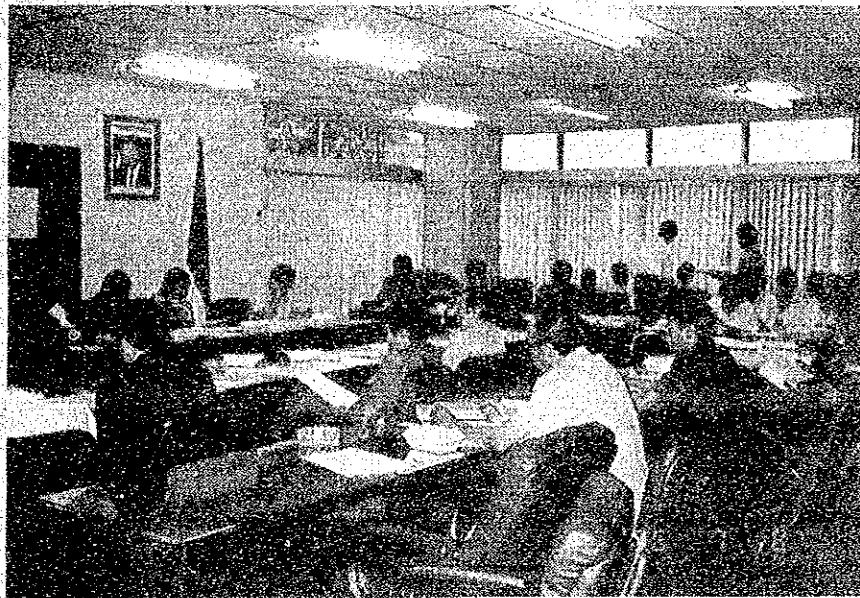
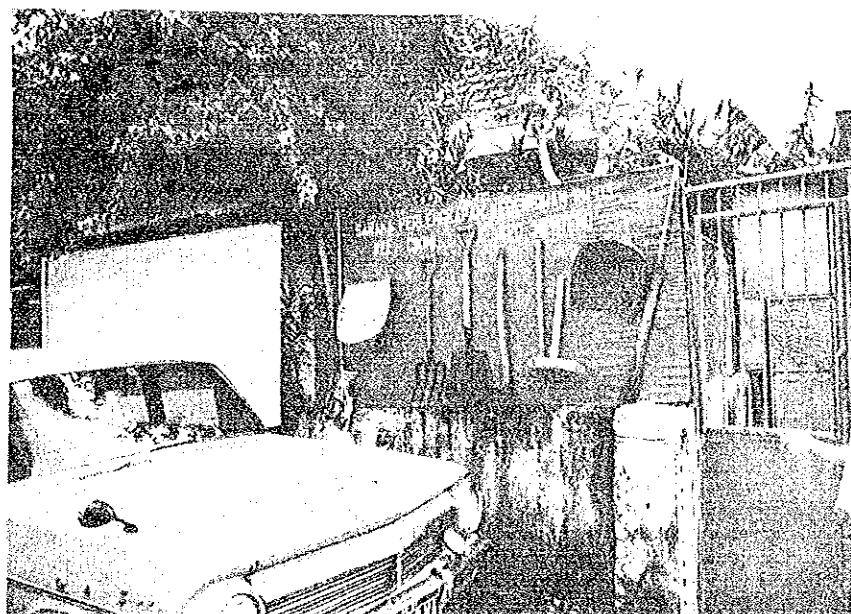


PART III PROJECT PLAN



CHAPTER 1 INTRODUCTION



CHAPTER 1 INTRODUCTION

1.1 Selection of First Priority Projects

Gradual improvements will be required for the achievement of the objectives specified in the Conceptual Master Plan by the year 2005 and it is anticipated in the Conceptual Master Plan that these objectives will be achieved through the following 3 phases.

Phase I-A : 1989-1992

-B : 1993-1995

Phase II : 1996-2000

Phase III : 2001-2005

The projects selected in Phase I -A will be first priority projects, acting as strategic projects and collectively playing the role of a trigger to achieve the highly important objectives by 2005.

Jakarta Pusat has subsequently been selected as the subject area for the implementation of these first priority projects and the success of these projects will be the key for the successful solid waste management throughout the whole of Jakarta.

The projects required for Jakarta Pusat were determined to be as follows through detailed discussions.

- ① Construction of a sanitary landfill site at Bekasi
- ② Construction of a transfer station at Sunter
- ③ Improvement of the collection system
- ④ Improvement of the street sweeping
- ⑤ Construction of a sub-workshop

The construction of the landfill site is possible since land acquisition for the Bekasi disposal site has been settled. As the sanitary landfill operation at Bekasi is considered to be indispensable from the viewpoint of environmental conservation, its construction must

PART III

be classified as a first priority project. This sanitary landfill site will mark the commencement of large-scale sanitary landfill preventing environmental pollution in Jakarta. The accumulation of technology concerning the sanitary landfill technique will be made possible through the implementation process of this project and the project will be an important pilot project for future reference.

In general, a transfer station is required to save cost of hauling waste a long distance from a collection area to a disposal site. Construction of the Sunter transfer station is also determined to be a priority project with the preparation of construction site.

The transfer station at Sunter will be constructed as an example of a representative standard transfer station for large cities in Indonesia. The construction of this type of facility will give hope for large cities in Indonesia's solid waste management in the future as well as providing a clear objective to be aimed at. In addition, it will provide a useful opportunity for people to realize the importance of solid waste management.

The construction of the sub-workshop is selected as project to be implemented in view of the importance of properly maintaining the collection equipment for improving the efficiency of waste collection. The introduction of this sub-workshop in addition to the main workshop, which is close to the collection sites and which offers middle level maintenance, will result in an awareness of the fact that this type of facility is of paramount importance for such a large city as Jakarta.

Finally, in regard to the projects aiming at the improvement of the collection system and street sweeping, these projects will not be accepted or carried out as easily as the facility projects in view of the fact that they necessarily demand the improvement of the labour conditions for the workers engaged in solid waste collection and street sweeping and, therefore, generally face difficulties in the achievement of such demands. However, the existing solid waste collection and street sweeping systems must be strictly dealt with to control the problems

PART III

associated with urban solid waste in Jakarta which has grown too large. These projects will be remembered in the future as historical attempts to solve urban solid waste problems in Jakarta.

All of the above projects must record victories in the history of Jakarta's urban solid waste management and all of those associated with these projects are expected to give of their very best in their respective areas to make them highly successful.

1.2 Solid Waste Flow Target and Project Outlines

1) Solid Waste Flow Target

The current flow of the solid waste generated in Jakarta Pusat, is shown in Fig.1-2-1, necessitating improvements at the informal disposal sites and the inadequate collection service in certain areas, etc. The previously mentioned 5 projects will be implemented by 1995 to change the current situation and to achieve the new solid waste flow shown in Fig.1-2-2. The completion of these projects is expected to form an urban solid waste management system which provides a sanitary, efficient and adequate service.

2) Project Outlines

The outlines of the planned 5 projects are given in Fig.1-2-3.

PART III

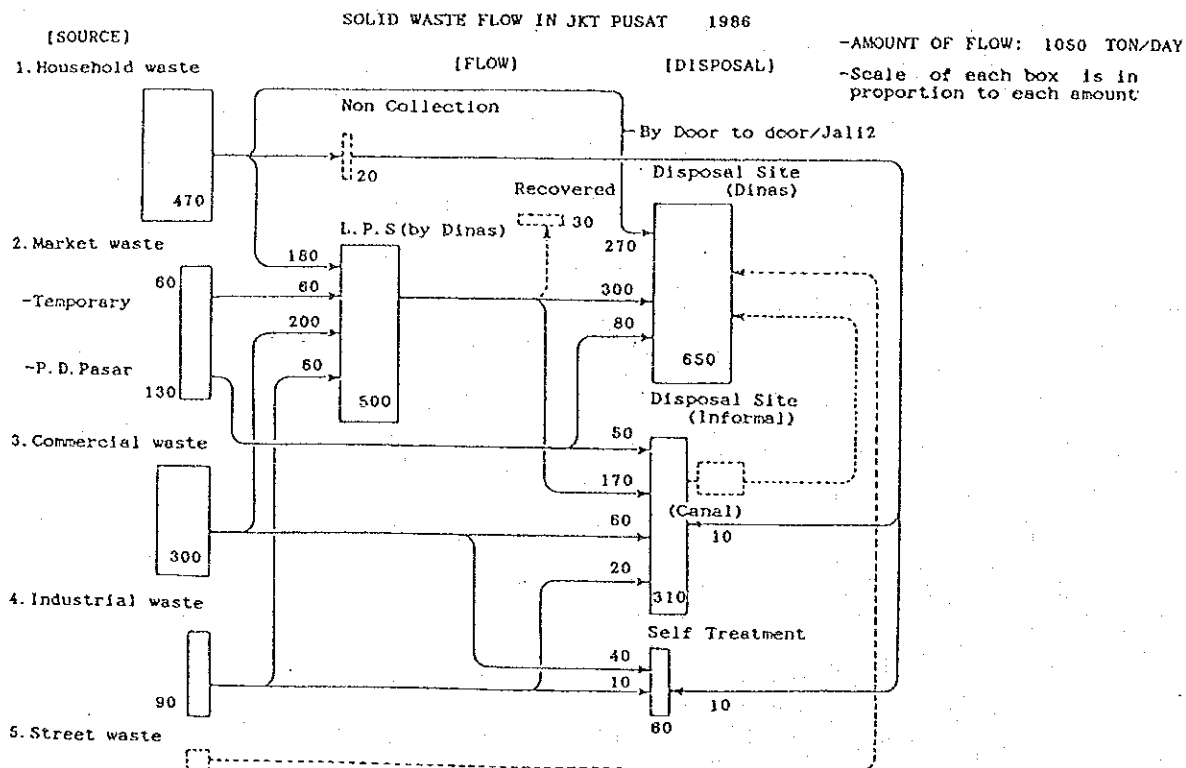


Fig. 1-2-1

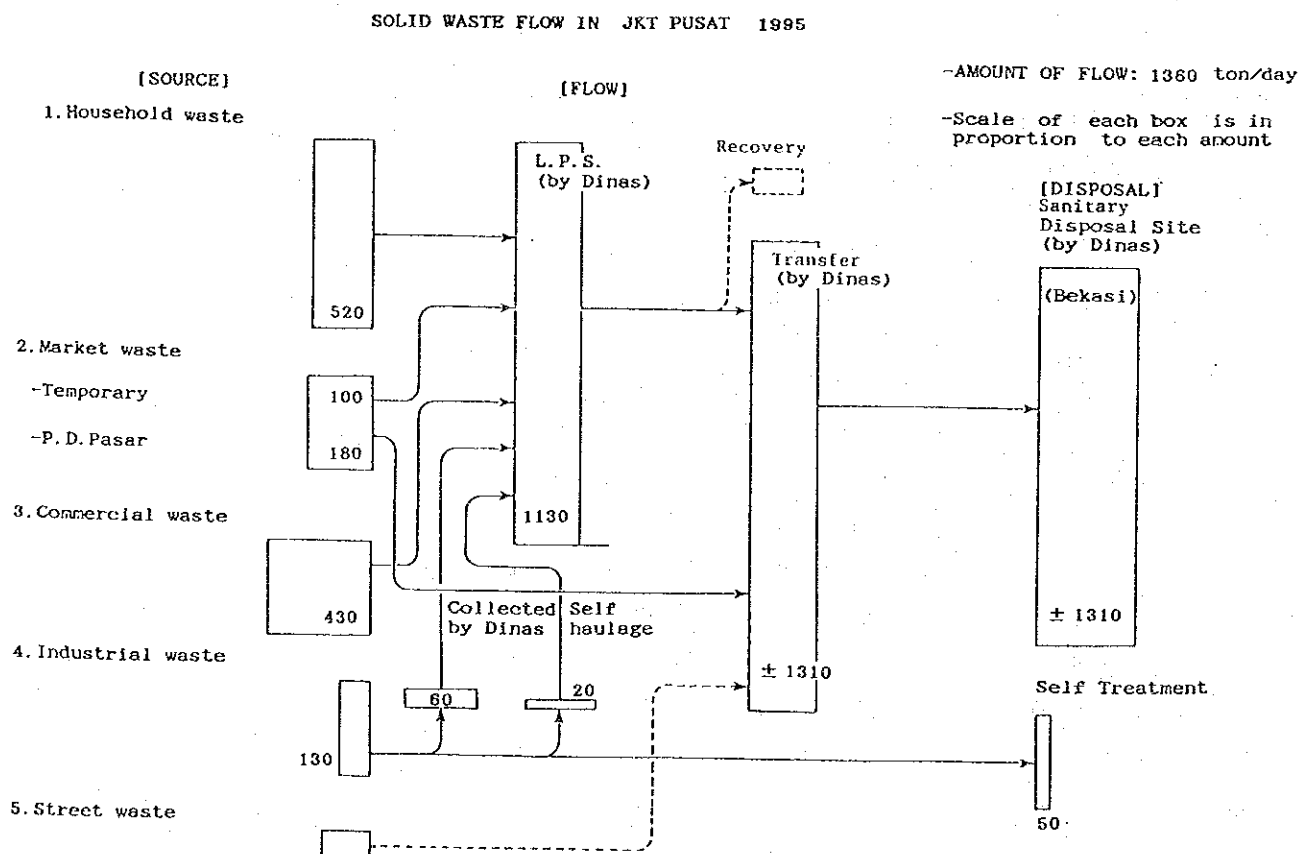


Fig. 1-2-2

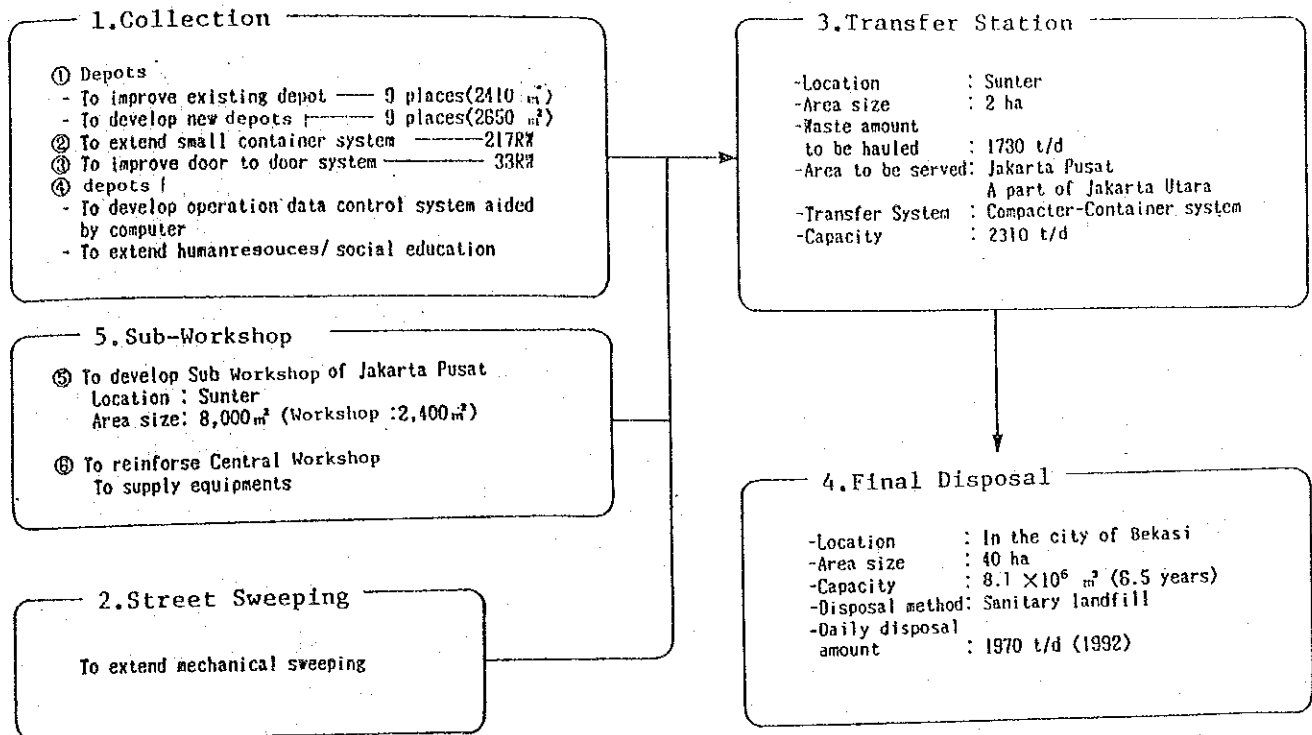


Fig. 1-2-3 Project Outlines

1.3 Project Plan Preparation Process

The Conceptual Master Plan for the solid waste management system improvement project in the city of Jakarta in Indonesia to be completed in the year 2005 was presented in January, 1987. Based on the stage plan incorporated in it, it was then agreed to authorise the 5 projects previously described, following which a feasibility study was conducted in Jakarta from January to March, 1987 in order that the basic plans for the 5 projects could be prepared. The results of this feasibility study were compiled in Progress Report III and outlines of the project plan and the basic policy for implementation was decided. The detail of the project plans, project evaluation and the implementation plans were then examined and the results of them are comprehensively compiled in this report.

A number of examinations were conducted in the preparation of the project plans and the flow of the study is shown in Fig.1-3-1.

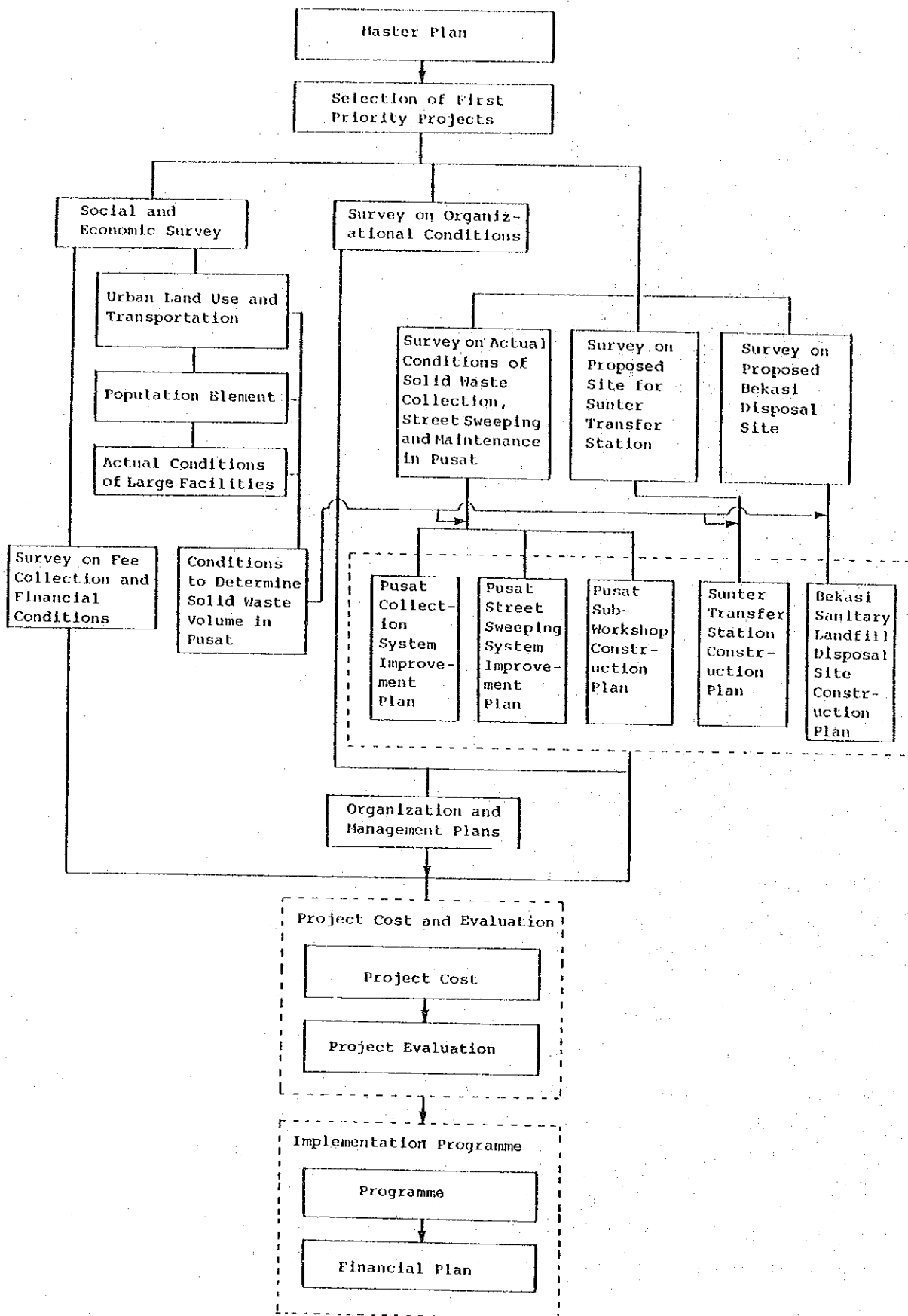


Fig. 1-3-1 Study Flow

CHAPTER 2 PRECONDITIONS FOR THE PROJECT PLAN

CHAPTER 2 PRECONDITIONS FOR THE PROJECT PLAN

2.1 Study Area

Jakarta is the capital city of the Republic of Indonesia. The Jakarta Pusat is the central part of Jakarta where most of the central government offices and also the residential area e.g. Menteng, Compaka Putih and Kemayoran are located.

Jakarta Pusat has an area of 48.2 km² and consists of 7 Kecamatan. Fig.2-1-1 shows the study area. Administration boundary of Jakarta Pusat is shown in Fig. 2-1-2.

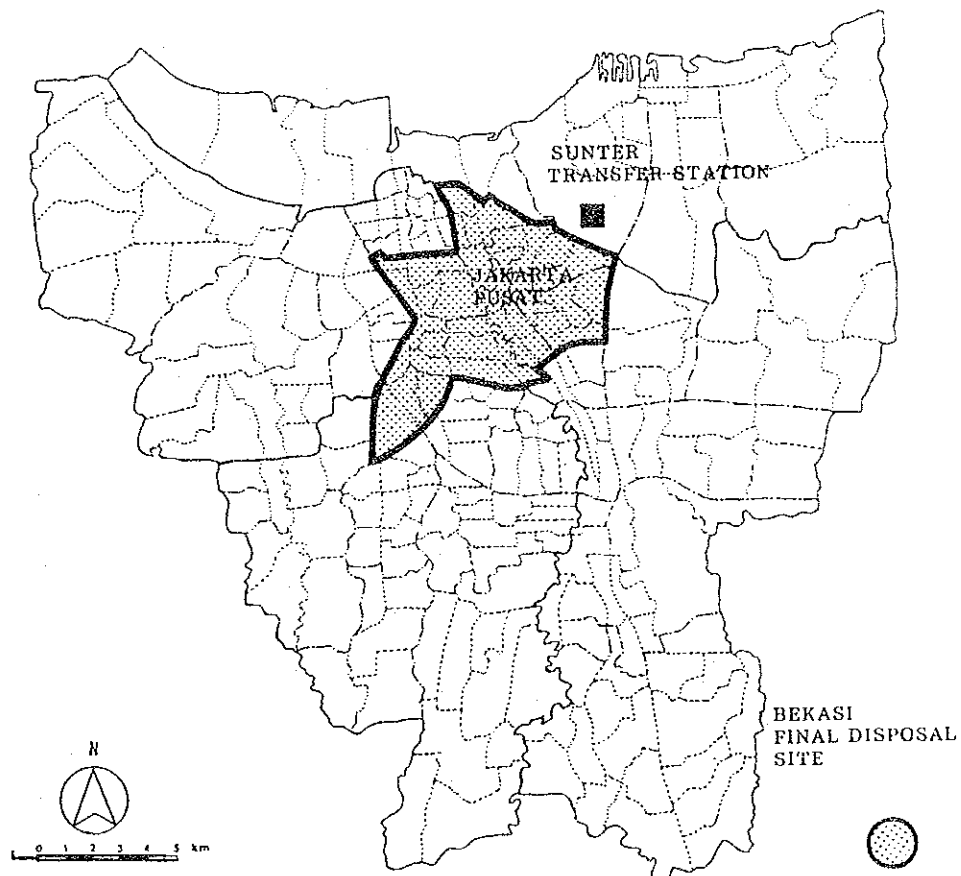


Fig. 2-1-1 Study Area of the Project

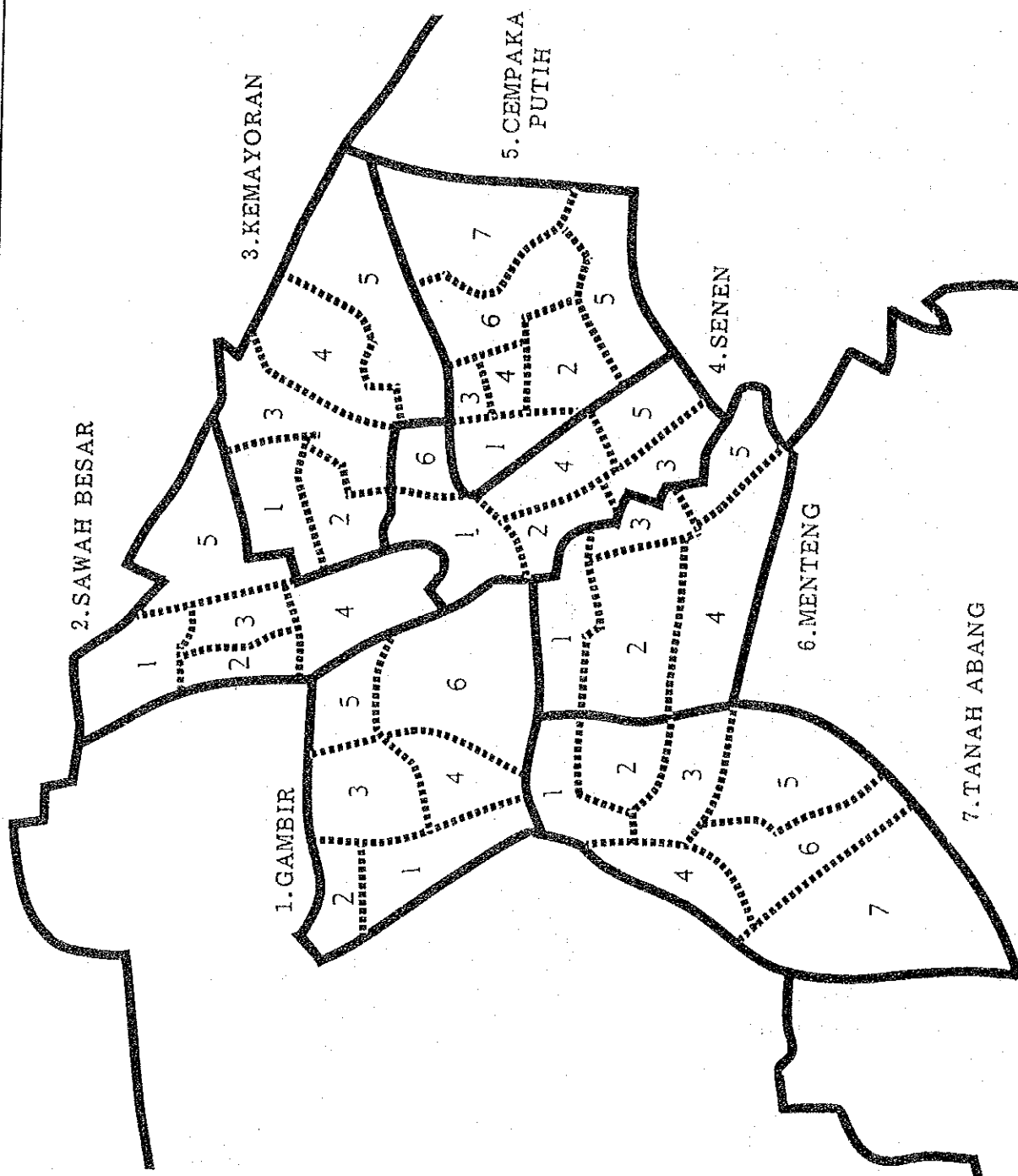


Fig. 2-1-2 ADMINISTRATION BOUNDARY OF JAKARTA PUSAT

1. KOTA MADYA JAKARTA PUSAT

1. Kecamatan Gambir, (Hal 5).
2. Kelurahan Cideng.
3. Kelurahan Duri Pulo.
4. Kelurahan Petojo Utara.
5. Kelurahan Kebon Selatan.
6. Kelurahan Gambir.

2. Kecamatan Sawah Besar, (Hal. 6)

1. Kelurahan Mangge Dua Selatan.
2. Kelurahan Karang Anyar.
3. Kelurahan Kartini.
4. Kelurahan Pasar Baru.
5. Kelurahan Gunung Sahari Utara.

3. Kecamatan Kemayoran, (Hal 7).

1. Kelurahan Gunung Sahari Selatan.
2. Kelurahan Kemayoran.
3. Kelurahan Kebon Kosong.
4. Kelurahan Serdang.
5. Kelurahan Harapan Mulya.

4. Kecamatan Senen, (Hal 8)

1. Kelurahan Senen.
2. Kelurahan Kwiang.
3. Kelurahan Kenari.
4. Kelurahan Kramat.
5. Kelurahan Paseban.
6. Kelurahan Bungur.

5. Kecamatan Cempaka Putih, (Hal 9)

1. Kelurahan Tanah Tinggi.
2. Kelurahan Johar Baru.
3. Kelurahan Galur.
4. Kelurahan Kampung Rawa.
5. Kelurahan Rawa Sari.
6. Kelurahan Cempaka Putih Barat.
7. Kelurahan Cempaka Putih Timur.

6. Kecamatan Menteng, (Hal 10)

1. Kelurahan Kebon Sirih.
2. Kelurahan Gondang Dia.
3. Kelurahan Cikini.
4. Kelurahan Menteng.
5. Kelurahan Pegangsaan.

7. Kecamatan Tanah Abang (Hal 11)

1. Kelurahan Kampung Bali.
2. Kelurahan Kebon Kacang.
3. Kelurahan Kebon Melati.
4. Kelurahan Petamburan.
5. Kelurahan Karet Tengsin.
6. Kelurahan Bendungan Hilir.
7. Kelurahan Gelora.

STUDY ON

SOLID WASTE MANAGEMENT SYSTEM
IMPROVEMENT PROJECT
IN JAKARTA

2.2 Future Social and Urban Conditions

2.2.1 Population

Pusat had a population of 1,392,100 in 1985 and a population density of 283 persons/hectare. Kecamatan Senen has the highest density of 369.5 persons/hectare while Kecamatan Gambir has the lowest with 211.3 persons/hectare. Table 2-2-1 shows the estimated number of households and population by Kelurahan in 1995. It is estimated that Pusat will have a population of 1,408,900 in 2005.

Table 2-2-1

Households and Population by Kelurahan (1985, 1995)

	Households		Population	
	1985	1995	1985	1995
JAKARTA PUSAT	287000	310000	1392100	1400500
1. Kec. Tanah Abang	57350	60100	268830	271390
1. Kel. Kampung Bali	5850	3430	28630	15470
2. Kel. Kebon Kacang	11160	17550	34160	79240
3. Kel. Kebon Melati	12250	12680	64470	57260
4. Kel. Petamburan	7870	7210	36530	32570
5. Kel. Karet Tengsin	11800	11360	56630	51290
6. Kel. Bendungan Hilir	6300	5470	37720	24700
7. Kel. Gelora	2120	2400	10690	10860
2. Kec. Menteng	22550	30000	138280	139140
1. Kel. Menteng	7780	12540	44470	58160
2. Kel. Kebon Sirih	4520	5940	32070	27550
3. Kel. Gondang Dia	1440	1170	10720	5430
4. Kel. Cikini	2400	2220	16680	10300
5. Kel. Pegangsaan	6410	8130	34340	37700
3. Kec. Senen	34620	32600	159030	151670
1. Kel. Senen	3380	4300	12520	20010
2. Kel. Kwitang	5120	5220	21070	24270
3. Kel. Kenari	4220	4600	17110	21390
4. Kel. Kramat	6750	9510	36420	44290
5. Kel. Pasemban	8000	4240	36820	19720
6. Kel. Bungur	7150	4730	35090	21990

PART III

4. Kec. Cempaka Putih	49870	53300	232230	236020
1. Kel. Tanah Tinggi	9420	11030	46100	48850
2. Kel. Johar Baru	7960	10230	42270	45320
3. Kel. Galur	5340	3890	22620	17230
4. Kel. Kampung Rawa	3930	1920	22650	8500
5. Kel. Rawasari	6000	4000	26570	17700
6. Kel. Cempaka Putih Barat	10980	13860	41910	61360
7. Kel. Cempaka Putih Timur	6240	8370	30110	37060
5. Kec. Sawah Besar	36580	40600	178370	182990
1. Kel. Mangga Dua Selatan	10180	9710	54100	43730
2. Kel. Karang Anyar	6350	7020	37380	31660
3. Kel. Kartini	9190	9340	32500	42090
4. Kel. Pasar Baru	6160	9700	26140	43730
5. Kel. Gunung Sahari Utara	4700	4830	28250	21780
6. Kec. Gambir	35400	36000	155970	159390
1. Kel. Cideng	6950	7990	27590	35380
2. Kel. Duri Pulo	9280	8060	43070	35700
3. Kel. Petojo Utara	6350	8350	30290	36980
4. Kel. Petojo Selatan	7200	7850	30420	34750
5. Kel. Kebon Kelapa	4730	3380	19420	14980
6. Kel. Gambir	890	370	5180	1600
7. Kec. Kemayoran	50630	57400	259390	259900
1. Kel. Gunung Sahari Selatan	6620	9180	32860	41580
2. Kel. Kemayoran	5900	9700	24640	43920
3. Kel. Kebon Kosong	9070	10560	49320	47820
4. Kel. Serdang	11730	9130	69400	41320
5. Kel. Harapan Mulya	17310	18830	83170	85260

PART III

2.2.2 Income

The average household income in Pusat in 1985, 1995 and 2005 are estimated to be Rp. 103,000, Rp. 161,000 and Rp. 219,000 respectively based on the DKI Jakarta Master Plan and Census in 1980.

