

Executed Counterparts Counterpart No. _____ of _____

Including Addenda Nos. _____ through _____

CPA No. _____

Georgetown Wet Weather Treatment Station - Treatment Station

Contract No. C01025C17

**Funded in part by the
Washington State Department of Ecology**

Volume 7 of 23

Technical Specifications
(Division 17)

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King County

**Department of Natural Resources and Parks
Wastewater Treatment Division**



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Contract C01025C17

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DIVISION 17

INSTRUMENTATION AND CONTROL

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SECTION 17000

PROCESS INSTRUMENTATION AND CONTROL

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies requirements for process instrumentation and control for Division 17, which consists of hardware, software, and services necessary to provide the control functions specified.
- B. The required control system uses information and requirements in other Drawings, Schedules and Narrative/Specifications. The Drawings and Schedules depict application dependent data while the Narrative/Specifications define broader requirements such as overall quality and performance.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following documents. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
API RP 551	Process Measurement Instrumentation – Latest Edition
API RP 552	Transmission Systems - Latest Edition
ANSI/ISA S5.4	Instrument Loop Diagrams
ISA S20	Specification Forms for Process Measurement and Control Instrumentation, Primary Elements, and Control Valves
ANSI/ISA S5.1	Instrumentation symbols and Identification
ANSI/ISA S51.1	Process Instrumentation Terminology
IBC	International Building Code
ISA S5.3	Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic and Computer systems
ISA RP12.2.02	Recommendations for the Preparation, Content and Organization of Intrinsic Safety Control Drawings
NFPA 70	National Electric Code (NEC)
NFPA 79	Electrical Standards for Industrial Machinery
NFPA 820	Fire Protection in Wastewater Treatment and Collection Facilities
IBC	International Building Code
UL 508	Industrial Control Equipment
UL 508A	Industrial Control Panels
UL 60947	Low Voltage Switchgear and Controlgear

- B. Qualifications:
 - 1. Systems Integrator:
 - a. Shall be a single systems integration firm regularly engaged in the design and installation of systems of similar scope and complexity.
 - b. Shall have a demonstrated history of successful execution of work commensurate with the scope of work of this Contract.
 - c. Shall have a minimum of five years in the business of providing system integration.
 - d. Shall have completed the same type of work specified on at least five projects of equal or larger size.
 - e. Shall have local support within 50 miles of the work Site.
 - f. Has an electrical or control system engineer currently registered as a professional engineer in the state of Washington to supervise the work.

- g. The Onsite Project Manager shall have a minimum of five years' experience installing and testing wastewater control systems of similar scope and complexity.
 - h. Provide the services of skilled instrument technicians for testing, calibration, and adjustment activities under direct Onsite Project Manager.
- C. Labeling: Electrical control panels shall be manufactured in conformance with UL 508A and shall bear the UL label.
- D. Calibrate, test, and start up the complete process instrumentation and control system.
- E. Place the complete system in operation including tuning loops and making final adjustments to instruments as required during the start-up.
- F. Provide the services of skilled instrument technicians for testing, calibration, and adjustment activities under direct on site supervision of the electrical or controls engineer.

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Qualifications:
- 1. System Integrator:
 - a. Company qualifications and experience with projects of similar size and complexity.
 - b. On-site project manager qualifications.
 - c. A project team organizational chart showing all assigned personnel with titles.
 - d. Assigned personnel resumes demonstrating the qualifications for design, commissioning and start-up support.
- C. Complete listing of instruments to be furnished under the work of this Contract.
- D. Catalog cuts of furnished components and equipment:
- 1. Include catalog information, technical specifications, and application information for each piece of equipment to be furnished.
 - 2. Edit catalog cuts to indicate only those items, models, or series of equipment to be furnished. Cross out or otherwise obliterate extraneous materials information. Clearly identify configuration options for the equipment to be furnished.
 - 3. Include data sheets in accordance to ISA S20.
- E. Fabrication drawings with coordinated Bills of Materials:
- 1. Detailed interconnection diagrams, wiring diagrams, elementary diagrams, loop diagrams, and process and instrument diagrams with electrical and electronic components clearly identified by tag number.
 - 2. Detailed construction drawings for panel layouts and equipment enclosures with dimensions in inches.
 - a. Show both exterior and interior views.
- F. Seismic design: Section 01031.
- G. Certifications.
- H. Source Quality Control documentation.
- 1. Factory demonstration test schedule.
 - 2. Factory demonstration test procedures.
 - 3. Factory testing documentation and forms.

- I. Field Quality Control documentation.
 - 1. Testing schedule.
 - 2. Testing procedures.
 - 3. Test documentation and forms.
- J. Operation and maintenance information: Section 01730.
- K. System Integration Drawings. Electronic format.
- L. Record drawings: Section 01720.

1.04 DEFINITIONS

- A. Unless otherwise specified, the definitions of terminology used in Division 17 shall be as defined in ISA S51.1.
- B. Electronic Format:
 - 1. Drawings shall be AutoCAD 2010 or newer “.dwg” format files.
 - 2. Tabular data shall be submitted in electronic format compatible with Microsoft Excel 2010®.
 - 3. Text data shall be submitted in electronic format compatible with Microsoft Word 2010®.

