ADDENDUM NO. 1

BID NO. 19-11

CHLORINE GAS CONVERSION
CITY OF ABERDEEN, MARYLAND

To all holders of the specifications, the following corrections are hereby made. All other items shall remain unchanged. This addendum shall become part of the Contract Documents for the above referenced project.

Acknowledgement of Addendum

Name: _____

Company: _____

Date: _____

Signature: _____

Addendum Section No. 1: Answers to questions posed by bidders.

Addendum Section No. 2: Section 463000 – Chemical Addition Equipment – has been revised. The attached specifications include the revision to specify peristaltic pumps and names Blue White and Watson Marlow as acceptable manufacturers.

Addendum Section No. 3: Pre-bid sign in sheet.

Section No. 1:

Q1: Heaters are to be mounted to the ceiling. How tall are the ceilings?
A1: The ceilings vary in height but are less than 14 feet maximum height.

Q2: Can the water heaters be isolated without shutting down the water plant?
A2: Yes, the water heaters can be isolated for replacement.

Q3: What permits are required?
A3: The building permit will come from the City. The electrical, mechanical and gas permits, as well as all building inspections, will come from Harford County.

Q4: What are the working hours?
A4: Working hours are 7:00 AM thru 5:00 PM, Monday thru Friday. Additional working hours must be approved, in writing, by the City.

Q5: What is the contact info for inspecting the plant prior to submitting a bid?
A5: For additional site inspections, contact George Skinner, gskinner@aberdeenmd.gov, 410-272-2650, with additional notice to Ryan Harrah, rharrah@aberdeenmd.gov, 410-297-4223.

Section No. 2:

SECTION 463000 – CHEMICAL ADDITION EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Contractor shall furnish and install all equipment, chemicals and service necessary to provide a completely integrated chemical addition system. System to include transfer pump, day tank, metering pumps, fittings, accessories, and controls to convey hypochlorite from the bulk storage tanks to the treatment facility clear well. Installation of the chemical metering pumps and transfer pumps shall ensure functionality and operation with interrelated equipment and systems. The Contractor shall be responsible for coordinating the existing and proposed water treatment systems for a seamless design.

1.2 REFERENCE STANDARDS

A. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:

1. American Water Works Association (AWWA)
2. American Society for Testing and Materials (ASTM)
3. American Society for Mechanical Engineers (ASME)
4. Hydraulic Institute Standards
5. National Electric Code (NEC)
6. OSHA Rules and Regulations

1.3 SUBMITTALS

A. Submit shop drawings and product data for each item in accordance with Division 01 Section 013300 - “Submittals”.

B. Provide operation and maintenance manuals in accordance with Division 01 Section 013300 - “Submittals”.

1.4 EQUIPMENT DESIGN

A. All work performed under this section shall be free from defects in workmanship and materials under normal use and service for a period of one (1) year from final acceptance. Any work proven to be defective in material or workmanship shall be adjusted, repaired or replaced as required to perform satisfactorily as originally intended. All work performed under the guarantee shall be performed by the Contractor or Equipment manufacturer without additional expense to

the Owner.

1.5 QUALITY ASSURANCE

A. The Contractor shall furnish and coordinate the services of all equipment manufacturer's qualified field representatives to aid in the installation, inspect the equipment after installation, instruct plant personnel in its operation and maintenance, and supervise its initial operation for a minimum of three (3) 24-hour days.

B. Manufacturer of pumps, motors, and package assemblers shall have a minimum of five years of successful operation and installation.

1.6 MANUFACTURER'S CERTIFICATE

A. The Contractor shall furnish to the Engineer a manufacturer's Certificate, as specified under Division 01 Section 013300 "Submittals", certifying that all equipment has been installed in a complete and satisfactory manner ready for operation.

1.7 COORDINATION

A. The Contractor shall coordinate the work so that all necessary valves, piping, wiring, and other details as may be required, are furnished to the proper subcontractor, to assure a complete and properly integrated installation.

