LOCATION OF FLOW METER (IN DISTRIBUTION MAINS)

Sl No	Name of Distribution Zone	Distribution Main Pipe dia. (in mm)	Flow Meter Dia. (in mm)	Total Number
1		600	400	1
	Borjahar	450	300	1
		350	250	2
	Total Borjhar			4
2		500	400	2
	Mirjapur	400	250	1
		350	250	2
	Total Mirjapur			5
3		700	500	1
		600	400	1
	Jalukbari	500	400	1
		450	300	1
		350	250	1
		250	200	1
	Total Jalukbari			6
4	Ganeshpara			
	Ganeshpara (East)	300	200	1
		250	200	1
	Ganeshpara (West)	450	300	1
		350	200	1
	Ganeshpara (Central)	300	200	1
		200	150	1
	Total Ganeshpara			6
5		700	500	1
		500	400	1
	Wes t Kamakhya	450	300	1
		400	250	2
		100	100	1
	Total West Kamakhya			6

Total no of Flow Meter 27

ENCLOSED SEPARATELY

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SECTION - B

Description of the Project

1. GENERAL :

GMDA wants to build up a new and modern **107 MLD** capacity **24x7** water supply system for south Guwahati Western part only. Area location has been demarcated on the GMA map. The entire work will be carried out on Govt. land and also on acquired land. Water supply scheme has been drawn up to create such infrastructures that would have capacities and design service life as per guide lines mentioned in CPHEEO manual on water supply and treatment and as per specification given in the tender document.

Raw water will have intake arrangements at defined location of river Brahmaputra and intake arrangement to be provided shall be capable of abstracting required quantity of raw water under all weather flow conditions so that treated water output is always 107 MLD. Jack well type Intake System with Submersible / Turbine Pump housed on it as per enclosed sketch plan is to be designed for raw water supply.

Raw water abstracted would be conveyed to a nearby Water Treatment Centre for usual Water Treatment Process for removal of odor and turbidity and removal / killing of micro-organisms to produce water suitable for human consumption as per quality standard suggested in CPHEEO manual. Water treatment process design has been detailed in technical requirement section of this document.

Clear water would be pumped to a nearby main Hill-Top reservoir and from there flow will be by gravity / boosting to distant other hill-top service reservoirs. Schematic line diagram showing distances, inlet and outlet levels and corresponding water requirements are enclosed in this document. From all Hill-Top service reservoirs / ESRs (R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9) water is fed by gravity to respective hydraulic pipe networks. However, successful bidders shall select final levels after necessary survey by them if required. For all other units bidders to provide GA drawings.

Capacities of all components have been worked out. Bidders can make certain minor changes after fresh survey and design. For technical bid this is not necessary but the successful bidder shall have to provide the entire design works and would be allowed to execute only after the same is approved by the department .Pipe line laying works required some special technologies as micro-tunneling and jack pushing for some limited lengths and application of good system of quick road restoration methods shall also be adopted causing 'Least Inconvenience' to public at large and avoiding of disruption of traffic. In this contract only initial road restoration is to be done by filling with excavated materials and rolling the bituminous material on top. Final road restoration will be done by State Govt. through PWD or under separate contract as per Govt. decision. Tenderer shall declare in the declaration form that in the event the work is allotted in their favour they will be able to arrange such machines within 2 months from the date of issue of work order. The work also extends upto house connection with metering. Setting up suitable monitoring sites (i.e. instrumentations with data transfer system inbuilt) is one of the control measures of the project, as computerized distribution management retail of it has been described in this document.

The project aims at adoption of good technologies in construction for durable structures. Good specifications of materials, equipments, machines & instruments should be considered which have been described in technical specification. Weather & soil conditions of the project area have important part to play. Due care and analysis would be required during design and procurement phase for durable system design. The project also aims at adequate security and protective measures for all its component structures, adjuncts and appliances. Good aesthetic designs are required to be considered in the technical bid, by the successful bidder.

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Brief Description of the project:

The project is on a turnkey basis and involves design and construction of 107 MLD capacity potable water supply infrastructures for Guwahati city (South Guwahati, Western Part). The work involves all civil, electrical and mechanical, instrumentation parts including erection and commissioning. The work also involves PLC based operation and monitoring system for water treatment plant and pumping stations and computerized distribution management system for primary grid as well as distribution grid from centralized location including creation of digitized maps of the pipelines laid and house connection effected which the successful bidder shall have to arrange through special software. GIS road maps available are based on GPS survey.