1.05 SYSTEM INTEGRATOR

- A. Perform detailed design for new facilities for all interconnected components. Interconnected components shall include:
 - 1. New and existing mechanical and electrical equipment specified in other Sections.
 - 2. New and existing process control system equipment specified within Division 17.
- B. Provide specified equipment and assemblies.
- C. Provide applications software programming for the Process Control System.
 - 1. PLC system.
 - 2. Facility OIT system.
 - 3. Facility SCADA system.
 - 4. Communications with existing Metrotel SCADA system.
 - 5. Communication with existing Off-Site SCADA system.
- D. Calibrate, test, and start up the complete process instrumentation and control system.
- E. Place the completed system in operation including tuning loops and making final adjustments to instruments as required during facility testing, start-up and commissioning.
- F. Work shall be completed under the supervision of the Onsite Project Manager.

1.06 DESCRIPTION OF SYSTEM

- A. Process Control System consists of the following, installed in accordance to NFPA 70:
 - 1. Programmable Logic Controller, (PLC) systems.
 - 2. Main control panel PNL854881 (MCP) including conventional panel-mounted switches, controllers, indicators and Operator Interface terminal (OIT).
 - 3. Regulator PLC panel PNL854281 including conventional panel-mounted switches, controllers, indicators and OIT.
 - 4. Electrical building PLC panel PNL854981 including conventional panel-mounted switches, controllers, indicators and OIT.
 - 5. Specific purpose control panels.

6. Local Control Stations for individual equipment manual control.
 7. Control panels shall be manufactured in compliance with the requirements of UL 508A and UL 698A.
 8. Conventional field instrumentation including primary elements, indicating transmitters, level, and pressure switches.
 9. Final control elements such as valve positioners and solenoids.
 10. Integration with vendor supplied control systems.
- B. Process control system interfaces with variable frequency drives, motor control centers, and other auxiliary equipment.
- C. Brandon and Michigan Regulator Level Signal Interface:
1. Provide communications cards installed in the existing PLC racks at the Brandon and Michigan Regulator facilities.
 2. Connect the communications cards with communications cards installed in the Georgetown Regulator PLC rack via leased line telephone connections.
 - a. Coordinate with the Project Representative to order telephone service from the local telephone utility.
- D. Hierarchical Levels:
1. A description of how each unit process is controlled is provided in the following Sections and as indicated in the Drawings.
 - a. Section 17510.
 - b. Section 17511.
 - c. Section 17512.
 - d. Section 17513.
 - e. Section 17514.
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 - y. Section 17556.
 - z. Section 17557.
 - aa. Section 17560.
 - bb. Section 17570.
 - cc. Section 17572.
 - dd. Section 17580.
 - ee. Section 17590.
 - ff. Section 17596.
 - gg. Section 17599.

2. In all cases, the process control system shall be capable of controlling the processes as described in Division 17 and as indicated in the Drawings.
3. The process control system consists of two levels of control:
 - a. Supervisory Control:
 - 1) Fully automatic, where the PLC systems sequences the operation of the treatment systems.
 - a) Operators can adjust supervisory control setpoints through the Facility OIT System per Section 17801, 17810 and the control strategies.
 - b. Local Equipment Controls:
 - 1) Local manual control using a local OITs or local control switches.
- E. Facility Operator Interface Terminal (OIT) System: Displays facility alarms and status information on panel mounted OIT units.
 1. The Contractor shall supply, install and configure the non-package system OITs per Section 17801 and the control strategies.
 2. The Contractor shall manage the configuration of all facility OITs per Section 17810.
- F. Facility SCADA System: Displays facility alarms and status information on a workstation installed in the facility control room.
 1. The SCADA system collects information from the facility PLC systems over the facility control system network.
 2. The County will supply the facility SCADA computer workstation hardware, computer operating system software.
 3. The Contractor shall supply and install all SCADA operating system software.
 - a. SCADA software
 - 1) Rockwell – Factory Talk View SE Server – 250 graphic displays (latest version).
 - 2) Rockwell – RSLinx Enterprise (latest version).
 - 3) Rockwell – Factory Talk View SE Client (latest version).
 - b. Historian software:
 - 1) Factory Talk SE Historian – 2500 points (latest version).
 4. The Contractor shall install the County supplied SCADA workstation.
 5. The Contractor shall configure, test and start-up all specified SCADA system software functions.
- G. Off-Site SCADA Communications Interface: Communicates facility alarms and status information to the existing off-site SCADA system located at the West Point WWTP.
 1. The existing Off-Site SCADA system collects information from the facility PLC systems via an Ethernet connection to the West Point Ovation control system network.
 2. The County will supply the Off-Site SCADA computer workstation hardware and computer operating system software.
 3. The Contractor shall configure the communications interface per Section 17802.
 4. The Contractor shall install the County supplied SCADA workstation.
 5. The County will configure the existing Off-Site SCADA system.
 6. Testing: Joint activity between Contractor and the County.
- H. METROTEL Communications Interface: Communicates facility alarms and status information to the existing METROTEL system.
 1. The existing METROTEL system collects information via leased telephone lines from METROTEL RTUs installed in the following control panels:
 - a. PNL854282.
 - b. PNL854882.
 - c. PNL854982.
 2. The County will supply the Metrotel computer workstation hardware and computer operating system software.
 3. The Contractor shall supply, install and configure the Metrotel RTUs and their communications interfaces per Section 17802.
 4. The Contractor shall install the County supplied Metrotel SCADA workstation.

