TABLES

Table VI-1 (1/2) Basic Features of Proposed Drainage Channels

Sungai Petani

Sub-basin Code	Related Drainage	Channel Length (m)	Ave. Channel Gradient (%)	No. of Bridges to be built	No. of B.Culvert to be built	Ave. Discharge (m3/s)	Ave. Channel Width (m)	Channel Area (m2)	Total Channel Area (1000m2)
Sg.Lalang Basin									
LA-1	Sg. Lalang	2,020	0.171	0	0	12.3	4	8,080	
LA-4	Alur C	2,200	0.455	0	2	15.4	4	8,800	
LA-5	Alur A	490	0.433	0	1	9.8	4	1,960	
LA-8	Sg. Bakap	1,350	0.372	0	5	24.5	4	5,400	24.2
Sg.Tukang Basin									
TU-2	Sg. Tukang	1,450	0.161	0	6	19.5	6	8,700	
TU-3	Cabang I-M	140	0.407	0	1	5.4	2	280	
TU-4	Sg. Tukang	700	0.133	0	2	34.5	6	4,200	
TU-5	Cabang H-L	1,700	0.353	0	4	37.2	6	10,200	23.4
Sg.Layer Besar Basin									
LB-1	Sg. Layar Besar	430	0.980	0	2	16.9	4	1,720	
LB-2	Sg. Layar Besar	2,070	0.248	0	5	34.0	6	12,420	
LB-3	Cabang D-E	680	0.309	0	1	19.7	4	2,720	
LB-4	Sg. Layar Besar	1,800	0.171	0	0	53.0	8	14,400	31.3
Sg.Che Bima Basin									
CB-1	Sg. Che Bima	1,070	0.138	0	0	13.2	4	4,280	
CB-2	Sg. Che Bima	1,300	0.138	0	5	25.0	6	7,800	
CB-3	Sg. Che Bima	1,200	0.138	0	1	34.5	6	7,200	19.3
Sg.Petani Basin									
PE-1	Sg. Pasir Kechil	1,420	0.434	0	5	16.3	4	5,680	
PE-2	Sg. Pasir Kechil	950	0.366	0	2	26.0	6	5,700	
PE-3	Line A1	1,200	0.623	0	8	23.7	4	4,800	
PE-4	Line A1	1,220	0.342	0	4	47.5	6	7,320	
PE-6	Sg. Petani	290	0.077	0	0	19.3	6	1,740	
PE-7	Line A	870	0.457	0	0	18.8	4	3,480	
PE-8	Line A	840	0.457	1	0	26.0	4	3,360	
PE-10	Line B	290	0.355	0	0	14.7	4	1,160	
	Line B1	300	0.376	0	1	10.4	4	1,200	
PE-12	Line C	1,080	0.356	0	2	12.1	4	4,320	
PE-14	Line D	900	0.423	0	3	10.1	4	3,600	
PE-16	Line E	680	0.372	0	5	21.7	4	2,720	
PE-17	Line F	230	0.265	0	2	11.2	4	920	
PE-19	Line G	300	0.370	0	0	10.4	4	1,200	
PE-20	Line G	1,600	0.370	0	4	20.0	4	6,400	
PE-22	Line H	100	0.210	0	1	10.6	4	400	
PE-24	Line N	970	0.830	0	5	25.1	4	3,880	
PE-25	Line N	990	0.321	5	2	46.0	6	5,940	
	Line P	260	0.305	0	3	11.9	4	1,040	
PE-26	Sg. Air Mendidih	1,310	0.138	3	1	55.5	8	10,480	
PE-28	Sg. Gelugor & Line L	600	0.378	0	2	24.8	4	2,400	
	Line K	220	0.168	0	0	12.6	4	880	
PE-29	Sg. Gelugor	1,800	0.267	2	1	46.0	6	10,800	
PE-30	Line Q	700	0.144	0	5	21.6	6	4,200	
PE-32	Sg. Bakar Arang & Line M	2,290	0.213	3	2	39.6	6	13,740	
PE-33	Line R	980	0.325	0	4	27.1	4	3,920	
	Line S	380	0.322	0	4	12.2	4	1,520	112.8
Sg.Pasir Basin									
PA-1	Sg. Pasir	370	0.030	0	0	10.7	6	2,220	
PA-9	Drain III & IV	300	0.200			19.3	6	1,800	4.0
Total Channel Area in Sungai Petani									215.0

