

**BID SCHEDULE
2012 INFLUENT BYPASS
AT WASTEWATER TREATMENT PLANT
OPTIONAL ADDENDUM # 3**

<u>Item No.</u>	<u>Description</u>	<u>Amount</u>
OPTIONAL LUMP SUM BID ITEM #1		
	2012 Influent Bypass as shown and specified.	\$ _____
	Addition (+) or Deduction (-)	\$ _____
	TOTAL BASE LUMP SUM BID	\$ _____
OPTIONAL BID ITEM # 1		
1.	Site Clearing and Grubbing. The bid shall include: clearing and grubbing of all objectionable materials and obstructions above and below grade including piping, brush, grass, roots and removal and disposal of these materials from within the construction area as specified and shown on drawings.	\$ _____
2.	Demolition and disposal of existing block building (23x16x8'h), and total of 128 ft (33', 34', 33', 28') concrete walls (2 ft high, 6" thick) of the existing drying beds. The bid shall include work required or necessary for a completed demolition of the existing structures.	\$ _____
3.	Removal and Reinstallation of 20 l.f. Concrete V-Ditch, 3' W x 8" D. Bid shall include demolition, excavation, foundation work, concrete other work required or necessary for a complete drainage system.	\$ _____
4.	Removal and relocation of & 50' of existing chain link fence 6 ft. The bid shall include: removal, installation and other accessories or work required or necessary for a completed and operable structure as specified and shown on drawings.	\$ _____
5.	Construction of one Precast Vault for check & plug valves (bypass force main). The bid shall include: excavation, backfill, foundation work, concrete, vault, access cover, hardware, reinforcing steel, painting and all other items and work required to complete all work as specified and shown on drawings.	\$ _____

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6. Furnish and Installation of 8" dia. Check & Plug Valves, (bypass force main). The bid shall include check valve, plug valve, restrained couplings, sample connection, pressure gage, installation, testing, and other accessories or work required or necessary for a completed and operable instrumentation as specified and shown on a drawings. \$ _____

7. Modification of the existing treatment plant SCADA system to incorporate all new bypass (SolarBee and floatable pumps) equipment. The bid shall include: programing of all new head headworks equipment into SCADA so plant operators can control and/or monitor equipment from the plant control room SCADA computer. **All controls shall have the same control as local control or more.** (All analog signals shall be trended and all I/O shall be stored in the SCADA data base for future data retrieval and report generation. All new programming shall match or be similar to existing SCADA system programing). The SCADA programmer shall be approved by the City prior to bid. \$ _____

8. Construction of Pump and SolarBee's anchor posts. The bid shall include: excavation, backfill, concrete, reinforcing steel, all piping, and other accessories or work required or necessary for a completed structure shown on drawing **(M-5)**. \$ _____

9. Construction of the SolarBee's concrete pad 4'x4'x6". The bid shall include: excavation, backfill, concrete, reinforcing steel, electrical conduits, future conduit stub-out, hand hole/pull boxes, painting, hardware, and other accessories or work required or necessary for a completed and operable structure and pipelines as specified and shown on drawings. \$ _____

10. Furnish and Installation of Circulation Equipment - SolarBee, establishing communication with the Cooper Creek Lift Station PLC using Modbus communication for SCADA communication. The bid shall include: SolarBee, installation, electrical and controls, control panel and PLC per manufacturer, testing, hardware and assembly fastener, establishing communication with the Cooper Creek Lift Station PLC and other accessories or work required or necessary for a complete and operable unit as specified and shown on drawings. \$ _____

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11. Furnish and Installation of floatable submersible pump
The bid shall include: pump with Victaulic outlet, float, installation, piping, fittings, level switch, electrical and controls, testing, painting, hardware and other accessories or work required or necessary for a complete and operable unit as specified and shown on drawings. \$ _____

12. Furnish and Installation of three 48 inch diameter manholes. Bid shall include: excavation, backfill, manholes, manholes covers, plastic liner, coating, testing and other accessories or work required or necessary for a completed and operable unit as specified and shown on drawings. \$ _____

13. Furnish and installation of 6 inch dia. 80 l.f. HDPE Class 200 or better pressure bypass force main. Bid shall include: excavation, backfill, all piping, testing and other accessories or work required or necessary for a completed and operable pipelines as specified and shown on drawings. \$ _____

14. Installation of 8 inch dia. 860 l.f. PVC, (pipe will be provided by te City). Bid shall include: excavation, backfill, all piping, testing and other accessories or work required or necessary for a completed and operable pipelines as specified and shown on drawings. \$ _____

15. Furnish and installation of 8 inch dia. 40 l.f. DI bypass force main. Bid shall include: excavation, backfill, all piping, testing and other accessories or work required or necessary for a completed and operable pipelines as specified and shown on drawings. \$ _____

16. Furnish and installation of 18 inch dia. 874 l.f. PVC, class 200 or better gravity sewer. Bid shall include: excavation, backfill, all piping, testing and other accessories or work required or necessary for a completed and operable pipelines as specified and shown on drawings. \$ _____

17. Furnish and installation of 18 inch dia. 20 l.f. DI, Bid shall include: excavation, backfill, all piping, testing and other accessories or work required or necessary for a completed and operable pipelines as specified and shown on drawings. \$ _____

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- 18. Furnish and installation of 24 inch dia., 12.50 l.f., PVC, class 200 or better gravity sewer. Bid shall include: excavation, backfill, all piping, stub-out, testing and other accessories or work required or necessary for a completed and operable pipelines as specified and shown on drawings. \$ _____

- 19. Furnish and Installation of 1.5" dia, 109 l.f. of Plant Water pipes Bid to include: excavation, backfill, all piping, fittings, valves, testing, hose rack, hose valves and other accessories or work required or necessary for a completed and operable system as specified and shown on drawings. \$ _____

- 20. Construction of 18 inch and 12 inch diameter pipe penetration through existing HDPE liner as shown on drawing M-5. Bid shall include excavation, backfill, foundation work, concrete, piping and all other items and work required to complete all work as specified and shown on drawings. \$ _____

- 21. Relocation of 40 ft, 14 feet deep, 18" diameter existing storm drain. Bid to include: excavation, backfill, piping, fittings, testing, and other work required or necessary for a completed storm drain. \$ _____

- 22. All piping, fittings, and all other accessories not included elsewhere as specified and shown on drawings. \$ _____

- 23. Furnish and Installation of 8 inch diameter magnetic flow meter with controls incorporated into the floatable pump system at the Cooper Creek Lift Station. The bid shall include: 8 inch magnetic flow meter, controls, electrical, installation, testing, all conduit runs from sensors to controllers, and other accessories or work required or necessary for a completed and operable instrumentation as specified and shown on a drawings. \$ _____

- 24. Installation of all equipment, all electrical and control components, conduit runs, and electrical trenching not included elsewhere as specified and shown on drawings. \$ _____

- 25. Removal and disposal of 9,223 sq ft of existing asphalt. \$ _____

- 26. Construct new 3" asphalt with 6" of aggregate base & 12" compacted soil 2,240 sq.ft. (249.0 sq yard). \$ _____

- 27. Earth Work (Rough Grading, Excavation, Backfilling & Compaction as specified in soil report) as shown on drawing C-7. \$ _____

- 28. Site Final Grading as specified and shown on drawings. \$ _____

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29.	All other work not included elsewhere as specified and shown on drawings.	\$ _____
30.	TOTAL BID (Items 1 to 29)	\$ _____
31	Addition (+) or Deduction (-)	\$ _____
	TOTAL BID (Items 30 to 31)	\$ _____

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The following cost items are for additive or deductive items in the Bid Schedule, if required, constructed according to the requirements of the Plans and Specifications. It is understood that the unit prices herein below will be paid for or deducted from the actual quantity required to complete the work, and the contract price increased or decreased accordingly.

LIST OF NAMED EQUIPMENT/MATERIAL SUPPLIERS

The Bidder shall indicate below which Supplier the Bidder intends to use to furnish under the Bid, each item of equipment or material listed on this form by writing in one of the named suppliers specified in the Technical Specifications for that equipment or material (proposed substitutes may be listed on the Proposed Substitute Equipment/Material Supplier List form but will only be considered after award of the Contract). If no supplier is named in the Technical Specifications, the Bidder may list any supplier whose product meets all of the requirements and technical criteria specified. The listing of more than one supplier for each equipment/material to be furnished with the words "and/or" will not be permitted. Failure to comply with this requirement will render the Bid non-responsive and may cause its rejection.

