



TECHNICAL SPECIFICATION

TITLE: SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) SYSTEM FOR THREE (3) PUMPING STATIONS AND ONE (1) RESERVOIR

1.0 SCOPE OF CONTRACT

The scope of work for this project shall be supply, delivery, installation, testing and commissioning of supervisory control and data acquisition (SCADA) system to General Santos City Water District with in 90 Calendar Days.

Item no.	Requirements	Statement of Compliance
1.1	The winning bidder shall supply, install, test, and commission the Super Supervisory Control and Data Acquisition (SCADA) System for Pumping Station No. 1 (Kaunlaran), Pumping Station No.2(Malakas) and Pumping Station No. 5 (Riverside) and Reservoir at PurokKaunlaran, Brgy. San Isidro. All required parameters shall be transmitted and displayed in the newly built command center.	
1.2	The winning bidder shall furnish all labor, materials, tools, equipment, transport, supplies, and other necessary services required for the complete and proper conclusion of a working SCADA system.	
1.3	The system and instruments shall be brand new Programmable Automation Controllers, Sensors and transmitters and SCADA Software, those that were not stated herein but are necessary in the complete SCADA system shall be included in the tendered price.	



2.0 LIST OF MAJOR COMPONENTS

Item no.	Item	Quantity	Spare Unit	Total Quantity	Statement of Compliance
1	Programmable Logic Controller (PLC)	5	1	6	
2	Power Meter	3		3	
3	Fabricated Powder Coated Panels	4		4	
4	Human Machine Interface (HMI)	3	1	4	
5	Un-interruptible Power Supply	4		4	
6	Surge Protection Device	4		4	
7	Chlorine Gas Leak Sensor	3		3	
8	Automatic Regulating Valve for Chlorine	3		3	
9	Residual Chlorine Analyzer	3		3	
10	Butterfly Valve with Actuator	6		6	
11	Pressure Transducer	3	1	4	
12	Automatic Transfer Switch	3		3	
13	Water Level Monitoring Transmitter	1	1	2	
14	Android tablet	4		4	



3.0 COMPONENT SPECIFICATIONS

Item	Required Specifications	Statement of Compliance
Programmable Logic Controller (PLC)	<p>PROGRAMMABLE LOGIC CONTROLLER, HMI AND I/O UNITS:</p> <ul style="list-style-type: none"> ➤ Programming of the various facilities required in this contract shall be done by the winning bidder. The required field instrument and equipment shall be controlled, monitored and transmitted data by means of analog, digital and serial communication protocol. ➤ The winning bidder shall pre-submit Human Machine Interface (HMI) to the <u>Control and Monitor using PC, Smartphone or Tablet.</u> <p>HARDWARE:</p> <ul style="list-style-type: none"> ➤ Minimum of 32MB NOR flash memory, 64MB SDRAM ➤ Capable to extend data storage up to 32GB ➤ DC powered, 9 - 30V DC can be supplemented by solar power ➤ Has embedded battery charger for sealed lead acid battery backup ➤ Aluminium material enclosure with alodine coating ➤ Capable to support different communication such as ethernet for Modbus TCP/IP protocol, USB, and GSM modem capable of 4G, 3G, 2G communication ➤ DIN rail mounting (IEC 60715) ➤ Operating temperature of 0 to 70 degrees Celsius and up to 95% humidity ➤ Capable of RUN-STOP-RESET function 	