The income estimation in 1985 and 1995 by Kecamatan are shown in Table 2-2-2.

Table 2-2-2 Estimated Income by Kecamatan

(Unit: household)

	1985				1995			
	Low	Middle	High	Total	Low	Middle	High	Total
Gambir	15,720 (44.4%)	15,150 (42.8)	4,530 (12.8)	35,400	7,750 (21.5)	18,770 (52.1)	9,480 (26.3)	36,000
Sawah Besar	16,750 (45.8)	16,350 (44.7)	3,480 (9.5)	36,580	9,020 (22.2)	21,990 (54.2)	9,590 (23.6)	40,600
Kemayoran	22,990 (45.4)	24,400 (48.2)	3,240 (6.4)	50,630	12,640 (22.0)	32,350 (56.4)	12,410 (21.6)	57,400
Senen	14,330 (41.4)	16,860 (48.7)	3,430 (9.9)	34,620	6,550 (20.1)	17,810 (54.6)	8,240 (25.3)	32,600
Cempaka Putih	22,240 (44.6)	22,990 (46.1)	4,640 (9.3)	49,870	11,530 (21.6)	29,050 (54.5)	12,720 (23.9)	53,300
Mentens	9,940 (44.0)	9,250 (41.0)	3,360 (14.9)	22,550	6,410 (21.4)	15,230 (50.8)	8,360 (27.9)	30,000
Tanah Abang	26,550 (46.3)	25,350 (44.2)	5,450 (9.5)	57,350	13,500 (22.5)	32,500 (54.1)	14,100 (23.5)	60,100
Pusat	128,520 (44.8)	130,350 (45.4)	28,130 (9.8)	287,000	67,400 (21.7)	167,700 (54.1)	74,900 (24.2)	310,000

Source: Prepared by Study Team based on DKI Master Plan 2005.

2.2.3 Land Use

The characteristics of the current land use in each Kecamatan are as follows.

a. Tanah Abang

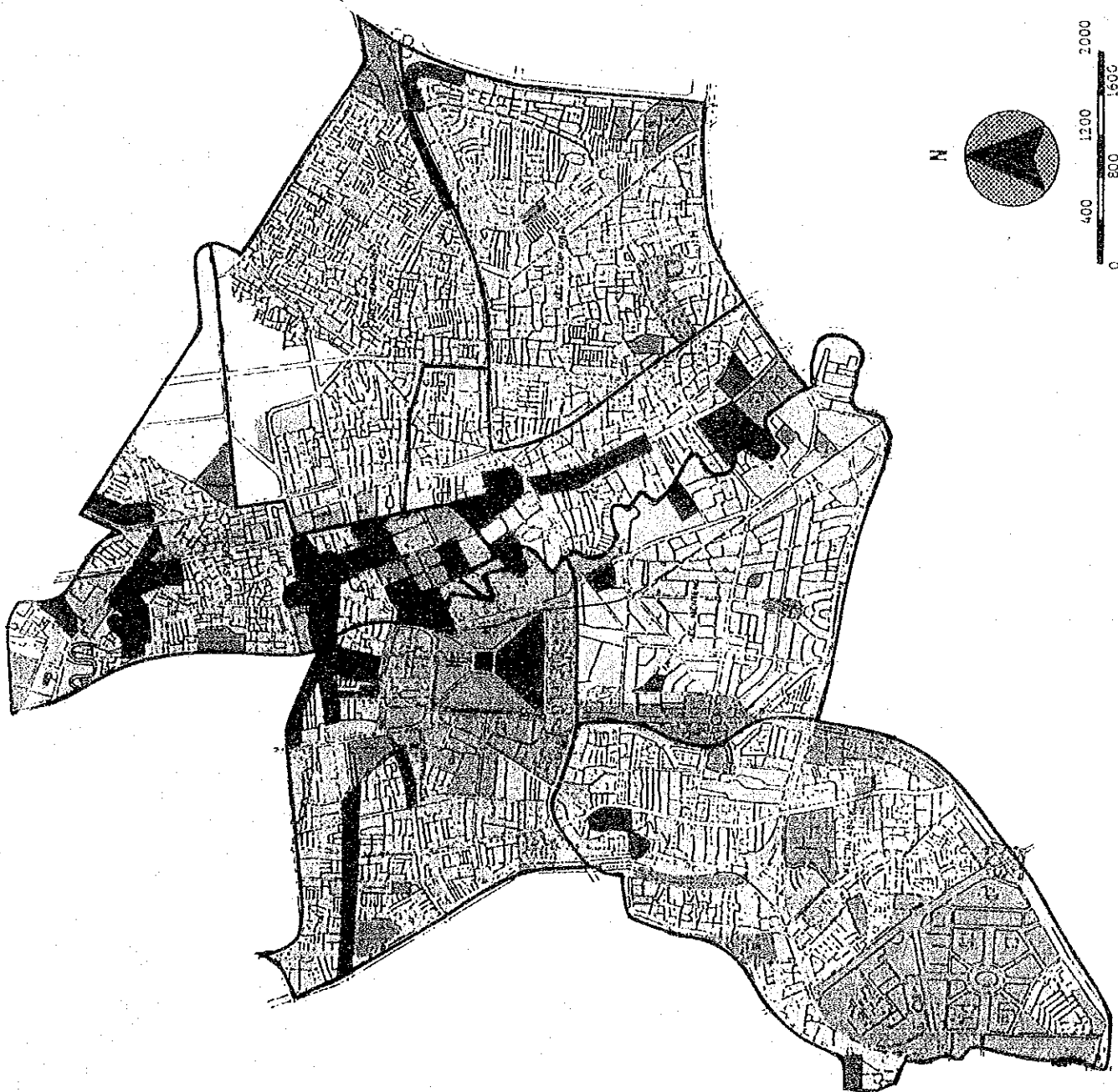
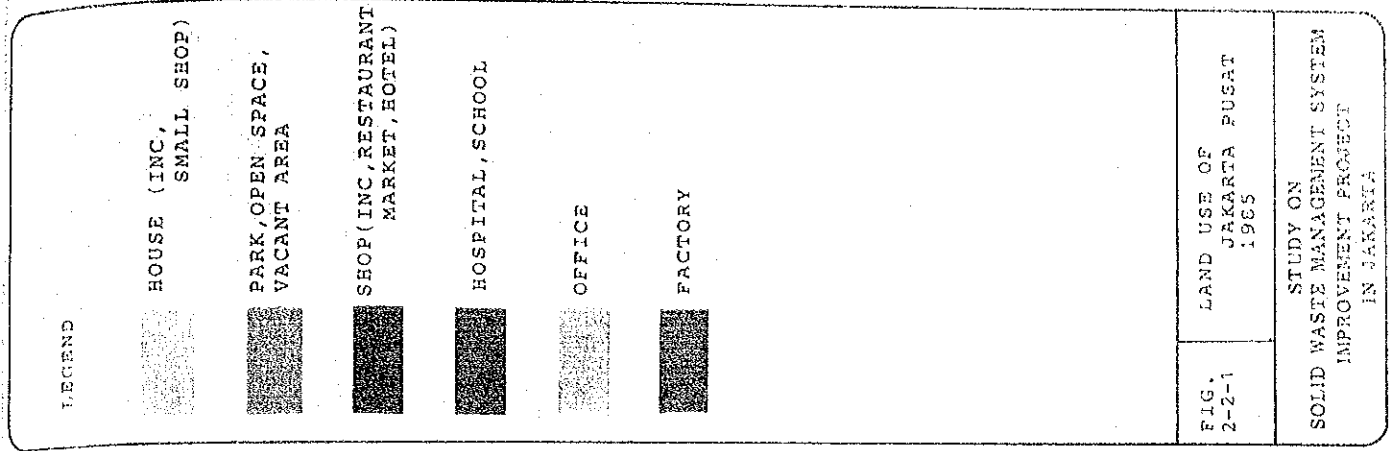
Although 60% of the area is used for residential purposes, such public and recreational facilities as the Senayan National Stadium, the National Assembly Building, a TV station, tennis courts and a golf course occupy 30% of the area. The remaining area is characterised by office buildings and hotels along Jl. Sudirman, commercial quarters in the Kebon Kacang district and a cemetery in the Karet Tengijin district.

b. Menteng

Residential areas account for nearly 85% of the entire land with more than 80% of them being classified as high-class residential areas. Commercial and office quarters are found along Jl. Thamirin, as well as hotels, department stores, banks and embassies, etc. In addition to the commercial and medical quarters along Jl. Cikini Raya, there is a highly noticeable number of parks and green belts are scattered throughout the Kecamatan.

c. Senen

Residential areas account for some 75% of the entire land and the West Campus of the University of Indonesia, other educational premises (including those of the Catholic University) and 6 major hospitals account for 15%. The remaining 10% is used for commercial purposes, from Jl. Pasar Senen to Jl. Kramat Raya.

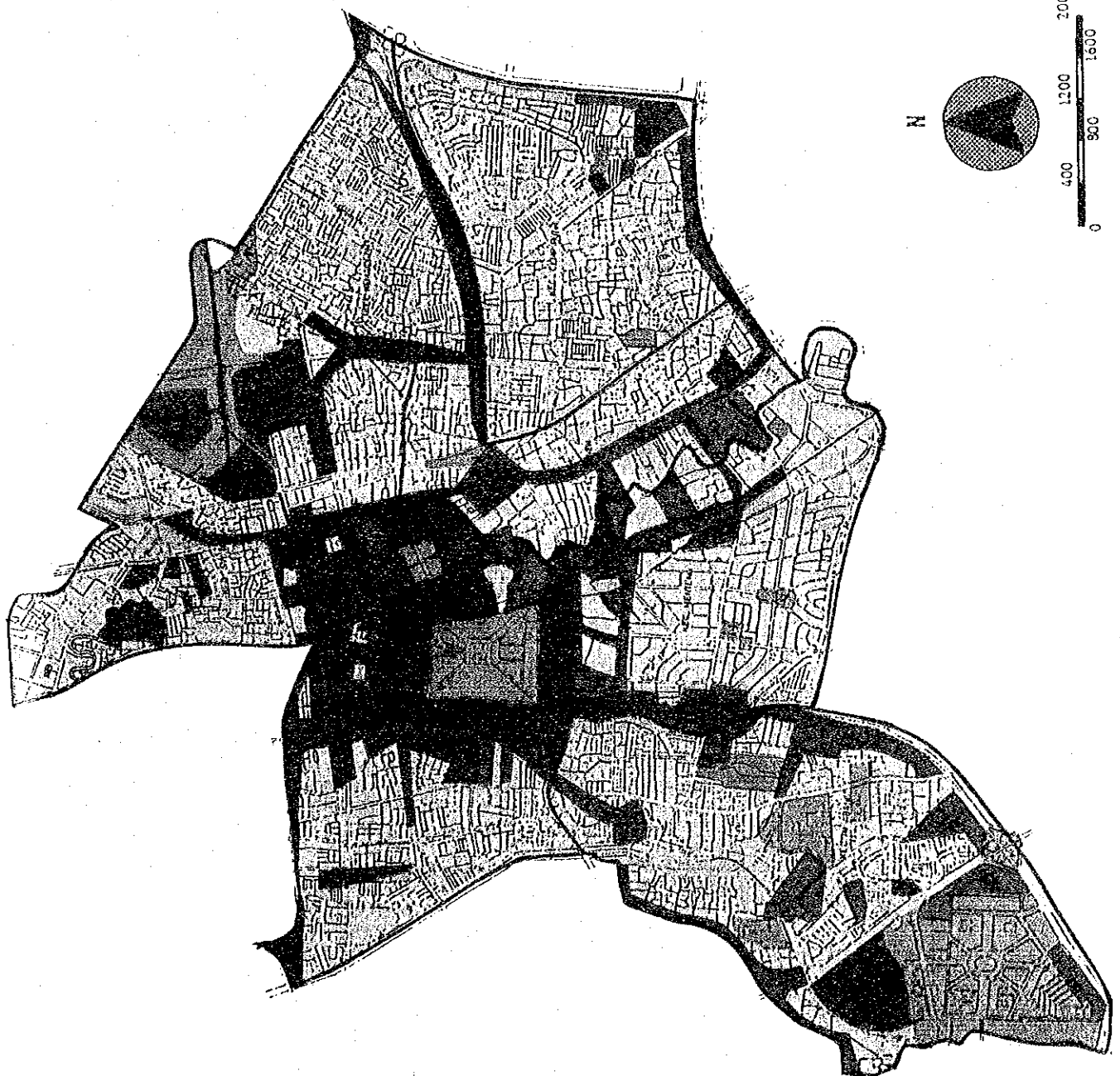


LEGEND

HOUSING WITH
FACILITIESSERVICE,
COMMERCIAL, OFFICE

PARK, OPEN SPACE

PUBLIC BUILDING

PUBLIC BUILDING
WITH LOW BUILDING
COVERAGEINDUSTRY, WAREHOUSE
INDUSTRY, MIXED
WITH PUBLIC
BUILDING

N

0 500 1000 1500 2000



FIG
2-2-2

LAND USE PLAN 2005
JAKARTA PUSAT

SOLID WASTE MANAGEMENT SYSTEM
IMPROVEMENT PROJECT
IN JAKARTA

PART III

d. Cempaka Putih

While some 85% of the Kecamatan is made up of residential areas, land for educational/medical and commercial/industrial purposes and open space account for 5% each.

e. Sawah Besar

Since the ex-Kemayoran Airport is located in this Kecamatan, 25% of the entire land is open space, including the cemetery in the north, and parks and green belts around the Boreobudur Hotel. Residential areas account for some 60% while the commercial quarters centering around Pasar Baru account for some 10%. The industrial area in the north accounts for the remaining 5%, showing the highest ratio of land for industrial purposes in the 7 Kecamatans.

f. Gambir

The ratio of residential areas of slightly less than 45% is the lowest in the 7 Kecamatans. The public facilities, including the Presidential Residence, embassies, ministerial buildings and the National Museum, and the office buildings located around Independence Square (Monas) account for nearly 42% of the Kecamatan (the Monas accounts for 12%). Most of the remaining 13% is used for commercial purposes and a little land is used for educational purposes.

g. Kemayoran

As the ex-Kemayoran Airport is located in this area, open space accounts for 34% of the entire land. Residential areas account for some 60% while the remaining land is used for commercial or educational purposes.

Existing and future land use maps are shown in Fig. 2-2-1 and Fig. 2-2-2.

2.3 Waste Amount

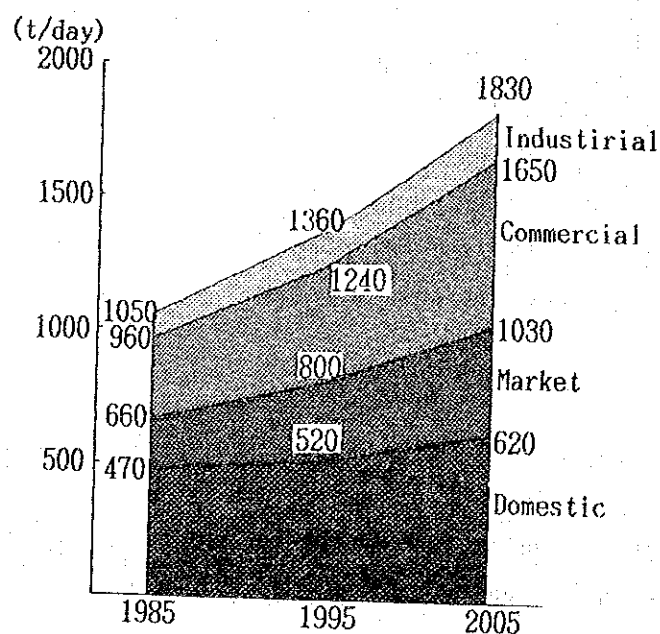
(1) Waste amount of Jakarta Pusat

It is estimated that the waste amount will grow from 1,050 t/day in 1985 to 1,360 t/day in 1995 and 1,830 t/day in 2005.

Table 2-3-1 Waste Amount by year

	(Unit: t/day)		
	1985	1995	2005
Jakarta Pusat	1,050	1,360	1,830
Other areas	3,880	6,000	8,390
Entire Jakarta	4,930	7,360	10,220

The waste amount by generating source will change as follows.



The waste amount by area by generating source in the target year will be as shown in Table 2-3-2.

PART III

Table 2-3-2 Waste Amount by Area in Target Year

(Unit: t/day)

	House- hold	Markets		Com- mercial	Facto- ries	Total
		Tempo- rary	P.D. Pasar			
1985						
Gambir	60	10	10	100	20	200
Sawah Besar	60	10	15	50	15	150
Kemayoran	80	5	20	10	5	120
Senen	50	5	25	40	0	120
Campaka Putih	80	10	15	20	0	125
Menteng	50	0	20	50	5	125
Tanah Abang	90	20	25	30	35	200
Total	470	60	130	300	90	1,050
1995						
Gambir	60	20	15	140	35	270
Sawah Besar	70	20	20	75	12	197
Kemayoran	90	10	30	20	4	154
Senen	60	10	30	60	7	167
Campaka Putih	90	15	25	20	2	152
Menteng	50	5	25	75	10	165
Tanah Abang	100	20	35	40	60	255
Total	520	100	180	430	130	1,360

(2) Waste amount of other Wilayahs

The waste amount of each Wilayah will be as shown in Table 2-3-3.

Table 2-3-3 Waste Amount by Wilayah by Generating Source

(Unit: t/day)							
	Year	House- hold	Markets		Com- mercial	Facto- ry	Total
			Tempo- rary	P.D Pasar			
Selatan	1985	620	50	110	160	170	1,110
	1995	1,070	80	160	220	240	1,770
	2005	1,410	120	220	330	330	2,410
Timur	1985	560	60	110	170	120	1,020
	1995	950	80	160	250	180	1,620
	2005	1,330	120	230	360	240	2,280
Utara	1985	340	40	80	100	210	770
	1995	510	50	120	140	300	1,120
	2005	670	80	170	210	400	1,530
Pusat	1985	470	60	130	300	90	1,050
	1995	520	100	180	430	130	1,360
	2005	1,080	160	200	270	360	2,070
Barat	2005	620	140	270	620	180	1,830
	1985	440	80	90	130	190	930
	1995	720	110	130	190	270	1,420
Total	1985	2,430	290	520	860	780	4,880
	1995	3,770	420	750	1,230	1,120	7,290
	2005	5,110	620	1,090	1,790	1,510	10,120

Note: Street waste is not included in this table.

(3) Waste amount of Bekasi and Tangerang

The amount of waste generated in Bekasi and Tangerang, estimated on the basis of per capita generation rate in Jakarta (0,333 kg/capita/day), will be as shown in Table 2-3-4.

Table 2-3-4 Waste Amount of Bekasi and Tangerang

	1985	1995
BEKASI	80	340
TANGERANG	140	530
TOTAL	240	870

(4) Design waste amount

- a) Design waste amount to be collected by Suku Dinas Kebersihan in Jakarta Pusat

The collection service by the Suku Dinas Kebersihan will exclude market waste of P.D. Pasar Jaya and self-transported industrial waste. The design waste amount to be collected by the Suku Dinas Kebersihan in this Project will be 1,110 t/day in 1995.

Table 2-3-5 Design Waste Amount to be Collected

(Unit: t/day)

	1995	2005
Suku Dinas Kebersihan	1,110	1,440
Others (Self-transported)	250	390
Total	1,360	1,830

- b) Design Waste Amount for Sunter Transfer Station

The design waste amount for the Sunter Transfer Station is as shown in Table 2-3-6. The size of this facility will be 1,730 t/day which is the estimated amount of waste to be transferred in Jakarta Pusat in 2005.

In view of this transfer station's operation at full capacity, 420 t/day of waste collected in Jakarta Utara will be treated in 1995.

Table 2-3-6 Design Waste Amount for Sunter Transfer Station

		(Unit: t/day)	
		1995	2005
Pusat	by Suku Dinas	1,110	1,440
	by others	200	290*
	Subtotal	1,310	1,730
Utara		420	0
Total		1,730	1,730

Note: Other 50 t/day in 1995 and 100 t/day in 2005 will be self-treated.

c) Design amount for Bekasi Disposal Site

The waste amount disposed of in Bekasi disposal site will be as shown in Table 2-3-7.

Table 2-3-7 Waste Amount for Bekasi Disposal Site

(Unit: t/day)		
	1995	2005
Pusat	1,310	1,730
Utara	420	0
Bekasi	340	880
Total	2,070	2,610

The Bekasi disposal site will be constructed in three blocks. The Project will be carried out in the first blocks. The total waste amount to be disposed of during 1992-1997 is calculated to be as follows.

1992 - 1997	
Volume	8,092,000 m ³
Weight	5,308,000 tons

2.4 Site of Facilities

2.4.1 Site Conditions of Sunter Transfer Station

It is planned to construct a final disposal site in Sunter using the sanitary landfill method. The site has an area of about 12 ha and its location is shown in Fig.2-4-1. Part of the Sunter final disposal site and the surrounding area will also be the site of the transfer station which will require about 2 ha.

1) Topography

The planned site is located on the Sunter area in Jakarta Utara, Jl.Danau Sunter Selatan and Jl.Kedondong running on the north and west sides respectively. The area is composed of relatively low ground with a difference in altitude of between 25 cm and 40 cm. A small part of the existing land on the north side has a higher elevation of about 1 m which has already become a waste dump site.

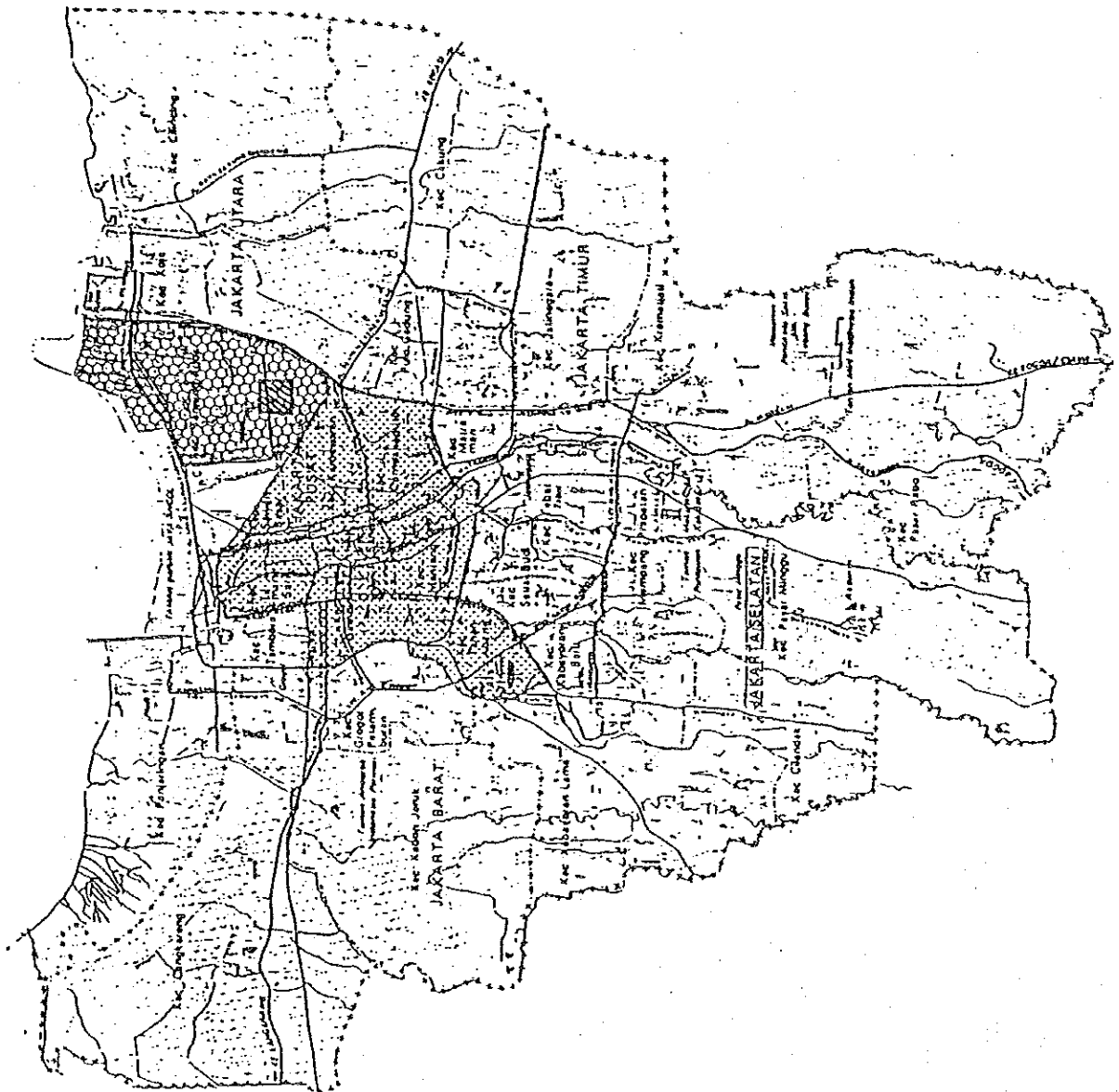
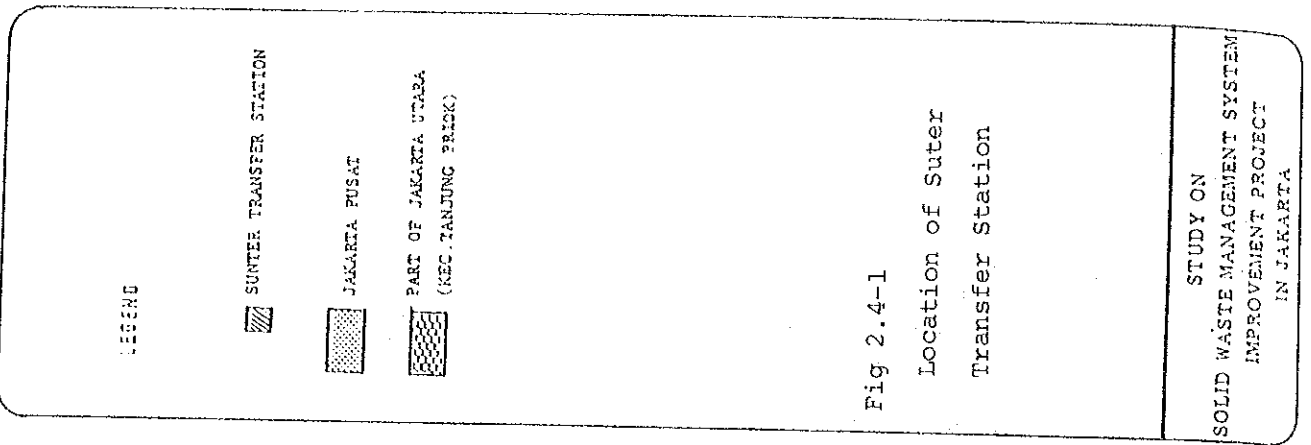
Most of the land is unused swamp, with swamp plants and a chinese plantation. Some parts of the surrounding area, where the ground level is generally more elevated, are housing sites.

Rain water and waste water is channeled from the housing area on the south side in the direction of the planned side so that the site is always wet, especially in the rainy season.

2) Geology

Jakarta lies on a quarternary sediment layer which is between about 100 to 300 m thick. Most of the sediment was formed by the delta.

The low and sludged areas on the sea plateau are covered with holocene sediment, consisting of clay, silt, sand and gravel. The depth of the base layer of the structure is about 10 m below.



3) Land Use Surrounding the Planned Site

The existing land use of the planned site for the Sunter transfer station and the surrounding area is as follows:

(1) North side

The north side of the site is almost adjacent to Jl. Danau Sunter Selatan and relatively close to the water processing plant owned by PAM. There is a permanent housing area, "Sunter Agung Podomoro" (real estate), in the upper northern part and a warehouse in the north-east.

(2) East side

The east side of the site is adjacent to empty land with a warehouse area along the west side of Jalan Yos Sudarso, about 1 km east of the centre of the site.

(3) South side

The south side of the site is adjacent to empty land which is now used as a plantation (Kebun Kangkung). In the upper southern part, about 300 m from the center of the site, there is a permanent housing area comprising a complex of Dinas Kebersihan DKI Jakarta, Sunter Hijau, Sunter Mas and other housing.

(4) West side

The west side of the site is adjacent to Jalan Kedondong which is a connecting road between Jalan Danau Sunter Selatan and Jalan Kemayoran. Parts of these roads are not paved. The south side is adjacent to permanent and temporary housing area. The west of Jalan Kedondong is a temporary housing site.

The land use plan for the landfill site until the year 2005 has already been prepared and is shown in Fig.2-4-2.

PART III

According to the plan, most of the site will be a green belt for recreation and sports and the southern area will be blocked by a planned road and low density housing area. In general, the land use is unchanged for the built-up area around the planned site except for the temporary housing area located on the southern side of the lake and along Jalan Kedondong which will be made into a green belt and a low density housing area.

4) Traffic Conditions and Access Roads.

There are 2 routes to the site from Jakarta Pusat, which is the main service area of the Sunter Transfer Station:

- a. (Menteng) --- Jl.Suprpto --- Jl.Laks muda Yos Sudarso ---
--- Jl.Danau Sunter Selatan --- Site.
- b. (Menteng) --- Jl.Suprpto --- Jl.Kali Baru Barat ---
Jl.Danau Sunter Selatan --- Site.

The traffic volume on Jl. Danau Sunter Selatan (4 lanes) is estimated to be about 12,000 vehicles/day and 55,000 vehicles/day on Jl. Laks Muda Yos Sudarso (8 lanes).

Since Jl. Laks Muda Yos Sudarso is also the main transportation route from the Sunter Transfer Station to the Bekasi Disposal Site, it is desirable that the intersection of the above two roads will be improved for smooth access.

5) Plan of Sunter sanitary landfill site.

The site is intended for the sanitary landfill of the solid waste collected in Kecamatan Kemayoran, Cempaka Putih, Tanjung Priok, Koja and Pulo Gadung. The amount of waste to be disposed of at this site is estimated to be 632 t/day.

The results of the study show that the site will be full within a year, at a height of 3 m. However, the Dinas Kebersihan wants to use the site for at least 2 years by increasing the height.






