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**PEA RIDGE PUBLIC SERVICE DISTRICT
CABELL COUNTY, WEST VIRGINIA**

**CONTRACT #1 – “A” PLANT WASTEWATER TREATMENT PLANT
UPGRADE**

ADDENDUM # 3

JULY 15, 2022

THRASHER PROJECT #020-1392

TO WHOM IT MAY CONCERN:

A Pre-Bid Conference was held on Wednesday, June 15, 2022, on the above-referenced project. The following are clarifications and responses to questions posed by contractors for the above reference project.

A. GENERAL

1. Davis Bacon Wage Rates have not been updated since issued in previous addendum.

B. SPECIFICATIONS

1. Specification 333219
2. Specification 461405

C. DRAWINGS

N/A

D. QUESTIONS AND RESPONSES

QUESTION

1. Revised 333219 partially specified a new control panel with a partial version of the Gorman-Rupp panel in 333218 but the level control sections are not there and there are no SCADA I/O for the Mission RTU.

RESPONSE

Specification 333219 has been revised to include level control and SCADA I/O information. A copy of the revised specification is included in this Addendum.

QUESTION

2. Revised 461405 does not list Mission Communications I/O called out in 401250 for the SBR RTU. Other systems were updated to include Mission I/O list.

RESPONSE

Specification 461405 has been revised to include SCADA I/O information. A copy of the Specification is included in this Addendum.

E. CLARIFICATIONS

1. N/A

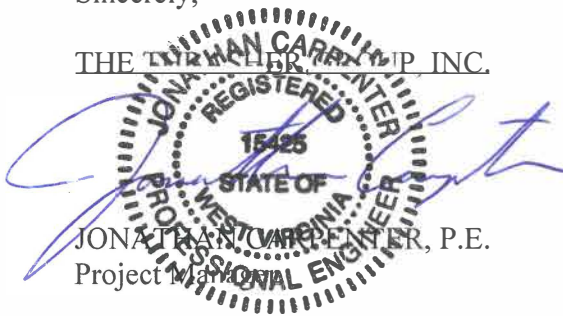
If you have any questions or comments, please feel free to contact me at your earliest convenience. As a reminder, bids will be received until 2:00 p.m. on July 20, 2022 at Pea Ridge Public Service District, 500 Nova St., Huntington, WV 25705. Good luck to everyone and thank you for your interest in the project.

Sincerely,

~~THE TYRMAN CARRUTHERS P. INC.~~

JONATHAN CARPENTER, P.E.
Project Manager

Enclosures:
Specifications Sections



SECTION 333219 – SUBMERSIBLE PUMP FOR EXISTING PLANT PUMP STATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Contractor shall furnish two (2) submersible non-clog wastewater pump to serve as a spare for the existing Plant Lift Station. The existing pumps are Flygt NP3127_185-422.

1.2 REFERENCE STANDARDS

- A. Design, manufacturing and assembly of elements of the equipment herein specified shall be accordance with the standards of the below listed organizations. Where reference is made to a standard of one of the following or other organizations, the version of the standard in effect at the time of the bid opening shall apply.

1. American Gear Manufacturing Association (AGMA)
2. American Institute of Steel construction (AISC)
3. American Iron and Steel Institute (AISI)
4. American Society of Mechanical Engineers (ASME)
5. American National Standards Institute (ANSI)
6. American Society for Testing Materials (ASTM)
7. American Water Works Association (AWWA)
8. American Welding Society (AWS)
9. Anti-Friction Bearing MANUFACTURERS Association (AFBMA)
10. Hydraulic Institute Standards
11. Institute of Electrical and Electronics Engineers (IEEE)
12. National Electrical Code (NEC)
13. National Electrical MANUFACTURERS Association (NEMA)
14. Occupational Safety and Health Administration (OSHA)
15. Steel Structures Painting Council (SSPC)
16. Underwriters Laboratories, Inc. (UL)

1.3 QUALIFICATIONS

- A. The equipment covered by these Specifications shall be standard units of proven ability as manufactured by competent organizations having long experience in the production of such equipment. The pumps shall be the standard cataloged product of **their** Manufacturer. The pumps furnished shall be designed, constructed and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed. Pumps shall be manufactured in accordance with the Hydraulic Institute Standards, except as otherwise specified herein.

- B. All Equipment furnished under this Specification shall be new and unused and shall be the standard product of Manufacturers showing a successful record of manufacturing and servicing the equipment and systems specified herein for a minimum of five (5) years.
- C. The Manufacturer shall be fully responsible for the design, arrangement and operation of all connected rotating components of the assembled pumping unit to ensure that neither harmful nor damaging vibrations occur within the specified operating range.

1.4 SUBMITTALS

- A. Copies of all materials required to establish compliance with the specifications shall be submitted in accordance with the provisions of Section 013000. The submittal format shall be in the form of a booklet, suitably tabbed and divided to cover at least the areas noted below for each major equipment item. The submittal booklet shall include adequate detail and sufficient information for the Engineer to determine that all of the equipment proposed meets the detailed requirements of the Specifications. Incomplete or partial submittals will not be reviewed. Submittals shall include at least the following:
 - 1. Certified shop and erection drawings showing all important details of construction, dimensions and anchor bolt locations.
 - 2. Descriptive literature, bulletins and/or catalogs of the equipment.
 - 3. Data on the characteristics and performance of each pump. Data shall include guaranteed performance curves, based on actual shop tests of similar units, which show that they meet the specified requirements for head, capacity and horsepower. Curves shall be submitted on 8 ½" by 11" sheets, at as large a scale as is practical. Catalog sheets showing a family of curves will not be acceptable.
 - 4. A complete total bill of materials of all equipment (may be furnished with Operation and Maintenance manuals specified under paragraph 1.5).
 - 5. A list of the Manufacturer's recommended spare parts, in addition to those specified, with the manufacturer's current price for each item, shall be supplied. Include gaskets, packing, etc. on the list. List bearings by the bearings manufacturer's numbers only.
 - 6. Complete motor and control systems data.
- B. A copy of this specification section and all referenced and applicable sections, with addendum updates included and with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements is required under this section. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a

number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Engineer shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

- C. Test Reports to be Submitted:
 - 1. A schedule of the date of shop testing and delivery of the equipment to the job site.
 - 2. Description of pump factory test procedures and equipment.
 - 3. Copies of all tests results, as specified.
- D. Complete operating and maintenance instructions shall be furnished for all equipment included under these specifications. The maintenance instructions shall include trouble shooting data and full preventative maintenance schedules and complete spare parts lists with ordering information.
- E. Submit the Manufacturer's Certificate of Installation, Testing and Instruction.
- F. In the event that it is impossible to conform with certain details of the specifications due to different manufacturing techniques, describe completely all non-conforming aspects.

PART 2- PRODUCTS

2.1 PUMP MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering submersible non-clogging pumps which may be incorporated in the work include, but are not limited to, the following:
 - 1. Flygt Corporation
- B. Pump Model – NP3127_185-422
 - 1. Impeller Diameter – 188 mm
 - 2. Horsepower – 7.5
 - 3. Voltage – 230
 - 4. Phase – 3
 - 5. Frequency – 60 HZ
 - 6. Rate Speed - 1750 RPM

2.2 GENERAL

- A. The equipment covered by these Specifications shall be standard units of proven ability as manufactured by reputable concerns having long experience in the production of such equipment. The equipment furnished shall be designed, constructed, and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed as shown on the Drawings.
- B. All equipment shall be designed and built for 24-hour continuous service at any and all points within the specified range of operation, without overheating, without cavitation, and without excessive vibration or strain.
- C. The pumping units required under this section shall be complete. All parts shall be so designed and proportioned as to have liberal strength, stability, and stiffness and to be especially adapted for the service to be performed. Ample room for inspection, repairs and adjustment shall be provided.
- D. Stainless steel nameplates giving the name of the Manufacturer, the rated capacity, head, speed and all other pertinent data shall be attached to each pump, motor, and control panel.
- E. All working parts of the pumps and motors, such as bearings, wearing rings, shaft, sleeves, etc., shall be standard dimensions built to limit gauges or formed to templates, such that parts will be interchangeable between like units and such that the Owner may, at any time in the future, obtain replacement and repair parts for those furnished in the original machines.
- F. The nameplate ratings of the motors shall not be exceeded, nor shall the design service factor be reduced when the pump is operating at any point on its characteristic curve at maximum speed.
- G. Mechanical equipment, including drives and electric motors shall be supplied and installed in accordance with applicable OSHA regulations. Stainless steel guards shall be installed on all rotation assemblies. The noise level of motors, unless otherwise noted, shall not exceed 85 dBA measured 3 meters from the unit under free field conditions while operating on utility power.
- H. All lubrication fittings shall be brought to the outside of all equipment so that they are readily accessible from the outside without the necessity of removing covers, plates, housings, or guards.

2.3 PUMP DESIGN

- A. The pumps shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the

discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor.

- B. The Owner and Engineer believe the following manufacturers are capable of producing equipment and products, which will satisfy the requirements of this Section. This statement, however, shall not be construed as an endorsement of a particular manufacturer's product, nor shall it be construed that a named manufacturer's standard product will comply with the requirements of this Section. It shall be the responsibility of the contractor to coordinate with the "selected" equipment manufacturer by use of this specification and all related design drawings for any necessary adjustments, modifications or alterations to standard products to ensure that the product complies with all sections of this specification.

2.4 PUMP CONSTRUCTION

- A. Major pump components shall be of grey cast iron, ASTM A-48, Class 35 B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.
- B. Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.
- C. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

2.5 COOLING SYSTEM

- A. Motors are sufficiently cooled by the surrounding environment or pumped media. A water jacket is not required.

2.6 CABLE ENTRY SEAL

- A. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical

elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

2.7 MOTOR

- A. The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and capable of up to 30 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (260°F) shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber containing the terminal board, shall be hermetically sealed from the motor by an elastomer compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding post permanently affixed to a terminal board. The motor and the pump shall be produced by the same manufacturer.
- B. The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics. The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out. The motor shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.
- C. The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The power

cable shall be of a shielded design in which an overall tinned copper shield is included and each individual phase conductor is shielded with an aluminum coated foil wrap. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

2.8 BEARINGS

- A. The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. Single row lower bearings are not acceptable.

2.9 MECHANICAL SEAL

- A. Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating, corrosion resistant tungsten-carbide ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary and one positively driven rotating, corrosion resistant tungsten-carbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable. For special applications, other seal face materials shall be available.
- B. The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.
- C. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. **The motor shall be able to operate dry without damage while pumping under load.**

- D. Seal lubricant shall be FDA - Approved, nontoxic.

2.10 PUMP SHAFT

- A. Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft shall be stainless steel, ASTM a479 S43100-T.
- B. If a shaft material of lower quality than stainless steel, ASTM A479 S431000-T, is used, a shaft sleeve of stainless steel (ASTM A479 S431000-T) is used to protect the shaft material. However, shaft sleeves only protect the shaft around the lower mechanical seal. No protection is provided for in the oil housing and above. Therefore, the use of stainless steel sleeves will not be considered equal to stainless steel shafts.

2.11 IMPELLER

- A. The impeller(s) shall be cast of (ASTM A-48, Class 35B gray iron or ASTM A-532 (Alloy III A) 25% chrome cast iron), dynamically balanced, semi-open, multi-vane, back-swept, non-clog design. The impeller vane leading edges shall be mechanically self-cleaned upon each rotation as they pass across a spiral groove located on a replaceable insert ring.
- B. (The ASTM A-48, Class 35B gray iron impeller(s) shall have vanes hardened to Rc 45 or The ASTM A-532 (Alloy III A) 25% chrome cast iron impeller shall have a hardness of Rc 55) and shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in waste water. The screw shape of the impeller inlet shall provide an inducing effect for the handling of sludge and rag-laden wastewater. The impeller shall be capable of momentarily moving axially upwards a distance of 15mm/0.6-in. to allow larger debris to pass through and immediately return to normal operating position.

