NATIONAL WATER SUPPLY & DRAINAGE BOARD (NWSDB)
MINISTRY OF WATER SUPPLY AND DRAINAGE
THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

PREPARATORY SURVEY
ON
ANURADHAPURA NORTH
INTEGRATED WATER SUPPLY PROJECT
IN
THE DEMOCRATIC SOCIALIST REPUBLIC
OF
SRI LANKA

FINAL REPORT
(VOLUME III : APPENDICES)

FEBRUARY 2013

JAPAN INTERNATIONAL COOPERATION AGENCY

NJS CONSULTANTS CO., LTD.
in Association with
NIHON SUIDO CONSULTANTS CO., LTD.

GE
JR(先)
13-041

TABLE OF CONTENTS

CHAPTER 1

WATER SUPPLY SECTOR IN SRI LANKA

Appendix 1.2 Details of Foreign-funded On-going Water Supply and Sanitation Projects - 2011

	Name of the project	Districts	Location	Beneficiaries	Funding Agency	Project Period	Total Est. Cost (Rs. Mil.)	Scope of Work
1	Greater Kandy WS – Phase I Stage II	Kandy	Improve Water Supply to Kandy City & PS Area Akurana, Pujapitiya, Kandy for Grevants.Harispattuwa & Patha Dumbara	183,000 beneficiaries & 432,800 service level improve	JICA	2007 – 2012	4,164	• Expansion of service area • Augmentation of WTP capacity from 37,000 to 50,000 m3/day
	Towns South of Kandy WS	Kandy		360,000	Denmark	?? - 2012	9,626	• Expansion of service area
2	Towns North of Colombo WS - Stage II	Colombo/ Gampaha	Ja-Ela, Kandana, Eakala, Mahara, Biyagama, Ragama & Welisara	250,000	JICA	2007 – 2012	6,490	• Expansion of service area
3	Greater Colombo Water Rehabilitation	Colombo	Rehabilitation /Enhance the Water Supply of CMC and Kottikawatte-Mulleriyawa area	100,000	JICA	2007 - 2012	4,785	• Reinforcement of water storage system • Increase of transmission capacity
4	Rehabilitation & Augmentation of Labugama Kalatuwawa	Colombo	Labugama Kalatuwawa	375,000	Hungary	2011 - 2014	4,184	• Rehabilitation & augmentation of two WTPs
5	Kalu Ganga WS – Phase 1 Stage-II (JBIC)	Colombo, Kalutara	Kandana, Kesbewa, Jamburaliya, Piliyandala, Kumbuka and Panadura East	400,000	JICA	2007 - 2013	10,846	• Construction of 60,000 m3/day WTP, Transmission main and distribution
	Capacity Development for NRW Reduction in Colombo City	Colombo	Borella & Kotahena	267,000	JICA	?? – 2012	200	• Capacity development for NRW reduction
	Water Supply Facilities		Moratuwa, Panadura and Negombo	10,000	Spanish Company	2008 - ??	2,690	• Construction of 50,000 m3/day WTP in Ambatale and 3,000 m3/day desalination plant for Negombo
6	Augmentation of Negombo WS	Gampaha	Negambo Town Area	215,000 in 2015	Netherland	?? – 2011	7,288	• Construction of 12,500 m3/day WTP at Bambukuliya • Transmission and distribution system
7	Kelani Right Bank WTP	Gampaha	Ja-Ela,Wattala, Ragama, Biyagama Mahabole	1,500,000	Denmark	2008 - 2011	8,100	• Construction of 40 MGD intake and WTP on Kelani right bank

	Name of the project	Districts	Location	Beneficiaries	Funding Agency	Project Period	Total Est. Cost (Rs. Mil.)	Scope of Work
8	Energy Conservation – Ambatale Water Treatment Plant	Colombo	Ambatale		Germany	2012 – 2014	6,903	• Carriyng-out of comprehensive energy audits • Replacement of major transmission systems • Rearrangement of pipe connections • Rearrangement and replacement of pump units
9	Ruhunupura WS Development – Stage I	Hambantota	Ambalanthota, Sooriyaweva	112,000	Korea	2010 - 2014	9,742	(Not clear)
10	Rehabilitation & Augmentation of Kirindi Oya WS	Hambantota	Kirindi Oya, Lunugamwehera, Weerawila, Pannegamuwa, Mattala	50,000	Austria	2008 – 2011	2,105	• Pipe laying • Construction of WTP
	Water Supply & Sewerage Facilities to IDP's Welfare Centres	Vanuviya & Jaffna			JICA	?? - 2011	303	• Construction of septage treatment plant • Procurement of equipment to strength activities for drinking water
11	Eastern Province WS Development Project - Ampara Water Supply	Ampara	Ampara	267,000	JICA	2010 - 2013	6,526	• Laying of transmission main and distribution system
12	Integrated Water Supply Scheme for Unserved Area of Ampara District – Phase III	Ampara	Ampara	150,000	Australia	2010 - 2013	15,860	• Construction of 12,000 m3/day WTP, sump, And transmission and distribution mains
13	Jaffna Peninsula & Kilinochchi WS & Sanitation (ADB 6th)	Jaffna	Jaffna	689,000	ADB	2011 - 2017	20,000	• Improvement of drinking water supply facilities
14	Secondary Towns Rural Community Based WS & Sanitation (ADB 4th)	Batticaloa, Muttur, Anuradhapura, Polonnaruwa and Hambantota, Trincomalee Districts	Batticaloa, Muttur, Anuradhapura, Polonnaruwa and Hambantota,Trincomalee	968,000 (Water) / 171,500 (Sanitation)	ADB	2004 – 2013	29,680	• Improvement of access to safe water and sanitation for poor population

	Name of the project	Districts	Location	Beneficiaries	Funding Agency	Project Period	Total Est. Cost (Rs. Mil.)	Scope of Work
15	Dry Zone Urban Water & Sanitation - Formerly ADB Assisted Small Town & Rural Aid Areas WS	Chilaw, Puttalam, Vauniya, Mannar	Chilaw - Kala oya Puttalam - Kala oya,Vauniya - Peru Aru, Mannar - Jayent Lake	500,000	ADB	2009 - 2014	12,430	
16	Wastewater Disposal for Kandy M.C.	Kandy	Establishment of Wastewater Disposal System in Kandy City	616,000	JBIC	2007 - 2017	22,585	• Laying of 85 km long pipelines • Construction of 14,000 m3/day WWTP
17	Rehabilitation & Upgrading of Southern Catchments of GC Sewerage	Colombo	To Construct the main sewerage pumping station Wellawatta &to rehabilitate Two main sewer lines approximately 7.3Km long leading to the Wellawatta pump station	300,000	Australian	2007 - 2010	2,222	
18	Wastewater Disposal System For Ratmalana/ Moratuwa & Ja-Ela/ Ekala Areas	Colombo and Gampaha	Ratmalana / Moratuwa & Ja-Ela / Ekala Areas	94,500	Sweden (SIDA)	2006 – 2014	16,155	• DB Contract for construction of sewer network, force mains, pump stations and WWTP
19	Greater Trincomalee Integrated WS	Trincomalee	Kantala, Kinniya, Thampalakamum	325,000	France	2008 – 2012	4,218	• Increase of production capacity of Kantale WTP to 12 MGD and service level
	Hambantota, Ambalantota, Weligama & Kataragama WS	Hambantota	Hambantota, Ambalantota, Weligama, Kataragama	150,000	Austria	?? – 2011	2,126	• Construction of 5,000 and 7,500 m3/day WTPs
20*	*Greater Rathnapura WS – Phase I	Rathnapura	Rathnapura	160,000	Spain	2012 - 2013	9,928	• Construction of 13,000 m3/day WTP, intake, transmission and distribution pipelines
	Tsunami Affected Area Rebuilding Project	Hambantota, Batticaloa and Trincomalee		125,000	ADB	?? – 2011	1,230	• Construction of new water supply scheme and rehabilitation / augmentation of existing water supply scheme
	Water Sanitation and Hygiene (WASH) Programme	Anuradhapura & Ampara			UNICEF			• Emergency relief activities • Awareness on improvement of water quality • Activities under the groundwater

	Name of the project	Districts	Location	Beneficiaries	Funding Agency	Project Period	Total Est. Cost (Rs. Mil.)	Scope of Work
								investigation • Support to strengthen the backup support for district level rural water supply units
	Tsunami Rehabilitation	Ampara, Galle, Matara, Hambantota & Jaffna			Red Cross	?? – 2011	3,785	• Expansion of distribution areas • Improvement of WTPs • Replacing of corroded pipelines • Water supply to new settlement sites of tsunami victims
21*	*Kolonna - Balangoda WS	Rathnapura	Kolonna - Balangoda	117,500	Belgium	2011 - 2013	4,854	• Construction of 7,700 m3/day WTP, intake, sump, water tanks and 25 km long transmission & distribution network
	Greater Colombo Wastewater Management Project	Colombo, Kolonnawa & Dehiwala / Mt. Lavinia		700,000 500,000 imgrant	ADB	2009 – 2014	1,012	• Rehabilitation of wastewater pumping stations
	Increase of Number of Sewerage Connections and Access to Safe Sanitation	Colombo	Dehiwala/Mt. Ravinia & Moratuwa MC & Kolonnawa and Ja-Ela Pradeshiya Sabha	76,400 poor	WB			• Direct connections • Conventional and simplified short sewer network extension • Connection to small networks with decentralised treatment system

20 * Agreement has been signed, 21 *Agreement has not been signed

Source: Prepared by the Study Team based on "Performance Report 2011", Ministry of Water supply and Drainage

CHAPTER 2

NATURAL AND SOCIAL CONDITIONS

Appendix 2.1 Information of Existing CBO Water Supply Schemes

S/N	Name of CBO	Water Source (Type/ Number)					Elevated Tank		Distribution Network		
		System Capacity m3 / day	Tube Well	Shallow Well	Water Treatment	Distibution Method	Capacity	Elevation above GL m	Pipe Materials	Range of Size	Total Length
01	Swashakthi CBO	160	-	1	No	gravity	60	13	PVC Type 600	63-110	11,495
02	Ikra CBO	516	1	1	No	gravity	225	15	PVC Type 600	63 - 225	11,229
03	Arunalu CBO	196	1	1	No	gravity	80	13	PVC Type 600	63-160	3,600
04	Samagi CBO	111	1	-	No	gravity	40	12	PVC Type 600	63-90	5,427
05	Ekamuthu CBO	227	1	1	No	gravity	80	12	PVC Type 600	63-160	13,081
06	Rangiri CBO	179	1	1	No	gravity	60	6	PVC Type 600	63-160	9,575
07	Nildiyadahara CBO	108	-	1	No	gravity	40	12	PVC Type 600	32-110	14,338
08	Eksath CBO	89	-	1	No	gravity	40	12	PVC Type 600	32 -110	8,051
09	Mahasen CBO	110	-	1	No	gravity	40	10	PVC Type 600	40-110	4,178
10	Dimuthu CBO	72	-	1	No	gravity	20	15	PVC Type 600	40-75	8,007
11	Pragithi CBO	109	-	1	No	gravity	40	12	PVC Type 600	40-110	10,039
12	Jayashakthi CBO	216	1	-	No	gravity	60	9	PVC Type 600	50-110	2,403
13	Samagi CBO	180	1	-	No	gravity	50	13	PVC Type 600	50-160	13,400
14	Samagi CBO	144	-	1	No	gravity	60	9	PVC Type 600	63-160	8,262
15	Ekamuthu CBO	144	1	-	No	gravity	50	13	PVC Type 600	50-110	7,519
16	Ran Arulnalu CBO	173	1	-	No	gravity	60	15	PVC Type 600	50-160	11,755
17	Isuru CBO	180	2	-	No	gravity	60	13	PVC Type 600	63-110	9,396
18	Randiya Dhahara CBO	90		1	No	gravity	40	10	PVC Type 600	32-90	9,255
19	Nelum CBO	105	-	1	No	gravity	40-60	12	PVC Type 600	32-110	13,614
20	Diriyamatha CBO	169	-	2	No	gravity	40+40	15+12	PVC Type 600	32-90	8,204
21	Gemunu CBO	98	-	1	No	gravity	40	15	PVC Type 600	32-90	8,204
22	Sisila Diyadahara CBO	139	-	1	No	gravity	40	12	PVC Type 600	32-110	16,008
23	Diriya Shakthi	95	-	1	No	gravity	40	12	PVC Type 600	32-110	11,300
24	Ridi Nadee	87	-	1	No	gravity	40	9	PVC Type 600	32-110	8,524
25	Shakthi CBO	252	1	1	No	gravity	60	12	PVC Type 600 (PN 6)	63-160	8,717

S/N	Name of CBO	Water Source (Type/ Number)					Elevated Tank		Distribution Network		
		System Capacity m3 / day	Tube Well	Shallow Well	Water Treatment	Distibution Method	Capacity	Elevation above GL m	Pipe Materials	Range of Size	Total Length
26	Al-Naja	130	1	-	No	gravity	30 + 40	9+13	PVC Type 600	63-160	11,005
27	CBO not formed & Scheme Not implemented	-	-	-	-	-	-	-	-	-	-
28	Parakum CBO	405	2	-	No	gravity	225	15	PVC Type 600	63-225	23,675
29	Suwasehana CBO	124	1	-	No	gravity	35	9	PVC Type 600	40-90	6,689
30	Suwasetha CBO	173	-	1	No	gravity	40	9	PVC Type 600	63-90	4,500
31	Vajira CBO	108	1	-	No	gravity	60	8	PVC Type 600	63-90	7,400
32	Pragathi CBO	90	1	-	No	gravity	40	9	PVC Type 600	50-90	7,770
33	Janasetha CBO	144	-	1	No	gravity	60	9	PVC Type 600	63-90	8,800
34	Sobasisila CBO	126	-	1	No	gravity	60	9	PVC Type 600	63-90	7,803
35	Randiya	180	-	1	No	gravity	80	12	PVC Type 600	63-110	11,430
36	Nilmini (not functioning)	55	1	-	No	gravity	40	11	PVC Type 600	32-90	4,631
37	Senath CBO	83	-	1	No	gravity	60	15	PVC Type 600	32-110	5,336
38	Eksath CBO	89	-	1	No	gravity	40	12	PVC Type 600	32-110	5,210
39	Praja Shakthi	110		2	No	gravity	40	9	PVC Type 600	32-110	6,700
40	Apsara	82	-	1	No	gravity	30	-	PVC Type 600	32-110	6,822
41	Pinibindu CBO	Rainwater supply implmented in 60 Households. No Piped Water Supply									
42	Sham Sham	83	failed BH	-	NO	gravity	45	12	PVC Type 600	40-110	5,000
43	Ekamuthu CBO	93		1	NO	gravity	35	9	PVC Type 600	40-90	4,281
44	Pradeepa	145	1	4	NO	gravity	50	13	PVC Type 600	50-160	7,190
45	Upul CBO	145	1	-	NO	gravity	60	11/9	PVC Type 600	50-110	11,128
46	Jalasavi	112	1	-	NO	gravity	50	11.2/9	PVC Type 600	50-90	4,485
47	Tristar CBO	not operational	2	-	NO	gravity	60	15.2/13	PVC Type 600	63-110	11,402
48	Alhidra CBO	337	2	-	NO	gravity	80	13	PVC Type 600	63-110	8,645
49	Adhikwa CBO	120	1	1	NO	gravity	40	15.2/13	PVC 600/1000	63-90/90	5,300/3,350
50	Hansajala CBO	150	-	1	NO	gravity	50	11.2/9	PVC Type 600	32-90	4,490

Appendix 2.2

Chemical Results of the Sampled Well Water (1987)

Area No.	Fluoride in average (ppb)	Location No.	Flouride (ppb)	Flouride (mg/l)	Topographic sheet
		33	140	0.14	Alutgama
		34	100	0.1	Alutgama
		35	110	0.11	Alutgama
1	0.11	36	100	0.1	Alutgama
		41	200	0.2	Rakwana
2	0.35	43	500	0.5	Rakwana
		45	770	0.77	Kataragama
		46	720	0.72	Kataragama
3	0.74	53	720	0.72	Kataragama
		78	370	0.37	Haputale
		86	700	0.7	Haputale
4	0.42	88	200	0.2	Haputale
5	2	92	2000	2	Buttala
		100	40	0.04	Awissawella
		102	510	0.51	Awissawella
6	0.33	104	430	0.43	Awissawella
		114	200	0.2	Hatton
7	0.25	117	300	0.3	Hatton
		121	20	0.02	Nuwara Eliya
		122	10	0.01	Nuwara Eliya
8	0.01	124	10	0.01	Nuwara Eliya
		134	220	0.22	Potuvil
9	0.27	137	320	0.32	Potuvil
		143	500	0.5	Gampaha
		145	280	0.28	Gampaha
10	0.49	151	700	0.7	Gampaha
		154	80	0.08	Kandy
		155	20	0.02	Kandy
		157	70	0.07	Kandy
		158	80	0.08	Kandy
		159	90	0.09	Kandy
		160	90	0.09	Kandy
		161	10	0.01	Kandy
		162	100	0.1	Kandy
		163	10	0.01	Kandy
		165	100	0.1	Kandy
		166	100	0.1	Kandy
		168	100	0.1	Kandy
		169	100	0.1	Kandy
		170	150	0.15	Kandy
11	0.08	171	120	0.12	Kandy

Area No.	Fluoride in average (ppb)	Location No.	Flouride (ppb)	Flouride (mg/l)	Topographic sheet
		172	20	0.02	Hanguranketa
		173	170	0.17	Hanguranketa
		175	320	0.32	Hanguranketa
		176	100	0.1	Hanguranketa
		177	990	0.99	Hanguranketa
		178	120	0.12	Hanguranketa
12	0.29	179	320	0.32	Hanguranketa
		187	1500	1.5	Tirrukovil
		188	1200	1.2	Tirrukovil
13	1.7	192	2300	2.3	Tirrukovil
		197	70	0.07	Dandagamuwa
		200	90	0.09	Dandagamuwa
		201	10	0.01	Dandagamuwa
		202	620	0.62	Dandagamuwa
		203	730	0.73	Dandagamuwa
		206	120	0.12	Dandagamuwa
		207	190	0.19	Dandagamuwa
14	0.27	208	300	0.3	Dandagamuwa
		211	100	0.1	Kurunegala
		214	200	0.2	Kurunegala
		221	40	0.04	Kurunegala
		230	10	0.01	Kurunegala
15	0.07	231	10	0.01	Kurunegala
		232	20	0.02	Rangala
		233	130	0.13	Rangala
		234	290	0.29	Rangala
		236	90	0.09	Rangala
		237	170	0.17	Rangala
		238	270	0.27	Rangala
		239	90	0.09	Rangala
16	0.16	240	190	0.19	Rangala
		244	130	0.13	Maha Oya
		246	20	0.02	Maha Oya
		248	320	0.32	Maha Oya
17	0.21	250	370	0.37	Maha Oya
		251	620	0.62	Kalmunai
18	0.46	257	300	0.3	Kalmunai
		268	570	0.57	Wariyapola
19	0.535	270	500	0.5	Wariyapola
		273	40	0.04	Nalanda
		276	130	0.13	Nalanda
		280	170	0.17	Nalanda
		282	20	0.02	Nalanda
		284	30	0.03	Nalanda
20	0.08	285	70	0.07	Nalanda

Area No.	Fluoride in average (ppb)	Location No.	Flouride (ppb)	Flouride (mg/l)	Topographic sheet
		290	120	0.12	Elahera
		291	230	0.23	Elahera
		292	270	0.27	Elahera
		293	70	0.07	Elahera
		296	7000	7	Elahera
		297	2320	2.32	Elahera
		298	320	0.32	Elahera
21	2.1	301	7000	7	Elahera
		303	270	0.27	Rukam
22	1.7	312	3100	3.1	Rukam
		325	7000	7	Polonnaruwa
		330	7820	7.82	Polonnaruwa
		332	10000	10	Polonnaruwa
		333	9780	9.78	Polonnaruwa
23	8.9	334	9780	9.78	Polonnaruwa
24	3.7	337	3720	3.72	Vakaneri
		355	3400	3.4	Aanuradhapura
		356	3800	3.8	Aanuradhapura
		357	3200	3.2	Aanuradhapura
		358	3000	3	Aanuradhapura
		359	2920	2.92	Aanuradhapura
		361	400	0.4	Aanuradhapura
		362	600	0.6	Aanuradhapura
		363	700	0.7	Aanuradhapura
		364	720	0.72	Aanuradhapura
		366	410	0.41	Aanuradhapura
		368	5000	5	Aanuradhapura
25	2.4	369	4070	4.07	Aanuradhapura
26	0.75	421	750	0.75	Vavuniya
27	0.50	428	500	0.5	Mantai
28	2.8	442	2800	2.8	Padaviya
29	1.5	452	1500	1.5	Tunukkai
		453	500	0.5	Iranamadu
		454	1000	1	Iranamadu
30	0.75	455	750	0.75	Iranamadu
		456	500	0.5	Murunkan
		457	750	0.75	Murunkan
31	0.75	458	1000	1	Murunkan
32	0.32	483	321	0.321	Kala Oya

Source: The Hydrogeochemical Atlas of Sri Lanka, C.B. Dissanayake and S.V.R. Weerasooriya (Original report is included in **Reference 1.3**)

Appendix 2.3

NATIONAL ORAL HEALTH SURVEY
SRI LANKA
2002 – 2003

Activity Manager: Dr.J.M.W. Jayasundara Bandara

Principal Investigator: Dr.K. Krishnarasa

The National Oral Health Survey 2002 – 2003 was funded by World Health Organization.

Ministry of Healthcare and Nutrition

"Suwasiripaya"

385, Rev. Baddegama Wimalawansa Thero Mawatha

Colombo 10.

National Oral Health Survey 2002/2003

Activity Manager
Dr.J.M.W. Jayasundara Bandara

Principal investigator
Dr. K. Krishnarasa

National Advisory Committee
Prof. A.N.I. Ekanayake - Professor of Community Dentistry University of Peradeniya
Prof. Lilanie Ekanayake - Professor of Community Dentistry University of Peradeniya
Dr.K.D.G. Saparamadu - Consultant in Community Dentistry
Dr. Siromini Abayaratna - Consultant in Community Dentistry

Examiners

Dr. P. Konthasinghe
Dr. R.D.F.C. Kanthi
Dr. F.N. Shahim
Dr. E.A. Fernando
Dr. A.A.H.K. Amarasinghe
Dr. Vipula Wickramasinghe
Dr. B.M.G.H.Marasinghe
Dr. Naresha Samarasekera
Dr.Malani Vasudevan
Dr. S.D.S.P. Rodrigo
Dr. Udaya Usgodaarachchi
Dr.T.P.B. Fernando
Dr. T.M.M.H. Tennakoon
Dr.S.M. Rannula
Dr. G. Kalaranjinee
Dr. Adly Mohamad

Compilation Assistance

Dr. W.A. Geethani Kandaudahewa
Dr. Irosha Rukmalie
Dr. Nilantha Rathnayaka.

CONTENTS

8.3 DENTAL FLUOROSIS

Table 8.3 Distribution of subjects with dental fluorosis

	Age In Years.	Normal (0)		Questionable (1)	Very Mild (2)	Mild (3)	Moderate (4)	Severe (5)	Not Recorded (9)
		No	%	%	%	%	%	%	%
Sri Lanka	12	1999	85.1	2.6	4.1	3.5	2.6	0.6	1.5
	15	2001	87.3	3.0	3.4	3.1	2	0.3	0.85
	35-44	1980	91.4	0.7	0.7	0.9	0.4	0.1	5.76
Male	12	1009	84.2	3.1	4.2	3.5	3.2	0.7	1.1
	15	872	87	3.2	3.8	2.9	1.7	0.2	1.2
	35-44	599	90.5	0.3	1.2	1.2	0.3	0.2	6.3
Female	12	990	86.1	2.1	4	3.5	1.9	0.5	1.9
	15	1129	87.4	2.8	3.2	3.4	2.2	0.4	0.6
	35-44	1381	91.8	0.9	0.4	0.8	0.4	0.1	5.6
Sinhalese	12	1534	82.3	3.0	5	4.2	3.1	0.8	1.6
	15	1540	85.8	2.9	3.8	3.6	2.3	0.4	1.2
	35-44	1513	92.5	0.5	0.7	1.1	0.5	0.1	4.6
Tamil	12	256	93	2.0	2.3	1.2	1.2	0.0	0.3
	15	255	92.9	2.4	2.4	2.0	0.4	0.0	0
	35-44	229	89.5	0.4	0.4	0.4	0	0.0	9.3
Muslim	12	207	96.6	0.5	0	1.0	0.5	0.0	1.4
	15	205	91.2	4.4	2	1.0	1.5	0.0	0
	35-44	235	86	2.1	0.4	0.0	0.4	0.0	11.1
Urban	12	465	95.5	0.9	1.5	0.4	0.6	0.2	0.9
	15	457	94.3	1.8	2.2	0.7	0.2	0.0	0.8
	35-44	466	88.8	0.4	0.6	0.0	0.2	0.0	10
Rural	12	1534	82	3.1	4.9	4.4	3.1	0.7	1.8
	15	1544	85.2	3.4	3.8	3.9	2.5	0.4	0.8
	35-44	1514	92.2	0.8	0.7	1.2	0.5	0.1	4.5
Colombo	12	160	98.8	0.0	0	1.3	0	0.0	0
	15	160	99.4	0.0	0	0.0	0	0.0	0.6
	35-44	158	91.1	0.0	0.6	0.0	0	0.0	8.3
Gampaha	12	159	99.4	0.0	0	0.0	0	0.0	0.6
	15	160	95	4.4	0	0.0	0	0.0	0.6
	35-44	160	90.6	3.1	0	0.0	0.6	0.0	5.7
Kalutara	12	120	96.7	0.0	0	0.8	2.5	0.0	0
	15	120	97.5	0.8	0.8	0.8	0	0.0	0.1
	35-44	126	96	0.0	0	0.0	0	0.0	4
Kandy	12	120	98.3	0.8	0.8	0.0	0	0.0	0.1
	15	120	98.3	0.0	0	0.0	0	0.0	1.7
	35-44	120	94.2	0.0	0.8	0.0	0	0.0	5
Matale	12	40	45	7.5	7.5	17.5	22.5	0.0	0
	15	40	42.5	7.5	15	20.0	15	0.0	0
	35-44	40	92.5	0.0	0	5.0	2.5	0.0	0
N' Eliya	12	80	97.5	0.0	1.3	0.0	0	0.0	1.2
	15	80	100	0.0	0	0.0	0	0.0	0
	35-44	80	95	0.0	1.3	0.0	0	0.0	3.7

	Age In Years.	Normal (0)		Questionable (1)	Very Mild (2)	Mild (3)	Moderate (4)	Severe (5)	Not Recorded (9)
		No	%	%	%	%	%	%	%
Galle	12	120	92.5	2.5	2.5	0.0	0	0.0	2.5
	15	120	95	2.5	0.8	0.0	0	0.0	1.7
	35-44	121	91.7	0.0	0.8	0.0	0	0.0	7.5
Matara	12	80	92.5	0.0	5	1.3	0	0.0	1.2
	15	80	82.5	8.8	8.8	0.0	0	0.0	0
	35-44	80	93.8	5.0	0	0.0	0	0.0	1.2
Hambantota	12	82	59.8	11.0	8.5	4.9	7.3	6.1	2.4
	15	79	60.8	13.9	10.1	8.9	2.5	3.8	0
	35-44	80	96.3	0.0	1.3	0.0	0	0.0	2.4
Jaffna	12	80	91.3	1.3	2.5	2.5	1.3	0.0	1.1
	15	80	92.5	3.8	1.3	2.5	0	0.0	0
	35-44	73	83.6	0.0	0	1.4	0	0.0	15
Vavuniya	12	38	73.7	7.9	10.5	2.6	5.3	0.0	0
	15	41	75.6	2.4	12.2	7.3	2.4	0.0	0.1
	35-44	24	87.5	4.2	0	0.0	0	0.0	8.3
Batticaloa	12	80	100	0.0	0	0.0	0	0.0	0
	15	80	100	0.0	0	0.0	0	0.0	0
	35-44	80	80	0.0	1.3	0.0	0	0.0	18.7
Ampara	12	80	78.8	1.3	10	2.5	5	0.0	2.4
	15	80	92.5	0.0	2.5	1.3	3.8	0.0	0
	35-44	80	86.3	0.0	2.5	1.3	0	1.3	8.6
Trincomale	12	40	97.5	2.5	0	0.0	0	0.0	0
	15	40	97.5	0.0	2.5	0.0	0	0.0	0
	35-44	40	95	2.5	0	0.0	2.5	0.0	0
Kurunegala	12	160	70.6	7.5	8.8	6.3	3.8	0.6	2.4
	15	160	79.4	6.3	4.4	3.8	1.9	1.3	2.9
	35-44	160	83.8	0.0	0	2.5	1.9	0.6	11.2
Puttalam	12	80	98.8	0.0	0	1.3	0	0.0	0
	15	80	92.5	0.0	0	2.5	3.8	0.0	1.2
	35-44	80	96.3	0.0	1.3	0.0	0	0.0	2.4
Anura'pura	12	80	28.8	3.8	18.8	31.3	12.5	5.0	0
	15	80	32.5	1.3	16.3	27.5	21.3	1.3	0
	35-44	80	87.5	1.3	2.5	5.0	2.5	0.0	1.2
Polnna'wa	12	40	67.5	2.5	22.5	5.0	2.5	0.0	0
	15	40	52.5	2.5	27.5	15.0	2.5	0.0	0
	35-44	40	100	0.0	0	0.0	0	0.0	0
Badulla	12	80	86.3	2.5	3.8	3.8	0	0.0	3.6
	15	80	97.5	0.0	1.3	0.0	0	0.0	1.2
	35-44	79	93.7	1.3	1.3	0.0	0	0.0	3.7
Monaragala	12	80	77.5	8.8	6.3	2.5	3.8	0.0	1.1
	15	80	81.3	10.0	3.8	1.3	3.8	0.0	0
	35-44	80	98.8	0.0	0	0.0	0	0.0	1.2
Ratnapura	12	120	75	4.2	1.7	5.8	4.2	1.7	7.4
	15	120	87.5	3.3	1.7	3.3	0.8	0.0	0
	35-44	119	89.9	0.8	0.8	5.0	0	0.0	3.5

	Age In Years.	Normal (0)		Questionable (1)	Very Mild (2)	Mild (3)	Moderate (4)	Severe (5)	Not Recorded (9)
		No	%	%	%	%	%	%	%
Kegalle	12	80	95	0.0	1.3	0.0	1.3	0.0	2.4
	15	81	100	0.0	0	0.0	0	0.0	0
	35-44	80	96.3	0.0	0	0.0	0	0.0	3.7

KEY FINDINGS

- As emerged from the findings, prevalence of dental fluorosis was highest among 12-year-old children followed by 12.7% and 8.6% among 15-year-old children and 35-44 year-old adults respectively.
- Severity also followed a similar pattern. Among 12 year-olds- 10.8 % had very mild to severe form of fluorosis while 8.8 % of 15-year-old children and 2.1% of 35-44 year-old adults were presented with very mild to severe dental fluorosis.
- According to socio-demographic attributes more male children aged 12-years presented with fluorosis than female children while the pattern was in contrast for 15-year-olds and adults. Moreover, among all age groups, Sinhalese reported the highest prevalence of dental fluorosis while Muslims recorded the lowest.
- In addition there was a remarkable increase in prevalence of dental fluorosis among rural residents than their urban counter part. Obviously, there was distinct regional variation in the prevalence as well as severity of dental fluorosis dominated by the districts of Anuradhapura and Polonnaruwa followed by Hambantota, Kurunegala, Vavuniya and Matale.

CHAPTER 3

EXISTING WATER SUPPLY FACILITIES IN THE STUDY AREA

Appendix 3.1

Existing Water Supply Facilities

No	Location/Item	Specification
I. Anuradhapura District		
1	**Kebithigollewa**	
	Year of Commissioning (Augmentation)	1975
	No of connections as at end Dec 2010	822
	Population Served as at end Dec 2010	3,200
	Source (s)	Bore Hole - 03Nos. Ranney Type Dug well 01 No
	Yield of Source (s)	BH- 400m3/day , DW- 200m3/day
	GN Divisions Covered /GND No	466, 469, 470, 471, 474, 475, 476, 478, 480, 481, 482.
	Length of Distribution System	35.9 km
	Diameters & Types of Pipes	32, 40, 50, 63, 75, 90, 110 & 160mm dia PVC pipes
	Treatment Process (units)	Pre chlorination, Aeration, Sedimentation, RSF, Post chlorination.
2	**Anuradhapura East (Wijepura)**	
	Year of Commissioning (Augmentation)	2005
	No of connections as at end Dec 2010	4,928
	Population Served as at end Dec 2010	20,000
	Source (s)	Thuruwila Tank
	Yield of Source (Daily Production)	2787m3/day
	GN Divisions Covered /GND No	242, 244, 243, 245, 246,247, 236, 237, 238, 239, 241.
	Length of Distribution System	76.3 km
	Diameters & Types of Pipes	50, 63, 75, 90, 110, 160 & 225mm PVC pipes.
	Treatment Process (units)	Full treatment at Thuruvila & Chlorination at Wijepura
3	**Anuradhapura North (Jaffna junction)**	
	Year of Commissioning (Augmentation)	2008
	No of connections as at end Dec 2010	5,492
	Population Served as at end Dec 2010	21,968
	Source (s)	Nuwarawewa & Nuwarawewa Treatment Plant
	Yield of Source (s)	4000m3/day
	GN Divisions Covered /GND No	574 573 572 571 276 277 279 275 278
		113 315 316 313 314 280 317 318 99 100
	Length of Distribution System	150 km
	Diameters & Types of Pipes	63, 90, 110 & 225mm dia. PVC pipes
	Treatment Process (units)	Full Treatment Plant
4	**Anuradhapura New Town**	
	Regional Support Centre	North Central
	Name of Scheme	Anuradhapura New Town
	Year of Commissioning (Augmentation)	1972 Augmentation -1984 & 2005
	No of connections as at end Dec 2010	10,869
	Population Served as at end Dec 2010	43,476
	Source (s)	Nuwarawewa & Thuruwila wewa
	Yield of Source (daily production)	10761 m3/day
	GN Divisions Covered /GND No	240, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257.
	Length of Distribution System	425 Km
	Diameters & Types of Pipes	50, 75, 110, 160, 225 & 280mm dia PVC pipes
		2", 3", 4", 6", 8" & 10" dia. AC pipes.
	Treatment Process (units)	Full Treatment Plant

No	Location/Item	Specification
5	**Maradankadawala**	
	Regional Support Centre	North Central
	Name of Scheme	Maradankadawala
	Year of Commissioning (Augmentation)	2007
	No of connections as at end Dec 2010	1,017
	Population Served as at end Dec 2010	5,000
	Source (s)	Kalawewa
	Yield of Source (s)	4000m3/day
	GN Divisions Covered /GND No	612 613 614 615 616 617
	Length of Distribution System	14 Km
	Diameters & Types of Pipes	63, 90, 110, 160 & 225mm dia.PVC pipes
	Treatment Process (units)	Chlorination, water from Kalawewa T.P.
6	**Kekirawa**	
	Year of Commissioning (Augmentation)	1985
	No of connections as at end Dec 2010	5,102
	Population Served as at end Dec 2010	20,500
	Source (s)	Kalawewa and Olembewa BH
	Yield of Source (s)	3300m3/day
	GN Divisions Covered /GND No	618 619 620 621 622 623 624 625 626 627
	Length of Distribution System	130 km
	Diameters & Types of Pipes	90, 110, 160, 225 & 280mm PVC pipes
		200, 250, 300, 350 mm dia. DI pipes
	Treatment Process (units)	Full Treatment
7	**Sacred City**	
	Regional Support Centre	North Central
	Name of Scheme	Sacred -City
	Year of Commissioning (Augmentation)	1984
	No of connections as at end Dec 2010	4,491
	Population Served as at end Dec 2010	17,000
	Source (s)	Tissawewa
	Yield of Source (s)	4500 m3/day
	GN Divisions Covered /GND No	286, 290, 293, 294, 295, 295A, 296, 298, 299, 300, 301, 302, 303, 304
	Length of Distribution System	165 km
	Diameters & Types of Pipes	63, 75, 90, 110, 160, 280 & 315mm dia PVC pipes
	Treatment Process (units)	Full Treatment
8	**Eppawala**	
	Year of Commissioning (Augmentation)	1984
	No of connections as at end Dec 2010	146
	Population Served as at end Dec 2010	600
	Source (s)	Eppawala Wewa
	Yield of Source (s)	120 m3/day
	GN Divisions Covered /GND No	390, 373.
	Length of Distribution System	4.5 km
	Diameters & Types of Pipes	32, 40, 50, 63, 75, 90 & 110mm dia. PVC pipes, 110mm dia.GIpipes
	Treatment Process (units)	Aeration, Chlorination, Sedimentation, and Filtration
9	**Kahatagasdigiliya**	
	Year of Commissioning (Augmentation)	1982
	No of connections as at end Dec 2010	943
	Population Served as at end Dec 2010	3,800
	Source (s)	Bore Hole -02 Nos
	Yield of Source (s)	650 m3/day
	GN Divisions Covered /GND No	155, 156, 255
	Length of Distribution System	31 km
	Diameters & Types of Pipes	32, 50, 63, 75, 90, 110 & 160mm dia. PVCpipes
	Treatment Process (units)	Chlorination

No	Location/Item	Specification
10	**Thambuttegama**	
	Year of Commissioning (Augmentation)	1988
	No of connections as at end Dec 2010	2,887
	Population Served as at end Dec 2010	11,500
	Source (s)	Nallachchiya Tank
	Yield of Source (s)	1500 m3/day
	GN Divisions Covered /GND No	418 419 420 421 422 423 425 426 427
	Length of Distribution System	75 km
	Diameters & Types of Pipes	63, 75, 90, 110, 160 ,225& 280mm dia. PVC pipes
	Treatment Process (units)	Full Treatment.
11	**Galnewa - Bulnewa**	
	Year of Commissioning (Augmentation)	2002
	No of connections as at end Dec 2010	2,742
	Population Served as at end Dec 2010	11,000
	Source (s)	Galnewa Main Canal
	Yield of Source (s)	1200 m3/day
	GN Divisions Covered /GND No	466 469 470 471 474 475 476 482 478 479 480 481
	Length of Distribution System	109 km
	Diameters & Types of Pipes	63, 90, 110, 160, 225 &280mm dia. PVC pipes
	Treatment Process (units)	Pre chlorination, Post chlorination, Aeration, Sedimentation, RFS.
12	**Horowpoththana**	
	Year of Commissioning (Augmentation)	1977
	No of connections as at end Dec 2011	158
	Population Served as at end Dec 2010	650
	Source (s)	Bore Hole -02 Nos & Dug well
	Yield of Source (s)	150 m3/day
	GN Divisions Covered /GND No	128 63
	Length of Distribution System	10 km
	Diameters & Types of Pipes	50, 63, 75 & 90mm dia. PVC pipes
	Treatment Process (units)	Chlorination
13	**Habarana**	
	Year of Commissioning (Augmentation)	1986
	No of connections as at end Dec 2010	735
	Population Served as at end Dec 2010	3,000
	Source (s)	Bore Hole -03 Nos
	Yield of Source (s)	400 m3/day
	GN Divisions Covered /GND No	389 590 591 23
	Length of Distribution System	36 km
	Diameters & Types of Pipes	63, 90, 110, 160 & 225mm dia. PVC pipes.
	Treatment Process (units)	
14	**Medawachchiya**	
	Year of Commissioning (Augmentation)	1985
	No of connections as at end Dec 2010	1,185
	Population Served as at end Dec 2010	5,000
	Source (s)	Bore Hole -05 Nos & Dug well - 02 Nos.
	Yield of Source (s)	
	GN Divisions Covered /GND No	65 61 58 67 68 69 59
	Length of Distribution System	Length of Distribution System : 22.7km
	Diameters & Types of Pipes	63, 75, 90, 110 & 160, 225 mm dia. PVC pipes. 100 mm dia. AC pipes.
	Treatment Process (units)	Bleaching
15	**Pabaviya**	
	Year of Commissioning (Augmentation)	1991
	No of connections as at end Dec 2010	578
	Population Served as at end Dec 2010	2,400
	Source (s)Bore Hole -04 Nos	Bore Hole -04 Nos
	Yield of Source (s)	550 m3/day
	GN Divisions Covered /GND No	1, 2, 3
	Length of Distribution System	17 km
	Diameters & Types of Pipes	50, 63, 90, 110mm dia. PVC pipes.
	Treatment Process (units)	Chlorination.

No	Location/Item	Specification
16	**Talawa (Anuradhapura south)**	
	Year of Commissioning (Augmentation)	
	No of connections as at end Dec 2010	3,404
	Population Served as at end Dec 2010	16,943
	Source (s)	Thuruwila Tank
	Yield of Source (s)	2200 m3/day
	GN Divisions Covered /GND No	292, 259, 260, 261, 262, 263, 265, 273, 401, 403, 405.
	Length of Distribution System	112 km
	Diameters & Types of Pipes	63, 90, 110, 160, 225 & 280mm dia. PVC pipes.
	Treatment Process (units)	Full Treatment
17	**Nachchaduwa**	
	Year of Commissioning (Augmentation)	2007
	No of connections as at end Dec 2010	1,746
	Population Served as at end Dec 2010	7,000
	Source (s)	Thuruwila Tank
	Yield of Source (s)	980 m3/day
	GN Divisions Covered /GND No	536 535 262
	Length of Distribution System	55 km
	Diameters & Types of Pipes	63,90, 110, 160, 225 & 280mm dia.PVC pipes.
	Treatment Process (units)	
18	**Mihintale**	
	Year of Commissioning (Augmentation)	1985
	No of connections as at end Dec 2010	2,472
	Population Served as at end Dec 2010	10,000
	Source (s)	Nuwarawewa (Jaffna junction)
	Yield of Source (s)/day	1700 m3/day
	GN Divisions Covered /GND No	574 575 577 579 582 586 588 583 584 585
	Length of Distribution System	43.21 km
	Diameters & Types of Pipes	63, 90, 110, 160 & 225mm dia.PVC pipes. 2", 4" & 6" DI pipes
	Treatment Process (units)	
II. Polommaruwa District		
19	**Minneriya**	
	Year of Commissioning (Augmentation)	2003
	No of connections as at end Dec 2010	1,917
	Population Served as at end Dec 2010	7,600
	Source (s)	Minneriya Wewa
	Yield of Source (s)	2300 m3/day
	GN Divisions Covered /GND No	34 36 37 38 39 40 41 54 55 56 57 59 60 64 65
	Length of Distribution System	80 km
	Diameters & Types of Pipes	50, 63, 90, 110, 160, 225, 280 & 315mm PVC pipes.
	Treatment Process (units)	Full Treatment
20	**Polonnaruwa**	
	Year of Commissioning (Augmentation)	1986
	No of connections as at end Dec 2010	7,026
	Population Served as at end Dec 2010	35,000
	Source (s)	Parakkrama Samudraya
	Yield of Source (s)	5232 m3/day
	GN Divisions Covered /GND No	159 161 162 163 164 167 168 169 170 171 172 179 180 181 183 184 185 186
	Length of Distribution System	106 km
	Diameters & Types of Pipes	32, 50, 63, 90, 110, 160 & 225 mm di.PVC pipes.
		50, 75, 100, 150 & 200 mm dia. CI pipes
	Treatment Process (units)	Full treatment
21	**Dimbulagala**	
	Year of Commissioning (Augmentation)	1985
	No of connections as at end Dec 2010	2
	Population Served as at end Dec 2010	
	Source (s)	Bore Hole 1 No
	Yield of Source (s)	100 m3/day
	GN Divisions Covered /GND No	211
	Length of Distribution System	-- km
	Diameters & Types of Pipes	63 & 90 mm dia. PVC
	Treatment Process (units)	Chlorination

Appendix 3.2(a)

Distribution of O&M Personnel according to the Water Supply Schemes
Anuradhapura District Office, NWSDB N/C RSC
As of July 07, 2012

OFFICE SCHEME	POST (CATEGORY)	Outsourced / Contractual	Approved Posts		Total
			Vacant	Filled	
DISTRICT OFFICE					**05**
	District Engineer			01	
	Engineering Assistant			01	
	Clerk Typist			01	
	Office Labour			01	
	Driver			01	
RURAL WATER SUPPLY (For Anuradhapura District)					**03**
	Engineer			01	
	Engineering Assistant			01	
	Labourer	01			
ANURADHAPURA NEW TOWN WSS					**24**
	Engineering Assistant			01	
	Lab Supervisor			01	
	Store Keeper			01	
	Meter Reader	02		03	
	Pipefitter			04	
	Driver			01	
	Labour	02		09	
NUWARAWEWA WTP					**13**
	Engineering Assistant			01	
	Pump Operator Mechanic			07	
	Pipefitter			01	
	Labour	01		03	
ANURADHAPURA NORTH WSS					**13**
	Engineering Assistant			01	
	Pump Operator Mechanic			04	
	Pipefitter			02	
	Driver			01	
	Labour	02		03	
ANURADHAPURA EAST WSS					**12**
	Engineering Assistant			01	
	Pump Operator Mechanic			03	
	Meter Reader			02	
	Pipefitter			02	
	Driver			01	
	Labour	01		02	
ANURADHAPURA SOUTH WSS					**14**
	Engineering Assistant			01	
	Meter Reader	02	01		
	Pipefitter			01	
	Driver			01	
	Labour	04	04		
THURUWILA WTP					**09**
	Engineering Assistant			02	
	Electrician			01	
	Plant Operator Technician			03	
	Labour		03		
NATCHCHIYADUWA WSS (EA/OIC covered by Thuruwila)					**04**
	Meter Reader			01	
	Pipefitter			02	
	Labour			01	

OFFICE SCHEME	POST (CATEGORY)	Outsourced / Contractual	Approved Posts		Total
			Vacant	Filled	
SACRED CITY WSS					**30**
	Engineering Assistant			01	
	Pump Operator Mechanic			03	
	Storekeeper			01	
	Meter Reader	03	02		
	Pipefitter			03	
	Driver			01	
	Labour	09	02	05	
MEDAWACHCHIYA WSS					**08**
	Engineering Assistant			01	
	Pump Operator	01		02	
	Pipefitter			01	
	Meter Reader	01			
	Labour	01		01	
KEBITHIGOLLEWA WSS					**06**
	Engineering Assistant			01	
	Pump Operator Mechanic			03	
	Labour			02	
PADAVIYA WSS (EA/OIC covered by Kebithigollewa)					**07**
	Pump Operator Mechanic			03	
	Pipefitter			01	
	Caretaker			01	
	Labour			02	
KAHATAGASDIGILIYA WSS					**07**
	Engineering Assistant			01	
	Pump Operator			01	
	Pipefitter			01	
	Labour	03		01	
HOROWPOTHANA WSS (EA/OIC covered by Kahatagasdigiliya)					**02**
	Caretaker	02			
MIHINTALE WSS					**14**
	Engineering Assistant			01	
	Pump Operator			03	
	Meter Reader	01			
	Pipefitter			02	
	Circuit Bungalow Keeper			01	
	Security			01	
	Driver			01	
	Labour	02		02	
THAMBUTHEGAMA WSS					**14**
	Technical Assistant			01	
	Pump Operator Mechanic			03	
	Meter Reader	01		01	
	Pipefitter			02	
	Driver			01	
	Labour	02		03	
EPPAWALA WSS					**04**
	Labour			04	
KEKIRAWA WSS					**13**
	Engineering Assistant			01	
	Pump Operator Mechanic			02	
	Meter Reader	02		01	
	Pipefitter			01	
	Security			01	
	Labour			05	
M'KADAWALA (EA/OIC covered by Kekirawa)					**02**
	Meter Reader	01			
	Pump Operator			01	
HABARANA (EA/OIC covered by Kekirawa)					**05**
	Pump Operator			01	
	Labour	01		03	

OFFICE SCHEME	POST (CATEGORY)	Outsourced / Contractual	Approved Posts		Total
			Vacant	Filled	
GALNEWA WSS					**10**
	Engineering Assistant			01	
	Pipefitter			01	
	Meter Reader	02			
	Office Labour			01	
	Caretaker	01		01	
	Labour	01		02	
KALAWEWA WTP AND WATER DISTRIBUTION					**16**
	Engineering Assistant (C)			01	
	Engineering Assistant (M)			01	
	Plant Technicians			03	
	Pump Operators			01	
	Pipe Fitter			01	
	Driver			01	
	Meter Readers	02			
	Labourers	06			
NUWARAWEWA CIRCUIT BUNGALOW					**01**
	Circuit Bungalow Keeper			01	
THISAWEWA CIRCUIT BUNGALOW					**03**
	Circuit Bungalow Keeper			01	
	Cook			01	
	Labour			01	
	TOTAL	**57**	**12**	**170**	**239**

Source of Raw Data: HR Office and O&M Section (As of May 2012)

- ***Approved Posts*** *means posts in the approved cadre of NWSDB, whether these have been filled or not been filled, in which case the post is vacant.*
- ***Outsourced or Contractual*** *means posts that are not in the approved cadre of NWSDB, but for which people have been hired (outsourced) on contract basis to perform particular tasks.*

Appendix 3.2(b)

Distribution of Personnel according to Water Supply Schemes
Polonnaruwa District Office, NWSDB NC
As of July 2012

OFFICE SCHEME	POST (CATEGORY)	Outsourced / Contractual	Approved Posts		Total
			Vacant	Filled	
DISTRICT OFFICE					**06**
	District Engineer			01	
	Engineering Assistant			01	
	Clerk			01	
	Driver			02	
	Labourer	01			
POC WORKSHOP					**05**
	Engineer Assistant			01	
	Operator Technician			02	
	Driver			01	
	Labour			01	
RURAL WATER SUPPLY (For Polonnaruwa District)					**04**
	Engineering Assistant			01	
	Driver			01	
	Labourer			02	
MINNERIYA WSS					**13**
	Engineer Assistant			01	
	Pump Operator			01	
	Pump Operator Mechanic			06	
	Pipefitter			01	
	Labour			03	
	Driver			01	
POLONNURAWA WSS					**24**
	Engineer Assistant			01	
	Store Keeper			01	
	Labour Supervisor			01	
	Pump Operator Mechanic			04	
	Pipefitter			02	
	Meter Reader			04	
	Driver			01	
	Labour	05		05	
GALLELE WSS					**04**
	Engineering Assistant			01	
	Pipefitter			01	
	Labourer			02	
GALLELE WTP					**07**
	Engineer (E)			01	
	Engineer (M)			01	
	Engineering Assistant			01	
	Lab Assistant			01	
	Plant Technician			03	
BEDIWARE WSS					**03**
	Engineering Assistant			01	
	Meter Reader	01			
	Labourer			01	
SEWAGAME					**02**
	Engineering Assistant			01	
	Labourer			01	
HINGURAKGODA WSS					**8**
	Engineer Assistant			01	
	Meter Reader	02		01	
	Pipefitter			01	
	Labour	02		01	
DIMBULAGALA WSS					**01**
	Caretaker			01	

OFFICE SCHEME	POST (CATEGORY)	Outsourced / Contractual	Approved Posts		Total
			Vacant	Filled	
BAKAMOONA WSS					**04**
	Technical Assistant			01	
	Pipefitter			01	
	Caretaker	01			
	Labourer	01			
POLONNARUWA PROJECT ZONE 1					**11**
	Engineering Assistant (C)			01	
	Meter Reader		03		
	Labour Supervisor		01		
	Driver		01		
	Pipefitter		02		
	Caretaker		01		
	Labourer		02		
POLONNARUWA PROJECT ZONE 2					**11**
	Engineering Assistant ©			01	
	Meter Reader		03		
	Labour Supervisor		01		
	Driver		01		
	Pipefitter		02		
	Caretaker		01		
	Labourer		02		
POLONNURAWA PROJECT ZONE 3					**8**
	Meter Reader		03		
	Labour Supervisor		01		
	Pipefitter		02		
	Labourer		02		
	TOTAL	**13**	**28**	**70**	**111**

Source of Raw Data: HR Office and O&M Section (As of July 2012)

- ***Approved Posts*** *means posts in the approved cadre of NWSDB, whether these have been filled or not been filled, in which case the post is vacant.*
- ***Outsourced or Contractual*** *means posts that are not in the approved cadre of NWSDB, but for which people have been hired (outsourced) on contract basis to perform particular tasks.*

Appendix 3.2(c)

PROFILE OF O&M PERSONNEL IN THE SIX STUDY AREAS

	POST	STATUS	YEARS WITH NWSDB	AGE	EDUCATION	TRAININGS RECEIVED	CONDUCTED BY	YEAR	TRAINING DAYS
	MEDAWACHCHIYA								
1	Pump Operator Mechanic	Permanent	-	53	Secondary School	Repair and Maintenance of Small Pump	Water Board	2011	02
						Repair and Maintenance of Chlorinator	Water Board	2009	01
2	Engineering Assistant	Permanent	3	33	High School (NCT)	Chlorination and Water Treatment	Water Board	2009	02
3	Pipefitter	Permanent	-	-	Secondary School	Administrative Procedure	Water Board	2012	01
						Chlorination and Chlorinator Repair	Water Board	2011	01
						Pipe Repair and Maintenance	Water Board	2011	01
4	Pump Operator	Permanent	28	50	Secondary School	Chlorination	Water Board	2011	01
5	Meter Reader	Permanent	30	52	Secondary School	None	-	-	-
6	Labourer	Casual	-	-	Secondary School	None	-	-	-
	KEBITHEGOLLEWA								
7	Pump Operator	Permanent	25	46	High School	Small Pump Maintenance	Water Board	2011	02
8	-	-	-	-	Grade 7	Small Pump Maintenance	Water Board	-	02
9	Pump Operator	-	24	59	High School	None	-	-	-
10	Lab Technician	Casual	32	1	High School	None	-	-	-
11	Labourer	Casual	1	68	High School	None	-	-	-
	PADAVIYA								
12	Pump Operator	-		-	Primary School	None	-	-	-
13	Pump Operator	-	-	-	High School	Chlorination Machine	Thelavel	2009	03
14	Pump Operator	-	-	-	High School	Small Pump Maintenance	Thelavel	2012	02
15	Labourer	-	-	-	Grade 7	None	-	-	-
16	Labourer	-	-	-	Grade 8	None	-	-	-
17	Labourer	-	-	-	Grade 7	None	-	-	-
18	Pipefitter	-	-	-	-	-	-	-	-
19	Engineering Assistant	Permanent	28	52	High School NCT	None	-	-	-

	POST	STATUS	YEARS WITH NWSDB	AGE	EDUCATION	TRAININGS RECEIVED	CONDUCTED BY	YEAR	TRAINING DAYS
	KAHATAGASDIGILIYA AND HOROWPATHANA								
20	Engineering Assistant	Permanent	10	41	High School	Accounts Training	Water Board	2009	01
						Rain Water Harvesting	Water Board	2009	01
						Construction Technology	Water Board	2009	01
						Chlorinator Repair	Water Board	2010	01
						New Connections	Water Board	2011	01
						New Connections Estimation	Water Board	2012	01
21	Pipefitter	Permanent	24	44	Secondary School	Operation and Maintenance	Water Board	2011	01
						5S Training	Labour Dept	2011	01
						New Connections	Water Board	2012	01
						Administration	Water Board	2012	01
22	Labourer	Permanent	33	58	Primary School	5S Training	Labour Dept	2011	01
						New Connections	Water Board	2012	01
23	Pump Operator	Permanent	24	46	High School	None	-	-	-
	ANURADHAPURA NORTH (RAMBEWA)								
24	Pump Operator	Permanent	25	52	Primary School	None	-	-	-
25	Pump Operator	Permanent	25	53	Primary School	None	-	-	-
26	Labourer	Permanent	30	49	Primary School	None	-	-	-
27	Labourer	Permanent	30	49	Primary School	None	-	-	-
28	Pump Operator	Permanent	30	59	Primary School	None	-	-	-
29	Pipe Fitter	Permanent	30	59	Primary School	None	-	-	-
30	Pipe Fitter	Permanent	27	49	Primary School	None	-	-	-
31	Labourer	Permanent	03	49	Secondary School	None	-	-	-
32	Engineering Assistant	Permanent	15	45	University Level	None	-	-	-
33	Driver	Permanent	30	55	Primary School	None	-	-	-
34	Driver	Permanent	30	50	Primary School	None	-	-	-

Source: Completed O&M Personnel Profile Survey for WSS in the six study areas, July 2012.

Appendix 3.3

ශ්‍රී ලංකා ප්‍රජාතාන්ත්‍රික සමාජවාදී ජනරජයේ ගැසට් පත්‍රය
අති විශෙෂ
The Gazette of the Democratic Socialist Republic of Sri Lanka
EXTRAORDINARY

අංක 1776/13 - 2012 සැප්තැම්බර් මස 18 වැනි අඟහරුවාදා - 2012.09.18
No. 1776/13 - TUESDAY SEPTEMBER 18, 2012

(Published by Authority)

PART I : SECTION (I) — GENERAL

Government Notifications

NATIONAL WATER SUPPLY AND DRAINAGE BOARD LAW, No. 2 OF 1974

Notice under Section 84

NOTICE is hereby given in terms of Section 84 of the National Water Supply and Drainage Board Law No. 02 of 1974 that the following tariffs will be charged with effect from the 01st day of October 2012, from all the consumers supplied with water from the water supply schemes of the National Water Supply and Drainage Board.

This notice replaces with effect from the 01st day of October 2012, the notice appearing in the *Gazette Extraordinary* No. 1588/26 dated 13th February, 2009 in respect of the water tariff applicable to all consumers who are supplied with water by the National Water Supply and Drainage Board.

KARUNASENA HETTIARACHCHI,
Chairman.

National Water Supply and Drainage Board,
Ratmalana,
18th September 2012.

TARIFF 01

DOMESTIC - SAMURDHI RECEIPIENTS

(i) This tariff shall apply to water provided to households of Samurdhi recipients for domestic purposes.

(ii) The monthly charges for supply under this tariff shall be as given in the table below :–

No. of units	*Usage Charge Rs./Unit*	*Monthly Service Charge Rs.*
00 - 05	5.00	50.00
06 - 10	10.00	50.00
11 - 15	15.00	50.00
16 - 20	40.00	80.00
21 - 25	58.00	100.00
26 - 30	88.00	200.00
31 - 40	105.00	400.00
41 - 50	120.00	650.00
51 - 75	130.00	1,000.00
Over 75	140.00	1,600.00

TARIFF 02

DOMESTIC - NON SAMURDHI TENEMENT GARDEN

(i) This tariff shall apply to supplies of water to households, other than those of Samurdhi recipients, residing in tenement gardens, for domestic purposes.

(ii) The monthly charges for supply under this tariff shall be as given in the table below :–

No. of units	*Usage Charge Rs./Unit*	*Monthly Service Charge Rs.*
00 - 05	8.00	50.00
06 - 10	11.00	65.00
11 - 15	20.00	70.00
16 - 20	40.00	80.00
21 - 25	58.00	100.00
26 - 30	88.00	200.00
31 - 40	105.00	400.00
41 - 50	120.00	650.00
51 - 75	130.00	1,000.00
Over 75	140.00	1,600.00

TARIFF 03

OTHER THAN FOR SAMURDHI RECEIPIENTS AND TENEMENT GARDEN

(i) This tariff shall apply to supplies of water to households, other than those of Samurdhi recipients and residing in tenement gardens, for domestic purposes.

(ii) The monthly charges for supply under this tariff shall be as given in the table below :–

No. of units	*Usage Charge Rs./Unit*	*Monthly Service Charge Rs.*
00 - 05	12.00	50.00
06 - 10	16.00	65.00
11 - 15	20.00	70.00
16 - 20	40.00	80.00
21 - 25	58.00	100.00
26 - 30	88.00	200.00
31 - 40	105.00	400.00
41 - 50	120.00	650.00
51 - 75	130.00	1,000.00
Over 75	140.00	1,600.00

TARIFF 04

PUBLIC STAND POSTS AND GARDEN TAPS

(i) This tariff shall apply for the supply of water through public Stand Posts and Garden Taps.

(ii) The monthly charges for supply of water under this tariff shall be as given in the table below :–

No. of units	*Usage Charge Rs./Unit*	*Monthly Service Charge Rs.*
00 - 25	10.00	250.00
26 - 50	10.00	500.00
51 - 100	10.00	1,000.00
101 - 200	10.00	1,600.00
Over 200	10.00	2,500.00

TARIFF 05

SCHOOLS AND RELIGIOUS INSTITUTIONS

(i) This tariff shall apply for supply of water to Government Schools and Government Assisted Schools, Places of Worship in Religious Institutions and Government approved Charitable Institutions.

(ii) The monthly charges for supply of water under this tariff shall be as given in the table below :–

No. of units	*Usage Charge Rs./Unit*	*Monthly Service Charge Rs.*
00 - 05	6.00	50.00
06 - 10	6.00	65.00
11 - 15	6.00	70.00
16 - 20	6.00	80.00
21 - 25	6.00	100.00
26 - 30	6.00	200.00
31 - 40	6.00	400.00
41 - 50	16.00	650.00
51 - 75	16.00	1,000.00
Over 75	16.00	1,600.00

TARIFF 06

COMMERCIAL

(i) This tariff shall apply for supply of water to Commercial Institutions, Private Hospitals, Non State Institutions, Tourist Hotels and Guest Houses.

(ii) The monthly charges for supply of water under this tariff shall be as given in the table below :–

No. of units	*Usage Charge Rs./Unit*	*Monthly Service Charge Rs.*
00 - 25	75.00	290.00
26 - 50	75.00	575.00
51 - 75	75.00	1,150.00
76 - 100	75.00	1,150.00
101 - 200	75.00	1,840.00
201 - 500	75.00	2,875.00
501 - 1,000	75.00	4,600.00
1,001 - 2,000	75.00	8,625.00
2,001 - 4,000	75.00	14,375.00
4,001 - 10,000	75.00	28,750.00
10,001 - 20,000	75.00	57,500.00
Over 20,000	75.00	115,000.00

TARIFF 07

GOVERNMENT HOSPITALS

(i) This tariff shall apply for supply of water to Government Hospitals.

(ii) The monthly charges for supply of water under this tariff shall be as given in the table below :–

No. of units	*Usage Charge Rs./Unit*	*Monthly Service Charge Rs.*
00 - 25	53.00	250.00
26 - 50	53.00	500.00
51 - 75	53.00	1,000.00
76 - 100	53.00	1,000.00
101 - 200	53.00	1,600.00
201 - 500	53.00	2,500.00
501 - 1,000	53.00	4,000.00
1,001 - 2,000	53.00	7,500.00
2,001 - 4,000	53.00	12,500.00
4,001 - 10,000	53.00	25,000.00
10,001 - 20,000	53.00	50,000.00
Over 20,000	53.00	100,000.00

TARIFF 08

INDUSTRIES UNDER SMALL AND MEDIUM ENTERPRISES (SME)

(i) This tariff shall apply for supply of water to Industries under Small and Medium Enterprises (SME).

(ii) The monthly charges for supply of water under this tariff shall be as given in the table below :–

No. of units	*Usage Charge Rs./Unit*	*Monthly Service Charge Rs.*
00 - 25	56.00	265.00
26 - 50	56.00	525.00
51 - 75	56.00	1,050.00
76 - 100	56.00	1,050.00
101 - 200	56.00	1,680.00
201 - 500	56.00	2,625.00
501 - 1,000	56.00	4,200.00
1,001 - 2,000	56.00	7,875.00
2,001 - 4,000	56.00	13,125.00
4,001 - 10,000	56.00	26,250.00
10,001 - 20,000	56.00	52,500.00
Over 20,000	56.00	105,000.00

TARIFF 09

INDUSTRIES OTHER THAN INDUSTRIES UNDER SMALL AND MEDIUM ENTERPRISES (SME) AND GOVERNMENT INSTITUTIONS

(i) This tariff shall apply for supply of water to Industries and Government Institutions.

(ii) The monthly charges for supply of water under this tariff shall be as given in the table below :–

No. of units	*Usage Charge Rs./Unit*	*Monthly Service Charge Rs.*
00 - 25	58.00	275.00
26 - 50	58.00	550.00
51 - 75	58.00	1,100.00
76 - 100	58.00	1,100.00
101 - 200	58.00	1,760.00
201 - 500	58.00	2,750.00
501 - 1,000	58.00	4,400.00
1,001 - 2,000	58.00	8,250.00
2,001 - 4,000	58.00	13,750.00
4,001 - 10,000	58.00	27,500.00
10,001 - 20,000	58.00	55,000.00
Over 20,000	58.00	110,000.00

TARIFF 10

EXPORT PROCESSING ZONES OF THE BOARD OF INVESTMENT

(i) This tariff shall apply for supply of water to Industries Export Processing Zones of the Board of Investment.

(ii) The monthly charges for supply of water under this tariff shall be as given in the table below :–

No. of units	*Usage Charge Rs./Unit*	*Monthly Service Charge Rs.*
00 - 25	61.00	290.00
26 - 50	61.00	575.00
51 - 75	61.00	1,150.00
76 - 100	61.00	1,150.00
101 - 200	61.00	1,840.00
201 - 500	61.00	2,875.00
501 - 1,000	61.00	4,600.00
1,001 - 2,000	61.00	8,625.00
2,001 - 4,000	61.00	14,375.00
4,001 - 10,000	61.00	28,750.00
10,001 - 20,000	61.00	57,500.00
Over 20,000	61.00	115,000.00

TARIFF 11

SHIPPING

(i) The monthly charges for supply of water to Ships calling, over at Ports/Harbours shall be as given in the table below :

(ii) The monthly charges for supply of water under this tariff shall be as given in the table below :–

No. of units	*Usage Charge Rs./Unit*	*Monthly Service Charge Rs.*
00 - 25	480.00	300.00
26 - 50	480.00	600.00
51 - 75	480.00	1,200.00
76 - 100	480.00	1,200.00
101 - 200	480.00	1,920.00
201 - 500	480.00	3,000.00
501 - 1,000	480.00	4,800.00
1,001 - 2,000	480.00	9,000.00
2,001 - 4,000	480.00	15,000.00
4,001 - 10,000	480.00	30,000.00
10,001 - 20,000	480.00	60,000.00
Over 20,000	480.00	120,000.00

TARIFF 12

BULK SUPPLY

(i) This tariff shall apply for the bulk supply of water to Local Authorities.

(ii) The monthly charges for supply of water under this tariff shall be as given in the table below :–

No. of units	*Usage Charge Rs./Unit*	*Monthly Service Charge Rs.*
00 - 25	18.00	275.00
26 - 50	18.00	550.00
51 - 75	18.00	1,100.00
76 - 100	18.00	1,100.00
101 - 200	18.00	1,760.00
201 - 500	18.00	2,750.00
501 - 1,000	18.00	4,400.00
1,001 - 2,000	18.00	8,250.00
2,001 - 4,000	18.00	13,750.00
4,001 - 10,000	18.00	27,500.00
10,001 - 20,000	18.00	55,000.00
Over 20,000	18.00	110,000.00

TARIFF 13

COMMUNITY BASED ORGANIZATIONS

(i) This tariff shall apply for the bulk supply of water to Rural Water Supply Schemes maintained by Community based Organization.

(ii) The monthly charges for supply of water under this tariff shall be as given in the table below :

No. of units	*Usage Charge Rs./Unit*
01 - 999999999	17.00

TARIFF 14

BOWSER SUPPLY

(i) This tariff for supply of water through Bowsers shall be at the rate of Rs. 72.00 per unit.

(ii) This charge excludes costs incurred for transport and other overheads, which would be recovered on the basis of actuals.

DEFECTIVE METERS

If a meter is found to be out of order or if it is removed for repairs or calibration, the consumption, of water during the time that the meter is not available to record consumption, shall be calculated according to the average rate of daily consumption obtained during any two successive readings immediately preceding the removal of meter or the meter becoming defective.

Miscellaneous Charges and Conditions

(1) *New Service Connections :*

The cost of providing a new service connection will be levied from the consumer.

(2) *Testing of water meters at the request of consumers :*

The fee for testing of water meters at the request of the consumers, shall be determined by the General Manager of the National Water Supply and Drainage Board, based on costs incurred for the testing of such meter. If on testing such meter it is proved that the meter had been over/under registering by more than 2% of the correct consumption, this fee will be refunded.

(3) *Incentive for prompt Payment :*

Consumers paying their water bills within 14 working days from the date of issue of the bill will be given a rebate of 2% on the value of the bill. Arrangements are available for consumers to deposit money with the Board in advance to meet the cost of water bills.

(4) *Surcharge for delay in Payment :*

Consumers are expected to pay bills, within a period of 14 days. If consumers fail to settle the water bill within a period of 30 days from the date of issuing a bill, an additional charge of 2.5% per month on the balance outstanding shall be made from the date the bill was issued.

(5) *Disconnection of Service Connections :*

The General Manager of the National Water Supply and Drainage Board shall have the power to disconnect the service connection of consumers, whose bills are in arrears for a period of more than 30 days.

(6) *Re-Connection Fee :*

The fee for re-connecting the supply, after the service has been disconnected, shall be determined by the General Manager of the National Water Supply and Drainage Board, based on the costs incurred for such re-connection.

(7) *Violation of Regulations :*

If any regulation, under which the water supply has been provided, is violated by any consumer, action will be taken under the relevant provisions of the National Water Supply and Drainage Board Law No. 02 of 1974, the National Water Supply and Drainage Board (Amendment) Act, No. 13 of 1992 or any other subsequent amendment to the legislation.

(8) *Prevailing taxes will be included when preparing Water Charges*

Note :- One Unit shall be defined as one cubic meter. (1000 Liters)

10-231

PRINTED AT THE DEPARTMENT OF GOVERNMENT PRINTING, SRI LANKA.

Appendix 3.4

Water Supply Development Plan

Sr. No	Project Name	Temtetive Estemated Cost	Population	Capacity m3 / d	Source	Final Review	RPRC	PAC	Board Approval	NPD Approval	Cabinet Approval	Source Approval	Donor Identified	Present Status
I. Anudarapura District														
1	Anuradhapura South integrated WSP Phase 11	12,275.0	73,412	21,000	Thuruwila	√	√	√	√	√		NR	Under Process	Eol evaluation completed RFP completed
			29,897	5,500	Nuwarawewa									
			36,211	7,000	Tissawewa									
2	Anuradhapura North integrated WSP	10,462.0	186,025	22,500	Mahakanadarawa	√	√	√	√	√		R	Under Process	JICA team has mobilized to do feasibility stydy
			85,500	11,250	Wahalkada									
3	Mahawilachchiya	976.0	21,980	4,500	Mahawilachchiya	√	√	√	√	S08/08/2012	S18/01/2012	S 09/.3/2012		Awaiting for funding
4	Padaviya	2,055.0	42,000	9,000	Padawiya Wewa	√	√	√	√					Included in the Anuradhapura North project
5	Galenbindunuwewa	1,707.8	77,125	13,500	Huruluwewa	√	√	√	√	√	S 18/01/2012	S 25/01/2012		Awaiting for funding
6	Thambuttegama	1,805.0	155,000		Thambuthegama Tank	√	√	√	√					Arranged to get Chinese fund
7	Parasangaswewa (Included Paragoda)	31.0	3,956	*	Jaffna Junction Existing Scheme	√	√	√	√	√	S 1/12/2011	NR		Awaiting for funding
8	Viharapalugama	365.0	22,000	1,184	Scheme	√	√	√	√	Will be Covered by Anuradhapura South				
9	Palugaswewa Integrated	2,237.4	37,652	6,750	Hiriwadunna	√	√	√	√	√	S18/01/2012	O		Awaiting for funding
10	Eppawal	4,537.0	84,000	15,000	Koonwewa	√	√	√	√	S 12/12/2011	O	30/05/2012		Awaiting for NPD & source Approval
11	Galnewa-Bulnewa													under study
12	Rajanganaya													Studies will be completed within two months
II. Polonnaruwa District														
13	Lankapura WSS	1,853.0	55,428	9,000	Priaru	√	√	√	√	S08/08/2012	O	O		Awaiting for funding
14	Welikanda	2,776.0	58,247	9,000	Dalukana & Ruhunu ketha	√	√	√	√	√	O	O		Awaiting for funding
15	Dimbulagala				Pimburettewa									PAC Will be completed within 03 months
16	Hingurakgoda	609.0	36,233	*	(Extention Only)									PAC report has been sent to P&D - H/O for the comment
17	Minneriya	832.0	52,464	9,000	Minneriya wewa									
18	Elahera-Bakamoona													Study to be started
19	Medirigiriya Stage 2	825.0												to be sent to P&D-O/H section for comments

Legend: RPAC - Regional Project Approval Committee, PAC - Project Approval Committee, NPD - National Planning Department
NR - Not Required, R - Received, O - to be Obtained

CHAPTER 4

PROJECTION OF POPULATION AND WATER DEMAND IN THE STUDY AREA

Appendix 4.1 Design Population

In the Pre-Feasibility Study prepared by NWSDB uses a high annual average growth rate of 3.20% to estimate the 2010 population. What is the basis of this high value? The available data for a period of 1981 to 2012 in Anuradhapura District are in the rage of 1.2% to 1.4%.

When a population of 233,550 persons in 2010 will be increased by 2012 with an annual average growth rate of 1.25% for a period of 2010 to 2034 as used in the above Pre-F/S, it will be 239,425 persons with a population increment of 63,535 persons from the year of 2001. According to the latest Census 2012, the population increment is 113,027 persons for period of 2001 to 2012 in entire Anuradhapura District. It means that 56.2% population increase of the whore district occurs in the study area.

(1) NWSDB Pre-FS

	2001	2010		2034	2010/2001		2034/2010
Padaviya	21,146	31,951		43,034	4.69		1.25
Kebithigollewa	19,457	23,739		31,973	2.23		1.25
Horoupothana	29,642	39,096		52,657	3.12		1.25
Kahatagasdigillia	33,572	42,890		57,767	2.76		1.25
Sub-total	**103,817**	**137,676**		**185,431**	**3.19**		**1.25**
Medawachchiya	40,469	53,355		71,861	3.12		1.25
Rambewa	31,604	42,519		57,268	3.35		1.25
Sub-total	**72,073**	**95,874**		**129,129**	**3.22**		**1.25**
Total	**175,890**	**233,550**		**314,560**	**3.20**		**1.25**
	2001	2012		2001/1981	2012/2001		
Anuradhapura	**742,535**	**855,562**		**1.25**	**1.33**		
Urban	**53,151**			**1.26**			
Rural	**691,573**			**1.19**			
Estate	**969**						
	745,693						

(2) JICA Study

	Census	Estimated Population			Annual Average Growth Rate (%)		
	2001	2012	2024	2034	2012/2001	2024/2012	2034/2012
Padaviya	21,146	24,403	28,583	32,655	1.31	1.33	1.33
Kebithigollewa	19,457	23,007	27,661	32,276	1.54	1.55	1.55
Horoupothana	29,642	34,374	40,462	46,412	1.36	1.37	1.37
Kahatagasdigillia	33,572	39,096	46,234	53,219	1.39	1.41	1.41
Sub-total	**103,817**	**120,880**	**142,940**	**164,562**	**1.39**	**1.41**	**1.41**
Medawachchiya	40,469	47,533	56,688	65,677	1.47	1.48	1.48
Rambewa	31,604	36,325	42,355	48,207	1.27	1.29	1.29
Sub-total	**72,073**	**83,858**	**99,043**	**113,884**	**1.39**	**1.40**	**1.40**
Total	**175,890**	**204,738**	**241,983**	**278,446**	**1.39**	**1.40**	**1.41**

Note: All red figures show the results of Census.

Appendix 4.2(a)

No. of Connections and Consumption (As of March 2012)

Area No.		1		4		5		7		8		9		10		11		12		13		14		15		18		21	
Location		Anuradhapura		Eppawala		Habarana		Horowpothana		Kahatagasdigiliya		Kebithigollewe		Kekirawa		Maradankadawala		Medawachchiya		Ipalogama		Mihinthale		Padaviya Village		Sacret City		Thambuththegа	
Item		Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)
Domestic	10	8,114	147,562	77	1,329	685	8,532	76	859	870	11,566	675	8,251	2,686	36,850	1,196	14,379	976	12,621	2,834	38,353	2,317	34,086	458	5,397	4,437	65,779	2,615	36,695
Board Quarters	11	42	463	0	0	0	0	1	0	3	13	2	17	1	15	1	18	7	36	0	0	3	38	1	0	5	49	3	22
Schools	12	17	12,518	1	954	1	58	3	565	2	278	3	115	12	2,356	5	414	4	708	4	272	6	427	1	157	5	474	3	1,156
Govt Quarters	13	926	12,770	19	288	8	35	18	129	34	311	28	196	50	544	5	39	34	348	2	29	75	819	43	466	77	654	172	1,661
Tenaman Garden	14	63	998	0	0	0	0	0	0	0	0	0	0	32	247	0	0	9	144	5	65	0	0	16	186	11	207	36	343
Dome. Samurdhi	20	3	38	0	0	0	0	0	0	0	0	0	0	3	50	0	0	0	0	0	0	18	272	0	0	5	44	19	217
Stand Posts	51	14	0	1	40	0	0	0	0	2	0	1	0	7	0	3	0	2	43	0	0	2	0	0	0	13	224	2	69
Garden Taps	52	2	157	0	0	0	0	0	0	1	22	1	0	1	68	0	0	0	0	0	0	0	0	1	0	1	71	0	0
Govt Institution	60	170	15,504	2	39	5	80	5	16	20	378	18	299	38	1,606	8	134	20	262	0	0	28	8,865	11	181	59	3,007	25	812
Army	61	8	4,070	0	0	0	0	0	0	0	0	1	32	0	0	0	0	6	1,791	2	728	1	68	2	86	6	3,566	0	0
Police	62	9	2,916	0	0	1	32	2	415	1	29	2	919	1	693	0	0	2	278	0	0	4	233	1	687	7	510	6	464
Hospitals	63	12	25,072	1	375	1	311	3	905	1	533	1	633	7	1,087	1	391	5	963	2	20	3	415	5	971	3	50	4	1,602
Commercial Instit.	70	1,739	35,684	46	421	66	2,557	60	447	146	1,621	116	1,520	266	3,208	53	584	184	2,750	36	484	115	2,375	48	505	41	591	274	3,733
Tourist/Guest	71	10	3,706	0	0	0	0	0	0	0	0	0	0	1	128	6	52	1	29	0	0	1	228	0	0	4	355	0	0
Indust/Construt	73	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	66	0	0	2	0	0	0
Other Comm and Pri	80	52	3,466	1	0	2	2	2	16	2	81	3	20	8	53	0	0	5	23	0	0	46	2,824	4	7	13	966	12	98
Religious	81	45	3,885	1	11	5	77	2	25	7	73	1	11	18	384	0	0	9	250	7	230	12	326	2	47	59	2,027	5	283
NWSDB premises	82	9	1,177	1	75	1	23	0	0	3	0	1	22	1	55	1	30	2	29	1	41	4	70	2	7	5	53	1	15
Religious 2	83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	389	0	0	4	41,281	0	0
Bulk (CBO)	91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5,044	1	1,373
Total		11,236	269,986	150	3,532	775	11,707	172	3,377	1,093	14,905	853	12,035	3,132	47,344	1,279	16,041	1,267	20,275	2,893	40,222	2,640	51,501	595	8,697	4,758	124,952	3,178	48,543
Percentage		20.5%	26.0%	0.3%	0.3%	1.4%	1.1%	0.3%	0.3%	2.0%	1.4%	1.6%	1.2%	5.7%	4.6%	2.3%	1.5%	2.3%	1.9%	5.3%	3.9%	4.8%	5.0%	1.1%	0.8%	8.7%	12.0%	5.8%	4.7%

Area No.		25		27		28		29		30				>10%		>5%		<=5%		Total		>10%		>5%		<=5%		Total	
Location		Galnawa		Anuradhapura North		Thalawa		Nachchaduwa		Anu-East		Total																	
Item		Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (nos.)	Consu. (m3/mo.)	Conn. (%)	Consu. (%)	Conn. (%)	Consu. (%)	Conn. (%)	Consu. (%)	Conn. (%)	Consu. (%)
Domestic	10	2,709	30,087	5,729	78,834	3,942	54,540	1,875	21,201	5,456	83,693	47,727	690,614	19,299	310,089	19,223	262,304	9,205	118,221	47,727	690,614	84.3	61.1	90.7	71.6	85.5	71.2	87.0	66.4
Board Quarters	11	3	23	4	73	7	593	2	10	2	37	87	1,407	48	573	19	702	20	132	87	1,407	0.2	0.1	0.1	0.2	0.2	0.1	0.2	0.1
Schools	12	5	515	9	563	28	233	5	317	6	504	120	22,584	32	13,585	57	5,006	31	3,993	120	22,584	0.1	2.7	0.3	1.4	0.3	2.4	0.2	2.2
Govt Quarters	13	34	418	43	229	0	0	3	48	1	29	1,572	19,013	970	13,028	335	3,306	267	2,679	1,572	19,013	4.2	2.6	1.6	0.9	2.5	1.6	2.9	1.8
Tenaman Garden	14	15	128	0	0	0	0	0	0	1	35	188	2,353	64	1,033	99	990	25	330	188	2,353	0.3	0.2	0.5	0.3	0.2	0.2	0.3	0.2
Dome. Samurdhi	20	20	254	18	227	34	525	4	59	5	71	129	1,757	26	336	81	1,090	22	331	129	1,757	0.1	0.1	0.4	0.3	0.2	0.2	0.2	0.2
Stand Posts	51	0	0	12	0	0	0	0	0	6	0	65	376	32	0	22	293	11	83	65	376	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.0
Garden Taps	52	0	0	0	0	0	0	0	0	0	0	7	318	2	157	2	139	3	22	7	318	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Govt Institution	60	16	636	18	3,141	17	362	4	16	8	12,443	472	47,781	196	31,088	155	6,423	121	10,270	472	47,781	0.9	6.1	0.7	1.8	1.1	6.2	0.9	4.6
Army	61	0	0	9	29,335	1	9,169	0	0	7	18,426	43	67,271	24	51,831	9	13,463	10	1,977	43	67,271	0.1	10.2	0.0	3.7	0.1	1.2	0.1	6.5
Police	62	2	343	0	0	1	112	1	171	0	0	40	7,802	9	2,916	17	2,122	14	2,764	40	7,802	0.0	0.6	0.1	0.6	0.1	1.7	0.1	0.8
Hospitals	63	6	351	3	54	3	208	1	83	1	2	63	34,026	16	25,128	25	3,318	22	5,580	63	34,026	0.1	5.0	0.1	0.9	0.2	3.4	0.1	3.3
Commercial Instit.	70	116	1,123	169	3,272	231	2,905	20	158	61	1,159	3,787	65,097	1,969	40,115	964	12,044	854	12,938	3,787	65,097	8.6	7.9	4.6	3.3	7.9	7.8	6.9	6.3
Tourist/Guest	71	0	0	0	0	0	0	0	0	1	159	24	4,657	11	3,865	5	483	8	309	24	4,657	0.0	0.8	0.0	0.1	0.1	0.2	0.0	0.4
Indust/Construt	73	0	0	0	0	0	0	0	0	0	0	6	66	1	0	2	0	3	66	6	66	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Comm and Pri	80	4	4	33	3,219	2	0	8	4	13	26	210	10,809	98	6,711	39	1,121	73	2,977	210	10,809	0.4	1.3	0.2	0.3	0.7	1.8	0.4	1.0
Religious	81	3	162	35	946	22	647	10	370	17	650	260	10,404	97	5,481	114	3,733	49	1,190	260	10,404	0.4	1.1	0.5	1.0	0.5	0.7	0.5	1.0
NWSDB premises	82	1	72	1	28	1	313	2	10	2	137	39	2,157	12	1,342	10	549	17	266	39	2,157	0.1	0.3	0.0	0.1	0.2	0.2	0.1	0.2
Religious 2	83	0	0	0	0	1	1,695	1	1,575	0	0	10	44,940	0	0	5	42,976	5	1,964	10	44,940	0.0	0.0	0.0	11.7	0.0	1.2	0.0	4.3
Bulk (CBO)	91	0	0	0	0	0	0	0	0	0	0	2	6,417	0	0	2	6,417	0	0	2	6,417	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.6
Total		2,934	34,116	6,083	119,921	4,290	71,302	1,936	24,022	5,587	117,371	54,851	1,039,849	22,906	507,278	21,185	366,479	10,760	166,092	54,851	1,039,849	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percentage		5.3%	3.3%	11.1%	11.5%	7.8%	6.9%	3.5%	2.3%	10.2%	11.3%	100%	100%																

Appendix 4.2(b) Results of Water Demand Estimation by Option

Option-1

G.N. Division number and name	Population 2012	2016	2018	2020	2024	2028	2032	2034	Isolated? (X)	Served Population 2012	2016	2018	2020	2024	2028	2032	2034		Water Demand 2012	2016	2020	2024	2028	2032	2034
Padaviya DSD	24,403	25,715	26,403	27,110	28,583	30,142	31,794	32,655	4	5,572	9,468	10,627	11,848	14,527	22,679	28,343	31,374		752	1,374	1,749	2,179	3,380	4,319	4,831
Kebithigollewa DSD	21,653	23,054	23,790	24,553	26,153	27,854	29,673	30,627	1	4,319	12,375	13,221	14,114	16,207	21,503	27,420	30,627		583	1,644	1,924	2,268	3,105	4,071	4,606
Horowpothana DSD	33,333	35,181	36,150	37,144	39,217	41,415	43,749	44,967	8	4,676	20,749	21,831	22,973	25,634	32,784	40,704	44,967		632	2,141	2,475	2,884	3,974	5,223	5,916
Kahatagasdigiliya DSD	39,096	41,336	42,506	43,715	46,234	48,905	51,740	53,219	12	12,358	29,413	31,142	32,956	36,915	41,498	49,128	53,219		1,669	2,684	3,188	3,767	5,140	6,366	7,039
Wahalkada System (Dave)	118,485	125,286	128,849	132,522	140,187	148,316	156,956	161,468	25	26,925	78,510	83,471	88,692	100,393	119,656	146,846	161,468		3,636	7,843	9,336	11,098	15,599	19,979	22,392
Wahalkada System (Dmax)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		4,400	9,400	11,200	13,300	18,700	24,000	26,900
Wahalkada System (Dmax)x1.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		4,600	9,900	11,800	14,000	19,700	25,200	28,200
Medawachchiya DSD	46,103	48,885	50,341	51,837	54,978	58,307	61,840	63,693	6	14,349	27,020	29,203	31,498	36,448	47,003	58,337	63,693		1,936	2,832	3,491	4,241	6,053	7,869	8,755
Rambewa DSD	36,325	38,223	39,215	40,236	42,355	44,597	46,970	48,207	16	11,543	27,870	29,228	30,644	33,649	37,455	44,682	48,207		1,559	2,129	2,503	2,913	3,976	5,094	5,659
Mahakanadarawa System (Dave)	82,428	87,108	89,556	92,073	97,333	102,904	108,810	111,900	22	25,892	54,890	58,431	62,142	70,097	84,458	103,019	111,900		3,495	4,961	5,994	7,154	10,029	12,963	14,414
Mahakanadarawa System (Dmax)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		4,200	6,000	7,200	8,600	12,000	15,600	17,300
Mahakanadarawa System (Dmax)X1.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		4,400	6,300	7,600	9,000	12,600	16,300	18,200

47

Option-2

G.N. Division number and name	Population 2012	2016	2018	2020	2024	2028	2032	2034	Isolated? (X)	Served Population 2012	2016	2018	2020	2024	2028	2032	2034		Water Demand 2012	2016	2020	2024	2028	2032	2034
Padaviya DSD	24,403	25,715	26,403	27,110	28,583	30,142	31,794	32,655	4	5,572	15,973	17,277	18,649	21,637	23,871	29,594	32,655	-	752	1,374	1,749	2,179	3,380	4,319	4,831
Kebithigollewa DSD	21,653	23,054	23,790	24,553	26,153	27,854	29,673	30,627	3	4,319	13,873	14,737	15,646	17,741	22,479	27,766	30,627	-	583	1,501	1,761	2,076	2,798	3,633	4,095
Horowpothana DSD	33,333	35,181	36,150	37,144	39,217	41,415	43,749	44,967	12	4,676	22,624	23,729	24,890	27,553	34,007	41,136	44,967	-	632	1,964	2,268	2,644	3,592	4,674	5,276
Kahatagasdigiliya DSD	39,096	41,336	42,506	43,715	46,234	48,905	51,740	53,219	14	12,358	30,794	32,538	34,369	38,328	42,398	49,447	53,219	-	1,669	2,552	3,037	3,590	4,858	5,963	6,568
Wahalkada System (Dave)	118,485	125,286	128,849	132,522	140,187	148,316	156,956	161,468	33	26,925	83,264	88,281	93,554	105,259	122,755	147,943	161,468	-	3,636	7,391	8,815	10,489	14,628	18,589	20,770
Wahalkada System (Dmax)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		4,400	8,900	10,600	12,600	17,600	22,300	24,900
Wahalkada System (Dmax)x1.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		4,600	9,300	11,100	13,200	18,400	23,400	26,200
Medawachchiya DSD	46,103	48,885	50,341	51,837	54,978	58,307	61,840	63,693	9	14,349	29,470	31,732	34,109	39,231	47,907	57,784	62,605		1,936	2,769	3,422	4,164	5,665	7,213	7,991
Rambewa DSD	36,325	38,223	39,215	40,236	42,355	44,597	46,970	48,207	19	11,543	29,942	31,364	32,844	35,986	38,649	44,999	48,207		1,559	2,095	2,465	2,873	3,739	4,692	5,191
Mahakanadarawa System (Dave)	82,428	87,108	89,556	92,073	97,333	102,904	108,810	111,900	28	25,892	59,412	63,096	66,953	75,217	86,556	102,783	110,812		3,495	4,864	5,887	7,037	9,404	11,905	13,182
Mahakanadarawa System (Dmax)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		4,200	5,800	7,100	8,400	11,300	14,300	15,800
Mahakanadarawa System (Dmax)X1.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		4,400	6,100	7,400	8,900	11,800	15,000	16,600

61

Appendix 4.3(a)
Monthly Mean Temparature

Station Name: Anuradhapura
LAT: 8.35N LON: 80.38E EV: 92.5m

Montly Mean Temparature in Anuradhapura

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	26.1	27.3	28.5	30.0	30.6	29.1	29.8	28.8	29.2	27.9	27.1	26.2
2001	26.0	26.9	29.5	29.5	29.8	28.2	29.0	29.2	29.4	28.7	27.2	26.4
2002	26.6	27.0	29.3	29.2	29.6	29.6	29.5	29.7	30.1	28.0	27.1	26.2
2003	26.0	27.5	29.0	29.8	29.5	29.6	29.5	29.2	29.9	28.2	26.5	26.8
2004	26.7	27.3	29.3	29.8	28.4	28.6	29.2	30.1	29.1	27.9	26.7	25.9
2005	26.4	27.7	29.8	29.1	30.0	29.6	29.2	30.0	29.7	28.6	26.6	26.1
2006	25.6	26.9	28.8	29.3	29.4	29.7	29.6	29.6	29.3	28.5	27.7	26.2
2007	25.8	26.9	28.7	29.1	29.8	29.5	29.1	29.5	29.3	28.0	27.0	26.0
2008	26.1	27.1	27.6	28.7	29.5	29.4	29.1	29.1	29.1	28.1	27.0	26.0
2009	25.7	26.9	29.0	29.6	30.0	29.5	29.7	29.3	29.7	29.4	27.2	26.6
2010	26.5	27.8	29.9	30.4	29.7	29.8	29.6	28.8	28.6	28.1	27.2	25.5
Ave.	26.1	27.2	29.0	29.5	29.7	29.3	29.4	29.4	29.4	28.3	27.0	26.2

Appendix 4.3(b)
Monthly Mean Evaporation

Maha IIuppallama LAT 8.75 LOG 80.50 ELE 106.0m Since 1/1/1997
Vavuniya LAT 8.12 LOG 80.46 ELE 137.8m Sincs 9/1/1975

MAHAILLUPPALLAMA

Monthly Mean Pan Evaporation - (mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	2.62	2.63	3.87	4.46	4.93	5.13	5.49	3.88	4.15	3.95	2.69	2.27
2001	2.28	3.40	4.69	3.83	5.66	4.96	5.27	5.70	5.07	3.97	2.90	2.35
2002	3.04	3.75	5.21	3.91	4.60	5.46	5.52	5.67	6.37	3.91	2.03	1.91
2003	2.70	3.17	3.91	4.46	4.51	5.02	4.45	5.17	5.96	3.63	1.97	2.69
2004	3.07	3.96	4.62	4.07	3.93	4.76	5.09	6.19	4.28	3.03	1.89	1.89
2005	2.30	3.94	4.37	3.64	4.32	4.79	4.91	5.69	5.57	3.97	2.62	2.31
2006	2.11	2.75	3.24	3.17	3.50	4.16	4.45	4.96	4.43	3.44	2.56	1.97
2007	2.37	3.18	4.00	3.36	3.91	4.06	3.93	4.25	3.70	2.90	2.49	1.78
2008	2.12	2.75	2.27	2.80	3.95	3.87	3.87	3.98	4.45	2.37	2.20	2.35
2009	Na	Na	3.01	3.30	3.70	3.74	4.73	4.02	4.19	3.08	1.60	1.48
2010	2.24	3.00	3.87	2.85	3.24	3.82	3.81	3.83	3.07	3.01	1.89	1.50
2011	1.45	2.67	3.03	3.22	3.99	4.28	4.60	4.62	4.65	3.48	2.30	2.02
Ave.	2.39	3.20	3.84	3.59	4.19	4.50	4.68	4.83	4.66	3.39	2.26	2.04
Days	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00
Monthly	74.16	89.59	119.05	107.70	129.78	135.13	144.96	149.72	139.71	105.24	67.85	63.36
	Na: Not available											1326.26

VAVUNIYA

Monthly Mean Pan Evaporation - (mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	1.95	2.28	2.98	4.03	4.87	4.17	4.96	3.81	4.28	2.98	2.08	2.09
2001	2.68	2.87	3.94	3.03	4.42	4.12	4.65	4.81	4.57	2.83	2.16	1.70
2002	2.17	2.70	3.80	2.89	3.96	4.60	5.13	5.48	6.21	3.10	2.87	1.66
2003	1.91	3.00	3.77	4.00	3.74	4.82	3.53	3.50	4.50	2.78	1.08	2.09
2004	2.35	3.10	3.33	3.73	2.92	4.28	4.37	4.43	3.20	2.32	1.20	1.71
2005	1.89	3.20	3.64	2.74	4.12	4.75	4.35	4.29	4.29	2.45	1.76	1.78
2006	2.09	2.88	2.99	3.37	4.07	4.75	4.87	5.35	4.17	3.85	1.77	2.10
2007	2.34	2.86	3.83	3.32	4.60	3.61	4.08	4.58	4.40	3.21	2.24	2.15
2008	2.38	3.06	2.60	3.37	4.69	5.20	4.28	3.49	4.43	2.39	2.09	1.82
2009	2.10	3.27	3.40	3.45	4.20	4.75	4.85	3.84	4.76	3.64	1.75	1.69
2010	2.36	3.25	4.04	3.79	3.78	5.00	4.61	4.22	3.80	3.18	1.98	1.45
2011	1.73	2.10	3.25	3.11	4.21	4.94	4.74	4.33	4.94	2.55	2.02	1.83
Ave.	2.16	2.88	3.46	3.40	4.13	4.58	4.53	4.34	4.46	2.94	1.92	1.84
Days	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00
Monthly	67.06	80.69	107.38	102.09	128.08	137.52	140.55	134.67	133.88	91.12	57.52	56.97
	Na: Not available											1237.52

2012/11/5

Agromet Division
Dept.of Meteorology
Colombo-07

Appendix 4.3(c)
Monthly Mean Rainfall

Station Name: Anuradhapura
LAT: 8.35N LON: 80.38E EV: 92.5m

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1981	46.7	19.3	53.8	151.7	74.1	13.8	61.2	85.8	146.0	165.1	159.7	82.6	1059.8
1982	0	0	122.3	137.8	77.9	33.4	4.9	0	76.8	255.9	177.5	147.4	1033.9
1983	4.6	0	0	74.6	190.3	18.2	19.3	24.3	72.8	121.6	128.0	472.1	1125.8
1984	289.7	527.5	156.1	169.9	26.3	0.3	75.9	0	161.2	114.4	286.6	69.3	1877.2
1985	132.3	68.9	81.6	56.8	159.3	9.7	16.9	64.3	119.0	48.4	355.6	160.5	1273.3
1986	199.9	17.2	148.7	122.7	110.0	0	9.0	10.1	22.3	245.2	126.8	102.6	1114.5
1987	49.7	0	22.9	159.2	112.1	0	0	4.3	143.3	424.7	172.1	88.6	1176.9
1988	14.8	41.7	16.0	302.5	24.2	7.1	86.7	67.1	88.8	88.8	-	-	
1989	35.5	0	22.2	54.9	65.8	59.1	146.5	7.8	102.3	245.3	317.3	47.7	1104.4
1990	208.9	6.3	185.1	58.2	180.1	0	0.2	78.1	49.0	271.7	107.8	153.1	1298.5
1991	59.5	15.0	74.3	153.8	145.3	49.7	17.9	3.3	32.2	211.4	503.9	190.5	1456.8
1992	10.1	0	0	168.3	81.0	20.0	33.1	12.3	60.0	140.7	230.3	183.9	939.7
1993	13.1	1.4	52.8	150.1	74.7	1.3	20.7	0	2.1	405.8	403.9	453.0	1578.9
1994	224.8	226.2	23.5	156.6	27.1	0.1	5.9	0.1	62.8	397.9	241.0	39.1	1405.1
1995	114.1	10.7	5.9	194.0	77.9	1.7	0.3	0.9	-	205.5	167.5	19.3	797.8
1996	18.3	73.3	8.4	212.7	2.3	67.7	0.5	129.0	42.8	256.8	167.5	89.0	1068.3
1997	7.6	9.0	74.4	257.9	89.3	16.4	70.1	0	62.4	188.2	271.7	283.3	1330.3
1998	69.4	0	8.6	100.9	268.3	0.7	51.4	84.2	6.2	109.3	253.2	254.4	1206.6
1999	150.0	96.1	42.6	142.4	11.9	14.4	0	0	85.9	282.0	199.8	167.6	1192.7
2000	160.5	113.5	17.3	38.1	51.7	1.2	0.5	31.0	121.0	88.7	390.0	232.4	1245.9
2001	110.7	29.8	0	274.1	1.8	73.1	101.9	0	27.1	180.3	226.5	137.1	1162.4
2002	56.4	63.7	64.5	142.0	11.7	0.4	0	60.5	17.7	220.8	301.9	320.8	1260.4
2003	189.1	36.2	79.2	158.7	22.4	18.7	52.3	47.3	127.6	192.0	219.7	49.1	1192.3
2004	48.5	13.8	105.6	238.1	127.6	16.9	3.1	0	131.9	343.9	162.4	252.5	1444.3
2005	49.6	0	68.3	113.3	42.3	2.4	52.6	12.1	0	314.7	339.0	104.5	1098.8
2006	135.2	37.2	183.3	91.1	77.5	0	0	0	23.7	357.8	287.6	131.0	1324.4
2007	113.4	15.7	28.4	291.5	2.1	22.1	27.1	6.6	56.2	372.8	187.8	257.2	1380.9
2008	61.5	97.5	297.2	197.6	0	0	10.7	59.8	17.8	271.4	150.1	321.9	1485.5
2009	73.2	0	121.4	157.4	8.3	6.7	0.7	63.8	1.3	45.7	288.9	307.7	1075.1
2010	40.4	13.4	26.8	251.3	62.4	2.6	16.4	149.6	263.3	134.9	376.5	327.8	1665.4
2011	295.2	369.2	19.2	371.4	4.2	3.7	9.7	4.0	1.4	283.5	382.5	-	1744.0
Ave.	89.6	51.1	69.7	159.3	73.5	15.3	29.5	33.4	73.2	223.4	248.3	187.8	1254.3

Station Name: Wahalkada
LAT:

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1997	-	-	-	-	-	-	-	-	-	-	-	255.1	-
1998	59.9	0	0	0	94.2	0	26.0	23.5	71.0	113.0	183.0	662.2	1232.8
1999	387.7	227.2	0	124.2	0	26.1	0	0	182.8	198.1	359.5	0	1505.6
2000	162.6	280.1	0	77.0	46.7	0	0	29.2	133.4	8.5	406.4	429.9	1573.8
2001	188.2	7.0	0	148.8	0	77.8	68.8	0	80.3	132.9	132.5	238.2	1074.5
2002	139.8	0	0	110.0	0	30.5	0	0	45.5	168.4	242.9	439.4	1176.5
2003	210.7	74.7	0	0	0	0	95.6	96.1	174.6	0	597.8	50.6	1300.1
2004	0	0	0	34.0	97.7	0	0	82.9	181.7	331.4	448.2	481.5	1657.4
2005	206.7	0	32.6	221.2	91.9	0	5.0	47.5	47.5	179.3	533.2	142.0	1506.9
2006	165.2	27.5	77.7	10.0	125.0	0	0	0	46.2	238.4	246.1	149.9	1086.0
2007	198.5	79.0	0	67.7	0	52.6	0	40.5	65.5	297.6	32.2	232.9	1066.5
2008	5.0	173.9	410.9	0	0	0	156.5	424.8	0	15.7	376.5	235.8	1799.1
2009	76.5	0	151.6	102.0	70.0	0	69.2	0	10.0	0	318.7	457.7	1255.7
2010	28.0	0	8.0	0	71.5	0	85.0	50.0	156.5	118.0	475.0	643.0	1635.0
2011	587.0	368.0	0	138.0	0	0	0	63.0	0	328.7	487.0	333.0	2305.0
Ave.	172.6	88.4	48.6	73.8	42.6	13.4	36.2	61.3	85.4	152.1	345.6	321.2	1441.1

Appendix 4.3(d)
Daily Rainfall

Station Name: Anuradhapura
LAT: 8.35N LON: 80.38E EV: 92.5m

Year: 2000 (Unit: mm)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0.7	0	0	0	0	0	0	0	6.4	0	0
2	0.2	32.0	0	1.1	0	0	0	3.2	0	2.2	4.6	0
3	24.6	20.3	0	1.5	0	0	0	4.1	0	0	0	0
4	18.7	0	0	0.7	0	0	0	0	0	0.5	11.6	6.3
5	38.5	0	0	18.5	0	0	0	0	0	38.7	0.2	0.5
6	9.2	11.9	3.2	0.4	0	0.8	0	2.5	0	0.6	0	0
7	19.4	0	3.8	0	0	0	0	5.5	0	0	0.5	0
8	7.1	0	1.0	0	0	0	0	0.2	0	5.6	0.1	0
9	0.3	0	4.9	0	0	0	0	0	0	0	0.1	0
10	0.6	0	0	0	0	0	0	0	0	0	3.3	0
11	0	0	0.2	0	0	0	0	0	0	0	5.8	0
12	0	0	0	0	0	0	0	4.4	0	0	0	0
13	0	0	0	0	0	0	0	1.8	0	0	10.6	0
14	9.0	2.0	0	0	0	0	0	0.2	0	0.2	0	0
15	1.2	0	1.2	0	0	0	0	0	0	22.4	0	0
16	21.1	0	0	0	0	0	0	0	0	0.1	3.4	0
17	0	0	0	0	0	0	0	0	0	0	66.8	1.8
18	0	0	0	0	0	0	0	0	9.6	0	77.6	5.1
19	0	0	0	15.9	0	0	0	0	0.1	0	4.6	0.1
20	0	0	0	0	0	0	0	0	4.0	0	10.8	0
21	0	0	0	0	0	0	0	0	0	0	4.6	0.9
22	0	34.8	0	0	0	0	0	0	1.3	0	76.1	0
23	0	2.1	1.6	0	0	0	0	0	2.3	11.6	108.8	23.4
24	0	0	1.0	0	0	0	0	9.1	66.9	0	0	17.9
25	0	0	0	0	0	0.4	0	0	3.4	0	0.1	11.1
26	0	0	0	0	13.4	0	0	0	1.7	0	0	164.7
27	0	0	0	0	0	0	0	0	0.5	0	0.4	0.2
28	3.6	6.0	0.4	0	0	0	0	0	0	0	0	0
29	7.0	3.7	0	0	0	0	0	0	0	0	0	0.1
30	0		0	0	34.4	0	0	0	31.2	0	0	0.1
31	0		0		3.9		0.5	0		0.4		0.2
Total	**160.5**	**113.5**	**17.3**	**38.1**	**51.7**	**1.2**	**0.5**	**31.0**	**121.0**	**88.7**	**390.0**	**232.4**
											Total	**1245.9**

Year: 2001

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	11.0	0	0	0.7	0	0	0	0	0	0	2.4
2	5.4	0	0	0	0	10.8	0	0	0	0	0	2.2
3	3.7	13.0	0	0	0	39.2	0	0	0	0	44.6	34.1
4	0	0	0	0	0	21.2	0	0	0	34.6	8.3	2.3
5	0	0	0	0.9	0	0	0	0	0	0	10.8	2.1
6	0	0	0	1.4	0	0	0	0	0	0	14.3	0.2
7	0.3	0	0	17.9	0	0	0	0	0	0	4.8	0
8	2.2	0	0	25.4	0	0	0	0	0	0	29.5	0
9	0	0	0	0	0	0	0	0	0	0	21.2	0
10	17.9	0	0	66.9	0	1.8	0.2	0	0	0	0	0
11	3.9	0	0	32.0	0	0	0	0	0	0	0	0
12	0.4	0	0	9.8	1.1	0	0	0	0	0	0	0
13	0	0	0	0.9	0	0	0	0	0	21.1	0	0
14	0	0	0	19.5	0	0.1	0	0	3.5	0.4	21.3	0
15	0	0	0	9.1	0	0	0	0	5.9	0	17.5	0
16	0	4.7	0	0	0	0	0	0	1.8	0	8.4	0
17	0.8	0	0	0	0	0	0	0	0	0	0	0.7
18	16.7	1.1	0	21.4	0	0	0	0	0.9	0	0.4	6.1
19	0	0	0	3.9	0	0	0	0	4.5	0.8	0	29.9
20	0	0	0	3.0	0	0	0	0	0	18.8	1.9	14.6
21	0.3	0	0	6.1	0	0	0	0	0	13.6	5.3	0
22	2.8	0	0	0	0	0	0	0	2.7	6.9	35.6	0
23	23.2	0	0	0	0	0	0	0	0.5	1.4	2.6	13.1
24	1.5	0	0	0	0	0	0	0	1.4	11.3	0	3.5
25	13.1	0	0	0	0	0	3.5	0	4.2	0.8	0	0
26	0.1	0	0	8.5	0	0	98.2	0	0	2.7	0	0
27	0	0	0	0	0	0	0	0	0	30.5	0	1.3
28	0	0	0	27.6	0	0	0	0	0.5	11.3	0	4.2
29	14.5		0	19.2	0	0	0	0	0.8	22.2	0	12.9
30	1.4		0	0.6	0	0	0	0	0.4	3.9	0	7.5
31	2.5		0		0		0	0		0		0
Total	**110.7**	**29.8**	**0.0**	**274.1**	**1.8**	**73.1**	**101.9**	**0.0**	**27.1**	**180.3**	**226.5**	**137.1**
											Total	**1162.4**

Year: 2002

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	3.0	0	0	19.3	0	0.1	0	0	0	34.6	26.3	0
2	0	0	0	0	4.2	0	0	0	0	20.6	9.6	0
3	4.1	8.8	0	4.8	3.5	0	0	0	0	5.2	15.1	11.3
4	21.4	15.0	0	11.9	1.5	0	0	0	0	9.5	1.5	16.9
5	0	0.9	0	1.7	0	0	0	0	0	24.4	0	21.9
6	0	0	2.9	0	2.0	0	0	0	0	10.5	0.6	11.3
7	0	0	22.5	5.0	0	0	0	0	0	28.9	9.5	8.5
8	0	0	0	0	0	0	0	0	0	24.2	27.2	15.7
9	0	0	0	0	0	0	0	0	2.0	0.6	13.3	46.1
10	0	39.0	0	0	0	0	0	0	0	0	14.5	0.1
11	0	0	0	19.5	0	0.1	0	0	0	0	0	23.1
12	0	0	0	6.8	0	0.2	0	0	0	0	0	21.1
13	0.2	0	0	0.9	0	0	0	0	0	0	0	17.7
14	6.7	0	0	0	0	0	0	0	0	0.3	0	16.7
15	0	0	0	0	0	0	0	0	0	0	3.8	29.1
16	0	0	0	1.8	0	0	0	0	0	0	9.9	38.9
17	0	0	0	0	0.5	0	0	0	0	0	10.7	9.7
18	0	0	0	9.0	0	0	0	0	0	13.6	4.4	32.7
19	0	0	0	1.0	0	0	0	0	0	4.0	67.5	0
20	0	0	0	0	0	0	0	0	0	8.8	67.9	0
21	2.4	0	0	1.8	0	0	0	0	0	1.2	5.0	0
22	0	0	0	1.3	0	0	0	0	0	0	14.7	0
23	0	0	0	0.3	0	0	0	0	0	0.2	0	0
24	0	0	0	0	0	0	0	20.7	0	2.4	0	0
25	0	0	0	4.8	0	0	0	1.2	0	6.0	0	0
26	0	0	3.1	1.1	0	0	0	28.1	0	0	0	0
27	0	0	0	49.2	0	0	0	0.2	0	13.2	0.4	0
28	0	0	1.2	0.2	0	0	0	10.3	0	0.1	0	0
29	0		0	1.6	0	0	0	0	11.5	1.6	0	0
30	1.0		34.6	0	0	0	0	0	4.2	6.7	0	0
31	17.6		0.2		0		0	0		4.2		0
Total	**56.4**	**63.7**	**64.5**	**142.0**	**11.7**	**0.4**	**0.0**	**60.5**	**17.7**	**220.8**	**301.9**	**320.8**
											Total	**1260.4**