<u>Item No.</u>	<u>Item Description</u>	<u>Supplier (list only one)</u>	<u>Lump Sum Price in Base Bid Constructed Complete</u>
1	Circulation Equipment - SolarBee with all controls & PLC control panel	_____	\$ _____
2	Floatable Submersible Pump	_____	\$ _____
3	One 8" Plug Valve	_____	\$ _____
4	One 8" Check Valve	_____	\$ _____
5	One 8" Magnetic Flow Meter	_____	\$ _____
6	One Pre-cast Vault for CV & PV	_____	\$ _____
7	Manhole	_____	\$ _____
8	Standard Manhole Covers & Frames	_____	\$ _____
9	Bypass Pump Control Panel (E-6)	_____	\$ _____
10	L300P VFD with Line Reactors	_____	\$ _____
11	Quick Panel (1C75UCF06CDT)	_____	\$ _____
12	All Thermal Circuit Breakers	_____	\$ _____
13	Communication Card (1C693CMM321)	_____	\$ _____

**SECTION 06600
SMOOTH HDPE LINER
OPTIONAL ADDENDUM #3**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section describes the installation & repair of impervious liners to completely seal Storage Basin as shown on the drawings.
- B. Work includes subgrade preparation and the installation of geotextile fabric and high density polyethylene (HDPE) liners. The work also requires a concrete revetment mattress to be furnished and installed if and where shown on the plans.
- C. The work includes all accessories and appurtenances necessary to provide a complete installation for the liners defined above.

1.02 RELATED SECTIONS

- A. Section 02200 - Earthwork
- B. Section 03300 - Cast-in-Place Concrete
- C. Section 11370 - Aeration Mixing System
- D. Section 15030 - Piping and Accessories

1.03 SUBMITTALS

- A. Conform with General Provisions, Section 01040, Item 1.12.
- B. Manufacturer's data shall include manufacturer's specifications, shop drawings, and installation instructions. Shop drawings shall describe:
 - 1. Seal design per Subsection 2.01.A-5 herein;
 - 2. A complete plan layout to scale for the patterns of placing/jointing liner sheets, including identification marks; and
 - 3. Accessory and appurtenance detail drawings.
- C. Laboratory Test Results

Submit test data from an independent laboratory addressing chemical attack

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resistance, strengths of different welds, and material strength for all liner materials provided and identify sample points. Provide batch mix design by a laboratory for sand/cement mortar mix used for concrete reinforcement.

D. Samples

Submit 8 inch by 8 inch samples of proposed materials.

E. Field test results for tests described herein.

F. Warranty shall be issued by the Contractor and include his manufacturer and subcontractor. Contractor shall provide a written 5 year warranty for installation and workmanship and a written 20 year warranty for materials and weathering resistance at the HDPE liner. Integrity of field seams shall be covered by the above warranty conditions. Warranty shall apply to normal use and service for the applications specified and for the weather conditions in the area.

1.04 QUALITY ASSURANCE

A. Materials shall have a successful life under similar environment, including wastewater, solar, and weather for a period of ten years in a liner installation and design similar to the Drawings.

B. Installation

Furnish references of manufacturer's and supplier's experience.

C. Linings shall be supplied by:

1. GSE Lining Technology, Inc.(1-800-435-2008)
2. Watersaver Company, Inc.

Substitutions shall conform with Section 11010.

D. Installer

Linings shall be installed by supplier or licensed subcontractor with at least 5,000,000 square feet of installation experience. A qualification statement shall be provided with submittals which will describe the level of experience and reference projects, owner's name, contact people, and phone numbers.

PART 2 - PRODUCTS

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2.01 MATERIALS

A. High Density Polyethylene (HDPE)

1. Provide a new 60-mil HDPE liner free of defects.
2. Chemical Resistance: Liner must be able to withstand domestic wastewater with a pH ranging from 2 to 12.
3. Temperature Resistance: Liner should be able to maintain its physical and chemical properties through a temperature range of 20° to 130°F.
4. Liner Properties: The liner shall meet or exceed the minimum standards set by the Geosynthetic Research Institute, Test Method GRI GM 13 for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes.
5. Seals
 - a. Provide tight seals where liner sheets terminate at concrete structures and where pipes penetrate the liner. Seal systems shall be capable of withstanding all forces due to expansion, contraction, and filling of the pond without damage to the lining system. Submit shop drawings showing proposed seal system.
 - b. Proposed seal systems shall utilize materials equivalent to the following. Minor deviations will be considered if recommended by the basin lining system supplier.
 - 1) Neoprene Adhesive: Provide between concrete and sponge.
 - 2) Neoprene Sponge: 1/4 inch by 2 ½ inch, closed cell, conforming to Standard SC 43-M.
 - 3) Batten Bar: 1/4 inch by 2 inch, Type 316 stainless steel.
 - 4) Straps: Stainless Steel.
 - 5) Tape: Butyl Mastic Tape, type 1779. Install above and below batten bars.
 - 6) Expansion Anchors, Nuts, and Washers: Type 316 stainless steel.

B. Geotextile

1. Provide new 8 ounce geotextile per square yard, free of defects.
2. Chemical Resistance

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Geotextile shall be able to withstand pH ranging from 2 to 12 without losing its chemical and physical characteristics.

3. Temperature Resistance: 20° to 130°F.

4. Textile Properties

Geotextile shall meet or exceed following values:

Weight (oz/sq yd)	8
Normal Water flow	
Under 6 inch head	32 gpm/ft ²
Grab Strength	200 lbs
Grab Elongation	50 percent
Trapezoid Tear	70 pounds

C. Concrete Revetment Mattress

1. Provide new 4 inch thick grouted or pumped concrete into a synthetic pillow fabric to form a permanent revetment mattress.

2. Chemical Resistance

Revetment shall be able to withstand domestic wastewater and pH ranging from 2 to 12.

3. Temperature Resistance

Revetment shall be able to maintain its physical and chemical properties through a temperature range of 20° to 130°F.

4. Properties

Nylon and polyester fibers shall be woven to form a fabriform style fabric with 8 inch centered pillow (envelope) strips the length of the fabric. A highly fluid sand/cement mortar shall be pumped into this fabric (envelope) pillow during final stage of line completion.

5. Sand/cement mortar shall be based upon a trial batch mix design prepared by testing laboratory with a minimum 28 day compressive strength of 6,000 psi. Field test cones shall be taken per Section 03300. Sample cylinder will be fabric material shaped to conform to standard test cylinder.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install all liner sheets and lining system accessories in strict accordance with the manufacturer's and supplier's instructions.

3.02 SURFACE PREPARATION

- A. The subgrade soils shall be over excavated to one foot below finished surface and recompacted to 95 percent relative compaction. Subgrades and levees shall be prepared by rolling with a steel-wheeled roller. Subgrade shall be free of sharp rocks or objects, large stones, and vegetal material. Grading shall be within five percent of the lines and grades shown on the Drawings. The supplier shall certify to the Engineer, in writing, that surface has been adequately prepared before installing lining.

3.03 CONCRETE

- A. Concrete splash pads shall be constructed as shown on the Drawings and as specified in Section 03300.

3.04 PIPING

- A. Pipe installation shall strictly conform to all manufacturer's recommendations and be installed as shown on the Drawings and as specified in Section 15030. Backfill compaction must be 95 percent.

3.05 GEOTEXTILE INSTALLATION

- A. General

All work shall be performed by a favorably reviewed lining system installer in accordance with Part 1 above. Strictly follow all manufacturer's instructions and recommendations. Perform all work in accordance with favorably reviewed shop drawings and as shown on the Drawings. Take care to prevent wind damage during installation. Field weld lining in the cool part of the day and night so that lining will not expand or contract excessively during subsequent high and low temperature periods, and so that field seaming is accomplished while liner sheets are lying flat. Conform to supplier's recommendations regarding proper temperature, sunlight, and weather conditions for installation. Continuously monitor ambient temperature at the actual work locations. Field seams on levee slopes shall run vertically up the slope.

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B. Joints

1. General

Provide fusion, extrusion, or fusion/extrusion equipment commonly used for welding liners, operated by qualified and trained personnel.

2. Preparation

Take care in preparation of all areas to be welded. Overlap liner sheets prior to welding by the distance required by the supplier's and installer's favorably reviewed instructions. Clean and prepare areas to be welded according to the favorably reviewed instructions.