2.12 VOLUTE/SUCTION COVER

- A. The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall have a guide pin integral to the casting and shall be cast of (ASTM A-48, Class 35B gray iron or ASTM A-532 (Alloy III A) 25% chrome cast iron) and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

2.13 PROTECTION

- A. All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. The thermal switches shall open at 125°C (260°F), stop the motor and activate an alarm.
- B. A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will stop the motor and send an alarm both local and/or remote. **Use of voltage sensitive solid state sensors and trip temperature above 125°C (260°F) shall not be allowed.**
- C. The thermal switches and FLS shall be connected to a Mini CAS (Control and Status) monitoring unit. The Mini CAS shall be designed to be mounted in any control panel.

2.14 ELECTRICAL COMPONENTS

A. Panel Enclosure

- 1. The electrical control equipment shall be mounted within a NEMA 4X stainless steel, dead front type control enclosure. The enclosure door shall be hinged and sealed with a neoprene gasket. It shall include a removable plated steel back panel on which control components shall be mounted. Back panel shall be secured to enclosure with collar studs. Operator controls shall be mounted on the enclosure door. The control panel shall be equipped with vapor emission type corrosion inhibitors.
- 2. All control components shall be securely fastened to a removable back panel with screws and lock washers. Switches, indicators and instruments shall be mounted through the control panel door. All control devices and instruments shall be secured to the sub-plate with machine screws and lock washers. Mounting holes shall be drilled and tapped; Self-tapping screws shall not be used to mount any components. All connections from the back panel to door mounted or remote devices shall be made through terminal blocks. All control devices shall be clearly labeled to indicate function.
- 3. A main terminal block and ground bar shall be furnished for field connection of the electrical supply. The connections shall be designed to accept copper conductors of sufficient size to serve the pump station loads. The main terminal block shall be mounted to allow incoming wire bending space in accordance with Article 373 of the National Electrical Code (NEC).

B. UL Label Requirement:

- 1. Pump station controls shall conform to third party safety certification. The panel manufacturer shall be certified to apply a serialized UL label listed for "Enclosed

Industrial Control Panels". The enclosure, and all components mounted on the sub-panel or control cover shall conform to UL descriptions and procedures.

C. Transient Voltage Surge Suppressor

1. The control panel shall be equipped with a modular surge arrester to minimize damage to the pump motors and control from transient voltage surges. The suppressor shall utilize thermally protected by heavy duty zinc-oxide varistors encapsulated in a non-conductive housing. Mechanical indicators shall be provided on each phase to indicate protection has been lost. The suppressor shall have a short circuit current rating of 200,000 Amps and a Maximum Discharge current rating [I_{max}] of 40,000 Amperes. Nominal discharge current [I_n] is 20,000 Amperes. Surge arrester according to UL 1449 3rd Edition, Type 2 component assembly.

D. Voltage Alert Indication

1. The control panel shall include a voltage alert indicator to reduce the risk of electrical arc flash by pre-verifying the electrical isolation from outside of the control panel. Hardwired to the main incoming point of termination, the indicator shall be powered by the same voltage that it indicates utilizing redundant circuitry, thereby flashing whenever voltage is present. An eight detector display shall visually alert the presence of dangerous AC or DC potentials occurring between any combinations of the monitored input lines.

E. Motor Branch Components

1. A properly sized heavy duty air circuit breaker shall be furnished for each pump motor, and shall have a symmetrical RMS interrupting rating of 10K amperes at 480 volts. All circuit breakers shall be sealed by the manufacturer after calibration to prevent tampering.
2. A padlocking operating mechanism shall be installed on each motor circuit breaker. Operator handles for the mechanisms shall be located on the door, with interlocks which permit the door to be opened only when circuit breakers are in the "OFF" position. An additional mechanism(s) shall be provided on the circuit breaker permitting the breaker to be operated and/or locked with the control panel door in the open position.
3. The inverter shall be suitable for operation of NEMA Design B, 4 pole motors. The inverter will have a diode bridge rectifier on the input to minimize the generation of electrical noise back into the line and provide near unity power factor. Output devices shall be transistors.

F. Environment Conditions

1. The inverter shall be capable of operation under any combination of the following

conditions without mechanical or electrical damage. Ambient Temperature: 0 to +40 degrees C

2. Relative Humidity: Less than 95% non-condensing
3. Altitude: Less than 1,000M (3300 ft) above sea level
4. Vibration: .006 inches displacement, 1G peak
5. Shock: 15G peak for 11mS (+/- 1.0mS)
6. Control Specification
7. Control System: Sinusoidal pulse width modulated voltage waveform
8. Frequency Accuracy: +/- 0.4% of max. frequency
9. Volts/Hertz Ratio: V/Hz user programmable
10. Operation Frequency: 0 to 400 Hz
11. Overload Capacity: 110% Overload capability for up to 1 minute, 150% Overload capability for up to 3 seconds

G. Digital Readout and Monitor

1. Interface to the drive is provided via a module with integral LCD display. Unit is a 7 line by 21 character backlit LCD display with graphics capability. It is used to display drive operating conditions, fault / alarm indications and programming information with full text support in multiple languages, including but not limited to English, German, French, Italian, Spanish, Portuguese and Dutch. The unit will display standby status (power on, not running), output frequency (drive run), set-up parameters and fault. With keypad, user can monitor current, voltage, frequency, acceleration and deceleration time, minimum frequency and maximum frequency. Readout also provides inverter status and protective circuit's status. HIM shall be mounted to the door of the enclosure.

H. Operational Functions:

1. Acceleration and deceleration time independently adjustable from 0.1 to 3600.0 seconds (selectable ranges).
2. Volts/Hertz patterns user selectable.
3. Maximum and minimum frequency limit adjustments.

I. Other Control Components

1. The pump control panel shall be equipped with a MiniCAS module for each pump to terminate pump operation due to high motor winding temperature or moisture in the motor housing or seal cavity, utilizing contacts in the pump motor housing and seal cavity. If a moisture or thermal event should occur, the motor starter will drop out and a visible indicator shall indicate the pump motor has been shut down. If shutdown is due to high motor temperature, motor power will automatically be restored when the temperature returns to normal range. If the shutdown occurs due to moisture, a manual reset will be required before motor power is restored. Dry contacts, wired to terminal blocks, shall be furnished for each pump for thermal/moisture shutdown.
 - a. The MiniCAS module is the basis of design. Control panel manufacturers not utilizing a MiniCAS module shall include a seal failure relay for each pump as alternates.
2. The control circuit shall be protected by a normal duty thermal- magnetic air circuit breaker which shall be connected in such a manner as to allow control power to be disconnected from all control circuits.
3. Pump mode selector switches shall be connected to permit manual start and manual stop for each pump individually, and to select automatic operation of each pump under control of the liquid level control system. Manual operation shall override the liquid level control system. Selector switches shall be heavy duty, oil-tight design, with contacts rated NEMA A300 minimum.
4. Pump alternation shall be integral to the liquid level controller. Provisions for automatic alternation or manual selection shall also be integral to the liquid level controller.
5. Control panel shall be equipped with one oil-tight pilot light for each pump motor. Light shall be wired in parallel with the related pump motor starter to indicate that the motor is on or should be running.
6. Six digit elapsed time meter shall be displayed on the Integrinex™ Standard operator interface to indicate total running time of each pump in "hours" and "tenths of hours". Pump runtime shall be adjustable, and password protected.
7. The panel shall be equipped with a 500 VA stepdown transformer to supply 115 volt, AC, single phase for the control. The transformer to be protected by a thermal magnetic circuit breaker, sized to meet the power requirements of the transformer.
8. The control panel shall be equipped to monitor the incoming power and shut down the pump motors when required to protect the motor(s) from damage caused by phase reversal, phase loss, voltage unbalance, high voltage, and low voltage. An adjustable time delay shall be provided to minimize nuisance trips. The motor(s)

shall automatically restart, following an adjustable time delay, when power conditions return to normal.

9. Pump Start Delay

- a. The control circuit for LAG pump shall be equipped with a time delay to prevent simultaneous motor starts.

10. Lag 2 Pump Lockout

- a. The control panel will prevent more than two (2) pumps from operating at a time.

11. Panel Heater

- a. The control panel shall be equipped with a panel heater to minimize the effects of humidity and condensation. The heater shall include a thermostat.

J. Wiring

- 1. The control panel, as furnished by the manufacturer, shall be completely wired. The contractor shall field connect the power feeder lines to the main terminal block, final connections to the remote alarm devices, and the connections between the pump and the pump motor control. All wiring, workmanship, and schematic wiring diagrams shall be in compliance with applicable standards and specifications set forth by the National Electric Code (NEC).
- 2. All user serviceable wiring shall be type MTW or THW, 600 volts, and shall be color coded as follows:
 - a. Line and load circuits, AC or DC power.....Black
 - b. AC control circuit less than line voltage.....Red
 - c. DC control circuit.....Blue
 - d. Interlock control circuit, from external source.....Yellow
 - e. Equipment grounding conductor.....Green
 - f. Current carrying ground.....White
 - g. Hot with circuit breaker open.....Orange
- 3. Control circuit wiring inside the panel, with the exception of internal wiring of individual components, shall be of 16 gauge minimum, type MTW or THW, 600 volts. Power wiring shall be 14 gauge minimum.
- 4. Motor branch and other power conductors shall not be loaded above the temperature rating of the connected termination. Wires shall be clearly numbered at each end in accordance with the electrical diagrams. All wires on the sub-plate shall be bundled and tied.

5. Wires connected to components mounted on the enclosure door shall be bundled and tied in accordance with good commercial practice. Bundles shall be made flexible at the hinged side of the enclosure. Adequate length and flex shall be provided to allow the door to swing to its fully open position without undue stress or abrasion on the wire or insulation. Bundles shall be held in place on each side of the hinge by mechanical fastening devices.

K. Conduit requirements are as follows

1. All conduit and fittings shall be UL listed.
2. Liquid tight flexible metal conduit shall be constructed of smooth, flexible galvanized steel core with smooth abrasion resistant, liquid tight, polyvinyl chloride cover.
3. Conduit shall be supported in accordance with articles 346, 347, and 350 of the National Electric Code.
4. Conduit shall be sized according to the National Electric Code.

L. Grounding

1. The pump control manufacturer shall provide a common ground bar mounted on the enclosure back plate. The mounting surface of the ground bar shall have any paint removed before making final connections.
2. The contractor shall make the field connections to the main ground lug and each pump motor in accordance with the National Electric Code.

M. Identification

1. A permanent corrosion resistant name plate(s) shall be attached to the control and include the following information:
 - a. Equipment serial number
 - b. Control panel short circuit rating
 - c. Supply voltage, phase and frequency
 - d. Current rating of the minimum main conductor
 - e. Electrical wiring diagram number
 - f. Motor horsepower and full load current
 - g. Motor overload heater element
 - h. Motor circuit breaker trip current rating
 - i. Name and location of equipment manufacturer

2. Control components shall be permanently marked using the same identification shown on the electrical diagram. Identification label shall be mounted adjacent to the device.
3. Switches, indicators, and instruments shall be plainly marked to indicate function, position, etc. Marking shall be mounted adjacent to and above the device.

2.15 LIQUID LEVEL CONTROL

- A. The manufacturer of the liquid level control system must be ISO 9001:2000 revision certified, with scope of registration including design control and service after sales activities.
- B. The level control system shall start and stop the pump motors in response to changes in wet well level, as set forth herein.
- C. The level control system shall be capable of operating as either an submersible transducer type system or ultrasonic transmitter type system.
- D. The level control system shall utilize alternation to select first one pump, then the second pump, then the third pump (if required), to run as lead pump for a pumping cycle. Alternation shall occur at the end of a pumping cycle, or in the event of excessive run time.
- E. The level control system shall utilize an electronic pressure switch which shall continuously monitor the wet well level, permitting the operator to read wet well level at any time. Upon operator selection of automatic operation, the electronic pressure switch shall start the motor for one pump when the liquid level in the wet well rises to the "lead pump start level". When the liquid is lowered to the "lead pump stop level", the electronic pressure switch shall stop this pump. These actions shall constitute one pumping cycle. Should the wet well level continue to rise, the electronic pressure switch shall start the second and/or third pump (if required) when the liquid reaches the "lag pump start level", or "standby pump start level" so that all pumps are operating. These levels shall be adjustable as described below.
 1. The electronic pressure switch shall include integral components to perform all pressure sensing, signal conditioning, EMI and RFI suppression, DC power supply and 120 volt outputs. Comparators shall be solid state, and shall be integrated with other components to perform as described below.
 2. The electronic pressure switch shall be capable of operating on a supply voltage of 12-24Vdc in an ambient temperature range of -10 degrees C (14 degrees F) through 55 degrees C (131 degrees F). Ingress Protection of IP56 for indoor use with closed cell neoprene blend gasket material. Evaluated by Underwriters Laboratories for Pollution Degree 2 device for U.L. and cU.L. Control range shall be 0 to 33.3 feet of water with an overall repeat accuracy of (plus/minus) 0.1 feet of water. Memory shall be non-volatile. A Battery backed real time clock shall be standard.

