

The above results clearly shows that the effluent of septic tanks are of very poor quality with respect to all the measured parameters. Infact septic tank effluents are not intended for direct disposal with no further treatment.

Finally to conclude, the performance of the surveyed treatment systems are in an overall sense not very satisfactory. Especially septic tanks are designed in areas where sufficient infiltration/drain fields are probably no longer available to treat the high effluent loading. In comparison, package treatment plants of extended aeration performed better, however their operation and maintenance are inadequate because of shortage of skilled operators. The practice of not disinfecting the effluent is deplorable.

In a relatively high population density area, package treatment plants of extended aeration/RBC are necessary as sufficient land area is not generally available for the sanitary disposal of septic tank effluent using soakaway and infiltration/drain fields, thereby making the use of this relatively operation and maintenance free system very difficult. On the other hand, for the proper functioning of package treatment systems like extended aeration/RBC, though they are very compact, relatively skilled operational personnel is necessary to ensure the design and operational constraints are adhered to. Unfortunately, availability of skilled operators also seems to be a constraint at present.

2 Desludging and Treatment

2.1 General

The Cleansing Department (Dinas Kebersihan) of DKI, Jakarta is the organization responsible for desludging, transport and treatment of sludge of septic tanks in Jakarta, in addition to its major function of solid waste management. Herein, "septic tank" means both the type (1) and type (3) systems defined in section 1.1.1. They are, individual toilet with treatment and public toilet, the systems that require desludging.

The central (main) office of the Cleansing Department is located in Jl. Cililitan Besar Mandala V, East Jakarta. Also there are five (5) branch offices located in each of the five (5) administrative districts of Jakarta.

The Cleansing Department owns two (2) number sludge treatment plants, located at Kebon Nanas and Pulo Gebang, for treating desludged sludge. Another one is planned at Duri Kosambi. The location of the main office, the five (5) number branch offices, and the three (3) number treatment plants, including the one to be constructed, are shown in Fig. F.5. This figure also shows the service areas of Kebon Nanas and Pulo Gebang treatment plants.

2.2 Desludging

The requests for desludging is accepted both by telephone and direct visit to main or any other five (5) number branch offices of Cleansing Department.

The charge of desludging by the Cleansing Dept. from residents is Rp. 5000 per m^3 capacity of the septic tank, and typical capacity of residential septic tank is about 2-4 m^3 .

Direct callers to Dinas Kebersihan (Cleansing Dept.) specify their size of septic tank and make advance payment for desludging accordingly. While those telephone requesters make their payment directly to the truck drivers.

The frequency of desludging of residential units varies from a few months to even up to seven (7) years or more, and is considered to be dependent on the quality of construction and maintenance with respect to the prevention of storm water intrusion into the septic tanks, and the level of groundwater table. For example, in the northern area of Jakarta, where the level of groundwater table is high, the frequency of desludging is also high in comparison to southern areas of Jakarta. Nevertheless, the average frequency of desludging is estimated at once in two (2) years.

The total number of consumers served annually during the last five (5) fiscal years of 1985-1990 and the corresponding quantity of sludge collected

in the Study Area by the Cleansing Department is summarized in the Table given below.

Fiscal Year	No. of Household Served	Total Sludge Volume (m ³)	Sludge Collection Rate (m ³ /household)
1985 - 1986	25,029	65,101	2.6
1986 - 1987	24,961	65,224	2.6
1987 - 1988	23,438	60,412	2.6
1988 - 1989	25,171	68,307	2.7
1989 - 1990	24,632	71,823	2.9
Average	24,646	66,173	2.7

Note : Source - Dinas Kebersihan Tahun 1989-1990. Fiscal year 1985-1986 means April 1985-March 1986.

It is evident from the above Table that the per household quantity of sludge collection is in the range of 2.6-2.9 m³.

Furthermore assuming a 310 number working days in a year, the average number of household served and the corresponding volume of sludge collected per day is estimated to be respectively about 80 and 190-230 m³.

2.3 Transportation of Sludge

Vacuum trucks of capacity 2m³, 4m³ and 6m³ are used for desludging, and subsequent transport to treatment plant, of sludge.

At present, the main office own 66 number (vacuum) trucks. The five (5) branch offices own among them 8-9 truck each, with a total of 42.

The distribution of vacuum trucks along with their capacities owned by the main and branch offices of the Cleansing Department in the year 1990 is tabulated below.

Capacity (m ³)	Number of Trucks		Total Each Capacity
	Main Offices	Branch Offices	
2	43	34	77
4	2	2	4
6	21	6	27
Total	66	42	108

The available latest monthly operational details of desludging and transportation by the vacuum trucks belonging to the Cleansing Department (Dinas Kebersihan) during the fiscal year 1989-1990 (April 1989-March 1990) is provided in Table F.9.

The transported sludge is discharged for treatment in the two (2) number existing sludge treatment plants in Pulo Gebang and Kebon Nanas. The sludge treatment is described in details in the following section.

Based on Table F.9, in 1989-1990, the daily average request for desludging was from 91 households with a daily sludge volume of 242 m³ (2.65 m³ sludge/household).

The average number of vacuum trucks employed daily was 73 with 101 number cycles of sludge disposal to treatment plants, resulting in about 1.4 cycle per truck in one(1) day. Furthermore, the effective utilization ratio of vacuum trucks, computed in reference to the total available trucks of 108, was about 68%.

The number of cycles per truck depends on various factors such as, capacity of truck, per household quantity of desludging, distance between household and treatment plant, the age of truck and others. In general, new truck make more than one cycle per day while old ones do only one cycle.

The initial transport time/distance of an empty truck to the location of desludging is optimized, as far as possible, by utilizing a truck stationed at the nearest one of the six (6) offices of the Cleansing Department.

2.4 Sludge Treatment

(1) Existing and planned Treatment Plants

The Cleansing Department operate and maintain two (2) sludge treatment plants, became operational since 1984, at Kebon Nanas and Pulo Gebang. The principle of treatment in both plants basically consist of aerobic digestion and anaerobic digestion cum solid-liquid separation.

The Kebon Nanas plant is strategically located close to central area of Jakarta (ref. Fig. F.5), but has a treatment capacity of only 60 m³/d, while the one at Pulo Gebang in East Jakarta has a capacity of 300 m³/d but its location is quite far away from central Jakarta area, and hence from the location of most septic tanks. A new treatment plant is planned at Duri Kosambi in West Jakarta which is very similar to the one at Pulo Gebang with respect to both its capacity and treatment process.

Before the two existing sludge treatment plants became operational in 1984, the sludge was disposed in natural waterways.

The proposed new treatment plant site in Duri Kosambi in West Jakarta is located near Angke River and an area of 10 ha is already reserved for the plant.

Though, this new plant was originally planned to be completed within this year, 1990, the works has been delayed due to budget constraints.

A layout diagram of the existing main treatment plant at Pulo Gebang, along with typical water quality as BOD from influent raw sludge to the drained effluent, is shown in Fig. F.6 for illustrative purpose.

The sludge treatment process in Pulo Gebang consists of four (4) basic steps of both liquid and sludge treatment streams.

- (i) Aerobic digestion
- (ii) Sedimentation and anaerobic digestion in two (2) stages
- (iii) Facultative/Maturation pond treatment
- (iv) Sludge drying in drying beds.

- (i) Aerobic digestion

There are eight (8) number aeration tanks, each with a capacity of 300 m³. Diffused air aeration is employed as the method of aeration. The sludge, desludged from septic tanks, transported by vacuum trucks are discharged sequentially into each tank, and digested for six (6) days continuously.

- (ii) Sedimentation and anaerobic digestion

The aerobically digested sludge is pumped to the sedimentation tanks and undergo gravity settling cum anaerobic digestion in two (2) stages. The first stage sedimentation involves two (2) tanks, with one (1) as standby for alternative use, and the second stage with one (1) tank. All three (3) tanks are of capacity 4,800 m³.

- (iii) Facultative/Maturation pond treatment

This is the final treatment step for liquid stream, in which the effluent of two (2) stage anaerobic digestion stream of above is further treated in one (1) baffled facultative/maturation pond with capacity of 1,600 m³. The treated effluent is discharged to Cakung River.

- (iv) Sludge drying

The settled sludge in the sedimentation tanks is pumped to the sand drying bed. Ten (10) number open drying beds each with an area of 50 m² (5mX10m) and a sand drain depth of 200 mm became operational in January, 1990. Sludge to a depth of

200 mm is spread and dried for a period ranging from 7 days to 30 days. Minimum drying period is obtained during dry seasons with no significant rainfall.

Due to faulty construction, the underdrain waste of the drying beds is discharged to Cakung River along with treated effluent instead of being recycled to the sedimentation pond. It is recommended to rectify this fault and recycle the underdrain to influent stream of initial sedimentation (anaerobic digestion) pond.

The capacity of the drying beds is inadequate, hence at times excess sludge is pumped to the adjoining open area, which essentially functions as a natural sludge lagoon. It is strongly recommended to reserve a portion of the open area as sludge lagoon by using earthen embankment type confinement.

(2) Efficiency of Sludge Treatment

The sludge treatment efficiency of Pulo Gebang treatment plant has been monitored once a year for the last three (3) years, by the Cleansing Department. As this available data is extremely limited, the JICA Study Team conducted an additional sampling survey to supplement the data on sludge treatment efficiency, in September 1990. In this survey, the treatment efficiency of each individual sub treatment units of the sludge/liquid stream, other than sludge drying, was monitored for three (3) days. The results obtained by the Study Team are integrated along with those of available data by the Cleansing Department in order to evaluate the efficiency of sludge treatment system in Pulo Gebang.

The available sludge quality data of influent and effluent to aerobic digestion tank, the major initial step of treatment system, measured as BOD₅ and the respective BOD removal efficiency are given below.

Date of Sampling	Sludge Quality of Aeration (mg BOD ₅ /l)		BOD Removal Efficiency
	Influent	Effluent	
13-09-1990*	7140	5660	20.0
26-01-1990	3640	2520	30.8
10-01-1988	1200	800	33.3
-02-1987	8312**	7108	14.5

* Data of Study Team

** Data obtained on second day of aeration

Based on the three (3) sets of recent data and disregarding the oldest one due to its inconsistency with respect to influent, the BOD removal efficiency of aerobic digestion process of Pulo Gebang is about 30% in 6 days of aeration. Further more, based on the whole integrated data on influent sludge quality, the average BOD₅ of raw sludge is estimated to be 5,000 mg/l. This is in agreement with the typical value given in US EPA publication on On-site Septage Treatment and Disposal(1977).

In regard to the final effluent quality of facultative/maturation pond, it was in the range of 110 ~ 240 mg/l as BOD according to the results of analysis by Study Team. While, a range of 60 ~ 170 mg/l was recorded in previous survey by the Cleansing Department. Accordingly, the effluent BOD₅ is considered to be in the range of 60 ~ 120 mg/l, in an overall sense.

The effluent quality of intermediate sedimentation cum anaerobic digestion unit was an average of 460 mg/l as BOD, with no significant difference between the two (2) stages. This may be attributed to poor sludge settling in the second stage pond. In fact both intermediate sedimentation cum anaerobic digestion ponds contained high accumulated sludge during sampling by the Study Team.

A high fecal coliform density (FC) was observed not only in the final effluent of facultative/maturation pond but also in the Cakung River reaches of the treatment plant (about 2×10^7 No./100 ml).

Based on the survey results by the Study Team, the final effluent quality is not satisfactory. It seems that an additional facultative/maturation pond in series to the existing one would be necessary. The existing open area of excess sludge pumping could be used to provide both a confined sludge lagoon and a maturation pond. Furthermore, simultaneous use of both the initial stage sedimentation ponds to reduce sludge loading, instead of alternative use as practised at present, may also be considered.

Nevertheless it is recommended to monitor the performance of Pulo Gebang plant at least three (3) times a year, once in 4 months, against the present practice of once a year as this sampling frequency is too low to make use of the data for the purpose of analysis with confidence. It is adequate to determine the basic parameters (COD, BOD, TS, TVS, pH, FC and DO) necessary to evaluate the overall performance of the plant. Detailed evaluation including the quality of dried sludge may be restricted to once a year as being carried out at present.

(3) Cost of Sludge Treatment

The breakdown in cost for the annual operation and maintenance of the major sludge treatment plant in Pulo Gebang (Capacity $300 \text{ m}^3/\text{d}$) is summarized in the Table given below. This cost does not include the nominal wages paid to the 20 number treatment plant personnel employed, but includes the subsistence allowances paid to them.

Annual operation and Maintenance Cost of Pulo Gebang Sludge Treatment Plant.

ITEM	ANNUAL COST (Thousand Rp)
Maintenance of Digester	2,800
Maintenance and Draining of Sedimentation Ponds	31,812
Electricity Charge of Air Blower and Pumps	22,680
Replacement of Sand and Gravel	2,350
Operation and Maintenance of Shovel Loaders	4,848
Miscellaneous Items	364
Subsistence Allowance	6,480
TOTAL	71,334

The total annual operation and maintenance cost, excluding that of nominal wages of employees, is estimated to be about Rp. 71 million.

2.5 Private Desludging

There are five (5) number registered private desludging companies which carry out desludging operations in addition to Dinas Kebersihan. On average each company owns about 5 number vacuum trucks only, hence their contribution is not very significant in comparison to the Cleansing Department.

Table F.10 illustrates the comparative evaluation on quantity of desludging by both the private companies and the Cleansing Department for the fiscal year 1989-1990. Accordingly, the contribution by the private companies is only a 2.3% for the whole one year.

These private companies are allowed to discharge their sludge to the sludge treatment plant at Pulo Gebang only, but for a treatment fee of 2,000 Rp/m³.

3. On-going Sewerage and Sanitation Project

3.1 General

The masterplan prepared in 1977 on sewage disposal in Jakarta for the WHO recommended a phased construction of conventional sewerage system, discharging untreated sewage into Java Sea.

The first phase of the above plan of 1977 recommended sewerage development for Setia Budi and Gambir areas. Even though the plan was not implemented due to its extra ordinary high cost and inadequate consideration to low cost sanitation options other than conventional sewerage, in 1979, it was agreed upon between the Government of Indonesia (GOI) and International Bank for Reconstruction and Development (IBRD) of World Bank to conduct a pilot project in Setia Budi, the priority area identified by the above masterplan, but with a different approach. This is to develop a conventional sewerage system along with continued use and development of low cost options like septic tanks, leaching pits, and communal facilities like public toilet, to improve the overall level of sanitation and to gain experience on such an integrated approach. Also, in order to have a wide range of income distribution of customers for service Kecamatan Tebet Manggarai was also later incorporated along with Kecamatan Setia Budi. The project has become to be known as "Jakarta Sewerage and Sanitation Project" or JSSP.

The total cost of the project, including physical and price contingencies, but excluding duties and taxes, was estimated at US\$ 37.2 million in 1982 prices.

The project area of JSSP covers about 2000 hectare of area with a population of about 460,000 in 1989.

There are altogether 15 number Kelurahan in the JSSP area. The area, population and population density of all Kelurahan in the JSSP area are tabulated in Table F.11, ranked according to the ascending order of population density (ref. also Fig. F.7).

3.2 Elements of JSSP Project

The JSSP project consists of the following basic subsectors.

