



October 10, 2024

**CITY OF TOLAR, TEXAS
WASTEWATER TREATMENT PLANT IMPROVEMENTS**

Addendum No. 4

Attention is called to the following modifications to the referenced Plans, Specification and Contract Documents for the above referenced project. The City of Tolar (City) will receive sealed Bids for the Wastewater Treatment Plant Improvements Project at **Tolar City Hall** located at **8712 W. Highway 377, Tolar, Texas 76476**, until **Tuesday, November 12, 2024**, at **2:00 p.m.** local time. We hereby modify the documents as follows:

BID DOCUMENTS:

1. **REPLACE** all references to the proposed bid opening dates in the Contract Documents from October 15, 2024, with **Tuesday, November 12, 2024**, at 2:00 p.m.
2. **REPLACE** all references to the Request for Information (RFI) deadline date from October 10, 2024, with **Thursday, October 31, 2024**, at 5:00 p.m.
3. **REPLACE** all references to the Substantial completion date from 365 days, with **545** days; and **REPLACE** all references to the Final completion date from 420 days, with **605** days.

SPECIFICATIONS:

1. **ADD** Section 13310 *I&C Field Instrumentation*.
2. **ADD** Section 13312 *I&C Control Devices*.
3. **ADD** Section 13315 *I&C Control Panels*.
4. **ADD** Section 13322 *I&C Network and Communications Equipment*.
5. **ADD** Section 13441 *Control Strategies*. This specification provides clarification of the SCADA requirements based upon questions received during the pre-bid conference.

DRAWINGS:

1. **REPLACE** drawing 08E-03 *Modified Site Electrical Plan* with the attached.
2. **REPLACE** drawing 08E-18 *Conduit Schedule* with the attached.

3. **ADD** drawing 08E-26 *Network Diagram*. This drawing is provided to clarify the integration of the SBR system into the new main plant SCADA.
4. **ADD** drawing 08E-27 *I-O List Main SCADA & RTU-BB Panels*.

CLARIFICATIONS:

1. The plant water pumps in Section 11317 *Plant Water Pump Station Equipment* are required to be self-priming as the non-potable water source is the buried chlorine contact basin.

This addendum consists of forty three (43) pages and becomes a part of the referenced plans, specifications and contract documents and shall be acknowledged by the proposer and attached to the sealed proposal submitted.

Brittany D. White

By Brittany White, P.E.
Project Engineer



10/10/2024

TECHNICAL SPECIFICATIONS

SECTION 13310

I&C FIELD INSTRUMENTATION

PART 1 GENERAL

1.1 SUMMARY:

A. Scope:

1. This Specification Section covers work related to the various field instruments to be supplied with the Control System.
2. Field instrumentation, as specified herein, shall be furnished by the same SYSTEM SUPPLIER furnishing services and equipment as outlined in 13300.

1.2 SUBMITTALS:

A. Submit the following Field Instrumentation Shop Drawings in a single package:

1. Catalog information, descriptive literature, wiring diagrams, and shop drawings on all components of the field instruments, including all miscellaneous electrical and mechanical devices furnished under this section.
2. Individual data sheets for all components of the field instruments to supplement the above information by citing all specific features for each specific component (e.g. scale range, materials of construction, special options included, etc.). Each component data sheet shall bear the component name and instrument tag number designation shown in the Drawings and Specifications.
3. Installation details for all field mounted devices to show conformance with the Contract Documents.
4. Configuration documentation for all programmable devices to indicate actual settings used to set the device scale, range, trip points, and other control parameters.
5. Proposed tag numbers for each specific instrument.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS:

- A. Equipment to be installed in a hazardous area shall meet Class, Group, and Division classification as shown on the Contract Electrical Drawings, or comply with the local or National Electrical Code, whichever is the most stringent requirement.
- B. All instruments requiring plumbing shall utilize stainless steel components as follows:

1. Test Tap: Shall consist of Crawford Fitting Co. Swagelock quick connects Series QC4-DE, or equal.
 2. Tubing, Stainless Steel: Shall be ASTM A 312, TP 316, seamless, soft annealed with 0.065 inch wall. Fittings shall be ASTM A 276, TP 316 compression or socket weld type.
 3. Valve, Ball: Shall be stainless steel ball valves, Whitey Series 40, Hoke Flamite Series 7100, or equal.
- C. All instruments shall be provided with mounting hardware and floor stands, wall brackets, or instrument racks.
- D. All transmitters shall be provided with either integral indicators or conduit mounted indicators in process units, accurate to two percent. Indicator readouts shall be linear in process units.
- E. Electronic equipment shall utilize printed circuitry suitably coated to prevent contamination by dust, moisture and fungus. Solid-state components shall be conservatively rated for their purpose, to assure optimum long-term performance and dependability over ambient atmosphere fluctuations and 0 to 100 percent relative humidity. The field mounted equipment and system components shall be designed for installation in dusty, humid, and slightly corrosive service conditions.

2.2 FIELD INSTRUMENTS:

- A. Provide the filed instrumentation shown the Special Device Table included on the contract drawings, or as specified herein.

2.3 SPARE AND EXPENDABLES:

- A. Provide the following spare parts:
1. One spare sensor of each type used.
 2. Ten spare fuses of each type and rating installed.
 3. One spare surge protection device.
- B. Provide the following expendables:
1. One year's (or shelf life worth if less than one year) supply of buffer and reagents used for analyzers.

PART 3 EXECUTION

3.1 INSTALLATION:

- A. Install the Control System field instrumentation in strict accordance with the respective manufacturer's instructions and recommendations, in locations as shown on the Drawings, and as indicated on the installation details of the Drawings.

- B. Fully Calibrate each instrument.
- C. Provide surge protection enclosures to the electrical sub-contractor for mounting and installation. The enclosures shall be fully wired internally. Coordinate grounding requirements with Division 16, Electrical.

3.2 TRAINING:

- A. Two days of on-site (field) training shall be conducted at the OWNER's plant site and shall provide detailed hands-on instruction to OWNER's personnel covering all supplied field instruments.
- B. Training shall include:
 - 1. calibration procedures.
 - 2. preventive maintenance methods and timing.
 - 3. fault-finding techniques.

END OF SECTION

SECTION 13312

I&C CONTROL DEVICES

PART 1 GENERAL

1.1 SUMMARY:

A. Section Includes:

1. Pilot Devices:

- a. Selector switches.
- b. Pushbuttons.
- c. Indicating lights.
- d. Potentiometer.

2. Relays/timers

- a. Control relays
- b. Time delay relays.

- 3. Pump alternators.
- 4. Phase failure relays.
- 5. Signal isolators.
- 6. Miniature circuit breakers.

- B. Supersedes: This specification supersedes all major equipment items 11000 series specifications with sections containing control requirements. Features and options indicated in these 11000 series specifications are to be retained and included along with additional features, options, materials, submittals, and requirements stated here.

1.2 REFERENCES:

A. National Electrical Manufacturers Association (NEMA)

- 1. 250, Enclosures for Electrical Equipment (1000 volts Maximum)
- 2. ICS 2, Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts

B. ANSI/NFPA 70 - National Electrical Code (NEC).

C. Underwriters Laboratories, Inc. (UL).

D. Factory Mutual (FM).

E. American National Standards Institute (ANSI).

1.3 SUBMITTALS:

- A. Conform to Sections regarding submittal procedures.

- B. Product Data: Provide manufacturer's product literature and specifications.

1.4 REGULATORY REQUIREMENTS:

- A. Conform to requirements of ANSI/NFPA 70 (NEC).
- B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown; install in accordance with UL requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS:

- A. Acceptable Manufacturers
 - 1. Subject to compliance with the Contract Documents, the manufactures listed in the applicable articles below are acceptable.
 - 2. Provide similar components from the same manufacturer for uniformity of appearance, operations, and maintenance.
- B. Substitutions: Comply with sections regarding substitutions.

2.2 SELECTOR SWITCHES, PILOT LIGHTS, AND PUSHBUTTONS:

- A. Manufactures:
 - 1. Square D Class 9001, Type K
 - 2. Allen Bradley 800T
 - 3. Eaton 10250T
 - 4. Pre-approved equal
- B. Construction:
 - 1. NEMA 4X
 - 2. Heavy duty
 - 3. Oil-tight
 - 4. Dust-tight
 - 5. Water-tight
 - 6. 30.5 mm diameter
 - 7. Provide nameplates as required for application or as indicated on drawings.
- C. Selector Switches:
 - 1. Position switches
 - a. Maintained contact type.
 - b. Knob type operator.

