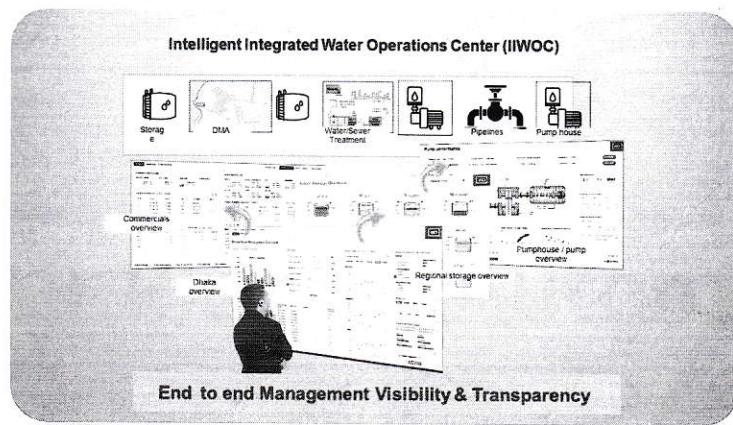


Master Plan on Automation

for



Smart Water Management: Digital WASA
(Smart Water Meter /SCADA Systems/ integrated apps)

May , 2021
FINAL REPORT

Prepared By

SCADA/Automation TEAM

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ACRONYMS and ABBREVIATIONS

SCADA : supervisory control and data acquisition

IED : Intelligent Electronic Device

OPC UA: Open Platform Communications unified Architecture

DNP3 : Distributed Network Protocol 3

HMI : Human-Machine Interface

1.0 Introduction:

Dhaka Water Supply and Sewerage Authority (DWASA) is the Government authority for water supply and sewage disposal of the city Dhaka. As one of the main utility company of the country, DWASA operates a big water network. The pumping station equipped with deep tube wells, are the main network nodes of the system. DWASA management wants to implement a SCADA (Supervisory Control and Acquisition) system in the network, complete with remote monitoring from handsets. The present conceptual report in response to that requirement.

This document is a conceptual overview presented to WASA for a unified, fully integrated Central SCADA Platform with Interactive IoT Dashboard.

The accompanying pages are meant to provide a brief overview of the architecture and framework that has been envisioned by the SCADA Committee for deploying the ideal solution at Dhaka WASA.

More detailed descriptions of features, technologies used, component and system specifications can be provided upon further discussion

2.0 SCADA Committee formulation and scope of work :

SCADA related meeting was held in 21/10/2021 with chair honorable Managing Director who to formulate a SCADA committee with following personnel:

1. Md. Abul kashem, Director (Development), Dhaka WASA (Chairman)
2. A.K.M Shahid Uddin, Director (Technical), Dhaka WASA (member)
3. Md. Kamrul Hasan, Chief Engineer, Dhaka WASA
4. Md. Nurul islam, Superintendent Engineer, Dhaka WASA (Member)
5. Md. Wahidul Islam Murad, Superintendent Engineer, Dhaka WASA (Member)
6. Md. Ashraful habib, Executive Engineer, Mods zone 10
7. Md. Badrul Alam, Executive Engineer and Staff officer, Dhaka WASA, (Member)
8. Engineer Ramayswer Das, Executive Engineer -2 (Tech-2), DWSNI Project, Dhaka WASA
9. Kazi Md. Khalid Ahsan , Sr. Systems Analyst (GIS), Dhaka WASA (Member Secretary)

The following is the scope of work that has been earmarked for this committee:

1. SCADA Software Specification Preparation
2. Detail specification preparation of required field devices
3. Specified of Standard Communication Protocol
4. Proposed common platform to integrate DTW, Meter, Valve and Treatment Plant's SCADA or non-SCADA data.
5. Compatibility assessment of existing piloting SCADA

3.0 Methodology

Details Discussion with Focus Group (Zonal People, SoC, FM and Existing vendor who implemented existing in Dhaka WASA to find out the requirement no of meeting was held around 12. the following participants were present in those meeting :

- All Zonal Executive Engineer was participated in Meeting
- All Executive Engineer and related person was participated in Meeting from SoC, Project, FM Division, P&D (elec & Mechanical)
- All CEO & Technical Person was participated in Meeting from Datasoft, Rockwell, System Engineering and SCADA Implemented Vendor of DWASA

All feedback result has been attached in this document (Annexure -1), And detail questionnaire has been published and collected from the user. (Annexure-2)

4.0 Existing Status of Present Piloting SCADA based of survey:

In 2017, Dhaka WASA started the piloting for DTW SCADA, and has covered 163 out of 913 DTW under SCADA systems. Around 8 (eight) company was done this work. Above them 77 DTW has done by M/S Faisal Enterprise Ltd. During the assessment, we found that M/S Faisal Enterprise had sold the License software to Dhaka WASA (which is yet not implemented). and also found that the procured software is not perfect to fulfil WASA requirements. So, it need to be stop to implement. All SCADA are running under the vendor controlled demo software. In this regards, Data is heart of SCADA but it's not in proper way.

Table 1.0 : No of DTW under SCADA

No of Implemented SCADA by Zone and Vendor Wise										
Zonal name	total SCADA	Total Pump	VFD	Faisal Enterprise	Optimal Track	Sajeda+Royal IT	Pepco	Aplombtech	Fatema	System Engg
Zone-1	X	82	71							
Zone-2	X	59	39							
Zone-3	30	146	89		30					
Zone-4	28	117	99		28					
Zone-5	26	61	53			26				
Zone-6	12	117	82				12			
Zone-7	X	59	34							
Zone-8	26	82	74					10	16	
Zone-9	22	69	60							1
Zone-10	19	121	96		19					21
Total=	163	913	697							
				Total=	77	26	12	10	16	1
Software & data status		Vendor End			WASA server	Vendor end	Vendor end	Clouding	Vendor end	Vendor end
and some portion (for 19 Scada) in wasa end										

Table 2.0 : DTW SCADA Field device and Software

SCADA Field Device and Software Status										
Sl No	Name of Field Device & Software	ZONE-3 (total -30)	Zone -4 (Total 28)	Zone 5 (total - 26)	Zone-6 (total 12)	Zone-8 (total- 26)	Zone-9 (total 22)	Zone-10 (Total-19)		
1	Water Level Transmitter sensor	Faisal Enterprise	Faisal Enterprise	OTAE	Shajeda Enterprise Royal IT	Pepco bangladesh [10] Aplombtech [16]	Fatema traders Systems Engineering [23]	Faisal Enterprise [19]		
2	Pressure Meter Sensor	Siemens p200	wasa	wasa	wasa	wasa	Honeywell provided by dwasa	provided by DWASA		
3	PLC (Microprocessor)	Allen Bradley	Siemens p200	DATAWATT	Siemens	Siemens p200	Danfoss Autonics (Korea) TPS-20	Wika (Germany)		
4	RTU (Microprocessor)		Allen Bradley		Rocwell	Allen Bradley	X	SIEMENS LS korea		
5	Micro-controller	In 7 station		X			X	Modbus serial RTU (Inhand)	X	
6	Communication protocol	ModBUS RTU, ethernet ip			telecontrol	ethermet	ModBUS RTU, ethernet ip	MQTT, ModBUS	MODBUS TCP/IP ModBUS TCP/IP	
7	Energy Meter Analyzer	secure, Mitsubishi	ModBUS RTU, ethernet ip		Siemens	SECURE	secure, Mitsubishi	tepsong	SIEMENS 7KT03 (LS korea/Schneider EU)	
8	GPRS Ethernet based WAN Modul	Mikrotik	secure, Mitsubishi		D-link	Mikrotik	ursalink	TP Link	In hand	
9	Human Machine Interface (HMI)	Allenbird	Mikrotik		Siemens	rockwell	Allenbird	hp	D-Link	
10	Industrial Router	Teltonica	Allenbird		D-link	Teltonica	?	?	Panelview 800, Brand: Allen Bradley	
11	SCADA Control panel	unipolar		OTAE	Mark automation	unipolar	?	?	RS12L, Brand: In Hand Network Rtu 240, Brand: Teltonika	
12	Power Supply	Phonix /relay	unipolar		Siems	Phonix /relay	manwell korea	SIMENS	ModBus by NASCO Power Engineering Ltd.	
13	UPS	local	Phonix /relay		WINCC (Siemens)	CL1000	local	Autonics Korea	Weldmüller (Germany)	
14	Software	Rockwell factor view	Rockwell factor view	STREAM DATAWA	WINCC (Siemens)	Factory talk View	powerguard	Apollo	Not available	
15	Software hosting	Vendor premises	Vendor premises	DWASA Server	Rockwell Vendor Server	Vendor Server	Water Monitoring System	WinCC [Siemens]	FactoryTalk View (Rockwell, USA)	
							Vendor Server	vendor Server	Zone 10 SCADA Control Room	

In the above table 2.0 shows that several vendor used several RTU/PLC as well as different demo software which is running at vendor end. on the other hand, total 16 (by M/S Aplombtech) and another 7 (by M/S Faisal/NASCO Enterprise) was used Microcontroller based communication device which are infeasible to integrate into central SCADA.

Two type of standardized Demo software was used named Rockwell Fantasy Talk View and SIEMENS WINCC software. On the other hand, One company had used own developed customized software which is cloud based hosting.

Water Treatment Plant SCADA: In Dhaka WASA, Three WTP has been used SCADA for Plant. All SCADA brand are Schineder/AVEVA.

5.0 The Committee approach splits WASA's requirements into 4 parts

The split four requirements are describe with their functionality as below. Its compatibility from DTW, DMA, WTP all the way to Central SCADA will be secured as long as standardized;. Each part is fed with data from the same central server maintained locally and centrally.

Sl No	Item	Major activities
3.1	Field Devices	<ul style="list-style-type: none"> • Collect data from Field • Monitoring Status of Equipment • Control Equipment • Communicating with remote station
3.2	Communication (Network)	<ul style="list-style-type: none"> • used protocol to communicate or send/receive data between field devices and Central SCADA
3.3	SCADA Software Platform	<ul style="list-style-type: none"> • Application Data Acquisition & Supervisory control by Zonal Personnel • Device Configuration • Central data preservation and distribution • Template creation for operation and management
3.4	Common Infrastructure and Computer-network hardware	<ul style="list-style-type: none"> • Stablish Data center or operation room • Stablish communication tools • Install software • Stablish video wall

Key Components to be standardized => Compatibility throughout DWASA Facilities

The report describes on the following items.

1. Compatibility assessment of existing piloting SCADA
2. Proposed common platform to integrate DTW, Meter, Valve and Treatment Plant's SCADA or non-SCADA data.
3. Detail specification preparation of required field devices
4. Specified of Standard Communication Protocol
5. SCADA Software Specification Preparation
6. Recommendation

5.1 Compatibility assessment of existing piloting SCADA

DWASA aims at the future integrate of the existing SCADA with Central SCADA. Future expansion and up gradating will be made under proposed system. So Committee recommends the following with their assessment.

- SCADA servers are located remotely, not in Mods zone office or Central . Mods zone office is just a dummy terminal.
- Each contractor implemented its own way. No compatibility in RTU, Comm & Network, SCADA software, which makes the integration into Central SCADA infeasible.
- Mods zone office does not possess the ownership of the data and control.

5.1.1 Incorporation Present SCADA into Central SCADA:

- Micro-controller based system shall be replaced with PLC-based system
- PLC-based system shall have the function of Modbus serial and Modbus TCP for communication within DTW and to zonal or central SCADA.
- Electric meter, LIT, PIT, Flow meter shall be connected to PLC in order to maintain the consistency and compatibility.
- The software cannot be integrated into central SCADA. Only hardware can be saved through required modification to certain degree.
- The above is general requirement. Individual system in each DTW shall be closely examined to determine required modification and/or replacement in order to integrate into zonal or central SCADA.

6.0 Proposed common platform to integrate DTW, Meter, Valve and Treatment Plant's SCADA or non-SCADA data.

The proposed common platform a dual redundant systems at local control and central monitoring of each DTW,DMA shall include but not limit to process controlling including the central process units (CPUs) Communication module, input-output modules, control network, operator, with Video walls printer UPS etc including all required software and hardware.

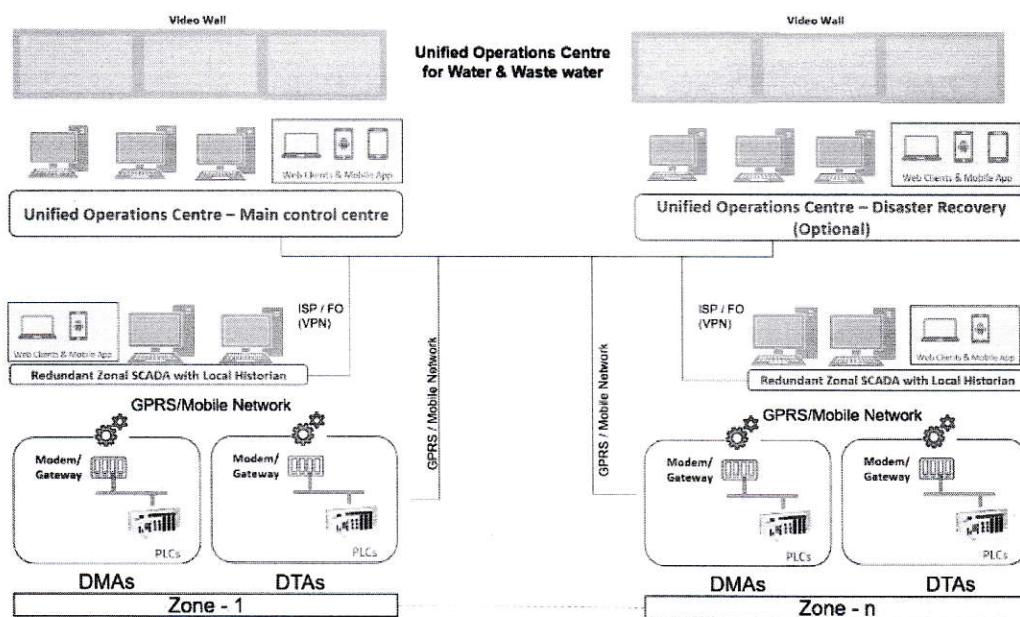


Figure – 1: System Architecture of DTW SCADA

5.1 Compatibility assessment of existing piloting SCADA

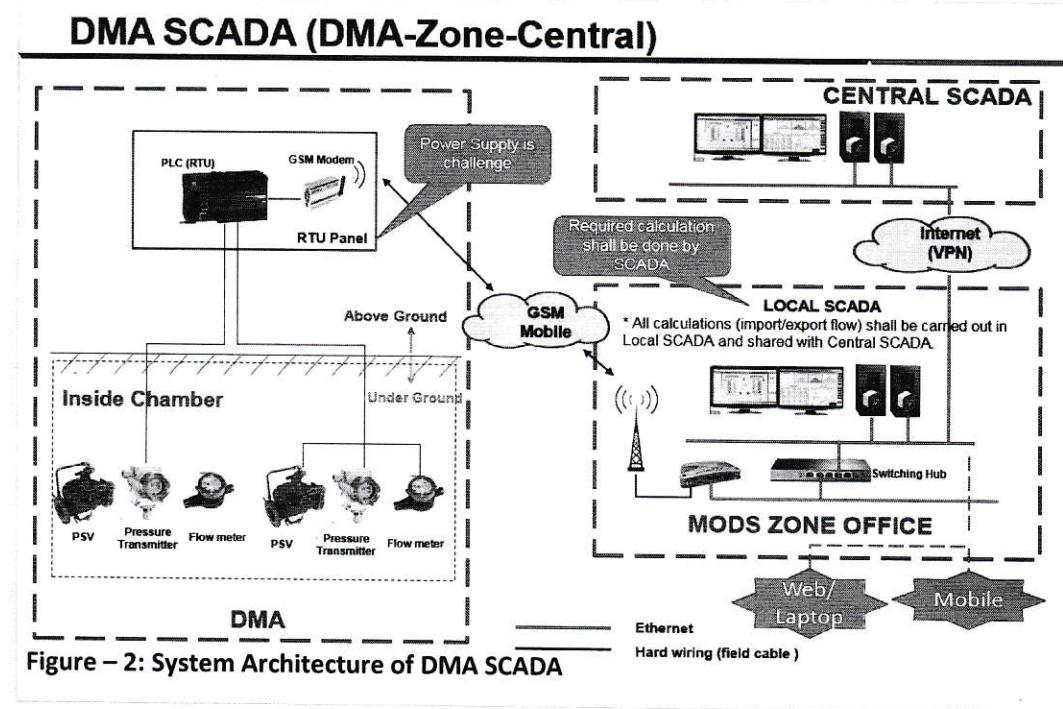
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- The above is general requirement. Individual system in each DTW shall be closely examined to determine required modification and/or replacement in order to integrate into zonal or central SCADA.

The SCADA shall be a fully dual redundant server integrated microprocessor-based control and data acquisition system which will monitor, control, display, record and trend all assigned plant and water supply network inputs and outputs. The main process monitoring and control shall be by means of Visual Display Unit (min. 60 inch. LED



monitor) based process operator workstations that shall be located in the central control room.

SCADA/HMI system shall be Dual Redundant server system. SCADA/HMI system shall be designed and implemented such that the failure of a central processor or HMI console does not inhibit continuous automatic control of the plant. In the event of such a failure, historical data shall be recoverable to a condition where a worst-case maximum of 15 minutes of historical data is lost.

Failure of a single outstation or communications to that outstation shall not affect control or operation of any other outstation, unless the failed outstation provides essential data to another outstation, in which case the non-failed outstations shall revert to a fail-safe mode.

6.1 Detail specification preparation of required field devices

The SCADA & TELEMETRY system (Supervisory Control and Data Acquisition) is a complete system consisting of hardware and software, whereby information regarding the status of pumps and regulation valves, flow rates from pumps and distribution pipes, pressures in the network, water's level of PTWs, water consumers consumption in Dhaka is sent to a central server (computer) in the local and central offices of DWASA.

With this information, DWASA has insight into the water balance within the distribution network, and should it be necessary be able to take corrective measures to control the flow and pressure through the DMAs of Dhaka city.

The SCADA & TELEMETRY System is a complete system that consists of hardware (such as flowmeters, level meters, data loggers, enclosures, servers etc.) and software (in the data loggers, servers, modem etc.).

This SCADA System will be for data acquisition from the measuring points, and control of operations in the field.

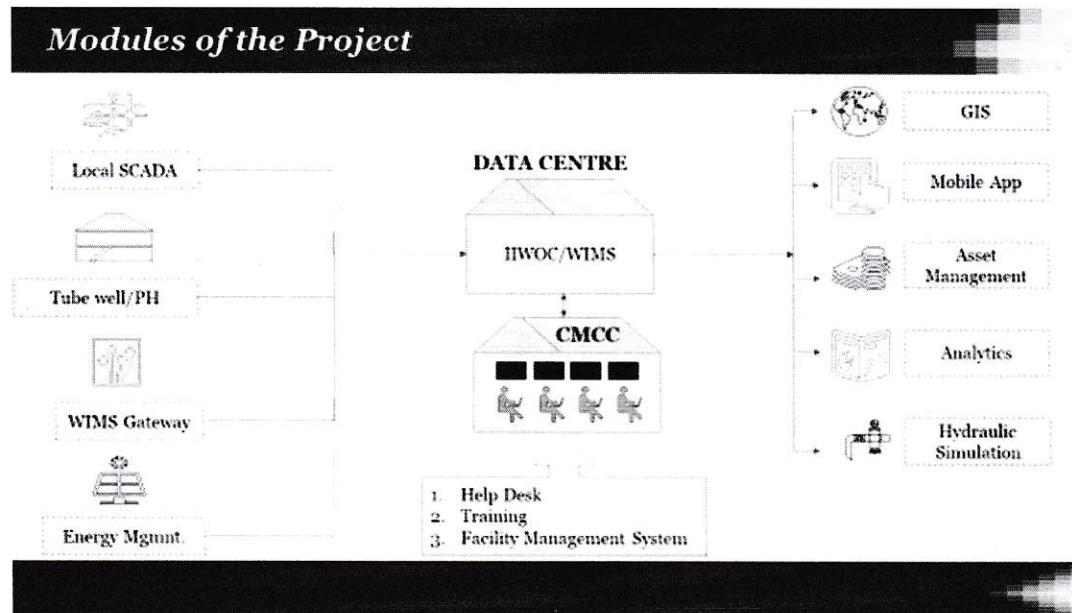
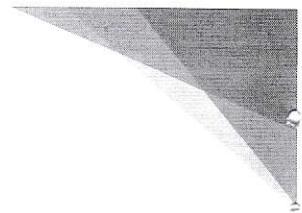


Figure 3 : Basic Architecture and Modules of proposed Systems

DESIGN CRITERIA FOR INSTRUMENTATION, CONTROL, AUTOMATION AND SCADA SYSTEMS

- a) Electronic instruments shall utilize solid state electronic components, integrated circuits, microprocessors, etc., and shall be of proven design;
- b) All instruments shall be suitable for continuous operation;
- c) All digital outputs shall be volt free;

- d) All instrumentation systems for use out of doors shall be protected to IP 65 for sensors and transmitters, while enclosures under submersible conditions shall be protected to IP 68;
- e) all analogue displays shall be of the digital type with no moving parts utilizing back lit liquid crystal diode technology;
- f) For transmitting instruments, output signal shall be 4-20 mA DC linear having two wire system.
- g) Unless otherwise stated, overall accuracy of all measurement systems shall be $\pm 0.5\%$ of measured value, and repeatability shall be $\pm 0.5\%$.
- h) After a power failure, when power supply resumes, the instruments and associated equipment shall start working automatically.
- i) The instruments shall be designed to permit maximum interchangeability of parts and ease of access during inspection and maintenance.
- j) The instruments shall be designed to work at extremes of the ambient conditions of temperature, humidity, and chlorine contamination that may prevail. The instruments shall be given enough protection against corrosion.
- k) Lockable enclosure shall be provided for the field mounted instruments wherever required.
- l) All field instruments, and cabinets / panel-mounted instruments shall have tag plates / name plates permanently attached to them.
- m) The performance of all instruments shall be unaffected for the $\pm 10\%$ variation in power supply voltage and $\pm 5\%$ variation in frequency simultaneously.
- n) All wetted parts of sensors shall be made out of non-corrosive material capable of working with chlorine content of 5 ppm.
- o) For all instruments (transmitting analogue signals) installed in the field, surge protection devices (SPDs) shall be provided at both ends of the connecting cable for the protection against static discharges / lightning and electromagnetic interference.
- p) Pressure transmitters shall be provided with two valve manifold and a test port, so that in situ calibration can be carried out.
- q) Two wire transmitters shall be provided with on-line test terminals.
- r) The ranges of all instruments shall be suitable for the application in the process.
- s) Instruments of similar type shall be of same make for appropriate inventory of spares, ease of maintenance and training.
- t) The Bangladesh agents of imported equipment shall have establishment to provide after sales maintenance facilities.