(a) Sewerage

The sewerage subsector includes the construction of the following basic elements:

- main sewers and interceptors, the respective secondary and tertiary sewers, shallow sewers and house connections.
- open drain interceptors to collect dry weather flow, known as kampung inlets, an indirect service to low income communities.
- the necessary equipments and their installation to convert Setiabudi West and Setiabudi East ponds to receive and treat the collected wastewater.

(b) Sanitation

Sanitation subsector includes the construction and/or rehabilitation of the following basic elements:

- individual on-site sanitation facilities like leaching pits and public water taps.
- communal on-site sanitation facilities like public toilet.
- drains and drain outlets.

(c) Institution

Institution subsector includes the following basic elements:

- Development of an institution to administer, operate and maintain the sewerage facilities.
- Staff training on administration, operation and maintenance.

3.3 Sewerage Project of JSSP

(1) Sewer System

The very first sewerage system in Jakarta is being installed in the JSSP area since 1985 and planned to be completed by 1993. The existing condition of the sewer system installation as of the end of 1989 is illustrated in Fig.F.7. In this figure the ranking of population density of each Kelurahan as presented in Table F.11 is also indicated. The Kelurahans with, considerable, already laid sewers, but may not yet to be operational, their population density, and their ranking of population density in ascending order, by the end of the year 1989, is tabulated below (ref. Fig. F.7).

Kelurahans with laid sewers under JSSP

Kelurahan	Population Density (person/ha)	Ranking of population density
Setiabudi	123	2
Karet Kuningan	199	6
Pasar Manggis	349	9
Karet	380	11
Manggarai	447	12
Guntur	458	13

These sewer installations were carried out under the JSSP first stage (JSSP-1) program and all the remaining interconnections are planned to be completed until March 1991, the end of JSSP-1. The whole project will be completed by 1993, under the JSSP extension programme of JUDP-II (Jabotabek urban development project-II).

The design population served, both by direct house connections and indirect interceptor sewer, is 170,000. The total sewer length is about 46,000 m, which will serve 3,700 houses through direct connection of conventional sewer. The sewerage development cost is estimated at Rp. 49 billion in 1989.

The area selected for conventional sewers and their initial installation are decided mainly based on limitation of treatment capacity in Setia Budi West and Setia Budi East ponds, topography, ease of accessibility and attainment of balanced consumer level with cross subsidy among residential, institutional, commercial and industrial users. As shown in the above table, the population density of the Kelurahan with laid sewers vary from as low as 123 person/hectare in Setiabudi to as high as 458 person/hectare in Guntur. Infact these two (2) Kelurahan have the highest density of laid sewers (ref. Fig.F.7) and are closest to the Setiabudi treatment ponds adjoining each other. However, the prime usage of these ponds are for flood control.

The trunk mains of the sewer system are designed to carry the whole future wastewater discharge in the year 2000, for a direct population demand of 500,000 people and an indirect discharge equivalent to 250,000 people from neighbouring Kecamatan of Setia Budi, namely, Mampang Prapatan. As such it seems that the major constraints of increasing the level of direct connections are the limited treatment capacity of the Setiabudi Ponds and lack of accessibility to, especially, the Kampung areas due to high housing density.

The interceptor sewer will collect the dry weather flow from inaccessible properties like Kampung areas that are located in the direct services area, utilizing the surface drains/ditches.

(2) Wastewater Treatment

The master plan of 1977 proposed ocean outfall of raw wastewater with no treatment. However, due to the limited service area of this pilot project and at least marginally contribute to the downstream water quality it is decided to institute a viable treatment of wastewater collected.

As a provisional, economic, and interim treatment measure it is decided to utilize the flood control ponds, the Setiabudi West Pond and the Setiabudi East Pond as sequencing batch reactor (SBR) type aerated lagoons, in principle, during dry season with dry weather

wastewater flow (ref. Fig.F.7 and Fig.F.8). The installation of aerators in both the ponds, 4 nos. in West Pond and 3 Nos. in East Pond, have been completed, and the test operations are already made. Proliferation of water hyacinth is noted in the West Pond, but not in the East Pond. A healthy development of algal population is noticeable in both the West and East Ponds imparting a greenish colour, implying that the ponds are already functioning as facultative ponds. This is probably due to the relatively low hydraulic and organic loadings to the pond at present. The pertinent information concerning the ponds, including the aerators, are summarized in Table F.12.

It is to be noted that during rainy season and at times of heavy rainfall runoff, priority will be given to the flood control, purpose. During such times of pumped drainage for flood control, the operation of aerators shall be stopped.

It is expected by intermittent operation of aerators along with settling and drawoff it is possible to retain the active biomass in the pond to achieve a reasonable reduction of BOD by limiting the escape of suspended biomass with the effluent. Though there is no precise target for effluent water quality it is expected to be within 30 mg/l as BOD. Also the stopping of aerators during pumping under high stormwater inflow is expected to facilitate in retaining the active biomass in the pond. All these predictions remain to be demonstrated with the actual operation and an effective monitoring of the treatment system. If flocculant settleable biomass is formed it is possible to have a long solids retention time with even shorter hydraulic detention time, thereby increasing the pond treatment capacity. This is the major constraint of the ponds design criteria, which limits the expansion of sewerage areas.

(3) Institution for Sewerage Management

As the JSSP Project is the very first sewerage development project in Jakarta, it involves establishing an appropriate institution that could operate and maintain the sewer facilities and the wastewater

treatment system, and also could plan and implement future sewerage developments in Jakarta.

The other aspects related to the institution are:

- (i) Formulation of an appropriate sewerage tariff rate and structure.
- (ii) Organization and staffing for operation and maintenance of the sewer system.
- (iii) Enactment of necessary laws for enforcement.

This institutional development for JSSP sewerage has much relevance to this Study, because the developed institution would probably be responsible for the implementation of the project identified by this Study.

At present the JSSP Project is under an interim sewerage unit called BPAL that was established under the Ministry of Public Works of the Central Government of Indonesia.

The recent progress towards establishing a permanent institution of sewerage and other related developments are summarized below.

- (i) It is understood that the DKI, Jakarta has decided on the permanent organization that would be primarily responsible for Sewerage in Jakarta.
- (ii) The Ministry of Public Works has approved the sewerage tariff structure proposed by BPAL, and the sewerage charge has already been put into effect for the customers served since July 1989.

3.4 Sanitation Project of JSSP

(1) General

The sanitation subsector of the JSSP project on human waste management incorporated the provision of both individual and communal on-site sanitation facilities, of leaching pits (LPs) and public toilets, respectively to middle and low income communities lacking basic sanitation, wherever appropriate. This program also incorporated rehabilitation of existing sanitation facilities of this nature.

The JSSP project intends to serve 60% of the project area (Kecamatan Setia Budi and Tebet Manggarai) with both conventional and interceptor (Kampung inlets) sewerage, while the remaining 40% of the project area is intended to be served with on-site sanitation facilities.

In 1983, at the commencement of the JSSP project, it was estimated that there were 32,000 leaching pits in the Project Area serving mainly middle income communities. The number of public toilet in the project area during this time was 24.

(2) Sanitation Facilities

Leaching Pits (LPs)

It is targeted to construct 3000 leaching pits (LPs), under a credit programme by JSSP. Accordingly, the recipient receives a loan to construct one's own LP which has to be repaid in 5 year period. The amount disbursed per household ranges from about Rp. 136,000 to 600,000, which is also the cost of construction. This construction cost is high for low income communities. Since the commencement of the self help programme under the World Bank loan in 1985, so far only 453 number LP units, out of the planned 3000, have been completed until October 1989. These included 40 number pilot project LPs that were constructed initially to formulate an improved construction standards, the location of which are shown in Fig. F.9.

Of these completed 453 units, about 200 are constructed inside the houses due to lack of available space outside. This is an unacceptable practice, especially when only one LP is provided, where desludging will have to deal with septic sludge within the house once in every 1-3 years.

This practice of constructing single pit system inside the house is already discontinued, and JSSP has decided to monitor closely the performance of those already constructed units.

The slow progress of the LP program so far is reported to be mainly due to unfavorable site conditions of the initial areas, like high population density, difficult soil conditions and flooding problems.

A maximum population density of 500 person per hectare has been adopted by JSSP for the provision of LP, which is very high, and would have led to the provision of LP inside the house. However, it has been decided by JSSP to stick to 300 person/ha as far as possible in future.

Since July 1989 the project sites of LPs are reported to be moved to more favorable locations and the construction progress has gained momentum. Moreover, the original target of 3000 LP units is planned to be reached by March 1991. It is also to be noted that of the 453 units constructed so far since 1985, 383 units or 84% has in fact been constructed very recently in 1988-1989. The distribution of these recently constructed LP units on a Kelurahan basis, during 1988-1989, in the ascending order of population density, is shown in Table F.13. This Table also shows the distribution of public toilets, which is dealt with in the subsequent section.

Public Toilets (MCKs)

A total of 124 public toilet units having communal bathing, washing and toilet facilities with a total toilet seating capacity of 248, for low income communities, was planned to be completed by 1990, in the Project Area. Of these, 98 units with a total seating capacity of 196 have already been completed and another 3 units were rehabilitated.

The locations of these public toilet units constructed are shown in Fig.F.9. and their numbers in each Kelurahan is tabulated in Table F.13.

The remaining 26 units with a total toilet seating capacity of 52 is scheduled to be completed by March 1990.

The toilet seating capacity of these public toilet vary from 2 to 4 in general, with most having 2 seats per unit. It is reported by JSSP that each toilet seat is assumed to serve about 10 families, or 50 persons. The public toilets are maintained by the community concerned.

(3) Sanitation Criteria of JSSP

The criteria and other basic design considerations adopted by JSSP for the provision of on-site sanitation facilities are summarized below. Wherever possible, these are compared with other available source of information.

Criteria of Leaching Pits

JSSP adopts the following as the site selection criteria for LPs.

- (i) Soil Permeability : 10-25 l/m² /day
- (ii) Population Density : Permissible maximum is 500 person/ha
Preferable < 300 person/ha.
- (iii) Flood Condition : No flooding
- (iv) Landuse : Residential

The level of groundwater table is not considered as a critical parameter, because in the project areas the average groundwater table level even during rainy season is about 6m below ground surface. The corresponding value during dry season is 14m below ground surface.

The criteria on population density for the provision of individual on-site sanitation facilities, from other sources are as follows:

(a) World Bank

For single storey homes : 250-300 person/ha

Double this figure could be utilized for predominantly two (2) storey homes.

(b) Six Cities Sanitation Program, Indonesia

The permissible maximum population density adopted was 200 person/ha.

On the other hand, the cross over population density at which the cost of individual on-site system exceeds that of shallow sewer system is estimated as follows:

(a) Estimation of JSSP for Jakarta

300-350 person/ha.

(b) United Nations Centre for Human Settlements (UNCHS)

May be as low as 100-500 person/ha.

Capacity of Leaching Pits

Consideration of JSSP is as follows:

Specific accumulation of sludge in LP = 35 l/person/year.

Capacity of LP per pit for double leaching pit system for a family of about 5 person is 1.25 m³/pit.

The corresponding value for single pit is 1.75 m³.

Public Toilets

The JSSP adopts the following site selection criteria for public toilets.

(i) Population density

Population density is not considered as a separate entity for site selection.

Instead, a concentrated group of low income communities along with the availability of sufficient area for the construction of facility at a convenient distance for use is considered.

(ii) Treatment System

As treatment system septic tank with soakaway is considered. The required seating capacity of the toilets is decided by considering each seat can serve 50 person(10 families).

Table F.1(1) Existing Service Population Ratio by Sanitation Facility

(Unit : %)

CODE NUMBER	NAME OF KELURAHAN & KECAMATAN	NO FACILITY	PUBLIC TOILET	TOILET WITHOUT TREATMENT	TOILET WITH TREATMENT	TOILET WITH SEWERAGE	OTHERS	TOTAL
1101	CIDENG	0.0	28.0	0.0	72.0	0.0	0.0	100.0
1102	DURI PULO	0.0	10.5	44.4	45.1	0.0	0.0	100.0
1103	PETOJO UTARA	21.0	0.0	21.0	58.0	0.0	0.0	100.0
1104	PETOJO SELATAN	0.0	0.0	23.3	76.7	0.0	0.0	100.0
1105	KEBON KELAPA	12.9	0.0	16.1	71.0	0.0	0.0	100.0
1106	GAMBIR	25.4	0.0	0.0	74.6	0.0	0.0	100.0
1100	GAMBIR	6.3	7.7	23.4	62.6	0.0	0.0	100.0
1201	MANGGA DUA SELATAN	0.0	0.0	16.0	84.0	0.0	0.0	100.0
1202	KARANG ANYAR	11.4	11.4	11.4	65.8	0.0	0.0	100.0
1203	KAR TINI	0.0	0.0	37.5	62.5	0.0	0.0	100.0
1204	PASAR BARU	22.9	0.0	0.0	77.1	0.0	0.0	100.0
1205	GUNUNG SAHARI UTARA	13.9	0.0	2.1	84.0	0.0	0.0	100.0
1200	SAWAH BESAR	7.7	2.5	14.7	75.1	0.0	0.0	100.0
1301	GUNUNG SAHARI SELATAN	0.0	0.0	69.9	30.1	0.0	0.0	100.0
1302	KEMAYORAN	13.5	27.0	0.0	59.5	0.0	0.0	100.0
1303	KEBON KOSONG	34.9	0.0	15.1	50.0	0.0	0.0	100.0
1304	SERDANG	12.5	0.0	16.7	70.8	0.0	0.0	100.0
1305	HARAPAN MULLA	12.3	12.3	12.3	63.1	0.0	0.0	100.0
1306	UTANPANIANG	0.0	36.9	24.7	38.4	0.0	0.0	100.0
1307	CEMPAKA BARU	12.3	12.3	0.0	75.4	0.0	0.0	100.0
1308	SUMURBATU	12.3	0.0	0.0	87.7	0.0	0.0	100.0
1300	KEMAYORAN	11.9	13.0	16.4	58.7	0.0	0.0	100.0
1401	SEKEN	14.2	0.0	14.2	71.6	0.0	0.0	100.0
1402	KWITANG	28.7	48.3	0.0	23.0	0.0	0.0	100.0
1403	KENARI	28.6	24.2	24.2	23.0	0.0	0.0	100.0
1404	KRAMAT	0.0	0.0	61.8	38.2	0.0	0.0	100.0
1405	PASEBAN	14.4	28.7	0.0	56.9	0.0	0.0	100.0
1406	BUNBUR	0.0	0.0	22.1	77.9	0.0	0.0	100.0
1400	SEKEN	11.3	15.7	20.7	52.3	0.0	0.0	100.0
1501	TANAH TINGGI	0.0	16.5	49.1	34.4	0.0	0.0	100.0
1502	JOHAR BARU	16.4	0.0	49.2	34.4	0.0	0.0	100.0
1503	GALUR	0.0	0.0	18.1	81.9	0.0	0.0	100.0
1504	KAMPUNG RAWA	0.0	0.0	18.1	81.9	0.0	0.0	100.0
1505	RAWA SARI	32.8	0.0	0.0	67.2	0.0	0.0	100.0
1506	CEMPAKA PUTIH BARAT	0.0	0.0	34.9	65.1	0.0	0.0	100.0
1507	CEMPAKA PUTIH TIMUR	6.9	0.0	9.7	83.4	0.0	0.0	100.0
1500	CEMPAKA PUTIH	7.8	3.2	30.7	58.3	0.0	0.0	100.0
1601	KEBON SIRIH	15.9	0.0	35.0	49.1	0.0	0.0	100.0
1602	GONDANGDIA	0.0	0.0	0.0	100.0	0.0	0.0	100.0
1603	CIKINI	14.8	7.4	33.7	44.1	0.0	0.0	100.0
1604	MENTENG	6.5	6.5	13.4	73.6	0.0	0.0	100.0
1605	PEGANGSAAN	8.7	26.2	59.4	5.7	0.0	0.0	100.0
1600	MENTENG	14.5	10.1	29.3	46.1	0.0	0.0	100.0
1701	KAMPUNG BALI	23.3	0.0	11.6	65.1	0.0	0.0	100.0
1702	KEBON KACANG	0.0	0.0	11.5	88.5	0.0	0.0	100.0
1703	KEBON MELATI	11.5	0.0	0.0	77.0	0.0	11.5	100.0
1704	PETAMBURAN	0.0	32.8	0.0	67.2	0.0	0.0	100.0
1705	KARET TENGSI	24.1	0.0	0.0	75.9	0.0	0.0	100.0
1706	BENDUNGAN HILIR	13.7	13.7	13.7	58.9	0.0	0.0	100.0
1707	GELORA	0.0	20.5	0.0	79.5	0.0	0.0	100.0
1700	TANAH ABANG	11.3	8.4	5.7	71.9	0.0	2.7	100.0
1000	JAKARTA PUSAT	10.2	8.5	19.1	61.7	0.0	0.5	100.0