<p>Programmable Logic Controller (PLC)</p>	<p>I/O modules :</p> <ul style="list-style-type: none"> ➤ Minimum of 16 digital Input/Output ➤ Minimum of 8 analog input, capable of current (4 - 20 mA) and voltage (0 - 10 VDC) setup ➤ Minimum of 2 analog output (4 - 20 mA) ➤ Built-in RS232 and RS485 for Modbus RTU Protocol <p>SOFTWARE:</p> <ul style="list-style-type: none"> ➤ Ladder Logic, IEC 61131-3 Basic & Function Blocks programming ➤ Has smart alarm management with embedded calendar ➤ Has smart data logging: Sampling tables (periodic) + digital & analogue chronologies (event) ➤ Has Read SMS/POP3 Embedded ability to receive and interpret Incoming messages. ➤ Has access security protection for Modbus, HTTP, FTP Server, and Read SMS. ➤ Capable to support for over 40 protocols, including Modbus (master/slave, RTU/TCP/ASCII), DNP 3.0, IEC 60870-5-101/104, OPC UA, MQTT(S), Siemens ISO-on-TCP, Allen Bradley DF1 & EtherNET/IP, IEC-61850 (MMS) and many more. <p>PLC INTERNET PROTOCOL (IP)</p> <p>PARAMETERS:</p> <p>IP parameters consist in the global configuration for TCP/IP services:</p> <ul style="list-style-type: none"> ➤ Connecting to an ISP (dial-up connection) ➤ Sending files: FTP(S), SFTP ➤ Sending e-mail: SMTP(S) 	
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<p>Programmable Logic Controller (PLC)</p>	<ul style="list-style-type: none"> ➤ Reading e-mail subject: POP3 ➤ Time synchronization: NTP ➤ DynDNS: handling of public, dynamic IP addresses ➤ Configuring Virtual Server rules ➤ Configuring IP Bridges ➤ Configuring HTTP POST to a server ➤ Configuring a connection to TConnect through Ethernet <p>PLC INTERNET PROTOCOL (IP) SECURITY</p> <p>IP security services are:</p> <ul style="list-style-type: none"> ➤ VPN (Virtual Private Network provides secure connections using Open VPN ➤ Firewall (must be activated from the RTU properties -> IP security) ➤ Hypertext Transfer Protocol Secure (HTTPS) with use of SSL and TSL Protocols for PLC Webserver <p>PLC ALARMS</p> <ul style="list-style-type: none"> ➤ Capable to send SMS message alarms to Mobile Phone ➤ Capable of sending Alarms to email ➤ Capable of sending files to FTP site ➤ Capable of dialing another PLC or SCADA <p>OTHER REQUIREMENTS:</p> <ul style="list-style-type: none"> ➤ PLC Approvals CE, FCC, C-tick, A-Tick and RoSH3 ➤ Documentation or Statement of MTBF for at least 1,000,000 hours ➤ Manufacturer and supplier must be ISO 9001:2015 certified. (<i>compliance during submission and opening of bids</i>) ➤ The winning bidder must have a Manufacturer Authorization Certificate 	
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	<p>specified for this project. (<i>compliance during submission and opening of bids</i>)</p> <ul style="list-style-type: none"> ➤ Warranty support for controllers should be 12 months minimum. Proof of warranty from the manufacturer must be provided by the winning bidder. 	
<p style="text-align: center;">PLC Enclosure Panel</p>	<p>Shall be installed inside the pumping stations and it shall be properly ventilated. The design shall conform to the standards.</p> <ul style="list-style-type: none"> ➤ The winning bidder shall provide newly fabricated powder coated panels with a complete set of wiring consumables for network and monitoring of all required parameters. The said panel shall house the following: <ul style="list-style-type: none"> • Programmable Logic Controller • Human Machine Interface (HMI) • IO modules • Circuit Breaker Protection • Power meter • Surge Protection Device • Uninterruptible Power Supply • Exhaust Fan 	
<p style="text-align: center;">Power Meter</p>	<p>The winning bidder shall provide a Digital Intelligent Power Meter to be installed in each pumping station. It shall measure the following electrical parameters: real power, apparent power and reactive power, power factor, line to line, voltage and line current. These parameters shall be seen to the newly built command center.</p> <p>The Power Meter shall have the following specifications:</p> <ul style="list-style-type: none"> ➤ Support for Modbus, DNP3 or DLMS 	



