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ADDENDUM No. FOUR

Date: June 25, 2025

Project: Pembroke WWTP Expansion, MES No. 2020-48

Engineer: M.E. Sack Engineering
Hinesville, Georgia 

The plans, specifications, and bid documents are amended to include the following:

Proposal Form:

- Replace the previous Proposal Form with the enclosed of the same. Note that a line item for SBR Tank Foundation has been added.

Specifications:

- Replace the previous Section 01150 Measurement and Payment with the enclosed of the same. Note that revisions were made to include item 2.24 SBR Tank Shallow Foundation.
- Replace the previous Section 15280 Chemical Feed System with the enclosed of the same. Note that revisions were made to clarify materials on part 2.02.C Diaphragm metering pump skid, and part 2.05 Liquid End.
- Replace the previous Section 15501 Ultraviolet Disinfection Equipment with the enclosed of the same. Note that revisions were made to increase the flow to match SBR peak hourly flow rate.
- Replace the previous Section 15512 Sludge Dewatering System with the enclosed of the same. Note that revisions were made to match the flow digester peak hourly flow rate and loading.

Plans:

- Replace the previous Sheet M16 UV Disinfection with the enclosed of the same. Note that revisions were made to include the new model UV Disinfection System.

The following clarifications are offered for questions received:

1. *Ground Improvement Note #3 on sheet OS-1 of the construction plans indicates the contractor shall be responsible for engaging a design-build ground improvement specialty geotechnical contractor to improve the soil to specified allowable bearing pressures. It also states that pre-loading alone is insufficient. The geotechnical report for this project states rigid inclusion, aggregate piers, or surcharging are options. How should we address the foundational requirements for this project?*

- The geotechnical report recommends using shallow foundations; however, due to their estimates of settlements being higher than typical (~3 inches), they have recommended three basic options to reduce the settlements. The geotechnical does not recommend deep-pile foundations. Based on guidance from the geotechnical report, if we were using deep-pile foundations, the structural engineer would provide the sizes, depths, quantities, etc. of the required piles to meet the load demands. In this case, the three options the geotechnical engineer provided are performance-based site improvement techniques. No structural engineering guidance is required for any of these items; however, a specialty geotechnical contractor would be hired to engineer and perform the soil improvements necessary to meet the requirements outlined in the geotechnical report.
- Option 1 – Pre-loading: Guidance has been provided by the geotechnical engineer for the specifics of pre-loading. It is recommended surcharging with twelve (12) feet of soil over a period of three (3) months with some settlement monitoring to verify the soils are properly consolidated.
- Option 2 – Rigid Inclusions: This option would be performed by a specialty geotechnical contractor and engineered by a delegated professional engineer. The report mentions that this option would be warranted by the specialty contractor.
- Option 3 – Rammed Aggregate Piers: Very similar to rigid inclusions, but using rock or coarse sand instead of grout. This option would also be performed by a specialty geotechnical contractor and would be engineered by a delegated professional engineer. This option would also be warranted.

The contractor shall offer options for ground improvements. Option 1 should be the base bid scenario, with options 2 and 3 provided as bid options, including the cost delta and time savings. New line items have been added to the bid documents. Please refer to the updated Section 01150, part 2.24 SBR Tank Shallow Foundation, for measurement and payment details.

2. *Section 15280 part 2.01 E. requests 1" pump suction and discharge but pump and all associated skid system piping and fittings only require 1/2" piping for 15.8 gph.*

- 1/2" piping is acceptable as long as it is warranted by the manufacturer.



3. *Section 15280 part 2.02 C. requests welded steel frames encapsulated in a PVC lining. We will supply welded steel frames with PP sheets for base and back because they request integral chemical containment capability. It might have to include removable drip trays fabricated out of sheet metal.*
 - The welded steel frame with PP sheets for base and back, including the removable drip trays, is an acceptable alternative.
4. *Section 15280 part 2.05 requests clear PVC pump valves for integral sight flow indication. The pump suction and discharge valves shall be PVDF as clear PVC is not available.*
 - PVDF pump valves are an acceptable alternative.
5. *The Section 15280 pump manufacturer's scope does not include tanks or heat tracing.*
 - The equipment listed in Section 15280 part 1.02 of the specifications book is not intended to be supplied by the chemical pump manufacturer. The contractor shall supply the complete system from different providers.
6. *Can the Blue-White MD3 dual diaphragm pump be considered as an equal for the chemical dosing pumps according with the Section 15280 of the specifications book?*
 - Blue-White MD3 dual diaphragm pump is considered an approved equal.

-END-



B. PROPOSAL FORM

Item No.	Quantity	Units	Description	Unit Price	Cost
1	1	LS	Grading	-	\$
2	1	LS	Demolition	-	\$
3	3,300	SY	Granite Roadway Base	\$	\$
4	2,100	SY	Rock Drive	\$	\$
5	1,200	SY	Asphalt Paving	\$	\$
6	1	LS	Discharge, Gravity Sewer, Drainage Pipe, and Structures	-	\$
7	1	LS	Electrical Complete	-	\$
8	1	LS	Control and SCADA System Complete	-	\$
9	1	LS	Erosion Control and Grassing	-	\$
10	1	LS	Complete Headworks and Truck Dump Station	-	\$
11	1	LS	Complete Influent Pump Station	-	\$
12	1	LS	Complete SBR System-Based Treatment Plant	-	\$
13	1	LS	Complete Disk Filtration System	-	\$
14	1	LS	Complete UV Disinfection System	-	\$
15	1	LS	Complete Reject Pump Station	-	\$
16	1	LS	Complete Underdrain Pump Station	-	\$
17	1	LS	Complete Reclaimed Water Pump Station	-	\$
18	1	LS	Complete Sludge Dewatering System	-	\$
19	1	EA	Emergency Power Supply	\$	\$
20	1	EA	Transformer	\$	\$

B. PROPOSAL FORM continued

Item No.	Quantity	Units	Description	Unit Price	Cost
21	1	LS	Laboratory Casework and Laboratory Equipment	-	\$
22	1	LS	Mobilization (5% Max)	-	\$
SUBTOTAL					\$
ALTERNATE BID ITEMS*					
23	1	LS	SBR Expansion Tank	-	\$
24	1	LS	**SBR Tank Shallow Foundation	-	\$
25	1	LS	**SBR Tank Shallow Foundation – Ground Improvement Option 2	-	\$
26	1	LS	**SBR Tank Shallow Foundation – Ground Improvement Option 3	-	\$
LUMP SUM BID					\$

*ALTERNATE ITEMS

The owner reserves the right to add the noted alternate items to the work for the purpose of making contract award. The award of the contract may be with or without these items. Each offeror must fill in the unit price amount for each item.

** Offerors shall provide the estimated cost, noting any additional or reduced expenses compared to having no subsurface improvements, along with the timeline required to complete the task.

**ESTIMATED TIMELINE	
Option 1	
Option 2	
Option 3	

**SECTION 01150
MEASUREMENT AND PAYMENT**

PART 1- GENERAL

1.01 QUANTITIES

- A. Quantities: Quantities listed in the Proposal are approximate only and are intended to serve as a guide in comparing bids and may be increased or decreased without invalidating the unit price bid.
- B. Payment: The contractor shall be paid for actual in-place quantities as determined by the Engineer's field measurements.
- C. Discrepancies: In case of discrepancies between the figures shown in the unit prices and totals, the unit prices shall apply, and the totals shall be corrected to agree with the unit price.

1.02 DELIVERY, STORAGE, AND HANDLING

- A. Contractor shall bear the responsibility for delivery of equipment, spare parts, special tools, and materials to the site and shall comply with the requirements specified herein and shall provide required information concerning the shipment and delivery of the materials specified. Manufacturer shall supply detailed storage instructions, as necessary, at the time of shipment. These requirements also apply to any sub suppliers making direct shipments to the Site.
- B. Equipment shall be delivered on site. All exposed openings shall be protected to prevent entrance of debris, moisture or water during transportation and storage. Contractor shall unload material and sensitive equipment/material must be store out of the weather.
- C. All items shall be checked against packing lists immediately on delivery to the site for damage and for shortages. Damage and shortages shall be remedied with the minimum of delay.
- D. Delivery of portions of the equipment in several individual shipments shall be subject to review of Engineer before shipment. When permitted, all such partial shipments shall be plainly marked to identify, to permit easy storage, and to facilitate eventual installation.

- E. Contractor shall guarantee all equipment against faulty assembly, defective workmanship, breakage, or other failure. Materials shall be suitable for service connections. Connections shall be manufactured at standard sizes so that unit can be installed in the field

PART 2 - MEASUREMENT AND PAYMENT

2.01 GRADING

- A. Measurement: Measurement will be made on the basis of the percent completion of the item of work. All cut and fill quantities are based on the difference between initial topographic data and proposed contours shown on the plans.
- B. Payment: Payment will be made at the price bid for each item. Work shall include all equipment, labor, and material to complete each task. This item will include but is not limited to excavation, material transportation and placement, grading to the lines and grades shown on the plans, compaction, and stabilization. Grading does not include pre-loading ground improvement for shallow foundation.

2.02 DEMOLITION

- A. Measurement: Measurement shall be made on the basis of the percentage of completed items in accordance with the plans, specifications, and bid documents.
- B. Payment: Payment will be made on the basis of the completed item of work. The lump sum price shall include furnishing all labor, materials, and equipment necessary to complete this item of work. Work shall include, but is not limited to, removal of any storm pipe, drainage structures, carport and storage building including the water and sewer line associated, headworks, forcemain, water lines, fire hydrants or other material that exist and will not be used as part of this project, plug and seal of the existing water well, excavation, disposal at an approved site, backfill, compaction and surface restoration.

2.03 GRANITE ROADWAY BASE

- A. Measurement: Measurement shall be made on the basis of the number of square yards of graded aggregate base applied to the parking lot and roadway at the specified thickness, as shown on the construction plans. Irregular areas

such as turnouts, filler strips, and intersections will be measured to the closest square yard. Prior to the installation of the asphalt, all areas will be checked for proper thickness.

- B. Payment: Payment will be made on the basis of the number of square yards of granite crusher run (graded aggregated) base at the specified thickness applied to the roadway at the unit price stated in the bid. The price shall include all labor, equipment, and material to complete the task. Work shall include, but not be limited to, the furnishing, hauling, placing, and compaction of the crusher run base in order to bring the base to the lines, grades, and cross sections shown on the construction plans or established by the Engineer.

2.04 ROCK DRIVE

- A. Measurement: Measurement will be made on the basis of the number of square yards of granulated rock drive in place, in accordance with the construction plans and accepted by the Engineer.
- B. Payment: Payment will be made on the basis of the number of square yards of granulated rock drive in place in accordance with the unit price bid as stated in the contract. Work shall include, but is not limited to, the furnishing, hauling, placing and compaction of the granulated rock in order to bring the drive to the grades and cross sections as designated on the construction plans and as determined by the Engineer.

2.05 ASPHALT PAVING

- A. Measurement: Measurement will be made on the basis of the number of square yards of asphalt in place, in accordance with the construction plans and accepted by the Engineer.
- B. Payment: Payment will be made on the basis of the number of square yards of asphalt in place in accordance with the unit price bid as stated in the contract. Work shall include, but is not limited to, the furnishing, hauling, placing and compaction of the asphalt in order to bring the pavement to the lines, grades and cross sections as designated on the construction plans and as determined by the Engineer. The unit price bid shall also include surface cleaning, prime, and tack.

2.06 DISCHARGE, GRAVITY SEWER, AND STORM DRAINAGE PIPE AND STRUCTURES

- A. Measurement: Measurement shall be made on the basis of the percentage completed of the task in accordance with the plans and specifications.
- B. Payment: Payment will be made at the lump sum stated in the bid. The price bid shall include furnishing all labor, materials, and equipment necessary to complete this item. Work shall include, but is not limited to, excavation, trenching, necessary shoring and sheeting, dewatering, forming, form wrecking, foundations as required, furnishing and installing the storm drainage structures, manholes, raiser sections, castings, invert, stub outs, plugs, pipe connections, concrete manhole markers (if applicable), ram-neck, placement of grates, manhole rings and covers as applicable, grouting around pipe, all pipe bedding, furnishing and installing pipe backfill, compaction, grading, complete surface restoration and cleanup.

2.07 ELECTRICAL COMPLETE

- A. Measurement: Measurement shall be made on the basis of the percent complete of the task in accordance with approved plans and specifications.
- B. Payment: Payment will be based on the percent of this task completion at the time of the request based on the price bid. The work shall include equipment, labor, and materials required to complete the task. The task shall include, but is not limited to supplying and installing all electrical materials, sensors (including discharge sensors), site lighting, conduit, wire, control panels, breakers, fiber, handholes, manholes; testing, operational start-up, trenching, excavation, backfill, clean up and surface restoration.

2.08 CONTROL AND SCADA SYSTEM COMPLETE

- A. Measurement: Measurement shall be made on the basis of the percent complete of the task in accordance with approved plans and specifications.
- B. Payment: Payment will be based on the percent of this task completion at the time of the request based on the price bid. The work shall include equipment, labor, and materials required to complete the task. The task shall include, but is not limited to supplying and installing SCADA equipment, SCADA panels, RTUs, SCADA software and License, integration and commissioning, conduit, wire, communication with existing sewage pumps stations, existing Land Application Pump Station, and discharge sensors; testing, and operational start-up.

2.09 EROSION CONTROL AND GRASSING

- A. Measurement: Measurement will be made on the basis of the completed item of work. All silt fence will be measured by the linear foot of the silt fence properly installed and trenched in.
- B. Payment: Payment will be made on the basis of the price bid for each item. Work shall include all equipment, material, and labor to complete the installation. This item will include but is not limited to trenching, grading, inlet and outlet protection, furnishing, and installing silt fence; temporary and final stabilization; check dams, straw bale, sediment traps, compost socks, emergency spillways and concrete washout, maintaining erosion and sediment control structures and facilities, and establishing a final stand of cover in accordance with the plans and specifications. Retainage on final grassing will be based on the engineer's estimate of the cost to complete the task, which may not be reflected in the contractor's bid price.