3. Welding Equipment

Operate favorably reviewed equipment capable of continuously monitoring and controlling temperature in the welding contact zone to ensure uniformly satisfactory welds under varying environmental conditions.

3.06 FIELD TESTING AND INSPECTION

A. Visual Inspection

Visually inspect all field welds. Welds shall be smooth and shall have a neat, even appearance. Allow no "fish mouth" within the seamed area. If a fish mouth occurs, clearly mark and repair as described in Paragraph 3.06 E. below.

B. Vacuum Testing

Perform field testing for all of the field seams using a favorably reviewed vacuum box seam tester and a solution of water and liquid soap. The testing shall be performed by a qualified technician. Perform all vacuum testing in the presence of the City's representative. No soap bubbles shall be generated at a minimum vacuum of 3 pounds per square inch (psi). Clearly mark all unsatisfactory areas, and repair in accordance with Paragraph 3.06 E. Before beginning each day's seaming, each welding machine operator shall produce a 3 foot long sample weld under identical working conditions. Do not begin actual field seaming until each sample weld has passed vacuum box testing and the weld strength tests described in Subparagraph 3.06 D.2.

C. Air Pressure Testing

Perform air pressure testing on all double seams with enclosed air spaces using a

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favorably reviewed air pump with air gauge. The testing shall be performed by a qualified technician. Pressure shall be maintained at 25 pounds per square inch (psi) for 5 minutes. Clearly mark all unsatisfactory areas, and repair in accordance with Paragraph 3.06 E.

D. Weld Strength Testing

1. Shop Drawings

In accordance with Paragraph 3.06 C above, submit test data on welded seams identical to those proposed for work on this project. Submit samples to a favorably reviewed independent testing laboratory. The shear strength of welded joints shall be at least equal to that of unseamed liner sheets. Test for shear strength in accordance with applicable ASTM procedures. Also perform a peel test, whereby weld strength is tested by peeling back one overlapped edge. Certify that by visual observation, the weld does not separate prior to damage to the liner sheet.

2. Field Testing

Take samples of field seaming for shear and peel strength testing as described herein. Perform field testing of weld strength using only favorably reviewed field tensometer equipment operated by qualified factory-trained technicians. Test results in both peel and shear shall be at least equal to those obtained from unseamed liner sheets. Perform field tensometer shear and peel testing before beginning each day's seaming on each 3 foot long sample weld produced in accordance with Paragraph 3.06 B. Do not begin actual field seaming until the sample weld from each welding machine has passed both the vacuum box testing and the shear and peel weld strength testing. Halfway through each day's seaming operations, cut out a sample from each welding machine's actual welding and field test as soon as possible for shear and peel strength.

3. Laboratory Testing

After every 1,000 feet of field seaming (accumulated total for all welding machines combined), take additional samples of actual field welding for laboratory shear and peel testing. Take samples at a location selected by the City's representative. Deliver samples to a favorably reviewed independent testing laboratory. Test in accordance with Subparagraph 3.06 D.1 above. Full payment for installation work will be contingent in part upon favorable review of these laboratory tests.

E. Repairs

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Repair all unsatisfactory areas and seams in strict accordance with the liner manufacturer's favorably reviewed instructions and as satisfactory to the City's representative. Reweld or overlap and cover all unsatisfactory areas as required to attain maximum integrity of the lining system. Repeat tests until repairs and tests are successful.

1. Repair Procedures
 - a. Remove damaged geomembrane and replace with acceptable geomembrane materials if damage cannot be satisfactorily repaired.
 - b. Repair any portion of unsatisfactory geomembrane or seam area failing a destructive or non-destructive test.
 - c. Installer shall be responsible for repair of defective areas.
 - d. Agreement upon the appropriate repair method shall be decided Between Consultant and Installer by using one of the following repair methods:
 - 1) Patching- Used to repair large holes, tears, undispersed raw materials and contamination by foreign matter.
 - 2) Abrading and Re-welding- Used to repair short section of a seam.
 - 3) Spot Welding- Used to repair pinholes or other minor, localized flaws or where geomembrane thickness has been reduced.
 - 4) Capping- Used to repair long lengths of failed seams.
 - 5) Flap Welding- Used to extrusion weld the flap (excess outer portion) of a fusion weld in lieu of a full cap.
 - 6) Remove the unacceptable seam and replace with new material.
 - e. The following procedures shall be observed when a repair method is used:
 - 1) All geomembrane surfaces shall be clean and dry at the time of repair.
 - 2) Surfaces of the polyethylene which are to be repaired by extrusion welds shall be lightly abraded to assure cleanliness.
 - 3) Extend patches or caps at least 6 inches for extrusion welds and 4 inches for wedge welds beyond the edge of the defect, and around all corners of patch material.

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- f. Repair Verification
 - 1) Number and log each patch repair (performed by Consultant).
 - 2) Non-destructively test each repair using methods specified in this Specification.

3.07 CONCRETE REVETMENT INSTALLATION

- A. Fabric shall be cut and tailored to lay uniformly upon the HDPE liner.
- B. Laps with adjoining fabric shall be 4 inches.
- C. Before placing concrete, have all HDPE liner repairs and tests completed.
- D. Fluid, sand, and cement shall be pumped into each fabric (envelope) pillow strip. The filling shall be uniform and even. Mortar placement shall be continuous for each strip.

3.08 REVETMENT INSPECTION

- A. Concrete Tests
- B. Profile and conformance with Drawings.

- END OF SECTION -

**SECTION 11250
FLOATABLE BYPASS PUMP
OPTIONAL ADDENDUM # 3**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This section covers furnishing and installation of pump and accessories.
 - 1. Submersible pumps shall be provided for the influent and effluent bypass force main. The pump shall be heavy duty, electric submersible centrifugal non-clog unit designed for handling raw screened and unscreened sewage and shall be fully guaranteed for this service. The pump furnished shall be designed for wet pit (NS) installation and continuous full load operation at minimum water level with their submersible motor in non-submerged conditions. The pump shall be fully supported by a foam filled floatation module.
 - 2. The design of this application is based upon the use of Flygt products. Equal products, if submitted, must meet the requirements of this specification in its entirety.

1.02 RELATED SECTIONS

- A. Section 09900 Special Coatings
- B. Section 11010 General Equipment Requirements
- C. Section 11020 Electrical Motor Drives
- D. Section 15030 Piping and Accessories
- E. Section 15040 Valves and Accessories
- F. Division 16 Electrical
- G. Division 17 Instrumentation and Control

1.03 SUBMITTALS

- A. Comply with General Provisions, Section 01040, Item 1.12 and Section 11010.
- B. Pump shall not be shipped until the Contractor has complied with submittal requirements. Pump submittal shall include catalogue literature, detailed

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specifications and drawings indicating dimensions and descriptive data covering make, style, model, speed, size, type, horsepower, full-load amps, head-capacity, efficiency-capacity, NPSH-capacity, performance curves, specific materials used, design features, weights, and piping end connection.

- C. Submit Certification of materials and five (5) year pro-rated municipal warranty.
- D. Furnish O&M manuals per Section 11010.

1.04 QUALITY ASSURANCE

A. Construction

1. Impellers, cases, seals, shafts, bearings, and any other item which does not comply with the Specifications as to the metallurgy, materials, or hardness shall be replaced without additional cost to the Authority for new parts, removal, and replacement.
2. Any bronze used in the manufacture of any pump shall conform to ASTM B062.
3. Any pump found to have or exhibit mechanical defects or does not meet capacity characteristics, horsepower, efficiency, and vibration requirements will be rejected after testing and shall be replaced without additional cost to the Authority including removal, reinstallation, and retesting. Mechanical defects shall include excessive vibration, improper balancing of any rotating parts, improper tolerances, binding, excessive bearing heating, defective materials, including materials that do not conform to the Specifications, improper fitting of parts, and any other defect which will in time damage the pump or unreasonably impair the efficiency of the pump.

1.05 MOTORS

- A. Motors shall be in accordance with the applicable provisions of Section 11020 in addition to the following provisions and characteristics specified hereinafter.
- B. Motors, as furnished and installed, shall be of sufficient horsepower rating so that the rated horsepower and full-load amps will not be exceeded at any point on the pump curve.

1.06 OPERATION AND MAINTENANCE MANUALS

- A. Per Section 11010.

