Appendix 5.6 Detailed Plan for Staged Construction of Intake Facilities

A entire portion of the intake facilities, which is composed of inflow chamber, grit chambers, and pump sump, is proposed to be constructed in the first phase, taking consideration into the following issues:

- Minimisation of interruption of river flow during construction
- Minimisation of construction cost for temporary facilities such as de-watering and its necessary structures

The following three cases for construction of are discussed hereunder to come up with the optimum construction schedule.

Table A-5.6.1 Construction Alternatives

Alternative	Descriptions
Case 1	To construct entire portion for year 2015 of intake facilities in phase 1
Case 2	To construct entire portion of inflow chamber in phase 1 and to construct grit chamber separately into three phases
Case 3	To construct 1/3 of intake facilities separately in three phases

According to the geographic survey for the prospective construction site conducted by the Study Team, N-value at four to five meter below underground is higher than 40. The basement of structure is then supposed to be a hard rock. Therefore, in Case 2 excavation will be necessary for base construction in each stage. In Case 3, intake structures is to be constructed separately to avoid the effect of blasting during excavation works. Detailed drawings are referred to Figure A-5.6.1, 5.6.2 and 5.6.3.

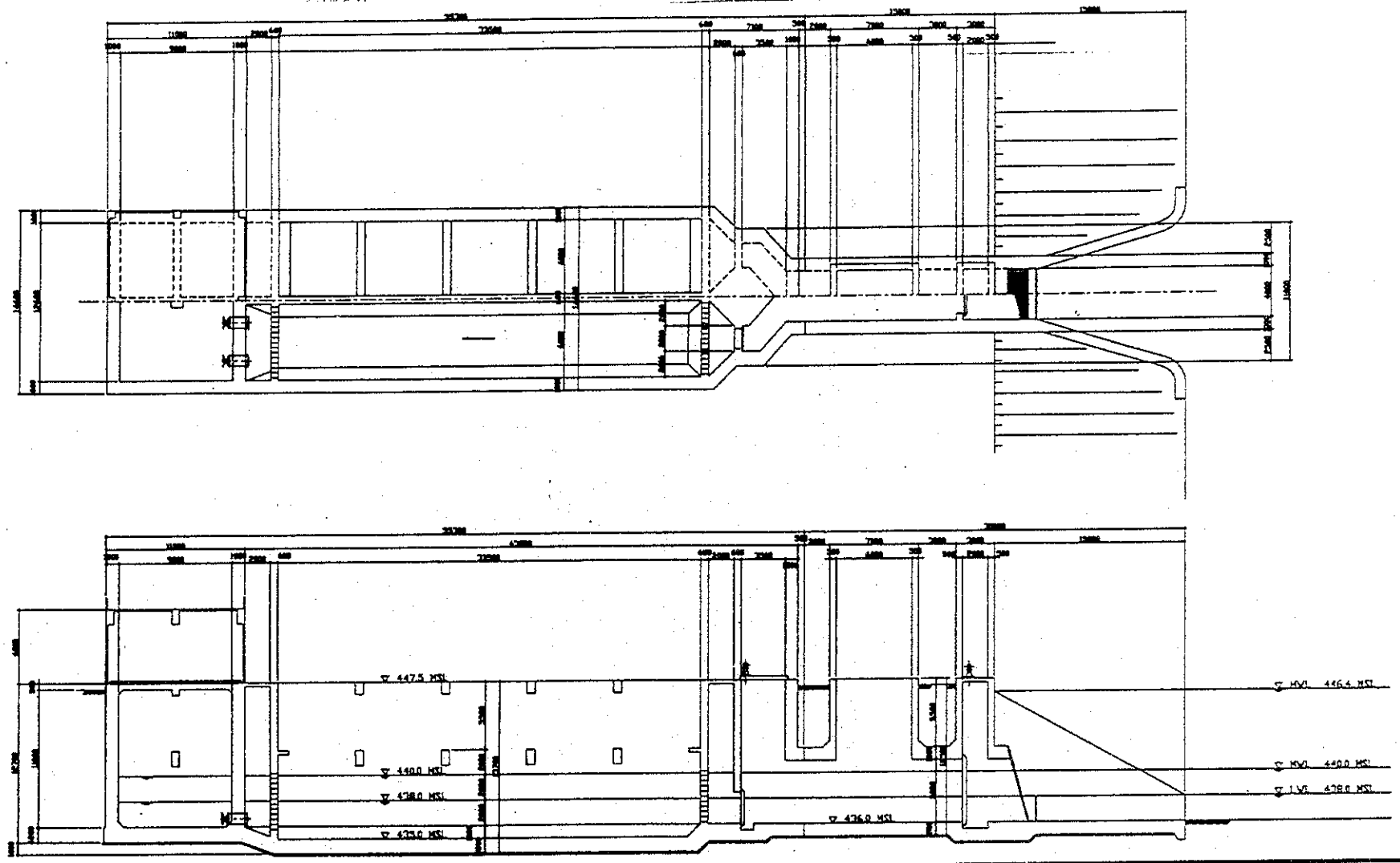

Figure A-5.6.1
Intake Facilities (Case 1)

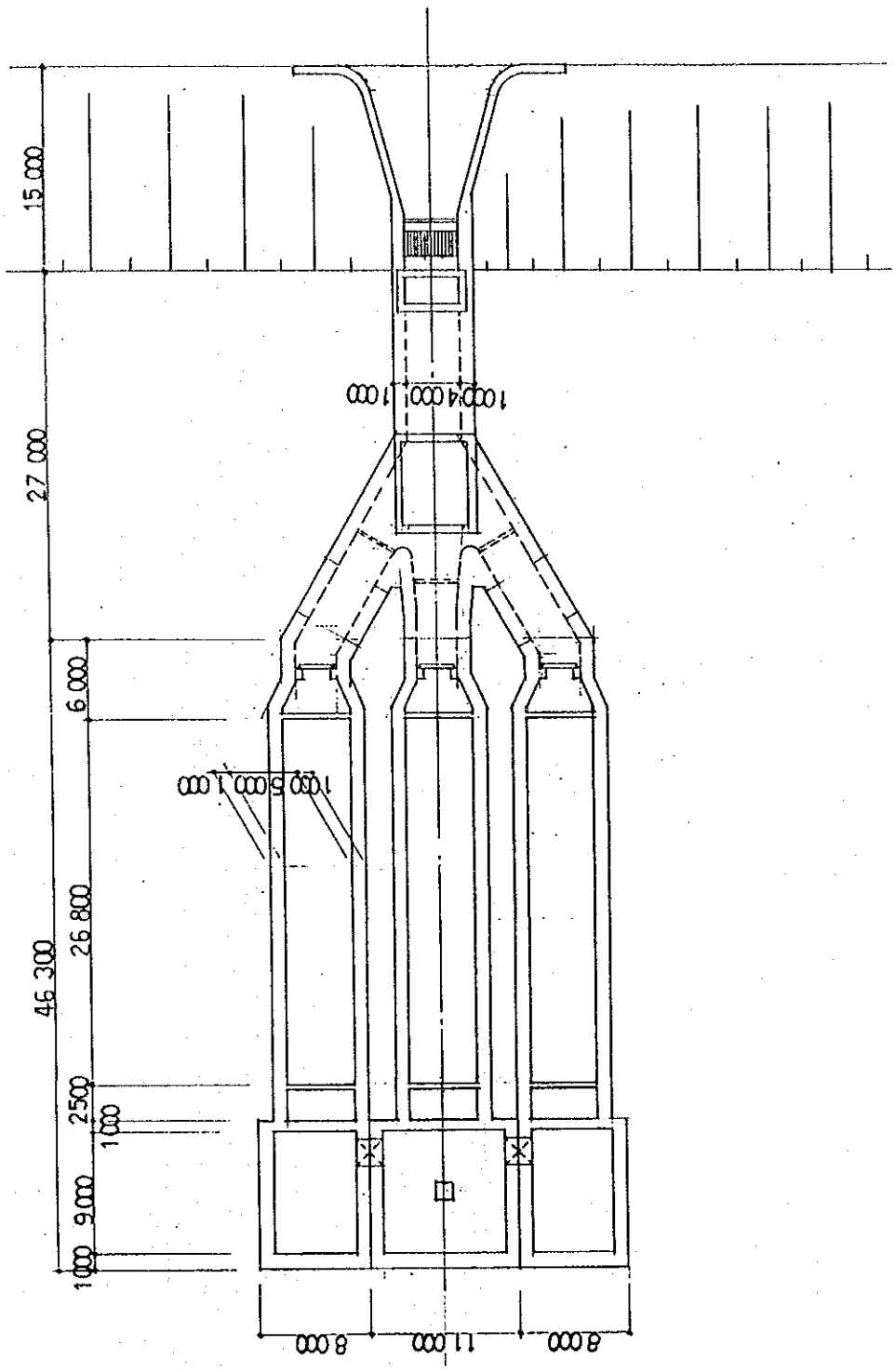

Figure A-5.6.2
Intake Facilities (Case 2)

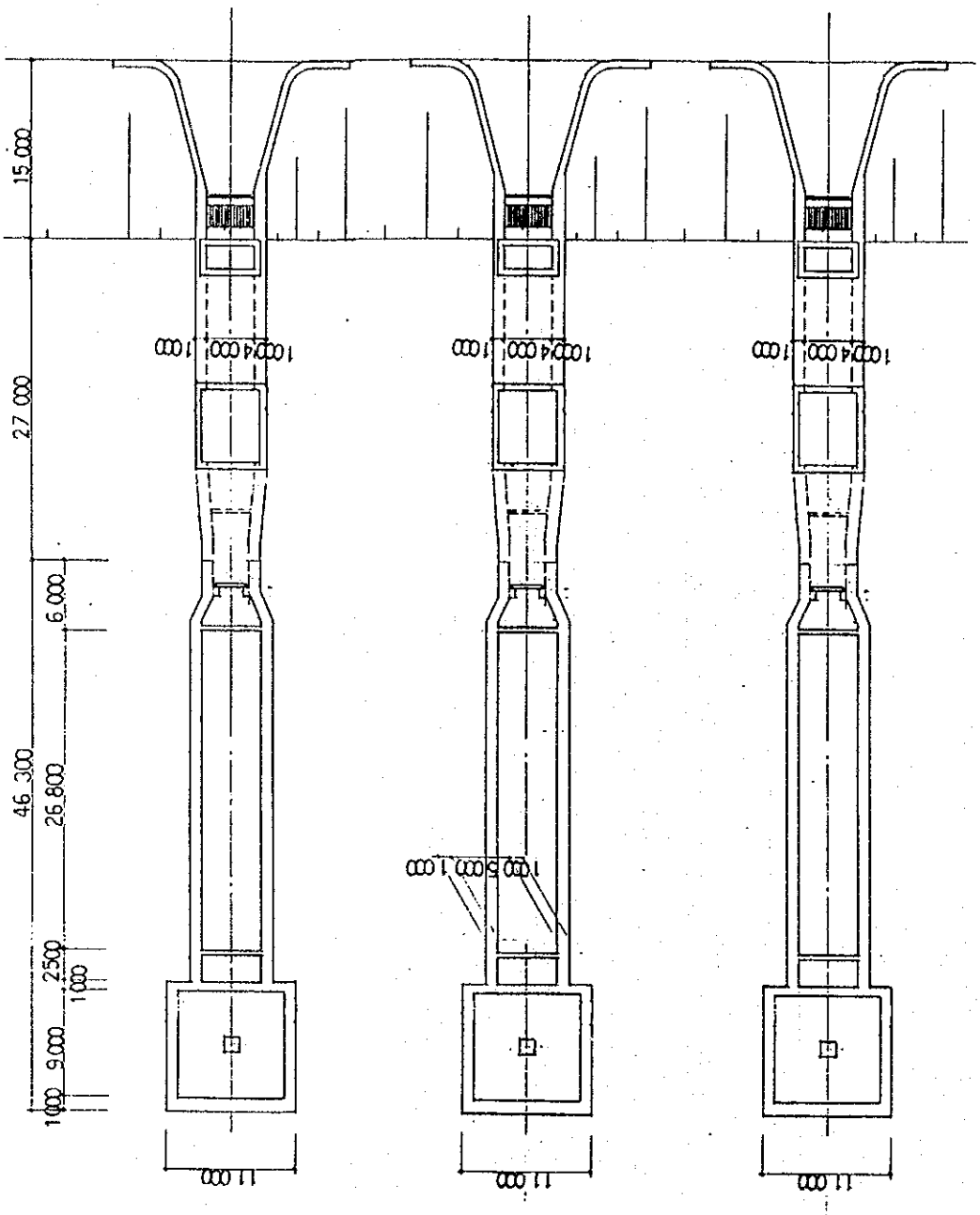

Figure A-5.6.3
Intake Facilities (Case 3)

Table A-5.6.2 Construction Cost

		1.Intake Mouth /Sluice Way	2.Grit Chamber	3.Pump House	4.Provisional		Total
					Coffering	Unwatering	
Case1		29,500	68,000	26,200	16,800	6,500	147,000
Case2	Stage1	32,600	28,700	22,700	16800	6,500	107,300
	Stage2	2,700	28,700	18,100	-	4,900	54,400
	Stage3	2,700	28,700	18,100	-	4,900	54,400
	Total	38,000	86,100	58,900	16,800	16,300	216,100
Case3	Stage1	28,300	28,700	18,100	16,800	6,500	98,400
	Stage2	28,300	28,700	18,100	16,800	6,500	98,400
	Stage3	28,300	28,700	18,100	16,800	6,500	98,400
	Total	84,900	86,100	54,300	50,400	19,500	295,200

Table A-5.6.2 summarises a comparison of construction cost. Case 1 costs 147 million Rupees. Case 2 costs 216 million Rupees or 50 percent higher than that of Case 1. Case 3 costs 295 million Rupees or two times as much as Case 1 cost.

