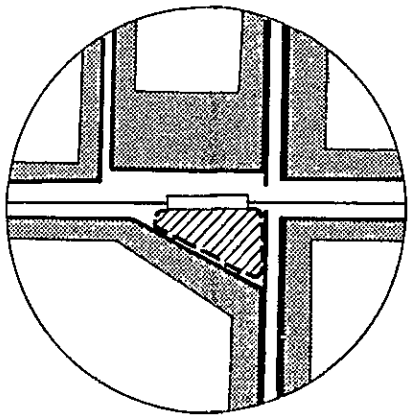
JAYAKARTA STATION



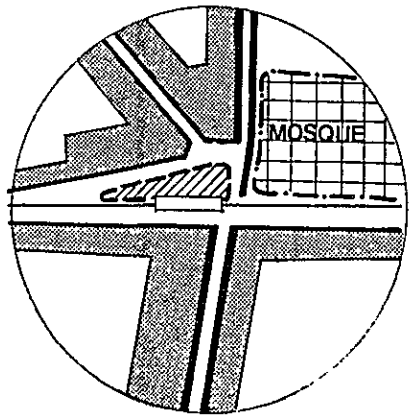
MANGGA BESAR STATION



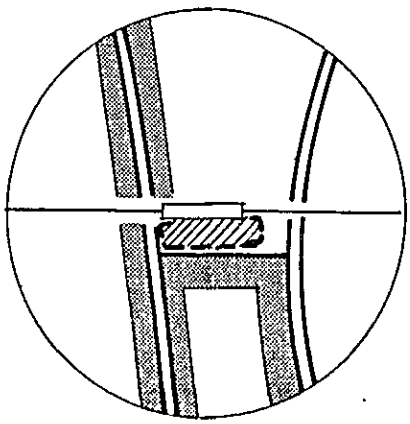
SAWAH BESAR STATION



JUANDA STATION



GONDANGDIA STATION



CIKINI STATION

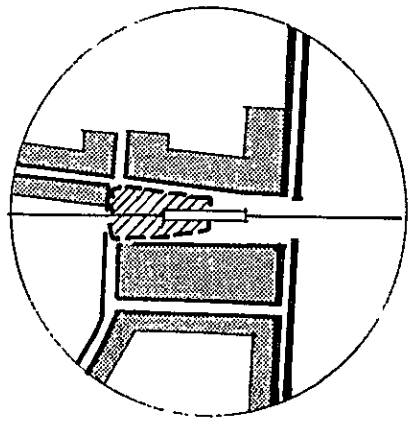


Fig. 2.3.4 FUTURE FORMATION PATTERN OF COMMERCIAL DISTRICT

(2) Impact Created by Track Elevation Project

The quality of impact caused by progress of the railway was already described. It is considered that track elevation project further will exert an impact of a different aspect.

That is, the track elevation project will give a positive outlook for commercial business to the investers because of the facts that a fairly certain prospect for increase of railway passengers is obtained and that the passengers lead to an important market force, and will give a large incentive to them. Accordingly, it can be considered that the effect to induce prior investment for at least five years shead of time compared to the case without track elevation will be created.

From a viewpoint of urban configuration, it means acceleration of the increase ratio of effective land utilization.

In accordance with the thought described above it is possible to estimate the impact created by the track elevation project as substituted by the value of floor space of commercial buildings. The data used for estimation are the present situation of land use classified by application, which was made clear as a result of present situation survey, the estimated future population classified by zone, the estimated number of passengers classified by station and some indexes of building ratio, floor space ratio, etc. obtained as a result of field survey. As a conclusion, commercial building floor space will be produced as the impact volume created by the track elevation project by about 53,000 m^2 in 1990, about 58,000 m^2 in 2000 and about 61,000 m^2 in 2010 as shown in Table 2.3.3.

Table 2.3.3 Impact Volume over Floor Space of Commercial Buildings brought by Track Elevation Project

	Year	1190	2000	2010
	Total	53,380 m^2 (100%)	57,720 m^2 (100%)	60,930 m^2 (100%)
1	Utilized floor under track	24,700 (46.3)	24,700 (42.2)	24,700 (40.5)
2	Area contributing to high-degree land utilization for commercial use	20,670 (38.7)	24,360 (42.2)	27,090 (44.5)
3	Area changing from residential land use	5,340 (10)	5,770 (10)	6,090 (10)
4	Area changing from distribution and industrial use	2,670 (5)	2,890 (5)	3,050 (5)

Notes: 1. The estimated values indicated in this table corespond only to the floor spaces which will be newly created as an impact of the track elevation project.

It is assumed that the present floor land ratio of 100% (estimated) in the commercial land area in the vicinity of stations will increase to about 180%, which is equivalent to 1.8 times of the value of the present time by 2010 as a result of increase of effective land utilization, and at the same time, it is assumed that the commercial area will be expanded by approximately 15% of the present area.
It is general that expansion of commercial area is made by converting land from other present application of low land cost bearing power, and it is considered that conversion from residential land, warehouse land, factory land and so forth to commercial land will occur.
As is apparent from the result of this estimation that the impact of the track elevation project against utilization of commercial land is very large. However, it is essential that the regional foundation that permits acceptance of such development is thoroughly consolidated in order to allow this impact to effectively function for development of the town area and to be actualized in adesirable urban formation.
In this sense, planned development and consolidation of the peripheral areas including station front areas is earnestly desired.

2.3.4. Urban planning regulations to be considered

Some regulations should be prepared so that the railway traffic system can be established as one of the principle urban transporation systems and increase the passengers in number by promoting the convenience of utilizing the railway.

The following are examples of items which should be covered by these regulations:

1) Any kind of land utilization for private benefit in the right-of-way should be restricted.
2) Concerning the land utilization under the track, construction, maintenance and management of the planned facilities should be performed by a public body.
3) Comprehensive development planning for the station fronts and the vicinity of stations should be prepared as soon as possible, and that planning should be authorized in a urban planning regulation by the relevant government.
It would be desirable that the regulation includes the following:
   i) Definition of the area to be developed
   ii) Restriction of building construction with permanent structures within the defined area until the execution of development.
   iii) Prohibit the transaction of real-estate properties within the defined area, except for cases where the land owner intends to sell to a public body.

In order to comprehensively embrace the above matters, it would be recommendable to organize a coordination board consisting of representatives from the municipality of DKI Jakarta, PJKA and the related departments of Central Government.
The board should discuss the appropriate ways to develop the urban transportation system and make the comprehensive development planning of station areas.
Also early consideration must be given to promote the feeder service taking into account of the renewal of the bus service network.

CHAPTER 3. TRAIN OPERATION

CHAPTER 3 TRAIN OPERATION

3.1 Present Situation

The present situation of train operation of the Central Line (number of trains classified by section in all day based on the diagram revised on May 21, 1981) is as follows.

(1) Electric railcar train

Table 3.1.1 Number of Electric Railcar Train (all day)

Operating Section	Operating Direction	
	To Jakarta	To Bogor
Jakarta – Bogor	16	16
Jakarta – Depok	2	–
Gambir – Bogor	1	1
Jakarta – Manggarai	2	4
Manggarai – Depok	–	2
Manggarai – Bogor	–	1

(2) Diesel railcar train

Table 3.1.2 Number of Diesel Railcar Train (all day)

Operating Section	Operating Direction	
	To Jakarta	To Bogor
Jakarta – Bogor	–	1
Jakarta – Sukabumi	1	1
Gambir – Sukabumi	1	–
Manggarai – Sukabumi	–	1
Manggarai – Depok	–	1
Jakarta – Depok	1	–
Manggarai – Bogor	1	–

(3) Market train (Type BB303 locomotive hauled passenger car train)

Table 3.1.3 Number of Market Train (all day)

Operating Section	Operating Direction	
	To Manggarai	To Bogor
Manggarai – Bogor	3	3

(4) Long distance train

Table 3.1.4 Number of Long Distance Train (all day)

Operating Section	Operating Direction	
	To Jakarta	To Manggarai
Jakarta – Manggarai	6	6
Gambir – Manggarai	6	6

(5) Freight train

Table 3.1.5 Number of Freight Train (all day)

Operating Section	Operating Direction	
	To Jakarta	To Manggarai
Jakarta – Manggarai	–	–
Manggarai – Bogor	2	2

Five electric railcar trains arriving in Jakarta station are operated during the rush hours of two hours beginning at 6 o'clock and terminating at 8 o'clock in the morning. One out of them is of 8-railcar. Although the majority of electric railcar trains are of 4-railcar, three 8-railcar trains have been operated per day since May of 1981.

No freight trains are operated between Jakarta and Manggarai of the Central Line.

3.2 Train Operation during Construction Period

3.2.1 Basic conditions for proposal of alternatives

(1) Preconditions regarding facility

The preconditions regarding facility were considered as follows for examination of train operation during the construction period classified by alternatives of track elevation work.

1) Master plan projects

It was assumed that construction works of projects of the Master Plan related to train operation during the track elevation work are executed in the following investment schedule.