1.07 NAME PLATE INFORMATION

A. Name Plate Information

Information plates shall conform to Section 11010 and be attached with Type 316 stainless steel locking screws to the pumps. Information shall contain the manufacturer's name, pump size and type, serial numbers, speed, impeller diameter, capacity and head rating, and other pertinent data. An additional plate shall be attached to the bearing frame of nonclog pumps which shall contain identification of frame and bearing manufacturer's part numbers.

1.08 WARRANTY

- A. The complete pump unit shall conform to these specifications and shall be free from defects in materials and workmanship for a period of 5 (five) years after acceptance.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Submersibles

1. Flygt (Xylem Inc.)

- B. Substitutions shall conform to Section 11010 and the Specifications.

- C. The pump, mechanical seals and motor shall be from the same manufacturer.

2.02 GENERAL

- A. It is the intent of these Specifications to obtain pumps of heavy-duty construction for heavy-duty continuous or intermittent service, whichever imposes the most severe service on the pump. Pumps will be installed at an elevation of approximately 2,500 feet above sea level.

- B. The pump shall be furnished as a complete, ready-to-install unit including, but not limited to, the pump and motor, discharge connection, power cable, and other accessories, unless otherwise specified herein.

- C. Included with the Specifications for individual pieces of equipment are brief descriptions of the expected operation and the necessary controls for the equipment, along with signals to be transmitted to other locations. The

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information provided for each piece of equipment or each system is not intended to be totally inclusive or exclusive of required devices, connections, or methods of operations. The Contractor shall carefully review the other sections of these Specifications and the Drawings for additional requirements.

2.03 SUBMERSIBLE PUMPS

- A. The pump shall be provided with a horizontal ANSI Class 125 flange discharge, flange adapter bolted onto the pump discharge, Victaulic cast iron, rubber coated 90° elbow, Victaulic flex coupling Style 78 connected to HDPE pipe with a Victaulic groove on the end. The elbow shall be pivoted in direction to accommodate the HDPE pipe angle.

The length of the 6" HDPE discharge pipe shall be long enough to accommodate variations of water levels in the storage basins from 6 inches to 17 feet.

- B. The submersible pumps shall be connected to the HDPE discharge piping via Victaulic Flex Coupling Style 78 method to allow for quick removal of the pump. The pump shall be of portable configuration with built-in support stand. Submersible pumps shall be easily removable for inspection or service, none of the weight of the pump shall rest on the discharge piping. The design fluid temperature range shall be from 40 degrees to 104 degrees F. The pump shall be suitable for continuous operation; under submerged, partially submerged, or dry conditions. Without de-rating the motor, the pump shall be able to pump continuously without the need to spray systems or moving equipment; pump shall operate with the motor exposed and the water level at the top of the volute under full load and until pump suction bell breaks suction. The pump shall be capable of handling raw, unscreened sewage. The stand of the pump shall be provided with a ¼ inch of neoprene feet in order to protect the HDPE liner.
- C. The pump shall be fully supported by a foam filled pump floatation module with pump mounting bracket, Flygt Model PFM550. The floatation module shall be compact & light-weight. Steel pontoons shall not be acceptable. Floatation module shall measure 55" x 55" x 22" and be capable of supporting 1,213 lbs. Floatation module shall be easy to install on the pump, have lifting points for easy installation and be easily towable with a boat. Floatation module shall be held in place by ¼ inch 316 SST guide cables anchored on shore. The length of the anchored cable shall be long enough to accommodate variations of water levels in the storage basins from 6 inches to 17 feet. Once installed the floatation module shall remain visible above the water surface for easy recovery.
- D. The Floatable Bypass Pump shall be of the submersible centrifugal non-clog type as manufactured by Flygt Pumps or approved equal. One pump shall be Model NP-3153 HT with curve # 63-464-00- (253 impeller diameter). All pumps shall be

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installed as specified in Section 11250 and as shown on the drawings.

E. Performance Criteria

Pump Location	Bypass Holding Pump
Flygt Model	N-3153 HT
Impeller (mm)	253
Curve No.	63-464
Force main	6" HDPE & 8" PVC
Discharge	4"
Capacity (gpm)	770
TDH (feet)	52
Hydraulic Efficiency (%)	68
Power Required (HP)	17 LSPM
Speed (rpm)	1,800
Pole #	4
freq. (Hz)	60
Total Number of pumps	1
Number of spare pumps	0
Impeller throughlet, inches	1.66 (If N-Pump)

F. Materials

1. Pump Construction: Major pump component shall be of gray cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes and other irregularities. The lifting handle shall be of 316 stainless steel.

All exposed nuts and bolts shall be made of 316 stainless steel.

All metal surfaces coming into contact with the pumpage, other than stainless steel or brass shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

Sealing design shall incorporate metal-to-metal contact between machined surfaces, critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile O-ring. Fittings will be result of controlled compression of rubber O-ring contact of four sides without the requirements of a specific torque limit. Rectangular cross sectioned

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gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

2. **Pump Shaft:** The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using mechanical couplings shall not be acceptable. The shaft shall be stainless steel ASTM A479 S43100-T. Shaft sleeves will not be acceptable.
3. **Cable Entry Seal:** The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of dual cylindrical elastomer grommets, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be sealed from each other, which shall isolate the stator housing from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered equal.
4. **Bearings:** The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a single ball type bearing to handle radial loads. The lower bearing shall be a two row angular contact ball bearing to handle the thrust and radial forces. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump curve.
5. **Mechanical Seal:** Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal unit, located between the pump and the lubricant chamber shall contain one stationary and one positively driven rotating, corrosion resistant tungsten-carbide ring. The upper, secondary seal unit, located between the lubricant chamber and seal inspection chamber, shall contain one stationary and one positively-driven rotating corrosion tungsten carbide seal ring. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in contact by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be

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isolated from the pumped media to prevent materials from packing around them, limiting their performance.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal, shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. Cooling and seal lubricant shall be FDA approved non-toxic.

The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. The groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.

A separate seal leakage chamber shall be provided so that any leakage that may occur past the upper secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch that will signal if the chamber should reach 50% capacity.

6. Impeller: The impeller shall be of gray cast iron, ASTM A-48 Class 35B, dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The screw-shaped leading edges of the impeller shall be hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impellers shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer.

7. Volute: The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which al-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall be cast of (ASTM A-48,

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Class 35B gray iron and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

G. Motor

1. Motors shall be in accordance with the provisions of Section 11020 in addition to the following provisions and characteristics specified hereinafter. The motors shall operate at 1,800 rpm with 4 pole, 480 VAC, 3-phase, 60 Hertz electrical power for all pumps.
2. Line Start Permanent Magnet (LSPM) Premium Efficiency Motor: The LSPM motor shall have the same features specified in Section “Motors” above plus have a rotor fitted with permanent magnets. The premium efficiency motor shall meet or exceed the efficiency levels specified in the IEC standard 60034-30 for international efficiency, Class IE3. The motor shall have the capability to be started across the line, start and accelerate as an induction motor. Upon reaching full speed, the motor shall operate as a synchronous motor. The motor shall also have the capability of being controlled by a variable frequency drive.
3. The pump motor shall be a NEMA B design, submersible, induction type with squirrel-cage rotor, shell-type design, housed in an air-filled, watertight chamber. The stator windings shall be insulated with moisture resistant class H insulation rated for 180C (356F). The stator shall be insulated by the trickle impregnation method using class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The stator shall be heat-shrink fitted in to the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be specifically designed for submersible pump usage and designed for continuous duty pumping media of up to 40C (104F) with an 80C temperature rise and capable of at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches shall be embedded in the stator end coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chambers shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-type connectors is not acceptable. The motor and pump shall be produced by the same manufacturer.

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The combined service factor (combined effect of the voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output KW and efficiency. This chart shall also include data on starting and no-load characteristics.

The power cable with controls shall be sized according to the NEC and ICEA standards and shall be of sufficient length (100 ft) to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber. The motor and cable shall be capable of continuous submergence under water without loss of watertight integrity to a depth of at least 65 feet.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

4. Protection (For Model N-3153): Each pump motor stator shall incorporate three thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall stop and activate an alarm. A float switch shall be installed in the seal leakage chamber and will activate if leakage into the chamber reaches 50% chamber capacity, signaling the need to schedule an inspection.

The thermal switches and float switch shall be connected to a Mini CAS control and status monitoring unit. The Mini CAS unit shall be designed to be mounted in the pump control panel.

5. Cooling System: Each unit shall be provided with an integral motor cooling system. A motor cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104°F (40 °C). Operational restrictions at temperatures below 104°F are not acceptable. Fans, blowers or auxiliary cooling systems that are mounted external to the pump motor are not acceptable.