PART 2 – PRODUCTS

2.1 EQUIPMENT

A. Provide the following:

a. Chemical Metering Pumps with Accessories
b. Transfer Pumps
c. Chemical Day Tanks with Containment
d. Chemical Feed System Control Panel

2.2 CHEMICAL METERING PUMPS

A. Metering pumps shall be rated for the capacities listed on table below.

Service	Normal Capacity	Pressure Rating	Quantity
Sodium Hypochlorite	1.96 gph	110 PSI	2

B. METERING PUMPS - Shall be positive displacement, peristaltic type tubing pumps with a variable speed motor, integral tube failure detection system, tube life roller revolution counter with user alarm set-point and flexible tubing with attached connection fittings, capable of output

volumes from 0.0019 to 19 gallons per hour.

1. There shall be no valves, diaphragms, springs, or dynamic seals in the fluid path. Process fluid shall contact the pump tubing assembly and connection fittings only.
2. Pump shall be capable of 24 hour continuous duty, self-priming and operating in either direction of flow at the rated maximum pressure of up to 110 PSI (7.6 bar).
3. Pump shall be capable of running dry without damage.
4. Pump shall be capable of operating in either direction without output variation.
5. Suction lift shall be 30 feet of water.
6. Pump shall be warranted by the manufacturer for a period of five years. Warranty shall include chemical damage to the pump head and roller assembly for a period of two years.
7. The pump shall be model M324-MNGG as manufactured by Blue White Industries or Series 520R2 as manufactured by Watson Marlow. (the following specification is based on Blue White Industries, but comparable Watson Marlow Series 520R2 will be accepted as equal).

C. PUMPHEAD – Shall be a single, unbroken track with a clear removable cover

1. Tube failure detection sensors shall be wholly located in the pumphead. Tube failure detection system shall not trigger with water contact. Float type switches shall not be used. Process fluid waste ports or leak drains shall not be provided.
2. Squeeze rollers with encapsulated ball bearings shall be directly coupled to a one piece thermoplastic rotor. Four polymeric rollers shall be provided; two squeeze rollers for tubing compression shall be located 180 degrees apart and two guide rollers that do not compress the tubing shall be located 180 degrees apart. The roller diameters and occlusion gap shall be factory set to provide the optimum tubing compression; field adjustment shall not be required.
3. Rotor assembly shall be installed on a D-shaped, chrome plated motor shaft and removable without tools.
4. For tubing installation and removal, rotor assembly shall be rotated by the motor drive at 6 RPM maximum when the pumphead cover is removed. Hand cranking of the rotor assembly shall not be required.
5. Pump head and tubing compression surface shall be corrosion resistant Valox thermoplastic.
6. The pump head cover shall be clear, polycarbonate thermoplastic with an integral ball bearing fitted to support the overhung load on the motor shaft. Cover shall include an imbedded magnetic safety interlock which will limit the motor rotation speed to 6 RPM when removed.
7. Cover shall be positively secured to the pump head using a minimum of four thumb screws. Tools shall not be required to remove the pump head cover.

D. PUMP TUBE ASSEMBLY

1. To ensure pump performance and accuracy, only tubing provided by the manufacturer is acceptable.

2. Pump tube shall be assembled to connection fittings of PVDF material.
3. Connection fittings shall be permanently clamped to the tubing with stainless steel clamps or over molded directly to the tubing. To prevent tubing misalignment and ensure accuracy, fittings shall insert into keyed slots located in the pump head and secured in place by the pump head cover.
4. Connection fittings shall be 1/2" M/NPT.
    a) Alternate: fittings shall accept 1/4" ID x 3/8" OD flexible tubing, fittings shall accept 1/2" ID flexible tubing.
5. Tube sizes and connections shall be measured in inches.
6. The tube shall be replaceable without replacing the entire head assembly. Pumps that require that will not be accepted.

E. DRIVE SYSTEM – Shall be factory installed and totally enclosed in a NEMA 4X, (IP66) wash-down enclosure. Capable of operating on any input power from 110VAC to 240VAC, 50/60 Hz single phase supply without user configuration or selection switches.

