

付属資料

第3章

フェーズ1プロジェクトのレビュー

Report on phytoplankton composition in 4 reservoirs in Anuradhapura District

1. Mahakandarwa
2. Nuwarawewa
3. Thuruwila Tank
4. Kekirawa Tank

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Technical Assistant: Ms. Iranganie Thumpela

Introduction

This is the report on the observations made on the waters of Nuwarawewa, Thuruwila, Kekirawa and Mahakandarawa reservoirs sampled for phytoplankton analyses on behalf of Ceywater PLC.

Method

Net samples as well as direct samples were collected for taxonomical and counting examinations. A 20 micron net was used to collect the net sample for taxonomic observations. A 50 ml sample was taken directly to a graduated tube for counting purposes. 2-3 drops of Lugol's iodine solution was added to each sample for preservation. These samples were kept overnight to settle down and the supernatant water was decanted until only 5 ml remained. This was shaken and 1.0 ml was taken for counting. Samples were observed in a Sedgewick Rafter counting cell and observed under an Olympus microscope (model). 50 squares per sample was counted and the mean value taken for tabulation.

Results

The results of the algae identified and their counts (units per ml) are presented in Tables 1, 2, 3 and 4 for Nuwarawewa, Kekirawa, Thuruwila and Mahakandarawa reservoirs respectively.

Parameter : Phytoplankton Composition

Date : 19.08.2014

Table 1: Nuwarawewa

Species Name	Taxa	Counts
CYANOPHYCEAE		
<i>Anabeana solitaire</i>	c	24
<i>Chroococcus disperse</i>	c	22
<i>Cylindrospermopsis raciborskii</i>	d	32,000
<i>Merismopaedia punctata</i>	c	32
<i>Mycrocystis aergunosa</i>	r	4
<i>Microcystis sp.</i>	r	10
<i>Microcystis wesenbergii</i>	r	4
<i>Oscillatoria sp.</i>	c	24
<i>Pseudanabeana sp.</i>	c	22
DIATOMOPHYCEAE		
<i>Melosira granulata</i>	c	20
<i>Navicula sp.</i>	m	60
<i>Surella sp</i>	r	4
<i>Synedra sp</i>	c	22
CHLOROPHYCEAE		
<i>Ankistrodesmus sp.</i>	r	4

Pediastrum simplex	r	4
DINOPHYCEAE		
<i>Peridiniopsis sp</i>	r	8
ZYGNEMAPHYCEAE		
<i>Cosmarium sp</i>	r	12
EUGLENOPHYCEAE		
<i>Euglena sp.</i>	c	20
No. of taxa		18
Total Counts per ml		32,296

Table 2: Kekirawa Tank

Species Name	Taxa	Counts
CYANOPHYCEAE		
<i>Anabeana solitaire</i>	r	12
<i>Chroococcus disperse</i>	c	34
<i>Cylindrospermopsis raciborskii</i>	d	4200
<i>Merismopaedia punctata</i>	c	24
<i>Mycrocystis aergunosa</i>	r	2
<i>Microcystis sp.</i>	r	4
<i>Microcystis wesenbergii</i>	r	8
<i>Oscillatoria sp.</i>	r	12
DIATOMOPHYCEAE	r	12
<i>Melosira granulata</i>	m	190
<i>Navicula sp.</i>	c	22
<i>Pinularia sp</i>	c	26
<i>Pinularia sp.</i> (long strains)	C	22
<i>Synedra sp</i>	m	640
CHLOROPHYCEAE		
<i>Pediastrum simplex</i>	c	22
<i>Scenedesmus sp.</i>	r	12
ZYGNEMAPHYCEAE		
<i>Strautrum sp</i>	r	12
EUGLENOPHYCEAE		
<i>Euglena sp.</i>	r	12
No. of taxa		18
Total Counts per ml		5266

Table 3: Thuruwila Tank

Species Name	Taxa	Counts
CYANOPHYCEAE		
<i>Anabeana solitaire</i>	m	32
<i>Chroococcus disperse</i>	m	32
<i>Cylindrospermopsis raciborskii</i>	d	1200
<i>Merismopaedia punctata</i>	c	130
<i>Mycrocystis aergunosa</i>	r	2
<i>Microcystis sp.</i>	m	26
<i>Pseudanabeana sp.</i>	m	36
DIATOMOPHYCEAE		
<i>Navicula sp.</i>	c	28
<i>Surella sp</i>	r	4
<i>Synedra sp</i>	m	32
CHLOROPHYCEAE		
<i>Ankistrodesmus sp.</i>	r	4
<i>Pediastrum simplex</i>	m	32
<i>Scenedesmus sp.</i>	r	8
DINOPHYCEAE		
<i>Peridiniopsis sp</i>	c	22
ZYGNEMAPHYCEAE		
<i>Strautrum sp</i>	r	8
EUGLENOPHYCEAE		
<i>Euglena sp.</i>	r	8
No. of taxa		16
Total Counts per ml		1604

Table 4; Mahakandarawa Tank

Species Name	Taxa	Counts
CYANOPHYCEAE		
<i>Anabeana solitaire</i>	r	12
<i>Chroococcus disperse</i>	c	24
<i>Cylindrospermopsis raciborskii</i>	d	26900
<i>Merismopaedia punctata</i>	c	22
<i>Mycrocystis aergunosa</i>	r	8
<i>Microcystis sp.</i>	r	10
<i>Microcystis wesenbergii</i>	r	8
<i>Oscillatoria sp.</i>	R	8
<i>Planktolyngbia sp.</i>	m	326
<i>Spirulina sp.</i>	m	164
DIATOMOPHYCEAE		
<i>Melosira granulata</i>	m	40
<i>Navicula sp.</i>	c	28
<i>Synedra sp</i>	m	72
CHLOROPHYCEAE		
<i>Ankistrodesmus sp.</i>	R	6
<i>Pediastrum simplex</i>	r	8
<i>Scenedesmus sp.</i>	R	6
No. of taxa		16
Total Counts per ml		27642

d=dominant : m=moderately: c=common: r=rare

Table 5: Relative Abundance of *Cylindrospermopsis raciborskii*

Reservoir Name	Relative Abundance %
Nuwarawewa	99.08
Kwkirawa Tank	79.75
Thurwila Tank	74.8
Mahakandarawa Tank	97.3

Discussion

The results presented in the four Tables show that the total algae in the Nuwarawewa and Mahakandarawa tanks are much higher than in Thurwila and Kekirawa. Perhaps they are more eutrophied than the other two. Nonetheless, in all the four tanks the predominant alga is *Cylindrospermopsis raciborskii* (Table 5) which has the potential to produce the algal toxin cylindrospermopsin. The abundance of *Cylindrospermopsis raciborskii* and other algae in North Central Province is influenced by water pollution that determines the trophic levels of the reservoir and this could also vary with the rainfall. Relative abundance and species spectrum shows the dominant, sub-dominant, common and occasional species which reflects the eutrophication of the water body.

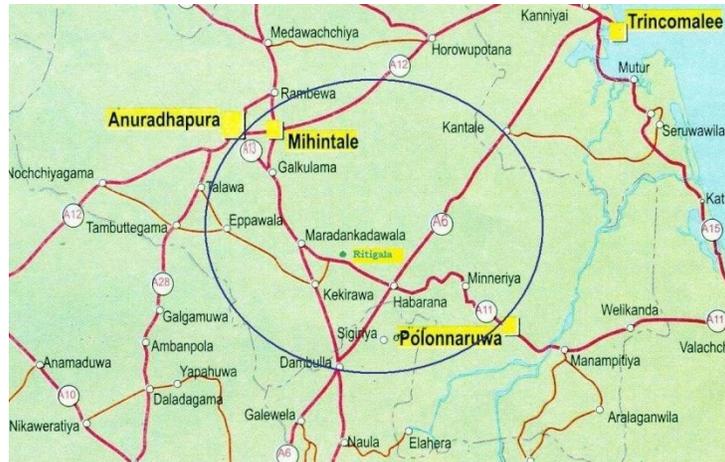
Accordingly the phytoplankton composition of the four water bodies could be identified as follows.

1. Mahakandarawa: the dominant species is *Cylindrospermopsis raciborskii* among the Cyanophyceae along with the other species belonging to other algal families. Comparing the results obtained earlier there's no significant changes in the phytoplankton composition.
2. Thurwila Reservoir: the dominant species is *Cylindrospermopsis raciborskii* but less in counts than Mahakandarawa.
3. Kekirawa Reservoir: This records the lowest population of algal species but even here the dominant alga was *Cylindrospermopsis raciborskii* with a relatively high abundance of diatoms.
4. Nuwarawewa Reservoir: Highest algal counts with a predominance of *Cylindrospermopsis raciborskii* indicating eutrophic conditions. While diatoms were common an increase in the Euglena population indicates plenty of exposure to sunlight and richness in organic matter. Water body in under eutrophic conditions.

Recommendations

In all the four reservoirs examined the dominant alga is *Cylindrospermopsis raciborskii*, a toxigenic species. The counts for Nuwarawewa and Mahakandarawa tanks are certainly beyond the danger levels. However, the mere presence of a cyanobacterium does not mean it produces toxins. The IFS is currently

in a position to measure and quantify the toxin cylindrospermopsin produced by this organism. If the NWSDB can purchase the ELISA kits needed for this work, we will be able to estimate the quantity of the toxins present (if any) in these waters. It is recommended that such analysis be done at least for Nuwarawewa and Mhakarawewa water samples before and after water treatment. It is then possible to see to what extent the water treatment is effective in reducing the toxin levels.



Prof. S.A. Kulasooriya

Visiting Professor/IFS

Jar Test Carried out on the 04th of September 2014 at the Anuradhapura Regional Laboratory.

Those present : Mr. Buw Perera (Ceywater Consultants (pvt) Ltd)
Mr. Lakruwan Alwis (NWSDB – Chemist, Anuradhapura)

1.0 Jar testing Procedure

- a) Measure the turbidity of the raw water so as to estimate the dosing of Alum.
- b) Measure the pH value of the raw water so as to estimate the dosing of Hydrated Lime required to enable the flocculation and coagulation of the alum taken place within the pH range of 6.4 – 6.8.
- c) Measure 1000 ml raw water into each jar.
- d) Adjust the Flocculator speed at 100 PRM.
- e) Add in the estimated Hydrated Lime dosing .
(1 ml 0.1% solution to 1 Litre = 1 ppm)
- f) Add in the estimated Alum dosing .
(1 ml 0.1% solution to 1 Litre = 1 ppm)
- g) The above mentioned chemicals should be added quickly and then stir at 100 RPM for 1 minutes after chemicals addition.
- h) Reduce the speed to 20 RPM and stir for 15 minutes.
- i) Then allow the floc to settle for 15 minutes and observe its speed of settlement. Grade the floc size and speed of settlement. Decant supernatant from each jar and measure the turbidity and pH value.

Additional Tests

- a) Filter the decanted supernatant through a 0.45 μ watman filter paper using a Buchner Funnel under Vacuum.
- b) Send samples of the raw water and filtered water to NWSDB laboratory in Ratmalana for heavy metal analysis. 1ml of dilute nitric acid was added as a preservative.

2.0 Results of the Jar Test

Stock Solution = 1% Alum
Therefore 1 ml of stock solution = 10mg of Alum

Best dose rate



	Dose Rate mg/l	30	34	36	38	40	42
Raw Water	pH	8.37	8.37	8.37	8.37	8.37	8.37
	Turbidity (NTU)	5.27	5.27	5.27	5.27	5.27	5.27
	Conductivity (μ /sem)	760	760	760	760	760	760

Best settling flocc



Dosed Water	PH	7.36	7.26	7.21	7.14	7.12	7.1
	Supernatant Turbidity (NTU)	1.33	1.21	0.94	1.54	0.77	0.79
	Conductivity (μ /sem)	-	-	-	-	-	-

Tests were repeated for reproducibility.



Equipment Used for Jar Testing



Jar Testing in Progress

3.0 Results of Heavy Metal Analysis

(To be provided by NWSDB - Ratmalana, Samples handed over 5th September 2014)

MAHAKANDARAWA WEWA RAW WATER DATA 2013 to 2014

No	Sri Lanka Standards SIS - 614 - Part 1	Units	Aug-13		Sep-13		Oct-13		Nov-13		Jan-14		Feb-14		Mar-14		Apr-14		May-14		Jun-14		STATISTICS			
			Canal	Intake	Canal	Intake	Canal	Intake	Canal	Intake	Canal	Intake	Canal	Intake	Canal	Intake	Canal	Intake	Canal	Intake	Average	Max	parameter	Units		
1	Appearance																							Appearance		
2	Colour	Pt.Co.	28	18	63	29	42	13	63	24	42	27	68	15	28	30	22	20	18	15	16	15	31	68	Colour	Pt.Co.
3	Turbidity	NTU	8.07	5.47	6.97	6.57	1.91	0.75	4.39	2.85	8.75	5.13	15.49	4.44	4.44	4.9	5.27	4.48	3.11	2.91	4.6	4.46	5	15.49	Turbidity	NTU
4	pH value		7.87	7.89	7.85	7.85	8.1	8.1	7.82	7.67	7.43	7.24	8.07	8.17	8.1	8.05	8.01	8.09	8.11	8.23	8.32	8	8.32	pH value		
5	Electrical Conductivity	µs/cm	530	530	570	570	610	610	610	590	550	500	590	640	630	640	630	630	600	580	620	630	592	640	Electrical Conductivity	µs/cm
6	Chloride	mg/l as Cl	88	94	80	84	164	168	104	112	96	92	112	120	112	112	104	112	112	104	124	120	110	168	Chloride	mg/l as Cl
7	Total Alkalinity	mg/l as CaCO ₃	108	196	140	132	148	148	140	140	106	108	104	110	110	148	144	104	120	110	110	110	123	196	Total Alkalinity	mg/l as CaCO ₃
8	Total Hardness	mg/l as CaCO ₃	132	136	148	132	142	150	140	152	160	160	136	180	170	148	144	156	152	156	132	140	148	180	Total Hardness	mg/l as CaCO ₃
9	Nitrate	mg/l as N	0.2	0.3	0.2	0.2	0.3	0.5	0.2	0.5	0.1	0.3	0.3	0.1	0.1	<0.10	<0.10	<0.10	<0.1	<0.1	0.4	0.3	0.267	0.500	Nitrate	mg/l as N
10	Nitrite	mg/l as N	0.001	0.007	0.005	0.008	0.004	0.004	0	0.004	0.001	0.005	0.001	0.001	0.006	<0.001	<0.001	<0.001	0.002	0.003	<0.001	0.001	0.003	0.008	Nitrite	mg/l as N
11	Sulphate	mg/l as SO ₄	3	3	3	4	5	5	5	5	14	5	4	5	5	5	5	5	4	4	4	5	4.895	14.000	Sulphate	mg/l as SO ₄
12	Fluoride	mg/l as F	0.28	0.31	0.29	0.21	0.2	0.26	0.32	0.23	0.34	0.32	0.4	0.45	0.42	0.39	0.41	0.55	0.58	0.58	0.58	0.6	0.376	0.600	Fluoride	mg/l as F
13	Total Phosphate	mg/l as PO ₄	0.17	0.16	0.15	0.08	0.05	0.06	0.28	0.3	0.17	0.28	0.23	0.31	0.22	0.12	0.09	0.1	0.05	0.4	0.38	0.189	0.400	Total Phosphate	mg/l as PO ₄	
14	Total Iron	mg/l as Fe	0.12	0.05	0.07	0.08	0.01	0.01	0.08	0.03	0.05	0.04	0.21	0.07	0.06	0.15	0.11	0.03	0.03	0.03	0.07	0.1	0.072	0.210	Total Iron	mg/l as Fe
15	Free Ammonia	mg/l	0.09	0.18	0.15	0.11	0.12	0.1	0.02	0.03	0.12	0.06	0.13	0.06	0.12	0.04	0.06	0.17	0.16	0.35	0.28	0.124	0.350	Free Ammonia	mg/l	
16	Residual Chlorine	mg/l as OCl/HOCl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n/a	n/a	Residual Chlorine	mg/l	

Bacteriological

No	Parameter	unit	23.04.2014		16.01.2014		01.11.2013																	
			Bottle 1	Bottle 2	Bottle 1	Bottle 2	Bottle 1	Bottle 2																
1	Total Coliform Bacteria	Colonies / 100ml	66	82	42	68	28	28	40	380	125	600	102	304	92	368	44	124	70	144	146	600	Total Coliform Bacteria	Colonies / 100ml
2	E-Coli Bacteria	Colonies / 100ml	24	36	Nil	20	Nil	Nil	Nil	140	56	432	22	42	44	120	12	28	32	36	71	432	E-Coli Bacteria	Colonies / 100ml

Algae

No	Parameter	unit	23.04.2014		16.01.2014		01.11.2013																		
			Bottle 1	Bottle 2	Bottle 1	Bottle 2	Bottle 1	Bottle 2																	
1	Cylindrospermopsis	Count per ml									6200	4400									8733	15600	Cylindrospermopsis	Count per ml	
2	Total algal count	Count per ml									6692	4914										8999	15392	Total Algae	Count per ml

Heavy Metals

No	Parameters	Unit	23.04.2014		16.01.2014		01.11.2013																	
			Bottle 1	Bottle 2	Bottle 1	Bottle 2	Bottle 1	Bottle 2																
1	As	ppb									1.6	1.501	1.941		1.8	1.701	1.942				1.757	1.95	As	ppb
2	Cd	ppb									0.87	0.73	1.51		0.91	0.83	1.51				1.081	1.51	Cd	ppb
3	Zn	ppb									72	72	71		70	690	71				138.88	690	Zn	ppb
4	Mn	ppb									28	ND	ND		21	ND	ND				72.25	156	Mn	ppb
5	Cu	ppb									ND	ND	ND		ND	ND	ND				3.5	4	Cu	ppb
6	Cr	ppb									201	312	244		ND	ND	ND				252	312	Cr	ppb
7	Pb	ppb									ND	ND	ND		ND	ND	ND				ND	ND	Pb	ppb

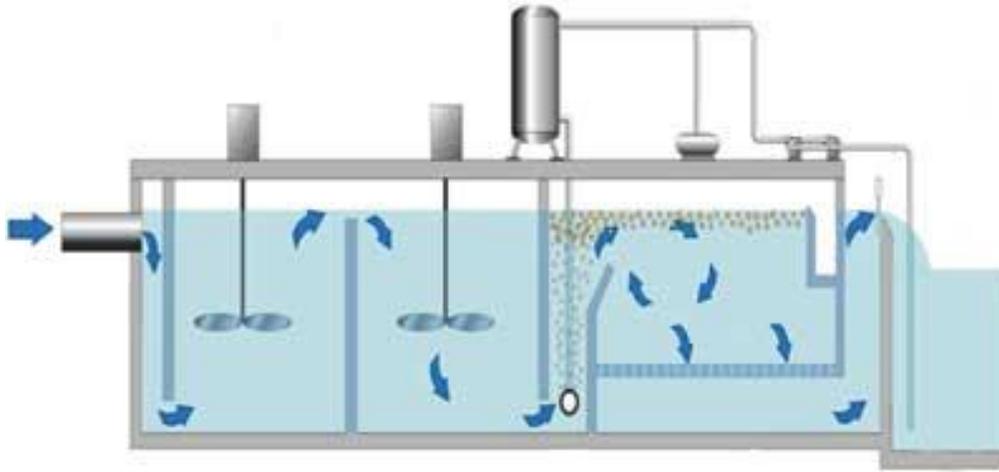
TESTS BY IFS	Limits on SLS 614: 1983 part 1 & 2														
	Kakirawa lake	Thiruwiila lake	Nuwara W. lake	Kakirawa WTP	Thiruwiila WTP	Nuwara W WTP	Mahakandarawa lake	Madawachiyha CBO 1	Madawachiyha CBO 2	Anuradhapura town tap	Rembewa CBO 1	Rembewa CBO 2	Kandy town Tap Water Control 1	Getambe Mahaweli River Control 2	
Parameter	Unit	Sampling locations													
Total Manganese	mg/l	0.21	0.41	0.38	0.03	0.12	0.15	0.24	0.12	0.16	0.10	0.15	0.15	0.08	
Free Amonia	mg/l	0.09	0.17	0.13	0.09	0.14	0.10	0.12	0.10	0.12	0.14	0.12	0.28	0.03	
Soluble Iron	mg/l														
Soluble Manganese	mg/l	0.10	0.22	0.37	0.02	0.10	0.12	0.17	0.04	0.12	0.01	0.12	0.07	0.04	
Temporary Hardness	mg/l	21.92	44.76	26.92	0.09	63.62	6.52	27.68	321.84	372.04	320.44	300.04	5.12	0.96	
Albimanoind ammonia	mg/l	0.31	0.92	2.03	ND	0.68			0.06	ND	ND	0.07	ND	ND	
Anionic detergent	mg/l														
Phenolic compounds	mg/l														
Pesticide residue															
Grease and Oil	mg/l														
Copper	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Zinc	mg/l	0.02	0.02	0.01	0.04	0.03	0.08	0.03	0.04	0.02	0.02	0.02	0.02	0.03	
Aliminium	mg/l														
Arsenic	ug/l														
Cadmium	ug/l	0.16	0.14	0.13	0.25	0.16	0.11	0.33	0.04	0.04	0.01	0.13	0.27	0.18	
Cyanide	ug/l														
Total Mercury	ug/l														
Lead	ug/l	0.48	3.56	3.03	3.39	1.51	3.72	ND	0.45	ND	0.64	0.79	5.21	2.55	
Selenium	ug/l														
Chromium	ug/l	0.09	ND	0.26	ND	ND	0.28	ND	0.71	2.63	0.08	0.81	0.12	ND	
Algae- Taxonomy															
Algae- Counting															
Total															

Albimanoind ammonia ND - LOD -0.05mg/l

Copper- ND - LOD -0.01mg/l

Chromium ND - LOD - 0.05 ug/l

Dissolved Air Flotation



Flotation is described as a gravity separation process in which gas bubbles attach to solid particles to cause the apparent density of the bubbled solid agglomerates to be less than that of water, thereby allowing the agglomerate to float to the surface. DAF is employed mainly for the treatment of nutrient rich reservoir waters that may have heavy algal blooms and for low turbidity low alkalinity coloured water

Advantages

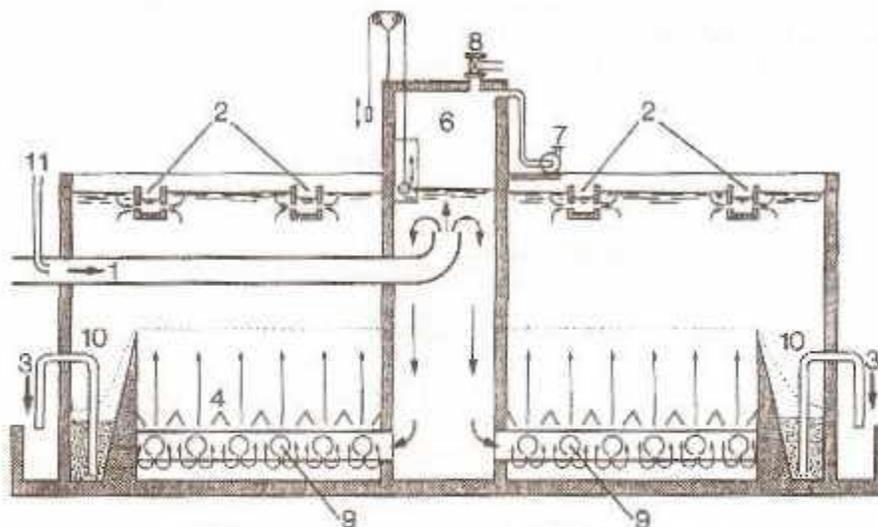
1. High loading rates can be used , typically 8 to 12 m/h for potable water treatment plant.
2. A thick float of typically 1 to 3 % total solids can be used using hydraulic or mechanical skimming.
3. Large dense floc is not required and hence less flocculation time when compared to sedimentation.
4. coagulation dose rate can be reduced in some circumstances as a smaller floc particle size is required.
5. No polymer is required.
6. Rapid start up time, typically 30 to 60 mins.
7. Excellent algae removal efficiency.
8. 2 to 2.5 log removal of crypto and giardia possible.
9. Smaller footprint required compared to conventional flocculation and sedimentation.

10. Many Contractors have the experience and technology to install these and hence a competitive price can be expected for these clarifiers.

Disadvantages

1. Requires a cover or roof to protect the float layer from rain.
2. Mechanically more complex than conventional gravity clarifiers.
3. More power consumption than conventional sedimentation plant as recycle pumps, compressor/saturators, scrapers are required.
4. Not suitable for high turbidity waters.
5. Requires a higher degree of maintenance and operator skill.
6. With some waters it may be more difficult to dewater the sludge.

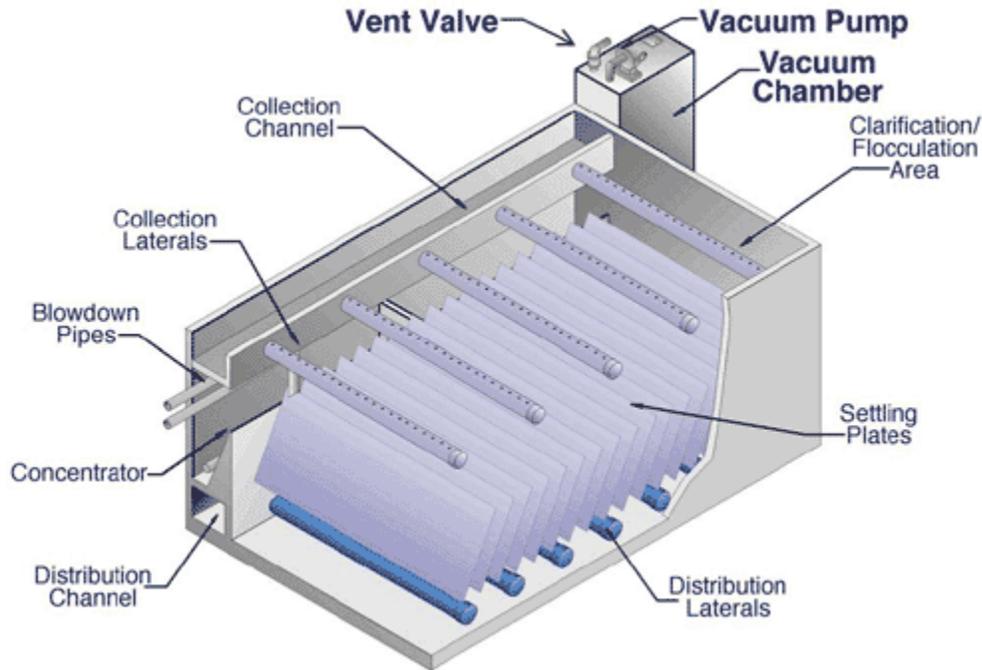
Pulsator



1. Raw water inlet.
2. Clarified water outlet.
3. Sludge discharge.
4. Stilling plates.
6. Vacuum chamber.
7. Vacuum pump.

8. Automatic vacuum-breaker.
9. Raw water perforated distribution piping.
10. Sludge concentrators.
11. Reagent inlet.

Superpulsator



The pulsator clarifier combines basic chemical principles and proven clarification technology in a high rate solids contact clarifier. It is a pulsed sludge blanket type clarifier which simultaneously carries out flocculation and clarification without the need for separate stages. The sludge formed during flocculation is made up of an expansion mass called the sludge bed or the sludge blanket. Water that has been coagulated beforehand arrives from the bottom of the device and flows through the this sludge bed to emerge clarified at the top of the settling tank. The forces resulting from the pulsation of the flow and the collisions and entrapments within the flocc blanket ensures complete flocculation and efficient separation of the flocc from the clarified water.

Inclined settling plates inside the clarifier in the Superpulsator keeps the sludge blanket homogeneous across the entire settling area aiding in the flocculation and helps guide the sludge into the concentrator during the pulsing. The vacuum generated flow pulsing creates a homogeneous sludge blanket that results in excellent effluent quality at minimal operating costs.

Advantages

1. Relatively high loading rates of 3 to 4.5 m/h rise rates are possible with Pulsators. 10 m/h may be possible with the Superpulsator models.
2. Flexible operation. Capable of removing colour , turbidity and organics
3. Controlled hydraulics.
4. Reduced operating costs. Most other solids contact clarifiers require mechanical or flow impeding devices such as mixers, pumps, or baffles to keep the sludge homogeneous
5. Easy operation. The vacuum pump, vent valve arrangement, and sludge waste valves are the only mechanical parts which are automated and require minimal operator attention.

Disadvantages

1. Not good if the inlet raw water has more than 100,000 u/ml of algae(This is according to Infilco Degremont's own brochure)
2. Flocc carryover is fine particles and hence not ideal for filtration downstream.
3. Algal growth and slime in the plates in a Superpulsator, if allowed to accumulate, will partially clog them and hence affect performance.
4. Requires the installation of a distribution lateral system at the base , and in the case of the superpulsator, inclined plates have to be installed inside the tanks.
5. Relatively large footprint of the Pulsator compared to the DAF.
6. For waters that need aeration, an upstream aerator is needed for the solids contact clarifiers whereas the DAF does not need this.
7. Pulsator and Superpulsator designs are patented technologies from Degremont. Although there are other similar solids contact clarifier technologies available from other Contractors, NWSDB appear to prefer the Pulsator. This would narrow down the Contractor to one (unless this technology is made available to other Contractors under some license agreement by Degremont)

General note on process selection.

With respect to use of Superpulsators for the project, we have major concern as this directs us to use only one vendor – which is Degremont and then we are at the mercy of getting economical solution – capex and opex. The client will eventually loose on this. If they say any sludge blanket clarifier would do in stead of saying Superpulsator then it is not true. Other sludge blanket clarifiers would not be as effective as a Superpulsators, resulting in large algal masses floating and chocking on the filters as is normally happening. With DAF there are number of vendors, including Degremontt that can participate in the project and client would get a better competitive bids resulting in cost savings for the client in Capex and Opex.

National Water Supply and Drainage Board

Anuradhapura North Water Supply Project

Optimal WTP Process

30 August 2007

**Optimal WTP Process that may help
mitigate probable contaminants causing
CKD**

Water Treatment Plant

**Production Capacity = 17, 900 m³/day
(ultimate)**

Raw Water Source = Mahakandarawa Lake

Existing WTPs

Nuwara Wewa



Kakirawa



Thuruwila



Algae – floating



Raw Water Quality

Raw Water Quality Analysis (2013-14 data)

STATISTICS			
Average	Max	parameter	Units
		Apearance	
31	68	Colour	
5	15.49	Turbidity	Pt.Co.
8	8.32	pH value	NTU
592	640	Electrical Conductivity	
110	168	Chloride	µs/cm
123	196	Total Alkalinity	mg / l as Cl
148	180	Total Hardness	mg / l as Caco ₃
0.267	0.500	Nitrate	mg / l as Caco ₃
0.003	0.008	Nitrite	mg / l as N
4.895	14.000	Sulphate	mg / l as N
0.376	0.600	Fluoride	mg / l as SO ₄
0.189	0.400	Total Phosphate	mg / l as F
0.072	0.210	Total Iron	mg / l as PO ₄
0.124	0.350	Free Ammonia	mg / l as Fe
n/a	n/a	Residual Chlorine	mg / l

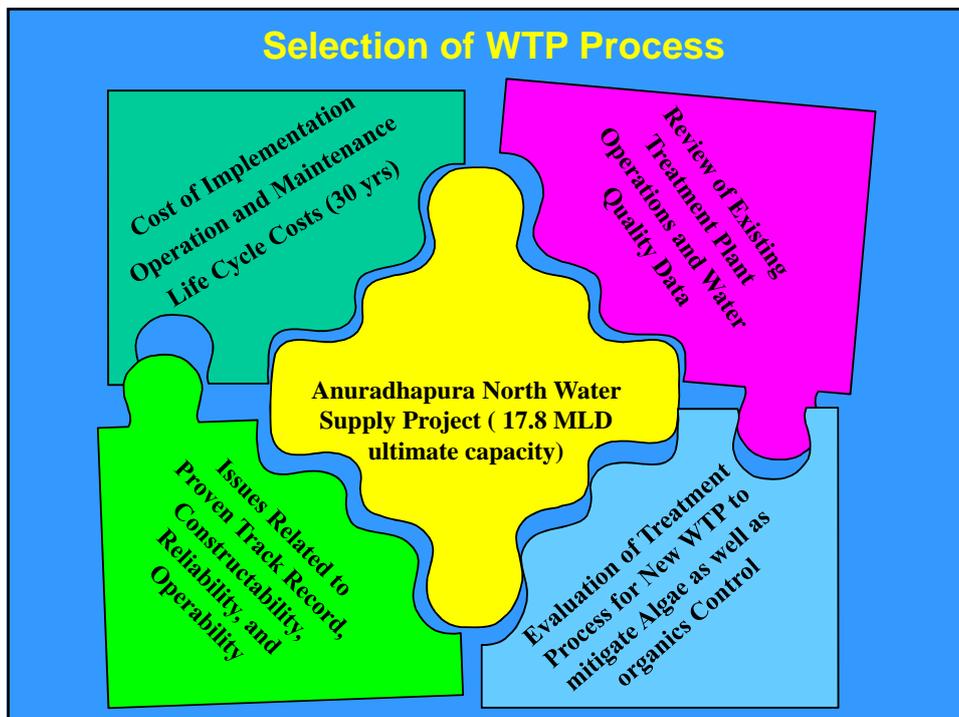
STATISTICS			
Ave	Max	Parameter	unit
8733	15600	Cylindrospermopsis	Count per ml
8999	15392	Total Algae	Count per ml

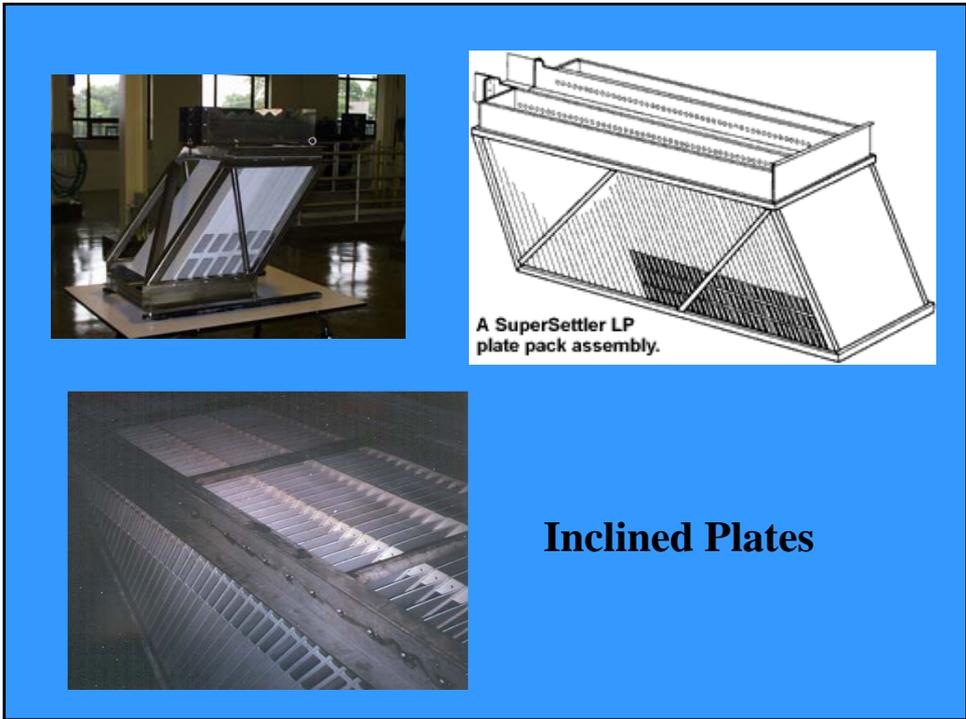
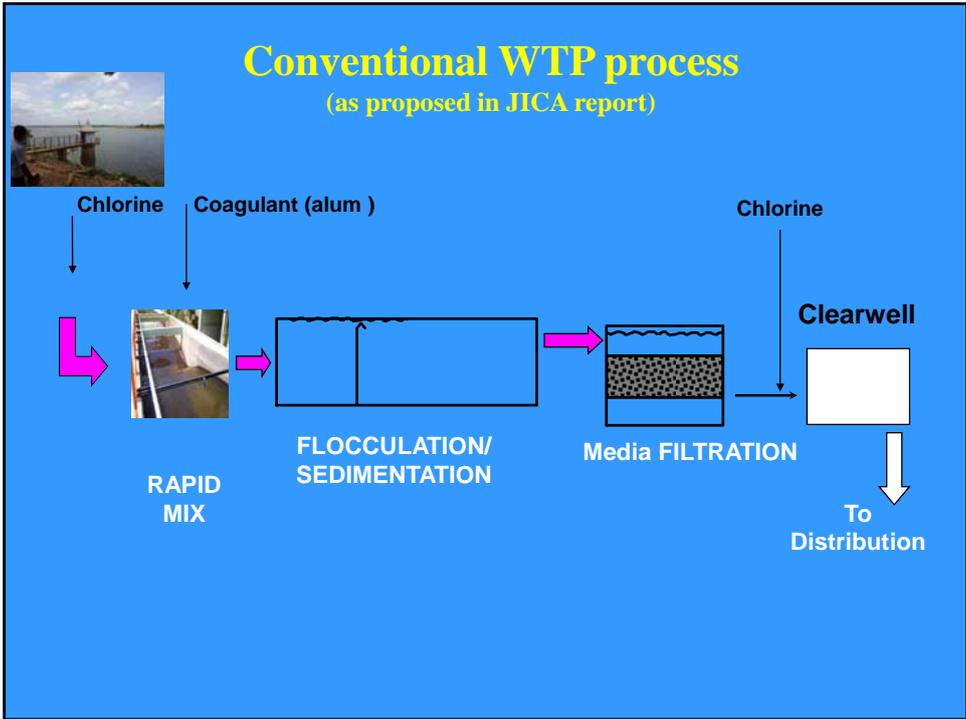
STATISTICS			
Ave	Max	Parameter	unit
1.757	1.95	As	ppb
1.081	1.51	Cd	ppb
138.88	690	Zn	ppb
72.25	156	Mn	ppb
3.5	4	Cu	ppb
252	312	Cr	ppb
ND	ND	Pb	ppb

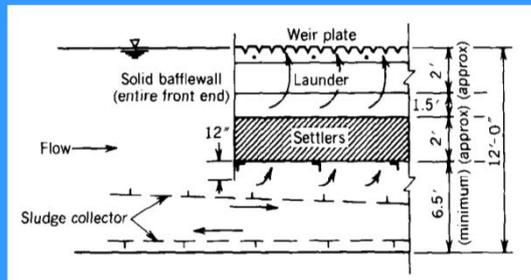
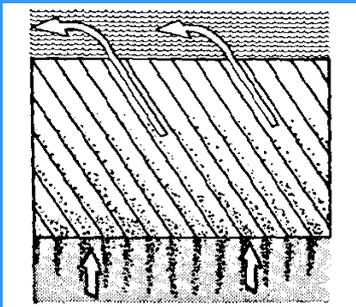
Probable Causes of CKD

- hardness and/or high content of fluorides in drinking water;
- use of cheap aluminium cookware which is easily solubilised by the fluoride in water;
- excessive use of agrochemicals containing nephrotoxic chemicals, such as compounds of heavy metals like cadmium and arsenic, and even plant nutrients like phosphate itself (*hyperphosphatemia*); and Glyphosate.
- consumption of food items such as lotus roots and smoking tobacco, which have high Cadmium (Cd) levels;
- algal and herbal toxins in the drinking water supply;
- high ionic concentration in groundwater aquifers supplying the wells from which people draw their drinking water;
- nephrotoxic ingredients (e.g. *Sapsanda*) in widely used ayurvedic herbal medicines;
- excessive dehydration in the work environment of farmers; and even genetic predisposition of the affected population to kidney damage from normally harmless levels of nephrotoxins

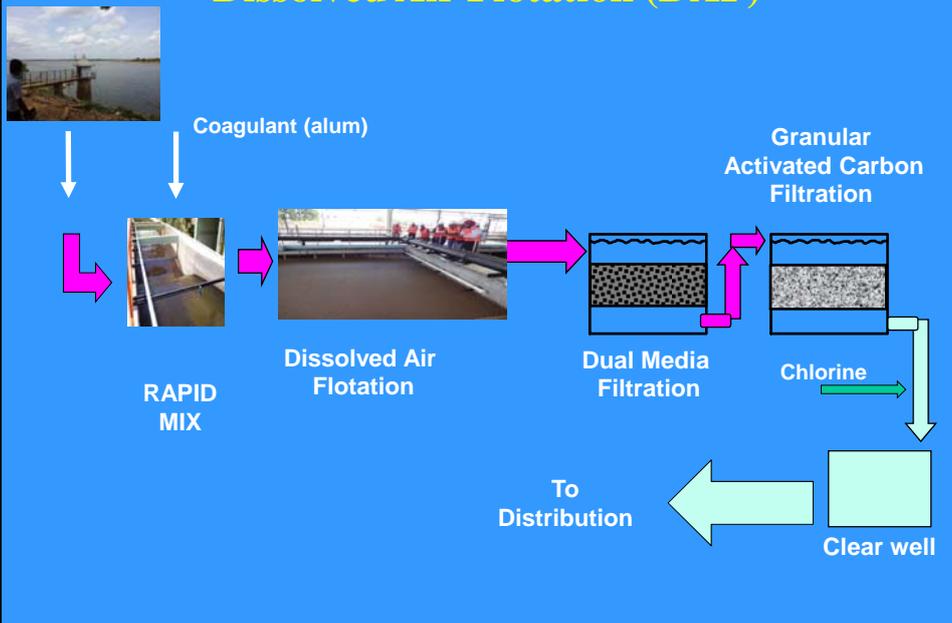
Selection of WTP Process



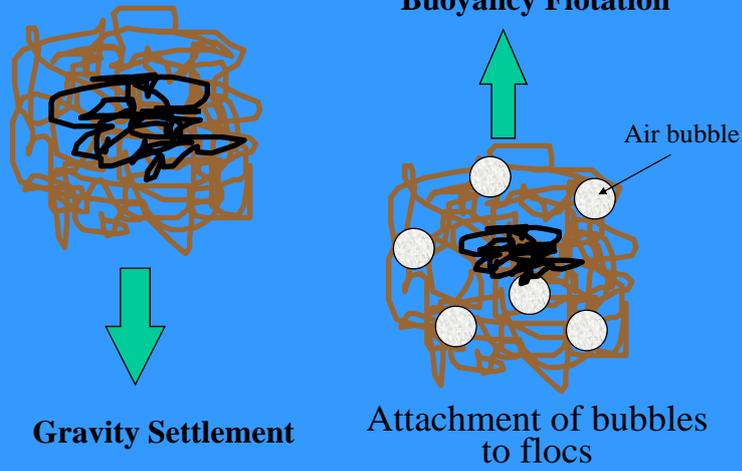




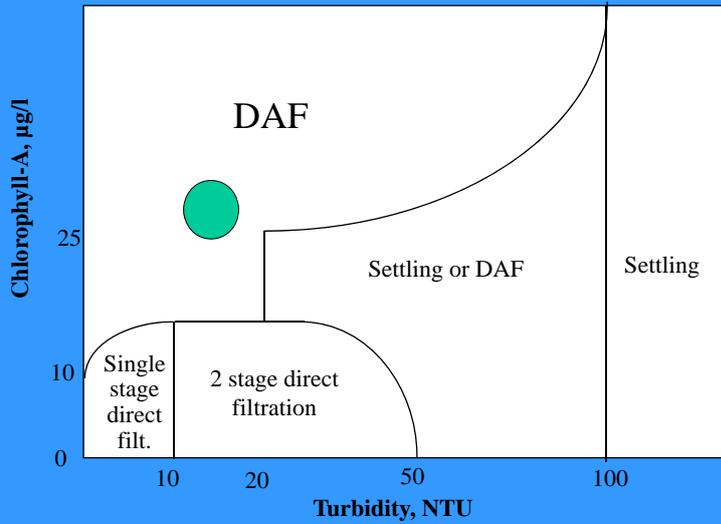
Dissolved Air Flotation (DAF)



Primary difference between conventional and dissolved air flotation

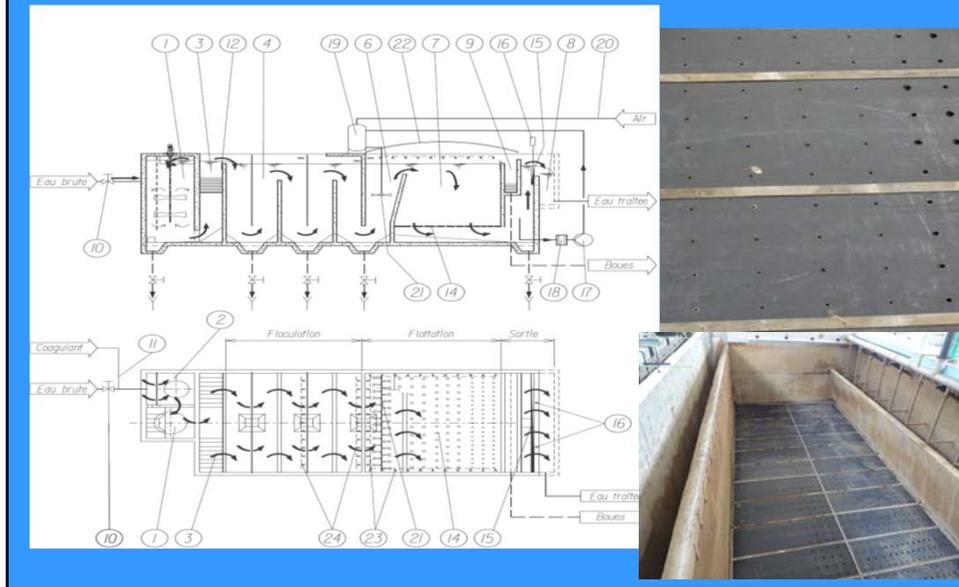


Clarification/ Process Selection Range



Source: Janssens, J., and A. Buekens (1993). Assessment of Process Selection for Particle Removal in Surface Water Treatment. Aqua.