3. Eleven optically isolated, user defined digital inputs for pump and alarm status. Rated at 10mA at 24Vdc. Eight digital output relays (mechanical contacts), configurable for pump start/stop or alarms. Three relays rated at 12 Amp @ 28Vdc and 120Vac, five relays rated at 3 Amp @ 30Vdc and 120Vac. The electronic pressure switch shall consist of the following integral components: pressure, display, electronic comparators, digital inputs and digital output relays.
 - a. The internal pressure sensor shall be a strain gauge transducer and shall receive an input pressure from the air bubbler system. The transducer shall convert the input to a proportional electrical signal for distribution to the display and electronic comparators. The transducer output shall be filtered to prevent control response to level pulsations or surges. The transducer range shall be 0-14.5 PSI, temperature compensated from -40 degrees C (-40 degrees F) through 85 degrees C (185 degrees F), with a repeat accuracy of (plus/minus) 2.5% full scale about a fixed temperature. Transducer overpressure rating shall be 3 times full scale.
 - b. The electronic pressure switch shall incorporate a digital back lighted LCD panel display which, upon operator selection, shall indicate liquid level in the wet well, and pump status indication for up to 3 pumps. The display shall include a 128 x 64 bit resolution LCD to read out directly in feet of water, accurate to within one-tenth foot (0.1 foot), with a full scale indication of not less than 12 feet. The display shall be easily convertible to indicate English or metric units.
 - c. Level adjustments shall be electronic comparator set-points to control the levels at which the lead, lag and standby pumps start and stop. Each of the level settings shall be easily adjustable with the use of membrane type switches, and accessible to the operator without opening any cover panel on the electronic pressure switch. Controls shall be provided to permit the operator to read the selected levels on the display. Such adjustments shall not require hard wiring, the use of electronic test equipment, artificial level simulation or introduction of pressure to the electronic pressure switch.
 - d. Each digital input can be programmed as pump run, pump HOA, pump high temp, pump moisture/thermal, starter failure (FVNR, RVSS, VFD), and phase failure. Inputs are used for status and alarm indication.
 - e. Each output relay in the electronic pressure switch shall be hard contact mechanical style. Each relay input shall be optically isolated from its output and shall incorporate zero crossover switching to provide high immunity to electrical noise. Each output relay shall have an inductive load rating equivalent to one NEMA size 3 contactor. A pilot relay shall be incorporated for loads greater than a size 3 contactor.

4. The electronic pressure switch shall be equipped with alarm banners with time and date history for displaying alarm input notification. Alarm history will retain a 16 of the most recent alarm events.
5. The electronic pressure switch shall be equipped with pump start/stop and alarm input delay(s) that have an adjustable delay set points.
6. An Antiseptic function with a built in timer shall be incorporated in the electronic pressure switch to prevent the well from becoming septic.
7. The electronic pressure switch shall be capable of jumping to next available pump if current pump is out of service due to pump failure or manual selection. Circuit design in which application of power to the lag pump motor starter is contingent upon completion of the lead pump circuit shall not be acceptable.
8. The electronic pressure switch shall be equipped with a simulator system capable of performing system cycle testing functions.
9. The electronic pressure switch shall be capable of calculating and displaying pump elapse run time. The elapse run time is resettable and adjustable.
10. The electronic pressure switch shall have internal capability of providing automatic simplex, duplex, and triplex alternation, manual selection of pump sequence operation, and alternation in the event of 1-24 hours of excessive run time.
11. The electronic pressure switch shall be equipped with a security access code to prevent accidental set-up changes and provide liquid level set-point lock-out. The supervisor access code is adjustable.
12. The electronic pressure switch shall be equipped with one (1) 0-33 ft. W.C. input, one (1) scalable analog input of either 0-5Vdc, or 4-20mA, and one (1) scalable analog output of either 0-5Vdc, 0-10Vdc or 4-20mA. Output is powered by 10-24Vdc supply. Load resistance for 4-20mA output shall be 100-1000 ohms.
13. The electronic pressure switch shall include a DC power supply to convert 120Vac control power to 12 or 24Vdc power. The power supply shall be 500 mA (6W) minimum and be UL listed Class II power limited power supply.
14. The electronic pressure switch shall be equipped with an electronic comparator and mechanical output relay to alert maintenance personnel to a high liquid level in the wet well. An alarm banner, visible on the front of the controller, shall indicate that a high wet well level exists. The alarm signal shall be maintained until the wet well level has been lowered and the circuit has been manually reset. High water alarm shall be furnished with a dry contact wired to terminal blocks.

15. The electronic pressure switch shall be equipped with an electronic comparator and mechanical output relay to alert maintenance personnel to a low liquid level in the wet well. An alarm banner, visible on the front of the controller, shall indicate that a low wet well level exists. The alarm signal shall be maintained until the cause for the low wet well level has been corrected and the circuit has been manually reset. A low liquid level condition shall disable all pump motors. When the wet well rises above the low level point, all pump motors shall be automatically enabled. Low water alarm shall be furnished with a dry contact wired to terminal blocks.
 16. Integrinex Standard Analog Output circuit will be furnished with transient voltage surge suppression to protect related equipment from induced voltage spike from lighting.
- N. An alarm silence pushbutton and relay shall be provided to permit maintenance personnel to de-energize the audible alarm device while corrective actions are under way. After silencing the alarm device, manual reset of the alarm condition shall clear the alarm silence relay automatically. The pushbutton shall be a membrane style button integral to the Integrinex Standard level controller.
- O. Submersible Transducer System
1. The level control system shall utilize a submersible transducer. It shall be a strain gauge transducer with a pressure sensor housed in a 316 SST or Titanium case designed to extend into the wet well. The pressure transducer shall provide a proportional signal for distribution to the display and electronic comparators of the electronic pressure switch, and remainder of the level control system. Sensor range shall be 0-12 ft. W.C. minimum with an over-pressure rating 3 times full scale. The transducer shall have output capability of 0-5Vdc or 4-20mA. The transducer's polyurethane jacketed shielded cable shall be 50 feet for proper installation into the wet well without splicing.
 2. An intrinsically safe repeater shall be supplied in the control enclosure. Repeater must be recognized and listed as intrinsically safe by a nationally recognized testing laboratory. Station manufacturer shall make all connections from repeater to feeder lines and motor controls. Installing contractor shall make connections from repeater to transducer.
 3. Submersible transducer will be furnished with transient voltage surge suppression to protect related equipment from an induced voltage spike from lighting.
- P. Alarm Light
1. Station manufacturer will supply one 115 volt AC alarm light fixture with vapor-tight red globe, guard, conduit box, and mounting base. The design must prevent rainwater from collecting in the gasketed area of the fixture, between the base and globe. The alarm light shall be mounted on the control enclosure.

Q. Alarm Flasher

1. The alarm light circuit shall be equipped with a repeat cycle timer causing the alarm light to flash. Flash rate shall be approximately 1 second. (1/2 second on and off).

R. Control system spare parts

1. One (1) spare level transducer shall be provided with 50' of cable.
2. Ten (10) each size fuse and bulb

2.16 REMOTE MONITORING SYSTEM INTERFACE

A. A dedicated terminal strip will provide the following status and alarm contacts for the plant SCADA System. Digital status contacts shall be N.O. dry contacts. Analog outputs shall be surge protected 4-20 mA signals.

1. Pump 1 running
2. Pump 2 running
3. Pump 3 running
4. Pump 1 any fault
5. Pump 2 any fault
6. Pump 3 any fault
7. Utility power fault
8. Digital high water alarm
9. Digital low water alarm
10. Analog wet well level as 4-20 mA

PART 3 – EXECUTION

3.1 PRODUCT HANDLING

- A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation.
- B. All equipment and parts must be properly protected against any damage during a prolonged period at the site.
- C. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer.
- D. Finished surfaces of all exposed pump openings shall be protected by wooden blanks, strongly built and securely bolted thereto.

- E. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.
- F. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.
- G. Each box or package shall be properly marked to show its net weight in addition to its contents.

3.2 INSTALLATION

- A. The pump shall be installed by the Owner.

3.3 SHOP PAINTING

- A. Before exposure to weather and prior to shop painting, all surfaces shall be thoroughly cleaned, dry and free from all mill-scale, rust, grease, dirt and other foreign matter.
- B. All exposed portions of the pumps and motors shall be shop primed, with primer compatible with field painting as specified.
- C. All nameplates shall be properly protected during painting.

3.4 INSPECTION AND TESTING

- A. General
 - 1. The Engineer shall have the right to inspect, test or witness tests of all materials or equipment to be furnished under these specifications, prior to their shipment from the point of the manufacture.
 - 2. The Engineer shall be notified in writing prior to initial shipment, in ample time so that arrangements can be made for inspection by the Engineer.
 - 3. Field tests shall not be conducted until such time that the entire installation is complete and ready for testing.
- B. Factory Pump Tests
 - 1. Factory testing in accordance with the standards of the Hydraulic Institute shall be required for all pumps. All pumps shall be witness tested by the pump Manufacturer in the presence of the Engineer. All witness travel and out-of-

pocket expenses shall be provided by and included in the Contractor's bid price.

2. Certified pump performance curves shall be submitted, including head, capacity, and brake horsepower, for each pump supplied.
3. Prior to conducting a pump test, notification of such test and a list of test equipment and test procedures shall be forwarded to the Engineer at least ten working days before the schedule test date. All electronic transducers, meter, gauges, and other test instruments shall have been calibrated in accordance with the requirements of the Hydraulic Institute Standards. Copies of calibration data shall be provided.
4. All pumps shall be tested at full speed and complete staging through the specified range of flow, and head/capacity/efficiency curves plotted at maximum output speed. During each test, the pump shall be run at each head condition for sufficient time to accurately determine discharge, head, power input, and efficiency.
5. If any pump tested fails to meet any specification requirement, it will be modified until it meets all specification requirements. If any pump tested fails to meet the efficiency requirements at any of the listed flow or head conditions listed and all reasonable attempts to correct the inefficiency are unsuccessful, the pump(s) shall be replaced with units(s) which meet the specified requirements.

C. Field Inspection and Owner Instruction

1. The Contractor shall furnish the services of the Manufacturer's field service technician, who has complete knowledge of proper operation and maintenance of the equipment, for a period of not less than two (2) days to inspect the installed equipment, supervise the initial test run, and to provide instruction to the plant personnel. The first visit shall be checking and inspecting the equipment after it is installed. The second visit will be to operate and supervise the initial field test.
2. At least one (1) of the two (2) days shall be allocated solely to instruction of plant personnel in operation and maintenance of the equipment. The instruction period shall be scheduled at least ten (10) days in advance with the Owner and shall take place prior to start up and acceptance by Owner. The final copies of operation and maintenance manuals specified must be delivered to the Engineer prior to scheduling the instruction period with the Owner with the permission of the Engineer, these services may be combined with those specified by Paragraph 1.5.

D. Field Pump Tests

1. In the presence of the Engineer, such tests as necessary to indicate that the pumps and motors conform to the operating conditions specified shall be performed. A 30-day operating period of the pumps will be required before acceptance. If a pump performance does not meet the specified requirements, corrective measures

shall be taken. All test procedures shall be in accordance with factory test procedures specified above and certified results of tests shall be submitted. Provide, calibrate and install all temporary gauges and meters, make necessary tapped holes in the pipes, and install all temporary piping and wiring required for the field acceptance tests. Written test procedures shall be submitted to the Engineer for approval 30 days prior to testing.

