

TABLE Q - 7 FACTORIES IN BAYAN LEPAS INDUSTRIAL AREA

No.	Products	Discharge (cum/d)	Effluents Characteristics
1	Electronics	100	Metal/Inorganic
2	Medical Appliances	100	Inorganic
3	Electronics	300	Metal/Inorganic
4	Rubber products	400	Metal/Inorganic
5	Electronics	200	Metal/Inorganic
6	Electronics	800	Metal/Inorganic
7	Garments	700	Dye
8	Rubber products	800	Zinc/Inorganic
9	Bleaching	180	Metal/Inorganic
10	Electronics	-	Metal/Inorganic
11	Garments	200	Dye
12	Electronics	300	Metal/Inorganic
13	Electronics	15	Metal/Inorganic
14	Electronics	20	Metal/Inorganic
15	Medical Appliances	30	Metal/Inorganic
16	Electronics	-	Metal/Inorganic

TABLE Q - 8 FACTORIES OUTSIDE THE INDUSTRIAL AREA

No.	Products	Discharge (cum/d)	Effluents Characteristics
1	Ice	-	Floor washing
2	Batik (Textile)	30	Dye
3	Seafoods	40-50	Floor/Sea food washing
4	Seafoods	50	Floor/Sea food washing
5	Jeans/Jacket	100	Dye/Stone Washing
6	Jeans/Jacket	60	Dye/Stone Washing
7	Fabric	70	Bleach process water
8	Waste paper recycle	800	Waste paper washing
9	Paper printing	30	Ink/Solvent
10	Rubber	400	Rubber washing
11	Batik	20	Dye

TABLE Q-9 REMOVAL EFFICIENCY OF DOMESTIC WASTEWATER DISPOSAL

Type	Removal efficiency (%)		Discharged BOD Load (BODg/day)	
	Discharge from toilet	Discharge from other than toilet	Discharge from toilet	Discharge from other than toilet
Sewer Collection	100	100	0	0
Sewerage treatment plants (Communal Plant)	75	75	3.3	15.3
Individual Septic Tank	50	50	6.5	30.5
Bucket Type Toilet	100	50	0.0	30.5
Pour Flush Toilet	100	50	0.0	30.5

BOD Load: Toilet 13 g/day
Other than Toilet 61 g/day

TABLE Q-10 CALCULATED POLLUTANT LOAD IN EACH CATCHMENT

River Name	BOD load(kg/day)		
	Domestic	Pig Farm	Total
SG. Pinang	2,929	13,539	16,468
Sg. Teluk Awak	65	0	65
Sg. Teluk Bahang	63	51	114
Sg. Batu Ferringghi	36	30	66
Sg. Satu	43	0	43
Sg. Mas	56	0	56
Sg. Kecil	36	595	631
Sg. Kelian	299	0	299
Sg. Balik Batu	87	0	87
Sg. Fettes	125	5	130
Sg. Bagan Jermal	43	26	69
Sg. Babi	52	0	52
Sg. Gelugor	726	0	726
Sg. Dua Besar	259	614	873
Sg. Nibong Besar	62	0	62
Sg. Nibong Kecil	120	2,688	2,808
Sg. Keluang	272	3,013	3,285
Sg. Nipah	54	4,604	4,658
Sg. Kampong Masjid	80	0	80
Sg. Ikan Mati	33	0	33
Sg. Bayan Lepas	99	180	279
Sg. Batu	48	0	48
Sg. Mati	32	0	32
Sg. Teluk Kumbar	174	167	341
Sg. Gemuroh	25	0	25
Sg. Gertak Sanggul	40	1,567	1,607
Total	5,858	27,079	32,937

TABLE Q- 11 JAPANESE WATER QUALITY STANDARDS FOR RIVER

Item Category	Adaptable exploitation	Standard value					Applicable water area
		Hydrogen ion concentration (pH)	Biochemical oxygen demand (BOD)	Suspended substances (SS)	Dissolved oxygen (DO)	Number of colitis germs	
AA	Tap water Class 1, Preservation of natural environments and exploitations in the categories A and after	From 6.5 to 8.5	No more than 1 ppm	Not more than 1 ppm	Not less than 7.5 ppm	Not more than 50 MPN/100m	Water areas specified for each category by the Article 1.2.2 of the Notice 59 issued from the Environment Agency
A	Tap water Class 1, Fishing Class 1, bathing and exploitations given in the categories B and after	From 6.5 to 8.5	No more than 2 ppm	No more than 25 ppm	Not less than 7.5 ppm	No more than 1000m	
B	Tap water Class 3, fishing Class 2 and exploitation given in the categories C and after	From 6.5 to 8.5	No more than 3 ppm	No more than 25 ppm	Not less than 5 ppm	Not more than 5,000 MPN/100m	
C	Fishing Class 3, Industrial water Class 1 and exploitation given in the categories D and after	From 6.5 to 8.5	No more than 5 ppm	No more than 50 ppm	Not less than 2 ppm	-	
D	Industrial water Class 2, Agricultural water and exploitations given in the categories E	From 6.0 to 8.5	No more than 8 ppm	No more than 100 ppm	Not less than 2 ppm	-	
E	Industrial water Class 3, preservation of environment	From 6.0 to 8.5	No more than 10 ppm	No suspended dust	Not less than 2 ppm	-	
Measurement method		Conforms to the Standard 8	Conforms to the Standard 16	Conforms to the Standard 10.2.1	Conforms to the Standard 24	Quantitative analysis by most probable value	

Notice:

- The standard values are calculated on the basis of daily mean value (also applies to a lake, marsh or sea area)
- The oxygen ionic concentration of water for agricultural exploitation must be kept in a range of 6.0 to 7.5 pH and its dissolved oxygen not less than 5 ppm (these rules apply also to a lake or marsh)
- The quantitative analysis by most probable value is to follow the below mentioned procedures:
 Make a sampling of water in four consecutive steps such as a 10 ml, 1 ml, 0.1 ml and 0.01 ml of water (if the amount of sampled water is not more than 0.1 ml, dilute it with pure water into 1 ml). Implant the water sampled in each step into five BGLB fermentation tubes and cultivate the waters inside these twenty tubes at a temperature of 35 to 37°C for a period of 48 ± 3 hours. Under these conditions, a tube generating gas should be considered to be positive for colitis germs. After counting the number of tubes generating gas, calculate the most probable number of colitis germs per 100 ml of sampled water, with reference to the most probable value table. At this moment, the sampled water must be diluted so that all or most of the tubes which receive the water sampled in the highest or lowest step may be positive for colitis germs. When a test cannot be made immediately after sampling, the sampled water can be kept in cold storage for two or three hours at the most.

- (Note)
- Preservation of natural environment: Preservation of natural environments like scenery
 - Tap water Class 1: Simplified water purification by filter
 Tap water Class 2: Normal water purification by filter and sedimentation
 Tap water Class 3: Intensive water purification with pretreatment
 - Fishing Class 1: Fish in oligosaprobic water like char and those belonging to the Fishing Classes 2 and 3
 Fishing Class 2: Fish in oligosaprobic water like salmon or sweetfish and those belonging to the Fishing Class 3
 Fishing Class 3: Fish in beta-mesosaprobic water like carp and gibel
 - Industrial water Class 1: Normal purification by sedimentation
 Industrial water Class 2: Intensive purification by chemicals
 Industrial water Class 3: Special purification
 - Environmental preservation: Not to be unpleasant in the of course daily life (coastal promenade)

TABLE Q-12 PROBABLE NON-EXCEEDENCE FLOW RATES

Non-Exceedence Probability (%)	Sg. Teluk Bahang				Sg. Air Terjun (Jl. Brook)			
	1984		1989		1987		(1989-1990)	
	Runoff (cum/s)	Specific Runoff (cum/s/sqkm)	Runoff (cum/s)	Specific Runoff (cum/s/sqkm)	Runoff (cum/s)	Specific Runoff (cum/s/sqkm)	Runoff (cum/s)	Specific Runoff (cum/s/sqkm)
50	0.275	0.024	0.268	0.024	0.300	0.026	0.410	0.043
75	0.319	0.028	0.389	0.034	0.779	0.069	0.850	0.088
80	0.336	0.030	0.550	0.048	0.916	0.081	1.000	0.104
90	0.389	0.034	1.421	0.125	1.302	0.115	1.370	0.142

TABLE Q-13 RESULTS OF WATER QUALITY SURVEY FOR SG. DONDANG

Points *	Date	pH	DO (mg/l)	BOD (mg/l)	COD (mg/l)	SS (mg/l)	NH4-N (mg/l)	Coliform Bacteria (/100ml)
D-1	26 Jul, 90	7.7	0.1	67	120	105	25.0	1.6x10 ⁶
	6 Aug, 90	7.0	1.0	36	65	57	18.0	
	13 Aug, 90	7.7	1.3	27	53	48	14.6	
	Average	7.5	0.8	43	79	70	19.2	
D-2	26 Jul, 90	7.6	0.4	51	95	86	14.0	1.6x10 ⁶
	6 Aug, 90	7.7	1.7	28	50	38	10.0	
	13 Aug, 90	7.7	1.8	25	47	34	8.4	
	Average	7.7	1.3	35	64	53	10.8	
D-3	26 Jul, 90	7.6	0.2	56	115	93	20.0	9.2x10 ⁵
	6 Aug, 90	8.0	1.5	29	54	41	14.0	
	13 Aug, 90	7.8	2.3	22	45	32	8.0	
	Average	7.8	1.3	36	71	55	14.0	
D-4	26 Jul, 90	7.8	0.8	37	70	53	10.0	2.8x10 ⁵
	6 Aug, 90	7.8	1.1	20	40	27	12.0	
	13 Aug, 90	7.8	2.5	18	36	22	6.2	
	Average	7.8	1.5	25	49	34	9.4	

- * D-1 : Upstream of the Proposed Retention Pond-A
D-2 : Downstream of the Proposed Retention Pond-A
D-3 : Upstream of the Proposed Retention Pond-B
D-4 : Upstream of the Proposed Retention Pond-C
For sampling locations, please refer to Fig. Q-21

TABLE Q - 14 LIST OF COMMUNAL PLANTS IN SG. PINANG BASIN

Service Area	Plant No.	Location of Plant	No. of Houses	Year of Const.	Type	Basin No.
14	8	Jalan Air Putih	70	1985	A	1-b
14A	7	Lengkok Paya Terubong	79	1984	A	1-c
14	16	Halaman Zoo 2	130	1986	A	1-c
14A	8	Lebuh Rambai 14	1800	1986	A	1-c
14A	9	Tingkat Paya Terubong 3	1500	1987	RBC	1-c
14	31	Jalan Kampong Melayu	4	1961	S	1-a
14	21	Jalan Hye Keat A	4	1960	S	1-b
14	25	Jalan Hye Keat E	4	1960	S	1-b
14	30	Jalan Shaik Madar	5		S	1-a
14	20	Jalan Empat	5	1960	S	1-b
14	22	Jalan Hye Keat B	7	1960	S	1-b
14	24	Jalan Hye Keat D	8	1960	S	1-b
14	12	Lorong Zoo Satu	9	1959	S	1-a
14	18	Jalan Chor Sin Kheng B	9	1957	S	1-a
14	23	Jalan Hye Keat C	9	1960	S	1-b
20	3	Lorong Sempadan Empat	9	1957	S	1-e
14	2	Jalan Satu	10	1960	S	1-a
14	17	Jalan Chor Sin Kheng A	10	1957	S	1-a
14	9	Lorong Air Putih	12	1957	S	1-b
14	28	Jalan Pokok Saga	12		S	1-b
20	1	Lorong Sempadan Dua	15	1957	S	1-e
20	4	Lorong Sempadan Enam	16	1957	S	1-e
20	2	Lorong Sempadan Tiga	18	1957	S	1-e
14	5	Jalan Thean Teik	20	1983	S	1-a
14A	1	Lintang Zoo	4	1962	SR	1-c
14	29	Jalan Pasar	6		SR	1-a
14	6	Behind 4-F Jalan Air Itam	8	1959	SR	1-a
14	33	Choong Nam Theatre	14	1975	SR	1-b
14	13	Lorong Zoo Dua	17	1959	SR	1-a
14A	5	Lorong Paya Terubong	19	1964	SR	1-c
14A	4	Tingkat Lembah Ria 2	20	1960	SR	1-c
14A	3	Tingkat Lembah Ria 3	22	1960	SR	1-c
14A	10	Solok Zoo Satu	24	1986	SR	1-c
14	1	Jalan Tunggal	27	1960	SR	1-a
14	15	Lorong Zoo Lima	29	1963	SR	1-a
14	26	Jalan Hye Keat	31	1961	SR	1-b
14	3	Jalan Ulong	33	1960	SR	1-a
14	14	Lorong Zoo Empat	33	1959	SR	1-a
14A	2	Lorong Lembah Ria	39	1960	SR	1-c
14	4	Jalan Dua	49	1960	SR	1-a
20	5	Reservoir 9th Avenue	58	1958	SR	1-e
14	11	Jalan Taman Ria 3	75	1957	SR	1-e
14	32	Reservoir Drive	77	1957	SR	1-e
14	27	Lorong Taman Cantek 1	93	1972	SR	1-b
14	19	Medan Chor Sin Kheng	97	1958	SR	1-a
14A	6	Jalan Oriental	176	1967	SR	1-c
14	7	Jalan Air Putih	217	1957	SR	1-e
14	34	Lorong Kampong Melayu			SR	1-b
14A	11	Tingkat Lembah Ria 3	13	1970	ST	1-c
14	10	Kampung Melayu Flats	1202	1957	ST	1-a

TYPE

A: Activated Sludge
S: Septic Tank
SR: Septic Tank and Rectangular Filter
ST: Septic Tank and Trickling Filter
RBC: Rotating Biofilm Contact

TABLE Q - 15 SUMMARY OF TREATMENT TYPES OF COMMUNAL PLANTS

Type of Treatment	No. of Houses	No. of Plants	Houses/Plant
Activated Sludge	2079 (33.8%)	4 (8.%)	519.8
Septic Tank	186 (3.%)	19 (38.%)	9.8
Septic Tank with Rectangular Filter	1168 (19.%)	24 (48.%)	48.7
Septic Tank with Trickling Filter	1215 (19.8%)	2 (4.%)	607.5
RBC	1500 (24.4%)	1 (2.%)	1500.0
Total	6148 (100.%)	50 (100.%)	123.0

TABLE Q-16 SAMPLING FREQUENCY FOR
SEWERAGE TREATMENT PLANT SURVEY

Name of Plant	Type of Treatment	Sampling Points	No. of Samples	Remarks
Halaman Zoo 2	Activated Sludge - A Condition -1	Inflow	8	Every 3 hours
		Outlet of Primary Sedimentation	8	Every 3 hours
		Outlet of Aeration Tank	8	Every 3 hours
		Outlet of Final Sedimentation	8	Every 3 hours
	Activated Sludge - A Condition -2	Inflow	8	Every 3 hours
		Outlet of Primary Sedimentation	8	Every 3 hours
		Outlet of Aeration Tank	8	Every 3 hours
		Outlet of Final Sedimentation	8	Every 3 hours
Batu Maung	Activated Sludge - B Condition -1	Inflow	8	Every 3 hours
		Outlet of Primary Sedimentation	8	Every 3 hours
		Outlet of Aeration Tank	8	Every 3 hours
		Outlet of Final Sedimentation	8	Every 3 hours
	Activated Sludge - B Condition -2	Inflow	8	Every 3 hours
		Outlet of Primary Sedimentation	8	Every 3 hours
		Outlet of Aeration Tank	8	Every 3 hours
		Outlet of Final Sedimentation	8	Every 3 hours
Jln. Air Putih	Septic Tank with Rectangular filter	Inflow	8	Every 3 hours
		Outlet of Septic tank	3	Every 8hours
		Outlet of Filter	3	Every 8hours
Kmpg. Maleyu Flats	Septic Tank with Trickling Filter	Inflow	8	Every 3 hours
		Outlet of Septic Tank	3	Every 8hours
		Outlet of Filter	3	Every 8hours
Total			156	

TABLE Q - 17 RESULT OF WATER QUALITY SURVEY FOR JALAN AIR PUTIH

Date : 6-7/8/1990

Time	Inflow rate (cum/h)	BOD (mg/l)				SS (mg/l)			
		inlet		S/Tank	R/Filter	inlet		S/Tank	R/Filter
8:00	3.6	161		452	8	250		960	15
11:00	2.7	116				55			
14:00	2.4	171				75			
17:00	3	61		83	12	105		2195	320
20:00	4.5	69		337	22	75		1530	35
23:00	2.4	167				100			
2:00	1.1	5				5			
5:00	1.1	22				5			
	62.4								

