

Table 7.2.3.3 Imported Materials/Equipment Cost of Sewer Construction

Unit: Tk

Area	Material	Diameter	Average Sewer Covering							Total	
			1.0 m	2.0 m	3.0 m	4.0 m	5.0 m	6.0 m	7.0 m		
New Service Area	PVC	200	15,888,795	5,625,555	1,263,015	96,135	0	0	0	22,873,500	
	PVC	250	0	89,460	0	94,430	258,440	0	0	442,330	
	RC	900	0	7,369,350	0	0	0	0	0	7,369,350	
	RC	1000	0	1,975,600	6,106,400	2,559,300	0	0	0	10,641,300	
	RC	1100	0	0	0	14,391,000	4,981,500	0	0	19,372,500	
	RC	1200	0	0	0	0	3,772,900	0	0	3,772,900	
	RC	1500	0	0	0	0	6,817,000	25,864,500	601,500	33,283,000	
	<b>Sub-total</b>			15,888,795	15,059,965	7,369,415	17,140,865	15,829,840	25,864,500	601,500	97,754,880
	SP	1100		57,376,000	0	0	0	0	0	0	57,376,000
<b>Total</b>			73,264,795	15,059,965	7,369,415	17,140,865	15,829,840	25,864,500	601,500	155,130,880	
Existing Service Area	PVC	300	543,620	0	480,080	0	0	0	0	1,023,700	
	PVC	350	18,620	931,000	0	1,117,200	0	0	0	2,066,820	
	PVC	400	1,610,140	0	0	2,168,495	0	0	0	3,778,635	
	RC	700	0	0	0	0	3,436,400	0	0	3,436,400	
	RC	800	0	6,543,600	0	0	4,993,800	0	0	11,537,400	
	RC	1100	0	0	0	8,856,000	0	0	0	8,856,000	
	<b>Sub-total</b>			2,172,380	7,474,600	480,080	12,141,695	8,430,200	0	0	30,698,955
	SP	900		11,385,980	0	0	0	0	0	0	11,385,980
<b>Total</b>			13,558,360	7,474,600	480,080	12,141,695	8,430,200	0	0	42,084,935	
Grand Total	F/S	Local	15,888,795	5,715,015	1,263,015	190,565	258,440	0	0	23,315,830	
		Foreign	42,246,360	16,819,550	6,586,480	29,091,995	24,001,600	25,864,500	601,500	145,211,985	
		<b>Total</b>	58,135,155	22,534,565	7,849,495	29,282,560	24,260,040	25,864,500	601,500	168,527,815	
	M/P	Local	15,888,795	5,715,015	1,263,015	190,565	258,440	0	0	23,315,830	
		Foreign	70,934,360	16,819,550	6,586,480	29,091,995	24,001,600	25,864,500	601,500	173,899,985	
		<b>Total</b>	86,823,155	22,534,565	7,849,495	29,282,560	24,260,040	25,864,500	601,500	197,215,815	

Note: PVC: Polyvinyl Chloride Pipe, RC: Reinforced Concrete Pipe, SP: Steel Pipe

## Appendix 7.2.4 Direct Construction Cost of Pump Station

**Table 7.2.4.1 Direct Construction Cost and Electrical Demand of Each Pump Station**

Unit: Tk

		Merul Pump Station		Gulshan Pump Station		Total	
		F/S	M/P	F/S	M/P	F/S	M/P
Daily Average		43,320m <sup>3</sup> /day	104,500m <sup>3</sup> /day	33,242m <sup>3</sup> /day	43,699m <sup>3</sup> /day	-	-
Daily Maximum		52,440m <sup>3</sup> /day	130,625m <sup>3</sup> /day	40,240m <sup>3</sup> /day	54,624m <sup>3</sup> /day	-	-
Hourly Maximum		66,120m <sup>3</sup> /day	167,200m <sup>3</sup> /day	50,738m <sup>3</sup> /day	69,918m <sup>3</sup> /day	-	-
Civil	Local	368,000	379,000	344,000	344,000	712,000	723,000
	Foreign	59,005,000	115,434,000	32,117,000	32,117,000	91,122,000	147,551,000
	Sub-Total	59,373,000	115,813,000	32,461,000	32,461,000	91,834,000	148,274,000
Mechanical /Electrical	Foreign	176,028,000	311,746,000	118,115,000	136,157,000	294,143,000	447,903,000
Total	Local	368,000	379,000	344,000	344,000	712,000	723,000
	Foreign	235,033,000	427,180,000	150,232,000	168,274,000	385,265,000	595,454,000
	Sub-Total	235,401,000	427,559,000	150,576,000	168,618,000	385,977,000	596,177,000
Land Acquisition	Local	10,934,000	10,934,000	7,702,000	7,702,000	18,636,000	18,636,000
Imported Materials /Equipment	Foreign	176,028,000	311,746,000	118,115,000	136,157,000	294,143,000	447,903,000
Total Electrical Power	-	344.7kw	675.3kw	149.7kw	194.9kw	-	-
Annual Electric Consumption	-	1,493,387kwh	3,540,389kwh	771,971kwh	1,000,987kwh	-	-
Annual Repair Expense	Local	4,170,000	7,595,000	2,739,000	3,165,000	6,909,000	10,760,000

Table 7.2.4.2 Civil Direct Construction Cost of Merul Pump Station

Unit: Tk

Item	Unit	Unit Price	Quantity		Total	
			F/S	M/P	F/S	M/P
Sheet Pile Installation	Lraf	4,925	289	447	1,423,325	2,201,475
Sheet Pile Withdrawal	Lraf	3,193	289	447	922,777	1,427,271
Steel Support Installation	t	5,229	46.24	71.44	241,788	373,559
Excavation(Backhoe-1)	cu.m	90	1,099	1,981	98,910	178,290
Excavation(Cramshell)	cu.m	160	5,551	10,005	888,160	1,600,800
Excavation(Backhoe-2)	cu.m	90	550	991	49,500	89,190
Manual Subgrading	sq.m	50	550	991	27,500	49,550
Backfilling (backhoe)	cu.m	150	887	1,337	133,050	200,550
Backfilling (Cramshell)	cu.m	220	1,437	2,166	316,140	476,520
Disposal	cu.m	230	4,875	9,473	1,121,250	2,178,790
Reinforced Concrete	cu.m	20,700	2,314	4,590	47,899,800	95,013,000
Plain Concrete	cu.m	7,200	37	72	266,400	518,400
Gravel Foundation	cu.m	2,000	74	145	148,000	290,000
Architecture	sq.m	37,500	136	289	5,100,000	10,837,500
Land Acquisition	sq.m	7,500	1,457.90	1,457.90	10,934,250	10,934,250
Road Pavement (Asphalt)	sq.m	1,020	239	239	243,780	243,780
Fence	m	610	139	157	84,790	95,770
Water Supply Connection	set	9,850	1	1	9,850	9,850
Telephone Connection	set	30,000	1	1	30,000	30,000
Total	Local				368,420	379,400
	Foreign				69,939,270	115,434,895
	Total				70,307,690	115,814,295

Table 7.2.4.3 Quantity Calculation Formula of Merul Pump Station

Item	Formula	
	F/S	M/P
Sheet Pile Installation	$(45.8+12)*2/0.4$	$(45.8+12)*2/0.4+(42+10.5*2)/0.4$
Sheet Pile Withdrawal	$(45.8+12)*2/0.4$	$(45.8+12)*2/0.4+(42+10.5*2)/0.4$
Steel Support Installation	$(45.8+12)*2*0.1*4$	$(45.8+12)*2*0.1*4+(42+10.5*2)*0.1*4$
Excavation(Backhoe-1)	$(45.8*12)*2$	$(45.8*12+42*10.5)*2$
Excavation(Cramshell)	$(45.8*12)*(6.5+6.3+0.3-2-1)$	$(45.8*12+42*10.5)*(6.5+6.3+0.3-2-1)$
Excavation(Backhoe-2)	$(45.8*12)*1$	$(45.8*12+42*10.5)*1$
Manual Subgrading	$45.8*12$	$45.8*12+42*10.5$
Backfilling (backhoe)	$(45.8*12-(39*9+4.6*4.6))*5$	$(45.8*12+42*10.5-(39*18+4.6*4.6))*5$
Backfilling (Cramshell)	$(45.8*12-(39*9+4.6*4.6))*(6.5+6.3+0.3-5)$	$(45.8*12+42*10.5-(39*18+4.6*4.6))*(6.5+6.3+0.3-5)$
Disposal	$(39*9+4.6*4.6)*(6.5+6.3+0.3)$	$(39*18+4.6*4.6)*(6.5+6.3+0.3)$
Reinforced Concrete	$(39*9*(0.5*2+1)+4.6*4.6*(0.5+1))+((39+9+4.6+4.6)*2+7)*(7+5.3)*0.8*1.2$	$(39*18*(0.5*2+1)+4.6*4.6*(0.5+1))+((39+9+4.6+4.6)*2+7)*(7+5.3)*0.8*2*1.2$
Plain Concrete	$(39*9+4.6*4.6)*0.1$	$(39*18+4.6*4.6)*0.1$
Gravel Foundation	$(39*9+4.6*4.6)*0.2$	$(39*18+4.6*4.6)*0.2$
Architecture	17*8	17*17
Land Acquisition	47.8*30.5	47.8*30.5
Road Pavement (Asphalt)	47.8*5	47.8*5
Fence	$(47.8+21.5)*2$	$(47.8+30.5)*2$
Water Supply Connection	1	1
Telephone Connection	1	1

**Table 7.2.4.4 Calculation for Unit Price of Civil Construction of Merul Pump Station**

**Steel Sheet Pile Jacking (Hydraulic Sheet Piler) L = 13 m**

Items	Specification	Unit	Quantity	Unit Cost	Cost	Remarks
Foreman		person	0.91	260	236	
Scaffolder		person	1.82	210	382	
Skilled Labor		person	0.91	148	134	
Sheet Piler Operation	100-130 t	day	0.91	43,177	39,291	
Generator Operation	75kVA	day	0.91	4,310	3,922	
Truck Crane Operation	25ton	hr	0.91	5,812	5,288	
<b>Total</b>					<b>49,253</b>	
Per 1 sheet					4,925	

**Steel Sheet Pile Withdrawing (Hydraulic Sheet Piler) L = 13 m**

Items	Specification	Unit	Quantity	Unit Cost	Cost	Remarks
Foreman		person	0.59	260	153	
Scaffolder		person	1.18	210	247	
Skilled Labor		person	0.59	148	87	
Sheet Piler Operation	100-130 ton	day	0.59	43,177	25,474	
Generator Operation	75kVA	day	0.59	4,310	2,543	
Truck Crane Operation	25ton	hr	0.59	5,812	3,428	
<b>Total</b>					<b>31,932</b>	
Per 1 sheet					3,193	

**Hydraulic Sheet Piler Operation Cost**

Items	Specification	Unit	Quantity	Unit Cost	Cost	Remarks
Ownership Cost		day	1.62	26,653	43,177	
Miscellaneous Cost		Unit			0	
<b>Total</b>					<b>43,177</b>	

**Support Installation Cost**

**Strut and Wale Installation Cost**

Items	Specification	Unit	Quantity	Unit Cost	Cost	Remarks
Foreman		person	1.6	260	416	
Scaffolder		person	3.2	210	672	
Welder		person	1.6	210	336	
Unskilled Labor		person	3.2	130	416	
Truck Crane Rental Fee	15-16ton	day	1.6	15,144	24,230	
Welding Machine Operation Cost	250A	day	1.6	6,058	9,692	
Miscellaneous Cost		unit			129	7% of labor
<b>Total</b>	per 10 ton				<b>35,891</b>	
Per 1 ton					3,589	

**Strut and Wale Withdrawal Cost**

Items	Specification	Unit	Quantity	Unit Cost	Cost	Remarks
Foreman		person	1.0	260	260	
Scaffolder		person	2.0	210	420	
Welder		person	1.0	210	210	
Unskilled Labor		person	2.0	130	260	
Truck Crane Rental Fee	15-16ton	day	1.0	15,144	15,144	
Miscellaneous Cost		unit			115	10% of labor
<b>Total</b>	per 10 ton				<b>16,409</b>	
Per 1 ton					1,640	

**Table 7.2.4.5 Calculation Sheet for Number of Sheet pile of Merul Pump Station**

Length of Sheet Pile                      L =                      17  
 Installation Time per Sheet Pile        Nmax =                15  
 Installation No. per Day                    N =                      11

	L ≤ 2m	2m < L ≤ 4m	4m < L ≤ 6m	6m < L ≤ 9m	9m < L ≤ 12m	12m < L ≤ 16m	16m < L ≤ 20m
Nmax < 10	50	42	32	25	19	16	13
10 < Nmax < 20	46	38	29	22	17	13	11
20 < Nmax < 30	43	35	26	19	15	12	

Length of Sheet Pile                      L =                      17  
 Withdrawal Time per Sheet Pile        Nmax =                15  
 Withdrawal No. per Day                    N =                      17

	L ≤ 2m	2m < L ≤ 4m	4m < L ≤ 7m	7m < L ≤ 11m	11m < L ≤ 15m	15m < L ≤ 20m
No. of Pile	65	55	40	28	21	17

Table 7.2.4.6 Equipment Cost & Power Consumption of Merul Pump Station at Feasibility Study (2005)

Merul Pump Station at Feasibility Study (2005)		Daily Average/Daily Maximum/Hourly Maximum 43,320/52,440/66,120m <sup>3</sup> /day						
Item No.	Name of Equipment	Specification	Power	Unit Cost (Yen'000)	Qty.	Total Cost (Yen'000)	Remarks	
<b>Mechanical Equipment</b>								
1	Inlet Gate	Manually operated Cast Iron Type	W1500mm×H1500mm	---	6,440	1	6,440	
2	Gate	Manually operated Cast Iron Type	W1300mm×H1300mm	---	4,255	4	17,020	
3	Screen	Hand Raked Bar Screen	W1700mm×H1500mm×D50mm	---	3,327	2	6,654	
4	Sand Pump	Submersible Sand Lifting Pump	φ80mm×0.2m <sup>3</sup> /min×8mH	1.5kW	2,057	1	2,057	For Grit Chamber
5	Chain Hoist	Motor Operated Geared Trolley Chain Hoist	0.5ton×12mH×15mT	2.2kW 0.4kW	1,370	1	1,370	For Grit Chamber
6	Suction Valve	Hand Operated Butterfly Valve	φ450mm	---	1,728	4	6,912	Include 1 Standby
7	Check Valve	Swing Check Valve	φ450mm	---	3,106	4	12,424	Include 1 Standby
8	Lifting Pump	Vertical Centrifugal Mixed Flow Pump	φ450mm×20m <sup>3</sup> /min×22mH	---	20,340	4	81,360	Include 1 Standby
9	Lifting Pump Motor	Wound Rotor Induction Motor	400V×50Hz×6P	110kW	6,289	4	25,156	Include 1 Standby
10	Delivery Valve	Motor Operated Butterfly Valve	φ450mm	0.2kW	2,446	4	9,784	Include 1 Standby
11	Crane	Manually operated Geared Trolley Chain Hoist	3.2ton×15mH×15mT	---	7,612	1	7,612	For Pumps
	Installation Work					1set	88,395	
	<b>Subtotal</b>						265,184	
<b>Electrical Equipment</b>								
12	Power Receiving & Distribution Facility	Power Receiving Panel Transformer Distribution Panel	VCB 500kVA MCCB		29,450	1	29,450	
13	Operating Facility	Pump Panel	W800mm×H1950mm×D600mm		3,200	4	12,800	
14	Monitoring Instrumentation Facility	Control Panel With Water Flow Monitor & Water Level Monitor	W1000mm×H2350mm×D600mm		12,800	1	12,800	
15	Standby Generator	Diesel Engine Generator	500kVA			1	75,000	
16	Lighting Facilities	Lighting Panel & Out door Lighting	300VA×10	10kW	3,800	1	3,800	
	Installation Work					1set	66,925	
	<b>Subtotal</b>						200,775	
	Transportation					1 set	62,128	
<b>Grand Total</b>							<b>528,086</b>	
<b>Total Electrical Power (kW)</b>				<b>344.7</b>				
<b>Annual Electric Consumption (kWh)</b>				<b>1,493,387</b>				
<b>Annual Repair Expense (Yen'000/Year)</b>				<b>12,510</b>				

Table 7.2.4.7 Equipment Cost & Power Consumption of Merul Pump Station at Master Plan (2020)