- c. Provide position switches as required to perform functions specified or shown in drawings:
 - i. Two-position
 - ii. Three-Position
 - iii. Four-Position
 - 2. Contact Blocks:
- D. Provide contacts as required to perform functions specified or shown in drawings.
 - 1. Double break.
 - 2. AC Rating:
 - a. 7,200 VA make
 - b. 720 VA break
- E. Pilot Lights:
 - 1. LED type
 - 2. Lenses:
 - a. Glass type
 - b. Color as appropriate for application or as indicated on drawings.
 - c. Interchangeable
 - d. Push to test
 - e. Voltage as required
- F. Pushbuttons:
 - 1. Flush mounted.
 - 2. Black button color, unless otherwise noted.
 - 3. Contacts
 - a. Double break.
 - b. Momentary or maintained contacts as appropriate for application or as indicated on drawings.
 - c. AC Rating:
 - i. 7,200 VA make
 - ii. 720 VA break
- G. Potentiometers:
 - 1. Linear adjustment through 0-1,000 ohm with 1 percent resolution.
 - 2. Three-wire interface.
 - 3. Dial plate with 0-100 percent scale.
 - 4. One-turn adjustment knob.

2.3 CONTROL RELAYS:

- A. Manufacturers:
 - 1. Square D
 - 2. Allen Bradley
 - 3. IDEC
 - 4. Pre-approved equal
- B. DIN rail mounted Plug-in socket.
- C. Clear polycarbonate dust cover with clip fastener.
- D. Internal LED indicator when coil is energized.
- E. Check button.
- F. Temperature rise:
 - 1. Coil 85 DegF max.
 - 2. Contact 65 DegF max.
- G. Insulation resistance: 100 Meg min.
- H. Frequency response: 1800 operations/hour.
- I. Operating temperature: -20 to +150 DegF.
- J. Lift expectancy:
 - 1. Electrical: 500,000 operations or more
 - 2. Mechanical: 50,000,000 operations or more.
- K. Four (4) single-pole double-throw contacts rated 10A at 120V.
- L. Coil voltage as required.

2.4 TIME DELAY RELAYS:

- A. Manufacturers:
 - 1. ATC
 - 2. Idec
 - 3. Macromatic
 - 4. Eagle Signal Controls
 - 5. Pre-approved equal
- B. Melt design test and performance requirements of NEMA ICS 2-218.
- C. Heavy-duty.
- D. Solid-state construction.

- E. External adjustment dial.
- F. DIN rail mounted Plug-in socket.
- G. Two (2) single-pole double-throw switches rated 5A at 120V.
- H. Auxiliary relays as required to perform functions specified or shown in drawings.
- I. LED indication during time cycle.
- J. Power source voltage as required.
- K. Operation Modes:
 - 1. On-Delay Relay
 - a. Five (5) time ranges.
 - b. .02 seconds to 30 minutes or as required to perform functions specified or shown in drawings.
 - 2. Instantaneous Open, Time Delay Close.
 - a. 1.5 seconds to 15 seconds or as required to perform functions specified or shown in drawings.
 - 3. Or operation modes as required to perform functions specified or shown in drawings.

2.5 ELAPSED TIME METERS:

- A. Manufacturers:
 - 1. Cramer 635s/Hrs
 - 2. Quartz 722-0004
- B. Six (6) digits.
- C. Non-resettable.
- D. Voltage as required.

2.6 TIMERS:

- A. 24 Hour Clock Timer (Repeat Cycle)
 - 1. Manufacturers:
 - a. Tork Time Controls
 - b. Intermatic
 - c. Pre-approved equal
 - 2. Surface mount.

3. 24-hour LCD display.
4. One (1) single-pole double-throw contact rated 20A at 120V.
5. 288 setpoints per 24 hours.
6. 1 to 7-day skip feature.
7. Time cycle programmable by keyboard.

B. Interval/Duration Timer

1. Manufactures:
 - a. ATC
 - b. Pre-approved equal
2. DIN rail mounted plug-in base with dust tight cover.
3. Time range as indicated on drawings.
4. Two (2) single-pole, double-throw contacts rated 10A at 120V.

2.7 PRESSURE SWITCHES:

- A. Manufacturers:**
1. Mercoird (No substitutions).
- B. Electronic Pressure Switch**
- C. ¼ " male NPT process connection**
- D. 316L SS**
- E. 4-20mA Output**
- F. Pressure Ranges**
1. As required for process:
 - a. 0-20 psig EDAW-N1-E1-02-T1
 - b. 0-60 psig EDAW-N1-E1-03-T1
 - c. 0-100 psig EDAW-N1-E1-04-T1

2.8 EXTERIOR MOUNTED FLASHING BEACON:

- A. Manufactures:**
1. Edwards Model No. 48XBRMR120A
 2. Or Equal
- B. NEMA 4X**
- C. Red Polycarbonate Lens**
- D. -31 to +150 DegF Operating Range**

2.9 ALTERNATORS:

- A. Provide the following types of alternators to perform functions specified or shown in drawings:
 - 1. Two (2) Pump Lead/Lag
 - a. Alternate two pumps in a lead/ lag sequence.
 - b. Toggle switch to lock operating sequence.
 - c. Din rail mounted plug-in base.
 - d. LED indicating lights.
 - e. 120VAC.
 - f. 10A contacts at 120V.
 - g. Time Mark 2611 or equal.
 - 2. Two (2) Pump Duplexer
 - a. Toggle switch to lock operating sequence.
 - b. DIN rail mounted plug-in base.
 - c. LED indicating lights.
 - d. 120VAC.
 - e. 10A contacts at 240V.
 - f. Diversified Electronics ARA-120-ABA
 - 3. Three (3) Pump Triplexor
 - a. Selector switch to lockout pump.
 - b. DIN rail mounted plug-in base.
 - c. LED indicating lights.
 - d. 120VAC.
 - e. 10A contacts at 240V.
 - f. Diversified Electronics ARA-120-AHE

2.10 PHASE FAILURE PROTECTION DEVICES:

- A. Diversified Electronics Model No. SLD-440-ALE, 480 Volt, three-phase.
- B. Diversified Electronics Model No. SLD-220-ALE, 240 Volt, three-phase.
- C. Macromatic Model No. PMDU, 208-480 Volt, three-phase.

2.11 FLOAT SWITCH:

- A. Manufactures:
 - 1. Siemens 9G
 - 2. Anchor Scientific
 - 3. Pre-approved equal
- B. Direct acting switch
- C. Teflon coated 316 SS Float Switch

D. 60' cable

2.12 SUBMERSIBLE PUMP PROTECTION MODULE:

- A. As provided by pump vendor.
- B. Winding overtemp alarm, indication, and protection.
- C. Seal leak alarm, indication, and protection.
- D. Manual reset pushbutton.

END OF SECTION

SECTION 13315

I&C CONTROL PANELS

PART 1 GENERAL

1.1 SUMMARY:

- A. Section Includes: SYSTEM SUPPLIER Control Panels and Motor Controllers for use on AC circuits rated 600 V or less.
- B. Supersedes: This specification supersedes all major equipment items 11000 series specifications with sections containing control requirements. Features and options indicated in these 11000 series specifications are to be retained and included along with additional features, options, materials, submittals, and requirements stated here.

1.2 REFERENCES:

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. ANSI/NFPA 70 - National Electrical Code (NEC).
- C. Underwriters Laboratories, Inc. (UL).
- D. Factory Mutual (FM).
- E. American National Standards Institute (ANSI).

1.3 SUBMITTALS:

- A. Conform to Section 01300 - Submittal Procedures.
- B. Product Data: Provide manufacturer's product literature and specifications.
- C. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- D. CPT Sizing Information: Provide Manufacturer's 120V load analysis as required in Section 2.06.

1.4 REGULATORY REQUIREMENTS:

- A. Conform to requirements of ANSI/NFPA 70 (NEC).
- B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown; install in accordance with UL requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS:

A. Acceptable Manufacturers

1. Hennessey Products, Inc.
2. Hoffman Engineering.
3. The EMF Company.
4. Weigman Company.
5. N.E.M.A. Enclosure Mfg. Co.

B. Substitutions: Comply with Section 01630 - Product Substitutions and Procedures.

2.2 PANEL MATERIALS:

A. All outdoor enclosures are to be stainless steel rated NEMA 4X or NEMA 3R as indicated on plans.

B. All indoor enclosures in non-air conditioned spaces are to be stainless steel rated NEMA 4X or NEMA 3R as indicated on plans.

C. All indoor enclosures in air conditioned spaces are to be painted steel rated NEMA 1 or NEMA 12.

D. Backpanel for mounting components is to be 12 gauge steel minimum finished in white enamel.

E. Power Supplies.

1. Uninterruptible power supplies (UPS) or battery backup system shall be provided in all SCADA monitoring and control panels as follows:

- a. Size the supplies for all internal equipment plus an additional 20% spare capacity.
- b. Provide 60 minutes battery back-up capability at full load.
- c. Provide relay option card for indication of "On UPS Power" and "Low Battery Level".
- d. For outdoor panels provide an UPS and battery rated for operation at up to 50 degrees C.
- e. Provide manufacturer's hot-swappable maintenance bypass switch.