TABLE Q - 18 RESULT OF WATER QUALITY SURVEY FOR KAMPUNG MELAYU
FLATS

Date : 6-7/8/1990

Time	Inflow rate (cum/h)	BOD (mg/l)				SS (mg/l)			
		inlet		S/Tank	T/Filter	inlet		S/Tank	T/Filter
7:30	16.9	108		23	23	185		60	190
10:30	21.2	56		55	25	15		85	15
13:30	20.1	26				35			
16:30	21.6	51				155			
19:30	22.6	48		35	48	85		125	140
22:30	23.4	44				15			
1:30	21.9	47				5			
4:30	21.6	5				5			
	507.9								

TABLE Q - 19 RESULT OF WATER QUALITY SURVEY FOR LINTANG BATU
MAUNG

Date : 6-7/8/1990

Time	Inflow rate (cum/h)	BOD (mg/l)				SS (mg/l)			
		inlet	P/Pit	A/tank	outlet	inlet	P/Pit	A/tank	outlet
9:00	9.4	81	108	60	72	95	40	90	35
12:00	18.8	96	130	54	43	70	90	48	55
15:00	15.7	86	109	47	51	30	30	60	10
18:00	14.1	90	69	42	41	175	125	325	346
21:00	17.2	108	87	33	35	20	30	175	125
0:00	12.5	114	86	60	60	175	205	140	110
3:00	11.0	89	88	58	53	60	70	75	110
6:00	1.6	100	84	56	52	5	5	60	95
	300.8	95.5	95.13	51.25	50.88	78.75	74.38	121.63	110.8

Date : 22-23/8/90

Time	Inflow rate (cum/h)	BOD (mg/l)				SS (mg/l)			
		inlet	P/Pit	A/tank	outlet	inlet	P/Pit	A/tank	outlet
9:00	24.5	140	144	134		203	290	617	
12:00	18.3	178	185	139		1198	387	318	
15:00	16	153	120	123	81	133	155	155	106
18:00	22	112	120	99	97	353	297	387	150
21:00	17.5	129	114	100	100	141	193	706	176
0:00	4.4	107	100	87	74	40	470	1028	165
3:00	0	111	95	85	82	83	58	599	183
6:00	4.5	54	64	64	52	67	38	959	339
	321.6	123	117.8	103.9	81	277.3	236	596.13	186.5

TABLE Q-20 RESULT OF WATER QUALITY SURVEY FOR HALAMAN ZOO 2

Date : 22-23/8/90

Time	Inflow rate (cum/h)	BOD (mg/l)				SS (mg/l)			
		inlet	P/Pit	A/tank	outlet	inlet	P/Pit	A/tank	outlet
7:00	1.4	162	122	74	113	80	160	170	130
10:00	10.3	266	132	72	36	60	60	35	15
13:00	17.8	41	130	96	120	80	95	20	30
16:00	17.8	151	122	183	108	225	155	90	145
19:00	14.0	53	80	57	67	255	25	15	215
22:00	6.6	51	80	49	61	240	95	75	125
1:00	15.4	75	89	81	72	110	40	180	15
4:00	4.1	67	86	25	78	5	30	155	10
	262.2	108.3	105.1	79.63	81.88	131.9	82.5	92.5	85.63

Date : 22-23/8/90

Time	Inflow rate (cum/h)	BOD (mg/l)				SS (mg/l)			
		inlet	P/Pit	A/tank	outlet	inlet	P/Pit	A/tank	outlet
7:00	9.4	130	204	133	97	115	219	156	112
10:00	11.4	119	87	110	58	227	103	2076	49
13:00	10.4	77	175	59	46	84	143	455	22
16:00	9.9	104	94	92	62	106	65	376	33
19:00	15.9	104	107	67	70	144	208	204	44
22:00	9.9	84	141	47	34	41	162	482	55
1:00	2.4	95	65	42	60	34	113	370	51
4:00	2.4	170	129	25	23	470	191	375	85
	215.1	110.4	125.3	71.88	56.25	152.6	150.5	561.75	56.38

TABLE Q-21 OPERATION CONDITIONS OF SEPTIC TANK TYPE PLANTS

Plant No.	Location of Plant	Type	Population served		Inflow Rate (cum/d)		Volumetric Loading (cum/cum/d)		BOD Loading (Kg/cum/d)		Area Loading (Kg/cum/d)		BOD Loading (Kg/cum/d)	
			Design	Actual	Design	Actual	Design	Actual	Design	Actual	Design	Actual	Design	Actual
6	Jalan Kampong Melayu	S	24			1.6	0.1		3.4					
7	Jalan Hye Keat A	S	24			1.6	0.4		3.4					
8	Jalan Hye Keat E	S	24			1.6			3.4					
9	Jalan Shaik Madar	S	30			2	0.1		4					
10	Jalan Empat	S	30			2	0.3		4					
11	Jalan Hye Keat B	S	42						5.2					
12	Jalan Hye Keat D	S	48						5.8					
13	Lorong Zoo Satu	S	54			3.6			6.4					
14	Jalan Chor Sin Kheng B	S	54			3.6	0.3		6.4					
15	Jalan Hye Keat C	S	54			3.6	0.3		6.4					
16	Lorong Sempadan Empat	S	54			3.6	0.2		6.4					
17	Jalan Satu	S	60			4	0.3		7					
18	Jalan Chor Sin Kheng A	S	60			4	0.3		7					
19	Lorong Air Putih	S	72			4.8	0.3		8.2					
20	Jalan Pokok Saga	S	72			4.8	0.2		8.2					
21	Lorong Sempadan Dua	S	90			6	0.2		10					
22	Lorong Sempadan Enam	S	96						10.6					
23	Lorong Sempadan Tiga	S	108						11.6					
24	Jalan Thean Teik	S	120			6.4	0.3		13					
25	Lintang Zoo	SR	120			1.6	0.3		3.4				0.1	
26	Jalan Pasar	SR	24			2.4	0.3		4.6					
27	Behind 4-F Jalan Air Itar	SR	48			3.2	0.3		5.8					
28	Choong Nam Theatre	SR	84			5.6	0.4		9.4					
29	Lorong Zoo Dua	SR	102			6.8	2.1		11.2					
30	Lorong Pava Terubong	SR	114			7.6	0.3		12.4				0.23	
31	Tingkat Lambah Ria 2	SR	120			8	0.3		13				0.42	
32	Tingkat Lambah Ria 3	SR	132			8.8	0.4		14.2				0.18	
33	Solak Zoo Satu	SR	144			9.6	0.3		15.4					
34	Jalan Tunggal	SR	162			10.8	0.3		17.2					
35	Lorong Zoo Lima	SR	174			11.7	0.3		18.4				0.45	
36	Jalan Hye Keat	SR	186			12.5	0.4		19.6				0.53	
37	Jalan Ulong	SR	198			13.3	1.5		20.8					
38	Lorong Zoo Empat	SR	198			13.3	0.4		20.8				0.24	
39	Lorong Lambah Ria	SR	234			15.7	0.4		24.4				0.35	
40	Jalan Dua	SR	294			20	0.4		30.4				0.8	
41	Reservoir 9th Avenue	SR	348			23.3	0.4		35.8					
42	Jalan Taman Ria 3	SR	450			30.1	0.4		46				0.29	
43	Reservoir Drive	SR	462			31	0.6		47.2					
44	Lorong Taman Cantek 1	SR	558			37.4	0.4		56.8				0.5	
45	Medan Chor Sin Kheng	SR	562			39	0.4		59.2				0.57	
46	Jalan Oriental	SR	1056			70.7	0.4		106.6					
47	Jalan Air Putih	SR	1302			87.2	0.4		131.2				0.25	
48	Lorong Kampung Melayu	SR	348			23.3	0.4		35.8				0.31	
49	Tingkat Lambah Ria 3	ST	78						8.8					
50	Kampung Melayu Flats	ST	7212			476	1.58		722.2				0.56	
						234			25.5				0.29	

TABLE Q-22 OPERATION CONDITIONS OF ACTIVATED SLUDGE TYPE PLANTS

Plant No.	Location of Plant	Type	Population served		Inflow Rate (cum/d)		Aeration Tank				Sedimentation Tank			
							Volumetric Loading (cum/cum/d)		BOD Loading (Kg/cum/d)		Aeration (Oxy/kgBOD/kg)		Volumetric Loading (cum/cum/d)	
			Design	Actual	Design	Actual	Design	Actual	Design	Actual	Design	Actual	Design	Actual
1	Jalan Air Putih	A	420											
2	Lengkok Paya Terubong	A	474	91			1.1							18.6
3	Hasman Zoo 2	A	780	177.3	254.9	1	1.3	0.25	0.22	1.7	1.4	5.3	7.7	26.8
4	Labuh Rambai 14	A	10800	2450	1035	0.93	0.35	0.24	0.08	1.6	1.2	4.4	1.9	28.5
51	Lintang Batu Muang	A	1620	373	508	0.9	1.2	0.21	0.18		0.8	4	5.5	13.9
														18.7

TABLE Q-23 MAJOR DESIGN VALUES FOR EXTENDED AERATION IN THE JAPANESE STANDARDS

Effluent BOD (mg/l)		60		30		20
Population served (persons)		201 - 500		201 - 500		501 - 5000
Aeration Tank	Volume(cum)	> $2/3 \cdot Q$		> $2/3 \cdot Q$		> $2/3 \cdot Q$
	BOD loading (BODkg/cum/d)	< 0.3		< 0.2		< 0.3
	DO (mg/l)	> 1		> 1		> 1
	Sludge Return(%)	> 200%		> 200%		> 200%
Sedimentation Tank	Volume(cum)	> 3 and $> 1/6 \cdot Q$		> $1/6 \cdot Q$		> $1/6 \cdot Q$
	Areal Loading (cum/sqm/d)	< 8		< 15		< 15

Q : Daily inflow rate (cum/d)

TABLE Q-24 RECORDS ON OPERATION AND MAINTENANCE OF COMMUNAL PLANTS

(for the plants in the Sg. Pinang basin)

Plant Name	Operation	1990					1989											
		May	Apr	Mar	Feb	Jan	Dec	Nov	Oct	Sep	Aug	Jul	Jun	May	Apr	Mar	Feb	Jan
Jalan Air Putih (SR)	Pit cleaning	3			1			1	1	1			1					1
	Screen Cleaning																	
	Filter Bed cleaning	2						1	1	1			1			1		
	Sludge withdrawal																	
Kampung Melayu Flats (ST)	Pit cleaning	1		1	1	1	1	1	1	1	1	1	1			1	1	1
	Screen Cleaning	1		1	1	1	1		1	1	1	1	1		1	1	1	1
	Filter Bed cleaning	1	1	1	1	1			1	1	1	1	1			1	1	1
	Sludge withdrawal			1	1		1		1	1	1		1		1	1		
Halaman Zoo 2 (A)	Pit cleaning	1				1	1		1	1	1	1	1		1	1	1	1
	Screen Cleaning	1	1	1	1	1	1	1	1				1		1	1	1	1
	Filter Bed cleaning																	
	Sludge withdrawal			1				1					1					
Lubuh Rambai 14 (A)	Pit cleaning	2	2	1	1	2	1	2	1	4	2	2	1		1			
	Screen Cleaning	1	1		1	1	1	1	1				1		1	1	1	1
	Filter Bed cleaning																	
	Sludge withdrawal					1				1					1			
Jalan Air Putih (A)	Pit cleaning			1	1	1	1		1	1								1
	Screen Cleaning	1	1		1		1	1		1		1		1		1	1	1
	Filter Bed cleaning																	
	Sludge withdrawal																	
Lorokok Paya Terubong (A)	Pit cleaning	1					1	2	1	1								
	Screen Cleaning	1			1	1	1	1	1	1		1		1		1	1	1
	Filter Bed cleaning																	
	Sludge withdrawal						1	1		1								

TABLE Q-25 EXAMPLE OF INSPECTION AND MAINTENANCE SCHEDULE FOR EXTENDED AERATION METHOD

Items	Description	Scheduled Interval						
		Days	1 week	1 month	3 months	6 months	1 year	(2 Years)
Water Quality Test	Water temp, SV, Appearance	x						
	DO		x					
	MLSS, SVI			x				
	Detailed water quality test						x	
Return Sludge	Monitoring Return Rate	x						
	Adjustment of return rate			x				
Excess Sludge	Withdrawal	x						
Aeration Tank	Aeration conditions	x						
	Air Supply, pressure			x				
	Cleaning of aerator				x			
	replacement of defuser							x

Figures

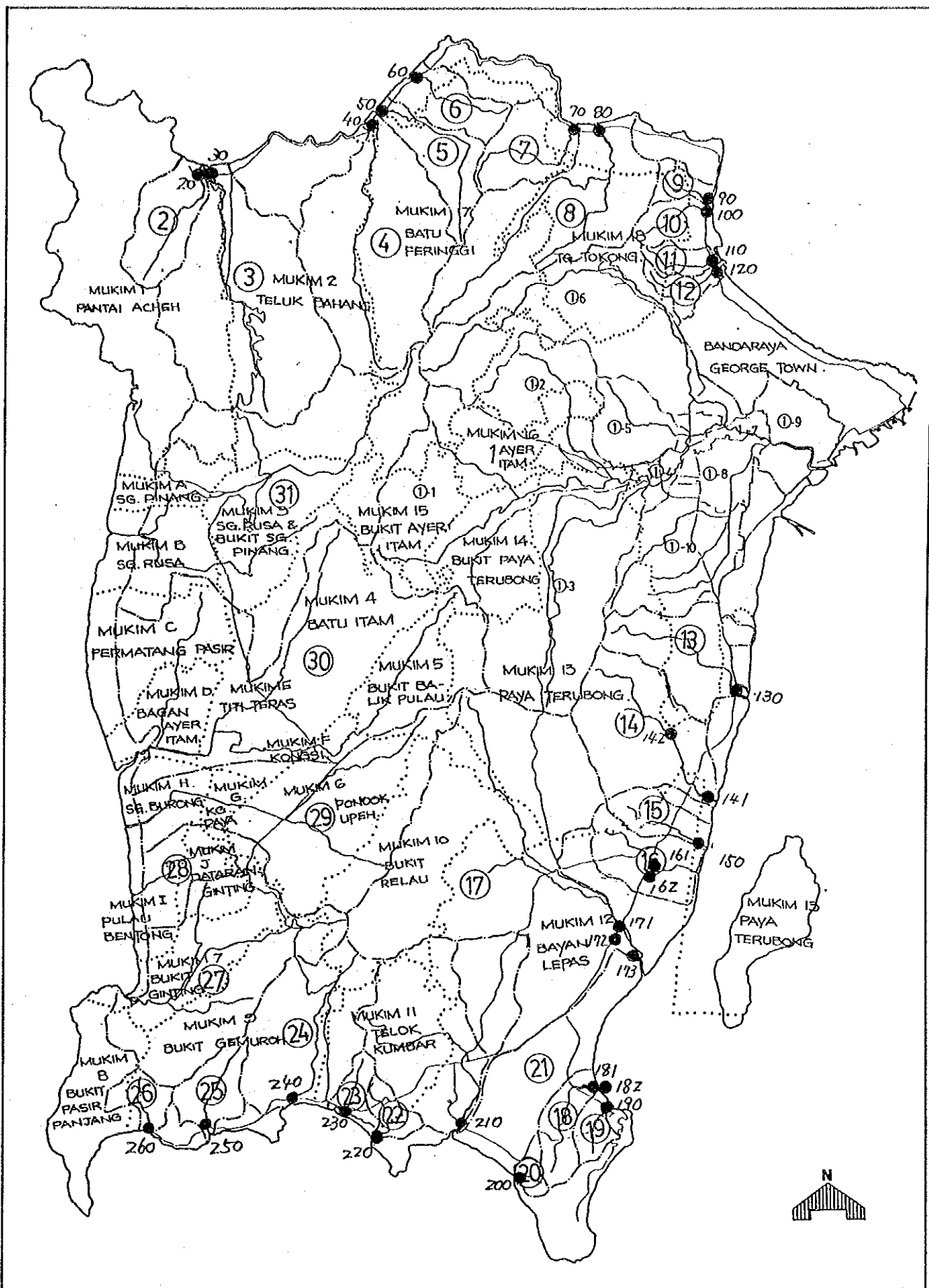


FIG. Q-1

SAMPLING LOCATION OF RIVERS IN PENANG ISLAND .