Source : JICA

Table F.1(2) Existing Service Population Ratio by Sanitation Facility

(Unit : %)

CODE NUMBER	NAME OF KELURAHAN & KECAMATAN	NO FACILITY	PUBLIC TOILET	TOILET WITHOUT TREATMENT	TOILET WITH TREATMENT	TOILET WITH SEWERAGE	OTHERS	TOTAL
2201	KAMAL MUARA	41.0	4.5	0.0	54.5	0.0	0.0	100.0
2202	KAPUK MUARA	0.0	16.4	69.3	14.3	0.0	0.0	100.0
2203	PEJAGALAN	10.7	10.7	0.0	78.6	0.0	0.0	100.0
2204	PENJARINGAN	42.8	0.0	9.6	47.6	0.0	0.0	100.0
2205	PLUIT (MANGGA DUA UTARA)	34.2	0.0	8.6	57.2	0.0	0.0	100.0
2206	PADEMANGAN BARAT	13.0	13.0	13.1	60.9	0.0	0.0	100.0
2207	PADEMANGAN TIMUR	11.0	0.0	11.6	77.4	0.0	0.0	100.0
2208	ANCOL	26.0	22.3	18.7	33.0	0.0	0.0	100.0
2200	PENJARINGAN	22.3	7.5	10.8	59.4	0.0	0.0	100.0
2301	SUNTER AGUNG	49.2	0.0	8.2	26.1	0.0	16.5	100.0
2302	PAPANGGO	0.0	28.1	11.4	60.5	0.0	0.0	100.0
2303	SUNGAI BAMBU	0.0	0.0	66.7	33.3	0.0	0.0	100.0
2304	KEBON BAWANG	0.0	28.5	5.4	66.1	0.0	0.0	100.0
2305	TANJUNG PRIOK	0.0	14.3	25.0	60.7	0.0	0.0	100.0
2306	SUNTER JAYA	16.5	0.0	0.0	83.5	0.0	0.0	100.0
2307	WARAKAS	0.0	28.1	14.1	57.8	0.0	0.0	100.0
2300	TANJUNG PRIOK	9.9	14.7	17.1	55.9	0.0	2.4	100.0
2401	KOJA UTARA	0.0	37.3	9.6	53.1	0.0	0.0	100.0
2402	LOGOA	6.3	0.0	27.0	66.7	0.0	0.0	100.0
2403	KOJA SELATAN	18.6	0.0	46.8	34.6	0.0	0.0	100.0
2404	TUGU SELATAN	0.0	0.0	24.0	76.0	0.0	0.0	100.0
2405	TUGU UTARA	0.0	0.0	31.1	68.9	0.0	0.0	100.0
2406	RAWA BADAQ	0.0	0.0	71.5	28.5	0.0	0.0	100.0
2407	KELAPA GADING BARAT	0.0	0.0	13.7	86.3	0.0	0.0	100.0
2408	KELAPA GADING TIMUR	7.6	7.6	7.6	77.2	0.0	0.0	100.0
2409	PEGANGSAAN DUA	36.3	0.0	36.3	27.4	0.0	0.0	100.0
2400	KOJA	5.8	5.3	36.2	52.7	0.0	0.0	100.0
2501	KALI BARU	54.5	0.0	20.0	25.5	0.0	0.0	100.0
2502	CILINCING	35.9	0.0	17.1	47.0	0.0	0.0	100.0
2503	SEMPER BARAT	13.0	0.0	0.9	86.1	0.0	0.0	100.0
2504	SEMPER TIMUR	38.9	0.0	10.4	50.7	0.0	0.0	100.0
2505	MARUNDA	24.0	24.0	37.9	14.1	0.0	0.0	100.0
2506	SUKAPURA	35.0	0.0	0.1	64.9	0.0	0.0	100.0
2507	ROROTAN	70.0	10.0	15.0	5.0	0.0	0.0	100.0
2500	CILINCING	35.1	1.5	11.3	52.1	0.0	0.0	100.0
2000	JAKARTA UTARA	16.4	7.7	20.1	55.2	0.0	0.6	100.0
3101	SEMANAN	15.9	0.0	0.0	84.1	0.0	0.0	100.0
3102	KAMAL	64.9	0.0	2.4	32.7	0.0	0.0	100.0
3103	TEGAL ALUR	83.4	0.0	2.8	13.8	0.0	0.0	100.0
3104	PEGADUNGAN	24.2	0.0	3.3	72.5	0.0	0.0	100.0
3105	KALI DERES	33.2	21.2	0.0	45.6	0.0	0.0	100.0
3106	CENKARENG TIMUR	43.1	0.0	21.5	35.4	0.0	0.0	100.0
3107	KAPUK	32.7	38.5	5.8	23.0	0.0	0.0	100.0
3108	KEDAUNG KALI ANGKE	24.3	24.3	20.5	30.9	0.0	0.0	100.0
3109	DURI KOSAMBI	24.1	0.0	0.0	75.9	0.0	0.0	100.0
3110	RAWA BUAYA	0.0	0.0	0.0	100.0	0.0	0.0	100.0
3111	CENKARENG BARAT	16.2	0.0	16.2	67.6	0.0	0.0	100.0
3100	CENKARENG	33.3	10.2	7.4	48.5	0.0	0.6	100.0

Source : JICA

Table F.1(3) Existing Service Population Ratio by Sanitation Facility

(Unit : %)

CODE NUMBER	NAME OF KELURAHAN & KECAMATAN	NO FACILITY	PUBLIC TOILET	TOILET WITHOUT TREATMENT	TOILET WITH TREATMENT	TOILET WITH SEWERAGE	OTHERS	TOTAL
3201	GROGOL	0.0	0.0	20.5	79.5	0.0	0.0	100.0
3202	JELAMBAR	0.0	0.0	27.0	73.0	0.0	0.0	100.0
3203	TANJUNG DUREN	0.0	0.0	11.3	88.7	0.0	0.0	100.0
3204	TOMANG	0.0	0.0	22.7	65.9	0.0	11.4	100.0
3205	JATI PULO	0.0	0.0	13.0	87.0	0.0	0.0	100.0
3206	KOTA BAMBU	0.0	0.0	28.7	71.3	0.0	0.0	100.0
3207	SLIPI	27.2	0.0	0.0	72.8	0.0	0.0	100.0
3208	PAL MERAH	0.0	0.0	28.2	71.8	0.0	0.0	100.0
3209	KEMANGGISAN	0.0	0.0	0.0	100.0	0.0	0.0	100.0
3210	JELAMBAR BARU	0.0	0.0	0.0	100.0	0.0	0.0	100.0
3211	WIJAYA KUSUMA	29.3	0.0	0.0	70.7	0.0	0.0	100.0
3200	GROGOL PETAMBURAN	2.7	0.0	15.6	80.5	0.0	1.2	100.0
3301	PINANGSIA	10.6	10.6	19.1	59.7	0.0	0.0	100.0
3302	MANGGA BESAR	10.5	10.5	24.9	54.1	0.0	0.0	100.0
3303	TANGKI	10.5	10.5	2.8	76.2	0.0	0.0	100.0
3304	GLODOK	0.0	0.0	13.3	76.2	0.0	10.5	100.0
3305	KEAGUNGAN	0.0	10.5	1.9	66.6	0.0	21.0	100.0
3306	KRUKUT	0.0	0.0	27.8	58.2	0.0	14.0	100.0
3307	TAMAN SARI	0.0	21.0	0.0	79.0	0.0	0.0	100.0
3308	MAHPAR	28.4	8.2	16.4	47.0	0.0	0.0	100.0
3300	TAMAN SARI	8.5	7.6	12.6	64.7	0.0	6.6	100.0
3401	PEKOJAN	46.9	0.0	0.0	53.1	0.0	0.0	100.0
3402	ROA MALAKA	35.2	0.0	24.6	40.2	0.0	0.0	100.0
3403	TAMBORA	23.5	23.9	0.0	52.6	0.0	0.0	100.0
3404	JEMBATAN LIMA	24.2	0.0	24.6	51.2	0.0	0.0	100.0
3405	ANGKE	24.8	29.6	0.0	45.6	0.0	0.0	100.0
3406	JEMBATAN BESI	14.8	22.8	0.0	62.4	0.0	0.0	100.0
3407	KRENDANG	23.5	0.0	33.8	42.7	0.0	0.0	100.0
3408	TANAH SEREAL	23.5	11.7	11.7	53.1	0.0	0.0	100.0
3409	DURI UTARA	0.0	23.5	24.6	51.9	0.0	0.0	100.0
3410	KALI BARU	16.0	44.4	0.0	39.6	0.0	0.0	100.0
3411	DURI SELATAN	0.0	0.0	12.5	87.5	0.0	0.0	100.0
3400	TAMBORA	21.0	15.1	10.9	53.0	0.0	0.0	100.0
3501	KEMBANGAN	0.0	0.0	15.5	84.5	0.0	0.0	100.0
3502	KEDOYA	0.0	0.0	10.6	89.4	0.0	0.0	100.0
3503	DURI KEPA	0.0	12.4	12.4	75.2	0.0	0.0	100.0
3504	MARUYA ILIR	7.7	0.0	23.2	69.1	0.0	0.0	100.0
3505	MARUYA UDIK	0.0	23.3	32.8	43.9	0.0	0.0	100.0
3506	JOGLO	11.6	23.9	23.3	41.2	0.0	0.0	100.0
3507	SRENGSENG	0.0	23.3	0.0	76.7	0.0	0.0	100.0
3508	KEBON JERUK	6.4	0.0	6.4	87.2	0.0	0.0	100.0
3509	SUKABUMI ILIR	0.0	0.0	18.6	81.4	0.0	0.0	100.0
3510	KELAPA DUA	9.3	0.0	0.0	90.7	0.0	0.0	100.0
3511	SUKABUMI UDIK	0.0	18.7	40.7	40.6	0.0	0.0	100.0
3500	KEBON JERUK	2.7	7.1	15.1	75.1	0.0	0.0	100.0
3000	JAKARTA BARAT	13.1	7.2	12.6	65.9	0.0	1.2	100.0
4101	MENTENG DALAM	20.1	0.0	18.6	61.3	0.0	0.0	100.0
4102	TEBET BARAT	31.3	0.0	15.1	53.6	0.0	0.0	100.0
4103	TEBET TIMUR	0.0	13.0	40.3	46.7	0.0	0.0	100.0
4104	KEBON BARU	0.0	3.7	36.1	60.2	0.0	0.0	100.0
4105	BUKIT DURI	0.0	8.9	56.3	34.8	0.0	0.0	100.0
4106	MANGGARAI SELATAN	21.4	0.0	51.8	26.8	0.0	0.0	100.0
4107	MANGGARAI	11.9	43.6	37.5	7.0	0.0	0.0	100.0
4100	TEBET	10.4	9.5	38.7	41.4	0.0	0.0	100.0

Source : JICA

Table F.1(4) Existing Service Population Ratio by Sanitation Facility

(Unit : %)