1. Motor
    a) Reversible, DC gear motor rated for continuous duty.
    b) Motor shall include overload protection.

2. Enclosure
    a) Pressure cast aluminum with acidic liquid iron phosphate three-stage clean and coat pretreatment and exterior grade corrosion resistant polyester polyurethane powder coat.
    b) Rated NEMA 4X (IP66).
    c) Provided with 316SS floor/shelf level mounting brackets and hardware. Optional: provide extended height brackets for mounting pump 4.5 inches above grade level.
    d) A wiring compartment shall be provided for connection of input/output signal wires and alarm output loads to un-pluggable type terminal block connectors. Terminal board shall be positively secured to the rear of the pump housing by two polymeric screws and fully enclosed by the wiring compartment cover. The terminal board shall not be disturbed by the removal of the wiring compartment cover. Ribbon cables shall not be used in the wiring compartment. Conduit hubs, liquid-tight connectors, connector through holes and tapped holes shall be sized in U.S. inches.

3. Control Circuitry. All control circuitry shall be integral to the pump.
    a) All control circuitry shall be integral to the pump and capable of adjusting the pump motor speed from 0.001% to 100.0% in 0.001% increments less than 1% motor speed, in 0.01% increments between 1% and 10% motor speed, and in 0.1% increments greater than 10% motor speed (10,000:1 turndown ratio).
    b) The pump output shall be capable of being manually controlled via front panel user touchpad controls. The pump motor speed shall be adjustable from 0.001% to 100.0% in 0.001% increments less than 1% motor speed, in 0.01% increments between 1% and 10% motor speed, and in 0.1% increments greater than 10% motor speed.

c) The pump output shall be capable of being remotely control via 4-20mA analog input. The input resolution shall be 0.01 of input value and capable of adjusting the pump motor speed from 0% to 100.0% motor speed in 0.1% increments. Four values shall be user configurable to define the low and high points on the output slope; a low input value, the required pump percentage of motor speed at the low input value, a high input value, the required pump percentage of motor speed at the high input value.

d) The pump output shall be capable of being remotely control via 0-10 VDC input. The input resolution shall be 0.01 of input value and capable of adjusting the pump motor speed from 0% to 100.0% motor speed in 0.1% increments. Four values shall be user configurable to define the low and high points on the output slope; a low input value, the required pump percentage of motor speed at the low input value, a high input value, the required pump percentage of motor speed at the high input value.

e) The pump output shall be capable of being remotely control via TTL/Cmos digital high speed pulse type input and an AC sine wave type pulse input in the range of 0 to 1000 Hz. The frequency resolution shall be 1 Hz and capable of adjusting the pump motor speed from 0% to 100.0% motor speed in 0.1% increments. Four values shall be user configurable to define the low and high points on the output slope; a low input value, the required pump percentage of motor speed at the low input value, a high input value, the required pump percentage of motor speed at the high input value.

f) The pump output shall be capable of being remotely control via pulse triggered batching. The pump shall accept a TTL/Cmos digital pulse type input and a contact closure type pulse input in the range of 1 to 9999 pulses per batch. The batch time shall be adjustable from 1 to 999999.9 seconds. The pump motor speed during the batch shall be adjustable from 0% to 100.0% motor speed in 0.1% increments.

g) The pump shall include an internal cycle timer capable of automatically cycling the pump on and off. The pumping total cycle time shall be adjustable from 1 to 999999.9 seconds. The pumping on time during the cycle shall be adjustable from 1 to 999999.9 seconds. The pump motor speed during the cycle shall be adjustable from 0% to 100.0% motor speed in 0.1% increments.

h) The pump shall be capable of dispensing upon demand. The dispensing shall be manually triggered by pressing the front panel start button or by inputting a contact closure. The dispensing volume shall be adjustable from 1 to 999999.9 milliliters. The pump motor speed during the dispensing cycle shall be adjustable from 0% to 100.0% motor speed in 0.1% increments.