Considering the maintenance works, minimum width of intake mouth and sluice way is set by 4 m regardless the intake amount and thus, Case 1 is cheapest in Category 1. As to grit chamber construction, since phased construction is adopted to Case 2 and 3, total cost is higher than Case 1. Further, unwatering work is needed for Case 2 and 3 in almost every construction stage.

Table A-5.6.3 Calculation by N.P.V.

Year	Case 1		Case 2		Case 3	
	Investment Year	Construction Cost	Investment Year	Construction Cost	Investment Year	Construction Cost
2005Year	2002Year	147,000	2002Year	107300	2002Year	98,400
2010Year			2007Year	54400	2007Year	98,400
2015Year			2012Year	54400	2012Year	98,400
	Total	147,000	Total	216100	Total	295,200
1999	0		0		0	
2000	0		0		0	
2001	0		0		0	
2002	147,000		107,300		98,400	
2003	0		0		0	
2004	0		0		0	
2005	0		0		0	
2006	0		0		0	
2007	0		54,400		98,400	
2008	0		0		0	
2009	0		0		0	
2010	0		0		0	
2011	0		0		0	
2012	0		54,400		98,400	
2013	0		0		0	
2014	0		0		0	
2015	0		0		0	
Rate 8%	108.049		124.603		155.053	
Rate 10%	100.403		110.683		134.852	
Rate 12%	93.421		98.940		118.154	

Table A-5.6.3 shows a comparison of present values, applying 8 percent to 12 percent discount rate, provided that entire investment of Case 1 will be implemented in 2002, investment for Case 2 will be implemented in 2002, 2007, and 2012, and investment for Case 3 will be implemented in 2002, 2007, and 2012. As a result of analysis, Case 1 is concluded to be the lowest investment cost, followed by Case 2 and Case 3.

In comparison of cost for Stage 1, Case 1 costs 147 million Rupees or the highest among alternatives, and Case 2 and Case 3 cost 107 million Rupees or 73 percent of Case 1 and 98 million Rupees or 67 percent of Case 1, respectively.

However, additional excavation will be needed for Case 2 and 3 to secure intake water way. Accounting this additional cost, Case 1 is most economical in every construction stage. Accordingly, Case 1, which construct whole intake facility in stage 1 years, shall be adopted.

Appendix 5.7 Summary of Project Cost

Facilities \ Phase		Phase 1		Phase 2		Phase 3		Total	
		Qt'ty	Amount	Qt'ty	Amount	Qt'ty	Amount	Qt'ty	Amount
1 Intake Facility									
Intake/Grit Chamber/Pump House	L.S.	1	147.000	-	0	-	0	1	147.000
Pump	units	2	142.000	1	71.000	1	71.000	4	284.000
Electrical Equipment	L.S.	1	24.600	1	24.500	1	24.500	3	73.600
Power Supply	L.S.	1	670	1	670	1	660	3	2.000
Conveyance Pipe (ϕ 800 - 900 mm)	m	2.200	94.879	600	30.365	-	0	2.800	125.244
Balancing Tank	L.S.	1	7.780	-	0	-	0	1	7.780
Sub Total			416.929		126.535		96.160		639.624
2 Treatment Plant	m^3/d	(36,670)		(73,330)		(110,000)		(110,000)	
Earth Work	L.S.	1	14.062	1	10.124	1	10.129	1	34.315
Receiving Well	L.S.	1	4.928	-	0	-	0	1	4.928
Sedimentation Basin	L.S.	1	52.336	1	52.336	1	52.336	1	157.008
Rapid Sand Filter	L.S.	1	53.543	1	53.543	1	53.542	1	160.628
Clear Water Reservoir	L.S.	1	33.384	1	33.384	1	33.385	1	100.153
Backwash Return Pump	L.S.	1	9.756	-	0	-	0	1	9.756
Sludge Lagoon	L.S.	1	11.964	1	5.982	1	5.982	1	23.928
Office	L.S.	1	6.280	-	0	-	0	1	6.280
Pump House	L.S.	1	6.000	-	0	-	0	1	6.000
Chemical House	L.S.	1	8.000	-	0	-	0	1	8.000
Chlorination House	L.S.	1	990	-	0	-	0	1	990
Warehouse	L.S.	1	4.000	-	0	-	0	1	4.000
Mechaical/Electrical Equipment	L.S.	1	514.300	1	514.100	1	514.100	1	1.542.500
Power Supply	L.S.	1	1.400	1	1.300	1	1.300	1	4.000
Inplant Piping	L.S.	1	19.100	1	14.500	1	14.500	1	48.100
Miscellaneous	L.S.	1	37.000	1	34.300	1	34.300	1	105.600
Sub Total			777.043		719.569		719.574		2.216.186

Facilities \ Phase		Phase 1		Phase 2		Phase 3		Total	
		Qt'ty	Amount	Qt'ty	Amount	Qt'ty	Amount	Qt'ty	Amount
3 Chlorination Facilities for Distribution Reservoir									
Equipment	units	20	12.000	12	7.200	46	27.600	78	46.800
Chlorination House	units	20	9.000	12	5.400	46	20.700	78	35.100
Sub Total			21.000		12.600		48.300		81.900
4 Transmission Pipeline									
Pipeline									
PVC (75 - 225 mm)	m	23.745	94.735	26.610	99.590	52.050	191.120	102.405	385.445
DCIP (250 - 900 mm)	m	18.400	326.368	27.879	393.982	37.795	358.932	84.074	1.079.282
Aqueduct									
ϕ 350-120m	L.S.	-	0	1	101.000	-	0	1	101.000
(ϕ 600, ϕ 600)-120m	L.S.	1(ϕ 600*1)	170.000	-	0	1(ϕ 600*1)	100.000	1(ϕ 600*2)	270.000
(ϕ 700, ϕ 600)-120m	L.S.	1(ϕ 700*1)	189.000	-	0	1(ϕ 600*1)	100.000	1(ϕ 700*1, ϕ 600*1)	289.000
ϕ 110- ϕ 600,20m	L.S.	5	25.000	2	10.000	2	10.000	9	45.000
Sub Total			805.103		613.012		760.052		2.178.167
4 Pumping Station									
KMC W.T.P. to Primose I.B.P. ($0.7\ m^3$/min x 168 m x 33 kW x 3 units : 1 unit stand by)	L.S.	1	3.298	-	0	-	0	1	3.298
Eriyagama R. to Daulagala R. ($2.6\ m^3$/min x 52 m x 38 kW x 3 units : 1 unit stand by)	L.S.	-	0	1	10.644	-	0	1	10.644
Eriyagama R. to Sooriyagoda R. ($0.7\ m^3$/min x 100 m x 20 kW x 3 units : 1 unit stand by)	L.S.	-	0	-	0	1	6.051	1	6.051
I.B. to Mahakanda R. ($0.7\ m^3$/min x 40 m x 8 kW x 1 unit)	L.S.	-	0	-	0	1	2.816	1	2.816
Udu to Peradeniya to Bowalawatta R. ($2.1\ m^3$/min x 56 m x 33 kW x 2 units : 1 unit stand by)	L.S.	-	0	-	0	1	5.191	1	5.191
Bowalawatta R. to Augustawatta R. ($0.7\ m^3$/min x 82 m x 16 kW x 3 units : 1 unit stand by)	L.S.	-	0	-	0	1	5.240	1	5.240
Augustawatta R. to SpringHill Estate R. ($0.7\ m^3$/min x 62 m x 12 kW x 2 units : 1 unit stand by)	L.S.	-	0	-	0	1	3.324	1	3.324

Facilities	Phase		Phase 1		Phase 2		Phase 3		Total	
			Qt'ty	Amount	Qt'ty	Amount	Qt'ty	Amount	Qt'ty	Amount
4	Pumping Station									
	Heerasagala Low R. to Heerasagala Mid R. ($0.7\ m^3$/min x 63 m x 12 kW x 3 units : 1 unit stand by)	L.S.	1	3.902	1	1.962	-	0	1	5.864
	Heerasagala Mid R. to Heerasagala Upper R. ($0.7\ m^3$/min x 73 m x 14 kW x 2 units : 1 unit stand by)	L.S.	1	3.517	-	0	-	0	1	3.517
	R2 to Hantana Place R. ($1.1\ m^3$/min x 94 m x 29 kW x 3 units : 1 unit stand by)	L.S.	-	0	1	7.649	-	0	1	7.649
	Hantana Low R. to Hantana Upper R. ($0.35m^3$/min x 100 m x 10 kW x 3units : 1 unit stand by)	L.S.	-	0	2	4.113	-	0	1	4.113
	Ampitiya R. to Elhena R. ($0.7\ m^3$/min x 55 m x 11 kW x 2 units : 1 unit stand by)	L.S.	1	3.200	-	0	-	0	1	3.200
	Ampitiya R. to Mullpihila Low R. ($0.5\ m^3$/min x 78 m x 11 kW x 2 units : 1 unit stand by)	L.S.	1	3.193	-	0	-	0	1	3.193
	Ampitiya R. to Meekanuwa R. ($0.5\ m^3$/min x 66 m x 10 kW x 2 units : 1 unit stand by)	L.S.	1	3.162	-	0	-	0	1	3.162
	Katugastota W.T.P. to Kahawatta R. ($14.3\ m^3$/min x 103 m x 411 kW x 3 units : 1 unit stand by)	L.S.	1	64.000	1	32.000	-	0	1	96.000
	Balanagara R. to Udatalawina R ($0.9\ m^3$/min x 93 m x 23 kW x 2 units : 1 unit stand by)	L.S.	-	0	-	0	1	5.630	1	5.630
	Balanagara R. to Pityegendara R ($0.6\ m^3$/min x 66 m x 11 kW x 3 units : 1 unit stand by)	L.S.	-	0	-	0	1	4.328	1	4.328
	Kahawatta R. to Godahana Branch ($2.2\ m^3$/min x 106 m x 64 kW x 3 units : 1 unit stand by)	L.S.	-	0	-	0	1	15.317	1	15.317
	Godahana Branch to Godahana R. ($1.8\ m^3$/min x 47 m x 24 kW x 1 unit)	L.S.	-	0	-	0	1	4.264	1	4.264
	Godahana R. to I.B. ($0.9\ m^3$/min x 61 m x 15 kW x 3 units : 1 unit stand by)	L.S.	-	0	-	0	1	5.145	1	5.145
	I.B. to Galhinna R. ($1.8\ m^3$/min x 50 m x 25 kW x 1 unit)	L.S.	-	0	-	0	1	4.402	1	4.402
	Kahawatta R. to Kurugoda R. ($1.9\ m^3$/min x 75 m x 41 kW x 3 units : 1 unit stand by)	L.S.	1	7.611	-	0	1	3.476	1	11.087
	Kurugoda R. to Heepitiya R. ($1.0\ m^3$/min x 60 m x 17 kW x 3 units : 1 unit stand by)	L.S.	-	0	-	0	1	5.522	1	5.522