Typical DAF Arrangement



Way Forward

- Initiate the design of First phase of WTP with DAF, Media Filtration followed by GAC as primary barriers for Algae and other organic & pesticide control.
- Continue to monitor data on specific water quality parameters from existing WTPs (inlet and outlet) as well as from proposed water source.
- Develop detailed mapping of existing as well as future CKD patients within the existing water Distribution system area
- Allocate specific budget and continue to provide public education program on use of treated surface water from WTPs

THANK YOU

ANURADHAPURA NORTH WATER SUPPLY PROJECT PHASE 1

Minutes of Discussion on Working Paper No.4 Mahakandarawa Water Treatment Plant at RSC (North-Central) Office

Date: 01.10.2014

The power point presentation of and discussion on Working Paper No.4 were organized by the Project Director. There was a discussion between the NWSDB staff (Project & RSC) following the power point presentation, which was made by the Consultant's staff. The following staff members of the NWSDB and Consultant participated and the key points discussed are given below:

NWSDB Staff

Mr. M.A.G.Susantha	AGM (NWSDB)
Mr. D.B.Gunadasa	PD (ANWSP)
Mr. N.Chandrasena	Manager (O&M)
Mr. C.S.Lokubarana	CE (C)
Ms. D.P.K.Jayasena	CE (P&D)
Mr. W.A.T.P Senevirathne	ME (NWSDB)
Mr. S.C.Rathnayake	CE (SP)
Mr. M.M.R.U.Kumara	Eng. (ANWSP)
Mr. K.M.K.G.Karunarathna	Eng. (ANWSP)
Mr. S.H.N.S.Senanayake	OIC (NWSDB)

Consultant's Staff

Mr. Kevin Holroyd	Team Leader (ANWSP)	NJS
Mr. P. Kulatunga	Co-Team Leader	Ceywater
Mr. Uday Kelkar	Water Treatment Expert	NJS
Mr. Yasuaki Konda	Mechanical Engineer	NJS
Mr. K.G. Dayarathne	Mechanical Engineer	Ceywater
Mr. V.B. Perera	Microbiologist	Ceywater
Mr. B.A. Gunarathne	Electrical Engineer	Ceywater
Mr. Lal Elamaldeniya	Instrumentation Engineer	Ceywater

- 1) Application of Dissolved Air Flotation (DAF) followed by Rapid Sand Filters (RSF) and Granular Activated Carbon (GAC) is an appropriate process selected for this treatment plant, would it be applicable to add Powder Activated Carbon (PAC) upfront in the treatment process? (Question by CE (SP))

Addition of PAC would certainly be helpful in removing additional colour as well as Taste and Odour (T&O) compounds. However, the dose of PAC needs to be pre-determined based on laboratory study to evaluate optimal PAC dose for maximum adsorption of colour and T&O compounds. Consultant can provide space for implementing PAC, if it is required in the future. As the plant is designed with GAC, which would provide as a barrier to Geosmin/MIB/and other organic compounds.

- 2) Can the existing treatment process reduce Total Dissolved Solids (TDS) below 300 mg/L level, which is being put in as a desirable level for CKDu area? (Question by CE (SP))

The treatment scheme that is provided here in really does not provide any reduction for more than 10% to the influent raw water TDS. It is interesting to know whether there has been kept a desirable limit for TDS by the NWDSB. Overall the influent TDS levels are in the 500 to 650 mg/L levels and to achieve lower than 300 mg/L TDS, the plant has to use reverse osmosis (RO) process and that is not practical as it will require higher volume, almost twice the amount of raw water source to meet the total production capacity, as RO processes, do not provide more than 75% product recovery and the rejects will to be discharged appropriately as it will contain much higher levels of TDS. What has seen from the literature that Total hardness (TH) should be less than 300 mg/L and fluoride less than 0.6 mg/L in the treated water. The raw water from the lake does not have more than 200 mg/L TH and fluoride is less than 0.5 mg/L, which is essentially get reduced to more than 50% as a result of treatment process through coagulation/filtration.

- 3) Will the plant be designed for use of poly aluminium chloride as a coagulant instead of alum that has been proposed? (Question by CE (SP))

Yes, the coagulant could be either Alum or poly aluminium chloride, which will provide better coagulation regime in the pH range of the raw water, have less degree of sludge production as the dosages required for coagulation are lower than that of Alum for this type of water. We can make provision to use either of the coagulant.

- 4) Will you be using polymer in the DAF process? (Question by CE (SP))

No. Polymers have not been used in the process, it is only suggested that if you use high rate DAF process, you need to use polymer, however, high rate DAF has not been suggested here. The sludge thickener will also not have polymer addition as the supernatant will be discharged in to natural drains/channels.

- 5) The groundwater level in the area where the plant is located is very high. We hope that you have taken into account this for lagoon as well as sludge drying bed. (Question by CE (P&D))

Yes, we have. The concrete bed underneath the sand drying beds will be designed to reduce any effect of uplift, as well as to have proper collection of dewatered fluid. The lagoons will also be constructed with a concrete bed and will be designed to reduce any effect of uplift.

- 6) Have you considered other advanced oxidation processes like ozone, chlorine dioxide instead of chlorine? (Question by CE (SP))

We have not specifically considered these chemicals as we think they are not required since, DAF and GAC have been adopted for the treatment and pre-chlorination dose would be reduced to get better treatment and reduce any T&O associated with higher dosages of pre-chlorination. Plus both ozone and chlorine dioxide needs to be produced on-site and cannot

be stored as these are very reactive chemicals and get exhausted within no time. The cost of producing and maintaining the unit operation for these chemicals is also very energy intensive and costlier. Hence are not recommended.

The above minutes are certified as correct.

Assistant General Manager
(NC)

Manager
(O&M)

Project Director
(ANWSP)

Team Leader
(Consultant)

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1
CONSTRUCTION OF INTAKE FACILITY, WATER TREATMENT PLANT, WATER STORAGE STRUCTURES, MECHANICAL, ELECTRICAL AND BUILDING WORKS
CONTRACT NO. AN/JICA/STRCT/LOT A

BILL OF QUANTITIES

GRAND SUMMARY

BILL NO.	DESCRIPTION	TOTAL AMOUNT			
		Supplied from outside the Employer's Country Price		Supplied from within the Employer's Country Price	Installation & all Other Civil Works
		CIF	Port charges & taxes (except custom duties & VAT), handling, double handling, clearance, CIP Anuradhapura site, etc.	Supply & delivery to Anuradhapura site	
		US\$	SLRs.	SLRs.	SLRs.
1	GENERAL REQUIREMENTS				97,539,940.00
2	PROVISIONAL SUMS				335,121,818.00
3 - 1	CONSTRUCTION OF INTAKE STRUCTURE				86,057,481.07
3 - 2	CONSTRUCTION OF FLOW CONTROL STRUCTURE				5,785,098.72
3 - 3	SUPPLY AND INSTALLATION OF INTERNAL PIPES AT INTAKE	9,064.10	315,086.37	0.00	121,865.39
3 - 4	SUPPLY AND INSTALLATION OF MECHANICAL EQUIPMENT AT INTAKE AND FLOW CONTROL STRUCTURE	323,131.41	11,233,017.12	76,000.00	3,864,184.22
3 - 5	SUPPLY AND INSTALLATION OF ELECTRICAL EQUIPMENT AT INTAKE	95,803.71	3,330,328.71	2,861,000.00	1,306,682.81
3 - 6	SUPPLY AND INSTALLATION OF INSTRUMENTATION EQUIPMENT AT INTAKE	53,841.16	1,871,626.37	390,000.00	554,115.44
4 - 1	SITE WORK - INTAKE AND WTP				191,001,722.50
4 - 2	CONSTRUCTION OF STRUCTURE - RECEIVING AND DISTRIBUTION CHAMBER				11,277,254.28
4 - 3	CONSTRUCTION OF STRUCTURE - FLOCCULATION TANKS AND DAF UNIT				44,970,534.27
4 - 4	CONSTRUCTION OF STRUCTURE - RAPID SAND FILTER				57,312,853.00
4 - 5	CONSTRUCTION OF STRUCTURE - GAC FILTER				81,463,467.18
4 - 6	CONSTRUCTION OF STRUCTURE - CLEAR WATER TANK AND PUMP HOUSE				105,101,776.65
4 - 7	CONSTRUCTION OF STRUCTURE - BACKWASH WATER RECYCLING TANK AND SLUDGE BALANCING TANK				31,164,029.07
4 - 8	CONSTRUCTION OF STRUCTURE - SLUDGE THICKENER AND PUMP HOUSE				15,631,356.61
4 - 9	CONSTRUCTION OF STRUCTURE - SLUDGE DRYING BED				35,337,197.33
	TOTAL CARRIED FORWARD TO PAGE BOQ - 1334	481,840.39	16,750,058.57	3,327,000.00	1,103,611,376.55

3.2.1-1

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1
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		US\$	SLRs.	SLRs.	SLRs.
	TOTAL BROUGHT FORWARD FROM PAGE BOQ - 1333	481,840.39	16,750,058.57	3,327,000.00	1,103,611,376.55
4 - 10	CONSTRUCTION OF STRUCTURE - SLUDGE LAGOON				10,320,548.58
4 - 11	CONSTRUCTION OF CHEMICAL BUILDING AT WATER TREATMENT PLANT				22,609,328.47
4 - 12	CONSTRUCTION OF CHLORINATION BUILDING AT WATER TREATMENT PLANT				8,332,526.77
4 - 13	CONSTRUCTION OF ADMINISTRATION BUILDING AT WATER TREATMENT PLANT				41,068,082.76
4 - 14	CONSTRUCTION OF STORE BUILDING AT WATER TREATMENT PLANT				10,827,829.88
4 - 15	CONSTRUCTION OF WORK SHOP AT WATER TREATMENT PLANT				11,458,403.47
4 - 16	CONSTRUCTION OF GENERATOR BUILDING AT WATER TREATMENT PLANT				7,318,735.69
4 - 17	CONSTRUCTION OF GUARD HOUSE AT WATER TREATMENT PLANT				2,500,380.51
4 - 18	CONSTRUCTION OF CARETAKER QUARTERS AT WATER TREATMENT PLANT				6,310,822.56
4 - 19	CONSTRUCTION OF OIC QUARTERS AT WATER TREATMENT PLANT				8,605,496.59
4 - 20	CONSTRUCTION OF PARKING SHED AT WATER TREATMENT PLANT				4,523,290.71
4 - 21	SUPPLY AND INSTALLATION OF INTERNAL PIPES AT RECEIVING AND DISTRIBUTION CHAMBER	6,188.51	215,125.04	0.00	104,809.29
4 - 22	SUPPLY AND INSTALLATION OF INTERNAL PIPES AT FLOCCULATION TANKS AND DAF UNIT	7,468.00	259,602.56	0.00	103,386.74
4 - 23	SUPPLY AND INSTALLATION OF INTERNAL PIPES AT RAPID SAND FILTER	102,413.77	3,560,107.35	0.00	334,320.78
4 - 24	SUPPLY AND INSTALLATION OF INTERNAL PIPES AT GAC FILTER	101,366.40	3,523,698.83	0.00	661,619.74
	TOTAL CARRIED FORWARD TO PAGE BOQ - 1335	699,277.07	24,308,592.34	3,327,000.00	1,238,690,959.09

3.2.1-2

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1
CONSTRUCTION OF INTAKE FACILITY, WATER TREATMENT PLANT, WATER STORAGE STRUCTURES, MECHANICAL, ELECTRICAL AND BUILDING WORKS
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		US\$	SLRs.	SLRs.	SLRs.
	TOTAL BROUGHT FORWARD FROM PAGE BOQ - 1334	699,277.07	24,308,592.34	3,327,000.00	1,238,690,959.09
4 - 25	SUPPLY AND INSTALLATION OF INTERNAL PIPES AT CLEAR WATER TANK AND PUMP HOUSE	37,057.86	1,288,205.26	0.00	2,501,708.27
4 - 26	SUPPLY AND INSTALLATION OF INTERNAL PIPES AT BACKWASH WATER RECYCLING TANK AND SLUDGE BALANCING TANK	12,549.68	436,252.04	0.00	429,262.70
4 - 27	SUPPLY AND INSTALLATION OF INTERNAL PIPES AT SLUDGE THICKENER AND SLUDGE PUMP HOUSE	3,388.08	117,776.55	0.00	58,934.54
4 - 28	SUPPLY AND INSTALLATION OF INTERNAL PIPES AT SLUDGE DRYING BED	9,817.48	341,275.22	0.00	158,686.27
4 - 29	SUPPLY AND INSTALLATION OF INTERNAL PIPES AT SLUDGE LAGOON	656.06	22,805.90	17,892.00	13,195.30
4 - 30	SUPPLY AND INSTALLATION OF YARD PIPES AT INTAKE AND WTP	77,449.32	2,692,272.71	1,760,465.00	9,370,376.56
4 - 31	SUPPLY AND INSTALLATION OF MECHANICAL EQUIPMENT AT WTP	3,047,017.09	101,720,884.77	2,902,130.53	29,381,234.50
4 - 32	SUPPLY AND INSTALLATION OF ELECTRICAL EQUIPMENT AT WTP	993,002.24	34,518,743.72	34,264,500.00	13,390,284.89
4 - 33	SUPPLY AND INSTALLATION OF INSTRUMENTATION EQUIPMENT AT WTP	428,822.99	14,906,744.82	16,310,939.50	5,681,529.33
4 - 34	RE-CONSTRUCTION OF LB CANAL (UP STREAM OF INTAKE)				27,334,628.70
5 - 1	SITE WORK - RAMBEWA				19,344,493.00
5 - 2	CONSTRUCTION OF 1500M ³ GROUND RESERVOIR AND PUMP HOUSE AT RAMBEWA				76,996,838.66
5 - 3	CONSTRUCTION OF ELEVATED WATER TOWER CAPACITY 1000 M ³ AT RAMBEWA				92,661,192.89
5 - 4	CONSTRUCTION OF RE - CHLORINATION BUILDING AT RAMBEWA				2,142,328.71
	TOTAL CARRIED FORWARD TO PAGE BOQ - 1336	5,309,037.86	180,353,553.33	58,582,927.03	1,518,155,653.40

3.2.1-3

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1
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		US\$	SLRs.	SLRs.	SLRs.
	TOTAL BROUGHT FORWARD FROM PAGE BOQ - 1335	5,309,037.86	180,353,553.33	58,582,927.03	1,518,155,653.40
5 - 5	CONSTRUCTION OF GENERATOR BUILDING AT RAMBEWA				7,318,735.69
5 - 6	CONSTRUCTION OF OIC OFFICE AT RAMBEWA				12,012,517.20
5 - 7	CONSTRUCTION OF AREA ENGINEER QUARTERS AT RAMBEWA				9,673,288.32
5 - 8	CONSTRUCTION OF CARETAKER QUARTERS AT RAMBEWA				6,295,822.56
5 - 9	CONSTRUCTION OF GUARD HOUSE AT RAMBEWA				2,040,186.51
5 - 10	CONSTRUCTION OF PARKING SHED AT RAMBEWA				2,260,505.34
5 - 11	SUPPLY AND INSTALLATION OF INTERNAL PIPES AT 1500M ³ GROUND RESERVOIR AND PUMP HOUSE AT RAMBEWA	27,258.34	947,554.27	0.00	2,271,920.58
5 - 12	SUPPLY AND INSTALLATION OF INTERNAL PIPES AT 1000M ³ ELEVATED WATER TOWER AT RAMBEWA	25,227.12	876,945.29	2,000.00	225,328.94
5 - 13	SUPPLY AND INSTALLATION OF YARD PIPES AT RAMBEWA	36,929.18	1,283,732.30	100,800.00	1,527,208.48
5 - 14	SUPPLY AND INSTALLATION OF MECHANICAL EQUIPMENT AT RAMBEWA	280,281.61	9,744,445.93	1,765,625.02	3,680,040.07
5 - 15	SUPPLY AND INSTALLATION OF ELECTRICAL EQUIPMENT AT RAMBEWA	197,249.21	6,856,777.21	3,288,000.00	2,186,370.81
5 - 16	SUPPLY AND INSTALLATION OF INSTRUMENTATION EQUIPMENT AT RAMBEWA	79,712.97	2,770,982.24	525,000.00	795,787.48
6 - 1	SITE WORK - EAST RAMBEWA				11,297,621.00
6 - 2	CONSTRUCTION OF 500M ³ GROUND RESERVOIR AND PUMP HOUSE AT EAST RAMBEWA				42,879,552.64
	TOTAL CARRIED FORWARD TO PAGE BOQ - 1337	5,955,696.30	202,833,990.56	64,264,352.05	1,622,620,539.01

3.2.1-4

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1
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		US\$	SLRs.	SLRs.	SLRs.
	TOTAL BROUGHT FORWARD FROM PAGE BOQ - 1336	5,955,696.30	202,833,990.56	64,264,352.05	1,622,620,539.01
6 - 3	CONSTRUCTION OF ELEVATED WATER TOWER CAPACITY 250 M ³ AT EAST RAMBEWA				50,534,972.05
6 - 4	CONSTRUCTION OF RE - CHLORINATION BUILDING AT EAST RAMBEWA				2,142,328.71
6 - 5	CONSTRUCTION OF GENERATOR BUILDING AT EAST RAMBEWA				7,318,735.69
6 - 6	CONSTRUCTION OF CARETAKER QUARTERS AT EAST RAMBEWA				6,295,822.56
6 - 7	SUPPLY AND INSTALLATION OF INTERNAL PIPES AT 500M ³ GROUND RESERVOIR AND PUMP HOUSE AT EAST RAMBEWA	9,301.39	323,335.05	0.00	1,746,288.87
6 - 8	SUPPLY AND INSTALLATION OF INTERNAL PIPES AT 250M ³ ELEVATED WATER TOWER AT EAST RAMBEWA	11,519.42	400,438.00	900.00	131,945.41
6 - 9	SUPPLY AND INSTALLATION OF YARD PIPES AT EAST RAMBEWA	10,003.81	347,752.39	0.00	504,971.95
6 - 10	SUPPLY AND INSTALLATION OF MECHANICAL EQUIPMENT AT EAST RAMBEWA	181,685.84	6,317,128.49	1,512,866.14	3,337,461.39
6 - 11	SUPPLY AND INSTALLATION OF ELECTRICAL EQUIPMENT AT EAST RAMBEWA	134,403.95	4,672,150.27	2,541,400.00	1,525,120.11
6 - 12	SUPPLY AND INSTALLATION OF INSTRUMENTATION EQUIPMENT AT EAST RAMBEWA	55,902.65	1,943,287.84	365,000.00	619,517.32
7 - 1	SITE WORK - MEDAWACHCHIYA				41,302,172.00
7 - 2	CONSTRUCTION OF 1000M ³ GROUND RESERVOIR AND PUMP HOUSE AT MEDAWACHCHIYA				65,184,312.14
7 - 3	CONSTRUCTION OF RE - CHLORINATION BUILDING AT MEDAWACHCHIYA				2,142,328.71
	TOTAL CARRIED FORWARD TO PAGE BOQ - 1338	6,358,513.36	216,838,082.60	68,684,518.20	1,805,406,515.92

3.2.1-5

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1
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		US\$	SLRs.	SLRs.	SLRs.
	TOTAL BROUGHT FORWARD FROM PAGE BOQ - 1337	6,358,513.36	216,838,082.60	68,684,518.20	1,805,406,515.92
7 - 4	CONSTRUCTION OF GENERATOR BUILDING AT MEDAWACHCHIYA				7,318,735.69
7 - 5	CONSTRUCTION OF WORK SHOP AT MEDAWACHCHIYA				11,453,403.47
7 - 6	CONSTRUCTION OF AREA ENGINEER'S OFFICE AT MADAWACHCHIYA				13,451,734.11
7 - 7	CONSTRUCTION OF AREA ENGINEER'S QUARTERS AT MEDAWACHCHIYA				9,635,583.12
7 - 8	CONSTRUCTION OF CARETAKER QUARTERS AT MEDAWACHCHIYA				6,295,822.56
7 - 9	CONSTRUCTION OF GUARD HOUSE AT MEDAWACHCHIYA				2,040,186.51
7 - 10	CONSTRUCTION OF PARKING SHED AT MEDAWACHCHIYA				2,260,505.34
7 - 11	SUPPLY AND INSTALLATION OF INTERNAL PIPES AT 1000M ³ GROUND RESERVOIR AND PUMP HOUSE AT MEDAWACHCHIYA	20,734.55	720,774.32	0.00	2,176,866.06
7 - 12	SUPPLY AND INSTALLATION OF YARD PIPES AT MEDAWACHCHIYA	26,063.65	906,024.54	181,440.00	1,440,768.41
7 - 13	SUPPLY AND INSTALLATION OF MECHANICAL EQUIPMENT AT MEDAWACHCHIYA	241,322.08	8,390,083.35	1,512,866.14	2,995,128.69
7 - 14	SUPPLY AND INSTALLATION OF ELECTRICAL EQUIPMENT AT MEDAWACHCHIYA	179,195.14	6,229,181.41	3,414,900.00	1,988,773.23
7 - 15	SUPPLY AND INSTALLATION OF INSTRUMENTATION EQUIPMENT AT MEDAWACHCHIYA	76,080.78	2,644,720.00	410,000.00	708,128.37
8 - 1	SITE WORK - ISSINBASSAGALA				29,945,492.00
8 - 2	CONSTRUCTION OF ELEVATED WATER TOWER CAPACITY 2000 M ³ AT ISSINBASSAGALA				123,700,697.21
	TOTAL CARRIED FORWARD TO PAGE BOQ - 1339	6,901,909.55	235,728,866.21	74,203,724.34	2,020,818,340.68

3.2.1-6

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1
CONSTRUCTION OF INTAKE FACILITY, WATER TREATMENT PLANT, WATER STORAGE STRUCTURES, MECHANICAL, ELECTRICAL AND BUILDING WORKS
CONTRACT NO. AN/JICA/STRCT/LOT A

BILL OF QUANTITIES

GRAND SUMMARY

BILL NO.	DESCRIPTION	TOTAL AMOUNT			
		Supplied from outside the Employer's Country Price		Supplied from within the Employer's Country Price	Installation & all Other Civil Works
		CIF	Port charges & taxes (except custom duties & VAT), handling, double handling, clearance, CIP Anuradhapura site, etc.	Supply & delivery to Anuradhapura site	
		US\$	SLRs.	SLRs.	SLRs.
	TOTAL BROUGHT FORWARD FROM PAGE BOQ - 1338	6,901,909.55	235,728,866.21	74,203,724.34	2,020,818,340.68
8 - 3	CONSTRUCTION OF CARETAKER QUARTERS AT ISSINBASSAGALA				6,295,822.56
8 - 4	SUPPLY AND INSTALLATION OF INTERNAL PIPES AT 2000M ³ ELEVATED WATER TOWER AT ISSINBASSAGALA	31,427.69	1,092,489.41	0.00	263,742.17
8 - 5	SUPPLY AND INSTALLATION OF YARD PIPES AT ISSINBASSAGALA	13,328.15	463,313.15	0.00	713,664.82
8 - 6	SUPPLY AND INSTALLATION OF MECHANICAL EQUIPMENT AT ISSINBESSAGALA	19,987.14	694,792.80	0.00	139,540.87
8 - 7	SUPPLY AND INSTALLATION OF ELECTRICAL EQUIPMENT AT ISSINBESSAGALA	2,858.64	99,372.00	256,000.00	54,425.31
8 - 8	SUPPLY AND INSTALLATION OF INSTRUMENTATION EQUIPMENT AT ISSINBESSAGALA	18,937.92	658,320.00	120,000.00	143,398.28
9 - 1	SITE WORK - ETHAKADA				16,025,874.00
9 - 2	CONSTRUCTION OF ELEVATED WATER TOWER CAPACITY 750 M ³ AT ETHAKADA				93,050,393.03
9 - 3	CONSTRUCTION OF RE - CHLORINATION BUILDING AT ETHAKADA				2,142,328.71
9 - 4	CONSTRUCTION OF CARETAKER QUARTERS AT ETHAKADA				6,295,822.56
9 - 5	SUPPLY AND INSTALLATION OF INTERNAL PIPES AT 750M ³ ELEVATED WATER TOWER AT ETHAKADA	20,248.60	703,881.71	2,000.00	190,762.90
9 - 6	SUPPLY AND INSTALLATION OF YARD PIPES AT ETHAKADA	20,486.45	712,150.08	228,000.00	2,285,068.86
9 - 7	SUPPLY AND INSTALLATION OF MECHANICAL EQUIPMENT AT ETHAKADA	59,536.96	2,070,907.52	1,474,866.14	836,345.14
	TOTAL CARRIED FORWARD TO PAGE BOQ - 1340	7,088,721.10	242,224,092.87	76,284,590.48	2,149,255,529.89

3.2.1-7

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1
CONSTRUCTION OF INTAKE FACILITY, WATER TREATMENT PLANT, WATER STORAGE STRUCTURES, MECHANICAL, ELECTRICAL AND BUILDING WORKS
CONTRACT NO. AN/JICA/STRCT/LOT A

BILL OF QUANTITIES

GRAND SUMMARY

BILL NO.	DESCRIPTION	TOTAL AMOUNT			
		Supplied from outside the Employer's Country Price		Supplied from within the Employer's Country Price	Installation & all Other Civil Works
		CIF	Port charges & taxes (except custom duties & VAT), handling, double handling, clearance, CIP Anuradhapura site, etc.	Supply & delivery to Anuradhapura site	
		US\$	SLRs.	SLRs.	SLRs.
	TOTAL BROUGHT FORWARD FROM PAGE BOQ - 1339	7,088,721.10	242,224,092.87	76,284,590.48	2,149,255,529.89
9 - 8	SUPPLY AND INSTALLATION OF ELECTRICAL EQUIPMENT AT ETHAKADA	47,412.73	1,648,161.34	584,100.00	506,597.59
9 - 9	SUPPLY AND INSTALLATION OF INSTRUMENTATION EQUIPMENT AT ETHAKADA	25,919.22	901,004.00	80,000.00	248,163.09
A	Total of (1 to 9-9)	7,162,053.05	244,773,258.21	76,948,690.48	2,150,010,290.56
B	Day Works				5,247,282.61
C	Total Provisional Sum				335,121,818.00
D	Total of (A - C)	7,162,053.05	244,773,258.21	76,948,690.48	1,814,888,472.56
E	Contingencies (10% of D)	716,205.31	24,477,325.82	7,694,869.05	181,488,847.26
F	Grand Total (B + C + D + E) excluding VAT Carried to Letter of Bid	7,878,258.36	269,250,584.04	84,643,559.53	2,336,746,420.44

Foreign Currency Component	US\$	7,878,258.36
Converted based on rates 28 days prior to the bid closure (1 US\$ = 133.70 SLRs.)	SLRs.	1,053,323,142.44
Local Currency Component	SLRs.	2,690,640,564.00
TOTAL ESTIMATED COST IN LOCAL CURRENCY	SLRs.	3,743,963,706.45
TOTAL ESTIMATED COST IN FOREIGN CURRENCY	US\$	28,002,720.32
VAT Amount	SLRs.	411,836,007.71

3.2.1-8

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1
CONSTRUCTION OF INTAKE FACILITY, WATER TREATMENT PLANT, WATER STORAGE STRUCTURES, MECHANICAL, ELECTRICAL AND BUILDING WORKS
CONTRACT NO. AN/JICA/STRCT/LOT A

BILL OF QUANTITIES

BILL NO. 2 : PROVISIONAL SUMS

ANURADHAPURA NWSP

ITEM No.	CESMM3 Code No.	DESCRIPTION	UNIT	QTY	RATE SLRs.	TOTAL PRICE SLRs.
		<u>CLASS A : GENERAL ITEMS</u> General obligations, site services and facilities, temporary works, testing of materials and work, provisional items and prime cost items Provisional Sums may be used in whole or in part or not at all as directed by the Engineer. <u>Other Provisional Sums</u>				
1	A 420.1	Allow for inspection, testing of materials and other required laboratory tests as directed by the Engineer.	P.Sum		500,000.00	500,000.00
2	A 420.2	Percentage adjustment to above Provisional Sum item (.....%).	%			
3	A 420.3	Allow for soil testing, geotechnical investigation where necessary as directed by the Engineer.	P.Sum		200,000.00	200,000.00
4	A 420.4	Percentage adjustment to above Provisional Sum item (.....%).	%			
5	A 420.5	Allow for making trial pits at suitable intervals for identifying utility services in path of pipe trace and to facilitate arrangements for any deviations necessary as directed by the Engineer	P.Sum		200,000.00	200,000.00
6	A 420.6	Percentage adjustment to above Provisional Sum item (.....%).	%			
7	A 420.7	Allow for diversion, support, protection or relocation of existing services or utilities as directed by the Engineer	P.Sum		500,000.00	500,000.00
8	A 420.8	Percentage adjustment to above Provisional Sum item (.....%).	%			
9	A 420.9	Allow for demolition and reinstatement of private properties as directed by the Engineer	P.Sum		500,000.00	500,000.00
10	A 420.10	Percentage adjustment to above Provisional Sum item (.....%).	%			
11	A 420.11	Allow for payment to RDA/PRDA/PS/LA for supervision and others.	P.Sum		500,000.00	500,000.00
12	A 420.12	Percentage adjustment to above Provisional Sum item (.....%).	%			
13	A 420.13	Allow for payment to other authorities for supervision and others.	P.Sum		500,000.00	500,000.00
14	A 420.14	Percentage adjustment to above Provisional Sum item (.....%).	%			
		Total of Page BOQ - 6 to Page BOQ - 9 Summary				2,900,000.00

3.2.1-9

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1
CONSTRUCTION OF INTAKE FACILITY, WATER TREATMENT PLANT, WATER STORAGE STRUCTURES, MECHANICAL, ELECTRICAL AND BUILDING WORKS
CONTRACT NO. AN/JICA/STRCT/LOT A

BILL OF QUANTITIES

BILL NO. 2 : PROVISIONAL SUMS

ANURADHAPURA NWSP

ITEM No.	CESMM3 Code No.	DESCRIPTION	UNIT	QTY	RATE SLRs.	TOTAL PRICE SLRs.
		<u>Other Provisional Sums (Contd.)</u>				
15	A 420.15	Allow sum for Technical staff/Engineer's Representative for working during holidays and after working hours as assigned by the Engineer	P.Sum		3,500,000.00	3,500,000.00
16	A 420.16	Percentage adjustment to above Provisional Sum item (.....%).	%			
17	A 420.17	Allow sum for construction of canal close to access bridge location B (up stream and down stream) with the erosion protection as directed by Engineer.	P.Sum		10,000,000.00	10,000,000.00
18	A 420.18	Percentage adjustment to above Provisional Sum item (.....%).	%			
19	A 420.19	Provision of permanent power supply to the Works from Ceylon Electricity Board including transformers, meter cubicals, etc; at WTP and all other sites.	P.Sum		40,000,000.00	40,000,000.00
20	A 420.20	Percentage adjustment to above Provisional Sum item (.....%).	%			
21	A 420.21	Provision of permanent telephone line from Sri Lanka Telecom for the Administration building, OIC Office, Area Engineer's Office and other locations as identified by NWSDB.	P.Sum		200,000.00	200,000.00
22	A 420.22	Percentage adjustment to above Provisional Sum item (.....%).	%			
23	A 420.23	Furniture and equipment for Administration Building, Area Engineer's Office, OIC Office, Stores, Workshop and Laboratory.	P.Sum		6,000,000.00	6,000,000.00
24	A 420.24	Percentage adjustment to above Provisional Sum item (.....%).	%			
25	A 420.25	Supply and installation of Automatic power factor correction system	P.Sum		3,000,000.00	3,000,000.00
26	A 420.26	Percentage adjustment to above Provisional Sum item (.....%).	%			
27	A 420.27	Allow for manufacturer's recommended spare parts for Electrical, Mechanical, Instrumentation and SCADA equipment.	P.Sum		15,000,000.00	15,000,000.00
28	A 420.28	Percentage adjustment to above Provisional Sum item (.....%).	%			
29	A 420.29	Topographic Survey, design and construction of 1km long earthen trapezoidal canal for effluent discharge. Proposed canal demension are 450mm bed with 1:1 side slopes and depth of 750mm	P.Sum		3,000,000.00	3,000,000.00
30	A 420.30	Percentage adjustment to above Provisional Sum item (.....%).	%			
		Total of Page BOQ - 7 to Page BOQ - 9 Summary				80,700,000.00

3.2-1-10

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1
CONSTRUCTION OF INTAKE FACILITY, WATER TREATMENT PLANT, WATER STORAGE STRUCTURES, MECHANICAL, ELECTRICAL AND BUILDING WORKS
CONTRACT NO. AN/JICA/STRCT/LOT A

BILL OF QUANTITIES

BILL NO. 2 : PROVISIONAL SUMS

ANURADHAPURA NWSP

ITEM No.	CESMM3 Code No.	DESCRIPTION	UNIT	QTY	RATE SLRs.	TOTAL PRICE SLRs.
		<u>Other Provisional Sums (Contd.)</u>				
31	A 420.31	Supply of 400mm wide, 4m long Aluminium ladders (2 nos.) for Water Treatment Plant	P.Sum		100,000.00	100,000.00
32	A 420.32	Percentage adjustment to above Provisional Sum item (.....%).	%			
33	A 420.33	Allow for Overseas Training of NWSDB Staff	P.Sum		4,000,000.00	4,000,000.00
34	A 420.34	Percentage adjustment to above Provisional Sum item (.....%).	%			
35	A 420.35	Allow for design, supply and installation of automated LB canal sluice gate including control panel by Department of Irrigation.	P.Sum		2,000,000.00	2,000,000.00
36	A 420.36	Percentage adjustment to above Provisional Sum item (.....%).	%			
37	A 420.37	Allow for Re-construction of existing irrigation turn out structure, chinage at 0+087	P.Sum		1,000,000.00	1,000,000.00
38	A 420.38	Percentage adjustment to above Provisional Sum item (.....%).	%			
39	A 420.39	Allow for Internal communication system	P.Sum		1,200,000.00	1,200,000.00
40	A 420.40	Percentage adjustment to above Provisional Sum item (.....%).	%			
41	A 420.41	Allow provisional sum for payment to Dispute Board(Employer's portion)	P.Sum		500,000.00	500,000.00
42	A 420.42	Allow for Price Escalation	P.Sum		145,000,000.00	145,000,000.00
43	A 420.43	Supply,Installation and vender arranged training of the respective staff of NWSDB for the following softwares(each software with 5 user license). Small Word Water Network Information System,ArcGIS,WaterCAD,Surge Analysis Software,Structural Design Software & Project Management Software.	P.Sum		82,358,901.00	82,358,901.00
44	A 420.44	Percentage adjustment to above Provisional Sum item (.....%).	%			
45	A 420.45	Capacity Building Training (Oversees)	P.Sum		15,362,917.00	15,362,917.00
46	A 420.46	Percentage adjustment to above Provisional Sum item (.....%).	%			
		Total of Page BOQ - 8 to Page BOQ - 9 Summary				251,521,818.00

3.2-1-11

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1
SUPPLY AND LAYING OF HDPE, DI TRANSMISSION MAIN, SUBMAIN AND DISTRIBUTION MAINS
CONTRACT NO. AN/JICA/PL(M&SM)/LOTB

BILL OF QUANTITIES

GRAND SUMMARY

BILL NO.	DESCRIPTION	TOTAL AMOUNT		
		FOREIGN COMPONENT	LOCAL COMPONENT	
		CIF	Port charges & taxes (other than stated in preamble to BOQ), handling, double handling, clearance, CIP Anuradhapura site, etc.	Installation & all Other Civil Works
		Yen	SLRs.	SLRs.
1	GENERAL REQUIREMENTS			81,157,490.00
2	PROVISIONAL SUMS			147,325,000.00
3	SUPPLY AND LAYING OF TRANSMISSION MAINS & SUB MAINS	819,819,598.44	240,479,369.58	788,105,885.45
4	SUPPLY AND LAYING OF DISTRIBUTION MAINS EAST RAMBEWA ZONE	3,653,857.29	1,082,253.01	16,989,938.43
5	SUPPLY AND LAYING OF DISTRIBUTION MAINS ETHAKADA ZONE	54,974,793.39	16,178,078.39	154,670,553.44
6	SUPPLY AND LAYING OF DISTRIBUTION MAINS RAMBEWA ZONE	42,284,748.95	12,384,236.24	73,887,494.87
7	SUPPLY AND LAYING OF DISTRIBUTION MAINS ISSINBESSAGALA ZONE	203,066,392.80	59,995,909.09	431,132,397.26
A	Total of (1 to 7)	1,123,799,390.87	330,119,846.31	1,693,268,759.44
B	Total Provisional Sum (Except Percentage Adjustment)			147,325,000.00
C	Total of (A - B)	1,123,799,390.87	330,119,846.31	1,545,943,759.44
D	Contingencies (10% of C)	112,379,939.09	33,011,984.63	154,594,375.94
E	Grand Total (B + C + D) excluding VAT Carried to Letter of Price Bid	1,236,179,329.96	363,131,830.94	1,847,863,135.39

Foreign Currency Component	Yen	1,236,179,329.96	1,123,799,390.87
Converted based on rates 28 days prior to the bid closure (1 Yen = 1.139 SLRs.)	SLRs.	1,408,008,256.82	
Local Currency Component	SLRs.	2,210,994,966.33	2,023,388,605.76
TOTAL ESTIMATED COST IN LOCAL CURRENCY	SLRs.	3,619,003,223.15	
TOTAL ESTIMATED COST IN FOREIGN CURRENCY	Yen	3,177,351,381.17	
VAT Amount	SLRs.	398,090,354.55	

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1
 SUPPLY AND LAYING OF HDPE, DI TRANSMISSION MAIN, SUBMAIN AND DISTRIBUTION MAINS
 CONTRACT NO. AN/JICA/PL(M&SM)/LOTB

BILL OF QUANTITIES

BILL NO. 2 : PROVISIONAL SUMS

ANURADHAPURA NWSP

ITEM No.	CESMM3 Code No.	DESCRIPTION	UNIT	QTY	RATE SLRs.	TOTAL PRICE SLRs.
		<u>CLASS A : GENERAL ITEMS</u> General obligations, site services and facilities, temporary works, testing of materials and work, provisional items and prime cost items Provisional Sums may be used in whole or in part or not at all as directed by the Engineer.				
		<u>Contractual Requirements</u>				
2.1	A 190.1	For payment of actual charges incurred for all insurance policies taken under the contract as per clause 18 of GCC and PCC	P.Sum		24,000,000.00	24,000,000.00
2.2	A 190.2	Percentage adjustment to above Provisional Sum item (.....%).	%			
2.3	A 411	<u>Daywork</u> Daywork labour	P.Sum		1,000,000.00	1,000,000.00
2.4	A 412	Percentage adjustment to provisional sum for daywork labour (.....%).	%			
2.5	A 413	Daywork Materials	P.Sum		1,000,000.00	1,000,000.00
2.6	A 414	Percentage adjustment to provisional sum for daywork Materials (.....%).	%			
2.7	A 415	Daywork Plants	P.Sum		1,000,000.00	1,000,000.00
2.8	A 416	Percentage adjustment to provisional sum for daywork Plants (.....%).	%			
		<u>Other Provisional Sums</u>				
2.9	A 420.1	Allow for inspection, testing of materials and other required laboratory tests as directed by the Engineer.	P.Sum		500,000.00	500,000.00
2.10	A 420.2	Allow for soil testing, geotechnical investigation where necessary as directed by the Engineer.	P.Sum		200,000.00	200,000.00
2.11	A 420.3	Allow for making trial pits at suitable intervals for identifying utility services in path of pipe trace and to facilitate arrangements for any deviations necessary as directed by the Engineer	P.Sum		500,000.00	500,000.00
2.12	A 420.4	Allow for diversion, support, protection or relocation of existing services or utilities as directed by the Engineer	P.Sum		4,000,000.00	4,000,000.00
Total of Page BOQ - 5 to Page BOQ - 7 Summary						32,200,000.00

3.2-1-13

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1
SUPPLY AND LAYING OF HDPE, DI TRANSMISSION MAIN, SUBMAIN AND DISTRIBUTION MAINS
CONTRACT NO. AN/JICA/PL(M&SM)/LOTB

BILL OF QUANTITIES

BILL NO. 2 : PROVISIONAL SUMS

ANURADHAPURA NWSP

ITEM No.	CESMM3 Code No.	DESCRIPTION	UNIT	QTY	RATE SLRs.	TOTAL PRICE SLRs.
		<u>Other Provisional Sums (Contd.)</u>				
2.13	A 420.5	Allow for demolition and reinstatement of private properties as directed by the Engineer	P.Sum		2,000,000.00	2,000,000.00
2.14	A 420.6	Allow for payment to RDA/PRDA/PS/LA for supervision and others.	P.Sum		2,400,000.00	2,400,000.00
2.15	A 420.7	Allow for payment to Sri Lanka Railway for work related to the crossings of the railway tracks	P.Sum		500,000.00	500,000.00
2.16	A 420.8	Allow for payment to other authorities for supervision and others.	P.Sum		500,000.00	500,000.00
2.17	A 420.9	Allow for conducting the HIV/AIDS, prevention programme as per the Clause 6.7 of General Conditions of Contract and maintain the health and hygienic condition at site through out the Contract period.	P.Sum		1,000,000.00	1,000,000.00
2.18	A 420.10	Allow sum for Technical staff/Engineer's Representative for working during holidays and after working hours as assigned by the Engineer	P.Sum		1,500,000.00	1,500,000.00
2.19	A 420.11	Allow sum for supply and installation of all necessary pipes, fittings, specials and ancillaries in railway crossings (8 nos.) using trenchless technology as specified and as approved by the Sri Lanka Railway & Engineer through a Nominated Sub-Contractor.	P.Sum		18,000,000.00	18,000,000.00
2.20	A 420.12	Allow for removing and relocating of existing electrical posts as per the specifications given by relevant government authority.	P.Sum		2,800,000.00	2,800,000.00
2.21	A 420.13	Allow for removing and relocating of existing telephone posts as per the specifications given by relevant government authority.	P.Sum		2,800,000.00	2,800,000.00
2.22	A 420.14	Allow for pipeline flushing arrangement at 01 location of East Rambewa zone & 4 locations of Issinbessagala zone.(Reffer drawings no ANP1/LB/STD/031,ANP1/LB/DM/510/G/003a & ANP1/LB/DM/530/G/002a	P.Sum		3,125,000.00	3,125,000.00
2.23	A 420.16	Percentage adjustment to above Provisional Sum items 2.9, 2.10, 2.11, 2.12, 2.13, 2.14, 2.15, 2.16, 2.17, 2.18, 2.19, 2.20, 2.21 ,& 2.22 (.....%)	%			
2.24	A 420.17	Allow provisional sum for payment to Dispute Board(50% only)	PS		500,000.00	500,000.00
2.25	A 420.18	Allow for Price Escalation	PS		80,000,000.00	80,000,000.00
Total of Page BOQ - 6 to Page BOQ - 7 Summary						115,125,000.00

3.2-1 -14

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1
TENDER FOR LAYING OF uPVC PIPES, FITTINGS AND SPECIALS AND SUPPLY AND LAYING OF DI AND GI PIPES, FITTINGS AND SPECIALS IN ISSINBESSAGALA ZONE.
CONTRACT NO. AN/JICA/PL(DSS)/LOT C1

BILL OF QUANTITIES

GRAND SUMMARY

BILL NO.	DESCRIPTION	TOTAL AMOUNT		
		FOREIGN COMPONENT	LOCAL COMPONENT	
		CIF	Port charges & taxes (other than stated in preamble to BOQ), handling, double handling, clearance, CIP Anuradhapura site, etc.	Installation & all Other Civil Works
		Yen	SLRs.	SLRs.
1	GENERAL REQUIREMENTS			35,396,000.00
2	PROVISIONAL SUMS			85,600,000.00
3	SUPPLY AND LAYING OF DISTRIBUTION MAINS ISSINBESSAGALA ZONE	14,280,724.00	3,520,686.00	248,016,167.00
4	SUPPLY AND DELIVERY OF GI PIPES AND FITTINGS (EAST RAMBEWA, RAMBEWA, ETHAKADA & ISSINBESSAGALA ZONES FOR LOT C2)	3,222,752.60	170,644.75	
5	SUPPLY AND DELIVERY OF DI VALVES AND MAN HOLE COVERS (EAST RAMBEWA, RAMBEWA, ETHAKADA & ISSINBESSAGALA ZONES FOR LOT C2)	4,441,581.68	235,181.75	
A	Total of (1 to 5)	21,945,058.28	3,926,512.50	369,012,167.00
B	Total Provisional Sum			85,600,000.00
C	Total of (A - B)	21,945,058.28	3,926,512.50	283,412,167.00
D	Contingencies (10% of C)	2,194,505.83	392,651.25	28,341,216.70
E	Grand Total (B + C + D) excluding VAT Carried to Letter of Price Bid	24,139,564.11	4,319,163.75	397,353,383.70

Foreign Currency Component	Yen	24,139,564.11	21,945,058.28
Converted based on rates 28 days prior to the bid closure (1 Yen = 1.059 SLRs.)	SLRs.	25,563,798.39	
Local Currency Component	SLRs.	401,672,547.45	372,938,679.50
TOTAL ESTIMATED COST IN LOCAL CURRENCY	SLRs.	427,236,345.84	
TOTAL ESTIMATED COST IN FOREIGN CURRENCY	Yen	403,433,754.33	
VAT Amount	SLRs.	46,995,998.04	

3.2-1-15

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1

TENDER FOR LAYING OF uPVC PIPES, FITTINGS AND SPECIALS AND SUPPLY AND LAYING OF DI AND GI PIPES, FITTINGS AND SPECIALS IN ISSINBESSAGALA ZONE.