Year: 2003

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	10.6	0	0	6.1	0	98.4	0	0
2	0	1.9	0	1.0	0	0	0	0	0	31.1	0	1.4
3	0.3	0	0	0	0	0	0	0	0	2.4	8.1	9.9
4	3.7	0	0	0	0	0	0	0	0	10.8	0	14.5
5	10.2	3.3	0	0	0	0	0	0	0	1.7	0.9	0.2
6	90.5	8.2	0.4	0	0	0	0	0	0	5.8	3.1	2.5
7	3.8	2.8	0	68.0	0	0	0	0	0	1.3	6.0	0
8	1.0	0	0	0	0	0	3.4	0	0	0	9.4	0
9	25.7	0	0	14.1	0	0	0	0	0	0	0	0
10	35.7	0	0	0	0	0	21.8	1.9	0	0	6.6	9.0
11	0	0.8	0.4	0	0	0	0	0	0	0	11.2	0.8
12	0	18.7	0.7	0	9.3	0	0	0	0	17.4	0	0
13	0	0	1.5	0	2.5	0	0	0	0	0	3.2	0
14	0	0.5	0.4	4.5	0	0	0	0	0	0	13.4	0
15	0	0	0	0	0	0	0	0	0	13.1	0.4	0
16	0	0	3.0	0	0	0.5	0	0	0	0	13.0	0
17	6.3	0	0	0	0	0	0	39.2	0	0	0.2	0
18	8.5	0	61.5	7.8	0	1.2	0	0.1	0	0.4	0	0
19	1.5	0	1.9	0	0	0.4	0	0	0	0.8	4.4	0
20	1.3	0	9.4	0.4	0	10.7	0	0	0	3.9	15.1	0
21	0	0	0	4.9	0	3.3	0	0	0	0	17.6	0
22	0	0	0	1.1	0	0.5	0	0	0	0	16.9	0
23	0	0	0	9.7	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	1.8	0	9.6
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	5.4	0	0	0	0	63.7	0	13.6	0.5
27	0	0	0	20.8	0	0	0	0	0	0	43.5	0
28	0	0	0	10.2	0	1.0	0	0	0	0	15.0	0
29	0		0	7.9	0	1.1	0	0	1.6	2.6	18.1	0.7
30	0		0	2.9	0	0	9.6	0	62.3	0	0	0
31	0.6		0		0		17.5	0		0.5		0
Total	**189.1**	**36.2**	**79.2**	**158.7**	**22.4**	**18.7**	**52.3**	**47.3**	**127.6**	**192.0**	**219.7**	**49.1**
											Total	**1192.3**

Year: 2004

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0.5	12.1	0	0	0	6.3	7.4	2.6	0
2	0	0	0	0	9.0	0	0	0	3.5	0	0.2	3.2
3	0	0	0	43.8	17.4	0	0	0	0	0	3.8	21.1
4	0	0	0	7.1	2.3	0	0	0	0	0	7.3	0
5	0	0	0	49.6	21.8	0	0	0	0	0	3.6	10.5
6	0	0	0	3.6	5.9	0	3.1	0	0	0	4.7	0
7	0	13.8	0	0	2.4	0	0	0	0	0	1.2	0.5
8	3.1	0	0.7	0	0	0	0	0	0	0	2.8	1.8
9	22.8	0	15.0	0	0	0.2	0	0	0	0	0.5	1.5
10	1.4	0	0	0	0	0	0	0	0	0	1.0	0.3
11	0	0	0	0	0	0	0	0	0	22.1	1.8	41.3
12	0	0	0	0	0	0	0	0	0	10.1	13.6	66.0
13	0	0	0	4.6	0	16.3	0	0	0.6	15.5	3.9	17.5
14	0	0	0	0	0	0	0	0	0	12.3	6.0	40.9
15	0	0	1.8	0	0	0	0	0	0	4.4	19.0	13.5
16	0	0	0	0	0	0	0	0	0	14.9	0.1	0.8
17	0	0	3.7	0	1.4	0	0	0	0.8	63.5	0	0
18	0	0	0	0	0	0.4	0	0	0	62.5	0	0
19	0	0	0	0	0	0	0	0	0	0	9.2	0
20	0	0	0	0	0	0	0	0	0	3.9	3.3	0
21	0	0	14.6	10.7	0	0	0	0	0	0.3	7.8	0
22	0	0	0	36.0	0	0	0	0	2.0	0	28.6	0
23	0	0	40.9	9.8	0	0	0	0	0.1	3.2	3.9	0
24	6.2	0	5.3	38.2	0	0	0	0	9.0	4.7	5.3	14.6
25	15.0	0	0	0	0	0	0	0	9.2	25.8	0.8	0
26	0	0	0	2.7	36.6	0	0	0	18.5	12.1	16.8	0.7
27	0	0	0.8	2.0	18.7	0	0	0	52.1	37.1	3.0	0.6
28	0	0	0.2	0	0	0	0	0	0	3.6	3.0	0.7
29	0	0	2.5	0.1	0	0	0	0	0	40.5	0	0.8
30	0		12.4	29.4	0	0	0	0	29.8	0	8.6	12.4
31	0		7.7		0		0	0		0		3.8
Total	**48.5**	**13.8**	**105.6**	**238.1**	**127.6**	**16.9**	**3.1**	**0.0**	**131.9**	**343.9**	**162.4**	**252.5**
											Total	**1444.3**

Year: 2005

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	16.0	0	0	0	0	0	0	0
2	0	0	0	17.1	0	0	0	0	0	0	1.8	0
3	0	0	0	15.9	26.3	0	0	0	0	0	25.5	0.7
4	0	0	0	7.5	0	0	0	0	0	0	15.3	23.3
5	0.2	0	0	1.6	0	0	0	0	0	0.8	13.3	0
6	0	0	0	2.6	0	2.2	0	0	0	0	81.0	0.1
7	0	0	0	0	0	0	0	0	0	0.3	18.1	0
8	0	0	0	0	0	0.1	0	0	0	1.9	1.5	1.9
9	0	0	0.2	0	0	0.1	0	0	0	29.9	8.6	5.1
10	0	0	46.6	0	0	0	0	0	0	37.9	24.1	1.9
11	0	0	0.4	0	0	0	0	0	0	9.2	16.4	0.6
12	0	0	0	15.0	0	0	0	0	0	10.1	1.7	15.0
13	0	0	0	10.3	0	0	1.8	0	0	4.6	20.4	2.3
14	0	0	0	11.2	0	0	24.9	0	0	0	0	9.8
15	0	0	0	0.1	0	0	25.9	0	0	0.6	2.4	7.4
16	0	0	0	1.1	0	0	0	0	0	0.9	0	1.4
17	0	0	0	0	0	0	0	0	0	4.4	0	2.0
18	7.7	0	0	4.5	0	0	0	0	0	3.4	0	0.8
19	2.3	0	0	16.9	0	0	0	0	0	1.6	24.4	0
20	7.7	0	0	0	0	0	0	0	0	0	38.1	0
21	20.1	0	0	0	0	0	0	0	0	47.0	2.8	27.4
22	2.9	0	0	0.3	0	0	0	9.9	0	69.4	0.1	4.7
23	5.8	0	0	0	0	0	0	0	0	0.0	14.0	0
24	0	0	0.7	0	0	0	0	0	0	22.8	10.6	0
25	0	0	0	3.7	0	0	0	0	0	47.3	15.7	0
26	0	0	0	1.5	0	0	0	2.2	0	20.9	0.1	0
27	0	0	0	0	0	0	0	0	0	0	0.7	0
28	0	0	0	0	0	0	0	0	0	0	2.4	0
29	0		0	4.0	0	0	0	0	0	0	0	0
30	0.3		0.1	0	0	0	0	0	0	1.7	0	0
31	2.6		20.3		0		0	0		0.0		0.1
Total	**49.6**	**0.0**	**68.3**	**113.3**	**42.3**	**2.4**	**52.6**	**12.1**	**0.0**	**314.7**	**339.0**	**104.5**
											Total	**1098.8**

Year: 2006

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	0	0	0	0	0	0	0.7	0
2	0	0	90.3	0	0	0	0	0	2.1	0	0.6	0
3	0.6	28.3	17.8	0	0	0	0	0	0	0	4.4	5.1
4	9.9	8.8	27.8	0	66.1	0	0	0	0	0	23.3	5.3
5	5.0	0	0	0	0	0	0	0	0	0	8.9	0
6	0	0	0	0	0	0	0	0	14.0	0	2.0	0
7	0.6	0	0	0	4.6	0	0	0	0	0.8	65.8	0
8	0.3	0.1	0.3	0	0.4	0	0	0	1.0	0	7.6	0
9	0	0	0	0	1.8	0	0	0	0.5	0	35.7	0
10	1.6	0	3.4	0.5	0	0	0	0	0	0	10.4	1.1
11	18.6	0	0	0	0	0	0	0	4.3	0	15.8	30.3
12	36.3	0	0	0	0	0	0	0	0	36.8	14.2	0
13	5.7	0	0	6.3	0	0	0	0	0	43.7	9.5	0
14	41.2	0	0	14.5	0	0	0	0	0	5.5	23.4	0
15	0	0	0	0	0	0	0	0	0.5	1.0	0	0
16	0	0	0	23.3	0	0	0	0	1.3	10.7	2.5	0
17	0	0	0	0	0	0	0	0	0	1.2	19.0	0
18	0	0	0	0	1.3	0	0	0	0	25.5	10.4	0
19	0	0	0	45.3	0	0	0	0	0	19.4	4.8	61.5
20	0	0	0	0.5	0	0	0	0	0	1.0	3.0	27.4
21	0	0	0	0.7	0	0	0	0	0	0	5.9	0
22	0	0	0	0	0	0	0	0	0	5.0	5.6	0.3
23	0	0	0	0	0	0	0	0	0	2.5	0	0
24	0	0	0	0	0	0	0	0	0	61.9	0	0
25	0	0	0	0	0	0	0	0	0	56.1	1.1	0
26	0	0	0	0	0	0	0	0	0	47.2	2.9	0
27	6.0	0	0	0	0.8	0	0	0	0	39.1	0	0
28	9.4	0	11.9	0	0	0	0	0	0	0	10.1	0
29	0		0.4	0	0.7	0	0	0	0	0	0	0
30	0		0	0	1.8	0	0	0	0	0.4	0	0
31	0		31.4		0		0	0		0		0
Total	**135.2**	**37.2**	**183.3**	**91.1**	**77.5**	**0.0**	**0.0**	**0.0**	**23.7**	**357.8**	**287.6**	**131.0**
											Total	**1324.4**

Year: 2007

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0.2	0	0	0	0	0	0	7.6	0
2	0	0	16.4	3.4	0	0	0	0	0	0	6.8	3.3
3	0	0	0	0.5	0	0	0	0	0	0	13.8	0
4	0	0	0	0	0	0	0	0	0	0	49.6	0
5	0	0	0	20.0	0	0.5	0	0	0	0	18	0
6	0	0	0	6.4	0	0	0	0	0	0	0.4	0
7	0	0	0	4.0	0	0	0	0	17.4	0	3.3	1.6
8	53.3	0	0	0	0	0	0	0	18.7	2.8	28.3	0
9	0	0	0	2.4	2.1	0	0	0	18.8	0	0.6	0
10	0.4	0	0	28.8	0	0	0	0	0	109.2	0	0
11	0	0	0	2.8	0	0	1.8	0	0	7.3	15.6	0
12	0.8	0	0	0	0	0	0	0	0	3.3	21.4	39.5
13	0	0	0	0	0	1	0	0	0	17.4	0	36.9
14	0.6	0	0	0	0	0	0	0	0	0	0	3.8
15	0	0	0	7.4	0	0	0	0	0	0.8	0	33.6
16	0	0	0	0	0	0	0	0	0.8	2.2	0	23.9
17	0	0	0	0	0	0	4.2	0	0.5	33.6	0	16.7
18	0	0.3	0	0	0	1.1	1.7	0	0	2.7	0	15.2
19	0	0	0	0	0	0	0	0	0	0	2.9	27.3
20	0	0	0	8.8	0	0	0	0	0	0.5	0	20.7
21	0	0	0	101.9	0	2	0	0	0	0	3.4	26.1
22	0	0	0	0	0	0	19.4	0	0	50.2	0	3.4
23	0	0	0	0	0	13.8	0	0.2	0	1.9	0	5.2
24	0	2.9	0	0	0	0	0	6.4	0	6.4	0	0
25	0	12.5	0	13.3	0	0	0	0	0	17.2	0	0
26	35.5	0	0	42.5	0	0	0	0	0	68.6	0	0
27	22.8	0	0	0	0	0	0	0	0	48.7	14.4	0
28	0	0	0	7.1	0	0	0	0	0	0	0	0
29	0		0	42.0	0	3.7	0	0	0	0	1.7	0
30	0		0	0	0	0	0	0	0	0	0	0
31	0		12.0		0		0	0		0		0
Total	**113.4**	**15.7**	**28.4**	**291.5**	**2.1**	**22.1**	**27.1**	**6.6**	**56.2**	**372.8**	**187.8**	**257.2**
											Total	**1380.9**

Year: 2008

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	0	0	0	0	0	0	0	0
2	9.0	0	0	0.6	0	0	0	4.3	0	0	0	0
3	20.8	0	0	10.7	0	0	0	0	0	0	0	0
4	1.1	0	0	0	0	0	0	0	0	69.4	0	0
5	0.4	0	0	3.9	0	0	0	0	16.0	0	0	0.2
6	0.2	8.2	9.1	0	0	0	0	0	1.4	3.1	0	28.0
7	0	5.9	0	20.9	0	0	0	0	0	0	1.2	127.1
8	8.9	30.0	1.9	9.5	0	0	0	0	0.4	0	0	8.5
9	1.1	23.4	92.0	12.5	0	0	0	0	0	17.1	3.8	34.0
10	0	10.6	30.5	6.6	0	0	0	0	0	0	2.7	15.6
11	0	0	0	3.2	0	0	0	0	0	7.2	2.5	0
12	0	0	0	10.8	0	0	0	0	0	37.6	4.4	0
13	0	0	2.7	0	0	0	0	0	0	9.9	5.5	0
14	0	0	3.2	0	0	0	0	1.8	0	6.2	0	0
15	0	0	22.7	7.5	0	0	7.9	0	0	1.7	0	36.1
16	0	0	1.1	0	0	0	0	0	0	0.9	0	3.6
17	0	0	17.6	0.4	0	0	0	0	0	0.5	0	57.0
18	0	0	5.5	0	0	0	0.8	0	0	13.3	0	7.4
19	0	0	4.6	1.3	0	0	0	0	0	13.8	1.1	0.5
20	2.6	0.5	8.1	0	0	0	0	0	0	4.4	4.3	0
21	4.8	0	2.6	0	0	0	0	0	0	22.8	9.3	0
22	0	0	47.7	0	0	0	0	0	0	6.4	25.0	0.5
23	0	0	43.4	0	0	0	0	0	0	22.9	17.4	3.4
24	0	0	1.1	0.5	0	0	0	6.6	0	29.1	6.4	0
25	0	0	0	31.9	0	0	0	1.3	0	5.1	28.8	0
26	0	5.1	1.1	77.3	0	0	0	9.7	0	0	18.6	0
27	0	1.9	2.3	0.0	0	0	2.0	10.3	0	0	3.5	0
28	12.6	0	0	0	0	0	0	3.1	0	0	5.0	0
29	0	11.9	0	0	0	0	0	0	0	0	10.6	0
30	0		0	0	0	0	0	22.7	0	0	0	0
31	0		0		0		0	0		0		0
Total	**61.5**	**97.5**	**297.2**	**197.6**	**0.0**	**0.0**	**10.7**	**59.8**	**17.8**	**271.4**	**150.1**	**321.9**
											Total	**1485.5**

Year: 2009

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	0	0	0	0	0	0	0	32.2
2	0	0	0	0	0	0	0	0	0	0	32.1	0
3	0	0	0	0	0	0	0	0	0	0	14.1	1.0
4	0	0	0	5.5	0	0	0	0	0	0	28.0	0
5	0	0	0	0	0	0	0	0	0	0	1.0	0
6	0	0	0	0	0	1.6	0	0	0	0	89.3	0
7	0	0	0	0	0	5.1	0	0	0	0	4.5	2.0
8	1.3	0	36.4	3.7	0	0	0	0	0	0	17.3	4.9
9	48.3	0	5.6	12.6	0	0	0	0	0	0	13.5	1.0
10	0.8	0	48.5	12.0	0	0	0	0	0	0	0	0.7
11	0	0	0.5	17.8	0	0	0	0	0	0	0	7.6
12	1.1	0	0	2.2	0	0	0	0	0	11.5	2.7	23.5
13	0	0	2.5	28.4	0	0	0	30.4	0	0	7.0	12.3
14	4.1	0	1.9	0	0	0	0	1.4	0	13.4	41.7	6.4
15	0	0	0	0	0	0	0.7	0	0	0	14.5	1.0
16	0	0	0	0	0	0	0	16.7	0	0	0	0
17	0	0	0	0	0	0	0	1.2	0	0	3.7	17.4
18	0	0	0	0	0	0	0	0	0	7.7	0	0
19	0	0	0	0	2.3	0	0	11.5	0	1.8	3.6	0
20	0	0	0	0	0	0	0	2.0	0	0	5.3	3.8
21	0	0	0	0	0	0	0	0.6	0	0	5.6	33.1
22	0	0	0	0	0	0	0	0	0	0	3.2	11.1
23	0	0	0	0	6.0	0	0	0	0	0	0.6	41.4
24	0	0	16.7	0	0	0	0	0	0	0	0.1	8.8
25	9.3	0	0	0	0	0	0	0	0	0	0	39.8
26	8.3	0	0	0	0	0	0	0	0	0	0	58.1
27	0	0	8.3	8.1	0	0	0	0	0	0	0.4	1.6
28	0	0	0	67.1	0	0	0	0	0	1.1	0	0
29	0		0	0	0	0	0	0	1.3	3.1	0.2	0
30	0		1.0	0	0	0	0	0	0	0	0.5	0
31	0		0		0		0	0		7.1		0
Total	**73.2**	**0.0**	**121.4**	**157.4**	**8.3**	**6.7**	**0.7**	**63.8**	**1.3**	**45.7**	**288.9**	**307.7**
											Total	**1075.1**

Year: 2010

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	0	0	0	0	0	26.0	0	1.2
2	0	0	0	0	0	0	0	0	0	19.2	0	47.1
3	0	0	0	0	0	0	0	0	0	0.6	3.1	12.0
4	0	0	0	18.9	0	0	0	0	0	0	26.2	15.0
5	0	0	0	2.0	0	0	0	0	0	6.2	10.5	52.3
6	0	0	0	0	1.7	0	0.8	0	0	0	0	0
7	0	0	0	9.5	22.5	0	7.8	0	0	0	0	19.3
8	0	0	0	0	27.0	0	3.1	0	0	0	0	5.5
9	8.0	0	0	0	0	0	0.4	0	0	0	3.3	0
10	0	0	0	0	0	1.4	4.1	0	0.5	0	3.2	0
11	6.8	0	0	0	0	0	0.2	32.9	20.5	0	0	0
12	0	0	0	0	0	0	0	0	8.4	0	10.9	0
13	0	0	0	0	0	0.5	0	0	0.2	0	1.4	0
14	0	0	0	0	0	0	0	23.7	0	0	0	26.5
15	0	0	0	2.6	0	0	0	1.1	0	0	0	0
16	4.3	13.4	0	26.7	0	0	0	0	0	0	0.5	0
17	0	0	0	63.3	2.7	0	0	0	0	0	98.6	0
18	21.3	0	0	3.5	7.9	0	0	0	0	0	2.0	0
19	0	0	0	0	0	0	0	6.1	0	0	1.7	0
20	0	0	0	0	0.6	0	0	56.8	45.1	0	0.6	7.2
21	0	0	0	0	0	0	0	29.0	5.1	0	5.1	32.9
22	0	0	0	0	0	0	0	0	4.7	0	14.2	0
23	0	0	0	30.9	0	0	0	0	0.3	0	3.5	61.8
24	0	0	6.5	0	0	0	0	0	4.2	0	67.2	9.8
25	0	0	0	0	0	0	0	0	0	0	36.6	3.3
26	0	0	1.4	18.1	0	0	0	0	12.9	0	8.3	0.4
27	0	0	12.8	16.3	0	0	0	0	0	2.2	5.8	4.8
28	0	0	5.6	0	0	0	0	0	88.8	1.6	2.2	1.7
29	0		0.5	0	0	0.7	0	0	1.8	43.5	3.1	14.1
30	0		0	59.5	0	0	0	0	70.8	35.0	68.5	10.7
31	0		0		0		0	0		0.6		2.2
Total	**40.4**	**13.4**	**26.8**	**251.3**	**62.4**	**2.6**	**16.4**	**149.6**	**263.3**	**134.9**	**376.5**	**327.8**
											Total	**1665.4**

Station Name: Wahalkada
LAT: 8.73N LON: 80.85E EV: 92.5m

Year: 1997 (Unit: mm)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	-	-	-	-	-	-	-	-	-	-	-	7.2
2	-	-	-	-	-	-	-	-	-	-	-	43.4
3	-	-	-	-	-	-	-	-	-	-	-	6.3
4	-	-	-	-	-	-	-	-	-	-	-	59.5
5	-	-	-	-	-	-	-	-	-	-	-	0
6	-	-	-	-	-	-	-	-	-	-	-	0
7	-	-	-	-	-	-	-	-	-	-	-	6.4
8	-	-	-	-	-	-	-	-	-	-	-	0
9	-	-	-	-	-	-	-	-	-	-	-	14.5
10	-	-	-	-	-	-	-	-	-	-	-	3.0
11	-	-	-	-	-	-	-	-	-	-	-	0
12	-	-	-	-	-	-	-	-	-	-	-	5.4
13	-	-	-	-	-	-	-	-	-	-	-	7.5
14	-	-	-	-	-	-	-	-	-	-	-	4.0
15	-	-	-	-	-	-	-	-	-	-	-	5.2
16	-	-	-	-	-	-	-	-	-	-	-	8.0
17	-	-	-	-	-	-	-	-	-	-	-	29.0
18	-	-	-	-	-	-	-	-	-	-	-	0
19	-	-	-	-	-	-	-	-	-	-	-	0
20	-	-	-	-	-	-	-	-	-	-	-	0
21	-	-	-	-	-	-	-	-	-	-	-	0
22	-	-	-	-	-	-	-	-	-	-	-	5.0
23	-	-	-	-	-	-	-	-	-	-	-	0
24	-	-	-	-	-	-	-	-	-	-	-	0
25	-	-	-	-	-	-	-	-	-	-	-	0
26	-	-	-	-	-	-	-	-	-	-	-	0
27	-	-	-	-	-	-	-	-	-	-	-	0
28	-	-	-	-	-	-	-	-	-	-	-	3.0
29	-		-	-	-	-	-	-	-	-	-	0
30	-		-	-	-	-	-	-	-	-	-	0
31	-		-	-	-		-	-		-		47.7
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**255.1**
											Total	**255.1**

Year: 1998

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	31.4	0	0	0	0	0	0	10.0	0	0	5.0	19.0
2	12.4	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	19.0	0	0	4.0
5	0	0	0	0	0	0	0	0	0	0	0	24.0
6	0	0	0	0	0	0	0	0	0	0	18.0	63.0
7	3.1	0	0	0	0	0	0	0	0	0	0	3.0
8	0	0	0	0	0	0	0	0	0	0	0	46.0
9	13.0	0	0	0	40.5	0	0	0	0	0	11.0	25.0
10	0	0	0	0	0	0	0	0	0	0	5.0	3.5
11	0	0	0	0	0	0	0	0	0	0	110.0	2.0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	13.0	0	5.0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	20.0	0
15	0	0	0	0	40.7	0	0	0	0	0	0	4.5
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	16.0	0	0	0	0	18.2
18	0	0	0	0	0	0	0	13.5	0	0	14.0	0
19	0	0	0	0	0	0	5.0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	113.0	0	0
24	0	0	0	0	0	0	0	0	27.0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	25.0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	65.0
28	0	0	0	0	0	0	0	0	0	0	0	41.0
29	0		0	0	0	0	0	0	0	0	0	95.0
30	0		0	0	0	0	0	0	0	0	0	176.0
31	0		0		0		0	0		0		73.0
Total	**59.9**	**0.0**	**0.0**	**0.0**	**94.2**	**0.0**	**26.0**	**23.5**	**71.0**	**113.0**	**183.0**	**662.2**
											Total	**1232.8**

Year: 1999

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	20.5	0	0	0	0	0	0	0	0	0	22.5	-
2	81.5	0	0	0	0	0	0	0	0	8.1	10.2	-
3	0	0	0	0	0	0	0	0	0	0	8.1	-
4	0	0	0	77.1	0	0	0	0	0	2.3	2.3	-
5	99.0	0	0	0	0	0	0	0	0	5.3	5.3	-
6	80.3	0	0	0	0	0	0	0	0	0	0	-
7	11.4	0	0	0	0	0	0	0	0	15.2	15.2	-
8	0	0	0	0	0	0	0	0	0	30.4	11.6	-
9	0	11.0	0	0	0	0	0	0	0	20.5	45.2	-
10	0	0	0	0	0	0	0	0	0	39.5	0	-
11	0	0	0	0	0	0	0	0	0	4.2	0	-
12	2.4	0	0	0	0	0	0	0	0	0	0	-
13	0	0	0	0	0	0	0	0	0	0	0	-
14	0	0	0	0	0	0	0	0	0	0	0	-
15	24.2	0	0	0	0	0	0	0	0	0	0	-
16	0	0	0	0	0	0	0	0	0	0	0	-
17	0	0	0	0	0	0	0	0	0	0	14.3	-
18	0	0	0	0	0	0	0	0	0	0	0	-
19	7.4	32.0	0	0	0	0	0	0	0	0	0	-
20	61.0	5.0	0	8.0	0	0	0	0	0	0	92.3	-
21	0	165.2	0	3.0	0	0	0	0	0	0	49.3	-
22	0	0	0	36.1	0	0	0	0	4.0	0	18.5	-
23	0	0	0	0	0	0	0	0	0	19.3	0	-
24	0	0	0	0	0	0	0	0	3.0	0	0	-
25	0	8.0	0	0	0	0	0	0	0	0	16.5	-
26	0	0	0	0	0	0	0	0	97.6	0	0	-
27	0	6.0	0	0	0	0	0	0	45.5	19.2	0	-
28	0	0	0	0	0	0	0	0	0	34.1	14.0	-
29	0		0	0	0	26.1	0	0	22.5	0	34.2	-
30	0		0	0	0	0	0	0	10.2	0	0	-
31	0		0	0	0		0	0		0		-
Total	**387.7**	**227.2**	**0.0**	**124.2**	**0.0**	**26.1**	**0.0**	**0.0**	**182.8**	**198.1**	**359.5**	**-**
											Total	**1505.6**

Year: 2000

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	63.3	0	0	0	0	0	13.2	0	0	0	0
3	27.5	17.2	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	6.0	0	0	0	0
5	0	0	0	0	0	0	0	10.0	0	0	0	0
6	17.1	0	0	8.0	0	0	0	0	0	0	0	0
7	70.2	0	0	41.0	0	0	0	0	0	5.3	0	0
8	4.4	0	0	0	0	0	0	0	0	3.2	18.4	0
9	3.5	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	3.7	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	92.5	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	4.8	0	0	0	0	0	0	0	0	0	0	0
16	19.5	0	0	0	0	0	0	0	0	0	0	0
17	11.9	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	100.3	8.0
19	0	37.0	0	0	0	0	0	0	0	0	110.3	0
20	0	0	0	0	0	0	0	0	7.3	0	27.4	0
21	0	0	0	8.0	0	0	0	0	0	0	40.5	0
22	0	0	0	20.0	0	0	0	0	0	0	0	0
23	0	69.1	0	0	0	0	0	0	19.5	0	17.0	15.1
24	0	0	0	0	5.0	0	0	0	22.2	0	0	39.0
25	0	28.2	0	0	13.0	0	0	0	84.4	0	0	50.0
26	0	9.0	0	0	0	0	0	0	0	0	0	22.5
27	0	0	0	0	20.7	0	0	0	0	0	0	250.0
28	0	0	0	0	0	0	0	0	0	0	0	45.3
29	0	56.3	0	0	0	0	0	0	0	0	0	0
30	0		0	0	0	0	0	0	0	0	0	0
31	0		0		8.0		0	0		0		0
Total	**162.6**	**280.1**	**0.0**	**77.0**	**46.7**	**0.0**	**0.0**	**29.2**	**133.4**	**8.5**	**406.4**	**429.9**
											Total	**1573.8**

Year: 2001

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	25.4	7.0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	40.3	0	0	0	0	0	0
3	0	0	0	0	0	37.5	0	0	0	0	0	0
4	0	0	0	17.0	0	0	0	0	0	10.5	28.0	0
5	0	0	0	4.3	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	11.3	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	10.0	0	0	47.3	0	0	0	0	0	0	0	0
14	0	0	0	13.3	0	0	0	0	0	0	10.5	0
15	0	0	0	0	0	0	0	0	0	0	8.0	0
16	0	0	0	0	0	0	0	0	26.5	0	30.0	0
17	0	0	0	0	0	0	0	0	30.3	0	0	0
18	0	0	0	0	0	0	0	0	23.5	0	0	0
19	0	0	0	0	0	0	0	0	0	35.2	0	7.5
20	110.0	0	0	0	0	0	0	0	0	0	0	22.0
21	0	0	0	0	0	0	0	0	0	10.5	11.5	47.0
22	0	0	0	0	0	0	5.0	0	0	0	27.0	41.0
23	0	0	0	0	0	0	0	0	0	0	17.5	0
24	7.0	0	0	0	0	0	0	0	0	50.2	0	87.3
25	17.5	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	27.0	0	0	10.5	0	14.0
27	7.0	0	0	3.7	0	0	28.3	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	16.0	0	5.0
29	0		0	63.2	0	0	0	0	0	0	0	0
30	0		0	0	0	0	0	0	0	0	0	14.4
31	0		0		0		8.5	0		0		0
Total	**188.2**	**7.0**	**0.0**	**148.8**	**0.0**	**77.8**	**68.8**	**0.0**	**80.3**	**132.9**	**132.5**	**238.2**
											Total	**1074.5**

Year: 2002

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	10.0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	7.5	0
3	0	0	0	0	0	0	0	0	0	0	43.0	0
4	0	0	0	0	0	0	0	0	0	0	4.0	30.5
5	38.0	0	0	0	0	0	0	0	0	0	25.0	5.0
6	77.3	0	0	0	0	0	0	0	0	0	0	12.5
7	0	0	0	0	0	0	0	0	0	0	0	33.7
8	0	0	0	0	0	30.5	0	0	0	0	0	17.0
9	0	0	0	0	0	0	0	0	0	0	24.4	10.5
10	0	0	0	0	0	0	0	0	0	0	0	3.0
11	3.0	0	0	0	0	0	0	0	0	0	0	26.5
12	11.5	0	0	0	0	0	0	0	0	0	0	28.5
13	0	0	0	0	0	0	0	0	0	0	0	76.8
14	0	0	0	0	0	0	0	0	0	0	6.0	45.6
15	0	0	0	0	0	0	0	0	0	0	7.5	8.0
16	0	0	0	0	0	0	0	0	0	0	0	57.6
17	0	0	0	0	0	0	0	0	0	0	33.7	46.7
18	0	0	0	0	0	0	0	0	0	0	11.6	37.5
19	0	0	0	0	0	0	0	0	0	17.5	23.0	0
20	0	0	0	65.0	0	0	0	0	0	20.6	45.0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	6.5	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	35.0	0	0
25	0	0	0	0	0	0	0	0	5.0	22.5	0	0
26	0	0	0	0	0	0	0	0	0	0.5	5.7	0
27	0	0	0	0	0	0	0	0	40.5	9.5	0	0
28	0	0	0	45.0	0	0	0	0	0	4.0	0	0
29	0		0	0	0	0	0	0	0	0	0	0
30	0		0	0	0	0	0	0	0	35.5	0	0
31	0		0		0		0	0		23.3		0
Total	**139.8**	**0.0**	**0.0**	**110.0**	**0.0**	**30.5**	**0.0**	**0.0**	**45.5**	**168.4**	**242.9**	**439.4**
											Total	**1176.5**

Year: 2003

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	0	0	0	28.0	0	0	0	4.0
2	0	0	0	0	0	0	0	0	0	0	0	15.6
3	0	13.0	0	0	0	0	0	0	0	0	0	12.2
4	5.4	0	0	0	0	0	0	0	6.5	0	0	0
5	6.2	0	0	0	0	0	0	0	0	0	0	13.3
6	28.4	8.5	0	0	0	0	0	0	0	0	0	5.5
7	15.0	39.7	0	0	0	0	0	0	0	0	35.6	0
8	0	0	0	0	0	0	0	0	0	0	18.0	0
9	10.4	0	0	0	0	0	56.6	0	0	0	0	0
10	117.5	0	0	0	0	0	8.0	0	0	0	11.0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	13.5	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	55.5	0	0	16.1	0
15	0	0	0	0	0	0	0	0	0	0	41.0	0
16	0	0	0	0	0	0	0	0	0	0	38.1	0
17	0	0	0	0	0	0	0	12.6	0	0	36.1	0
18	22.5	0	0	0	0	0	0	0	0	0	9.0	0
19	5.3	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	20.0	0	38.0	0
22	0	0	0	0	0	0	0	0	40.5	0	22.1	0
23	0	0	0	0	0	0	0	0	0	0	27.1	0
24	0	0	0	0	0	0	0	0	107.6	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	130.0	0
27	0	0	0	0	0	0	0	0	0	0	146.6	0
28	0	0	0	0	0	0	0	0	0	0	12.7	0
29	0		0	0	0	0	0	0	0	0	16.4	0
30	0		0	0	0	0	15.6	0	0	0	0	0
31	0		0		0		15.4	0		0		0
Total	**210.7**	**74.7**	**0.0**	**0.0**	**0.0**	**0.0**	**95.6**	**96.1**	**174.6**	**0.0**	**597.8**	**50.6**
											Total	**1300.1**

Year: 2004

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	22.0	0	0	0	0	0	0	24.5
2	0	0	0	0	34.5	0	0	0	0	0	0	10.0
3	0	0	0	0	0	0	0	0	0	1.0	34.0	15.4
4	0	0	0	0	8.2	0	0	0	0	0	27.5	20.2
5	0	0	0	0	3.0	0	0	0	0	0	0	18.3
6	0	0	0	15.0	8.5	0	0	0	0	0	52.4	0
7	0	0	0	0	8.0	0	0	0	0	0	14.2	0
8	0	0	0	0	0	0	0	0	0	55.6	0	0
9	0	0	0	0	0	0	0	0	0	3.5	0	0
10	0	0	0	0	0	0	0	0	0	5.4	24.3	0
11	0	0	0	0	0	0	0	0	0	0	5.2	40.2
12	0	0	0	0	0	0	0	0	0	0	17.7	156.3
13	0	0	0	0	0	0	0	0	50.0	8.0	15.4	39.0
14	0	0	0	0	0	0	0	0	0	26.5	5.0	5.3
15	0	0	0	0	0	0	0	0	0	0	36.2	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	48.7	6.5	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	29.0	0
20	0	0	0	0	0	0	0	0	0	23.4	9.2	0
21	0	0	0	0	0	0	0	0	28.5	0	12.4	0
22	0	0	0	0	0	0	0	0	5.4	0	68.3	0
23	0	0	0	0	0	0	0	0	0	0	21.0	0
24	0	0	0	0	0	0	0	0	8.4	0	8.2	44.3
25	0	0	0	0	0	0	0	60.4	0	64.3	14.3	0
26	0	0	0	19.0	0	0	0	17.0	40.7	42.2	22.4	0
27	0	0	0	0	0	0	0	5.5	0	20.5	20.5	0
28	0	0	0	0	13.5	0	0	0	0	12.0	9.0	0
29	0	0	0	0	0	0	0	0	0	54.5	2.0	0
30	0		0	0	0	0	0	0	0	0	0	108.0
31	0		0		0		0	0		8.0		0
Total	**0.0**	**0.0**	**0.0**	**34.0**	**97.7**	**0.0**	**0.0**	**82.9**	**181.7**	**331.4**	**448.2**	**481.5**
											Total	**1657.4**

Year: 2005

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	48.2	0	0	47.5	47.5	0	0	0
2	0	0	0	68.3	3.0	0	0	0	0	0	0	0
3	0	0	0	56.3	29.3	0	0	0	0	15.0	72.0	29.2
4	0	0	0	8.0	11.4	0	0	0	0	33.2	22.0	0
5	0	0	0	62.2	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	10.2	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	30.0	0
9	0	0	27.4	0	0	0	0	0	0	0	80.4	17.4
10	0	0	0	26.4	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	5.0	40.0	10.4
13	0	0	0	0	0	0	0	0	0	0	5.0	45.2
14	0	0	0	0	0	0	5.0	0	0	0	0	7.3
15	0	0	0	0	0	0	0	0	0	10.5	0	5.2
16	0	0	0	0	0	0	0	0	0	0	0	4.0
17	0	0	0	0	0	0	0	0	0	0	0	23.3
18	49.0	0	5.2	0	0	0	0	0	0	0	0	0
19	8.2	0	0	0	0	0	0	0	0	0	54.0	0
20	44.4	0	0	0	0	0	0	0	0	0	136.0	0
21	84.6	0	0	0	0	0	0	0	0	0	35.0	0
22	9.3	0	0	0	0	0	0	0	0	0	0	0
23	3.0	0	0	0	0	0	0	0	0	39.2	13.0	0
24	0	0	0	0	0	0	0	0	0	8.4	17.2	0
25	0	0	0	0	0	0	0	0	0	0	18.4	0
26	0	0	0	0	0	0	0	0	0	68.0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0		0	0	0	0	0	0	0	0	0	0
30	8.2		0	0	0	0	0	0	0	0	0	0
31	0		0		0		0	0		0		0
Total	**206.7**	**0.0**	**32.6**	**221.2**	**91.9**	**0.0**	**5.0**	**47.5**	**47.5**	**179.3**	**533.2**	**142.0**
											Total	**1506.9**

Year: 2006

DAY	JAN	FEB	MAR	PR	MAY	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	0	0	0	0	0	0	0	3.0	0
2	0	0	0	0	0	0	0	0	0	0	0	5.7	0
3	0	15.3	0	0	0	0	0	0	0	0	0	3.2	0
4	38.0	0	65.3	0	20.0	0	0	0	0	0	0	0	10.2
5	17.3	0	12.4	0	85.0	0	0	0	0	0	0	0	0
6	10.2	0	0	0	5.0	0	0	0	0	0	0	0	0
7	5.0	0	0	0	10.0	0	0	0	25.3	0	30.4	0	
8	0	0	0	0	5.0	0	0	0	4.4	0	0	0	
9	0	0	0	0	0	0	0	0	16.5	0	0	0	
10	0	12.2	0	0	0	0	0	0	0	0	0	6.0	
11	10.0	0	0	10.0	0	0	0	0	0	0	0	0	
12	0	0	0	0	0	0	0	0	0	5.0	0	50.3	
13	15.3	0	0	0	0	0	0	0	0	3.0	0	0	
14	30.0	0	0	0	0	0	0	0	0	4.0	0	0	
15	0	0	0	0	0	0	0	0	0	2.0	40.2	0	
16	0	0	0	0	0	0	0	0	0	0	20.0	0	
17	0	0	0	0	0	0	0	0	0	6.0	20.3	0	
18	0	0	0	0	0	0	0	0	0	0	55.8	0	
19	0	0	0	0	0	0	0	0	0	14.5	5.2	65.3	
20	0	0	0	0	0	0	0	0	0	5.5	15.0	0	
21	0	0	0	0	0	0	0	0	0	10.8	12.0	18.1	
22	0	0	0	0	0	0	0	0	0	25.4	0	0	
23	0	0	0	0	0	0	0	0	0	31.5	0	0	
24	0	0	0	0	0	0	0	0	0	71.5	0	0	
25	0	0	0	0	0	0	0	0	0	10.4	0	0	
26	0	0	0	0	0	0	0	0	0	15.5	0	0	
27	0	0	0	0	0	0	0	0	0	0	0	0	
28	24.4	0	0	0	0	0	0	0	0	33.3	35.3	0	
29	15.0		0	0	0	0	0	0	0	0	0	0	
30	0		0	0	0	0	0	0	0	0	0	0	
31	0		0	0	0		0	0		0		0	
Total	**165.2**	**27.5**	**77.7**	**10.0**	**125.0**	**0.0**	**0.0**	**0.0**	**46.2**	**238.4**	**246.1**	**149.9**	
											Total	**1086.0**	

Year: 2007

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	0	0	-	0	0	0	0	0
2	0	0	0	0	0	0	-	0	0	0	0	0
3	0	0	0	0	0	0	-	0	0	0	0	0
4	0	0	0	0	0	0	-	0	0	0	0	0
5	0	0	0	0	0	0	-	0	0	0	0	0
6	0	0	0	23.5	0	0	-	0	0	0	15.0	0
7	0	0	0	0	0	0	-	0	0	0	0	0
8	20.5	0	0	0	0	0	-	0	0	0	0	0
9	0	0	0	0	0	0	-	0	0	0	0	0
10	0	6.0	0	0	0	0	-	0	65.5	0	0	0
11	0	8.0	0	0	0	0	-	0	0	67.7	0	0
12	0	0	0	0	0	0	-	0	0	11.6	0	101.7
13	0	0	0	0	0	0	-	0	0	0	0	18.4
14	0	0	0	0	0	52.6	-	0	0	5.8	0	16.3
15	0	0	0	0	0	0	-	40.5	0	10.0	0	58.5
16	0	0	0	16.0	0	0	-	0	0	0	0	10.0
17	0	0	0	28.2	0	0	-	0	0	32.8	0	15.0
18	0	0	0	0	0	0	-	0	0	2.7	0	0
19	0	0	0	0	0	0	-	0	0	35.2	0	8.0
20	0	0	0	0	0	0	-	0	0	0	10.0	5.0
21	0	0	0	0	0	0	-	0	0	0	7.2	0
22	22.0	0	0	0	0	0	-	0	0	0	0	0
23	98.0	0	0	0	0	0	-	0	0	0	0	0
24	58.0	0	0	0	0	0	-	0	0	0	0	0
25	0	15.0	0	0	0	0	-	0	0	21.0	0	0
26	0	50.0	0	0	0	0	-	0	0	20.3	0	0
27	0	0	0	0	0	0	-	0	0	12.3	0	0
28	0	0	0	0	0	0	-	0	0	78.2	0	0
29	0		0	0	0	0	-	0	0	0	0	0
30	0		0	0	0	0	-	0	0	0	0	0
31	0		0	0	0		-	0		0		0
Total	**198.5**	**79.0**	**0.0**	**67.7**	**0.0**	**52.6**	**0.0**	**40.5**	**65.5**	**297.6**	**32.2**	**232.9**
											Total	**1066.5**

Year: 2008

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	13.0
5	5.0	0	0	0	0	0	0	0	0	0	0	56.0
6	0	0	0	0	0	0	0	0	0	0	0	7.0
7	0	68.6	40.6	0	0	0	0	0	0	0	0	0
8	0	10.0	20.8	0	0	0	0	0	0	0	0	0
9	0	0	85.5	0	0	0	0	0	0	0	0	7.0
10	0	0	110.6	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	26.0	15.0
12	0	0	0	0	0	0	0	0	0	0	15.6	0
13	0	0	0	0	0	0	65.0	0	0	0	0	0
14	0	0	32.7	0	0	0	0	0	0	0	0	10.7
15	0	0	18.5	0	0	0	0	60.7	0	0	0	25.5
16	0	0	10.0	0	0	0	0	0	0	5.7	0	15.8
17	0	0	38.0	0	0	0	0	50.0	0	10.0	0	0
18	0	0	0	0	0	0	0	1.8	0	0	15.7	85.8
19	0	0	0	0	0	0	35.7	0	0	0	20.0	0
20	0	0	0	0	0	0	0	0	0	0	12.5	0
21	0	0	0	0	0	0	0	0	0	0	22.5	0
22	0	0	0	0	0	0	0	0	0	0	18.7	0
23	0	0	31.7	0	0	0	55.8	0	0	0	95.7	0
24	0	0	0	0	0	0	0	0	0	0	122.8	0
25	0	0	0	0	0	0	0	20.0	0	0	15.0	0
26	0	32.5	10.0	0	0	0	0	30.7	0	0	0	0
27	0	52.8	0	0	0	0	0	40.5	0	0	0	0
28	0	0	0	0	0	0	0	160.6	0	0	12.0	0
29	0	10.0	0	0	0	0	0	60.5	0	0	0	0
30	0		0	0	0	0	0	0	0	0	0	0
31	0		12.5		0		0	0		0		0
Total	**5.0**	**173.9**	**410.9**	**0.0**	**0.0**	**0.0**	**156.5**	**424.8**	**0.0**	**15.7**	**376.5**	**235.8**
											Total	**1799.1**

Year: 2009

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	0	0	0	0	0	0	0	58.0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	14.0
5	0	0	0	0	43.0	0	0	0	0	0	50.7	10.0
6	0	0	0	0	0	0	0	0	0	0	6.0	0
7	0	0	0	0	0	0	0	0	0	0	8.0	2.7
8	0	0	0	0	0	0	0	0	0	0	0	65.5
9	5.0	0	112.6	0	0	0	0	0	0	0	0	0
10	0	0	13.0	62.0	0	0	0	0	0	0	0	0
11	0	0	26.0	40.0	0	0	0	0	0	0	0	10.0
12	0	0	0	0	0	0	0	0	0	0	45.0	0
13	0	0	0	0	0	0	0	0	0	0	10.5	12.0
14	10.0	0	0	0	0	0	0	0	0	0	9.4	0
15	0	0	0	0	0	0	0	0	0	0	14.5	50.5
16	17.0	0	0	0	0	0	0	0	0	0	27.5	0
17	0	0	0	0	0	0	0	0	0	0	82.0	0
18	0	0	0	0	0	0	0	0	0	0	17.0	0
19	0	0	0	0	27.0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	5.0
21	0	0	0	0	0	0	0	0	10.0	0	39.7	0
22	0	0	0	0	0	0	0	0	0	0	8.4	48.0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	38.7	0	0	0	0	50.0
25	26.5	0	0	0	0	0	30.5	0	0	0	0	67.0
26	18.0	0	0	0	0	0	0	0	0	0	0	45.0
27	0	0	0	0	0	0	0	0	0	0	0	20.0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0		0	0	0	0	0	0	0	0	0	0
30	0		0	0	0	0	0	0	0	0	0	0
31	0		0	0			0	0		0		0
Total	**76.5**	**0.0**	**151.6**	**102.0**	**70.0**	**0.0**	**69.2**	**0.0**	**10.0**	**0.0**	**318.7**	**457.7**
											Total	**1255.7**

Year: 2010

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	-	0	0	0	0	0	18.0	0	14.0
2	0	0	0	-	7.0	0	0	0	0	32.0	0	28.0
3	0	0	0	-	0	0	0	0	0	0	0	54.0
4	0	0	0	-	0	0	0	0	0	0	0	24.0
5	0	0	0	-	0	0	0	0	0	0	22.0	38.0
6	0	0	0	-	0	0	0	0	0	0	18.0	0
7	0	0	0	-	0	0	0	0	0	0	0	20.0
8	0	0	0	-	0	0	0	0	0	0	0	4.0
9	20.0	0	0	-	22.0	0	0	0	0	0	8.0	0
10	0	0	0	-	0	0	0	0	28.0	0	0	0
11	0	0	0	-	0	0	0	0	0	0	0	0
12	0	0	0	-	0	0	0	0	0	0	0	0
13	0	0	0	-	0	0	0	0	10.0	0	0	0
14	0	0	0	-	0	0	0	0	0	0	0	0
15	0	0	0	-	0	0	0	0	0	0	0	0
16	8.0	0	0	-	0	0	0	0	0	0	0	0
17	0	0	0	-	0	0	0	0	0	0	8.0	0
18	0	0	0	-	0	0	0	0	0	0	0	0
19	0	0	0	-	42.5	0	0	0	28.5	0	12.0	15.0
20	0	0	0	-	0	0	0	22.0	6.0	0	7.0	65.0
21	0	0	0	-	0	0	0	28.0	56.0	0	15.0	78.0
22	0	0	0	-	0	0	85.0	0	0	0	8.0	0
23	0	0	0	-	0	0	0	0	0	0	0	32.0
24	0	0	0	-	0	0	0	0	0	0	112.0	38.0
25	0	0	0	-	0	0	0	0	0	0	6.0	0
26	0	0	8.0	-	0	0	0	0	0	0	47.0	26.0
27	0	0	0	-	0	0	0	0	0	0	87.0	83.0
28	0	0	0	-	0	0	0	0	0	0	25.0	83.0
29	0		0	-	0	0	0	0	28.0	0	30.0	18.0
30	0		0	-	0	0	0	0	0	40.0	70.0	18.0
31	0		0	-			0	0		28.0		5.0
Total	**28.0**	**0.0**	**8.0**	**0.0**	**71.5**	**0.0**	**85.0**	**50.0**	**156.5**	**118.0**	**475.0**	**643.0**
											Total	**1635.0**

Year: 2011

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	125.0	0	0	0	0	0	0	0	0	0	0
4	43.0	46.0	0	0	0	0	0	0	0	0	0	0
5	30.0	26.0	0	0	0	0	0	0	0	0	110.0	0
6	10.0	139.0	0	0	0	0	0	0	0	0	0	0
7	0	32.0	0	0	0	0	0	0	0	0	0	0
8	85.0	0	0	0	0	0	0	0	0	0	0	0
9	42.0	0	0	0	0	0	0	0	0	0	0	0
10	48.0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	48.0	0	0	0	0	0	0	8.0	0	0	0	8.0
13	32.0	0	0	0	0	0	0	6.0	0	6.0	0	75.0
14	0	0	0	0	0	0	0	13.0	0	10.0	0	55.0
15	22.0	0	0	0	0	0	0	0	0	20.4	0	37.0
16	0	0	0	0	0	0	0	13.0	0	43.3	0	0
17	0	0	0	0	0	0	0	23.0	0	62.0	0	0
18	0	0	0	0	0	0	0	0	0	0	20.0	17.0
19	0	0	0	0	0	0	0	0	0	0	40.0	37.0
20	0	0	0	0	0	0	0	0	0	8.0	68.0	74.0
21	0	0	0	0	0	0	0	0	0	12.0	48.0	12.0
22	0	0	0	0	0	0	0	0	0	9.0	41.0	0
23	0	0	0	8	0	0	0	0	0	6.0	66.0	18.0
24	0	0	0	0	0	0	0	0	0	18.0	36.0	0
25	0	0	0	0	0	0	0	0	0	30.0	34.0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	70.0	0	0	0	0	0	20.0	24.0	0
28	0	0	0	60.0	0	0	0	0	0	10.0	0	0
29	0		0	0	0	0	0	0	0	12.0	0	0
30	192.0		0	0	0	0	0	0	0	58.0	0	0
31	35.0		0		0		0	0		4.0		0
Total	**587.0**	**368.0**	**0.0**	**138.0**	**0.0**	**0.0**	**0.0**	**63.0**	**0.0**	**328.7**	**487.0**	**333.0**
											Total	**2304.7**

Appendix 4.3(e)
Water Storage & Level in Mahakanadarawa & Wahalkada Wewa
Mahakanadarawa Wewa Record of Water Storage Capacity

2011 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	36250	36250	31125	28600	33900	25000	15500	8100	5600	5150	12000	33900
2	36250	36250	32000	28600	33800	24000	15400	7800	5600	5150	12400	33250
3	36250	36250	32100	28600	33500	23500	15200	7500	5600	5150	12600	32800
4	36250	36250	32100	28500	33000	23500	14900	7300	5600	5150	12900	32800
5	36250	36250	32100	28500	32800	23500	14600	7000	5600	5150	13000	32600
6	36250	36250	32100	28500	32600	22450	14200		5500	2941	13000	32400
7	36250	36250	32100	28400	32100	22450	14000		5500	2941	13000	32100
8	36250	36250	32000	28400	32000	22350	14000		5500	2941	13000	32000
9	36250	36250	31125	28400	31125	22300	14000	6150	5400	2941	12900	31500
10	36250	35750	30750	28400	30750	22000	13800	6100	5400	2941	12900	31125
11	36250	34250	30500	28200	30750	21500	13600	6000	5400	2941	12900	30750
12	36250	34750	30300	28200	30750	21200	13250	6000	5400	2941	12900	31125
13	36250	35250	30000	28200	30750	20450	12800	6000	5400	2941	12900	34250
14	36250	34750	28750	28200	30300	20000	12400	6000	5350	2941	12900	36250
15	36250	34750	28750	28200	30000	20000	12000	6000	5350	5150	12800	36250
16	36250	34250	28600	28200	28850	20000	11400	6000	5350	5300	12500	36250
17	36250	33900	28600	28200	28600	20000	11200	5900	5350	5800	12300	36250
18	36250	33800	28600	28400	28600	20000	11200	5900	5350	5800	12000	36250
19	36250	33500	28500	28400	28600	19850	11200	5900	5300	6000	12600	36250
20	36250	33000	28500	28600	28600	19500	11200	5850	5300	6000	12600	36250
21	36250	32800	28500	31312.5	28500	19200	10700	5850	5300	6000	12500	36250
22	36250	32600	28500	33900	28400	18250	10400	5850	5300	6900	13800	36250
23	36250	32600	28500	33900	28000	17800	10200	5850	5250	7400	15200	36250
24	36250	32600	28500	36250	27850	17500	9900	5800	5250	7800	16400	36250
25	35750	32400	28500	36250	27000		9600	5800	5250	7900	19700	34250
26	35500	32100	28400	36250	26750		9300	5800	5250	8100	28850	34250
27	35750	32000	28400	36250	26750	16700	9000	5800	5200	8400	36250	34250
28	35750	31500	28400	35750	26750	16600	8800	5700	5200	9000	36250	34250
29	36250			35250	26000	16500	8700	5700	5200	9900	36250	34250
30	36250			34250	25700	16200	8600	5700	5200	10500	34250	34250
31	36250				25400		8300	5700		11400		34250
Ave.	36,177	34,386	29,868	30,569	29,628	20,439	11,915	6,180	5,375	5,793	16,785	34,165

2010 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	18250	16400	10300	10000	10600	14650	12500	10950	9900	10800	11400	16200
2	18600	16400	10100	10000	10600	14500	12450	10800	9800	11100	11400	16800
3	18600	16400	9900	10000	10600	14400	12400	10750	9800	11600	11400	17500
4	18600	16000	9700	10000	10600	14300	12350	10650	9800	11600	11400	19300
5	18600	15500	9600	10000	10550	14200	12350	10600	9700	11800	11500	20650
6	18600	15400	9400	10000	10500	14100	12350	10500	9700	11800	11600	22500
7	18250	15200	9200	10000	10500	14100	12350	10400	9700	11800	11600	25000
8	17800	15000	9000	10000	10800	14100	12350	10400	9700	11800	11600	26750
9	17600	14700	9000	9900	13800	14100	12350	10400	9600	11800	11600	28000
10	17500	14400	9000	9900	14900	14100	12350	10400	9600	11800	11800	28400
11	17800	14000	9000	9900	15200	13900	12350	10400	9600	11800	11800	28500
12	18000	13700	9000	9800	15200	13800	12350	10350	9600	11800	11800	28500
13	18250	13600	8900	9800	15200	13375	12300	10350	9600	11800	12000	28500
14	18250	13500	8900	9800	15200	13700	12200	10350	9600	11800	12000	28400
15	18250	13000	8900	9900	15200	13700	12100	10250	9500	11800	12000	28000
16	18250	12800	8900	9900	15000	13650	11900	10200	9500	11600	12000	28000
17	18600	12500	8900	9900	14950	13650	11800	10150	9500	11600	12000	27850
18	19000	12300	8900	9900	14300	13500	11600	10100	9500	11600	12200	27500
19	19000	12000	8900	10000	15000	13375	11600	10000	9500	11600	12200	27500
20	19200	11800	8800	10000	15000	13250	11600	10000	9400	11600	12300	27000
21	19000	11800	8800	10000	15000	13125	11550	10000	9400	11500	12300	27000
22	18250	11600	8800	10000	15000	11400	11550	10000	9900	11500	12600	28400
23	17800	11500	8800	10000	15000	11250	11550	10000	10000	11500	12800	28750
24	17500	11500	8800	10000	15000	13000	11550	10000	10000	11500	12600	30300
25	17400	11400	8800	10000	14950	13000	11400	10000	10000	11500	13800	32800
26	17000	11100	8800	10200		13000	11300	10000	10000	11400	14400	35750
27	16900	10700	8700	10500		13000	11200	9900	10000	11400	14400	Spilling
28	16800	10500	9100	10500		16650	11100	9800	10000	11400	14700	Spilling
29	16600		9500	10500		11150	10950	9800	10600	11400	15400	Spilling
30	16500		9700	10500			10950	9800	10600	11400	15500	Spilling
31	16400		9900				10950	9800		11400		Spilling
Ave.	17,973	13,382	9,161	10,030	13,546	13,587	11,860	10,229	9,770	11,574	12,470	26,302

Mahakanadarawa wewa

2009 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	36250	33000	22450	25000	21200	15200	9900	5250	4900	4300	3750	8300
2	36250	32800	22400	25000	21000	15000	9900	5150	4900	4300	3750	8250
3	36250	32600	22325	25000	20650	14700	9900	5050	4800	4300	3750	8200
4	36250	32100	22300	25000	20450	14400	9800	4900	4800	4250	3750	8100
5	35750	32000	22250	25000	19850	14000	9700	4750	4800	4250	3750	8000
6	35250	31125	22250	25000	19500	13700	9400	4600	4750	4250	3750	7900
7	34750	30500	22250	25000	19300	13600	9100	4450	4750	4250	4600	7900
8	34250	30300	22250	24690	19000	13600	8800	4400	4700	4200	5300	8000
9		30000	22250	24690	18600	13600	8600	4300	4700	4200	5500	8100
10	36250	28850	22325	25000	18000	13600	8300	4200	4700	4200	5700	8200
11		28850	22400	25000	18000	13600	8100	4100	4600	4200	5700	8250
12		28850	22400	25000	18000	13500	8000	3900	4600	4150	5700	8400
13		28850	22400	25000	18000	13250	8000	3800	4600	4150	5700	8800
14		28750	22400	25400	18000	12900	8000	3750	4600	4150	6000	9200
15		28500	23500	25400	18000	12500	8000	3700	4500	4100	6250	9500
16		28400	24000	25400	17600	12300	7900	3700	4500	4100	6500	9700
17	36250	28000	24000	25400	17400	12000	7900	4700	4500	4100	6500	9800
18	36250	27500	24000	25400	17000	11600	7600	4700	4500	4000	7500	9900
19	36250	26750	24000	25400	16800	11600	7400	5000	4450	4000	8000	9900
20	36250	26000	24000	25400	16700	11600	7100	5000	4450	4000	8400	9800
21	36250	25700	24000	25000	16700	11600	6900	5050	4450	3900	8500	9700
22	35750	25400	24000	24000	16700	11500	6700	5050	4450	3900	8900	10200
23	35250	25400	24000	22450	16600	11500	6500	5050	4400	3900	9000	11300
24	34750	25400	24000	22400	16500	11500	6300	5050	4400	3800	9200	12500
25	34250	25400	25000	22325	16400	11200	6200	5050	4400	3800	9300	13800
26	33900	25000	25000	22250	15750	10700	6200	5000	4350	3800	9200	15400
27	33800	24500	25000	21500	15500	10400	6200	5000	4350	3800	9100	16400
28	33500	24000	25000	21500	15400	10200	6150	5000	4350	3750	8700	17000
29	33000		25000	21500	15400	10000	5900	5000	4350	3750	8600	17800
30	33000		25000	21500	15400	9900	5700	5000	4300	3750	8400	18000
31	33000		25000		15400		5400	4900		3750		18250
Ave.	35,113	28,376	23,456	24,220	17,703	12,492	7,727	4,663	4,563	4,044	6,625	10,792

2008 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	30000	30500	28500	spilling	spilling	25700	14900	8500	9800	9300	10500	9700
2	28850	30300	28500	spilling	36250	25400	14700	8400	9800	9200	10500	9800
3	28850	30200	28500	spilling	35750	25100	14700	8400	9800	9300	10500	9900
4	28850	30200	28500	spilling	35750	24500	14700	8400	9800	9200	10500	10100
5	30200	30200	28600	spilling	35250	24000	14700	8400	9800	9200	10500	10100
6	30300	30200	28600	spilling	35250	22450	14400	8400	9800	9300	10500	9900
7	30500	30000	28750	spilling	34750	22450	14000	8300	9800	9300	10500	10200
8	31900	30000	28750	spilling	34250	22450	13700	8300	9700	9300	10500	14200
9	31900	30200	28750	spilling	33900	22450	13500	8300	9700	9300	10200	16600
10	32600	30200	30300	spilling	33500	22400	12900	8300	9700	9300	10000	19500
11	33000	30200	32100	spilling	33000	22325	12500	8300	9700	9400	9800	22350
12	33500	30200	33000	spilling	32800	22250	12200	8300	9700	9500	9600	25500
13	33600	30000	33900	spilling	32800	21750	11800	8300	9700	9700	9400	26000
14	33800	30000	34750	spilling	32800	21400	11500	8250	9700	9900	9100	27000
15	33500	28750	35750	spilling	32600	21000	11200	8250	9700	9900	8800	27000
16	33000	28600	spilling	spilling	32400	20650	10700	8250	9600	9900	8500	28000
17	32800	28600	spilling	spilling	32000	20000	10700	8250	9600	9900	8300	30300
18	32600	28600	spilling	spilling	31125	19700	10700	8250	9600	10000	8200	34750
19	32600	28600	spilling	36250	30500	19300	10700	8250	9600	10000	7900	spilling
20	32600	28600	spilling	36250	30200	19000	10400	8200	9600	10100	7600	
21	32400	28600	spilling	36250	28850	18250	10100	8200	9600	10100	7450	
22	32600	28600	spilling	36250	28750	17800	9900	8200	9500	10200	7200	spilling
23	32800	28600	spilling	36250	28500	17500	9600	8200	9500	10200	7000	spilling
24	32800	28500	spilling	35750	28400	17250	9300	8200	9500	10300	7450	spilling
25	32800	28400	spilling	34750	28200	16700	9100	8100	9500	10300	7800	spilling
26	32400	28200	spilling	34750	28200	16500	8000	8100	9400	10400	8250	spilling
27	32100	28200	spilling	spilling	28200	16200	8700	9200	9400	10400	8700	spilling
28	32000	28200	spilling	spilling	28000	15750	8500	9600	9400	10500	9000	spilling
29	31500	28400	spilling	spilling	27500	15500	8500	9700	9300	10500	9300	spilling
30	30000		spilling	spilling	26750	15200	8500	9700	9300	10600	9600	36250
31			spilling		26000		8500	9700		10500		36250
Ave.	31,878	29,305	30,483	35,813	31,408	20,364	11,397	8,490	9,620	9,839	9,105	20,670

Mahakanadarawa wewa

2007 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	16900	17400	13700	12300	13000	9800	7500	6300	5100	4900	11000	9200
2	16800	17250	13500	12300	13000	9600	7450	6200	5100	4900	11100	9200
3	16700	16900	13250	12300	13000	9400	7450	6150	5100	4900	11200	9200
4	16600	16800	12900	12300	13000	9200	7450	6100	5100	4900	11300	9200
5	16600	16700	12900	12200	12900	9200	7450	6100	5050	4900	11200	9200
6	16500	16600	12900	12200	12800	9200	7450	6100	5050	4900	11100	9100
7	16500	16500	12900	12200	12600	9200	7400	6100	5050	4900	11100	9000
8	16500	16400	12900	12200	12400	9200	7400	6100	5150	4900	11200	8800
9	16700	16000	12900	12200	12000	9200	7200	6000	5150	4900	11200	8600
10	16800	15750	12900	12200	11600	9200	7000	6000	5150	4900	11100	8400
11	16900	15750	12900	12200	11500	9200	6900	5850	5150	4900	11100	8400
12	17000	15600	12900	12200	11300	9200	6700	5700	5150	4900	10600	7800
13	17000	15600	12900	12200	11300	9200	6600	5500	5150	5000	10400	7900
14	17250	15600	12900	12200	11300	9000	6600	5350	5150	5050	10300	8100
15	17250	15400	12900	12200	11200	8900	6600	5250	5100	5050	10300	8800
16	17000	15200	12900	12200	11200	8600	6600	5150	5100	5100	10300	9600
17	16900	14700	12900	12200	11200	8500	6500	5150	5100	5100	10300	10200
18	16700	14900	12900	12200	11200	8400	6500	5150	5100	6200	10300	10800
19	16600	14700	12900	12200	11100	8400	6500	5150	5100	6200	10300	13700
20	16500	14600	12600	12200	11100	8400	6500	5150	5100	6200	10300	15400
21	16400	14400	12600	12800	10700	8400	6700	5150	5100	6200	10100	15400
22	16200	14400	12500	12800	10500	8400	6700	5150	5100	6200	9900	21200
23	16000	14400	12500	12900	10300	8400	6700	5150	5100	7000	9700	25200
24	15750	14400	12400	12900	10100	8400	6900	5100	5100	7000	9500	27000
25	15750	14400	12400	12900	10100	8400	6900	5100	5100	7400	9300	28500
26	15750	14400	12400	12900	10100	8400	6900	5100	5050	9100	9100	28750
27	16400		12400	13000	10100	8300	6900	5100	5050	9100	8900	28850
28	16700		12400	13000	10000	8200	6900	5100	5050	9600	8900	30000
29	16900		12300	13000	10000	7900	6900	5100	5000	10200	9000	30000
30	17000		12300	13000	10000	7700	6700	5100	5000	10500	9200	30000
31			12300		10000		6500	5100		10800		30000
Ave.	16,618	15,567	12,773	12,453	11,310	8,783	6,918	5,510	5,095	6,316	10,310	15,661

2006 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	8900	10100	9400	14900	13800	9500					2700	14900
2	9000	10100	9400	14900	13600	9400					2700	14900
3	9000	10000	9700	14900	13250	9200					2700	14900
4	9000	10400	10200	14900	13000	9100	5100				2700	14900
5	9000	10700	10400	14900	13000	9000	5050				2700	15000
6	9000	10800	10500	14900	13250	8900	4900				2700	15000
7	9100	10800	11500	14900	13500	8700	4700				2800	15000
8	9200	10800	12200	14900	13500	8500	4500				3400	15000
9	9300	10800	12300	14900	13500	8300	4350				3450	15000
10	9400	11100	12500	14900	13500	8200	4250				4000	14900
11	9400	11100	13000	14900	13250	800	4150				4300	14700
12	9500	11100	13800	14900	12900	7800	4000				4500	14700
13	10000	10800	14400	15000	12800	7500	3900				5000	14700
14	10400	10700	14400	14900	12500	7400	3750				5200	14700
15	11200	10800	14400	15200	12300	7200	3650				5350	14700
16	11600	10500	14400	15200	12200	700	3550				5500	14900
17	11600	10300	14400	15200	12000	6800	3450				5500	14900
18	12000	10200	14400	15200	12000	6700	3300				6900	14900
19	12200	10100	14400	15200	11600	6500	3250				7000	
20	12000	9900	14400	15200	11500	6500	3200				8800	
21	11600	9600	14400	15200	11400	6450	3000				9300	
22	11500	9400	14400	15400	11300	6300	2800				10200	
23	11300	9400	14400	15400	11200	6100					12200	
24	11100	9400	14400	15400	10800	6000				500	13250	
25	10700	9400	14400	15500	10600	5900				1000	13700	
26	10500	9400	14400	15400	10400	5850				2000	14000	
27	10400	9400	14400	15400	10200	5700				2300	14200	
28	10300	9400	14400		10000	5600				2400	14400	
29	10200				9900	5400				2400		
30	10100				9700	5350				2400		
31	10100				9600					2700		
Ave.	10,277	10,232	13,046	15,096	12,002	6,845	3,939	#DIV/0!	#DIV/0!	1,963	6,755	14,872

Mahakanadarawa wewa

2005 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	21000	21300	17800	17400	16600	12000	8600	5400	2900	2300	3250	6800
2	21200	21000	17800	17400	16500	12000	8400	5350	2900	2300	3250	6800
3	21200	21000	17800	17400	16400	12000	8250	5200	2900	2300	3300	6800
4	21200	21000	17800	17400	16200	12000	8100	5850	2900	2300	3450	6800
5	21400	21000	17800	17400	16200	12000	7100	5600	2900	2300	3550	6900
6	21500	21000	17800	17400	16200	11800	7300	5350	2800	2300	3550	7400
7	21500	21000	17800	17400	16000	11500	7450	5050	2800	2300	3600	7400
8	21500	21000	17600	17400	15750	11300	7400	4250	2800	2300	3650	7400
9	21400	21000	17600	17400	15600	11100	7400	4250	2800	2300	3650	7600
10	21200	21000	17600	17400	15500	10800	7400	3900	2800	2300	3750	7800
11	21000	21000	17600	17400	15200	10600	7200	3750	2800	2300		7900
12	21000	20650	17600	17400	14900	10300	6950	3650	2800	2300		7900
13	20650	20450	17600	17400	14800	10200	6700	3550	2800	2300		7900
14	20650	20000	17600	17400	14600	10200	6500	3450	2800	2300	4100	
15	20450	19850	17500	17400	14400	10200	6400	3300		2300	4150	
16	20000	19700	17500	17400	14250	10200	6400	3250		2300	4150	8400
17	20000	19700	17500	17400	14250	10100	6400	3200		2800	4200	8600
18	20000	19550	17500	17400	14250	9900	6400	3100		2800	4300	8600
19	19850	19550	17500	17400	14000	9700	6400	3000		3000	4450	8600
20	19850	19300	17500	17400	13800		6400	3000		3000	4500	8700
21	20000	19300	17500	17500	13700		6400	3000		3000	4750	8700
22	21000	19300	17500	17500	13500		6400	3000		3100	5000	8700
23	21400	19300	17500	17500	13250	9200	6250	3000		3100	5150	8700
24	21500	19200	17500	17500	13250	9000	6200	3000		3100	5300	8700
25	21750	19200	17325	17500	13250	9000	6150	3000		3200	5500	8700
26	21750	18800	17325	17400	13250	9000	6100	2900		3250	6100	8700
27	21750	18000	17325	17400	13000	9000	5900	2900		3250	6500	8700
28	21500	17800	17325	17000	12900	9000	5800	2900		320	6700	8900
29	21400		17325	16700			5600	2900			6800	8900
30	21400		17325	16700			5400	2900			6800	8900
31	21400		17325				5400					8900
Ave.	21,013	20,034	17,551	17,357	14,696	10,484	6,734	3,765	2,836	2,526	4,572	8,097

2004 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	5850	3680	-	-	2800	-	-	-	Nil	-	3550	6300
2	5600	3680	-	-	2800	-	2700	-	Nil	-	3550	-
3	5350	3680	-	-	3000	-	2700	-	-	-	-	6400
4	5250	-	-	-	3250	3300	2700	-	-	-	-	6450
5	5100	-	2900	-	3450	3300	2500	-	-	-	-	6500
6	5000	3500	2900	-	3450	3300	2400	-	-	-	-	6600
7	4900	3450	2900	-	3450	3300	2300.00	-	-	-	-	6600
8	4800	3700	2900	-	3450	-	-	-	-	-	-	6700
9	4750	3700	2800	-	3450	-	2300.00	-	-	-	-	-
10	4600	3700	2800	-	3450	-	2300.00	-	Nil	-	-	6800.00
11	4450	3650	2800	-	3450	3250	2300.00	-	Nil	-	-	6800.00
12	4350	3600	2800	-	3450	3200	-	-	Nil	-	4300	6900.00
13	-	3550	2700	-	-	3200	-	-	Nil	-	-	8500
14	-	3500	2700	-	3450	3200	-	-	Nil	-	4350	11200
15	-	3450	-	-	3450	3200	-	-	Nil	-	4400	13500
16	3900	3400	-	-	3450	3000	2200	-	-	-	4600	16000
17	3800	-	-	-	3450	3000	2200	-	Nil	-	4900	17800
18	3750	-	-	-	3450	-	2200	-	Nil	-	-	19200
19	3700	-	-	-	-	-	2200	-	Nil	-	-	19500
20	3700	3200	-	-	3400	-	-	-	Nil	-	5050	19500
21	3680	3200	2700	-	3400	-	-	-	Nil	-	5100	19500
22	-	3200	2700	-	3400	-	-	-	Nil	-	5150	19750
23	3550	3200	2700	-	3400	-	2150	-	-	-	5400	-
24	3550	3200	2800	-	3400	-	2150	-	Nil	-	5700	-
25	3500	3100	2800	-	3300	2800	2150	-	Nil	-	5900	-
26	3450	-	-	-	-	2800	2150	-	Nil	-	6100	-
27	-	3100	-	-	-	2800	2000	Nil	Nil	-	6150	-
28	-	3100	-	-	-	2800	2000	Nil	Nil	-	6200	-
29	-	3100	-	-	-	2800	2000	Nil	Nil	2700	6250	-
30	3700		-	2700	-	-	-	Nil	-	-	6250	-
31	3700		-		-		-	Nil				-
Ave.	4,333	3,419	2,793	2,700	3,348	3,078	2,280	#DIV/0!	#DIV/0!	2,700	5,161	11,525

Mahakanadarawa wewa

2003 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	36250	34250	32100	28500	-	24000	17500	12400	-	8900	6900	6950
2	35250	33800	32000	28500	-	22450	17500	12300	-	-	6700	-
3	35250	33800	31500	28400	-	22450	-	12300	-	9200	6450	-
4	34250	33800	31000	28400	-	23470	17000	12300	-	9200	-	-
5	34250	33800	31000	28400	-	23470	16900	12300	-	9200	-	6950
6	35250	34250	30500	28400	-	23470	16900	12300	-	9200	-	6950
7	Spilling	33900	30500	28400	-	23470	16900	12300	-	9200	5800	7000
8	Spilling	33900	30300	28200	-	23470	16700	12300	-	9200	5600	7000
9	Spilling	33900	30200	28200	-	23470	-	12000	-	-	5400	7000
10	Spilling	33900	30000	-	-	21625	-	11000	-	9200	5350	7000
11	Spilling	33900	28850	-	-	21625	16450	11400	-	9200	-	-
12	Spilling	33900	28750	-	-	-	16200	11200	9400	9100	-	-
13	Spilling	34250	28600	-	-	-	15875	-	9300	9200	-	-
14	Spilling	33800	28500	-	-	-	15675	-	9300	9200	-	-
15	Spilling	33500	28200	-	27500	-	15600	10500	9300	9200	-	-
16	Spilling	33500	28000	-	27000	-	15600	10300	-	9200	-	-
17	Spilling	33000	28000	28200	27000	-	-	10100	-	9200	-	-
18	Spilling	33000	28000	28200	27000	-	-	10100	-	9200	-	-
19	Spilling	33000	28000	28200	27000	-	-	10100	9100	9200	-	6200
20	Spilling	33000	28000	28200	27000	-	-	10100	9100	9200	-	6200
21	Spilling	33800	28000	28200	27000	-	-	10000	9100	9000	5100	6150
22	Spilling	33800	28500	28500	-	-	-	-	9100	8800	5150	6100
23	Spilling	33800	28500	28500	-	-	-	-	-	8600	5200	6000
24	Spilling	33500	28600	-	-	-	-	-	-	8400	5200	5900
25	Spilling	33500	28750	-	-	-	14000	-	-	8250	5200	5850
26	36250	33500	28750	-	-	19700	13700	-	8900	8100	5200	5850
27	36250	32600	28600	-	-	19500	13700	-	8800	8000	5250	5850
28	35750	32400	28600	-	-	19300	13700	-	8800	7800	5700	5850
29	35750		28600	-	25500	19100	13600	-	8800	7500	6150	5800
30	34750		28500	-	25300	18900	13250	-	8800	-	6900	5800
31	34250		28500		25000		12900	-		7000		5900
Ave.	35,292	33,609	29,223	28,338	26,530	21,842	15,483	11,332	9,062	8,809	5,721	6,315

2002 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	11500	10400	9800	8600	-	8800	7000	5250.00	3700	3100	3550	9000
2	-	10300	9700	8600	10700	8800	6950	5200	3700	3100	3600	8800
3	11600	10200	9400	8600	10700	8700	6900	5150	3650	3100	3800	9000
4	11800	10000	9200	8600	10700	8700	6900	5150	3600	3100	4000	9000
5	12000	10000	9000	8600	10700	8700	6900	5100	3600	3200	4200	9300
6	12200	-	9100	8600	10700	8400	6850	5100	3550	3200	4350	9600
7	12200	10000	9200	8700	-	8300	6850	5050	3550	3250	4200	9900
8	12200	10000	9200	8700	-	8300	6800	5000	3500	3250	4250	10400
9	12200	10000	9200	8700	10600	8250	6800	4900	3450	3250	4300	10700
10	12200	10100	9200	8700	10600	8250	6800	4800	3450	3450	4350	12200
11	12000	10500	9200	9000	10500	8200	6600	4750	3400	3450	4400	13000
12	11800	10800	9100	9100	10500	8200	6500	4700	3425	3450	4400	13700
13	11600	11200	9100	9200	10400	8100	6450	4600	3425	3450	4400	15200
14	11600	11300	9100	9300	-	7900	6300	4500	3425	3450	4450	18000
15	11500	11300	9100	9400	-	7800	6250	4450	3400	3450	4500	20000
16	11500	11200	9000	9500	10100	7800	6200	4400	3400	3450	4600	22300
17	11500	11100	9000	9600	10000	7800	6150	4350	3400	3300	4700	33900
18	11400	10800	9000	-	9900	7800	6100	4300	3400	3300	4750	31500
19	11400	10600	9000	-	9800	7800	6000	4250	3250	3300	4800	Spilling
20	11300	10500	8800	-	9700	7700	5900	4200	3250	3400	4900	Spilling
21	11200	10400	8600	-	9600	7600	5900	4150	3200	3400	7600	Spilling
22	11100	10300	8400	-	9500	7500	5900	4100	3200	3400	8200	Spilling
23	10800	10200	8300	-	9400	7450	5850	4000	3100	3400	8400	Spilling
24	10600	10200	8300	-	9300	7450	5850	4000	3100	3400	8600	Spilling
25	10500	10200	8300	9900	9200	7450	5800	4000	3100	3400	8800	Spilling
26	10500	10200	8300	9900	9100	7400	5700	4000	3100	3350	9000	Spilling
27	10500	10100	8300	10100	9000	7400	5600	4000	3100	3350	9000	Spilling
28	10500	9900	8250	10200	8900	7300	5500	3900	3100	3350	9000	Spilling
29	10500		8250	10300	8900	7200	5400	3800	3100	3350	9000	Spilling
30	10500		8250	10300	8800	7100	5350	3750	3100	3350	9000	36250
31	10400		8250		8800		5300	3750		3450		36250
Ave.	11,353	10,437	8,868	9,226	9,850	7,938	6,237	4,473	3,358	3,329	5,770	16,900

Mahakanadarawa wewa

2001 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	NA	NA		-	-	-	-	-	-	-	6900	-
2				-	-	-	-	7700	-	-	6900	-
3				-	-	-	-	7700	-	-	6800	-
4				-	-	-	-	7700	-	-	6800	-
5				15600	-	-	-	7600	-	-	6800	-
6				15500	-	-		7600	-	-	-	-
7				15400	-	14400	-	7600	-	-	-	-
8				15400	-	14400	-	7600	-	-	6900	-
9				15200	-	14000	-	-	-	-	6950	-
10				15000	17400	13800	-	-	-	-	7000	-
11				-	17000	13700	-	-	-	-	7000	-
12				-	16900	-	-	-	-	-	7100	-
13				-	16800	-	8900	-	-	-	-	8500
14				-	16700	12900	-	-	-	-	-	8500
15			20000	-	16600	12800	-	-	-	-	7100	8500
16			19900	-	16600	12800	8800	-	-	-	7300	8300
17			19900	-	16500	12600	-	-	-	-	7300	8200
18			19850	-	16400	12500	-	-	-	6450	7300	8000
19			19500	15500	16200	-	-	-	-	6450	7300	-'
20			-	15500	16000	-	-	-	6900	6450	7300	-'
21			-	15400	-	12200	-	-	6900	6450	7300	-'
22			18250	15400	-	11800	-	-	6900	6500	7300	9300
23			18000	15400	-	11500	-	-	6800	6600	7600	9900
24			17800	-	15600	11400	-	-	6800	6600	7600	10000
25			17600	-	15500	-	-	-	6800	-	7600	10200
26			17500	-	-	-	-	-	-	-	7600	10200
27			17400	-	-	-	-	-	-	-	7600	10200
28			17000	-	-	-	-	-	-	-	7600	-
29			-	-	-	-	-	-	-	-	-	-
30			-	-	-	-	-	-	-	-	-	-
31			-		14200		-	-		-		-
Ave.	-	-	18,558	15,391	16,314	12,914	8,850	7,643	6,850	6,500	7,206	9,150

Vewa Record of Water Level

2010 **Waterlevel(feet)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	13.58	12.50	9.08	8.83	9.33	11.63	10.50	9.54	8.75	9.50	9.83	12.42
2	13.67	12.50	8.83	8.83	9.33	11.54	10.46	9.50	8.67	9.58	9.83	12.83
3	13.67	12.50	8.75	8.83	9.33	11.50	10.42	9.46	8.67	10.00	9.83	13.25
4	13.67	12.33	8.58	8.83	9.33	11.46	10.38	9.38	8.67	10.00	9.83	13.92
5	13.67	12.08	8.50	8.83	9.29	11.42	10.38	9.33	8.58	10.08	9.92	14.42
6	13.67	12.00	8.33	8.83	9.25	11.38	10.38	9.25	8.58	10.08	10.00	15.08
7	13.58	11.92	8.17	8.83	9.25	11.38	10.38	9.17	8.58	10.08	10.00	15.75
8	13.42	11.83	8.00	8.83	9.75	11.38	10.38	9.17	8.58	10.08	10.00	16.42
9	13.33	11.67	8.00	8.75	11.25	11.38	10.38	9.17	8.50	10.08	10.00	16.75
10	13.25	11.50	8.00	8.75	11.75	11.38	10.38	9.17	8.50	10.08	10.08	16.92
11	13.42	11.33	8.00	8.75	11.92	11.29	10.38	9.17	8.50	10.08	10.08	17.00
12	13.50	11.17	8.00	8.67	11.92	11.25	10.38	9.13	8.50	10.08	10.08	17.00
13	13.58	11.08	7.92	8.67	11.92	11.21	10.33	9.13	8.50	10.08	10.17	17.00
14	13.58	11.00	7.92	8.67	11.92	11.17	10.25	9.13	8.50	10.08	10.17	16.92
15	13.58	10.83	7.92	8.75	11.92	11.17	10.21	9.04	8.42	10.08	10.17	16.75
16	13.58	10.67	7.92	8.75	11.83	11.04	10.13	9.00	8.42	10.00	10.17	16.75
17	13.67	10.50	7.92	8.75	11.79	11.04	10.08	8.96	8.42	10.00	10.17	16.67
18	13.75	10.33	7.92	8.75	11.75	11.00	10.00	8.92	8.42	10.00	10.25	16.58
19	13.75	10.17	7.92	8.83	11.83	10.96	10.00	8.83	8.42	10.00	10.25	16.58
20	13.83	10.08	7.83	8.83	11.83	10.92	10.00	8.83	8.33	10.00	10.33	16.50
21	13.75	10.08	7.83	8.83	11.83	10.88	9.96	8.83	8.33	9.92	10.33	16.50
22	13.58	10.00	7.83	8.83	11.83	9.83	9.96	8.83	8.75	9.92	10.58	16.92
23	13.42	9.92	7.83	8.83	11.83	9.79	9.96	8.83	8.83	9.92	10.67	17.17
24	13.25	9.92	7.83	8.83	11.83	9.75	9.96	8.83	8.83	9.92	10.58	17.50
25	13.17	9.83	7.83	8.83	11.79	9.75	9.92	8.83	8.83	9.92	11.25	18.25
26	13.00	9.58	7.83	9.00		9.75	9.83	8.83	8.83	9.83	11.50	18.92
27	12.92	9.42	7.75	9.25		9.75	9.67	8.75	8.83	9.83	11.50	19.25
28	12.83	9.25	8.08	9.25		9.71	9.58	8.67	8.83	9.83	11.67	19.50
29	12.67		8.42	9.25		9.63	9.54	8.67	9.33	9.83	12.00	19.42
30	12.58		8.58	9.25	11.71		9.54	8.67	9.33	9.83	12.08	19.42
31	12.50		8.75		11.67		9.54	8.67		9.83		19.42
Av	13.40	10.93	8.13	8.86	11.07	10.84	10.10	9.02	8.64	9.95	10.44	16.70

2009 **Waterlevel(feet)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	19.00	18.33	15.42	15.75	14.58	11.92	8.75	4.17	3.67	2.92	2.25	7.42
2	19.00	18.25	15.33	15.75	14.50	11.83	8.75	4.00	3.67	2.92	2.25	7.33
3	19.00	18.17	15.17	15.75	14.42	11.67	8.75	3.83	3.58	2.92	2.25	7.25
4	19.00	18.00	15.08	15.75	14.33	11.50	8.67	3.67	3.58	2.00	2.25	7.17
5	18.92	17.92	15.00	15.75	14.17	11.33	8.58	3.50	3.58	2.83	2.25	7.08
6	18.83	17.75	15.00	15.75	14.00	11.17	8.33	3.33	3.50	2.83	2.25	7.00
7	18.75	17.58	15.00	15.75	13.92	11.08	8.08	3.17	3.50	2.83	3.33	7.00
8	18.67	17.50	15.00	15.67	13.75	11.08	7.00	3.08	3.42	2.75	4.25	7.08
9		17.33	15.00	15.67	13.67	11.08	7.67	2.92	3.42	2.75	4.00	7.17
10	19.00	17.25	15.17	15.75	13.50	11.08	7.42	2.75	3.42	2.75	4.67	7.25
11	19.42	17.25	15.33	15.75	13.50	11.08	7.17	2.58	3.33	2.75	4.67	7.33
12	19.42	17.25	15.33	15.75	13.50	11.00	7.00	2.00	3.33	2.67	4.67	7.50
13		17.25	15.33	15.75	13.50	10.92	7.08	2.33	3.33	2.67	4.67	7.83
14	19.25	17.17	15.33	15.92	13.50	10.75	7.08	2.25	3.33	2.67	5.00	8.17
15	19.17	17.00	15.50	15.92	13.50	10.50	7.08	2.17	3.25	2.58	5.33	8.42
16	19.08	16.92	15.58	15.92	13.33	10.33	7.00	2.17	3.25	2.58	5.67	8.58
17	19.00	16.75	15.58	15.92	13.17	10.17	7.00	3.50	3.25	2.58	5.08	8.67
18	19.00	16.58	15.58	15.92	13.00	10.00	6.75	3.50	3.25	2.50	6.00	8.75
19	19.00	16.42	15.58	15.92	12.83	10.00	6.50	3.75	3.17	2.50	7.08	8.75
20	19.00	16.25	15.58	15.92	12.75	10.00	6.25	3.75	3.17	2.50	7.50	8.67
21	19.00	16.08	15.58	15.75	12.75	10.00	6.00	3.00	3.17	2.42	7.58	8.58
22	18.92	15.92	15.58	15.58	12.75	9.92	5.83	3.83	3.17	2.42	7.00	9.00
23	18.83	15.92	15.58	15.42	12.67	9.92	5.67	3.83	3.08	2.42	8.00	9.75
24	18.75	15.92	15.58	15.33	12.58	9.92	5.42	3.83	3.08	2.33	8.17	10.50
25	18.67	15.92	15.75	15.17	12.42	9.67	5.25	3.83	3.08	2.33	9.25	11.25
26	18.58	15.75	15.75	15.00	12.25	9.42	5.25	3.75	3.00	2.33	8.00	12.00
27	18.50	15.67	15.75	14.83	12.08	9.17	5.25	3.75	3.00	2.33	8.08	12.50
28	18.42	15.58	15.75	14.83	12.00	9.00	5.17	3.75	3.00	2.25	7.75	13.00
29	18.33		15.75	14.83	12.00	8.83	4.92	3.75	3.00	2.25	7.00	13.42
30	18.33		15.75	14.83	12.00	8.75	4.67	3.75	2.92	2.25	7.00	13.50
31	18.33		15.75		12.00		4.42	3.67		2.25		13.58
Av	18.87	16.92	15.44	15.59	13.19	10.44	6.73	3.33	3.28	2.55	5.44	9.08

Mahakanadarawa wewa

2008 **Waterlevel(feet)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	17.33	17.58	17.00	19.33	19.08	16.08	11.75	7.58	8.67	8.25	9.25	8.58
2	17.25	17.50	17.00	19.25	19.00	15.92	11.58	7.50	8.67	8.17	9.25	8.67
3	17.25	17.42	17.00	19.17	18.92	15.75	11.58	7.50	8.67	8.25	9.25	8.75
4	17.25	17.42	17.00	19.25	18.92	15.67	11.58	7.50	8.67	8.17	9.25	8.92
5	17.42	17.42	17.08	19.17	18.83	15.58	11.58	7.50	8.67	8.17	9.25	8.92
6	17.50	17.42	17.08	19.08	18.83	15.42	11.50	7.50	8.67	8.25	9.25	8.75
7	17.58	17.33	17.17	19.00	18.75	15.42	11.33	7.42	8.67	8.25	9.25	9.00
8	17.75	17.33	17.17	19.00	18.67	15.42	11.17	7.42	8.58	8.25	9.25	11.42
9	7.75	7.42	7.17	19.00	18.58	15.42	11.00	7.42	8.58	8.25	9.00	12.67
10	18.17	7.42	7.50	19.00	18.42	15.33	10.75	7.42	8.58	8.25	8.83	14.00
11	18.33	17.42	18.00	19.25	18.33	15.17	10.50	7.42	8.58	8.33	8.67	15.25
12	18.42	17.42	18.33	19.25	18.25	15.00	10.25	7.42	8.58	8.42	8.50	16.00
13	18.50	17.33	18.58	19.25	18.25	14.83	10.08	7.42	8.58	8.58	8.00	16.25
14	18.50	17.33	18.75	19.25	18.25	14.67	9.92	7.33	8.58	8.75	8.08	16.50
15	18.42	17.17	18.92	19.25	18.17	14.50	9.67	7.33	8.58	8.75	7.83	16.50
16	18.33	17.08	19.00	19.17	18.08	14.42	9.42	7.33	8.50	8.75	7.58	16.75
17	18.25	17.08	19.00	19.08	17.92	14.25	9.42	7.33	8.50	8.75	7.42	17.50
18	18.17	17.08	19.50	19.17	17.75	14.08	9.42	7.33	8.50	8.83	7.25	18.75
19	18.17	17.08	19.50	19.00	17.58	13.92	9.42	7.33	8.50	8.83	7.00	19.75
20	18.17	17.08	19.50	19.00	17.42	13.75	9.17	7.25	8.50	8.92	6.75	
21	18.08	17.08	19.58	19.00	17.25	13.58	8.92	7.25	8.50	8.92	6.58	
22	18.17	17.08	19.58	19.00	17.17	13.42	8.75	7.25	8.42	9.00	6.33	19.33
23	18.25	17.08	19.50	19.00	17.00	13.25	8.50	7.25	8.42	9.00	6.17	19.25
24	18.25	17.00	19.42	18.92	16.92	13.08	8.25	7.25	8.42	9.08	6.58	19.25
25	18.25	16.92	19.42	18.75	16.83	12.75	8.08	7.17	8.42	9.08	6.92	19.25
26	18.08	16.83	19.42	18.75	16.83	12.58	7.92	7.17	8.33	9.17	7.33	19.17
27	18.00	16.83	19.33	19.33	16.83	12.42	7.75	8.00	8.33	9.17	7.75	19.08
28	17.92	16.83	19.25	19.33	19.75	12.25	7.58	8.50	8.33	9.25	8.00	19.04
29	17.83	16.92	19.25	19.25	16.58	12.08	7.58	8.58	8.25	9.25	8.25	19.04
30	17.75		19.25	19.17	16.42	11.92	7.58	8.58	8.25	9.33	8.50	19.00
31			19.25		16.25		7.58	8.58		9.25		19.00
Av	17.64	16.51	17.85	19.11	17.93	14.26	9.66	7.54	8.52	8.70	8.04	15.32

2007 **Waterlevel(feet)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	12.92	13.17	11.17	10.33	10.83	8.67	6.67	5.42	3.92	3.67	9.50	8.17
2	12.83	13.08	11.00	10.33	10.83	8.50	6.58	5.25	3.92	3.67	9.58	8.17
3	12.75	12.92	10.92	10.33	10.83	8.33	6.58	5.17	3.92	3.67	9.67	8.17
4	12.67	12.83	10.75	10.33	10.83	8.17	6.58	5.08	3.92	3.67	9.75	8.17
5	12.67	12.75	10.75	10.25	10.75	8.17	6.58	5.08	3.83	3.67	9.67	8.17
6	12.00	12.67	10.75	10.25	10.67	8.17	6.58	5.08	3.83	3.67	9.00	8.08
7	12.58	12.58	10.75	10.25	10.58	8.17	6.50	5.08	3.83	3.67	9.58	8.00
8	12.58	12.50	10.75	10.25	10.42	8.17	6.50	5.08	4.00	3.67	9.67	7.83
9	12.75	12.33	10.75	10.25	10.17	8.17	6.33	5.00	4.00	3.67	9.67	7.67
10	12.83	12.25	10.75	10.25	10.00	8.17	6.17	5.00	4.00	3.67	9.58	7.50
11	12.92	12.25	10.75	10.25	9.92	8.17	6.00	4.83	4.00	3.67	9.58	7.50
12	13.00	12.17	10.75	10.25	9.75	8.17	5.83	4.67	4.00	3.67	9.33	6.92
13	13.00	12.17	10.75	10.25	9.75	8.17	5.75	4.50	4.00	3.75	9.17	7.00
14	13.08	12.17	10.75	10.25	9.75	8.00	5.75	4.33	4.00	3.83	9.08	7.17
15	13.08	12.00	10.75	10.25	9.67	7.92	5.75	4.17	3.92	3.83	9.08	7.83
16	13.00	11.92	10.75	10.25	9.67	7.67	5.75	4.00	3.92	3.92	9.08	8.50
17	12.92	11.67	10.75	10.25	9.67	7.58	5.67	4.00	3.92	3.92	9.08	9.00
18	12.00	11.75	10.75	10.25	9.67	7.50	5.67	4.00	3.92	5.25	9.08	9.50
19	12.67	11.67	10.75	10.25	9.58	7.50	5.67	4.00	3.92	5.25	9.08	11.17
20	12.58	11.58	10.58	10.25	9.58	7.50	5.67	4.00	3.92	5.25	9.08	12.00
21	12.50	11.50	10.58	10.67	9.42	7.50	5.83	4.00	3.92	5.25	8.92	12.00
22	12.42	11.50	10.50	10.67	9.25	7.50	5.83	4.00	3.92	5.25	8.75	14.58
23	12.33	11.50	10.50	10.75	9.08	7.50	5.83	4.00	3.92	6.17	8.58	15.00
24	12.25	11.50	10.42	10.75	8.92	7.50	6.00	3.92	3.92	6.17	8.42	16.50
25	12.25	11.50	10.42	10.75	8.92	7.50	6.00	3.92	3.92	7.00	8.25	17.00
26	12.25	11.50	10.42	10.75	8.92	7.50	6.00	3.92	3.83	8.08	8.08	17.17
27	12.50		10.42	10.83	8.92	7.42	6.00	3.92	3.83	8.08	7.92	17.25
28	12.75		10.42	10.83	8.83	7.25	6.00	3.92	3.83	8.50	7.00	17.33
29	12.92		10.33	10.83	8.83	7.00	6.00	3.92	3.75	9.00	8.00	17.33
30	13.00		10.33	10.83	8.83	6.83	5.83	3.92	3.75	9.25	8.17	17.33
31			10.33		8.83		5.67	3.92		9.50		17.33
Av	12.67	12.13	10.66	10.43	9.73	7.81	6.05	4.42	3.91	5.20	8.98	11.14

Mahakanadarawa wewa

2006 **Water level (feet)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	7.92	8.92	8.33	11.75	11.25	8.42					1.00	11.75
2	8.00	8.92	8.33	11.75	11.08	8.33					1.00	11.75
3	8.00	8.83	8.58	11.75	10.92	8.17					1.00	11.75
4	8.00	9.17	9.00	11.75	10.83	8.08	3.92				1.00	11.75
5	8.00	9.42	9.17	11.75	10.83	8.00	3.83				1.00	11.83
6	8.00	9.50	9.25	11.75	10.92	7.92	3.67				1.00	11.83
7	8.08	9.50	9.92	11.75	11.00	7.75	3.42				1.08	11.83
8	8.17	9.50	10.25	11.75	11.00	7.58	3.25				1.67	11.83
9	8.25	9.50	10.33	11.75	11.00	7.42	3.00				1.75	11.83
10	8.33	9.58	10.50	11.75	11.00	7.25	2.83				2.50	11.75
11	8.33	9.58	10.83	11.75	10.92	7.08	2.67				2.92	11.67
12	8.42	9.58	11.25	11.75	10.75	6.92	2.50				3.25	11.67
13	8.83	9.50	11.50	11.83	10.67	6.67	2.42				3.75	11.67
14	9.17	9.42	11.50	11.75	10.50	6.50	2.25				4.08	11.67
15	9.67	9.50	11.50	11.92	10.33	6.33	2.08		0.00		4.33	11.67
16	10.00	9.25	11.50	11.92	10.25	6.17	1.92				4.50	11.75
17	10.00	9.08	11.50	11.92	10.17	6.00	1.75				4.50	11.75
18	10.17	9.00	11.50	11.92	10.17	5.83	1.58				6.00	11.75
19	10.25	8.92	11.50	11.92	10.00	5.67	1.50				7.17	
20	10.17	8.75	11.50	11.92	9.92	5.67	1.42				7.83	
21	10.00	8.50	11.50	11.92	9.83	5.58	1.25				8.25	
22	9.92	8.33	11.50	12.00	9.75	5.42	1.08				9.00	
23	9.75	8.33	11.50	12.00	9.67	5.08	0.92				10.25	
24	9.58	8.33	11.50	12.00	9.50	5.00	0.75			0.25	10.92	
25	9.42	8.33	11.50	12.08	9.33	4.92				0.33	11.17	
26	9.25	8.33	11.50	12.00	9.17	4.83				0.42	11.33	
27	9.17	8.33	11.50	12.00	9.00	4.67				0.67	11.42	
28	9.08	8.33	11.50		8.83	4.58				0.75	11.50	
29	9.00				8.75	4.42				0.75		
30	8.92				8.58	4.33				0.75		
31	8.92				8.50					1.00		
Av	8.99	9.01	10.71	11.85	10.14	6.35	2.29	-	0.00	0.61	5.18	11.75

2005 **Water level (feet)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	14.50	14.58	13.42	13.17	12.67	10.17	7.67	4.42	1.17	0.67	1.50	5.92
2	14.58	14.50	13.42	13.17	12.58	10.17	7.50	4.33	1.17	0.67	1.50	5.92
3	14.58	14.50	13.42	13.17	12.50	10.17	7.33	4.08	1.17	0.67	1.58	5.92
4	14.58	14.50	13.42	13.17	12.42	10.17	7.17	4.00	1.17	0.67	1.75	5.92
5	14.67	14.50	13.42	13.17	12.42	10.17	7.00	4.58	1.17	0.67	1.92	6.00
6	14.75	14.50	13.42	13.17	12.42	10.08	6.83	4.33	1.08	0.67	1.00	6.50
7	14.75	14.50	13.42	13.17	12.33	9.92	6.58	4.08	1.08	0.67	2.00	6.50
8	14.75	14.50	13.33	13.17	12.25	9.75	6.50	3.83	1.08	0.67	2.08	6.50
9	14.67	14.50	13.33	13.17	12.17	9.58	6.50	2.83	1.08	0.67	2.08	6.75
10	14.58	14.50	13.33	13.17	12.08	9.50	6.50	2.42	1.08	0.67	2.25	6.92
11	14.50	14.50	13.33	13.17	11.92	9.33	6.33	2.25	1.08	0.67		7.00
12	14.50	14.42	13.33	13.17	11.75	9.17	6.08	2.08	1.08	0.67		7.00
13	14.42	14.33	13.33	13.17	11.67	9.00	5.83	1.92	1.08	0.67		7.00
14	14.42	14.25	13.33	13.17	11.58	9.00	5.67	1.75	1.08	0.67	2.58	
15	14.33	14.17	13.25	13.17	11.50	9.00	5.50	1.58		0.67	2.67	
16	14.25	14.08	13.25	13.17	11.42	9.00	5.50	1.50		0.67	2.67	7.50
17	14.25	14.08	13.25	13.17	11.42	8.92	5.50	1.42		1.08	2.75	7.67
18	14.25	14.00	13.25	13.17	11.42	8.75	5.50	1.33		1.08	2.92	7.67
19	14.17	14.00	13.25	13.17	11.33	8.58	5.50	1.25		1.25	3.17	7.67
20	14.17	13.92	13.25	13.17	11.25		5.50	1.25		1.25	3.25	7.75
21	14.25	13.92	13.25	13.25	11.17		5.50	1.25		1.25	3.50	7.75
22	14.50	13.92	13.25	13.25	11.00		5.50	1.25		1.33	3.75	7.75
23	14.67	13.92	13.25	13.25	10.92	8.17	5.33	1.25		1.33	4.00	7.75
24	14.75	13.83	13.25	13.25	10.92	8.00	5.25	1.25		1.33	4.25	7.75
25	14.83	13.83	13.21	13.25	10.92	8.00	5.17	1.25		1.42	4.50	7.75
26	14.83	13.71	13.21	13.17	10.92	8.00	5.08	1.00		1.50	5.08	7.75
27	14.83	13.50	13.21	13.17	10.83	8.00	4.92	1.17		1.50	5.67	7.75
28	14.75	13.42	13.21	13.00	10.75	8.00	4.75	1.17		1.50	5.83	7.92
29	14.67		13.21	12.92			4.58	1.17			5.92	7.92
30	14.67		13.21	12.92			4.42	1.17			5.92	7.92
31	14.67		13.21				4.42					7.92
Av	14.55	14.17	13.30	13.16	11.66	9.14	5.85	2.24	1.11	0.95	3.19	7.17

Wahalkada Wewa Storage Capacity

2011 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	21,680	48,500	47,905	45,385	45,245	39,520	32,450	29,680	28,900	28,580	29,360	35,040
2	22,000	49,900	47,905	45,385	45,595	39,220	32,450	29,620	28,900	28,560	29,360	35,480
3	22,220	53,500	47,625	45,385	45,595	38,650	32,270	2,920	28,900	28,560	29,280	35,480
4	22,220	59,000	47,625	45,245	45,595	38,650	32,150	29,280	28,900	28,560	29,220	35,400
5	23,320	59,000	47,800	45,245	45,035	38,140	31,980	29,280	28,900	28,560	29,220	35,340
6	25,280	56,200	47,800	45,245	45,140	37,660	31,840	29,420	28,900	28,560	29,880	35,220
7	25,680	56,000	47,800	45,245	44,910	37,180	31,720	29,280	28,900	28,560	29,880	35,040
8	25,940	57,320	47,800	45,245	4,440	36,780	31,720	29,160	28,900	28,560	29,880	35,040
9	28,240	53,500	47,450	45,245	44,100	36,460	31,720	29,020	28,900	28,560	29,820	35,040
10	30,820	50,250	47,450	45,245	44,040	36,480	31,720	28,900	28,900	28,560	29,740	35,040
11	33,740	49,200	46,750	45,140	43,740	36,480	31,580	28,760	28,900	28,560	29,620	35,040
12	34,730	49,025	46,750	45,140	43,440	36,480	31,460	28,640	28,900	28,560	29,420	35,220
13	35,800	48,850	46,750	45,140	43,140	36,480	31,320	28,640	28,760	28,560	29,280	35,920
14	36,800	48,500	46,750	45,140	42,870	36,480	31,260	28,640	28,760	28,560	29,160	36,960
15	37,680	48,185	46,435	45,140	42,570	36,120	31,080	28,640	28,760	28,580	28,960	37,180
16	38,650	48,185	46,435	45,140	42,270	35,800	30,920	28,640	28,760	28,440	28,960	38,710
17	39,160	48,185	46,435	45,140	41,840	35,420	30,920	28,900	28,760	28,240	28,900	38,370
18	39,340	48,185	46,435	45,140	41,520	35,140	30,920	28,900	28,700	28,440	28,820	38,740
19	39,640	48,185	46,435	45,140	41,200	34,570	30,920	28,220	28,700	28,440	28,900	39,160
20	39,640	48,185	46,435	45,035	4,106	34,430	30,920	28,220	28,700	28,380	28,900	43,000
21	39,640	48,185	46,435	44,930	40,860	34,430	30,820	28,220	28,700	28,320	28,900	43,400
22	39,640	48,185	45,595	44,930	40,740	34,340	30,600	28,220	28,700	28,320	28,960	43,200
23	39,550	48,185	45,595	44,820	40,600	34,130	30,480	28,220	28,640	28,240	29,020	43,200
24	39,550	48,185	45,595	44,730	40,480	33,830	30,340	28,220	28,640	28,580	30,820	43,760
25	39,160	48,185	45,595	44,730	40,340	33,530	30,200	29,160	28,640	28,580	32,270	44,220
26	39,160	48,045	45,595	44,730	40,200	33,260	30,200	28,900	28,640	28,900	33,740	44,220
27	39,160	47,905	45,595	44,730	40,050	32,960	30,200	28,900	28,640	28,820	34,730	43,760
28	39,160	47,905	45,490	44,730	39,970	33,660	30,200	28,900	28,640	28,900	34,910	43,580
29	39,400		45,490	44,730	39,730	32,570	30,200	28,900	28,640	29,160	35,020	43,400
30	40,200		45,490	44,730	39,730	32,570	29,960	28,900	28,580	29,220	35,040	43,200
31	44,520		45,490				29,820	28,900				43,160
Ave.	34,249	50,451	46,604	45,065	39,970	35,714	31,108	28,006	28,772	28,581	30,332	39,017

2010 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	17,075	15,440	13,180	12,790	12,050	9,256	6,054	3,470	2,145	2,195	2,377	5,496
2	17,075	15,440	13,180	12,790	11,920	9,192	5,860	3,363	2,175	2,210	2,377	6,131
3	16,985	15,260	13,180	12,790	11,800	9,124	5,630	3,248	2,175	2,210	2,377	6,351
4	16,835	15,040	13,180	12,790	11,800	9,060	5,440	3,118	2,175	2,225	2,377	7,444
5	16,685	14,860	13,180	12,790		8,948	5,232	3,118	2,175	2,298	2,405	7,828
6	16,650	14,860	13,060	12,790	11,180	8,612	5,093	3,118	2,175	2,298	2,405	8,612
7	16,385	14,860	12,940	12,790	10,950	8,612	4,763	3,118	2,175	2,298	2,405	8,612
8	16,235	14,860	12,850	12,790	10,790	8,612	4,763	3,118	2,175	2,262	2,405	9,060
9	16,340	14,860	12,745	12,790	10,620	8,612	4,763	2,934	2,175	2,262	2,405	9,100
10	16,340	14,860	13,180	12,790	10,790	8,612	4,763	2,762	2,175	2,262	2,405	9,100
11	16,340	14,660	13,180	12,790	10,720	8,356	4,763	2,600	2,175	2,262	2,405	9,100
12	16,340	14,660	13,180	12,790	10,620	7,970	4,763	2,405	2,175	2,262	2,405	9,072
13	16,340	14,660	13,180	12,790	10,560	7,668	4,530	2,405	2,175	2,262	2,405	9,060
14	16,340	14,660	13,180	12,790	10,790	7,300	4,326	2,405	2,175	2,262	2,405	9,072
15	16,340	14,560	13,180	12,790	10,720	6,932	4,228	2,405	2,175	2,262	2,405	9,044
16	16,340	14,380	13,180	12,790	10,620	6,612	4,150	2,405	2,175	2,262	2,405	9,020
17	16,235	14,280	13,180	12,790	10,560	6,485	4,072	2,405	2,145	2,262	2,405	9,020
18	16,100	14,180	13,180	12,790	10,560	6,476	3,986	2,322	2,145	2,262	2,405	9,020
19	16,340	14,080	12,640	12,790	10,760	6,476	3,986	2,225	2,145	2,262	2,405	9,020
20	16,340	14,080	12,640	12,790	10,390	6,476	3,986	2,225	2,145	2,262	2,426	9,008
21	16,205	14,080	12,640	12,640	10,300	6,410	3,986	2,225	2,145	2,262	2,426	9,124
22	16,040	14,080	12,640	12,610	10,300	6,351	3,986	2,225	2,145	2,262	2,485	10,920
23	15,890	14,080	12,640	12,610	10,300	6,269	4,021	2,225	2,175	2,262	2,485	10,950
24	15,755	14,080	12,640	12,550	10,200	6,216	4,021	2,225	2,175	2,262	2,485	11,860
25	15,605	13,960	12,610	12,490	10,070	6,203	4,021	2,225	2,175	2,262	3,248	13,180
26	15,440	13,780	12,610	12,460	10,000	6,158	4,021	2,195	2,175	2,280	3,433	14,980
27	15,440	13,540	12,610	12,400	9,360	6,158	4,021	2,195	2,175	2,280	4,021	16,580
28	15,440	13,380	12,610	12,400	9,320	6,158	3,938	2,195	2,175	2,280	4,487	18,305
29	15,440		12,610	12,355	9,320	6,158	3,825	2,175	2,195	2,280	4,763	19,040
30	15,440		12,745	12,190	9,320	6,144	3,690	2,175	2,195	2,280	4,949	19,790
31	15,440		12,790		9,320		3,594	2,175		2,377		20,700
Ave.	16,187	14,483	12,921	12,684	10,534	7,387	4,460	2,561	2,169	2,265	2,760	10,761

