4.4 Financial Planning (Refer to Chapter 8, Volume IV)

The financial viability for the implementation of the First Phase Programme is studied based on the estimated capital cost of M$17,136,000 at 1979 price level (M$22,873,000 at escalated price) and annual recurrent costs presented in Tables 4.6 and 4.7 respectively.

The availability of the various sources of funds for the required costs estimated as above are studied including internal generation revenues as well as external fundings. Another potential source of revenue for the project is studied to raise by charging for the sewerage facility use and relevant user's ability to pay for the sewerage services.

The foreign currency portion of the capital cost is normally assumed to be financed by the loans from the international lending agencies such as International Bank for Reconstruction and Development (IBRD), Asian Development Bank (ADB) or bilateral fund sources such as Overseas Economic Cooperation Fund (OECF), Japan. The local currency part of construction cost is assumed to be financed by the Federal Government. However, as the estimated foreign currency portion is significantly small equivalent to only 24 percent of total cost, alternative financial projections are attempted on the assumption that the above international lending agencies would not limit the loan to the foreign currency portion only but extent a loan to a part of local currency portion, when local procurement is done for those of foreign origin.

The condition for the loans of above lending agencies are assumed as follows based on the current lending practice.

1. International lending agency (IBRD or ADB)
   Interest : 8 percent per annum
   Repayment : 25 years including 5 years grace period

2. Bilateral lending agency (OECF)
   Interest : 3.25 percent per annum
   Repayment : 35 years including 5 years grace period

3. Federal government

Interest : 6 percent per annum

Repayment : 35 years including 5 years grace period

Based on the assumption made above, the establish the most feasible financial programme, nine sets of loan alternative are developed and compared each other with detailed financial statements for every alternatives, so that it will require the least amount of annual contribution from MPKS, assuming that the project implementation is dictated mainly by the MPKS's financial capacity.

As the result of above comparative study of each alternative, the most favourable financing plan is 1) The project cost amounting to M$7,998,000 is to be financed out of bilateral loan with annual interest of 3.25 percent per annum with 30 years repayment after 5 years grace period. 2) A part of local currency portion amounting to M$11,998,000 is to be financed by Federal Government loan with 6 percent interest per annum and 30 years repayment after 5 years grace period. 3) Land acquisition cost amounting M$2,877,000 is to be financed by Federal Government grant.

The sufficient revenues have to be raised for the satisfactory operation as well as maintenance of the sewerage system constructed. The policy to raise revenues for the public services should generally based on the principle that these who will receive benefits or convenience from such services should pay the charge or fees in accordance with quantity and quality of benefits received. After consideration on alternatives, it is recommended that sewerage charge is collected from the direct users of the system as surcharges on water consumptions of each household, and sewerage tax of 5 percent of the whole annual property value which MPKS is to impose in accordance with the Local Government Act and Street, Drainage and Building Act is considered since those who are not directly using facilities would also receive tangible or intangible benefits such as environmental beautification and land value increases.

On the basis of studies made on abilities and willingness to pay of the residents in the Study Area, sewerage charge is recommended approximately M$0.17/$m^3$ for domestic waste rate and M$0.30/$m^3$ for trade waste rate from 1984 to 1986 to be collected from all customers whenever public sewers are made available within 10 ft of customer's promises or connections are made. These rate are equivalent to 70 percent of existing water rate respectively. Such rate is recommended to increase to 90 percent of existing water bill from 1987 to meet the allowance for assumed escalated price, which is M$0.223/$m^3$ and M$0.386/$m^3$ for domestic and trade waste water respectively. Such increase of rate is assumed to be justifiable as the ability of the customers to pay would increase in accordance with general trend of increase of wage level as result of the continuing favourable economic development of the State and the Country.

The municipal fund allocation is assumed to be provided from general rates fund of MPKS to supplement to sewerage charge revenue. The amount of such revenue is assumed to meet the minimum requirements to enable the financial plan of each alternative to be viable. Tables from 4.8 to 4.10 are presented projected Income statement, Cash flow statement and Balance sheet from 1981 to 1991.

Table 4.8 Project Income Statement, 1981-1991

(M$1,000)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Operating Revenue											
Sewerage Charge	-	-	-	381	564	690	921	954	991	1,026	1,063
General Tax (a)	-	-	-	-	-	886	974	1,072	1,179	1,297	1,427
Municipal Fund Allocation	289	333	520	296	205	545	306	273	286	223	159
Total Operating Revenue	289	333	520	677	769	2,121	2,201	2,299	2,456	2,456	2,649
Operating Expenses											
Billing and Collection Fees: (b)	-	-	-	8	11	14	18	19	20	21	21
Provision for Bad Debts : (c)	-	-	-	4	6	7	9	10	10	10	11
Payroll	197	234	438	473	527	569	615	664	820	907	980
Power	-	-	-	31	56	75	83	92	104	114	126
Maintenance	-	-	11	51	78	89	96	104	112	121	131
Administration	20	24	44	47	52	57	61	66	82	91	98
Total Operating Expenses	217	258	493	614	730	811	882	955	1,148	1,264	1,367
Net Operating Income	72	75	27	63	35	1,310	1,319	1,344	1,308	1,282	1,282
Depreciation (d)	-	-	-	303	429	499	499	499	499	499	499
Interest	-	-	-	-	-	976	956	944	924	904	892
Net Income (Deficit)	72	75	27	(240)	(394)	(165)	(136)	(99)	(115)	(121)	(109)

Note: (a) Estimated at 5% of "Property Value".

(b) Estimated at 2% of "Sewerage Charge".

(c) Estimated at 1% of "Sewerage Charge".

(d) Composite rate of 2.5% for "Assets in service" in the following table.

Table 4.9 Project Cash Flow Statement, 1981-1991

(M$1,000)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Source of Funds											
Net Operating Income	72	75	27	63	35	1,310	1,319	1,344	1,308	1,282	1,282
Increase in Account Payable	18	4	19	9	9	7	5	6	16	10	8
Decrease in Current Assets (Less cash)	-	-	-	-	-	-	-	-	-	-	-
Foreign Loan	1,104	1,352	3,246	1,560	736	-	-	-	-	-	-
Government Loan	382	3,719	3,322	2,580	1,955	-	-	-	-	-	-
Government Contribution (Interest-free Advance)	2,877	-	-	-	-	-	-	-	-	-	-
Total Source	4,453	5,150	6,614	4,212	2,775	1,317	1,324	1,350	1,324	1,292	1,290
Application of Funds											
Capital Expenditure	4,363	5,071	6,568	4,140	2,731	-	-	-	-	-	-
Interest											
Foreign Loan	-	-	-	-	-	256	248	248	240	232	232
Government Loan	-	-	-	-	-	720	708	696	684	672	660
Amortization of Principal											
Foreign Loan	-	-	-	-	-	160	168	168	176	184	184
Government Loan	-	-	-	-	-	144	156	168	180	192	204
Total Dept Service	-	-	-	-	-						
Increase in Current Assets (Less cash)	4	1	5	34	17	13	20	5	6	6	5
Decrease in Current Liabilities	-	-	-	-	-	-	-	-	-	-	-
Total Applications	4,367	5,072	6,573	4,174	2,748	1,293	1,300	1,285	1,286	1,286	1,286
Net Cash Increase (Decrease)	86	78	41	38	27	24	24	65	38	35	34
Cash Available at End of Year (a)	86	164	205	243	270	294	318	383	421	456	490

Note: (a) Estimated at 1/3 of "Operating Expenses" in the previous table.