CONTRACT NO. AN/JICA/PL(DSS)/LOT C1

BILL OF QUANTITIES

BILL NO. 2 : PROVISIONAL SUMS

ANURADHAPURA NWSP

ITEM No.	CESMM3 Code No.	DESCRIPTION	UNIT	QTY	RATE SLRs.	TOTAL PRICE SLRs.
		<u>CLASS A : GENERAL ITEMS</u> General obligations, site services and facilities, temporary works, testing of materials and work, provisional items and prime cost items Provisional Sums may be used in whole or in part or not at all as directed by the Engineer. <u>Contractual Requirements</u>				
2.1	A 190.1	For payment of actual charges incurred for all insurance policies taken under the contract as per clause 18 of GCC and PCC	P.Sum		5,000,000.00	5,000,000.00
2.2	A 190.2	Percentage adjustment to above Provisional Sum item (.....%).	%			
		<u>Daywork</u>				
2.3	A 411	Daywork labour	P.Sum		700,000.00	700,000.00
2.4	A 412	Percentage adjustment to provisional sum for daywork labour (.....%).	%			
2.5	A 413	Daywork Materials	P.Sum		700,000.00	700,000.00
2.6	A 414	Percentage adjustment to provisional sum for daywork Materials (.....%).	%			
2.7	A 415	Daywork Plants	P.Sum		700,000.00	700,000.00
2.8	A 416	Percentage adjustment to provisional sum for daywork Plants (.....%).	%			
		<u>Other Provisional Sums</u>				
2.9	A 420.1	Allow for inspection, testing of materials and other required laboratory tests as directed by the Engineer.	P.Sum		500,000.00	500,000.00
2.10	A 420.2	Percentage adjustment (.....%).				
2.11	A 420.3	Allow for soil testing, geotechnical investigation where necessary as directed by the Engineer.	P.Sum		700,000.00	700,000.00
2.12	A 420.4	Percentage adjustment (.....%).				
2.13	A 420.5	Allow for making trial pits at suitable intervals for identifying utility services in path of pipe trace and to facilitate arrangements for any deviations necessary as directed by the Engineer	P.Sum		450,000.00	450,000.00
2.14	A 420.6	Percentage adjustment (.....%).				
Total of Page BOQ - 4 to Page BOQ - 7 Summary						8,750,000.00

3.2-1 -16

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1

TENDER FOR LAYING OF uPVC PIPES, FITTINGS AND SPECIALS AND SUPPLY AND LAYING OF DI AND GI PIPES, FITTINGS AND SPECIALS IN ISSINBESSAGALA ZONE.

CONTRACT NO. AN/JICA/PL(DSS)/LOT C1

BILL OF QUANTITIES

BILL NO. 2 : PROVISIONAL SUMS

ANURADHAPURA NWSP

ITEM No.	CESMM3 Code No.	DESCRIPTION	UNIT	QTY	RATE SLRs.	TOTAL PRICE SLRs.
		<u>Other Provisional Sums (Contd.)</u>				
2.15	A 420.7	Allow for diversion, support, protection or relocation of existing services or utilities as directed by the Engineer	P.Sum		200,000.00	200,000.00
2.16	A 420.8	Percentage adjustment (.....%).				
2.17	A 420.9	Allow for demolition and reinstatement of private properties as directed by the Engineer	P.Sum		900,000.00	900,000.00
2.18	A 420.10	Percentage adjustment (.....%).	%			
2.19	A 420.11	Allow for payment to RDA/PRDA/PS/LA for supervision and others.	P.Sum		900,000.00	900,000.00
2.20	A 420.12	Percentage adjustment (.....%).	%			
2.21	A 420.13	Allow for payment to other authorities for supervision and others.	P.Sum		200,000.00	200,000.00
2.22	A 420.14	Percentage adjustment (.....%).	%			
2.23	A 420.15	Allow for conducting the HIV/AIDS, prevention programme as per the Clause 6.6 of Contract Data and maintain the health and hygienic condition at site through out the Contract period.	P.Sum		500,000.00	500,000.00
2.24	A 420.16	Percentage adjustment (.....%).	%			
2.25	A 420.17	Allow sum for the Staff of Engineer's Representative for working during holidays and after working hours as assigned by the Engineer	P.Sum		900,000.00	900,000.00
2.26	A 420.18	Percentage adjustment (.....%).	%			
2.27	A 420.19	Allow for removing and relocating of existing electrical posts as per the specifications given by relevant government authority.	P.Sum		900,000.00	900,000.00
2.28	A 420.20	Percentage adjustment (.....%).	%			
2.29	A 420.21	Allow for removing and relocating of existing telephone posts as per the specifications given by relevant government authority.	P.Sum		900,000.00	900,000.00
2.30	A 420.22	Percentage adjustment (.....%).	%			
2.31	A 420.23	Allow for pipeline flushing arrangement at 12 locations.(Reffer drawings no ANP1/LC/DM/510/GA/001 & ANP1/LC/STD/018)	P.Sum		7,200,000.00	7,200,000.00
Total of Page BOQ - 5 to Page BOQ - 7 Summary						12,600,000.00

3.2-1-17

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1

TENDER FOR LAYING OF uPVC PIPES, FITTINGS AND SPECIALS AND SUPPLY AND LAYING OF DI AND GI PIPES, FITTINGS AND SPECIALS IN ISSINBESSAGALA ZONE.

CONTRACT NO. AN/JICA/PL(DSS)/LOT C1

BILL OF QUANTITIES

BILL NO. 2 : PROVISIONAL SUMS

ANURADHAPURA NWSP

ITEM No.	CESMM3 Code No.	DESCRIPTION	UNIT	QTY	RATE SLRs.	TOTAL PRICE SLRs.
2.32	A 420.24	Percentage adjustment (.....%).	%			
2.33	A 420.25	Allow sum for Dewatering	P.Sum		2,000,000.00	2,000,000.00
2.34	A 420.26	Percentage adjustment (.....%).	%			
2.35	A 420.27	Allow sum for Shoring	p.sum		36,000,000.00	36,000,000.00
2.36	A 420.28	Percentage adjustment (.....%).	%			
2.37	A 420.29	Allow provisional sum for payment to Dispute Board	PS		500,000.00	500,000.00
2.38	A 420.31	Allow for Price Escalation	PS		25,000,000.00	25,000,000.00
2.39	A 420.32	Supply and delivery of a portable engine driven pump with minimum duty point of 10m ³ /hr at 40m head.(This pump will be used for flushing of dead ends of the distribution pipe net work of Issenbessagala,Ethakada,Rambewa & East Rambewa zones)	p.sum		750,000.00	750,000.00
2.40	A 420.33	Percentage adjustment (.....%).	%			
Total of Page BOQ - 6 to Page BOQ - 7 Summary						64,250,000.00

3.2-1-18

**TENDER FOR SUPPLY AND DELIVERY OF uPVC PIPES, FITTINGS AND SPECIALS FOR
ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1
CONTRACT NO. AN/JICA/SUP(PIPES)/LOT C2
GRAND SUMMARY**

BOQ BILL NO.	DESCRIPTION	TOTAL AMOUNT(Rs)
01	SUPPLY AND DELIVERY OF uPVC PIPES, FITTINGS AND SPECIALS FOR EAST RAMBEWA, RAMBEWA, ETHAKADA & ISSINBASSAGALA ZONES OF LOT C2	23,991,318.00
02	SUPPLY AND DELIVERY OF uPVC PIPES, FITTINGS AND SPECIALS FOR EAST RAMBEWA ZONE OF LOT C3	6,574,225.00
03	SUPPLY AND DELIVERY OF uPVC PIPES, FITTINGS AND SPECIALS FOR ETHAKADA ZONE OF LOT C3	26,813,481.00
04	SUPPLY AND DELIVERY OF uPVC PIPES, FITTINGS AND SPECIALS FOR RAMBEWA ZONE OF LOT C3	20,524,451.00
05	SUPPLY AND DELIVERY OF uPVC PIPES, FITTINGS AND SPECIALS FOR ISSINBASSAGALA ZONE OF LOT C1	47,308,067.00
A	SubTotal of (1 to 5)	125,211,542.00
B	Less Discount (if any)	
C	Grand Total (A -B) excluding VAT Carried to Letter of Price Bid	125,211,542.00

TOTAL ESTIMATED COST IN LOCAL CURRENCY (SLRs.) 125,211,542

VAT Amount (11%) IN LOCAL CURRENCY (SLRs.) 13,773,270

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1

TENDER FOR LAYING OF uPVC PIPES, FITTINGS AND SPECIALS AND SUPPLY AND LAYING OF DI AND GI PIPES, FITTINGS AND SPECIALS IN RAMBEWA, EAST RAMBEWA & ETHAKADA ZONES.

CONTRACT NO. AN/JICA/PL(DSS)/LOT C3

BILL OF QUANTITIES

GRAND SUMMARY

BILL NO.	DESCRIPTION	TOTAL AMOUNT		
		FOREIGN COMPONENT	LOCAL COMPONENT	
		CIF	Port charges & taxes (other than stated in preamble to BOQ), handling, double handling, clearance, CIP Anuradhapura site, etc.	Installation & all Other Civil Works
		Yen	SLRs.	SLRs.
1	GENERAL REQUIREMENTS			35,436,000.00
2	PROVISIONAL SUMS			92,200,000.00
3	SUPPLY AND LAYING OF DISTRIBUTION MAINS EAST RAMBEWA ZONE	2,695,601.54	632,913.07	41,605,005.89
4	SUPPLY AND LAYING OF DISTRIBUTION MAINS ETHAKADA ZONE	9,462,338.33	2,248,032.66	151,035,211.29
5	SUPPLY AND LAYING OF DISTRIBUTION MAINS RAMBEWA ZONE	6,681,239.78	1,553,774.28	107,362,053.39
A	Total of (1 to 6)	18,839,179.65	4,434,720.01	427,638,270.57
B	Total Provisional Sum			92,200,000.00
C	Total of (A - B)	18,839,179.65	4,434,720.01	335,438,270.57
D	Contingencies (10% of C)	1,883,917.96	443,472.00	33,543,827.06
E	Grand Total (B + C + D) excluding VAT Carried to Letter of Price Bid	20,723,097.61	4,878,192.01	461,182,097.63

Foreign Currency Component	Yen	20,723,097.61
Converted based on rates 28 days prior to the bid closure (1 Yen = 1.059 SLRs.)	SLRs.	21,945,760.37
Local Currency Component	SLRs.	466,060,289.64
TOTAL ESTIMATED COST IN LOCAL CURRENCY	SLRs.	488,006,050.01
TOTAL ESTIMATED COST IN FOREIGN CURRENCY	Yen	460,817,799.82
VAT Amount	SLRs.	53,680,665.50

3.2-1-20

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1

TENDER FOR LAYING OF uPVC PIPES, FITTINGS AND SPECIALS AND SUPPLY AND LAYING OF DI AND GI PIPES, FITTINGS AND SPECIALS IN RAMBEWA, EAST RAMBEWA & ETHAKADA ZONES.

CONTRACT NO. AN/JICA/PL(DSS)/LOT C3

BILL OF QUANTITIES

BILL NO. 2 : PROVISIONAL SUMS

ANURADHAPURA NWSP

ITEM No.	CESMM3 Code No.	DESCRIPTION	UNIT	QTY	RATE SLRs.	TOTAL PRICE SLRs.
		<u>CLASS A : GENERAL ITEMS</u>				
		General obligations, site services and facilities, temporary works, testing of materials and work, provisional items and prime cost items Provisional Sums may be used in whole or in part or not at all as directed by the Engineer.				
		<u>Contractual Requirements</u>				
2.1	A 190.1	For payment of actual charges incurred for all insurance policies taken under the contract as per clause 18 of GCC and PCC	P.Sum		6,000,000.00	6,000,000.00
2.2	A 190.2	Percentage adjustment to above Provisional Sum item (.....%).	%			
2.3	A 411	<u>Daywork</u> Daywork labour	P.Sum		800,000.00	800,000.00
2.4	A 412	Percentage adjustment to provisional sum for daywork labour (.....%).	%			
2.5	A 413	Daywork Materials	P.Sum		800,000.00	800,000.00
2.6	A 414	Percentage adjustment to provisional sum for daywork Materials (.....%).	%			
2.7	A 415	Daywork Plants	P.Sum		800,000.00	800,000.00
2.8	A 416	Percentage adjustment to provisional sum for daywork Plants (.....%).	%			
		<u>Other Provisional Sums</u>				
2.9	A 420.1	Allow for inspection, testing of materials and other required laboratory tests as directed by the Engineer.	P.Sum		500,000.00	500,000.00
2.10	A 420.2	Percentage adjustment (.....%).				
2.11	A 420.3	Allow for soil testing, geotechnical investigation where necessary as directed by the Engineer.	P.Sum		800,000.00	800,000.00
2.12	A 420.4	Percentage adjustment (.....%).				
2.13	A 420.5	Allow for making trial pits at suitable intervals for identifying utility services in path of pipe trace and to facilitate arrangements for any deviations necessary as directed by the Engineer	P.Sum		500,000.00	500,000.00
2.14	A 420.6	Percentage adjustment (.....%).				
		Total of Page BOQ - 4 to Page BOQ - 7 Summary				10,200,000.00

3.2-1-21

ANURADHAPURA NORTH WATER SUPPLY PROJECT - PHASE 1

TENDER FOR LAYING OF uPVC PIPES, FITTINGS AND SPECIALS AND SUPPLY AND LAYING OF DI AND GI PIPES, FITTINGS AND SPECIALS IN RAMBEWA, EAST RAMBEWA & ETHAKADA ZONES.

CONTRACT NO. AN/JICA/PL(DSS)/LOT C3

BILL OF QUANTITIES

BILL NO. 2 : PROVISIONAL SUMS

ANURADHAPURA NWSP

ITEM No.	CESMM3 Code No.	DESCRIPTION	UNIT	QTY	RATE SLRs.	TOTAL PRICE SLRs.
		<u>Other Provisional Sums (Contd.)</u>				
2.15	A 420.7	Allow for diversion, support, protection or relocation of existing services or utilities as directed by the Engineer	P.Sum		300,000.00	300,000.00
2.16	A 420.8	Percentage adjustment (.....%).				
2.17	A 420.9	Allow for demolition and reinstatement of private properties as directed by the Engineer	P.Sum		1,000,000.00	1,000,000.00
2.18	A 420.10	Percentage adjustment (.....%).	%			
2.19	A 420.11	Allow for payment to RDA/PRDA/PS/LA for supervision and others.	P.Sum		1,000,000.00	1,000,000.00
2.20	A 420.12	Percentage adjustment (.....%).	%			
2.21	A 420.13	Allow for payment to other authorities for supervision and others.	P.Sum		200,000.00	200,000.00
2.22	A 420.14	Percentage adjustment (.....%).	%			
2.23	A 420.15	Allow for conducting the HIV/AIDS, prevention programme as per the Clause 6.6 of Contract Data and maintain the health and hygienic condition at site through out the Contract period.	P.Sum		500,000.00	500,000.00
2.24	A 420.16	Percentage adjustment (.....%).	%			
2.25	A 420.17	Allow sum for the Staff of Engineer's Representative for working during holidays and after working hours as assigned by the Engineer	P.Sum		1,000,000.00	1,000,000.00
2.26	A 420.18	Percentage adjustment (.....%).	%			
2.27	A 420.19	Allow for removing and relocating of existing electrical posts as per the specifications given by relevant government authority.	P.Sum		1,000,000.00	1,000,000.00
2.28	A 420.20	Percentage adjustment (.....%).	%			
2.29	A 420.21	Allow for removing and relocating of existing telephone posts as per the specifications given by relevant government authority.	P.Sum		1,000,000.00	1,000,000.00
2.30	A 420.22	Percentage adjustment (.....%).	%			
2.31	A 420.23	Allow for pipeline flushing arrangement at 3 locations of Rambewa zone, 4 locations of Ethakada zone & 3 locations of East Rambewa zone. (Reffer drawings no ANP1/LC/DM/500/GA/001, ANP1/LC/DM/520/GA/001, ANP1/LC/DM/530/GA/001 & ANP1/LC/STD/018)	P.Sum		6,000,000.00	6,000,000.00
		Total of Page BOQ - 5 to Page BOQ - 7 Summary				12,000,000.00

3.2-1-22

National Water Supply & Drainage Board



**RATES
2011**

**PLANNING & DESIGNS DIVISION
QUANTITY SURVEYING SECTION**

SUPPLY OF PVC PIPES

Table A-PVC/1

SUPPLY OF TYPE 600 PVC PIPES

1	2	3	4
Diameter (mm)	Supply Rate (Rs:/m)	Supply Rate Transmission Main (Rs: /m)	Supply Rate Distribution System (Rs: /m)
32	42.00	50.00	57.00
40	65.00	78.00	88.00
50	89.00	107.00	120.00
63	141.00	169.00	190.00
75	282.00	338.00	381.00
R.R.J. 90	380.00	456.00	513.00
S.C.J. 90	374.00	449.00	505.00
R.R.J. 110	556.00	667.00	751.00
160	998.00	1198.00	1347.00
225	1954.00	2345.00	2638.00
280	3080.00	3696.00	4158.00
315	3960.00	4752.00	5346.00

Table A-PVC/2

SUPPLY OF TYPE 1000 PVC PIPES

1	2	3	4
Diameter (mm)	Supply Rate (Rs:/m)	Supply Rate Transmission Main (Rs: /m)	Supply Rate Distribution System (Rs: /m)
20	27.00	32.00	36.00
25	42.00	50.00	57.00
32	62.00	74.00	84.00
40	91.00	109.00	123.00
50	132.00	158.00	178.00
63	221.00	265.00	298.00
75	458.00	550.00	618.00
R.R.J. 90	581.00	697.00	784.00
S.C.J. 90	577.00	692.00	779.00
R.R.J. 110	873.00	1048.00	1179.00
160	1577.00	1892.00	2129.00
225	3074.00	3689.00	4150.00
280	4738.00	5686.00	6396.00
315	6200.00	7440.00	8370.00

Note :

- 1.0 Supply rate includes cost of rubber rings and lubricants.
- 2.0 Supplier's O/H&P included in the supply rate.
- 3.0 To obtain supply rate for transmission main, 20% was added to basic supply rate to accommodate cost of fittings, specials, valves, culvert crossings and valve chambers etc. that are incorporated in the Transmission System.
- 4.0 To obtain supply rate for distribution main, 35% was added to basic supply rate to accommodate cost of fittings, specials, valves, culvert crossings and valve chambers etc. and specials that are incorporated in the Distribution System.
- 5.0 Supply and laying contracts below 110mm dia. pipes 10% is to be added only for supply rate.

Source:

- 6.0 Tender Prices (NWS&DB)- 2010 3rd and 4th quarters.
- 7.0 Supplier's Price List.

PVC LAYING

Table A-PVC/3

Diameter mm	Basic Excavation Cost Max. depth n.e. 1.5m				Earth Work Support Rs./m	Allow for Dewatering/ Disposal of Water Rs./m	Laying & Plumbing Rs./m	
	Firm Sand		Soft or sandy soil					Gravel Rs./m
	Rs./m	Rs./m	Rs./m	Rs./m				
63	84.00	106.00	108.00	757.00	13.00	51.00		
90	154.00	193.00	197.00	832.00	24.00	51.00		
110	168.00	208.00	215.00	908.00	26.00	55.00		
160	222.00	276.00	286.00	908.00	35.00	61.00		
225	240.00	299.00	310.00	983.00	38.00	72.00		
280	240.00	299.00	310.00	983.00	38.00	107.00		
315	311.00	388.00	402.00	1,021.00	49.00	139.00		

Note :

1. Add for disposal of water and earth work support to basic laying cost if applicable.
2. Basic excavation cost includes excavation, preparation of bottom, backfilling, rammimg (consider 95% compaction), disposal of excavated excess material and assuming earth available at site for backfilling.
3. Assuming earth available at site for backfilling. If imported soil is required an allowance should be made. (Calculated from basic price list)
4. Laying contractor's O/H & P not included.
5. Pressure testing, cleaning and disinfection included in laying cost. (Ref. Table B - PVC/2)
6. 30% is to be added to Laying rate for laying of specials, fittings, valves, culvert crossings and valve chambers etc.
7. To obtain laying rate in ordinary soil under high ways 40% is to be added to total cost of Excavation and laying (to remove asphalts coat and other base courses)
8. Traffic arrangements , dust controlling , maintenance of roads , temporary road reinstatement and other Preliminaries are not included

Source :

1. Based on work study and established data from published books.

Supply and Laying of HDPE Pipes (PE 100 - SDR 17 PN10)

Asian Countries (Without Japan and Malaysia)

1	2	3	4	5	6	7	8	9	10
Pipe Dia. mm	CIF Value Rs./m	Transmission main				Distribution main			
		CIF value for Specials Rs./m	(Col.2+3) Total CIFCost Rs./m	Transport & Clearing Rs./m	Custom Duty Rs./m	CIF value for Specials Rs./m	(Col.2+7) Total CIFCost Rs./m	Transport & Clearing Rs./m	Custom Duty Rs./m
90	274.00	69.00	343.00	35.00	158.00	96.00	370.00	37.00	171.00
110	333.00	84.00	417.00	42.00	192.00	117.00	450.00	45.00	207.00
160	637.00	160.00	797.00	80.00	367.00	223.00	860.00	86.00	396.00
180	1,053.00	264.00	1,317.00	132.00	606.00	369.00	1,422.00	143.00	655.00
225	1,274.00	319.00	1,593.00	160.00	733.00	446.00	1,720.00	172.00	792.00
250	1,717.00	430.00	2,147.00	215.00	988.00	601.00	2,318.00	232.00	1,067.00
280	1,824.00	456.00	2,280.00	228.00	1,049.00	639.00	2,463.00	247.00	1,133.00
315	2,928.00	732.00	3,660.00	366.00	1,684.00	1,025.00	3,953.00	396.00	1,819.00
355	3,519.00	880.00	4,399.00	440.00	2,024.00	1,232.00	4,751.00	476.00	2,186.00
400	4,944.00	1,236.00	6,180.00	618.00	2,843.00	1,731.00	6,675.00	668.00	3,071.00
450	6,000.00	1,500.00	7,500.00	750.00	3,450.00	2,100.00	8,100.00	810.00	3,726.00
500	8,640.00	2,160.00	10,800.00	1,080.00	4,968.00	3,024.00	11,664.00	1,167.00	5,366.00
560	11,520.00	2,880.00	14,400.00	1,440.00	6,624.00	4,032.00	15,552.00	1,556.00	7,154.00
630	14,400.00	3,600.00	18,000.00	1,800.00	8,280.00	5,040.00	19,440.00	1,944.00	8,943.00

Note :

- Column (4) includes additional 25 % of CIF value for transmission mains and Column (8) includes additional 30% of CIF value for distribution mains to cover the costs of fittings, specials, valves, culvert crossings and valve chambers etc.
- Column (5 and 9) 10% of total CIF cost is added for clearing & transporting (up to site stores)
- Custom Duty is taken as 46.00% of CIF value.
- Supplier's O/H & P are included in the CIF value.

Source :

Based on supplier's rates, tender prices of 2010 and forecast to 2011

Laying of HDPE Pipes (PE 100 - SDR 17 PN10)

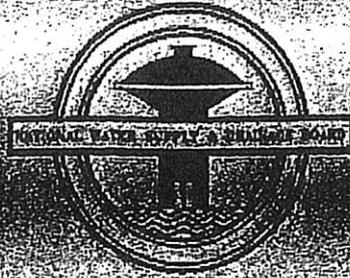
1	2	3		4		5		6		7	8	9
Pipe Dia. mm	Basic Laying Cost	Transmission main		Distribution main		Excavation Cost (Ordinary Soil) Rs./m		EWS Cost Rs./m	Allow for Dewatering/Disposal of Water Rs./m			
		Laying Cost for Specials Rs./m	Total Laying Cost	Laying Cost for Specials Rs./m	Total Laying Cost							
90	138.00	42.00	180.00	56.00	194.00	245.00	842.00	15.00				
110	140.00	42.00	182.00	56.00	196.00	255.00	857.00	22.00				
160	145.00	44.00	189.00	58.00	203.00	263.00	895.00	26.00				
180	174.00	53.00	227.00	70.00	244.00	275.00	911.00	26.00				
225	210.00	63.00	273.00	84.00	294.00	310.00	949.00	30.00				
250	227.00	69.00	296.00	91.00	318.00	345.00	964.00	30.00				
280	280.00	84.00	364.00	112.00	392.00	410.00	987.00	37.00				
315	325.00	98.00	423.00	130.00	455.00	460.00	1,499.00	57.00				
355	370.00	111.00	481.00	148.00	518.00	520.00	1,499.00	66.00				
400	430.00	129.00	559.00	172.00	602.00	570.00	1,499.00	66.00				
450	475.00	143.00	618.00	190.00	665.00	620.00	1,499.00	66.00				
500	652.00	196.00	848.00	261.00	913.00	672.00	1,499.00	71.00				
560	668.00	201.00	869.00	268.00	936.00	720.00	1,499.00	85.00				
630	673.00	202.00	875.00	270.00	943.00	922.00	1,499.00	85.00				

Note:

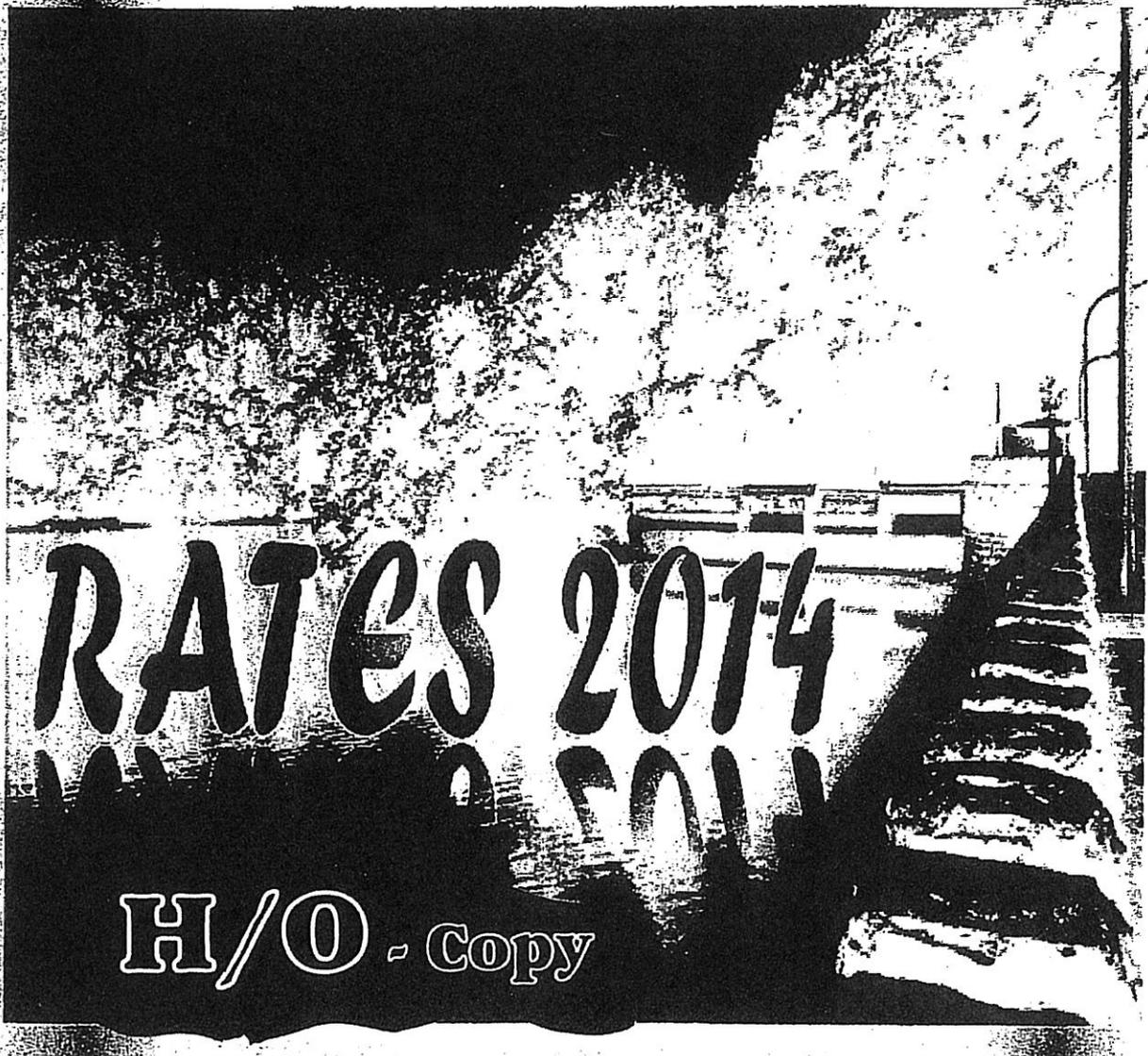
- Column (2) Basic laying cost includes placing, jointing, transporting from site stores, cleaning, disinfection, pressure testing and cost of polythene sleeving.
- Column (4) includes additional 30% of basic laying cost for transmission mains and Column (6) includes additional 40% of basic laying cost for distribution mains to cover the cost of specials and other all costs, such as culvert crossings, bridge crossings, valve chambers, valves, thrust blocks, pipe supports etc.
- Column (7) Basic excavation cost includes excavation, preparation of bottom, backfilling ramming (consider 95% compaction) and assuming earth available at site for backfilling.
- Contractor's OH and P not included.
- Rock excavation, traffic management, dust controlling and maintenance of roads. Preliminaries are not to basic cost.
- To obtain additional 40% to the total cost of laying and excavation under ordinary soil for highways. (To remove asphalt coat with base courses and other relevant additional costs)

Source:

Based on work study and established data from published books. (Refer Annex 7)



National Water Supply & Drainage Board



PLANNING & DESIGNS DIVISION
QUANTITY SURVEYING SECTION

SUPPLY OF PVC PIPES

SUPPLY OF TYPE 600 PVC PIPES

Table A – PVC/1

1	2	3	4
Diameter (mm)	Supply Rate (Rs:/m)	Supply Rate Transmission Main (Rs:/m)	Supply Rate Distribution System (Rs: /m)
32	38.00	46.00	52.00
40	52.00	63.00	71.00
50	81.00	98.00	110.00
63	129.00	155.00	175.00
75	193.00	232.00	261.00
90 (RRJ)	257.00	309.00	347.00
110 (RRJ)	439.00	527.00	593.00
160	776.00	932.00	1,048.00
225	1,525.00	1,830.00	2,059.00
280	2,387.00	2,865.00	3,223.00
315	4,013.00	4,816.00	5,418.00

SUPPLY OF TYPE 1000 PVC PIPES

Table A – PVC/2

1	2	3	4
Diameter (mm)	Supply Rate (Rs:/m)	Supply Rate Transmission Main (Rs:/m)	Supply Rate Distribution System (Rs: /m)
20	26.00	32.00	36.00
25	39.00	47.00	53.00
32	52.00	63.00	71.00
40	82.00	99.00	111.00
50	128.00	154.00	173.00
63	217.00	261.00	293.00
75	309.00	371.00	418.00
90 (RRJ)	428.00	514.00	578.00
110 (RRJ)	568.00	682.00	767.00
160	1,338.00	1,606.00	1,807.00
225	2,568.00	3,082.00	3,467.00
280	4,136.00	4,964.00	5,584.00
315	8,066.00	9,680.00	10,890.00

Note:

1. Supply rate includes cost of rubber rings and lubricants.
2. Supplier's O/H & P included.
3. To obtain supply rate for transmission main, 20% added to basic supply rate to accommodate cost of fittings and specials, valves, culvert crossings, bridge crossings and valve chambers etc. that are incorporated in the Transmission System.
4. To obtain supply rate for distribution main, 35% added to basic supply rate to accommodate cost of fittings and specials, valves culvert crossings, bridge crossings and valve chambers etc. that are incorporated in the Distribution System.
5. Add 20% for supply rates for Contractor's O/H & P only for Supply and Laying Contracts.

Source:

Tender Prices (NWS&DB) – 2013 3rd and 4th quarters
Supplier's Price Lists

Table A - PVC/3

PVC LAYING

Diameter mm	Basic Excavation Cost Max. depth n.e. 1.5m			Earthwork Support Rs:/m	Allow for Disposal of Water Rs:/m	Laying & Plumbing Rs:/m
	Firm Sand Rs:/m	Soft or Sandy Soil Rs:/m	Gravel Rs:/m			
63	115.00	147.00	149.00	1,172.00	51.00	91.00
75	135.00	178.00	185.00	1,218.00	51.00	91.00
90	210.00	266.00	273.00	1,289.00	76.00	92.00
110	229.00	287.00	298.00	1,407.00	76.00	101.00
160	303.00	381.00	396.00	1,407.00	48.00	140.00
225	328.00	413.00	429.00	1,524.00	101.00	183.00
280	328.00	413.00	429.00	1,524.00	101.00	216.00
315	424.00	536.00	556.00	1,582.00	115.00	283.00

Note:

1. Add for dewatering and earthwork support to basic laying cost if applicable.
2. Basic excavation cost includes excavation, preparation of bottom, backfilling, ramming (consider 98% compaction), disposal of excess excavated material.
3. Generally use selected excavated material for backfilling. An allowance should be made for backfilling with imported material.
4. For pressure testing, cleaning and disinfection of pipes ; refer Table B - PVC/2.
5. For laying of specials, fittings, valves, valve chambers, culvert crossings etc. 30% to be added .
6. To obtain laying rate in ordinary soil under high ways 40% to be added to total cost of excavation and laying. (to remove asphalt coat and other base courses)
7. Traffic arrangement, dust controlling, maintenance of roads, permanent and temporary road reinstatement and other preliminaries are not included.
8. Pipe bedding and surroundings are not included.
9. Laying Contractor's O/H & P is not included.

Source:

Based on work study and established data from published books.

SUPPLY OF HDPE Pipes (PE 100 - SDR 17 PN10)

Asian Countries without Japan & Malaysia

1	2	3	4	5	6	7	8	9	10
Pipe Dia. mm	CIF Value Rs./m	Transmission main				Distribution main			
		CIF value for Specials Rs./m	(Col.2+3) Total CIFCost Rs./m	Transport & Clearing Rs./m	Custom Duty Rs./m	CIF value for Specials Rs./m	(Col.2+7) Total CIFCost Rs./m	Transport & Clearing Rs./m	Custom Duty Rs./m
20	60.00	15.00	75.00	4.00	35.00	21.00	81.00	5.00	38.00
32	98.00	25.00	123.00	7.00	57.00	35.00	133.00	7.00	62.00
50	222.00	56.00	278.00	14.00	128.00	78.00	300.00	15.00	138.00
63	265.00	67.00	332.00	17.00	153.00	93.00	358.00	18.00	165.00
75	430.00	108.00	538.00	27.00	248.00	151.00	581.00	30.00	268.00
90	525.00	132.00	657.00	33.00	303.00	184.00	709.00	36.00	327.00
110	750.00	188.00	938.00	47.00	432.00	263.00	1,013.00	51.00	466.00
160	1,650.00	413.00	2,063.00	104.00	949.00	578.00	2,228.00	112.00	1,025.00
180	2,100.00	525.00	2,625.00	132.00	1,208.00	735.00	2,835.00	142.00	1,305.00
200	2,600.00	650.00	3,250.00	163.00	1,495.00	910.00	3,510.00	176.00	1,615.00
225	3,150.00	788.00	3,938.00	197.00	1,812.00	1,103.00	4,253.00	213.00	1,957.00
250	4,050.00	1,013.00	5,063.00	254.00	2,329.00	1,418.00	5,468.00	274.00	2,516.00
280	4,900.00	1,225.00	6,125.00	307.00	2,818.00	1,715.00	6,615.00	331.00	3,043.00
315	6,150.00	1,538.00	7,688.00	385.00	3,537.00	2,153.00	8,303.00	416.00	3,820.00
355	7,600.00	1,900.00	9,500.00	475.00	4,370.00	2,660.00	10,260.00	513.00	4,720.00
400	11,500.00	2,875.00	14,375.00	719.00	6,613.00	4,025.00	15,525.00	777.00	7,142.00
450	12,700.00	3,175.00	15,875.00	794.00	7,303.00	4,445.00	17,145.00	858.00	7,887.00
500	14,650.00	3,663.00	18,313.00	916.00	8,424.00	5,128.00	19,778.00	989.00	9,098.00
560	21,000.00	5,250.00	26,250.00	1,313.00	12,075.00	7,350.00	28,350.00	1,418.00	13,041.00
630	26,500.00	6,625.00	33,125.00	1,657.00	15,238.00	9,275.00	35,775.00	1,789.00	16,457.00
750	35,200.00	8,800.00	44,000.00	2,200.00	20,240.00	12,320.00	47,520.00	2,376.00	21,860.00
800	45,250.00	11,313.00	56,563.00	2,829.00	26,019.00	15,838.00	61,088.00	3,055.00	28,101.00
900	58,750.00	14,688.00	73,438.00	3,672.00	33,782.00	20,563.00	79,313.00	3,966.00	36,484.00

Note :

1. Column (4) includes additional 25 % of CIF value for transmission mains and Column (8) includes additional 35% of CIF value for distribution mains to cover the costs of fittings, specials, valves, culvert crossings, bridge crossing and valve chambers etc.
2. Column (5 and 9) 5% of total CIF cost is added for clearing & transporting (up to site stores)
3. Custom Duty is taken as 46.00% of CIF value.
4. Supplier's O/H & P are included in the CIF value.
5. For supply & laying contracts add an additional 20% for supply rate for transport, loading, unloading, investment cost, overhead and profit for supply parties.