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

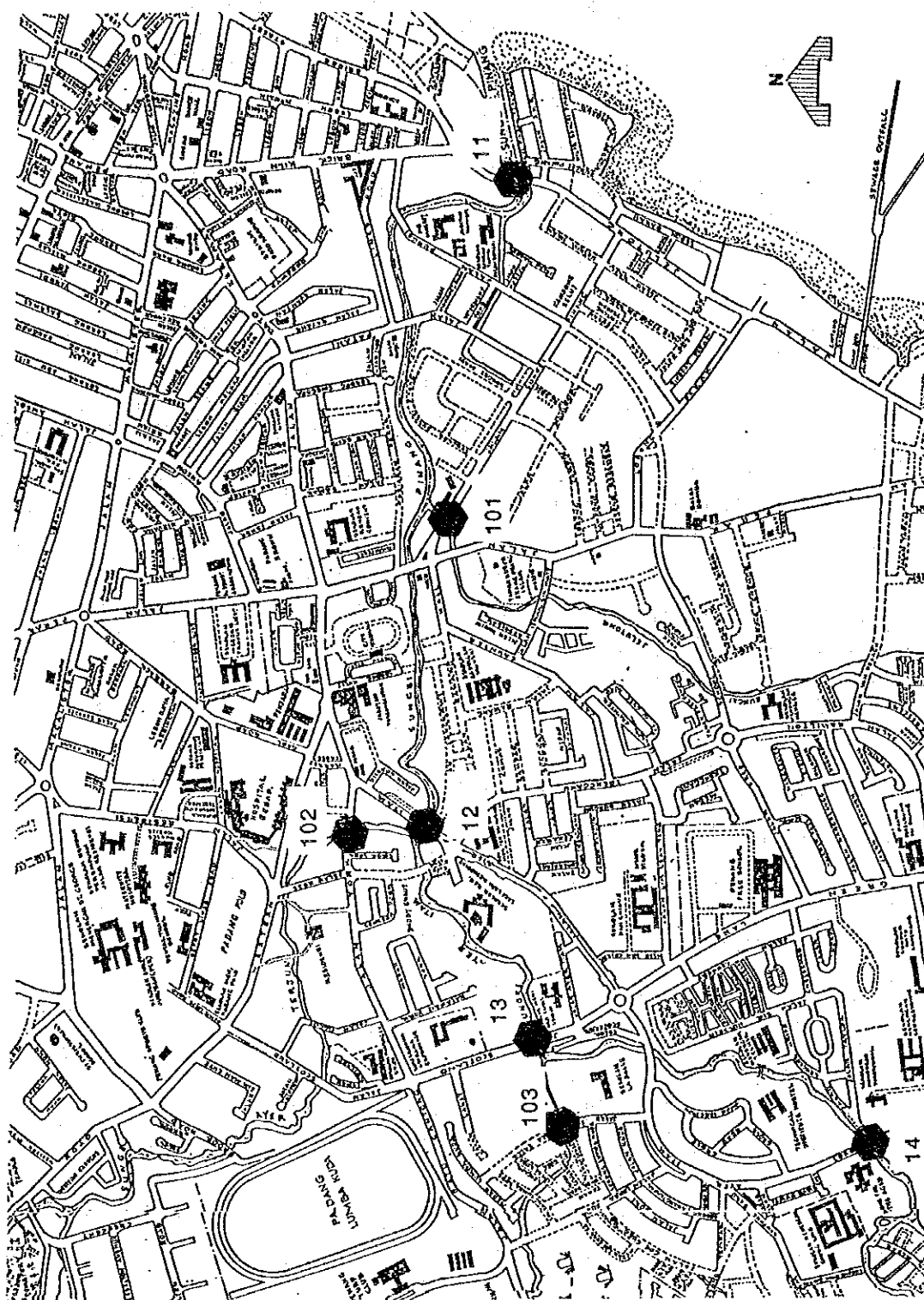


FIG. Q-2

SAMPLING LOCATION OF SG. PINANG

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

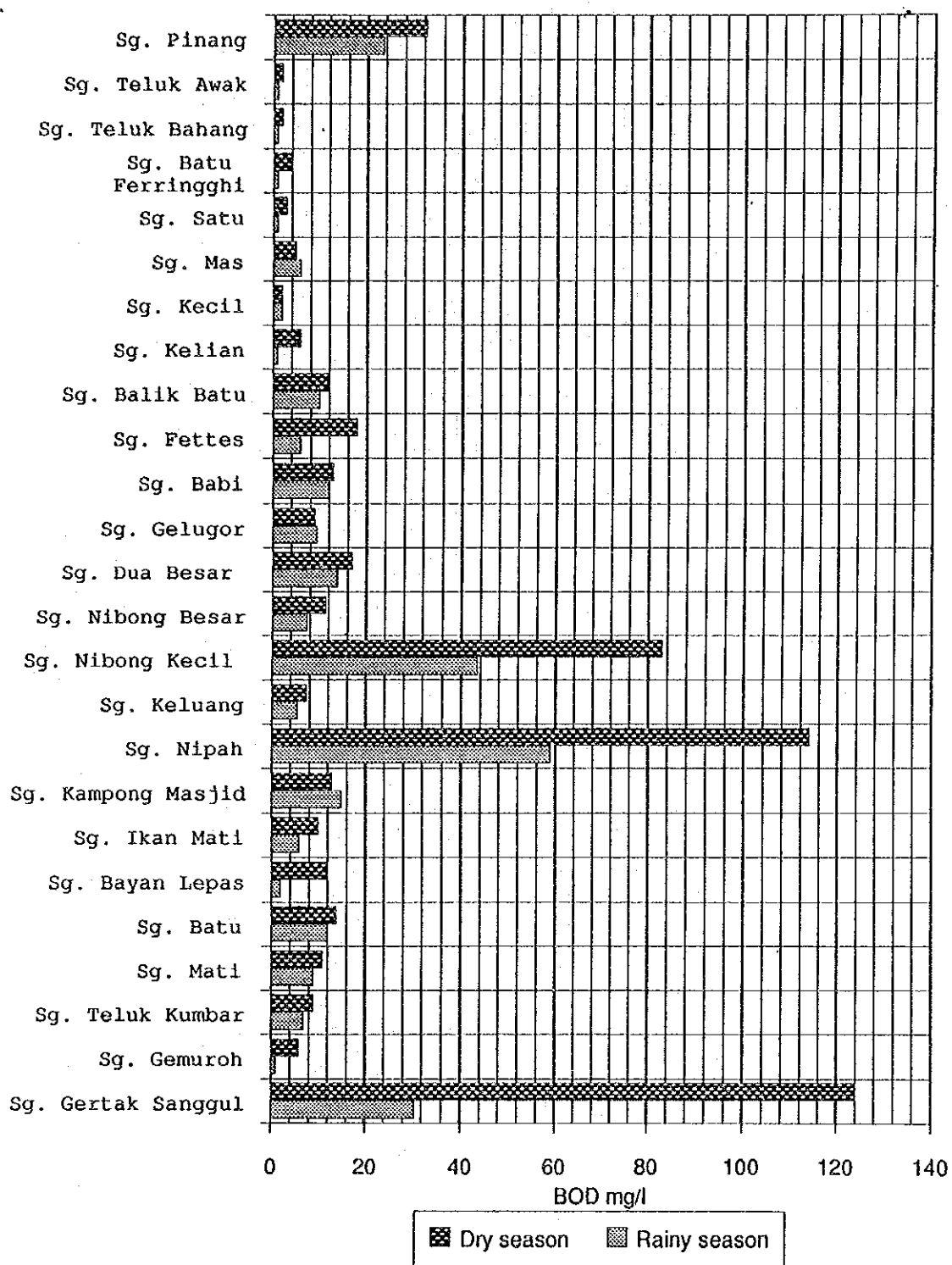


FIG. Q-3

BOD AT RIVER MOUTH

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

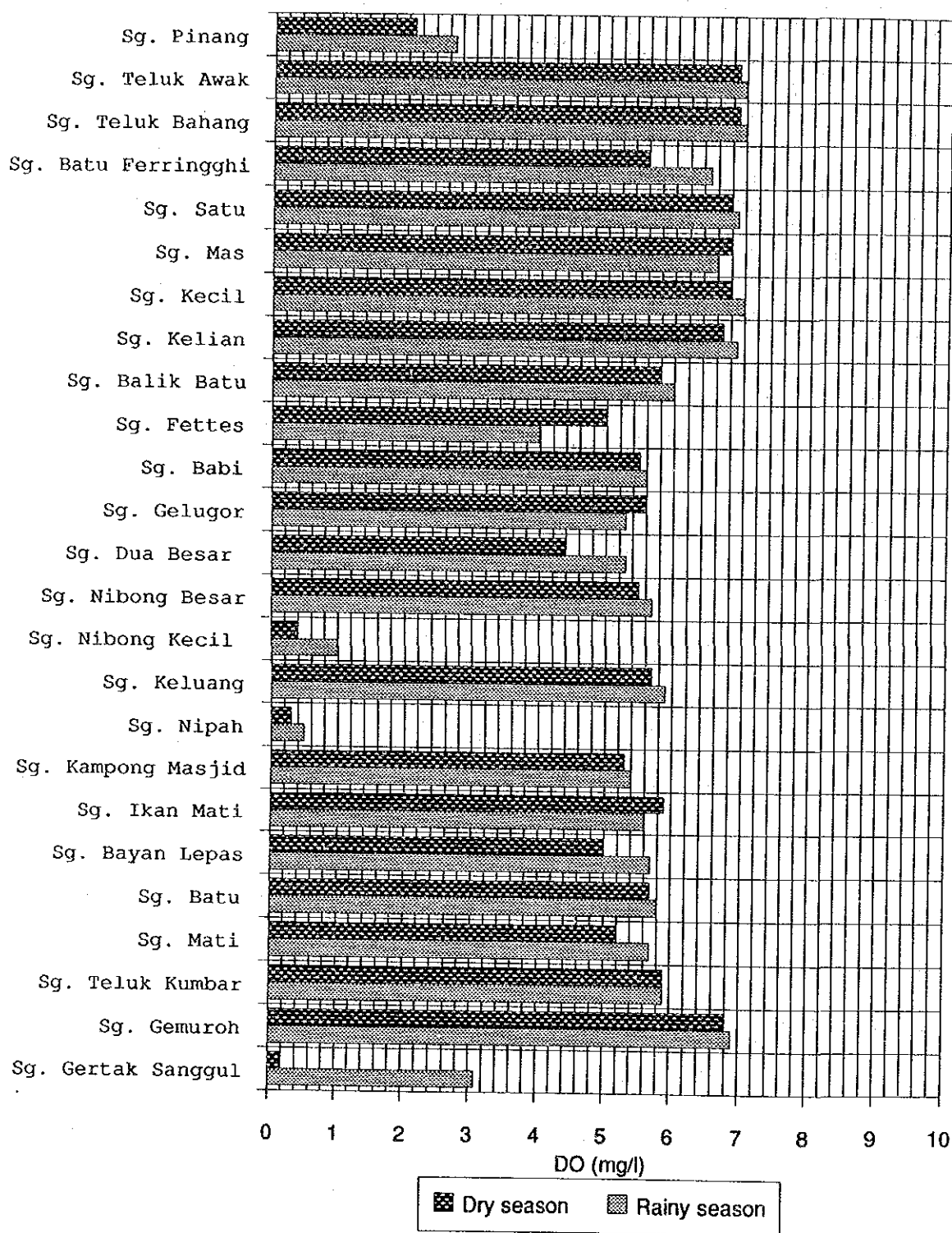


FIG. Q-4

DO CONCENTRATION AT RIVER MOUTH

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

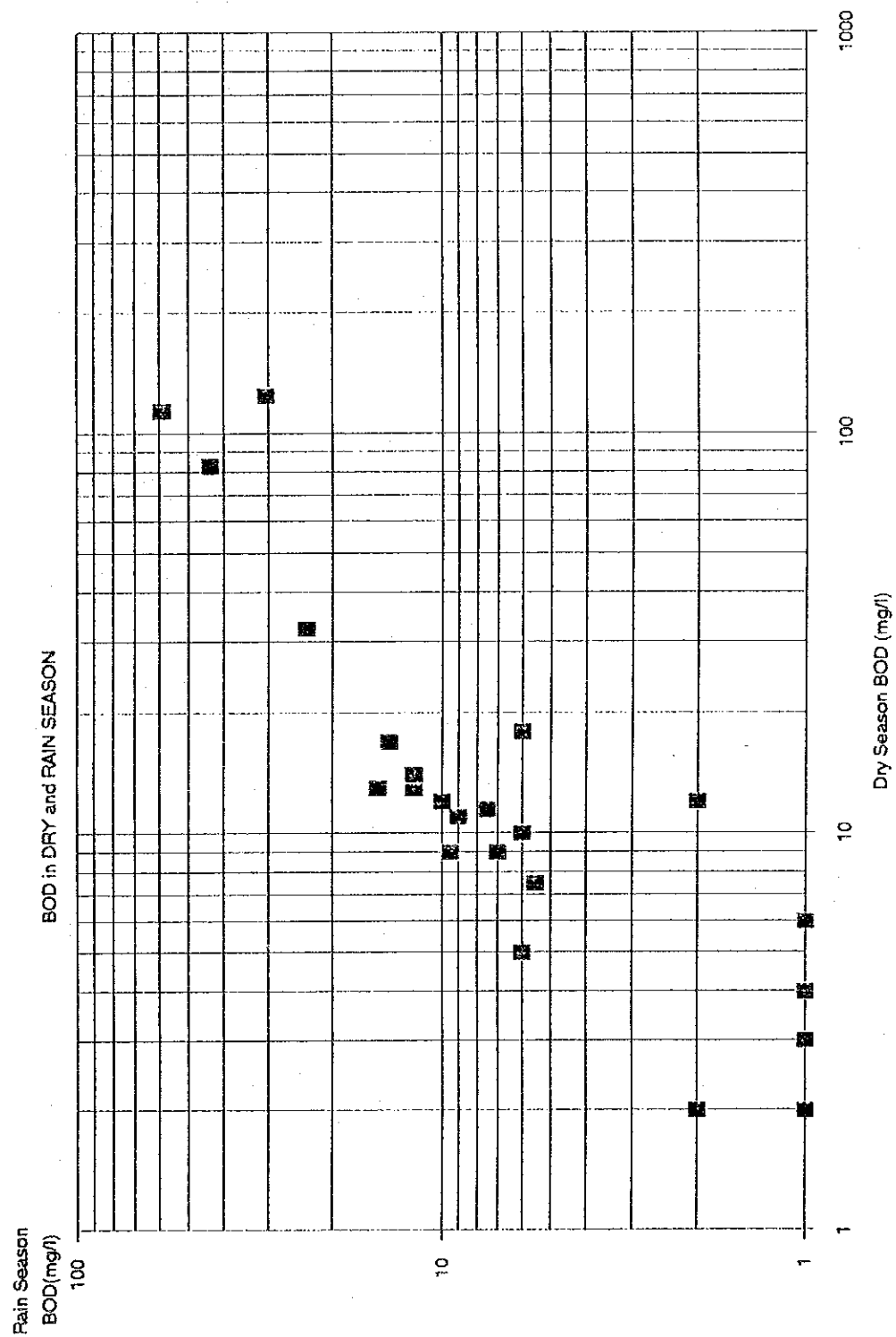


FIG. Q-5

BOD IN DRY AND RAIN SEASON

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

