an urgent need for modern sewerage and drainage systems in the Project Area, for which an administrative organization will be required for implementation of the Project, as well as its operation and maintenance.

The existing organizations, such as the Engineering Department of Kelang Municipality, the Drainage and Irrigation Department and Public Works Department of the State Government, are more or less concerned with sewerage and drainage activities in the Project Area. It is possible for these agencies to operate the proposed sewerage and drainage systems efficiently if substantial aid in the form of staff and funds are provided. For this purpose, the following respective alternatives are considered.

7.2.1. Proposed Organization

1) General

As implementation of the sewerage project proposed for the Municipality would proceed according to schedule together with the on-going and proposed program for the drainage works, it is necessary to consider further detailed organization of the Sewer and Drain Section and its staffing pattern with clearly defined terms of reference. The following are recommended:

i. The current Work Shop Unit of the Sewer and Drain Section should be made a separate section, since most of its current work has little or no direct relation to sewerage and drainage services. As shown in Table 7.1, the Engineering Department will thus consist of six sections. Functional efficiency, including controlling operations, should be emphasized in this organizational expansion.

ii. Proper arrangements should be made with the Treasury Department for separate accounting of the sewerage activities from those of the Municipality's general finance. This arrangement is indispensable for incorporating the cost-recovery system into the sewerage service system. Also, aside from administrative advantages, it will be useful in loan arrangements with any lending agency.

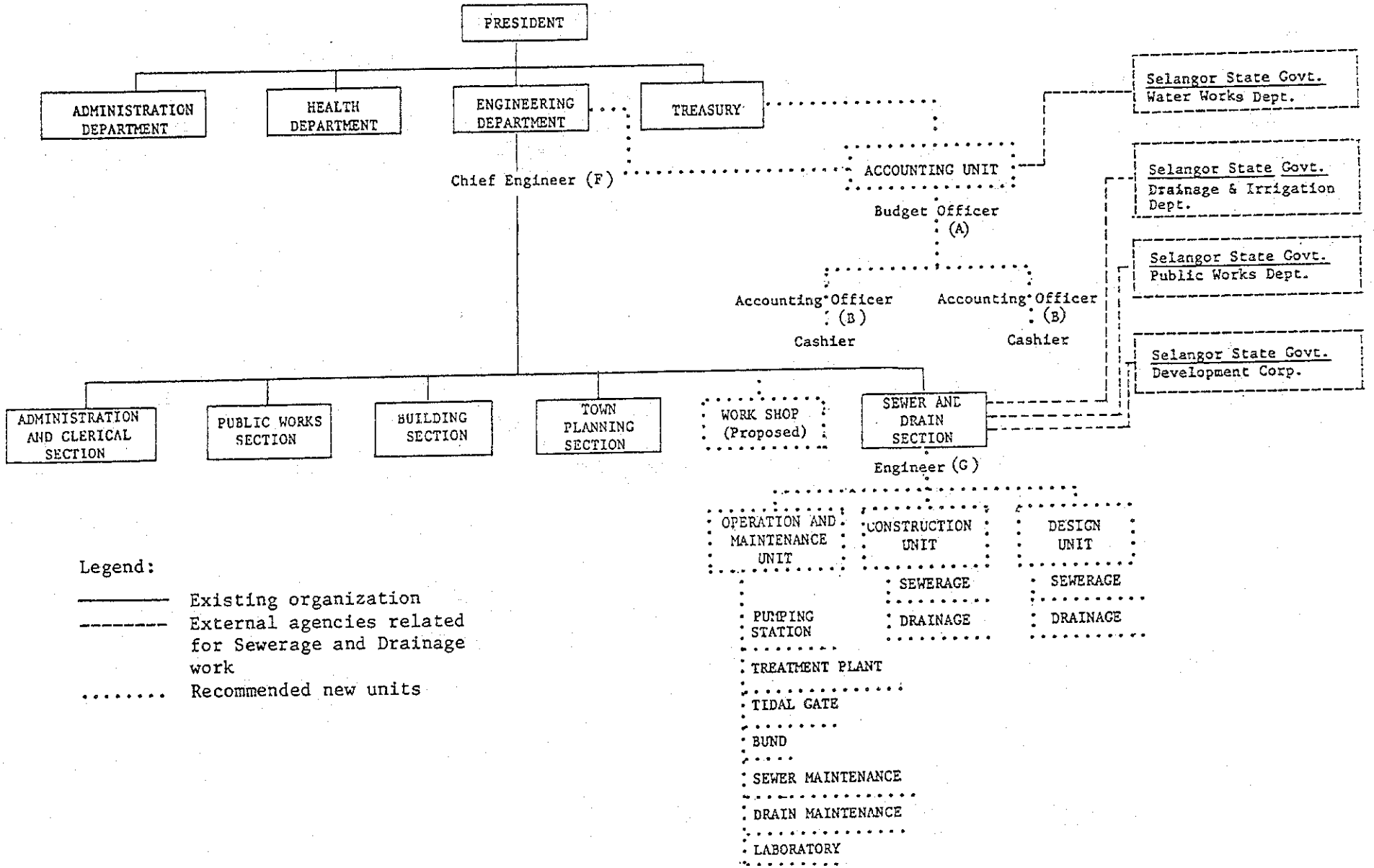
iii. The Engineering Department would take over the drain cleaning duties from the Health Department, which is presently in charge of cleaning the existing drains.

iv. Close coordination with other departments of the Municipality should not be neglected.