CODE NUMBER	NAME OF KELURAHAN & KECAMATAN	NO FACILITY	PUBLIC TOILET	TOILET WITHOUT TREATMENT	TOILET WITH TREATMENT	TOILET WITH SEWERAGE	OTHERS	TOTAL
4201	SETIA BUDI	0.0	14.3	0.0	85.7	0.0	0.0	100.0
4202	GUNTUR	0.0	0.0	7.7	92.3	0.0	0.0	100.0
4203	KARET	0.0	0.0	11.4	88.6	0.0	0.0	100.0
4204	KARET SEMANGGI	0.0	26.5	0.0	73.5	0.0	0.0	100.0
4205	KARET KUNINGAN	0.0	0.0	0.0	100.0	0.0	0.0	100.0
4206	KUNINGAN TIMUR	5.9	0.0	0.0	94.1	0.0	0.0	100.0
4207	PASAR MANGGIS	15.4	0.0	1.7	82.9	0.0	0.0	100.0
4208	MENTENG ATAS	0.0	0.0	38.5	61.5	0.0	0.0	100.0
4200	SETIA BUDI	2.3	1.8	11.7	84.2	0.0	0.0	100.0
4301	KUNINGAN BARAT	0.0	20.1	35.0	44.9	0.0	0.0	100.0
4302	MAMPANG PRAPATAN	25.3	7.5	7.5	59.7	0.0	0.0	100.0
4303	PELA MAMPANG	0.0	0.0	34.4	65.6	0.0	0.0	100.0
4304	TEGAL PARANG	0.0	12.7	34.4	40.2	0.0	12.7	100.0
4305	BANGKA	15.3	0.0	27.6	57.1	0.0	0.0	100.0
4306	PANCORAN	0.0	0.0	31.2	68.8	0.0	0.0	100.0
4307	DUREN TIGA	0.0	19.2	40.4	40.4	0.0	0.0	100.0
4308	KALI BATA	25.6	0.0	0.0	74.4	0.0	0.0	100.0
4309	CIKOKO	18.1	0.0	15.2	66.7	0.0	0.0	100.0
4310	PENGADEGAN	0.0	15.2	15.2	69.6	0.0	0.0	100.0
4311	RAWAJATI	0.0	0.0	0.0	100.0	0.0	0.0	100.0
4300	MAMPANG PRAPATAN	10.8	6.4	23.2	59.6	0.0	0.0	100.0
4401	PEJATEN BARAT	20.6	0.0	10.3	69.1	0.0	0.0	100.0
4402	PASAR MINGGU	0.0	0.0	55.5	44.5	0.0	0.0	100.0
4403	TANJUNG BARAT	11.0	0.0	22.0	67.0	0.0	0.0	100.0
4404	JATI PADANG	0.0	0.0	52.1	47.9	0.0	0.0	100.0
4405	RAGUNAN	17.4	0.0	11.4	71.2	0.0	0.0	100.0
4406	CILANDAK TIMUR	13.0	0.0	9.1	77.9	0.0	0.0	100.0
4407	JAGAKARSA	0.0	0.0	18.2	81.8	0.0	0.0	100.0
4408	LENTENG AGUNG	22.0	0.0	17.5	60.5	0.0	0.0	100.0
4409	SRENGSENG SAWAH	0.0	0.0	0.0	100.0	0.0	0.0	100.0
4410	CIGANJUR	18.2	0.5	22.2	59.1	0.0	0.0	100.0
4411	KEBAGUSAN	0.0	13.1	0.0	86.9	0.0	0.0	100.0
4412	PEJATEN TIMUR	0.0	10.7	10.7	78.6	0.0	0.0	100.0
4400	PASAR MINGGU	6.3	3.5	19.4	70.8	0.0	0.0	100.0
4501	SENAYAN	3.8	0.0	0.0	96.2	0.0	0.0	100.0
4502	RAWA BARAT	8.9	0.0	0.0	82.2	0.0	8.9	100.0
4503	SELONG	0.0	22.1	20.3	57.6	0.0	0.0	100.0
4504	GUNUNG	0.0	12.7	49.2	38.1	0.0	0.0	100.0
4505	KRAMAT PELTA	0.0	11.9	18.6	69.5	0.0	0.0	100.0
4506	MELAWAI	12.7	17.9	0.0	69.4	0.0	0.0	100.0
4507	PETOGOGAN	0.0	17.9	0.0	82.1	0.0	0.0	100.0
4508	PULO	34.3	8.9	0.0	56.8	0.0	0.0	100.0
4509	GANDARIA UTARA	0.0	0.0	24.3	75.7	0.0	0.0	100.0
4510	CIPETE UTARA	11.9	0.0	11.9	76.2	0.0	0.0	100.0
4500	KABAYORAN BARU	5.4	5.8	13.9	74.9	0.0	0.0	100.0
4601	GROGOL UTARA	0.0	0.0	22.1	77.9	0.0	0.0	100.0
4602	GROGOL SELATAN	0.0	0.0	1.4	98.6	0.0	0.0	100.0
4603	CIPULIR	0.0	0.0	10.1	89.9	0.0	0.0	100.0
4604	KEBAYORAN LAMA UTARA	0.0	0.0	0.0	100.0	0.0	0.0	100.0
4605	PONDOK PINANG	0.0	0.0	19.4	80.6	0.0	0.0	100.0
4606	PETUKANGAN UTARA	0.0	23.3	0.0	76.7	0.0	0.0	100.0
4607	PETUKANAGN SELATAN	0.0	0.0	14.8	85.2	0.0	0.0	100.0
4608	ULUJAMI	0.0	23.3	0.0	76.7	0.0	0.0	100.0
4609	PESANGGARAHAH	0.0	0.0	12.5	87.5	0.0	0.0	100.0
4610	BINTARO	0.0	0.0	48.9	51.1	0.0	0.0	100.0
4611	KEBAYORAN LAMA SELATAN	0.0	0.0	0.0	100.0	0.0	0.0	100.0
4600	KEBAYORAN LAMA	0.0	2.9	11.4	85.7	0.0	0.0	100.0

Source : JICA

Table F.1(5) Existing Service Population Ratio by Sanitation Facility

(Unit : %)

CODE NUMBER	NAME OF KELURAHAN & KECAMATAN	NO FACILITY	PUBLIC TOILET	TOILET WITHOUT TREATMENT	TOILET WITH TREATMENT	TOILET WITH SEWERAGE	OTHERS	TOTAL
4701	GANDARIA SELATAN	0.0	0.0	28.7	71.3	0.0	0.0	100.0
4702	CIPETE SRLATAN	16.5	0.0	0.0	83.5	0.0	0.0	100.0
4703	CILANDAK BARAT	0.0	0.0	4.9	86.9	0.0	8.2	100.0
4704	LEBAK BULUS	0.0	16.5	18.0	65.5	0.0	0.0	100.0
4705	PONDOK LABU	0.0	0.0	3.3	96.7	0.0	0.0	100.0
4700	CILANDAK	2.5	2.4	8.6	83.4	0.0	3.1	100.0
4000	JAKARTA SELATAN	5.3	4.7	18.8	71.0	0.0	0.2	100.0
5101	KEBON MANGGIS	0.0	27.4	0.0	51.6	0.0	21.0	100.0
5102	PAL MBRIAM	21.0	0.0	1.7	77.3	0.0	0.0	100.0
5103	KAYUMANIS	0.0	0.0	35.2	64.8	0.0	0.0	100.0
5104	UTAN KAYU UTARA	0.0	0.0	0.0	100.0	0.0	0.0	100.0
5105	PISANGAN BARU	0.0	0.0	22.3	77.7	0.0	0.0	100.0
5106	UTAN KAYU SELATAN	10.6	0.0	22.3	56.5	0.0	10.6	100.0
5100	MATRAMAN	2.4	3.4	15.4	78.8	0.0	0.0	100.0
5201	KAYU PUTIH	0.0	19.9	0.0	80.1	0.0	0.0	100.0
5202	JATI	9.9	19.9	0.0	60.3	0.0	9.9	100.0
5203	PISANGAN TIMUR	9.9	0.0	21.3	68.8	0.0	0.0	100.0
5204	CIPINANG	0.0	0.0	0.0	100.0	0.0	0.0	100.0
5205	PULO GADUNG	0.0	13.3	0.0	86.7	0.0	0.0	100.0
5206	JATINEGARA KAUM	0.0	19.9	0.0	80.1	0.0	0.0	100.0
5207	RAWAMANGUN	9.9	0.0	0.0	90.1	0.0	0.0	100.0
5200	PULO GADUNG	5.0	8.7	3.8	81.2	0.0	1.3	100.0
5301	KAMPUNG MELAYU	9.1	0.0	1.5	80.3	0.0	9.1	100.0
5302	BALI MESTER	27.4	0.0	12.0	60.6	0.0	0.0	100.0
5303	BIDARA CINA	18.3	0.0	21.2	60.5	0.0	0.0	100.0
5304	CIPINANG CEMPEDAK	9.1	27.4	0.0	63.5	0.0	0.0	100.0
5305	RAWA BUNGA	9.2	0.0	0.5	90.3	0.0	0.0	100.0
5306	CIPINANG MUARA	0.0	0.0	3.5	96.5	0.0	0.0	100.0
5307	CIPINANG BESAR UTARA	0.0	0.0	1.8	98.2	0.0	0.0	100.0
5308	PONDOK BAMBU	0.0	0.0	15.8	84.2	0.0	0.0	100.0
5309	KLENDER	6.9	6.9	0.0	86.2	0.0	0.0	100.0
5310	DUREN SAWIT	0.0	4.8	4.8	90.4	0.0	0.0	100.0
5311	MALAKA SARI	0.0	0.0	8.0	92.0	0.0	0.0	100.0
5312	PONDOK KELAPA	0.0	14.3	38.1	47.6	0.0	0.0	100.0
5313	CIPINANG BESAR SELATAN	0.0	0.0	15.6	84.4	0.0	0.0	100.0
5314	MALAKA JAYA	0.0	0.0	0.0	100.0	0.0	0.0	100.0
5315	PONDOK KOPI	0.0	0.0	0.0	100.0	0.0	0.0	100.0
5300	JATINEGARA	4.3	4.5	7.4	83.8	0.0	0.0	100.0
5401	CAWANG	0.0	0.0	19.4	80.6	0.0	0.0	100.0
5402	CIPINANG MELAYU	0.0	19.6	6.5	73.9	0.0	0.0	100.0
5403	CILILITAN	0.0	0.0	23.2	76.8	0.0	0.0	100.0
5404	KRAMAT JATI	0.0	0.0	15.1	84.9	0.0	0.0	100.0
5405	KEBON PALA	28.8	0.0	41.1	30.1	0.0	0.0	100.0
5406	HALIM PERDANA KUSUMA	6.6	0.0	32.0	49.1	0.0	12.3	100.0
5407	BATU AMPAR	0.0	0.0	8.3	91.7	0.0	0.0	100.0
5408	BALU KAMBANG	0.0	0.0	8.3	91.7	0.0	0.0	100.0
5409	MAKASSAR	31.8	0.0	0.0	68.2	0.0	0.0	100.0
5410	KAMPUNG TENGAH	0.0	0.0	25.0	75.0	0.0	0.0	100.0
5411	DUKUH	18.2	0.0	0.0	81.8	0.0	0.0	100.0
5412	PINANG RANTE	0.0	9.1	18.2	72.7	0.0	0.0	100.0
5400	KRAMAT JATI	7.6	2.1	19.3	69.5	0.0	1.5	100.0

Source : JICA

Table F.1(6) Existing Service Population Ratio by Sanitation Facility

(Unit : %)

CODE NUMBER	NAME OF KELURAHAN & KECAMATAN	NO FACILITY	PUBLIC TOILET	TOILET WITHOUT TREATMENT	TOILET WITH TREATMENT	TOILET WITH SEWERAGE	OTHERS	TOTAL
5501	LUBANG BUAYA	0.0	0.0	25.1	74.9	0.0	0.0	100.0
5502	GEDONG	0.0	14.2	11.2	74.6	0.0	0.0	100.0
5503	RAMBUTAN	0.0	0.0	13.9	86.1	0.0	0.0	100.0
5504	CEGER	0.0	0.0	0.2	99.8	0.0	0.0	100.0
5505	BAMBU APUS	0.0	0.0	0.2	99.8	0.0	0.0	100.0
5506	SETU	0.0	0.0	17.8	82.2	0.0	0.0	100.0
5507	CIPAYUNG	13.5	0.0	23.2	63.3	0.0	0.0	100.0
5508	SUSUKAN	0.0	0.0	0.0	100.0	0.0	0.0	100.0
5509	CIRACAS	10.5	0.0	10.5	79.0	0.0	0.0	100.0
5510	CIJANTUNG	10.5	0.0	0.0	89.5	0.0	0.0	100.0
5511	BARU	0.0	0.0	0.0	100.0	0.0	0.0	100.0
5512	KALI SARI	0.0	0.0	0.0	100.0	0.0	0.0	100.0
5513	PEKAYON	15.5	0.0	36.9	47.6	0.0	0.0	100.0
5514	KELAPA DUA WETAN	13.5	0.0	0.3	86.2	0.0	0.0	100.0
5515	MUNJUL	0.0	0.0	0.0	100.0	0.0	0.0	100.0
5516	CILANGKAP	0.0	0.0	23.2	76.8	0.0	0.0	100.0
5517	CIBUBUR	0.0	0.0	0.0	100.0	0.0	0.0	100.0
5518	PONDOK RANGON	18.0	0.0	41.3	40.7	0.0	0.0	100.0
5500	PASAR REBO	5.2	1.1	10.6	83.1	0.0	0.0	100.0
5601	RAWA TERATE	45.4	0.0	27.2	27.4	0.0	0.0	100.0
5602	JATI NEGARA	0.0	0.0	0.0	100.0	0.0	0.0	100.0
5603	PENGGILINGAN	17.1	8.1	0.0	74.8	0.0	0.0	100.0
5604	CAKUNG BARAT	22.0	0.0	0.0	78.0	0.0	0.0	100.0
5605	UJUNG MENTENG	15.8	0.0	21.8	62.4	0.0	0.0	100.0
5606	PULO GEBANG	0.0	0.0	12.8	87.2	0.0	0.0	100.0
5607	CAKUNG TIMUR	12.2	0.0	47.6	40.2	0.0	0.0	100.0
5600	CAKUNG	12.2	1.4	12.2	74.2	0.0	0.0	100.0
5000	JAKARTA TIMUR	5.7	3.7	10.8	79.3	0.0	0.5	100.0
10000	JAKARTA	9.4	6.0	16.0	68.0	0.0	0.6	100.0

Source : JICA

Table F.2 (1) Service Level of Existing On-site Sanitation Facilities in Each Kecamatan

Code Number	Name of Kecamatan	Population Density in 1988(per/ha)	Service Level of On-site Sanitation Facilities (%)			(3)+(4)	Income Group Ratio (%)		
			(1) Individual With Treatment	(2) Public Toilet	(3) Individual Toilet With No Treatment		(4) No Toilet	High	Mid.
1100	GAMBIR	163.3	62.6	7.7	23.4	29.7	5.4	50.5	44.1
1200	SAWAH BESAR	245.6	75.1	2.5	14.7	22.4	2.1	47.6	50.3
1300	KEMAYORAN	272.0	58.7	13.0	16.4	28.3	2.0	47.1	50.9
1400	SEKEN	317.3	52.3	15.7	20.7	32.0	3.5	39.3	57.2
1500	CEMPAKA PUTIH	274.2	58.3	3.2	30.7	38.5	4.2	42.5	53.3
1600	MENTENG	180.5	46.1	10.1	29.3	43.8	8.8	48.6	42.6
1700	TANAH ABANG	240.8	71.9	8.4	5.7	19.7	4.6	52.0	43.4
1000	JKT. PUSAT	237.7	61.7	8.5	19.1	29.8	4.1	47.0	48.9
2200	PENJARINGAN	59.3	59.4	7.5	10.8	33.1	5.3	48.2	46.5
2300	TANJUNG PRIOK	102.2	55.9	14.7	17.1	29.4	1.5	39.3	59.2
2400	KOJA	101.6	52.7	5.3	36.2	42.0	1.7	38.9	59.3
2500	CILINCING	43.5	52.1	1.5	11.3	46.4	0.5	40.5	59.0
2000	JKT. UTARA	71.4	55.2	7.7	20.1	37.1	2.4	41.8	55.8
3100	CENKARENG	46.8	48.5	10.2	7.4	41.3	1.0	33.9	65.1
3200	GROGOL PETAMBURAN	217.8	80.5	0.0	15.6	19.5	7.2	48.3	44.5
3300	TAMAN SARI	348.0	64.7	7.6	19.2	27.7	2.8	55.3	41.9
3400	TAMBORA	463.4	53.0	15.1	10.9	31.9	1.3	47.7	51.0
3500	KEBON JERUK	56.8	75.1	7.1	15.1	17.8	8.6	50.3	41.1
3000	JKT. BARAT	103.7	65.9	7.2	13.8	26.9	4.5	46.5	49.0
4100	TEBET	284.7	41.4	9.5	38.7	40.1	4.6	49.8	45.6
4200	SETIA BUDI	246.1	84.2	1.8	11.7	12.0	3.5	48.5	48.0

Table F.2 (2) Service Level of Existing On-site Sanitation Facilities in Each Kecamatan