A. PLC SYSTEM

PLC shall be provided as a Hot-Standby configuration to perform combinational and sequential logic functions, status monitoring and reporting functions with counter and timer facilities.

PLC Panel interrogation power supply should be fully redundant.

PLC shall comprise of necessary processors, input/output (I/O) modules, communication interface modules and man-machine interface (MMI) required to perform the desired functions.

Each PLC shall have memory protected built in historical archiving/data logging of system alarms & events and process variables. Data logger shall be able to log data based on time or an event PLC shall have enough memory allocated to allow 200,000 time and data stamped discrete and /or analog values to be archived. The historical archive shall allow the oldest data to roll off the system as memory is used keeping the 200,000 most current data points available. Process point time stamping frequency shall be selectable within the configuration software. It shall be possible for the archived data to be exported in CSV format allowing use with standard spreadsheet and data software applications

PLC shall have the following attributes as a Hot-Standby configuration.

1. carry out sequential logic implementation for operations of plant;
2. carry out computation and interfacing for data acquisition, data storage and retrieval;
3. it shall accept downloaded program from a programmer;
4. it shall have different functional modules to perform the desired functions;
5. it shall scan the inputs in time cycles and update the status of its outputs.

PLC/RTU shall be designed in accordance with this specification. The RTU shall be of proven design and suited for water supply and distribution SCADA applications.

RTU design should aim to minimize power consumption and heat generation. It should be designed to work in remote installation by being of robust physical construction with immunity to electrical noise.

The RTU shall be assembled from modular units, for example, power supply module, CPU and communications module, communication interface modules and modules for input/output purposes. I/O and serial cards shall be able to be arranged in the RTU rack in any order.

Modules shall be interconnected via a suitably robust plug and socket method. It shall not be necessary to unscrew individual wires/cables, both internal RTU wiring and I/O

wiring, to replace faulty modules. The failure of one module will not affect the performance of any other module.

A marshalling terminal area shall be incorporated with each RTU to provide terminations for field cables. This area can be located in the RTU cubicle itself for an RTU replacement but for new locations there should be a separate marshalling cubicle. The RTU and marshalling cubicles shall normally be bolted together to form a 2-bay cubicle suite. A separation plate may be located between the cubicles.

The RTU and the cubicles shall be designed to accommodate the actual number of input/outputs, plus spare capacity.

Field Devices: The following devices need to be setup in all pump station : (a) energy Meter (b) Flow meter (c) Pressure Sensor (d) Water Level Sensor (e) HMI (f) Inverter (10) PLC/RTU

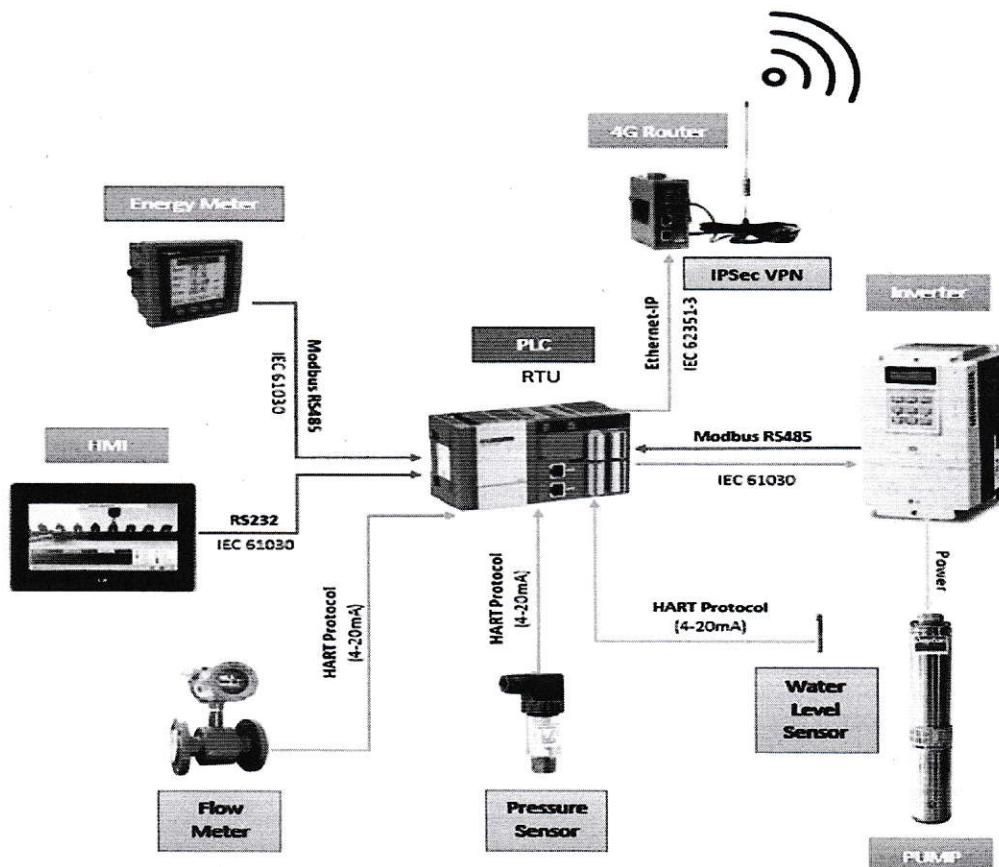


Figure – 4 : Architecture view of DTW's Field Devices

A list of Device Specification added in the following:

Annexure: 3 – Field Device Specification of DTW SCADA

Description	Qty	Unit	Comments
-------------	-----	------	----------

Enclosure

Electrical panel Box, Size 900mm x 800mm x 400mm-Wall Mounted)

It is installed inside room -so water protection not needed

Scope of Works: Supply, installation of RTU

All incoming and outgoing cable 1 Nos
should be passed through SS metallic gland. Rating and size of all cable mentioned in the cable section. All electrical items, accessories
(Mentioned in Electric device section, accessories section.

Electric Device

Circuit Breaker for main automation component (with GFCI) [Single Phase,21 Pole, 16A

Surge Protector for PLC/RTU [Single Phase ,2 Pole , 15 KA] 1 Nos

Circuit Breaker for PLC/RTU (with GFCI) [Single Phase,2 Pole, 06A

Circuit Breaker for Energy Meter, HMI, Router (with GFCI) [Single Phase,2 Pole, 06A

1 KVA Off line Online UPS 1 Nos on Line and off line is Ok

Safety System

Fire Detection System and Extinguisher 1 Nos

Built in Fire Protection System 1 Nos

Description	Qty	Unit	Comments
Cable			
Single Core Cable/5 Amp	30	Mtr	
Twin core Cable/ 5 Amp	20	Mtr	
Control Cable 0.65mm ² (Red color)	50	Mtr	
Control Cable 0.65mm ² (Yellow color)	50	Mtr	
Control Cable 0.65mm ² (Blue color)	50	Mtr	
Control Cable 0.65mm ² (Gray color)	100	Mtr	
Control Cable 0.65mm ² (Black color)	50	Mtr	
12 Core cable 0.65rm for Energy Meter	10	Mtr	
12 Core cable 0.65rm for VFD	10	Mtr	12 core cable can not handle for small Engergy Meter, we can consider 6 core cable for VFD
6 Core cable 0.65rm for Cholorin	10	Mtr	and chlorine control
4 core shielded cable for field sensor and flow meter	100 (25)	Mtr	25M is ok
Twisted Pair Shielded Cable (Com.)/ 18 AWG/ Ethernet UTP Cable	3	Mtr	

Description	Qty	Unit	Comments
Accessories			
Panel LED (delete) Light for door-24vdc	1	Nos	In case of night time maintenance, we can consider panel Light

Phase Indicator Light :Red,yellow,Blue,- 220vac,50Hz	3	Nos	
Power Outlet (inlet): 3 Pin , 15 Amp	1	No	Power socket-2 pin with earth needed for Laptop computer
SS cable gland of 10mm to 6 mm2 cable	25	Nos	
Wire ties	50	nos	
Numbering tag with printed ferrule	1	Lot	
Nut, Bolt, Gasket etc.	1	Lot	
Push Switch with lamp Red, Green, Yellow-1ea (22mm)	3	Nos	
Emergency stop Switch 22mm	1	Nos	
Buzzer 24vdc	1	Nos	
Fuse with holder 5A	10	sets	
Other Accessories like terminal block, Din rail etc	1	Lot	

Description	Qty	Unit	Comments
AUTOMATION HARDWARE ITEMS			
Industrial LTE(GSM) Router	1	Nos	

Network Interface: 2G, 3G, 4G LTE

Redundancy: Dual-SIM Redundancy for link backup

Data Security: IPsec VPN, L2TP, PPTP, GRE, OPENVPN, DMVPN, CA

Operator Access: APN, VPDN

Ethernet Ports: 2 Ports (10/100Mbps): LAN (ARP, Ethernet), WAN

Protocol: Ping, Traceroute, DHCP Server/Relay/Client, DNS Relay,

Dynamic DNS, Telnet, SSH, HTTP, HTTPS, TFTP, FTP, SFTP

IP Routing: Static Routing, RIP, OSPF, IGMP Proxy, BGP V4

Console: RS-232 x1, RJ45 Serial

Security: Firewall (Stateful Packet Inspection (SPI), Anti-DoS Attack)

Multi-Level Authority: Two level authority: Full Authority and Read-Only User

Antenna: 3G/4G (SMA Female Connector x 2)

Mechanical Installation: Din Rail, Wall Mounted

Scope of Works: Supply installation and commissioning of Industry grade LTE dual SIM/Broad-band Industrial Router with redundant facilities. Data must be transmit/receive via IPsec VPN.

Description	Qty	Unit	Comments
Pressure Sensor Pressure transmitter measures the absolute pressure of liquids, gases and vapors, Measuring Range: 0~5 Bar, Power: 24VDC, Output: 4~20mA, IP68	1		
<u>Scope of Works:</u> Supply installation and commissioning of Pressure sensor- sensor to install on the delivery line of pump station.			
Flow Control Valve: Size DN200 or as required Type Modulating with respect to input 4 to 20mA, power 24VDC with position feedback signal 4 to 20mA, Body material UPVC.	1	no	
Scope of Work: Valve to install in the delivery line by replacing old valve, it should be synchronized with water pressure transmitter to maintain constant pressure. It should also maintain water level of well.			
Energy Meter Measuring accuracy: 0.3% (Real Scale)			
Measuring Values: 40 Values (Standard)			
Dimension: 144(w) x 144(H) x 85(D) mm (Standard)			
Communication Protocols: Modbus RTU/ASCII, Modbus TCP	1	No	
Communication Interfaces: RS-422/485 (1 Channel) or Ethernet TCP-IP, Display 3Ph Voltage, Current, PF,KW,KWH			
<u>Scope of Works:</u> Supply, installation and commissioning of Digital energy meter to monitor different parameter of Government source DPDC/DESCO/REB and ensure safety of the pump if the supply source is unbalanced/phase loss.			
Power Supply:-Input -220Vac, Output -24vdc, Capacity 10A or 5A			Incase of un Manned Operation Flow control Valve needed, in this case 5A is insufficient 10A Recommended
Ethernet Module Switch: 100/10Mbps, Protocol TCP/IP, UDP for P2P service			OK
Analog Input/Output Module:-Resolution 12 Bit			
Relay: SPDT relays	1		

Description	Qty	Unit	Comments
Electromagnetic Smart Flow Meter			
Electromagnetic Flow Meter(With Display): Size: 8" Flange Type, IP68, Power: 24VDC, Output: 4~20mA / RS-485 (Modbus RTU)	1	No	8" Or 6"
Level Sensor			
Differential Hydrostatic Level Sensor, Measuring Range: 0~30 Meter H2O, Cable length 125M, IP68, Power: 24 VDC, Output: 4~20mA,	1	Nos	
Touch Monitoring Screen (HMI) and SCADA			
Display size: 10.2" (25.90cm) 4.3"			4.3" is very small and can not handle data storage, like log sheet/alarm history, if the SCADA fail due to network problem data need to store in HMI and PLC as well-later data will transfer to SCADA server once internet establish
Resolution: 800 x 600 Pixel(WVGA), 24-Bit Color(16.7M)			
Contrast: Adjustable			
Luminance: 400cd/m ²	1	Nos	
Protection: IP65			
Communication Interfaces: USB Host X2, RS232C (2 Channel), RS-422/485 (1 Channel), Ethernet 10/100 Base-TX, SD Card			
<u>Scope of Works:</u> Supply, installation and programming of 10" (4.3) HMI in the pump stations to visualize all below data/information, set speed of pump and record alarm history as and when occurred and record pump log sheet every 1 hour interval, Automatic e-mailing of logging and alarm data. (want to delete)			We recomenend data backup both in HMI and SCADA beause of LAN network failure is common in Bangladesh
Pump Information-			

Pump Run time, Pump Stop Time, Flow rate, total flow, Water Pressure.

Power Information-

A~B Line voltage, B~C Line voltage, C~A Line voltage, A, B, C individual phase current, Power factor, KW, KWH.

Inverter Information-

Output Voltage, Motor Current, Output power, Frequency, DC link voltage,

Description	Qty	Unit	Comments
PLC CPU/RTU			
Digital Input: 16 (14) Point (24 VDC), separate module is accepted			I think - we should go for open tender for all vendor, few vendor need additional module
Digital Output: 12 (10) Point – separate module is accepted			OK
Analog Input: 4 Channel – separate module is accepted			
Analog Output: 4 (2) Channel— separate module is accepted			OK
Communication Interfaces : RS232C, RS-422/485, Ethernet: 10/100 Base-TX (2 Ports Ethernet switch)			
Communication Protocols : Modbus TCP/IP, Modbus RTU, Ethernet, DNP3, MQTT, GSM Module to be integrated	1		OK
Expansion capability: Expandable up-to 10 (6) modules (if needed)			
RTC (Real time clock): Embedded RTC support			
Data Logging: SD Card (at least 8GB of operation data storables), FTP link, Emailing of log data.			
Web Server (Built-in with PLC/RTU CPU): SNTP , SMTP , Basic HTTP, VPN			Separate module is accepted
Scope of Works: This RTU/ PLC CPU should be programmed to run pump automatically with full safety of the pump and inverter and other field devices as mentioned below:			

Safety Feature: Over Current, Under Current, Unbalanced Current, Over Voltage, Under Voltage, Unbalanced Voltage, Over voltage in any phase Pumping low water level, Excess delivery pressure, Inverter Faults and Trips. Maintaining preset delivery pressure. Pump operation time scheduling for unmanned operation.

Alarm Feature:

Pump production efficiency Alarms, Low Flowrate Alarm, Over current alarm, phase loss/unbalanced alarm/high water pressure alarm/network fail alarm

B. TAG (required information need to be collect for field devices)
Information

The proposed solution shall support tag database storage of unlimited tags. A list of required tag has been added in the following tables

SL	Parameter	Sub-parameter	Monitored Parameter	Parameter Group
Parameter Group: Chlorine				
30			Chlorine_Pump_Running	
31			HMI_Chlorine_Pump_start	
32			HMI_Chlorine_Pump_Stop	
33			Chlorine_Faulted	

SL.	Parameter	Sub-parameter	Monitored Parameter	Parameter Group
Parameter Group: Water Quality (Optional)				
34	pH			
35	TDS			

List of alarms and safety features display in Local HMI and SCADA system.

SL.	Alarm	Sub-Alarm Group	Alarm Parameter
1	Current	Over Current Alarm	A _{Current-OC}
		Under Current Alarm	A _{Current-UC}
		Unbalanced Current Alarm	A _{Current-UBC}
2	Voltage	Over Voltage Alarm	A _{Voltage-OV}
		Under Voltage Alarm	A _{Voltage-UV}
		Unbalanced Voltage Alarm	A _{Voltage-UBV}
3	Pumping water level Alarm		A _{PWL}
4	Excess delivery pressure Alarm		A _{DP}
5	Inverter Faults and Trips Alarms		A _{InvF}
6	Pump production efficiency Alarms		A _{EFF}
7	Low Flowrate Alarm		A _{FR}
8	Misc Alarms (Total : 18 Nos)		Another 18 Nos

List of monitoring and control parameters in PRV

SL.	Parameter	Sub-parameter	Monitored Parameter	Parameter Group
Parameter Group: Power				
1	Battery_Voltage-D210_M		PRV _{RPM}	

2	Flow_Rate-D235_M	INV _{ov}
3	Inlet_PT-D1170_M	INV _{OP}
4	Outlet_PT-D1195_M	INV _{DCLV}
5	Turbine_Voltage-D310_M	INV _R
6	VO_M	INV _{R-C}
7	Alarms (5 Nos)	INV _{S-C}
8	Misc TAGs (15 Nos)	INV _{Freq-V}

6.2 Standard Communication Network and Protocol :

Since Central SCADA is to embrace Water treatment Plants and a large number of Deep Tube Wells including DMA, standardization of key components is crucial to integration of all facilities into Central SCADA .

Interface equipment to enable communication between water supply system field instruments, PLC's, RTU's, LCC SCADA at WTP's, RTU's at DMA's and Local & Centralized Monitoring Control Center at DWASA.

Supply, installation, testing commissioning of RTU's along with GPRS modem at DMAs to transmit flow, pressure and actuated pumps data to Locals and Central Monitoring and Control Centers (L&CMCC) for monitoring and control.

The monitoring and control of all the DMAs in the Water Supply system shall be at Locals and Central Monitoring and Control Centers, for this purpose Bulk flow meters and pressure transmitters at strategic locations in the DMAs shall be provided along with RTU's, GPRS modem and shall be interfaced with the Local Monitoring and Control Center. The instrumentation provided at the DMAs shall be capable to measure and record reverse flow and uncommon flow shall be alarmed at the Locals and Centralized Monitoring and Control Centers.

The communication equipment required to achieve this interfacing complete with all required accessories shall be supplied, installed, tested and commissioned under this contract.

Data acquisition and processing: The data acquisition, processing and interfacing with the Locals and Centralized Monitoring and Control Centers of entire water supply scheme of Dhaka city is covered under this package. The domestic water meters data shall be collected and this data shall be fed into the Centralized Monitoring and Control Centre SCADA system for records and further analytical purposes.

System Console: Control room furniture (system console) including but not limited to control console for dual redundant workstations, desk for engineering workstations, Servers, ODMS workstations and printer compartment along with chairs. The system console design shall be submitted to the Employer for prior approval.