i) The pump shall be capable of automatically calculating the pump motor speed required to achieve a part per million dosing output that is proportional to a fixed system flow rate. The pump shall permit the user to input the dispensing chemical percentage concentration from 0% to 100.0% in 0.1% increments. The pump shall permit the user to input the dispensing chemical specific gravity from 0.1 to 9.9 in 0.1 increments. The pump shall permit the user to input the fixed system flow rate from 1.0 to 9999.9 liters per minute in 0.1 liters per minute increments. The pump shall permit the user to input the required dosing parts per million (PPM) from 0.1 to 100.0 in 0.1 increments.

j) The pump shall be capable of automatically calculating the pump motor speed required to achieve a part per million dosing output that is proportional to a variable system flow rate. The pump shall permit the user to input the dispensing chemical

percentage concentration from 0% to 100.0% in 0.1% increments. The pump shall permit the user to input the dispensing chemical specific gravity from 0.1 to 9.9 in 0.1 increments. The pump shall permit the user to input a K-factor in pulses per liter from a sensor in the water system that outputs a high speed digital pulse from 0 to 1000 Hz that is proportional to the system water flow velocity. The pump shall permit the user to input the required dosing parts per million (PPM) from 0.1 to 100.0 in 0.1 increments.

k) Provide an 11-button front panel user touchpad control for stop/start, configuration menu access and navigation, operating mode selection, auto priming, display options selection, tube life data, and reverse direction.

l) Provide a multi-color VGA graphic LCD display for menu driven configuration settings, pump output value, service alerts, tube failure detection (TFD) system and flow verification system (FVS) alarms status, remote input signal values, tubing life timer value. Display color shall be green when indicating normal operation, blue when in stand-by, and red to indicate an alarm condition exists.

m) Provide for remote stop/start pump via 6-30 VDC powered loop or non-powered contact closure loop.

n) Provide a user selectable 4-20mA and 0-1000Hz output signal which are scalable and proportional to pump output volume.

o) Provide four contact closure alarm outputs. Three rated at 1A-115VAC, 0.8A-30VDC and one rated at 6A-250VAC, 5A-30VDC. Each alarm output shall be assignable to monitor any of the following pump functions: TFD system, FVS system, motor run/stop, motor failed to respond to commands, motor is running in reverse, general alarm (TFD, FVS, and/or motor over current), input signal failure, output signal failure, remote/local control status, revolution counter (tube life) set-point, or monitor which of the nine different pump operating modes is currently active.

p) Provide a four digit password protected configuration menu.

q) Provide a flow verification system with programmable alarm delay time from 1-255 seconds. FVS system shall monitor the FVS flow sensor while pump is running only. System shall not monitor pump while not running.

r) Provide a roller revolution counter display (tube life indicator) with user programmable alarm set-point value from 1 to 999,999,999 revolutions which can be assigned to any one of the 4 contact closure alarm outputs.

s) Provide a user programmable maximum RPM (revolutions per minute) set-point value from 0.1 to 100.0 RPM in 0.1 increments.

t) Provide a user adjustable response delay time from 0 to 999.9 seconds for the remote start/stop input and the four contact closure alarm outputs to facilitate closed-loop applications.

u) Provide a power interruption pump restart option which is user programmable to either automatically restart or require a user re-start if AC mains power is interrupted.

F. SAFETY

1. The pump shall be certified to NSF Standard 61 Drinking Water System Components, UL standard 778 motor operated pump and CSA standard C22.2 process control equipment.

2. Tube Failure Detection (TFD) system sensors shall be wholly located in the pumphead.

TFD system will stop the pump within three seconds of leak detection. To prevent false alarms due to rain, wash-down, condensation, etc., tube failure detection system shall not trigger with water contact. Process fluid waste ports or leak drains shall not be provided.

3. Pumphead cover shall include an imbedded magnetic safety interlock which will stop the pump when removed. Pump rotor speed shall be limited to 6 RPM when cover is removed.
4. Secondary user confirmation input required for motor reversal, tube life revolution count reset, and factory default configuration reset.

G. A total of 16 ft (4.8m) of polyethylene tubing shall be provided per pump complete with compression connections. A foot valve with integral one piece strainer shall be provided for the suction line, and an injection check/back pressure valve with ½" NPT male connection for the injection point. The injection check valve shall incorporate a dilating orifice which prohibits scale formation and accumulation of crystalline deposits.