2.10 COMPLETE HEADWORKS AND TRUCK DUMP STATION

- A. Measurement: Measurement shall be made on the basis of the percentage completed of the task in accordance with the plans and specifications.
- B. Payment: Payment will be made at the lump sum stated in the bid. The price bid shall include furnishing all labor, materials, and equipment necessary to complete this item. Work shall include, but is not limited to, excavation, trenching, backfill, shoving, sheeting, dewatering, receiving, and installing automated screen filter equipment, screw conveyor, compactor, screen mountings, discharge piping, manual cleaning screen filter equipment, manual rake, biotrickling filter vessel (odor control system), media, irrigation system, dampers, blower, parshall flume, ultrasonic flow meter, spiral separation units, grit airlift units, discharge piping, truck dump station, refrigerated autosampler equipment, miscellaneous hardware, spare parts, instrumentation and process control equipment, operations and maintenance manual, and other auxiliaries as required for proper installation and operation, water and air piping, valves, gates, fittings, conduit, miscellaneous hardware construction of concrete structure to include all concrete, rebar, framing, modification and finishing, concrete pads, testing, operational setup, general cleanup, and surface restoration.

2.11 COMPLETE INFLUENT PUMP STATION

- A. Measurement: Measurement shall be made on the basis of the percentage completed of the task in accordance with the plans and specifications.
- B. Payment: Payment will be made at the lump sum stated in the bid. The price bid shall include furnishing all labor, materials, and equipment necessary to complete this item. Work shall include, but is not limited to, excavation, trenching, backfill, shoving, sheeting, dewatering, receiving and installing pumps, miscellaneous hardware, spare parts, aluminum cover, supports, instrumentation and process control equipment, operations and maintenance manual, and other auxiliaries as required for proper installation and operation, piping, valves, gates fittings, conduit, miscellaneous hardware, construction of concrete structure and concrete pads to include all concrete, rebar, framing and finishing, testing, operational setup, general cleanup, and surface restoration.

2.12 COMPLETE SBR SYSTEM-BASED TREATMENT PLANT

- A. Measurement: Measurement shall be made on the basis of the percentage completed of the task in accordance with the plans and specifications.
- B. Payment: Payment will be made on the basis of the percentage completion of the lump sum price stated in the bid. The price bid shall include furnishing all labor, materials, tools, and equipment necessary to complete the task. The task shall include, but is not limited to, excavation, trenching, backfill, shoving, sheeting, dewatering, receiving, and installing SBR system, digester, and post equalization equipment such as, mixers, transfer and sludge pumps, decanter assembly, floating weir, retrievable fine bubble diffuser system, lifting system, fixed coarse bubble diffuser system; SBR, digester, and post equalization positive displacement blowers; structures, air and water piping (including drinking and NPRL), yard piping (including influent and LAS forcemain relocation), water and sewer connection to existing maintenance shop, appurtenances, chemical metering pump skids, chemical storage tanks, chemical piping, pipe insulation, pipe supports, miscellaneous hardware, spare parts, davit crane, instrumentation and process control equipment, electrical equipment, walkways, railing, stairs, operations and maintenance manual, and other auxiliaries as required for proper installation and operation, construction of concrete structures and basins to include all concrete, foundation, rebar, framing, modification and finishing, concrete pads for SBR

system and auxiliary equipment such as the emergency power supply, the transformer, the UV system and Filtration system. Piping, valves, fittings, conduit, miscellaneous hardware, liner, coating, buildings (dewatering building, chemical storage building, blower building, electrical building, and operations building), site development, testing, operational setup, general cleanup, and surface restoration.

2.13 COMPLETE DISK FILTRATION SYSTEM

- A. Measurement: Measurement shall be made on the basis of the percentage completed of the task in accordance with the plans and specifications.
- B. Payment: Payment will be made at the lump sum stated in the bid. The price bid shall include furnishing all labor, materials, and equipment necessary to complete this item. Work shall include, but is not limited to, receiving, and installing disk cloth filters, metal tanks, drive assembly, pumps, piping and appurtenances, miscellaneous hardware, spare parts, instrumentation and process control equipment, walkways, stairs, operations and maintenance manual, and other auxiliaries as required for proper installation and operation.

2.14 COMPLETE UV DISINFECTION SYSTEM

- A. Measurement: Measurement shall be made on the basis of the percentage completed of the task in accordance with the plans and specifications.
- B. Payment: Payment will be made at the lump sum stated in the bid. The price bid shall include furnishing all labor, materials, and equipment necessary to complete this item. Work shall include, but is not limited to, receiving and installing UV lamp modules, electronic ballast, metal tank, miscellaneous hardware, spare parts, instrumentation and process control equipment, automatic mechanical cleaning system, operations and maintenance manual, and other auxiliaries as required for proper installation and operation, construction of concrete structure to include all concrete, rebar, framing.

2.15 COMPLETE REJECT PUMP STATION

- A. Measurement: Measurement shall be made on the basis of the percentage completed of the task in accordance with the plans and specifications.
- B. Payment: Payment will be made at the lump sum stated in the bid. The price bid shall include furnishing all labor, materials, and equipment necessary to

complete this item. Work shall include, but is not limited to, excavation, trenching, backfill, shoving, sheeting, dewatering, receiving and installing pumps, miscellaneous hardware, spare parts, aluminum cover, supports, instrumentation and process control equipment, operations and maintenance manual, and other auxiliaries as required for proper installation and operation, piping, valves, fittings, conduit, miscellaneous hardware, construction of concrete structure to include all concrete, rebar, framing and finishing, testing, operational setup, general cleanup, and surface restoration.

2.16 COMPLETE UNDERDRAIN PUMP STATION

- A. Measurement: Measurement shall be made on the basis of the percentage completed of the task in accordance with the plans and specifications.
- B. Payment: Payment will be made at the lump sum stated in the bid. The price bid shall include furnishing all labor, materials, and equipment necessary to complete this item. Work shall include, but is not limited to, excavation, trenching, backfill, shoving, sheeting, dewatering, receiving and installing pumps, miscellaneous hardware, spare parts, aluminum cover, supports, instrumentation and process control equipment, outfall sensors, communication to control room, power generator, operations and maintenance manual, and other auxiliaries as required for proper installation and operation, piping, valves, fittings, conduit, miscellaneous hardware, construction of concrete structure to include all concrete, rebar, framing and finishing, testing, operational setup, general cleanup, and surface restoration.

2.17 COMPLETE RECLAIMED WATER PUMP STATION

- A. Measurement: Measurement shall be made on the basis of the percentage completed of the task in accordance with the plans and specifications.
- B. Payment: Payment will be made at the lump sum stated in the bid. The price bid shall include furnishing all labor, materials, and equipment necessary to complete this item. Work shall include, but is not limited to, pumps, hydropneumatic tank, piping and appurtenances, miscellaneous hardware, spare parts, aluminum cover, supports, instrumentation and process control equipment, operations and maintenance manual, and other auxiliaries as required for proper installation and operation, piping, valves, fittings, conduit, miscellaneous hardware, construction of concrete structure to include all concrete, rebar, framing and finishing, testing, operational setup, general cleanup, and surface restoration.

2.18 COMPLETE SLUDGE DEWATERING SYSTEM

- A. Measurement: Measurement shall be made on the basis of the percentage completed of the task in accordance with the plans and specifications.
- B. Payment: Payment will be made at the lump sum stated in the bid. The price bid shall include furnishing all labor, materials, and equipment necessary to complete this item. Work shall include, but is not limited to, receiving and installing belt filter press equipment, pumps, shaftless screw conveyor equipment, piping and appurtenances, miscellaneous hardware, spare parts, instrumentation and process control equipment, operations and maintenance manual, and other auxiliaries as required for proper installation and operation.

2.19 EMERGENCY POWER SUPPLY

- A. Measurement: Measurement shall be made on the basis of the percentage completed of the task in accordance with the plans and specifications.
- B. Payment: Payment will be made at the lump sum stated in the bid. The price bid shall include furnishing all labor, materials, and equipment necessary to complete this item. Work shall include, but is not limited to, receiving and installing the emergency power supply, air supply/exhaust system, transfer switch, wiring, conduit, miscellaneous hardware, spare parts, instrumentation and control equipment, walkways, stairs, operations and maintenance manual, fuel supply tank, and other auxiliaries as required for proper installation and operation.

2.20 TRANSFORMER

- A. Measurement: Measurement shall be made on the basis of the percentage completed of the task in accordance with the plans and specifications.
- B. Payment: Payment will be made at the lump sum stated in the bid. The price bid shall include furnishing all labor, materials, and equipment necessary to complete this item. Work shall include, but is not limited to, receiving and installing electrical transformer, wiring, conduit, overcurrent protection, miscellaneous hardware, spare parts, and other auxiliaries as required for proper installation and operation.

2.21 LABORATORY CASEWORK AND LABORATORY EQUIPMENT

- A. Measurement: Measurement shall be made on the basis of the percentage completed of the task in accordance with the plans and specifications.
- B. Payment: Payment will be made at the lump sum stated in the bid. The price bid shall include furnishing all labor, materials, and equipment necessary to complete this item. Work shall include, but is not limited to, wood cabinets, filler and closure panels, countertops, shelves, sinks, water, gas, and electrical fittings and accessories, miscellaneous hardware, fume hood, sterilizer, incubator, furnace, refrigerator, spare parts, instrumentation, operations and maintenance manual, laboratory supplies, and other auxiliaries as required for proper installation and operation.

2.22 MOBILIZATION

- A. Payment: Payment will be made for the price as stated in the Contract once the Contractor has established his construction yard and met the requirements established in the Contract Documents. Mobilization will be recognized as complete once the Contractor has provided a construction schedule and moved his equipment and a substantial amount of material to the job site. Construction must be underway and progressing. Payment for mobilization will be limited to a maximum amount not to exceed 5.0% of the bid price.

2.23 SBR EXPANSION TANK

- A. Measurement: Measurement shall be made on the basis of the percentage completed of the task in accordance with the plans and specifications.
- B. Payment: Payment will be made on the basis of the percentage completion of the lump sum price stated in the bid. The price bid shall include furnishing all labor, materials, tools, and equipment necessary to complete the task. The task shall include, but is not limited to, excavation, trenching, backfill, shoving, sheeting, dewatering, construction of concrete structures and basins of the SBR expansion tank to include all concrete, foundation, rebar, framing, modification and finishing, general cleanup, and surface restoration.

2.24 SBR TANK SHALLOW FOUNDATION

- A. Measurement: Measurement shall be made on the basis of the percentage completed of the task in accordance with the plans and specifications.
- B. Payment: Payment will be made on the basis of the percentage completion of the lump sum price stated in the bid. The price bid shall include furnishing all labor, materials, tools, and equipment necessary to complete the task. The task shall include, but is not limited to, construction services, excavations, soil, rock, grout, rebar, sand, or any other provision necessary to stabilize the soil properly for bearing pressure. The contractor shall engage a professional engineer and a specialty contractor to provide design based on soil conditions and the contractor shall warrant the foundation as installed upon completion.

END OF SECTION

**SECTION 15280
CHEMICAL FEED SYSTEM**

PART 1 - GENERAL

1.01 GENERAL

- A. The work described in this section consists of furnishing and installing a complete chemical feed system for the Soda Ash, Alum, and Polymer feed system. The chemical feed system shall be approved by the engineer prior to purchase. Work shall include, but not be limited to, furnishing, and installing all piping, chemical feed tanks, pumps, controls and appurtenances, heat tracing, all trenching, excavation and backfill, installing all concrete structures and complete surface restoration and cleanup.

1.02 SUBMITTALS

- A. Six copies of manufacturer's drawings and catalog cuts of the following items shall be submitted for approval by the Engineer:
1. Duplex Chemical Feed Package
 2. Chemical feed controls
 3. Chemical storage tanks
 4. Pipe and appurtenance
 5. Heat Tracing

1.03 GENERAL EQUIPMENT DESIGN AND CAPACITY

- A. General equipment design shall be such that:
1. feeders will be able to supply, at all times, the necessary amounts of chemicals at an accurate rate, throughout the range of feed;
 2. feeders are adjustable to handle all plant flow rates;
 3. chemical-contact materials and surfaces are resistant to the aggressiveness of the chemical solution;
 4. corrosive chemicals are introduced in such a manner as to minimize potential for corrosion;
 5. chemicals that are incompatible are not stored or handled together;

6. all chemicals are conducted from the feeder to the point of application in separate conduits;
7. chemical feeders are as near as practical to the feed point;
8. chemicals are fed by gravity where practical, and shall not be siphoned into the water supply;
9. service water supply shall be protected from contamination by the chemical solutions. It should be equipped with backflow prevention devices, or an air gap should be provided between the supply line and the solution tank;
10. no direct connection shall exist between any sewer and drain or overflow from the feeder or solution chamber or tank. All drains shall terminate at least six inches or two pipe diameters, whichever is greater, above the overflow rim of a receiving sump, conduit, or waste receptacle;
11. Pumps must be sized to match or exceed maximum head conditions found at the point of injection;
12. calibration tubes or mass flow monitors which allow for direct physical measurement of actual feed rates should be provided;
13. a pressure relief valve should be provided on the pump discharge line; and
14. liquid Chemical Feeders shall be such that chemical solutions cannot be siphoned into the water supply, by assuring discharge at a point of positive pressure, or providing vacuum relief, or providing a suitable air gap, or other suitable means or combinations as necessary.

PART 2 – PRODUCTS

2.01 DUPLEX CHEMICAL FEED PACKAGE

- A. Duplex Chemical Feed Package shall be furnished as manufactured by ProMinent Sigma 2 16050PVT or approved equal.
- B. The chemical feed pumps shall have a capacity of 15.8 GPH @ max backpressure (75 psi min).
- C. The pumps shall be self-priming, capable of suction lifts, when dry, up to ten feet.