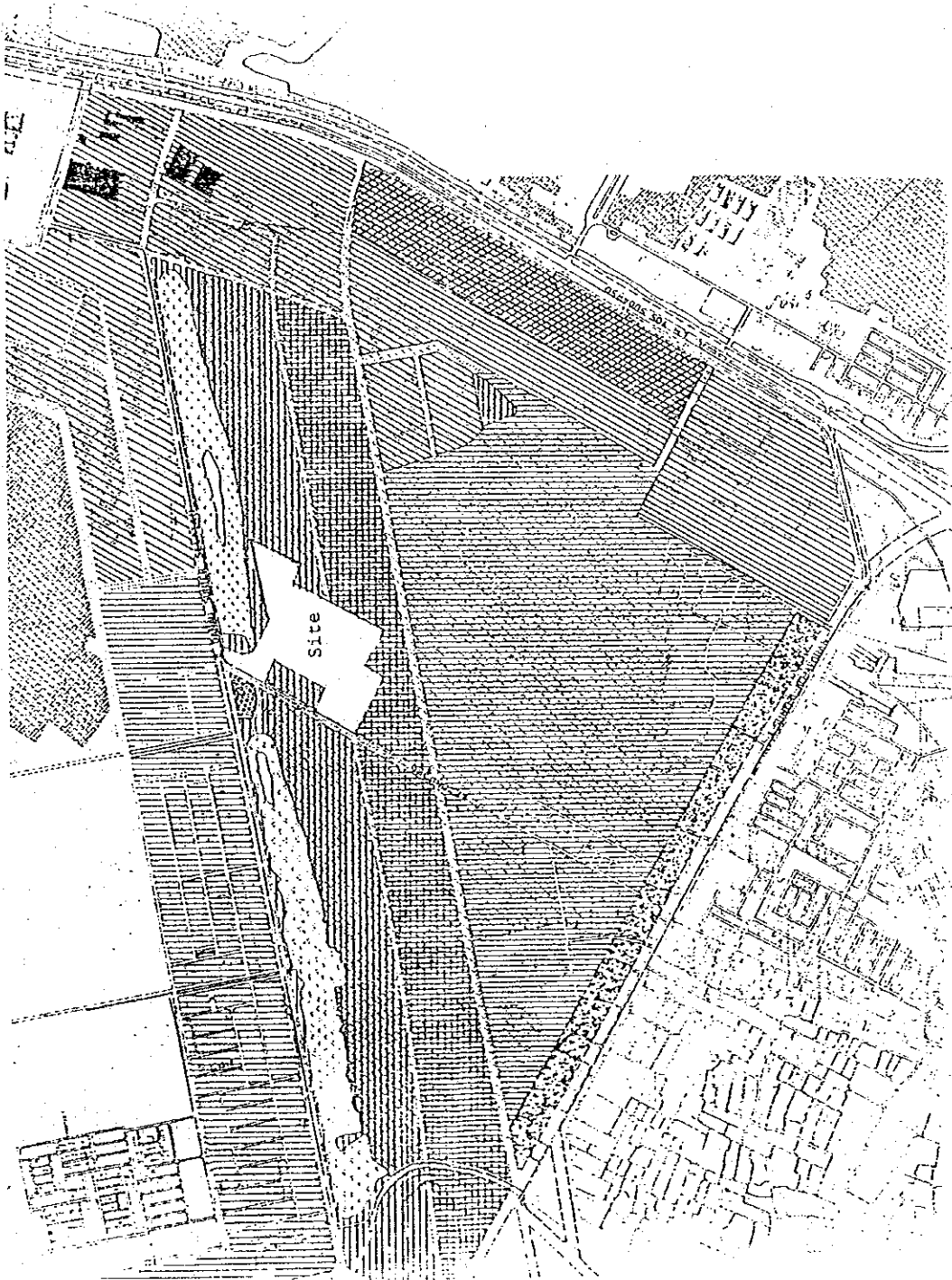
 Housing area
 Housing area
 Warehouse
 Government
 Green belt

Fig. 2-4-2

Landuse Plan
 of Surrounding
 Area of Sunter Site

STUDY ON
 SOLID WASTE MANAGEMENT SYSTEM
 IMPROVEMENT PROJECT
 IN JAKARTA



PART III

The construction of the sanitary landfill site will start in early 1987/88 and operation will start in 1988/89.

2.4.2 Conditions of Bekasi Final Disposal Site

The Bekasi disposal site is located in Kecamatan Bantar Gebang in Bekasi and belongs to three villages; Cikiwul, Ciketing Udik and Sumurbatu. The distance from the center of DKI Jakarta is about 35 km in the south-east direction. The total site area will be more than 100 ha.

1) Topography

In general, the site and surrounding area is tableland mainly consisting of volcanic ash. Small rivers have eroded the tableland and made the lower land which is used for rice fields. The site is divided into two parts by the Ciketing river which flows from south-west to north-east as shown in Fig.2-4-3, with the Cibitung river further downstream. Lower land along this river is also used for rice fields. Most of the tableland on this site is waste land which has been excavated for earth work material.

2) Geology

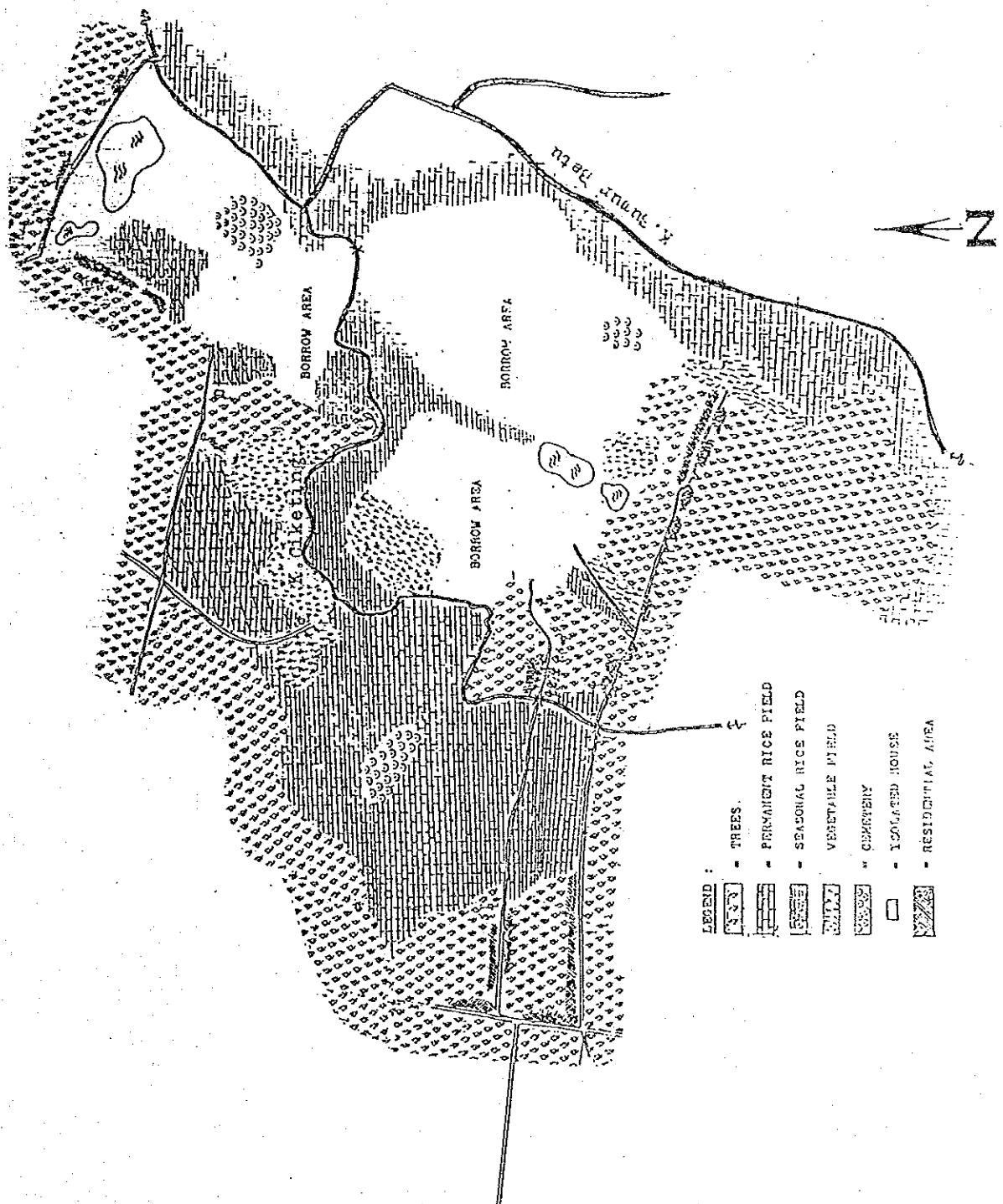
The tableland of this area is covered with volcanic ash and rice fields along the small river are covered with alluvial soil which is not deep. The upper layer of tableland consists of silty clay and silt with a permeability coefficient of 10^{-5} cm/sec.

3) Land use

Land use of the site and the surrounding area consists of rice fields on the lower land and mixed use agricultural land on the tableland.

Fig. 2-4-3
Present Landuse of
Surrounding Area of
Bekasi Site

STUDY ON
SOLID WASTE MANAGEMENT SYSTEM
IMPROVEMENT PROJECT
IN JAKARTA



PART III

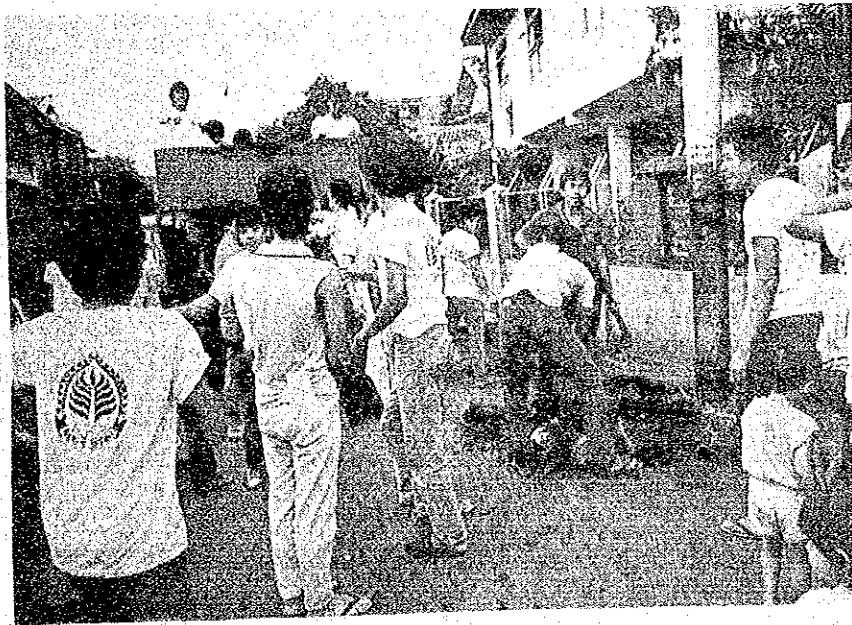
The land use of areas adjacent to this site is as follows:

- North side; Mixed use agricultural land, dotted with houses.
- East side ; Mostly rice fields with no housing.
- South side; Mixed use agricultural land and quite a few houses adjacent to the site.
- West side ; Mixed agricultural land with rice fields in the south.

4) Traffic conditions and access road

The access road to this site is Jl. Bekasi-Bogor which has only two lanes and which has an estimated traffic volume of 6,000 vehicles/day. From Jl. Bekasi-Bogor, a paved road with a width of 7 m leads about 400 m in the direction of the site. The remaining part, which is about 1.6 km, is only an unpaved narrow road. Paving and extension of the access road will be necessary.

CHAPTER 3 PROJECT PLAN



CHAPTER 3 PROJECT PLAN

3.1 Improvement of Collection System in Pusat

3.1.1 Introduction

The collection improvement project for Jakarta Pusat was selected as the first step for improving the collection system outlined in the Conceptual Master Plan. Jakarta Pusat is not only the central area of DKI Jakarta but also of Indonesia. Improvement of the collection service in this Wilayah, therefore, is sure to favorably affect all other Wilayahs of DKI Jakarta and Indonesia as a whole.

In view of the fact that waste collection in Jakarta Pusat is performed relatively well compared to other Wilayahs, it has been pointed out that priority should be given to other Wilayahs where the collection service is not as good. Nevertheless, priority is given to Jakarta Pusat because, firstly, it is evident that if priority is given to another Wilayah it will only result in expanding the current collection system and force the Wilayah to suffer a financial burden beyond its means, thus exacerbating the poorly managed collection system. If the collection system and its control system in Jakarta Pusat, where the collection system is operated in better condition, is improved, it will undoubtedly not only generate an extra capacity which can be used by other Wilayahs but also facilitate the transfer of the improved control system to other Wilayahs. In this sense, the priority given to Jakarta Pusat for the improvement of its collection service is considered justifiable.

Solid waste collection is a basic public service necessary for maintaining a sanitary living environment. The cost, however, increases with the progress of urbanization. The current situation seems to be that while the cost involved in waste collection continues to exert pressure on the city's finances, the city, which must give preference to the development of various infrastructure facilities, is unable to allocate adequate financial resources to cleansing activities.

PART III

Therefore, the establishment of a rational waste collection system which will result in a saving of financial sources is strongly required.

The waste collection system is virtually based on vehicles and equipment and the workers who operate them. Generally speaking, improvement of the collection system cannot be achieved merely by improving the equipment and can only be truly achieved when the workers who operate it work satisfactorily. It is strongly emphasized here, therefore, that the improved collection system proposed in this project plan can only function satisfactorily under a management system where the workers give their best efforts.

An excellent waste collection system can only function under excellent management

3.1.2 Project Objectives

(1) Targets

Target year of the project : 1995
Waste collection coverage : 100%
(Coverage by public service : 82%)
Vehicle mechanization rate : Approx. 100%
Vehicle operating rate of vehicles (Ratio of stand-by vehicles)
: 85% (15%)

(2) Project objectives

- a Elimination of illegal dumping sites in the city
(Attainment of 100% collection of discharge waste)
- b Realization of a rational collection system by altering the
existing collection system

PART III

- c Improvement of collection efficiency by improving the control systems.
- d Securing of inhabitants' confidence in the collection service through the realization of regular collection and promotion of their willingness to pay for this service.

3.1.3 Policy for Improvement of Collection Systems

1) Improvement of collection systems

(1) Basic division of collection systems

In applying the waste collection systems, two collection division shall be clearly separated in consideration of the pattern of waste generation and bulky waste which is difficult to collect by these two collection systems shall be collected separately.

a. Ordinary collection (mainly for households and small shops)

Collection of domestic and commercial waste which is discharged in small amounts.

b. Special collection (large offices and commercial buildings, etc.)

Collection separated from ordinary collection for the offices and shops which discharge large amount of waste.

c. Bulky waste collection

Collection of bulky waste (trees, etc.) generated at irregular intervals by households and commercial establishments.

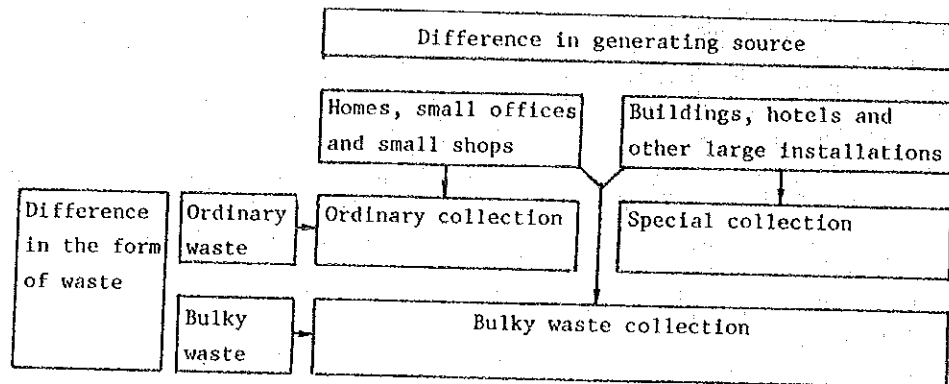


Fig.3-1-1 Collection System

By effecting these divisions, it will be possible to provide a regular and reliable collection service to ordinary households and small shops and also to establish a rational collection system differing from that for ordinary collection for special collection. In addition, by separating bulky waste collection from ordinary collection, it will be possible to realize a regular operation for ordinary collection.

(2) Application of collection systems

a. Ordinary collection

Ordinary collection shall apply to areas other than where special collection applies.

The current inefficient handcart pool collection system, concrete bin collection system and open space collection system shall be totally abolished. Instead, the current handcart-depot-container collection system and small container system shall be made standard collection systems and the areas where these systems shall apply shall be expanded. Depending on the conditions of the areas, the current Jali-jali collection system (so-called block collection system) and door-to-door collection system shall

PART III

also be adopted. Reducing the many collection systems which exist today into the foregoing four types will be meaningful in terms of making operation control easier and making the collection service more regular than it is at present.

The suitability of these four collection systems differs depending on the physical conditions of the streets and socio-economic conditions of each area. In order to judge their suitability, therefore, the following criteria (given in the Master Plan) shall be employed.

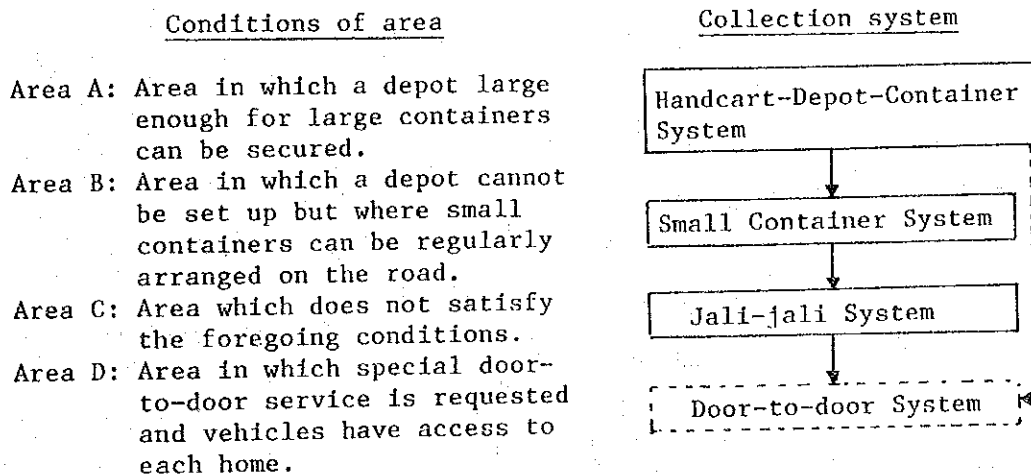


Fig. 3-1-2 Flow of Selection of Ordinary Collection System

b. Special collection

Special collection shall apply to commercial and business establishments which generate large amounts of waste. The establishments covered shall be independent buildings which have adequate extra space and which discharge 10 kgs or more of waste a day. They shall be selected based on the actual condition of waste discharge which shall be investigated by each Seksi Kecamatan concerned.

PART III

Judgement of application on the following three collection systems shall be made with consideration to the condition of waste generation and of extra space for installing waste storage facilities inside the building or out side.

If there is only little extra space

..... Small container collection system

If there is adequate extra space

..... Large container collection system

If difficult to install container

..... Portable container collection system

c. Bulky waste collection


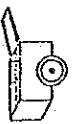

















Bulky waste generated from household and shops shall be collected on the once-a-month community cleansing day arranged by Kelurahan or by Dinas Kebersihan.

The basic composition of the future collection system is shown in Table 3-1-1.

(3) Improvement of depots

Existing depots stand on a site of 200 to 300 m² in area which is enclosed by walls and an administration office of less than 20 m² is adjacent to each depot. These depots are mainly used as stations for transferring waste from handcarts to collection vehicles and some of them are provided with large communal containers. The structure of these existing depots will be improved as shown in Fig. 3-1-3. A container yard, waste receiving platform, roof and water supply facilities will be provided.

Table 3-1-1 Details of Collection System

Collection System	Area Characteristics	Collection Method	Discharge	Primary Collection	Transfer Point	Collection equipment	Equipment/Facility
Ordinary Collection	Area A Where depot site is provided	Depot with large communal container collection system	Plastic bag 	Handcart 	Large container  (8-10m ³)		① Preparation of container ② Provision of arm roll truck ③ Construction of depots
	Area B Where roads are wide enough to place small container	Small container collection system	Plastic bag 	—	Small container  (1m ³)	Large compactor vehicle with lifting equipment  (8-10m ³)	① Small container ② Large compactor vehicle
	Area C Where all roads are narrow in congested area	Block collection system (Jali-jali)	Plastic bag Portable bin 20~40 l  	—	—	Small compactor vehicle  (4m ³)	① Small compactor vehicle
	Area D Where streets are wide in high income residential area	Door-to-door collection system	Plastic bag Portable bin 40~60 l  	—	(a front of door or gate)	Small compactor  (4m ³)	① Small compactor vehicle
Special Collection	Large facilities, such as buildings	① Large communal container collection system ② Small communal container collection system ③ Portable bin collection system	Large communal container (8-10m ³)  Portable bin (1m ³) (60-100 l)  	—	—	Large compactor  } Large compactor 	① Large container ② Small container ③ Arm roll vehicle ④ Large compactor
Bulky waste Collection	All areas	Designated day collection	—	—	—	Tipper  (4-8m ³)	① Tipper truck

PART III

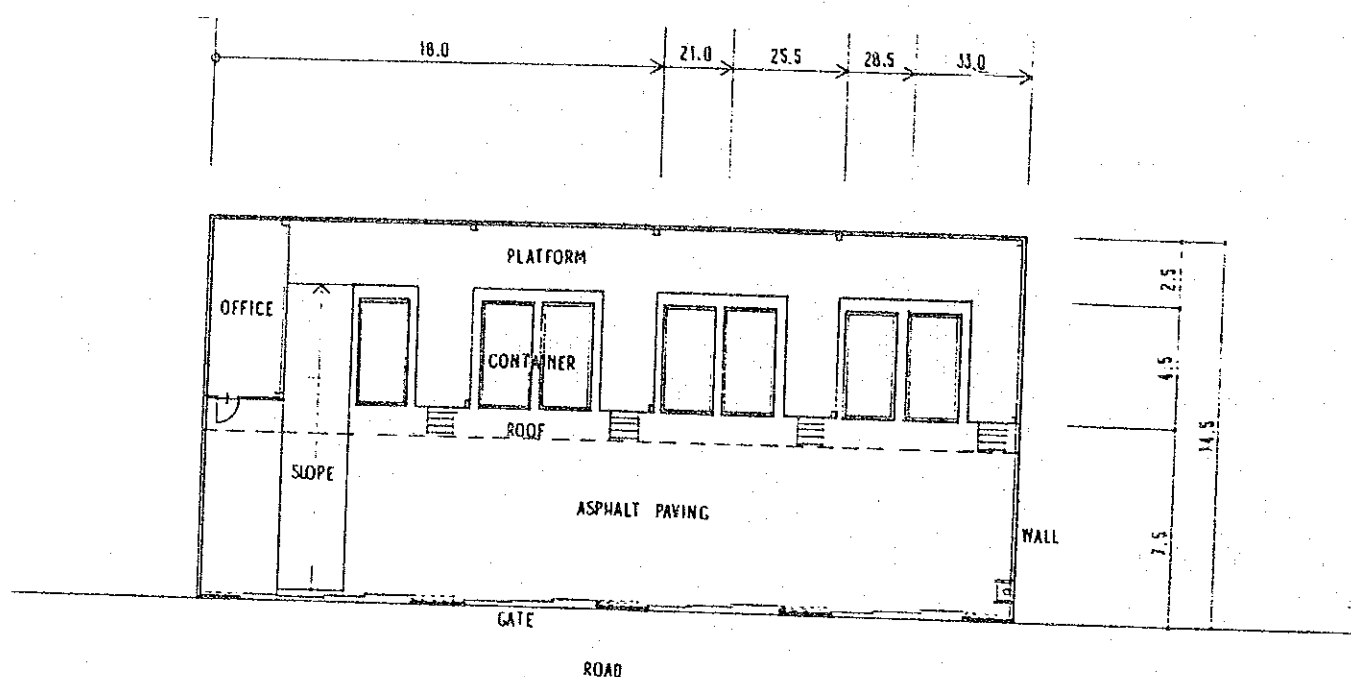


Fig. 3-1-3 Plan of Standard Depot

Where sites for new depots can be acquired, depots will be developed according to the following standards.

Table 3-1-2 Depot Standards

Size of Depot (m ³)	Area (m ²)	No. of Containers
60	310	3
80	380	4
100	420	5

(4) Improvement of collection equipments

Collection equipment will be provided as follows in order to improve the collection efficiency.

Table 3-1-3 Policy for Improvement of Collection Equipment

Ordinary Collection	Area A	Large Communal Container (8 - 10m ³)
		Arm Roll Vehicle
	Area B	Small Communal Container (1m ³)
		Large Compactor Vehicle (8 - 10m ³)
	Area C/D	Small Compactor Vehicle (4m ³)
Special Collection		Large Communal Container (8 - 10m ³)
		Arm Roll Vehicle
		Small Container (1m ³)
		Large Compactor Vehicle (8 - 10m ³)
Bulky Collection		Tipper Truck (medium size)

(5) Improvement of collection process

The efficiency of the process upto the loading of waste onto vehicles is an important factor in efficient waste collection. Important factors in the collection and loading of waste are the location of waste stations, loading height of collection vehicles and type of containers used for discharging waste. Handling of waste is particularly important and proper containers are necessary for its handling in a sanitary manner.

In view of the above, the collection process should be improved and speeded up by using plastic bags and portable plastic containers for waste discharge.

2) Improvement of organization and management

(1) Organizational structure

The organizational structure for waste collection shall be divided into the Suku Dinas Kebersihan and the Seksi Kecamatan as previously described. A Special Collection Section to administer special collection and control all vehicles and a Workshop Section to administer vehicle maintenance shall be established.

PART III

(2) Management and control

a. Control system

Control on weighing of waste, assignment of collection routes and standard work etc. shall be enforced.

b. Maintenance

Maintenance of vehicles, containers, etc. shall be stepped up.

c. Safety measures

Necessary measures shall be taken to prevent accidents during collection work.

3) Improvement of supporting systems

(1) Citizen cooperation

Citizen's cooperation should be strongly sought in respect to the method of waste discharge. Where handcart collection is in operation, its operation by the community shall be continued. Cooperation of the establishments discharging large amounts of waste shall be sought in view of installing containers.

(2) Enlightenment of inhabitants

A thorough understanding of the significance of waste collection activities is indispensable if the cooperation of citizens is to be obtained and, therefore, citizens should be provided with adequate information on waste collection activities.

(3) Support of citizens' activities

In order to support the handcart collection by inhabitants, the provision of handcarts, etc. shall be continued in the future.

PART III

Continued support shall also be given to community cleansing which is carried out as a community activity by the citizens.

(4) Regulations

Regulations pertaining to dischargers of large amounts of waste, regulations on waste discharge and regulations relating to waste collection, as well as work regulations and other necessary regulations, shall be stipulated as official rules.

3.1.4 Collection System Plan

1) Planned collection systems

(1) Ordinary collection

Four types of systems may be considered for ordinary collection. The local conditions for these systems were studied by RWs and the appropriate systems decided for each area, as shown in Fig. 3-1-4.

(2) Special collection

A special collection should be provided for establishments which discharge large amounts of waste. Approximately 600 establishments will be subject to special collection and their locations are shown in Fig. 3-1-5.

(3) Bulky waste collection

Bulky waste collection will be provided for all areas. In principle, this service will be provided on request when bulky waste discharged by inhabitants and business establishments cannot be collected by the vehicles used for ordinary collection or special collection.

PART III

2) Planned waste amount to be collected

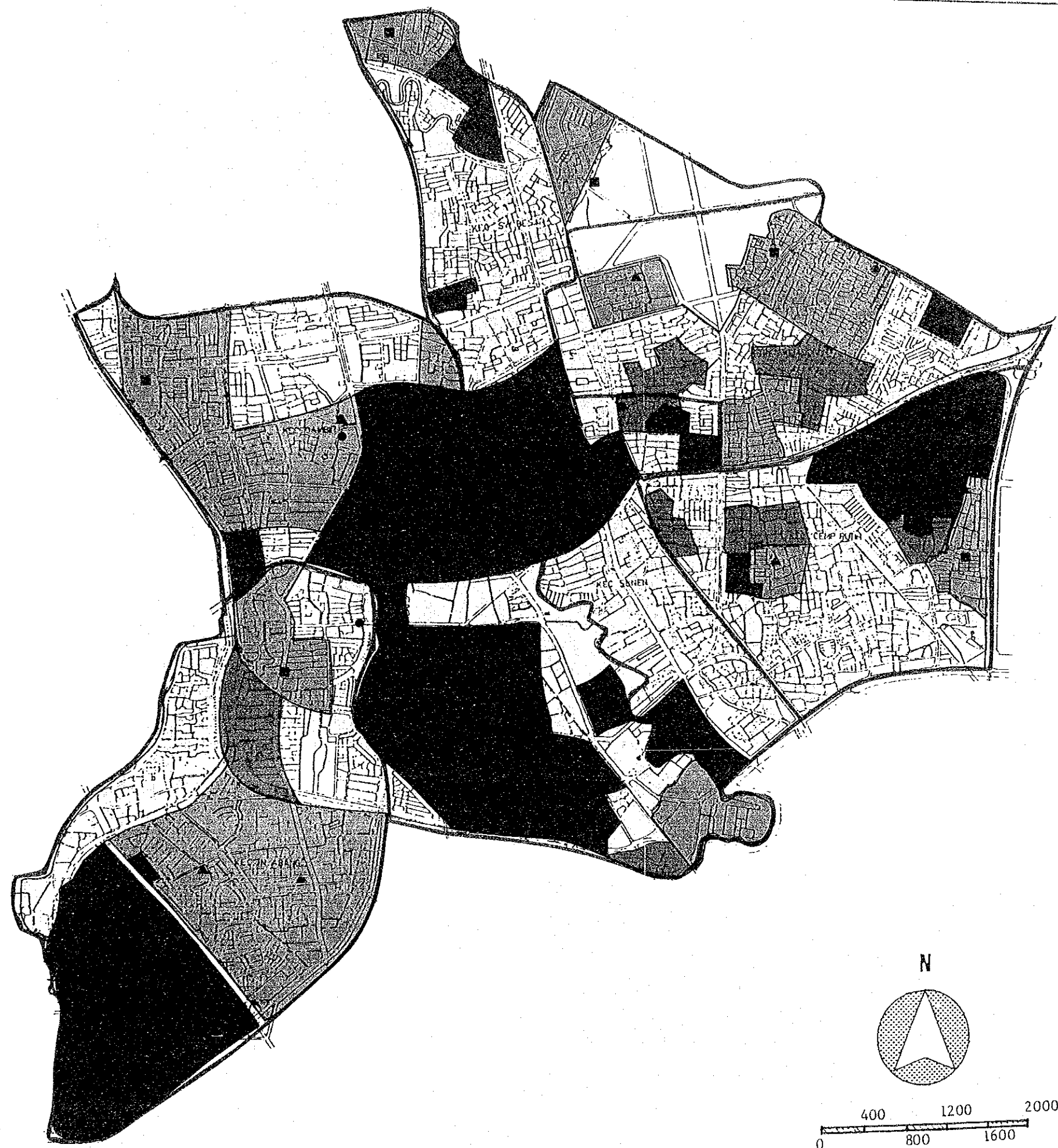
The entire amount of waste generated in Pusat is currently collected by the Suku Dinas Kebersihan, P.D. Pasar Jaya and private collectors and this arrangement will be continued, as indicated in the Master Plan.

The waste subject to this collection system improvement project is the waste collected by the Suku Dinas Kebersihan. The plan calls for the collection of the subject waste by the broadly classified systems of ordinary collection and special collection, as stated previously. The amount of waste to be collected by each system in the target year is as shown in Table 3-1-4.

3) Planned service population and waste amount.

(1) Ordinary Collection

The population and the waste amount for ordinary collection is as shown in Table 3-1-5.