2) Proposed Functional Units of Sewer and Drain Section

It is recommended that the Sewer and Drain Section be divided into three new functional units: Design Unit, Construction Unit, and Operation/Maintenance Unit, as shown in Table 7.1. Each unit would cooperate with the other units in undertaking both sewerage and drainage work.

Table 7.1. Proposed Modification of Kelang Municipality Organization for Administration

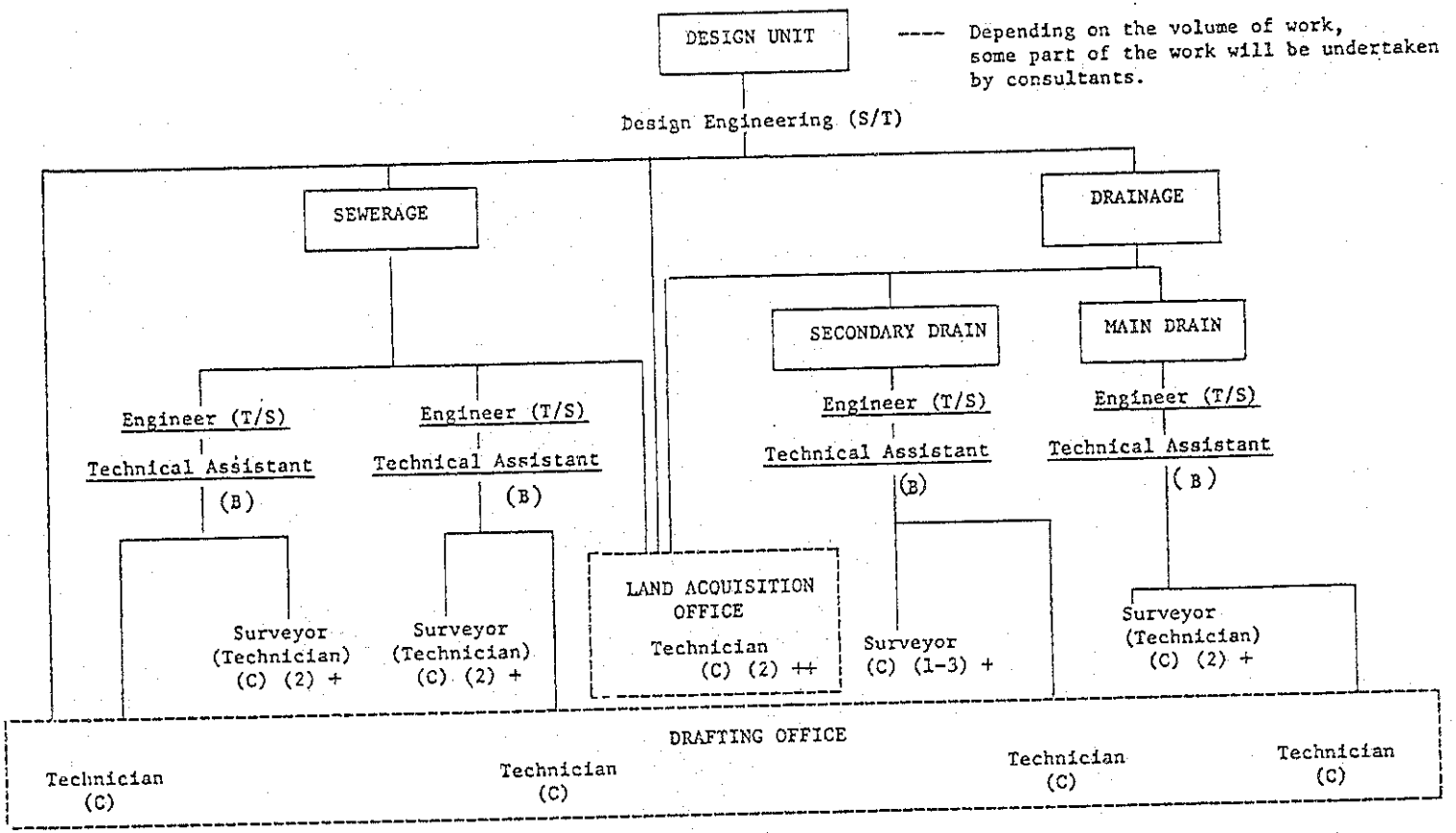


2-1) Design Unit

This unit would be responsible for preparation of engineering design and specifications of all sewerage and drainage projects and also for review and approval of the design plans submitted by private developers. It would also be responsible for collecting and compiling accurate information on the sewerage system, including priority areas, population trends, number of connections and persons served, sewage flows, receiving water quality, treatment plant performance, etc. The organization chart for this unit is shown in the following Table 7.2.

It will also maintain liaison with other Government departments for shifting squatters and service lines (e.g. cables & water mains) affected by proposed drains and culverts at the design stage.

Table 7.2. Proposed Organization of Design Unit



\+ One is special grade and one is ordinary.

