Bidder's Proposal

City of Tonka Bay
4901 Manitou Road
Tonka Bay, MN 55331

The City of Tonka Bay Control Panel and Pump Replacement For Lift Station No. 8

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PART 1 - General Requirements

1.1 Scope of Work

The work to be carried out under these specifications shall include furnishing all labor, materials, tools and equipment necessary for the construction and installation of the proposed control panel, two new pumps with new base elbows and guide rail system complete in place as described in these General Requirements.

1.2 Description of Project

The project consists of the construction and installation of one (1) new control panel and two new submersible pumps with new base elbows and guide rail system to replace the existing control panel and pumps described in the specification as Lift Station No. 8 located at 97 Interlachen Lane, Tonka Bay, MN. 55331. The bid shall also include any necessary guide rail brackets, stainless steel float racks or hooks necessary to complete the project. Labor to install shall be included in the bid.

Removal of existing panel and installation of new panel will be done by owner.

1.3 Minimum Contractor Requirements to respond

Contractors who are interested in responding to this solicitation must demonstrate that they meet the following minimum qualifications and meet the requirements indicated below:

a. The Contractor shall have been continuously involved in the design and manufacture of control systems for the past ten (10) years.

b. The Contractor shall have successfully built and placed into operation, systems similar to the one proposed herein and will furnish a list of at least ten (10) operating installations.

c. The Contractor shall have on staff a minimum of 10 qualified instrument technicians and shall maintain a stock inventory of spare parts of all major components of the system.

Proposals that fail to demonstrate meeting the requirements of a through c may be rejected as Non-responsive.

PART 2- BONDS, INDEMNIFICATION AND INSURANCE, AND CONTRACT CONDITIONS.

2.1 Performance and Payment Bonds

Prior to execution of the contract, the successful Contractor shall submit to the owner Performance and Payment Bonds, each in an amount equal to the contract price, as security for the faithful performance and payment of Contractor's obligations under the contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due.

If the surety on any bond furnished is bankrupt or becomes insolvent of the surety's right to do business is terminated in the State of Minnesota, the Contractor shall promptly notify the Owner within 20 days after the event giving rise to such notification, and shall provide another bond and surety, both of which shall comply with the requirements of this RFP.

2.2 Indemnification

The Contractor shall indemnify, hold harmless, and defend the Owner from and against any claim of, or liability for error, omission or negligent act of the Contractor, under this agreement.

The Contractor shall not be required to indemnify the contracting agency for a claim of, or liability for, the joint negligence of the Owner. If there is a claim of, or liability for, the joint negligent error or omission of the Contractor and the independent negligence of the Owner, the indemnification and hold harmless obligation shall be apportioned on a comparative fault basis. "Contractor" and "Owner", as used within this and following article, include the employees, agents and other contractor who are directly responsible, respectively, to each. The term "independent negligence" is negligence other than in the Owner's selection, administration, monitoring, or controlling of the Contractor and in approving or accepting the Contractor's work.

2.3 Insurance

The Contractor shall deliver to the Owner, certificates of insurance which the Contractor is required to purchase and maintain throughout the life of the Contract, as outlined below.

a. Worker's Compensation
   1) State — Statutory
   2) Applicable Federal (e.g. Longshoreman's) — Statutory
   3) Employer's Liability — $2,000,000

b. Contractor's Liability Insurance including completed operations and

product liability coverage's:

1) General Aggregate	$2,000,000
2) Products Completed	$2,000,000
3) Personal and Advertising injury (per person/Organization)	$2,000,000
4) Each Occurrence (Bodily Injury and Property Damage)	$2,000,000
5) Property Damage Liability Insurance	$2,000,000
6) Excess Liability	
a. General Aggregate	$2,000,000
b. Each Occurrence	$2,000,000
7) Automobile Liability	
a. Bodily Injury	$2,000,000
b. Each Accident	$2,000,000
c. Property Damage (Each Accident) Or	$2,000,000
d. Combined Single Limit (Bodily Injury for Property Damage-Each Accident)	$2,000,000

8) Additional Insured for Contractor's liability and Property Insurance: City of Tonka Bay, Minnesota

2.4 Standard Contract Provisions

The successful Offeror will be required to enter into a Contract with the Owner for services proposed in accordance with this RFP and the proposal submitted by Offeror.

2.5 Proposal as Part of the Contract

All or part of the final proposal may be incorporated into the final negotiated contract.

2.6 Additional Terms and Conditions

The City of Tonka Bay reserves the right to include additional terms and conditions during the contract negotiations. These terms and conditions must be within the scope of the original RFP and contract documents, and will be limited to cost, clarification, definition, and administrative and legal requirements.

If after award of a conflict:

1) A conflict arises between terms offered in contractor's proposal and the terms of the contract or RFP, the terms of the RFP or Contract will prevail.

2) If the Owner's rights would be diminished as a result of application of a contractor's supplemental term or condition included in the contractor's proposal, the supplemental term or condition will be considered null and void.

2.7 Ownership of Materials

The owner shall maintain ownership and use of all equipment, material or software produced and accepted as a final product, as a result of this contract.