LOCATION OF THE PROJECT

About the project area: The command area of water supply project is on the western part of the South Guwahati City. The project area is within seismic zone –V of India. The arbitrary dividing line of this area from the South Guwahati city is the Fatasil Ambari road from Garchuk to Kumarpara, then along the Mora Bharalu River and upto the River Brahmaputra at Bharalumukh. It covers the major localities like Jalukbari, Ganeshpara, Kamakhya, Azara, Mirjapur, Borjhar, parts of Rani area etc. Some major Educational Institutions located in this area are Guwahati University, Assam Engineering College, Auyurvedic College. The G N B International Airport is also situated in the project area. The approximate area of this west part is 100.95 sq.km. The present population is around 3.00 lacs. The projected population in 2025 and 2040 is 5.83 lacs and 8.96 lacs respectively. The water demand of the project area is 66 mld, 107 mld and 170 mld respectively in the year 2010, 2025 and 2040.

Raw Water Intake Station: The raw water intake station shall be near the bank of River Brahmaputra (at the foot hill of Kamakhya Hill near Pandu). The intake may be of suitable structure (Jack well type). There shall be a provision of pump house and pumping arrangement Design is to be made by thorough study of past history of the river, its fluctuations of water levels and receding characters and silt depositions etc. The length of raw water pumping main (from Intake station to Treatment Plant) is approximately 3.32 km. The bidder shall have to get such report by their own arrangement.

Water Treatment Plant: The water treatment plant will be located in Sadilapur (near Saraighat Bridge approach). The capacity of the treatment plant is 107 mld with a provision of future expansion for 170 mld. For future expansion only space requirement is to be considered at present. The treatment plant shall be designed on modular concept. Besides the basic treatment plant components like Pre-Settling tank, Aerator, Flash Mixer, Parshall Flume, Flocculator, Clarifier, Rapid Gravity Filter, Clear water reservoirs, pumping stations etc in the treatment plant site, it also includes Administrative Building, Chlorine House, Chemical House, Guard Room , Alum Godown etc. The NGL is 48.50 m and FGL is 50.50 m. Average level of the low level road is 48.80 m. Filling of 2.25 m depth (average) will be required.

UGR cum Main Pumping Station:- The main pumping station will be located within WTP Complex. The size of sump shall be 1100 cum. The capacity of main pumping station will be of 107 MLD. The water will be pumped to the reservoir at west Kamakhya Hill for 23 Hrs.

Semi-Under Ground Main Reservoir:
The semi underground main reservoir will be located at west Kamakhya hill. The capacity of the semi- underground main reservoir will be of 6300 cum capacity.

Booster Pumping Station:
Two nos of booster pumping station will be there. Booster Pumping Station-1 will be at west Kamakhya, near main reservoir for service reservoir near Bhubaneswari Temple and Booster Pumping Station-2 will be at Ganeshpara (East) for service reservoir at Durga Sarobar hill top. The capacity of BPS-I and BPS-II are 2.30 MLD and 9.04 MLD respectively. Capacity of sump at BPS-I and BPS-II is 100 cum and 380 cum

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Service Reservoirs:

The location and capacity of service reservoirs are given below (see example in Drg. No. 27):-

Sl No	Service Reservoir	Location	Capacity (cum) (in 2025)	Type of Reservoir	Remark
1	West Kamakhya	West Kamakhya Hill Top (near Main Reservoir)	9300	Semi Underground Hill top Water Reservoir	
2	Kamakhya (Hill top)	Near Bhubaneswari Temple	450	Semi Underground Hill top Water Reservoir	Existing GMC Reservoir to be used. No major rectification work is required.
3	Ganeshpara (East)	Fatasil Ambari	5700	Semi Underground Hill top Water Reservoir	
4	Ganeshpara (West)	Madhav Dev Nagar Hill Top	3400	Semi Underground Hill top Water Reservoir	
5	Ganeshpara (Central)	Durga Sarubar Hill Top	1700	Semi Underground Hill top Water Reservoir	
6	Jalukbari	G U Hill Top	6400	Semi Underground Hill top Water Reservoir	
7	Mirzapur	Mirjapur	1600	Elevated Service Reservoir	Staging height 18 m from FGL
8	Borjhar	Jogipara	1600	Elevated Service Reservoir	Staging height 18 m from FGL

Primary Grid:

The primary grid will have to be laid within the project area of South Guwahati, West Part to connect the Main pumping Station to main reservoir, and main reservoir to booster pumping station and service reservoir. Also from booster pumping station to service reservoirs.