The Contractor shall be responsible for the design of each instrumentation and plant monitoring system, including the selection and design of appropriate transducers (on approval by the Employer's representative), transmitters, signal conditioning devices, indicators, alarm system programmable devices, communications, cable system etc. The Contractor shall take account in his design of all installation and environmental conditions prevailing at the site.

Video Wall: A 55" 2x3 LED large screen video wall with controller shall be provided. The bidder shall ensure the 2x3 combination of above-mentioned LED tiled together contiguously to form one large Video wall. All necessary hardware (like video wall mounting bracket etc.) to stack LED screen together to be supplied which should also be easily maintainable and accessible from the front of the video wall.

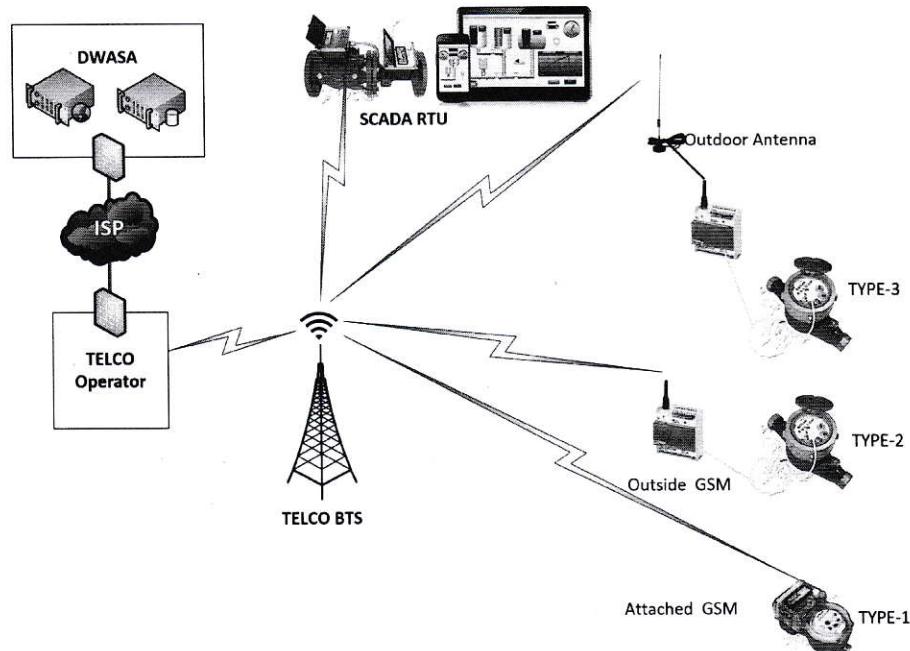


Figure 5: Types of GSM (3G/ 4G)

Protocol for SCADA

1. It shall support all telemetry protocols such as Modbus, DNP 3.0, IEC 104, MQTT etc
2. DAS should be able to retrieve data from RTU data log in case of communication failure using DNP3.0 communication.
3. It shall support OPC DA and OPC UA communication. Also SCADA shall be OPC UA Server

6.3 SCADA Software

Despite relying on the same database, the software in our expecting can run independently from each other. Each software is aimed towards different category of personnel within WASA as described in the subsequent sections

SCADA Software Solutions & Total Systems requirements

The Contractor shall propose the most recent version of a standard production model most closely matching the specification below and must provide detailed software acceptance test results, cyber security, penetration test results, software design details with the APIs for possible future extensions and interfacing with the other DWASA IT (Information Technology) / MIS (Management Information Systems) Systems, GIS (Geographical Information Systems), ERP (Enterprise Resource Planning) and other OT (Operational Technologies') SCADA-like systems:

- Ethernet supporting both UDP and TCP transports on an IP network
- able to support multiple logical networks on the same physical infrastructure.
- secure network that complies with the DWASA and National Cybersecurity Policy
- less than two-second end-to-end response.
- network availability greater than 99.999%.
- scalable without a reduction in performance.
- failover to redundant WAN paths must be within the limits of 3 seconds or less.
- the SCADA WAN must be robust, with route redundancy using separate and distinct technologies.
- the redundant communications path must also allow for planned outages on either path without causing disruptions to the SCADA system.
- only IP/Ethernet enabling technologies will be considered for the SCADA backbone. Fully routed network with automated transparent failover between primary and secondary paths.
- a system end-to-end response of four seconds or less is desired. Depending on the physical distance and medium used to connect a distribution RTU to a local plant or remote operation center, the end-to-end response could vary between 4 to 10 seconds roundtrip.
- Mission critical and high priority site network links should be designed with route redundancy based on diverse technologies. For example, one connection could be a local wireless carrier / Mobile Network Operator (MNO) such as Tele Talk and a second could be a fiber optic landline such as Fiber@Home Private Network.

- the redundant communications path must also allow for planned outages on the various paths without causing disruptions to the SCADA system.

- capable of providing remote access by operators and SCADA support staff.

A. The minimum requirements of the SCADA Software include:

- support situational awareness graphic development.
- adherence to ISA 101 standards and guidelines.
- support business system integration using industry accepted protocols (SNMP, OPC, etc).
- support 3rd party systems and control vendors (SNMP, etc.)
- provide a seamless and simple transfer of programming and configuration from a Development environment to the Production Environment.
- support a modular object-based development environment with direct links between graphic elements and control elements as in the latest Industrial robust PLC systems
- a built in full featured Trending package.
- built in Reporting capability.
- built in Alarm / Event Analysis and Alarm Management tools.
- support key performance indicators, dashboards and overview displays.

SCADA Historian – Operations Data Management System (ODMS)

The historian will be a key source of data for the DWASA Integrated Intelligent Water Operations Center (IIWOC) to find data trends through analytics. The minimum requirements of the SCADA Historian include:

- a minimum of five years of real-time data must be actively available to be retrieved and displayed both on the SCADA Operator Workstations and on systems in the DMZ.
- archive data will be available for comparative historical trend analysis on the SCADA Operator Workstations and on systems in the DMZ.
- SCADA systems reports will be capable of being generated on demand from SCADA Operator Workstations and on systems in the DMZ. Does not need to be embedded in HMI Screens.
- support data exchange with external SQL Databases.
- capability to create dashboard without the need for third party software packages.

B. SCADA Application change Management

The SCADA System shall maintain a record of changes made to the application. The minimum requirements of the SCADA Software Systems include:

- provide centralized software application configuration version control.
- provide centralized patch management and platform version control.
- provide a Disaster Recovery point for the HMI Applications.

C. Remote and Mobile Access

IT, Operations, and Maintenance staff members may require remote access to SCADA System components, such as the SCADA Network equipment, HMI workstations, PLCs, Vendor Package Systems, and the Historian. The minimum requirements for SCADA Remote and Mobile Access include:

- on-call SCADA and Maintenance staff may require remote access to the SCADA Systems from anywhere in the DWASA service area, both inside the SCADA network and outside of the SCADA network.
- during normal business hours Operations and Support staff may require access to SCADA from remote water facilities.
- secure remote access could be provided for access to the corporate network for email and network maintenance.
- IT will require remote access to networking equipment from a central location / IIWOC (Intelligent Integrated Water Operations Center) & IISOC (Intelligent Integrated Security Operations Center).

Training

Training should include configuration interface, troubleshooting the SCADA system, display building, security, and ongoing operation of provided computer software components.

Maintenance and Support with the DBO

The Contractor shall include maintenance support for all software components of the HMI system software.

The Contractor will provide SCADA software service support, updates, and upgrades for a period of at least 5 years following completion of the Design and Build Phases of the DBO (Design, Build and Operate) Contract.

Detail Specification of SCADA plugin application packages (annexure- 5). This is not enterprise or DCS software, it's a application which will be delivered as part of central Command Center for below benefits.

- As DWASA is integrating a very large water distribution network, it is not always possible to keep an eye on every condition on field so to provide decision support to DWASA Management and stakeholders regarding abnormal conditions or deviations smartly,

package is offered with capabilities of alarms/incident/calibration/maintenance and asset management, so dwasa will not only able to monitor but also will be able to handle situations in more better way. Also DWASA will be able to justify ROI on investment with managing maintenance/calibration activities on time, managing complete life cycle of their asset, optimizing energy efficiency and water quality.

- Now a days these trend is adopted in most of central command control platforms for water, smart cities and smart infrastructures globally to empower decision making for optimizing sources and justify ROI. So DWASA will be also able to set global benchmark.
- DWASA management have decided to go with all monitoring and control will happen from Zonal scada and central platform will capture data from zonal scada, it must have redundancy and web clients for local monitoring and control operations. Also addition to that, historian storage up to 1 year is recommended, but it DWASA need it for 3 year, there will not be any license cost implication
- Central SCADA will not directly fetch data from PLC/RTU, but it will fetch data from Zonal SCADA. It should be like that only. But as zonal scada is responsible for monitoring and controlling. It should have required remote access clients (Mobile/Web) for secured monitoring and control from field area and it must have redundancy. So continuous operations can be ensured at zonal offices also and there will not be any loss of data on central SCADA.
- Zonal SCADA must have web/mobile clients available for their local teams (field, maintenance, operations) to have easy remote operation, specific to their area, and advantage of it is also that local management of change and assignment from its respective authorities of Zonal SCADA office. Also it can have secured and limited access across respective zonal scada teams. However offered Central SCADA should have web clients/mobile clients for DWASA stakeholder in order to have situational awareness from complete water distribution network with required, analysis, reporting, monitoring and decision support.

Integrated Water Command & Control Platform Software

i. Zonal SCADA

Sr. No.	Category	Minimum required Specification
1	General	SCADA Server software with database historian (with High Availability Architecture)
2		SCADA Shall be with Server client architecture, and shall have overall monitoring and controlling of Zonal functions at Zonal location
3		All communication from WTP/DMA/DTWs and other location RTU/PLC will come to SCADA server. SCADA server will be single repository of all data, screens, objects, alarms etc. SCADA Client will connect to SCADA server for all information to be provided to operators
4		Zonal SCADA should have native connection with WCCC without any additional need of Software license / gateway
5		Complete SCADA system software, to monitor and control the conditions of remote equipment while ensuring data integrity, overall system visibility and security, shall be installed at the each zonal offices
6		SCADA system shall be designed with most suitable customized commercial software package architecture and hardware capable for monitoring and control of various devices deployed.
7		The system shall be supplied with minimum of 32,000 no. of tags which shall be installed at the city operation centre in HA mode.
8		All SCADA software management tools and engineering services, necessary to administer the SCADA software system shall be provided such that no additional software or IT hardware should be required to configure or run each and every feature of the SCADA system
9		SCADA system shall be designed to remotely control, monitor, store, display and log process and equipment operating information
10		The SCADA software, as delivered shall operate with a fully developed control screens, database and a communication network for seamless real-time of data communication
11		The application shall have the facilities for Historical process Graphics Display; Real-time screen updates etc.
12		There shall be no limitation on number of screens, database, reports, trends to be created in SCADA System
13	Data Acquisition Server	It shall support all telemetry protocols such as Modbus, DNP 3.0, IEC 104 etc.
14		DAS should be able to retrieve data from RTU data log in case of communication failure using DNP3.0 communication.
15		It shall support OPC DA and OPC UA communication. Also SCADA shall be OPC UA Server
16		The system shall have the desired communication interfaces for the data integration with other existing applications as necessary
17		DAS shall also provide data to EAPMS and IMS system as and when required.
18	Redundancy	The system shall have distributed architecture to provide high availability architecture using multiple servers/hardware/systems.
19		The system shall be provided with high availability architecture.
20	Database server &	This database shall have administrator window like user interface that permits to monitor, supervise, archive, retrieve and control data gathering functions from the SCADA system. The Database Builder and

	Development Environment	Editor (Engineering Software) shall be as part of the SCADA software package
21		The databases shall include the all measured and operational data fully synchronized time stamping system
22		The SCADA software shall provide the capability to make configuration changes to the global process database from the SCADA software
23	User Interface	The operator shall select subsets of the displayed data. The plot function shall automatically scale the requested data to fit the time frame requested by the operator. The plot function shall display these data as a multiline chart with each variable easily determined by colour.
24		The system shall support a screen resolution of up to 4000 x 4000 pixel resolution
25		The graphics system shall support full 32 bit (65 million) colors, and be capable of displaying images imported from 3rd party packages for use within the displays, including animating and color flooding the image.
26		It shall be possible to display other graphics pages by selecting screen targets, and to automatically display any screen based on the condition of a tag e.g. automatically call a particular graphic display when an alarm occurs
27		automatically call a particular graphic display when an alarm occurs The SCADA HMI software shall support curve display with the line graphs with time on a linear, continuous horizontal axis and the trended variable on the vertical axis.
28		The system shall have the capability to read the exact value of any displayed variable, by selecting a point on the graph or chart
29		Display of historical information as far back in time as desired, as is available in the history log
30		The SCADA screen builder and editor shall be an integral part of the SCADA package, supporting user building and editing of user friendly control screens in the project
31		The system shall have the desired interfaces for the data integration with other existing applications as necessary.
32	Graphics Builder	The graphics builder shall be capable of creating screens composed of both static and dynamic objects. To create these objects, the vendor shall provide sample screens and a set of standard shapes or symbols in a library at no charge. The developer shall be able to include these symbols by reference, or create new symbols/objects
33		Commonly used pages such as Alarm and Trend pages shall be included with the software and not require any development to use them at runtime.
34		Pages shall be based on Templates, and 'linked' such that changes to the master template in the library are propagated to all pages throughout the project without needing to access each page.
35	Reports	The SCADA software shall perform all report generation, report scheduling and management using its built-in capabilities. Reports shall be defined based on historical data
36		Export of any portion of the historical trend database CSV or TXT formats
37		The reports shall be either "single-point-in-time" (online and historical) or "time-range", with no software limit on the number of points in one report
38	Alarm Management	The SCADA software shall support alarm and event logging, including description text and time stamp
39		The alarms shall be logged to the SCADA database without any limit on the number of alarm occurrences
40		The SCADA software shall allow viewing of alarms without disrupting data collection or alarm processing

41		The system shall provide multiple levels of alarm priority or category. The priority of an alarm shall be identifiable by the color and font settings of the alarm message on the screen.
42		Sound indication for each alarm category shall be configurable. This must be possible at each station. It shall be possible to have the alarm sound either by internal or external speaker.
43		The system shall support at least 10 categories of alarms, and up to 255 priorities of alarms.
44		For alarm events (both digital and analogue) which are time-stamped by the field controller for increased accuracy, the system shall support using that timestamp for the event. The system shall support millisecond precision for this time-stamp.
45		When configured in a redundant architecture, the system shall automatically ensure that if the Primary Alarm Server fails, all alarm functions shall continue to operate normally and transparently to the clients. The system shall automatically generate a diagnostic alarm to indicate that the Primary or Standby has failed.
46	Trend Display	Trend displays shall comprise line graphs with time on a linear, continuous horizontal or vertical axis and the trended value on the vertical or horizontal axis. Resolution of each graph shall be to within 0.1% of full scale. Where more than one tag is graphed, the graph of each tag and associated information shall be displayed in a different color.
47		Trend displays shall support both analogue and digital pens on the same graph. Trend pen assignments shall be user definable and retrievable in runtime to allow easy creation and management of favorite trend groups.
48		Each trend graph shall be capable of displaying up to 32 pens with adjustable time base to one second samples and reporting up to 10,000 points with user-specifiable time ranges, using the standard software. The graph shall be capable of viewing the entire archived trend history for a group of pens on a single display.
49		Each pen shall display individual ranges and engineering units. Each pen shall be scalable for display purposes independently of other pens displayed on a page.
50	Logs	The system shall support logging of all operator actions to disk, printer or screen.
51		The system shall be capable of logging the following information, User Name, Action, Time, Date, Value, and Comment in a user definable format.
52		The sequence of actions shall be viewable via an event viewer window within the system and also stored in an external open file format (such as txt, csv, dbf, sql) for later analysis.
53	Historian	<p>The SCADA system shall provide a separate data historian with the following facilities as standard feature</p> <ul style="list-style-type: none"> • Time-series relational database • ODBC / SQL interface to historical (trend) data • Historical data to be stored with time-stamp, point quality, alarm status • Historic storage is to be based on configurable criteria including time between samples, alarm state change • Compression capability • Web clients for reports / KPIs / trend access
54		The historian should support redundant control system links. In the event that one link fails, the historian should request the data from the other link to the zonal SCADA system. In the event that the network link to the historian fails, the historian should backfill from the zonal SCADA system's

		trend and alarm systems to acquire data that it could not acquire in real time.
55		While there are always physical limiting factors such as disk space, there shall be no programmatic limit to the amount of data that may be stored on-line. Additionally, there shall be no performance penalty for long-term data storage. There shall be no discernable difference in retrieval speed of data based on the age of the data. For example, the retrieval of two hours data stored two years prior shall be the same as for two hours of data stored one day ago.
56		The data historian database shall acquire and store process data at full resolution. The data historian database shall include normalized extension tables for real time data and include a set of client tools for data analysis and reporting such as those described in earlier sections.
57		The zonal SCADA Historian should have Store and forward capability. If the Historian is off-line or unreachable, the engines servicing active objects shall store data locally, and forward the buffered data to the Historian complete with time stamps and quality information when the historian server is available.
58	System Security & Access	Security shall be fully integrated into the system to allow access to any individual part of the system only to users with appropriate security levels. Security must be checked on the server side and passwords must be encrypted.
59		The system shall support users that are defined in a Windows domain. Users will be able to be added, removed and granted access to existing roles via the Windows domain server without requiring changes to the system configuration.
60		The software shall monitor the actions of the user currently logged on at each station, and automatically log the user out of the system after an adjustable time period. Logging out a user will not shut down the system; the system will revert to a view only security status.
61		For each graphic object it shall be possible to assign it to a plant area, define its privilege level, define whether operator input is enabled or disabled, or whether the object will be visible or not based on the user's current privilege levels within the given plant area.
62		It shall be possible to define a minimum of 8 privilege levels. The system will check to ensure that the user logged on has the correct privilege level for all functions. If the user does not have the correct privilege for a function or object the software will be able to display visual indication to the user such as shaded, hidden or popup message.
63		It shall be possible to prevent access to the operating system by unauthorized personnel.
64		It shall be possible to disable Windows "hot" keys such as Ctrl Esc, Ctrl Alt Del etc to prevent operator access to unauthorized software.
65	Web Clients	SCADA Shall be scalable to provide unlimited web client for department users, maintenance team, Bidders and all other stake holders.
66		It shall display different set of data for different users. Each user will be validate thru login ID, password and user group.
67		The system shall support full operator display functionality via an internet web browser without any loss of functionality. It shall not be necessary to export, compile or recreate graphics specifically for the Web Clients. Instead they shall operate from the same project configuration as the rest of the system, minimizing maintenance overheads and version control risks. The web browser version shall be fully functional in all aspects, with the exception that 3rd party items such as ActiveX objects may need to be loaded on the client PCs

68		Changes will be automatically uploaded to the Web Client only when the user accesses a display that has been modified so as to conserve bandwidth and optimize performance.
69		It shall be possible to limit access to "view only" or provide full "read and write" access and web clients will provide identical functionality to an operator workstation on the LAN.
70		Assuming reasonable ISP performance, users accessing via the internet using a 56K modem access shall consistently obtain display refresh times on average of 1 to 5 seconds and page display times of on average less than 5 seconds.
71		Systems that require third party thin client software to be loaded onto the Web Clients (such as MS Remote Desktop or Citrix) to achieve this functionality will not be accepted.