PART 3. SYSTEM COORDINATION AND SOURCE RESPONSIBILTY

3.1 Control System Description

The equipment provided shall be a completely integrated automatic control and monitoring system consisting of the required automation and alarm monitoring equipment in a factory wired and tested assembly. The automatic control and alarm/monitoring system components shall be standard, catalogued, stocked products of the system supplier to assure one source responsibility, immediately available spare/replacement parts, proper system interconnections and reliable long term operation.

3.2 Equipment Design

The Contractor shall prepare detailed design information, procure, configure, install, start-up, make ready for use, the complete instrumentation's systems as indicated in the RFP.The Specifications included in this RFP are descriptions of functional operation and performance, as well as standards, but do not necessarily enumerate detailed specifications for all components and devices that are essential for system operation. However, all components and devices shall be furnished and installed as required to provide compete and operable systems for accomplishing the functions and meeting the performance set forth hereinafter.

3.3 Installation

The system shall be manufactured complete and ready to be connected to the main source of power and pumps under a separate contract by the Owner. Proposers shall include an allowance of time in the proposal of eight (8) hours for

coordination with the Owner's contractor to coordinate installation, including one site visit to inspect and verify proper installation of the control panel.

3.4 Training

The Contractor shall include in the pricing all costs for factory-trained service personnel to supervise and install, adjust all the equipment until the system has been completely accepted in writing by the Superintendent of Public Works.

PART 4. QUALITY ASSURANCE

4.1 Quality of Design and Workmanship

The Supplier shall maintain quality, the design, workmanship, and material used in manufacture of equipment supplied. All equipment supplied under this Contract shall be of new manufacture.

4.2 Manufacture of Control System

The Supplier shall be firm that is engaged in the manufacturing of process control systems. The system shall be in regular production with pre-designed hardware and software for process control systems.

4.3 Standard System

A standard system is defined as one which is available, at time of bid, with fully tested hardware and software, fully documentation, and prepared training classes such that no development must be done beyond system configuration.

Part 5. Documentation

5.1 Design Review

The complete assembly shall be provided with job-specific wiring diagrams, parts lists, enclosure dimensional and door layout drawings and instructions for review and approval by the Superintendent of Public Works, Prior to any ordering of supplies or materials or commencement of any construction for this project.

5.2 Shop Drawings

Shop Drawings shall be submitted for approval for all equipment herein specified. The Shop Drawing shall include a Document List. An Order Specification shall be included which shall describe in detail all equipment provided. Each panel shall be provided with a job-specific wiring diagram, numbered terminal or nodes corresponding to numbered wires, part lists, enclosure door layout and enclosure dimension drawing. Manufacturer's wiring diagrams that are not job-specific (standard drawings with options crossed out, etc.) are not acceptable. The wiring diagram requirement applies to all field mounted instrumentation and control equipment. Interconnection details shall be shown for all field mounted instrumentation. A description of Operation shall be provided detailing the operation of the complete system, including the control and alarm handling.

5.3 Asbuilt Drawings

The Contractor shall provide As-built Drawings and Instruction Manuals. These manuals shall include corrected Shop Drawings. In addition, a detailed Programming and Operations Manual for the Microprocessor-based Controller Unit shall be included. The manual shall include all information as detailed for the Shop Drawing Submittals above.

PART 6 – PRODUCTS

6.1 LIFT STATION CONTROL PANEL

A. The control panel shall be constructed in accordance with Underwriter's Laboratories (UL) Standard 698A- "Industrial Control Panels for Hazardous Locations" and applicable portions of UL Standard 913 – "Intrinsically-Safe Apparatus and Associated Apparatus for use in Class I, II, and III, Division I, Hazardous Locations". The panel(s) shall be shop inspected by UL, or constructed in a UL- recognized facility. Each completed shall bear a serialized UL label indicating acceptance under Standard 698A and 913.

B. Enclosure

1. The described equipment shall be housed in a NEMA 3R – Stainless Steel Enclosure. The unit shall measure 36" wide, 48" high, and 12" deep. All panels shall be of not less than 14 gauge 304 stainless steel with continuously welded seams. The enclosure shall contain an interior sub-panel for mounting all control components and the enclosure shall be sufficiently large to accept all control components without crowding. Larger enclosures shall contain door and stiffeners as required. The front door shall have a rolled lip and the door flanged

and corners ground smooth. All enclosure welding seams shall also be ground smooth.

2. The door shall be fastened to the enclosure with a continuous type stainless steel piano hinge and locking three- point minimum, stainless steel hardware. The door latching must be of the type that will accept a padlock keyed to match existing City keys. The inside of the door shall contain data pockets. The interior shall be painted white.
3. Enclosure shall have full-height dead-front inner hinged doors that house all front-panel components including switches, indicating lights, circuit breakers operating handles, running time meters, overload reset pushbuttons, and other controls that require operator access.
4. Enclosure shall be insulated on all interior surfaces with one- inch thick foil backed rigid insulation. The enclosure shall have thermostatically controlled heaters to maintain temperature above 32 F in an ambient temperature of -30 F.
5. Enclosure sub-panel shall have a 20 inch by 20 inch space located at the top center for the purpose of mounting a cellular cell phone and battery back up device.