Wahalkada wewa

2009 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	14,150	15,605	13,540	15,500	12,745	10,360	6,009	3,797	3,524	2,780	2,210	5,008
2	14,020	15,605	13,540	15,300	12,745	10,300	5,890	3,797	3,470	2,762	2,210	5,496
3	13,780	15,605	13,540	15,100	12,550	10,300	5,830	3,797	3,454	2,744	2,210	5,496
4	13,640	15,440	13,540	14,920	12,355	10,130	5,830	3,776	3,433	2,726	2,262	5,544
5	13,640	15,260	13,540	14,660	12,190	9,388	5,730	3,776	3,412	2,702	2,358	5,630
6	13,640	15,040	13,520	14,450	12,400	9,320	5,730	3,776	3,384	2,684	3,248	5,660
7	13,640	14,860	13,520	14,350	12,400	9,256	5,496	3,748	3,363	2,660	3,270	5,660
8	13,640	14,660	13,520	14,220	12,400	9,192	5,173	3,748	3,342	2,648	3,270	5,890
9	13,640	14,560	13,520	14,120	12,400	9,124	4,817	3,748	3,314	2,624	3,270	6,423
10	13,640	14,410	14,410	14,020	12,400	9,060	4,461	3,734	3,292	2,600	3,270	6,476
11	13,640	14,410	14,980	14,980	12,400	8,808	4,210	3,734	3,276	2,579	3,270	6,506
12	13,640	14,410	15,605	15,300	12,355	8,708	4,063	3,734	3,245	2,558	3,270	6,772
13	13,640	14,410	15,755	15,380	12,190	8,708	3,793	3,690	3,240	2,537	3,545	7,044
14	13,640	14,410	15,860	15,380	12,050	8,564	3,657	3,690	3,195	2,512	3,690	7,140
15	13,640	14,380	15,860	15,380	11,920	8,244	3,573	3,690	3,173	2,512	3,748	7,140
16	13,640	14,380	15,860	15,260	11,860	7,976	3,470	3,690	3,150	2,512	3,846	7,958
17	14,980	14,380	15,860	15,040	11,860	7,668	3,470	3,675	3,118	2,512	4,021	9,060
18	15,300	14,280	15,860	14,860	11,860	7,396	3,433	3,675	3,094	2,512	4,297	9,060
19	15,605	14,180	15,860	14,660	11,720	7,140	3,292	3,675	3,070	2,512	4,487	13,060
20	15,605	14,080	15,860	14,560	11,760	6,980	3,240	3,657	3,045	2,512	4,487	13,060
21	15,605	13,920	15,860	14,350	11,760	6,980	2,985	3,657	3,011	2,512	4,763	13,060
22	15,560	13,720	15,860	14,220	11,760	6,980	2,840	3,639	2,995	2,512	4,888	13,060
23	15,440	13,540	15,800	14,080	11,760	6,980	2,726	3,639	2,960	2,512	4,949	14,050
24	15,220	13,540	15,800	13,920	11,720	6,884	2,600	3,615	2,934	2,512	4,974	14,050
25	14,920	13,540	15,800	13,640	11,720	7,044	3,150	3,615	2,900	2,512	5,008	14,120
26	14,960	13,540	15,800	13,380	11,465	6,485	3,690	3,594	2,882	2,512	5,008	15,560
27	14,980	13,540	15,800	13,120	11,225	6,396	3,825	3,594	2,864	2,512	5,008	16,100
28	15,605	13,540	15,800	12,895	10,990	6,306	3,825	3,573	2,840	2,210	5,008	16,580
29	15,605		15,800	12,745	10,820	6,216	3,825	3,573	2,822	2,210	5,008	16,835
30	15,605		15,800	12,745	10,660	6,131	3,825	3,545	2,804	2,210	5,008	16,835
31	15,605		15,615		10,490		3,825	3,545		2,210		17,075
Ave.	14,512	14,402	15,074	14,418	11,901	8,101	4,138	3,684	3,153	2,536	3,862	10,045

2008 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	12,090	10,660	10,790	18,065	17,180	11,760	8,244	5,860	9,280	9,244	9,020	10,000
2	12,090	10,660	10,790	18,065	17,075	11,760	8,244	5,700	9,296	9,244	8,766	10,000
3	12,090	10,660	10,790	18,065	16,925	11,760	7,958	5,700	9,296	9,228	8,564	9,372
4	12,090	10,660	10,790	18,065	16,730	11,570	7,716	5,700	9,296	9,228	8,356	9,336
5	12,090	10,660	10,790	18,065	16,550	11,375	7,140	5,700	9,296	9,228	8,162	9,296
6	12,090	10,660	10,790	18,065	16,295	11,120	6,980	5,700	9,296	9,228	7,876	9,320
7	12,090	10,950	10,790	18,065	16,440	10,950	6,820	5,700	9,296	9,228	7,620	10,300
8	12,090	11,180	10,790	18,065	15,800	10,790	6,820	5,630	9,296	9,204	7,348	10,330
9	12,090	11,270	11,660	18,065	15,560	10,790	6,820	5,583	9,296	9,204	7,092	10,330
10	12,090	11,270	12,070	18,065	15,300	10,790	6,820	5,540	9,296	9,204	6,820	10,360
11	12,050	11,270	13,840	18,065	14,980	10,690	6,714	5,098	9,296	9,204	6,520	10,360
12	11,960	16,205	14,180	18,065	14,660	10,560	6,485	5,173	9,280	9,204	6,441	10,950
13	11,860	16,205	14,250	18,065	14,660	10,460	6,410	5,035	9,280	9,176	6,423	11,660
14	11,760	16,205	14,310	18,065	14,250	10,360	6,351	4,488	9,280	9,176	6,306	12,190
15	11,660	16,205	14,980	18,065	14,150	10,200	6,351	4,817	9,280	9,176	6,248	12,265
16	11,570	16,205	15,440	18,065	14,080	10,030	6,351	4,915	9,280	9,176	6,158	12,400
17	11,465	16,145	15,860	18,065	14,080	9,348	6,351	4,949	9,280	9,176	6,086	12,640
18	11,465	16,040	16,730	18,005	13,920	9,320	6,351	4,974	9,280	9,176	6,009	14,410
19	11,465	10,990	16,925	18,005	13,540	9,320	6,351	4,974	9,268	9,176	5,860	15,300
20	11,465	10,850	17,075	18,005	13,260	9,320	6,351	4,974	9,268	9,176	5,700	15,380
21	11,465	10,890	17,180	18,005	12,850	9,320	6,351	4,974	9,268	9,164	5,960	15,380
22	11,465	10,820	17,225	18,005	12,745	9,320	6,351	5,007	9,268	9,164	6,054	15,440
23	11,465	10,720	17,225	18,005	12,745	9,204	6,351	5,007	9,268	9,164	6,099	15,440
24	11,420	10,620	17,525	17,975	12,745	9,136	6,351	5,007	9,256	9,164	7,300	15,550
25	11,375	10,620	17,615	17,870	12,745	9,072	6,351	5,007	9,256	9,156	10,950	15,380
26	11,270	10,620	17,660	17,765	12,490	9,044	6,351	5,035	9,256	9,156	10,990	15,380
27	11,180	10,690	17,810	17,660	12,265	8,660	6,270	5,093	9,256	9,156	10,000	15,260
28	11,075	10,750	17,870	17,570	12,100	8,404	6,256	5,208	9,244	9,156	10,000	15,260
29	10,950	10,790	17,915	17,435	11,920	8,244	6,158	5,256	9,244	1,124	10,000	14,600
30	10,850		17,915	17,270	11,760	8,244	6,086	6,506	9,244	1,124	10,000	14,600
31	10,750		18,005		11,760		6,009	9,060		1,124	10,000	14,600
Ave.	11,641	12,120	14,761	17,956	14,244	10,031	6,662	5,399	9,277	8,410	7,701	12,680

Wahalkada wewa

2007 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	18,455	20,760	19,445	18,560	15,695	10,820	8,708	5,830	4,530	4,846	9,124	8,766
2	18,455	20,760	19,235	18,560	15,440	10,690	8,612	5,830	4,530	4,817	9,124	8,564
3	18,455	20,760	19,040	18,500	15,220	10,560	8,404	5,760	4,530	4,817	9,124	8,356
4	18,455	20,760	18,860	18,500	14,920	10,490	8,196	5,630	4,530	4,817	9,124	8,132
5	18,305	20,760	18,755	18,500	14,660	10,590	7,951	5,520	4,400	4,817	9,124	7,924
6	18,110	25,000	18,755	18,500	14,450	10,590	7,876	5,416	4,400	4,817	9,124	7,820
7	17,915	20,240	18,755	18,500	14,310	10,460	7,876	5,312	4,573	4,763	9,124	7,716
8	17,720	20,120	18,755	18,500	14,180	10,330	7,876	5,208	4,573	4,763	9,192	7,716
9	17,570	19,985	18,755	18,500	14,080	10,200	7,716	5,093	4,573	4,763	9,192	7,716
10	17,525	19,790	18,710	18,455	14,840	10,070	7,508	4,974	4,817	4,763	9,192	7,716
11	17,525	19,685	18,710	18,455	13,540	9,360	7,300	4,846	4,888	5,700	9,192	7,716
12	17,615	19,685	18,710	18,410	13,320	9,336	7,092	4,763	4,916	5,830	9,192	7,716
13	17,720	19,685	18,710	18,410	13,060	9,336	6,884	4,763	4,916	5,890	9,192	8,356
14	17,720	19,685	18,710	18,410	12,850	9,336	6,764	4,763	4,916	5,960	9,192	8,500
15	17,720	19,685	18,710	18,410	12,640	9,360	6,612	4,665	4,916	6,009	9,192	9,060
16	17,720	19,685	18,710	18,410	12,460	9,360	6,476	4,627	4,916	6,027	9,192	10,300
17	17,720	19,490	18,650	18,305	12,400	9,360	6,410	4,627	4,916	6,351	9,192	10,560
18	17,720	19,295	18,650	18,005	12,355	9,360	6,378	4,627	4,916	6,455	9,192	11,077
19	17,523	19,100	18,650	17,870	12,295	9,320	6,378	4,627	4,916	6,520	9,204	12,190
20	17,330	18,890	18,650	17,720	12,150	9,280	6,378	4,600	4,888	6,708	9,204	12,490
21	17,120	18,710	18,650	17,570	12,070	9,176	6,378	4,600	4,888	6,772	9,216	12,640
22	16,925	18,500	18,650	17,435	11,840	9,176	6,364	4,600	4,888	6,820	9,216	12,700
23	16,730	18,305	18,605	17,330	11,760	9,124	6,306	4,600	4,888	6,820	9,216	12,700
24	16,550	18,155	18,605	17,180	11,570	9,072	6,306	4,600	4,888	6,820	9,216	12,745
25	16,550	18,800	18,605	17,030	11,525	9,032	6,189	4,600	4,846	7,188	9,216	12,745
26	16,835	19,535	18,605	16,580	11,525	9,032	6,131	4,573	4,846	7,300	9,216	12,745
27	18,560	19,580	18,605	16,385	11,525	9,032	6,072	4,573	4,846	7,460	9,164	12,640
28	19,295	19,580	18,605	16,205	11,525	9,032	6,009	4,573	4,846	9,060	9,124	12,550
29	20,700		18,560	16,040	11,315	9,032	5,890	4,573	4,846	9,124	9,008	12,390
30	20,760		18,560	15,860	11,120	9,032	5,830	4,573	4,817	9,124	9,020	12,295
31	20,760		18,560		10,950		5,830	4,573		9,124		12,190
Ave.	18,002	19,821	18,727	17,837	12,955	9,632	6,926	4,901	4,772	6,292	9,167	10,217

2006 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	32,360	34,220	31,840	31,720	30,160	26,940	22,220	18,350	14,180	14,720	19,385	19,835
2	32,150	34,220	31,840	31,720	29,880	26,720	22,080	18,350	14,180	14,720	19,385	19,640
3	32,060	34,010	31,840	31,660	29,620	26,600	21,880	18,305	14,180	14,720	19,385	19,535
4	31,920	33,920	32,270	31,660	29,160	26,400	21,740	18,305	14,180	14,720	19,385	19,340
5	31,840	33,830	32,270	31,580	30,200	26,400	21,740	18,155	14,180	14,720	19,385	19,190
6	31,980	33,740	32,270	31,580	30,200	26,260	21,680	18,005	14,310	14,720	19,385	18,995
7	32,060	33,650	32,270	31,580	30,160	26,080	21,480	17,870	14,380	14,660	19,190	18,800
8	32,270		32,270	31,520	29,960	26,020	21,280	17,720	14,410	14,660	18,995	18,710
9	32,270		32,150	31,520	29,820	25,820	21,100	17,570	14,520	14,660	18,000	18,710
10	32,270		32,150	31,520	29,680	25,620	20,900	17,375	14,980	14,660	18,605	18,710
11	32,270		32,150	31,520	29,560	25,420	20,700	17,225	14,980	14,660	18,410	18,710
12	32,270	33,350	32,150	31,460	29,420	25,220	20,500	17,075	14,980	14,600	17,975	18,650
13	32,450	33,260	32,150	31,460	29,280	25,100	20,370	17,075	14,980	14,600	17,915	18,650
14	33,740	33,050	32,150	31,460	29,160	24,960	20,240	17,030	14,980	14,600	17,810	18,650
15	34,730	32,780	32,150	31,460	29,020	24,780	20,240	16,835	14,920	14,600	18,305	18,650
16	34,820	32,660	32,060	31,380	28,900	24,640	20,240	16,640	14,920	14,600	18,560	18,500
17	35,020	32,660	32,060	31,380	28,760	24,640	20,040	16,340	14,920	14,600	18,800	18,305
18	35,020	32,660	32,060	31,380	28,640	24,440	19,440	16,145	14,920	14,600	19,685	18,110
19	35,040	32,450	31,980	31,320	28,520	24,240	19,790	15,950	1,492	14,600	19,895	17,915
20	35,040	32,270	31,980	31,320	28,380	24,020	19,640	15,755	14,920	14,660	19,985	18,455
21	35,040	32,150	31,980	31,320	28,240	23,840	19,490	15,560	14,860	14,660	20,120	18,890
22	35,040	31,980	31,920	31,320	26,120	23,660	19,385	15,300	14,860	14,920	20,120	19,295
23	35,020	31,920	31,920	31,260	27,980	23,580	19,385	15,040	14,780	15,220	20,120	19,295
24	34,820	31,920	31,920	31,260	27,860	23,520	19,385	15,040	14,780	16,145	20,120	19,535
25	34,610	31,920	31,840	31,260	27,720	23,520	19,340	15,040	14,780	18,560	19,985	19,535
26	34,430	31,920	31,840	31,200	27,580	23,320	19,190	14,980		18,800	19,835	19,535
27	34,220	31,920	31,840	31,140	27,380	23,120	19,040	14,860		19,040	19,685	19,340
28	34,220	31,920	31,780	30,820	27,260	22,920	18,890	14,720		19,145	19,835	19,145
29	34,220		31,780	30,600	27,120	22,740	18,755	14,520		19,295		18,950
30	34,220		31,780	30,200			18,605			19,385		18,755
31	34,220		31,720				18,455					18,560
Ave.	33,601	32,849	32,012	31,353	28,819	24,846	20,233	16,591	14,143	15,608	19,224	18,932

Wahalkada wewa

2005 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	28,900	35,660	33,740	32,450	32,270	31,000	26,460	23,126	21,540	21,420	21,740	31,260
2	29,100	35,660	33,740	32,450	32,160	31,000	26,260	23,000	21,690	21,420	21,620	31,200
3	29,220	35,660	33,740	32,450	32,920	31,000	26,080	22,860	21,880	21,420	21,420	31,080
4	29,280	35,660	33,740	32,450	32,570	30,820	25,940	22,660	21,880	21,360	21,240	31,000
5	29,360	35,660	33,740	32,450	34,010	30,740	25,820	22,540	21,880	21,360	21,880	31,000
6	29,480	25,620	33,650	34,130	34,130	30,600	25,620	22,400	21,880	21,360	21,880	31,000
7	29,480	25,620	33,650	34,340	34,130	30,420	25,420	22,400	21,880	21,280	21,880	31,000
8	29,480	25,620	33,530	34,340	34,130	30,000	25,280	22,400	21,880	21,280	21,880	30,920
9	29,480	35,540	33,350	34,340	34,010	29,820	25,160	22,400	21,880	21,280	22,540	30,820
10	29,360	35,540	33,140	34,220	33,830	29,620	25,160	22,260		21,240	23,660	30,820
11	29,280	35,480	32,960	34,340	33,740	29,420	25,160	22,140		21,240	23,780	30,820
12	29,160	35,400	32,720	34,430	33,650	29,280	25,020	22,000		21,240		30,820
13	29,160	35,400	32,750	34,340	33,530	29,280	24,900	21,880		21,240	24,960	32,270
14	29,020	35,340	32,750	34,130	33,440	29,280	24,900	21,740	21,740	21,240	24,960	32,360
15	28,960	35,340	32,750	34,010	33,350	28,960	24,960	21,620	21,740	21,160	24,960	32,450
16	28,900	35,280	32,750	33,920	33,350	28,760	24,960	21,480	21,740	21,420	24,960	32,660
17	28,900	35,040	32,750	33,830	33,260	28,520	24,900	21,480	21,740	21,540	24,960	33,260
18	28,900	35,020	32,750	33,740	33,050	28,320	24,780	21,480	21,680	21,620	25,100	33,260
19	29,560	34,910	32,750	33,650	32,780	28,180	24,580	21,480	21,690	21,620	25,560	33,260
20	29,620	34,820	32,660	33,650	32,660	27,980	24,360	21,420	21,680	21,620		33,260
21	30,340	34,730	32,660	33,440	32,450	27,860	24,240	21,420	21,620	21,540		33,260
22	33,260	34,520	32,660	33,350	32,360	27,720	24,100	21,420	21,620	21,480	28,900	33,140
23	35,020	34,520	32,660	33,260	32,150	27,720	24,360	21,420	21,620	21,420	29,560	33,050
24	35,040	34,520	32,660	33,146	31,980	27,580	24,200	21,360	21,540	21,620	29,740	32,960
25	35,480	34,430	32,660	33,050	31,840	27,360	24,100	21,360	21,540	21,680	30,740	32,780
26	35,620	34,130	32,570	32,960	31,720	27,180	23,960	21,360	21,540	22,140	31,200	32,750
27	35,660	33,920	32,570	32,720	31,520	27,000	23,720	21,360	21,540	22,200	31,520	32,750
28	35,660	33,740	32,570		31,380	26,800	23,520	21,360	21,480	22,200	31,660	32,750
29	35,660		32,570		31,260	26,600	23,380	21,360		22,140	31,580	32,660
30	35,620		32,570		31,440	26,540	23,380	21,360		22,000	31,460	32,660
31	35,620		32,570		31,000		23,260	21,680		21,880		
Ave.	31,212	34,028	32,978	33,540	32,776	28,845	24,772	21,878	21,704	21,537	25,753	32,109

2004 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1				14,410	11,660					3,825	6,144	
2	19,040				11,800		6,130			3,825	6,203	
3	19,040				12,910		6,072			3,825		
4	18,950					9,348	6,009			3,825	9,256	
5	18,890			14,350		9,280	5,890				9,308	
6	18,800			14,350		9,244					10,030	
7				14,280	12,265	9,192		3,270			10,230	
8	18,656			14,280	12,190	9,124		3,172		3,797	10,620	
9		18,410		14,120	12,120		5,360	3,070		3,797		
10		18,305		14,050	12,050		5,232	2,934	2,537	3,895		15,860
11		18,305			11,990		5,119	2,762	2,537	3,937		15,755
12		18,305			11,920		5,119		2,512	3,937		16,100
13						9,008	5,119	2,558	2,512	3,958		19,790
14					11,860	8,708	5,093	2,485	3,317	3,958		23,660
15					11,800	8,500		2,485		3,986		24,640
16		18,110		13,260	11,660	8,292	4,763	2,426		4,003		
17		17,870		13,180	11,525	7,994	4,624	2,322		4,051		25,100
18		17,660		13,180	11,315		4,487	2,225		4,063		25,200
19		17,525		13,120	11,180		4,381			4,072		25,940
20				13,060				2,130				25,280
21				13,000	10,920			2,049				25,220
22					10,850			1,939				
23		17,330			10,750		4,228	1,813				
24		17,330			10,660		4,219	1,813				
25		17,330		12,610	10,520	6,834	4,189	1,799				
26		17,225		12,460		6,520	4,150					
27		17,225	14,860	12,295		6,423		2,555				
28		17,225	14,560	12,190		6,337		2,600				
29			14,520	12,090		6,337		2,600				
30		17,180	14,410	12,990		6,216						
31				11,720								
Ave.	18,896	17,689	14,588	13,250	11,597	7,960	5,010	2,450	2,683	3,922	8,827	22,050

Wahalkada wewa

2003 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	20,500	26,600	27,180	26,340		19,580	16,580	13,180				19,535
2	20,380	26,540	27,180	26,340		19,448	16,580	14,250	13,260			19,640
3	20,240	26,460	27,180	26,340		19,295		14,460				19,730
4	20,120	26,400	27,120	26,340		19,190	16,100	14,410				
5	19,985	26,340	27,120	26,260		19,040	15,990	14,410	13,180			20,120
6	19,940	26,460	26,940	26,260		18,860	15,860		13,180			20,160
7	20,100	26,460	26,800	26,260		18,650	15,695		13,060			20,300
8	20,100	26,940	26,720	26,260		18,500		13,720	13,060			20,300
9	22,260	26,940	26,600			18,500		13,460				20,240
10	23,180	26,940	26,600			18,500		13,180		12,130		
11	25,940	26,940	26,600			18,500	15,500	12,000		12,130		
12	25,940	26,940					15,500	12,350		12,130		
13	26,600	27,920	26,660				15,380	12,700		12,130		
14	26,600	28,180	26,600				15,260			12,130		
15	26,600	28,240	26,600		21,540		15,040	13,180		12,130		
16	26,600	28,240	26,600		21,440		14,920	13,520		12,130		
17	26,600	28,120	26,600	26,080	21,240			12,720		12,790		
18	26,600	28,120	26,600	26,080	21,100			13,840		12,790		
19	27,480	28,120		26,020	20,960			13,840	12,895	12,790		19,940
20	26,940	27,860	26,540	26,020	20,820				12,895	12,790		19,895
21	27,180	27,720	26,540	25,880	20,820				12,895	12,745	12,150	19,940
22	27,260	27,580	26,540	25,740					12,895		12,400	19,895
23	27,260	27,580	26,460	25,740					12,895	12,130	13,180	19,895
24	27,120	27,460	26,460						12,350	12,460	13,260	19,895
25	27,000	27,460	26,460				13,960			12,355		19,895
26	26,940	27,460				6,340	13,840		13,000	12,220		1,730
27	26,880	27,180	26,400			16,235	13,640		13,000	12,150		19,649
28	26,720	27,180	26,400			16,235	13,460		13,000	12,090		19,535
29	26,720		26,400		19,895	16,235			13,000	12,070	17,810	19,445
30			26,340		19,790	16,235			13,000	12,130	19,040	
31					19,640							
Ave.	24,682	27,299	26,676	26,131	20,725	17,459	15,207	13,451	12,973	12,321	14,640	18,934

2002 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		26,920	24,900	22,260		18,800	14,600	10,210	6,270		6,470	9,032
2		26,920	24,780	22,260	21,740	18,550	14,600	10,070	6,269		6,485	9,032
3	23,640	26,920	24,640	22,260	21,620	18,500	14,560	9,360	6,269		6,441	8,948
4	24,300	26,920	24,500	22,200	22,140	18,350	14,660	9,308	6,269	6,194	6,396	8,708
5	24,960	26,920	24,300	22,200	22,000	18,155	14,300	9,244	6,261	6,194	6,351	8,948
6	26,140		24,100	22,200	20,880	18,005	14,300	9,176	6,261	6,176	6,506	9,032
7	26,600	26,740	24,100	22,140	21,940	17,870	13,980	9,112	6,261	6,176	6,708	9,100
8	26,600	26,660	24,100	22,140	21,620	17,720	13,720	9,004	6,248	6,176	6,948	9,146
9	26,600	26,480	24,100	22,140	21,480	17,570	13,460	8,548	6,248	6,176	7,236	9,256
10	26,880	26,480	24,040	22,080	21,360	17,570	13,200	8,660	6,248	6,176	7,300	10,620
11	27,580	26,340	24,040	22,080	21,220	17,420	12,895	8,612	6,248	6,176	7,396	11,075
12	27,580	26,220	23,980	22,080	21,080	17,270	12,700	8,564	6,234	6,176	7,252	11,489
13	27,580	16,140	23,980	22,080	20,960		12,550	8,356	6,234	6,027	7,252	12,020
14	27,580	26,140	23,840	22,000	20,760		12,355	8,132	6,234	6,027	7,044	13,380
15	27,580	26,140	23,840	22,000	20,620		12,165	7,876	6,234	6,027	6,455	15,300
16	27,580	26,080	23,840	22,000	20,500		12,070	7,668	6,216	6,027	6,724	16,100
17	27,520	25,940	23,720	21,980	20,360		11,890	7,460	6,216	5,960	6,564	
18	27,460	25,820	23,520		20,220		11,760	7,252	6,216	5,960	6,772	
19	27,380	25,680	23,380		20,100		11,570	7,044	6,216	5,960	6,948	20,360
20	27,320	25,540	23,260		23,260	16,490	11,375	7,044	6,068	5,860	7252[	21,020
21	27,260	25,360	23,120		23,120	16,385	11,225	7,044	6,068	5,860	9,084	21,540
22	27,180	25,280	23,000		23,000	16,235	11,180	6,980	6,068	5,860	9,164	21,680
23	27,180	25,220	22,800		22,800	16,100	11,120	6,980	6,054	5,860	9,192	21,740
24	27,180	25,220	22,660		22,660	15,950	11,000	6,425	6,054	5,630	9,204	21,680
25	27,180	25,220	22,540	21,360	22,540	15,755	10,850	6,365	6,054	5,960	9,176	21,680
26	27,180	25,220	22,540	21,160	22,540	15,755	10,750	6,306	6,054	6,203	9,176	21,360
27	27,120	25,160	22,540	21,020	22,400	15,320	10,620	6,306	6,054	6,279	9,164	20,960
28	27,060		22,400	22,260	22,340	15,060	10,490	6,306	6,068	6,306	9,096	20,760
29	27,000		22,400	22,140		14,800	10,360	6,270	6,068	6,320	9,072	20,620
30	26,920		22,340	22,000	22,340	14,600	10,230	6,270	6,068	6,320	9,072	20,620
31	26,860				19,045		10,210			6,396	9,032	20,560
Ave.	26,862	25,680	23,577	22,002	21,608	16,880	12,282	7,865	6,178	6,088	7,656	15,371

Wahalkada wewa

2001 **Capacity (Ac ft)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1				31,260		31,200	27,060				17,810	16,340
2				31,200		30,920	26,920	24,240			17,765	16,340
3					33,050			24,240				
4					32,960			24,240		17,720		
5				31,060	32,960			23,900		17,720		
6				31,060	32,960			23,900	19,100	17,720		
7					32,960	30,280			19,040	17,615		
8					32,840	20,000			19,040	17,615		
9	22,260				32,840	20,400			18,895	17,615		
10	23,180				32,840	30,280			18,890	17,615		
11	25,940				32,840	30,080						
12	25,940			31,060	32,840	29,880	25,420					
13	26,600			31,060	32,750		25,280					15,755
14	26,600			31,120	32,750	29,560						15,650
15	26,600		33,050	31,200	32,750	2,920						15,605
16			32,500	31,200	32,750	29,280						15,500
17			32,450	31,200	32,660	29,100						15,440
18			32,270		32,660	28,900				17,330		
19			32,060	31,200	32,660					17,330		
20			31,920	31,200	32,660		24,300			17,330		15,500
21				31,200	32,660	28,440	24,100			17,330		15,890
22			31,660	31,200	32,660	28,240	23,980			17,330	16,640	16,100
23			31,660	31,120	32,570	28,100	23,840	20,100			16,775	20,200
24			31,660		32,570	27,920	23,640	19,970			16,925	20,020
25			31,660		32,450	27,780	23,440	19,880			16,880	20,700
26			31,580		32,360		23,640	19,880				20,700
27			31,580	31,120	32,270		23,840	19,880				
28			31,580	31,120	32,060	27,520	23,980	19,880				
29			31,460			27,380	23,980	19,730			16,490	
30			31,460			27,260					16,385	
31			31,320		31,460							
Ave.	25,303	#DIV/0!	31,867	31,152	32,659	26,926	24,530	21,653	18,993	17,523	16,959	17,124

2010 **Water level (feet)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	17.06	15.98	14.60	14.38	13.83	11.65	8.15	4.76	2.79	2.89	3.21	7.87
2	17.06	15.98	14.60	14.38	13.67	11.48	8.27	4.50	2.85	2.92	3.21	8.69
3	16.98	15.90	14.60	14.38	13.56	11.33	8.04	4.43	2.85	2.92	3.21	9.81
4	16.90	15.79	14.60	14.38	13.56	11.17	7.81	4.26	2.85	2.95	3.21	9.84
5	16.79	15.67	14.60	14.38	13.25	10.98	7.54	4.26	2.85	3.08	3.25	10.33
6	16.71	15.67	14.54	14.38	13.13	10.83	7.38	4.26	2.85	3.08	3.25	10.82
7	16.60	15.67	14.46	14.38	12.96	10.83	7.05	4.26	2.85	3.08	3.25	10.82
8	16.50	15.67	14.42	14.38	12.79	10.83	7.05	4.26	2.85	3.02	3.25	11.15
9	16.56	15.67	14.33	14.38	12.65	10.83	7.05	4.03	2.85	3.02	3.25	11.25
10	16.56	15.67	14.60	14.38	12.79	10.83	7.05	3.77	2.85	3.02	3.25	11.25
11	16.56	15.58	14.60	14.38	12.06	10.67	7.05	3.51	2.85	3.02	3.25	11.25
12	16.56	15.58	14.60	14.38	12.65	10.46	7.05	3.25	2.85	3.02	3.25	11.18
13	16.56	15.58	14.60	14.38	12.56	10.25	6.79	3.25	2.85	3.02	3.25	11.15
14	16.56	15.58	14.60	14.38	12.56	10.00	6.53	3.25	2.85	3.02	3.25	11.18
15	16.56	15.48	14.60	14.38	12.75	9.77	6.26	3.25	2.85	3.02	3.25	11.12
16	16.56	15.40	14.60	14.38	12.42	9.58	6.00	3.25	2.85	3.02	3.25	11.05
17	16.50	15.29	14.60	14.38	12.38	9.48	5.74	3.25	2.79	3.02	3.25	11.05
18	16.42	15.19	14.60	14.38	12.31	9.46	5.48	3.12	2.79	3.02	3.25	11.05
19	16.56	15.08	14.27	14.38	12.31	9.46	5.48	2.95	2.79	3.02	3.25	11.05
20	16.56	15.08	14.27	14.38	12.96	9.46	5.48	2.95	2.79	3.02	3.28	11.02
21	16.48	15.08	14.27	14.27	12.31	9.33	5.48	2.95	2.79	3.02	3.28	11.32
22	16.38	15.08	14.27	14.25	12.31	9.17	5.48	2.95	2.79	3.02	3.35	12.92
23	16.27	15.08	14.27	14.25	12.31	9.02	5.58	2.95	2.85	3.02	3.35	12.96
24	16.17	15.08	14.27	14.21	12.21	8.90	5.58	2.95	2.85	3.02	3.35	13.61
25	16.08	14.98	14.25	14.17	12.08	8.88	5.58	2.95	2.85	3.02	4.43	16.40
26	15.98	14.90	14.25	14.13	12.00	8.75	5.58	2.89	2.85	3.05	4.69	15.74
27	15.98	14.79	14.25	14.10	11.92	8.75	5.58	2.89	2.85	3.05	5.58	16.73
28	15.98	14.69	14.25	14.10	11.81	8.75	5.41	2.89	2.85	3.05	6.62	17.88
29	15.98		14.25	14.08	11.81	8.75	5.25	2.85	2.89	3.05	7.05	18.83
30	15.98		14.33	13.92	11.81	8.73	5.08	2.85	2.89	3.05	7.22	18.86
31	15.98		14.38		11.81		4.92	2.85		3.21		19.35
Av.	16.46	15.40	14.44	14.30	12.57	9.95	6.35	3.44	2.84	3.02	3.79	12.50

Wahalkada wewa

2009 **Water level (feet)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	15.15	16.08	14.79	16.02	14.33	12.38	8.42	5.21	4.81	3.83	2.92	7.29
2	15.02	16.08	14.79	15.92	14.33	12.29	8.29	5.21	4.75	3.77	2.92	7.88
3	14.90	16.08	14.79	15.81	14.21	12.29	8.23	5.21	4.73	3.75	2.92	7.88
4	14.83	15.96	14.79	15.71	14.08	12.15	8.23	5.17	4.69	3.71	3.02	7.94
5	14.83	15.88	14.79	15.58	13.94	11.96	8.13	5.17	4.67	3.67	3.17	8.04
6	14.83	15.77	14.75	15.46	14.10	11.81	8.13	5.17	4.63	3.65	4.42	8.06
7	14.83	15.67	14.75	15.35	14.10	11.65	7.88	5.15	4.58	3.63	4.46	8.06
8	14.83	15.58	14.75	15.21	14.10	11.48	7.48	5.15	4.56	3.58	4.46	8.31
9	14.83	15.48	14.75	15.13	14.10	11.31	7.08	5.15	4.52	3.54	4.46	9.35
10	14.83	15.42	15.42	15.02	14.10	11.15	6.69	5.13	4.50	3.50	4.46	9.46
11	14.83	15.42	15.75	15.75	14.10	10.96	6.19	5.13	4.46	3.48	4.46	9.50
12	14.83	15.42	16.08	15.92	14.08	10.90	5.71	5.13	4.42	3.44	4.46	9.67
13	14.83	15.42	16.17	15.94	13.94	10.90	5.21	5.08	4.40	3.42	4.85	9.83
14	14.83	15.42	16.25	15.94	13.81	10.71	5.02	5.08	4.38	3.38	5.08	9.92
15	14.83	15.38	16.25	15.94	13.67	10.58	4.90	5.08	4.33	3.38	5.15	9.92
16	14.83	15.38	16.25	15.88	13.63	10.46	4.75	5.08	4.29	3.38	5.29	10.42
17	15.75	15.38	16.25	15.77	13.63	10.23	4.75	5.04	4.25	3.38	5.58	11.15
18	15.92	15.29	16.25	15.67	13.63	10.06	4.69	5.04	4.23	3.38	6.48	11.15
19	16.08	15.19	16.25	15.58	13.48	9.90	4.48	5.04	4.19	3.38	6.73	14.54
20	16.08	15.08	16.25	15.48	13.50	9.81	4.40	5.02	4.17	3.38	6.73	14.54
21	16.08	14.96	16.25	15.35	13.50	9.81	4.10	5.02	4.13	3.38	7.06	14.54
22	16.04	14.88	16.25	15.23	13.50	9.81	3.90	4.98	4.10	3.38	7.15	14.54
23	15.98	14.79	16.21	15.08	13.50	9.81	3.71	4.98	4.08	3.38	7.23	15.11
24	15.83	14.79	16.21	14.96	13.48	9.73	3.50	4.94	4.02	3.38	7.25	15.11
25	15.71	14.79	16.21	14.83	13.48	9.83	4.29	4.94	4.00	3.38	7.29	15.13
26	15.58	14.79	16.21	14.69	13.33	9.48	5.08	4.92	3.96	3.38	7.29	16.04
27	15.75	14.79	16.21	14.56	13.15	9.27	5.25	4.92	3.94	3.38	7.29	16.40
28	16.06	14.79	16.21	14.42	12.98	9.08	5.25	4.90	3.90	2.92	7.29	16.73
29	16.06		16.21	14.33	12.81	8.90	5.25	4.90	3.88	2.92	7.29	16.90
30	16.06		16.21	14.33	12.65	8.69	5.25	4.85	3.83	2.92	7.29	16.90
31	16.06		16.15		12.50		5.25	4.85		2.92		17.06

2008 **Water level (feet)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	13.85	12.67	12.79	17.71	17.13	13.52	10.58	8.27	11.71	11.63	11.04	12.00
2	13.85	12.67	12.79	17.71	17.06	13.52	10.58	8.10	11.75	11.63	10.92	12.00
3	13.85	12.67	12.79	17.71	16.96	13.52	10.42	8.10	11.75	11.58	10.79	11.94
4	13.85	12.67	12.79	17.71	16.83	13.38	10.29	8.10	11.75	11.58	10.67	11.83
5	13.85	12.67	12.79	17.71	16.71	13.25	9.92	8.10	11.75	11.58	10.52	11.75
6	13.85	12.67	12.79	17.71	16.54	13.13	9.81	8.10	11.75	11.58	10.35	11.81
7	13.85	12.96	12.79	17.71	16.56	12.96	9.71	8.10	11.75	11.58	10.21	12.31
8	13.85	13.13	12.79	17.71	16.29	12.79	9.71	8.04	11.75	11.50	10.04	12.33
9	13.85	13.19	13.46	17.71	16.06	12.79	9.71	7.98	11.75	11.50	9.88	12.33
10	13.85	13.19	13.79	17.71	15.90	12.79	9.71	7.81	11.75	11.50	9.71	12.38
11	13.81	13.19	14.92	17.71	15.73	12.73	9.65	7.40	11.75	11.50	9.54	12.38
12	13.71	16.48	15.19	17.71	15.58	12.56	9.48	7.48	11.71	11.50	9.38	12.96
13	13.60	16.48	15.25	17.71	15.58	12.46	9.33	7.31	11.71	11.46	9.35	13.46
14	13.50	16.48	15.33	17.71	15.25	12.38	9.17	7.15	11.71	11.46	9.08	13.94
15	13.46	16.48	15.75	17.71	15.15	12.21	9.17	7.08	11.71	11.46	8.96	14.00
16	13.40	16.48	15.98	17.71	15.08	12.04	9.17	7.19	11.71	11.46	8.75	14.10
17	13.33	16.42	16.25	17.71	15.08	11.88	9.17	7.23	11.71	11.46	8.58	14.27
18	13.33	16.38	16.83	17.67	14.96	11.81	9.17	7.25	11.71	11.46	8.42	15.42
19	13.33	12.98	16.96	17.67	14.79	11.81	9.17	7.25	11.67	11.46	8.27	15.92
20	13.33	12.88	17.08	17.67	14.63	11.81	9.17	7.25	11.67	11.46	8.10	15.94
21	13.33	12.90	17.13	17.67	14.40	11.81	9.17	7.25	11.67	11.42	8.38	15.94
22	13.33	12.83	17.17	17.67	14.33	11.81	9.17	7.27	11.67	11.42	8.54	15.96
23	13.33	12.75	17.17	17.67	14.33	11.50	9.17	7.27	11.67	11.42	8.65	15.96
24	13.29	12.65	17.35	17.65	14.33	11.35	9.17	7.27	11.65	11.42	10.00	16.00
25	13.25	12.65	17.42	17.58	14.33	11.17	9.17	7.27	11.65	11.40	12.96	15.94
26	13.19	12.65	17.46	17.52	14.17	11.13	9.17	7.31	11.65	11.40	12.98	15.94
27	13.13	12.69	17.56	17.46	14.02	10.85	9.04	7.38	11.65	11.40	12.00	15.88
28	13.06	12.75	17.58	17.38	13.83	10.69	8.92	7.50	11.63	11.40	12.00	15.88
29	12.96	12.79	17.63	17.29	13.67	10.58	8.75	7.58	11.63	11.33	12.00	15.56
30	12.88		17.63	17.19	13.50	10.58	8.58	9.50	11.63	11.33	12.00	15.56
31	12.75		17.67		13.50		8.42	11.15		11.33	12.00	15.56

Wahalkada wewa

2007 **Water level (feet)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	17.98	19.40	18.65	18.04	16.10	12.83	10.96	8.23	6.79	7.12	11.32	10.92
2	17.98	19.40	18.50	18.04	15.98	12.71	10.83	8.23	6.79	7.08	11.32	10.79
3	17.98	19.40	18.38	18.02	15.83	12.56	10.69	8.17	6.79	7.08	11.32	10.66
4	17.98	19.40	18.25	18.02	15.71	12.50	10.56	8.04	6.79	7.08	11.32	10.53
5	17.90	19.40	18.17	18.02	15.58	12.60	10.42	7.90	6.86	7.08	11.32	10.40
6	17.75	19.25	18.17	18.02	15.46	12.60	10.35	7.77	6.86	7.08	11.32	10.33
7	17.63	19.13	18.17	18.02	15.33	12.46	10.35	7.64	6.82	7.05	11.32	10.27
8	17.48	19.06	18.17	18.02	15.19	12.33	10.35	7.51	6.82	7.05	11.48	10.27
9	17.40	18.98	18.17	18.02	15.06	12.21	10.27	7.38	6.82	7.05	11.48	10.27
10	17.35	18.88	18.15	17.98	14.92	12.08	10.15	7.25	7.08	7.05	11.48	10.27
11	17.35	18.79	18.15	17.98	14.79	11.92	10.00	7.12	7.15	8.10	11.48	10.27
12	17.42	18.79	18.15	17.94	14.67	11.83	9.88	7.05	7.18	8.13	11.48	10.27
13	17.48	18.79	18.15	17.94	14.54	11.83	9.75	7.05	7.18	8.23	11.48	10.66
14	17.48	18.79	18.15	17.94	14.40	11.83	9.65	7.05	7.18	8.36	11.48	10.76
15	17.48	18.79	18.15	17.94	14.27	11.92	9.58	6.92	7.18	8.50	11.48	11.05
16	17.48	18.79	18.15	17.94	14.15	11.92	9.44	8.90	7.18	8.46	11.48	12.30
17	17.48	18.67	18.13	17.90	14.10	11.92	9.33	8.90	7.18	9.18	11.48	12.56
18	17.48	18.54	18.13	17.67	14.08	11.92	9.25	8.90	7.18	9.41	11.48	13.02
19	17.35	18.40	18.13	17.58	14.04	11.81	9.25	8.90	7.18	9.54	11.51	13.94
20	17.23	18.27	18.13	17.48	13.92	11.71	9.25	6.86	7.15	9.61	11.51	14.17
21	17.08	18.15	18.13	17.40	13.79	11.46	9.25	6.86	7.15	9.68	11.55	14.27
22	16.96	18.02	18.13	17.29	13.65	11.46	9.21	6.86	7.15	9.71	11.55	14.30
23	16.83	17.90	18.08	17.23	13.50	11.33	9.08	6.86	7.15	9.71	11.55	14.30
24	16.71	17.79	18.08	17.13	13.40	11.17	9.08	6.86	7.15	9.71	11.55	14.33
25	16.71	18.21	18.08	17.63	13.35	11.08	8.83	6.86	7.12	9.94	11.55	14.33
26	16.90	18.71	18.08	16.73	13.35	11.08	8.69	6.82	7.12	10.00	11.55	14.33
27	18.04	18.73	18.08	16.60	13.35	11.08	8.56	6.82	7.12	10.10	11.41	14.27
28	18.54	18.73	18.08	16.48	13.35	11.08	8.42	6.82	7.12	11.15	11.32	14.20
29	19.35		18.04	16.38	13.23	11.08	8.31	6.82	7.12	11.32	11.02	14.10
30	19.40		18.04	16.25	13.08	11.08	8.23	6.82	7.08	11.32	11.05	14.04
31	19.40		18.04		12.96		8.23	6.82		11.32		13.94

2006 **Water level (feet)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	25.12	25.75	24.93	24.86	24.08	22.47	20.17	17.91	15.19	15.61	18.60	18.89
2	25.06	25.75	24.93	24.86	23.94	22.37	20.04	17.91	15.19	15.61	18.60	18.75
3	25.30	25.68	24.93	24.83	23.81	22.30	19.94	17.88	15.19	15.61	18.60	18.70
4	24.96	25.65	25.09	24.83	23.58	22.21	19.88	17.88	15.19	15.61	18.60	18.56
5	24.93	25.62	25.09	24.80	24.11	2214.00	19.88	17.78	15.19	15.61	18.60	18.47
6	24.99	25.58	25.09	24.80	24.11	22.04	19.84	17.68	15.32	15.61	18.60	18.34
7	25.03	25.55	25.09	24.80	24.08	22.04	19.75	17.58	15.38	15.58	18.47	18.20
8	25.09	25.52	25.09	24.76	23.98	22.01	19.65	17.48	15.42	15.58	18.47	18.14
9	25.09	25.52	25.06	24.76	23.91	21.91	19.55	17.38	15.51	15.58	18.34	18.14
10	25.09	25.52	25.06	24.76	23.85	21.81	19.45	17.25	15.74	15.58	18.20	18.14
11	25.09	25.52	25.06	24.76	23.78	21.71	19.35	17.15	15.74	15.58	18.07	18.14
12	25.16	25.45	25.06	24.73	23.71	21.61	19.25	17.06	15.74	15.55	17.94	18.11
13	25.26	25.42	25.06	24.73	23.65	21.55	19.19	17.06	15.74	15.55	17.65	18.11
14	25.58	25.35	25.06	24.73	23.58	21.48	19.12	17.02	15.74	15.55	17.61	18.11
15	25.91	25.29	25.06	24.73	23.52	21.39	19.12	16.89	15.71	15.55	17.55	18.11
16	25.94	25.22	25.03	24.70	23.45	21.32	19.12	16.76	15.71	15.55	17.88	18.01
17	26.01	25.22	25.03	24.70	23.29	21.32	19.02	16.56	15.71	15.55	18.04	17.88
18	26.01	25.22	25.03	24.70	23.27	21.22	18.96	16.43	15.71	15.55	18.20	17.74
19	26.08	25.16	24.99	24.67	23.26	21.12	18.86	16.30	15.71	15.55	18.79	17.61
20	26.08	25.09	24.99	24.67	23.19	21.02	18.76	16.17	15.71	15.58	18.93	17.97
21	26.08	25.06	24.99	24.67	23.12	20.93	18.66	16.04	15.67	15.58	18.99	18.27
22	26.08	24.99	24.96	24.67	23.06	20.83	18.60	15.91	15.67	15.71	19.06	18.53
23	26.01	24.96	24.96	24.63	22.99	20.80	18.60	15.78	15.65	15.84	19.06	18.53
24	25.94	24.96	24.96	24.63	22.93	20.76	18.60	15.78	15.65	16.43	19.06	18.70
25	25.88	24.96	24.93	24.63	22.86	20.76	18.56	15.78	15.65	18.04	19.06	18.70
26	25.81	24.96	24.93	24.60	22.80	20.66	18.47	15.74		18.20	18.99	18.70
27	25.75	24.96	24.93	24.57	22.70	20.57	18.37	15.68		18.37	18.89	18.56
28	25.75	24.96	24.90	24.44	22.63	20.47	18.27	15.61		18.43	18.79	18.43
29	25.75		24.90	24.30	22.57	20.37	18.17	15.51		18.53	18.89	18.30
30	25.75		24.90	24.11			18.07			18.60		18.17
31	25.75		24.86				17.97					18.04

Wahalkada wewa

2005 **Water level (feet)**

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	23.45	26.34	25.58	25.15	25.09	24.53	22.27	20.60	19.78	19.71	19.88	24.63
2	23.55	26.34	25.58	25.15	25.03	24.53	22.27	20.50	19.84	19.71	19.81	24.60
3	23.62	26.34	25.58	25.15	24.96	24.53	22.24	20.43	19.94	19.71	19.71	24.53
4	23.65	26.34	25.58	25.15	25.19	24.40	22.14	20.34	19.94	19.68	19.61	24.53
5	23.68	26.34	25.58	25.15	25.68	24.37	22.04	20.27	19.94	19.68	19.84	24.50
6	23.70	26.31	25.55	25.71	25.72	24.30	22.98	20.20	19.94	19.68	19.94	24.50
7	23.70	26.31	25.55	25.78	25.72	24.21	21.91	20.20	19.94	19.65	19.94	24.50
8	23.70	26.31	25.52	25.78	25.72	24.01	21.81	20.20	19.94	19.65	19.94	24.50
9	23.70	26.27	25.45	25.78	25.68	23.91	21.71	20.20	19.94	19.65	20.27	24.47
10	23.68	26.27	25.39	25.75	25.62	23.81	21.65	20.17	19.80	19.61	20.83	24.44
11	23.65	26.24	25.32	25.78	25.58	23.71	21.58	20.07	19.80	19.61	20.89	24.44
12	23.58	26.21	25.29	25.81	25.55	23.65	21.58	20.01	19.80	19.61		24.44
13	23.58	26.21	25.26	25.78	25.52	23.65	21.58	19.94	19.80	19.61	21.48	24.44
14	23.52	26.17	25.26	25.72	25.49	23.65	21.52	19.88	19.88	19.61	21.48	25.09
15	23.48	26.17	25.26	25.68	25.45	23.48	21.45	19.81	19.88	19.58	21.48	25.12
16	23.45	26.14	25.26	25.65	25.45	23.39	21.45	19.74	19.88	19.10	21.48	25.15
17	23.45	26.04	25.26	25.62	25.42	23.26	21.48	19.74	19.88	19.78	21.48	25.22
18	23.45	26.01	25.26	25.58	25.35	23.16	21.48	19.74	19.84	19.81	21.55	25.42
19	23.78	25.98	25.26	25.55	25.28	23.06	21.48	19.74	19.84	19.81	21.78	25.42
20	23.81	25.94	25.22	25.55	25.22	22.99	21.45	19.71	19.84	19.81		25.42
21	24.17	25.91	25.22	25.49	25.15	22.93	21.39	19.71	19.81	19.78		25.42
22	25.42	25.85	25.22	25.45	25.12	22.86	21.29	19.71	19.81	19.75	23.45	25.42
23	26.01	25.85	25.22	25.42	25.05	22.86	21.19	19.71	19.81	19.71	23.78	25.38
24	26.08	25.85	25.22	25.39	24.99	22.80	21.12	19.68	19.81	19.81	23.88	25.35
25	26.24	25.81	25.22	25.37	24.82	22.70	21.06	19.68	19.78	19.84	24.37	25.32
26	26.31	25.72	25.19	25.32	24.86	22.60	20.96	19.68	19.78	20.70	24.60	25.29
27	26.34	25.65	25.19	25.29	24.76	22.50	20.86	19.68	19.78	20.11	24.76	25.26
28	26.34	25.58	25.19	25.12	24.69	22.40	20.76	19.68	19.75	20.11	24.83	25.26
29	26.34		25.19		24.63	22.34	20.70	19.68		20.07	24.80	25.26
30	26.31		25.19		24.57	22.27	20.70	19.68		20.01	24.73	25.22
31	26.31		25.19		24.53		20.63	19.65		19.94		25.16

Appendix 4.3(f)

General Information of Mahakandarawa & Wahalkada wewa

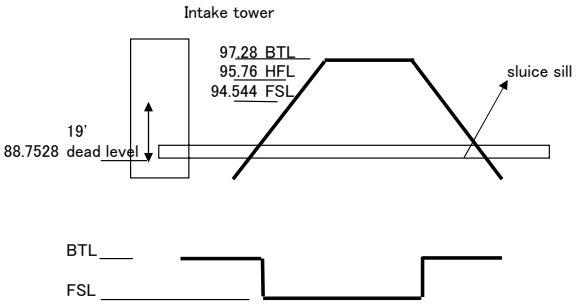
Mahakannadarawa Wewa

Construction 1965

Co-ordinate	unit	F/5(0.3 x 2.10)	unit	
Catchment area	Sq miles	126	km2	326
FSL	MSL	311	masl	94.544
BTL	MSL	320	masl	97.28
HFL	MSL	315	masl	95.76
FSD	ft	19	m	5.776
Capacity of FSL	Acft	36250	m3	44,696,250
Area of FSL	Ac	3600	km2	15
Dead Storage	Acft	2000	m3	2,466,000
Irrigable Area	Ac	6000	ha	2428

Appendix 4.3.1(6)

1 Acre =	4046.8 m2	1 mile =	1609 m
1 ft=	0.3048 m2	1chain=	20.116 m
1 Acft =	1233 m3	1 cusec=	0.028317 m3/sec



BUND

Length	Mile & chs	2miles & 13 chas
BTW	ft	18
Side slope		
U/S		01 on 2.5
D/S		01 on 03

SPILL

		RB	LB
Location	mil & chs	2.0 mil	01 mil 15 chs
Type		CO with 02Nos. Radial gate	CO
Length	ft	290	695

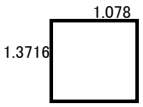
No. of opening		2
Size of opening		10″ x 20″
Crest Level	ft	311

Capacity FSL/ Area of FSL	307	m3/m2
Capacity FSL	44,696,250	m3
rainfall	1,200	mm
Catchment Area	326	km2
Area FSL	15	km2
Efficency	0.100	
Inflow	39,120,000	

灌漑効率？

Slucies

Sluices		RB	LB
type		tower	tower
Sill level		293	292
opening	ft	3.5' x 4.5'	3.5' x 4.5'
No. of opening		1	1



Canal

		RB	LB
Length	mls	10.29	14.95
D.CC length	mls	14.6	20.04
Average	acs	3265	2835

Statistical Data of Mahakanadarawa

R/B Main Canal			
Q	cusec	100	m3/sec
FSD	ft	4	
FB	ft	3	
BW	ft	6	
Length	mls	10.68	
L/B Main Canal			
Q	cusec	120	m3/sec
FSD	ft	3.62	
FB	ft	3	
BW	ft	10	
Length	mls	13 Mls 0.68 chs	

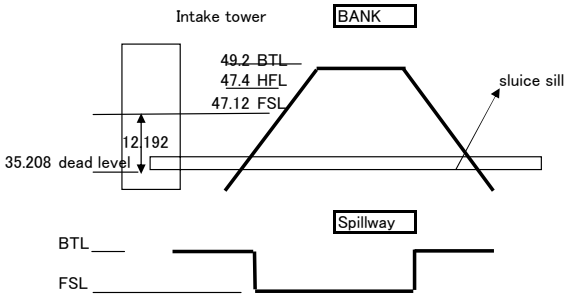
Wahalkada wewa

1 Acre =	4046.8 m2	1 mile =	1609 m
1 ft=	0.3048 m2	1chain=	20.116 m
1 Acft =	1233 m3	1 cusec=	0.028317 m3/sec

Construction: 1974

Co-ordinate	unit	F/5(0.3 x 2.10) unit		
Catchment area	Sq miles	31.5	km^2	82
FSL	MSL	155	masl	47.12
BTL	MSL	162	masl	49.248
HFL	MSL	156	masl	47.424
FSD	ft	40	m	12.16
Capacity of FSL	Acft	43000	m^3	53,019,000
Area of FSL	Ac	2257	km2	9
Dead Storage	Acft	2025	m^3	2,496,825
Irrigable Area	Ac	2000	ha	809

40' =



BUND

Length	ft	16840	5132.832
BTW	ft	20	6.096
Side slope			
U/S		01 on 3	
D/S		01 on 2	

SPILL

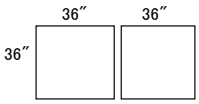
Type & Locatipn		Natural L.B.	
Level	ft	155	
Length	ft	160	
No. & type of gate		3 No. wooden gate	

No. of opening		
Size of opening		
Crest Level	ft	

Capacity FSL/ Area of FSL	580	m3/m2
Capacity FSL	53,019,000	m3
rainfall	1,300	mm
Catchment Area	82	km2
Area FSL	70	km2
Efficency	0.100	
Inflow	10,601,468	

Slucies

Sluices			
type		Tower R.CC	
Sill level	ft MSL	126.5	
Size	inch	2 No. GI gate 36″x 36″	



Canal

		ft	m
Length of Main canal	ft	28670	8739
length of dist canal	ft	42134	12842
Length of field canal	ft	185433	56520

CHAPTER 5

PLAN OF PROPOSED WATER SUPPLY SYSTEM

AA Canal **Mahakandarawa Design**

1. Design section and discharge of Irrigation Canal

Canal Data in ft & cusec

	RB	LB
Q(cusec)	100	120
FSD(ft)	4	3.62
FB(ft)	3	3
BW(ft)	6	10
Length(miles)	10.68	13-0.68chain

Canal Data in m3/sec

	RB	LB
Q(m3/sec)	2.83	3.40
FSD(m)	1.22	1.10
FB(m)	0.91	0.91
BW(m)	1.83	3.05
Length(km)	17.18	20.92

2. Canal section measured in the site is as follows

Shape: rectangle

BW(m)=	3.5
FSD(m)=	1.5
FB(m)=	0.5

← Water Level is estimated by water trace

3. Record of Max. discharge in 2010 and 2011

	RB	LB
2010	1.98	2.51
2011	2.55	3.03

4. Discharge for Drinking Water

Year of 2034

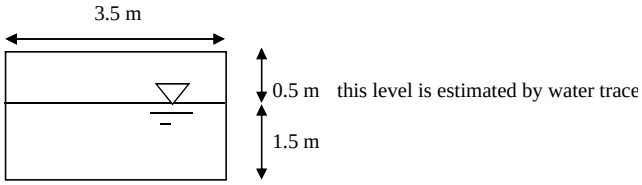
Q(m3/day)	18800
Q(m3/sec)	0.22

Year of 2024

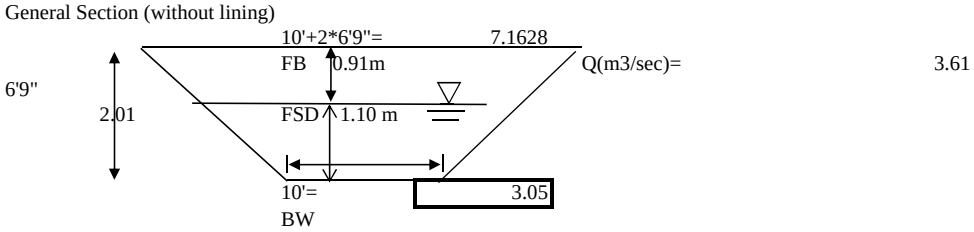
Q(m3/day)	9400
Q(m3/sec)	0.11

5. Left Bank Canal Section

Section of Intake Point



General Section (without lining)



6. Calculation of Discharge

Calculation is conducted by manning formula

V=1/n*R^(2/3)*I^(1/2)

n	roughness coefficeient by canal material	0.015 for concrete lining
h (m)	water depth	
A (m2)	water section	
S		
R	hydraulic mean radious	
I	canal bed slope	
V (m/s)	mean velocity	

Q(m3/s)= V x A

(1) Point of Intake (Shape of Rectagular with concrete lining)

Calculation: case n=0.015

	Irrigation	Irrigation+Drink	Drink
n	0.015	0.015	0.015
BW	3.5	3.5	3.5
h	1.17	1.23	0.20
A	4.095	4.305	0.7
S	5.84	5.96	3.9
R	0.70	0.72	0.18
I	0.00025	0.00025	0.00025
V	0.83	0.85	0.34
Q	3.41	3.65	0.23
Design Q	Q=3.4	Q=3.62	Q=0.22

Calculation: case n=0.02

	Irrigation	Irrigation+Drink	Drink
n	0.02	0.02	0.02
BW	3.5	3.5	3.5
h	1.45	1.51	0.23
A	5.075	5.285	0.805
S	6.4	6.52	3.96
R	0.79	0.81	0.20
I	0.00025	0.00025	0.00025
V	0.68	0.69	0.27
Q	3.44	3.63	0.22
Design Q	Q=3.4	Q=3.62	Q=0.22

⟹ **Design height of canal lower portion: 0.30m**

for Freeboard calculation

Irrigation+Drink
0.02
3.5
1.74
6.09
6.98
0.87
0.00025
0.72
4.40
Q=4.34

(2) Point of Intake (Shape of Trapezoid with concrete lining)

Trapezoid with concrete lining (1:1)

	Irrigation	Irrigation+Drink	Drink
n	0.015	0.015	0.015
BW	3.05	3.05	3.05
h	1.02	1.05	0.2
A	4.15	4.31	0.65
S	5.93	6.02	3.62
R	0.70	0.72	0.18
I	0.00025	0.00025	0.00025
V	0.83	0.84	0.34
Q	3.45	3.63	0.22
Design Q	Q=3.4	Q=3.62	Q=0.22

Trapezoid with concrete lining (1:1)

	Irrigation	Irrigation+Drink	Drink
n	0.02	0.02	0.02
BW	3.05	3.05	3.05
h	1.19	1.24	0.24
A	5.05	5.32	0.79
S	6.42	6.56	3.73
R	0.79	0.81	0.21
I	0.00025	0.00025	0.00025
V	0.67	0.69	0.28
Q	3.40	3.66	0.22
Design Q	Q=3.4	Q=3.62	Q=0.22

(3) Point of Intake (Shape of Trapezoid without lining)

Trapezoid with no lining (1:2)

	Irrigation	Irrigation+Drink	Drink
n	0.02	0.02	0.02
BW	3.05	3.05	3.05
h	1.32	1.37	0.25
A	5.7684	6.0554	0.825
S	8.95304	9.17664	4.168
R	0.64	0.66	0.20
I	0.00025	0.00025	0.00025
V	0.59	0.60	0.27
Q	3.40	3.63	0.22
Design Q	Q=3.4	Q=3.62	Q=0.22

7. Calculation of Free Board

Free board of the irrigation canal is calculated by following factors. (Based on Design Standard for Irrgation Facility in Japan)

1. Factor from Roughness coefficient

Type of canal	idea	α
with lining, without lining	5% of water depth	0.05
Retaining wall (Flume, Culvert and other ready-made)	7% of water depth	0.07

2. Factor from water head by velocity

Case		
No need to insider raising up of water level by velocity head, for example, no facility like gate&screen in downstream	50% of velocity head	0.5
Water level is raised up by the facility at daownstream side	100% of velocity head	1

3. Factor of Wave by wind or other reason

Point of this idea is, wave is made trembling by special structures like drop work, gate, pumping and by wind
This wave tremblins is normally 10-30cm.
For desgin, value of half (5-15cm)is emplyed

If disgn condition has more than one facter from following condition: 0.10m=< hw =< 0.15m
If disgn condition has no facter from following condition: 0.05m=< hw =< 0.10m

Consition: 1) Scale, Impotance, Place: Important canal concening big irrigation area, and near from residential area
2) Concerning Wroks: Location is upstream of Siphon, Tunnel, etc.
3) Location and Curve: Location is at upstream of Cueve, Gate, Screen
4) Operation: There is possibility of larger discharge than designed

4. Reserve to Scale of the discharge

20% of Discahrge

5. Influence of Flooding

Case of Irrigation Canal Water depth by (Design discharge+ Considerable flooding discharge)+ 10cm

Step of the Calculation

(a) Calcurate Freeboard by total value from Factor 1 & Factor 2 & Facotor 3.
(b) Calculate Free board fro Factor 4
(c) Calculate Free board fro Factor 5

And, choose highr Canal hight

(a) Calcurate Canal height by total value from Factor 1 & Factor 2 & Facotor 3.

$$F_b = \alpha x d + \beta x h_v + hw$$

here,
Fb: Free Board
d: Design water depth
hv: 流速水深
wave

Canal height H= water depth + Fb

(b) Calculate Canal hight from Factor 4
Canal hight H= Water depth in 1.2 x Q(design)

(c) Calculate Canla hight from Factor 5
Canal hight H= Water depth with flooding discahrge + 0.1(m)

1. Factor from Roughness coefficient	Hc x 0.05	Hc=1.51	0.0755
2. Factor from water head by velocity	Hv x 0.5	Hv=V^2 /2g, V=0.69, Hv=0.024	0.012
3. Factor of Wave by wind or other reason	0.05<hw<0.1		0.1
		total	0.1875
		h+1&2&3 total	1.6975
4. Factor of Ratio of Discharge	1.2 x Q	Q=4.3 -> h=1.74	1.74
5. Factor of Flooding	df+10cm		1.61

and, compare (1+2+3) and 4 and 5

Max H=	1.74
Existing free board =	0.5
When Irrigation & Drinking Wate	0.45

0.45 > (1.74-1.51)=0.23 **OK**

4 Canal Wahalkada Design

1. Design section and discharge of Irrigation Canal

Canal Data in ft & cusec

Q(cusec)	55
FSD(ft-inchi)	2-6"
FB(ft-inchi))	2-5"
BW(ft)	10
Length(miles)	
Slope	0.00025

Canal Data in cumec

Q(m3/sec)	1.5565
FSD(m)	0.762
FB(m)	0.7366
BW(m)	3.048
Length(km)	0
Slope	0.00025

3. Record of Max. discharge in 2009, 2010 and 2011

2009	2.0	m3/sec
2010	2.0	
2011	2.0	

4. Discharge for Drinking Water

Discharge for Drinking Water in 2034

Q(m3/day)	28800
Q(m3/sec)	0.33

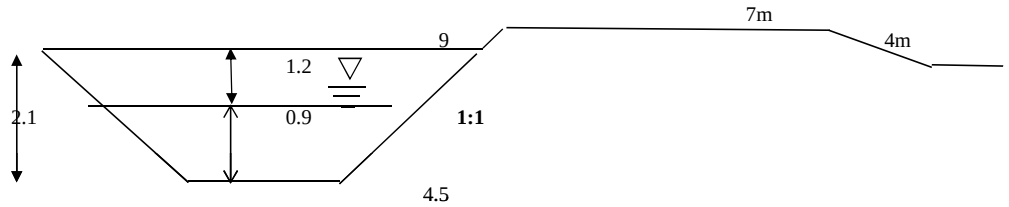
in 2024

Q(m3/day)	14200
Q(m3/sec)	0.16

5. Canal Section

Intake Point measured in the site

No Lining



6. Calculation of Discharge

Calculation is conducted by mannoing formula

V=1/n*R^(2/3)*I^(1/2)

n	roughness coefficeient by canal material	0.015 for concrete lining
h (m)	water depth	
A (m2)	water section	
S		
R	hydraulic mean radious	
I	canal bed slope	
V (m/s)	mean velocity	

Q(m3/s)= V x A

(1) Piont of Intake (Shape of Rectagular with concrete lining)

Calculation: case n=0.015

	Irrigation	Irrigation+Drinl	Drink
n	0.015	0.015	0.015
BW	3.05	3.05	3.05
h	0.76	0.82	0.26
A	2.90	3.17	0.86
S	5.20	5.37	3.79
R	0.56	0.59	0.23
I	0.00025	0.00025	0.00025
V	0.71	0.74	0.39
Q	2.07	2.36	0.34
Design Q	Q=2.0	Q=2.33	Q=0.33

Calculation: case n=0.02

	Irrigation	Irrigation+Drinl	Drink
n	0.02	0.02	0.02
BW	3.05	3.05	3.05
h	0.88	0.96	0.32
A	3.46	3.85	1.08
S	5.54	5.76	3.95
R	0.62	0.67	0.27
I	0.00025	0.00025	0.00025
V	0.58	0.60	0.33
Q	2.00	2.32	0.36
Design Q	Q=2.0	Q=2.33	Q=0.33

→ **Design height of canal lower portion: 0.40m**

for Freeboard calculation

Irrigation+Drink
0.02
3.05
1.07
4.41
6.08
0.73
0.00025
0.64
2.81
Q=2.80

Trapezoid with no lining slope (1:1) measured in the site

Calculation: case n: Earth excavated 0.025

n	0.025	0.025	0.025
BW	4.5	4.5	4.5
h	0.81	0.89	0.25
A	4.3011	4.7971	1.1875
S	6.67232	7.03008	4.168
R	0.644618364	0.682367768	0.284908829
I	0.00025	0.00025	0.00025
V	0.47	0.49	0.27
Q	2.03	2.35	0.33
Design Q	Q=2.0	Q=2.33	Q=0.33

Calculation: case n: Earth excavated 0.03

n	0.03	0.03	0.03
BW	4.5	4.5	4.5
h	0.91	1	0.29
A	4.9231	5.5	1.3891
S	7.11952	7.522	4.34688
R	0.691493247	0.731188514	0.319562537
I	0.00025	0.00025	0.00025
V	0.41	0.43	0.25
Q	2.03	2.35	0.34
Design Q	Q=2.0	Q=2.33	Q=0.33

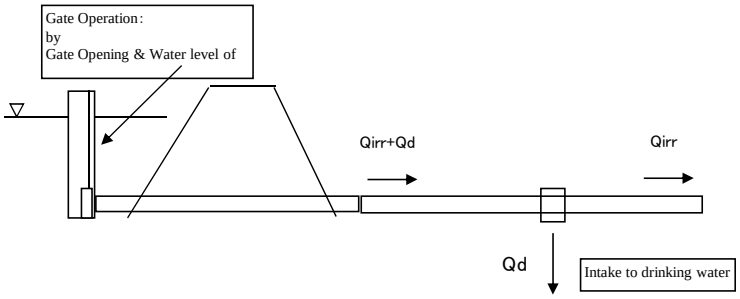
7. Calculation of Free Board

1. Factor from Roughness coefficient	Hc x 0.05	Hc=0.96	0.048
2. Factor from water head by velocity	Hv x 0.5	Hv=V^2 /2g, V=0.60, Hv=0.018	0.009
3. Factor of Wave by wind or other reason	0.05<hw<0.1		0.1
		total	0.157
		h+1&2&3 total	1.117
4. Factor of Ratio of Discharge	1.2 x Q	Q=2.8 -> h=1.07	1.07
5. Factor of Flooding	df+10cm		1.06

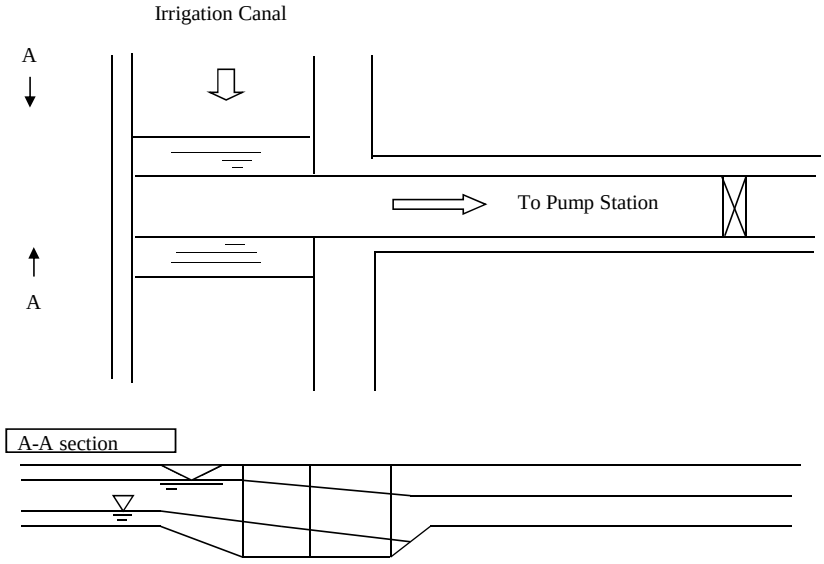
and, compare (1+2+3) and 4 and 5

Max H=	2.1
Existing free board =	1.2
When Irrigation & Drinking Wate	0.96
0.96 > (1.117-0.96)=0.157	OK

Intake well - Bank - Canal



Intake by the lower basin



Appendix 5.2(a) Raw Water Quality of Existing WTPs

1 Existing WTPs

There are three existing WTPs in Anuradhapura City and water resources of these WTPs are irrigation tank. Water treatment system of these three existing WTPs is rapid sand filter system. The capacity and water rescues is shown in **Table 1**.

Table 1 Existing WTPs

WTP name	Capacity (m3/d)	Source
New town	13,500	Nuwara Wewa
Sacred city	4,500	Thissa Wewa
Thuruwila	21,000	Thuruwila

2 Raw Water Quality

The raw water qualities of existing WTPs are similar and turbidity and color goes up slightly at the beginning of rainy season, but totally does not change so much through the year (see **Tables 1 to 3**). The value of pH is comparatively high and average value of pH is nearly 8.0 and the maximum is 8.5. On the other hand, existing three WTPs are supplying treated water which clears the water quality standard of Sri Lanka.

Table 2 Nuwara Wera Raw Water Quality

Nuwara

Date	Color (HAZAEN UNIT)	Turbity (NTU/FTU)	pH	Total Coliform at 35 C /100 ml	Elec. Conductivity at 25 (ms/cm)	Chloride (as Cl) - mg/L	Total Alkaliniity (as Caco3) -mg/L	Nitrate (as N) -mg/L	Nitrite (as N) - mg/L	Flouride (as F) - mg /L	Phosphate (as PO4) -mg/L	Total Hardness (as CaCo3)-mg/L	Total Iron (as Fe) -mg/L	Sulphate (as So4)- mg/L	Escherichia Coli at 44 C /100 mL
2010.05.17	20	8	7.8	15	520	90	210	1.2	0.0017	0.2	0.54	64		4.3	7
2010.07.19	20	8	8.4	10	520	89	198	1.9	0.001	0.61	0.957	164	0.055	9.1	2
2010.8.20	70	29	8.5	10	600	95	210	1.9	0.001	0.5	0.8	185	0.055	10	2
2010.09.15	60	42	8.4	10	630	96	128	2.2	0.045	0.52	0.687	200	0.508	15.3	2
2010.10.27	60	40	8.0	20	530	90	120	2.00	0.04	0.48	0.67	180	0.04	15	4
2010.11.10	20	13	7.8	10	510	89	198					154			Nill
2010.12.17	20	13	7.8	10	380	88	88					150			4
2011.02.11	10	10	7.9	20	380	40	120					140			4
2011.03.08	10	8	7.9	20	300	16	150					120			4
2011.04.25	5	5	7.9	18	310	16	148	*	*	*	*	118	*	*	6
2011.06.27	20	13	8.4	TMTC	360	120	88	1.50		0.49	1.61	100	0.02	2	28
2011.07.04	5	12	8.0	40	300	80	100	1.00		0.4	2	100	0.08	2	20
2011.08.25	30	4	7.9	60	410	78	84	2.90		0.24		150	0.32	1	40
2011.09.05	20	7	8.3	25	440	68	112	11.50		0.08	0.50	132	0.12	5	18
2011.10.26	20	1	7.3	25	510	53	86	0.90		0.46	NT	170	0.08	1	18
2011.11.28	20	5	8.0	18	410	98	106	0.50		0.21	NT	105	0.04	21	6
2011.12.31	20	7	7.3	10	460	98	132	0.50		0.10	NT	177	0.05	17	2
Ave	25	13	8		445	77	134								

Table3 Tissa Wera Raw Water Quality

Tissa

Date	Color (HAZAEN UNIT)	Turbity (NTU/FTU)	pH	Total Coliform at 35 C /100 ml	Elec. Conductivity at 25 (ms/cm)	Chloride (as Cl)- mg/L	Total Alkaliniity (as Caco3) -mg/L	Nitrate (as N) -mg/L	Nitrite (as N) - mg/L	Flouride (as F) - mg /L	Phosphate (as PO4) -mg/L	Total Hardness (as CaCo3)-mg/L	Total Iron (as Fe) -mg/L	Sulphate (as So4)- mg/L	Escherichia Coli at 44 C /100 mL
2010.05.11	30	13	7.9	15	350	50	100	1	0.002	0.1	0.51	64		2.8	6
2010.07.12	30	8	8.1	25	330	40	90	5.5	0.013	0.41	0.831	120	0.11	2.3	2
2010.8.20	45	10	8.5	40	350	35	110	5.5	0.013	0.41	0.831	110	0.01	2.6	15
2010.09.22	40	8	8.0	45	348	28	98	3	0.025	0.45	0.487	98	0.06	4.1	15
2010.10.27	40	4	7.9	60	290	44	116	2.8	0.018	0.5	0.389	110	0.08	5	15
2010.11.10	15		7.6	40	290	44	198					164			2
2010.12.17	20	10	7.6	40	270	28	72					120			12
2011.02.11	10	10	7.8	40	360	36	100					120			10
2011.03.08	10	10	7.8	40	300	48	64					64			10
2011.04.28	5	8	7.8	38	280	46	60	*	*	*	*	60	*	*	8
2011.06.22	40	46	7.3	TMTC	340	88	148	6.80		0.3	2.67	120	0.1	3	30
2011.07.04	5	50	7.6	40	320	84	120	4.80		0.35	2.8	110	0.1	2	8
2011.08.25	30	40	7.7	TMTC	400	76	160	7.30		0.20		120	0.53	5	10
2011.09.05	40	32	8.2	8	430	64	118	24.04		0.20	0.06	124	0.09	8	6
2011.10.26	40	12	7.3	8	520	11	80	0.90		0.30	NT	169	0.10	3	6
2011.11.28	30	9	7.9	6	350	50	105	0.00		0.29	NT	141	0.07	5	2
2011.12.31	30	18	7.3	4	370	64	119	0.10		0.15	NT	141	0.09	10	2
Ave	27	9	7.8		346	49	109								

Table 4 Thuruwila Wera Raw Water Quality

Thuruwila

Date	Color (HAZAEN UNIT)	Turbity (NTU/FTU)	pH	Total Coliform at 35 C /100 ml	Elec. Conductivity at 25 (ms/cm)	Chloride (as Cl)- mg/L	Total Alkaliniity (as Caco3) -mg/L	Nitrate (as N) -mg/L	Nitrite (as N) - mg/L	Flouride (as F) - mg /L	Phosphate (as PO4) -mg/L	Total Hardness (as CaCo3)-mg/L	Total Iron (as Fe) -mg/L	Sulphate (as So4)- mg/L	Escherichia Coli at 44 C /100 mL
2010.01.15	10	5	8.4	TMTC	350	14	125								Nil
2010.02.15	10	7	7.6	TMTC	350	20	125								Nil
2010.03.25	10	7	7.6	12	350	20	125								Nil
2010.04.20	10	7	7.6	10	350	20	125								Nil
2010.05.25	10	7	8.4	12	370	40	125	4	0.033		1.7021	64		0.7	Nil
2010.07.12	15	6	8.2	10	400	38	160	4.4	0.032	0.5	0.568	168	0.104	1.8	1
2010.8.20	15	6	8.2	20	410	40	160	3.5	0.032	0.2	0.568	150	0.001	2	5
2010.09.23	10	5	8.0	10	350	20	160	3.9	0.289	0.3	0.99	80	0.582	0.6	5
2010.10.27	15	4	7.8	12	300	44	76	2.9	0.029	0.5	0.89	180	0.482	0.58	5
2010.11.10	10	8	7.0	80	180	18	70					110			10
2010.12.14	15	9	7.8	TMTC	200	20	76					100			20
2011.02.01	20	20	7.0	80	280	30	120					90			10
2011.03.08	15	8	7.5	80	310	36	84					72			8
2011.04.27	5	7	7.6	40	300	30	80	*	*	*	*	70	*	*	6
2011.06.27	40	17	8.2	TMTC	480	144	92	9.70		0.4	2.45	104	0.23	4	20
2011.7.21	70	37	8.7	80	530	120	130	2.40		0.01	2.75	190	0.13	2	20
2011.8.29	20	14	8.1	100	420	100	100	4.20		0.14		112	0.03	0	18
2011.9.05	15	7	7.4	20	460	80	120	2.60		0.64	0.23	120	0.15	1	6
2011.10.26	70	3	7.1	20	500	53	170	0.80		0.27	NT	189	0.06	12	6
2011.11.28	10	1	8.0	4	420	68	119	0.80		0.36	NT	176	0.09	23	2
2011.12.27	10	3	7.3	2	420	63	132	1.00		0.38	NT	140	0.07	16	4
Ave	19	9	7.8		368	48	118								

Appendix 5.2(b) Pilot Plant

1 A Purpose of Pilot Plant

The water sources for this project contains relatively small amount of turbidity due to that from the tank for irrigation. Based on the condition, the following pilot plant was implemented to verify the possible usage of ecological purification system to purify the water. Ecological purification system is similar to slow sand filter system, which uses the algae and organisms to purify water. The following characteristics are unique to ecological purification system:

a. A water depth above filtration media shall be shallow, and sunlight shall be reachable to the surface of the media.
b. Velocity of the filtration media will be set to approximately 10 m/day to supply enough oxygen for algae and organisms.
c. Filtration media can be relatively bigger in size and uniformity coefficient due to the physical filtration is not a main purpose of the filter.
d. When algae on the surface of the filtration media starts floating in the water by detaching themselves, this algae is recommended to be removed through the installation of an overflow device and it can also help cleaning the surface of the filtration media less frequently.

To verify a quality of the water purification by ecological purification system with the special characteristics mentioned above, this pilot plant was conducted. The location of the pilot plant was chosen to be inside the existing Sacred City Water Treatment Plant property where has been using rapid sand filter systems to purify water from Thissa Tank.

2 Outline of the Pilot Plant Facilities

For this pilot plant, 1) the water was extracted from the existing aerator in the Sacred City Water Treatment Plant, 2) the water was conveyed by gravity to the roughing filter where upflow velocity is 30 m/day, and 3) the water was conveyed to sand filter No.1 for filtration. Sand filter No.2 used smaller sizes of filtration media than sand filter No.1 and used the raw=water directly from the aerator. Sand filter No.3 was implemented using the treated water by the roughing filter because the filtration head loss was observed after commencement of sand filter No.2 operation. At the same time, the water source of sand filter No.2 was changed to the treated water by the roughing filter. The more details of the facilities are included in Figure **1. Layout of Pilot Plant.**

3 Results of the Pilot Plant

The results, including the turbidity and color (however, the color does not reflect the true color due to a lack of turbidity removal form the water), of the water during the pilot plant operation is listed in the following Tables, Figures and Pictures.

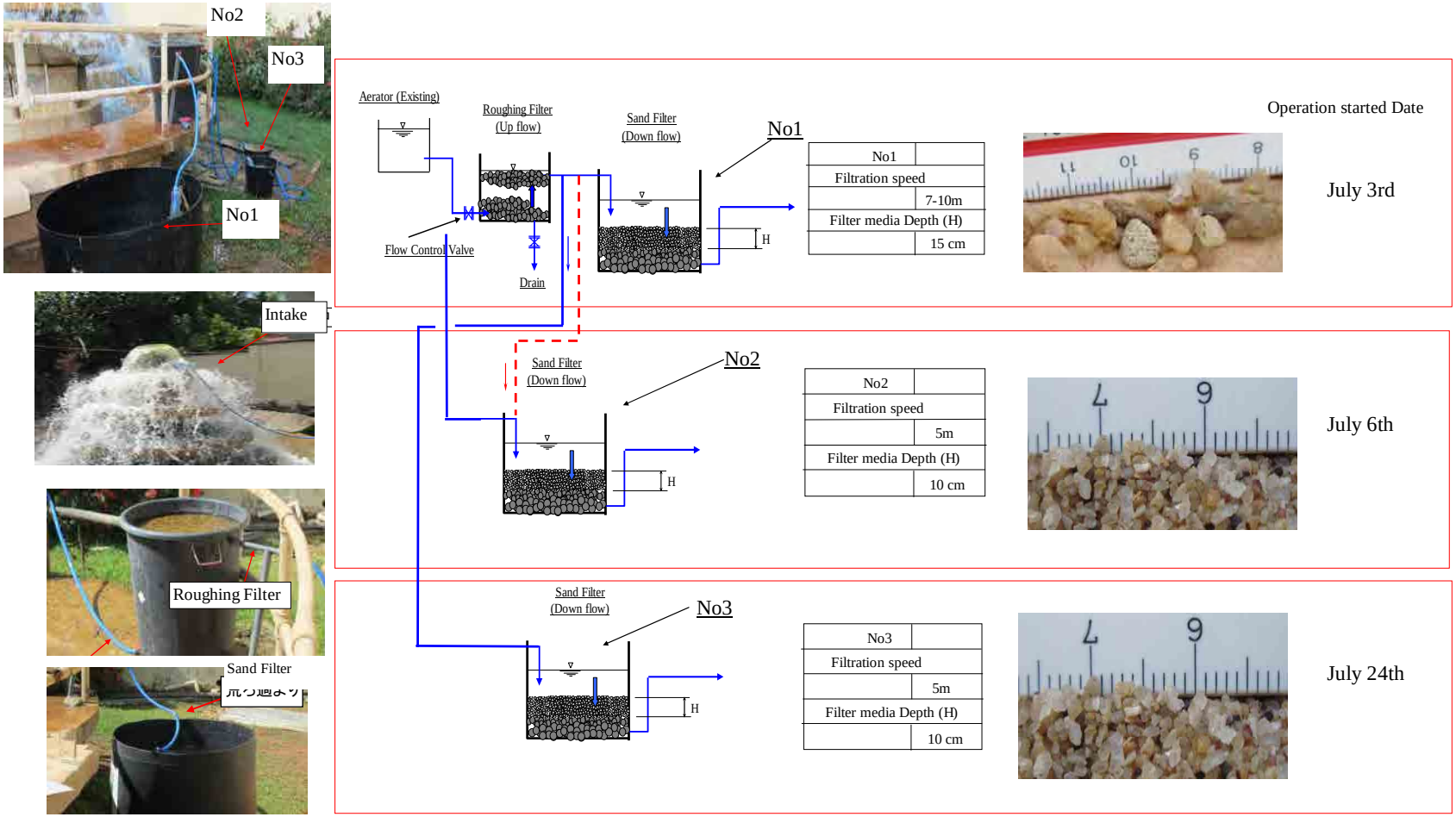


Figure 1 Layout of Pilot Plant

Table 1 Treated Water Quality of Pilot Plant (1/2)

Date/ Time		Raw Water		Roughing Filter		No.1 Filter			No.2 Filter			No.3 Filter		
		Turbidity (NTU)	Color (degree)	Turbidity (NTU)	Color (degree)	Turbidity (NTU)	Color (degree)	Filtration rate m/d	Turbidity (NTU)	Color (degree)	Filtration rate m/d	Turbidity (NTU)	Color (degree)	Filtration rate m/d
2012/7/3	9:00	19.7	38.0	14.8	31.0	12.4	29.5	7.8						
	17:00	29.6	46.0	15.8	33.5	12.7	31.5	7.1						
2012/7/4	8:45	21.2	36.5	13.5	29.5	10.2	25.5	7.8						
	18:00	24.0	37.0	13.9	30.0	10.9	27.0	7.1						
2012/7/5	8:45	19.5	36.0	9.2	25.5	8.0	24.5	4.6						
	18:00	21.8	35.5	14.9	30.0	11.8	28.0	8.7						
2012/7/6	9:00	19.9	36.5	13.8	32.5	12.5	29.5	8.7	15.0	38.0				
	17:30	24.0	34.0	14.3	27.5	11.5	25.5	7.8	15.9	34.0				
2012/7/7	9:00	20.4	37.5	13.7	31.0	11.8	28.0	8.7	15.6	34.0				
	18:00	21.2	41.0	13.2	30.0	9.5	27.5	7.1	14.9	36.0				
2012/7/8	8:45	18.1	39.5	8.5	26.0	7.0	22.5	1.9	15.6	35.0				
	17:00	19.4	38.0	12.9	31.0	10.4	28.5	7.8	13.3	34.5				
2012/7/9	8:45	19.1	38.0	12.0	30.0	9.9	27.0	6.0	14.2	33.5				
	17:50	24.4	42.0	14.2	32.5	9.4	26.0	6.0	13.6	34.0	3.2			
2012/7/10	8:40	19.2	36.5	12.9	32.0	10.3	27.5	6.0	14.8	33.5	3.4			
	18:00	20.6	39.5	14.1	28.5	9.6	25.0	6.0	15.5	33.5	3.2			
2012/7/11	9:00	18.3	38.0	10.8	27.0	9.0	22.0	1.9	15.8	32.5	3.8			
	17:40	22.4	38.5	13.8	31.0	9.9	24.5	6.0	13.6	32.0	3.8			
2012/7/12	8:45	19.0	39.0	13.1	32.0	9.8	26.5	5.6	14.4	32.5	1.9			
	18:00	19.6	32.0	14.2	29.5	4.7	19.0	5.6	11.7	29.0	2.9			
2012/7/13	8:50	19.6	37.5	13.4	34.0	9.9	29.5	6.0	14.2	31.5	3.8			
	17:45	23.0	39.5	15.7	33.5	10.6	26.5	6.0	12.2	30.5	4.4			
2012/7/14	9:15	18.9	36.5	15.5	33.0	11.4	28.5	6.5	14.4	30.9	4.8			
	17:45	18.0	36.5	12.9	31.0	5.2	20.5	3.9	12.2	29.0	4.8			
2012/7/15	8:45	17.7	35.5	12.6	32.0	9.2	26.0	6.5	12.4	30.5	4.4			
2012/7/16														
2012/7/17	8:45	20.6	37.5	14.5	31.0	9.4	24.5	6.5	13.1	26.5	4.8			
	17:45	21.8	36.5	15.3	24.2	5.1	18.0	0.9	10.9	25.0	3.8			
2012/7/18	8:45	18.4	42.5	12.4	32.0	6.7	24.0	5.2	11.7	30.0	4.8			
	17:50	26.4	43.0	15.2	35.0	6.7	23.5	6.0	10.3	27.0	3.8			
2012/7/19	9:10	21.8	44.0	12.8	32.5	9.2	27.5	6.0	11.4	27.5	3.8			
	17:45	24.2	45.0	14.6	33.0	7.0	24.0	6.5	8.5	23.5	3.1			
2012/7/20	8:45	19.9	41.5	13.1	33.0	8.8	27.0	7.1	11.3	27.0	4.4			
	17:45	24.2	42.0	14.5	34.0	7.6	24.0	6.5	7.7	22.0	3.1			
2012/7/21	8:45	19.9	42.0	15.4	32.0	8.1	26.0	6.5	9.0	24.0	2.9			
	17:15	24.6	42.0	15.5	35.0	8.5	24.5	7.8	7.0	23.5	2.9			
2012/7/22	8:40	19.5	44.0	9.8	29.0	6.2	23.0		10.0	25.0	4.8			
	17:00	25.8	44.0	15.9	33.0	4.9	21.5	2.6	7.4	22.5	2.1			
2012/7/23	9:15	21.4	36.5	14.2	34.0	8.9	25.5	5.2	9.5	26.0	2.3			
	17:30	24.0	40.5	15.2	31.0	6.9	21.0	3.4	8.7	23.5	2.5	14.0	33.5	3.8
2012/7/24	9:00	20.2	38.5	15.0	31.5	6.1	23.5	1.2	8.7	24.5	2.9	14.0	33.5	3.8
	18:00	24.8	41.0	13.8	32.5	5.4	23.5	1.3	7.2	22.0	1.9	13.1	32.0	3.8
2012/7/25	8:40	19.9	40.5	14.1	32.5	7.4	26.0	4.1	10.9	26.0	2.9	13.8	35.5	
	17:50	21.0	40.0	14.5	33.0	7.3	25.0	4.9	7.0	23.5	2.3	12.4	32.5	8.4
2012/7/26	9:00	23.4	38.5	14.4	33.0	10.0	26.0	2.2	12.1	28.0	3.8	13.1	30.5	8.0
	17:50	24.0	40.5	15.6	34.5	7.2	23.5	3.9	8.1	24.0	2.9	11.7	32.0	8.4
2012/7/27	9:00	25.0	42.0	15.5	33.5	9.2	26.5	4.6	10.2	27.0	3.8	12.5	31.0	4.8
	18:00	18.4	44.0	11.5	37.0	5.8	24.5	3.9	4.7	25.0	3.3	6.9	28.5	4.6
2012/7/28	9:00	21.6	42.0	14.4	35.5	9.5	26.0	4.6	10.6	28.5	4.8	12.0	29.5	5.3
	15:45	29.8	47.0	19.5	40.0	8.1	26.0	3.4	6.8	22.0	4.2	8.8	23.5	7.1
2012/7/29	9:00	22.6	43.5	14.7	35.0	8.5	30.0	4.6	10.6	29.0	5.7	11.4	30.0	6.5
	16:00	27.6	49.5	15.1	38.0	7.2	25.0	4.5	9.1	25.5	4.8	10.2	26.0	6.1
2012/7/30	10:10	23.6	44.0	13.7	31.5	10.2	27.0	1.0	12.0	27.0	7.6	10.0	28.0	3.8
	17:15	24.0	46.0	18.1	39.5	4.6	23.5	3.1	16.0		5.7	8.1	25.0	4.8
2012/7/31	8:30	21.0	45.0	15.1	37.5	10.3	29.5	3.1	11.5	31.5	4.3	11.8	30.0	3.8
	17:00	28.0	50.0	12.0	32.0	7.3	28.5	2.6	6.9	23.5	3.8	7.4	23.0	3.8
2012/8/1	9:15	20.2	44.0	11.3	32.0	3.6	21.0	1.6	12.5	33.5	1.9	11.3	28.5	2.3
	18:15	27.0	48.0	11.5	31.5	3.3	25.0	0.9	7.7	25.5	3.8	6.3	25.0	2.9
2012/8/2	7:30	21.4	44.0	17.0	37.5	11.2	31.0	5.2	10.7	26.0	1.9	11.2	30.0	3.2
	17:00	32.0	56.0	17.0	40.5	8.1	29.0	1.3	12.7	34.0	5.3	7.1	28.0	1.9
2012/8/3	8:00	20.0	44.5	15.8	39.0	12.9	32.0	4.3	14.9	37.0	5.5	11.7	29.5	2.9
	16:45	31.2	52.0	15.4	35.5	6.3	24.0	2.4	8.8	26.5	6.1	7.3	25.0	3.8
2012/8/4														
2012/8/5														

Table 2 Treated Water Quality of Pilot Plant (2/2)

Date/ Time		Raw Water		Roughing Filter		No.1 Filter			No.2 Filter			No.3 Filter		
		Turbidity (NTU)	Color (degree)	Turbidity (NTU)	Color (degree)	Turbidity (NTU)	Color (degree)	Filtration rate m/d	Turbidity (NTU)	Color (degree)	Filtration rate m/d	Turbidity (NTU)	Color (degree)	Filtration rate m/d
2012/8/6	10:00	29.0	50.0						15.6	33.0	5.7	12.8	29.0	2.9
	18:00	31.2	56.0	20.0	42.5	8.0	30.0	2.4	14.2	35.0	5.7	8.8	27.0	3.2
2012/8/7	8:45	26.2	53.0	18.3	42.0	14.9	36.5	5.2	14.4	35.5	5.7	11.8	31.0	2.9
	18:00	28.0	51.0	19.2	38.0	9.6	29.5	2.2	12.4	31.5	4.8	9.1	27.0	3.3
2012/8/8	8:30	24.6	47.0	18.0	42.0	15.9	40.0	5.2			4.8			
	17:30	32.0	57.0	20.0	45.0	8.8	30.5	3.9	12.2	34.0	5.5	7.3	26.5	2.9
2012/8/9	8:00	23.6	52.0	18.6	40.5	13.3	35.0	4.9	14.8	38.0	5.3	10.7	31.0	1.9
	17:15	33.4	62.0	17.7	42.5	9.5	32.5	2.1	9.9	32.5	3.2	7.4	25.5	2.1
2012/8/10	8:00	23.4	51.0	15.3	39.5	10.9	34.0	1.5	14.9	36.5	4.2	10.4	30.0	1.9
	18:15	33.2	58.0	14.9	40.0	6.6	29.0	1.2	11.0	32.5	4.0	5.6	28.5	1.0
2012/8/11														
2012/8/12														
2012/8/13		28.8	57.0	10.9	56.0									
	17:30	30.8	56.0	26.0	56.0	16.2	43.5	6.5	17.0	42.0	4.8	20.0	45.5	7.6
2012/8/14	8:30	27.6	55.0	23.6	53.0	13.1	39.5	2.6	17.7	43.5	4.3	16.7	41.5	6.7
2012/8/15	8:15	26.2	51.0	21.2	43.0	16.4	44.0	3.1	16.9	40.5	2.9	17.4	41.0	3.8
	17:30	29.0	68.0	26.0	52.0	11.4	41.0	3.1	12.0	35.5	2.9	12.5	34.5	3.8
2012/8/16														
	17:45	38.6	72.0											
2012/8/17	8:30	35.0	66.0	25.0	50.0	10.6	34.0	2.2	11.7	35.0	1.2	12.1	33.5	2.0
	17:50	47.4	80.0	22.6	58.0	13.3	43.5	2.7	12.2	35.5	1.6	12.4	39.0	1.8
2012/8/18	9:30	24.8	55.0			5.9	23.5	1.8	15.5	41.0	1.5	20.0	45.5	1.9
	17:30	35.2	71.0	28.0	65.0	14.7	47.5	4.1	12.8	40.5	1.8	11.7	39.5	1.9
2012/8/19	9:20	27.4	62.0	24.6	59.0	17.4	45.0	3.4	15.5	45.0	1.6	16.9	45.5	1.7
	17:00	35.6	76.0	28.0	67.0	15.9	45.5	4.3	12.9	40.5	1.6	13.4	41.5	1.8
2012/8/20	9:00	35.0	62.0	27.6	54.0	16.9	48.5	3.9	16.4	45.0	1.6	16.8	44.5	1.7
	18:00	49.5	87.0	31.0	63.0	13.7	42.5	1.6	16.2	42.5	1.9	15.5	43.5	3.8
2012/8/21	8:40	30.8	58.0	25.0	52.0	18.0	44.0	4.6	17.2	42.5	1.8	21.0	47.5	4.7
	18:20	43.5	67.0	30.2	57.0	12.8	37.0	2.9	15.6	37.5	1.9	14.7	36.0	3.5
2012/8/22	8:50	29.4	59.0	26.8	57.0	16.9	43.5	3.5	17.4	44.0	2.3	17.0	40.5	3.0
	18:10	27.6	56.0	24.4	51.0	17.4	39.5	3.9	17.8	42.5	4.1	14.5	35.5	3.1
2012/8/23	9:00	24.6	57.0	15.0	43.0	9.1	34.0	2.7	14.2	38.0	3.6	13.5	37.0	1.8
	18:00	35.0	69.0	24.8	50.0	14.2	41.5	1.9	18.0	45.5	3.1	13.2	36.5	2.3
2012/8/24	9:00	30.6	63.0	19.9	48.5				16.7	44.0	3.9	14.2	39.5	1.9
	18:10	43.5	72.0	19.8	46.0				12.8	37.5	2.8	9.9	31.5	1.1
2012/8/25	9:20	35.4	58.0	26.4	52.0	16.7	42.5	3.7	19.0	45.5	4.1	17.3	41.5	2.5
	17:30	48.6	84.0	29.2	64.0	14.5	43.0	1.7	18.8	49.0	2.9	14.5	38.0	2.5
2012/8/26	9:15	37.6	72.0	28.2	63.0	16.5	47.5	3.1	19.2	49.0	3.0	17.1	46.0	2.3
	17:20	53.1	87.0	33.4	69.0	12.2	44.5	2.5	17.4	49.5	0.7	14.3	45.0	1.0
2012/8/27	9:20	34.8	63.0	24.8	54.0	16.5	43.5	2.9	19.9	47.0	3.8	18.8	45.0	2.3
	18:00	54.3	79.0	31.4	52.0	10.9	36.5	0.1	16.5	40.5	1.8	13.8	37.0	2.2
2012/8/28	9:20	45.9	73.0	28.4	59.0	16.2	45.0	2.5	19.4	46.5	2.8	18.4	45.0	1.9
	17:55	59.4	100.5											
2012/8/29	9:10	41.1	82.5											

Based on tables above, a trend of the treated water qualities of sand filter Nos.1, 2 and 3 in mornings and afternoons is that the water qualities in afternoons are better than that in mornings. The trends were observed from the following dates:

The water quality 15th day after sand filter No.1 operation commencement

The water quality 6th day after sand fitter No. 2 operation commencement

The water quality 2nd day after sand filter No.3operation commencement

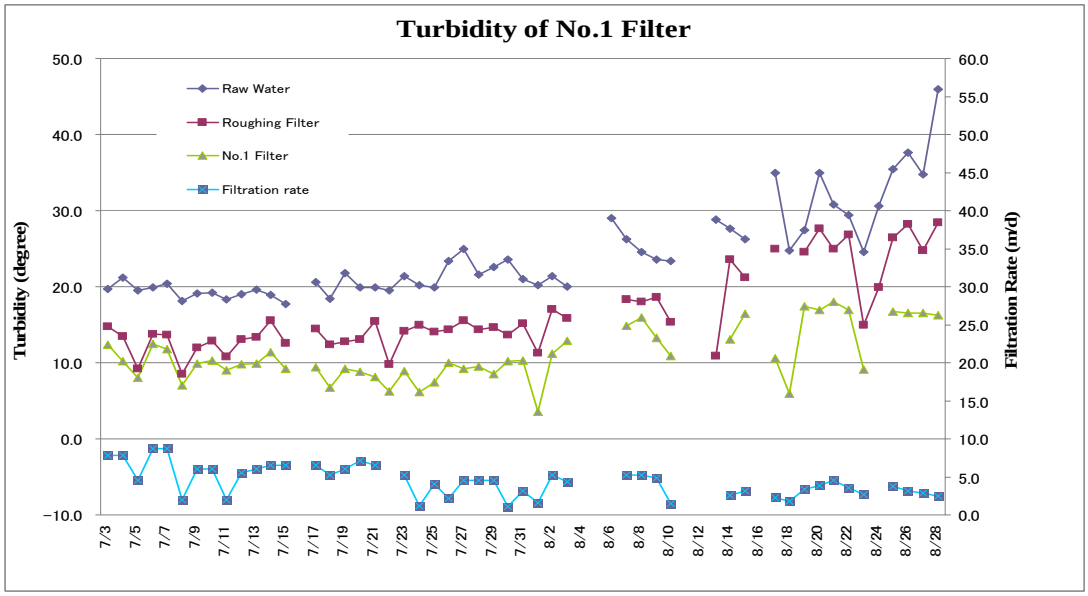
After the trends were observed in each sand filter, the average values of the turbidity of the treated water in sand filter No.1 are 11.5 degree for mornings and 9.3 degree for afternoons. Similarly, these values in sand filter No.2 are 13.9 degree for mornings and 11.6 degree for afternoons and that in sand filter No.3 are 14.3 degree for mornings and 11.0 degree for

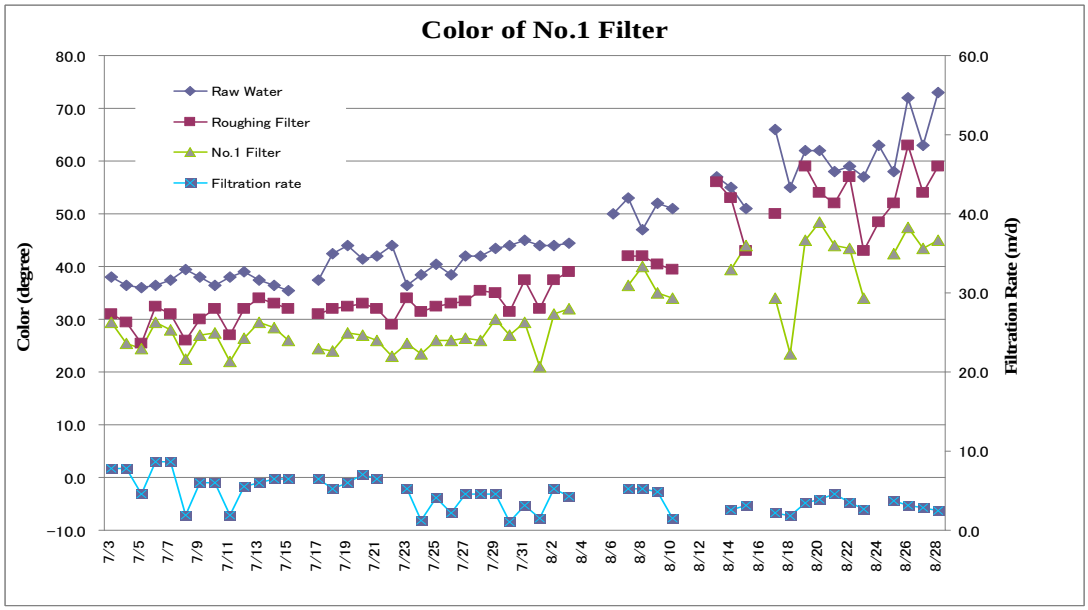
afternoons. These results can be speculated due to the algae and organism activities during daytimes.

3.1 The Result of Sand Filter No.1

The average values of the turbidity and color in the raw water during the Pilot Plant operation were 26.5 degrees and 49.1degree respectively. The average values of the turbidity and color in the treated water by roughing filter were 17.5 degrees and 39.5 degrees respectively. By comparing the values before and after the roughing filter, 34% of the turbidity and 20% of the color were removed. The average values of the turbidity and color in the treated water by sand filter No.1 were 10.3 degrees and 30.6 degrees respectively, and 41% of the turbidity of 23% of the color were removed in comparison with the values at the treated water by roughing filter. The overall 61% of the turbidity and 38% of the color were removed through the facilities mentioned above.

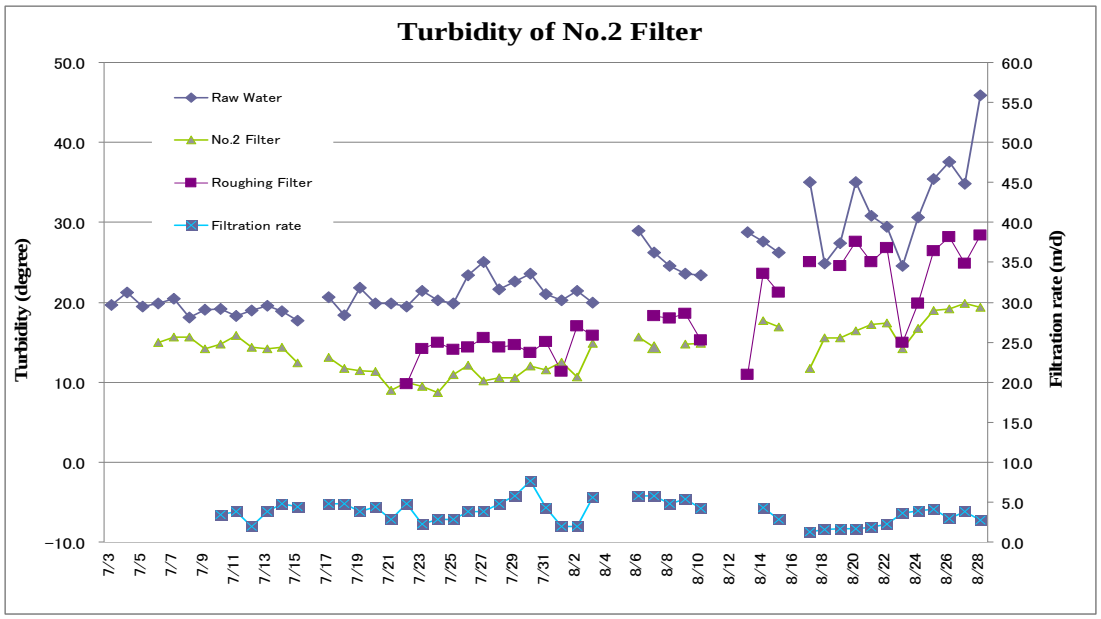
At the beginning of the pilot plant operation, the targeted velocity was maintained in sand filter No.1. However, the targeted velocity could not be maintained, not due to increase in the filtration head loss, rather due to the following reasons: when the clear water reservoir in WTP was filled up to the maximum capacity, the intake pump in Sacred City WTP was stopped, and the enough water was not secured for the pilot plan operation and due to clogging in the pilot plant.





3.2 The Result of Sand Filter No.2

The average values of the turbidity and color in the treated water by sand filter No.2 during the pilot plant operation were 12.9 degrees and 33.1 degrees respectively. By comparing the values in the treated water by roughing filter, 27% of the turbidity and 18% of the color were removed. The overall 52% of the turbidity and 34% of the color were removed during the process by comparing the values with the raw water. From July 22, 2012, the water source of sand filter No.2 was changed from the raw water to the treated water by roughing filter because the filtration head loss was increased after July 6, 2012.