Integrated Water Command & Control Platform (Central Platform)

Sr. No.	Category	Minimum required Specification
1	Core Components	<ul style="list-style-type: none"> i. Business Rules Engine – should enable users to define the business rules around incidents handling and Emergency response as per agreed SOPs for the water systems ii. Integration Layer – Should provide a common data integration layer which can collect and contextualize information from disparate data sources regardless of protocol. iii. Workflow Engine – should manage the life cycle of incidents and related entities via pre-defined workflows. Workflow should able to write interactive SOPs. The workflow could cut across multiple systems via the interfacing modules. Workflow for operational alerts and escalations should be triggered automatically without human intervention. iv. Task Management – should manage the planning preparations of an incident including resource allocation, tasks management etc. v. Analytics and MIS –should provide users with business analytics reporting and tools to organize, evaluate and efficiently perform day to day operations vi. Reports and Dashboards – should provide filterable reports and dashboards about critical information pertaining to incidents and KPIs collated in a single view which can be drilled down further for more detailed information vii. Security & Roles – should manage roles definition for internal as well as external access viii. Centralized data archiving for operational data: Should provide facility for centralized storage of operational data (time-series and transactional) with high granularity and data compression capability ix. Mobility: Should enable operators and the crew members to access the workflow task assigned to them and act using the native mobile application. They should be able to close loop of workflow by acknowledging the real-time status of Action assigned to them. x. Command & Control: Should have ability to take over control of Zonal SCADA .
2	Platform Functionality	<ul style="list-style-type: none"> i. The software shall consist of a suite of Commercial-off-the-shelf modular components that are tightly integrated together to perform all IWCCP functions ii. The system shall provide IWCCP operators and managers with a management dashboard that provides a regular status and is automatically updated when certain actions, incidents and resources have been assigned, pending, acknowledged, dispatched, implemented, and completed. The above attributes shall be colour coded. iii. The IWCCP shall provide the “day to day operation”, “Common Operating Picture” and “Situational Awareness” to participating water utilities department. iv. The IWCCP shall define all the water utilities objects in a hierarchical fashion to segregate data. These objects are water utilities assets that will have all the relevant information

		<p>in the smart water area. These objects give real time status of assets and update automatically in case of failure.</p> <p>v. The IWCCP shall have tightly integrated Asset Management/ CMMS System to have all relevant information of all assets in Smart water solutions to give real time status of assets & update automatically in case of failure.</p> <p>vi. It shall improve scalability for large and geographically distributed environments.</p> <p>vii. It shall provide complete view of facilities, sensors, and alarms in an easy-to-use and intuitive GIS-enabled graphical interface with a powerful workflow and business logic engine.</p> <p>viii. It shall provide a uniform, coherent, user-friendly and standardized interface</p> <p>ix. It shall provide possibility to connect to workstations to be displayed in one or more video wall with one or more module/application/solution being independently and/or simultaneously being displayed and functional.</p> <p>x. The dashboard content and layout shall be configurable and information displayed on these dashboards shall be filtered by the role of the person viewing dashboard.</p> <p>xi. IWCCP should allow creation of hierarchy of incidents and can present the same in the form of a tree structure for analysis purposes</p> <p>xii. The system shall integrate with GIS and map information and can dynamically update information on the GIS maps to show status of resources.</p> <p>xiii. The IWCCP shall be available via a VPN as a web-based interface or a thin-client interface.</p> <p>xiv. It shall be possible to combine the different views onto a single screen or a multi-monitor workstation.</p> <p>xv. IWCCP should maintain a comprehensive and easy to understand audit trail of read and write actions performed on the system</p> <p>xvi. IWCCP should have instant messaging which should provide the ability to converse virtually through the exchange of text, audio, and /or video based information in real time with one or more individuals with in emergency management community.</p> <p>xvii. IWCCP should provide ability to extract data in desired formats for publishing and interfacing purposes.</p> <p>xviii. IWCCP should have mobility devices & applications for field staff to ensure fast restoration of services in case of alarms, issues, incidences. In case of non-attending of alarm, decision escalations will be done automatically. After closure of issue the workflow must be closed with feedback from those devices.</p> <p>xix. System should provide ability to attach documents and other artefacts to incidents and other entities.</p>
3	Standard Operating Procedures	IWCCP should provide for authoring and initiating un-limited number of configurable and customizable Standard Operating Procedures (SOPs) through drag and drop design tool preferably using workflow engine.

		<ul style="list-style-type: none"> i. SOPs should be established, approved set of actions considered to be best practices for responding to the situations or carrying out an operation. ii. User should be able to edit SOP, including adding, editing or deleting activities. iii. Solution should allow provision for automatically logging the actions, changes, and commentary for the SOP and its activities, so that the record will be maintained for after action review. iv. SOP should be able to define following activities <p>Manual activities – The activity initiate by the user manually.</p> <p>Automation Activity – The activity initiated through sensors, control system or any other integrated application without any human intervention.</p> <p>Notification activities – An activity that displays a notification window that contains an email template for the activity owner to complete, and then send email notification.</p> <p>SOP activity – An activity that launches another standard operating procedure.</p> <ul style="list-style-type: none"> v. The SOPs defined in the system should be easily editable by an administrator with drag and drop capabilities. vi. The IWCCP shall present the workflow and task information in a clear and logical manner on the incidents screen. vii. IWCCP system shall include a section that will contain the Policy and standard operation procedures with easy to search functions to support the Operators during a crisis. viii. IWCCP should be able to pass the SOP step on to mobile application for the user to respond based on his role and responsibility in the SOP to achieve faster response to the incidences or events.
4	Common Operational Picture	IWCCP as the central control function of the integrated water utilities operations should have capabilities to create and watch command operational picture. It is envisaged that IWCCP console should able to have the functionalities of monitoring and control of integrated sub-systems.

		<ul style="list-style-type: none"> i. The IWCCP should be able to combine data from various sources and present it as different views tailored to different operator's needs. ii. The IWCCP should automatically update the information based on alarms and incidents that are presented to it via the business rules engine. The polling and IWCCP database refresh cycle shall be configurable to match the status of the situation (whether there is an emergency or crisis or just monitoring only). iii. The IWCCP should be able to take over control of integrated sub-systems either passing set points or changing process as applicable. iv. Common Operational Picture should comprise of a comprehensive view of the incident or a group of related incidents as on a specific date and time which should include but not be limited to the following: <ul style="list-style-type: none"> a. Tasks assignment and their status b. Agencies involved c. Resources deployed d. Incident status across relevant parameters of the incident e.g. household affected by a transformer shut down e. Timeline view of the situation <p>Suggested actions from the system with their status</p>
5	Task Management Functional Capability	<p>The IWCCP must provide incidence management Services to facilitate the management of response and recovery operations to water utilities incidences.</p> <ul style="list-style-type: none"> i. Should support comprehensive reporting on event status in real time manually or automatically by sensors and integrated sub-systems ii. Should support for sudden critical events and linkages to standard operating procedures automatically without human intervention. iii. Should support for multiple incidents with both segregated and / or overlapping management and response teams iv. Should support geospatial rendering of events and incidence information. v. Should support plotting of area of impact using polynomial lines to divide the area into multiple zones on the GIS maps vi. Should support incorporation of resource database for mobilizing the resources for response.

		<p>vii. Should provide facility to capture critical information such as location, name, status, time of the incident and be modifiable in real time by multiple authors with role associated permissions (read, write) . incidents should be captures in standard formats to facilitate incident correlation and reporting</p> <p>viii. The system must identify and track status of critical infrastructure/ resources and provide a status overview of facilities and systems</p> <p>ix. Should provide user-defined forms as well as standard incident command Forms for incident management.</p> <ul style="list-style-type: none"> i. The system should be able to create, assign, track and report on the lifecycle of tasks during a particular incident. ii. The system should allow a particular task to be decomposed into sub-tasks. iii. The system should provide an easy to interpret management dashboard view of the progress of all tasks during an incident. iv. The platform shall have cross functional workflows with the ability to communicate between People, devices and systems (ERP/ CMMS/ EAM). v. The system should be able to organise the visual representation of tasks into prioritized list, filtered list, as well as colour coded representation for ease of understanding. vi. The system should be able to perform the following functions around task management: <ul style="list-style-type: none"> a. Create a task with unique ID. (Subtasks shall follow parent ID with second level numbering). b. Assign a target completion date and time for the task, either directly or as a time-span from the task's creation. c. Date and time stamp of the creation of the task. d. Log and track status of tasks. System should provide capability to define status of tasks during its lifecycle. These status definitions
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		<p style="text-align: right;">could be mapped to other task attributes such as the task type.</p> <ul style="list-style-type: none"> e. Key-word search against task list. f. The above attributes shall be colour coded. <p>The system shall allow the tasks to be filtered on the real-time dashboard by agency then by task status. This filtering should allow an operator to filter for all tasks of a particular state or a combination of state; and by the time remaining until (or time elapsed since) the target completion time.</p>
6	Dashboarding and KPI – Functional Capabilities	<p>IWCCP should provide integrated dashboard and KPI tracking capabilities for various water utilities functions. Dashboards should be designed in such a way that user should be easily navigate user interfaces for managing profiles, groups, messages templates, communications, tracking receipts and compliance. Likewise, IWCCP should have capabilities to configure and monitor key performance indicators on real time basis.</p> <ul style="list-style-type: none"> i. Dashboard should collect major information from other integrated water utilities sensors/ platforms and sub-systems ii. Should allow multi-display configurations iii. Should provide tools to assemble personalized dashboard views of information pertinent to incidence, emergencies ad operations of different departments and water utilities divisions iv. Should provide historical reports, events data, activity logs. the reports can be exported to PDF or other formats v. Should provide dashboard filtering capabilities that enables end-users to dynamically filter the data in their dashboard based upon criteria, such as region, dates, products, sub-systems and capability to drill down to the lowers details. <p>Should be able to facilitate measurement or criteria to access the condition or performance of department process and policies on real time basis.</p>
7	Business Rules Engine – Technical Capabilities	<ul style="list-style-type: none"> i. The IWCCP system should have a built-in alarm handling facility based on configurable cause and effect rules. ii. The IWCCP system should receive inputs (referred to as "incidents") from various sources. These incidents when passed through the business rules engine shall trigger an automated response as defined using the business rules engine. iii. The business rules engine should be able to send and receive messages to other applications

		<p>running within the IWCCP suite as well as external systems like the surveillance system.</p> <ul style="list-style-type: none"> iv. The business rules engine shall be able to correlate between different types of incidents or frequency of similar types of incidents. v. The business rules engine shall be able to distinguish between "early warning or anticipation" type mode of operation and an "emergency or crisis" mode of operation. vi. The IWCCP shall provide capability for users with appropriate rights to define business rules. <p>The IWCCP shall provide capability to do a simulation run of a newly created/added business rule before it is activated.</p>
8	Workflow - Technical Capabilities	<ul style="list-style-type: none"> i. Workflow and Incidents lifecycle system – this function should allow users to define and modify new workflows. The workflow could cut across multiple system via the interfacing modules. Workflows for operational alerts and escalation should be triggered automatically without human intervention. ii. It is to enable a collaborative work environment that supports cross departmental communication. iii. Audit trails maintained throughout the business process lifecycle from design and deployment to optimization, track and trace the actions of individuals for resource performance analytics and accountability. iv. Workflow approvals should have facility to approve from any smart device. v. Workflow function should provide facility to trigger a corrective action workflow and define the stakeholders for the same. vi. Workflow system should be able to create, assign, track and report on the lifecycle of tasks during an incident. vii. The workflow system should allow a specific task to be decomposed into sub-tasks. viii. The workflow engine should be able to dynamic assignment of tasks based on roles, name,

		<p>designation or any other attribute present in the resource database</p> <ul style="list-style-type: none"> ix. The system should provide an easy to interpret management dashboard view of the progress of all tasks during an incident. x. The workflow should have Multi-level calendars for managing resource availability during the design time. xi. Escalation mechanisms to ensure tasks are never delayed xii. Multi-channel task notification set up at the design level xiii. Assign a target completion date and time for the task, either directly or as a time-span from the task's creation.
9	Analytics and Reporting – Technical Capabilities	<ul style="list-style-type: none"> i. The analytics tool should be able to produce performance analysis and produce dashboard reports on performance. ii. The IWCCP should allow users to define benchmarks against performance parameters. Performance reports shall have the option to generate reports with or without benchmark comparison iii. The IWCCP should use analytics to create a view of hazards and prioritizes based on a severity and risk profile iv. The IWCCP shall be able to import data into its analytical tool. v. IWCCP should be capable of easily interfacing with any other external analytical tool that might be required in future to provide warning inputs to Smart water. vi. The IWCCP shall present a prioritized list of key actual incidents, and tasks requiring action. vii. IWCCP should be able to perform multi-dimensional analysis on incidents data. This should provide capability to do Trends Analysis. <p>The IWCCP should provide a clear reporting function following an incident for: Management dashboard reporting and Analysis of what went well and “lessons learnt”</p>

10	Graphical User Interface (GUI)-Technical Capabilities	<ul style="list-style-type: none"> i. The IWCCP should present information on standard Windows based workstations and terminals. ii. The IWCCP GUI shall be able to present management data such as dashboards, alarm and alerts, resource management information, incident information in color coded, clear, simple and unambiguous, logical format iii. The color coding on the IWCCP GUI shall represent the different status of a task or incident / alert. iv. The GUI layout and arrangement of windows shall be user customizable. v. Should able to present information and distinguish between an “early warning or anticipation” type set of data and “emergency or crisis” operating mode. vi. The IWCCP should be capable of presenting information in a browser based format such that it is accessible from any terminal with a web-browser. The supported browser should include, but not limited to, Internet Explorer, Chrome, Firefox and Safari vii. The IWCCP should be capable of showing still as well as video imagery. viii. The IWCCP information shall be capable of pushing onto other display devices such as the video wall of the Water utilities Management Centre. ix. The IWCCP should be capable of providing the following features for still and video imagery: <ul style="list-style-type: none"> a. The system shall have a thumbnail gallery to display all imported images b. The system shall be able to import pictures from still imagery cameras c. The system shall be able to import pictures from local hard drives d. The system shall be able to share the imported images with other users e. The system shall time and date stamp any imported images f. The system shall have the ability to view each still image full screen g. The system shall have the ability to zoom in an out of a still image when viewed full screen h. The system shall allow the image to be imported to the planning whiteboard module i. The system shall enable users to add tags to images for easy search and retrieval later on
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		<ul style="list-style-type: none"> j. The system shall enable users to group and title images together for easy retrieval k. The system shall be able to display video imagery l. The system shall have a thumbnail gallery to display all video images m. The system shall allow the video streams to be grouped and titled as per defined requirements. <p>The IWCCP presentation layer shall have the capability of only refreshing those elements of the GUI that have changed state.</p>
11	Integration Layer – Technical Capabilities	<p>The IWCCP should have robust integration capabilities of integration with existing and future platforms, IOT devices and application. The success and suitability of the platform also depends on the integration capabilities of the platform.</p> <ul style="list-style-type: none"> i. The IWCCP should support various Information Technology Standards (like ESB, API Integration, Web Services), industrial protocols (like OPC UA, BCNET, Serial communication). The layer should have capabilities to integrated with operational, IT systems and applications on real time basis and not on off line basis or near real time. ii. The IWCCP platform shall include a broad range of Device Integration services for establishing the I/O interface to field devices such as RTU's, PLC's, IBMS etc systems. iii. The IWCCP should provide a comprehensive API or SDK (Software development kit) to allow interfacing and integration of 3rd party systems <p>Bidder must demonstrate OPC connectivity for real time systems during POC & project for acquiring controls over subsystems like Water, Electrical, Street Lighting, Sewage etc. ESB Integration for such systems shall not be acceptable.</p>
12	System Development Functionality-Technical Capabilities	<ul style="list-style-type: none"> i. The IWCCP platform Development Environment shall provide a mechanism to develop Application Object Templates. ii. The IWCCP Should provide SDK tools that help the water utilities to produce new applications, and/or use solution APIs to enhance or manage existing or future solutions. iii. The IWCCP system software shall include an object-oriented colour graphics display generator with full animation capabilities to provide users with a realistic and efficient visualization of the IWCCP system process. It shall provide graphical capabilities to allow design of highly efficient user interface aimed at helping operators to easily

		achieve a state of situational awareness in relation to the process.
13	System Display Functionality- Technical Capabilities	<ul style="list-style-type: none"> i. Shall have the facility to view and handle multiple alarms at one time ii. Shall have the facility to view multiple video windows at one time. Operators shall be able to resize and move video windows. The capability is essential for CCTV integration in future. iii. Shall have the facility to view windows in a single monitor or across multiple monitors iv. Shall have the facility to access, display and manage incidents/alarms and related sensors data and information from subsystem based on priority and authority level. v. Shall view and manage detailed response procedures and tasks vi. Shall enable a single operator or multiple operators to monitor and control commands from connected subsystems, including all operational capabilities for detection, assessment, notification, entry control, and communications <p>Shall provide the rapid annunciation and display of alarms to facilitate evaluation and assessment</p>
14	GIS Display – Technical Capabilities	<ul style="list-style-type: none"> i. Shall view the environment fixed composite computer-generated (JPEG, BMP, AutoCAD, etc.) map ii. Should allow user to view sensor and related name from the displayed map iii. Should allow all resources, objects, sensors and elements on the map to be geo-referenced such that they have a real-world coordinate. iv. Should visually display an alarming sensor on map v. Should visually differentiate sensor alarm severities on map through different colour and icon identifiers vi. Should immediately view alarm details (including description, video, etc.) and investigate the alarm from the map

		<ul style="list-style-type: none"> vii. Should allow user to jump from one map to the next with a single click of a mouse with map links viii. Should allow map information "layers" to be displayed/hidden on items such as – <ul style="list-style-type: none"> a. Sensor names b. Sensors c. Sensor range d. Locations and zones e. Perimeter ranges f. Resource tracks g. Allow user to zoom in/out on different regions of map graphic
15	IWCCP Historian Server	<ul style="list-style-type: none"> I. The IWCCP platform historian shall support high-speed data acquisition and efficient data compression. The data compression for the historian shall not use any algorithms that do not allow for the storage of the tag data at their scanned rate. The stored data records shall be able to recreate the process data in a loss-less format. II. The IWCCP Platform shall provide a real-time relational database historian for long-term storage of process data. The Data Historian shall provide for the storage of real-time and historical data for each analog, discrete or string tag name. The data historian shall also store summary, event, alarm and configuration data. III. The data historian database shall acquire and store process data at full resolution. The data historian database shall include normalized extension tables for real time data and include a set of client tools for data analysis and reporting such as those described in earlier sections. IV. While there are always physical limiting factors such as disk space, there shall be no programmatic limit to the amount of data that may be stored on-line. Additionally, there shall be no performance penalty for long-term data storage. There shall be no discernable difference in retrieval speed of data based on the age of the data. For example, the retrieval of two hours data stored two years prior shall be the same as for two hours of data stored one day ago.

		The IWCCP platform Historian should have Store and forward capability. If the Historian is off-line or unreachable, the engines servicing active objects shall store data locally, and forward the buffered data to the Historian complete with time stamps and quality information when the historian server is available.
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ii. Incident Management

Sr. No.	Category	Minimum required Specification
1	General	The system must provide Incident Management Services to facilitate the management of response and recovery operations
2		System should support comprehensive reporting on event status in real time manually or automatically from SCADA Server, IWCCP, GIS, EAM or any other system.
3		System should support for sudden critical events and linkage to standard operating procedures automatically.
4		System should support for multiple incidents with both segregated and/or overlapping management and response teams.
5		System should support Geospatial rendering of event and incident information.
6		System should support plotting of area of impact using lines and circles to divide the area into multiple zones on the GIS maps. Should support overlapping and exclusion on top of overlapping.
7		System should support incorporation of resource database for mobilizing the resources for response.
8		System should provide facility to capture critical information such as location, name, status, time of the incident and be modifiable in real time by multiple authors with role associated permissions (read, write). Incidents should be captured in standard formats to facilitate incident correlation and reporting.
9		The system must identify and track status of critical infrastructure / resources and provide a status overview of facilities and systems
10		System should provide detailed reports and summary views to multiple users based on their roles.
11		System must provide posting, updating and disseminating plans, procedures, checklists and other related information.
12		System must provide User-defined forms as well as Standard Incident Command Forms for incident management
13		Incident management system should have web based interface for configuration and runtime operations.
14		Incident management should also have mobile app to support field maintenance staff.
15	Mobile App	<p>IMS Mobile app shall support following,</p> <ul style="list-style-type: none"> • Assignment of tasks/issues to field staff based on the category, location, department, zone • Field staff should be able to manage and close any task/issues using the App. • The app should have facility to upload a geo-tagged & time-stamped photograph and remarks text, from mobile device. • Mobile App shall provide push notifications to field staff in parallel to SMS and email.

iii. Digital Workbook.

Sr. No.	Category	Minimum required Specification
1	General	Digital Workbook should provide user with standard structure of location, water systems and instrumentation, ready available data forms, integrate with incident management to report incident manually by clicking equipment.
2	Functional Requirement	Digital workbook shall support RFID based equipment identification.
3		There should be a provision of a minimum of [03] administrator and [unlimited] non-administrator user-ids in the software.
4		Enforce standard operating procedures related to recording, verifying and reviewing equipment logs.
5		Reporting and trending should easily achieved with all relevant data stored electronically in the database. It should provide reports and dashboard for analysis purpose.
6		It shall be possible to access Digital Workbook from tablet, or smart phone supporting web interface or as an app.
7		Mobile device can be used in offline mode, in locations where there is no/ slow connectivity. The data will be synced automatically to the [cloud server], when the tablet is connected to the internet.
8		The solution will restrict the access to a particular operator only to the equipment's assigned to him/her.
9		The system shall have necessary features to trends, reports, notification creation etc.
10		Basic features of Digital Workbook shall be as per following, O Attached Documents - set up attached documents to view on handheld device O Data Filters - configures the corresponding alerts associated to capture reading O Default Notes - configures sets of pre-defined remarks for users to add to procedures as comments O Responses - defines a list of observations for users to select during inspection O Status Lists - defines a list of possible statuses to enable/disable the tasks to be executed for the equipment O Units of Measurement - defines the units associated to each reading. Can include custom units of measurement.
11		System Management/Configuration <ul style="list-style-type: none"> • Capability to create users, groups and assign permissions.