- D. The flow rate of each pump shall be adjustable based on a 4-20 mA signal.
- E. Pump suction and discharge shall be 1" I.D.
- F. Pump skid shall be 110 volt, 60 Hz, single phase and base-mounted.
- G. Each Pump Skid shall include:
 - 1. a minimum of two diaphragm metering pumps;
 - 2. Control Panel for pump speed control – SCADA
 - 3. Diaphragm Leak Detector
 - 4. Hydraulic Accessories as listed in Section 2.08
- H. A separate pump skid shall be provided for each chemical applied. In addition, spare parts should be available for all pumps to replace parts which are subject to damage.

2.02 DIAPHRAGM METERING PUMP SKID SYSTEM

- A. The metering pump skid system shall be designed and constructed of corrosion resistant materials for severe environments encountered in liquid chemical feed applications.
- B. The skid system shall be completely self-contained, including pumps, piping, fittings, accessories, and controls.
- C. The skid frame shall be constructed of welded structural steel frame, encapsulated in a PVC lining. Plastic frame construction metering skid system shall not be acceptable.
- D. Metering pump skid structure design shall be an open frame with support stand for mounting of controls and accessories, providing 360 degree accessibility to facilitate easy operation and system maintenance.
- E. The pump system components shall be easily accessible and have unions located for easy disassembly of system piping and accessories for maintenance and repair with no special tools.
- F. The skids shall be designed for installation on the floor and provide an integral chemical containment capability.

- G. Piping and fittings shall be constructed of Schedule 80 socket welded PVC, threaded at the pump head and accessories as specified. The piping shall be adequately supported with pipe clips and supported from the skid frame. Support of the piping of the pump head shall not be acceptable.
- H. Plugged tee at the inlet shall be provided for ganging of multiple metering pump skids.
- I. The metering pump skid system shall include two sets of back pressure valve and pressure relief valves on the discharge side with built in by-pass arrangement to prime the pump and fill the calibration column without the need to reset the relief valve.
- J. The two pump inlets shall be located at the lower rear of the skid base and have an inlet isolation ball valve off a pre-assembled with the main suction header. The two outlets shall be located at the top rear of the skid and have an outlet isolation ball valve off a pre-assembled main discharge header.
- K. A common calibration column shall be installed on the pump suction side, with isolation ball valve and vented top fill connection, sized for 30 seconds minimum retention capacity at maximum pump flow rate.
- L. Two (2) air charged bladder type pulsation dampeners shall be sized for 95% minimum dampening of the pump flow, with air fill connection and pressure gauge.
- M. Two (2) liquid filled pressure gauges with isolation diaphragm shall be installed on the pump discharge piping. The pump shall be installed on the skid with the pump head exposed to full accessibility for removal for service and maintenance with no disassembly of the system piping and accessories.
- N. All controls shall be mounted on the skid support frame and pre-wired by the metering pump manufacturer.
- O. All controls shall be functionally tested at the factory for proper operation prior to shipment.

- P. Chemical metering pump assembled on the skid shall be a non-loss of motion positive displacement, mechanical diaphragm type.

2.03 DIAPHRAGM METERING PUMP DESCRIPTION

- A. Chemical metering pumps shall be of the positive displacement, mechanical diaphragm type.
- B. A steel and nodular iron non-loss-motion stroke adjust mechanism, driven by a pulley coupled, variable speed DC motor, shall actuate a flat, Teflon-faced composite diaphragm.
- C. Solenoid-driven pumps, lost-motion mechanically actuated diaphragm pumps and hydraulically actuated diaphragm pumps will not be accepted.
- D. The liquid ends shall provide for easy maintenance and integral sight flow indication via clear PVC cartridge-type check valves.
- E. Conventional threaded and integral sight flow indicator will not be allowed.

2.04 DRIVE

- A. A steel and nodular iron non-loss-motion stroke adjust mechanism shall be housed in a corrosion resistant, epoxy painted, cast iron gearbox.
- B. All drive bearings shall be tapered rollers; all fasteners shall be 316 SS.
- C. The gearbox shall be oil-bath lubricated. Grease filled gearbox shall not be allowed.
- D. Stroke and nodular iron non-loss-motion stroke adjust mechanism shall be housed in a corrosion resistant, epoxy painted, cast iron gearbox.
- E. A percent scale and vernier shall indicate stroke length in 0.25% increments. Each revolution of the knob shall change stroke length by 10%. The motor shall be coupled to the gearbox via a field retrofittable, 4-step pulley and belt driven mechanism. This mechanism shall provide four separate individual capacities. Each speed range shall have 10:1 stroke turndown adjustment, thereby extending the

total operation turndown to 40:1 with a standard induction motor, 800:1 with a variable speed permanent Magnet DC motor.

2.05 LIQUID END

- A. The process diaphragm shall be Teflon-faced, fabric reinforced and bonded to pre-formed elastomeric support.
- B. It shall incorporate convolutions, for unconstrained rolling action and a steel backing plate for volumetric accuracy.
- C. An O-ring groove in the head's diaphragm cavity will provide for a complete leak-free seal.
- D. Positive flow shall be ensured via single ball cartridge-type check valves.
- E. The valve retainers shall be clear PVC, for integral sight flow indication and shall have compression seal to the pump head and pipe connectors via O-rings.
- F. A rolling secondary diaphragm seal shall be provided and shall completely seal and separate the pump head from the drive unit, to eliminate any risk of cross-contaminating gearbox lubricant and process fluid. Sliding seal type arrangement shall not be allowed.
- G. Liquid end shall be PVC including head, valves, seats, and guides. Seals shall be Hypalon O-rings. Valve balls shall be made from Teflon material, with PTFE faced Viton gasket seals and ceramic valve balls.

2.06 CONTROLS AND MONITORING

Each pump shall be supplied with its own control panel to conform to the following:

- A. Feed rate shall be controlled manually, via a 10-turn micrometer-type stroke length adjuster with integral self-locking ratchet mechanism. A percent scale and vernier shall indicate stroke length in 0.25% increments. Each revolution of the knob shall change stroke length by 10%. Feed rate shall be infinitely adjustable from 0 through 100%. Stroke length shall be adjustable over a 10:1 operating range. Repeatable metering accuracy shall be $\pm 2\%$ of full scale, at constant hydraulic conditions, over the operating range.

- B. Pump speed shall be controlled via DC drive and standard 56C frame motor attached via an external 4-20mA input signal.
- C. Control panel shall be housed in an external FRP control box mounted on the skid providing pump speed regulation.
- D. Control panel shall utilize UL listed components and include following display and functionality.
 - 1. Pump speed digital meter
 - 2. Panel power ON pilot light
 - 3. Pump run pilot light
 - 4. Pump failure pilot light
 - 5. Main disconnect switch
 - 6. Start-stop control mode
 - 7. Hand-off-Auto
 - 8. Auto mode via remote customer contact
 - 9. Pump speed control mode
 - 10. Local and Remote speed control
 - 11. Local speed control via Potentiometer
 - 12. Remote speed control via external 4-20 mA input
 - 13. Remote stop function provision for customer supplied contact or stop button
 - 14. Pump motor overload input monitoring
 - 15. Remote alarm provision for customer supplied contact
 - 16. Dry normally open 10 Amp contact for remote indication of pump run and pump failure
 - 17. Pump speed 4-20 mA output

18. Spare terminal blocks
19. 120 VAC, 1 PH, 60 HZ input
20. Pump shall be supplied with ($\frac{3}{4}$ HP DC) motor

2.07 DIAPHRAGM LEAK DETECTOR

- A. The metering pump skid system shall be fitted with a diaphragm leak detection system for each pump head, to detect the early stages of diaphragm failure.
- B. The system shall consist of a solid-state electro-optic sensor that mounts to the liquid end and a NEMA 4X control box.
- C. Each control box shall be capable of auto shutdown.

2.08 HYDRAULIC ACCESSORY

The following accessories shall be integral with the Skid system.

- A. Inlet Ball Valves
- B. Outlet Ball Valves
- C. Calibration Column Assembly with valve
- D. Backpressure Valve per pump
- E. Gauge w/ PVC isolators per pump
- F. Pulsation Dampener per pump
- G. Pressure Relief Valves per pump
- H. Flushing valve assembly

2.09 SPARE PARTS

1. Each spare parts kit to include suction and discharge valves and diaphragm.

2. A spare unit for each skid of sufficient capacity to replace the one of the pumps during shutdowns;

2.10 CHEMICAL STORAGE TANKS

- A. Provide two molded, seamless, filament wound, FRP tanks with a capacity of 4,500 gallons. The tanks shall be placed above ground on a concrete containment basin as shown on the drawings.
- B. The tanks shall have one 24" bolted manway, 3 - 3" flanged nozzles and 1 -6" "U" vent with screened opening.
- C. The tanks shall have a level gauge of 1½" clear PVC sight glass. Each tank shall have one 2" PVC filler line located in the top of the tank terminating with a 2" ball valve and stainless steel camlock male coupling with a PVC cap mounted on a stainless-steel shelf within the containment area.
- D. The chemical storage tanks shall have an overflow and a receiving basin or drain capable of receiving accidental spills or overflows.
- E. The chemical storage tanks shall be insulated.
- F. Shop drawings for fiberglass chemical storage tanks shall be stamped by an engineer registered in Georgia.
- G. Alum and caustic soda ash shall not be handled in open vessels but should be pumped in undiluted form from original containers through suitable hose, to the point of treatment or to day tanks.
- H. Chemicals shall be stored in covered or unopened shipping containers unless the chemical is transferred into an approved storage unit.
- I. Offloading areas shall be clearly labeled to prevent accidental cross-contamination.
- J. Acids shall be kept in closed, acid resistant shipping containers or storage units. Acids shall not be handled in open vessels but should be pumped in undiluted form from original containers, through suitable hose, to the point of treatment.

2.11 HOUSING

- A. Structures, rooms, and areas accommodating chemical feed equipment shall provide convenient access for servicing, repair, and observation of operation.
- B. Floor surfaces shall be smooth and impervious, slip-proof and well drained with 2.5 % minimum slope.
- C. Vents from feeders, storage facilities and equipment exhaust shall discharge to the outside atmosphere above grade and remote from air intakes.
- D. Open basins, tanks and conduits shall be protected from chemical spills or accidental drainage.

2.12 PIPING AND APPURTENANCES

- A. All piping, suction and discharge shall be 1" schedule 80 PVC. All valves, fittings and connectors shall be schedule 80 PVC.
- B. All fill line pipes shall be 2" schedule 80 PVC. All fill line valves, fittings and connectors shall be schedule 80 PVC.
- C. Fill line shall have a 2" stainless steel male camlock with a 2" plastic female camlock cap. There shall be a spill containment basin and an HDPE piping sump for the fill port.
- D. All casing pipe and appurtenances shall be schedule 80 PVC.

2.13 HEAT TRACING

- A. Provide heat tracing with controls for all exterior PVC lines on the chemical system.
- B. Heat tracing to maintain a temperature of 80° F and should be self-regulating.
- C. All exposed PVC lines to receive UV resistant pipe insulation.
- D. Heat tracing to be weatherproof for outside installation.

2.14 CHEMICAL INFORMATION

- A. For each chemical the information submitted shall include:
 - 1. specifications for the chemical to be used;

2. purpose of the chemical;
 3. proposed minimum non-zero, average and maximum dosages, solution strength or purity (as applicable), and specific gravity or bulk density;
 4. method for independent calculation of amount fed daily; and
 5. chemical hazards class, if any, and regulatory workplace health/safety and chemical exposure standards listed in Safety Data Sheets (SDS).
- B. Chemical containers shall be fully labeled to include:
1. chemical name, purity and concentration;
 2. supplier name and address; and
 3. expiration date where applicable.
- C. Chemicals shall be listed as meeting NSF Standard 60 and shall meet AWWA specifications, where applicable.
- D. Provisions should be made for assay of chemicals delivered.
- E. Chemicals shall not impart any toxic material to the water under recommended dosages.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. The Contractor shall be responsible for the complete installation which must be in accordance with equipment manufacturer's recommendation.
- B. Furnish and install the pumps, drives, and related accessories required for this Project.
- C. Ensure pumps operate at system fluid temperatures without vapor binding and cavitation and are non-overloading in parallel or individual operation.
- D. The manufacturer should furnish supervision of all installation and supply a qualified service representative to instruct the Owner in the operation and servicing of the equipment.
- E. All pipe penetrations through walls shall be cored and cased with schedule 80 PVC pipe. All penetrations shall be insulated and waterproofed.

- F. Check valve shall be installed at end of chemical feed pipe run prior to discharge into wet well.
- G. All piping shall be adequately supported with pipe clips and supported from frames constructed of galvanized steel, anchored to concrete. Support of the piping shall be at the minimum of 6' of pipe run. All piping shall be installed plumb and level.
- H. Support piping adjacent to chemical pump skid such that no weight is carried on pump skid.
- I. Provide drains for bases, seals, and air cocks piped to and discharging to floor drains.
- J. Lubricate pumps before start-up.
- K. Conduct field tests to demonstrate that capacities and operating characteristics specified are developed.
- L. Safety Items: Provide gloves, goggles, face mask, and apron suitable for use with the chemical involved. Provide signage to be mounted outside of door of chemical room as required by OSHA. Paint all tripping hazards with safety yellow paint. Provide carts and other appropriate means for lifting chemical containers to minimize excessive lifting by operators. The chemical building shall include an emergency shower and eye wash station.

END OF SECTION

SECTION 15501
ULTRAVIOLET (“UV”) DISINFECTION EQUIPMENT

PART I – GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and appurtenances required to provide an open channel, gravity flow, low pressure, high intensity ultraviolet lamp (UV) disinfection system complete with an automatic mechanical/chemical cleaning system and variable output electronic ballasts. The UV system to be complete and operational with all control equipment and accessories as shown and specified herein. The system will be capable of disinfecting effluent to meet the water quality standards listed in this section.
- B. The ultraviolet disinfection system will be purchased from Trojan Technologies or approved equal by the Contractor. The system shall be installed by the Contractor and tested and commissioned by the manufacturer, as specified in this section. The Owner will consider alternatives if all requirements of this specification are met without exception including Pre-qualification Requirements in section 1.02.
- C. The unit(s) shall be furnished with all necessary accessory equipment including but not limited to the UV lamp assemblies, power distribution centers, monitor and/or system controls, automatic Cleaning system as an option if available, lifting system and other auxiliaries, whether specifically mentioned in this Section or not, as required for an installation incorporating the highest standards for the type of service including field testing and instructing the regular operating personnel in the care, operation and maintenance of all equipment.
- D. For purposes of standardization, and to achieve a common operator interface for control systems within the facility, the major items of instrumentation and process control equipment provided for the UV disinfection system local control panels shall be sufficient for full operation. The proposal shall be complete and require only power in accordance with 2.06 to become fully operational. This equipment shall include but not be limited to system monitor and operator interface devices.
- E. The UV system shall be capable of disinfecting existing effluent as well as future flows to meet the water quality standards listed in this Section.
- F. Each proposer shall supply a list of at least three comparable installations of current technology within the United States of America.