Source :

Based on supplier's rates, tender prices of 2013 and forecast to 2014

LAYING OF HDPE PIPES (PE 100 - SDR 17 PN10)

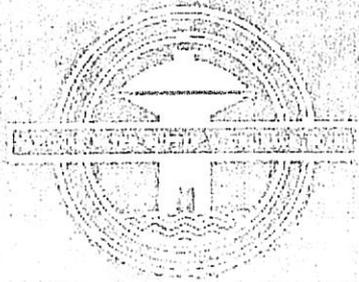
1	2	3	4	5	6	7	8	9
Pipe Dia. mm	Basic Laying Cost	Transmission main		Distribution main		Excavation Cost (Ordinary Soil) Rs./m	EWS Cost Rs./m	Allow for Dewatering/Disposal of Water Rs./m
		Laying Cost for Specials Rs./m	Total Laying Cost	Laying Cost for Specials Rs./m	Total Laying Cost			
20	68.00	21.00	89.00	28.00	96.00	165.00	1,789.00	51.00
32	104.00	32.00	136.00	42.00	146.00	165.00	1,789.00	51.00
50	126.00	38.00	164.00	51.00	177.00	165.00	1,789.00	51.00
63	154.00	47.00	201.00	62.00	216.00	165.00	1,789.00	51.00
75	154.00	47.00	201.00	62.00	216.00	165.00	1,789.00	51.00
90	154.00	47.00	201.00	62.00	216.00	165.00	1,789.00	51.00
110	154.00	47.00	201.00	62.00	216.00	241.00	1,822.00	58.00
160	255.00	77.00	332.00	102.00	357.00	279.00	1,903.00	60.00
180	273.00	82.00	355.00	110.00	383.00	284.00	1,936.00	60.00
200	279.00	84.00	363.00	112.00	391.00	288.00	1,968.00	60.00
225	286.00	86.00	372.00	115.00	401.00	328.00	2,017.00	67.00
250	358.00	108.00	466.00	144.00	502.00	334.00	2,050.00	67.00
280	441.00	133.00	574.00	177.00	618.00	410.00	2,098.00	77.00
315	512.00	154.00	666.00	205.00	717.00	422.00	2,163.00	78.00
355	582.00	175.00	757.00	233.00	815.00	508.00	2,229.00	80.00
400	677.00	204.00	881.00	271.00	948.00	522.00	2,294.00	81.00
450	749.00	225.00	974.00	300.00	1,049.00	541.00	2,375.00	82.00
500	1,026.00	308.00	1,334.00	411.00	1,437.00	732.00	2,781.00	111.00
560	1,052.00	316.00	1,368.00	421.00	1,473.00	878.00	2,850.00	133.00
630	1,060.00	318.00	1,378.00	424.00	1,484.00	878.00	2,850.00	133.00
750	1,150.00	345.00	1,495.00	460.00	1,610.00	1,171.00	2,955.00	178.00
800	1,210.00	363.00	1,573.00	484.00	1,694.00	1,339.00	3,302.00	203.00
900	1,280.00	384.00	1,664.00	512.00	1,792.00	1,626.00	3,476.00	246.00

Note:

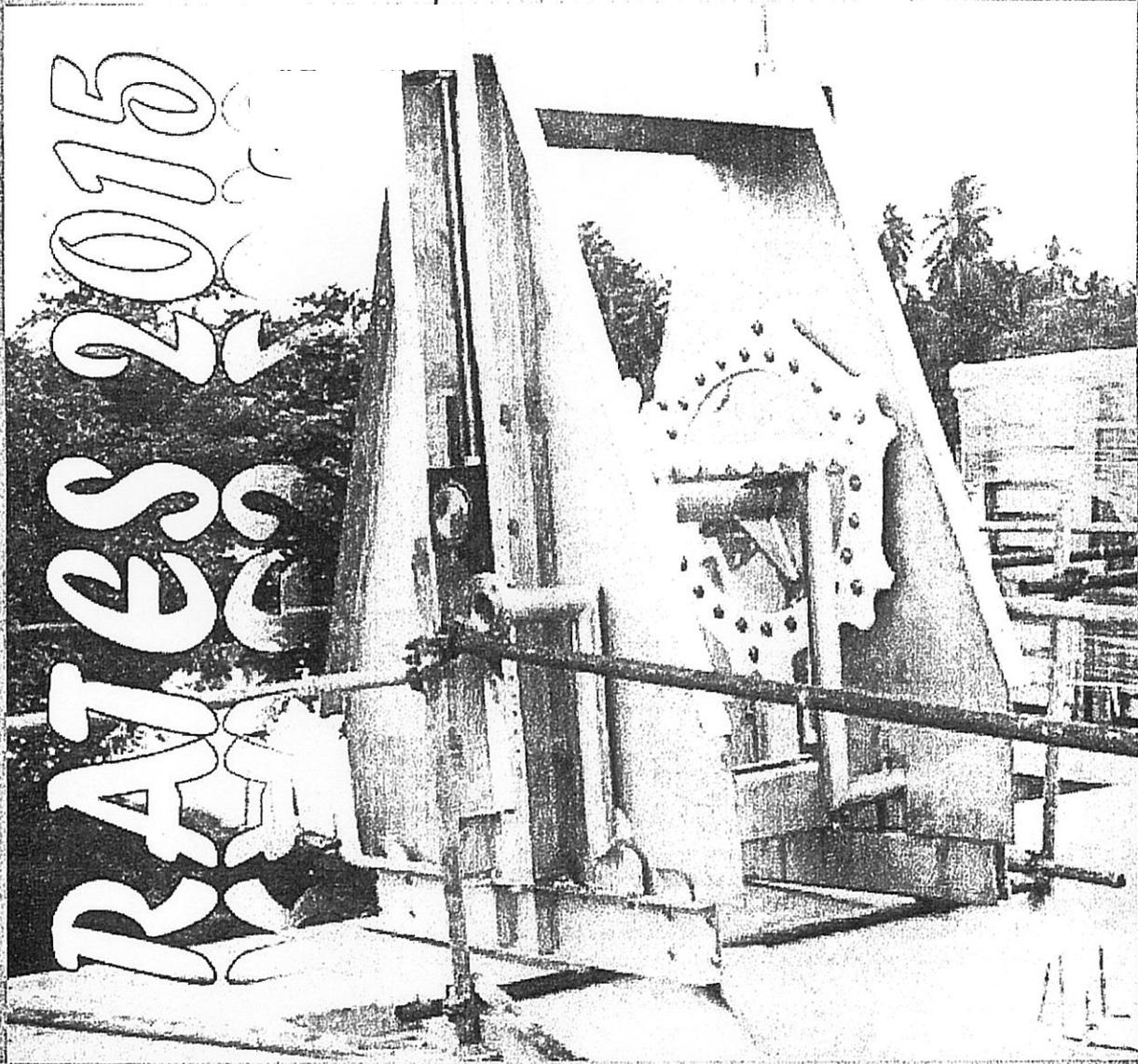
- Column (2) Basic laying cost includes placing, jointing, transporting from site stores, cleaning, disinfection, pressure testing and cost of polythene sleeving.
- Column (4) includes additional 30% of basic laying cost for transmission mains and Column (6) includes additional 40% of basic laying cost for distribution mains to cover the cost of specials and other all costs, such as culvert crossings, bridge crossings, valve chambers, valves, thrust blocks, pipe supports etc.
- Column (7) Basic excavation cost includes excavation, preparation of bottom, backfilling ramming (consider 95% compaction) and assuming earth available at site for backfilling.
- Contractor's OH and P not included.
- Rock excavation, traffic management, dust controlling and maintenance of roads. Preliminaries are not to basic cost.
- To obtain additional 40% to the total cost of laying and excavation under ordinary soil for highways. (To remove asphalt coat with base courses and other relevant additional costs)

Source:

Based on work study and established data from published books. (Refer Annex 7)



National Water Supply & Drainage Board



RATES 2015

**PLANNING & DESIGNS DIVISION
QUANTITY SURVEYING SECTION**

SUPPLY OF PVC PIPES

SUPPLY OF TYPE 600 PVC PIPES

Table A – PVC/1

1 Diameter (mm)	2 Supply Rate (Rs:/m)	3 Supply Rate Transmission Main (Rs:/m)	4 Supply Rate Distribution System (Rs: /m)
32	39.00	47.00	53.00
40	53.00	64.00	72.00
50	83.00	100.00	113.00
63	133.00	160.00	180.00
75	199.00	239.00	269.00
90 (RRJ)	265.00	318.00	358.00
110 (RRJ)	452.00	543.00	611.00
160	799.00	959.00	1,079.00
225	1,570.00	1,884.00	2,120.00
280	2,457.00	2,949.00	3,317.00
315	4,131.00	4,958.00	5,577.00

SUPPLY OF TYPE 1000 PVC PIPES

Table A – PVC/2

1 Diameter (mm)	2 Supply Rate (Rs:/m)	3 Supply Rate Transmission Main (Rs:/m)	4 Supply Rate Distribution System (Rs: /m)
20	26.00	32.00	36.00
25	39.00	47.00	53.00
32	52.00	63.00	71.00
40	83.00	100.00	113.00
50	129.00	155.00	175.00
63	219.00	263.00	296.00
75	312.00	375.00	422.00
90 (RRJ)	432.00	519.00	584.00
110 (RRJ)	573.00	688.00	774.00
160	1,350.00	1,620.00	1,823.00
225	2,592.00	3,110.00	3,500.00
280	4,175.00	5,010.00	5,637.00
315	8,141.00	9,770.00	10,991.00

Note:

1. Supply rate includes cost of rubber rings and lubricants.
2. Supplier's O/H & P included.
3. To obtain supply rate for transmission main, 20% added to the basic supply rate to accommodate cost of fittings, specials and valves for Valves, Culvert crossings and, bridge crossings etc. that are incorporated in the Transmission Main.
4. To obtain supply rate for distribution Systems, 35% added to basic supply rate to accommodate cost of fittings, specials and valves for Valves, Culvert crossings and, bridge crossings etc. that are that are incorporated in the Distribution System.
5. An additional 20% added for supplying and laying contracts, for transport from supplier's store to site store, loading, unloading, investment cost, storage, protection, overhead and profit of the supply & laying contractor.

Source:

Tender Prices (NWS&DB) – 2014 3rd and 4th quarters
Supplier's Price Lists

Table A – PVC/3

LAYING OF PVC PIPES

1 Pipe Dia. mm	2 Basic Laying Cost (Firm Sand)		3 Transmission Main		4 Transmission Main		5 Distribution System		6 Total Laying Cost	7 Excavation Cost (Firm Sand)	8 Earthwork Support (Firm Sand)	9 Dewatering (Firm Sand)
	Rs: /m	Rs: /m	Laying Cost for Specials	Total Laying Cost	Laying Cost for Specials	Total Laying Cost	Laying Cost for Specials	Total Laying Cost	Rs: /m	Rs: /m	Rs: /m	Rs: /m
63	177.00	54.00	54.00	231.00	71.00	248.00	71.00	248.00	299.00	1,737.00	133.00	
75	177.00	54.00	54.00	231.00	71.00	248.00	71.00	248.00	299.00	1,737.00	133.00	
90	209.00	63.00	63.00	272.00	84.00	293.00	84.00	293.00	348.00	1,612.00	155.00	
110	217.00	66.00	66.00	283.00	87.00	304.00	87.00	304.00	348.00	1,759.00	155.00	
160	299.00	90.00	90.00	389.00	120.00	419.00	120.00	419.00	464.00	1,759.00	207.00	
225	387.00	117.00	117.00	504.00	155.00	542.00	155.00	542.00	580.00	1,906.00	258.00	
280	517.00	156.00	156.00	673.00	207.00	724.00	207.00	724.00	760.00	1,906.00	338.00	
315	639.00	192.00	192.00	831.00	256.00	895.00	256.00	895.00	908.00	1,979.00	404.00	

Note:

1. Column (2) Basic Laying Cost includes placing, jointing, transporting from the site stores to site, pressure testing, cleaning & disinfection and many risks.
2. Column (4) includes additional 30% of the basic laying cost for transmission main and Column (6) includes additional 40% of basic laying cost for distribution systems to cover the laying cost of fittings, specials, accessories and miscellaneous items including other costs such as culvert crossings, bridge crossings, valve chambers, thrust blocks, pipe supports etc..
3. Column (7) basic excavation cost includes excavation in 'normal' ground condition (firm sand), preparation of bottom of excavation, backfilling with selected excavated material, ramming (consider 98% compaction) and disposal of excavated material.
4. Pipe bedding and surrounding, rock excavation, traffic management, dust controlling, maintenance of roads and preliminaries are not included in the basic cost.
5. Add 40% to the total cost of laying and excavation to cover the additional cost for removing asphalt layer with base courses and other relevant additional cost for high ways.
6. Contractor's O/H & P is not included.

Source:

Based on work study and established data from published books.

SUPPLY & DELIVERY OF HDPE Pipes (PE 100 - SDR 17 PN10)

Asian Countries without Malaysia

1	2	3	4	5	6	7	8	9	10
Pipe Dia. mm	CIF Value Rs./m	Transmission main				Distribution main			
		CIF value for Specials Rs./m	(Col.2+3) Total CIF Cost Rs./m	Transport & Clearance Rs./m	Custom Duty Rs./m	CIF value for Specials Rs./m	(Col.2+7) Total CIF Cost Rs./m	Transport & Clearance Rs./m	Custom Duty Rs./m
20	54.00	17.00	71.00	4.00	30.00	22.00	76.00	4.00	32.00
25	81.00	25.00	106.00	6.00	44.00	33.00	114.00	6.00	47.00
32	95.00	29.00	124.00	7.00	51.00	38.00	133.00	7.00	55.00
40	111.00	34.00	145.00	8.00	60.00	45.00	156.00	8.00	64.00
50	173.00	52.00	225.00	12.00	93.00	70.00	243.00	13.00	100.00
63	271.00	82.00	353.00	18.00	145.00	109.00	380.00	19.00	156.00
75	367.00	111.00	478.00	24.00	196.00	147.00	514.00	26.00	211.00
90	528.00	159.00	687.00	35.00	282.00	212.00	740.00	37.00	304.00
110	787.00	237.00	1,024.00	52.00	420.00	315.00	1,102.00	56.00	452.00
125	1,006.00	302.00	1,308.00	66.00	537.00	403.00	1,409.00	71.00	578.00
140	1,261.00	379.00	1,640.00	82.00	673.00	505.00	1,766.00	89.00	725.00
160	1,642.00	493.00	2,135.00	107.00	876.00	657.00	2,299.00	115.00	943.00
180	2,087.00	627.00	2,714.00	136.00	1,113.00	835.00	2,922.00	147.00	1,199.00
200	2,866.00	860.00	3,726.00	187.00	1,528.00	1,147.00	4,013.00	201.00	1,646.00
225	3,251.00	976.00	4,227.00	212.00	1,734.00	1,301.00	4,552.00	228.00	1,867.00
250	4,010.00	1,203.00	5,213.00	261.00	2,138.00	1,604.00	5,614.00	281.00	2,302.00
280	5,053.00	1,516.00	6,569.00	329.00	2,694.00	2,022.00	7,075.00	354.00	2,901.00
315	6,403.00	1,921.00	8,324.00	417.00	3,413.00	2,562.00	8,965.00	449.00	3,676.00
355	8,154.00	2,447.00	10,601.00	531.00	4,347.00	3,262.00	11,416.00	571.00	4,681.00
400	10,497.00	3,150.00	13,647.00	683.00	5,596.00	4,199.00	14,696.00	735.00	6,026.00
450	13,026.00	3,908.00	16,934.00	847.00	6,943.00	5,211.00	18,237.00	912.00	7,478.00
500	16,112.00	4,834.00	20,946.00	1,048.00	8,588.00	6,445.00	22,557.00	1,128.00	9,249.00
560	20,178.00	6,054.00	26,232.00	1,312.00	10,756.00	8,072.00	28,250.00	1,413.00	11,583.00
630	25,560.00	7,668.00	33,228.00	1,662.00	13,624.00	10,224.00	35,784.00	1,790.00	14,672.00
710	36,680.00	11,004.00	47,684.00	2,385.00	19,551.00	14,672.00	51,352.00	2,568.00	21,055.00
800	46,508.00	13,953.00	60,461.00	3,024.00	24,790.00	18,604.00	65,112.00	3,256.00	26,696.00
900	65,817.00	19,746.00	85,563.00	4,279.00	35,081.00	26,327.00	92,144.00	4,608.00	37,780.00

Note :

1. Column (4) includes additional 30% of CIF value for transmission mains and Column (8) includes additional 40% of CIF value for distribution mains to cover the costs of fittings, specials, accessories, valves and miscellaneous items.
2. Column (5 and 9) - 5% of total CIF cost added for clearance & transport (up to site stores) for supply only Contracts and additional 20% added for supply & laying Contracts for transport from supplier's store to site store, loading, unloading, investment cost, storage, protection, overhead and profit of the supply & laying Contractor.
3. Custom Duty is taken as 41.00% of CIF value.
4. Supplier's O/H & P are included in the CIF value.

Source :

Based on supplier's rates and forecast tender prices of 2014 to 2015

Table A - PE/5

LAYING OF HDPE PIPES (PE 100 - SDR 17 PN10)

1 Pipe Dia. mm	2 Basic Laying Cost	3 Transmission main		4 Distribution main		7 Excavation Cost (firm sand) Rs./m	8 EWS Cost Rs./m	9 Dewatering Rs./m
		Laying Cost for Specials Rs./m	Total Laying Cost	Laying Cost for Specials Rs./m	Total Laying Cost			
50	260.00	78.00	338.00	104.00	364.00	370.00	1,447.00	207.00
63	303.00	91.00	394.00	122.00	425.00	427.00	1,737.00	238.00
75	306.00	92.00	398.00	123.00	429.00	427.00	1,737.00	238.00
90	366.00	110.00	476.00	147.00	513.00	504.00	1,930.00	282.00
110	450.00	135.00	585.00	180.00	630.00	616.00	1,642.00	344.00
125	458.00	138.00	596.00	184.00	642.00	616.00	1,671.00	344.00
140	466.00	140.00	606.00	187.00	653.00	616.00	1,686.00	344.00
160	601.00	181.00	782.00	241.00	842.00	792.00	1,715.00	443.00
180	616.00	185.00	801.00	247.00	863.00	792.00	1,744.00	443.00
200	632.00	190.00	822.00	253.00	885.00	792.00	1,774.00	443.00
225	697.00	210.00	907.00	279.00	976.00	853.00	1,818.00	477.00
250	722.00	217.00	939.00	289.00	1,011.00	853.00	1,847.00	477.00
280	804.00	242.00	1,046.00	322.00	1,126.00	924.00	1,891.00	517.00
315	849.00	255.00	1,104.00	340.00	1,189.00	924.00	1,950.00	517.00
355	1,034.00	311.00	1,345.00	414.00	1,448.00	1,109.00	2,008.00	620.00
400	1,106.00	332.00	1,438.00	443.00	1,549.00	1,109.00	2,067.00	620.00
450	1,281.00	385.00	1,666.00	513.00	1,794.00	1,233.00	2,140.00	689.00
500	1,514.00	455.00	1,969.00	606.00	2,120.00	2,090.00	2,214.00	744.00
560	1,690.00	507.00	2,197.00	676.00	2,366.00	2,177.00	2,404.00	775.00
630	1,866.00	560.00	2,426.00	747.00	2,613.00	2,177.00	2,404.00	775.00
710	2,298.00	690.00	2,988.00	920.00	3,218.00	2,612.00	2,404.00	930.00
800	2,586.00	776.00	3,362.00	1,035.00	3,621.00	2,612.00	2,492.00	930.00
900	3,084.00	926.00	4,010.00	1,234.00	4,318.00	2,903.00	2,785.00	1,033.00

Note:

- 1 Column (2) Basic laying cost includes placing, jointing, transporting from site stores, pressure testing, and cleaning & disinfection.
- 2 Column (4) includes additional 30% of basic laying cost for transmission mains and Column (6) includes additional 40% of basic laying cost for distribution mains to cover the laying cost of fittings, specials, accessories and miscellaneous items including other costs such as culvert crossings, bridge crossings, valve chambers, thrust blocks, pipe supports etc.
- 3 Column (7) Basic excavation cost includes excavation in 'normal' ground conditions (firm sand), preparation of bottom of excavation, backfilling with selected excavated material, ramming (consider 98% compaction) and disposal of surplus excavated material.
- 4 Contractor's O/H & P not included.
- 5 Rock excavation, traffic management, dust controlling, maintenance of roads and preliminaries are not included in basic cost.
- 6 Add 40% to the total cost of laying and excavation to cover the additional cost for removing asphalt layer with base courses and other relevant additional costs for highways.

Source:

Based on work study and established data from published books (Refer Annex 9).

第4章

フェーズ2プロジェクトのレビュー

RUHUNUPURA WATER SUPPLY PROJECT PHASE I



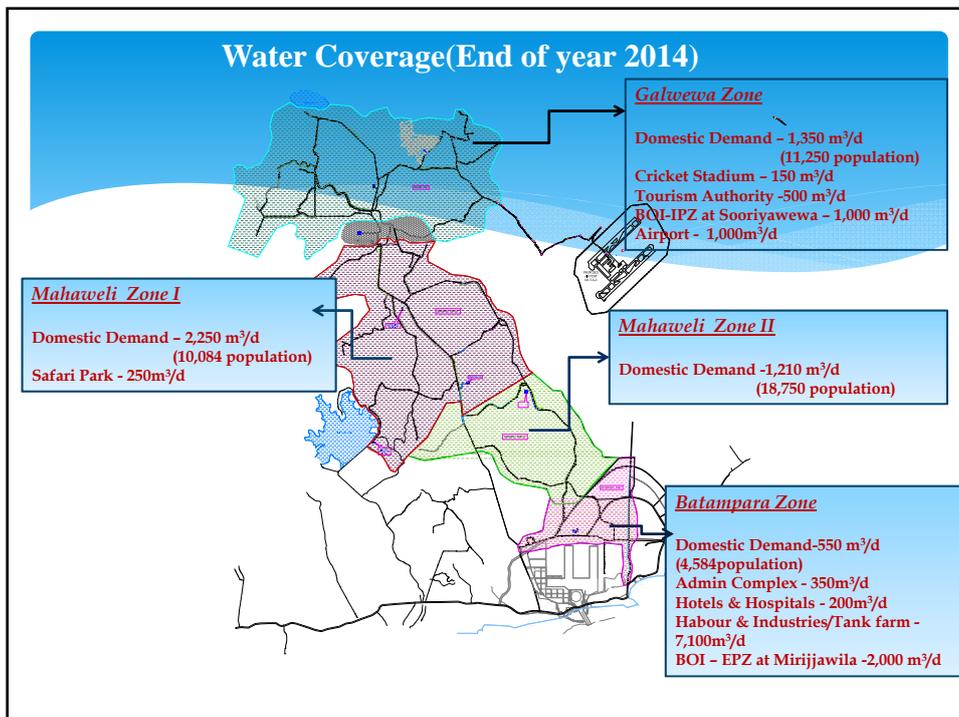
National Water Supply & Drainage Board
Ministry of Water Supply & Drainage

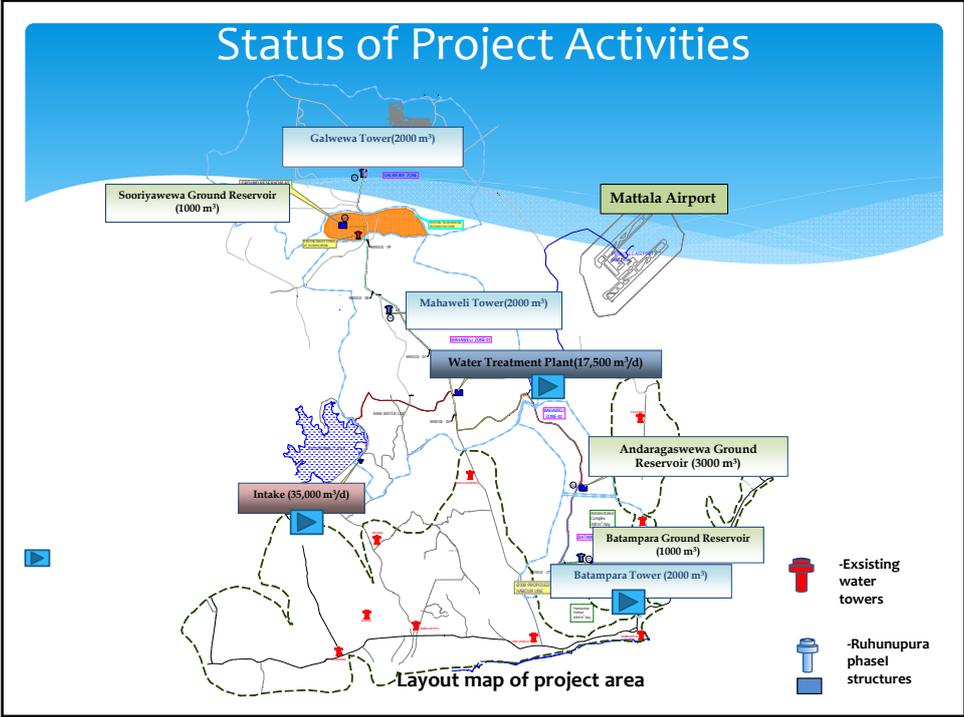
Introduction – Project Brief

The project is implemented,

- ❖ To provide Drinking water for Commercial & Industrial demand of the Ruhunupura & Mahaweli Development Areas
- ❖ To serve 112,000 population of suburb

Item	Phase I	Phase II
Investment	Korean Government- (US\$) 76,337 (65.9%)	SLR Mn. 5,200
	Sri Lankan Government- (US\$) 39,427 (34.1%)	
Production (m ³ /Day)	17,500	17,500
Commencement	February 2011	To be decided
Completion	September 2014	To be decided
Contractor	M/S Kolon-Pankorea- Yooshin Consortium	To be decided





Intake

Water Source - Ridiyagama Tank

Physical Progress - 81.7%

Financial Progress - 67%

After Completion



Intake



Water Treatment Plant



Physical Progress - 80.1%
Financial Progress - 62.2%



After Completion



Water Treatment Plant



Towers & Reservoirs



Physical Progress - 71.5%
Financial Progress - 50.8%



Pipe Laying

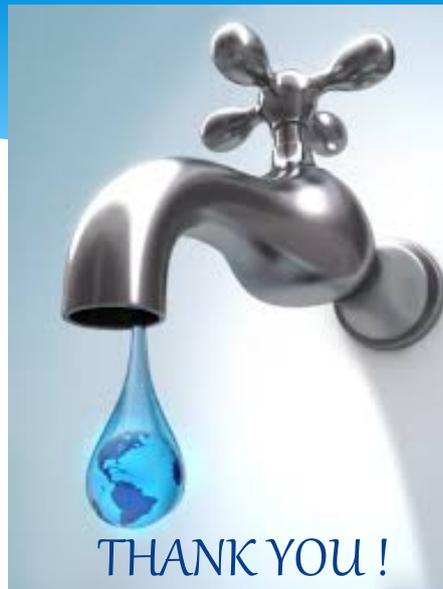


Physical Progress -
Raw Water Main-88.1%
Transmission Main-79.6%
Distribution Main-72%
Financial Progress - 78.5%

Overall Physical Progress - 82.4%
Overall Financial Progress - 70.5%

Issues

- Balance 210 km distribution pipe laying
- Batampara Tower site modification work



Appendix 4.1-2 Water Quality of Raw Water and Treated Water of Ruhunupura WSS

(1) Treated Water

TREATED WATER QUALITY MONITORING OF HAMBANTOTA REGION-2015

Treated Water - Ruhunupura WSS

Month	Date	Time	Lab.No.	RCl (as Cl ₂)-mg/l	Total Coliform	E-Coll	Color (Hazen unit)	Turbidity (NTU/FTU)	pH	EC (µs/cm)	Chloride (as Cl) -mg/l	Total alkalinity(as CaCO ₃)-mg/l	Free Ammonia -mg/l	Nitrate (as NO ₃) - mg/l	Nitrite (as NO ₂) - mg/l	Fluoride (as F) - mg/l	Phosphate (as PO ₄) - mg/l	Total Hardness(as CaCO ₃)-mg/l	Total Iron (as Fe) - mg/l	Sulphate(as SO ₄) - mg/l	Total Dissolve Solids - mg/l	Temp. °C	Manganese(as Mn)-mg/l
SLS	614	2013	STANDARDS	1.0	3	Nil	15	2	6.5-8.5		250	200	0.06	50	3	1.0	2.00	250	0.3	250	500		0.1
January	27	14:30	47	0.8	0	0	5	0.57	7.1	402	40	120	0.08	0.04	0.023	0.21	0.61	132	0.06	14	265	27.0	
February	26	14:35	100	1.5	0	0	5	0.98	7.3	399	42	124	0.05	0.17	0.046	0.26	0.09	136	0.04	12	263	27.4	
March	9	10:55	135	2.0	0	0	5	0.33	7.5	481	68	112	0.03	0.48	0.072	0.25	0.22	160	0.02	20	317	27.2	
April	29	8:28	662	1.0	0	0	5	0.30	7.1	414	28	116	0.03	0.08	0.006	0.37	0.02	124	0.02	11	273	30.0	
May	12	8:35	770	>2.0	0	0	5	0.30	6.9	413	30	112	0.03	0.13	0.003	0.35	0.07	120	0.04	10	273	30.0	0.019
June	8	8:55	936	1.0	0	0	5	0.52	7.3	364	42	112	<0.01	0.08	0.009	0.41	0.16	118	0.03	9	240	30.0	
July	2	9:05	1128	1.5	0	0	10	0.87	7.1	368	38	116	0.03	0.26	0.016	0.39	0.18	116	0.04	14	243	30.0	

August	3	10.40	1345	0.8	0	0	5	0.49	7.1	337	38	112	0.02	0.08	0.023	0.38	0.18	114	0.03	10	222	27.8
September	22	9.30	1705	1.5	0	0	5	0.48	7.1	335	34	120	0.05	0.08	0.016	0.38	0.02	118	0.03	9	221	30.0
October	16	9.10	1925	1.5	0	0	5	0.32	6.9	333	42	106	0.04	0.04	0.019	0.39	0.09	118	0.04	9	220	29.9

(2) Raw Water

SURFACE WATER QUALITY MONITORING OF HAMBANTOTA REGION-2015

Raw Water - Ridiyagama Lake, Ruhunupura WSS

Laboratory No	Month	Date	Time	Color (Hazen unit)	Turbidity (NTU/FTU)	pH	EC (µs/cm)	Chloride (as Cl) - mg/l	Total alkalinity(as CaCO ₃) - mg/l	Free Ammonia - mg/l	Nitrate (as NO ₃) - mg/l	Nitrite (as NO ₂) - mg/l	Fluoride (as F) - mg/l	Phosphate (as PO ₄) - mg/l	Total Dissolved Solids - mg/l	Total Hardness(as CaCO ₃) - mg/l	Total Iron(as Fe) - mg/l	Sulphate(as SO ₄) - mg/l	COD - mg/l	Dissolved Oxygen (DO)-mg/l	BOD - mg/l	Total Coliform at 37°C/100ml	Escherichia Coll at 44°C/100ml
	SLS 614:2013 STANDARDS			15	2	6.5-8.5		250	200	0.06	50	3	1.0	2.0	500.0	200	0.30	250	10			3	0
156	January	27	14.25	40	12.20	7.9	372	25	132	0.12	0.22	0.003	0.21	0.69	246	124	0.25	14	nt	nt	nt	380	44
309	February	26	14.30	35	10.30	7.7	365	24	136	0.18	0.39	0.023	0.25	0.20	241	124	0.15	14	nt	nt	nt	230	40
403	March	9	10.40	15	3.57	7.7	378	23	142	0.10	0.75	0.028	0.24	0.19	249	128	0.08	12	nt	nt	nt	90	9
935	June	08	8.42	30	8.32	7.5	341	22	140	0.02	0.08	0.004	0.42	0.27	225	100	0.15	9	nt	nt	nt	43	43
1127	July	2	8.58	30	7.96	7.5	349	20	140	0.01	0.08	0.006	0.41	0.25	230	114	0.16	13	nt	nt	nt	150	150
1344	August	3	10.20	35	6.50	7.5	322	20	136	0.06	0.22	0.007	0.41	0.24	213	116	0.18	10	12	4.8	1.8	23	23
1704	September	22	8.38	30	7.08	7.3	316	20	140	0.08	0.22	0.006	0.40	0.10	209	116	0.27	10	12	4.8	1.8	93	93
1924	October	16	9.00	30	6.14	6.5	309	22	132	0.10	0.04	0.019	0.4	0.18	204	116	0.26	9	nt	5.0	2.2	93	93

Terms of Reference (TOR)

Consulting Services (Detailed Design and Tender Assistance) for

Anuradhapura North Water Supply Project Phase 2

1. The Background including the Project Summary

1.1 Background

The Government of Sri Lanka will undertake the Anuradhapura North Water Supply Project, (the Project) with financial assistance from the Japan International Cooperation Agency (hereinafter referred to as "JICA"). Anuradhapura is located about 205km away from Colombo. The Project area covers the four (4) Divisional Secretariat Divisions (DSDs) namely Kebithigollewa, Kahatagasdigiliya, Horowpothana and Padaviya in Anuradhapura District. The location map is attached as **Annex 1**. The objective of the Project is to provide safe drinking water to the area which does not have access to water supply system and to increase water supply coverage by constructing surface water supply systems in Anuradhapura North area where the people depend on unsafe ground water which causes dental and skeletal fluorosis, Chronic Kidney Disease (CKD) and thereby contributing to improved hygienic status and health condition in the area.

1.2 Project Summary

The Project comprises the following sub scheme:

Wahalkada Water Supply Scheme which provides drinking water supply to the four (4) Divisional Secretariat Divisions (DSDs) namely Kebithigollewa, Kahatagasdigiliya, Horowpothana and Padaviya.

The detail components of the project are attached as **Annex 2**.

1.3 Project Implementation Arrangement

The National Water Supply and Drainage Board (NWSDB) will be the Project's Implementing Agency. The Executing Agency will be the Ministry of City Planning and Water Supply.

Project Management Unit (PMU) has been set up in NWSDB for project implementation. The PMU is headed by the Project Director who is reporting to the Additional General Manager of Water Supply Projects [Addl. GM WSP] of NWSDB. The organization chart of NWSDB is attached as **Annex 3.1** and the organization chart of PMU is attached as **Annex 3.2**.

2. The Consulting Services

The consulting services shall be provided by an international consulting firm (hereinafter referred to as "the Consultant") in association with national consultants

in compliance with the Guidelines for the Employment of Consultants under Japanese ODA Loans (April 2012). The Anuradhapura North Water Supply Project plans to be implemented under Japanese ODA loan and the Consulting Services consists of the following parts;

Phase 2: Pre Design, Detail Design and Preparation of Bid documents, Procurement Assistance, Environmental Matters, Technology Transfer, and Awareness Programmes of Wahalkada Water Supply System.

This TOR is for "Anuradhapura North Water Supply 'Project Phase 2".

2.1 The Objectives of the Consultancy Assignment

The objective of the consulting services assignment is to achieve and ensure the quality and efficiency of the project implementation through the proper and correct detailed designs, preparation of bidding documents, procurement assistance, environmental matters, technology transfer and awareness programs of Wahalkada Water Supply System.

2.2 Funding Source for Consultancy Services

The Government of Sri Lanka intends to use part of the proceeds of the Japanese ODA Loan No. SL-P 110 for eligible payments for consulting services for which this TOR is issued.

2.3 The Scope Consulting Services

2.3.1 Pre Design Stage

The Consultants shall;

- (a) Review the Final Report of Preparatory Survey study carried out by M/s. NJS Consultants Co., Ltd. & M/s. Nihon Suido Consultants Co., Ltd. for any deviation from the scope ensuring;
 1. Adequacy of foundation investigations
 2. Cost effectiveness
 3. Compatibility with site conditions
- (b) Review and verify all available primary and secondary data collected during the above referenced preparatory survey study.
- (c) Carry out all the required engineering surveys and investigations such as topographical survey, hydrological survey, geotechnical survey, material availability survey, raw water quality survey, etc., as applicable to the concerned project components.
- (d) Investigate and recommend water treatment plant effluent disposal routes and effluent reuse systems.
- (e) Plan the consultancy services in such a way that procurement of works of at least one package could commence within the first six months of the consultancy services.
- (f) Submit the Inception Report
- (g) Prepare detailed work plan, progress reports and implementation schedule

for the Project to ensure effective monitoring and timely project outputs, and regularly update the same during other stages;

2.3.2 Detailed Design Stage

The Consultants shall;

- (a) Carry out detailed designs and prepare Bidding Documentation for Wahalkada Water Supply System which shall include, but not limited to, following:
- Water Intake of Capacity 28,800 m³/day (approx) with associated Mechanical & Electrical installations having pumping capacity of 16,000 m³/day (approx) by keeping provisions for future installation up to full capacity of 28,800 m³/day.
 - Raw Water Main from Wahalkada Intake to Wahalkada WTP including surge arresting system, suitable line flushing and flow measuring devices etc.,
 - Water Treatment plant of capacity of 27,400 m³/day (approx) to cater to year 2034 projected demand in a manner that 15,000 m³/day capacity treatment plant could be implemented as the first stage and the number of process trains shall be more than two as appropriate and shall accommodate the minimum of the given treatment plant components of the preparatory survey study including flocculator, sedimentation tank, Rapid Sand filters, sludge treatment, clear water storage units. The following components and related appurtenances shall suit the WTP capacity of 27,400 m³/day.
 - i. Receiving Well
 - ii. Distribution Chamber
 - iii. Activated Carbon Filters (ACF) including a sump
 - iv. Backwash water recycle tank
 - v. Blower room including blowers
 - vi. Chlorine mixing chamber
 - vii. Chlorine house including Chlorinators, neutralization facilities
 - viii. Chemical building, including chemical storing, Chemical preparation and delivering facilities
 - ix. Clear water tank
 - x. High lift pumping Station
 - xi. Elevated service water tank
 - xii. Sludge lagoon
 - xiii. Administrator building including process laboratory
 - xiv. Warehouse
 - xv. Watchers hut, parking shed etc;
 - xvi. Quarters
 - xvii. Boundary walls internal roads yard piping & Landscaping
 - Transmission Mains and Sub mains from Wahalkada WTP to Kahatagollewa Bogahawewa, KAH-KEB Median, Kebithigollewa , Weerasole, North Horowpothana, Horowpothana, West Horowpothana, Rathmalgahawewa, Hamillewa and Kahatagasdigiliya of total length 142 km including required surge arresting systems
 - Distribution model design to cover Horowpothana, Kahatagasdigiliya,

Kebithigollewa, and Padaviya divisions and Distribution Systems to cater to said areas of total length 873 km approx.

- Ground Reservoirs at
 - i. Kahatagollewa (1,000 m³)
 - ii. Kebithigollewa (500 m³)
 - iii. Weerasole (1,500 m³)
 - iv. Horowpothana (1,000 m³)
 - v. Kahatagasdigiliya (500 m³)
- Elevated Tank
 - i. Wahalkada (500 m³)
 - ii. Kahatagollewa (250 m³)
 - iii. Bogahawewa (2,000 m³)
 - iv. KAH-KEB Median (250 m³)
 - v. Kebithigollewa (750 m³)
 - vi. North Horowpothana (250 m³)
 - vii. Horowpothana (500 m³)
 - viii. West Horowpothana (750 m³)
 - ix. Rathmalgahawewa (500 m³)
 - x. Hamillewa (1,250 m³)
 - xi. Kahatagasdigiliya (1,500 m³)
 - xii. Other 5 tanks (250 m³ each)
- Chlorine Building 100 m² (approx.) including chlorinators at
 - i. Weerasole
 - ii. Horowpothana
 - iii. North Horowpothana
 - iv. West Horowpothana
 - v. Hamillewa
 - vi. Kahatagasdigiliya
 - vii. Rathmalgahawewa
 - viii. Kebithigollewa
 - ix. KAH-KEB Median
 - x. Kahatagollewa
 - xi. Bogahawewa
- Area Engineer's Office with Operational complex, SCADA system, Consumer counter, Zonal lab (Residual Chlorine, Turbidity, pH) at;
 - i. Horowpothana
 - ii. Kahatagasdigiliya
 - iii. Kebithigollewa
 - iv. Bogahawewa
- OIC Office with SCADA system, Consumer counter, Zonal lab (RCI, Turbidity, pH) and Room for crews etc., at
 - i. Kahatagasdigiliya
 - ii. Kebithigollewa
 - iii. Bogahawewa
- Work Shop buildings at
 - i. Horowpothana
 - ii. Kebithigollewa
- Care taker Quarters 100 m² approx. at
 - i. Weerasole

- ii. Horowpothana
- iii. North Horowpothana
- iv. West Horowpothana
- v. Hamillewa
- vi. Kahatagasdigiliya
- vii. Rathmalgahawewa
- viii. Kebithigollewa
- ix. KAH-KEB Median
- x. Kahatagollewa
- xi. Bogahawewa

- Staff Quarters at
 - i. Horowpothana
 - ii. Kahatagasdigiliya
 - iii. Kebithigollewa
 - iv. Bogahawewa

Note: It should be noted that the consultant shall not be limited to the above referenced components but shall design a complete scheme by incorporating additional components/ items as appropriate. The Consultants shall accommodate reasonable requests made by the Project Director, if necessary, for the completeness of the scheme within the given inputs.

- (b) Prepare bidding documents for procurement activities of Wahalkada WSS in accordance with the latest version of Standard Bidding Documents under Japanese ODA Loans for Procurement of Works together with all relevant specifications, drawings and other documents; for following procurement packages, separately for Wahalkada WSS

Package	Component	Procurement
Package A	Intake, Water Treatment Plants, Ground Sumps, Pumping Stations and Elevated Tanks, Civil, Mechanical Electrical works and Building works	ICB with PQ
Package B	Procurement and installation of Transmission/ Distribution Mains (HDPE)	ICB with PQ
Package C	Procurement and Installation of Distribution System for 63mm to 225mm, uPVC pipes	LCB
Package D	Procurement of Vehicles	LCB
Package E	Procurement of Heavy Duty Machines	LCB

* ICB -International competitive bidding

*LCB -Local competitive bidding

*PQ -Pre- Qualification

*HDPE- high density Polyethylene

- (c) Sign all detailed designs, drawings and calculations where the Consultant shall ensure and be responsible for the satisfactory structural and functional requirements of the scheme components.

- (c) Carry out Cost estimation including Engineer's estimate. The Engineer's estimate shall be prepared using NWSDB Rate Book and other appropriate rates if NWSDB rates are not available for such items.

The Consultant shall prepare the detailed designs of the Project in sufficient detail to ensure clarity and understanding by NWSDB, contractors and other relevant stakeholders. All the designs should be in conformity with the Sri Lankan Standards (SLS) if available, or with the appropriate international standards subject to the approval of the Engineer.

The detailed designs will, as a minimum, include construction drawings, detailed cost estimates, necessary calculations, associated contract documentation to including detailed specifications, bill of quantities (BOQ), and the implementation schedule for the Project.

Such detailed specifications will contain those in relation to

- i. Quality assurance and control of plant, materials and workmanship,
- ii. Safety
- iii. Protection of the environment,
- iv. Other stake holder's requirements such as RDA, CEB, Pradeshiya Saba etc.,

The detailed design shall be prepared in close consultation with, and to meet the requirements of NWSDB and the consultants shall make every effort to incorporate the comments made by NWSDB into the detailed designs prior to submission for approval. The consultant's staff shall make presentations to the relevant NWSDB staff on detailed design prior to finalization, on agreed intervals during the designs.

2.3.3 Procurement Process Assistance Stage

2.3.3.1 Assistance in Pre-Qualification (PQ)

The Consultants shall:

- a) Define technical and financial requirements, capacity and/or experience for PQ criteria taking into consideration technical features of the project;
- b) Prepare PQ documents in accordance with the latest version of Standard Pre-qualification Documents under Japanese ODA Loans;
- c) Assist NWSDB in PQ announcement, addendum/corrigendum, and clarifications to the applicants' queries;
- d) Assist to evaluate PQ applications in accordance with the criteria set forth in PQ documents; and
- e) Assist to prepare a PQ evaluation report for approval of the PQ evaluation committee.

2.3.3.2 Assistance during the Bidding

The Consultants shall:

- a) Assist NWSDB in issuing bid invitation, conducting pre-bid conferences, issuing addendum/corrigendum, and clarifications to bidders' queries.
- b) Assist for the technical clarification during bid evaluation in accordance with the criteria set forth in the bidding documents. In such evaluation assistance, the Consultant shall carefully confirm that bidders' submissions in their technical proposal including, but not limited to, site organization, mobilization schedule, method statement, construction schedule, safety plan,

have . been prepared in harmony each either and will meet such requirements set forth in applicable laws and regulations, specifications and other parts of the bidding documents;

- c) Assist Technical Evaluation Committees (TECs) in preparation of bid evaluation reports for approval of the procurement committees and to submit an independent report to JICA.
- d) Assist NWSDB in contract negotiations by preparing agenda and facilitating negotiations including preparation of minutes of negotiation meetings;
- e) Assist to prepare a draft and final contract agreement.
- f) Assist in tender awards and signing the contract agreements.

2.4. Facilitation of implementation of Environmental Management Plan (EMP), Environmental Monitoring Plan (EMoP) and Resettlement Action Plan (RAP)

The Consultant shall:

- a) Update EMP, as appropriate; incorporate necessary technical specifications with design and contract documentation;
- b) During the preparation of bidding documents, clearly identify environmental responsibilities as explained in the Environmental Impact Assessment/Initial Environmental Examination report and Environmental Monitoring Plan;
- c) Update and/or prepare RAP as necessary based on detailed design in accordance with the agreed resettlement framework, including entitlement matrix and compensation plan, coordinate with various agencies in preparing the procedures for timely land acquisition and disbursement of compensation to affected persons;
- d) Assess the social impact and prepare necessary social development plans. The plan should be based on indigenous people development framework, as required;
- e) Monitor land acquisition and compensation activities being undertaken by NWSDB and district authorities, and report the activities in monthly progress reports;
- f) Assist NWSDB in the capacity building of NWSDB staff on environmental management through on-the-job training on environmental assessment techniques, mitigation measure planning, supervision and monitoring, and reporting.