2. Noise and vibration tests shall be conducted in conformance with the Hydraulics Institute Test Codes and OSHA Standards of Occupational Noise Exposure. Maximum allowable noise level, corrected for background sound, shall not exceed 85 dBA when measured at a horizontal distance of 3 meters from the equipment being tested, at a height of 3 meters above floor level. The actual natural frequency of the installed pumping units shall be verified using industry accepted procedures.
3. All pumps operating settings, alarms, controls, and shutdown devices shall be calibrated and tested during the field tests.
4. The Contractor shall furnish all power, water, facilities, labor, materials, supplies and test instruments required to conduct field test.
5. Deliver to the Engineer, upon completion of satisfactory testing of the equipment, reports as specified in Part 1.

3.8 WARRANTY

- A. Pumping and all associated equipment shall be provided with a 5-year extended warranty from the date of substantial completion.

3.9 DELIVERY, STORAGE AND HANDLING

- A. The Manufacturer shall furnish and deliver all equipment, freight prepaid to job site located at 500 Nova Street, Huntington, WV.
- B. All equipment shall be delivered with all required protective packaging to prevent any damage from transportation. Each container shall be clearly marked with contents contained inside.
- C. The Contractor shall be responsible for all off-loading and deliver to the Owner.

END OF SECTION 333219

SECTION 461405 – SEQUENCING BATCH REACTOR (SBR) EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This section contains the requirements for Sequencing Batch Reactor (SBR) equipment for the treatment of wastewater. This section also includes Post-EQ Basin equipment.
- B. This section also specifies the overall performance requirements and operation of the SBR treatment equipment.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 013300 – Submittal Procedures.
- B. Product data for the SBR equipment and accessories.
- C. Shop Drawings: Submit plans, elevations, and details for work not fully shown by product data; include rough-in dimensions and service connection details.
- D. Design Calculations: The equipment manufacturer shall submit calculation verifying the design of the proposed SBR system.
- E. A copy of this specification section and all referenced and applicable sections, with addendum updates included and with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements is required under this section. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Engineer shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

1.3 SYSTEM SOURCE & QUALITY ASSURANCE

- A. Basis of Design: The Drawings and Specifications have been developed based on SBR equipment manufactured by Aqua-Aerobic Systems, Inc. of Rockford, Illinois. Any costs resulting from changes made necessary by the approval of other SBR equipment shall be borne by the Contractor. This shall include all design work and drawing and specification revisions by the Engineer. Also, the Contractor shall submit drawings to the Engineer for approval showing all changes made necessary by the other equipment.

- B. The SBR System shall be supplied by a company of good reputation that is regularly engaged in the manufacture and fabrication of SBR wastewater treatment systems. The manufacturer's experience shall include a minimum of ten (10) installations where equipment of similar size and design has been in operation successfully in a similar process for a minimum of five (5) years. As a minimum, the supplier shall be the manufacturer of the following components: mixers, decanters, retrievable diffuser, and controls.
- C. The Contractor shall assign full responsibility for the functional operation of all SBR System components to a Single Source Supplier. This Supplier shall be responsible for all engineering necessary in order to select, furnish, inspect the installing contractor's equipment installation and connections, calibrate, and place into operation the SBR System along with all other equipment and accessories as specified herein.

1.4 ELECTRICALLY ACTUATED VALVE QUALITY ASSURANCE

- A. Actuated valves shall be tested to Aqua-Aerobic Systems test protocol prior to shipment. Testing shall consist of the following:
 - 1. Project and nameplate data verification per assembly documentation.
 - 2. Limit switch and torque switch setup and cycle test.
 - 3. Hydrostatic test (two pressurization cycles) for all plug and butterfly valves.

1.5 MIXER QUALITY ASSURANCE

- A. The floating mixer(s) shall be shop inspected and tested prior to shipment. Testing shall consist of the following:
 - 3. Project and nameplate data verification per assembly documentation.
 - 2. Dynamic balancing.
 - 3. Final inspection.

1.6 CONTROL PANEL QUALITY ASSURANCE

- A. All Control panels shall be UL certified. Testing by manufacturer's electrical engineering prior to releasing for shipment shall be completed. Testing shall consist of the following:
 - 1. Point to point testing of all wiring prior to application of power.
 - 2. Intended supply voltage shall be applied to the enclosure.
 - 3. All components shall be tested for proper operation and calibration.
 - 4. The PLC and operator interface program shall be loaded and functionally checked.
 - 5. All components shall be checked to confirm proper mounting specifications have been followed.
 - 6. Enclosure shall be inspected for defects and repaired if necessary.
 - 7. All labeling of wires and devices are correct, properly installed and clean.
- B. The manufacturer shall finalize the factory checkout by completing a control panel checklist to document all testing completed above.

- C. Upon the successful completion of the control testing of the enclosure assembly, all applicable documentation (i.e. finalized drawing set, signed control checklist cover page, device data sheets, etc.) shall be placed in the drawing pocket of the enclosure.

1.7 MOTOR COMPLIANCE

- A. Motors shall be in compliance with the Energy Independence and Security Act of 2007 (EISA 2007).

1.8 SPECIFICATION PRECEDENCE

- A. The specifications for equipment and controls under this section supersede specifications for equipment and controls specified elsewhere in the contract documents and drawings. Purchased components such as gear reducers, pumps, motors, valves, and actuators shall be provided with standard recommended manufacturers paint, unless otherwise specified within this section.
- B. The SBR area electrical classification shall be Nonclassified. Motors within the basin shall be rated for a temperature code T2A (280 Deg.C).

1.9 WARRANTY

- A. The Manufacturer shall provide a written warranty against defects in materials and workmanship. Manufacturer shall warrant the goods provided by the Manufacturer to be free from defects in materials and workmanship under normal conditions and use for a period of one (1) year from the date of Substantial Completion. This warranty shall not apply to any goods or part which has been altered, applied, operated or installed contrary to the Manufacturer's instructions or subject to misuse, chemical attack/degradation, negligence or accident.

1.10 SBR FUNCTIONAL REQUIREMENT

- A. The manufacturer of the SBR system shall be completely responsible for the proper design of their system, including but not limited to; diffused aeration equipment, transfer pumps, mixers, decanters, and controls. All equipment shall perform as specified and the completed installation shall operate in accordance with the requirements of the plans and specifications.
- B. As an alternate to the specified AquaEndura maintenance free unit herein specified, the manufacturer shall supply one (1) complete power section for each AquaEndura unit specified. The power section shall include a motor and shaft section, diffusion head or motor base and propeller complete and assembled. The complete power section shall include storage protection and motor space heaters.
- C. The aeration system is defined as the aeration device working in conjunction with a mixer. The aeration system shall be designed to provide oxygen distribution to the entire basin. It shall also ensure mixing to promote suspension of all biological solids in the basin without the introduction of air. No change in the basin geometry shall be allowed. The velocity and mixing in the basin shall be sufficient to ensure complete biological solids suspension and dispersion.
- D. The aeration system for the aeration basins shall be capable of providing mixing such that when

operated under any combination of the specified design conditions it shall suspend all biological floc and mixed liquor suspended solids throughout the liquid mass in each basin. The aeration system shall further be capable of maintaining complete aerobic conditions and suspension of all biological floc and suspended solids throughout the liquid mass in each basin.

1.11 PERFORMANCE AND DESIGN STANDARDS

A. The equipment furnished under this section shall be a complete SBR treatment system.

The jobsite conditions are:

1.	Average Daily Flow	3.0 MGD		
	Max. Daily Flow	6.0 MGD		
2.	<u>Design Loadings</u>		<u>Influent</u>	<u>Effluent</u>
	BOD		250 mg/l	16 mg/l
	TSS		250 mg/l	30 mg/l
	TKN		25 mg/l	
	NH ₃ -N			3.5 mg/l
	Phosphorus		8 mg/l	
3.	Wastewater temperature			
	Minimum		50°F	
	Maximum		68°F	
4.	Ambient air temperature			
	Minimum		35°F	
	Maximum		87°F	
5.	Jobsite elevation		569 feet MSL	
6.	Alpha (maximum value allowed)		0.85	
7.	Beta (maximum value allowed)		0.95	
8.	F/M ratio		0.086 lb BOD ₅ /lb MLSS - Day	
9.	MLSS at low water level		4500 mg/l	
10.	Maximum Cycles at Max. Daily Flow		5/day/basin	
11.	Oxygen Requirements		1.25 lbs O ₂ /lb BOD ₅ applied	
			4.60 lbs O ₂ /lb NH ₃ -N applied	
12.	Minimum Hourly AOR		445.7 lbs O ₂ /hr	
13.	Actual Oxygen Required		10,696 lbs/day	

- | | | |
|-----|-----------------------|--------------------------------------|
| 14. | Air Flowrate/Basin | 3,116 SCFM |
| 15. | Minimum Aeration Time | 2.4 hrs/cycle at maximum daily flow |
| | Minimum Mixing Time | 2.98 hrs/cycle at maximum daily flow |
| | Minimum Settling Time | 0.75 hrs/cycle at maximum daily flow |

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include but are not limited to the following:
1. Aqua-Aerobic Systems, Inc.
 2. Alfa Laval

2.2 SBR STRUCTURE

- A. The SBR system shall be field erected in two basins as shown on the Drawings:

1. Basin Quantity: 2
2. Inside Dimensions: 100 ft. x 100 ft.
3. Side Water Depth:
 - a. Minimum Operating Level: 13.0 ft. SWD
 - b. Maximum Operating Level: 21.0 ft. SWD
 - c. Top of Wall: 23.0 ft.

B. INFLUENT PLUG VALVE

1. Furnish electrically operated flanged plug valve(s) for each basin to control the influent flow.

Valve Quantity	1 per Basin
Valve Size	20 inch
Valve Model	Milliken 601
Actuator	Auma
Actuator Power	Three (3) Phase
Actuator Type	Open/Close Service
Compartment House	Yes
2. Valves shall be a 125# flanged end connection, ASTM A-126 Class B cast iron body with welded in nickel seat, coated non-lubricated ductile or cast iron plug with 80 % port opening, assembled and tested with an electric actuator. Valve actuator shall include motor winding protection, manual override, and limit switch feedback in the open and closed position. Actuator(s) include local controls consisting of pushbutton(s), selector

switch(es), and light(s). Field wiring and junction/box disconnect shall be provided by the installing contractor.

C. ENDURA® SERIES DDM MIXER

1. Furnish AquaDDM® mechanical floating mixer(s) and related equipment accessories as described herein for each new basin. Each mixer shall consist of a motor, direct-drive impeller driven at a constant speed, an integral flotation unit, and impeller volute. The Endura Series shall incorporate design enhancements that provide for three (3) years without routine maintenance (greasing).

Mixer Quantity	1 per Basin
Mixer Properties	
Zone of Complete Mix	100 ft x 100 ft
Direct Pumping Rate	25,100 gpm
Recirculation Rate	830,000 gpm
MLSS	4500 mg/l or less
Motor	
Size	50 HP
RPM	900 RPM
Efficiency	Premium
Mounting Base Materials	304 SS
Float	
Diameter (minimum)	114.5 inches
Shell Material	304 SS
Impeller Volute Material	304 SS

2. PERFORMANCE

- a. Each mixer shall meet the requirements summarized above. Complete mix shall be defined as maintaining biological suspension of all mixed liquor suspended solids with the specified MLSS concentration without the introduction of air.

3. MIXER DRIVE MOTOR

- a. The motor shall be vertical P base design, totally enclosed fan cooled TEFC, and generally rated for severe duty. The motor shall in all cases equal or exceed standard NEMA specifications. A minimum service factor of 1.15 shall be furnished.
- b. The motor winding shall be nonhygroscopic, and insulation shall equal or exceed NEMA Class "F". A lip seal shall be provided below the bottom bearing to prevent moisture from penetrating around the motor shaft. A condensate drain shall be located at the lowest point in the lower-end bell housing. Unit shall have a one-piece motor shaft continuous from the top motor bearing, through the lower bearing and down to and through the propeller. The shaft shall be manufactured from 17-4 PH stainless steel.
- c. Motor bearings shall be regreasable. Sealed bearings are not acceptable. Top bearing shall be shielded on the bottom side only. Bottom bearing shall be open. The top and bottom motor bearings shall be of combined radial and axial thrust

type. The lower motor bearing inner brace shall be locked to the motor shaft via a special washer and locking nut arrangement. The shaft shall be threaded just below the lower bearing and shall have a keyway cut into the motor shaft. This key shall accept a tab from the inner diameter of the locking washer, and the locking nut shall have recesses to accept a tab from the outer diameter of the locking washer to prevent the nut from backing off. Snap ring type bearing retainers will not be acceptable.