Code Number	Name of Kecamatan	Population Density in 1988(per/ha)	Service Level of On-site Sanitation Facilities (%)				(3)+(4)	Income Group Ratio (%)			
			(1) Individual Toilet With Treatment	(2) Public Toilet	(1)+(2) Individual Toilet With No Treatment	(4) No Toilet		High	Mid.	Low	
4300	MAMPANG PRAPATAN	150.6	59.6	6.4	66.0	23.2	10.8	34.0	3.5	52.5	44.0
4400	PASAR MINGGU	62.0	70.8	3.5	74.3	19.4	6.3	25.7	3.3	49.1	47.6
4500	KEBAYORAN BARU	153.7	74.9	5.8	80.7	13.9	5.4	19.3	7.2	44.3	48.5
4600	KEBAYORAN LAMA	111.4	85.7	2.9	88.6	11.4	0.0	11.4	3.9	45.0	51.1
4700	CILANDAK	74.9	83.4	2.4	85.8	11.7	2.5	14.2	8.9	58.2	32.9
4800	JKT. SELATAN	118.0	71.0	4.7	75.7	18.6	5.3	24.3	4.6	48.9	46.5
5100	MATRAMAN	364.4	78.8	3.4	82.2	15.4	2.4	17.6	2.1	55.5	42.3
5200	PULO GADUNG	155.9	81.2	8.7	89.9	5.1	5.0	10.1	6.6	53.6	39.7
5300	JATINEGARA	144.8	83.8	4.5	88.3	7.4	4.3	11.7	4.7	62.8	32.5
5400	KRAMAT JATI	83.8	69.5	2.1	71.6	20.8	7.6	28.4	2.7	61.4	35.9
5500	PASAR REBO	47.0	83.1	1.1	84.2	10.6	5.2	15.8	1.0	51.6	47.4
5600	CAKUNG	37.2	74.2	1.4	75.6	12.2	12.2	24.4	0.9	37.8	61.3
5000	JKT. TIMUR	86.4	79.3	3.7	83.0	11.3	5.7	17.0	3.4	56.1	40.5
	Total		68.0	6.0	64.0	16.6	9.4	36.0			

Table F.3 (1) Existing Public Toilet by Kelurahan in Study Area

Code Number	Name of Kelurahan	No. of Public Toilet	No. of tenant/day	Average charge/person (Rp.)	Population density (person/ha)	
					1988	2010
1101	CIDENG	2	40	75	216.4	242.9
1102	DURI PULO	2	89	59	664.1	697.2
1103	PETOJO UTARA	4	184	68	264.3	297.3
1104	PETOJO SLT.	6	217	95	249.4	317.9
1105	KEBON KELAPA	8	324	28	276.7	309.0
1106	GAMBIR	3	230	-	22.3	98.1
	GAMBIR	25	1,084	46	212.1	264.2
1201	MANGGA 2 SLT	3	187	84	462.1	493.0
1202	KARANG ANYAR	5	282	70	843.8	876.5
1203	KARTINI	4	152	66	684.4	716.4
1204	PASAR BARU	14	677	50	139.4	172.5
1205	GN. SAHARI UT.	1	25	-	160.4	161.6
	SAWAH BESAR	27	1,323	50	319.0	341.3
1301	GN. SAHARI SLT.	9	937	53	227.6	363.1
1302	KEMAYORAN	12	728	65	562.3	563.6
1303	KEBON KOSONG	4	201	90	317.7	318.6
1305	HARAPAN MULYA	2	280	63	364.4	373.6
1306	UTAN PANJANG	23	1,398	58	408.5	409.5
1307	CEMPAKA BARU	7	382	40	529.9	532.6
	KEMAYORAN	66	3,926	58	353.2	381.2
1401	SEZEN	6	825	45	163.5	172.8
1402	KWITANG	18	2,548	41	516.1	548.9
1403	KENARI	2	214	49	208.2	240.7
1404	KRAMAT	13	1,444	52	560.5	593.0
1405	PASABEAN	9	900	65	562.0	594.4
1406	BUNGUR	1	175	32	615.2	619.0
	SEZEN	49	6,106	47	412.0	435.8
1501	TANAH TINGGI	71	3,058	55	777.9	809.7
1502	JOHAR BARU	8	1,049	55	381.9	414.3
1503	GALUR	3	141	78	881.1	914.8
1504	KAMPUNG RAWA	5	399	52	777.6	810.0
1505	RAWA SARI	2	126	62	240.2	271.2
	CEMPAKA PUTIH	89	4,773	55	356.1	388.3
1601	KEBON SIRIH	1	60	83	417.9	484.3
1602	GONDANGDIA	1	80	63	78.6	154.1
1603	CIKINI	11	880	78	226.9	298.8
1604	MENTENG	7	308	72	204.3	259.4
1605	PEGANGSAAN	18	2,280	27	392.0	467.3
	MENTENG	38	3,608	43	234.4	300.6
1701	KAMPUNG BALI	14	1,154	52	428.0	500.0
1702	KEBON KACANG	6	1,414	16	543.3	618.3
1703	KEBON MELATI	19	2,992	21	553.2	627.0
1704	PETAMBURAN	10	1,090	70	444.8	510.0
1705	KARET TENGSIN	12	1,175	72	375.1	445.8
1706	BENDUNGAN HILIR	4	261	50	272.0	329.7
1707	GELORA	4	223	87	42.2	73.0
	TANAH ABANG	69	8,309	41	312.7	370.4
SUB TOTAL	CENTRAL JKT	363	29,129	49	308.7	350.7

Table F.3 (2) Existing Public Toilet by Kelurahan in Study Area

Code Number	Name of Kelurahan	No. of Public Toilet	No. of tenant/day	Average charge/person (Rp.)	Population density (person/ha)	
					1988	2010
2206	PADEMANGAN BRT	3	175	60	434.0	437.9
2207	PADEMANGAN TMR	2	97	68	187.0	310.3
	PENJARINGAN	5	272	62	74.6	110.1
2303	SUNGAI BAMBU	8	308	63	160.6	242.4
2304	KEBON BAWANG	3	85		364.3	445.7
2305	TANJUNG PRIOK	3	75	56	66.2	138.6
2307	WARAKAS	3	32	78	505.5	576.1
	TANJUNG PRIOK	17	500	52	128.4	189.5
2401	KOJA UTARA	21	500	54	328.8	410.3
2402	LAGOA	4	136	63	441.3	522.8
2404	TUGU SELATAN	5	120	40	46.0	114.6
2406	RAWA BADAQ	20	739	46	310.7	392.9
	KOJA	50	1,495	51	127.7	188.4
2503	SEMPER BARAT	7	240	50	397.8	472.3
2504	SEMPER TIMUR	6	155	52	94.1	161.4
	CILINCING	13	395	51	54.6	94.9
SUB TOTAL	NORTH JKT.	85	2,662	53	89.7	136.5
3106	CENKARENG TMR	10	617	51	72.1	124.6
3108	KEDAUNG ANGKE	24	1,092	74	90.3	130.7
3110	RAWA BUAYA	8	762	29	58.7	101.9
	CENKARENG	42	2,471	34	62.6	107.3
3201	GROGOL	8	300	94	292.5	325.4
3203	TANJUNG DUREN	13	631	64	250.3	283.3
3205	JATI PULO	5	314	42	486.8	519.5
3208	PAL MERAH	2	95	80	282.7	315.5
	GROGOL PETAM-BURAN	28	1,340	63	291.0	323.4
3302	MANGGA BESAR	1	40	78	346.5	374.5
3303	DANGKI	3	170	55	713.7	745.9
3305	KEAGUNGAN	3	156	55	1032.0	1,065.6
	TAMAN SARI	7	366	58	465.0	495.6
3401	PEKAJON	4	322	51	507.7	538.5
3403	TAMBORA	3	230	58	615.6	650.0
3404	JEMBATAN LAMA	1	66	55	730.3	763.0
3405	ANGKE	11	783	60	527.5	560.0
3406	JEMBATAN BESI	11	835	44	709.4	741.8
	TAMBORA	30	2,236	53	619.3	651.4
SUB TOTAL	WEST JKT	107	6,413	56	138.6	210.8

Table F.3 (3) Existing Public Toilet by Kelurahan in Study Area

Code Number	Name of Kelurahan	No. of Public Toilet	No. of tenant/day	Average charge/person (Rp.)	Population density (person/ha)	
					1988	2010
4101	MENTENG DALAM	17	899	67	262.1	338.0
4102	TEBET BARAT	7	240	52	233.0	307.6
4103	TEBET TIMUR	7	405	57	231.1	305.0
4104	KEBON BARU	6	371	69	364.6	440.0
4105	BUKIT DURI	6	226	63	502.7	577.8
4106	MANGGARAI SLT.	15	836	73	784.7	860.8
	TEBET	58	2,977	64	343.8	419.0
4201	SETIA BUDI	3	289	31	161.8	229.7
4202	GUNTUR	12	834	72	536.3	603.1
4203	KARET	12	744	73	485.4	557.4
4204	KARET SEMANGGI	1	76	59	174.0	246.7
4205	KARET KUNINGAN	2	120	42	295.9	369.8
4207	PASAR MANGGIS	5	207	84	433.5	507.7
4208	MENTENG ATAS	15	697	61	608.2	678.9
	SETIA BUDI	50	2,967	64	297.1	367.8
4301	KUNINGAN BRT.	5	486	61	239.3	298.0
4303	PELA MAMPANG	1	30	50	316.6	387.0
	MAMPANG PRA-PATAN	6	516	60	332.0	406.4
4509	GANDARIA UTARA	2	80	50	413.9	486.8
	KEBAYORAN BARU	2	80	50	185.6	258.9
	SOUTH JKT	116	6,540	64	142.5	216.0
5101	KEBON MANGGIS	1	78	55	347.0	453.3
5102	PAL MERIEM	4	275	62	407.3	513.8
5103	KAYU MANIS	10	510	55	694.7	800.9
5105	PISANGAN BARU	1	71	51	747.5	854.7
5106	UTAN KAYU SLT.	3	128	52	397.4	492.8
	MATRAMAN	19	1,062	54	481.9	585.4
5301	KAMP. MELAYU	6	244	54	689.7	796.6
5302	BALI MESTER	1	65	65	273.4	380.0
5303	BIDARA CINA	2	56	55	456.4	563.0
5305	RAWA BUNGA	3	106	92	458.0	564.7
5307	CIPINANG B. UTR.	1	50	70	404.6	501.7
5309	KLENDER	3	95	60	181.1	282.9
	JATINEGARA	16	616	64	191.4	291.5
SUB TOTAL	EAST JKT	35	1,678	58	114.2	175.4
TOTAL	JAKARTA	697	46,422	52	134.9	196.5

Table F.4 (1) On-site Sanitation Facilities - Shops

On-site Sanitation Facilities (%)	
No Facilities	Total
4.8	100.0
45.6	46.1
46.1	3.5
46.1	100.0

Sources of Water (%)	
Well Water	Total
56.4	100.0
43.1	0.5
0.5	100.0

Use of Water (%)	
Kitchen Toilet	Total
28.8	100.0
46.4	24.7
24.7	100.0

Classification	Floor Area (m ²)	No. of Workers	Capacity of Toilet (m ³)	Consumption of Water (m ³ /day)
1 Ordinary Retailer	141	4	4.8	1.2
2 Super Market	857	55	12.8	5.4
3 Department Store	1,066	128	7.7	1.7
4 Others	341	27	4.1	3.9
Average	202	11	5.1	1.5

Note : ST = Septic Tank, LP = Leaching Pit, SA = Soak Away
 Above figures are the result of sampling questionnaire surveys.
 Source : JICA

Table F.4 (2) On-site Sanitation Facilities - Factories

Classification	Floor Area (m ²)	No. of Workers (person)	Capacity of Toilet (m ³)	On-site Sanitation Facilities (%)				
				No Facilities	Toilet with ST/LP	Toilet with ST&SA	Others Total	
1 Food beverages and tobacco	886	36	10.1	10.0	35.0	46.5	8.5	100.0
2 Textile, wearing apparel and leather	3,214	126	15.7					
3 Wood and wood products including furniture and fixtures	1,231	63	17.8					
4 Paper, paper products, printing and publishing	2,054	68	10.6					
5 Industrial chemicals, chemical products, petroleum, coal, rubber and plastic wares	2,862	177	11.4					
6 Non-metallic mineral products	2,046	91	7.5					
7 Iron and Steel	3,805	182	21.0					
8 Fabricated mineral products, machinery and equipment	2,042	111	14.0					
9 Others	2,159	67	12.5					
Average	2,176	91	13.5					

Sources of Industrial Water (%)			
Well water	Piped Water	Rivers/ Ponds	Recycled Water Total
71.8	25.7	1.5	1.0
			100.0

Note : ST = Septic Tank, LP = Leaching Pit, SA = Soak Away

Above figures are the results of sampling questionnaire surveys.

Source : JICA

Table F.4 (3) On-site Sanitation Facilities - Restaurants and Hotels

Classification	Floor Area (m ²)	No. of Customers /Rooms	Capacity of Toilet (m ³)	Consumption of Water (m ³ /day)	
				(Customers/day)	(m ³ /day)
1 Restaurant	170	74	4.7	3.1	
2 Hotel		(Rooms)			
1) Without Stars	728	29	22.5	17.3	
3) 1 - 3 Stars	4,011	86	26.9	73.5	
3) 4 - 5 Stars	29,173	601	288.9	1,100.0	
4) Others	1,362	25	9.2	12.1	
Average	3,706	77	23.3	215.4	

Classification	On-site Sanitation Facilities (%)			
	No Facilities	Toilet with ST/LP	Toilet with ST&SA	Total
1. Restaurant	7.1	49.7	40.0	100.0
2. Hotel	4.2	33.3	45.8	100.0

Classification	Sources of Water (%)		
	Well Water	Piped Water	Rivers/Ponds
1. Restaurant	71.8	27.7	0.5
2. Hotel	56.9	43.1	0.0

Classification	Use of Water (%)		
	Kitchen	Toilet	Others
1. Restaurant	28.5	41.0	30.5
2. Hotel	22.8	58.7	18.5

Note : ST = Septic Tank, LP = Leaching Pit, SA = Soak Away
 Above figures are the result of sampling questionnaire surveys.
 Source : JICA

Table F.4(4) On-site Sanitation Facilities - Hospitals

Classification	Floor Area (m ²)	No. of beds	Capacity of Toilet (m ³)	On-site Sanitation Facilities (%)				
				No Facilities	Toilet with ST/LP	Toilet with ST&SA	Others Total	
1 Private Hospital/ Clinic	596	8	7.7	0.0	36.1	58.8	5.1	100.0
2 Public Hospital	9,809	166	31.0					
3 Others	729	19	11.2					
Average	2,274	47	13.2					

Classification	Floor Area (m ²)	No. of beds	Capacity of Toilet (m ³)	Consumption of Water (m ³ /day)	
				Toilet	Total
1 Private Hospital/ Clinic	596	8	7.7	2.4	
2 Public Hospital	9,809	166	31.0	244.6	
3 Others	729	19	11.2	9.3	
Average	2,274	47	13.2	48.5	

Sources of Water (%)			
Well Water	Piped Water	Rivers/ Ponds	Total
66.3	33.7	0.0	100.0

Use of Water (%)			
Kitchen	Toilet	Others	Total
25.1	49.6	25.3	100.0

Note : ST = Septic Tank, LP = Leaching Pit, SA = Soak Away
 Above figures are the result of sampling questionnaire surveys.
 Source : JICA

Table F.4(5) On-site Sanitation Facilities - Offices and Schools

Classification	Floor Area (m ²)	No. of Workers/ Students (Workers/ Students)	Capacity of Toilet (m ³)	Consumption of Water (m ³ /day)
1 Office	1,061	83	12.8	5.1
2 School				
1) Primary	804	407	7.9	2.2
2) Middle	1,065	554	11.5	2.9
3) High	2,784	842	16.5	6.5
4) College/ University	2,934	2,296	17.9	12.3
5) Others	-	-	-	-
Average	1,366	718	11.0	4.1

Classification	On-site Sanitation Facilities (%)			
	No Facilities	Toilet with ST/LP	Toilet with SI&SA	Total
1. Office	2.9	40.8	54.4	100.0
2. School	1.9	40.2	57.9	100.0

Classification	Sources of Water (%)			
	Well Water	Piped Water	Rivers/ Ponds	Total
1. Office	59.8	40.2	0.0	100.0
2. School	85.9	14.1	0.0	100.0

Classification	Use of Water (%)			
	Kitchen	Toilet	Others	Total
1. Office	59.8	40.2	0.0	100.0
2. School	22.4	53.4	24.2	100.0

Note : ST = Septic Tank, LP = Leaching Pit, SA = Soak Away
Above figures are the result of sampling questionnaire surveys.