Table 3.2.1 Master Plan Investment Schedule

No.	Project Items	1982	83	84	85	86	87	88	89	90	91
1 – 8	Rehabilitation Program			←	—	→					
10	Grade Separated Crossing in Manggarai Station							←	—	—	→
11	Track Addition (Manggarai – Depok)			←	—	—	→				
12	Track Addition (Depok – Bogor)						←	—	—	→	
14	Installation of Automatic Signal of Eastern Line							←	→		
15	Improvement of Station Facilities at Kampung Bandan							←	→		
16	Installation of Automatic Signal and Station Facility Improvement of Western Line							←	→		
17	Installation of Automatic Signal and Station Facility Improvement between Kampung Bandan and Tanjungpriuk							←	→		
19	Electrification of Bekasi Line				←	—	→				
20	Track Addition and Other Improvement on Merak Line						←	—	—	→	
21	Track Addition and Other Improvement on Tangerang Line							←	—	—	→
Electrification on Western Line (Intermediate Program)		—	→								

The numbers indicated in Table 3.2.1 are project item numbers of the Master Plan. Electrification of the Western Line is planned in the Intermediate Program and is scheduled to be completed by the end of 1983.

2) Construction time schedule classified by alternative

The time of commencement of construction work was assumed as 1985 for draw-up of the train operation schedule.

The construction time schedule classified by alternative is as shown in the following table.

Table 3.2.2 Construction Time Schedule

Alternative \ Year		1985	1986	1987	1988	1989	1990	1991
Alternative A Partial suspension train operation	Bridge structure for elevated tracks (Jak – Gmr)	Apr. '85 ←			Completion toward end of Jan. '89 →			
	Bridge structure for elevated tracks (Gmr – Mri)					Completion toward end of Apr. '91 →		
	8-railcar operating facility	Oct. '85 ←	Completion toward end of Mar. '88 →					
Alternative B Single track operation	Bridge structure for elevated tracks	Completion toward end of Jul. '89 →						
	8-railcar operating facility	Completion toward end of Sept. '87 →						
Alternative C Double track operation	Bridge structure for elevated tracks		Completion toward end of Jul. '89 →					
	8-railcar operating facility	Oct. '85 ←	Completion toward end of Mar. '88 →					

For Alternative A, it was planned to execute construction work with the section between Jakarta and Manggarai divided in two sectors and to execute the work first in the sector between Jakarta and Gambir. Eight-railcar operating facility means the work to increase the capacity of substations for permitting operation of electric 8-railcar trains along the Central Line, Western Line and Eastern Line. This work is required for allowing detour of trains of the Central Line to the Western Line or Eastern Line during the construction period.

(2) Train running time and operation headway

The train operation time classified by line and section were assumed as follows. The maximum running speed was assumed as 40 km/h and the blocking time was assumed as 2 minutes.

Table 3.2.3 Train Running Time of Central Line (during track elevation work)

Station Name	Blocking Station	Kilometrage (km)	Distance between Stations (km)	Running Time		Stopping Time (min)	Operation Headway	
				Down	Up		Down	Up
Jakarta	o	0.136				–		
			3.700	7'00"	7'00"		9'	9'
Sawah Besar	o	3.836				2'		
			1.704	3'30"	3'30"		5'30"	5'30"
Gambir	o	5.540				2'		
			1.156	2'30"	2'30"		4'30"	4'30"
Gondangdia	o	6.696				2'		
			1.337	2'30"	2'30"		6'30"	6'30"
Cikini	x	8.033				1'		
			0.554	1'00"	1'00"			
Pegangsaan	o	8.587				2'		
			1.303	4'00"	4'00"		6'00"	6'00"
Manggarai	o	9.890				–		

Table 3.2.4 Train Running Time of Eastern Line (during track elevation work)

Station Name	Blocking Station	Kilometrage (km)	Distance between Stations (km)	Running Time		Stopping Time (min)	Operation Headway	
				Down	Up		Down	Up
Jakarta	o	–0.739				–		
			3.518	7'00"	7'00"		9'00"	9'00"
Rajawali	o (Newly establish-ed)	2.779				2'		
			1.930	4'00"	4'00"		6'00"	6'00"
Kemayoran	o	4.709				2'		
			1.436	3'30"	3'30"		5'30"	5'30"
Pasarsenen	o	6.145				2'		
			1.568	3'00"	3'00"		8'00"	8'00"
Gangsentiang	x	7.713				1'		
			0.972	2'00"	2'00"			
Kramat	o	8.685				2'		
			1.829	3'30"	3'30"		9'00"	9'00"
Pandokjati	x	10.514				1'		
			1.236	2'30"	2'30"			
Jatinegara	o	11.750				–		

Table 3.2.5 Train Running Time of Western Line (during track elevation work)

Station Name	Blocking Station	Kilometrage (km)	Distance between Stations (km)	Running Time		Stopping Time (min)	Operation Headway	
				Down	Up		Down	Up
Jakarta	o	0.000	1.364	4'00"	4'00"	–	13'00"	13'00"
Kampung Bandan	o	1.364 / 0.362				3'		
			1.986	4'00"	4'00"		12'00"	12'00"
Kota Intan	x	1.624				1'		
			2.116	5'00"	5'00"			
Angke	o	3.739 / 2.063				2'		
			1.230	4'00"	4'00"	2'	8'00"	8'00"
Duri	o	3.293						
			3.632	7'00"	7'00"		11'00"	11'00"
Tanah Abang	o	6.925 / 0.000				2'		
			1.944	5'00"	4'00"			
Karet	x	1.944				1'	10'00"	9'00"
			0.556	2'00"	2'00"			
Dukuh	o (Newly establish-ed)	2.500				2'		
			2.043	4'00"	4'00"			
Mampang	x	4.543				1'	11'00"	11'00"
			1.483	4'00"	4'00"			
Manggarai	o	6.026 / 0.010				2'		
			2.652	6'00"	6'00"		8'00"	8'00"
Jatinegara	o	2.662 / 11.750				–		

Blocking stations are indicated with o marks in the above tables. The section between Jakarta and Kemayoran of the Eastern Line and the section between Tanah Abang and Manggarai of Western Line are one block section respectively at the present time, but because section lengths are long, train running times are long. Accordingly, the track capacity of the Eastern Line and Western Line is held at a low level because of these sections. It was therefore determined to newly establish block devices at Rajawali Station of the Eastern Line and Dukuh Station of the Western Line.

For Alternative B, train operation is continued on single track, and accordingly, it was decided to newly establish train meeting facility at Sawah Besar Station and Cikini Station. The train running time and operation headway in the case of single track operation are as follows.

Table 3.2.6 Train Running Time of Central Line (Single track operation)

Station Name	Blocking Station	Train Meeting Facility	Kilometrage (km)	Distance between Stations (km)	Running Time		Stopping Time	Operation Headway	
					Down	Up		Down	Up
Jakarta	o	–	0.136	3.700	7'00"	7'00"	–	9'00"	9'00"
Sawah Besar	o	o	3.836	1.704	3'30"	3'30"	2'	5'30"	5'30"
Gambir	o	o	5.540	1.156	2'30"	2'30"	2'	7'00"	7'00"
Gondangdia	o	x	6.696	1.337	2'30"	2'30"	2'		
Cikini	o	o	8.033	0.554	1'00"	1'00"	2'	7'00"	7'00"
Pegangsaan	o	x	8.587	1.303	4'00"	4'00"	2'		
Manggarai	o	o	9.890				–		

The scheduled running time obtained classified by line and section from Tables 3.2.3 through 3.2.5 is shown in the following table. If electric trains of the Central Line are operated to Jakarta via the Western Line during the period of track elevation work, the arrival time delays by 23 minutes. The stopping time was decided as 2 minutes for a blocking station and 1 minute for a no-blocking station. The shuttling time at Kampung Bandan station was decided as 3 minutes.

Table 3.2.7 Scheduled Running Time Classified by Section

Line	Section	Scheduled Running Time	
		Down	Up
Central Line	Jakarta – Manggarai	29'30"	29'30"
	Jakarta – Gambir	12'30"	12'30"
	Gambir – Manggarai	15'00"	15'00"
Eastern Line	Jakarta – Jatinegara	35'30"	35'30"
	Jakarta – Pasarsenen	18'30"	18'30"
	Pasarsenen – Jatinegara	15'00"	15'00"
Western Line	Jakarta – Jatinegara	61'00"	60'00"
	Jakarta – Manggarai	53'00"	52'00"
	Duri – Jatinegara	36'00"	35'00"
	Tanah Abang —Jatinegara	27'00"	26'00"
	Duri – Manggarai	28'00"	27'00"
	Tanah Aban – Manggarai	19'00"	18'00"
	Manggarai – Jatinegara	6'00"	6'00"

The track capacity classified by main section is obtained from Tables 3.2.3 through 3.2.5 as shown below. The track capacity is indicated for one direction in the unit of two hours.