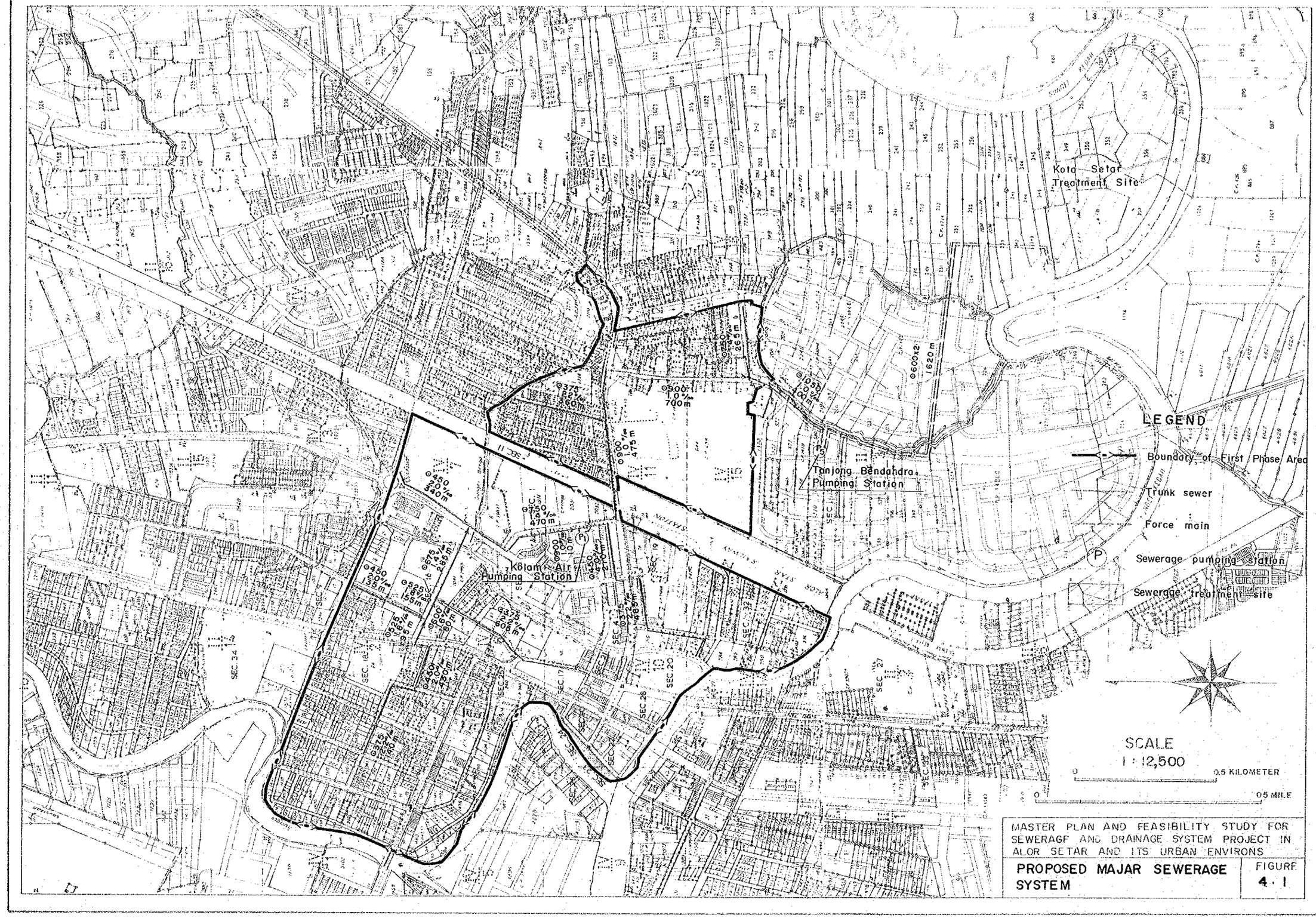
Table 4.10 Project Balance Sheet, 1981-1991

(M$1,000)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Assets											
Fixed Assets											
Land	2,877	2,877	2,877	2,877	2,877	2,877	2,877	2,877	2,877	2,877	2,877
Utility Plant in Service	-	-	-	13,125	17,265	19,996	19,996	19,996	19,996	19,996	19,996
Less Accumulative Depreciation	-	-	-	303	732	1,231	1,730	2,229	2,728	3,227	3,726
Net Fixed Assets in Service	-	-	-	15,699	19,410	21,642	21,143	20,644	20,145	19,646	19,147
Construction in Progress	1,486	6,557	13,216	4,140	2,731	-	-	-	-	-	-
Total Fixed Assets	4,363	9,437	16,002	19,839	22,141	21,642	21,143	20,644	20,145	19,646	19,147
Current Assets											
Cash	86	164	205	243	270	294	318	383	421	456	490
Account Receivable (a)	-	-	-	32	47	58	77	80	83	86	89
Inventory (b)	4	5	10	12	14	16	17	19	22	25	27
Total Current Assets	90	169	215	287	331	368	412	482	526	567	606
Total Assets	4,453	9,603	16,217	20,216	22,472	22,010	21,555	21,126	20,671	20,213	19,753
Liabilities and Equity											
Long Term Dept											
Foreign Loan	1,104	2,456	5,702	7,262	7,838	7,670	7,502	7,326	7,142	6,958	6,766
Government Loan	382	4,101	7,423	10,003	11,854	11,698	11,530	11,350	11,158	10,954	10,738
Total Long Term Dept	1,486	6,557	13,125	17,265	19,692	19,368	19,032	18,676	18,300	17,912	17,504
Current Liabilities											
Accounts Payable (c)	18	22	41	50	59	66	71	77	93	103	111
Current Debt Maturities	-	-	-	-	304	324	336	356	376	388	408
Total Current Liabilities	18	22	41	50	363	390	407	433	469	491	519
Equity											
Government Capital Contribution	2,877	2,877	2,877	2,877	2,877	2,877	2,877	2,877	2,877	2,877	2,877
Retained Earnings	72	147	174	(66)	(460)	(625)	(761)	(860)	(975)	(1,096)	(1,025)
Total Equity	2,949	3,024	3,051	2,811	2,417	2,252	2,116	2,017	1,902	1,781	1,672
Total Liabilities and Equity	4,453	9,603	16,217	20,126	22,472	22,010	21,555	21,126	20,671	20,213	19,753

Note: (a) : Estimated at 1/12 "Sewerage Charges" in the previous table.
(b) : Estimated at 2% of "Operating Expenses" in the previous table.
(c) : Estimated at 1/12 of "Operating Expenses" in the previous table.