C. Starters

1. The starters shall be UL labeled. Starters shall be NEMA-rated for the motor horsepower. Starter shall have three ambient compensated quick – trip elements for submersible pumps. The Starter operating coil shall be suitable for operations at 120 VAC. IEC starters are not acceptable.

D. Control Switches

1. All control devices including, but not limited to, selector switches, push button switches and indicating lights, shall be of the heavy duty, oil tight type. The contacts shall meet NEMA rating designation A600. The devices shall be Cutler-Hammer Type T, Allen Bradley Bulletin 800T, Square D Class 9001 units, or equal. Each shall be supplied complete with escutcheon and nameplate.

E. Control Relays

1. Relays shall be of the plug-in type with associated sockets and retaining clips. The relays shall have dust covers. All contacts shall be rated for not less than 10 amps at 120 VAC with 3/16" diameter gold flashed silver cadmium oxide moving and stationary points. Insulation resistance shall be 1000 megohms, nominal, at 500 VDC between all non-connected terminals. Dielectric withstand shall be 2,000 VAC between non-connected terminals. All relays shall have "coil energized" indicating lights.

F. Circuit Breakers
1. All circuit breakers shall be UL labeled and shall be of the size shown. All breakers shall have an interrupting rating of not less than 14,000 amps, sym.
2. Main and generator breakers shall be supplied with a "walking beam" type mechanical interlock to prevent both breakers from being closed simultaneously.

G. Receptacle
1. The receptacle for portable tools, etc. shall be a 20 amp specification grade, UL-listed ground fault interrupter.

H. Terminals and Wiring
1. All field wiring shall be terminated on terminal strips. The terminal strips shall be of the barrier type. Each terminal shall be of the two screw type. The contacts shall be tin-plated copper, capable of carrying 10 amps at 600 VAC. The contacts shall be large enough to accept up to NO. 12 AWG wire. The barrier strip shall have a minimum voltage withstand of 5,000 volts. The barrier strip shall be suitable for the required number of co contacts.
2. Power wiring shall be terminated on barrier-type blocks sized for the application.
3. Number all terminals and tag all conductors to correlate with manufacturer's drawing.

I. Surge Arresters
1. Controls shall include surge protectors on all incoming phases, Square D Class 6671 or equal.

J. Indicating Lights
1. Nominal 1-inch diameter, opaque colored lens.
2. Press-to-test feature.
3. Heavy-duty, oil-tight.

K. Running Time Meters
1. Six digit, hours and tenths.
2. Non-resettable.
3. 3-inch diameter front, nominal

L. Enclosure Heat
1. Manufactured unit with metal housing and integral thermostat and 0 – 100 F adjustable range.

2. 200 watt (minimum), 120 VAC, fan forced.
3. UL labeled.
4. Provide quantity and size as required to meet temperature requirements specified.
5. Hoffman "Design-Aire" or equal.

M. Alarm Light
1. A top mounted weatherproof, strobe alarm indication light assembly with shatter resistant polycarbonate red lens mounted on a polycarbonate/ABS blend case shall be provided. The alarm light shall be NEMA 4X rated. The strobe tube shall provide a minimum of 300,000 peak candela output and shall be rated for 3,000 hour life.
2. The alarm light shall flash upon occurrence of an alarm condition.

N. Float Switches
1. Polypropylene with encapsulated "mechanical tilt" (non-mercury) type switch.
2. Contact rating: 3 amps, 120 VAC, resistive.
3. Operating differential: 1 inch, nominal.
4. Extra flexible cord in length as required for application.

O. Phase Failure Relay
1. The controls shall contain a phase failure, phase reversal, and undervoltage relay. The relay shall de-energize the motor control circuits upon an abnormality. When "normal" power is restored, the unit shall automatically re-energize the control circuits. The unit shall be fitted with instrument fuses and shall feature an adjustable voltage sensing range of 200 to 250 volts; an adjustable phase unbalance sensing rang of 0 to10%, and an adjustable 0.1 to 25 second fault delay to prevent nuisance operation.
2. The relay shall sense negative sequence voltages when a single phasing condition occurs. The relay shall "pick up" when the negative sequence voltage exceeds 4% (nominal). The relay shall sense line-to-line undervoltage conditions and "pickup" at 83% (nominal) of the normal conditions with an inverse time/voltage relationship.
3. Manufacturer / Model: Diversified Electronics, SLU-100, or approved equal.

P. Submersible Transducer/Transmitter
1. Transducer and transmitter shall be provided by a single manufacturer. Two or three wire type as required to operate from the controller's regulated supply voltage and produce an instrumentation signal in

direct proportion to the measured level excursion over a factory calibrated range of 0 to 20 feet of water.

