SECTION 11375 – SEQUENCING BATCH REACTOR SYSTEM

PART 1 GENERAL

1.1 THE REQUIREMENT

A. Pre-negotiated Price and Supply: The District has entered into a Memorandum of Agreement (MOA) with ITT/Sanitaire (SBR Supplier) for the supply of the SBR system as provided for in this Specification. The MOA, included in Appendix A, describes price, terms, and conditions for the supply of SBR equipment by ITT/Sanitaire and is hereby assigned to the Contractor. The Contractor shall enter into a purchase order with the Supplier for the supply of the SBR system. The purchase order and supply of the SBR system shall be in full compliance with the terms and conditions of the MOA.

B. The total pre-negotiated price is included in the ITT/Sanitaire Proposal is $787,460. The price is included in Section 00300, Bidder’s Bid Pages. The purchase price shall include the scope of supply identified in this Specification, the ITT/Sanitaire scope of supply in Appendix B dated November 7, 2008, and the other requirements of the MOA. The Contractor shall review the scope of supply and provide all additional appurtenances, equipment, installation labor, testing, and other services for a complete system. The price is based on a delivery of the equipment prior to June 30, 2010. If the Contractor elects to have delivery after this time, the purchase price shall be adjusted in accordance with the MOA, and the Contractor shall be responsible for such additional costs.

C. The Contractor and SBR Supplier shall also ensure that the other obligations defined in the MOA are complied with. These include, but are not limited to, delivery, inspections, testing and payment. A performance bond for the full value of the equipment supply cost listed above shall be furnished to the District within ten days of the Contractor’s issuance of the purchase order/contract to the Supplier. The appended Patent License Agreement shall be executed and delivered to the District within ten days of the Supplier’s receipt of the payment due for the delivery of the equipment to the site.

D. Exceptions to the Scope of Supply in Appendix B include:

1. The retrievable rack system for the diffusers is deleted.

2. The SBR effluent butterfly valves are deleted.

3. Decanters shall be sized for 30 minute decant period. Decanter shall be upsized appropriately from the 7.5 ft shown in the Bill of Materials.

4. Positive displacement blowers are deleted and turbo blowers are added.

E. The Sequencing Batch Reactor Manufacturer, who is herein after referred to as “SBR SUPPLIER” shall furnish a SBR system, including all appurtenant equipment in accordance with the requirements of the Contract Documents. All equipment and appurtenances shall be new and high quality in conformance with typical industry standards. The system, which will be installed by the CONTRACTOR, will be integrated with other equipment to form a complete and functional Wastewater
Treatment system. The system will be used to perform equalization, biological treatment, and secondary clarification to meet regulatory requirements.

F. The SBR system shall be designed to treat peak hour, peak 3-hour, maximum day, and average day flow and loads (BOD, TSS, Ammonia, and Nitrate) to meet the effluent quality requirements specified herein.

G. The SBR process shall include multiple operation modes including mixed fill, aerated fill, reaction aerated, reaction mixed, settle, sludge wasting, and decant required to meet water quality criteria.

H. Number of Units: The SBR system will include two process trains to handle the continuous wastewater flow and provisions for an additional future train. The SBR system provided by the SBR SUPPLIER shall include provisions where required and as specified herein for future addition of one SBR train.

I. Unit Responsibility: All equipment specified in this Section shall be provided by a single SBR SUPPLIER. Where two or more units of the same class of material or equipment are required, products of a single manufacturer shall be provided. The SBR system package shall be the end product of one responsible system SBR SUPPLIER. The SBR SUPPLIER shall be completely responsible for the proper design of their system, including but not limited to diffuser system, pumps, mixers (if relevant), decanters, blowers and controls. The SBR SUPPLIER is responsible to the OWNER for performance of all equipment systems indicated. As such, the SBR SUPPLIER shall provide testing, start-up and training as described in this Section and referenced Sections. The SBR system will be installed in concrete basins, connected to an electrical power supply, integrated to the Plant control system, and integrated with other equipment to form a complete and functional Treatment Project. The SBR SUPPLIER shall be responsible for all engineering necessary in order to select, furnish, inspect the installing CONTRACTORS equipment installation and connections, calibrate, and place into operation the SBR system along with all other equipment and accessories, specified herein.

J. Qualification Requirements: The SBR SUPPLIER shall meet the following requirements:

1. SBR SUPPLIER shall have experience in the design and manufacture of the SBR systems for a minimum of five (5) years experience.

2. SBR SUPPLIER shall be able to demonstrate a minimum of ten (10) installations within the United States in municipal applications with a minimum flow of 200,000 gpd and a minimum operating time of 5 years and similar in size, design, and application to that herein specified. As a minimum, the SBR SUPPLIER shall be the manufacture of the following components: decanter, diffuser system, and controls.

K. Scope of Specifications: The equipment covered by this Specification is intended to call attention to certain features and requirements of the work, but does not purport to cover all details of the supply and construction of the SBR system. Ancillary and accessory devices necessary for meeting the performance, operational, and reliability requirements specified herein shall be provided by the SBR SUPPLIER whether specified or not.
1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. All work shall be performed in conformance with the industry standards, local laws, and ordinance specified in the General Requirements. Wherever the requirements of the specifications conflict with laws or codes, the stricter requirements shall govern.

B. Referenced Specifications:

- Section 00700 - General Conditions
- Section 01340 – Shop Drawings, Product Data and Samples
- Section 01612 – Seismic Design Requirement
- Section 01660 – Testing and Training
- Section 09900 – Paintings and Coatings
- Section 11148 – Submersible Non-Clog Pumps
- Section 11205 – Submersible Mixers
- Section 11505 – Turbo Blowers
- Section 13310 – Control Panels and Hardware
- Section 13315 – Field Instrumentation
- Section 13312 – Control Panels and Panel Mounted Equipment
- Section 15200 – Valves, General
- Specification Division 13 and 16

1.3 CONTRACTOR AND/OR SBR SUPPLIER SUBMITTALS

A. General: The SBR SUPPLIER shall submit administrative, shop drawings, samples, quality control, contract closeout, and other required submittals of all equipment furnished under this Section and in referenced Sections in accordance with the requirements of Section 01340 – Shop Drawings, Product Data and Samples. Submittal shall include adequate detail and technical data to facilitate review to assess conformance with the Contract Documents.

B. Shop Drawings: The SBR SUPPLIER shall submit shop drawings in accordance with the requirements of Section 01340 – Shop Drawings, Product Data and Samples. In addition to those requirements, the following specific information shall be provided according to the schedule given in the General Requirements. The content and format of the information shall conform to the General Requirements.

1. Detail drawings (including dimensions, materials of construction, fabrication details, and labels) and technical data of the SBR equipment, including but not limited to item defined in the Scope of Supply in Section 2.1C.

2. Detailed electrical schematics and layout drawings including, but not limited to:
a. Front exterior and interior panel component layout drawings for all electrical and control panels. Drawings shall include nameplate legends for identification of all panel devices.
b. Control schematics with unique wire numbers for each conductor.
c. Detailed interface and point-to-point interconnection drawings, which indicate all SBR system and external component and equipment connections.
d. Manufacturer catalog data sheets and O&M Manual for all electrical power and control/instrumentation equipment, including but not limited to panel boards, circuit breakers, transformers, harmonic filters, transmitters, indicators and pilot devices.

3. System block diagram complete with all inter-equipment wirings, cable quantity and recommended conduit requirements.

4. Recommended wire sizes and cable insulation types for system electrical interconnections and instructions for wire connections where specified.

5. Recommended main power feeder size and circuit breaker trip rating based on a length from feeder to SBR power centers as indicated on the Drawings.

6. Provide heat load calculations for cabinet cooling equipment sizing based on maximum project site ambient temperature.

7. Other submittal information including control subsystem hardware and software required in related specifications in Divisions 13 and 16.

C. Product Data: The SBR SUPPLIER shall submit product information in accordance with the requirements of Section 01340 – Shop Drawings, Product Data and Samples. In addition to those requirements, the following specific information shall be provided:

1. Complete description of system scope of supply in sufficient detail to permit an item by item comparison with the Specifications.

2. Current list of installation in the United States with names of contacts and phone numbers.

3. All equipment dimensions and installation requirements. All electrical equipment shall be UL listed.

4. Descriptive information including catalog cut sheets, materials of construction, and specifications for all components and ancillary equipment provided by the SBR SUPPLIER.

5. Written field electrical termination requirements and instructions as required for the CONTRACTOR to install a complete and operational system. Written requirements shall include, but not be limited to, source power feeder conductor quantities and sizes, control wiring quantities and sizes and signal cable quantities and sizes.

6. Design calculations and operating strategy including operating cycle descriptions for average, max day, peak 3-hour, and peak hour flow. Calculation shall be done for specific site conditions (ambient air temperature, influent waste temperature,
and elevation) used for design. Calculation shall include defining of the required aeration time per day, aeration rate, actual oxygen required, blower flow rate, anoxic mixing time, mixer/jet pump sizing, sludge production, WAS wasting rate, solids retention time. Aeration system calculation shall include number of required diffusers, diffuser air rate per unit, total diffuser air rate.

7. For pumps and blowers, system curves showing flow and head shall be provide with operating efficiency, impeller size, and speed.

8. Seismic calculations in accordance with Section 01612 - Seismic Design Requirements

9. If a separate electrical enclosure is required as specified herein, then submit information for this enclosure as specified in Division 16.