Power Meter	<p>protocol via RS485 or Ethernet.</p> <ul style="list-style-type: none"> ➤ Power requirement of 90V - 250VAC. ➤ Harmonics measurements - up to 32nd Harmonic. ➤ Offers historical logging capability which can be displayed through waveform or bar graph. ➤ Conforms to IEC 62052-11 and other related standards. <p>The winning bidder shall also provide a current transformer as accessory to the power meter. It shall have the following specifications:</p> <ul style="list-style-type: none"> ➤ Conforms to IEC185, BS 7626, BSEN 60044-1 and IEC 60044-1 ➤ Split-core current transformer with a plug-in short circuit link ➤ Ambient temperature range -30°C to 80°C. ➤ Insulation level 3kV for 1 minute. ➤ Insulation level 3kV for 1 minute. 	
Human Machine Interface	<p>Human Machine Interface via WEB Server Capable of:</p> <ul style="list-style-type: none"> ➤ Must be able to provide a real-time monitoring but not limited to the ff: Power , Voltage, Ampere, Frequency and Energy consumption ➤ Must be able to turn on the pump and motor with status display in the HMI (i.e.Pump - ON: Operational with green light indicator; OFF red light indicator) ➤ Must be able to monitor, record and transmit data such as Reservoir Water Level in meters and Chlorine Gas Level in terms of Kilograms. ➤ Must be able to monitor, record and 	



<p>Human Machine Interface</p>	<p>transmit data such as water quality like residual chlorine reading.</p> <ul style="list-style-type: none"> ➤ Must be able to monitor, record and transmit data such as pressure and flow ➤ Must be able to monitor, record and transmit data Automatic Transfer Switch (ATS) ➤ Must be able to control, monitor, record and transmit data such as Test line Valve, Distribution Valve and Auto-Valve for Chlorine. ➤ Must be available for viewing through the web browser, store current and historical data and capability of exporting reports data. ➤ Must be able to view Alarms with Time stamps, during alarm there should be a pop up message notifying the operator. <p>HMI Controller Panel shall have the following specifications:</p> <ul style="list-style-type: none"> ➤ Minimum 7" 1024 x 768 TFT LCD with Projected Capacitive Multi-Touch (PCAP), ➤ Mounting: Panel Mount, VESA mount ➤ Enclosure: Metal housing ➤ Touch / Glass: Resistive Touch Screen ➤ I/O ports: USB, LAN, Serial and HDMI ➤ Supply Voltage: 12 VDC ➤ Processor: Intel® Celeron® N2930 (2M Cache, up to 2.16 GHz) ➤ Resolution: 1024x600 pixels ➤ Memory: DDR3L 1600 MHz, 4GB ➤ Operating System: Windows 10 IoT Enterprise ➤ Certification CE, FCC 	
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<p>Butterfly Valve With Actuators Valve 8" Φ For Discharge Line and Test Line Butterfly Valve</p>	<p>The winning bidder shall install a butterfly valve with motorized actuator with a size of eight inches diameter for discharge lines and Test Line in each of the three pumping stations.</p> <ul style="list-style-type: none"> ➤ The material for the butterfly valve body shall be made of a cast iron. ➤ Disc shall be made of Stainless Steel 304 or Stainless Steel 316 <p>The actuator valve discharge line of each pumping station shall have the following specifications.</p> <ul style="list-style-type: none"> ➤ The actuators shall be suitable for use on a nominal 100/220VAC, Single Phase and 60 Hz power supply. ➤ The actuators can be mounted in all directions. ➤ Output torque of at least 30 N-m. ➤ 10min-35min duty cycle. ➤ Shall have limit switch for full open and full close as stopper during electric operation and mechanical stopper for manual operation ➤ Actuators can withstand the ambient temperature of -30° C - +60° C ➤ 1xSPST (NO) micro switch for each at open & close. ➤ Die cast aluminum alloy with built-in thermal protector. ➤ Detachable crank handle for manual operation ➤ Enclosure protection rating of IP67 or higher. 	
<p>Water Pressure Transmitter</p>	<p>The winning bidder shall install a pressure transmitter that can transmit an analog signal of 4-20mA to the PLC. The signal received shall be processed to convert into data and display to the monitor or Human Machine Interface. These</p>	