H. Calibration Cylinder shall be provided per pump, with clear PVC solution tube and schedule 80 end connections. Calibration cylinders shall be sized to allow 30-second draw of solution through system for testing. Calibration cylinders shall be manufactured by Griffco, or approved equal.

I. Back pressure valves shall be provided for each pump constructed from PVC with a Tef-lon-faced diaphragm and an adjustable range from 10 - 150 psi. Back pressure valve shall be manufactured by Griffco Valve.

J. Pressure relief valves shall be provided for each pump constructed from PVC with a Tef-lon-faced diaphragm and an adjustable range from 10 - 150 psi. Pressure relief valve shall be manufactured by Griffco Valve.

K. Pressure Guage and guard shall be provided for each pump, The guard shall be PVC with Viton diaphragm. The gauge is 316SS with brass internals. Gauge and guard shall be pro-vide my Marquest Scientific.

L. A check valve shall be provided for each pump manufactured from PVC with Viton seals. Check valves shall be manufactured by Asahi.

M. Wall Mount Bracket shall be provided per pump to allow the pump to be mounted on a wall or other vertical support constructed of heavy duty ABS plastic or 12 gauge stainless steel.

N. Cord and ground plug arrangement are to be furnished by the manufacturer.

2.3 CHEMICAL TANKS

A. Application Information:

Chemical	Capacity	Quantity
Sodium Hypochlorite Solution	120 Gallons (Day Tank)	1

B. The day tanks shall be flat bottom with closed top.

C. The day tanks shall be vertical tanks with a vented manway on top and a 2" pipe connection on the side near bottom. The day tanks shall be made of linear polyethylene, which is translucent for visible content level. The tank shall be molded in graduation lines on the tanks in 10 gallon intervals.

D. The tanks shall be constructed of material suitable for the application chemicals.

E. The tanks shall be manufactured by Snyder Industries or approved equal.

F. The day tanks shall have a containment basin, Ultra-IBC Spill Pallet #1058 as manufactured by Ultratech.

2.4 TRANSFER PUMPS

A. PUMP DESIGN

1. Chemical transfer pumps shall be Finish Thompson DB Series design, or pre-approved equal, as specified for chemical applications below.

Chemicals	Pump Model	Pump Construction	Impeller Diameter	Bushing	O-rings	Quantity
12% Sodium Hypochlorite	DB6VP-T-M226	PVDF	3"	PTFE	Viton	1

2. Pumps shall be non-metallic magnetic drive type, closed impeller design, female NPT suction, male NPT discharge connections (flanged or unions as option), close-coupled design.

3. Pumps shall comply with applicable sections of Hydraulic Institute Standards unless otherwise noted.

4. Pump shall be provided with constant speed drives, capable of at least five percent head increase at rated conditions by replacement of impeller with one of larger diameter or different design.

5. Pump shall have a BEP of 68% or greater.

6. Pumps, drivers and accessories shall be suitable for continuous operation at the specified operating conditions, and at flows ranging from the specified minimum flow to end-of-curve conditions.

7. The pump shall accept close-coupled drivers that mount directly to pump's frame without a base, coupling or guards.

8. Any electrical drives or accessories shall be suitable for the specified electrical area classification and the environment of the installation.

9. The impeller assembly shall be able to be removed without disturbing the piping connections. The liquid end shall be able to be removed without removing the motor frame

adapter from the motor. The liquid and drive ends shall be independently serviceable.

10. Pump drive magnet shall conform to ISO 1940 G2.5 balancing.

11. Pump shall have extended run dry ability when equipped with a carbon bushing.

12. Pump shall have a maximum working pressure of 90 psi with O-ring elastomer.

13. Pump shall handle up to 1.8 specific gravity fluids with standard impeller trims.

B. PUMP CASING

1. Casing shall be one-piece, moded and made of glass fiber reinforced polypropylene (GFRPP) or carbon fiber reinforced polyvinylidene fluoride (CFRPVDF).