- d. Submerged motors, jet pumps, submerged gear motors or gearboxes shall not be acceptable.

4. MOTOR MOUNTING BASE

- a. The motor shall be securely mounted onto a solid 304 stainless steel base which is integral with the motor base extension. All submersed wetted motor mounting base components shall be constructed of 304 stainless steel.
- b. The upper portion of the motor mounting base, immediately below the lower motor bearing, shall include two independent acting air seals. The two seals shall be capable of sealing off the flow of air from the suction action of the pumped flow, and prevent backflow of liquid during impeller reversal. The lower end of the motor base extension shall be provided with a rotating backflow seal that will prevent grit from being introduced into the anti-deflection insert reservoir, but shall allow liquid to contact the shaft. The backflow seal shall not require scheduled lubrication or maintenance.

5. FLOATATION

- a. Each unit shall be equipped with a modular float with a central float passage of a size to allow installation and removal of the pump impeller. The float shall be foamed full of polyurethane foam of the closed cell type, and shall be totally sealed to prevent the foam from being in contact with the external environment.

6. IMPELLER

- a. The impeller shall be designed to pump the liquid from near the surface and direct it down toward the vessel/basin bottom. The impeller shall be a two-blade marine type precision casting of 316 or 15/5 stainless steel and shall be specifically designed for the application intended. It shall be dynamically and hydraulically balanced. The propeller must be attached to the motor shaft with a hardened stainless steel pin and set screw. Impeller shall be capable of being reversed to cause back flow liquid movement without causing damage to the mixer chassis and without causing upflow liquid damage to the motor bearing and windings. No liquid spray or other liquid leakage upward onto the surface of the motor support surface or flotation chassis will be allowed.

7. INTAKE VOLUTE ASSEMBLY

- a. The impeller shall operate in a volute made of 304 stainless steel plate, minimum 3/16 inch thick.

8. VIBRATION

- a. The entire rotating assembly including the motor rotor, shaft, shaft accessories, and impeller shall be dynamically balanced within 2.0 mils peak-to-peak horizontal displacement measured at the upper and lower motor bearing. Measurements shall be taken at a frequency equivalent to the motor RPM. Measurements shall be taken with the motor in a vertical, shaft down position with the entire power section mounted on resilient pads.

9. MOORING SYSTEM

- a. Each unit shall be provided with a mooring system, as described below:

Mooring Type	Cable
Mooring Point Quantity	Four (4)
Cable Mooring	
Cable Material	304 SS
Hardware/Anchor Material	304 SS
Anchor Supply	By SBR System Manufacturer
Power Cable Size	#2-four Conductor

10. CABLE MOORING SYSTEM

- a. Each unit shall be provided with a maintenance cable mooring system complete with mooring cable, clips, thimbles, quick disconnects, anchors (if necessary), and extension springs as shown on the drawings. Field attachment of mooring points to the tank shall be the responsibility of the installing contractor.

11. CABLE MOORING ELECTRICAL SERVICE CABLE

- a. Each unit shall include power cable wired into the motor conduit box and terminating at the basin wall. Electrical cable shall be supplied with kellems grips at the motor and basin wall terminations. Electrical cable(s) shall be attached with cable ties provided by the equipment supplier. Attachment of cable and supply of junction box/disconnect at the basin wall shall be the responsibility of the installing contractor.

D. DECANTER ASSEMBLY

- 1. Furnish floating decanter(s) and related equipment accessories as described herein for each basin. Each decanter shall consist of an integral flotation unit, a stainless steel movable weir assembly, and an electric motor-driven actuator to open and close the weir.

Quantity	1 per Basin
Unit Size	12x11
Performance Requirements	
Max. Allowable Water Level (HWL)	21.0 ft
Min. Allowable Water Level (LWL)	13.0 ft
Decant Pipe Centerline	2.0 ft Below LWL
Decant Rate (Avg. from HWL to LWL)	9,375 gpm

Weir Actuator	
Linear Weir Actuator	Three Phase
Weir Actuator Closing Force	6000 lbs
Power Section Material	Painted Steel
Junction Box Rating	NEMA 4X
Power Cable(s) Required	#16 AWG Ten-Conductor #12 AWG Four-Conductor #12 AWG Three-Conductor
Heater and Thermostat Cable	
Weir	
Shape	Circular
Material	304 SS
Decanter Float Reserve Buoyancy	1,833 lbs
Discharge Line	
Type	Pipe
Diameter	24 inches
Mooring System	
Pylon Quantity	2 per Unit
Pylon Diameter	4 inch
Support Quantity	2 per Unit
Support Diameter	4 inch
Pylon/Support Material	Galv. Steel
Base Plate Material	Galv. Steel
Floor Connection	304 SS Adhesive Anchors
Mooring Frame Material	Galv. Steel
Discharge Pipe	
Elbow Material	304 SS
Pipe Material	304 SS
Flex Joint/Hinge Material	304L SS
Flex Joint Rating	12,000 cycles, minimum
Decant Valve	1 per Basin
Valve Size	24 inch
Valve Model	Milliken Fig. 511A
Decant Valve Actuator	Auma
Actuator Power	Three Phase
Actuator Type	Open/Close Service
Compartment Heater	Yes
Valve Extension	
Extension Length	16 Feet
Extension Material	304 SS

2. PERFORMANCE

- a. Each decanter shall be capable of withdrawing decant fluid from 4-6 inches beneath the liquid surface, regardless of liquid depth, down to the minimum allowable water level specified below. The decant liquid shall be drawn through an adjustable weir opening of 2-6 inches. The weir shall be circular in shape and permit liquid to enter the decanter from the entire 360 degrees without obstruction.
- b. The centerline of each decant pipe must be located at the elevation stated within this section by the installing contractor.

3. WEIR ACTUATOR

- a. Weir actuator shall include a reversible electric motor operated linear actuator. The actuator shall be capable of operating with a closing force as required above and shall operate from a remote power source as required above. Adjustable limit switches shall be included to permit adjustment of the weir opening. A spring shall be included to provide for travel after the weir has closed and provide desired closure pressure. A corrosion resistant removable cover shall be included to provide protection to the actuator and motor during normal operation. Power cable(s) as specified above shall be provided from the junction box of the unit to the basin wall. Supply of junction box/disconnect at the basin wall shall be the responsibility of the installing contractor.

4. WEIR

- a. The weir shall include vortex control baffles permanently affixed to the weir. The weir shall be attached to the actuator through a removable single shaft or linkage which shall also function as the torque restraint.

5. FLOATATION

- a. Each new unit shall be equipped with a modular float constructed of fiberglass filled with closed cell polyurethane foam having a minimum 2.0 lbs./ft³ density. Float shall be completely sealed to prevent the foam from being in contact with the external environment. Float shall have 875 lbs. reserve buoyancy to ensure stability and to provide support flotation required during decanter servicing. A urethane type seal shall be molded into the bottom of the float assembly to receive the decanter weir.

6. DECANTER DISCHARGE PIPE

- a. Each decanter shall include a stainless steel elbow with schedule 10 stainless steel discharge pipe as specified above. The installing contractor shall provide a 3/4" valve with hose bib connection on the decant line between the decanter and the decant valve.
- b. Each decanter shall include two stainless steel flex joints sized at the same diameter as the discharge pipe. Flex joints shall be constructed of stainless steel flanges and 321 stainless steel bellows. Flex joints shall utilize heavy duty stainless steel hinges with over-travel stops and full perimeter welds. Flex joints shall carry a minimum rating of as specified above per EJMA calculations, the Elastic Joint Manufacturer's Association. Flex joints shall be full port diameter, and not reduce flow area of the nominal pipe size. Flex joints shall be fully crated and provided with shipping bars that immobilize and protect the flex joint prior to final installation. Flex joints constructed of plastic or rubber material are not acceptable.
- c. All piping, supports, gaskets, and hardware beyond the terminating flange of the decant pipe flexible joint shall be supplied by the installing contractor.

7. DECANTER RESTRAINED MOORING SYSTEM

- a. Furnished as part of the decanter assembly shall be a mooring frame, which shall permit the assembly to move up and down following the change in liquid level while restrained within the vertical pylons.
- b. Each decanter shall be moored with a restrained mooring system consisting of vertical pylon(s) with base plate and/or supports as specified above. Each pylon/support with base plate shall be attached to the basin floor and filled with concrete by the installing contractor.
- c. Mooring post supports, if specified within this section shall be provided for attachment to the basin wall by the installing contractor.

8. DECANT FLOW CONTROL VALVE

- a. Furnish electrically operated butterfly valve(s) as specified above for each basin to control the decant flow rate. Valve(s) shall be an AWWA C-504 Class 150B electrically operated butterfly valve(s) with ANSI Class 125# flanged end ASTM ductile or cast iron body and disk with a 316 stainless steel edge, EPDM seat, 304 stainless steel shaft assembled and tested with an electric actuator. Valve actuator shall include motor winding protection, manual override, and limit switch feedback in the open and closed position. Actuator(s) include local controls consisting of pushbutton(s), selector switch(es), and light(s). Field wiring and junction/box disconnect shall be provided by the installing contractor.
- b. Each valve shall include valve stem extension. Intermediate valve supports and hardware required for mounting of the extension shall be provided by the installing contractor.

E. SLUDGE WASTE PUMP

- 1. Furnish submersible non-clog pump(s) for each basin as specified herein. Each pump shall be equipped with a submersible electrical motor connected for three phase operation. Pump housing shall be painted cast iron. Pump shall include an adequate length of multi-conductor chloroprene jacketed type SPC cable suitable for submersible pump applications. The power cable shall also be sized according to NEC and ICEA standards. The pump shall be supplied with a mating cast iron discharge elbow. Each unit shall be fitted with an adequate length of galvanized steel lifting chain of adequate strength to permit rising and lowering the pump. **The pumps shall be KSB or Flygt.**

Pump Quantity	1 Per Basin
Pump Function	Sludge
Motor Size	3 HP
Pump Flow Rate	250 GPM
Required TDH	20.5 ft
Discharge Valve	
Actuator Type	Manual
Manufacturer	Millken
Diameters	
Discharge Connection Elbow	3 inches

Discharge Pipe	4 inches
Valve(s)	4 inches
Materials of Construction	
Lifting Chain	Galvanized Steel
Upper Guide Bars and Brackets	Galvanized Steel
System Manufacturer Termination Point	Pump Discharge Elbow
Tank Connection	304 SS Adhesive Anchors

2. The pump shall be capable of handling raw, unscreened sewage. The discharge connection elbow shall be permanently installed with the discharge piping. The pump shall be automatically connected to the discharge connection elbow when lowered into place, and shall be easily removed for inspection or service. There shall be no need for personnel to enter the basin or pump well. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump.
3. An upper guide bar bracket shall be provided with each pump. The entire weight of the pumping unit shall follow guide bars into the operating position and pressed tightly against the discharge connection elbow with metal-to-metal contact. No sealing of the discharge interface by means of a diaphragm, O-ring, or other devices shall be acceptable. The pump, with its appurtenances and cable, shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 ft.
4. Supply of all discharge piping, supports, gaskets, and hardware beyond the flanged connection specified above shall be the responsibility of the installing contractor.
5. Each pump shall include a discharge valve to control the design transfer flow rate. Valve shall have a 125# flanged end connection, ASTM A-126 Class B cast iron body with welded in nickel seat, EPDM or neoprene coated ductile iron plug. The valve shall be a non-lubricated type with a port area of at least 80% of full pipe size.
6. Each pump shall include a Nibco F-918-B check valve with cast iron body and bronze disk to prevent backflow.
7. Valve(s) shall be provided loose for installation within the discharge piping by the installing contractor. Valve gaskets and hardware shall be supplied by the installing contractor.
8. Field attachment of the pump to the basin shall be the responsibility of the installing contractor.