Merul Pump Station at Mater Plan (2020)								
Daily Average/Daily Maximum/Hourly Maximum 104,500/130,625/167,200m <sup>3</sup> /day								
Item No.	Name of Equipment	Specification	Power	Unit Cost (Yen'000)	Qty.	Total Cost (Yen'000)	Remarks	
<b>Mechanical Equipment</b>								
1	Inlet Gate	Manually operated Cast Iron Type	W1500mm × H1500mm	---	6,440	1	6,440	
2	Gate	Manually operated Cast Iron Type	W1300mm × H1300mm	---	4,255	8	34,040	
3	Screen	Hand Raked Bar Screen	W1700mm × H1500mm × D50mm	---	3,327	4	13,308	
4	Sand Pump	Submersible Sand Lifting Pump	φ80mm × 0.2m <sup>3</sup> /min × 8mH	1.5kW	2,057	1	2,057	For Grit Chamber
5	Chain Hoist	Motor Operated Geared Trolley Chain Hoist	0.5ton × 12mH × 15mT	2.2kW 0.4kW	1,370	1	1,370	For Grit Chamber
6	Suction Valve	Hand Operated Butterfly Valve	φ450mm	---	1,728	7	12,096	Include 1 Standby
7	Check Valve	Swing Check Valve	φ450mm	---	3,106	7	21,742	Include 1 Standby
8	Lifting Pump	Vertical Centrifugal Mixed Flow Pump	φ450mm × 20m <sup>3</sup> /min × 22mH	---	20,340	7	142,380	Include 1 Standby
9	Lifting Pump Motor	Wound Rotor Induction Motor	400V × 50Hz × 6P	110kW	6,289	7	44,023	Include 1 Standby
10	Delivery Valve	Motor Operated Butterfly Valve	φ450mm	0.2kW	2,446	7	17,122	Include 1 Standby
11	Crane	Manually operated Geared Trolley Chain Hoist	3.2ton × 15mH × 15mT	---	7,612	1	7,612	For Pumps
	Installation Work				1set	151,095		
	<b>Subtotal</b>					453,285		
<b>Electrical Equipment</b>								
12	Power Receiving & Distribution Facility	Power Receiving Panel Transformer Distribution Panel	VCB 500kVA MCCB		48,750	1	48,750	
13	Operating Facility	Pump Panel	W800mm × H1950mm × D600mm		3,200	7	22,400	
14	Monitoring Instrumentation Facility	Control Panel With Water Flow Monitor & Water Level Monitor	W1000mm × H2350mm × D600mm		13,000	1	13,000	
15	Standby Generator	Diesel Engine Generator & Pallarel Running Panel	500kVA			2	160,000	
16	Lighting Facilities	Lighting Panel & Out door Lighting	300VA × 10	10kW	3,800	1	3,800	
	Installation Work				1set	123,975		
	<b>Subtotal</b>					371,925		
	<b>Transportation</b>				1set	110,028		
<b>Grand Total</b>						<b>935,238</b>		
<b>Total Electrical Power (kW)</b>				<b>675.3</b>				
<b>Annual Electric Consumption (kWh)</b>				<b>3,540,389</b>				
<b>Annual Repair Expense (Yen'000/Year)</b>				<b>22,785</b>				

Table 7.2.4.8 Civil Direct Construction Cost of Gulshan Pump Station

Unit: Tk

Item	Unit	Quantity	Unit Price	Total
Sheet Pile Installation	Lraf	279	4,167	1,160,510
Sheet Pile Withdrawal	Lraf	279	2,597	723,265
Steel Support Installation	t	44.56	5,229	233,004
Excavation(Backhoe-1)	cu.m	1,168	90	105,084
Excavation(Cramshell)	cu.m	4,495	160	719,200
Excavation(Backhoe-2)	cu.m	584	90	52,542
Manual Subgrading	sq.m	584	50	29,190
Backfilling (Backhoe)	cu.m	888	150	133,200
Backfilling (Cramshell)	cu.m	1,013	220	222,860
Disposal	cu.m	4,346	230	999,580
Reinforced Concrete	cu.m	1,010	20,700	20,907,000
Plain Concrete	cu.m	41	7,200	295,200
Gravel Foundation	cu.m	81	2,000	161,744
Architecture	sq.m	170	37,500	6,375,000
Land Acquisition	sq.m	1,026.95	7,500	7,702,125
Road Pavement (Asphalt)	sq.m	219	1,020	222,870
Fence	m	134	610	81,984
Water Supply Connection	set	1	9,850	9,850
Telephone Connection	set	1	30,000	30,000
<b>Total (F/S=MP)</b>	<b>Local</b>			344,704
	<b>Foregin</b>			32,117,378
	<b>Total</b>			32,462,082

Table 7.2.4.9 Quantity Calculation Formula of Gulshan Pump Station

Item	Formula
Sheet Pile Installation	$(41.7+14)*2/0.4$
Sheet Pile Withdrawal	$(41.7+14)*2/0.4$
Steel Support Installation	$(41.7+14)*2*0.1*4$
Excavation(Backhoe-1)	$(41.7*14)*2$
Excavation(Cramshell)	$(41.7*14)*(5.5+4.9+0.3-2-1)$
Excavation(Backhoe-2)	$(41.7*14)*1$
Manual Subgrading	$41.7*14$
Backfilling (Backhoe)	$(41.7*14-(35*11+4.6*4.6))*5$
Backfilling (Cramshell)	$(41.7*14-(35*11+4.6*4.6))*(5.5+4.9+0.3-5)$
Disposal	$(35*11+4.6*4.6)*(5.5+4.9+0.3)$
Reinforced Concrete	$(35*11*(0.5*2+1)+4.6*4.6*(0.5+1))+((35+11+4.6+4.6)*2+9)*(6-3.9)*0.8)*1.2$
Plain Concrete	$(35*11+4.6*4.6)*0.1$
Gravel Foundation	$(35*11+4.6*4.6)*0.2$
Architecture	$10*17$
Land Acquisition	$43.7*23.5$
Road Pavement (Asphalt)	$43.7*5$
Fence	$(43.7+23.5)*2$
Water Supply Connection	1
Telephone Connection	1



**Table 7.2.4.10 Calculation for Unit Price of Civil Construction of Gulshan Pump Station**

**Steel Sheet Pile Jacking (Hydraulic Sheet Piler) L = 13 m**

Items	Specification	Unit	Quantity	Unit Cost	Cost	Remarks
Foreman		person	0.77	260	200	
Scaffolder		person	1.54	210	323	
Skilled Labor		person	0.77	148	114	
Sheet Piler Operation	100-130 t	day	0.77	43,177	33,246	
Generator Operation	75kVA	day	0.77	4,310	3,318	
Truck Crane Operation	25ton	hr	0.77	5,812	4,474	
Total					41,675	
Per 1 sheet					4,167	

**Steel Sheet Pile Withdrawing (Hydraulic Sheet Piler) L = 13 m**

Items	Specification	Unit	Quantity	Unit Cost	Cost	Remarks
Foreman		person	0.48	260	124	
Scaffolder		person	0.95	210	199	
Skilled Labor		person	0.48	148	71	
Sheet Piler Operation	100-130 ton	day	0.48	43,177	20,724	
Generator Operation	75kVA	day	0.48	4,310	2,068	
Truck Crane Operation	25ton	hr	0.48	5,812	2,789	
Total					25,975	
Per 1 sheet					2,597	

**Hydraulic Sheet Piler Operation Cost**

Items	Specification	Unit	Quantity	Unit Cost	Cost	Remarks
Ownership Cost		day	1.62	26,653	43,177	
Miscellaneous Cost		Unit			0	
Total					43,177	

**Support Installation Cost**

**Strut and Wale Installation Cost**

Items	Specification	Unit	Quantity	Unit Cost	Cost	Remarks
Foreman		person	1.6	260	416	
Scaffolder		person	3.2	210	672	
Welder		person	1.6	210	336	
Unskilled Labor		person	3.2	130	416	
Truck Crane Rental Fee	15-16ton	day	1.6	15,144	24,230	
Welding Machine Operation Cost	250A	day	1.6	6,058	9,692	
Miscellaneous Cost		unit			129	7% of labor
Total	per 10 ton				35,891	
Per 1 ton					3,589	

**Strut and Wale Withdrawal Cost**

Items	Specification	Unit	Quantity	Unit Cost	Cost	Remarks
Foreman		person	1.0	260	260	
Scaffolder		person	2.0	210	420	
Welder		person	1.0	210	210	
Unskilled Labor		person	2.0	130	260	
Truck Crane Rental Fee	15-16ton	day	1.0	15,144	15,144	
Miscellaneous Cost		unit			115	10% of labor
Total	per 10 ton				16,409	
Per 1 ton					1,640	

**Table 7.2.4.11 Calculation Sheet for Number of Sheet pile of Gulshan Pump Station**

Length of Sheet Pile L = 13.7  
 Installation Time per Sheet Pile Nmax = 15  
 Installation No. per Day N = 13

	$L \leq 2m$	$2m < L \leq 4m$	$4m < L \leq 6m$	$6m < L \leq 9m$	$9m < L \leq 12m$	$12m < L \leq 16m$	$16m < L \leq 20m$
Nmax < 10	50	42	32	25	19	16	13
10 < Nmax < 20	46	38	29	22	17	13	11
20 < Nmax < 30	43	35	26	19	15	12	

Length of Sheet Pile L = 13.7  
 Withdrawal Time per Sheet Pile Nmax = 15  
 Withdrawal No. per Day N = 21

	$L \leq 2m$	$2m < L \leq 4m$	$4m < L \leq 7m$	$7m < L \leq 11m$	$11m < L \leq 15m$	$15m < L \leq 20m$
No. of Pile	65	55	40	28	21	17

Table 7.2.4.12 Equipment Cost & Power Consumption of Gulshan Pump Station at Feasibility Study (2005)

Gulshan Pump Station at Feasibility Study (2005)		Daily Average/Daily Maximum/Hourly Maximum 33,242/40,240/50,738m <sup>3</sup> /day						
Item No.	Name of Equipment	Specification	Power	Unit Cost (Yen'000)	Qty.	Total Cost (Yen'000)	Remarks	
<b>Mechanical Equipment</b>								
1	Inlet Gate	Manually operated Cast Iron Type	W1100mm × H1100mm	—	3,563	1	3,563	
2	Gate	Manually operated Cast Iron Type	W800mm × H800mm	—	2,025	6	12,150	
3	Screen	Hand Raked Bar Screen	W1000mm × H1200mm × O50mm	—	2,244	3	6,732	
4	Sand Pump	Submersible Sand Lifting Pump	φ80mm × 0.2m <sup>3</sup> /min × 8mH	1.5kW	2,057	1	2,057	For Grit Chamber
5	Chain Hoist	Motor Operated Geared Trolley Chain Hoist	0.5ton × 12mH × 12mT	2.2kW 0.4kW	1,276	1	1,276	For Grit Chamber
6	Suction Valve	Hand Operated Butterfly Valve	φ350mm	—	1,358	4	5,432	Include 1 Standby
7	Check Valve	Swing Check Valve	φ350mm	—	2,025	4	8,100	Include 1 Standby
8	Lifting Pump	Vertical Centrifugal Mixed Flow Pump	φ350mm × 12.5m <sup>3</sup> /min × 13mH	—	14,831	4	59,324	Include 1 Standby
9	Lifting Pump Motor	Wound Rotor Induction Motor	400V × 50Hz × 6P	45kW	3,054	4	12,216	Include 1 Standby
10	Delivery Valve	Motor Operated Butterfly Valve	φ350mm	0.2kW	2,077	4	8,308	Include 1 Standby
11	Crane	Manually operated Geared Trolley Chain Hoist	3.2ton × 15mH × 12mT	—	6,831	1	6,831	For Pumps
	Installation Work					1set	62,995	
	<b>Subtotal</b>						<b>188,984</b>	
<b>Electrical Equipment</b>								
12	Power Receiving & Distribution Facility	Power Receiving Panel Transformer Distribution Panel	VCB 250kVA MCCB		18,050	1	18,050	
13	Operating Facility	Pump Panel	W700mm × H1950mm × D600mm		2,200	4	8,800	
14	Monitoring Instrumentation Facility	Control Panel With Water Flow Monitor & Water Level Monitor	W1000mm × H2350mm × D600mm		11,800	1	11,800	
15	Standby Generator	Diesel Engine Generator	250kVA			1	40,000	
16	Lighting Facilities	Lighting Panel & Out door Lighting	300VA × 10	10kW	3,800	1	3,800	
	Installation Work					1set	41,225	
	<b>Subtotal</b>						<b>123,675</b>	
	Transportation					1 set	41,688	
<b>Grand Total</b>							<b>354,346</b>	
<b>Total Electrical Power (kW)</b>				<b>149.7</b>				
<b>Annual Electric Consumption (kWh)</b>				<b>771,971</b>				
<b>Annual Repair Expense (Yen'000/Year)</b>				<b>8,218</b>				

Table 7.2.4.13 Equipment Cost & Power Consumption of Gulshan Pump Station at Master Plan (2020)

Gulshan Pump Station at Mater Plan (2020)								
Daily Average/Daily Maximum/Hourly Maximum 43,699/54,624/69,918m <sup>3</sup> /day								
Item No.	Name of Equipment	Specification	Power	Unit Cost (Yen'000)	Qty.	Total Cost (Yen'000)	Remarks	
<b>Mechanical Equipment</b>								
1	Inlet Gate	Manually operated Cast Iron Type	W1100mm×H1100mm	---	3,563	1	3,563	
2	Gate	Manually operated Cast Iron Type	W800mm×H800mm	---	2,025	8	16,200	
3	Screen	Hand Raked Bar Screen	W1000mm×H1200mm×C50mm	---	2,244	4	8,976	
4	Sand Pump	Submersible Sand Lifting Pump	φ80mm×0.2m <sup>3</sup> /min×8mH	1.5kW	2,057	1	2,057	For Grit Chamber
5	Chain Hoist	Motor Operated Geared Trolley Chain Hoist	0.5ton×12mH×12mT	2.2kW 0.4kW	1,276	1	1,276	For Grit Chamber
6	Suction Valve	Hand Operated Butterfly Valve	φ350mm	---	1,358	5	6,790	Include 1 Standby
7	Check Valve	Swing Check Valve	φ350mm	---	2,025	5	10,125	Include 1 Standby
8	Lifting Pump	Vertical Centrifugal Mixed Flow Pump	φ350mm×12.5m <sup>3</sup> /min×13mH	---	14,831	5	74,155	Include 1 Standby
9	Lifting Pump Motor	Wound Rotor Induction Motor	400V×50Hz×6P	45kW	3,054	5	15,270	Include 1 Standby
10	Delivery Valve	Motor Operated Butterfly Valve	φ350mm	0.2kW	2,077	5	10,385	Include 1 Standby
11	Crane	Manually operated Geared Trolley Chain Hoist	3.2ton×15mH×12mT	---	6,831	1	6,831	For Pumps
	Installation Work					1set	77,814	
	<b>Subtotal</b>						<b>233,442</b>	
<b>Electrical Equipment</b>								
12	Power Receiving & Distribution Facility	Power Receiving Panel Transformer Distribution Panel	VCB 250kVA MCCB		18,050	1	18,050	
13	Operating Facility	Pump Panel	W700mm×H1950mm×D600mm		2,200	5	11,000	
14	Monitoring Instrumentation Facility	Control Panel With Water Flow Monitor & Water Level Monitor	W1000mm×H2350mm×D600mm		11,800	1	11,800	
15	Standby Generator	Diesel Engine Generator	250kVA			1	40,000	
16	Lighting Facilities	Lighting Panel & Out door Lighting	300VA×10	10kW	3,600	1	3,600	
	Installation Work					1set	42,325	
	<b>Subtotal</b>						<b>126,975</b>	
	<b>Transportation</b>					1 set	48,056	
<b>Grand Total</b>							<b>408,473</b>	
<b>Total Electrical Power (kW)</b>				<b>194.9</b>				
<b>Annual Electric Consumption (kWh)</b>				<b>1,000,987</b>				
<b>Annual Repair Expense (Yen'000/Year)</b>				<b>9,495</b>				

**Appendix 7.2.5 Direct Construction Cost of Sewage Treatment Plant**

**Table 7.2.5.1 Direct Construction Cost of Sewage Treatment Plant**

Unit: Tk

Item	Currency Mode	F/S	M/P
Civil Work	Local	954,829,000	1,745,955,000
	Foreign	835,893,000	1,631,610,000
	Sub-Total	1,790,722,000	3,377,565,000
Mechanical/Electrical Work	Local	0	0
	Foreign	187,041,000	328,937,000
	Sub-Total	187,041,000	328,937,000
Total	Local	954,829,000	1,745,955,000
	Foreign	1,022,934,000	1,960,547,000
	Total	1,977,763,000	3,706,502,000
Land Acquisition	Foreign	511,078,000	923,578,000
Imported Materials/Equipment	Local	0	0
	Foreign	244,856,800	447,588,300
	Total	244,856,800	447,588,300