Table VI-1 (2/2)   Basic Features of Proposed Drainage Channels

Melaka

Sub-basin Code	Related Drainage	Channel Length (m)	Ave. Channel Gradient (%)	No. of Bridges to be built	No. of B.Culvert to be built	Ave. Discharge (m3/s)	Ave. Channel Width (m)	Channel Area (m2)	Total Channel Area (1000m2)
Sg.Malim Basin									
AS-3	Pt. AB I	2,020	0.148	0	3	21.7	6	12,120	
AH-5	Pt. Cheng Besar	1,400	0.037	0	1	23.8	8	11,200	
AH-6	Pt. Cheng Kecil	1,860	0.024	0	3	11.3	8	14,880	
MA-3	Pt. Setulang Daing	2,390	0.134	0	8	16.6	8	19,120	57.3
Sg.Melaka Basin (Downstream of Merdeka Barrage)									
ME-2	Drain I	3,180	0.230	0	6	31.4	6	19,080	
ME-4	Drain II	640	0.111	0	1	33.7	6	3,840	
ME-6	Drain III	2,900	0.107	2	8	93.0	10	29,000	
ME-7	Drain IV	900	0.125	0	0	42.0	8	7,200	
ME-9	Drain V	920	0.167	0	2	32.8	6	5,520	
ME-10	Drain VI	1,820	0.087	0	2	24.6	6	10,920	
ME-11	Drain VII	600	0.100	0	2	8.1	4	2,400	
ME-12	Drain VIII	770	0.100	0	3	8.5	4	3,080	
ME-16	Drain X	1,090	0.154	0	1	18.8	6	6,540	87.6
Sg.Melaka Basin (Upstream of Merdeka Barrage)									
AR-1	Sg. Paya Rumput	2,200	0.344	0	3	15.0	4	8,800	
SB-1	Sg. Solo Bangsal	850	0.307	0	3	15.9	4	3,400	
SB-2	Sg. Solo Bangsal	2,150	0.130	0	1	25.5	6	12,900	25.1
Sg.Putat Basin									
PU-4	Sg. Ayer Saga	450	0.866	1	0	18.4	4	1,800	
PU-6	Sg. Bt. Bruang	2,100	0.699	3	0	50.4	6	12,600	14.4
Coastal Drainage System									
CD-2	Drain XII	500	0.200	0	2	9.6	4	2,000	
CD-3	Drain XIII	2,560	0.167	1	4	27.4	6	15,360	
CD-4	Drain XIV	2,710	0.012	5	3	34.4	10	27,100	
CD-5	Drain XV	600	0.067	1	0	12.7	6	3,600	
CD-6	Drain XVI	480	0.200	0	1	9.5	4	1,920	
CD-7	Drain XVII	1,380	0.067	1	0	18.8	6	8,280	58.3
Total Channel Area in Melaka									242.7

Table VI-2 (1/3) Summary of Characteristics by Type of Detention Pond

Description/Type of Pond	Non-community Pond		Community Pond	
	Earth Pond	Slope-Protection Pond	Slope-Protection Pond	Slope-Protection Pond
1. Design Concept				
Normal Condition of Pond	Dry	Dry	Wet	Dry
Applicability	Exclusively for flood detention use.	Exclusively for flood detention use.	Common use for flood detention and community space with watering place in the region under the condition that untreated domestic effluent does not store in the pond.	Common use for flood detention and community space in the region.
Practicability	Stable and consolidated soil condition is required to sustain excavation slope without surface protection.	This type is suitable in the site where high groundwater level and/or unconsolidated soil condition exits so as to sustain the slope stability. And, it is preferable under the condition of the restricted right-of –way, since a required pond area can be minimized with the adoption of steep and deep pond wall protected by stone pitching.	Relatively hilly and/or undulating site is suitable to make stages of pond bottom. Rather large-scale development is expected to make the most of development scale. Generally it is necessary to provide slope protection against stability in the circumstances of community use for the public.	Relatively hilly and/or undulating site is suitable to make stages of pond bottom. Rather large-scale development is expected to make the most of development scale. Generally it is necessary to provide slope protection against stability in the circumstances of community use for the public.

