

SECTION 11010

BIOLOGICAL TREATMENT SYSTEM – GENERAL PROVISIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install a biological treatment system complete and operational in accordance with the requirements of Section 11010 through 11020 and the Contract Drawings.
- B. The biological treatment system includes, but is not necessarily limited to, the membrane bioreactor system, process aeration equipment, residuals reduction system, and valves, chemical feed equipment, compressed air system, filtrate pumps, controls, instrumentation, and programmable controller system, and other appurtenances that comprise those systems. The components of the biological treatment system are specified in the following Sections:
1. Section 11010, Biological Treatment System – General Provisions.
 2. Section 11011, Membrane Bioreactor System.
 3. Section 11012, Process Aeration Equipment.
 4. Section 11013, Residuals Reduction System.
 5. Section 11014, Sodium Hypochlorite and Citric Acid Feed Equipment.
 6. Section 11015, Compressed Air System.
 7. Section 11016, Filtrate Pumps.
 8. Section 11017, Biological Treatment System – Valves.
 9. Section 11018, Biological Treatment System – Instrumentation.
 10. Section 11019, Biological Treatment System – Controls, Interface, and Hardware.
 11. Section 11020, Biological Treatment System – Functional Descriptions.
- C. All equipment provided in Sections 11010 through 11020 shall be furnished by a single biological treatment system supplier (the “Supplier”) who shall be responsible through the Contractor for the completeness, performance, adequacy, and proper operation of the biological treatment system in accordance with the requirements herein. The Contractor through the biological treatment system Supplier shall guarantee and shall be the source of information for the complete biological treatment system, including each piece of equipment furnished under the Sections named above, regardless of the manufacturing source of that equipment. The Supplier shall assume system responsibility for the satisfactory operation of all components required both those of its direct manufacture and any purchased items that may integrate into the complete system. The warranty obligations of the Supplier shall not in any way limit Contractor's warranty obligations under the Contract Documents. The Supplier warranties are in addition to all warranties to be provided by the Contractor.

- D. The biological treatment system Supplier shall be responsible for the liquidated damages and remedy costs identified in Section 11010 due to the failure of the Supplier or its equipment to perform to the requirements of the Contract Documents including, but not limited to the failure of the Supplier to meet the Warranty requirements in Paragraph 1.5 of this Section.

1.2 QUALITY ASSURANCE

- A. Component Supply and Compatibility:
1. Obtain all equipment included in this Sections 11010 through 11020 regardless of the component manufacturer from a single biological treatment system Supplier.
 2. The biological treatment system Supplier shall review and approve or shall prepare all Shop Drawings and other submittals for all components furnished under Sections 11010 through 11020.
 3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the biological treatment system Supplier.

1.3 DESIGN REQUIREMENTS

- A. Influent Characteristics:
1. The biological treatment system shall be designed according to the following influent parameters.
 - a. Influent Flow Rate:
 - 1) Average Daily Flow Rate (ADF) – 2.0 mgd.
 - 2) Peak Monthly Flow Rate (PMF) – 3.5 mgd.
 - 3) Peak Daily Flow Rate (PDF) – 6.0 mgd.
 - 4) Peak Hourly Flow Rate (PHF) – 6.0 mgd.
 - b. Influent Loading at ADF:
 - 1) Biological Oxygen Demand (BOD₅) – 240 mg/l (4,006 lb/day).
 - 2) Total Suspended Solids (TSS) – 180 mg/l (3,004 lb/day).
 - 3) Total Kjeldahl Nitrogen (TKN) – 28 mg/l (467 lb/day).
 - 4) Total Phosphorus (TP) – 5.0 mg/l (83 lb/day).
 - 5) Ammonia-Nitrogen (NH₃-N) – 18 mg/l (300 lb/day).
 - 6) Alkalinity – 350 mg/l as CaCO₃ (5,842 lb/day as CaCO₃).
 - c. Influent Loading at PMF:
 - 1) Biological Oxygen Demand (BOD₅) – 165 mg/l (4,807 lb/day).
 - 2) Total Suspended Solids (TSS) – 154 mg/l (4,507 lb/day).
 - 3) Total Kjeldahl Nitrogen (TKN) – 19 mg/l (561 lb/day).
 - 4) Total Phosphorus (TP) – 3.4 mg/l (100 lb/day).
 - 5) Ammonia-Nitrogen (NH₃-N) – 12 mg/l (361 lb/day).
 - 6) Alkalinity – 240 mg/l as CaCO₃ (7,010 lb/day as CaCO₃).
 - d. Influent Loading at PDF:
 - 1) Biological Oxygen Demand (BOD₅) – 160 mg/l (8,012 lb/day).
 - 2) Total Suspended Solids (TSS) – 150 mg/l (7,511 lb/day).
 - 3) Total Kjeldahl Nitrogen (TKN) – 19 mg/l (935 lb/day).