Table 3.2.8 Track Capacity Classified by Section (one direction, 2 hours)

Line	Section	Minimum Operation Headway (min, sec)	Track Capacity (one direction, 2 hours)
Central Line	Jakarta – Gambir	9'00"	13 trains
	Gambir – Manggarai	6'30"	18
Eastern Line	Jakarta – Pasarsenen	9'00"	13
	Pasarsenen – Jatinegara	9'00"	13
Western Line	Jakarta – Jatinegara	13'00"	9
	Jakarta – Manggarai	13'00"	9
	Duri – Jatinegara	11'00"	10
	Duri – Manggarai	11'00"	10
	Tanah Abang – Jatinegara	11'00"	10
	Tanah Abang – Manggarai	11'00"	10
	Manggarai – Jatinegara	8'00"	15

(3) Number of trains of electric and diesel railcars classified by year

The number of trains of electric or diesel railcars required for satisfying the traffic demand from the result of forecast of passenger traffic demand during peak two hour period can be obtained as shown in the following table. As the electric 8-railcar operating facility will be completed in 1987 as shown in Table 3.2.2, trains will become 8-railcar beginning in 1988 (latter half of 1987 with Alternative B). Diesel railcar trains only will be operated until 1987 along the Eastern Line.

Table 3.2.9 Number of Electric Railcar and Diesel Railcar Trains Classified by Year (peak 2 hours)

Line	Section	Train Direction	1985	86	87		88	89	90
			4 coaches	4	4	8	8	8	8
Central	Depok – Manggarai	Down	8	9	11	6	7	8	11
		Up	3	3	4	2	3	4	6
	Manggarai – Gambir	D	5	6	8	4	5	6	8
		U	2	2	3	1	2	2	3
	Gambir – Jakarta	D	3	3	4	2	2	3	4
		U	2	2	3	1	2	2	3
Eastern	Bekasi – Jatinegara	D	3	3	4	2	2	3	4
		U	2	3	3	2	2	3	4
	Jatinegara – Pasarsenen	D	3	4	5	2	3	3	5
		U	2	2	2	1	2	2	3
	Pasarsenen – Jakarta	D	2	2	3	1	2	2	3
		U	1	2	2	1	2	2	3
Western	Jatinegara – Manggarai	D	2	3	4	2	2	3	5
		U	1	2	2	1	2	2	3
	Manggarai – Tanah Abang	D	4	5	7	3	4	6	8
		U	3	4	6	3	4	5	9
	Tanah Abang – Duri	D	4	5	7	3	4	5	8
		U	3	4	5	3	3	4	7
	Duri – Kampung Bandan	D	4	6	8	4	5	7	11
		U	2	3	4	2	3	4	7

Note: (1) The above figure indicates the number of trains necessary to satisfy traffic demand during peak two hours.

(2) The maximum passenger load factor was assumed as 180% during construction period (1985 –1989) and 150% in 1990.

(3) Diesel railcars shall be operated up to the end of 1983 on the Western Line and up to the end of 1987 on the Eastern Line.

(4) Trains for Jakarta are called "down" trains and those for Manggarai or Jatinegara "up" trains.

It is necessary to operate trains of the Central Line via the Eastern Line or the Western Line during the track elevation work, but the track capacity is small with the existing block system. Consequently, planning was made with the passenger load factor assumed as 180% in order to reduce the number of trains to the minimum. Although it is desirable that electric trains are of 12-railcar, it is necessary to

increase the capacity of substations and changes to yard track layout are also required for extending effective track lengths of stations for operating trains of 12-railcar, and a huge investment value is involved. Therefore, it was decided to adopt 8-railcar.

(4) Number of long distance and deadhead trains classified by year
According to PJKA's "Ten Year Plan", the most likely passenger forecast for medium and long distance train is of a growth rate of 5.6% per annum at average. The values shown in Table 3.2.10 are obtained when the number of long distance and deadhead trains during the peak two hour period is calculated by using this growth rate.

(5) Number of trains of central line classified by year
The number of trains of the Central Line during the peak two hour period classified by year is indicated in Table 3.2.11.

As the fundamental data required for draw-up of the train operation program during the period of track elevation work were obtained as a result, train operation during the period of track elevation work classified by alternative is examined in the next section.

Table 3.2.10 Number of Long Distance and Deadhead Trains Classified by Year (peak 2 hours)

Line	Section	Kind of Train	Operating Direction	'85	'86	'87	'88	'89	'90
Central Line	Manggarai – Gambir	Long distance	Down	5	5	6	6	6	7
			Up	1	1	1	1	2	2
		Deadhead	D	2	2	2	2	2	2
			U	4	4	4	4	5	5
	Gambir – Jakarta	Long distance	D	1	1	1	1	2	2
			U	1	1	1	1	2	2
		Deadhead	D	5	5	6	6	6	7
			U	4	4	4	4	5	5
Eastern Line	Jatinegara – Pasarsenen	Long distance	D	0	0	0	0	0	0
			U	4	4	5	5	5	5
		Deadhead	D	5	6	6	6	7	7
			U	4	4	5	5	5	5
	Pasarsenen – Jakarta	Long distance	D	0	0	0	0	0	0
			U	3	3	3	3	3	4
		Deadhead	D	5	6	6	6	7	7
			U	4	4	5	5	5	5

Line	Section	Kind of Train	Operating Direction	'85	'86	'87	'88	'89	'90
Western Line	Tanah Abang – Duri	Long distance	D	2	2	2	2	2	2
			U	0	0	0	0	0	0
		Deadhead	D	2	2	2	2	2	2
			U	2	2	2	2	2	2
	Duri – Jakarta	Long distance	D	3	3	3	3	3	4
			U	2	2	2	2	2	2
		Deadhead	D	0	0	0	0	0	0
			U	2	2	2	2	2	2

Note: (1) Trains for Jakarta are called "down" trains and trains for Manggarai or Jatinegara are called "up" trains.

Table 3.2.11 Number of Trains on the Central Line by Year (peak 2 hours)

Section	Operating direction	Kind of train	1985 year	'86	'87		'88	'89	'90
					4-rail-car	8-rail-car			
Manggarai – Gambir	Down	Electric car	5	6	8	4	5	6	8
		Long distance	5	5	6	6	6	6	7
		Deadhead	2	2	2	2	2	2	2
		Sub-total	12	13	16	12	13	14	17
	Up	Electric car	2	2	3	1	2	2	3
		Long distance	1	1	1	1	1	2	2
		Deadhead	4	4	4	4	4	5	5
		Sub-total	7	7	8	6	7	9	10
Gambir – Jakarta	Down	Electric car	3	3	4	2	2	3	4
		Long distance	1	1	1	1	1	2	2
		Deadhead	5	5	6	6	6	6	7
		Sub-total	9	9	11	9	9	11	13
	Up	Electric car	2	2	3	1	2	2	3
		Long distance	1	1	1	1	1	2	2
		Deadhead	4	4	4	4	4	5	5
		Sub-total	7	7	8	6	7	9	10
Up and down total between Manggarai and Gambir			19	20	24	18	20	23	27
Up and down total between Gambir and Jakarta			16	16	19	15	16	20	23

Note: (1) Electric train is 4-railcar in 1985 and 1986 and 8-railcar in 1988–90.
For the year 1987, the numbers of 4-railcar trains and 8-railcar trains are indicated.
(2) Trains for Jakarta are called "down" trains and those for Manggarai "up" trains.

3.2.2 Alternative A: Partial suspension of train operation

The following three alternatives were examined.

1) Alternative A: Partial suspension of train operation.
The track elevation work is divided into two periods, and construction of the sector between Jakarta and Gambir is executed in the first period, and the sector between Gambir and Manggarai in the second period. Train operation in the sector in which construction work is executed is suspended, but operation is continued in another sector.

2) Alternative B: Single track operation
The track elevation work is simultaneously executed over the entire sector between Jakarta and Manggarai. A existing single track is provided, and train operation is continued by using this single track during the entire period of construction work.

3) Alternative C: Double track operation
The track elevation work is simultaneously executed over the entire sector, and existing double tracks are provided for continuing the train operation during the entire period of construction work.

Twenty percent of the urban traffic passengers for a day is concentrated to the peak two hour period in the morning, and as seen in Table 3.2.11, the number of trains for Jakarta (down trains) is larger than the number of trains for Manggarai or Jatinegara (up trains). Therefore, examination of train operation by alternative is made for down trains in the peak two hour period.

(1) Suspension of train operation between Jakarta and Gambir
Train operation between Jakarta and Gambir during the first period of the track elevation work (April, 1985 through December, 1988; 3 years and 10 months) is as follows.
Between Jakarta and Gambir: Operation of all trains is suspended.
Between Gambir and Manggarai: Operation is continued. Because of the fact that all the trains are shuttled at Gambir Station, the following measures should be taken.

1) Temporary Gambir Station
It will become impossible to use Gambir Station because of execution of track elevation work. Therefore, a temporary station is provided within the yard of Gambir Station. The scale of the temporary station is two island type platforms, four tracks and one engine run-around track. All of them have effective track lengths for accommodation of 12-railcar trains. As a result of draw-up and examination of the operation diagram, it was found that the capacity of the temporary station is sufficient for shuttling operation.