2. Solid-state, head-pressure sensing or piezoelectric type, suitable for continuous submergence, operation and installation in accordance with manufacturer's instruction. Bottom of diaphragm sensor shall be installed approximately 6 inches above the welt well floor. Sensor shall be mounted on a stainless steel cable suspension system in a location as shown by owner. Coordinate final location and mounting details for a complete installation.
3. Transducer housing shall be fabricated of Type 316 stainless steel with a bottom diaphragm of no less than 21/2" diameter of heavy-duty, limp, foul-free molded Teflon ™ bonded to a synthetic rubber back/seal. Furnish adequate length of submersible cable to reach control panel without splices.
4. A hydraulic fill liquid behind the diaphragm shall transmit the sensed pressure to a solid-state variable capacitance transducer element to convert the sensed pressure to a corresponding electrical value. The sensed media shall exert its pressure against the diaphragm that flexes minutely so as to vary the capacitance of an electrical field created between two surfaces. A stable, hybrid, operation amplifier assembly shall be incorporated in the transducer to excite and demodulate the sensing mechanism. The components and construction to provide a precise, reliable, stable output signal directly proportional to the sensed pressure over a factory calibrated range.
5. The transducer elements shall incorporate high over-pressure protection and shall be designed to withstand intermittent over-pressures five times the full-scale range being sensed. Metallic diaphragms shall not be acceptable as they are subject to damage or distortion. Sensing principles employing LVDTs, resistive or pneumatic elements shall not be acceptable.
6. The control panel shall include a UL-listed, intrinsic safety barrier that has been UL tested with the specific submersible transducer being furnished for this application to render the transducer suitable in a Class 1, Division 1, Group D hazardous environment such as the sewage wet well.
7. Manufacturer / Model:
   a. Us Filter-Consolidated A 1000 / Model 157GSCI
   b. Prior-approved equivalent.

Q. Primary Controller

1. The PUMP CONTROLLER/TELEMETRY UNIT shall be furnished for monitoring and automatically controlling the lift station pumps in a pump down mode of operation in response to level process variable, as based on set points that are to be configured in the field by the end

user. Unit shall be capable of communicating station status, level, alarms, and run times to a master station shall be IP addressable and shall communicate via CDMA, GSM, or other approved communications.

2. The PUMP CONTROLLER shall be a standard, catalogued product of a water and wastewater pumping automation equipment manufacturer regularly engaged in the design and manufacture of such equipment. The controller shall be specifically designed for water and wastewater pumping automation utilizing built-in preconfigured control and telemetry strategies allowing pump up or pump down mode control of from 1 (one) to 3 (three) pumps. "One of kind "systems using custom software with a generic programmable logic controller and operator interface will not be acceptable.

3. The PUMP CONTROLLER shall be designed to operate on a 20.4-28.8 VDC power source. The operating program shall be resident in non-volatile FLASH memory. The controller shall be capable of operating up to 2 (three) pumps plus high low (analog and digital) alarms. The on and off adjustments of each pump and alarm setpoint shall be full-range adjustable through the touchscreen. The controller shall show the current operating status of each control stage.

4. The PUMP CONTROLLER shall include operator adjustable on-delay timing logic to provided staggered pump starting following a power failure condition. Operator adjustable off-delay timing for each control stage shall allow for smooth transition between stages.

5. The PUMP CONTROLLER shall incorporate an integrated SD memory card slot which shall be capable of providing removable storage of historical data. Data to include pump run times, alarm history, and flow data. The data shall be presented in a CSV file format, which can easily be imported in t Microsoft Excel for manipulation and use by operating personnel.

6. The PUMP CONTROLLER shall incorporate an integral, user friendly, color, QVGA, LCD, touchscreen operator interface. The interface shall allow adjustment and viewing of all system parameters and statuses. The controller, when panel mounted, shall be NEMA 4X rated and suitable for front door mounting in locations requiring wash-down.
   - The level signal and pump statuses shall be displayed simultaneously on the main (home) screen of the controller. The level shall be presented as a vertical bargraph, as well as a large numerical read-out displaying units and tenths as a minimum. The

bargraph portion of the display shall have a minimum resolution of 100 vertical pixels to provide for high-resolution viewing of the current level.

- The controller shall have a built in process simulation capability allowing the operator to verify system operation by forcing the level control up or down via pushbutton arrows located next to the process bargraph display. The simulated value will be displayed on a separate bargraph visible during a manual simulation procedure. To prevent accidentally leaving the unit in simulation mode, the controller shall automatically restore monitored process display within 1 (one) minute of operator inactivity or immediately upon operator initiated cancellation.
- From a dedicated Setpoints button on the home screen, the operator can navigate to adjust all stage on/off setpoints as well as high and low alarm setpoints. Stage on/off and alarm setpoints shall be easily adjustable via individual up and own buttons located next to the associated setpoint display column(s).
- The controller shall provide current and historical alarm information. Active alarms shall be indicated on the main display by a red flashing indicator/button and shall (optionally) activate separate outputs for external visual and audible alarm indication/ annunciation. From the home screen, a touch of the Alarm button shall display the number of active alarms and provide the ability to view historical alarm data. The alarm historian shall be capable of storing up to 1000 alarms. All alarms shall be time and date stamped as to their occurrence, acknowledgement, and return to normal status.
- The controller shall display recorded analog data in a graphical (trend) format. The analog data available for viewing shall include the last seven days of level and influent flow (volumetric or flowmeter analog input) data in 2 hour increments. Unit shall also display the last 365 days of individual pump (flow) performance data. This data shall be accessible from the main display of the controller by pressing the Trend button.
- From the main screen of the controller, a Menu button shall be provided to grant access to higher level configuration parameters including the following:
    - Adjustment of the full-scale range indicated on the display
    - Time and date
    - Analog input calibration
    - Configuration of dynamic digital inputs and outputs
    - Telemetry port configuration
    - Security parameters
    - Side-by-side comparison of all pump data