Table VI-2 (2/3)   Summary of Characteristics by Type of Detention Pond

Description/Type of Pond	Non-community Pond		Community Pond	
	Earth Pond	Slope-Protection Pond	Slope-Protection Pond	Slope-Protection Pond
2. Structural Features				
Structural Design	Excavation pond with gentle slope.	Excavation pond with steep slope.	Excavation pond with higher & lower stages.	Excavation pond with higher & lower stages.
Slope Protection	Turfing	Stone-pitching	Stone-pitching	Stone-pitching
Bottom Protection	Turfing	Concrete lining	Higher stage : Turfing Lower stage : Natural	Higher stage : Turfing Lower stage : Turfing
Concrete Drain at the bottom	Concrete drain should be provided to keep the bottom dry up.	Concrete drain should be provided to keep the bottom dry up.	Not provided.	Concrete drain should be provided to keep the bottom dry up.
In/Outlet Structures	With rubbish trap and screen	With rubbish trap and screen	With rubbish trap and screen	With rubbish trap and screen
Storm Outfall with rerouted pipe	To prevent influx of untreated domestic effluent	To prevent influx of untreated domestic effluent	Not provided	To prevent influx of untreated domestic effluent

Table VI-2 (3/3) Summary of Characteristics by Type of Detention Pond

Description/Type of Pond		Non-community Pond		Community Pond	
		Earth Pond	Slope-Protection Pond	Slope-Protection Pond	Slope-Protection Pond
3. Others					
Case Study of Typical Pond (Storage Capacity : 12,800m3)	Surface Area of Pond	4,800 m2	4,400 m2	6,600 m2	6,600 m2
	Effective Storage Depth	3.2 m	3.2 m	3.2 m	3.2 m
	Required Site Area	6,100 m2	5,500 m2	8,200 m2	8,250 m2
	Estimated Construction Cost	0.15 million RM (100%)	0.34 million RM (210%)	0.29 million RM (200%)	0.27 million RM (180%)
Maintenance		Diligent maintenance should be carried out; otherwise a pond function will be deteriorated shortly.	Easy maintenance is expected.	Diligent maintenance should be executed; otherwise a pond function will be deteriorated shortly.	Diligent maintenance should be carried out; otherwise a pond function will be deteriorated shortly.
Environment/ Resident's Concern		Natural condition can be sustained when the bottom is dried up adequately.	Detention function of pond precedes natural environment.	Since the pond area with watering place can be used for multiple purposes, the resident's concern on the environment of the pond can be enhanced.	Since the pond area can be dried and used for multiple purposes, the resident's concern on the environment of the detention pond can be enhanced.
Reference Figures		Fig. VI-4 (1/4)	Fig. VI-4 (2/4)	Fig. VI-4 (3/4)	Fig. VI-4 (4/4)

Table VI-3 Basic Unit Costs/Prices Applied for Cost Estimate in Sungai Petani and Melaka

Item	Unit	Applied Cost (RM) May 1999	Remarks
1.Civil Engineering Construction			
Excavation (common, by mechanical equipment)	m3	2.0	
Excavation (foundation, by hand)	m3	13.5	
Excavation (foundation, by mechanical equipment)	m3	8.0	
Embankment (earthfill)	m3	12.0	
Steel Round bar	ton	1,200.0	
Steel Screen	ton	2,400.0	
Sluice Gate	ton	7,000.0	
Revetment/wall (Stone-Pitching, t=250mm)	m2	65.0	
Revetment/wall (One brickwall, t=250mm)	m2	60.0	
Revetment/wall (CHBl, t=190mm)	m2	52.0	
Mass. Concrete	m3	180.0	
R.C. Concrete	m3	250.0	
Concret Pavement (t=120mm)	m2	30.0	
PC pile (150mm x 150mm)	m	30.0	
PC pile (200mm x 200mm)	m	33.0	
Pipe Culvert (600mm)	m	120.0	
Pipe Culvert (900mm)	m	190.0	
Road Work (130mm thick crusher run w/ 50mm pavement)	m2	6.0	
Close Turfing	m2	4.0	
Roadside Drain (300mm x 300mm)	m	12.5	
PVC Rainwater Downpipe (100mm) w/ fixture	m	24.0	
PVC Half Round (150mm) Rainwater Gutter w/ fixture	m	35.0	
FRP Water Tank (2000l) w/ fixture	no.	800.0	
Chain Link Fencing (1.8m high)	m	45.0	
2. Land Prices			
			Land Acquisition :
Residential Area	m2	50.0	for drainage channel areas
Agricultural Land (rubber)	m2	6.2	for detention pond areas
3. Labour Wages			
Foreman	day	80.0	
Equipment Operator	day	55.0	
Stonemason	day	48.0	
Common Labour	day	33.0	

Table VI-4 (1/2) Unit Construction Cost of RC Drainage Channel Improvement

(Width x Depth : 1m x 1m) Unit : RM/m

Description of Work	Unit	Quantity	Unit Price(RM)	Amount(RM)	Remarks
1. Direct Cost					
a. Earth Work					
Common excavation	m3	1.344	2.00	2.7	by mech.equip
Foundation excavation	m3	0.336	10.75	3.6	50%:hand,50%:mech.
b. Concrete Work					
R.C. channel	m3	0.544	250.00	136.0	
c. Others (5% of the above)	L.S.			7.1	
2. Indirect Cost (20% of 1.)	L.S.			29.9	
3. Land Acquisition	m2	0.5	50.00	25.0	
4. Total (1.+2.+3.)				204.3	