2. Provide isolated DC power for field transmitters and devices as specified and/or shown in the Contract Drawings.

3. Analog signal loop power supplies shall be redundant.

F. Wiring:

1. Power wiring shall be 300 volt, type THWN stranded copper, No. 14 AWG size, for 120V service.
2. Discrete wiring shall be 300-volt type THWN stranded copper, sized for the current carried, but not smaller than No. 16 AWG.
3. Analog signal wiring shall be 300 volt, stranded copper in twisted shield pairs, no smaller than No. 18 AWG.
4. Panel wiring shall be routed within wire troughs or panduits.
5. Hinge wiring shall be secured at each end with the bend portion protected by a plastic sleeve.
6. Analog or dc wiring shall be separated from any ac power or control wiring by at least six inches.
7. Each wire shall be uniquely identified using plastic, snap-on or permanent adhesive wrap-on numbered tags.
8. Terminal blocks shall be provided for all field wiring entering the panel. Surge suppression shall be provided for all outdoor field wiring entering or leaving the panel. Five (5) spare terminal blocks shall be provided.
9. No more than one wire per screw and yoke termination.

G. Doors:

1. All control panels shall have a hinged door for ease of access. A minimum of 80% of the panel interior shall be exposed by doors.
2. Panel door openings shall be sealed and fully gasketed.
3. The inside of each door shall be equipped with a print pocket.
4. Two-door enclosures shall have a removable center post.
5. Sealed panel doors shall be equipped with quick-release latches.

H. Miscellaneous Equipment:

1. All panels shall be protected from internal corrosion by the use of corrosion – inhibiting vapor capsules, Northern Instruments Model Zerust VC, Hoffman, model A-HCI, or equal.
2. All sealed panels shall be equipped with combination drain/breathers, Crouse-Hinds model ECD18; or equal.
3. When noted on drawings, panels shall be equipped with thermostatically controlled space heaters to maintain internal temperatures above dew point.

2.3 MOTOR PROTECTION:

A. Motors Powered and Controlled by SYSTEM SUPPLIER'S Control Panel.

1. Motor disconnects shall be MCP type circuit breakers.
2. All three phase motors controlled by the SYSTEM SUPPLIER'S Control Panel shall have phase failure protection via phase failure monitoring relay or solid state overloads that feature phase failure protection.
3. For motors of 75HP or greater, include an adjustable cool down timer to prevent exceeding motor manufacturer's recommended starts per hour limit.

B. Motors Powered by Others and Controlled by SYSTEM SUPPLIER'S Control Panel.

1. A phase failure contact (open on fail) will be provided by others for use by the SYSTEM SUPPLIER'S Control Panel.
2. For motors of 75HP or greater, include an adjustable cool down timer to prevent exceeding motor manufacturer's recommended starts per hour limit.

2.4 PLANT MAINS AND GENERATOR PROTECTION:

- A. All individual motors or other loads powered by the SYSTEM SUPPLIER'S Control Panel or powered by others but controlled by the SYSTEM SUPPLIER'S Control Panel of 15 HP or greater shall have adjustable power on time delays of up to three minutes. Timer adjustments are to be coordinated with other plant loads to avoid simultaneous starts of multiple loads affecting feeders, mains, and generators.

2.5 DESIGN FOR CONTINUOUS OPERATION

- A. Excluding specifically intended batch operation panels, all control panels shall be configured to remain operable after short duration power failures using HAND-OFF-AUTO switches or RUN/STOP maintained toggle switches. START/STOP pushbuttons, PLC, or other control functions that interrupt continuous operations for non-batch applications and require operator action to reactivate panel processes require submittal and prior approval.

2.6 CONTROL POWER TRANSFORMER (CPT) SIZING:

- A. SYSTEM SUPPLIER is to submit a CPT sizing load analysis as part of product submittals. CPT size should include all loads indicated on the plans and all supplied loads required as part of this specification plus an additional 50%.

2.7 DEAD FRONT OPERABILITY:

- A. Panel construction shall result in dead front operability for all operator functions. If normal operator functions require opening of the panel door, the panel shall be equipped with a 3-point latch and the operator shall remain shielded from any live exposed components.

2.8 CONTROLS DOCUMENTATION:

- A. Control diagrams submitted under Section 1.02 shall be electrically complete and encompass all control components and their location. This shall include phase failure relays, RUN/STOP switches, SCADA contacts, emergency STOP push buttons, permissive switches, and other components that may be remote to the SYSTEM SUPPLIER'S Control Panel. Operating entity will have a single document for troubleshooting specific equipment items. Failure to comply with this Section will result in rejection of SYSTEM SUPPLIER'S Control Panel.

2.9 OTHER FEATURES:

- A. Space Heaters: Provide minimum 150 watt strip-type space heaters with an individual thermostat in each section. Use heaters rated for 240V, producing the required wattage when operated at 120V.
- B. All panel indicators are to push-to-test type LED.
- C. Circuit breakers and starters are to be NEMA rated.
- D. Panel layout shall facilitate bottom entry of all conduits utilizing myers hubs.
- E. Panels larger than 24" X 24" shall include a troubleshooting light, LED, 400 lumen minimum.
- F. For customer control connections, provide a separate 30A terminal block. Contacts closures intended for alarm, autodialer, or PLC use shall be rated 5A minimum. Contacts that carry control currents used for starter coils shall be rated 10A minimum.
- G. Panel shall be equipped with integral surge protection for incoming 480V power. Panels that use telephone lines shall include telephone surge protection.
- H. Panel internal wiring shall not be smaller than #14 AWG for all 120V circuitry and #12 AWG for all 240V and 480V circuitry.
- I. Maintain NEC required minimum spacing for intrinsically safe circuits. Label intrinsically safe circuits.
- J. Supplied display screens, TFT panels, HMI panels, touch screens, LCD screens, or any operator interface panels shall be full sunlight viewable utilizing "Actively Enhanced Bright Active Matrix TFT Display" or similar technology. Minimum brightness in candelas per square meter (Cd/M2) or nits shall be 1000 for displays of 17" and below. Contrast ratio as measured in full sunlight shall be greater than 5:1. Shields, covers, shades, and screens are not allowed for achieving this contrast. Display screens shall be CrystalVue, VBond, StealthVU, High-Bright, Vartech Systems, Panel Bright or equal manufacturer or technology capable of achieving required full sunlight viewing. All display panels shall be NEMA 4/4X rated minimum.

PART 3 EXECUTION

3.1 INSTALLATION:

- A. Transport, handle and install products in accordance with manufacturer's instructions.
- B. All panel mounting hardware shall be stainless steel.
- C. Free standing panels shall be mounted with four corner stainless steel anchors minimum.
- D. Field mounted panels shall include an equipment pad with 3' minimum front operator area clear of obstructions. Maintain NEC required clear front (or rear if applicable) working space free from obstructions or grounded components.
- E. Ground in accordance with Section 16170 - Grounding and Bonding.
- F. Label all wires with heat shrink markers per Section 16195.

END OF SECTION

SECTION 13322

I&C NETWORK & COMMUNICATIONS EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY:

A. Scope:

1. This Section of the Specifications describes the requirements for Network and Communications Equipment and Systems to be furnished under other Sections of the Specifications as listed in the Related Work paragraph of this Section.
2. The SYSTEM SUPPLIER defined in Specification Section 13300 shall be responsible for coordinating all aspects of the network communications system.
3. It is the ultimate responsibility of the Contractor to furnish a complete and fully operable system that supports the required functions specified elsewhere. The Contractor is to assume full responsibility for additional costs which may result from unauthorized deviations from the specifications.
4. Equipment found to be defective prior to system acceptance shall be replaced and installed at no additional cost to the OWNER.

1.2 SUBMITTALS:

- A. Submittals for equipment specified herein shall be made as a part of equipment furnished under other Sections. Individual submittals for equipment specified herein will not be accepted and will be returned un-reviewed.
- B. Submit catalog data for all items supplied from this specification Section as applicable. Submittal shall include catalog data, functions, ratings, inputs, outputs, displays, etc., sufficient to confirm that the equipment provides every specified requirement. Any options or exceptions shall be clearly indicated.
- C. Furnish, as prescribed under the General Requirements, all required submittals covering the items included under this section and its associated sections of the work.
- D. Provide all shop drawing submittals on thumb drive in PDF format.
- E. Product Data:
 1. Manufacturer & Model information.
 2. Dimensions, ratings, and data on features and components.
 3. Equipment Brochure.
 4. Accessories.

PART 2 PRODUCTS

2.1 PANEL MOUNTED INDUSTRIAL ETHERNET SWITCH:

A. General

1. Provide an industrial managed Ethernet switch for connection to the control network backbone as shown in the Drawings and specified herein.

B. Physical Features

1. Minimum fiber uplinks: 4 x 100/1000 SFP ports.
2. Minimum copper ports: 8 x 10/100/1000 TX RJ45 ports.
3. Operating temperature: 0 to 130 °F.
4. Power: Redundant 24 VDC power supplies.
5. Enclosure: Metal case, DIN-rail mountable.

C. Network Features:

1. Fault tolerant for use in a ring topology if shown on drawings. The switch shall be able to detect a blocked port and redirect data flow in the opposite direction within 30ms.
2. The switch shall come equipped with a dry contact rated for 120 VAC 5A that shall be used for common trouble alarm. The alarm shall be programmable. If the contact cannot use 120 VAC 5A, provide the necessary 24 VDC power from the PLC panel and provide interposing relays in the PLC panel.