Rising Main:-

The rising main will have to be laid for carrying raw water from Raw Water Pumping Station to WTP as shown in drawing.

Distribution Grid:

The distribution grid will be laid along the road network throughout the project area as shown in drawings.

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Important Average Ground Levels of certain locations of the city is as tabulated below. For details refer the topographical survey drawings of respective site where applicable.

Important Locations	Average Ground Levels (in meters)
Intake(near Pandu) HFL LWL	 + 50.0 m + 35.0 m
Water Treatment Plant (Sadilapur) NGL FGL	 + 48.50 m + 50.50 m
Hill Top Reservoirs 1. West Kamakhya Hill Top 2. Kamakhya Hill Near Bhubaneswari Mandir 3. Madhav Dev Nagar Hill Top 4. Fatasil Ambari Hill 5. Durga Sarovar Hill 6. G U Hill Top **Elevated Service Reservoir** 1. Mirjapur 2. Borjhar	 + 164.00 m + 270.00 m + 136.00 m + 140.00 m + 204.00 m + 130.00 m + 47.0 m + 47.0 m
General ground levels	+ 47.00 to 52.00

REDUCED LEVELS FOR RAW WATER PUMP DESIGN

LWL at Jackwell		=	35.00 m
Submergible Level to be considered		=	30.00 m
Raw Water Inlet Collecting Well Water Level at Sadilaput WTP	= 50.50 (FGL) + 1.50 (Ht of UGR above GL) + 8.00 (WTP HL) + 1.00 (Residual Head at Inlet)	=	61.00 m
Pump Head Required =	61.00 - 30.00 + 3.00 (Raw water pipe HL)	=	34.00 m
Provide Raw Water Pump Head (Dynamic Head)		=	35.00 m

DETAILS OF PUMP DESIGN

Sl No	Description	Raw Water Pumping	Clear Water Pumping	Booster Pumping	
				At Ganeshpara East for Durga Sarubar Hill top reservoir	At Kamakhya Hill top for Bhubaneswari Temple Reservoir
1	Average Filtered Water production (MLD) in 2025	107	107	9.04	2.30
2	Pump Head (m)				
	Static	27	120	99	123
	Frictional	6.35	7.35	4.80	4.35
3	Pump Head provided (m)	35	130	105	130
4	Pumping Operation (Hrs)	23	23	23	23
5	Flow m^3/Hr	4652.17	4652.17	393.04	100.00
	Flow m³/min(normal without overload)	77.54	77.54	6.55	1.67

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Sl. No.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Flow in m^3/min (with 20% overload)	93.04	93.04	7.86	2.00
	Flow in lps (with 20% overload)	1550.72	1550.72	131.01	33.33
6	Pump type (multi stage)	Vertical Turbine Pump	Centrifugal Horizontal	Centrifugal Horizontal	Centrifugal Horizontal
	RPM (max)	1450	1450	2950	2950
7	Efficiency - Pump	82%	82%	82%	82%
	Efficiency - Motor (considering Ø)	90%	90%	88%	88%
8	No of Pump motor sets	3R + 3S	4R + 2S	1R + 1S	1R + 1S
9	Power - water power (Kw) [WP] - (normal) (0.163 x Q x H)	530.31	1971.59	134.54	42.38
	Pump Power (WP / 0.82)	647.33	2404.38	164.07	51.68
	Pump Power each (KW)	215.78	601.09	164.07	51.68
	Each pump power provided (KW)	250	650	175	60
10	Each motor power (KW) - 88%	277.78	722.22	198.86	68.18
	Each motor power provided (KW)	300	750	200	75