2.5 Technology Transfer

The Consultant shall carry out the technology transfer as an important aspect in design works. The Consultant shall provide the opportunity to NWSDB officers and staffs to be involved in the working team of the Consultant during the design and pre-contract administration works for their capacity building wherever possible. If requested by NWSDB, the Consultant shall brief and demonstrate the survey and design procedure and pre-contract management process and procedures. The consultant shall assist NWSDB and its staff to build their capacity as a part of on-the-job-training under the Project.

2.6 Guidance for Public Awareness Campaign

The purpose of public awareness campaign is to inform and educate the general public of the present situation of health damage in the project area caused by the use of

groundwater, the objectives of the proposed project, the importance of connection to a proposed water supply system under the project and payment of water tariff for sustainable operation and management of water supply facilities.

The Consultant shall:

- a) Arrange the data on health damage in the project area focusing on dental and skeletal fluorosis and Chronic Kidney Diseases. (CKD)
- b) Analyse the demographic characteristics of the project area such as sex, age, ethnic, religion, occupation, income, coverage by water supply, sanitation and power supply, etc.,
- c) Develop the strategy including approach and methodology to extend the Public Awareness Campaign.
- d) Organize the public information and education campaign teams by selecting the staff mainly from NWSDB and being reinforced by the use of external resources as required.
- e) Decide the assignment of respective staff in the public information and education campaign.
- f) Unify the campaign team through trial practice and brainstorming
- g) Hold the seminar/public information campaign on the date and at places as scheduled at least twelve (12) times.
- h) Improve & adjust the content of the seminar according to the people's response at the previous seminar.
- i) Prepare the report summarizing the public information and education campaign including the evaluation of the effect and recommendation for future extension of public awareness campaign.
- j) Awareness of farmers on water management.

2.7 Nature of and limit to the responsibilities, which the Consultant is to undergo.

The Consultant shall perform the Services and carry out their obligations hereunder with all due diligence, efficiency and economy, in accordance with generally accepted professional techniques and practices, and shall observe sound management practices, and deploy appropriate advance technology and safe and effective equipment, machinery, materials, computer software and methods. The Consultants shall always act, in respect of any matter relating to this Contract or to the Services, as faithful advisers to the Employer, and shall at all times support and safeguard the Employer's legitimate interests in any dealings with sub consultants or third parties.

The Consultants shall obtain the Employer's prior approval in writing before taking any of the following actions.

- a) Appointing such members of the personnel as is listed in **Section 2.9** merely by title but not by name;
- b) Entering into a sub contract for the performance of any part of the services, it being understood (a) that the selection of sub consultant and the terms and conditions of the sub contract shall have been approved in writing by the Employer prior to the execution of the sub contract, and (b) that the consultants shall remain fully liable for the performance of the services by the sub consultant and its personnel pursuant to this contract.
- c) Any variation of the scope of the Consultancy Service.

- d) Any variation orders to the Contractor during Contract execution

2.8 The Man Month Schedule and Expected Time Schedule

The team shall comprise Professional international consultants having allocated 65 person-months and Professional local consultants and technical administrative support staff having allocated 120 and 199 person-months maximum. The consultants will be engaged over 21 months duration of consulting services. Refer to **Annex 4** for proposed Implementation Schedule.

All necessary Technical and Administrative supporting staff (having allocated 384 PM) should be provided by the consultant by referring **Annex 5**.

It is the Consultant's responsibility to select the optimum team and to propose the professionals whom he believes will best meet the needs of NWSDB without exceeding total person months proposed for each category

2.9 The qualification and Expertise required and Detailed Scope of Works for Experts

Key Experts (International)

Position	Qualification	Experience
Team Leader	Professionally Qualified Civil Engineer and Graduate (B.Sc.) in Civil Engineering/ contract management and Masters/or PE Qualification in a relevant field and Should be a member of recognized professional Institution.	<p><u>Total Experience</u> At least 20 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 15 years experience out of which 10 years experience in Water Supply projects including; <ol style="list-style-type: none"> a) Design b) Project Management c) Contract Management of major projects with ICB contracts • At least ten years experience in similar water supply Projects as a Team Leader of a project more than 25 million US\$.
Water Treatment Expert	Professionally Qualified Civil Engineer and Graduate (B.Sc.) in Civil Engineering and Masters/or PE Qualification in a relevant field and Should be a member of recognized professional Institution.	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 8 years experience in designs of water treatment plants and at least 3 years experience in Operation and Maintenance of Water Supply Facilities • Experience as a water treatment specialist in at least two urban water supply projects of which each having water treatment plants of capacity at least 20,000 m³/day.
Civil Engineer (Water Treatment Plant)	Professionally Qualified Civil Engineer Graduate (B.Sc.) in Water Supply/ Civil Engineering and Should be a member of recognized professional Institution.	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 10 years experience in Design/ Operation and Maintenance of Water Supply Facilities • Experience as a Civil Engineer in at least two urban water supply projects of which each having WTP of capacity at least 20,000 m³/d and contract amount is more than 5 million US\$. • Experience in ICB contract is desirable.

Position	Qualification	Experience
Civil Engineer (Water Transmission)	Professionally Qualified Civil Engineer and Graduate (B.Sc.) in Water Supply/ Sanitation /Civil Engineering and related field and Should be a member of recognized professional Institution.	<u>Total Experience</u> At least 15 years experience <u>Project Related Experience</u> <ul style="list-style-type: none"> • At least 10 years experience in design/operation and maintenance of Water Supply transmission Facilities including minimum 8 years experience in water supply design. • Experience as a Civil Engineer in at least two urban water supply projects of which each having more than 200 km transmission/distribution system. • Experience in ICB contract is desirable.
Mechanical Engineer	Professionally Qualified Mechanical Engineer Graduate (B.Sc.) in Mechanical Engineering and related field Should be a member of recognized professional Institution.	<u>Total Experience</u> At least 15 years <u>Project Related Experience</u> <ul style="list-style-type: none"> • At least 7 years experience in design/operation and maintenance of Water Supply Facilities and related field • Experience as a Mechanical Engineer in four urban water supply projects of which each contract amount is more than 5 million US\$. • Experience in ICB contract is desirable -two urban water supply projects
Electrical Engineer	Professionally .Qualified Electrical Engineer Graduate (B.Sc.) in Electrical Engineering and related field and Should be a member of recognized professional Institution.	<u>Total Experience</u> At least 15 years <u>Project Related Experience</u> <ul style="list-style-type: none"> • At least 7 years experience in design/operation and maintenance of Water Supply Facilities and related field • Experience as an Electrical Engineer in four urban water supply projects of which each contract amount is 5 million US\$. • Experience in ICB contract -two urban water supply projects
Hydrologist	Professionally Qualified Hydrologist and Graduate (B.Sc.) in Hydrology and Should be a member of recognized professional Institution.	<u>Total Experience</u> At least 15 years experience <u>Project Related Experience</u> <ul style="list-style-type: none"> • At least 7 years experience in four urban water supply projects of which each contract amount is 5 million US\$. • Experience in ICB contract -two urban water supply projects

Key Experts (Local)

Position	Qualification	Experience
Deputy Team Leader	Chartered Civil Engineer and Graduate (B.Sc.) or equivalent in Civil Engineering/ and Masters Qualification in a relevant field.	<p><u>Total Experience</u> At least 20 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least fifteen years experience combined experience in Water Supply projects including; <ul style="list-style-type: none"> (i) Design (ii) Project Management (iii) Contract Management of major projects with ICB contracts • At least five years experience in similar water supply Projects as a Co-Team Leader or Deputy Team Leader of a project more than 15 million US\$
Structural Specialist	Chartered Civil Engineer and Graduate (B.Sc.) or equivalent in Civil Engineering and Masters Qualification in Structural Engineering	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 10 years experience in design/ operation and maintenance of Water Supply Facilities • Experience as a structural specialist in at least two urban water supply projects of which each contract amount is more than 10 million US\$
Civil Engineer (Intake & Water Treatment Plant)	Chartered Civil Engineer and Graduate (B.Sc.) or equivalent in and Masters Qualification in Water Supply Engineering /Environmental Engineering	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 10 years experience in design/ operation and maintenance of Water Supply Facilities • Experience as a Civil Engineer in two urban water supply projects of which each contract amount is more than 5 million US\$. • Experience in ICB contract is desirable

Position	Qualification	Experience
Civil Engineer (Reservoirs, Pumping Stations, Towers, Transmission & Distribution)	Chartered Civil Engineer and Graduate (B.Sc.) or equivalent in Water Supply/ Sanitation /Civil Engineering and related field	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 10 years experience in design/ operation and maintenance of Water Supply transmission Facilities, reservoirs, pumping stations and towers • Experience as a civil Engineer in two urban water supply projects of which each contract amount is more than 5 million US\$. • Experience in ICB contract is desirable.
Civil Engineer- Pipeline	Chartered Civil Engineer and Graduate (B.Sc.) or equivalent in Water Supply/ Sanitation /Civil Engineering and related field	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 10 years experience in design/ operation and maintenance of Water Supply transmission Facilities, reservoirs, pumping stations and towers • Experience as a civil Engineer in two urban water supply projects of which each contract amount is more than 5 million US\$. <p>Experience in ICB contract is desirable</p>
Mechanical Engineer	Mechanical Engineer Graduate (B.Sc.) or equivalent in Mechanical Engineering and related field	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 7 years experience in design/ operation and maintenance of Water Supply Facilities and related field • Experience as a Mechanical Engineer in four urban water supply projects of which each contract amount is more than 5 million US\$ • Experience in ICB contract is desirable -two urban water supply projects

Position	Qualification	Experience
Electrical Engineer	Electrical Engineer Graduate (B.Sc.) or equivalent in Electrical Engineering and related field	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 7 years experience in design/ operation and maintenance of Water Supply Facilities and related field • Experience as an Electrical Engineer in four urban water supply projects of which each contract amount is 5 million US\$. • Experience in ICB contract -two urban water supply projects
Instrumentation Specialist	Electrical Engineer Graduate (B.Sc.) or equivalent in Electrical Engineering and related field	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 7 years experience in design/ operation and maintenance of Water Supply Facilities and related field • Experience as an Electrical Engineer in four urban water supply projects of which each contract amount is 5 million US\$. • Experience in ICB contract -two urban water supply projects

Other Experts (Local)

Position	Qualification	Experience
Procurement Specialist	Graduate in Civil Engineering (B.Sc.) or equivalent and Masters Qualification in project management and Diploma in Procurement and construction claims	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 7 years experience as a Procurement Specialist • Experience in two urban water supply projects of which each having ICB contract more than 10 million US\$. • Experience in JICA projects is
Environmental Specialist	Bachelor degree in Engineering/environmental science/Agriculture	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • Not less than six years experience in environmental • Assessments with reference to water pollution, waste water, sanitation, and the impact of construction works and at least two years experience with a recognized consulting firm/National water utility Organization
Public Awareness Campaign Specialist	Bachelor degree in Social Science	<p><u>Total Experience</u> At least 10 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least two years experience with a recognized consulting firm /National water utility Organization Having experience in conducting Public awareness campaigns
Architect	Professionally qualified graduate Architect and should be a member of recognized professional institution	<p><u>Total Experience</u></p> <ul style="list-style-type: none"> • At least 10 years after graduation experience <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • Not less than 5 years experience in architectural buildings and industrial/ water or wastewater treatment plant plans, familiar with green building techniques & practice on energy efficient buildings and at least two years experience with a recognized consulting firm

Position	Qualification	Experience
Quantity Surveyor	Professionally qualified Quantity Surveyor with Bachelor degree or equivalent in Quantity surveying and should be a member of recognized professional institution	<p><u>Total Experience:</u> At least 10 years after graduation experience</p> <p><u>Project Related Experience:</u></p> <ul style="list-style-type: none"> • At least two years experience in water treatment plant estimates with a recognized consulting firm//National water utility Organization <p>Note: An input of 8 man months of a Quantity Surveyor (local) shall be allocated exclusively for the use of Planning & Design Section in Head Office.</p>
Micro-Biologist/ Chemist	A graduate in the relevant field with a Master Degree in Micro- Biology/ Chemistry/ Limnology	<p><u>Total Experience:</u> At least 10 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • Not less than 10 Years experience in the drinking water sector specially in enumeration of Algae and other constituents/species in impounded water bodies with emphasis on Algae & Cyanobacterial control and at least five years in recognized consulting firm

2.10 Task of the Experts

2.10.1 The Tasks of the Key Experts

International Experts

The specific tasks include, but not limited to;

Position	Main Tasks
Team Leader	<ol style="list-style-type: none"> 1. Shall bear the overall responsibility and shall represents the project Consultant's Team in all matters relating to the performance of services, coordinating with all other consultant's staff to deliver excellent product during the stipulated time schedule. 2. Shall oversee and Supervise the Consultant's services 3. Assume direct responsibility for day-to-day consulting services including day to day management of all consultants' staff and coordination among and with them. 4. Review existing studies/documents and other resources available and formulate a best implementation approach including programmatic project schedule; 5. Prepare PQ and bid evaluation report for JICA, 6. Coordinate interfaces between Consultancies (Phase 1 & Phase 2) 7. Check the bidding documents prepared by the local consultants and ensure all bidding documents are complete in every respect; 8. Assist PD to conduct pre-bid conferences, issuing addendum/corrigendum, and classifications to bidders' queries. 9. Assist in PQ, evaluation of bids; 10. Assist NWSDB in contract negotiations; 11. Assist to prepare a draft and final contract agreement. 12. Assist tender awards and signing the contract agreements
Water Treatment Expert	<ol style="list-style-type: none"> 1. Carry out bench scale testing and pilot testing for average and critical conditions of raw water quality 2. Decide the required water treatment process and to review the Intake, WTP components proposed by the preparatory survey studies 3. Prepare the preliminary (basic) designs of the Intake and WTP. 4. Prepare WTP detailed Process Diagrams 5. Assure resource optimization including the treatment plant waste treatment and re-cycling 6. Advise on the degree of Automation and controlling required for the optimum performance of the WTPs and distribution systems in collaborations with Electrical and Mechanical Engineers 7. Advise on preparation of Sequence of Operation (SOO) for the treatment plants
Civil Engineer (Intake & Water Treatment Plant)	<ol style="list-style-type: none"> 1. Assist the Water Treatment expert in preparing the basic design of the water treatment plant including water intake facilities 2. Direct the local Consulting Engineers attending the detailed designs of the water treatment plant including water intake facilities and check the detailed designs done by the local Consulting engineers 3. Prepare Technical Specifications 4. Check and certify the drawings and BOQs

Civil Engineer (Water Transmission)	<ol style="list-style-type: none"> 1. Assist the water treatment expert in preparing the basic design of the water supply transmission and distribution systems including storage reservoirs and towers 2. Direct the local Engineers attending the detailed designs including network models of the water Transmission and Distribution systems 3. Select appropriate modelling software with the consultation of PD 4. Check Network models 5. Prepare Technical Specifications 6. Check and certify the drawings and BOQs 7. Develop course module on network installation and maintenance training and Conduct 3 days Water Distribution and Network Installation and Maintenance Training Course for NWSDB RSC-NC & P&D staff
Mechanical Engineer	<ol style="list-style-type: none"> 1. Design of the mechanical equipment 2. Prepare specifications, Mechanical layouts and drawings; 3. Assist during commissioning of project components 4. Assist Team Leader for preparation of O&M manuals 5. Direct the local Mechanical Engineers for mechanical designs and check the designs 6. Direct the local Mechanical Engineers in their day-to-day activities 7. Support the O&M training
Electrical Engineer	<ol style="list-style-type: none"> 1. Designs of the electrical equipment 2. Prepare specifications, electrical layouts and drawings; 3. Assessment of the power requirements and establish power availability and assist NWSDB staff obtaining the requirement from CEB; 4. Assist Team Leader for preparation of the O&M manuals 5. Direct the local Electrical Engineers for electrical designs and check the designs 6. Direct the local Electrical Engineers in their day-to-day activities 7. Check the performance of an instrumentation system
Hydrologist	<ol style="list-style-type: none"> 1. Carry out suitable hydrological investigations for proposed water resources and review the extraction methodology; 2. Prepare detailed Engineering designs for extraction; 3. Recommend and find the solutions for protection of water resources and their catchments prepare cost estimation; 4. Analyzing the effect of environmental changes on water flow, 5. Planning of water resource development by forecasting and monitoring water usage and rainfall, 6. Assessing the relationship between rainfall & run off of tank catchment

Local Experts

Position	Main Tasks
Deputy Team Leader	<ol style="list-style-type: none"> 1. Shall assist the Team Leader in all matters relating to the performance of services. 2. Shall assist the Team Leader to oversee and supervise the Consultant's services 3. Assumes direct responsibility for day-to-day consulting services including day to day management of all consultants' staff during the absence of the team leader 4. Prepare of basic designs 5. Prepare detailed designs including the specifications, drawings and BOQs etc., for all the project components 6. Develop bidding documents, including bill of quantities and specifications for the water treatment plant following JICA guidelines 7. Conduct topographical, geotechnical and other surveys; 8. Formulate and use GIS base for details design works; 9. Liaise with others to ensure adequate site investigations carried out for the design of the water supply and distribution systems and for the contractor's bidding requirements 10. Liaise with other specialists to ensure a consistent philosophy and integrated approach to the design and operation of the distribution system; 11. Advise on O&M requirements such as training, human resources, etc. 12. Assist to prepare a draft and final contract agreement
Structural Specialist	<ol style="list-style-type: none"> 1. Carry out all structural designs and necessary structural drawings and specifications including BOQs for the entire project; 2. Identify the necessary soil investigations required for the structural designs and administer that work 3. Liaise with other specialists to ensure consistent philosophy and integrated approach to the design
Civil Engineer (Intake & Water Treatment Plant)	<ol style="list-style-type: none"> 1. Review structural designs 2. Assist the water supply experts in preparing the basic design of the water treatment plant including water intake facilities 3. Carry out detailed designs of the Intakes, Raw water mains, water treatment plants 4. Prepare Technical Specifications 5. Check Drawings and Bill of Quantities 6. Assist the Deputy Team Leader
Civil Engineer (Reservoirs, Pumping Stations, Towers, Transmission & Distribution)	<ol style="list-style-type: none"> 1. Review structural designs 2. Assist the water supply expert in preparing the basic design of the water treatment plant including reservoirs, pumping stations, towers transmission and distribution lines. 3. Carry out detailed designs of the Water storage reservoirs, pumping stations, Elevated towers, Transmission & distribution networks 4. Prepare Technical Specifications 5. Check Drawings and Bill of Quantities
Mechanical Engineer	<ol style="list-style-type: none"> 1. Attend to the detailed design of mechanical equipment 2. Prepare specifications, mechanical layouts and drawings;
Electrical Engineer	<ol style="list-style-type: none"> 1. Attend detailed Designs of Electrical equipment 2. Design associated PLC control system/SCADA systems 3. Prepare specifications, electrical layouts and drawings; 4. Assessment of the power requirements and establish power availability and assist NWSDB staff obtaining the requirement from CEB;

2.10.2 The Tasks of the other Experts

Environmental Specialist	<ol style="list-style-type: none"> 1. Update Environmental management Plan (EMP) 2. Prepare programs and strategies to improve / protect these catchments with short term / long term perspectives in consultation with other experts
Procurement Specialist	<ol style="list-style-type: none"> 1. Prepare pre-qualification requirements and evaluation; 2. Prepare bidding documents compliant with JICA's latest standard bidding requirements 3. Design post-qualification criteria which should comply with JICA's guidelines 4. Organize and identify with NWSDB staff in contract packaging and preparing procurement time schedules for each contract package in consultation with project staff 5. Prepare sample Evaluation Reports to ensure JICA's and GOSL requirements are satisfied 6. Assist the TEC members during evaluation
Architect	<ol style="list-style-type: none"> 1. Design environmental friendly and energy efficient building designs, for water treatment plants, waste water treatment plants, pump houses and intakes, landscaping treatment plants, towers and intake facilities 2. Provide design, specification for interior decorations including interior lighting, selecting furniture for plant offices, colour coding and painting of structures, exterior lighting etc. 3. Design necessary buffer zones and other architectural features for noise and odour control
Quantity Surveyor	<ol style="list-style-type: none"> 1. Prepare BOQs, according to CESSM code for water supply systems and SLS code for buildings 2. Prepare rated BOQs 3. Prepare work norms and material/day work schedules 4. Prepare cost estimates
Public Awareness Campaign Specialist	<ol style="list-style-type: none"> 1. Analyse the demographic characteristics of the project area such as sex, age, ethnic, occupation, income, coverage by water supply, sanitation and power supply, etc. 2. Arrange the data on health damage in the project area focusing on dental and skeletal fluorosis and chronic kidney diseases (CKD) 3. Develop the strategy including approach and methodology to extend the public awareness campaign 4. Organize the public information and education campaign teams through selecting the staff mainly from NWSDB and being reinforced by the use of external resources as required 5. Decide the assignment of respective staff in the public information and education campaign 6. Unify the campaign team through trial practice and brainstorming 7. Design, implement, and monitor the public awareness campaigns for farmers and arrange site visits to farmer organizations leaders and other relevant stake holders for inspection of water treatment plants. 8. Develop methods of mobilizing community participation in the design, management, construction, and O&M of community water supply and sanitation; 9. Conduct public awareness campaigns / seminar at the date and places as scheduled at least eight (8) times on issues related to water conservation, reduction of NRW, efficient irrigation water management practices for farmers, importance of pipe born water, water related diseases, catchment protection, preventing water pollution and sanitation in household level. 10. Improve and adjust the content of the seminar according to the people's response at the previous seminar.

	11. Prepare the report summarizing the public information and education campaign including the evaluation of the effect and recommendation for future extension of public awareness campaign.
Micro-Biologist/Chemist	<ol style="list-style-type: none"> 1. Test and recommend relevant parameters of raw water; especially with respect to the fresh water Algae/Cyanobacteria and Nutrients. 2. Advise the process design of water treatment plants during designing stage to suit the raw water qualities and to assure resource optimization including the treatment plant 3. Advise the pilot water quality testing 4. Advise preparation of sequence of operation (SOO) for the treatment plants 5. Assist in adjusting water quality and treated effluent of water treatment plants during commissioning 6. Advise on chemical dosing during commissioning stage 7. Identify and recommend the list of requirements for the Laboratory to procurement officer. 8. Prepare manual for day to day Operation & Maintaining of plants Preparation of Algae, Nutrient Control & Monitoring system 9. Training O&M staff including Chemists for trouble shooting

2.11 The Reports and Documents

Within the scope of consulting services, the Consultant shall prepare and submit reports and documents to Project Director / Project manager in charge in NWSDB as shown in Table 2.13. The Consultant shall provide electronic copy of each of these reports.

Table 2.13

Stage	Type of Report	Timing	No. of Copies
Consultancy Services	Monthly Progress Report	Every month (by the 10 th day of each month)	10
	Quarterly Progress Report	Every quarter (at every three months)	10
Pre-Design	Inception Report	Within 1 month after commencement of the services	10
	Project Definition Report	Within 3 months after commencement of the services	10
Detailed Design	Draft Design Report	Within 8 months after commencement of the services	10
	Final Design Report including drawings & Cost Estimates	Within 10 months after commencement of the services	10
Tender Assistance	Pre-Qualification Document Report	Within 5 months after commencement of the services	10
	Bidding Documents each (Draft)	At appropriate timing	15
	Bidding Documents each (Final)	At appropriate timing	20
	Pre-qualification Evaluation Report	At appropriate timing	10
	Technical Evaluation Report	At appropriate timing	10
	Tender Evaluation Report	At appropriate timing	10
Assistance in Environment	Environmental Monitoring Report	At appropriate timing	10

and Resettlement Monitoring	Land Acquisition and Resettlement Monitoring Report	During land acquisition and resettlement implementation period	10
	Environmental and Social Plan Report	At the end of the services	10

Contents to be included in each report are as follows:

a) Monthly Progress Report:

Shall briefly describe all the activities carried out and progress for the previous month. Problems encountered or anticipated will be clearly stated, together with actions to be taken or recommendations on remedial measures for correction. Also indicates the work to be performed during the coming month.

b) Quarterly Progress Report

Shall present the progress status of the Project.

c) Inception Report:

Shall present the methodologies, schedule, organizations, etc.;

d) Project Definition Report

Shall present the design criteria, Design Concepts, Key plans, Preliminary Designs, Lay outs and standards use by the consultant in detailed designs. Also indicate the Network modelling software, Surge analysis software, Structural modelling software etc.;

e) Draft Design Report

Shall present the detailed engineering design including draft detailed designs, cost estimates, procurement plan etc.; incorporating the NWSDB comments on Project Definition Report.

f) Final Design Report

Shall present the final detailed designs, final cost estimates and finalized procurement plan incorporating the NWSDB comments on Draft Design Report, provided by and the Consultant

g) Pre-qualification Document Report

Shall present the pre-qualification documents and its evaluation criteria.

h) Bidding Document Report

Shall present bidding documents and bid evaluation criteria.

i) Pre-qualification Evaluation Report

Shall present the results of the evaluation and the criteria to select the qualified applicants

j) Technical Evaluation Report

Shall present the results of technical evaluation and the criteria to recommend the qualified applicants.

k) Tender Evaluation Report

Shall present the results of the tenders and the criteria to select the most responsible contractors.

l) Environmental Monitoring Report

Shall present the environmental impacts and implementation of environmental mitigation measures during and after the construction stage. Environmental monitoring forms attached as Appendix will be filled and attached to the Report.

m) Land Acquisition and Resettlement Monitoring Report

Shall present the progress of land acquisition and resettlement implementation. RAP monitoring form attached as Appendix shall be filled and attached the Report.

n) Environmental and Social Plan Report

Shall present the EMP, EMoP and RAP prepared by the consultants.

2. Client's input and Counterpart Personnel

A certain range of arrangements and services will be provided by NWSDB to the Consultant for smooth implementation of the Consulting Services. In this context, NWSDB will:

(1) Report and data

Make available to the Consultant existing reports and data available with NWSDB related to the Projects as required.

(2) Office Space

During the pre-Design, Design and procurement assistance stages and consultants shall have their own offices with necessary equipment, furniture and utility and shall accommodate the office space for NWSDB project staff and counterpart officials. The Consultant's requirement for office space, office rental including necessary equipment, furniture and utilities, should be clearly stated in the proposal with cost for providing such facilities. Such equipment and furniture shall be handed over to employer after completion of the project.

(3) Cooperation and counterpart staff

The Client shall provide the following counterpart officials for effective implementation of the Consulting Services;

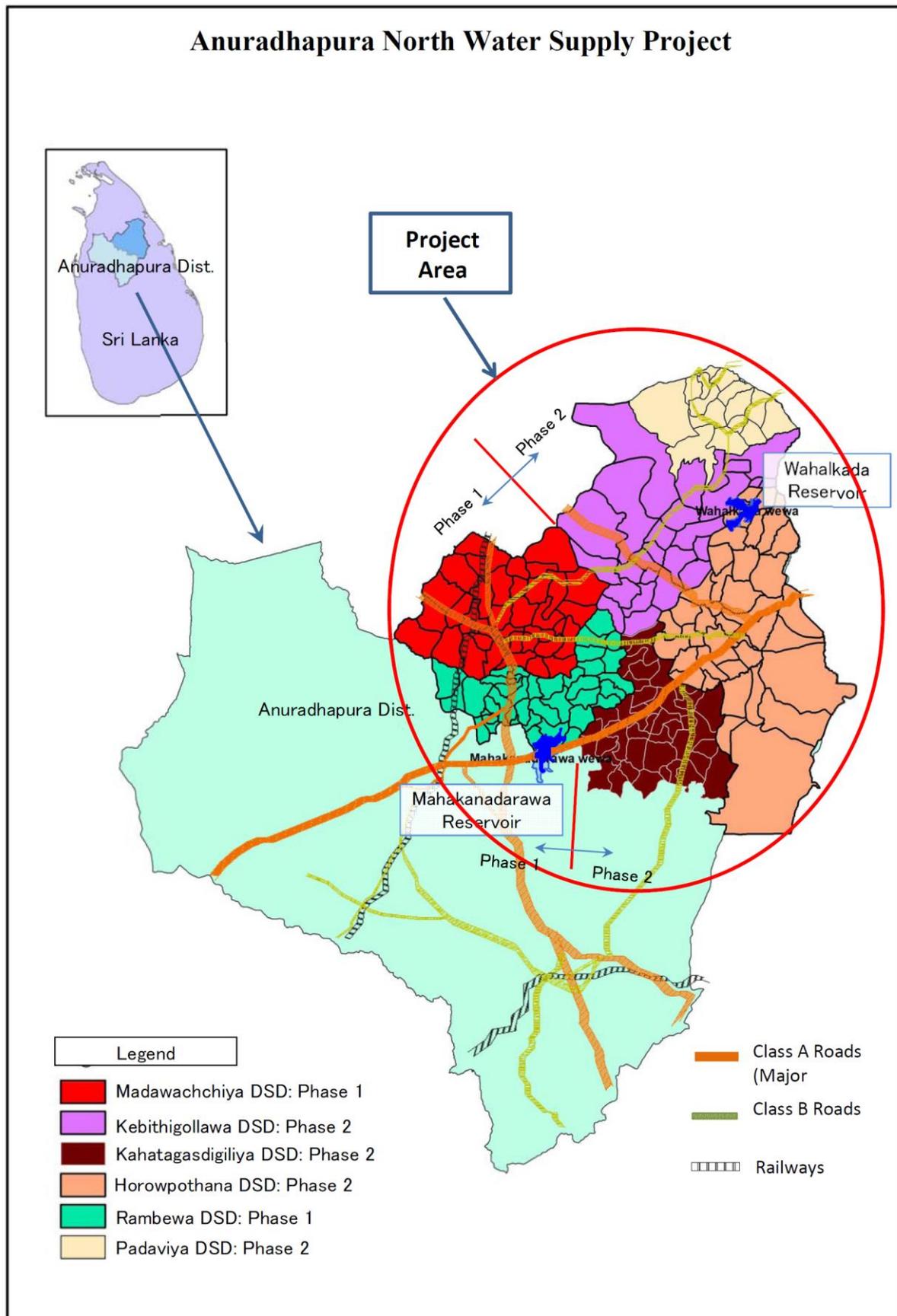
- 01 No. Engineer (civil)
- 02 01 No. Engineering Assistant (civil)

(4) Assistance and exemption

Use its best efforts to ensure that the assistance and exemption, as described in the Standard Request for Proposal issued by JICA, will be provided to the Consultant, in relation to

- Work permit and such other documents;
- Entry and exit visas, residence permits, exchange permits and such other documents
- Clearance through customs;
- Instruction and information to officials, agent and representatives of the Sri Lankan Government;
- Exemption from any requirement for registration to practice their profession;
- Privilege pursuant to the applicable law in Sri Lanka.

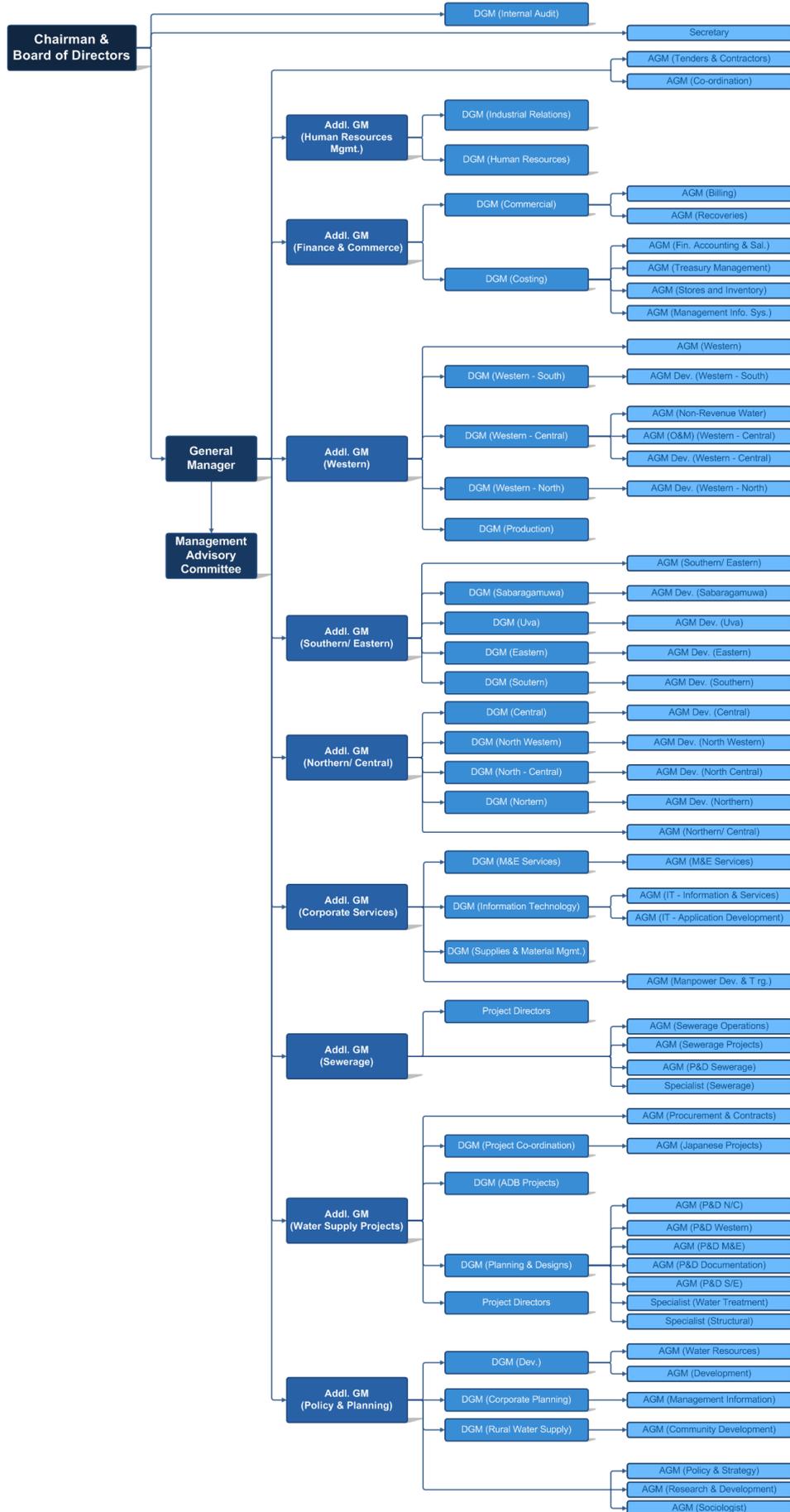
ANNEX 1. LOCATION MAP



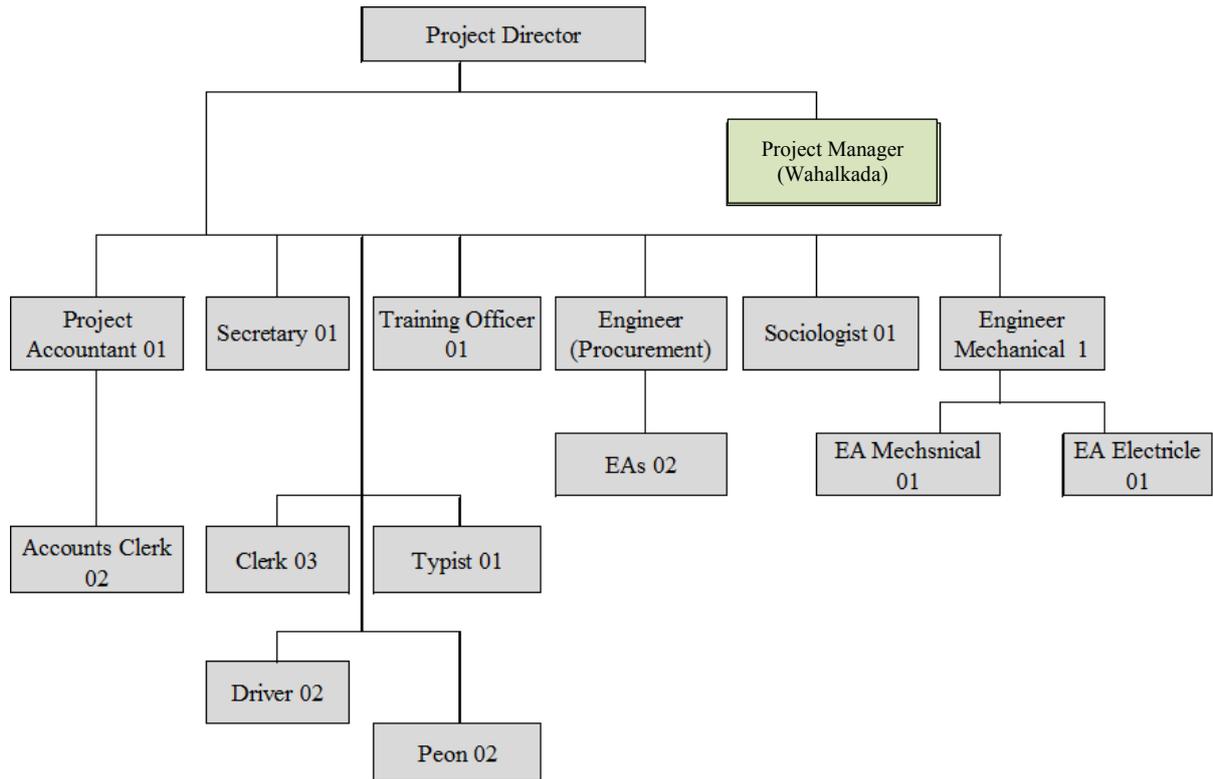
ANNEX 2. PROJECT COMPONENTS

COMPONENT ITEMS	QUANTITY
<<Lot A>> Intake, WTP, Reservoirs	
Intake	Capacity: 28,800m ³ /d
WTP	Capacity: 15,000m ³ /d
Elevated Tanks and Ground Sumps	
Elevated Tanks and reservoirs	16 nos.
same for ex-Bowser Area	5 nos.
<<Lot B>>Transmission and Distribution Pipe	
Pipe Works	
Transmission Main	126,100 m
Transmission Sub-main	24,300 m
Distribution Main	326,700 m
Bridges	1,955 m
Flowmeters	35 nos.
<<Lot C>> Distribution Sub-System	
Pipe Works	
Distribution Sub-system	330,000 m
Distribution Sub-system in ex-Bowser Area	390,740 m
<<Lot D>> Vehicles	
Vehicles	7 types 16 nos.
<<Lot E>> Heavy Duty Machines	
Heavy Duty Machines	7 types 13 nos.

ANNEX 3.1. ORGANIZATION CHART OF NWSDB



ANNEX 3.2. ORGANIZATION CHART OF PMU



ANNEX5. ESTIMATED PERSON-MONTHS FOR CONSULTING SERVICES

	Position	PM
Pro-A Foreign Staff		
1	Team Leader	18.0
2	Water Treatment Specialist	3.0
3	Civil Engineer - WTP	10.0
4	Civil Engineer - Pipelines 1	10.0
5	Civil Engineer - Pipelines 2	7.0
6	Mechanical Engineer	6.0
7	Electrical Engineer	6.0
8	Contract Specialist	3.0
9	Hydrologist	2.0
	Sub-Total A	65.0
Pro-B Local Staff		
1	Deputy Team Leader	22.0
2	Environmental Specialist	1.5
3	Geo-technical Engineer	1.5
4	Civil Engineer-1 for WTP1	10.0
5	Civil Engineer-2 for Reservoirs & Towers	10.0
6	Civil Engineer-3 for Pipelines 1	10.0
7	Civil Engineer-4 for Pipelines 2	10.0
8	Civil Engineer-5 for Pipelines 3	8.0
9	Civil Engineer-6 for Pipelines 4	8.0
10	Mechanical Engineer	2.0
11	Electrical Engineer	2.0
12	Instrumentation Engineer	3.0
13	Structural Engineer	7.0
14	Architect	7.0
15	Building Utilities Engineer	3.0
16	Chemist	2.0
17	Quantity Surveyor1	5.0
18	Procurement Specialist	5.0
19	Public Awareness campaign Expert	1.0
20	IEC Specialist	2.0
	Sub-Total B	120.0
Staff C. Project Office Support		
1	Assistant Engineer	20.0
2	Inspector/Surveyor	20.0
3	CAD Operator	68.0
4	GIS Specialist	3.0
5	Office Manager	22.0
6	Accountant	22.0
7	Clerk	22.0
8	Office Aid	22.0
	Sub-Total C	199.0
	Total	384.0

Terms of Reference (TOR)

Construction Supervisory Services for Anuradhapura North Water Supply Project Phase 2

1. The Background including the Project Summary

1.1 Background

The Government of Sri Lanka will undertake the Anuradhapura North Water Supply Project Phase 2 (the ANWSP2) with financial assistance from the Japan International Cooperation Agency (hereinafter referred to as “JICA”). Anuradhapura is located about 250km away from Colombo. The project area of ANWSP2 covers the six (6) Divisional Secretariat Divisions (DSDs) namely Kebithigollewa, Kahatagasdigiliya, Horowpothana and Padaviya for the Wahalkada Water Supply System, and Rambewa and Medawachchiya Anuradhapura District. The location map is attached as **Annex 1**. The objective of the Project is to provide safe drinking water to the area which does not have access to water supply system and to increase water supply coverage by constructing surface water systems in Anuradhapura North area where the people depend on unsafe ground water which causes dental and skeletal fluorosis, Chronic Kidney Diseases (CKD) and thereby contributing to improved hygienic status and health condition in the area.

1.2 Project Summary

The Project comprises the following sub scheme:

Wahalkada Water Supply Scheme which provides drinking water supply to the four (4) Divisional Secretariat Divisions (DSDs) namely Kebithigollewa, Kahatagasdigiliya, Horowpothana and Padaviya.

A part of Mahakanadarawa Water Supply Scheme which provides drinking water supply to the three (3) Divisional Secretariat Divisions (DSDs) namely Rambewa, a small part of Mihinthale, and Medawachchiya. Main part of Mahakanadarawa Water Supply Scheme will be constructed in the Anuradhapura North water Supply Project Phase 1 (ANWSP1). Distribution sub-systems in isolated areas in Rambewa and Medawachchiya will be included in ANWSP2.

The detail components of the Project are attached as Annex 2.

1.3 Project Implementation Arrangement

The National Water Supply and Drainage Board (NWSDB) will be the Project’s Implementing Agency. The Executing Agency will be the Ministry of City Planning and Water Supply.

Project Management Unit (PMU) has been set up in NWSDB for project implementation. The PMU is headed by the Project Director who is reporting to the Additional General manager of Water Supply Project [Addl. GM WSP] of NWSDB.

2. The Consulting Services

The consulting services shall be provided by an international consulting firm (hereinafter referred to as “The Consultant”) in association with national consultants in compliance with the Guidelines for the Employment of Consultants under Japanese ODA Loans (April 2012).

The Anuradhapura North Water Supply Project plans to be implemented under Japanese ODA loan and the Consulting Services consists of the following parts:

Construction Supervision, Safety Matter, Environmental Matters, Technology Transfer and Awareness Programmes of Wahalkada Water Supply System.

2.1 The Objectives of the Consultancy Assignment

The objective of the consulting services assignment is to achieve and ensure the quality and efficiency of the project implementation through the proper Construction supervision, Contract administration, Public awareness campaigns, and environmental matters of Wahalkada Water Supply System and the technology transfer and training for capacity building of NWSDB staff.

2.2 Funding Source for Consultancy Services

The Government of Sri Lanka intends to use part of the proceeds of the Japanese ODA Loan No. _____ for eligible payments for consulting services for which this TOR is issued.