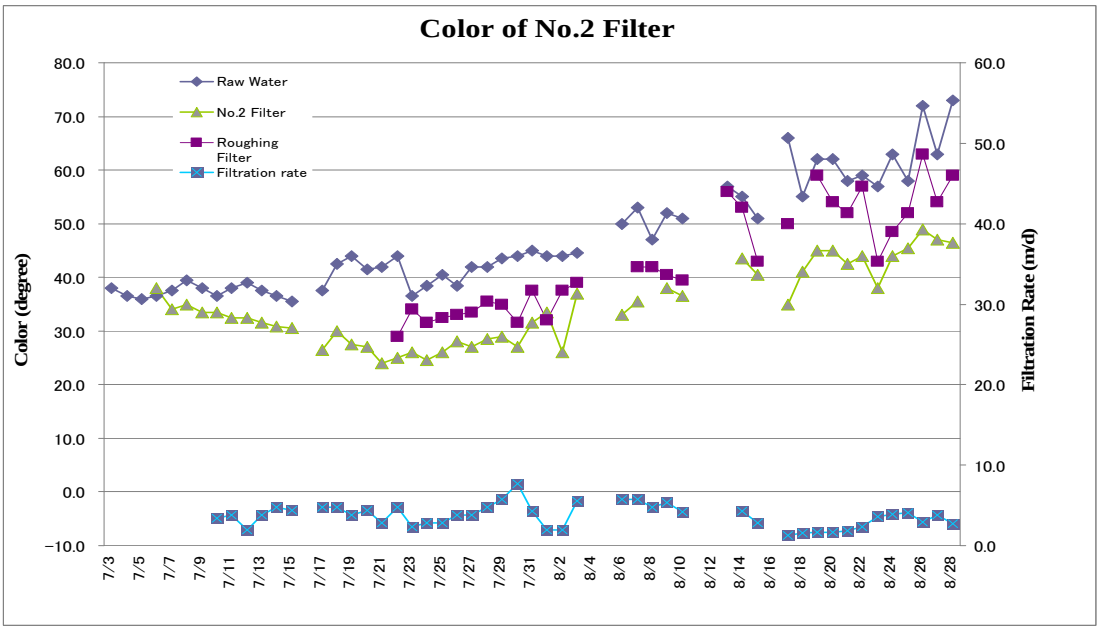
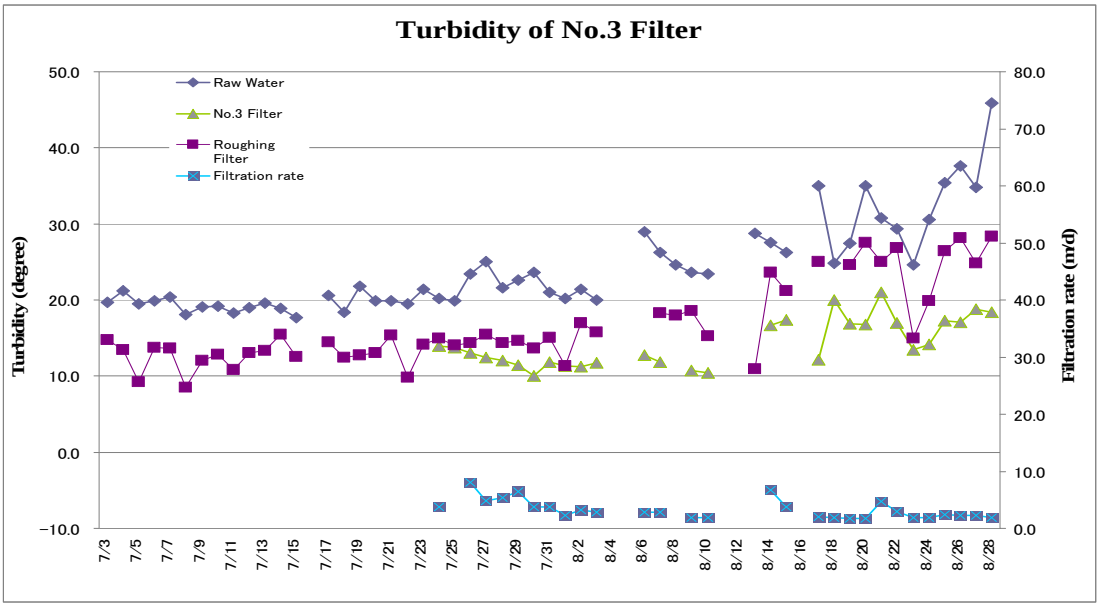


Figure 3 Treated Water Quality of No2 Sand Filter

3.3 The Result of Sand Filter No.3

The average values of the turbidity and color in the treated water by sand filter No.3 during the pilot plant operation were 12.6 degrees and 34.1 degrees respectively. By comparing the values in the treated water by roughing filter, 37% of the turbidity and 25% of the color were removed. The overall 58% of the turbidity and 39% of the color were removed during the process by

comparing the values with the raw water.



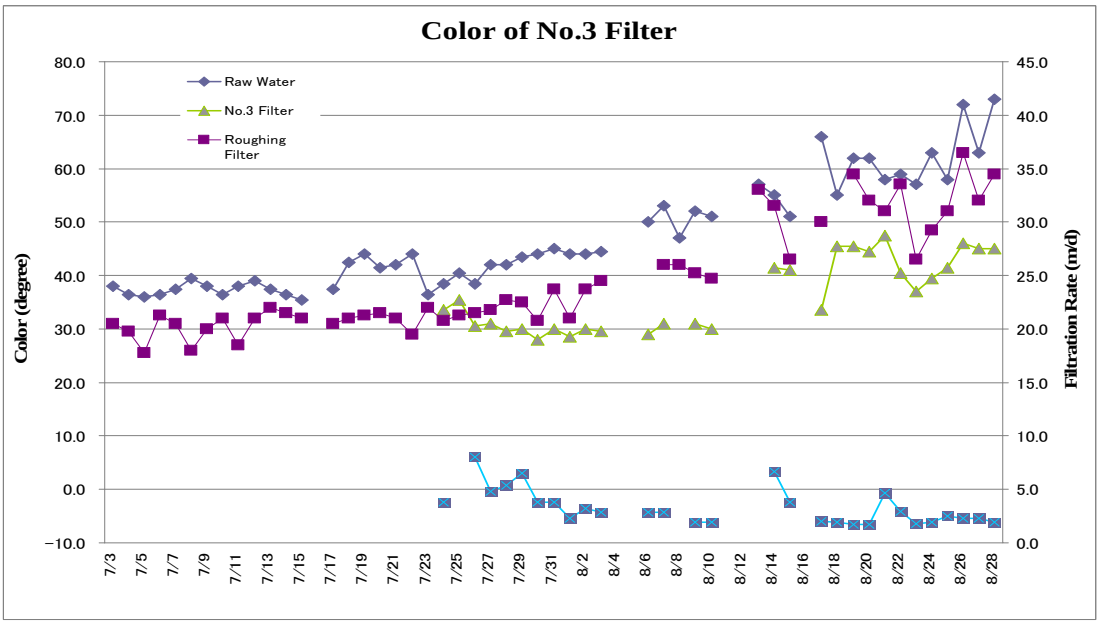


Figure 4 Treated Water Quality of No3 Sand Filter

3.4 Comparison of Treated Water Quality in Each Sand Filter Nos. 1, 2 and 3

The following figures show the turbidity and color of the treated water for each sand filter Nos.1, 2 and 3. Based on the results, the turbidity and color of the water in each sand filter was improved. The water quality did not show any progressive or improvement and hit equilibrium state 3 to 4 weeks (1 week for sand filter No.3) after the commencement of the pilot plant

operation. In addition, due to deterioration in the raw water quality, the treated water quality was also similarly worsened. The similar results were observed from each sand filter without noticeable difference.

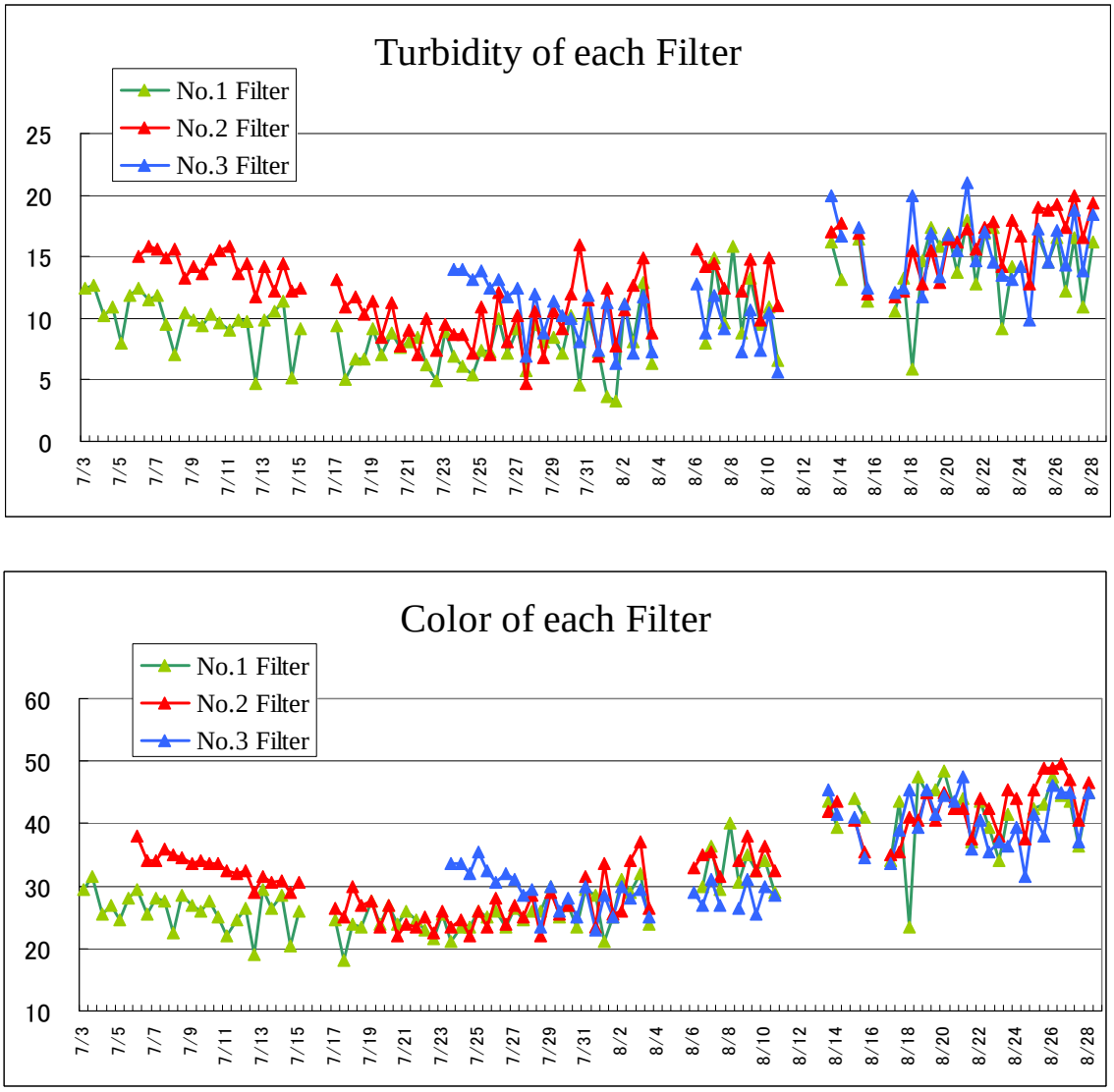
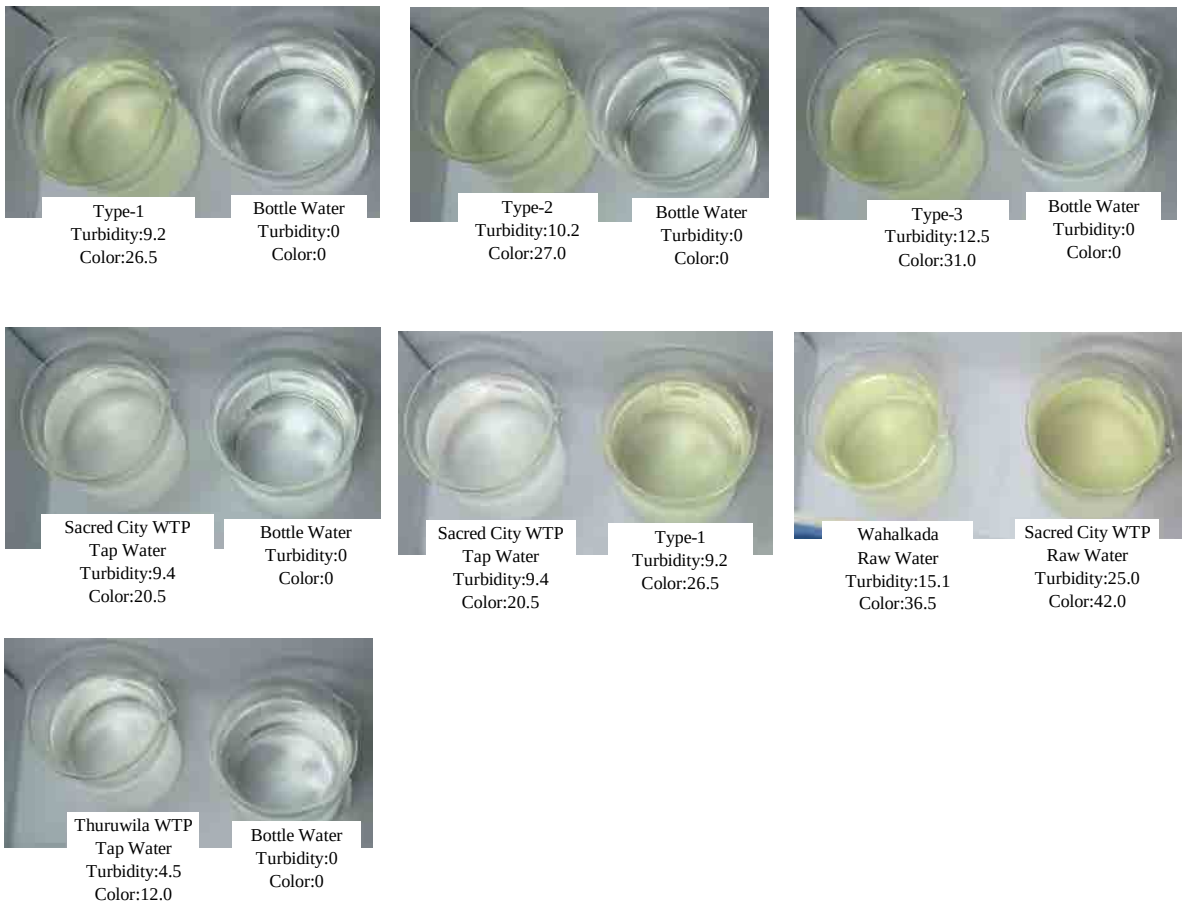


Figure 5 Water Quality Comparison of Each Sand Filter

3.5 Comparison of Color

The colors of raw water and the treated water were compared as shown in the pictures below:



Picture 1 Water Color Comparison of Raw and Treated Water

After the treated water in the pilot plant was compared with the treated water from the Sacred City WTP and Thuruwila WTP where water was treated using rapid sand filter system, the treated water from the pilot plant was much more yellowish green color. Since the water in Wahalkada Tank, which is one of the project water sources, in comparison with the water in Thissa Tank, which is water source for Sacred City WTP, had the similar color of yellowish green. Therefore with the result of the pilot plant, the implementation of ecological purification/slow sand system will not improve the color of the water in the Wahalkada Tank. In addition, the removal rate of the turbidity in pilot plant is worse than that in Thuruwila WTP. The turbidity of the treated water in Sacred City WTP is higher due to the treatment process was not functioned properly since the facilities have been aged and the filter sand was contaminated by over used. Near the end of the pilot plant operation, the sand of existing rapid sand filter was started to be replaced with new.

4 The Situation of the Pilot Plant

The pilot plant was terminated on August 28, 2012 due to the water source quality was worsened, and the pictures of the roughing fitters and others were taken to show the conditions. To describe the observed conditions of the water source, a portion of the submerged water pump was above the water surface, and the silt from the bottom of the reservoir was pumped up.

Roughing Filter : Surface

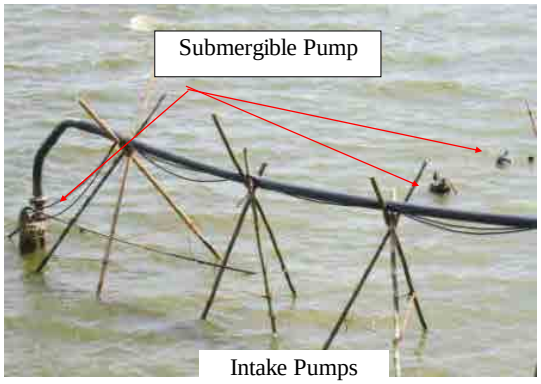
Roughing Filter : 5cm from surface

Picture 2 Roughing Filter

No1. Filter
Operation days : 57days

No2. Filter
Operation days : 54days

No3. Filter
Operation days : 34days



Picture 3 Sand Filter Surface and Intake Pumps

4.1 Roughing Filter

When the installed valve at the bottom of the roughing filter was opened for drain, a large amount of silt was observed. The removal of the turbidity by the roughing filter can be assumed to be effective. Reddish worms from the drained silt were also observed. Therefore, it can be stated that in addition to the physical turbidity removal, the biotical removal can be performed by the roughing filter. On the surface of the roughing filter, algae activities and a large amount of feces from organisms were observed. Approximately 5 cm below the surface, these mentioned above activities were much less observed.

4.2. Sand Filter

In sand filter No.1, sand as the filtration media was exposed because algae were removed from the surface a week prior to the pilot plant termination. In sand filter No.2, the green algae were thriving because enough time was passed for algae to grow. In sand filter No.3, green algae were not one of the dominated organisms, but the surface was covered by feces from organisms and algae. Filter No2 changed into the present state, after becoming like filter No3.

5. Observation

During the pilot plant operation, the water in the water source and the roughing filter contained much higher turbidity than water suitable for slow sand filter systems. Therefore, this condition was not suitable for ecological purification system to function properly and efficiently. Even the velocity in the sand filters were set lower than the original calculated velocity, the turbidity was insufficiently removed, less than 5 degrees. For the color, no difference was observed and the treated water was yellowish green color. The following table shows the water quality including the removal rates of turbidity and colors.

The water source used for the pilot plant operation was taken during the middle of dry season which could affect the experiment results. For a purpose of the portable water sources, the Anuradhapura North Water Supply project is proposed to intake the water from Mahakandarawa Tank and Wahalkada Tank, which currently used only for the irrigation purpose. With the additional intake of the water for the portable water purpose, the water levels in both tanks can be lower than the current condition, and the similar condition to the Anuradhapura City Water Supply can be predicted. In considerations of the above conditions and results, the implementation of ecological purification system or slow sand filter system for the project is not suitable and recommended. In conclusion, the implementation of rapid sand filter system is recommended for the Anuradhapura North Water Supply project. And also it is recommended to

install ACF (Active Carbon Filter) as soon as possible to remove the odor, if a bad odor occurred in the treated water for a long period, after operation of Phase - 1 facility started.

Table 3 Raw water and Treated water quality

	No1 filter	No2 filter	No3 filter
Duration of Pilot Plant	Jul.3rd-Aug.28th (57days)	Jul.6th-Aug.28th (54days)	Jul.24th-Aug.28th (36days)
Raw water			
Turbidity Ave.(degree)	26.5	26.8	30.2
Color Ave.(degree)	49.1	49.9	56.1
Roughing filter water			
Turbidity Ave.(degree)	17.5	17.7	20.1
Color Ave.(degree)	39.5	40.2	45.2
Removal Rate Comparing with Raw water			
Turbidity (%)	34	34	33
Color (%)	20	19	19
Filter Water			
Turbidity Ave.(degree)	10.3	12.9	12.6
Color Ave.(degree)	30.6	33.1	34.1
Removal Rate Comparing with Raw Water			
Turbidity (%)	61	52	58
Color (%)	38	34	39
Removal Rate Comparing with Roughing Filter Water			
Turbidity (%)	41	27	37
Color (%)	23	18	25

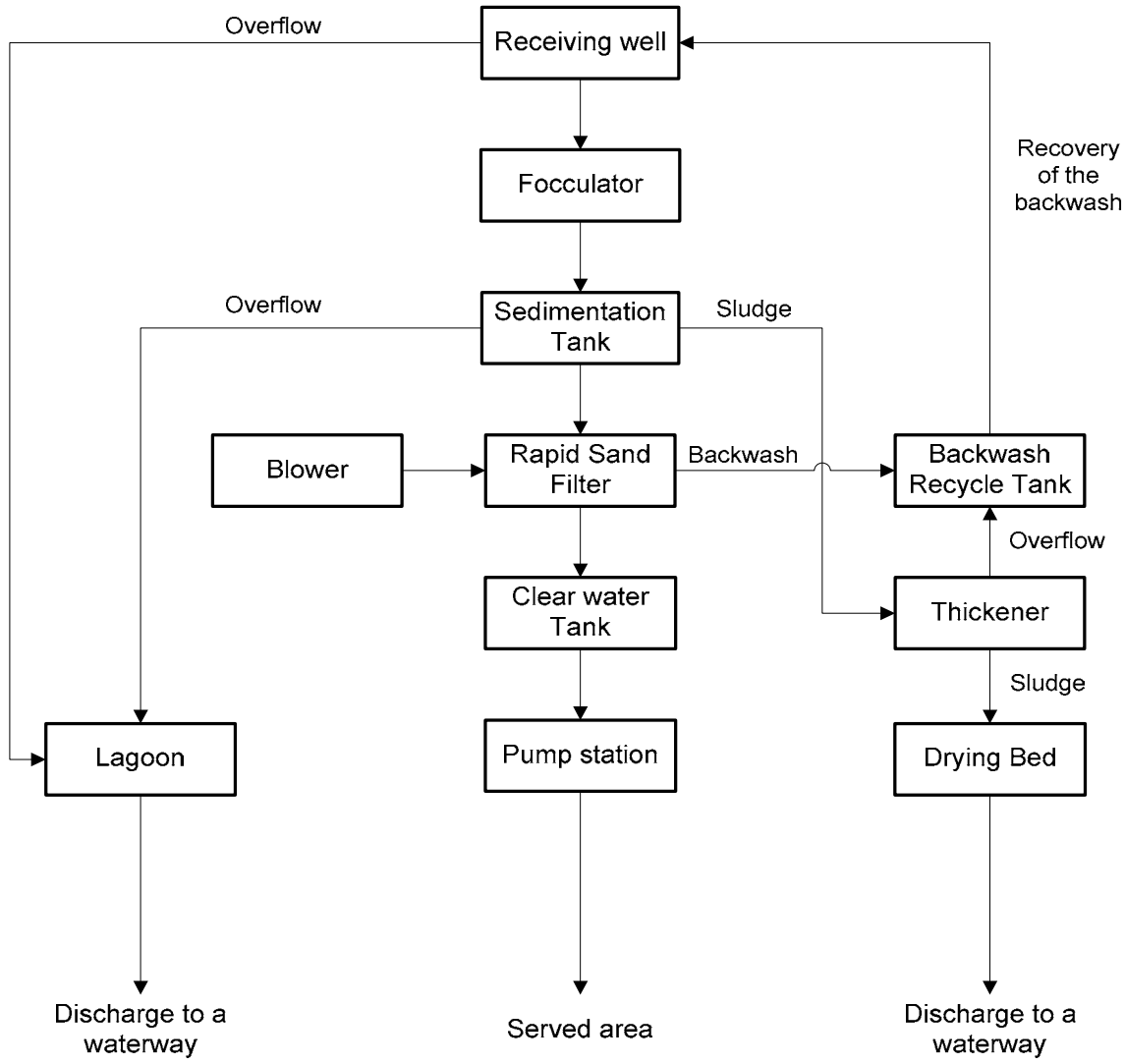
APPENDIX 5.2(c)

WTP CAPACITY CALCULATION FOR MAHAKANADARAWA PHASE 2

1. General

1.1	1) Plant Capacity	:	Q	=	19,000	m3/d
				=	792	m3/hr
				=	13.2	m3/min
				=	0.22	m3/s
	2) Production loss	:		=	5.0	%
	3) Production capacity	:	Q	=	18,100	m3/d

1.2 Flow diagram



2. Receiving Well

2.1 Design Criteria

1)	Detention Time	:	>	1.50	min	

2.2 Design

1)	Units	:	=	1		
2)	Length	:	=	4.00	m	
3)	Width	:	=	4.60	m	
4)	Depth	:	=	6.00	m	
5)	Effective capacity	:	=	110.4	m3	
6)	Detention Time	:	=	8.4	min	…OK

3. Flash Mixing

3.1 Type

Hydraulic mixing by using a weir.

3.2 Design Criteria

1)	G value	:	>	100	/s	
2)	Effective fall at the weir The energy provided by a weir with an effective fall of 0.3m provides a G value of 1000 s-1 at 20 C.	:	=	1.00	m	…OK

4. Flocculator

4.1 Type

Baffle channels

4.2 Design Criteria

1)	Detention Time	:	=	20	min.	
			to	40	min.	
2)	G value	:	=	10	/s	
			to	75	/s	
3)	GT value	:	=	23,000		
			to	210,000		

4.3 Design

1)	Number of Baffle Channels	:	=	8		
2)	Unit flow	:	=	1.6	m3/min	
3)	Number of stages of the Baffle channel	:	=	5	stages	
4)	Effective capacity of Baffle Channels (refer to the Baffle channels caluculation)	:	=	62.8	m3	
5)	Detention Time	:	=	38.0	min	…OK
6)	G value (refer to the Baffle channels caluculation)	:	=	27	/s	…OK
7)	Gt value (refer to the Baffle channels caluculation)	:	=	72,694		…OK

5. Sedimentation Tank

5.1 Type

High-rate clarification by using upflow plate settlers

5.2 Design Criteria

1) Surface Load of the plate settlers	:	a	=		7	mm/min
				to	14	mm/min
2) Upward flow velocity	:	v	<		80.0	mm/min
3) Effluent Weir Load	:		<		350	m3/day/m

5.3 Design

1) Sedimentation tank

- Units	:		=	8	
- Unit flow	:		=	1.6	m3/min
- Length	:	L	=	10.40	m
- Width	:	W	=	4.00	m
- Depth	:		=	4.00	m

2) Characteristics of the plate

- Length of the plate	:		=	1.100	m
- Width of the plate	:		=	1.000	m
- Angle of the tilted plates	:		=	60	degree
- Spacing of the sloping parallel plates			=	0.075	m
- Horizontal spacing of the sloping parallel plates	:		=	0.087	m
- Height of the sloping plates	:		=	0.953	m
- Effective settling area of the plate	:		=	0.550	m2/plate

3) Number of the plates

- Total length of the plate settlers	:		=	8.000	m
- Total width of the plate settlers	:		=	3.000	m
- Number of the plates	:		=	277	plates

4) Surface load of the plates

- Flow rate	:		=	1.6	m3/min
- Total effective area of the plates	:		=	152.4	m2
- Efficiency of the plates	:		=	90	%
- Surface load of the plates	:		=	12.0	mm/min …OK

5) Upward flow velocity

- Flow rate	:		=	1.6	m3/min
- Projected area of the plate settlers	:		=	24	m2
- Upward flow velocity through projected area of the plate settlers	:		=	69	mm/min …OK

6) Effluent Weir

- Number of effluent weirs	:		=	12	weirs/train
- Length of effluent weir	:		=	4.00	m
- Diameter of the orifice on the weir	:		=	0.03	m
- Perimeter of the orifice	:		=	0.09	m
- Spacing between orifices	:		=	0.10	m
- Number of orifices	:		=	78	per trough
- Total number of orifices	:		=	936	per train
- Total length of the perimeter of the					

	orifices	:	=	88.17	m	
-	Effluent Weir Load	:	=	27	m3/day/m	…OK

5.4 Average Sludge Production

1) Dry Solid Sludge

-	Average turbidity	:	=	10.0	NTU
-	Coefficient converting turbidity to SS	:	=	1.0	
-	Amount of dry solid sludge	:	=	0.2	t/d

2) Dry Alum Sludge

-	Alum dosage as $Al_2(SO_4)^3 18H_2O$	:	=	60.0	mg/L
-	Percentage of Al_2O_3	:	=	16.0	%
-	Solid alum dosage	:	=	1.1	t/d
-	Amount of dry alum sludge	:	=	0.3	t/d

3) Dry Sludge Production Rate

-	Total amount of dry sludge	:	=	0.5	t/d

4) Wet Sludge Production Rate

-	Percentage of solids to water	:	=	0.2	%
-	Total amount of wet sludge	:	=	234.5	m3/d

6. Rapid Sand Filter

6.1 Type

Down Flow, Single Media

6.2 Design Criteria

1)	Filtration Rate	:		<	200.0	m/d
2)	Filter Area per Unit	:		<	150.0	m2

6.3 Design

1)	Units	:		=	8	
2)	Unit flow	:		=	2,375	m3/min
				=	1.6	m3/min
3)	Unit flow during one unit washing	:		=	2,714	m3/min
				=	1.9	m3/min
4)	Length of the filter	:	L	=	5.50	m
5)	Width of the filter	:	W	=	3.00	m
6)	Width of the gullet	:		=	1.30	m
7)	Maximum water depth above filter media	:		=	2.00	m
8)	Type of filter media	:		=	Sand	
9)	Effective size of filter media	:		=	1.2	mm
10)	Depth of filter bed	:		=	1.2	m
11)	Unit Filtration Area	:		=	16.50	m2
12)	Filtration Rate	:		=	143.9	m/d …OK
13)	Filtration Rate during one unit washing	:		=	164.5	m/d …OK
14)	Filter Washing Frequency	:		=	1	/d
15)	Filter Washing Rate					
-	Air scouring rate	:		=	1.00	m3/m2/min
-	Air scouring duration	:		=	5.00	min

- Backwashing rate	:		=	0.25	m3/m2/min	
- Backwashing duration	:		=	10.00	min	
- Backwashing rate per filter	:		=	4.13	m3/min	
	:		=	0.07	m3/sec	
16) Washing Water Discharge Rate						
- Loss of settled water	:	Vs	=	47.3	m3/unit/wash	
- Backwashing amount	:	Vb	=	41.3	m3/unit/wash	
- Vs + Vb	:		=	88.6	m3/unit/wash	
- Total amount for washing	:		=	708.4	m3/d	
- Ratio of washed water to the amount of water treated	:		=	3.7	%	

7. Clear Water Tank

7.1 Design Criteria

1) Detention Time	:		=	1.00	hours	

7.2 Design

1) Units	:		=	2		
2) Length	:		=	17.00	m	
3) Width	:		=	8.00	m	
4) Depth	:		=	4.00	m	
5) Effective capacity	:		=	1,088.0	m3	
6) Detention Time	:		=	1.4	hrs	…OK

8. Thickener

8.1 Design Criteria

1) Detention time of the sludge	:		=	24	hours	
			to	48	hours	
2) Loading rate of solids per surface area	:		=	10	kg/m2/d	
			to	20	kg/m2/d	

8.2 Amount of the sludge (Inflow to Thickener)

1) Dry Solid Sludge						
- Raw water turbidity (high turbidity) 4 times of average turbidity for considering high turibidity period	:		=	40.0	NTU	
- Amount of dry solid sludge	:		=	0.8	t/d	
2) Dry Alum Sludge						
- Alum dosage as $Al_2(SO_4)^3 18H_2O$	:		=	100.0	mg/L	
- Percentage of Al_2O_3	:		=	16.0	%	
- Solid alum dosage	:		=	1.9	t/d	
- Amount of dry alum sludge	:		=	0.5	t/d	
3) Total Amount of Dry Sludge	:		=	1.2	t/d	
4) Wet Sludge						
- Percentage of sludge to water	:		=	0.2	%	
- Total amount of wet sludge (Inflow to Thickener)	:		=	612.6	m3/d	

8.3 Design

1)	Units	:	=	2		
2)	Diameter		=	10.00	m	
2)	Area	:	=	78.50	m2	
4)	Depth	:	=	4.00	m	
5)	Effective capacity	:	=	628.0	m3	…OK

8.4 Average Sludge Production (Outflow from Thickener)

1) Average Dry Sludge Production Rate

- Total amount of dry sludge	:	=	0.5	t/d	

4) Wet Sludge Production Rate

- Percentage of solids to water	:	=	4.0	%
- Total amount of wet sludge (Outflow from Thickener)	:	=	11.7	m3/d

9. Backwash Recycle Tank

9.1 Design Criteria

1) Tank must be large enough to accommodate the oveflow from thickener for 6 hours and waste water of three sand filter backwash discharge.

- Oveflow from the Thickener for 6 hours	:		=	150.2	m3
- Waste water of three filter backwash discharge	:		=	265.7	m3
- Total (=required capacity)	:		=	415.9	m3
2) Depth	:	D	=	2	m
			to	4	m

9.2 Design

1)	Units	:	=	2		
2)	Length	:	=	14.00	m	
3)	Width	:	=	5.00	m	
4)	Depth	:	=	3.00	m	
5)	Effective capacity	:	=	420.0	m3	…OK

9.3 Return of the Water to Receiving Well

- The water is returned to Receiving Well for 6 hours.	:	=	69.3	m3/hr
- Percentage of the water to the raw water	:	=	8.8	%

11. Drying Bed

11.1 Design Guidance

1)	Detention time to hold the sludge	:	>	3	months
			to	4	months
2)	Loading rate of solids per surface area	:	=	40	kg/m2
			to	80	kg/m2

11.2 Amount of Sludge

1)	Dry sludge on average	:	=	0.5	t/d

2) Wet sludge on average	:	=	11.7	m3/d	

11.3 Design

1) Units	:	=	6		
- Duty	:	=	4		
- Stand-by (during the period of dischrge of dry sludge from beds)	:	=	2		
2) Length	:	=	20.00	m	
3) Width	:	=	12.50	m	
4) Depth	:	=	1.00	m	
5) Effective capacity	:	=	1,000.0	m3	
6) Detention time	:	=	3.0	months	…OK
7) Loading rate	:	=	42.2	kg/m2	…OK

12. Lagoon

12.1 Design Guidance

Lagoon should be large enough to hold overflow from receiving well for 20 min.

1) Overflow form receiving well	:	=	19,000	m3/d	
	:	=	13.2	m3/min	
1) Overflow form receiving well for 20 min.	:	=	263.9	m3	

12.1 Design

1) Units	:	=	1		
2) Length	:	=	27.00	m	
3) Width	:	=	10.00	m	
4) Depth	:	=	1.00	m	
5) Effective capacity	:	=	270.0	m3	…OK

Hydraulic Flocculation (Baffle Walls, Up and Down)

Plant Capacity : = 19,000 cu m/day
: = 792 cu m/hour
: = 13.2 cu m/min
: = 0.220 cu m/sec
Number of flocculation channel : = 8 units

Item No.	Descriptions	Unit	Symbol	Nos. of Stages							Between Raws							
				No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No.1&2	No.2&3	No.3&4	No.4&5	No.5&6	No.6&7	No.7&8	No.8&9
1. General Descriptions																		
1)	Design capacity	m3/d	(Q)	2,375	2,375	2,375	2,375	2,375			2,375	2,375	2,375	0				
2)	Width of wall	m	(Ww)	0.900	0.900	0.900	0.900	0.900			0.600	0.600	0.600	0.600				
3)	No. of wall in one raw	-	(Nw)	6	6	6	6	6			1	1	1	1				
4)	Depth	m		3.00	3.00	3.00	3.00	3.00										
2. Loss of down flow																		
1)	Downflow depth	m	(Hb)	0.08	0.10	0.15	0.20	0.25										
2)	Downflow velocity	m/s	(vb)	0.380	0.310	0.200	0.150	0.120										
3)	Downflow coefficent of friction loss	-	(fb)	3.5	3.5	3.5	3.5	3.5										
4)	No. of down flows			3	3	3	3	3										
5)	hb = fb/2/9.8*vb^2*no. of down flows	m		0.0774	0.0515	0.0214	0.0121	0.0077	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000				
3. Loss of over flow																		
1)	Overflow depth	m	(Ho)	0.10	0.10	0.20	0.20	0.30			0.30	0.30	0.50	0.50				
2)	Oveflow velocity	m/s	(vo)	0.305	0.305	0.153	0.153	0.102			0.153	0.153	0.092	0.000				
3)	Downflow coefficent of friction loss	-	(fb)	2.0	2.0	2.0	2.0	2.0			2.0	2.0	2.0	2.0				
4)	No. of over flows			3	3	3	3	3			1	1	1	1				
4)	ho = fb*vo^2/2/9.8*no. of over flows	m		0.029	0.029	0.007	0.007	0.003	0.000	0.000	0.002	0.002	0.001	0.000				
4. Loss of friction																		
1)	R = W_w*Lc2/(W_{w+Lc})	m	(R)	0.180	0.180	0.180	0.180	0.180										
2)	n = roughness coefficient	-	(n)	0.013	0.013	0.013	0.013	0.013										
3)	vc=velocity	m/s	(vc)	0.051	0.051	0.051	0.051	0.051										
4)	C^2 = 1/n^2*$R^{1/3}$	-	($C^{2)}$	3,341	3,341	3,341	3,341	3,341										
5)	Length of ditch	m	($L_{1)}$	5.5	5.5	5.5	5.5	5.5										
6)	Length of wall	m	($L_{w)}$	2.820	2.800	2.650	2.600	2.450										
7)	L = L1 + Lw*(Nw+1)	m	(L)	25.240	25.100	24.050	23.700	22.650										
8)	hf = L n^2vc^2/R^(4/3)	m		0.000	0.000	0.000	0.000	0.000										
5. Total Loss of Head																		
1)	H = h_1 + h_2 + h_3	m	**0.251**	0.106	0.080	0.029	0.019	0.011	0.000	0.000	0.002	0.002	0.001	0.000	0.000	0.000	0.000	0.000
6. G-value											**Total**							
1)	Volume of raw	m3	(V)	12.49	12.50	12.56	12.58	12.64			**63**	**m3**	(TTL Volume of Flloculation Basin)					
2)	Detention time	min	(T)	7.57	7.58	7.62	7.63	7.67			**38.1**	**min**	(TTL Detention Time)					
3)	Density of Water (at 25 degree)	kg/m3	(ρ)	997														
4)	Viscosity of Water (x 10-3)	kg/m/s	(μ)	0.898									**Ave. Turbidity=**				**17.7**	
5)	Acceleration of Gravity	m/s2	(g)	9.8							**Ave G**		**GCT=**				**1,286,684**	
6)	G=(H·ρ·Q·g/(V·μ))$^{0.5}$	s-1	(G)	**50.9**	**44.4**	**26.5**	**21.4**	**16.1**			**26.6**							
7)	Gt value	-		23,153	20,208	12,117	9,803	7,414			**72,694**	(23,000 to 210,000)						

Chlorine Dosage

1. Chlorine application points
   1). Receiving Well (Pre-chlorination)
   2). Clear Water Tank (Post-chlorination)

2. Flow rate for pre- and post chlorination:
   = 19,000 m3/d
   = 800 m3/hr

3. Dosage of pre-chlorination
   Maximum 5.0 mg/L
   Average 2.0 mg/L
   Minimum 1.0 mg/L

4. Dosage of post-chlorination
   Maximum 2.0 mg/L
   Average 1.0 mg/L
   Minimum 0.5 mg/L

5. Amount of Chlorine
Amount of chlorine can be calculated by using the formula:

$$V = Q \times R \times 10^{-3}$$

V: amount of chlorine to be used (kg/h)
Q: flow rate (m3/h)
R: chlorine dosage (mg/L)

	chlorine dosage (mg/L)		flow (m3/h)	amount of chlorine (kg/h)
Pre-chlorine	max.	5.0	800	4.0
	ave.	2.0	800	1.6
	min.	1.0	800	0.8
Post-chlorine	max.	2.0	800	1.6
	ave.	1.0	800	0.8
	min.	0.5	800	0.4

	chlorine dosage (mg/L)		flow (m3/h)	amount of chlorine (kg/h)	total amount of chlorine (kg/h)
Maximum	Pre-	5.0	800	4.0	5.6
	Post-	2.0	800	1.6	
Average	Pre-	2.0	800	1.6	2.4
	Post-	1.0	800	0.8	
Minimum	Pre-	1.0	800	0.8	1.2
	Post-	0.5	800	0.4	

6. Required number of chlorne cylinders to be used
   Yield of chlorine gas from one ton cylinder without an evaporator
   = 8.0 kg/h
   Maximum amount of chlorine dosage
   = 5.6 kg/h
   Required number of cylinders
   = 1 cylinders
   Prepare 2 times to maintain chlorination during changeover of cylinders
   = 2 cylinders

7. Storage of cylinders
   Storage of cylinders
   = 30 days for average dosage
   Average amount of chlorine dosage
   = 2.4 kg/h
   = 57.6 kg/d
   = 1,728.0 kg/month
   = 1.7 t/month
   Storage of cylinders for 30 days for average dosage
   = 2 cylinders

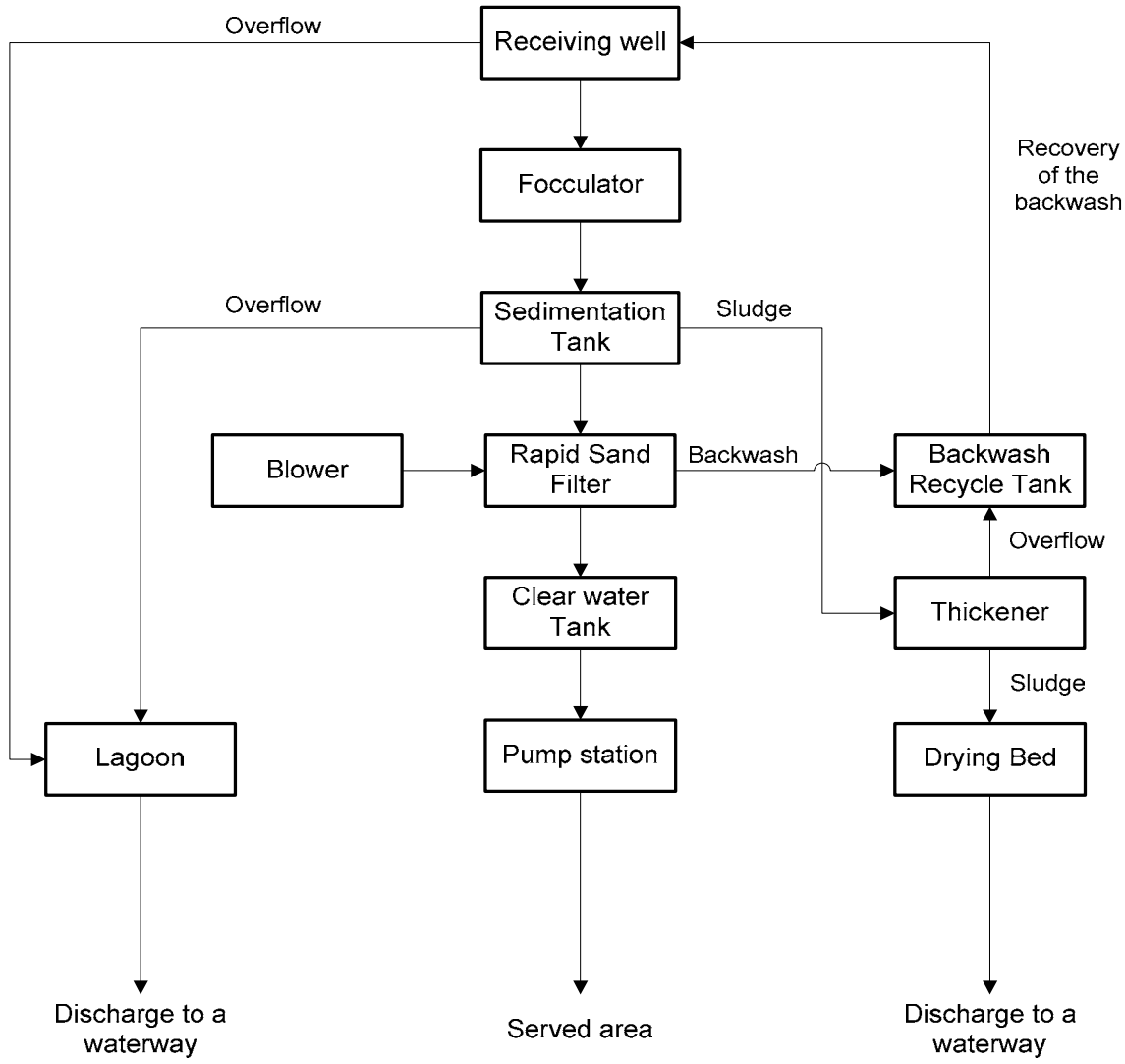
APPENDIX 5.2 (d)

WTP CAPACITY CALCULATION FOR MAHAKANADARAWA PHASE 1

1. General

1.1	1) Plant Capacity	:	Q	=	9,500	m3/d
				=	396	m3/hr
				=	6.6	m3/min
				=	0.11	m3/s
	2) Production loss	:		=	5.0	%
	3) Production capacity	:	Q	=	9,000	m3/d

1.2 Flow diagram



2. Receiving Well

2.1 Design Criteria

1)	Detention Time	:	>	1.50	min	

2.2 Design

1)	Units	:	=	1		
2)	Length	:	=	4.00	m	
3)	Width	:	=	4.60	m	
4)	Depth	:	=	6.00	m	
5)	Effective capacity	:	=	110.4	m3	
6)	Detention Time	:	=	16.7	min	…OK

3. Flash Mixing

3.1 Type

Hydraulic mixing by using a weir.

3.2 Design Criteria

1)	G value	:	>	100	/s	
2)	Effective fall at the weir The energy provided by a weir with an effective fall of 0.3m provides a G value of 1000 s-1 at 20 C.	:	=	1.00	m	…OK

4. Flocculator

4.1 Type

Baffle channels

4.2 Design Criteria

1)	Detention Time	:	=	20	min.	
			to	40	min.	
2)	G value	:	=	10	/s	
			to	75	/s	
3)	GT value	:	=	23,000		
			to	210,000		

4.3 Design

1)	Number of Baffle Channels	:	=	4		
2)	Unit flow	:	=	1.6	m3/min	
3)	Number of stages of the Baffle channel	:	=	5	stages	
4)	Effective capacity of Baffle Channels (refer to the Baffle channels caluculation)	:	=	62.8	m3	
5)	Detention Time	:	=	38.0	min	…OK
6)	G value (refer to the Baffle channels caluculation)	:	=	27	/s	…OK
7)	Gt value (refer to the Baffle channels caluculation)	:	=	72,694		…OK

5. Sedimentation Tank

5.1 Type

High-rate clarification by using upflow plate settlers

5.2 Design Criteria

1) Surface Load of the plate settlers	:	a	=		7	mm/min
				to	14	mm/min
2) Upward flow velocity	:	v	<		80.0	mm/min
3) Effluent Weir Load	:		<		350	m3/day/m

5.3 Design

1) Sedimentation tank

- Units	:		=	4	
- Unit flow	:		=	1.6	m3/min
- Length	:	L	=	10.40	m
- Width	:	W	=	4.00	m
- Depth	:		=	4.00	m

2) Characteristics of the plate

- Length of the plate	:		=	1.100	m
- Width of the plate	:		=	1.000	m
- Angle of the tilted plates	:		=	60	degree
- Spacing of the sloping parallel plates	:		=	0.075	m
- Horizontal spacing of the sloping parallel plates	:		=	0.087	m
- Height of the sloping plates	:		=	0.953	m
- Effective settling area of the plate	:		=	0.550	m2/plate

3) Number of the plates

- Total length of the plate settlers	:		=	8.000	m
- Total width of the plate settlers	:		=	3.000	m
- Number of the plates	:		=	277	plates

4) Surface load of the plates

- Flow rate	:		=	1.6	m3/min
- Total effective area of the plates	:		=	152.4	m2
- Efficiency of the plates	:		=	90	%
- Surface load of the plates	:		=	12.0	mm/min …OK

5) Upward flow velocity

- Flow rate	:		=	1.6	m3/min
- Projected area of the plate settlers	:		=	24	m2
- Upward flow velocity through projected area of the plate settlers	:		=	69	mm/min …OK

6) Effluent Weir

- Number of effluent weirs	:		=	12	weirs/train
- Length of effluent weir	:		=	4.00	m
- Diameter of the orifice on the weir	:		=	0.03	m
- Perimeter of the orifice	:		=	0.09	m
- Spacing between orifices	:		=	0.10	m
- Number of orifices	:		=	78	per trough
- Total number of orifices	:		=	936	per train
- Total length of the perimeter of the					

	orifices	:		=	88.17	m
-	Effluent Weir Load	:		=	27	m3/day/m …OK

5.4 Average Sludge Production

1) Dry Solid Sludge

-	Average turbidity	:		=	10.0	NTU
-	Coefficient converting turbidity to SS	:		=	1.0	
-	Amount of dry solid sludge	:		=	0.1	t/d

2) Dry Alum Sludge

-	Alum dosage as $Al_2(SO_4)^3 18H_2O$	:		=	60.0	mg/L
-	Percentage of Al_2O_3	:		=	16.0	%
-	Solid alum dosage	:		=	0.6	t/d
-	Amount of dry alum sludge	:		=	0.1	t/d

3) Dry Sludge Production Rate

-	Total amount of dry sludge	:		=	0.2	t/d

4) Wet Sludge Production Rate

-	Percentage of solids to water	:		=	0.2	%
-	Total amount of wet sludge	:		=	117.3	m3/d

6. Rapid Sand Filter

6.1 Type

Down Flow, Single Media

6.2 Design Criteria

1)	Filtration Rate	:		<	200.0	m/d
2)	Filter Area per Unit	:		<	150.0	m2

6.3 Design

1)	Units	:		=	4	
2)	Unit flow	:		=	2,375	m3/min
				=	1.6	m3/min
3)	Unit flow during one unit washing	:		=	3,167	m3/min
				=	2.2	m3/min
4)	Length of the filter	:	L	=	5.50	m
5)	Width of the filter	:	W	=	3.00	m
6)	Width of the gullet	:		=	1.30	m
7)	Maximum water depth above filter media	:		=	2.00	m
8)	Type of filter media	:		=	Sand	
9)	Effective size of filter media	:		=	1.2	mm
10)	Depth of filter bed	:		=	1.2	m
11)	Unit Filtration Area	:		=	16.50	m2
12)	Filtration Rate	:		=	143.9	m/d …OK
13)	Filtration Rate during one unit washing	:		=	191.9	m/d …OK
14)	Filter Washing Frequency	:		=	1	/d
15)	Filter Washing Rate					
-	Air scouring rate	:		=	1.00	m3/m2/min
-	Air scouring duration	:		=	5.00	min

- Backwashing rate	:		=	0.25	m3/m2/min	
- Backwashing duration	:		=	10.00	min	
- Backwashing rate per filter	:		=	4.13	m3/min	
	:		=	0.07	m3/sec	
16) Washing Water Discharge Rate						
- Loss of settled water	:	Vs	=	47.3	m3/unit/wash	
- Backwashing amount	:	Vb	=	41.3	m3/unit/wash	
- Vs + Vb	:		=	88.6	m3/unit/wash	
- Total amount for washing	:		=	354.2	m3/d	
- Ratio of washed water to the amount of water treated	:		=	3.7	%	

7. Clear Water Tank

7.1 Design Criteria

1) Detention Time	:	=	1.00	hours	

7.2 Design

1) Units	:	=	2		
2) Length	:	=	17.00	m	
3) Width	:	=	8.00	m	
4) Depth	:	=	4.00	m	
5) Effective capacity	:	=	1,088.0	m3	
6) Detention Time	:	=	2.7	hrs	…OK

8. Thickener

8.1 Design Criteria

1) Detention time of the sludge	:	=	24	hours	
		to	48	hours	
2) Loading rate of solids per surface area	:	=	10	kg/m2/d	
		to	20	kg/m2/d	

8.2 Amount of the sludge (Inflow to Thickener)

1) Dry Solid Sludge					
- Raw water turbidity (high turbidity) 4 times of average turbidity for considering high turibidity period	:	=	40.0	NTU	
- Amount of dry solid sludge	:	=	0.4	t/d	
2) Dry Alum Sludge					
- Alum dosage as $Al_2(SO_4)^3 18H_2O$	:	=	100.0	mg/L	
- Percentage of Al_2O_3	:	=	16.0	%	
- Solid alum dosage	:	=	1.0	t/d	
- Amount of dry alum sludge	:	=	0.2	t/d	
3) Total Amount of Dry Sludge	:	=	0.6	t/d	
4) Wet Sludge					
- Percentage of sludge to water	:	=	0.2	%	
- Total amount of wet sludge (Inflow to Thickener)	:	=	306.3	m3/d	

8.3 Design

1) Units	:		=	2		
2) Diameter			=	10.00	m	
2) Area	:		=	78.50	m2	
4) Depth	:		=	4.00	m	
5) Effective capacity	:		=	628.0	m3	…OK

8.4 Average Sludge Production (Outflow from Thickener)

1) Average Dry Sludge Production Rate						
- Total amount of dry sludge	:		=	0.2	t/d	
4) Wet Sludge Production Rate						
- Percentage of solids to water	:		=	4.0	%	
- Total amount of wet sludge (Outflow from Thickener)	:		=	5.9	m3/d	

9. Backwash Recycle Tank

9.1 Design Criteria

1) Tank must be large enough to accommodate the oveflow from thickener for 6 hours and waste water of three sand filter backwash discharge.						
- Oveflow from the Thickener for 6 hours	:		=	75.1	m3	
- Waste water of three filter backwash discharge	:		=	265.7	m3	
- Total (=required capacity)	:		=	340.8	m3	
2) Depth	:	D	=	2	m	
			to	4	m	

9.2 Design

1) Units	:		=	2		
2) Length	:		=	14.00	m	
3) Width	:		=	5.00	m	
4) Depth	:		=	3.00	m	
5) Effective capacity	:		=	420.0	m3	…OK

9.3 Return of the Water to Receiving Well

- The water is returned to Receiving Well for 6 hours.	:		=	56.8	m3/hr	
- Percentage of the water to the raw water	:		=	14.3	%	

11. Drying Bed

11.1 Design Guidance

1) Detention time to hold the sludge	:		>	3	months	
			to	4	months	
2) Loading rate of solids per surface area	:		=	40	kg/m2	
			to	80	kg/m2	

11.2 Amount of Sludge

1) Dry sludge on average	:		=	0.2	t/d	

2) Wet sludge on average	:	=	5.9	m3/d	

11.3 Design

1) Units	:	=	4		
- Duty	:	=	2		
- Stand-by (during the period of dischrge of dry sludge from beds)	:	=	2		
2) Length	:	=	20.00	m	
3) Width	:	=	12.50	m	
4) Depth	:	=	1.00	m	
5) Effective capacity	:	=	500.0	m3	
6) Detention time	:	=	3.0	months	…OK
7) Loading rate	:	=	42.2	kg/m2	…OK

12. Lagoon

12.1 Design Guidance

Lagoon should be large enough to hold overflow from receiving well for 20 min.

1) Overflow form receiving well	:	=	9,500	m3/d	
	:	=	6.6	m3/min	
1) Overflow form receiving well for 20 min.	:	=	131.9	m3	

12.1 Design

1) Units	:	=	1		
2) Length	:	=	27.00	m	
3) Width	:	=	10.00	m	
4) Depth	:	=	1.00	m	
5) Effective capacity	:	=	270.0	m3	…OK

Hydraulic Flocculation (Baffle Walls, Up and Down)

Plant Capacity	:	=	9,500	cu m/day
	:	=	396	cu m/hour
	:	=	6.6	cu m/min
	:	=	0.110	cu m/sec
Number of flocculation channel	:	=	4	units

Item No.	Descriptions	Unit	Symbol	Nos. of Stages											Between Rav
				No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No.1&2	No.2&3	No.3&4	No.4&5	No.5&6
1. General Descriptions															
1)	Design capacity	m3/d	(Q)	2,375	2,375	2,375	2,375	2,375			2,375	2,375	2,375	0	
2)	Width of wall	m	(Ww)	0.900	0.900	0.900	0.900	0.900			0.600	0.600	0.600	0.600	
3)	No. of wall in one raw	-	(Nw)	6	6	6	6	6			1	1	1	1	
4)	Depth	m		3.00	3.00	3.00	3.00	3.00							
2. Loss of down flow															
1)	Downflow depth	m	(Hb)	0.08	0.10	0.15	0.20	0.25							
2)	Downflow velocity	m/s	(vb)	0.380	0.310	0.200	0.150	0.120							
3)	Downflow coefficent of friction loss	-	(fb)	3.5	3.5	3.5	3.5	3.5							
4)	No. of down flows			3	3	3	3	3							
5)	hb = fb/2/9.8*vb^2*no. of down flows	m		0.0774	0.0515	0.0214	0.0121	0.0077	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
3. Loss of over flow															
1)	Overflow depth	m	(Ho)	0.10	0.10	0.20	0.20	0.30			0.30	0.30	0.50	0.50	
2)	Oveflow velocity	m/s	(vo)	0.305	0.305	0.153	0.153	0.102			0.153	0.153	0.092	0.000	
3)	Downflow coefficent of friction loss	-	(fb)	2.0	2.0	2.0	2.0	2.0			2.0	2.0	2.0	2.0	
4)	No. of over flows			3	3	3	3	3			1	1	1	1	
4)	ho = fb*vo^2/2/9.8*no. of over flows	m		0.029	0.029	0.007	0.007	0.003	0.000	0.000	0.002	0.002	0.001	0.000	
4. Loss of friction															
1)	R = W_w*Lc/2/(W_{w+Lc})	m	(R)	0.180	0.180	0.180	0.180	0.180							
2)	n = roughness coefficient	-	(n)	0.013	0.013	0.013	0.013	0.013							
3)	vc=velocity	m/s	(vc)	0.051	0.051	0.051	0.051	0.051							
4)	$C^2 = 1/n^2*R^{1/3}$	-	($C^{2)}$	3,341	3,341	3,341	3,341	3,341							
5)	Length of ditch	m	($L_{1)}$	5.5	5.5	5.5	5.5	5.5							
6)	Length of wall	m	($L_{w)}$	2.820	2.800	2.650	2.600	2.450							
7)	L = L1 + Lw*(Nw+1)	m	(L)	25.240	25.100	24.050	23.700	22.650							
8)	hf = L n^2vc^2/R^(4/3)	m		0.000	0.000	0.000	0.000	0.000							
5. Total Loss of Head															
1)	H = h_1 + h_2 + h_3	m	**0.251**	0.106	0.080	0.029	0.019	0.011	0.000	0.000	0.002	0.002	0.001	0.000	0.000
6. G-value											**Total**				
1)	Volume of raw	m3	(V)	12.49	12.50	12.56	12.58	12.64			**63**	**m3**	(TTL Volume of Flloculation Ba		
2)	Detention time	min	(T)	7.57	7.58	7.62	7.63	7.67			**38.1**	**min**	(TTL Detention Time)		
3)	Density of Water (at 25 degree)	kg/m3	(ρ)	997											
4)	Viscosity of Water (x 10-3)	kg/m/s	(μ)	0.898									**Ave. Turbidity=**		
5)	Acceleration of Gravity	m/s2	(g)	9.8							**Ave G**		**GCT=**		
6)	G=(H· ρ ·Q·g/(V· μ))$^{0.5}$	s-1	(G)	**50.9**	**44.4**	**26.5**	**21.4**	**16.1**			**26.6**				
7)	Gt value	-		23,153	20,208	12,117	9,803	7,414			**72,694**	(23,000 to 210,000)			

Chlorine Dosage

1. Chlorine application points
   1). Receiving Well (Pre-chlorination)
   2). Clear Water Tank (Post-chlorination)

2. Flow rate for pre- and post chlorination:
   = 9,500 m3/d
   = 400 m3/hr

3. Dosage of pre-chlorination
   Maximum 5.0 mg/L
   Average 2.0 mg/L
   Minimum 1.0 mg/L

4. Dosage of post-chlorination
   Maximum 2.0 mg/L
   Average 1.0 mg/L
   Minimum 0.5 mg/L

5. Amount of Chlorine
Amount of chlorine can be calculated by using the formula:

$$V = Q \times R \times 10^{-3}$$

V: amount of chlorine to be used (kg/h)
Q: flow rate (m3/h)
R: chlorine dosage (mg/L)

	chlorine dosage (mg/L)		flow (m3/h)	amount of chlorine (kg/h)
Pre-chlorine	max.	5.0	400	2.0
	ave.	2.0	400	0.8
	min.	1.0	400	0.4
Post-chlorine	max.	2.0	400	0.8
	ave.	1.0	400	0.4
	min.	0.5	400	0.2

	chlorine dosage (mg/L)		flow (m3/h)	amount of chlorine (kg/h)	total amount of chlorine (kg/h)
Maximum	Pre-	5.0	400	2.0	2.8
	Post-	2.0	400	0.8	
Average	Pre-	2.0	400	0.8	1.2
	Post-	1.0	400	0.4	
Minimum	Pre-	1.0	400	0.4	0.6
	Post-	0.5	400	0.2	

6. Required number of chlorne cylinders to be used
   Yield of chlorine gas from one ton cylinder without an evaporator
   = 8.0 kg/h
   Maximum amount of chlorine dosage
   = 2.8 kg/h
   Required number of cylinders
   = 1 cylinders
   Prepare 2 times to maintain chlorination during changeover of cylinders
   = 2 cylinders

7. Storage of cylinders
   Storage of cylinders
   = 30 days for average dosage
   Average amount of chlorine dosage
   = 1.2 kg/h
   = 28.8 kg/d
   = 864.0 kg/month
   = 0.9 t/month
   Storage of cylinders for 30 days for average dosage
   = 1 cylinders

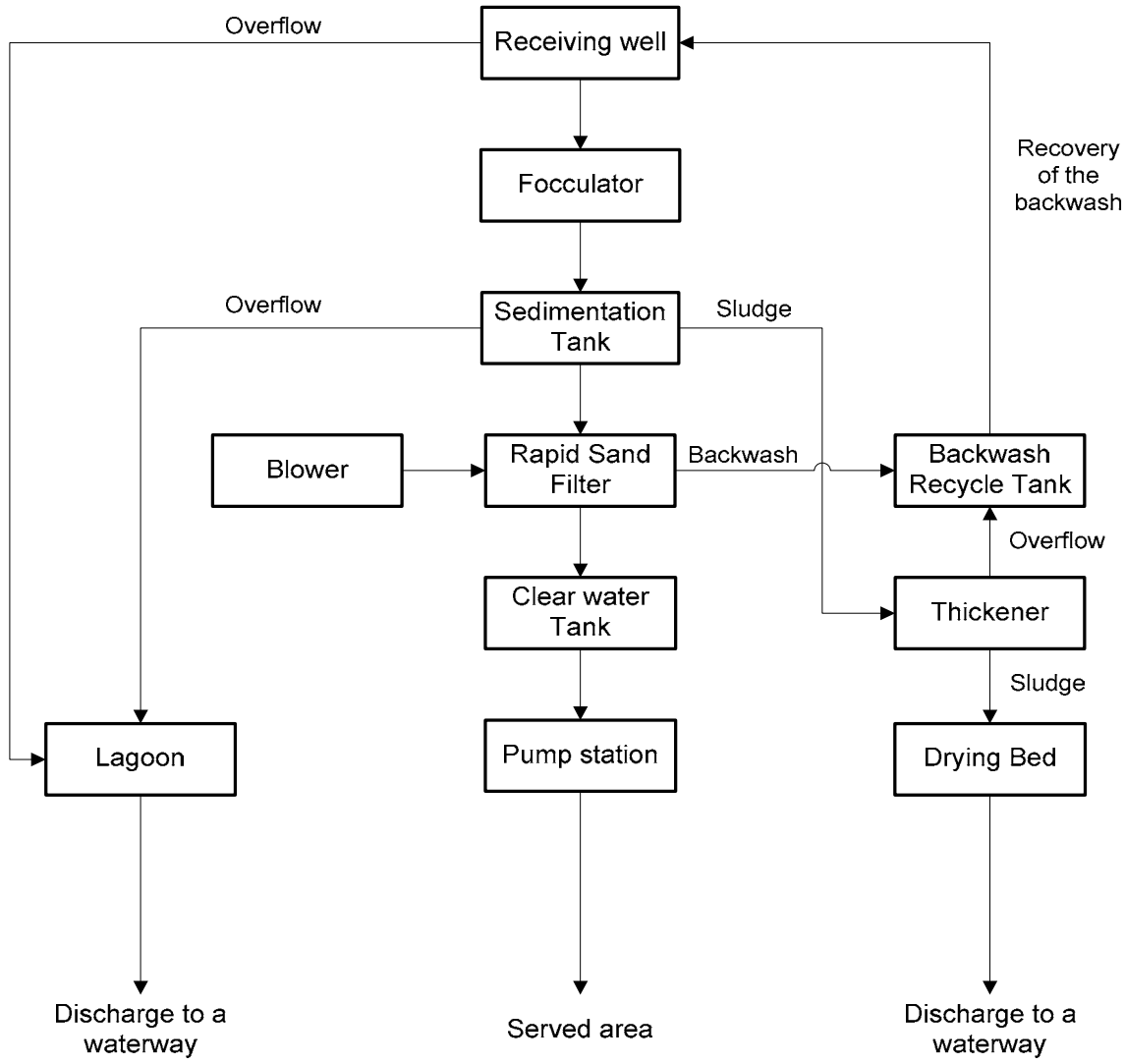
APPENDIX 5.2 (e)

WTP CAPACITY CALCULATION FOR WAHALKADA PHASE 2

1. General

1.1	1) Plant Capacity	:	Q	=	29,000	m3/d
				=	1,208	m3/hr
				=	20.1	m3/min
				=	0.34	m3/s
	2) Production loss	:		=	5.0	%
	3) Production capacity	:	Q	=	27,600	m3/d

1.2 Flow diagram



2. Receiving Well

2.1 Design Criteria

1)	Detention Time	:	>	1.50	min	

2.2 Design

1)	Units	:	=	1		
2)	Length	:	=	5.00	m	
3)	Width	:	=	5.60	m	
4)	Depth	:	=	6.00	m	
5)	Effective capacity	:	=	168.0	m3	
6)	Detention Time	:	=	8.3	min	…OK

3. Flash Mixing

3.1 Type

Hydraulic mixing by using a weir.

3.2 Design Criteria

1)	G value	:	>	100	/s	
2)	Effective fall at the weir The energy provided by a weir with an effective fall of 0.3m provides a G value of 1000 s-1 at 20 C.	:	=	1.00	m	…OK

4. Flocculator

4.1 Type

Baffle channels

4.2 Design Criteria

1)	Detention Time	:	=	20	min.	
			to	40	min.	
2)	G value	:	=	10	/s	
			to	75	/s	
3)	GT value	:	=	23,000		
			to	210,000		

4.3 Design

1)	Number of Baffle Channels	:	=	8		
2)	Unit flow	:	=	2.5	m3/min	
3)	Number of stages of the Baffle channel	:	=	7	stages	
4)	Effective capacity of Baffle Channels (refer to the Baffle channels caluculation)	:	=	89.3	m3	
5)	Detention Time	:	=	35.5	min	…OK
6)	G value (refer to the Baffle channels caluculation)	:	=	37	/s	…OK
7)	Gt value (refer to the Baffle channels caluculation)	:	=	67,705		…OK

5. Sedimentation Tank

5.1 Type

High-rate clarification by using upflow plate settlers

5.2 Design Criteria

1) Surface Load of the plate settlers	:	a	=		7	mm/min
				to	14	mm/min
2) Upward flow velocity	:	v	<		80.0	mm/min
3) Effluent Weir Load	:		<		350	m3/day/m

5.3 Design

1) Sedimentation tank

- Units	:		=	8	
- Unit flow	:		=	2.5	m3/min
- Length	:	L	=	14.40	m
- Width	:	W	=	4.00	m
- Depth	:		=	4.00	m

2) Characteristics of the plate

- Length of the plate	:		=	1.100	m
- Width of the plate	:		=	1.000	m
- Angle of the tilted plates	:		=	60	degree
- Spacing of the sloping parallel plates			=	0.075	m
- Horizontal spacing of the sloping parallel plates	:		=	0.087	m
- Height of the sloping plates	:		=	0.953	m
- Effective settling area of the plate	:		=	0.550	m2/plate

3) Number of the plates

- Total length of the plate settlers	:		=	12.000	m
- Total width of the plate settlers	:		=	3.000	m
- Number of the plates	:		=	416	plates

4) Surface load of the plates

- Flow rate	:		=	2.5	m3/min
- Total effective area of the plates	:		=	228.6	m2
- Efficiency of the plates	:		=	90	%
- Surface load of the plates	:		=	12.2	mm/min …OK

5) Upward flow velocity

- Flow rate	:		=	2.5	m3/min
- Projected area of the plate settlers	:		=	36	m2
- Upward flow velocity through projected area of the plate settlers	:		=	70	mm/min …OK

6) Effluent Weir

- Number of effluent weirs	:		=	12	weirs/train
- Length of effluent weir	:		=	4.00	m
- Diameter of the orifice on the weir	:		=	0.03	m
- Perimeter of the orifice	:		=	0.09	m
- Spacing between orifices	:		=	0.10	m
- Number of orifices	:		=	78	per trough
- Total number of orifices	:		=	936	per train
- Total length of the perimeter of the					

	orifices	:		=	88.17	m
-	Effluent Weir Load	:		=	41	m3/day/m …OK

5.4 Average Sludge Production

1) Dry Solid Sludge

-	Average turbidity	:		=	10.0	NTU
-	Coefficient converting turbidity to SS	:		=	1.0	
-	Amount of dry solid sludge	:		=	0.3	t/d

2) Dry Alum Sludge

-	Alum dosage as $Al_2(SO_4)^3 18H_2O$	:		=	60.0	mg/L
-	Percentage of Al_2O_3	:		=	16.0	%
-	Solid alum dosage	:		=	1.7	t/d
-	Amount of dry alum sludge	:		=	0.4	t/d

3) Dry Sludge Production Rate

-	Total amount of dry sludge	:		=	0.7	t/d

4) Wet Sludge Production Rate

-	Percentage of solids to water	:		=	0.2	%
-	Total amount of wet sludge	:		=	358.0	m3/d

6. Rapid Sand Filter

6.1 Type

Down Flow, Single Media

6.2 Design Criteria

1)	Filtration Rate	:		<	200.0	m/d
2)	Filter Area per Unit	:		<	150.0	m2

6.3 Design

1)	Units	:		=	8	
2)	Unit flow	:		=	3,625	m3/min
				=	2.5	m3/min
3)	Unit flow during one unit washing	:		=	4,143	m3/min
				=	2.9	m3/min
4)	Length of the filter	:	L	=	6.00	m
5)	Width of the filter	:	W	=	4.00	m
6)	Width of the gullet	:		=	1.30	m
7)	Maximum water depth above filter media	:		=	2.00	m
8)	Type of filter media	:		=	Sand	
9)	Effective size of filter media	:		=	1.2	mm
10)	Depth of filter bed	:		=	1.2	m
11)	Unit Filtration Area	:		=	24.00	m2
12)	Filtration Rate	:		=	151.0	m/d …OK
13)	Filtration Rate during one unit washing	:		=	172.6	m/d …OK
14)	Filter Washing Frequency	:		=	1	/d
15)	Filter Washing Rate					
-	Air scouring rate	:		=	1.00	m3/m2/min
-	Air scouring duration	:		=	5.00	min

- Backwashing rate	:		=	0.25	m3/m2/min	
- Backwashing duration	:		=	10.00	min	
- Backwashing rate per filter	:		=	6.00	m3/min	
	:		=	0.10	m3/sec	
16) Washing Water Discharge Rate						
- Loss of settled water	:	Vs	=	63.6	m3/unit/wash	
- Backwashing amount	:	Vb	=	60.0	m3/unit/wash	
- Vs + Vb	:		=	123.6	m3/unit/wash	
- Total amount for washing	:		=	988.8	m3/d	
- Ratio of washed water to the amount of water treated	:		=	3.4	%	

7. Clear Water Tank

7.1 Design Criteria

1) Detention Time	:		=	1.00	hours	

7.2 Design

1) Units	:		=	2		
2) Length	:		=	21.00	m	
3) Width	:		=	10.00	m	
4) Depth	:		=	4.00	m	
5) Effective capacity	:		=	1,680.0	m3	
6) Detention Time	:		=	1.4	hrs	…OK

8. Thickener

8.1 Design Criteria

1) Detention time of the sludge	:	=	24	hours	
		to	48	hours	
2) Loading rate of solids per surface area	:	=	10	kg/m2/d	
		to	20	kg/m2/d	

8.2 Amount of the sludge (Inflow to Thickener)

1) Dry Solid Sludge				
- Raw water turbidity (high turbidity) 4 times of average turbidity for considering high turibidity period	:	=	40.0	NTU
- Amount of dry solid sludge	:	=	1.2	t/d
2) Dry Alum Sludge				
- Alum dosage as $Al_2(SO_4)^3 18H_2O$	:	=	100.0	mg/L
- Percentage of Al_2O_3	:	=	16.0	%
- Solid alum dosage	:	=	2.9	t/d
- Amount of dry alum sludge	:	=	0.7	t/d
3) Total Amount of Dry Sludge	:	=	1.9	t/d
4) Wet Sludge				
- Percentage of sludge to water	:	=	0.2	%
- Total amount of wet sludge (Inflow to Thickener)	:	=	935.0	m3/d

8.3 Design

1) Units	:		=	2		
2) Diameter			=	12.50	m	
2) Area	:		=	122.66	m2	
4) Depth	:		=	4.00	m	
5) Effective capacity	:		=	981.3	m3	…OK

8.4 Average Sludge Production (Outflow from Thickener)

1) Average Dry Sludge Production Rate						
- Total amount of dry sludge	:		=	0.7	t/d	
4) Wet Sludge Production Rate						
- Percentage of solids to water	:		=	4.0	%	
- Total amount of wet sludge (Outflow from Thickener)	:		=	17.9	m3/d	

9. Backwash Recycle Tank

9.1 Design Criteria

1) Tank must be large enough to accommodate the oveflow from thickener for 6 hours and waste water of three sand filter backwash discharge.						
- Oveflow from the Thickener for 6 hours	:		=	229.3	m3	
- Waste water of three filter backwash discharge	:		=	370.8	m3	
- Total (=required capacity)	:		=	600.0	m3	
2) Depth	:	D	=	2	m	
			to	4	m	

9.2 Design

1) Units	:		=	2		
2) Length	:		=	15.00	m	
3) Width	:		=	5.00	m	
4) Depth	:		=	4.00	m	
5) Effective capacity	:		=	600.0	m3	…OK

9.3 Return of the Water to Receiving Well

- The water is returned to Receiving Well for 6 hours.	:		=	100.0	m3/hr	
- Percentage of the water to the raw water	:		=	8.3	%	

11. Drying Bed

11.1 Design Guidance

1) Detention time to hold the sludge	:		>	3	months	
			to	4	months	
2) Loading rate of solids per surface area	:		=	40	kg/m2	
			to	80	kg/m2	

11.2 Amount of Sludge

1) Dry sludge on average	:		=	0.7	t/d	

2) Wet sludge on average	:	=	17.9	m3/d	

11.3 Design

1) Units	:	=	6		
- Duty	:	=	4		
- Stand-by (during the period of dischrge of dry sludge from beds)	:	=	2		
2) Length	:	=	25.00	m	
3) Width	:	=	15.00	m	
4) Depth	:	=	1.00	m	
5) Effective capacity	:	=	1,500.0	m3	
6) Detention time	:	=	3.0	months	…OK
7) Loading rate	:	=	43.0	kg/m2	…OK

12. Lagoon

12.1 Design Guidance

Lagoon should be large enough to hold overflow from receiving well for 20 min.

1) Overflow form receiving well	:	=	29,000	m3/d	
	:	=	20.1	m3/min	
1) Overflow form receiving well for 20 min.	:	=	402.8	m3	

12.1 Design

1) Units	:	=	2		
2) Length	:	=	25.00	m	
3) Width	:	=	12.00	m	
4) Depth	:	=	1.50	m	
5) Effective capacity	:	=	900.0	m3	…OK

Hydraulic Flocculation (Baffle Walls, Up and Down)

Plant Capacity : = 29,000 cu m/day
: = 1,208 cu m/hour
: = 20.1 cu m/min
: = 0.336 cu m/sec
Number of flocculation channel : = 8 units

Item No.	Descriptions	Unit	Symbol	Nos. of Stages							Between Raws							
				No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No.1&2	No.2&3	No.3&4	No.4&5	No.5&6	No.6&7	No.7&8	No.8&9
1. General Descriptions																		
1)	Design capacity	m3/d	(Q)	3,625	3,625	3,625	3,625	3,625	3,625	3,625	3,625	3,625	3,625	3,625	3,625	3,625		
2)	Width of wall	m	(Ww)	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900		
3)	No. of wall in one raw	-	(Nw)	4	4	4	4	4	4	4	1	1	1	1	1	1		
4)	Depth	m		3.00	3.00	3.00	3.00	3.00	3.00	3.00								
2. Loss of down flow																		
1)	Downflow depth	m	(Hb)	0.10	0.12	0.15	0.20	0.30	0.40	0.50		0.15		0.30		0.50		
2)	Downflow velocity	m/s	(vb)	0.470	0.390	0.310	0.230	0.160	0.120	0.090		0.310		0.160		0.090		
3)	Downflow coefficent of friction loss	-	(fb)	3.5	3.5	3.5	3.5	3.5	3.5	3.5		3.5		3.5		3.5		
4)	No. of down flows			2	2	2	2	2	2	2		1		1		1		
5)	hb = fb/2/9.8*vb^2*no. of down flows	m		0.0789	0.0543	0.0343	0.0189	0.0091	0.0051	0.0029		0.0172		0.0046		0.0014		
3. Loss of over flow																		
1)	Overflow depth	m	(Ho)	0.30	0.30	0.50	0.50	0.50	0.60	0.60	0.30	0.30	0.50	0.50	0.50	0.60		
2)	Oveflow velocity	m/s	(vo)	0.155	0.155	0.093	0.093	0.093	0.078	0.078	0.155	0.155	0.093	0.093	0.093	0.078		
3)	Downflow coefficent of friction loss	-	(fb)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		
4)	No. of over flows			2	2	2	2	2	2	2	1	1	1	1	1	1		
4)	ho = fb*vo^2/2/9.8*no. of over flows	m		0.005	0.005	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001		
4. Loss of friction																		
1)	R = W_w*Lc,2/(W_{w+Lc})	m	(R)	0.225	0.225	0.225	0.225	0.225	0.225	0.225								
2)	n = roughness coefficient	-	(n)	0.013	0.013	0.013	0.013	0.013	0.013	0.013								
3)	vc=velocity	m/s	(vc)	0.052	0.052	0.052	0.052	0.052	0.052	0.052								
4)	C^2 = 1/n^2*$R^{1/3}$	-	($C^{2)}$	3,599	3,599	3,599	3,599	3,599	3,599	3,599								
5)	Length of ditch	m	($L_{1)}$	5.3	5.3	5.3	5.3	5.3	5.3	5.3								
6)	Length of wall	m	($L_{w)}$	2.600	2.580	2.350	2.300	2.200	2.000	1.900								
7)	L = L1 + Lw*(Nw+1)	m	(L)	23.450	23.310	21.700	21.350	20.650	19.250	18.550								
8)	hf = L n^2vc^2/R^(4/3)	m		0.000	0.000	0.000	0.000	0.000	0.000	0.000								
5. Total Loss of Head																		
1)	$H = h_1 + h_2 + h_3$	m	**0.253**	0.084	0.059	0.036	0.021	0.011	0.006	0.004	0.002	0.020	0.001	0.005	0.001	0.002	0.000	0.000
6. G-value											**Total**							
1)	Volume of raw	m3	(V)	12.66	12.67	12.73	12.74	12.77	12.83	12.85	**89**	**m3**	(TTL Volume of Flloculation Basin)					
2)	Detention time	min	(T)	5.03	5.03	5.06	5.06	5.07	5.09	5.11	**35.5**	**min**	(TTL Detention Time)					
3)	Density of Water (at 25 degree)	kg/m3	(ρ)	997														
4)	Viscosity of Water (x 10-3)	kg/m/s	(μ)	0.898									**Ave. Turbidity=**				**17.7**	
5)	Acceleration of Gravity	m/s2	(g)	9.8							**Ave G**		**GCT=**				**1,198,383**	
6)	$G=(H\cdot\rho\cdot Q\cdot g/(V\cdot\mu))^{0.5}$	s-1	(G)	**55.8**	**53.3**	**36.5**	**30.6**	**19.8**	**15.1**	**12.2**	**37.2**							
7)	Gt value	-		16,841	16,105	11,060	9,305	6,032	4,628	3,735	**67,705**	(23,000 to 210,000)						

Chlorine Dosage

1. Chlorine application points
   1). Receiving Well (Pre-chlorination)
   2). Clear Water Tank (Post-chlorination)

2. Flow rate for pre- and post chlorination:
   = 29,000 m3/d
   = 1,200 m3/hr

3. Dosage of pre-chlorination
   Maximum 5.0 mg/L
   Average 2.0 mg/L
   Minimum 1.0 mg/L

4. Dosage of post-chlorination
   Maximum 2.0 mg/L
   Average 1.0 mg/L
   Minimum 0.5 mg/L

5. Amount of Chlorine
Amount of chlorine can be calculated by using the formula:

$$V = Q \times R \times 10^{-3}$$

V: amount of chlorine to be used (kg/h)
Q: flow rate (m3/h)
R: chlorine dosage (mg/L)

	chlorine dosage (mg/L)		flow (m3/h)	amount of chlorine (kg/h)
Pre-chlorine	max.	5.0	1,200	6.0
	ave.	2.0	1,200	2.4
	min.	1.0	1,200	1.2
Post-chlorine	max.	2.0	1,200	2.4
	ave.	1.0	1,200	1.2
	min.	0.5	1,200	0.6

	chlorine dosage (mg/L)		flow (m3/h)	amount of chlorine (kg/h)	total amount of chlorine (kg/h)
Maximum	Pre-	5.0	1,200	6.0	8.4
	Post-	2.0	1,200	2.4	
Average	Pre-	2.0	1,200	2.4	3.6
	Post-	1.0	1,200	1.2	
Minimum	Pre-	1.0	1,200	1.2	1.8
	Post-	0.5	1,200	0.6	

6. Required number of chlorne cylinders to be used
   Yield of chlorine gas from one ton cylinder without an evaporator
   = 8.0 kg/h
   Maximum amount of chlorine dosage
   = 8.4 kg/h
   Required number of cylinders
   = 2 cylinders
   Prepare 2 times to maintain chlorination during changeover of cylinders
   = 4 cylinders

7. Storage of cylinders
   Storage of cylinders
   = 30 days for average dosage
   Average amount of chlorine dosage
   = 3.6 kg/h
   = 86.4 kg/d
   = 2,592.0 kg/month
   = 2.6 t/month
   Storage of cylinders for 30 days for average dosage
   = 3 cylinders

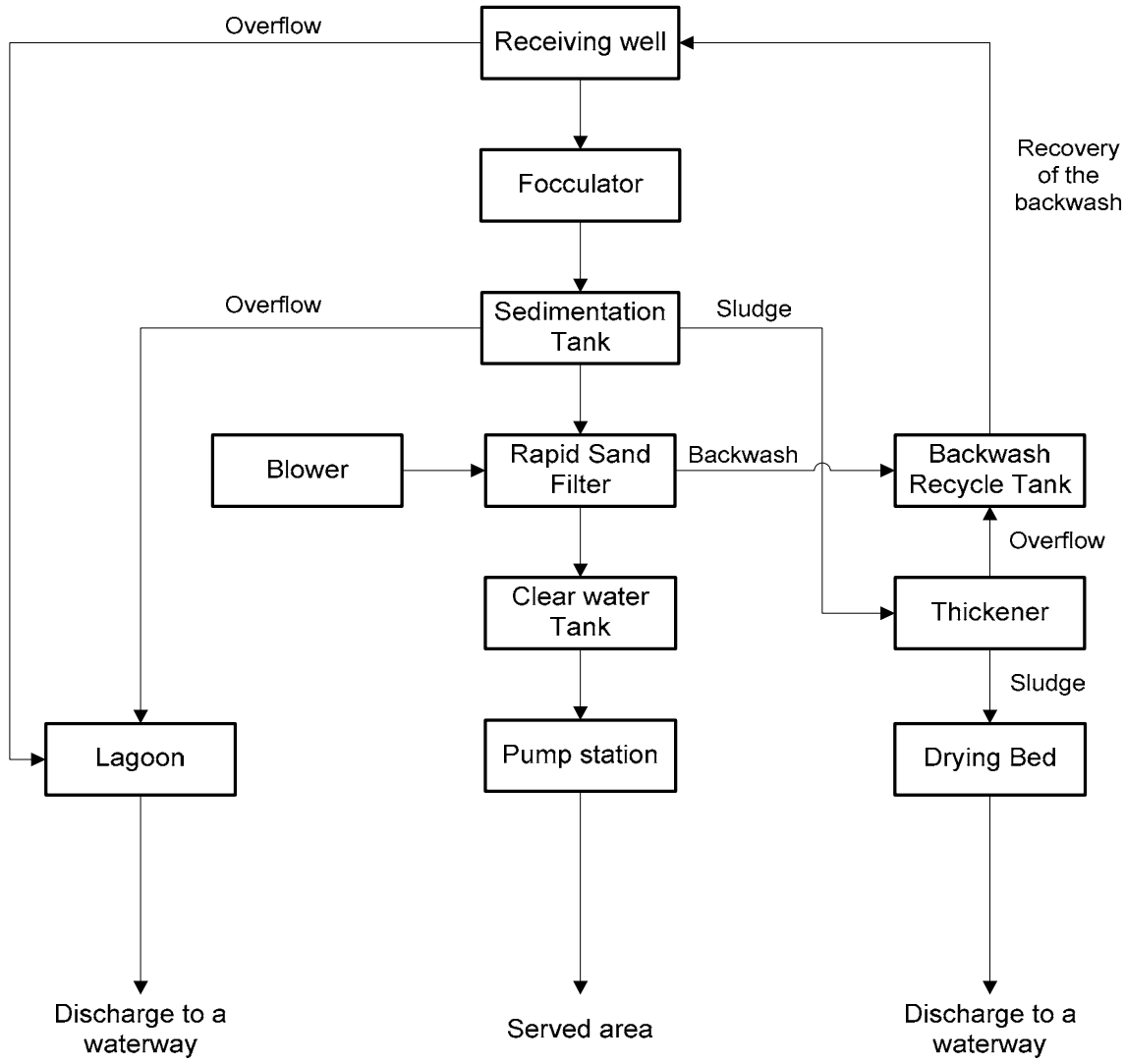
APPENDIX 5.2 (f)

WTP CAPACITY CALCULATION FOR WAHALKADA PHASE 1

1. General

1.1	1) Plant Capacity	:	Q	=	14,500	m3/d
				=	604	m3/hr
				=	10.1	m3/min
				=	0.17	m3/s
	2) Production loss	:		=	5.0	%
	3) Production capacity	:	Q	=	13,800	m3/d

1.2 Flow diagram



2. Receiving Well

2.1 Design Criteria

1) Detention Time	:	>	1.50	min	

2.2 Design

1) Units	:	=	1		
2) Length	:	=	5.00	m	
3) Width	:	=	5.60	m	
4) Depth	:	=	6.00	m	
5) Effective capacity	:	=	168.0	m3	
6) Detention Time	:	=	16.7	min	…OK

3. Flash Mixing

3.1 Type

Hydraulic mixing by using a weir.

3.2 Design Criteria

1) G value	:	>	100	/s	
2) Effective fall at the weir The energy provided by a weir with an effective fall of 0.3m provides a G value of 1000 s-1 at 20 C.	:	=	1.00	m	…OK

4. Flocculator

4.1 Type

Baffle channels

4.2 Design Criteria

1) Detention Time	:	=	20	min.	
		to	40	min.	
2) G value	:	=	10	/s	
		to	75	/s	
3) GT value	:	=	23,000		
		to	210,000		

4.3 Design

1) Number of Baffle Channels	:	=	4		
2) Unit flow	:	=	2.5	m3/min	
3) Number of stages of the Baffle channel	:	=	7	stages	
4) Effective capacity of Baffle Channels (refer to the Baffle channels caluculation)	:	=	89.3	m3	
5) Detention Time	:	=	35.5	min	…OK
6) G value (refer to the Baffle channels caluculation)	:	=	37	/s	…OK
7) Gt value (refer to the Baffle channels caluculation)	:	=	67,705		…OK

5. Sedimentation Tank

5.1 Type

High-rate clarification by using upflow plate settlers

5.2 Design Criteria

1) Surface Load of the plate settlers	:	a	=		7	mm/min
				to	14	mm/min
2) Upward flow velocity	:	v	<		80.0	mm/min
3) Effluent Weir Load	:		<		350	m3/day/m

5.3 Design

1) Sedimentation tank

- Units	:		=	4	
- Unit flow	:		=	2.5	m3/min
- Length	:	L	=	14.40	m
- Width	:	W	=	4.00	m
- Depth	:		=	4.00	m

2) Characteristics of the plate

- Length of the plate	:		=	1.100	m
- Width of the plate	:		=	1.000	m
- Angle of the tilted plates	:		=	60	degree
- Spacing of the sloping parallel plates	:		=	0.075	m
- Horizontal spacing of the sloping parallel plates	:		=	0.087	m
- Height of the sloping plates	:		=	0.953	m
- Effective settling area of the plate	:		=	0.550	m2/plate

3) Number of the plates

- Total length of the plate settlers	:		=	12.000	m
- Total width of the plate settlers	:		=	3.000	m
- Number of the plates	:		=	416	plates

4) Surface load of the plates

- Flow rate	:		=	2.5	m3/min	
- Total effective area of the plates	:		=	228.6	m2	
- Efficiency of the plates	:		=	90	%	
- Surface load of the plates	:		=	12.2	mm/min	…OK

5) Upward flow velocity

- Flow rate	:		=	2.5	m3/min	
- Projected area of the plate settlers	:		=	36	m2	
- Upward flow velocity through projected area of the plate settlers	:		=	70	mm/min	…OK

6) Effluent Weir

- Number of effluent weirs	:		=	12	weirs/train
- Length of effluent weir	:		=	4.00	m
- Diameter of the orifice on the weir	:		=	0.03	m
- Perimeter of the orifice	:		=	0.09	m
- Spacing between orifices	:		=	0.10	m
- Number of orifices	:		=	78	per trough
- Total number of orifices	:		=	936	per train
- Total length of the perimeter of the					

	orifices	:	=	88.17	m	
-	Effluent Weir Load	:	=	41	m3/day/m	…OK

5.4 Average Sludge Production

1) Dry Solid Sludge

-	Average turbidity	:	=	10.0	NTU	
-	Coefficient converting turbidity to SS	:	=	1.0		
-	Amount of dry solid sludge	:	=	0.1	t/d	

2) Dry Alum Sludge

-	Alum dosage as $Al_2(SO_4)^3 18H_2O$	:	=	60.0	mg/L	
-	Percentage of Al_2O_3	:	=	16.0	%	
-	Solid alum dosage	:	=	0.9	t/d	
-	Amount of dry alum sludge	:	=	0.2	t/d	

3) Dry Sludge Production Rate

-	Total amount of dry sludge	:	=	0.4	t/d	

4) Wet Sludge Production Rate

-	Percentage of solids to water	:	=	0.2	%	
-	Total amount of wet sludge	:	=	179.0	m3/d	

6. Rapid Sand Filter

6.1 Type

Down Flow, Single Media

6.2 Design Criteria

1)	Filtration Rate	:	<	200.0	m/d	
2)	Filter Area per Unit	:	<	150.0	m2	

6.3 Design

1)	Units	:	=	4		
2)	Unit flow	:	=	3,625	m3/min	
			=	2.5	m3/min	
3)	Unit flow during one unit washing	:	=	4,833	m3/min	
			=	3.4	m3/min	
4)	Length of the filter	: L	=	6.00	m	
5)	Width of the filter	: W	=	4.00	m	
6)	Width of the gullet	:	=	1.30	m	
7)	Maximum water depth above filter media	:	=	2.00	m	
8)	Type of filter media	:	=	Sand		
9)	Effective size of filter media	:	=	1.2	mm	
10)	Depth of filter bed	:	=	1.2	m	
11)	Unit Filtration Area	:	=	24.00	m2	
12)	Filtration Rate	:	=	151.0	m/d	…OK
13)	Filtration Rate during one unit washing	:	=	201.4	m/d	...NG
14)	Filter Washing Frequency	:	=	1	/d	
15)	Filter Washing Rate					
-	Air scouring rate	:	=	1.00	m3/m2/min	
-	Air scouring duration	:	=	5.00	min	

- Backwashing rate	:		=	0.25	m3/m2/min	
- Backwashing duration	:		=	10.00	min	
- Backwashing rate per filter	:		=	6.00	m3/min	
	:		=	0.10	m3/sec	
16) Washing Water Discharge Rate						
- Loss of settled water	:	Vs	=	63.6	m3/unit/wash	
- Backwashing amount	:	Vb	=	60.0	m3/unit/wash	
- Vs + Vb	:		=	123.6	m3/unit/wash	
- Total amount for washing	:		=	494.4	m3/d	
- Ratio of washed water to the amount of water treated	:		=	3.4	%	

7. Clear Water Tank

7.1 Design Criteria

1) Detention Time	:		=	1.00	hours	

7.2 Design

1) Units	:		=	2		
2) Length	:		=	21.00	m	
3) Width	:		=	10.00	m	
4) Depth	:		=	4.00	m	
5) Effective capacity	:		=	1,680.0	m3	
6) Detention Time	:		=	2.8	hrs	…OK

8. Thickener

8.1 Design Criteria

1) Detention time of the sludge	:	=	24	hours	
		to	48	hours	
2) Loading rate of solids per surface area	:	=	10	kg/m2/d	
		to	20	kg/m2/d	

8.2 Amount of the sludge (Inflow to Thickener)

1) Dry Solid Sludge					
- Raw water turbidity (high turbidity) 4 times of average turbidity for considering high turibidity period	:	=	40.0	NTU	
- Amount of dry solid sludge	:	=	0.6	t/d	
2) Dry Alum Sludge					
- Alum dosage as $Al_2(SO_4)^3 18H_2O$	:	=	100.0	mg/L	
- Percentage of Al_2O_3	:	=	16.0	%	
- Solid alum dosage	:	=	1.5	t/d	
- Amount of dry alum sludge	:	=	0.4	t/d	
3) Total Amount of Dry Sludge	:	=	0.9	t/d	
4) Wet Sludge					
- Percentage of sludge to water	:	=	0.2	%	
- Total amount of wet sludge (Inflow to Thickener)	:	=	467.5	m3/d	

8.3 Design

1) Units	:		=	2		
2) Diameter			=	12.50	m	
2) Area	:		=	122.66	m2	
4) Depth	:		=	4.00	m	
5) Effective capacity	:		=	981.3	m3	…OK

8.4 Average Sludge Production (Outflow from Thickener)

1) Average Dry Sludge Production Rate						
- Total amount of dry sludge	:		=	0.4	t/d	
4) Wet Sludge Production Rate						
- Percentage of solids to water	:		=	4.0	%	
- Total amount of wet sludge (Outflow from Thickener)	:		=	8.9	m3/d	

9. Backwash Recycle Tank

9.1 Design Criteria

1) Tank must be large enough to accommodate the oveflow from thickener for 6 hours and waste water of three sand filter backwash discharge.						
- Oveflow from the Thickener for 6 hours	:		=	114.6	m3	
- Waste water of three filter backwash discharge	:		=	370.8	m3	
- Total (=required capacity)	:		=	485.0	m3	
2) Depth	:	D	=	2	m	
			to	4	m	

9.2 Design

1) Units	:		=	2		
2) Length	:		=	15.00	m	
3) Width	:		=	5.00	m	
4) Depth	:		=	4.00	m	
5) Effective capacity	:		=	600.0	m3	…OK

9.3 Return of the Water to Receiving Well

- The water is returned to Receiving Well for 6 hours.	:		=	80.8	m3/hr	
- Percentage of the water to the raw water	:		=	13.4	%	

11. Drying Bed

11.1 Design Guidance

1) Detention time to hold the sludge	:		>	3	months	
			to	4	months	
2) Loading rate of solids per surface area	:		=	40	kg/m2	
			to	80	kg/m2	

11.2 Amount of Sludge

1) Dry sludge on average	:		=	0.4	t/d	

2) Wet sludge on average	:	=	8.9	m3/d	

11.3 Design

1) Units	:	=	4		
- Duty	:	=	2		
- Stand-by (during the period of dischrge of dry sludge from beds)	:	=	2		
2) Length	:	=	25.00	m	
3) Width	:	=	15.00	m	
4) Depth	:	=	1.00	m	
5) Effective capacity	:	=	750.0	m3	
6) Detention time	:	=	3.0	months	…OK
7) Loading rate	:	=	43.0	kg/m2	…OK

12. Lagoon

12.1 Design Guidance

Lagoon should be large enough to hold overflow from receiving well for 20 min.

1) Overflow form receiving well	:	=	14,500	m3/d	
	:	=	10.1	m3/min	
1) Overflow form receiving well for 20 min.	:	=	201.4	m3	

12.1 Design

1) Units	:	=	2		
2) Length	:	=	25.00	m	
3) Width	:	=	12.00	m	
4) Depth	:	=	1.50	m	
5) Effective capacity	:	=	900.0	m3	…OK

Hydraulic Flocculation (Baffle Walls, Up and Down)

Plant Capacity : = 14,500 cu m/day
: = 604 cu m/hour
: = 10.1 cu m/min
: = 0.168 cu m/sec
Number of flocculation channel : = 4 units

Item No.	Descriptions	Unit	Symbol	Nos. of Stages							Between Raws							
				No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No.1&2	No.2&3	No.3&4	No.4&5	No.5&6	No.6&7	No.7&8	No.8&9
1. General Descriptions																		
1)	Design capacity	m3/d	(Q)	3,625	3,625	3,625	3,625	3,625	3,625	3,625	3,625	3,625	3,625	3,625	3,625	3,625		
2)	Width of wall	m	(Ww)	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900		
3)	No. of wall in one raw	-	(Nw)	4	4	4	4	4	4	4	1	1	1	1	1	1		
4)	Depth	m		3.00	3.00	3.00	3.00	3.00	3.00	3.00								
2. Loss of down flow																		
1)	Downflow depth	m	(Hb)	0.10	0.12	0.15	0.20	0.30	0.40	0.50		0.15		0.30		0.50		
2)	Downflow velocity	m/s	(vb)	0.470	0.390	0.310	0.230	0.160	0.120	0.090		0.310		0.160		0.090		
3)	Downflow coefficent of friction loss	-	(fb)	3.5	3.5	3.5	3.5	3.5	3.5	3.5		3.5		3.5		3.5		
4)	No. of down flows			2	2	2	2	2	2	2		1		1		1		
5)	hb = fb/2/9.8*vb^2*no. of down flows	m		0.0789	0.0543	0.0343	0.0189	0.0091	0.0051	0.0029		0.0172		0.0046		0.0014		
3. Loss of over flow																		
1)	Overflow depth	m	(Ho)	0.30	0.30	0.50	0.50	0.50	0.60	0.60	0.30	0.30	0.50	0.50	0.50	0.60		
2)	Oveflow velocity	m/s	(vo)	0.155	0.155	0.093	0.093	0.093	0.078	0.078	0.155	0.155	0.093	0.093	0.093	0.078		
3)	Downflow coefficent of friction loss	-	(fb)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		
4)	No. of over flows			2	2	2	2	2	2	2	1	1	1	1	1	1		
4)	ho = fb*vo^2/2/9.8*no. of over flows	m		0.005	0.005	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001		
4. Loss of friction																		
1)	R = W_w*Lc2/(W_{w+Lc})	m	(R)	0.225	0.225	0.225	0.225	0.225	0.225	0.225								
2)	n = roughness coefficient	-	(n)	0.013	0.013	0.013	0.013	0.013	0.013	0.013								
3)	vc=velocity	m/s	(vc)	0.052	0.052	0.052	0.052	0.052	0.052	0.052								
4)	C^2 = 1/n^2*$R^{1/3}$	-	($C^{2)}$	3,599	3,599	3,599	3,599	3,599	3,599	3,599								
5)	Length of ditch	m	($L_{1)}$	5.3	5.3	5.3	5.3	5.3	5.3	5.3								
6)	Length of wall	m	($L_{w)}$	2.600	2.580	2.350	2.300	2.200	2.000	1.900								
7)	L = L1 + Lw*(Nw+1)	m	(L)	23.450	23.310	21.700	21.350	20.650	19.250	18.550								
8)	hf = L n^2vc^2/R^(4/3)	m		0.000	0.000	0.000	0.000	0.000	0.000	0.000								
5. Total Loss of Head																		
1)	H = h_1 + h_2 + h_3	m	**0.253**	0.084	0.059	0.036	0.021	0.011	0.006	0.004	0.002	0.020	0.001	0.005	0.001	0.002	0.000	0.000
6. G-value											**Total**							
1)	Volume of raw	m3	(V)	12.66	12.67	12.73	12.74	12.77	12.83	12.85	**89**	**m3**	(TTL Volume of Flloculation Basin)					
2)	Detention time	min	(T)	5.03	5.03	5.06	5.06	5.07	5.09	5.11	**35.5**	**min**	(TTL Detention Time)					
3)	Density of Water (at 25 degree)	kg/m3	(ρ)	997														
4)	Viscosity of Water (x 10-3)	kg/m/s	(μ)	0.898									**Ave. Turbidity=**				**17.7**	
5)	Acceleration of Gravity	m/s2	(g)	9.8							**Ave G**		**GCT=**				**1,198,383**	
6)	G=($H\cdot\rho\cdot Q\cdot g/(V\cdot\mu)$)$^{0.5}$	s-1	(G)	**55.8**	**53.3**	**36.5**	**30.6**	**19.8**	**15.1**	**12.2**	**37.2**							
7)	Gt value	-		16,841	16,105	11,060	9,305	6,032	4,628	3,735	**67,705**	(23,000 to 210,000)						

Chlorine Dosage

1. Chlorine application points
   1). Receiving Well (Pre-chlorination)
   2). Clear Water Tank (Post-chlorination)

2. Flow rate for pre- and post chlorination:
   = 14,500 m3/d
   = 600 m3/hr

3. Dosage of pre-chlorination
   Maximum 5.0 mg/L
   Average 2.0 mg/L
   Minimum 1.0 mg/L

4. Dosage of post-chlorination
   Maximum 2.0 mg/L
   Average 1.0 mg/L
   Minimum 0.5 mg/L

5. Amount of Chlorine
Amount of chlorine can be calculated by using the formula:

$$V = Q \times R \times 10^{-3}$$

V: amount of chlorine to be used (kg/h)
Q: flow rate (m3/h)
R: chlorine dosage (mg/L)

	chlorine dosage (mg/L)		flow (m3/h)	amount of chlorine (kg/h)
Pre-chlorine	max.	5.0	600	3.0
	ave.	2.0	600	1.2
	min.	1.0	600	0.6
Post-chlorine	max.	2.0	600	1.2
	ave.	1.0	600	0.6
	min.	0.5	600	0.3

	chlorine dosage (mg/L)		flow (m3/h)	amount of chlorine (kg/h)	total amount of chlorine (kg/h)
Maximum	Pre-	5.0	600	3.0	4.2
	Post-	2.0	600	1.2	
Average	Pre-	2.0	600	1.2	1.8
	Post-	1.0	600	0.6	
Minimum	Pre-	1.0	600	0.6	0.9
	Post-	0.5	600	0.3	

6. Required number of chlorne cylinders to be used
   Yield of chlorine gas from one ton cylinder without an evaporator
   = 8.0 kg/h
   Maximum amount of chlorine dosage
   = 4.2 kg/h
   Required number of cylinders
   = 1 cylinders
   Prepare 2 times to maintain chlorination during changeover of cylinders
   = 2 cylinders

7. Storage of cylinders
   Storage of cylinders
   = 30 days for average dosage
   Average amount of chlorine dosage
   = 1.8 kg/h
   = 43.2 kg/d
   = 1,296.0 kg/month
   = 1.3 t/month
   Storage of cylinders for 30 days for average dosage
   = 2 cylinders

APPENDIX 5.3 (a) TRANSMISSION HYDRAULICS

1. General

The project area comprises six (6) DSDs, which are further divided into 194 GNDs covering about 2,863 km^2. The six DSDs are Padaviya, Kebithigollewa, Medawachchiya, Rambewa, Horowpothana and Kahatagasdigiliya.

Two (2) water sources are selected for the present integrated water supply system in the northern and southern parts of the project area, namely Wahalkada Wewa (tank) and Mahakanadarawa Wewa respectively, from where water is conveyed, after treatment, to the entire project area through two (2) transmission systems.

The transmission system from the Mahakanadarawa Wewa is named as the Mahakanadarawa System, which will cover DSDs of Medawachchiya and Rambewa. The Wahalkada system from Wahalkada Wewa transmits treated water to three DSDs of Padaviya, Kebithigollewa, Horowpothana and Kahatagasdigiliya.

From the demand projection for the year of 2034, the transmission capacity for the Mahakanadarawa and Wahalkada systems is determined as 17,100 m^3/day and 26,900 m^3/day respectively.

Each transmission system is composed of a transmission main system and sub-main system. The main system is formed to cover the entire supply zone from the respective water treatment plant and the sub-system supplements the main system to convey bulk water to the elevated tanks, which are placed at strategic locations to distribute water to the new system of GNDs and transmit bulk water to the existing CBOs.

This appendix presents the hydraulic analysis of the above systems.

Transmission mains are planned between the water treatment plant and the service centers by pumping. Ground elevations at such sites for construction of the major facilities are important to determine the size of the transmission main and the dimensions of the pump facilities. Based on the topographical and line surveys, key ground elevations are determined as shown in **Attachment 1**. Position and ground elevation at the existing elevated tower of each CBO was also measured using GPS with high accuracy and summarized in **Attachment 2**.

Pipe materials used for the transmission main and sub-main are selected PE pipes. Friction loss coefficient used for hydraulic analysis is 120 for both transmission main and sub-main.

2. Hydraulic Analysis of Transmission Main

The schematic layouts of the transmission main systems are prepared in Figure 1, 2 and 3 of **Attachment 3** showing Mahakanadarawa System, Wahalkada Sub-system A and Wahalkada Sub-system B respectively. Wahalkada Sub-system A shows the system covering northern part mainly for Padaviya and Kebithigollewa. Horowpothana and Kahatagasdigiliya, southern part of Wahalkada System is shown in Wahalkada Sub-system B.

The summary of hydraulic analysis of each system is presented in Table 1 to 3. Table 1 shows hydraulic analysis 0f Mahakanadarawa System, Table 2 is for Wahalkada Sub-system and Wahalkada Sub-system is shown in Table 3.

3. Hydraulic Analysis of Transmission Sub-main

There are four branches are provided to the transmission main of Mahakanadarawa System. From these Branches, the transmission sub-mains are installed. Transmission sub-main from branch “a” convey water to East Rambewa Elevated Tank(I-4 ET) and other several existing tanks of CBOs. Other transmission sub-mains from Branch “b” to “d” feed water to CBOs.

Wahalkada A System has one branch to convey water to Kah-Keb Median Elevated tank (II-4 ET). Wahalkada Sub-system B has eight branches. Transmission Sub-main from Branch “e” feeds water to North Horowpothana Elevated Tank (II-6 ET), from Branch “g” sub-main supplies water to West Horowpothana Elevated Tank (II-8 ET) and Hamillewa Elevated Tank (II-10 ET) receive transmission water from Branch”h”. Other five branches provide water to the existing elevated tanks of CBOs.

Schematic flow diagram of Transmission Sub-main and hydraulic analysis is presented in **Attachment 4**.