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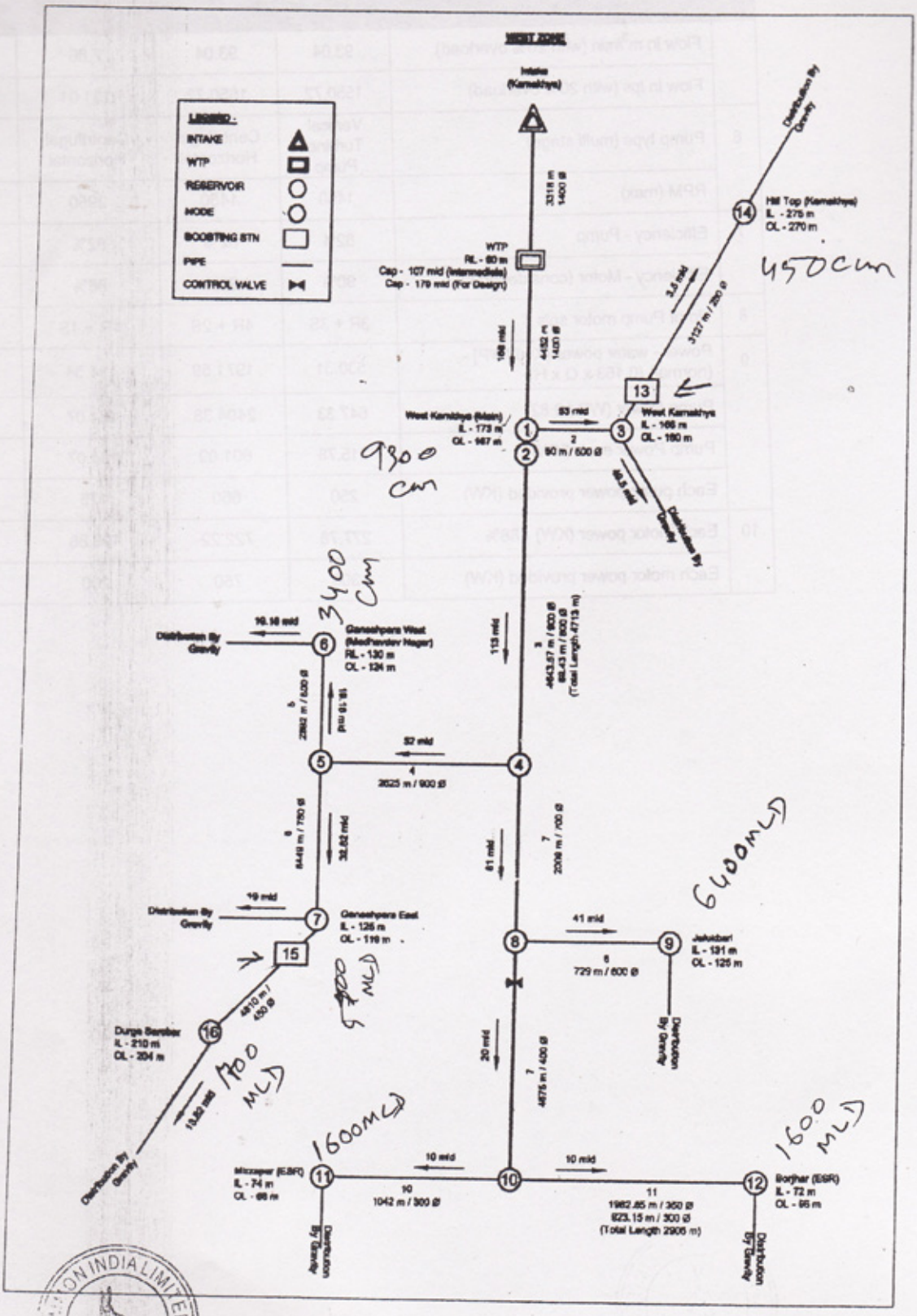
Schematic Diagram of Clear Water Pumping & Gravity Mains- South Guwahati West



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WORK TO BE DONE UNDER THIS TENDER

The different works to be done, in general:

i) Design, detailing and construction of Raw Water Intake Structure(Jack Well type) and other ancillary works in the river Brahmaputra for abstracting Raw water from river to the Raw Water Pump house.

ii) Design, detailing and construction of Raw Water Pumping Station. Design, Detailing, erection and commissioning of Electro Mechanical machines and instrumentation parts.

iii) Design, detailing and construction of complete Water Treatment Plant. Design, Detailing, erection and commissioning of Electro Mechanical parts and instrumentation parts.

iv) Design, detailing and construction of Clear Water Sump cum Pumping Station. Design, Detailing, erection and commissioning of Electro Mechanical parts and instrumentation parts.

v) Design, detailing and construction of Main Clear Water Reservoir at Hill Top (Kamakhya).

vi) Design, detailing and construction of Clear Water Reservoir cum Booster Pumping Station. Design, Detailing, erection and commissioning of Electro Mechanical parts and instrumentation parts.

