**SECTION 16900**

ADD. 2

 **SUPERVISORY CONTROL & DATA ACQUISITION SYSTEM**

# GENERAL

* 1. SCOPE
		1. The work to be accomplished under this section shall consist of furnishing the equipment necessary for a complete automatic control and monitoring system to function as specified herein and as shown on the drawings. The system integrator shall furnish a completely integrated all solid-state radio telemetry base Supervisory Control and Data Acquisition (SCADA) system. The complete system shall be designed, fabricated, programmed, tested, started up, and warranted by a single supplier to insure a single source of responsibility.
		2. Scope of Work: This section covers a radio SCADA system to include:
			1. Interface of proposed equipment at the WWTP as outlined within the Drawings and Specifications.
			2. Alarm dialer for remote communication of alarms.
			3. (1) Industrial Front Panel Computer with HMI SCADA Software
			4. Interface of low-level operational data between existing WTP SCADA platform and proposed WWTP SCADA platform, permitting observation of operational data from either site.
		3. General/Electrical Contractor Shall Supply
			1. All equipment required in other sections of the specifications.
			2. All labor for installation of the RTU and radio equipment.
			3. Conduit and conductors to interface local control panels, local equipment, power supply and antennas.
		4. System Integrator Shall Supply:
			1. Engineering submittal and shop drawings prior to installation.
			2. Operation and maintenance manuals, as detailed in this section.
			3. All start-up labor and services, as required for equipment specified in this section.
			4. All the paper work and fees necessary to obtain any required FCC radio licenses in the name of the Owner.
			5. All user licenses and fees for software supplied in this system with licenses in the name of the Owner.
			6. Operator training as detailed in this section.

* + 1. Owner Shall Supply:
			1. Access and easements as needed for all sites.
			2. 120 VAC power at all sites.
			3. Internet connectivity at the WWTP.
	1. QUALITY ASSURANCE
		1. Manufacturer's Qualifications: The system specified herein shall be the product of a manufacturer who can demonstrate at least ten (10) years of satisfactory experience in furnishing and installing comparable radio based telemetry/control systems for water and wastewater installations.

* + 1. The manufacturer of this system shall maintain a 24-hour available inventory of all replaceable modules to assure the Owner of prompt maintenance service and a single source of responsibility. The manufacturer shall certify this to the Engineer in writing at the time of bidder pre-qualification.
		2. Pre-Bid Approval:
			1. The Base Bid approved systems integrator for this project is:

 Micro-Comm, Inc. Local Contact:

 15895 S. Plfumm Rd Hydro-Dynamics, Inc.

 Olathe, KS 66066 (513) 899-9992

* + - 1. Other integrators desiring to bid this project as "alternate" integrators must seek pre-bid approval by providing a submittal ten (10) days prior to the bid date. Submissions that fail to include a complete submittal as detailed shall be deemed unresponsive. The Engineer and the Owner shall be the sole judge as to whether the alternate equipment is considered an approved equal. Approval of an alternate system by the Engineer will not relieve the alternate system of strict adherence to these specifications. The pre-bid submittal shall include the following:
				1. An installation list with the names and phone numbers of both the Owner and Engineer for at least ten projects of similar size and complexity.
				2. A "statement of compliance" detailing paragraph by paragraph the bidder’s compliance to these specifications.
				3. Block diagrams for the various sites in the proposed system showing the selected pieces of hardware equipment to be used.
				4. Sample electrical drawings for typical sites proposed in this contract.
				5. A product performance data sheet shall be included for each hardware component in the system (i.e. antennas, radios, coaxial cables & arrestors, programmable controllers, power supplies, time delays and relays, and the various sensors required) and each software component (programming & configuration software and operator display console software).
				6. Radio path study for each radio path in the system. Bidders shall satisfy themselves that the necessary radio frequency(s) can be obtained. The radio path study provided by each bidder shall utilize either:

Computer generated techniques utilizing a USGS 3 second terrain database to plot the path profiles for each radio path with elevation samples at not more that 200 foot increments.