10. PLC information and data shall be in accordance with Division 13 and as specified herein.

   a. Submit complete information on the package system PLC, LOI display system, and controls as required as specified herein and in Section 13300.
   b. Submit variable list showing the name and description of each register and/or bit in the register, as applicable. Highlight where Plant Control Network interface points are located.
   c. Submit narrative control strategies explaining package system functional control in accordance with related sections of Division 13 of the Specifications and meet the requirements of the Project P&IDs. Submit system block diagrams showing all digital and hardwired interfaces. Submit an input/output list, as well as a description of the interface with the Plant Control Network. Submit flow charts, block diagrams, and other descriptive material as needed to fully describe system overall function.
   d. Submit package PLC application program in both hardcopy and electronically early in the project, prior to startup again, (following factory testing and resulting fixes), and then as finally installed and tested.
   e. Submit screens both in color hardcopy and electronically on the same schedule as package PLC application program above.
   f. SCADA Interface Testing: Submit a test plan with testing forms describing in detail how the interface between the package and the SCADA system will be demonstrated. Testing shall include a test for each interface point and demonstration of each function.
   g. Integrate all submittals in final O&M’s. Update and coordinate documents to provide a complete and cohesive PLC/screen documentation package.

11. Form A as provided herein, completed in its entirety.

D. Installation Instructions: The SBR SUPPLIER shall submit installation instructions in accordance with the requirements of Section 01340 - Shop Drawings, Product Data and Samples. In addition to those requirements, the following specific information shall be provided:

1. Requirements for storage and protection of all delivered equipment and materials prior to installation.

2. Installation drawings and instructions for equipment installation.
3. List of maintenance materials required for the equipment prior to and during startup, and list of maintenance materials furnished with the equipment. Submit requirements for required maintenance prior to startup.

E. O & M Manuals: The SBR SUPPLIER shall provide operation and maintenance data for all equipment furnished for the project in accordance with Section 01340 - Shop Drawings, Product Data and Samples.

1. Provide a detailed Owner’s Manual for the SBR system including, but not limited to:
   a. Detailed step-by-step instructions for all normal operating procedures required to operate the equipment, including: process startup; process shutdown; process preparation for long-term shutdowns and service outages; observation and adjustment under normal operation; automatic operation; manual operation; inspection and assessment of SBR equipment condition; regular preventative maintenance; major maintenance procedures; problem diagnostics and troubleshooting; tuning and optimization; and equipment removal and replacement procedures.
   b. Detailed O & M Manual for each manufactured equipment item in the SBR system.
   c. Control system configuration and programming documentation with both hard copies and electronic version.
   d. Operating parameters for optimal operation.
   e. Troubleshooting manual.
   f. Contact information including company name, address, and phone number for technical services and replacement components/consumable parts.

2. Update O & M Manuals as required following successful performance testing and facility startup.

F. Startup and Training Plans: The SBR SUPPLIER shall submit startup and training plans in accordance with the requirements of Section 01340 - Shop Drawings, Product Data and Samples.

1. The detailed plan for testing during startup shall include, but is not limited to, a step by step testing procedure, description of parameters to be monitored, description of operating scenarios to be tested, list of coordination activities between the CONTRACTOR and SBR SUPPLIER required for testing, testing schedule, and other details necessary for successful equipment testing.

2. The training plan shall include a syllabus for training activities, schedule, and list of training materials/manuals that will be reviewed.

G. Inspection, Startup, and Field Adjustment Certification: An authorized service representative of the SBR SUPPLIER shall certify in writing that the equipment and controls have been properly installed, lubricated, adjusted, and readied for operation.

H. Tools: Special tools necessary for maintenance and repair of the equipment shall be furnished as a part of the WORK hereunder; such tools shall be suitably stored in metal tool boxes, and identified with the equipment number by means of stainless steel or solid plastic name tags attached to the box.
I. Warranty Submittals: The SBR SUPPLIER shall submit equipment and performance guarantees as outlined in Article 1.4.

J. Qualification Information: The SBR SUPPLIER shall provide name of facility, design capacity, treatment requirements, length of operation, and contact information, including name and title of contact person and phone number for the SBR SUPPLIER's SBR Systems in domestic or industrial wastewater applications within the United States. A minimum of 10 references shall be provided.

1.4 QUALITY ASSURANCE

A. The SBR SUPPLIER shall submit the following:

1. Manufacturer’s Certificate of Proper Installation
2. Functional Test Certification
3. Factory performance test reports
4. Performance test

B. The SBR SUPPLIER shall provide documentation of SBR SUPPLIER’s service capabilities including personnel names, location, experience, and references.

C. The SBR SUPPLIER shall provide equipment labeled and listed by Underwriters’ Laboratory (UL) or another nationally recognized testing laboratory, furnished by a single manufacturer qualified and experienced in the production of similar equipment.

D. Performance Guarantee:

1. If the SBR System fails to meet performance requirements, the SBR SUPPLIER shall modify, change, or add equipment as necessary to meet performance requirements. The SBR SUPPLIER shall be responsible for any additional costs due to changes (including piping, mechanical, structural, electrical, or control changes) or additional equipment as necessary to meet performance requirements. This includes additional cost for design, engineering, testing, construction, and equipment.

2. The SBR SUPPLIER shall submit to the OWNER a written performance guarantee for a period of three (3) calendar years following equipment startup, which shall include:

   a. The required process and performance guarantees.
   b. Signature by two authorized officers.
   c. Seal and signature of Notary Public.

E. SBR Equipment Warranty:

1. The SBR SUPPLIER shall furnish a warranty for the SBR system equipment.

   a. Equipment shall be warranted for one (1) year from the date of substantial completion, in accordance with the requirements of this specification and Section 00700 - General Conditions. The equipment shall be free of defects in materials and workmanship, including damages that may be incurred during
shipping. Contractor shall be responsible for damages that may be incurred during storage and installation.

b. Under the warranty, the SBR SUPPLIER shall replace, at no cost to the OWNER, any failed equipment or wiring within 14 calendar days notice.

1.5 MANUFACTURERS SERVICE REPRESENTATIVE

A. Manufacturer's Representative. In accordance with the requirements of Section 01660, a Manufacturer's Representative shall be present at the site or classroom designated by the OWNER to provide the services and minimum person-days listed below, travel time excluded.

1. An authorized service representative of the SBR SUPPLIER shall visit the site for a minimum of 3 trips and twelve (12) working days, travel time excluded, for inspection, start-up, field adjustment, and providing process assistance. A working day shall consist of up to 8-hours, breaks excluded.

2. An authorized training representative of the SBR SUPPLIER shall provide training for a minimum of 2 trip and 5 working days, travel time excluded, in accordance with this Section. The representative shall have at least 2 year's experience in training. Training shall be scheduled prior to the final acceptance field testing. The instruction provided shall be in the operation and maintenance of the specific models of equipment provided.

3. An authorized service representative shall visit the site for a minimum of 2 trips, for a minimum of one (1) working day for each trip, travel time excluded, after acceptance of the SBR system to review the system performance, operations and maintenance.

PART 2 PRODUCTS

2.1 GENERAL

A. Manufacturer – SBR Systems

   1. Sanitaire/ITT industries – ABJ® ICEAS®

B. Scope of Work: The SBR SUPPLIER's Scope of Work includes, but is not limited to, sizing of all process components, layout of all systems, development of detailed control descriptions, programming of the SBR PLC and supply of all major equipment and materials. The SBR SUPPLIER shall be responsible for coordinating with the CONTRACTOR for equipment installation, electrical installation of interconnecting wiring, power supplies, control circuitry, installation inspections, and field testing. The SBR SUPPLIER shall also be responsible for design of instrumentation and control systems and for coordinating with the CONTRACTOR on integration of the SBR PLC with the plant's PLC and SCADA system. Programming of the Plant SCADA system will be by the OWNER, through the services of the System Integrator (a third party programmer). The SBR SUPPLIER shall attend all SCADA system coordination meetings with the System Integrator, as specified in Section 13300.

C. Scope of Supply: The SBR SUPPLIER shall furnish all tools, supplies, materials, and equipment for an operational SBR System. SBR SUPPLIER shall also be responsible for design, fabrication, and delivery of all equipment, electrical panels, motor control centers, variable speed drive, appurtenances and instrumentation, an integrated
control system with hardware and software, installation oversight, equipment checkout, functional testing, startup, and training. The SBR SUPPLIER’s Scope of supply includes, but is not limited to:

1. Decanters, including supports, automatic control valves, and in-basin discharge piping, etc. Decanters shall decant from the top water surface to the decant bottom water level. Fixed decanters are not allowed. Contractor shall supply out of basin piping and wall thimble as required.

2. Influent distribution piping.

3. Turbo blowers with noise enclosures and accessories.

4. Waste sludge pumps, including sludge collection accessories, motors, housings, cables, discharge valves.

5. Fine bubble diffuser system in accordance with Section 11450, including membrane diffusers, frame assembly, manifold weldment, vertical air column, track/beam, flexible air line, and isolation valves.

6. Submersible mixers, including motor and track.

7. Valving, including but not limited to influent valve, decant valve, air control valves, scum valve, utility water valve.

8. Special instrumentation, including but not limited to pressure transducers, level sensors, float switches, dissolved oxygen sensors, flow meters.

9. Equipment supports and field joint materials.

10. Control System hardware (i.e. PLC, local control panels, etc), and PLC and Local Operator Interface (LOI) control system programming software logic as specified in Section 13300 and related sections.

11. Motor Control Centers

12. Variable Frequency Drives

13. Transformers as needed.

14. Major equipment anchorage systems including anchor bolts for all equipment

15. Custom fabricated components

16. Spare Parts

D. Service and Environment Conditions

1. Service Conditions: The equipment will be used in an industrial environment and must be designed and constructed to provide efficient performance, serviceability, long life, and ease of maintenance and operation.

2. Environment Conditions: The work of this Section shall be suitable for long term operation under the following conditions:
Duty | Continuous, with periodic short and long term process shutdowns  
---|---  
Fluid | Raw Municipal Wastewater  
Ambient Environment | Outdoors  
Ambient Temperature | 20 – 100 degree F  
Ambient Relative Humidity | 5 – 95 percent  
Ambient Pressure | 14.3 PSIA  
Project Site Elevation | Approximately 520 ft above mean sea level

3. Seismic Conditions: All SBR components and elements shall be design and anchored in accordance with seismic provisions conforming to the current California Building Codes and per Section 01612.