(Width x Depth : 2m x 1.5m) Unit : RM/m

Description of Work	Unit	Quantity	Unit Price(RM)	Amount(RM)	Remarks
1. Direct Cost					
a. Earth Work					
Common excavation	m3	3.500	2.00	7.0	by mech.equip
Foundation excavation	m3	0.875	10.75	9.4	50%:hand,50%:mech.
b. Concrete Work					
R.C. channel	m3	1.1	250.00	275.0	
c. Others (5% of the above)	L.S.			14.6	
2. Indirect Cost (20% of 1.)	L.S.			61.2	
3. Land Acquisition	m2	1	50.00	50.0	
4. Total (1.+2.+3.)				417.2	

(Width x Depth : 4m x 2m) Unit : RM/m

Description of Work	Unit	Quantity	Unit Price(RM)	Amount(RM)	Remarks
1. Direct Cost					
a. Earth Work					
Common excavation	m3	8.464	2.00	16.9	by mech.equip
Foundation excavation	m3	2.116	10.75	22.7	50%:hand,50%:mech.
b. Concrete Work					
R.C. channel	m3	2.064	250.00	516.0	
c. Others (5% of the above)	L.S.			27.8	
2. Indirect Cost (20% of 1.)	L.S.			116.7	
3. Land Acquisition	m2	2.0	50.00	100.0	
4. Total (1.+2.+3.)				800.2	

Table VI-4 (2/2)   Unit Construction Cost of RC Drainage Channel Improvement

(Width x Depth : 6m x 2.5m)   Unit : RM/m

Description of Work	Unit	Quantity	Unit Price(RM)	Amount(RM)	Remarks
1. Direct Cost					
a. Earth Work					
Common excavation	m3	15.276	2.00	30.6	by mech.equip
Foundation excavation	m3	3.819	10.75	41.1	50%:hand,50%:mech.
b. Concrete Work					
R.C. channel	m3	3.276	250.00	819.0	
c. Others (5% of the above)	L.S.			44.5	
2. Indirect Cost (20% of 1.)	L.S.			187.0	
3. Land Acquisition	m2	3.0	50.00	150.0	
4. Total (1.+2.+3.)				1,272.2	

(Width x Depth : 8m x 3m)   Unit : RM/m

Description of Work	Unit	Quantity	Unit Price(RM)	Amount(RM)	Remarks
1. Direct Cost					
a. Earth Work					
Common excavation	m3	23.936	2.00	47.9	by mech.equip
Foundation excavation	m3	5.984	10.75	64.3	50%:hand,50%:mech.
b. Concrete Work					
R.C. channel	m3	4.736	250.00	1,184.0	
c. Others (5% of the above)	L.S.			64.8	
2. Indirect Cost (20% of 1.)	L.S.			272.2	
3. Land Acquisition	m2	4.0	50.00	200.0	
4. Total (1.+2.+3.)				1,833.2	

(Width x Depth :10m x 3.5m)   Unit : RM/m

Description of Work	Unit	Quantity	Unit Price(RM)	Amount(RM)	Remarks
1. Direct Cost					
a. Earth Work					
Common excavation	m3	34.444	2.00	68.9	by mech.equip
Foundation excavation	m3	8.611	10.75	92.6	50%:hand,50%:mech.
b. Concrete Work					
R.C. channel	m3	6.444	250.00	1,611.0	
c. Others (5% of the above)	L.S.			88.6	
2. Indirect Cost (20% of 1.)	L.S.			372.2	
3. Land Acquisition	m2	5.0	50.00	250.0	
4. Total (1.+2.+3.)				2,483.3	

Table VI-5   Unit Construction Cost of Concrete Box Culvert

(Width x Depth : 1m x 1m)   Unit : RM/m

Description of Work	Unit	Quantity	Unit Price(RM)	Amount(RM)	Remarks
1. Direct Cost					
a. Earth Work					
Common excavation	m3	0.900	2.00	1.8	by mech.equip
Foundation excavation	m3	0.225	10.75	2.4	50%:hand,50%:mech.
b. Concrete Work					
R.C. box culvert	m3	1	250.00	250.0	
c. Others					
(5% of the above)	L.S.			12.7	
2. Indirect Cost (20% of 1.)	L.S.			53.4	
3. Total (1.+2.)				320.3	