2.3 The Scope of the Consulting Services

The Consultant shall perform his duties during the construction period in accordance with the contracts to be executed between NWSDB and the contractors (Packages A, B, C, D and E). FIDIC MDB Harmonized Edition (2010) complemented with the Specific Provisions as included in the Standard Bidding Documents under Japanese ODA Loans for Procurement of Works will be applied to the civil works of the Project. The Consultant shall function with the authorities and responsibilities of the role of Engineer's representative in case it is provided in the Contract Documents of this Project. In this context, the Consultant shall:

- a) Act as the Engineer's Representative to execute construction supervision and contract administration services in accordance with the power and authority delegated by NWSDB
- b) Review, analyse and make recommendations to the Employer concerning variations and claims which are to be ordered/issued by NWSDB;
- c) Provide recommendation to NWSDB for acceptance of the Contractor's Performance security, advance payment security and required insurances.
- d) Review and recommend for approval the proposal submitted by the contractors which include work program, method statements, material sources, manpower and equipment deployment. In light of Section 3.03 of Guidelines for the Employment of Consultants under Japanese ODA Loans (April 2012), the Consultant shall pay attention, in particular, to whether such proposals will meet the safety requirements set forth in the applicable laws and regulations, the specifications or other parts of the contract;
- e) Make no design change at site unless any unforeseen situation.
- f) Provide guidance for unforeseen matters.
- g) Review, verify and further detail the design of the works, recommend to approve the Contractor's working drawings and if necessary, issue further drawings and/or give instructions to the Contractor;
- h) Ensure that all the affected utility services are promptly relocated by the contractors.
- i) Carry out field inspections on the contractor's setting out to ensure that the works are carried out in accordance with drawings and other design details and approve the same.
- j) Direct and guide the supervising Engineering staff of the contractor to ensure adequate rate of progress and quality in the field.
- k) Regularly monitor physical and financial progress against the milestones as per the contract so as to ensure completion of contract in time;
- l) Supervise the works so that all the contractual requirements will be met by the contractors, including those in relation to i) quality of the works, ii) safety and iii) protection of the

- environment. In light of Section 3.03 of Guidelines for the Employment of Consultants under Japanese ODA Loans (April 2012), the Consultant shall confirm that the accident prevention officer proposed by the contractor is duly assigned at the project site and that construction works are carried out according to the requirements set forth in the applicable laws and regulations, the specifications or other parts of the contract;
- m) Inspect all construction materials at site, check and verify quality test reports.
 - n) Supervise field tests, sampling and laboratory tests to be carried out by the contractors;
 - o) Develop checklist and other formats for the supervisory staff.
 - p) Review and approve the bar schedules submitted by the contractors.
 - q) Inspect the construction method, equipment to be used, workmanship and quality of work at the site.
 - r) Survey and measure the work output performed by the contractors and recommend to issue payment certificates such as interim payment certificates and final payment certificate as specified in the contract;
 - s) Coordinate the works among different contractors employed for the Project;
 - t) Assist NWSDB in coordinating with the external agencies including preparation of minutes of all meetings. It is very essential to have smooth continued coordination meetings with Road Authorities, Local Authorities, Utility Agencies such as Ceylon Electricity Board and Sri Lanka Telecom Ltd., NWSDB Operation and Maintenance (O&M) Section, etc.
 - u) Conduct weekly progress meeting, preparation of minutes and reporting. This shall include critical review and advise on timely execution of Contractor's detail work programmes, machinery and manpower inputs, etc., and identification and advising on removal of hindrances and obstacles to smooth execution of the programmes.
 - v) Carry out timely reporting to NWSDB for any inconsistency in executing the works and suggest appropriate corrective measures to be applied;
 - w) Inspect, verify and determine claims issued by NWSDB in accordance with the civil works contract;
 - x) Perform the inspection of the works and recommend to issue certificates such as the Taking-Over Certificates, Performance Certificate as specified in the civil works and contract;
 - y) Supervise commissioning and carry out testing during commissioning;
 - z) Provide periodic and/or continuous inspection services during defects liability period and if any defects are noted, recommend to instruct the contractor to rectify;
 - aa) Check and recommend to certify as-built drawings for the parts of the works designed by the contractors, if any: Prepare and submit an operation and maintenance manual for the facilities constructed in the Project; and Prepare and submit reports to NWSDB, which are detailed in Clause 2.13 of the TOR in relation to the implementation of the Project.
 - bb) Prepare an efficient and effective strategy to provide water service connections to individual consumers during the construction period itself;
 - cc) Ensure a set up for better NRW management and maintenance;
 - dd) Conduct training program for O&M staff during WTP commissioning;
 - ee) Prepare an asset registry,
 - ff) Assist to obtain approval from other organizations such as RDA, PRDA, Pradeshiya Saba, etc.,
 - gg) Evaluation and recommendation for approval of time extension claims, etc.,
 - hh) Coordination of works among the contractors engaged in the project including organizing, conducting and preparation of minutes for progress meetings, design review meetings and preparation of progress reports.
 - ii) Assist the Engineer in preparation of cash flow statements & disbursement schedules
 - jj) All possible claims that may arise, for which notices given or not, should be identified in advance and action shall be taken to maintain detail contemporary records, as are reasonable and may be material to the claim, with the Consultant and the Contractor together with necessary signatures, etc.

2.4 Safety Measures

The Consultant shall;

- a) Review the safety plans submitted by the bidders from the point of view of securing the safety during the construction (Refer to Paragraph (2), Section 4.02 Scope of the Project and of the Consulting Services of the Guidelines for the Employment of Consultants under Japanese ODA Loans, April 2012).
- b) Review the Programme submitted by the contractors from the point of view of securing the safety during the construction and requires them to submit further details, if necessary.
- c) Confirm that an accident prevention officer proposed by the contractor is duly assigned at the project site during the supervision of the construction works and ensure the work is carried out according to the safety plan as well as the safety measures prescribed in the Programme. If consultants recognize any questions regarding the safety measures in general including the ones mentioned above, the consultants shall require the contractors to make appropriate improvements.
- d) Supervise the contractor to implement an HIV-AIDS awareness programme of the contractor certainly.

2.5 Facilitation of Implementation of Environmental Monitoring Plan (EMoP) and Resettlement Action Plan (RAP)

The Consultant shall;

- a) Supervise EMP implementation and undertake regular compliance monitoring to ensure that the civil works are implemented in accordance with the EMP; and
- b) Assist NWSDB staff on environmental management through on-the-job training on environmental assessment techniques, mitigation measure planning, supervision and monitoring and reporting.
- c) Further, when it becomes necessary, update and/or prepare RAP in accordance with the related JICA's guidelines as necessary based on detailed design in accordance with the agreed resettlement framework, including entitlement matrix and compensation plan, coordinate with various agencies in preparing the procedures for timely land acquisition and disbursement of compensation to affected persons; and
- d) Update EMP and EMoP with the related JICA's guidelines, when it becomes necessary.

2.6 Technology Transfer

The Consultant shall carry out the technology transfer as an important aspect in design, construction supervision and O&M works. The Consultant shall provide the opportunity to NWSDB offices and staffs to be involved in the working team of the Consultant during the supervision works for their capacity building wherever possible. If requested by NWSDB, the Consultant shall brief and demonstrate the construction supervision and contract management process and procedures. The consultant shall assist NWSDB and its staff to build their capacity as part of on-the-job training under the Project.

2.7 Training for Capacity Development of NWSDB's Staff

The objectives of capacity building and development are twofold. First is to enhance the capacity/ability of the RSC (NC) to perform the activities related to the operation and maintenance of the newly constructed facilities. Second is to enhance the existing skills of key staff, as well as identified group(s) of personnel with the competencies required to manage, operate and maintain the new facilities/system thereby transforming organizational and individual potentials into actuality.

The Consultant shall:

- a) Conceptualize and develop the five-year RSC(NC) Training Plan for implementation by the proposed Training Unit of the regional support centre;
- b) Develop the training modules, materials and manuals for the following training programme/courses:
 - The technical courses:
 - i) Project management;
 - ii) Water Treatment Plant Operations and Maintenance;
 - iii) Network Designs
 - The non-technical courses:
 - i) Human Resources Management (focus on Training and Development);
 - ii) Public Information, Education and Communication;
 - iii) Trainer's Training
- c) Use new technical software for design and construction of water supply systems and train the NWSDB staff for the above and all software should be handed over to NWSDB; and
- d) Conduct the actual training for the identified training programmes (as enumerated) for the concerned / identified personnel of the RSC (NC) of NWSDB following the training needs analysis.

2.8 Guidance for Public Awareness Campaign

The purpose of public awareness campaign is to inform and educate the general public of the present situation of health damage in the project area caused by use of groundwater, the objectives of the proposed project, the importance of connection to a proposed water supply system under the project and payment of water tariff for sustainable operation and management of water supply facilities.

The Consultant shall:

- a) Arrange the data on health damage in the project area focusing on dental and skeletal fluorosis and Chronic Kidney Diseases (CKD),
- b) Analyse the demographic characteristics of the project area such as sex, age, ethnic, religion, occupation, income, coverage by water supply, sanitation and power supply, etc.,
- c) Develop the strategy including approach and methodology to extend the Public Awareness Campaign which shall be prepared with considerations on gender and poverty to attain the well attendance of them.
- d) Organize the public information and education campaign teams through selecting the staff mainly from NWSDB and being reinforced by the use of external resources as required,
- e) Decide the assignment of respective staff in the public information and educational campaign,
- f) Unify the campaign team through trial practice and brainstorming,
- g) Hold the seminar/public information campaign at the date and place as scheduled at least twelve (12) times,
- h) Improve & adjust the content of the seminar according to the people's response at the previous seminar,
- i) Prepare the report summarizing the public information and education campaign including the evaluation of the effect and recommendation for future extension of public awareness campaign, and
- j) Raise awareness of farmers on water management.

2.9 Nature of and limit to the responsibilities, which the Consultant is to undergo

The Consultant shall perform the Services and carry out their obligations hereunder with all due diligence, efficiency and economy, in accordance with generally accepted professional techniques and practices, and shall observe sound management practices, and deploy appropriate advance technology and safe and affectivity equipment, machinery, materials, computer software and methods. The Consultants shall always act, in respect of any matter relating to this Contract or to the Services, as faithful advisers to the Employer, and shall at all times support and safeguard the Employer's legitimate interests in any dealings with sub consultants or third parties.

The Consultants shall obtain the Employer's prior approval in writing before taking any of the following actions:

- a) Appointing such members of the personnel as listed in **Section 2.11** merely by title but not by name;
- b) Entering into a sub contract for the performance of any part of services, it being understood (a) that the selection of sub consultant and the terms and conditions of the sub contract shall have been approved in writing by the Employer prior to the execution of the sub contract, and (b) that the consultants shall remain fully liable for the performance of the services by the sub consultants and its personnel pursuant to this contract.
- c) Any variation of the scope of the Consultancy Service
- d) Any variation orders to the Contractor during Contract execution

In the process, it is necessary that detail diary extracts (including those of expatriate staff) are submitted to the Project Management Unit (PMU). Also during the construction stage, it is necessary that the Consultant's staff is available for supervision during Saturdays.

2.10 The Man Month Schedule and Expected Time Schedule

The team shall comprise Professional international consultants having allocated 42.5 person-months and Professional local consultants having allocated 256.0 person-months maximum. The consultants will be engaged over 47 months duration of consulting services, including Defect Liability Period. Refer to **Annex 3** for proposed Implementation Schedule.

All necessary Technical and Administrative supporting staff (having allocated 357.0 person-months) should be provided by the consultant by referring to **Annex 4**.

It is the Consultant's responsibility to select the optimum team and to propose the professionals which he believes best meets the needs of NWSDB without exceeding total person months proposed for each category.

2.11 Qualification and Expertise Required and Detailed Scope of Works for Experts

Key Experts (International)

Position	Qualification	Experience
Team Leader	Professionally Qualified Civil Engineer and Graduate (B.Sc.) in Civil Engineering/ construction or PE management and Masters/or PE Qualification in a relevant field and Should be a member of recognized professional Institution.	<p><u>Total Experience</u> At least 20 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 15 years' experience out of which 10 years' experience in Water Supply projects including; <ol style="list-style-type: none"> a) Design b) Project Management c) Contract Management of major projects with ICB contracts • At least ten years' experience in similar water supply Projects as a Team Leader of a project more than 25 million US\$.
Water Treatment Expert	Professionally Qualified Civil Engineer and Graduate (B.Sc.) in Civil Engineering and Masters/or PE Qualification in a relevant field and Should be a member of recognized professional Institution.	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 8 years' experience in design of water treatment plants and at least 3 years' experience in Operation and Maintenance of Water Supply Facilities • Experience as a water treatment specialist in at least two urban water supply projects of which each having water treatment plants of capacity at least 20,000 m³/day.
Civil Engineer (Water Transmission)	Professionally Qualified Civil Engineer and Graduate (B.Sc.) in Water Supply/ Sanitation/Civil Engineering and related field and Should be a member of recognized professional Institution.	<p><u>Total Experience</u> At least 15 years' experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 10 years' experience in design/ operation and maintenance of Water Supply transmission Facilities including minimum 8 years' experience in water supply design. • Experience as a Civil Engineer in at least two urban water supply projects of which each having more than 200 km transmission/distribution system. • Experience in ICB contract is desirable.

Position	Qualification	Experience
Mechanical Engineer	Professionally Qualified Mechanical Engineer Graduate (B.Sc.) in Mechanical Engineering and related field Should be a member of recognized professional Institution.	<p><u>Total Experience</u> At least 15 years</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> •At least 7 years' experience in design/ operation and maintenance of Water Supply Facilities and related field •Experience as a Mechanical Engineer in four urban water supply projects of which each contract amount is more than 5 million US\$. •Experience in ICB contract is desirable -two urban water supply projects
Electrical Engineer	Professionally .Qualified Electrical Engineer Graduate (B.Sc.) in Electrical Engineering and related field and Should be a member of recognized professional Institution.	<p><u>Total Experience</u> At least 15 years</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> •At least 7 years' experience in design/ operation and maintenance of Water Supply Facilities and related field •Experience as an Electrical Engineer in four urban water supply projects of which each contract amount is 5 million US\$. • Experience in ICB contract -two urban water supply projects

Key Experts (Local)

Position	Qualification	Experience
Deputy Team Leader	Chartered Civil Engineer and Graduate (B.Sc.) or equivalent in Civil Engineering/ and Masters Qualification in a relevant field.	<p><u>Total Experience</u> At least 20 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 15 years' experience combined experience in Water Supply projects including; <ul style="list-style-type: none"> (i) Design (ii) Project Management (iii) Contract Management of major projects with ICB contracts • At least 5 years' experience in similar water supply Projects as a Deputy Team Leader of a project more than 15 million US\$
Structural Specialist	Chartered Civil Engineer and Graduate (B.Sc.) or equivalent in Civil Engineering and Masters Qualification in Structural Engineering	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 10 years' experience in design/ operation and maintenance of Water Supply Facilities • Experience as a structural specialist in at least two urban water supply projects of which each contract amount is more than 10 million US\$
Civil Engineer (Intake & Water Treatment Plant)	Chartered Civil Engineer and Graduate (B.Sc.) or equivalent in and Masters Qualification in Water Supply Engineering /Environmental Engineering	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 10 years' experience in design/ operation and maintenance of Water Supply Facilities • Experience as a Civil Engineer in two urban water supply projects of which each contract amount is more than 5 million US\$. • Experience in ICB contract is desirable

Position	Qualification	Experience
Civil Engineer (Reservoirs, Pumping Stations, Towers, Transmission & Distribution)	Chartered Civil Engineer and Graduate (B.Sc.) or equivalent in Water Supply/ Sanitation/Civil Engineering and related field	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 10 years' experience in design/ operation and maintenance of Water Supply transmission Facilities • Experience as a civil Engineer in two urban water supply projects of which each contract amount is more than 5 million US\$. • Experience in ICB contract is desirable.
Mechanical Engineer	Mechanical Engineer Graduate (B.Sc.) or equivalent in Mechanical Engineering and related field	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 7 years' experience in design/ operation and maintenance of Water Supply Facilities and related field • Experience as a Mechanical Engineer in four urban water supply projects of which each contract amount is more than 5 million US\$ • Experience in ICB contract is desirable -two urban water supply projects
Electrical Engineer	Electrical Engineer Graduate (B.Sc.) or equivalent in Electrical Engineering and related field	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 7 years' experience in design/ operation and maintenance of Water Supply Facilities and related field • Experience as an Electrical Engineer in four urban water supply projects of which each contract amount is 5 million US\$. • Experience in ICB contract -two urban water supply projects

Other Experts (Local)

Position	Qualification	Experience
Procurement Specialist	Graduate in Civil Engineering (B.Sc.) or equivalent and Masters Qualification in project management and Diploma in Procurement and construction claims	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 7 years' experience as a Procurement Specialist • Experience in two urban water supply projects of which each having ICB contract more than 10 million US\$. • Experience in JICA projects is
Environmental Specialist	Bachelor degree in Engineering/environmental science/Agriculture	<p><u>Total Experience</u> At least 15 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • Not less than 6 years' experience in environmental Assessments with reference to water pollution, waste water, sanitation, and the impact of construction works and at least two years' experience with a recognized consulting firm/National water utility Organization
Public Awareness Campaign Specialist	Bachelor degree in Social Science	<p><u>Total Experience</u> At least 10 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 2 years' experience with a recognized consulting firm /National water utility Organization • Having experience in conducting Public awareness campaigns
IEC Specialist	Bachelor degree in Social Science	<p><u>Total Experience</u> At least 10 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> • At least 2 years' experience with a recognized consulting firm /National water utility Organization • Having experience in conducting Public awareness campaigns

Architect	Professionally qualified graduate Architect and should be a member of recognized professional institution	<p><u>Total Experience</u></p> <ul style="list-style-type: none"> At least 10 years after graduation experience <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> Not less than 5 years' experience in architectural buildings and industrial/ water or wastewater treatment plant plans, familiar with green building techniques & practice on energy efficient buildings and at least 2 years' experience with a recognized consulting firm
Quantity Surveyor	Professionally qualified Quantity Surveyor with Bachelor degree or equivalent in Quantity surveying and should be a member of recognized professional institution	<p><u>Total Experience:</u></p> <p>At least 10 years after graduation experience</p> <p><u>Project Related Experience:</u></p> <ul style="list-style-type: none"> At least 2 years' experience in water treatment plant estimates with a recognized consulting firm//National water utility Organization <p>Note: An input of 8 man months of a Quantity Surveyor (local) shall be allocated exclusively for the use of Planning & Design Section in Head Office.</p>
Micro-Biologist/ Chemist	A graduate in the relevant field with a Master Degree in Micro- Biology/ Chemistry/ Limnology	<p><u>Total Experience:</u></p> <p>At least 10 years after graduation experience</p> <p><u>Project Related Experience</u></p> <ul style="list-style-type: none"> Not less than 10 years' experience in the drinking water sector specially in enumeration of Algae and other constituents/species in impounded water bodies with emphasis on Algae & Cynobacteria control and at least five years in recognized consulting firm

2.12 Task of the Experts

2.12.1 The Tasks of the Key Experts

International Experts

The specific tasks include, but not limited to;

Position	Main Tasks
Team Leader	<ol style="list-style-type: none"> 1. Shall bear the overall responsibility and shall represents the project Consultant's Team in all matters relating to the performance of services, coordinating with all other consultant's staff to deliver excellent product during the stipulated time schedule. 2. Shall oversee and Supervise the Consultant's services 3. Assume direct responsibility for day-to-day consulting services including day to day management of all consultants' staff and coordination among and with them. 4. Review existing studies/documents and other resources available and formulate a best implementation approach including programmatic project schedule; 5. Contract management and administration; 6. Develop and implement quality assurance programme; 7. Recommend contract payments; 8. Review, analyse and make recommendations to the Employer concerning variations and claims which are to be ordered/issued by NWSDB; 9. Recommend to issue the commencement order to the Contractors; 10. Evaluation of time extension claims and make recommendations 11. Provide recommendation to NWSDB for acceptance of the Contractor's Performance security, advance payment security and required insurances. 12. Explain and/or adjust ambiguities and/or discrepancies in the Contract Documents and recommend to issue any necessary clarifications or instructions; 13. Review, verify and further detail the design of the works, recommend to approve the Contractors' working drawings and if necessary, issue further drawings and/or give instructions to the Contractor; 14. Review and recommend to approve the proposals submitted by the contractors 15. Make necessary design changes and amendments at site 16. Provide guidance for unforeseen matters. 17. Progress reporting 18. Prepare necessary documentation to obtain approval from all concerned authorities such as local authorities, Provincial Road Authority, Road Development Authority, Ceylon Electricity Board, Central Environmental Authority, Telecom, Police or any other related institutions for laying pipes and construction of other structures; 19. Present designs, Progress of works at agreed time schedules and milestones to NWSDB staff and other stakeholders including arranging of field trips if necessary 20. Briefly present and demonstrate the studies, surveys, design procedures, treatment process, conceptual designs, detailed designs, and contract management process and procedures to NWSDB staff 21. Prepare Asset registry; 22. Prepare institutional arrangement for O&M; 23. Prepare training programmes for NWSDB designs, construction supervision and O&M staff and organize and conduct the training. 24. Certify all the drawings, BOQs, Cost Estimates and specifications 25. Ensure the safety conditions at work sites 26. Supervise commissioning and carry out testing during commissioning;

27. Review O&M manuals
28. Develop a course module on project management including project coordination, contract administration, over-all supervision over the implementation of the project and conduct 3 days Project Management Training Course for the NWSDB project staff
29. Conduct training needs analysis for RSC-NC as the basis for the training plan and arrange to conduct the identified training programmes (as enumerated) for the concerned/identified personnel of the RSC-NC of NWSDB following the training needs analysis.

Water
Treatment
Expert

1. Assure resource optimization including the treatment plant waste treatment and re-cycling
2. Advise on the degree of Automation and controlling required for the optimum performance of the WTP and distribution systems in collaborations with Electrical and Mechanical Engineers.
3. Advise on preparations of Sequence of Operation (SOO) for the treatment plants
4. Supervise commissioning of WTP and carry out testing and adjusting water quality of WTP during commissioning
5. Advise on chemical dosing during commissioning stage.
6. Preparing manuals for day to day operation & maintaining of plants
7. Training O&M staff for trouble shooting
8. Guiding O&M staff on preventive maintenance
9. Give directions to the local consulting engineers attending the detailed designs of the water treatment plant and water intake facilities
10. Develop a course module on water production & Treatment Training and treatment plant Operation & Maintenance for NWSDB(RSC-NC) Staff

Mechanical
Engineer

1. Check the shop drawings submitted by the contractors
2. Assess the substitution of products proposed by the contracts
3. Assist during the commissioning of project components
4. Assist Team Leader for preparation of O&M manuals
5. Direct the local Mechanical Engineers in their day-to-day activities
6. Supervise the installation works of mechanical equipment
7. Attend the trial operation of mechanical equipment
8. Check the performance of an instrumentation system.
9. Support the O&M training

Electrical
Engineer

1. Assess the power requirements and establish power availability and assist NWSDB staff obtaining the requirement from CEB;
2. Assist during commission of project components
3. Assist Team Leader for preparation of O&M manuals
4. Direct the local Electrical Engineers in their day to day activities
5. Check the shop drawings submitted by the contractors
6. Assess the substitution of products proposed by the contractors
7. Supervise the installation work of Electrical equipment
8. Attend the trial operations of Electro-mechanical equipment
9. Check all the performance of an instrumentation system
10. Support the O&M training

Local Experts

Position	Main Tasks
Deputy Team Leader	<ol style="list-style-type: none"> 1. Shall assist the Team Leader in all matters relating to the performance of services. 2. Shall assist the Team Leader to oversee and supervise the Consultant's services 3. Assumes direct responsibility for day-to-day consulting services including day to day management of all consultants' staff during the absence of the team leader 4. Ensure site safety requirements 5. Conduct weekly progress meetings at sites, preparation of minutes and reporting. This shall include critical review and advice on timely execution of Contractor's detail work programmes, machinery and manpower inputs etc., and identification and advising on removal of hindrances and obstacles to smooth execution of the programmes. 6. Inspect all construction material at site, check and verify quality test reports. 7. Supervise field test, sampling and laboratory test to be carried out by the contractors; 8. Develop checklist & other formats for the supervisory staff (NWSDB staff) 9. Review and approve the bas schedules submitted by the contractors. 10. Inspect the construction method, equipment to be used workmanship at the sites 11. Ensure Quality assurance and control of plant, materials and workmanships at the sites. 12. Supervise the commissioning and carry out testing during commission; 13. Prepare O&M manuals and construction record drawings (As Built Drawings) 14. Prepare an efficient and effective strategy to provide water service connections to individual consumers during the construction period itself 15. Ensure a set up for better NRW management and maintenance 16. Provide periodic and/or continuous inspection of services during defects liability period and if any defects are noted, recommend to instruct to contractor to rectify;
Structural Specialist	<ol style="list-style-type: none"> 1. Identify the necessary soil investigations required for the structural designs and administer such work 2. Liaise with other specialists to ensure consistent philosophy and integrated approach to the design 3. Provide necessary advises to carry out all construction works in order to comply with the design codes

Position	Main Tasks
Civil Engineer (Intake & Water Treatment Plant)	<ol style="list-style-type: none"> 1. Assist the Deputy Team Leader in contract supervision of the water treatment plants including water intake facilities 2. Assist the Deputy Team Leader in inspection all construction materials at site, check and verify quality test reports of the water treatment including water intake facilities. 3. Assist the Deputy team leader in supervise field tests, sampling and laboratory test to be carried out by the contractors of the water treatment plant including water intake facilities; 4. Assist the Deputy Team Leader in developing a checklist & other formats for the supervisory staff. (NWSDB Staff) of the water treatment plant including water intake facilities; 5. Assist the Deputy Team Leader in reviewing and approving the bar schedules submitted by the contractors of the water treatment plant including water intake facilities; 6. Assist the Deputy Team Leader in inspecting the construction method, equipment to be used, workmanship at the sites of the water treatment plant including water intake facilities; 7. Assist the Deputy Team Leader in quality assurance and control of plant, materials and workmanship at sites of the water treatment plant including water intake facilities; 8. Assist the Deputy Team Leader in supervising the commissioning and carrying out of testing during commissioning of the water treatment plant including water intake facilities;
Civil Engineer (Reservoirs, Pumping Stations, Towers, Transmission & Distribution)	<ol style="list-style-type: none"> 1. Assist the Deputy Team Leader in contract supervision of the Reservoirs, PS, Towers Transmission & Distribution System; 2. Assist the Deputy Team Leader in inspecting all construction materials, at site; check and verify quality test reports of Reservoirs, PS, Towers Transmission & Distribution System; 3. Assist the Deputy Team Leader in supervising field tests, sampling and laboratory test to be carried out by the contractors of the Reservoirs, PS, Tower Transmission & Distribution System; 4. Assist the Deputy Team Leader in developing a checklist & other formats for the supervisory staff (NWSDB staff) of the Reservoirs, PS, Tower Transmission & Distribution System; 5. Assist the Deputy Team Leader in reviewing and approving the bar schedules submitted by the contractors of Reservoirs, PS, Tower Transmission & Distribution System; 6. Assist the Deputy Team Leader in inspecting the construction method, equipment to be used, workmanship at the sites of the Reservoirs, PS, Tower Transmission & Distribution System; 7. Assist the Deputy Team Leader in quality assurance and control of plant, materials and workmanship at sites of the Reservoirs, PS, Tower Transmission & Distribution System; 8. Assist the Deputy Team Leader in supervising the commissioning and carry out testing during commissioning of the Reservoirs, PS, Tower Transmission & Distribution System;
Mechanical Engineer	<ol style="list-style-type: none"> 1. Check the shop drawings submitted by the contractors 2. Assess the substitution of products proposed by the contractors 3. Supervise the installation work of mechanical equipment 4. Attend the trial operations and testing's of mechanical equipment 5. Support the O&M training
Electrical Engineer	<ol style="list-style-type: none"> 1. Check the shop drawings submitted by the contractors 2. Assessment of the power requirements and establish power availability and assist NWSDB staff obtaining the requirement from CEB; 3. Assist during commissioning of project components

Position	Main Tasks
	4. Assist Team Leader for preparation of O&M manuals
	5. Assess the substitution of products proposed by the contractors
	6. Supervise the installation work of Electrical equipment
	7. Attend the trial operation of Electro-mechanical equipment
	8. Check the performance of a instrumentation system
	9. Support the O&M training

2.12.2 The Tasks of the other Experts

Position	Main Tasks
Environmental Specialist	<ol style="list-style-type: none"> 1. Update Environmental management Plan (EMP) 2. Prepare programs and strategies to improve/protect these catchments with short term/long term perspectives in consultation with other experts
Procurement Specialist	<ol style="list-style-type: none"> 1. Prepare pre-qualification requirements and evaluation; 2. Prepare bidding documents compliant with JICA's latest standard bidding requirements 3. Design post-qualification criteria which should comply with JICA's guidelines 4. Organize and identify with NWSDB staff in contract packaging and preparing procurement time schedules for each contract package in consultation with project staff 5. Prepare sample Evaluation Reports to ensure JICA's and GOSL requirements are satisfied 6. Assist the TEC members during evaluation
Architect	<ol style="list-style-type: none"> 1. Supervise and confirm that all water treatment plants, waste water treatment plants, pump houses and intakes, landscaping treatment plants, towers and intake facilities shall be constructed as per specifications. 2. Supervise the contractor to follow the specification for interior decorations including interior lighting, selecting furniture for plant offices, colour coding and painting of structures, exterior lighting etc. 3. Design necessary buffer zones and other architectural features for noise and odour control
Quantity Surveyor	<ol style="list-style-type: none"> 1. Confirmation of work norms and material/day work schedule 2. Checking relevant documents for contractors' claims and variations 3. Prepare of cost estimates
Public Awareness Campaign Specialist	<ol style="list-style-type: none"> 1. Analyse the demographic characteristics of the project area such as sex, age, ethnic, occupation, income, coverage by water supply, sanitation and power supply, etc. 2. Arrange the data on health damage in the project area focusing on dental and skeletal fluorosis and chronic kidney diseases (CKD) 3. Develop the strategy including approach and methodology to extend the public awareness campaign 4. Organize the public information and education campaign teams through selecting the staff mainly from NWSB and being reinforced by the use of external resources as required 5. Decide the assignment of respective staff in the public information and education campaign 6. Unify the campaign team through trial practice and brainstorming 7. Design, implement, and monitor the public awareness campaigns for farmers and arrange site visits to farmer organizations leaders and other relevant stake holders for inspection of water treatment plants. 8. Develop methods of mobilizing community participation in the design, management, construction, and O&M of community water supply and sanitation; 9. Conduct public awareness campaigns / seminar at the date and places as scheduled at least twelve (12) times on issues related to water conservation,

Position	Main Tasks
Micro-Biologist/Chemist	<p>reduction of NRW, efficient irrigation water management practices for farmers, importance of pipe born water, water related diseases, catchment protection, preventing water pollution and sanitation in household level.</p> <ol style="list-style-type: none"> 10. Improve and adjust the content of the seminar according to the people's response at the previous seminar. 11. Prepare the report summarizing the public information and education campaign including the evaluation of the effect and recommendation for future extension of public awareness campaign. 1. Advise on the pilot water quality testing 2. Advise preparation of sequence of operation (SOO) for the treatment plants 3. Assist in adjusting water quality and treated effluent of water treatment plants during commissioning 4. Advise on chemical dosing during commissioning stage 5. Identify and recommend the list of requirements for the Laboratory to procurement officer. 6. Prepare manual for day to day Operation & Maintaining of plants Preparation of Algae, Nutrient Control & Monitoring system 7. Training O&M staff including Chemists for trouble shooting

2.13 The Reports and Documents

Within the scope of consulting supervisory services, the Consultant shall prepare and submit reports and documents to Project Director/Project Manager in charge in NWSDB as shown in Table 2.13. The Consultant shall provide electronic copy of each of these reports.

Table 2.13 Reports and Documents

Stage	Type of Report	Timing	No. of Copies
Consultancy Services	Monthly Progress Report	Every month (by the 10 th day of next month)	10
Construction Supervision	Operation and maintenance Manual	One month after the commissioning of the plant	10
	Construction Completion Report (and As-Built drawing, if any)	Within 1 month after completion of Commissioning	10
	Project Completion Report (for submission to JICA)	At the end of the services	10
Training	Training Plan	At appropriate timing in accordance with the Inception Report	10
	Training Execution and Evaluation Report	Within 1 month after training	10
Other Report	Technical Report	As required or upon request	As required

Contents to be included in each report are as follows:

- a) Monthly Progress Report:
Shall briefly describe all the activities carried out and progress for the previous month. Problems encountered or anticipated will be clearly stated, together with actions to be taken or recommendations on remedial measures for correction. Also indicates the work to be performed during the coming month.
- b) Operation and Maintenance Manual:
Shall contain technical procedures for the appropriate operation and maintenance of all project facilities
- c) Construction Completion Report:
Shall comprise full size As-Built drawings for all the structures and facilities completed in a format appropriate to the Employer, and the final details of the construction completed together with all data, records material tests results, field books
- d) Project Completion Report (for Submission to JICA):
Shall comprise a full report of the project according to JICA requirements

3. Client's input and Counterpart Personnel

A certain range of arrangements and services will be provided by NWSDB to the Consultant for smooth implementation of the Consulting Services. In this context, NWSDB will:

(1) Report and data

Make available to the Consultant existing reports and data available with NWSDB related to the Project as required.

(2) Office Space

During the construction stage, the consultants shall have their own offices with necessary equipment, furniture and utility and shall accommodate the office space for NWSDB project staff and counterpart officials. The Consultant's requirement for

office space, office rental including necessary equipment, furniture and utilities, should be clearly stated in the proposal with cost for providing such facilities. Such equipment and furniture shall be handed over to employer after completion of the project.

(3) Cooperation and counterpart staff

The Client shall provide the following counterpart officials for effective implementation of the Consulting Services:

01 No. Engineer (civil)

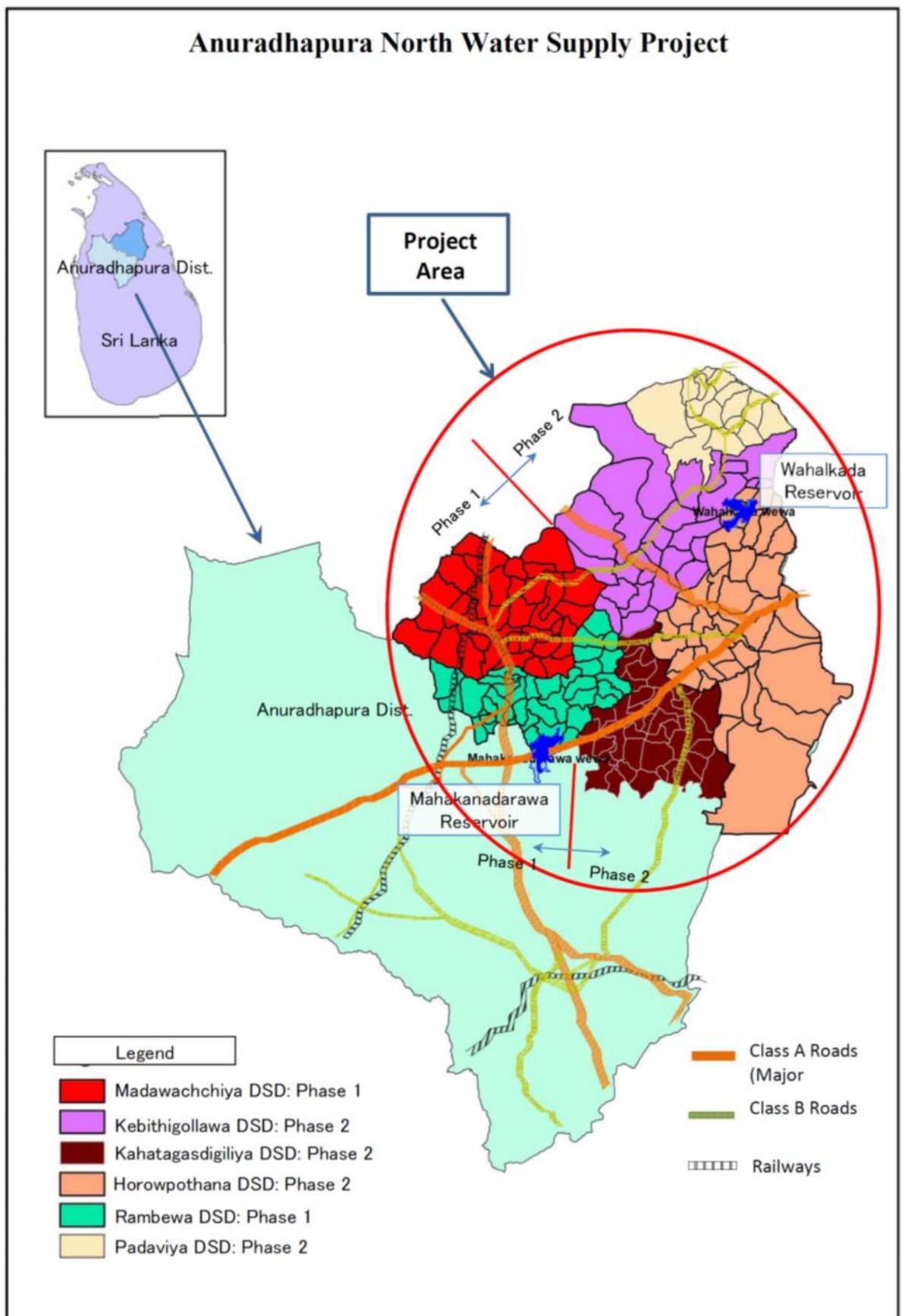
01 No. Engineering Assistant (civil)

(4) Assistance and exemption

Use its best efforts to ensure that the assistance and exemption, as described in the Standard Request for Proposal issued by JICA, will be provided to the Consultant, in relation to

- Work permit and such other documents;
- Entry and exit visas, residence permits, exchange permits and such other documents
- Clearance through customs;
- Instruction and information to officials, agent and representatives of the Sri Lankan Government;
- Exemption from any requirement for registration to practice their profession;
- Privilege pursuant to the applicable law in Sri Lanka.

ANNEX 1. LOCATION MAP



ANNEX 2. PROJECT COMPONENTS

COMPONENT ITEMS	QUANTITY
<<Lot A>> Intake, WTP, Reservoirs	
Intake	Capacity: 28,800m ³ /d
WTP	Capacity: 15,000m ³ /d
Elevated Tanks and Ground Sumps	
Elevated Tanks and Reservoirs	16 nos.
same for Isolated Area	5 nos.
<<Lot B>>Transmission and Distribution Pipe	
Pipe Works	
Transmission Main	126,100 m
Transmission Sub-main	24,300 m
Distribution Main	326,700 m
Pipe Bridges	1,955 m
Flowmeters	35 nos.
<<Lot C>> Distribution Sub-System	
Pipe Works	
Distribution Sub-systems	330,000 m
Distribution Sub-systems in Isolated Areas	390,740 m
<<Lot D>> Vehicles	
Vehicles	7 types 16 nos.
<<Lot E>> Heavy Duty Machines	
Heavy Duty Machines	7 types 13 nos.