Actual field measurements to showing the necessary antenna heights, transmitter power, and antenna gains required to insure a 20db fade margin as detailed in these specifications. The physical path analysis shall be made using temporary equipment installations and a radio communications analyzer to measure actual path margins. The bidder shall include in his bid, all the calculations used to extrapolate the measured data. The bidder is expected to obtain the necessary temporary FCC license for the study.

* + - * 1. Communications diagram for the entire system showing normal CTU-RTU communications paths and Peer-to-Peer back-up communications paths.
		1. Approval Agencies: The control system and its components shall comply will all applicable requirements of the following:

* + - 1. Electrical Code Compliance (National & Local)
			2. UL 508A
			3. NEMA Compliance
			4. IEEE Compliance
			5. EIA Compliance
			6. FCC Compliance
	1. RELATED SECTIONS
		1. Section 16010 – General Electrical Provisions
		2. Section 16020 – Conduit Systems
		3. Section 16030 – Wire and Cable
		4. Section 16035 – Instrument Wire and Cable
		5. Section 16170 – Process Control Panels and Hardware
		6. Section 16171 – Panel Mounted Devices and Instruments
		7. Section 15270 – Flow Meters
		8. Division 11 – Process Equipment
	2. SUBMITTALS
		1. Submit under provisions of Section 01300 and Section 16010.
		2. Product Data: Include list which indicates use, operating range, total range and location for manufactured components.
		3. Submit manufacturer's installation procedures under provisions of Section 01300.
		4. Complete submittal shall be provided to the engineer for approval prior to equipment fabrication. The submittal data shall include the following:

* + - 1. Product Data - Provide product data sheets for each instrument and component supplied in the system. The data sheets shall show the component name as used on reference drawings, manufacturer's model number or other product designator, input and output characteristics, scale or ranges selected, electrical or mechanical requirements, and materials compatibility.
			2. Shop Drawings - Provide drawings for each panel showing the wiring diagrams for control circuits and interconnections of all components. The drawings shall include wiring diagrams for all remote devices connected to the panel.
			3. Panel Layout Drawings - A front panel and sub-panel layout shall be included as part of each control panel drawing. Components shall be clearly labeled on the drawing.
			4. Installation Drawings - Typical installation drawings applicable to each site in the system shall be included.
			5. Operator Interface Software - The submittal shall include a generic but detailed technical description of the Operator's Interface Software as proposed for this system including:
				1. Sample text screens and menus
				2. Sample graphics screens
				3. Sample report logs and printed graphs
	1. MAINTENANCE INFORMATION
		1. Maintenance Data Manuals: Submit maintenance manuals and "as built" drawings on all items supplied with the system. The manuals and drawings are to be bound into one or more books as needed. In addition to "as built" engineering submittal data and drawings, the manual shall include trouble shooting guides and maintenance and calibration data for all adjustable items.
	2. JOB CONDITIONS
		1. All instruments and equipment shall be designed to operate under the environmental conditions where they are to perform their service. The equipment shall be designed to handle lightning and transient voltages as normal environmental hazards. The environmental conditions are as follows:
			1. Outdoor - The equipment will be exposed to direct sunlight, dust, rain, snow, ambient temperatures from -20 to +120 degrees F, relative humidity of 10 to 100 percent, and other natural outdoor conditions. The installations shall be hardened to with stand normal vandalism.
			2. Indoor - The equipment will be capable of operating in ambient temperatures of +32 to +130 degrees F and relative humidity of 20 to 100 percent.
	3. DELIVERY, STORAGE, & HANDLING
		1. All items shall be stored in a dry sheltered place, not exposed to the outside elements, until ready for installation. All items shall be handled with appropriate care to avoid damage during transport and installation.
	4. SEQUENCING & SCHEDULING
		1. Coordination: The Systems Integrator shall coordinate with other electrical and mechanical work including wires/cables, raceways, electrical boxes and fittings, controls supplied by others, and existing controls, to properly interface installation and commissioning of the control system.
		2. Sequence: Sequence installation and start-up work with other trades to minimize downtime and to minimize the possibility of damage and soiling during the remainder of the construction period.
	5. PROJECT RECORD DOCUMENTS
		1. Submit documents under provisions of Section 01700.
	6. DISTRIBUTED CONTROL OPERATION
		1. General: The control system shall use "Programmable Logic Controllers" (PLCs) at all locations in the system as detailed later in these specifications. Each site in the system shall have a unique digital address. The Central Processing Units (CPUs) and Input/output (I/O) cards used in each of the PLCs shall all be identical, fully interchangeable without reprogramming by the operator. The PLCs shall be "self-initializing" and "self-restoring” so that operator intervention is not required after power interruptions, transients from lightning storms, or component changes.