		<ul style="list-style-type: none"> • Assigning users to the relevant work areas and works scope • Support for complex password policies • Connectivity settings to other 3rd party information systems • Connectivity settings to handhelds and other supported peripherals • Email functionality need to be provided for scheduled reports, approval workflow, status tracking etc. • It must include the shift rounds that enable data collection from Hand Held Device.
12	Reporting	<p>Web report Manager to support:</p> <ul style="list-style-type: none"> • Scheduled emailing of reports based on configuration. • Email reports to external parties (E.g. vendors) with attachment of report results • Daily department wise summary of data should be forwarded to assigned e-mail addresses. • Following deviation summary should be generated for Higher management • Parameter out of range • Critical observation/emergency • Operator round not completed

iv. Equipment Efficiency monitoring

Sr. No.	Category	Minimum required Specification
1	General	EEM application shall have capability of tracking performance of equipment
2	Energy Auditing	The Energy Meter data at each pumping station, shall be used to analyse the real efficiency of the pumps.
3		It shall facilitate continuous energy management and increased operational efficiency
4		With help of Flow and pressure measurement it shall be possible to compare pump operation with standard pump curve.
5		Energy Meter data shall be fetched from DAS system to analyse with the other parameter.
6		Pump system analysis shall be carried out w.r.t the real-time data acquisition of flow, pressure measurements w.r.t the design specification.
7		It shall be possible to push data from EEM to SCADA Server and IWCCP
8		It shall provide web based energy distribution single line diagram, web based reporting and trends.
9		It shall provide unlimited users to access system based on roles & access rights defined.
10		System should provide the facility to handle roll-over value of totalizer readings from the device. System should calculate the periodic consumption even if roll-over has occurred in middle of particular period. System should provide the facility to handle change of device hardware. System should calculate periodic consumption values with hardware change using last reading from device and first reading received from the device.
12		System should provide the facility to configure Industrial data cleansing for intermittent wrong data due to open-loop or calibration. System should provide data validation with time duration so that such wrong signal do not disturb the system reports in major ways. i.e. data with 100% increment for 10 second will not be recorded or data less than 1% only for 2 consecutive readings will be ignored if 3rd reading is in normal range.
13		System should provide the facility to calculate consumption / totalizer value from instantaneous readings using Integration of reading inside software. Integration cycle must be able to calculate and update calculated tag before new reading data is available from the device
14		System should have facility to read Sequence of Event record or Fault record from devices like energy meters and electrical relays over communication protocol so that events happened and recorded in device can be recorded in SCADA system with original time stamp provided by the device.
15		System should have facility to define various reconciliation points where energy is received and dispatched in

		<p>hierarchical fashion. i.e. energy reconciled at organization level can be again reconsolidate at plant level or electrical bus or utility header level.</p> <p>System should have facility to show this calculation on web portal in graphical manner as well as generate reports for any reconciliation point on-demand</p>
16		<p>System should provide separate handling for variable rates of energy based on time of transfer i.e. system should have provision to enter rate of electrical energy per hour in day or dates in month. System should be able to distinguish between energy with constant rates and variable rates for different times. History should be maintained for all the entered rates.</p> <p>Any cost calculation should be based on such rate entries and data should be able to shown on screen as well as reports.</p>
17	OEE & Downtime calculations	<p>Software shall have functionality to capture downtime information for each equipment and shall provide utilization of equipment for same.</p> <p>Also Overall Equipment efficiency shall be able to calculate for equipment</p> <p>Predefined reports shall be available for which can be generated for equipment wide or DMA/DTW/WTP or Zone wise</p>

v. Enterprise Asset Management (Condition Based Maintenance & Preventive Maintenance)

		Minimum required Specification
1.	General	Does the system allow a user to define a hierarchy of assets? For example: Division Department Area Equipment Component Location Component
2.		Are all of the terminologies in the hierarchy user definable?
3.		Can the hierarchy have an unlimited number of levels?
4.		Can the system support more than one hierarchy? If so, how many?
5.		Can hierarchies cross sites/organizational entities?
6.		Can the system support assets with multiple parents, each with a different purpose (i.e. costing, GL, location)?
7.		Can costs be accumulated up the hierarchy and viewed at any level?
8.		Can more than one cost roll-up hierarchy be defined?
9.		Can operating statistics be accumulated up the hierarchy?
10.		Can operating statistics be accumulated down the hierarchy?
11.		Can operating statistics be not accumulated, but instead act as a measurement point?
12.		Can the hierarchy be displayed in a tree format?
13.		Can this tree format be used for inquiries elsewhere in the system?
14.		Can the asset system act as a sub-ledger to the general ledger?
15.		Can an asset be an intangible item, such as a cost center?
16.	Asset information	Can the asset contain default information that is automatically prompted on work orders?
17.		Can unlimited fields be defined to classify, codify and describe an asset? (i.e., name plate data, specifications)
18.		Can this information be equipment type specific i.e. motor versus pump?
19.		Can an asset contain unlimited text? Can this text be in any MS Windows word processor?
20.		Can any other documents be attached to a document, such as drawings, videos, Web pages, etc.? Is there a limit to the number or type of attached documents?
21.		Can an asset contain unlimited keywords?
22.		Can shutdown information be defined at an asset level?
23.		Can this information be defaulted to the associated work orders?

24.		Can non-work order activities be tracked against an asset (operator's log, minor maintenance actions, etc.).
25.		<p>From an asset, can a user drill down to:</p> <ul style="list-style-type: none"> • Current Work Orders • Closed Work Orders • PM Triggers • PM History • Cost Summaries • Cost transactions, such as timecards, issues, receipts, etc. • Purchase Orders • Safety and Special Instructions • Spare Parts Lists • MRO Inventory • Vendor Supplied Items • Operating Statistic Transactions • Summarized Operating Statistics • Detailed Operating Statistics readings/values
26.		Can minor adjustments, comments, activities, statistics, etc. be recorded against the equipment without a Work Order being issued?
27.		Can users create their own performance reports?
28.		Can an asset be flagged as an ISO certified item?
29.		Can unlimited audit reports be produced to support an ISO certification program?
30.		Can an asset's failure modes be defined, to support better diagnostics?
31.		Can an asset be flagged as under PSM Change management control?
32.		Can a new asset be created from an existing asset?
33.		Can an asset be created from a template, or description of a standard asset?
34.		Can your system fully support Linear Asset tracking? Specifically inserting sections of pipe into an already existing section of pipe?
35.		Can system track manufacturer's warranty information?
36.		Can multiple warranties be defined for an asset?
37.		Can a warranty cover multiple assets?
38.		Can warranty expiry be defined in terms of time and/or operating statistic? What statistics are supported?
39.		Does the system flag, notify when work is created for an asset under warranty?
40.	Condition based maintenance	System shall support for condition and performance based maintenance.
41.		Does the application support data acquisition directly from control systems which utilize open fieldbus technology?
42.		Does system integrate to PLC systems, if so which ones?
43.		Does system support integration to operator interface applications (HMIs)?
44.		Can operator request maintenance work directly from control system or HMI?
45.		Can operator access work history, failure information, and equipment specifications directly from control system or HMI?

46.		Does system integrate with SCADA systems? Please describe.
47.		Does EAM support data\alarms originating from plant safety systems, describe.
48.		Describe how "tags" or "real time points" are associated with assets in the system.
49.		Can intelligent devices and instrumentation loops be managed in the enterprise asset management system.
50.		Describe the types of data sources and operational process variables the system supports e.g., equipment service time, diagnostics from plant floor intelligent devices, instrumentation status, etc.
51.		Can system support multi variable analysis of correlated sensors in order to provide early equipment fault detection?
52.		How is diagnostic information used by the system, e.g., how is the diagnostic data stored in a valve positioner used by the system to drive work activities?
53.		Can the system track and analyze equipment reliability metrics based on plant floor data? Please describe.
54.	Maintenance Work order	How does the system determine when to create a work order when the control system indicates a process or system alarm?
55.		Describe system support for creation of "work package" based on automatic generation of work, i.e., does the work order automatically indicate which material, labor and safety requirements are necessary to complete the work? Please describe steps involved.
56.		Does system provide historical information based on asset reliability, reasons for failure, root cause, remedy, etc.?
57.		Does your system connect with Human Machine Interfaces so that operators can create requested work directly from their operations screens?
58.		Will your system communicate directly with SCADA or other PLC based applications in order to automatically generate Work Orders and Notifications?
59.		Does your system provide support for OPC (OLE for Process Control)?
60.		Can your system collect and analyze equipment health data from process historians and other databases?
61.		Can your system automatically update the PM Program with equipment health based on statistics (temperature, pressure, hours of operation, etc.)?
62.		Is your system capable of communicating with Smart Field Instrumentation such as valve positioners and transmitters (temperature, pressure, level, etc.)?

vi. Calibration Management Module

Sr. No.		Minimum required Specification				
1.	General	The system shall be user friendly and shall support self-configurable planners covering all the equipment's with scheduled frequency of PPM (Planned Preventive Maintenance) by the user.				
		The system shall generate Annual PPM (Planned Preventive Maintenance) planners department wise and category wise for all the equipment's with defined scheduled frequency. Annual Planned Preventive Maintenance Schedule (A4 planner), At a Glance Annual Planned Preventive Maintenance schedule (A3 planner) / Add on At a Glance Annual Planned Preventive Maintenance schedules.				
		The planners for all the department shall be prepared before the start of the Year and shall be maintained by engineering department.				
		The Add on At a Glance Annual Planned Preventive Maintenance schedule shall be prepared for new equipment received after the preparation on Main planner.				
		The system shall include the checklist of PPM for all the equipment's.				
2.		The system shall generate advance notifications for Department Head approval prior start of week / at the start of the week (Friday/Monday) / prior to at least one day before the actual scheduled date of PPM or on the same day. The tentative date of PPM shall be given by User through notification in the system.				
		The system shall provide automatic email notifications to users on initiation, assignment and when various actions are allocated to a user (i.e. activities approaching approval of PPM, due date or activities crossed due date etc.) with a link which will direct the user to the login screen of the system.				
		In the event of no response/feedback on approval of scheduled PPM by Dept. Head, the system shall consider the date as approved.				
3.		calibration activities are scheduled on weekly, fortnightly, monthly, quarterly, four monthly, six monthly, yearly, two yearly basis shall be carried out within tolerance given as per below table				
		<table border="1"> <thead> <tr> <th>Frequency</th><th>Tolerance</th></tr> </thead> <tbody> <tr> <td>Weekly (1 week)</td><td>+/- 1 day</td></tr> <tr> <td>Fortnightly (2 weeks)</td><td>+/- 1 day</td></tr> </tbody> </table>	Frequency	Tolerance	Weekly (1 week)	+/- 1 day
Frequency	Tolerance					
Weekly (1 week)	+/- 1 day					
Fortnightly (2 weeks)	+/- 1 day					

		Monthly (4 weeks) Quarterly (12 weeks) Four monthly (16 weeks) Six monthly (24 weeks) Yearly (48 weeks) Two Yearly (96 weeks)	+/- 1 week +/- 1 week +/- 1 week +/- 2 weeks +/- 3 weeks +/- 4 weeks
4	Calibration checklists	The system shall have certain defined data entry fields or selection fields which shall be mandatory. The system shall provide entry fields to enter the data as per the need.	
		The system shall allow authorized users to create new records and link them to master records/planners/checklist	
		All users shall be able to login using a Unique ID and Password combination	
		System shall allow creating and editing reports and workflow through administrator only.	
		The system shall have the facility to create users based on Locations, Unit, Departments	
		Every submission/ rejection step in the workflow shall accompany electronic signature with mandatory comments	
		System Shall have the provision to delegate responsibility to alternate person for absence in a particular period for all new assigned tasks.	
		System shall ask for the reason for any delays from the due dates for any activity	
		All Data entry field shall allow alphabets, numerical, special characters to be entered, as applicable. Tab key and enter key shall also be functional	
		System shall log off automatically after predefined time of inactivity	
7		The system shall be able to be integrated with other systems(e.g- SAP) for importing the data	
10	Notification Requirements	The system shall give the prior information of due dates through popup-mails	
		The system shall give the notification for additional requirements.	
		The system shall give notifications after discontinuation of equipment's	
		Report Requirements	
11		The reports shall be retrievable, printable, customizable, and run on a demand basis.	

		<p>The system shall support the use of both system and user defined queries for tracking</p> <p>The system shall allow to print the sorted data after application of queries for tracking.</p>
12	Regulatory	<p>To ensure signed electronic records contain information associated with the signing which clearly indicates all of the following:</p> <ol style="list-style-type: none"> 1. Full name of the signer 2. User ID of the signer. 3. The date and time of the execution of signature. 4. The meaning (such as review, approval, authorship) associated with the signature <p>To control this information as other electronic Records. To show this information whenever the Record is shown, displayed or printed. If the record extends to multiple pages of display or printout, the signing information shall be clearly linked to the entire record to which it applies.</p>

vii. Enterprise Alarms Information Management Module

Sr. no		Minimum Required Specification
1	General Requirements	<p>The Enterprise Alarm Information Management System (AIMS) for IWCCP shall comply ISA 18.2 / EEMUA 191/IEC 62682:2017 or equivalent standard. It shall be a fully configurable and expandable (provision to add additional nodes in future) system capable of processing all alarms in an appropriate manner to maximize the information provided, but to minimize the number of alarms displayed. There shall not be any limitation of for no. of capturing the alarms/ events etc.</p>
2		<p>In order to minimize the number of alarms, grouping, suppression and/or filtering techniques shall be available. Suppressing and/or filtering of alarms shall include:</p> <ul style="list-style-type: none"> • Automatic suppression of individual and/or groups of alarms based on the occurrence of a pre-selected alarm or event • Automatic disabling of alarms based on the associated equipment running status. E.g. low flow when associated pump is not running
3		<p>The system shall capture all the alarms, messages, events from the installed IWCCP/SCADA of BXP units with time stamping and archival of the same in the respective client & central server for a minimum period of one year</p>
4		<p>AIMS Server shall be connected to IWCCP/SCADA through Serial or TCP/IP Printer port.</p>
5		<p>All the alarms and Events shall be logged in to a database with full-fledged analysis options like frequency analysis, Chattering analysis, Duplicate alarm analysis, Standing alarm analysis, Early event detection & Root cause analysis, Tree map analysis, Priority wise segregation, Diversion of alarms to concerned departments.</p>
6	Expert Alarming	<p>The package shall be able to carry out statistical analysis i.e.,</p> <ul style="list-style-type: none"> • Real-time frequency analysis • Alarm frequency break-up • Alarm frequency monitoring • Standing alarms • Time elapsed between two alarms/events
7	Alarm Notification	<p>In case of a predefined alarm, condition the system shall be able to automatically send SMS to pre-defined users of the group.</p>
8		<p>When a predefined tag alarm occurs, the system shall be able to send message through an e-mail to the predefined user</p>
9	Redundancy & Diagnostic Messages	<p>Source redundancy for serial, Ethernet and OPC channels shall be available.</p>
10		<p>AIMS shall be having system diagnostics subroutines running on real time basis and provide diagnostic alarms e.g. System failure alarm, Disc/Disc drive failure,</p>

		Application software failure, Network failure, Communication software failure, Disc full, Power supply failure
11	Critical alarms listing	AIMS Critical Alarm Handling Application shall be a separate application for handling most critical alarms in a fast and efficient way so that no critical alarm missed by a Operator.
12	Analysis Reports & Charts	<p>AIMS Software shall be having following types of Alarm Analysis reports & charts. These reports shall be available to users on automatic scheduled time over email as well as manually</p> <p>General Reports:</p> <ul style="list-style-type: none"> • System Alarm Report • Alarm Performance Overview • Frequency Break up • Frequency Monitoring • Duration Analysis • Alarm Burst • Alarm Rate • Operator Action Report • Symptomatic Alarms Report <p>Alarm System Setting Changes</p> <ul style="list-style-type: none"> • Alarm Set by Priority • Alarm Set by Type • Disabled/Inhibited Alarms • Enable state by Tag • Tags by Type • Tags by Alarm
13	Analysis Reports & Charts	<p>The following points are to be strictly complied with by the system:</p> <p>The alarms generated in IWCCP/SCADA are in three categories:</p> <ul style="list-style-type: none"> • System Alarm/Diagnostic alarms. • Process Alarm • Operator messages
14	REPORTS	<p>All the reports shall be generated/exported in MS Excel files.</p> <p>The following reports shall be possible to be generated:</p> <p>Shift reports:</p>

		<p>This report shall be generated once every 8 hours - at 6:00 hrs, 14:00 hrs and 22:00 hrs.</p> <p>Manual Report: It shall be possible to create Manual report by searching alarms/events as mentioned & on demand basis</p> <p>Frequency Reports: such as bad PV, alarms which will give the number of instances the search item is found within a selectable period. The period may vary from 10 minutes to 1 month</p>
15	Clients	<p>The following features should be available in the AIMS PC as well as in the User's PCs</p> <p>Viewing of the raw data (alarms/ messages) received from IWCCP/SCADA. This raw data shall be 'Read - Only' and shall not be modifiable.</p> <p>Conversion of the raw data to MS Excel files from both AIMS as well as User's PC.</p> <p>Facility of searching w.r.t. each column in the alarm format</p> <p>Retrieving of data by searching with either of the columns in the alarm formats as mentioned above</p> <p>Provision for conversion of the data as retrieved to MS Excel format & printing of the alarms in A4 size paper</p>

1. Tentative Bill of Quantities

Sr. No.	DESCRIPTION	QTY.	UNIT
Zonal Control Centre			
1	Supply, Erection, Installation, Testing, Commissioning of Zonal SCADA Software for unlimited screens, minimum 32000 tags with Redundancy and with 5 Web/mobile clients. Android & iOS Application.	10	Set
2	Supply, Erection, Installation, Testing, Commissioning of time series local Historian with redundancy and 10 web clients	10	Set
Sr. No.	DESCRIPTION	QTY.	UNIT
Integrated Water Command Control Platform			
1	Supply, Erection, Installation, Testing, Commissioning of Integrated Water Command and Control Platform with unlimited screens, minimum 50000 IO Points, unlimited reports & Dashboards. Redundant Historian, OMI Clients, 4 redundant pairs of Application Server engines for runtime server.	1	Set
2	Supply, Installation, Testing, Commissioning of Enterprise Alarms Information management module with required connectivity with zonal SCADA/AWCCP and required license for email/voice message/SMS escalations	1	Set
3	Supply, Installation, Testing, Commissioning of Incident Management module with unlimited clients and Mobile Application	1	Set
4	Supply, Installation, Testing, Commissioning of equipment efficiency monitoring module with Digital Workbook module with required development of paper based log sheets in software with required mobile/web clients	1	Set
5	Supply, Installation, Testing, Commissioning of calibration management module with required asset types licenses	1	Set
6	Supply, Installation, Testing, Commissioning of Asset Management software with required work view clients.	1	Set

Hardware Infrastructure for IWCCP

Sr. No.	DESCRIPTION	QTY.	UNIT
Data Centre Infrastructure			
1	Supply, Erection, Installation, Testing, Commissioning Blade/Rack mounted Server hardware as for Data Centre Infrastructure as per specification mentioned and sizing done by bidder. Data Centre configured in High availability mode with no single point of failure in Active-Active Mode.	TBD	Numbers
2	Supply, Erection, Installation, Testing, Commissioning Workstation for operator terminal and engineering station along with 32" dual monitor, cables, keyboard, mouse, operating system, antivirus software, office software etc. as per specification mentioned	TBD	Numbers
3	DC Core Switch and other networking components required for HA environments	TBD	Lot
4	Multi-Function Printer, Colour, Laser Jet, A3 Size.	TBD	Number
5	Data Centre & Control Room Infrastructure for area of 10000 sq. mtr with civil construction as per site conditions, false ceiling, false flooring, Interior decoration, video wall mounting arrangement, control desk, chairs, discussion table, operator sitting area with furniture, access control system, fire detection & suppression system, Water Leak detection & Rodent Repellent system, Power Earthing (2 Nos. chemical earth) all in complete aspect.	TBD	Lot
6	Supply, Erection, Installation, Testing, Commissioning Large Video Screen (Video Wall) with 55" x 4cube arranged in 2x2 Matrix, along with display controller, pc unit, mounting stand, power supply, cables, HDMI cables etc. as per specifications mentioned	TBD	Lot
7	Supply, Erection, Installation, Testing, Commissioning UPS rating 20 KVA with 60 minutes battery backup along with battery stand, dc links, distribution board as per specification mentioned	TBD	Lot
8	Low Power Wide Area (LPWA) Communication Module based Data Concentrators for AMI. Bidder to do a site survey and consider total number of Gateway Required	TBD	Lot
9	Establishing Disaster Recovery Station for IWCCP & CSS in different seismic zone with minimum 50% sizing of DC.	TBD	Lot

Approved Make

Component	Approved Make
Integrated Water Command & Control Platform	Aveva, Siemens, Rockwell, Emerson
Application Software (IMS, EAPMS, GIS, EAM, CMS AIMS etc.)	Aveva, Schneider, X-Force, Rockwell, Emerson, Bentley,
Server & Workstation Hardware	HP-Compact, Dell, Acer, IBM-Lenovo,
Networking Components	CISCO, Net gear, HP, Checkpoint, Dlink.