FIGURE 4 - 1

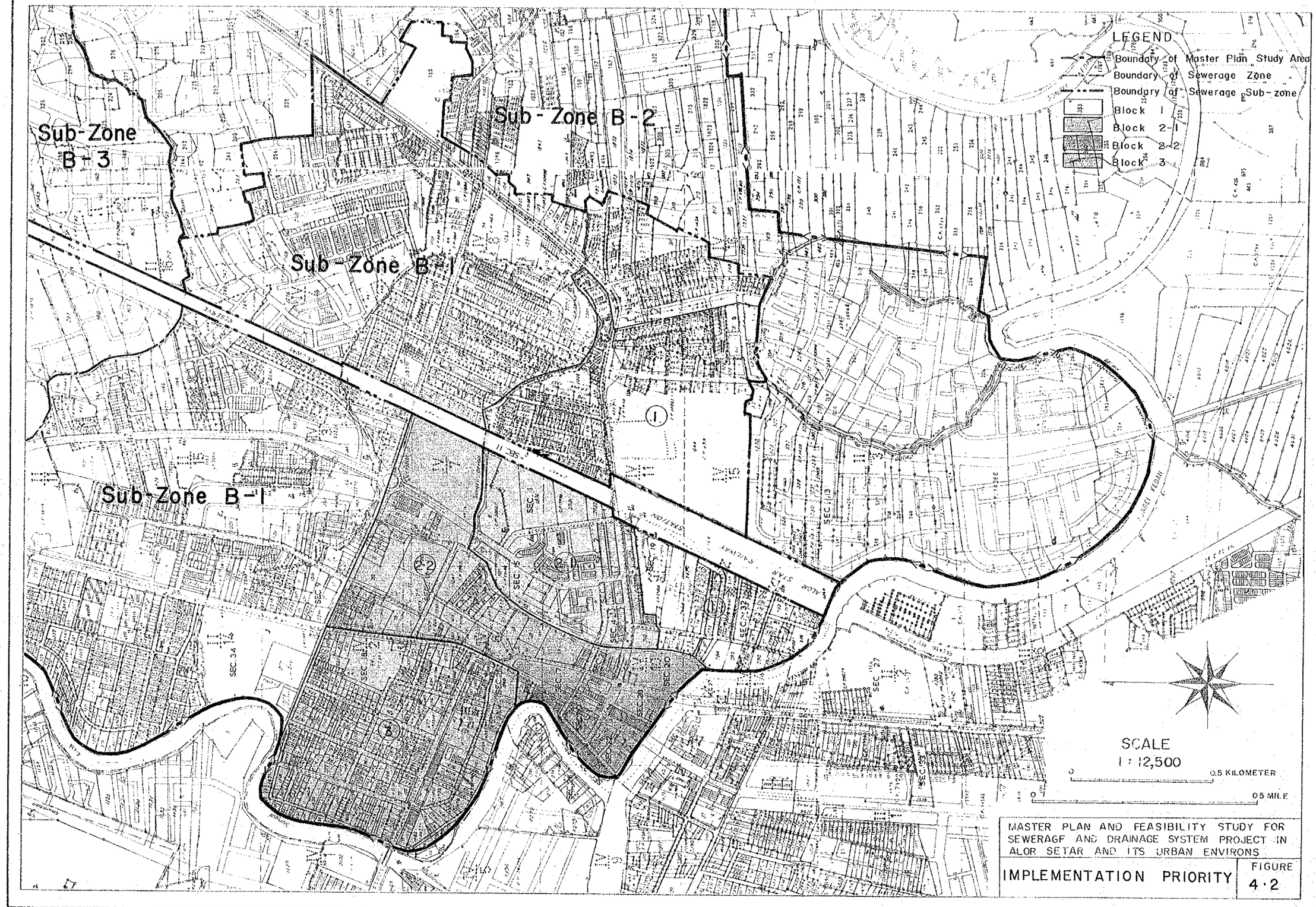


MASTER PLAN AND FEASIBILITY STUDY FOR SEWERAGE AND DRAINAGE SYSTEM PROJECT IN ALOR SETAR AND ITS URBAN ENVIRONS

PROPOSED MAJAR SEWERAGE SYSTEM

FIGURE 4 - 1

FIGURE 4·2


Sub-Zone B-3
Sub-Zone B-2
Sub-Zone B-1
Sub-Zone B-1
LEGEND
Boundary of Master Plan Study Area
Boundary of Sewerage Zone
Boundary of Sewerage Sub-zone
Block 1
Block 2-1
Block 2-2
Block 3
SCALE
1 : 12,500
0 0.5 KILOMETER
0 .5 MILE
MASTER PLAN AND FEASIBILITY STUDY FOR SEWERAGE AND DRAINAGE SYSTEM PROJECT IN ALOR SETAR AND ITS URBAN ENVIRONS
IMPLEMENTATION PRIORITY
FIGURE 4·2

PART V
DRAINAGE FEASIBILITY STUDY

5. Drainage Feasibility Study

Most of the Study Area, which is indentical to that for Sewerage Feasibility Study, different from the area for Drainage Master Plan, has been already urbanized as residential and commercial areas. This urbanization would be further advanced, according to the development plan prepared by STCP. The development within the tributary outside the Study Area also have been undertaken for residential and commercial purposes.

The ground elevation of the Study Area is generally low ranging from 2.1 m (7 ft) to 1.4 m (4.5 ft), especially the residential area along Jl. Telok Wan Jah at the upstream of the Sg. Raja, is flat in low-lying with an average of 1.5 m (5 ft) above MSWL.

The existing drainage system in the Study Area consists of two main watercourses namely the Sg. Raja and Sg. Derga, and various type of smaller drains. These main drains are basically natural streams which are earth channel with various width and depth, and are heavily silted with about 1 meter or more in depth. These drains have capacities from 2 m^3/s at upstream and 12 m^3/s at downstream, but these are not sufficient to cater for the surface runoff, even the 1-year storm frequency occurred under the present ground condition. The network of smaller drains throughout the built-up area consists of either U-shape or rectangular section of open channel, and although these smaller drains have generally been working well so far, some of them especially earth drains are insufficient to accommodate the surface runoff under the present condition.

5.1 Basic Considerations

In accordance with the study in the Master Plan prepared by SDID, 1-year river flood level resulted from the hydrological analysis of river flood flow on the basis of the statistical data is applied as the basis for the design of urban drainage system. This river water level as applied by 1-year river flood level is 1.71 m (5.6 ft) at the confluence of the two river, namely the Sg. Kedah and Sg. Anak Bukit. Further, the 100-year frequency river flood flows are also considered and applied for the purpose of checking the trunk drainage system together with the bund alignment, same as the recommendation made in the Master Plan. This water level applied at the confluence of two rivers referred above is 2.23 m (7.3 ft).

The design work of the drainage facilities proposed is basically in accordance with that recommended in DID's Planning and Design Procedure No. 1 "Urban Drainage Design Standards and Procedures for Peninsular Malaysia", and Master Plan proposed by SDID.