vii) Design, detailing and construction of Service Reservoirs at Hill Top- 5 Nos.

viii) Design, detailing and construction of Elevated Service Reservoirs - 2 Nos.

ix) Design, detailing and laying of Raw Water Rising main.

x) Design, detailing and laying of Primary grid to connect the Main pumping Station to main reservoir, and main reservoir to booster pumping station and service reservoir. Also from booster pumping station to service reservoir.

xi) Design, detailing and laying of distribution network throughout the project Area.

xii) Installation of computerized Primary Grid and Distribution Grid management System throughout the project area from a centralized location which included digitized mapping of the pipes laid and upto house connection showing important ground features.

WATER TREATMENT PLANT AND SIZE OF ITS COMPONENT

Modern drinking water treatment plant is designed for removal of suspended particles. The hydraulics of the treatment plant is designed in such a way that water flows by gravity from the collecting well to the clear water reservoir and the sludge generated from the inclined plate settler flows by gravity to sludge sump and ultimately disposed at sludge disposal sites. For removal of Odour, gravity cascade aerator is placed. Pre-settling tanks are also placed for tackling higher turbidity, above 300 NTU. Rapid Gravity Filtration of false bottom nozzle based with air water backwash system and recirculation of backwash water has been considered. A typical layout plan and flow diagram of WTP are given in drg. No. TD/16 and TD/17 respectively only for guidance. Final hydraulic design of WTP shall be done by the successful bidder as per tender specifications.

- Raw Water collecting well
- Parshall Flume (Raw water flow channel & measurement)
- Falsh Mixer
- Flocculation tank
- Inclined Plate Settler
- Rapid Gravity filter with nozzle based false bottom with air water backwash & reuse.
- Filtered water conveyance channel including flow measurement
- Clear water reservoir and pump house
- Sludge sump, dirty backwash sump and pump house

SIZE OF DIFFERENT COMPONENT OF THE WATER TREATMENT PLANT

Layout of water treatment plant components has been shown in the enclosed sketch plants. The component sizes are given below.

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Component Sizes and Numbers

Sl. No.				
1	**Raw Water Inlet Wel (Jack Well Type) with Pump House on it**		3	12.0 m dia Inside
2	**Water Treatment Plant**		1	**Module of 2 (2 x 53.5 MLD Capacity)**
	(i)	Cascade Aerator	2 x 1	10.90 m dia
	(ii)	Raw Water Inlet Chamber	2 x 1	3.3 m (dia) x 3.5 m (SWD) + 0.50 m (FB)
	(iii)	Pre-Settling Tanks	2 x 6	10.5 m (L) x 35.5 m (B) x 2.0 m (LD) + 0.50 m (FB)
	(iv)	Flash Mixer	2 x 1	3.0 m (L) x 3.0 m (B) x 2.5 m (LD) + 0.50 m (FB)
	(v)	Flocculator	2 x 1	17.3 m (L) x 17.3 m (B) x 4.0 m (LD) + 0.50 m (FB)
	(vi)	Inclined Plate Settler	2 x 2	11.0 m (L) x 9.5 m (B) x 3.5 m (LD) + 0.30 m (FB)
	(vii)	R.G. Filter Beds	2 x 8	10.0 m (L) x 7.0 m (B)
3	**Clear Water Sump and Pump House**		1	**Sump = 30.0 m (L) x 5.50 m (B) x 6.40 m (H)**
				Pump House = 30.0 m (L) x 12.50 m (B) x 9.975 m (H)
4	**Main and Service Reservoir for Storage**			
	(a)	**Hill Top Reservoir**	**6**	**(L) x (B) x (D)**
	(i)	West Kamakhya (Main)	1	56.0 m x 30.0 m x 5.10 m
	(ii)	West Kamakhya	1	56.0 m x 42.0 m x 5.10 m
	(iii)	Jalukbari	1	56.0 m x 30.0 m x 5.10 m
	(iv)	Ganeshpara East	1	50.0 m x 30.0 m x 4.60 m
	(v)	Ganeshpara West	1	35.0 m x 25.0 m x 4.60 m
	(vi)	Ganeshpara Central	1	32.0 m x 20.0 m x 4.60 m
	(b)	**Elevated Service Reservoir (Staging Heigh = 18.0 m)**	**2**	**Capacity in Cum**
	(i)	Mirjapur	1	1600 m^3
	(ii)	Borjhar	1	1600 m^3