- Pump 1,2 3; Run Time (each pump)
- Pump 1,2,3; Number of starts (each pump)
- Pump 1,2,3; Run time (each combination)
- Pump 1,2,3; Number of Starts (each combination)

7. The PUMP CONTROLLER shall monitor a 4-20mA analog input representing the process variable. The analog input circuitry shall provide galvanic isolation from the main board to the field device. Simple pushbutton calibration of level shall be easily accessible. Zero value can be offset to allow display of a pressure of level range that does not start at zero. The display ranges shall be field-configurable. This signal shall also be available for telemetry transmission.

8. The PUMP CONTROLLER shall include the ability to dynamically configure up to 16 digital inputs. Each input can be used in providing control and monitoring of any of 32 possible functions. All control algorithms shall automatically reconfigure based upon current digital input mapping. Each discrete input shall provide galvanic isolation from the main board to the field device. A separate screen shall be provided which indicates current digital input configuration and status. All discrete inputs shall be available for telemetry transmission. The following input functions shall be available for mapping to any of 16 physical digital input points:
   - Pump 1 Run
   - Pump 1 In Auto
   - Pump 1 Overtemp
   - Pump 1 Seal Fail
   - Pump 2 Run
   - Pump 2 In Auto
   - Pump 2 Overtemp
   - Pump 2 Seal Fail
   - Pump 3 Run
   - Pump 3 In Auto
   - Pump 3 Overtemp
   - Pump 3 Seal Foil
   - Float Control
   - Low Float
   - Off Float
   - Lead Float
   - Lag Float
   - Lag 2 Float
   - High float
   - 3-phase Power Fail
   - Control Power Fail
   - Alarm Silence
   - Door Switch
   - Acknowledge
   - Rain Gauge
   - Generator Running
   - Generator Alarm
   - ATS Position
   - Pump Inhibit
   - Pump 1 Fail
   - Pump 2 Fail
   - Pump 3 Fail

9. The PUMP CONTROLLER shall include the ability to dynamically configure up to 10 relay outputs. Each output can provide control based upon any of 20 possible functions. All control algorithms shall automatically reconfigure based upon current output mapping. A separate screen shall be provided which indicates current output configuration and status. All output status shall be available for telemetry transmission. The following output functions shall be available for mapping to any of the 10 physical relay output points:
   - Pump 1 Required
   - Pump 2 Required
   - Pump 1 Overtemp
   - Pump 1 Seal Fail
   - Pump 1 Running
   - Pump 2 Running

- Pump 3 Required
- Visual Alarm
- Audible alarm
- High Level Alarm
- Pump 2 Overtemp
- Pump 2 Seal Fail
- Pump 3 Overtemp
- Pump 3 Seal Fail
- Power Fail
- Pump 3 Running
- Pump 1 Alarm
- Pump 2 Alarm
- Pump 3 Alarm

10. The PUMP CONTROLLER shall be protected from unauthorized changes via built-in system security. There shall be 3 levels of security provided. For each level, the unit shall support a different 4-digit access code (PIN) which shall allow an authorized operator to manipulate controller settings based upon their security level. The first level shall allow viewing of all controller data. In addition to the features of the first level, the second level of security allows viewing and modification of all controller data (including setpoints) with the exception of equipment runtimes, flow totals, and pump starts. The third level of security allows all the functions of the previous two levels with the additional ability to modify equipment runtimes, flow totals, and pump starts and the ability to assert a controller reset function.

11. The PUMP CONTROLLER shall provide 2 (two) 4-20 mA output signals for interface to external equipment including VFDs, Chart Recorders or other analog devices. Analog outputs can be configured to provide representation of scaled process variable for retransmission, or as a process control output for interface to VFDs, Valves, or other controlled device.

12. The PUMP CONTROLLER shall be capable of monitoring inputs from float or pressure switches representing high and low (*Level/Pressure*). The controller shall annunciate these inputs as alarms and optionally use them to provide back-up control in the event of primary (analog) sensor failure. Unit will provide local alarm indication and utilize the inputs to cycle pumps on and off to maintain system operation.