5.2 Proposed First Phase Programme

The proposed First Phase Programme selected among three most feasibile alternatives follows the concept to satisfy a minimum level of work required to mitigate the existing flood problems by constructing the trunk and secondary drains, and by protecting the low-lying area from flooding of river water by provision of embankment and installation of gates, as shown in Table 5.1.

The proposed drainage facilities include trunk and secondary drains, embankment and other related facilities. The proposed route of the trunk drain is basically the same as that of the existing water courses of the Sg. Raja and Sg. Derga. The type of this drain is rubble wall channel with mortar linning using wire nets, taking into account the advantage on hydraulic, economic and esthetic points of view. (Refer to Figure 5.1, Volume V)

To protect the whole Study Area from backing up of the river water, the outlet gates are proposed to be installed at the outlet of trunk and secondary drains. Further, for protection from river flooding especially low-lying area along the Sg. Kedah, embankment is proposed from Jl. Raja to railway along the Sg. Kedah.

In the area not served by trunk drain, adequate secondary drains necessary for the immediate need are proposed. The networks proposed for the secondary drain which shall serve per area of approximately 4 ha (10 acres) is basically in accordance with the existing network system identified based on the findings of the survey carried out during the course of the field work.

Table 5.1 Proposed Implementation Programme

Item	1981	1982	1983	1984	1985
Engineering Design	R20				
Construction of Trunk Drain		R19, R18, R17 R16, R15	R14, R13	R11, R10, R9 R8, R7, R6, R5	R4, R3, R2, R1
Construction of Secondary Drain			R14-1		R26
Reconstruction of Bridges			R14	R5	R1
Construction of box culvert					R27, R23
Installation of gates at outlet of drain	R20				R28, L6
Construction of embankment			Land Acquisition for embankment		Between Jl. Raja and railway

5.3 Disbursement Schedule

The cost required for the porposed implementation programme over the five years from 1981 through 1985 is to be approximately M$4.4 million at 1979 price level, M$6.1 million at escalation price with 8 percent annum escalation factor from 1979 price level of construction works, and M$0.2 million of operation and maintenance works for the same period, with those facilities of trunk and secondary drains, embankment and other related facilities excluding the floodway, pumping station and reservoir. These cost referred above are presented in Table 5.2 and 5.3 respectively, and estimated annual disbursement at escalated prices are presented in Table 5.4.

Table 5.2 Project Costs Estimates at 1979 Price (Escalated Price) (a)

(M$1,000)

Year	Project Costs
1981	721 (841)
1982	817 (1,029)
1983	862 (1,172)
1984	930 (1,366)
1985	977 (1,550)
Total*	4,307 (5,958)

(a): (1) Figures in parentheses are prices escalated at 8% per annum from 1979 price level.
(2) * includes costs for embankment, contingency allowance, engineering fee and acquisition.

Table 5.3 Maintenance Costs at 1979 Price (Escalated Price) (a)

(M$1,000)

Year	Maintenance Costs	
1981	15	(17)
1982	22	(28)
1983	40	(54)
1984	50	(73)
1985	58	(92)
1986	65	(112)
1987	84	(156)
1988	84	(168)
1989	84	(180)
1990	84	(196)
1991	84	(213)

(a): Figures in parentheses are prices escalated at 8% per annum from 1979 price level.

Table 5.4 Estimated Annual Disbursement at escalated price

(M$1,000)

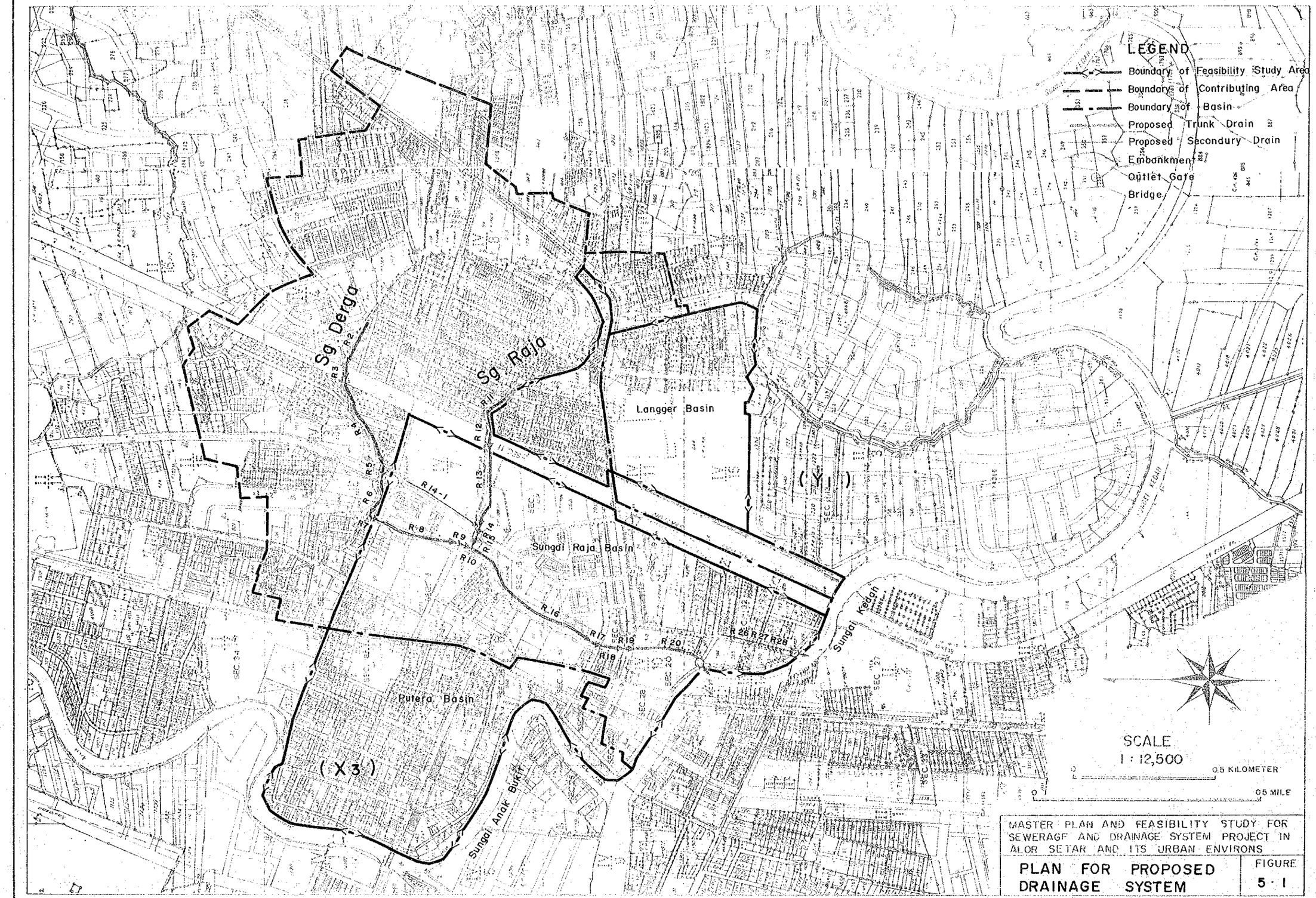
Year	Construction	Maintenance	Total
1981	841	17	858
1982	1,029	28	1,057
1983	1,172	54	1,226
1984	1,366	73	1,439
1985	1,550	92	1,642
1986	-	112	112
1987	-	156	156
1988	-	168	168
1989	-	180	180
1990	-	196	196
1991	-	213	213

5.4 Financing Consideration

As described in the preceding paragraph M$6.1 million is required to implement the proposed drainage system project and the substantial portion of the construction cost is related to the trunk drains equivalent to approximately 80 percent of the total cost. After careful consideration, MPKS is to be an executing agency for the project implementation as proposed in "Institutional Study Report" (Volume VI). It may therefore be necessary for MPKS to ensure the required fund and establish an annual disbursement programme prior to the project implementation.