Table 7.2.5.2 Summary of Direct Construction Cost for Civil Work & Land Acquisition Cost

(Unit: Tk)

Item	F/S		M/P		Total	Contents	Remark
	Construction	Land Acquisition	Construction	Land Acquisition			
Reclamation (Site, Road)	925,020,900	511,078,500	1,436,099,400	2,631,054,300	1,707,475,800	SIP site Access Load, Outfall Log	see Table 7.2.5.5
Facility Civil Work	747,291,440	-	747,291,440	1,467,108,540	1,467,108,540	G.C, P.S.F, F.P.D.T...etc	see Table 7.2.5.6
In-plant Piping	52,799,520	-	52,799,520	107,579,410	107,579,410	Swage Pipe, Sludge Pipe	see Table 7.2.5.7
Architecture	13,012,500	-	13,012,500	13,012,500	13,012,500	Admin. & Elec. Bldg, Chlorin. Bldg	see Table 7.2.5.8
Ground Arrange	29,809,050	-	29,809,050	38,480,050	38,480,050	Fence, Inner Load, Electric, Gas...	see Table 7.2.5.8
Water Analysis Equip.	1,670,000	-	1,670,000	1,670,000	1,670,000		see Table 7.2.5.8
Maintenance Materials	21,120,200	-	21,120,200	42,240,400	42,240,400	Dump Truck, Engine Pump...etc	see Table 7.2.5.8
<b>Total</b>	<b>1,790,723,610</b>	<b>511,078,500</b>	<b>2,301,802,110</b>	<b>4,301,145,200</b>	<b>3,377,566,700</b>		

Table 7.2.5.3 Local and Foreign Portion of Civil Work Direct Construction Cost & Land Acquisition Cost (F/S)

(Unit: Tk)

Item	Local Portion		Foreign Portion		Total	Grand Total
	Construction	Land Acquisition	Construction	Land Acquisition		
Reclamation (Site, Road)	925,020,900	511,078,500	-	-	1,436,099,400	1,436,099,400
Facility Civil Work	-	-	747,291,440	-	747,291,440	747,291,440
In-plant Piping	-	-	52,799,520	-	52,799,520	52,799,520
Architecture	-	-	13,012,500	-	13,012,500	13,012,500
Ground Arrange	29,809,050	-	-	-	29,809,050	29,809,050
Water Analysis Equip.	-	-	1,670,000	-	1,670,000	1,670,000
Maintenance Materials	-	-	21,120,200	-	21,120,200	21,120,200
<b>Total</b>	<b>954,829,950</b>	<b>511,078,500</b>	<b>835,893,660</b>	<b>0</b>	<b>835,893,660</b>	<b>2,301,802,110</b>

Table 7.2.5.4 Local and Foreign Portion of Civil Work Direct Construction Cost & Land Acquisition Cost (M/P)

(Unit: Tk)

Item	Local Portion		Foreign Portion		Total	Grand Total
	Construction	Land Acquisition	Construction	Land Acquisition		
Reclamation (Site, Road)	1,707,475,800	923,578,500	-	-	2,631,054,300	2,631,054,300
Facility Civil Work	-	-	1,467,108,540	-	1,467,108,540	1,467,108,540
In-plant Piping	-	-	107,579,410	-	107,579,410	107,579,410
Architecture	-	-	13,012,500	-	13,012,500	13,012,500
Ground Arrange	38,480,050	-	-	-	38,480,050	38,480,050
Water Analysis Equip.	-	-	1,670,000	-	1,670,000	1,670,000
Maintenance Materials	-	-	42,240,400	-	42,240,400	42,240,400
<b>Total</b>	<b>1,745,955,850</b>	<b>923,578,500</b>	<b>1,631,610,850</b>	<b>0</b>	<b>1,631,610,850</b>	<b>4,301,145,200</b>

Table 7.2.5.5(1) Direct Construction Cost of Reclamation and Land Acquisition Cost(F/S)

Item	Direct Construction						Land Acquisition		Total
	Banking cu.m	Tamping sq.m	Slope sq.m	Asphalt Surface sq.m	Gravel Surface sq.m	Sub-Total	Site <sup>*)</sup> sq.m	750	
Unit Cost (Tk)	200	40	50	1020	500	-	650,000	-	-
STP Site	4,434,000	157,770	41,290	0	0	895,175,300	487,500,000	1,382,675,300	-
Cost (Tk)	886,800,000	6,310,800	2,064,500	0	0	-	20,060	-	-
Road for Access	72,360	6,000	17,055	5,000	0	20,664,750	15,045,000	35,709,750	-
Cost (Tk)	14,472,000	240,000	852,750	5,100,000	0	-	11,378	-	-
Road for Discharge	37,989	2,520	10,745	0	1,890	9,180,850	8,533,500	17,714,350	-
Cost (Tk)	7,597,800	100,800	537,250	0	945,000	-	681,438	-	-
Total	4,544,349	166,290	69,090	5,000	1,890	925,020,900	511,078,500	1,436,099,400	-
Cost (Tk)	908,869,800	6,651,600	3,454,500	5,100,000	945,000	-	-	-	-

\*) STP Site: as 650m<sup>w</sup> x 1,000m<sup>L</sup> (=650,000sq.m)  
 Road for Access: 20.06m<sup>w</sup> x 1,000m<sup>L</sup> (width of upper face 6.0m, width of sole face 20.06m, Design elevation 6.5m, present elevation 0.47m, Slope 1:1)  
 Road for Discharge: 18.06m<sup>w</sup> x 630m<sup>L</sup> (width of upper face 4.0m, width of sole face 18.06m, Design elevation 6.5m, present elevation 0.47m, Slope 1:1)

Table 7.2.5.5(2) Direct Construction Cost of Reclamation and Land Acquisition Cost(M/P)

Item	Direct Construction						Land Acquisition		Total
	Banking cu.m	Tamping sq.m	Slope sq.m	Asphalt Surface sq.m	Gravel Surface sq.m	Sub-Total	Site sq.m	750	
Unit Cost (Tk)	200	40	50	1020	500	-	1,200,000	-	-
STP Site	8,322,330	241,980	69,700	0	0	1,677,630,200	900,000,000	2,577,630,200	-
Cost (Tk)	1,664,466,000	9,679,200	3,485,000	0	0	-	20,060	-	-
Road for Access	72,360	6,000	17,055	5,000	0	20,664,750	15,045,000	35,709,750	-
Cost (Tk)	14,472,000	240,000	852,750	5,100,000	0	-	11,378	-	-
Road for Discharge	37,989	2,520	10,745	0	1,890	9,180,850	8,533,500	17,714,350	-
Cost (Tk)	7,597,800	100,800	537,250	0	945,000	-	1,231,438	-	-
Total	8,432,679	250,500	97,500	5,000	1,890	1,707,475,800	923,578,500	2,631,054,300	-
Cost (Tk)	1,686,535,800	10,020,000	4,875,000	5,100,000	945,000	-	-	-	-

\*) STP Site: as 1,200m<sup>w</sup> x 1,000m<sup>L</sup> (=120,000sq.m)  
 Road for Access: same as Table 7.2.5.3(1)  
 Road for Discharge: same as Table 7.2.5.3(1)

Table 7.2.5.6 (1) Direct Construction Cost of Civil Facility (R/S)

[upper column: Volumn., lower column :Cost:(TK)]

Unit Cost (TK)	Banking(2) for Pond qu.m	Machine Excavation qu.m	Manual Subgrading sq.m	Slope Protection sq.m	Gravel qu.m	Plain Concrete qu.m	Reinforced Concrete qu.m	Backfilling qu.m	Sheet Pile	Total
Parshall Flume	0	203	113	0	23	12	73	0	0	0
	0	22,330	5,650	0	46,000	86,400	839,500	2,960	0	1,002,840
	0	104	16	0	3	2	116	61	0	-
Distrib. Tank	0	11,440	800	0	6,000	14,400	1,334,000	2,440	0	1,369,080
	0	9,879	2,121	0	426	213	2,169	1,281	0	-
Primary Sediment. Tank	0	1,086,690	106,050	0	852,000	1,533,600	24,945,500	51,240	4,551,970	33,105,050
	0	197	26	0	5	3	36	99	0	-
P. S.T Distrib. Chamber	0	21,670	1,300	0	10,000	21,600	414,000	3,960	0	472,550
	98,540	0	259,570	50,190	0	60,360	0	0	0	-
Facultative Pond	61,094,800	0	12,978,500	2,509,500	0	434,592,000	0	0	0	511,174,800
	0	122	26	0	5	3	28	62	0	-
F. P Distrib. Chamber	0	15,420	1,300	0	10,000	21,600	322,000	2,480	0	370,800
	0	171	30	0	6	3	30	114	0	-
F. P Outlet Weir	0	18,810	1,500	0	12,000	21,600	345,000	4,560	0	403,470
	0	108	15	0	3	3	15	72	0	-
F. P Outlet Manhole(1)	0	11,880	750	0	6,000	21,600	172,500	2,880	0	215,610
	0	50	6	0	2	1	7	38	0	-
F. P Outlet Manhole(2)	0	5,500	300	0	4,000	7,200	80,500	1,520	0	99,020
	0	58	6	0	2	1	8	44	0	-
F. P Outlet Manhole(3)	0	6,380	300	0	4,000	7,200	92,000	1,760	0	111,640
	29,230	0	77,920	13,480	0	17,530	0	0	0	-
Sludge Lagoon	18,122,600	0	3,896,000	674,000	0	126,216,000	0	0	0	148,908,600
	0	42	48	0	12	6	60	24	0	-
S. L Outlet Weir	0	4,620	2,400	0	24,000	43,200	690,000	960	0	765,180
	13,160	0	15,760	6,030	0	3,990	0	0	0	-
Septage Lagoon	8,159,200	0	788,000	301,500	0	28,728,000	0	0	0	37,976,700
	0	905	319	0	64	32	219	185	0	-
Disinfection Chamber	0	99,550	15,950	0	128,000	250,400	2,518,500	7,400	0	2,999,800
	0	372	56	0	12	6	154	228	0	-
Inverted Siphon	0	40,920	2,800	0	24,000	43,200	1,771,000	9,120	0	1,891,040
	0	38	15	60	3	19	32	9	0	-
Outfall	0	4,180	750	3,000	6,000	136,800	368,000	360	107,110	626,200
	0	891	89	0	18	9	437	290	0	-
P.S.T Pump Chamber	0	98,010	4,450	0	36,000	64,800	5,025,500	11,600	558,720	5,799,080
	140,930	13,140	356,136	69,760	584	82,193	3,384	2,581	0	-
Total	87,376,600	1,445,400	17,806,800	3,488,000	1,168,000	591,789,600	38,916,000	103,240	5,197,800	747,291,440



Table 7.2.5.6 (2) Direct Construction Cost of Civil Facility (MP)

[upper column: Volume, lower column: Cost(Tk.)]

Unit Cost (Tk.)	Banking(2) qu.m	Machine Excavation qu.m	Manual Subgrading sq.m	Slope Protection(2) sq.m	Gravel qu.m	Plain Concrete qu.m	Reinforced Concrete qu.m	Backfilling qu.m	Sheet Pile	Total
Parshall Flume	0	203	113	0	23	12	73	0	0	0
	0	22,330	5,650	0	46,000	86,400	839,500	2,960	0	1,002,840
Grit Chamber Distrib. Tank	0	104	16	0	3	2	116	61	0	0
	0	11,440	800	0	6,000	14,400	1,334,000	2,440	0	1,369,080
Primary Sedimentation Tank	0	19,758	4,242	0	852	426	4,338	2,562	0	0
	0	2,173,380	212,100	0	1,704,000	3,067,200	49,887,000	102,480	9,063,940	66,210,100
P. S.T Distrib. Chamber	0	394	52	0	10	6	72	198	0	0
	0	43,340	2,600	0	20,000	43,200	828,000	7,920	0	945,060
Facultative Pond	175,660	0	519,000	92,490	0	119,940	0	0	0	0
	108,909,200	0	25,950,000	4,624,500	0	863,568,000	0	0	0	1,003,051,700
F. P Distrib. Chamber	0	244	52	0	10	6	56	124	0	0
	0	26,840	2,600	0	20,000	43,200	644,000	4,960	0	741,600
F. P Outlet Weir	0	342	60	0	12	6	60	228	0	0
	0	37,620	3,000	0	24,000	43,200	690,000	9,120	0	806,940
F. P Outlet Manhole(1)	0	72	10	0	2	2	10	48	0	0
	0	7,920	500	0	4,000	14,400	115,000	1,920	0	143,740
F. P Outlet Manhole(2)	0	100	12	0	4	2	14	76	0	0
	0	11,000	600	0	8,000	14,400	161,000	3,040	0	198,040
F. P Outlet Manhole(3)	0	116	12	0	4	2	16	88	0	0
	0	12,760	600	0	8,000	14,400	184,000	3,520	0	223,280
Sludge Lagoon	58,460	0	155,840	26,960	0	35,060	0	0	0	0
	36,245,200	0	7,792,000	1,348,000	0	252,432,000	0	0	0	297,817,200
S. L Outlet Weir	0	84	96	0	24	12	120	48	0	0
	0	9,240	4,800	0	48,000	86,400	1,380,000	1,920	0	1,530,360
Septage Lagoon	26,320	0	31,520	12,060	0	7,980	0	0	0	0
	16,318,400	0	1,576,000	603,000	0	57,456,000	0	0	0	75,953,400
Disinfection Chamber	0	905	319	0	64	32	219	185	0	0
	0	99,550	15,950	0	128,000	230,400	2,518,500	7,400	0	2,999,800
Inverted Siphon	0	372	56	0	12	6	154	228	0	0
	0	40,920	2,800	0	24,000	43,200	1,771,000	9,120	0	1,891,040
Outfall	0	38	15	60	3	19	32	9	0	0
	0	4,180	750	3,000	6,000	136,800	368,000	360	107,110	626,200
P. S.T Pump Station	0	1,782	178	0	36	18	874	580	0	0
	0	196,020	8,900	0	72,000	129,600	10,051,000	23,200	1,117,440	11,598,160
Total	260,440	24,514	711,593	131,570	1,059	163,531	6,154	4,509	0	0
	161,472,800	2,696,540	35,579,650	6,578,500	2,118,000	11,774,923,200	70,771,000	180,360	10,288,490	11,467,108,540

Table 7.2.5.7 (1) Direct Construction Cost of In-plant Piping (F/S)

Item	Pipe Type	Diameter mm	Earth Cover.		length m	Unit Cost		Material Unit Cost		Construction Cost		Material Cost		Remark
			Depth m			Tk		Tk		Tk		Tk		
Sewerage	Concrete Pipe	1100	1.0		1,650	14,170	11,070	23,380,500	18,265,500	Inlet				
		1100	1.3	80	15,198	11,070	1,215,840	885,600	from G.C.Distrib. to P.S.T					
		700	1.1	170	6,848	4,840	1,164,160	822,800	from P.S.T Cham. to P.S.T					
		700	1.1	500	6,848	4,840	3,424,000	2,420,000	from P.S.T to F.P					
		700	1.5	300	7,786	4,840	2,335,800	1,452,000	from F.P to F.P Manhole(1)					
		900	1.5	120	10,341	6,730	1,240,920	807,600	from F.P Manhole(1) to F.P Manhole(2)					
		1100	1.5	10	15,198	11,070	151,980	110,700	from F.P Manhole(2) to D.T					
		1100	1.0	50	14,170	11,070	708,500	553,500	from D.T to Boundary					
		1100	1.0	280	14,170	11,070	3,967,600	3,099,600	from Boundary to Inverted Siphone					
		1000	3.0	20	257,360	8,980	5,147,200	179,600	Inverted Siphon					
		1100	1.0	350	14,170	11,070	4,959,500	3,874,500	from Inverted Siphone to Outlet					
		150	1.0	1,000	1,993	800	1,993,000	800,000	P.S.T pump to Sludge Lagoon					
		400	1.0	980	3,174	1,790	3,110,520	1,754,200	Sludge Lagoon to P.S.T Chamb.					
Sludge	Steel Pipe													
	Concrete Pipe													
Total					5,510					52,799,520			35,025,600	