2) Inspection and cleaning of cars
The car depot for long distance trains is located in Jakarta Kota, and inspection and cleaning of cars are made at Jakarta Kota Depot. Deadheading of trains terminated at Gambir Station to Kota Depot via the Eastern Line involves problems in both train operation time and track capacity of the Eastern Line. Consequently, it was decided to carry out simple inspection such as daily inspection of cars

and minor cleaning at temporary Gambir Station.

3) Deadhead trains

It is estimated that the number of deadhead trains during the peak hour band is two in down direction and four in up direction in 1988 as shown in Table 3.2.10. As these deadhead trains are of the operation between Jakarta and Manggarai, they are changed for operation via the Eastern Line.

4) Countermeasures for passengers to Jakarta

According to the forecasts of traffic demand in the peak time zone; about 40% of passengers between Manggarai and Gambir are for Jakarta. Therefore, countermeasures such as substitute transportation by buses from Gambir Station and increased train operation of electric trains on the Western Line are required. There is an allowance in the track capacity of the Western Line in this time zone.

(2) Suspension of train operation between Gambir and Manggarai

Train operation between Gambir and Manggarai during the second period of the track elevation work (January, 1989 through end of April, 1991; 2 years, 4 months) is as follows.

Between Jakarta and Gambir: Shuttling operation of electric trains

Between Gambir and Manggarai: Suspension of operation of all trains

It is not possible to operate trains between Gambir and Manggarai in this period. Therefore, trains are operated via the Eastern Line or the Western Line. If electric trains are operated via the Eastern Line, shuttling is required at Manggarai and Jatinegara. Therefore, it was decided to operate electric trains via the Western Line and long distance trains via the Eastern Line. As the 8-railcar operating facility is completed by this time, electric trains in the JABOTABEK area are operated in 8-railcar. According to the Master Plan, automatic signaling system will be completed on the Eastern and Western Lines by the end of 1989 and the track capacity on both Line is expected to show a sharp increase from 1990; Therefore, it is in 1989 when train operation is most difficult during construction period.

1) Operation of electric trains via the Western Line

In case electric trains on the Central Line are operated via the Western Line, the track capacity and the number of trains on the Western Line in 1989 will be as shown below.

Table 3.2.12 Track Capacity and Number of Electric Trains (1989, Passenger Load Factor: 180%)

Track capacity (one direction, 2 hours)	Number of Electric Trains (peak 2 hours)			Difference
	Western Line	Central Line	Total	
9 (A)	7	8	15 (B)	△6 (A–B)

As operation of 6 electric trains will become impossible during peak 2 hours, the following measures shall be taken.

i) The number of electric trains on the Western and Central Lines shall be reduced from 15 to 11.

ii) Two Central Line electric trains coming from Depok shall be terminated at Manggarai Station.

iii) Three long distance trains on the Merak Line shall be terminated at Tanah Abang Station.

As a result, the passenger load factor will rise from 180 % to about 250 %. Substitute transportation by buses from Manggarai Station should be arranged.

2) Operation of long distance trains, etc. via the Eastern Line

In case long distance trains and deadhead trains on the Central Line are operated via the Eastern Line, the situation on the Eastern Line during peak 2 hours in 1989 will be as shown below.

Table 3.2.13 Track Capacity and Number of Trains (1989)

Track capacity (one direction)	Eastern Line				Central Line			Total	Difference
	Diesel railcar	Long distance	Dead-head	Subtotal	Long distance	Dead-head	Subtotal		
13 (A)	3	0	7	10	6	2	8	18 (B)	△5 (A−B)

As all of the trains can not be operated, 5 deadhead trains shall be operated in other time zones than peak hours, upon examination of rolling stock utilization.

3) Operation of electric trains between Jakarta and Gambir

Shuttling operation of electric trains will be made by making use of already completed elevated track section between Jakarta and Gambir. The number of passengers between Jakarta and Gambir is expected as about 9,000 persons (peak 2 hour period) in 1989; Comfortable high speed operation on elevated tracks in this section will appeal to passengers who are suffered from inconvenience because the track elevation work between Gambir and Manggarai.

Besides three alternatives described above, an alternative to execute the track elevation work with operation of trains suspended in the entire sections between Jakarta and Manggarai of the Central Line can also be considered. In this case, train operation until completion of 8-railcar operating facility, particularly in the first half of 1987, is a problem. The points of the problem can be summarized as follows.

i) It is necessary to terminate five trains out of eight electric trains (4-railcar) of the Central Line at Manggarai Station.

ii) Although it is possible to operate all of long distance trains of the Central Line via the Eastern Line, it is necessary to shift five deadhead trains of the Eastern Line and the Central Line to outside of the peak time zone.

iii) Three long distance trains of the Merak Line should be terminated at Tanah Abang.

3.2.3 Alternative B: Single track operation

(1) Necessary facility

An existing track is provided between Jakarta and Manggarai for performing single track operation. Besides, the following facility is required.

1) Temporary station at Gambir

The temporary station is of the scale described for Alternative A.

2) Establishment of new train meeting facility

Train meeting facility are newly established at Sawah Besar Station and Cikini Station for increasing the track capacity.

3) New establishment of block devices

A block device is newly established at Cikini Station.

4) New establishment of signals and so forth

Home and departure signals will be newly established at each station for performing single track operation. It is desirable that direction levers are additionally provided for increasing the safety of train operation.

(2) Maximum number of trains

The maximum number of trains which can be operated during two hour period varies by the number of up trains (trains toward Manggarai). From Table 3.2.11, two up electric trains are minumum required. If the number of up trains is assumed as two, the number of trains is as follows.

Table 3.2.14 Maximum Number of Trains for Single Track Operation (2 hours)

Direction / Section	Down Train (To Jakarta)	Up Train (To Manggarai)
Jakarta – Gambir	11	2
Gambir – Manggarai	13	2

When the number of up trains is reduced to one or zero, the number of down trains can be increased and the total number of trains on both directions also increases. It is possible to further increase the total number of trains if train meeting facility are provided at intermediate stations. However, because of the fact that train meeting facility will become unnecessary after completion of track elevation work, it was decided to newly establish them at above mentioned two stations only.

(3) Train operation

The occasions at which problems occur in the planning of train operation are the first half of 1987, that is immediately before completion of 8-railcar operating facility, and beginning of 1989, which is immediately before completion of track elevation work. Countermeasures required at each of these occasions can be summarized as follows.

1) Year 1987

The track capacities and the numbers of trains on the Central and Eastern Lines in 1987 (peak 2 hours, for Jakarta) will be as shown below.

Table 3.2.15 Track Capacity and Number of Trains by Lines (1987)

Line	Track Capacity	Number of Trains			
		EC, DC	Long Distance	Deadhead	Total
Central Line	11	8	6	2	16
Eastern Line	13	3	0	6	9
Total	24	11	6	8	25

If both Central and Eastern Lines are utilized, almost all trains can be operated even during the peak time zone. However, some long distance trains and all deadhead trains on the Central Line should be operated via the Eastern Line and one deadhead train must be operated outside the peak time zone. Passenger load factor of electric railcar and diesel railcar will become about 250%.

2) Year 1989

Table 3.2.16 Track Capacity and Number of Trains by Lines (1989)

Line	Track Capacity	Number of Trains			
		EC	Long Distance	Deadhead	Total
Central Line	11	6	6	2	14
Eastern Line	13	3	0	7	10
Total	24	9	6	9	24

If deadhead trains and some long distance trains on the Central Line are operated via the Eastern Line, all the trains can be operated. However, the passenger load factor of electric railcar will rise to about 250%.

(4) Track capacity of temporary Gambir Station

As seen in Table 3.2.14, the track capacity between Gambir and Manggarai is larger than that between Jakarta and Gambir. If it is wanted to operate trains of the maximum number along these two sections, adjustment at temporary Gambir Station is required. Waiting time of trains occur at temporary Gambir Station from these reasons. The scale of temporary Gambir Station is assumed as the same as what was described for Alternative A, and station capacity was found out to be sufficient as a result of examination based on the operation diagram.

(5) Prevention of train operation accidents

The possibility of occurrence of train operation accidents is high with single track operation compared to double track operation. Trains are operated to the limit of the track capacity during the peak time zone as described earlier, and track elevation work is going on in addition. Because of the fact that the existing block system is dependent on the attentiveness of the staff, education and training of related employees are extremely important. It is also important to consolidate regulations, manuals and so forth for operation and handling.

3.2.4 Alternative C: Double Track Operation

In the case of double track operation, 8-railcar operating facility will be completed toward the end of 1987 and electric trains of 8-railcar make-up will be used beginning in 1988, the required number of trains is less than the track capacity in every year, and there is no problem at all for planning of train operation. (see Tables 3.2.8 and 3.2.11).

3.3 Future Terminal Stations for Long Distance Trains

As selection of future terminal stations for long distance trains depend on the scale of principal station and the land space for tarcks, it should be examined on the occasion of track elevation work planning. From the fact that a railway terminal station is important from aspects of city planning, its location should be well examined not only from viewpoint of railway but also from that of city planning. The following two alternatives can be considered as future terminal stations for long distance trains.