In the mean time, it is noted in the annual report of State Budget for 1979 that State Government received subsidy amounting to M$13 million from the Federal Government and approximately M$4 million was allocated to State Government agency of DID for its activities. So far as MPKS will undertake drainage activities, arrangement should be made that MPKS will receive certain amount of subsidy from the Federal Government in order to meet required construction activities. It is also recommended that cooperation should be established between the State Government and MPKS to prepare the cost estimation for drainage programme and to submit to the Federal Treasury for the Federal subsidy to finance the project in a form of annual allocation during five years in accordance with disbursement programme as shown in Table 5.2.

FIGURE 5·1



MASTER PLAN AND FEASIBILITY STUDY FOR SEWERAGE AND DRAINAGE SYSTEM PROJECT IN ALOR SETAR AND ITS URBAN ENVIRONS

PLAN FOR PROPOSED DRAINAGE SYSTEM

FIGURE 5·1

PART VI
INSTITUTIONAL STUDY

6. Institutional Study

The studies are perfomred on institutional and administrative arrangement for the proposed sewerage and drainage system at Alor Setar and its urban environs, Kedah State aiming at the creation of a sound and viable local institution in the Project Area to deal with and execute sewerage and drainage system construction and operation in the immediate and long term period up to the year 2000.

For the early implementation of the Project a practical and realistic institutional arrangement is recommended by mobilizing the existing agencies' functions and personnel with emphasis on gradual organizational development for the subsequent stages. In this connection existing various agencies at all levels more or less related to the activities of the sewerage and drainage have been identified through investigation and discussions with officials concerned.

The studies contain recommended institutional arrangement together with the organizational structure for a newly proposed institution in broad terms with the required staffing schedule, together with reviews on existing legal provisions which would provide supporting basis for implementation of sewerage and drainage administration.

6.1 Studies and Recommendation for Sewerage (Refer to Section 1, Chapter 2 Volume VI)

(1) The existing activities of various government agencies at all levels related to sewerage system have been looked into to substantiate the data by which a potential executive institution for the project can be identified. It is found that several government agencies have been found to be more or less related to the services for the improvement of sanitary and health as well as environmental control in the community in Federal, state and Local Government levels as listed below including an authority which deals with rural agricultural development:

Federal Government Level

1. Economic Planning Unit (EPU) under Prime Minister's Office
2. Enviornmental Health and Engineering Unit (EHEU) under the Ministry of Health
3. Drainage and Irrigation Department (DID) under the Ministry of Agriculture and Fisheries
4. Ministry of Local Government
5. Department of Environment, Ministry of Science, Technology and Environment
6. Public Works Department (Federal JKR) under the Ministry of Works and Utilities in Federal Government

State Government Level (Kedah State)

1. State Economic Planning Unit (SEPU)
2. State Medical and Health Services Department
3. State Town and Country Planning (STCP)
4. State Public Works Department (JKR)
5. State Drainage and Irrigation Department (SDID)
6. State Economic Department Corporation (SEDC)
7. Muda Agricultural Development Authority (MADA)

Local Government Level

1. Majlis Perbandaran Kota Setar (MPKS)
   (Municipal Council of Kota Setar)

(2) Four feasible alternatives are considered. They are:

Alternative 1. Creation of a new sewerage autonomous statutory body by the State Government

Alternative 2. Expansion of the Water Supply Division of State Public Works Department to include the sewerage service function

Alternative 3. Expansion of the existing function of MPKS to include sewerage service function

Alternative 4. Creation of Joint Committee with representatives from JKR, SDID and Health Department and MPKS

After analyzing and balancing advantage and disadvantage of the four alternatives, Alternative 3 is recommended as the most appropriate alternative.

(3) The following new functional units recommended to be set up in the existing Engineering Division of MPKS based on the selected Alternative 3 as shown in Table 6.1.

1. Operation and maintenance
2. Design
3. Construction
4. Laboratory

The staffing schedule for the newly required functions were estimated at the end of every five years up to the year 2000 as guideline for executing institution of MPKS to recruit the personnel.

1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1995	2000
15	15	34	34	35	35	35	35	39	40	45	50

The newly expanded Engineering Division should coordinate closely with the Finance and Health Division of MPKS. It is suggested that a separate accounting system exclusively for sewerage system operation be arranged in Finance Division to perform financial function properly for sewerage activities separated from others.

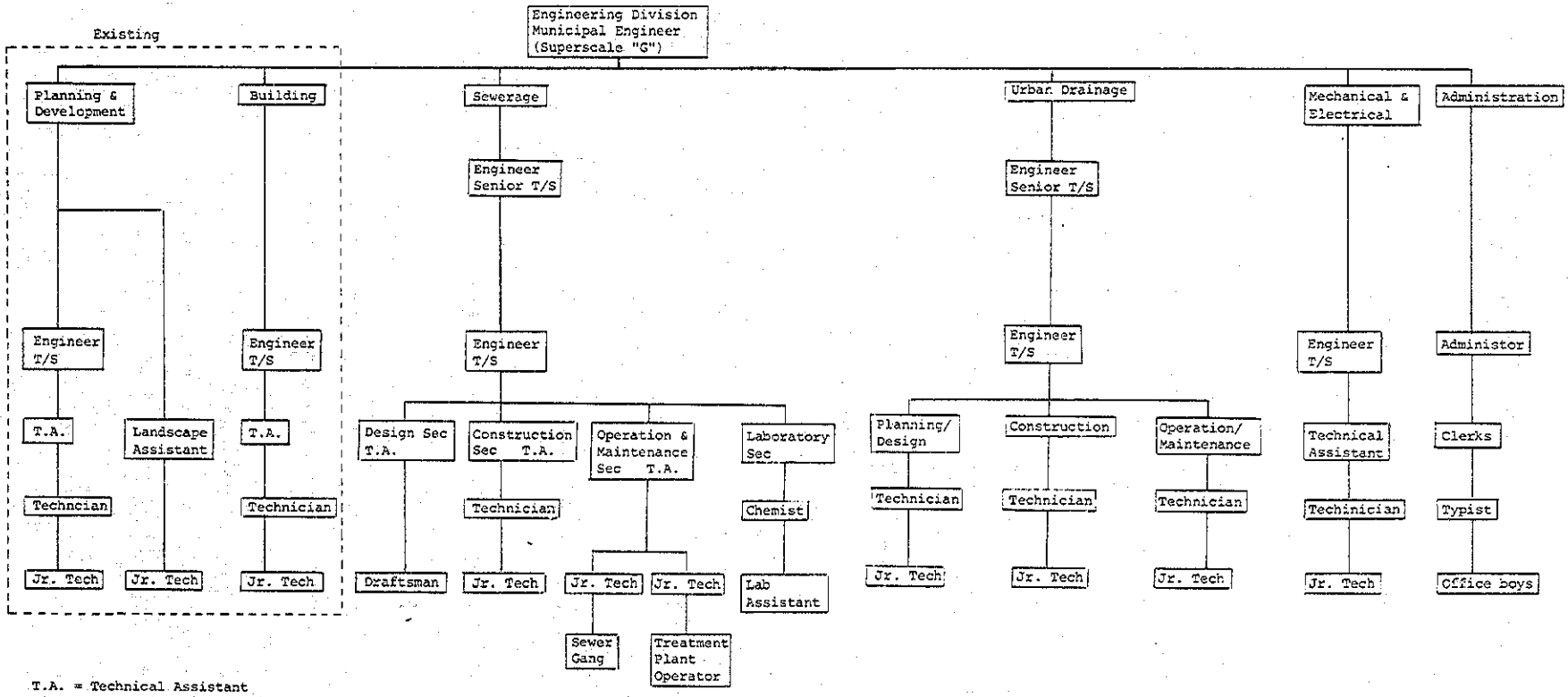
Preferably the new division should take over the sanitary functions from the Health Division by stage over a period of say, 2 years. This gradual take-over will not pose a sudden burden on the Engineering Division and will make the task easier.