Table 7.2.5.7 (2) Direct Construction Cost of S.T.P In-plant Piping (M/P)

Item	Pipe Type	Diameter mm	Earth Cover. Depth m	length m	Unit Cost		Material Unit Cost		Cost		Material Cost		Remark
					Tk	Tk	Tk	Tk	Tk	Tk			
Sewerage	Concrete Pipe	1100	1.0	3,300	14,170	11,070	46,761,000	36,531,000	Inlet				
		1100	1.3	160	15,198	11,070	2,431,680	1,771,200	from G.C Distrib. to P.S.T				
		700	1.1	340	6,848	4,840	2,328,320	1,645,600	from P.S.T Cham. to P.S.T				
		700	1.1	1,000	6,848	4,840	6,848,000	4,840,000	from P.S.T to F.P				
		650	1.5	500	7,786	4,840	3,893,000	2,420,000	from F.P to F.P Manhole(1)				
		900	1.5	290	10,341	6,730	2,998,890	1,951,700	from F.P Manhole(1) to F.P Manhole(2)				
		1100	1.5	360	15,198	11,070	5,471,280	3,985,200	from F.P Manhole(2) to D.T				
		1100	1.0	100	14,170	11,070	1,417,000	1,107,000	from D.T to Boundary				
		1100	1.0	560	14,170	11,070	7,935,200	6,199,200	from Boundary to Inverted Sihone				
		1000	2.0	20	257,360	8,980	5,147,200	179,600	Inverted Siphon				
		1100	1.0	700	14,170	11,070	9,919,000	7,749,000	from Inverted Sihone to Outlet				
		Sludge	Steel Pipe	150	1.0	2,000	1,993	800	3,986,000	1,600,000	P.S.T pump to Sludge Lagoon		
			Concrete Pipe	400	1.0	1,960	3,174	1,790	6,221,040	3,508,400	Sludge Lagoon to P.S.I Chamb.		
Total		400	1.0	700	3,174	1,790	2,221,800	1,253,000	Septage Lagoon to P.S.T Chamb.				
				11,990			107,579,410	74,740,900					

Table 7.2.5.8 (1) Direct Construction Cost of Architecture, Ground Arrange, Others (F/S)

Sort	Item	unit	unit cost Tk	Volumn	Cost Tk	Remark
Architecture	Admin. & Elec. Bldg	sq.m	37,500	224 sq.m	8,400,000	
	Chlorination Bldg	sq.m	37,500	123 sq.m	4,612,500	
	Sub-Total				13,012,500	
Ground Arrange	Fence, Gate	m	610	3,520 m	2,147,200	
	Inner Road (Gravel Surface)	m	500	16,000 m	8,000,000	width 5m, length 3,200m
	Water Supply Connect	set	9,850	1 set	9,850	
	Electric Power Connect	m	7,400	2,650 m	19,610,000	
	Gas Connect	set	12,000	1 set	12,000	
	Telephone Connect	set	30,000	1 set	30,000	
	Sub-Total				29,809,050	
Water Analysis Equipment		set	1,670,000	1 set	1,670,000	
	Dump Truck	unit	2,400,000	2 unit	4,800,000	8T
Maintenance Materials	Bulldozer	unit	1,800,000	2 unit	3,600,000	40Ps
	Power Shovel	unit	5,600,000	2 unit	11,200,000	0.6cu.m
	Small Boat	unit	897,000	1 unit	897,000	
Total	Portable Engine Pump	unit	623,200	1 unit	623,200	10m, 0.5cu.m/min
	Sub-Total				21,120,200	
					65,611,750	

Table 7.2.5.8 (2) Direct Construction Cost of Architecture, Ground Arrange, Others (M/P)

Sort	Item	unit	unit cost Tk	Volumn	Cost Tk	Remark
Architecture	Admin. & Elec. Bldg	sq.m	37,500	224 sq.m	8,400,000	
	Chlorination Bldg	sq.m	37,500	123 sq.m	4,612,500	
	Sub-Total				13,012,500	
Ground Arrange	Fence, Gate	m	610	4,620 m	2,818,200	
	Inner Road (Gravel Surface)	m	500	32,000 m	16,000,000	width 5m, length 6,400m
	Water Supply Connect	set	9,850	1 set	9,850	
	Electric Power Connect	m	7,400	2,650 m	19,610,000	
	Gas Connect	set	12,000	1 set	12,000	
	Telephone Connect	set	30,000	1 set	30,000	
	Sub-Total				38,480,050	
	Water Analysis Wqipment	set	1,670,000	1 set	1,670,000	
	Maintenance Materials	unit	2,400,000	4 unit	9,600,000	8T
Bulldozer	unit	1,800,000	4 unit	7,200,000	40Ps	
Power Shavel	unit	5,600,000	4 unit	22,400,000	0.6cu.m	
Small Boat	unit	897,000	2 unit	1,794,000		
Portable Engine Pump	unit	623,200	2 unit	1,246,400	10m.0.5qu.m/min	
Sub-Total				42,240,400		
Total					95,402,950	

Table 7.2.5.9 Pipe Installation Cost inner STP Site

Pipe Type	Reinforced Concrete Pipe						Steel Pipe			
	400		700		1100			900		1100
	1.0							1.5		
Earth Covering Depth(m)										
(1) Quantity										
Excavation (m3)	3.28	5.30	8.63	6.43	8.16	10.04				2.12
Sand Foundation (m3)	0.40	0.89	1.70	0.89	1.27	1.70				0.14
Backfilling(1) (m3)	0.83	1.46	2.49	1.46	1.95	2.49				0.42
Backfilling(2) (m3)	0.94	1.25	1.66	5.08	5.81	6.51				0.67
Sheetpile (sheet)										
Timbering (t)										
Concrete Pipe Laying (m)	1	1	1	1	1	1				1
(2) Unit Cost (Tk/Unit)										
Pipe Laying	1,790	4,840	11,070	4,840	6,730	11,070				800
(3) Construction Cost (TAKA/m)										
Excavation	295	477	776	578	734	903				190
Sand Foundation	344	765	1,462	765	1,092	1,462				120
Backfilling(1)	124	219	373	219	292	373				63
Backfilling(2)	141	187	249	762	871	976				100
Sheetpile(driving and removal)	0	0	0	0	0	0				0
Timbering	0	0	0	0	0	0				0
RC Pipe Laying	1,790	4,840	11,070	4,840	6,730	11,070				800
Manhole(for Depth 1m)	480	360	240	622	622	414				720
Manhole(for Depth 2m)										
Total	3,174	6,848	14,170	7,786	10,341	15,198				1,995
Total (including tax etc.)										

Table 7.2.5.10 Mechanical & Electrical Equipment Cost of STP (F/S)

North Dhaka East STP at Feasibility Study (2005)								
Daily Average/Daily Maximum/Hourly Maximum 43,320/52,440/66,120m <sup>3</sup> /day								
Item No.	Name of Equipment	Specification	Power	Unit Cost (Yen'000)	Qty.	Total Cost (Yen'000)	Remarks	
<b>Mechanical Equipment</b>								
1	Chain Hoist	Motor Operated Geared Trolley Chain Hoist	0.5ton×12mH×12mT	2.2kW 0.4kW	1,276	1	1,276	
2	Sludge Collector	Circular Tank Sludge Scraper Center Drive Floor Mount	φ 28m×3.8m	1.5kW	52,821	3	158,463	
3	Auxiliary Equipment of Sludge Collector	Circular Tank Sludge Scraper Center Drive Floor Mount	φ 28m×3.8m	---	14,029	3	42,087	
4	Sludge Pump	Nonclogging Sludge Pump	φ 150mm×1.1m <sup>3</sup> /min×20mH	11kW	4,882	4	19,528	Include 1 Standby
5	Sludge Pump Motor	Totally Enclosed Fan	200V×50Hz×4P	11kW	124	4	496	Include 1 Standby
6	Scum Return Pump	Submersible Pump	φ 80mm×0.5m <sup>3</sup> /min×10mH	1.5kW	679	2	1,358	Include 1 Standby
7	Sump Pump	Submersible Pump	φ 50mm×0.2m <sup>3</sup> /min×10mH	0.75kW	211	2	422	
8	Disinfection Equipment	Chlorine Gas Dosing Method	10kg/h	---	13,910	1	13,910	Ejector System
9	Booster Pump	Horizontal Multistage Pump	φ 50mm×0.1m <sup>3</sup> /min×40mH	3.7kW	492	3	1,476	Include 1 Standby
10	Strainer	Automatic Backwash Type	φ 50mm×0.1m <sup>3</sup> /min	0.1kW	2,884	3	8,652	Include 1 Standby
11	Chain Hoist	Motor Operated Geared Trolley Chain Hoist	2ton×6mH×10mT	3.7kW 0.75kW	1,452	1	1,452	For Cl Cylinder
12	Movable Weir	Hand Operated Cast Iron Type Direct Connected	W2000mm×H1500mm	---	8,605	1	8,605	
13	Inverted Siphon Gate	Manually operated Cast Iron Type	W1100mm×H1100mm	---	2,943	4	11,772	
	Installation Work					1	134,749	
	<b>Subtotal</b>						<b>404,246</b>	
<b>Electrical Equipment</b>								
14	Power Receiving & Distribution Facility	Power Receiving Panel Transformer Distribution Panel	VCB 150kVA MCCB		19,950	1	19,950	
15	Operating Facility	Each Panel	Out Door Use		15,450	1	15,450	
16	Monitoring Instrumentation Facility	Monitoring Panel with Water Flow Meter	W1000mm×H2350mm×D600mm		7,000	1	7,000	
17	Standby Generator	Diesel Engine Generator	50kVA			1	8,000	
18	Lighting Facilities	Lighting Panel & Out door Lighting	300VA×10	10kW	3,800	1	3,800	
	Installation Work					1 set	37,940	
	<b>Subtotal</b>						<b>92,140</b>	
	<b>Transportation</b>					1 set	64,739	
<b>Total</b>							<b>561,125</b>	
Annual Electric Consumption (kWh/Year)					169,083			
Total Electrical Power (kW)					65.15			
Annual Repair Expense (Yen'000/Year)					10,366			

Table 7.2.5.11 Mechanical & Electrical Equipment Cost of STP (M/P)

North Dhaka East STP at Mater Plan (2020)				Daily Average: Daily Maximum: Hourly Maximum			
				104,500:130,625:167,200m <sup>3</sup> /day			
Item No.	Name of Equipment	Specification	Power	Unit Cost (Yen'000)	Qty.	Total Cost (Yen'000)	Remarks
<b>Mechanical Equipment</b>							
1	Chain Hoist	Motor Operated Geared Trolley Chain Hoist	0.5ton × 12mH × 12mT 2.2kW 0.4kW	1,276	1	1,276	
2	Sludge Collector	Circular Tank Sludge Scraper Center Drive Floor Mount	φ 28m × 3.8m 1.5kW	52,821	6	316,926	
3	Auxiliary Equipment of Sludge Collector	Circular Tank Sludge Scraper Center Drive Floor Mount	φ 28m × 3.8m ---	14,029	6	84,174	
4	Sludge Pump	Nonclogging Sludge Pump	φ 150mm × 1.1m <sup>3</sup> /min × 20mH 11kW	4,882	8	39,056	Include 2 Standby
5	Sludge Pump Motor	Totally Enclosed Fan	200V × 50Hz × 4P 11kW	124	8	992	Include 2 Standby
6	Scum Return Pump	Submersible Pump	φ 80mm × 0.5m <sup>3</sup> /min × 10mH 1.5kW	679	4	2,716	Include 2 Standby
7	Sump Pump	Submersible Pump	φ 50mm × 0.2m <sup>3</sup> /min × 10mH 0.75kW	211	2	422	
8	Disinfection Equipment	Chlorine Gas Dosing Method	10kg/h ---	18,297	1	18,297	Ejector System
9	Booster Pump	Horizontal Multistage Pump	φ 50mm × 0.1m <sup>3</sup> /min × 40mH 3.7kW	492	3	1,476	Include 1 Standby
10	Strainer	Automatic Backwash Type	φ 50mm × 0.1m <sup>3</sup> /min 0.1kW	2,884	3	8,652	Include 1 Standby
11	Chain Hoist	Motor Operated Geared Trolley Chain Hoist	2ton × 6mH × 10mT 3.7kW 0.75kW	1,452	1	1,452	For C1 Cylinder
12	Movable Weir	Hand Operated Cast Iron Type Direct Connected	W2000mm × H1500mm ---	8,605	2	17,210	
13	Inverted Siphon Gate	Manually operated Cast Iron Type	W1100mm × H1100mm ---	2,943	4	11,772	
	Installation Work				1	252,211	
	<b>Subtotal</b>					<b>756,632</b>	
<b>Electrical Equipment</b>							
14	Power Receiving & Distribution Facility	Power Receiving Panel Transformer Distribution Panel	VCB 150kVA MCCB	19,950	1	19,950	
15	Operating Facility	Each Panel	Out Door Use	25,500	1	25,500	
16	Monitoring Instrumentation Facility	Monitoring Panel with Water Flow Meter	W1000mm × H2350mm × D600mm 7,000	7,000	1	7,000	
17	Standby Generator	Diesel Engine Generator	50kVA		1	8,000	
18	Lighting Facilities	Lighting Panel & Out door Lighting	300VA × 10 10kW	3,800	2	7,600	
	Installation Work				1 set	47,635	
	<b>Subtotal</b>					<b>115,685</b>	
	Transportation				1 set	114,494	
<b>Total</b>						<b>986,811</b>	
Annual Electric Consumption (kWh)				181,128			
Total Electrical Power (kW)				114.15			
Annual Repair Expense (Yen'000/Year)				18,221			



## Appendix 7.3.1 Operation and Maintenance Cost

A breakdown of operation and maintenance cost is shown in Table 7.3.1.1.

Table 7.3.1.1 Operation and Maintenance Cost

Item	Sewer		Pump Station		Sewage Treatment Plant		Total	
	F/S	M/P	F/S	M/P	F/S	M/P	F/S	M/P
Personnel Expense	0	0	1,855	2,503	1,659	2,145	3,514	4,648
Water Charge	0	0	7	13	3	9	10	22
Electricity Charge	0	0	10,194	20,436	760	815	10,954	21,251
Fuel Cost	0	0	688	1,131	54	54	742	1,185
Chemical Cost	0	0	0	0	6,640	16,019	6,640	16,019
Repair/Replacement Cost	0	0	6,909	10,760	3,455	6,073	10,364	16,833
Sewer Cleaning Cost	3,840	3,840	0	0	0	0	3,840	3,840
<b>Total</b>	<b>3,840</b>	<b>3,840</b>	<b>19,653</b>	<b>34,843</b>	<b>12,571</b>	<b>25,115</b>	<b>36,064</b>	<b>63,798</b>

### (1) Personnel expense

Personnel expenses were estimated to cover salary and wages staffs to be assigned at two (2) pump stations and sewage treatment plant and presented in Table 7.3.1.2. Staff composition at these sewerage facilities is based on "Chapter 6 - Operation and Maintenance Plan" of this report.

Table 7.3.1.2 Personnel Expense

Designation	Unit Cost (Tk/month)	Pump Station				Sewage Treatment Plant	
		Gulshan		Merul		North Dhaka East	
		F/S	M/P	F/S	M/P	F/S	M/P
Executive Engineer	13,500	-	-	-	-	1	1
		-	-	-	-	13,500	13,500
Sub-divisional Engineer	9,800	1	1	1	1	1	1
		9,800	9,800	9,800	9,800	9,800	9,800
Foreman	7,500	3	3	3	3	3	3
		22,500	22,500	22,500	22,500	22,500	22,500
Operator	6,000	3	3	3	3	6	6
		18,000	18,000	18,000	18,000	36,000	36,000
Worker	4,500	6	12	6	12	9	18
		27,000	54,000	27,000	54,000	40,500	81,000
Microbiologist	16,000	-	-	-	-	1	1
		-	-	-	-	16,000	16,000
<b>Total</b>	<b>No. of Staff</b>	<b>13</b>	<b>19</b>	<b>13</b>	<b>19</b>	<b>21</b>	<b>30</b>
	<b>Tk/month</b>	<b>77,300</b>	<b>104,300</b>	<b>77,300</b>	<b>104,300</b>	<b>138,300</b>	<b>178,800</b>
	<b>Tk/year</b>	<b>927,600</b>	<b>1,251,600</b>	<b>927,600</b>	<b>1,251,600</b>	<b>1,659,600</b>	<b>2,145,600</b>

Note: Upper Column: No. of Staff, Lower column: Salary

(2) Water charge

Water charge were considered for cleaning of sewerage facilities and office use by O&M personnel at amount of 5,000 l/day and 7,000 l/day for pump station and sewage treatment plant during the master plan stage. Water charge within the scope of feasibility study (priority project) were estimated in proportion to the design sewage flow against the planned sewage flow in the master plan. The estimated water charge is shown in Table 7.3.1.3.