The system shall be composed of a Central Terminal Unit (CTU) that monitors the operation of multiple Remote Terminal Units (RTUs). The CTU shall be composed of a PLC (as described above) and one or more Operator Display Consoles (ODCs) with Human-Machine-Interface (HMI) software to display, alarm, record, all data received and for operator input for changes to the system.

The control system shall be capable of implementing multiple modes of communications in a single system to include radio, high-speed data highway, fiber optic, and Ethernet communications as details in these specifications.

* + 1. Standard Control Software Features: The supplied software shall not be a one-of-a-kind system, but rather a comprehensively designed software platform that provides a number of built in features that monitor local & remote inputs combined with standard software algorithms to provide an integrated system as follows:
			1. Monitor local Hand/Off/Automatic (HOA) selector switch positions (i.e. on existing pump control panels) and integrate the switch position in to the control logic such that a HOA in HAND or OFF shall be considered by the control system as 'un-available".
			2. Provide for communication of pressure, flow and related data readings sourced from existing and/or new equipment to designated locations to support operation of local equipment control panels.

# PRODUCTS

* 1. ENCLOSURES
		1. Enclosures shall be NEMA 1 for indoor and NEMA 4X for outdoor locations. Enclosure shall be fabricated from a minimum of 14-gauge cold rolled steel with a baked enamel finish in the manufacturer's standard color. Units shall include a single gasket front door. Hinges, locking hasp and door clamping hardware shall be included.
	2. INCOMING POWER REQUIREMENTS & UPS
		1. Controls shall operate from a source of 120 volts, 1 phase, 60 Hz. Each panel shall be accompanied with an uninterruptible power supply (UPS). The UPS shall condition the power as well as provide 500 VA of power during outages. A 6-amp control power circuit breaker shall be employed as both a method of equipment protection and as a means of power disconnection. The circuit breaker shall be a single pole, thermal, magnetic type with a 10,000 Amp Interrupt Current rating. The circuit breaker shall be UL listed.
	3. POWER SUPPLIES
		1. All DC power supplies required for operation shall be provided. Units shall provide sufficient voltage regulation and ripple control to assure powered components can operate within their required tolerances.
	4. TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS) – DATA COMMUNICATIONS AND SIGNAL WIRING
		1. The system manufacturer shall provide transient voltage and surge suppression for all PLC data communication devices whenever the communications cable is located outside the building in which the panel resides. This also applies to all outdoor panels with communications cables exiting the PLC panel enclosure. The TVSS unit shall be UL 497B listed. The TVSS unit shall have a maximum DC operating voltage of 9.6 VDC, a clamping voltage of 81V, and an 8 x 20 US surge current rating of 1000 amps.
		2. Transient voltage and surge suppression shall also be provided for 10-32 VDC instrumentation signal systems. The TVSS units shall be employed when the signal cable extends beyond the boundaries of the building in which the PLC panel is located. The TVSS unit shall be UL 497B listed. The TVSS unit shall have a maximum operating voltage of 32 VDC, a clamping voltage of 100V, and an 8 x 20 US surge current capability of 1000 amps.
		3. TVSS units shall be as manufactured by Leviton, Inc., of Little Neck, New York, Model 3803-485/DHP or equal for PLC communications and Model 3420-009/035 for 10-32 VDC signal wiring or equal.
	5. NETWORK DATA LINE SURGE SUPPRESSORS
		1. Provide transient surge suppressors for all leased telephone line, and Ethernet connections that are included as a part of this system. Unit shall have connection capabilities for RJ45, 100 BASE-T, 10 BASE-T, Token Ring, and RS-422 connections. The unit shall have a nominal clamping voltage of 7.5 volts and a Peak Pulse Current rating of 750 amperes. Unit shall be as manufactured by Tripp Lite, Inc., Model DNET-1 or equal.
	6. TELEPHONE LINE SURGE SUPPRESSORS
		1. Provide the following for all dial-up connected to data modems or automated alarm dialing equipment that are included as a part of this system. Unit shall have connection capabilities for RJ11 or RJ45. The unit shall have a nominal clamping voltage of 260 volts and a Peak Pulse Current rating of 1020 amperes. Unit(s) shall be as manufactured by Tripp Lite, Inc., Model DTEL2 or equal.
	7. HIGH SPEED DATA RADIOS (900MHZ MAS & 900MHZ SPREAD SPECTRUM)
		1. General
			1. Specific communications paths in the system may utilize a "high-speed data radio" to provide fast data update and control implementation. The radios shall operate in the 928-952MHz licensed frequency bands (or optionally in the unlicensed 900MHz Spread Spectrum Radio band). The radios shall provide half duplex or simplex operation as required by the control system.
			2. The high-speed data radios shall have integral digital data modems that provide 9600bps data transmissions with a 10mS data turn-around time. Connection to the RTUs shall be via a standard DB-25F connector with a RS-232 interface. The radios shall be synthesized and fully field programmable and include a built-in time-out timer to disable the transmitter. Programmability shall include transmit and receive frequency, output power, time-out timer (1-255sec or off), RTS-CTS delay (1-255mS), PTT delay (0-31mS), and squelch tail eliminator. The units shall be tuned to FCC specifications for the specific frequency assigned.
		2. Un-Licensed Spread Spectrum Data Radios
			1. The un-licensed data radios shall have 1-watt of output power and integral digital data modems to insure a high level of quality and reliability. The radios shall be adjustable to .6 watts output power as may be required by the FCC for ERP (Effective Radiated Power) restrictions. The high-speed data radios shall have integral digital data modems that provide 9600bps to 2mbps data transmissions with a 10mS data turn-around time. Connection to the RTUs shall be via a standard DB-9F RS232 (and/or optional RJ45 Ethernet) interface. All connections to the radio shall be plug-in. The data radios shall have the following specifications:

Transmitter:

RF output power 1 watt (adjustable to .6watt)

Spurs & Harmonics -65 dBc

Frequency stability ±0.00015% (-30 to +60 degrees C)

Emission 12F2 (with 5kHz DEV max)

Receiver:

Bit Error Rates (BER) 1x10-6 at -110dbm @ 9600 baud

 or 1x10-6 at -99dbm @ 256bps for Ethernet Radios

IF Selectivity -100 dB

Inter-modulation -75 dB

Frequency stability ±0.00015% (-30 to +60 degrees C)

Receive bandwidth 12kHz as required to match the transmitter

* + - 1. The data radios shall be Microwave Data Systems MDS Orbit or equal.
		1. Antenna & Coaxial Cable
			1. The radio antennas at all locations shall be a seven to nine element Yagi, constructed with 3/8" diameter solid aluminum rod elements and aluminum pipe element support with a type N coaxial connector. The antenna shall have a minimum 9.0db forward gain with a 20.0db front-to-back ratio. The antenna shall be wind rated for a 100-MPH wind speed. The antennas shall be MC-Yagi, Celwave PD688S, Celwave PD10108, or equal.
			2. Directional antennas shall be cabled to the transmitter enclosure connection by a Amphenol 9913 low loss (less than 4.3db per 100ft @ 900MHz) coaxial cable with semi-solid polyethylene dielectric or heliax cable as needed to maintain the required 20db of operational pad. The coaxial cable shall have a combination braided copper and aluminum foil shield with coverage of 100% and a long life weather resistant polyvinyl chloride jacket. The antenna coaxial cable connection shall be a constant impedance weatherproof Type N connector, taped with a weather resistant electrical tape to insure a lifetime watertight assembly. The coaxial cable shall be Belden 9913 cable or heliax type cable as needed.
			3. Omni-directional antennas used at data repeater sites shall be center-fed collinear antennas to insure consistent gain and impedance across the operating frequency band and provide a minimum of 7.5dBd gain. The antenna shall be constructed of copper alloy radiating elements encased in a weatherproof fiberglass low loss housing and permanently attached to a 6061-T6 aluminum support pipe. The Omni-directional antenna shall be a Celwave PD1109 or equal.
		2. Antenna Lightning Protection
			1. Coaxial connection to remote and central unit enclosures shall be by means of a type N coaxial type bulkhead lightning arrestor. The units shall be rated at 1 kilowatt with a minimum 500V and maximum 2000V-breakdown voltage. Coaxial lightning arrestors shall be a PD-395, r PolyPhaser IS-B50LU-CO, or equal.
		3. Antenna Mounting Systems
			1. Antennas shall be mounted at a height above ground that is consistent with FCC rules and regulations and provides adequate signal fade margin as described earlier. Antennas must be a minimum of 15 feet above ground and mounted as follows:
				1. Above Ground Structures: The antenna shall be mounted on a 10' long X 1-1/2" diameter galvanized mast with top mounted weather-head. The mast assembly shall be secured to the side of the building or equipment rack structure with Uni-strut clamps.
	1. INDUSTRIAL HMI FRONT PANEL TOUCH-SCREEN DISPLAY UNIT
		1. The HMI Front Panel Touch Screen Display Unit shall be a 19” (1920x1080 native resolution) diagonal backlit Color Active Matrix Display with Graphical Touch-Screen interface. The display shall have either a capacitive or 5-wire resistive touchscreen with a touch accuracy of 2mm. The unit shall have a “runtime” version of the SCADA HMI software installed in the Main HMI Computer. The unit shall automatically monitor all the PLCs in the network and receive expansion/revision updates from the Main HMI computer. The unit shall have a minimum of 8GB of RAM memory, 100GB HDD, serial communications port, parallel printer port, and a Gigabit Ethernet port. The operator interface shall be graphical and provide for display of all data monitored and operator input of setpoints and operating commands in the SCADA system. The Graphical Touch-screen unit shall be supplied and mounted on the front of the PLC enclosure if detailed in the specific PLC I/O requirement list. The unit shall maintain the Nema 4 rating of the PLC enclosure. The computer shall be a Dell OptiPlex 7060 mini with a Hope HIS-ML19.5 Industrial Touchscreen or equal.