H. Pump Accessories:

1. The pump shall be provided with a pressure gauge in the discharge piping in the check valve / plug valve vault. The gauges shall be connected to the piping and conform to ANSI/ASME B40.1. The range of each pressure gauge shall be from 0 to 50 psi.
2. Cable and Fittings: The pump shall be fitted with stainless steel lifting cable. The cable shall be capable of lifting the pump and motor. All cable fittings and hardware shall be provided.
3. The pump system and appurtenances, including the pump, motor, and wiring, shall be approved by a nationally-approved testing agency for installation in the State of California for explosion-proof service. The system shall be rated for Class 1, Division 1, Group C and D service as determined by the National Electrical Code and approved by a nationally recognized testing agency (UL or FM) at the time of bidding of this project.
4. The submersible electrical cable shall be Submersible Pump Cable and be of sufficient length to reach the junction box. The material shall be (chloroprene rubber) jackets for Flygt SUBCAB, rated for 90 degrees C, and the insulation shall be ethylene propylene rubber. Wicking filler shall not be accepted. The motor and cable shall have watertight integrity to a depth of 65 feet.

The cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval.

5. Furnish and Install ENM-10 level regulator and all associated electrical wiring, hardware and brackets required for proper functioning of above-mentioned device. ENM-10 level regulator is intended for use in raw screened wastewater and sludge and will be mounted on the side of the floatable pump per manufacturer's recommendations. Density range for ENM-10 is to be obtained from manufacturer. The float switch cable shall be of sufficient length (100 ft) to reach the junction box without the need of any splices.

I. Testing

Each pump shall be tested for performance at the factory to determine head vs. capacity, efficiencies, and kilowatt draw required for the operating points that are specified. All tests shall be run in accordance with the latest edition of the

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American Hydraulic Institute Standards. Testing shall also include the following:

1. Impeller, motor rating and electrical connections shall first be checked for compliance to specific requirements.
2. Motor and cable insulation test for moisture content or insulation defects.
3. After a submerged test run of 30 minutes under 6 feet of water, Item 2 shall be retested.
4. If any deviation from 1, 2, or 3 is found, the pump shall be rejected.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Contractor shall install the pump and accessories with strict conformance to the recommendations of the manufacturer.

3.02 INSTALLATION CHECKING, TESTING, AND OPERATOR INSTRUCTION

- A. The manufacturer's Factory Representative shall be present for testing of all pumps. The representative shall check and certify proper functioning of all mechanisms.
- B. The manufacturer's Factory Representative shall also assist in initial start-up, and instruct the plant personnel on proper operation and maintenance. The representative shall be available for a minimum of one (8-hour) day of pump service.

- END OF SECTION -

**SECTION 11380
SOLARBEE MIXING EQUIPMENT
OPTIONAL ADDENDUM # 3**

PART 1 - GENERAL

1.01 EQUIPMENT OVERVIEW

- A. This section covers furnishing and installation of one circulation/mixing system called SolarBee to provide odor control for raw screened wastewater at the City of Beaumont Bypass Holding Pond as well as enhance organic (BOD/TSS) reduction.

The equipment system shall be manufactured and fabricated for one bypass holding pond. The surface of the holding pond is 29,553 sq. ft. (0.678 acres) as shown on the Drawings.

The system shall include brushless electric motor, stainless steel framework, dish and float assembly, solar-charge battery power system, digital control system for intelligent power management with factory programmed reversed functions and anti-jam routines, three 80 watt solar panels, PV Remote Kit, dual-mix intake, SCADA outputs and all other required appurtenances.

In addition to odor-cap, SolarBee system shall be capable of providing complete mixing of the holding pond. The system shall be equipped with upper and lower mixed zone fluid intake as specified herein.

Solar panels, battery and controller shall be mounted on shore as specified and shown on the drawings.

1.02 REFERENCES

- A. Occupational Safety and Health Administration, OSHA
- B. Department of Transportation, DOT
- C. Underwriters Laboratories Inc., UL 1989 and UL 1703
- D. United States Military Standard, U.S. MIL-B-8565 and U.S. MIL-I-45208
- E. International Electrotechnical Commission, IEC #896-2
- F. Hunt Water Adsorption Test
- G. United States Food and Drug Administration, FDA title 21

1.03 RELATED SECTIONS

- A. Division 1 General Requirements
- B. Division 3 Concrete

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- C. Section 11010 General Equipment Requirements
- D. Section 11020 Electrical Motor Drives
- E. Section 15030 Piping and Accessories
- F. Division 16 Electrical
- G. Division 17 Instrumentation and Control

1.04 QUALITY ASSURANCE

- A. Continuous Operation Equipment. The circulation equipment shall operate continuously, all day and all night, 365 days per year, and have a 25 year design life.
- B. No Visual Defects. The circulation equipment shall have no visual defects, and shall have high quality welds and assembly, corrosion resistant finish, and site specific operational controls.
- C. Qualified US Manufacturer. The manufacturer of the equipment shall have extensive experience in the production of such equipment.
- D. Factory Startup Services. Delivery, installation and startup services shall be included in the bid, and performed by full time factory employees experienced in the operation of this equipment and who have completed OSHA safety trainings applicable to this type of installation.

1.05 WARRANTY

- A. The circulation equipment shall be warranted to be free of defects in materials and workmanship for a period of 2 (two) years, including parts and labor. In addition, if the equipment is ever "off" more than 25% of any calendar month during the first two years after purchase, the equipment will be deemed "defective", and must be replaced by the manufacturer; in that event all warranties begin anew with the placement of the new equipment.
- B. The motor shall be warranted for 10 (ten) years, including parts and labor.
- C. The photovoltaic modules shall have a module manufacturer's warranty for 25 (twenty-five) years, parts only.

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- D. "Parts and labor" in this section is defined to mean that the manufacturer will make the needed repairs, using its parts and its factory personnel, at its cost, in the field at the jobsite. There will be no requirement for the owner to remove or crate defective parts or machines and return them to the factory for repair or replacement.

1.06 SUBMITTALS

- A. Comply with General Provisions, Section 01040, Item 1.12 and Section 11010.
- B. The awarded Bidder shall provide five copies of the following documents. Upon acceptance of these documents by the Engineer, the Bidder will be issued a Notice to Proceed, and may then proceed to install the equipment.
1. At least two independent flow studies of the equipment proposed to be provided, with said studies conducted in working reservoirs over 3 million gallons in volume, and based on 24 hours per day operation, and using rhodamine dye or another tracer to verify the flow rate and flow pattern of the proposed equipment.
 2. A statement of the quantity, model number, and flow rate of the machines that would be provided for each Cell to comply with the required flow rates shown in Section 2.02 below.
 3. A copy of the circulation equipment warranty in compliance with Section 1.03.
 4. Shop drawings and specifications for the circulation equipment to be provided, in compliance with Section 2.02.
 5. Manufacturer's literature, illustrations and specification sheets defining materials of construction, dimensions, and weights including the following:
 - a. Digital controller diagnostic LED indication chart.
 - b. Digital controller daily operation schedule example.
 - c. Digital controller software update instruction sheet.
 - d. Digital controller stored log example.
 - e. Digital controller SCADA output specifications.

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- f. Type 316 Stainless Steel Certification.
 - g. Battery specifications.
 - h. Motor specifications.
6. A diagram and listing of replacement parts.
- C. Additionally, at no charge to the owner, the manufacturer is to perform water testing during the installation, and provide, following installation, additional Submittals that shall include:
- 1. Four hard copies and one electronic copy of a complete operation and maintenance manual per Section 11010.
 - 2. Within 30 days of installation, the manufacturers installation report including:
 - a. Aerial photograph with labeling of pond, cell or reservoir data.
 - b. Work summary.
 - c. Customer contact information.
 - d. Climate / weather conditions.
 - e. Circulation machine information.
 - f. Installation crew field notes.
 - g. GPS location of each circulation machine and test point.
 - h. Secchi depth at a minimum of two 2 locations per pond, cell or reservoir.
 - i. Water quality testing information (water temperature, specific conductance, dissolved oxygen and pH) at a minimum of 2 locations per pond, cell or reservoir at 1 foot increments down to 17 feet water depth.
 - j. Free water, slurry and sludge / sediment depths at a minimum of 2 locations of the bypass storage basin.