- 4) Total Phosphorus (TP) – 3.3 mg/l (167 lb/day).
- 5) Ammonia-Nitrogen (NH₃-N) – 12 mg/l (601 lb/day).
- 6) Alkalinity – 233 mg/l as CaCO₃ (11,684 lb/day as CaCO₃).
- e. Influent Temperature:
 - 1) Minimum Temperature – 46 degrees F
 - 2) Maximum Temperature – 73 degrees F
- f. Influent pH:
 - 1) Minimum pH – 6.0
 - 2) Maximum pH – 8.0

B. Effluent Requirements:

1. Effluent (filtrate) from the biological treatment system shall achieve the following quality limits. Values indicated are the maximum allowable averages for the periods indicated.

Summer Months (May 1 through October 31)		
Parameter	Monthly	Weekly
CBOD ₅	10.0 mg/l	15.0 mg/l
TSS	12.0 mg/l	18.0 mg/l
NH ₃ -N	1.0 mg/l	1.5 mg/l
Total Phosphorus*	1.0 mg/l	1.5 mg/l
Turbidity**	0.2 NTU	0.2 NTU

Winter Months (November 1 through April 30)		
Parameter	Monthly	Weekly
CBOD ₅	10.0 mg/l	15.0 mg/l
TSS	12.0 mg/l	18.0 mg/l
NH ₃ -N	3.0 mg/l	4.5 mg/l
Total Phosphorus*	1.0 mg/l	1.5 mg/l
Turbidity**	0.2 NTU	0.2 NTU

* Total phosphorus limit shall be achieved through chemical precipitation.

** Turbidity shall be less than 0.2 NTU 95 percent of the time and shall not exceed 0.5 NTU

1.4 SUBMITTALS

A. Warranty:

1. Submit executed Effluent Quality Warranty as specified in Paragraph 1.5 of this Section as part of Agreement.
2. Submit ~~Warranty~~ Operational Service Agreement as specified in Paragraph 3.3 of this Section.

B. Start-up Plan: Submit detailed start-up plan for the biological treatment system as specified in Paragraph 3.1 of this Section.

1.5 WARRANTY

A. Effluent Quality Warranty:

1. The biological treatment system Supplier shall warrant that the biological treatment system shall produce an effluent stream meeting the effluent requirements specified in Paragraph 1.3 of this Section.
2. Remedy and Conditions: The Supplier shall pay liquidated damages in an amount of \$500,000 if the biological treatment system fails to meet the specified effluent requirements upon completion of the Testing Program specified in Section 11010.
3. Influent Characteristics: The influent characteristics will meet the concentrations and ranges specified in Paragraph 1.3 of this Section. In addition, the following influent characteristics will be met:
 - a. Maximum sulfate concentration: 100 mg/l as SO₄
 - b. Maximum freon-solubles (FOG) concentration: 30 mg/l
 - c. Inhibitory matter and heavy metals: Concentrations not to exceed threshold limits as defined in WPCF Manual of Practice No. 8, 1977 Edition (MOP 8).
4. Testing Program:
 - a. The Testing Program shall begin not less than 30 days or no more than 60 days from the date of Substantial Completion once the system has begun producing a stable effluent as mutually agreed by the Owner and Supplier. The Testing Program shall extend until such time as:
 - 1) The first consecutive 30-day period which shows that both average influent characteristics and effluent values comply with requirements specified in this Section.
 - 2) Subject to Owner's right to correct influent deficiencies pursuant to procedures defined below; the first consecutive 30-day period which shows that effluent values comply with the requirements specified in this Section, regardless of the average influent characteristics.
 - b. All sampling and testing to satisfy the requirements of the warranty will be paid for by the Owner.
 - c. All sampling and laboratory analysis methods and principles to be used for verification of the requirements of the warranty shall conform to the provisions of the most recent edition of "Standard Methods For The Examination of Water and Wastewater" (the "Standard Methods"). Should situations develop warranting a necessary modification of any procedure in the Standard Methods, Owner and Supplier may approve such modification upon express written consent of both parties.
 - d. Testing Program shall consist of the collection and laboratory analysis of not less than 12 nor more than 30 pairs (not necessarily consecutive) of influent and effluent samples as specified below, during the 30-day test period.
 - 1) Each influent and effluent sample shall be analyzed for BOD₅, TSS, NH₃-N, pH, and TP.