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Component Sizes and Numbers

Sl No	Item Description		No. of Components	Size/Capacity
5	**Clear Water Boosting (Sump + Pump House)**			
	(i)	West Kamakhya Hill Top	1	Sump = 8.0 m (L) x 5.0 m (B) x 2.50 m (LD) + 0.60 (FB)
				Pump House = 20.0 m (L) x 9.0 m (B) x 6.0 m (H)
	(ii)	Ganeshpara	1	Sump = 16.0 m (L) x 12.0 m (B) x 3.00 m (LD) + 0.60 (FB)
				Pump House = 20.0 m (L) x 9.0 m (B) x 6.0 m (H)
6	**Others**			
	(i)	Administrative Building at WTP site & laboratory	1	Floor area (including wall thickness):
				Ground Floor = 160.00 sqm (store)
				First Floor = 160.00 sqm (lab)
				Second Floor = 149.25 sqm (office)
	(ii)	Chemical House	1	Floor area (including wall thickness):
				Ground Floor = 150.00 sqm (store)
				First Floor = 150.00 sqm (Chemical vats)
	(iii)	Chlorine House	1	Floor Area = 112.00 sqm, 5.50 m (H)
	(iv)	Chlorine Contact Chamber	2 x 1	Floor Area = 135.00 sqm, 5.10 m (H)
	(v)	Back Wash Pump room	1	Floor Area=50 sqm
	(vi)	Recirculation Pump room	1	Floor Area = 25 Sqm
	(vii)	Compressor Room	1	Floor Area= 25 sqm.
	(v)	Guard Room	10	Floor Area = 30.15 sqm, 3.00 m (H)
	(vi)	Coagulant Godown	1	25mx7.0m, Ht=5.10m
	(vii)	Chlorine godwon	1	15.0m x3.2 m
	(viii)	Weigh Bridge	1	25 MT capacity
	(ix)	Stack Yard (Office + Open Space)	1	Office Floor Area = 72.25 sqm, 5.00 m (H)
				Open Space = 0.70 Hactare
	(x)	Sludge Sump with Pump House	1	Sump Area = 55.00 sqm, 3.0 m (H)
				Pump House Area = 15.00 sqm, 3.0 m (H)
	(xi)	Sludge Disposal Site	1	Area = 0.50 Hactare

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GENERAL PROCESS DESCRIPTION

Various process units through which the raw water gets treated are described below:

- **Aerator / pre-settling tanks**

  From intake pumping station, raw water is lifted to aerator and bypassed to pre-settling tanks whenever necessary and from small lifting stations the pre-settled raw water is fed into collecting well. Bypass arrangement is there. Small pump house is also located to lift settled water from pre-settling tanks to collecting well.

- **Collecting well**

  Raw water is received form Aerator/ or through a pumping main from small pump house of presetling tanks with suitable head to the proposed collecting well. The collecting well is designed for a retention time of 30sec and velocity of inlet water in the range of 0.06 to 0.08 m/s to achieve quiescent conditions.

- **Parshall Flume**

  Water from collecting well then flows through a RCC channel installed with parshall flume of standard design where ultrasonic flow meter is installed to monitor the flow through the channel. The channel is also installed with online pH meter and Turbidity meter to monitor the inlet characteristics of raw water.

- **Flash Mixer**

  Flash mixer of RCC construction is designed for a flow of more than average flow. The tank is installed with an agitator to achieve intimate mixing of raw water with alum/ poly aluminium chloride, solution.

- **Flocculation tank**

  Flocculation tank of RCC construction is designed for slow mixing of influent water. The tank is installed with paddle type agitators, which operate at very low speed to create gentle contact between the solids and thus aid the formation of flocs.

- **Inclined Plate Settlers / Other options can be considered**

  Clarification of Coagulated raw water will be done by use of suitable technologies (Plate Settler / tube settler).

- **Rapid Gravity Sand Filters (Nozzle Based – False Bottom)**

  Nozzle based, false bottom, high rate filtration system will be used for filtration and uniform air and water backwash system application. Design of sand media and gravel of good quality is to be made.

- **Clear Water Sump and Pump House**

  After filtration, the filtered water is taken to the clear water sump through a chlorine contact chamber by filtered water channel and piping system. 30 minutes detention can be considered in the contact chamber. The sump is constructed partially underground with a pump house. The chlorine contact chamber will be RCC construction with all inside surfaces ceramic tiled. The filtered water from the pumps is fed to a common manifold.