ANNEX 4. ESTIMATED PERSON-MONTHS FOR CONSULTING SERVICES

	Position	PM
Pro-A Foreign Staff		
1	Team Leader	33.0
2	Water Treatment Specialist	2.5
3	Civil Engineer - WTP	0.0
4	Civil Engineer - Pipelines 1	0.0
5	Civil Engineer - Pipelines 2	0.0
6	Mechanical Engineer	3.5
7	Electrical Engineer	3.5
8	Contract Specialist	0.0
9	Hydrologist	0.0
	Sub-Total A	42.5
Pro-B Local Staff		
1	Deputy Team Leader	36.0
2	Environmental Specialist	3.5
3	Geo-technical Engineer	0.0
4	Civil Engineer-1 for WTP1	30.0
5	Civil Engineer-2 for Reservoirs & Towers	30.0
6	Civil Engineer-3 for Pipelines 1	35.0
7	Civil Engineer-4 for Pipelines 2	30.0
8	Civil Engineer-5 for Pipelines 3	0.0
9	Civil Engineer-6 for Pipelines 4	0.0
10	Mechanical Engineer	4.5
11	Electrical Engineer	4.5
12	Instrumentation Engineer	1.5
13	Structural Engineer	2.0
14	Architect	4.0
15	Building Utilities Engineer	1.0
16	Chemist	2.0
17	Quantity Surveyor 1	35.0
18	Quantity Surveyor 2	29.0
19	Procurement Specialist	1.0
20	Training Expert	1.0
21	Public Awareness campaign Expert	3.0
22	IEC Specialist	3.0
	Sub-Total B	256.0
Staff C. Project Office Support		
1	Assistant Engineer	35.0
2	Inspector/Surveyor	147.0
3	CAD Operator	35.0
4	GIS Specialist	0.0
5	Office Manager	35.0
6	Accountant	35.0
7	Clerk	35.0
8	Office Aid	35.0
	Sub-Total C	357.0
	Total	655.5

Appendix 4.3-1

November 2015

Base Cost of Construction Work of Phase 2 Wahalkada Water Supply System

1 USD= 120.1 JPY
1 USD= 139.0 LKR
1 LKR= 0.864 JPY

Package	Item	Specifications	Amount			Remarks
			JPY	LKR	Total JPY	
Grand Total			5,817,879,000	9,586,664,000	14,100,755,000	
A	Lot A: Intake, WTP, Reservoirs		1,371,127,000	3,979,613,000	4,809,512,000	
B	Lot B: Transmission and Distribution Pipe		4,109,327,000	3,061,695,000	6,754,631,000	
C	Lot C: Distribution Sub-system		337,425,000	2,466,266,000	2,468,278,000	
D	Lot D: Vehicles		0	63,440,000	54,812,000	
E	Lot E: Heavy Duty Machines		0	15,650,000	13,522,000	
A	<<Lot A>> Intake, WTP, Reservoirs		1,371,127,000	3,979,613,000	4,809,512,000	
A-1	Intake		79,025,000	208,104,000	258,827,000	
A-2	WTP		782,331,000	1,370,674,000	1,966,593,000	
A-3	Elevated Tanks and Ground Sumps		509,771,000	2,400,835,000	2,584,092,000	
B	<<Lot B>>Transmission and Distribution Pipe		4,109,327,000	3,061,695,000	6,754,631,000	
B-1	Transmission Main		2,478,743,000	1,207,722,000	3,522,215,000	
B-2	Transmission Sub-main		63,894,000	91,625,000	143,058,000	
B-3	Distribution Main		1,563,998,000	1,662,969,000	3,000,803,000	
B-4	Miscellaneous works		2,692,000	99,379,000	88,555,000	
C	<<Lot C>>Distribution Sub-System		337,425,000	2,466,266,000	2,468,278,000	
C-1	Distribution Sub-system		135,116,000	954,706,000	959,982,000	
C-2	Miscellaneous Works		1,795,000	90,668,000	80,132,000	
C-3	ex-Bowser Area in Phase1		73,743,000	489,792,000	496,923,000	
C-4	ex-Bowser Area in Phase2		126,771,000	931,100,000	931,241,000	
D	<<Lot D>> Vehicles		0	63,440,000	54,812,000	
D-1	Vehicles	7 types 16nos.	0	63,440,000	54,812,000	
E	<<Lot E>> Heavy Duty Machines		0	15,650,000	13,522,000	
E-1	Heavy Duty Machines	7 types 13 nos.	0	15,650,000	13,522,000	

Lot A

1 USD= 120.1 JPY
 1 USD= 139.0 LKR
 1 LKR= 0.864 JPY

4.3-1-2

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
A	<<Lot A>> Intake, WTP, Reservoirs						1,371,127,000	3,979,613,000	4,809,512,000	
A-1	Intake		Ls	1			79,025,000	208,104,000	258,827,000	
A-2	WTP		Ls	1			782,331,000	1,370,674,000	1,966,593,000	
A-3	Elevated Tanks and Ground Sumps		Ls	1			509,771,000	2,400,835,000	2,584,092,000	
A-1	Intake						79,025,000	208,104,000	258,827,000	
A-1-1	Civil Works for Intake		Ls	1			1,681,000	173,441,000	151,534,000	
A-1-2	Mechanical Works for Intake		Ls	1			52,844,000	20,636,000	70,674,000	
A-1-3	Electrical Works for Intake		Ls	1			24,500,000	14,027,000	36,619,000	
A-2	WTP						782,331,000	1,370,674,000	1,966,593,000	
A-2-1	Civil Works for WTP		Ls	1			62,932,000	1,031,550,000	954,191,000	
A-2-2	Mechanical Works for WTP		Ls	1			490,488,000	179,566,000	645,633,000	
A-2-3	Electrical Works for WTP		Ls	1			228,911,000	159,558,000	366,769,000	
A-3	Elevated Tanks and Ground Sumps						509,771,000	2,400,835,000	2,584,093,000	
A-3-1	Elevated Tanks and Ground Sumps		Ls	1			479,394,000	2,029,433,000	2,232,824,000	
A-3-2	Additional E.T. for Phase 1 ex-Bowser Area		Ls	1			17,357,000	179,849,000	172,747,000	
A-3-3	Additional E.T. for Phase 2ex-Bowser Area		Ls	1			13,020,000	191,553,000	178,522,000	

Lot A-1

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
A-1	Intake						79,025,000	208,104,000	258,827,000	
A-1-1	Civil Works for Intake		Ls	1			1,681,000	173,441,000	151,534,000	
A-1-2	Mechanical Works for Intake		Ls	1			52,844,000	20,636,000	70,674,000	
A-1-3	Electrical Works for Intake		Ls	1			24,500,000	14,027,000	36,619,000	
A-1-1	Civil Works for Intake						1,681,000	173,441,000	151,534,000	
A-1-1	Civil Works for Intake		Ls	1			1,681,000	173,441,000	151,534,000	
A-1-2	Mechanical Works for Intake						52,844,000	20,636,000	70,674,000	
A-1-2	Mechanical Works for Intake		Ls	1			52,844,000	20,636,000	70,674,000	
A-1-3	Electrical Works for Intake						24,500,000	14,027,000	36,619,000	
A-1-3	Electrical Works for Intake		Ls	1			24,500,000	14,027,000	36,619,000	

4.3-1-3

Lot A-2

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
A-2	WTP						782,331,000	1,370,674,000	1,966,593,000	
A-2-1	Civil Works for WTP		Ls	1			62,932,000	1,031,550,000	954,191,000	
A-2-2	Mechanical Works for WTP		Ls	1			490,488,000	179,566,000	645,633,000	
A-2-3	Electrical Works for WTP		Ls	1			228,911,000	159,558,000	366,769,000	
A-2-1	Civil Works for WTP						62,932,000	1,031,550,000	954,192,000	
A-2-1-1	Site Work (including Intake Site)		Ls	1			0	278,863,000	240,938,000	
A-2-1-2	Receiving Well/Distribution Chamber		Ls	1			0	15,112,000	13,057,000	
A-2-1-3	Flocculation and DAF		Ls	1			0	65,657,000	56,728,000	
A-2-1-4	Rapid Sand Filter		Ls	1			0	76,800,000	66,355,000	
A-2-1-5	Granual Activated Carbon (GAC) Filter		Ls	1			0	109,162,000	94,316,000	
A-2-1-6	Clear Water Tank and Pump House		Ls	1			0	140,837,000	121,683,000	
A-2-1-7	Backwash Recycling Tank and Sludge Tank		Ls	1			0	41,760,000	36,081,000	
A-2-1-8	Sludge Thickener and Pump House		Ls	1			0	20,947,000	18,098,000	
A-2-1-9	Sludge Drying Bed		Ls	1			0	47,352,000	40,912,000	
A-2-1-10	Lagoon		Ls	1			0	13,830,000	11,949,000	
A-2-1-11	Inplant Building Works		Ls	1			0	180,391,000	155,858,000	
A-2-1-12	Inplant Pipe Works		Ls	1			62,932,000	40,839,000	98,217,000	

4.3-1-4

Lot A-3, Lot A-3-1

4.3-1-6

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
A-3	Elevated Tanks and Ground Sumps						509,771,000	2,400,835,000	2,584,093,000	
A-3-1	Elevated Tanks and Ground Sumps						479,394,000	2,029,433,000	2,232,824,000	
A-3-2	Additional Elevated Tank for Phase 1						17,357,000	179,849,000	172,747,000	
A-3-3	Additional Elevated Tank for Phase 2						13,020,000	191,553,000	178,522,000	
A-3-1	Elevated Tanks and Ground Sumps						479,394,000	2,029,433,000	2,232,824,000	
A-3-1-1	Reservoir Construction		Ls	1	0		0	1,178,512,000	1,018,234,000	
A-3-1-2	Site Work		Ls	1	0		0	122,630,000	105,952,000	
A-3-1-3	Internal Building Work		Ls	1	0		0	474,200,000	409,709,000	
A-3-1-4	Internal Pipe Works		Ls	1	0		39,457,000	24,639,000	60,745,000	
A-3-1-5	Yard Pipe Works		Ls	1	0		26,049,000	24,141,000	46,907,000	
A-3-1-6	Mechanical and Electrical Work		Ls	1	0		413,888,000	205,311,000	591,277,000	
A-3-1-1	Reservoir Construction						0	1,178,512,000	1,018,232,000	
A-3-1-1-1	Kabithigollewa	Ground V=500m3	Ls	1	0	42,879,553	0	42,880,000	37,048,000	
A-3-1-1-2	Kahatagollewa	Ground V=1,000m3	Ls	1	0	65,184,312	0	65,184,000	56,319,000	
A-3-1-1-3	Weerasole	Ground V=1,500m3	Ls	1	0	76,996,839	0	76,997,000	66,525,000	
A-3-1-1-4	Horowpothana	Ground V=1,000m3	Ls	1	0	65,184,312	0	65,184,000	56,319,000	
A-3-1-1-5	Kahatagasdigiliya	Ground V=500m3	Ls	1	0	42,879,553	0	42,880,000	37,048,000	
A-3-1-1-6	Wahalkada	Elevated V=500m3	Ls	1	0	71,792,683	0	71,793,000	62,029,000	
A-3-1-1-7	Kebithigollewa	Elevated V=750m3	Ls	1	0	93,050,393	0	93,050,000	80,395,000	
A-3-1-1-8	Keb-Kah	Elevated V=250m3	Ls	1	0	50,534,972	0	50,535,000	43,662,000	

Lot A-3-1

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
A-3-1-1-9	Kahatagollewa	Elevated V=250m3	Ls	1	0	50,534,972	0	50,535,000	43,662,000	
A-3-1-1-10	Bogahawewa	Elevated V=2000m3	Ls	1	0	123,700,697	0	123,701,000	106,878,000	
A-3-1-1-11	Horowpothana	Elevated V=500m3	Ls	1	0	71,792,683	0	71,793,000	62,029,000	
A-3-1-1-12	Horowpothana North	Elevated V=250m3	Ls	1	0	50,534,972	0	50,535,000	43,662,000	
A-3-1-1-13	Horowpothana West	Elevated V=750m3	Ls	1	0	93,050,393	0	93,050,000	80,395,000	
A-3-1-1-14	Hamillewa	Elevated V=1250m3	Ls	1	0	100,421,069	0	100,421,000	86,764,000	
A-3-1-1-15	Kahagasdigiliya	Elevated V=1500m3	Ls	1	0	108,180,945	0	108,181,000	93,468,000	
A-3-1-1-16	Rathmalgahawewa	Elevated V=500m3	Ls	1	0	71,792,683	0	71,793,000	62,029,000	
A-3-1-2	Site Work						0	122,630,000	105,950,000	
A-3-1-2-1	Kabithigollewa	Ground +Elevated 500+750m3	m3	1,250	0	9,433	0	11,791,000	10,187,000	
A-3-1-2-2	Kahatagollewa	Ground +Elevated 1,000+250m3	m3	1,250	0	9,433	0	11,791,000	10,187,000	
A-3-1-2-3	Horowpothana	Ground +Elevated 1,000+500m3	m3	1,500	0	9,433	0	14,150,000	12,226,000	
A-3-1-2-4	Kahatagasdigiliya	Ground +Elevated 500+1,500m3	m3	2,000	0	9,433	0	18,866,000	16,300,000	
A-3-1-2-5	Weerasole	Ground only 1,500m3	m3	1,500	0	9,433	0	14,150,000	12,226,000	
A-3-1-2-6	Wahalkada	Elevated only 500m3	m3	500	0	9,433	0	4,717,000	4,075,000	
A-3-1-2-7	Keb-Kah	Elevated only 250m3	m3	250	0	9,433	0	2,358,000	2,037,000	
A-3-1-2-8	Bogahawewa	Elevated only 2,000m3	m3	2,000	0	9,433	0	18,866,000	16,300,000	
A-3-1-2-9	Horowpothana North	Elevated only 250m3	m3	250	0	9,433	0	2,358,000	2,037,000	
A-3-1-2-10	Horowpothana West	Elevated only 750m3	m3	750	0	9,433	0	7,075,000	6,113,000	

4.3-1-7

Lot A-3-1

4.3-1-8

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
A-3-1-2-11	Hamillewa	Elevated only 1250m3	m3	1,250	0	9,433	0	11,791,000	10,187,000	
A-3-1-2-12	Rathmalgahawewa	Elevated only 500m3	m3	500	0	9,433	0	4,717,000	4,075,000	
A-3-1-3	Internal Building Work						0	474,200,000	409,709,000	
A-3-1-3-1	Kabithigollewa		Ls	1			0	62,400,000	53,914,000	
A-3-1-3-2	Kahatagollewa		Ls	1			0	37,100,000	32,054,000	
A-3-1-3-3	Horowpothana		Ls	1			0	79,720,000	68,878,000	
A-3-1-3-4	Kahatagasdigiliya		Ls	1			0	41,200,000	35,597,000	
A-3-1-3-5	Weerasole		Ls	1			0	33,580,000	29,013,000	
A-3-1-3-6	Wahalkada		Ls	1			0	144,400,000	124,762,000	
A-3-1-3-7	Keb-Kah		Ls	1			0	8,500,000	7,344,000	
A-3-1-3-8	Bogahawewa		Ls	1			0	33,300,000	28,771,000	
A-3-1-3-9	Horowpothana North		Ls	1			0	8,500,000	7,344,000	
A-3-1-3-10	Horowpothana West		Ls	1			0	8,500,000	7,344,000	
A-3-1-3-11	Hamillewa		Ls	1			0	8,500,000	7,344,000	
A-3-1-3-12	Rathmalgahawewa		Ls	1			0	8,500,000	7,344,000	
A-3-1-4	Internal Pipe Works						39,457,000	24,639,000	60,745,000	
A-3-1-4-1	Kabithigollewa	Ground V=500m3	m3	500	2,302	3,061	1,151,000	1,531,000	2,474,000	
A-3-1-4-2	Kahatagollewa	Ground V=1,000m3	m3	1,000	2,302	3,061	2,302,000	3,061,000	4,947,000	
A-3-1-4-3	Weerasole	Ground V=1,500m3	m3	1,500	2,302	3,061	3,453,000	4,592,000	7,420,000	

Lot A-3-1

4.3-1-9

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
A-3-1-4-4	Horowpothana	Ground V=1,000m3	m3	1,000	2,302	3,061	2,302,000	3,061,000	4,947,000	
A-3-1-4-5	Kahatagasdigiliya	Ground V=500m3	m3	500	2,302	3,061	1,151,000	1,531,000	2,474,000	
A-3-1-4-6	Wahalkada	Elevated V=500m3	m3	500	3,423	1,278	1,712,000	639,000	2,264,000	
A-3-1-4-7	Kebithigollewa	Elevated V=750m3	m3	750	3,423	1,278	2,567,000	959,000	3,396,000	
A-3-1-4-8	Keb-Kah	Elevated V=250m3	m3	250	3,423	1,278	856,000	320,000	1,132,000	
A-3-1-4-9	Kahatagollewa	Elevated V=250m3	m3	250	3,423	1,278	856,000	320,000	1,132,000	
A-3-1-4-10	Bogahawewa	Elevated V=2000m3	m3	2,000	3,423	1,278	6,846,000	2,556,000	9,054,000	
A-3-1-4-11	Horowpothana	Elevated V=500m3	m3	500	3,423	1,278	1,712,000	639,000	2,264,000	
A-3-1-4-12	Horowpothana North	Elevated V=500m3	m3	250	3,423	1,278	856,000	319,000	1,132,000	
A-3-1-4-13	Horowpothana West	Elevated V=750m3	m3	750	3,423	1,278	2,567,000	958,000	3,395,000	
A-3-1-4-14	Hamillewa	Elevated V=1250m3	m3	1,250	3,423	1,278	4,279,000	1,597,000	5,659,000	
A-3-1-4-15	Kahagasdigiliya	Elevated V=1500m3	m3	1,500	3,423	1,278	5,135,000	1,917,000	6,791,000	
A-3-1-4-16	Rathmalgahawewa	Elevated V=500m3	m3	500	3,423	1,278	1,712,000	639,000	2,264,000	
A-3-1-5	Yard Pipe Works						26,049,000	24,141,000	46,907,000	
A-3-1-5-1	Kabithigollewa	Ground +Elevated 500+750m3	m3	1,250	1,689	1,151	2,111,000	1,439,000	3,354,000	
A-3-1-5-2	Kahatagollewa	Ground +Elevated 1,000+250m3	m3	1,250	1,689	1,151	2,111,000	1,439,000	3,354,000	
A-3-1-5-3	Horowpothana	Ground +Elevated 1,000+500m3	m3	1,500	1,689	1,151	2,534,000	1,727,000	4,026,000	
A-3-1-5-4	Kahatagasdigiliya	Ground +Elevated 500+1,500m3	m3	2,000	1,689	1,151	3,378,000	2,302,000	5,367,000	
A-3-1-5-5	Weerasole	Ground only 1,500m3	m3	1,500	3,130	2,528	4,695,000	3,792,000	7,971,000	
A-3-1-5-6	Wahalkada	Elevated only 500m3	m3	500	2,040	2,444	1,020,000	1,222,000	2,076,000	

Lot A-3-1

4.3-1-10

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
A-3-1-5-7	Keb-Kah	Elevated only 250m3	m3	250	2,040	2,444	510,000	611,000	1,038,000	
A-3-1-5-8	Bogahawewa	Elevated only 2,000m3	m3	2,000	2,040	2,444	4,080,000	4,888,000	8,303,000	
A-3-1-5-9	Horowpothana North	Elevated only 250m3	m3	250	2,040	2,444	510,000	611,000	1,038,000	
A-3-1-5-10	Horowpothana West	Elevated only 750m3	m3	750	2,040	2,444	1,530,000	1,833,000	3,114,000	
A-3-1-5-11	Hamillewa	Elevated only 1250m3	m3	1,250	2,040	2,444	2,550,000	3,055,000	5,190,000	
A-3-1-5-12	Rathmalgahawewa	Elevated only 500m3	m3	500	2,040	2,444	1,020,000	1,222,000	2,076,000	
A-3-1-6	Mechanical and Electrical Work						413,888,000	205,311,000	591,277,000	
A-3-1-6-1	Kabithigollewa Mechanical	Ground +Elevated 500+750m3	m3	1,250	21,279	10,483	26,599,000	13,104,000	37,921,000	
A-3-1-6-2	Kabithigollewa Electrical	Ground +Elevated 500+750m3	m3	1,250	21,889	11,062	27,361,000	13,828,000	39,308,000	
A-3-1-6-3	Kahatagollewa Mechanical	Ground +Elevated 1,000+250m3	m3	1,250	21,279	10,483	26,599,000	13,104,000	37,921,000	
A-3-1-6-4	Kahatagollewa Electrical	Ground +Elevated 1,000+250m3	m3	1,250	21,889	11,062	27,361,000	13,828,000	39,308,000	
A-3-1-6-5	Horowpothana Mechanical	Ground +Elevated 1,000+500m3	m3	1,500	21,279	10,483	31,919,000	15,725,000	45,505,000	
A-3-1-6-6	Horowpothana Electrical	Ground +Elevated 1,000+500m3	m3	1,500	21,889	11,062	32,834,000	16,593,000	47,170,000	
A-3-1-6-7	Kahatagasdigiliya Mechanical	Ground +Elevated 500+1,500m3	m3	2,000	21,279	10,483	42,558,000	20,966,000	60,673,000	
A-3-1-6-8	Kahatagasdigiliya Electrical	Ground +Elevated 500+1,500m3	m3	2,000	21,889	11,062	43,778,000	22,124,000	62,893,000	
A-3-1-6-9	Weerasole Mechanical	Ground only 1,500m3	m3	1,500	28,983	12,898	43,475,000	19,347,000	60,191,000	
A-3-1-6-10	Weerasole Electrical	Ground only 1,500m3	m3	1,500	30,659	15,396	45,989,000	23,094,000	65,942,000	
A-3-1-6-11	Wahalkada Mechanical	Elevated only 500m3	m3	500	5,367	3,130	2,684,000	1,565,000	4,036,000	
A-3-1-6-12	Wahalkada Electrical	Elevated only 500m3	m3	500	6,526	2,978	3,263,000	1,489,000	4,549,000	

Lot A-3-1

4.3-1-11

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
A-3-1-6-13	Keb-Kah Mechanical	Elevated only 250m3	m3	250	5,367	3,130	1,342,000	783,000	2,019,000	
A-3-1-6-14	Keb-Kah Electrical	Elevated only 250m3	m3	250	6,526	2,978	1,632,000	745,000	2,276,000	
A-3-1-6-15	Bogahawewa Mechanical	Elevated only 2,000m3	m3	2,000	5,367	3,130	10,734,000	6,260,000	16,143,000	
A-3-1-6-16	Bogahawewa Electrical	Elevated only 2,000m3	m3	2,000	6,526	2,978	13,052,000	5,956,000	18,198,000	
A-3-1-6-17	Horowpothana North Mechanical	Elevated only 250m3	m3	250	5,367	3,130	1,342,000	783,000	2,019,000	
A-3-1-6-18	Horowpothana North Electrical	Elevated only 250m3	m3	250	6,526	2,978	1,632,000	745,000	2,276,000	
A-3-1-6-19	Horowpothana West Mechanical	Elevated only 750m3	m3	750	5,367	3,130	4,025,000	2,348,000	6,054,000	
A-3-1-6-20	Horowpothana West Electrical	Elevated only 750m3	m3	750	6,526	2,978	4,895,000	2,234,000	6,825,000	
A-3-1-6-21	Hamillewa Mechanical	Elevated only 1250m3	m3	1,250	5,367	3,130	6,709,000	3,913,000	10,090,000	
A-3-1-6-22	Hamillewa Electrical	Elevated only 1250m3	m3	1,250	6,526	2,978	8,158,000	3,723,000	11,375,000	
A-3-1-6-23	Rathmalgahawewa Mechanical	Elevated only 500m3	m3	500	5,367	3,130	2,684,000	1,565,000	4,036,000	
A-3-1-6-24	Rathmalgahawewa Electrical	Elevated only 500m3	m3	500	6,526	2,978	3,263,000	1,489,000	4,549,000	

Lot A-3-1-3 Internal buiding work

4.3-1-12

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
A-3-1-3-1	Kebithigollewa		Ls	1			0	62,400,000	53,914,000	
1)	Guard House		Ls	1	0	2,100,000	0	2,100,000	1,814,000	
2)	AE Office		Ls	1	0	13,000,000	0	13,000,000	11,232,000	
3)	Pump House	17 x 6.0m	m2	102	0	100,000	0	10,200,000	8,813,000	
4)	Generator Building		Ls	1	0	7,400,000	0	7,400,000	6,394,000	
5)	Workshop		Ls	1	0	11,500,000	0	11,500,000	9,936,000	
6)	Chlorination Building		Ls	1	0	2,200,000	0	2,200,000	1,901,000	
7)	Caretaker Quarters		Ls	1	0	6,300,000	0	6,300,000	5,443,000	
8)	Staff Quarters		Ls	1	0	9,700,000	0	9,700,000	8,381,000	
A-3-1-3-2	Kahatagollewa		Ls	1			0	37,100,000	32,054,000	
1)	Generator Building		Ls	1	0	7,400,000	0	7,400,000	6,394,000	
2)	Chlorination Building		Ls	1	0	2,200,000	0	2,200,000	1,901,000	
3)	Pump House	26.5x8.0m	m2	212	0	100,000	0	21,200,000	18,317,000	
4)	Caretaker Quarters		Ls	1	0	6,300,000	0	6,300,000	5,443,000	
A-3-1-3-3	Horowpothana		Ls	1			0	79,720,000	68,878,000	
1)	Guard House		Ls	1	0	2,100,000	0	2,100,000	1,814,000	
2)	AE Office		Ls	1	0	13,000,000	0	13,000,000	11,232,000	
3)	Pump House	34.4x8.0m	m2	275	0	100,000	0	27,520,000	23,777,000	
4)	Generator Building		Ls	1	0	7,400,000	0	7,400,000	6,394,000	
5)	Chlorination Building		Ls	1	0	2,200,000	0	2,200,000	1,901,000	
6)	Workshop		Ls	1	0	11,500,000	0	11,500,000	9,936,000	
7)	Caretaker Quarters		Ls	1	0	6,300,000	0	6,300,000	5,443,000	

Lot A-3-1-3 Internal buiding work

4.3-1-13

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
8)	Staff Quarters		Ls	1	0	9,700,000	0	9,700,000	8,381,000	
A-3-1-3-4	Kahatagasdigiliya		Ls	1			0	41,200,000	35,597,000	
1)	Guard House		Ls	1	0	2,100,000	0	2,100,000	1,814,000	
2)	OIC Office		Ls	1	0	13,000,000	0	13,000,000	11,232,000	
3)	Caretaker Quarters		Ls	1	0	6,300,000	0	6,300,000	5,443,000	
4)	Chlorination Building		Ls	1	0	2,200,000	0	2,200,000	1,901,000	
5)	Generator Building		Ls	1	0	7,400,000	0	7,400,000	6,394,000	
6)	Pump House	17x6m	m2	102	0	100,000	0	10,200,000	8,813,000	
A-3-1-3-5	Weerasole		Ls				0	33,580,000	29,013,000	
1)	Pump House	22.1x8m	m2	177	0	100,000	0	17,680,000	15,276,000	
2)	Generator Building		Ls	1	0	7,400,000	0	7,400,000	6,394,000	
3)	Chlorination Building		Ls	1	0	2,200,000	0	2,200,000	1,901,000	
4)	Caretaker Quarters		Ls	1	0	6,300,000	0	6,300,000	5,443,000	
A-3-1-3-6	Wahalkada		Ls	1			0	144,400,000	124,762,000	
1)	Guard House		Ls	1	0	2,100,000	0	2,100,000	1,814,000	
2)	Caretaker Quarters		Ls	4	0	6,300,000	0	25,200,000	21,773,000	
3)	Warehouse		Ls	1	0	10,900,000	0	10,900,000	9,418,000	
4)	Chlorination Building		Ls	1	0	8,400,000	0	8,400,000	7,258,000	
5)	Chemical Building		Ls	1	0	22,600,000	0	22,600,000	19,526,000	
6)	Pump Station	33.5x8m	m2	268	0	100,000	0	26,800,000	23,155,000	
7)	Generator Building		Ls	1	0	7,400,000	0	7,400,000	6,394,000	
8)	Administration Building		Ls	1	0	41,000,000	0	41,000,000	35,424,000	

Lot A-3-1-3 Internal buiding work

4.3-1-14

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
A-3-1-3-7	Keb-Kah Median		Ls	1			0	8,500,000	7,344,000	
1)	Chlorination Building		Ls	1	0	2,200,000	0	2,200,000	1,901,000	
2)	Caretaker Quarters		Ls	1	0	6,300,000	0	6,300,000	5,443,000	
A-3-1-3-8	Bogahawewa		Ls	1			0	33,300,000	28,771,000	
1)	Guard House		Ls	1	0	2,100,000	0	2,100,000	1,814,000	
2)	OIC Office		Ls	1	0	13,000,000	0	13,000,000	11,232,000	
3)	Chlorination Building		Ls	1	0	2,200,000	0	2,200,000	1,901,000	
4)	Caretaker Quarters		Ls	1	0	6,300,000	0	6,300,000	5,443,000	
5)	Staff Quarters		Ls	1	0	9,700,000	0	9,700,000	8,381,000	
A-3-1-3-9	Horowpothana North		Ls	1			0	8,500,000	7,344,000	
1)	Chlorination Building		Ls	1	0	2,200,000	0	2,200,000	1,901,000	
2)	Caretaker Quarters		Ls	1	0	6,300,000	0	6,300,000	5,443,000	
A-3-1-3-10	Horowpothana West		Ls	1			0	8,500,000	7,344,000	
1)	Chlorination Building		Ls	1	0	2,200,000	0	2,200,000	1,901,000	
2)	Caretaker Quarters		Ls	1	0	6,300,000	0	6,300,000	5,443,000	
A-3-1-3-11	Hamillewa		Ls	1			0	8,500,000	7,344,000	
1)	Chlorination Building		Ls	1	0	2,200,000	0	2,200,000	1,901,000	
2)	Caretaker Quarters		Ls	1	0	6,300,000	0	6,300,000	5,443,000	
A-3-1-3-12	Rathmalgahawewa		Ls	1			0	8,500,000	7,344,000	
1)	Chlorination Building		Ls	1	0	2,200,000	0	2,200,000	1,901,000	
2)	Caretaker Quarters		Ls	1	0	6,300,000	0	6,300,000	5,443,000	

Lot A-3-2

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
A-3-2	Additional Elevated Tank for Phase 1						17,357,000	179,849,000	172,746,000	
A-3-2-1	Reservoir Construction		Ls	1			0	143,585,000	124,057,000	
A-3-2-2	Site Work		Ls	1			0	9,433,000	8,150,000	
A-3-2-3	Internal Building Work		Ls	1			0	17,000,000	14,688,000	
A-3-2-4	Internal Pipe Works		Ls	1			3,423,000	1,279,000	4,528,000	
A-3-2-5	Yard Pipe Works		Ls	1			2,040,000	2,444,000	4,152,000	
A-3-2-6	Mechanical and Electrical Work		Ls	1			11,894,000	6,108,000	17,171,000	
A-3-2-1	Reservoir Construction						0	143,585,000	124,057,000	
	Kallanchiya	Elevated V=750m3	Ls	1	0	93,050,393	0	93,050,000	80,395,000	
	Konakumbukwewa	Elevated V=250m3	Ls	1	0	50,534,972	0	50,535,000	43,662,000	
A-3-2-2	Site Work						0	9,433,000	8,150,000	
	Kallanchiya	Elevated V=750m3	m3	750	0	9,433	0	7,075,000	6,113,000	
	Konakumbukwewa	Elevated V=250m3	m3	250	0	9,433	0	2,358,000	2,037,000	
A-3-2-3	Internal Building Work						0	17,000,000	14,688,000	
A-3-2-3-1	Kallanchiya						0	8,500,000	7,344,000	
1)	Chlorination Building		Ls	1	0	2,200,000	0	2,200,000	1,901,000	
2)	Caretaker Quarters		Ls	1	0	6,300,000	0	6,300,000	5,443,000	
A-3-2-3-2	Konakumbukwewa						0	8,500,000	7,344,000	
1)	Chlorination Building		Ls	1	0	2,200,000	0	2,200,000	1,901,000	
2)	Caretaker Quarters		Ls	1	0	6,300,000	0	6,300,000	5,443,000	

4.3-1-15

Lot A-3-2

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
A-3-2-4	Internal Pipe Works						3,423,000	1,279,000	4,528,000	
	Kallanchiya	Elevated V=750m3	m3	750	3,423	1,278	2,567,000	959,000	3,396,000	
	Konakumbukwewa	Elevated V=250m3	m3	250	3,423	1,278	856,000	320,000	1,132,000	
A-3-2-5	Yard Pipe Works						2,040,000	2,444,000	4,152,000	
	Kallanchiya	Elevated V=750m3	m3	750	2,040	2,444	1,530,000	1,833,000	3,114,000	
	Konakumbukwewa	Elevated V=250m3	m3	250	2,040	2,444	510,000	611,000	1,038,000	
A-3-2-6	Mechanical and Electrical Work						11,894,000	6,108,000	17,172,000	
	Kallanchiya Mechanical	Elevated V=750m3	m3	750	5,367	3,130	4,025,000	2,347,000	6,053,000	
	Kallanchiya Electrical	Elevated V=750m3	m3	750	6,526	2,978	4,895,000	2,234,000	6,825,000	
	Konakumbukwewa Mechanical	Elevated V=250m3	m3	250	5,367	3,130	1,342,000	782,000	2,018,000	
	Konakumbukwewa Electrical	Elevated V=250m3	m3	250	6,526	2,978	1,632,000	745,000	2,276,000	

4.3-1-16

Lot A-3-3

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
A-3-3	Additional Reservoir for Phase 2						13,020,000	191,553,000	178,522,000	
A-3-3-1	Reservoir Construction						0	151,605,000	130,987,000	
A-3-3-2	Site Work						0	7,074,000	6,112,000	
A-3-3-3	Internal Building Work						0	25,500,000	22,032,000	
A-3-3-4	Internal Pipe Works						2,568,000	960,000	3,397,000	
A-3-3-5	Yard Pipe Works						1,530,000	1,833,000	3,114,000	
A-3-3-6	Mechanical and Electrical Work						8,922,000	4,581,000	12,880,000	
A-3-3-1	Reservoir Construction						0	151,605,000	130,986,000	
A-3-3-1-1	North Area	Elevated V=250m3	Ls	1	0	50,534,972	0	50,535,000	43,662,000	
A-3-3-1-2	Central Area	Elevated V=250m3	Ls	1	0	50,534,972	0	50,535,000	43,662,000	
A-3-3-1-3	South Area	Elevated V=250m3	Ls	1	0	50,534,972	0	50,535,000	43,662,000	
A-3-3-2	Site Work						0	7,074,000	6,111,000	
A-3-3-2-1	North Area	Elevated V=250m3	m3	250	0	9,433	0	2,358,000	2,037,000	
A-3-3-2-2	Central Area	Elevated V=250m3	m3	250	0	9,433	0	2,358,000	2,037,000	
A-3-3-2-3	South Area	Elevated V=250m3	m3	250	0	9,433	0	2,358,000	2,037,000	

4.3-1-17

Lot A-3-3

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
A-3-3-3	Internal Building Work						0	25,500,000	22,032,000	
A-3-3-3-1	North Area						0	8,500,000	7,344,000	
	1) Chlorination Building		Ls	1	0	2,200,000	0	2,200,000	1,901,000	
	2) Caretaker Quarters		Ls	1	0	6,300,000	0	6,300,000	5,443,000	
A-3-3-3-2	Central Area						0	8,500,000	7,344,000	
	1) Chlorination Building		Ls	1	0	2,200,000	0	2,200,000	1,901,000	
	2) Caretaker Quarters		Ls	1	0	6,300,000	0	6,300,000	5,443,000	
A-3-3-3-3	South Area						0	8,500,000	7,344,000	
	1) Chlorination Building		Ls	1	0	2,200,000	0	2,200,000	1,901,000	
	2) Caretaker Quarters		Ls	1	0	6,300,000	0	6,300,000	5,443,000	
A-3-3-4	Internal Pipe Works						2,568,000	960,000	3,396,000	
A-3-3-4-1	North Area	Elevated V=250m3	m3	250	3,423	1,278	856,000	320,000	1,132,000	
A-3-3-4-2	Central Area	Elevated V=250m3	m3	250	3,423	1,278	856,000	320,000	1,132,000	
A-3-3-4-3	South Area	Elevated V=250m3	m3	250	3,423	1,278	856,000	320,000	1,132,000	

4.3-1-18

Lot A-3-3

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
A-3-3-5	Yard Pipe Works						1,530,000	1,833,000	3,114,000	
A-3-3-5-1	North Area	Elevated V=250m3	m3	250	2,040	2,444	510,000	611,000	1,038,000	
A-3-3-5-2	Central Area	Elevated V=250m3	m3	250	2,040	2,444	510,000	611,000	1,038,000	
A-3-3-5-3	South Area	Elevated V=250m3	m3	250	2,040	2,444	510,000	611,000	1,038,000	
A-3-3-6	Mechanical and Electrical Work						8,922,000	4,581,000	12,882,000	
A-3-3-6-1	North Area Mechanical	Elevated V=250m3	m3	250	5,367	3,130	1,342,000	782,000	2,018,000	
A-3-3-6-2	North Area Electrical	Elevated V=250m3	m3	250	6,526	2,978	1,632,000	745,000	2,276,000	
A-3-3-6-3	Central Area Mechanical	Elevated V=250m3	m3	250	5,367	3,130	1,342,000	782,000	2,018,000	
A-3-3-6-4	Central Area Electrical	Elevated V=250m3	m3	250	6,526	2,978	1,632,000	745,000	2,276,000	
A-3-3-6-5	South Area Mechanical	Elevated V=250m3	m3	250	5,367	3,130	1,342,000	782,000	2,018,000	
A-3-3-6-6	South Area Electrical	Elevated V=250m3	m3	250	6,526	2,978	1,632,000	745,000	2,276,000	

4.3-1-19

Lot B

1 USD= 120.1 JPY
 1 USD= 139.0 LKR
 1 LKR= 0.864 JPY

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
B	<<Lot B>> Transmission and Distribution Main						4,109,327,000	3,061,695,000	6,754,631,000	
B-1	Transmission Main						2,478,743,000	1,207,722,000	3,522,215,000	
B-2	Transmission Sub-main						63,894,000	91,625,000	143,058,000	
B-3	Distribution Main						1,563,998,000	1,662,969,000	3,000,803,000	
B-4	Miscellaneous works						2,692,000	99,379,000	88,555,000	
B-1	Transmission Main						2,478,742,542	1,207,722,048	3,522,214,000	
B-1(A)	Transmission Main A						683,474,000	365,837,969	999,558,000	
B-1(B)	Transmission Main B						1,795,268,542	841,884,079	2,522,656,000	
B-2	Transmission Sub Main						63,894,000	91,625,062	143,058,000	
B-2(A)	Transmission Sub-Main A						367,000	691,510	964,000	
B-2(B)	Transmission Sub-Main B						63,527,000	90,933,552	142,094,000	

4.3-1-20

Lot B

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
B-3	Distribution Main						1,563,998,000	1,662,969,388	3,000,803,000	
B-3(A)	Distribution Main A						454,633,000	587,465,720	962,203,000	
B-3(B)	Distribution Main B						1,109,365,000	1,075,503,668	2,038,600,000	
B-4	Miscellaneous works						2,692,000	99,379,000	88,556,000	
B-4-1	Provision of Bonds and Insurances						0	10,084,000	8,713,000	
B-4-2	Provision and maintenance of site office						0	12,160,000	10,506,000	
B-4-3	Provision of pipe stores						0	16,807,000	14,521,000	
B-4-4	Provision of site safety						0	38,929,000	33,635,000	
B-4-5	Quality assurance and material testing						2,692,000	2,584,000	4,925,000	
B-4-6	Progress documents and drawings						0	2,597,000	2,244,000	
B-4-7	Miscellaneous						0	16,218,000	14,012,000	

4.3-1-21

Lot B-1

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
B-1	Transmission Main						2,478,742,542	1,207,722,048	3,522,214,000	
B-1(A)	Transmission Main A						683,474,000	365,837,969	999,558,000	
B-1(B)	Transmission Main B						1,795,268,542	841,884,079	2,522,656,000	
B-1(A)	Transmission Main A						683,474,000	365,837,969	999,558,000	
B-1(A)-1	Pipe Works Excavate, install pipes, back fill and compact		Ls	1			652,900,000	313,493,200	923,758,000	
B-1(A)-2	Restoration of Road Pavement		Ls	1			2,003,000	15,585,797	15,469,000	
B-1(A)-3	Bridges		Ls	1			28,571,000	36,758,972	60,331,000	
B-1(A)1	Pipe Works Excavate, install pipes, back fill and compact		m	41,900			652,900,000	313,493,200	923,758,000	
B-1(A)1-1	HDPE ND400 / OD450		m	8,200	18,366	8,205	150,601,000	67,281,000	208,732,000	
B-1(A)1-2	HDPE ND350 / OD400		m	33,700	14,905	7,306	502,299,000	246,212,200	715,026,000	
B-1(A)2	Restoration of Road Pavement						2,003,000	15,585,797	15,469,000	
B-1(A)2-1	Temporary Reinstatement (Carriageway) RDA/PRDA	2	m2	1,006	266	2,070	268,000	2,082,420	2,067,000	
B-1(A)2-2	Temporary Reinstatement (Shoulder) RDA/PRDA	2	m2	1,006	133	1,035	134,000	1,041,210	1,034,000	
B-1(A)2-3	Restoration of Pavement (carriageway)RDA/PRDA	4	m2	2,011	568	4,419	1,142,000	8,886,609	8,820,000	
B-1(A)2-4	Restoration of Pavement (Shoulder)RDA/PRDA	4	m2	2,011	228	1,778	459,000	3,575,558	3,548,000	
B-1(A)3	Bridges						28,571,000	36,758,972	60,331,000	
B-1(A)3-1	Bridges		m	735	34,243	41,317	25,168,000	30,367,944	51,406,000	
B-1(A)3-2	Pipe Support		m	375	9,074	17,043	3,403,000	6,391,028	8,925,000	

4.3-1-22

Lot B-1

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
B-1(B)	Transmission Main B						1,795,268,542	841,884,079	2,522,655,542	
B-1(B)-1	Pipe Works Excavate, install pipes, back fill and compact		Ls	1			1,789,079,000	798,560,600	2,479,035,000	
B-1(B)-2	Restoration of Road Pavement		Ls	1			4,025,000	31,323,479	31,088,000	
B-1(A)-4	Surge Chamber	100m3	Ls	1			2,164,542	12,000,000	12,532,542	
B-1(B)1	Pipe Works Excavate, install pipes, back fill and compact		m	84,200			1,789,079,000	798,560,600	2,479,035,000	
B-1(B)1-1	HDPE ND450 / OD500		m	51,400	22,777	10,543	1,170,738,000	541,910,200	1,638,948,000	
B-1(B)1-2	HDPE ND300 / OD355		m	13,900	11,715	6,577	162,839,000	91,420,300	241,826,000	
B-1(B)1-3	HDPE ND400 / OD450 PN16		m	12,600	27,717	9,484	349,234,000	119,498,400	452,481,000	
B-1(B)1-4	HDPE ND300 / OD355 PN16		m	6,300	16,868	7,259	106,268,000	45,731,700	145,780,000	
B-1(B)2	Restoration of Road Pavement						4,025,000	31,323,479	31,088,000	
B-1(B)2-1	Temporary Reinstatement (Carriageway) RDA/PRDA		2 m2	2,021	266	2,070	538,000	4,183,470	4,153,000	
B-1(B)2-2	Temporary Reinstatement (Shoulder) RDA/PRDA		2 m2	2,021	133	1,035	269,000	2,091,735	2,076,000	
B-1(B)2-3	Restoration of Pavement (carriageway)RDA/PRDA		4 m2	4,042	568	4,419	2,296,000	17,861,598	17,728,000	
B-1(B)2-4	Restoration of Pavement (Shoulder)RDA/PRDA		4 m2	4,042	228	1,778	922,000	7,186,676	7,131,000	

4.3-1-23

Lot B-2

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
B-2	Transmission Sub Main						63,894,000	91,625,062	143,058,000	
B-2(A)	Transmission Sub-Main A						367,000	691,510	964,000	
B-2(B)	Transmission Sub-Main B						63,527,000	90,933,552	142,094,000	
B-2(A)	Transmission Sub-main A						367,000	691,510	964,000	
B-1(A)-1	Pipe Works Excavate, install pipes, back fill and compact		Ls	1			358,000	619,600	893,000	
B-1(A)-2	Restoration of Road Pavement		Ls	1			9,000	71,910	71,000	
B-2(A)1	Pipe Works Excavate, install pipes, back fill and compact		m	200			358,000	619,600	893,000	
B-2(A)1-1	HDPE ND100 / OD125		m	200		1,791	3,098	358,000	619,600	893,000
B-2(A)2	Restoration of Road Pavement						9,000	71,910	71,000	
B-1(A)2-1	Temporary Reinstatement (Carriageway) RDA/PRDA		2 m2	5		266	2,070	1,000	10,350	10,000
B-1(A)2-2	Restoration of Pavement (carriageway)RDA/PRDA		4 m2	10		568	4,419	6,000	44,190	44,000
B-1(A)2-3	Restoration of Pavement UC/PS		4 m2	10		223	1,737	2,000	17,370	17,000

4.3-1-24

Lot B-2

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
B-2(B)	Transmission Sub-main B						63,527,000	90,933,552	142,094,000	
B-1(B)-1	Pipe Works Excavate, install pipes, back fill and compact		Ls	1			62,458,000	82,614,600	133,837,000	
B-1(B)-2	Restoration of Road Pavement		Ls	1			1,069,000	8,318,952	8,257,000	
B-2(B)1	Pipe Works Excavate, install pipes, back fill and compact		m	24,100			62,458,000	82,614,600	133,837,000	
B-2(B)1-1	HDPE ND250 / OD280		m	600	7,435	5,232	4,461,000	3,139,200	7,173,000	
B-2(B)1-2	HDPE ND200 / OD225		m	5,000	4,942	4,417	24,710,000	22,085,000	43,791,000	
B-2(B)1-3	HDPE ND150 / OD180		m	100	3,329	3,872	333,000	387,200	668,000	
B-2(B)1-4	HDPE ND100 / OD125		m	18,400	1,791	3,098	32,954,000	57,003,200	82,205,000	
B-2(B)2	Restoration of Road Pavement						1,069,000	8,318,952	8,256,000	
B-2(B)2-1	Temporary Reinstatement (Carriageway) RDA/PRDA		2 m2	578	266	2,070	154,000	1,196,460	1,188,000	
B-2(B)2-2	Restoration of Pavement (carriageway)RDA/PRDA		4 m2	1,157	568	4,419	657,000	5,112,783	5,074,000	
B-2(B)2-3	Restoration of Pavement UC/PS		4 m2	1,157	223	1,737	258,000	2,009,709	1,994,000	

4.3-1-25

Lot B-3

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
B-3	Distribution Main						1,563,998,000	1,662,969,388	3,000,803,000	
B-3(A)	Distribution Main A						454,633,000	587,465,720	962,203,000	
B-3(B)	Distribution Main B						1,109,365,000	1,075,503,668	2,038,600,000	
B-3(A)	Distribution Main A						454,633,000	587,465,720	962,203,000	
B-3(A)-1	Pipe Works Excavate, install pipes, back fill and compact		Ls	1			448,843,000	542,403,800	917,480,000	
B-3(A)-2	Restoration of Road Pavement		Ls	1			5,790,000	45,061,920	44,723,000	
B-3(A)1	Pipe Works Excavate, install pipes, back fill and compact		m	152,500			448,843,000	542,403,800	917,479,000	
B-3(A)1-1	HDPE ND350 / OD400		m	2,600	16,493	7,663	42,882,000	19,923,800	60,096,000	
B-3(A)1-2	HDPE ND300 / OD355		m	1,900	12,952	6,883	24,609,000	13,077,700	35,908,000	
B-3(A)1-3	HDPE ND250 / OD280		m	3,400	8,205	5,449	27,897,000	18,526,600	43,904,000	
B-3(A)1-4	HDPE ND200 / OD225		m	14,500	5,443	4,585	78,924,000	66,482,500	136,365,000	
B-3(A)1-5	HDPE ND150 / OD180		m	25,000	3,655	4,008	91,375,000	100,200,000	177,948,000	
B-3(A)1-6	HDPE ND100 / OD125		m	76,000	1,952	3,189	148,352,000	242,364,000	357,754,000	
B-3(A)1-7	HDPE ND75 / OD90		m	29,100	1,196	2,812	34,804,000	81,829,200	105,504,000	
B-3(A)2	Restoration of Road Pavement						5,790,000	45,061,920	44,724,000	
B-3(A)2-3	Restoration of Pavement (carriageway)RDA/PRDA		4 m2	7,320	568	4,419	4,158,000	32,347,080	32,106,000	
B-3(A)2-4	Restoration of Pavement UC/PS		4 m2	7,320	223	1,737	1,632,000	12,714,840	12,618,000	