LEGEND

COLLECTION SYSTEM


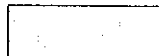





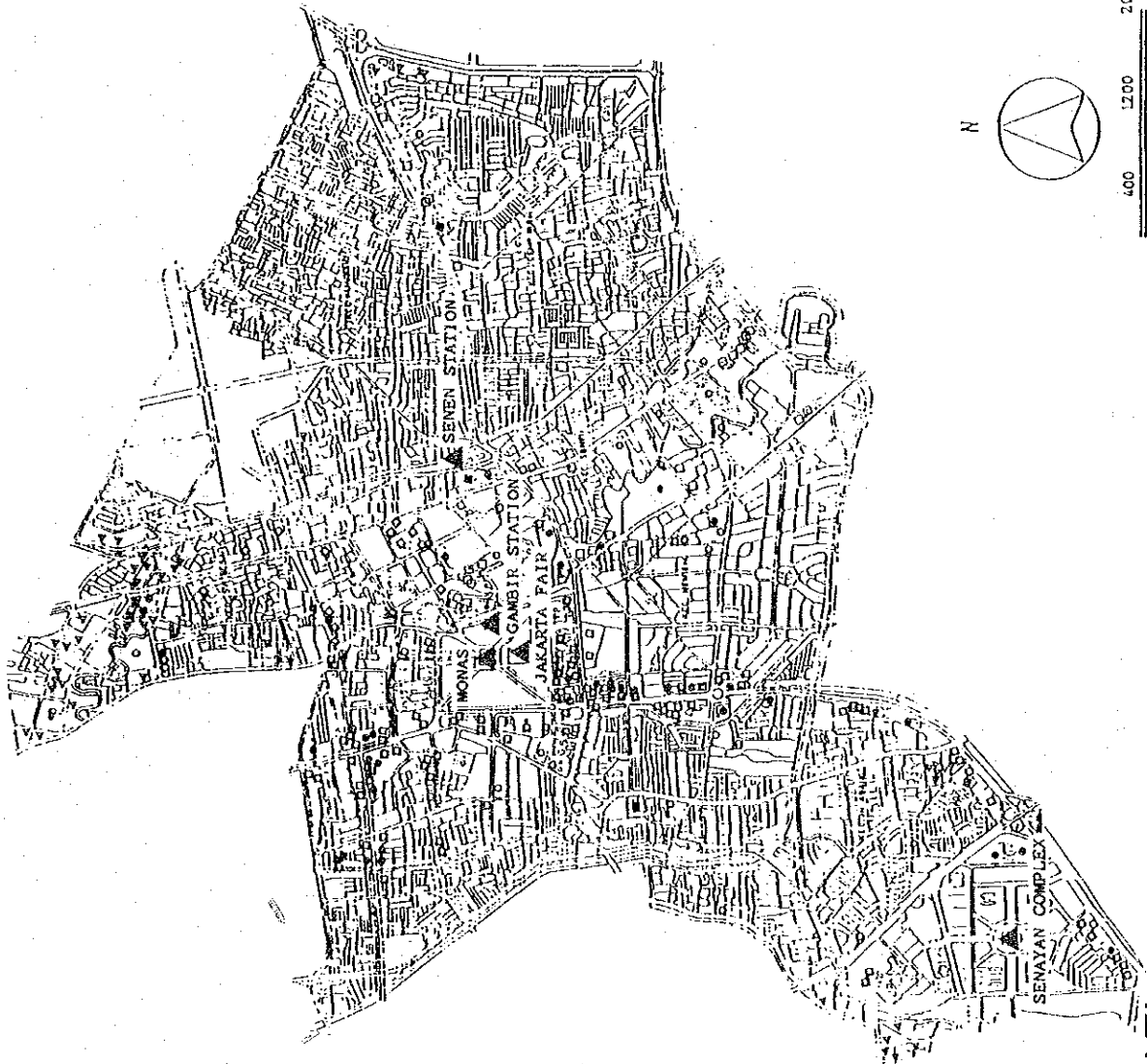
-  Depot-Container
-  Small Container
-  Jali-jali
-  New Door-to-door
-  Existing Depot
-  New Depot
-  Office

Fig. 3-1-4

Location Map of Collection
Systems in Ordinary
Collection

STUDY ON
SOLID WASTE MANAGEMENT SYSTEM
IMPROVEMENT PROJECT
IN JAKARTA



LEGEND :

▲ FACTORY

• COMMERCIAL
(HOTEL, RESTAURANT
SHOPPING CENTER)

□ OFFICE

○ HOSPITAL

■ MARKET

▲ OTHERS

Fig. 3-1-5 LOCATION OF LARGE
AMOUNT DISCHARGER

STUDY ON

SOLID WASTE MANAGEMENT SYSTEM
IMPROVEMENT PROJECT
IN JAKARTA

PART III

Table 3-1-4 Planned Waste Amount to be Collected

(Unit: tons/day)

		GAMBIR	KEMAYORAN	SENEH	CEMPAKA PUTIH	SAWAH BESAR	MEN- TENG	TANAH ABANG	TOTAL
1985									
	Households	60	80	50	80	60	50	90	470
Suku Dinas Collection	Commercial and busi- ness esta- blishments	100	10	40	20	50	50	30	300
	Markets	10	5	5	10	10	5	15	60
	Factories	15	0	0	0	10	5	30	60
	Total	185	95	95	110	130	110	165	890
Other Collection	Markets and facto- ries	18	21	28	16	16	22	39	160
TOTAL		203	116	123	126	146	132	204	1,050
1995									
	Households	60	90	60	90	70	50	100	520
Suku Dinas Collection	Commercial and busi- ness esta- blishments	70	10	30	10	40	40	20	220
	Factories	15	0	0	0	10	5	30	60
Ordinary Collection	Total	145	100	90	100	120	95	150	800
Suku Dinas Collection	Commercial and busi- ness esta- blishments	70	10	30	10	35	35	20	210
	Markets	20	10	10	15	20	5	20	100
	Total	90	20	40	25	55	40	40	310
Special Collection	Markets and factories	34	34	37	27	22	30	65	250
TOTAL		270	154	167	152	197	165	255	1,360

Fig.3-1-5 Service Population and Waste Amount for Ordinary Collection

	Hand- cart Depot	Hand- cart Pool	Conc- rete Bin	Open Space	Large Space	Jali- jali	Depot Con- tainer	Door to door	Small Con- tainer	Self Mana- gement
1986										
GANBIR	8,263 32.0 32.6	12,143 53.6 52.1	4,440 16.2 15.7	0 0 0	1,678 6.9 1.5	0 0 0	0 0 0	4,854 19.9 23.2	0 0 0	0 0 0
SAWAI BESAR	11,794 67.4 42.8	10,293 59.8 40.0	841 6.0 3.8	0 0 0	3,151 15.5 9.8	0 0 0	0 0 0	148 0.9 0.6	0 0 0	0 0 0
KEMAYORAN	2,254 12.5 4.9	28,235 152.3 59.4	1,170 6.1 0.6	0 0 0	3,334 15.8 6.2	3,365 18.1 7.1	0 0 0	1,860 13.0 5.1	0 0 0	0 0 0
SEKEN	0 0 0	13,645 69.5 38.7	276 1.0 0.6	0 0 0	4,031 19.7 11.0	3,581 15.4 8.6	0 0 0	6,061 26.3 14.7	0 0 0	0 0 0
CENPAKA PUTIH	2,512 11.5 5.4	9,151 51.9 24.2	0 0 0	0 0 0	2,342 10.0 4.7	17,065 86.2 40.3	0 0 0	2,822 12.7 5.9	0 0 0	4,450 20.4 9.5
MENTENG	3,447 18.5 13.1	481 2.8 2.0	4,060 23.9 17.0	980 4.8 3.4	1,994 14.2 8.0	4,351 26.8 20.2	0 0 0	2,991 21.8 15.5	0 0 0	0 0 0
TANAH ABANG	19,358 104.1 59.8	10,401 56.3 32.4	5,751 27.5 15.8	0 0 0	2,351 11.3 6.5	0 0 0	0 0 0	255 2.4 1.4	0 0 0	4,177 20.4 11.8
TOTAL	47,628 246.0 158.6	84,349 446.3 246.8	16,538 80.7 55.2	980 4.8 3.4	18,881 93.4 47.3	28,362 146.5 76.1	0 0 0	18,982 97.0 66.0	0 0 0	8,627 40.8 21.3
1995										
GANBIR	- - -	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	21,722 61.9 57.5	5,323 23.5 23.1	8,953 74.0 64.4	0 0 0
SAWAI BESAR	- - -	0 0 0	0 0 0	0 0 0	0 0 0	5.2 0 0	6,518 26.6 22.5	1,531 2.9 4.2	32,547 148.3 92.9	0 0 0
KEMAYORAN	- - -	0 0 0	0 0 0	0 0 0	0 0 0	4,441 25.8 4.4	27,434 122.9 47.4	2,891 16.8 12.0	22,633 94.4 36.4	0 0 0
SEKEN	- - -	0 0 0	0 0 0	0 0 0	0 0 0	2,038 10.1 5.8	0 0 0	6,130 28.2 17.6	25,946 125.6 69.8	0 0 0
CENPAKA PUTIH	- - -	0 0 0	0 0 0	0 0 0	0 0 0	663 30.1 12.1	7,262 31.6 12.1	3,692 17.1 12.0	35,713 157.2 63.6	0 0 0
MENTENG	- - -	0 0 0	0 0 0	0 0 0	0 0 0	4,703 18.9 9.2	5,791 26.3 17.2	4,249 23.4 18.8	15,259 68.6 50.2	0 0 0
TANAH ABANG	- - -	0 0 0	0 0 0	0 0 0	0 0 0	4,169 17.9 11.0	29,334 131.4 67.1	1,312 6.8 3.6	25,286 115.4 61.1	0 0 0
TOTAL	- - -	0 0 0	0 0 0	0 0 0	0 0 0	21,982 108.1 49.9	98,061 400.7 206.7	25,128 120.6 91.1	166,337 783.4 448.3	0 0 0

Upper line : No. of households / Middle line : Population
Lower line : Waste amount (t/day)

(2) Special collection

The number of establishments subject to special collection and the waste amount are shown in Table 3-1-6.

Table 3-1-6 Planned Waste Amount by Special Collection (1995).

	GAMBIR	SAWAH	KEMAYO-	SENEB	CEMPA-	MANTE-	TANAH	TOTAL
	BESAR	BESAR	RAN		KA	NG	ABANG	
					PUTIH			
Establishments								
FACTORIES	3	32	1	0	3	0	13	52
HOSPITALS	4	2	0	6	1	6	4	23
SCHOOLS/MOSQUES	30	26	33	51	52	45	54	291
HOTELS/RESTAURANTS	11	6	0	2	2	12	6	39
SHOPPING CENTERS								
OFFICES	72	22	0	14	6	35	17	166
OTHERS	3	4	0	1	0	2	1	11
MARKETS	2	2	1	1	2	0	4	12
TOTAL	125	94	35	75	66	100	99	594
Waste amount (1995)								
								(Unit: t/day)
COMMERCIAL etc.	70	35	10	30	10	35	20	210
MAKET	15	20	10	10	15	5	25	100
TOTAL	85	55	0	40	25	40	45	310

(3) Bulky waste collection

Bulky waste mainly consists of cuttings from garden trees and roadside trees. Bulky waste from households is mainly discharged in high class residential areas and little bulky waste is discharged from low and medium income households. It is extremely difficult to determine the amount of bulky waste but it is assumed to be around 3% of ordinary waste.

	(1995)
GAMBIR	4.4 tons/day
SAWAH BESAR	3.6
KEMAYORAN	3.0
SENEB	2.9
CENPAKA PUTIH	3.0
MENTENG	2.9
TANAH ABANG	4.4
TOTAL	24.2

(4) Depots

As shown in the following table, depots currently exist at 10 locations but most of them are not adequately equipped and need to be improved. The plan for the development of depots in those areas where the depot-container system is proposed in the collection systems plan is as shown in Tables 3-1-7 and 3-1-8. The location of the depots and the areas to be served by them are as shown on Fig.3-1-6.

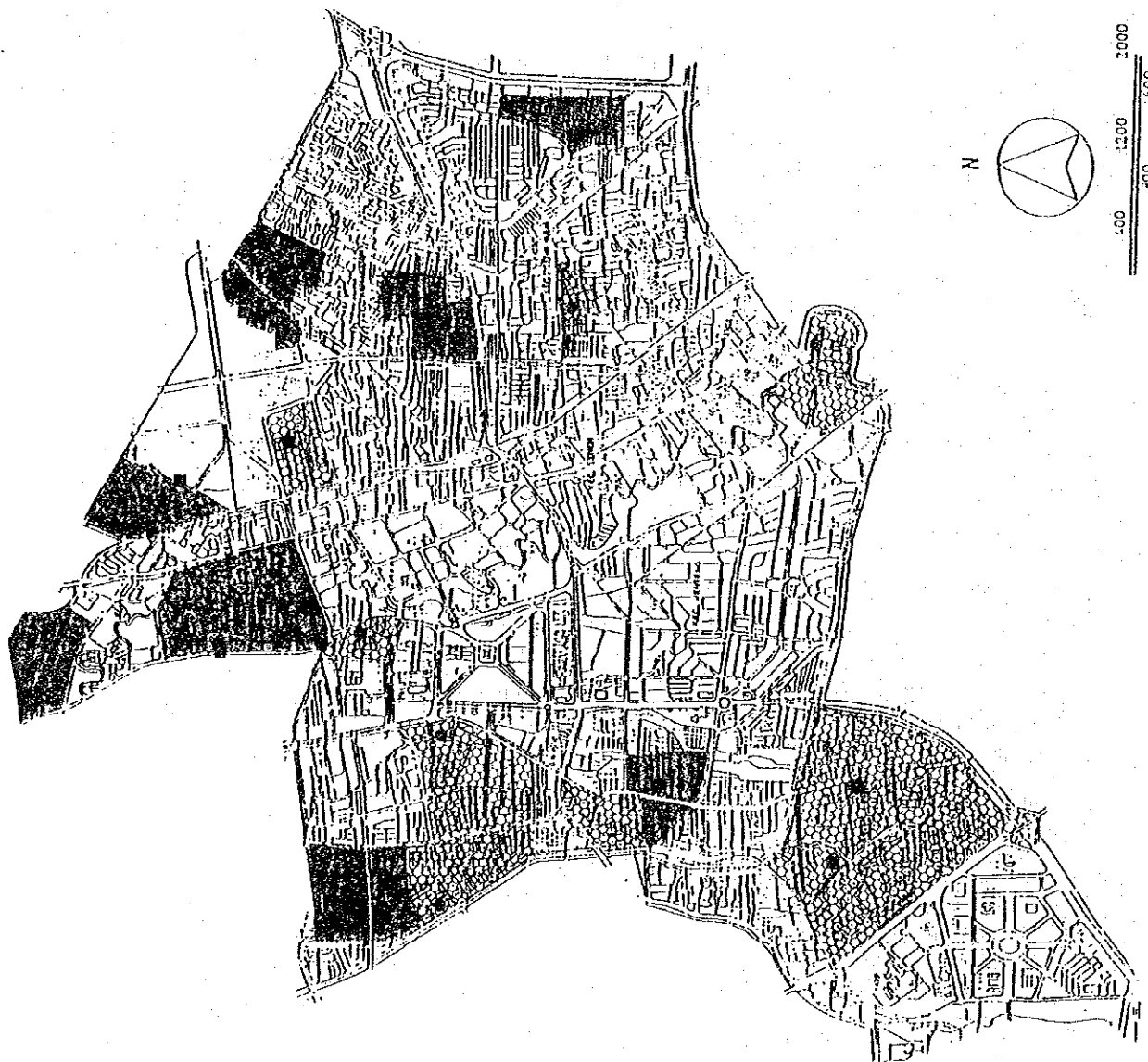
Table 3-1-7 Condition of Present Depots

No.	KECAMATAN	KELURAHAN	JALAN	AREA (m ³)	WASTE AMOUNT (m ³)	PRESENT CONTAINER
1	Gambir	Cideng	Jl.Tanjung Selor	305 (492)	60	Compactor Container
2	Gambir	Petojo Utara	Jl.Tanah Abang I	221	60	-
3	Gambir	Kebon Kelapa	Jl.Pintu Afr II	328	60	-
4	Tanah Abang	Kebon Kacang	Jl.Jati Baru	320	40	-
5	Tanah Abang	Karet Tengsin	Jl.Nabsyur	327	48	-
6	Tanah Abang	Bendungan Hilir	Jl.Penjernihan	267	36	-
7	Menteng	Pegangsaan	Jl.Matraman Dalam I	277	30	1*
8	Cempaka Putih	Johar Baru	Jl.Johar Baru	185 (300)	18	-
9	Kemayoran	Gunung Sahari Selatan	Jl.Kran	180	40	2
10	Sawah Besar	Karang Anyar	Jl.Karang Anyar	279	220	Compactor* Container

() including front yard

* Out of order

Of these, Sawah Besar will be abolished due to expansion of the railway zone.



LEGEND



NEW DEPOT



EXISTING DEPOT

Fig. 3-1-6

LOCATION OF DEPOTS

STUDY ON
SOLID WASTE MANAGEMENT SYSTEM
IMPROVEMENT PROJECT
IN JAKARTA

Table 3-1-8 Planned New Depots

No.	Kecamatan	Kelurahan	Jalan	No. of RW	Required Area (m ²)	Remarks
A	Gambir	Duri Pulo	Jl. Kompa	8	380	Present Suku Site
B	"	Cideng	Jl. Hasyim Ashhari	3	270	
C	Tanah Abang	Kebon Melati	Jl. Mas Mansyur	7	270	
D	Sawah Besar	Mangga Dua-Selatan	Jl. Mangga Dua Paser	6	380	
E	"	Gunung Sahari-Utara	Jl. Rajawali Selatan	3	270	
F	Cempaka Putih	Cempaka Putih-Timur	Jl. Cempaka-Putih Timur	3	270	
G	Kemayoran	Harapan Mulya	Jl. Harapan Mulya	9	420	
H	"	Serdang	Jl.	7	310	
I	"	Kebon Kosong	Jl.	7	270	
Total				53	2,840	

4) Service level Plan

(1) Ordinary collection

a. Waste discharge locations

The collection services which will be provided in Pusat are shown in Table 3-1-9.

Table 3-1-9 Waste Discharge Locations

SYSTEM	WASTE DISCHARGE LOCATIONS	REMARKS
Depot-Container	Depot	Residents must carry waste to depots by hand-cart or other.
Small-Container	Small-Container	
Jali-Jali	Waste collection vehicle	Residents must carry waste to waste collection vehicle.
Door-to-door	Kerbside	

Depots will be established at locations where waste can be easily transported by handcart. Small containers will be distributed with due consideration to the estimated waste amount and also to enable each RW to control its respective container.

b. Waste discharge times

The time for discharging waste will be regulated as shown in Table 3-1-10.

Table 3-1-10 Discharging Waste Times

SYSTEM	TIME ZONE	REMARKS
Depot-container	7:00 a.m. - 2:00 p.m.	
Small container	Early in the morning	
Jali-jali	When collection vehicle arrives	Collection vehicle shall generally arrive at a specified time
Door-to-door	Early in the morning on specified collection days.	

c. Waste collection frequency

The waste collection frequency will be regulated as shown in Table 3-1-11.

Table 3-1-11 Waste Collection Frequency

SYSTEM	FREQUENCY	REMARKS
Depot-container	Every day	
Small container	Every day or three times a week	According to the condition of each area
Jali-jali	Twice a week	
Door-to-door	Twice a week	

* For certain specified commercial districts, whether collection will be conducted once or twice a day will be decided depending on the condition of each district.

d. Waste discharge method

The form of storage, such as plastic bags and plastic portable containers, etc. for waste will be stipulated separately.

(2) Special collection

a. Waste discharge locations

The locations for discharging waste shall be generally located at the site of each facility.

The locations for waste discharge shall be accessible by collection vehicle.

b. Waste discharge times

Times for discharging waste shall be determined by the administrator of each facility.

PART III

c. Waste collection frequency

The collection frequency will be studied separately for each facility.

d. Waste discharge method

The form of storing waste will be stipulated separately.

(3) Bulky waste collection

a. Waste discharge locations

The locations for discharging waste are shown in Table 3-1-12.

Table 3-1-12 Places for Discharging Waste

SYSTEM		DISCHARGING PLACE
Ordinary collection	Depot-container	Depot
	Small container	Each home, on the street within the district
	Jali-jali	On the street within the district
	Door-to-door	Each home
Special collection		Each installation

b. Waste discharge times

The time for discharging wastes will not be stipulated and waste shall be discharged on days specified by the Dinas Kebersihan.

c. Collection frequency

Waste will be collected as requested by the dischargers.

d. Waste discharge method

Waste must be discharged in a form which can be loaded onto a collection vehicle.

3.1.5 Operation Plan

1) Work rules

(1) Work hours

a. Ordinary collection

Waste collection in residential areas will be carried out within the following normal hours.

8:00 AM - 3:00 PM (with one hour break)

Night collection may be considered for commercial areas, such as Pasar Baru.

7:00 PM - 12:00 PM

b. Special collection

In principle, special collection will be carried out within normal working hours. However, collection early in the morning or in the evening will also be considered for places which daily generate large amounts of waste.

c. Bulky waste collection

Collection will be done within normal working hours.

PART III

(2) Crew size

The crew size is shown in Table 3-1-13.

Table 3-1-13 Crew Size

SYSTEM		CREW SIZE
Ordinary collection	Large container - Arm roll vehicle	1 person
	Small container - Large compactor vehicle	4 persons
	Jali - jali - Small compactor vehicle	3 persons
	Door-to-door - Small compactor vehicle	4 persons
Special collection	Arm roll vehicle	1 person
	Large compactor vehicle	2 persons
Bulky waste collection	Tipper truck	2 persons

(3) Standard work schedule

The Standard work schedule is shown in Table 3-1-14.

Table 3-1-14 Standard Work Schedule

	ORDINARY				SPECIAL	
	Depot- Container	Small Container	Jali -jali	Door to door	Small Container	Large Container
Vehicle check, etc.	← (8:00 ————— 8:30) →				← (8:00) - (8:30) →	
Leave garage	← (8:30) →				← (8:30) →	
Journey (one way)	← (40 min.) →				30 min.	
Collection work	10 min.	60 min.	80 min.	80 min.	60 min.	10 min.
Loading and unloading	← (10 min.) →				← (10 min.) →	
Cleaning and refueling	← (20 min.) →				← (20 min.) →	
Time for one cycle of collection work	90 min.	140 min.	160 min.	160 min.	140 min.	90 min.

PART III

(4) Standard work volume

a. Ordinary collection

The standard number of trips, determined in accordance with conditions of each area, is shown in Table 3-1-15.

Table 3-1-15 Standard Number of Trips

Depot-container	Arm Roll Vehicle	3.5 trips
Small-container	Large Compactor Vehicle	2.5 trips
Jali-jali	Small Compactor Vehicle	2 trips
Door-to-door	Small Compactor Vehicle*	2 trips

* Provided that large compactor vehicles are employed in Menteng and Gambir.

b. Special collection

The standard number of trips per day shall be regulated as follows depending on the type of vehicle.

Arm Roll Vehicle ... 3 trips

Large Compactor Vehicle ... 2 trips

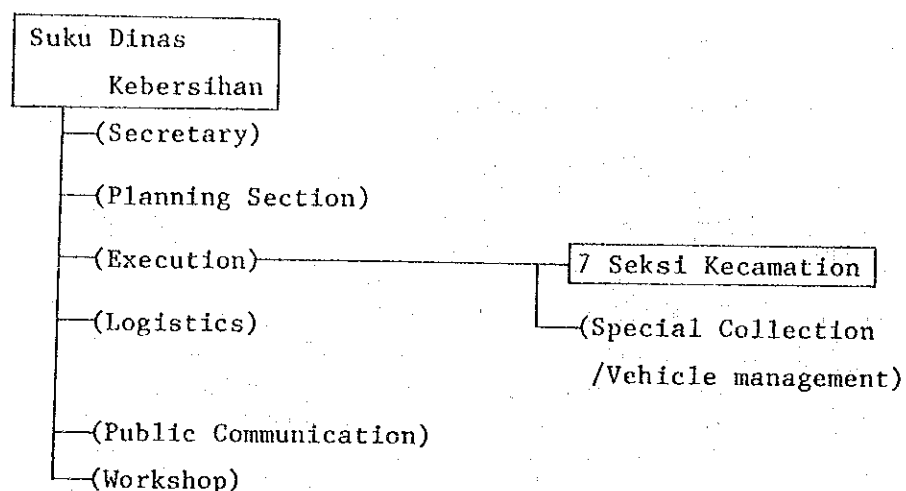
c. Bulky waste collection

The standard number of trips per day shall be two.

2) Management system

(1) Organizational structure and functional roles

Waste collection will be managed under the following organizational structure.



The Suku Dinas Kebersihan will mainly undertake planning, work control, logistics, public relations, special collection and vehicle management. The Sub Workshop will perform preventive maintenance and repair work. Specifically, each will perform the following roles.

Table 3-1-16 Function and Roles

PART III

Organization	Section	Functional Roles
Suku Dinas Kebersihan	Secretary	Coordination, planning, preparation of regulations and personnel, etc.
	Planning	Application of collection methods Application of collection routes Vehicle purchase plan Depot construction plan/construction management Survey on collection efficiency Time study Handcart purchasing and supplying plan
	Logistic(s)	Uniforms Supplies Spare parts Materials (containers, handcarts)
	Public communi- cation	Window for complaints Preparation of pamphlets RT/RW cleansing activities Control on supply of handcarts Information
Seksi- Kecamatan	Execution	Attendance control of personnel Operating status control of vehicles Trip control Collected waste amount control Work time control Safety measures Performance evaluation
		Daily working status control of ordinary collection and bulky waste collection Work allocation/assignment Provision of guidance to inhabitants
Garage	Vehicle management	Vehicle management Safety measures Control on departure time and returning time of vehicles Fuel consumption control Travelling distance control Washing of vehicles
	Special collection	Control of dischargers of large amounts of waste Arrangement for and work control of special collection and bulky collection.
Workshop		Periodical inspection Repair of containers Repair of handcarts Light repair work Vehicle breakdown process control Control of the use of spare parts

PART III

(2) Management method

a. Management indices

The following will be used as management indices.

① Maintenance

* Vehicle operating rate (monthly) ...

$$\frac{\text{No. of breakdown vehicles} \times \text{No. of days not worked (per month)}}{\text{No. of vehicles operating per day} \times \text{No. of days worked (per month)}}$$

* Maintenance ratio (monthly) ...

$$\frac{\text{No. of vehicles actually received maintenance work (per month)}}{\text{No. of vehicles planned for maintenance (per month)}}$$

② Collection efficiency

* Net collection efficiency

$$\frac{\text{Waste amount}}{\text{No. of crews} \times \text{Net waste collection time}}$$

* Gross collection efficiency

$$\frac{\text{Waste amount}}{\text{No. of crews} \times \text{Gross work time}}$$

③ Work load

* Daily work times and ratio

work time... Time of leaving garage/ time of arriving at
Seksi Kecamatan/time of arriving at and
leaving transfer station/time of returning
to garage

$$\text{ratio} \dots\dots\dots \frac{\text{Average time per trip by type of vehicle}}{\text{Standard time}}$$

* Daily waste amount and ratio

Waste amount collected per day per vehicle

$$\text{ratio} \dots \frac{\text{Actual amount collected (per month)}}{\text{Planned amount to be collected (Per month)}}$$

PART III

* Daily number of trips and ratio

Daily number of trips

ratio
$$\frac{\text{Total No. of trips by type of vehicle per month}}{\text{Standard No. of trips/day by type of vehicle} \times \text{No. of days worked per month}}$$

* Travelling distance

$$\frac{\text{Actual Travelling distance of the month}}{\text{Standard travelling distance per month}}$$

* Light oil consumption

④ No. of complaints (monthly)

⑤ Absentee rate

⑥ Accident occurrence rate

⑦ No. of days RT/RW collection activities were supported

⑧ Quantities of supplies and materials consumed

b. Management method

The following methods will be employed for managerial control.

* Daily records Absentee rates of drivers and workers

Number of trips

Amount of waste collected

Number of vehicle in operation

Record of maintenance work

Record of spare parts usage

Travelling distance

Light oil consumption

* Monthly records .. Seksi Kecamatan and Special Collection Section shall compile the monthly data of a foregoing management index 3 and records of 5, 6, 8, and 9 and write a monthly report.

PART III

The Workshop shall write a monthly report on 1 above.

The Suku Dinas shall write a monthly report which comprehensively summarizes the data for foregoing 1 through 9.

The Suku Dinas Kebersihan shall evaluate the collection activities of each Kecamatan and of other sections and suggest improvements to them also. It shall also compile the data for each vehicle and evaluate its productivity and review the work standards.

c. Control methods

The sections responsible for work control (Workshop, Special Collection, Seksi Kecamatan) shall prepare daily reports, on the basis of which they shall also prepare monthly reports and submit them to the Suku Dinas Kebersihan.

The Suku Dinas Kebersihan shall control the data submitted and prepare a monthly report for all of Pusat.

For accurate information management, computer processing shall be actively utilized.

One micro-computer shall be installed at the Special Collection Section and another at the Suku Dinas. These computers are to be exclusively used for the management of control data and not for management of fee collection data. Time control by time recorder and weighing control by truck scale shall be enforced and equipment which assures accurate data shall be actively utilized.

3) Collection equipment distribution plan

Collection equipment shall be distributed to each area as described below.

PART III

(1) Policy of vehicle distribution

Vehicles shall be distributed separately for ordinary collection, special collection and bulky waste collection.

a. Ordinary collection

In regard to ordinary collection, vehicles will be distributed so that each Kecamatan can, in principle, control its own vehicles. As exceptions, however, vehicles may be allocated jointly to two Kecamatans in consideration of utilizing them efficiently. Even in these special cases, the vehicles will be assigned to each of the two Kecamatans on different days of the week.

Small compactor vehicles used for jali-jali and door-to-door collection, on the other hand, will be utilized jointly. Large compactor vehicles used for small container collection will also be used for door-to-door collection.

b. Special collection

Since the discharging times and frequency of special collection will vary for each establishment, vehicle assignment will be determined depending on the waste discharge conditions at each.

c. Bulky waste collection

Bulky waste may be discharged in relatively large amounts in some districts and less in other districts. Special vehicles will be assigned to those districts where bulky waste is discharged in large amounts. However, in those districts where little bulky waste is discharged, a common vehicle will be utilized.

(2) Policy of container distribution

a. Ordinary collection

PART III

i) Large containers at depots

Containers should be able to cope with the amount of waste on Monday and one of the two containers should be emptied at least twice a day without fail.

ii) Small containers

Small containers will be placed on the assumption that waste will be collected three times a week and that the containers can hold three days' waste. They will also be placed so as to enable each RW to control its own container.

In business quarters, containers will be placed on the assumption that collection will be made every day (including Sunday).

b. Special collection

i) Large containers

Large containers will be placed at markets, play grounds, amusement parks and exhibition plazas, etc.

ii) Small containers

Waste will be collected every day (including Sunday) from department stores, shopping centers and hotels which are particularly large dischargers of waste. Small containers will be placed at these establishments on the basis of providing collection service twice a day. For other large dischargers, small containers will be placed so that the waste can be collected daily, except on Sundays.

(3) Policy of handcart provision

RWs which will implement handcart collection, will be provided with the necessary number of handcarts based on waste collection of twice a week with two trips per day to the nearby

depot.

(4) Vehicle distribution plan

a. Ordinary collection

The necessary number of vehicles is estimated for each Kecamatan according to the following formula.

Necessary number of vehicles

$$= \frac{\text{Variability factor} \times \text{mean collection amount}}{\text{No. of trips} \times \text{mean loading capacity}}$$

The necessary number of vehicles for each Kecamatan calculated as above and the number of stand-by vehicles are given in the following table. All vehicles shall be assigned to the Vehicle Management Section for centralized control. The stand-by vehicles shall also be controlled by the same section and dispatched as necessary.

Table 3-1-17 Vehicle Distribution Plan in Ordinary Collection

	Arm Roll Vehicles	Small Compactor Vehicles	Large Compactor Vehicles	Total
Gambir	8	0	11	19
Sawah Besar	3	1	11	15
Kemayoran	6	4	5	15
Senen	0	6	8	14
Cempaka Putih	2	6	8	16
Menteng	2	3	10	15
Tanah Abang	9	4	7	20
Sub total	30	24	60	114
Stand-by	5	4	11	20
Total	35	28	71	134

About 15% of the total number of vehicles is allowed for stand-by vehicles.

PART III

b. Special collection

Of those establishments subject to special collection, about 30% (in terms of the ratio of waste amount) can install large containers. The remaining 70%, however, must cope with their waste by installing small containers. The number of vehicles necessary is as follows. Every one of these vehicles will be controlled by the Garage Section.

Table 3-1-18 Necessary Vehicles for Special Collection

Arm Roll Vehicle	1
Large Compactor Vehicles	24
Stand-by Vehicles	4
Total	29

c. Bulky waste collection

The number of vehicles necessary for bulky waste collection is 8 small tipper trucks.

d. Summary of the Vehicle Distribution Plan

The necessary number of vehicles is as summarized in Table 3-1-19.

Table 3-1-19 Vehicle Distribution Plan

	1986								1995				
	Open		Tipper		S. Compactor		Arm Roll	Total	S. Compactor	L. Compactor	Arm Roll	Tipper	Total
	L	S	L	S	L	S							
Gambir	10	6	1	5	5	4	22	33	0	11	8	0	19
Sawah Besar	10	3	2	4	1	2	2	24	1	11	3	0	15
Kemayoran	7	2	1	4	3	3	3	23	4	5	6	0	15
Senen	10	2	0	4	2	4	2	24	6	8	0	0	14
Cempaka Putih	9	2	0	5	1	7	1	25	6	8	2	0	16
Menteng	11	2	0	6	5	7	2	33	3	10	2	0	15
Tanah Abang	10	7	2	6	3	1	1	30	4	7	9	0	20
Suku Dinas Garage	5	6	4	3	1	0	1	20	-	-	-	-	-
	4	41	6	8	58								
Total	72	30	10	37	21	28	14	212	28	101	36	8	172

(5) Container allocation plan

a. Ordinary collection

The allocation of small containers for each Kecamatan is as shown in Table 3-1-20.

Table 3-1-20 Allocation of $1m^3$ Containers

Kecamatan	Small containers
Gambir	278
Sawah Besar	400
Kemayoran	157
Senen	302
Cempaka Putih	275
Menteng	259
Tanah Aban	264
Total	1,935

The number of large containers that will be assigned to depots is as follows.