13. The PUMP CONTROLLER shall have built-in operator adjustable alternation sequences allowing for equal wear of the pumps and to account for variations in pump equipment size and availability. The following alternation sequences shall be supported:
    - Fixed
    - First On First Off (FOFO)
    - Jockey

14. The PUMP CONTROLLER shall incorporate built-in pump failure detection logic. In the event any pump has been called into operation and the pump run signal is not received within an operator-adjustable

time period, a pump failure condition shall be executed. The failed pump shall be disabled, an alarm shall be displayed, and the next available pump (based on the selected alternation sequence) shall be requested to start. The pump shall remain in a failed state until the alarm condition has been cleared and the failure has been reset.

15. The PUMP CONTROLLER shall include integral intrusion detection logic that will monitor an external sensor (motion, door switch, etc.) and allow authorized access to the station via entry of proper security code PIN or assertion of the door acknowledge input. The intrusion system, upon detection of entry, will allow a configurable amount of time for an operator to enter the proper code (or assert the input) before determining an intrusion. Additionally, the controller shall allow a configurable amount of time for re-securing the site before automatically re-arming.

16. The PUMP CONTROLLER shall include a volumetric lift station flow and pump performance monitoring capability allowing station flow measurement without the use of an in-line flow meter. In addition to flow measurement, the controller shall provide pump performance related information. Pump station flow and pump performance data shall be visible locally and available for telemetry transmission to a master station. The following information is to be provided:
    - Average Station Influent Flow Rate (GPM)
    - Maximum Station Influent Rate (GPM)
    - Current Day Total Effluent Flow (KGal)
    - Previous 7-days' Total Effluent Flow (KGal)
    - Maximum Daily Effluent Flow (KGal)
    - Total Station Effluent Flow (KGal)
    - Average Flow Rate; Pump 1, 2, 3; Over last 365 days (GPM; each pump)
    - Average Flow Rate; Pump 1, 2, 3; Over last 3 cycles (GPM: each pump)
    - Total Flow; Pump, 1, 2, 3; (KGal; each pump)
    - Total Flow; Pumps 1, 2 (KGal; combined)
    - Total Flow; Pumps 1, 3 (KGal; combined)
    - Total Flow; Pumps 2, 3 (KGal; combined)
    - Total Flow; Pumps 1, 2, 3 (KGal; combined)
    - Pump 1, 2, 3 Low Flow; Alarm Setpoint (each pump)

17. The PUMP CONTROLLER shall have 2 (two) RS-232 / RS-485 serial communication ports that shall be available for telemetry communication. The RS-232 / RS-485 serial ports shall support open

communication standards including, as a minimum, MODBUS RTU or ASCII, Allen-Bradley DF1 half-duplex slave mode. Unit shall support communication data rates of 300 to 115,200 baud rates. An optional, integral Ethernet communication port shall be available. With the Ethernet option, MODBUS TCP shall be supported.

18. The PUMP CONTROLLER shall be constructed for application in harsh industrial environments. Unit shall have an operating temperature range of 0 to +50 Deg C, and be able to operate in environments with 5-95% humidity (non-condensing). Unit shall be UL Listed and in compliance with FCC part 15 Class A emissions.

19. The PUMP CONTROLLER shall provide for all connections to be made via plug-in terminal blocks with a minimal rating of 10 Amps, 300 Volts and capable of accepting wire sizes of 26-12 AWG.

20. It is the intention of this specification that a standard controller/transceiver be provided, with all of the control and communications features described, as a fully-integrated assembly. The Manufacture / Model:

    a. Quality Control & Integration Model 1500ct.
    b. Siemens – LC -150
    c. Or prior –approved equivalent.

R. REDUNDANT LIQUID LEVEL RESPONSIVE ALARM/CONTROL- **2-FLOAT** CONFIGURATION

1. The Independent alarm/control panel equipment shall be designed to UL Industrial Control Panel standards and shall incorporate 120 VAC input power transient protection, a fused primary and a DC power supply with limited 12VDC to power the intrinsic safety barrier level sensing float circuit(s).

2. The redundant control shall operate in conjunction with necessary direct-acting float switches (as specified elsewhere) to provide back up control of lift pumps, detection of high level and to protect the pumps from damage that may result from low wet well levels. The system shall monitor the float switch inputs and provide local indication of system operation. Relay contacts shall be interfaced to alarm circuitry and pump motor starter pilot circuitry. The back up system shall not interfere with primary controller operation when wet well levels are primary control and sensor system and

within normal operation range. The backup system will only become active, and bypass the primary control and sensor system and assume full control; in the event wet well levels go outside of normal operating range. Back up sensors shall be mounted and configured to operate outside primary controller setpoint settings.

3. Upon detection of abnormally high wet well level the back up system shall provide independent dedicated high level alarm indication and contact closure output for activation of common alarm system. The back up system shall also provide independent dedicated control output active indication and dual isolated outputs suitable for direct interface to motor starter pilot circuits to activate both lift pumps. The high level alarm signal shall be deactivated upon lowering of wet well level below the high alarm sensor. The pumps will remain on until wet well level drops below a separate pump off sensor. Pump off sensor shall be mounted at a level that is below the normal operating range of the primary controller setpoint setting.

4. The redundant control/alarm pump control module shall be completely integrated in the specified control panel and system as described and in accordance with all applicable codes and job requirements.