4.3-1-26

Lot B-3

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
B-3(B)	Distribution Main B						1,109,365,000	1,075,503,668	2,038,601,000	
B-3(B)-1	Pipe Works Excavate, install pipes, back fill and compact		Ls	1			1,038,370,000	816,055,000	1,743,442,000	
B-3(B)-2	Restoration of Road Pavement		Ls	1			6,615,000	51,476,472	51,091,000	
B-3(B)-3	Bridges		Ls	1			62,924,000	207,435,995	242,149,000	
B-3(B)-4	Flowmeter to Tank		Ls	1			1,456,000	536,201	1,919,000	
B-3(B)1	Pipe Works Excavate, install pipes, back fill and compact		m	174,200			1,038,370,000	816,055,000	1,743,443,000	
B-3(B)1-1	HDPE ND400 / OD450		m	2,000	20,334	8,633	40,668,000	17,266,000	55,586,000	
B-3(B)1-2	HDPE ND350 / OD400		m	7,900	16,493	7,663	130,295,000	60,537,700	182,600,000	
B-3(B)1-3	HDPE ND300 / OD355		m	8,300	12,952	6,883	107,502,000	57,128,900	156,861,000	
B-3(B)1-4	HDPE ND250 / OD280		m	29,200	8,205	5,449	239,586,000	159,110,800	377,058,000	
B-3(B)1-5	HDPE ND200 / OD225		m	47,900	5,443	4,585	260,720,000	219,621,500	450,473,000	
B-3(B)1-6	HDPE ND150 / OD180		m	62,000	3,655	4,008	226,610,000	248,496,000	441,311,000	
B-3(B)1-7	HDPE ND100 / OD125		m	16,900	1,952	3,189	32,989,000	53,894,100	79,554,000	
B-3(B)2	Restoration of Road Pavement						6,615,000	51,476,472	51,090,000	
B-3(B)2-3	Restoration of Pavement (carriageway)RDA/PRDA	4	m2	8,362	568	4,419	4,750,000	36,951,678	36,676,000	
B-3(B)2-4	Restoration of Pavement UC/PS	4	m2	8,362	223	1,737	1,865,000	14,524,794	14,414,000	
B-3(B)3	Bridges						62,924,000	207,435,995	242,148,000	
B-3(B)3-1	Bridges		m	1,220	9,356	16,881	11,414,000	20,595,320	29,208,000	
B-3(B)3-2	Pipe Support		m	10,500	4,906	17,794	51,510,000	186,840,675	212,940,000	

4.3-1-27

Lot C: Distribution Sub-System

1 USD= 120.1 JPY
 1 USD= 139.0 LKR
 1 LKR= 0.864 JPY

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
C	<<Lot C>> Distribution Sub-System						337,425,000	2,466,266,000	2,468,278,000	
C-1	Distribution Sub System		m	330,000			135,116,000	954,706,000	959,982,000	
C-2	Miscellaneous works for distribution sub system						1,795,000	90,668,000	80,132,000	
C-3	ex-Bowser Area in Phase 1		m	160,240			73,743,000	489,792,000	496,923,000	
C-4	ex-Bowser Area in Phase 2		m	230,500			126,771,000	931,100,000	931,241,000	
C-1	Distribution Sub System						135,116,000	954,705,640	959,981,000	
C-1(A)	Distribution Sub System (A)		m	117,000			47,535,000	335,933,096	337,781,000	
C-1(B)	Distribution Sub System (B)		m	213,000			87,581,000	618,772,544	622,200,000	
C-2	Miscellaneous works for distribution sub system						1,795,000	90,668,000	80,132,000	
C-2-1	Provision of Bonds and Insurances		Ls	1			0	0	0	
C-2-2	Provision and maintenance of site office		Ls	1			0	4,025,000	3,478,000	
C-2-3	Provision of pipe stores		Ls	1			0	15,126,000	13,069,000	
C-2-4	Provision of site safety		Ls	1			0	38,929,000	33,635,000	
C-2-5	Quality assurance and material testing		Ls	1			1,795,000	8,866,000	9,455,000	
C-2-6	Progress documents and drawings		Ls	1			0	2,630,000	2,272,000	
C-2-7	Miscellaneous		Ls	1			0	21,092,000	18,223,000	

4.3-1-29

Lot C-1(A)

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
C-1	Distribution Sub System						135,116,000	954,705,640	959,981,000	
C-1(A)	Distribution Sub System (A)		Ls	1			47,535,000	335,933,096	337,781,000	
C-1(B)	Distribution Sub System (B)		Ls	1			87,581,000	618,772,544	622,200,000	
C-1(A)	Distribution Sub System (A)						47,535,000	335,933,096	337,781,000	
C-1(A)1	Distribution Sub-main (A)	NWSDB	m	85,700			31,592,000	220,980,000	222,519,000	
C-1(A)2	Road Reinstatement (A)	NWSDB	Ls	1			3,254,000	25,325,784	25,135,000	
C-1(A)3	Distribution Sub-main (A)	CBO	m	31,300			11,501,000	80,381,000	80,950,000	
C-1(A)4	Road Reinstatement (A)	CBO	Ls	1			1,188,000	9,246,312	9,177,000	
C-1(A)1	Distribution Sub-main (A)	NWSDB	m	85,700			31,592,000	220,980,000	222,520,000	
C-1(A)1-1	PVC ND200/OD225		m	0	917.00	7,044.00	0	0	0	
C-1(A)1-2	PVC ND150/OD 160		m	1,100	618.00	4,596.00	680,000	5,055,600	5,048,000	
C-1(A)1-3	PVC ND100/OD 110		m	13,100	430.00	3,059.00	5,633,000	40,072,900	40,256,000	
C-1(A)1-4	PVC ND 75/ OD 90		m	19,900	396.00	2,782.00	7,880,000	55,361,800	55,713,000	
C-1(A)1-5	PVC ND 50/ OD 63		m	22,200	303.00	2,088.00	6,727,000	46,353,600	46,777,000	
C-1(A)1-6	PVC ND200/OD225 T600		m	0	738.00	5,474.00	0	0	0	
C-1(A)1-7	PVC ND150/OD 160 T600		m	0	521.00	3,749.00	0	0	0	
C-1(A)1-8	PVC ND100/OD 110 T600		m	13,100	408.00	2,873.00	5,345,000	37,636,300	37,863,000	
C-1(A)1-9	PVC ND 75/ OD 90 T600		m	8,100	366.00	2,526.00	2,965,000	20,460,600	20,643,000	
C-1(A)1-10	PVC ND 50/ OD 63 T600		m	8,200	288.00	1,956.00	2,362,000	16,039,200	16,220,000	

4.3-1-30

Lot C-1(A)

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
C-1(A)2	Restoration of Road Pavement	NWSDB					3,254,000	25,325,784	25,135,000	
C-1(A)2-1	Restoration of Pavement (carriageway)	RDA/PRDA 4 % of pipeline	m2	4,114	568	4,419	2,337,000	18,179,766	18,044,000	
C-1(A)2-2	Restoration of Pavement (Carriageway)	UC/PS 4 % of pipeline	m2	4,114	223	1,737	917,000	7,146,018	7,091,000	
C-1(A)3	Distribution Sub-main (A)	CBO	m	31,300			11,501,000	80,381,000	80,950,000	
C-1(A)3-1	PVC ND200/OD225		m	0	917.00	7,044.00	0	0	0	
C-1(A)3-2	PVC ND150/OD 160		m	600	618.00	4,596.00	371,000	2,757,600	2,754,000	
C-1(A)3-3	PVC ND100/OD 110		m	2,800	430.00	3,059.00	1,204,000	8,565,200	8,604,000	
C-1(A)3-4	PVC ND 75/ OD 90		m	10,300	396.00	2,782.00	4,079,000	28,654,600	28,837,000	
C-1(A)3-5	PVC ND 50/ OD 63		m	7,700	303.00	2,088.00	2,333,000	16,077,600	16,224,000	
C-1(A)3-6	PVC ND200/OD225 T600		m	0	738.00	5,474.00	0	0	0	
C-1(A)3-7	PVC ND150/OD 160 T600		m	0	521.00	3,749.00	0	0	0	
C-1(A)3-8	PVC ND100/OD 110 T600		m	2,800	408.00	2,873.00	1,142,000	8,044,400	8,092,000	
C-1(A)3-9	PVC ND 75/ OD 90 T600		m	4,200	366.00	2,526.00	1,537,000	10,609,200	10,703,000	
C-1(A)3-10	PVC ND 50/ OD 63 T600		m	2,900	288.00	1,956.00	835,000	5,672,400	5,736,000	
C-1(A)4	Restoration of Road Pavement	CBO					1,188,000	9,246,312	9,177,000	
C-1(A)4-1	Restoration of Pavement (carriageway)	RDA/PRDA 4 % of pipeline	m2	1,502	568	4,419	853,000	6,637,338	6,588,000	
C-1(A)4-2	Restoration of Pavement (Carriageway)	UC/PS 4 % of pipeline	m2	1,502	223	1,737	335,000	2,608,974	2,589,000	

4.3-1-31

Lot C-1(B)

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					JPY	LKR	JPY	LKR	Total JPY	
C-1(B)	Distribution Sub System (B)						87,581,000	618,772,544	622,201,000	
C-1(B)-1	Distribution Sub-main (B)	NWSDB	m	98,700			37,058,000	259,426,600	261,203,000	
C-1(B)-2	Road Reinstatement (B)	NWSDB	Ls	1			3,748,000	29,167,128	28,948,000	
C-1(B)-3	Distribution Sub-main (B)	CBO	m	114,300			42,436,000	296,407,000	298,532,000	
C-1(B)-4	Road Reinstatement (B)	CBO	Ls	1			4,339,000	33,771,816	33,518,000	
C-1(B)1	Distribution Sub-main (B)	NWSDB	m	98,700			37,058,000	259,426,600	261,203,000	
C-1(B)1-1	PVC ND200/OD225		m	0	917.00	7,044.00	0	0	0	
C-1(B)1-2	PVC ND150/OD 160		m	800	618.00	4,596.00	494,000	3,676,800	3,671,000	
C-1(B)1-3	PVC ND100/OD 110		m	14,900	430.00	3,059.00	6,407,000	45,579,100	45,787,000	
C-1(B)1-4	PVC ND 75/ OD 90		m	29,900	396.00	2,782.00	11,840,000	83,181,800	83,709,000	
C-1(B)1-5	PVC ND 50/ OD 63		m	19,000	303.00	2,088.00	5,757,000	39,672,000	40,034,000	
C-1(B)1-6	PVC ND200/OD225 T600		m	0	738.00	5,474.00	0	0	0	
C-1(B)1-7	PVC ND150/OD 160 T600		m	0	521.00	3,749.00	0	0	0	
C-1(B)1-8	PVC ND100/OD 110 T600		m	14,900	408.00	2,873.00	6,079,000	42,807,700	43,065,000	
C-1(B)1-9	PVC ND 75/ OD 90 T600		m	12,200	366.00	2,526.00	4,465,000	30,817,200	31,091,000	
C-1(B)1-10	PVC ND 50/ OD 63 T600		m	7,000	288.00	1,956.00	2,016,000	13,692,000	13,846,000	
C-1(B)2	Restoration of Road Pavement	NWSDB					3,748,000	29,167,128	28,949,000	
C-1(B)2-1	Restoration of Pavement (carriageway)RDA/PRDA	4 % of pipeline	m2	4,738	568	4,419	2,691,000	20,937,222	20,781,000	
C-1(B)2-2	Restoration of Pavement (Carriageway) UC/PS	4 % of pipeline	m2	4,738	223	1,737	1,057,000	8,229,906	8,168,000	

4.3-1-32

Lot C-1(B)

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
C-1(B)3	Distribution Sub-main (B)	CBO	m	114,300			42,436,000	296,407,000	298,532,000	
C-1(B)3-1	PVC ND200/OD 225		m	0	917.00	7,044.00	0	0	0	
C-1(B)3-2	PVC ND150/OD 160		m	800	618.00	4,596.00	494,000	3,676,800	3,671,000	
C-1(B)3-3	PVC ND100/OD 110		m	7,800	430.00	3,059.00	3,354,000	23,860,200	23,969,000	
C-1(B)3-4	PVC ND 75/ OD 90		m	49,300	396.00	2,782.00	19,523,000	137,152,600	138,023,000	
C-1(B)3-5	PVC ND 50/ OD 63		m	20,700	303.00	2,088.00	6,272,000	43,221,600	43,615,000	
C-1(B)3-6	PVC ND200/OD225 T600		m	0	738.00	5,474.00	0	0	0	
C-1(B)3-7	PVC ND150/OD 160 T600		m	0	521.00	3,749.00	0	0	0	
C-1(B)3-8	PVC ND100/OD 110 T600		m	7,800	408.00	2,873.00	3,182,000	22,409,400	22,544,000	
C-1(B)3-9	PVC ND 75/ OD 90 T600		m	20,200	366.00	2,526.00	7,393,000	51,025,200	51,479,000	
C-1(B)3-10	PVC ND 50/ OD 63 T600		m	7,700	288.00	1,956.00	2,218,000	15,061,200	15,231,000	
C-1(B)4	Restoration of Road Pavement	CBO					4,339,000	33,771,816	33,518,000	
C-1(B)4-1	Restoration of Pavement (carriageway)RDA/PRDA	4 % of pipeline	m2	5,486	568	4,419	3,116,000	24,242,634	24,062,000	
C-1(B)4-2	Restoration of Pavement (Carriageway) UC/PS	4 % of pipeline	m2	5,486	223	1,737	1,223,000	9,529,182	9,456,000	

4.3-1-33

Lot C: Distribution Sub-System

1 USD= 120.1 JPY
 1 USD= 139.0 LKR
 1 LKR= 0.864 JPY

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					JPY	LKR	JPY	LKR	Total JPY	
C-3	ex-Bowser Area in Phase1		m	160,240			73,743,000	489,792,000	496,923,000	
C-3-1	Rambewa		m	100,705			44,388,000	318,027,000	319,163,000	
C-3-2	Medawachchiya		m	59,535			29,355,000	171,765,000	177,760,000	
C-3-1	Rambewa		m	100,705			44,388,000	318,027,000	319,163,000	
C-3-1-1	Pipe Extension area GDN 80, 104, 105, 116		m	49,204			21,155,000	150,987,000	151,608,000	
C-3-1-2	Kallanchiya Cluster GDN 89, 92, 95,96, 98		m	39,581			18,243,000	131,505,000	131,863,000	
C-3-1-3	Koonakubukwewa and Peenagama GDN 90, 91		m	11,920			4,990,000	35,535,000	35,692,000	
C-3-2	Medawachchiya		m	59,535			29,355,000	171,765,000	177,760,000	
C-3-2-1	Pipe Extension area GDN 62, 63, 48, 76, 77		m	59,535			29,355,000	171,765,000	177,760,000	

4.3-1-34

Lot C-3

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					JPY	LKR	JPY	LKR	Total JPY	
C-3-1-1	Pipe Extension area in Rambewa		m	49,204			21,155,000	150,987,000	151,608,000	
C-3-1-1-1	PVC ND150/OD 160		m	4,262	618.00	4,596.00	2,634,000	19,588,000	19,558,000	
C-3-1-1-2	PVC ND100/OD 110		m	16,000	430.00	3,059.00	6,880,000	48,944,000	49,168,000	
C-3-1-1-3	PVC ND 75/ OD 90		m	10,782	396.00	2,782.00	4,270,000	29,996,000	30,187,000	
C-3-1-1-4	PVC ND 50/ OD 63		m	18,160	303.00	2,088.00	5,502,000	37,918,000	38,263,000	
C-3-1-1-5	Restoration of Pavement (carriageway)RDA/PRDA 4 % of pipeline		m2	2,362	568	4,419	1,342,000	10,438,000	10,360,000	
C-3-1-1-6	Restoration of Pavement (Carriageway) UC/PS 4 % of pipeline		m2	2,362	223	1,737	527,000	4,103,000	4,072,000	
C-3-1-2	Kallanchiya Cluster in Rambewa		m	39,581			18,243,000	131,505,000	131,862,000	
C-3-1-2-1	PVC ND200/OD 225		m	3,050	917.00	7,044.00	2,797,000	21,484,000	21,359,000	
C-3-1-2-2	PVC ND150/OD 160		m	2,700	618.00	4,596.00	1,669,000	12,409,000	12,390,000	
C-3-1-2-3	PVC ND100/OD 110		m	7,470	430.00	3,059.00	3,212,000	22,851,000	22,955,000	
C-3-1-2-4	PVC ND 75/ OD 90		m	11,561	396.00	2,782.00	4,578,000	32,163,000	32,367,000	
C-3-1-2-5	PVC ND 50/ OD 63		m	14,800	303.00	2,088.00	4,484,000	30,902,000	31,183,000	
C-3-1-2-6	Restoration of Pavement (carriageway)RDA/PRDA 4 % of pipeline		m2	1,900	568	4,419	1,079,000	8,396,000	8,333,000	
C-3-1-2-7	Restoration of Pavement (Carriageway) UC/PS 4 % of pipeline		m2	1,900	223	1,737	424,000	3,300,000	3,275,000	

4.3-1-35

Lot C-3

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					JPY	LKR	JPY	LKR	Total JPY	
C-3-1-3	Koonakubukwewa and Peenagama[m	11,920			4,990,000	35,535,000	35,692,000	
C-3-1-3-1	PVC ND200/OD225		m	57	917.00	7,044.00	52,000	402,000	399,000	
C-3-1-3-2	PVC ND150/OD 160		m	1,075	618.00	4,596.00	664,000	4,941,000	4,933,000	
C-3-1-3-3	PVC ND100/OD 110		m	1,300	430.00	3,059.00	559,000	3,977,000	3,995,000	
C-3-1-3-4	PVC ND 75/ OD 90		m	4,153	396.00	2,782.00	1,645,000	11,554,000	11,628,000	
C-3-1-3-5	PVC ND 50/ OD 63		m	5,335	303.00	2,088.00	1,617,000	11,139,000	11,241,000	
C-3-1-3-6	Restoration of Pavement (carriageway)RDA/PRDA	4 % of pipeline	m2	572	568	4,419	325,000	2,528,000	2,509,000	
C-3-1-3-7	Restoration of Pavement (Carriageway) UC/PS	4 % of pipeline	m2	572	223	1,737	128,000	994,000	987,000	
C-3-2-1	Pipe Extension area in Medawachchiya		m	59,535			29,355,000	171,765,000	177,759,000	
C-3-2-1-1	HDPE 180		m	1,645	3,655.00	4,008.00	6,012,000	6,593,000	11,708,000	
C-3-2-1-2	PVC ND100/OD 110		m	11,913	430.00	3,059.00	5,123,000	36,442,000	36,609,000	
C-3-2-1-3	PVC ND 75/ OD 90		m	21,810	396.00	2,782.00	8,637,000	60,675,000	61,060,000	
C-3-2-1-4	PVC ND 50/ OD 63		m	24,167	303.00	2,088.00	7,323,000	50,461,000	50,921,000	
C-3-2-1-5	Restoration of Pavement (carriageway)RDA/PRDA	4 % of pipeline	m2	2,858	568	4,419	1,623,000	12,630,000	12,535,000	
C-3-2-1-6	Restoration of Pavement (Carriageway) UC/PS	4 % of pipeline	m2	2,858	223	1,737	637,000	4,964,000	4,926,000	

4.3-1-36

Lot C-4

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					JPY	LKR	JPY	LKR	Total JPY	
C-4	ex-Bowser Area in Phase2		m	230,500			126,771,000	931,100,000	931,242,000	
C-4-1	Bogahawera Tower Zone GND 4, 8,9, 15		m	39,000			21,574,000	158,435,000	158,462,000	
C-4-2	Wahalkada Tower Zone GND 146, 143		m	10,500			5,570,000	40,732,000	40,762,000	
C-4-3	KAH-KEB Median Tower Zone GND 31		m	10,500			5,847,000	43,001,000	43,000,000	
C-4-4	North Horowpothana City Tower Zone GND 137, 123, 142		m	40,000			22,126,000	162,562,000	162,580,000	
C-4-5	West Horowpothana City Tower Zone GND 118		m	9,500			5,137,000	37,655,000	37,671,000	
C-4-6	Halmillewa Tower Zone GND 124, 154		m	20,000			12,520,000	93,117,000	92,973,000	
C-4-7	Kahatagasdigiliya Tower Zone GND 205,217, 204, 216, 227, 228, 197, 200, 199		m	101,000			53,997,000	395,598,000	395,794,000	
C-4-1	Bogahawera Tower Zone		m	39,000			21,574,000	158,435,000	158,462,000	
C-4-1-1	PVC ND200/OD 225		m	6,000	917.00	7,044.00	5,502,000	42,264,000	42,018,000	
C-4-1-2	PVC ND150/OD 160		m	8,000	618.00	4,596.00	4,944,000	36,768,000	36,712,000	
C-4-1-3	PVC ND100/OD 110		m	9,000	430.00	3,059.00	3,870,000	27,531,000	27,657,000	
C-4-1-4	PVC ND 75/ OD 90		m	10,000	396.00	2,782.00	3,960,000	27,820,000	27,996,000	
C-4-1-5	PVC ND 50/ OD 63		m	6,000	303.00	2,088.00	1,818,000	12,528,000	12,642,000	
C-4-1-6	Restoration of Pavement (carriageway)RDA/PRDA 4 % of pipeline		m2	1,872	568	4,419	1,063,000	8,272,000	8,210,000	
C-4-1-7	Restoration of Pavement (Carriageway) UC/PS 4 % of pipeline		m2	1,872	223	1,737	417,000	3,252,000	3,227,000	

4.3-1-37

Lot C-4

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
C-4-2	Wahalkada Tower Zone		m	10,500			5,570,000	40,732,000	40,762,000	
C-4-2-1	PVC ND200/OD 225		m	1,500	917.00	7,044.00	1,376,000	10,566,000	10,505,000	
C-4-2-2	PVC ND150/OD 160		m	1,500	618.00	4,596.00	927,000	6,894,000	6,883,000	
C-4-2-3	PVC ND100/OD 110		m	2,500	430.00	3,059.00	1,075,000	7,648,000	7,683,000	
C-4-2-4	PVC ND 75/ OD 90		m	3,000	396.00	2,782.00	1,188,000	8,346,000	8,399,000	
C-4-2-5	PVC ND 50/ OD 63		m	2,000	303.00	2,088.00	606,000	4,176,000	4,214,000	
C-4-2-6	Restoration of Pavement (carriageway)RDA/PRDA	4 % of pipeline	m2	504	568	4,419	286,000	2,227,000	2,210,000	
C-4-2-7	Restoration of Pavement (Carriageway) UC/PS	4 % of pipeline	m2	504	223	1,737	112,000	875,000	868,000	
C-4-3	KAH-KEB Median Tower Zone		m	10,500			5,847,000	43,001,000	42,999,000	
C-4-3-1	PVC ND200/OD 225		m	2,000	917.00	7,044.00	1,834,000	14,088,000	14,006,000	
C-4-3-2	PVC ND150/OD 160		m	1,500	618.00	4,596.00	927,000	6,894,000	6,883,000	
C-4-3-3	PVC ND100/OD 110		m	3,000	430.00	3,059.00	1,290,000	9,177,000	9,219,000	
C-4-3-4	PVC ND 75/ OD 90		m	2,000	396.00	2,782.00	792,000	5,564,000	5,599,000	
C-4-3-5	PVC ND 50/ OD 63		m	2,000	303.00	2,088.00	606,000	4,176,000	4,214,000	
C-4-3-6	Restoration of Pavement (carriageway)RDA/PRDA	4 % of pipeline	m2	504	568	4,419	286,000	2,227,000	2,210,000	
C-4-3-7	Restoration of Pavement (Carriageway) UC/PS	4 % of pipeline	m2	504	223	1,737	112,000	875,000	868,000	
C-4-4	North Horowpothana City Tower Zone		m	40,000			22,126,000	162,562,000	162,578,000	
C-4-4-1	PVC ND200/OD 225		m	6,000	917.00	7,044.00	5,502,000	42,264,000	42,018,000	
C-4-4-2	PVC ND150/OD 160		m	9,000	618.00	4,596.00	5,562,000	41,364,000	41,300,000	
C-4-4-3	PVC ND100/OD 110		m	10,000	430.00	3,059.00	4,300,000	30,590,000	30,730,000	

4.3-1-38

Lot C-4

Code	Halmillewa Tower Zone	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
C-4-4-4	PVC ND 75/ OD 90		m	7,500	396.00	2,782.00	2,970,000	20,865,000	20,997,000	
C-4-4-5	PVC ND 50/ OD 63		m	7,500	303.00	2,088.00	2,273,000	15,660,000	15,803,000	
C-4-4-6	Restoration of Pavement (carriageway)RDA/PRDA	4 % of pipeline	m2	1,920	568	4,419	1,091,000	8,484,000	8,421,000	
C-4-4-7	Restoration of Pavement (Carriageway) UC/PS	4 % of pipeline	m2	1,920	223	1,737	428,000	3,335,000	3,309,000	
C-4-5	West Horowpothana City Tower Zone		m	9,500			5,137,000	37,655,000	37,670,000	
C-4-5-1	PVC ND200/OD 225		m	1,500	917.00	7,044.00	1,376,000	10,566,000	10,505,000	
C-4-5-2	PVC ND150/OD 160		m	1,500	618.00	4,596.00	927,000	6,894,000	6,883,000	
C-4-5-3	PVC ND100/OD 110		m	2,500	430.00	3,059.00	1,075,000	7,648,000	7,683,000	
C-4-5-4	PVC ND 75/ OD 90		m	2,000	396.00	2,782.00	792,000	5,564,000	5,599,000	
C-4-5-5	PVC ND 50/ OD 63		m	2,000	303.00	2,088.00	606,000	4,176,000	4,214,000	
C-4-5-6	Restoration of Pavement (carriageway)RDA/PRDA	4 % of pipeline	m2	456	568	4,419	259,000	2,015,000	2,000,000	
C-4-5-7	Restoration of Pavement (Carriageway) UC/PS	4 % of pipeline	m2	456	223	1,737	102,000	792,000	786,000	
C-4-6	Halmillewa Tower Zone		m	20,000			12,520,000	93,117,000	92,973,000	
C-4-6-1	PVC ND200/OD 225		m	5,000	917.00	7,044.00	4,585,000	35,220,000	35,015,000	
C-4-6-2	PVC ND150/OD 160		m	6,000	618.00	4,596.00	3,708,000	27,576,000	27,534,000	
C-4-6-3	PVC ND100/OD 110		m	4,000	430.00	3,059.00	1,720,000	12,236,000	12,292,000	
C-4-6-4	PVC ND 75/ OD 90		m	2,500	396.00	2,782.00	990,000	6,955,000	6,999,000	
C-4-6-5	PVC ND 50/ OD 63		m	2,500	303.00	2,088.00	758,000	5,220,000	5,268,000	
C-4-6-6	Restoration of Pavement (carriageway)RDA/PRDA	4 % of pipeline	m2	960	568	4,419	545,000	4,242,000	4,210,000	
C-4-6-7	Restoration of Pavement (Carriageway) UC/PS	4 % of pipeline	m2	960	223	1,737	214,000	1,668,000	1,655,000	

4.3-1-39

Lot D: Vehicles

1 USD= 120.1 JPY
 1 USD= 139.0 LKR
 1 LKR= 0.864 JPY

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
D-1	Vehicles						0	63,440,000	54,812,000	
D-1-1	Crew Cab		Nr.	2	0	6,630,000	0	13,260,000	11,457,000	
D-1-2	Single Cab		Nr.	1	0	3,320,000	0	3,320,000	2,868,000	
D-1-3	Double Cab		Nr.	2	0	6,630,000	0	13,260,000	11,457,000	
D-1-4	Water Bowser		Nr.	2	0	7,030,000	0	14,060,000	12,148,000	
D-1-5	Motor Cycles		Nr.	7	0	220,000	0	1,540,000	1,331,000	
D-1-6	Lorry with Jib Crane	capacity: 5 ton	Nr.	1	0	8,000,000	0	8,000,000	6,912,000	
D-1-7	Lorry	with enclosed cargo bed capacity: 8 ton	Nr.	1	0	10,000,000	0	10,000,000	8,640,000	

4.3-1-41

Lot E: Heavy Duty Machines

1 USD= 120.1 JPY
 1 USD= 139.0 LKR
 1 LKR= 0.864 JPY

Code	Item	Specifications	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
E-1	Heavy Duty Machines						0	15,650,000	13,522,000	
E-1-1	Asphalt Cutters		Nr.	2	0	630,000	0	1,260,000	1,089,000	
E-1-2	Tapping Machines		Nr.	2	0	80,000	0	160,000	138,000	
E-1-3	Compactors		Nr.	2	0	330,000	0	660,000	570,000	
E-1-4	Vibrating Hammers		Nr.	2	0	330,000	0	660,000	570,000	
E-1-5	Portable Generators		Nr.	3	0	800,000	0	2,400,000	2,074,000	
E-1-6	Water Meter Test Bench		Nr.	1	0	3,320,000	0	3,320,000	2,868,000	
E-1-7	Mini-Backhoe		Nr.	1	0	7,190,000	0	7,190,000	6,212,000	

4.3-1-42

1 USD= 120.1 JPY
 1 USD= 139.0 LKR
 1 LKR= 0.864 JPY

Non-Eligible Work by NWSDB

Code	Item	Specificactions	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
Non-eligible Wahalkada										
NEW	Service Connections for Phase 2						6,674,000	71,423,048	68,382,000	Non-eligible
NEW-1	Service Connections for Area A						950,000	13,760,934	12,839,000	Non-eligible
NEW-1-1	Service Connections for Area A-1	NWSDB					650,000	9,423,738	8,792,000	Non-eligible
NEW-1-1-1	Domestic House Connections	incl. ND15mm Meter	nos	2,241	252	3,642	565,000	8,161,722	7,617,000	Non-eligible
NEW-1-1-2	Non-Domestic House Connections	incl. ND25mm Meter	nos	112	763	11,268	85,000	1,262,016	1,175,000	Non-eligible
NEW-1-2	Service Connections for Area A-2	CBO					300,000	4,337,196	4,047,000	Non-eligible
NEW-1-2-1	Domestic House Connections	incl. ND15mm Meter	nos	1,030	252	3,642	260,000	3,751,260	3,501,000	Non-eligible
NEW-1-2-2	Non-Domestic House Connections	incl. ND25mm Meter	nos	52	763	11,268	40,000	585,936	546,000	Non-eligible
NEW-2	Service Connections for Area B						1,201,000	17,406,714	16,240,000	Non-eligible
NEW-2-1	Service Connections for Area B-1	NWSDB					598,000	8,663,124	8,083,000	Non-eligible
NEW-2-1-1	Domestic House Connections	incl. ND15mm Meter	nos	2,060	252	3,642	519,000	7,502,520	7,001,000	Non-eligible
NEW-2-1-2	Non-Domestic House Connections	incl. ND25mm Meter	nos	103	763	11,268	79,000	1,160,604	1,082,000	Non-eligible
NEW-2-2	Service Connections for Area B-2	CBO					603,000	8,743,590	8,157,000	Non-eligible
NEW-2-2-1	Domestic House Connections	incl. ND15mm Meter	nos	2,079	252	3,642	524,000	7,571,718	7,066,000	Non-eligible
NEW-2-2-2	Non-Domestic House Connections	incl. ND25mm Meter	nos	104	763	11,268	79,000	1,171,872	1,091,000	Non-eligible
NEW-3	Procurement of PVC ND 50						4,523,000	40,255,400	39,303,000	Non-eligible
NEW-3-1	PVC ND 50/ OD 63 T600	Procurement only	m	58,200	23.00	205.00	1,339,000	11,931,000	11,647,000	Non-eligible
NEW-3-2	PVC ND 50/ OD 63	Procurement only	m	83,800	38.00	338.00	3,184,000	28,324,400	27,656,000	Non-eligible

4.3-1-43

Non-Eligible Work by NWSDB

1 USD= 120.1 JPY
 1 USD= 139.0 LKR
 1 LKR= 0.864 JPY

Code	Item	Specificactions	Unit	Quantity	Unit Price		Amount			Remarks
					FC(JPY)	LC(LKR)	FC(JPY)	LC(LKR)	Total (JPY)	
Non-eligible Mahakanadarawa										
NEM	Service Connections for Phase 1						7,658,000	77,156,664	74,321,000	Non-eligible
NEM-1	Service Connections for NWSDB						807,000	11,694,654	10,911,000	Non-eligible
NEM-1-1	Domestic House Connections	incl. ND15mm Meter	nos	2,781	252	3,642	701,000	10,128,402	9,452,000	Non-eligible
NEM-1-1	Non-Domestic House Connections	incl. ND25mm Meter	nos	139	763	11,268	106,000	1,566,252	1,459,000	Non-eligible
NEM-2	Service Connections for CBO						799,000	11,581,410	10,805,000	Non-eligible
NEM-2-1	Domestic House Connections	incl. ND15mm Meter	nos	2,753	252	3,642	694,000	10,026,426	9,357,000	Non-eligible
NEM-2-1	Non-Domestic House Connections	incl. ND25mm Meter	nos	138	763	11,268	105,000	1,554,984	1,449,000	Non-eligible
NEM-3	Procurement of PVC ND 50						6,052,000	53,880,600	52,605,000	Non-eligible
NEM-3-1	PVC ND 50/ OD 63 T600	Procurement only	m	130,600	23.00	205.00	3,004,000	26,773,000	26,136,000	Non-eligible
NEM-3-2	PVC ND 50/ OD 63	Procurement only	m	80,200	38.00	338.00	3,048,000	27,107,600	26,469,000	Non-eligible

4.3-1-44

Pipe Works Unit Price

Summary

Transmission

Item ID	OD	Supply Cost		Laying Cost		Total		
		F/S	S/S	F/S	S/S	F/S	S/S	Ratio
HDPE								
500	560	25,331	34,322	2,431	10,128	27,762	44,450	1.60
450	500	20,221	27,406	2,184	9,499	22,405	36,905	1.65
400	450	16,569	22,157	1,598	7,305	18,168	29,462	1.62
350	400	12,917	17,855	1,497	6,702	14,414	24,557	1.70
300	355	10,223	13,870	1,375	6,266	11,598	20,136	1.74
250	280	6,340	8,596	1,080	5,241	7,420	13,837	1.86
200	250	5,050	6,822	879	4,923	5,929	11,744	1.98
150	180	2,633	3,549	715	4,176	3,348	7,725	2.31
100	110	1,273	1,338	593	3,446	1,866	4,785	2.56
75	90	671	898	476	3,129	1,147	4,027	3.51
PVC Pipe								
250	280	5,316	6,263	923	4,395	6,239	10,658	1.71
200	225	4,445	3,888	860	3,522	5,305	7,410	1.40
150	160	1,610	2,026	753	2,904	2,363	4,930	2.09
100	110	772	859	568	2,518	1,340	3,377	2.52
75	90	508	648	512	2,449	1,020	3,097	3.04
50	63	340	329	322	2,024	662	2,352	3.55
PN16 HDPE								
400	450	24,855	34,005	1,598	7,559	26,453	41,564	1.57
350	400	19,376	26,248	1,497	6,815	20,873	33,063	1.58
300	355	15,334	20,403	1,375	6,379	16,709	26,783	1.60

Distribution

Item ID	OD	Supply Cost		Laying Cost		Total		
		F/S	S/S	F/S	S/S	F/S	S/S	Ratio
HDPE								
500	560	27,357	38,136	2,517	10,450	29,874	48,586	1.63
450	500	21,839	30,452	2,266	9,787	24,105	40,239	1.67
400	450	17,895	24,619	1,658	7,549	19,553	32,168	1.65
350	400	13,950	19,840	1,551	6,912	15,502	26,752	1.73
300	355	11,041	15,411	1,422	6,463	12,463	21,874	1.76
250	280	6,847	9,551	1,115	5,394	7,962	14,945	1.88
200	250	5,454	7,579	907	5,060	6,361	12,639	1.99
150	180	2,843	3,945	737	4,293	3,580	8,238	2.30
100	110	1,375	1,488	611	3,532	1,986	5,020	2.53
75	90	724	998	494	3,198	1,218	4,196	3.44
PVC Pipe								
250	280	5,980	7,265	923	4,494	6,903	11,758	1.70
200	225	5,001	4,510	860	3,596	5,861	8,105	1.38
150	160	1,811	2,350	753	2,961	2,564	5,311	2.07
100	110	868	997	568	2,559	1,436	3,557	2.48
75	90	572	751	512	2,489	1,084	3,240	2.99
50	63	383	382	322	2,057	705	2,439	3.46

Transmission Line

<<Preparatory Survey>>

Item ID	OD	Supply Cost								Laying Cost										1RS= 0.61 JPY			
		CIF Price	10% Discount	Conv LKR	Fitting&Val	Inland Trans	Supply Price	Contractor OH	Total Supply	NWSDB Rate	Laying	Fittings & Valves	Exc. Comm	Earth work supports	Dewatering	Bedding & surrounding	Rock Allw	total Laying	Contractor OH	Total Install	TOTAL PRICE	Unit Price	
HDPE																							
500	560	152.71	137.44	17,867	4,467	1,340	23,674	1,657	25,331	22,176	30%	869	697				349	1,915	517	2,431	27,762	14,552	3,907
450	500	121.91	109.72	14,263	3,566	1,070	18,898	1,323	20,221	16,632	30%	848	581				291	1,720	464	2,184	22,405	11,639	3,325
400	450	99.90	89.91	11,687	2,922	877	15,485	1,084	16,569	13,519	30%	618	427				214	1,259	340	1,598	18,168	9,519	2,563
350	400	77.88	70.09	9,111	2,278	683	12,072	845	12,917	9,519	30%	559	413				207	1,179	318	1,497	14,414	7,444	2,211
300	355	61.63	55.47	7,211	1,803	543	9,555	669	10,223	6,774	30%	481	301				201	1,083	292	1,375	11,598	5,909	1,911
250	280	38.23	34.40	4,472	1,118	335	5,925	415	6,340	3,514	30%	364	224				162	850	230	1,080	7,420	3,685	1,379
200	250	30.45	27.40	3,562	891	267	4,720	330	5,050	3,306	30%	296	264				132	692	187	879	5,929	2,937	1,114
150	180	15.87	14.29	1,857	464	139	2,461	172	2,633	1,788	30%	227	224				112	563	152	715	3,348	1,554	800
100	110	7.68	6.91	898	225	67	1,190	83	1,273	642	30%	182	190				95	467	126	593	1,866	774	597
75	90	4.05	3.64	473	118	35	627	44	671	527	30%	180	130				65	375	101	476	1,147	423	453
PVC Pipe																							
250	280			4,440	828		4,968	348	5,316	4,140	30%	219.7	338				169	726.7	196	923	6,239	232	5,859
200	225			3,462	692		4,154	291	4,445	3,462	30%	170.3	338				169	677.3	183	860	5,305	202	4,974
150	160			1,254	251		1,505	105	1,610	1,254	30%	124.8	312				156	592.8	160	753	2,363	113	2,178
100	110			601	120		721	50	772	601	30%	96.2	234				117	447.2	121	568	1,340	73	1,220
75	90			396	79		475	33	508	336	30%	80.6	215				107.5	403.1	109	512	1,020	61	920
50	63			265	53		318	22	340	265	30%	78	117				58.5	253.5	68	322	662	39	598
PN16 HDPE																							
400	450	149.84	134.86	17,531	4,383	1,315	23,229	1,626	24,855	9,519		618	427				214	1,259	340	1,598	26,453	14,207	3,163
350	400	118.82	105.14	13,667	3,417	1,025	18,109	1,268	19,376	9,519		559	413				207	1,179	318	1,497	20,873	11,098	2,680
300	355	92.45	83.20	10,816	2,704	811	14,331	1,003	15,334	6,774		481	401				201	1,083	292	1,375	16,709	8,800	2,283

<<Supplemental Survey>>

Item ID	OD	Supply Cost								Laying Cost										1RS= 0.904 JPY			
		CIF Price	10% Discount	Conv LKR	Fitting&Val	Clearance & Trans	Supply Price	Contractor OH	Total Supply	NWSDB Rate	Laying	Fittings & Valves	Excavation	Earth work supports	Dewatering	Bedding & surrounding	Rock allowanc	total Laying	Contractor OH	Total Install	TOTAL PRICE	Unit Price	
HDPE Pipe																							
500	560	20,178			35%	7,062	1,362	28,602	5,720	34,322	1,690	591.5	2,177	480.80	155.00	1,792	1,089	7,975	2,153	10,128	44,450	29,607	11,699
450	500	16,112			35%	5,639	1,088	22,839	4,568	27,406	1,514	529.9	2,090	442.80	148.80	1,709	1,045	7,480	2,019	9,499	36,905	23,831	10,543
400	450	13,026			35%	4,559	879	18,464	3,693	22,157	1,281	448.35	1,233	428.00	137.80	1,607	617	5,752	1,553	7,305	29,462	19,216	8,205
350	400	10,497			35%	3,674	709	14,880	2,976	17,855	1,106	387.1	1,109	413.40	124.00	1,583	555	5,277	1,425	6,702	24,557	15,595	7,306
300	355	8,154			35%	2,854	550	11,558	2,312	13,870	1,034	361.9	1,109	401.60	124.00	1,349	555	4,934	1,332	6,266	20,136	12,257	6,578
250	280	6,403			35%	2,241	432	9,076	1,815	10,891	849	297.15	924	390.00	103.40	1,237	462	4,263	1,151	5,413	16,305	9,991	5,585
200	250	5,053			35%	1,769	341	7,163	1,433	8,596	804	281.4	924	378.20	103.40	1,174	462	4,127	1,114	5,241	13,837	7,779	5,232
150	180	2,087			35%	1,404	271	5,685	1,137	6,822	722	252.7	853	369.40	95.40	1,157	427	3,876	1,047	4,923	11,744	6,276	4,802
100	110	1,642			35%	1,138	219	4,608	922	5,530	697	243.95	853	363.60	95.40	948	427	3,627	979	4,607	10,137	5,171	4,417
75	90	877			35%	730	141	2,958	592	3,549	616	215.6	792	348.80	88.60	831	396	3,288	888	4,176	7,725	3,483	3,872
50	63	528			35%	575	111	2,328	466	2,793	601	210.35	792	343.00	88.60	794	396	3,225	871	4,096	6,889	2,850	3,736
PVC Pipe																							
250	280	4,175			25%	1,044	5,219	1,044	6,263	5,170	517	180.95	760	381.20	67.60	1,174	380	3,461	934	4,395	10,658	5,970	4,054
200	225	2,592			25%	648	3,240	648	3,888	3,522	387	135.45	580	381.20	51.60	948	290	2,773	749	3,522	7,410	3,813	3,192
150	160	1,350			25%	338	1,688	338	2,026	2,026	299	104.65	464	351.80	41.40	794	232	2,287	617	2,904	4,930	2,130	2,574
100	110	573			25%	143	716	143	859	859	217	75.95	348	351.80	31.00	785	174	1,983	535	2,518	3,377	1,077	2,186
75	90	432			25%	108	540	108	648	648	209	73.15	348	322.40	31.00	771	174	1,929	521	2,449	3,097	886	2,117
50	63	219			25%	55	274	55	329	329	177	61.95	299	347.40	26.60	532	150	1,593	430	2,024	2,352	555	1,739
HDPE PIPE PE100 SDR11 PN																							