1.02 QUALITY ASSURANCE

- A. Pre-qualification Requirements: Any alternative UV manufacturer that is not named or listed as approved equal must submit the following 15 days prior to bid to be considered for approval:
1. To be considered, the manufacturer will be regularly engaged in the manufacture of UV systems with a proven track record of at least two hundred (200) operating installations of the proposed UV system.
 2. The manufacturer will provide documentation of previous experience with municipal UV disinfection systems in wastewater applications with variable output electronic ballasts.
 3. Pre-qualification submittals from manufacturers will include a complete and detailed proposal of equipment offered, including the number of lamps proposed and a detailed description of any exceptions taken to the specification.
 4. To be considered, the manufacturer will submit a bioassay evaluation for the proposed reactor, without exception. The bioassay will have been completed by an independent third party and have followed protocols described in the NWRI Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse (May 2003) using MS2 bacteriophage as the surrogate test organism. The bioassay must demonstrate that the proposed UV system design and number of lamps will deliver the specified dose.
 5. Independent certification of fouling factor and lamp aging factor must be submitted if values other than the specified default values are being proposed.
 6. Documentation of UV manufacturer's service capabilities including location and experience.
 7. Sample disinfection performance guarantee including scope and duration of guarantee.
 8. All UV manufacturers will be required to pre-qualify unless the manufacturer is the base bid manufacturer.

1.03 SUBMITTALS

- A. Complete shop and installation drawings of all materials and equipment furnished under this Section shall be submitted for approval in accordance with the Request for Proposal. Submittals shall include, but not be limited to, the following:

1. Complete description in sufficient detail to permit an item comparison with the specifications.
2. Detailed drawings showing all details of the construction of the UV system and installation details of all equipment.
3. Detailed schematic and layout drawings and a description of operation of all control panels.
4. Detailed schematic and layout drawings and a description of operation of all control panels.
5. All interconnections and interface requirements, dimensions, and locations of all major elements of the UV system including critical clearance requirements.
6. Basis of design, including background data, calculations, operational plant data and other information showing the development of the proposed design and that it will conform to the requirements of Paragraph 1.04D.
7. The startup/performance testing report and manufacturer's certification as required in Part 3.
8. Complete operation and maintenance manuals shall be submitted. The manuals shall recognize that UV disinfection technology is not common knowledge to most plant operators, so the manuals shall be thorough and instructive to such personnel. O&M manuals shall be delivered 2 weeks before delivery of system.

1.04 SYSTEM STARTUP

- A. The ultraviolet light system supplier shall provide a representative for startup services once the installation is complete.
- B. Manufacturer's Representative
 1. The manufacturer's representative shall inspect the construction plans and the installation and recommend any required modifications, additions, or other changes required to allow the manufacturer to certify that the complete installation is appropriate and is expected to operate as expected.
 2. The manufacturer's representative shall instruct the Owner's and Engineer's personnel on the operation and maintenance of the UV disinfection system.

The instruction shall include classroom training on UV technology, and field training on proper operation and maintenance procedures, along with complete demonstrations of the same.

3. The manufacturer’s representative shall supervise the performance testing of the installation.
4. The manufacturer’s representative shall provide minimum services in accordance with the following table:

<u>Purpose</u>	<u>No. of Days</u>
Installation Supervision	As required of proper installation
Functional Testing	2
Performance Testing	3
Operator Training	1

5. The number of days indicated above shall be provided on an 8-hour-day on-site basis and shall be in addition to travel time.

1.05 DESCRIPTION OF THE SYSTEM

A. The equipment specified herein shall be low pressure, low or high output ultraviolet light disinfection equipment designed to reduce the *E.Colli* of domestic wastewater treated to secondary standards utilizing SBR system as specified in Paragraph 1.05B so that the final effluent shall meet the effluent discharge conditions as specified in Paragraph 1.05D. The UV system shall be hydraulically rated for at least 2.0 mgd peak flow and be installed in a stainless steel channel.

B. Influent Characteristics to Disinfection Channels

1. The UV disinfection system shall be designed to disinfect an influent at the flow rates and with the characteristics as shown below:

a. Peak Flow (mgd)	2.0 MGD
b. Total Suspended Solids (mg/l)	30 mg/L
c. 5-day B.O.D. (mg/l)	5 mg/L
d. UV Transmittance at 253.7 nm	65% minimum
e. Annual Effluent Temperature Range	33° to 85° F
f. Effluent Standards to be Achieved	100/100 ml <i>E.Colli</i> , based on 30 day geometric mean of daily samples
g. Design Dose:	31 mJ/cm ² MS2 (bioassay validated)

- | | |
|-----------------------|---|
| h. Validation Factors | 0.98 end of lamp life factor
0.95 fouling factor |
| i. Redundancy | 1 UV Bank at ADF of peak flow |

C. UV Channel Configuration

1. The system shall be installed in open channels having the characteristics shown on the attached Drawings.
2. The minimum design requirements of the UV system supplied shall be as follows:

Channel

- | | |
|---------------------------------------|--------|
| a. Number of UV Channels at each site | 1 |
| b. Approximate Channel Length Req. | 24'-8" |
| c. Channel Width | 2'-8" |
| d. Channel Depth | 1'-11" |

UV Modules

- | | |
|---|-----------------------------|
| e. Number of UV banks per channel | 2 (1 Duty + 1 Redundant) |
| f. Number of UV lamp modules per bank | 8 |
| g. Number of lamps in each UV lamp module | 4 |
| h. Total number of lamps | 64 (including 32 redundant) |

UV Panels

- | | |
|------------------------------|---|
| i. Power Distribution Center | 2 |
| j. System Control Center | 1 |

Misc. Equipment

- | | |
|---|--|
| k. Level Controller | 1 |
| l. Lever Controller Type | Fixed Weir |
| m. Auto Chemical Cleaning | Trojan ActiClean-WW™ or approved similar |
| n. UV Module Lifting Device | Davit Crane |
| o. Standard Spare Parts | Included |
| p. Minimum and maximum water levels above channel floor shall be specified as part of the proposal. | |

These requirements are considered minimum. Each supplier shall present the specific number of units proposed for his installation.

D. Bacteriological Inactivation Requirements

1. Flow Characteristics
 - a. Number of channels in service 1
 - b. Total average flow (mgd) Initial = 0.65 mgd

2. *E.Colli* Testing Criteria
 - a. 30-day geometric mean of daily samples 100 per 100 ml

3. Grab samples of the influent to and effluent from the UV disinfection system shall be collected during the performance testing period specified in Part 3 of this Section. The samples shall be tested for fecal coliform content in accordance with the procedures recommended in "Standard Methods."

E. Performance Requirements

1. The UV system will be designed to deliver a minimum UV dose of 31 mJ/cm² at peak flow, in effluent with a UV Transmission of 65 % at end of lamp life (EOLL) after reductions for quartz sleeve fouling. The basis for evaluating the UV dose delivered by the UV system will be the independent third-party bioassay, without exception. Bioassay validation methodology to follow protocols described in NWRI Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse (May 2003) using MS2 bacteriophage as the surrogate test organism.

2. The UV Dose will be adjusted using an end of lamp life factor of 0.5 to compensate for lamp output reduction over the time period corresponding to the manufacturer's lamp warranty. The use of a higher lamp aging factor will be considered only upon review and approval of independent third party verified data that has been collected and analyzed in accordance with protocols described in NWRI Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse (May 2003).

3. The UV Dose will be adjusted using a quartz sleeve fouling factor of 0.8 when sizing the UV system in order to compensate for attenuation of the minimum dose due to sleeve fouling during operation. The use of a higher quartz sleeve fouling factor will be considered only upon review and approval of independently verified data that has been collected and analyzed in accordance with protocols described in NWRI Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse (May 2003).

4. Independent Validation for use of higher factors (lamp aging and sleeve fouling) must be submitted to the Engineer a minimum of fifteen (15) days prior to bid.

5. The system will be able to continue providing disinfection while replacing UV lamps, quartz sleeves, ballasts and while cleaning the UV lamp sleeves.
6. The system will be designed for complete outdoor installation.

1.06 MAINTENANCE

A. Spare parts shall be provided with the UV disinfection system. The parts shall not be consumed by the manufacturer or Contractor and shall be in the hands of the Owner upon Substantial Completion. The parts shall be provided in sturdy containers, labeled on all sides with information concerning the contents and suitable for long term storage in a room without environmental controls.

B. Spare Parts

The following spare parts shall be provided:

1. Four (4) UV Lamps
2. Four (4) Lamp Sleeves
3. Four (4) Lamp Holders

C. Operators Kit

The following items will be furnished:

1. One (1) face shield to protect operator from UV light
2. One (1) gallon of cleaning solution. (Lime-A-Way manufactured by Ecolab or approved similar)

1.07 WARRANTY

A. The equipment furnished under this section shall be free of defects in materials and workmanship, including damages that may be incurred during shipping, storage, and installation for a period of one year from the date of the startup or for one and half years from the date of shipment.

B. The UV lamps shall be warranted for a period of 12,000 hours at full power when in automatic mode, prorated after 9,000 hours. On/off cycles are limited to four (4) per day.

C. Ballasts to be warranted for 5 years, prorated after 1 year.

PART 2- PRODUCTS

2.01 MANUFACTURER

- A. The physical layout of the system shown on the contract drawings and the equipment specified herein are based upon the UV3600PTP System, as manufactured by Trojan Technologies, London, Ontario, Canada.
- B. If other equipment is proposed, the Contractor will demonstrate to the Engineer and the Owner that all requirements of materials, performance, and workmanship have been met or exceeded by the equipment proposed. Contractors proposing alternate manufacturers will be responsible for all costs associated with system evaluation and redesign including all electrical, mechanical, and civil aspects of the installation.

2.02 DESIGN, CONSTRUCTION, AND MATERIALS

A. General

- 1. All module welded metal components in contact with effluent will be Type 316 stainless steel.
- 2. All metal components above the effluent will be Type 304 stainless steel with the exception of the ballast enclosure, which is constructed of anodized aluminum.
- 3. All wiring exposed to UV light will be Teflon™ coated.
- 4. All wires connecting the lamps to the ballasts will be enclosed inside the frame of the UV Module and not exposed to the effluent. To be considered as an alternate, wires that are exposed to the effluent will be warranted for 15 years and will be Teflon™ coated to prevent degradation under constant exposure to UV light.

B. Lamp Array Configuration

- 1. The lamp array configuration will be the uniform array with all lamps parallel to each other and to the flow.
- 2. The system will be designed for complete immersion of the UV lamps including both electrodes and the full length of the lamp tube in the effluent.

C. UV Module

- 1. Each UV module will consist of four (4) UV lamps with an electronic ballast enclosure mounted on a Type 316 stainless steel frame. To be considered as an alternate, ballasts housed in a separate enclosure located external to the channel will be equipped with a suitable air conditioning system, supplied by

the UV manufacturer, to maintain internal enclosure temperatures below 80°F (26°C). No forced air ventilation will be allowed.

2. Each lamp will be enclosed in its individual quartz sleeve, one end of which will be closed, and the other end sealed by a lamp end seal. To be considered as an alternate, lamp quartz sleeves that are open at both ends will be supplied with twice the amount of specified spare seals and lamps.
3. The closed end of the quartz sleeve will be held in place by means of a retaining O-ring. The quartz sleeve will not come in contact with any steel in the frame.
4. The ends of the lamp sleeve will not protrude beyond the stainless steel frame of the UV Module.
5. Lamp wires will terminate in the electronic ballast enclosure located at the top of the UV Module.
6. All lamp to ballast connections will be made by and tested by the UV Manufacturer.
7. The electronic ballast enclosure will contain the electronic ballasts and addressable lamp status monitoring systems.
8. Each UV Module will be connected to a receptacle on the Power Distribution Center.
9. At the point of exit from the UV Module frame the multi conductor cable will pass through a waterproof strain relief.
10. Each UV module will have a rating of Type 6P.

D. Ultraviolet Lamps

1. Lamps will be high intensity low pressure amalgam design. The lamp will be preheated to promote longevity. Lamps that are not amalgam or that are based on driving a low pressure lamp at amperages greater than 500 milliamps will not be allowed.
2. The filament will be of a clamped design, significantly rugged to withstand shock and vibration.
3. Electrical connections will be at one end of the lamp and have four pins, dielectrically tested for 2,000 Vrms. Lamps that do not have 4 pins will be

considered instant start. To be considered as an alternative, instant start lamp systems will supply replacement spare lamps equal to 50% of the total number of lamps in the system.

4. Lamps will be operated by electronic ballasts with variable output settings.
5. Changing of lamps and sleeves shall be easily performed by the operating personnel at the plant. Systems whereby the lamp assemblies have to be returned to the factory for lamp replacement will not be allowed.
6. The UV lamps in the UV reactor should be submerged at all times to prevent overheating and UV equipment damage. This is accomplished by installing the UV reactors at an elevation below the hydraulic grade line elevation and maintaining submersion by installing a flow control weir downstream of the UV reactor.