6.4 Data Center Specification

Detail Data center requirement and specification had been prepared By WB's Consultant and also revised by DWASA own Consultant, no need more engage new consultant, If we engaged previous consultant, we can get result more precisely within short time.

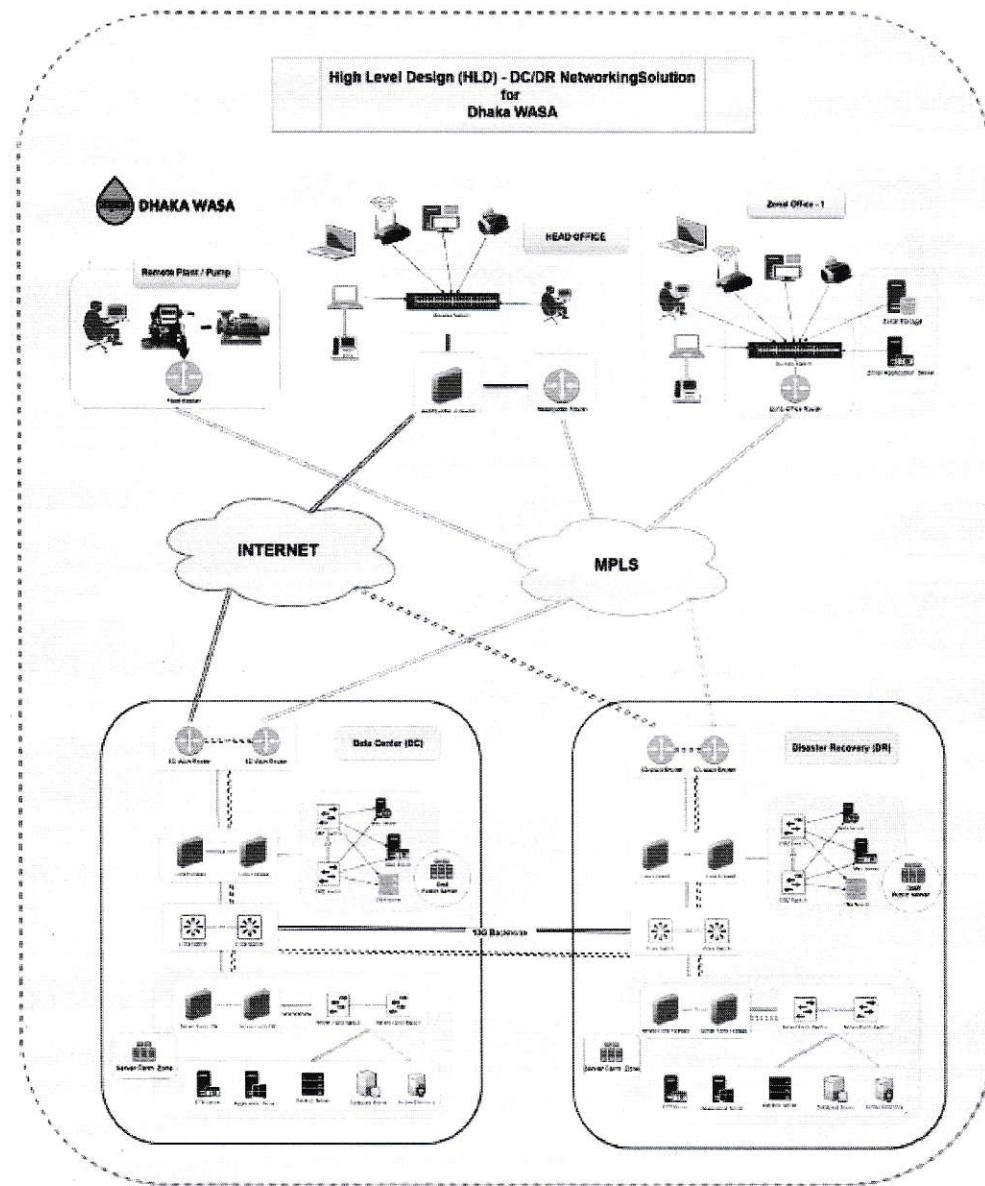
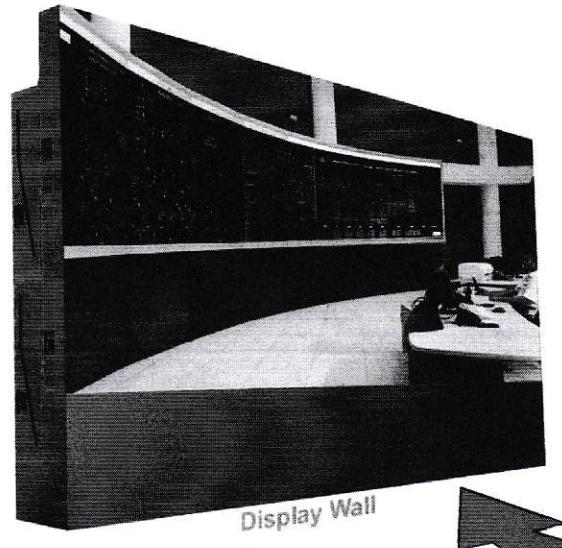


Figure 6: High level design for DC/DR

6.5 Server and Storage and Video WALL

Detailed Server and Network requirement and specification had been prepared by WB's Consultant and also revised by DWASA own Consultant, no need more engage new consultant, If we engaged previous consultant, we can get result more precisely within short time.



Display Wall

Server Farm Switch:

SL	Item Name	Detail Required Specification	Bidder response
	Quantity	02 (Two) (DC: 2 units)	
1	Brand	Offered vendor must be listed in the leader's quadrant of Gartner's Magic Quadrant for the last consecutive 5 years	
2	Quality	Offered switch should have ISO 9001, FCC Class A for quality assurance	
3	Model	To be mentioned by the bidder	
4	Country of origin	USA/UK	
5	Manufacturing Country	To be mentioned by the bidder	
6	Architecture	<ul style="list-style-type: none"> • Advanced Layer 3 Enterprise Grade switch (all licenses supporting mentioned features shall be included from day one) • At least 28 x 1G/10G/25G SFP28 ports • At least 4 x 10G/25G SFP28 ports • At least 4 x 40G/100G QSFP28 ports • Min. 12 x 25G SFP28 SR Transceivers with required adapters with 5-meter LC/LC OM4 optical cable. • Min. 2 x 10G SFP+ SR Transceivers with required adapters with 15-meter LC/LC OM4 optical cable. • Min. 2 x 40G QSFP+ LC Bidirectional 150m transceivers with 15-meter LC/LC OM4 optical cable • Min. 1 x 100G QSFP28 to QSFP28 Direct Attached Cable 	
7	Memory and Processor	<ul style="list-style-type: none"> • CPU: 1.8 GHz 4-core 64-bit • Memory, Drive and Flash: 16GB RAM, 32GB Flash/Storage • Packet Buffer: 32MB 	
8	Performance	<ul style="list-style-type: none"> • Forwarding performance - at least 1145 Mpps • Switching Fabric Speed - at least 2.4 Tbps • VLANs - 4000 • Mac address table size - at least 212,000 • IPv4 Routing table size - at least 600,000 • Line rate performance on all ports 	
9	Other features	Offered switch should support for the followings: <ul style="list-style-type: none"> • VRF • VXLAN 	

		<ul style="list-style-type: none"> • BGP EVPN • Dynamic VxLAN with BGP-EVPN • IPv4 Multicast in VxLAN / EVPN overlay • IPv6 VxLAN/EVPN overlay • Packet storm protection • Advance QoS, rate limiting, 802.1p, port based rate limiting • Radius/TACACS+ • 802.1ab – LLDP, 802.3x, 802.3az • VRRP • sFlow/ Netflow/ Jflow • UDLD / DLDP or equivalent • Dual stack - IPv4 and IPv6 • SNMP v2c/v3 • STP/RSTP/MSTP/RPVST+ • DHCP Server • Policy based Routing • Static IP Routing + RIP + OSPFv2 + BGP • Static IPv6 Routing + RIPng + OSPFv3 + MP-BGP • PIM-SM, PIM-DM, MLD • ECMP • Access control lists • Port mirroring • Telnet / SSHv2 	
10	Accessories	All other required accessories – like: UTP cables, FC Cables, power adapters etc must be provided from day one.	
11	Warranty & services	<p>3-yrs collaborative warranty with one-point support from OEM.</p> <p>Warranty support SKU and datasheet with the detail BoQ and sizing document should be provided with the technical compliance document.</p>	

SAN Switch:

SL	Item Name	Detail Required Specification	Bidder response
	Quantity	02 (Two) (DC: 2 units)	
1	Brand	Same as server vendor	
2	Quality	Offered switch should have ISO 9001, FCC Class A for quality assurance	
3	Model	To be mentioned.	
4	Country of Origin	To be mentioned.	
5	Country of Manufacturing	To be mentioned.	
6	Form Factor	Please specify rack unit.	
7	Number of ports	<ul style="list-style-type: none"> • Each switch should be configured with 24 ports in a single domain concurrently active at 32Gb/sec with no over subscription. 	
8	Scalability	<ul style="list-style-type: none"> • Scalability up to forty-eight (48) Ports 	
9	Auto-sensing	<ul style="list-style-type: none"> • Auto-sensing of 8, 16, 32 Gbps port speeds 	
10	Port Type	<ul style="list-style-type: none"> • The switch shall support different port types such as D_Port , E_Port, EX_Port, F_Port, AE_Port 	
11	Quality of Service (QoS)	Should support Quality of Service (QoS) to help optimize application performance in consolidated, virtual environments. It should be possible to define high, medium and low priority QoS zones to expedite high priority traffic. Aggregated device Bandwidth: 2 Tbps	
12	Firmware Upgrades	Non-disruptive Microcode/ firmware Upgrades and hot code activation.	
13	Software License support	Offered switch shall support with the Zoning, ISL Licenses, Extended fabric license.	
14	High Availability	<ul style="list-style-type: none"> • Integrated single power supply and 4 built-in cooling fans (Minimum 2 fans required for the switch to continue functioning properly). 	

		<ul style="list-style-type: none"> Achieve continuous uptime with the industry's lowest failure rate and high availability. Monitor proactively the overall health of your storage network and VM performance with Store Fabric Power Pack+ Software. Enhanced Fault Detection Logic. Parity protection on all data paths and system memory. 	
15	Security Features	DH-CHAP (between switches and end devices), FCAP switch authentication; HTTPS, IPsec, IP filtering, LDAP with IPv6, OpenLDAP, Port Binding, RADIUS, TACACS+, User-defined Role-Based Access Control (RBAC), Secure Copy (SCP), Secure RPC, Secure Syslog, SFTP, SSH v2, SSL, Switch Binding, Trusted Switch.	
16	Manageability	Web Tools required; Please specify if others	
17	Software	To be mentioned the features of all the software in details	
18	Peripherals and Accessories	All required peripherals and accessories.	
19	Port Activation	Minimum twenty four (24) ports should be activated from day one.	
20	FC Cable	24 x LC/LC Multi-mode OM4 5m Fiber Cable	
21	Short wave kit	24 x 32 Gbps (min) short wave transceivers	
22	Warranty	<p>Three (03) years 24x7 mission critical 4-hour response back-to-back OEM warranty with onsite support, labor, parts, and replacement. The OEM should have own parts exchange center /warehouse within Dhaka city</p> <p>Every component of proposed solution must be supplied by OEM.</p> <p>Warranty support SKU with the detail BoQ should be provided with the technical compliance document.</p>	

Application Server:

SL	Item Name	Detail Required Specification	Bidder response
Quantity	06 (Six) (DC: 06 units)		
1	Brand	To be mentioned by Bidder. Must be in the top three OEM for the last 5 years in terms of revenue and shipment.	
2	Quality	ISO 9001/9002 for manufacturer, FCC Class A for quality assurance	
3	Model	To be mentioned by the bidder	
4	Country of origin	USA/UK	
5	Manufacturing Country	To be mentioned by the bidder	
6	Form Factor	2U Rack Mountable Server with Rail Kit, Cable Management and Bezel Kit.	
7	Processors	Should be provided with min. 2 x Intel Xeon-Gold 5218R (2.1GHz/ 20-core/ 125W) Processor	
8	Cache L3	Minimum 27.5 MB of L3 Cache	
9	Chipset	Intel C621 Chipset or higher	
10	Internal HDD	<p>4 x 480GB SATA Read Intensive 2.5" hot-plug SSD.</p> <p>Should be provided with 8SFF drive bay kit. HDD expandability up to 30.</p>	
11	Storage array controller	<p>Integrated SAS/SATA/SSD/NVMe controller with 2GB flash backed cache supported RAID level 0, 1, 5, 6, 10, 50.</p> <p>Array backup battery should be provided with necessary cabling.</p>	
12	Memory	<p>384GB (12 x 32GB) 2933 MT/s DDR4 with advanced ECC (DRAM ECC detects and corrects data bit errors features) capability.</p> <p>Expandability up to 3TB using persistent memory.</p> <p>Min. 24 DIMM slots</p>	

13	Remote management	<p>Integrated remote management capability from day 1 with dedicated network connection supporting GUI.</p> <ul style="list-style-type: none"> • Silicon root of trust • Single sign-on & 2-factor authentication • Remote firmware update • Agentless management • FW supply chain attack detection • Remote system logs • Remote console • Virtual media 	
14	Power supply and Fan kit	Redundant & fully provisioned; min. 2 x 800W power supply with high performance fan kit should be provided.	
15	Network & FC Card	The rack server should support Converged Network Adapter or FCoE adapter, which aggregates both the Ethernet and FC connectivity on a single controller	
		Should be provided with at least embedded 1 x 4-port 1GbE NIC, 2 x dual-port 10/25Gb SFP+ adapter with 25Gb SR SFP+ transceivers and 2 x 32Gb Dual Port Fibre Channel Host Bus Adapter with required transceivers	
		Shall be offered with minimum Three (03) PCIe 3.0 Slots as standard and upgradable up to (8) slots.	
16	Monitoring and analytic engine	<p>Offered server shall have cloud enabled monitoring and analytics engine for proactive server management. All required licenses for same shall be included in the offer.</p> <p>Cloud Enabled Monitoring and analytics engine shall have capability to provide following:</p> <ol style="list-style-type: none"> a. Providing Firmware upgrade and patch upgrade recommendations proactively. b. Shall provide history of support cases logged with Support team under different column like Critical, Normal and low severity along with closed cases. Cloud monitoring tool shall be able to provide the complete month-wise breakup. c. Global Operational Dashboard - consolidated view of the status, performance, and health of the server infrastructure including system information, server warranty and support status. <p>Cloud enabled Analytics engine shall have capability to provide following:</p> <ol style="list-style-type: none"> a. Analytics engine shall have capability of proactive recommendation for arresting the issues / problems noticed at other install bases of vendor after identifying the problematic signature. b. Data analytics for server security and Predictive data analytics for parts failure. 	
17	Server Management	Software should support and provided with dashboard view to quickly scan the managed resources to assess the overall health of the data center. It should provide an at-a-glance visual health summary of the resource's user is authorized to view.	
		The Dashboard minimum should display a health summary of the following: <ul style="list-style-type: none"> • Server Profiles • Server Hardware • Appliance alerts 	
		The Systems Management software should provide Role-based access control	
		Management software should support integration with popular virtualization platform management software like vCenter, and SCVMM	
		Should help provide proactive notification of actual or impending component failure alerts on critical components like CPU, Memory and HDD.	

		Should provide an online portal that can be accessible from anywhere. The portal should provide one stop, online access to the product, support information and provide information to track warranties, support contrast and status. The Portal should also provide a Personalized dashboard to monitor device health, hardware events, contract and warranty status. Should provide a visual status of individual devices and device groups. The Portal should be available on premise (at our location - console based) or off premise (in the cloud).	
		Should help to proactively identify out-of-date BIOS, drivers, and Server Management agents and enable the remote update of system software/firmware components.	
18	Industry Standard Compliance	<ul style="list-style-type: none"> • ACPI 6.1 Compliant • Energy Star • SMBIOS 3.1 • Redfish API • ASHRAE A3/A4 	
19	Operating system license	Offered server shall support all the industry leading operating system license including- Microsoft Windows Server, Red Hat Enterprise Linux, SUSE Enterprise Linus and hypervisors- VMWare, Hyper-V & KVM.	
20	Installation services, manage & control	<p>The Server Management Software should be of the same brand as of the server supplier.</p> <p>Connect devices to OEM for real-time diagnosis, alerts, and information</p>	
21	Warranty & services	<p>3-yrs collaborative warranty with 24x7 mission critical one-point support from OEM</p> <p>4-hour onsite response time for hardware issue. Supporting service-related document should provide.</p> <p>Warranty support SKU and datasheet with the detail BoQ and sizing document should be provided with the technical compliance document.</p>	

Database Server:

SL	Item Name	Detail Required Specification	Bidder response
	Quantity	02 (Two) (DC: 2 units)	
1	Brand	To be mentioned by Bidder. Must be in the top three OEM for the last 5 years in terms of revenue and shipment.	
2	Quality	ISO 9001/9002 for manufacturer, FCC Class A for quality assurance	
3	Model	To be mentioned by the bidder	
4	Country of origin	USA/UK	
5	Country of manufacturer	To be mentioned by the bidder	
6	Modularity & Flexibility	The server must be designed in modular architecture, with each module scaling to 4Sockets architecture. Scale-up capability and upgrade must be achieved by adding more building blocks of 4-Socket modules, without the need to upfront investing to a big chassis.	
7	Scalability	<p>Server should be able to scale from lower entry point of 2 sockets and up to 8 sockets in 2-socket increments, with 16-224 cores.</p> <p>Scaling from 64 GB to 24TB of shared memory using DRAM (with 256GB DIMM availability). Shall support of 1, 4, 6 & 12 DIMM per socket for granular scalability</p>	
8	Processor	<p>The server must support 3rd Generation Intel Xeon Scalable Processors (Cooper Lake 6UPI or CPX6).</p> <p>Should be provided with min. 4 x Intel Xeon-Gold 5318H (2.5GHz/18-core/150W) Processor.</p>	
9	Memory	<p>512GB memory with 16 x 32GB DDR4-3200 RDIMM.</p> <p>Server should support memory scalability to 12TB using 128GB LRDIMM.</p>	

10	Memory Protection	Should support Adaptive DDDC and Fast Fault Tolerance	
11	HDD Bays	Min. 4 x 1.6TB SAS 12G Write Intensive 2.5' hot-pluggable SSD.	
12	Hard disk drive & DVD RW	Eight (8) 2.5-inch HDD, SSD, or NVMe drive bays plus an DVD RW optical drive. And can be scalable to min. 16 dive bays for 8 socket configurations.	
13	Array Controllers	SAS drives use PCIe v3.0 based 12Gb/s SAS Internal Hardware RAID Controller; 4GB Cache	
14	Connectivity features	Should be provided with Embedded 1 x 2-port 1GbE RJ45 ports, 2 x 2-port 10/25Gb SFP+ adapter with 25Gb SR SFP+ transceivers and 2 x 32Gb 2-port Fibre Channel Host Bus Adapter with required transceivers. Support of up to 100Gbps network adapter; 200Gb InfiniBand & 32Gb FC HBAs.	
15	IO architectures	Direct IO architecture from all CPUs for unblocking, best performance, and low latencies	
16	Bus Slots	Server should come with Sixteen PCIe v3.0 slots per Chassis (with 16-slot riser)	
17	GPUs	Up to 4 GPUs in a chassis; up to 16 per system. GPU should be able to use in Windows OS.	
18	Power Supply	Support for standard 4 x C13 power supplies and connectivity's in 4 Socket configurations Scaling up to 8 power supplies and 8 x C13 connectivity's for 8 Socket configurations	
19	Fans	8 x Redundant hot-plug fan (per Chassis)	
20	Reliability, Availability and Serviceability (RAS) features	Key areas of RAS superiority over standard x86- <ul style="list-style-type: none"> • Firmware First • Automatic error logging • Auto self-healing (Analysis Engine) • Disabling and deconfiguration of failed FRUs • Onboard fault analyzer • Automatic restart • Advanced processor error handling (EMCA2) • Advanced memory resiliency (ADDC) • Memory error storm response • Enhanced fabric resiliency (Flex Grid adaptive routing) • Advanced PCIe error recovery (LER) 	
21	Operating Systems and Virtualization Software Support	RHEL, SLES, VMware, Windows Virtualization technologies: VMware vSphere, RHEV, KVM and Microsoft Hyper-V.	
22	GPU support	Support of up to 16 single-wide GPUs; up to 8 double-wide GPUs	
23	Security	Secure architecture, design and supply chain, with limited exposure Silicon root of trust TPM2.0	
24	Server Management	Embedded management controller with the offered Server. Software should support dashboard view to quickly scan the managed resources to assess the overall health of the data center. It should provide an at-a-glance visual health summary of the resource's user is authorized to view. The Dashboard minimum should display a health summary of the following: <ul style="list-style-type: none"> • Server Profiles • Server Hardware • Appliance alerts The Systems Management software should provide Role-based access control Management software should support integration with popular virtualization platform management software like vCenter, and SCVMM	

		Should help provide proactive notification of actual or impending component failure alerts on critical components like CPU, Memory and HDD.	
		Should provide an online portal that can be accessible from anywhere. The portal should provide one stop, online access to the product, support information and provide information to track warranties, support contrast and status. The Portal should also provide a Personalized dashboard to monitor device health, hardware events, contract and warranty status. Should provide a visual status of individual devices and device groups. The Portal should be available on premise (at our location - console based) or off premise (in the cloud).	
		Should help to proactively identify out-of-date BIOS, drivers, and Server Management agents and enable the remote update of system software/firmware components.	
25	Installation services, manage & control	Access to OEM experts via phone, web, or both Connect devices to OEM for real-time diagnosis, alerts, and information	
26	Warranty& services	3-yrs collaborative warranty with 24x7 mission critical one-point support from OEM. 4-hour onsite response time for hardware issue. Supporting service-related document should provide. All above features BoQ should be provided with proper explanation.	