2.2 REQUIREMENTS

A. General Design Criteria: The SBR system shall be capable of meeting performance requirements specified herein across the full range of influent flow rates and loads.

<table>
<thead>
<tr>
<th>Influent Discharge</th>
<th>to the pre-react zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpd</td>
<td></td>
</tr>
<tr>
<td>Average Day Flow</td>
<td>350,000</td>
</tr>
<tr>
<td>Maximum Day Flow</td>
<td>430,000</td>
</tr>
<tr>
<td>Peak Hour Flow</td>
<td>903,000</td>
</tr>
<tr>
<td>Peak 3-Hour Flow</td>
<td>817,000</td>
</tr>
<tr>
<td>Plant Recycle Flow (Added to Design Flows above)</td>
<td>150,000</td>
</tr>
</tbody>
</table>

BOD

| Design Influent BOD Concentration, mg/l | 338 |
| Design Plant Recycle BOD Concentration, mg/l | 20 |
| Average Day BOD, lbs/day | 1,010 |
| Max Day BOD, lbs/day | 1,235 |

TSS

| Design Influent TSS Concentration, mg/l | 338 |
| Design Plant Recycle TSS Concentration, mg/l | 40 |
| Average Day TSS, lbs/day | 1,040 |
| Max Day TSS, lbs/day | 1,260 |

TKN
### Design Influent TKN as N Concentration, mg/l
54

### Design Plant Recycle TKN as N Concentration, mg/l
10

### Average Day TKN as N, lbs/day
170

### Max Day TKN as N, lbs/day
206

### Ammonia

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Influent Ammonia as N Concentration, mg/l</td>
<td>36</td>
</tr>
<tr>
<td>Design Plant Recycle Ammonia as N Concentration, mg/l</td>
<td>10</td>
</tr>
<tr>
<td>Average Ammonia as N, lbs/day</td>
<td>120</td>
</tr>
<tr>
<td>Max Day Ammonia as N, lbs/day</td>
<td>141</td>
</tr>
</tbody>
</table>

### Wastewater Temperature, deg C
16 to 22

### Mixed Liquor Suspended Solids (MLSS), mg/l
4,000

### Volatile Fraction, % VSS
75%

### Solids Yield Fraction, MLSS/BOD
0.9

### SVI, mL/g
150

### Design Dissolved Oxygen Setpoint, mg/l
2

### Aeration Time per day, hrs
12

### Settle Time per Cycle, hrs
0.75

### Decant time per Cycle, hrs
0.5

### Blower Design Temperature for, deg C
38

### Minimum Free Liquid Depth to Decanter, ft
3

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B. The SBR equipment shall be installed in concrete SBR basin(s) defined below. The SBR SUPPLIER shall provide a SBR system that meets the performance requirements in the basin configuration specified below.

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Required Volume, gals</td>
<td>639,300</td>
</tr>
<tr>
<td>Number of Basins</td>
<td>2</td>
</tr>
<tr>
<td>HRT at Average Flow, hrs</td>
<td>43.8</td>
</tr>
<tr>
<td>SBR Basin Volume at High Water Level, gals</td>
<td>319,700</td>
</tr>
<tr>
<td>SBR Basin Footprint Size, ft x ft</td>
<td>30 x 77</td>
</tr>
<tr>
<td>High Water Level, ft</td>
<td>18.5</td>
</tr>
<tr>
<td>Decant Bottom Water Level, ft</td>
<td>15.0</td>
</tr>
<tr>
<td>SBR Basin Free Board from High water level to top of basin, ft</td>
<td>2</td>
</tr>
<tr>
<td>Minimum Cycles per day</td>
<td>5</td>
</tr>
<tr>
<td>Maximum Decant Volume per Cycle, gals</td>
<td>60,476</td>
</tr>
<tr>
<td>Decant Flow Rate, gpm</td>
<td>2,016</td>
</tr>
<tr>
<td>Solids Generation (Dry Solids), lbs/day</td>
<td>908</td>
</tr>
<tr>
<td>WAS Concentration, mg/l</td>
<td>4,000</td>
</tr>
<tr>
<td>WAS daily waste volume, gals</td>
<td>Determined by SBR SUPPLIER</td>
</tr>
<tr>
<td>WAS Pump Units</td>
<td>2 Duty + 1 shelf spare</td>
</tr>
<tr>
<td>Wasting Time per Cycle, minutes</td>
<td>10</td>
</tr>
<tr>
<td>WAS Pump Rate, gpm</td>
<td>Determined by SBR SUPPLIER</td>
</tr>
<tr>
<td>Blower Operation time, hrs/day</td>
<td>Determined by SBR SUPPLIER, Maximum of 10 hours</td>
</tr>
<tr>
<td>Blower Units</td>
<td>2 duty + 1 stand-by</td>
</tr>
<tr>
<td>Blower Flow Rate per Unit, scfm</td>
<td>600</td>
</tr>
<tr>
<td>Blower horsepower per Unit, hp</td>
<td>30</td>
</tr>
<tr>
<td>Fine Bubble Aeration System</td>
<td></td>
</tr>
<tr>
<td>Mixer Units</td>
<td>4 Duty + 1 shelf spare</td>
</tr>
<tr>
<td>Mixer horsepower per Unit, hp</td>
<td>Determined by SBR SUPPLIER</td>
</tr>
</tbody>
</table>

C. SBR System Treatment Performance Criteria: the Central Coast Regional Water Quality Control Board (RWQCB) updated the SSCWD Waste Discharge Requirement (WDR) permit (Order No. R3-2004-0065) in December 2004. The SBR system shall be capable of meeting the following effluent water quality limitations:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>30-Day Average Limitations (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate</td>
<td>5</td>
</tr>
<tr>
<td>Ammonia as Nitrogen</td>
<td>5</td>
</tr>
<tr>
<td>BOD₅</td>
<td>30</td>
</tr>
<tr>
<td>TSS</td>
<td>30</td>
</tr>
</tbody>
</table>

D. Sizing of SBR equipment shall be based on General Design Criteria, Defined Basin Characteristics, and Treatment Performance Criteria. The SBR system shall be designed for the seismic design criteria of Section 01612. SBR SUPPLIER shall perform the following calculations:

1. SBR system design for the specified basin
2. Oxygen requirement
3. Process design:
   a. Cycle times at Average Flow and Peak Flow
   b. Aeration system design
c. Blower design, including aeration requirements
d. Pumping design, including jet motive pumps (if applicable) and WAS pumps
e. Decanter sizing
f. Hydraulic retention time
g. Sludge production and removal
h. Mixing system design (if applicable)

E. Seismic calculations for equipment anchorage and supports.

F. Expandability: The system shall be designed to allow for future expansion by adding an additional SBR basin with equivalent dimensions defined above.

2.3 SBR SYSTEM REQUIREMENTS

A. General: SBR SUPPLIER shall furnish equipment, components, and appurtenances as specified herein.

B. Blowers and Accessories:
   1. SBR SUPPLIER shall furnish turbo type blowers in a noise enclosure in accordance with Section 11505 – Turbo Blowers.

C. Waste Sludge Pump:
   1. Waste sludge pumps shall be submersible sewage pumps in accordance with Section 11148 – Submersible Non-Clog Pumps.
   2. 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. 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 of the pump discharge connection shall be the responsibility of the CONTRACTOR.

D. Valves:
   1. All valves shall be supplied according to Specification Section 15200 – Valves, General. Power shall be provide by CONTRACTOR.
   2. SBR SUPPLIER shall furnish the following valves for the system:
      a. Electric actuated plug valves for influent control (open/close service). One (1) valve per basin plus one (1) shelf spare.
      b. Electric actuated butterfly valves for effluent control (open/close service). One (1) valve per basin plus one (1) shelf spare.
c. Electric actuated plug valves for scum discharge control (open/close service). One (1) valve per basin.
d. Electric actuated butterfly valves for utility water spray control (open/close service). One (1) valve per basin.
e. Electric actuated butterfly valves for air control (open/close service). One (1) valve per basin plus one (1) shelf spare.
f. Provide other valves or meet other requirements in SUPPLIER specific sections.

E. Field Joint Materials necessary to complete field joins of the system shall be supplied in sufficient quantity and quality.

F. Materials of Construction

1. All metal components within the SBR basins and below the top of wall elevation or with parts that extend down below the top wall elevation shall be Type 316 stainless steel unless otherwise noted. All metal components above the top deck shall be 304 stainless steel unless otherwise specified.

a. Stainless Steel – Pipe, Fittings and Supports

1) Fabricate all welded parts and assemblies from sheets and plates of 304L or 316L stainless steel with a 2D finish conforming to ASTM A240, 554, 774, 778.
2) Fabricate non-welded parts and flanges from sheets, plates or bars of 304 or 316 stainless steel conforming to ASTM A240 or ASTM A276.
3) Welds & Welding Procedure
   a) Weld in the factory with ER 316L filler wire using MIG, TIG or plasma-arc inert gas welding processes. Provide a cross section equal to or greater than the parent metal.
   b) Provide full penetration butt welds to the interior surface with gas shielding of interior and exterior of joint.
   c) Continuously weld both sides of face rings and flanges to eliminate potential for crevice corrosion.

b. Corrosion Protection and Finishing

1) Clean all welded stainless steel surfaces and welds after fabrication by using the following procedure:
   a) Pre-clean all outside weld areas to remove weld splatter with stainless steel brushes and/or deburring and finish grinding wheels.
   b) Finish clean all interior and exterior welds and piping by full immersion pickling and rinse with water to remove all carbon deposits and contaminants to regenerate a uniform corrosion resistant chromium oxide film per ASTM A380 Section 6.2.11, Table A2.1 Annex A2 and Section 8.3.
   c) Corrosion protection techniques not utilizing full immersion methods are unacceptable and will be cause for rejection of the equipment.

2. All material used shall be designed to prevent any risk of electrolytic corrosion between any supports or frame and irradiation chamber.