D. Manufacturers:

1. MOXA SDS-3008/3016
2. MOXA EDS-2016-ML
3. MOXA EDS-82810 G
4. Or Approved Equal.

2.2 ETHERNET COMMUNICATION CABLES:

A. Subject to compliance with the contract documents, the following manufacturers are acceptable:

1. Belden

B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.

C. Cables for Ethernet: Category 5e Above Grade Cable: Sunlight and Oil Resistant U/UTP 003 Cable, non-plenum.

1. Conductors: 4 bonded pair 24 AWG Bare Copper

2. Insulation: Polyolefin
3. Jacket: PVC with 600 volt rated color of jacket to match as follows:
 - a. Green – Phone / Data
 - b. Red – FIRE Alarm
 - c. Blue – SCADA
4. Transmission Standards: ANSI/TIA568C
5. Nominal Velocity of Propagation: 69%
6. Flame Test Method: CMR Regulatory Compliance
7. Model: Belden 7957A

D. Cables for Ethernet: Category 6 Above Grade Cable: Sunlight and Oil Resistant U/UTP:

1. Cable, non-plenum.
2. Conductors: 4 bonded pair 23 AWG Bare Copper
3. Insulation: Polyolefin
4. Overall Cabling Separator Material of Foamed Polyolefin Tape
5. Jacket: PVC with 300 volt rated Color of jacket to match as follows:
6. Green – Phone / Data
7. Red – FIRE Alarm
8. Blue – SCADA
9. Transmission Standards: Category 6 - TIA 568.C.2
10. Nominal Velocity of Propagation: 72 %
11. Flame Test Method: UL1666 Vertical Riser
12. Model: Belden 7953A

2.3 ETHERNET SURGE PROTECTOR:

A. Subject to compliance with the contract documents, the following manufacturers are acceptable:

1. Phoenix Contact
2. PolyPhaser
3. Cooper Bussman

B. Environmental:

1. Operating temperature: -40 degrees F to 176 degrees F
2. Operating humidity: 95% non-condensing for indoor applications
3. Storage Temperature: -40 to 176 degrees F

C. Physical:

1. DIN Rail Mountable indoors and pole mountable outdoors applications.
2. I/O connectors: RJ-45
3. Power over Ethernet POE + to IEEE802.3 at up to 57VDC

D. Functional Performance:

1. Protection: handles 100 or more lightning strikes at surge levels of 8/20uSec at 6kV/3kA.

2. Standard: Compliant to IEC61000-4-5.

2.4 CELLULAR ROUTER:

- A. Cellular Router shall be high performance mobile 3G/4G-LTE, with all related power supplies, cabling, mounting devices, adapters, Wi-Fi antenna, and documentation. Provide and install according to Manufacturer's instructions, per Plans and Specifications, and to fit space in control cabinets.
- B. Provide and install one Verizon capable 3G/4G-LTE USB modem or SIM card for each router supplied. Provide model as recommended by manufacturer for best results at time of deployment.
- C. Provide and install 3G/4G Cellular Amplifier to boost signal reception as required. Include all required appurtenances for a complete operating system.
- D. Provide outdoor rated antennas with length of cable required for connection to router or cards with antenna located in outdoor location shown on Plans, or for optimum signal reception at site. Antenna cables to be complete with SMA connector, or as required by devices supplied. Wrap all outdoor antenna and cable connectors with 3M weatherproof tape. Antenna shall have swivel base for adjustment of antenna. Multiband cellular antennas shall be rated 2 dbm or better, as required for optimum signal strength.
- E. Router Characteristics:
 - 1. Open Upgradable Architecture: High Speed 3G/4G Modem Slot with Modem-Lock and External Antenna Ports.
 - 2. Supports LTE, HSPA + EV-DO Rev-A, EV-DO Rev-0, 1xRTT, HSUPA, HSDPA, UMTS, EDGE, GPRS USB Modems
 - 3. IPsec VPN (up to 5 concurrent sessions) and GRE Tunneling option, also support pass through VPN connections (IPsec, L2TP, PPTP) Automatic Fail-Over Between 3G/4G Cellular and Ethernet WAN
 - 4. Web Interface and SNMP
 - 5. (IPsec) Tunnel, NAT-T, and transport modes; connect to CradlePoint, Cisco/Linksys, CheckPoint, Watchguard, Juniper, SonicWall, Adtran, etc.; certificate support; Hash (MD5, SHA128, SHA256, SHA384, SHA512), Cipher (AES, 3DES, DES), support for 5 concurrent connections, GRE tunneling, multiple networks supported in a single tunnel, site-to-site dynamic VPN with NHRP, L2TP.
- F. ACCESSORIES:
 - 1. 4G in-line Signal Amplifier. Weboost #470119 or equal
 - 2. MSNSwitch Remote power cycle device Model#UIS522b
- G. MANUFACTURERS:
 - 1. CradlePoint IBR600 with integrated 3G/4G Modem and no Wifi

PART 3 EXECUTION

3.1 INSTALLATION:

- A. Install in accordance with manufacturer's written instructions, Contract Documents, and approved submittals.
- B. Sim Cards for each Cellular router shall be purchased and activated by Owner. Contractor shall provide written notification to owner and engineer 4 weeks prior to installation of cell routers for installation coordination. Any delay in construction due to failure of providing written notice is at Contractor's risk.

END OF SECTION

SECTION 13441

CONTROL STRATEGIES

PART 1 GENERAL

1.1 SUMMARY:

A. Section Includes:

1. Instrumentation control strategies including operational requirements and goals.
2. Contractor's SCADA System Integrator (SSI) shall develop the Control System and provide all required instruments, hardware, and software to fulfill the functions described below and/or shown.

1.2 QUALITY ASSURANCE:

A. See Section 13440.

1.3 SYSTEM DESCRIPTION:

- A. The control system shall start and stop equipment, monitor system operation as outlined herein, and adjust important system parameters at the WWTP OIS.
- B. A new control system will be provided for the WWTP. The City does not have any existing off-site facilities.
- C. The WWTP shall remain in service throughout the project, except for brief shutdowns. Refer to the Construction Sequencing and Shutdown notes on the General Notes sheet in the Drawings.
- D. Provide the following new PLCs/RTUs. Refer to Drawings for location of PLCs and RTUs.
 1. The SCADA provider shall provide the following panels:
 - a. Main SCADA (Service Rack).
 - b. RTU-BB (SBR Blower Canopy)
 2. The SCADA provider shall connect to and communicate with the following vendor-supplied panels:
 - a. Influent Lift Station.
 - b. Pretreatment – Coarse Mechanical Screen System.
 - c. Secondary Treatment – SBR System.
 - d. Solids Handling – Solids Transfer Pumping System.
 - e. Solids Handling – Solids Dewatering System.
 - f. Support System – Non-Potable Water System.
 - g. Support System – Chlorination System.

- E. Interconnect the Plant MCP with RTU's via Multimode Fiber.
- F. All inputs and outputs between the RTU-BB PLC and the SBR Control System shall be over the Ethernet network, and not by hard-wired I/O points. SBR supplier shall provide all required information including programming points and addresses.
- G. Provide a desktop computer to be located in the Control Room. The computer shall operate the server for the plant control system. The computer shall be provided with HMI software to provide the graphical interface for the control system including reports, alarms, autodialing, and data logging (historian). The computer and peripheral devices shall be installed as directed by the Owner. The computer shall be as follows:
 - 1. HP Desktop Computer (or Engineer-approved equal).
 - 2. Intel i9 processor.
 - 3. 3.2 GHz or better.
 - 4. 32 GB of RAM.
 - 5. Two, 2 TB solid state hard drives.
 - 6. DVD-RW Drive.
 - 7. Video card with minimum 6 GB DDR, with multiple HDMI ports.
 - 8. Wireless-AC LAN Card.
 - 9. Minimum 2 ethernet ports.
 - 10. 27-inch LCD Monitor (three monitors to allow for split screen view or screen extension).
 - 11. 42-inch LCD Monitor (to be wall mounted for overall plant summary and alarm list).
 - 12. Wireless keyboard.
 - 13. Wireless optical mouse.
 - 14. HP Laser Printer.
 - 15. Uninterruptible Power Supply (4-hour runtime for computer and primary monitor).
 - 16. Latest Windows Professional, 64-bit operating system.
 - 17. Latest MS Office Professional.
- H. A separate desktop computer will be provided by Manufacturer to serve as the main operator interface for the SBR system. The two control systems will share limited data points over their ethernet connection, but the SBR HMI does not need to be accessible from the plant control computer, or vice versa.
- I. The control strategy descriptions provide the functional requirements of the control loops represented in the Contract Documents.
- J. The control loop descriptions are not intended to be an all-inclusive listing of all elements and appurtenances required to execute loop functions but are rather intended to supplement and complement the Drawings and other Specification Sections.
 - 1. The control loop descriptions shall not be considered equal to a bill of materials.