(5) Following regulations pertinent to sewerage services were reviewed in terms of their executive and financial power.

* Local Government Act, 1976
* The Street, Drainage and Building Act, 133, 1974
* Drainage, Sanitation and Sanitary Plumbing By-Laws, 1976
* Town and Country Planning Act, 1976
* The Environmental Quality Act, 1974
* Kota Setar Municipal Council Anti-Litter By-Laws, 1979

The provisions of the existing regulations as above, especially those of The Street, Drainage and Building Act, have been considered satisfactory to legally support the implementation of the proposed project and no additional legislation would be needed except certain supplementary provision by way of by-laws/regulations. (Refer to Section 1, Chapter 3, Volume VI)

Figure 6.1 Proposed Expansion of Engineering Division



6.2 Studies and Recommendation for Drainage (Refer to Section 2, Chapter 2, Volume VI)

(1) The institutional arrangement for the drainage system project has been studied in a similar approach, in principle, employed for the sewerage system project.

Among the existing agencies reviewed for the sewerage system project the following agencies specifically related to the drainage activities in the project area were further reviewed. Such agencies are:

1. Drainage and Irrigation Department (DID), Federal Government
2. Drainage and Irrigation Department (SDID), State Government of Kedah
3. Majlis Perbandaran Kota Setar (MPKS)
4. Public Works Department, State Government of Kedah (JKR)
5. Muda Agricultural Development Authority (MADA)

After reviewing the present activities practiced by above agencies SDID and MPKS are considered to be directly involved in the prepared drainage project.

(2) Three alternatives are considered as follows:

Alternative 1. SDID undertakes overall responsibility for the construction and operation/maintenance of the drainage system.

Alternative 2. MPKS undertakes overall responsibility for the construction and operation/maintenance of the drainage system.

Alternative 3. SDID undertakes the construction of all drainage system proposed in the Project, while MPKS is responsible for the maintenance of the secondary and infrastructural drains and SDID undertake responsibility for the trunk drains maintenance in compliance with present practice.

Taking into the recent intention of the Federal Government that the local government should be responsible for sewerage and drainage undertakings Alternative 2 is recommended as appropriate to meet the immediate need for the organizational arrangement required for the implementation of the project.

(3) In accordance with the recommended alternative as above, MPKS is recommended to provided functional units responsible for planning/ designing as well as construction and to expand the sewer unit in the sewerage & drainage department proposed for the sewerage system project recruiting personnel to be required for the maintenance subrequest to the completion of drainage system construction.

(4) Following regulations were reviewed in addition to those regulation reviewed for sewerage system project.

* The drainage Works Ordinance, 1954
* The Irrigation Areas Ordinance, 1953
* Waters Enactment No. 129 KEDAH, 1960

The provisions of the existing regulation reviewed for drainage works are found to meet the legislative requirement, when gazetted for MPKS as proposed to undertake the construction and maintenance of the drainage system respectively. (Refer to Section 2, Chapter 3, Volume VI)

ANNEX 1

PROJECT ORGANIZATION FOR STUDY

The members of the Steering and Technical Committees of the Government of Malaysia, the Japanese Supervisory Committee and Study Team of the Consultants throughout the overall period of the project are as follows:

1. Steering Committee, Government of Malaysia

Dato' Haji Radzi Bin Bassir Dsak, Smk, Amn, Bck	State Government, Kedah
Mr. Bashah bin Nordin	Economic Planning Unit
Ms. Rosmah Hj. Jentra	Economic Planning Unit
Mr. A. Sekarajasekaran	Ministry of Health
Mr. Khoo Soo Hock	Drainage and Irrigation Dept.
Mr. Mohd Said bin Abdul Kadir	Ministry of Housing and Local Government
Y.B. Dato' James Ponnudurai	Public Works Dept., Kedah
Y.B. Dato' Ng Chow Choon	Drainage and Irrigation Dept., Kedah
Mr. Ahmad bin Abdullah	State Economic Planning Unit, Kedah
Ms. Latifah bt. Hj. Mohd Yatim	Town and Country Planning Dept., Kedah
Mr. Nor Aman bin Haji Raffii	Municipal Council Kota Setar, Kedah
Mr. Mohd Safee bin Ishak	Municipal Council Kota Setar, Kedah

Mr. Bashah bin Nordin or Dato' Haji Radzi Bin Bassir serves as a Chairman of the Committee depending upon the venue of meeting to be held either in Alor Setar or in Kuala Lumpur.

2. Technical Committes, Government of Malaysia

Mr. A. Sekarajasekaran	Ministry of Health
Mr. Ahmad bin Abdullah	State Economic Planning Unit, Kedah
Y.B. Dato' Ng Chow Choon	Drainage and Irrigation Dept., Kedah
Y.B. Dato' James Ponnudurai	Public Works Dept., Kedah
Ms. Latifah bt. Hj. Mohd Yatim	Town and Country Planning Dept., Kedah
Dr. R.G. Pillay	Health Dept., Kedah
Mr. K. Rishyakaran	Health Dept., Kedah

Mr. Nor Aman bin Haji Raffii	Municipal Council Kota Setar, Kedah
Mr. Mohd Safee bin Ishak	Municipal Council Kota Setar, Kedah

Mr. A. Sekarajasekaran serves as a Chairman of the Committee.