2. Casing shall house stationary front high-purity alumina ceramic or silicon carbide thrust ring facing against the impeller assembly front thrust ring.

3. NPT shall have NPT female suction and male discharge connections and option for adjustable ANSI Class 150, standard hole pattern flanges or unions.

4. Casing shall have integrally molded front shaft support with three rounded arms to provide minimum inlet flow resistance.

5. Casing and containment shell shall form volute for maximum hydraulic efficiency.

6. Casing shall be designed for specified design pressures, temperatures and hydrostatic test pressures.

C. IMPELLER ASSEMBLY/INNER DRIVE MAGNET

1. Impeller assembly shall be closed, molded GFRPP or CFRPVDF and has glass reinforced molybdenum disulfide filled PTFE or silicon carbide front and rear axial thrust rings.

2. Impeller and inner drive magnet assembly shall have snap fit design allowing for individual replacement.

3. Impeller assembly shall have balance holes for thrust balancing.

4. The magnets shall be constructed of high strength, rare earth neodymium iron boron magnets and be hermetically sealed from the environment by two layer shots of unfilled plastic and one layer shot of reinforced plastic.

5. The bore of the inner drive magnet assembly shall have an anti-rotation flat that corresponds to the shape of the press fit shaft bushing.

6. The shaft bushing shall be of a press fit design with anti-rotation flat, have flushed grooves along the bore, be replaceable, and shall be constructed of carbon, alumina ceramic, PTEE or silicon carbide.

D. SHAFT

1. The shaft shall be constructed of alumina ceramic, Hastelloy C or silicon carbide.

2. The shaft shall have an anti-rotation flat for fitting shaft in containment shell.

3. The shaft shall be simply supported on both ends and replaceable.

E. O-RING ELASTOMER

1. The O-ring shall be constructed of FKM/Viton, EPDM, PTFE, Kalrez or Simriz.

2. The O-ring shall provide axial sealing between the pump casing and containment shell.

F. CONTAINMENT SHELL

1. The shell shall be one piece molded GFRPP or CFRPVDF with elliptical shape for optimum pressure and shock capabilities.

2. The shell shall have alumina ceramic thrust ring facing against the impeller assembly rear thrust ring. The thrust ring shall have an anti-rotation flat.

G. OUTER DRIVE MAGNET ASSEMBLY

1. The outer drive magnet assembly shall be constructed of a steel shell with nickel-plated high strength neodymium magnets.

2. The outer drive magnet assembly shall be dynamically balanced.

3. The outer drive magnet assembly shall be capable of mounting directly to standard NEMA motors and dimensionally set without having to make any measurements.

H. MOTOR FRAME ADAPTER

1. The motor frame shall be a one piece GFRPP with mounts for standard NEMA C-frame motors and shall not require alignment.

I. DRIVERS

1. Each driver shall have a BHP output equal to our greater than the horsepower required to operate the pump at any point on the head capacity curve, while pumping liquid of the specified specific gravity and viscosity.

2. All magnetic drives shall have torque ratings greater than or equal to the maximum motor torque the driver is rated for.

J. MOTORS

1. Motors shall be 1/2 HP, 3450 rpm, single phase, 60 Hz, 115/230 Volt, 56C frame, TEFC motors.

K. CONNECTION CABLE

1. Power connection cable shall be provided with the pump from the manufacturer.

2.5 CHEMICAL FEED SYSTEM CONTROL PANEL

A. The supplier of the chemical feed equipment shall be responsible for supplying a fully integrated Central Control Panel that will control and relay signals to all equipment outlined in this section and in Section 434145. The Central Control Panel will be an Allen Bradley panel with an HMI for operator input and controls. The Control Panel shall be a NEMA 12 rated enclosure, with back plate for mounting of equipment and hinged door with hold open hardware and three latch assembly.

B. Manual Mode shall permit operation of the pumps locally, including pump start, stop and pump motor speed.

C. Automatic Mode shall control the transfer pump and metering pumps based on remote signals and operator input dosing rate.