- **Chemical Dosing System**

  The following chemical dosing system of adequate capacity tanks with agitators for alum and PE and dosing pumps shall be considered as part of the treatment scheme.

  - **Alum solution preparation and dosing system:** liquid and solid alum shall be used commonly for removal of raw water turbidity. Alum dosing tanks of RCC construction with epoxy lining is provided. Liquid alum storage & pumping has to be provided.

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- **Polyelectrolyte solution preparation and dosing system:** Provision for PE tank & dosing shall be made for higher turbidity and colloidal particles.
- **Post Chlorination:** Chlorine tonner is used to feed chlorine gas & water mixed in a chlorination system & fed into chlorine contact chamber through HDPE pipes. Chlorine Cylinders are placed in the chemical house with chlorine board & other arrangement. 10 nos of chlorine tonner will be required.

SCOPE OF WORK

- The tender is a detailed design - cum - execution tender. The Tenderer is advised to go through the documents meticulously and prepare tender on the basis of the data made available. He is also advised to make himself thoroughly acquainted with the site and its working environment. In case of any doubt about any data the Tenderer may contact the undersigned before submission of the tender.
- The work consists of all kinds of design for all Components, equipments, systems etc including concrete mix design require for execution of the entire work. All bidders will be required to provide full design for each & every Component required for the entire project. It shall also include Pipe Network analysis, Surge analysis, PLC (at all locations like intake, WTP, boosting stations and data transfer should be made through SCADA to a Central Monitoring Station through GSM), Computerized distribution management.
- It also consists of necessary survey and soil testing for all sites as would be necessary for execution of the entire project and ground water quality management to determine exposure conditions.
- Earthquake phenomenon shall be considered as per relevant IS codes.
- Collection of data of river flow and sedimentation, erosion & flood has to be collected for last 50 years for designing suitable intake system.
- Execution of all works can be taken up after approval of the design by the client time to time.
- Detail work components are detailed in this document as schedule of works in Financial Bid Document.
- Any analysis required for economic designs and safety shall be carried out. Without sound analysis & practices as in vague in India no design can be accepted simply by following codes.
- Testing of all works, supplies shall have to be carried out as per relevant IS or other international code e.g. ISO, ASTM, DIN, BSS as would be applicable. This will require setting up fully equipped site laboratory for testing materials of RCC works..
- Engineering drawings including P&I and other structural drawings, Process flow drawings etc for all works & supplies shall be submitted to the client for approval and execution thereafter.
- Progress report every 15 days' interval shall be furnished for execution of all events & supply schedule of each items. Vendor list shall be approved by the client before any procurement is made from any vendor.
- Communication system between different infrastructures like WTP, Intake station, Boosting station and all Hill top reservoirs are to be made through telephone and wireless system. Government will help in getting required radio frequency for wireless system and applied to the respective authority for both systems.
- All other works specified in this document including setting up water quality test lab and meter testing setup..

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- **Technical Report** for concrete work shall have to be designed for every 100m^3 of concrete in a most comprehensive format to take account of material quality & strength..

Special Notes:

All units shall be made operative to the entire satisfaction of the authority with one year's free operation and maintenance excluding trial run.

Laboratory set up with manpower & testing materials and equipments are to be supplied as per recommendation in CPHEEO manual.

Construction water, power & workers hutments health care units are included in the schedule of works. Initial construction and their support measures deemed to have been included in the offer.

State Govt. will provide necessary Electrical power through ASEB within 200 m of Raw Water Intake Station and within 100 m of all other stations i.e WTP, Booster Station and Hill top and other reservoirs before trial run. Successful bidder will draw power from those sources through necessary electrical power system appliances and cable line works upto their plant site at their cost. However power required for construction works will have to be arranged by the successful bidder at their own cost as mentioned at Page C-48, Clause 4.

Micro tunneling and Jack pushing though included in most groups of pipe laying works shall have to be executed by expert agencies of the profession.

Pumps, Motors, Valves and all kinds of water meters and flow meters are to be procured from noted manufacturers with the approval of the authorities and may be imported for ascertaining very high standard qualities.