- 2) If necessary, up to 20 times during the Testing Program, influent samples shall be analyzed for alkalinity, carbonaceous oxygen demand (COD), sulfide, sulfate as SO₄, and freon-solubles.
 - 3) If toxicity/inhibition is suspected, influent shall be analyzed for phenols, cyanide, and other heavy metals included in MOP 8.
- e. Suspension and Resumption: If adverse circumstances develop beyond the control of the Owner which interfere with the continuation of the Testing Program, Owner shall be given reasonable time to make corrective measures. Owner will notify Supplier of necessary suspension and all samples collected during the suspension period will be disallowed. The Testing Program will be resumed once the system has stabilized and notification has been sent to the Supplier.
 - f. Procedures for Non-Conforming Influent: If after 14 days of testing, the average influent characteristics are not within the specified limits and the effluent values from the system exceed the specified requirements, then Owner shall take corrective actions as necessary until the average influent characteristics meet the specified requirements for a minimum period of three weeks and the system's effluent appears at steady state conditions (as reflected by the appearance of no downward trend in the measured concentrations of specified parameters from five days of 24-hour composite samples). Owner shall then recommence the Testing Program. Owner shall be allowed to take corrective actions for a total of three times. If the influent subsequently continues to remain out of compliance with the specified requirements, then Supplier's obligations under the Warranty shall be deemed fully satisfied.
 - g. Procedures for Non-Conforming Effluent: If after 14 days of testing, the average influent characteristics to the system meets the specified requirements within the preceding 14 days and the system's effluent does not meet the specified values after reaching steady-state conditions, the Owner will notify the Supplier in writing of such non-compliance. Upon receipt of such notice, Supplier shall provide a written performance evaluation of the system, and may recommend operational changes to obtain compliance, upon which the Owner will initiate said operational changes within a reasonable period of time. Provided influent to the system is continuously meeting the specified requirements, then as soon as the system's effluent appears at steady state conditions, the Owner shall recommence the Testing Program. If steady-state conditions are not achieved within 30 days of operational and/or equipment changes made pursuant to this Paragraph, then Supplier shall reevaluate the system's performance and recommend additional operational changes. Supplier shall be allowed to recommend operational changes for a total of three times. If the effluent values continue to exceed those specified following implementation of the aforementioned operational changes, then Supplier may provide additional equipment and/or make modifications to the system. Such equipment changes shall be completed by Supplier within a reasonable period of time and at its cost. Once the system effluent appears at steady-state conditions, Owner will then recommence the Testing

Program. If necessary, two additional retests may be performed after implementation of equipment changes or modifications. If after the procedures described above have been followed and the effluent values still do not meet the specified requirements, then the Supplier shall be deemed to have failed his obligations under the warranty and shall pay liquidated damages as listed in this Section.

5. Exclusions: The Supplier shall not be liable for payment of damages under this warranty under the following conditions:
 - a. If the biological treatment system is not operated and maintained in accordance with Supplier's operations and maintenance manuals.
 - b. If the influent stream does not meet the influent characteristics listed in this Article.
 - c. If the system is subjected to limitations from other unit processes that would detrimentally impact the performance of the system, including pretreatment, equalization, or recycle flows.
 - d. The warranties set forth herein are Supplier's sole and exclusive warranties. Supplier makes no other warranties of any kind, express or implied, including without limitation, any warranty of merchantability or fitness for purpose. Fulfillment by Supplier of its obligations under Section 11010, Paragraph 1.5 A.2., shall be the Owner's sole and exclusive remedy against Supplier for any failure by Supplier to satisfy any requirement of this warranty. Except for such obligations identified in this Section, in no event shall supplier be liable for any damages of any nature whatsoever for any breach of this warranty, including without limitation any direct, indirect, consequential, incidental, special, punitive or other damages. The foregoing limitations apply regardless of whether the liabilities or damages arise or are alleged to arise under contract, tort, strict liability or any other theory.

PART 2 - PRODUCTS

2.1 SUPPLIERS

- A. Supplier: The biological treatment system shall be supplied by Siemens Water Technologies.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Factory trained representatives of the Supplier shall be provided for installation supervision, technical assistance, start-up and testing services, programming services, and operation and maintenance personnel training services. The Supplier shall provide a total of 88 man-days during 20 separate trips to the Site. Field services shall generally include the number of days indicated below and include all components of the biological treatment system. Additional hours required for

complete performance of these services due to unforeseen deficiencies by the Contractor or Supplier are not included in the hours noted below.

1. Installation supervision, technical direction, and verification: 19 man-days.
2. Process, equipment, instrumentation, and control system startup and troubleshooting: 21 man-days.
3. Process, equipment, instrumentation, and control system training conducted in accordance with Section 01821: 14 man-days.
4. Process testing: 10 man-days.
5. PLC programming, meetings, tuning, and troubleshooting: 24 man-days.

- B. Supplier shall prepare and submit a detailed start-up plan for the biological treatment system. The plan shall be submitted no less than 90 days prior to the scheduled start-up date and shall include all activities that are to be performed by the Supplier's representative, Contractor, and Owner. Activities to be performed by the Owner, will only be binding upon the Owner's review and approval of the start-up plan.

3.2 FOLLOW-UP OPERATOR TRAINING

- A. Within three months of Substantial Completion, provide the services of a factory trained representative of the Supplier for follow-up operator training. Follow-up training shall consist of one trip of two days. Follow-up training submittals and services shall conform to Section 01821.

3.3 ~~WARRANTY SERVICE AGREEMENT~~ OPERATIONAL SERVICE AGREEMENT

- A. Provide a ~~warranty~~-operational service agreement to provide after-sales services for one-year after Substantial Completion. ~~Warranty-Operational~~ agreement shall be supplied for a total of 4 man-days in 4 separate trips to the Site. ~~This warranty does-~~ These services do not limit any other warranties required under the Contract Documents.

++ END OF SECTION ++