F. PUMP HOIST ASSEMBLY

1. Furnish portable hoist assembly(ies) as specified herein. Each hoist shall be rated for a safe load of 500 lbs., lift of 30 feet, 36" minimum reach and a 60" maximum reach. Hoist shall consist of 1/4" diameter 304 stainless steel cable, painted steel lifting hook, zinc plated winch, painted cast iron sheave, and 304 stainless steel snap hook.

Hoist	
Quantity	1

Materials of Construction	Painted Steel
Socket	
Quantity	7
Materials of Construction	Painted Steel
Tank Connection	304 SS Adhesive Anchors

2. Field attachment/welding of the platform socket(s) shall be the responsibility of the installing contractor.

G. RETRIEVABLE FINE BUBBLE AIR DIFFUSER ASSEMBLIES

1. The aeration system shall be a fine bubble diffused air system and shall be a retrievable configuration as shown on the contract drawings.

Airflow per Basin	3,116 SCFM
Assembly Quantity	11 per Basin
Diffuser Rack Size	25 Duplex Tubes
Materials of Construction	
Manifold	304 SS
Vertical Air Column	Galv. Steel
Threaded Flange	Galv. Steel
Quick Disconnect Adapter	Ny-Glass
Track/Beam Assembly	Galv. Steel
Diffuser Hoist Assembly	Galv. Steel
Valve Seat	EPDM
Tank Connection	304 SS Adhesive Anchors

2. Furnish retrievable air diffuser assemblies for each basin. Each assembly shall consist of membrane diffusers, frame assembly, manifold weldment, vertical air column, track/beam, flexible air line, isolation valve, and lifting mechanism. Duplex diffuser tubes total that specified herein shall be provided for each diffuser rack. The 4" diffuser manifold weldment shall be constructed of stainless steel. The entire assembly shall be located such that each diffuser centerline is twelve (12) inches above the basin floor.
3. Air diffuser assemblies shall be of the tubular, non-clog, fine bubble type with a flexible perforated air release membrane. Disc and panel diffuser designs are not acceptable. The diffuser membrane shall be constructed from EPDM rubber and be suitable for continuous or intermittent aeration. Each membrane shall be held in place by two 304 stainless steel band clamps. The membrane shall include UV inhibitor and compounds designed for resistance to chemical attack, weathering, fatigue, and aging. The diffuser assemblies shall have double backflow prevention to prevent liquid from passing into the aeration header. Backflow prevention shall consist of self sealing slits and membrane clamping over the circumference of the diffuser support pipe. The membrane exterior surface shall be smooth as to inhibit biological film growth. The membrane shall inflate during aeration and deflate when the airflow is discontinued, further restricting biological film growth. The membrane shall be cleanable in place with water from a high pressure wash. Each diffuser membrane shall be supported over its' full length and circumference by a support tube. Tube diffuser shall be of non-buoyant design. Diffusers which are of buoyant design are not acceptable.
4. Each diffuser assembly shall include a 3" diameter wire reinforced EPDM flexible air line with quick disconnect end fittings, and a threaded flange, elbow and quick

disconnect adapters. All air distribution piping, gaskets, and hardware beyond the threaded flange shall be supplied by the installing contractor. The vertical track/beam shall support the lifting mechanism assembly during operation and servicing.

5. Each assembly shall include a diffuser hoist assembly with base socket to receive a portable electric winch. A total of (one) portable electric winch shall be provided for the diffuser assemblies. The winch mechanism shall be of sufficient design capacity to raise the diffuser rack assembly to the servicing position. The portable electric winch shall operate from a single phase, electrical supply rated for 12.6 full load amps. The winch shall be provided with a total of 8 feet of electrical cable. Supply of electrical power supply, wiring and junction box for winch shall be the responsibility of the installing contractor.
6. Each diffuser assembly shall include a 3" diameter manually operated isolation butterfly valve for connection to the main air distribution piping by the installing contractor. Valve gaskets and hardware are to be provided by the installing contractor.
7. Valve shall be a butterfly valve with cast iron body, seat as specified herein, disk and one piece stainless steel shaft.
8. Anchoring the diffuser assemblies to the basin shall be the responsibility of the installing contractor.

H. BLOWERS

1. Furnish three phase rotary lobe type, rotary compressors as described below with premium efficient, T.E.F.C. U.S. Electric, Class F insulation, Teco, Siemens, or equal motor. The blowers shall be manifolded for individual and/or combined operation.

Blower Quantity	3
Motor Size	100 HP
Manufacturer	Aerzen
Model Number	D52S
Airflow Rate	1,558 SCFM per Blower
Max. Discharge Gauge Pressure	10.67 PSIG
Inlet Configuration	Combination Filter/Silencer
Enclosure	Galv. Steel Acoustic Hood with Oil Drip Pan
Discharge Isolation Valve	
Diameter	6 inches
Seat Material	Viton
2. Each motor shall include a single phase normally closed motor winding thermostat.
3. Each blower assembly shall be complete and mounted on a base weldment with four-corner anti-vibration mountings, designed for direct application on a concrete slab or other solid foundation. Each assembly shall be suitable for shipment as a complete unit, factory assembled (less discharge pipe fittings) as much as possible to facilitate shipping and handling.
4. Equipment shall include a blower, electric motor, belts and sheaves, inlet package,

discharge silencer, discharge check valve, rubber inlet sleeve and discharge connection, pressure relief valve, butterfly discharge isolation valve, and rubber expansion joint. A personnel protection guard shall be included over the belts and sheaves.

5. Equipment shall include local control panel, factory installed.

I. AIR CONTROL VALVES

1. Furnish operated butterfly valve(s) to control the air flow as outlined herein.

Valve Quantity	2 Shared for all Blowers
Valve Size	10 inch
Valve Model	Milliken AWWA Class 150B
Connection Type	Flanged
Materials of Construction	
Valve Seat	EPDM
Disk	Ductile Iron with 316 SS Edge
Valve Actuator	Auma
Actuator Power	Single Phase
Actuator Type	Open/Close Service
Compartment Heater	Yes

J. PRESSURE TRANSDUCER

1. Furnish submersible pressure transducer unit(s) constructed of stainless steel as specified herein. Transducer shall utilize a diffused silicone semiconductor sensor protected by an integral stainless steel diaphragm with seal fluid. Transducer output shall be a 4-20 mA signal. Electrical connection shall be 2-wire, loop powered through a shielded integral cable comprised of 22 AWG conductors and separate drain wire.

Quantity	1 per Basin
Model	Keller Levelrat
Mounting Materials of Construction	
Support Pipe	304 SS
Supports	304 SS
Anchors	304 SS
Tank Connection	304 SS Adhesive Anchors

2. Transducers shall be suspended on a removable mounting pipe assembly. Pipe, supports and anchors shall be provided. Field attachment of the pipe and supports to the basin shall be the responsibility of the contractor. A moisture excluding aneroid bellows shall be supplied loose for installation in the junction box/ disconnect. Attachment and supply of the junction box/ disconnect at the basin wall shall be the responsibility of the contractor.
3. Field attachment of the pressure transducer mounting brackets to the tank shall be the responsibility of the installing contractor.

K. LEVEL SENSORS

1. Furnish one (1) level sensor assembly consisting of an Anchor Scientific model GSI 40NONC float switch with a smooth, chemical resistant polypropylene casing, and 316

stainless steel mounting bracket for each basin. Each float switch shall be provided with a three conductor electrical cable. Electrical cable shall terminate at a junction box/disconnect located at the basin wall. Field wiring and junction box/disconnect shall be provided by the installing contractor.

2. Field attachment of the level sensor assembly to the tank shall be the responsibility of the installing contractor.

L. PROCESS CONTROL INSTRUMENTATION

Manufacturer	ABB
Controller	
Quantity	1 per Basin
Model	AZTEC AWT440
Max. Inputs per Controller	2 per Controller
Probes	
DO	
Quantity	1 per Basin
Model	AZTEC ADS430
Probe Mounting	
Materials of Construction	304 SS

1. Controller
 - a. The controller will communicate with the main PLC via 4-20 mA signals. The controller will have a NEMA 4X enclosure with corrosion-resistant finish and shall be AC powered from a 100-230VAC, power source. Each probe module shall include a sun shield.
2. Sensors
 - a. Furnish one sensor of each type specified above per basin. Sensors shall be suspended on a removable mounting pipe assembly. Stainless steel pipe, stainless supports and stainless steel anchors shall be provided. Field attachment of the pipe and supports to the basin shall be the responsibility of the installing contractor. Field wiring, conduit, and installation of cable shall be the responsibility of the installing contractor.

2.3 POST-EQUALIZATION BASIN STRUCTURE

- A. The Post-Equalization/Holding basin shall be field erected as shown on the contract drawings and summarized below:
 1. Basin Quantity: 1
 2. Inside Dimensions: 69 ft. x 69 ft.
 3. Side Water Depth:
 - a. Minimum Operating Level: 1.5 ft. SWD
 - b. Maximum Operating Level: 11.0 ft. SWD

B. POST-EQ TRANSFER PUMP

1. Furnish submersible non-clog pump(s) for each basin as specified herein. Each pump shall be equipped with a submersible electrical motor connected for three phase operation. Pump housing shall be painted cast iron. Pump shall include an adequate length of multi-conductor chloroprene jacketed type SPC cable suitable for submersible pump applications. The power cable shall also be sized according to NEC and ICEA standards. The pump shall be supplied with a mating cast iron discharge elbow. Each unit shall be fitted with an adequate length of galvanized steel lifting chain of adequate strength to permit rising and lowering the pump. **The pumps shall be KSB or Flygt.**

Pump Quantity	4 Per Basin
Pump Function	Transfer
Motor Size	15 HP
Pump Flow Rate	1,389 GPM
Required TDH	27 ft
Discharge Valve	
Actuator Type	Manual
Manufacturer	Millken
Diameters	
Discharge Connection Elbow	6 inches
Discharge Pipe	8 inches
Valve(s)	8 inches
Materials of Construction	
Lifting Chain	Galvanized Steel
Upper Guide Bars and Brackets	Galvanized Steel
System Manufacturer Termination Point	Pump Discharge Elbow
Tank Connection	304 SS Adhesive Anchors

2. The pump shall be capable of handling raw, unscreened sewage. The discharge connection elbow shall be permanently installed with the discharge piping. The pump shall be automatically connected to the discharge connection elbow when lowered into place, and shall be easily removed for inspection or service. There shall be no need for personnel to enter the basin or pump well. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump.
3. An upper guide bar bracket shall be provided with each pump. The entire weight of the pumping unit shall follow guide bars into the operating position and pressed tightly against the discharge connection elbow with metal-to-metal contact. No sealing of the discharge interface by means of a diaphragm, O-ring, or other devices shall be acceptable. The pump, with its appurtenances and cable, shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 ft.
4. Supply of all discharge piping, supports, gaskets, and hardware beyond the flanged connection specified above shall be the responsibility of the installing contractor.
5. Each pump shall include a discharge valve to control the design transfer flow rate. Valve shall have a 125# flanged end connection, ASTM A-126 Class B cast iron body with

welded in nickel seat, EPDM or neoprene coated ductile iron plug. The valve shall be a non-lubricated type with a port area of at least 80% of full pipe size.

6. Each pump shall include a Nibco F-918-B check valve with cast iron body and bronze disk to prevent backflow.
7. Valve(s) shall be provided loose for installation within the discharge piping by the installing contractor. Valve gaskets and hardware shall be supplied by the installing contractor.
8. Field attachment of the pump to the basin shall be the responsibility of the installing contractor.

C. FIXED PVC COARSE BUBBLE DIFFUSER SYSTEM

1. The aeration system shall be a coarse bubble diffused air system and shall be a fixed configuration as shown on the drawings.