All Flash SAN Storage:

SL	Item Name	Detail Required Specification	Bidder response
	Quantity	01 (One) (DC: 1 units)	
1	Brand	Same as server Brand	
2	Quality	ISO 9001:2015 for manufacturer, FCC Class A for quality assurance. Offered storage brand should be in leaders' quadrant in Gartner Magic Quadrant of All-Flash Array for the last 5 years.	
3	Model	To be mentioned by the bidder	
4	Country of origin	USA/EU	
5	Country of manufacturer	To be mentioned by the bidder	
6	All-Flash / Unified Storage	1. Offered Storage array shall be end-to end 12Gbps enabled which means that both Front-end Fibre channel ports and Back-end engines shall be operated at minimum 12Gbps speed. 2. Offered Storage shall be a flagship Flash array from the organization and shall be clearly published on their website.	
7	Operating System & Clustering Support	The storage array should support industry-leading Operating System platforms & clustering including: Windows Server 2016, VMware, Solaris and HPE-UX, IBM-AIX and Linux.	
8	Capacity & Scalability	1. The Storage Array shall be offered with minimum 100TB usable Capacity using 7.68TB SSD (minimum 18 unit) with RAID6. Deduplication and compression should not be considered when calculating the usable capacity. 2. Offered storage system shall be provided with minimum two active-active controller and can be scalable up to four active-active controllers with/without replacing the existing controllers. 3. Offered storage system should deliver min. 100k IOPS considering 4k IO Block, 80:20 Read/Write ration and max. 0.4ms latency.	

9	Storage Encryption	<p>1. Vendor shall offer only the encrypted drives (FIPS enabled) with appropriate encryption licenses and shall meet FIPS 140-2 – Level 2 security requirements. Vendor shall not offer any controller based or Software based encryption.</p> <p>2. Offered FIPS 140-2 Validated encryption drives shall support both KMIP 1.1 for key management solutions. Vendor shall offer at-least internal Key manager engine for key management.</p>	
10	Cache	<p>1. Offered Storage array should have at-least on-board 256GB cache in single unit. Controller Cache can be expandable up to 4TB with/without replacing the existing controllers.</p> <p>2. Cache shall be used only for Data & Control information and should be isolated from each other. OS overhead shall not be done inside cache.</p>	
11	Architecture & Processing Power	<p>1. Vendor shall ensure that all controllers, with and without scalability, shall be connected to a common backplane and shall not use any loosely connected architecture like through SAN Switches, Ethernet Switches, InfiniBand switches etc.</p> <p>2. Controllers shall be true active-active so that a single logical unit can be shared across all offered controllers in symmetrical fashion, while supporting all the major functionalities like Thin Provisioning etc.</p> <p>3. Offered storage array shall have native virtualization support so that Raid can be carved out from a logical space instead of dedicating separate physical disks for each application.</p>	
12	No Single point of Failure	Offered Storage Array shall be configured in a No Single Point of configuration including Array Controller card, Cache memory, FAN, Power supply etc.	
13	Data Protection	<p>1. In case of power failure, storage subsystem shall have de-staged mode so that un-committed information can be protected. De-staging shall happen to redundant vault drives and vault drives shall be encrypted.</p> <p>2. Vendor shall not use any Vault drive as data drives for capacity calculation. Vendor shall not consume any additional drive slot in the drive enclosure for vault drives.</p>	
14	Host Ports and Back-end Ports	<p>1. Offered Storage array shall have minimum of 8 x 32Gbps Fiber Channel ports.</p> <p>2. Offered Storage array system shall be supplied with built-in native IP ports for storage-based replication.</p> <p>3. Offered Storage array shall have minimum of 32 SAS lanes in the back-end for disk connectivity running at 12Gbps speed.</p>	
15	Global Hot Spare	<p>1. Offered Storage Array shall support distributed Global hot Spare for offered Disk drives.</p> <p>2. Global hot spare shall be configured as per industry practice. Min. 2 distributed spare drive capacity should be considered for each drive types.</p>	
16	Performance and Quality of Service	<p>1. Offered storage array shall support quality of service for critical applications so that appropriate and required response time can be defined for application logical units at storage. It shall be possible to define different service / response time for different application logical units.</p> <p>2. Quality of service engine shall allow to define minimum and maximum cap for required IOPS / bandwidth for a given logical units of application running at storage array.</p>	

		3. It shall be possible to change the quality-of-service (QoS) Response time (In both milliseconds as well as Sub-milliseconds), IOPS, bandwidth specification at real time.	
17	Capacity efficiency	<p>1. Offered storage array shall support inline data efficiency engine (Supporting Thin Zero detect and re-claim, De-duplication and Compression) and shall be enabled by default.</p> <p>2. Vendor shall have flexibility to enable / disable the data efficiency engine at the time of Volume creation.</p> <p>3. Storage subsystem shall be supplied with Thin Provisioning, Thin Re-claim, Snapshot, De-duplication, Compression, Performance Monitoring, and Quality of service on day 1 for the maximum supported capacity of array.</p> <p>4. Offered storage array shall be tightly integrated with VMware so that Eager zero disks layout can be used with thin provisioning and thin re-claim.</p>	
18	Maintenance	Offered storage shall support online non-disruptive firmware upgrade for both Controller and disk drives.	
19	Integration - VMWARE	<p>1. Offered storage array shall be tightly integrated with VMware and shall be certified for VVOL.</p> <p>2. Offered Storage array VASA provider shall be certified by VMware for VVOL - Storage based replication.</p> <p>3. Offered storage system should have validated reference architecture or technical white paper on VMware Metro Storage Cluster.</p>	
20	Snapshot / Point in time copy	The storage array should have support for controller-based snapshots functionality (At-least 1024 copies for a given volume).	
21	Application Consistent Copies	<p>1. Offered storage shall be supplied with unlimited license for creation of application consistent copies for Oracle, SQL, Exchange, SAP HANA and VMware through Storage console GUI.</p> <p>2. Offered Storage shall be supplied with in-built copy management and backup S/W unlimited license for movement of data copies of Oracle, SQL, Exchange, SAP HANA and VMware to disk based backup device, public Cloud like AWS, Azure and object storage.</p>	
22	Storage Array Configuration & Management Software	<p>Vendor shall provide Storage Array configuration and Management software.</p> <p>Software shall be able to manage more than one array of same family.</p> <p>Offered Storage management engine shall have in-built on-site edge analytics performance engine, without connectivity to Internet / Intranet and shall offer following functionalities: All required license for offering this functionality shall be offered.</p> <p>a. Shall have saturation panel which can depict the overall saturation level of the storage array at different time intervals instead of looking into individual parameters like IOPS, CPU utilization, Cache utilization etc.</p> <p>b. Shall have capability to assign and compare the performance score with similar nature of workload across worldwide install base. Vendor management and edge analytic engine shall have in-built performance statistics of worldwide install base instead of connecting to internet / intranet.</p> <p>c. Shall have capability to display top 5 volumes by hotspots as well as by latency.</p>	

		<p>d. If similar nature of arrays being used in the environment then offered engine shall show the top systems by saturation level within the same console</p>	
23	Monitoring and analytic engine	<p>Offered storage shall have cloud enabled monitoring and analytics engine for proactive Storage management. All required licenses for same shall be included in the offer.</p> <p>Cloud Enabled Monitoring and analytics engine shall have capability to provide following:</p> <ul style="list-style-type: none"> a. Providing Firmware upgrade and patch upgrade recommendations proactively and with awareness of the peripheral infrastructure connected to the array. b. Providing extremely granular per-minute historical capacity and performance trend analysis by default, without the need to enable extra logging, install any appliances (physical or virtual), or install any software. c. Providing overall saturation level of the array while combining while analyzing various parameters like IOPS, MB/sec, Block size etc. d. Providing overall performance score of the array at a scale of 0 to 10 for both read and write operations. e. Shall provide history of support cases logged with Support team under different column like Critical, Normal and low severity along with closed cases. Cloud monitoring tool shall be able to provide the complete month-wise breakup. f. Shall be able to provide the executive Dashboard covering various critical and must aspects of Total Capacity, overall health / wellness score of array. De-duplication and compression ratio, over-all front-end performance etc. <p>Cloud enabled Analytics engine shall have capability to provide following:</p> <ul style="list-style-type: none"> a. Shall have capability of learning mechanism to provide the analytics and problem finding/solving based on global learning available for the arrays across the install based. b. Analytics engine shall have capability of proactive recommendation for arresting the issues / problems noticed at other install base of vendor after identifying the problematic signature <p>Cloud enabled monitoring and analytics engine integration with Hypervisor:</p> <ul style="list-style-type: none"> a. Offered Cloud enabled monitoring and analytics engine shall be tightly integrated with Hypervisor layer and shall be certified to work with at-least VMware. b. Hypervisor integration shall be able to provide end to end monitoring of hypervisor Datacenter, Data-store, Hypervisor Host and VMs running within the hypervisor datacenter and shall be able to link with offered storage array. c. Cloud monitoring and integration tool shall provide the detailed analysis of CPU Contention, Memory contention, IO contention for each VM – including the latency. d. Cloud monitoring and integration tool shall have capability to identify the top VMs which are contributing towards maximum IOs and Latency. 	

24	High Availability Features	The Data storage array should provide with a design where storage should supplied/provide data availability even in entire drive-Chassis/enclosure failure. Offered storage system should be availed with min. 99.9999% Guarantee for data availability. Public document should be provided	
25	Data Integrity	Offered storage system shall come with T10-DIF data integrity from day 1.	
26	Remote Replication	1. The storage array should support hardware based synchronous and asynchronous data replication at the array controller level across all models of the offered family. 2. Replication shall support incremental replication after resumption from Link Failure or failback situations.	
27	Licenses	Storage subsystem shall be supplied with all-inclusive license that should include Thin provisioning, replication, data-at-rest encryption, Snapshot, Clone, Performance Monitoring, Online Raid Migration, Online Volume conversion (thin to thin compressed, thin to thin de-dup etc.), Quality of services, and File services on day 1 for the maximum supported capacity of array.	
28	Installation services, manage & control	Bidder shall provide OEM onsite implementation service from OEM Engineers only. CV to be submitted during bid submission. Partner engineer is not allowed to power-up the device without OEM Engineer presence. Access to OEM experts via phone, web, or both Connect devices to OEM for real-time diagnosis, alerts, and information.	
30	Warranty& services	3-yrs collaborative warranty with 24x7 mission critical one-point support 4-hour response time back-to-back with OEM. 4-hour onsite response time for hardware issue. Supporting service-related document should provide. Pre-failure alert, root cause analysis, Automatic problem reporting and call logging shall be available from day1. All above features BoQ should be provided with proper explanation.	

Other Server for each Zone:

SL	Item Name	Detail Required Specification	Bidder response
	Quantity	20 (Twenty) [10 zone will have 2 server in each zone]	
1	Brand	To be mentioned by Bidder. Must be in the top three OEM for the last 5 years in terms of revenue and shipment.	
2	Quality	ISO 9001/9002 for manufacturer, FCC Class A for quality assurance	
3	Model	To be mentioned by the bidder	
4	Country of origin	USA/UK	
5	Manufacturing Country	To be mentioned by the bidder	
6	Form Factor	2U Rack Mountable Server with Rail Kit, Cable Management and Bezel Kit.	
7	Processors	Should be provided with min. 2 x Intel Xeon-Silver 4214R (2.4GHz/ 12-core/ 100W) Processor	
8	Cache L3	Minimum 16.5 MB of L3 Cache	
9	Chipset	Intel C621 Chipset or higher	
10	Internal HDD	Should be provided with 2 x 480GB SATA Mixed Use 2.5" hot-plug SSD and 3 x 1.92TB SATA Mixed Use 2.5" hot-plug SSD Should be provided with 8SFF drive bay kit. HDD expandability up to 30.	
11	Storage array controller	Integrated SAS/SATA/SSD/NVMe controller with 2GB flash backed cache supported RAID level 0, 1, 5, 6, 10, 50.	

		Array backup battery should be provided with necessary cabling.	
12	Memory	128GB (4 x 32GB) 2933 MT/s DDR4 with advanced ECC (DRAM ECC detects and corrects data bit errors features) capability. Expandability up to 3TB using persistent memory. Min. 24 DIMM slots	
13	Remote management	Integrated remote management capability from day 1 with dedicated network connection supporting GUI. <ul style="list-style-type: none"> • Silicon root of trust • Single sign-on & 2-factor authentication • Remote firmware update • Agentless management • FW supply chain attack detection • Remote system logs • Remote console • Virtual media 	
14	Power supply and Fan kit	Redundant & fully provisioned; min. 2 x 800W power supply with high performance fan kit should be provided.	
15	Network & FC Card	The rack server should support Converged Network Adapter or FCoE adapter, which aggregates both the Ethernet and FC connectivity on a single controller	
		Should be provided with at least embedded 1 x 4-port 1GbE NIC, 2 x dual-port 10GbE Base-T network Adapter with required transceivers	
		Shall be offered with minimum Three (03) PCIe 3.0 Slots as standard and upgradable up to (8) slots.	
16	Monitoring and analytic engine	Offered server shall have cloud enabled monitoring and analytics engine for proactive server management. All required licenses for same shall be included in the offer. <p>Cloud Enabled Monitoring and analytics engine shall have capability to provide following:</p> <ol style="list-style-type: none"> a. Providing Firmware upgrade and patch upgrade recommendations proactively. b. Shall provide history of support cases logged with Support team under different column like Critical, Normal and low severity along with closed cases. Cloud monitoring tool shall be able to provide the complete month-wise breakup. c. Global Operational Dashboard - consolidated view of the status, performance, and health of the server infrastructure including system information, server warranty and support status. <p>Cloud enabled Analytics engine shall have capability to provide following:</p> <ol style="list-style-type: none"> a. Analytics engine shall have capability of proactive recommendation for arresting the issues / problems noticed at other install bases of vendor after identifying the problematic signature. b. Data analytics for server security and Predictive data analytics for parts failure. 	
17	Server Management	Software should support and provided with dashboard view to quickly scan the managed resources to assess the overall health of the data center. It should provide an at-a-glance visual health summary of the resource's user is authorized to view.	
		The Dashboard minimum should display a health summary of the following: <ul style="list-style-type: none"> • Server Profiles • Server Hardware • Appliance alerts 	
		The Systems Management software should provide Role-based access control	

		<p>Management software should support integration with popular virtualization platform management software like vCenter, and SCVMM</p> <p>Should help provide proactive notification of actual or impending component failure alerts on critical components like CPU, Memory and HDD.</p> <p>Should provide an online portal that can be accessible from anywhere. The portal should provide one stop, online access to the product support information and provide information to track warranties, support contrast and status. The Portal should also provide a Personalized dashboard to monitor device health, hardware events, contract and warranty status. Should provide a visual status of individual devices and device groups. The Portal should be available on premise (at our location - console based) or off premise (in the cloud).</p> <p>Should help to proactively identify out-of-date BIOS, drivers, and Server Management agents and enable the remote update of system software/firmware components.</p>	
18	Industry Standard Compliance	<ul style="list-style-type: none"> • ACPI 6.1 Compliant • Energy Star • SMBIOS 3.1 • Redfish API • ASHRAE A3/A4 	
19	Operating system license	Offered server shall support all the industry leading operating system license including- Microsoft Windows Server, Red Hat Enterprise Linux, SUSE Enterprise Linus and hypervisors- VMware, Hyper-V & KVM.	
20	Installation services, manage & control	<p>The Server Management Software should be of the same brand as of the server supplier.</p> <p>Connect devices to OEM for real-time diagnosis, alerts, and information</p>	
21	Warranty & services	<p>3-yrs collaborative warranty with 24x7 mission critical one-point support from OEM</p> <p>4-hour onsite response time for hardware issue. Supporting service-related document should provide.</p> <p>Warranty support SKU and datasheet with the detail BoQ and sizing document should be provided with the technical compliance document.</p>	

NAS Storage for each zone:

SL	Item Name	Detail Required Specification	Bidder response
	Quantity	10 (Ten) [10 zone will have 1 NAS in each zone]	
1	Brand	To be mentioned by Bidder. Must be in the top three OEM for the last 5 years in terms of revenue and shipment.	
2	Standard	ISO 9001/9002 for manufacturer, FCC Class A/B for quality assurance. Bidder must submit appropriate documents for the certifications.	
3	Model	To be mentioned by the Bidder	
4	Country of origin	USA/EU	
5	Country of Assemble	To be mentioned by the Bidder	
6	Rack mount	NAS Controller Should be rack mounted with a form factor of not more than 2U	
7	Processor	Dual processor of eight Core each. Shall be Intel silver 4208 - 2.1Ghz with 11MB L3 Cache or higher.	
8	Memory	64GB DDR4 RAM or higher, scalable to 384GB DDR4 RAM	
9	Hard Drives	<p>Shall be supplied with minimum of 4 x 2.4TB SAS 10K rpm hard drives in Raid 5.</p> <p>Offered NAS Storage shall have separate dedicated SSD drives for Operating system in Raid 1+0. Hard drives shall be M2 form factor.</p>	

10	Storage expandability	1. Offered NAS controller shall support at-least 28 internal SFF Slots and shall be offered with at-least 24 SFF Slots. 2. Offered storage shall also have capability to attach additional drive enclosures. NAS shall support at-least 300TB of external capacity using 10TB drives.	
11	Network Connectivity	Min. 4 X 1Gbps auto sensing NICs ports and shall also be 4 numbers of 10Gbps ethernet port.	
12	Protocols support	TCP/IP, iSCSI, FTP, FTPS, CIFS/SMB 3.1.1, HTTP, HTTPS, NFS 4.1, WebDev etc.	
13	Fault Tolerance for internal drives	Offered NAS shall support Raid 0, Raid 1, Raid 1+0, Raid 5 and Raid 6 for internal drives. Offered Raid controller shall have minimum of 4GB flash back write cache.	
14	Fault Tolerance for external drives	Offered NAS shall support Raid 0, Raid 1, Raid 1+0, Raid 5 and Raid 6 for external drives. Supported Raid controller shall have minimum of 4GB flash back write cache.	
15	Network Client Types Support	Should support Windows 10, Windows 2012, 2016, , HP-UX, AIX, SOLARIS, Linux etc.	
16	Operating System	Microsoft Windows Storage Server 2016 - 64 bit edition (NAS optimized) including powered OS drivers	
17	De-duplication	Offered NAS shall have block based De-duplication which can be enabled for all required volumes. De-duplication engine shall have: 1. Flexibility to decide the multiple schedules when de-duplication process can be run. 2. Flexibility to limit the time period of de-duplication process so that production operations remain intact. 3. Flexibility to bypass the recent files under the de-duplication process so that production operations remain intact. 4. License for De-duplication shall be provided. 5. Shall support more than 64TB of file system for de-duplication.	
18	File screening and quota management	1. Offered NAS shall have support for file screening so that administrator can ensures that users shall not be able to store unwanted files on offered NAS device. 2. Offered NAS shall have Quota management for both Volume and Directory. 3. Software for both File screening as well as Quota management shall be provided.	
19	File Management	1. Shall have flexibility to expire or move files to different folder / Location / Volumes / drives on the basis of policies like day of creation / modification / access of on the basis of file pattern like extension. 2. Shall also be able to expire or move files to different folder / Location / Volumes / Drives on the basis of content classification within files.	
20	SAN storage (iSCSI based)	Integrated iSCSI for block access over LAN.	
21	Snapshots	Point in time copies of your data to guard against data corruption.	