1.07 FIELD SERVICES

- A. Factory Personnel. The installation and startup shall be performed by full time factory employees trained in the operation of the circulation equipment.
- B. Safety. Installation personnel shall have received job-specific safety training on (a) Working over Water, (b) Boating Safety, (c) Disinfecting Procedures, (d) Confined Space Entry, (e) Fall Protection, and (f) DOT Compliance.

PART 2 - PRODUCT SPECIFICATIONS

2.01 MANUFACTURER

- A. Specified Equipment. The circulation equipment shall be manufactured by SolarBee, Inc. of Dickinson, ND, or approved equal.
- B. Approved Alternative(s) to the specified equipment shall include but not be limited to the followings:
 - a. A brief description of how the offered alternative does or does not meet each of the specifications in this document.
 - b. An analysis of how acceptance of the alternative equipment would likely affect the overall water quality goals of the project.
 - c. A statement of the science and support background of the supplier of the alternative equipment, so that the benefits and costs of the alternative equipment to the Owner can be estimated by the Engineer.

2.02 PERFORMANCE AND FEATURES

- A. Flow Rate Required for Bypass Holding Pond. Pond surface is 29,553 sq. ft. (0.678 acres). To meet the project flow rate requirements, the following total flow rate shall be provided for Beaumont Bypass Holding Pond, 24 hours per day X 365 days/year, involved in this project. "Total flow rate" is defined to be the total flow, in gallons per minute (gpm), through the impeller(s) of the machines in that cell. The total flow rate may be achieved with a fewer number of high gpm machines, or else a larger number of low gpm machine, at the bidders option, as long as the total gpm shown below is met on a continuous basis for 24 hours per day.

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Cell #	Total flow rate through the impeller(s), gallons per minute (gpm)
Bypass Storage Basin	3,000 GPM delivered by (1) SolarBee model SB10000U80DM

- B. Continuous Operation with Solar Power Only. The circulation equipment shall operate continuously during day, night, and extended overcast conditions, 365 days per year. Continuous operation for this project shall be defined as operating a minimum of 97% of the total hours during the course of one year, on solar power, without reliance on any connection to the A.C. power grid.
- C. Stainless Steel Construction. The circulation equipment shall be constructed primarily of Type 316 stainless steel metal for corrosion resistance. Each machine shall also undergo a passivation bath, also known as stainless steel pickling, to restore corrosion resistance to the welds and other areas of imperfections.
- D. Motor. The circulation equipment shall be mechanically operated by a motor that meets the following criteria.
1. Brushless, and using hall effect commutation, to avoid brush replacement.
 2. Direct Drive, with no gearbox, to avoid lubrication maintenance.
 3. Stainless Steel Bearings, requiring no scheduled lubrication, rated bearing life expectancy greater than 100,000 hours continuous operation.
 4. Designed for marine, outdoor environment by having a sealed housing with polymeric encapsulated internal windings for superior corrosion resistance. Capable of withstanding the following environment conditions.
 - a. -40°F to 140°F (-40°C to 60°C) ambient temperature range, freeze resistant
 - b. 100% humidity
 - c. Condensation resistant
 - d. Splash resistant
 5. Designed for Continuous Operation without overheating or compromising motor life expectancy.
 6. Less Than 48 volts DC power requirement, to avoid risk of electrocution.

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7. 10 Year Replacement Warranty.
- E. Controller. The circulation equipment shall be supplied with a motor controller and power management with the following features.
1. Digital Electronic Control System, with firmware and software that is easily re-programmable to optimize the level of water quality achieved in the reservoir.
 2. Anti-Jam Reverse, automated self-clearing for locked rotor triggered by high current occurrences caused from jammed impeller.
 3. Operation Schedule, with daily and seasonal scheduling for motor speed and direction.
 4. Scheduled Reverse Cycles, with daily reverse impeller cycling for self-clearing of impeller to minimize fouling.
 5. Motor Health Status Monitoring and Recording, including scheduled speed, commanded speed, actual speed, motor current, motor voltage, and motor controller errors.
 6. Fully Potted and Encapsulated Motor Control Circuit, for superior corrosion resistance in marine environment.
 7. SD (Secured Digital) Card Reprogrammable features, so digital controller is capable of being field programmable using an SD card for uploading new firmware and changing programmed operations. The software shall be provided by the manufacturer with complete instructions.
 8. Manual On/Off Switch, to shut power off to the motor. On/Off switch shall be rated for marine environment and have yellow and red color markings for indicating emergency shut off.
 9. Fused Main Power Line, for added protection against power surge through motor controller and motor.
 10. Temperature Compensated Charging, so that battery charging parameters are automatically adjusted based on battery temperature.
 11. Maximum Power Point Tracking (MPPT), so the charging algorithm is automatically adjusted for optimum results based on solar power input and battery capacity.

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12. Power Conservation & Continued Operation Mode, a programmed algorithm for reducing motor load and continuing operation by incremental speed reduction. This feature to be automatically enabled when extended low sunlight conditions occur or battery reserve power is reduced.
 13. Low Voltage Shut Off, a programmed shut off switch to disconnect motor load before reaching damaging depth of battery discharge. The motor load automatically re-connects when battery capacity is restored.
 14. NEMA 4 Enclosure, for protection against condensation and moisture in a marine environment. The internal circuit boards shall be conformal coated for added protection against moisture.
 15. System shall include a PV Remote Kit for mounting solar panels and controller on shore on 4'X4' concrete base as shown on the drawings. The PV Remote Kit includes a 316 stainless steel pole stand, top of pole mounting bracket, additional electrical cable, and associated hardware. The circulator shall utilize the tethering configuration for holding the circulator in position as shown on the drawings.
 16. Add Solarbee Modbus communication to existing Cooper Creek PLC for display on the City SCADA system. This will include all health and status indications with no control. A new modbus communication card (IC693CMM321) will be needed to be added to the existing PLC.
- F. Battery. The battery power storage shall meet the following criteria.
1. Single Battery, multiple batteries are not allowed unless connected in series, to avoid charging problems leading to failed batteries.
 2. Battery Capacity Rating, at a 24 hour discharge rate, in watt hours, shall be at least 50 times the motor load in watts during normal operation (full speed, peak load).
 3. Battery shall be submerged, to avoid extremes in temperature and extend battery life.
 4. Battery shall comply with DOT HMR49, non-spillable battery, for transport.
 5. Battery shall be UL Listed, compliant to UL 1989.

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6. Battery shall have a pressure relief Safety Valves for each cell that incorporates a flame-arrester for safety, and rated as Explosion Resistant.
7. Battery shall be Maintenance Free and not require re-watering.
8. Battery shall contain 10 AWG Power Conductors constructed of multi strand power wire having a flexible outer jacket, all contained inside stainless steel sheathing for protection from the elements and from rodents.
9. Battery shall be Freeze Tolerant for frigid conditions.
10. Battery shall have a Self-Discharge Rate of less than 1% per month (7 year of design life).
11. Battery shall have a Temperature Sensor monitoring battery housing temperature, not ambient temperature, to optimize charging cycles and extend battery life.
12. Battery shall be manufactured to the following quality standards:
 - a. U.S. MIL-B-8565
 - b. U.S. MIL-I-45208
13. Battery shall Not Emit more than 1% hydrogen during a MIL-B-8565 gas emission test after being heated to 55°C and overcharged to 16.1 V.
14. Battery Cycle Life test per the IEC #896-2 Endurance Testing shall be:

% Depth Of Discharge, D.O.D.	Number of Cycles
10%	8100
20%	4800
30%	3500
50%	2050

15. Battery shall be encased in Double Wall Plastic, and mounted in a Stainless Steel Cage, for safety and battery protection purposes.
- G. Photovoltaic Modules (PV modules, Solar Panels). The PV modules shall meet the following criteria.