E. Lamp End Seal and Lamp Holder

1. Each lamp will be enclosed in its individual quartz sleeve, one end of which will be closed, and the other end sealed by a lamp end seal and holder.
2. The open end of the lamp sleeve will be sealed by means of a sleeve nut which threads onto a sleeve cup and compresses the sleeve O-ring.
3. The sleeve nut will have a knurled surface to allow a handgrip for tightening. The sleeve nut will not require any tools for removal.
4. The lamp will be held in place by means of a molded lamp holder that will incorporate two seals. The lamp holder will incorporate a double seal against the inside of the quartz sleeve to act in series with the external O-ring seal.
5. The second seal on the lamp holder will isolate and seal the lamp from the module frame and all other lamps in the module.
6. In the event of a quartz sleeve fracture the two seals of the lamp holder will prevent moisture from entering the lamp module frame and the electrical connections to the other lamps in the module.
7. The lamp holder will also incorporate a UV resistant PVC molded stop that will prevent the lamp sleeve from touching the steel sleeve cup.

F. UV Lamp Quartz Sleeves

1. Type 214 clear fused quartz circular tubing as manufactured by General Electric or approved equal.
2. Lamp sleeves will be domed at one end.
3. The nominal wall thickness will be 1.5mm.

G. UV Module Support Rack

1. The UV module support rack will be minimum Type 304 stainless steel and be mounted above the effluent in the channel allowing adjustment to the precise height of the channel.

H. Effluent Level Controller

1. Level Control Weir
 - a. Located at the discharge end of the UV channel.
 - b. Designed to maintain a minimum channel effluent level as required to keep lamps submerged.
 - c. Constructed of Type 304 Stainless Steel.

I. Low Water Level Sensor

1. One low water level sensor will be provided by the UV Manufacturer.
2. During manual, automatic, and remote modes of system operation, the water level sensor will ensure that lamps extinguish automatically if the water level in the channel drops below an acceptable level.
3. The low water level sensor will be powered by the Power Distribution Center.

J. Electrical

1. Each UV module within a bank will be powered from the bank's dedicated Power Distribution Center.
2. UV manufacturer to supply all cabling and conduit between lamps and ballasts.
3. UV manufacturer to perform all terminations between lamps and ballasts.
4. Each electronic ballast within a UV module will operate two lamps.
5. Power factor will not be less than 98% leading or lagging.

6. Electrical supply to each Power Distribution Center will be 120V 60Hz,40 A.
7. Electrical supply for the water level sensor will be provided by the PDC and be 12 Volt DC.
8. Electrical supply to the System Control Center will be 120V 60Hz, 5 A.

Note to Specifier: The UV System electrical panels are not provided with electrical disconnects. Each electrical power supply should be provided with a separate disconnect to be supplied under the electrical contract.

K. Power Distribution Center

1. Power distribution will be through environmentally sealed receptacles on the PDC(s) to allow for local connection of UV modules.
2. Data concentration will be through integrated circuit boards located inside the Power Distribution Center.
3. PDC enclosure material will be Type 304 Stainless Steel - Type 4X (IP66).
4. All internal components will be sealed from the environment.
5. All Power Distribution Centers to be UL listed and UL listed to Canadian safety standards or equivalent with a rating of Type 4X.
6. One separate sealed Power Distribution Center will be provided per bank of lamps.
7. To be considered as an alternative, systems that have ballasts mounted in cabinets, the UV manufacturer will provide one complete cabinet for each bank of lamps, to ensure that each bank is electrically isolated for safety during maintenance and to provide redundancy under average flow conditions.

Note to Specifier: If the System Controller is installed outdoors, it is recommended that the operator interface side be positioned away from direct sunlight.

L. UV Detection System

1. A submersible UV sensor will continuously monitor the UV intensity produced in each bank of UV lamps.

2. The sensor will measure only the germicidal portion of the light emitted by the UV lamps. The detection system will be factory calibrated. Detection systems that can be field calibrated will not be permitted.

M. Dose-Pacing

1. A dose-pacing system will be supplied to modulate the lamp UV output in relationship to a 4-20 mA DC signal from an effluent flow meter (by Others).
2. The system to be dose-paced such that as the flow and effluent quality change, the design UV dose is delivered while conserving power.
3. The dose-pacing system will allow the operator to vary the design dose setting. Logic and time delays will be provided to regulate UV bank ON/OFF cycling.

N. Cleaning System

1. An automatic cleaning system will be provided to clean the quartz sleeves using both mechanical and chemical methods. Wiping sequence will be automatically initiated with capability for manual override.
2. The cleaning system will be fully operational while UV lamps and modules are submerged in the effluent channel and energized.
3. Cleaning cycle intervals to be field adjustable.
4. Remote Manual and Remote Auto cleaning control options will be provided.
5. The cleaning system will be provided with the required solutions necessary for initial equipment testing and for equipment start-up.
6. To be considered as an alternate, systems that use only mechanical wiping must have the ability to periodically be cleaned out of channel using a chemical bath. Out of channel cleaning will include lifting slings, removable banks, cleaning tanks, agitation system and air compressors, as required. The UV manufacturer will be responsible for supplying all equipment including any equipment not specifically listed required to perform out of channel chemical cleaning. Contactor will be responsible for installation.

O. Module Lifting Device

1. One Davit crane, base and lifting sling will be supplied to assist in removing individual modules from the effluent channel.

2. Lifting device will be a crane with hand winch and will include an adjustable boom to ensure adequate reach and height.
3. Lifting device to include a swivel handle for rotation and positioning.
4. Crane and base will be supplied by the Manufacturer and will be installed by the Contractor.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The City of Pembroke will obtain a qualified contractor to install the ultraviolet system in strict compliance with the manufacturer's instructions and recommendations.
- B. In accordance with contract drawings, manufacturers' shop drawings, instructions, and installation checklist. Contractor Installation Checklist to be completed and returned at least two (2) weeks prior to date requested for commissioning. Photographs illustrating site readiness are required. The Contractor assumes all responsibility for the installation readiness of the UV system.
- C. All labor, materials, and test apparatus necessary for completing the installation shall be furnished by the Contractor at no additional cost to the Manufacturer.

3.02 MANUFACTURER'S SERVICES

- A. Start-up and field testing: Start-up and Field Services will only be scheduled upon written request. Contractor shall notify Trojan of schedule requirements at least ten (10) working days in advance. Upon arrival to commission the equipment, if the Trojan's Certified Service Technician determines the Contractor work is not complete and the start-up cannot be completed in the allotted time. A return visit will be scheduled at the Contractors expense. Contractor will issue a change order or purchase order for the return trip and additional time required.
- B. Operator Training: Contractor responsible for scheduling the training with manufacturer.
- C. Warranty Service: As outlined in warranty agreement.

3.03 GENERAL TESTING REQUIREMENTS

- A. The manufacturer shall furnish the services of a factory trained engineer as given in Paragraph 1.04 to supervise start-up and testing of the system. The system shall operate to the specified requirements. If the system fails to meet specified requirements, it shall be adjusted, repaired, and/or replaced at no additional cost to the Owner.

3.04 FUNCTIONAL TESTING

- A. Prior to startup, the Engineer shall inspect the installed UV disinfection system for proper alignment, correct operation, proper connection, and satisfactory function of all components, including ground fault circuit interrupters and a safety inspection of wet cable connectors. The Engineer shall approve the installation and provide certification that the system components have been installed correctly and are ready for operation.
- B. Proposed check list shall be developed by the manufacturer and submitted to and reviewed by the Engineer prior to scheduling the verification of the check list.

3.05 PERFORMANCE TESTING

- A. Tests shall be performed by an Independent Certified Testing laboratory. Testing shall commence after installation and start-up of the UV system. Samples will be collected at times when the flow through the plant is at or near the peak flow rating of the UV system.
 - 1. The samples collected shall be analyzed for the following, using standard testing procedures.
 - a. Fecal coliform count just prior to disinfection.
 - b. Fecal coliform count just after disinfection.
 - c. Suspended solids prior to disinfection.
 - d. BOD5 prior to disinfection.
 - e. Percent transmission at 254 nm prior to disinfection.
 - 2. The duration of the performance testing shall be three days and the frequency of sample collection will be three times per 24 hour period at intervals directed by the Owner. The data obtained shall be recorded and included in the formal test report.
- B. Analytical Method. Test and sample preservation methods for test contaminants shall be in accordance with the latest revisions of AWWA Standards Method for Examination of Water and Wastewater.

- C. The contractor is responsible for local laboratory costs and coordination, and the supplier will provide the procedure and compile the results. An allowance for testing shall be included in the proposal.

END OF SECTION

SECTION 15512
SLUDGE DEWATERING SYSTEM

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. The contractor shall furnish a complete dewatering system as specified and indicated on the drawings to meet the specified performance requirements. The Tower Belt Filter Press shall comply with the following specifications which are based upon time-proven design. That design combines high strength structural integrity, extensive material longevity, minimal maintenance and utility requirements, and state of the art process resulting in superior overall performance.
- B. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless noted by the engineer.

1.02 SYSTEM DESCRIPTION

- A. The Tower Belt Filter Press shall be Charter Machine Company model TP 7.4-3 or approved equal.
- B. The conveyor shall be made by the same manufacturer of the Belt Filter Presses. Acceptable manufacturers: Charter Machine Co. or approved equal.
- C. The Tower Belt Filter Press model furnished shall feature a vertical arrangement of pressure rollers that permits 205 degree minimum wrap on each roller.
- D. The sludge dewatering system shall consist of a skid mounted belt filter press with slurry feed pump, wash water pump, and polymer conditioning system, and includes all necessary controls, piping and wiring to provide a turnkey system.
- E. The minimum belt width required shall be 0.7m. The overall width, length, and height shall be 4'-10", 10'2", and 7'4", respectively.
- F. A sludge discharge conveyor shall be supplied as shown in the Contract Drawings. The conveyor shall receive dewatered sludge cake from the belt filter press and convey the material to the sludge storage area.

- G. The screw conveyor system shall include conveyor troughs with liners, spiral flighting, conveyor drive w/motor, gearbox adaptor w/packing rings, trough ends, covers, inlet hopper, outlet hopper and all hardware.
- H. The conveyor shall be 10" diameter shafted screw conveyor approximately 20' long capable of conveying the dewatered cake solids to a dumpster. This conveyor shall discharge via a chute. All of the conveyors shall be of the latest design and shall be fabricated of materials and in a fashion which will fully perform the necessary functions.

1.03 QUALITY ASSURANCE

- A. System Responsibility: Vested responsibility for operation and control of the BFP system, which is comprised of all equipment controlled by the BFP control panel, is the BFP manufacturer.
- B. Experience Qualification: BFP equipment shall be provided by a manufacturer who is qualified and experienced in the production, installation, operation, and process control of dewatering polymer, conditioned, aerobically digested sludge dewatering polymer, conditioned, aerobically digested sludge from municipal wastewater treatment facilities. A qualified manufacturer is one having a minimum of ten (10) units of the proposed model, each having been in operation for a period of not less than five (5) years.
- C. The belt filter press manufacturer is to have a minimum of 20 years of development, assembly, and manufacturing experience. No exceptions to this requirement shall be accepted.
- D. Equipment submitted for approval which does not meet the specified experience period shall be considered only if the Contractor provides a bond or certified check which shall guarantee replacement in the event of failure to comply with all other criteria contained in the procurement documents. The amount of the guaranteed bond or certified check shall be 200% of the full bid price of the equipment. The period of time for which the guaranteed bond or certified check is required shall be equal to the experience period specified.
- E. Source Quality Control: The belt filter press shall be designed, fabricated, assembled, and tested by the belt filter press manufacturer in their own facility. In order to provide maximum quality assurance, all aspects of the design, fabrication, and assembly shall be performed by personnel employed by the manufacturer. The belt filter press manufacturer shall at the same facility.
- F. Factory Quality Control Test: Prior to shipment, the belt filter press and control panel shall be factory tested at the place of assembly. Factory test each pre-

assembled, pre-wired, lubricated, and aligned BFP and its associated control panel to be supplied to the job site. Prior to shipment, verify through a one-hour continuous operating test that the BFP and associated equipment operate smoothly, noiselessly, vibration free, and without overheating of any bearing or motor. Particular attention must be given to assure that the BFP is properly aligned for maintaining the centerline-to-centerline tracking of the belts relative to the machine. Submit a certified test report to the Engineer for approval, prior to shipping that demonstrates compliance with all applicable industry standards, manufacturing quality control, and the functional intent of these Specifications.

- G. The owner/engineer shall, at their option, be permitted to witness the factory quality control test at the manufacturer's facility. The manufacturer shall give the owner/engineer a minimum of two- (2) weeks notice prior to testing.
- H. Alternate manufacturers shall, at no cost to the Owner, conduct a field performance test, at the plant site, within 30 days of the bid opening to demonstrate compliance with the specified performance criteria. This test must be conducted with a belt filter press of the same design and configuration as the unit proposed for this project, with a minimum effective belt width of .7 meter. Test procedures shall assure meaningful results and shall be subject to the approval of the Owner. The Owner, on the basis of qualitative results of this testing, will select the equipment to be supplied.

1.04 MANUFACTURER'S WARRANTY

- A. The manufacturer shall warrant, in writing, that all equipment supplied by them shall be free from defects in material and workmanship, for a period of twelve (12) months from the date of startup, not to exceed eighteen (18) months from the date of delivery, unless noted otherwise within the specifications.

1.05 CONDITIONS OF SERVICE

- A. The sludge dewatering equipment shall be designed to adequately condition and dewater the sludge so that a dewatered sludge cake is produced that easily discharges from the dewatering unit without blinding and that may be handled by the pump or conveying equipment.
- B. Each unit shall be designed to operate in the environment for which it is intended, continuously or intermittently on demand, and shall perform the required dewatering operations without spillage of water or sludge beyond the nominal machine envelope.