22	Encryption and compression	Shall have support for encryption and Compression. License for both of same shall be offered.	
23	Replication	Offered NAS shall also be supported with leading NAS replication software's in the industry	
24	Power Supply and FAN	Offered NAS shall also have Hot Plug redundant power supply and FAN	
35	Installation services, manage & control	OEM should have at least 01(One) Engineer for Bangladesh and CV to be submitted during bid submission.	
36	Warranty& services	3-yrs collaborative warranty with 24x7 mission critical one-point support back-to-back with OEM. All above features BoQ should be provided with proper explanation.	

Virtualization software license

SL	Item Name	Detail Required Specification	Bidder response
1	Virtualization Software License (VMware)	60 x VMware vSphere Standard 1 Processor 3 Years 24x7 support and subscription, 1 x VMware vCenter Server Foundation 3 -Years 24x7 support and subscription	

KVM Switch and Console Kit:

SL	Item Name	Detail Required Specification	Bidder response
	Quantity	02 (Two) (DC: 2 units)	
1	Brand	Same as server brand	
2	Quality	ISO 9001/9002 for manufacturer	
3	Model	To be mentioned by the bidder	
4	Country of Origin	USA/UK	
5	Manufacturing Country	To be mentioned by the bidder	
6	KVM console	18.5-inch LCD monitor with international English keyboard and touch pad in a 1U form factor	
7	KVM Display Specifications	Max. Input Graphics Resolution: 1600 x 1200 @60Hz Refresh Rate Response time: <16ms Brightness: >187 (cd/m^2) Contrast ratio: >700:1	
8	KVM Switch & Accessories	16-port IP KVM switch with necessary cables and interface adapter for 16 servers	
9	Warranty	Minimum 3 (three) years warranty with parts replacement and labor	

Server RACK:

SL	Item Name	Detail Required Specification	Bidder response
	Quantity	02 (Two) (DC: 2 units)	
1	Brand	Same as server/storage brand	
2	Quality	ISO 9001/9002 for manufacturer	
3	Model	To be mentioned by the bidder	
4	Country of Origin	USA/UK	

5	Manufacturing Country	To be mentioned by the bidder	
6	Size & Dimensions	42U EIA or equivalent	
7	Industry Standards Compliance	EIA (Type A cabinet per section 4.1.1), UL/CES Certification, WEEE, RoHS compliant.	
8	PDU specifications	Minimum 2 x 7.3kVA 3-wired 32A/230V vertical 32 x C13 & 6 x C19 outlets per PDU	
9	Panels	Bidder should include all necessary panels including side panels that should be removable, Solid with Lock	
10	Filler Panel	Bidder should include min. 20U Filler Panel kit.	
11	Rack Color	Black or please specify	
12	Authentication	Different parts of the system must be certified with brand company and should have Parts No. on each part	
13	Accessories	Bidder should be provided with grounding kit including the other necessary accessories	
14	Warranty	Minimum 3 (three) years warranty with parts replacement and labor	

Disk Based Appliance:

SL	Item Name	Detail Required Specification	Bidder response
	Quantity	01 (One)	
1	Brand	Same as Server vendor.	
2	Model	Please mention	
3	Country of Origin	USA/EU	
4	Country of assemble	Please mention	
5	Architecture	Offered Disk to disk backup device shall be Modular design to allow configuration, add capacity increase performance	
7	Compatibility	Offered appliance shall be certified to work with at-least 3 Backup application vendor ISV like HPE, Veritas, Dell-EMC, Veeam, Commvault etc	
8	Capacity	Offered device shall be offered with Minimum of 96TB of raw space and can be expandable to at-least 144TB raw space by using not more than 4TB drives	
9	Scalability	Offered device shall also be scalable to at-least 108TB usable in native mode (Without de-duplication and compression) and additional min. 200TB of native usable capacity using storage on the cloud like AWS, Azure or on object storage	
10	Integration	Vendor shall not use any additional staging device in-between while moving the data from Disk based backup device to public cloud or object storage	
11	Boot drives	Offered device shall have separate dedicated drives for Operating System of appliance and shall not participate in data backup	
12	RAID	Offered device shall be protected with hardware raid 6 from the factory so that no raid configuration is required in field Offered device shall be offered with dual Hardware Raid Controller card. Each card shall have dual 12Gbps SAS ports	
13	Protocol supported	Offered device shall support emulation of both VTL and NAS target like CIFS	
14	Host port	Should be provided with 2 x dual port 32Gbps FC	

15	Cloud integration	Offered device shall have capability to do complete copy of data sets from on premise disk backup storage to Cloud storage instead of data tiering	
16	Licensing	Offered device shall have integrated de-duplication license, low bandwidth replication license so that only unique non duplicated block transfers to remote / DR location	
17	Deduplication	Offered device shall have intelligence to understand both source based, and target based de-duplication and shall be integrated with all well-known backup ISVs like Veritas, Commvault and Veeam etc. At-least 3 ISVs shall be supported	
18	Remote backup	Offered device shall support receiving non duplicated data from remote locations or branch office directly from the application servers / Client servers in low bandwidth mode without using any backup or replication-based device at remote location / Branch office	
19	Performance	When fully populated, offered device shall support rated write performance of more than 6TB per hour in native mode When fully populated, offered device shall support rated write performance, when enabled with source level deduplication, of more than 16TB/hr.	
20	Installation services, manage & control	Bidder shall provide OEM onsite implementation service from OEM Engineers only. CV to be submitted during bid submission. Partner engineer is not allowed to power-up the device without OEM Engineer presence. Access to OEM experts via phone, web, or both Connect devices to OEM for real-time diagnosis, alerts, and information.	
21	Warranty	3-yrs OEM collaborative warranty with 24x7 mission critical one-point support 4-hour response time. 4-hour onsite response time for hardware issue. Supporting service-related document should provide. Warranty support SKU and datasheet with the detail BoQ and sizing document should be provided with the technical compliance document.	

Backup software license

SL	Item Name	Detail Required Specification	Bidder response
1	Brand Name	Internationally Reputed brand (To be mentioned by the Bidder) and the OEM of the proposed brand must be in the latest Gartner's Magic Quadrant for datacentre Backup and Recovery Solution.	
2	Model	To be mentioned by the bidder	
3	Country of Origin	To be mentioned by the bidder	
4	Country of Manufacture	To be mentioned by the bidder	
5	Quantity	Proposed backup software shall be supplied with 5TB Front-end-TB capacity license and 20 VM perpetual license with 3 year maintenance.	
6	OEM credibility	Backup Software OEM should be a publicly listed company for last 3 years in any of the world's leading stock exchanges like NYSE, NASDAQ, Tokyo Stock Exchange.	

7	Centralized Management	The backup software may have firewall support & alerts on Mobile devices etc. centralized management / Single interface for management of all backup and archival (file system and E-mail) activities across physical servers, VMs and Mobile devices like Laptops / Tabs / Phone and SaaS based applications like Microsoft O365(Backup & Archival) and G Suite	
8	Security	The proposed solution must have ability to protect all mount paths associated with disk libraries configured from a Backup/Media Server against Ransomware attacks.	
9	Efficient Data Management	Should support software based de-duplication to support any storage system, cloud repository and object storage as de-duplicated disk target. Based on policy backup software should be able to move data to a tape library automatically	
10	Replication	Backup software should be able to replicate backed up data in de-duplicated format (for bandwidth optimization) to another site for compliance purposes, with or without the need of external replication tools. All necessary licenses for achieving consistent replication of backup data should be quoted.	
11	Licensing	The proposed licenses should be Subscription in nature. All the necessary licenses should be supplied along with the solution.	
12	Database Support	Backup software should be able to protect the following through online agents enabling granular restores. Major DBs Oracle, Exchange, Sybase, Informix, DB2, MS SQL, MySQL, MongoDB, MariaDB, etc. and Applications likes SAP, etc. across wide range of popular Windows / Linux and Unix flavours.	
13	Hardware Support	Backup software must have the ability to perform cross hardware restore with completely different hardware configurations. Must support dissimilar system hardware restore on multiple platforms including Windows, Solaris, Linux and AIX.	
14	Reporting	Comprehensive reporting of media, backup server, jobs, and analytics should be offered as part of the functionality in the supplied software. Must not be a separate product or console.	
15	Hypervisor Support	It should have full support for backing up virtual servers (image level) on various hypervisors like Hyper - V, ESXi, RHEV, OVM, Acropolis, Citrix, Fusion, etc.	
16	Efficient Data Management	Backup software should have the ability to archive data and create a single repository for backup and archive for space efficiency and easier data management.	
17	Encryption	It should support the following algorithms and provide better security in deployment across sites - BLOWFISH, GOST, Serpent, AES, Twofish, 3-DES, etc.	
18	Storage Array Support	Should support software based de-duplication to support any storage system, cloud repository and object storage as de-duplicated disk target. Based on policy backup software should be able to move data to a tape library automatically. The proposed backup solution should support snapshot based backup from various vendors such as Hyperflex, HP 3PAR, EVA, Fujitsu Eternus, Oracle ZFS, Infinidat, Solidfire, Huawei, Tintri,etc.	

19	Oracle/ MSSQL Database Security	The Backup solution should support Oracle/MSSQL Data Masking, whereby a copy of backed up data can be handed over to any third party without allowing them to view data within the instance. They should be able to troubleshoot, run dev / test instances on the copy and yet not have access to confidential data of the organization.	
20	Data Management	Proposed solution should support universal recovery to restore from P2P, P2V, V2V, V2P, V2C and C2V without having to wait to extract the full backup to production storage. Backup software should be able to protect the Big data apps like Cassandra, Greenplum, Hadoop, IBM-GPFS	
21	Warranty	3 (Five) years warranty should be provided for this unit from the date of commissioning	
22	Installation, testing and commissioning	Installation, testing and commissioning with necessary accessories	

7.0 Recommendation

7.1 Major Component of Complete SCADA: It is recommended that the following item should be setup to complete SCADA and digitalization. Committee had assessed and find out the requirement and source of Implementation as the described in below.

Package Name	Item required	Implemented by
Package 1	1 Central IT Infrastructure (Active & Passive)	DWSNIP
	2 Central Control Room with Bazel less Video Wall	DWSNIP
	3 10 Zonal IT Infrastructure (Active & Passive)	DWSNIP
	4 10 Zonal Control Room with Bazel less Video Wall	DWSNIP
Package 2	1 Central Server and Virtualization, Storage and Backup	DWSNIP
	10 Zonal Server (2) and Virtualization	DWSNIP
Package 3	1 Network and Firewall (HQ & Zonal)	DWSNIP
	2 Core Structured Cabling (HQ)	DWSNIP
Package 4	Data and Internet Bandwidth (5 Yrs)	DWSNIP
Package 5	1 Central Unified Distributed SCADA System and Implementation	DWSNIP
	2 Web GIS Software, Customization & Reporting with data modelling	DWSNIP DSNIP

Package 6	1 Billing software and interfacing with Financial DSIP management system (5Yrs)	
	2 Financial Management software (5 Yrs) DSIP (Modules: Accounts, General Ledger, Intercompany Transaction, Fixed Asset, warehouse, Procurement, payroll with facility management & HR)	
package 7	1 SCADA RTU/PLC, Field Devices (Smart flow EWSP, DWSNIP, Meter, Smart Pressure Sensors Sensor, Levelling WASA switch and Sensor, Water Quality Sensor & Energy Meter) & Electrical Components	
Package 8	1 Smart Digital Water Meter (4G) for Household DWSNIP	
	2 MDM & central Firmware Update Platform DWSNIP	

7.2 Field Device: The following category devices should be used:

Object name	PLC	Communication & Network	SCADA Software
Water Treatment Plants	Medium end PLC with capacity to process large data in each WTP	GSM, ISP	Compatibility and consistency with existing SCADA software to be considered (Central SCADA software related)
Protocol for WTP	Modbus TCP over F/O internet with VPN configuration		
Deep Tube Wells	Small size and capacity of PLC	ISP (Primary) , GSM (Secondary)	Complete SCADA Software shall be installed at Central Server and each Mods zone office will be connected with client server. (Web, Mobile and Connection to Central SCADA are additional feature)
Protocol for DTW	Modbus/HART within DTW, Modbus or DNP3 from DTW to Central and Local SCADA		

DMA	Small size and capacity of PLC	GSM	Complete SCADA Software shall be installed at Central Server and each Mods zone office will be connected with client server. (Web, Mobile and Connection to Central SCADA are additional feature)
Protocol for DMA	Modbus or DNP3 from DMA to Central and Local SCADA		
I/O	Universal I/O as required with PLC		

7.3 Generic Specification of SCADA Application packages :

Sr. No.	DESCRIPTION	QTY.	UNIT
Zonal Control Centre			
1	Supply, Erection, Installation, Testing, Commissioning of Zonal SCADA Software for unlimited screens, minimum 32000 tags with Redundancy and with 5 Web/mobile clients. Android & iOS Application.	10	Set
2	Supply, Erection, Installation, Testing, Commissioning of time series local Historian with redundancy and 10 web clients	10	Set
Sr. No.	DESCRIPTION	QTY.	UNIT
Integrated Water Command Control Platform			
1	Supply, Erection, Installation, Testing, Commissioning of Integrated Water Command and Control Platform with unlimited screens, minimum 50000 IO Points, unlimited reports & Dashboards. Redundant Historian, OMI Clients, 4 redundant pairs of Application Server engines for runtime server.	1	Set
2	Supply, Installation, Testing, Commissioning of Enterprise Alarms Information management module with required connectivity with zonal SCADA/AWCCP and required license for email/voice message/SMS escalations	1	Set
3	Supply, Installation, Testing, Commissioning of Incident Management module with unlimited clients and Mobile Application	1	Set
4	Supply, Installation, Testing, Commissioning of equipment efficiency monitoring module with Digital Workbook	1	Set

	module with required development of paper based log sheets in software with required mobile/web clients		
5	Supply, Installation, Testing, Commissioning of calibration management module with required asset types licenses	1	Set
6	Supply, Installation, Testing, Commissioning of Asset Management software with required work view clients.	1	Set

7.4 Bill of materials for DC/DR

Item#	Item	Description	Qty/LOT
1	Server Farm Switch	Details Spec is attached	2
2	SAN Switch	Details Spec is attached	2
3	Application Server	Details Spec is attached	6
4	Database Server	Details Spec is attached	2
5	All Flash SAN Storage	Details Spec is attached	1
6	Other Server for each Zone	Details Spec is attached	20
7	NAS Storage for each zone	Details Spec is attached	10
8	Vmware	Details Spec is attached	1
9	KVM Switch and Console	Details Spec is attached	2
10	Server RACK	Details Spec is attached	2
11	Disk Based Appliance	Details Spec is attached	1
12	Backup and Recovery Software	Details Spec is attached	1

7.5 Video Wall for Dhaka WASA

30ft x 6ft Indoor Curved LED Video Wall (Full Curved Wall)

Item No.	Items	Items Descriptions	Qnty	Unit
1	LED Display Body	P1.5 Indoor Curved LED Display, 30ft x 6ft size, 1.5mm Pixel, IP30, Viewing angle 160° x 140°	180	sqft
2	Control System	Sending card	1	Pcs
		Receiving card	1	LOT
		Video Processor	1	Pcs
3	LED Structure, Power supply, Accessories, Necessary Finishing and Installation		1	Lot

15ft x 6ft Indoor Curved LED Video Wall (Half Wall)

1	LED Display Body	P1.5 Indoor Curved LED Display, 15ft x 6ft size, 1.5mm Pixel, IP30, Viewing angle 160° x 140°, Brightness -700 cd/m2	90	sqft
2	Control System	Sending card	1	Pcs

		Receiving card	1	LOT
		Video Processor	1	Pcs
3	LED Structure, Power supply, Accessories, Necessary Finishing and Installation		1	Lot
	163 Inch All In One LED Display (for Half Straight Wall)			

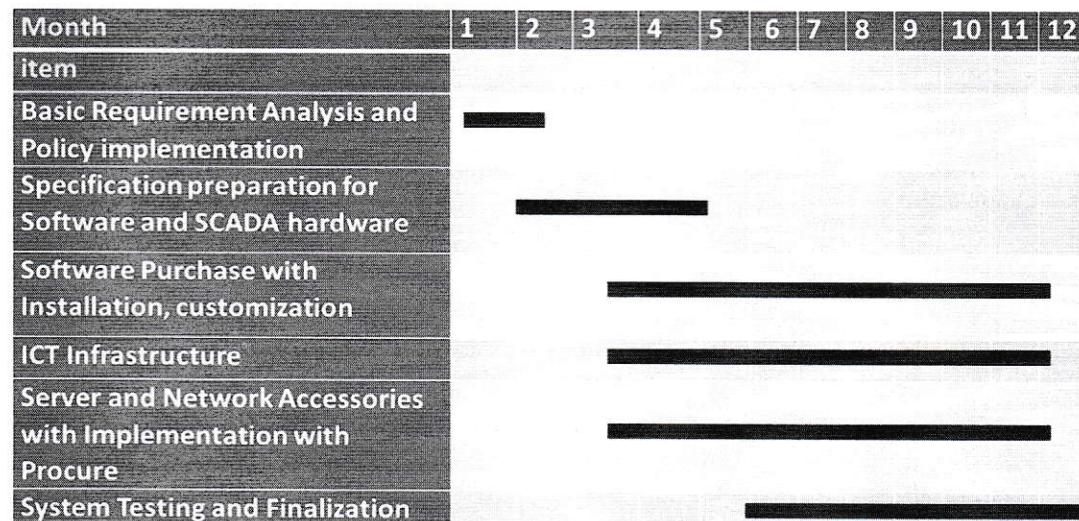
163 Inch All In One LED Display (for Half Straight Wall)

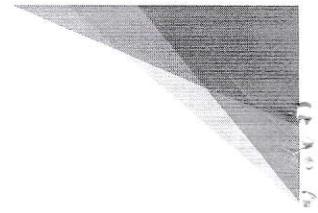
SN	Item	Brand	Model	Qty.
1	163 Inch All In One LED Display			
2	HDMI Cable (10m)			
3	Wall Mounting Structure			
4	Wall Mounting Structure			
5	Installation			

136 Inch All In One LED Display (for Zonal Office)

1	163 Inch All In One LED Display			
2	HDMI Cable (10m)			
3	Wall Mounting Structure			
4	Wall Mounting Structure			
5	Installation			

7.6 Indicative Estimated Time Schedule & activities to establish Common Platform:





7.7 General Recommendation

1. To build a staff awareness and Consensus
2. All staff, from senior management to the crew, should understand the SCADA and automation systems.
3. Building the understanding of top-level management on Automation
4. Middle management and staff must understand their roles and responsibilities on automation, since it requires a long-term, combined effort from all departments in the utility.
5. to establish any automation specially SCADA and related work should follow the guideline and verified by SCADA team
6. SCADA team should be supervise, advice and updating the technology as required. Every year should be check the technological change and after 5 years could be rebuild the master plan.
7. All project and stockholder should follow the guideline of Automation Masterplan
8. Intensive training will be organized on SCADA and Automation.

8.0 Conclusion:

However, SCADA is not only brand new concept using ICT but also ordinary management based concept. Therefore, primary and systematic operation and maintenance of water supply system is very critical issues above all. Integrated Water operation control and command platform is a future oriented water management strategy by integrating ICT based water management technology. So, it is managing the entire process of the water production source as well as water cycle scientifically and systematically above all.

Aligning with master plan for automation will best impact on Smart water management systems. The outcome will be sustainable provision of a more reliable, improved and climate-resilient water supply in Dhaka city. Sustainable managerial capacity of district metered areas enhanced DWASA's managerial and technical capacity will be strengthened to keep Smart Water management Systems.