	<p>parameters shall be transmitted and displayed to the command and monitoring station.</p> <p>The Water Pressure Transmitter shall have the following specifications:</p> <ul style="list-style-type: none"> ➤ Measuring Range: 0 to 20 Bar ➤ Current Output signal: 4-20mA ➤ Degree of Protection to EN 60529: IP67 	
<p style="text-align: center;">Water Level Monitoring Transmitter</p>	<p>The winning bidder shall install a water level sensor and transmitter that can transmit analog signals of 4-20mA to the PLC. The signal received shall be processed to convert into data and display to the transmitter. These parameters shall be transmitted and displayed to the command and monitoring station.</p> <p>The Water Level Monitoring Sensor shall have the following specifications:</p> <ul style="list-style-type: none"> ➤ Principle: Piezoresistive Pressure Transmitter ➤ Pressure type: gauge, absolute or sealed gauge ➤ Stainless steel housing and diaphragm ➤ Range: Minimum of 1MPa ➤ Minimum of 20 meters sensor cable to transmitter. ➤ Output signal: 4mA-20mADC(2-wire) ➤ Accuracy: 0.25%FS ➤ Power supply: 15V~28VDC ➤ Ingress Protection: IP65 <p>The Water Level Monitoring Transmitter shall have the following specifications:</p> <ul style="list-style-type: none"> ➤ Display: Double four-digit LED display. ➤ Power requirement: 100-240VAC ➤ Has up to 4 alarm indicator ➤ Level can be displayed in a bar graph ➤ Mounting Type : Front mounted 	



<p>Residual Chlorine Monitoring System</p>	<p>The winning bidder shall install a chlorine gas monitoring system which is able to monitor and regulate the required ppm of the line through an automatic regulation valve. It shall transmit analog signals of 4-20mA to the PLC. The signal received shall be processed to convert into data and display to the transmitter. These parameters shall be transmitted and displayed to the command and monitoring station.</p> <p>The Residual Chlorine Sensor shall have the following specifications</p> <ul style="list-style-type: none">➤ It shall be suitable for chlorine gas➤ Measurement Principle: Membrane-covered, amperometric, potentiostatic three-electrode system with integrated electronics➤ Range: 0.05 up to 200 mg/l (ppm)➤ Voltage supply of 12V to 30V➤ Operating temperature of 0 to 55°C ambient➤ Slope Drift: Approx. < -1 % per month➤ Membrane cap can work properly for at least one year before replacement.➤ Electrolyte replacement: 3 to 6 month➤ Flow fittings intended to hold the individual membrane covered sensor should be mounted in a bypass line. <p>The Automatic Regulation Valve shall have the following specifications:</p> <ul style="list-style-type: none">➤ Power: 115/230 VAC (+ 15%), 50/60 Hz, Single Phase. <p style="text-align: center;">Physical Inputs: FLOW: 4-20mA DC RESIDUAL: 4-20mA DC VALVE POSITION: Potentiometer input, approx. 0.25-2.25 VDC 4-20mA Input</p>	
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<p>Residual Chlorine Monitoring System</p>	<ul style="list-style-type: none"> ➤ Calibration: Factory Set, field adjustable. 0%, 25% & 100% valve set points 4mA & 20 mA Input signal 4mA & 20 mA Output (Valve Position) Input Signal Filter; 0-50S ➤ Display: 2-line, 16 character, back-lighted LCD. ➤ Control Mode: Manual or Automatic ➤ Dosage Ratio: adjustable through keypad and display. ➤ Alarm Contacts: 10 Amps @120 VAC or 30 VDC 5 Amps @ 240 VAC resistive load, unlatching. 	
<p>Gas Leak Monitoring System</p>	<p>The winning bidder shall install a gas leak monitoring device that continuously monitors the gas chlorine in the pumping house. It shall transmit analog signals of 4-20mA to the PLC. These parameters shall be transmitted and displayed to the command and monitoring station</p> <p>The Gas Leak Sensor shall have the following specifications:</p> <ul style="list-style-type: none"> ➤ Gas sampling: Natural diffusion ➤ Power supply: DC24V±25% ➤ Working method: Continuous monitoring ➤ Condition display: 3 LED lights indicate fault alarm, L-alarm level alarm and H-alarm level ➤ Current Output: 4-20mA ➤ Explosion proof structure, water and dust tight design ➤ Mounting: Fixed-Type, wall mounted 	