- K. Provide instrumentation hardware and software as necessary to perform control functions specified herein and shown on Drawings.
- L. SSI shall develop the Control System and provide all required instruments, hardware, and software to fulfill the functions shown or specified.

1.4 DEFINITIONS:

A. General:

- 1. FE/FIT – Flow Element/Flow Indicator Transmitter.
- 2. FM – Flow Meter (Same as FE/FIT).
- 3. LE/LIT – Level Element/Level Indicator Transmitter.
- 4. AE/AIT – Analyzer Element/Analysis Indicator Transmitter.
- 5. OIS – Operator Interface Software or Human Machine Interface (HMI) software.
- 6. OIC – Operator Interface Controller.
- 7. PIT – Pressure Indicator Transmitter.
- 8. PLC – Programmable Logic Controller.
- 9. RTU – Remote Terminal Unit.
- 10. SSI – SCADA System Integrator – See Section 13440.
- 11. VFD – Variable Frequency Drive.

1.5 SUBMITTALS:

- A. See Section 01300 for requirements for the mechanics and administration of the submittal process.
- B. Submittals shall include but not be limited to the following:
 - 1. Diagram of proposed SCADA system architecture.
 - 2. HMI Screenshots (prior to Factory Acceptance Testing of PLCs).
- C. Operation and Maintenance Manuals:
 - 1. See Section 01300 for requirements for:
 - a. The mechanics and administration of the submittal process.
 - b. The content of Operation and Maintenance Manuals.

PART 2 EXECUTION

2.1 OPERATOR INTERFACE FOR NEW FACILITIES:

- A. The Operator Interface Software shall be VTScada or approved equal.
- B. General Requirements:
 - 1. Include provisions to enable future integration of additional inputs and outputs, such as those required for planned future pumps where shown on Drawings.

2. All calculations, trip points from analog values, timers, numeric manipulations, etc. shall be accomplished in the PLC and not in the operator interface software.
3. Alarms:
 - a. All open/close valves and on/off motors monitored by the PLC system shall have a maximum time value allowed to either open/close or start/stop.
 - b. Failure to achieve the control function (position or status) within this maximum time value shall result in a time out alarm.
 - c. An alarm shall be generated from the PLC to the operator interface software for indication of the control function time out failure (i.e. Pump XX-XXX-XXXX FAIL TO START or Valve XX-XXX-XXXX FAIL TO CLOSE, etc.).
 - d. Other specific alarms are designated in the control loop descriptions.
 - e. All alarms are to be sealed in at the PLC until acknowledged via the operator interface.
4. Analog inputs: All analog inputs to the PLC shall be configured in the operator interface software for historical trending.
5. Analog outputs: All setpoints (such as minimum and maximum values and durations of timed operations) shall be operator adjustable via the operator interface software.
6. Operator entries: Entries made by the operator (such as operation modes, setpoints, etc.) shall be displayed on the process screens for information.

C. Screens:

1. General: The screens for process control/observation shall be configured using a 3-level hierarchy plus an alarm screen, PLC system status screen, Report Selection screen, and real-time/historical trend displays.
 - a. The top level shall be the plant overview.
 - b. The second level shall be the process screens.
 - c. The bottom level shall be the equipment control detail screens.
2. Plant overview: The process overview screen consists of a full graphical schematic of the process and contains active displays for the major plant flows and levels.
 - a. Each process flow area shall be "active" so that clicking with the mouse takes the operator to a process screen showing full status for all of the items in that process area.

- b. At the bottom of the process overview screen shall be a button to move to the alarms screen, a button to move to the historical/real time trend display, a button to move to report generation, and a button to move to the PLC system status screen.
- 3. Process screens: The Process Screens shall be developed to show the full status for each piece of equipment within the process displayed.
 - a. The color of the equipment shall vary as well as a text indicator to show the status of each valve, pump, etc.
 - b. All analog values associated with the process displayed shall be shown.
 - c. Each piece of equipment which can be controlled shall be "active" and allow the operator to click on the equipment and bring up a pop-up equipment control detail screen.
 - d. There shall be three buttons in the same location at the bottom of each process screen to move back to the plant overview screen, the alarm screen, and the trend screen.
- 4. Equipment control detail pop-up: Develop a set of standard equipment control detail pop-ups to be used for each type of equipment controlled from the OIS.
- 5. Alarm screen: Regardless of which screen an operator is on, a flashing ALARM box shall come up on the current screen directing the user to the alarms screen.
 - a. The flashing ALARM box shall not go away until the alarm is acknowledged by a user.
 - b. All alarms shall have a time date stamp.
 - c. Alarm designation names are called out in the respective control loop description.
- D. The OIS displays shall be animated as necessary to clearly convey equipment status, operation modes, process displays, alarms, etc.
- E. Equipment status color (Contractor to field verify existing colors):
 - 1. ON- Green.
 - 2. READY – Red(flashing).
 - 3. OFF – Red.
 - 4. FAIL – Amber (flashing).
 - 5. Travel (for Valves) – Yellow.

6. Provide numeric representation of process signals in engineering units. Graphical animation shall also be used to depict levels in tanks, wet wells, and sumps where these signals are available.
7. All OIS displays shall use consistent styles to convey information to operator, and for operator entry.

2.2 TYPICAL CONTROL STRATEGIES:

- A. Activation of an emergency eyewash/shower flow switch shall trigger an alarm in the OIS.
- B. Strategy for Actuated Valve Position Control and Indication:
 1. See Section 15100 for detailed requirements for control and position indication for both open/close actuated valves and modulating actuated valves.
 2. It shall be possible to actuate and/or modulate valves automatically via the SCADA system programming, manually from the control room, or locally via manual overrides at the valve location.
 3. Valve position indications shall be displayed by the OIS.
- C. Hand-Off-Automatic (HOA) switches: Equipment with a HOA switch at the local control panel shall be capable of running in manual (HAND) mode or in automatic (AUTO) mode. Position of the HOA switch shall be available at the WWTP OIS. In HAND, the equipment shall run until being turned off. In AUTO, the equipment shall be programmed to run as described in the specific control strategies below.
- D. Lockouts: All lockouts based on measured parameters (such as level, pressure, flow, turbidity, etc.) shall be programmed with an operator-selectable bypass. For example, a low level lockout for a pump shall be programmed such that the operator can disable (bypass) the lockout and operate the pump in the event that the associated level transmitter is malfunctioning and being repaired.
- E. Flow Meters, Level Transmitters, Pressure Transmitters, Analytical Instruments (Turbidimeters, etc.), and similar instruments: Display current measurement in OIS and log historical measurements. Provide the ability for operators to view historical measurements in tabular and graphical format.
 1. For flow meters, display and log both instantaneous and totalized (cumulative) flow measurements.
 2. Provide alarms for low and high readings based on operator-adjustable setpoints.
 3. Not all instruments are mentioned in the control strategies below. Only instruments involved in automated control loops are mentioned below. Refer to the P&IDs and Section 13442 for a complete inventory of the instruments required, which shall be incorporated in the OIS. Refer to

the P&IDs and Electrical Drawings for designation of the PLC which shall provide inputs and receive outputs for each instrument.

- F. Valve actuators: See Section 15100 for required inputs and outputs.
- G. Equipment: See the applicable Division 11 specification for required inputs and outputs.
- H. Pumps: Run/ready status, pump start/stop, pump fail alarm, instantaneous speed indication, speed control, and position of the HOA switch shall be displayed at the WWTP OIC.
- I. Parallel pumps in a pump station:
 - 1. Pumps shall operate on a First Call, First Off basis.
 - 2. Pumps shall alternate with each pump start to ensure similar run time.
 - 3. Operators shall be able to manually rotate/advance the pumps (designate the lead and lag pumps) through the WWTP OIS.
 - 4. If a high level float is reached, start all pumps (including standby pumps) until the low level float is reached.
- J. Motor thermal protection: Proposed motors 50 HP and above controlled by VFDs and other motors 100 HP and above will be provided with an integrated temperature alarm. Alarm shall be displayed at WWTP OIC.
- K. Power Supply Monitors, also called voltage transmitters (VT) herein:
 - 1. The proposed power supply monitors shall continuously monitor voltage of each phase, current, power factor, and any other parameters provided by the proposed monitor. The parameters shall be conveyed to the corresponding PLC (for example, the "PB-MCP" power monitor data shall be conveyed to the Plant MCP) and displayed in the WWTP OIS. The SSI shall provide operator-adjustable high and lower setpoints to trigger alarms, as well as high and low setpoints to prevent calls to variable speed pump motors to operate until the problem condition clears. (Similar functionality is already provided for constant speed motors in the motor's phase failure relay.)
- L. Alarms:
 - 1. Time out alarms:
 - a. All open/close valves and on/off motors monitored by the PLC system shall have an operator-adjustable maximum time value allowed to either open/close or start/stop.
 - b. Failure to achieve the control function (position or status) within this maximum time value shall result in a time out alarm.