3. Supervisory Committee, Government of Japan

Dr. Mamoru Kashiwaya	Director, Research and Technology Development Division, Japan Sewage Works Agency
Mr. Shigeru Ando	Head, Sewage Works Section, Water Quality Control Division, Ministry of Construction
Mr. Yukio Nakagawa	Deputy Director, Planning Division, Japan Sewage Works Agency
Mr. Akira Kato	Deputy Director, Flood Protection Division, River Bureau, Ministry of Construction
Mr. Shigetaro Yamamoto	Deputy Director, Research and Statistic Division, Planning Bureau, Ministry of Construction
Mr. Taigo Matsui	Special Assistant to Director of Planning Department, Japan Sewage Works Agency.

Dr. M. Kashiwaya serves as a Chairman of the Committee.

4. Nihon Sudio Consultants (NSC)

Mr. Akira Saita	Project Manager
Mr. Takeshi Ueno	Co-Project Manager, Site Representative of NSC
Mr. Takeshi Tsutsumi	Engineering Advisor
Mr. Shohei Sata	Engineering Advisor
Mr. Ikuo Sugawara	Senior Engineer
Mr. Katsuji Shimizu	Sanitary Engineer
Mr. Tetsuo Horikawa	Civil Engineer
Mr. Yoshihiro Yamazaki	Sanitary Engineer
Mr. Kazuhiro Asada	Sanitary Engineer
Mr. Masahito Onogi	Civil Engineer
Mr. Shunji Etoh	Chemical Engineer

Mr. Osamu Suda	Chemical Engineer
Mr. Mitsugu Takai	Chemical Engineer
Mr. Hiromichi Yuasa	Economist
Mr. Yoshio Mitsuhashi	Economist

Mr. A. Saita, Project Manager is responsible for overall operation of the project throughout the contract period, and Mr. T. Ueno, Co-Project Manager, serving as Site Representative of NSC, supervise entire work throughout the period of the project.

Messrs. T. Tsutsumi and S. Sata are some of the senior engineer for serving the duration of project, as overall technical advisor to the team activities, and also participated partially during the period of field works.

ANNEX 2

GLOSSARY (Definitions of Terms)

* Activated Sludge Process

A process for achieving biological stabilization of sewage based on use of activated sludge generated under aerobic conditions mainteined by included aeration in a reaction chamber, with the effluent subsequently settled and part of the sludge returned to the reaction chamber.

* Aeration

The bringing about of intimate contact between air and a liquid by one or more of the following methods: (a) spraying the liquid in the air, (b) bubbling air through the liquid, (c) agitating the liquid to promote surface absorption of air.

* Aerated Laboon

A natural or artificial wastewater treatment pond in which mechanical or diffused-air aeration is used to supplement the oxygen supply.

* Aerobic

Requiring, or not destroyed by, the presence of free elemental oxygen.

* Aerobic Bacteria

Bacteria that require free elemental oxygen for their growth.

* Benefit-Cost Ratio

A theoretical economic concept, usually expressed by relating the present value of the stream of capital costs and annual expenses of the project.

* Biochemical Oxygen Demand (BOD)

Abbreviation for biochemical oxygen demand. The quantity of oxygen used in the biochemical oxidation of organic matter in specified time, at a specified temperature, and under specified conditions.

* Box Culvert

A culvert with a rectangular cross section.

* Branch Sewer

A sewer which receives wastewater from a relatively small area, and discharges into a main sewer serving more that one branch-sewer area.

* Coefficient

A numerical quantity, determined by experimental or analytical methods, interposed in a formula which express the relationship between two or more variables to include the effect of special conditions or to correct a theoretical relationship to one found by experiment or actual practice.

* Chlorination

The application of chlorine to water or wastewater, generally for the purpose of disinfection, but frequently for accomplishing other biological or chemical results.

* Coliforms

An important parameter for assessing the level of pollution in receiving waters, based on measuring the concentration of coliform bacteria, which is a rough index of the probable level of contamination by human excreta.

* Collecting System

A system of sewers and appurtenances for the collection, transportation, and pumping of sewage and industrial wastes.

* Combined Sewer

A sewer receiving both surface runoff and sanitary and/or industrial wastewater.

* Culvert

A closed conduit for the free passage of surface drainage water under a high-way, railroad, canal, or other embankment.

* Demographic Characteristics

The vital statistics of population, such as births, deaths, marriages, rate of growth, age distribution, literacy and levels of education, skills and/or income.

* Depreciation

The amount which must be charged against profits each year in a series which will equal the original purchase price of a given asset at the end of its useful life expectancy.

* Discount Rate

The compound rate of interest which measure the difference between two values separated by one or more successive periods of time. The rate is applied to the ultimate value to determine the present value of the series at any prior point in time.

* Design Rainfall

The rainfall estimate corresponding to an enveloping depth - duration curve for the selected frequency, often referred to as the "Design Storm".

* Discharge

As applied to a stream or conduit, the rate of flow, or volume of water flowing in the stream or conduit at a given place and within a given period of time.

* Dissolved Oxygen

The oxygen dissolved in water, wastewater, or other liquid, usually expressed in milligrams per liter, parts per million, or percent of saturation. Abbreviated - Do.

* Domestic Wastewater

Wastewater derived principally from dwellings, business buildings, institutions and the like. It may or may not contain ground water, surface water or storm water. Also called sanitary sewage.

* Drainage Basin

An area from which surface runoff is carried away by a single drainage system. Also called catchment area, watershed, drainage area.

* Feasibility Study

A compilation of the economic benefits of a proposed project for comparison with engineering and other estimates of total costs to determine the relative merits of the project vis-a-vis other potential social investment.

* Force Main

A pressure pipe joining the pump discharge at a water or wastewater pumping station with a point of gravity flow.

* Gradient

The rate of change of any characteristic per unit of length or scope. The terms is usually applied to such terms as elevation, velocity, pressure.

* Head

The height of the free surface of fluid above any point in a hydraulic system; a measure of the pressure or force exerted by the fluid.

* House Connection

The pipe carrying sewage from the building to a public sewer. Also called Building Sewer and House Sewer.

* Hydraulic Gradient

The slope of the hydraulic grade line; the rate of change of pressure head; the ratio of the loss in the sum of the pressure head and position head to the flow distance. For open channels, it is the slope of the water surface and is frequently considered barallel to the invert. For closed conduits under pressure, it is the slope of the line jointing the elevations to which water would rise in pipes freely vented and under atmospheric pressure. A positive slope is usually one which drops in the direction of flow.

* Industrial Wastes

The liquid wastes from industrial processes, as distinct from domestic or sanitary wastes.

* Infiltration

(1) The flow or movement of water through the interstices or pores of a soil or other porous medium. (2) The quantity of groundwater that leaks into a pipe through joints, porous walls, or breaks. (3) The entrance of water from the ground into a gallery. (4) The absorption of liquid by the soil, either as it falls as precipitation or from a stream flowing over the surface.

* Infrastructure

The basic structures and facilities upon which the economic activities of a community or region are dependent, such as roads, railways, school systems, water and power supply and other public utilities. Sometimes referred to as Social Overhead Capital.

* Initial Storm

The storm having a return period of 2 or 5 years.