Facilities	Phase		Phase 1		Phase 2		Phase 3		Total	
			Qt'ty	Amount	Qt'ty	Amount	Qt'ty	Amount	Qt'ty	Amount
4	Pumping Station									
	Katugastota W.T.P. to Rajapihilla R. ($6.1\ m^3$/min x 147 m x 251 kW x 2 units : 1 unit stand by)	L.S.	-	0	1	9.252	-	0	1	9.252
	Rajapihilla R. to Madadeniya R. ($0.6\ m^3$/min x 48 m x 7 kW x 3 units : 1 unit stand by)	L.S.	-	0	-	0	1	3.704	1	3.704
	Katugastota W.T.P. to Kondadeniya Sump ($2.7\ m^3$/min x 5 m x 4 kW x 2 units : 1 unit stand by)	L.S.	1	1.331	-	0	-	0	1	1.331
	Kondadeniya Sump to Kondadeniya R. ($2.7\ m^3$/min x 145 m x 110 kW x 2 units : 1 unit stand by)	L.S.	1	13.561	-	0	-	0	1	13.561
	Katugastota W.T.P. to Upland R. ($8.5\ m^3$/min x 160 m x 378 kW x 5 units : 1 unit stand by)	L.S.	1	136.800	1	45.600	1	45.600	1	228.000
	Asgiriya R. to Bahirawakanda R. ($4.7\ m^3$/min x 45 m x 59 kW x 2 units : 1 unit stand by)	L.S.	1	8.852	-	0	-	0	1	8.852
	Balanagara R. to Sirimaruwatta R. ($10.6\ m^3$/min x 20 m x 59 kW x 1 unit)	L.S.	-	0	1	8.775	-	0	1	8.775
	Sirimaruwatta R. to Dambaraya R. ($2.0\ m^3$/min x 33 m x 19 kW x 3 units : 1 unit stand by)	L.S.	-	0	1	7.067	-	0	1	7.067
	Katugastota W.T.P. to Gohagoda R. ($1.8\ m^3$/min x 112 m x 55 kW x 3 units : 1 unit stand by)	L.S.	1	4.761	-	0	-	0	1	4.761
	Bogahakabda Tank to Bogahakanda R. ($0.1\ m^3$/min x 38 m x 1 kW x 3 units : 1 unit stand by)	L.S.	-	0	1	2.366	-	0	1	2.366
	Sub Total		9	257.188	8	129.428	15	120.010	32	506.626
5	Distribution Reservoirs									
	Buluwemuduna Low ($47\ m^3$)	L.S.	-	0	-	0	1	4.273	1	4.273
	Buluwemuduna Upper ($118\ m^3$)	L.S.	-	0	-	0	1	7.284	1	7.284
	Ambakote ($216\ m^3$)	L.S.	-	0	-	0	1	10.638	1	10.638
	Kolongaswatta ($243\ m^3$)	L.S.	-	0	-	0	1	11.514	1	11.514
	Kundasale ($630\ m^3$)	L.S.	-	0	1	22.401	-	0	1	22.401
	Menikhina ($775\ m^3$)	L.S.	-	0	1	26.127	-	0	1	26.127

Facilities \ Phase		Phase 1		Phase 2		Phase 3		Total	
		Qt'ty	Amount	Qt'ty	Amount	Qt'ty	Amount	Qt'ty	Amount
5 Distribution Reservoirs									
Sirimalwatta (208 m^3)	L.S.	-	0	1	10.384	-	0	1	10.384
Rajawella (47 m^3)	L.S.	-	0	-	0	1	4.273	1	4.273
BOI (1,511 m^3)	L.S.	-	0	-	0	1	43.758	1	43.758
Gum Udawa (72 m^3)	L.S.	-	0	1	5.441	-	0	1	5.441
Dambarawa (70 m^3)	L.S.	-	0	1	5.358	-	0	1	5.358
Jambugahapitiya (167 m^3)	L.S.	-	0	-	0	1	9.004	1	9.004
Udatalawinna (167 m^3)	L.S.	-	0	-	0	1	9.004	1	9.004
Kahalla (323 m^3)	L.S.	1	54.470	-	0	-	0	1	54.470
Bangalawatta (298 m^3)	L.S.	1	13.191	-	0	-	0	1	13.191
Wattegama (422 m^3)	L.S.	-	0	-	0	1	16.790	1	16.790
Pitiyegendara (360 m^3)	L.S.	-	0	-	0	1	15.031	1	15.031
Pihilladeniya (248 m^3)	L.S.	1	11.643	-	0	-	0	1	11.643
Bokkawela (479 m^3)	L.S.	-	0	-	0	1	18.383	1	18.383
Pujapitiya (278 m^3)	L.S.	-	0	-	0	1	12.605	1	12.605
Kahawatta (1,174 m^3)	L.S.	1	35.884	-	0	-	0	1	35.884
Kurugoda (535 m^3)	L.S.	1	19.888	-	0	-	0	1	19.888
Telambugawatta (124 m^3)	L.S.	1	7.494	-	0	-	0	1	7.494
Heepitiya (865 m^3)	L.S.	-	0	-	0	1	28.388	1	28.388
Galhinna (490 m^3)	L.S.	-	0	-	0	1	18.673	1	18.673
Madadeniya (111 m^3)	L.S.	-	0	-	0	1	6.994	1	6.994
Nugawela (1,150 m^3)	L.S.	-	0	-	0	1	35.300	1	35.300
Kulugammana (111 m^3)	L.S.	1	6.994	-	0	-	0	1	6.994
Udawawala (520 m^3)	L.S.	-	0	1	19.472	-	0	1	19.472
Kondadeniya (384 m^3)	L.S.	1	15.703	-	0	-	0	1	15.703
Hindagala (223 m^3)	L.S.	-	0	-	0	1	10.885	1	10.885
Daulagala (476 m^3)	L.S.	-	0	1	18.295	-	0	1	18.295
Kalugamuwa (311 m^3)	L.S.	-	0	-	0	1	13.569	1	13.569
Sooliyagoda (272 m^3)	L.S.	-	0	-	0	1	12.396	1	12.396
Murutalawa (182 m^3)	L.S.	-	0	-	0	1	9.545	1	9.545

Facilities	Phase		Phase 1		Phase 2		Phase 3		Total	
		Qt'ty	Amount	Qt'ty	Amount	Qt'ty	Amount	Qt'ty	Amount
5 Distribution Reservoirs									
Gonnoruwa (272 m^3)	L.S.	-	0	1	12.396	-	0	1	12.396
Gohagoda (207 m^3)	L.S.	1	10.384	-	0	-	0	1	10.384
Bogahakanda (41 m^3)	L.S.	-	0	1	3.979	-	0	1	3.979
Yatihalagala (206 m^3)	L.S.	-	0	1	10.303	-	0	1	10.303
Bahirawakanda (1,595 m^3)	L.S.	1	45.684	-	0	-	0	1	45.684
Primrose (315 m^3)	L.S.	1	13.693	-	0	-	0	1	13.693
Heerasagala Low (198 m^3)	L.S.	1	10.052	-	0	-	0	1	10.052
Heerasagala Middle (248 m^3)	L.S.	1	11.643	-	0	-	0	1	11.643
Heerasagala Upper (248 m^3)	L.S.	1	11.643	-	0	-	0	1	11.643
Bowalawatta (248 m^3)	L.S.	-	0	-	0	1	11.643	1	11.643
Augustawatte (248 m^3)	L.S.	-	0	-	0	1	11.643	1	11.643
Spring Hill Estate (248 m^3)	L.S.	-	0	-	0	1	11.643	1	11.643
Dangola (254 m^3)	L.S.	1	11.849	-	0	-	0	1	11.849
Mahakanda (260 m^3)	L.S.	-	0	-	0	1	12.021	1	12.021
Gurudeniya (248 m^3)	L.S.	-	0	-	0	1	11.643	1	11.643
Hantana Place (248 m^3)	L.S.	1	11.643	-	0	-	0	1	11.643
Hantana Call Link (236 m^3)	L.S.	-	0	1	11.267	-	0	1	11.267
Asgiriya (3,059 m^3)	L.S.	1	77.924	-	0	-	0	1	77.924
Upland (2,728 m^3)	L.S.	1	70.806	-	0	-	0	1	70.806
Talwatta (248 m^3)	L.S.	-	0	1	11.643	-	0	1	11.643
Elhena (248 m^3)	L.S.	1	11.643	-	0	-	0	1	11.643
Muiupihilla (79 m^3)	L.S.	1	5.735	-	0	-	0	1	5.735
Talathu Oya (247 m^3)	L.S.	-	0	-	0	1	11.638	1	11.638
Halagama (247 m^3)	L.S.	-	0	-	0	1	11.638	1	11.638
Sub Total		20	457.966	12	157.066	27	380.176	59	995.208
Direct Construction Cost Total	L.S.		2.735.229		1.758.210		2.124.272		6.617.711

Appendix 5.8 Transmission Route to Kundasale Area

A small scale water supply system exists in Kundasale area being located at eastern area of Greater Kandy. NWSDB has a plan of bulk water supply (13,000 cu.m/day) to the Kundasale WSS in this particular area and is about to start its implementation.

Kundasale WSS has following feature of facility plan:

1) Water treatment plant situates at north of the outskirt of Greater Kandy area. Deinking water is transmitted to the eastern end of Kundasale area and diverted to Silimalwatta area and Kundasale area, both of which pass through western part of Kundasale area.

   Owing to this physical configuration, transmission line in the eastern area has relatively large diameter, while that in the western area has smaller diameter.

2) Within Kundasale area, Menikhina, Silimalwatta, Kundasale, BOI has large water demand and Silimalwatta and Kundasale are located at western edge of Kundasale area.

3) The planned supply amount to Kundasale WSS can only cope with water demand in the eastern area of Kundasale and a part of BOI in the year 2015.

The current bulk water supply plan is not considered for future expansion and the future water demand beyond its target year shall therefore depend on the transmission from Katugastota Water Treatment Plant. Water demand increase in Kundasale area by 2015 is estimated at 28,900 cu.m/day, while the above mentioned Kundasale WSS can cater for 13,000 cu.m/day and the future use of the existing water source has 700 cu.m/day. In this regard, the water gap at 15,200 cu.m/day will rely on the transmission from Katugastota Water Treatment Plant.

For water transmission to Kundasale area, there are two possible routing as shown in Figure A5.12.1 to A5.12.4; (1) passing at north-side of the Mahaweli River and (2) crossing at the Mahaweli River in Buwelikada after passing through the Upland Reservoir in KMC area. For branching water to distribution reservoirs at Silimalwatta, Dangarawa, Menikhina and Kundasale in the Kundasale area, there are also two alternatives as mentioned on the above. Thus, A total of 4 cases would be considered as alternatives.

Comparative evaluation of the above four alteratives was carried out from the viewpoints of pump station construction cost, transmission line installation cost, pump operation cost taking into account of elevation and receiving water volume at each distribution reservoir from Katugastota Water Treatment Plant and of transmission routes. This evaluation concluded that Case D was the most economical plan.

Cost Categoty \ Alternative		Case A		Case B		Case C		Case D	
Construction Cost	Transmission Line	546.671	②	484.291	①	585.410	④	569.283	③
	Aqueduct	525.000	④	500.000	③	386.000	①	386.000	①
	Transmission Pump	306.997	④	203.436	①	206.908	③	204.788	②
	Total	1.378.668	④	1.187.727	③	1.178.318	②	1.160.071	①
Power Consumption		84.722	④	83.144	②	83.581	③	80.659	①

Note: Number in circle shows ranking in cost comparison.