Attachment 1 Key Ground Elevation

Attachment 1 Key Elevation

Transmission System	Pump Station / Main Elevated Tank	Ground Elevation (m)
Mahakanadarawa System	Water Treatment Plant I (Mahakanadarawa WTP)	+ 100
	Pump Station I-1 PS / Elevated Tank I-1 ET (Rambewa)	+ 95
	Pump Sta. I-2 PS (Medawachchiya)	+ 106
	Elevated Tank I-2 ET (Issinbassagala)	+ 111
	Elevated Tank I-3 ET (Ethakada)	+ 123
	Elevated Tank I-4 East Rambewa	+ 114
Wahalkada System	Water Treatment Plant II (Wahalkada WTP)	+ 55
	Elevated Tank II-1 ET (Wahalkada WTP)	+ 60
	Pump Station II-1 PS / Elevated Tank II-2 ET (Kahatagollewa)	+ 73
	Elevated Tank II-3 ET (Bogahawewa)	+ 73
	Pump Station II-3 PS Elevated Tank II-4 ET (Kebithigollewa)	+ 128
	Elevated Tank II-5 (KAH-KEB Median)	+ 120
	Pump Station II-4 PS (Weerasole)	+ 67
	Elevated Tank II-6 (North Horowpothana)	+ 94
	Pump Station II-5 PS / Elevated Tank II-7 ET (Horowpothana)	+ 79
	Elevated Tank II-8 ET (West Horowpothana)	+ 120
	Elevated Tank II-9 ET (Rathmalgahawewa)	+ 129
	Elevated Tank II-10 ET (Hamillewa)	+ 105
	Pump Station II-6 SP / Elevated Tank II-11 (Kahatagasdigiliya)	+ 143

Attachment 2
Location and Ground Elevation of CBO's Elevated Tank

Attachment 2 Location and Ground Elevation of Elevated Tank of CBO

CBO NO.	VILLAGE NAME	NAME OF CBO	NATIONAL GRID		MSL	LATITUDE	LONGITUDE
			NORTH (m)	EAST (m)	ELEVATION (m)		
1	KENDEWA	SWASHAKTHI	664603.970	481253.586	112.898	8°29'21.32430"N	80°36'12.44520"E
2	IKIRIGOLLEWA	IKRA	662092.197	472201.337	94.653	8°27'59.39684"N	80°31'16.50889"E
3	SANGILIKANADARAWA	ARUNALU	665706.709	471764.196	90.292	8°29'57.05005"N	80°31'02.13748"E
4	THALGAHAWEWA	SAMAGI	663517.284	477083.836	103.412	8°28'45.88256"N	80°33'56.12191"E
5	WAMALGOLLEWA	EKAMUTHU	664501.803	469956.806	89.404	8°29'17.78654"N	80°30'03.06612"E
6	WEWELKETIYA	RANGIRI	668227.150	486573.506	120.023	8°31'19.33597"N	80°39'06.35844"E
7	MAHAKANADARAWAYAYA 1	NILDIYADAHARA	656466.574	474726.862	99.394	8°24'56.31748"N	80°32'39.19257"E
8	KATUKELIYAWA	EKSATH	665355.999	469784.072	84.675	8°29'45.58897"N	80°29'57.39823"E
9	MAHAKANADARAWAYAYA 2	MAHASEN	658893.933	473972.038	96.536	8°26'15.32051"N	80°32'14.46764"E
10	IHALAKOLONGASWEWA	DIMUTHU	663807.244	488801.746	129.687	8°28'55.47584"N	80°40'19.26264"E
11	BALAHONDAWEWA	PRAGITHI	665968.449	484705.539	116.113	8°30'05.78762"N	80°38'05.30118"E
12	KATUWELA	JAYASHAKTHI	669691.690	467917.993	97.266	8°32'06.68268"N	80°28'56.27293"E
13	HELABAGASWEWA	SAMAGI	670102.118	474046.945	91.993	8°32'20.18058"N	80°32'16.69207"E
14	ATAWEERAGOLLEWA	SAMAGI	678470.948	475186.563	112.436	8°36'52.63135"N	80°32'53.79794"E
15	HIRULUGAMA	EKAMUTHU	677938.244	480812.905	130.393	8°36'35.38704"N	80°35'57.83620"E
16	WIRALMURIPPU	RAN ARULNALU	669696.135	463212.757	77.757	8°32'06.70244"N	80°26'22.40406"E
17	KADAWTHGAMA	ISURU	673299.126	464249.928	96.207	8°34'04.01789"N	80°26'56.22119"E
18	UNAGASWEWA	RANDIYA DHAHARA	671866.519	479614.519	114.774	8°33'17.71676"N	80°35'18.73589"E
19	KIRIGALWEWA	NELUM	669632.180	477937.584	95.148	8°32'04.95501"N	80°34'23.93250"E
20-1	MAHA-WTI	DIRIYAMATHA	678471.857	468430.698	105.494	8°36'52.51250"N	80°29'12.82337"E
20-2	MAHA-WT2	DIRIYAMATHA	680315.726	467626.161	89.703	8°37'52.51497"N	80°28'46.46147"E
21	MAHADIVULWEWA	GEMUNU	676164.148	472148.804	105.302	8°35'37.47655"N	80°31'14.48737"E
22	KIDAWARANKULAMA	SISILA DIYADAHARA	680993.607	465052.584	85.448	8°38'14.51409"N	80°27'22.26157"E
23	PERIYAKULAMA	DIRIYAMATHA	676924.696	459826.997	85.675	8°36'01.90871"N	80°24'31.45909"E
24	ETHAKADA	RIDI NADI	678345.915	477608.708	116.692	8°36'48.60581"N	80°34'13.02523"E
25	AYYATIGEWEWA	SHAKTHI	680186.462	491248.178	99.432	8°37'48.68756"N	80°41'39.14148"E
26-1	ATAWEERAWEWA-40SQM	AL-NAJA	683338.757	499613.965	83.392	8°39'31.33494"N	80°46'12.78663"E
26-2	ATAWEERAWEWA-30SQM	AL-NAJA	685333.318	500749.322	82.091	8°40'36.26359"N	80°46'49.92802"E
27	NOT USED						
28	PARAKRAMAPURA	PARAKUM	709985.668	500135.478	40.383	8°53'58.76270"N	80°46'29.84490"E
29	18-KANUWAI	SUWASEHANA	702458.268	500735.205	61.922	8°49'53.72688"N	80°46'49.47312"E
30	BOGAHAWEWA	SUWASETHA	700134.281	502880.913	62.008	8°48'38.07242"N	80°47'59.69244"E
31	MAHAKUMBUKWEWA	VAJIRA	666156.924	489902.418	123.914	8°30'11.97431"N	80°40'55.23333"E
32	MORAGAHAWILA	PRAGATHI	658582.391	485281.579	124.752	8°26'05.35529"N	80°38'24.22148"E
33	PALISPOTHANA	JANASETHA	668782.013	489619.691	124.009	8°31'37.42672"N	80°40'45.96696"E
34	PANDERELLEWA	SOBASISILA	654665.137	500466.464	100.256	8°23'57.92050"N	80°46'40.66896"E
35	RANPATHWILA	RANDIYA	656090.501	484827.674	110.307	8°24'44.23118"N	80°38'09.41089"E
36	KOKMADUWA	NILMINI	658739.866	489719.344	121.344	8°26'10.52438"N	80°40'49.30646"E
37	GONAMERUWEWA	SENATH	664593.964	490067.930	124.259	8°29'21.09643"N	80°41'00.65764"E
38	TURUKKURAGAMA	EKSATH	661338.330	489688.250	127.808	8°27'35.11237"N	80°40'48.26902"E
39	MAHAWEWA	PRAJA SHAKTHI	656720.825	493121.555	124.061	8°25'04.82075"N	80°42'40.54821"E
40	MEEKUBUKWEWA	APSARA	651872.435	502615.561	130.916	8°22'27.00666"N	80°47'50.91926"E
41	NOT USED						
42	WELIGOLLEWA	SHAM SHAM	650270.884	494904.760	104.453	8°21'34.86229"N	80°43'38.87106"E
43	KUBUKGOLLEWA	EKAMUTHU	658122.533	501481.478	88.570	8°25'50.46947"N	80°47'13.85369"E
44	WADIGEWEWA	PRADEEPA	664719.461	501228.399	75.463	8°29'25.22072"N	80°47'05.58473"E
45	PRANGIYAWADIYA	UPUL	664544.375	510638.434	73.296	8°29'19.48029"N	80°52'13.27515"E
46	KAPUGOLLEWA	JALASAVI	683045.183	507791.005	61.765	8°39'21.75618"N	80°50'40.27773"E
47	IHALA AGUNUCHCHIYA	TRISTAR	670449.703	498224.793	102.078	8°32'31.75670"N	80°45'27.36312"E
48	ANOLONDAWEWA	ALHIDRA	683432.070	502903.087	72.981	8°39'34.36988"N	80°48'00.38282"E
49	WEERASOLE	ADHIKWA	685257.169	505894.207	65.727	8°40'33.77234"N	80°49'38.23866"E
50	MARADANKADAWALA	HANSAJALA	672681.536	508397.109	66.295	8°33'44.38558"N	80°51'00.03912"E

Attachment 3 Hydraulic Analysis of Transmission Mains

SUMMARY OF TRANSMISSION HYDRAULICS

Table 1 Mahakandarawa Sysytem - I

	SYSTEM / SECTUI\\ION			GL	WL	Flow	ND	OD	ID	Length	H. Dradient	Head Loss	Dy. WL	Dy. Head	Pressure
				m	m	l/sec	mm	mm	mm	km	o/oo	m	m	m	Rating
PHASE II (2034)															
1			WTP - I	91.4	86.4								119.7	28	PN10
1.1	WTP - I	to	I - 1 PS	89.0	91.0	200.2	450	500	441	7.13	3.60	25.7	94.0	5	PN10
2			I - 1 PS	89.0	87.0								144.5	55	PN10
2.1	I - 1 PS	to	Br. "a"	78.4		154.6	450	500	441	3.20	2.23	7.1	137.3	59	PN10
2.2	Br. "a"	to	Br. "b"	90.3		128.7	400	450	397	3.80	2.65	10.1	127.3	37	PN10
2.3	Br. "b"	to	I - 2 PS	101.3	103.3	121.6	400	450	397	8.77	2.39	21.0	106.3	5	PN10
3			I - 2 PS	101.3	99.3								153.7	52	PN10
3.1	I - 2 PS	to	I - 2 ET	115.4	143.4	87.9	350	400	353	3.13	2.32	7.3	146.4	31	PN10
4		to	I-2 PS	101.3	99.3								168.6	67	PN10
4.1	I - 2 PS	to	Br. "c"	100.3		32.7	300	355	313	7.10	0.67	4.7	163.8	64	PN10
4.2	Br. "c"	to	Br. "d"	105.0		29.5	250	280	247	4.15	1.75	7.3	156.5	52	PN10
4.3	Br. "d"	to	I - 3 ET	117.9	149	26.7	250	280	246.8	3.10	1.47	4.5	152.0	34	PN10
PHASE I (2024)															
			WTP - I	91.4	86.4								100.3	9	PN10
1	WTP - I	to	I - 1 PS	89	91	93.8	450	500	441	7.13	0.89	6.3	94.0	5	PN10
2			I - 1 PS	89	87								116.5	28	PN10
2.1	I- 1 PS	to	Br. "a"	78.4		77.8	450	500	441	3.2	0.63	2.0	114.5	36	PN10
2.2	Br. "a"	to	Br. "b"	90.3		63.5	400	450	397	3.8	0.72	2.7	111.8	21	PN10
2.3	Br. "b"	to	I - 2 PS	101.3	103.3	58.9	400	450	397	8.77	0.62	5.5	106.3	5	PN10
3			I - 2 PS	101.3	99.3								148.6	47	PN10
	I - 2 PS	to	I - 2 ET	115.4	143.4	45.5	350	400	353	3.13	0.69	2.2	146.4	31	PN10
4			I-2 PS	101.3	99.3								154.4	53	PN16
4.1	I - 2 PS	to	Br. "c"	100.3		12.3	300	355	313	7.1	0.11	0.8	153.6	53	PN10
4.2	Br. "c"	to	Br. "d"	105		10.5	250	280	247	4.15	0.26	1.1	152.6	48	PN10
4.3	Br. "d"	to	I - 3 ET	117.9	149	8.7	250	280	246.8	3.1	0.18	0.6	152.0	34	PN10

note:

Capacity (m3):	250	500 ~1250	additional head loss:		delivery (pump sta.):	3	m	
Water depth of elevated tank (m):	6	7			receiving (sump/elevated tank):	3	m	
	HWL	LWL			total:	6	m	
Water Levels of Grounf Reservoir:	GL + 2m	GL - 2m						

Table 2 Wahalkada System - IIA (north)

	SYSTEM / SECTUI\\ION			GL	WL	Flow	ND	OD	ID	Length	H. Dradient	Head Loss	Dy. WL	Dy. Head	Pressure
				m	m	l/sec	mm	mm	mm	km	o/oo	m	m	m	Rating
PHASE II (2034)															
			WTP - II	50	45								92.3	42	PN10
1	WTP - II	to	II - 1 PS	68.3	70.3	122.8	400	450	397	7.80	2.43	19.0	73.3	5	PN10
2			II - 1 PS	68.3	66.3								113.4	45	PN10
2.1	II - 1 PS	to	II - 3 ET	65.5	93.5	67.1	350	400	353	12.00	1.41	16.9	96.5	31	PN10
3			II - 1 PS	68.3	66.3								140.4	72	PN10
3.1	II - 1 PS	to	Br. "a"	90.5	118.5	48.9	350	400	353	10.1	0.78	7.9	132.5	42	PN10
3.2	Br. "a"	to	II - 2 PS	120.1	124	40.3	350	400	353	10	0.55	5.5	127.0	7	PN10
PHASE I (2024)															
			WTP - II	50	45								76.4	26	PN10
1	WTP - II	to	II - 1 PS	68.3	70.3	46.4	400	450	397	7.80	0.40	3.1	73.3	5	PN10
2			II - 1 PS	68.3	66.3								99.7	31	PN10
2.1	II - 1 PS	to	II - 3 ET	65.5	93.5	27.2	350	400	353	12.00	0.26	3.2	96.5	31	PN10
3			II - 1 PS	68.3	66.3								129.4	61	PN10
3.1	II - 1 PS	to	Br. "a"	90.5	118.5	18.3	350	400	353	10.10	0.13	1.3	128.1	38	PN10
3.2	Br. "a"	to	II - 2 PS	120.1	124	17.1	350	400	353	10.00	0.11	1.1	127.0	7	PN10

note:	Capacity (m3):	250	500 ~1250		additional head loss:		delivery (pump sta.):	3	m		
	Water depth of elevated tank (m):	6	7				receiving (sump/elevated tank):	3	m		
		HWL	LWL				total:	6	m		
	Water Levels of Grounf Reservoir:	GL + 2m	GL - 2m								

Table 3 Wahalkada System - IIB (south)

	SYSTEM / SECTUI\\ION			GL m	WL m	Flow l/sec	ND mm	OD mm	ID mm	Length km	H. Dradient o/oo	Head Loss m	Dy. WL m	Dy. Head m	Pressure Rating
PHASE II (2034)															
1			WTP - II	50	45								103.0	53	PN10
	WTP - II	to	II - 3 PS	56.2	58.2	176.2	450	500	441	14.70	2.84	41.8	61.2	5	PN10
2			II - 3 PS	56.2	54.2								125.0	69	PN10
2.1	II - 3 PS	to	Br. "b"	56.2		176.2	450	500	441	0.05	2.84	0.1	124.9	69	PN10
2.2	Br. "b"	to	Br. "c"	55.8		173.6	450	500	441	0.94	2.77	2.6	122.3	66	PN10
2.3	Br. "c"	to	Br. "d"	70.5		171.5	450	500	441	4.16	2.70	11.2	111.0	41	PN10
2.4	Br. "d"	to	Br. "e"	86.0	96.0	168.0	450	500	441	2.21	2.60	5.8	105.3	19	PN10
2.5	Br. "e"	to	II - 4 PS	73.5	82.5	162.2	450	500	441	8.10	2.44	19.8	85.5	12	PN10
												39.5			
3			II- 4 PS	73.5	78.5								161.2	88	PN16
				87.3		31.6	300	355	291	6.00	0.90	5.4	155.8	69	PN16
3.1	II- 4 PS	to	Br. " g"	95	128	31.6	300	355	313	2.40	0.63	1.5	154.3	59	PN10
3.2	Br. " g"	to	II - 9 ET	122	150	13.0	300	355	313	10.80	0.12	1.3	153.0	31	PN10
4			II - 4 PS	73.5	78.5								177.8	104	PN16
4.1	II - 4 PS	to	Br. "f"	65.8		112.1	450	500	409	0.60	1.78	1.1	176.8	111	PN16
				83.7		112.1	450	500	409	11.40	1.78	20.3	156.5	73	PN16
4.2	Br. "f"	to	Br. "h"	93.7	131.7	109.5	450	500	441	1.12	1.18	1.3	155.2	61	PN10
4.3	Br. "h"	to	II - 5 PS	135.5	148.0	65.0	450	500	441	9.28	0.45	4.2	151.0	16	PN10
PHASE I (2024)															
1			WTP - II	50	45								68.7	19	PN10
	WTP - II	to	II - 3 PS	56.2	58.2	69.7	450	500	441	14.70	0.51	7.5	61.2	5	PN10
2			II - 3 PS	56.2	54.2								100.6	44	PN10
2.1	II - 3 PS	to	Br. "b"	56.2		69.7	450	500	441	0.05	0.51	0.0	100.6	44	PN10
2.2	Br. "b"	to	Br. "c"	55.8		69.3	450	500	441	0.94	0.51	0.5	100.1	44	PN10
2.3	Br. "c"	to	Br. "d"	70.5		67.5	450	500	441	4.16	0.48	2.0	98.1	28	PN10
2.4	Br. "d"	to	Br. "e"	86	96	65.1	450	500	441	2.21	0.45	1.0	97.1	11	PN10
2.5	Br. "e"	to	II - 4 PS	73.5	82.5	64.3	450	500	441	8.10	0.44	3.6	93.5	20	PN10
3			II- 4 PS	73.5	78.5								154.2	81	PN16
				87.3		9.8	300	355	291	6.00	0.10	0.6	153.5	66	PN16
3.1	II- 4 PS	to	Br. " g"	95	128	9.8	300	355	313	2.40	0.07	0.2	153.4	58	PN10
3.2	Br. " g"	to	II - 9 ET	122	150	6.5	300	355	313	10.80	0.03	0.4	153.0	31	PN10
4			II - 4 PS	73.5	78.5								156.6	83	PN16
4.1	II - 4 PS	to	Br. "f"	65.8		46.6	450	500	409	0.60	0.35	0.2	156.4	91	PN16
				83.7		46.6	450	500	409	11.40	0.35	4.0	152.4	69	PN16
4.2	Br. "f"	to	Br. "h"	93.7	131.7	44.4	450	500	441	1.12	0.22	0.2	152.2	58	PN10
4.3	Br. "h"	to	II - 5 PS	135.5	148	32.8	450	500	441	9.28	0.13	1.2	151.0	16	PN10

note:

Capacity (m3):	250	500 ~1250	additional head loss:		delivery (pump sta.):	3	m	
Water depth of elevated tank (m):	6	7			receiving (sump/elevated tank):	3	m	
	HWL	LWL			total:	6	m	
Water Levels of Grounf Reservoir:	GL + 2m	GL - 2m						

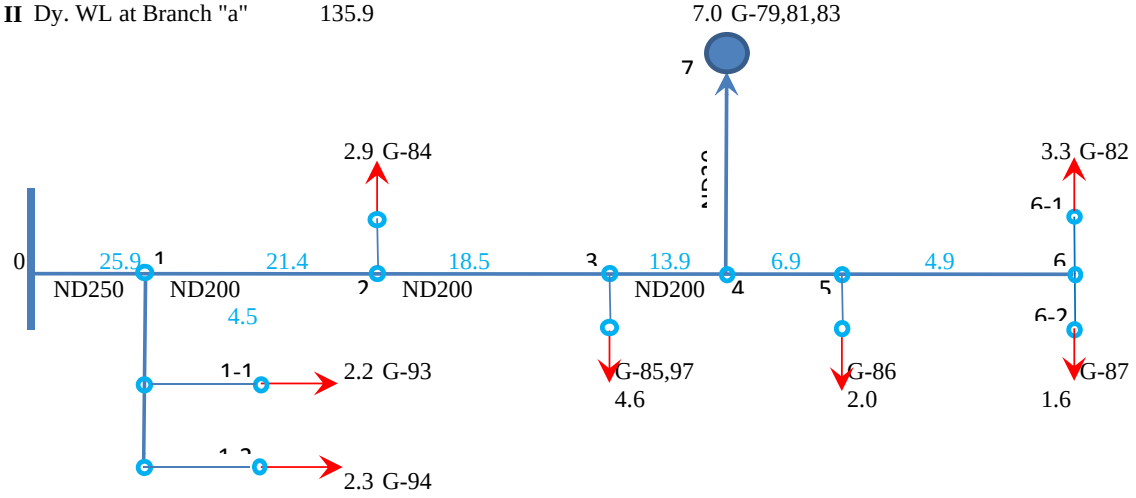
Attachment 4　Hydraulic Analysis of Transmission Sub-main

TRANSMISSION SUB-MAIN

1 MAHAKANDAWARA SYSTEM

1) Branch "a"

PHASE II Dy. WL at Branch "a" 135.9



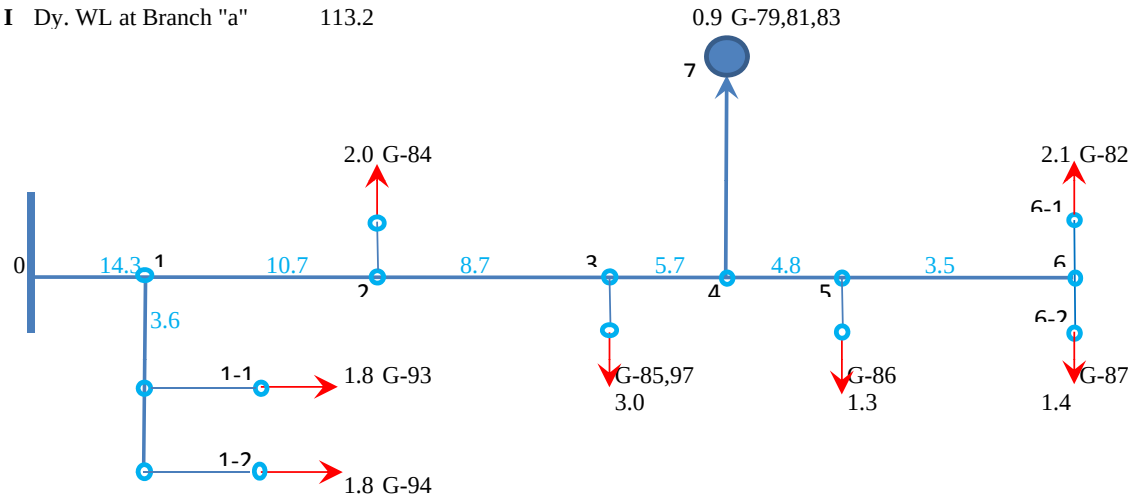
Demand

		PH-II	PH-I
CBO	82	3.3	2.1
	84	2.9	2.0
	85	2.9	1.9
	86	2.0	1.3
	87	1.6	1.4
	93	2.2	1.8
	94	2.3	1.8
	97	1.7	1.1
sub-total		18.9	13.4
New	79	1.6	0.2
	81	3.7	0.5
	83	1.6	0.2
sub-total		7.0	0.9
		25.9	14.3

Section	Category	Pressure required	GND	GL	Discharge	Flow	ND	OD	ID	L	v	i	hf	WL	He	
					l/s	l/s	mm	mm	mm	km	m/s	‰	m	m	m	
0				95										135.9	40.9	
0 ~ 1			Br.		4.5	25.9	250	280	247	0.30	0.54	0.4	0.1	135.8		
1 ~ 2	CBO 4	15	84	103.4	2.9	21.4	200	225	198	6.70	0.69	0.8	5.2	130.5	27.1	
2 ~ 3	CBO 1	16	85,97	112.9	4.6	18.5	200	225	198	4.73	0.60	0.6	2.8	127.7	14.8	
3 ~ 4			Br.		7.0	13.9	200	225	198	0.50	0.45	0.4	0.2	127.5		
4 ~ 5	CBO 11	15	86	116.1	2.0	6.9	150	180	159	3.20	0.35	0.3	0.9	126.6	10.5	B.P
5 ~ 6			Br.		4.9	4.9	150	180	159	2.20	0.25	0.2	0.3	126.3		
4 ~ 7	New	28	I-4 ET	112.0	7.0	7.0	200	225	198	7.67	0.23	0.1	0.8	126.7	14.7	B.P
1-1.1	CBO 9	15	93	100	2.2	4.5	100	125	110	4.10	0.47	0.8	3.1	132.6	32.6	
1-1.2	CBO 7	15	94	105	2.3	2.3	100	125	110	4.10	0.24	0.2	0.9	131.7	26.7	
6 ~ 6.1	CBO 6	9	82	120.0	3.3	3.3	100	125	110	1.70	0.35	0.4	0.7	125.5	5.5	B.P
6 ~ 6.2	CBO 10	18	87	129.7	1.6	1.6	100	125	110	5.80	0.17	0.1	0.7	125.6	-4.1	B.P
					25.9					41.00						

note: BP means booster pump required

PHASE I Dy. WL at Branch "a" 113.2

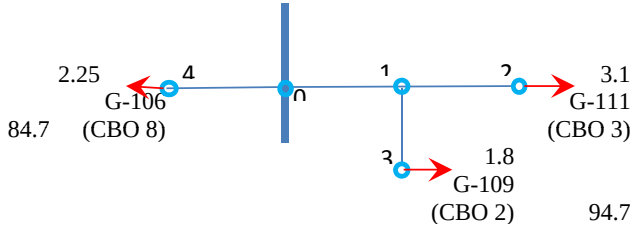


Section	Category	Pressure required	GND	GL	Discharge l/s	Flow l/s	ND mm	OD mm	ID mm	L km	v m/s	i ‰	hf m	WL m	He m	He' 18 *	
0				95										113.2	18.2	131.2	
0 ~ 1			Br.			14.3	250	280	247	0.30	0.30	0.1	0.0	113.1		131.1	
1 ~ 2	CBO 4	15	84	103.4	2.0	10.7	200	225	198	6.70	0.35	0.2	1.5	111.7	8.3	129.7	
2 ~ 3	CBO 1	16	85,97	112.9	3.0	8.7	200	225	198	4.73	0.28	0.1	0.7	111.0	-1.9	129.0	
3 ~ 4			Br.			5.7	200	225	198	0.50	0.18	0.1	0.0	110.9		128.9	
4 ~ 5	CBO 11	15	86	116.1	1.3	4.8	150	180	159	3.20	0.24	0.1	0.5	110.5	-5.6	128.5	B.P
5 ~ 6			Br.			3.5	150	180	159	2.20	0.18	0.1	0.2	110.3		128.3	
4 ~ 7	New	28	I-4 ET	112.0	0.9	0.9	200	225	198	7.67	0.03	0.0	0.0	110.9	-1.1	128.3	B.P
1-1.1	CBO 9	15	93	100	1.8	3.6	100	125	110	4.10	0.38	0.5	2.1	108.4	8.4	126.2	
1-1.2	CBO 7	15	94	105	1.8	1.8	100	125	110	4.10	0.19	0.1	0.6	109.7	4.7	125.6	
6 ~ 6.1	CBO 6	9	82	120.0	2.1	2.1	100	125	110	1.70	0.22	0.2	0.3	110.0	-10.0	125.3	B.P
6 ~ 6.2	CBO 10	18	87	129.7	1.4	1.4	100	125	110	5.80	0.15	0.1	0.5	109.8	-19.9	124.8	B.P

note: * additional head loss given at the inflow of II-2 PS, Medawachchiya, BP means booster pump required

2) Branch "b"

Phase II Dy WL at point "b" 125.8



Water Demand

	PH II m3/d	PH II l/sec	PH I m3/d	PH I l/sec
GND111	266	3.1	205	2.4
GND109	155	1.8	127	1.5
GND106	194	2.2	140	1.6

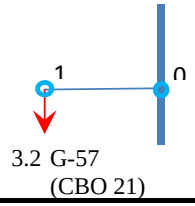
Section	Category	Pressure required	GND	GL	Discharge l/s	Flow l/s	ND mm	OD mm	ID mm	L km	v m/s	i ‰	hf m	WL m	He m
0				94										125.8	
0 ~ 1						4.9	100	125	110	1.0	0.51	0.9	0.9	124.9	
1 ~ 2	CBO	16	111	84.7	3.1	3.1	100	125	110	1.0	0.32	0.4	0.4	124.5	39.8
1 ~ 3	CBO	16	109	94.7	1.8	1.8	100	125	110	1.0	0.19	0.1	0.1	124.8	30.1
0 ~ 4	CBO	15	106	84.7	2.2	2.2	100	125	110	2.0	0.24	0.2	0.4	125.4	40.7
										5.0					

Phase I Dy WL at point "b" 110.4

Section	Category	Pressure required	GND	GL	Discharge l/s	Flow l/s	ND mm	OD mm	ID mm	L km	v m/s	i ‰	hf m	WL m	He m
0				94										110.4	
0 ~ 1						3.8	100	125	110	1	0.40	0.6	0.6	109.8	
1 ~ 2	CBO	16	111	84.7	2.4	2.4	100	125	110	1	0.25	0.2	0.2	109.6	24.9
1 ~ 3	CBO	16	109	94.7	1.5	1.5	100	125	110	1	0.15	0.1	0.1	109.7	15.0
0 ~ 4	CBO	15	106	84.7	1.6	1.6	100	125	110	2	0.17	0.1	0.2	110.2	25.5

3) Branch "c"

Phase II



Water Demand

	PH II m3/d	PH II l/sec	PH I m3/d	PH I l/sec
GND57	275	3.2	155	1.8

Section	Category	Pressure required	GND	GL	Discharge l/s	Flow l/s	ND mm	OD mm	ID mm	L km	v m/s	i ‰	hf m	WL m	He m
0														163.7	
0 ~ 1	CBO	18	57.0	105.3	3.2	3.2	100	125	110	0.1	0.34	0.4	0.0	163.7	58.4
										0.1					

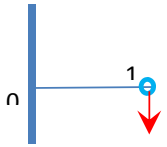
Phase I

Section	Category	Pressure required	GND	GL	Discharge l/s	Flow l/s	ND mm	OD mm	ID mm	L km	v m/s	i ‰	hf m	WL m	He m
0														153.6	
0 ~ 1	CBO	18	57.0	105.3	1.8	1.8	100	125	110	0.1	0.19	0.1	0.0	153.6	48.3

4) Branch "d"

Phase II

Water Demand



		PH II		PH I	
	GND56	m3/d	l/sec	m3/d	l/sec
		240	2.8	157	1.8

Section	Category	Pressure	GND	GL	Discharge	Flow	ND	OD	ID	L	v	i	hf	WL	He
		required			l/s	l/s	mm	mm	mm	km	m/s	‰	m	m	m
0														156.4	
0 ~ 1	CBO	12	56	112.4	2.8	2.8	100	125	110	0.1	0.29	0.3	0.03	156.4	44.0
										0.1					

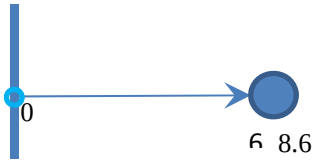
Phase I

Section	Category	Pressure	GND	GL	Discharge	Flow	ND	OD	ID	L	v	i	hf	WL	He
		required			l/s	l/s	mm	mm	mm	km	m/s	‰	m	m	m
0														152.6	
0 ~ 1	CBO	12	56	112.4	1.8	1.8	100	125	110	0.1	0.19	0.1	0.01	152.6	40.2

TRANSMISSION SUB-MAIN

2 WAHAKALDA SUB-SYSTEM -A

1) Branch "a" (to KAH-KEB Median, II-4 ET)



	Water Demand GND	Ph-II		Ph-I	
New	22	133	1.5	19	0.2
	30	221	2.6	30	0.3
	33	244	2.8	35	0.4
	34	145	1.7	20	0.2
	total	743	8.6	104	1.2

Phase II

Section	Pressure Required	GL	Discharge l/s	Flow l/s	ND mm	OD mm	ID mm	L km	v m/s	i ‰	hf m	WL m	He m
0												136.9	
0 ~ 1	28	94.5	8.6	8.6	100	125	110	0.2	0.91	2.6	0.5	136.4	41.9

Phase I

Section	Pressure Required	GL	Discharge l/s	Flow l/s	ND mm	OD mm	ID mm	L km	v m/s	i ‰	hf m	WL m	He m
0												129.0	
0 ~ 1	28	94.5	1.2	1.2	100	125	110	0.2	0.13	0.07	0.01	129.0	34.5

3 WAHAKALDA SUB-SYSTEM -B

1) Branch "b"

	Water Demand GND	Ph-II		Ph-I	
	139	224	2.6	32	0.4

Phase II

Section	Pressure required	GL	Discharge l/s	Flow l/s	ND mm	OD mm	ID mm	L km	v m/s	i ‰	hf m	WL m	He m
0												125.0	
0 ~ 1	16	65.7	2.6	2.6	100	125	110	1.4	0.27	1.00	1.40	123.6	57.9

Phase I

Section	Pressure required	GL	Discharge l/s	Flow l/s	ND mm	OD mm	ID mm	L km	v m/s	i ‰	hf m	WL m	He m
0												100.6	
0 ~ 1	16	65.7	0.4	0.4	100	125	110	1.4	0.04	0.03	0.04	100.5	34.8

2) Branch "c"

	Water Demand					
	GND	Ph-II		Ph-I		
	140	185	2.1	156	1.8	

Phase II

Section	Pressure required	GL	Discharge	Flow	ND	OD	ID	L	v	i	hf	WL	He
			l/s	l/s	mm	mm	mm	km	m/s	‰	m	m	m
0												122.4	
0 ~ 1	12	61.8	2.1	2.1	100	125	110	1.0	0.23	0.70	0.70	121.7	59.9

Phase I

Section	Pressure required	GL	Discharge	Flow	ND	OD	ID	L	v	i	hf	WL	He
			l/s	l/s	mm	mm	mm	km	m/s	‰	m	m	m
0												100.1	
0 ~ 1	12	61.8	1.8	1.8	100	125	110	1.0	0.19	0.51	0.51	99.6	37.8

3) Branch "d"

	Water Demand					
	GND	Ph-II		Ph-I		
	138	301	3.5	205	2.4	

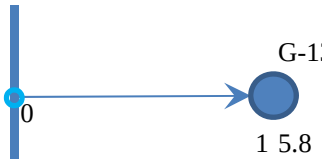
Phase II

Section	Pressure required	GL	Discharge	Flow	ND	OD	ID	L	v	i	hf	WL	He
			l/s	l/s	mm	mm	mm	km	m/s	‰	m	m	m
0												111.6	
0 ~ 1	16	73.0	3.5	3.5	100	125	110	5.3	0.37	1.73	9.18	102.38	29.4

Phase I

Section	Pressure required	GL	Discharge	Flow	ND	OD	ID	L	v	i	hf	WL	He
			l/s	l/s	mm	mm	mm	km	m/s	‰	m	m	m
0												98.2	
0 ~ 1	16	73.0	2.4	2.4	100	125	110	5.3	0.25	0.85	4.51	93.66	20.7

4) Branch "e" (to North Horopothana, II-6 ET)



G-134, 135 (New)

		Water Demand GND	Ph-II		Ph-I	
New		134	322	3.7	43	0.5
		135	179	2.1	26	0.3
		Total	501	5.8	69	0.8

Phase II

Section	Pressure required	GL	Discharge l/s	Flow l/s	ND mm	OD mm	ID mm	L km	v m/s	i ‰	hf m	WL m	He m	He m
0												105.3		
0 ~ 1	10	86.0	5.8	5.8	150	185	158.6	0.1	0.29	0.75	0.07	105.2	19.2	13.4

Phase I

Section	Pressure required	GL	Discharge l/s	Flow l/s	ND mm	OD mm	ID mm	L km	v m/s	i ‰	hf m	WL m	He m	He m
0												97.1		
0 ~ 1	10	86.0	0.8	0.8	150	185	158.6	0.1	0.04	0.02	0.00	97.1	11.1	10.3

5) Branch "f"

G-149 (CBO 45)

		Water Demand GND	Ph-II		Ph-I	
		149	224	2.6	186	2.2

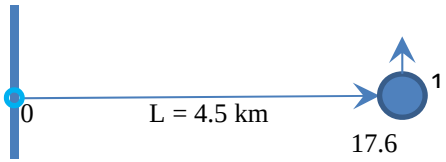
Phase II

Section	Pressure required	GL	Discharge l/s	Flow l/s	ND mm	OD mm	ID mm	L km	v m/s	i ‰	hf m	WL m	He m
0												168.5	
0 ~ 1	15	73.3	2.6	2.6	100	125	110	9.0	0.27	1.00	9.02	159.5	86.2

Phase I

Section	Pressure required	GL	Discharge l/s	Flow l/s	ND mm	OD mm	ID mm	L km	v m/s	i ‰	hf m	WL m	He m
0												154.7	
0 ~ 1	15	73.3	2.2	2.2	100	125	110	9.0	0.23	0.71	6.40	148.3	75.0

6) Branch "g" (to West Horowpothana ET)



Water Demand

	GND	Q (Ph II)		Q (Ph I)	
New	117	294	3.4	41	0.5
	120	234	2.7	32	0.4
	121	302	3.5	42	0.5
	122	354	4.1	48	0.6
	129	338	3.9	46	0.5
			17.6		2.4

Phase II

Section	Category	Pressure required	GL	Discharge l/s	Flow l/s	ND mm	OD mm	ID mm	L km	v m/s	i ‰	hf m	WL m	He m
0													166.40	
0 ~ 1	New	29	116.0	17.6	17.6	200	225	198	4.5	0.57	1.99	8.93	157.47	41.5

Phase II

Section	Category	Pressure required	GL	Discharge l/s	Flow l/s	ND mm	OD mm	ID mm	L km	v m/s	i ‰	hf m	WL m	He m
0													156.71	
0 ~ 1	New	29	116.0	2.4	2.4	200	180	158.6	4.5	0.12	0.15	0.67	156.04	40.0

7) Branch "h" (to Hamillewa ET)

	Water Demand GND	Q (Ph II)		Q (Ph I)		GL
CBO 44	126	200	2.3	163	1.9	75.5
CBO 43	209	211	2.4	131	1.5	88.6
CBO 34	210	197	2.3	119	1.4	100.3
CBO 34	211	121	1.4	76	0.9	100.3
CBO 40	212	170	2.0	146	1.7	130.9
	subtotal	899	10.4	635	7.3	
New GND	125	226	2.6	31	0.4	
	127	359	4.2	49	0.6	
	131	192	2.2	25	0.3	
	132	108	1.3	16	0.2	
	150	222	2.6	31	0.4	
	151	150	1.7	22	0.3	
	152	214	2.5	30	0.3	
	153	175	2.0	25	0.3	
	205	288	3.3	40	0.5	
	206	282	3.3	43	0.5	
	207	310	3.6	30	0.3	
	208	215	2.5	30	0.3	
	213	203	2.3	372	4.3	
	subtotal	2,944	34.1	744	8.6	
	Total	3,843	44.5	1,379	16.0	

Phase II

Section	Category	Pressure required	GL	Discharge l/s	Flow l/s	ND mm	OD mm	ID mm	L km	v m/s	i ‰	hf m	WL m	He m
0													155.2	
0 ~ 1	New	29	101.7	44.5	44.5	200	225	198	0.5	1.45	11.00	5.50	149.67	48.0

Phase II

Section	Category	Pressure required	GL	Discharge l/s	Flow l/s	ND mm	OD mm	ID mm	L km	v m/s	i ‰	hf m	WL m	He m
0													152.2	
0 ~ 1	New	29	101.7	16.0	16.0	200	225	198	0.5	0.52	1.65	0.83	151.35	49.6

APPENDIX 5.3(b) HYDRAULIC ANALYSIS OF DISTRIBUTION MAIN

1. Backgrounds and Objectives

Distribution network of Mahakanadarawa Water Supply Systems (Mah WSS) and Wahalkada Water Supply systems (Wah WSS) are planned as gravity distribution system. Therefore, it is important to implement hydraulic estimation to clarify the water supply area from elevated tanks and assumed pipeline quantities regarding topographical feature of target area.
In this document, hydraulic analysis for distribution pipelines are implemented (1) to determine the diameter and length of Distribution Mains (Trunk Mains) and (2) to check the appropriateness of the height of Elevated Tank.

2. Methods

2.1 Target Subzone and Elevated Tank

Target Elevated Tanks and their piped supply area (Subzone) are listed as below. There are four Subzones in Mah WSS and eleven Subzones in Wah WSS.

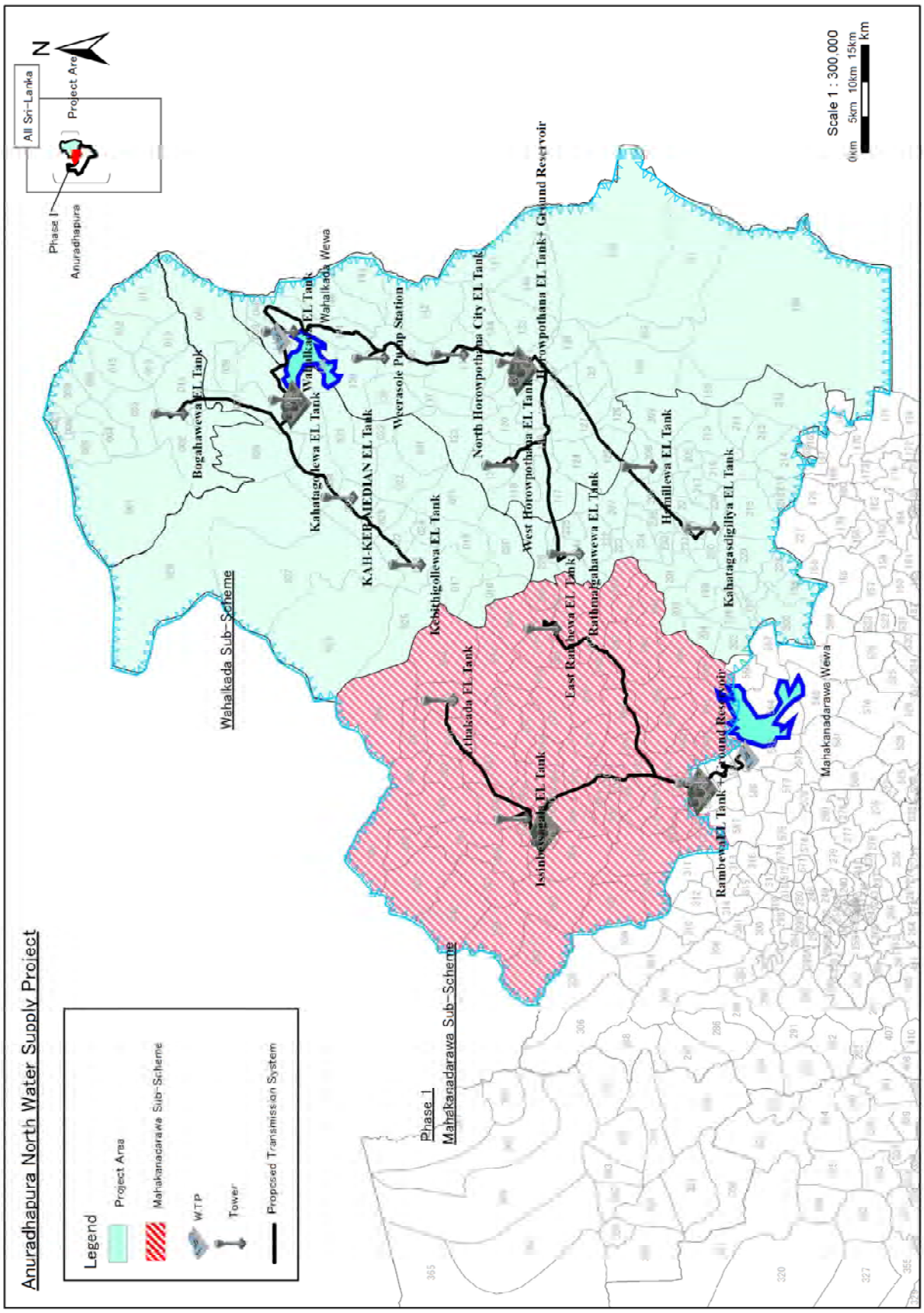
Table 1 List of Elevated Tanks and supply area (Subzone)

No.	Subzone
I.1	Rambewa
I.2	Issinbassagala
I.3	Ethakada
I.4	East Rambewa
II.1	Wahalkada
II.2	Kahatagollewa
II.3	Bogahawewa
II.4	Kahatagollewa - Kebithigollewa Median
II.5	Kebithigollewa
II.6	North Horowpothana City
II.7	Horowpothana
II.8	West Horowpothana
II.9	Rathmalgahawewa
II.10	Hamillewa
II.11	Kahatagasdigiliya

2.2 Limitation of the analysis

There are some limitations in this analysis as below;

- Ground levels of each sites and junctions are estimated by Google earth. As a result, the accuracy of each point is sometimes low. Thus detailed hydraulic analysis according to the topographical investigation has to be done in the detailed design stage.
- High water demand facilities such as army camps, hospitals, schools or temples are not regarded individually but included as a wholesome water demand of each GND. Thus the point use of water should be regarded in the hydraulic analysis of detailed design stage so that pipeline diameter should be determined appropriately.
- Diameters of distribution mains are independently estimated from distribution subsystems showed in Appendix 3. It should be noted that in some GNDs, especially for the terminal placed in each subzone using ND100 – 150mm diameter, distribution networks which are over the distribution mains (ex. ND 150 – 200mm) may be included in this survey report. The results of determining the diameter between the two analyses are not much different because they are coherent in regard with using the same value of hourly based water demand. However, it should be noted that distribution sub-systems must be determined individually regarding with the diameter of distribution mains in detailed design stage.


Anuradhapura North Water Supply Project
Legend
Project Area
Mahakanadarawa Sub-Scheme
WTP
Tower
Proposed Transmission System
Wahalkada Sub-Scheme
Phase I
Mahakanadarawa Sub-Scheme
Phase I
Anuradhapura
All Sri-Lanka
Project Area
N
Scale 1 : 300,000
0km 5km 10km 15km
Km
Bogahawewa EL Tank
Wahalkada EL Tank
Wahalkada Wewa
Kahatagollewa EL Tank
KAH-KEB-MEDIAN EL Tank
Weerasole Pump Station
Kebithigollewa EL Tank
North Horowpothana City EL Tank
West Horowpothana EL Tank
Horowpothana EL Tank+ Ground Reservoir
Hemillewa EL Tank
Kahatagasdigiliya EL Tank
Chalsada EL Tank
Issinbessak EL Tank
East Rathnagahawewa EL Tank
Rathnagahawewa EL Tank
Rambewa EL Tank + Ground Reservoir
Mahakanadarawa Wewa

2.3 Flowchart of analysis

Model establishment and hydraulic analysis was done as the flow chart below;

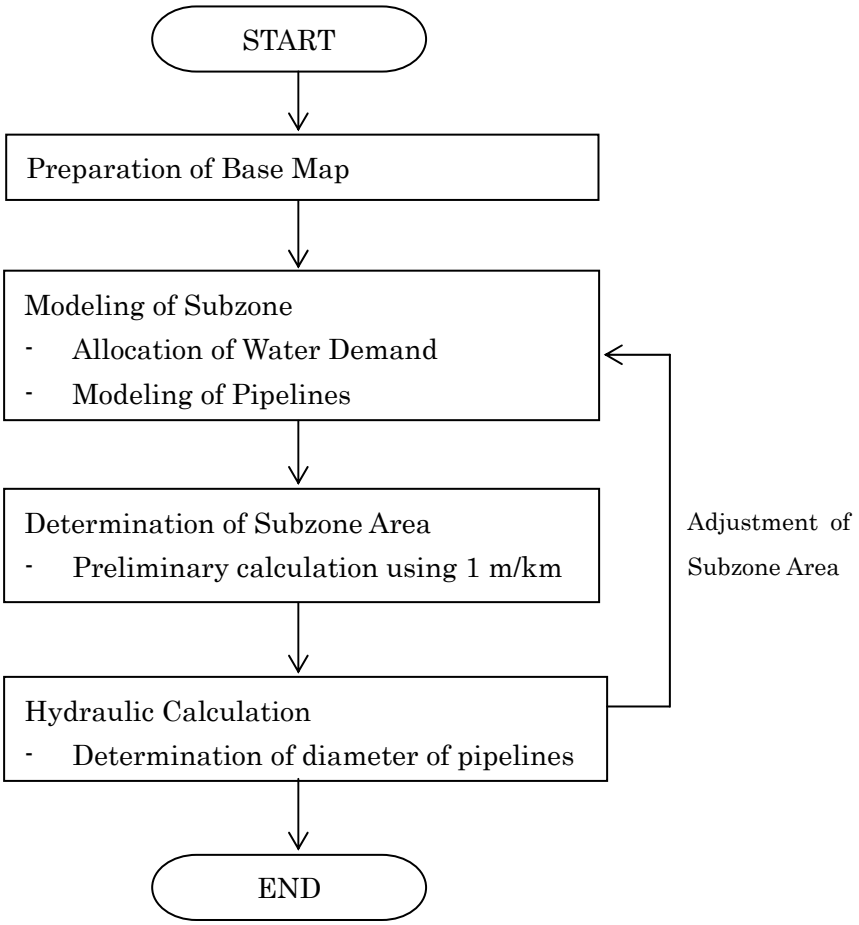


Fig. 1 Flowchart of Analysis

2.4 Preparation of Base Map

Base map was prepared from provided Terrain Map of North Central Area (1:5000).
Other information was plotted as below

Location of Elevated Tanks, CBOs, and their elevation: Location of Elevated Tanks and CBOs are directly checked and confirmed in this study (see attachment "Final report of Status Survey on Existing Water Supply Schemes"). Elevation of Elevated Tanks and CBOs are extracted from the elevation in the same location at Google earth (July 2012). The Google map based elevation is adopted in this study because all the levels in the sites and CBOs must be compared with that of the place of demand in the same format. It should be noted that the elevations of each sites and CBOs are not coherent with that is stated in transmission line.

Roads: Roads in the base map was checked for the existence by Google map (July 2012).

2.5 Modeling of Subzone and Determination of Subzone Area

Pipeline model was established according to the Elevated Tanks/CBOs locations, elevations and roads in base map. Demands of each GND were set at the populated locations that were seen in Google earth (July 2012). The demands were allocated for one to four locations, which are set as “Nodes (Junctions)” in a Model, as a matter of convenience. The locations of GNDs with existing CBOs were set at the exact places of the CBOs’ elevated tanks. According to the location of water demands, Pipelines were set to connect from Elevated tank to the demand points through visibly checkable roads in Google earth.

Subzone area and the extent of pipelines were preliminary determined as 1 o/oo (1m water head loss for 1km pipeline) regarding the elevation of nodes. Minimum pressures for nodes were set as 15m as effective water head. Minimum pressure 15m was assumed 7m at tapping points plus 8m for the losses between the branches of trunk main to the tapping points.

2.6 Hydraulic calculation

Hydraulic analysis was done using Hazen-Williams equation.

$$\Delta H = 10.666 \cdot C^{-1.85} \cdot D^{-4.87} \cdot Q^{1.85} \cdot L$$

In this equation, all the minor losses are regarded to be included in the losses which are calculated as delta H.

The results of calculation are shown in 1.3 Results of Hydraulic Analysis. Meanings of input data and results in the tables are as below;

<Specification of Nodes>

Node: Name of the nodes correspond to the same name in the model

Type: "1" represents Elevated Tank (ET) where the water level (shown in TH) is fixed.
"0" represents Junctions which represents junctions of pipelines or end point at the demands.

Demand: Water demand allocated to the junction/ET (L/sec, Hourly maximum in 2034)

TH: Total water head at the Junction/ET (TH at ET represents the Low Water Level (LWL) of the ET.)

GL: Ground Level at the Junction/ET

He: Effective Water Head at the Junction/ET. He at junctions is calculated by TH-GL

GND: GNDs of which the water demand is allocated to the junctions

Demand m3/day:
Water demand allocated to the junction/ET (m3/day, Daily Maximum in 2034)
(Here it is shown the water demand before the application of "Allocation" and "Peak factor")

Allocation:
Ratio of allocation of water demand of GNDs at the junction

(Ex. Where the allocation ration is 0.5, half of water demand of the GND is allocated at the junction.)

Peak Factor:

Peak factor (Hourly Maximum / Daily Maximum) (=2.0)

<Specification of Pipelines>

Node (u)(d):

Start (u) and End (d) nodes of the pipeline.

Type: (Vacant)

DIA: Diameter of the pipeline

Length: Length of the pipeline

C: Hazen-Williams Coefficient (=130, for HDPE)

Spec.Loss:

Specific Loss which is added to the loss for Hazen-Williams Equation (=0)

Q: Flow Volume

V: Flow Speed

I: Hydraulic gradient which represents the head loss (m) per length of pipeline (km)

All the height of elevated tanks were set for 20m (up to 500m3) and 21m (above 500m3) as default according to the prepared standard plan of each structures.

2.7 Estimation of pipeline quantity

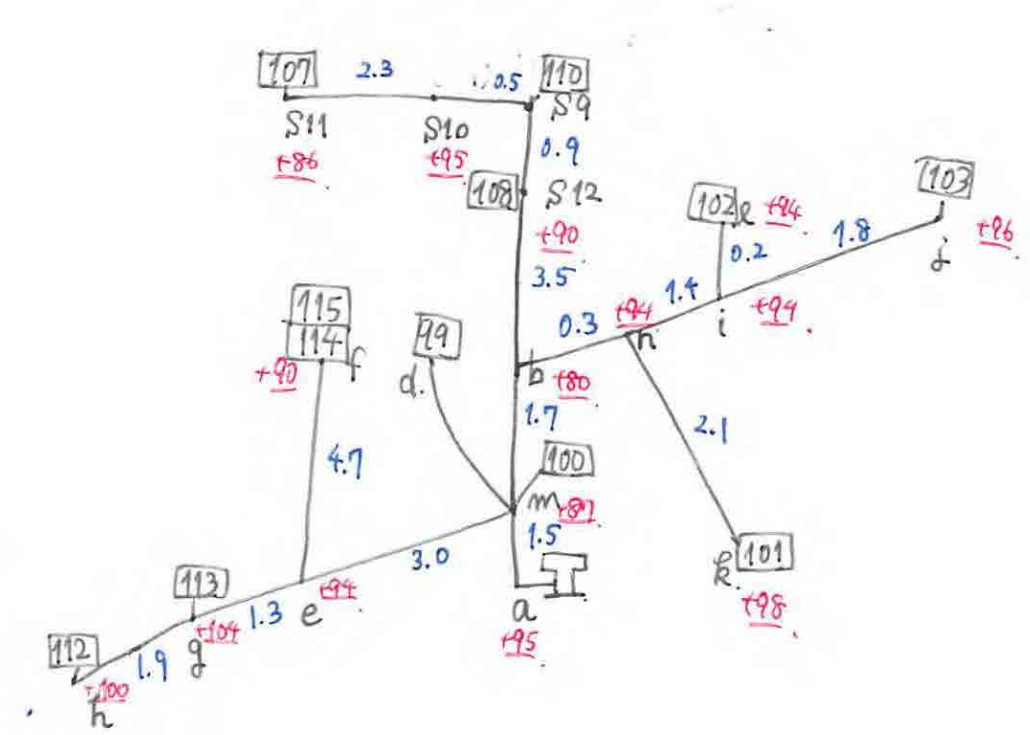
Pipeline quantities were estimated according to the target area in 2024. Since the hydrologic analysis has done for water demand in 2034, the scope of pipeline is estimated by deleting the pipelines which is needed only to connect the GNDs where is excluded in phase 2024.

In this method for estimation there is a concern for underestimation of pipelines because the locations of GNDs are set arbitrary. Therefore, all the pipelines were added 10% contingency to compensate the underestimation.

3. Results of Hydraulic Analysis

I.1 Rambewa Subzone

(1) Distribution Model



(2) Results of Calculation

Specification of Nodes

NO	Node	Type	Demand l/sec	TH m	GL m	He m	GND No.	Demand m3/day	Allocation	Peak factor
1	a	1	-82.500	116.00	95.00	21.0		0	1.00	2.00
2	b	0	0.000	113.08	88.00	25.1		0	1.00	2.00
3	s12	0	0.000	111.15	81.00	30.2		0	1.00	2.00
4	d	0	8.287	109.57	84.00	25.6	99	358	1.00	2.00
5	e	0	0.000	113.49	94.00	19.5		0	1.00	2.00
6	f	0	9.190	110.82	90.00	20.8	114+115	397	1.00	2.00
7	g	0	4.259	112.79	104.00	8.8	113	184	1.00	2.00
8	h	0	4.676	111.53	100.00	11.5	112	202	1.00	2.00
9	i	0	0.000	110.07	94.00	16.1		0	1.00	2.00
10	j	0	4.306	108.66	96.00	12.7	103	186	1.00	2.00
11	k	0	5.602	112.28	98.00	14.3	101	242	1.00	2.00
12	l	0	27.639	109.20	94.00	15.2	102	1194	1.00	2.00
13	m	0	10.139	114.31	87.00	27.3	100	438	1.00	2.00
14	n	0	0.000	112.76	94.00	18.8		0	1.00	2.00
15	s9	0	5.093	110.72	95.0	15.7	110	220	1.00	2.00
16	s10	0	0.000	110.55	86.0	24.5		0	1.00	2.00
17	s11	0	3.310	109.75	90.0	19.7	107	143	1.00	2.00
total								3564		

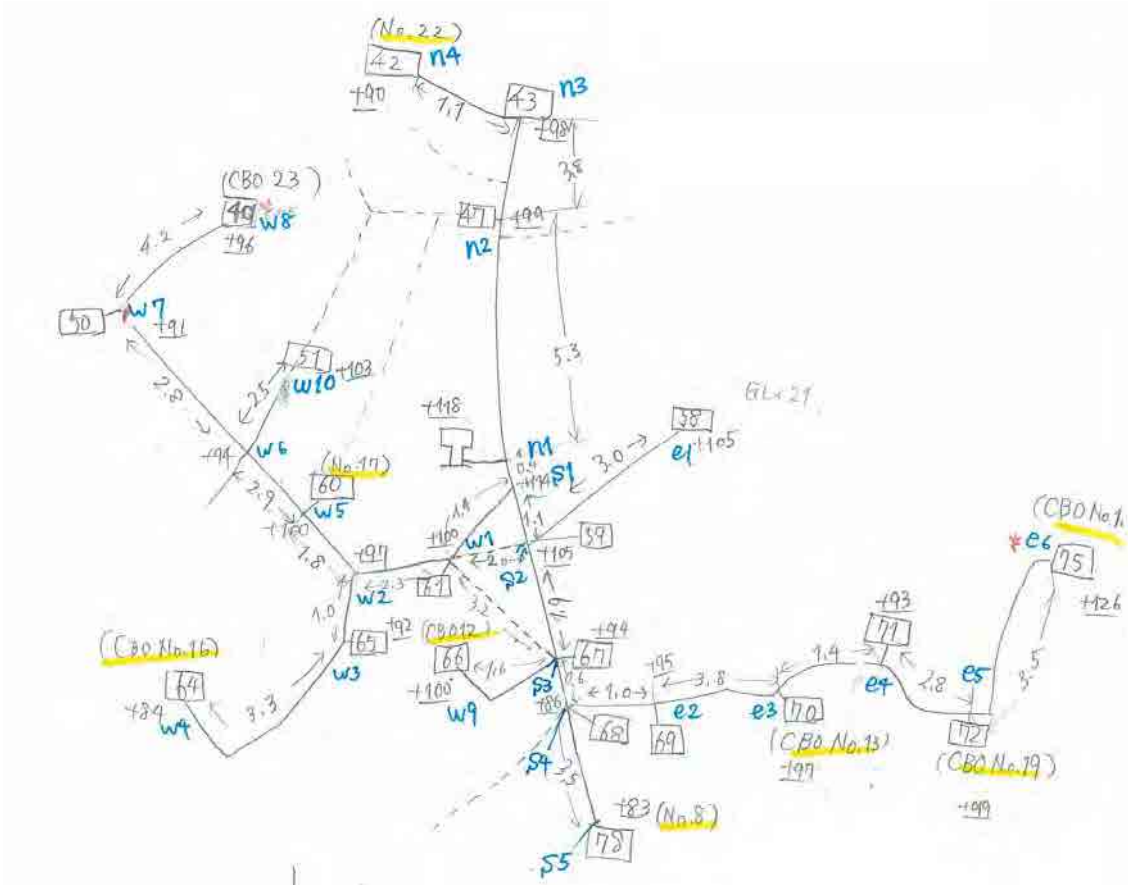
Specification of Pipelines

NO	Node(u)	Node(d)	Type	DIA mm	Length m	C	Spec. Loss m	Q l/sec	V m/sec	I o/oo
1	a	m	0	400	1500	130	0.00	82.5	0.7	1.1
2	m	e	0	300	3000	130	0.00	18.1	0.3	0.3
3	e	f	0	200	4700	130	0.00	9.2	0.3	0.6
4	e	g	0	200	1300	130	0.00	8.9	0.3	0.5
5	g	h	0	150	1900	130	0.00	4.7	0.3	0.7
6	m	b	0	350	1700	130	0.00	45.9	0.5	0.7
7	m	d	0	150	2500	130	0.00	8.3	0.5	1.9
8	b	s12	0	200	4000	130	0.00	8.4	0.3	0.5
9	b	n	0	300	300	130	0.00	37.5	0.5	1.1
10	n	k	0	200	2100	130	0.00	5.6	0.2	0.2
11	n	i	0	250	1400	130	0.00	31.9	0.7	1.9
12	i	l	0	200	200	130	0.00	27.6	0.9	4.3
13	s12	s9	0	200	900	130	0.00	8.4	0.3	0.5
14	s9	s10	0	150	500	130	0.00	3.3	0.2	0.3
15	s10	s11	0	150	2300	130	0.00	3.3	0.2	0.3
16	i	j	0	150	2500	130	0.00	4.31	0.24	0.57

Note: Grey colored lines are the pipelines which are excluded in scope 2024.

I.2 Issinbassagala Subzone

(1) Distribution Model



(2) Results of Calculation

Specification of Nodes

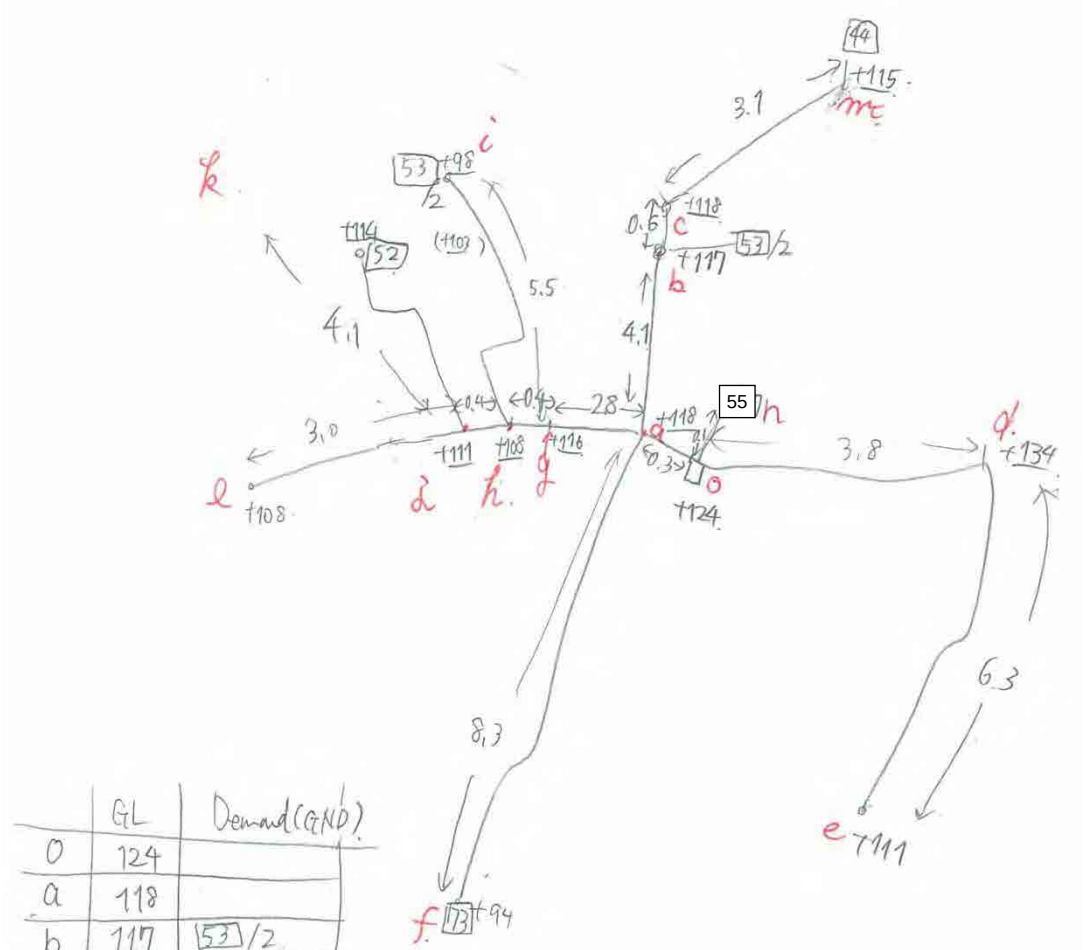
NO	Node	Type	Demand l/sec	TH m	GL m	He m	GND No.	Demand m3/day	Allocation	Peak factor
1	n1	1.0	(175.9)	139.0	118.0	21.0		0	1.00	2.00
2	n2	0.0	17.5	127.0	99.0	28.0	47	757	1.00	2.00
3	n3	0.0	9.3	120.0	98.0	22.0	43	401	1.00	2.00
4	n4	0.0	8.1	117.9	90.0	27.9	42	352	1.00	2.00
5	s1	0.0	0.0	136.7	114.0	22.7		0	1.00	2.00
6	s2	0.0	8.9	133.7	105.0	28.7	59	383	1.00	2.00
7	s3	0.0	14.6	130.1	94.0	36.1	67	632	1.00	2.00
8	s4	0.0	10.8	129.1	86.0	43.1	68	467	1.00	2.00
9	s5	0.0	9.4	128.4	83.0	45.4	78	406	1.00	2.00
10	w1	0.0	5.6	131.2	100.0	31.2	61	244	1.00	2.00
11	w2	0.0	0.0	124.1	97.0	27.1		0	1.00	2.00
12	w3	0.0	5.4	120.5	92.0	28.5	65	234	1.00	2.00
13	w4	0.0	6.3	93.5	84.0	9.5	64	271	1.00	2.00
14	w5	0.0	6.6	121.0	100.0	21.0	60	283	1.00	2.00
15	w6	0.0	0.0	118.0	94.0	24.0		0	1.00	2.00
16	w7	0.0	9.2	113.4	91.0	22.4	50	397	1.00	2.00
17	w8	0.0	7.0	107.5	96.0	11.5	49	304	1.00	2.00
18	w9	0.0	14.7	121.3	100.0	21.3	66	636	1.00	2.00
19	w10	0.0	6.9	114.6	103.0	11.6	51	300	1.00	2.00
20	e1	0.0	8.2	128.1	105.0	23.1	58	353	1.00	2.00
21	e2	0.0	6.0	127.7	95.0	32.7	69	259	1.00	2.00
22	e3	0.0	4.9	124.3	97.0	27.3	70	212	1.00	2.00
23	e4	0.0	6.1	122.0	93.0	29.0	71	265	1.00	2.00
24	e5	0.0	5.2	120.0	99.0	21.0	72	223	1.00	2.00
25	e6	0.0	5.0	117.4	126.0	(8.6)	75	218	1.00	2.00

Specification of Pipelines

NO	Node(u)	Node(d)	Type	DIA mm	Length m	C	Spec. Loss m	Q l/sec	V m/sec	I o/oo
1	n1	n2	0	250	5300	130	0.00	35.0	0.7	2.3
2	n2	n3	0	200	3800	130	0.00	17.4	0.6	1.9
3	n3	n4	0	150	1100	130	0.00	8.1	0.5	1.8
4	n1	s1	0	350	400	130	0.00	140.9	1.5	5.8
5	s1	w1	0	250	1400	130	0.00	47.1	1.0	3.9
6	w1	w2	0	250	2300	130	0.00	41.4	0.8	3.1
7	w2	w3	0	150	1000	130	0.00	11.7	0.7	3.6
8	w3	w4	0	100	3300	130	0.00	6.3	0.8	8.2
9	w2	w5	0	250	1800	130	0.00	29.7	0.6	1.7
10	w5	w6	0	250	2900	130	0.00	23.2	0.5	1.1
11	w6	w10	0	150	2500	130	0.00	6.9	0.4	1.4
12	w6	w7	0	200	2800	130	0.00	16.2	0.5	1.6
13	w7	w8	0	150	4200	130	0.00	7.0	0.4	1.4
14	s1	s2	0	350	1100	130	0.00	93.8	1.0	2.7
15	s2	e1	0	150	3000	130	0.00	8.2	0.5	1.9
16	s2	s3	0	350	1900	130	0.00	76.8	0.8	1.9
17	s3	w9	0	150	1600	130	0.00	14.7	0.8	5.5
18	s3	s4	0	300	600	130	0.00	47.5	0.7	1.6
19	s4	s5	0	250	3500	130	0.00	9.4	0.2	0.2
20	s4	e2	0	250	1000	130	0.00	27.2	0.6	1.4
21	e2	e3	0	250	3800	130	0.00	21.3	0.4	0.9
22	e3	e4	0	200	1400	130	0.00	16.3	0.5	1.6
23	e4	e5	0	200	2800	130	0.00	10.2	0.3	0.7
24	e5	e6	0	150	3500	130	0.00	5.0	0.3	0.8

I.3 Ethakada Subzone

(1) Distribution Model



	GL	Demand(GND)
o	124	
a	118	
b	117	53/2
c	118	44
d	134	54
e	111	114
f	94	73
g	116	56/2
h	108	
i	98	53/2
j	111	
k	101	
l	108	57/2
m	115	44
n	124	53/2

(2) Results of Calculation

Specification of Nodes

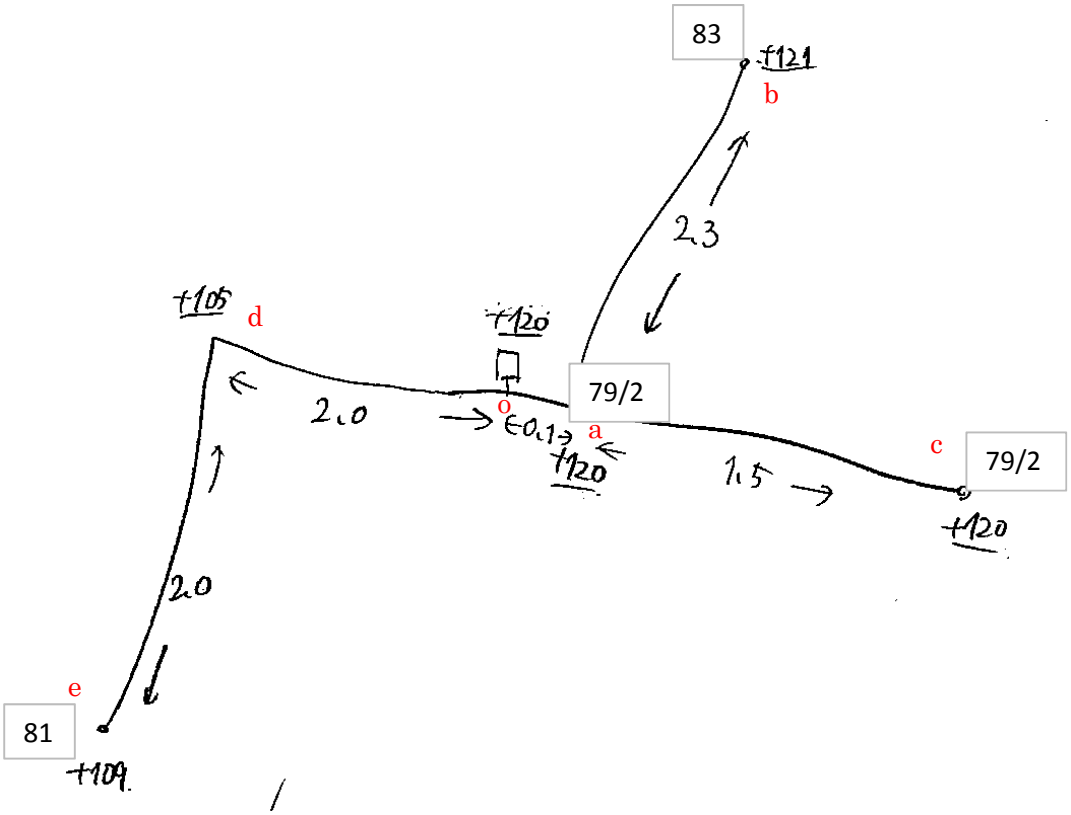
NO	Node	Type	Demand l/sec	TH m	GL m	He m	GND No.	Demand m3/day	Allocation	Peak factor
1	o	1.0	(66.3)	144.0	124.0	20.0		0	1.00	2.00
2	a	0.0	0.0	142.8	118.0	24.8		0	1.00	2.00
3	b	0.0	2.9	135.7	117.0	18.7	53	252	0.50	2.00
4	c	0.0	6.9	134.9	118.0	16.9	44	300	1.00	2.00
5	d	0.0	8.0	138.5	134.0	4.5	54	344	1.00	2.00
6	e	0.0	7.3	129.1	111.0	18.1	74	314	1.00	2.00
7	f	0.0	4.6	137.5	94.0	43.5	73	197	1.00	2.00
8	g	0.0	2.8	131.3	116.0	15.3	56	240	0.50	2.00
9	h	0.0	0.0	129.9	108.0	21.9		0	1.00	2.00
10	i	0.0	10.1	114.8	98.0	16.8	55	437	1.00	2.00
11	j	0.0	0.0	127.9	111.0	16.9		0	0.50	2.00
12	k	0.0	10.7	124.8	114.0	10.8	52,45	464	1.00	2.00
13	l	0.0	3.2	120.9	108.0	12.9	57	275	0.50	2.00
14	m	0.0	6.9	130.7	115.0	15.7	44	300	1.00	2.00
15	n	0.0	2.9	143.8	124.0	19.8	53	252	0.50	2.00

Specification of Pipelines

NO	Node(u)	Node(d)	Type	DIA mm	Length m	C	Spec. Loss m	Q l/sec	V m/sec	I o/oo
1	o	a	0	250	300	130	0.00	48.2	1.0	4.1
2	a	b	0	200	4100	130	0.00	16.8	0.5	1.7
3	b	c	0	200	600	130	0.00	13.9	0.4	1.2
4	c	m	0	150	3100	130	0.00	6.9	0.4	1.4
5	o	n	0	100	100	130	0.00	2.9	0.4	2.0
6	o	d	0	200	3800	130	0.00	15.2	0.5	1.4
7	d	e	0	150	6300	130	0.00	7.3	0.4	1.5
8	a	f	0	150	8300	130	0.00	4.6	0.3	0.6
9	a	g	0	200	2800	130	0.00	26.8	0.9	4.1
10	g	h	0	200	400	130	0.00	24.0	0.8	3.4
11	h	i	0	150	5500	130	0.00	10.1	0.6	2.7
12	h	j	0	150	400	130	0.00	13.9	0.8	5.0
13	j	k	0	200	4100	130	0.00	10.7	0.3	0.8
14	j	l	0	100	3000	130	0.00	3.2	0.4	2.3

I.4 East-Rambewa Subzone

(1) Distribution Model



(2) Results of Calculation

Specification of Nodes

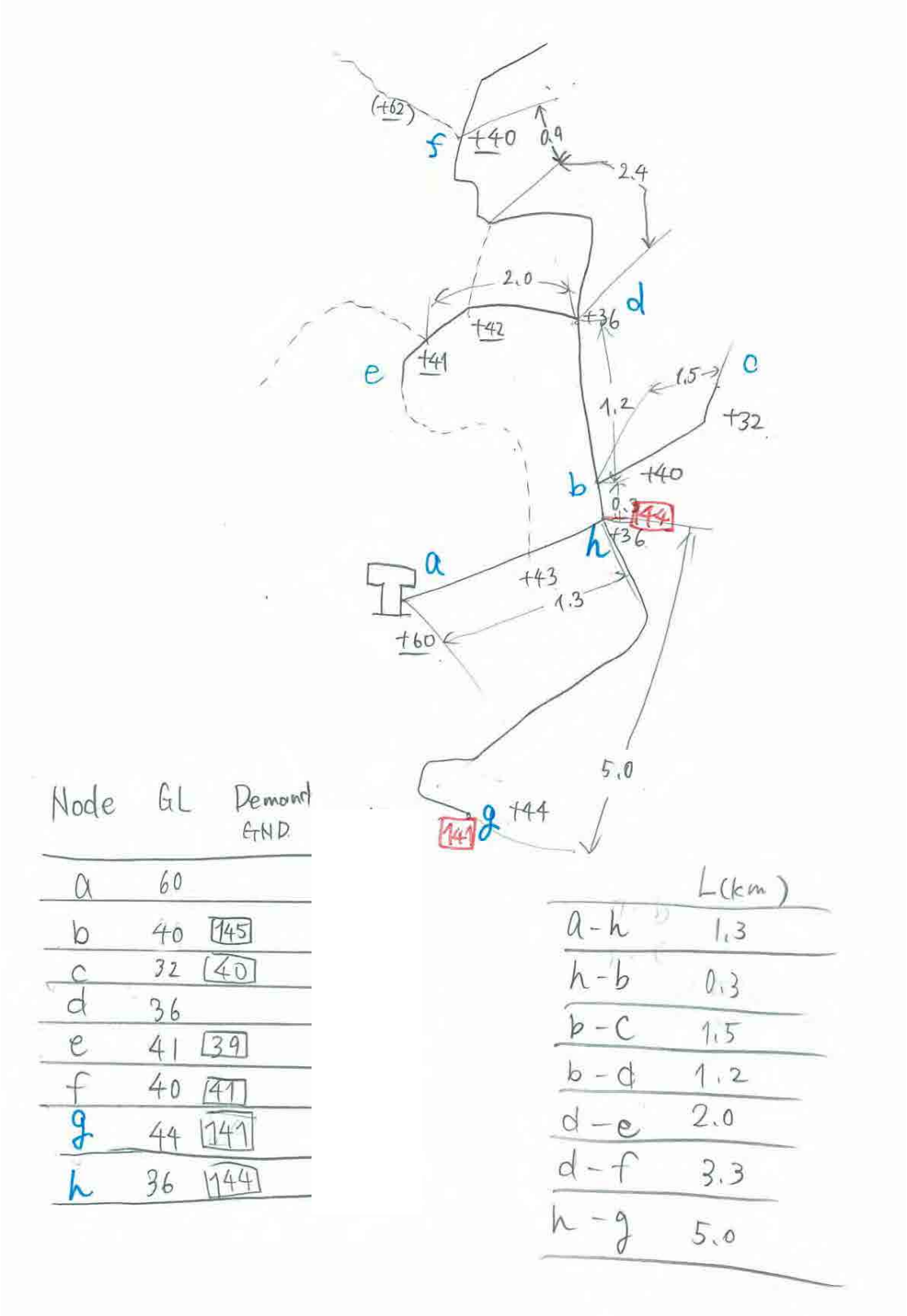
NO	Node	Type	Demand l/sec	TH m	GL m	He m	GND No.	Demand m3/day	Allocation	Peak factor
1	o	1.0	(13.9)	141.0	120.0	21.0		0	1.00	2.00
2	a	0.0	1.6	141.0	120.0	21.0	79	142	0.50	2.00
3	b	0.0	3.3	140.8	121.0	19.8	83	142	1.00	2.00
4	c	0.0	1.6	140.8	120.0	20.8	79	142	0.50	2.00
5	d	0.0	0.0	137.9	105.0	32.9		0	1.00	2.00
6	e	0.0	7.4	134.9	109.0	25.9	81	318	1.00	2.00

Specification of Pipelines

NO	Node(u)	Node(d)	Type	DIA mm	Length m	C	Spec. Loss m	Q l/sec	V m/sec	I o/oo
1	o	a	0	250	100	130	0.00	6.6	0.1	0.1
2	a	b	0	200	2300	130	0.00	3.3	0.1	0.1
3	a	c	0	150	1500	130	0.00	1.6	0.1	0.1
4	o	d	0	150	2000	130	0.00	7.4	0.4	1.5
5	d	e	0	150	2000	130	0.00	7.4	0.4	1.5

II.1 Wahalkada Subzone

(1) Distribution Model



Node	GL	Demand GND
a	60	
b	40	145
c	32	40
d	36	
e	41	39
f	40	41
g	44	141
h	36	144

	L(km)
a-h	1.3
h-b	0.3
b-c	1.5
b-d	1.2
d-e	2.0
d-f	3.3
h-g	5.0

(2) Results of Calculation

Specification of Nodes

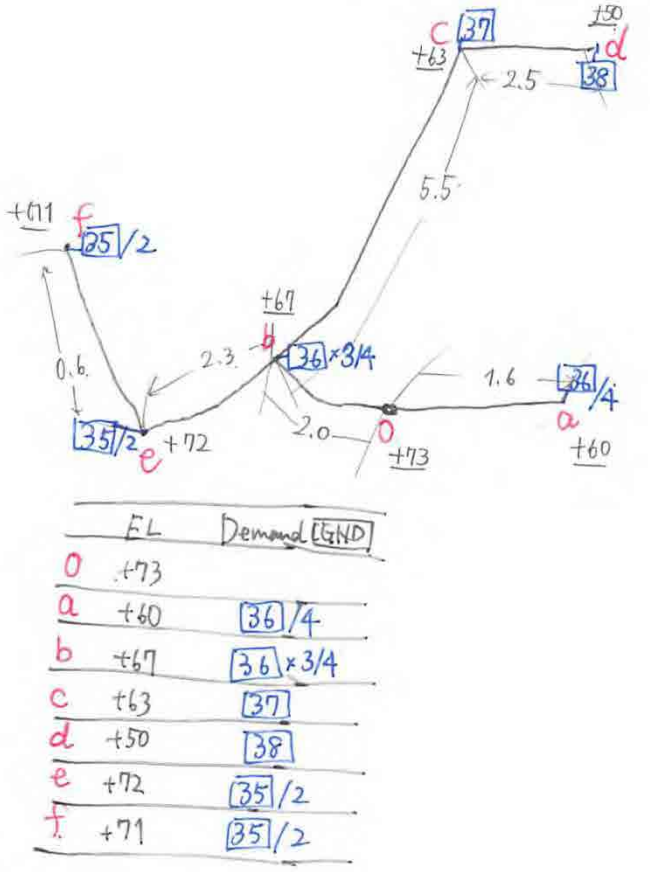
NO	Node	Type	Demand l/sec	TH m	GL m	He m	GND No.	Demand m3/day	Allocation	Peak factor
1	a	1.0	(24.0)	80.0	60.0	20.0		0	1.00	2.00
2	b	0.0	6.7	75.2	40.0	35.2	145	288	1.00	2.00
3	c	0.0	3.8	70.2	32.0	38.2	40	166	1.00	2.00
4	d	0.0	0.0	74.0	36.0	38.0		0	1.00	2.00
5	e	0.0	4.3	72.8	41.0	31.8	39	187	1.00	2.00
6	f	0.0	1.4	72.2	40.0	32.2	41	62	1.00	2.00
7	g	0.0	3.1	64.2	44.0	20.2	141	136	1.00	2.00
8	h	0.0	4.6	75.6	36.0	39.6	144	199	1.00	2.00

Specification of Pipelines

NO	Node(u)	Node(d)	Type	DIA mm	Length m	C	Spec. Loss m	Q l/sec	V m/sec	I o/oo
1	a	h	0	200	1300	130	0.00	24.0	0.8	3.4
2	h	b	0	200	300	130	0.00	16.3	0.5	1.6
3	b	c	0	100	1500	130	0.00	3.8	0.5	3.3
4	b	d	0	150	1200	130	0.00	5.8	0.3	1.0
5	d	e	0	150	2000	130	0.00	4.3	0.2	0.6
6	d	f	0	100	3300	130	0.00	1.4	0.2	0.5
7	h	g	0	100	5000	130	0.00	3.1	0.4	2.3

II.2 Kahatagollewa Subzone

(1) Distribution Model



(2) Results of Calculation

Specification of Nodes

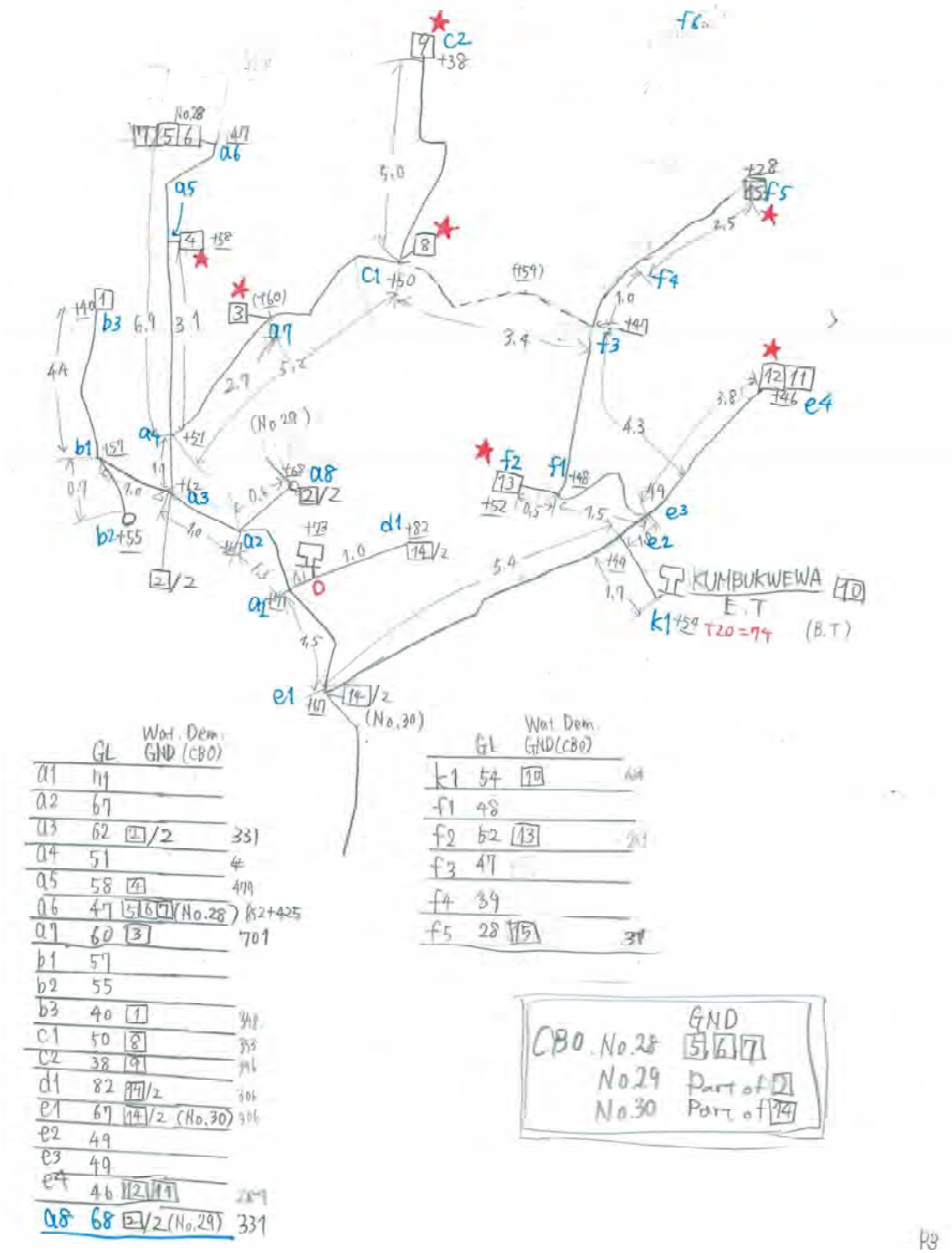
NO	Node	Type	Demand l/sec	TH m	GL m	He m	GND No.	Demand m3/day	Allocation	Peak factor
1	o	1.0	(13.6)	93.0	73.0	20.0		0	1.00	2.00
2	a	0.0	1.0	92.6	60.0	32.6	36	175	0.25	2.00
3	b	0.0	3.0	91.0	67.0	24.0	36	175	0.75	2.00
4	c	0.0	4.4	84.2	63.0	21.2	37	192	1.00	2.00
5	d	0.0	2.1	81.4	50.0	31.4	38	92	1.00	2.00
6	e	0.0	1.5	90.3	72.0	18.3	35	130	0.50	2.00
7	f	0.0	1.5	89.9	71.0	18.9	35	130	0.50	2.00

Specification of Pipelines

NO	Node(u)	Node(d)	Type	DIA mm	Length m	C	Spec. Loss m	Q l/sec	V m/sec	I o/oo
1	o	a	0	100	1600	130	0.00	1.0	0.1	0.3
2	o	b	0	200	2000	130	0.00	12.6	0.4	1.0
3	b	c	0	150	5500	130	0.00	6.6	0.4	1.2
4	c	d	0	100	2500	130	0.00	2.1	0.3	1.1
5	b	e	0	150	2300	130	0.00	3.0	0.2	0.3
6	e	f	0	100	600	130	0.00	1.5	0.2	0.6

II.3 Bogahawewa Subzone

(1) Distribution Model



(2) Results of Calculation

Specification of Nodes

NO	Node	Type	Demand l/sec	TH m	GL m	He m	GND No.	Demand m3/day	Allocation	Peak factor
1	o	1.0	(134.2)	94.0	73.0	21.0		0	1.00	2.00
2	a1	0.0	0.0	93.7	71.0	22.7		0	1	2.00
3	a2	0.0	0.0	91.8	67.0	24.8		0	1	2.00
4	a3	0.0	7.7	90.4	62.0	28.4	2	662	0.5	2.00
5	a4	0.0	0.0	88.5	51.0	37.5		0	1	2.00
6	a5	0.0	11.1	84.7	58.0	26.7	4	479	1	2.00
7	a6	0.0	29.6	66.0	47.0	19.0	5,6,7	1277	1	2.00
8	a7	0.0	16.2	82.8	60.0	22.8	3	701	1	2.00
9	a8	0.0	7.7	91.5	68.0	23.5	2	662	0.5	2.00
10	b1	0.0	0.0	88.6	57.0	31.6		0	1	2.00
11	b2	0.0	0.0	88.6	55.0	33.6		0	1	2.00
12	b3	0.0	8.1	80.7	40.0	40.7	1	348	1	2.00
13	c1	0.0	8.2	78.2	50.0	28.2	8	353	1	2.00
14	c2	0.0	9.2	66.8	38.0	28.8	9	396	1	2.00
15	d1	0.0	7.1	92.6	82.0	10.6	14	612	0.5	2.00
16	e1	0.0	7.1	91.3	67.0	24.3	14	612	0.5	2.00
17	e2	0.0	0.0	85.9	49.0	36.9		0	1	2.00
18	e3	0.0	0.0	84.9	49.0	35.9		0	1	2.00
19	e4	0.0	6.7	80.0	46.0	34.0	11,12	289	1	2.00
20	k1	0.0	9.8	81.5	53.0	28.5	10	424	1	2.00
21	f1	0.0	0.0	83.3	48.0	35.3		0	1	2.00
22	f2	0.0	5.6	80.0	52.0	28.0	13	241	1	2.00
23	f3	0.0	0.0	83.1	47.0	36.1		0	1	2.00
24	f4	0.0	0.0	83.1	39.0	44.1		0	1	2.00
25	f5	0.0	0.4	83.0	28.0	55.0	15	16	1	2.00

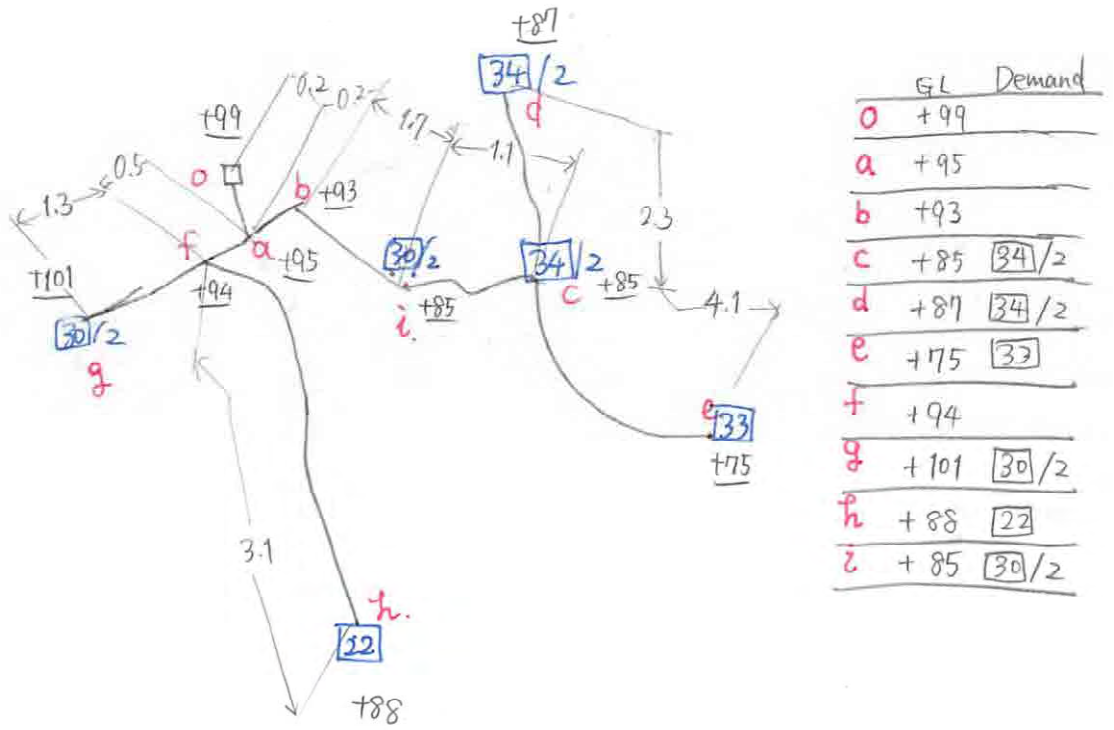
Specification of Pipelines

NO	Node(u)	Node(d)	Type	DIA mm	Length m	C	Spec. Loss m	Q l/sec	V m/sec	I o/oo
1	o	a1	0	400	100	130	0.00	127.1	1.0	2.5
2	a1	a2	0	400	1300	130	0.00	97.6	0.8	1.5
3	a2	a3	0	400	1000	130	0.00	89.9	0.7	1.3
4	a3	a4	0	350	1100	130	0.00	74.2	0.8	1.8
5	a4	a5	0	300	3100	130	0.00	40.6	0.6	1.2
6	a5	a6	0	200	3800	130	0.00	29.6	0.9	4.9
7	a4	a7	0	250	2700	130	0.00	33.6	0.7	2.1
8	a2	a8	0	200	600	130	0.00	7.7	0.2	0.4
9	a3	b1	0	150	1000	130	0.00	8.1	0.5	1.8
10	b1	b2	0	150	700	130	0.00	-0.6	0.0	0.0
11	b1	b3	0	150	4400	130	0.00	8.1	0.5	1.8
12	o	d1	0	150	1000	130	0.00	7.1	0.4	1.4
13	a1	e1	0	250	1500	130	0.00	29.5	0.6	1.7
14	e1	e2	0	250	5400	130	0.00	22.5	0.5	1.0
15	e2	e3	0	200	1000	130	0.00	12.6	0.4	1.0
16	e3	e4	0	150	3800	130	0.00	6.7	0.4	1.3
17	e3	f1	0	150	1500	130	0.00	5.9	0.3	1.0
18	f1	f2	0	100	500	130	0.00	5.6	0.7	6.6
19	f1	f3	0	100	4300	130	0.00	0.4	0.0	0.0
20	f3	f4	0	100	1000	130	0.00	0.4	0.0	0.0
21	f4	f5	0	100	2500	130	0.00	0.4	0.0	0.0
22	a7	c1	0	200	2500	130	0.00	17.3	0.6	1.8
23	c1	c2	0	150	5000	130	0.00	9.2	0.5	2.3
24	e2	k1	0	150	1700	130	0.00	9.8	0.6	2.6

Note: Grey colored lines are the pipelines which are excluded in scope 2024

II.4 Kahatagollewa-Kebithigollewa Median Subzone

(1) Distribution Model



(2) Results of Calculation

Specification of Nodes

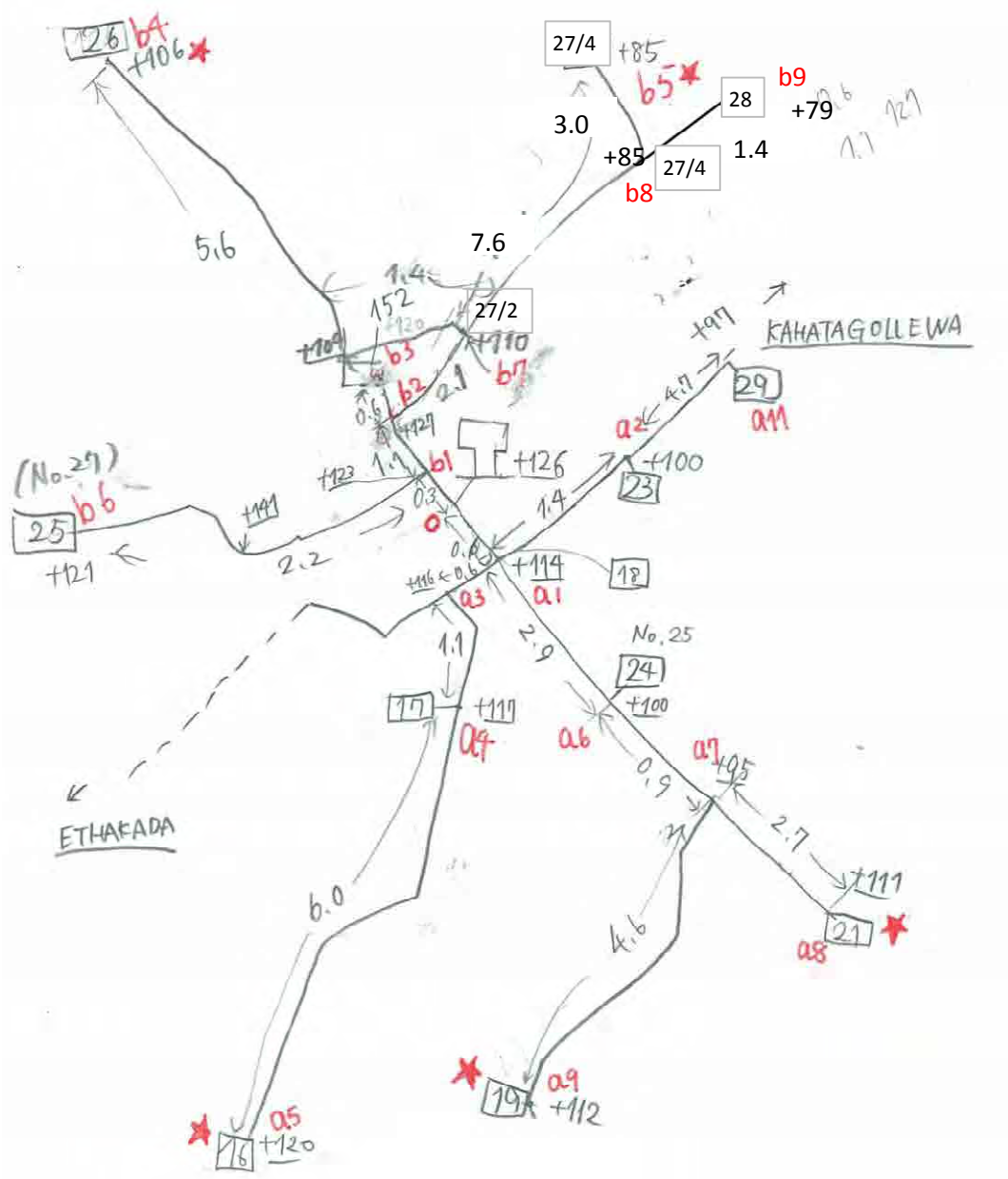
NO	Node	Type	Demand l/sec	TH m	GL m	He m	GND No.	Demand m3/day	Allocation	Peak factor
1	o	1.0	(17.2)	119.0	99.0	20.0		0	1.00	2.00
2	a	0.0	0.0	118.8	95.0	23.8		0	1	2.00
3	b	0.0	0.0	117.7	93.0	24.7		0	1	2.00
4	c	0.0	1.7	114.4	85.0	29.4	34	145	0.5	2.00
5	d	0.0	1.7	109.7	87.0	22.7	34	145	0.5	2.00
6	e	0.0	5.6	106.1	75.0	31.1	33	244	1	2.00
7	f	0.0	0.0	116.3	94.0	22.3	0	0	1	2.00
8	g	0.0	2.6	115.4	101.0	14.4	30	221	0.5	2.00
9	h	0.0	3.1	112.6	88.0	24.6	22	133	1	2.00
10	i	0.0	2.6	116.8	85.0	31.8	30	221	0.5	2.00

Specification of Pipelines

NO	Node(u)	Node(d)	Type	DIA mm	Length m	C	Spec. Loss m	Q l/sec	V m/sec	I o/oo
1	o	a	0	200	100	130	0.00	17.2	0.5	1.8
2	a	b	0	200	1300	130	0.00	11.6	0.4	0.9
3	b	i	0	200	1000	130	0.00	11.6	0.4	0.9
4	i	c	0	150	1100	130	0.00	9.0	0.5	2.2
5	c	d	0	150	3100	130	0.00	7.3	0.4	1.5
6	d	e	0	150	3800	130	0.00	5.6	0.3	0.9
7	a	f	0	150	2700	130	0.00	5.6	0.3	0.9
8	f	g	0	100	600	130	0.00	2.6	0.3	1.6
9	f	h	0	100	1700	130	0.00	3.1	0.4	2.2

II.5 Kebithigollewa Subzone

(1) Distribution Model



(2) Results of Calculation

Specification of Nodes

NO	Node	Type	Demand l/sec	TH m	GL m	He m	GND No.	Demand m3/day	Allocation	Peak factor
1	o	1.0	(80.6)	146.0	126.0	20.0		0	1.00	2.00
2	a1	0.0	16.4	145.4	114.0	31.4	18	709	1.00	2.00
3	a2	0.0	5.8	141.8	100.0	41.8	23	251	1.00	2.00
4	a3	0.0	0.0	144.1	116.0	28.1		0	1.00	2.00
5	a4	0.0	5.1	141.7	117.0	24.7	17	222	1.00	2.00
6	a5	0.0	3.7	139.1	120.0	19.1	16	161	1.00	2.00
7	a6	0.0	7.1	138.6	100.0	38.6	24	306	1.00	2.00
8	a7	0.0	0.0	137.7	95.0	42.7		0	1.00	2.00
9	a8	0.0	8.5	132.3	111.0	21.3	21	366	1.00	2.00
10	a9	0.0	4.3	135.1	112.0	23.1	19	184	1.00	2.00
11	a11	0.0	3.9	139.6	123.0	16.6	29	169	1.00	2.00
12	b1	0.0	0.0	145.6	123.0	22.6		0	1.00	2.00
13	b2	0.0	0.0	144.5	127.0	17.5		0	1.00	2.00
14	b3	0.0	0.0	141.6	109.0	32.6		0	1.00	2.00
15	b4	0.0	4.8	137.7	106.0	31.7	26	206	1.00	2.00
16	b5	0.0	7.7	126.3	85.0	41.3	25	332	1.00	2.00
17	b6	0.0	3.7	144.7	121.0	23.7	27	319	0.50	2.00
18	b7	0.0	1.8	142.5	110.0	32.5	27	319	0.25	2.00
19	b8	0.0	1.8	131.2	85.0	46.2	27	319	0.25	2.00
20	b9	0.0	5.9	121.0	79.0	42.0	28	256	1.00	2.00

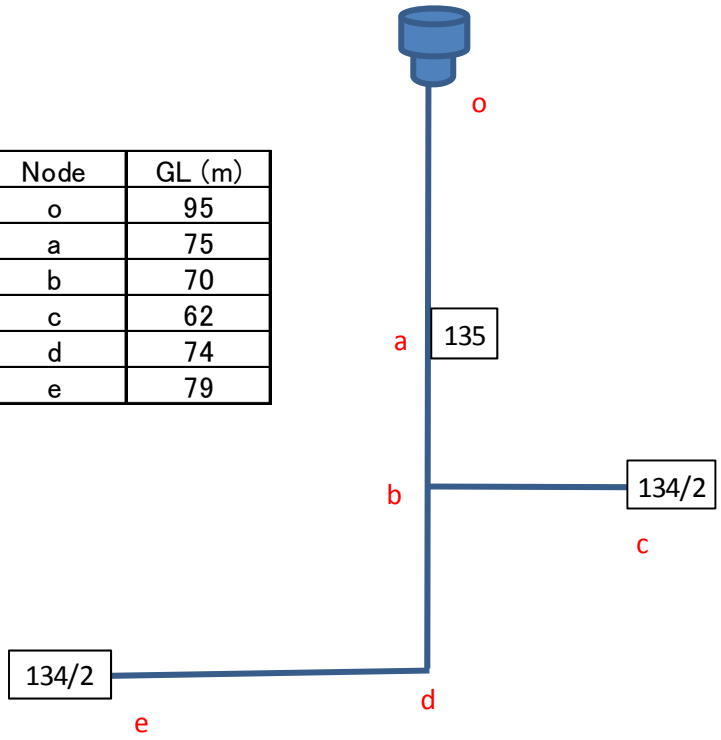
Specification of Pipelines

NO	Node(u)	Node(d)	Type	DIA mm	Length m	C	Spec. Loss m	Q l/sec	V m/sec	I o/oo
1	o	a1	0	350	600	130	0.00	54.8	0.6	1.0
2	a1	a2	0	150	1400	130	0.00	9.7	0.6	2.6
3	a1	a3	0	150	600	130	0.00	8.9	0.5	2.2
4	a3	a4	0	150	1100	130	0.00	8.9	0.5	2.2
5	a4	a5	0	150	6000	130	0.00	3.7	0.2	0.4
6	a1	a6	0	200	2900	130	0.00	19.8	0.6	2.3
7	a6	a7	0	200	900	130	0.00	12.7	0.4	1.0
8	a7	a8	0	150	2700	130	0.00	8.5	0.5	2.0
9	a7	a9	0	150	4600	130	0.00	4.3	0.2	0.6
10	a2	a11	0	150	4700	130	0.00	3.9	0.2	0.5
11	o	b1	0	250	300	130	0.00	25.8	0.5	1.3
12	b1	b2	0	250	1100	130	0.00	22.1	0.4	1.0
13	b1	b6	0	150	2200	130	0.00	3.7	0.2	0.4
14	b2	b7	0	250	2100	130	0.00	22.1	0.4	1.0
15	b7	b8	0	200	7600	130	0.00	15.5	0.5	1.5
16	b7	b3	0	150	1400	130	0.00	4.8	0.3	0.7
17	b3	b4	0	150	5600	130	0.00	4.8	0.3	0.7
18	b8	b5	0	150	3000	130	0.00	7.7	0.4	1.7
19	b8	b9	0	100	1400	130	0.00	5.9	0.8	7.3

II.6 North Horowpothana Subzone

(1) Distribution Model

Node	GL (m)
o	95
a	75
b	70
c	62
d	74
e	79



(2) Results of Calculation

Specification of Nodes

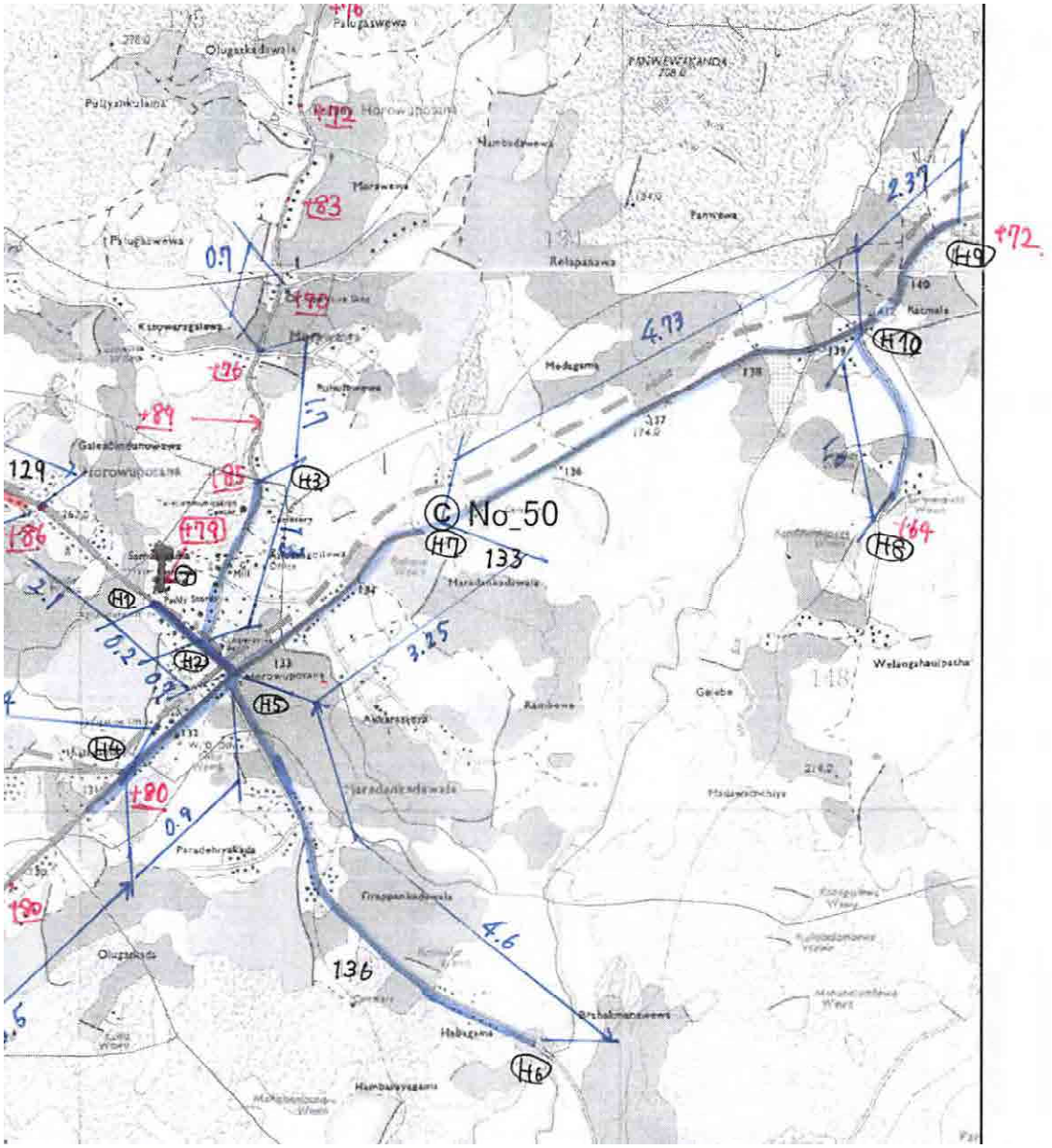
NO	Node	Type	Demand l/sec	TH m	GL m	He m	GND No.	Demand m3/day	Allocation	Peak factor
1	o	1	-11.597	100.00	95.00	5.0		0	1.00	2.00
2	a	0	4.144	97.12	75.00	22.1	135	179	1.00	2.00
3	b	0	0.000	95.56	70.00	25.6		0	1.00	2.00
4	c	0	3.727	94.78	62.00	32.8	134	322	0.50	2.00
5	d	0	0.000	95.22	74.00	21.2		0	1.00	2.00
6	e	0	3.727	94.78	79.0	15.8	134	322	0.50	2.00
total								823		