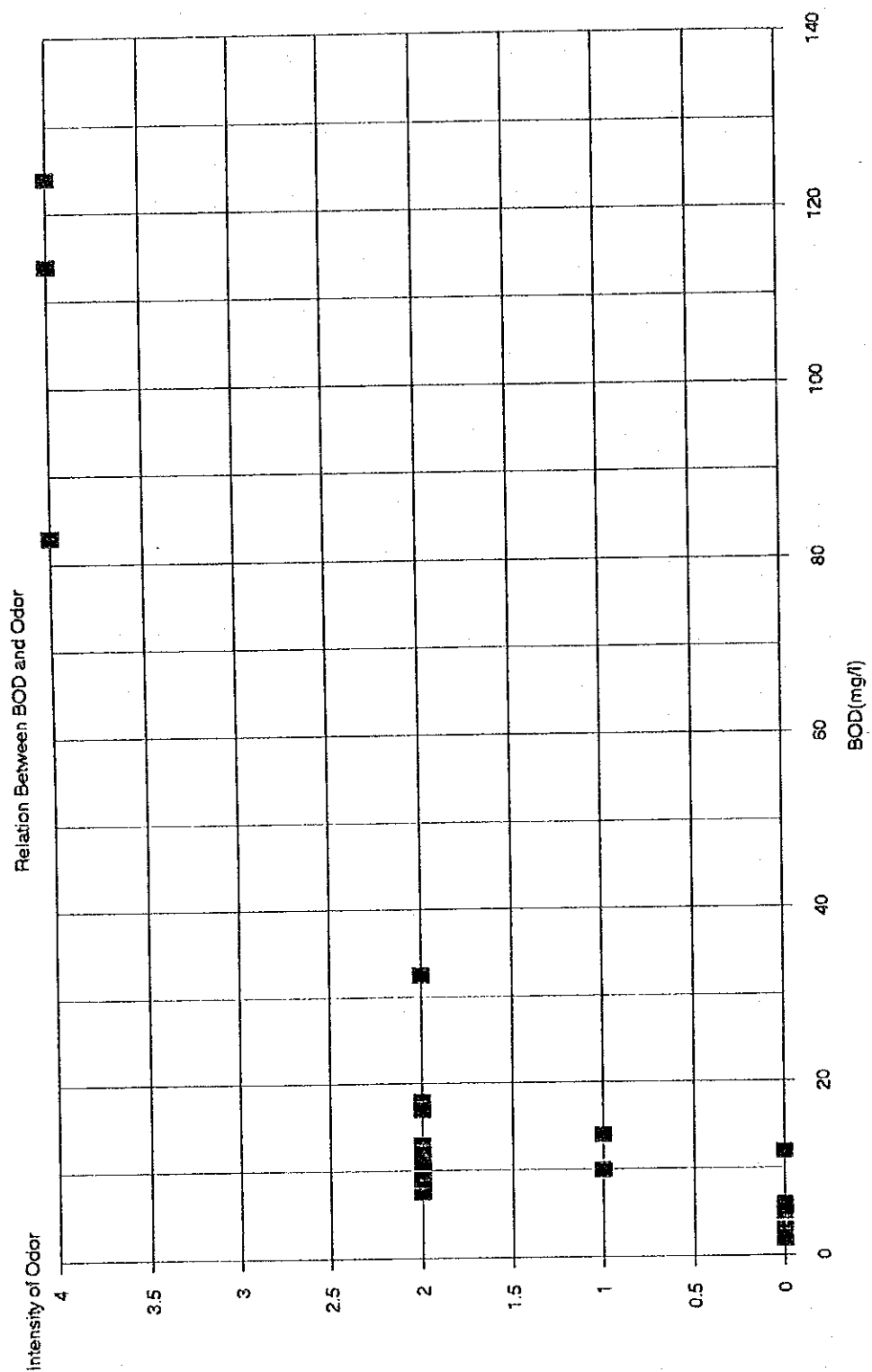


FIG. Q-6

RELATION BETWEEN BOD AND ODOR

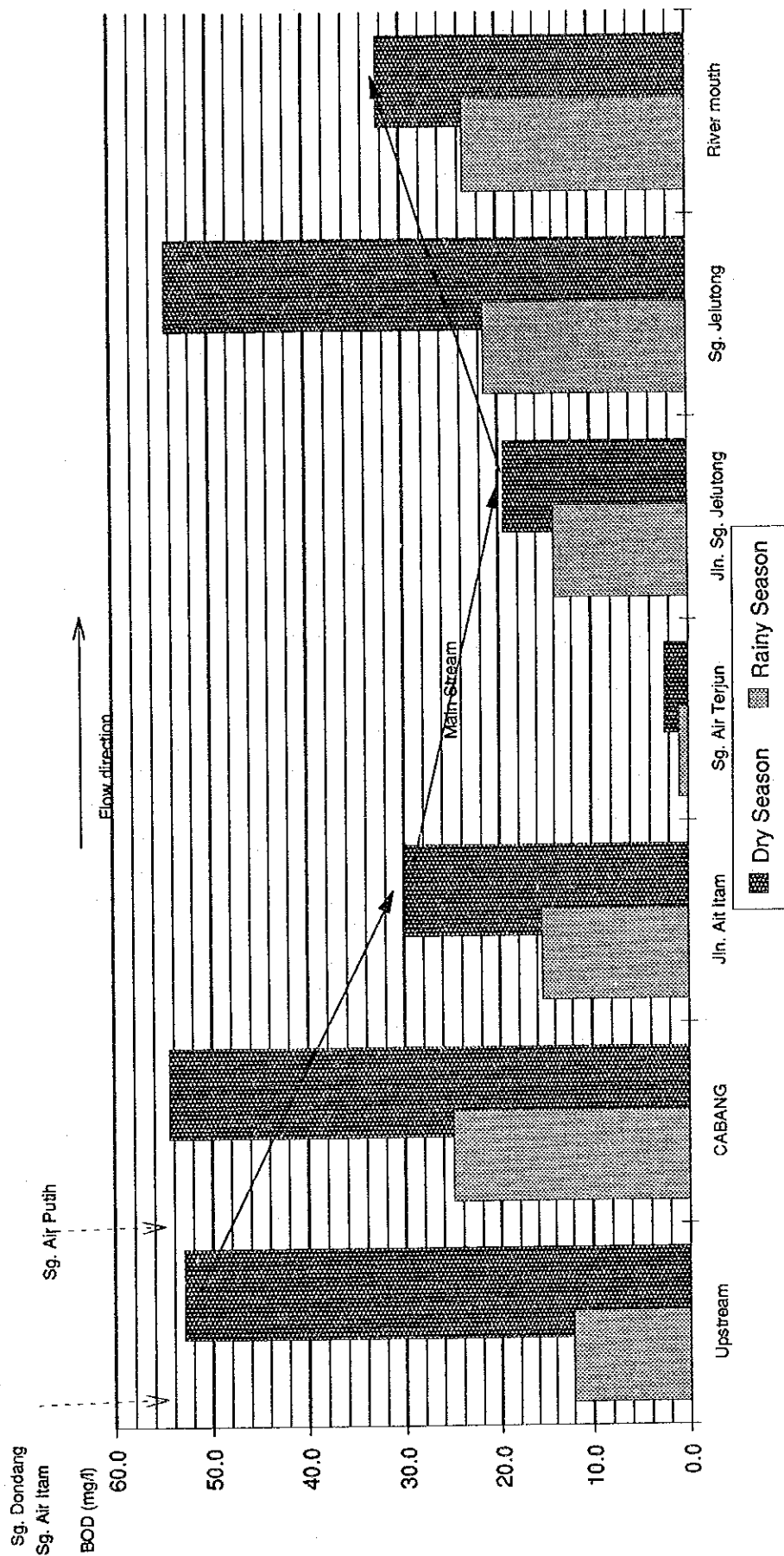


FIG. Q-7

BOD IN SG. PINANG SYSTEM

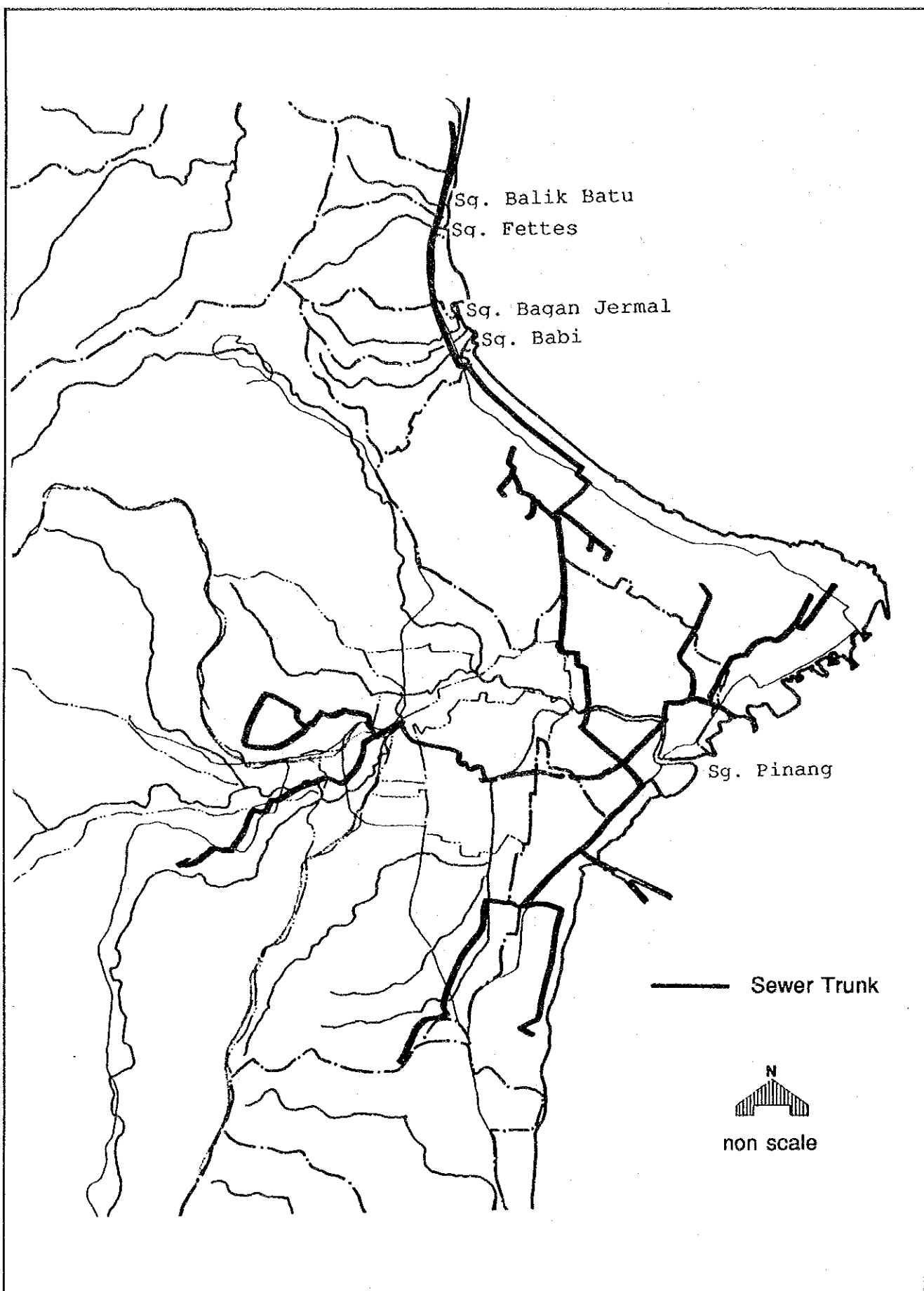


FIG. Q - 8

GEORGETOWN SEWER TRUNK

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

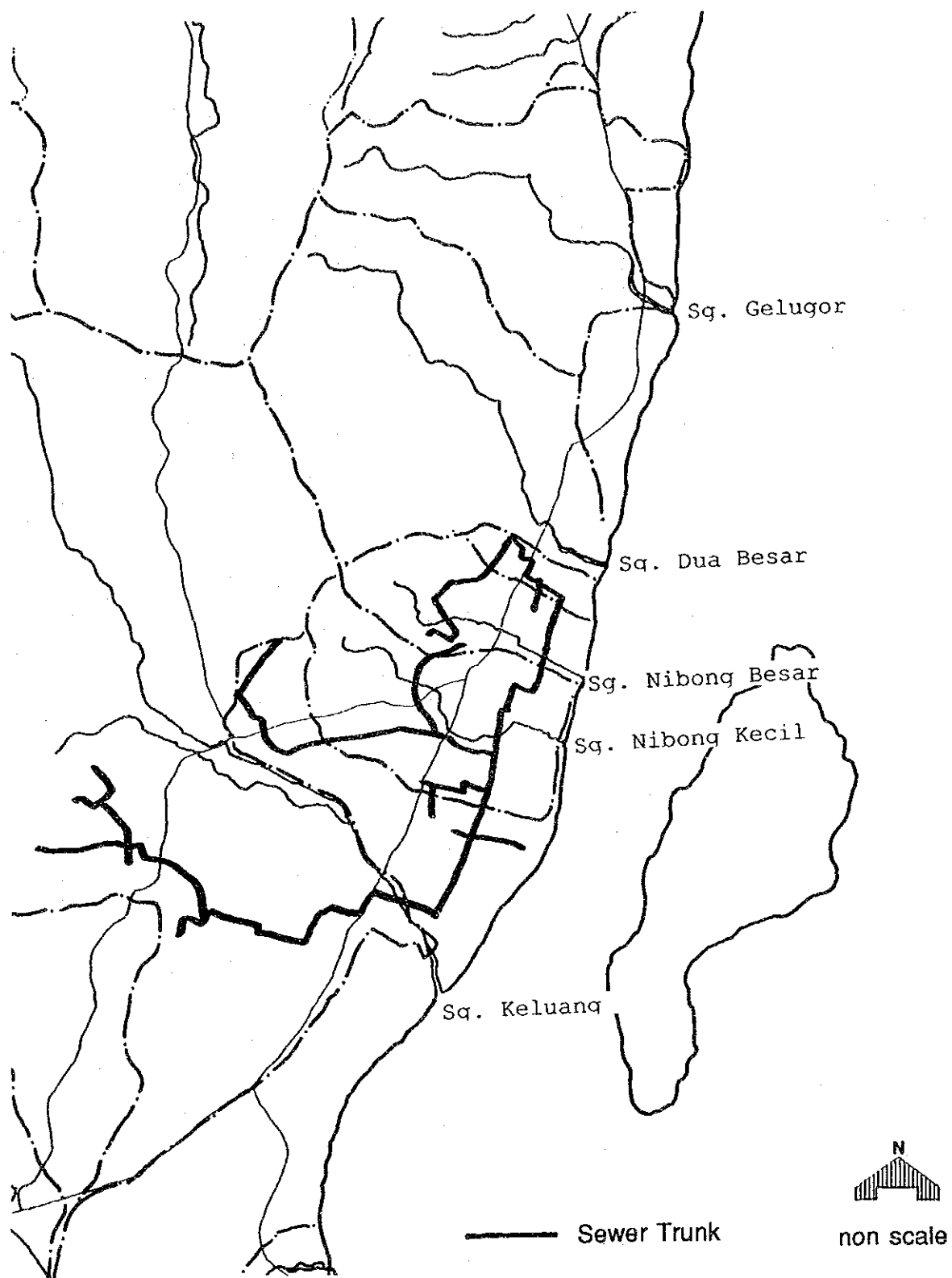


FIG. Q-9

BAYAN BARU SEWER TRUNK

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

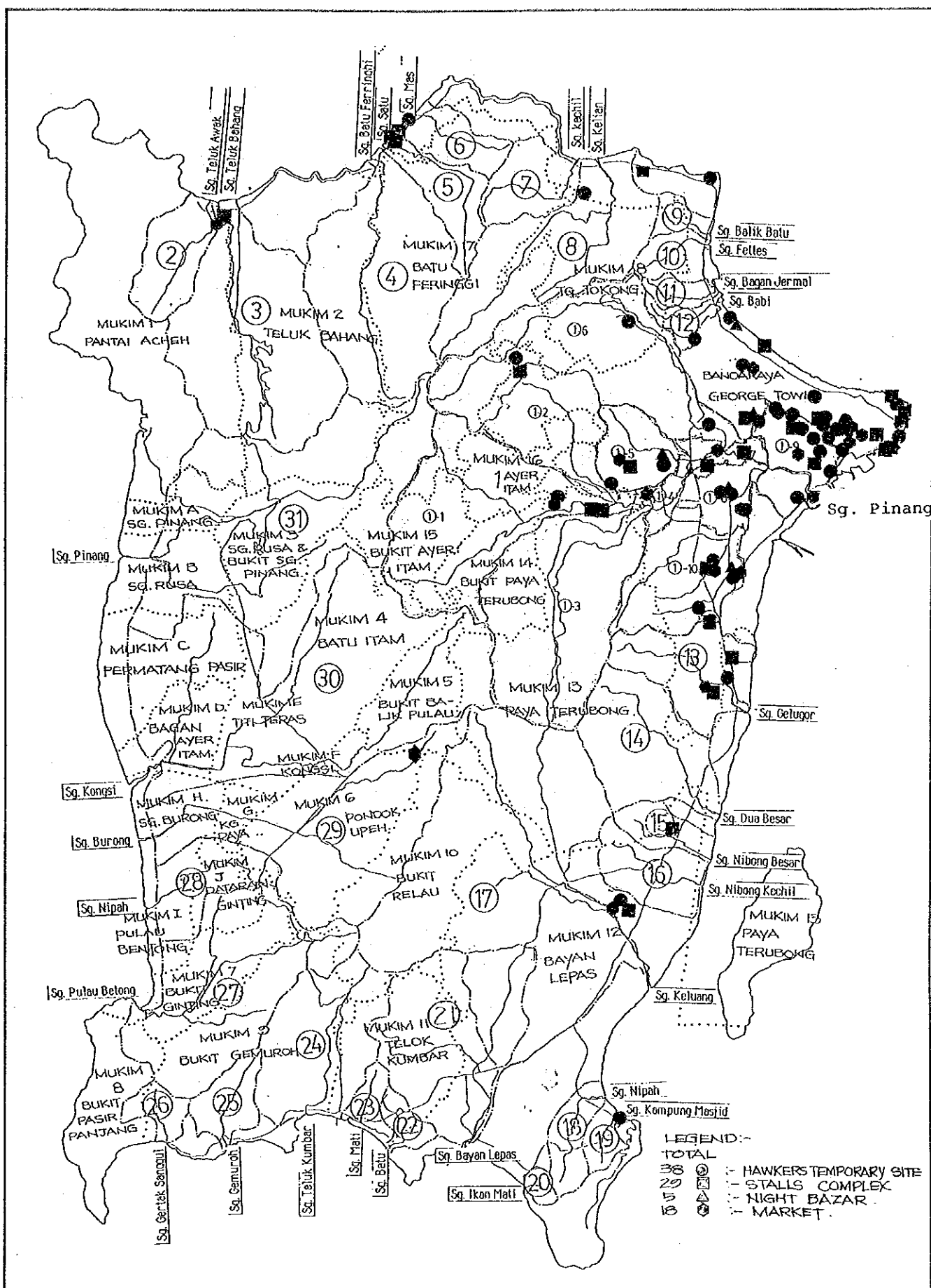


FIG. Q-11

LOCATION OF HAWKERS PLACE IN PENANG ISLAND

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