(Width x Depth : 2m x 1.5m)   Unit : RM/m

Description of Work	Unit	Quantity	Unit Price(RM)	Amount(RM)	Remarks
1. Direct Cost					
a. Earth Work					
Common excavation	m3	2.184	2.00	4.4	by mech.equip
Foundation excavation	m3	0.546	10.75	5.9	50%:hand,50%:mech.
b. Concrete Work					
R.C. box culvert	m3	1.968	250.00	492.0	
c. Others					
(5% of the above)	L.S.			25.1	
2. Indirect Cost (20% of 1.)	L.S.			105.5	
3. Total (1.+2.)				632.8	

(Width x Depth : 4m x 2m)   Unit : RM/m

Description of Work	Unit	Quantity	Unit Price(RM)	Amount(RM)	Remarks
1. Direct Cost					
a. Earth Work					
Common excavation	m3	5.274	2.00	10.5	by mech.equip
Foundation excavation	m3	1.318	10.75	14.2	50%:hand,50%:mech.
b. Concrete Work					
R.C. box culvert	m3	4.147	250.00	1,036.8	
c. Others					
(5% of the above)	L.S.			53.1	
2. Indirect Cost (20% of 1.)	L.S.			222.9	
3. Total (1.+2.)				1,337.5	

Table VI-6   Unit Construction Cost of R.C. Bridge

(Span x Height of pier : 5m x 2.25m)   Unit : RM/m

Description of Work	Unit	Quantity	Unit Price(RM)	Amount(RM)	Remarks
1. Direct Cost					
a. Earth Work					
Common excavation	m3	3.600	2.00	7.2	by mech.equip
Foundation excavation	m3	0.900	10.75	9.7	50%:hand,50%:mech.
b. Piling					
PC pile (200mm x 200mm)	m	22.400	33.00	739.2	
c. Concrete Work					
R.C. beam	m3	1.782	250.00	445.5	
Abutment	m3	0.324	250.00	81.0	
d. Others					
(5% of the above)	L.S.			64.1	
2. Indirect Cost	L.S.			269.3	
(20% of 1.)					
3. Total (1.+2.)				1,616.0	

(Span x Height of pier : 6m x 2.5m)   Unit : RM/m

Description of Work	Unit	Quantity	Unit Price(RM)	Amount(RM)	Remarks
1. Direct Cost					
a. Earth Work					
Common excavation	m3	4.000	2.00	8.0	by mech.equip
Foundation excavation	m3	1.000	10.75	10.8	50%:hand,50%:mech.
b. Piling					
PC pile (200mm x 200mm)	m	25.600	33.00	844.8	
c. Concrete Work					
R.C. beam	m3	2.34	250.00	585.0	
Abutment	m3	0.4	250.00	100.0	
d. Others					
(5% of the above)	L.S.			77.4	
2. Indirect Cost	L.S.			325.2	
(20% of 1.)					
3. Total (1.+2.)				1,951.2	

(Span x Height of pier : 8m x 3m)   Unit : RM/m

Description of Work	Unit	Quantity	Unit Price(RM)	Amount(RM)	Remarks
1. Direct Cost					
a. Earth Work					
Common excavation	m3	4.800	2.00	9.6	by mech.equip
Foundation excavation	m3	1.200	10.75	12.9	50%:hand,50%:mech.
b. Piling					
PC pile (200mm x 200mm)	m	32.000	33.00	1,056.0	
c. Concrete Work					
R.C. beam	m3	3.672	250.00	918.0	
Abutment	m3	0.576	250.00	144.0	
d. Others					
(5% of the above)	L.S.			107.0	
2. Indirect Cost	L.S.			449.5	
(20% of 1.)					
3. Total (1.+2.)				2,697.0	

(Span x Height of pier : 10m x 3.5m)   Unit : RM/m

Description of Work	Unit	Quantity	Unit Price(RM)	Amount(RM)	Remarks
1. Direct Cost					
a. Earth Work					
Common excavation	m3	5.600	2.00	11.2	by mech.equip
Foundation excavation	m3	1.400	10.75	15.1	50%:hand,50%:mech.
b. Piling					
PC pile (200mm x 200mm)	m	38.400	33.00	1,267.2	
c. Concrete Work					
R.C. beam	m3	5.04	250.00	1,260.0	
Abutment	m3	0.784	250.00	196.0	
d. Others					
(5% of the above)	L.S.			137.5	
2. Indirect Cost	L.S.			577.4	
(20% of 1.)					
3. Total (1.+2.)				3,464.3	