1.06 PERFORMANCE REQUIREMENTS

- A. Each belt filter press shall be capable of meeting the following minimum performance criteria provided the above Conditions of Service are furnished:

Sludge throughput, lbs. d.w.s./hour	200-800
Hydraulic capacity, gpm.	0-50
Cake solids, percent d.w.s.	13-18%
Solids capture, percent	93-95%
Polymer consumption lbs./ton of active polymer in feed, d.w.s.	6-10

PART 2 – PRODUCTS

2.01 MATERIALS OF CONSTRUCTION

- A. All materials used in the construction of the sludge dewatering equipment shall be of the best quality and entirely suitable in every respect for the service required. All structural steel shall conform to the ASTM Standard Specification for Structural Steel, Designation A36/A36M. All iron castings shall conform to the ASTM Standard Specifications for Gray Iron Castings, Designation A48, and shall be of a class suitable for the purpose intended. All structural carbon steel plates and shapes shall have a minimum thickness of 1/4 inch and shall be hot dip galvanized in accordance with ASTM A-123

- B. The following materials and coatings shall be provided for the belt filter press and related components unless specified otherwise herein:

1. Main Frame Box frame of welded and bolted MC channels conforming to ASTM A36, then hot dip galvanized according to ASTM A123.
2. Flocculator Type 304 stainless steel and UHMW polyethylene.
3. Sieve Drum Carbon steel, hot dip galvanized according to ASTM A123.
4. Perforated Roller Carbon steel, hot dip galvanized according to ASTM A123.
5. Sludge Plows Polyethylene
6. Drive Rollers Carbon steel coated with 3/8" thick synthetic rubber, 60 durometer.
7. Tracking Rollers Carbon steel coated with 3/8" thick synthetic rubber, 60

durometer.

8. Other Rollers Carbon steel coated with 25 mil Rilsan II Nylon or approved equal.
9. Bearings Single race ball, self aligning, grease fittings, B-10 rating
10. exceeding 100,000 hours.
11. Bearing Seals Metal shielded, land riding, nitrite rubber contact seal.
12. Pneumatic 200 psi rating, anodized aluminum tube Cylinders with no external tie rods, Teflon seals, graphite bearing,
13. Belt Tracking Fully pneumatic analog.
14. Belt Tensioning Fully pneumatic.
15. Belt Wash Stations: Hand wheel operated internal brush type with stainless steel manifold, valve, nozzles, brush, aluminum handwheel and type 304 stainless steel enclosure with neoprene seals.
16. Belts and Screen Monofilament polyester weave selected for function and particular sludge. Seams are 316 stainless steel clipper type.
17. Filtrate Pans Type 304 stainless steel.
18. Sludge Chutes Type 304 stainless steel.
19. Cake Discharge Chute Type 304 stainless steel.
20. Water Plumbing PVC, schedule 80.
21. Pneumatic Plumbing Polyethylene tubing, 120 psi work, 625 psi burst.
22. Doctor Blades UHMW polyethylene
23. Junction Box NEMA 4X
24. Pneumatics Station NEMA 4X
25. Assembly Hardware Type 304 stainless steel

2.02 STRUCTURAL FRAME

- A. The structural main frame shall be a box frame of welded and bolted MC channels conforming to ASTM A36 Standard Specifications for Structural Steel, into a rigid structure, adequately braced to withstand intended loads without excessive vibration, deformation, or deflection. Maximum load on the frame, rollers and bearings shall be based on the summation of forces applied to the frame from roller mass forces; weight of the rollers; the sludge and belts and static belt tension of 50 lbs. per inch plus friction forces; roller, equipment, and sludge loads; the tension produced by the driving torque of the motor; and any loads induced by the belts or the torque of the drive. The frame shall have a minimum design safety factor greater than 7.1, and the pressure load main beams shall have a moment of inertia of at least 60 inches to the fourth power.
- B. The structure shall be designed for installation on an equipment manufacturer supplied skid foundation and secured with anchor bolts. The entire system shall be enclosed and protected by removable 14-gauge stainless steel safety shields. The construction of the belt press with the shields removed shall allow easy access and visual inspection of all internal components.
- C. Main frame coating is crucial to the protection of the press main frame. All frame members shall be prepared and coated according to ASTM A123; hot dip galvanized to a minimum 5 mil thickness. All frame members shall be drilled and machined, and all bolted connections shall be disassembled prior to galvanizing.

2.03 FLOCCULATOR

- A. The belt filter press shall be furnished with an upstream sludge-conditioning device consisting of an inline adjustable orifice venturi type mixer complete with polymer injection device. The mixer shall be designed to condition the sludge with polymer to result in a degree of flocculation that will produce the greatest amount of dewatering while maintaining the highest quality filtrate.
- B. Location of the flocculation device will vary with the application. Several locations may be specified with the unused locations plumbed with spool pieces.

2.04 GRAVITY DRAINAGE SECTION

- A. The gravity-dewatering zone shall be two stage consisting of one (1) rotating sieve drum and a section of the horizontal filter belt. The sieve drum shall be rotated by variable speed drive and shall be an integral part of the belt filter press. The drum shall be at least 29.5" diameter and 36" long with a minimum dewatering area of 23 sq.ft. Integral internal helical baffles shall gently tumble and transport the sludge through the rotating drum and prevent short-circuiting of the flow thereby

allowing all of the sludge to contact the total dewatering area. Designs that do not utilize a rotating drum for the gravity section, will not be acceptable.

- B. The drum shall be covered by a monofilament polyester weave-dewatering screen designed specifically for optimal gravity dewatering. The screen shall be easily replaceable without removing the dewatering drum from the belt filter press.
- C. The rotating sieve drum shall be continually washed by a self-cleaning internal brush type spray manifold with overlapping spray jets.
- D. Sludge from the sieve drum shall be distributed onto the horizontal belt by a baffled type 304 stainless steel chute. The sludge shall be contained on that belt by a type 304 stainless steel box with neoprene seals. An adjustable stainless steel sludge level bar shall provide the desired sludge thickness uniformly across the belt width. Halfway through the second stage gravity zone the sludge shall be completely inverted and shall continue towards the wedge zone.
- E. The gravity belt section of the second stage-dewatering zone shall be supported by rollers and a grid of high-density polyethylene wear bars. The effective dewatering area of the second stage gravity zone shall be a minimum of 2.1 sq.ft.

2.01 WEDGE ZONE

- A. The wedge zone shall be provided in order to gently apply and gradually increase the pressure on the thickened sludge. The wedge zone is formed by the convergence of both filter belts coming off of their respective tensioning rollers and gradually forming a cloth/cake sandwich prior to contacting the perforated roll in the pressure section. The pressure shall be gradually increased by a grid of UHMW supports beneath the bottom cloth. The effective dewatering area of the wedge zone shall be a minimum 5.66 sq.ft.

2.05 HIGH PRESSURE / SHEAR ZONE

- A. The high pressure/shear zone shall consist of a minimum of eight (8) rollers. The first shall be a perforated drum of 14" diameter with perforations of minimum 5/8" diameter and minimum 34% open area. The succeeding rollers shall be solid faced decreasing in diameter from 10-3/4" to 6-5/8" to 5-9/16" and arranged in both a vertical and horizontal configuration. The total effective high pressure dewatering area shall be a minimum 11.75 sq.ft. Manufacturers that do not supply at least 8 pressure rollers will be deemed not acceptable.

2.06 CAKE DISCHARGE ZONE

- A. Adjustable counterweighted doctor blades shall be mounted at the drive roller for removing sludge cake from both belts. The doctor blades shall be made from UHMW polyethylene. The blades shall be rigidly reinforced to provide even gentle pressure on the belts with a minimal amount of abrasiveness and shall be capable of providing passage clearance for the belt seam without injuring that seam. A type 304 stainless steel chute for directing the sludge to the next destination shall be provided.

2.07 ROLLERS

- A. All Drive rollers shall be designed for a maximum deflection of less than 0.05" at mid span under maximum loading conditions. Maximum loading shall be defined as the sum of the belt tension load at 50 pli; friction loads; equipment and sludge loads; any loads induced by the elasticity of the belts; and any loads induced by the torque of the drive.
- B. All rollers and perforated drum shall be of through-shaft design with matched deflection of shafts and end plates. Assembly of rollers, shafts, and end plates shall be of machined concentricity and by means of continuous weld.
- C. Drive rollers and tracking rollers shall be coated with a minimum 3/8" thick synthetic rubber of 60 durometer to provide the friction required for efficient belt drive and tracking. All other solid rollers shall be coated with Rilsan Nylon 11 to a thickness of 25 mil by the Electro Static, Fusion Bonded Rilsan Powder Dispersion Process.
- D. The perforated drum shall be hot dip galvanized to a minimum thickness of 5 mil and shall be totally free of projections that may shorten belt life.

2.08 ROLLER BEARINGS AND SEALS

- A. Ball bearings shall have a B-10 rating greater than 100,000 hours per AFBMA test procedure under typical loading conditions. All bearings shall be self aligning and grease able with all grease fittings located for easy servicing from the machine exterior. All bearings shall be pillow block type with metal shielded, nitrile rubber, land riding contact seals.

2.09 BELT TENSIONING SYSTEM

- A. Belt tensioning shall be maintained pneumatically and controlled from the press mounted pneumatic control center.

- B. Each filter belt shall be tensioned by a pair of noncorrosive pneumatic cylinders attached to a rigid tensioning assembly. The tensioning assembly shall be attached to each tensioning cylinder in such a way as to assure parallel movement of each tensioning roller.
- C. Each belt shall be tensioned individually, with capability of changes with the machine operating. Tensioning pressure shall be gauged at the pneumatic control center. Tensioning cylinders shall be power retractable for belt replacement and emergency detensioning.
- D. The tensioning arrangement shall have adequate allowances for normal belt stretch throughout the anticipated belt life.

2.10 BELT TRACKING

- A. Belt tracking shall be totally pneumatic and shall function as a continuous automatic belt guidance system. Each belt shall be tracked individually by a type 304 stainless steel paddle arm and analog system sensor which monitors one edge of the belt and pneumatically signals a noncorrosive pneumatic cylinder for corrective positioning when required. That corrective motion shall be smooth, minimal, and adjustable.
- B. Each belt tracking assembly shall be center pivoting complete with bearings to minimize dewatering belt stretch and wear. Manufacturers that only steer from one side of the belt and/or do not offer the center steer design, shall be deemed unacceptable.

2.11 PNEUMATIC CONTROL SYSTEM

- A. All belt press pneumatic system controls, tensioning and tracking, shall be frame mounted on the belt press in a NEMA 4X enclosure with the tension gauges mounted on the panel door. Tensioning adjustments, low air alarm switch, and tensioning valves for on/off control shall be mounted inside the enclosure. Tensioning on/off levers shall extend through the enclosure wall for easy access. The enclosed controls shall be preceded by a three (3) micron filter regulator with gauge and an oil coalescing filter. One (1) supply air connection only shall be required to the total pneumatic system. Lubrication of the pneumatic system shall not be required.
- B. Each belt press shall be furnished with a receiver mounted single stage air compressor. The unit shall be complete with 17 gallon ASME Code receiver rated for 200 psi, pressure gauge, automatic overload protector, intake air filter-muffler, pressure switch, safety valve, tank drain, outlet valve, and constant speed regulator. The motor shall be 1.5 HP, TEFC with 1.15 service factor.

2.12 BELT WASH STATIONS

- A. Each filter belt and sieve drum shall be equipped with a belt wash station for constant belt washing. Each station shall include a manifold with removable stainless steel nozzles, internal handwheel operated brush, handwheel operated flush valve, and stainless steel neoprene skirted enclosure for containing spray mist. Belt spray water and flush water shall be collected in stainless steel pans and plumbed to the base sump to prevent rewatering of the sludge process. Spray nozzles shall be suitable for use with non-potable water with a maximum solids concentration of 200 mg/l without clogging.
- B. A washwater booster pump shall be provided for increasing the water flow and pressure to the belt press. The pump shall be centrifugal type with replaceable wear rings. All plumbing connections shall be clearly labeled and numbered terminals shall be provided in the belt press junction box.

2.13 FILTER BELTS AND SIEVE DRUM SCREEN

- A. Filter belts shall be of polyester monofilament wovenware with minimum tensile strength of 890 pounds per lineal inch. Edges shall be chamfered and belt seams shall be type 316 stainless steel clipper type. Mesh shall be selected for optimal pressure dewatering of the pertinent sludge. Belts shall be self threading under power for replacement.
- B. Sieve drum screen shall be of polyester monofilament wovenware specifically designed for optimal gravity (no pressure) dewatering of the pertinent sludge.
- C. Replacement of filter belts and sieve drum screen shall be accomplished without any disassembly of any part of the belt filter press except the belt and screen joints.

2.14 DRIVES AND MOTORS

- A. Main belt drive shall be 1.5 HP derated to 1.0 HP, variable speed, shaft mounted on one drive roller shaft. Drive shall transfer to the second drive roller by means of a gear combination. The gears shall be totally enclosed by a solid, stainless steel enclosure. The sieve drum drive shall be ½ HP, variable speed and shaft mounted on the sieve drum shaft. All motors shall be severe duty TEFC of ample power for starting and operating under normal conditions without exceeding the nameplate horsepower and shall have a service factor of 1.15.

- B. Drives shall be mechanically variable speed traction disc type with constant speed AC motors with speed variable manually at the drive. Electrical control of the drives shall be in the belt press control panel.
- C. The drive shall be Variable Frequency Drive using AC motor and quadruple gear speed reducer. Speed control of the drive shall be in the belt press control panel. The inverter, start/stop and speed control of the drive shall be in the belt press control panel.

2.15 FACTORY WIRING

- A. All equipment and components shall be factory wired using non-metallic, flexible liquid-tight conduit and fittings wired to numbered terminal blocks in a frame mounted NEMA 4X junction box. All conduit shall be run and secured inside the channel frame wherever possible.

2.16 SAFETY FEATURES

- A. Each belt filter press shall be equipped with a lanyard type safety switch with cable encircling three sides of the press at an easily accessible height.
- B. The tensioning system shall have a limit switch that shall shut down the system in the event of total belt failure.
- C. The belt tracking system shall have a limit switch on each side of the press that shall shut down the system in the event of belt tracking failure.
- D. The pneumatic control center shall have a pressure switch that shall shut down the system in the event of low air pressure.
- E. Each gear drive shall have a solid stainless steel enclosure.

2.17 CONTROL PANEL

- A. System Controls:
 - 1. General Requirements: Each belt filter press shall be provided with a control panel that will contain the necessary control devices and equipment for controlling the dewatering process as described herein. The control panel shall meet the following general requirements:
 - a. The control panel shall accept 460 volts, 60 hertz, and 3-phase AC power input. A main disconnect circuit breaker and operator mechanism shall be

included. When the disconnect is in the open position, all power shall be removed from the control system.