Airflow per Basin	774 SCFM
Riser Pipe Diameter	6 inches
Materials of Construction	
Diffuser	Schedule 80 PVC
Manifold	Schedule 80 PVC
Supports	Galvanized
Riser Pipe	Galvanized
Tank Connection	304 SS Adhesive Anchors

2. Furnish one (1) fixed coarse bubble diffuser system for each basin. The diffuser system shall consist of diffusers, supports, manifold, and riser pipe. Diffuser pipes shall be not less than three-inch nominal diameter. Each diffuser section shall be supplied with uniformly-spaced machined orifices located on the top of each section. Size and number of orifices shall be provided to ensure a uniform air distribution.
3. Each diffuser section (and manifold pipe) shall be supported at span lengths not greater than 6 feet by supports. No unsupported end shall be longer than 2 ft. Diffuser sections shall be secured to the supports with a corrosion resistant retainer. Support brackets shall be adjustable to provide header leveling within $\pm 1/4$ inch of a fixed elevation for each aeration basin.
4. Diffuser system shall be field assembled by the installing contractor. All submerged PVC joints 8" and smaller shall be socket welded joints. Expansion joints shall be included to compensate for thermal expansion for PVC manifold runs longer than 40 feet. Pipe sizing, location and supports shall be as shown on the drawings. Diffuser sections and internal manifold piping shall have flange connections for disassembly.
5. The riser pipe shall terminate in a flanged connection at the top of the basin wall. All piping, gaskets, and hardware beyond the riser pipe's flanged connection shall be the provided by the installing contractor.
6. Attachment to the basin shall be the responsibility of the installing contractor.

D. BLOWERS

1. Furnish three phase rotary lobe type, rotary compressors as described below with premium efficient, T.E.F.C. U.S. Electric, Class F insulation, Teco, Siemens, or equal motor. The blowers shall be manifolded for individual and/or combined operation.

Blower Quantity	2
Motor Size	30 HP
Manufacturer	Aerzen
Model Number	GM30L
Airflow Rate	774 SCFM per Blower
Max. Discharge Gauge Pressure	5.6 PSIG
Inlet Configuration	Combination Filter/Silencer
Enclosure	Galv. Steel Acoustic Hood with Oil Drip Pan
Discharge Isolation Valve	
Diameter	6 inches
Seat Material	EPDM

2. Each motor shall include a single phase normally closed motor winding thermostat.
3. Each blower assembly shall be complete and mounted on a base weldment with four-corner anti-vibration mountings, designed for direct application on a concrete slab or other solid foundation. Each assembly shall be suitable for shipment as a complete unit, factory assembled (less discharge pipe fittings) as much as possible to facilitate shipping and handling.
4. Equipment shall include a blower, electric motor, belts and sheaves, inlet package, discharge silencer, discharge check valve, rubber inlet sleeve and discharge connection, pressure relief valve, butterfly discharge isolation valve, and rubber expansion joint. A personnel protection guard shall be included over the belts and sheaves.

E. PRESSURE TRANSDUCER

1. Furnish submersible pressure transducer unit(s) constructed of stainless steel as specified herein. Transducer shall utilize a diffused silicone semiconductor sensor protected by an integral stainless steel diaphragm with seal fluid. Transducer output shall be a 4-20 mA signal. Electrical connection shall be 2-wire, loop powered through a shielded integral cable comprised of 22 AWG conductors and separate drain wire.

Quantity	1 per Basin
Model	KPSI Model 700
Mounting Materials of Construction	
Support Pipe	PVC
Supports	304 SS
Anchors	304 SS
Tank Connection	304 SS Adhesive Anchors

2. Transducers shall be suspended on a removable assembly consisting of support pipe and EPDM hose. Removable assembly shall be supported by steel supports and guide rail, and anchors. Field attachment of the guide rail and supports to the basin shall be the

responsibility of the installing contractor. A moisture excluding aneroid bellows shall be supplied loose for installation in the junction box/ disconnect. Attachment and supply of the junction box/disconnect at the basin wall shall be the responsibility of the installing contractor.

3. Field attachment of the pressure transducer mounting brackets to the tank shall be the responsibility of the installing contractor.

F. LEVEL SENSORS

1. Furnish one (1) level sensor assembly consisting of an Anchor Scientific model GSI 40NONC float switch with a smooth, chemical resistant polypropylene casing, and 316 stainless steel mounting bracket for each basin. Each float switch shall be provided with a three conductor electrical cable. Electrical cable shall terminate at a junction box/disconnect located at the basin wall. Field wiring and junction box/disconnect shall be provided by the installing contractor.
2. Field attachment of the level sensor assembly to the tank shall be the responsibility of the installing contractor.

G. PROCESS CONTROL INSTRUMENTATION

Manufacturer	ABB
Controller	
Quantity	1 per Basin
Model	AZTEC AWT440
Max. Inputs per Controller	2 per Controller
Probes	
DO	
Quantity	1 per Basin
Model	AZTEC ADS430
Probe Mounting	
Materials of Construction	304 SS

1. Controller
 - a. The controller will communicate with the main PLC via 4-20 mA signals. The controller will have a NEMA 4X enclosure with corrosion-resistant finish and shall be AC powered from a 100-230VAC, power source. Each probe module shall include a sun shield.
2. Sensors
 - a. Furnish one sensor of each type specified above per basin. Sensors shall be suspended on a removable mounting pipe assembly. Stainless steel pipe, stainless supports and stainless steel anchors shall be provided. Field attachment of the pipe and supports to the basin shall be the responsibility of the installing contractor. Field wiring, conduit, and installation of cable shall be the responsibility of the installing contractor.

2.4 SPARE PARTS

- A. The following spare parts shall be supplied by the SBR equipment manufacturer:

<u>Qty.</u>	<u>Description</u>
1	Decanter linear actuator with capacitor.
1	Decanter limit switch with arm.
1	Input card.
1	Output card.
50	Membrane Kits
1	Crimping Tool
2	Blower Inlet Filters per Blower
1	Sets V-belts per Blower

2.5 UV SYSTEM CONTROL

- A. The SBR control panel will send a signal to the UV system to control the UV based on quantity of post EQ pumps operating.

2.6 CONTROL PANEL WITHOUT MOTOR STARTERS

- A. The control system shall be designed to optimize the AquaSBR® process while minimizing operator attention and to accommodate the continuous maximum daily flow without adjusting cycle structures. The control software program shall be factory tested prior to installation at the jobsite.
- B. The control system shall be a timer based system with level overrides and shall provide control, sequence, monitoring, and alarm annunciation capabilities. The operator shall be able to access the timer values and set points through the operator interface panel to allow for adjustment of cycle times and system flexibility. The control system shall be designed to automatically accommodate the plant's full range of loads and flows.
- C. A complete control system shall be provided as described in the following and as shown on the contract drawings. The control system shall include 115 volt control circuit breaker, microprocessor control, operator interface display, indicator lights, and HAND-OFF-AUTOMATIC selector switches.
- D. The incoming service of the control system shall be 115 volt, 60 hertz, single-phase. Controls for the equipment listed below shall be provided within the SBR control panel. Elapsed time indication shall be provided through the operator interface of the SBR control panel for equipment indicated by an asterisk(*).

SBR EQUIPMENT DESCRIPTION

- (2) 50 HP Mixer(s)*
- (2) 3 HP Sludge Pump(s)*
- (3) 100 HP Blowers*
- (2) Influent Valve(s)
- (2) Decanter Actuator(s)

- (2) Decanter Valve(s)
- (2) Air Control Valves
- (2) 4-20 mA D.O. signal(s)
- (2) 4-20 mA Pressure Transducer(s)
- (1) Common Alarm
- (2) Level Sensor(s)

POST EQ BASIN EQUIPMENT DESCRIPTION

- (4) 15 HP SBR Transfer Pump(s)
- (2) 30 HP Blower(s)*
- (1) 4-20 mA D.O. Signal(s)
- (1) 4-20 mA Pressure Transducer(s)
- (1) Level Sensor

In addition, controls (as shown on the contract drawings) for the following equipment shall be included within the SBR control panel:

EQUIPMENT DESCRIPTION

- (1) 4-20 mA D.O. Signal(s) for Post-Aeration
- (1) UV Start/Stop Contact

- (1) Level Sensors

E. CONTROL PANEL WIRING AND ASSEMBLY

1. All control enclosures shall be custom assembled and wired in an Underwriters Laboratories (UL) certified cabinet shop using quality materials and labor. Short circuit rating of control enclosure shall be 5 kA RMS symmetrical @ 120VAC maximum.
2. All control panel single conductor wire shall be 16 AWG multi-strand machine tool wire (MTW) minimum, with PVC insulation.
3. Wire colors are as follows:

208 VAC or higher	-	Black
120 VAC control power	-	Red
Neutral	-	White
Ground	-	Green
AC Power from remote source	-	Yellow
Neutral from remote source	-	White with Yellow Stripe
24 VDC (+)	-	Blue
24 VDC (-)	-	White with Blue Stripe
VDC (+) from remote source	-	Orange
VDC (-) from remote source	-	White with Orange Stripe
Intrinsically Safe	-	Light Blue
4. All wires shall be clearly marked with an identification number consistent with the wiring schematic drawing. Wire markers shall be a thermal transfer printable type. The material shall be a self-laminating vinyl. Labels shall be Brady THT-9-427-10 or approved equal.

5. Wiring inside the control panel shall be run in PVC wiring duct rated for continuous temperatures up to 122° F (50°C). Devices mounted in the enclosure door shall have wires run in spiral wrap to avoid pinch points when opening and closing the door.
6. Control components mounted internal and external to the enclosure shall be mounted with stainless steel hardware and clearly labeled with a plastic identification nametag. The tag shall be white with black lettering.

F. CONTROL ENCLOSURE

1. The automatic controls shall be provided in a UL listed, NEMA Type 12 mild steel (12 gauge) floor mount enclosure that provides a degree of protection for electrical controls and components from dust, dripping water and external condensation of non-corrosive liquids. The enclosure is intended for indoor installation. Enclosure shall include gasketed overlapping doors with a 3-point latch mechanism operated by an oil tight key-lock handle. The enclosure shall have white polyester powder paint inside with ANSI 61 gray polyester powder paint outside over phosphatized surfaces. The enclosure shall include a painted white mild steel (10 gauge) sub-panel mounted with collar studs. Enclosure shall be manufactured by Hoffman or approved equal.
2. The control enclosure shall be mounted remotely.

G. CORROSION INHIBITOR

1. Each control enclosure assembly shall be provided with corrosion inhibitors to protect interior electrical components from damage caused by high humidity. The corrosion inhibitors shall be installed prior to shipment to provide protection during shipment and storage of the enclosure. The corrosion inhibitor shall be Hoffman AHCI5E or approved equal.

H. CIRCUIT BREAKER

1. All single phase branch or supplementary circuits shall be protected with a single-pole, C-Curve rated circuit breaker. Circuit breakers shall be rated for 240 VAC maximum, 50/60 Hz and UL 489 listed. Supplementary and branch protection circuit breakers shall be Merlin Gerin Multi 9 or approved equal.

I. FUSE

1. Properly rated fuses and fuse holders shall be provided for protection of individual control devices (discrete and analog signals) mounted outside of the enclosure. Each fuse shall be housed in a hinged type fuse block to protect against contact with the fuse. Fuses shall be rated up to 250 VAC and be Littelfuse or approved equal. Fuse holders for discrete devices shall be rated to 600 VAC and 30 Amps. Fuse holders for analog devices shall be rated to 300 VAC and 15 Amps. Fuse holders shall be Allen Bradley 1492 or approved equal.

J. OPERATOR DEVICE

1. Operator devices (pushbuttons and selector switches) shall be mounted through the control enclosure door for all automatic controlled equipment. Transformer type pilot lights and illuminated pushbuttons shall be provided for indication of an operation status. Lights shall be a 6 VAC incandescent type lamp. Color coding shall be applied as required and is as follows:

Amber – Alarm active, caution
Green – Valve open, motor running
Red – Valve closed
White - Information

2. All operator devices shall be UL Listed, 30.5mm style, NEMA Type 4X rated, oil and water tight with finger safe guards located on the contact blocks to prevent accidental contact with wire connections. Operator device function shall be identified with an engraved white Gravoply nameplate with black letters. Operator devices shall be Allen-Bradley 800H, Square D 9001, or approved equal.

K. HIGH FREQUENCY NOISE FILTER

1. A UL listed active tracking filter shall be provided to protect the PLC and HMI power feeds from high-frequency noise and low-energy transients. It shall be designed for a single phase input voltage of 120/240VAC operating at 47 to 63 Hz. The unit shall reduce normal mode transients to plus or minus 2 volts, provide surge capacity of 45,000 amps and protect in all modes (Line to neutral, line to ground and neutral to ground). The noise filter shall be an Islatrol IC+ or approved equal.