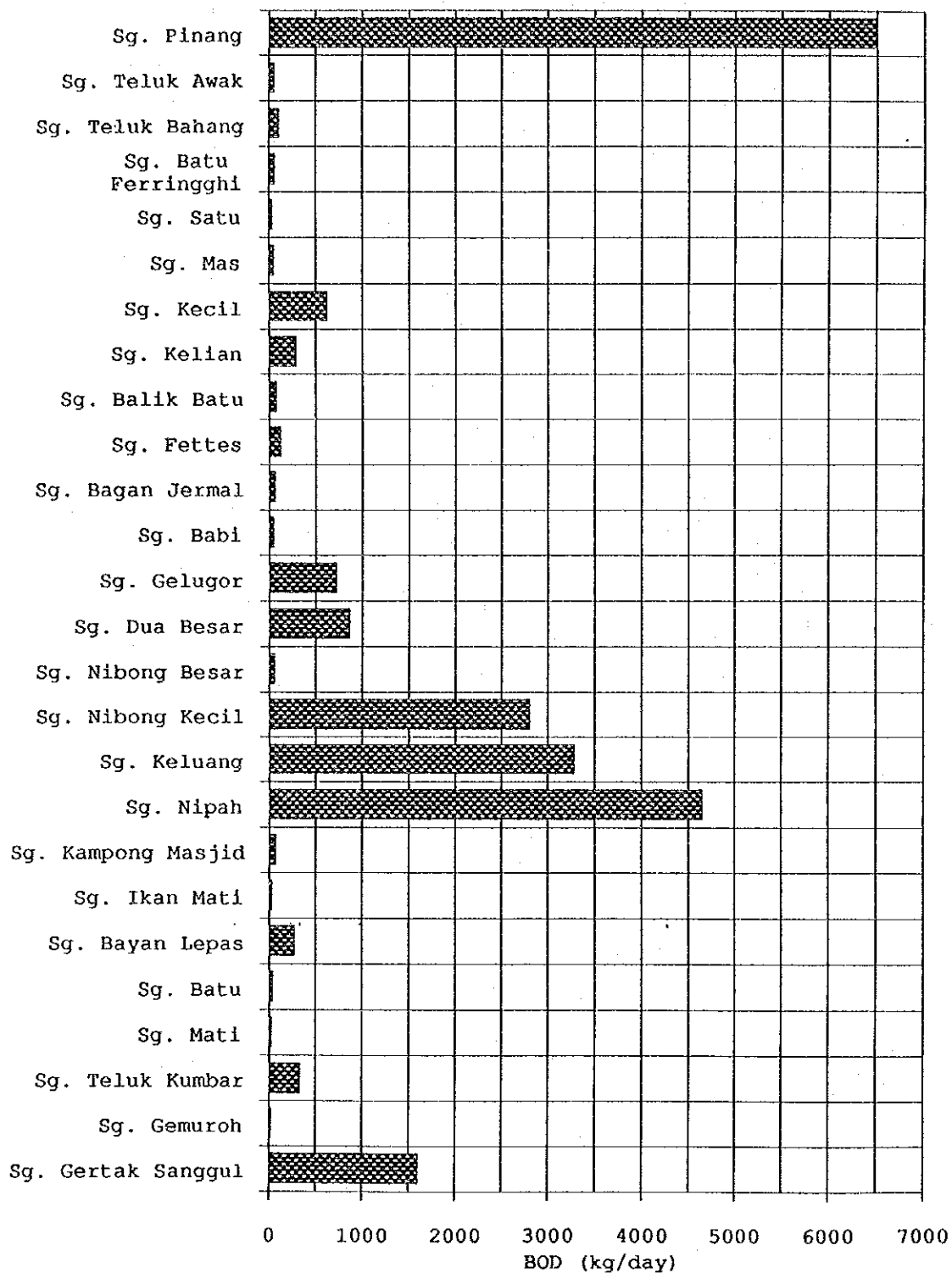


FIG. Q-12

ESTIMATED BOD LOAD

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

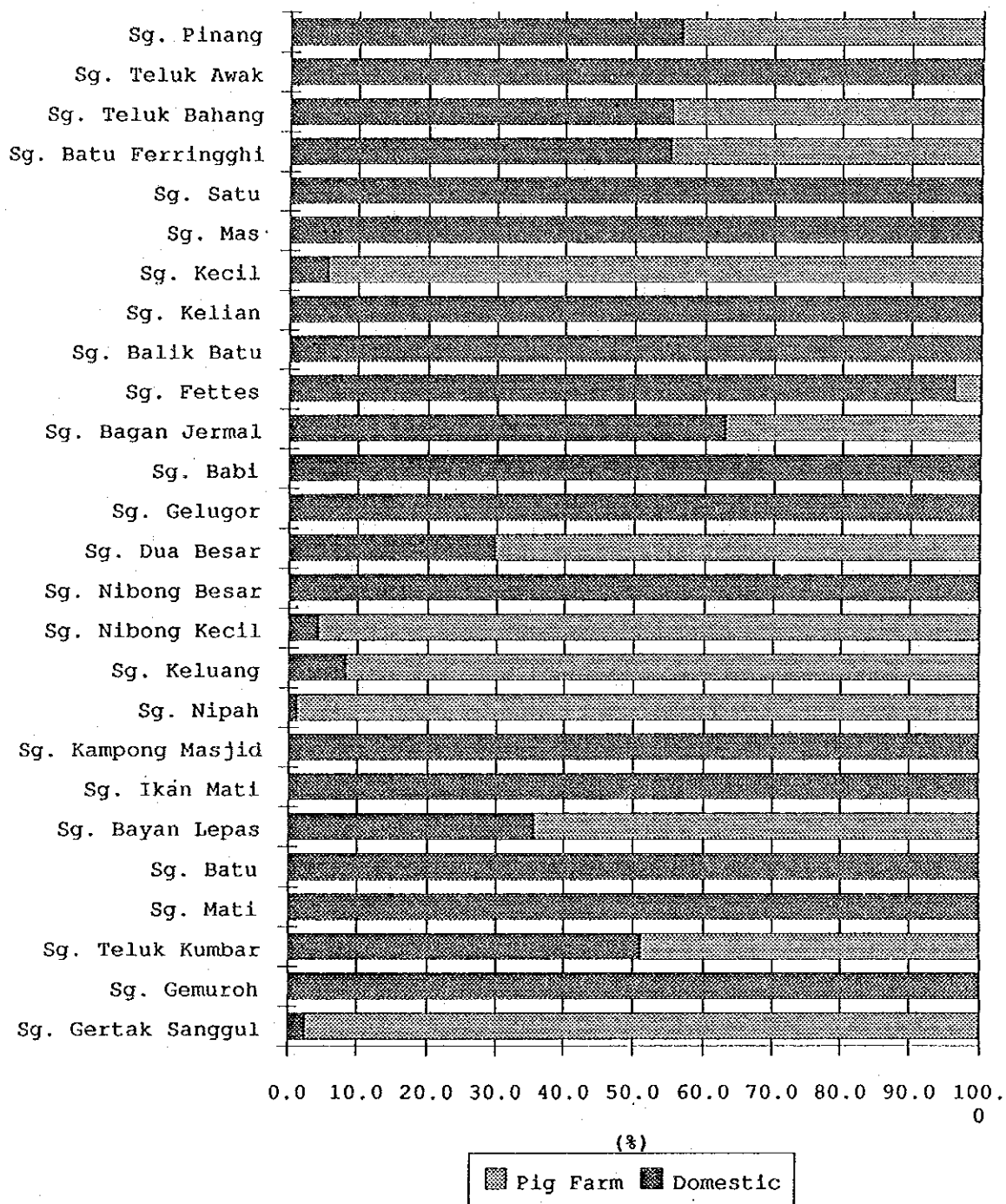


FIG. Q- 13

SOURCE OF POLLUTION LOAD

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

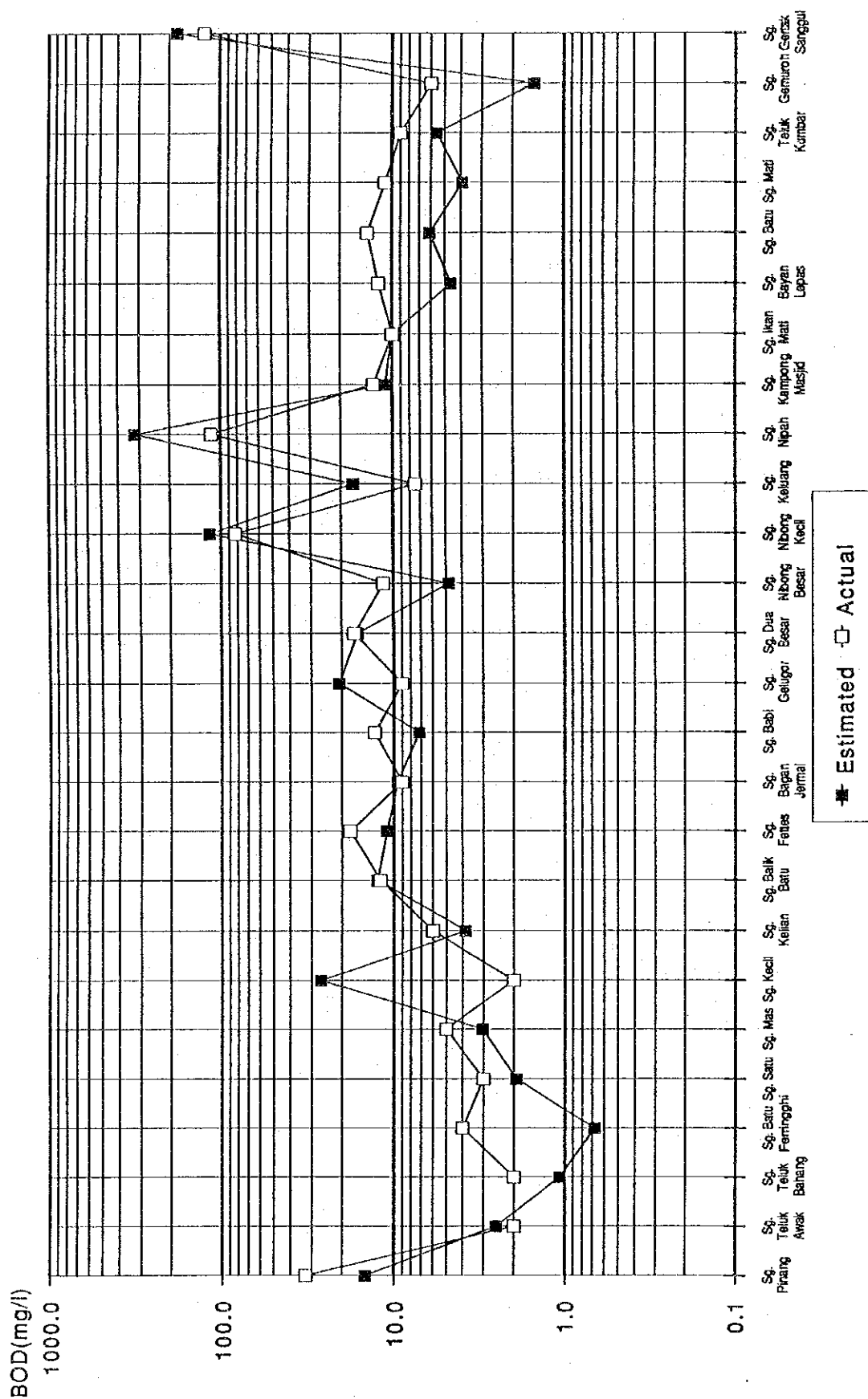


FIG. Q - 14

COMPARISON OF ESTIMATED AND ACTUAL BOD

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

Daily Flow Rate of Sg. Air Terjun (Jl. Brook)

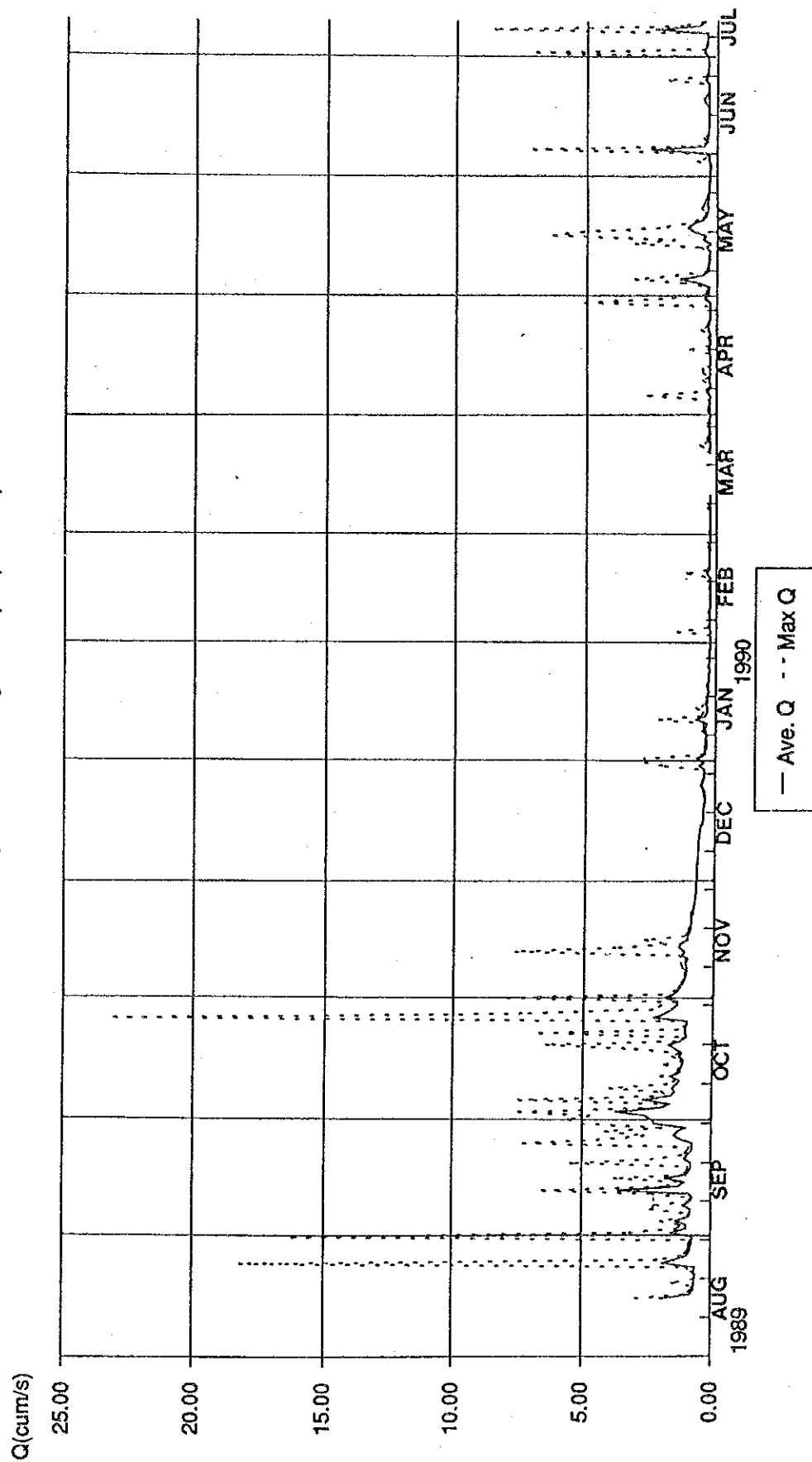


FIG. Q-15

DAILY FLOW RATE OF SG. AIR TERJUN (JL. BROOK)

Flow Regime of Sg Air Terjun (Jl. Brook)