- c. An alarm shall be generated from the PLC to the OIS for indication of the control function time out failure (i.e. Pump XX-XXX-XXXX FAIL TO START or Valve XX-XXX-XXXX FAIL TO CLOSE, etc.).
 - d. In the case of a pump that fails to start, the next pump in sequence (lag pump) shall start, unless a problem condition such as high or low voltage exists as detected by the applicable power supply monitor. If the lag pump then fails to start, the lag-lag pump shall NOT be started. Rather, the pumps shall await operator examination and intervention, to minimize potential damage to the pumps.
- 2. Other specific alarms are designated in the control loop descriptions below.
 - 3. All alarms shall be sealed in at the PLC until acknowledged via the operator interface.
 - 4. A telephone dialer shall be part of the WWTP OIS. The dialer shall have the ability to be disabled during certain times of the day such as the day shift, with alarms restricted to the Plant Computer. The callout system shall include operator-selectable, configurable modes of handling each type of alarm at certain times of day, including phone calls, emails, SMS messages, or no callout. The dialer shall be suitable for call-in from external telephone sources to verify status of alarms and query for the plant alarm status.

2.3 WWTP START/STOP:

- A. Normal plant startup sequence programming shall be coordinated with process and electrical engineers.
- B. The WWTP shall start and stop automatically based on operator-adjustable level setpoints.
- C. Controls for each unit process are described in more detail in their respective sections below.
- D. The reverse sequence of events shall cause the WWTP to stop automatically.

2.4 WWTP TREATMENT FLOW RATE:

- A. The treatment rate (flow) of the WWTP, specifically the SBR system, shall be automatic.

2.5 EQUIPMENT CONTROL STRATEGIES:

- A. Area 02 (Pretreatment) Influent Lift Station
 - 1. Influent Lift Station shall be controlled as specified in section 11220 - Submersible Pump. The lift station system shall be powered from the "PB-MCB". Control of the system will be via a LCP. Status and alarms

from lift station system LCP will be transmitted to the plant OIC.

B. Area 02 (Pretreatment) – Coarse Mechanical Screening System:

1. The Coarse Mechanical Screen control panel will be vendor supplied and located outside adjacent to the screening area and will be powered from the "PB-BB" panel. The control of the Mechanical Screening package is as specified in section 11075. The Mechanical Screen will have its own controls that shall interface with the plant OIC. The Mechanical Screen LCP shall be able to be switched between LOCAL and REMOTE. With a Mechanical Screen LCP set to "REMOTE", the plant OIC will be capable of initiating a screen cleaning cycle. Additionally, the plant OIC will be capable of changing the mechanical screening system from AUTOMATIC to OFF. LCP alarms will be sent to the plant OIC. 02-LE/LIT-0002 will transmit level conditions to plant OIC. A high-level alarm will be field set and transmitted to the plant OIC, and the phone dialer.

C. Area 02 (Pretreatment) – Manual Screening System:

1. The Manual Screen will operate as a backup to the new mechanical screens in the event of a screening system bypass need. A high-level alarm will be field set and transmitted to the plant OIC.

D. Area 02 (Pretreatment) – Flow Equalization (EQ) System:

1. The abandoned oxidation ditch will continue to operate as an EQ basin, to allow dampening of flows sent to the SBR system if needed to support maintenance and/or significant wet weather events in the WWTP sewer shed.
2. The influent lift station will have an overflow line that is open to the EQ basin. If the water level in the wet well reaches this overflow line, raw wastewater (RWW) will flow by gravity into the EQ storage basin. The City plans to reuse an existing submersible pump to transfer RWW to the influent lift station. The new control panel for the existing pump will have HOA controls. The pump will not be automatically started but will need to be capable of being started from the OIC by the operators as needed. Pump off and running indications will need to be shown on the OIC.

E. Area 03 (Secondary Treatment) – Sequencing Batch Reactor System:

1. The Sequencing Batch Reactor (SBR) system (controlled by the SBR System LCP) shall be controlled as specified in section 11375. The SBR system shall consist of two basins. SBR System LCP and vendor provided motor loads shall be powered from the "PB-BB" as shown on the one-line diagrams. This panel shall be powered from the utility transformer and shall be able to be connected to the standby power supply for the loss of utility power.

2. The SBR System LCP shall be supplied with its own PLC that will interface with the plant OIC for monitoring and alarm conditions. An ethernet connection shall be provided for remote access. Refer to specification 11375 for the control strategy, beyond the description below:
 - a. The SBR system shall be a continuous flow type in which influent flow is continuously directed into both basins.
 - b. The control system shall automatically adjust blower output and air flow control valves to maintain dissolved oxygen (DO) setpoints while conserving power and maintaining a supply of air to the SBR basins.
 - c. Effluent (EFF) discharge from the SBR system shall be controlled by the SBR system LCP and monitored by flow meter FIT-03.0001. This flow meter will provide instantaneous flow (gpm) and totalized flow (gal x 1000) to the SBR system LCP and to the plant OIC.
 - d. Waste Activated Sludge (WAS) discharge from the SBR System to the Sludge Storage Tank shall be controlled by the SBR System LCP.

F. Area 03 (Secondary Treatment) – SBR Aeration System:

1. The SBR aeration packaged system (controlled by the SBR Blower LCP) shall be controlled as specified in section 11371. The SBR Blower LCP and vendor provided motor loads shall be powered from the "PB-BB" as shown on the one-line diagrams. This panel shall be powered from the utility transformer and shall be able to be connected to the standby power supply for the loss of utility power.
2. The SBR Blower LCP shall be supplied with its own PLC that will interface with the plant OIC for monitoring and alarm conditions. A modem or ethernet connection shall be provided for remote access.
3. The SBR Aeration system will have three blowers BLR-03.0001, BLR-03.0002, and BLR-03.0003 which will be controlled via the vendor supplied SBR Blower LCP. The blowers and their instrumentation are specified in section 11371. These motors will normally run with a 2 out of 3 logic as input by the Operator. These motors shall not start simultaneously and shall have a minimum of 10 seconds between starts. Interface with other plant motor starts shall be controlled via the OIC for motors greater than 15 HP. Control of simultaneous motor starts is to minimize the impact to system voltage when fed normally from the utility and when powered from the standby power supply.
4. Each aeration blower discharge is monitored for temperature and pressure. Instantaneous temperatures and pressures will be transmitted to the SBR Blower PLC and the plant computer. A high reading for temperature or pressure on a discharge line will shut down the corresponding blower and trigger an alarm. The aeration blower

suction side is monitored for vacuum. A high vacuum condition will generate an alarm and a high-high vacuum setpoint will shut down its corresponding blower.

G. Area 04 (Post Treatment) – Chlorination System:

1. The chlorination system shall be controlled as specified in section 11260 - Chlorination Equipment. The system shall be powered from the "LP-NPW" panel. Control of the system will be via the vendor supplied System LCP. Status and alarms from Chlorination System LCP will be transmitted to the plant OIC.

H. Area 05 (Solids Handling) – Sludge Storage Basins:

1. The solids storage system is powered from the "PB-MDP" panel. The control of the system will be automatically controlled from the plant OIC. The proposed operation is as follows:
 - a. The solids storage basins shall operate under several process steps discussed below:
 - i. Filling Phase – WAS is transferred from the secondary SBR system to the tank.
 - ii. Mixing Phase – Air is introduced to the tank via a surface aerator/mixer (MX-05.0001) to both mix and maintain aerobic conditions within the solids.
 - The surface mixer will have a LCP that will be monitored and controlled by the plant OIC.
 - iii. Settling Phase – Air is no longer added, allowing solids to separate from liquid, forming a clear supernatant at the top surface of the tank, with concentrating solids settling to the bottom of the tank.
 - iv. Decant Phase – Clear effluent is drained from the top of the tank via a decanter unit, while air is still not added to the tank. This step continues until the decanter reaches the concentrated solids layer of the tank.
 - v. Wasting Phase – Solids are drawn from the tank via solids transfer pumps (located in the Dewatering Area) and sent downstream to the new mechanical dewatering unit.
 - b. Transfer of WAS to the solids storage basins will be due to completion of the WAS wasting cycle from the SBR system LE/LIT-05.0001 will transmit level to the plant OIC and to the SBR system to prevent SBR system from wasting if level of solids storage basin is too full.

- c. Solids discharge from the tank shall be controlled by Motorized Operated Valves 06-PV-1102/1202 on the discharge line of each basin. Discharge is also controlled by the Solids Transfer Pump LCP and monitored by 06-FE/FIT-3101. The unit will provide instantaneous flow (gpm) and totalized flow (gal X 1000) to the Solids Transfer Pump LCP and to the plant OIC.
- d. Dissolved oxygen content in the solids storage basin will be monitored via 06-AE/AIT-1101 and 1201 and transmitted to the plant OIC. These DO devices will be mounted locally and alarm on a preset low level.