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<p>SCADA Center</p>	<p>All monitoring and control can be done in the SCADA Center. One main computer shall serve as an Operator Interface Terminal (OIT) utilizing a Windows based Human Interface (HMI) Software.</p> <p>The winning bidder shall supply a PLC unit which will serve as the brain of the SCADA Center.</p> <p>The winning bidder shall supply all the necessary needed accessories and controls for the completeness of SCADA command center.</p>	
<p>Android tablet</p>	<p>The contractor/supplier shall supply an android tablet unit which will serve as mobile HMI. Android Tablet shall have the following minimum specifications:</p> <ul style="list-style-type: none"> ➤ 4GB RAM / 64GB ROM ➤ Octacore , 1.8GHz Processor ➤ 8" display ➤ 6400Mah Battery with fast charger 	



4.0 LIST OF HMI ALARM

No.	Alarms	Statement of Compliance
1	Low Voltage	
2	High Voltage	
3	Over Current	
4	Water Reservoir Low Level	
5	Water Reservoir High Level	
6	Chlorine leak	
7	Chlorine low level	
8	Valve Close	
9	Discharge line High pressure	
10	Discharge line Low Pressure	
11	Motor Control Panel Tripped	
12	Submersible motor tripped off	
13	Motor Control Panel High Temperature	
14	Well water Level Low	
15	Power Utility / Generator Power	

5.0 ALARM MESSAGES VIA SMS

No.	Alarms	Statement of Compliance
1	Submersible Motor Stop	
2	Submersible Motor Running	
3	Submersible motor Tripped	
4	Submersible motor Tripped Reset	
5	Voltage Monitor Tripped	
6	Voltage Monitor Tripped Reset	
7	Main Contactor Closed	
8	Main Contactor Open	
9	Chlorine Leak	
10	Discharge line High pressure	
11	Power Utility Power	
12	Genset Power	



6.0 INTEGRATION OF EXISTING ELECTRICAL COMPONENTS

Particulars	Requirements	Statement of Compliance
Existing Electromagnetic Flow Meter	The winning bidder shall integrate the Flow Meter to be connected to the PLC by means of any communication protocol and the data collected shall be displayed and monitored at the command and monitoring center such as but not limited to flow rate, total volume, total volume of reverse flow and water velocity.	
Existing Soft Starter Motor Controller	The winning bidder shall integrate all existing motor controllers to the Programmable Logic Controller. It can be controlled and monitored in the command and monitoring center such as but not limited to voltage, current, fault and fault history.	
Existing Fault Monitoring Devices	The winning bidder shall integrate existing fault monitoring devices, such as voltage monitor and EOCRs to the Programmable Logic Controller. The fault status shall be logged to the alarm reports with exact time of fault.	
Existing Standby Generator Set	The winning bidder shall integrate all existing standby Generator Set to the Programmable Logic Controller. It can be controlled and monitored in the command and monitoring center.	
API	The winning bidder shall provide API (Application Programmers Interface) for the data acquisition and future customization.	

7.0 OTHER REQUIREMENTS

Requirements	Statement of Compliance
Reports During fault alarms of soft starter, pressure, flow and other protective devices to command center.	