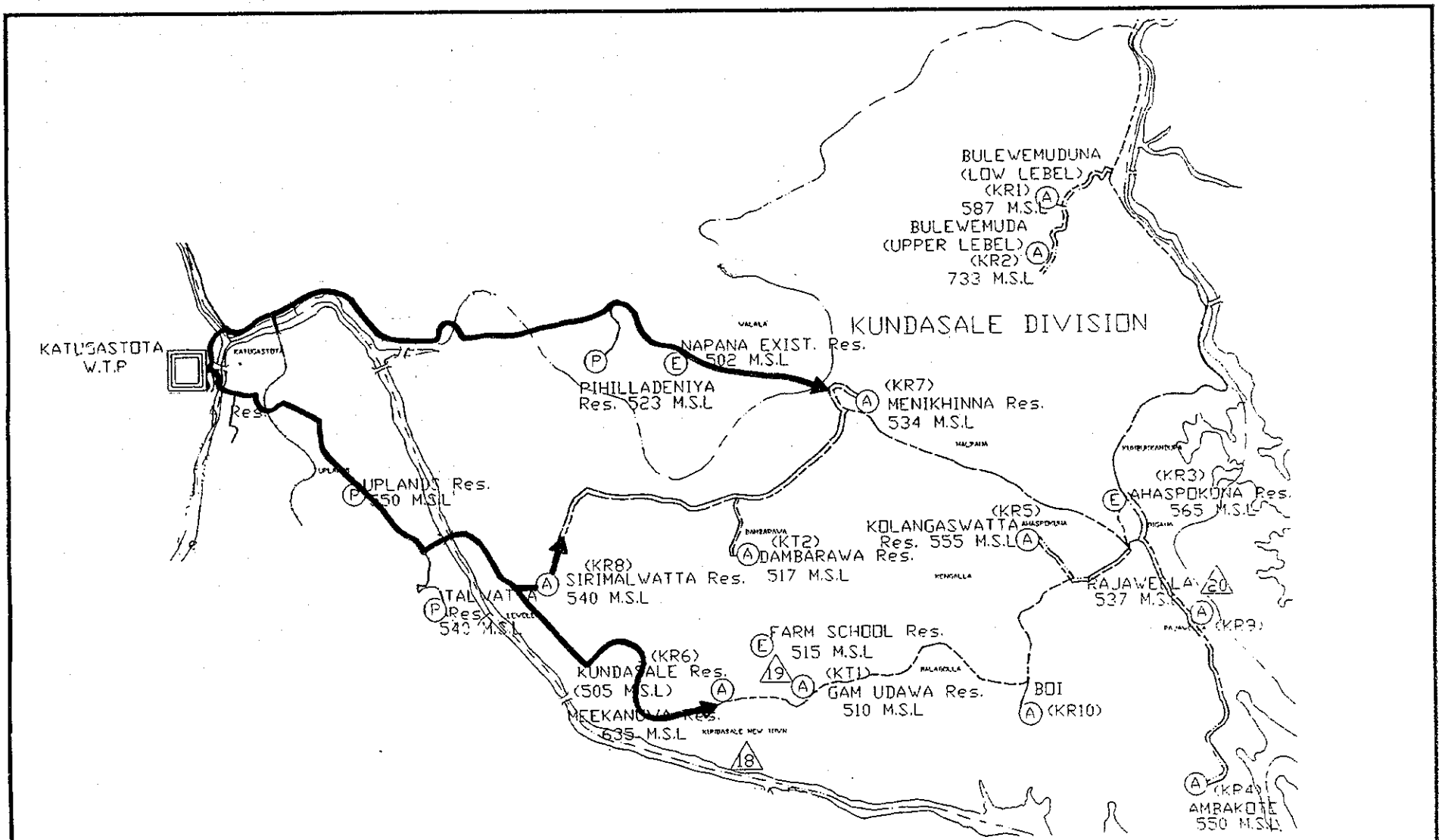

Figure A5.9.1

Case A

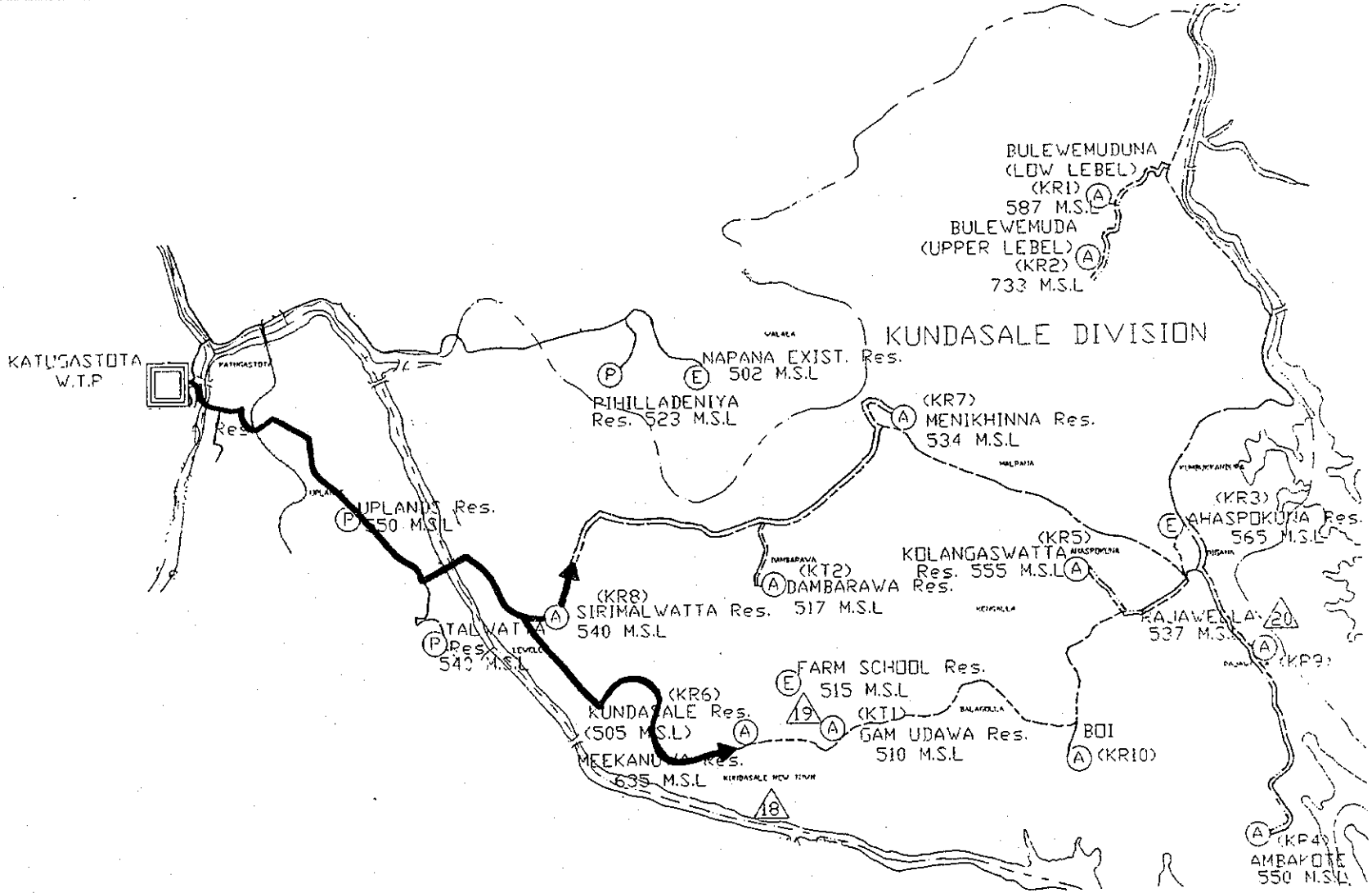

Figure A5.9.2

Case B

Figure A5.9.3

Case C

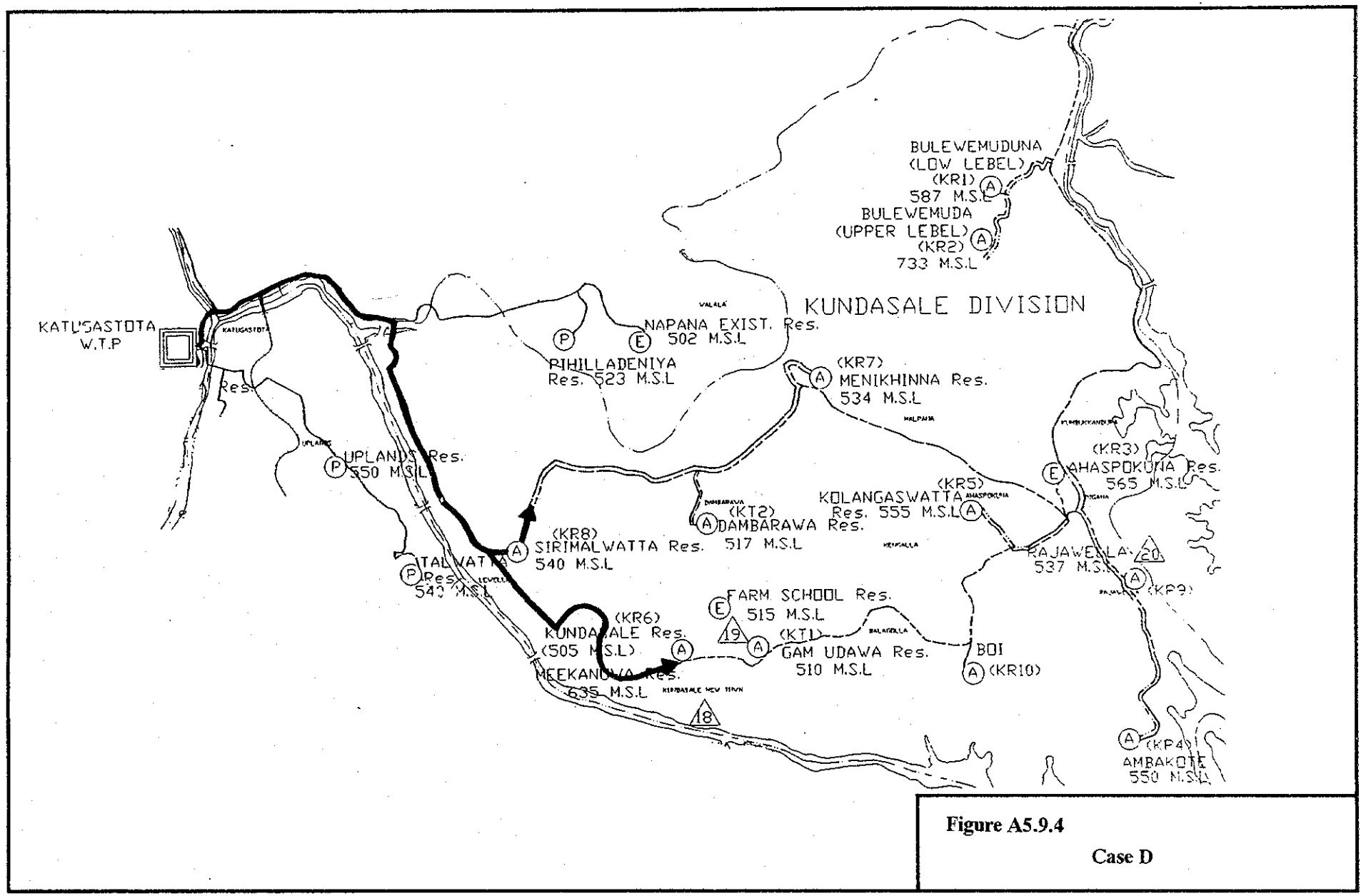

Figure A5.9.4

Case D

Appendix 5.8 Hydraulic Calculation for Transmission Pipeline (Kundasale Area)

Node / Node-Node		B/G	Flow Rate Q(m3/d)	Dia. D(mm)	Mixed Dia Dm(mm)	Exist.	Length L(m)	Velocity v(m/sec)	Hyd.Grd I(‰)	Loss h(m)	Dynamic Pressure Hd(MSL)	GL	Dynamic Pressure He(m)	Pump Type	Head H(m)	set Excluding	Output (kw/set)	Remark
Transmision Main Analysis (Case A)									Year 2015		(Kundasale)							
Katugastota-Madawala											546,994	430,000	116,994					
PG														B	117,0	2	373,5	
PG	-	601	B	32.900	700	700	700	0,989	1,446	1,012								
											545,981	430,000	115,981					
601																		
601	-	301	(B)	15.500	500	500	900	0,914	1,850	1,665								
											544,317	445,000	99,317					
301																		
301	-	5001	(B)	14.200	500	500	930	0,837	1,573	1,463								
											542,854	440,000	102,854					
5001																		
5001	-	5002	(B)	11.400	400	400	1.250	1,050	3,106	3,883								
											538,971	450,000	88,971					
5002																		
5002	-	26'	(B)	11.400	400	400	2.670	1,050	3,106	8,293								
											530,678	470,000	60,678					
26'																		
26'	-	26	(B)	2.900	250	250	1.100	0,684	2,435	2,678								
											528,000	523,000	5,000					
26																		
											530,678	470,000	60,678					
26'																		
26'	-	25'	(B)	8.500	350	350	630	1,023	3,458	2,178								
											528,500	460,000	68,500					
25'																		
25'	-	25	(B)	1.000	198	198	1.300	0,376	0,912	1,185								
											527,314	523,000	4,314					
25																		
											528,500	460,000	68,500					
25'																		
25'	-	25B	(B)	7.500	250	250	1.100	1,768	14,121	15,533								
											512,967	502,000	10,967					
25B																		
25B	-	25N	(B)	500	65	65	50	1,744	57,393	2,870								
											510,097	502,000	8,097					
25N																		
											600,600	502,000	98,600					
25B														IB	87,6	1	119,0	
25B	-	K701	IB	7.000	350	350	7.000	0,842	2,414	16,900								
											583,700	510,000	73,700					
K701																		
Katugastota-KFG,R2											579,922	430,000	149,922					
PG														B	149,9	4	413,8	
PG	-	17'	B	56.900	900	900	550	1,035	1,172	0,644								
											579,278	480,000	99,278					
17'																		
17'	-	AG'	(B)	33.900	700	700	2.400	1,020	1,528	3,668								
											575,610	520,000	55,610					
AG'																		
AG'	-	AG	(B)	19.000	600	600	550	0,778	1,109	0,610								
											575,000	570,000	5,000					
AG																		
											579,278	480,000	99,278					
17'																		
17'	-	1702	(B)	23.100	500	500	2.500	1,362	3,870	9,674								
											569,604	545,000	24,604					
1702																		
											569,604	545,000	24,604					
1702																		
1702	-	18'	(B)	12.200	450	450	1.500	0,888	1,984	2,976								
											566,628	480,000	86,628					
18'																		
18'	-	K801	(B)	8.200	450	450	2.750	0,597	0,951	2,616								
											564,011	520,000	44,011					
K801																		
K801	-	KR8	(B)	3.400	198	198	900	1,278	8,773	7,895								
											556,116	540,000	16,116					
KR8																		
											566,628	480,000	86,628					
18'																		