Table 7.3.1.3 Water Charge

Sewerage Facility	Design Sewage Flow		Unit Cost	Daily Consumption	Period	Water Charge	
	F/S	M/P				F/S	M/P
	cu.m/day	cu.m/day				Tk/year	Tk/year
Merul Pump Station	66,120	167,200	3.67	5,000	365	2,648	6,697
Gulshan Pump Station	50,738	69,918	3.67	5,000	365	4,859	6,697
Sub-Total	-	-	-	-	-	7,507	13,394
North Dhaka East STP	43,320	104,500	3.67	7,000	365	3,886	9,376
Total	-	-	-	-	-	11,393	22,770

(3) Electricity charge

Electricity charge were estimated based on the annual power consumption at pump stations and sewage treatment plant as shown in Table 7.3.1.4.

Table 7.3.1.4 Electricity Charge

Sewerage Facility	Unit Cost	Power Consumption		Period	Electricity Charge	
		F/S	M/P		F/S	M/P
		kwh/year	kwh/year		Tk/year	Tk/year
Merul Pump Station	4.5	1,493,387	3,540,389	1	6,720,241	15,931,750
Gulshan Pump Station	4.5	771,971	1,000,987	1	3,473,869	4,504,441
Sub-Total	-	2,265,358	4,541,376	-	10,194,110	20,436,191
North Dhaka East STP	4.5	169,083	181,128	1	760,873	815,076

(4) Fuel cost

Fuel cost was estimated for the operation of emergency generator at pump stations and sewage treatment plant. Frequency of usage was estimated at 25 hours/month of actual operation and 2 hours/month of trial operation based on the hearing at existing sewerage facilities.

The estimated fuel cost is shown in Table 7.3.1.5.

**Table 7.3.1.5 Fuel Cost**

Sewerage Facility	Generator Power	Fuel Consumption Rate	Fuel Specific Gravity	Running Hours		Diesel Fuel Cost	No. of Generator		Fuel Cost	
				Operation	Test Run		F/S	M/P	F/S	M/P
	PS	kg/PS	kg/l	hours/month		Tk/l	set	set	Tk/year	
Merul PS	700	0.18	0.83	25	2	9	1	2	442,669	885,339
Gulshan PS	350	0.20	0.83	25	2	9	1	1	245,927	245,927
Sub-Total	-	-	-	-	-	-	2	3	688,596	1,131,266
Sewage Treatment Plant	70	0.22	0.83	25	2	9	1	1	54,104	54,104
Total	-	-	-	-	-	-	3	4	742,700	1,185,370

**(5) Chemical Cost**

Chemical cost was estimated for the consumption of chlorine gas for disinfection of treated effluent from the sewage treatment plant, as shown in Table 7.3.1.6.

**Table 7.3.1.6 Chemical Cost**

Items	Unit	North Dhaka East Sewage Treatment Plant	
		F/S	M/P
Sewage Flow	cu.m/day	43,320	104,500
Dosaing Rate	mg/l	3.0	3.0
Amount	kg/year	47,435	114,428
Unit Cost	Tk/50kg	7,000	7,000
Chemical Cost	Tk/year	6,640,900	16,019,920

**(6) Repair/Replacement Cost**

Repair/Replacement was considered for mechanical and electrical equipment to maintain the required performance and estimated at certain percentage to the procurement cost of relevant equipment referring to respective service life and their importance.

Following equipment were considered at 5 % of their procurement cost:

- Screen, Lifting Pump, Sludge Pump, Disinfection Equipment, Booster Pump, Strainer, Standby Generator, Lifting Facility

Following equipment were considered at 3 % of their procurement cost:

- Sand Pump, Suction Valve, Check Valve, Delivery Valve, Sludge Collector, Scum Return Pump, Sump Pump, Power Receiving & Distribution Facility, Operating Facility, Monitoring Instrumentation Facility

Following equipment were considered at 1 % of their procurement cost:

- Gate, Chain Hoist, Crane, Movable Weir

Repair/replacement cost estimated as mentioned above is shown in Table 7.3.1.7.

**Table 7.3.1.7 Repair/Replacement Cost**

Sewerage Facility	F/S	M/P	Remarks
	Tk/year	Tk/year	
Merul Pump Station	4,170,000	7,595,000	Refer to Table 7.3.1.8 and Table 7.3.1.9
Gulshan Pump Station	2,739,000	3,165,000	Refer to Table 7.3.1.10 and Table 7.3.1.11
<b>Sub-Total</b>	<b>6,909,000</b>	<b>10,760,000</b>	
North Dhaka East STP	3,455,000	6,073,000	Refer to Table 7.3.1.12 and Table 7.3.1.13
<b>Total</b>	<b>10,364,000</b>	<b>16,833,000</b>	

**(7) Sewer Cleaning Cost**

Sewer cleaning cost was estimated as the sum of personnel expense and fuel cost based on the following conditions:

**1) Cleaning progress**

- Daily Progress: 50 m/day
- Yearly Progress:  $50 \text{ m/day} \times 22 \text{ days/month} \times 12 \text{ month} = 13,200 \text{ m/year}$

**2) Personnel expense**

Site Engineer	1 person $\times$ 10,000 Tk/month $\times$ 12 month = 120,000 Tk/year
Equipment Operator	3 person $\times$ 7,000 Tk/month $\times$ 12 month = 252,000 Tk/year
Asst. Equip. Operator	6 person $\times$ 5,500 Tk/month $\times$ 12 month = 396,000 Tk/year
Driver	8 person $\times$ 4,500 Tk/month $\times$ 12 month = 432,000 Tk/year
<b>Sub-Total</b>	<b>1,200,000 Tk/year</b>

**3) Fuel cost**

Fuel Expense  $200 \text{ Tk/m} \times 13,200 \text{ m/year} = 2,640,000 \text{ Tk/year}$

**4) Sewer cleaning cost**

$1,200,000 \text{ Tk/year} + 2,640,000 \text{ Tk/year} = 3,840,000 \text{ Tk/year}$

Table 7.3.1.8 Repair Expense of Merul Pump Station at Feasibility Study (2005)

Merul Pump Station at Feasibility Study (2005)			Daily Average/Daily Maximum/Hourly Maximum 43,320/52,440/66,120m <sup>3</sup> /day				
Item No.	Name of Equipment	Specification	Power	Unit Cost (Yen'000)	Qty.	Cost Rate %	Total Cost (Yen'000)
<b>Mechanical Equipment</b>							
1	Inlet Gate	Manually operated Cast Iron Type	W1500mm×H1500mm	---	6,440	1	64
2	Gate	Manually operated Cast Iron Type	W1300mm×H1300mm	---	4,255	4	170
3	Screen	Hand Raked Bar Screen	W1700mm×H1500mm× <sup>o</sup> 50mm	---	3,327	2	333
4	Sand Pump	Submersible Sand Lifting Pump	φ80mm×0.2m <sup>3</sup> /min×8mH	1.5kW	2,057	1	62
5	Chain Hoist	Motor Operated Geared Trolley Chain Hoist	0.5ton×12mH×15mT	2.2kW 0.4kW	1,370	1	14
6	Suction Valve	Hand Operated Butterfly Valve	φ450mm	---	1,728	4	207
7	Check Valve	Swing Check Valve	φ450mm	---	3,106	4	373
8	Lifting Pump	Vertical Centrifugal Mixed Flow Pump	φ450mm×20m <sup>3</sup> /min×22mH	---	20,340	4	4,068
9	Lifting Pump Motor	Wound Rotor Induction Motor	400V×50Hz×6P	110kW	6,289	4	1,258
10	Delivery Valve	Motor Operated Butterfly Valve	φ450mm	0.2kW	2,446	4	294
11	Crane	Manually operated Geared Trolley Chain Hoist	3.2ton×15mH×15mT	---	7,612	1	76
<b>Electrical Equipment</b>							
12	Power Receiving & Distribution Facility	Power Receiving Panel Transformer Distribution Panel	VCB 500kVA MCCB		29,450	1	884
13	Operating Facility	Pump Panel	W800mm×H1950mm×D600mm		3,200	4	384
14	Monitoring Instrumentation Facility	Control Panel With Water Flow Monitor & Water Level Monitor	W1000mm×H2350mm× D600mm		12,800	1	384
15	Standby Generator	Diesel Engine Generator	500kVA		75,000	1	3,750
16	Lighting Facilities	Lighting Panel & Out door Lighting	300VA×10	10kW	3,800	1	190
<b>Annual Repair Expense (Yen'000/Year)</b>				<b>12,510</b>			

Table 7.3.1.9 Repair Expense of Merul Pump Station at Master Plan (2020)

Merul Pump Station at Mater Plan (2020)								Daily Average/Daily Maximum/Hourly Maximum 104,500/130,625/167,200m <sup>3</sup> /day	
Item No.	Name of Equipment	Specification	Power	Unit Cost (Yen'000)	Qty.	Cost Rate %	Total Cost (Yen'000)		
<b>Mechanical Equipment</b>									
1	Inlet Gate	Manually operated Cast Iron Type	W1500mm×H1500mm	---	6,440	1	1	64	
2	Gate	Manually operated Cast Iron Type	W1300mm×H1300mm	---	4,255	8	1	340	
3	Screen	Hand Raked Bar Screen	W1700mm×H1500mm×O50mm	---	3,327	4	5	665	
4	Sand Pump	Submersible Sand Lifting Pump	φ80mm×0.2m <sup>3</sup> /min×8mH	1.5kW	2,057	1	3	62	
5	Chain Hoist	Motor Operated Geared Trolley Chain Hoist	0.5ton×12mH×15mT	2.2kW 0.4kW	1,370	1	1	14	
6	Suction Valve	Hand Operated Butterfly Valve	φ450mm	---	1,728	7	3	363	
7	Check Valve	Swing Check Valve	φ450mm	---	3,106	7	3	652	
8	Lifting Pump	Vertical Centrifugal Mixed Flow Pump	φ450mm×20m <sup>3</sup> /min×22mH	---	20,340	7	5	7,119	
9	Lifting Pump Motor	Wound Rotor Induction Motor	400V×50Hz×6P	110kW	6,289	7	5	2,201	
10	Delivery Valve	Motor Operated Butterfly Valve	φ450mm	0.2kW	2,446	7	3	514	
11	Crane	Manually operated Geared Trolley Chain Hoist	3.2ton×15mH×15mT	---	7,612	1	1	76	
<b>Electrical Equipment</b>									
12	Power Receiving & Distribution Facility	Power Receiving Panel Transformer Distribution Panel	VCB 500kVA MCCB		48,750	1	3	1,463	
13	Operating Facility	Pump Panel	W800mm×H1950mm×D600mm		3,200	7	3	672	
14	Monitoring Instrumentation Facility	Control Panel With Water Flow Monitor & Water Level Monitor	W1000mm×H2350mm×D600mm		13,000	1	3	390	
15	Standby Generator	Diesel Engine Generator & Pallarel Running Panel	500kVA		80,000	2	5	8,000	
16	Lighting Facilities	Lighting Panel & Out door Lighting	300VA×10	10kW	3,800	1	5	190	
<b>Annual Repair Expense (Yen'000/Year)</b>				<b>22,785</b>					

Table 7.3.1.10 Repair Expense of Gulshan Pumping Station at Feasibility Study (2005)

Gulshan Pump Station at Feasibility Study (2005)			Daily Average/Daily Maximum/Hourly Maximum 33,242/40,240/50,738m <sup>3</sup> /day				
Item No.	Name of Equipment	Specification	Power	Unit Cost (Yen'000)	Qty.	Cost Rate %	Total Cost (Yen'000)
<b>Mechanical Equipment</b>							
1	Inlet Gate	Manually operated Cast Iron Type	W1100mm×H1100mm	---	3,563	1	36
2	Gate	Manually operated Cast Iron Type	W800mm×H800mm	---	2,025	6	122
3	Screen	Hand Raked Bar Screen	W1000mm×H1200mm×O50mm	---	2,244	3	337
4	Sand Pump	Submersible Sand Lifting Pump	φ80mm×0.2m <sup>3</sup> /min×8mH	1.5kW	2,057	1	62
5	Chain Hoist	Motor Operated Geared Trolley Chain Hoist	0.5ton×12mH×12mT	2.2kW 0.4kW	1,276	1	13
6	Suction Valve	Hand Operated Butterfly Valve	φ350mm	---	1,358	4	163
7	Check Valve	Swing Check Valve	φ350mm	---	2,025	4	243
8	Lifting Pump	Vertical Centrifugal Mixed Flow Pump	φ350mm×12.5m <sup>3</sup> /min×13mH	---	14,831	4	2,966
9	Lifting Pump Motor	Wound Rotor Induction Motor	400V×50Hz×6P	45kW	3,054	4	611
10	Delivery Valve	Motor Operated Butterfly Valve	φ350mm	0.2kW	2,077	4	249
11	Crane	Manually operated Geared Trolley Chain Hoist	3.2ton×15mH×12mT	---	6,831	1	68
<b>Electrical Equipment</b>							
12	Power Receiving & Distribution Facility	Power Receiving Panel Transformer Distribution Panel	VCB 250kVA MCCB		18,050	1	352
13	Operating Facility	Pump Panel	W700mm×H1950mm×D600mm		2,200	4	264
14	Monitoring Instrumentation Facility	Control Panel With Water Flow Monitor & Water Level Monitor	W1000mm×H2350mm×D600mm		11,800	1	354
15	Standby Generator	Diesel Engine Generator	250kVA		40,000	1	2,000
16	Lighting Facilities	Lighting Panel & Out door Lighting	300VA×10	10kW	3,800	1	190
<b>Annual Repair Expense (Yen'000/Year)</b>				<b>8,218</b>			

Table 7.3.1.11 Repair Expense of Gulshan Pump Station at Master Plan (2020)

Gulshan Pump Station at Mater Plan (2020)		Daily Average/Daily Maximum/Hourly Maximum 43,699/54,624/69,918m <sup>3</sup> /day					
Item No.	Name of Equipment	Specification	Power	Unit Cost (Yen'000)	Qty.	Cost Rate %	Total Cost (Yen'000)
<b>Mechanical Equipment</b>							
1	Inlet Gate	Manually operated Cast Iron Type	W <sup>1</sup> 1100mm×H <sup>1</sup> 1100mm	---	3,563	1	36
2	Gate	Manually operated Cast Iron Type	W <sup>8</sup> 800mm×H <sup>8</sup> 800mm	---	2,025	8	162
3	Screen	Hand Raked Bar Screen	W <sup>1</sup> 1000mm×H <sup>1</sup> 1200mm×O <sup>5</sup> 50mm	---	2,244	4	449
4	Sand Pump	Submersible Sand Lifting Pump	φ 80mm×0.2m <sup>3</sup> /min×8mH	1.5kW	2,057	1	62
5	Chain Hoist	Motor Operated Geared Trolley Chain Hoist	0.5ton×12mH×12mT	2.2kW 0.4kW	1,276	1	13
6	Suction Valve	Hand Operated Butterfly Valve	φ 350mm	---	1,358	5	204
7	Check Valve	Swing Check Valve	φ 350mm	---	2,025	5	304
8	Lifting Pump	Vertical Centrifugal Mixed Flow Pump	φ 350mm×12.5m <sup>3</sup> /min×13mH	---	14,831	5	3,708
9	Lifting Pump Motor	Wound Rotor Induction Motor	400V×50Hz×6P	45kW	3,054	5	764
10	Delivery Valve	Motor Operated Butterfly Valve	φ 350mm	0.2kW	2,077	5	312
11	Crane	Manually operated Geared Trolley Chain Hoist	3.2ton×15mH×12mT	---	6,831	1	68
<b>Electrical Equipment</b>							
12	Power Receiving & Distribution Facility	Power Receiving Panel Transformer Distribution Panel	VCB 250kVA MCCB	---	18,050	1	542
13	Operating Facility	Pump Panel	W <sup>7</sup> 700mm×H <sup>1</sup> 1950mm×P <sup>6</sup> 600mm	---	2,200	5	330
14	Monitoring Instrumentation Facility	Control Panel With Water Flow Monitor & Water Level Monitor	W <sup>1</sup> 1000mm×H <sup>2</sup> 2350mm×P <sup>6</sup> 600mm	---	11,800	1	354
15	Standby Generator	Diesel Engine Generator	250kVA	---	40,000	1	2,000
16	Lighting Facilities	Lighting Panel & Out door Lighting	300VA×10	10kW	3,800	1	190
<b>Annual Repair Expense (Yen'000/Year)</b>				<b>9,495</b>			