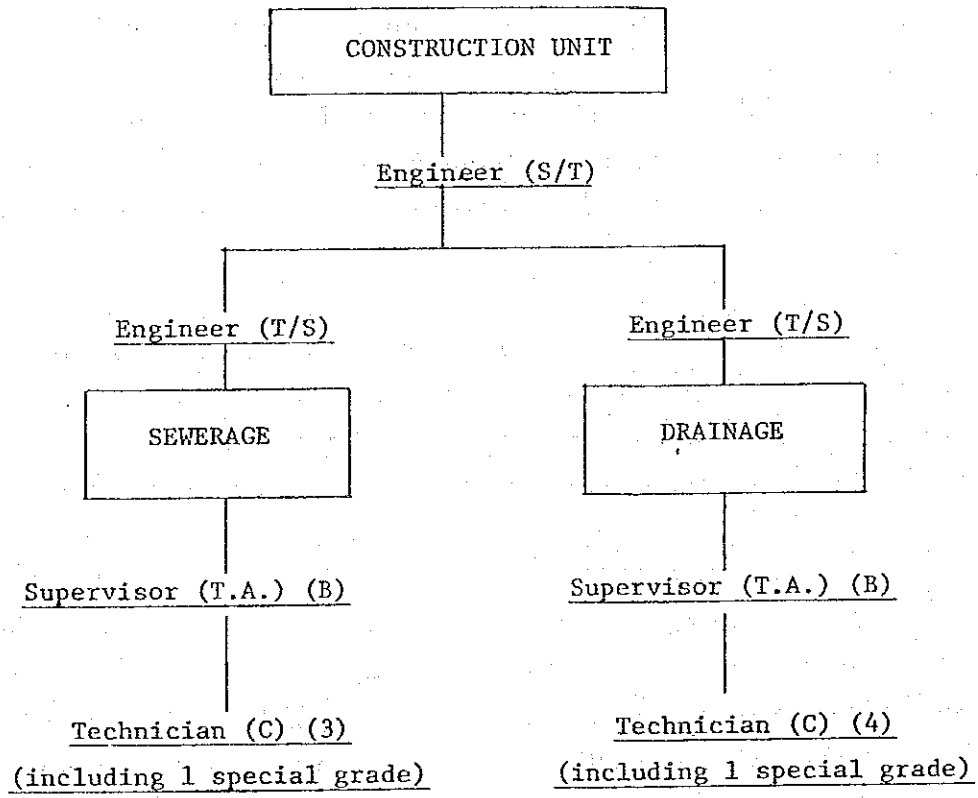
++ If all works are undertaken by Consultant, only one (1) surveyor (ordinary) will be required.
If all works are conducted by MPK, one (1) surveyor (special grade) and two (2) surveyors (ordinary) will be required.

Generally, in the organization of sewerage and drainage systems, each has its own Land Acquisition Office (LAO) and Drafting Office (DO). However, it is proposed that there be one LAO and one DO to serve both sewerage and drainage systems, for efficient manpower utilization.

2-2) Construction Unit

The Construction Unit would be responsible for management and supervision of all construction of facilities with attendant surveys and inspections to ensure compliance with required specifications and standards. The organization chart for this unit is shown in the following Table 7.3.

Table 7.3. Proposed Organization of Construction Unit



2-3) Operation and Maintenance Unit

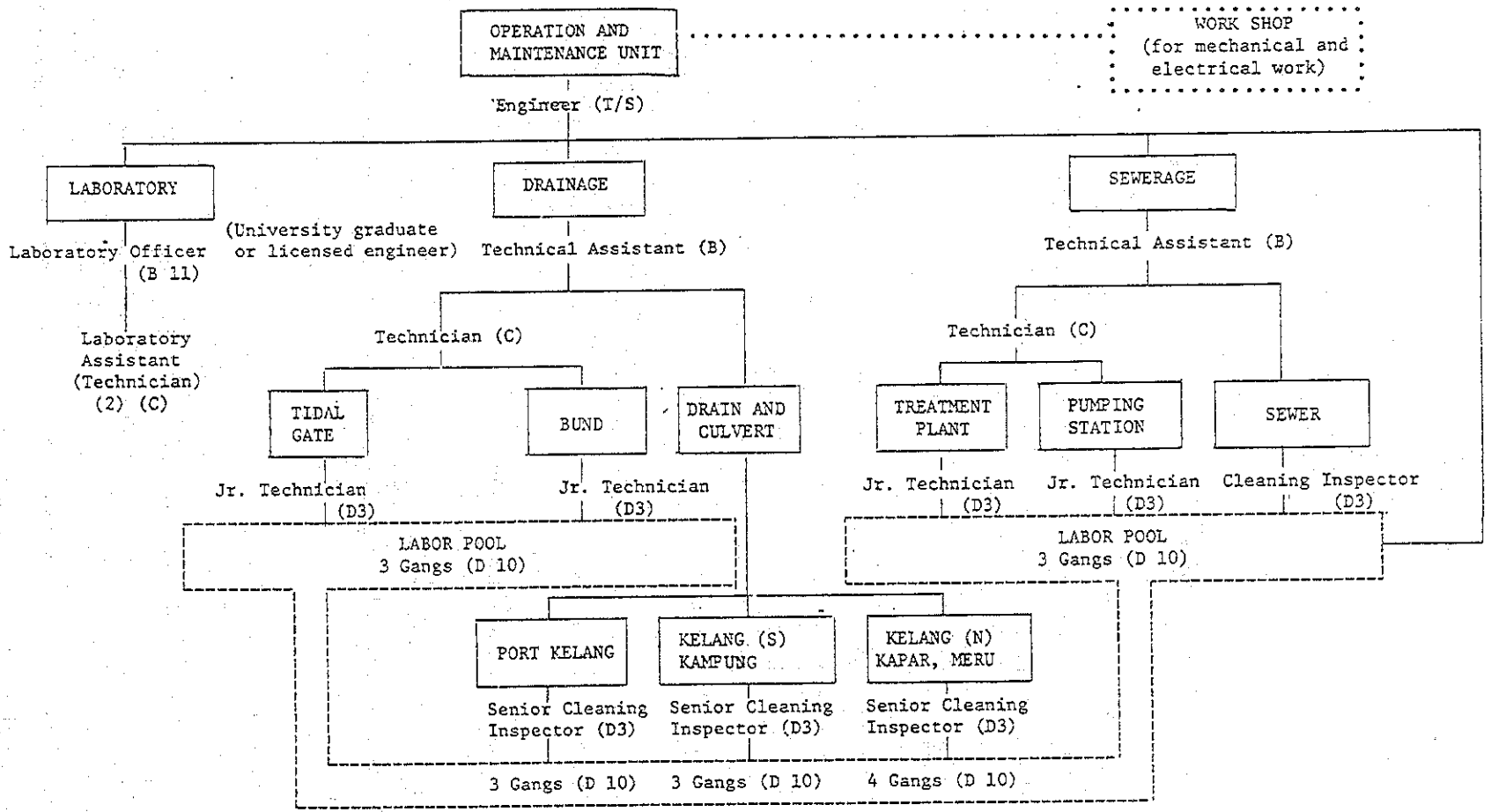
As shown in Table 7.4, the function of this unit is divided into sewerage, drainage and laboratory. The sewerage function is to cover operation and maintenance of sewers, pumping stations and treatment plants, and the drainage function is for drains and culverts, retention ponds, bunds and tidal gates. The function of the laboratory is for monitoring and surveillance of industrial wastewater quality, and stabilization pond effluents.