I. Area 05 (Solids Handling) – Solids Transfer Pumps:

- 1. The solids transfer packaged system (controlled by the Solids Dewatering LCP) shall be controlled as specified in section 11144 - Sludge Dewatering Screw Press. The Solids Dewatering LCP and vendor provided motor loads shall be powered from the "PB-MDP" panel as shown on the one-line diagrams. This "PB-MDP" panel shall be powered from the utility transformer and shall be able to be connected to the standby power supply for the loss of utility power.
- 2. The Solids Dewatering LCP shall be supplied with its own PLC that will interface with the plant OIC for monitoring and alarm conditions. A ethernet connection shall be provided for remote access.
- 3. The Solids Transfer Pump system will have one progressive cavity pumps STP-05.0001 which will be controlled via the vendor supplied Dewatering System LCP. The pumps and their instrumentation are specified in section 11350.
- 4. The solids transfer pump discharge is monitored for pressure. Instantaneous pressures will be transmitted to the Solids Dewatering PLC and the plant OIC. A high reading for pressure on a discharge line will shut down the pump and trigger an alarm. The pump suction side is monitored for pressure as well. A low suction side pressure condition will generate an alarm and a low-low vacuum setpoint will shut down the corresponding pump.

J. Area 06 (Solids Handling) – Dewatering Press:

- 1. The Mechanical Dewatering Press system (controlled by the Dewatering Press LCP) shall be controlled as specified in section 11144 - Sludge Dewatering Screw Press. The Dewatering Press LCP and vendor provided motor loads shall be powered from the "PB-MDP" panel as shown on the one-line diagrams. This "PB-MDP" panel shall be powered from the utility transformer and shall be able to be connected to the standby power supply for the loss of utility power.
- 2. The Dewatering Press LCP shall be supplied with its own PLC that will interface with the plant OIC for monitoring and alarm conditions. An ethernet connection shall be provided for remote access. Refer to specification 11144 for the control strategy, beyond the description

below:

- a. The dewatering press shall rely on injection, mixing and flocculation of solids with polymer prior to applying pressure to enhanced dewatering of solids.
- b. The dewatering press will control the dewatering press equipment and the polymer mixing and injection system. The dewatering press will send start/stop and speed adjustment signals to the Plant PLC to be routed to the Solids Transfer Pump PLC.

K. Area 06 (Support Systems) – Plant Water System:

1. The plant water system shall be controlled as specified in Section 11317 - Plant Water Pump Station Equipment for additional details.

L. Plant Standby Power Systems:

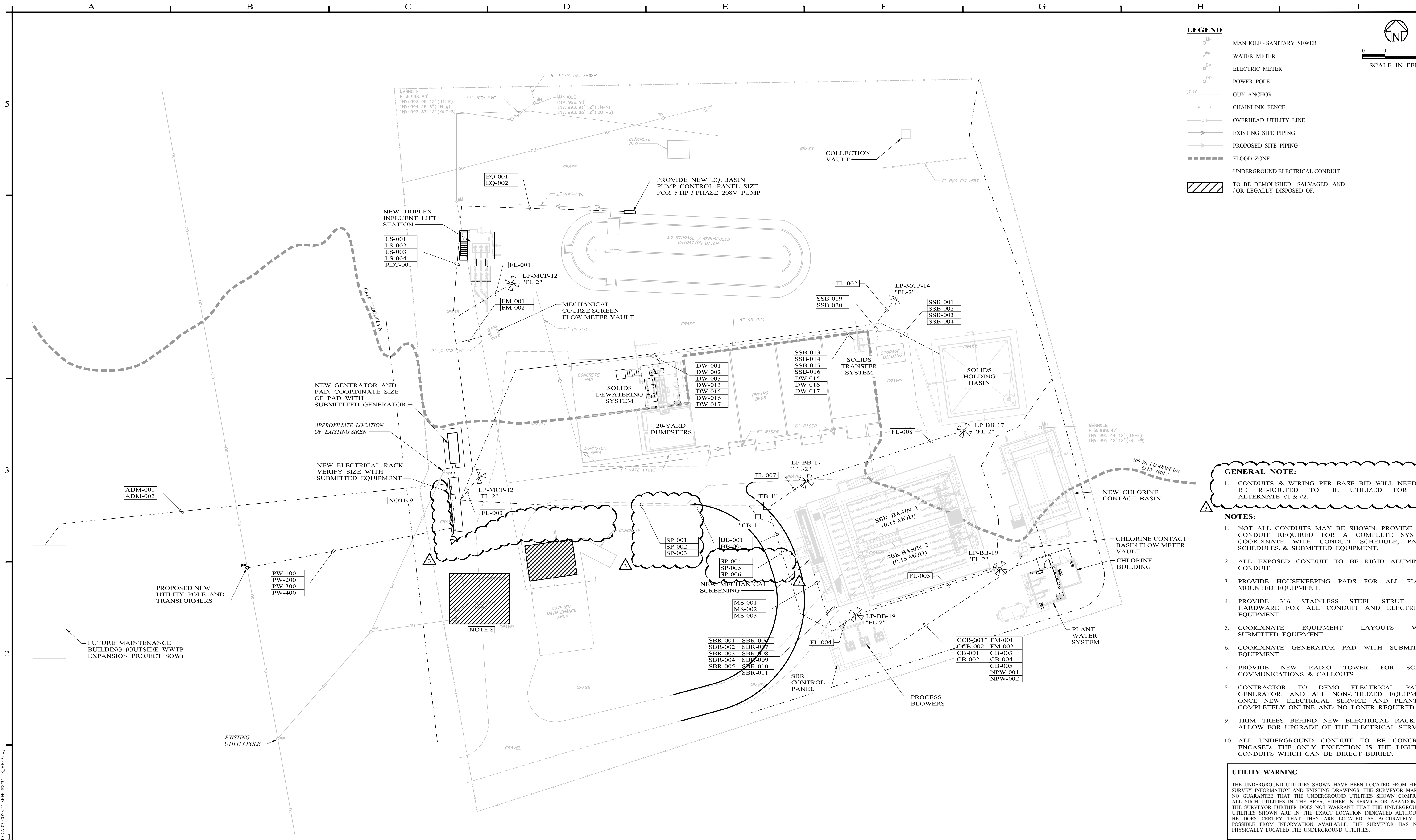
1. The standby power systems will function due to the loss of utility power. The utility distribution system adjacent to the plant site has a transfer scheme that will transfer power between distribution feeders in the event that power is lost in the normal feeder. The standby power systems are present to function in the event the normal and backup transfer scheme provided by the Utility fails to maintain power to the site.
2. The plant computer and the PLC controls shall be programmed to sequence loads in a stepped fashion to the onsite generators. Power shall be first restored to the plant controls, computers and necessary lighting. Individual motor loads and other plant loads shall be sequenced on as though the plant was starting up. Motor starts shall have a 10 second delay between starts. Several loads as specified herein will not function during the operation of the on-site standby power system to minimize loading impact on the generator. Refer to the one-line drawing for generator/transfer switch connections.

M. Alarm System:

1. Owner provided internet connection to plant OIC network will be provided for plant alarm callouts and remote connection. Coordinate with owner for internet connection.
 - a. Remote access for owner approved operators will be required. Coordinate with owner for operator access requirements.

END OF SECTION

DRAWINGS



GENERAL NOTE:

1. CONDUITS & WIRING PER BASE BID WILL NEED TO BE RE-ROUTED TO BE UTILIZED FOR BID ALTERNATE #1 & #2.

- NOTES:**
1. NOT ALL CONDUITS MAY BE SHOWN. PROVIDE ALL CONDUIT REQUIRED FOR A COMPLETE SYSTEM. COORDINATE WITH CONDUIT SCHEDULE, PANEL SCHEDULES, & SUBMITTED EQUIPMENT.
 2. ALL EXPOSED CONDUIT TO BE RIGID ALUMINUM CONDUIT.
 3. PROVIDE HOUSEKEEPING PADS FOR ALL FLOOR MOUNTED EQUIPMENT.
 4. PROVIDE 316 STAINLESS STEEL STRUT AND HARDWARE FOR ALL CONDUIT AND ELECTRICAL EQUIPMENT.
 5. COORDINATE EQUIPMENT LAYOUTS WITH SUBMITTED EQUIPMENT.
 6. COORDINATE GENERATOR PAD WITH SUBMITTED EQUIPMENT.
 7. PROVIDE NEW RADIO TOWER FOR SCADA COMMUNICATIONS & CALLOUTS.
 8. CONTRACTOR TO DEMO ELECTRICAL PANEL, GENERATOR, AND ALL NON-UTILIZED EQUIPMENT ONCE NEW ELECTRICAL SERVICE AND PLANT IS COMPLETELY ONLINE AND NO LONER REQUIRED.
 9. TRIM TREES BEHIND NEW ELECTRICAL RACK TO ALLOW FOR UPGRADE OF THE ELECTRICAL SERVICE.
 10. ALL UNDERGROUND CONDUIT TO BE CONCRETE ENCASED. THE ONLY EXCEPTION IS THE LIGHTING CONDUITS WHICH CAN BE DIRECT BURIED.

UTILITY WARNING

THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH HE DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.