Design Works : All components, Structure, any system, equipments, instrumentation system including concrete mix design has to be carried out by the successful bidder

DESIGN BASIS FOR VARIOUS STRUCTURES

The various types of structures are listed & described as bellow –

- **Aerator**

The Aerator is a cascade type one supported on RCC column shaft. The bottom slab of the aerator is cantilevering on all sides from one circular beam to be constructed at the top of the shaft. The steps are to be constructed with mass concrete in proportion 1: 1: 3. The foundation is designed as circular raft foundation. Anti skid vitrified tiles are to be provided on the steps of the aerator. The bottom slab along with the steps are designed as liquid retaining structural member as per IS : 3370.

- **Pre Settling Tank**

The Pre Settling Tank (PST) is a rectangular shaped tank to retain the raw water before Treatment Plant. The sides of the PST are proposed to be constructed by rouble masonry boulder wall. The floor of the tank is to be provided by double brick soling with joints cement mortar over a compacted sand bed of 150 mm thick. Inlet & Drainage outlets are to be provided with valves / gates and drainage pipe lines. The PST is to be used only during rainy season when turbidity is high.

- **Collection Well**

The collection well is an elevated circular tank supported on RC columns. The Circular Walls and base slab of the collection wall are designed as liquid retaining structural members as per IS : 3370. The columns are founded on Base Raft (open foundation)

- **Parshall Flume**

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Parshall Flume is an elevated channel supported on collection Wall on one side and Flash Mixer on the other side. Also an intermediate support is provided in the form of beam column arrangement. The column on open foundation. The Walls & Base Slab of the Parshall Flume are designed as liquid retaining structural members.

- **Flash Mixer**

The Flash Mixer is an elevated squar/circular tank supported on RC Columns. The walls & Base Slab of the Flash Mixer are designed as liquid retaining members. The Columns are founded on open foundation . The Columns and foundation system are designed as per Limit State Method of Design as per IS : 456-2000

- **FlocculationTank**

The Flocculation Tank in an elevated squar/rectangular tank with hopper bottom supported on RC columns. The Walls & Base Slab of the Flocculation tank are designed as liquid retaining structural members. The columns are founded on BCIS Pile Foundation . The Pile caps of the columns are effectively tied with tie beams. Suitable agitator supporting spaltforms inside the tank are provided.

- **Inclined Plate Settlers**

The Inclined Plate Settler tank is an elevated square/rectangular tank supported on RC columns. The top portion of the tank is square in shape with inclined plate settlers and the bottom portion is conical in shape to house scrapper mechanism. The Walls & Bottom base slab of the inclined plate settler tank is designed as liquid retaining structural members. The columns are founded on BCIS Pile Foundation. The Pile Caps of the columns are effectively tied with tie beams. Hooper bottom plate settler with telescopic valve arrangement for desludging and drainage pipeline connected to sludge sumps are to be provided.

- **Clarified Water Channel**

The Clarified Water Channel connects the inclined Plate Settler and the Rapid Gravity Filters. It is an elevated channel running by the side of the inclined plate settlers and is supported from the walls of the inclined plate settlers.

- **Rapid Gravity Filter House**

The Rapid Gravity Filter (constant head type) consists of 4 Twin beds each in a row on both side of the Filter Gallery (8 unit twin beds in each module). The side walls of the filter beds are in RC construction. The base slab of the filter beds is designed as structural slab spanning between the RC walls. The RC walls of the filter beds are supported on end columns which are founded on BCIS pile Foundation. Suitable operating platforms are provided on top of the filter beds. False floor supporting the filter media and embedded with filter nozzles is considered, suitably supported with dwarf walls below. The filter beds and Filter Gallery portion are covered on the top with cylindrical shell roof. The sides on top of the filter beds are kept open (No brick walls are provided). Inlet and dirty back wash channels are supported from the columns. The filter Gallery on one side of the filter beds houses the control boxes and the filtered water channel. The Filter Gallery has common RC wall with the Clear Water Reservoir on one side supporting the RC columns of the filter gallery. Filter Gallery is cladded on three sides with 230 mm thick brick work. Office room is provided at the operating platform level of the gallery. Architectural Finishing for the filter house shall be provided as per NIT.

- **Clear Water Reservoir, Suction Sump, Pump House & HT Panel Room**

RCC reservoir is a watertight underground tank with side walls, base slab & cover slab designed as flat slab construction (top water level of clear water reservoir to be fixed by design by bidder). The walls and base Slab of reservoir are designed as uncracked sections a per IS: 3370. The base raft is designed also as flat slab supported on 500mm

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