IV. EQUIPMENT & SYSTEM SPECIFICATIONS

a. The SCADA system shall include signal hardware (input and output), computer, controllers, networks, communication modules and software, enclosures and instrumentation. The hardware gathers and feeds data into a computer that has SCADA software installed.

b. The supplied computer shall serve as an Operator Interface Terminal (OIT) using a Windows based Human Interface (HMI) Software. The HMI software shall be programmed to graphically display all specified operating parameters and allow for operator intervention of remote operation via "point and click" control of graphically presented control services. It shall serve monitoring and imposed control functions. PLCs shall sustain all plant control functions in the absence of OIT operation.

c. The winning bidder/contractor or its designated Supplier/Manufacturer shall submit HMI graphics to the ZCWD project in-charge (Technical Services Group) for input and approval.

d. The brains of SCADA system are perform by the PLC. The controller consists of programmable logic converter controller. Any changes or errors are usually automatic logged for and/or displayed.

e. SCADA System, PLC/RTU and Radio Hardware shall comply with any DTI - International Electrotechnician Commission (IEC) standards including UL hazardous Locations approval and ATEX compliant as to protect the workers from potential risk from explosive atmospheres.

f. The system and instruments shall include but not limited to the following goods, tools and equipment which were necessary in the configuration and programming of the SCADA System. Other components that are not specifically stated herein but necessary for the complete installation of the SCADA system shall be provided by the Contractor and/or its designated Supplier/Manufacturer as part of this Contract without any additional cost to ZCWD.

    1.   Sensors

        a)   *Turbidity Sensor*

Turbidity Sensor Proposed Location:	Inlet of Raw Water (for WTP Phase I & Phase II
Process Connection	Flow Through Cell, 2 x 2" FNPT entries, 1 x 1" FNPT sensor port, with 1" compression fitting
Cable Length	10 ft. (3.0 meters) water resistant cable
Measurement Range	0 – 10,000 NTU

b)   *Ultrasonic Level Sensors*

Type	Ultrasonic level sensor
Optimum Range	80 in. (2m)
Maximum Range	10 ft. (3m)
Case Material	PVDF
Humidity	0 to 100% operating
Compensation	Temperature compensation
Resolution	Digital: 0.0034 in. (0.086mm) Analog: 4099 steps (0-10 VDC), 3279 steps (4-20mA)
Protection	NEMA-4X, NEMA-6P, IP68
Update Rate	20Hz (50ms)
Input Power	10-30 VDC, 50 mA maximum
Voltage Output	0-10, 0-5 VDC or Pc customized; 10mA max
Configuration	Stored in non-volatile memory
Outputs	Five selectable, plus serial data
Transducer	Rugged piezoelectric
RS232, RS485	Modbus protocol, 9600-115200 baud (selectable), 8 data bits, 1 stop, no parity

c)   *SCADA Hardware*

The SCADA Server shall have the following specifications:

Processors	Intel Core i7
Hard Drive	1TB
Memory	16GB
Graphics	NVIDIA GeForce GTX 950

d)   *CENTRIC DISC VALVE PLUS ELECTRIC ACTUATOR*

Butterfly Valve	
Design	Centric disc butterfly valve, U-shaped flanged type body
Materials	Body in Ductile Iron epoxy coated, Shaft in Stainless Steel 420
Mounting	Direct to the electric actuator
Electric Multi-turn Actuator	
Power Supply	3-Ph, 460V AC, 60 Hz
Complete with **Integrated Control AC Electronic**	
Transmitter	IP68 Position Transmitter with graphic display
Signal	Position feedback signal 4-20mA
Functional Duty	Complete with Micro-processor based control for multi-function suitable for modulating duty

e) *Flowmeter for Production Wells*

Production wells shall equipped with electromagnetic flowmeters with the following specifications:

Gov. Ramos Production Well	Brillantes Production Well
150mm Diameter	100mm Diameter
Electromagnetic Induction	
60 Hz Mains Supply	
ANSI B16.5, Class 150, Flange Type	
-40 +70 °C Ambient Temperature	
Complete with remote type IP67 transmitter	
Digital Input 11-30V DC, Signal Range 4-20mA	
0.4% ± 1 mm/s Max. Measuring Error	
Functions: Flow rate, totalizers, low-flow cut-off, empty pipe, flow direction, error system	
Power supply 115-230 V AC + 10%-15%, 50-60Hz, 500 mA Trip Fuse	

g. The specifications herein are the minimum requirements for this project; the winning bidder/contractor may offer an approved equivalent specification higher than these requirements.

h. Supply and installation of Programmable Logic Controller (PLC) and other components that are not specifically stated herein but necessary for the completion shall be provided by the winning bidder/ contractor and/or its designated supplier/manufacturer as part of this contract.