Source : JICA

Table F.5 Regression Analysis of Relationships between Floor Space and Water Consumption for Commerce/Institutions

Establishment/ Facilities	Regression Equation	f(500) (f(2000) for Factory)	Correlation Coefficient	T-Value
1. Shops	$f(x) = 1.03 + 0.002390x$	2.25	0.4294	6.8080
2. Factory	$f(x) = -36.65 + 0.026850x$	17.05	0.9381	31.3646
3. Hotel	$f(x) = 90.66 + 0.033647x$	107.48	0.3011	2.1419
4. Restaurant	$f(x) = 1.78 + 0.007891x$	5.73	0.3946	5.3113
5. Hospital	$f(x) = 17.27 + 0.013602x$	24.07	0.3478	3.5968
6. Office	$f(x) = 2.94 + 0.001301x$	3.59	0.2935	3.0697
7. School	$f(x) = 2.90 + 0.000852x$	3.33	0.1773	1.8457

where x : floor space (m²)
 $f(x)$: water consumption (m³/day)

Source : JICA

Table F.6 Commerce/Institutions of Sampling Site

Hotel	Office Building	Plaza Building
Hilton	Wisma BCA	Glodok Plaza
Borobudur	Chase Plaza	Ratu Plaza
President	BPPT	Gajah Mada Plaza
Sahid Jaya	Indocement	Pasar Pramuka
Menteng	Setiabudi II	Pasar Blok M
Sofyan	Pertambangan	Pasar Pagi

Table F.7 Individual Treatment Plants and Sampling Conditions

Wastewater Treated	Commerce/Institution	Wastewater Treatment Method	Water Sampled
Combined wastewater from toilet and Others	Hotel Hilton Hotel Borobudur Wisma BCA Chase Plaza Ged. BPPT Ged. Indocement Ged. Setiabudi II	Extended aeration Extended aeration Extended aeration Extended aeration Extended aeration Rotating Biological Contactor Septic tank with filter	Effluent of Wastewater Treatment Plant
	Glodok Plaza Ratu Plaza Gajah Mada Plaza	Extended aeration Extended aeration Extended aeration	
Wastewater from toilet only	Hotel President Hotel Sahid Jaya Pasar Pramuka Pasar Blok M	Septic Tank Septic Tank Septic Tank Septic Tank	Effluent of Septic tank Effluent of Septic Tank and others
	Hotel Menteng Hotel Sofyan Ged. Pertambangan Pasar Pagi	Septic Tank Septic Tank Septic Tank Septic Tank with filter	

Table F.8 Effluent Water Quality of Treatment Plants

Location	COD (Dichromate) (mg/l)	BOD 20 °C, 5 days (mg/l)	Fecal-Coliform (MPN/100 cc)	SS (mg/l)
1. Hotel Hilton	1,510	1,160	1,100 x 10	60
2. Hotel Borobudur	175	140	23 x 10 ⁴	40
3. Wisma BCA	114	90	43 x 10 ⁶	10
4. Chase Plaza	184	126	93 x 10 ⁶	40
5. Ged. BPPT	107	78	23 x 10 ⁴	10
6. Ged. Indocement	122	78	93 x 10 ⁴	40
7. Ged. Setiabudi II	419	243	460 x 10 ⁵	20
8. Glodok Plaza	1,520	880	150 x 10 ⁵	180
9. Ratu Plaza	96	53	23 x 10 ³	60
10. Gajah Mada Plaza	514	370	240 x 10 ⁵	150
11. Hotel President	2,140	1,250	23 x 10 ⁵	460
12. Hotel Sahid Jaya	445	249	23 x 10 ⁷	20
13. Pasar Pramuka	1,240	980	150 x 10 ⁶	17
14. Pasar Blok M	2,140	1,800	23 x 10 ³	420
15. Hotel Menteng	91	617	93 x 10 ⁵	60
16. Hotel Sofyan	645	486	23 x 10 ⁴	220
17. Ged. Pertambangan	940	720	93 x 10 ⁵	15
18. Pasar Pagi	1,040	940	23 x 10 ⁶	35

Table F.9 Desludging and Transportation by Vacuum Trucks of Cleansing Department (April 1989 - March 1990)

Period	Total Number of Order		Total Sludge Volume (m3)		Total Service Trucks		Total Operational Cycle	
	Month	Day	Month	Day	Month	Day	Month	Day
April 1989	1870	74	4910	196	1544	61	2074	83
May 1989	1653	66	4219	169	1404	56	1867	75
June 1989	2061	82	5605	224	1745	69	2327	93
July 1989	2179	87	5758	230	1619	64	2442	98
Aug. 1989	2284	91	5825	232	1890	75	2470	99
Sept. 1989	2307	92	5931	237	1934	77	2517	100
Oct. 1989	2180	87	5677	227	1910	76	2499	100
Nov. 1989	2523	100	7038	281	1932	77	2747	110
Dec. 1989	2821	112	7298	292	2038	81	2973	119
Jan. 1990	2702	108	7207	288	2084	83	2947	118
Feb. 1990	2440	97	6443	258	1860	74	2650	106
March 1990	2477	99	6882	275	2082	81	2811	112
Average	2291	91	6066	242	1833	73	2527	101

Source : Cleansing Department

Table F.10 Contribution of Private Desludging (April 1989 - March 1990)

Period	Sludge Quantity (m3)		Private Service (%)
	Private	Cleansing Dept.	
April 1989	77.5	4,910	1.6
May 1989	125.0	4,219	2.9
June 1989	135.0	5,605	2.4
July 1989	82.0	5,758	1.4
Aug. 1989	113.0	5,825	1.9
Sept. 1989	185.5	5,931	3.0
Oct. 1989	169.5	5,677	2.9
Nov. 1989	172.0	7,038	2.4
Dec. 1989	128.0	7,298	1.7
Jan. 1990	174.0	7,207	2.4
Feb. 1990	184.5	6,443	2.8
March 1990	171.0	6,882	2.8
Average	1717.0	72,793	2.3

Source : Cleansing Department

Table F.11 Population Distribution in JSSP Area (1989)

Rank	Kelurahan	Population	Area (ha)	Population Density (person/ha)
1	Kuningan Timur	11,044	206.1	54
2	Setiabudi	7,592	61.8	123
3	Karet Semanggi	11,961	92.6	129
4	Tebet Timur	26,573	135.7	196
5	Tebet Barat	33,241	168.3	198
6	Karet Kuningan	35,643	178.7	199
7	Menteng Dalam	55,197	242.2	228
8	Kebon Baru	34,505	131.5	262
9	Pasar Manggis	27,695	79.3	349
10	Bukit Duri	40,979	108.4	378
11	Karet	35,292	92.8	380
12	Manggarai	35,013	78.4	447
13	Guntur	28,655	62.6	458
14	Manggarai Selatan	28,807	58.3	494
15	Menteng Atas	47,905	85.7	559
	TOTAL	460,099	1782.3	Ave: 258

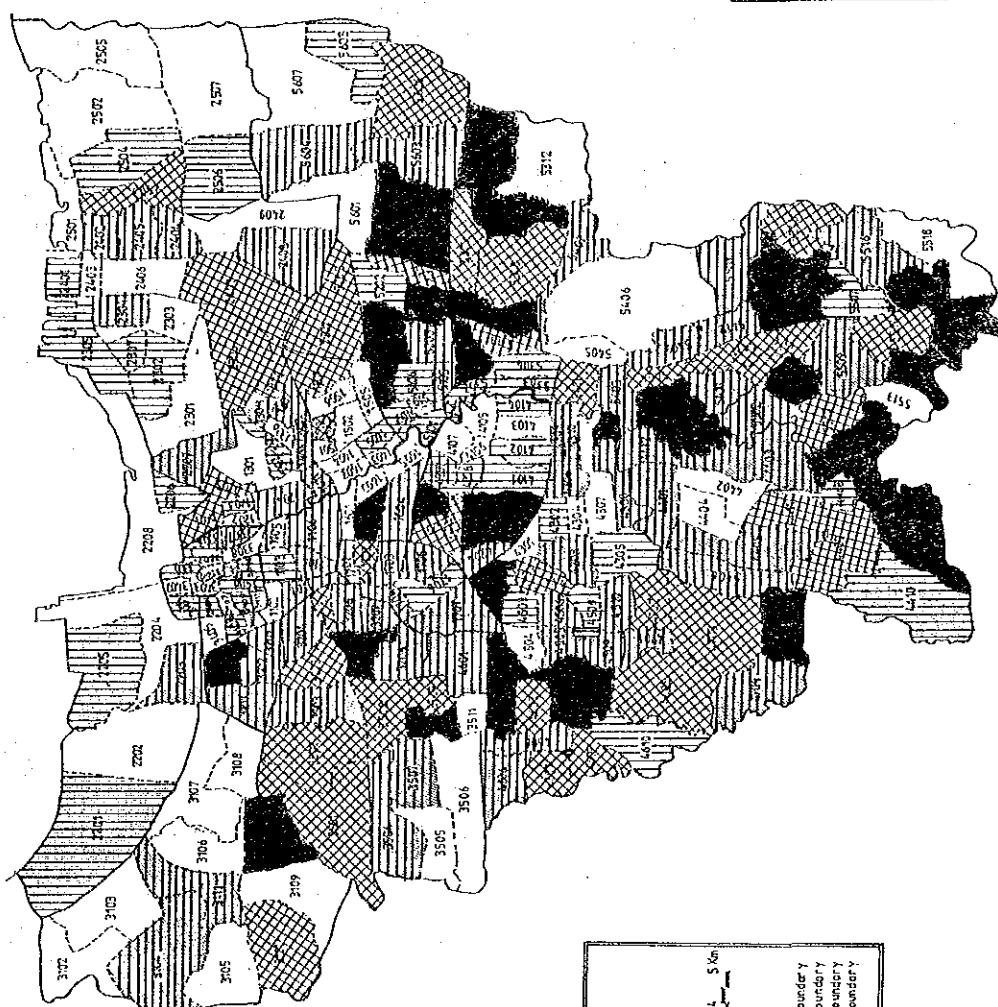
Table F.12 Details of Setia Budi Ponds

PARAMETER	UNIT	SETIA BUDI		COMMENTS
		WEST PD	EAST PD	
POND area	m ²	21.000	16.000	surface area
depth	m	2,0-2,5	2,0-2,5	assumed facultative aeration depth after dredging
volume	m ³	47.000	36.000	
LOAD hydraulic	m ³ /d	18.116	10.167	wastewater influent based on 150 mg BOD 5/liter average
BOD	kg/d	2.717	1.525	
Detention time	d	2,6	3,5	
OXYGEN requirement	kgO ₂ /h	104	62	oxygen input required
actual	kgO ₂ /h	105	80	based on 1 kgO ₂ /kWh. Oxygen surplus due to mixing requirement average in entire pond at high water level; mixing determines power input
mixing	W/m ³	2	2	
total	kW	105	80	
AERATION Aerator Nos.	-	4	3	Type: Horizontal shaft, floating brush
O ₂ -req.	kgO ₂ /h	26	21	max capacity per unit approx 35 kgO ₂ /h
Mix-req	kW	26,2	27	power input for mixing
n	-	0,79	0,79	mechanical efficiency
uptake	kW	33	34	motor power uptake
output	kW	37	37	nominal motor power
Length	m	6,0	6,0	length of rotor
Diameter	m m	1.000	1.000	rotor diameter

Table F.13 Public Toilets and Recent LPs constructed under JSSP Project

No.	Kelurahan	Population Density (person/ha)	No. of Recent LP (1988-1989)	No. of Public Toilet
1	Kuningan Timur	54	-	-
2	Setiabudi	123	-	3
3	Karet Semanggi	129	-	1
4	Tebet Timur	196	-	4
5	Tebet Barat	198	-	6
6	Karet Kuningan	199	70	3
7	Menteng Dalam	228	37	16
8	Kebon Baru	262	54	6
9	Pasar Manggis	349	50	5
10	Bukit Duri	378	127	4
11	Karet	380	-	12
12	Manggarai	447	-	14(1)
13	Guntur	458	3	11(1)
14	Manggarai Selatan	494	-	-
15	Menteng Atas	559	42	13(1)
	TOTAL	-	383	98(3)

Note: No in paranthesis indicate the public toilet rehabilitated.
 Ref. Fig. 7.3.3 for the location of public toilets.