# EXECUTION

* 1. FCC Licensing
		1. The system manufacturer/supplier shall be responsible for collecting all information, generating all paper work, and paying all fees required for modifying the license on behalf of the Owner.
	2. EQUIPMENT EXAMINATION
		1. The control system shall be completely tested prior to shipment. The entire control system shall be "Burned In" at the factory for a period of at least 20 days. The component equipment shall be computer tested and temperature cycled at zero degrees and at fifty degrees centigrade.
		2. All local indicators, transmitters and converters shall be inspected that the correct scales have been supplied.
		3. Inspect area to assure the locations for the equipment to be installed are suitable for their application.
	3. PREPARATION
		1. Contractor and System Integrator shall coordinate on installation of related components, verifying interface of equipment, scales, etc.
	4. SYSTEM START-UP
		1. The system manufacturer shall supply "Factory" personnel for start-up service as needed to insure satisfactory operation. Subsequent trips to the job site to correct defects shall be made at no charge to the Owner during the warranty period.
	5. TRAINING
		1. The manufacturer shall supply "Factory" personnel for start-up service as needed to insure satisfactory operation. The training shall be conducted include a minimum of two days of on-site training sessions. Subsequent trips to the job site to correct defects shall be made at no charge to the Owner during the warranty period.
		2. The initial training session shall be conducted during start-up as needed until the Owner and Engineer are satisfied that the operators are comfortable with the operation and maintenance of the system. Training shall be done on site with the Owner's personnel.
	6. SUBSTANTIAL COMPLETION
		1. The Engineer will recommend substantial completion to the Owner only after completion of the start-up and initial training phase of the project. The Engineer shall make an inspection of the system to determine the status of completion. Substantial completion will be awarded only when the system is providing usable service to the Owner. If the system is commissioned in phases, the Contractor may request substantial completion for the completed phases.
	7. WARRANTY/SUPPORT PROGRAM
		1. The control system manufacturer shall supply a five (5) year parts and labor warranty and comprehensive support program for all items and software supplied under this section (except as noted below). Power surges and lightning damage shall be included as part of the warranty.
		2. The warranty shall begin from the time of "substantial completion" as issued by the Engineer and Owner. The manufacturer shall provide a 24-hour response to calls from the Owner. The manufacturer, at his discretion, may dispatch replacement parts to the Owner by next-day delivery service for field replacement by the Owner. Any damage to the control system caused by the actions of the Owner in attempting these field replacements shall be the sole responsibility of the system manufacturer. If, during the warranty period, satisfactory field repair cannot be attained by field replacement of parts by the Owner, the system manufacturer shall dispatch "factory" personnel to the job site to complete repairs at no cost to the Owner.
		3. The support program shall begin from the time of "substantial completion" as issued by the Engineer and Owner. The support program shall include free updating of all software as needed and providing free phone support from the integrator throughout the warranty period.