Table 7.3.1.12 Repair Expense of North Dhaka East Sewerage Treatment Plant at Feasibility Study (2005)

North Dhaka East STP at Feasibility Study (2005)			Daily Average/Daily Maximum/Hourly Maximum 43,320/52,440/66,120m <sup>3</sup> /day				
Item No.	Name of Equipment	Specification	Power	Unit Cost (Yen'000)	Qty.	Cost Rate %	Total Cost (Yen'000)
<b>Mechanical Equipment</b>							
1	Chain Hoist	Motor Operated Geared Trolley Chain Hoist	0.5ton×12mH×12mT	2.2kW 0.4kW	1,276	1	13
2	Sludge Collector	Circular Tank Sludge Scraper Center Drive Floor Mount	φ 28m×3.8m	1.5kW	52,821	3	4,754
3	Auxiliary Equipment of Sludge Collector	Circular Tank Sludge Scraper Center Drive Floor Mount	φ 28m×3.8m	—	14,029	3	1,263
4	Sludge Pump	Nonclogging Sludge Pump	φ 150mm×1.1m <sup>3</sup> /min×20mH	11kW	4,882	4	976
5	Sludge Pump Motor	Totally Enclosed Fan	200V×50Hz×4P	11kW	124	4	25
6	Scum Return Pump	Submersible Pump	φ 80mm×0.5m <sup>3</sup> /min×10mH	1.5kW	679	2	41
7	Sump Pump	Submersible Pump	φ 50mm×0.2m <sup>3</sup> /min×10mH	0.75kW	211	2	13
8	Disinfection Equipment	Chlorine Gas Dosing Method	10kg/h	—	13,910	1	696
9	Booster Pump	Horizontal Multistage Pump	φ 50mm×0.1m <sup>3</sup> /min×40mH	3.7kW	492	3	74
10	Strainer	Automatic Backwash Type	φ 50mm×0.1m <sup>3</sup> /min	0.1kW	2,884	3	433
11	Chain Hoist	Motor Operated Geared Trolley Chain Hoist	2ton×6mH×10mT	3.7kW 0.75kW	1,452	1	15
12	Movable Weir	Hand Operated Cast Iron Type Direct Connected	W2000mm×H1500mm	—	8,605	1	86
13	Inverted Siphon Gate	Manually operated Cast Iron Type	W1100mm×H1100mm	—	2,943	4	118
<b>Electrical Equipment</b>							
14	Power Receiving & Distribution Facility	Power Receiving Panel Transformer Distribution Panel	VCB 150kVA MCCB		19,950	1	599
15	Operating Facility	Each Panel	Out Door Use		15,450	1	464
16	Monitoring Instrumentation Facility	Monitoring Panel with Water Flow Meter	W1000mm×H2350mm× D600mm		7,000	1	210
17	Standby Generator	Diesel Engine Generator	50kVA		8,000	1	400
18	Lighting Facilities	Lighting Panel & Out door Lighting	300VA×10	10kW	3,800	1	190
<b>Annual Repair Expense (Yen'000/Year)</b>				<b>10,366</b>			

Table 7.3.1.13 Repair Expense of North Dhaka East Sewerage Treatment Plant at Master Plan (2020)

North Dhaka East STP at Mater Plan (2020)		Daily Average/Daily Maximum/Hourly Maximum 104,500/130,625/167,200m <sup>3</sup> /day						
Item No.	Name of Equipment	Specification	Power	Unit Cost (Yen'000)	Qty.	Cost Rate %	Total Cost (Yen'000)	
<b>Mechanical Equipment</b>								
1	Chain Hoist	Motor Operated Geared Trolley Chain Hoist	0.5ton×12mH×12mT	2.2kW 0.4kW	1,276	1	13	
2	Sludge Collector	Circular Tank Sludge Scraper Center Drive Floor Mount	φ 28m×3.8m	1.5kW	52,821	6	9,508	
3	Auxiliary Equipment of Sludge Collector	Circular Tank Sludge Scraper Center Drive Floor Mount	φ 28m×3.8m	—	14,029	6	2,525	
4	Sludge Pump	Nonclogging Sludge Pump	φ 150mm×1.1m <sup>3</sup> /min×20mH	11kW	4,882	8	1,953	
5	Sludge Pump Motor	Totally Enclosed Fan	200V×50Hz×4P	11kW	124	8	50	
6	Scum Return Pump	Submersible Pump	φ 80mm×0.5m <sup>3</sup> /min×10mH	1.5kW	679	4	81	
7	Sump Pump	Submersible Pump	φ 50mm×0.2m <sup>3</sup> /min×10mH	0.75kW	211	2	13	
8	Disinfection Equipment	Chlorine Gas Dosing Method	10kg/h	—	18,297	1	915	
9	Booster Pump	Horizontal Multistage Pump	φ 50mm×0.1m <sup>3</sup> /min×40mH	3.7kW	492	3	74	
10	Strainer	Automatic Backwash Type	φ 50mm×0.1m <sup>3</sup> /min	0.1kW	2,884	3	433	
11	Chain Hoist	Motor Operated Geared Trolley Chain Hoist	2ton×6mH×10mT	3.7kW 0.75kW	1,452	1	15	
12	Movable Weir	Hand Operated Cast Iron Type Direct Connected	W2000mm×H1500mm	—	8,605	2	172	
13	Inverted Siphon Gate	Manually operated Cast Iron Type	W1100mm×H1100mm	—	2,943	4	118	
<b>Electrical Equipment</b>								
14	Power Receiving & Distribution Facility	Power Receiving Panel Transformer Distribution Panel	VCB 150kVA MCCB		19,950	1	3 599	
15	Operating Facility	Each Panel	Out Door Use		25,500	1	3 765	
16	Monitoring Instrumentation Facility	Monitoring Panel with Water Flow Meter	W1000mm×H2350mm×D600mm		7,000	1	3 210	
17	Standby Generator	Diesel Engine Generator	50kVA		8,000	1	5 400	
18	Lighting Facilities	Lighting Panel & Out door Lighting	300VA×10	10kW	3,800	2	5 380	
<b>Annual Repair Expense (Yen'000/Year)</b>				<b>18,221</b>				

**A. 14**

**EMERGENCY PROJECT FOR  
NORTH DHAKA EAST**

Appendix 14.3.1 Sewage Flow Calculation of Sewer System for Baridhara Area

Sewer No.	Sewer No. of Downstream	Area		Length		Population			Sewage Flow Rate		Design Sewer						Remark				
		Each	Total	Each	Total	Per/ha	Population		Sewage Flow	Material	Diameter	Gradient	Velocity	Flow Rate	Ground Level			Invert Level		Covering	
							Each	Total							Person	Person		cu.m/sec	-	mm	%
3001	3003	0.22	0.22	70	70	561.06	123	123	0.0002	VP	200	2.50	0.679	0.0213	6.70	5.491	5.317	1.00	1.18		
3002	3003	1.13	1.13	190	190	561.06	634	634	0.0012	VP	200	2.50	0.679	0.0213	6.70	5.491	5.015	1.00	1.48		
3003	3005	0.20	1.55	50	240	561.06	112	870	0.0016	VP	200	2.50	0.679	0.0213	6.70	5.015	4.890	1.48	1.60		
3004	3005	0.90	0.90	170	170	561.06	505	505	0.0009	VP	200	2.50	0.679	0.0213	6.70	5.491	5.067	1.00	1.43		
3005	3007	0.40	2.85	55	295	561.06	224	1,599	0.0030	VP	200	2.50	0.679	0.0213	6.70	4.890	4.752	1.60	1.74		
3006	3007	0.92	0.92	160	160	561.06	516	516	0.0010	VP	200	2.50	0.679	0.0213	6.70	5.491	5.091	1.00	1.40		
3007	3011	0.44	4.21	55	350	561.06	247	2,362	0.0044	VP	200	2.50	0.679	0.0213	6.70	4.752	4.491	1.74	1.00		
3008	3010	0.55	0.55	100	100	561.06	309	309	0.0006	VP	200	2.50	0.679	0.0213	6.70	5.491	5.241	1.00	1.25		
3009	3010	0.16	0.16	50	50	561.06	90	90	0.0002	VP	200	2.50	0.679	0.0213	6.70	5.491	5.366	1.00	1.13		
3010	3011	1.24	1.95	265	365	561.06	696	1,094	0.0020	VP	200	2.50	0.679	0.0213	6.70	5.241	4.491	1.25	1.00		
3011	3014	0.52	6.68	65	430	561.06	292	3,748	0.0069	VP	200	2.50	0.679	0.0213	5.70	4.432	4.211	1.06	1.00		
3012	3013	0.16	0.16	50	50	561.06	90	90	0.0002	VP	200	2.50	0.679	0.0213	6.20	4.796	4.671	1.20	1.00		
3013	3014	1.08	1.24	240	290	561.06	606	696	0.0013	VP	200	2.50	0.679	0.0213	5.88	4.671	4.071	1.00	1.14		
3014	3017	0.52	8.44	75	505	561.06	292	4,735	0.0088	VP	200	2.50	0.679	0.0213	5.42	4.071	3.883	1.14	1.34		
3015	3016	0.20	0.20	55	55	561.06	112	112	0.0002	VP	200	2.50	0.679	0.0213	5.88	4.671	4.533	1.00	1.04		
3016	3017	1.08	1.28	205	260	561.06	606	718	0.0013	VP	200	2.50	0.679	0.0213	5.78	4.533	4.023	1.04	1.20		
3017	3020	0.59	10.31	75	580	561.06	331	5,785	0.0107	VP	200	2.50	0.679	0.0213	5.43	3.883	3.695	1.34	1.57		
3018	3019	0.20	0.20	50	50	561.06	112	112	0.0002	VP	200	2.50	0.679	0.0213	5.78	4.571	4.446	1.00	1.05		
3019	3020	1.07	1.27	195	245	561.06	600	713	0.0013	VP	200	2.50	0.679	0.0213	5.70	4.446	3.959	1.05	1.30		
3020	3021	0.52	12.10	70	650	561.06	292	6,789	0.0126	VP	200	2.50	0.679	0.0213	5.47	3.695	3.521	1.57	1.80		
3021	3037	1.19	29.31	130	1,120	561.06	668	16,445	0.0305	VP	250	2.20	0.739	0.0363	5.53	2.394	2.109	2.88	3.33		
3022	3021	1.67	16.20	320	990	561.06	937	9,089	0.0168	VP	200	2.50	0.679	0.0213	5.71	3.240	2.442	2.26	2.88		
3023	3025	0.40	0.40	65	65	561.06	224	224	0.0004	VP	200	2.50	0.679	0.0213	6.55	5.241	5.179	1.00	1.16		
3024	3025	1.12	1.12	190	190	561.06	628	628	0.0012	VP	200	2.50	0.679	0.0213	6.70	5.491	5.015	1.00	1.33		
3025	3027	0.30	1.82	50	240	561.06	168	1,021	0.0019	VP	200	2.50	0.679	0.0213	6.55	5.015	4.890	1.33	1.45		
3026	3027	0.89	0.89	190	190	561.06	499	499	0.0009	VP	200	2.50	0.679	0.0213	6.70	5.491	5.015	1.00	1.33		
3027	3029	0.43	3.14	70	310	561.06	241	1,762	0.0033	VP	200	2.50	0.679	0.0213	6.55	4.890	4.716	1.45	1.63		
3028	3029	0.91	0.91	190	190	561.06	511	511	0.0009	VP	200	2.50	0.679	0.0213	6.70	5.491	5.015	1.00	1.33		

Sewer No.	Sewer No. of Downstream	Area		Length		Sewage Flow Rate			Design Sewer							Remark					
		Each	Total	Each	Total	Population Density	Population		Sewage Flow	Material	Diameter	Gradient	Velocity	Flow Rate	Ground Level		Invert Level		Covering		
							ha	ha							m		m	Person	Person	cu.m/sec	M
3029	3031	0.88	4.93	145	455	561.06	494	2,766	0.0051	VP	200	2.50	0.679	0.0213	6.55	4.716	4.553	1.63	1.32		
3030	3031	0.56	0.56	100	100	561.06	314	314	0.0006	VP	200	2.50	0.679	0.0213	5.88	4.671	4.421	1.00	1.25		
3031	3033	0.39	5.88	75	530	561.06	219	3,299	0.0061	VP	200	2.50	0.679	0.0213	5.88	4.353	4.165	1.32	1.41		
3032	3033	0.64	0.64	80	80	561.06	359	359	0.0007	VP	200	2.50	0.679	0.0213	5.78	4.571	4.371	1.00	1.20		
3033	3035	0.35	6.87	70	600	561.06	196	3,854	0.0071	VP	200	2.50	0.679	0.0213	5.78	4.165	3.991	1.41	1.50		
3034	3035	0.64	0.64	105	105	561.06	359	359	0.0007	VP	200	2.50	0.679	0.0213	5.70	4.491	4.230	1.00	1.26		
3035	3022	0.26	7.77	70	670	561.06	146	4,359	0.0081	VP	200	2.50	0.679	0.0213	5.70	3.991	3.817	1.50	1.69		
3036	3055	0.63	30.57	55	1235	561.06	353	17,152	0.0318	VP	250	2.20	0.739	0.0363	5.81	1.977	1.857	3.58	3.59		
3037	3036	0.63	29.94	60	1180	561.06	353	16,798	0.0311	VP	250	2.20	0.739	0.0363	5.84	2.109	1.977	3.47	3.47		
3038	3040	1.73	1.73	335	335	561.06	971	971	0.0018	VP	200	2.50	0.679	0.0213	5.81	4.601	3.762	1.00	1.73		
3039	3040	0.24	0.24	50	50	561.06	135	135	0.0003	VP	200	2.50	0.679	0.0213	6.04	4.831	4.706	1.00	0.79		
3040	3042	0.39	2.36	70	405	561.06	219	1,324	0.0025	VP	200	2.50	0.679	0.0213	6.10	3.762	3.588	2.13	1.91		
3041	3042	1.63	1.63	305	305	561.06	915	915	0.0017	VP	200	2.50	0.679	0.0213	5.84	4.631	3.869	1.00	1.62		
3042	3044	0.36	4.35	70	475	561.06	202	2,441	0.0045	VP	200	2.50	0.679	0.0213	5.78	3.588	3.414	1.99	2.08		
3043	3044	1.61	1.61	300	300	561.06	903	903	0.0017	VP	200	2.50	0.679	0.0213	5.77	4.561	3.811	1.00	1.68		
3044	3022	0.31	6.27	70	545	561.06	174	3,518	0.0065	VP	200	2.50	0.679	0.0213	5.73	3.414	3.240	2.11	2.26		
3045	3022	0.31	0.31	90	90	561.06	174	174	0.0003	VP	200	2.50	0.679	0.0213	6.75	5.123	4.501	1.40	1.00		
3046	3055	2.53	2.53	420	420	561.06	1,419	1,419	0.0026	VP	200	2.50	0.679	0.0213	6.04	4.831	3.779	1.00	1.71		
3047	3051	0.28	0.28	50	50	561.06	157	157	0.0003	VP	200	2.50	0.679	0.0213	6.02	4.811	4.686	1.00	0.81		
3048	3050	0.67	0.67	150	150	561.06	376	376	0.0007	VP	200	2.50	0.679	0.0213	6.07	4.861	4.436	1.00	1.01		
3049	3050	0.32	0.32	65	65	561.06	180	180	0.0003	VP	200	2.50	0.679	0.0213	6.04	4.831	4.669	1.00	0.82		
3050	3053	0.36	1.35	65	215	561.06	202	757	0.0014	VP	200	2.50	0.679	0.0213	6.09	4.486	4.324	1.40	1.17		
3051	3057	0.26	0.54	50	100	561.06	146	303	0.0006	VP	200	2.50	0.679	0.0213	6.07	4.686	4.561	1.18	0.93		
3052	3053	0.63	0.63	150	150	561.06	353	353	0.0007	VP	200	2.50	0.679	0.0213	6.03	4.821	4.446	1.00	1.05		
3053	3056	0.26	2.24	75	290	561.06	146	1,257	0.0023	VP	200	2.50	0.679	0.0213	6.00	4.324	4.136	1.47	1.36		
3054	3056	0.31	0.31	95	95	561.06	174	174	0.0003	VP	200	2.50	0.679	0.0213	6.75	5.360	4.941	1.18	0.55		
3055	3061	2.03	35.13	200	1435	561.06	1,139	19,710	0.0365	VP	300	1.90	0.775	0.0548	6.00	1.809	1.429	3.88	3.96		
3056	3058	1.07	3.62	130	420	561.06	600	2,031	0.0038	VP	200	2.50	0.679	0.0213	6.15	4.136	3.812	1.81	1.68		
3057	3058	0.22	0.76	55	155	561.06	123	426	0.0008	VP	200	2.50	0.679	0.0213	6.03	4.561	4.423	1.26	1.07		