LEGEND	
	Less than 50.0%
	50.0% - 64.9%
	65.0% - 79.9%
	80.0% - 89.9%
	More than 90.0%

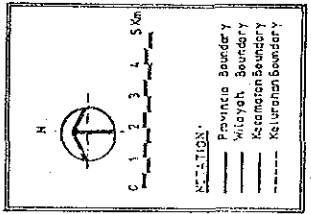


FIG. F.1 RATIO OF HOUSEHOLDS USING INDIVIDUAL ON-SITE SANITATION FACILITIES WITH TREATMENT IN 1989

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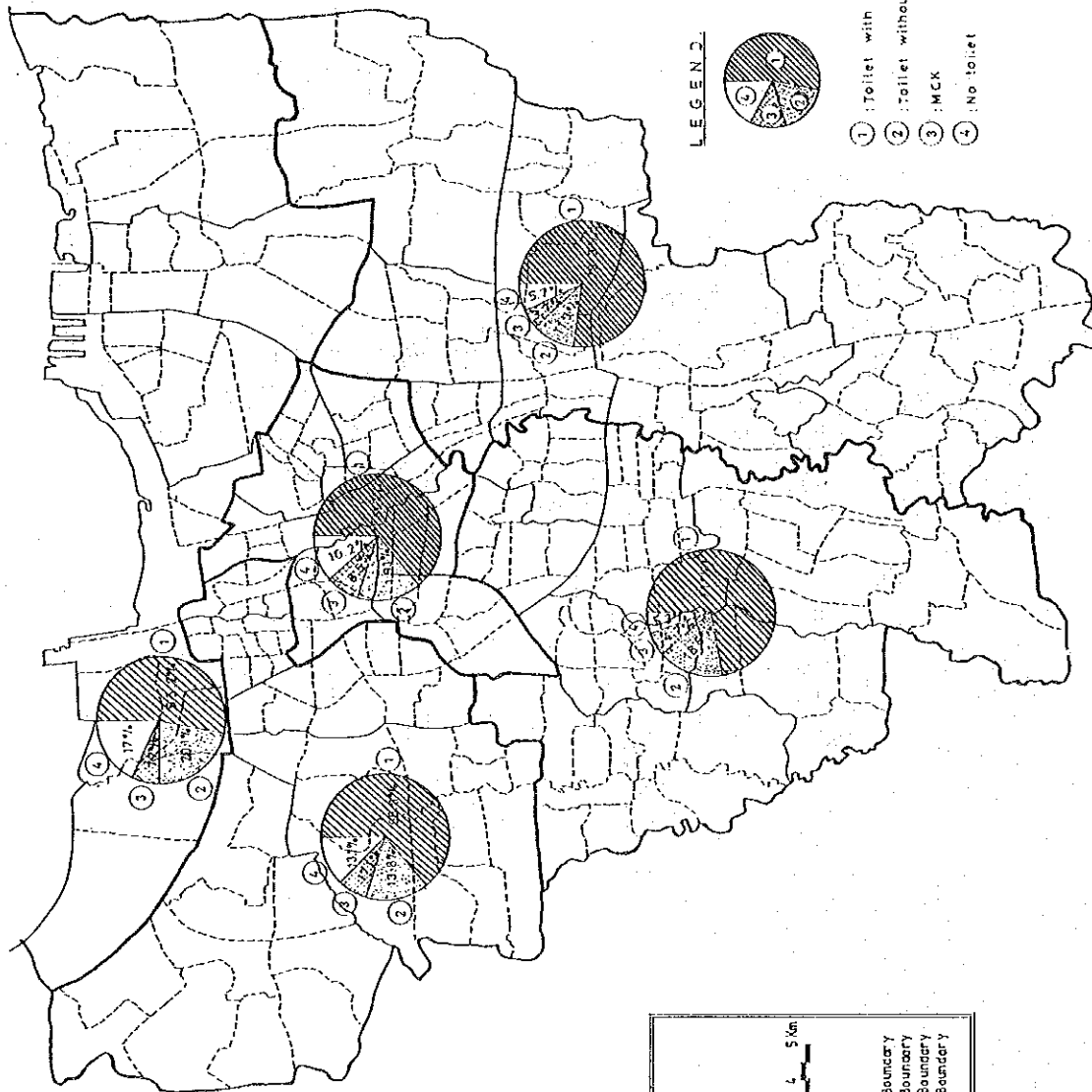
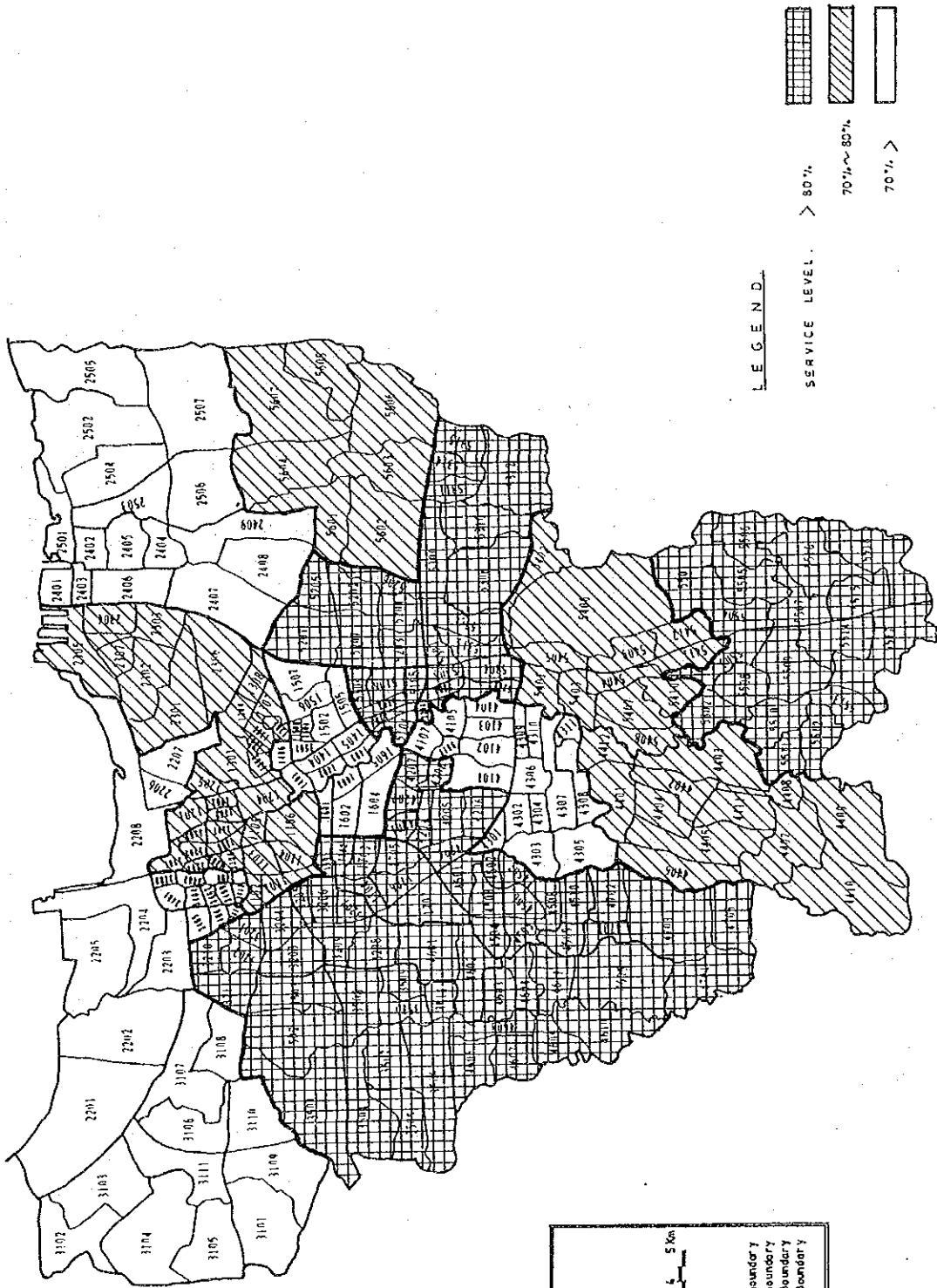


FIG. F.2 POPULATION PERCENTAGE SERVED BY EACH ON-SITE SANITATION FACILITY IN EACH WILAYAH

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LEGEND

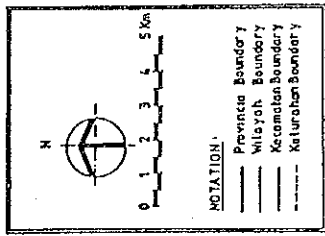
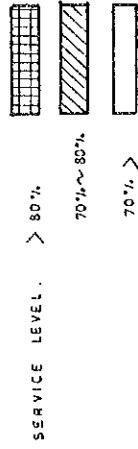


FIG. F.3 REGIONAL DISTRIBUTION OF ON-SITE SANITATION SERVICE LEVEL BY TOILET WITH TREATMENT AND PUBLIC TOILET

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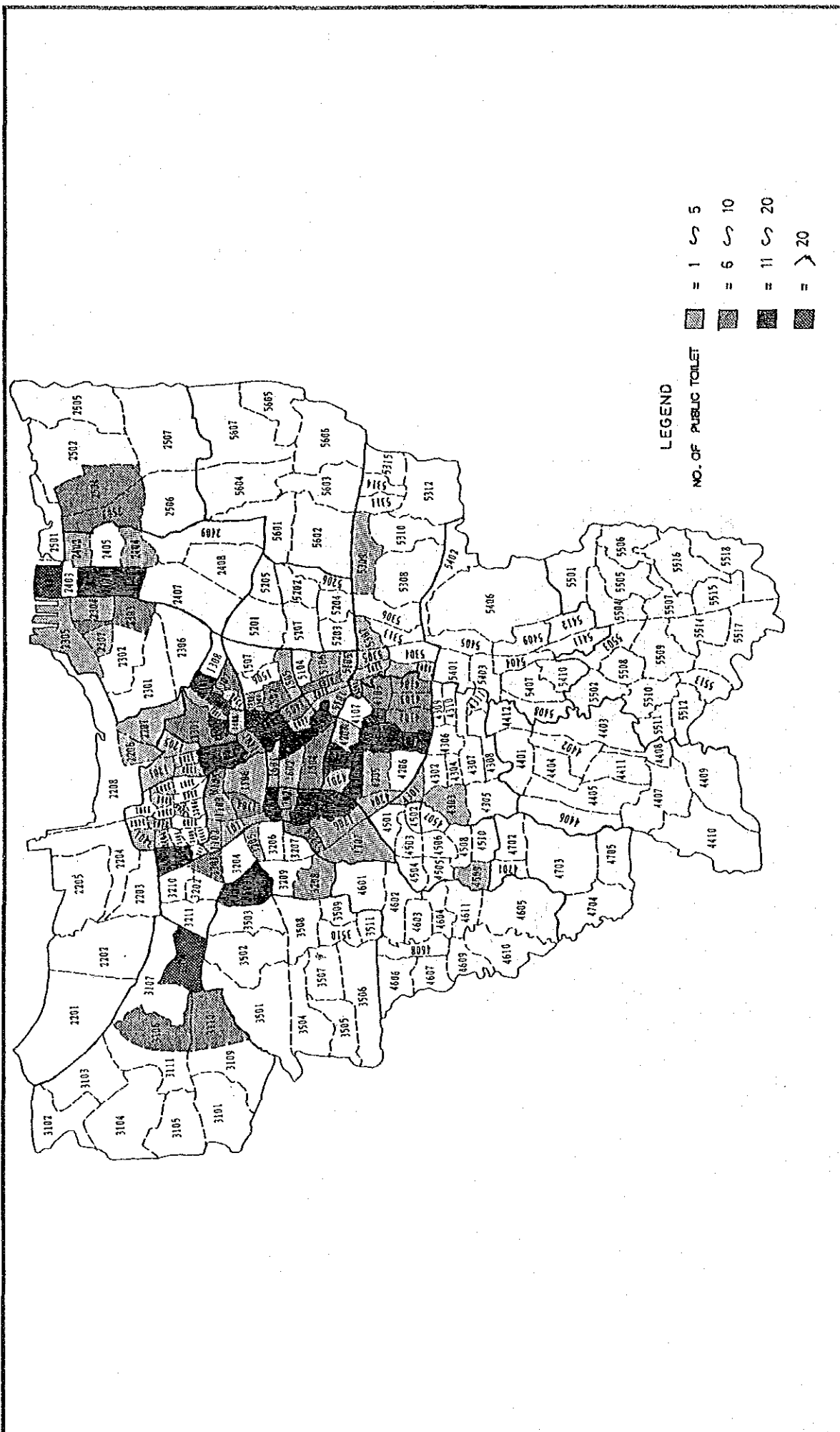


FIG. F.4

DISTRIBUTION OF EXISTING PUBLIC TOILET

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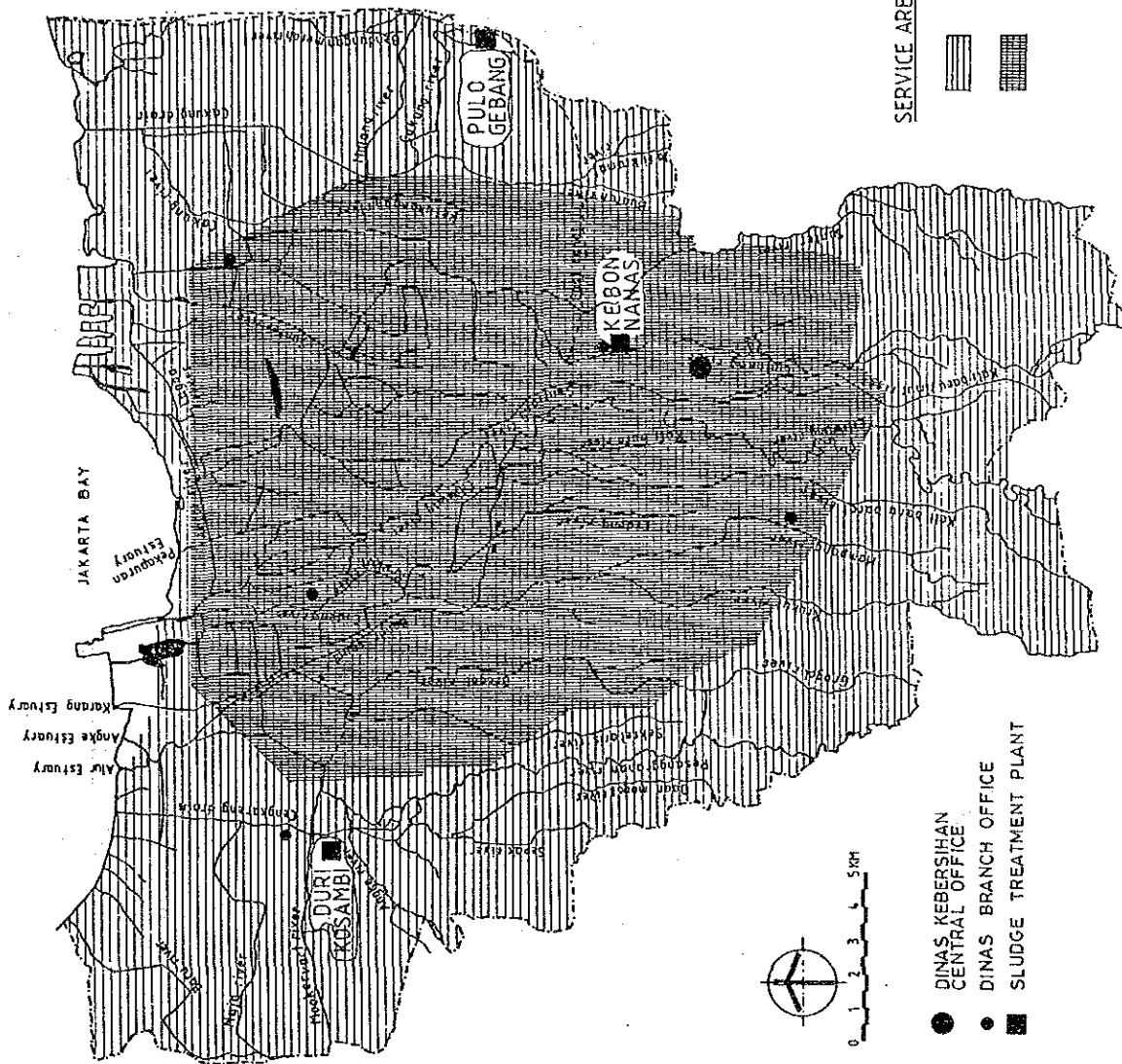