1) Actual terminal stations shall remain unchanged; Jakarta, Gambir, Pasarsenen, Manggarai, Tanjungpriuk and Tanah Abang.
2) Terminal stations shall be integrated into peripheral stations on the urban line; Manggarai, Jatinegara and Tanah Abang.

Both alternatives have their respective merits and demerits as follows.

1) Passengers' convenience

Actual operation of long distance trains through city center is very convenient for passengers. If terminal stations are integrated into peripheral stations on the urban line, passengers will have to make a change. Large-scale facilities will be required for bus terminals, taxi stations and so forth.

2) Train operation

If operation of long distance trains originates and terminates at peripheral staions, influence of its perturbation on commuter electric train operation can be made smaller. However, for the reason of facilities, urban transport and inter-city transport can not be completely separated in actual railway in JABOTABEK area. Such complete separation must wait until completion of four-track conversion on the urban and suburban lines.

3) City planning

If terminal stations for long distance trains are integrated into peripheral stations, sub-city-centers can be easily formed by large-scale investment centering on terminal stations. This is desirable from viewpoint of city planning.

4) Facilities

Time is expected to come when four-track conversion on the urban line will be needed due to increased number of trains. If operation of long distance trains through city center is discontinued, such time for four-track conversion can be delayed.

In the light of these merits and demerits, we propose on terminals for long distance trains as follows.

1) For the time being, long distance trains shall be operated up to actual terminal stations.
2) Increased number of commuter electric trains in the near future will make it difficult to operate long distance trains during the peak time zone.
   In such a case, operation of long distance trains shall avoid peak hours or shall be terminated at Manggarai and Jatinegara Stations. In other time zones than peak hours, operation shall be done in the same manner as for above 1).
3) When the number of commuter electric trains further increases, operation of long distance trains will become difficult not only during peak hours but also in other time zones. On such occasion, double tracks for long distance trains should be newly constructed on the Central and Eastern Lines if the State Railway wants to maintain actual terminal stations. Although, with operation of commuter electric tranis alone, time will come sonner or later when four-track conversion will be required on the Central and Eastern Lines, operation of long distance trains through city center will substantially advance the date of such conversion.
   Final decision on terminal stations for long distance trains must be made at the time when four-track conversion will become inevitable, but such occasion will be in a quite remote future.
   Selection of terminal stations is closely related with numerous factors such as future city planning, city structure, road traffic, commuter transport and long distance passenger trends. Therefore, at the present time when railway improvement in JABOTABEK area has just commenced, operation of long distance trains shall be continued in the same manner as actual and it is reasonable to make a decision on the occasion when change and trends of railway use can be tangible grasped along with the progress of railway improvements.
   As the Master Plan itself proposes a review every several years, this problem shall be examined together with it.

3.4 Elevated Track Connecting Gradient

The hauling capacity of diesel locomotives by train speed is shown in the following table for gradient 10 ‰ and 14 ‰.

Table 3.4.1 Hauling Tonnages of Diesel Locomotive

Type of Diesel Locomotive			CC 201 (1950HP)	BB 304 (1500HP)
Gradient	Kind of Train	Speed (km/hr)		
10 ‰	Passenger	70	330 t	235 t
	Fast Freight	50	510 t	400 t
	Mixed Train	45	590 t	460 t
14 ‰	Passenger	70	240 t	175 t
	Fast Freight	50	380 t	290 t
	Mixed Train	45	435 t	340 t

The number of cars and weights of long distance trains operated along the Central Line are as shown in the following table. There will be no case even in the future where freight trains are operated between Jakarta and Manggarai.

Table 3.4.2 Train Weight of Long Distance Train

Train Number	Name of Train	Operation Section	Diesel Locomotive	No. of Coaches	Train Weight (t)	Max. Gradeint
1/2	BIMA	Sgu – Jak	CC 201	9	356	14 ‰
3/4	MUT. UTARA	Jak – Sbi	BB 304	8	420	9
9/10	GBM.SELATAN	Gmr – Sgu	CC 201	11	394	14
25-30	GN JATI	Cn – Jak	BB201/ CC201	8	277	5
31-34, 36, 37	PARAHYANGAN	Bd – Jak	CC 201	7	272	16
35/38	"	Jak – Bd	CC 201	8	291	16
39/40	"	Bd – Gmr	CC 201	7	256	16
23/24	SENJA Slo	Slo – Gmr	CC 201	9	317	14

The largest train weight among long distance trains is 420 tons, and when the elevated track connecting gradient is 14 ‰, it is not possible for a BB304 type locomotive to haul this train. The hauling capacity of a CC201 type locomotive is 240 tons at the speed of 70 km/h. When the speed is reduced, however, it is capable of hauling a weight of 380 tons at 50 km/h or 435 tons at 45 km/h.

Because of the fact that CC201 type locomotives are hauling long distance trains at the steepest gradient of 14 ‰ at the present time, there is no problem for operation with elevated track connecting gradient of 14 ‰ . The hauling capacity of BB304 type locomotives, however, is weak and it is necessary to replace it with CC201 type locomotives up to Cirebon. (The east side of Cirebon of the Northern Line is of low track strength, and it is not possible to use CC201 type locomotives in this section.)

Elevated track connecting gradient would be adjusted in the case of necessity for hauling capacity, operation speed and type of diesel locomotive.

3.5 Number of Platforms at Gambir Station

3.5.1 Number of Long Distance Trains and Stopping Time

The number of long distance trains at Gambir Station is indicated below for the time zone in which many long distance trains make departures and arrivals in a form of comparison between 1981 and 1990, which is after completion of track elevation.

Table 3.5.1 Number of Long Distance Trains

Train Direction	Terminal	1981		1990	
		6–8	17–19	6–8	17–19
To Jakarta	Last station: Jakarta	1	0	2	0
	Last station: Gambir	3	1	5	2
To Manggarai	Beginning station: Jakarta	1	0	2	0
	Beginning station: Gambir	0	4	0	7

The following stopping time is required for long distance trains at Gambir Station.

Train terminating at Gambir Station ..... 3 minutes

Train originating at Gambir Station ..... 15 minutes or longer

3.5.2 Number of Platforms

The situation of use of tracks at Gambir Station in the time zones in the morning and in the evening in which number of trains making departures and arrivals from and to this station is large is shown in the following figure, The figure is drawn in the form of a pattern, assuming that the stopping time of trains which are originated at Gambir Station is 15 minutes.

There is no problem at all in the morning time zone with one platform, 2 tracks. Also in the evening time zone, there still is an allowance although the length of use of the platform is considerably long. Further allowance will be produced if the stopping time is changed to less than 15 minutes and the arrival times of deadhead trains are corrected. Therefore, two platforms with four tracks are sufficient for Gambir Station, that is, one platform with two