Based on Data from 16/8/1989 to 11/7/1990

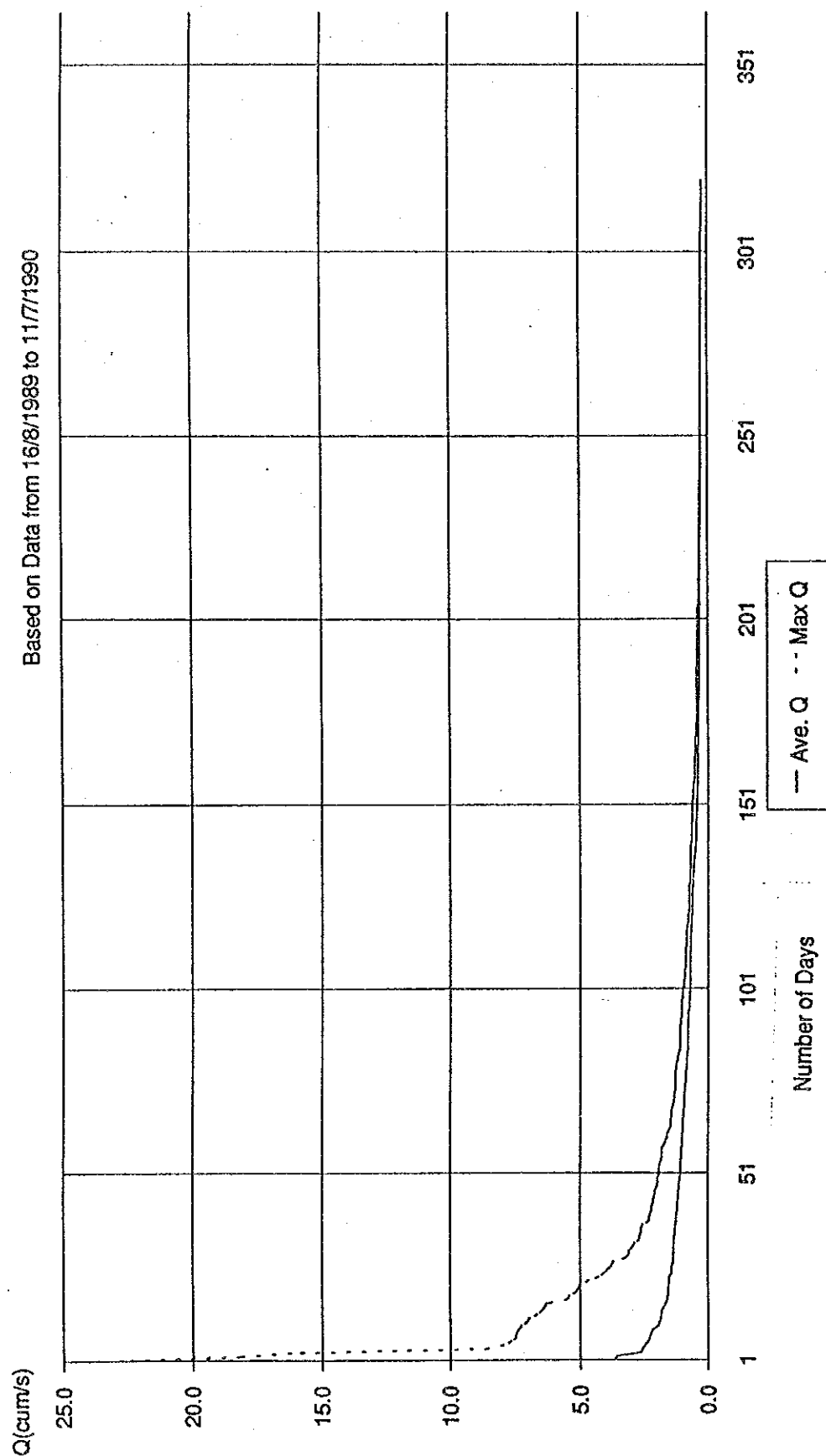


FIG. Q-16

FLOW REGIME OF SG. AIR TERJUN (JL. BROOK)

Based on Data from 16/8/1989 to 11/7/1990

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

Daily flow of Sg. Teluk Bahang

Data source: PBA

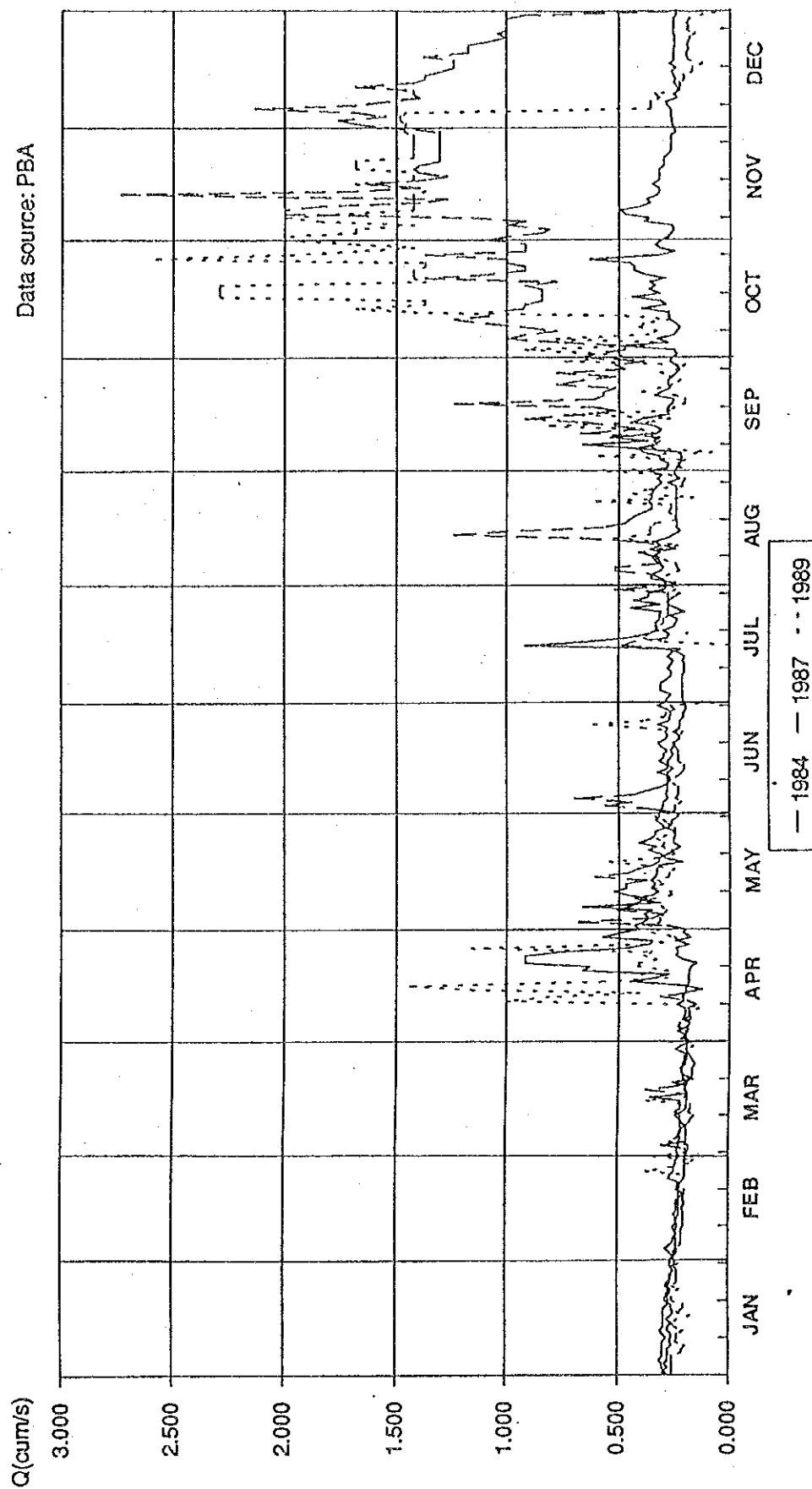


FIG. Q-17

DAILY FLOW OF SG. TELUK BAHANG

Data source: PBA

Flow Regime of Sg. Teluk Bahang

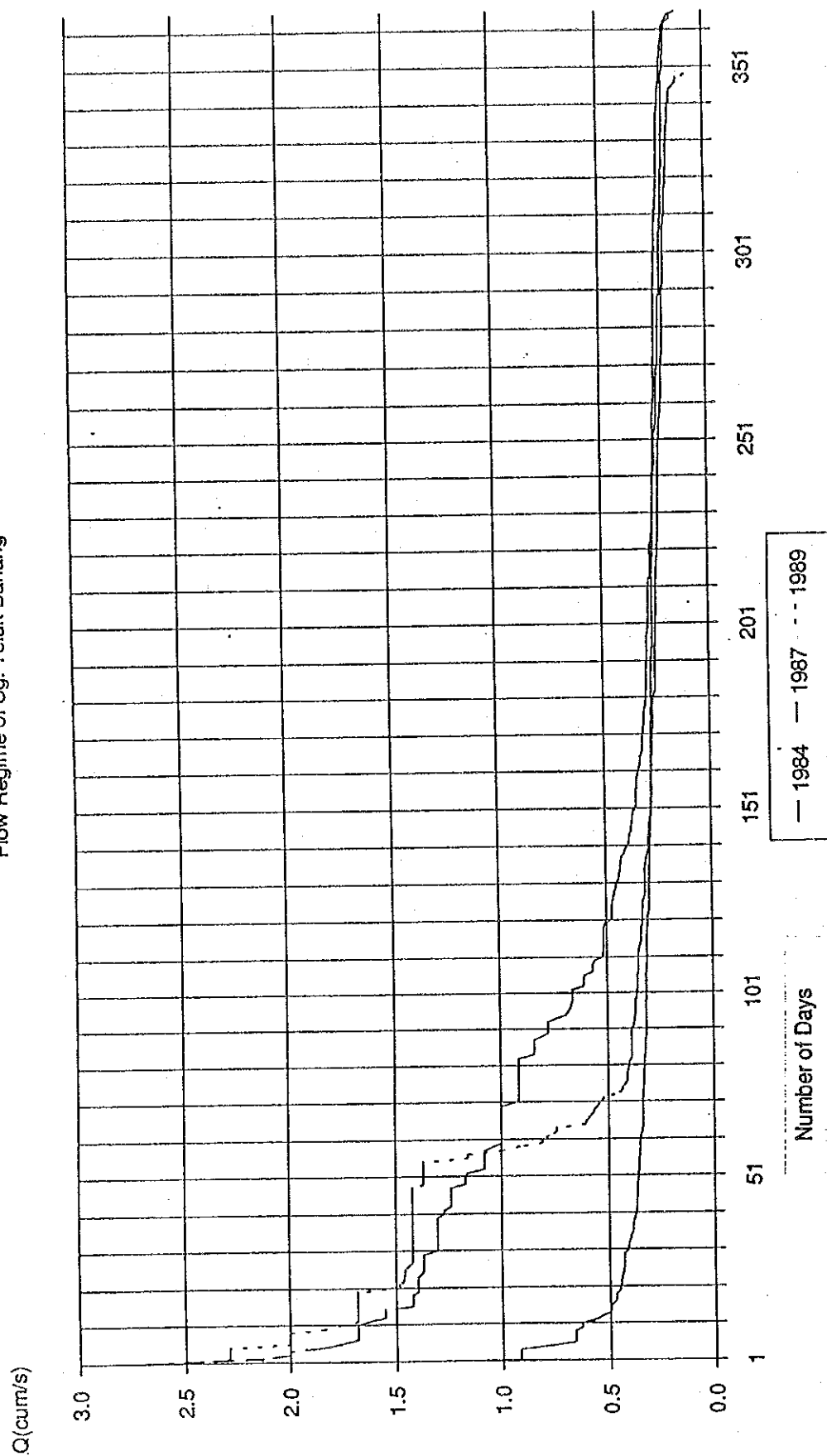


FIG. Q-18

FLOW REGIME OF SG. TELUK BAHANG

Q(cum/s)

Probability Distribution of Daily Water Flow in Sg. Air Terjun(Jl.Brook)

Based on data from 16/8/1989 to 11/7/1990

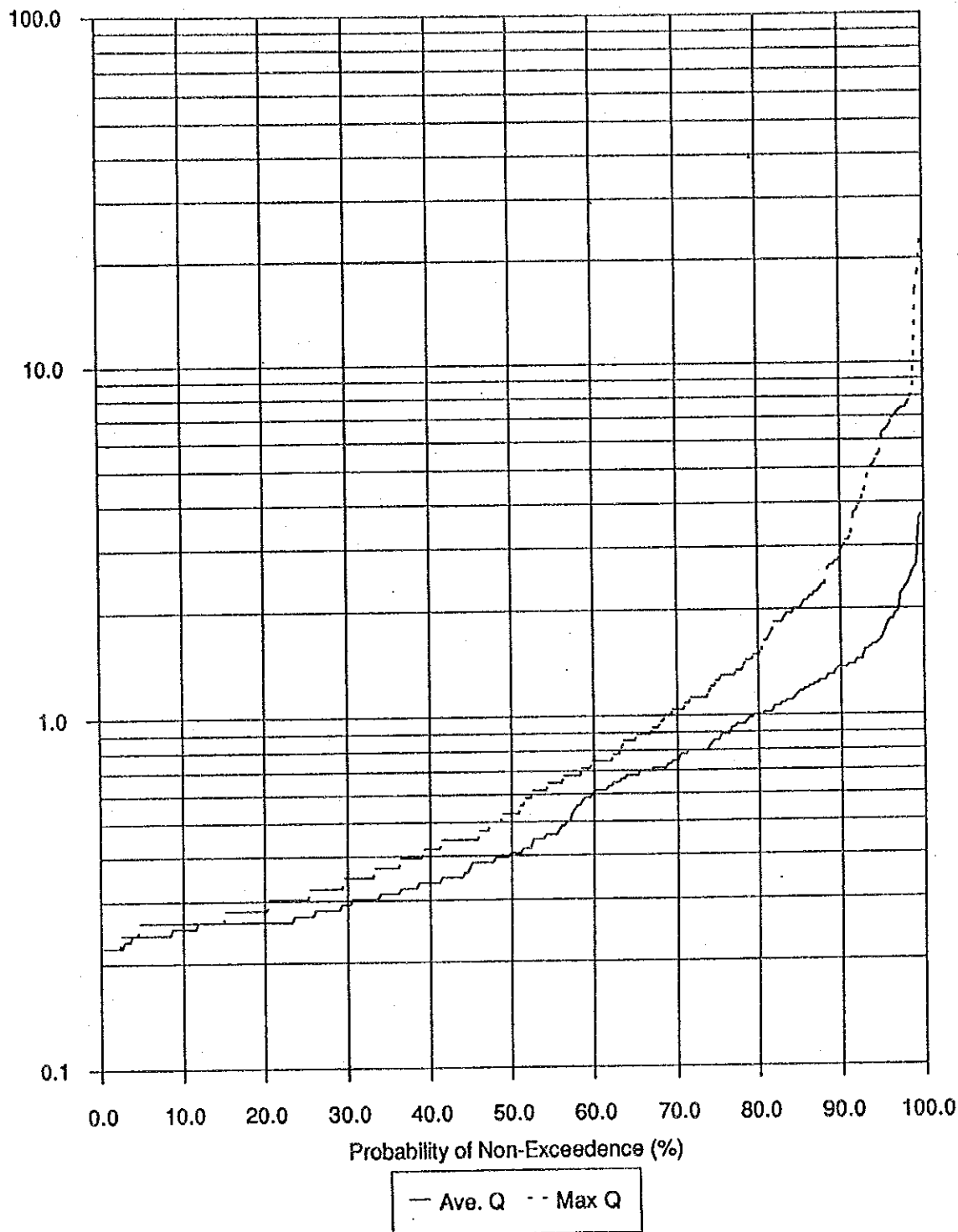


FIG. Q-19

PROBABILITY DISTRIBUTION OF DAILY WATER FLOW
IN SG. AIR TERJUN(JL.BROOK) Based on data from 16/8/1989 to 11/7/1990