FIG. F.5 LOCATION OF TREATMENT PLANT AND OFFICE OF CLEANSING DEPARTMENT

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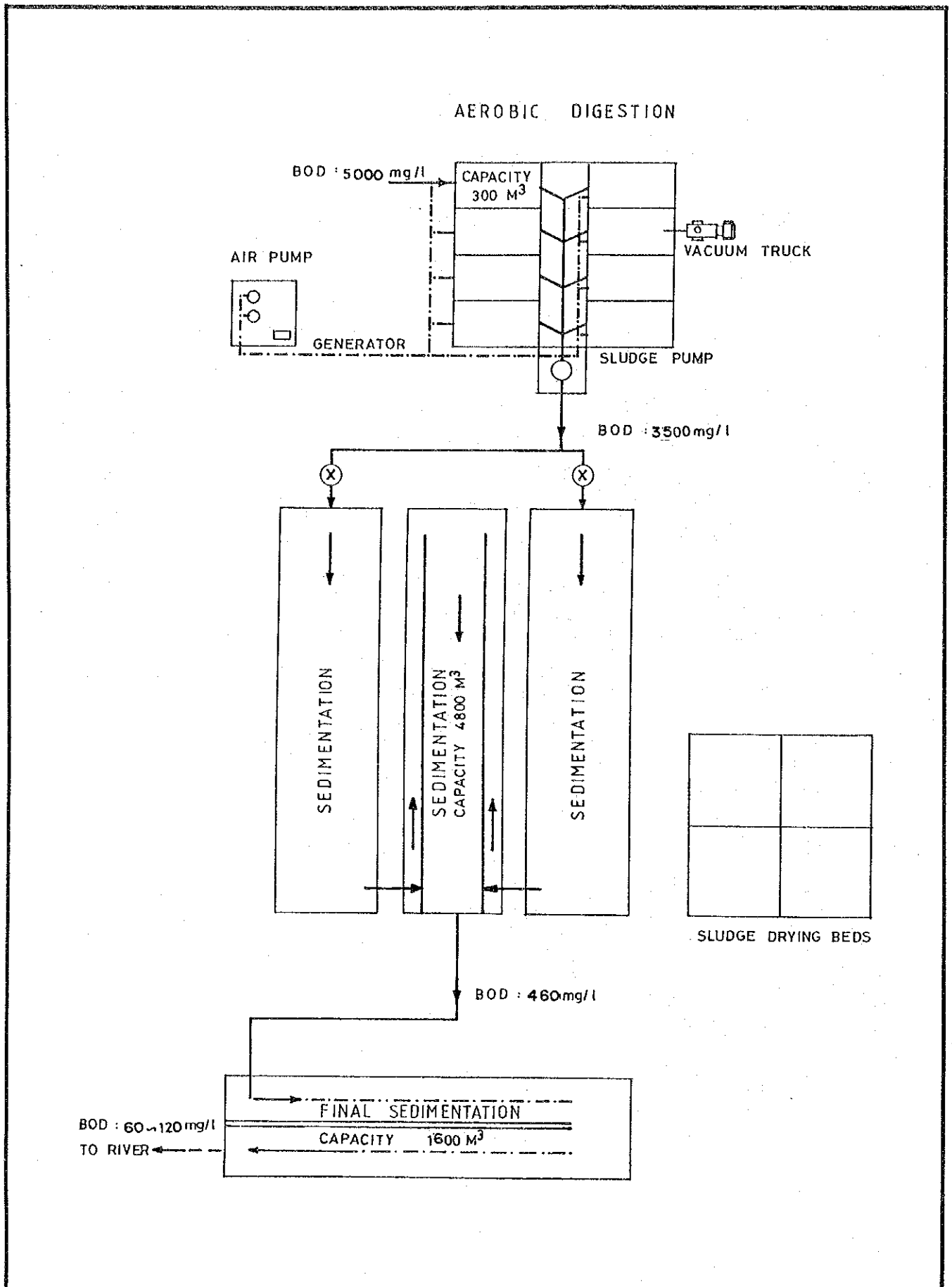


FIG. F.6

LAYOUT OF PULO GEBANG TREATMENT PLANT

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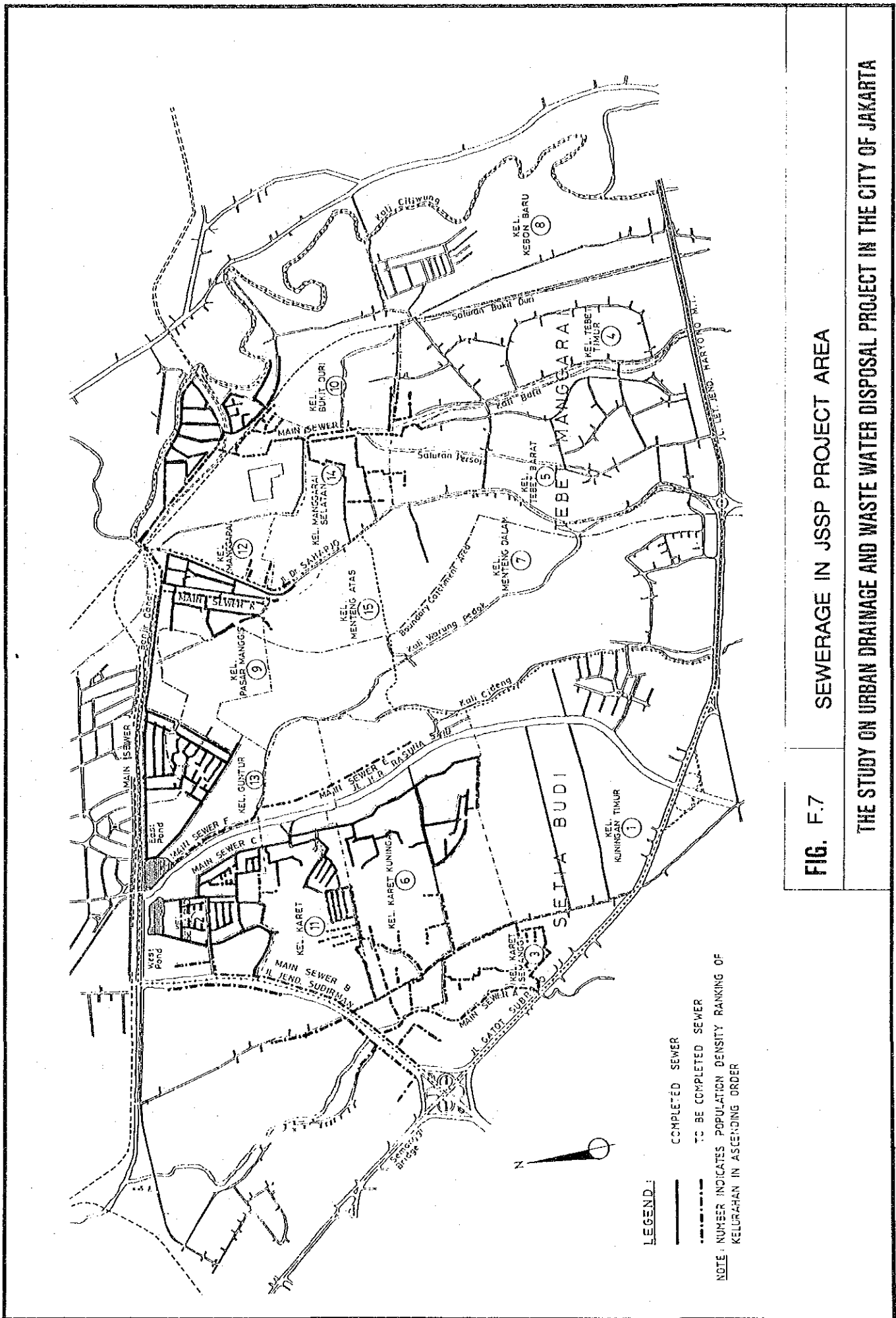


FIG. F.7

SEWERAGE IN JSSP PROJECT AREA

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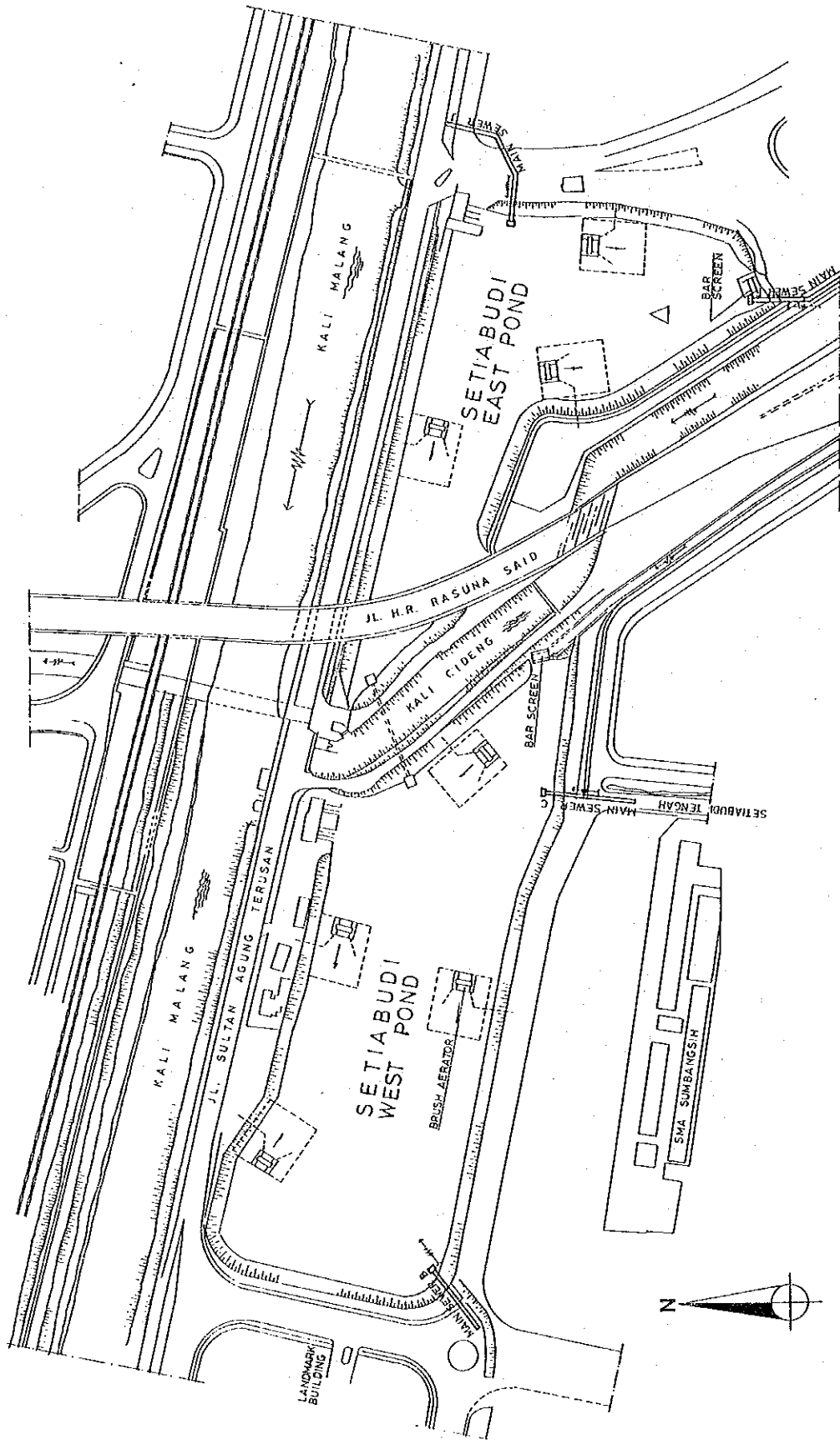


FIG. F.8

SETIABUDI WASTEWATER TREATMENT PONDS

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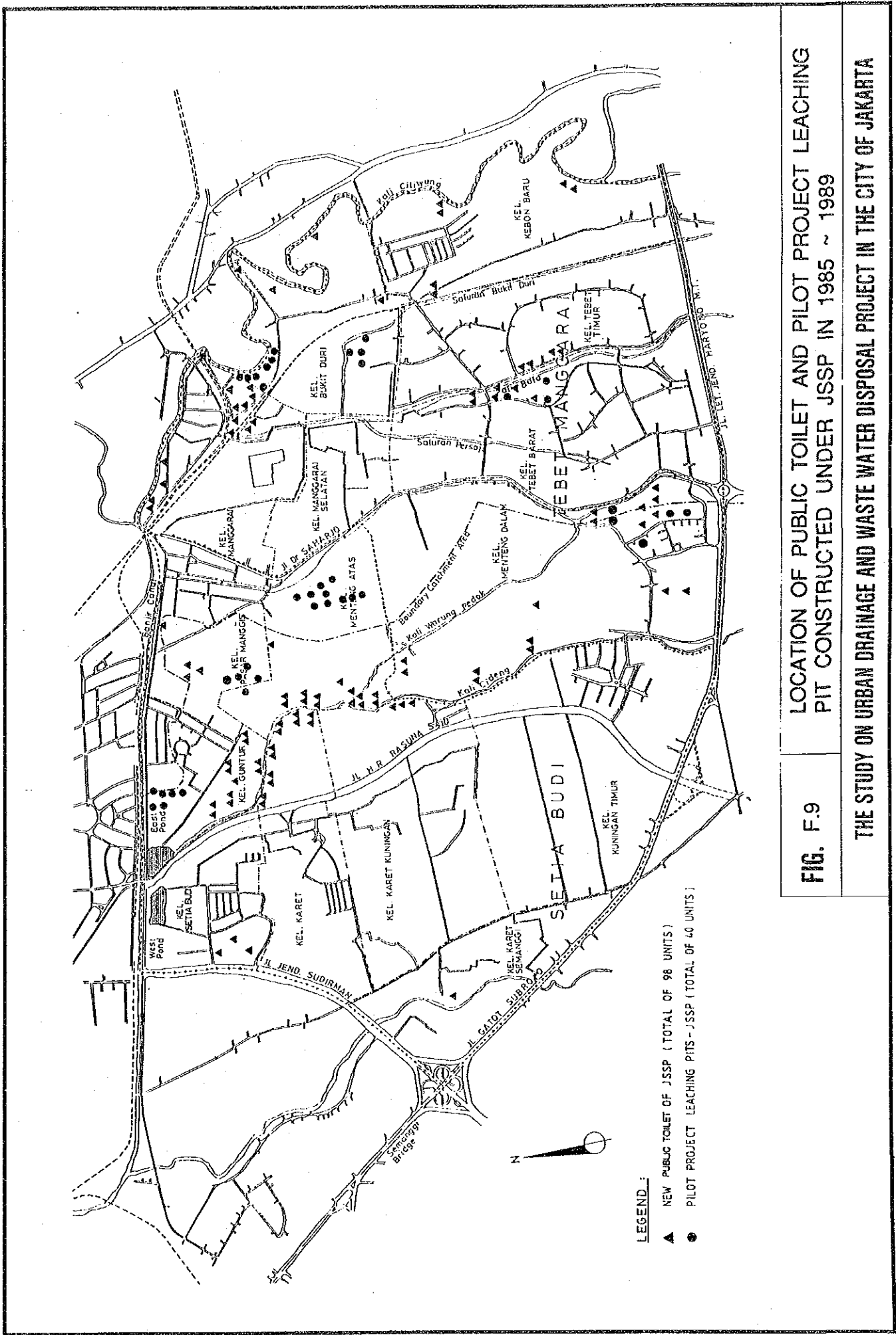


FIG. F.9 LOCATION OF PUBLIC TOILET AND PILOT PROJECT LEACHING PIT CONSTRUCTED UNDER JSSP IN 1985 ~ 1989

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