3. Equipment and removable equipment components weighing over 100 pounds shall be provided with lifting lugs to permit easy handling.
4. Anchor bolts shall be provided for all equipment and shall be Type 316 stainless steel, at least 1/2 inch in diameter unless otherwise noted.

5. All major mechanical components and equipment provided under this Section, both field and panel mounted, shall be provided with permanently mounted name tags. Panel mounted tags shall be plastic; field mounted tags shall be stainless steel, stamped with inscriptions as shown or as provided by the ENGINEER. Panel mounted nameplates shall be engraved, rigid, laminated plastic type attached to the panel with stainless steel panhead screws. Unless otherwise noted, color shall be black with white letters. Letter height shall be 1/2 inch for all nameplates. Field mounted tags shall be 16-gauge, 316L stainless steel with 1/2-inch high characters.

G. Supports and Anchors:

1. All necessary supports for the aeration headers, in-basin liquid and air piping, manifolds, and decanters shall be provided as a part of the system.

2. The supports and fastening hardware shall be fabricated of Type 316 stainless steel.

3. The base shall be anchored with anchor bolts and grouted in place, as needed.

4. Saddles shall be provided with a Buna-N rubber pad to avoid abrasion.

5. A contoured clamp with an accompanying Buna-N rubber pad shall secure the piping to the saddle.

6. Anchor bolts of sufficient size and quantity shall be provided for mounting of all manufacture supplied SBR equipment and piping in the basin.

7. The anchor bolts shall be two part stud and acrylic resin system unless otherwise indicated.

8. The anchor system shall consist of acrylic resin and a hardener contained in a dual cartridge with static dispensing nozzle unless otherwise indicated.

9. Each anchor bolt shall be supplied with a stud, flatwasher, lockwasher & nut of Type 316 stainless steel.

H. Protective coating

1. All equipment, materials, and accessories provided are subject to the coating requirements of Section 09900 – Painting and Coatings and shall be shop-painted as specified. Coatings shall be suitable for long-term service under the expected service conditions, and all wetted parts shall be of materials suitable for the service conditions specified.

2.4 ELECTRICAL:

A. General: The SBR SUPPLIER shall design the electrical system to provide safe operation and reliability of the SBR System, including provision of the following:
1. Segregation of plant services and supplies into sensible groups to allow for safe and simple maintenance or servicing while ensuring maximum possible treatment capability is maintained.

B. Plant electrical supply shall be a 480 Volts, 3 phase, 60 Hz, 3-wire (plus ground) connection. Where SBR SUPPLIER’s equipment requires other voltages, SBR SUPPLIER shall provide K-4 rated transformers necessary for step down purposes and for proper system operation. Transformer shall be in accordance with Division 16.

C. SBR SUPPLIER shall provide internal 480 volt to 120 volt control power transformers for all 480V motor controls. All 480V circuit breakers and related bussing shall be able to withstand a short circuit of 65kA symmetrical.

D. All components of the electrical system shall comply with requirements of Division 16. Electrical documentation and cable and circuit identification labels shall conform to Division 16.

E. All motors supplied as part of the SBR system shall conform to the requirements of Division 16.

2.5 INSTRUMENTATION

A. General: All instrumentation shall be in accordance with Section 13315 – Field Instrumentation. Instrumentation shall be designed for use in the intended application. All instrumentation shall be installed per SBR SUPPLIER’s instructions.

B. Water Level Measurement: SBR SUPPLIERS shall furnish one level measurement instrument and appurtenances for each basin. The level measurement instrument shall be one of the following types:

1. Ultrasonic Level Sensor
   a. Ultrasonic level transmitter indicator and mounting bracket and anchors shall be included for each basin. The ultrasonic level transmitter shall meet the requirements of Section 13315 - Field Instrumentation.

2. Submersible Pressure Transducers
   a. Submersible pressure transducers and mounting bracket and anchors shall be included for each basin. The Submersible Pressure Transducers shall be in accordance with Section 13315 - Field Instrumentation.

C. Water Level Floats. One high level float and one low level float shall be provided in each basin. Floats shall be provided by the SBR SUPPLIER and shall meet the requirements of Section 13315 - Field Instrumentation.

D. Dissolved Oxygen System

1. SBR SUPPLIER shall furnish a dissolved oxygen system for each SBR basin. The dissolved oxygen system shall include a dissolved oxygen analyzer and sensor.

2. Dissolved Oxygen Controller/Transmitter
a. Microprocessor-controlled measuring unit with measured value display, temperature display, and menu-driven system
b. The system shall provide continuous dissolved oxygen monitoring.
c. The controller shall be housed in a NEMA 4X or IP66 metal enclosure with corrosion resistance finish and bracket for wall, stand post, or standard two inch diameter round handrail assembly as applicable. Sunshield for outdoor installations.
d. All program memory and features of the instrument shall be unaffected by power interruptions. All run, programming, and calibration functions shall be accessible without having to open the enclosure. The controller shall be proven by an independent industry authority, such as Instrument Testing Association, to operate for at least three months without any maintenance whatsoever.
e. The controller shall have the following capabilities:
   1) Four programmable relays with unlimited individual programmable hysteresis on each.
   2) Three data logs to measure data at selected intervals.
   3) Display dissolved oxygen in either parts per million or percent saturation.
   4) Display two decimal places when in the parts per million mode and under 10 ppm.
   5) A minimum 11.25 square inch graphical display that continuously shows dissolved oxygen, temperature, and relay status.
   6) Display a trend graph of the dissolved oxygen value and temperature for the last 24-hour period with a real time update of current value.
   7) Three SPDT, user-configured contacts
   8) Two (Analog (4–20 mA)) outputs, maximum impedance 500 ohm.
   9) Standard back lite display.
   10) CE approved
   11) Listed for use in general locations to UL and CSA safety standards by ETL

3. Dissolved Oxygen Sensor

a. The DO sensor shall be a luminescent sensor technology using blue and red LED light with a photo diode. It shall have a zero output, repeatable at 0 mg/l dissolved oxygen.
b. Probe materials shall be Foamed Noryl and 316 SS. The sensor shall be Polybutyl methacrolate and shall be supplied with a length of polyurethane jacketed cable with quick connect plug to meet site installation requirements.
c. The mounting hardware shall be 316 stainless steel with a Ball float.
d. Measuring range: 0 to 20 ppm
e. Accuracy: 0.2% of span
f. Resolution below 10 ppm shall be 0.01 ppm and above 10 ppm shall be 0.1 ppm
g. Response time for a 90% signal change shall be less than 40 seconds.
h. The sensor cap shall be warranted for one full year against defects in material and workmanship.
i. The probe shall be warranted for three full years against defects in material and workmanship.

E. Special Tools

1. Provide any specialized tools required for maintenance of the SBR system.
2.6 CONTROL SYSTEMS

A. General

1. SBR SUPPLIER shall provide a complete control system including panel-mounted and field-mounted components.

2. Indicating light colors shall meet the requirements as specified in Section 13312 - Control Panels and Panel Mounted Equipment (green for RUNNING, ON, or OPEN, amber for FAIL/FAULT/TROUBLE, and red for STOPPED, OFF, or CLOSED).

B. Control Panel Requirements

1. Control panels and components shall meet all applicable requirements of Section 13312 - Control Panels and Panel Mounted Equipment, and Division 13 including, but not limited to, requirements for submittals, components, materials, and workmanship. Components include NEMA-rated motor starters, circuit breakers, control components, power supplies, and pilot devices.

2. Outdoor control panels shall be type 316 stainless steel, NEMA 4X. Indoor control panels shall be NEMA 12. Mounting shall be as shown on the Drawings.

3. Provide a panel space heater and cooling system(s), as required, in each local control panel. Refer to Section 13312 - Control Panels and Panel Mounted Equipment for detailed requirements on temperature control.

C. Package PLC System

1. Provide a complete and operable package PLC control system in accordance with Section 13310 - Process Control System to provide automated control of the system.

2. The PLC will be mounted in a cabinet located in the SBR Electrical Building. The Building shall include an HVAC system to control room temperature to a maximum of 90 degrees Fahrenheit. The PLC shall include a local operator interface (LOI).

3. Programmable Logic Controllers as specified in Section 13300.

4. Programming Requirements

   a. SBR SUPPLIER shall be responsible for programming the PLC.

   b. The package system PLC programming platform shall be in accordance with Section 13310.

   c. Program code shall be fully annotated to the best practices of the industry. Early submittals of programming and screens shall demonstrate the SBR SUPPLIER's proposed approaches, and the OWNER's representatives will mark up submittals with general requirements, which then shall be incorporated by the SBR SUPPLIER throughout and resubmitted if necessary.

   d. The display system shall be a panel-mount local operator interface (LOI) computer running Wonderware. The LOI shall meet the requirements specified in Section 13310.
e. LOI displays shall follow conventions (defacto and published) established for use elsewhere in the plant. General screen layout, depictions, scale and proportion, colors, animation, navigation, use of pop-ups, and general operator interface shall match and line up with those in the rest of the plant.

f. The LOI shall allow for complete SBR system control and monitoring through the keypad and display. Screen conventions shall match those to be developed and used in the remainder of the plant. The SBR SUPPLIER shall adjust colors, layout, depictions, structure, etc., as needed to conform to defacto and published plant standards.

5. Network Requirements as shown on the Drawings an as required under section 13300.

D. Local Operator Interface:

1. Interface shall consist of display and keypad, and software for communication to the PLC system in accordance with section 13310.

2. Memory programming shall be in a “menu” structure, allowing easy access to all points.

3. Function keys shall be programmed for one key access to most commonly used data.

4. Direct access to any setpoint shall be available.

5. Individual data points as well as group data points shall be password protected as directed by the engineer.

6. All setpoints shall be described with text that explains specifically what setpoint or monitoring point is.

7. Operator interfaces that refer to PLC memory register locations are unacceptable.

8. All numeric values shall be represented with floating point decimal in correct position, sign (for negative numbers), and annotated with units designation (i.e. feet, gpm, minutes).