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1. To ensure continuous operation of the motor and impeller in all seasons, the total Nominal Wattage Rating of the PV modules shall be a minimum of 5 times the normal operating wattage of the motor.
 2. To ensure adequate power collection during low sunlight conditions, photovoltaic modules shall be Mono-Crystalline, not multi-crystalline.
 3. Photovoltaic modules shall contain 16 AWG Power Conductors constructed of multi strand power wire having a flexible outer jacket, and shall be contained inside stainless steel sheathing for protection from the elements and from rodents.
 4. Photovoltaic modules shall be certified to the following quality and safety standards:
 - a. UL 1703, Class C
 - b. IEC 61215 and 60364
 5. Photovoltaic modules shall have 25 Year Manufacturer Performance Warranty.
- H. System Operation Monitoring. The digital controller shall have the following monitoring features.
1. LED (Light Emitting Diode) Flash Code, flashing LEDs in the control box readily accessible by service personnel shall provide continuous electrical diagnostics so the state of the power system can easily be determined.
 2. SCADA (Supervisory Control and Data Acquisition), the digital controller shall output system state of health and operation monitoring using RS-232 serial communication (Modbus RTU), DB9 male connection point. A protocol document shall be provided for local network (PLC or RTU) programming assistance.
 3. Operation Back Log, the digital controller shall store within controller memory a 30 day rolling log of all primary machine operation parameters.
- I. Adjustable Horizontal Water Intake. The circulation equipment shall be supplied with an intake capable of being field adjusted to a set level below the water surface without requiring machine removal and reinstallation. The intake shall bring a 1 ft (30 cm) thick horizontal layer of water into the machine. The intake shall include a singular hose of adequate length to reach the required intake depth

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setting. The flow through the hose and intake shall not exceed 1 foot per second (0.3 meter per second).

1. Dual Mix Intake

The circulation equipment shall be supplied with a dual mix intake that consists of the following.

- a. The Upper Mixed Zone fluid intake shall be flanged and bolted to the bottom of the circulation equipment. The intake shall be a fixed horizontal 48-inch (1.2 m) diameter stainless steel intake plate. Horizontal flow into the intake shall be through 12-inch (30 cm) openings above the intake plate.
- b. The Lower Mixed Zone fluid intake shall be flanged, fit through an opening in the fixed horizontal plate and bolted to the bottom of the circulation equipment. The intake hose shall be 12-inch (30 cm) diameter for SB10000U80DM by 20 feet length and constructed of thermoplastic rubber. The inlet end of the hose shall include an inverted bell-shaped strainer with 3-inch holes. The strainer shall have built-in flotation and the inlet end of the hose shall have a built-in weight, so that the strainer is always held up 2 feet above the bottom of the pond or reservoir.

J. Maintenance Requirements. The circulation equipment shall operate normally with the following maintenance features.

1. No scheduled lubrication is required of any system components including motor and motor bearing.
2. No brush replacement, gearbox replacement, or motor replacement shall be expected or required during the 25 year expected life of the circulation equipment.
3. No spare parts shall be required to be kept on hand.
4. No tools beyond normal cleaning supplies and a few common hand tools shall be required for scheduled maintenance.
5. Circulator shall be equipped with swinging latched gates for easy access to digital controller, motor, and impeller assembly for inspection.

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6. Impeller assembly shall be removable without requiring any tools and shall be easily accomplished out on the water where circulation equipment is deployed.
 7. Circulator shall be equipped with a bird deterrent system to minimize bird roosting, droppings on photovoltaic modules.
- K. Solids Handling: The circulation equipment shall be capable of passing up to 4 inch (10 cm) spherical solids through the intake and impeller.
- L. Flotation: The circulation equipment shall contain a flotation system meeting the following criteria.
1. Adjustable Float Arms shall have a 1” diameter shaft and turnbuckle to achieve the optimal performance setting. The float arms shall be a closed frame to minimize torsion forces on the circulation equipment and provide balanced flotation.
 2. Flotation Buoyancy shall be 1,350 pounds or more to support the weight of the assembled circulation equipment with a safety factor greater than 1.5. Each circulation machine shall weigh approximately 850 pounds.
 3. For Flotation Longevity, flotation shall contain Expanded Polystyrene Foam (EPS) beads that are steamed together to minimize water adsorption and provide a solid float core for structural strength. The EPS contents shall have a 0.9-1.2 pounds per cubic foot density with water adsorption not to exceed three pounds per cubic foot in accordance with the Hunt Water Adsorption Test. The flotation shall not sink should the float encasement be punctured.
 4. The Flotation Encasement shall be constructed of a linear polyethylene resin containing ultraviolet (UV) inhibitors to prevent accelerated deterioration in this marine environment and have a 25 year design life. The float encasement shall offer a balance of toughness, rigidity, environmental stress-crack resistance and low temperature impact performance. Resin shall also be in compliance with FDA title 21. Resin shall be made of a food grade material that will not contaminate the waterways and is recyclable. Encasements shall be rotationally molded for seamless, one-piece construction and shall have a nominal minimum wall thickness of 0.15 inches (4 mm). Encasements shall be resistant to damage by animals, ice, bumps by watercraft, contact deterioration from petroleum products and suitable for marine use.

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5. Minimum water level in the holding pond shall be 3 feet.
- M. Anchoring: The circulation equipment shall be held in position by tethering the circulation equipment to shore as specified and shown on the drawings. Floatation module shall be held in place by ¼ inch 316 SST guide cables anchored on shore. The length of the anchored cable shall be long enough to accommodate variations of water levels in the storage basins from 6 inches to 17 feet.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The circulation equipment manufacturer shall provide Installation, Startup, and On-Site Water Testing Services to insure (a) proper machine spatial placement in the reservoir, and (b) proper intake depth setting.
- B. The field services shall be performed by full time factory employees experienced in the operation of this equipment , and who have completed safety trainings required for this type of installation in compliance with OSHA regulations including (a) Working over Water, (b) Boating Safety, (c) Disinfecting Procedures, (d) Confined Space Entry, (e) Fall Protection, and (f) DOT Compliance.
- C. Within 30 days following installation, the manufacturer shall provide an installation report detailing as described in submittal section.
- D. The circulation equipment manufacturer shall have the following support team available for full service if ever needed following the installation.
 1. A minimum of ten (10) 2-member factory crews.
 2. A full customer service staff including engineers and science personnel that are trained for assistance in this application.

- END OF SECTION -

**SECTION 15040
VALVES AND ACCESSORIES
OPTIONAL ADDENDUM #3**

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

Please add the following Series 250 Swing Check Valve Specifications to the 2012 Headworks Upgrades Specifications:

L. Series 250 Swing Check Valve

1. Description

- a. The Swing Check Valve shall be constructed of heavy ductile iron body with a stainless steel body seat ring and single continuous stainless steel shaft for attachment of outside weight and lever.
- b. The valve shall prevent the return of water or sewage back through the valve on pump shut off or power failure and is tight seating. The seat ring must be renewable and securely held in place by stainless steel screws.
- c. The valve disc shall be ductile iron suspended from a stainless steel shaft which shall pass through a stuffing box.
- d. This valve shall be guaranteed for a period of two years against failure to operate satisfactorily due to faulty workmanship or defective material.
- e. The valve shall be APCO Series 250 Swing Check Valve with ANSI 125/150# class flanges, as supplied by Valve & Primer Corporation, Schaumburg, Illinois, U.S.A.
- f. Valve is 'fusion bond' lined and coated.

2. Materials

- a. Materials shall be certified to the following A.S.T.M. specifications:

Body, cover, disc levers	Ductile iron	ASTM A536, Gr65-45-12
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Disc Arm	Ductile iron	ASTM A536, Gr65-45-12
Seat	Stainless steel	ASTM A296 T304
Seat ring	Buna-N	80 Durometer
Gasket	Composition or Buna-N	Fiber Rubber
Pivot Shaft	Stainless steel	ASTM A582 T303
Studs, bolts, nuts	316 Stainless steel	Commercial
Stuffing box packing	Composition	Teflon

**SECTION 16010
ELECTRICAL GENERAL REQUIREMENTS
OPTIONAL ADDENDUM # 3**

**All previous electrical specifications still apply.
The following are additions to the Scope of Work.**

PART 1 - GENERAL REQUIREMENTS

1.01 SCOPE OF WORK

- A. Bypass pump with new VFD control panel with lockable disconnect, line reactors and NEMA 3R enclosure.
- B. Circulation equipment – SolarBee

1.02 VARIABLE SPEED DRIVES

- A. General Design Characteristics
 1. The VFD shall be of the Pulse Width Modulated (PWM) voltage source type, utilizing fixed diode bridge or half wave input rectification and Insulated Gate Bipolar Transistor (IGBT) technology. The VFD shall be Hitachi.
 2. All VFDs shall include input reactors of a minimum impedance of 3.5% at 60 Hz. The input reactor shall be a three phase AC reactor.
 3. All VFDs over 90 Hp shall include input RFI filters.
 4. All VFDs above 150 amps shall include fast acting semi-conductor fuses.
 5. VFDs rated for variable torque applications shall offer an overload rating of 120% for 60 seconds. VFDs rated for constant torque shall offer an overload rating of 150% for 60 seconds.
 6. All VFDs shall be factory UL Listed.
 7. The VFD shall be capable of operating in an open circuit mode i.e. with the motor(s) disconnected, for start-up and test purposes.
 8. The VFD shall have a minimum displacement power factor of 0.99 at all output frequencies.