PART III

Table 3-1-21 Allocation of Large Containers

Kecamatan	No. of depots	No. of large containers
Gambir	5	15
Sawah Besar	2	6
Kemayoran	4	13
Senen	0	0
Campaka Putih	2	4
Menteng	1	4
Tanah Abang	4	17
Total	18	59

b. Special collection

The following containers will be used for special collection.

Table 3-1-22 Required Number of Containers for Special Collection

Waste discharge establishments	No.	Remarks (Collection frequency)
Market	167	Every day (Twice a day)
Hotel		
Shopping Center	182	Every day (Twice a day)
Others	433	Three days a week
Sub Total	782	
No. of large containers	11	One day a week

(6) Handcart provision plan

Table 3-1-23 Provision of Handcarts

Kecamatan	No. of depots	No. of handcarts
Gambir	5	112
Sawah Besar	2	44
Kemayoran	4	92
Senen	0	0
Campaka Putih	2	24
Menteng	1	34
Tanah Abang	4	131
Total	18	437

4) Personnel plan

The necessary personnel is shown in Table 3-1-24.

Table 3-1-24 Personnel Plan

	Chiefs (Senior & inter- mediate grade)	Staff (Junior grade)	Inspec- tors	Drivers	Workers	Total
Gambir	1	4	6	19	42	72
Sawah Besar	1	4	5	15	41	66
Kemayoran	1	4	8	15	30	58
Senen	1	4	6	14	47	72
Campaka Putih	1	4	7	16	45	73
Menteng	1	4	5	15	44	69
Tanah Abang	1	4	7	20	35	67
Special	2	6	7	44	138	195
Suku Dinas	9	19	16	-	8	52
Total	18	53	67	158	430	726

3.1.6 Equipment Provision and Facilities Construction Project

1) Specification of project contents

(1) Project objectives

- To expand and improve collection service.
- To establish a collection system consisting of the three categories of ordinary collection for ordinary waste, special collection for waste of large dischargers and bulky waste collection for bulky waste in order to realize a stable collection service.
- To reorganize the application of the collection systems, strengthen operation control and provide adequate collection equipment in order to realize efficient collection.

PART III

- To improve the conventional depots as well as construct new depots, in order to realize efficient collection.

(2) Specifications of the project

a. Planned collection service coverage

The planned collection service coverage will be improved from 88% in 1986 to 100% by 1992. This means that as of 1995, 134 t/day of additional waste will be collected by the expanded collection service. To cope with this expansion, the provision of new equipment will become necessary.

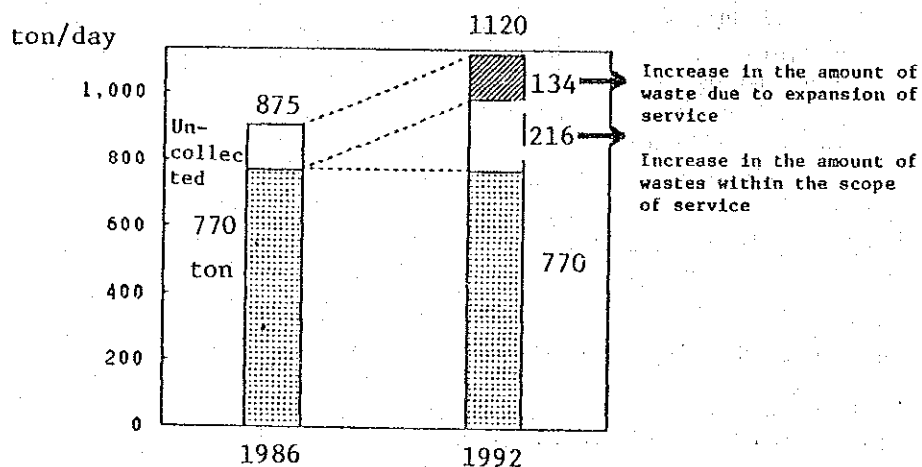


Fig. 3-1-7 Collection Amount

b. Ratio of special collection

The amount of waste currently collected from large dischargers is about 150 tons/day which is 20% of the current total amount of collected waste. This ratio will increase to about 30% between 1992-1995.

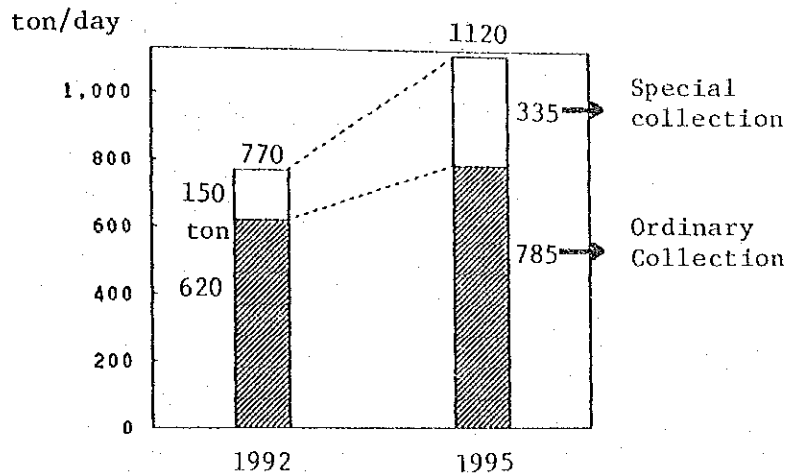


Fig. 3-1-8 Special and Ordinary Collection Amounts

c. Service method ratios in ordinary collection

The seven conventional ordinary collection methods will be integrated into four, not only to facilitate operation control but also to increase the weight of efficient collection methods. The transition of the share of each collection system is shown in Fig.3-1-9.

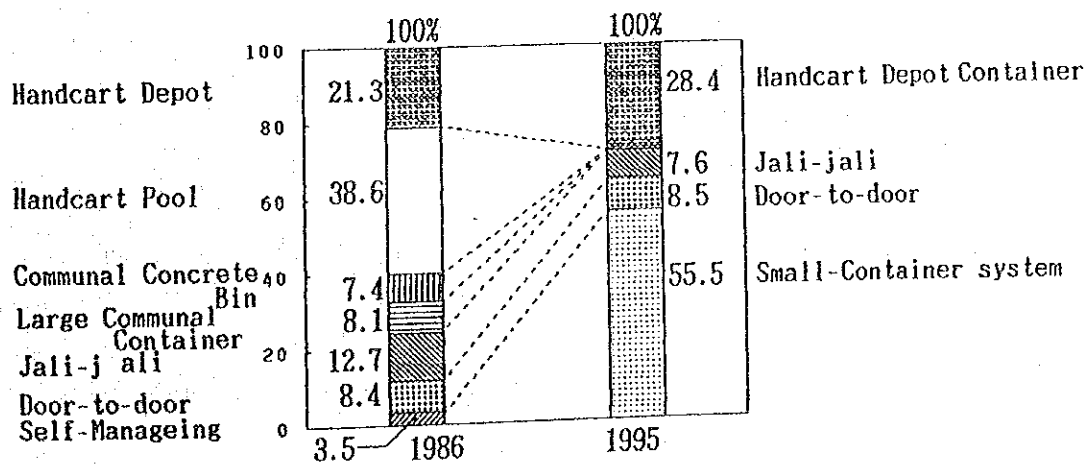


Fig. 3-1-9 Transition of Share of Each Collection System

PART III

Table 3-1-25 Population of Each Collection System

	1986			1995		
	RW	Population (10 ³)	Household	RW	Population (10 ³)	Household
Handcart Depot (Depot Container)	75	246.0	47,628	104	400.7	98,061
Handcart Pool	151	446.3	84,349	0	0	0
Communal Concrete Bin (Open Space)	25	85.5	17,518	0	0	0
Large C. Container	34.5	93.4	18,881	0	0	0
Jali-jali	50	146.5	28,362	28	108.0	21,982
Door-to-door	41.5	97.0	18,982	250	120.6	25,128
Self-Managing	14	40.8	8,627	0	0	0
Small Container	0	0	0	209	783.4	166,337
Total	391	1,155.5	224,347	391	1,412.7	311,508

d. Development of depots

Of the 10 depots that exist in 1986, one will be abolished and the remaining nine will be completely improved. In addition, nine new depots will be constructed.

2) Collection equipment provision plan

With the progress of the Project, waste collection vehicles and containers will be newly provided as Table 3-1-26.

Table 3-1-26 Collection Equipment Plan

				1986	1992		
					Total no. of units	New units	Replaced units
Collection vehicles	Open Trucks	L	72	0	0	0	
		S	30	0	0	0	
	Tippers	L (8m ³)	10	0	0	0	
		S (4m ³)	37	8	0	8	
	Compactors	L (10m ³)	21	99	78	21	
		S (4m ³)	28	28	0	28	
	Arm Rolls	L (10m ³)	14	36	22	14	
		S (6m ³)					
	Total			212	171	100	71
	Containers	Large Containers (6-10m ³)		48	70	22	48
Small Containers		334	2,717	2,383	334		
Handcarts (for subsidizing)			-	437	-	437	

3) Development of depots

Depots to be developed are as follows.

New depots will be developed according to the following specifications.

Specifications for Depots

Platform : Reinforced Concrete

Roof : Structure -- Steel

Roof ----- Galvanized steel, corrugated sheet
roofing

Pavement : Asphalt

PART III

Office : Structure -- Concrete block
Floor ----- Concrete + Mortar
Wall ----- Mortar + Paint
Roof ----- Galvanized steel, corrugated sheet
roofing
Door ----- Wood
Drainage : Open ditch with cover
Water Supply : Piping, taps
Electricity : Lighting, Electricity Supply
Wall : Concrete block with R.C. frame H=2m
Gate : Steel with wheel and rail

4) Other equipment

Micro-computers will be introduced for the operation control of collection services.

No. of micro-computers	2
Specifications	16 bit micro-computer, color display, hard disk 40 MB, Printer

In regard to truck scales, those installed at the transfer stations will be utilized.

3.1.7 Measures for Project Promotion

In order to make the improved collection system adequately function the support of the citizens, organizations and institutional system is considered necessary as shown in the following diagram.

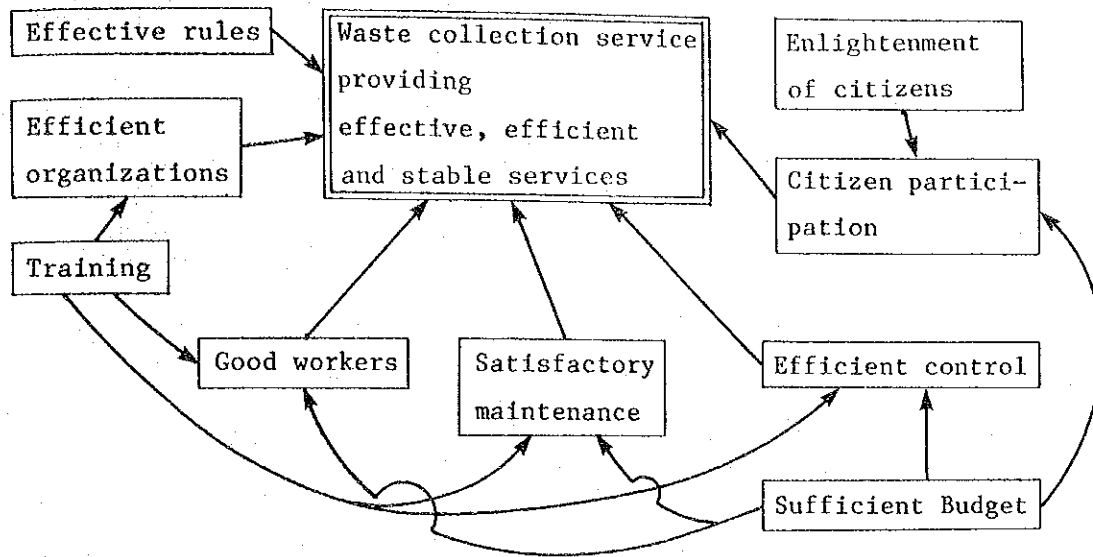


Fig. 3-1-10 Project Promotion Measures

Of the above, citizen participation, regulations and training will be discussed here as organization, maintenance and control have already been dealt with.

1) Citizen participation

The success or failure of the improved waste collection system will depend on whether or not the citizens' full cooperation can be secured. In concrete terms, citizen participation must be sought in regard to the following.

- a. Each household should keep its surroundings clean.
- b. Waste discharge rules should be observed.
- c. Handcart collection in districts which have a depot should be continued
- d. Each RW should control its own small communal containers.
- e. Citizens should cooperate in district sweeping and cleaning.
- f. Citizens should cooperate in recycling activities.
- g. Citizens should pay the collection fees.

In order to realize citizen participation, the following measures should be taken.

PART III

- a. Rules established for discharging waste and other relevant matters.
- b. Handcarts provided as necessary to support handcart collection by RWs.
- c. Support provided for the periodical kelurahan sweeping and cleansing.
- d. Each RW provided with small communal containers that would be easy to trace which RW is responsible.
- e. Support provided for recycling activities.
- f. Education provided for the enlightenment of inhabitants.

2) Rules

Regulations on the method of waste discharge (container to be used and discharge time), etc. and regulations pertaining to the responsibility of the citizens should be established.

3) Training

Training will be offered to senior management and middle management staff.

(1) Senior management staff will be given training in the following.

- a. How to appraise management indices and management conditions.
- b. How to collect and control data.
- c. How to establish targets and develop plans.
- d. How to operate organizations and systems

(2) Middle management staff will be given training in the following.

- a. Contents of managerial duties and management techniques.
- b. On institution and regulations
- c. On cleansing activities in general

4) Public communication

A pamphlet which provides general information on public sanitation and the importance of solid waste management, etc. will be prepared and distributed to women's associations and advanced classes of primary schools as part of the campaign to enlighten the public.








Billboards and instruction sheets describing the method of waste collection in each area and the corresponding method of waste discharge to be observed by the citizens will be prepared and/or distributed to RW/RT organizations to make sure that every citizen is fully informed on matters concerning waste collection.

3.1.8 Project Implementation Schedule

Overall improvement of the waste collection system will be implemented and synchronized with the operation commencement of the transfer station. However, a transition period of one year shall be allowed in which the changes in the collection system in Pusat shall be conducted. As management techniques, etc. can be improved without the provision of vehicles and other equipment, such improvements will be put into practice before the shift to the new collection system.

The following implementation schedule was developed with consideration to the above.

Table 3-1-27 Implementation Schedule

		1988	1989	1990	1991	1992-1995
Improve- ment of collec- tion	<ul style="list-style-type: none"> ● Detailed plan for improvement ● Detailed operating plan ● Application of the collection improvement plan 					
	<ul style="list-style-type: none"> ● Acquisition of sites for depots ● Development of depots ● Overall implementation of the improved collection system ● Purchasing of vehicles ● Purchasing of other equipment (Containers) 					
Other measures	<ul style="list-style-type: none"> ● Complete provision of rules ● Enlightenment of citizens 					
	<ul style="list-style-type: none"> ● Training <ul style="list-style-type: none"> Senior management Middle management 					

3.2. Improvement of Street Sweeping

3.2.1 Introduction

Street sweepers account for the largest segment of the cleansing personnel and their wage costs comprise a major part in the total personnel cost. Street sweeping, which is undertaken by such a large number of persons and at such great expense, is important behind the scene for maintaining the environment of Jakarta and it should not be forgotten that it contributes to the creation of job opportunities for many people.

Street sweeping will undoubtedly continue to be important in the maintenance of the city's environment. However, conditions in DKI Jakarta are undergoing the following changes.

- a. It is becoming difficult to carry out manual sweeping due to the increased traffic volume on major roads.
- b. Because equipment must be provided from the city's limited financial resources to expand the cleansing service and to cope with increased amount of waste, an increase of the manpower cost is greatly restricted. As a result, it is becoming difficult to increase the number of sweepers or to fill vacancies.

A rational street sweeping system is now being sought to cope with this situation. In other words, to switch the current empirically established system of street sweeping to one based on systematic planning and rational thinking.

3.2.2 Project Objectives

- a. Target year of the project 1992 - 1995

PART III

- b. Street sweeping coverage
 - Protocol streets 100%
 - Economy streets 100%
 - Other streets as required
- c. Mechanical sweepers will be assigned to arterial streets in view of the dangers involved.
- d. A rational street sweeping system will be established based on a systematic street sweeping management plan and manpower assignment plan.

3.2.3 Street Sweeping System Improvement Policy

1) Street Sweeping System Improvement Policy

(1) Sweeping method

a. Manual sweeping

In principle, the method of sweeping will be manual sweeping, as at present.

b. Mechanical sweeping

As it is extremely dangerous to employ manual sweeping in some arterial streets, mechanical sweeping will be introduced.

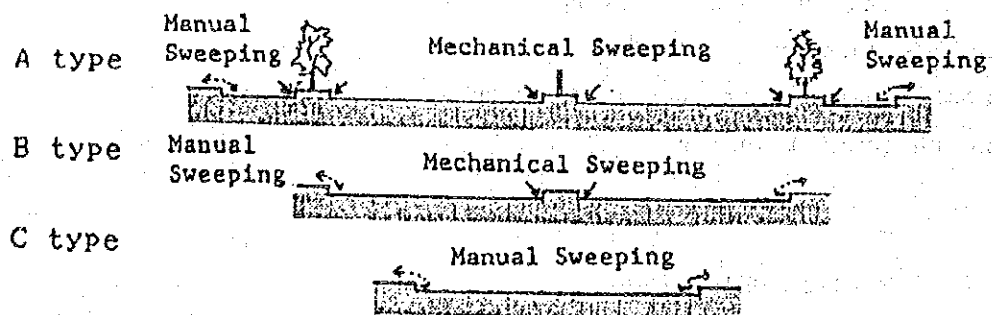


Fig. 3-2-1 Types of Streets for Sweeping

c. Provision of trash boxes

Trash boxes will be provided mainly at bus stops and those places where people tend to gather to prevent the littering of waste. Waste in the trash boxes will be collected by waste collection vehicles.

(2) Collection of street waste

Street waste collected by sweeping will be placed in communal containers ($1m^3$) provided on arterial streets and hauled to transfer stations by waste collection vehicles.

(3) Street sweeping process

a. Manual sweeping

Sweepers will be assigned to sweep certain streets. Three persons will form a team, two of the which will sweep the assigned street and the remaining one will collect the waste that has been swept. Sweepers will report to their respective Seksi Kecamatan Office, then walk to their assigned streets and sweep the waste into piles with a broom.

After sweeping, two persons will collect the street waste in a hardcart and transfer it containers.
The hardcart shall be inconspicuously parked.

b. Mechanical sweeping

The mechanical sweeper will leave the garage at night and sweep only the roadsides of arterial streets and then haul the collected waste to the transfer station.

(4) Provision of equipment and supplies

a. Manual sweeping

- brooms Those which can be procured locally.

PART III

- handcarts.. Wheelbarrows will be provided for streets where the waste mostly consist of sand and soil; ordinary handcarts will be provided for streets where the amount of waste is large.

- communal containers...

Those provided for collecting waste will be used.

b. Mechanical sweeping

- Vacuum type mechanical sweepers of the same type as the ones already introduced will be provided.

2) Supporting system development policy

(1) Control system

A control system capable of adequately controlling the work shall be introduced.

(2) Citizens' participation and cooperation

Citizens will be urged to sweep streets, other than those for which a sweeping service is offered by the public authorities. In addition, the citizens' cooperation shall be sought to prevent the littering of waste in streets.

(3) Regulations

Regulations against the dumping of waste in streets shall be strengthened.

(4) Organizational system

The administrative system for street sweeping will be separated from that for waste collection.

(5) Education of Citizens

Activities to enlighten citizens in view of becoming more sanitary conscious shall be promoted for citizen participation and cooperation in street sweeping.

(6) Safety measures

Sweepers should wear gloves, a helmet, uniform and special shoes during sweeping for their protection. In the case of night work in particular, they should wear a helmet with a fluorescent lamp. Other safety measures shall also be taken to assure complete safety.

3.2.4 Street Sweeping System Application Plan

1) Streets subject to sweeping

Street subject to sweeping are as shown in Fig.3-2-2.

2) Division of application of street sweeping method

Manual sweeping will apply to all streets while mechanical sweeping will apply to some Protocol streets. Mechanical sweeping will apply to the type A streets in Fig.3-2-3.

3) Extension of streets subject to sweeping

The length of the streets subject to sweeping is as shown in Table 3-2-1 and Table 3-2-2.

PART III

Table 3-2-1 Length of Streets for Sweeping

Street Characteristics	Gambir (*)	Menteng (*)	Sawali Besar (*)	Tanah-Abang (*)	Kemayoran (*)	Campak Putih (*)	Senen (*)	Total (*)
Protocol A	0	1.8(1.0)	0	7.6(1.0)	3.5(3.2)	8.2(3.2)	3.4(0)	24.5(8.4)
B	14.4(0.8)	4.6(0)	6.2(4.4)	0	3.0(1.8)	0.8(0.8)	2.4(0.6)	31.4(8.4)
C	0	0	0	0	0	0	0	0
Total	14.4(0.8)	6.4(1.0)	6.2(4.4)	7.6(1.0)	6.5(5.0)	9.0(4.0)	5.8(0.6)	55.9(16.8)
Economy A	0	0	0	0	0	0	0	0
B	5.6(2.7)	8.2(1.0)	0	6.6(1.4)	5.6(0.4)	0	2.6(0.6)	28.6(6.1)
C	6.2(0.8)	5.0(0)	6.4(1.2)	7(0)	5.3(0.2)	6(0)	3.9(1.2)	39.8(3.4)
Total	11.8	13.2(1.0)	6.4(1.2)	13.6(1.4)	10.9(0.6)	6(0)	6.5(1.8)	68.4(9.5)
Others A	0	0	0	0	0	0	0	0
B	0	0	0	0	0	0	0	0
C	5.1	24.8	0	3.4	0	0	1.4(0.6)	34.7(0.6)
Total	5.1	24.8	0	3.4	0	0	1.4(0.6)	34.7(0.6)

1) A,B,C means types of streets 2) (*) Boundary Streets

Table 3-2-2 Length of Street Sweeping

Street Characteristics	Gambir (*)	Menteng (*)	Sawah Besar (*)	Tanah-Abang (*)	Kemayoran (*)	Campak Putih (*)	Senen (*)	Total (*)
2/day								
P-A	28.0	11.8	0	14.2	8.0	14.0	11.0	87.0
P-B	2.0	13.4	8.0	6.0	0	0	0	29.4
Total	30.0	25.2	8.0	20.2	8.0	14.0	11.0	116.4
1/day								
E-B	11.9	59.6	0	8.6	20.6	12.0	11.2	123.9
E-C	11.6	2.0	11.6	14.0	0	0	2.2	41.4
O-C	10.2	0	0	6.8	0	0	0	17.0
Total	33.7	61.6	11.6	29.4	20.6	12.0	13.4	182.3

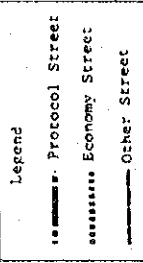
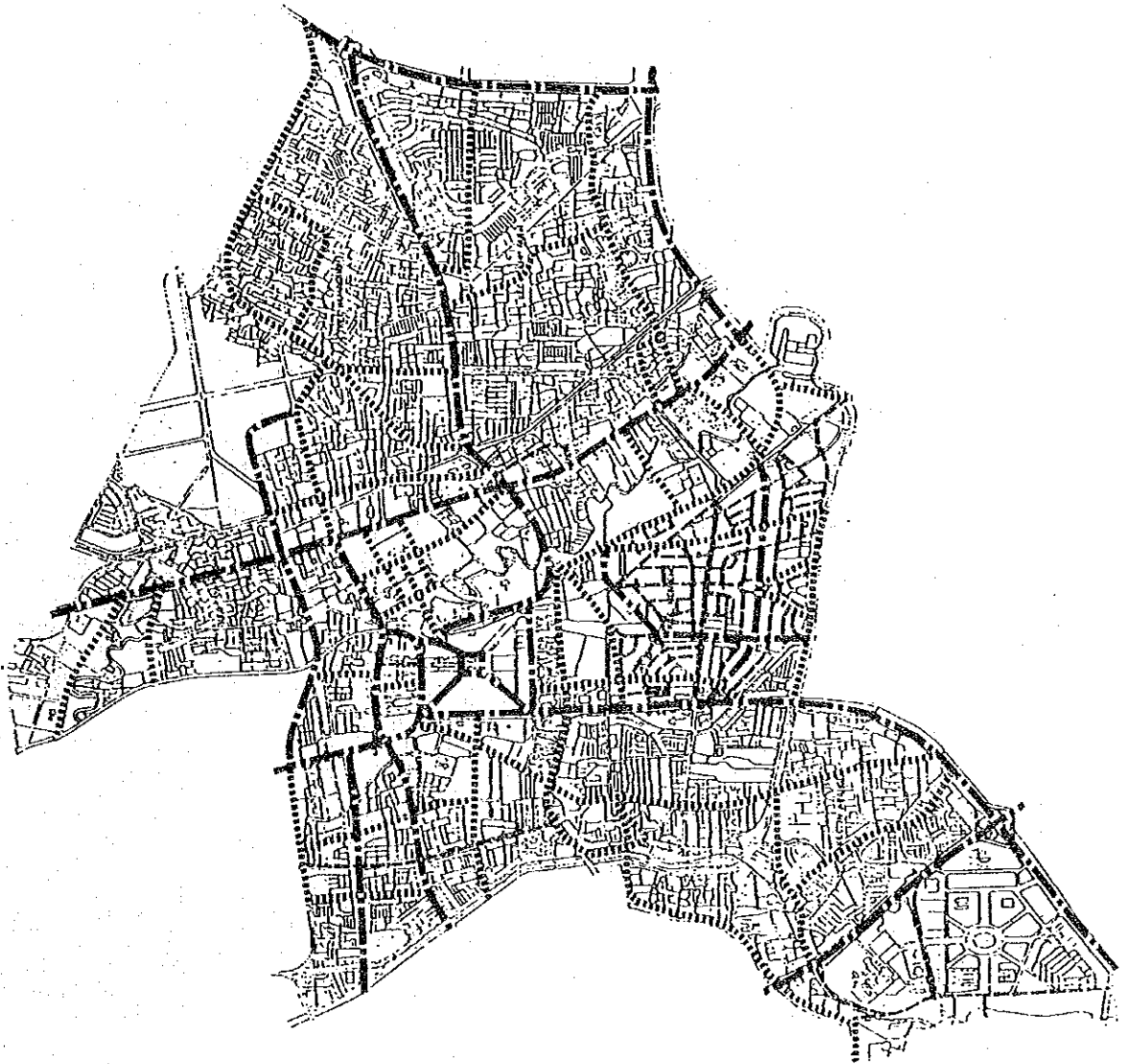
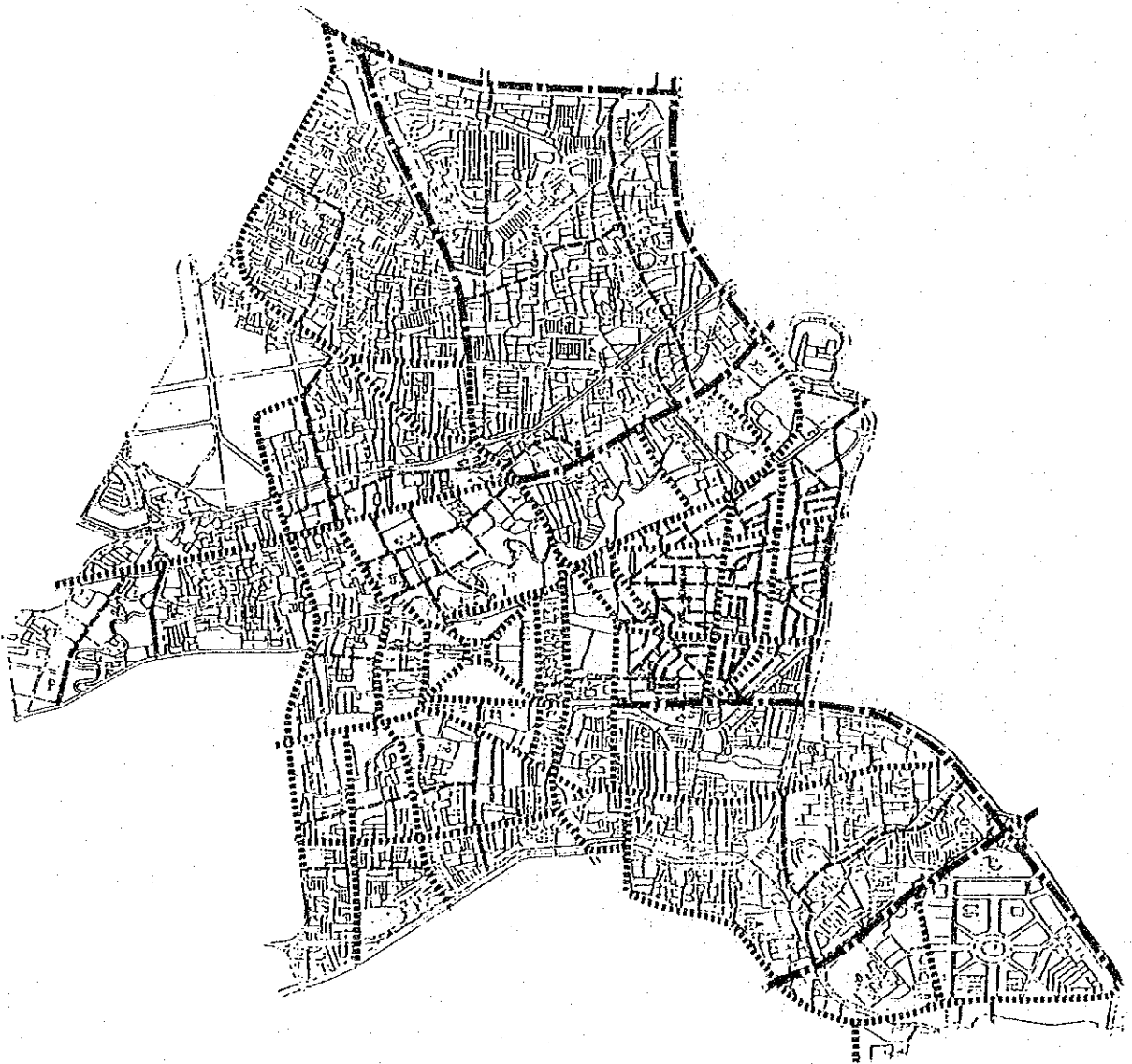


Fig. 3-2-2

Streets for Sweeping

STUDY ON

SOLID WASTE MANAGEMENT SYSTEM
IMPROVEMENT PROJECT
IN JAKARTA



Legend
 A
 B
 C

Fig. 3-2-3

Street Characteristics

STUDY ON
 SOLID WASTE MANAGEMENT SYSTEM
 IMPROVEMENT PROJECT
 IN JAKARTA

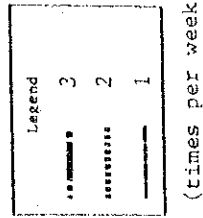
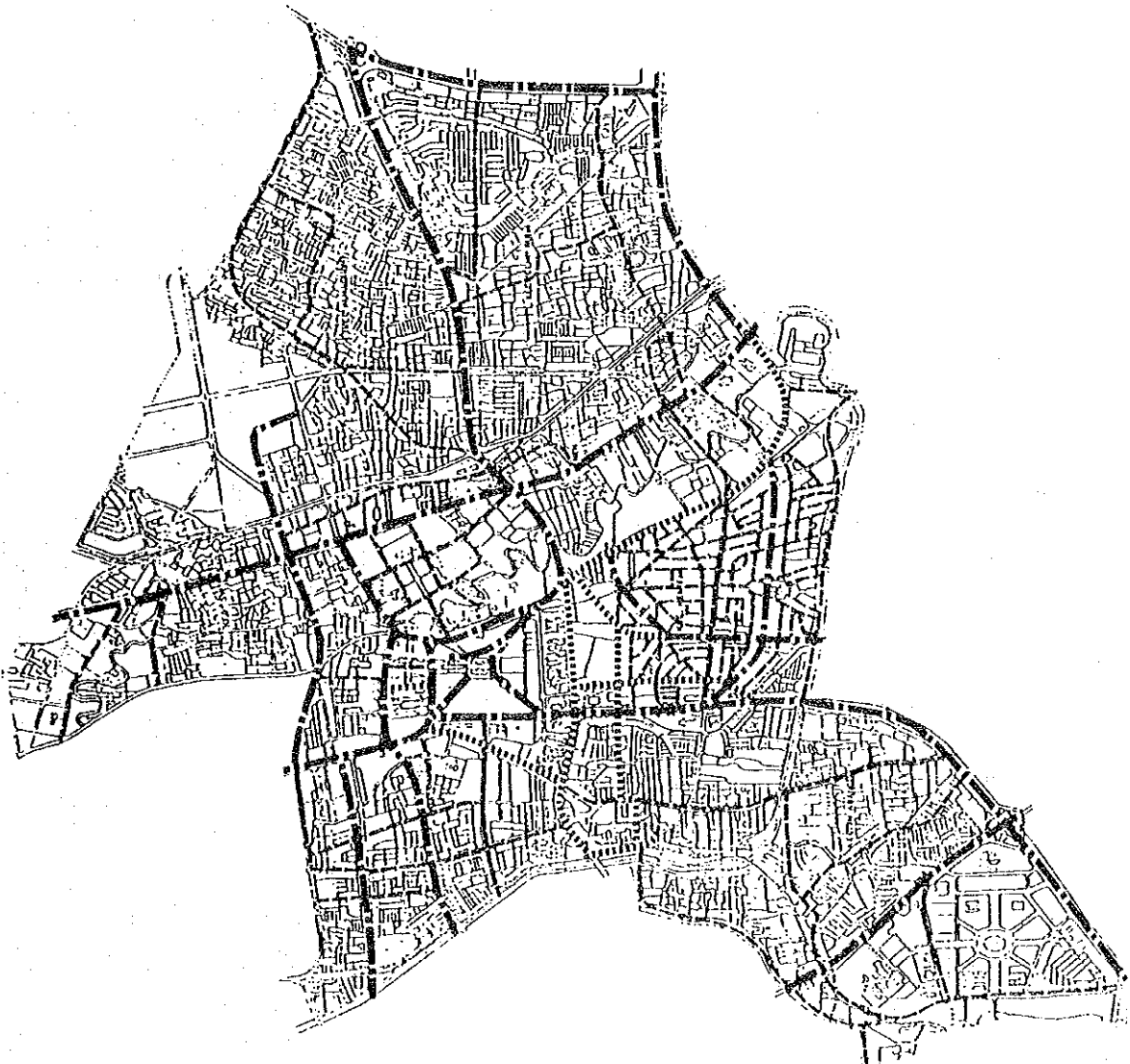


Fig. 3-2-4

Frequency of
Street Sweeping

STUDY ON
SOLID WASTE MANAGEMENT SYSTEM
IMPROVEMENT PROJECT
IN JAKARTA

4) Sweeping frequency

The standard sweeping frequency shall be as shown in Table 3-2-3.