Sewer No.	Sewer No. of Downstream	Area		Length		Sewage Flow Rate				Design Sewer								Remark		
		Each	Total	Each	Total	Population Density	Population		Sewage Flow	Material	Diameter	Gradient	Velocity	Flow Rate	Ground Level	Invert Level			Covering	
							Each	Total								cu.m./sec	Person		Person	M
3058	3060	0.99	5.37	140	560	561.06	555	3,013	0.0056	VP	200	2.50	0.679	0.0213	6.03	3.812	3.462	2.01	2.03	
3059	3060	1.36	1.36	190	190	561.06	763	763	0.0014	VP	200	2.50	0.679	0.0213	6.03	4.821	4.345	1.00	1.15	
3060	3061	0.32	7.05	90	650	561.06	180	3,955	0.0073	VP	200	2.50	0.679	0.0213	5.90	3.462	3.258	2.23	2.26	
3061	3065	1.12	43.30	145	1580	561.06	628	24,294	0.0450	VP	300	1.90	0.775	0.0548	5.87	1.429	1.153	4.13	4.24	
3062	3064	2.71	2.71	260	260	561.06	1,520	1,520	0.0028	VP	200	2.50	0.679	0.0213	6.06	4.851	4.202	1.00	1.29	
3063	3064	0.75	0.75	120	120	561.06	421	421	0.0008	VP	200	2.50	0.679	0.0213	5.90	4.691	4.391	1.00	1.10	
3064	3065	0.36	3.82	90	350	561.06	202	2,143	0.0040	VP	200	2.50	0.679	0.0213	5.80	4.202	3.978	1.39	1.52	
3065	3076	1.08	48.20	170	1750	561.06	606	27,043	0.0501	VP	300	1.90	0.775	0.0548	5.84	1.153	0.829	4.38	4.56	
3066	3076	0.44	9.68	50	580	561.06	247	5,431	0.0101	VP	200	2.50	0.679	0.0213	6.16	3.665	3.540	2.29	1.95	
3067	3069	0.51	0.51	155	155	561.06	286	286	0.0005	VP	200	2.50	0.679	0.0213	6.20	4.991	4.604	1.00	0.89	
3068	3069	0.51	0.51	120	120	561.06	286	286	0.0005	VP	200	2.50	0.679	0.0213	6.20	4.991	4.691	1.00	0.80	
3069	3071	0.56	1.58	130	285	561.06	314	886	0.0016	VP	200	2.50	0.679	0.0213	6.02	4.604	4.280	1.21	1.21	
3070	3071	1.15	1.15	180	180	561.06	645	645	0.0012	VP	200	2.50	0.679	0.0213	6.29	5.081	4.633	1.00	0.86	
3071	3066	0.44	3.17	110	395	561.06	247	1,779	0.0033	VP	200	2.50	0.679	0.0213	6.07	4.280	4.005	1.58	1.49	
3072	3066	2.41	6.07	250	530	561.06	1,352	3,406	0.0063	VP	200	2.50	0.679	0.0213	6.06	4.290	3.665	1.56	1.83	
3073	3072	1.57	1.57	260	260	561.06	881	881	0.0016	VP	200	2.50	0.679	0.0213	6.15	4.941	4.292	1.00	1.20	
3074	3072	1.77	1.77	280	280	561.06	993	993	0.0018	VP	200	2.50	0.679	0.0213	6.20	4.991	4.290	1.00	1.20	
3075	3072	0.32	0.32	95	95	561.06	180	180	0.0003	VP	200	2.50	0.679	0.0213	6.71	5.295	4.851	1.21	0.64	
3076	3077	0.00	57.88	20	1770	561.06	0	32,474	0.0601	VP	550	1.60	0.788	0.0759	6.16	0.779	0.747	5.02	4.59	
3077	PUMP	0.00	57.88	500	2270	561.06	0	32,474	0.0601	SP	250	8.29	0.049	1.2243	6.16	4.903	5.763	1.00	1.00	















Appendix 14.3.3 Present Sewerage Service Ratio

Item	Zone	1992	1993	1994	1995	1996	1997
Water Connection	I	23,632	24,895	26,888	29,057	30,584	32,150
	II	16,886	17,208	17,671	18,144	18,537	19,037
	III	17,922	18,515	18,905	19,682	20,327	21,023
	IV	25,439	27,318	29,397	31,648	33,358	35,430
	V	11,598	17,200	19,197	21,493	23,388	26,213
	VI	18,062	18,983	19,845	20,982	21,656	22,412
	Govt.	1,699	1,741	1,868	1,943	2,033	2,092
	Toatl	115,238	125,860	133,771	142,949	149,883	158,357
	North Dhaka	11,598	17,200	19,197	21,493	23,388	26,213
	South Dhaka	58,440	60,618	63,464	66,883	69,448	72,210
Sewer Connection	I	15,401	15,622	15,876	16,052	16,242	16,419
	II	11,124	11,321	11,509	11,787	11,959	12,119
	III	2,847	3,012	3,184	3,381	3,613	3,845
	IV	0	0	0	0	0	0
	V	3,058	3,212	3,370	3,495	3,565	3,714
	VI	5,775	5,927	6,106	6,303	6,427	6,527
	Govt.	748	748	748	750	752	753
	Toatl	38,953	39,842	40,793	41,768	42,558	43,377
	North Dhaka	3,058	3,212	3,370	3,495	3,565	3,714
	South Dhaka	29,372	29,955	30,569	31,220	31,814	32,383
Sewerage Service Ratio	Toatl	33.8	31.7	30.5	29.2	28.4	27.4
	North Dhaka	26.4	18.7	17.6	16.3	15.2	14.2
	South Dhaka	50.3	49.4	48.2	46.7	45.8	44.8

Appendix 14.3.4 Sewage Flow Calculation for Existing Sewerage Service Area (Year 2005)

Sewer No.	Sewer No. of Downstream	Area				Length				Population				Sewage Flow Rate				Design Sewer								Hydraulic Capacity / Sewage Flow %	Remark	
		Each		Total	Each		Total	Each		Total	Each		Total	Sewage Flow cu.m/sec	Material	Diameter mm	Gradient %	Velocity m/sec	Hydraulic Capacity cu.m/sec	Ground Level M	Invert Level		Covering		Hydraulic Capacity Check			
		ha	ha	ha	m	m	m	Per/ha	Person	Person	Person	Person	Person								M	M	M	M	M			M
1001	1002	7.26	7.26	7.26	580	580	444.70	3,229	3,229	0.0019	VP	200	2.00	0.607	0.0191	7.75	6.741	5.577	0.80	1.78	OK	-	-	-	-			
1002	1004	1.43	8.69	8.69	280	860	444.70	636	3,864	0.0023	VP	300	1.20	0.616	0.0435	7.56	5.577	5.241	1.67	1.89	OK	-	-	-	-			
1003	1004	17.64	17.64	17.64	800	800	444.70	7,845	7,845	0.0046	VP	200	2.00	0.607	0.0191	6.69	5.681	4.081	0.80	3.15	OK	-	-	-	-			
1004	1005	0.00	26.33	26.33	230	1,090	444.70	0	11,709	0.0069	VP	300	1.20	0.616	0.0435	7.44	4.081	3.806	3.05	2.66	OK	-	-	-	-			
1005	1021	49.79	76.12	76.12	340	1,430	444.70	22,142	33,851	0.0200	VP	300	1.20	0.616	0.0435	6.78	3.806	3.400	2.66	3.45	OK	-	-	-	-			
1007	1008	7.02	7.02	7.02	550	550	444.70	3,122	3,122	0.0018	VP	200	2.00	0.607	0.0191	7.59	6.581	5.481	0.80	2.02	OK	-	-	-	-			
1008	1010	4.84	11.86	11.86	415	965	444.70	2,152	5,274	0.0031	VP	300	1.20	0.616	0.0435	7.71	5.481	4.986	1.92	2.37	OK	-	-	-	-			
1009	1010	8.82	8.82	8.82	630	630	444.70	3,922	3,922	0.0023	VP	200	2.00	0.607	0.0191	7.53	6.521	5.261	0.80	2.20	OK	-	-	-	-			
1010	1021	0.46	21.14	21.14	95	1,060	444.70	205	9,401	0.0055	VP	300	1.20	0.616	0.0435	7.67	4.986	4.872	2.37	1.98	OK	-	-	-	-			
1011	1013	2.21	2.21	2.21	100	100	444.70	983	983	0.0006	VP	200	2.00	0.607	0.0191	6.12	5.111	4.911	0.80	1.00	OK	-	-	-	-			
1012	1013	0.38	0.38	0.38	25	25	444.70	169	169	0.0001	VP	300	1.20	0.616	0.0435	6.12	5.012	4.982	0.80	0.83	OK	-	-	-	-			
1013	1015	3.09	5.68	5.68	230	330	444.70	1,374	2,526	0.0015	VP	300	1.20	0.616	0.0435	6.12	4.911	4.636	0.90	1.95	OK	-	-	-	-			
1014	1015	6.76	6.76	6.76	420	420	444.70	3,006	3,006	0.0018	VP	200	2.00	0.607	0.0191	6.82	5.811	4.974	0.80	1.72	OK	-	-	-	-			
1015	1020	2.43	14.87	14.87	230	650	444.70	1,081	6,613	0.0039	VP	300	1.20	0.616	0.0435	6.90	4.636	4.361	1.95	2.97	OK	-	-	-	-			
1016	1017	2.01	2.01	2.01	215	215	444.70	894	894	0.0005	VP	200	2.00	0.607	0.0191	6.82	5.811	5.381	0.80	1.46	OK	-	-	-	-			
1017	1019	1.97	3.98	3.98	260	475	444.70	876	1,770	0.0010	VP	300	1.20	0.616	0.0435	7.05	5.381	5.069	1.36	2.33	OK	-	-	-	-			
1018	1019	3.91	3.91	3.91	440	440	444.70	1,739	1,739	0.0010	VP	200	2.00	0.607	0.0191	7.20	6.191	5.309	0.80	2.19	OK	-	-	-	-			
1019	1020	0.27	8.16	8.16	75	550	444.70	120	3,629	0.0021	VP	300	1.20	0.616	0.0435	7.71	5.069	4.979	2.33	2.35	OK	-	-	-	-			
1020	1021	8.94	31.97	31.97	340	990	444.70	3,976	14,217	0.0084	VP	300	1.20	0.616	0.0435	7.64	4.361	3.955	2.97	2.90	OK	-	-	-	-			
1021	1024	17.42	146.65	146.65	835	2,265	444.70	7,747	65,215	0.0385	VP	450	0.70	0.617	0.0981	7.16	3.400	2.812	3.30	3.74	OK	-	-	-	-			
1022	1023	48.07	48.07	48.07	1,040	1,040	444.70	21,377	21,377	0.0126	VP	200	2.00	0.607	0.0191	5.76	4.751	2.671	0.80	3.34	OK	-	-	-	-			
1023	1024	47.13	95.20	95.20	600	1,640	444.70	20,959	42,335	0.0250	VP	250	1.50	0.610	0.0299	6.22	2.671	1.771	3.29	4.99	OK	-	-	-	-			
1024	1025	59.65	359.38	359.38	710	2,975	444.70	26,526	159,816	0.0943	VP	450	0.70	0.617	0.0981	7.02	1.771	1.271	4.79	5.27	OK	-	-	-	-			
1025	1035	60.79	420.17	420.17	870	3,845	444.70	27,033	186,850	0.1103	VP	450	0.70	0.617	0.0981	7.00	1.271	0.659	5.27	5.51	NO	89	-	-	-			
1026	1028	7.93	7.93	7.93	285	285	444.70	3,526	3,526	0.0021	VP	300	1.20	0.616	0.0435	7.00	5.892	5.550	0.80	1.04	OK	-	-	-	-			

Sewer No.	Sewer No. of Downstream	Area		Length		Sewage Flow Rate			Design Sewer										Hydraulic Capacity / Sewage Flow %	Hydraulic Capacity Check	Remark			
		Each	Total	Each	Total	Population Density	Each	Total	Sewage Flow	Material	Diameter	Gradient	Velocity	Hydraulic Capacity	Ground Level	Upstream	Downstream	Upstream				Downstream	Upstream	Downstream
		ha	ha	m	m	Per./ha	Person	Person	cu.m/sec	-	mm	%	m/sec	cu.m/sec	M	M	M	M	m	m	m			
1027	1028	7.12	7.12	170	170	444.70	3,166	3,166	0.0019	VP	200	2.00	0.607	0.0191	7.00	5.991	5.651	5.651	0.80	1.04	1.04	OK	-	
1028	1030	1.14	16.19	115	400	444.70	507	7,200	0.0043	VP	300	1.20	0.616	0.0435	6.90	5.550	5.412	5.412	1.04	1.18	1.18	OK	-	
1029	1024	57.88	57.88	0	0	444.70	25,739	25,739	0.0152	VP	400	0.80	0.609	0.0766	7.02	5.813	5.813	5.813	0.80	0.80	0.80	OK	-	From Baridhara
1030	1034	8.10	24.29	620	1,020	444.70	3,602	10,802	0.0064	VP	450	0.70	0.617	0.0981	6.90	5.412	4.980	4.980	1.02	1.54	1.54	OK	-	
1031	1033	72.50	72.50	385	385	444.70	32,241	68,782	0.0406	VP	300	1.20	0.616	0.0435	6.88	5.772	5.308	5.308	0.80	1.41	1.41	OK	-	
1032	1033	21.46	21.46	310	310	444.70	9,543	9,543	0.0056	VP	200	2.00	0.607	0.0191	6.84	5.831	5.209	5.209	0.80	1.61	1.61	OK	-	
1033	1034	6.66	100.62	500	885	444.70	2,962	44,746	0.0264	VP	300	1.20	0.616	0.0435	7.03	5.209	4.609	4.609	1.51	2.06	2.06	OK	-	
1034	1035	128.88	253.79	1,140	2,160	444.70	57,313	112,860	0.0666	VP	450	0.70	0.617	0.0981	6.98	4.609	3.810	3.810	1.91	2.36	2.36	OK	-	
1035	1036	37.92	711.88	780	4,625	444.70	16,863	198,505	0.1172	VP	450	0.70	0.617	0.0981	6.63	0.672	0.122	0.122	5.49	6.04	6.04	NO	84	

## Appendix 14.4.1 Direct Construction Cost of Sewer

### Table 14.4.1.1 Bill of Quantity of Sewer

Unit: m

Area	Material	Diameter	Average Sewer Covering						Total	
			1.0 m	2.0 m	3.0 m	4.0 m	5.0 m	6.0 m		
Baridhara Area	PVC	200	7,465	1,295	320	0	0	0	9,080	
	PVC	250	0	0	190	55	0	0	245	
	PVC	300	0	0	0	515	0	0	515	
	PVC	350	0	0	0	0	20	0	20	
	Sub-total			7,465	1,295	510	570	20	0	9,860
	SP	250	500	0	0	0	0	0	500	
	Total			7,965	1,295	510	570	20	0	10,360
Existing Service Area	RC	700	0	0	0	0	0	2,615	2,615	
	RC	1000	0	0	0	0	0	4,015	4,015	
	RC	1200	0	0	0	3,370	0	0	3,370	
	Total			0	0	0	3,370	0	6,630	10,000