9. Setpoints shall be protected by low and high limits.

10. Control circuits shall allow for manual override of PLC system by selector switches on the panel front.

11. Panel mounted indicator lamps for operation and failure of equipment shall be provided. All failure lamps and alarm horn operations shall annunciate following I.S.A. sequence “A”.

12. Overload cutout and seal failure indication shall be provided for submersible pumps.

13. Float switch detection of high level in each SBR shall override the transducer level signal to initiate an emergency decant.
14. System Functions: The LOI shall include the following minimum functions (as applicable for the specific equipment supplied by the SBR Supplier).

a. Set Process Cycle Phases and Target Runtimes
b. Blower - Hand/Off/Auto selection per unit.
c. Blower Minimum Speed Set point
d. Blower Time delay before altering speed
e. Blower Speed and Delay setpoint for turning on next unit
f. Blower Speed and Delay setpoint for turning off blower
g. Jet Pump - Hand/Off/Auto selection per unit.
h. Mixer - Hand/Off/Auto selection per unit.
i. Decant Actuator - Hand/Off/Auto selection per unit.
j. WAS - Hand/Off/Auto selection per unit.
k. WAS Pump Runtime
l. WAS Pump Start Time from beginning of decant cycle
m. DO Control Setpoint
n. DO acceptable range before call for blower speed change.
o. Scum Valve - Hand/Off/Auto selection per unit.
p. Utility Water Valve (Scum Sprays) - Hand/Off/Auto selection per unit.
q. Basin READY indication per basin.
r. ALARM SILENCE pushbutton.

15. Alarms and Monitoring

a. Send the following statuses, alarms and analog values (as applicable for the specific equipment supplied by the SBR Supplier) via Ethernet TCIP communication to the SCADA system via the Plant Control Network.

1) Monitoring:
   a) Basin 1 Status – Remote
   b) Basin 2 Status – Remote
c) Blower 1 Setting – Remote
d) Blower 2 Setting – Remote
e) Blower 3 Setting – Remote
f) Blower 1 Status – Running, Ready/Off, Fail
g) Blower 2 Status – Running, Ready/Off, Fail
h) Blower 3 Status – Running, Ready/Off, Fail
i) Blower 1 Speed
j) Blower 2 Speed
k) Blower 3 Speed
l) Air Flow Rate
m) Air Pressure
n) Air Valve, Basin 1 Setting – Remote
o) Air Valve, Basin 2 Setting – Remote
p) Air Valve, Basin 1 Status – Open, Close, Fail
q) Air Valve, Basin 2 Status – Open, Close, Fail
r) Jet Pump, Basin 1 Setting – Remote
s) Jet Pump, Basin 2 Setting – Remote
t) Jet Pump, Basin 1 Status – Running, Ready/Off, Fail
u) Jet Pump, Basin 2 Status – Running, Ready/Off, Fail
v) Mixer 1, Basin 1 Setting – Remote
w) Mixer 2, Basin 1 Setting – Remote
x) Mixer 3, Basin 2 Setting – Remote
y) Mixer 4, Basin 2 Setting – Remote
z) Mixer 1, Basin 1 Status – Running, Ready/Off, Fail
aa) Mixer 2, Basin 1 Status – Running, Ready/Off, Fail
bb) Mixer 3, Basin 2 Status – Running, Ready/Off, Fail
c) Mixer 4, Basin 2 Status – Running, Ready/Off, Fail
d) Influent Valve, Basin 1 Setting – Remote
e) Influent Valve, Basin 2 Setting – Remote
f) Influent Valve, Basin 1 Status – Open, Close, Fail
g) Influent Valve, Basin 2 Status – Open, Close, Fail
h) Decant Actuator, Basin 1 Status – Running, Ready/Off, Fail (as applicable)
ii) Decant Actuator, Basin 2 Status – Running, Ready/Off, Fail (as applicable)
j) Basin 1 and 2 Water Level
kk) Basin 1 and 2 Dissolved Oxygen
ll) Basin 1 and 2 Phase Status – Fill Mixed, Fill Aerate, React Mixed, React Aerated, Settle, Decant, Idle
mm) Cycle Time (From beginning of fill cycle)
nn) Phase Runtime
oo) WAS Pump, Basin 1 Setting – Remote
pp) WAS Pump, Basin 2 Setting – Remote
qq) WAS Pump, Basin 1 Status – Running, Ready/Off, Fail
rr) WAS Pump, Basin 2 Status – Running, Ready/Off, Fail
ss) WAS Pump, Basin 1 PHASE RUNTIME
tt) WAS Pump, Basin 2 PHASE RUNTIME
uu) WAS Flow Rate
vv) Scum Valve, Basin 1 Setting – Remote
ww) Scum Valve, Basin 2 Setting – Remote
xx) Scum Valve, Basin 1 Status – Open, Close, Fail
yy) Scum Valve, Basin 2 Status – Open, Close, Fail
zz) Utility Water Valve, Basin 1 Setting – Remote
aaa) Utility Water Valve, Basin 2 Setting – Remote
bbb) Utility Water Valve, Basin 1 Status – Open, Close, Fail
ccc) Utility Water Valve, Basin 2 Status – Open, Close, Fail

2) High Priority Alarms
   a) HIGH-HIGH Water Level (water level in basin activates high level float)
b) Two or more Blowers Fail
c) Air Valve Fail
d) Jet Pump Fail
e) Mixer Fail
f) Influent Valve Fail to Open or Close
g) Decant Actuator Fail to Open or Close (as applicable)

3) Low Priority Alarms
   a) Individual Blower Fail
   b) WAS Pump Fail
c) WAS flow meter fail
d) DO Fail
e) High water level above a predetermined setpoint
f) Level meter fail
g) Utility water valve fail
h) Scum valve fail
i) Air flow meter fail

4) General Alarm Conditions
   a) Flowmeter signal input FAIL alarm (signal to be provided by others)
   b) Power FAIL alarm

E. PLC Discrete Outputs: Provide the following dry contact outputs (as applicable for
   the specific equipment supplied by the SBR SUPPLIER), rated no less than 3 amps
   at 120 volts, 60 Hz and 24 volts dc. All outputs shall operate interposing control
   relays per Section 13310.

   1. Blower 1 On/Off
   2. Blower 2 On/Off
   3. Blower 3 On/Off
   4. Air Valve 1 Open/Close
   5. Air Valve 2 Open/Close
   6. Jet Pump 1 On/Off
   7. Jet Pump 2 On/Off
   8. Mixer 1 On/Off
   9. Mixer 2 On/Off
  10. Mixer 3 On/Off
  11. Mixer 4 On/Off
  12. WAS Pump 1 On/Off
  13. WAS Pump 2 On/Off
  14. Influent Valve 1 Open/Close
  15. Influent Valve 2 Open/Close
  16. Scum Valve 1 Open/Close
  17. Scum Valve 2 Open/Close
  18. Utility Water Valve 1 Open/Close
  19. Utility Water Valve 2 Open/Close

F. PLC Discrete Inputs: The PLC shall accept the following dry contact inputs for
   package configuration (as applicable for the specific equipment supplied by the SBR
   SUPPLIER), which will be suitable for use with 120V 60 Hz sensing voltage provided
   by the PLC panel. Coordinate the contact sense of discrete I/O with those in use for
   the plant control system.

   1. Blower 1 - Remote
   2. Blower 1 - Run
   3. Blower 1 - Fail
   4. Blower 1 - High Temperature
   5. Blower 2 - Remote
   6. Blower 2 - Run
   7. Blower 2 - Fail
   8. Blower 2 - High Temperature
   9. Blower 3 - Remote
  10. Blower 3 - Run
  11. Blower 3 - Fail
  12. Blower 3 - High Temperature
  13. Air Valve 1 - Remote
  14. Air Valve 1 - Open/Closed
  15. Air Valve 1 - Fail
  16. Air Valve 2 - Remote
17. Air Valve 2 – Open/Closed
18. Air Valve 2 – Fail
19. Jet Pump 1 - Remote
20. Jet Pump 1 - Run
21. Jet Pump 1 - Fail
22. Jet Pump 2 - Remote
23. Jet Pump 2 - Run
24. Jet Pump 2 - Fail
25. Mixer 1 - Remote
26. Mixer 1 - Run
27. Mixer 1 - Fail
28. Mixer 2 - Remote
29. Mixer 2 - Run
30. Mixer 2 - Fail
31. Mixer 3 - Remote
32. Mixer 3 - Run
33. Mixer 3 - Fail
34. Mixer 3 - Remote
35. Mixer 3 - Run
36. Mixer 3 - Fail
37. WAS Pump 1 - Remote
38. WAS Pump 1 - Run
39. WAS Pump 1 - Fail
40. WAS Pump 2 - Remote
41. WAS Pump 2 - Run
42. WAS Pump 2 - Fail
43. Influent Valve 1 - Remote
44. Influent Valve 1 – Open/Closed
45. Influent Valve 1 – Fail
46. Influent Valve 2 - Remote
47. Influent Valve 2 – Open/Closed
48. Influent Valve 2 – Fail
49. Decant Actuator 1 - Remote
50. Decant Actuator 1 – Open/Closed
51. Decant Actuator 1 – Fail
52. Decant Actuator 2 - Remote
53. Decant Actuator 2 – Open/Closed
54. Decant Actuator 2 – Fail
55. Scum Valve 1 - Remote
56. Scum Valve 1 – Open/Closed
57. Scum Valve 1 – Fail
58. Scum Valve 2 - Remote
59. Scum Valve 2 – Open/Closed
60. Scum Valve 2 – Fail
61. Utility Water Valve 1 - Remote
62. Utility Water Valve 1 – Open/Closed
63. Utility Water Valve 1 – Fail
64. Utility Water Valve 2 - Remote
65. Utility Water Valve 2 – Open/Closed
66. Utility Water Valve 2 – Fail
67. Basin 1 DO - Fail
68. Basin 2 DO – Fail
69. Basin 1 LSH
70. Basin 1 LSL
71. Basin 2 LSH
72. Basin 2 LSL

G. PLC Analog Inputs: Accept the following 4-20mA input, and do not load the loops more than 250 ohms.

1. Total Influent Flow; 4mA = 0 mgd, 20mA = 2 mgd, as applicable
2. Basin 1 Water Level Instrument; 4mA = 5 ft, 20mA = 20 ft
3. Basin 2 Water Level Instrument; 4mA = 5 ft, 20mA = 20 ft
4. Basin 1 DO Instruments; 4mA = 0 mg/l, 20mA = 8 mg/l
5. Basin 2 DO Instruments; 4mA = 0 mg/l, 20mA = 8 mg/l
6. Blower 1 – Speed
7. Blower 1 – Pressure
8. Blower 2 - Speed
9. Blower 2 – Pressure
10. Blower 3 – Speed
11. Blower 3 – Pressure
12. Basin 1 - Air Flow
13. Basin 2 - Air Flow
14. Basin 1 WAS Flow
15. Basin 2 WAS Flow

H. PLC Analog Outputs: Send the following 4-20mA output, and do not load the loops more than 250 ohms.

1. Blower 1 - Speed
2. Blower 2 - Speed
3. Blower 3 – Speed

I. The PLC package shall include 20% spare I/O points completely wired to terminal strips and shall have minimum cabinet space for an additional 20% I/O points to be installed in the future.