* Inlet

(1) A surface connection to a drain pipe. (2) A structure at the diversion end of a conduit. (3) The upstream end of any structure through which water may flow. (4) A form of connection between the surface of the ground and a drain or sewer for the admission of surface or storm water. (5) An intake.

* Invert

The floor, bottom, or lowest portion of the internal cross section of a closed conduit. Used particularly with reference to aqueducts, sewers, tunnels, and drains. Originally, it referred to the inverted arch which was used to from the bottom of a masonry-lined sewer.

* Land Use

The culture of the land surface, which affects the social and economic conditions of a region and which determines the amount and character of the runoff and erosion. Existing or zoned economic use of land, such as residential, industrial, farm, commercial.

* Pumping Station

A wastewater pumping station that lifts the wastewater to a higher elevation when the continuance of the sewer at reasonable slopes would involve excessive depths of trench, or that raises wastewater from areas too low to drain into available sewers. These stations may be equipped with pneumatic ejectors, centrifugal pumps, or other pumps.

* Main Sewer

A sewer that receives many tributary branches and serves a large territory. Also called Trunk Sewer. In small systems, a sewer to which one or more branch sewers are tributary.

* Major Storm

The storm having a return period of 100 years.

* Manhole

An opening in sewer provided for the purpose of permitting a man to enter or leave the sewer.

* Municipality

The officials governing such a community as city, town, etc.

* Outfall Sewer

A sewer which receives the sewage from a collecting system and carries it to a point of final discharge. See Pipe Outlet.

* Open Channel

Any natural or artificial waterway or conduit in which water flows with its surface exposed to the outside stmosphere.

* Outlet

Downstream opening or discharge end of pipe, culvert or canal.

* Overland Flow

The flow of water over the ground before it enters some defined channal.

* Oxidation Pond

A basin used for retention of wastewater before final disposal, in which biological oxydation of organic material is effected by natural or artificially accelerated transfer of oxygen to the water from air.

* pH

The reciprocal of the logarithm of the hydrogen-ion concentration in grams per liter of solution. Neutral water, for example, has a pH value of 7 and a hydrogen-ion concentration of 10^{-7}.

* Pipe Outlet

A pipeline which conveys the effluent from a reservoir, sewage treatmentplant, or other structure to its point of discharge.

* Present Valve

The economic method which recognizes and quantifies the values of differences in time. Benefits or costs which are expected to be received or incurred at a future date are worth less than those which can be enjoyed or must be paid currently. Present value at any point in time is determined by applying a given discount rate to the ultimate value for the appropriate number of years.

* Public Sewer

All sanitary sewers, except house connections.

* Primary Treatment

(1) The first major (some times the only) treatment in wastewater treatment works, usuably sedimentation. (2) The removal of a substantial amount of suspended matter but little colloidal and no dissolved matter.

* Rainfall Intensity

Amount of rainfall occurring in a unit of time, converted to its equivalent in millimeters per hour at the same rate.

* Rainfall-Intensity Curve

A curve that expresses the relation on rate of rainfall and their duration. Each curve is generally for a period of years during which time the intensities shown will not, on the average, be exceeded more than once.

* Rational Method

A method of estimating the runoff in a drainage basin at a specific point and time by means of the rational runoff formula. For each drainage area, the rainfall rate under a stated intensity-duration relationship, the fraction that will appear as runoff, and the basin area above the specific point are estimated. Their products is the flow. This method is used to estimate storm runoff in urban areas and flood flows in streams.

* Roughness Coefficient

A factor in the Chezy, Darcy-Weisbach, Hazen-Williams, Kutter, Manning, and other formulae for computing the average velocity of flow of water in the conduit or channel, which represent the effect of roughness of the confining material on the energy losses in the flowing water.

* Runoff

(1) That portion of the earth's available water supply that is transmitted through natural surface channels. (2) That part of the precipitation which runs off the surface of a drainage area and reaches a stream or other body of water or a drain or sewer.

* Runoff Coefficient

The ratio of the maximum rate of the runoff to the uniform rate of rainfall with a duration equaling or exceeding the time of concentration which produced this rate of runoff.

* Sanitary sewer

A sewer which carries liquid and water-carried wastes from sanitary conveniences of residences, commercial buildings, industrial plants, and institutions, together with quantities of ground, storm and surface water which are not admitted intentionally.

* Sanitary Wastewater

(1) Domestic wastewater with storm and surface water excluded. (2) Wastewater discharging from the sanitary conveniences of dwellings (including apartment houses and hotels), office buildings, industrial plants, or institutions. (3) The water supply of a community after it has been used and discharge into a sewer. Also called sanitary sewage.

* Separate System

A system of sewers and drains in which sanitary wastewater and storm water are carried in separate conduits.

* Septic Tank

A settling tank in which settled sludge is in immediate contact with the wastewater flowing through the tank and the organic solids are docomposed by anaerobic bacterial action.

* Sewage

The spent water of a community. Term now being replaced in technical usage by the preferable term wastewater.

* Sewage Works

All-inclusive term for wastewater collection, pumping, treatment, and disposal facilities. Term declining in use.

* Sewer

A pipe or conduit that carries wastewater or storm water drainage.

* Sewerage

System of piping, with appurtenances, for collecting and conveying wastewater from source to discharge. Term declining in use.

* Stabilization Lagoon

A shallow pond for storage of wastewater before discharge. Such lagoons may serve only to detain and equalized wastewater composition before regulated discharge to a stream, but often they are used for biological oxidation.

* Stabilization pond

A type of oxidation pond in which biological oxidation of organic matter is effected by natural or artificially accelerated transfer of oxygen to the water from air.

* Storm Sewer

A sewer that carries storm water and surface water, street wash and other wash waters, or drainage but excludes domestic wastewater and industrial wastes. Also called storm drain.

* Storm Water

The excess water runninf off from the surface of a drainage area during or immediately after a period of rain. It is that portion of the rainfall and resulting surface flow that is excess of that which can be absorbed through the infiltration capacity of the surface of the area.

* Sullage

Any household waste liquids discharged from any bath, shower, lavatory, basin, floor gully, laundries or sink (not being a slop sink) but excludes faecal water and urine.

* Term

The period of time stated in the loan contract by the end of which the loan must be fully repaid.

* Tidal River

A river in which flow and water surface elevation are effected by the tides. Such effect usually occurs in the lower stretch near the mouth, where the gradient is very flat. In some streams, the effect may extend a hundred or more kilometers upstream from the mouth.

* Time of Consentration

The period of time required for storm runoff to flow from the most remote point of a catchment or drainage area to the outlet or point under consideration. It is not constant, but varies with depth of flow and condition of channel.

* Useful Life Expectancy

The period of time during which a piece of equipment a building or other physical asset is expected to render the service or perform the function for which it is intended, at an acceptable level of efficiency, with ordinary maintenance and under operating conditions expected in the given situation. Technical and financial planning assumes that the asset will have to be replaced at the end of its expected useful life.

* Wastewater

The spent water of a community. From the standpoint of source, it may be a combination of the liquid and watercarried wastes from residences, commercial buildings, industrial plants, and institutions, together with any groundwater, surface water, and storm water that may be present. In recent years, the ward wastewater has taken precedence over the work sewage.