The work on sewers, drains and culverts require their proper maintenance through routine inspections for physical damage and obstruction in the sewers and drains, including control of illegal industrial discharge into the main sewers. Proper maintenance and routine inspections are also required on bunds and tidal gates to prevent physical damage and obstruction.

The Sewer and Drain Section would rely on the staff of the Work Shop Section concerning the relatively small volume of mechanical and electrical work, as it is recommended that mechanical and electrical staff members belong to the Work Shop Section, rather than the Sewer and Drain Section.

Assistance from a labor pool, as shown in Table 7.4, from which work gangs of appropriate number would be assigned to the Sewer and Drain Section, according to the volume of work, should also be agreed and arranged. This would have the advantage of limiting assignments only to the number of workers needed for each job. Some laborers now engaged in cleaning drains should be shifted from the Health Department to the Engineering Department.

Table 7.4. Proposed Organization of Operation and Maintenance Unit



(Note: 1 Gang consists of 6 Persons)

3) Other Support Agencies

Supportive functions by other agencies of different levels should be also considered for the sake of efficiency and economy as described below:

i. Local Government

3-1) Work Shop Section

The Work Shop Section would cooperate with the Operation and Maintenance Unit concerning all mechanical and electrical equipment and facilities for the sewerage and drainage activities.

3-2) Administration and Clerical Section

This section would be responsible for the recruitment and selection of the new staff for the sewerage and drainage systems.

3-3) Public Works Section, Building Section and Town Planning Section

It is proposed that these sections be responsible for encouraging the residents to avail themselves of the sewerage and drainage systems.

3-4) Administration Department

This Department should expand its function as necessary for proper administration including the legal aspect of the sewerage and drainage systems.

3-5) Health Department

This Department should continue the work of night soil collection and desludging septic tanks until completion of the sewerage and drainage project, while cooperating with the Sewer and Drain Section in the gradual changeover. The existing duties of cleaning drains is recommended to be turned over to the Engineering Department.

ii. State Government

3-6) Water Works Department, Selangor State (WWD)

It is recommended that the sewerage charge be based on the users' water bill. As the Water Works Department of Selangor State is now handling water supply services, cooperation between MPK and WWD will be required for billing and collecting of sewerage charges on behalf of MPK. In this connection, agreement should be made on procedures for transfer of the collected charges and its administration fees.

3-7) Drainage and Irrigation Department (DID), Selangor State

DID should assist MPK in the work of planning, designing, constructing and maintaining the major drains up to the year 1990.

3-8) Public Works Department (JKR), Selangor State

This Department is responsible for the construction and maintenance of federal and state roads, including construction of roadside drains, which should continue. However, the maintenance work for these drains should be transferred to MPK.

3-9) Selangor State Development Corporation (PKNS)

It is recommended that the Sewer and Drain Section coordinate its sewerage and drainage facilities with PKNS concerning low cost housing projects, development of industrial areas, and general development of new towns.

7.2.2. Staffing Schedule

Staffing projections from 1983 up to the year 2000 shown in the following tables are intended as guidelines in determining the number of personnel and laborers necessary to undertake the required functions for

the proposed sewerage and drainage program. The staffing estimates show a total of 17 in the initial year of 1983, 28 in 1990 at the end of the First Phase (excluding the labor pool and staff of other Departments or Sections).