Table 3-2-3 Sweeping frequency

	Manual Sweeping	Mechanical Sweeping
Protocol Streets	2/days	1/day
Important Economy Streets	2/days	-
Economy/Important Other Streets	1/day	-

Streets subject to manual sweeping classified by frequency are as shown in Fig.3-2-4.

3.2.5 Operating Plan

1) Work rules

(1) Working hours

a. Manual sweeping

Manual sweeping will start at 6 a.m. and end at 2 p.m. The working hours on streets that will be swept twice a day will be as follows.

1st sweeping from 6 a.m. to 9 a.m.

2nd sweeping from 11 a.m. to 2 p.m.

In the case of streets that will be swept once a day, the working hours will be from 6 a.m. to 2 p.m., or six hours at night.

b. Mechanical sweeping

The working hours will be from 11 p.m. to 6 a.m. the following morning but the actual sweeping time will be between 12 a.m. and 5 a.m. with the remainder of the time used for the inspection of equipment and supplies.

(2) Standard workload

a. Manual sweeping

The workload per hour of manual sweeping will vary depending on whether there is a side walk and on traffic conditions but the standard sweeping length/sweeper/day shall be set at 2,000 m. The average sweeping speed will be 500 m/h.

b. Mechanical sweeping

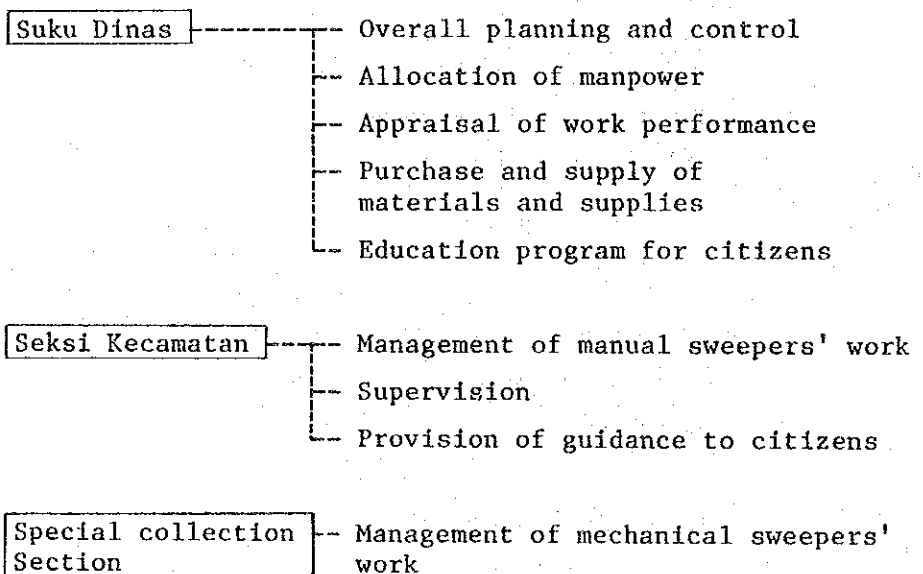
The average operating speed shall be set as follows.

10 km/h

2) Control system

(1) Sharing of functional roles

The Suku Dinas and Seksi Kecamatan Office shall respectively share the following roles.



(2) Control methods

a. Suku Dinas

The following should be mainly prepared exercise control.

- Ledger of streets to be swept
- Diagram of manual sweeping work assignments
- Map of appraisal spots
- Mechanical sweeping route map

The following will be used as control indices.

- Number of complaints from citizens
- Results of appraisal at appraisal spots periodically patrolled.
- Sweeper's working time per street extension (according to report of Seksi Kecamatan)

PART III

b. Seksi Kecamatan

The Seksi Kecamatan will prepare the following to exercise control.

Diagram of work assignment

Time schedule

The following will also be used to appraise work in the daytime work area.

Number of complaints from citizens

Net working time of sweepers

3) Manpower plan

The necessary manpower is shown in Table 3-2-4.

Table 3-2-4 Manpower for Street Sweeping

Kecamatan	1985		1992 - 1995		
	Sweepers	Sweepers	Drivers	Inspectors	Total
Gambir	131	78	0	5	83
Menteng	174	109	0	7	116
Sawah Besar	68	23	0	2	25
Tanah Abang	113	58	0	4	62
Kemayoran	42	30	0	2	32
Campaka Putih	41	33	0	2	35
Senen	100	30	0	2	32
Special		0	5	1	6
Suku Dinas *	24	0	0	0	0
TOTAL	693	361	5	25	391

* Suku Dinas Sweeper: Mechanical Sweeping Equipment Driver

3.2.6 Equipment Provision Plan

The necessary equipment, etc. is shown in Table 3-2-5.

Table 3-2-5 Equipment for Street Sweeping

	1986	1992-1995
Broom		
Handcarts/wheelbarrows		114
Mechanical sweepers	2	6

Brooms, uniforms and helmets and trash boxes, etc. are considered items that will need to be renewed every year.

3.2.7 Project Promotion Measures

1) Citizen participation

Street sweeping will be promoted by citizen participation. By stipulating in the regulations that each household should be responsible for keeping its own surroundings clean, the citizens shall be urged to maintain a clean environment.

In addition, by coordinating with the Camat of each Kelurahan, the once-a-month-cleaning of the area by the local community shall be continued and Dinas Kebersihan shall back up this activity by hauling the waste so collected.

2) Regulations

Regulations pertaining to the responsibility of citizens, penal provisions against unlawful dumping of waste and application of penal provisions by policemen, etc. shall be reviewed and stipulated as rules to raise the citizens' sense of responsibility.

3) Education of the citizens

School children shall be taught about citizen responsibility and the importance of cleanliness for sanitary reasons. An area cleaning and sweeping day shall be also established, and information shall be provided through community organizations about those days.

4) Training

In order to ansure the smooth implementation of the Project, the executive staff of the Suku Dinas and chiefes of the Seksi Kecamatans will receive training in planning and managerial techniques.

3.2.9 Project Implementation Schedule

In order to improve the street sweeping system, it should be advanced according to the following schedule, starting first of all with the improvement of the implementing organization.

Table 3-2-6 Implementation Schedule

Description	1988	1989	1990	1991	1992-1995
Strengthening of the organizational structure				→	
Detailed study of current conditions			→		
Detailed implementation plan			→		
Strengthening of regulations	---	→			
Instructing of cleansing personnel			→		
Purchasing plan for project equipment			→		
Purchasing of equipment				→	
Training of executive staff				→	
Provision of guidance to citizens, etc.		---		→	
Preparations for the new organization and system				→	
Start of project					→

3.3 Sunter Transfer Station Project

3.3.1 Position of Transfer station and Facility Scale

Jakarta currently has three disposal sites at Serenseng, Cakung and Kapuk Kamal, mainly for open dumping. The capacity of these disposal sites is too small compared to the estimated waste generation of 4,930 t/d. As it is difficult to secure large scale disposal sites within Jakarta, the City plans to secure future disposal sites at Bekasi, located 35 kms southeast of the city center, and at Tangerang, located 35 kms to the northwest of the city.

Locating disposal sites at more distant places will not only deteriorate transport efficiency but will also invite rising costs and make the collection system unstable. To cope with the problems that will arise from locating the disposal sites at remote places, it will be necessary to enhance transport efficiency by using larger haulage vehicles, and to separate the collection function from the transport function and develop facilities with a transfer function to stabilize collection.

The Sunter Transfer Station is intended as a facility to transfer the waste generated in Pusat; where the requirement for such a station is particularly acute, in order to realize the improvement of solid waste management by the target year of 1995. For the following reasons, the size of this facility will be 1,730 t/day, which is the estimated amount of waste in Pusat that will have to be transferred in 2005.

- a. Urbanization is already in progress in Pusat and this is the only available site for locating a transfer station.
- b. A station with a life expectancy of 15 years will have an extra capacity, at least for the time being, even if the necessary amount of waste from Pusat is transferred. However, it can be operated at full capacity by also transferring the waste of adjacent Utara.

3.3.2 Planning Conditions

1) Service areas

The Station will accept waste generated in Pusat. The areas that will be served are as shown in Fig. 3-3-1. However, as the Station will have some spare capacity, at least for the time being, it will also accept waste generated in Utara.

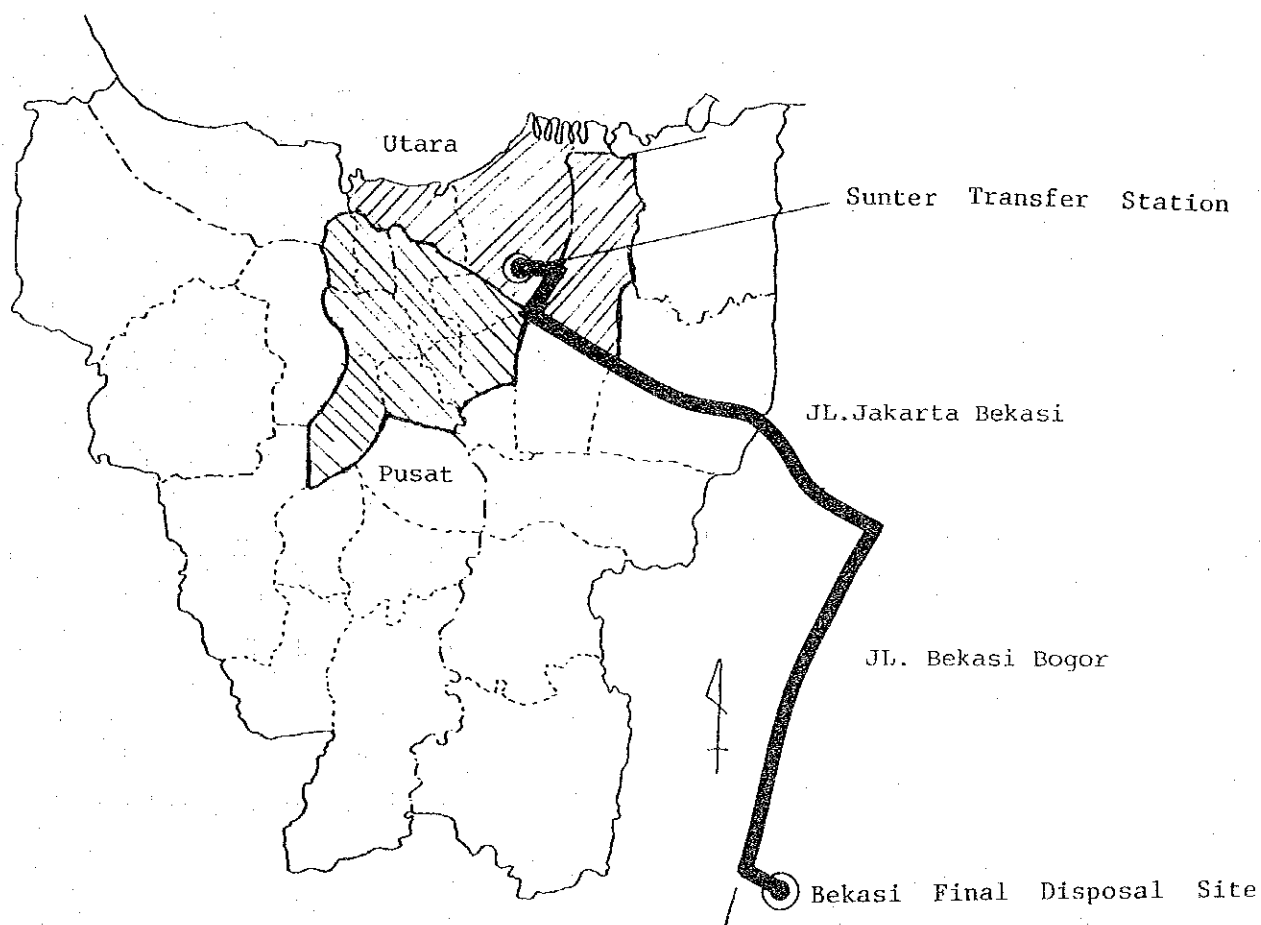


Fig.3-3-1 Areas to be Served

2) Target year of the project

The target year of the Project is 1995.

3) Subject wastes

The subject waste shall be the entire amount of waste generated in the service areas, excluding waste which is self disposed of. Classified by the type of haulage, the subject waste is as follows.

- a. Waste collected by ordinary collection
- b. Waste of large dischargers collected by special collection
- c. Bulky waste
- d. Waste directly transported

4) Planned treatment amount

The planned waste amount to be treated shall be the same 1,730 t/d which is the amount transferred from Pusat. Since twice a week collection is practiced in Pusat to cope with this much waste, four days' waste, including the amount generated on Sunday, must be transferred during the three days of Monday, Tuesday and Wednesday. Hence, the planned treatment capacity shall be 2,310 t/d while the hourly treatment capacity shall be 420 t/d, i.e. 1.45 times the average rate, so as to be able to cope with the hourly fluctuations in the amount hauled in. Maintenance work should be done at the end of week when the facilities are not being fully utilised.

Planned treatment amount 1,730 t/day

Planned treatment capacity $1,730 \text{ t/d} \times 4/3 = 2,310 \text{ t/d}$

Hourly treatment capacity $2,310 \text{ t/d} \times 1.45 \div 8 \text{ hr/d} = 420 \text{ t/d}$

The planned treatment amount by year will be as follows.

Table 3-3-1 Planned Treatment Amount

	(tons/day)			
	1992	1995	2000	2005
Jakarta Pusat	1,240	1,310	1,520	1,730
Jakarta Utara	490	420	210	-
Total	1,730	1,730	1,730	1,730

5) Transportation Vehicles

With due regard to the current status and the future collection plan, the following types of vehicles will be considered for collecting waste.

Compactor Large	10m ³
Compactor Small	4m ³
Container Large	10m ³
Container Small	6m ³
Tipper Large	10m ³
Tipper Small	6m ³

In principal, waste hauled in by ordinary trucks will not be accepted because a long time required for unloading.

6) Working conditions

As a rule, transfer stations shall be operated six days a week and eight hours a day from 8:00 to 16:00. The annual working days will be 313 days.

No. of working days	6 days/week 313 days/year
Working hours	8 hours/day 8:00 - 16:00

Seasonal fluctuations in the amount of waste is coped with by extending the working hours.

7) Location of site for transfer station

The two locations shown in Fig. 3-3-2 may be considered as appropriate sites for locating the facilities of Sunter Transfer Station relative to the proposed street for construction under City Planning. While Alternative A proposes to use the existing JL.Danau Sunter Selatan as the access road, Alternative B proposes to use the street which is planned to be constructed under City Planning.

As a result of the comparative study of both alternatives, it was decided Alternative A be chosen because of the following reasons.

- a. Most of the site of Alternative A is already reclaimed and the ground is relatively stable.
- b. If Alternative B is adopted, a long access road would have to be constructed for the interim period which would make the cost high.
- c. The land on which the transfer station shall be built must be a well-shaped piece of land. The shape of the land in Alternative B will not allow a functionally efficient layout of facilities.
- d. According to the Plan, a road to connect the existing JL. Danau Sunter Selatan with the planned street is also planned. No particular problem, therefore, is foreseen in gaining access to the site of Alternative A in the future.

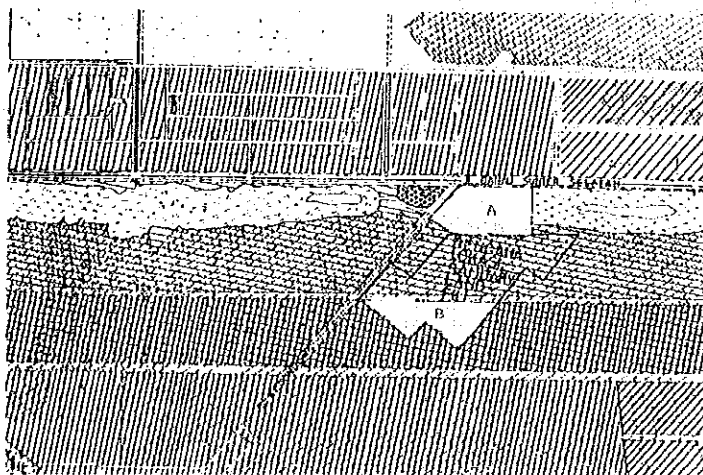


Fig.3-3-2 Location of Alternative at Sunter Site

3.3.3 Traffic Line Plan

1) Hauling

The road which will be used for hauling wastes in and out of the transfer station is shown in Fig.3-3-3. To haul in waste from Pusat, access to the site will be gained from the east side via JL.Laks Mude Sundarso at the initial stage. In the future, however, access will be gained from the west side of the station via the road to be constructed in Kemayoran District. Waste from Utara will be mostly hauled from the west side.

Waste which has been transferred will be hauled to the Bekasi disposal site for landfilling. Accordingly, outgoing vehicles from the station will gain access to the station from the east side. To reach Bekasi disposal site from the transfer station, the JL.Jakarta Bekasi will be mainly used. The vehicles to be used for transport are semi-trailers with a loading capacity of 40 m³ each. The intersection of JL.Danau Sunter Selatan and JL. Laks Muda Sudarso, therefore, will have to be improved.

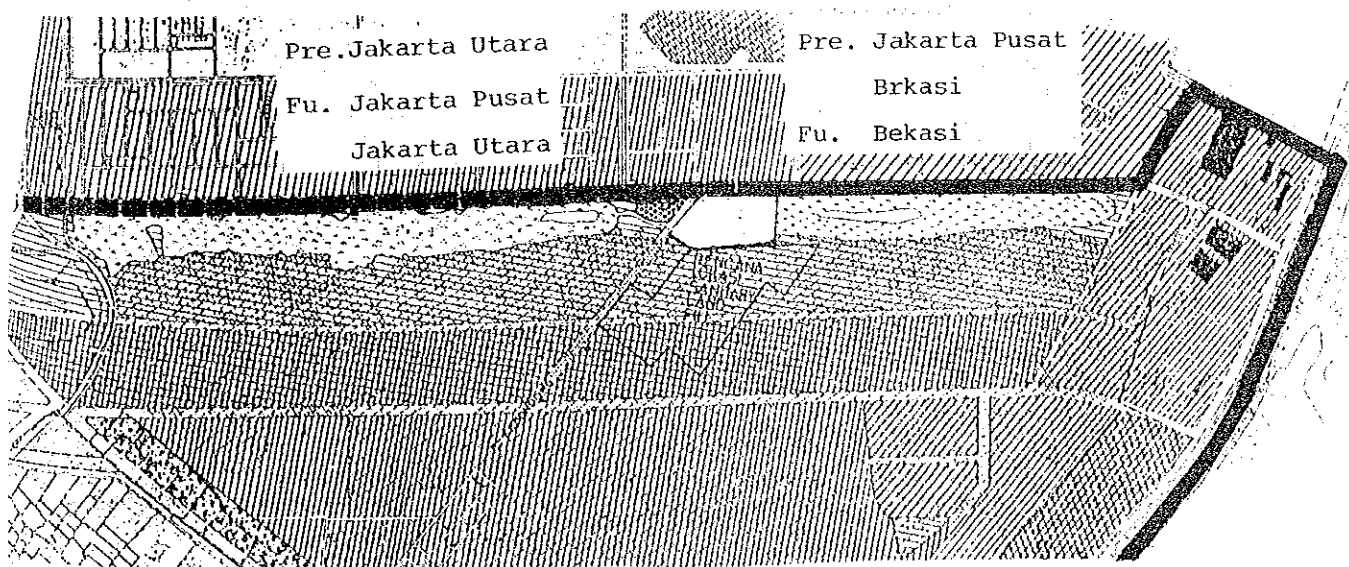


Fig.3-3-3 Access to the Sunter Transfer Station

2) Traffic line plan on the premise

Major traffic lines on the premise of the transfer station will be the following three.

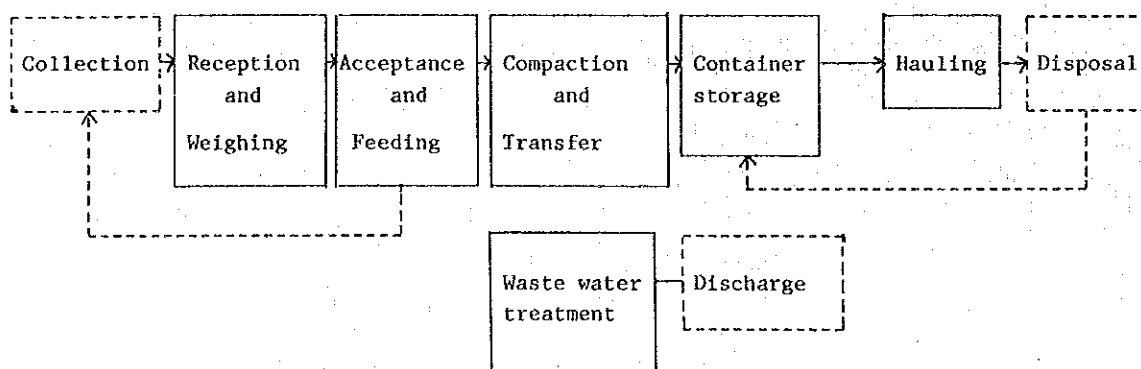
- a. Vehicles hauling in waste
- b. Vehicles hauling out waste - semi-trailer
- c. Moving of containers - semi-trailer

In planning the traffic lines at the transfer station, it will be necessary to separate the traffic line of vehicles hauling in waste from that of vehicles hauling out waste, and to make the traffic line for moving containers as smooth as possible. It is also desirable to locate the entrance and exit at the same place for the convenience of controlling vehicle traffic by traffic signals.

There are two basic alternatives: one is to build an incoming and outgoing lane and the other is to build two separate lanes, one for incoming vehicles and the other for outgoing vehicles. The latter alternative of separate construction will be adopted because it allows a longer waiting line for vehicles.

3.3.4 Treatment Flow

The basic treatment flow at the transfer station will be as follows.



3.3.5 Layout Plan

There are four alternative facilities layout plans, each with differing locations of the treatment building and traffic line for vehicles hauling in waste as shown in Fig. 3-3-4. As a result of a comparative study of these four alternatives, Alternative A, which permits placing the entrance and exit at the same location and installing a long waiting line for vehicles, is adopted. The layout plan designed based on layout plan A is shown in Fig. 3-3-5.

3.3.6 Major Facilities Plan

The transfer station will be composed of the following facilities.

- a. Driveway and receiving facility
- b. Platform and dumping facility
- c. Compacting and loading facility
- d. Container yard and moving facility
- e. Hauling out facility
- f. Ancillary facilities

An outline of each facility is given in Table 3-3-2.

Table 3-3-2 List of Major Facilities

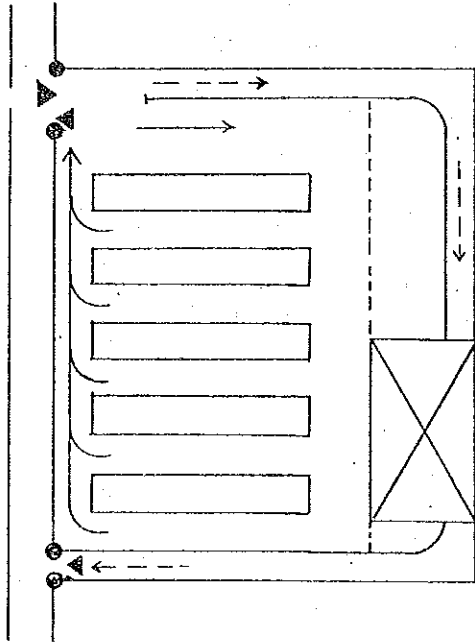
Facility	Equipment	Main Details	Quantity
Driveway	Driveway	W 5.25 m - 8.0 m	480 m
Receiving facility	Truck scale	20 t max.	2
	Receiving house	W 2.5 m x L 8 m	20 m ²
Dumping facility	Platform	W = 18 m, L = 60 m on the 2nd floor or treatment bldg.	
	Dumping place	2 lines/unit	12 lines
	Hopper	7.5 m x 4.5 m	6

Traffic line
 --> Collection Vehicle
 — Semi-trailor

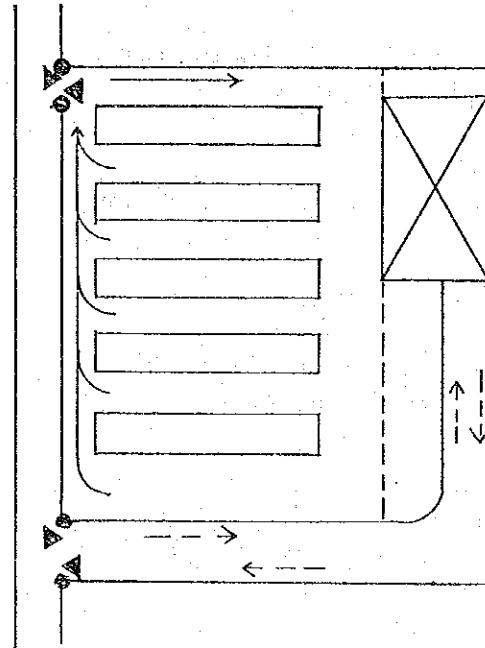
Fig. 3-3-4

Layout Plans
 for Transfer Station

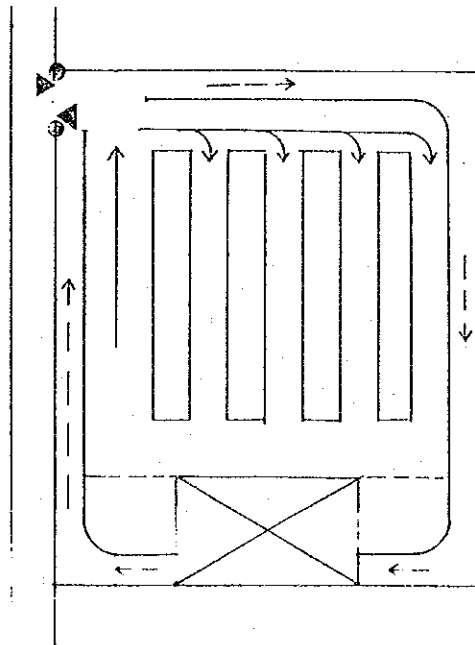
STUDY ON
 SOLID WASTE MANAGEMENT SYSTEM
 IMPROVEMENT PROJECT
 IN JAKARTA



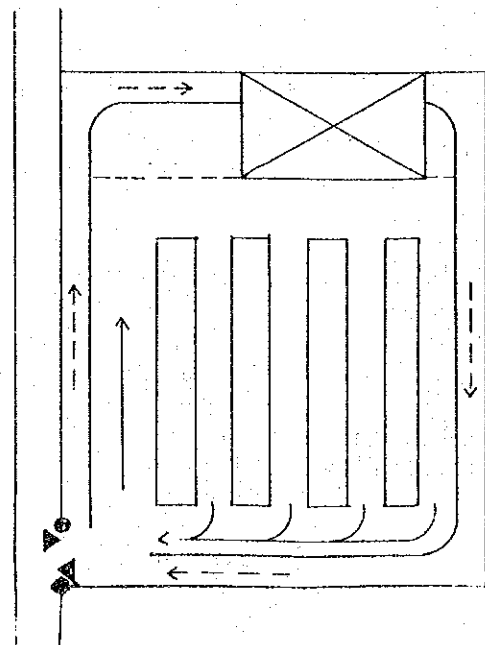
(3) Layout Plan C



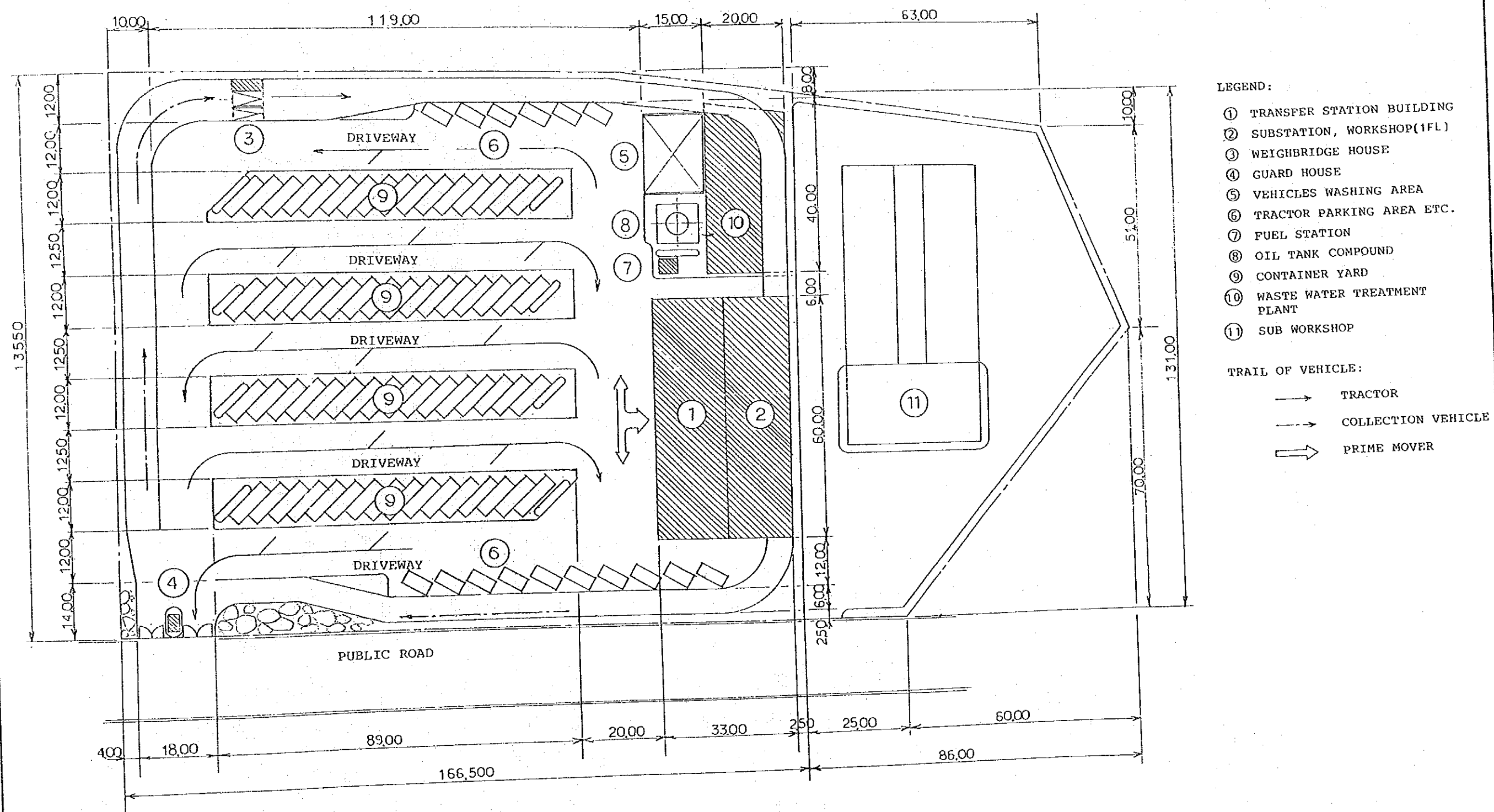
(4) Layout Plan D



(1) Layout Plan A



(2) Layout Plan B



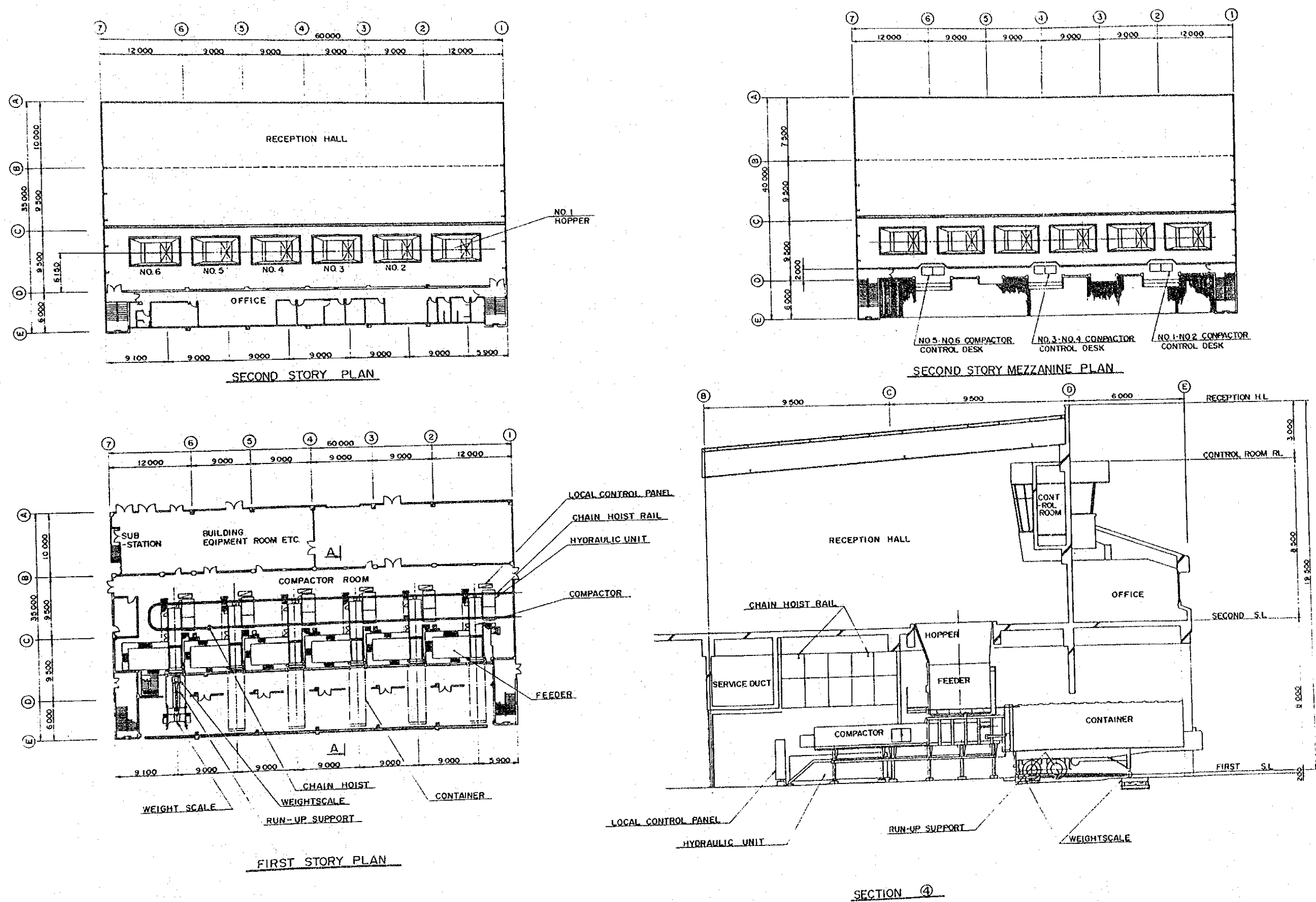


Fig. 3-3-6 Transfer Station Building

Table 3-3-2 List of Major Facilities (Cont'd)