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B. VFD Standard Default Features

1. **Microprocessor Logic:** The VFD shall include a 32 bit microprocessor and DSP (Digital Signal Processor). A NEMA 12 rated digital display keypad shall be provided for input of parameter setting and operating commands. The digital display shall indicate output torque, speed reference, frequency, motor speed in %, motor speed RPM, output current, DC bus voltage, output voltage, output power in kW, VFD temperature in %.
2. **Digital Inputs:** The VFD shall include a minimum of six (6) digital inputs programmable for function plus external/motor PTC input. Each input shall also be programmable to operate as a normally open (n/o) or normally closed (n/c) contact. Digital inputs shall include preset speeds, analog input reference switching, FW, RV, Jog, Reset, External trip, invert speed, invert reference, invert jog, coast to stop, second accel/decel, speed/torque mode switch, analog input 1/analog input 2 switch.
3. **Analog Inputs:** The VFD shall accept an analog speed reference input signal of 4-20 ma.
4. **Digital Outputs:** The VFD shall include three (3) digital relay outputs each programmable for power on, VFD fault, supply fault, overload, overload warning, start reference acknowledgment, VFD run, zero speed, at set speed, torque sign, speed sign, torque reference sign, speed reference sign, speed limit, torque limit, voltage limit, current limit, comparator level, window comparator (output current, output voltage, DC bus voltage, motor power, motor speed, motor torque, reference speed, reference torque, motor temperature , VFD temperature, analogue input echo), brake release.
5. **Analog Outputs:** The VFD shall provide two (2) analog output signals programmable for 0-10 VDC, +/- 10 VDC, 0-20ma or 4-20 ma, proportional to the output frequency, output current, output voltage, DC bus voltage, motor speed, motor torque, reference speed, reference torque, output power in kW, motor temperature, VFD temperature, analogue input echo, fiber optic echo, process reference.
6. **PID control:** The VFD shall be internally programmable for PID with set point control via digital setting, analog input or serial communication input.
7. **Auto Restart:** The VFD shall have the capability to automatically restart the motor after an interruption in input power. The VFD must be capable

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of starting into a spinning motor at all speeds.

8. Critical Frequency Rejection: The VFD shall provide a minimum of two (2) selectable skip frequency points used to avoid critical resonance of the mechanical system. Frequency bandwidth for each jump frequency shall be programmable from 0 to 20% of the full scale.
9. DC Injection Braking: The VFD DC braking control shall be programmable for initiation frequency, power level, and on duration. It shall be programmable for initiation after a stop command or prior to a start.
10. Anti condensation heating: The VFD shall be programmable to apply anti condensation DC power to the motor when the motor is not running.
11. Acceleration/Deceleration Control: The VFD shall provide independent programmable settings for accel / decel time (.02-3000 seconds). The VFD shall also include a setting to allow the motor to coast to a stop. Acceleration and deceleration shall be programmable for linear, S-Curve, U-Curve or Reverse-U-Curve output.
12. Carrier Frequency: The carrier frequency shall be programmable up to a maximum of 10 kHz.
13. Energy Savings: The VFD shall include an Automatic Energy Savings feature to optimize energy consumption by minimizing the current demand of the motor for a given load, automatically and continuously.
14. Automatic Voltage Regulation: The VFD shall maintain the rated starting torque independent of the input voltage tolerance of +/-10%.
15. Power Loss Ride-through: The VFD shall have a ride-through capability during an intermittent power loss for up to 50 mSec.
16. Min/Max Speed: Minimum and maximum speed settings shall be adjustable from 100%.
17. Pre-set Speeds: Using the digital inputs a minimum of 7 programmable pre-set speeds shall be selectable.
18. RS 232/485 ports for serial communication.
19. All VFDs shall have TCP/IP and Modbus connectivity.

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- C. Output Ratings: The VFD shall operate within the following rated values.
- Output Frequency Range: 0.1 to 400 Hz.
Frequency Accuracy: +/- 0.01% with respect to digital input setting.
Overload Rating: Variable Torque – 120% for 60 seconds
Constant Torque – 150% for 30 seconds
- D. Input Power
- Voltage: 3 phase (3 wire) 480Vac +/-10%
Frequency: 60 Hz +/- 3%
- E. Environmental Ratings: The VFD shall operate within the following parameters:
- Temperature: 0 to 50 degrees C.
Humidity: < 90% RH non-condensing.
Altitude: <1,000 meters without de-rating.
-1%/100 meters up to 3000 meters
- F. Protective Features: The VFD shall be designed to include the following protective functions and display for maintainability:
1. All control circuits shall be physically and electrically isolated from the power circuit voltages to ensure reliability and safety to maintenance personnel.
 2. Instantaneous Over Current Protection: The output of the VFD shall automatically be turned off if the operating current exceeds the specified level.
 3. Motor Overload Protection: The VFD shall include electronic thermal overload protection with provision for automatic reduction of the overload limit at reduced operating speed. The output of the VFD shall be turned off if the motor's thermal rating is exceeded.
 4. External Trip: The VFD shall have the capability to accept an external trip input programmable for either N/O or N/C operation.
 5. Loss of analog input signal: The VFD shall be programmable to trip or operate at a preset speed or continue to operate at the last speed command prior to loss of signal.
 6. Loss of serial communication signal: The VFD shall be programmable to trip, operate at a preset speed, continue to operate at the last speed

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command prior to loss of signal, revert to analog speed command and internal PID control.

7. Phase Loss Protection: Phase loss detection shall be provided to prevent single phasing of the VFD input.
 8. Over Voltage Protection: The output of the VFD shall be automatically turned off if the DC Bus voltage exceeds the specified level either due to regenerative energy from the motor or high input voltage.
 9. Ground Fault Protection: The VFD shall have the capability to sense current imbalance during motor start-up for protection of the power circuit in the event of a ground fault.
 10. Software Lock: The VFD shall include a software function that prevents changes to the user-defined settings.
 11. Control board Error: VFD shall automatically be turned off in the event of an error in the CPU or EEPROM.
- G. VFD Manufacture: VFD'S shall be Hitachi L300P

- END OF SECTION-

**SECTION 17010
INSTRUMENTATION AND CONTROLS
OPTIONAL ADDENDUM # 3**

**All previous instrumentation and controls specifications still apply.
The following are additions to the scope of work.**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This work shall incorporate the installation of one bypass pond VFD pump and bypass force main flow meter, one SolarBee – mixing equipment and controls associated with SolarBee.
- B. Bypass Pond Pump, Flow Meter Controls and Cooper Creek Lift Station PLC Modifications

This work will use the existing Cooper Creek PLC for controls and a new Quickpanel for an HMI. The Quickpanel shall be an IC754CFO6CTD, with Ethernet communication to the PLC. A new digital input and digital output card will need to be added with the PLC rack possibly needing to be reconfigured. The existing analog input card in slot #6 will need to have flow and pump speed added. The existing analog output card in slot #7 will need one more output added for pump speed control.

The pump will have temperature, liquid level and a float switch incorporated into the controls to stop the pump and a pond high level float switch so the operator knows not to fill pond any more. The HMI will have pump controls to maintain constant flow, float switch bypass, hours run, alarms, on / off indication, pond high level, pond low level, pump speed and trend screen. These same controls shall be available in SCADA. All SCADA and PLC work shall be done by a City approved programmer prior to bid.

- C. Add SolarBee Modbus communication to the existing Cooper Creek PLC for display on the City SCADA system. This will include all health and status indications with no control. A new Modbus communication card (IC693CMM321) will need to be added to the PLC.

1.02 FLOW METER

- A. The flow meter shall be a magmeter type with a 4-20 mA output sized to the pipe size (8 inch) and rated system flow (800 GPM). It shall also be suitable for wastewater application. The accuracy shall be $\pm 0.5\%$ of full scale. The meter shall have grounding rings either side of sensor. The magmeter shall have 316 stainless

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steel electrodes, teflon liner, be epoxy painted, and made of carbon steel.

- B. Acceptable vendors shall be B&B, Sparling or approved equal.

- END OF SECTION -