	Node		B/G	Flow Rate	Dia.	Mixed Dia	Exist.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Pump	Head	set	Output	Remark
Node-Node				Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)	Type	H(m)	Excluding	(kw/set)	
18'	-	18	(B)	4.000	198	198		1.350	1,504	11,850	15,997								
	18											550,631	540,000	10,631					
	K801											564,011	520,000	44,011					
K801	-	K601	(B)	4.800	250	250		5.100	1,132	6,184	31,540								
	K601											532,471	480,000	52,471					
	KR8											590,630	540,000	50,630					
KR8	-	K702	B	0	0	200	Atten	3.000	0,000	0,000	0,000				B	50.6	2	0,0	Exist Pipe ϕ200
	K702											590,630	500,000	90,630					
	Katugastota-Kundasale																		
	K701											583,700	510,000	73,700					
K701	-	K702	(B)	1.000	0	250	Atten	2.150	0,236	0,293	0,630								Exist Pipe ϕ250
	K702											583,070	500,000	83,070					
	K701											583,700	510,000	73,700					
K701	-	K301	(B)	1.100	300	300	K	4.843	0,180	0,167	0,807								Exist Pipe ϕ300
	K301											582,893	538,000	44,893					
K301	-	K105	(B)	500	300	300	K	25	0,082	0,039	0,001								Exist Pipe ϕ300
	K105											582,892	522,000	60,892					
	K301											582,893	510,000	72,893					
K301	-	KR3	(B)	600	300	300	K	285	0,098	0,054	0,015								Exist Pipe ϕ300
	KR3											582,877	565,000	17,877					
	Kundasale																		
	BPT											623,000	623,000	0,000					
BPT	-	K102	G	13.000	400	400	K	3.940	1,197	3,960	15,604								Exist Pipe ϕ400
	K102											607,396	503,000	104,396					
K102	-	K103	(G)	11.000	400	400	K	4.340	1,013	2,907	12,618								Exist Pipe ϕ400
	K103											594,778	501,000	93,778					
K103	-	K104	(G)	11.000	350	350	K	1.500	1,323	5,571	8,356								Exist Pipe ϕ350
	K104											586,422	505,000	81,422					
K104	-	K105	(G)	11.000	250	360	Atten	735	1,249	4,836	3,554								Exist Pipe ϕ300
	K105											582,867	522,000	60,867					
K105	-	K501	(G)	14.000	350	393	Atten	1.500	1,295	4,590	6,885								Exist Pipe ϕ250
	K501											575,982	490,000	85,982					
K501	-	KR5	(G)	1.400	123	127	Atten	1.000	1,274	14,625	14,625								Exist Pipe ϕ50
	KR5											561,357	555,000	6,357					
	K501											575,982	490,000	85,982					
K501	-	K502	(G)	7.800	250	250	K	150	1,839	15,184	2,278								Exist Pipe ϕ250
	K502											573,705	480,000	93,705					
	K601											532,471	480,000	52,471					
K601	-	K503	(G)	800	200	200	K	500	0,295	0,575	0,287								Exist Pipe ϕ200
	K503											532,184	470,000	62,184					
K503	-	K502	(G)	0	250	250	K	150	0,000	0,000	0,000								Exist Pipe ϕ250
	K502											532,184	480,000	52,184					
	K601											532,471	480,000	52,471					
K601	-	KR6	(G)	3.900	150	150	K	500	2,554	43,708	21,854								Exist Pipe ϕ150
	KR6											510,617	505,000	5,617					
	K503											532,184	470,000	62,184					
K503	-	KT1	(G)	800	250	250	K	1.950	0,189	0,225	0,438								Exist Pipe ϕ250
	KT1											531,746	510,000	21,746					

Node	B/G	Flow Rate	Dia.	Mixed Dia	Exist.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Pump	Head	set	Output	Remark
Node-Node		Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)	Type	H(m)	Excluding	(kw/set)	
Sub Total															9	906.3	

Node			B/G	Flow Rate	Dia.	Mixed Dia	Exist.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Pump	Head	set	Output	Remark
Node-Node				Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)	Type	H(m)	Excluding	(kw/set)	
Transmision Main Analysis (Case B)										**Year 2015**		**(Kundasale)**							
Katugastota-Madawala																			
	PG											544,538	430,000	114,538					
PG	-	601	B	25.900	600	600		700	1,060	1,968	1,377				B	114.5	2	287.8	
	601											543,161	430,000	113,161					
601	-	301	(B)	8.500	400	400		900	0.783	1,805	1,624								
	301											541,536	445,000	96,536					
301	-	5001	(B)	7.200	350	350		930	0.866	2,543	2,365								
	5001											539,171	440,000	99,171					
5001	-	5002	(B)	4.400	300	300		1.250	0.720	2,167	2,708								
	5002											536,463	450,000	86,463					
5002	-	26'	(B)	4.400	300	300		2.670	0.720	2,167	5,785								
	26'											530,678	470,000	60,678					
26'	-	26	(B)	2.900	250	250		1.100	0.684	2,435	2,678								
	26											528,000	523,000	5,000					
																-			
	26'											530,678	470,000	60,678					
26'	-	25'	(B)	1.500	198	198		630	0.564	1,930	1,216								
	25'											529,462	460,000	69,462					
25'	-	25	(B)	1.000	198	198		1.300	0.376	0.912	1,185								
	25											528,277	523,000	5,277					
	25'											529,462	460,000	69,462					
25'	-	25B	(B)	500	97	97		1.100	0.783	8,169	8,986								
	25B											520,476	502,000	18,476					
25B	-	25N	(B)	500	65	65		50	1,744	57,393	2,870								
	25N											517,606	502,000	15,606					
Katugastota-KFG,R2																			
	PG											580,079	430,000	150,079					
PG	-	17'	B	64.000	900	900		550	1,164	1,456	0,801				B	150.1	4	466.0	
	17'											579,278	480,000	99,278					
17'	-	AG'	(B)	33.900	700	700		2.400	1,020	1,528	3,668								
	AG'											575,610	520,000	55,610					
AG'	-	AG	(B)	19.000	600	600		550	0.778	1,109	0,610								
	AG											575,000	570,000	5,000					
	17'											579,278	480,000	99,278					
17'	-	1702	(B)	30.100	500	500		2.500	1,774	6,314	15,786								
	1702											563,492	545,000	18,492					
	1702											563,492	545,000	18,492					
1702	-	18'	(B)	19.200	450	450		1.500	1,397	4,591	6,887								
	18'											556,605	480,000	76,605					
18'	-	K801	(B)	15.200	450	450		2.750	1,106	2,980	8,195								
	K801											548,410	520,000	28,410					
K801	-	KR8	(B)	15.200	450	450		900	1,106	2,980	2,682								
	KR8											545,728	540,000	5,728					
	18'											556,605	480,000	76,605					
18'	-	18	(B)	4.000	250	250		1.350	0.943	4,414	5,959								
	18											550,647	540,000	10,647					
Katugastota-Kundasale																			
	KR8											571,329	540,000	31,329					
KR8	-	K702	B	5.900	250	296	Atten	3.000	0.994	3,995	11,984				B	31.3	1	35.9	Exist Pipe ϕ200

	Node		B/G	Flow Rate	Dia.	Mixed Dia	Exist.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Pump	Head	set	Output	Remark
Node-Node				Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)	Type	H(m)	Excluding	(kw/set)	
	K702											559,345	500,000	59,345					
K702	-	K701	(B)	4.900	198	295	Atten	2.150	0,831	2,486	5,345								Exist Pipe ø250
	K701											554,000	510,000	44,000					
K701	-	K301	(B)	0	300	300	K	4.843	0,000	0,000	0,000								Exist Pipe ø300
	K301											554,000	538,000	16,000					
	Kundasale																		
	BPT											623,000	623,000	0,000					
BPT	-	K102	G	13.000	400	400	K	3.940	1,197	3,960	15,604								Exist Pipe ø400
	K102											607,396	503,000	104,396					
K102	-	K103	(G)	11.000	400	400	K	4.340	1,013	2,907	12,618								Exist Pipe ø400
	K103											594,778	501,000	93,778					
K103	-	K104	(G)	11.000	350	350	K	1.500	1,323	5,571	8,356								Exist Pipe ø350
	K104											586,422	505,000	81,422					
K104	-	K105	(G)	11.000	250	360	Atten	735	1,249	4,836	3,554								Exist Pipe ø300
	K105											582,867	522,000	60,867					
K105	-	K501	(G)	14.000	350	399	Atten	1.500	1,295	4,590	6,885								Exist Pipe ø250
	K501											575,982	490,000	85,982					
K501	-	KR5	(G)	1.400	123	127	Atten	1.000	1,274	14,625	14,625								Exist Pipe ø50
	KR5											561,357	555,000	6,357					
	K105											582,867	522,000	60,867					
K105	-	K301	(B)	600	300	300	K	25	0,098	0,054	0,001								Exist Pipe ø300
	K301											582,866	538,000	44,866					
	K301											582,866	510,000	72,866					
K301	-	KR3	(B)	600	300	300	K	285	0,098	0,054	0,015								Exist Pipe ø300
	KR3											582,851	565,000	17,851					
	K501											575,982	490,000	85,982					
K501	-	K502	(G)	6.700	250	250	K	150	1,580	11,461	1,719								Exist Pipe ø250
	K502											574,263	480,000	94,263					
	K801											548,410	520,000	28,410					
K801	-	K601	(B)	5.900	350	350		5.100	0,710	1,760	8,974								
	K601											539,436	480,000	59,436					
K601	-	K503	(B)	2.000	200	200	K	500	0,737	3,130	1,565								Exist Pipe ø200
	K503											537,871	470,000	67,871					
K503	-	K502	(B)	0	250	250	K	150	0,000	0,000	0,000								Exist Pipe ø250
	K502											537,871	480,000	57,871					
	K601											539,436	480,000	59,436					
K601	-	KR6	(B)	3.900	150	150	K	500	2,554	43,708	21,854								Exist Pipe ø150
	KR6											517,582	505,000	12,582					
	K503											537,871	470,000	67,871					
K503	-	KT1	(G)	800	250	250	K	1.950	0,189	0,225	0,438								Exist Pipe ø250
	KT1											537,432	510,000	27,432					
Sub Total																	7	789,7	

Node		B/G	Flow Rate	Dia.	Mixed Dia	Exist.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Pump	Head	set	Output	Remark
Node-Node			Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)	Type	H(m)	Excluding	(kw/set)	
Transmision Main Analysis (Case C)									**Year 2015**		**(Kundasale)**							
	Katugastota-Madawala																	
	PG										544,139	430,000	114,139					
PG	-	601	B	41.100	800	800	700	0,946	1,139	0,797				B	114,1	2	455,1	
	601										543,342	430,000	113,342					
601	-	301	(B)	23.700	600	600	900	0,970	1,670	1,503								
	301										541,839	445,000	96,839					
301	-	5001	(B)	22.400	600	600	930	0,917	1,504	1,399								
	5001										540,440	440,000	100,440					
5001	-	5002	(B)	19.600	600	600	1.250	0,802	1,175	1,469								
	5002										538,971	450,000	88,971					
5002	-	26'	(B)	11.400	400	400	2.670	1,050	3,106	8,293								
	26'										530,678	470,000	60,678					
26'	-	26	(B)	2.900	250	250	1.100	0,684	2,435	2,678								
	26										528,000	523,000	5,000					
	26'										530,678	470,000	60,678					
26'	-	25'	(B)	8.500	350	350	630	1,023	3,458	2,178								
	25'										528,500	460,000	68,500					
25'	-	25	(B)	1.000	198	198	1.300	0,376	0,912	1,185								
	25										527,314	523,000	4,314					
	25'										528,500	460,000	68,500					
25'	-	25B	(B)	7.500	250	250	1.100	1,768	14,121	15,533								
	25B										512,967	502,000	10,967					
25B	-	25N	(B)	500	65	65	50	1,744	57,393	2,870								
	25N										510,097	502,000	8,097					
	25B										600,600	502,000	98,600					
25B	-	K701	IB	7.000	350	350	7.000	0,842	2,414	16,900				IB	87,6	1	119,0	
	K701										583,700	510,000	73,700					
	Katugastota-KFG,R2																	
	PG										580,135	430,000	150,135					
PG	-	17'	B	48.700	800	800	550	1,121	1,559	0,857				B	150,1	4	354,7	
	17'										579,278	480,000	99,278					
17'	-	AG'	(B)	33.900	700	700	2.400	1,020	1,528	3,668								
	AG'										575,610	520,000	55,610					
AG'	-	AG	(B)	19.000	600	600	550	0,778	1,109	0,610								
	AG										575,000	570,000	5,000					
	17'										579,278	480,000	99,278					
17'	-	1702	(B)	14.900	500	500	2.500	0,878	1,719	4,298								
	1702										574,980	545,000	29,980					
	1702										574,980	545,000	29,980					
1702	-	18'	(B)	4.000	250	250	1.500	0,943	4,414	6,621								
	18'										568,359	480,000	88,359					
18'	-	18	(B)	4.000	198	198	1.350	1,504	11,850	15,997								
	18										552,362	540,000	12,362					
	Katugastota-Kundasale																	
	K701										583,700	510,000	73,700					
K701	-	K702	(B)	1.000	0	250	Atten	2.150	0,236	0,293	0,630							Exist Pipe ϕ250
	K702										583,070	500,000	83,070					