L. GROUND FAULT DUPLEX RECEPTACLE

1. A UL listed ground fault circuit interrupter (GFCI) duplex receptacle shall be provided within the panel for instrument (e.g. programming terminal, modem, etc.) use only. The receptacle shall be protected with a 5 Amp circuit breaker. The receptacle shall carry a 20A / 120VAC rating. The electro-mechanical circuit interrupter shall be double-pole and trip free (GFCI protection and shall not be overridden by holding reset button). Built-in transient suppression shall protect GFCI's internal circuitry from voltage transients. Receptacle shall be Hubbell DRUBGFI20 or approved equal.

M. 24 VOLT DC POWER SUPPLY

1. A UL listed, industrial grade, compact power supply shall be supplied to provide 24 VDC power to such rated components. The power supply shall be DIN rail mounted and functional with input voltage of 100 to 240 VAC (single-phase) incoming control power. The power supply shall have a green LED which shall be illuminated when output voltage is "OK". The power supply shall be an Allen Bradley 1606 or approved equal.

N. CONTROL RELAY

1. UL listed control relays for general control purposes shall be supplied with a pilot light to indicate when the coil is in an energized state. The relay socket shall be panel or DIN rail mounted inside the enclosure. The relays shall provide the following ratings: 120VAC

coil, 10A contact rating (thermal), 250 VAC insulation rating and 5 million mechanical life cycles. Relays shall be Allen Bradley 700-HK, Square D, or approved equal.

O. TERMINAL BLOCK

1. Standard feed-through screw terminal blocks, DIN rail mounted, shall be supplied for all point to point wiring connections. All terminals shall be numbered per the wiring schematic with printed markers. Terminals shall carry a 600V AC/DC voltage rating. Terminal blocks shall be Allen-Bradley 1492-J4 (35A max) and 1492-J16 (85A max) or approved equal.

P. PROGRAMMABLE LOGIC CONTROLLER

1. Automatic operation of the AquaSBR shall be controlled through a programmable logic controller (PLC) mounted inside the main control panel. The PLC components shall consist of a power supply, CPU, discrete input and output modules and analog input and output modules. The processor unit shall include built-in USB and two (2) Ethernet IP communication ports. All input and output points supplied (including unused) shall be wired to terminal blocks. Processor design characteristics shall include: 1.0MB user memory size, real-time clock and calendar, battery backed RAM and an operating temperature range between 32 °F and 140°F. The PLC processor shall be an Allen-Bradley CompactLogix 1769-L33ER or approved equal.
2. Modular equipment shall be provided to complete the PLC system. These Allen-Bradley components include: 1769-PA4 – Power Supply, 1769-IA16 – Discrete input (16 point) modules, 1769-OW16 – Discrete output (16 point) modules and 1769-IF8 – Analog input (8 point) modules, 1769-OF4 – Analog output (4 point) modules.

Q. PLC POWER SUPPLY

1. Input voltage range of 85-265 / 170-265 VAC, 47-63 Hz, maximum inrush current of 30 amps, backplane output current of 4 amps @ 5V or 2 amps @ 24V, internal fuse protection, ambient operating temperature of 32°F to 140°F, Class I, Division 2 hazardous location certified, UL Listed.

R. DISCRETE INPUT MODULE

1. Operating voltage of 79 to 132 VAC at 47 to 63 Hz, backplane current draw at 5VDC = 115mA , off-state current 2.5mA maximum, maximum inrush current 250mA, LED status indication of each point, ambient operating temperature of 32°F to 140°F, UL Listed.

S. DISCRETE OUTPUT MODULE

1. Operating voltage of 5 to 265 VAC at 47 to 63 Hz / 5 to 125 VDC, backplane current draw at 5 VDC = 205mA , at 24VDC = 180mA, off-state current leakage is 1.0mA, LED status indication of each point, ambient operating temperature of 32°F to 140°F, UL Listed.

T. ANALOG INPUT MODULE

1. Backplane current draw at 5 VDC = 120mA, at 24VDC = 70mA, LED status indication of each point, ambient operating temperature of 32°F to 140°F, UL Listed.

U. ANALOG OUTPUT MODULE

1. Backplane current draw at 5 VDC = 120mA, at 24VDC = 170mA, LED status indication of each point, ambient operating temperature of 32°F to 140°F, UL Listed.

V. HUMAN MACHINE INTERFACE

1. The operator interface shall be a NEMA Type 12, 13, 4X rated, 10.4" diagonal, color touchscreen display with Ethernet and serial communications. The interface shall be a liquid crystal display (LCD). The display type shall be color active matrix thin-film transistor (TFT) with 640 x 480 pixel resolution. The rated operating temperature shall be 32° to 131° F (0° to 55° C). The operator interface shall be an Allen Bradley PanelView Plus 7 10".

2.9 SCADA MONITORING SYSTEM

- A. A SCADA (Supervisory Control And Data Acquisition) system shall be provided by the wastewater equipment manufacturer as described herein and as shown on the contract drawings.
- B. The SCADA functionality includes custom designed software with the following distinct features:
 - Detailed, dynamic graphics depicting regions of the facility and specific equipment within each area
 - Drill-down feature to provide detailed pop-up windows for pieces of equipment
 - Simple, intuitive navigation
 - System setpoint and preset adjustments
 - Consolidated alarm summary for all monitored areas, plus an alarm log
 - Event log which may capture operator commands as well as process/equipment functions
 - Historical data logging, providing long term storage of data to assist with plant optimization
 - Historical trending of analog and/or discrete variables. Trends also provide real time values, zoom/pan, and pause features
 - Security – both the operating system and graphical package have multiple levels of logins.
 - Picture/video screen captures – allows screen captures to be saved to a file or sent to a printer
- C. The SCADA system includes remote access capabilities using a broadband internet communication. The remote access facilitates support from the SCADA supplier (to address concerns or future upgrades) and provides the option to allow remote access by the operations personnel to help assess a situation when away from the site.
- D. The SCADA system shall be designed, programmed and functionally tested by the SCADA manufacturer prior to shipment. All software packages shall be provided with licenses that can be transferred to the end user.
- E. The SCADA system shall be provided loose for installation, interconnection, and field wiring by the installing contractor.
- F. MONITORED EQUIPMENT

1. The SCADA system may provide monitoring and control of remote functions and processes for the following wastewater applications.
 - a. AquaSBR® Sequencing Batch Reactor (Monitor Only)
 - b. Refer to Section 401250 for monitoring requirements for all other process equipment.

G. SCADA SYSTEM HARDWARE

1. The SCADA system provided shall meet or exceed the following hardware specifications. At the time of manufacture, components specified below shall be subject to "or equal" or "upgrade" status to provide for the most current model available.

PERSONAL COMPUTER (PC)

Dell OptiPlex 7090 Desktop, with 5-Year ProSupport
Processor: Intel® Core™ i7-10700 (8-Core, 16MB Cache)
Memory: 32GB DDR4
Hard Drive: 512 GB NVMe Class 40 Solid State Drive
Backup HD: 2.5" SATA, 1TB, 7200rpm
Video Card: Intel Integrated
Keyboard: Dell Wired Keyboard
Mouse: Dell Wired Optical Mouse
Network: Integrated NIC
Monitor: Dell UltraSharp 24" Monitor

PRINTER

Color inkjet printer with printer cable

UNINTERRUPTABLE POWER SUPPLY (UPS)

APC battery backup UPS, 1000VA minimum

PC OPERATING SYSTEM AND PRODUCTIVITY SOFTWARE

Operating system: Microsoft® Windows 10 Professional
Productivity software: Microsoft® Office Home and Business
Anti-virus / Anti-spam / Firewall software: Cylance 10-year subscription

GRAPHICAL SOFTWARE

Rockwell Software FactoryTalk View SE Station
Rockwell Software FactoryTalk View SE Development

PROGRAMMING SOFTWARE FOR PLC

Rockwell Software Studio5000 Logix Designer (IEC-61131-3 compliant)

PROGRAMMING SOFTWARE FOR HMI

Rockwell Software FactoryTalk View Studio ME

2. The PLC(s) shall communicate to a dedicated PC network interface card (NIC) which shall provide the SCADA connectivity to the plant control network.
3. Ethernet shall be a local area network that provides communication between various devices at 10/100 MBaud. The protocol utilized for message transport between devices

shall be TCP/IP. The processor connector shall conform to ISO/IEC 8802-3 STD 802.3 and utilize 10/100Base-T media. Connections shall be made directly from the processor to an industrial Ethernet switch. The SCADA computer NIC shall also be of the type 10/100Base-T and shall connect directly to an Ethernet switch. Twisted-pair 10/100Base-T cables with RJ-45 connectors shall be used to make connections between switches and devices. Twisted-pair cabling between all switches and devices shall be a maximum of 323 feet in length; and kept to a minimum whenever possible. If a distance greater than 323 feet or runs through high noise environments are required, the SCADA supplier must be contacted.

4. Conduit and routings for the communication cable(s) shall be provided by the installing contractor. Communication cable(s) shall not be installed within conduit which contains AC control or power cable(s).
5. Additional hardware (repeaters or switches) to accommodate longer Ethernet cable runs shall be supplied by others.

2.9 SCADA CONTACTS

A. SCADA Contacts shall be included to interface with Specification 461405 as follows:

1. Digital Inputs (Standard)

- DI-1 PLC Battery Low Alarm
- DI-2 PLC Output Power Fault
- DI-3 Any Basin Mixer Alarm
- DI-4 Any Process Blower Alarm
- DI-5 Any Process Pump Alarm
- DI-6 Any WAS Pump Fault
- DI-7 Post EQ Blower Fault
- DI-8 Any Post EQ Pump Fault

Digital Expansion Module

- DI-9 SBR Basin #1 Level High Alarm
- DI-10 SBR Basin #2 Level High Alarm
- DI-11 Loss of Power/Phase/Fault Alarm
- DI-12 Generator Run/Run Time
- DI-13 Any Generator Alarm
- DI-14 Spare
- DI-15 Spare
- DI-16 Spare

2. Analog Input

- AI-1 SBR Basin #1 Level/Trend/Alarm
- AI-2 SBR Basin #2 Level/Trend/Alarm

3. Relay Outputs

- R-1 E-Stop SBR Process

R-2 Spare
R-3 Spare

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect all equipment prior to erection. Repair or replace damaged items as directed by the Engineer, at no additional cost to the Owner. Have only factory-trained manufacturer's representative perform repair work.

3.2 INSTALLATION

- A. General: The installation of the equipment furnished by the manufacturer shall be the responsibility of the installing contractor in accordance with all requirements of the contract documents. The SBR equipment and appurtenances shall be installed by competent and experienced mechanics and electricians. Installation shall be in accordance with the manufacturer's erection drawings and instructions.
- B. The Contractor shall install SBR equipment in accordance with the Manufacturer's drawings and installation manual.

3.3 MANUFACTURER'S REPRESENTATIVES

- A. The equipment manufacturer shall furnish the services of a factory trained representative for a maximum of five (5) trips and sixteen (16) eight-hour days at the jobsite to inspect the installing contractor's equipment installation, supervise the initial operation of the equipment, instruct the plant operating personnel in proper operation and maintenance, and provide process assistance.
- B. If additional service is required due to the mechanisms not being fully operational, at the time of service requested by the contractor, the additional service days will be at the contractor's expense.

3.4 SYSTEM OPERATION AND MAINTENANCE MANUALS

- A. Complete system Operation and Maintenance manuals shall be available in hardcopy and electronic form. The electronic form shall be provided in .pdf format and be fully bookmarked. Manuals shall address:
 - 1. General project information.
 - 2. Installation and start-up.
 - 3. Process design and operational control description.
 - 4. Mechanical, electrical and field instrumentation component descriptions.
 - 5. Maintenance and troubleshooting.
 - 6. Mechanical and electrical drawings.

3.5 PERFORMANCE GUARANTEE

- A. The SBR equipment shall be tested at the normal plant operating conditions and shall provide results equal to or greater than specified herein.

END OF SECTION 461405