- b. IEC rated motor starters shall be provided for the air compressor, belt wash water booster pump, cross conveyor, and the discharge conveyor.
 - c. Variable frequency drive (VFD) shall be provided for the belt drive and sludge feed pump.
 - d. Short circuit protection for each motor shall be accomplished utilizing fuses. Individual thermal overload protection shall be provided (except for the belt drive and sludge feed pump).
 - e. A control power transformer shall be included that will provide 120 volts, AC control power to the system.
 - f. An industrial programmable logic controller (PLC) located in the control panel shall perform all logic functions for the system.
 - g. A CONTROL POWER ON/OFF switch shall be located on the front of the control panel. When in the ON position, the CONTROL POWER ON pilot light will be illuminated and control power shall be distributed to the control system. When in the OFF position, the control system shall be held de energized.
 - h. An EMERGENCY STOP pushbutton shall be located on the control panel. It shall be a mushroom head style pushbutton that when depressed shall immediately de energize all moving equipment in the system.
 - i. An alarm horn shall be included with the control panel for audible alarm annunciation along with a horn silencing button in the front of the panel.
2. Control and Pilot Devices: As a minimum, the following control and pilot devices shall be located on the front of the control panel with nameplates as worded below in UPPERCASE LETTERS:
- a. Pushbuttons:
 - i. AUTO START
 - ii. AUTO STOP
 - iii. SYSTEM RESET
 - iv. ALARM SILENCE
 - v. AIR COMPRESSOR START
 - vi. AIR COMPRESSOR STOP
 - vii. WASHWATER PUMP START

- viii. WASHWATER PUMP STOP
- ix. BELT DRIVE START
- x. BELT DRIVE STOP
- xi. SLUDGE PUMP START
- xii. SLUDGE PUMP STOP
- xiii. POLYMER SYSTEM START
- xiv. POLYMER SYSTEM STOP
- xv. CROSS CONVEYOR START
- xvi. CROSS CONVEYOR STOP
- xvii. DISCHARGE CONVEYOR START
- xviii. DISCHARGE CONVEYOR STOP

b. Selector Switches:

- i. PRESS HAND/OFF/AUTO MODE
- ii. CONTROL POWER ON/OFF

c. Indicator Lights:

- i. PREWET CYCLE ON
- ii. POSTWASH CYCLE ON
- iii. AIR COMPRESSOR RUNNING
- iv. WASHWATER PUMP RUNNING
- v. BELT DRIVE RUNNING
- vi. SLUDGE PUMP RUNNING
- vii. POLYMER SYSTEM RUNNING
- viii. CROSS CONVEYOR RUNNING
- ix. DISCHARGE CONVEYOR RUNNING
- x. LOW AIR PRESSURE
- xi. BELT OVERTRAVEL
- xii. BELT BROKEN
- xiii. LOW POLYMER

d. Speed Potentiometers:

- i. SLUDGE PUMP SPEED
- ii. BELT DRIVE SPEED

3. Signal Input and Output Devices:

- a. Discrete Input Signals: The control panel shall receive the following discrete input signals from normally open dry contacts in external devices (contacts close when the equipment runs, or a fault occurs):
 - i. POLYMER SYSTEM RUNNING
 - ii. POLYMER SYSTEM FAIL
- b. Discrete Output Signals: The control panel shall provide the following discrete signals for transmission using normally open dry contacts (contacts close when the equipment is called to run, or a fault occurs):

- i. PRESS RUNNING
- ii. PRESS FAULT

4. Sequence of Operation:

a. Automatic Mode of Operation:

- i. The press may be operated in the automatic mode by placing the HAND/OFF/AUTO selector switch in the AUTO position. The operator will next press the AIR COMPRESSOR START pushbutton and allow the pressure to reach normal operating level.
- ii. After the air pressure has reached operating level, the operator will press the AUTO START pushbutton, this will energize the wash water pump and belt drive, illuminate the PREWET CYCLE ON pilot light and start the pre wet time delay. After the pre wet timer times out, the sludge pump, polymer system, cross conveyor and the discharge conveyor will be energized.
- iii. Pressing the AUTO STOP pushbutton will de-energize the sludge pump and polymer system, illuminate the WASHDOWN CYCLE ON pilot light and start a washdown time delay. After the washdown timer has timed out, the belt drive, wash water pump, cross conveyor and discharge conveyor will be de energized.

b. Manual Mode of Operation

- i. To operate the press in the manual mode, the operator will place the HAND/OFF/AUTO selector switch in the HAND position. The operator will next start the air compressor by pressing the AIR COMPRESSOR START pushbutton. After the air pressure has reached operating level, start the wash water pump by pressing the WASHWATER PUMP START pushbutton.
- ii. The operator will not proceed until the belts are allowed to be fully tensioned. No interlock shall be provided to prevent the operator from starting the belt drive in the manual mode. Pressing the BELT DRIVE START pushbutton will energize the belt drive. At this time, the operator will start the cross conveyor by pressing the CROSS CONVEYOR START pushbutton, the discharge conveyor by pressing the DISCHARGE CONVEYOR START pushbutton, the sludge pump by pressing the SLUDGE PUMP START pushbutton and the polymer pump by pressing the POLYMER SYSTEM START pushbutton.

- iii. The system will be stopped by pressing the respective STOP pushbutton in the reverse order stated above.

5. Faults:

- a. When any of the following fault conditions occur, in automatic or manual mode, the appropriate fault indicator will be illuminated, the alarm horn will sound, and the belt filter press and associated equipment will be de-energized:
 - i. LOW AIR PRESSURE (amber light)
 - ii. BELT OVERTRAVEL (amber light)
 - iii. BELT BROKEN (amber light)
 - iv. LOW POLYMER (amber light)
 - v. BOOSTER PUMP FAULT (flashing run light)
 - vi. BELT DRIVE FAULT (flashing run light)
 - vii. SLUDGE PUMP FAULT (flashing run light)
 - viii. CROSS CONVEYOR FAULT (flashing run light)
 - ix. DISCHARGE CONVEYOR FAULT (flashing run light)

6. Components:

- a. Enclosures: Control panel enclosures shall be free-standing, fabricated of type 304 stainless steel and shall be suitable for NEMA 4X service. Enclosures shall be manufactured by Saginaw Manufacturing.
- b. Wiring: All power and control wiring shall be 600 volt, type SIS insulation stranded copper and shall be sized for the required load, 14 AWG minimum.
- c. Circuit Breakers: Circuit breakers for the main disconnect shall be thermal magnetic molded case units. Circuit breakers shall be Square D, Class 650, Type FAL.
- d. Motor Starters: Motor starters shall be full voltage, non-reversing, IEC style across the line units. Coils shall be 120 volts ac. Siemens type Sirius 3RT10.
- e. Selector Switches: All selector switches shall be heavy duty, corrosion resistant units rated for NEMA 4X service. Contact blocks shall be rated for 10-ampere continuous service. Selector switches shall be Idec Series TWTD or approved equal.
- f. Pushbuttons: All pushbuttons shall be heavy duty, corrosion resistant units rated for NEMA 4X service. Contact blocks shall be rated for 10-ampere

continuous service. Pushbuttons shall be Idec Series TWTD or approved equal.

- g. Pilot Lights: Pilot lights shall be heavy duty, corrosion resistant units rated for NEMA 4X service. Units shall be 120 VAC full voltage incandescent type. Pilot lights shall be Idec Series TWTD or approved equal.
- h. Terminal Blocks: Terminal blocks shall be high density, solderless box lug style, with 600-volt rating. Terminal blocks shall be Allen Bradley type 1492 or approved equal.
- i. Control Relays: Control relays shall be general purpose type with a 10 amp contact rating, miniature square base and internal on status pilot light. Relays shall be Allen Bradley Type 700-HF Series or approved equal.
- j. Programmable Logic Controller (PLC): The PLC shall be a modular type with discrete and analog capabilities. The CPU shall have 6K minimum RAM for user instructions. The unit shall have battery backed RAM and EEPROM backup. The PLC shall be an Allen Bradley Micrologix Type or approved equal.
- k. Variable Frequency Drive (VFD): The VFD shall be UL listed and shall be manufactured by Omron.

2.18 UTILITY REQUIREMENTS

Electrical	-	460 volt, 3 phase, 60 Hz is standard.
Power	-	Belt Drive - 1.0 HP (1.5 HP derated)
	-	Sieve Drum Drive - 0.5 HP
	-	Wash Water Booster Pump - 7.5 HP
	-	Air Compressor - 1.5 HP
Belt Wash	-	30 gpm @ 85 psi (minimum)
Pneumatics	-	3 cfm at 80-psi min., 250 psi max.

2.19 FLOW METER

- A. The manufacturer shall include a 3" Stainless steel magnetic style flow meter. The output will be wired to the control panel by an installing contractor. The belt press control panel will read out flow in gpm and contain a totalizer.

2.20 FEED PUMP

- A. The manufacturer shall include a positive displacement rotary lobe feed pump capable of delivering up to 50 gpm of sludge feed flow. The pump shall be by Boerger and no alternative manufacturers shall be permitted. The pump HP will be determined after the final pump placement and site layout is determined.

PART 3 – EXECUTION

3.01 FIELD SERVICE

- A. The manufacturer shall include the services of a factory trained field engineer for the purposes of installation inspection, equipment start-up, polymer selection, performance testing and training of plant personnel regarding proper operation and maintenance of the equipment.

3.02 QUALITY CONTROL TESTING

- A. Prior to shipment, the belt filter press and control panel shall be factory tested at the place of assembly. Factory test each pre-assembled, pre-wired, lubricated, and aligned BFP and its associated control panel to be supplied to the job site. Prior to shipment, verify through a one-hour continuous operating test that the BFP and associated equipment operate smoothly, noiselessly, vibration free, and without overheating of any bearing or motor. Particular attention must be given to ensure that the BFP is properly aligned for maintaining the centerline-to-centerline tracking of the belts relative to the machine. Submit a certified test report to the Engineer for approval, prior to shipping that demonstrates compliance with all applicable industry standards, manufacturing quality control, and the functional intent of these Specifications.
- B. Alternate manufacturers shall, at no cost to the Owner, conduct a field performance test, at the plant site, within 30 days of the bid opening to demonstrate compliance with the specified performance criteria. This test must be conducted with a belt filter press of the same design and configuration as the unit proposed for this project, with a minimum effective belt width of 0.7 meters. Test procedures shall assure meaningful results and shall be subject to the approval of the Owner. The Owner, on the basis of qualitative results of this testing, will select the equipment to be supplied.
- C. Testing will be conducted as follows:
 - 1. The objective of the test will be to measure throughput, dewatered sludge solids concentration, polymer usage and filtrate solids.

2. Suitable means, acceptable to the Engineer, shall be provided to measure sludge feed rate, filtrate flow rate, washwater feed rate and polymer feed rate.
 3. Testing shall be conducted for at least one 6-hour period. During the test period the following data shall be collected at 30-minute intervals by the Construction Manager:
 - a. Measure belt speed
 - b. Record polymer type, concentration, and feed rate
 - c. Collect polymer sample
 - d. Record sludge feed rate
 - e. Record filtrate feed rate
 - f. Record washwater feed rate
 - g. Collect 200-ml filtrate sample for lab analysis
 - h. Collect 200 ml dewatered sludge sample for lab analysis
 - i. Collect 200 ml dewatered sludge sample for lab analysis
- D. The alternate bid manufacturer and Contractor shall absorb all costs associated with changes in layout, piping, controls, electrical wiring, etc. (including engineering costs) if the alternate bid manufacturer is accepted.

3.03 START-UP AND OPERATOR TRAINING

- A. Services of the manufacturer's factory trained representative, who is specifically knowledgeable in the type of equipment specified herein, shall be provided during the equipment installation period. Upon complete installation of equipment by installing contractor, including placement of equipment, setting, and leveling the equipment, piping, and electrical connections to all the equipment specified herein, the manufacturer's service representative will approve the installation and begin start up and training.
- B. Upon approval of the installation, the services of the manufacturer's factory trained representative shall be provided at the project site for equipment start-up and calibration. During the start-up and calibration phase the manufacturer's representative shall inspect all system components for proper connection and alignment and assist the installation contractor in placing the equipment in a proper operating condition.
- C. Upon satisfactory completion of the start-up and calibration, a representative of the manufacturer shall be provided to instruct Owner's personnel in the proper operation and maintenance of the equipment. The manufacturer's representative who will be providing the instruction shall have prior operation, maintenance and instructing experience acceptable to the Engineer.

D. The manufacturer's representative shall complete all of the above sessions in **one trip** to the jobsite. The equipment manufacturer will request in writing that all installation prior to arriving at the jobsite be completed by the contractor. If the equipment manufacturer arrives at the jobsite and equipment installation is not complete, the equipment manufacturer shall bill the contractor for the installation time, which is not covered under this contract.

<u>Purpose</u>	<u>No. of Days</u>
Installation Supervision	As required for complete installation
Start-up and Calibration	1 per press
Initial operation, Performance Test and Maintenance Instruction	3
Follow-up Instruction and Optimization	2

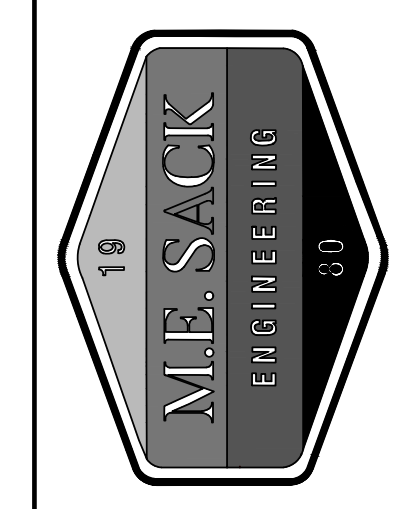
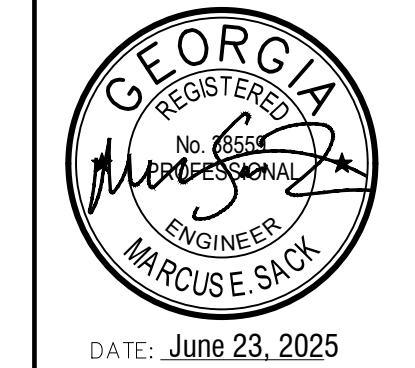
E. Additional services, other than those provided for by warranties or as specified herein, may be charged to the Owner/Contractor at the manufacturer's standard service rates or as agreed to at the time of the service request.