Node			B/G	Flow Rate	Dia.	Mixed Dia	Exist.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Pump	Head	set	Output	Remark
Node-Node				Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)	Type	H(m)	Excluding	(kw/set)	
	K701											583,700	510,000	73,700					
K701	-	K301	(B)	1,100	300	300	K	4.843	0,180	0,167	0,807								Exist Pipe ϕ300
	K301											582,893	538,000	44,893					
K301	-	K105	(B)	500	300	300	K	25	0,082	0,039	0,001								Exist Pipe ϕ300
	K105											582,892	522,000	60,892					
	K301											582,893	510,000	72,893					
K301	-	KR3	(B)	600	300	300	K	285	0,098	0,054	0,015								Exist Pipe ϕ300
	KR3											582,877	565,000	17,877					
	Kundasale																		
	BPT											623,000	623,000	0,000					
BPT	-	K102	G	13,000	400	400	K	3.940	1,197	3,960	15,604								Exist Pipe ϕ400
	K102											607,396	503,000	104,396					
K102	-	K103	(G)	11,000	400	400	K	4.340	1,013	2,907	12,618								Exist Pipe ϕ400
	K103											594,778	501,000	93,778					
K103	-	K104	(G)	11,000	350	350	K	1.500	1,323	5,571	8,356								Exist Pipe ϕ350
	K104											586,422	505,000	81,422					
K104	-	K105	(G)	11,000	250	360	Atten	735	1,249	4,836	3,554								Exist Pipe ϕ300
	K105											582,867	522,000	60,867					
K105	-	K501	(G)	14,000	350	399	Atten	1.500	1,295	4,590	6,885								Exist Pipe ϕ250
	K501											575,982	490,000	85,982					
K501	-	KR5	(G)	1,400	123	127	Atten	1.000	1,274	14,625	14,625								Exist Pipe ϕ50
	KR5											561,357	555,000	6,357					
	K501											575,982	490,000	85,982					
K501	-	K502	(G)	7,800	250	250	K	150	1,839	15,184	2,278								Exist Pipe ϕ250
	K502											573,705	480,000	93,705					
	5002											564,117	450,000	114,117					
5002	-	K801	IB	8,200	350	350		5.000	0,986	3,235	16,176				IB	25,1	1	40,0	
	K801											547,941	520,000	27,941					
	K801											547,941	520,000	27,941					
K801	-	KR8	(B)	3,400	250	250		900	0,802	3,268	2,941								
	KR8											545,000	540,000	5,000					
	KR8						-					590,630	540,000	50,630					
KR8	-	K702	B	0	0	200	Atten	3.000	0,000	0,000	0,000				B	50,6	2	0,0	Exist Pipe ϕ200
	K702											590,630	500,000	90,630					
	K801											547,941	520,000	27,941					
K801	-	K601	(B)	4,800	300	300		5.100	0,786	2,545	12,979								
	K601											534,962	480,000	54,962					
	K601											534,962	480,000	54,962					
K601	-	K503	(G)	800	200	200	K	500	0,295	0,575	0,287								Exist Pipe ϕ200
	K503											534,674	470,000	64,674					
K503	-	K502	(G)	0	250	250	K	150	0,000	0,000	0,000								Exist Pipe ϕ250
	K502											534,674	480,000	54,674					
	K601											534,962	480,000	54,962					
K601	-	KR6	(G)	3,900	150	150	K	500	2,554	43,708	21,854								Exist Pipe ϕ150
	KR6											513,108	505,000	8,108					
	K503											534,674	470,000	64,674					
K503	-	KT1	(G)	800	250	250	K	1.950	0,189	0,225	0,438								Exist Pipe ϕ250

Node	B/G	Flow Rate	Dia.	Mixed Dia	Exist.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Pump	Head	set	Output	Remark
Node-Node		Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)	Type	H(m)	Excluding	(kw/set)	
KT1										534.236	510.000	24.236					
Sub Total															10	968.9	

Node		B/G	Flow Rate	Dia.	Mixed Dia	Exist.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Pump	Head	set	Output	Remark
Node-Node			Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)	Type	H(m)	Excluding	(kw/set)	
Transmision Main Analysis (Case D)									Year 2015		(Kundasale)							
Katugastota-Madawala																		
	PG										541,631	430,000	111,631					
PG	-	601	B	41.100	800	800	700	0.946	1.139	0.797				B	111.6	2	445.1	
	601										540,833	430,000	110,833					
601	-	301	(B)	23.700	600	600	900	0.970	1.670	1.503								
	301										539,331	445,000	94,331					
301	-	5001	(B)	22.400	600	600	930	0.917	1.504	1.399								
	5001										537,932	440,000	97,932					
5001	-	5002	(B)	19.600	600	600	1,250	0.802	1.175	1.469								
	5002										536,463	450,000	86,463					
5002	-	26'	(B)	4.400	300	300	2,670	0.720	2.167	5.785								
	26'										530,678	470,000	60,678					
26'	-	26	(B)	2.900	250	250	1,100	0.684	2.435	2.678								
	26										528,000	523,000	5,000					
	26'										530,678	470,000	60,678					
26'	-	25'	(B)	1.500	350	350	630	0.180	0.140	0.088								
	25'										530,590	460,000	70,590					
25'	-	25	(B)	1.000	198	198	1,300	0.376	0.912	1.185								
	25										529,405	523,000	6,405					
	25'										530,590	460,000	70,590					
25'	-	25B	(B)	500	97	97	1,100	0.783	8.169	8.986								
	25B										521,604	502,000	19,604					
25B	-	25N	(B)	500	65	65	50	1.744	57.393	2.870								
	25N										518,734	502,000	16,734					
Katugastota-KFG,HZ																		
	PG										580,135	430,000	150,135					
PG	-	17'	B	48.700	800	800	550	1.121	1.559	0.857				B	150.1	4	354.7	
	17'										579,278	480,000	99,278					
17'	-	AG'	(B)	33.900	700	700	2,400	1.020	1.528	3.668								
	AG'										575,610	520,000	55,610					
AG'	-	AG	(B)	19.000	600	600	550	0.778	1.109	0.610								
	AG										575,000	570,000	5,000					
	17'										579,278	480,000	99,278					
17'	-	1702	(B)	14.900	500	500	2,500	0.878	1.719	4.298								
	1702										574,980	545,000	29,980					
	1702										574,980	545,000	29,980					
1702	-	18'	(B)	4.000	250	250	1,500	0.943	4.414	6.621								
	18'										568,359	480,000	88,359					
18'	-	18	(B)	4.000	198	198	1,350	1.504	11.850	15.997								
	18										552,362	540,000	12,362					
Katugastota-Kundasale																		
	5002										555,504	450,000	105,504					
5002	-	K801	IB	15.200	500	500	5,000	0.896	1.784	8.920				IB	19.0	1	56.2	
	K801										546,584	520,000	26,584					
K801	-	KR8	(B)	5.900	350	350	900	0.710	1.760	1.584								
	KR8										545,000	540,000	5,000					
	KR8										571,329	540,000	31,329					
KR8	-	K702	B	5.900	250	296	Atten	3.000	0.994	3.995	11.984			B	31.3	1	35.9	Exist Pipe ϕ200

Node			B/G	Flow Rate	Dia.	Mixed Dia	Exisi.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Pump	Head	set	Output	Remark
Node-Node				Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)	Type	H(m)	Excluding	(kw/set)	
	K702											559,345	500,000	59,345					
K702	-	K701	(B)	4.900	198	295	Atten	2.150	0,831	2,486	5,345								Exist Pipe ϕ250
	K701											554,000	510,000	44,000					
	Kundasale																		
	BPT											623,000	623,000	0,000					
BPT	-	K102	G	13.000	400	400	K	3.940	1,197	3,960	15,604								Exist Pipe ϕ400
	K102											607,396	503,000	104,396					
K102	-	K103	(G)	11.000	400	400	K	4.340	1,013	2,907	12,618								Exist Pipe ϕ400
	K103											594,778	501,000	93,778					
K103	-	K104	(G)	11.000	350	350	K	1.500	1,323	5,571	8,356								Exist Pipe ϕ350
	K104											586,422	505,000	81,422					
K104	-	K105	(G)	11.000	250	360	Atten	735	1,249	4,836	3,554								Exist Pipe ϕ300
	K105											582,867	522,000	60,867					
K105	-	K501	(G)	14.000	350	399	Atten	1.500	1,295	4,590	6,885								Exist Pipe ϕ250
	K501											575,982	490,000	85,982					
K501	-	KR5	(G)	1.400	123	127	Atten	1.000	1,274	14,625	14,625								Exist Pipe ϕ50
	KR5											561,357	555,000	6,357					
	K105											582,867	522,000	60,867					
K105	-	K301	(B)	600	300	300	K	25	0,098	0,054	0,001								Exist Pipe ϕ300
	K301											582,866	538,000	44,866					
K301	-	KR3	(B)	600	300	300	K	285	0,098	0,054	0,015								Exist Pipe ϕ300
	KR3											582,851	565,000	17,851					
	K501											575,982	490,000	85,982					
K501	-	K502	(G)	6.700	250	250	K	150	1,580	11,461	1,719								Exist Pipe ϕ250
	K502											574,263	480,000	94,263					
	K801											546,584	520,000	26,584					
K801	-	K601	(B)	5.900	350	350		5.100	0,710	1,760	8,974								
	K601											537,609	480,000	57,609					
K601	-	K503	(G)	800	200	200	K	500	0,295	0,575	0,287								Exist Pipe ϕ200
	K503											537,322	470,000	67,322					
K503	-	K502	(G)	0	250	250	K	150	0,000	0,000	0,000								Exist Pipe ϕ250
	K502											537,322	480,000	57,322					
	K601											537,609	480,000	57,609					
K601	-	KR6	(G)	3.900	150	150	K	500	2,554	43,708	21,854								Exist Pipe ϕ150
	KR6											515,755	505,000	10,755					
	K503											537,322	470,000	67,322					
K503	-	KT1	(G)	800	250	250	K	1.950	0,189	0,225	0,438								Exist Pipe ϕ250
	KT1											536,884	510,000	26,884					
Sub Total																	8	891,9	

A-5.8.16

Appendix 5.9 Hydraulic Calcuration for Transmision Pipeline (M/P) Year 2015 (Integrated)

Node		B/G	Flow Rate	Dia.	Mixed Dia	Exist.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Stage	Pump	Head	set	Output	Remark
Node-Node			Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)		Type	H(m)	Excluding Stand-by	(kw/set)	
KMC-Primrose																			
KMC											642.065	475.000	167.065						
KMC	63	B	2,000	200	200	K	500	0.737	3.130	1.565				1	B	167.1	2	32.4	Exist Pipe ϕ200
63											640.500	635.500	5.000						
KMC-Eliyagama																			
KMC											582.960	475.000	107.960						
KMC	36'	B	13,700	500	500		2,000	0.808	1.472	2.944				K	B	108.0	3	95.7	
36'											580.016	480.000	100.016						
36'	36H	(B)	900	140	140		3,700	0.677	4.058	15.016									
36H											565.000	560.000	5.000						
36'											580.016	480.000	100.016						
36'	36	(B)	12,800	350	350		2,000	1.540	7.374	14.748									Exist Pipe ϕ450
36											565.269	545.000	20.269						
36											600.205	545.000	55.205						
36	3602	B	7,600	300	336	Atten	1,354	0.994	3.443	4.662				2	B	55.2	2	40.7	Exist Pipe ϕ200
3602											595.543	510.000	85.543						
3602	3601	(B)	7,600	300	318	Atten	1,950	1.110	4.513	8.800									Exist Pipe ϕ150
3601											586.743	490.000	96.743						
3601	22'	(B)	7,600	300	360	Atten	2,915	0.863	2.440	7.112									Exist Pipe ϕ250
22'											579.630	480.000	99.630						
22'	22	(B)	6,500	350	350	K	4,575	0.782	2.105	9.630									Exist Pipe ϕ350
22											570.000	565.000	5.000						
22'											579.630	480.000	99.630						
22'	24'	(B)	1,200	400	400	K	1,350	0.111	0.048	0.065									Exist Pipe ϕ400
24'											579.565	480.000	99.565						
36											645.110	545.000	100.110						
36	37	B	2,100	198	198		4,200	0.789	3.598	15.110				3	B	100.1	2	20.4	
37											630.000	625.000	5.000						
37											625.000	625.000	0.000						
37	39	G	700	79	79		1,000	1.653	41.366	41.366									
39											583.634	575.000	8.634						
37											625.000	625.000	0.000						
37	38	G	300	97	97		9,800	0.470	3.175	31.116									
38											593.884	545.000	48.884						
Nillambe Oya																			
NO											582.000	582.000	0.000						
NO	21'	G	9,000	500	500	K	1,400	0.531	0.677	0.947									Exist Pipe ϕ500
21'											581.053	500.000	81.053						
21'	23'	G	9,000	400	400	K	800	0.829	2.006	1.605									Exist Pipe ϕ400
23'											579.448	500.000	79.448						
23'	2301	(G)	1,000	140	140		2,000	0.752	4.932	9.864									
2301											569.584	560.000	9.584						
2301											609.932	560.000	49.932						