It should be noted that the above estimates are so arranged as to keep the number required for the smooth operation of the sewerage and drainage services to a minimum. However, recruitment of the required number of qualified staff for the relatively short period is expected to be difficult and result in a shortage of the required staff, particularly in the Design and/or Construction Unit, which will impose restraints on implementation of the proposed sewerage and drainage systems. In this case, it is suggested that outside engineering consultants be contracted to undertake the detailed design work and preparation of tender documents and subsequent supervision of construction at the initial stage of the program.

A schedule of estimated staff requirement and the qualifications and job descriptions of each personnel for each unit follow:

1-1) Design Unit Staff Schedule

Job Title	1983	1984	1985	1986	1987	1988	1989	1990
Engineer (S/T)*	1	1	1	1	1	1	1	1
Engineer (T/S)	1	1	1	1	1	1	1	2
Technical Asst.	1	1	1	1	1	1	1	2
Technician	2	2	2	2	2	2	2	4
Sub-Professional* Pool (Technician)	2	2	2	2	2	2	2	4
Land Acquisition Pool (Technician)	2	2	2	2	2	2	2	2
Total	9	9	9	9	9	9	9	15

Note: It is assumed one design engineer would engage in M$4 million worth of project work a year.
In case of excess work, either local or foreign consultants may be assigned.
* Concurrently serve as sewerage staff.

1-2) Design Unit Staff Qualifications and Job Description

Position	Qualifications		Job Description Responsibilities
	Degree	Work Experience	
Engineer (S/T)	B.S. in C.E. (or S.E.)	8 years	Designs engineering specifications. Supervision of design engineers and draftsmen
Engineer (T/S)	B.S. in C.E. (or S.E.)	2 years	Preparation of plans and designs for construction improvement and repair of sewerage facilities, including house connections
Technical Assistant & Technician	Diploma (or H.S. Cert.)	—	Assist design engineer (as drawings and other miscellaneous work)

2-1) Construction Unit Staff Schedule

Job Title	1983	1984	1985	1986	1987	1988	1989	1990
Engineer (S/T)*	1	1	1	1	1	1	1	1
Engineer (T/S)	1	1	1	1	1	1	1	1
Supervisor (Technical Asst.)	–	–	1	1	1	1	1	1
Technician	–	–	2	2	2	2	2	2
Total	2	2	5	5	5	5	5	5

Note: It is assumed one construction engineer engages in M$7 million worth of project work a year.
In case of excess work, either local or foreign consultants would be assigned.
* Concurrently serve as sewerage staff.

2-2) Construction Unit Staff Qualifications and Job Description

Position	Qualifications		Job Description Responsibilities
	Degree	Work Experience	
Engineer (S/T)	B.S. in C.E.	8 years	All construction work and supervision of inspectors
Engineer (T/S)	B.S. in C.E.	2 years	Supervision of all construction work of sewerage or drainage facilities
Technical Assistant & Technician	Diploma (or Tech. H.S. Cert.)	——	Inspection of equipment and materials for construction, including house connections and public sewer laying (according to technical specifications)

3-1) Operation and Maintenance Unit Staff Schedule

Job Title	1983	1984	1985	1986	1987	1988	1989	1990
Engineer (T/S)	1	1	1	1	1	1	1	1
Technical Asst.	1	1	1	1	1	1	1	1
Technician	1	1	1	1	1	1	1	1
Jr. Technician	3	3	3	3	3	3	3	3
Chemist						1	1	1
Laboratory Asst.						1	1	1
Labor Pool*	120	120	120	120	120	120	120	120
Total	126	126	126	126	128	128	128	128

* The Engineering Department takes over labourers from the Health Department.

3-2) Operation and Maintenance Unit Staff Qualifications and Job Description

Position	Qualifications		Job Description Responsibilities
	Degree	Work Experience	
Engineer (T/S)	B.S. in S.E.	5 years	All activities for operation and maintenance (O & M) of the sewerage and drainage systems
Technical Assistant, Technician and Junior Technician	Diploma (or Tech. H.S. Cert.)	2 years	All work related to O & M and supervising laborers
Chemist	B.S. in Chem.	-	Management and provision of laboratory services for regular monitoring tests concerning quantity and quality of wastewaters of the sewerage system and effluents from the sewage treatment plant
Laboratory Assistant	Diploma (or H.S. Cent.)	2 years	Collection of water samples and water quality examination of drains and stabilization ponds under the direction of the Chemist
Laborer	(None)	(None)	Routine work, such as desilting and cleaning of sewers and drains

4-1) Other Departments or Sections

Code : S = Sewerage
D = Drainage
T = Total

Job Title	1983			1984			1985			1986			1987			1988			1989			1990		
	S	D	T	S	D	T	S	D	T	S	D	T	S	D	T	S	D	T	S	D	T	S	D	T
Budget Officer																1	-	1	1	-	1	1	-	1
Accounting Officer																			1	-	1	1	-	1
Senior Clerk*																			1	-	1	1	-	1
Engineer (Mechanical)																			1		1	1		1
Technical Asst. (Electrical)																								
Technician (Electrical)	1		1	1		1	1		1	1		1	1		1	1		1	1		1	1		1
Senior Clerk**																								
Clerk and Typist	4		4	4		4	4		4	4		4	4		4	4		4	6		6	6		6
Total			5			5			5			5			5			6			11			11