5. The redundant high level alarm/pump control module shall connect to the float switch level sensors through a control panel mounted UL Listed intrinsic Safety barrier. The module shall provide an intrinsically safe interface for up to two sensors located in a hazardous area (the wet well) rated Class 1, Division 1 or 2, Groups A,B, C and D, and Class 11, Division 1 or 2, Groups E, F, and G.

S. REDUNDANT CONTROL LEVEL SENSORS

Small Diameter Eco Floats

1. The contractor shall furnish, Install, and wire the floats for back up control.

2. Each float shall have molded polyethylene body, internal redundant polyurethane foam flotation, non- mercury and cable connections and fine-stranded AWG #18 cables with heavy-duty synthetic rubber jacket in lengths required to run un-spliced to the control panel. The floats shall include internal weight allowing suspended operation without the use of special pipe or suspension mounting systems.

3. The float switches shall be manufactured by Anchor Scientific.

4. One new stainless cable rack shall be supplied for hanging floats.

T. OVER-TEMPERATURE PUMP PROTECTION & PUMP SEAL FAILURE ALARM.

1. Over-temperature protection shall be provided in the control panel to operate in conjunction with the over-temperature switch in each pump motor. The control shall provide pump operation lockout upon the occurrence of high temperature.

2. The circuitry shall also include a 30.5 mm diameter, NEMA Type 4X, red " pump overtemp" shutdown alarm indicating light (with front replaceable bulb) and a 30.5mm diameter, NEMA Type 4X, manual reset push-button on the operator's door for each pump motor.

3. An operator's door mounted 30.5 mm diameter, NEMA Type 4 red seal fail alarm light (with front replaceable bulb) and a panel mounted seal leakage relay (to operate with the pump seal leak sensor) shall be provided to indicate a pump seal failure alarm condition for each sewage pump. The seal leakage relay shall be of solid state design incorporating LED for visual indication of sensor activation. Unit shall include built in low voltage sensor and electrical surge protection. Unit shall be CSA approved and UL recognized.

U. ALARM DIALER

1. The Alarm Dialer shall be flush panel mounted per Manufacturers specifications.
2. Manufacturer/ Model
   a. Antx, Inc. / Dialog Scout
   b. No substitutions.

V. GENERATOR REPEPTACLE

A generator receptacle shall be provided and mounted on the side of the enclosure by the panel manufacturer. The Generator receptacle shall be of the metallic NEC style configured to UL 1686 specifications. Receptacle must be suitable for NEMA 4X environments. Cable clamps must be of contoured smooth 2-screw design. Wire terminals must be of the increased safety design. The receptacle shall be Crouse Hinds AR1041 S22, or equal, rated at 100 Amperes, 600 VAC/250 VDC.

The generator receptacle shall be style 1 (grounded through receptacle collar).

W. UNDER VOLTAGE / OVERVOLTAGE PUMP PROTECTION

1. A power monitor shall be provided to monitor incoming voltage and provide protection to the motors. The power monitor shall be manufactured by SymCom or approved equal. The power monitor shall detect incoming service abnormalities including over voltage, under-voltage and rapid cycling protection and provide automatic cutout of pumps and provide local alarm. Upon detection that incoming power has returned to normal, the unit will restore pump operation and discontinue alarm. The power monitor shall be protected against overcurrent by the use of separately mounted extractor-type line voltage fuses. This device shall have a nominal 2-4 second dropout delay and (2-300 second) adjustable restoration time delay.

2. The power monitor shall have built in dual color LED indicator. The indicator shall be green when system is normal shall turn red upon detection of proper power. The unit shall protect itself from voltage spikes and transients with internal transient protection meeting IEEE 587 standards.

3. The power monitor system shall also include a stagger time delay function providing time delay between lead and lag pump start to eliminate simultaneous start of motors upon return of system power. This feature shall be operation in all modes of pump operation.

X. Pumps

The plans and following pump specifications are based on equipment as manufactured by Flygt. Pumps for use on this project shall be as manufactured by Flygt, Hydromatic or KSB. Other pumps will not be accepted.

1. Pump Requirements

Furnish and install two explosion proof submersible non-clog waste water pumps. The new pumps will replace two existing Hydromatic 3.0 hp model S4N300M3-4 pumps. The new pumps shall be fitted with new base elbows and stainless steel slide system. All required bolts and fittings shall be stainless steel. Each new pump shall be equipped with a 3 hp premium efficient submersible electric motor and connected for operation on 240 volts, single phase, 60 hertz, 2 wire service with * feet of submersible cable (SUBCAB) suitable for submersible pump applications. The pump shall be supplied with a mating cast iron minimum 4-inch discharge connection and be capable of delivering 100 GPM at 24 feet TDH. Each pump shall be fitted with

a stainless steel lift handle and * feet of stainless lifting chain. The working load of the lifting system shall be 50% greater than the pump unit weight.

*The CONTRACTOR shall verify length of submersible cable and lifting chain prior to ordering pumps.