J. Provide other controls, indications, and alarms as necessary to properly operate and troubleshoot the system.

K. Other Requirements

1. SBR operation shall resume unchanged following short power outages.

2. Software shall recognize, and initiate plant restart based upon length of outage and tank levels upon power restoration. The system shall include an operator adjustable time delay for returning equipment to operation in any mode. This delay shall be configurable from 5 to 120 seconds, with initial setting coordinated among packages to avoid coincident equipment restarts.

3. The system shall include an electrical power disconnect meeting the requirements of Division 16 and the National Electrical Code.

4. Provide interconnection schematic diagrams. The SBR SUPPLIER of the systems specified in this Section shall provide information and prepare documentation as required in the development and submission of interconnection diagrams.
5. The controls provided under this section shall protect the equipment provided under all operating conditions.

L. Control Strategy

1. AUTO mode

   a. When in the AUTO mode, the PLC shall accept and act on commands as described in the SBR System Control Philosophy below. Refer to the control strategies in Section 13305 - Process Control Descriptions for description of coordinated operation with the related Plant PLC. Regardless of what is the manufacturer’s standard control configuration, the requirements herein shall be met.

   b. General Philosophy (Two Basins in Operation):

      1) The SBR control system shall utilize the operator defined setpoints, DO measurement, basin water level, and influent flow to operate the system.

      2) The SBR basins shall operate on a complementary basis so that only one tank is aerating at a given time. The fill phases shall be complementary as one basin will always be filling.

      3) The SBR control system shall control the blowers, mixers/pumps, influent valve, decant valve/actuators, and WAS pumps in accordance with the cycle phases (Fill Mixed, Fill Aerate, React Mixed, React Aerated, Settle, Decant, Idle, and Sludge Wasting which takes place at the end of the decant cycle).

      4) The blowers speed shall be controlled to maintain the operator DO setpoint. There shall be an operator adjustable allowable variance from the DO setpoint where no adjustment to blower speed is made. Following a speed adjustment there shall be an operator setpoint delay that allows the system to reach an equilibrium prior to blower speed being adjusted again.

      5) There shall be two operator selectable modes of blower sequencing. Mode 1 shall operate the blowers on a first on/first off rotational basis. Mode 2 shall operate on a Lead/Lag/Follow basis.

   c. General Philosophy (Single Basin in Operation).

      1) For Single Basin operation influent plant flows will have the option to be stored in the Biosolids Storage Basin. However, to minimize the flow to the biosolids basin the Single SBR Basin shall operate with a modified set of phases in each cycle. Under single basin operation filling shall occur throughout the cycle. The modified phases shall be Fill Mixed, Fill Aerate, Fill Settle, Fill Decant, and Sludge Wasting which would occur during the Fill Settle or Fill Decant phase.

2.7 SPARE PARTS

A. The SBR SUPPLIER shall provide the following spare parts for the System:

   1. One (1) Mixer Shelf Spare

   2. One (1) WAS Pump Shelf Spare

   3. One (1) Influent Valve Shelf Spare
4. One (1) Decant Actuator Shelf Spare

5. One (1) Air Valve Shelf Spare

6. One (1) DO Sensor Shelf Spare

7. For Fine Bubble Aeration Supplier, 10 diffuser assemblies/tubes, 10 gaskets, 10 O-rings, and 10 retainer rings (as applicable).

8. PLC and control system spare parts as specified in Section 13300 and related sections.

2.8 SANITAIRE ICEAS (ABJ) ® SBR REQUIREMENTS

A. This section outlines the requirement for named SBR SUPPLIER only. All other specification requirements apply to all listed manufacturers and systems unless otherwise stated.

B. Fine Bubble Aeration System

1. The aeration system shall be a fine bubble diffused air system.

2. Each diffuser assembly shall consist of membranes diffusers, frame assembly, manifold weldment, dropleg, track/beam, flexible air line, and isolation valve. All metal components shall be Type 316 stainless steel unless otherwise specified.

a. Droplegs

1) Droplegs shall be constructed of stainless steel from air main connection on the manifold
2) A Van Stone style flange with a 150 pound bolt pattern for the top connection shall be provided.
3) A band clamp coupling with gasket for the lower dropleg to manifold shall be provided.
4) SBR SUPPLIER shall furnish supports to carry the full weight of the dropleg. The drop leg shall be supported to maintain a plumb position so that lateral loads are not imposed on the air manifold in the basin or the Air piping feeding the drop legs.

b. Air Manifolds

1) PVC manifolds shall be provided for connection to the air distribution headers.
2) Manifolds shall be of 4” diameter fixed threaded union or flanged joints for connection to the air distributors.
3) Manifold, distributor connections, and supports shall be designed to resist thrust generated by expansion/contraction of the air distributors over a temperature range of 125°F.
4) Manifold shall be supported by a minimum two (2) supports.
5) Manifold shall be connected with fixed union or flanged joints to prevent rotation or blow apart.

c. Air Distributors and Diffuser Holders
1) Distributors with single diffuser holders shall be solvent welded to the
crown of the air distributor for complete air seal and strength.
2) Distributor and holders shall be designed to resist a dead load of 200 lbs
applied vertically to the outer edge of the diffuser holder.
3) 4-inch diameter threaded removable end caps complete shall be provided.
The end caps shall be provided with gasket, threaded coupling and end
plate for clean out at the end of each distributor.

d. Air Distributor and Manifold Connection Joints

1) Air distribution sections shall be joined with positive locking fixed threaded
union or flange type joints for all submerged header joints to prevent blow
apart and rotation.
2) Bell and spigot, slip on or expansion type joints are not acceptable for
submerged joints.
3) Threaded union joints with spigot section shall be connected to one end of
the distribution header. A threaded socket section shall be connected to
the mating distribution header, an “O” ring gasket and a threaded screw on
retainer ring. Solvent welding shall be done in the factory.
4) Flanged joints shall be designed with a 125 lb drilling angle, face ring,
follower flange and stainless steel hardware.

e. Supports

1) Each section of manifold and air distributor shall be provided with a
minimum of two (2) supports.
2) Maximum support spacing shall be limited to 8 feet.
3) All supports shall be designed to allow for thermal expansion and
contraction forces over a temperature range of 125°F and to minimize
stress build up in the piping system.
4) Supports shall be designed to allow complete removal from the tank to
facilitate installation of additional headers and tank maintenance.
5) Manifold supports with 6 inch diameter and larger:
   a) Supports shall be designed to include hold down guide straps, support
structure and anchor bolts.
   b) Guide straps shall be designed with a 2 inch minimum width to
eliminate point load on manifold and minimize binding.
   c) Supports shall be designed for 2 inches plus or minus vertical
adjustment for leveling of manifold.

f. Air Distributor and manifold Supports with 4 inch diameter

1) Supports shall be guide and fixed type to allow expansion/contraction.
2) Supports shall be designed with hold down straps, support structure and
anchor bolt.
3) Guide support
   a) Guide straps shall have 1.5 inch wide top and bottom contoured
bearing surface with chamfered edges to minimize binding and
resistance to movement of air distributor under full buoyant uplift load.
   b) Strap shall be designed with 1/8 inch clearance around distributor so
strap is self limiting and cannot be over tightened.
4) Fixed supports
a) Fixed straps shall have 1.5 inch wide top and bottom contoured bearing surface with punched burrs to positively grip the air distributor when tighten.
b) Strap shall be designed to be self limiting to prevent stressing the distributor if the clamp is over tightened.

g. Diffuser Assemblies

1) The diffuser assembly shall include diffuser, diffuser gasket, holder, retaining ring and air flow control orifice.
2) Membrane diffuser
   a) An integral check valve shall be incorporated into the membrane diffuser.
   b) Diffusers shall be designed and tested for a dynamic pressure (DWP) of 12 inches ±20% water column at 1.0 SCFM/diffuser and 2 inches submergence.
   c) Visual uniformity: diffusers shall be observed for uniform air distribution across the active surface of the diffuser at 1.0 SCFM/diffuser and 2 inches submergence. Active surface is defined as the perforated horizontal projected area of the diffuser.
   d) Quality control: Diffuser shall be tested using primary sampling criteria outlined in Military Standard 105E.
   e) Diffuser support plate: A PVC support plate shall be provided to form an air plenum under the diffuser and support for the membrane when the air is off.