Note: PVC: Polyvinyl Chloride Pipe, RC: Reinforced Concrete Pipe, SP: Steel Pipe

### Table 14.4.1.2 Direct Construction Cost of Sewer

Unit: Tk

Area	Material	Diameter	Average Sewer Covering						Total	
			1.0 m	2.0 m	3.0 m	4.0 m	5.0 m	6.0 m		
Baridhara Area	PVC	200	23,380,380	5,894,840	1,958,080	0	0	0	31,233,300	
	PVC	250	0	0	1,251,530	1,705,330	0	0	2,956,860	
	PVC	300	0	0	0	16,271,425	0	0	16,271,425	
	PVC	350	0	0	0	0	761,980	0	761,980	
	Sub-total			23,380,380	5,894,840	3,209,610	17,976,755	761,980	0	51,223,565
	SP	250	2,333,500	0	0	0	0	0	2,333,500	
	Total			25,713,880	5,894,840	3,209,610	17,976,755	761,980	0	53,557,065
Existing Service Area	RC	700	0	0	0	0	0	137,920,330	137,920,330	
	RC	1000	0	0	0	0	0	247,448,465	247,448,465	
	RC	1200	0	0	0	187,995,450	0	0	187,995,450	
	Total			0	0	0	187,995,450	0	385,368,795	573,364,245
Grand Total			25,713,880	5,894,840	3,209,610	205,972,205	761,980	385,368,795	626,921,310	

Note: PVC: Polyvinyl Chloride Pipe, RC: Reinforced Concrete Pipe, SP: Steel Pipe

### Table 14.4.1.3 Direct Construction Cost

Unit: Tk

Item	Baridhara Area	South Dhaka Area	Total
Sewer	53,557,065	573,364,245	626,921,310
Manhole Pump	3,333,000	0	3,333,000
Total	56,890,065	573,364,245	630,254,310



Appendix 14.5.1 Design Population

Table 14.5.1.1 Population of the Existing Sewerage Service Area (Year 1991)

Zone (SPZ No.)	Areas		Established Urban and Urban Fringe	Established Urban +Security Zone		Urban Fringe	New Urban	Cantonment Security Zone	Others	Total
	SPZ Area (ha)	Service Area (ha)		Residential	Non-resident					
1	SPZ Area (ha)	Service Area (ha)	858	0	0	0	0	0	0	858
	Density (person/ha)		287	0	0	0	0	0	0	287
	Population (person)		246,000	0	0	0	0	0	0	246,000
	SPZ Area (ha)	Service Area (ha)	1,288	0	0	0	0	0	55	1,343
2	SPZ Area (ha)	Service Area (ha)	993	0	0	0	0	0	0	993
	Density (person/ha)		297	0	0	0	0	0	0	297
	Population (person)		295,000	0	0	0	0	0	0	295,000
	SPZ Area (ha)	Service Area (ha)	1,121	0	0	0	0	0	28	1,149
3	SPZ Area (ha)	Service Area (ha)	924	0	0	0	0	0	0	924
	Density (person/ha)		791	0	0	0	0	0	0	791
	Population (person)		731,000	0	0	0	0	0	795	731,000
	SPZ Area (ha)	Service Area (ha)	1,059	0	0	157	0	0	0	2,011
4	SPZ Area (ha)	Service Area (ha)	439	0	0	0	0	0	0	439
	Density (person/ha)		532	0	0	0	0	0	0	533
	Population (person)		234,000	0	0	0	0	0	0	234,000
	SPZ Area (ha)	Service Area (ha)	1,536	0	0	344	0	0	8	1,888
7	SPZ Area (ha)	Service Area (ha)	878	0	0	0	0	0	0	878
	Density (person/ha)		536	0	0	0	0	0	0	536
	Population (person)		471,000	0	0	0	0	0	0	471,000
	SPZ Area (ha)	Service Area (ha)	5,862	0	0	501	0	0	886	7,249
Sub-total	SPZ Area (ha)	Service Area (ha)	4,092	0	0	0	0	0	0	4,092
	Density (person/ha)		483	0	0	0	0	0	0	483
	Population (person)		1,977,000	0	0	0	0	0	132	1,977,000
	SPZ Area (ha)	Service Area (ha)	732	68	0	0	0	0	0	932
6	SPZ Area (ha)	Service Area (ha)	635	0	0	0	0	0	0	635
	Density (person/ha)		235	53	0	0	0	0	0	235
	Population (person)		149,000	0	0	0	0	0	0	149,000
	SPZ Area (ha)	Service Area (ha)	473	855	274	210	261	64	0	2,137
13-1	SPZ Area (ha)	Service Area (ha)	19	65	0	0	0	0	0	84
	Density (person/ha)		131	53	0	0	0	0	0	60
	Population (person)		2,000	3,000	0	0	0	0	0	5,000
	SPZ Area (ha)	Service Area (ha)	1,205	923	274	210	261	64	132	3,069
Sub-total	SPZ Area (ha)	Service Area (ha)	654	65	0	0	0	0	0	719
	Density (person/ha)		231	46	0	0	0	0	0	214
	Population (person)		151,000	3,000	0	0	0	0	0	154,000
	SPZ Area (ha)	Service Area (ha)	7,067	923	274	711	261	64	1,018	10,318
Total	SPZ Area (ha)	Service Area (ha)	4,746	65	0	0	0	0	0	4,811
	Density (person/ha)		448	46	0	0	0	0	0	443
	Population (person)		2,128,000	3,000	0	0	0	0	0	2,131,000
	SPZ Area (ha)	Service Area (ha)								

Table 14.5.1.2 Population of the Existing Sewerage Service Area (Year 1997)

Zone (SPZ No.)	Established Urban and Urban Fringe	Established Urban		Urban Fringe	New Urban	Cantonment Security Zone	Others	Total
		+Residential	+Security Zone Non-resident					
1	SPZ Area (ha)	858	0	0	0	0	0	858
	Service Area (ha)	858	0	0	0	0	0	858
	Density (person/ha)	360	0	0	0	0	0	360
	Population (person)	309,000	0	0	0	0	0	309,000
2	SPZ Area (ha)	1,288	0	0	0	0	55	1,343
	Service Area (ha)	993	0	0	0	0	0	993
	Density (person/ha)	377	0	0	0	0	0	377
	Population (person)	374,000	0	0	0	0	0	374,000
3	SPZ Area (ha)	1,121	0	0	0	0	28	1,149
	Service Area (ha)	924	0	0	0	0	0	924
	Density (person/ha)	866	0	0	0	0	0	866
	Population (person)	800,000	0	0	0	0	0	800,000
4	SPZ Area (ha)	1,059	0	157	0	0	795	2,011
	Service Area (ha)	439	0	0	0	0	0	439
	Density (person/ha)	680	0	0	0	0	0	681
	Population (person)	299,000	0	0	0	0	0	299,000
7	SPZ Area (ha)	1,536	0	344	0	0	8	1,888
	Service Area (ha)	878	0	0	0	0	0	878
	Density (person/ha)	691	0	0	0	0	0	691
	Population (person)	607,000	0	0	0	0	0	607,000
Sub-total	SPZ Area (ha)	5,862	0	501	0	0	886	7,249
	Service Area (ha)	4,992	0	0	0	0	0	4,992
	Density (person/ha)	584	0	0	0	0	0	584
	Population (person)	2,389,000	0	0	0	0	0	2,389,000
6	SPZ Area (ha)	732	68	0	0	0	132	932
	Service Area (ha)	635	0	0	0	0	0	635
	Density (person/ha)	348	57	0	0	0	0	348
	Population (person)	221,000	0	0	0	0	0	221,000
13-1	SPZ Area (ha)	473	855	274	210	64	0	2,137
	Service Area (ha)	19	65	0	0	0	0	84
	Density (person/ha)	140	57	0	0	0	0	83
	Population (person)	3,000	4,000	0	0	0	0	7,000
Sub-total	SPZ Area (ha)	1,205	923	274	210	64	132	3,069
	Service Area (ha)	654	65	0	0	0	0	719
	Density (person/ha)	343	62	0	0	0	0	317
	Population (person)	224,000	4,000	0	0	0	0	228,000
Total	SPZ Area (ha)	7,067	923	274	711	64	1,018	10,318
	Service Area (ha)	4,746	65	0	0	0	0	4,811
	Density (person/ha)	551	62	0	0	0	0	544
	Population (person)	2,613,000	4,000	0	0	0	0	2,617,000

Table 14.S.1.3 Population of the Existing Sewerage Service Area (Year 2005)

Zone (SPZ No.)	Established Urban and Urban Fringe	Established Urban + Security Zone		Urban Fringe	New Urban	Cantonment Security Zone	Others	Total
		Residential	Non-resident					
1	SPZ Area (ha)	858	0	0	0	0	0	858
	Service Area (ha)	858	0	0	0	0	0	858
	Density (person/ha)	458	0	0	0	0	0	458
	Population (person)	393,000	0	0	0	0	0	393,000
2	SPZ Area (ha)	1,288	0	0	0	0	55	1,343
	Service Area (ha)	993	0	0	0	0	0	993
	Density (person/ha)	484	0	0	0	0	0	484
	Population (person)	481,000	0	0	0	0	0	481,000
3	SPZ Area (ha)	1,121	0	0	0	0	28	1,149
	Service Area (ha)	924	0	0	0	0	0	924
	Density (person/ha)	965	0	0	0	0	0	965
	Population (person)	892,000	0	0	0	0	0	892,000
4	SPZ Area (ha)	1,059	0	157	0	0	795	2,011
	Service Area (ha)	439	0	0	0	0	0	439
	Density (person/ha)	876	0	0	0	0	0	877
	Population (person)	385,000	0	0	0	0	0	385,000
7	SPZ Area (ha)	1,536	0	344	0	0	8	1,888
	Service Area (ha)	878	0	0	0	0	0	878
	Density (person/ha)	897	0	0	0	0	0	897
	Population (person)	788,000	0	0	0	0	0	788,000
Sub-total	SPZ Area (ha)	5,862	0	501	0	0	886	7,249
	Service Area (ha)	4,092	0	0	0	0	0	4,092
	Density (person/ha)	718	0	0	0	0	0	718
	Population (person)	2,939,000	0	0	0	0	0	2,939,000
6	SPZ Area (ha)	732	68	0	0	0	132	932
	Service Area (ha)	635	0	0	0	0	0	635
	Density (person/ha)	500	64	0	0	0	0	501
	Population (person)	318,000	0	0	0	0	0	318,000
13-1	SPZ Area (ha)	473	855	210	261	64	0	2,137
	Service Area (ha)	19	65	0	0	0	0	84
	Density (person/ha)	150	64	0	0	0	0	83
	Population (person)	3,000	4,000	0	0	0	0	7,000
Sub-total	SPZ Area (ha)	1,205	923	210	261	64	132	3,069
	Service Area (ha)	654	65	0	0	0	0	719
	Density (person/ha)	491	62	0	0	0	0	452
	Population (person)	321,000	4,000	0	0	0	0	325,000
Total	SPZ Area (ha)	7,067	923	711	261	64	1,018	10,318
	Service Area (ha)	4,746	65	0	0	0	0	4,811
	Density (person/ha)	687	62	0	0	0	0	678
	Population (person)	3,260,000	4,000	0	0	0	0	3,264,000

Table 14.5.1.4 Population of the Existing Sewerage Service Area (Year 2010)

Zone (SPZ No.)	Areas	Established Urban and Urban Fringe	Established Urban		Urban Fringe	New Urban	Cantonment Security Zone	Others	Total
			Residential	+Security Zone Non-resident					
1	SPZ Area (ha)	858	0	0	0	0	0	0	858
	Service Area (ha)	858	0	0	0	0	0	0	858
	Density (person/ha)	474	0	0	0	0	0	0	474
	Population (person)	407,000	0	0	0	0	0	0	407,000
2	SPZ Area (ha)	1,288	0	0	0	0	0	55	1,343
	Service Area (ha)	993	0	0	0	0	0	0	993
	Density (person/ha)	504	0	0	0	0	0	0	504
	Population (person)	500,000	0	0	0	0	0	0	500,000
3	SPZ Area (ha)	1,121	0	0	0	0	0	28	1,149
	Service Area (ha)	924	0	0	0	0	0	0	924
	Density (person/ha)	981	0	0	0	0	0	0	981
	Population (person)	906,000	0	0	0	0	0	0	906,000
4	SPZ Area (ha)	1,059	0	0	157	0	0	795	2,011
	Service Area (ha)	439	0	0	0	0	0	0	439
	Density (person/ha)	929	0	0	0	0	0	0	929
	Population (person)	408,000	0	0	0	0	0	0	408,000
7	SPZ Area (ha)	1,536	0	0	344	0	0	8	1,888
	Service Area (ha)	878	0	0	0	0	0	0	878
	Density (person/ha)	949	0	0	0	0	0	0	949
	Population (person)	833,000	0	0	0	0	0	0	833,000
Sub-total	SPZ Area (ha)	5,862	0	0	501	0	0	886	7,249
	Service Area (ha)	4,092	0	0	0	0	0	0	4,092
	Density (person/ha)	746	0	0	0	0	0	0	746
	Population (person)	3,054,000	0	0	0	0	0	0	3,054,000
6	SPZ Area (ha)	732	68	0	0	0	0	132	932
	Service Area (ha)	635	0	0	0	0	0	0	635
	Density (person/ha)	545	68	0	0	0	0	0	545
	Population (person)	346,000	0	0	0	0	0	0	346,000
13-1	SPZ Area (ha)	473	855	274	210	261	64	0	2,157
	Service Area (ha)	19	65	0	0	0	0	0	84
	Density (person/ha)	148	68	0	0	0	0	0	83
	Population (person)	3,000	4,000	0	0	0	0	0	7,000
Sub-total	SPZ Area (ha)	1,205	923	274	210	261	64	132	3,069
	Service Area (ha)	634	65	0	0	0	0	0	719
	Density (person/ha)	534	62	0	0	0	0	0	491
	Population (person)	349,000	4,000	0	0	0	0	0	353,000
Total	SPZ Area (ha)	7,067	923	274	711	261	64	1,018	10,318
	Service Area (ha)	4,746	65	0	0	0	0	0	4,811
	Density (person/ha)	717	62	0	0	0	0	0	708
	Population (person)	3,403,000	4,000	0	0	0	0	0	3,407,000

Table 14.5.1.5 Population of the Existing Sewerage Service Area (Year 2015)

Zone (SPZ No.)	Established Urban and Urban Fringe	Established Urban		Urban Fringe	New Urban	Cantonment Security Zone	Others	Total
		Residential	Security Zone Non-resident					
1	SPZ Area (ha)	858	0	0	0	0	0	858
	Service Area (ha)	858	0	0	0	0	0	858
	Density (person/ha)	491	0	0	0	0	0	491
	Population (person)	421,000	0	0	0	0	0	421,000
2	SPZ Area (ha)	1,288	0	0	0	0	55	1,343
	Service Area (ha)	993	0	0	0	0	0	993
	Density (person/ha)	525	0	0	0	0	0	525
	Population (person)	521,000	0	0	0	0	28	1,149
3	SPZ Area (ha)	1,121	0	0	0	0	0	924
	Service Area (ha)	924	0	0	0	0	0	998
	Density (person/ha)	998	0	0	0	0	0	922,000
	Population (person)	922,000	0	0	0	0	795	2,011
4	SPZ Area (ha)	1,059	0	157	0	0	0	439
	Service Area (ha)	439	0	0	0	0	0	984
	Density (person/ha)	984	0	0	0	0	0	432,000
	Population (person)	432,000	0	0	0	0	8	1,888
7	SPZ Area (ha)	1,536	0	344	0	0	0	878
	Service Area (ha)	878	0	0	0	0	0	1,002
	Density (person/ha)	1,002	0	0	0	0	0	880,000
	Population (person)	880,000	0	0	0	0	886	7,249
Sub-total	SPZ Area (ha)	5,862	0	501	0	0	0	4,092
	Service Area (ha)	4,092	0	0	0	0	0	776
	Density (person/ha)	776	0	0	0	0	0	3,176,000
	Population (person)	3,176,000	0	0	0	0	132	932
6	SPZ Area (ha)	732	68	0	0	0	0	635
	Service Area (ha)	635	0	0	0	0	0	594
	Density (person/ha)	593	73	0	0	0	0	377,000
	Population (person)	377,000	0	0	0	0	0	2,137
13-1	SPZ Area (ha)	473	855	210	261	64	0	84
	Service Area (ha)	19	65	0	0	0	0	95
	Density (person/ha)	142	73	0	0	0	0	8,000
	Population (person)	3,000	5,000	0	0	0	0	3,069
Sub-total	SPZ Area (ha)	1,205	923	210	261	64	132	719
	Service Area (ha)	654	65	0	0	0	0	535
	Density (person/ha)	142	77	0	0	0	0	385,000
	Population (person)	380,000	5,000	0	0	0	0	10,318
Total	SPZ Area (ha)	7,067	923	711	261	64	1,018	4,811
	Service Area (ha)	4,746	65	0	0	0	0	740
	Density (person/ha)	749	77	0	0	0	0	3,561,000
	Population (person)	3,556,000	5,000	0	0	0	0	0