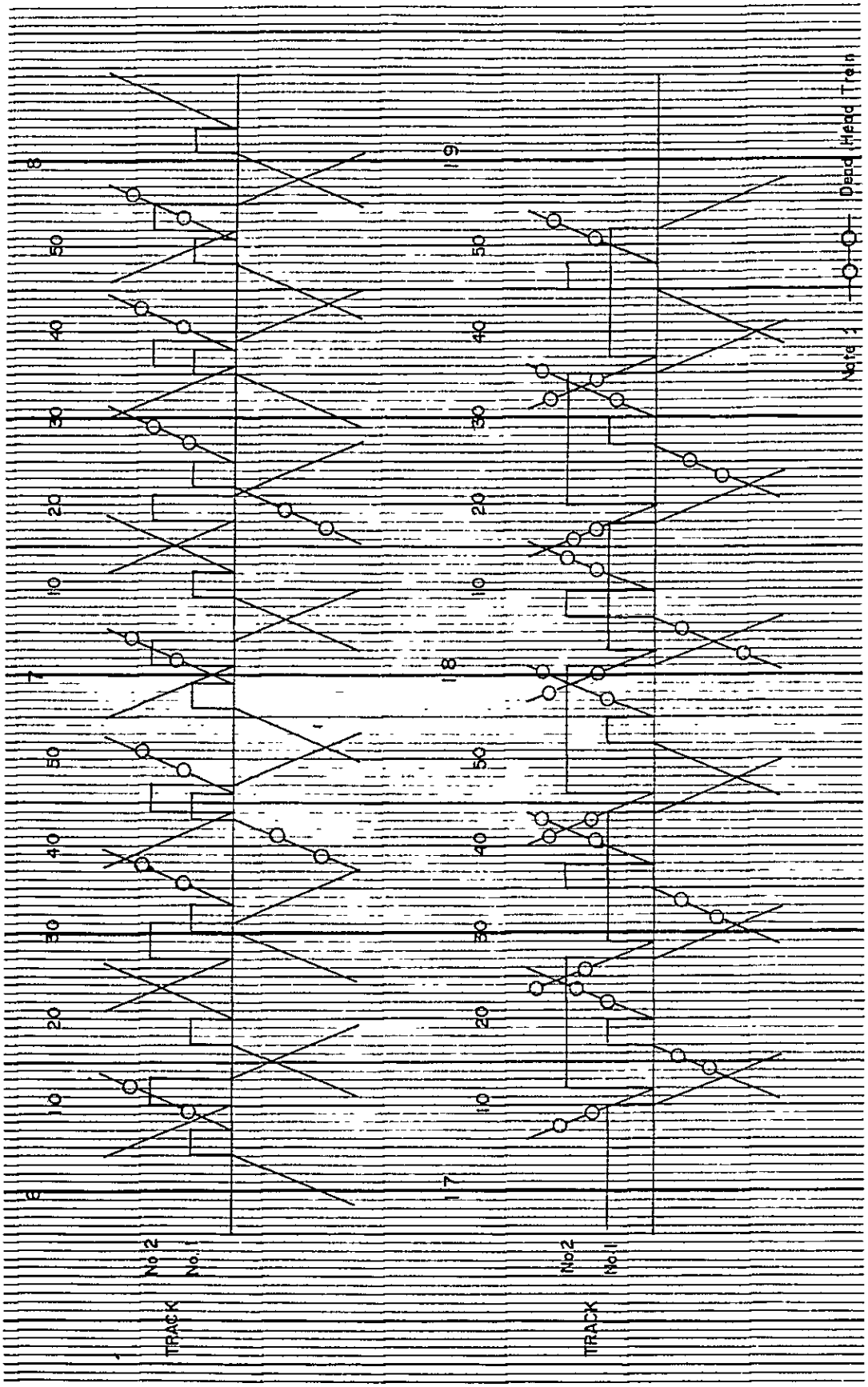


Fig. 3.5.1 Train Operation for Long Distance Train at Gambir Station (1990)

tracks for long distance trains and one platform with two tracks for electric tracks for electric trains.

Transportation in periods in which the number of passengers increases should be examined next. There are two periods in which number of passengers increases, that is, school holidays in June and after fast in August. According to records of 1981, five long distance trains including one extra train were originated from Gambir Station in the time zone of 17:00 through 19:40 on July 30, and 8,900 passengers took these five trains. Because seat reservation system is not adopted, these passengers waited on the platform for arrival of trains four to five hours prior to departures of trains for securing seats. As it is not a good policy to increase the number of platforms for periods in which the number of passengers increases, which occur only twice a year, the following three measures are proposed as countermeasures against this problem.

1) To change the originating station of some of these five trains to Jakarta. It is possible to distribute passengers to two stations as a result.
2) To shift the place where passengers wait for arrival of trains from the platform to another place, station concourse or temporary waiting room in the station-front-area, for instance. It is desirable that seat reservation system is adopted. But if it is not possible, cause passengers to form lines in accordance with guidance of station employees. When a train arrives, guide passengers to the train and cause them to board the train in accordance with the guidance of station employees. In preparation for high speed and high density transportation to be materialized in the future, it is necessary for PJKA to guide passengers to acquire the manner for boarding and alighting trains.
3) According to the time table of 1981, five trains originating from Gambir Station are concentrated to a short time zone that is less than three hours, and only one train is originated from this station outside of this time zone. Departure times may be determined with consideration of arrival times of the relevant trains, however, it is preferable to be distributed to other time zones as possible.

3.6 Train Operation after Completion of Elevated Tracks

The maximum running speed will be increased to 90 km/h after completion of elevated tracks, as all crossings are gone and tracks are strengthend. Although the elevated track gradient is 14 ‰ on the Jakarta side, electric trains have the acceleration of about 1 km/h/s even on this gradient, and it is possible to increase the speed by about 30 km/h in a gradient section of 500 m.

The running times of trains which stop at each station and fast trains are shown in the following table.

Table 3.6.1 Train Running Time of Central Line
(after Completion of Track Elevation)

Station Name	Kilo-metrage (km)	Distance between Stations (km)	Train to Stop at Each Station			Fast Train		
			Down	Up	Stopping Time	Down	Up	Stopping Time
Jakarta	0.136	1.304	3'00"	3'00"	–	6'00"	6'30"	–
Jayakarta	1.440	1.030	1'30"	1'30"	1'			–
Mangga Besar	2.470	1.220	1'30"	1'30"	1'			–
Sawah Besar	3.690	0.720	1'30"	1'30"	1'			–
Juanda	4.410	1.140	1'30"	1'30"	1'			–
Gambir	5.550	1.100	1'30"	1'30"	2'			2'
Gondangdia	6.650	1.650	2'00"	2'00"	1'	6'30"	6'00"	–
New Cikini	8.300	1.680	4'30"	4'00"	1'			–
Manggarai	9.890				–			–
Total			17'00"	16'30"	8'	12'30"	12'30"	2'
Scheduled running time between Jakarta and Manggarai			25'00"	24'30"		14'30"	14'30"	–

The number of stations increases because of opening of new stations and distance between stations will be reduced to 1.2 km at average, but as it was found out as a result of examination with operation diagrams drawn that the running speed will be 70 to 75 km/h at maximum for trains stopping at each station and 90 km/h for fast trains. The stopping time is 2 minutes only at Gambir Station and 1 minute at other stations for trains stopping at each station. Fast trains stop at Gambir Station only between Jakarta and Manggarai.

The running time for the section between Jakarta and Manggarai is compared during track elevation work (Table 3.2.7) and after completion of track elevation work in the following table.

Table 3.6.2 Compariton of Scheduled Running Time
(between Jakarta and Manggarai)
(down Train)

Operating Section	During Track Elevation Work	After Completion of Track Elevation Work	
	Train Stopping at Each Station	Train Stopping at Each Station	Fast Train
Jakarta ~ Manggarai (down train)	29'30" (A)	25'00" (B)	14'30" (C)
Difference	–	(A–B) 4'30"	(A–C) 15'00"

Although two intermediate stations are increased, the running time is reduced by 4 minutes 30 seconds with trains stopping at each stations and by 15 minutes with fast trains after completion of track elevation work. It is considered that around 5 : 5 is good as the ratio in the number of trains between fast trains and trains stopping at each station, with the numbers of passengers who get on and off at Gambir Station and the total of number of passengers who get on and off at intermediate stations taken into account. It is desirable that the stopping time is shortened to 30 seconds in the future because platforms are elevated.

CHAPTER 4. GEOLOGICAL CONDITIONS

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4.1 Topography

Jakarta is situated at the mouth of Ciliwung River. The area near the mouth of river is a delta, with a plateau of Diluvium extending in its hinterland. On both sides of the delta is a ridged beach plain.

Once the Batavia Castle stood in a place near the present Jakarta-Kota Station. Though this castle was facing the sea in 1619, this place is now located about 2.0 km inland of the coast line due to sediments of soil from Ciliwung River.

The delta is mostly a flat land with the altitude 3.8 m near the coast and about 6.5 m near the plateau. The diluvial plateau has the altitude of about 6.5 m while rising to about 10 m altitude at the southern end of survey area. In the delta area, land subsidence is observed due to drop in the underground water level.

4.2 Geology

The geological composition near Jakarta-Kota is as shown in Table 4.2.1. The geology is shown in Fig. 4.2.1.

Table 4.2.1 Geological Composition Near Jakarta Kota

Geological Period		Formation	Description
Quaternary	Holocene	Alluvium	Unsolid sediments composed principally from cohesive soil forming the delta
	Pleistocene	Diluvium	Volcanic ash forming the diluvial plateau in the south, which is lateritized to the substantial depth
Neogene	Pliocene	Genten Formation	Basement rock, alternation of thin sandstone and mudstone layers. The upper portion of this alternate layers is weathered and becomes soft.

Within the survey area, the Genten Formation is not exposed to the ground surface. The thickness of weathered zone ranges from 2 m to 2.5 m.

The volcanic ash of diluvial plateau is similar to the Kanto Loam in Japan. The fresh volcanic ash shows gray color and belongs to A-2-7 of ASSHTO soil classification and the volucanic ash lateritized into red-purple color belongs to A-7-5. Both are used as embankment material.

In the Jakarta Plain, the thickness of alluvial deposits generally ranges 15 m or less. At a point possibly of the old mouth of Ciliwung River, this thickness rises nearly to 30 m and an in-depth-survey will have to be made on this point before the commencement of construction in future.