* No direct handling of money

** Senior clerk for Drainage and Sewerage Section

4-2) Qualifications and Job Descriptions of Staff Members of Other Depts. or Sections

Position	Qualifications		Job Description Responsibilities
	Degree	Work Experience	
Budget Officer	B.S.	5 years	Loan administration and reimbursement for the sewerage project
Cashier	Diploma (or H.S. Cert.)	___	Daily accounting work under the direction of the Budget Officer and Accounting Officer, and preparing and keeping accounting records
Engineer (Mechanical)	B.S. in M.E.	5 years	O & M of treatment plant and pumping stations, including control and repair of cleaning machines and trucks and maintenance equipment
Engineer (Electrical)	B.S. in E.E.	5 years	Control, monitoring and repair of all electrical equipment required on treatment plant and pumping station. Safekeeping of all maintenance equipment
Personnel Officer	B.S. in Adm. (or liberal arts)	___	Recruitment of new staff and administration of personnel assignments and wage control
Clerk	Diploma (or H.S. Cert.)		Assist Personnel Officer in various clerical duties, such as recording and filing

7.2.3. Training

Parallel to the recruitment schedule of necessary staff of all levels, training programs should be considered for those recruited in an attempt to raise their level of qualification/experience for satisfactory performance of their assignment, by way of practical and effective approaches including the following, to be implemented as soon as possible when implementation of the 1st Phase of the proposed project is decided:

On-the-job training program will be arranged with foreign engineering consultants for training of sewerage engineers and other related technical staff during the period of consulting services for planning, designing and construction supervision, including procurement procedure, etc.

7.3 Legal Aspect

Concerning legal aspects of the project implementation, the Local Government Act (1976), the Street, Drainage and Building Act (1974), Town and Country Planning Act (1976), and The Environmental Quality Act (1974) are reviewed in the Master Plan report. The review of these Acts, and interviews with relevant officials, both in Federal and State agencies as well as the Kelang Municipality, reveal no legal problems in implementing the sewerage and drainage projects under existing laws and regulations.

CHAPTER 8

BENEFITS AND EFFECT

CHAPTER 8 BENEFITS AND EFFECT

8.1. Anticipated Benefits

The proposed drainage system is expected to bring about the following benefits for the Project Area which are described in detail below:

(1) Reduction of flood damage
(2) Improvement of environment
(3) Increase in land value

8.2. Recognition and Quantification of Benefits

8.2.1. Reduction of Flood Damage

Many houses, premises, roads and institutional facilities suffer damage from flooding, causing considerable nuisance and hardships in the daily life of the inhabitants. If appropriate flood relief measures are taken on the drainage system, the various kinds of flood damage would be considerably eliminated.

The benefits to be derived from flood prevention are considered to be equivalent to the amount of flood damage. However, in the absence of available data concerning flood damage, the amount of benefits cannot be calculated in monetary terms. Therefore, some of the factors of the above-mentioned benefits are quantified under the following points:

a) Area to be Benefitted by Flood Mitigation

The Master Plan up to the year 2000 provides mitigation of 720 hectares of current major flood-prone areas, of which 507 ha is residential, 83 ha industrial, 80 ha commercial and 47 ha institutional area.

b) Reduction of Frequency, Duration and Depth of Flooding

According to the results of the survey conducted in October 1981, the average number of days of flood occurrence per year was 43.2 days, average duration of flooding was 5.1 hours and average depth of flooding was 29.5 cm. By the year 2000, this situation will be greatly improved from the Project Area.

c) Population to be Benefitted

The flood-prone area population, which was 45,900 in 1980, is expected to reach 68,300 by the year 2000. Accordingly, the greater number of people will be expected to benefit from flood mitigation program.

In addition, inhabitants living in flood-prone areas suffer both during and after flooding. Their daily lives and/or means of making a livelihood are disrupted and inconvenienced due to flood damages and the necessity of cleaning up after flooding. This situation results in loss of manpower. By undertaking adequate flood relief measures, such loss of income or inconvenience and manpower loss would be alleviated, for which complaints have presently been constantly made from almost all those affected areas.

Thus, flood mitigation by drainage improvement could be considered to result in elimination of manpower loss additional to the benefits stated above, although quantification of increased manpower is difficult to determine. Some of above mentioned benefit are shown in Table 8.1.

Table 8.1. Anticipated Benefits from Flood Mitigation

Item	Phase I (1983 - 1990)
Flood-prone Area (ha)	87.6
Population In Flood-prone Area (person)	5,600
Households* In Flood-prone Area (Household)	982

* A household is assumed to be comprised of 5.7 persons.

8.2.2. Improvement of Environment

Benefits under this item could be considered as benefits to the community. Its importance, however, depends on public awareness and recognition of these benefits stemming from the drainage system, which differs from person to person. Generally speaking, it is expected that the higher the public living standard, the higher the public recognition of the benefits. The following benefits are expected to result from improvement of the environment:

a) Aesthetic Aspect

Elimination of the present offensive odors emanating from the drains and sludge accumulations will result in improvement of environmental aesthetics, particularly for those living in or near the flood-prone areas who will find great relief from the polluted atmosphere and unsightly environment. Also, the Municipality's new commercial and industrial activities would find the improved environment definitely attractive for their respective purposes.

b) Public Health and Sanitation Aspect

Generally, the condition of public health in the Project Area is considered to be good. The incidence of water-borne communicable diseases is insignificant, partly as a result of the practice of spreading disinfectants after flooding, according to data obtained from the Kelang Municipality Health Department.