Appendix 5.9 Hydraulic Calcuration for Transmision Pipeline (M/P) Year 2015 (Integrated)

Node			B/G	Flow Rate	Dia.	Mixed Dia	Exist.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Stage	Pump	Head	set	Output	Remark
Node-Node				Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)		Type	H(m)	Excluding Stand-by	(kw/set)	
															3	IB	40.3	1	7.8	
2301	-	23	IB	1,000	140	140		1,000	0.752	4.932	4.932									
	23											605.000	600.000	5.000						
	23'											579.448	500.000	79.448						
23'	-	24'	(G)	8,000	400	400	K	903	0.737	1.613	1.457									Exist Pipe φ400
	24'											577.992	480.000	97.992						
24'	-	2401	(G)	9,100	300	318	Atten	750	1.330	6.298	4.723									Exist Pipe φ150あり
	2401											573.268	500.000	73.268						
2401	-	24	(G)	9,100	250	296	Atten	500	1.533	8.905	4.453									Exist Pipe φ200あり
	24											568.816	560.000	8.816						
	KMC-Udaperdeniya																			
	KMC											589.904	475.000	114.904		-				
KMC	-	66'	B	4,000	300	300		1,100	0.655	1.816	1.998				K	B	114.9	1	89.2	
	66'											587.906	490.000	97.906						
66'	-	67	(B)	4,000	300	300		1,600	0.655	1.816	2.906									
	67											585.000	580.000	5.000						
	67											635.801	580.000	55.801						
67	-	68	B	3,000	346	346	K	1,500	0.370	0.534	0.801				3	B	55.8	1	32.5	Exist Pipe φ280, φ250
	68											635.000	630.000	5.000						
	68											711.574	630.000	81.574						
68	-	69	B	2,000	198	198	K	2,000	0.752	3.287	6.574				3	B	81.6	2	15.8	Exist Pipe φ225
	69											705.000	700.000	5.000						
	69											761.905	700.000	61.905						
69	-	70	B	1,000	140	140		1,400	0.752	4.932	6.905				3	B	61.9	1	12.0	
	70											755.000	750.000	5.000						
	KMC-KFG																			
	KMC											568.983	475.000	93.983						
KMC	-	5401	B	13,800	500	500	K	500	0.813	1.492	0.746				K	B	94.0	3	83.9	Exist Pipe φ500
	5401											568.237	480.000	88.237						
5401	-	54'	B	12,300	500	500	K	700	0.725	1.206	0.844									Exist Pipe φ500
	54'											567.393	485.000	82.393						
54'	-	57'	(B)	9,500	500	500	K	1,800	0.560	0.748	1.346									Exist Pipe φ500
	57'											566.047	500.000	66.047						
57'	-	582	(B)	9,500	500	500	K	1,400	0.560	0.748	1.047									Exist Pipe φ500
	582											565.000	555.000	10.000						
	5401											568.237	480.000	88.237						
5401	-	66	(B)	1,500	123	123		900	1.461	19.615	17.653									
	66											550.584	535.000	15.584						
	54'											567.393	485.000	82.393						
54'	-	54	(B)	2,800	198	198		830	1.053	6.125	5.084									
	54											562.309	560.000	2.309						
	54											622.766	560.000	62.766						
54	-	55	B	2,000	198	198		1,450	0.752	3.287	4.766				1	B	62.8	2	12.2	
	55											618.000	613.000	5.000						

Appendix 5.9 Hydraulic Calcuration for Transmision Pipeline (M/P) Year 2015 (Integrated)

Node			B/G	Flow Rate	Dia.	Mixed Dia	Exist.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Stage	Pump	Head	set	Output	Remark
Node-Node				Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)		Type	H(m)	Excluding Stand-by	(kw/set)	
	55											686.059	613.000	73.059						
55	-	56	B	1,000	140	140		1,330	0.752	4.932	6.559				1	B	73.1	1	14.2	
	56											679.500	674.500	5.000						
	KMC-R2,KFG											623.416	555.000	68.416						
	582														K	B	68.4	2	55.1	Exist Pipe φ250×2
582	-	583	B	8,300	325	325	K	300	1.155	4.719	1.416	622.000	617.000	5.000						
	583																			
	582											648.961	555.000	93.961						
582	-	61S	B	3,200	200	200		1,200	1.179	7.467	8.961				K	B	94.0	2	29.2	
	61S											640.000	635.000	5.000						
	61S											687.529	635.000	52.529						
61S	-	61	B	2,200	198	198	K	900	0.827	3.921	3.529				2	B	52.5	2	11.2	Exist Pipe φ225
	61											684.000	679.000	5.000						
	61											679.000	679.000	0.000						
61	-	61H	G	900	140	140		1,700	0.677	4.058	6.899									
	61H											672.101	660.000	12.101						
	61											778.502	679.000	99.502						
61	-	HT	B	1,000	140	140		710	0.752	4.932	3.502				2	B	99.5	1	19.3	
	HT											775.000	770.000	5.000						
	583											617.000	617.000	0.000						
583	-	6001	G	3,900	350	350	K	541	0.469	0.818	0.443									Exist Pipe φ350
	6001											616.557	560.000	56.557						
6001	-	6002	(G)	3,900	300	300	K	1,304	0.639	1.733	2.260									Exist Pipe φ300
	6002											614.297	570.000	44.297						
6002	-	60	(G)	3,900	140	189	Atten	1,805	1.611	14.217	25.661									Exist Pipe φ150
	60											588.636	580.000	8.636						
	60											634.789	580.000	54.789						
60	-	60E	B	1,000	140	140		3,100	0.752	4.932	15.289				1	B	54.8	1	10.6	
	60E											619.500	614.500	5.000						
	60											658.354	580.000	78.354						
60	-	60'	B	700	140	140		2,100	0.526	2.549	5.354				1	B	78.4	1	10.6	
	60'											653.000	648.000	5.000						
	60'											713.922	648.000	65.922						
60'	-	60''	B	200	75	75	K	1,700	0.524	5.248	8.922				1	B	65.9	1	2.6	Exist Pipe φ75
	60''											705.000	700.000	5.000						
	60											646.027	580.000	66.027						
60	-	6002	B	800	140	140	K	1,500	0.601	3.264	4.896				1	B	66.0	1	10.2	Exist Pipe φ160
	6002											641.131	600.000	41.131						
6002	-	60M	(B)	800	150	150	K	485	0.524	2.332	1.131									Exist Pipe φ150
	60M											640.000	635.000	5.000						

Appendix 5.9 Hydraulic Calcuration for Transmision Pipeline (M/P) Year 2015 (Integrated)

Node			B/G	Flow Rate	Dia.	Mixed Dia	Exist.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Stage	Pump	Head	set	Output	Remark
Node-Node				Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)		Type	H(m)	Excluding Stand-by	(kw/set)	
Sub Total																		32	605.7	

Appendix 5.9 Hydraulic Calcuration for Transmision Pipeline (M/P) Year 2015 (Integrated)

Node		B/G	Flow Rate	Dia.	Mixed Dia	Exist.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Stage	Pump	Head	set	Output	Remark
Node-Node			Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)		Type	H(m)	Excluding Stand-by	(kw/set)	
Katugastota-Madawala																			
	PG										541.631	438.000	103.631						
PG	- 601	B	41,100	800	800		700	0.946	1.139	0.797				1	B	103.6	2	413.2	
	601										540.833	430.000	110.833						
601	- 301	(B)	23,700	600	600		900	0.970	1.670	1.503									
	301										539.331	445.000	94.331						
301	- 5001	(B)	22,400	600	600		930	0.917	1.504	1.399									
	5001										537.932	440.000	97.932						
5001	- 5002	(B)	19,600	600	600		1,250	0.802	1.175	1.469									
	5002										536.463	450.000	86.463						
5002	- 26'	(B)	4,400	300	300		2,670	0.720	2.167	5.785									
	26'										530.678	470.000	60.678						
26'	- 26	(B)	2,900	250	250		1,100	0.684	2.435	2.678									
	26										528.000	523.000	5.000						
	301										539.331	445.000	94.331						
301	- 3	(B)	1,300	97	97		750	2.036	47.849	35.887									
	3										503.444	464.300	39.144						
	5001										537.932	440.000	97.932						
5001	- 500	(B)	2,800	198	198		1,200	1.053	6.125	7.351									
	500										530.581	513.000	17.581						
	500										606.444	513.000	93.444						
500	- 4J	B	1,300	140	140		3,300	0.977	8.013	26.444				3	B	93.4	1	23.6	
	4J										580.000	575.000	5.000						
	4J										575.000	575.000	0.000						
4J	- 4	G	700	140	140		2,950	0.526	2.549	7.521									
	4										567.479	565.000	2.479						
	26										588.458	523.000	65.458						
26	- 27'	B	1,700	198	198		1,300	0.639	2.433	3.164				3	B	65.5	2	10.8	
	27'										585.294	470.000	115.294						
27'	- 27	(B)	300	79	79		2,700	0.708	8.628	23.294									
	27										562.000	557.000	5.000						
	27'										585.294	470.000	115.294						
27'	- 28	(B)	1,400	123	123		1,400	1.364	17.265	24.170									
	28										561.124	550.000	11.124						
	26'										530.678	470.000	60.678						
26'	- 25'	(B)	1,500	198	198		630	0.564	1.930	1.216									
	25'										529.462	460.000	69.462						
25'	- 25	(B)	1,000	198	198		1,300	0.376	0.912	1.185									
	25										528.277	523.000	5.277						
	25'										529.462	460.000	69.462						
25'	- 25N	(B)	500	97	97		1,150	0.783	8.169	9.394									
	25N										520.067	502.000	18.067						

Appendix 5.9 Hydraulic Calcuration for Transmision Pipeline (M/P) Year 2015 (Integrated)

Node / Node-Node		B/G	Flow Rate Q(m3/d)	Dia. D(mm)	Mixed Dia Dm(mm)	Exist.	Length L(m)	Velocity v(m/sec)	Hyd.Grd I(‰)	Loss h(m)	Dynamic Pressure Hd(MSL)	GL	Dynamic Pressure He(m)	Stage	Pump Type	Head H(m)	set Excluding Stand-by	Output (kw/set)	Remark
	Katugastota-Kahawatta																		
	601										540.833	430.000	110.833						
601	-	6	(B)	17,400	500	500	6,350	1.026	2.291	14.547									
	6										526.286	520.000	6.286						
											520.000	520.000	0.000						
	6																		
6	-	10	G	900	198	198	1,400	0.338	0.750	1.050	518.950	514.000	4.950						
	10																		
											626.233	520.000	106.233						
	6													3	B	106.2	2	63.9	
6	-	11'	B	6,200	350	350	6,150	0.746	1.929	11.862	614.371	570.000	44.371						
	11'																		
11'	-	12	(B)	2,500	198	198	3,900	0.940	4.967	19.371	595.000	590.000	5.000						
	12																		
											614.371	570.000	44.371						
	11'																		
11'	-	11	(B)	1,100	79	79	100	2.597	95.453	9.545	604.826	570.000	34.826						
	11																		
											661.764	570.000	91.764						
	11'													3	IB	47.4	1	23.9	
11'	-	11S	IB	2,600	250	250	3,400	0.613	1.989	6.764	655.000	650.000	5.000						
	11S																		
											710.968	650.000	60.968						
	11S													3	B	61.0	2	15.4	
11S	-	11G'	B	2,600	250	250	3,000	0.613	1.989	5.968	705.000	700.000	5.000						
	11G'																		
											755.172	700.000	55.172						
	11G'													3	IB	50.2	1	25.3	
11G'	-	11G	IB	2,600	250	250	2,600	0.613	1.989	5.172	750.000	745.000	5.000						
	11G																		
											593.618	520.000	73.618						
	6													1	B	73.6	2	40.0	
6	-	7'	B	5,600	300	300	3,650	0.917	3.385	12.355	581.263	460.000	121.263						
	7'																		
7'	-	7	(B)	5,100	300	300	2,200	0.835	2.847	6.263	575.000	570.000	5.000						
	7																		
											581.263	460.000	121.263						
	7'																		
7'	-	8	(B)	500	97	97	1,000	0.783	8.169	8.169	573.094	570.000	3.094						
	8																		
											629.747	570.000	59.747						
	7													3	B	59.7	2	17.4	
7	-	9	B	3,000	250	250	3,760	0.707	2.592	9.747	620.000	615.000	5.000						
	9																		
	Katugastota-Uduwawala										587.111	438.000	149.111						
	PG													2	B	149.1	1	254.6	
PG	-	5'	B	8,800	400	400	700	0.811	1.924	1.347	585.764	450.000	135.764						
	5'																		
5'	-	1301	(B)	8,800	400	400	1,200	0.811	1.924	2.309	583.455	470.000	113.455						
	1301																		