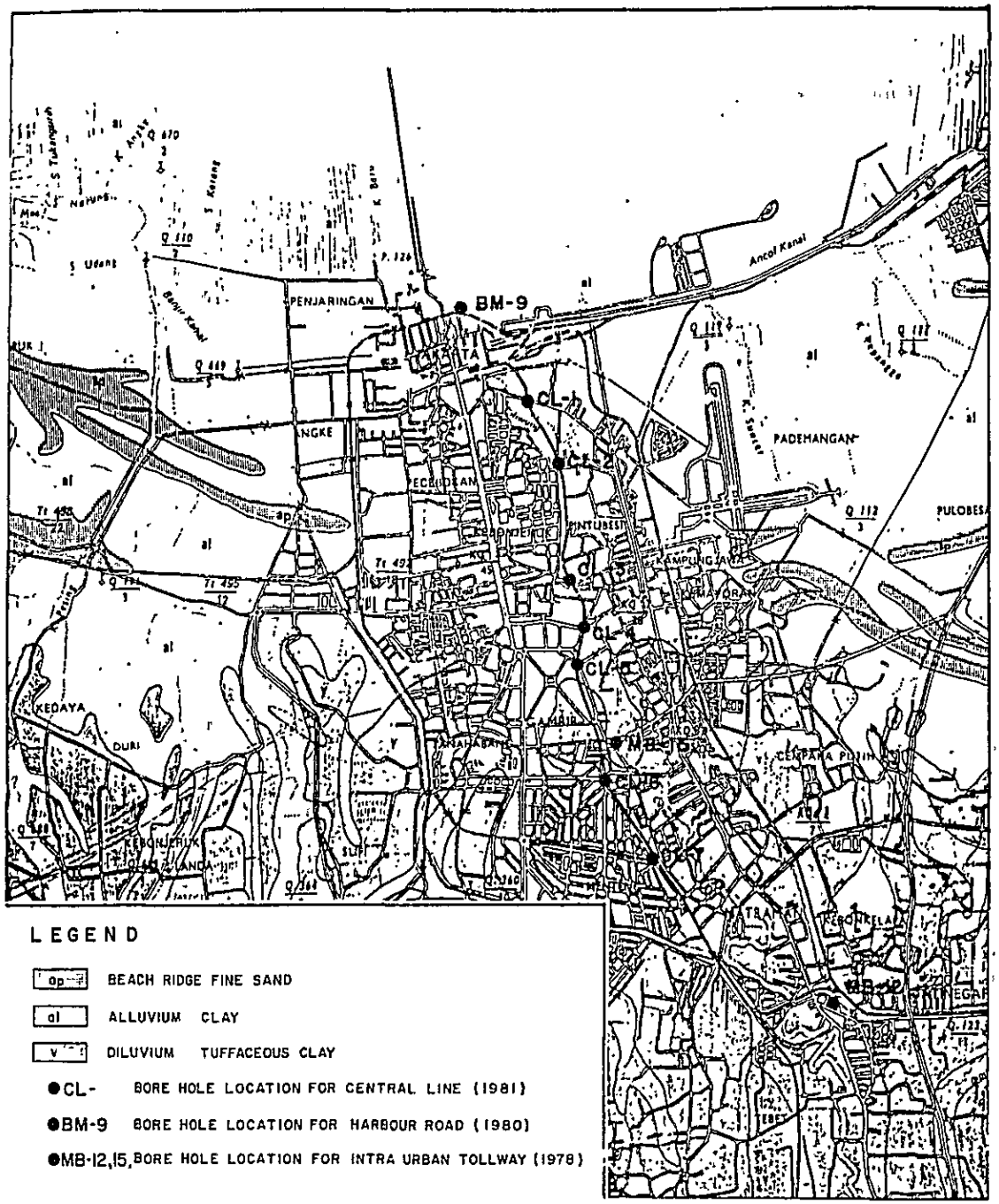

Fig. 4.2.1 Geological Map and Survey Points

4.3 Outline of Field Work

The outline of the survey of each borehole is shown in Table 4.3.1.

Table 4.3.1 Survey Result of Borehole

Borehole No.	Location	Boring Length (m)	Number of S.P.T	Depth of N-Value ≧ 50 (m)
CL – 1	Jl. Jayakarta	43.60	17	16.70
CL – 2	Jl. Mangga Besar	23.45	9	16.70
CL – 3	Jl. Sawah Besar	22.30	10	14.00
CL – 4	Jl. Juanda	23.45	12	18.00
CL – 5	Jl. Monas Utara	23.60	12	18.00
CL – 6	Jl. Cut Mutiah	40.40	16	33.75
CL – 7	Jl. Cikini	23.60	11	18.00
TOTAL:		200.40	87	

The geological profile determined from the geological survey is shown in Fig. 4.3.1. The geology of neighborhood of station 0 km is refered to the borehole BM-9 surveyed for the "Jakarta Harbour Road Feasibility Study, 1981."

As the survey result soil profiles of CL-6 and CL-7 are similar to those of MB-15 and MB-12 which are surveyed for "The Consulting Engineering Services for Jakarta Intra Urban Tollway, 1978" respectively.

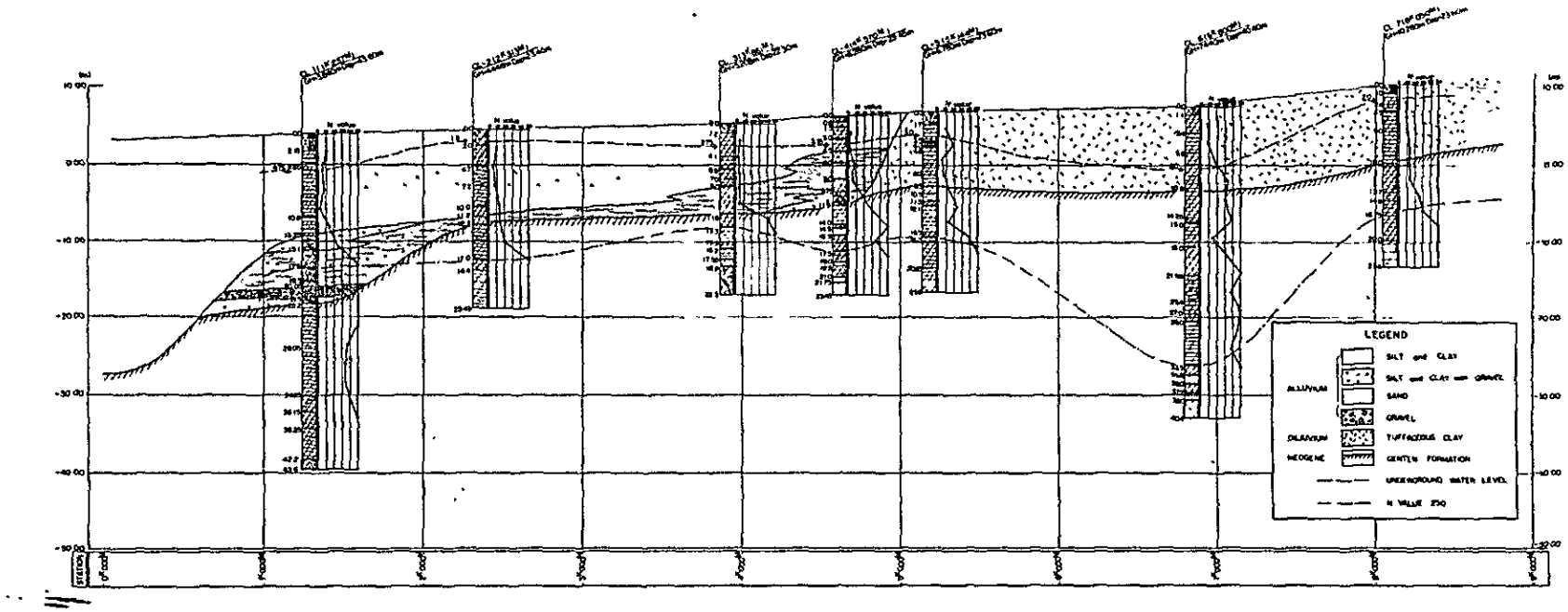

Fig. 4.3.1 Geological Profile of Central Line

4.4 Aggregates for Concrete

The main aggregate producing areas are summerized in Table 4.4.1, and their locations are shown in Fig. 4.4.1.

Table 4.4.1 Outline of Aggregate Producing Areas

	Producing Area	Occurrence	Volume of Reservation	Mining Method	Trans-portation	Producers Price Rp./m^3	Remarks
Coarse Aggregate	G. Dago	Andesite Hill	Abundant	Blast	Truck	6,500	Crushed stone of good quality Price at Tg. Priok 11,000 Rp/m^3
	S. Ciapus	Terrace-Deposits	Abundant	Man Power	Truck		Partially porous stone
	G. Sindur	Terrace-Deposits	Abundant	Man Power	Truck & Raft	Uncrushed 1,000	Partially soft stone
	G. Putri	Monadnock of Basalt	Not Abundant	Man Power	Truck	Boulder 4,200	Good quality With no crushing plant
	K. Manggu	River Deposits	Not Abundant	Man Power	Truck	Boulder 4,200 Gravel 4,000	With no crushing plant
Fine Aggregate	Krawan	River Deposits	Abundant	Man Power	Truck & Boat	2,000	Partially fine grain Price at Tg. Priok 7,000 Rp/m^3
	G. Sindur	River Deposits	Abundant	Man Power	Truck	2,000	Small content of silt
	S. Ciapus	Terrace-Deposits	Abundant	Man Power	Truck	3,000	Price of at Jakarta 800 ~ 900 Rp/m^3
	Kempalan	Old River Deposits	Not Abundant	Man Power	Truck	3,000	Coarse grain.