# DETAILED EQUIPMENT DESCRIPTION

* 1. EQUIPMENT SUPPLY – GENERAL
		1. Panels and Enclosures: Panels and enclosures required for SCADA equipment are to be supplied by the System Integrator.
		2. Flow Meters/Level Sensors: Flow meters and/or level sensors specified as requiring interface are either existing or are to be supplied and installed by the Contractor. Requirements for SCADA system interface are to be coordinated with the System Integrator.
		3. PLC, Radio Telemetry Equipment, Antennas, etc.: All equipment required as a part of the SCADA system and necessary for communication between sites shall be supplied by the System Integrator.
	2. EQUIPMENT SCHEDULE – EX. OPERATIONS BUILDING (CTU)
		1. Radio: High Speed Data Radio (900mHz Spread Spectrum)
		2. Panel: Wall-mounted, located interior to the existing Operations Building.
		3. Antenna: The CTU antenna(s) shall be mounted on a 10' long X 1-1/2" diameter mast secured to the side of the WTP structure with rigid conduit and a weather-head run to the CTU-PLC enclosure. The antenna(s) should be mounted as close as possible to the CTU-PLC enclosure.
		4. I/O Requirements:
			1. Discrete Outputs:
				1. – 4) spares
			2. Discrete Inputs:
				1. Power Failure
				2. – 8) spares
			3. Analog Inputs:
				1. – 4) spares
		5. Ethernet IP Data Network
			1. The CTU Panel shall include an Industrial Ethernet Switch/Router. The Ethernet Switch shall be an N-Tron 708TX or approved equal.
		6. Front Panel Computer (ODC) Requirements:
			1. The Industrial Front Panel Computer and SCADA HMI software (as detailed earlier will be the primary control/monitoring/alarm station for the SCADA system.
			2. This computer/HMI Software will include all standard day-to-day operation duties, trending, and historical data collection.
		7. WTP SCADA System Interface
			1. The front panel computer and PLC present at the WWTP shall be configured to display low-level operational data available from the existing WTP SCADA Control System.
			2. The existing front panel computer and PLC present at the WTP shall be configured to display low-level operational data available from the existing WWTP SCADA Control System.
	3. OPERATION DESCRIPTION – EX. OPERATIONS BUILDING (CTU)
		1. No operations or control panel interface is proposed at the existing Operations Building at the time of initial system installation.
	4. EQUIPMENT SCHEDULE – EX. PUMP BUILDING (RTU 1)
		1. Radio: High Speed Data Radio (900mHz Spread Spectrum)
		2. Panel: Wall-mounted, located interior to the existing Pump Building, Main Level.
		3. Antenna: As required to interface with CTU (Ex. Operations Building).
		4. Front Panel Display Requirements:
			1. Keypad & Display assembly to display all inputs and output status.
		5. I/O Requirements:
			1. Discrete Outputs:
				1. – 4) spares
			2. Discrete Inputs:
				1. Power Failure
				2. Sump High Level Alarm
				3. – 8) spares
			3. Analog Inputs:
				1. Wet Well Level (LT2)
				2. – 4) spares
		6. Ethernet IP Data Network
			1. The CTU Panel shall include an Industrial Ethernet Switch/Router. The Ethernet Switch shall be an N-Tron 708TX or approved equal.
	5. OPERATION DESCRIPTION – EX. PUMP BUILDING (RTU 1)
		1. SCADA panel shall interface via an Ethernet connection with Influent Pump Control Panel located adjacent. Control logic for pump operation and equipment interface shall be resident within the Influent Pump Control Panel PLC.
		2. In addition to local I/O noted, data provided to the WWTP SCADA System for monitoring and alarms shall be as outlined within the specifications outlining the Influent Pump Control Panel.