NO.		REVISION	DATE	10/09/2024			<p>BAR IS ONE INCH ON ORIGINAL DRAWING</p> <div><div></div><div>01</div></div> <p>IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.</p>	DESIGNED BY	T. PRINZ	SCALE	1" = 20'-0"	<p>CITY OF TOLAR</p> <p>WASTEWATER TREATMENT PLANT IMPROVEMENTS</p> <p>MODIFIED SITE ELECTRICAL PLAN</p>	PROJECT NO.:	8434
0		ISSUED FOR ADVERTISEMENT	08/27/2024	DRAWN BY				J.CASSIDY	DATE		SEQUENCE No.		91 OF 125	
3		ADDENDUM No. 4	10/09/2024	CHECKED BY				D. MATTERN	10/09/2024		SHEET No.		08E-03	

Donald S. Mattern

P:\Project\Tolar, City of\8434 WWTIP\Improvements\10_CADD\CONST\14_SHEETS\8434-08_08E-03.dwg

NO.	REVISION	DATE	10/09/2024		 <div>Enprotec Hibbs & Todd 402 Cedar Street • Abilene, Texas 79601 • T: (325) 698-5560 • F: (325) 690-3240 • www.e-ht.com PE Firm Registration No. 1151 • PG Firm Registration No. 50103 • RPLS Firm Registration No. 10011900</div>	<div>BAR IS ONE INCH ON ORIGINAL DRAWING</div> <div></div> <div>IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.</div>	DESIGNED BY T. PRINZ	SCALE NO SCALE	<div>CITY OF TOLAR WASTEWATER TREATMENT PLANT IMPROVEMENTS</div> <div>CONDUIT SCHEDULE</div>	PROJECT NO.: 8434		
0	ISSUED FOR ADVERTISEMENT	08/27/2024	DRAWN BY J.CASSIDY				DATE 10/09/2024	SEQUENCE No. 106 OF 125				
3	ADDENDUM No. 4	10/09/2024	CHECKED BY D. MATTERN					SHEET No. 08E-18				

Project Name: City of Tolar WWT Improvement ILL CADW: CONST-14-SHEETS-0451-18_08122.dwg

MAIN SCADA PLC

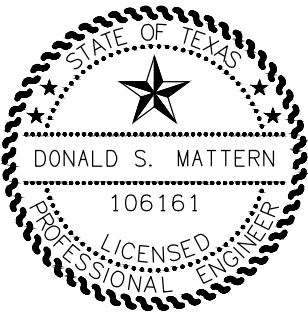
DIGITAL INPUTS	DIGITAL OUTPUTS	ANALOG INPUTS	ANALOG OUTPUTS	ETHERNET	FIBER
EQ. BASIN #1 MOV. CLOSED	EQ. BASIN #1 MOV. OPEN	EQ. BASIN #1 LEVEL	LIFT STATION PUMP #1 SPEED SETPOINT	GENERATOR	ADMIN SERVER
EQ. BASIN #1 MOV. IN LOCAL	EQ. BASIN #1 MOV. CLOSE	FLOWMETER FM-02-0002	LIFT STATION PUMP #2 SPEED SETPOINT	ATS	RTU-BB
EQ. BASIN #1 MOV. IN REMOTE	SITE LIGHTS CALL	LIFT STATION LEVEL	LIFT STATION PUMP #3 SPEED SETPOINT	MSB POWER MONITOR	
EQ. BASIN #1 MOV. OPENED	LIFT STATION PUMP #1 START/STOP COMMAND	LIFT STATION PUMP #1 SPEED FEEDBACK		LIFT STATION CONTROL PANEL	
EQ. BASIN #1 MOV. OVERTOURQUED	LIFT STATION PUMP #2 START/STOP COMMAND	LIFT STATION PUMP #2 SPEED FEEDBACK		DEWATERING PRESS CONTROL PANEL	
ATS FAILED TO TRANSFER	LIFT STATION PUMP #3 START/STOP COMMAND	LIFT STATION PUMP #3 SPEED FEEDBACK		RADIO EQUIPMENT	
ATS ON NORMAL	EQ. BASIN PUMP START/STOP COMMAND	SOLIDS STORAGE BASIN LEVEL			
ATS ON EMERGENCY	DEWATERING PRESS START/STOP COMMAND	SOLIDS STORAGE BASIN DO			
GENERATOR RUNNING	SOLIDS STORAGE BASIN MIXER START/STOP COMMAND				
GENERATOR ALARM	SOLIDS STORAGE BASIN MOV. OPEN/CLOSE COMMAND				
GENERATOR LOW FUEL	SLUDGE PUMP START/STOP COMMAND				
EQ. BASIN PUMP RUNNING	POLYMER SYSTEM START/STOP COMMAND				
EQ. BASIN PUMP FAULT					
LIFT STATION HIGH LEVEL ALARM					
LIFT STATION IN HAND					
LIFTS STATION IN AUTO					
LIFTS STATION FAULT					
LIFT STATION PUMP #1 RUNNING					
LIFT STATION PUMP #1 IN HAND					
LIFT STATION PUMP #1 IN AUTO					
LIFT STATION PUMP #1 FAULT					
LIFT STATION PUMP #2 RUNNING					
LIFT STATION PUMP #2 IN HAND					
LIFT STATION PUMP #2 IN AUTO					
LIFT STATION PUMP #2 FAULT					
LIFT STATION PUMP #3 RUNNING					
LIFT STATION PUMP #3 IN HAND					
LIFT STATION PUMP #3 IN AUTO					
LIFT STATION PUMP #3 FAULT					
DEWATERING PRESS IN HAND					
DEWATERING PRESS IN AUTO					
DEWATERING PRESS IN RUNNING					
DEWATERING PRESS IN FAULT					
SOLIDS STORAGE BASIN MIXER IN HAND					
SOLIDS STORAGE BASIN MIXER IN AUTO					
SOLIDS STORAGE BASIN MIXER IN RUNNING					
SOLIDS STORAGE BASIN MIXER IN FAULT					
SOLIDS STORAGE BASIN #1 MOV. CLOSED					
SOLIDS STORAGE BASIN #1 MOV. IN LOCAL					
SOLIDS STORAGE BASIN #1 MOV. IN REMOTE					
SOLIDS STORAGE BASIN #1 MOV. OPENED					
SOLIDS STORAGE BASIN #1 MOV. OVERTOURQUED					
SLUDGE PUMP IN HAND					
SLUDGE PUMP IN AUTO					
SLUDGE PUMP IN RUNNING					
SLUDGE PUMP IN FAULT					
POLYMER SYSTEM RUINNING					
POLYMER SYSTEM FAULT					
POLYMER SYSTEM IN HAND					
POLYMARE SYSTEM IN AUTO					

RTU-BB PLC

DIGITAL INPUTS	DIGITAL OUTPUTS	ANALOG INPUTS	ANALOG OUTPUTS	ETHERNET	FIBER
MECHANICAL SCREEN RUNNING	SITE LIGHTS CALL	SCREEN INFLUENT LEVEL	SBR EFFLUENT FLOW	MECHANICAL SCREEN CONTROL PANEL	MAIN SCADA PANEL
MECHANICAL SCREEN ALARM	MECHANICAL SCREEN START/STOP COMMAND	SCREEN EFFLUENT LEVEL		SBR MAIN CONTROL PANEL	
MECHANICAL SCREEN IN AUTO	NPW PUMP 1 START/STOP COMMAND	SYSTEM AIR PRESSURE			
MECHANICAL SCREEN IN HAND	NPW PUMP 2 START/STOP COMMAND	NPW SYSTEM PRESSURE			
AIR COMPRESSORS RUNNING	AIR SYSTM SOLENOID OPEN/CLOSE COMMAND	NPW FLOWMETER			
AIR COMPRESSORS ALARM		HYDRO TANK LEVEL			
AIR COMPRESSORS IN HAND		CHLORINE ANALYZER			
AIR COMPRESSORS IN AUTO		CHLORINE SCALE			
NPW PUMP 1 IN HAND		CHLORINE SCALE			
NPW PUMP 1 IN AUTO		CHLORINE SCALE			
NPW PUMP 1 IN RUNNING		CHLORINE SCALE			
NPW PUMP 1 IN FAULT		CHLORINE FLOWRATE			
NPW PUMP 2 IN HAND		CHLORINE CONTACT BASIN #1 LEVEL			
NPW PUMP 2 IN AUTO		CHLORINE CONTACT BASIN #2 LEVEL			
NPW PUMP 2 IN RUNNING					
NPW PUMP 2 IN FAULT					
CHLORINE LEAK DETECTOR					

NO.	REVISION	DATE
0	ISSUED FOR ADVERTISEMENT	08/27/2024
3	ADDENDUM No. 4	10/09/2024

Donald S. Matterm



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BAR IS ONE INCH ON ORIGINAL DRAWING
0 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGNED BY
T. PRINZ
DRAWN BY
J.CASSIDY
CHECKED BY
D. MATTERN

SCALE
NO SCALE
DATE
10/09/2024

CITY OF TOLAR
WASTEWATER TREATMENT PLANT
IMPROVEMENTS

I-O LIST MAIN SCADA & RTU-BB PANELS

PROJECT NO.:
8434
SEQUENCE No.
115 OF 125
SHEET No.
08E-27