Specification of Pipelines

NO	Node(u)	Node(d)	Type	DIA mm	Length m	C	Spec. Loss m	Q l/sec	V m/sec	I o/oo
1	o	a	0	200	3300	130	0.00	11.6	0.4	0.9
2	a	b	0	150	1000	130	0.00	7.5	0.4	1.6
3	b	c	0	150	1800	130	0.00	3.7	0.2	0.4
4	b	d	0	150	800	130	0.00	3.7	0.2	0.4
5	d	e	0	150	1000	130	0.00	3.73	0.21	0.43

II.7 Horowpothana Subzone

(1) Distribution Model



(2) Results of Calculation

Specification of Nodes

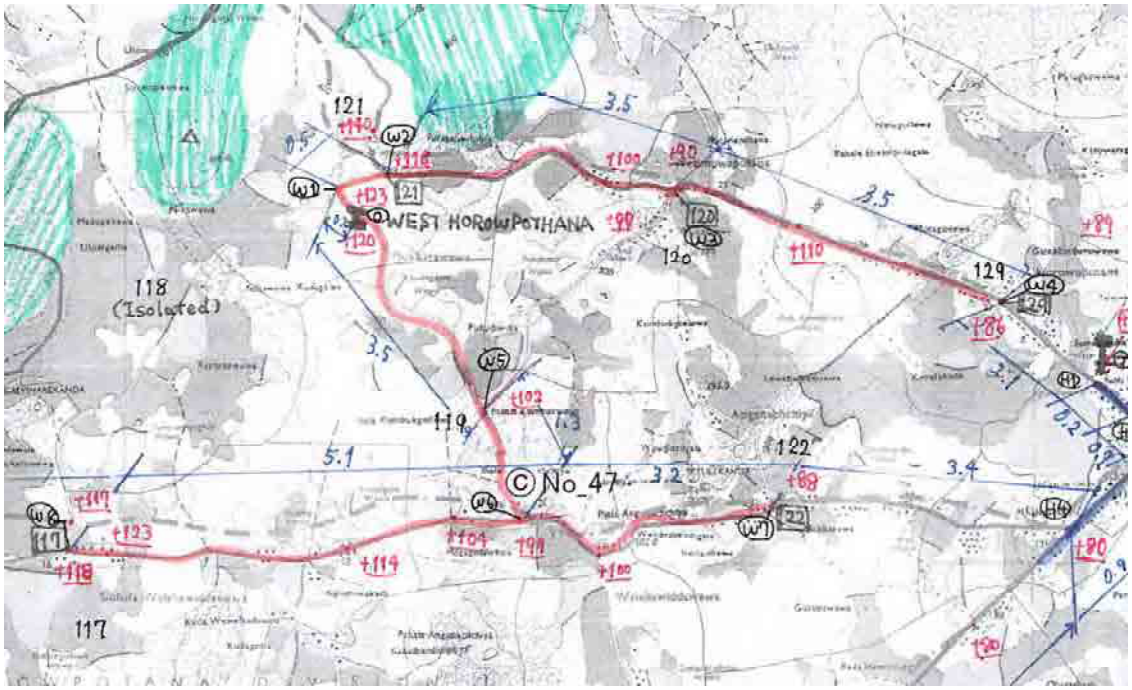
NO	Node	Type	Demand l/sec	TH m	GL m	He m	GND No.	Demand m3/day	Allocation	Peak factor
1	T	1.0	(36.829)	100.0	79.0	21.0		0	1.00	2.00
2	H1	0.0	0.000	100.0	78.0	22.0		0	1.00	2.00
3	H2	0.0	2.772	99.5	73.0	26.5	128	479	0.25	2.00
4	H3	0.0	2.772	97.1	70.0	27.1	128	479	0.25	2.00
5	H4	0.0	4.606	97.6	58.0	39.6	130	199	1.00	2.00
6	H5	0.0	5.544	98.2	71.0	27.2	128	479	0.50	2.00
7	H6	0.0	4.838	94.9	67.0	27.9	136	209	1.00	2.00
8	H7	0.0	9.676	96.4	75.0	21.4	133	418	1.00	2.00
9	H8	0.0	1.667	89.7	64.0	25.7	148	72	1.00	2.00
10	H9	0.0	4.954	88.7	72.0	16.7	147	214	1.00	2.00
11	H10	0.0	0.000	90.4	58.0	32.4		0	1.00	2.00

Specification of Pipelines

NO	Node(u)	Node(d)	Type	DIA mm	Length m	C	Spec. Loss m	Q l/sec	V m/sec	I o/oo
1	T	H1	1	250	20	130	0.00	36.8	0.8	2.5
2	H1	H2	0	250	200	130	0.00	36.8	0.8	2.5
3	H2	H3	0	100	1300	130	0.00	2.8	0.4	1.8
4	H2	H5	0	250	700	130	0.00	31.3	0.6	1.8
5	H5	H4	0	150	900	130	0.00	4.6	0.3	0.6
6	H5	H6	0	150	4600	130	0.00	4.8	0.3	0.7
7	H5	H7	0	250	3250	130	0.00	16.3	0.3	0.6
8	H7	H10	0	150	4730	130	0.00	6.6	0.4	1.3
9	H10	H8	0	100	1000	130	0.00	1.7	0.2	0.7
10	H10	H9	0	150	2370	130	0.00	5.0	0.3	0.7

II.8 West Horowpothana Subzone

(1) Distribution Model



(2) Results of Calculation

Specification of Nodes

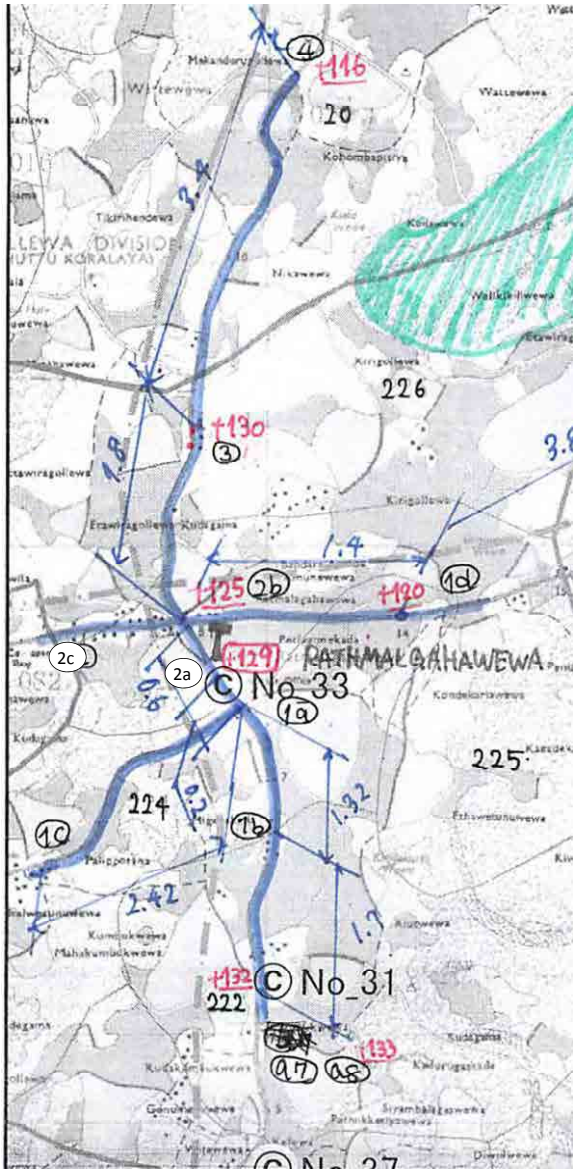
NO	Node	Type	Demand l/sec	TH m	GL m	He m	GND No.	Demand m3/day	Allocation	Peak factor
1	o	1.0	(35.231)	140.0	120.0	20.0		0	1.00	2.00
2	w1	0.0	0.000	139.5	123.0	16.5		0	1.00	2.00
3	w2	0.0	6.991	138.3	118.0	20.3	121	302	1.00	2.00
4	w3	0.0	5.417	134.4	90.0	44.4	120	234	1.00	2.00
5	w4	0.0	7.824	132.9	86.0	46.9	129	338	1.00	2.00
6	w5	0.0	0.000	138.3	102.0	36.3		0	1.00	2.00
7	w6	0.0	0.000	136.5	99.0	37.5		0	1.00	2.00
8	w7	0.0	8.194	130.6	88.0	42.6	122	354	1.00	2.00
9	w8	0.0	6.806	134.9	118.0	16.9	117	294	1.00	2.00

Specification of Pipelines

NO	Node(u)	Node(d)	Type	DIA mm	Length m	C	Spec. Loss m	Q l/sec	V m/sec	I o/oo
1	o	w1	1	200	200	130	0.00	20.2	0.6	2.4
2	w1	w2	0	200	500	130	0.00	20.2	0.6	2.4
3	w2	w3	0	200	3500	130	0.00	13.2	0.4	1.1
4	w3	w4	0	200	3500	130	0.00	7.8	0.2	0.4
5	o	w5	0	250	3500	130	0.00	15.0	0.3	0.5
6	w5	w6	0	200	1300	130	0.00	15.0	0.5	1.4
7	w6	w7	0	150	3200	130	0.00	8.2	0.5	1.9
8	w6	w8	0	200	5100	130	0.00	6.8	0.2	0.3

II.9 Rathmalgahawewa Subzone

(1) Distribution Model



(2) Results of Calculation

Specification of Nodes

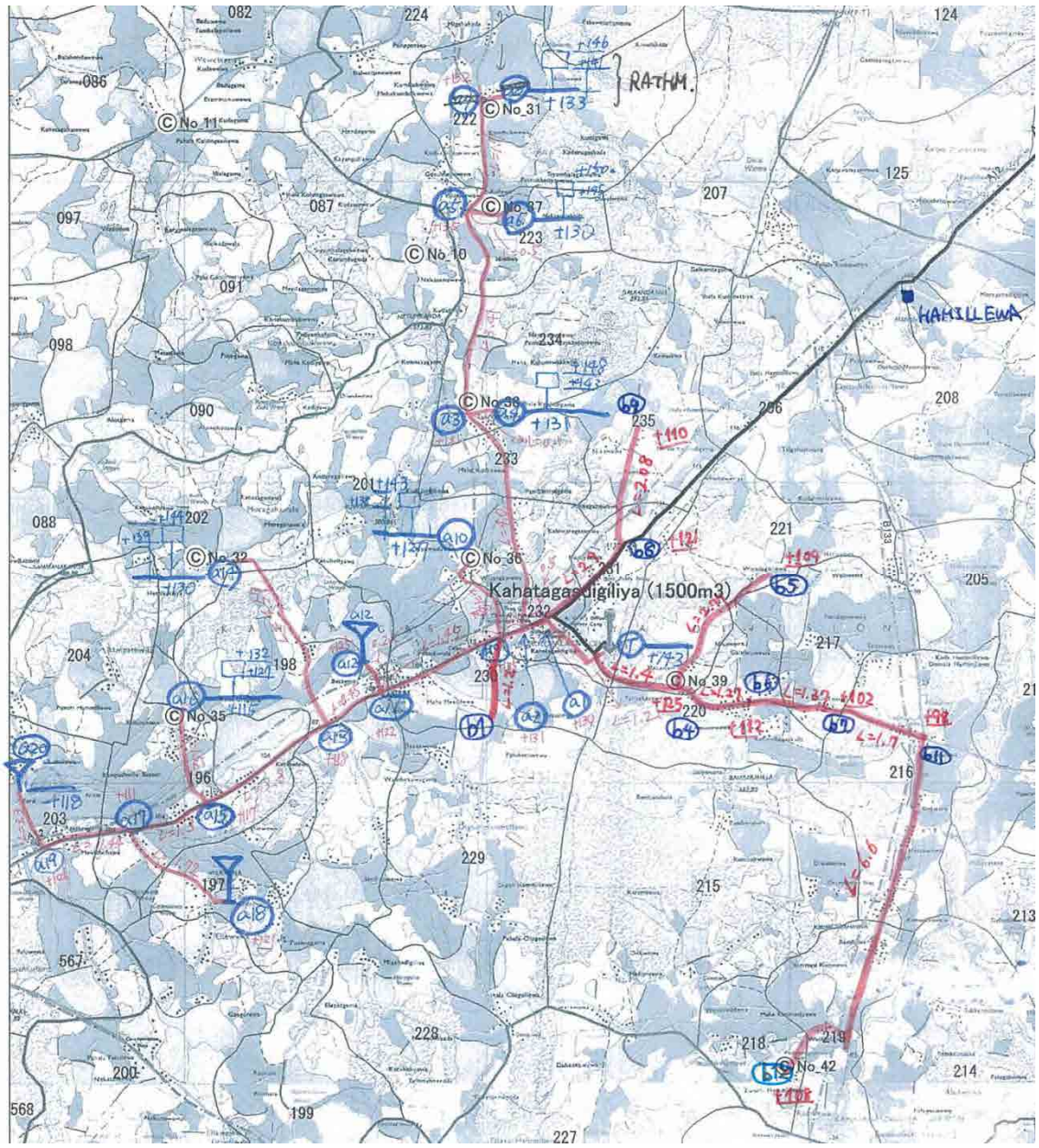
NO	Node	Type	Demand l/sec	TH m	GL m	He m	GND No.	Demand m3/day	Allocation	Peak factor
1	R	1.0	(25.891)	149.0	129.0	20.0		0	1.00	2.00
2	1a	0.0	0.938	148.6	129.0	19.6	224	162	0.25	2.00
3	1b	0.0	0.938	147.3	125.0	22.3	224	162	0.25	2.00
4	1c	0.0	0.938	148.0	124.0	24.0	224	162	0.25	2.00
5	1d	0.0	0.938	147.7	120.0	27.7	224	162	0.25	2.00
6	2a	0.0	1.910	149.0	129.0	20.0	225	250	0.33	2.00
7	2b	0.0	1.910	148.0	125.0	23.0	225	250	0.33	2.00
8	2c	0.0	1.910	147.1	130.0	17.1	225	250	0.33	2.00
9	3	0.0	4.722	146.5	130.0	16.5	226	204	1.00	2.00
10	4	0.0	6.713	142.1	116.0	26.1	20	290	1.00	2.00
11	a7	0.0	0.0	146.0	132.0	14.0	0	0	1.00	2.00
12	a8	0.0	5.0	146.0	133.0	13.0	222	215	1.0	2.0

Specification of Pipelines

NO	Node(u)	Node(d)	Type	DIA mm	Length m	C	Spec. Loss m	Q l/sec	V m/sec	I o/oo
1	R	2a	1	250	20	130	0.00	25.9	0.5	1.3
2	2a	1a	0	150	200	130	0.00	7.8	0.4	1.7
3	1a	1b	0	150	1320	130	0.00	5.9	0.3	1.0
4	1a	1c	0	100	2420	130	0.00	0.9	0.1	0.2
5	2a	2b	0	200	600	130	0.00	16.2	0.5	1.6
6	2b	1d	0	100	1400	130	0.00	0.9	0.1	0.2
7	2b	2c	0	100	1000	130	0.00	1.9	0.2	0.9
8	2b	3	0	200	1800	130	0.00	11.4	0.4	0.8
9	3	4	0	150	3400	130	0.00	6.7	0.4	1.3
10	1b	a7	0	150	1700	130	0.00	5.0	0.3	0.7
11	a7	a8	0	150	100	130	0.00	5.0	0.3	0.7

II.10 Hamillewa Subzone

(1) Distribution Model



(2) Results of Calculation

Specification of Nodes

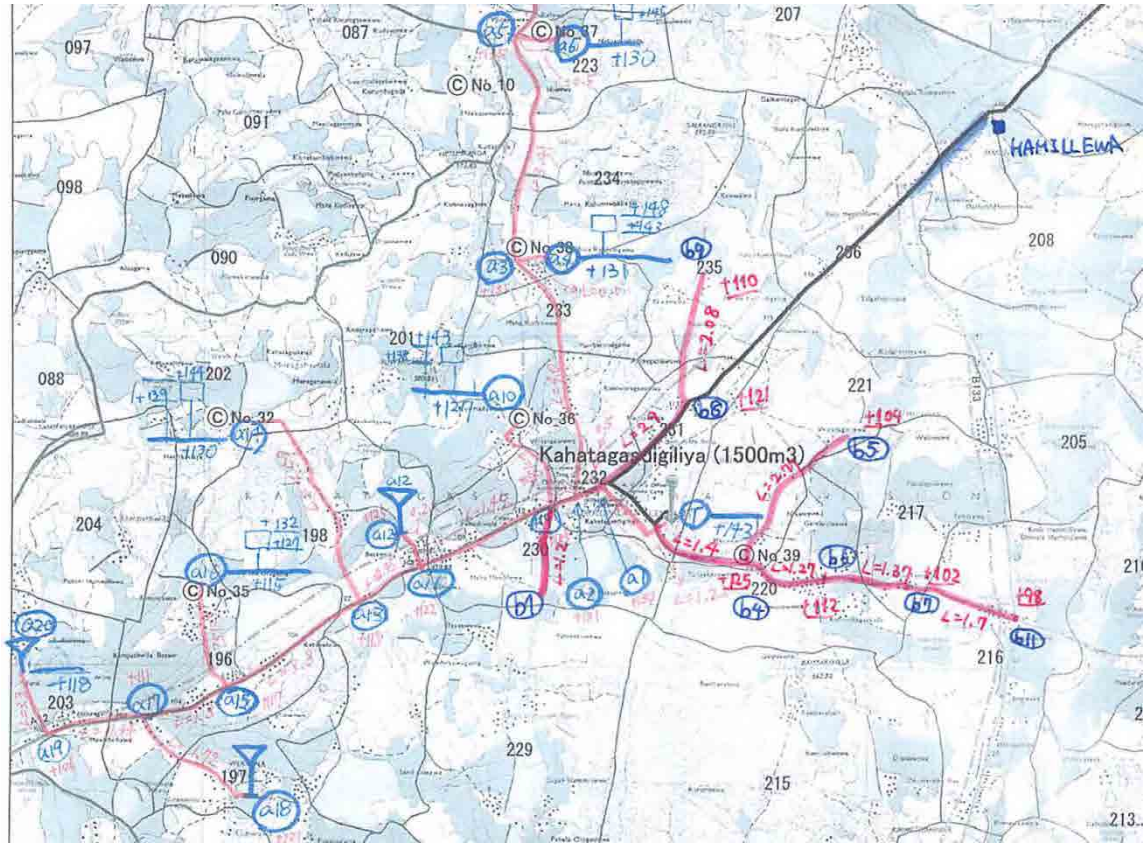
NO	Node	Type	Demand l/sec	TH m	GL m	He m	GND No.	Demand m3/day	Allocation	Peak factor
1	h1	0.0	0.000	127.1	86.0	41.1		0	1.00	2.00
2	h2	0.0	4.444	124.9	83.0	41.9	131	192	1.00	2.00
3	h3	0.0	2.500	124.3	84.0	40.3	132	108	1.00	2.00
4	h4	0.0	0.000	129.4	86.0	43.4		0	1.00	2.00
5	h5	0.0	8.310	125.6	81.0	44.6	127	359	1.00	2.00
6	h6	0.0	0.000	129.7	86.0	43.7		0	1.00	2.00
7	i	1.0	(94.469)	135.0	120.0	15.0		0	1.00	2.00
8	i1	0.0	0.000	134.9	100.0	34.9		0	1.00	2.00
9	i2	0.0	0.000	133.0	93.0	40.0		0	1.00	2.00
10	i3	0.0	4.977	127.7	95.0	32.7	208	215	1.00	2.00
11	i4	0.0	4.884	129.7	81.0	48.7	209	211	1.00	2.00
12	i5	0.0	8.310	129.1	85.0	44.1	127	359	1.00	2.00
13	i6	0.0	0.000	127.8	95.0	32.8		0	1.00	2.00
14	i7	0.0	4.560	127.7	99.0	28.7	210	197	1.00	2.00
15	i11	0.0	0.000	124.6	100.0	24.6		0	1.00	2.00
16	i12	0.0	4.699	124.4	106.0	18.4	213	203	1.00	2.00
17	i13	0.0	3.935	124.3	121.0	3.3	212	170	1.00	2.00
18	i14	0.0	0.000	129.9	89.0	40.9		0	1.00	2.00
19	i15	0.0	5.231	129.8	86.0	43.8	125	226	1.00	2.00
20	i16	0.0	4.630	129.6	89.0	40.6	126	200	1.00	2.00
21	j1	0.0	0.000	134.3	105.0	29.3		0	1.00	2.00
22	j2	0.0	7.176	133.4	94.0	39.4	207	310	1.00	2.00
23	j3	0.0	0.000	133.6	94.0	39.6		0	1.00	2.00
24	j4	0.0	6.528	130.5	97.0	33.5	206	282	1.00	2.00
25	j5	0.0	0.000	133.4	94.0	39.4		0	1.00	2.00
26	j6	0.0	6.667	123.2	88.0	35.2	205	288	1.00	2.00
27	b12	0.0	0.0	125.3	105.0	20.3		0	1.00	2.00
28	b13	0.0	0.0	125.6	103.0	22.6		0	1.00	2.00
29	b15	0.0	4.1	124.0	109.0	15.0	153	175	1.00	2.00
30	p1	0.0	0.000	123.0	83.0	40.0		0	1.00	2.00
31	p2	0.0	5.139	119.6	81.0	38.6	150	222	1.00	2.00
32	p3	0.0	4.954	119.8	82.0	37.8	152	214	1.00	2.00
33	p4	0.0	3.472	114.1	79.0	35.1	151	150	1.00	2.00

Specification of Pipelines

NO	Node(u)	Node(d)	Type	DIA mm	Length m	C	Spec. Loss m	Q l/sec	V m/sec	I o/oo
1	h1	h2	0	100	500	130	0.00	4.4	0.6	4.32
2	h1	h3	0	100	1860	130	0.00	2.5	0.3	1.49
3	h4	h1	0	150	1720	130	0.00	6.9	0.4	1.37
4	h4	h5	0	150	2000	130	0.00	8.3	0.5	1.91
5	h4	h6	0	300	1200	130	0.00	-15.3	-0.2	-0.20
6	i14	h6	0	300	700	130	0.00	19.9	0.3	0.33
7	h6	i16	0	300	2700	130	0.00	4.6	0.1	0.02
8	i	i1	0	400	100	130	0.00	94.5	0.8	1.44
9	i1	i2	0	350	2250	130	0.00	49.0	0.5	0.82
10	i2	i3	0	100	1000	130	0.00	5.0	0.6	5.33
11	i2	i4	0	350	4900	130	0.00	44.0	0.5	0.67
12	i4	i5	0	300	1200	130	0.00	25.6	0.4	0.52
13	i5	i6	0	250	2150	130	0.00	17.2	0.4	0.61
14	i6	i7	0	200	500	130	0.00	4.6	0.1	0.15
15	i11	i12	0	200	1100	130	0.00	4.7	0.1	0.16
16	i11	i13	0	200	2300	130	0.00	3.9	0.1	0.12
17	i1	i14	0	250	4030	130	0.00	25.1	0.5	1.23
18	i14	i15	0	150	100	130	0.00	5.2	0.3	0.81
19	j1	j2	0	200	2450	130	0.00	7.2	0.2	0.36
20	j1	j3	0	250	1900	130	0.00	13.2	0.3	0.37
21	j3	j4	0	100	350	130	0.00	6.5	0.8	8.80
22	j3	j5	0	250	1900	130	0.00	6.7	0.1	0.11
23	j5	j6	0	100	1110	130	0.00	6.7	0.8	9.15
24	i1	j1	0	300	1700	130	0.00	20.4	0.3	0.34
25	i4	p1	0	200	5800	130	0.00	13.6	0.4	1.16
26	p1	p2	0	100	600	130	0.00	5.1	0.7	5.65
27	p1	p3	0	150	1600	130	0.00	8.4	0.5	1.96
28	p3	p4	0	100	2100	130	0.00	3.5	0.4	2.74
29	i6	b13	0	200	2140	130	0.00	12.7	0.4	1.03
30	b13	b12	0	200	600	130	0.00	8.6	0.3	0.50
31	b12	i11	0	200	1330	130	0.00	8.6	0.3	0.50
32	b13	b15	0	150	3100	130	0.00	4.1	0.2	0.51

II.11 Kahatagasdigiliya Subzone

(1) Distribution Model



(2) Results of Calculation

Specification of Nodes

NO	Node	Type	Demand l/sec	TH m	GL m	He m	GND No.	Demand m3/day	Allocation	Peak factor
1	T	1.0	(117.8)	163.0	143.0	20.0		0	1.0	2.0
2	a1	0.0	0.0	161.5	130.0	31.5		0	1.0	2.0
3	a2	0.0	0.0	161.1	131.0	30.1		0	1.0	2.0
4	a3	0.0	0.0	158.8	131.0	27.8		0	1.0	2.0
5	a4	0.0	6.1	158.0	131.0	27.0	234	263	1.0	2.0
6	a5	0.0	0.0	156.3	131.0	25.3		0	1.0	2.0
7	a6	0.0	5.6	155.8	130.0	25.8	223	242	1.0	2.0
8	a7	0.0	0.0	155.0	132.0	23.0		0	1.0	2.0
9	a8	0.0	5.0	154.9	133.0	21.9	222	215	1.0	2.0
10	a9	0.0	0.0	160.5	125.0	35.5		0	1.0	2.0
11	a10	0.0	14.5	150.9	127.0	23.9	232	625	1.0	2.0
12	a11	0.0	0.0	157.9	122.0	35.9		0	1.0	2.0
13	a12	0.0	6.5	156.2	125.0	31.2	198	281	1.0	2.0
14	a13	0.0	0.0	157.4	118.0	39.4		0	1.0	2.0
15	a14	0.0	4.2	154.9	130.0	24.9	202	181	1.0	2.0
16	a15	0.0	0.0	154.6	117.0	37.6		0	1.0	2.0
17	a16	0.0	8.0	152.0	115.0	37.0	196	344	1.0	2.0
18	a17	0.0	0.0	153.4	111.0	42.4		0	1.0	2.0
19	a18	0.0	4.8	152.2	121.0	31.2	197	209	1.0	2.0
20	a19	0.0	0.0	151.1	106.0	45.1		0	1.0	2.0
21	a20	0.0	7.5	145.9	118.0	27.9	203	324	1.0	2.0
22	b1	0.0	10.1	157.2	125.0	32.2	230	437	1.0	2.0
23	b4	0.0	0.0	160.5	125.0	35.5		0	1.0	2.0
24	b5	0.0	8.0	155.6	104.0	51.6	221	344	1.0	2.0
25	b6	0.0	5.6	156.7	111.0	45.7	220	242	1.0	2.0
26	b7	0.0	4.8	154.2	102.0	52.2	217	209	1.0	2.0
27	b8	0.0	10.1	157.5	121.0	36.5	231	436	1.0	2.0
28	b9	0.0	4.8	147.3	110.0	37.3	235	206	1.0	2.0
29	b11	0.0	6.1	147.5	98.0	49.5	216	262	1.0	2.0
30	b12	0.0	6.3	141.0	108.0	33.0	218, 219	270	1.0	2.0

Specification of Pipelines

NO	Node(u)	Node(d)	Type	DIA mm	Length m	C	Spec. Loss m	Q l/sec	V m/sec	I o/oo
1	T	a1	0	400	1200	130	0.00	87.1	0.7	1.2
2	a1	a2	0	400	500	130	0.00	72.2	0.6	0.9
3	a2	a3	0	250	4000	130	0.00	16.7	0.3	0.6
4	a3	a4	0	100	100	130	0.00	6.1	0.8	7.7
5	a3	a5	0	200	3410	130	0.00	10.6	0.3	0.7
6	a5	a6	0	150	500	130	0.00	5.6	0.3	0.9
7	a5	a7	0	150	1700	130	0.00	5.0	0.3	0.7
8	a7	a8	0	150	100	130	0.00	5.0	0.3	0.7
9	a2	a9	0	250	100	130	0.00	55.6	1.1	5.3
10	a9	a10	0	150	1800	130	0.00	14.5	0.8	5.3
11	a9	a11	0	250	1450	130	0.00	31.0	0.6	1.8
12	a11	a12	0	100	200	130	0.00	6.5	0.8	8.7
13	a11	a13	0	250	450	130	0.00	24.5	0.5	1.2
14	a13	a14	0	150	4570	130	0.00	4.2	0.2	0.5
15	a13	a15	0	250	3300	130	0.00	20.3	0.4	0.8
16	a15	a16	0	150	1520	130	0.00	8.0	0.5	1.8
17	a15	a17	0	200	1300	130	0.00	12.3	0.4	1.0
18	a17	a18	0	150	1720	130	0.00	4.8	0.3	0.7
19	a17	a19	0	150	1440	130	0.00	7.5	0.4	1.6
20	a19	a20	0	150	3300	130	0.00	7.5	0.4	1.6
21	T	b4	0	250	1400	130	0.00	30.7	0.6	1.8
22	b4	b5	0	150	2770	130	0.00	8.0	0.5	1.8
23	b4	b6	0	200	1270	130	0.00	22.8	0.7	3.0
24	b6	b7	0	200	1370	130	0.00	17.2	0.5	1.8
25	b7	b11	0	150	1700	130	0.00	12.3	0.7	4.0
26	a1	b8	0	200	2900	130	0.00	14.9	0.5	1.4
27	b8	b9	0	100	2080	130	0.00	4.8	0.6	4.9
28	a9	b1	0	150	1200	130	0.00	10.1	0.6	2.7
29	b11	b12	0	150	6600	140	0.00	6.2	0.4	1.0

4. Summary of Pipeline Quantity

Line	Portion	DSD	Subzone	Construction profiles								
				Pipelines (m)								
				75	100	150	200	250	300	350	400	Total Length
MAH	I	Rambewa	I-1 Rambewa E.T. Subzone	0	0	4800	9400	1500	3600	1900	1700	22,900
MAH	I	Medawachchiya	I-2 Issinbassagala E.T. Subzone	0	3600	18600	11900	24200	700	3700	0	62,700
MAH	I	Medawachchiya	I-3 Ethakada E.T. Subzone	0	3400	26000	17400	300	0	0	0	47,100
MAH	I	Rambewa	I-4 East Rambewa E.T. Subzone	0	0	6100	2500	100	0	0	0	8,700
MAH	**I**	**(Subtotal)**		**0**	**7000**	**55500**	**41200**	**26100**	**4300**	**5600**	**1700**	**141,400**
WAH	II(a)	Padaviya /Kebithigollewa	II-1 Wahalkada E.T. Subzone	0	10800	3500	1800	0	0	0	0	16,100
WAH	II(a)	Kebithigollewa	II-2 Kahatagollewa E.T. Subzone	0	5200	8600	2200	0	0	0	0	16,000
WAH	II(a)	Padaviya	II-3 Bogahawewa E.T. Subzone (Including Kumbukwewa E.T.)	0	9100	15500	5900	10600	3400	1200	2600	48,300
WAH	II(a)	Kebithigollewa	II-4 KAH-KEB Median E.T. Subzone	0	2500	11800	2600	0	0	0	0	16,900
WAH	II(a)	Kebithigollewa	II-5 Kebithigollewa E.T. Subzone	0	1500	36600	12500	3900	0	700	0	55,200
WAH	**II(a)**	**(Subtotal)**		**0**	**29100**	**76000**	**25000**	**14500**	**3400**	**1900**	**2600**	**152500**
WAH	II(b)	Horowpothana	II-6 North Horowpothana City E.T. Subzone	0	0	5100	3600	0	0	0	0	8,700
WAH	II(b)	Horowpothana	II-7 Horowpothana E.T. Subzone	0	2500	13900	0	4600	0	0	0	21,000
WAH	II(b)	Horowpothana	II-8 West Horowpothana E.T. Subzone	0	0	3500	15500	3900	0	0	0	22,900
WAH	II(b)	Horowpothana	II-9 Rathmalgahawewa E.T. Subzone	0	5300	7400	2600	0	0	0	0	15,300
WAH	II(b)	Kahatagasdigiliya	II-10 Hamillewa E.T. Subzone	0	6500	9400	17800	8900	8300	7900	100	58,900
WAH	II(b)	Kahatagasdigiliya	II-11 Kahatagasdigiliya E.T. Subzone	0	2600	22700	8400	11800	0	0	1900	47,400
WAH	**II(b)**	**(Subtotal)**		**0**	**16900**	**62000**	**47900**	**29200**	**8300**	**7900**	**2000**	**174200**
WAH	II(a)+(b)	(Subtotal)		**0**	**46,000**	**138,000**	**72,900**	**43,700**	**11,700**	**9,800**	**4,600**	**326,700**
Grand Total				**0**	**53,000**	**193,500**	**114,100**	**69,800**	**16,000**	**15,400**	**6,300**	**468,100**

Note: Pipeline quantity in the above table includes 10% contingency

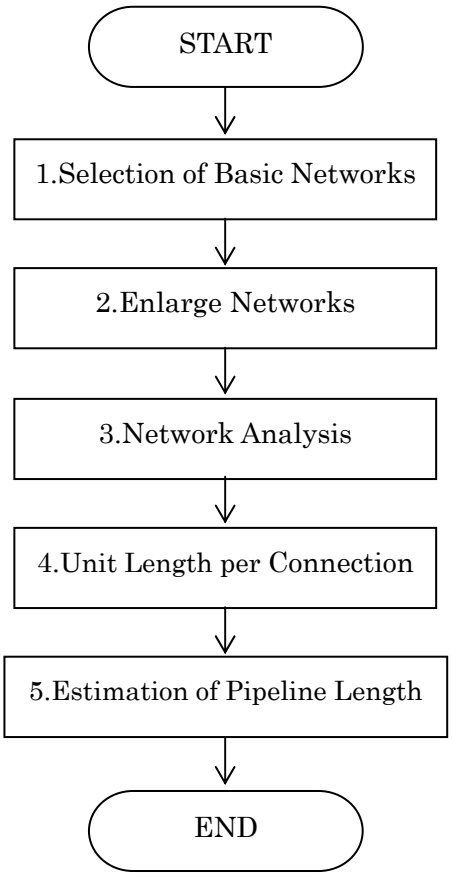
APPENDIX 5.3(c) DISTRIBUTION SUBSYSTEM

1. Method for Analysis

Distribution subsystem is the distribution network system to distribute water throughout the service area in GNDs. Treated water will be received either at the existing elevated tank of NWSDB or CBO systems and at the inlet of new system of GNDs. The purpose of this study is to estimate the cost for the Project by estimate of pipeline length for each size of distribution pipeline.

Since the service areas of the existing system and new system of GNDs are variety in size, demand and topographical conditions, the network models are provided for the network analysis. Based on the network analysis, unit length per connection is estimated for each size of pipeline, which is applied for GNDs to estimate required length of each size of distribution pipeline to estimate pipeline length required for the year 2024 and 2034.

The estimate of distribution pipeline length is carried out based on the following procedures:



1. Select three networks (small, medium and large systems) designed by existing CBO system. The system capacities of the above systems are 100m3/day as small system, 150m3/day as medium system and 300m3/day as large system.
2. Determine scale of distribution systems of 150m3/day for small system, 300m3/day for medium system and 600m3/day for large system as day average demand in 2034.
3. Network models were established by enlarging existing system in length and node discharge in proportion to demand difference. Using the above network models, network analysis carried out to obtain size and pipeline length.
4. Unit length of each size of distribution pipe per service connection is analyzed to obtain pipeline length by size for respective size of network.
5. Pipeline length of each size are estimated by GND using above unit length.

2. Network Analysis

The network analysis was carried out for the above three cases of Small, medium and large systems. The results of the analysis are shown in **Attachment 1**. From the above analysis, the unit length per service connection by size is calculated and summarized as Table 1 below.

Table 1 Unit Pipeline Length per Service Connection

Network Size	Distribution Pipeline length per Connection					
	200	150	100	75	50	Total
Small Size	-	-	6	25	39	70
Medium Size	-	2	6	15	27	50
Large Size	1	4	5	7	23	40

3. Service Connection and Distribution Pipeline Length

In accordance with water demand projection, the service connections are estimated by GNDs based on served population and average household size by DSDs. **Attachment 2** present the pipeline length required in each key year of 2018 as project completion year for Phase I, 2024 as the end of Phase I and 2034 as the target year of the project.

4. Pipeline Length by Size for Distribution Subsystem

Pipeline length required for the Phase I Project is estimated by the elevated tank of Mahakanadarawa and Wahalkada systems as detailed in the **Attachment 3** using the analysis made in the above. The summary of required pipeline length by size is presented in **Table 2**.

Table 2 Summary of Distribution Subsystem

Sr. No.	System/E. Tank	Pipeline Length (Phase I Requirement) 200	150	100	75	50	Total	Construction Phase (up to 2018) 200	150	100	75	50	Total
I	**Mahakandarawa System**												
I-1	Rambewa, I-1 ET	1,642	6,569	16,341	7,894	16,814	49,260	1,642	6,569	13,018	4,053	9,677	34,959
I-2	Issinbassagala. I-2 ET	4,479	28,179	40,265	46,995	83,657	203,575	4,479	26,979	40,265	27,747	54,412	153,882
I-3	Ethakada, I-3 ET	579	4,057	14,447	15,566	23,853	58,502	579	4,057	14,447	12,195	19,196	50,474
I-4	East Rambewa, I-4ET	0	886	3,844	1,697	2,882	9,309	0	886	3,844	1,548	2,629	8,907
I-5	Others	232	5,823	23,940	54,594	64,421	149,010	232	5,823	23,940	38,420	46,132	114,547
	Total of Mahakandarawa	6,932	45,514	98,837	126,746	191,627	**469,656**	6,932	44,314	95,514	83,963	132,046	**362,769**
II-A	**Wahalkada - A (north)**												
II-1	Wahalkada, II-1ET	0	0	8,372	5,311	8,283	21,966	0	0	8,372	4,976	7,762	21,110
II-2	Kahatagollewa, II-2 ET	0	0	4,679	2,799	4,366	11,844	0	0	4,679	2,530	3,948	11,157
II-3	Bogahawewa, II-3 ET	4,329	17,422	27,249	15,408	47,985	112,393	4,329	17,422	27,249	6,294	28,115	83,409
II-4	KAH-KEB Median, II-4 ET	0	0	7,709	4,195	6,544	18,448	0	0	7,709	3,835	5,983	17,527
II-5	Kebitigollewa, II-5 ET	2,200	8,756	17,618	7,054	30,937	66,565	2,200	7,788	17,021	6,409	21,215	54,633
II-6	Others	0	0	0	0	0	0	0	0	0	0	0	0
	Subtotal of Wahalkada-A	6,529	26,178	65,627	34,767	98,115	**231,216**	6,529	25,210	65,030	24,044	67,023	**187,836**
II-B	**Wahalkada - B (south)**												
II-6	North Horowpothana, II-6 ET	0	872	4,070	1,874	3,146	9,962	0	872	4,070	1,730	2,899	9,571
II-7	Horowpoyjana, II-7 ET	0	1,134	7,422	6,619	10,357	25,532	0	1,134	7,422	4,781	7,102	20,439
II-8	West Horowpothana, II-8 ET	0	2,700	12,395	5,526	9,318	29,939	0	2,700	12,395	5,027	8,471	28,593
II-9	Rathmalgahawewa, II-9 ET	837	3,346	7,235	7,262	11,188	29,868	837	3,346	7,235	4,512	6,143	22,073
II-10	Hamillewa, II-10 ET	0	2,674	27,408	27,382	32,110	89,574	0	2,674	25,977	22,387	24,237	75,275
II-11	Kahatagasdigikiya, II-11 ET	2,835	14,148	30,443	34,921	48,740	131,087	2,835	14,148	30,443	22,499	28,707	98,632
II-12	Other	0	66	4,975	7,803	15,408	28,252	0	66	4,975	6,346	12,430	23,817
	Subtotal of Wahalkada-B	3,672	24,940	93,948	91,387	130,267	**344,214**	3,672	24,940	92,517	67,282	89,989	**278,400**
	Total of Wahalkada	10,201	51,118	159,575	126,154	228,382	**575,430**	10,201	50,150	157,547	91,326	157,012	**466,236**
	Grand Total	**17,133**	**96,632**	**258,412**	**252,900**	**420,009**	**1,045,086**	**17,133**	**94,464**	**253,061**	**175,289**	**289,058**	**829,005**

Attachment 1 Distribution Network Analysis

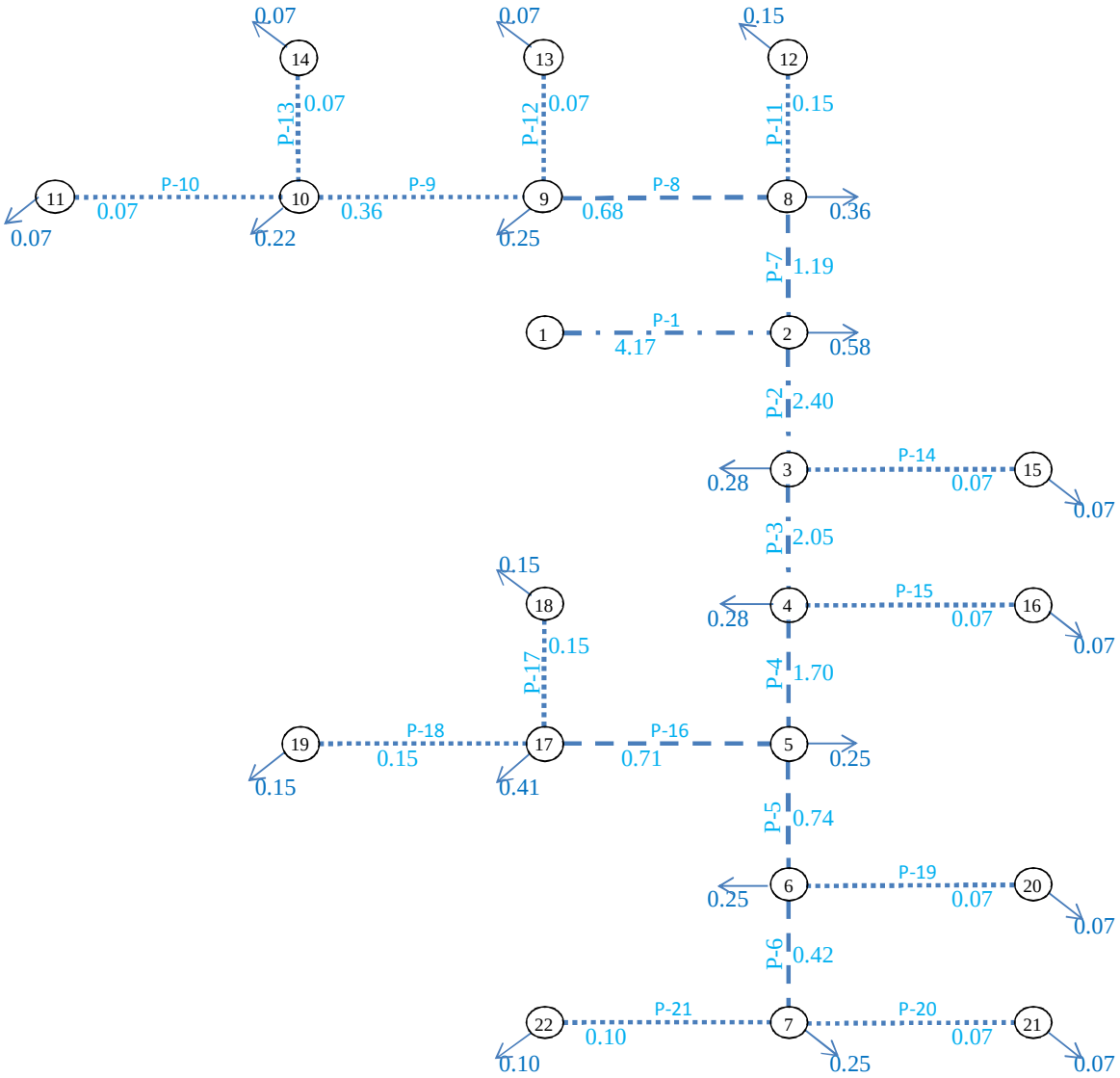
Small System

Year		2034	2024
Demand	m3/d	150	61
Pcpd	l/d	154	145
Popu.Served:		977	420
HH:		4	4
Connection	nos.	244	105

Year:	2012	2024	2034
pcpd:	80	86	91
Day ave.:	135	145	154
Day max.:	162	174	184
Peak hour:	324	348	369
			4.27
Non-dom:	35%	NRW:	20%
Day max:	1.2	Peak hour:	2

System Layout

System capacity: 4.17



Network Analysis

Node Data

No.	q34	WL34
	l/s	m
1	4.17	15.00
2	0.58	13.66
3	0.28	12.70
4	0.28	12.10
5	0.25	9.87
6	0.25	9.39
7	0.25	9.14
8	0.36	11.80
9	0.25	11.20
10	0.22	10.99
11	0.07	10.95
12	0.15	11.46
13	0.07	11.12
14	0.07	10.95
15	0.07	12.65
16	0.07	11.59
17	0.41	9.60
18	0.15	9.34
19	0.15	9.34
20	0.07	9.35
21	0.07	9.10
22	0.10	**9.05**
	4.17	

Line Data

No.	NOD(u)	NOD(d)	ND	L	q	i	hf
			mm	m	l/s	‰	m
1	1	2	100	300	4.17	4.45	1.34
2	2	3	100	600	2.40	1.60	0.96
3	3	4	100	500	2.05	1.20	0.60
4	4	5	75	650	1.70	3.44	2.23
5	5	6	75	650	0.74	0.74	0.48
6	6	7	75	950	0.42	0.26	0.25
7	2	8	75	1050	1.19	1.78	1.87
8	8	9	75	950	0.68	0.63	0.60
9	9	10	75	1050	0.36	0.19	0.20
10	10	11	50	700	0.07	0.07	0.05
11	8	12	50	1200	0.15	0.28	0.33
12	9	13	50	1200	0.07	0.07	0.08
13	10	14	50	1200	0.07	0.07	0.08
14	3	15	50	700	0.07	0.07	0.05
15	4	16	50	700	0.07	0.07	0.05
16	5	17	75	750	0.71	0.68	0.51
17	17	18	50	950	0.15	0.28	0.26
18	17	19	50	950	0.15	0.28	0.26
19	6	20	50	600	0.07	0.07	0.04
20	7	21	50	700	0.07	0.07	0.05
21	7	22	50	700	0.10	0.13	0.09
				17,050			

Summary of Pipeline Connection: 244

ND	L	u. length	rounded
mm	m	m/conn	m/conn
100	1,400	5.7	6
75	6,050	24.8	25
50	9,600	39.3	39
total	17,050		70

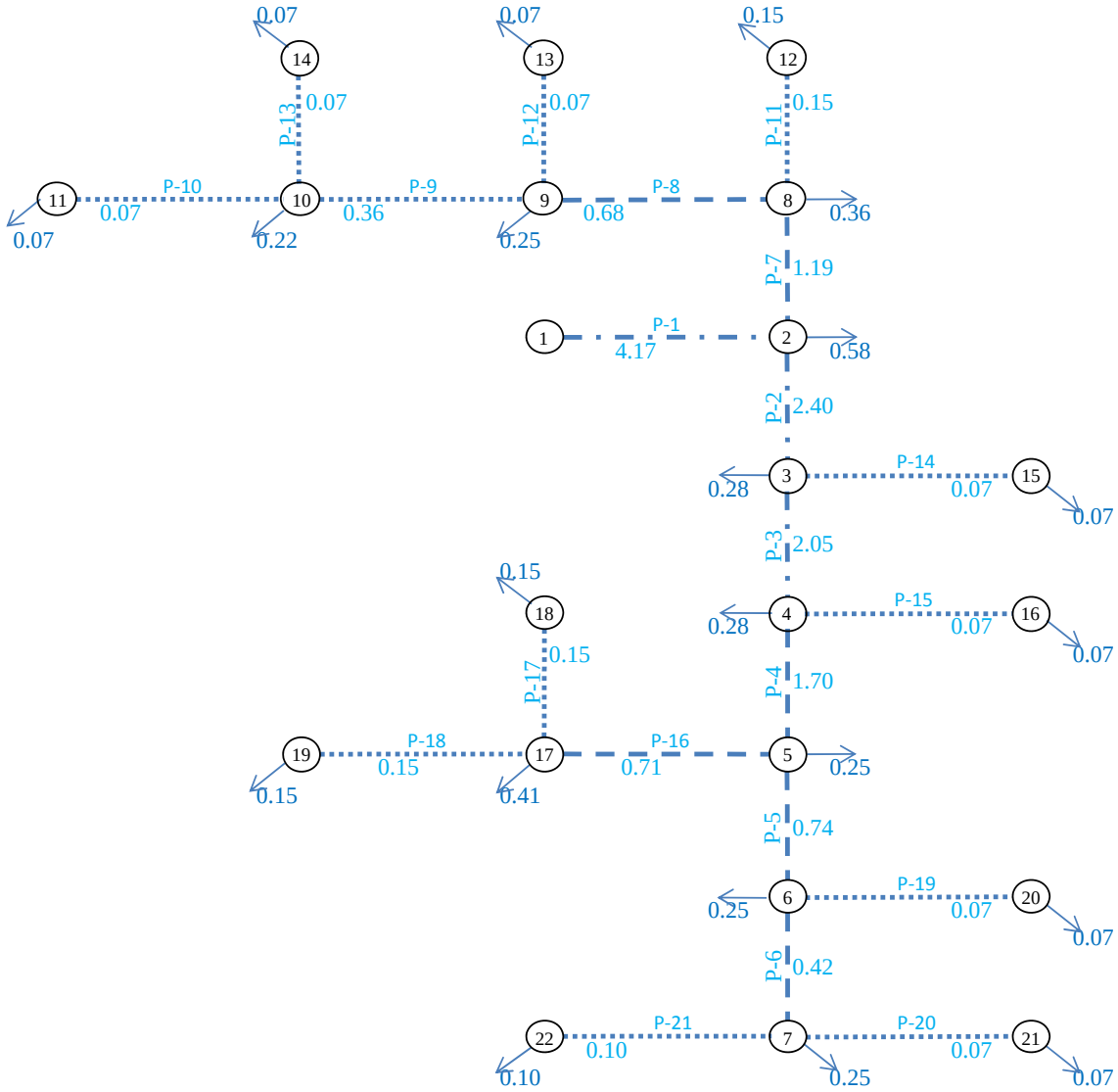
Small System

Year		2034	2024
Demand	m3/d	150	61
Pcpd	l/d	154	145
Popu.Served:		977	420
HH:		4	4
Connection	nos.	244	105

Year:	2012	2024	2034
pcpd:	80	86	91
Day ave.:	135	145	154
Day max.:	162	174	184
Peak hour:	324	348	369
			4.27
Non-dom:	35%	NRW:	20%
Day max:	1.2	Peak hour:	2

System Layout

System capacity: 4.17



Network Analysis

Node Data

No.	q34	WL34
	l/s	m
1	4.17	15.00
2	0.58	13.66
3	0.28	12.70
4	0.28	12.10
5	0.25	9.87
6	0.25	9.39
7	0.25	9.14
8	0.36	11.80
9	0.25	11.20
10	0.22	10.99
11	0.07	10.95
12	0.15	11.46
13	0.07	11.12
14	0.07	10.95
15	0.07	12.65
16	0.07	11.59
17	0.41	9.60
18	0.15	9.34
19	0.15	9.34
20	0.07	9.35
21	0.07	9.10
22	0.10	**9.05**
	4.17	

Line Data

No.	NOD(u)	NOD(d)	ND	L	q	i	hf
			mm	m	l/s	‰	m
1	1	2	100	300	4.17	4.45	1.34
2	2	3	100	600	2.40	1.60	0.96
3	3	4	100	500	2.05	1.20	0.60
4	4	5	75	650	1.70	3.44	2.23
5	5	6	75	650	0.74	0.74	0.48
6	6	7	75	950	0.42	0.26	0.25
7	2	8	75	1050	1.19	1.78	1.87
8	8	9	75	950	0.68	0.63	0.60
9	9	10	75	1050	0.36	0.19	0.20
10	10	11	50	700	0.07	0.07	0.05
11	8	12	50	1200	0.15	0.28	0.33
12	9	13	50	1200	0.07	0.07	0.08
13	10	14	50	1200	0.07	0.07	0.08
14	3	15	50	700	0.07	0.07	0.05
15	4	16	50	700	0.07	0.07	0.05
16	5	17	75	750	0.71	0.68	0.51
17	17	18	50	950	0.15	0.28	0.26
18	17	19	50	950	0.15	0.28	0.26
19	6	20	50	600	0.07	0.07	0.04
20	7	21	50	700	0.07	0.07	0.05
21	7	22	50	700	0.10	0.13	0.09
				17,050			

Summary of Pipeline Connection: 244

ND	L	u. length	rounded
mm	m	m/conn	m/conn
100	1,400	5.7	6
75	6,050	24.8	25
50	9,600	39.3	39
total	17,050		70

Nos of nodes 13
Nos of pipes 15

NODE

NO	Type	Q l/sec	WL m	GL m	EH m
1	1	-8.350	15.00		15.00
2	0	0.380	14.66		14.66
3	0	0.270	14.31		14.31
4	0	0.450	14.10		14.10
5	0	0.380	13.87		13.87
6	0	0.520	12.49		12.49
7	0	2.270	11.44		11.44
8	0	1.610	10.84		10.84
9	0	0.270	10.48		10.48
10	0	0.690	9.89		9.89
11	0	0.410	13.88		13.88
12	0	0.550	9.57		9.57
13	0	0.550	10.73		10.73

PIPE

	NO(u)	NO(d)	Dia mm	Length m	C	dH m	Q l/sec	V m/sec	I o/oo
1	1	2	150	150	120	0.34	8.350	0.47	2.23
2	2	3	150	300	120	0.36	5.923	0.34	1.18
3	3	4	150	300	120	0.21	4.504	0.25	0.71
4	4	5	150	380	120	0.22	4.054	0.23	0.59
5	5	6	100	380	120	1.38	3.738	0.48	3.64
6	6	7	100	380	120	1.05	3.218	0.41	2.76
7	2	8	75	790	120	3.83	2.047	0.46	4.85
8	8	9	75	1,260	120	0.35	0.437	0.10	0.28
9	9	10	50	1,770	120	0.60	0.167	0.09	0.34
10	10	11	50	890	120	-3.99	-0.675	-0.34	-4.49
11	11	5	75	790	120	0.01	0.064	0.01	0.01
12	11	3	100	1,050	120	-0.43	-1.149	-0.15	-0.41
13	10	12	50	1,110	120	0.32	0.152	0.08	0.29
14	12	13	50	690	120	-1.16	-0.398	-0.20	-1.69
15	13	7	75	610	120	-0.71	-0.948	-0.21	-1.17

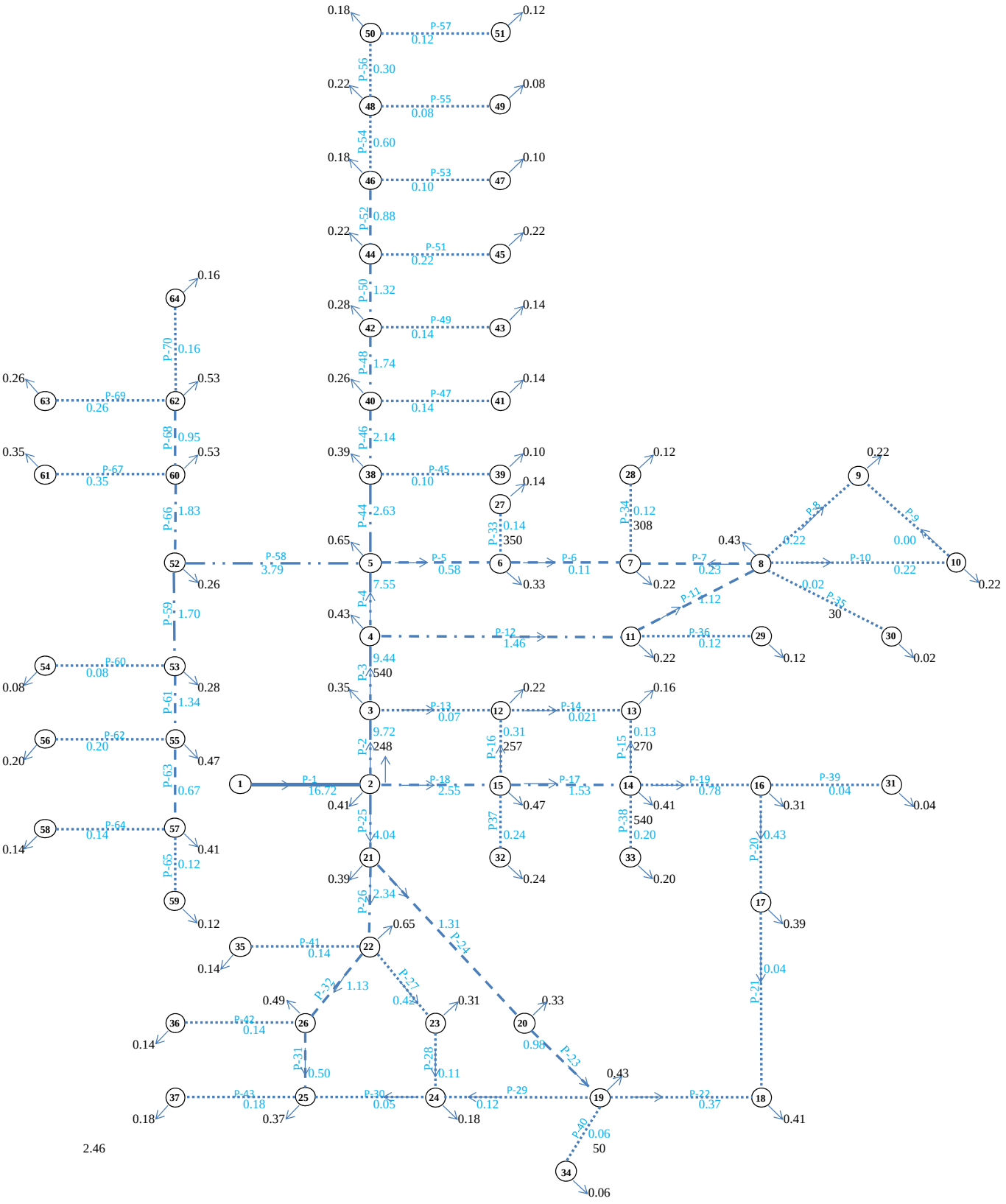
End

Large System

				Year:	2012	2024	2034
Year		2034	2012	pcpd:	80	86	91
Demand	m3/d	600	310	Day ave.:	135	145	154
Pcpd	l/d	154	145	Day max.:	162	174	184
Popu.Served:		3,907	2,136	Peak hour:	324	348	369
HH:		4	4				4.27
Connection	nos.	977	534	Non-dom:	35%	NRW:	20%
				Day max:	1.2	Peak hour:	2

System Layout

System Capacity: 16.67 l/s



Hydraulic Analysis

Node Data			Line Data							
No.	q34 l/sec	WL34 m	No.	Node (u)	Node (d)	ND mm	L34 m	q34 l/sec	i ‰	hf m
1	16.82	15.00	1	1	2	200	940	16.72	1.99	1.87
2	0.41	14.01	2	2	3	150	410	9.72	2.96	1.21
3	0.35	13.55	3	3	4	150	900	9.44	2.80	2.52
4	0.43	13.13	4	4	5	150	650	7.55	1.85	1.21
5	0.65	12.84	5	5	6	75	750	0.58	0.47	0.35
6	0.33	12.51	6	6	7	75	250	0.11	0.02	0.01
7	0.22	12.49	7	7	8	75	190	0.23	0.08	0.02
8	0.43	12.49	8	8	9	50	490	0.22	0.56	0.27
9	0.22	12.32	9	9	10	50	480	0.00	0.00	0.00
10	0.22	12.32	10	10	8	50	480	0.22	0.57	0.27
11	0.22	12.99	11	8	11	75	700	1.12	1.59	1.11
12	0.22	13.55	12	11	4	100	680	1.46	0.64	0.43
13	0.16	13.55	13	3	12	50	280	0.07	0.06	0.02
14	0.41	13.60	14	12	13	50	270	0.02	0.01	0.00
15	0.47	13.72	15	13	14	50	410	0.13	0.21	0.09
16	0.31	12.61	16	12	15	50	390	0.31	1.05	0.41
17	0.39	11.44	17	14	15	100	450	2.55	1.79	0.80
18	0.41	11.43	18	15	2	100	440	1.53	0.70	0.31
19	0.43	12.33	19	14	16	50	260	0.78	5.86	1.52
20	0.33	12.71	20	16	17	50	910	0.43	1.95	1.77
21	0.39	13.90	21	17	18	50	740	0.04	0.02	0.02
22	0.65	13.47	22	18	19	50	970	0.37	1.47	1.43
23	0.31	12.38	23	19	20	75	550	0.98	1.24	0.68
24	0.18	12.33	24	20	21	75	1000	1.31	2.12	2.12
25	0.37	12.33	25	21	2	150	300	4.04	0.58	0.17
26	0.49	12.50	26	21	22	100	680	2.34	1.53	1.04
27	0.14	12.37	27	22	23	50	910	0.42	1.87	1.70
28	0.12	12.40	28	23	24	50	480	0.11	0.16	0.08
29	0.12	12.90	29	24	19	50	100	0.12	0.18	0.02
30	0.02	12.49	30	24	25	50	160	0.05	0.04	0.01
31	0.04	12.61	31	25	26	75	700	0.50	0.36	0.25
32	0.24	13.02	32	26	22	75	950	1.13	1.62	1.53
33	0.20	13.19	33	6	27	50	560	0.14	0.24	0.14
34	0.06	12.32	34	7	28	50	490	0.12	0.18	0.09
35	0.14	13.33	35	8	30	50	50	0.02	0.01	0.00
36	0.14	12.36	36	11	29	50	480	0.12	0.18	0.09
37	0.18	12.02	37	15	32	50	1050	0.24	0.66	0.70
38	0.39	12.56	38	14	38	50	860	0.20	0.47	0.41
39	0.10	12.51	39	16	31	50	190	0.04	0.02	0.00
40	0.26	11.98	40	19	34	50	290	0.06	0.05	0.01
41	0.14	11.84	41	22	35	50	570	0.14	0.24	0.14
42	0.28	11.66	42	26	36	50	570	0.14	0.24	0.14
43	0.14	11.51	43	25	37	50	800	0.18	0.39	0.31
44	0.22	11.37	44	5	38	150	1050	2.63	0.26	0.28
45	0.22	10.99	45	38	39	50	430	0.10	0.13	0.06
46	0.18	11.23	46	38	40	100	450	2.14	1.30	0.58
47	0.10	11.18	47	40	41	50	570	0.14	0.24	0.14
48	0.22	10.37	48	40	42	100	360	1.74	0.88	0.32
49	0.08	10.33	49	42	43	50	620	0.14	0.24	0.15
50	0.18	10.09	50	42	44	100	540	1.32	0.53	0.29
51	0.12	10.00	51	44	45	50	680	0.22	0.56	0.38
52	0.26	12.58	52	44	46	75	140	0.88	1.02	0.14
53	0.28	12.26	53	46	47	50	430	0.10	0.13	0.06
54	0.08	11.39	54	46	48	50	240	0.60	3.61	0.87
55	0.47	11.83	55	48	49	50	380	0.08	0.09	0.03
56	0.20	11.45	56	48	50	50	280	0.30	1.00	0.28
57	0.41	11.34	57	50	51	50	480	0.12	0.18	0.09
58	0.14	11.20	58	5	52	150	500	3.79	0.52	0.26
59	0.12	11.25	59	52	53	100	380	1.70	0.85	0.32
60	0.53	10.93	60	53	54	50	380	0.08	0.09	0.03
61	0.35	**8.89**	61	53	55	100	780	1.34	0.55	0.43
62	0.53	10.30	62	55	56	50	810	0.20	0.47	0.38
63	0.26	9.47	63	55	57	75	800	0.67	0.61	0.49
64	0.16	10.08	64	57	58	50	570	0.14	0.24	0.14
		16.82	65	57	59	50	480	0.12	0.18	0.09
			66	52	60	75	420	1.83	3.94	1.65
			67	60	61	50	1530	0.35	1.33	2.04
			68	60	62	75	530	0.95	1.17	0.62
			69	62	63	50	1090	0.26	0.77	0.84
			70	60	64	50	720	0.16	0.31	0.23
							39,420			

Summary of Pipeline		Connection:	977
ND	L	u. length	rounded
mm	m	m/conn	m/conn
200	940	0.96	1
150	3,810	3.90	4
100	4,760	4.87	5
75	6,980	7.15	7
50	22,930	23.47	23
	39,420	40.36	40

Nos of nodes 26
Nos of pipes 32

NODE

NO	Type	Q	WL	GL	EH
		l/sec	m	m	m
1	1	-16.720	15.00		15.00
2	0	0.410	13.33		13.33
3	0	0.350	12.12		12.12
4	0	0.430	9.59		9.59
5	0	6.970	8.39		8.39
6	0	0.470	8.04		8.04
7	0	0.340	8.03		8.03
8	0	0.450	8.05		8.05
9	0	0.220	7.77		7.77
10	0	0.220	7.77		7.77
11	0	0.340	9.16		9.16
12	0	0.220	12.13		12.13
13	0	0.160	12.13		12.13
14	0	0.610	12.23		12.23
15	0	0.710	12.54		12.54
16	0	0.350	10.71		10.71
17	0	0.390	8.94		8.94
18	0	0.410	8.92		8.92
19	0	0.490	10.35		10.35
20	0	0.330	11.03		11.03
21	0	0.390	13.15		13.15
22	0	0.790	12.11		12.11
23	0	0.310	10.41		10.41
24	0	0.180	10.33		10.33
25	0	0.550	10.33		10.33
26	0	0.630	10.58		10.58

PIPE

	NO(u)	NO(d)	Dia	Length	C	dH	Q	V	I
			mm	m		m	l/sec	m/sec	o/oo
1	1	2	200	840	120		16.720	0.53	1.99
2	2	3	150	410	120		9.723	0.55	2.96
3	3	4	150	900	120		9.440	0.53	2.80
4	4	5	150	650	120		7.550	0.43	1.85
5	5	6	75	750	120		0.580	0.13	0.47
6	6	7	75	250	120		0.110	0.02	0.02
7	7	8	75	190	120		-0.230	-0.05	-0.09
8	8	9	50	490	120		0.219	0.11	0.56
9	9	10	50	480	120		-0.001	0.00	0.00
10	10	8	50	480	120		-0.221	-0.11	-0.57
11	8	11	75	700	120		-1.120	-0.25	-1.59
12	11	4	100	680	120		-1.460	-0.19	-0.64
13	3	12	50	280	120		-0.067	-0.03	-0.06
14	12	13	50	270	120		0.021	0.01	0.01
15	13	14	50	410	120		-0.139	-0.07	-0.24
16	12	15	50	390	120		-0.308	-0.16	-1.05
17	14	15	100	450	120		-1.528	-0.19	-0.70
18	15	2	100	440	120		-2.546	-0.32	-1.79
19	14	16	50	260	120		0.780	0.40	5.86
20	16	17	50	910	120		0.430	0.22	1.94
21	17	18	50	740	120		0.040	0.02	0.02
22	18	19	50	970	120		-0.370	-0.19	-1.48
23	19	20	75	550	120		-0.979	-0.22	-1.24
24	20	21	75	1000	120		-1.309	-0.30	-2.12
25	21	2	150	300	120		-4.040	-0.23	-0.58
26	21	22	100	680	120		2.341	0.30	1.53
27	22	23	50	910	120		0.421	0.21	1.87
28	23	24	50	480	120		0.111	0.06	0.16
29	24	19	50	100	120		-0.119	-0.06	-0.18
30	24	25	50	160	120		0.050	0.03	0.04
31	25	26	75	700	120		-0.500	-0.11	-0.36
32	26	22	75	950	120		-1.130	-0.26	-1.62

End

Attachment 2 Distribution Pipeline Length Required in Key Years

DISTRIBUTION NETWORK in GNDs

Connection (2034): <400 400~600 >600
Class: Small Medium Large

Distribution Network in 2034
Unit length per connect.: ND 200 150 100 75 50 total
Large: L(km) 1 4 5 7 23 40
medium: L(km) 2 6 15 27 50
Small: L(km) 6 25 39 70

GND No.	Name of GZD	NWSDB/ CBOs	Elavated Tank	Service Connection 2012	2018	2024	2034	Class	Day max. Demand	Distribution Network 2012 - Existing(km) 200	150	100	75	50	Total	Distribution Network 2018 (km) 200	150	100	75	50	Total	Distribution Network 2024 (km) 200	150	100	75	50	Total	Distribution Network 2034 (km) 350	300	250	200	150	100	75	50	Total
Padaviya									m3/d																										
1	Bisokotuwa	NWSDB	II-3 ET	287	329	377	472		348																										
3	Sudarshanagama	NWSDB	II-3 ET	193	351	542	950		701																										
2	Padaviya (50%)	NWSDB	II-3 ET	76	154	248	449		331																										
				555	833	1,166	1,871	L	1,380	0	0	590	6,323	6,292	13,205	833	3,331	4,164	4,164	19,153	31,645	1,166	4,665	5,831	8,164	26,824	46,650				1,871	7,483	9,354	13,095	43,027	74,830
4	Track B	New	II-3 ET	0	0	0	650	L	479							0	0	0	0	0	0	0	0	0	0	0	0				650	2,600	3,250	4,550	14,950	26,000
8	Maithreepura	New	II-3 ET	0	0	0	479	M	353						0	0	0	0	0	0	0	0	0	0	0	0	0				0	958	2,873	7,181	12,926	23,938
9	Abhayapura	New	II-3 ET	0	0	0	537	M	396						0	0	0	0	0	0	0	0	0	0	0	0	0				0	1,075	3,224	8,059	14,506	26,864
10	Kumbukwewa	New	II-3 ET	0	81	87	575	M	424						0	0	162	485	1211	2180	4,038	0	174	521	1,301	2,342	4,338				0	1,151	3,452	8,629	15,532	28,764
11	Urewa	New	II-3 ET	0	2	2	12	S	8						0	0	0	11	44	68	123	0	0	11	44	68	123				0	0	72	300	468	840
12	Mahasenpura	New	II-3 ET	0	56	59	381	S	281						0	0	0	338	1406	2194	3,938	0	0	356	1,481	2,311	4,148				0	0	2,286	9,525	14,859	26,670
13	Ruwanpura	New	II-3 ET	0	46	50	328	S	241						0	3713	2300	276	1150	1794	9,233	0	0	297	1,238	1,931	3,466				0	0	1,965	8,188	12,773	22,926
2	Padaviya (50%)	ADB3 (29)	II-3 ET	76	154	248	449	M	331	0	0	0	1,054	5,635	6,689	0	307	921	2303	4145	7,676	0	496	1,487	3,716	6,689	12,388				0	496	1,487	3,716	6,689	12,388
5	Buddhangala	ADB3 (28)	II-3 ET	123	191	268	420	-	310																										
6	Parakramapura	ADB3 (28)	II-3 ET	230	350	483	736	-	542																										
7	Elikimbulagala	ADB3 (28)	II-3 ET	180	274	378	576	-	425																										
	5+6+7			**532**	**815**	**1,129**	**1,732**	**L**	**1,277**	104	1,955	3,586	3,120	14,910	23,675	815	3,258	4,073	4,073	18,734	30,953	1,129	4,516	5,645	7,903	25,967	45,160				1,732	6,927	8,659	12,122	39,830	69,270
14	Bogahawewa	ADB3 (30)	II-3 ET	230	356	508	830	L	612	0	0	0	1,500	3,000	4,500	356	1,425	1,781	1,781	8,194	13,537	508	2,033	2,541	3,558	11,690	20,330				830	3,320	4,150	5,810	19,090	33,200
15	Balayawewa	Isolated	-	0	0	0	0	-								0	0	0	0	0	0														
	Subtotal			1,393	2,342	3,249	7,844			104	1,955	4,176	11,997	29,837	48,069	5,717	10,783	12,049	16,132	56,462	101,143	2,803	11,884	16,689	27,405	77,822	136,603				5,083	24,010	40,772	81,175	194,650	345,690
	Exit CBO									104	1,955	3,586	5,674	23,545	34,864	1,171	4,990	6,775	8,157	31,073	52,166	1,637	7,045	9,673	15,177	44,346	77,878				2,562	10,743	14,296	21,648	65,609	114,858
Kebitigollewa																																			
16	Handagala Kirimetiyawa	NWSDB	II-5 ET	137	155	175	213	S	161																										
17	Thimbiriwewa	NWSDB	II-5 ET	199	221	246	294	S	222																										
18	Kebithigollewa	NWSDB	II-5 ET	171	331	525	939	L	709																										
27	Halmillawetiya	NWSDB	II-5 ET	69	142	231	423	M	319																										
23	Ihala Usgollewa	NWSDB	II-5 ET	204	233	266	332	M	256																										
				780	**1,082**	**1,444**	**2,200**	**L**	**1,667**	0	2,252	3,367	15,494	14,589	35,702	1,082	4,330	5,412	5,412	24,896	41,132	1444	5776	7220	10107	33210	57757				2200	8800	11000	15400	50600	88000
19	Gonahathdenawa	NEW	II-5 ET	0	31	34	243	S	184						0	0	0	186	774	1208	2,168	0	0	206	860	1341	2407				0	0	1456	6067	9465	16988
20	Wattewewa	NEW	II-9 ET	0	51	56	384	S	290						0	0	0	309	1287	2007	3,603	0	0	338	1409	2197	3944				0	0	2306	9610	14991	26907
21	Kiriketuwewa	NEW	II-5 ET	0	65	71	484	M	366						0	0	130	389	973	1752	3,244	0	142	426	1065	1916	3549				0	968	2903	7259	13065	24195
26	Kunchuttuwa	NEW	II-5 ET	0	35	39	273	S	206						0	0	0	209	872	1360	2,441	0	0	233	970	1512	2715				0	0	1640	6835	10663	19138
28	Kanugahawewa	NEW	II-5 ET	0	43	48	338	S	256						0	0	0	259	1079	1684	3,022	0	0	288	1201	1874	3363				0	0	2027	8445	13174	23646
29	Ethalvidda Wewa	NEW	II-5 ET	0	30	33	224	S	169						0	0	0	180	750	1170	2,100	0	0	198	823	1284	2305				0	0	1345	5604	8742	15691
30	Galawewa	NEW	II-4 RT	0	39	43	292	S	221						0	0	0	234	976	1522	2,732	0	0	256	1067	1665	2988				0	0	1753	7305	11396	20454
32	Kurulugama	NEW	excluded	0	0	0	0	M							0							0	0	0	0	0	0				0	0	0	0	0	0
33	Thittagonewa	NEW	II-4 RT	0	45	49	323	S	244						0	0	0	272	1134	1769	3,175	0	0	293	1220	1902	3415				0	0	1939	8079	12604	22622
34	Thammennawa	NEW	II-4 RT	0	26	28	193	S	145						0	0	0	155	646	1008	1,809	0	0	170	707	1103	1980				0	0	1158	4823	7524	13505
35	Herathhalmillewa	NEW	II-2 ET	0	22	24	171	S	130						0	0	0	132	549	856	1,537	0	0	146	610	951	1707				0	0	1029	4287	6687	12003
36	Kahatagollewa	NEW	II-2 ET	0	31	34	232	S	175						0	0	0	187	780	1218	2,185	0	0	205	854	1332	2391				0	0	1395	5811	9065	16271
37	Bellankadawala	NEW	II-2 ET	0	32	36	254	S	192						0	0	0	195	811	1265	2,271	0	0	217	902	1408	2527				0	0	1522	6341	9893	17756
38	Punchimudagama	NEW	II-2 ET	0	16	17	122	S	92						0	0	0	94	390	609	1,093	0	0	104	433	675	1212				0	0	733	3055	4766	8554
39	Wahalkada D4	NEW	II-1 ET	0	35	37	248	S	187						0	0	0	209	872	1360	2,441	0	0	224	933	1455	2612				0	0	1485	6189	9655	17329
40	Wahalkada D5 a)	NEW	II-1 ET	0	32	34	220	S	166						0	0	0	195	811	1265	2,271	0	0	205	854	1332	2391				0	0	1317	5488	8561	15366
41	Wahalkada D6	NEW	II-1 ET	0	11	12	82	S	62						0	0	0	69	287	447	803	0	0	75	311	485	871				0	0	492	2049	3196	5737
22	Sinhalaetaweerawewa	NEW	II-4 ET	0	25	27	177	S	133	0	620	230	2,190	7,965	11,005	0	0	149	622	970	1,741	0	0	161	671	1046	1878				0	0	1062	4427	6906	12395
25	Gonumeriyawa	Pradesia(27)	II-5 ET	0	56	63	440	M	332						0	0	113	338	845	1521	2,817	0	125	376	940	1692	3133				0	880	2641	6604	11887	22012
24	Aiyathigewewa	ADB3 (25)	II-5 ET	274	305	339	405	M	306	0	450	2,689	2,689	4,583	10411	0	609	1828	4570	8225	15,232	0	678	2034	5085	9154	16951				0	810	2431	6077	10938	20256
31	Bandaraulpatha	isolated	-	0	0	0	0	-	-							0	0	0	0	0	0														
	Subtotal			1,053	2,014	2,470	7,306			0	3,322	6,286	20,373	27,137	57,118	1,082	5,182	11,001	24,440	56,112	97,817	1444	6721	13375	31022	67534	120096				2200	11458	41634	129755	233778	418825
	Exit CBO									0	1,070	2,919	4,879	12,548	21,416	0	722	2,315	6,037	10,716	19,790	0	803	2571	6696	11892	21962				0	1690	6134	17108	29731	54663

DISTRIBUTION NETWORK in GNDs

Connection (2034): <400 400~600 >600
Class: Small Medium Large

Distribution Network in 2034
Unit length per connect.: ND 200 150 100 75 50 total
Large: L(km) 1 4 5 7 23 40
medium: L(km) 2 6 15 27 50
Small: L(km) 6 25 39 70

GND No.	Name of GZD	NWSDB/ CBOs	Elavated Tank	Service Connection 2012	2018	2024	2034	Class	Day max. Demand	Distribution Network 2012 - Existing(km) 200	150	100	75	50	Total	Distribution Network 2018 (km) 200	150	100	75	50	Total	Distribution Network 2024 (km) 200	150	100	75	50	Total	Distribution Network 2034 (km) 350	300	250	200	150	100	75	50	Total
Medawachchiya																																		
58	Isinbessagama	NWSDB	I-2 ET	7	106	223	466	M	353																									
59	Ekirikanda	NWSDB	I-2 ET	120	201	299	507	L	383																									
61	Railway Town	NWSDB	I-2 ET	192	221	256	323	S	244																									
65	Walpola	NWSDB	I-2 ET	75	124	183	309	S	234																									
67	Medawachchiya West	NWSDB	I-2 ET	237	364	515	837	L	632																									
68	Medawachchiya East	NWSDB	I-2 ET	417	464	517	618	L	467																									
69	Kanadara Divulwewa	NWSDB	I-2 ET	86	140	205	343	S	259																									
78	Sangilikanadarawa	NWSDB	I-2 ET	93	189	303	537	L	406																									
				1,227	**1,809**	**2,500**	**3,940**	**L**	**2,978**	2,230	650	8,130	40,474	5,008	56,492	1,809	7,237	9,046	9,046	41,613	68,751	2500	10002	12502	17503	57511	100018				3940	15758	19698	27577	90609	157582
43	Prabodhagama	NEW	I-2 ET	0	71	78	530	M	401						0	0	142	426	1065	1916	3,549	0	156	467	1167	2101	3891				0	1061	3183	7957	14323	26524
44	Puhudivula	NEW	I-3 ET	0	56	60	397	S	300						0	0	0	335	1396	2178	3,909	0	0	360	1500	2340	4200				0	0	2382	9927	15486	27795
45	Paranahalmillewa	NEW	I-3 ET	0	0	0	386	S	292						0	0	0	0	0	0	0	0	0	0	0	0	0				0	0	2315	9646	15048	27009
47	Poonewa	NEW	I-2 ET	0	134	147	1,001	L	757						0	134	537	671	671	3,085	5,098	147	586	733	1026	3371	5863				1001	4006	5007	7010	23034	40058
51	Kuda Kumbukgollewa	NEW	I-2 ET	0	53	58	396	S	300						0	0	0	319	1329	2074	3,722	0	0	348	1451	2264	4063				0	0	2378	9909	15457	27744
52	Kadawath Rambewa	NEW	I-3 ET	101	131	164	228	S	172						0	0	0	784	3268	5099	9,151	0	0	982	4091	6383	11456				0	0	1367	5695	8884	15946
53	Lolugaswewa	NEW	I-3 ET	0	47	50	334	S	252						0	0	0	281	1171	1826	3,278	0	0	303	1262	1969	3534				0	0	2005	8354	13032	23391
71	Angunochchiya	NEW	I-2 ET	0	47	51	352	S	265						0	0	0	282	1177	1836	3,295	0	0	309	1287	2007	3603				0	0	2110	8793	13717	24620
73	Kidagalegama	NEW	I-3 ET	0	37	39	260	S	197						0	0	0	220	915	1427	2,562	0	0	236	982	1531	2749				0	0	1561	6506	10150	18217
74	Moragoda	NEW	I-3 ET	0	58	63	415	M	314						0	0	117	350	874	1574	2,915	0	125	376	940	1692	3133				0	831	2492	6230	11215	20768
42	Kidawarankulama	CWSSP (22)	I-2 ET	228	281	343	465	M	352	0	0	1,230	905	13,873	16,008	0	562	1687	4218	7593	14,060	0	685	2056	5140	9252	17133				0	930	2791	6977	12558	23256
46	Maha Kumbukgollewa	CWSSP 820)	excluded	0	0	0	0	M														0	0	0	0	0	0				0	0	0	0	0	0
49	Periyakulama	CWSSP (23)	I-2 ET	74	148	233	401	L	304																									
50	Yakawewa	CWSSP (23)	I-2 ET	91	185	297	526	L	397																									
				165	**334**	**530**	**927**	**L**	**701**	0	0	340	650	10,310	11,300	334	1,335	1,668	1,668	7,674	12,679	0	0	3179	13244	20660	37083				927	3708	4635	6490	21323	37083
54	Heerallugama	ADB3 (15)	I-3 ET	207	263	327	456	M	344							0	525	1576	3940	7092	13,133	0	654	1961	4902	8824	16341				0	912	2737	6841	12315	22805
55	Ethakada	CWSSP (24)	I-3 ET	146	240	351	579	L	437	0	0	990	570	6,964	8,524	240	961	1,201	1,201	5,526	9,129	351	1405	1756	2459	8078	14049				579	2314	2893	4050	13306	23142
56	Etaweeragollewa	ADB3 (14)	Br. "Id"	131	172	220	318	S	240	0	48	1,002	2,232	4,980	8,262	0	0	1035	4311	6725	12,071	0	0	1323	5512	8599	15434				0	0	1908	7951	12404	22263
57	Maha Divulwewa	CWSSP (21)	Br. "Ic"	84	145	217	364	**S**	275	0	0	0	48	8,156	8,204	0	0	869	3622	5650	10,141	0	0	1301	5421	8456	15178				0	0	2183	9098	14192	25473
60	Kadawathgama	ADB3 (17)	I-2 ET	219	255	295	375	S	283	0	0	2,136	2,760	4,500	9,396	0	0	1528	6366	9931	17,825	0	0	1771	7378	11510	20659				0	0	2248	9366	14611	26225
64	Viralmurippuwa	ADB3 (16)	I-2 ET	229	260	294	359	S	271							0	0	1560	6500	10140	18,200	0	0	1763	7348	11462	20573				0	0	2154	8976	14002	25132
66	Katuwela	ADB3 (12)	I-2 ET	267	389	534	841	L	636							389	1,555	1,944	1,944	8,942	14,774	534	2138	2672	3741	12291	21376				841	3366	4207	5890	19354	33658
70	Helambagaswewa	ADB3(13)	I-2 ET	202	221	242	281	S	212	0	1,200	1,200	3,500	7,500	13,400	0	0	1327	5530	8628	15,485	0	0	1450	6043	9427	16920				0	0	1684	7018	10949	19651
72	Kirigalwewa	CWSSP (19)	I-2 ET	166	195	229	295	S	223	0	0	300	1,262	12,052	13,614	0	0	1172	4884	7619	13,675	0	0	1376	5732	8941	16049				0	0	1772	7384	11519	20675
75	Unagaswewa	CWSSP (18)	I-2 ET	127	163	205	289	S	218	0	0	0	2,607	6,648	9,255	0	0	979	4079	6364	11,422	0	0	1229	5122	7990	14341				0	0	1734	7226	11272	20232
48	Anekattiya	Isolated	-	0	0	0	0	-	-																									
62	Puleliya	Isolated	-	0	0	0	0	-	-																									
63	Thammenne Elawaka	Isolated	-	0	0	0	0	-	-																									
76	Karambankulama	Isolated	-	0	0	0	0	-	-																									
77	Lindawewa	Isolated	-	0	0	0	0	-	-																									
	Subtotal			3,500	5,361	6,998	13,789			2,230	1,898	15,328	55,008	79,991	154,455	2906	12971	29260	69175	154512	268824	3532	15751	38453	103251	206659	367646				7288	32886	75444	194871	398760	709249
	Exit CBO									0	1,248	7,198	14,534	74,983	97,963	963	4,938	16,546	48,263	91,884	162,594	885	4,882	21,837	72,042	######	225,136				2,347	11,230	30,946	87,267	167,805	299,595

DISTRIBUTION NETWORK in GNDs

Connection (2034): <400 400~600 >600
Class: Small Medium Large

Distribution Network in 2034
Unit length per connect.: ND 200 150 100 75 50 total
Large: L(km) 1 4 5 7 23 40
medium: L(km) 2 6 15 27 50
Small: L(km) 6 25 39 70

GND No.	Name of GZD	NWSDB/ CBOs	Elavated Tank	Service Connection 2012	2018	2024	2034	Class	Day max. Demand	Distribution Network 2012 - Existing(km) 200	150	100	75	50	Total	Distribution Network 2018 (km) 200	150	100	75	50	Total	Distribution Network 2024 (km) 200	150	100	75	50	Total	Distribution Network 2034 (km) 350	300	250	200	150	100	75	50	Total
Rambewa																																		
99	Pallankulama	NWSDB	I-1 ET	81	167	272	497	M	358																									
100	Rambewa	NWSDB	I-1 ET	128	228	350	609	L	438																									
112	Katupuliyankulama	NWSDB	I-1 ET	90	135	185	280	S	202																									
113	Sandamalgama	NWSDB	I-1 ET	210	222	234	256	S	184																									
				508	**752**	**1,041**	**1,642**	**L**	**1,182**	0	0	1,000	2,900	12,600	16,500	752	3,008	3,760	3,760	17,297	28,577	1041	4164	5205	7287	23944	41641				1642	6569	8212	11496	37773	65692
79	Galweeragollewa	NEW	I-4 ET	0	26	29	198	S	142						0	0	0	158	660	1030	1,848	0	0	174	724	1130	2028				0	0	1186	4942	7710	13838
81	Pihimbiyagollewa	NEW	I-4 ET	0	59	65	443	M	318						0	0	118	355	888	1599	2,960	0	130	389	973	1752	3244				0	886	2658	6646	11963	22153
96	Kudagama	Isolated		-	-	-	-	-	-						0																			
101	Nabadagaswewa	NEW	I-1 ET	0	43	48	337	S	242						0	0	0	258	1077	1680	3,015	0	0	288	1199	1870	3357				0	0	2023	8429	13150	23602
103	Diviyaudabendawewa	NEW	I-1 ET	0	0	0	259	S	186						0	0	0	0	0	0	0	0	0	0	0	0	0				0	0	1552	6468	10090	18110
107	Siyambalagaswewa	NEW	I-1 ET	0	0	0	199	S	143						0	0	0	0	0	0	0	0	0	0	0	0	0				0	0	1197	4987	7780	13964
108	Wahamalgollewa	NEW	I-1 ET	0	44	47	325	S	234						0	0	0	262	1090	1700	3,052	0	0	285	1186	1850	3321				0	0	1949	8122	12670	22741
110	Wahamalgollewa Track 5	NEW	I-1 ET	0	41	45	306	S	220						0	0	0	246	1026	1600	2,872	0	0	269	1122	1750	3141				0	0	1834	7641	11920	21395
114	Mahawewa	NEW	I-1 ET	0	0	0	330	S	236						0	0	0	0	0	0	0	0	0	0	0	0	0				0	0	1978	8244	12860	23082
115	Pandukabhayapura	NEW	I-1 ET	0	0	0	224	S	161						0	0	0	0	0	0	0	0	0	0	0	0	0				0	0	1345	5603	8740	15688
82	Wewelketiya	ADB4 (06)	Br."Ia"	152	205	266	390	S	281																									
83	Thamarahalmillewa	ADB4 (06)	Br."Ia"	0	26	29	197	S	142																									
				152	**231**	**295**	**587**	**M**	**423**	0	472	2,740	4,095	2,268	9,575	0	462	1386	3465	6238	11,551	0	589	1768	4419	7955	14731				0	1174	3522	8804	15847	29347
84	Thalgahawewa	CBO	Br."Ia"	169	211	257	343	S	247	0	0	0	2,808	2,619	5,427	0	0	1266	5276	8230	14,772	0	0	1540	6417	10010	17967				0	0	2060	8583	13390	24033
85	Galkandegama	ADB 4	Br."Ia"	122	178	239	355	S	254																									
97	Kedewa	ADB 4	Br."Ia"	72	105	141	210	S	151																									
				195	**283**	**380**	**565**	**M**	**405**	0	0	225	1,020	10,250	11,495	0	566	1697	4242	7636	14,141	0	1129	3388	8469	15245	28231				0	1129	3388	8469	15245	28231
86	Balahondawewa	CWSSP	Br."Ia"	97	130	168	242	S	174	0	0	30	925	9,084	10,039	0	0	782	3256	5080	9,118	0	0	1008	4199	6550	11757				0	0	1452	6051	9440	16943
87	Ihala Kolongaswewa	CWSSP	Br."Ia"	150	162	173	195	S	140	0	0	0	0	8,007	8,007	0	0	969	4038	6300	11,307	0	0	1040	4333	6760	12133				0	0	1172	4885	7620	13677
93	Mahakanadarawa R.B.Track 2	CWSSP	Br."Ia"	193	210	228	262	S	188	0	0	498	650	3,030	4,178	0	0	1258	5244	8180	14,682	0	0	1368	5699	8890	15957				0	0	1569	6538	10200	18307
94	Mahakanadarawa R.B.Track 1	CWSSP	Br."Ia"	184	205	229	273	S	196	0	0	54	1,574	12,710	14,338	0	0	1231	5128	8000	14,359	0	0	1372	5718	8920	16010				0	0	1635	6814	10630	19079
102	Ikirigollewa	ADB4 (02)	I-1 ET	774	967	1,194	1,661	L	1,194	1,429	2,653	1,947	2,000	3,200	11,229	967	3,869	4,836	4,836	22,245	36,753	1194	4775	5969	8357	27458	47753				1661	6645	8306	11629	38209	66450
106	Katukeliyawa	CWSSP	Br."Ib"	148	175	207	270	S	194	0	0	99	515	7,437	8,051	0	0	1052	4385	6840	12,277	0	0	1243	5179	8080	14502				0	0	1620	6750	10530	18900
109	Wahamalgollewa Track 3	ADB 4	Br."Ib"	156	171	186	216	S	155	0	300	1,972	5,690	5,119	13,081	0	0	1023	4263	6650	11,936	0	0	1118	4660	7270	13048				0	0	1297	5404	8430	15131
111	Sangilikanadarawa	ADB 4	Br."Ib"	235	266	302	370	S	266	0	1,000	500	800	1,300	3,600	0	0	1597	6654	10380	18,631	0	0	1809	7538	11760	21107				0	0	2220	9250	14430	25900
80	Ambagahawewa	Isolated	-	0		0	0	-	-																									
88	Meemalwewa	Isolated	-	0		0	0	-	-																									
89	Kallanchiya	Isolated	-	0		0	0	-	-																									
90	Peenagama	Isolated	-	0		0	0	-	-																									
91	Konakumbukwewa	Isolated	-	0		0	0	-	-																									
92	Gonewa	Isolated	-	0		0	0	-	-																									
95	Rotawewa	Isolated	-	0		0	0	-	-																									
98	Kapiriggama	Isolated	-	0		0	0	-	-																									
104	Medagama	Isolated	-	0		0	0	-	-																									
105	Kolibendawewa	Isolated	-	0		0	0	-	-																									
116	Kadurugasdamana	Isolated	-	0		0	0	-	-																									
	Subtotal			2,960	3,976	4,893	9,247			1,429	4,425	9,065	22,977	77,624	115,520	1719	8023	22136	59288	120685	211851	2235	10787	28233	77479	151194	269928				3303	16403	52175	155755	288627	516263
	Exit CBO									1,429	4,425	8,065	20,077	65,024	99,020	967	4,897	17,097	50,787	95,779	169,527	1,194	6,493	21,623	64,988	######	213,196				1,661	8,948	28,241	83,177	153,971	275,998

DISTRIBUTION NETWORK in GNDs

Connection (2034):	<400	400~600	>600
Class:	Small	Medium	Large

Distribution Network in 2034

Unit length per connect.:	ND	200	150	100	75	50	total
Large:	L(km)	1	4	5	7	23	40
medium:	L(km)		2	6	15	27	50
Small:	L(km)			6	25	39	70

GND No.	Name of GZD	NWSDB/ CBOs	Elavated Tank	Service Connection 2012	2018	2024	2034	Class	Day max Demand	Distribution Network 2012 - Existing(km) 200	150	100	75	50	Total
Horowpothana															
128	Horowpothana	NWSDB	II-7 ET	193	290	405	650	L	479						
130	Medawachchi Handiya	NWSDB	II-7 ET	35	84	143	271	S	199						
				228	**373**	**548**	**921**	**L**	**678**	0	0	700	1,200	5,500	7400
117	Walahaviddawewa	NEW	II-8 ET	0	54	58	399	S	294						0
120	Welimuwapothana	NEW	II-8 ET	0	43	47	318	S	234						0
121	Nikawewa	NEW	II-8 ET	0	55	60	411	M	302						0
122	Mukkarawewa	NEW	II-8 ET	0	62	68	481	M	354						0
125	Kalpe	NEW	II-10 ET	0	41	45	307	S	226						0
127	Morakewa	NEW	II-10 ET	0	65	71	486	M	359						0
129	Kivulekada	NEW	II-8 ET	0	59	65	459	M	338						0
131	Nanumillawewa	NEW	II-10 ET	0	33	37	260	S	192						0
132	Vilewewa	NEW	II-10 ET	0	21	22	146	S	108						0
134	Puhulewewa	NEW	II-6 ET	0	56	62	436	M	322						0
135	Morawewa	NEW	II-6 ET	0	36	38	242	S	179						0
136	Thirappankadawala	NEW	II-7 ET	0	36	41	284	S	209						0
141	Pahala Divulwewa b)	NEW	II-2 ET	0	27	29	185	S	136						0
144	Wahalkada D1	NEW	II-2 ET	0	38	41	271	S	199						0
145	Wahalkada D2	NEW	II-2 ET	0	55	59	391	S	288						0
147	Rathmale	NEW	II-7 ET	0	39	42	289	S	214						0
148	Welangahaulpatha	NEW	II-7 ET	0	13	14	97	S	72						0
150	Puliyankadawala	NEW	II-10 ET	0	42	46	302	S	222						0
151	Diyatittawewa	NEW	II-10 ET	0	30	32	203	S	150						0
152	Nabadawewa	NEW	II-10 ET	0	41	44	290	S	214						0
153	Dekethipothana	NEW	II-10 ET	0	35	37	239	S	175						0
119	Ihala Angunachchiya	ADB4 (47)	excluded	0	0	0	0	S		0	0	1140	3742	6,520	11,402
126	Wadigawewa	ADB3 (44)	II-10 ET	196	214	234	272	S	200	0	1,224	522	2568	3,644	7,958
133	Maradankadawala	Rajarada (50)	II-7 ET	142	231	338	567	M	418	0	0	0	880	2,560	3,440
138	Anaolondewa	ADN4 (48)	Br."IId"	181	235	295	408	M	301	0	750	2950	1550	3,395	8,645
139	Weerasole	CWSSP (49)	Br."IIb"	0	45	47	304	S	224	0	0	0	1494	7,156	8,650
140	Kapugollewa	ADB3 (46)	Br."IIc"	196	210	224	251	S	185	0	0	0	2065	2,300	4,365
149	Parangiyawadiya	ADB3 (45)	Br."IIf"	227	246	266	304	S	224	0	0	180	4956	5,992	11,128
118	Rasnaka Wewa	Isolated	-	0		0	0	-	-						
123	Thimbiriettawala	Isolated	-	0		0	0	-	-						
124	Gammahegewewa	Isolated	-	0		0	0	-	-						
137	Thawalanhalmillewa	Isolated	-	0		0	0	-	-						
142	Dutuwewa	Isolated	-	0		0	0	-	-						
143	Wagollakada	Isolated	-	0		0	0	-	-						
146	Maradanmaduwa	Isolated	-	0		0	0	-	-						
154	Dematawewa	Isolated	-	0		0	0	-	-						
	Subtotal			1,169	2,433	2,910	9,518			0	1974	5,492	18,455	37,067	62,988
	Exit CBO									0	1,974	4,792	17,255	31,567	55,588

GND No.	Name of GZD	Distribution Network 2018 (km) 200	150	100	75	50	Total	Distribution Network 2024 (km) 200	150	100	75	50	Total	Distribution Network 2034 (km) 350	300	250	200	150	100	75	50	Total
Horowpothana																						
128	Horowpothana																					
130	Medawachchi Handiya																					
		373	1,492	1,865	1,865	8,579	14,174	548	2193	2741	3838	12610	21930				921	3683	4604	6445	21177	36830
117	Walahaviddawewa	0	0	321	1338	2087	3,746	0	0	350	1456	2272	4078				0	0	2391	9963	15542	27896
120	Welimuwapothana	0	0	255	1063	1658	2,976	0	0	279	1163	1814	3256				0	0	1905	7938	12383	22226
121	Nikawewa	0	110	330	825	1485	2,750	0	121	362	904	1627	3014				0	822	2465	6161	11090	20538
122	Mukkarawewa	0	123	369	923	1661	3,076	0	137	410	1024	1843	3414				0	961	2883	7208	12974	24026
125	Kalpe	0	0	246	1025	1599	2,870	0	0	270	1125	1755	3150				0	0	1839	7663	11954	21456
127	Morakewa	0	131	392	979	1762	3,264	0	143	428	1069	1924	3564				0	973	2918	7294	13129	24314
129	Kivulekada	0	117	351	878	1580	2,926	0	131	392	979	1762	3264				0	917	2751	6878	12380	22926
131	Nanumillawewa	0	0	200	831	1297	2,328	0	0	222	925	1443	2590				0	0	1562	6506	10150	18218
132	Vilewewa	0	0	123	513	800	1,436	0	0	132	550	858	1540				0	0	875	3644	5684	10203
134	Puhulewewa	0	112	335	836	1505	2,788	0	124	372	930	1674	3100				0	872	2616	6540	11772	21800
135	Morawewa	0	0	215	894	1394	2,503	0	0	227	944	1472	2643				0	0	1454	6056	9448	16958
136	Thirappankadawala	0	0	218	906	1414	2,538	0	0	243	1013	1580	2836				0	0	1703	7094	11066	19863
141	Pahala Divulwewa b)	0	0	164	681	1063	1,908	0	0	173	719	1121	2013				0	0	1107	4613	7196	12916
144	Wahalkada D1	0	0	228	950	1482	2,660	0	0	245	1019	1589	2853				0	0	1623	6763	10550	18936
145	Wahalkada D2	0	0	330	1375	2145	3,850	0	0	354	1475	2301	4130				0	0	2348	9781	15259	27388
147	Rathmale	0	0	233	969	1511	2,713	0	0	254	1056	1648	2958				0	0	1734	7225	11271	20230
148	Welangahaulpatha	0	0	78	325	507	910	0	0	86	356	556	998				0	0	584	2431	3793	6808
150	Puliyankadawala	0	0	254	1056	1648	2,958	0	0	273	1138	1775	3186				0	0	1811	7544	11768	21123
151	Diyatittawewa	0	0	180	750	1170	2,100	0	0	189	788	1229	2206				0	0	1220	5081	7927	14228
152	Nabadawewa	0	0	245	1019	1589	2,853	0	0	263	1094	1706	3063				0	0	1737	7238	11291	20266
153	Dekethipothana	0	0	212	881	1375	2,468	0	0	222	925	1443	2590				0	0	1431	5963	9302	16696
119	Ihala Angunachchiya							0	0	0	0	0	0				0	0	0	0	0	0
126	Wadigawewa	0	0	1286	5356	8356	14,998	0	0	1406	5856	9136	16398				0	0	1631	6794	10598	19023
133	Maradankadawala	0	462	1385	3461	6230	11,538	0	677	2030	5074	9133	16914				0	1134	3401	8501	15302	28338
138	Anaolondewa	0	471	1412	3529	6352	11,764	0	590	1770	4425	7965	14750				0	816	2448	6120	11016	20400
139	Weerasole	0	0	269	1119	1745	3,133	0	0	284	1181	1843	3308				0	0	1823	7594	11846	21263
140	Kapugollewa	0	0	1257	5238	8171	14,666	0	0	1346	5606	8746	15698				0	0	1506	6275	9789	17570
149	Parangiyawadiya	0	0	1476	6150	9594	17,220	0	0	1598	6656	10384	18638				0	0	1826	7606	11866	21298
118	Rasnaka Wewa																					
123	Thimbiriettawala																					
124	Gammahegewewa																					
137	Thawalanhalmillewa																					
142	Dutuwewa																					
143	Wagollakada																					
146	Maradanmaduwa																					
154	Dematawewa																					
	Subtotal	373	3018	14229	45735	79759	143114	548	4116	16921	53288	93209	168082				921	10178	56196	188919	317523	573737
	Exit CBO	0	933	7,085	24,853	40,448	73,319	0	1,267	8,434	28,798	47,207	85,706				0	1,950	12,635	42,890	70,417	127,892

DISTRIBUTION NETWORK in GNDs

Distribution Network in 2034

		<400	400~600	>600
Connection (2034):				
Class:		Small	Medium	Large
Unit length per connect.:	ND	200	150	100	75	50	total
Large:	L(km)	1	4	5	7	23	40
medium:	L(km)		2	6	15	27	50
Small:	L(km)			6	25	39	70

GND No.	Name of GZD	NWSDB/ CBOs	Elavated Tank	Service Connection 2012	2018	2024	2034	Class	Day max. Demand	Distribution Network 2012 - Existing(km) 200	150	100	75	50	Total	Distribution Network 2018 (km) 200	150	100	75	50	Total	Distribution Network 2024 (km) 200	150	100	75	50	Total	Distribution Network 2034 (km) 350	300	250	200	150	100	75	50	Total
Kahatagasdigiliya																																			
230	Maha Messalewa	NWSDB	II-11 ET	400	445	496	592	L	437																										
231	Kahatagasdigiliya East	NWSDB	II-11 ET	200	283	383	592	L	436																										
232	Kahatagasdigiliya West	NWSDB	II-11 ET	573	638	710	849	L	625																										
				1,173	**1,366**	**1,588**	**2,033**	**L**	**1,498**	0	1,550	1,550	4,450	19,300	26,850	1,366	5,465	6,831	6,831	31,424	51,917	1588	6353	7941	11118	36530	63530				2033	8130	10163	14228	46748	81302
197	Ellawewa	NEW	II-11 ET	0	0	0	283	S	209						0	0	0	0	0	0	0	0	0	0	0	0	0	0				0	0	1697	7069	11027	19793
198	Bethkewa Thulana	NEW	II-11 ET	0	51	56	381	S	281						0	0	0	306	1275	1989	3,570	0	0	335	1394	2174	3903				0	0	2285	9519	14849	26653
203	Mekichchawa	NEW	II-11 ET	0	59	65	440	M	324						0	0	118	354	885	1593	2,950	0	129	387	968	1742	3226				0	880	2639	6596	11873	21988
205	Sampathgama	NEW	II-10 ET	0	0	0	391	S	288						0	0	0	0	0	0	0	0	0	0	0	0	0				0	0	2348	9781	15259	27388
206	Dachchihalmillewa	NEW	II-10 ET	0	51	56	383	S	282						0	0	0	308	1281	1999	3,588	0	0	336	1400	2184	3920				0	0	2298	9575	14937	26810
207	Kudapattiya	NEW	II-10 ET	0	56	62	419	M	310						0	0	113	338	844	1519	2,814	0	123	369	923	1661	3076				0	839	2516	6289	11320	20964
208	Maha Hammillawewa	NEW	II-10 ET	0	39	43	292	S	215						0	0	0	234	975	1521	2,730	0	0	257	1069	1667	2993				0	0	1751	7294	11378	20423
213	Ambagahawewa	CWSSP (41)	II-10 ET	0	41	43	275	S	203						0	0	0	243	1013	1580	2,836	0	0	257	1069	1667	2993				0	0	1649	6869	10715	19233
216	Konwewa	NEW	II-11 ET	0	0	0	355	M	262						0	0	0	0	0	0	0	0	0	0	0	0	0				0	710	2129	5321	9578	17738
217	Thallattewa	NEW	II-11 ET	0	0	0	284	S	209						0	0	0	0	0	0	0	0	0	0	0	0	0				0	0	1703	7094	11066	19863
220	Kohombagaskada	NEW	II-11 ET	0	42	47	328	S	242						0	0	0	252	1050	1638	2,940	0	0	281	1169	1823	3273				0	0	1970	8206	12802	22978
235	Maha Galkandegama	NEW	II-11 ET	0	36	40	281	S	250						0	0	0	215	894	1394	2,503	0	0	240	1000	1560	2800				0	0	1683	7013	10940	19636
196	Ranpathvila	ADB3 (35)	II-11 ET	283	325	373	467	M	344	0	0	1,300	1,600	8,530	11,430	0	651	1952	4879	8782	16,264	0	747	2240	5599	10078	18664				0	934	2802	7005	12609	23350
201	Kokmaduwa	CWSSP (36)	II-11 ET	198	250	311	438	M	323	0	0	0	295	4,336	4,631	0	500	1500	3750	6750	12,500	0	623	1868	4669	8404	15564				0	876	2627	6566	11819	21888
202	Moragahawela	ADB3 (32)	II-11 ET	159	180	203	247	S	181	0	0	0	3,270	4,500	7,770	0	0	1079	4494	7010	12,583	0	0	1217	5069	7907	14193				0	0	1479	6163	9614	17256
209	Kumbukgollewa	CWSSP (43)	II-10 ET	95	139	189	287	S	211	0	0	0	295	3,986	4,281	0	0	831	3463	5402	9,696	0	0	1131	4713	7352	13196				0	0	1719	7163	11174	20056
210	Pandarellewa	ADB3 (34)	II-10 ET	78	121	170	267	S	197																										
211	Panwella	ADB3 (34)	II-10 ET	51	78	108	164	S	121																										
				129	**199**	**278**	**431**	**M**	**318**	0	0	830	1,360	5,613	7,803	0	398	1194	2985	5373	9,950	0	556	1667	4166	7499					0	862	2585	6461	11630	21538
212	Mee-Kumbukwewa	CWSSP (40)	II-10 ET	190	200	211	231	S	170	0	0	167	480	6,175	6,822	0	0	1200	5000	7800	14,000	0	0	1266	5275	8229					0	0	1385	5769	8999	16153
218	Weligollewa	CWSSP (42)	II-11 ET	28	68	113	199	S	146																										
219	Punchi Halmillewa	CWSSP (42)	II-11 ET	24	58	96	168	S	124																										
				51	**126**	**209**	**367**	**M**	**270**	0	0	741	370	2,865	3,976	0	252	756	1890	3402	6,300	0	419	1256	3139	5650					0	735	2204	5509	9916	18364
221	Mahawewa	CWSSP (39)	II-11 ET	202	260	328	468	M	344	0	0	1,702	1,806	5,491	8,999	0	520	1559	3896	7013	12,988	0	655	1965	4913	8843					0	936	2808	7020	12636	23400
222	Maha Kumbukwewa	CWSSP (31)	II-9 ET	166	194	227	291	S	215	0	0	0	1,940	5,460	7,400	0	0	1166	4856	7576	13,598	0	0	1361	5669	8843					0	0	1746	7275	11349	20370
223	Gonumeru Wewa	CWSSP (37)	II-11 ET	97	148	208	329	S	242	0	0	679	569	4,088	5,336	0	0	890	3706	5782	10,378	0	0	1247	5194	8102					0	0	1976	8231	12841	23048
224	Palippothana	ADB3 (33)	II-9 ET	60	95	136	220	S	162																										
225	Rathmalgahawewa	ADB3 (33)	II-9 ET	93	147	210	339	M	250																										
226	Kirigallewa	ADB3 (33)	II-9 ET	76	120	172	277	S	204																										
				229	**362**	**518**	**837**	**L**	**616**	0	0	1,000	1,500	6,300	8,800	362	1,447	1,809	1,809	8,320	13,747	518	2071	2589	3624	11908				837	3346	4183	5856	19240	33462
233	Maha Kiribbewa	CWSSP (38)	II-11 ET	63	142	239	445	M	328																										
234	Kurukkuragama	CWSSP (38)	II-11 ET	54	120	197	357	S	263																										
				117	**262**	**436**	**802**	**L**	**591**	0	0	230	0	4,980	5,210	262	1,047	1,309	1,309	6,020	9,947	436	1742	2178	3049	10017				802	3207	4009	5612	18440	32070
199	Kanadara-Rathmale	Isolated	-	0		0	0	-	-																										
200	Nekutunu Wewa	Isolated	-	0		0	0	-	-																										
204	Samadhigama	Isolated	-	0		0	0	-	-																										
214	Tikkampothana	Isolated	-	0		0	0	-	-																										
215	Divulwewa	Isolated	-	0		0	0	-	-																										
227	Kelenikawewa	Isolated	-	0		0	0	-	-																										
228	Nelugollakada	Isolated	-	0		0	0	-	-																										
229	Diganhalmillawewa	Isolated	-	0		0	0	-	-																										
	Subtotal			3,090	4,385	5,487	11,336			0	1,550	8199	17935	81624	109308	1990	10511	24326	57085	123887	217799	2542	13418	30388	75189	153840	151331				3672	21455	64354	183484	342759	615724
	Exit CBO									0	0	6,649	13,485	62,324	82,458	624	4,815	15,245	42,037	79,230	141,951	954	6,813	19,985	55,079	######	61,617				1,639	10,896	29,523	78,630	150,267	270,955
	Total																																		