3) Diffuser Holders and Retainer Rings
   a) Holder shall be designed with air flow control orifice and plenum chamber below the diffuser. Holder shall be provided for peripheral support for the diffuser.
   b) Retainer ring shall be designed to seal the diffuser and O-ring in the holder to prevent air leakage around gasket.
   c) Retainer rings threads shall be designed with minimum cross section of 1/8 inch and allow for one complete turn to engage threads.

h. Anchor bolts

1) Anchor bolts shall be designed for embedment in 4000 psi concrete with a pullout safety factor of 4.
2) A mechanical stainless steel expansion type anchor bolt system shall be provided.

i. Liquid purge system shall be provided to drain the entire submerged aeration piping system for each aeration grid including airlift purge eductor line and control valve. The purge system shall use a solenoid valve for automatic operation coordinated with SBR operation.

j. Materials of Construction:

1) Natural Rubber – Furnish all fixed and expansion joint O-ring gaskets of natural rubber/SBR with a Shore A durometer of 45 ± 5.
2) Polyvinyl Chloride (PVC) – Pipe and Fittings
3) Produce all PVC pipe and fittings from PVC compound with a minimum tensile strength of 7000 psi.
4) Provide lower drop pipe, manifold and air distributors as follows:
5) Design air distributors and manifolds to withstand 125°F mean wall temperature.

6) Add two parts by weight of titanium dioxide per 100 parts of resin to PVC compounds for manifolds, air distributors, joints and PVC diffuser assembly components to minimize ultraviolet light degradation.

7) Factory solvent weld all PVC joints. Field solvent welding will NOT be permitted.

8) EPDM - Membrane Diffusers and Gaskets
   a) Manufacture circular membrane diffuser discs with integral O-ring of EPDM synthetic rubber compound with precision die formed slits. Thermoplastic materials (i.e. plasticized PVC or polyurethane) are not acceptable.
   b) Add carbon black to the material for resistance to ultraviolet light.
   c) Design diffuser as one piece injection molded part with a minimum thickness of 0.080 inches for 9 inch diameter unit.
   d) Limit the maximum tensile strength of the diffuser to 10 pi when operating at 2.4 SCFM/sq. ft. of material. Furnish proportionately thicker material for larger diameter disc diffusers to limit the maximum tensile stress and to resist stretching.
   e) Produce diffusers free of tears, voids, bubbles, creases or other structural defects.
   f) Furnish diffuser material to meet the following:

<table>
<thead>
<tr>
<th>Item</th>
<th>Value/Units</th>
<th>ASTM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Polymer</td>
<td>EPDM</td>
<td>D573</td>
</tr>
<tr>
<td>UV Resistance</td>
<td>Carbon Black</td>
<td></td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.25 or less</td>
<td></td>
</tr>
<tr>
<td>Durometer – Minimum</td>
<td>58% ± 5%</td>
<td>D2240</td>
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<tr>
<td>Modulus of Elasticity</td>
<td>500 pi</td>
<td>D412</td>
</tr>
<tr>
<td>Ozone Resistance (72 hrs: 40°C pphm)</td>
<td>No cracks @ 2X magnification</td>
<td>D1171 Test A</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>1200 pi</td>
<td>D412</td>
</tr>
<tr>
<td>Elongation - %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Retained 70 hrs @ 100°C</td>
<td>75% Max</td>
<td>D573</td>
</tr>
<tr>
<td>- minimum at break</td>
<td>350%</td>
<td>D412</td>
</tr>
</tbody>
</table>

g) Quality Control – Test diffuser using primary sampling criteria outlined in Military Standard 105E.

C. Mixer:

1. The SBR system shall be furnished with submersible mixers for each basin in accordance with Section 11205 – Submersible Mixers.

2. Each mixer shall be of the integral design, close coupled, submersible type.

D. Decanter:
1. The SBR SUPPLIER shall furnish a minimum of one (1) decanter assemblies per each SBR basin. Decanter shall decant within 1.5 ft of the top water level and decant to the bottom water level. Fixed decanters are not acceptable.

2. The decanter shall be parked above the design top water level during aeration and settling phases, thereby eliminating any possibility of solids carryover during these phases.

3. At top park position, the decanter shall provide ‘fail safe’ overflow protection in the event of a power failure. Settled supernatant will flow via gravity, under the scum guard, over the weir, and into the decanters.

4. The decanter shall be designed with a scum guard mechanism to prevent the discharge of scum and floatables during decanter or overflow operation.

5. All in-basin seals and bearings shall be maintenance free.

6. The drive mechanism or actuator shall be mounted on the walkway to provide easy access for maintenance and service purposes.

7. The drive mechanism or actuator shall be designed for continuous duty, variable speed operation thereby producing a uniform effluent flow rate throughout the decant phase. The decanter drive system shall be configured such that the decanter weir reaches bottom water level at the end of the decant phase thereby maximizing settling time.

8. Actuator limit switches and motor shall be integrated with process control system to prevent blower operation during the decant phase of the cycle.

9. The decanter shall be supplied with the following parameters:
   a. Upper collection trough with integral overflow weir and Scum guard mechanism
   b. Downcomer pipes
   c. Collector pipe
   d. Seals and bearings
   e. Electro-mechanical actuator

10. The drive mechanism or actuator shall consist of a Duff-Norton, or equal, electro-mechanical screw jack with protective boot and redundant, magnetic end position limit switches. The actuator shall be equipped with a minimum 3/4 Hp, 460 volt, 3Ph, 60 Hz, TENV motor per Section 16220 – Low Voltage Motors, suitable for continuous duty in an outdoor, moist environment. The motor shall be driven by a variable frequency drive per Section 16481 – Variable Frequency Drives allowing the controls to vertically lower the decanter at a continuous and uniform rate.

11. The decanter shall be controlled by a local control station.

12. Materials of Construction:
   a. All in-basin welded decanter components, except seals and bearings, shall be constructed of corrosion and 316 stainless steel. All fasteners shall be constructed of 316 stainless steel.
b. The decanter seals and bearings shall be constructed of maintenance free, synthetic materials for longest possible service life. All seals and bearings shall be shipped factory assembled.

13. Fabrication and Finishing:

a. All decanter welding must be conducted by welders certified under ASME Code 9 to the following procedures:
   2) Base metal QW-403 Plate
   3) Type 300 Series
   4) P No. 8
   5) In all positions and pipe ½-inch diameter and larger

b. All joints to be finish tested for integrity by either air pressure (3.0 pi) or dye penetrate methods.

c. All finished decanter units to be free of abrasions, damage, flaws, carbon contamination and discoloration. All weld burn and discoloration shall be removed with pickle paste (DeRustit SS-3 stainless steel cleaner or equal). All stainless steel surfaces shall be passivated with Oakite 33 or equal. All finished units shall have a pleasing and uniform passivated appearance. Decanters shall be power washed for final cleaning prior to shipment.

E. Valves:

1. All valves shall meet the requirements of Section 2.3D.

2. SBR SUPPLIER shall furnish the following valves for the system:
   a. Solenoid valves for liquid purge system. One (1) valve per basin plus one (1) shelf spare.
   b. Each diffuser assembly shall include a manually operated isolation butterfly valve. Valve size to be specified by SBR Supplier.

PART 3  EXECUTION

3.1 DELIVERY AND STORAGE

A. A complete set of manufacturer’s instructions covering storage, installation, operation, lubrication, and maintenance shall be furnished to the OWNER no later than the date the equipment is shipped. Care during storage and procedures for installation, lubrication, and startup of the equipment and motors shall be in strict conformance with the manufacturer’s instructions.

B. All equipment shall be delivered by the SBR SUPPLIER to the site ready for installation according to the schedule provided in the General Requirements.

C. Delivery: Deliver materials dry and undamaged, and store out of contact with ground. Cover materials with weather tight coverings and keep dry.

3.2 INSTALLATION
A. The CONTRACTOR shall install the SBR system per the SBR SUPPLIER’s written instructions and the drawings.

B. Installation of the SBR equipment shall be by the CONTRACTOR in accordance with the Contract Documents, and the SBR SUPPLIER’s engineering drawings and instructions. The SBR SUPPLIER shall supervise and provide assistance during the installation.

3.3 TESTING

A. The CONTRACTOR and SBR SUPPLIER shall furnish all labor, material, equipment, and services required to conduct and satisfactorily complete their respective testing requirements, as specified in this article.

B. Factory Inspections: The SBR SUPPLIER shall inspect control panels and equipment for required construction, electrical connection, and intended function.

C. Factory Tests and Adjustments: Prior to shipment, all components of the SBR system shall be factory tested. Witnessing of factory testing shall be at the option of the ENGINEER and OWNER. The SBR SUPPLIER shall provide a minimum of 14-days notice to the ENGINEER for the factory test date. Factory testing shall include but not be limited to:

1. Water tightness of all submerged equipment (i.e. mixers and submersible pumps).
2. Proper operation of equipment, valves, instrumentation, alarms, interlocks and operating indicators associated with the SBR system.
3. Integrity of electrical wiring and connections.
4. Adequate ventilation in the MCC and control cabinets.
5. Proper operation of the monitoring and control system, including HMI and interface with Plant SCADA System.
6. Proper operation of system electrical components.

D. Inspection, Startup, and Field Adjustment: An authorized service representative of the SBR SUPPLIER shall visit the site (see Article 1.5 of this Section) to witness the following:

1. Proper installation of the equipment and external wiring terminations performed by (electrical) CONTRACTOR.
2. Proper inspection, checking, and adjustment of the equipment.
3. Startup and field-testing for proper operation. The SBR SUPPLIER shall furnish all necessary lubricants for the initial startup and testing of the equipment.

E. Field Testing:

1. Equipment Checks: Prior to the final acceptance field-testing, the SBR SUPPLIER shall check that all equipment is installed properly and functions as specified herein. The equipment checks shall include, but not be limited to:
a. Proper installation and alignment of equipment and supports.
b. Water tightness of all submerged equipment.
c. Proper placement of pumps/mixers, valves, decant equipment
d. Integrity of electrical wiring and connections.
e. Proper operation of instrumentation, alarms, interlocks and operating indicators associated with the SBR equipment.
f. Proper placement and operation of cooling fans and other equipment in the control cabinets.
g. Adequate ventilation in the control cabinets.
h. Proper operation of the monitoring and control system, including HMI. and interface with Plant SCADA System.