Probability Distribution of Daily Flow rate, Sg. Teluk Bahang

Q(cum/s)

based on Data by PBA

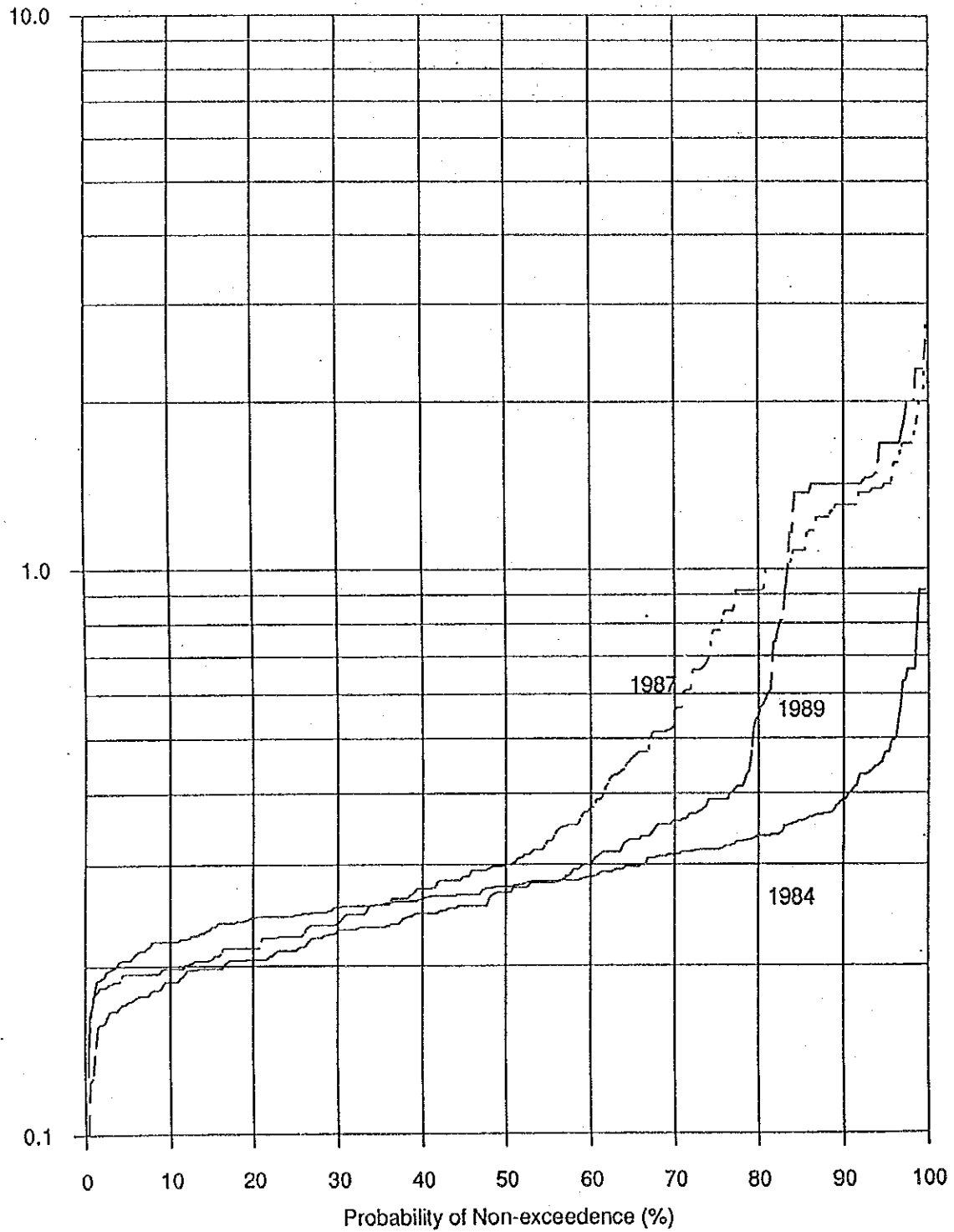


FIG. Q-20

PROBABILITY DISTRIBUTION OF DAILY FLOW RATE,
SG. TELUK BAHANG
based on Data by PBA

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

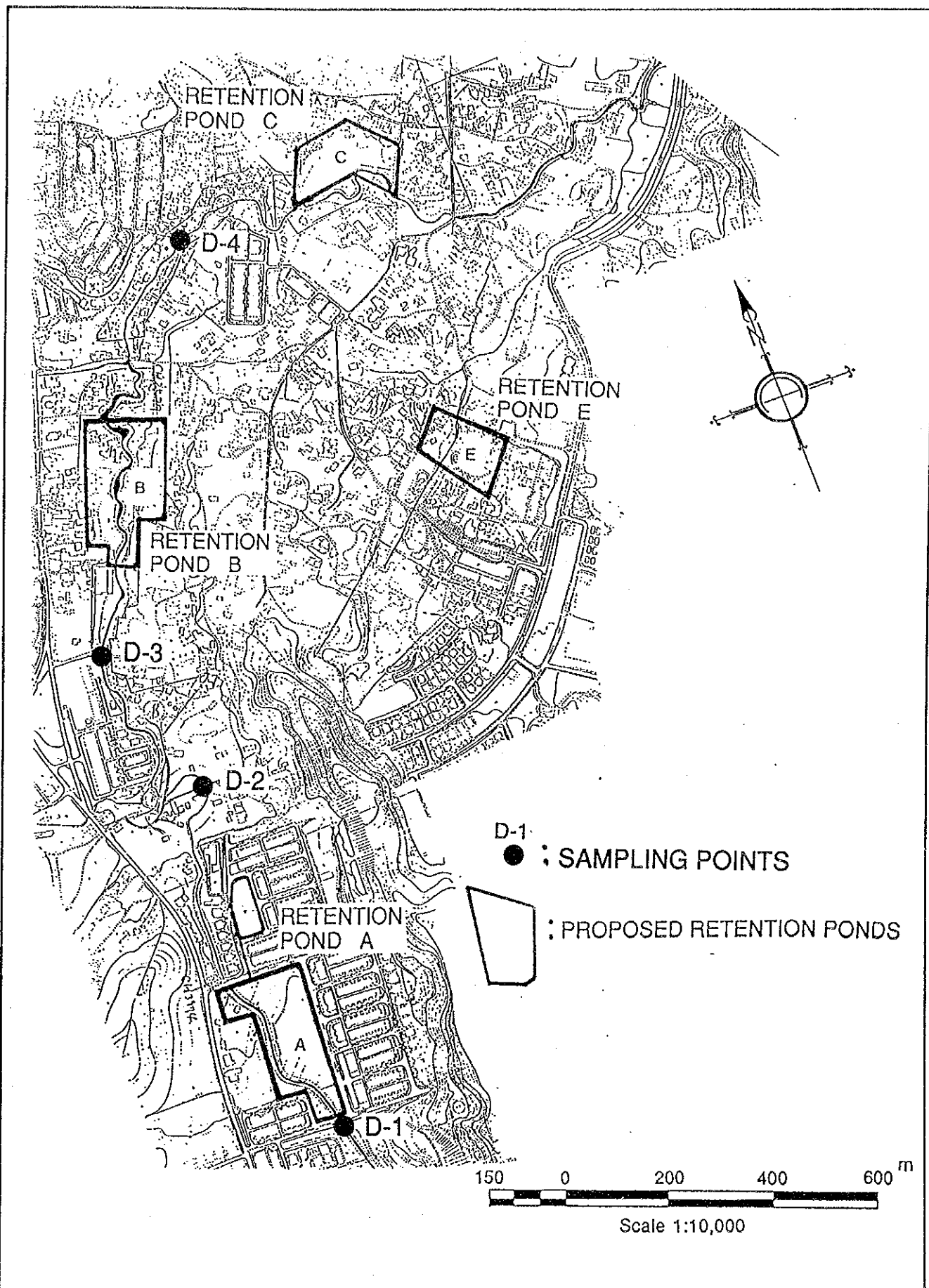
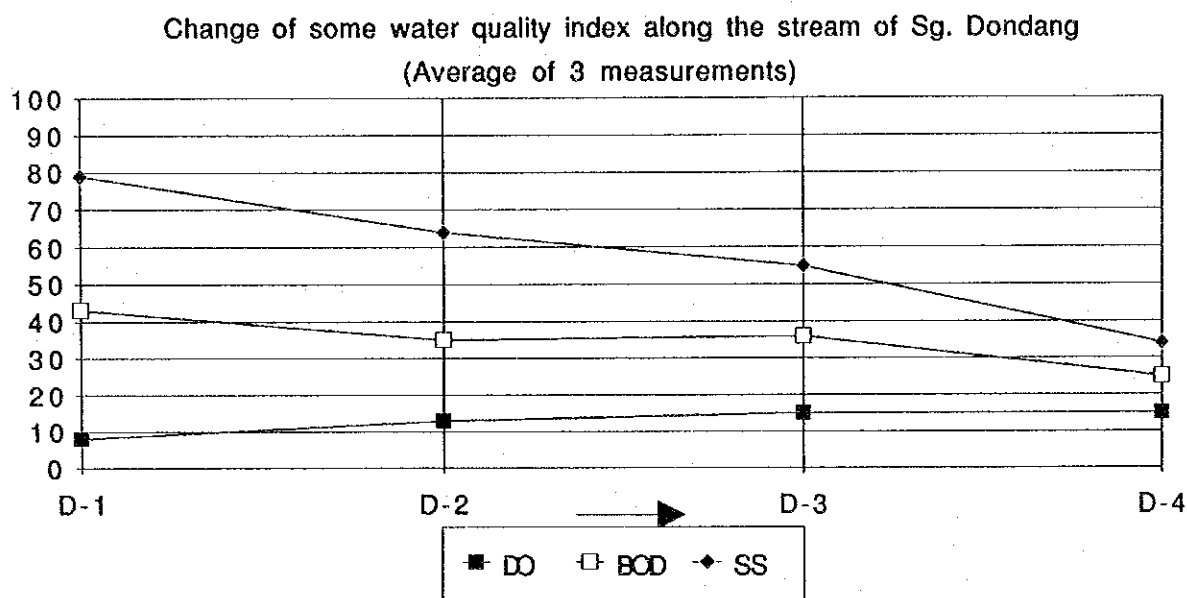


FIG. Q - 21

LOCATION OF SAMPLING POINTS FOR SG. DONDANG

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

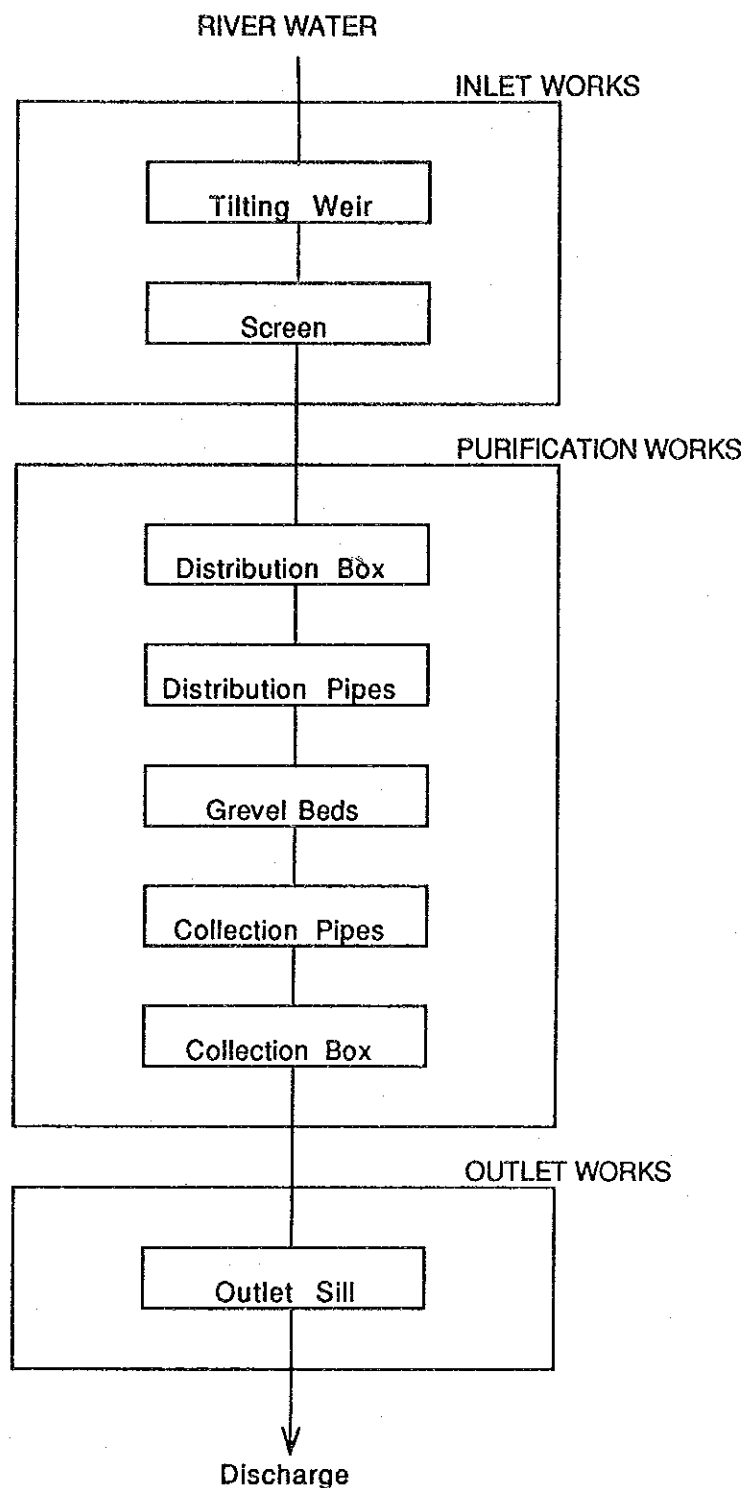


- * D-1 : Upstream of the Proposed Retention Pond-A
- D-2 : Downstream of the Proposed Retention Pond-A
- D-3 : Upstream of the Proposed Retention Pond-B
- D-4 : Upstream of the Proposed Retention Pond-C

FIG. Q-22

CHANGE OF SOME WATER QUALITY INDEX ALONG THE
STREAM OF SG. DONDANG

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

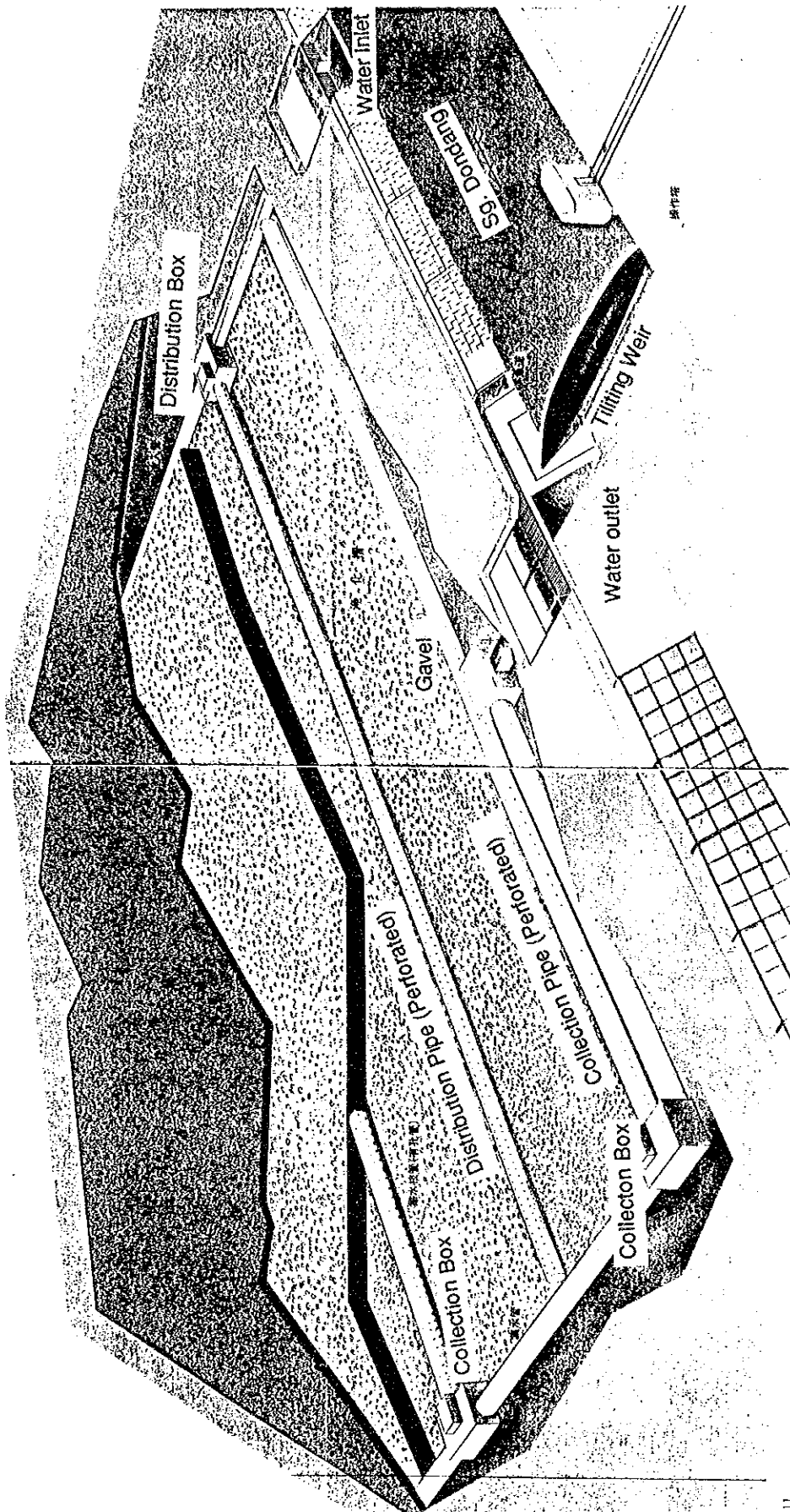


Flowsheet of GCP Facility

FIG. Q-23

FLOW SHEET OF GCP FACILITY

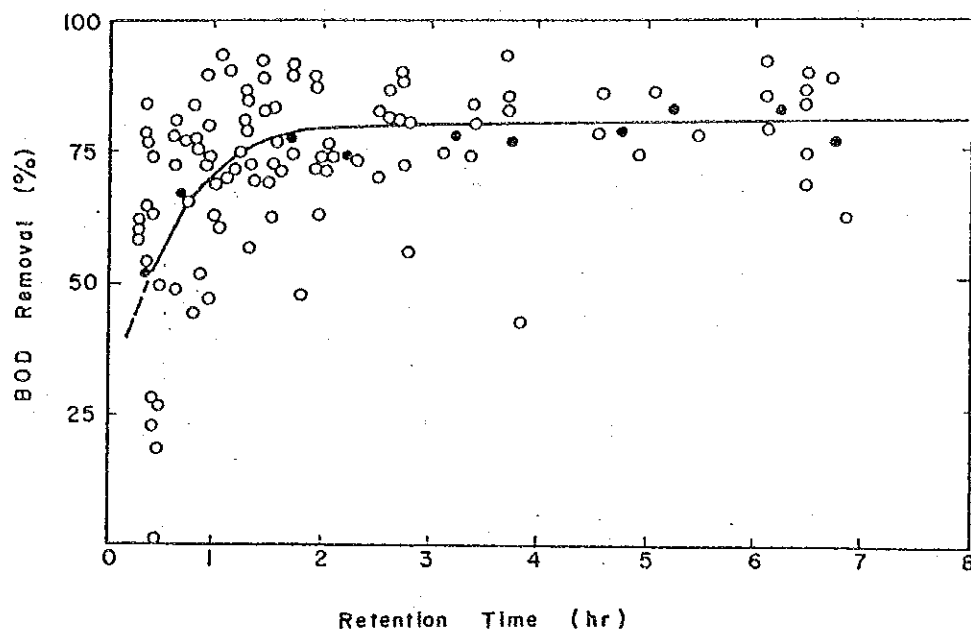
THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND



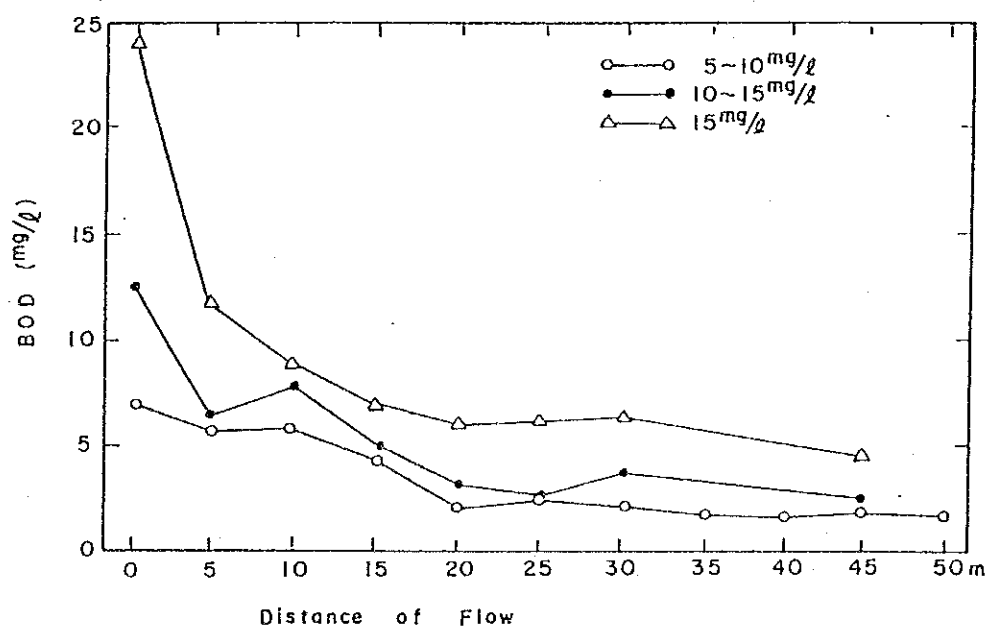
11

FIG. Q-24 CONCEPTUAL DRAWING OF GCP FACILITY

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND



RELATIONSHIP BETWEEN BOD REMOVAL RATE
AND RETENTION TIME IN A GRAVEL BED



BOD CHANGE BY DISTANCE OF FLOW IN A GRAVEL BED

(DATA FROM MOC)

FIG. Q-25
Q-26

RELATIONSHIP BETWEEN BOD REMOVAL RATE AND
RETENTION TIME IN A GRAVEL BED
BOD CHANGE BY DISTANCE OF FLOW IN A GRAVEL BED

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

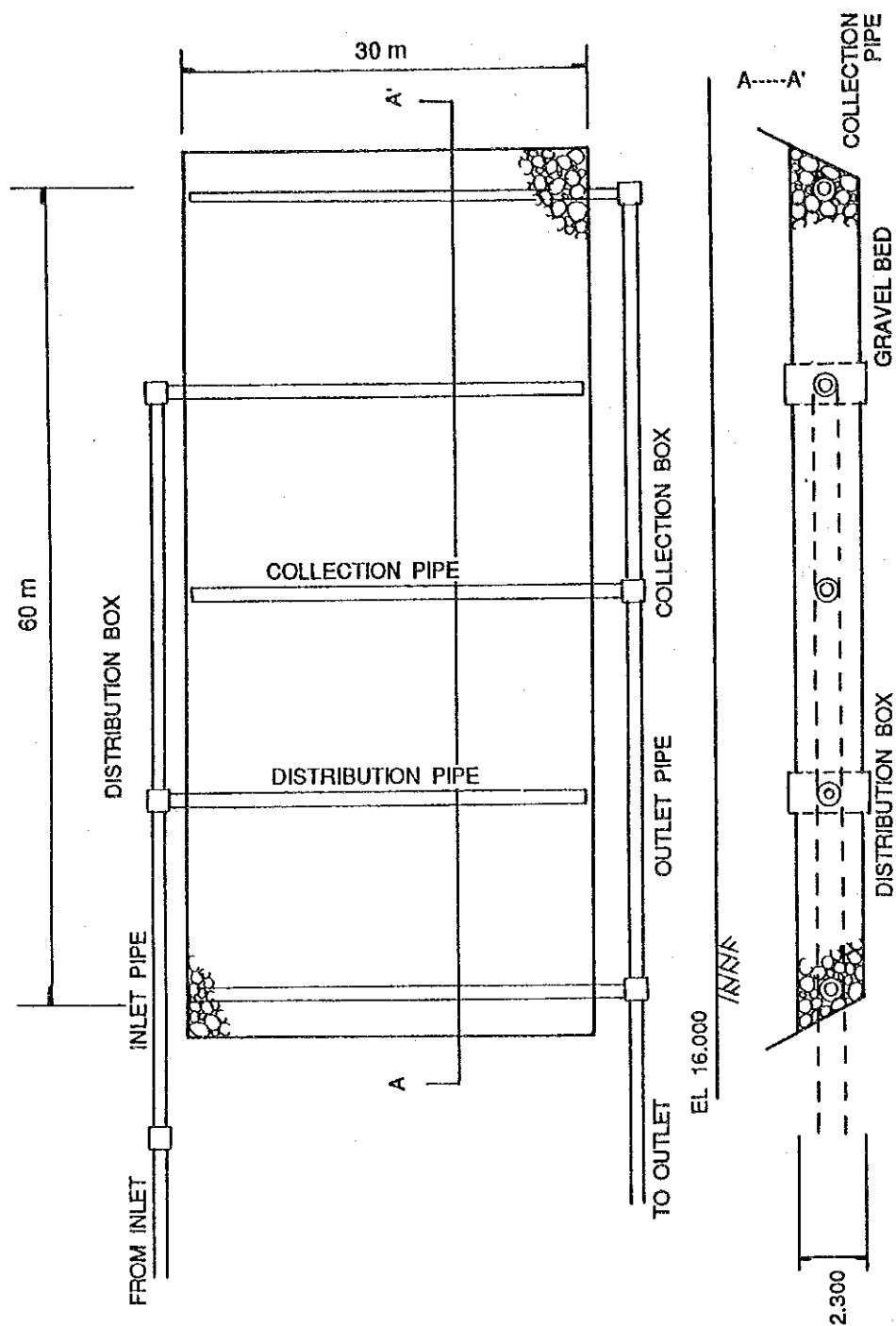


FIG. Q-27

LAYOUT OF GRAVEL BED

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

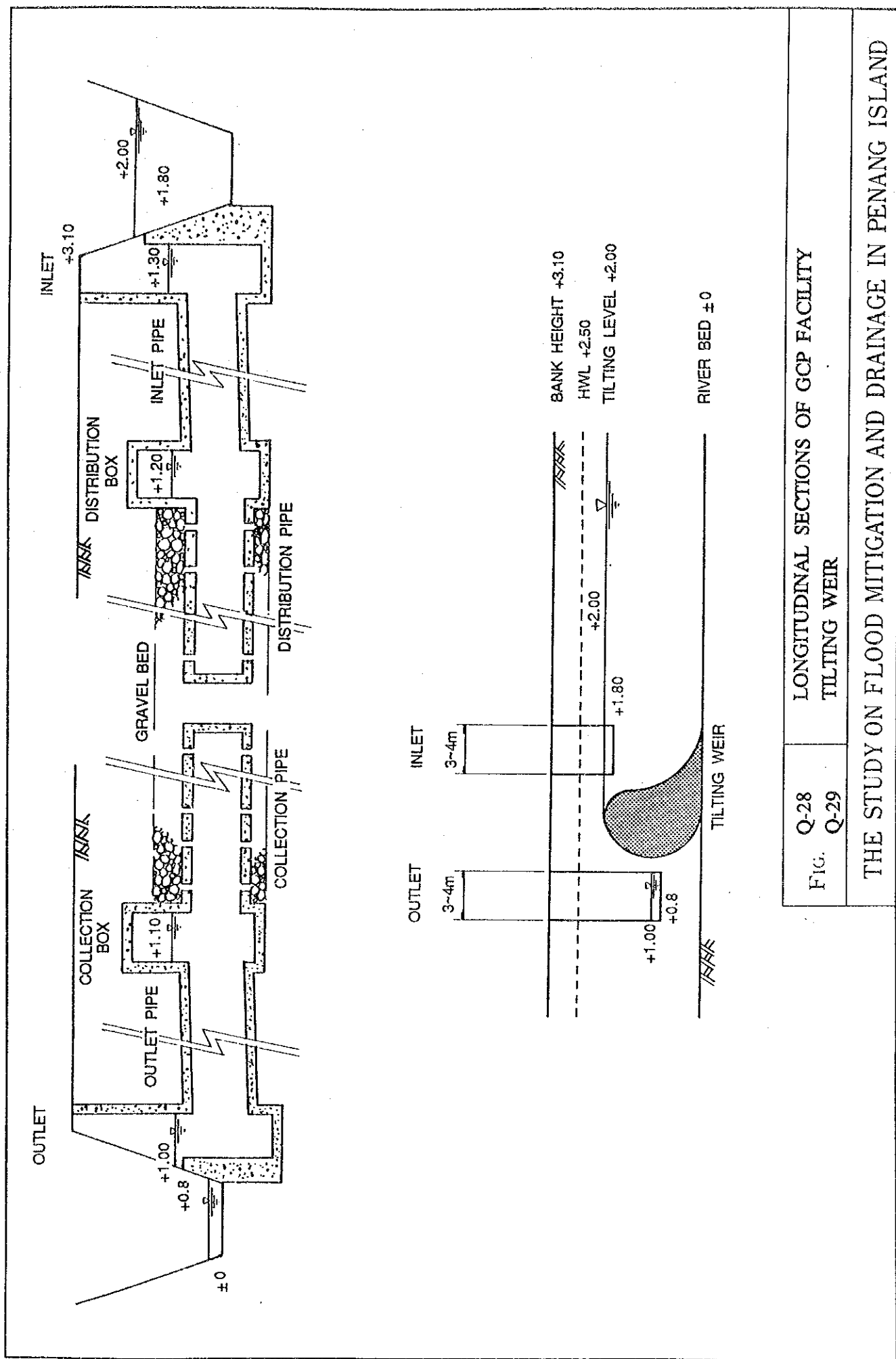


Fig. Q-28 LONGITUDINAL SECTIONS OF GCP FACILITY

Fig. Q-29 TILTING WEIR

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

Comparison between actual and calculated septic tank volume

Calculated required Volume (cum)

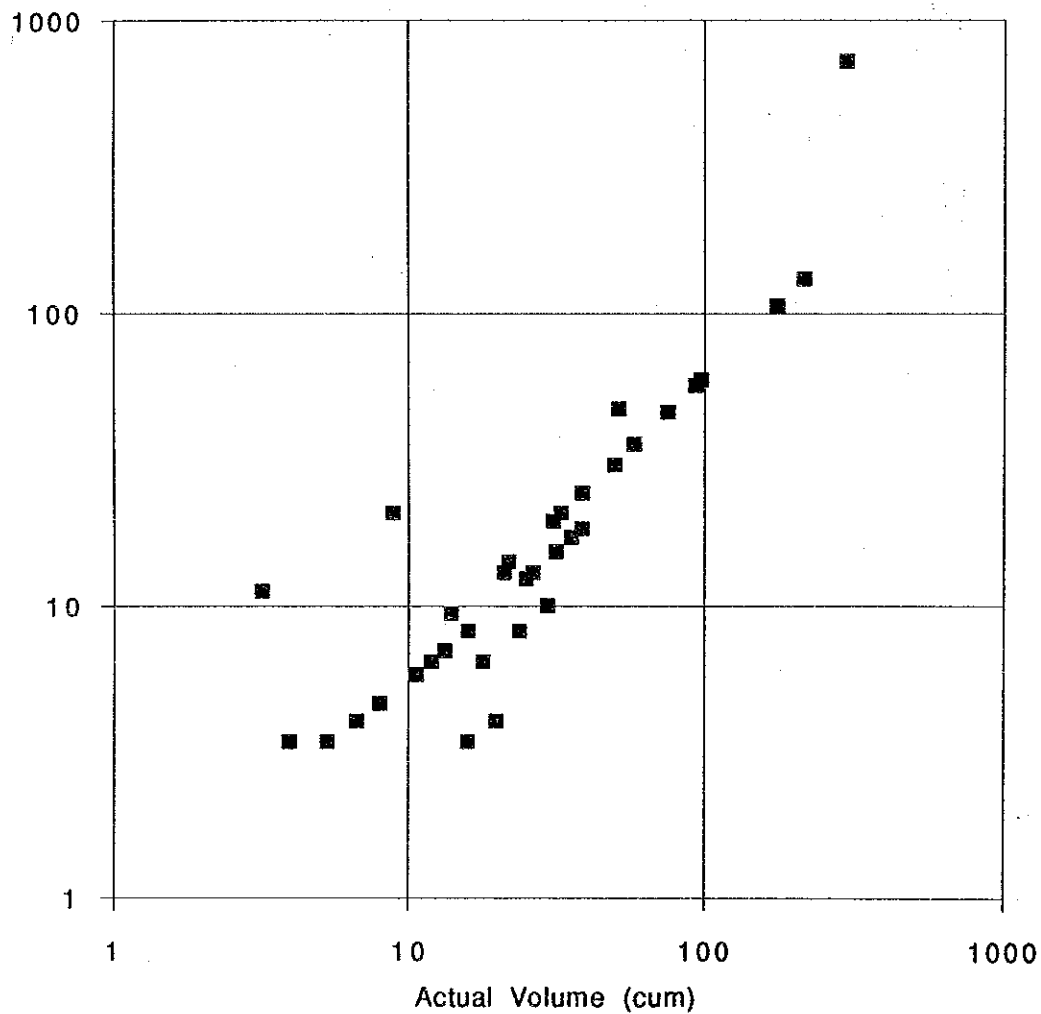


FIG. Q-30

COMPARISON BETWEEN ACTUAL AND CALCULATED SEPTIC
TANK VOLUME

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

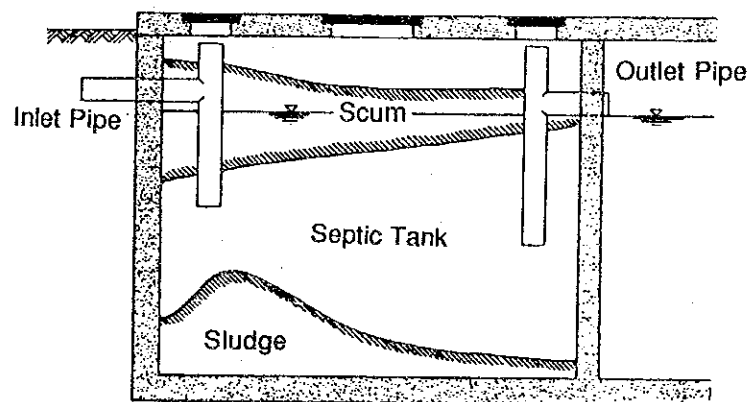


FIG. Q-31

ACCUMULATION CONDITIONS OF SCUM AND SLUDGE
IN SEPTIC TANK

THE STUDY ON FLOOD MITIGATION AND DRAINAGE IN PENANG ISLAND