<p>Trends and Data Logging GSCWD will provide the list of variables to be included in the trend and shall be logged continuously in the hard drive for historical trending with reference to the monitoring requirements.</p>	
<p>After Sales Service After the final acceptance, the contractor shall conduct a monthly site visit within the warranty period. The contractor shall have 24/7 availability of technicians within Mindanao Island.</p>	
<p>ISO 9001:2015 Certificate of the Manufacturer and Local Distributor (Supplier) for all components</p>	
<p>ISO 27001 Certificate from the manufacturer (information security management system)</p>	
<p>WARRANTY All components shall be guaranteed against defects in workmanship and materials for a period of two (2) years from the date of acceptance. Defective components or parts discovered within the warranty period shall be replaced without charge or additional cost to GSCWD.</p>	
<p>Trainings / Transfer of Technology The winning bidder shall provide training of the set-up and configuration of all equipments and shall conduct especial training on PLC without additional cost to General Santos City Water District.</p>	
<p>Bidders Qualification</p> <ul style="list-style-type: none"> ➤ Bidder must have a Regional Presence or a Regional Service/Support Partner/Center within Mindanao. ➤ Bidders must be an Authorized Distributor, Reseller, Partner or Dealer of the Equipment Manufacturer. ➤ Bidder must be the exclusive or authorized distributor of the principal company of the equipment and the necessary consumables in the Philippines. ➤ Bidder must have an experience of having completed at least Three (3) contracts that is similar to the contract to be bid, and at least one (1) contract whose value should be equivalent to at least fifty percent (50%) of the ABC of this project. ➤ Bidders must have been in the business for at least Five (5) Years of providing SCADA system solution and Services in government or private sectors. 	



8.0 TERMS AND CONDITION

No.	TERMS AND CONDITIONS	Statement of compliance
1	The winning bidder shall observed good housekeeping during the entire duration of the project. They shall be responsible of their own materials, equipments and tools to avoid accident to happen in the work place.	
2	<p>The winning bidder shall be liable for any damages to materials, electro-mechanical equipments such as but not limited to submersible motor, flow meters, pumps, motor controllers and other electro-mechanical devices during testing and commissioning of the SCADA project. And shall be required to replace immediately to any incur defects without cost to GSCWD.</p> <p>➤ The GSCWD shall issue MOA stating that all electro-mechanical equipments thereof as well as all facilities found therein are one hundred percent (100%) maintained and good working condition before commencement of the project. Any damages incur during the implementation of SCADA project, the winning bidder is held liable for any abnormalities and defects found.</p>	
3	Pursuant to the Electricity Safety Regulations, winning bidders are not permitted to allow unsafe wiring or equipment to be connected or remain connected to an electrical installation or supply of electricity in unsafe conditions. And also to control of the hazardous energy source, standard requires isolating machinery and equipment from its energy sources and to lock or tag them before service is performed.	
4	All bidders is required to submit and include documents but not limited to manuals, data sheets, Test Certificate and Manufacturers Certificate to all electrical and mechanical components in there bidding documents.	
5	That during the installation and commissioning of the SCADA System, the winning bidder shall be required to send a technician responsible of commissioning. All relevant and incidental cost (transportation, accommodation, allowances and etc.) in the commissioning of the SCADA System shall be	



	shouldered by the winning bidder.	
6	The winning bidder shall provide SIM cards to the four (4) units PLC with one (1) year load for SMS messages since PLC unit has the ability to send, receive and interpret Incoming messages.	
7	Winning Bidder shall supply spare of major components such as but not limited to the following: PLC with data cable, HMI with data cable, pressure transducer and Water Level Monitoring Transmitter with complete accessories and ready for installation (pre-program).	
8	The certificate of acceptance shall be release only if the project is 100% working condition.	
9	The winning bidder shall be subjected to Liquidated Damages (LD) for each day of delay as provided by the IRR of RA 9184.	

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