Facility	Equipment	Main Details	Quantity
Transfer bldg.	Compactor	Capacity 500 m ³ /unit	6
	Transfer bldg.	W = 35 m, L = 60 m two-storied, incl. office room and control room	2,100 m ²
Container yard and moving facility	Prime mover	PS 340 Hp.	3
	Container yard	W = 112.5 m, L = 100 m	11,250 m ²
Transport facility	Tractor	PS 340 Hp.	32
	Container trailer	Capacity 40 m ³	64
Ancillary facilities	Refueling facility		1
	Car wash area		1
	Maintenance equipment	Inside the treatment bldg.	1
	Leachate treat- ment facility	Treatment capacity 100m ³ /d rotary disk type	1
Other facilities	Guard house		20 m ²
	Fence etc.		1

3.3.7 Environmental Protection Plan

1) Items affecting environment

The influences on the environment which the transfer station may incur are as follows.

- a. Concentration of vehicles hauling in waste
- b. Offensive odor and dust accompanying storage and transfer of waste
- c. Drainage of waste water
- d. Reduced size at Sunter Lake

PART III

2) Degree of influence on environment and protective measures

(1) Concentration of vehicles hauling in waste

The number of vehicles hauling in waste will be 610, and vehicles hauling to Bekasi will be 97. As shown in the table below, they are equivalent to some 12% of the present traffic volume of JL Danau Sunter Selatan which have four traffic lines. They will not, therefore, pose any particular problem.

At the entrance and exit and also at intersections, however, control by signals, etc. will become necessary to secure traffic safety as semi-trailers will be used for hauling waste. During the peak hours, a queue of vehicles hauling in waste is anticipated to interfere with the general traffic. In order to cope with these problems, the following measures will be introduced.

Road	Present traffic volume Vehicles/day	Traffic volume of vehicles hauling in and out waste. Vehicles/day	Ratio %
JL.Danau Sunter Selatan	12,000	1,414	11.8
JL.Laks Muda Sudarso	55,000	1,414	2.6

- a. Traffic control by signals at the entrance and exit of the transfer station.
- b. A plan to provide a passing lane so that collection vehicles can wait on the premise during peak traffic hours.

PART III

- (2) Dust and offensive odor accompanying storage and transfer of waste.

Although dust and offensive odor will be generated by the storage and transfer of waste, it is planned to store waste in closed type containers instead of piling it up in the open. The prevention of offensive odor as much as possible by equipping the station with a device that sprays deodorant at the hoppers is also planned.

- (3) Drainage of waste water

Filthy water becomes squeezed out by the compacting and transferring of waste. The amount of waste water thus generated is estimated to be around 96 m³/day. The waste water will be drained into the Sunter River via Sunter Lake which lies to the west of the site. If waste water is not treated, it will further pollute Sunter Lake. It is planned, therefore, to discharge the waste water only after treatment.

- (4) Reduced size of Sunter Lake

An estimated 1 ha of area must be reclaimed from Sunter Lake to construct the transfer station. This lake is used for leisure activities such as fishing and the reclaimed area presents only a small part of the lake's surface.

- (5) Others

As the planned site for the transfer station is surrounded by the greenery, the station itself should have as much greenery as possible to harmonize with the scenery of the area.

3.3.8 Operation Plan

1) Operating organization

The transfer station will be operated under the following organization.

- a. Manager
- b. Administration
- c. Technical
- d. Operation

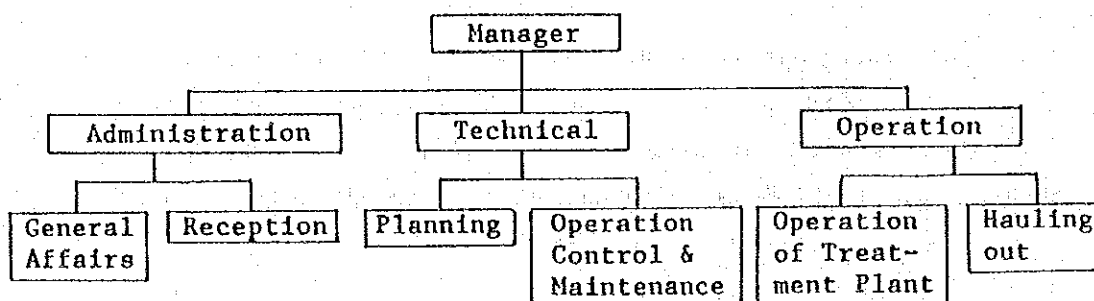


Fig. 3-3-7 Organization of Operating the Transfer Station

2) Required personnel

A total of 70 workers will be required to operate the transfer station, as listed below.

PART III

Table 3-3-3 Transfer Station Operating Personnel

Job Classification	No. (persons)
Manager	1
Administration	
Chief	1
Administration	2
Reception	3
Technical	
Chief	1
Planning	1
Engineers (Mechanical)	2
(Electric)	2
(Chemical)	1
Operation	
Chief	1
Operators (Control)	7
(Mover)	4
Drivers	38
Workers	6
Total	70

3) Operation and control

(1) Acceptance of waste

In accepting waste, hauled in wastes will be weighed and checked. Hazardous industrial waste will not be accepted. In principle, hauling in of waste will be based on a long term contract and fees will not be collected at the transfer station. Fees for waste hauled in by irregular vehicles, however, will be collected at the station. Hauling in of waste by ordinary trucks will be prohibited due the constraints imposed by inlet holes and accepting facilities.

(2) Compaction and transfer

In transfer, care must be taken not to overload the outgoing vehicles.

(3) Waste water treatment facility

It is important to daily measure the amount of waste water treated in order to precisely know the operating conditions of the waste water treatment facility. It is also important to analyze the quality of both untreated water and treated water every month and compile and summarize the data, and not to disrupt continued operation even in the event of power failure. If power failure does occur, the emergency power source should be immediately switched on.

3.4 Bekasi Disposal Site

3.4.1 Location of Bekasi Disposal Site

The Bekasi Disposal Site is 108 ha in total area and is located 35 km southeast of the center of Jakarta. It belongs to Bekasi City of West Java Province which is contiguous to Jakarta. As the construction of the Tangerang Disposal Site is planned in the northwest of Jakarta, the Bekasi Disposal Site will be developed as an intermunicipal disposal site for disposing waste generated in the eastern part of Jakarta and also that generated in Bekasi since it is located in Bekasi.

As the site is located far from the city center, transporting the waste directly to the disposal site by collection vehicles will result in a heavy burden in terms of operation and maintenance cost and there is the possibility of inviting the unlawful dumping of waste. The use of this disposal site, therefore, must be planned together with the development of the transfer stations. As the transfer stations will be developed in a stepwise fashion, the development of the disposal site must be advanced in keeping with each step of the construction. The estimated waste amount to be disposed of under this Project is 2070 tons/day in 1995.

Fig. 3-4-1
Topography of
Bekasi Final Disposal
Site

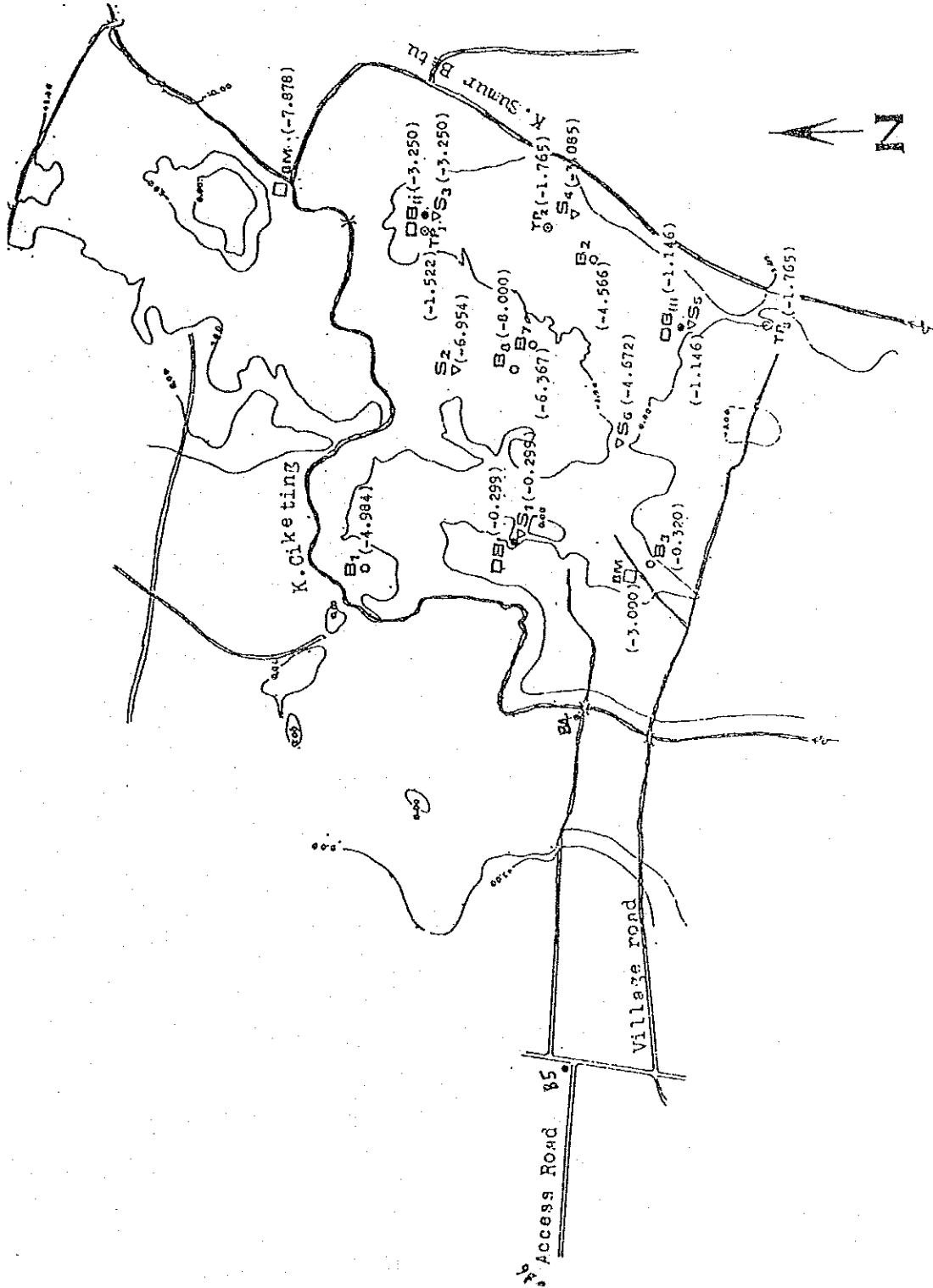


Table 3-4-1 Waste Disposal Amount at Bekasi Disposal Site

Area	1992	1995	2000	2005
Pusat	1,240	1,310	1,520	1,730
Utara	490	420	210	0
Bekasi	240	340	610	880
Total:	1,970	2,070	2,340	2,610

3.4.2 Planning Conditions

1) Service areas and waste to be disposed of

This disposal site will eventually serve as the disposal site for the eastern part of Jakarta and Bekasi. However, it will initially be constructed as the disposal site of waste transported from the Sunter Transfer Station and Bekasi to correspond with the construction of the transfer station. Accordingly, the areas served will be Pusat, Utara and Bekasi and the waste to be disposed of will be that treated at the Sunter Transfer Station as given below.

- a. Waste by ordinary collection
- b. Waste from large dischargers
- c. Bulky waste
- d. Directly hauled in waste
- e. Waste generated in Bekasi

2) Planned disposal amount

The planned daily disposal amount will be 2070t/d and the yearly disposal amount will be 756,000 t/year in 1995.

Table 3-4-2 Yearly Disposal Amount at Bekasi

	1992	1995	2000	2005
Disposal amount, (t/d)	1970	2070	2340	2610
Yearly disposal amount (1,000 t/year)	719	756	854	953

3) Hauling-in vehicles

Vehicles hauling in waste are as follows.

Semi-trailer	40 m ³
Tipper, large	10 m ³
Tipper, small	6 m ³

4) Working conditions

Working days	6 days/week
	313 days/year
Working hours	9:00 - 17:00

3.4.3 Onsite traffic lanes

Incoming vehicles are designed to move on the right-hand (clockwise) traffic lanes for landfilling from the downstream side. Vehicles for administrative use are designed to approach the administration area directly on the traffic lane secured for these vehicles.

3.4.4 Facilities layout plan

The layout of the facilities is shown on Fig. 3-4-2 based on building the leachate treatment facility on the lowland area of downstream and using the southwestern area, which is difficult to use as landfill site, as the administration. 34.4 ha will be secured for landfilling which will be divided into the east zone (A) and west zone (B), and landfilling will commence from Zone A which contains the lowland section.

3.4.5 Landfill Capacity

1) Landfill capacity

The area of the landfill site is 20.0 ha for Zone A and 14.4 ha for Zone B, totalling 34.4 ha. Because of the necessity to

prevents the ground water pollution, the bottom of the landfill site shall be laid with 2 m thick earth liners and levelled with a gradient of 1% towards a drainage pipe line in order to collect leachate easily. Landfilling shall be carried out up to the height of 30 m from the bottom of landfill site. As a result, the total landfilling capacity will become 8.1 million m³ and the amount of waste disposed of will be 5.3 million t.

Table 3-4-3 Landfill Capacity

	Capacity million m ³	Waste disposed of million m ³	Waste disposed of million tons	Soil covering million m ³
Zone A	4.3	3.53	2.8	0.77
Zone B	3.8	3.12	2.5	0.68
Total	8.1	6.65	5.3	1.45

The landfill period of this site is 6.8 years, as shown in Fig. 3-4-4.

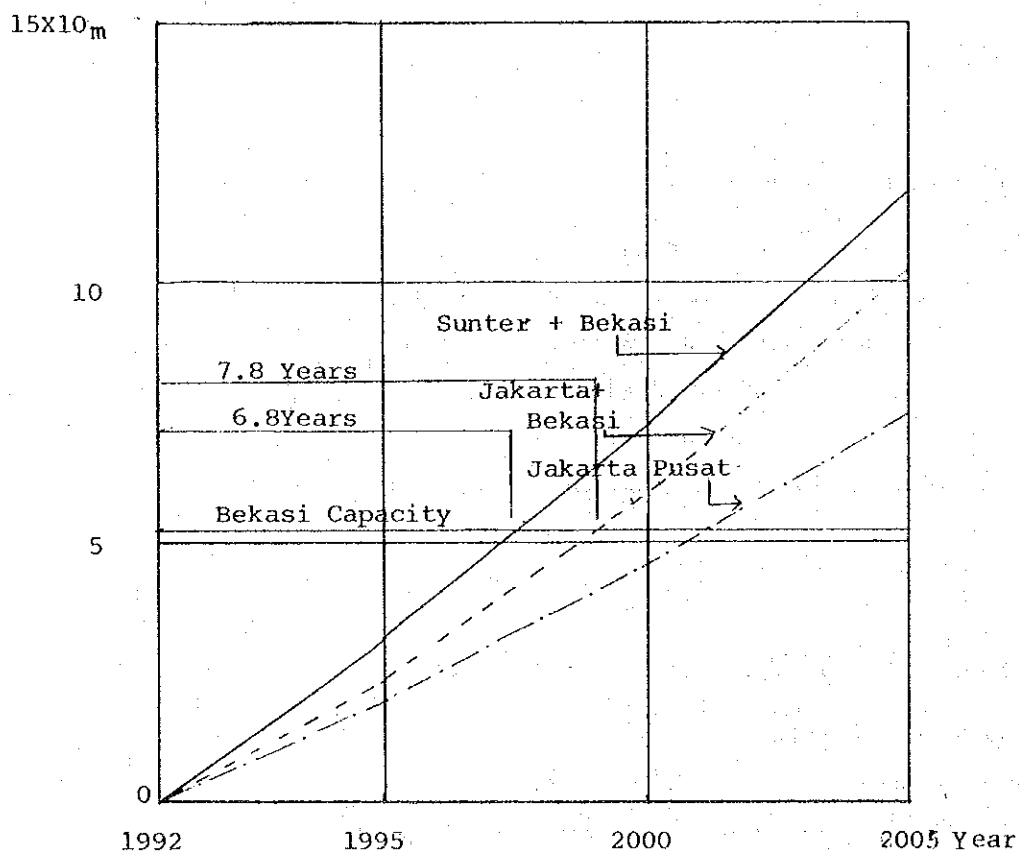
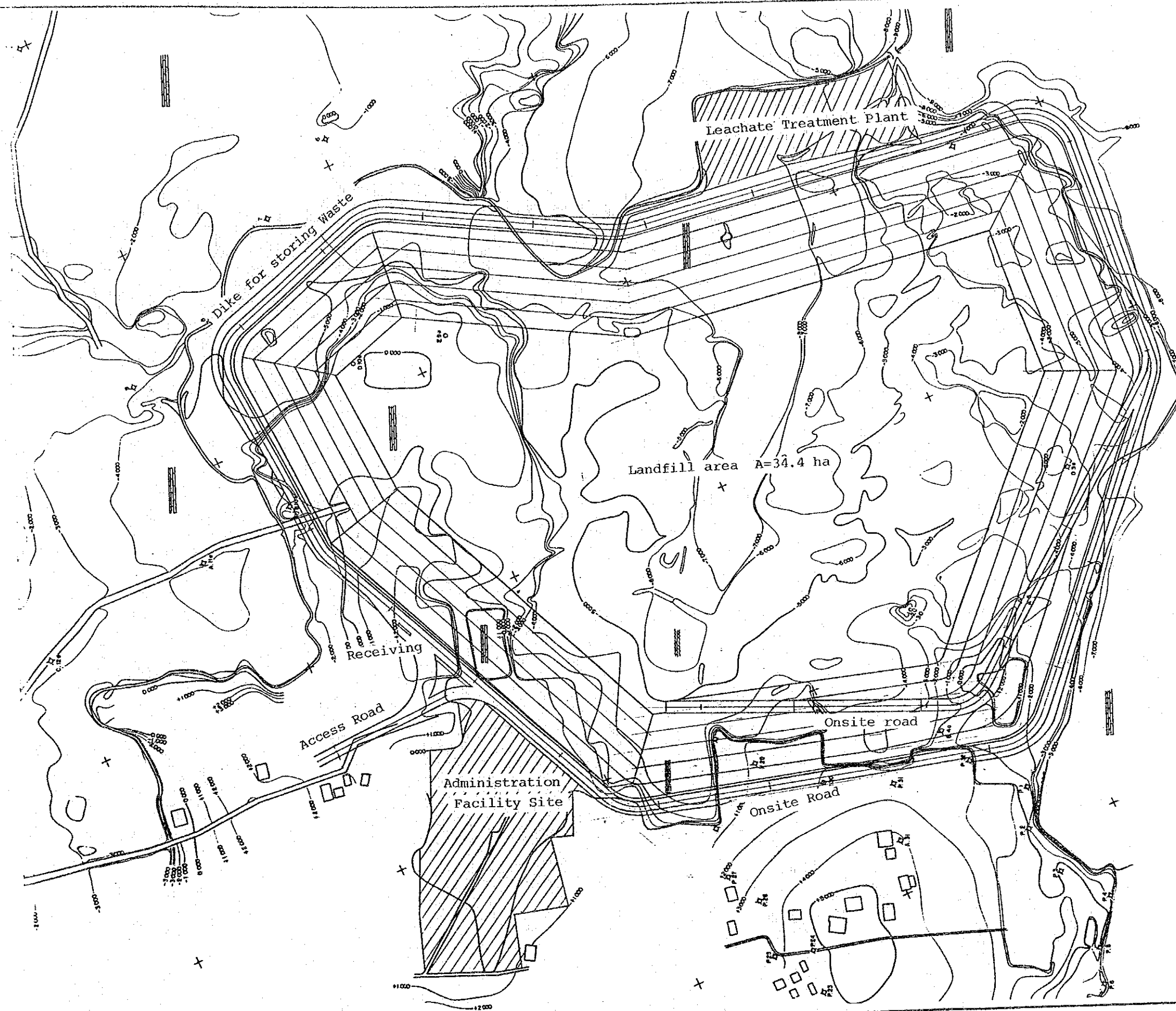


Fig. 3-4-4 Accumlated Solid Waste Amount and Landfill Capacity





PART III

2) Landfill method

Landfill will be executed by the sandwich method, with every 3 m of waste being covered by a 50 cm thick layer of soil. The final soil cover shall be 1 m thick.

In filling the bottom portion, care must be taken so as not to damage the impermeable layer and the leachate collecting pipes at the bottom.

In order to secure workability during the rainy season, the on-site road must be repaired as often as necessary.

3) Soil cover

In order to dispose of the waste, covering material of about 1.5 million m^3 , including the final soil cover, will be necessary. 0.5 million m^3 of this soil covering material will be collected from the planned site and the remaining 1 million m^3 from the other site.

3.4.6 Facilities Plan

1) Facility configuration

The facilities described below will be provided at the final disposal site.

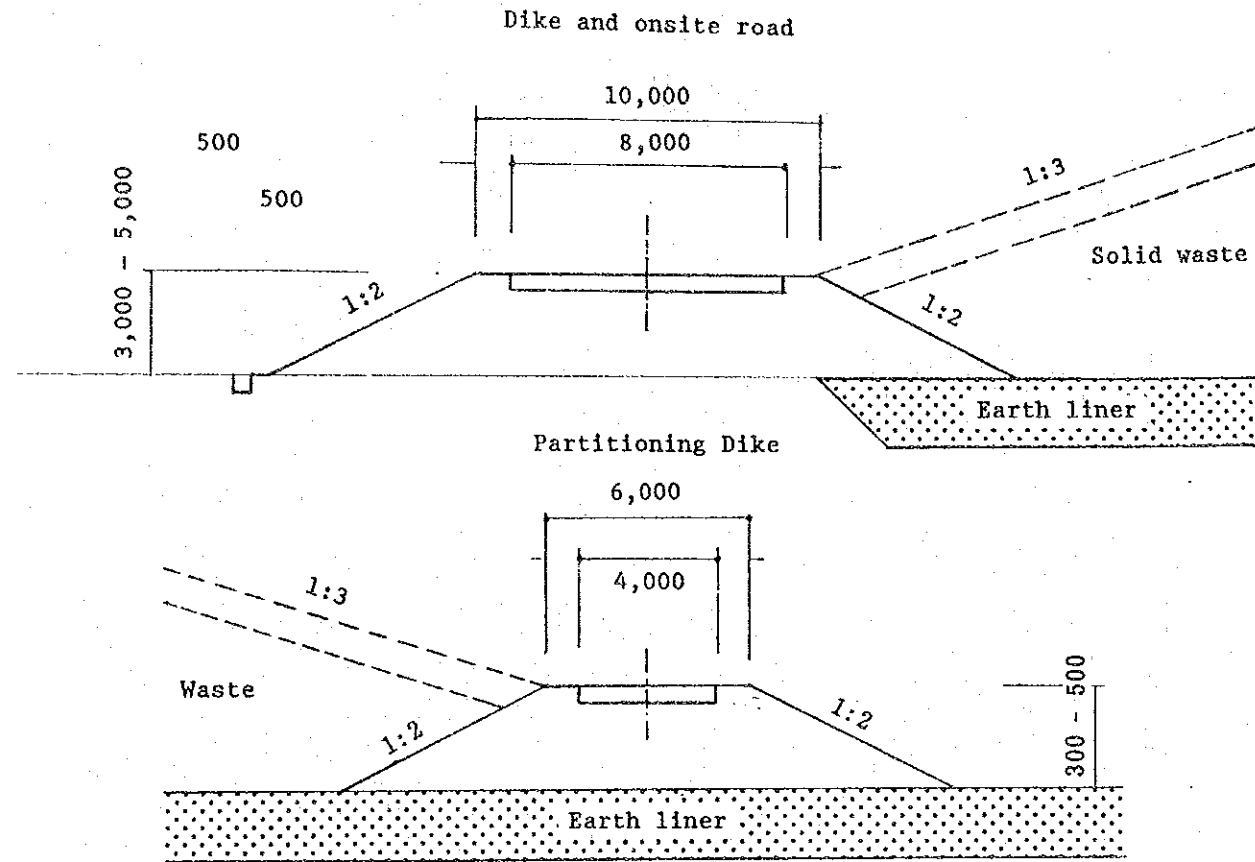
- a. Receiving facility
- b. Dike for storing waste
- c. Landfill site
- d. Earth liner
- e. Leachate collection and drainage facility
- f. Leachate treatment facility
- g. Drainage and ground water drainage facility
- f. Administration facilities, etc.
- k. Road, etc.

The major facilities are briefly described in Table 3-4-4.