2.   Programmable Logic Controller (PLC)

a. The winning bidder/ contractor shall do the Automatic Programming of the various facilities and the sequence shall be based on the diagram indicated in the drawing attached with this Terms of Reference.

b. The PLC shall integrate and control automatically the following pneumatic valves, motors and pumps:

      i. Coagulation Flash Mixers
      ii. Flocculation Mixers
      iii. Chemical Dosing Pumps
      iv. Scour Air Blowers
      v. Backwash Pumps
      vi. Pneumatic/Actuated Valves

c. The same model of PLC devise shall be used through the SCADA system to ensure the complete system continuity, compatibility between devices, enhancing overall system efficiency by the reduced need to learn, maintain, support and carry spare parts for multiple technologies.

3.   PLC Performance Specifications

a) Capable to do online editing, this is to increase the efficiency and speed troubleshooting by editing applications while the system is running, without having to shut down the entire system.

b) With dual independent Gigabit Ethernet network interface with Dynamic Host Configuration Protocol (DHCP).

c) All Central Processing Unit (CPU) connected in a network can be displayed on a list and can be connected when engineering workstation is connected.

d) Supports high level communication interface with any communication protocol such as Bacnet, Modbus, DNP3, DLMS or equivalent devices installed to monitor parameters such as Motor Status, Power. Voltage, Current, Motor Temperature, Phase Loss Frequency and Alarms.

e) Unit can be configured via web or controlled using the built-in LCD toch display.

f) Dual USB Ports for serial communication to touch-screen monitors or WiFi adapters.

g) With data logging function embedded in the CPU that allows data to be saved in several formats such as excel, TXT or CSV format on a not less than 32 GB micro SD memory card.

h) Supports up to 16 IO modules of various point capacities

4.   General IO Specifications

a) Touch sensitive Pad with pivoting cover
b) LED indicators for module health and module status
c) UL hazardous location approved and ATEX complaint

5.   Supply and Installation of Power Meter

Power Monitoring Device shall be Intelligent Power Meter and must be equipped with full graphic LCD display with the following features:

a) Metering: Voltage, Current, Power, Reactive Power, Apparent Power, Frequency, Power Factor, Energy, Demand, Load Features

b) Monitoring: Power Quality, Voltage Harmonics, Current Harmonics, Voltage Unbalance Factor, Current Unbalance, Max. Min Statistics with Time Stamps.

c) Communication protocols shall support Modbus, DNP3 or DLMS protocol via RS485 or Ethernet

d) Display shall be clear and not less than 40" LCD screen display with white backlight wide environmental temperature endurance display load percentage, 4 quadrants power and load nature.

e) Offers historical logging capability where the selected metering parameters can be recorded.

6.   Supply & Installation of SCADA Software

The SCADA Software shall be capable to centrally develop, manage, upgrade, maintain, change data, and visualization in one Station. All data shall have the capability to be saved in an open platform database that can readily share data with other systems requiring it. All data with other logging and trend report tools will be web based and reports can be customized by the contractor for the specific needs of ZCWD Water Treatment Plant.

7.   The Human Machine Interface (HMI)

Human Machine Interface Software Graphical User Interface configuration shall include:

a) Graphical interface shall be both console based, web based, mobile device ready and can be customized to the needs of the ZCWD.

b) Graphical User Interface (GUI) screens, sub screens and respective representations shall be pre-approved by the ZCWD project in-charge.

c) All monitored parameters shall be represented both graphically and digitally presented in keeping with the best practices of HMI design and implementation.

d) Graphics shall be pictorially illustrative of the actual device or component.

e) All screen layouts shall be logical and consistent with the general system layout.

f) Devices should be represented with motion and color changes when operating.

g) All graphics shall be represented by industry conventional color schemes.

h) A main overview screen shall schematically represent the overall system at a single glance.

i) All monitored parameters and respective values shall be represented on the main overview screen.

j) Each site shall be represented on a sub-screen accessed from a drill-down menu from main screen.

k) Each monitored device shall have operator intervention of its local control by point-and-click changes.

l) Control adjustments shall be graphical switches to provide remote control of all motors/pumps/valves.

m) Trend charts shall be created for all specified parameters exhibiting its value overtime.

n) All logged data shall be archived indefinitely to either local hard drives or back-up systems using a database system that can readily share data with other third party systems. Also, the database system can be used to generate web customized reports as deemed necessary by the operators of the system.

o) All Graphical User Interface alarms shall be pop-up flashing devices with respective audible enunciation via speakers.