However, improvement of the drainage system is expected to bring about the following results concerning public health and sanitation:

- Decrease in risk and incidence of diseases and consequent improvement in health and life span
- Decrease in medical expenses
- Decrease in loss of income through reduced absence from work for health reasons and subsequent increase in GDP.

8.2.3. Increase in Land Value

Land value increase is considered to be a comprehensive representation of the economic benefits to be gained from the drainage system. It is expected to spur the development program and consequent large-scale financial transactions due to improvement in the living environment, and also to bring additional revenue to the Municipality through the increased value of private property.

It should be noted that land price increase could be caused by not only drainage improvement but also various factors such as economic growth, concentration of population, and improvement of environmental condition. However, it is obvious that the improved environment through the proposed drainage system should provide sufficient impetus for land value increase in the areas concerned.

a) Analysis of the Effect of Drainage System on Land Value Increase

The possible effects of the drainage system on increase in land or

property value were not previously examined due to the extreme difficulty of isolating it from those of other factors. However, an attempt is made at this point to make an evaluation by applying a version of the Multivariate Analysis, which is referred to as the "Quantification Theory Type I Model" method on the basis of the survey result, the ideal form of which is as follows:

$$Y = A_{11} X_{11} + A_{12} X_{12} + A_{21} X_{21} + A_{22} X_{22} + A_{31} X_{31} + A_{32} X_{32} + A_{41} X_{41} + A_{42} X_{42} + A_{43} X_{43}$$

Y : Criterion variable (the price of land)
Xij : Explanatory variable (i : item, j : category)
Aij : Category weight

Item 1	Environmental Condition
Category 1 (X_{11})	Bad
Category 2 (X_{12})	Good
Item 2	Land Use
Category 1 (X_{21})	Residential
Category 2 (X_{22})	Commercial
Item 3	Population Density
Category 1 (X_{31})	Low
Category 2 (X_{32})	High
Item 4	Property Assessment Rank
Category 1 (X_{41})	Low
Category 2 (X_{42})	Middle
Category 3 (X_{43})	High

After completion of the proposed drainage system, flood damage would be eliminated, which means that land price increase can be obtained

by shifting the categories in Items 1 and 3.

It should be kept in mind that Xij is represented by either rating scale or nominal scale; therefore, it is a dummy variable which takes 1 or 0.

b) Result of the Analysis

The above model is used to estimate the land price increase in the First Phase area expected to result from completion of the drainage system. However, due to the lack of data for this type of analysis, this model is used to estimate the increment in property assessment value, which has been chosen as the criterion variable in lieu of the land price increase. Suitable parameters are estimated according to the following model.

$$Y = -52.195X_{11} + 18.227X_{12}$$
$$+ 658.241X_{21} - 359.041X_{22}$$
$$- 555.262X_{31} + 302.871X_{32}$$
$$- 2,434.237X_{41} + 407.033X_{42} + 10,869.477X_{43}$$

The results are summarized as follows:

(1) If the environmental condition (Item 1) is improved through completion of the drainage system from "bad" to "good", the property assessment value would show an average increase of about M$70 per household.

(2) The increase of population density (Item 3) would result in an average increase of property value by about M$858 per household.

(3) Item 4, property assessment value, is used as a proxy for the household income converted into a rating scale because of lack of data. The parameters of this item show that the higher the income, the higher the property assessment value.

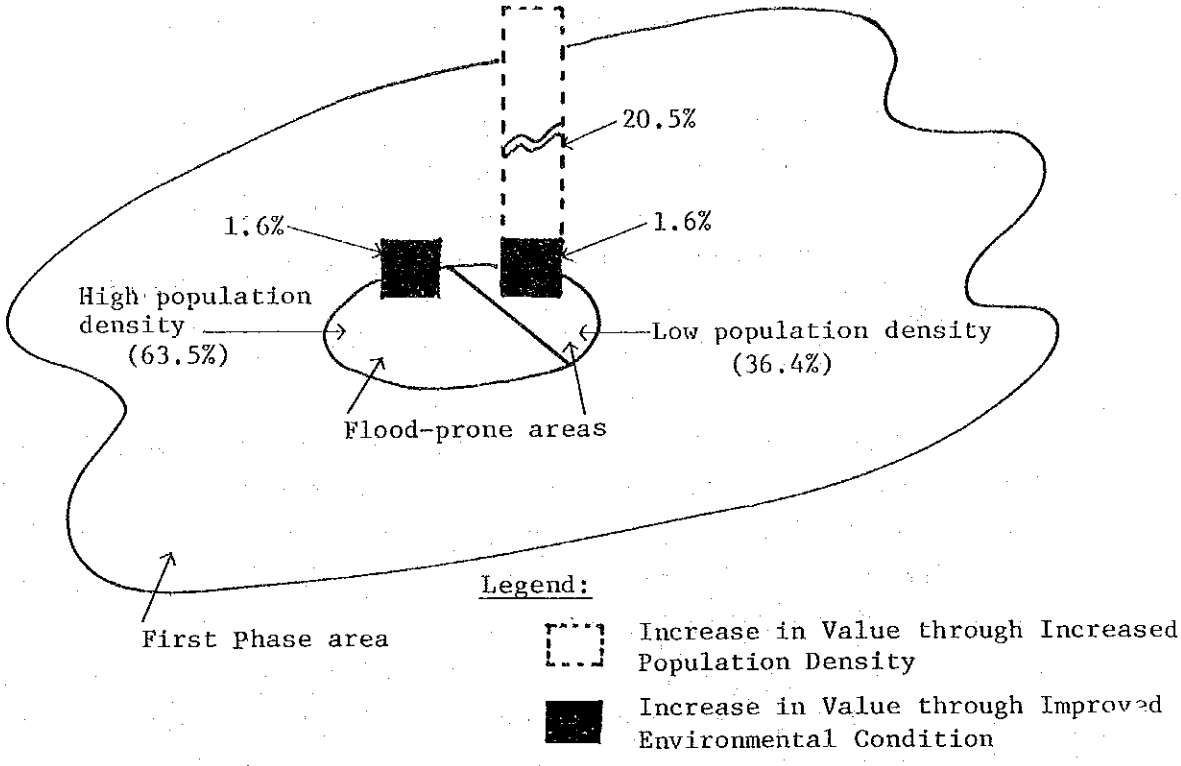
(4) The value of multiple correlation coefficient is 0.5908. This value could be considered to be considerably high although this type of model is comprised of only variables which do not take any figures except 0 or 1.