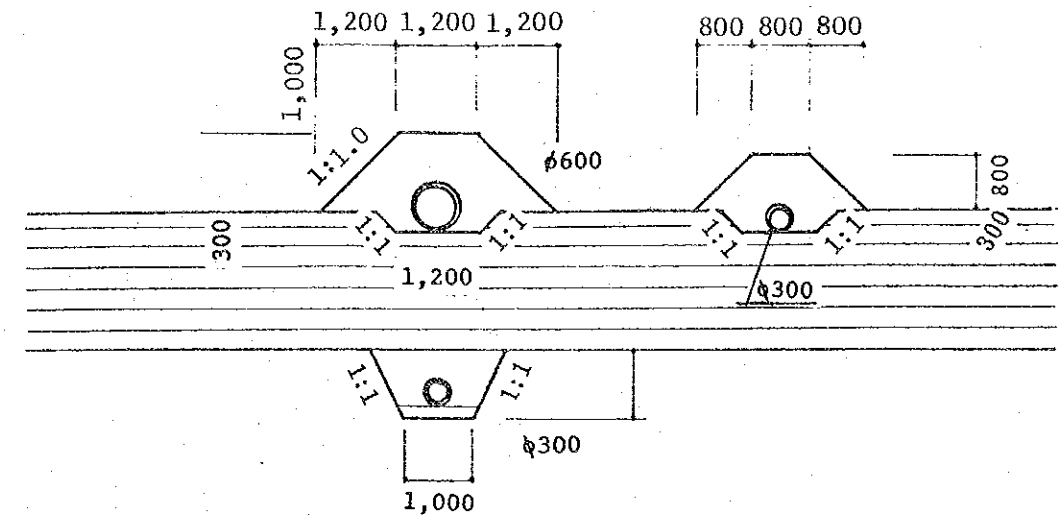
Table 3-4-4 Facilities Plan

Facility	Main Details	Quantity
1) Receiving facility		
Truck scale	20 t max.	1 unit
Receiving house	2.5 m x 4 m	10 m ²
2) Dike for storing waste		
Outer peripheral dike cum onsite road	Width 10 m H = 3.5 m	L = 1,600 m
Partitioning dike	Crown width 6 m H = 3.5 m	L = 540 m
3) Drainage		
Diversion channel	W = 11 m	L = 120 m
Outer Peripheral channel		L = 700 m

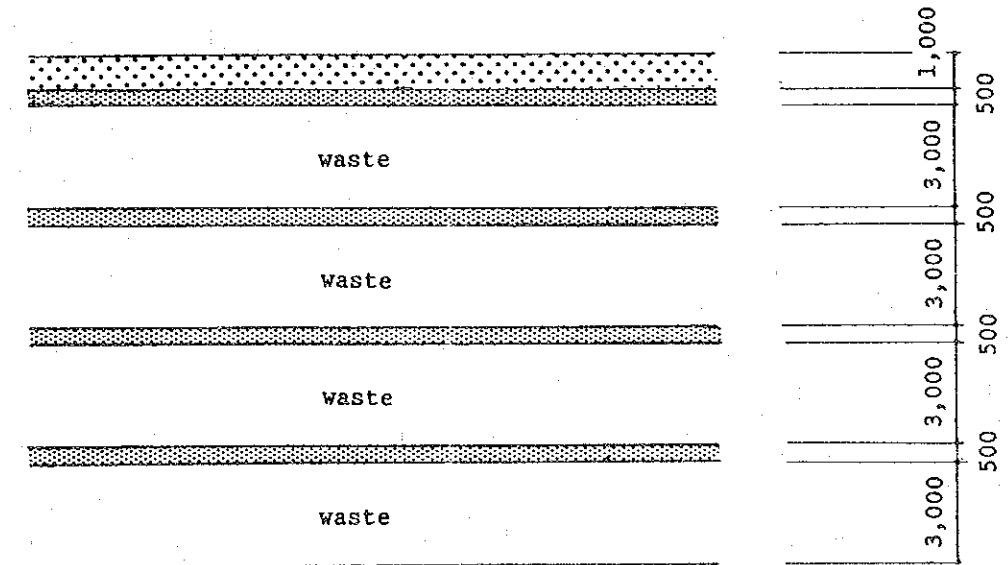
Dike and onsite road



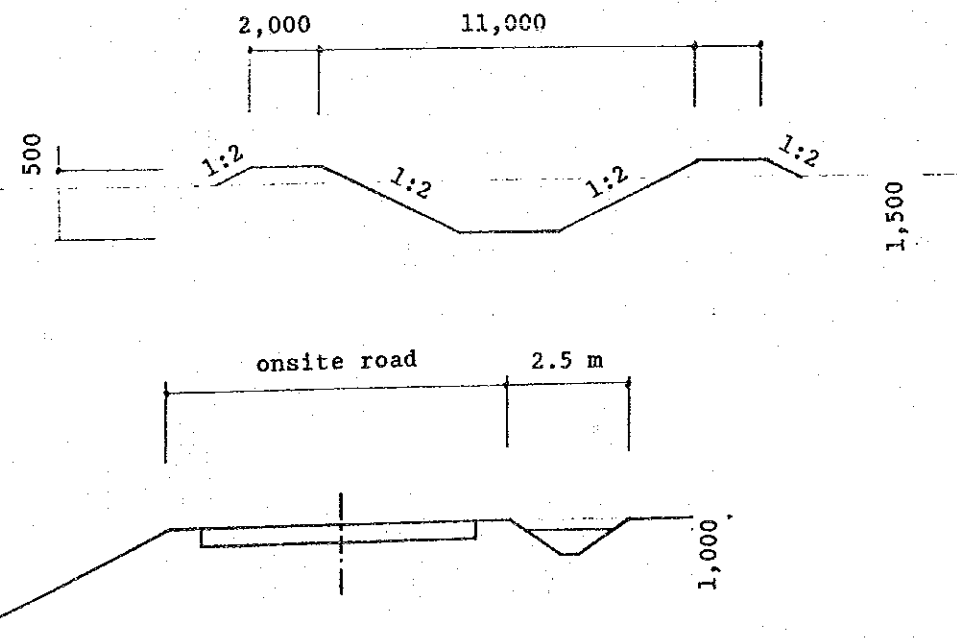
Leachate collecting pipe, earth liner and grand water collecting pipe



Covering Soil



Drainage



Access Road

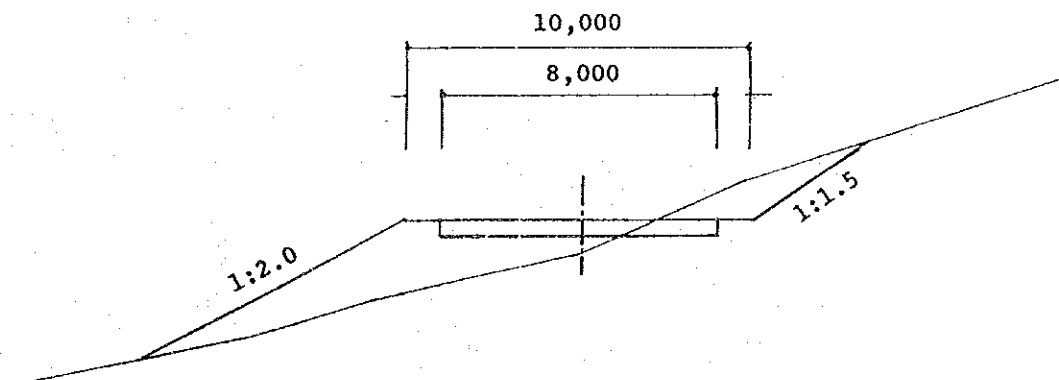


Table 3-4-4 Facilities Plan (Cont'd)

Facility	Main Details	Quantity
4) Landfill site	Planned height + 25 m	Area 34.4 ha Landfill capacity 8.1 million m ³
5) Leachate collection and drainage facility		
Main pipe	Ø 60 cm	L = 3,000 m
Branch pipe	Ø 30 cm	L = 6,500 m
6) Ground water collection Pipe	Ø 20 cm	L = 1,920 m
7) Leachate treatment facility	Pre-aeration-rotary disk	Treatment capacity 780 m ³ /day
8) Earth liner	M = 2.0 m	Area 34.4 ha
9) Onsite road	Total width 10 m	L = 1,200 m
10) Access Road	Total width 10 m	L = 1,240 m
11) Administration facility	Office room 400 m ²	1 set
	Maintenance room 100 m ²	1 set
	Warehouse 50 m ²	1 set

2) Treatment of leachate

The leachate from the landfill site will be collected through leachate collection pipes, treated in the treatment facility and then discharged.

The amount of leachate varies mainly by the amount of rainfall, size of the landfill area and the landfill method employed. In this area, it is an average of 780 m³/day. The quality of untreated leachate and treated water are estimated to be as follows.

Table 3-4-5 Quality of Untreated Leachate and Treated Water

Description	Untreated Leachate	Treated Water (Daily Mean)
BOD	3,200 ppm	120 ppm
COD	600 ppm	-
SS	300 ppm	150 ppm
T-N	200 ppm	-
pM	6 - 8	6 - 8

Note: - indicates that the said item is not the subject of treatment.

The treatment method will be the pre-aeration - rotary disk method or aeration lagoon method which system shows in Fig. 3-4-6.

3) Waterproof Structure

Most of the planned site is former borrow area of earth where a part of lowland area is currently cultivated as paddy fields. The top layer of the highland is silty clay with a permeability coefficient of some 10^{-5} cm/sec. Beneath this stratum is alternating sand and silt where the groundwater table is also located. The permeability of this alternating layer is around 10^{-4} - 10^{-5} cm/sec. This alternating layer is found some 1 m below the surface in the lowland area. The groundwater table gently dips towards the north-east.

As described above, the surface layer of the planned site consists of silty clay with a low permeability, beneath which is an alternating layer of sand and silt with a slightly higher permeability. Due to excavate for borrowing earth this alternating layer is seen to outcrop in part of the upper stream and, therefore, a waterproof layer should be mainly introduced at these parts to prevent the contamination of groundwater.

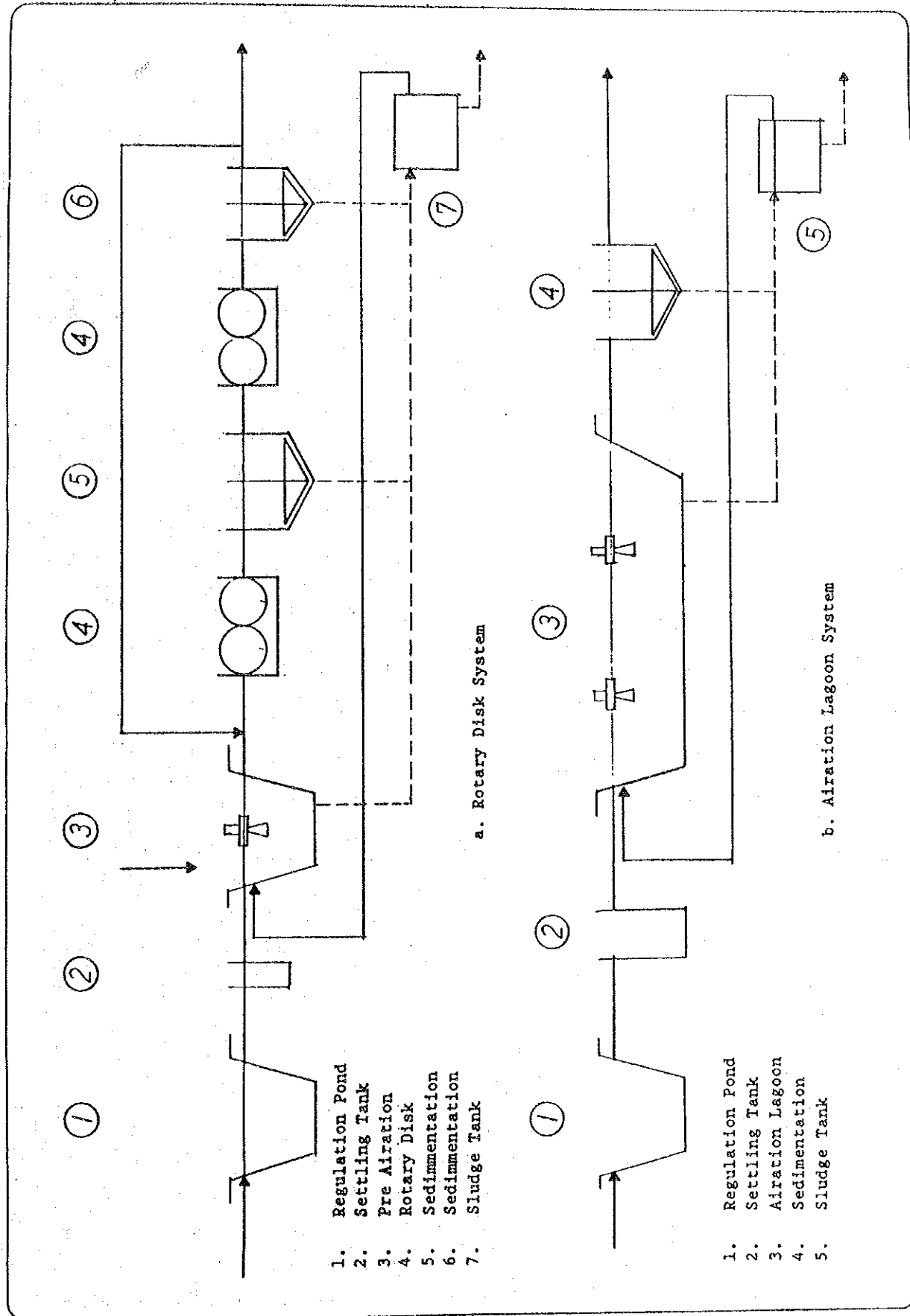


Fig. 3-4-6 Leachate Treatment Flow

STUDY ON SOLID WASTE MANAGEMENT SYSTEM IMPROVEMENT PROJECT IN JAKARTA

PART III

Possible waterproof structures could use rubber sheeting, asphalt lining, soil cement or earth lining. The characteristics of these structures are as follows.

Table 3-4-6 Characteristics of Waterproof Structures

	Waterproofness	Workability	Elasticity	Cost
Rubber Sheetting	o	Δ	o	X
Asphalt Lining	o	o	Δ	X
Soil Cement Lining	Δ	o	X	o
Earth Lining	Δ	Δ	Δ	o

Legend; o: Good, Δ: Fair, X: Bad

Although the use of either rubber sheeting or asphalt lining is preferable in terms of the waterproof capability, both are quite expensive. Soil cement lining lacks elasticity and cracks may occur due to ground settlement. Therefore, the earth lining method is adopted for protecting infiltration of leachate despite its rather inferiority in terms of reliable waterproofness. The thickness of the lining will be 2 m to increase the waterproofness of the lining. The silty clay of the top layer found in the planned area which can be expected to show a permeability coefficient of some 10^{-6} cm/sec after compaction will be used as the material for earth lining structure. In addition, efforts will be made to obtain appropriate materials in the vicinity to further improve the waterproof structure.

The quick discharge of the leachate will also be important to prevent groundwater contamination. In view of this requirement, a number of leachate drain pipes will be densely installed on the surface of earth lining to facilitate leachate discharge. As leachate tends to accumulate under these drain pipes, rubber sheeting will be used to prevent infiltration of leachate.

3.4.7 Equipment for landfilling

The machinery shown in the table will be prepared for landfilling the waste to be disposed of in 1995 and also for the collection of covering soil, soil covering work and other purposes.

a. Landfilling of waste

Bulldozers	21 t class	7 units
Landfill compactors	21 t class	2 units

b. Soil covering, collection and transport of covering soil

Bulldozers	21 t class	1 units
Backhoes	0,6 m ³	2 units
Dump trucks	11 t loading capacity	8 units

c. Others

Watering vehicle	4 t tank car	1 unit
Pick-up trucks for commuting		3 units
Passenger car for commuting		1 unit

3.4.8 Required Manpower and Organization

The final disposal site shall be managed by the Administration Section, Technical Section and Operation Section established under the Chief of the Disposal Site and operated with a total manpower of 52 persons, as shown in Fig. 3-4-7.

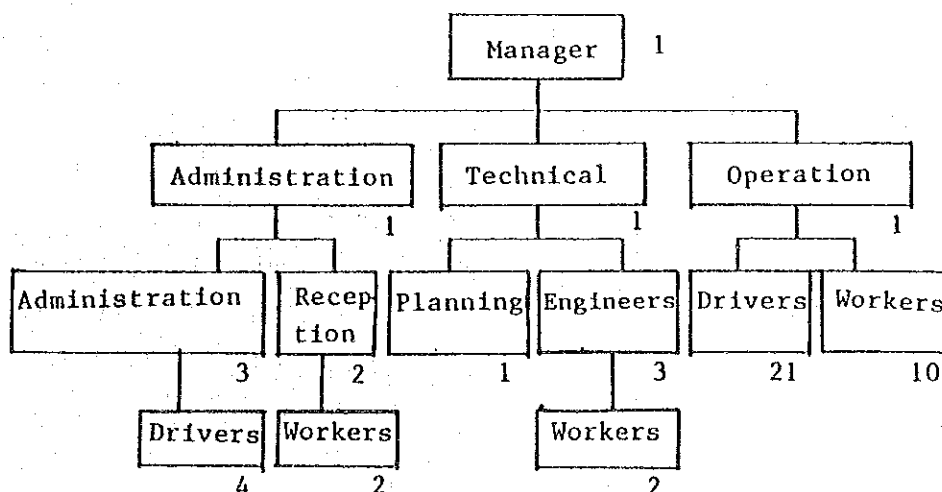


Fig.3-4-7 Organizational Structure and Manpower

3.5 Improvement of Maintenance System and Sunter Sub-Workshop Construction Project

3.5.1 Location of Sunter Sub-Workshop

DKI Jakarta currently performs maintenance work on all Jakarta's 800 collection vehicles at the central workshop which is adjacent to Dinas Kebersihan. Each Suku Dinas Kebersihan office also has its own small workshop but can only perform simple work, such as changing oil, due to lack of equipment. Furthermore, while the number of collection vehicles of DKI Jakarta is expected to increase to 1,800 by 2,005 in accordance with the increased amount of waste, the central workshop currently has only 60% of the required space maintenance bay. As things stand now, it is impossible to secure even the current operating rate of collection vehicles with the Workshop's existing capacity, let alone improve the operating rate.

There are also problems with the maintenance system. For instance, it is difficult to perform maintenance work on all the city's collection vehicles at one place even in terms of the cost of transporting the vehicles to be repaired. The city's policy, therefore, is to strengthen the workshop of each Suku Dinas Kebersihan to enable it to perform its own routine maintenance work and to have the central workshop carry out maintenance of mainly the chassis and vehicle inspection every two years.

The aforesaid Sunter sub-workshop is to be constructed as the sub-workshop of Pusat in order to strengthen the existing maintenance system and also to allow it to make the smooth transition to the new maintenance system. The facilities will be of a scale necessary to perform maintenance work on Pusat's collection vehicles of in 2005. As in the case of the transfer station, the facilities will have some extra room for the time being so that maintenance of the collection vehicles of adjacent Utara can be undertaken simultaneously in order to alleviate the central workshop's burden and to utilize the facilities effectively.

PART III

The Central Workshop, whose burden will be alleviated for some time by the construction of the Sunter sub-workshop, will need to make stepwise changes to a new maintenance system. It must, however, continue to conduct maintenance work. Since the Dinas Kebersihan does not have any space for constructing a new workshop at present, it must shift to the new maintenance system by providing its present facilities with equipment and supplies necessary to strengthen its functions.

3.5.2 Improvement of Maintenance System and Planning Conditions for Proposed Sub-Workshop

1) Planning conditions for sub-workshop

(1) Design Capacity

In conformity with the Conceptual Master Plan, 350 collection vehicles of Pusat in 2005 shall be the maintenance design capacity. However, since the sub-workshop will have some spare capacity available for the time being, it will also undertake maintenance work on collection vehicles of adjacent Utara. Maintenance of shovel loaders and other heavy equipment will be consigned to a private enterprise.

(2) Content of maintenance work

The sub-workshop will carry out inspection and light repairs once every three months, six months and one year according to the maintenance schedule. Chassis inspection and heavy repairs will be performed once every two years at the Central Workshop while special repair work and other repairs which the central workshop cannot undertake for the time being will be consigned to the private sector.

(3) Site

The sub-workshop will be constructed adjacent to the Sunter transfer station and a site of 8,000 m² in area will be secured.

2) Planning Condition of the Central Workshop

For the time being, the central workshop will perform maintenance work on all vehicles, excluding those of Pusat and Utara which are to be covered by the Sunter Sub-workshop, and also perform chassis inspection once every two years. Because of limited available site and limitations on existing facilities, maintenance work will be carried out for the time being by consigning some of the work to the private sector and by providing only necessary equipment and supplies which can be added to the existing basic facilities.

3.5.3 Sunter Sub-Workshop

1) Contents of maintenance work

The Sunter sub-workshop will perform maintenance work centering on preventive maintenance for the 350 vehicles assigned to the service area. The contents of this maintenance work are as follows:

- a. Periodical maintenance once every month, every three months, every six months and every year: Oil change, engine inspection, radiator and other components.
- b. Clutch-related work
- c. Brake-related repair work
Replacement of master cylinder, shoes and lining and compressor repair
- d. Electric system repair work
Wiring, lights, wipers and klaxon, etc.
- e. Repair of wheels and tires, etc.
Replacement of tires and wheel bearings

f. Minor repair work of chassis and body

Replacement of side glass and back mirror, including painting

g. Inspection of each component and replacement of parts assemblies.

2) Facilities and Equipment

The sub-workshop for 350 vehicles will consist of 20 maintenance bays, tool room, warehouse and office. The Layout plan is given in Fig. 3-5-1. The equipment of the sub-workshop is listed in Table 3-5-1. Refuelling facilities will also be prepared.

3) Organization and Manpower

The organization of the sub-workshop is shown in Fig. 3-5-3 and the necessary manpower will total 75 persons.

3.5.4 Main Workshop

1) Contents of Maintenance Work

The main workshop will oversee the sub-workshops in the five Wilayah and undertake major repairs and maintenance centering on the overhaul of truck chassis, engine and other components. In order to assist sub-workshops, it will also undertake emergency repairs and maintenance which cannot be done at the sub-workshops. Therefore, the function of the main workshop in the future will shift to following work.

- a. Periodical maintenance once every two years and repairs
- b. Major repairs which cannot be done at sub-workshops
- c. Overhaul and check of each component
- d. Chassis check following repair

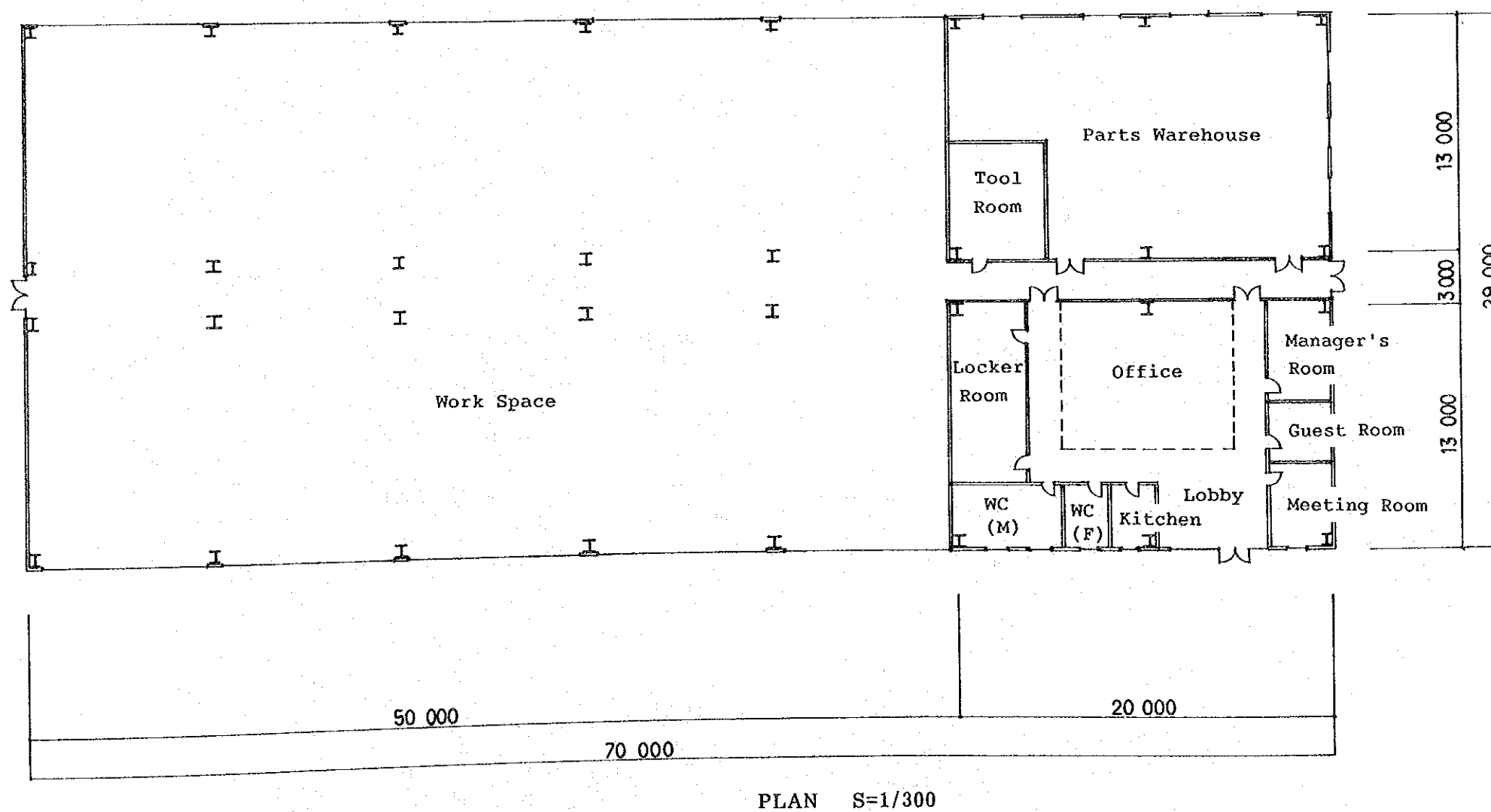
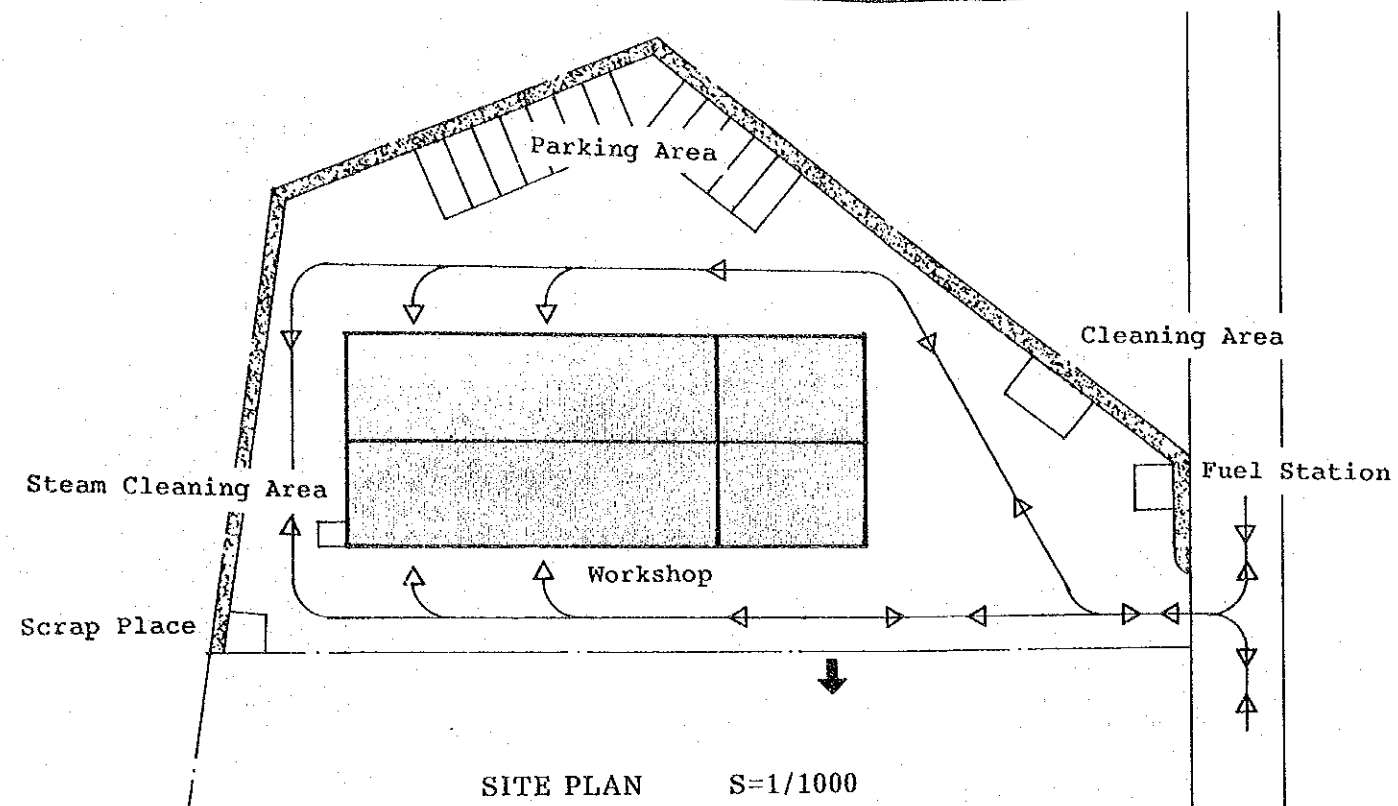
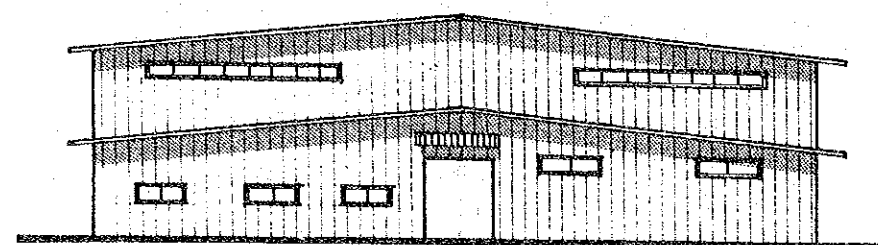


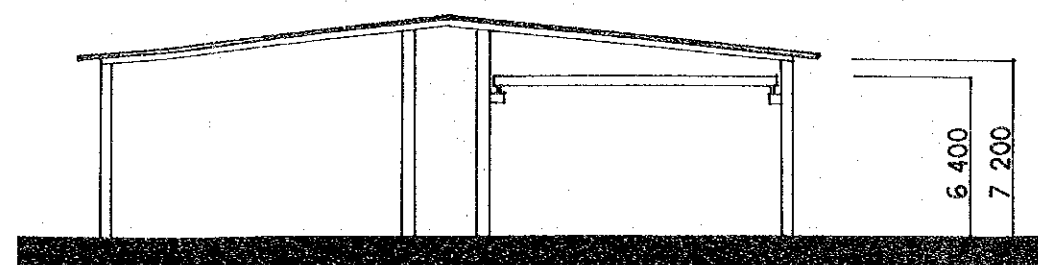
Fig. 3-5-1 SUB-WORKSHOP
SITE PLAN

SOLID WASTE MANAGEMENT SYSTEM
IMPROVEMENT PROJECT
IN JAKARTA



29 000

ELEVATION S=1/300



13 000

3 000

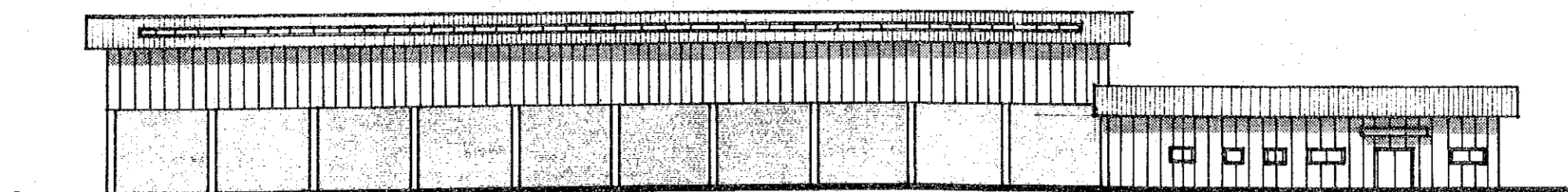
13 000

29 000

6 400

7 200

SECTION S=1/300



50 000

70 000

20 000

ELEVATION S=1/300

Fig. 3-5-2 SUB-WORKSHOP
ELEVATION
SECTION

SOLID WASTE MANAGEMENT SYSTEM
IMPROVEMENT PROJECT
IN JAKARTA

Table 3-5-1 Equipment For Sub Workshop

Maintenance Bay
Electric Component Service Tools
Tire Service Tools
Engine & Radiator Service Tools
Cleaning Equipment
Painting Tools
Air Compressor
Tools Room
Parts Warehouse
Equipment for Office

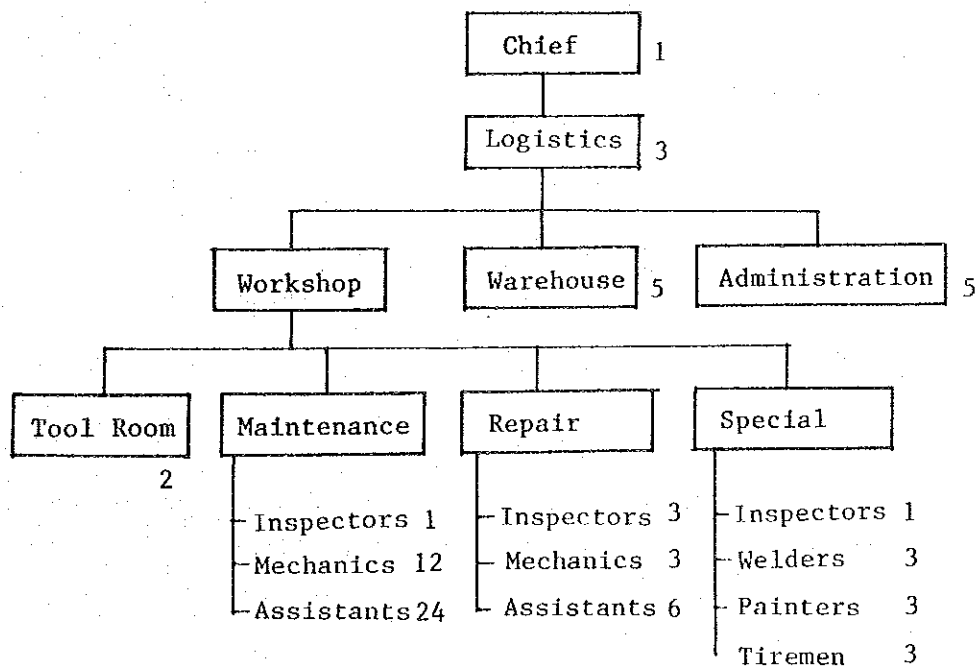


Fig.3-5-3 Organizational Structure of Sub-Workshop and Manpower

When the Sunter Sub-Workshop starts operation, the functions described above should be undertaken by the main workshop. Therefore, improvement of equipment for these functions will be required.

2) Contents of Supplementary Equipment

Repair equipment for engines and electric components, in which the existing workshop is particularly deficient, will be provided. Cleaning equipment will also be provided as the chassis are severely soiled and corroded.

a. Engine repair equipment and tools

Provision of supplementary equipment and tools for overhaul and assembly of engines; also repair equipment for cylinder heads, and valves.

b. Engine test equipment

Provision of supplementary horse power testing equipment and ancillary facilities and tools to confirm engine performance upon completion of overhaul.

c. Electric component repair equipment

Provision of supplementary tools for overhaul and assembly of starters and generators, as well as test equipment for confirming their performance.

d. Cleaning equipment

Provision of supplementary high-pressure cleaning equipment for cleaning chassis, as well as steam cleaner for cleaning engines and other components.

As one of the major functional roles of the main workshop is to undertake the overhaul every component. The main workshop will provide each sub-workshop with components to ensure speedy maintenance at sub-workshops by means of component exchange. It will also undertake centralized maintenance work on components to

PART III

minimize the down time of vehicles as a key point of the maintenance system.

If this maintenance system is to be operated smoothly, expansion of the component repair equipment and the installation of test equipment to confirm the quality of each component after repair at the main workshop are indispensable prerequisites. In view of this, the provision of supplementary equipment and tools for repair and performance confirmation of particularly engines and electric components shall be considered.