Attachment 3 Distribution Pipeline Length by Elevated Tanks

Summary of Distribution Subsystem by Elevated Tank- Phase I (Year 2024)

I. MAKANDARAWA SYSYTEM

I-1 Rambewa - I-1ET

GND	Phase I Requirement (up to 2024) 200	150	100	75	50	Total		Project Implementation period (Up to Year 2018) 200	150	100	75	50	Total
NWSDB / NEW								NWSDB / NEW					
99													
100	1,642	6,569	7,212	4,387	11,344	31,154		1,642	6,569	7,212	860	4,697	20,980
112													
113													
101	0	0	2,023	1,199	1,870	5,092		0	0	2,023	1,077	1,680	4,780
103							Isolated	0	0	0	0	0	0
107							Isolated	0	0	0	0	0	0
108	0	0	1,949	1,186	1,850	4,985		0	0	1,949	1,090	1,700	4,739
110	0	0	1,834	1,122	1,750	4,706		0	0	1,834	1,026	1,600	4,460
114	0	0	1,978	0	0	1,978	Isolated	0	0	0	0	0	0
115	0	0	1,345	0	0	1,345	Isolated	0	0	0	0	0	0
Subtotal	**1,642**	**6,569**	**16,341**	**7,894**	**16,814**	**49,260**		**1,642**	**6,569**	**13,018**	**4,053**	**9,677**	**34,959**
Exit. CBO	**0**	**0**	**0**	**0**	**0**	**0**		**0**	**0**	**0**	**0**	**0**	**0**
Total	**1,642**	**6,569**	**16,341**	**7,894**	**16,814**	**49,260**		**1,642**	**6,569**	**13,018**	**4,053**	**9,677**	**34,959**

I-2 Isingassagala - I-2 ET

GND	Phase I Requirement 200	150	100	75	50	Total	Project Implementation period (Up to Year 2018) 200	150	100	75	50	Total
NWSDB / NEW [1]												
58												
59												
61												
65	1,710	15,108	11,568	0	29,532	57,918	1,710	15,108	11,568	0	19,860	48,246
67												
68												
69												
78												
43	0	1,061	3,183	1,167	2,101	7,512	0	1,061	3,183	1,065	1,916	7,225
47	1,001	4,006	5,007	1,026	3,371	14,411	1,001	4,006	5,007	671	3,085	13,770
51	0	0	2,378	1,451	2,264	6,093	0	0	2,378	1,329	2,074	5,781
71	0	0	2,110	1,287	2,007	5,404	0	0	2,110	1,177	1,836	5,123
Subtotal	**2,711**	**20,175**	**24,246**	**4,931**	**39,275**	**91,338**	**2,711**	**20,175**	**24,246**	**4,242**	**28,771**	**80,145**
Exist. CBO [2]												
42	0	930	1,561	4,235	0	6,726	0	930	1,561	3,313	0	5,804
49	927	3,708	4,295	12,594	10,350	31,874	927	3,708	4,295	1,018	0	7,225
50												
60	0	0	112	4,618	7,010	11,740	0	0	112	3,606	5,431	9,149
64	0	0	2,154	7,348	11,462	20,964	0	0	2,154	6,500	10,140	18,794
66	841	3,366	4,207	3,741	12,291	24,446	841	3,366	4,207	1,944	8,942	19,300
70	0	0	484	2,543	1,927	4,954	0	-1,200	484	2,030	1,128	2,442
72	0	0	1,472	4,470	0	5,942	0	0	1,472	3,622	0	5,094
75	0	0	1,734	2,515	1,342	5,591	0	0	1,734	1,472	0	3,206
Subtotal	**1,768**	**8,004**	**16,019**	**42,064**	**44,382**	**112,237**	**1,768**	**6,804**	**16,019**	**23,505**	**25,641**	**73,737**
Total	**4,479**	**28,179**	**40,265**	**46,995**	**83,657**	**203,575**	**4,479**	**26,979**	**40,265**	**27,747**	**54,412**	**153,882**

note: [1] GND 58-78: existing pipeline length of ND 75 is longer than required length, thus the balance is converted to ND50

[2] GND 42 & 72: existing pipeline length of ND 50 is longer than required length, thus it makes zero

GND 70: from the same reason above , ND 150 length is maded as zero

I-3 Ethakada - I-3 ET

GND	Phase I Requirement 200	150	100	75	50	Total		Project Implementation period (Up to Year 2018) 200	150	100	75	50	Total
NWSDB / NEW													
44	0	0	2,382	1,500	2,340	6,222		0	0	2,382	1,396	2,178	5,956
45							Isolated						
52	0	0	1,367	4,091	6,383	11,841		0	0	1,367	3,268	5,099	9,734
53	0	0	2,005	1,262	1,969	5,236		0	0	2,005	1,171	1,826	5,002
73	0	0	1,561	982	1,531	4,074		0	0	1,561	915	1,427	3,903
74	0	831	2,492	940	1,692	5,955		0	831	2,492	874	1,574	5,771
Subtotal	**0**	**831**	**9,807**	**8,775**	**13,915**	**33,328**		**0**	**831**	**9,807**	**7,624**	**12,104**	**30,366**
Exist. CBO													
54	0	912	2,737	4,902	8,824	17,375		0	912	2,737	3,940	7,092	14,681
55	579	2,314	1,903	1,889	1,114	7,799		579	2,314	1,903	631	0	5,427
Subtotal	**579**	**3,226**	**4,640**	**6,791**	**9,938**	**25,174**		**579**	**3,226**	**4,640**	**4,571**	**7,092**	**20,108**
Total	**579**	**4,057**	**14,447**	**15,566**	**23,853**	**58,502**		**579**	**4,057**	**14,447**	**12,195**	**19,196**	**50,474**

I-4 East Rambewa - I-4 ET

	Phase I Requirement						Project Implementation period (Up to Year 2018)					
GND	200	150	100	75	50	Total	200	150	100	75	50	Total
NWSDB / NEW												
79	0	0	1,186	724	1,130	3,040	0	0	1,186	660	1,030	2,876
81	0	886	2,658	973	1,752	6,269	0	886	2,658	888	1,599	6,031
Subtotal	**0**	**886**	**3,844**	**1,697**	**2,882**	**9,309**	**0**	**886**	**3,844**	**1,548**	**2,629**	**8,907**
Exist. CBO	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total	**0**	**886**	**3,844**	**1,697**	**2,882**	**9,309**	**0**	**886**	**3,844**	**1,548**	**2,629**	**8,907**

Exist. CBO fed by Trans. Submain

	Phase I Requirement						Project Implementation period (Up to Year 2018)					
GND	200	150	100	75	50	Total	200	150	100	75	50	Total
Br. "a" [3]												
82 83	0	702	782	324	5,687	7,495	0	702	782	0	3,970	5,454
84	0	0	2,060	3,609	7,391	13,060	0	0	2,060	2,468	5,611	10,139
85 97	0	1,129	3,163	7,449	4,995	16,736	0	1,129	3,163	3,222	0	7,514
86	0	0	1,422	3,274	0	4,696	0	0	1,422	2,331	0	3,753
87	0	0	1,172	4,333	0	5,505	0	0	1,172	4,038	0	5,210
93	0	0	1,071	5,049	5,860	11,980	0	0	1,071	4,594	5,150	10,815
94	0	0	1,581	4,144	0	5,725	0	0	1,581	3,554	0	5,135
102	232	3,992	6,359	6,357	24,258	41,198	232	3,992	6,359	2,836	19,045	32,464
Subtotal	**232**	**5,823**	**17,610**	**34,539**	**48,191**	**106,395**	**232**	**5,823**	**17,610**	**23,043**	**33,776**	**80,484**
Br. "b" [4]												
106	0	0	1,521	4,664	0	6,185	0	0	1,521	3,870	0	5,391
109	0	0	0	0	2,151	2,151	0	0	0	0	1,531	1,531
111	0	0	1,720	6,738	10,460	18,918	0	0	1,720	5,854	9,080	16,654
Subtotal	**0**	**0**	**3,241**	**11,402**	**12,611**	**27,254**	**0**	**0**	**3,241**	**9,724**	**10,611**	**23,576**
Br. "c" [4]												
46						excl.						
57	0	0	2,183	5,373	0	7,556	0	0	2,183	3,574	0	5,757
Subtotal	**0**	**0**	**2,183**	**5,373**	**0**	**7,556**	**0**	**0**	**2,183**	**3,574**	**0**	**5,757**
Br. "d" [4]												
56	**0**	**0**	**906**	**3,280**	**3,619**	7,805	0	0	906	2,079	1,745	4,730
Total	**232**	**5,823**	**23,940**	**54,594**	**64,421**	**149,010**	**232**	**5,823**	**23,940**	**38,420**	**46,132**	**114,547**

note; [3] GND 86,87 & 94: existing pipeline length of ND 50 is longer than required length, thus it makes zero

[4] GND 106, 109, 111 GND 46 & 56 brom the same reason, pipeline length of respective pipeline size are made zero

Total of Mahakandarawa	**6,932**	**45,514**	**98,837**	**126,746**	**191,627**	**469,656**	**6,932**	**44,314**	**95,514**	**83,963**	**132,046**	**362,769**

Summary of Distribution Subsystem by Elevated Tank- Phase I (Year 2024)

II. WAHALKADA SYSTEM - Wahalkada Subsystem A

II-1 Wahalkada - II-1 ET

	Phase I Requirement (up to 2024)						Project Implementation period (Up to Year 2018)					
GND	200	150	100	75	50	Total	200	150	100	75	50	Total
NWSDB / NEW							NWSDB / NEW					
39	0	0	1,485	933	1,455	3,873	0	0	1,485	872	1,360	3,717
40	0	0	1,317	854	1,332	3,503	0	0	1,317	811	1,265	3,393
41	0	0	492	311	485	1,288	0	0	492	287	447	1,226
141	0	0	1,107	719	1,121	2,947	0	0	1,107	681	1,063	2,851
144	0	0	1,623	1,019	1,589	4,231	0	0	1,623	950	1,482	4,055
145	0	0	2,348	1,475	2,301	6,124	0	0	2,348	1,375	2,145	5,868
Subtotal	**0**	**0**	**8,372**	**5,311**	**8,283**	**21,966**	**0**	**0**	**8,372**	**4,976**	**7,762**	**21,110**
Exist. CBO	**0**	**0**	**0**	0	0	**0**	**0**	**0**	**0**	0	0	**0**
Total	**0**	**0**	**8,372**	**5,311**	**8,283**	**21,966**	**0**	**0**	**8,372**	**4,976**	**7,762**	**21,110**

II-2 Kahatagollewa - II-2 RT

	Phase I Requirement						Up to Year 2018					
GND	200	150	100	75	50	Total	200	150	100	75	50	Total
35	0	0	1,029	610	951	2,590	0	0	1,029	549	856	2,434
36	0	0	1,395	854	1,332	3,581	0	0	1,395	780	1,218	3,393
37	0	0	1,522	902	1,408	3,832	0	0	1,522	811	1,265	3,598
38	0	0	733	433	675	1,841	0	0	733	390	609	1,732
Subtotal	**0**	**0**	**4,679**	**2,799**	**4,366**	**11,844**	**0**	**0**	**4,679**	**2,530**	**3,948**	**11,157**
Exist. CBO	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total	**0**	**0**	**4,679**	**2,799**	**4,366**	**11,844**	**0**	**0**	**4,679**	**2,530**	**3,948**	**11,157**

II-3 Bogahawewa - II-3 ET

	Phase I Requirement							Project Implementation period (Up to Year 2018)					
GND	200	150	100	75	50	Total		200	150	100	75	50	Total
NWSDB / NEW													
1													
2	1,871	7,483	8,764	1,841	20,532	40,491		1,871	7,483	8,764	0	12,861	28,820
3													
4							Isolated						
8							Isolated						
9							Isolated						
10	0	1,151	3,452	1,301	2,342	8,246		0	1,151	3,452	1,211	2,180	7,994
11	0	0	72	44	68	184		0	0	72	44	68	184
12	0	0	2,286	1,481	2,311	6,078		0	0	2,286	1,406	2,194	5,886
13	0	0	1,965	1,238	1,931	5,134		0	0	1,965	1,150	1,794	4,909
15	-	-	-	-	-			-	-	-	-	-	
Subtotal	**1,871**	**8,634**	**16,539**	**5,905**	**27,184**	**60,133**		**1,871**	**8,634**	**16,539**	**3,811**	**19,097**	**49,952**
Exist. CBO													
2	0	496	1,487	2,662	1,054	5,699		0	496	1,487	1,249	0	3,232
5													
6	1,628	4,972	5,073	4,783	11,057	27,513		1,628	4,972	5,073	953	3,824	4,909
7													
14	830	3,320	4,150	2,058	8,690	19,048		830	3,320	4,150	281	5,194	13,775
Subtotal	**2,458**	**8,788**	**10,710**	**9,503**	**20,801**	**52,260**		**2,458**	**8,788**	**10,710**	**2,483**	**9,018**	**33,457**
Total	**4,329**	**17,422**	**27,249**	**15,408**	**47,985**	**112,393**		**4,329**	**17,422**	**27,249**	**6,294**	**28,115**	**83,409**

II-4 KAH-KEB Median - II-4 ET

	Phase I Requirement						Project Implementation period (Up to Year 2018)					
GND	200	150	100	75	50	Total	200	150	100	75	50	Total
NWSDB / NEW												
28	0	0	2,027	1,201	1,874	5,102	0	0	2,027	1,079	1,684	4,790
30	0	0	1,753	1,067	1,665	4,485	0	0	1,753	976	1,522	4,251
33	0	0	1,939	1,220	1,902	5,061	0	0	1,939	1,134	1,769	4,842
34	0	0	1,158	707	1,103	2,968	0	0	1,158	646	1,008	2,812
Subtotal	**0**	**0**	**6,877**	**4,195**	**6,544**	**17,616**	**0**	**0**	**6,877**	**3,835**	**5,983**	**16,695**
Exist. CBO [1)]												
22	**0**	**0**	**832**	**0**	**0**	**832**	0	0	832	0	0	832
Total	**0**	**0**	**7,709**	**4,195**	**6,544**	**18,448**	**0**	**0**	**7,709**	**3,835**	**5,983**	**17,527**

II-5 Kebitigollewa - II-5 ET

	Phase I Requirement						Project Implementation period (Up to Year 2018)					
GND	200	150	100	75	50	Total	200	150	100	75	50	Total
NWSDB / NEW[2)]												
16												
17												
18	2,200	6,548	7,633	0	18,621	35,002	2,200	6,548	7,633	0	10,307	2,812
23												
27												
19	0	0	1,456	860	1,341	3,657	0	0	1,456	774	1,208	3,438
21	0	968	2,903	1,065	1,916	6,852	0	0	2,306	1,287	2,007	5,600
25	0	880	2,641	940	1,692	6,153	0	880	2,641	845	1,521	5,887
26	0	0	1,640	970	1,512	4,122	0	0	1,640	872	1,360	3,872
29	0	0	1,345	823	1,284	3,452	0	0	1,345	750	1,170	3,265
Subtotal	**2,200**	**8,396**	**17,618**	**4,658**	**26,366**	**59,238**	**2,200**	**7,428**	**17,021**	**4,528**	**17,573**	**48,750**
Exist. CBO												
24	**0**	**360**	**0**	**2,396**	**4,571**	**7,327**	**0**	**360**	**0**	**1,881**	**3,642**	**5,883**
Total	**2,200**	**8,756**	**17,618**	**7,054**	**30,937**	**66,565**	**2,200**	**7,788**	**17,021**	**6,409**	**21,215**	**54,633**

New GND fed by Trans. Submain

	Phase I Requirement						Project Implementation period (Up to Year 2018)					
GND	200	150	100	75	50	Total	200	150	100	75	50	Total
Br."a"												
32						excl.						
Total of Wahakalda A	**6,529**	**26,178**	**65,627**	**34,767**	**98,115**	**231,216**	**6,529**	**25,210**	**65,030**	**24,044**	**67,023**	**187,836**

note: [1)] GND 22: existing pipeline length of ND75 is longer than required length, thus it makes zero

[2)] GND 16-27&24 from the same reason, length of respective are made zero

Summary of Distribution Subsystem by Elevated Tank- Phase I (Year 2024)

Wahakada Subsystem - B

II-6 North Horowpothana - II-6 ET

GND	Phase I Requirement (up to 2024) 200	150	100	75	50	Total	Project Implementation period (Up to Year 2018) 200	150	100	75	50	Total
NWSDB / NEW												
134	0	872	2,616	930	1,674	6,092	0	872	2,616	836	1,505	5,829
135	0	0	1,454	944	1,472	3,870	0	0	1,454	894	1,394	3,742
Subtotal	**0**	**872**	**4,070**	**1,874**	**3,146**	**9,962**	**0**	**872**	**4,070**	**1,730**	**2,899**	**9,571**
Exist. CBO	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total	**0**	**872**	**4,070**	**1,874**	**3,146**	**9,962**	**0**	**872**	**4,070**	**1,730**	**2,899**	**9,571**

II-7 Horowpoyjana - II-7 ET

GND	Phase I Requirement 200	150	100	75	50	Total	Project Implementation period (Up to Year 2018) 200	150	100	75	50	Total
NWSDB / NEW												
128 130	921	3,683	3,904	2,638	7,110	18,256	921	3,683	3,904	665	3,079	12,252
136	0	0	1,703	1,013	1,580	4,296	0	0	1,703	906	1,414	4,023
147	0	0	1,734	1,056	1,648	4,438	0	0	1,734	969	1,511	4,214
148	0	0	584	356	556	1,496	0	0	584	325	507	1,416
Subtotal	**0**	**0**	**4,021**	**2,425**	**3,784**	**10,230**	**0**	**0**	**4,021**	**2,200**	**3,432**	**9,653**
Exist. CBO												
133	**0**	**1,134**	**3,401**	**4,194**	**6,573**	**15,302**	**0**	**1,134**	**3,401**	**2,581**	**3,670**	**10,786**
Total	**0**	**1,134**	**7,422**	**6,619**	**10,357**	**25,532**	**0**	**1,134**	**7,422**	**4,781**	**7,102**	**20,439**

II-8 West Horowpothana - II-8 ET

GND	Phase I Requirement 200	150	100	75	50	Total	Project Implementation period (Up to Year 2018) 200	150	100	75	50	Total
NWSDB / NEW												
117	0	0	2,391	1,456	2,272	6,119	0	0	2,391	1,338	2,087	5,816
120	0	0	1,905	1,163	1,814	4,882	0	0	1,905	1,063	1,658	4,626
121	0	822	2,465	904	1,627	5,818	0	822	2,465	825	1,485	5,597
122	0	961	2,883	1,024	1,843	6,711	0	961	2,883	923	1,661	6,428
129	0	917	2,751	979	1,762	6,409	0	917	2,751	878	1,580	6,126
Subtotal	**0**	**2,700**	**12,395**	**5,526**	**9,318**	**29,939**	**0**	**2,700**	**12,395**	**5,027**	**8,471**	**28,593**
Exist. CBO	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total	**0**	**2,700**	**12,395**	**5,526**	**9,318**	**29,939**	**0**	**2,700**	**12,395**	**5,027**	**8,471**	**28,593**

II-9 Rathmalgahawewa - II-9 ET

GND	Phase I Requirement 200	150	100	75	50	Total	Project Implementation period (Up to Year 2018) 200	150	100	75	50	Total
NWSDB / NEW												
20	**0**	**0**	**2,306**	**1,409**	**2,197**	**5,912**	**0**	**0**	**2,306**	**1,287**	**2,007**	**5,600**
Exist. CBO												
222 224	0	0	1,746	3,729	3,383	8,858	0	0	1,746	2,916	2,116	6,778
225 226	837	3,346	3,183	2,124	5,608	15,098	837	3,346	3,183	309	2,020	9,695
Subtotal	**837**	**3,346**	**4,929**	**5,853**	**8,991**	**23,956**	**837**	**3,346**	**4,929**	**3,225**	**4,136**	**16,473**
Total	**837**	**3,346**	**7,235**	**7,262**	**11,188**	**29,868**	**837**	**3,346**	**7,235**	**4,512**	**6,143**	**22,073**

II-10 (Br."h") Hamillewa - II-10 ET

GND	Phase I Requirement 200	150	100	75	50	Total		Project Implementation period (Up to Year 2018) 200	150	100	75	50	Total
NWSDB / NEW													
125	0	0	1,839	1,125	1,755	4,719		0	0	1,839	1,025	1,599	4,463
127	0	973	2,918	1,069	1,924	6,884		0	973	2,918	979	1,762	6,632
131	0	0	1,562	925	1,443	3,930		0	0	1,562	831	1,297	3,690
132	0	0	875	550	858	2,283		0	0	875	513	800	2,188
150	0	0	1,811	1,138	1,775	4,724		0	0	1,811	1,056	1,648	4,515
151	0	0	1,220	788	1,229	3,237		0	0	1,220	750	1,170	3,140
152	0	0	1,737	1,094	1,706	4,537		0	0	1,737	1,019	1,589	4,345
153	0	0	1,431	925	1,443	3,799							
205							Isolated						
206	0	0	2,298	1,400	2,184	5,882		0	0	2,298	1,281	1,999	5,578
207	0	839	2,516	923	1,661	5,939		0	839	2,516	844	1,519	5,718
208	0	0	1,751	1,069	1,667	4,487		0	0	1,751	975	1,521	4,247
213	0	0	1,649	1,069	1,667	4,385		0	0	1,649	1,013	1,580	4,242
Subtotal	**0**	**1,812**	**21,607**	**12,075**	**19,312**	**54,806**		**0**	**1,812**	**20,176**	**10,286**	**16,484**	**48,758**
Exist. CBO [3)]													
126	0	0	1,109	3,288	5,492	9,889		0	0	1,109	2,788	4,712	8,609
209	0	0	1,719	4,418	3,366	9,503		0	0	1,719	3,168	1,416	6,303
210 211	0	862	1,755	2,806	1,886	7,309		0	862	1,755	1,625	0	4,242
212	0	0	1,218	4,795	2,054	8,067		0	0	1,218	4,520	1,625	7,363
Subtotal	**0**	**862**	**5,801**	**15,307**	**12,798**	**34,768**		**0**	**862**	**5,801**	**12,101**	**7,753**	**26,517**
Total	**0**	**2,674**	**27,408**	**27,382**	**32,110**	**89,574**		**0**	**2,674**	**25,977**	**22,387**	**24,237**	**75,275**

II-11 Kahatagasdigikiya - II-11 ET

	Phase I Requirement							Project Implementation period (Up to Year 2018)						
GND	200	150	100	75	50	Total		200	150	100	75	50	Total	
NWSDB / NEW														
230														
231	2,033	6,580	8,613	6,668	17,230	41,124		2,033	6,580	8,613	2,381	12,124	31,731	
232														
197							Isolated							
198	0	0	2,285	1,394	2,174	5,853		0	0	2,285	1,275	1,989	5,549	
203	0	880	2,639	968	1,742	6,229		0	880	2,639	885	1,593	5,997	
216							Isolated							
217							Isolated							
220	0	0	1,970	1,169	1,823	4,962		0	0	1,970	1,050	1,638	4,658	
235	0	0	1,683	1,000	1,560	4,243		0	0	1,683	894	1,394	3,971	
Subtotal	**2,033**	**7,460**	**17,190**	**11,199**	**24,529**	**62,411**		**2,033**	**7,460**	**17,190**	**6,485**	**18,738**	**51,906**	
Exist. CBO														
196	0	934	1,502	3,999	1,548	7,983		0	934	1,502	3,279	252	5,967	
201	0	876	2,627	4,374	4,068	11,945		0	876	2,627	3,455	2,414	9,372	
202	0	0	1,479	1,799	3,407	6,685		0	0	1,479	1,224	2,510	5,213	
218 219	0	735	1,463	2,769	2,785	7,752		0	735	1,463	1,520	537	31,731	
221	0	936	1,106	3,107	3,352	8,501		0	936	1,106	2,090	1,522	5,654	
223	0	0	1,297	4,625	4,014	9,936		0	0	1,297	3,137	1,694	6,128	
233 234	802	3,207	3,779	3,049	5,037	15,874		802	3,207	3,779	1,309	1,040	31,731	
Subtotal	**802**	**6,688**	**13,253**	**23,722**	**24,211**	**68,676**		**802**	**6,688**	**13,253**	**16,014**	**9,969**	**46,726**	
Total	**2,835**	**14,148**	**30,443**	**34,921**	**48,740**	**131,087**		**2,835**	**14,148**	**30,443**	**22,499**	**28,707**	**98,632**	

Exist. CBO fed by Trans. Submain

	Phase I Requirement							Project Implementation period (Up to Year 2018)						
GND	200	150	100	75	50	Total		200	150	100	75	50	Total	
Br."c" [3)]														
139	0	0	1,823	-313	0	1,510		0	0	1,823	0	0	1,823	
Br. "c' "														
140	0	0	1,506	3,541	6,446	11,493		0	0	1,506	3,173	5,871	10,550	
Br. "d" [3)]														
138	0	66	0	2,875	4,570	7,511		0	66	0	1,979	2,957	5,002	
Br. "f"														
149	0	0	1,646	1,700	4,392	7,738		0	0	1,646	1,194	3,602	6,442	
Br. "g"														
119							excl.							
Total	**0**	**66**	**4,975**	**7,803**	**15,408**	**28,252**		**0**	**66**	**4,975**	**6,346**	**12,430**	**23,817**	
Total of Wahalkada B	**3,672**	**24,940**	**93,948**	**91,387**	**130,267**	**344,214**		**3,672**	**24,940**	**92,517**	**67,282**	**89,989**	**278,400**	

note: [3)] pipeline lengths of respective size are longer than required length, thus they are made zero

FINAL REPORT

on

Status Survey of the Existing Water Supply Schemes

for

Preparatory Survey on Anuradhapura North Integrated Water Supply Project

Submitted to

JICA Study Team

by

Ceywater Consultants (Pvt.) Ltd

VOLUME – I

August 2012

Table of Contents

Volume – I

List of Tables

Annexures:

Annex 1 - Summary of Water Quality Reports Tested at NWSDB, Anuradhapura

Annex 2 - Detail calculations of NRW for the schemes

Annex 3 – Water Tariff Structure for each CBO

Annex 4 – Maps on selected GNDs in each DS Division

PART B : Summary Sheets-:

Sheet -1 : CBO General Information

Sheet -2 : Service Area & Population

Sheet -3 (a) & (b) : Water Supply System

Sheet - 4 : Operation & Maintenance (2011/2012

Sheet - 5 : Financial Conditions (2011/2012

Section 6 refers to relevant data & Information to be given separately

Sheet - 7 : Willingness to connect to bulk system

PART C : Completed Questionnaires on 50 Existing Water Supply Schemes Surveyed (Volume II)

PART D : Photographs

PART E : General System Layout Plans (Volume II)

GPS Coordinates and Z files are provided in Volume III *(provided only in CD)*

Abbreviations

ADB	-	Asian Development Bank
ANIWSP	-	Anuradhapura North Integrated Water Supply Project
BH	-	Bore Hole
CBO	-	Community Based Organization
CEB	-	Ceylon Electricity Board
CWSSP	-	Community Water Supply & Sanitation Project
DSD	-	Divisional Secretary Division
DS	-	District Secretary
GI	-	Galvanized Iron
GND	-	Grama Niladari Division
HH	-	House Hold
JICA	-	Japan International Cooperation Agency
NRW	-	Non Revenue Water
NWSDB	-	National Water Supply Development Board
ODA	-	Oversees Development Assistance
PS	-	Pradeshiya Sabha
RC	-	Reinforced Concrete
S/No.	-	Serial Number
UN	-	United Nation
WB	-	World Bank

Acknowledgement

Status Survey Study Team wishes to convey their sincere gratitude to the Deputy General Manager, (RSC - North Central) NWSDB and his staff including Assistant General Manager (RSC - North Central) and Engineer (RWS) for their valuable inputs and guidance to make this study a success.

We also thank Officials and Staff of the CBOs managing the Rural Water Supply Schemes in the Project Area, for their assistance and cooperation.

PART – A

1.0 General

1.1 Background

Anuradhapura North Integrated Water Supply Project is one of the five major water supply projects proposed to be undertaken in various parts of the country, with a view to achieve the UN Millennium Development Goals of halving the percentage of people with no access to safe drinking water. There are also significant disparities in availability, access, coverage and service level among provinces in both pipe borne water and safe drinking water.

In response to the request from the Sri Lankan Government, the Government of Japan decided to undertake a Feasibility Study to meet the requirements for JICA ODA Loan financed by the Japanese Government.

In the Anuradhapura North Integrated Water Supply Project Area, a number of small scale water supply systems are operated and maintained by Community Based Organizations (CBOs). However, the water sources are inadequate to provide 24 hour water supply. Also due to low piped water supply coverage, people living in Anuradhapura North basically depend on ground water sources such as tube wells and shallow dug wells. NWSDB water quality reports in the region, indicates that groundwater contains high levels of fluoride and hardness and is unsuitable for drinking.

1.2 Objective and Scope of the Status Survey of Existing Water Supply Schemes

The objective of the Status Survey of the existing small water supply systems in the project area is to examine the possibility of using the systems in the proposed Anuradhapura North Integrated Water Supply Project (ANIWSP). ANIWSP covers five (05) DS divisions, Rambewa, Madawachchiya Kebitigollawa, Padaviya, Kahatagasdigiliya and Horowpathana.

Maps of the DS Divisions showing the GN division in which the selected CBO Water Supply Schemes are located is given in Annex 4.

The scope of work consisted of a Questionnaire Survey administered to the CBO officials, operation and management staff and reference of relevant documents and available plans. The Questionnaire Survey was enhanced and supplemented with a Technical Field survey and Inspection.

The questionnaire survey carried out using the prepared questionnaire format covered:

- General Information: name of CBO, location, contact details, year of establishment, year/period of operation, service area, population, future expansion plans, etc.
- Water Supply System details including system capacity, type of water source, treatment if available, details of storage (elevated tank, ground reservoir) and details of Distribution System. Supply conditions such as:
    - supply service (continuous/ intermittent);
    - supply pressure (at tapping and maximum pressure) ;
    - overall water quality and supply conditions ;
    - estimation of water loss in terms of cubic meters per day and percentage loss.

- Details of Operation and Maintenance including staff, consumption of power / fuel, chemicals, repairs / replacements etc.

- Financial Conditions covering Revenue (water tariff, connection fee and other revenue) and Expenditure (cost of personnel, consumables such as electricity/fuel, chlorine and other chemicals, cost of maintenance including spare parts, repairs/replacement & other, depreciation[1*] and non- operating expenses).

- Relevant data and information on plans of service area, system layout and drawing of major facilities. Meter reading data records of the past, annual report with financial statements and water tariff structure and collecting system.

- Willingness to connect to new bulk system including proposed tariff.

- Other requirements are relevant data and information covering:
    - General plan of Service area boundary
    - General system layout plan
    - Dimensions/drawings of major facilities
    - Meter Reading Records for the past 3 months
    - Annual report with financial statements
    - Water tariff structure and collection system
    - Estimated/assumed non-revenue water (NRW)
    - Other items as incidental

Of the above relevant data and information, some are included in completing the questionnaire, while Plans, Annual Reports with Financial Statements and Photographs are given separately. Considering the level of management by CBOs, the above requirements must be cut down with respect to all community managed schemes. There are no Annual Reports in any of the 50 CBOs.

1* Depreciation of assets in typical Rural Water Supply Scheme annually is estimated at 7.55 % of the cost of the assets. This is on the basis of depreciating distribution pipes, water tower and intake well over 20 years and depreciating pipe fittings and Mechanical and Electrical items over 5 years.

2.0 Availability of Information

Summary Sheets of all the required information are given in Part B. These sheets provide a clear understanding of the status of the essential information required by the Design Consultants of the ANIWSP. It will be observed that except for system expansion plans under section 2 in the questionnaire, financial data, particularly non- domestic water tariff (mostly free), loan repayment (none), depreciation costs and 50% of results in water loss in the system, the other information have been well addressed. These Summary Sheets are completed with essential information for the Designers in spite of the characteristic lack of Planning and Operation & Management information in CBO managed water supply schemes.

It must be indicated at the outset that of the 50 schemes under study, 06 schemes are not operational. The present status and position of the 06 schemes, in the near future are given in Table 2.1.

Table 2.1: Present Status and Position in the near Future of the 06 Schemes not operational.

S/ No	Name of CBO	Details
26	Al Naja	This scheme will be completed and be ready to be incorporated into the Anuradhapura North Water Supply Project (ANIWSP). Present system capacity is 130 m^3/day to provide water to 2 villages but the CBO expect to increase the service area and need additional source or connecting to bulk supply. This will be a new scheme that could be incorporated into ANIWSP.
27	Gonumariyaya	As no CBO is formed and project not implemented, it may be assumed that there is no such WS scheme for implementing ANIWSP.
36	Nilmini	This scheme is not functioning, only because the CBO has no resources to replace the deep well pump. Therefore this scheme where operation started in 2008 & pump was also damaged in 2008. Prior to incorporating into the ANIWSP, the scheme should be initially made to function to determine the condition of the distribution system, especially whether there are valve leaks and extent of water loss, and the condition of the water tank and repairs/replacement done.
47	Tristar CBO	Only 43 House connections are given out of 310. Line cleaning and disinfection has to be done. Physical work is complete, but all House connections are not given till the community contributions (in ADB 4) are given. However, "community contributions[2*]" continue to come in and more than 50% HH will be given by Dec. 2012. NWSDB could intervene to expedite the process, but the scheme can be incorporated in ANIWSP.
48	Alhidra CBO	House Connections are given to 35% of the total HH by June 2012 as the community contribution is not complete. It is in the process of being collected and would be completed in Dec. 2012. Once the full community contribution is obtained the balance connections will be given, the staff recruited and the scheme officially opened and fully operated by the CBO. It is recommended that the scheme be incorporated in the ANIWSP. However, air valves are to be fitted and washout valves are also short. These need to be replaced.
49	Adhikwa CBO	Weerasole scheme funded by 4th ADB, house connections are to be completed, water meters are being purchased locally and fitted for the scheme to be fully operated. NWSDB operates the scheme partially. Once the scheme is fully handed over to the CBO, the staff could be recruited and the scheme fully operated. However, some water leaks are present and need to be attended to.

[2*] Community has to contribute 20% of the cost of the Project in labour or cash, or labour and cash.

2.1 General Information

Name of the system, location information including PS/DS/GND/Village and coordinates are provided. Telephone/fax information are lacking, while year of establishment and start date are given. 100% information are available in 49 out of 50 schemes, while serial no. 41 Ambagahawewa under Pinibindu CBO is only an individual rain-water harvesting project implemented in 60 households, where the information is not available.

2.2 Service Area & Population

There are large number of subheads under which information is sought including number and type of service connections, water consumption, alternative water source and consumption from such sources and details of system expansion plans including capacity, facility requirements and additional staff, costs and source of funds.

All required information are given for the operational schemes except that for system expansion, planned data is scanty with no information on target year, while capacity after expansion is incomplete.

2.3 Water Supply System

(a) Water Supply Facilities

Comprehensive details of the water supply systems including source of water, system capacity, water treatment facility, distribution method, technical details of elevated storage, distribution network, service connections, water meters, supply service: continuous / intermittent and supply pressure, are available in functioning schemes.

(b) Water Quality

Information on water quality is limited as CBOs have paid less attention, except that in a few cases water was tested for different test items such as pH, Turbidity, Color, Taste, Odor, Hardness, Iron, Manganese & Fluoride, a few at a time. Summary of Water Quality Reports Tested at NWSDB Anuradhapura are given in Annex -1.

2.4 Operation and Maintenance

Operation & Maintenance of the water supply scheme is the prime responsibility of the CBO. The designed questionnaire includes organizational details, particularly number and qualification of technical and non–technical staff, their qualifications and number of staff in each category.

Consumption of Electricity / fuel and chemicals such as chlorine is provided in quantum per month/year. Annual consumption of electrical power is available for all operational schemes. Four schemes installed diesel driven pumps. In many schemes disinfection is not done and data on use of chlorine is limited to about 50% of the operational schemes.

Information on repair and replacement of distribution network is limited mainly to repair of pipes/year or replacement of water meters/year. While only a limited amount of replacement of pipes are reported. Number of pipes repaired per year, replacement of pipes by diameter per year and replacement of pipes by meter lengths per year, has been recorded for each scheme.

Repair/ Service/Replacement of Pumps during the year are well recorded. Number of times per year that cleaning of wells and water tanks are done is recorded. This information is in summary sheet 4 – Operation and Maintenance.

2.5 Capability of CBOs

(a) Capability in O&M

Most of all CBOs are not efficient in operation and maintenance due to limited O&M staff and either lack of or poorly trained O&M group in CBOs. The policy adopted in development of CBOs was for CBO personnel to be trained in all aspects of water supply scheme management. O&M groups are trained for operational maintenance of the schemes. Though, only 2 salaried employees are deployed for O&M, it is carried out well as CBO's O&M groups are well trained. An example is S/N no.28 Parakramapura in Padaviya a large scheme, with system capacity of 405m^3/day and serving a population of 2820. This scheme is very well run, but has only 2 salaried employees on O&M but with a keen well trained O&M group in the CBO. Members of the O&M group will be suitably remunerated according to a system approved by CBO.

(b) Recommendations on Expansion

When the CBO scheme is used in the ANIWSP, it is necessary to determine the possibility of usefully expanding the CBO served area to cover GND in the Project Area. Any CBO scheme can be recommended for expansion only if the Design Parameters of the CBO scheme could satisfactorily provide for the total water supply demand including the expanded area.

Where the system capacity does not allow the total expanded area to be served, the balance area may be served through a separate pipe line from the same water tank, provided that the total area could be served by three times the capacity of the water tank.
In the case of CWSSP funded CBO schemes, the tertiary pipes are of narrow diameter and should not be used to feed the expanded area from the existing distribution system.

(c) Capacity Development of CBOs

During implementation of the CBO Water Supply Schemes, an intensive capacity development program was implemented to train the CBO personnel in the scheme development process, training in operation and management, and proper maintenance of the water supply scheme. The community participated in the construction through community contribution.

However with time, the O&M capability has deteriorated due to the trained people leaving for other employment, due to disputes between trained people and CBO office bearers or community, or changing of operational staff when new office bearers are elected.

Training has been given to CBO office bearers, especially for treasurer in book keeping, record maintenance & Accounts work. However, when a new committee takes over after some time they will not have capability to maintain book keeping, records works and accounts.

Therefore, there is a need to revitalize the O&M capability and financial management of the CBO with further training, reorganization of scheme management and improve facilities such as tools and equipment. The O&M capability of the CBOs is discussed under 3.0 Conclusions. It is recommended that Capacity Development of the CBOs is undertaken prior to project implementation.

2.6 Non-Revenue Water / Leakage

NRW in the existing water supply schemes is determined adopting various methods.
Some times where bulk meters are not available, pump details could be used in calculating monthly usage and determining m^3/ day and percentage loss based on monthly usage.

Where feasible, field test were conducted with the cooperation of the community to determine the NRW/ Leakage. The summary of NRW Results for 27 schemes is given in Table 2.2.

Details of calculation of NRW for the schemes are given in Annex -2.

Table 2.2 : Summary of NRW Results

S/ No	GND	GND No	DS Division	NRW %		
				Field Test	Bulk Meter	Pump Detail
1	Kendewa	97	Rambewa		20.75	
3	Sangilikandarawa	111	Rambewa		23.68	
8	Thalgahawewa	84	Rambewa		18.44	16.9
9	Mahakandarayaya 02	93	Rambewa	22.95		
	Average for Rambewa DSD			***22.95***	***20.96***	***16.9***
12	Katuwela	66	Madawachchiya	30.14		
13	Halambagaswewa	70	Madawachchiya	18.28	22	10.2
14	Attaweeragollawa	56	Madawachchiya			18.42
15	Hirulugama	54	Madawachchiya			11.67
16	Wiralmurippu	64	Madawachchiya		10.7	
17	Kadawathgama	60	Madawachchiya		8.39	16.74
19	Kirigalwewa	72	Madawachchiya	14.31		
22	Kidawarankulama	42	Madawachchiya			46.32
23	Periyakulama	49	Madawachchiya	41.38		
24	Athakade	55	Madawachchiya	16.03		
	Average for Madawachchiya DSD			**24.03**	**13.70**	**20.67**
S/ No	**GND**	**GND No**	**DS Division**	**NRW %**		
				Field Test	**Bulk Meter**	**Pump Detail**
25	Ayyatigewewa	24	Kebitigollawa	17.97		
	Kebitigollawa DSD			**17.97**		
29	18 Kanuwa	2	Padaviya	16.98		12.91

	Padaviya DSD			**16,98**		**12.91**
31	Maha Kumbukwewa	222	Kahadagasdigilliya		29.53	24.89
32	Moragahawewa	202	Kahatagasdigiliya		4.51	6.97
33	Palispotana	224	Kahatagasdigiliya		29.4	26.92
34	Pandaralla	210	Kahadagasdigilliya			21.74
38	Turrukkuragama	234	Kahadagasdigilliya	2.75		
39	Mahawewa	221	Kahadagasdigilliya	6.84		
40	Meekumbukwewa	212	Kahadagasdigilliya	33.96		
43	Kumbukgollawa	209	Kahadagasdigilliya	19.17		
	Average for Kahadagasdigilliya DSD			**15.68**	**16.95**	**18.54**
44	Wadigawewa	126	Horowpothana		4.63	
45	Parangiyawadi	149	Horowpothana		3.58	
50	Maradankadawala	133	Horowpothana	23.74		
	Average for Horowpothana DSD			**23.74**	**4.10**	

2.7 Financial Status

The Financial Status of CBOs managing the existing community water supply schemes is provided in terms of Revenue, Expenditure and annual balance. Annual Revenue is the sum of water tariff (domestic & non-domestic), connection fee and other revenue. The Annual Expenditure is built up of: staff expenditure, cost of power, chemicals and other items, & cost of maintenance. Depreciation cost and other expenditure are not provided.
Domestic water tariff revenue is available for 44 out of the 50 listed schemes, while the non-domestic water tariff is available only for 25 schemes. The reason for this short-fall is that free water supply is provided to public institutions such as schools, temples etc.

No CBO made available audited accounts and they are not preparing annual reports. Therefore the consultants were unable to provide annual reports.

2.8 Relevant Data and Information

(a) General Plans of Existing Water Supply Schemes

General plan of service area, general system lay out and source to tank system diagram are given in table 2.3. The general plan of service area is normally given in sketch plan similar to the village plan, but in many cases these are only rough sketches and are not available in 10 schemes (sch. Nos.36 to 44 and 46).

The table 2.3 provides the availability of General Plan of Service Area, General System Lay out Plan & Source to Tank- System Diagram for all the schemes.
The general system lay out plans are given under Part E, while the other requirements (except annual reports) are given in the completed questionnaires and the summary sheets.

Table 2.3 : Relevant Data and Information of Existing Water Supply Schemes

Serial No./Scheme Name	General Plan of Service Area	General System Lay out Plan	Source to Tank- System Diagram
02 Ikkirigollewa	Not Available	Yes	Yes
04 Thalgahawewa	Yes	Yes	Yes
05 Wahamalgollewa	Yes	Yes	Yes
07 Mahakandarawe Yaya 01	Yes. Only rough sketch.	Yes	Yes
08 Katukeliyawe	Yes. Very rough sketch.	Yes	Yes
09 Mahakanadarawe Yaya 02	Yes. Very rough sketch.	Yes	Yes
10 Ihala Kolongaswewa	Yes. Very rough sketch.	Yes	Yes
11 Balahonda wewa	Yes. Only rough sketch.	Yes	Yes
13 Helambagaswewa	Yes	Yes	Yes
14 Ataweeragollewa	Yes	Yes	Yes
15 Hirulagama	Incomplete Sketch	Incomplete Sketch	Yes
16 Wiralmurippu	Yes	Illegible	Yes
17 Kadawathgama	Yes	Incomplete Plan	Yes
18 Unagaswewa	Yes	Yes	Yes
19 Kirigalwewa	Yes	Yes	Yes
21 Mahadiulwewa	Yes	Yes	Yes
22 Kidawarankulama	Yes	Yes	Yes
23 Periyakulama	Incomplete sketch	Yes	Yes
24 Ethakada	Yes	Yes	Yes
25 Ayyathigewewa	Yes	Yes	Yes
28 Parakramapura	Yes	Yes	Yes
29 Kanuwa	Yes	Yes	Yes
30 Bogahawewa	Yes	Yes	Yes
31 Mahakumbukwewa	Yes	Yes	Yes
32 Moragawela	Yes	Yes	Yes
33 Palispothana	Yes	Yes	Yes
34 Pandarellewa	Yes	Yes	Yes
35 Ranpathwila	Yes with gen. lay out plan	Yes	Yes
36 Kokmaduwa	Not Available	Yes	Not Available
37 Gonamaruwewa	Not Available	Yes	Not Available
38 Kurukkuragama	Not Available	Yes	Yes
39 Mahawewa	Not Available	Yes	Yes
40 Meekumbukwewa	Not Available	Yes	Yes
42 Weligollewa	Not Available	Yes	Yes
43 Kumbukgollewa	Not Available	Yes	Yes
44 Wadigewewa	Not Available	Yes	Yes
45 Parangiyawadiya	Yes	Yes	Yes
46 Kapugollewa	Not Available	Not Available	Yes
47 Agunuchchiya	Yes	Yes	Yes
48 Anolandawewa	Yes	Yes	Yes
49 Weerasole	Yes	Yes	Yes
50 Maradankadawela	Not Available	Yes	Yes

(b) Scheme Details – Dimensions of Major Facilities, Estimated NRW and Tariff Structure

The Major Facility in the CBO schemes is only the Elevated Water Tank or Ground Reservoir, if any. The dimensions of the major structure are clearly given in the completed Questionnaire itself, and the estimated Non - Revenue Water (NRW) is given in table 2.2 of section 2.5.

The Tariff Structure for all CBO schemes are given in Annex 3. The tariff structure and meter reading records for 3 months or more are given in the completed questionnaires.

(c) Annual Report with Financial Statements

Annual Reports and Financial Statements are not available in any CBO water supply scheme. Payments are made to the CBO office by the consumer. The Water Tariff Structure for each CBO is given in Annex - 3.

The Annual Report with Financial Statements, which is essential for audit and transparency of the management of CBO funds, were not made available. Only for S/No. 02 Ikkirigollewa, an annual financial statement certified by audit is made available, while other CBOs have monthly revenue and expenditure statements.

2.9 Willingness to Connect to New Bulk System

It is only in 04 schemes that the CBOs have not given a positive answer regarding willingness to connect to the Bulk Supply. In all other schemes the CBOs are willing to obtain the bulk connection and the common bulk water tariff which they wish to pay is about Rs. 25/=, while the bulk rates mentioned varies from Rs. 20/m^3 to Rs. 30/m^3. Some CBOs are agreeable to NWSDB rates and a few CBOs want the community to decide the rate. However, all the CBOs wish to continue to manage the schemes.

The reasons to get the bulk connections are:

1. To get continuous supply of water.
2. To get supply of treated water.
3. To provide water to un-served areas.

3.0 Conclusions and Recommendations on Water Supply Schemes Surveyed.

Sources of water in all schemes are either shallow wells or tube wells, or both. The electro-mechanical equipment is limited to the centrifugal pump in shallow wells or the deep well submersible pump.

3.1 Scheme-wise Summary of Conclusions and Recommendations

The table below briefly summarizes the conclusions and recommendations by each scheme.

Table: 3.1 Summary of the Conclusions and Recommendations of the Existing Water Supply Schemes.

S/ No.	CBO	GND	Comments
01	Swashakthi	Kendewa (97) & Galkandagama (85)	The 60m^3 water tower is structurally sound and the distribution system is satisfactorily. NRW is 20.75%using bulk meter readings. The present system capacity is 160m^3/day. Scheme capacity to be expanded to180 m^3/day. O&M and financial management are satisfactory. Suitable for bulk supply.
02	Ikra	Ikkirigollawa (102)	The 225m^3 water tower is structurally sound. The system capacity is 516 m^3/ day. Water source is shallow well and deep well. There are some valve leaks. Otherwise the distribution system is satisfactory. O&M and financial management are satisfactory. Suitable for bulk supply.
03	Arunalu	Sangilikandarawa (111)	The 80 m^3 water tower is in good condition. The water source is a shallow well and deep well. The current system capacity is 196m^3/day – require expansion to 300m^3/day. Estimated NRW is 23.68 % (bulk meter), but distribution system is satisfactory. O&M and financial management are satisfactory. Suitable for bulk supply.
04	Samagi	Thalgahawewa (84)	The 40m^3 water tower is in good condition. Water source is a deep well. The system capacity is 111m^3/day and NRW 18.44%.O&M and financial management are fairly satisfactory. Suitable for bulk supply.
05	Ekamuthu	Wahamalgollawa (109)	The 80m^3 water tower is in good condition. The water source is deep well and shallow well. The system capacity is 227m^3/day. NRW not available, but there are visible leaks. No record of repairs/ replacement in distribution system. O&M is fair and financial management is satisfactory. Cumulative balance is Rs. 3.5 Million. Suitable for bulk supply with increase in staff to 3 nos. and training of O&M group and CBO key staff. .
06	Rangiri	Wewalkatiya (82)	The 60m^3 water tower is in good condition. The water source is deep well (satisfactory) and shallow well (not fully completed). The system capacity is 179m^3/day. The tapping pressure is low (4m). There are considerable gate valve leaks, which are not attended to. Poor O&M and financial management. There is lack of staff. Not recommended for bulk supply unless CBO management is improved.
07	Nildiyadahara	Maha Kandarawa yaya -01 (94)	The 40m^3 water tower and the distribution system are in good condition. The water source is a shallow well and the system capacity is 108m^3/day. Financial management is satisfactory. Recommended that bulk supply is given, but after replacement of some gate valves and water meters.
S/ No.	CBO	GND	Comments
08	Eksath	Katukeliya - 106	The 40m^3 water tower is structurally sound. The water source is a shallow well and the system capacity is 89m^3/day. NRW not available. The distribution system is in fairly good condition. O&M and financial management are satisfactory. Recommended to connect to new bulk system.
09	Mahasen	Mahakandarayaya - 02 (93)	The 40m^3 water tower is structurally sound. The water source is a shallow well and the system capacity is 110m^3/day. No evidence of repair/ replacement and well/ tank cleaning during maintenance (2011).Field test indicate NRW of 22.95% and the distribution system appear satisfactory. Annual revenue and expenditure is

			maintained. Recommended that bulk supply is given.
10	Dimuthu	Ihala Kolangaswewa (87)	The 20m^3 water tower in good condition. The water source is a shallow well and the system capacity is 72m^3/day. NRW value unreliable. No evidence of repair/ replacement and well/ tank cleaning during maintenance (2011). Annual revenue and expenditure is maintained. Recommended to connect to new bulk system.
11	Pragithi	Bala Honda Wewa(86) &Ihala Kolangaswewa (87)	The 40m^3 water tower in good condition. There is no indication of leakage in the distribution system. The water source is a shallow well and the system capacity is 109m^3/day. NRW is not estimated. There has been repair and replacement of pipes, but no evidence of maintaining pump, well & tank during 2011. Annual revenue and expenditure is maintained. Recommended to connect to new bulk system.
12	Jayashakthi	Katuwela (66)	The 60m^3 water tower in good condition. The water source is a deep well and the system capacity is 216m^3/day, but the fluoride level is high (1.9 mg/L). Field measurements indicate NRW of 30.14%. O&M and financial management are satisfactory and the scheme is running with good profit. Recommended to connect to new bulk system.
13	Samagi	Halambagaswewa (70)	The 50m^3 water tower in good condition. The water source is a deep well and the system capacity is 180m^3/day. Field test indicate NRW is 18.28%. O&M and financial management are satisfactory and the scheme is running with good profit. Recommended to connect to new bulk system.
14	Samagi	Ataweeragollewa (56)	The 60m^3 water tower in good condition. The water source is a shallow well and the system capacity is 144m^3/day. Pump details indicate NRW as 18.42%. Annual revenue and expenditure is maintained. Recommended that bulk supply is given.
15	Ekamuthu	Hirulugama (54)	The 50m^3 water tower in good condition. The water source is a deep well and the system capacity is 144m^3/day. The tapping pressure is low (4m). Pump details indicate NRW is 11.67%. No evidence of repair/ replacement and well/ tank cleaning during maintenance (2011). Annual revenue and expenditure is maintained. Recommended to connect to new bulk system.
S/ No.	CBO	GND	Comments
16	Ran Arulnalu	Wiralmurippu (64)	The 30m^3 water tower is in satisfactorily condition. The water source is a deep well and the current system capacity is 173m^3/day which need to expand to 250m^3/day. NRW is 10.7% (bulk meter reading). Hardness and fluoride exceed permissible limits. Annual revenue and expenditure is maintained. Recommended to connect to new bulk system.
17	Isuru	Kadawathgama (60)	The 60m^3 water tower and distribution system are in good condition and the CBO functioning well. The water source is a deep well and the system capacity is 180m^3/day to be expanded to 225m^3/ day. NRW from pump details is 16.12%. Rs. 79,000 spent on maintenance and the O&M and financial management

			are satisfactory. Recommended to connect to new bulk system.
18	Randiya Dhahara	Unagaswewa (75)	The 40m^3 water tower is in good condition. The water source is a shallow well and the system capacity is 90m^3/day. No data to calculate NRW. The distribution system is maintained fairly well and the financial management is satisfactory. Recommended to connect to new bulk system with improvements necessary on CWSSP schemes.
19	Nelum	Kirigalwewa (72)	The 40/60m^3 water tower is in satisfactorily condition. The water source is a shallow well and the current system capacity is 105m^3/day, to be expanded to163m^3/day. Field test indicate 14.31% NRW. No evidence of maintenance expenditure, but financial management is satisfactory. The distribution system is satisfactory. However, recommended to connect to new bulk system with improvements necessary on CWSSP schemes.
20	Diriyamatha	Maha-Kumbugollawa (46)	The two 40m^3 water towers are in satisfactorily condition. The water source is 2 shallow wells and the system capacity is 169m^3/day. NRW not recorded. Maintenance was undertaken (2011) in the distribution system. The Annual revenue and expenditure is maintained. Recommended to connect to new bulk system with improvements necessary on CWSSP schemes.
21	Gemunu	Maha Divulwewa (57)	The 40m^3 water tower is in satisfactorily condition. The water source is a shallow well and the system capacity is 98m^3/day. NRW not recorded. Tapping pressure is low (3m). Maintenance level is low (no expenses recorded). Annual revenue and expenditure is maintained. Recommended to connect to new bulk system with improvements necessary on CWSSP schemes. Replacement of small diameter pipes is required.
22	Sisila Diyadahara	Kidawarankulama (42)	The 40m^3 water tower is in satisfactorily condition. The water source is a shallow well and the system capacity is 139m^3/day. Tapping pressure is very low (2m) in section of the distribution system. Pump details give 46.32% NRW (can be due to illegal tapping for agriculture / industry). Repair, replacement of pipes and cleaning of well / tank. Annual revenue and expenditure is maintained. Recommended to connect to new bulk system with improvements necessary on CWSSP schemes.
S/ No.	CBO	GND	Comments
23	Diriyamatha	Periyakulama(49), Yakkawewa (50)	The 40m^3 water tower is in satisfactorily condition. The water source is a shallow well, providing water of moderately high hardness and the system capacity is 95m^3/day. Field test indicate NRW of 41.38% (can be due to illegal tapping for agriculture/ industry). Repair, replacement of pipes and frequent cleaning of well / tank. The financial management is satisfactory. Recommended to connect to new bulk system with improvements necessary on CWSSP schemes.
24	Ridi Nadi	Athakade (55)	The 40m^3 water tower is in satisfactorily condition. The water source is a shallow well and the system capacity is 87m^3/day. Field test indicate NRW of 16.03%. Distribution system is satisfactory but no evidence of Maintenance (2011). Annual revenue and expenditure is maintained. Recommended to connect

			to new bulk system with improvements necessary on CWSSP schemes.
25	Shakthi	Ayyatigewewa (24)	The 60m^3 water tower is in satisfactorily condition. The water sources are Deep well & shallow well and the system capacity is 252m^3/day. Field test indicate NRW of 17.97%. Maintenance included repair &, replacement of pipes. The financial management is satisfactory. Recommended to connect to new bulk system with improvements necessary on CWSSP schemes.
26	Al-Naja	Muslim Attaweerawewa (32	This ADB 4 funded scheme is newly constructed (2012) & not yet commissioned. The 30m^3 & 40 m^3 water towers are both new and structurally sound. This scheme established in 2009 is not commissioned yet. It is recommended that this new scheme be connected to the new bulk supply.
27	CBO not formed	Gonumariyaya (25)	The Scheme is not implemented. Hence there is no water supply scheme to be incorporated to ANIWSP.
28	Parakum	Parakramapura(06), Buddhangala(05), Elikumbulagala (07)	This is the largest among the community water supply schemes. The 225m^3 RC water tower is structurally sound. Water source is 02 deep well and the system capacity is 405m^3/day. The O&M of the Distribution system & financial management are satisfactory. The annual balance is Rs.1.4 million & the scheme is sustainable. The scheme could be connected to bulk supply, but O&M staff should increase from 2 to 4.
29	Suwasehana	18 Kanuwa (02)	The 35m^3 capacity water tower is in good condition. The water source is a deep well and the system capacity is 124 m^3/day & field tests indicate 16.98% NRW. Hardness & fluoride levels are moderately high. The distribution system is well maintained & financial management is good. The annual balance is nearly Rs. 600,000/-. It is recommended that the scheme, be connected to the bulk supply.
30	Suwasetha	Bogahawewa (14)	The 40m^3 water tower is in good condition. The water source is a shallow well. The system capacity is 173m^3/day. There is no NRW measurement. The scheme maintenances is satisfactory and financial management is good, with a annual balance over Rs. 250,000/- It is recommended that this scheme be connected to bulk supply, but the tapping pressure is low (3 m) at the tail & this will need attention.
S/ No.	CBO	GND	Comments
31	Vajira	Maha Kumbukwewa (222)	The 60m^3 water tower is structurally sound, water source is a deep well and the system capacity is 108m^3/day. The water has high fluoride (1.5/1.54 mg/L) and the water loss is 29.5% (bulk meter). The annual revenue & expenditure is maintained. The scheme is running in good condition. This scheme can be connected to bulk supply.
32	Pragathi	Moragahawela (202)	The 40m^3 water tower is in good condition. The water source is a deep well & the system capacity is 90m^3/day. In the maintenance of the scheme in 2011 no pipe repair/ replacement was necessary, but repair/service of pump & cleaning of well & tank was done. NRW is recorded as 4.51% (bulk meter) & 6.97 % (pump details). The O&M and the financial management are satisfactory. It is recommended that this scheme be connected to bulk supply.

33	Janasetha	Ratmalgahawewa(225), Paalishpothana(224), Kirigallawa (226)	The 60m^3 water tower is structurally sound and the shallow well is the water source. The system capacity is 144m^3/day. The fluoride level is 1.37mg/L & only 8 hrs. supply during dry period. NRW based in bulk meter reading is 29.4% & by pump details is 26.92 %. The annual revenue and expenditure is maintained. CBO is willing to get bulk connection and may be connected.
34	Sobasisila	Pandarella(210), Panwella (211)	The 60m^3 water tower in in sound condition. The water source is a shallow well & the system capacity is 126m^3/day. The NRW is 21.74% based on pump details – only 4hrs/day supply during dry period. Scheme maintenance satisfactory. Annual revenue & expenditure is well maintained. CBO willing to get bulk connection and this is recommended.
35	Randiya	Ranpathwila (196)	The 80m^3 RC Water tower is structurally sound. The water source is a shallow well & the system capacity is 180m^3/day. No value of NRW. O&M staff should be increased to 2 technical + 1 non-technical. Very little expenditure on system maintenance. The annual revenue & expenditure is well maintained and the annual balance is nearly 2/3rd of the revenue. Recommended to be connected to bulk supply.
36	Nilmini	Kokmaduwa(201)	This is a CWSSP scheme. The 40m^3 water tower appear to be structurally sound. The scheme started operation in 2006, but the borehole pump was damaged in the same year. The scheme did not operate from late 2006. The system capacity was 55m^3/ day. The water quality was not acceptable due to high hardness. The presently community travel 2-3 km to collect water. It is recommended that the scheme be connected to the bulk system. However, initially the scheme must be operated to determine any adverse effects on the water tank & the distribution system.
S/ No.	CBO	GND	Comments
37	Senath	Gonamaruwewa (223)	This is a CWSSP Scheme with a 60m^3 water tower in good condition. The water source is a shallow well & the system capacity is 83m^3/day. The fluoride level is high at 1.9mg/L No power at the intake and a land master tractor engine is used to drive the pump. There is no record of repair/replacing pipes & repair /service/ pump and cleaning well / tank during 2011. Also only one employed technical staff was used. The CBO management is not transparent & is run by one person. The annual revenue & expenditure is recorded, but is unreliable. The CBO is willing to connect to bulk supply. The scheme is not recommended until a complete overhaul to the CBO management.
38	Eksath	Turukkuragama (234) & Maha Kiri Ibbawa (233)	This is a CWSSP scheme. The 40 m^3 water tower is in good condition. The water source is a shallow well & the system capacity is 89m^3/ day. The well water hardness is 296 mg/L & fluoride is 1.62 mg/L. Field test indicate low NRW of 2.75%. There

			is very low pressure in part of the distribution system. The annual revenue & expenditure is not correctly maintained. Only one pump is working, CBO willing to connect to bulk supply. May be connected with the general improvement necessary in CWSSP Scheme. Including replacement of small diameter pipes.
39	Praja Shakthi	Mahawewa (221)	The 40m^3 water tower is in good condition. The water source is two shallow wells and the system capacity is 110m^3/day. But the water supply is limited to 12hrs/day normally and 2.5hrs/day during dry period. Field test indicate NRW of 6.84%. During maintenance in 2011. The annual revenue & expenditure is maintained. CBO is willing for bulk connection, but being a CWSSP scheme Chlorinator facility & bulk meter must be installed, a CBO Office constructed and small diameter pipes may have to be replaced as the minimum pressure is low (4m).
40	Apsara	Meekumbukwewa (212)	The 30m^3 capacity water tower is in good condition. The water source is one shallow well & the system capacity is 82m^3/day. The water supply has to be restricted to12 hrs/day during dry period. The fluoride level is 1.35 mg/L. Field test indicate NRW of 33.96%. The annual revenue and expenditure is maintained. The CBO is willing to be connected to bulk supply, but as this scheme was CWSSP it is necessary to attend to stranded and shortcomings. The tapping pressure is satisfactory (10m).
41	Pinibindu	Ambagahawewa - 213	This is a rainwater harvesting scheme 60 households have individual collection systems. This community can be directly serviced by ANIWSP distribution network as CBO is willing to be connected bulk supply. .
42	Sham Sham	Weligollawa (218), Kuncha Halmillawa (219)	This is a CWSSP scheme, with 40m^3 water tower which appears to be in good condition. The water source is a bore hole (deep well) which failed after one year operation in 2008. The pump was also damaged & is not replaced. CBO wishes to connect to bulk supply. However, if the scheme is to be incorporated the system must be "charged" and the status of the water tank & distribution system checked. All pipe leaks repaired or pipes replaced. Additionally all the shortfalls in a CWSSP scheme must be attended to.
S/ No.	CBO	GND	Comments
43	Ekamuthu	Kumbukgollawa (209)	The 35m^3 water tower is in good condition. The water source is a shallow well & the system capacity is 93m^3/day. The water supply is inadequate (only 2 hrs/day during dry period). Both hardness & fluorides are moderately high. Field tests indicate NRW of 19.17%. There is no power & diesel driven pump is used. The annual revenue and expenditure in recorded, but the annual balance is small. CBO is willing to get bulk connection, but as this is a CWSSP scheme, all the general short comings must be put right.
44	Pradeepa	Wadigewewa (126)	The 50m^3 water tower & distribution system are in good condition. The water sources consist of the deep well and 04 shallow wells. The system capacity is 145m^3/day. Hardness level is 448 mg/L fluoride 0.82 mg/L. Though high are well below the permissible limit. The annual revenue & expenditure are well maintained. The CBO is willing to get bulk supply, which is recommended. It is proposed that CBO be re-organized, and train the CBO staff in

			O&M train the CBO leaders in management, accounting & O&M.
45	Upul	Parangiwadiya (149)	The 60m^3 water tower is structurally sound. The water source is a deep well & the system capacity is 145m^3/day. Though water quality results are: Hardness 290 mg/L & Fluoride 0.92 mg/L the consumers complain in of high fluoride, as seasonally the level fluctuates to high. The distribution is a good condition & maintained well. The financial management is also very good with an annual revenue of Rs. 613,428/ - and an annual balance of Rs.389,000/-. Though no particular problems are indicated, CBO is willing for bulk connection. It is recommended that the scheme be incorporated in ANIWSP.
46	Jalasavi	Kapugollewa (140)	The 50m^3 water tower is in good condition. The water source is deep well. The system capacity is 112m^3/day. The water quality is a problem with high fluoride of 1.58 mg/L. The distribution system has many leaking valves and the leaking valves at domestic connections. Field test indicate NRW of 34%. The annual revenue & expenditure is maintained. The CBO is willing to get bulk connection, but it is necessary to repair or replace the leaking valves, and replace other missing valves at the proper locations, It is also necessary to recruit a proper O&M group to monitor the O&M service. This group is trained & formed at the time of scheme formulation & Implementation.
47	Tristar	Agunuchchiya (119)	The 60m^3 water tower is structurally sound. The water source consists of 2 deep wells. Hardness is 290 mg/L & fluoride is 0.92mg/L. The full system capacity is not fixed as the scheme is only partially operating. The scheme is not handed over to the CBO and O&M is not started and the tariff is not charged, though water is being used. CBO is willing to connect to bulk supply. It is recommended as all components are new, but training of O&M group and key staff is essential for reliable O&M scheme management.
S/ No.	CBO	GND	Comments
48	Alhidra	Anolondawewa (138)	This sub project is adjacent to Weerasole and also completed in March 2012. The 80m^3 water tower is new in good condition. The water source consists of 2 deep well (tube wells) & the system capacity is 335m^3/day. Though the system is not officially opened for consumes water is supplied as connection are given. This is increased from 35 units in March 2012 to 884 units in May 2012 and would be fully operational by end of 2012. CBO is willing to be connected to bulk supply and this can be done provided attention is paid to train a selected O&M group and the key staff of the CBO.
49	Adhikwa	Weerasole (139)	The 40m^3 water tower is new and structurally sound. The water source consist of 1 tube well & 01 shallow well. The water quality is tolerable (Hardness 280 mg/L & fluoride 0.70 mg/L). The scheme is under NWSDB but water is supplied to part of the consumers. The completed scheme is not handed over to CBO. There are some water leaks which have to be attended to before connecting

			to ANIWSP bulk supply.
50	Hansajala	Maradankadawala (133)	The 50m^3 water tower is satisfactory but the pipe network has not been properly constructed to cover the whole service area. The water source is 01 shallow well & the system capacity is 150m^3/day. The water quality is poor, hardness is 442 mg/L & fluoride level is 0.8mg/L. Field test indicates NRW of 23.74%. The annual revenue and expenditure is not fully recorded. Full time staff is not recruited. It may be that the CBO O&M group manages the scheme as Rs.142,185/= maintenance cost is recorded (2011). However, staff should be recruited and O&M organized. Though CBO wants to connect to bulk supply, number of improvements need to be undertaken & short comings overcome.

3.2 Structures

In the absence of the water treatment plant, the elevated water tank is the important structure. In all operational schemes the water tower is structurally sound. However, in S/No. 36 Kokmaduwa in Kahadagasdigilliya, the water tower has not been used for since late 2008. Condition of the water tower and the pipe distribution system should be tested by operating the scheme prior to connecting to ANIWSP.

All the 48 piped water schemes have elevated water tanks. Three schemes have 2 tanks each. Hence there are a total of 51 water towers in the 48 schemes, of which 34 nos. are 40 to 60m^3 capacity. The water supply schemes for Parakramapura in Padaviya and Ikkirigollewa in Rambewa have 225 m^3 Reinforced Concrete (RC) water towers, the largest. There are 3nos. of 80 m^3 capacity RC water towers, one of 20 m^3 and 4 schemes 30m^3 & 35m^3, all with ferro-cement water towers. Balance 2 CBOs have no pipe water supply scheme.

3.3 Status of Distribution System

The distribution of water is by gravity. The material of distribution network is PVC type 600. Pipe diameter range from 32mm – 110mm and 50/63mm – 110/160/225mm. The length of the distribution system varies from as low as 4.5 – 5.0 Km to 11.5 Km and 23.675 Km for Parakramapura in Padaviya. There are also five other schemes with distribution network ranging from 13 Km to 16 Km.

Only ADB 3rd and ADB 4th funded Schemes have bulk meters installed, but that too on the pumping main from intake to the water tank. The World Bank funded Community Water Supply Project) (CWSSP) schemes do not have bulk meters installed.

The shortcoming observed in the distribution system is given in Table 3.2.

Table 3.2- Shortcomings observed in the Distribution System

DS Division	S/No.	Name of CBO	Condition of facilities
Rambewa	1	Kendewa	20 house connections do not have meters. These meters are being supplied now.
	2	Ikkirigollawa	Some Gate valves are leaking. To be replaced

	6	Wewalkatiya	Gate valves are leaking. To be replaced
Madawachchiya	18– 24	All CWSSP Schemes	Generally small diameter pipes are used and there is pressure drop. Pipeline not tested for pressure. There are no air valves, wash out valves and sectional (gate) valves. The Distribution System needs improvement. No Bulk Meters installed. To be installed at the head of the delivery main. Office Building & chlorinator facility is not available. 3-4 pumps have to be repaired or replaced
		ADB 3 Schemes	Water quality is poor. Some Bulk meters to be repaired However, bulk meters have to be installed at the head of the delivery main.
Kebithigollawa / Padaviya		All ADB 3 Schemes	Distribution System is satisfactory with only minor leaks in valves.
Kahadagasdigilliya	33	Paalishpothana	Pipe leaks to be repaired.
	35	Ranpathwila	Poor maintenance by the CBO. Pipe leaks to be repaired.
	36	Kokmaduwa	Water Tower not used for long period.
	37	Gonamaruwewa	There was no water in the laid pipes since end of 2008. The system has to be "charged" to find out the present status of the pipe system. It may be necessary to repair leaks and replace some pipes & valves.
	40	Meekumbukwewa	There are no air valves, wash out valves and sectional (gate) valves these are to be provided. Pipe leaks to be corrected Poor maintenance by the CBO.
Horowpathana	48	Anolondawewa	Air valves to be fitted. Wash out valves is also short. These need to be replaced. O&M group to be trained and also train key CBO staff.
	50	Maradankadawala	Water Supply downpipe from water tower is PVC (not GI) and needs to be replaced. Gate valves to be provided. CBO O&M group to be trained. CBO management is poor. Needs upgrading.

3.4 Availability of Bulk meters and serviceability of house meters.

Bulk meters were provided in 28 ADB 3rd or ADB 4th funded water supply schemes. The 19, WB/CWSSP piped water schemes and one Treasury funded scheme have no bulk meter while the other WB/CWSSP funded Scheme. S/No.41- Ambagahawewa is household rainwater harvesting scheme.

One of the causes of breakdown of bulk meters is due to sand been drawn by the tube well pumps. This can be overcome by rescreening the tube well. Once the scheme is operated by the CBO, often they do not have the resources or due to neglect the faulty bulk meters are not replaced.

House water meters are installed in all operational schemes as they are essential for collection of water tariff. Any breakdown in water meters are replaced by the CBO at the Consumer's cost. However the survey indicated that there are some houses where house meters are not installed, but this problem is not extensive.

3.5 Availability of Operational Staff

While the management is by the CBO officials who are employed elsewhere as Teachers, Government Officials or local businessmen, generally two staff operate & maintain the water supply scheme. They are one technical and one non-technical, both technical or at times there are three staff, two non-technical & one technical. The minimum is a pump operator and meter reader, the latter also undertaking clerical work.

In the development of CBO, while the sub project is planned, designed and implemented, CBO personnel are trained in all aspects of water supply scheme management. Particularly the O&M groups are trained for operational maintenance of the schemes. The CBO can decide suitable remuneration depending on the revenue. There are in addition to the 2-3 salaried staff for technical and administrative work. However, this model may not be adopted in some funded projects. Then it is necessary to train the CBO staff using experienced trainers as resource persons.

The community managed water supply schemes to be incorporated into the ANIWSP with the CBO retaining the responsibility for operation & management of the schemes, the level of management the CBO is capable of must be reviewed and training effected to improve scheme O&M and financial management.

3.6 Soundness of the present Tariff Structure & Financial Status

A connection charge is levied on the consumer equivalent to the costs. Any replacement of meter is also charged to the consumer.

The tariff charged varies from scheme to scheme. ADB3 schemes generally have a lower tariff varying from Rs. 15/- for 20/-, but in few instances more than 20/- per m3

However, in CWSSP schemes the tariff is higher, varying from Rs. 21/- to 27/- per unit.

The tariff structure varies. But basically the volumetric rate increases as the consumption increases and there is a basic charge. A typical case is Kendewa in Rambewa DSD. Here the basic charge is Rs. 100/- per month per connection and for the 1st ten units the charge is Rs. 20/- per unit, 20 – 30 units it is Rs. 30/- per unit of for 30 – 40 units it is Rs. 40/- per unit. Sample analysis indicates that for a consumption of 18 units per month on the above basis the total bill is Rs. 510/-.

The Water Tariff Structure for each CBO is given in Annex - 3.

3.7 Problems in CBO Managed Water Supply Schemes

The summarized conclusion and recommendations in table 3.1 also includes briefly some of the problems in the CBO water supply schemes. Herein only the problems are highlighted.

Table 3.3 : Technical and Non-technical Problems in CBO Managed Water Supply Schemes

S/No.	CBO	GND	Technical Problems	Non-technical Problems
01	Swashakthi	Kendewa (97)	1. Bulk meter on pumping main 2. 12 HH + 2 Inst. No water meters.	1. 4-5 hrs/day supply in dry period.

				2. Rs. 50,000 arrears with CEB.
02	Ikra	Ikkirigollawa (102)	1. Some gate valves are leaking 2. No air valves and only 2 gate valves in whole scheme. 3. Bulk meter in only BH pumping main. Not in shallow well 4. BH pump drawing sand.	1. Low voltage from 6.00 p.m to 9.00p.m
03	Arunalu	Sangilikandarawa (111)	1. Bulk meter installed in Pumping main	1. In dry season, not enough water.
04	Samagi	Thalgahawewa (84)	1. Bulk meter installed in Pumping main	1. Previous Committee of CBO has not handed over all documents.
05	Ekamuthu	Wahamalgollawa (109)	1. Bulk meter installed in Pumping main	-
06	Rangiri	Wewalkatiya (82)	1. Gate Valves are leaking 2. Deep well is working, but shallow well not completed. 3. 15 HH + 2 Inst. No water meters. 4. No CBO Office & chlorination facility 5. Bulk meter installed in Pumping main	1 There is no proper record keeping. 2. Treasurer is working as Pump Operator/ Meter Reader/Clerk. 3. There is no fixed date for Billing. Meter reader is not taking reading exactly after one month.
S/No.	CBO	GND	Technical Problems	Non-technical Problems
07	Nildiyadahara	Maha Kandarawa yaya -01 (94)	1. 10-15 invisible water meters (glass not clear. Drops of water inside) are available in the system. 2. Air valves, Wash out valves and Sectional valves not installed. 3. No CBO Office & chlorination facility 4. No Bulk Meter	1. limited supply in dry period .
08	Eksath	Katukeliya - 106	1. No air valves, Wash out Valves and Sectional valves installed. 2. No Bulk Meter 3. No CBO Office & chlorination facility	1. Not sufficient water in the dry season
09	Mahasen	Mahakandarayaya - 02 (93)	1. Air valves, Wash out valves and Sectional valves are not installed 2. No Bulk Meters. 3. No CBO Office & chlorination facility	1. Not sufficient water in the dry season
10	Dimuthu	Ihala Kolangaswewa (87)	1. Air valves, Wash out valves and Sectional valves are not installed	1. Not sufficient water in the dry season

			2. No Bulk Meters 3. No CBO Office & chlorination facility	
11	Pragithi	Bala Honda Wewa(86) &Ihala Kolangaswewa (87)	1. Air valves, Wash out valves and Sectional valves are not installed 2. No Bulk Meters. 3. No CBO Office & chlorination facility	-
12	Jayashakthi	Katuwela (66)	1. Bulk meter installed in Pumping main	1. Not sufficient water in the dry season. 2. High Fluoride.
13	Samagi	Halambagaswewa (70)	1. Bulk meter installed in Pumping main	-
14	Samagi	Ataweeragollewa (56)	1. Bulk meter installed in Pumping main. Not functioning 2. No CBO Office & chlorination	-
15	Ekamuthu	Hirallugama - 54	1. In part of the Distribution System the pressure is low. 2. Bulk meter installed in pumping main is out of order. 3. No CBO Office	-
16	Ran Arunalu	Wiralamurippuwa (64)	1. No record of bulk meter readings. 2. Bulk meter to be installed at storage tank outlet.	-
17	Isuru	Kadawathgama (60)	1. Bulk meter installed in Pumping main.	-
S/No.	CBO	GND	Technical Problems	Non-technical Problems
18	Randiya Dhahara	Unagaswewa (75)	1. No power supply to intake site 2. Air valves, Wash out valves and Sectional valves are not installed. 3. No Bulk Meter. 4. No CBO Office & chlorination facility	-
19	Nelum	Kirigalwewa (72)	1. No Bulk Meter 2. No CBO Office & chlorination facility	1. Not sufficient water in the dry season.
20	Diriyamatha	Maha-Kumbugollawa (46)	1. No air valves, Wash out Valves and Sectional valves installed. 2. No Bulk Meter 3. No CBO Office & chlorination facility 4. Only one pump in Kuda Halmila Intake.	-
21	Gemunu	Maha Divulwewa (57)	1. Low pressure in part of distribution system 2. No Bulk Meter 3. No CBO Office & chlorination facility	-
22	Sisila Diyadahara	Kidawarankulama (42)	1. Low pressure at higher elevation of distribution system. 2. No air valves, Wash out valves and Sectional valves installed. 3. No Bulk Meter	1. Blackish water comes when supplying, after long hours power cut.

			4. No CBO Office & chlorination facility	
23	Diriyamatha	Periyakulama (49), Yakkawewa (50)	1. No air valves, Wash out Valves and Sectional valves installed. 2. No Bulk Meter 3. No CBO Office & chlorination facility. 4. No power supply to intake site	1. Not sufficient water in the dry season.
24	Ridi Nadi	Athakade (55)	1. No Bulk Meter 2. No chlorination facility. 3. Only one pump is working	1. Not sufficient water in the dry season.
25	Shakthi	Ayyatigewewa (24)	1. No Bulk Meter	1. Not sufficient water in the dry season. 2. High Iron.
26	Al-Naja	Muslim Attaweerawewa (32	1. No Bulk Meter 2. No CBO Office & chlorination facility.	-
27	CBO not formed	Gonumariyaya (25)	Scheme not implemented	
28	Parakum	Parakramapura (06),	1. Bulk meter installed in Pumping main. Not working.	-
S/No.	CBO	GND	Technical Problems	Non-technical Problems
29	Suwasehana	18 Kanuwa (02)	1. Bulk meter installed in Pumping main. Not working. 2. No CBO Office & chlorination facility.	-
30	Suwasetha	Bogahawewa (14)	1. Bulk meter installed in Pumping main. Not working 2. No CBO Office.	1. Not sufficient water in the dry season.
31	Vajira	Maha Kumbukwewa (222)	1. Bulk meter installed in Pumping main.	1. Fluoride is slightly high
32	Pragathi	Moragahawela (202)	1. Bulk meter installed in Pumping main.	-
33	Janasetha	Paalishpothana(224),	1. Bulk meter installed in Pumping main.	1. Not sufficient water in the dry season. 2. Low voltage from 6.00 p.m to 9.00p.m 3. Previous Committee of CBO has not handed over all documents and accounts.
34	Sobasisila	Pandarella(210),	1. Bulk meter installed in Pumping main. Not working	1. Not sufficient water in the dry season.
35	Randiya	Ranpathwila (196)	1. Bulk meter installed in Pumping main. Not working	1. Water is marginally enough to feed dry season.
36	Nilmini	Kokmaduwa (201)	1. Not functioning. BH pump damaged. 2. No CBO Office & chlorination facility. 3. No Bulk Meter	1. People have to fetch the water from 2-3 km. No CBO office, 2. Fluoride is slightly high

37	Senath	Gonamaruwewa (223)	1. No air valves, Wash out valves and Sectional valves installed. 2. No Bulk Meter 3. No CBO Office & chlorination facility. 4. No power supply to intake site pump run by tractor engine.	1. Not sufficient water in the dry season. 2. CBO run by one person. 3. No transparency & cooperation
38	Eksath	Turukkuragama (234) & Maha Kiri Ibbawa (233)	1. Very low pressure in part of the distribution system. 2. Only one pump working. 3. No CBO Office & chlorination facility. 4. No Bulk Meter	1. Not sufficient water in the dry season.
39	Praja Shakthi	Mahawewa (221)	1. No CBO Office & chlorination facility. 2. No Bulk Meter	1. Not sufficient water in the dry season. 2. Executive Committee members getting free water
S/No.	CBO	GND	Technical Problems	Non-technical Problems
40	Apsara	Meekumbukwewa (212)	1. No CBO Office & chlorination facility. 2. No Bulk Meter 3. Minor pump leak close to water tank	1. Not sufficient water in the dry season.
41	Pinibindu	Ambagahawewa - 213	No Pipe scheme	
42	Sham Sham	Weligollawa (218), Kuncha Halmillawa (219)	1. Scheme not functioning Safe yield from BH inadequate. Pump damaged. 2. No CBO Office & chlorination facility. 3. No Bulk Meter 4. No control valves (gate valves & , Wash out valves) ,installed in intake pumping main. 5. Reinforcement visible in small area of water tank slab.	-
43	Ekamuthu	Kumbukgollawa (209)	1. Very low pressure in part of the distribution system. 2. No power at intake site. 3. Diesel pump installed 4. No CBO Office & chlorination facility. 5. No Bulk Meter	1. Not sufficient water in the dry season.
44	Pradeepa	Wadigewewa (126)	-	1. Fluoride fluctuates to high levels at times 2. Need to train CBO staff in O&M

45	Upul	Parangiwadiya (149)	1. Not sufficient valves in the pump network 2. Valve leak in pipe network and leaks near domestic water meters. 3. Excessive capacity water pump, cause of high electricity bills.	1. Fluoride fluctuates to high levels at times 2. Need to train CBO staff in O&M. 3. No proper records maintained in accounting
46	Jalasavi	Kapugollewa (140)	1. Many valve leaks due to leaking or missing valves in the distribution network. 2. Leaking domestic valves.	1 High fluoride level 1.58 mg/L. 2. No proper O&M group. 3. CBO Key staff not appointed.
47	Tristar	Agunuchchiya (119)		1. Community contribution delayed, affecting official opening of scheme. 2. Training required for O&M group & Key staff.
S/No.	CBO	GND	Technical Problems	Non-technical Problems
48	Alhidra	Anolondawewa (138)		1. Community contribution delayed, affecting official opening of scheme. 2. Need to train O&M group.
49	Adhikwa	Weerasole (139)		1. Water quantity not adequate. 2. Scheme not handed over to CBO for operation. 3. O&M group and CBO Key staff need training.
50	Hansajala	Maradankadawala (133)	1.Valves in the distribution system not adequate for flexible operation. 2. Many leaks near domestic meters and valve locations. 3. Pump is too large & electricity cost is high.	1. No capable group for O& M. 2. Need to train both O&M group and CBO Key staff.

3.8 Necessity of Rehabilitation

In table 3.1 Conclusions and Recommendations the Necessity for repair /replacement, addition of essential components to enable the scheme to be operated and maintained affectively on connection to bulk supply, have been generally discussed.

In Table 3.4 the Rehabilitation Needs have been identified as far as feasible under this status survey to enable approximate estimation of cost involved.

Table 3.4 : Rehabilitation Needs

S/No	CBO	GND	Rehabilitation Needs
01	Swashakthi	Kendewa (97)	1. Installation of Bulk Meter at Storage tank outlet 2. Installation Water Meter for non-metered connections (about 15 nos.).

			3. Provide Tapping Instrument for Connection
02	Ikra	Ikkirigollawa (102)	1. Installation of Bulk Meter at Storage tank outlet 2. Installation Air Valves & about 8 nos. (80mm – 150mm) Gate Valves 3. Provide Tapping Instrument for Connection
03	Arunalu	Sangilikandarawa (111)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection
04	Samagi	Thalgahawewa (84)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection
05	Ekamuthu	Wahamalgollawa (109)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection
S/No	CBO	GND	Rehabilitation Needs
06	Rangiri	Wewalkatiya (82)	1. Installation of Bulk Meter at Storage tank outlet 2. Installation of about 05 nos. (80mm –150mm) Gate Valves 3. Provide Tapping Instrument for Connection 4. Installation of Water meter for non-metered Connections (17nos.) 5. Preferable to provide CBO office & store
07	Nildiyadahara	Maha Kandarawa yaya –01 (94)	1. Installation of Bulk Meter at Storage tank outlet 2. Installation of Air Valve, Washout Valve & about 05 nos. (63mm–110mm) Gate Valves 3. Provide Tapping Instrument for Connection 4. Installation of Water meter for non-visible meters (about 15 nos). 5. Preferable to provide CBO office & store
08	Eksath	Katukeliya – 106	1. Installation of Bulk Meter at Storage tank outlet 2. Installation of Air Valve, Washout Valve & about 04 nos. (63mm–110mm) Gate Valves 3. Provide Tapping Instrument for Connection 4. Replace invisible Water meter (about 15 nos). 5. Preferable to provide CBO office & store
09	Mahasen	Mahakandarayaya – 02 (93)	1. Installation of Bulk Meter at Storage tank outlet 2. Installation of Air Valve, Washout Valve & about 03 nos. (63mm– 80mm) Gate Valves. 3. Provide Tapping Instrument for Connection 4. Replace non-visible Water meters (about 15 no). 5. Preferable to provide CBO office & store
10	Dimuthu	Ihala Kolangaswewa (87)	1. Installation of Bulk Meter at Storage tank outlet

			2. Installation of Air Valve, Washout Valve & about 04 nos. (63mm– 80mm) Gate Valves. 3. Provide Tapping Instrument for Connection 4. Replace non–visible Water meters (about 15 no). 5. Preferable to provide CBO office & store
11	Pragithi	Bala Honda Wewa(86) & Ihala Kolangaswewa (87)	1. Installation of Bulk Meter at Storage tank outlet 2. Installation of Air Valves, Washout Valves & about 06 nos. (63mm– 110mm) Gate Valves. 3. Provide Tapping Instrument for Connection 4. Replace non–visible Water meters (about 15 no). 5. Preferable to provide CBO office & store
12	Jayashakthi	Katuwela (66)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection 3. Preferable to provide CBO office & store
S/No	CBO	GND	Rehabilitation Needs
13	Samagi	Halambagaswewa (70)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection 3. Preferable to provide CBO office & store
14	Samagi	Ataweeragollewa (56)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection 3. Preferable to provide CBO office & store
15	Ekamuthu	Hirulugama (54)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection 3. Undersized pipes have to be replaced with larger pipe in order to reduce pressure drop.
16	Ran Arunalu	Wiralamurippuwa (64)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection
17	Isuru	Kadawathgama (60)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection
18	Randiya Dhahara	Unagaswewa (75)	1. Installation of Bulk Meter at Storage tank outlet 2. Installation of Air Valve, Washout Valve & about 05 nos. (63mm– 80mm) Gate Valves. 3. Provide Tapping instrument for connection. 4. Preferable to provide CBO office & store
19	Nelum	Kirigalwewa (72)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping instrument for connection. 3. Preferable to provide CBO office & store
20	Diriyamatha	Maha–Kumbugollawa (46)	1. Installation of Bulk Meter at Storage tank

			outlet (2no.) 2. Installation of Air Valve, Washout Valve & about 50 nos. (63mm– 80mm) Gate Valves. 3. Provide Tapping instrument for connection. 4. Preferable to provide CBO office & store
21	Gemunu	Maha Divulwewa (57)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection 3. Undersized pipes have to be replaced with larger pipes in order to increase pressure. 4. Preferable to provide CBO office & Store
22	Sisila Diyadahara	Kidawarankulama (42)	1.Installation of Bulk Meter at Storage tank outlet 2.Provide Tapping Instrument for Connection 3.Undersized pipes have to be replaced with larger pipes in order to reduce pressure. 4.Preferable to provide CBO office & Store. 5.Install Air valves, washouts, sectional Valve etc.
S/No	CBO	GND	Rehabilitation Needs
23	Diriya Shakthi	Periyakulama (49), Yakkawewa (50)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection 3. Preferable to provide CBO office & Store. 4. Install Air valve, washouts, sectional valves etc.
24	Ridi Nadi	Athakade (55)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection
25	Shakthi	Ayyatigewewa (24)	1. Installation of Bulk Meter at Storage tank. 2. Provide Tapping Instrument for connection.
26	Al-Naja	Muslim Attaweerawewa (32	1nstallation of Bulk Meter at Storage Tank. 2. Provide Tapping Instrument for connection. 3. Preferable to provide CBO office and store.
27	CBO not formed	Gonumariyaya (25)	No scheme
28	Parakum	Parakramapura(06),	1. Installation of Bulk Meter at Storage Tank. 2. Provide Taping Instrument for connection.
29	Suwasehana	18 Kanuwa (02)	1. Installation of Bulk Meter at Storage Tank. 2. Provide Tapping Instrument for connection. 3. Preferable to provide CBO office & tore.
30	Suwasetha	Bogahawewa (14)	1. Installation of Bulk Meter at Storage Tank. 2.Provide Tapping Instrument for connection 3. Preferable to provide CBO office and store.
31	Vajira	Maha Kumbukwewa (222)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection
32	Pragathi	Moragahawela (202)	1. Installation of Bulk Meter at Storage tank

			outlet 2. Provide Tapping Instrument for Connection
33	Janasetha	Paalishpothana(224),	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection
34	Sobasisila	Pandarella(210),	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection
35	Randiya	Ranpathwila (196)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection
36	Nilmini	Kokmaduwa (201)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection 3. Soundness of Water tank, status of Distribution pipe line has to be checked in the field
S/No	CBO	GND	Rehabilitation Needs
37	Senath	Gonamaruwewa (223)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection 3. Installation of Air valve, Washout Valve & sectional Valve
38	Eksath	Turukkuragama (234) & Maha Kiri Ibbawa (233)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection 3. Undersize pipe has to be replaced with larger pipe in order to increase pressure. 4. Preferable to provide CBO office & Store
39	Praja Shakthi	Mahawewa (221)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection 3. Preferable to provide CBO office & Store
40	Apsara	Meekumbukwewa (212)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection 3. Preferable to provide CBO office & Store 4. Repair the water leak close to Water Tank
41	Pinibindu	Ambagahawewa – 213	Rainwater harvesting scheme for 60 HH
42	Sham Sham	Weligollawa (218), Kuncha Halmillawa (219)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection 3. Preferable to provide CBO office & Store 4. Check Status of Distribution line and repair all leaks or replace relevant pipe lines
43	Ekamuthu	Kumbukgollawa (209)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection 3. Preferable to provide CBO office & Store

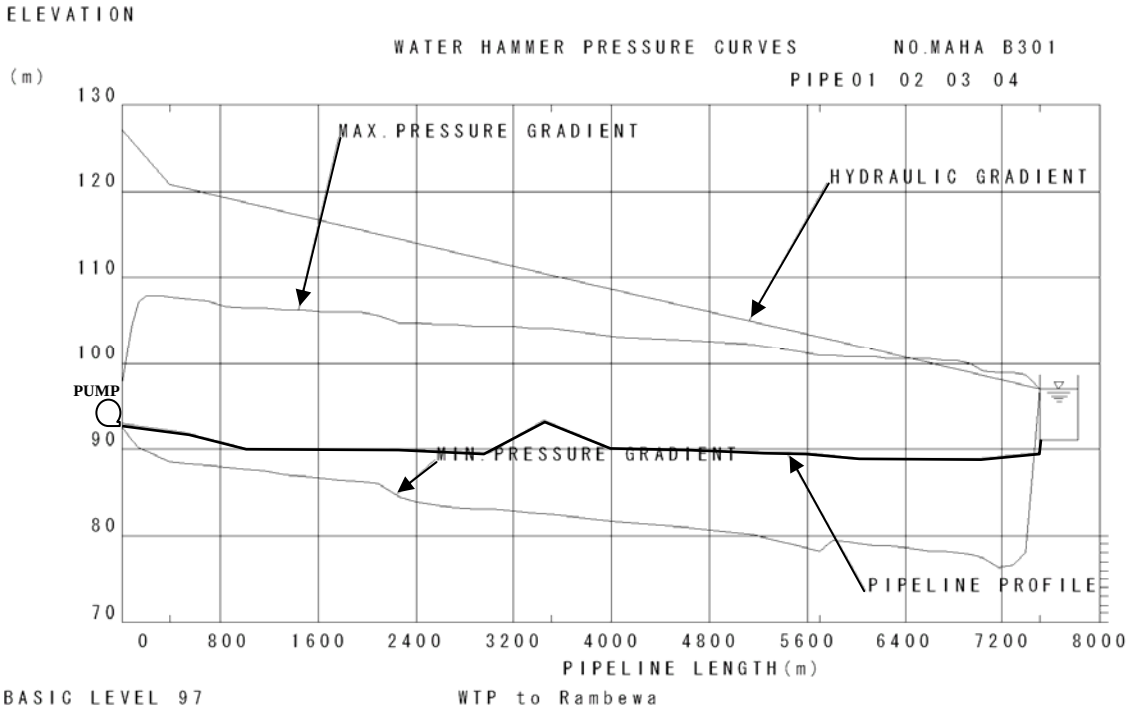
44	Pradeepa	Wadigewewa (126)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection
45	Upul	Parangiwadiya (149)	1. Installation of Bulk Meter at Storage tank outlet 2. Provide Tapping Instrument for Connection
46	Jalasavi	Kapugollewa (140)	1. 3no. 80mm Gate Valves in the distribution system are leaking. They have to be replaced. 2. 10no. domestic water meters have to be replaced (CBO will purchase) 3. Installation of Bulk Meter at Storage tank outlet 4. Provide Tapping Instrument for Connection.
47	Tristar	Agunuchchiya (119)	1. Installation of Bulk Meter at Storage tank outlet. 2. Balance domestic water meters to be provided (CBO will purchase)
S/No	CBO	GND	Rehabilitation Needs
48	Alhidra	Anolondawewa (138)	1. Installation of Bulk Meter at Storage tank outlet. 2. Balance domestic water meters to be provided (CBO will purchase)
49	Adhikwa	Weerasole (139)	1. Domestic water meters to be provided once CBO take holds scheme. 2. Preferable to provide CBO office & Store
50	Hansajala	Maradankadawala (133)	1. Installation of Bulk Meter at Storage tank outlet and replaced PVC water supply down pipe with GI pipe. 2. 500 m of 40 mm – 63 mm pipe line extension to cover GND area. 3. Preferable to provide CBO office & Store

Note : The numbers of pipe fittings to be replaced are only indicative.