	6. EQUIPMENT SCHEDULE – RAS PUMP STATION (RTU 3)
		1. Radio: High Speed Data Radio (900 MHz Spread Spectrum).
		2. Panel: Mounted on the Electric Service Panel assembly located adjacent to the RAS Pump Station. Exterior exposure.
		3. Antenna: As required to interface with CTU (Ex. Operations Building).
		4. Front Panel Display Requirements:
			1. Keypad & Display assembly to display all inputs and output status.
		5. I/O Requirements:
			1. Discrete Outputs:
				1. – 4) spares
			2. Discrete Inputs:
				1. Power Failure
				2. – 8) spares
			3. Analog Inputs:
				1. RAS Flow Rate / Total
				2. WAS Flow Rate / Total
				3. RAS Control Valve Position
				4. WAS Control Valve Position
				5. – 8) spares
		6. Ethernet IP Data Network
			1. The RTU Panel shall include an Industrial Ethernet Switch/Router. The Ethernet Switch shall be an N-Tron 708TX or approved equal.
	7. OPERATION DESCRIPTION – RAS PUMP STATION (RTU 3)
		1. SCADA panel shall interface via an Ethernet connection with RAS Pump Station Control Panel located at the site. Control logic for pump operation and equipment interface shall be resident within the RAS Pump Station Control Panel PLC.
		2. In addition to local I/O noted, data provided to the WWTP SCADA System for monitoring and alarms shall be as outlined within the specifications outlining the RAS Pump Station Control Panel.
	8. EQUIPMENT SCHEDULE – BLOWER AREA (RTU 2)
		1. Radio: High Speed Data Radio (900 MHz Spread Spectrum).
		2. Panel: Mounted on the Electric Service Panel assembly located adjacent to the Aerobic Digester Blowers. Exterior exposure.
		3. Antenna: As required to interface with CTU (Ex. Operations Building).
		4. Front Panel Display Requirements:
			1. Keypad & Display assembly to display all inputs and output status.
		5. I/O Requirements:
			1. Discrete Outputs:
				1. – 4) spares
			2. Discrete Inputs:
				1. Power Failure
				2. – 8) spares
			3. Analog Inputs:
				1. – 4) spares
		6. Ethernet IP Data Network
			1. The RTU Panel shall include an Industrial Ethernet Switch/Router. The Ethernet Switch shall be an N-Tron 708TX or approved equal.
	9. OPERATION DESCRIPTION – BLOWER AREA (RTU 2)
		1. SCADA panel shall interface via an Ethernet connection with Digester Blower Local Control Panel located at the site. Control logic for equipment operation and equipment interface shall be resident within the Digester Blower Local Control Panel PLC.
		2. SCADA panel shall interface via an Ethernet connection with the Oxidation Ditch Local Control Panel located remote from the site. Control logic for equipment operation and interface shall be resident within the Oxidation Ditch Local Control Panel PLC.
		3. In addition to local I/O noted, data provided to the WWTP SCADA System for monitoring and alarms shall be as outlined within the specifications outlining the Digester Blower Local Control Panel and the Oxidation Ditch Local Control Panel.
	10. EQUIPMENT SCHEDULE – SCREEN / PRESS BUILDING (RTU 4)
		1. Radio: High Speed Data Radio (900 MHz Spread Spectrum).
		2. Panel: Wall-mounted, interior to the Dewatering System Area in the Screen / Press Building.
		3. Antenna: As required to interface with CTU (Ex. Operations Building).
		4. Front Panel Display Requirements:
			1. Keypad & Display assembly to display all inputs and output status.
		5. I/O Requirements:
			1. Discrete Outputs:
				1. – 4) spares
			2. Discrete Inputs:
				1. Power Failure
				2. Main Power Fail (via ATS)
				3. Generator Run
				4. Generator Low Fuel