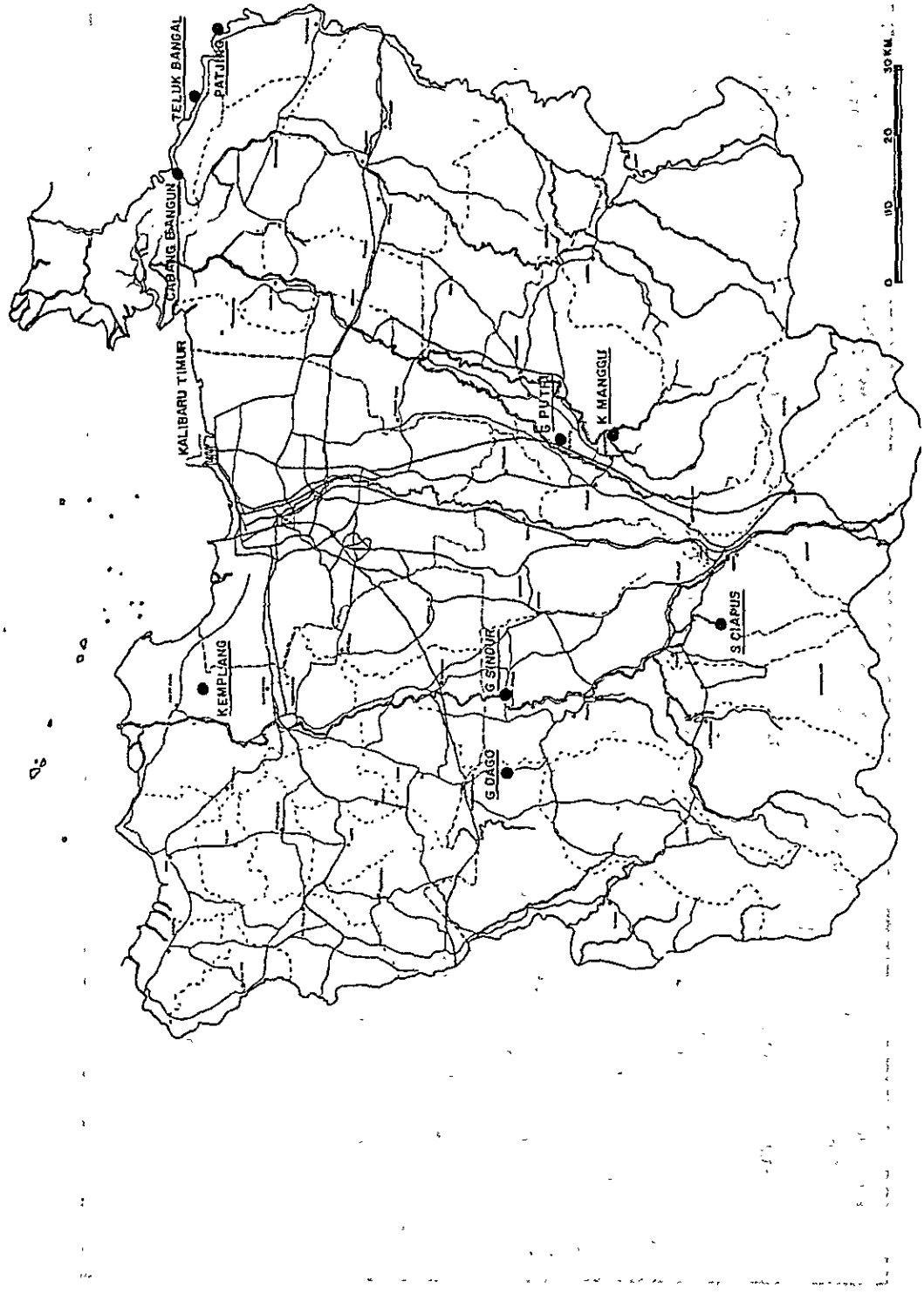

Fig. 4.4.1 Location of Quarry Sites

4.5 Embankment

In view of comparing the plan of continuous elevated railway and the alternative grade separated crossing with road, the following geological problem factors are described.

1) Original ground

The original ground is divided into alluvium and diluvium. The embankment over the diluvium will not present much problem, but particular attention should be paid to the embankment over the alluvium.

(a) Alluvium area

The section to be embanked over the alluvium indicates the following phenomena:

* Near Pluit of ISR West Line, the railway rides over the road. Though the embankment was made up to about 5 m, the height has been increased due to settlement of railway bridge abutment. Also the concrete retaining wall of embankment is damaged. The warehouse, which is on the opposite side of about a 3 m wide road, also inclines toward the railway due to the above settlement and is damaged. The affected zone may extend more than 10 m. In addition, at the grade separated crossing, the house in contact with the embankment slope end at the height from 7 to 8 m was found damaged.

As is evident from the above, the embankment in the grade separated crossing will require land arrangement with due consideration to the affected zone by settlement due to embankment. As the result of Jakarta Harbour Road Survey shows, a sand drain, etc. will have to be provided as a measure for ground after the embankment.

(b) Diluvium area

According to the Jakarta Intra-urban Tollway Survey, the on-the-spot CBR test proved that the average CBR is 5 %.

2) Embankment material

Normally the lateritized red-purple volcanic ash is used as embankment material. The soil classification proves that this volcanic ash belongs to A-7-5 (MH). The laboratory CBR test results are shown in Table 4.5.1.

Table 4.5.1 Result of Laboratory CBR Test

Natural Moisture (%)	48 ~ 57
Optimum Moisture Content (%)	30.0 ~ 36.5
Maximum Dry Density (g/cm^3)	1.32 ~ 1.35
Soaked C.B.R. (%)	6 ~ 13

Surveyed borrow pits of embankment material are shown in Fig. 4.5.1. The soils can be borrowed from any hilly fields by power shovel. The producers price is 3,000 Rp/cm^3 at Ciputat.

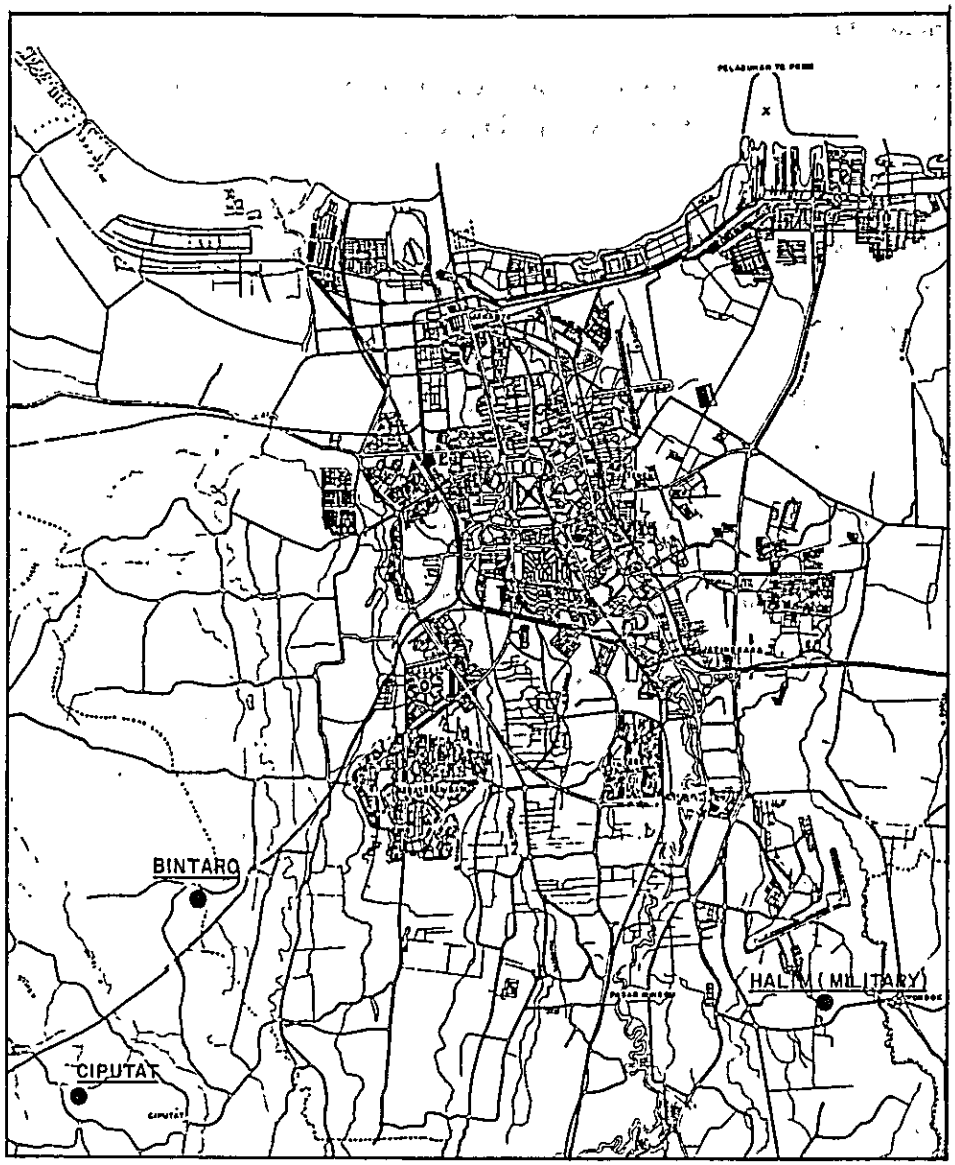

Fig. 4.5.1 Surveyed Borrow Pits of Embankment Materials