END OF SECTION

REVISIONS:	
1	SBR TANK SIZE
2	GSWCC ESP&C
3	ADDENDUM 1
4	ADDENDUM 2
5	ADDENDUM 4

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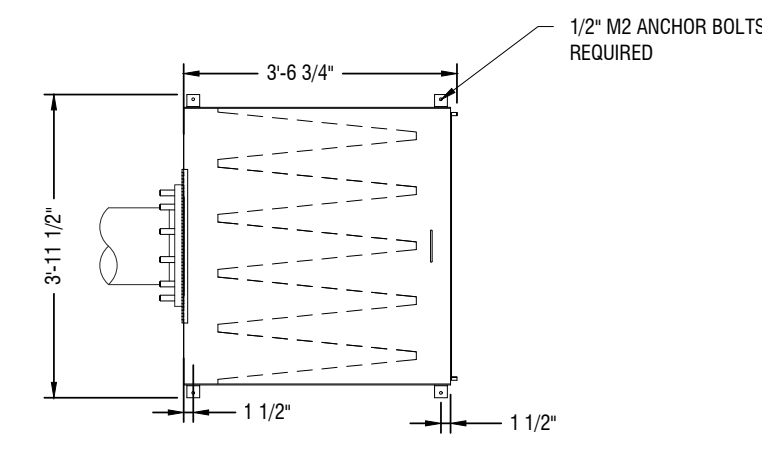
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WASTEWATER TREATMENT PLANT EXPANSION

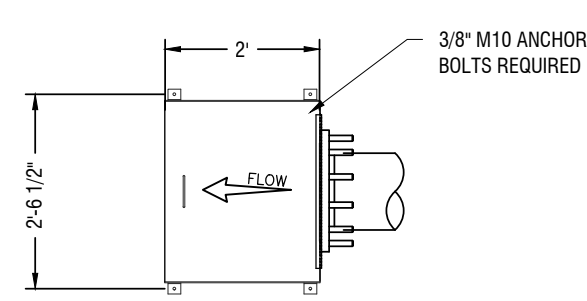
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M16

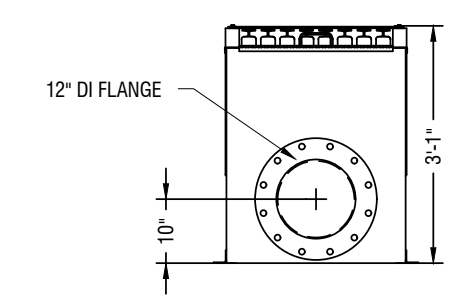
FILE NO: 2020-48
PLOT DATE: June 23, 2025



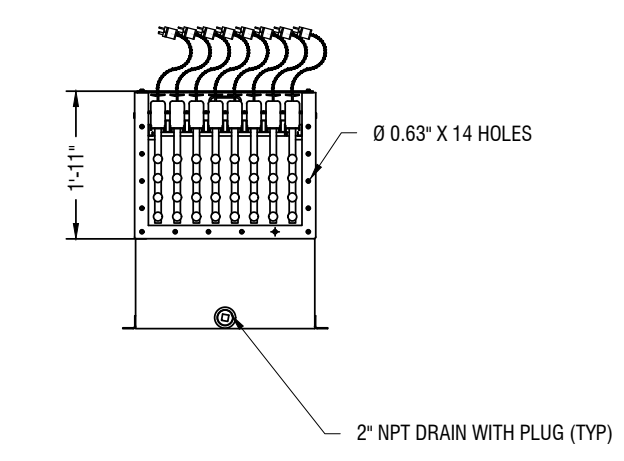
**DOWNSTREAM WEIR BOX
D3600K**
SCALE: 1"=30"



TRANSITION BOX
SCALE: 1"=30"



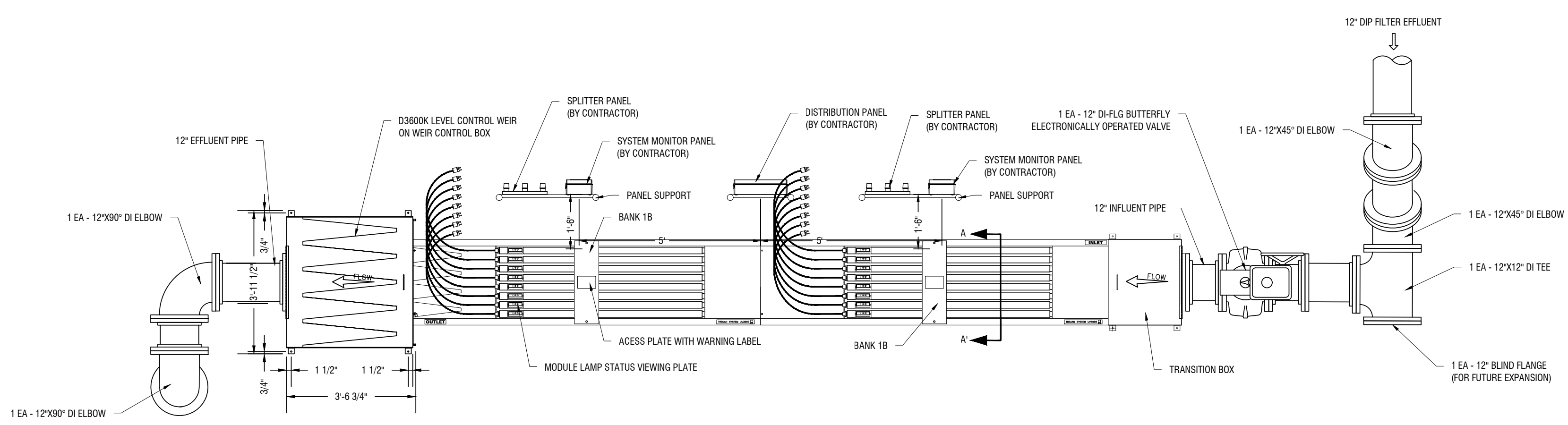
END VIEW
SCALE: 1"=30"



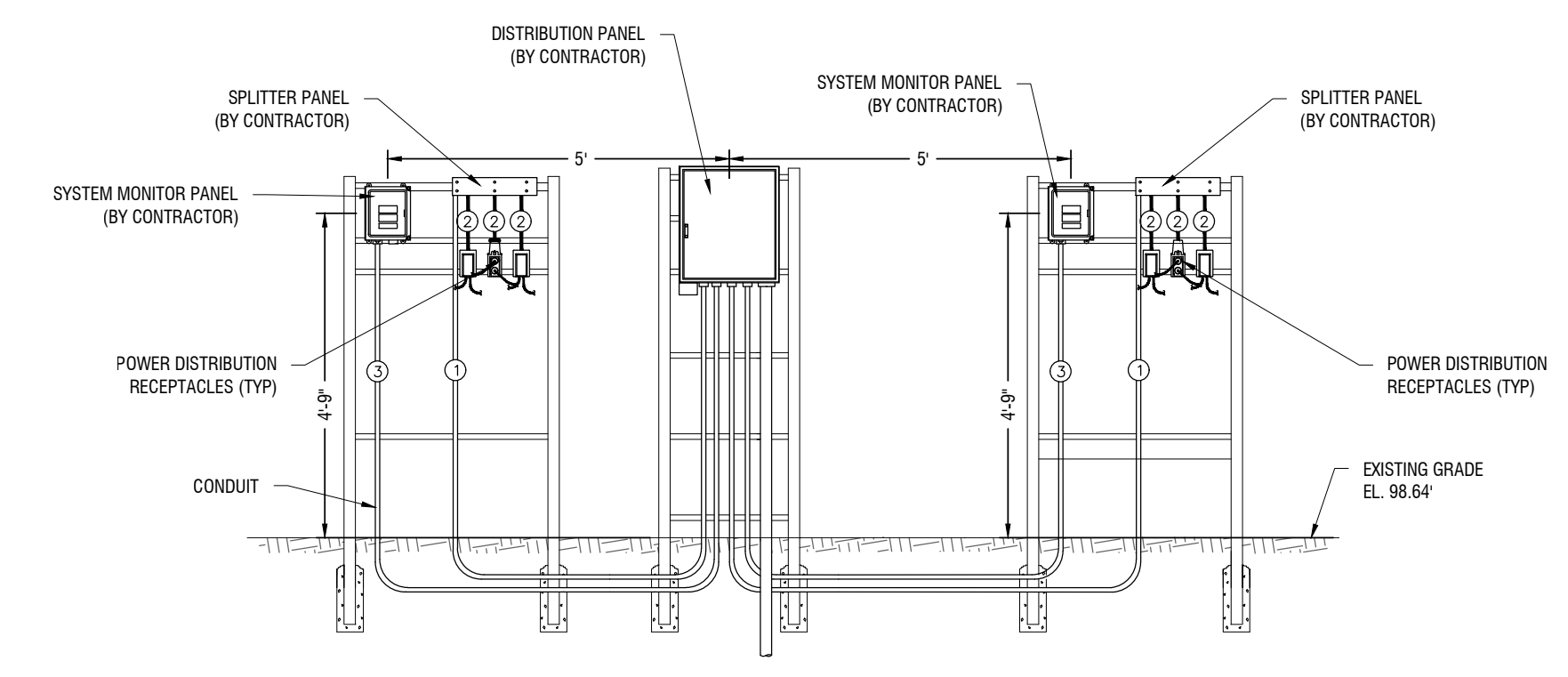
A-A' SECTION VIEW
SCALE: 1"=30"

EQUIPMENT INTERCONNECTIONS

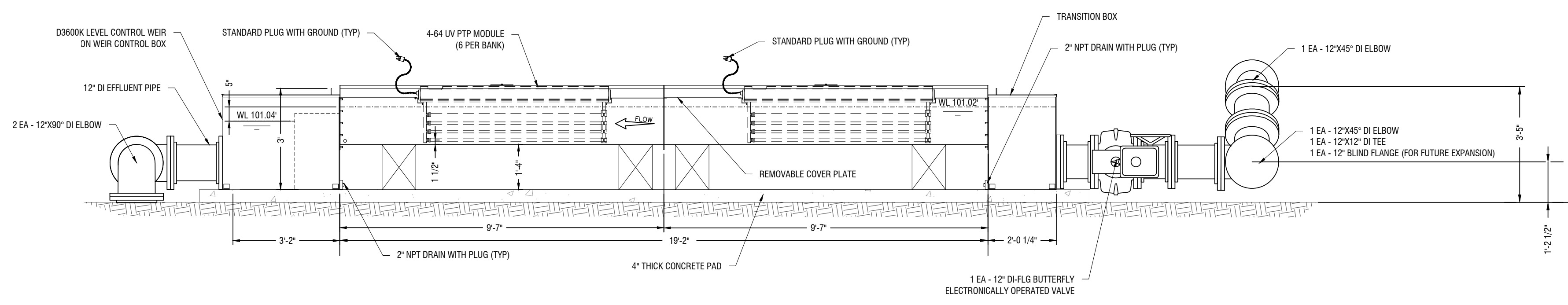
No.	DESCRIPTION	FROM	TO
1	SPLITTER PANEL POWER SUPPLY 120V, 1 PHASE, 2 WIRE, ACTUAL DRAW 25.4 AMPS / SPLITTER PANEL	DISTRIBUTION PANEL (BY CONTRACTOR)	SPLITTER PANEL (BY CONTRACTOR)
2	POWER DISTRIBUTION RECEPTACLE POWER SUPPLY 120V, 1 PHASE, 2 WIRE ACTUAL DRAW 6.3 AMPS / POR	SPLITTER PANEL (BY CONTRACTOR)	POWER DISTRIBUTION RECEPTACLE
3	SYSTEM MONITOR POWER SUPPLY 120 V, 1 PHASE, 2 WIRE, 5 AMPS	DISTRIBUTION PANEL (BY CONTRACTOR)	SYSTEM MONITOR



UV PLAN VIEW
SCALE: 1"=30"



**CONTROL PANEL
PROFILE VIEW**
NTS



PROFILE VIEW
SCALE: 1"=30"

- NOTES:
- ANCHOR BOLTS ARE NOT SUPPLIED BY TROJAN TECHNOLOGIES. SYSTEM CONDUIT, WIRING, DISTRIBUTION PANELS, & INTERCONNECTIONS.
 - BOLTS, WASHERS AND NUTS FOR CONNECTIONS OF CHANNELS AND TRANSITION BOXES TO CHANNELS ARE PROVIDED BY TROJAN OR APPROVED SIMILAR.
 - SYSTEM CONDUIT, WIRING, DISTRIBUTION PANELS & INTERCONNECTIONS BY CONTRACTORS.
 - DO NOT SLOPE CHANNEL FLOOR.
 - ELECTRICAL REQUIREMENTS SHOWN ARE TO SUPPLY TROJAN UV EQUIPMENT ONLY- ELECTRICAL INRUSH FACTOR TO BE ADDED AS PER LOCAL CODE.
 - CONTRACTOR TO REVIEW ALL TROJAN TECHNOLOGIES INSTALLATION INSTRUCTIONS PRIOR TO EQUIPMENT INSTALLATION.
 - ACCESS IS REQUIRED FOR MODULE REMOVAL.
 - EFFLUENT LEVELS SHOWN REFLECT HYDRAULICS ASSOCIATE WITH THE TROJAN EQUIPMENT ONLY. EFFLUENT LEVELS MAY CHANGE DUE TO CHANNEL DEBRIS.
 - POWER AND LOW VOLTAGE CONDUITS MUST ENTER LABELED LOCATION ON LEFT SIDE OF POR.