				5. Common Fault @ Generator
				6. Transfer Switch in Auto
				7. Transfer Switch Fault
				8. Smoke Alarm
				9. Combustible Gas Detector
				10. – 16) spares
			3. Analog Inputs:
				1. – 4) spares
		6. Ethernet IP Data Network
			1. The RTU Panel shall include an Industrial Ethernet Switch/Router. The Ethernet Switch shall be an N-Tron 708TX or approved equal.
	11. OPERATION DESCRIPTION – SCREEN / PRESS BUILDING (RTU 4)
		1. SCADA panel shall interface via an Ethernet connection with Press Control Panel located within the building. Control logic for equipment operation and equipment interface shall be resident within the Press Control Panel PLC.
		2. SCADA panel shall interface via an Ethernet connection with the Screen Control Panel located within the building. Control logic for equipment operation and interface shall be resident within the Screen Control Panel PLC.
		3. SCADA panel shall interface via an Ethernet connection with the Compost Blower Local Control Panel located exterior the building. Control logic for equipment operation and interface shall be resident within the Compost Blower Local Control Panel PLC.
		4. In addition to local I/O noted, data provided to the WWTP SCADA System for monitoring and alarms shall be as outlined within the specifications outlining the Press Control Panel, the Screen Control Panel and the Compost Blower Local Control Panel.
	12. EQUIPMENT SCHEDULE – UV AREA (RTU 5)
		1. Radio: High Speed Data Radio (900 MHz Spread Spectrum).
		2. Mounted on the Electric Service Panel assembly located adjacent to the UV Structure. Exterior exposure.
		3. Antenna: As required to interface with CTU (Ex. Operations Building).
		4. Front Panel Display Requirements:
			1. Keypad & Display assembly to display all inputs and output status.
		5. I/O Requirements:
			1. Discrete Outputs:
				1. – 4) spares
			2. Discrete Inputs:
				1. Power Failure
				2. UV System Monitor Bank #1 – Low UV Intensity Alarm
				3. UV System Monitor Bank #1 – Common Major Alarm
				4. UV System Monitor Bank #1 – Bank Status
				5. UV System Monitor Bank #2 – Low UV Intensity Alarm
				6. UV System Monitor Bank #2 – Common Major Alarm
				7. UV System Monitor Bank #2 – Bank Status
				8. Transfer Switch Fault
				9. – 16) spares
			3. Analog Inputs:
				1. Effluent Flow (LT3)
				2. – 4) spares
		6. Ethernet IP Data Network
			1. The RTU Panel shall include an Industrial Ethernet Switch/Router. The Ethernet Switch shall be an N-Tron 708TX or approved equal.
	13. OPERATION DESCRIPTION – UV AREA (RTU 5)
		1. SCADA panel shall interface via an Ethernet connection with the Post Air Blower Local Control Panel located at the site. Control logic for equipment operation and equipment interface shall be resident within the Post Air Blower Local Control Panel PLC.
		2. SCADA panel shall interface via an Ethernet connection with the River Pump Station Local Control Panel located at the site. Control logic for equipment operation and interface shall be resident within the River Pump Station Control Panel PLC.
		3. SCADA panel shall interface via an Ethernet connection with the Clarifier Local Control Panel located remote from the site. Control logic for equipment operation and interface shall be resident within the Clarifier Local Control Panel PLC.
		4. In addition to local I/O noted, data provided to the WWTP SCADA System for monitoring and alarms shall be as outlined within the specifications outlining the Post Air Blower Local Control Panel, the River Pump Station Control Panel and the Clarifier Local Control Panel.

END OF SECTION