Appendix 5.9 Hydraulic Calcuration for Transmision Pipeline (M/P) Year 2015 (Integrated)

Node			B/G	Flow Rate	Dia.	Mixed Dia	Exist.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Stage	Pump	Head	set	Output	Remark
Node-Node				Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)		Type	H(m)	Excluding Stand-by	(kw/set)	
1301	-	14'	(B)	4,600	300	300		3,420	0.753	2.352	8.045									
												575.410	560.000	15.410						
	14'																			
14'	-	17N	(B)	4,600	300	300		2,300	0.753	2.352	5.410									
												570.000	565.000	5.000						
	17N																			
												583.455	470.000	113.455						
	1301																			
1301	-	1302	(B)	4,200	198	198		1,800	1.579	12.969	23.344									
												560.111	510.000	50.111						
	1302																			
1302	-	15	(B)	2,100	198	198		2,300	0.789	3.598	8.274									
												551.836	532.000	19.836						
	15																			
												560.111	510.000	50.111						
	1302																			
1302	-	13	(B)	2,100	97	97		100	3.289	116.194	11.619									
												548.491	510.000	38.491						
	13																			
												580.312	532.000	48.312						
	15														3	B	48.3	2	7.5	
15	-	16	B	1,600	198	198		5,200	0.601	2.175	11.312									
												569.000	564.000	5.000						
	16																			
	Katugastota-Kondadeniya,Kulugamana											443.520	438.000	5.520						
	PG														1	B	5.5	1	4.2	
PG	-	5''	B	3,900	300	300		300	0.639	1.733	0.520									
												443.000	438.000	5.000						
	5''																			
												583.415	438.000	145.415						
	5''														1	B	145.4	1	110.0	Exist Pipe φ160×2
5''	-	5	B	3,900	182	182	K	2,680	1.731	16.946	45.415									
												538.000	533.000	5.000						
	5																			
												596.821	533.000	63.821						
	5														1	B	63.8	1	14.9	Exist Pipe φ160
5	-	14	B	1,200	140	140	K	2,000	0.902	6.910	13.821									
												583.000	578.000	5.000						
	14																			
	Katugastota-KFG,R2											598.982	438.000	160.982						
	PG														1	B	161.0	4	388.1	
PG	-	17'	B	49,700	900	900		550	0.904	0.912	0.502									
												598.481	480.000	118.481						
	17'																			
17'	-	AG'	(B)	34,900	700	700		2,400	1.050	1.613	3.871									
												594.610	520.000	74.610						
	AG'																			
AG'	-	AG	(B)	19,000	600	600		550	0.778	1.109	0.610									
												594.000	589.000	5.000						
	AG																			
												594.610	520.000	74.610						
	AG'																			
AG'	-	582	(B)	15,900	300	300		1,450	2.603	23.333	33.833									
												560.777	555.000	5.777						
	582																			
												634.558	589.000	45.558						
	AG														1	B	45.6	1	59.2	
AG	-	57	B	6,700	350	350		700	0.806	2.226	1.558									
												633.000	628.000	5.000						
	57																			
												598.481	480.000	118.481						
	17'																			
17'	-	1702	(B)	14,900	400	400		2,500	1.372	5.097	12.743									
												585.738	545.000	40.738						
	1702																			

Appendix 5.9 Hydraulic Calcuration for Transmision Pipeline (M/P) Year 2015 (Integrated)

Node			B/G	Flow Rate	Dia.	Mixed Dia	Exist.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Stage	Pump	Head	set	Output	Remark
Node-Node				Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)		Type	H(m)	Excluding Stand-by	(kw/set)	
1702	-	18'	(B)	4,000	198	198		1,500	1.504	11.850	17.775									
	18'											567.963	480.000	87.963						
18'	-	18	(B)	4,000	198	198		1,350	1.504	11.850	15.997									
	18											551.966	540.000	11.966						
												585.738	545.000	40.738						
	1702																			
1702	-	17	(B)	10,900	250	250		100	2.570	28.199	2.820									
	17											582.918	562.000	20.918						
												540.000	540.000	0.000						
	18																			
18	-	1901	G	3,000	250	250		4,300	0.707	2.592	11.147									
	1901											528.853	470.000	58.853						
1901	-	19	(G)	1,000	79	79		200	2.361	80.022	16.004									
	19											512.849	470.000	42.849						
												528.853	470.000	58.853						
	1901																			
1901	-	19'	(G)	2,000	250	250		2,000	0.472	1.224	2.449									
	19'											526.405	460.000	66.405						
19'	-	19H	(G)	1,000	198	198		3,000	0.376	0.912	2.735									
	19H											523.669	520.000	3.669						
	Talathuoya																			
												526.405	460.000	66.405						
	19'																			
19'	-	20'	(G)	1,000	198	198		3,000	0.376	0.912	2.735									
	20'											523.669	500.000	23.669						
20'	-	20	(G)	1,000	123	123		1,000	0.974	9.264	9.264									
	20											514.405	500.000	14.405						
	Katugastota-Kundasale																			
	5002											557.595	450.000	107.595						
5002	-	K801	IB	15,200	500	500		5,000	0.896	1.784	8.920				2	IB	21.1	1	62.3	
	K801											548.675	520.000	28.675						
K801	-	KR8	(IB)	9,300	350	350		900	1.119	4.084	3.675									
	KR8											545.000	540.000	5.000						
												573.232	540.000	33.232						
	KR8														2	B	33.2	2	19.0	Exist Pipe φ200
KR8	-	K702	B	5,900	198	259	Atten	3,000	1.296	6.574	19.723									
	K702											553.509	500.000	53.509						
K702	-	K701	(B)	4,900	0	250	Atten	2,150	1.155	5.541	11.912									Exist Pipe φ250
	K701											541.596	510.000	31.596						
K701	-	KR7	(B)	4,900	198	210	Atten	200	1.639	12.982	2.596									Exist Pipe φ100
	KR7											539.000	534.000	5.000						
	K702											553.509	500.000	53.509						
K702	-	KT2	(B)	1,000	79	100	Atten	1,300	1.466	25.053	32.569									Exist Pipe φ75
	KT2											520.939	517.000	3.939						
	K801											548.675	520.000	28.675						
K801	-	K601	(IB)	5,900	350	350		5,100	0.710	1.760	8.974									
	K601											539.701	480.000	59.701						
K601	-	K503	(IB)	2,000	200	200	K	500	0.737	3.130	1.565									Exist Pipe φ200
	K503											538.136	470.000	68.136						

Appendix 5.9 Hydraulic Calcuration for Transmision Pipeline (M/P) Year 2015 (Integrated)

Node		B/G	Flow Rate	Dia.	Mixed Dia	Exist.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Stage	Pump	Head	set	Output	Remark
Node-Node			Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)		Type	H(m)	Excluding Stand-by	(kw/set)	
K503	-	K502	(IB)	1,100	250	250	K	150	0.259	0.405	0.061								Exist Pipe φ250
	K502										538.075	480.000	58.075						
	K601										539.701	480.000	59.701						
K601	-	KR6	(IB)	3,900	150	150	K	500	2.554	43.708	21.854								Exist Pipe φ150
	KR6										517.847	505.000	12.847						
	K503										538.136	470.000	68.136						
K503	-	KT1	(IB)	800	250	250	K	1,950	0.189	0.225	0.438								Exist Pipe φ250
	KT1										537.698	510.000	27.698						
Kundasale																			
	BPT										623.000	623.000	0.000						
BPT	-	K102	G	13,000	400	400	K	3,940	1.197	3.960	15.604								Exist Pipe φ400
	K102										607.396	503.000	104.396						
K102	-	K103	(G)	11,000	400	400	K	4,340	1.013	2.907	12.618								Exist Pipe φ400
	K103										594.778	501.000	93.778						
K103	-	K104	(G)	11,000	350	350	K	1,500	1.323	5.571	8.356								Exist Pipe φ350
	K104										586.422	505.000	81.422						
K104	-	K105	(G)	11,000	250	360	Atten	735	1.249	4.836	3.554								Exist Pipe φ300
	K105										582.867	522.000	60.867						
K105	-	K501	(G)	8,100	250	325	Atten	1,500	1.127	4.511	6.767								Exist Pipe φ250
	K501										576.101	490.000	86.101						
K501	-	KR5	(G)	1,400	123	127	Atten	1,000	1.274	14.625	14.625								Exist Pipe φ50
	KR5										561.475	555.000	6.475						
	K102										607.396	503.000	104.396						
K102	-	K101	(G)	2,000	150	150	K	590	1.310	12.706	7.496								Exist Pipe φ150
	K101										599.900	519.000	80.900						
K101	-	KR1	(G)	2,000	123	146	Atten	550	1.376	14.315	7.873								Exist Pipe φ100
	KR1										592.027	587.000	5.027						
	K105										582.867	522.000	60.867						
K105	-	K301	(B)	5,300	300	300	K	25	0.868	3.057	0.076								Exist Pipe φ300
	K301										582.791	538.000	44.791						
K301	-	KR3	(B)	600	300	300	K	285	0.098	0.054	0.015								Exist Pipe φ300
	KR3										582.776	565.000	17.776						
	K105										582.867	522.000	60.867						
K105	-	K401	(G)	2,400	97	167	Atten	800	1.274	10.680	8.544								Exist Pipe φ150
	K401										574.323	522.000	52.323						
K401	-	KR4	(G)	1,800	97	167	Atten	2,400	0.956	6.273	15.054								Exist Pipe φ150
	KR4										559.269	550.000	9.269						
	K401										574.323	522.000	52.323						
K401	-	KR9	(G)	600	65	76	Atten	400	1.536	37.882	15.153								Exist Pipe φ50
	KR9										559.170	537.000	22.170						
	K501										576.101	490.000	86.101						
K501	-	K502	(G)	12,600	250	250	K	150	2.971	36.871	5.531								Exist Pipe φ250
	K502										570.570	480.000	90.570						

Appendix 5.9 Hydraulic Calcuration for Transmision Pipeline (M/P) Year 2015 (Integrated)

Node			B/G	Flow Rate	Dia.	Mixed Dia	Exist.	Length	Velocity	Hyd.Grd	Loss	Dynamic Pressure	GL	Dynamic Pressure	Stage	Pump	Head	set	Output	Remark
Node-Node				Q(m3/d)	D(mm)	Dm(mm)		L(m)	v(m/sec)	I(‰)	h(m)	Hd(MSL)		He(m)		Type	H(m)	Excluding Stand-by	(kw/set)	
Katugastota-Gohagoda												551.364	438.000	113.364						
	PG														2	B	113.4	2	56.1	
PG	-	65'	B	5,100	300	300		2,050	0.835	2.847	5.836									
	65'											545.528	490.000	55.528						既設管無視 φ160×2条
65'	-	6501	(B)	4,000	300	300		1,800	0.655	1.816	3.269									
	6501											542.258	510.000	32.258						既設管無視 φ225
6501	-	6401	(B)	300	140	140		1,250	0.601	3.264	4.080									
	6401											538.178	455.000	83.178						既設管無視
6401	-	64S	(B)	200	79	79		780	0.472	4.075	3.178									
	64S											535.000	530.000	5.000						
	65'											545.528	490.000	55.528						
65'	-	65G	(B)	1,100	200	200	K	200	0.405	1.036	0.207									Exist Pipe φ200
	65G											545.321	528.000	17.321						
	6501											542.258	510.000	32.258						
6501	-	65	(B)	3,200	200	200	K	100	1.179	7.467	0.747									Exist Pipe φ200
	65											541.511	526.000	15.511						
	6401											538.178	455.000	83.178						
6401	-	64'	(B)	600	97	97		820	0.940	11.446	9.386									既設管無視 φ160
	64'											528.793	460.000	68.793						
	64											512.000	512.000	0.000						
64	-	64'	G	500	97	97		750	0.783	8.169	6.127									既設管無視 φ160, φ110
	64'											505.873	460.000	45.873						
	64'											505.873	460.000	45.873						
64'	-	64G	(B)	1,100	140	140		3,000	0.827	5.883	17.649									既設管無視 φ225
	64G											488.225	480.000	8.225						
	64S											567.540	530.000	37.540						
64S	-	64B	B	200	97	97	K	360	0.313	1.500	0.540				2	B	37.5	1	1.5	Exist Pipe φ110
	64B											567.000	562.000	5.000						
																		30	1,197.7	
Sub Total																				
																		62	1,803.4	
Grand Total																				