c) Calculated Benefits from Drainage Service

Among the sample data used in the above model, 44 samples are located within the area where the environmental condition is "bad". This area is referred to as a "flood-prone area". The existing total property assessment value of these samples is M$195,560 and the expected total increment of the property assessment value is M$3,080, which is calculated at 70 times 44 according to result (1). Therefore, after completion of the drainage system, the average increase rate of the property assessment value is only 1.6 percent. This figure is very small; however, generally the greater the improvement of environmental condition, the greater the population influx, with consequent higher population density. Therefore, the effect of the drainage system should be considered ultimately from the viewpoint of the increase in population density (Item 3), which results from Item 1.

Among the 44 samples, 16 samples belong in the low population density area. This shows the possibility of increasing population density remains within 16/44 percent of the existing flood-prone area. As the property assessment value of these 16 samples is M$66,920 and the incremental value is M$13,728 (16 x 858), in the existing low population density area of the flood-prone area, its increase in property assessment value would reach 20.5 percent. (Ref.: Fig.8.1.)

Fig. 8.1. Analysis of Property Assessment Value Increase by Flood Mitigation Measures



Considering the size of flood-prone areas, the present total value of property assessment within the above flood-prone area is M$1,928,000 of the total MPK assessment revenue (M$15 million); therefore, the increment of this value derived from the improvement of environmental condition after completion of the drainage system is M$30,848, which is obtained by calculating M$1,928,000 x 0.016. On the other hand, the existing total property value of the low population density area within the flood-prone area is M$701,792 and the increment of this value caused by the population influx into this area is M$143,867, which is calculated from M$701,792 x 0.205.

In conclusion, the benefits from the drainage system, which is basically difficult to quantify, could be evaluated as the sum on the above two values of the property assessment increment; that is, M$174,715. This would result in the increment of the Municipal annual revenue through the

increase of property assessment value. Assuming a 15 percent tax rate, MPK could expect to raise the M$26,207 extra revenue annually. Moreover, this increase of property assessment value could contribute to the construction of the drainage system through the drainage charge for the increased property assessment value. To sum up, the added property assessment value would be of major economic benefit, which will not only stimulate commercial, industrial and real estate activities, but also result in an additional source of taxation revenue for Kelang Municipality. These above-mentioned results are summarized in Table 8.2. and Table 8.3.

Table 8.2. Results of Analysis Based on the Quantification Theory Type I Model

Item	Increase in Property Assessment Value	Sampled Numbers of Households	Total Property Value of Sampled Households (M$)	Increment of Property Value Per Household (M$)	Total Increment of Property Value (M$)	Rate of Increment (%)
I	Through Environmental Improvement	44	195,560	70	3,080	1.6
II	Through Population Increase	16	66,920	858	13,728	20.5

Table 8.3. Increment of MPK's Revenue

Item	Increase in Property Assessment Value	Property Value Related to Items I or II (M$)	Rate of Property Increment (%)	Increment of Property Value (M$)	Total Increment of Property Value (M$)	Tax Rate (%)	Total Tax Increment (M$)
I	Throught Environmental Improvement	1,928,000	1.6	30,848	174,715	0.15	26,207
II	Through Population Increase	701,792	20.5	143,867			

8.3. Justification

As already described above, there will undoubtedly be high social benefits if the proposed drainage system is completed because increased areas of flood-free land will become available for further development, and the existing living environment and inconveniences of community life will be improved considerably.

Due to the rapid socio-economic development in Malaysia, mean monthly household income of the lowest income group (40 percent of the population), increased from M$76 in 1970 to M$186 in 1979, according to the Fourth Malaysia Plan. This represents a rise of 145 percent compared with the increase of 66 percent in consumer price index.

With rise in the level of living standard, what once seemed tolerable has come to be recognized as being intolerable. Also, along with the rapidly increasing developments, flooding has become more serious. Thus, improvement of drainage facilities would undoubtedly contribute greatly to living conditions in Kelang and its environs. Therefore, construction of the proposed drainage system can be justified.