D. The key functions of the Central Control Panel are as follows:

1. A 4-20mA signal from influent flowmeter to the Central Control Panel (CCP) will initiate the analysis for calculating the total chemical dosing rate (gph) based on influent flow readings and operator inputs. Operator inputs will be provided for selecting dosing rates and inputting chemical strengths.

2. Based on dosing requirement, the CPP contains logic to select the number of pumps and speeds to achieve the appropriate dosing. The CPP transmits a signal to the metering pumps for dosing into the carrier water line. Alarms and operating conditions from the metering pumps are transmitted to the CPP.

3. At low levels in the day tank, a signal is sent to the CCP to signal the Transfer Pump on and off. The CCP contains logic for on/off operation of the Transfer Pump based on operator set points. Alarms and operating conditions from the Transfer Pump are transmitted to the CCP.

4. Levels within the Bulk Tanks are monitored with level transmitters (see Section 434145 for additional details), which relay a 4-20mA signal to the CPP indicating levels and low level alarms.

5. All alarms and key monitoring parameters are to be transmitted form the CPP to the City of Aberdeen's SCADA System. Connecting to the City's SCADA System will not be the responsibility of the Contractor, however, the contractor will be responsible for supplying terminal connections in order for the Owner to retrieve alarms and signals and relay them back to their SCADA System.

E. System supplier shall be responsible for process integration including all I/O requirements to provide a fully operational system. At a minimum the system shall include:

1. Inputs:

- Day Tank Level

- Bulk Tank 1 Level
- Bulk Tank 2 Level
- Raw Water Flow (4-20 mA)
- Pump Run/Fail (each pump)
- Feed Pump 1/2 Speed (4-20 mA)

2. Outputs:
   - Transfer Pump On/Off
   - Feed Pump Speed (4-20 mA)
3. Alarms (with output to SCADA):
   - Low Day Tank
   - Low Bulk Tank 1/2
   - Pump Fail (each pump)

2.6 PIPING, FITTINGS, AND SUPPORTS

A. General piping and support requirements

1. All chemical feed piping shall be Schedule 80 PVC unless specified otherwise by the Contract Drawings.
2. All Strut parts will be Unistrut Brand or approved equal.

B. Variable Length Pipe Supports

1. Each pipe support will be constructed using 1-5/8 inch galvanized steel channel fastened to the overhead wall with two (2) 3/8 inch x 3 inch galvanized expansion anchor with washer and nut as seen in the Contract Drawings. The pipe will be fastened to the channel using a galvanized pipe clamp.

C. Vertical Wall Supports

1. Each pipe support will be constructed using 1-5/8 inch x 1-5/8 inch x 8 inch galvanized steel channel fastened to the wall with two (2) 3/8 inch x 3 inch galvanized expansion anchor with washer and nut as seen in the Contract Drawings. The pipe will be fastened to the channel using a galvanized single piece pipe strap attached with two (2) ¼” channel spring nuts with 1/4 inch x 5/8 inch hex bolt.

D. Offset Wall Pipe Support

1. Each pipe support will be constructed using two (2) 1-5/8 inch x 1-5/8 inch x 12 inch

galvanized steel channels fastened vertically to the wall each with two (2) 3/8 inch x 3 inch galvanized expansion anchor with washer and nut as seen in the Contract Drawings. One (1) Unistrut P2513 Bracket, or approved equal, will be fastened horizontally to the two (2) vertical struts as shown on the Contract Drawings. The pipe will be fastened to the horizontal strut using a galvanized pipe clamp.

E. Floor Pipe Support

1. Each pipe support will be constructed using 1-5/8 inch galvanized steel channel fastened to the floor with two (2) 1/2 inch x 3 inch galvanized expansion anchor with washer and nut as seen in the Contract Drawings. The pipe will be fastened to the channel using a galvanized pipe clamp.