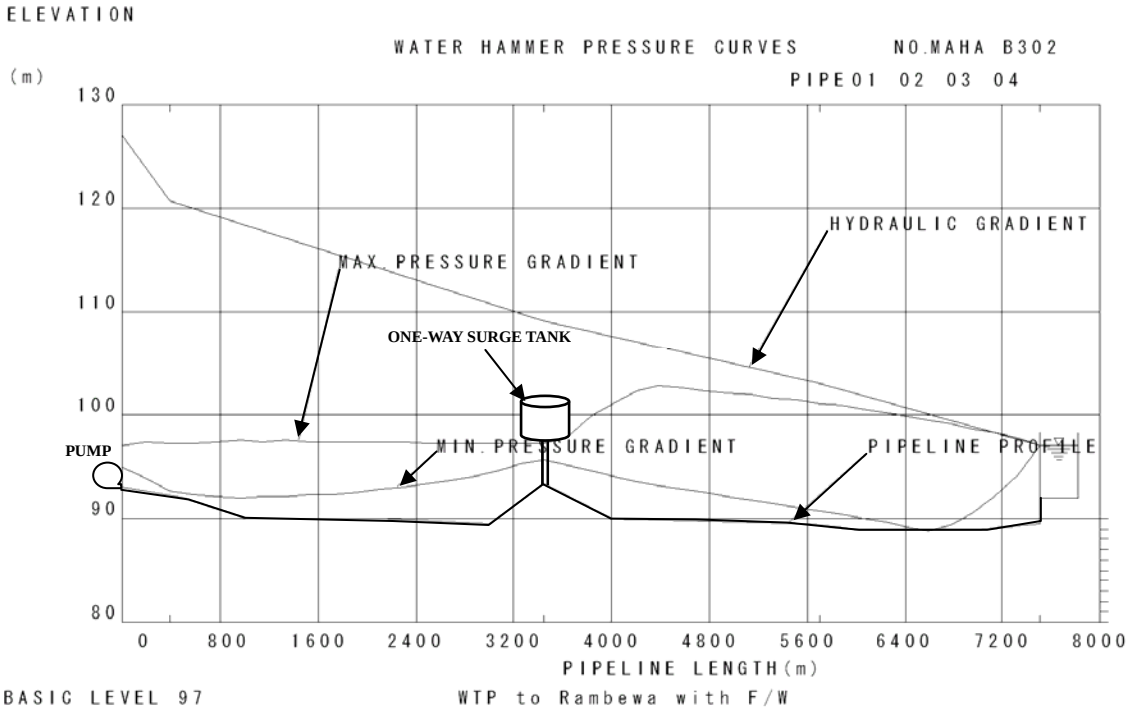
APPENDIX 5.4 Mechanical, Clause 5.4.8 Measures against Water Hammer

Results of water hammer analysis

1. Transmission line from Mahakanadarawa to Rambewa (line No. B)

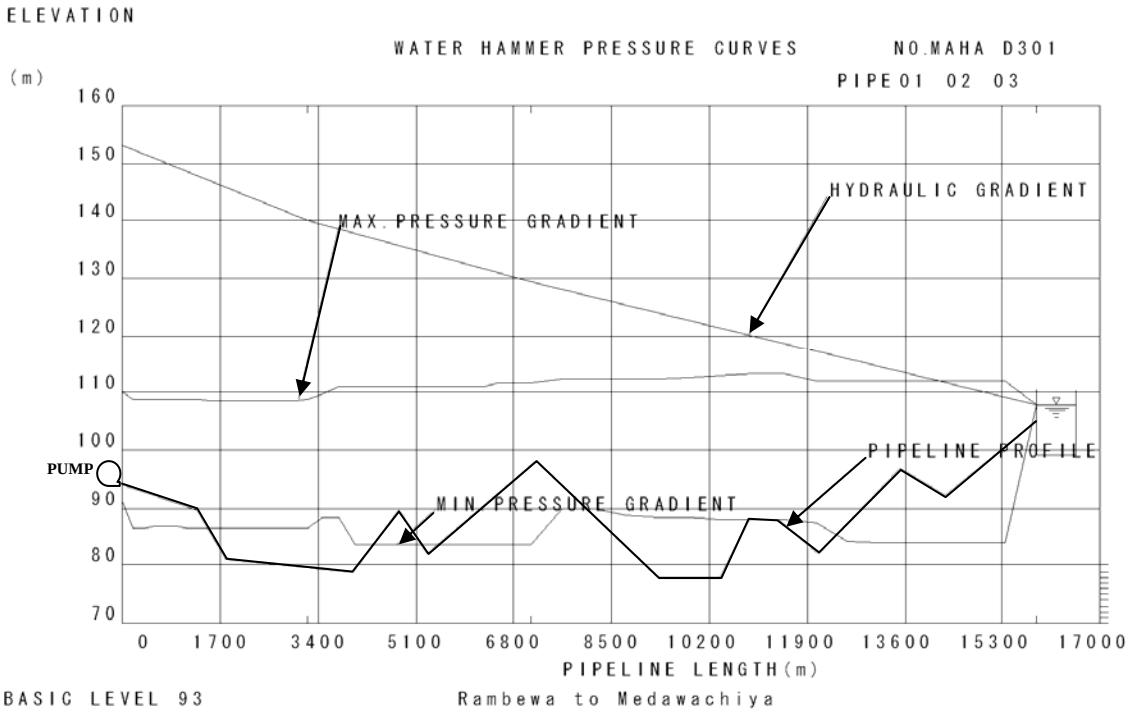


None measure system

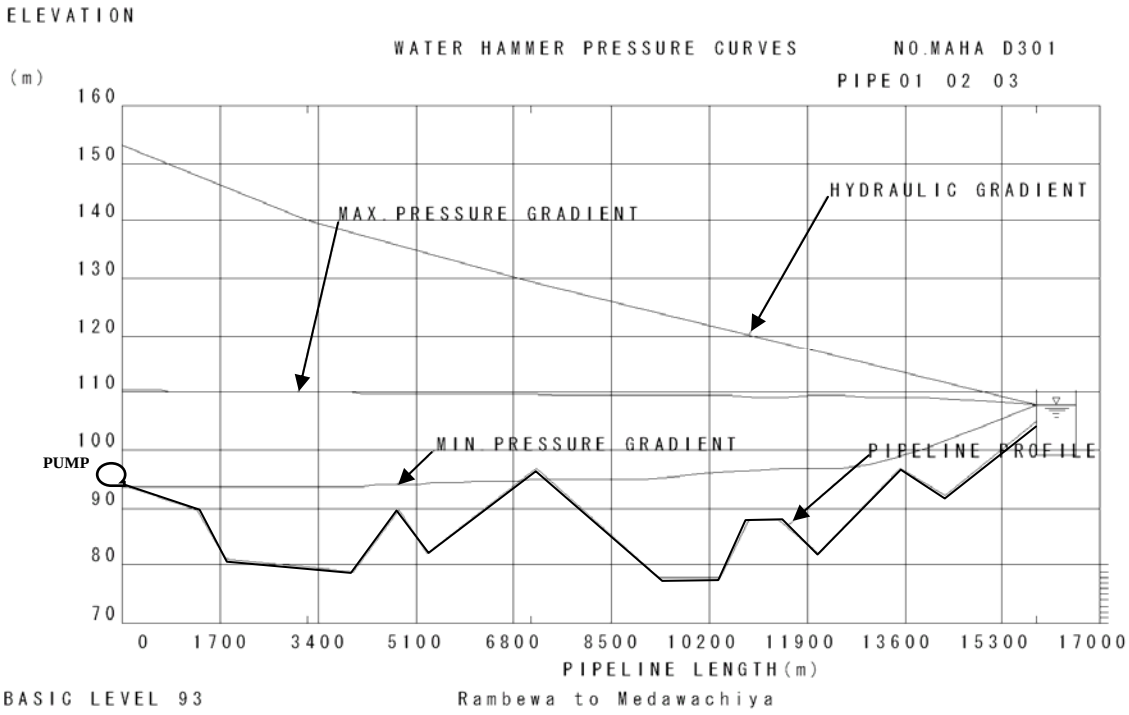


With one-way surge tank and flywheel (GD^2 =50kgm^2)

2. Transmission line from Rambewa o Medawachiya (line No. D)

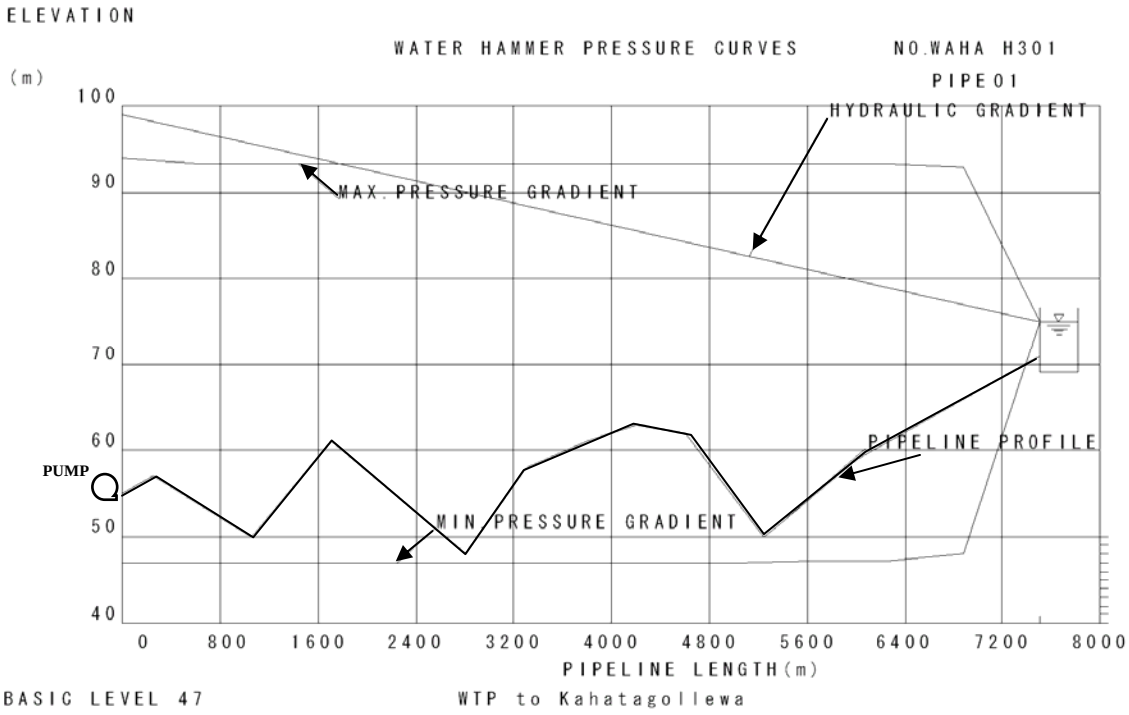


None measure system

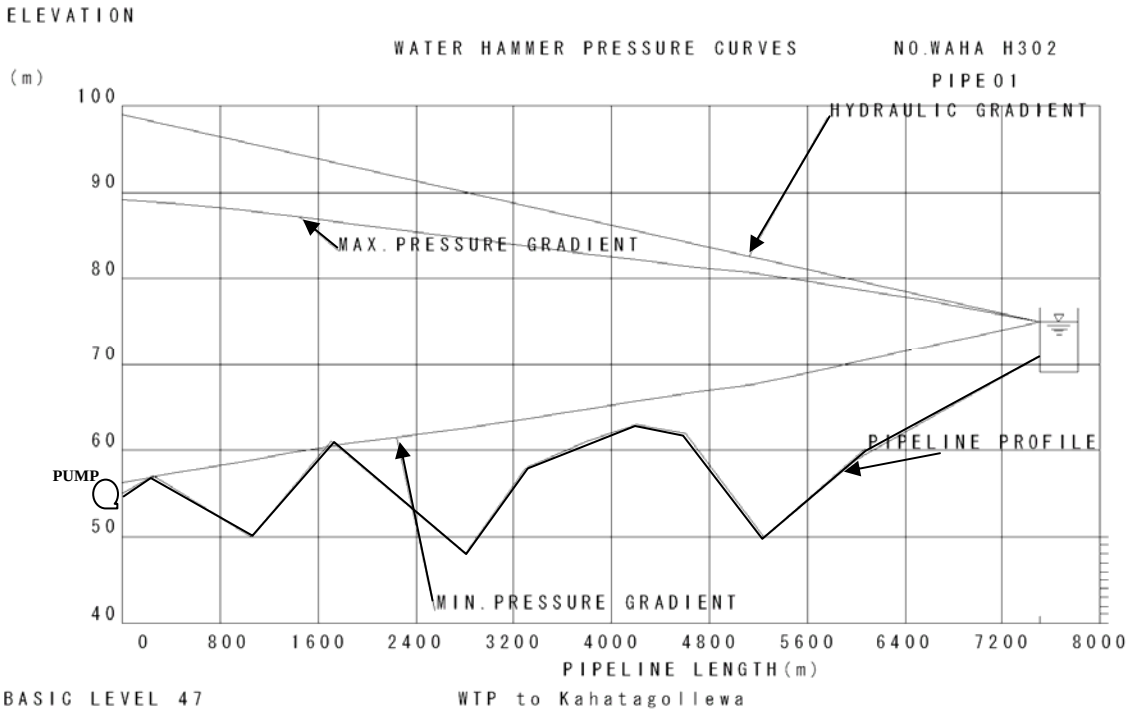


With flywheel (GD^2=100kgm^2)

3. Transmission line from Wahalkada to Kahatagollewa (line No. H)

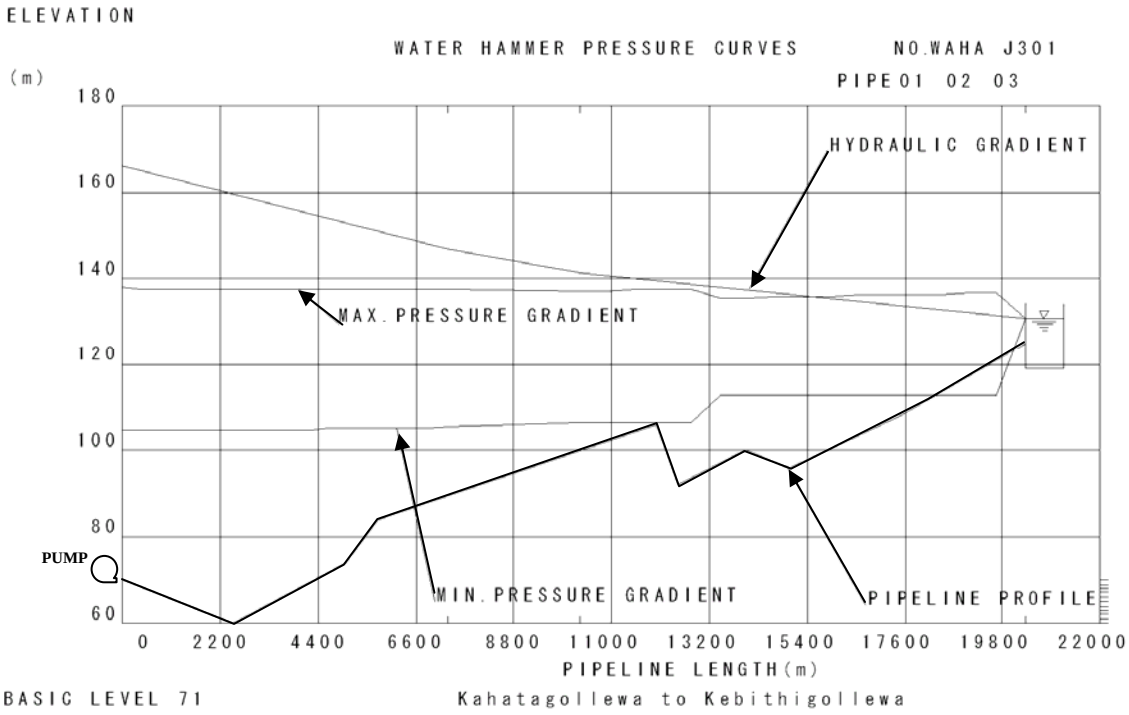


None measure



With flywheel (GD^2=150kgm^2)

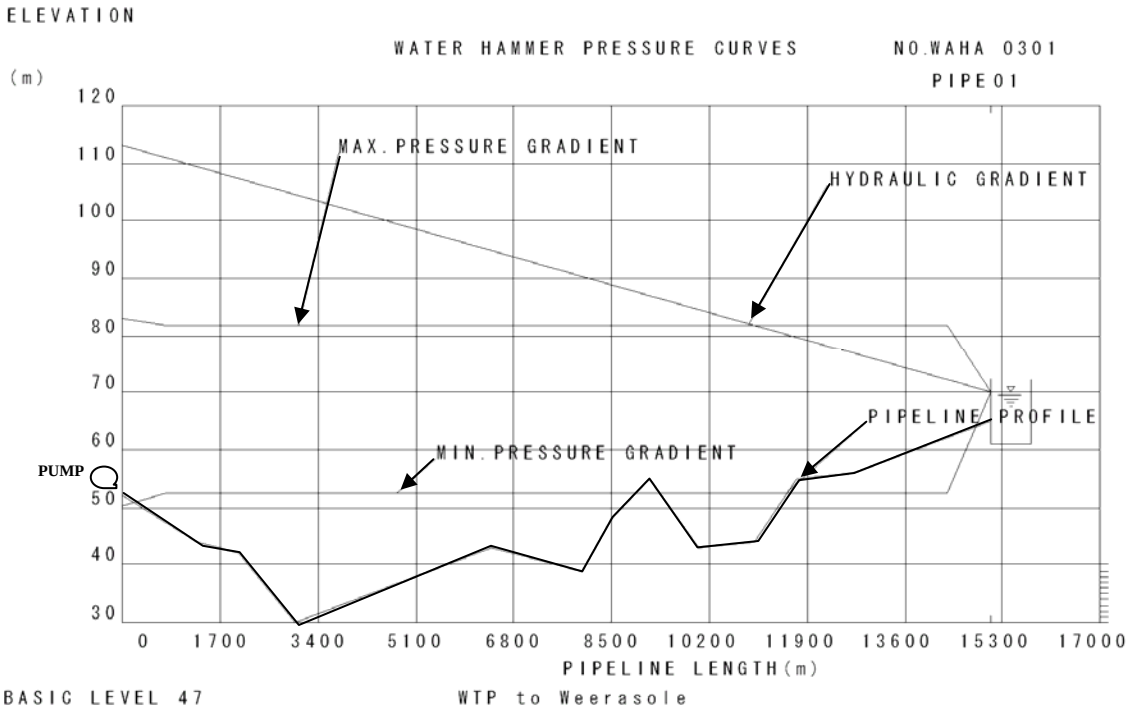
4. Transmission line from Kahatagollewa to Kebithigollewa (Line No. J)



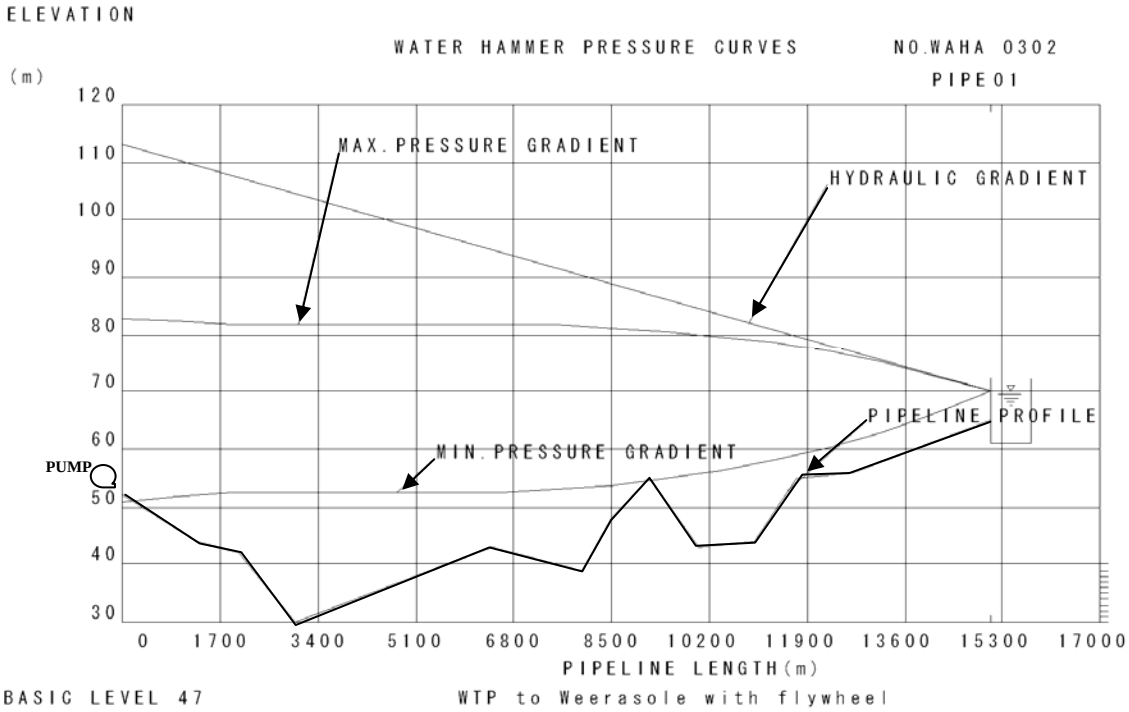
None measure

This line from Kahatagollewa to Kebithigollewa is not required the measure system

5. Transmission line from Wahalkada to Weerasole (Line No. O)

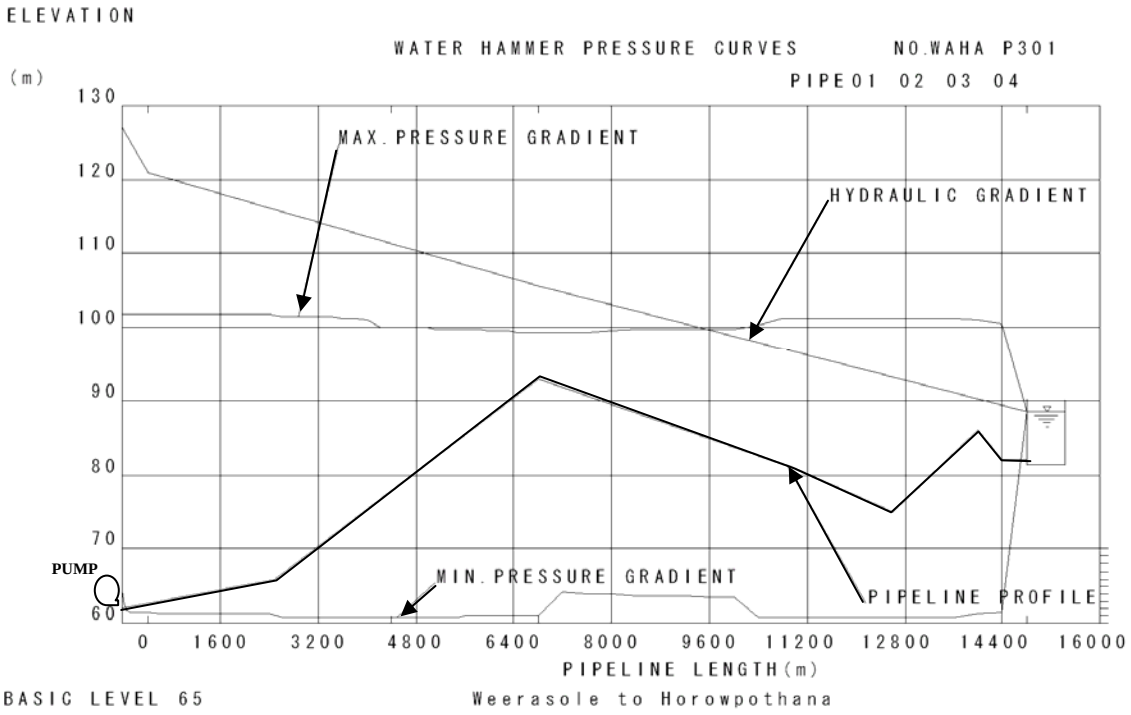


None measure

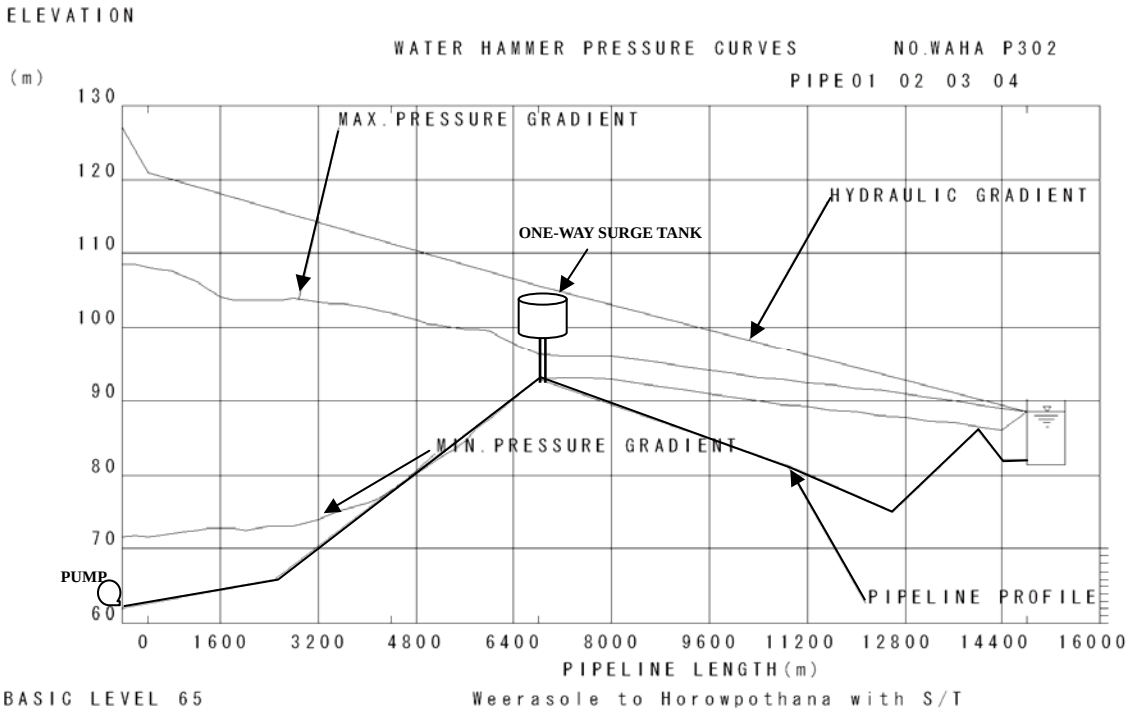


With flywheel (GD^2=150kgm^2)

6. Transmission line from Weerasole to Horowpothana (Line No.P)

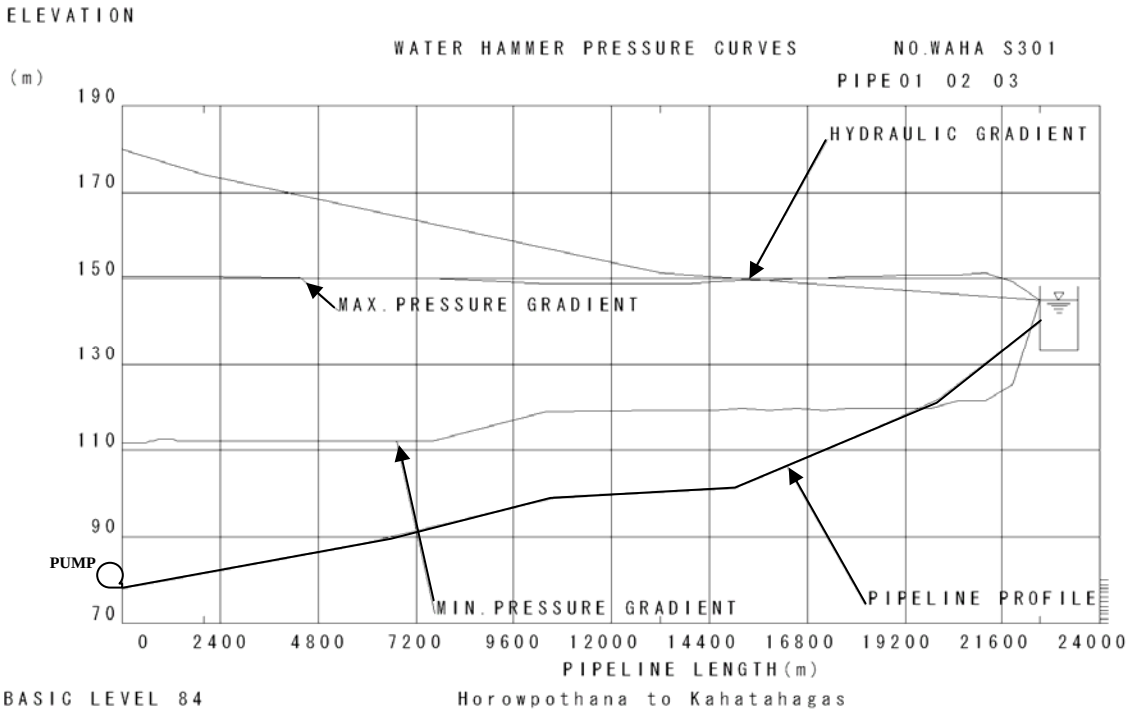


None measure

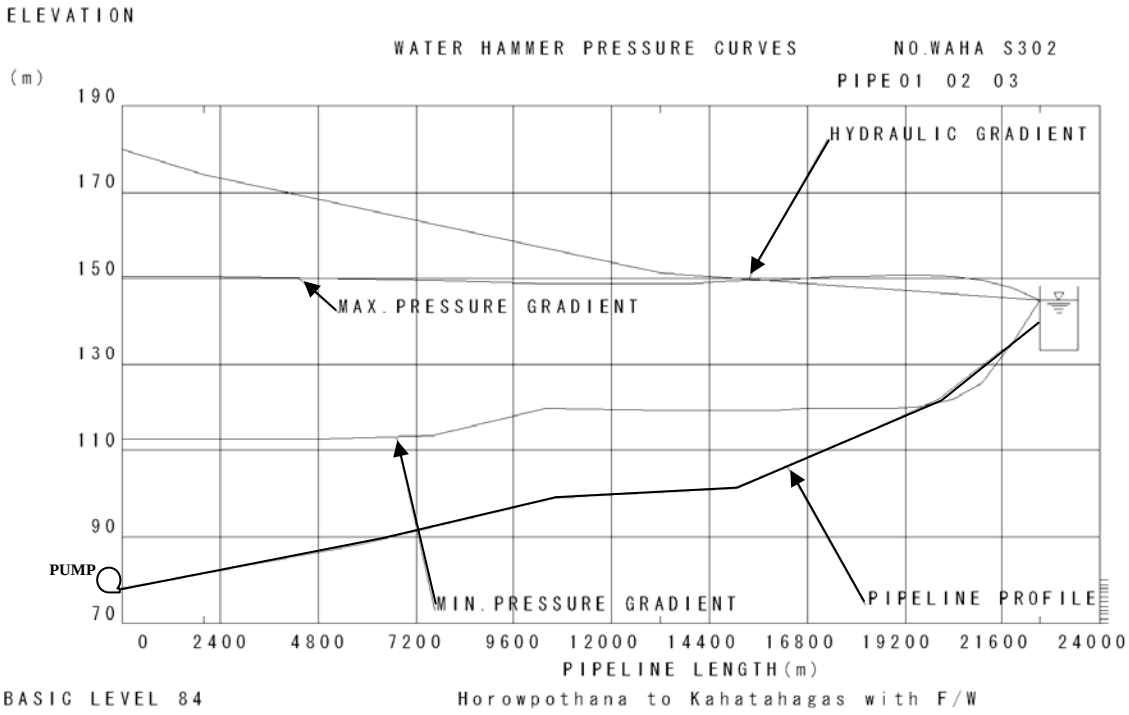


With open surge tank and flywheel (GD^2=200kgm^2)

7. Transmission line from Horowpothana to Kahasdigiliya (Line No.S)



None measure



With flywheel (GD^2=100kgm^2)

Appendix 5.5 (a) Load List for Anuradhapura North Integrated Water Supply Project

Location	Load Name	Drive	1st Stage					Final Stage					Capacitor
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
Makahanadarawa	Sand Pump	NR	1		5.5	5.5		1		5.5	5.5		
Water Intake	Intake Pump	VSD	3	1	15.0	30	30	4	1	15	45.0	45.0	
	Discharge Valve	R	3	1	0.4	0.8	0.8	4	1	0.4	1.2	1.2	
	Drain Pump	NR	2	1	3.7	3.7	3.7	2	1	3.7	3.7	3.7	
	Overhead Crane	F	1		5.0	5		1		5	5.0		
	Ventilation	F	4		0.2	0.8	0.8	4		0.2	0.8	0.8	
	Lighiting	F	1		2.0	2	2	1		2	2.0	5.0	
Total						47.8	37.3				63.2	55.7	

Location	Load Name	Drive	1st Stage					Final Stage					Capacitor
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
Makahanadarawa	De-sludge Valve	R	16		0.2	3.2	3.2	32		0.2	6.40	6.40	
Water Treatment	Sump Drainage Pump	NR	2	1	1.5	1.5	1.5	2	1	1.5	1.50	1.50	
Plant	Inlet Water Sampling Pump	NR	1		0.4	0.4	0.4	1		0.4	0.40	0.40	
	Front of Filter Water Sampling Pump	NR	1		0.4	0.4	0.4	1		0.4	0.40	0.40	
	Inflow Gate	R	4		0.4	1.6	1.6	8		0.4	3.20	3.20	
	Backwash Drainage Gate	R	4		0.4	1.6		8		0.4	3.20		
	Effluent Valve	R	4		0.2	0.8	0.8	8		0.2	1.60	1.60	
	Backwash Valve	R	4		0.4	1.6		8		0.4	3.20		
	Air Source Valve	R	4		0.2	0.8		8		0.2	1.60		
	Air Blower	RSD	2	1	15	15		2	1	15	15.00		
	Sump Drainage Pump	NR	2	1	1.5	1.5	1.5	2	1	1.5	1.50	1.50	
	Filtrated Water Sampling Pump	NR	1		0.4	0.4	0.4	1		0.4	0.40	0.40	
	ACF Lift Pump	VSD	2	1	30	30		4	2	30	60.00		
	ACF Inflow Gate	R	2		0.4	0.8		4		0.4	1.60		
	ACF Backwash Drainage Gate	R	2		0.4	0.8		4		0.4	1.60		
	ACF Effluent Valve	R	2		0.2	0.4		4		0.2	0.80		
	ACF Backwash Valve	R	2		0.4	0.8		4		0.4	1.60		
	ACF Air Source Valve	R	2		0.2	0.4		4		0.2	0.80		
	ACF Sump Drainage Pump	NR	2	1	1.5	1.5	1.5	2	1	1.5	1.50	1.50	
	ACF Water Sampling Pump	NR	1		0.4	0.4	0.4	1		0.4	0.40	0.40	
	Rambewa Transmission Pump	VSD	2	1	45	45	45.0	3	1	45	90.0	90.0	
	Discharge Valve	R	2	1	0.4	0.4	0.4	3	1	0.4	0.80	0.80	
	Back Wash Pump	SS	2	1	15	15		2	1	15	15.00		
	Discharge Valve	R	2	1	0.4	0.4		2	1	0.4	0.40		
	Transmission PST Drain Pump	NR	4	2	2.2	4.4	4.4	4	2	2.2	4.40	4.40	
	Overhead Crane	F	1		5	5		1		5	5.00		
	Alum Mixer	NR	2		1.5	3	3.0	4		1.5	6.00	6.00	
	Alum Pump	NR	2	1	0.4	0.4	0.4	2	1	0.4	0.40	0.40	
	Chlorinator-Pre	F	3	1	0.025	0.05	0.1	3	1	0.025	0.05	0.05	
	Chlorinator-Post	F	2	1	0.025	0.025	0.0	3	1	0.025	0.05	0.05	
	Chemical Crane	F	1		1.15	1.15		1		1.15	1.15		
	Exhaust Fan	NR	3		0.4	1.2	1.2	3		0.4	1.20	1.20	
	Backwash Recovery Pump	SS	2		11	22		2		11	22.0		
	Sludge Drainage Pump	NR	2	1	2.2	2.2		4	2	2.2	4.40		
	Sludge Thickener	NR	1		0.4	0.4		2		0.4	0.80		
	Sludge Pump	NR	2	1	2.2	2.2		4	2	2.2	4.40		
	Ventilation	NR	18		1.5	27	27.0	18		1.5	27.00	13.50	
	Lighiting	F	3		4	12	12.0	3		4	12.00	6.00	
	Outdoor Lighting	F	5		0.8	4		5		0.8	4.00		
Total						209.7	105.2				305.75	139.70	

Location	Load Name	Drive	1st Stage					Final Stage					Capacito
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
Rambewa	Rambewa ET Transmission Pump	SS	2	1	11	11	11	3	1	11	22.0	22.0	
Ground Reservoir	Discharge Valve for Rambewa	R	2	1	0.4	0.4	0.4	3	1	0.4	0.8	0.8	
	Medawachchiya Transmission Pump	VSD	2	1	90.0	90	90	3	1	90	180.0	180.0	
	Discharge Valve for Medawachchiya	R	2	1	0.4	0.4	0.4	3	1	0.4	0.8	0.8	
	Chlorination Booster Pump	NR	2	1	5.5	5.5	5.5	2	1	5.5	5.5	5.5	
	Exhaust Fan	NR	2		0.3	0.5	0.5	2		0.25	0.5	0.5	
	Ventilation	NR	2		0.2	0.4	0.4	2		0.2	0.4	0.4	
	Lighting	F	1		2.0	2	1	1		2	2.0	1.0	
Total						110.2	109.2				212	211.0	

Location	Load Name	Drive	1st Stage					Final Stage					Capacito
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
Medawachchiya	Ishinbassagala ET Transmission Pump	VSD	2	1	37	37	37	3	1	37	74.0	74.0	
Ground Reservoir	Discharge Valve for Ishinbassagala	R	2	1	0.4	0.4	0.4	3	1	0.4	0.8	0.8	
	Etakada ET Transmission Pump	VSD	2	1	30.0	30	30	3	1	30	60.0	60.0	
	Discharge Valve for Etakada	R	2	1	0.4	0.4	0.4	3	1	0.4	0.8	0.8	
	Chlorination Booster Pump	NR	2	1	5.5	5.5	5.5	2	1	5.5	5.5	5.5	
	Exhaust Fan	NR	2		0.3	0.5	0.5	2		0.25	0.5	0.5	
	Ventilation	NR	2		0.2	0.4	0.4	2		0.2	0.4	0.4	
	Lighting	F	1		2.0	2	1	1		2	2.0	2.0	
Total						76.2	75.2				144	144.00	

Appendix 5.5 (a) Load List for Anuradhapura North Integrated Water Supply Project

Location	Load Name	Drive	1st Stage					Final Stage					Capacito
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
East Rambewa Elevated Tank	Lighting	F	1		1	1		1		1	1		
	Chlorination Booster Pump	NR	2	1	5.5	5.5		2	1	5.5	5.5		
	Instrumentation & Controll	F	1		1	1		1		1	1		
Total						7.5					7.5		

Location	Load Name	Drive	1st Stage					Final Stage					Capacito
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
Ishinbassakgala Elevated Tank	Lighting	F	1		1	1		1		1	1		
	Chlorination Booster Pump	NR	2	1	5.5	5.5		2	1	5.5	5.5		
	Instrumentation & Controll	F	1		1	1		1		1	1		
Total						7.5					7.5		

Location	Load Name	Drive	1st Stage					Final Stage					Capacito
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
Etakada Elevated Tank	Lighting	F	1		1	1		1		1	1		
	Chlorination Booster Pump	NR	2	1	5.5	5.5		2	1	5.5	5.5		
	Instrumentation & Controll	F	1		1	1		1		1	1		
Total						7.5					7.5		

Location	Load Name	Drive	1st Stage					Final Stage					Capacito
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
GND Transmission Pump Station 1-1	Lighting	F	1		1	1		1		1	1		
	Transmission Pump	NR	2	1	3.7	3.7		2	1	3.7	3.7		
	Instrumentation & Controll	F	1		1	1		1		1	1		
Total						5.7					5.7		

Location	Load Name	Drive	1st Stage					Final Stage					Capacito
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
GND Transmission Pump Station 1-2	Lighting	F	1		1	1		1		1	1		
	Transmission Pump	NR	2	1	3.7	3.7		2	1	3.7	3.7		
	Instrumentation & Controll	F	1		1	1		1		1	1		
Total						5.7					5.7		

Location	Load Name	Drive	1st Stage					Final Stage					Capacito
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
GND Transmission Pump Station 1-3	Lighting	F	1		1	1		1		1	1		
	Transmission Pump	NR	2	1	3.7	3.7		2	1	3.7	3.7		
	Instrumentation & Controll	F	1		1	1		1		1	1		
Total						5.7					5.7		

Location	Load Name	Drive	1st Stage					Final Stage					Capacito
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
GND Transmission Pump Station 1-4	Lighting	F	1		1	1		1		1	1		
	Transmission Pump	NR	2	1	3.7	3.7		2	1	3.7	3.7		
	Instrumentation & Controll	F	1		1	1		1		1	1		
Total						5.7					5.7		

Location	Load Name	Drive	1st Stage					Final Stage					Capacito
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
GND Transmission Pump Station 1-5	Lighting	F	1		1	1		1		1	1		
	Transmission Pump	NR	2	1	3.7	3.7		2	1	3.7	3.7		
	Instrumentation & Controll	F	1		1	1		1		1	1		
Total						5.7					5.7		

Location	Load Name	Drive	1st Stage					Final Stage					Capacito
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
GND Transmission Pump Station 1-6	Lighting	F	1		1	1		1		1	1		
	Transmission Pump	NR	2	1	3.7	3.7		2	1	3.7	3.7		
	Instrumentation & Controll	F	1		1	1		1		1	1		
Total						5.7					5.7		

Appendix 5.5 (a) Load List for Anuradhapura North Integrated Water Supply Project

Location	Load Name	Drive	1st Stage					Final Stage					Capacitor
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
Wahalkada	Sand Pump	NR	1		5.5	5.5		1		5.5	5.5		
Water Intake	Intake Pump	VSD	3	1	30.0	60	60	4	1	30	90.0	90.0	
	Discharge Valve	R	3	1	0.4	0.8	0.8	4	1	0.4	1.2	1.2	
	Drain Pump	NR	2	1	3.7	3.7	3.7	2	1	3.7	3.7	3.7	
	Overhead Crane	F	1		5.0	5		1		5	5.0		
	Ventilation	F	4		0.2	0.8	0.8	4		0.2	0.8	0.8	
	Lighiting	F	1		10.0	10	5	1		10	10.0	5.0	
Total						85.8	70.3				116.2	100.7	

Location	Load Name	Drive	1st Stage					Final Stage					Capacitor
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
Wahalkada	De-sludge Valve	R	16		0.2	3.2	3.2	32		0.2	6.4	6.4	
Water Treatment	Sump Drainage Pump	NR	2	1	1.5	1.5	1.5	2	1	1.5	1.5	1.5	
Plant	Inlet Water Sampling Pump	NR	1		0.4	0.4	0.4	1		0.4	0.4	0.4	
	Front of Filter Water Sampling Pump	NR	1		0.4	0.4	0.4	1		0.4	0.4	0.4	
	Inflow Gate	R	4	1	0.75	2.25	2.3	8	1	0.75	5.3	5.3	
	Backwash Drainage Gate	R	4	1	0.75	2.25		8	1	0.75	5.3		
	Effluent Valve	R	4		0.4	1.6	1.6	8		0.4	3.2	3.2	
	Backwash Valve	R	4		0.4	1.6		8		0.4	3.2		
	Air Source Valve	R	4		0.4	1.6		8		0.4	3.2		
	Air Blower	RSD	2	1	22	22		2	1	22	22.0		
	Sump Drainage Pump	NR	2	1	1.5	1.5	1.5	2	1	1.5	1.5	1.5	
	Filtrated Water Sampling Pump	NR	1		0.4	0.4	0.4	1		0.4	0.4	0.4	
	ACF Lift Pump	VSD	2	1	37	37		4	2	37	74.0		
	ACF Inflow Gate	R	2		0.75	1.5		4		0.75	3.0		
	ACF Backwash Drainage Gate	R	2		0.75	1.5		4		0.75	3.0		
	ACF Effluent Valve	R	2		0.4	0.8		4		0.4	1.6		
	ACF Backwash Valve	R	2		0.4	0.8		4		0.4	1.6		
	ACF Air Source Valve	R	2		0.4	0.8		4		0.4	1.6		
	ACF Sump Drainage Pump	NR	2	1	1.5	1.5	1.5	2	1	1.5	1.5	1.5	
	ACF Filtrated Water Sampling Pump	NR	1		0.4	0.4	0.4	1		0.4	0.4	0.4	
	Wahalkada ET Transmission Pump	RSD	2	1	5.5	5.5	5.5	3	1	5.5	11.0	11.0	
	Discharge Valve	R	2	1	0.4	0.4	0.4	3	1	0.4	0.8	0.8	
	North Area Transmission Pump	VSD	2	1	55	55	55.0	3	1	55	110.0	110.0	
	Discharge Valve	R	2	1	0.4	0.4	0.4	3	1	0.4	0.8	0.8	
	South Area Transmission Pump	VSD	2	1	90	90	90.0	3	1	90	180.0	180.0	
	Discharge Valve	R	2	1	0.4	0.4	0.4	3	1	0.4	0.8	0.8	
	Back Wash Pump	SS	2	1	22	22	22.0	2	1	22	22.0	22.0	
	Discharge Valve	R	2	1	0.4	0.4	0.4	2	1	0.4	0.4	0.4	
	Transmission PST Drain Pump	NR	4	2	2.2	4.4	4.4	4	2	2.2	4.4	4.4	
	Overhead Crane	F	1		5	5		1		5	5.0		
	Alum Mixer	NR	2		1.5	3	3.0	4		1.5	6.0	6.0	
	Alum Pump	NR	2	1	0.75	0.75	0.8	2	1	0.75	0.8	0.8	
	Chlorinator-Pre	F	2	1	0.025	0.025	0.03	3	1	0.025	0.1	0.05	
	Chlorinator-Post	F	2	1	0.025	0.025	0.03	3	1	0.025	0.1	0.05	
	Chemical Crane	F	1		1.15	1.15		1		1.15	1.2		
	Exhaust Fan	NR	3		0.4	1.2	1.2	3		0.4	1.2	1.2	
	Backwash Recovery Pump	RSD	2		11	22		2		11	22.0		
	Sludge Drainage Pump	NR	2	1	2.2	2.2		4	2	2.2	4.4		
	Sludge Thickener	NR	1		0.4	0.4		2		0.4	0.8		
	Sludge Pump	NR	2	1	2.2	2.2		4	2	2.2	4.4		
	Ventilation	NR	18		1.5	27	13.5	18		1.5	27.0	13.5	
	Lighiting	F	3		4	12	6.0	3		4	12.0	6.0	
	Outdoor Lighting	F	5		0.8	4		5		0.8	4.0		
Total						342.5	216.2				558.4	378.7	

Location	Load Name	Drive	1st Stage					Final Stage					Capacitor
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
Kahatagollewa	Kebithigollewa GR Transmission Pump	VSD	2	1	45.0	45	45	3	1	45	90	90.0	
Ground Reservoir	Discharge Valve for Kebithigollewa	R	2	1	0.4	0.4	0.4	3	1	0.4	0.8	0.8	
	Bogahawewa ET Transmission Pump	VSD	2	1	30.0	30	30	3	1	30	60	60.0	
	Discharge Valve for Begehewa	R	2	1	0.4	0.4	0.4	3	1	0.4	0.8	0.8	
	Kahatagollewa ET Transmission Pump	RSD	2	1	3.7	3.7	3.7	3	1	3.7	7.4	7.4	
	Discharge Valve for Kahatagollewa	R	2	1	0.4	0.4	0.4	3	1	0.4	0.8	0.8	
	Chlorination Booster Pump	NR	2	1	5.5	5.5	5.5	2	1	5.5	5.5	5.5	
	Exhaust Fan	NR	2		0.3	0.5	0.5	2		0.25	0.5	0.5	
	Ventilation	NR	2		0.2	0.4	0.4	2		0.2	0.4	0.4	
	Lighting	F	1		2.0	2	1	1		2	2	1.0	
Total						88.3	87.3				168.2	167.2	

Location	Load Name	Drive	1st Stage					Final Stage					Capacitor
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
Kebithgollewa	Kebithgollewa ET Transmission Pump	SS	2	1	15	15	15	3	1	15	30	30.0	
Ground Reservoir	Discharge Valve for Kebithgollewa	R	2	1	0.4	0.4	0.4	3	1	0.4	0.8	0.8	
	Chlorination Booster Pump	NR	2	1	5.5	5.5	5.5	2	1	5.5	5.5	5.5	
	Exhaust Fan	NR	2		0.3	0.5	0.5	2		0.25	0.5	0.5	
	Ventilation	NR	2		0.2	0.4	0.4	2		0.2	0.4	0.4	
	Lighting	F	1		2.0	2	1	1		2	2	1.0	
Total						23.8	22.8				39.2	38.2	

Appendix 5.5 (a) Load List for Anuradhapura North Integrated Water Supply Project

Location	Load Name	Drive	1st Stage					Final Stage					Capacitor
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
Weerasole	Horowpothana Transmission Pump	VSD	2	1	90.0	90	90	3	1	90	180	180.0	
Ground Reservoir	Discharge Valve for Horowpothana	R	2	1	0.4	0.4	0.4	3	1	0.4	0.8	0.8	
	Chlorination Booster Pump	NR	2	1	5.5	5.5	5.5	2	1	5.5	5.5	5.5	
	Exhaust Fan	NR	2		0.3	0.5	0.5	2		0.25	0.5	0.5	
	Ventilation	NR	2		0.2	0.4	0.4	2		0.2	0.4	0.4	
	Lighting	F	1		2.0	2	1	1		2	2	1.0	
Total						98.8	97.8				189.2	188.2	

Location	Load Name	Drive	1st Stage					Final Stage					Capacitor
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
Horowpothana	Horowpothana ET Transmission Pump	RSD	2	1	5.5	5.5	5.5	3	1	5.5	11	11.0	
Ground Reservoir	Discharge Valve for Horowpothana	R	2	1	0.4	0.4	0.4	3	1	0.4	0.8	0.8	
	Rathmalgahawewa ET Transmission Pump	VSD	2	1	30.0	30	30	3	1	30	60	60.0	
	Discharge Valve for Rathmalgahawewa	R	2	1	0.4	0.4	0.4	3	1	0.4	0.8	0.8	
	Kahatagasdigiliya Transmission Pump	VSD	2	1	75.0	75	75	3	1	75	150	150.0	
	Discharge Valve for Kathmalgahawewa	R	2	1	0.4	0.4	0.4	3	1	0.4	0.8	0.8	
	Chlorination Booster Pump	NR	2	1	5.5	5.5	5.5	2	1	5.5	5.5	5.5	
	Exhaust Fan	NR	2		0.3	0.5	0.5	2		0.25	0.5	0.5	
	Ventilation	NR	2		0.2	0.4	0.4	2		0.2	0.4	0.4	
	Lighting	F	1		2.0	2	1	1		2	2	1.0	
Total						120.1	119.1				231.8	230.8	

Location	Load Name	Drive	1st Stage					Final Stage					Capacitor
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
Kahatagasdigiliya	Kahatagasdigiliya ET Transmission Pump	SS	2	1	22	22	22	3	1	22	44	44.0	
Ground Reservoir	Discharge Valve for Katagasdigiliya	R	2	1	0.4	0.4	0.4	3	1	0.4	0.8	0.8	
	Chlorination Booster Pump	NR	2	1	5.5	5.5	5.5	2	1	5.5	5.5	5.5	
	Exhaust Fan	NR	2		0.3	0.5	0.5	2		0.25	0.5	0.5	
	Ventilation	NR	2		0.2	0.4	0.4	2		0.2	0.4	0.4	
	Lighting	F	1		2.0	2	1	1		2	2	1.0	
Total						30.8	29.8				53.2	52.2	

Location	Load Name	Drive	1st Stage					Final Stage					Capacito
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
Kah-Keb Median	Lighting	F	1		1	1		1		1	1		
Elevated Tank	Chlorination Booster Pump	NR	2	1	5.5	5.5		2	1	5.5	5.5		
	Instrumentation & Controll	F	1		1	1		1		1	1		
Total						7.5					7.5		

Location	Load Name	Drive	1st Stage					Final Stage					Capacito
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
North Hor.City	Lighting	F	1		1	1		1		1	1		
Elevated Tank	Chlorination Booster Pump	NR	2	1	5.5	5.5		2	1	5.5	5.5		
	Instrumentation & Controll	F	1		1	1		1		1	1		
Total						7.5					7.5		

Location	Load Name	Drive	1st Stage					Final Stage					Capacitor
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
West Hor.City	Lighting	F	1		1	1		1		1	1		
Elevated Tank	Chlorination Booster Pump	NR	2	1	5.5	5.5		2	1	5.5	5.5		
	Instrumentation & Controll	F	1		1	1		1		1	1		
Total						7.5					7.5		

Location	Load Name	Drive	1st Stage					Final Stage					Capacitor
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
Rathmalgahawew	Lighting	F	1		1	1		1		1	1		
Elevated Tank	Chlorination Booster Pump	NR	2	1	5.5	5.5		2	1	5.5	5.5		
	Instrumentation & Controll	F	1		1	1		1		1	1		
Total						7.5					7.5		

Location	Load Name	Drive	1st Stage					Final Stage					Capacitor
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
Hamillewa	Lighting	F	1		1	1		1		1	1		
Elevated Tank	Chlorination Booster Pump	NR	2	1	5.5	5.5		2	1	5.5	5.5		
	Instrumentation & Controll	F	1		1	1		1		1	1		
Total						7.5					7.5		

Location	Load Name	Drive	1st Stage					Final Stage					Capacito
			Q,ty	stand-by	Output	Total	Generator	Q,ty	stand-by	Output	Total	Generator	
GND Transmission	Lighting	F	1		1	1		1		1	1		
Pump Station 2-1	Transmission Pump	NR	2	1	3.7	3.7		2	1	3.7	3.7		
	Instrumentation & Controll	F	1		1	1		1		1	1		
Total						5.7					5.7		

Note:Capacitor will be calculated to correct power factor 95% from 85% for over 25kW loads except VSD Starter.

Appendix 5.5 (b) Power Demand and Rates for Each Facilities

Rapid Sand Filter	Item	1st Stage	Final
Mahakandarawa	Total Demand (Rs/year)	28,844,455	72,238,638
Area	Water supply (m3/year)	3,248,500	6,533,500
	Unit Price (Rs/m3)	8.88	11.06
Wahalkada	Total Demand (Rs/year)	69,732,493	149,615,739
Area	Water supply (m3/year)	4,927,500	10,001,000
	Unit Price (Rs/m3)	14.15	14.96
Total	Total Demand (Rs/year)	98,576,948	221,854,377
	Water supply (m3/year)	8,176,000	16,534,500
	Unit Price (Rs/m3)	12.06	13.42

Location	Demand(kW)		Rates(Rs/year)		Category
	2024	2034	2024	2034	
Makahanadarawa Water Treatment Plant&Water Intake	120.9	215.2	15,448,056	27,468,669	I-2
Rambewa Ground Reservoir	48.5	187.4	6,222,516	23,917,776	I-2
Medawachchiya Ground Reservoir	33.2	126.2	4,272,421	16,117,398	I-2
East Rambewa Elevated Tank	3.575	6.05	379,232	639,783	GP-1
Ishinbassakgala Elevated Tank	3.575	6.05	379,232	639,783	GP-1
Etakada Elevated Tank	3.575	6.05	379,232	639,783	GP-1
GND Transmission Pump Station 1-1	2.8	4.4	293,961	469,241	GP-1
GND Transmission Pump Station 1-2	2.8	4.4	293,961	469,241	GP-1
GND Transmission Pump Station 1-3	2.8	4.4	293,961	469,241	GP-1
GND Transmission Pump Station 1-4	2.8	4.4	293,961	469,241	GP-1
GND Transmission Pump Station 1-5	2.8	4.4	293,961	469,241	GP-1
GND Transmission Pump Station 1-6	2.8	4.4	293,961	469,241	GP-1
Wahalkada Water Intake	39.2	84.2	5,033,340	21,393,105	I-2
Wahalkada Water Treatment Plant	202.8	378.5	25,879,342	48,281,659	I-2
Kahatagollewa Ground Reservoir	72.3	147.2	9,245,672	18,802,665	I-2
Kebithgollewa Ground Reservoir	16.6	32.6	2,149,750	4,186,388	I-2
Weerasole Ground Reservoir	84.1	167.6	10,753,108	21,393,105	I-2
Horowpothana Ground Reservoir	100.1	204.5	12,790,256	26,098,313	I-2
Kahatagasdigiliya Ground Reservoir	13.0	45.2	1,690,904	5,792,348	I-2
Kah-Keb Median Elevated Tank	3.6	6.1	379,232	639,783	GP-1
North Hor.City Elevated Tank	3.6	6.1	379,232	639,783	GP-1
West Hor.City Elevated Tank	3.6	6.1	379,232	639,783	GP-1
Rathmalgahawewa Elevated Tank	3.6	6.1	379,232	639,783	GP-1
Hamillewa Elevated Tank	3.6	6.1	379,232	639,783	GP-1
GND Transmission Pump Station 2-1	2.8	4.4	293,961	469,241	GP-1

Appendix 5.5 (c) Demand List for Anuradhapura North Integrated Water Supply Project

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
Makahanadarawa	Sand Pump	1		5.5	5.5	0.01	0.055	1		5.5	5.5	0.01	0.055
Water Intake	Intake Pump	3	1	15	30	0.6	18	4	1	15	45	0.9	40.5
	Discharge Valve	3	1	0.4	0.8	0.01	0.008	4	1	0.4	1.2	0.01	0.012
	Drain Pump	2	1	3.7	3.7	0.01	0.037	2	1	3.7	3.7	0.01	0.037
	Overhead Crane	1		5	5	0.001	0.005	1		5	5	0.001	0.005
	Ventilation	4		0.2	0.8	0.5	0.4	4		0.2	0.8	0.5	0.4
	Lighiting	1		2	2	0.2	0.4	1		2	2	0.2	0.4
Total					47.8		18.9				63.2		41.4

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
Makahanadarawa	De-sludge Valve	16		0.2	3.2	0.01	0.032	32		0.2	6.4	0.01	0.064
Water Treatment	Sump Drainage Pump	2	1	1.5	1.5	0.01	0.015	2	1	1.5	1.5	0.01	0.015
Plant	Inlet Water Sampling Pump	1		0.4	0.4	0.9	0.36	1		0.4	0.4	0.9	0.36
	Front of Filter Water Sampling Pump	1		0.4	0.4	0.9	0.36	1		0.4	0.4	0.9	0.36
	Inflow Gate	4		0.4	1.6	0.01	0.016	8		0.4	3.2	0.01	0.032
	Backwash Drainage Gate	4		0.4	1.6	0.01	0.016	8		0.4	3.2	0.01	0.032
	Effluent Valve	4		0.2	0.8	0.01	0.008	8		0.2	1.6	0.01	0.016
	Backwash Valve	4		0.4	1.6	0.01	0.016	8		0.4	3.2	0.01	0.032
	Air Source Valve	4		0.2	0.8	0.01	0.008	8		0.2	1.6	0.01	0.016
	Air Blower	2	1	15	15	0.03	0.45	2	1	15	15	0.03	0.45
	Sump Drainage Pump	2	1	1.5	1.5	0.01	0.015	2	1	1.5	1.5	0.01	0.015
	Filtrated Water Sampling Pump	1		0.4	0.4	0.9	0.36	1		0.4	0.4	0.9	0.36
	ACF Lift Pump	2	1	30	30	0.9	27	4	2	30	60	0.9	54
	ACF Inflow Gate	2		0.4	0.8	0.01	0.008	4		0.4	1.6	0.01	0.016
	ACF Backwash Drainage Gate	2		0.4	0.8	0.01	0.008	4		0.4	1.6	0.01	0.016
	ACF Effluent Valve	2		0.2	0.4	0.01	0.004	4		0.2	0.8	0.01	0.008
	ACF Backwash Valve	2		0.4	0.8	0.01	0.008	4		0.4	1.6	0.01	0.016
	ACF Air Source Valve	2		0.2	0.4	0.01	0.004	4		0.2	0.8	0.01	0.008
	ACF Sump Drainage Pump	2	1	1.5	1.5	0.01	0.015	2	1	1.5	1.5	0.01	0.015
	ACF Water Sampling Pump	1		0.4	0.4	0.9	0.36	1		0.4	0.4	0.9	0.36
	Rambewa Transmission Pump	2	1	45	45	0.9	40.5	3	1	45	90	0.9	81
	Discharge Valve	2	1	0.4	0.4	0.01	0.004	3	1	0.4	0.8	0.01	0.008
	Back Wash Pump	2	1	15	15	0.03	0.45	2	1	15	15	0.03	0.45
	Discharge Valve	2	1	0.4	0.4	0.01	0.004	2	1	0.4	0.4	0.01	0.004
	Transmission PST Drain Pump	4	2	2.2	4.4	0.01	0.044	4	2	2.2	4.4	0.01	0.044
	Overhead Crane	1		5	5	0.001	0.005	1		5	5	0.001	0.005
	Alum Mixer	2		1.5	3	0.5	1.5	4		1.5	6	0.5	3
	Alum Pump	2	1	0.4	0.4	0.45	0.18	2	1	0.4	0.4	0.9	0.36
	Chlorinator-Pre	2	1	0.025	0.025	0.9	0.0225	3	1	0.025	0.05	0.9	0.045
	Chlorinator-Post	2	1	0.025	0.025	0.9	0.0225	3	1	0.025	0.05	0.9	0.045
	Chemical Crane	1		1.15	1.15	0.05	0.0575	1		1.15	1.15	0.05	0.0575
	Exhaust Fan	3		0.4	1.2	0.01	0.012	3		0.4	1.2	0.01	0.012
	Backwash Recovery Pump	2		11	22	0.5	11	2		11	22	0.5	11
	Sludge Drainage Pump	2	1	2.2	2.2	0.05	0.11	4	2	2.2	4.4	0.05	0.22
	Sludge Thickener	1		0.4	0.4	0.9	0.36	2		0.4	0.8	0.9	0.72
	Sludge Pump	2	1	2.2	2.2	0.9	1.98	4	2	2.2	4.4	0.9	3.96
	Ventilation	18		1.5	27	0.5	13.5	18		1.5	27	0.5	13.5
	Lighiting	3		4	12	0.2	2.4	3		4	12	0.2	2.4
	Outdoor Lighting	5		0.8	4	0.2	0.8	5		0.8	4	0.2	0.8
Total					209.7		102.0				305.8		173.8

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
Rambewa	Rambewa ET Transmission Pump	2	1	11	11	0.45	4.95	3	1	11	22	0.9	19.8
Ground Reservoir	Discharge Valve for Rambewa	2	1	0.4	0.4	0.01	0.004	3	1	0.4	0.8	0.01	0.008
	Medawachchiya Transmission Pump	2	1	90	90	0.45	40.5	3	1	90	180	0.9	162
	Discharge Valve for Medawachchiya	2	1	0.4	0.4	0.01	0.004	3	1	0.4	0.8	0.01	0.008
	Chlorination Booster Pump	2	1	5.5	5.5	0.45	2.475	2	1	5.5	5.5	0.9	4.95
	Exhaust Fan	2		0.25	0.5	0.01	0.005	2		0.25	0.5	0.01	0.005
	Ventilation	2		0.2	0.4	0.5	0.2	2		0.2	0.4	0.5	0.2
	Lighting	1		2	2	0.2	0.4	1		2	2	0.2	0.4
Total					110.2		48.5				212.0		187.4

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
Medawachchiya	Ishinbassagala ET Transmission Pump	2	1	37	37	0.45	16.65	3	1	37	74	0.9	66.6
Ground Reservoir	Discharge Valve for Ishinbassagala	2	1	0.4	0.4	0.01	0.004	3	1	0.4	0.8	0.01	0.008
	Etakada ET Transmission Pump	2	1	30	30	0.45	13.5	3	1	30	60	0.9	54
	Discharge Valve for Etakada	2	1	0.4	0.4	0.01	0.004	3	1	0.4	0.8	0.01	0.008
	Chlorination Booster Pump	2	1	5.5	5.5	0.45	2.475	2	1	5.5	5.5	0.9	4.95
	Exhaust Fan	2		0.25	0.5	0.01	0.005	2		0.25	0.5	0.01	0.005
	Ventilation	2		0.2	0.4	0.5	0.2	2		0.2	0.4	0.5	0.2
	Lighting	1		2	2	0.2	0.4	1		2	2	0.2	0.4
Total					76.2		33.2				144		126.2

Appendix 5.5 (c) Demand List for Anuradhapura North Integrated Water Supply Project

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
East Rambewa	Lighting	1		1	1	0.2	0.2	1		1	1	0.2	0.2
Elevated Tank	Chlorination Booster Pump	2	1	5.5	5.5	0.45	2.475	2	1	5.5	5.5	0.9	4.95
	Instrumentation & Controll	1		1	1	0.9	0.9	1		1	1	0.9	0.9
Total					7.5		3.6				7.5		6.1

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
Ishinbassakgala	Lighting	1		1	1	0.2	0.2	1		1	1	0.2	0.2
Elevated Tank	Chlorination Booster Pump	2	1	5.5	5.5	0.45	2.475	2	1	5.5	5.5	0.9	4.95
	Instrumentation & Controll	1		1	1	0.9	0.9	1		1	1	0.9	0.9
Total					7.5		3.6				7.5		6.1

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
Etakada	Lighting	1		1	1	0.2	0.2	1		1	1	0.2	0.2
Elevated Tank	Chlorination Booster Pump	2	1	5.5	5.5	0.45	2.475	2	1	5.5	5.5	0.9	4.95
	Instrumentation & Controll	1		1	1	0.9	0.9	1		1	1	0.9	0.9
Total					7.5		3.6				7.5		6.1

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
GND Transmissior	Lighting	1		1	1	0.2	0.2	1		1	1	0.2	0.2
Pump Station 1-1	Transmission Pump	2	1	3.7	3.7	0.45	1.665	2	1	3.7	3.7	0.9	3.33
	Instrumentation & Controll	1		1	1	0.9	0.9	1		1	1	0.9	0.9
Total					5.7		2.8				5.7		4.4

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
GND Transmissior	Lighting	1		1	1	0.2	0.2	1		1	1	0.2	0.2
Pump Station 1-2	Transmission Pump	2	1	3.7	3.7	0.45	1.665	2	1	3.7	3.7	0.9	3.33
	Instrumentation & Controll	1		1	1	0.9	0.9	1		1	1	0.9	0.9
Total					5.7		2.8				5.7		4.4

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
GND Transmissior	Lighting	1		1	1	0.2	0.2	1		1	1	0.2	0.2
Pump Station 1-3	Transmission Pump	2	1	3.7	3.7	0.45	1.665	2	1	3.7	3.7	0.9	3.33
	Instrumentation & Controll	1		1	1	0.9	0.9	1		1	1	0.9	0.9
Total					5.7		2.8				5.7		4.4

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
GND Transmissior	Lighting	1		1	1	0.2	0.2	1		1	1	0.2	0.2
Pump Station 1-4	Transmission Pump	2	1	3.7	3.7	0.45	1.665	2	1	3.7	3.7	0.9	3.33
	Instrumentation & Controll	1		1	1	0.9	0.9	1		1	1	0.9	0.9
Total					5.7		2.8				5.7		4.4

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
GND Transmissior	Lighting	1		1	1	0.2	0.2	1		1	1	0.2	0.2
Pump Station 1-5	Transmission Pump	2	1	3.7	3.7	0.45	1.665	2	1	3.7	3.7	0.9	3.33
	Instrumentation & Controll	1		1	1	0.9	0.9	1		1	1	0.9	0.9
Total					5.7		2.8				5.7		4.4

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
GND Transmissior	Lighting	1		1	1	0.2	0.2	1		1	1	0.2	0.2
Pump Station 1-6	Transmission Pump	2	1	3.7	3.7	0.45	1.665	2	1	3.7	3.7	0.9	3.33
	Instrumentation & Controll	1		1	1	0.9	0.9	1		1	1	0.9	0.9
Total					5.7		2.8				5.7		4.4

Appendix 5.5 (c) Demand List for Anuradhapura North Integrated Water Supply Project

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
Wahalkada	Sand Pump	1		5.5	5.5	0.01	0.055	1		5.5	5.5	0.01	0.055
Water Intake	Intake Pump	3	1	30	60	0.6	36	4	1	30	90	0.9	81
	Discharge Valve	3	1	0.4	0.8	0.01	0.008	4	1	0.4	1.2	0.01	0.012
	Drain Pump	2	1	3.7	3.7	0.2	0.74	2	1	3.7	3.7	0.2	0.74
	Overhead Crane	1		5	5	0.001	0.005	1		5	5	-0.001	-0.005
	Ventilation	4		0.2	0.8	0.5	0.4	4		0.2	0.8	0.5	0.4
	Lighiting	1		10	10	0.2	2	1		10	10	0.2	2
Total					85.8		39.2				116.2		84.2

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
Wahalkada	De-sludge Valve	16		0.2	3.2	0.01	0.032	32		0.2	6.4	0.01	0.064
Water Treatment	Sump Drainage Pump	2	1	1.5	1.5	0.9	1.35	2	1	1.5	1.5	0.9	1.35
Plant	Inlet Water Sampling Pump	1		0.4	0.4	0.9	0.36	1		0.4	0.4	0.9	0.36
	Front of Filter Water Sampling Pump	1		0.4	0.4	0.9	0.36	1		0.4	0.4	0.9	0.36
	Inflow Gate	4	1	0.75	2.25	0.01	0.0225	8	1	0.75	5.25	0.01	0.0525
	Backwash Drainage Gate	4	1	0.75	2.25	0.01	0.0225	8	1	0.75	5.25	0.01	0.0525
	Effluent Valve	4		0.4	1.6	0.01	0.016	8		0.4	3.2	0.01	0.032
	Backwash Valve	4		0.4	1.6	0.01	0.016	8		0.4	3.2	0.01	0.032
	Air Source Valve	4		0.4	1.6	0.01	0.016	8		0.4	3.2	0.01	0.032
	Air Blower	2	1	22	22	0.03	0.66	2	1	22	22	0.03	0.66
	Sump Drainage Pump	2	1	1.5	1.5	0.01	0.015	2	1	1.5	1.5	0.01	0.015
	Filtrated Water Sampling Pump	1		0.4	0.4	0.9	0.36	1		0.4	0.4	0.9	0.36
	ACF Lift Pump	2	1	37	37	0.9	33.3	4	2	37	74	0.9	66.6
	ACF Inflow Gate	2		0.75	1.5	0.01	0.015	4		0.75	3	0.01	0.03
	ACF Backwash Drainage Gate	2		0.75	1.5	0.01	0.015	4		0.75	3	0.01	0.03
	ACF Effluent Valve	2		0.4	0.8	0.01	0.008	4		0.4	1.6	0.01	0.016
	ACF Backwash Valve	2		0.4	0.8	0.01	0.008	4		0.4	1.6	0.01	0.016
	ACF Air Source Valve	2		0.4	0.8	0.01	0.008	4		0.4	1.6	0.01	0.016
	ACF Sump Drainage Pump	2	1	1.5	1.5	0.01	0.015	2	1	1.5	1.5	0.01	0.015
	ACF Filtrated Water Sampling Pump	1		0.4	0.4	0.9	0.36	1		0.4	0.4	0.9	0.36
	Wahalkada ET Transmission Pump	2	1	5.5	5.5	0.45	2.475	3	1	5.5	11	0.9	9.9
	Discharge Valve	2	1	0.4	0.4	0.01	0.004	3	1	0.4	0.8	0.01	0.008
	North Area Transmission Pump	2	1	55	55	0.9	49.5	3	1	55	110	0.9	99
	Discharge Valve	2	1	0.4	0.4	0.01	0.004	3	1	0.4	0.8	0.01	0.008
	South Area Transmission Pump	2	1	90	90	0.9	81	3	1	90	180	0.9	162
	Discharge Valve	2	1	0.4	0.4	0.01	0.004	3	1	0.4	0.8	0.01	0.008
	Back Wash Pump	2	1	22	22	0.03	0.66	2	1	22	22	0.03	0.66
	Discharge Valve	2	1	0.4	0.4	0.01	0.004	2	1	0.4	0.4	0.01	0.004
	Transmission PST Drain Pump	4	2	2.2	4.4	0.01	0.044	4	2	2.2	4.4	0.01	0.044
	Overhead Crane	1		5	5	0.001	0.005	1		5	5	0.001	0.005
	Alum Mixer	2		1.5	3	0.5	1.5	4		1.5	6	0.5	3
	Alum Pump	2	1	0.75	0.75	0.45	0.3375	2	1	0.75	0.75	0.9	0.675
	Chlorinator-Pre	2	1	0.025	0.025	0.9	0.0225	3	1	0.025	0.05	0.9	0.045
	Chlorinator-Post	2	1	0.025	0.025	0.9	0.0225	3	1	0.025	0.05	0.9	0.045
	Chemical Crane	1		1.15	1.15	0.05	0.0575	1		1.15	1.15	0.05	0.0575
	Exhaust Fan	3		0.4	1.2	0.01	0.012	3		0.4	1.2	0.01	0.012
	Backwash Recovery Pump	2		11	22	0.5	11	2		11	22	0.5	11
	Sludge Drainage Pump	2	1	2.2	2.2	0.05	0.11	4	2	2.2	4.4	0.05	0.22
	Sludge Thickener	1		0.4	0.4	0.9	0.36	2		0.4	0.8	0.9	0.72
	Sludge Pump	2	1	2.2	2.2	0.9	1.98	4	2	2.2	4.4	0.9	3.96
	Ventilation	18		1.5	27	0.5	13.5	18		1.5	27	0.5	13.5
	Lighiting	3		4	12	0.2	2.4	3		4	12	0.2	2.4
	Outdoor Lighting	5		1	4	0.2	1	5		1	4	0.2	1
Total					342.5		202.8				558.4		378.5

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
Kahatagollewa	Kebithigollewa GR Transmission Pump	2	1	45	45	0.9	40.5	3	1	45	90	0.9	81
Ground Reservoir	Discharge Valve for Kebithigollewa	2	1	0.4	0.4	0.01	0.004	3	1	0.4	0.8	0.01	0.008
	Bogahawewa ET Transmission Pump	2	1	30	30	0.9	27	3	1	30	60	0.9	54
	Discharge Valve for Begehewa	2	1	0.4	0.4	0.01	0.004	3	1	0.4	0.8	0.01	0.008
	Kahatagollewa ET Transmission Pump	2	1	3.7	3.7	0.45	1.665	3	1	3.7	7.4	0.9	6.66
	Discharge Valve for Kahatagollewa	2	1	0.4	0.4	0.01	0.004	3	1	0.4	0.8	0.01	0.008
	Chlorination Booster Pump	2	1	5.5	5.5	0.45	2.475	2	1	5.5	5.5	0.9	4.95
	Exhaust Fan	2		0.25	0.5	0.01	0.005	2		0.25	0.5	0.01	0.005
	Ventilation	2		0.2	0.4	0.5	0.2	2		0.2	0.4	0.5	0.2
	Lighting	1		2	2	0.2	0.4	1		2	2	0.2	0.4
Total					88.3		72.3				168.2		147.2

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
Kebithgollewa	Kebithgollewa ET Transmission Pump	2	1	15	15	0.9	13.5	3	1	15	30	0.9	27
Ground Reservoir	Discharge Valve for Kebithgollewa	2	1	0.4	0.4	0.01	0.004	3	1	0.4	0.8	0.01	0.008
	Chlorination Booster Pump	2	1	5.5	5.5	0.45	2.475	2	1	5.5	5.5	0.9	4.95
	Exhaust Fan	2		0.25	0.5	0.01	0.005	2		0.25	0.5	0.01	0.005
	Ventilation	2		0.2	0.4	0.5	0.2	2		0.2	0.4	0.5	0.2
	Lighting	1		2	2	0.2	0.4	1		2	2	0.2	0.4
Total					23.8		16.6				39.2		32.6

Appendix 5.5 (c) Demand List for Anuradhapura North Integrated Water Supply Project

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
Weerasole	Horowpothana Transmission Pump	2	1	90	90	0.9	81	3	1	90	180	0.9	162
Ground Reservoir	Discharge Valve for Horowpothana	2	1	0.4	0.4	0.01	0.004	3	1	0.4	0.8	0.01	0.008
	Chlorination Booster Pump	2	1	5.5	5.5	0.45	2.475	2	1	5.5	5.5	0.9	4.95
	Exhaust Fan	2		0.25	0.5	0.01	0.005	2		0.25	0.5	0.01	0.005
	Ventilation	2		0.2	0.4	0.5	0.2	2		0.2	0.4	0.5	0.2
	Lighting	1		2	2	0.2	0.4	1		2	2	0.2	0.4
Total					98.8		84.1				189.2		167.6

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
Horowpothana	Horowpothana ET Transmission Pump	2	1	5.5	5.5	0.45	2.475	3	1	5.5	11	0.9	9.9
Ground Reservoir	Discharge Valve for Horowpothana	2	1	0.4	0.4	0.01	0.004	3	1	0.4	0.8	0.01	0.008
	Rathmalgahawewa ET Transmission Pump	2	1	30	30	0.9	27	3	1	30	60	0.9	54
	Discharge Valve for Rathmalgahawewa	2	1	0.4	0.4	0.01	0.004	3	1	0.4	0.8	0.01	0.008
	Kahatagasdigiliya Transmission Pump	2	1	75	75	0.9	67.5	3	1	75	150	0.9	135
	Discharge Valve for Kathmalgahawewa	2	1	0.4	0.4	0.01	0.004	3	1	0.4	0.8	0.01	0.008
	Chlorination Booster Pump	2	1	5.5	5.5	0.45	2.475	2	1	5.5	5.5	0.9	4.95
	Exhaust Fan	2		0.25	0.5	0.01	0.005	2		0.25	0.5	0.01	0.005
	Ventilation	2		0.2	0.4	0.5	0.2	2		0.2	0.4	0.5	0.2
	Lighting	1		2	2	0.2	0.4	1		2	2	0.2	0.4
Total					120.1		100.1				231.8		204.5

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
Kahatagasdigiliya	Kahatagasdigiliya ET Transmission Pump	2	1	22	22	0.45	9.9	3	1	22	44	0.9	39.6
Ground Reservoir	Discharge Valve for Katagasdigiliya	2	1	0.4	0.4	0.01	0.004	3	1	0.4	0.8	0.01	0.008
	Chlorination Booster Pump	2	1	5.5	5.5	0.45	2.475	2	1	5.5	5.5	0.9	4.95
	Exhaust Fan	2		0.25	0.5	0.01	0.005	2		0.25	0.5	0.01	0.005
	Ventilation	2		0.2	0.4	0.5	0.2	2		0.2	0.4	0.5	0.2
	Lighting	1		2	2	0.2	0.4	1		2	2	0.2	0.4
Total					30.8		13.0				53.2		45.2

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
Kah-Keb Median	Lighting	1		1	1	0.2	0.2	1		1	1	0.2	0.2
Elevated Tank	Chlorination Booster Pump	2	1	5.5	5.5	0.45	2.475	2	1	5.5	5.5	0.9	4.95
	Instrumentation & Controll	1		1	1	0.9	0.9	1		1	1	0.9	0.9
Total					7.5		3.6				7.5		6.1

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
North Hor.City	Lighting	1		1	1	0.2	0.2	1		1	1	0.2	0.2
Elevated Tank	Chlorination Booster Pump	2	1	5.5	5.5	0.45	2.475	2	1	5.5	5.5	0.9	4.95
	Instrumentation & Controll	1		1	1	0.9	0.9	1		1	1	0.9	0.9
Total					7.5		3.6				7.5		6.1

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
West Hor.City	Lighting	1		1	1	0.2	0.2	1		1	1	0.2	0.2
Elevated Tank	Chlorination Booster Pump	2	1	5.5	5.5	0.45	2.475	2	1	5.5	5.5	0.9	4.95
	Instrumentation & Controll	1		1	1	0.9	0.9	1		1	1	0.9	0.9
Total					7.5		3.6				7.5		6.1

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
Rathmalgahawewa	Lighting	1		1	1	0.2	0.2	1		1	1	0.2	0.2
Elevated Tank	Chlorination Booster Pump	2	1	5.5	5.5	0.45	2.475	2	1	5.5	5.5	0.9	4.95
	Instrumentation & Controll	1		1	1	0.9	0.9	1		1	1	0.9	0.9
Total					7.5		3.6				7.5		6.1

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
Hamillewa	Lighting	1		1	1	0.2	0.2	1		1	1	0.2	0.2
Elevated Tank	Chlorination Booster Pump	2	1	5.5	5.5	0.45	2.475	2	1	5.5	5.5	0.9	4.95
	Instrumentation & Controll	1		1	1	0.9	0.9	1		1	1	0.9	0.9
Total					7.5		3.6				7.5		6.1

Location	Load Name	1st Stage						Final					
		Q,ty	stand-by	Output	Total	Demand	Demand	Q,ty	stand-by	Output	Total	Demand Factor	Demand
GND Transmissior	Lighting	1		1	1	0.2	0.2	1		1	1	0.2	0.2
Pump Station 2-1	Transmission Pump	2	1	3.7	3.7	0.45	1.665	2	1	3.7	3.7	0.9	3.33
	Instrumentation & Controll	1		1	1	0.9	0.9	1		1	1	0.9	0.9
Total					5.7		2.8				5.7		4.4

Appendix 5.5 (d) Transformer List for Anuradhapura North Integrated Water Supply Project

Location	1st Stage			Final Stage		
	Total Load	Calculation result	Transformer Capacity	Total Load	Calculation result	Transformer Capacity
Makahanadarawa Water Treatment Plant&Water Intake	258	333.3	400	368.95	477.5	630
Rambewa Ground Reservoir	110	142.6	160	212	274.4	400
Medawachchiya Ground Reservoir	76	98.6	100	144	186.4	250
Wahalkada Water Intake	86	111.0	160	116	150.4	160
Wahalkada Water Treatment Plant	342	443.2	630	558.4	722.6	800
Kahatagollewa Ground Reservoir	88	114.3	160	168.2	217.7	250
Kebithgollewa Ground Reservoir	24	30.8	63	39.2	50.7	63
Weerasole Ground Reservoir	99	127.9	160	189.2	244.8	250
Horowpothana Ground Reservoir	120	155.4	160	231.8	300.0	400
Kahatagasdigiliya Ground Reservoir	31	39.9	63	53.2	68.8	100

Calculation formula is below:

Transformer Capacity(kVA)＝Total Load（kW）×（β×α）/（η×φ）

at this φ: Total power factor	0.85
η: Total efficiency	0.9
β: Demand factor	0.9
α: Safety factor	1.1

Remarks: Stand-by load is not included to total load.

standard transformer capacity

Voltage	Capacity	Capacity
33kV/400-230V	63	800
	100	1000
	160	1250
	250	1600
	400	2000
	630	2500

Appendix 5.5 (e) Diesel Engine Generator List for Anuradhapura North Integrated Water Supply Project (1st)

Location	Total Load	Max. Load	Starting method	β×C	R	Δp	PG1	PG2	PG3	PG4	Max .PG	Determined
Makahanadarawa Water Treatment Plant&Water Intake	142.5	45	VSD	1.20	0.0	0.0	199	41	126.8	0	199	200
Rambewa Ground Reservoir	109.2	90	VSD	1.20	0.0	0.0	153	81	89.9	0	153	200
Medawachchiya Ground Reservoir	75.2	37	VSD	1.20	0.0	0.0	105	33	65.2	0	105	150
Wahalkada Water Intake	70.3	30	VSD	1.20	0.0	0.0	98	27	61.5	0	98	100
Wahalkada Water Treatment Plant	216	90	VSD	1.20	0.0	0.0	302	81	189.5	0	302	375
Kahatagollewa Ground Reservoir	87.3	45	VSD	1.20	0.0	0.0	122	41	75.4	0	122	150
Kebithgollewa Ground Reservoir	22.8	15	VSD	1.20	0.0	0.0	32	14	19.3	0	32	50
Weerasole Ground Reservoir	97.8	90	VSD	1.20	0.0	0.0	137	81	79.3	0	137	150
Horowpothana Ground Reservoir	119.1	90	VSD	1.20	0.0	0.0	166	81	99.1	0	166	200
Kahatagasdigiliya Ground Reservoir	29.8	75	VSD	1.20	0.0	0.0	42	68	17.9	0	68	75

PG1:Determined by the total load operation
PG1=ΣPO×α×Sf/(ηL×φL)

PG2:Dtermined by permissible Vltage Drop
PG2=Pm×β×C×Xd×(1－ΔE)/ΔE

PG3:Determined by the largest load starting at last
PG3=Fv1/γG×{(ΣP0－Pm)×α/(ηL×φL)＋Pm×β×C}

PG4:Determined by the permissible reverse current
G4=1/KG4×{Σ(0.432R×Eq)2＋(1.23Δp)2×(1－3u＋3u2)}0.5

ΣPO:Total load
α:Total demand factor (1.0～0.8):0.95
Sf:Unbalancing load factor (1.0)
ηL:total efficiency (0.85)
φL:total power factpr (0.8)
Pm:Maximum load
β×C:Starting kVA (1.2 for VSD, 7.2 for direct on-line starting,7.2*2/3 for Star-delta, 7.2*1/3 for closed Star-delta, 7.2*0.65 for Reactor Starting)
Xd:generater constant (0.25)
ΔE:Permissible voltage drpo factor (0.25)
Fv1:Reduction factor by the throwing load (1.0)
γG:Short time over load tolerance (1.5)
R:Total hermonic load
Eq:Convert factor:(1.0)
Δp:Total unbalancing load
Δp=A+B-C (in case of each phase load are A, B and C, and A>B>C)
u:single phase unbalancing factor (u=(A-C)/Δp)
KG4:Permissible reverse current factor (0.15)

Appendix 5.5 (f) Diesel Engine Generator List for Anuradhapura North Integrated Water Supply Project (Final)

Location	Total Load	Max. Load	Starting method	βxC	R	Δp	PG1	PG2	PG3	PG4	Max .PG	Determined
Makahanadarawa Water Treatment Plant&Water Intake	195.4	45	VSD	1.20	0.0	0.0	273	41	176.1	0	273	300
Rambewa Ground Reservoir	211	90	VSD	1.20	0.0	0.0	295	81	184.7	0	295	300
Medawachchiya Ground Reservoir	144	37	VSD	1.20	0.0	0.0	201	33	129.3	0	201	250
Wahalkada Water Intake	100.7	30	VSD	1.20	0.0	0.0	141	27	89.8	0	141	150
Wahalkada Water Treatment Plant	379	90	VSD	1.20	0.0	0.0	529	81	340.9	0	529	625
Kahatagollewa Ground Reservoir	167.2	45	VSD	1.20	0.0	0.0	234	41	149.8	0	234	250
Kebithgollewa Ground Reservoir	38.2	15	VSD	1.20	0.0	0.0	53	14	33.6	0	53	75
Weerasole Ground Reservoir	188.2	90	VSD	1.20	0.0	0.0	263	81	163.5	0	263	300
Horowpothana Ground Reservoir	230.8	75	VSD	1.20	0.0	0.0	322	68	205.1	0	322	375
Kahatagasdigiliya Ground Reservoir	52.2	22	VSD	1.20	0.0	0.0	73	20	45.7	0	73	75

PG1:Determined by the total load operation
PG1=ΣPO×α×Sf/(ηL×φL)

PG2:Dtermined by permissible Vltage Drop
PG2=Pm×β×C×Xd×(1－ΔE)/ΔE

PG3:Determined by the largest load starting at last
PG3=Fv1/γG×{(ΣP0－Pm)×α/(ηL×φL)＋Pm×β×C}

PG4:Determined by the permissible reverse current
G4=1/KG4×{Σ(0.432R×Eq)2＋(1.23Δp)2×(1－3u＋3u2)}0.5

ΣPO:Total load
α:Total demand factor (1.0～0.8):0.95
Sf:Unbalancing load factor (1.0)
ηL:total efficiency (0.85)
φL:total power factpr (0.8)
Pm:Maximum load
β×C:Starting kVA (1.2 for VSD, 7.2 for direct on-line starting,7.2*2/3 for Star-delta, 7.2*1/3 for closed Star-delta, 7.2*0.65 for Reactor Starting)
Xd:generater constant (0.25)
ΔE:Permissible voltage drpo factor (0.25)
Fv1:Reduction factor by the throwing load (1.0)
γG:Short time over load tolerance (1.5)
R:Total hermonic load
Eq:Convert factor:(1.0)
Δp:Total unbalancing load
Δp=A+B-C (in case of each phase load are A, B and C, and A>B>C)
u:single phase unbalancing factor (u=(A-C)/Δp)
KG4:Permissible reverse current factor (0.15)

Appendix 5.5 (g) Fuel Tank List for Anuradhapura North Integrated Water Supply Project (Final)

Location	Determined (Pg)	ηG	Engine Output (Pe)	Fuel Consumption (be)	Run Hour (h)	Tank Culclation	Tank Capacity (L)
Makahanadarawa Water Treatment Plant&Water Intake	300	90	268.2	0.299	24	2.550	3,000
Rambewa Ground Reservoir	300	90	268	0.299	24	2.550	3,000
Medawachchiya Ground Reservoir	250	89	225	0.299	24	2.140	3,000
Wahalkada Water Intake	150	86	140	0.313	24	1.397	1,500
Wahalkada Water Treatment Plant	625	92	545	0.272	24	4.717	5,000
Kahatagollewa Ground Reservoir	250	89	225	0.299	24	2.140	3,000
Kebithgollewa Ground Reservoir	75	86	70	0.313	24	0.699	950
Weerasole Ground Reservoir	300	90	268	0.299	24	2.550	3,000
Horowpothana Ground Reservoir	375	90	335	0.272	24	2.900	3,000
Kahatagasdigiliya Ground Reservoir	75	86	70	0.313	24	0.699	950

Appendix 5.5 (h) Main MCCB List for Anuradhapura North Integrated Water Supply Project

Location	Transformer Capacity	Generator Capacity	Tr Main MCCB	DGE Main MCCB
Makahanadarawa Water Intake	100	100	225	225
Makahanadarawa Water Treatment Plant	400	200	600	400
Makahanadarawa Water Treatment Plant&Water Intake	630	300	1,000	600
Rambewa Ground Reservoir	400	300	600	600
Medawachchiya Ground Reservoir	250	250	400	400
Wahalkada Water Intake	160	150	400	225
Wahalkada Water Treatment Plant	800	625	1,200	1,000
Kahatagollewa Ground Reservoir	250	250	400	400
Kebithgollewa Ground Reservoir	63	75	100	225
Weerasole Ground Reservoir	250	300	400	600
Horowpothana Ground Reservoir	400	375	600	600
Kahatagasdigiliya Ground Reservoir	100	75	225	225

Calculation formula is below:

MCCB Frame Ampere (A)＝Capacity（kVA）/V/3^0.5

at this V: 400V 0.85

standard MCCB capacity

Voltage	Capacity	Capacity
400V 3phase	100	1000
	225	1200
	400	1600
	600	2000
	800	2500
	1000	

Appendix 5.5 (i) Brunch MCCB List for Anuradhapura North Integrated Water Supply Project

Location	Brunch Feeder	Total Load	Culculation	MCCB
Makahanadarawa Water Treatment Plant&Water Intake	Water Intake MCC	63.2	126	225
	Sedimentation MCC	8.7	17	50
	Rpid Sand Filter MCC	29.7	59	100
	AC Filter MCC	68.3	136	225
	Chemical MCC	8.9	18	50
	Transmission MCC	115.6	231	400
	Sludge MCC	31.6	63	100
	For Generator	10	20	50
Wahalkada Water Intake	Water Intake MCC	116.2	232	400
Wahalkada Water Treatment Plant	Sedimentation MCC	8.7	17	50
	Rpid Sand Filter MCC	44.0	88	100
	AC Filter MCC	86.7	173	225
	Chemical MCC	9.2	18	50
	Transmission MCC	335.2	670	800
	Sludge MCC	31.6	63	100
	For Generator	10	20	50

Calculation formula is below:

MCCB Frame Ampere (A)＝Total Capacity（kW）/0.85/0.85/V/3^0.5/1000

at this V: 400V

standard MCCB capacity

Voltage	Capacity	Capacity
400V 3phase	100	1000
	225	1200
	400	1600
	600	2000
	800	2500
	1000	

Appendix 5.5 (j) Motor Control Center Unit List for Anuradhapura North Integrated Water Supply Project (1st)

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
Makahanadarawa Water Intake	Sand Pump	1	5.5	NR	50.0		1.5
	Intake Pump	3	15	VSD	50.0		7
	Discharge Valve	3	0.4	R	50.0		1.5
	Drain Pump	2	3.7	NR	50.0		1.5
	Overhead Crane	1	5	F	50.0		1
	Ventilation	4	0.2	F	50.0		1
	Lighiting	1	2	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
Makahanadarawa Water Treatment Plant	De-sludge Valve	16	0.2	R	50.0		1.5
	Sump Drainage Pump	2	1.5	NR	50.0		1.5
	Inlet Water Sampling Pump	1	0.4	NR	50.0		1.5
	Front of Filter Water Sampling Pump	1	0.4	NR	50.0		1.5
	Inflow Gate	4	0.4	R	50.0		1.5
	Backwash Drainage Gate	4	0.4	R	50.0		1.5
	Effluent Valve	4	0.2	R	50.0		1.5
	Backwash Valve	4	0.4	R	50.0		1.5
	Air Source Valve	4	0.2	R	50.0		1.5
	Air Blower	2	15	RSD	50.0		3
	Sump Drainage Pump	2	1.5	NR	50.0		1.5
	Filtrated Water Sampling Pump	1	0.4	NR	50.0		1.5
	ACF Lift Pump	2	30	VSD	50.0		7
	ACF Inflow Gate	2	0.4	R	50.0		1.5
	ACF Backwash Drainage Gate	2	0.4	R	50.0		1.5
	ACF Effluent Valve	2	0.2	R	50.0		1.5
	ACF Backwash Valve	2	0.4	R	50.0		1.5
	ACF Air Source Valve	2	0.2	R	50.0		1.5
	ACF Sump Drainage Pump	2	1.5	NR	50.0		1.5
	ACF Water Sampling Pump	1	0.4	NR	50.0		1.5
	Rambewa Transmission Pump	2	45	VSD	100.0		7
	Discharge Valve	2	0.4	R	50.0		1.5
	Back Wash Pump	2	15	SS	50.0		7
	Discharge Valve	2	0.4	R	50.0		1.5
	Transmission PST Drain Pump	4	2.2	NR	50.0		1.5
	Overhead Crane	1	5	F	50.0		1
	Alum Mixer	2	1.5	NR	50.0		1.5
	Alum Pump	2	0.4	NR	50.0		1.5
	Chlorinator-Pre	3	0.025	F	50.0		1
	Chlorinator-Post	2	0.025	F	50.0		1
	Chemical Crane	1	1.15	F	50.0		1
	Exhaust Fan	3	0.4	NR	50.0		1.5
	Backwash Recovery Pump	2	11	SS	50.0		7
	Sludge Drainage Pump	2	2.2	NR	50.0		1.5
	Sludge Thickener	1	0.4	NR	50.0		1.5
	Sludge Pump	2	2.2	NR	50.0		1.5
	Ventilation	18	1.5	NR	50.0		1.5
	Lighiting	3	4	F	50.0		1
	Outdoor Lighting	5	0.8	F	50.0		1

Appendix 5.5 (j) Motor Control Center Unit List for Anuradhapura North Integrated Water Supply Project (1st)

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
Rambewa	Rambewa ET Transmission Pump	2	11	SS	50.0		7
Ground Reservoir	Discharge Valve for Rambewa	2	0.4	R	50.0		1.5
	Medawachchiya Transmission Pump	2	90	VSD	225.0		7
	Discharge Valve for Medawachchiya	2	0.4	R	50.0		1.5
	Chlorination Booster Pump	2	5.5	NR	50.0		1.5
	Exhaust Fan	2	0.25	NR	50.0		1.5
	Ventilation	2	0.2	NR	50.0		1.5
	Lighting	1	2	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
Medawachchiya	Ishinbassagala ET Transmission Pump	2	37	VSD	100.0		7
Ground Reservoir	Discharge Valve for Ishinbassagala	2	0.4	R	50.0		1.5
	Etakada ET Transmission Pump	2	30	VSD	50.0		7
	Discharge Valve for Etakada	2	0.4	R	50.0		1.5
	Chlorination Booster Pump	2	5.5	NR	50.0		1.5
	Exhaust Fan	2	0.25	NR	50.0		1.5
	Ventilation	2	0.2	NR	50.0		1.5
	Lighting	1	2	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
East Rambewa	Lighting	1	1	F	50.0		1
Elevated Tank	Chlorination Booster Pump	2	5.5	NR	50.0		1.5
	Instrumentation & Controll	1	1	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
Ishinbassakgala	Lighting	1	1	F	50.0		1
Elevated Tank	Chlorination Booster Pump	2	5.5	NR	50.0		1.5
	Instrumentation & Controll	1	1	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
Etakada	Lighting	1	1	F	50.0		1
Elevated Tank	Chlorination Booster Pump	2	5.5	NR	50.0		1.5
	Instrumentation & Controll	1	1	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
GND Transmissio	Lighting	1	1	F	50.0		1
Pump Station 1-1	Transmission Pump	2	3.7	NR	50.0		1.5
	Instrumentation & Controll	1	1	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
GND Transmissio	Lighting	1	1	F	50.0		1
Pump Station 1-2	Transmission Pump	2	3.7	NR	50.0		1.5
	Instrumentation & Controll	1	1	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
GND Transmissio	Lighting	1	1	F	50.0		1
Pump Station 1-3	Transmission Pump	2	3.7	NR	50.0		1.5
	Instrumentation & Controll	1	1	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
GND Transmissio	Lighting	1	1	F	50.0		1
Pump Station 1-4	Transmission Pump	2	3.7	NR	50.0		1.5
	Instrumentation & Controll	1	1	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
GND Transmissio	Lighting	1	1	F	50.0		1
Pump Station 1-5	Transmission Pump	2	3.7	NR	50.0		1.5
	Instrumentation & Controll	1	1	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
GND Transmissio	Lighting	1	1	F	50.0		1
Pump Station 1-6	Transmission Pump	2	3.7	NR	50.0		1.5
	Instrumentation & Controll	1	1	F	50.0		1

Appendix 5.5 (j) Motor Control Center Unit List for Anuradhapura North Integrated Water Supply Project (1st)

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
Wahalkada Water Intake	Sand Pump	1	5.5	NR	50.0		1.5
	Intake Pump	3	30	VSD	50.0		7
	Discharge Valve	3	0.4	R	50.0		1.5
	Drain Pump	2	3.7	NR	50.0		1.5
	Overhead Crane	1	5	F	50.0		1
	Ventilation	4	0.2	F	50.0		1
	Lighiting	1	10	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
Wahalkada Water Treatment Plant	De-sludge Valve	16	0.2	R	50.0		1.5
	Sump Drainage Pump	2	1.5	NR	50.0		1.5
	Inlet Water Sampling Pump	1	0.4	NR	50.0		1.5
	Front of Filter Water Sampling Pump	1	0.4	NR	50.0		1.5
	Inflow Gate	4	0.75	R	50.0		1.5
	Backwash Drainage Gate	4	0.75	R	50.0		1.5
	Effluent Valve	4	0.4	R	50.0		1.5
	Backwash Valve	4	0.4	R	50.0		1.5
	Air Source Valve	4	0.4	R	50.0		1.5
	Air Blower	2	22	RSD	50.0		4
	Sump Drainage Pump	2	1.5	NR	50.0		1.5
	Filtrated Water Sampling Pump	1	0.4	NR	50.0		1.5
	ACF Lift Pump	2	37	VSD	100.0		7
	ACF Inflow Gate	2	0.75	R	50.0		1.5
	ACF Backwash Drainage Gate	2	0.75	R	50.0		1.5
	ACF Effluent Valve	2	0.4	R	50.0		1.5
	ACF Backwash Valve	2	0.4	R	50.0		1.5
	ACF Air Source Valve	2	0.4	R	50.0		1.5
	ACF Sump Drainage Pump	2	1.5	NR	50.0		1.5
	ACF Filtrated Water Sampling Pump	1	0.4	NR	50.0		1.5
	Wahalkada ET Transmission Pump	2	5.5	RSD	50.0		3
	Discharge Valve	2	0.4	R	50.0		1.5
	North Area Transmission Pump	2	55	VSD	100.0		7
	Discharge Valve	2	0.4	R	50.0		1.5
	South Area Transmission Pump	2	90	VSD	225.0		7
	Discharge Valve	2	0.4	R	50.0		1.5
	Back Wash Pump	2	22	SS	50.0		7
	Discharge Valve	2	0.4	R	50.0		1.5
	Transmission PST Drain Pump	4	2.2	NR	50.0		1.5
	Overhead Crane	1	5	F	50.0		1
	Alum Mixer	2	1.5	NR	50.0		1.5
	Alum Pump	2	0.75	NR	50.0		1.5
	Chlorinator-Pre	2	0.025	F	50.0		1
	Chlorinator-Post	2	0.025	F	50.0		1
	Chemical Crane	1	1.15	F	50.0		1
	Exhaust Fan	3	0.4	NR	50.0		1.5
	Backwash Recovery Pump	2	11	RSD	50.0		3
	Sludge Drainage Pump	2	2.2	NR	50.0		1.5
	Sludge Thickener	1	0.4	NR	50.0		1.5
	Sludge Pump	2	2.2	NR	50.0		1.5
	Ventilation	18	1.5	NR	50.0		1.5
	Lighiting	3	4	F	50.0		1
	Outdoor Lighting	5	0.8	F	50.0		1

Appendix 5.5 (j) Motor Control Center Unit List for Anuradhapura North Integrated Water Supply Project (1st)

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
Kahatagollewa	Kebithigollewa GR Transmission Pump	2	45	VSD	100.0		7
Ground Reservoir	Discharge Valve for Kebithigollewa	2	0.4	R	50.0		1.5
	Bogahawewa ET Transmission Pump	2	30	VSD	50.0		7
	Discharge Valve for Begehewa	2	0.4	R	50.0		1.5
	Kahatagollewa ET Transmission Pump	2	3.7	RSD	50.0		3
	Discharge Valve for Kahatagollewa	2	0.4	R	50.0		1.5
	Chlorination Booster Pump	2	5.5	NR	50.0		1.5
	Exhaust Fan	2	0.25	NR	50.0		1.5
	Ventilation	2	0.2	NR	50.0		1.5
	Lighting	1	2	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
Kebithgollewa	Kebithgollewa ET Transmission Pump	2	15	SS	50.0		7
Ground Reservoir	Discharge Valve for Kebithgollewa	2	0.4	R	50.0		1.5
	Chlorination Booster Pump	2	5.5	NR	50.0		1.5
	Exhaust Fan	2	0.25	NR	50.0		1.5
	Ventilation	2	0.2	NR	50.0		1.5
	Lighting	1	2	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
Weerasole	Horowpothana Transmission Pump	2	90	VSD	225.0		7
Ground Reservoir	Discharge Valve for Horowpothana	2	0.4	R	50.0		1.5
	Chlorination Booster Pump	2	5.5	NR	50.0		1.5
	Exhaust Fan	2	0.25	NR	50.0		1.5
	Ventilation	2	0.2	NR	50.0		1.5
	Lighting	1	2	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
Horowpothana	Horowpothana ET Transmission Pump	2	5.5	RSD	50.0		7
Ground Reservoir	Discharge Valve for Horowpothana	2	0.4	R	50.0		1.5
	Rathmalgahawewa ET Transmission Pump	2	30	VSD	50.0		7
	Discharge Valve for Rathmalgahawewa	2	0.4	R	50.0		1.5
	Kahatagasdigiliya Transmission Pump	2	75	VSD	225.0		7
	Discharge Valve for Kathmalgahawewa	2	0.4	R	50.0		1.5
	Chlorination Booster Pump	2	5.5	NR	50.0		1.5
	Exhaust Fan	2	0.25	NR	50.0		1.5
	Ventilation	2	0.2	NR	50.0		1.5
	Lighting	1	2	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
Kahatagasdigiliya	Kahatagasdigiliya ET Transmission Pump	2	22	SS	50.0		7
Ground Reservoir	Discharge Valve for Katagasdigiliya	2	0.4	R	50.0		1.5
	Chlorination Booster Pump	2	5.5	NR	50.0		1.5
	Exhaust Fan	2	0.25	NR	50.0		1.5
	Ventilation	2	0.2	NR	50.0		1.5
	Lighting	1	2	F	50.0		1

Appendix 5.5 (j) Motor Control Center Unit List for Anuradhapura North Integrated Water Supply Project (1st)

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
Kah-Keb Median Elevated Tank	Lighting	1	1	F	50.0		1
	Chlorination Booster Pump	2	5.5	NR	50.0		1.5
	Instrumentation & Controll	1	1	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
North Hor.City Elevated Tank	Lighting	1	1	F	50.0		1
	Chlorination Booster Pump	2	5.5	NR	50.0		1.5
	Instrumentation & Controll	1	1	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
West Hor.City Elevated Tank	Lighting	1	1	F	50.0		1
	Chlorination Booster Pump	2	5.5	NR	50.0		1.5
	Instrumentation & Controll	1	1	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
Rathmalgahawew Elevated Tank	Lighting	1	1	F	50.0		1
	Chlorination Booster Pump	2	5.5	NR	50.0		1.5
	Instrumentation & Controll	1	1	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
Hamillewa Elevated Tank	Lighting	1	1	F	50.0		1
	Chlorination Booster Pump	2	5.5	NR	50.0		1.5
	Instrumentation & Controll	1	1	F	50.0		1

Location	Load Name	Q,ty	Output	Drive	MCCB	Capacitor	Unit
GND Transmissio Pump Station 2-1	Lighting	1	1	F	50.0		1
	Transmission Pump	2	3.7	NR	50.0		1.5
	Instrumentation & Controll	1	1	F	50.0		11

Appendix 5.5 (k) Motor Control Center RY & I/O List for Anuradhapura North Integrated Water Supply Project (1st)

Location	Load Name	Q,ty	Output	Drive	RY	RYtotal	DI/O	AI/O	TotalDI/O	TotalAI/O
Makahanadarawa	Sand Pump	1	5.5	NR	5.0	5	5		5	
Water Intake	Intake Pump	3	15	VSD	10.0	30	10	1	30	1
	Discharge Valve	3	0.4	R	10.0	30	10		30	
	Drain Pump	2	3.7	NR	5.0	10	5		10	
	Overhead Crane	1	5	F			2		2	
	Ventilation	4	0.2	F	3.0	12	5		20	
	Lighiting	1	2	F						
	MCC Inistument	1								
	MCC Main	1					2	2	2	2
Total						87			97	3

Location	Load Name	Q,ty	Output	Drive	RY	RYtotal	DI/O	AI/O	TotalDI/O	TotalAI/O
Makahanadarawa	De-sludge Valve	16	0.2	R	5.0	80	5		80	
Water Treatment	Sump Drainage Pump	2	1.5	NR	5.0	10	5		10	
Plant	Inlet Water Sampling Pump	1	0.4	NR	5.0	5	5		5	
	Front of Filter Water Sampling Pump	1	0.4	NR	10.0	10	10		10	
	Inflow Gate	4	0.4	R	10.0	40	10		40	
	Backwash Drainage Gate	4	0.4	R	10.0	40	10		40	
	Effluent Valve	4	0.2	R	10.0	40	10		40	
	Backwash Valve	4	0.4	R	10.0	40	10		40	
	Air Source Valve	4	0.2	R	10.0	40	10		40	
	Air Blower	2	15	RSD	10.0	20	5		10	
	Sump Drainage Pump	2	1.5	NR	5.0	10	5		10	
	Filtrated Water Sampling Pump	1	0.4	NR	3.0	3	3		3	
	ACF Lift Pump	2	30	VSD	10.0	20	10		20	
	ACF Inflow Gate	2	0.4	R	10.0	20	10		20	
	ACF Backwash Drainage Gate	2	0.4	R	10.0	20	10		20	
	ACF Effluent Valve	2	0.2	R	10.0	20	10		20	
	ACF Backwash Valve	2	0.4	R	10.0	20	10		20	
	ACF Air Source Valve	2	0.2	R	10.0	20	10		20	
	ACF Sump Drainage Pump	2	1.5	NR	5.0	10	5		10	
	ACF Water Sampling Pump	1	0.4	NR	3.0	3	3		3	
	Rambewa Transmission Pump	2	45	VSD	10.0	20	10	1	20	2
	Discharge Valve	2	0.4	R	10.0	20	10		20	
	Back Wash Pump	2	15	SS	10.0	20	10		20	
	Discharge Valve	2	0.4	R	10.0	20	10		20	
	Transmission PST Drain Pump	4	2.2	NR	5.0	20	5		20	
	Overhead Crane	1	5	F						
	Alum Mixer	2	1.5	NR	3.0	6	5		10	
	Alum Pump	2	0.4	NR	3.0	6	5		10	1
	Chlorinator-Pre	3	0.025	F	2.0	6	3		9	1
	Chlorinator-Post	2	0.025	F	2.0	4	3		6	1
	Chemical Crane	1	1.15	F						
	Exhaust Fan	3	0.4	NR	3.0	9	2		6	
	Backwash Recovery Pump	2	11	SS	10.0	20	3		6	
	Sludge Drainage Pump	2	2.2	NR	5.0	10	5		10	
	Sludge Thickener	1	0.4	NR	5.0	5	5		5	
	Sludge Pump	2	2.2	NR	5.0	10	5		10	
	Ventilation	18	1.5	NR	3.0	54	3		54	
	Lighiting	3	4	F						
	Outdoor Lighting	5	0.8	F						
	MCC Inistument	1						4		4
	MCC Main	1					7	2	7	2
Total						701			501	11

Appendix 5.5 (k) Motor Control Center RY & I/O List for Anuradhapura North Integrated Water Supply Project (1st)

Location	Load Name	Q,ty	Output	Drive	RY	RYtotal	DI/O	AI/O	TotalDI/O	TotalAI/O
Rambewa	Rambewa ET Transmission Pump	2	11	SS	10.0	20	10	1	20	1
Ground Reservoir	Discharge Valve for Rambewa	2	0.4	R	10.0	20	10		20	
	Medawachchiya Transmission Pump	2	90	VSD	10.0	20	10	1	20	1
	Discharge Valve for Medawachchiya	2	0.4	R	10.0	20	10		20	
	Chlorination Booster Pump	2	5.5	NR	5.0	10	5		10	
	Exhaust Fan	2	0.25	NR	3.0	6	5		10	
	Ventilation	2	0.2	NR			3		6	
	Lighting	1	2	F						
	MCC Inistument	1						4		4
	MCC Main	1					7	2	7	2
Total						96			106	8

Location	Load Name	Q,ty	Output	Drive	RY	RYtotal	DI/O	AI/O	TotalDI/O	TotalAI/O
Medawachchiya	Ishinbassagala ET Transmission Pump	2	37	VSD	10.0	20	10	1	20	1
Ground Reservoir	Discharge Valve for Ishinbassagala	2	0.4	R	10.0	20	10		20	
	Etakada ET Transmission Pump	2	30	VSD	10.0	20	10	1	20	1
	Discharge Valve for Etakada	2	0.4	R	10.0	20	10		20	
	Chlorination Booster Pump	2	5.5	NR	5.0	10	5		10	
	Exhaust Fan	2	0.25	NR	5.0	10	5		10	
	Ventilation	2	0.2	NR	3.0	6	3		6	
	Lighting	1	2	F						
	MCC Inistument	1						4		4
	MCC Main	1					7	2	7	2
Total						106			106	8

Location	Load Name	Q,ty	Output	Drive	RY	RYtotal	DI/O	AI/O	TotalDI/O	TotalAI/O
Ishinbassakgala	Lighting	1	1	F						
Elevated Tank	Chlorination Booster Pump	2	5.5	NR						
	Instrumentation & Controll	1	1	F			4	1	4	1
	MCC Main & UPS	1	1	F			4	1	4	1
Total									8	2

Location	Load Name	Q,ty	Output	Drive	Total	RYtotal	DI/O	AI/O	TotalDI/O	TotalAI/O
Etakada	Lighting	1	1	F						
Elevated Tank	Chlorination Booster Pump	2	5.5	NR						
	Instrumentation & Controll	1	1	F			4	1	4	1
	MCC Main & UPS	1	1	F			4	1	4	1
Total									8	2

Appendix 5.5 (k) Motor Control Center RY & I/O List for Anuradhapura North Integrated Water Supply Project (1st)

Location	Load Name	Q,ty	Output	Drive	RY	RYtotal	DI/O	AI/O	TotalDI/O	TotalAI/O
Wahalkada	Sand Pump	1	5.5	NR	5.0	5	5		5	
Water Intake	Intake Pump	3	30	VSD	10.0	30	10		30	1
	Discharge Valve	3	0.4	R	10.0	30	10		30	
	Drain Pump	2	3.7	NR	5.0	10	5		10	
	Overhead Crane	1	5	F			2		2	
	Ventilation	4	0.2	F	3.0	12	5		20	
	Lighiting	1	10	F						
	MCC Inistument	1						4		4
	MCC Main	1					7	2	7	2
Total						87			97	7

Location	Load Name	Q,ty	Output	Drive	RY	RYtotal	DI/O	AI/O	TotalDI/O	TotalAI/O
Wahalkada	De-sludge Valve	16	0.2	R	5.0	80	5		80	
Water Treatment	Sump Drainage Pump	2	1.5	NR	5.0	10	5		10	
Plant	Inlet Water Sampling Pump	1	0.4	NR	5.0	5	5		5	
	Front of Filter Water Sampling Pump	1	0.4	NR	10.0	10	10		10	
	Inflow Gate	4	0.75	R	10.0	40	10		40	
	Backwash Drainage Gate	4	0.75	R	10.0	40	10		40	
	Effluent Valve	4	0.4	R	10.0	40	10		40	
	Backwash Valve	4	0.4	R	10.0	40	10		40	
	Air Source Valve	4	0.4	R	10.0	40	10		40	
	Air Blower	2	22	RSD	5.0	10	5		10	
	Sump Drainage Pump	2	1.5	NR	5.0	10	5		10	
	Filtrated Water Sampling Pump	1	0.4	NR	3.0	3	3		3	
	ACF Lift Pump	2	37	VSD	10.0	20	10		20	
	ACF Inflow Gate	2	0.75	R	10.0	20	10		20	
	ACF Backwash Drainage Gate	2	0.75	R	10.0	20	10		20	
	ACF Effluent Valve	2	0.4	R	10.0	20	10		20	
	ACF Backwash Valve	2	0.4	R	10.0	20	10		20	
	ACF Air Source Valve	2	0.4	R	10.0	20	10		20	
	ACF Sump Drainage Pump	2	1.5	NR	3.0	6	5		10	
	ACF Filtrated Water Sampling Pump	1	0.4	NR	3.0	3	3		3	
	Wahalkada ET Transmission Pump	2	5.5	RSD	10.0	20	10	1	20	2
	Discharge Valve	2	0.4	R	10.0	20	10		20	
	North Area Transmission Pump	2	55	VSD	10.0	20	10	1	20	2
	Discharge Valve	2	0.4	R	10.0	20	10		20	
	South Area Transmission Pump	2	90	VSD	10.0	20	10	1	20	2
	Discharge Valve	2	0.4	R	10.0	20	10		20	
	Back Wash Pump	2	22	SS	10.0	20	10		20	
	Discharge Valve	2	0.4	R	10.0	20	10		20	
	Transmission PST Drain Pump	4	2.2	NR	5.0	20	5		20	
	Overhead Crane	1	5	F						
	Alum Mixer	2	1.5	NR	3.0	6	5		10	
	Alum Pump	2	0.75	NR	3.0	6	5		10	1
	Chlorinator-Pre	2	0.025	F	3.0	6	3		6	1
	Chlorinator-Post	2	0.025	F	3.0	6	3		6	1
	Chemical Crane	1	1.15	F						
	Exhaust Fan	3	0.4	NR	3.0	9	2		6	
	Backwash Recovery Pump	2	11	RSD	10.0	20	3		6	
	Sludge Drainage Pump	2	2.2	NR	5.0	10	5		10	
	Sludge Thickener	1	0.4	NR	5.0	5	5		5	
	Sludge Pump	2	2.2	NR	5.0	10	5		10	
	Ventilation	18	1.5	NR	3.0	54	3		54	
	Lighiting	3	4	F						
	Outdoor Lighting	5	0.8	F						
	MCC Inistument	1						4		4
	MCC Main	1					7	2	7	2
Total						577			581	15

Appendix 5.5 (k) Motor Control Center RY & I/O List for Anuradhapura North Integrated Water Supply Project (1st)

Location	Load Name	Q,ty	Output	Drive	RY	RYtotal	DI/O	AI/O	TotalDI/O	TotalAI/O
Kahatagollewa	Kebithigollewa GR Transmission Pump	2	45	VSD	10.0	20	10		20	1
Ground Reservoir	Discharge Valve for Kebithigollewa	2	0.4	R	10.0	20	10		20	
	Bogahawewa ET Transmission Pump	2	30	VSD	10.0	20	10		20	1
	Discharge Valve for Begehewa	2	0.4	R	10.0	20	10		20	
	Chlorination Booster Pump	2	5.5	NR	5.0	10	5		10	1
	Exhaust Fan	2	0.25	NR	5.0	10	5		10	
	Ventilation	2	0.2	NR	3.0	6	3		6	
	Lighting	1	2	F						
	MCC Inistument	1						4		4
	MCC Main	1					7	2	7	2
Total						106			106	9

Location	Load Name	Q,ty	Output	Drive	RY	RYtotal	DI/O	AI/O	TotalDI/O	TotalAI/O
Kebithgollewa	Kebithgollewa ET Transmission Pump	2	15	SS	10.0	20	10		20	1
Ground Reservoir	Discharge Valve for Kebithgollewa	2	0.4	R	10.0	20	10		20	
	Chlorination Booster Pump	2	5.5	NR	5.0	10	5		10	1
	Exhaust Fan	2	0.25	NR	5.0	10	5		10	
	Ventilation	2	0.2	NR	3.0	6	3		6	
	Lighting	1	2	F						
	MCC Inistument	1						4		4
	MCC Main	1					7	2	7	2
Total						66			66	8

Location	Load Name	Q,ty	Output	Drive	RY	RYtotal	DI/O	AI/O	TotalDI/O	TotalAI/O
Weerasole	Horowpothana Transmission Pump	2	15	SS	10.0	20	10		20	1
Ground Reservoir	Discharge Valve for Horowpothana	2	0.4	R	10.0	20	10		20	
	Chlorination Booster Pump	2	5.5	NR	5.0	10	5		10	1
	Exhaust Fan	2	0.25	NR	5.0	10	5		10	
	Ventilation	2	0.2	NR	3.0	6	3		6	
	Lighting	1	2	F						
	MCC Inistument	1						4		4
	MCC Main	1					7	2	7	2
Total						66			66	8

Location	Load Name	Q,ty	Output	Drive	RY	RYtotal	DI/O	AI/O	TotalDI/O	TotalAI/O
Horowpothana	Horowpothana ET Transmission Pump	2	5.5	RSD	10.0	20	10		20	1
Ground Reservoir	Discharge Valve for Horowpothana	2	0.4	R	10.0	20	10		20	
	Rathmalgahawewa ET Transmission Pump	2	30	VSD	10.0	20	10		20	1
	Discharge Valve for Rathmalgahawewa	2	0.4	R	10.0	20	10		20	
	Kahatagasdigiliya Transmission Pump	2	75	VSD	10.0	20	10		20	1
	Discharge Valve for Kathmalgahawewa	2	0.4	R	10.0	20	10		20	
	Chlorination Booster Pump	2	5.5	NR	5.0	10	5		10	1
	Exhaust Fan	2	0.25	NR	5.0	10	5		10	
	Ventilation	2	0.2	NR	3.0	6	3		6	
	Lighting	1	2	F						
	MCC Inistument	1						4		4
	MCC Main	1					7	2	7	2
Total						146			146	10

Location	Load Name	Q,ty	Output	Drive	RY	RYtotal	DI/O	AI/O	TotalDI/O	TotalAI/O
Kahatagasdigiliya	Kahatagasdigiliya ET Transmission Pump	2	22	SS	10.0	20	10		20	1
Ground Reservoir	Discharge Valve for Katagasdigiliya	2	0.4	R	10.0	20	10		20	
	Chlorination Booster Pump	2	5.5	NR	5.0	10	5		10	1
	Exhaust Fan	2	0.25	NR	5.0	10	5		10	
	Ventilation	2	0.2	NR	3.0	6	3		6	
	Lighting	1	2	F						
	MCC Inistument	1						4		4
	MCC Main	1					7	2	7	2
Total					33	66	66.0		66	8

Location	Load Name	Q,ty	Output	Drive	RY	RYtotal	DI/O	AI/O	TotalDI/O	TotalAI/O
West Hor.City	Lighting	1	1	F						
Elevated Tank	Chlorination Booster Pump	2	5.5	NR						
	Instrumentation & Controll	1	1	F			4	1	4	1
	MCC Main & UPS	1	1	F			4	1	4	1
Total									8	2

Location	Load Name	Q,ty	Output	Drive	RY	RYtotal	DI/O	AI/O	TotalDI/O	TotalAI/O
Rathmalgahawewa	Lighting	1	1	F						
Elevated Tank	Chlorination Booster Pump	2	5.5	NR			4	1	8	2
	Instrumentation & Controll	1	1	F			4	1	4	1
	MCC Main & UPS	1	1	F			4	1	4	1
Total									16	4