2. Upon completion of equipment checks, the SBR SUPPLIER shall submit to the OWNER written certification that all SBR equipment and accessory equipment associated with the SBR System have been properly installed, are in good condition, are functioning properly, and are in accordance with the Contract Documents.

F. Final Acceptance Field Testing:

1. Upon acceptance of the SBR SUPPLIER’s certification letter by the OWNER, two field acceptance tests shall be performed to determine whether or not the equipment meets the performance criteria specified within this specification.

a. Functional Testing:

1) The SBR SUPPLIER shall be responsible for Functional Testing (with oversight from the ENGINEER) of the installed SBR System. These requirements include the testing and verification of the following:
   a) System electrical components.
   b) Controls and alarms.
   c) Instrument calibration and consistent outputs.
   d) Interface with Plant SCADA System.

2) SBR SUPPLIER shall prepare and provide to the OWNER and ENGINEER a Functional Testing protocol 60 days prior to the commencement of testing for review and approval.

3) Upon completion of the Functional Testing, a report documenting and detailing the test results shall be submitted to the OWNER and ENGINEER for review and approval within 30 days of testing. SBR SUPPLIER shall provide two (2) copies of the report.

b. Performance Testing:

1) The testing period shall be conducted over a continuous 14 day period by OWNER personnel and supervised off-site by the SBR SUPPLIER. The SBR system shall operate 24-hours per day during this test. The initial startup (8-hours), time include in requirement in Article 1.5, of the tests shall be conducted on-site by SBR SUPPLIER and ENGINEER. ENGINEER shall be at the OWNER’s expense. If the performance testing fails, all costs of subsequent visits by ENGINEER to witness or observe additional tests shall be borne by the SBR SUPPLIER.

2) The SBR SUPPLIER shall provide the protocol for performance tests to OWNER and ENGINEER for review and approval 60 days prior to the commencement of testing. The protocol shall specifically detail the
operational mode of the SBR System, sampling program, method and schedule, equipment and system monitoring data to be collected with each sampling, the daily (manual) log format, and all sampling and analytical procedures. Upon acceptance of the protocol by the ENGINEER, the OWNER shall commence the acceptance test. At the discretion of the ENGINEER, if more than two performance or operational issues arise or if a performance issue cannot be addressed within a 2 day period, the performance test shall receive a fail. If performance testing receives a fail, the performance testing will be restarted.

3) Performance testing shall be conducted at times mutually agreed upon by OWNER, CONTRACTOR, and SBR SUPPLIER. Performance tests shall occur prior to substantial completion and shall be a condition precedent to achieving Substantial Completion.

4) Performance testing shall be conducted to determine compliance with the BOD, TSS, Ammonia, and Nitrate effluent requirements over the range of design flows. Flow to the SBR Basins shall be monitored and maintained at the flow rates required per the testing protocol. A procedure shall be established for maintaining a stabilized flow through the system two (2) weeks prior to performance testing.

5) The OWNER shall collect influent and effluent samples two (2) times per day and test for BOD, TSS, Ammonia, and Nitrate. Also, OWNER shall document cycle operating characteristics. An exceedance of the water quality requirements shall result in a performance test failure and shall require a restart of the performance test.

6) The OWNER will submit a copy of the test results to the SBR SUPPLIER within 30 days of the end of the testing period.

7) SBR SUPPLIER shall submit to OWNER and ENGINEER a summary report within 30 days of receipt of the test results from the OWNER testing documenting the SBR System performance as demonstrated by the performance testing results. The report shall include all raw monitoring and test results. The SBR System shall not be considered substantially complete until ENGINEER approval of the performance testing report.

c. No major changes in equipment or apparatus will be permitted during the Functional Testing or the Performance Testing periods. However, minor adjustments of equipment that would normally be expected during regular operation of the equipment in plant use may be made.

d. If during the initial performance testing, the SBR System does not run trouble free, the tests shall then be re-run, as described above. Additional testing, labor, materials, equipment, etc., associated with correcting deficiencies in the SBR system, including the repeated performance test, shall be borne by the SBR SUPPLIER. Each repetition of the acceptance test shall be for a continuous 30-day period unless failure mode has been documented and modifications accomplished.

e. Should said equipment, when tested for a second period, fail to meet all of the requirements of the guarantee, as well as the operational performance data requirements, as set forth herein, the SBR SUPPLIER shall make any and all modifications to the SBR System including additional equipment and appurtenances including piping, valves, diffusers, blowers, mixers/pumps, concrete tankage, control wiring, electrical system modifications, etc., necessary to cause the system to meet the performance specifications without any additional cost to the OWNER.
### Design Parameters

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Design Condition</th>
</tr>
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<tbody>
<tr>
<td>Design Conditions and Criteria</td>
<td>Per Article 2.2 A &amp; B</td>
</tr>
<tr>
<td>Performance Requirements</td>
<td>Per Article 2.2C</td>
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<td>Design Wastewater Temperature, deg C</td>
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<td>Wastewater Oxygen Solubility Correction Factor, $\beta$</td>
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<td>Oxygen Transfer Coefficient Correction Factor, $\alpha$ (New diffuser)</td>
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<td>$\alpha$ at Diffuser Design Life or Before Maintenance is Performed</td>
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<tr>
<td>Standard Oxygen Transfer Efficiency per foot of Submergence, %/ft</td>
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</tr>
<tr>
<td>Diffuser Elevation from Basin Invert, ft</td>
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<tr>
<td>Actual Oxygen Required, lbs O$_2$/day</td>
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<tr>
<td>Standard Oxygen Required, lbs O$_2$/day</td>
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### Aeration System Information

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<tr>
<th>Blower Units</th>
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<tbody>
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<td>Blower Manufacturer and Model</td>
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<td>Total Daily Aeration Time per Basin, hrs/day</td>
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<tr>
<td>Blower Flow Rate per Unit, SCFM</td>
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<tr>
<td>Blower Flow Rate per Unit, ACFM</td>
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<td>Total Design Head, psi</td>
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<td>Static Head, psi</td>
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<tr>
<td>Blower Headloss, psi</td>
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<td>Piping Headloss, psi</td>
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<td>Diffuser Headloss, psi</td>
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<td>Other Headloss, psi, Description:</td>
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<td>Blower Efficiency at 100% Flow, %</td>
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<tr>
<td>Blower Horsepower per Unit, hp</td>
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<tr>
<td>Blower Power Consumption, kW/unit</td>
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<tr>
<td>Average Total Blower Energy Use, kWh/year</td>
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<td>Blower Equipment Life Expectancy, yrs/unit$^{(1)}$</td>
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<tr>
<td>Average Blower Maintenance Effort, hrs/unit/year</td>
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### Mixing and Aeration System Information

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<tr>
<th>Mixer Type</th>
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<tr>
<td>Mixer Manufacturer and Model</td>
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<td>Mixer Units</td>
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<td>Mixer Horsepower per Unit, hp</td>
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<td>Criteria</td>
<td>Design Condition</td>
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<tr>
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<tr>
<td>Mixer Efficiency at 100% Flow, %</td>
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<tr>
<td>Average Mixer Operation Time per Basin, hrs/day</td>
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<td>Mixer Power Consumption, kW/unit</td>
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<td>Annual Total Mixer Energy Use, kWh/year</td>
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<td>Mixer Equipment Life Expectancy, yrs/unit(1)</td>
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<tr>
<td>Average Mixer Maintenance Effort, hrs/unit/year</td>
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<tr>
<td>Number of Diffusers per Basin</td>
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</tr>
<tr>
<td>Diffuser Air Rate, SCFM/diffuser</td>
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<tr>
<td>Total Diffuser Air Rate, SCFM/basin</td>
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<tr>
<td>Average Amount of Oxygen Delivered to a Basin, lbs/hr</td>
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<tr>
<td>Diffuser Membrane Life Expectancy, yrs(1)</td>
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<tr>
<td>Average Maintenance Effort for Diffuser Assembly or Membrane, hrs/yr</td>
<td></td>
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</table>

**Decanter System Information**

Headloss through Decanter from Water Surface, ft

Decanter Equipment Life Expectancy, yrs/unit(1)

Average Decanter Maintenance Effort, hrs/unit/year

**WAS Pumping System Information**

WAS Pump Units

2 duty (1 in each basin) + 1 shelf spare

WAS Pump Manufacturer and Model

WAS Pump Rate per Unit, gpm

WAS Pump Horsepower per Unit, hp

WAS Pump Efficiency at 100% Flow, %

Average WAS Pump Operation time, hrs/unit/day

WAS Pump Power Consumption, kW/unit

Average Total WAS Pump Energy Use, kWh/unit

WAS Pump Equipment Life Expectancy, yrs/unit(1)

Average WAS Pump Maintenance Effort, hrs/unit/year
### Form A. SBR System Design Information Sunnyslope County Water District

#### Criteria Design Condition

#### Other Information
- Complete List of all Exceptions to the Specification, for both Mechanical and Process Features (Attach Separate Sheet if Necessary)

- Listing of Additional Utilities required, other than those Specified

#### Complete System Information

**(For Complete Two Basin SBR System)**

- Average Overall System Power Consumption, kW
- Overall System Annual Energy Use, kWh/year
- Average Overall System Maintenance Effort, hrs/year

#### Notes:

1. Define equipment life expectancy when equipment is applied as intended in the specifications.
2. The overall system power consumption, energy use and maintenance effort information must be logically derived from the information provided for the individual system components in this form. In the event that the aggregate of the information provided for the individual components in this form does not match the overall system information, the discrepancy must be explained. The intent is to understand how each SBR system component contributes to power consumption, energy use and maintenance effort of the complete SBR system.

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**END OF SECTION**