F. Transfer Pump Support

1. The pump supports will be constructed using two (2) 1-5/8 inch x 1-5/8 inch x 12 inch galvanized steel channels fastened vertically to the wall each with two (2) 3/8 inch x 3 inch galvanized expansion anchor with washer and nut as seen in the Contract Drawings. One 8-1/2 inch x 18 inch 18 gauge galvanized steel plate will be fastened horizontally to the two (2) vertical struts as shown on the Contract Drawings. The horizontal plate will be supported against the horizontal channels using two (2) 8-1/2 inch x 3-3/4 inch brackets. The brackets will be fastened to the horizontal plate using two (2) 3/8 inch stainless steel round head machine bolts with a washer and nut for each bracket. The brackets will be fastened to the vertical channel using one (1) ¼ inch channel spring nut with one (1) 1/4 inch x 5/8 inch hex bolt per bracket. The pump will be fastened to the horizontal plate using stainless steel pump mounting hardware per the transfer pump manufacture's recommendation.

2.7 SPARE PARTS

A. Manufacturer(s) shall provide any specialty tools and recommended spare parts as required for maintaining the following equipment:

1. Chemical Metering Pumps with Accessories:

a. Ten lengths of tubing in each size (diameter) as necessary to satisfy the requirements of paragraph 1.01 Design Requirements.

b. One pump head for each size pump.

2. Transfer Pumps:

a. One set of all gaskets

b. One set of all bearings

c. One set of mechanical seals

d. One set of discharge connection sealing devices

B. Spare parts shall be tagged and stored per manufacturer's instructions.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install of all equipment shall be in strict accordance with the manufacturer's recommendations as approved by the Engineer. Furnish services of the manufacturer's technical representative to supervise the initial phase of installation; and after the installation is completed for start-up, testing and to instruct the Owner in proper maintenance.

B. Upon completion of the work and prior to its acceptance by the Owner, make all required field tests.

3.2 FIELD TESTING

A. The Contractor shall perform tests specified herein to assure compliance with all performance requirements.

1. All pumps shall be field tested to verify pump capacities and pressures.

2. After the Contractor has completed the installation of each pumping unit, each unit shall be given an acceptance test under the specified operating conditions, which will be approximated as closely as practicable by the manipulation of discharge valves to obtain the desired head conditions. The Contractor shall be responsible for scheduling the test and shall provide the Owner and Engineer a minimum of one (1) weeks' notice prior to the test. Each pump shall be field tested by the Contractor to verify pump capacity ranges. Flow shall be measured by a portable flow meter provided by the equipment Manufacturer, or by other means acceptable to the Engineer.

3.3 TRAINING

B. The equipment manufacturer shall provide a service representative properly trained in inspection and operation of the mechanism to approve the installation, and certify that the pumps can meet the specified flow rates. If additional service is required due to the mechanisms not being fully operational at the time of service requested by the Contractor, the additional service days will be at the Contractor's expense.

C. Ensuring that all necessary components, including electrical and controls, required for testing shall be the responsibility of the Contractor. No additional compensation shall be made by the Owner for additional trips required due to the lack of coordination or completion of support items by the Contractor.

D. In addition to the above activities, the Equipment Manufacturer's Representative shall provide startup and training services to familiarize the plant staff with operational and maintenance requirement of the chemical feed systems. Training shall consist of two (2) formal training sessions, on alternating shifts as coordinated with the operations supervisor. This service shall be completed in accordance with the following schedule:

1. 1 Trip (2-8Hour Days Per Trip Excluding Travel Time)

END OF SECTION 463000

Section No. 3

VISITOR REGISTER

Date	Time		Print Name	Your Company/Address	Reason for visit/ Aberdeen Rep.
	Arrive	Depart			
5-7-19	12:05		Craig Stokes	Horton mech 7909 Philadelphia	Pre Bid
5-7-19	12:10		JAY GOETTNER	GOETTNER CONST. 1520 Edgewood Rd	PRE-BID
5-7-19	12:10		James Beall	Goettner Const. 1520 Edgewood Rd	PreBid
5/7/19	12:15		Pat Holley	EMH Environmental, Inc. 3060 Washington Rd. Suite 216 Glenwood, MD	PREBID
5-7-19	12:20		Ellie Jones	M2 3101 Marietta Ave Lancaster	Prebid