2. Design

The pumps shall be automatically and firmly connected to the discharge connection guided by no less than two guides extending from the top of the station to the discharge connection. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. No portion of the pump shall bear directly on the sump floor.

3. Pump Construction

Major pump components shall be of grey cast iron, ASTM A-48, Class 30, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts and lifting ring shall be AISI type 304 stainless steel or brass construction. 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 alkyd primer with a chlorinated rubber 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 or Viton rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross-sectioned 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.

4. Cooling System

Motors are sufficiently cooled by the surrounding environment or pumped media. A water- cooling jacket is not required.

5. 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 a single cylindrical elastomer grommet, flanked by washers all have a close

tolerance fit against the cable outside diameter and the inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry design shall insure that no entry of moisture internal to the pump or terminal board is possible even if cable is damaged or severed below water level.

6. Motor

The pump motor shall be induction type wi8th a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber, NEMA B type. The stator windings and store loads shall be insulated with moisture resistant Class F insulation rated for 311 F (155 C). The stator shall be dipped and baked three time in Class F varnish and shall be heat – shrinked fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 104 F (40 C) and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 260 F (125 C) shall be embedded in the stator lead 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 motor and pump shall be designed and assembled by the same manufacturer.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.5. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 104 F (40 C) ambient and with a temperature rise not to exceed 176 F (80). A performance chart shall be provided 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 shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 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.

7. Bearings

The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The calculated B10 bearing life rating shall be 40,000 hours minimum. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces.

8. Mechanical Seal

Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in an oil reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the oil chamber, shall contain one stationary and one positively driven rotating tungsten-carbide or silicone carbide ring. The upper, secondary seal unit, located between the oil chamber and the motor housing, shall contain one stationary ceramic or cast chrome seal ring and one positively driven rotating carbon seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable.

Each pump shall be provided with an oil chamber for the shaft sealing system. The oil chamber shall be designed to prevent over filling and provide oil expansion capacity. The drain and inspection plug, with positive ant-leak seal shall be easily accessible from outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry with damage while under load.

9. Pump Shaft

Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft shall be AISI type 420 stainless steel or ASTM A576 GR carbon steel.

If a shaft material is not 420 stainless steel, a shaft sleeve of 420 stainless steel shall be used to protect the shaft material.

10. Impeller

The impeller(s) shall be of gray cast iron, Class 30 or 40B, dynamically balanced, and double shrouded non- clogging design having a long

throughlet without acute turns. The impeller(s) shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. A vortex impeller shall be used. Mass moment of inertia calculations shall be provided by the pump manufacturer upon request. Impeller(s) shall be, retained with an Allen head bolt and shall be capable of passing a minimum 3 – inch diameter solid. All impellers shall be coated with alkyd resin primer.

11. Wear Rings

A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impellers. The wear ring shall be sewage pump standard, replaceable, hard metal wear rings with a Brinell hardness rating greater than 200.

12. Volute

Pump volute(s) shall be single-piece grey cast iron, Class 30, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be specified.

13. Protection

All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 260 F (125 C) the thermal switches shall open, stop the motor and activate an alarm.

A leakage sensor shall be provided to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS sends an alarm.

The thermal switches and FLS shall be connected to a Flygt Mini CAS (Control and Status) monitoring unit or equivalent unit. The mini CAS shall be designed to be mounted in any control panel.

PART 7- EXECUTION

7.1 Start up Services

A. The equipment manufacturer shall furnish the services of a qualified trained field service engineer for one 8-hour working day at the site to inspect the installation and instruct the OWNER"S personnel on the operation and maintenance of the Control Panel and pumping units. After the pumps have been completely installed and wired, the OWNER shall have the manufacturer do the following at a minimum

1. Megger stator and power cables
2. Check seal lubrication
3. Check for proper rotation
4. Check power supply voltages
5. Measure motor operating load and load current
6. load and no load current
7. Check level control operation and sequence
8. Perform pump test to demonstrate pumps operate at design capacity.
9. Provide written start-up report.

During this initial inspection, the manufacturer's service representative shall review recommended operation and maintenance procedures with the OWNER'S personnel.

7.2 Supplies

A. Contractor shall provide all expendable items such as lamp, fuses, etc. for system start-up and check out.

B. At final completion, Contractor shall furnish the following expendable items:

1. Twenty percent (20%) spare fuses and lamps of each type furnished, but not less than two (2) of each type.

7.3 Spare Parts

A. Contractor shall furnish the following spare parts to the Owner. Spares shall be delivered in boxes labeled on the outside with manufacturer and part number identified on the box:

1. One (1) three phase power monitor relay.
2. One (1) each of every type of control relay used on the project.

PART 8. WARRANTY

A. Control Panel

Contract shall warranty all equipment against defects in material and workmanship for a period on one year from the date of Owner's final inspection and acceptance to the effect that any defective equipment shall be repaired or replaced without cost or obligation to the Owner.

B. Pumps

In Addition to the general guarantee required elsewhere in these specifications, the pump manufacturer and lift station supplier shall furnish OWNER with a warranty to cover the pumps, and motors against defects workmanship and material under normal use and service for a minimum of of five years.