5. The County will configure the Metrotel SCADA system.
 6. Testing: Joint activity between Contractor and the County.
- I. Some areas of this Contract may involve classified areas and shall be constructed per the requirements of NFPA 820.

1.07 EXISTING CONDITIONS

- A. Examine the mechanical Drawings and specifications to determine actual locations, sizes, materials and ratings of process connections.
- B. Any record drawings of existing work presented in these contract documents are for information only and may not accurately represent existing conditions.
 1. Field investigate all existing facility modifications to ascertain the exact physical and electrical conditions in each case.
 2. After field investigation, revise, as required, installation and interface wiring drawings to conform to actual conditions and to comply with codes and Contract requirements.
 3. Provide a detailed design and implement the proper method for physical installation and interface wiring for the required modifications.
 4. Submit revisions to the Project Representative.

1.08 SYSTEM INTEGRATION DRAWINGS

- A. General:
 1. The Drawings are functional in nature and do not show exact locations of equipment and may not show necessary interconnections between equipment.
 2. Wiring and loop diagrams shall carry a uniform and coordinated set of wire numbers and terminal block numbers in compliance with Division 16 and Section 17110 to permit cross-referencing between Contract Documents and the system integration Drawings.
 3. Each control circuit, control loop, control panel layout design, etc., shall be represented on a unique drawing. Control circuits, loop diagrams, and panel layouts referenced to typical diagrams are not acceptable.
 4. Drawing symbol format shall comply with NFPA 79, ISA 5.1, and ISA 5.3 and where appropriate, ISA RP 12.2.02.
 5. Plots shall be 11-inch by 17-inch (half-size) or 22 inch by 34 inch (full-size), as required.
 6. Minimum Text size: 0.125 inch for 22 x 34 inch drawings, 0.063 inch for 11 x 17 inch drawings.
 7. Drawings shall have borders and title blocks identifying the Contract, facility, system, and revisions to the drawing, and type of drawing. Borders and title blocks shall conform to current County drafting standards.
 8. Each release of a drawing shall carry a revision number, date, and a brief description of the changes. Changes associated with a given release shall be indicated on the drawing by a revision flag. Changes on the latest revision shall be indicated by clouding.
 9. Transfer record drawings per Section 01720 to the County in electronic format on CD and hard copy when work is completed.
- B. Elementary and Loop Diagrams:
 1. Drawings are functional in nature and may not show the exact wiring needed to achieve the required functions.
 2. Provide complete elementary diagrams for equipment control.
 3. Prepare loop diagrams in compliance with ISA S5.4 and provide for analog loops.
 4. Comply with NFPA 79.
 5. Show circuits and devices of a system.
 6. Arrange to emphasize device elements and their functions as an aid to understanding the operation of a system and maintaining or troubleshooting that system.

7. Show cable numbers, wire numbers, terminal box numbers, signal polarities, and terminal block numbers. Tables for cable numbers, wire numbers, terminal box numbers, signal polarity, and terminal block numbers are not acceptable.
 - a. Coordinate cable numbers with Division 16 and show on diagrams.
 - b. Coordinate terminal boxes with Division 16 and show on diagrams.
 8. Wiring between circuit elements shall terminate on terminal blocks, and shall not be connected from element to element. Exceptions are: common wires among contacts on a single circuit element (e.g., switch or relay contacts, but NOT the relay coil).
- C. Wiring Diagrams:
1. Panels: comply with NFPA79.
 2. Show components of a control panel in an arrangement similar to the actual layout of the panel.
 3. Show internal wiring between devices within the panel.
 4. Show terminal blocks whether used for internal or field wiring. Those used for field wiring shall be clearly identified as such.
 5. Wiring diagrams shall indicate insulation color code, signal polarities, and show wire numbers and terminal block numbers.
- D. Interconnection Diagrams:
1. Interconnection diagrams for field wiring.
 2. Show each panel and field devices.
 3. Show wire numbers, cable numbers, raceway numbers, terminal box numbers, terminal block numbers, panel numbers, and field device tag numbers.
 - a. Coordinate cable numbers with Division 16 and show on diagrams.
 - b. Coordinate terminal boxes with Division 16 and show on diagrams.

1.09 CERTIFICATIONS

- A. Temperature: Test data certified by the manufacturer to demonstrate that field electronic devices are suitable for the specified ambient temperatures.
- B. Corrosion: Test data showing design features of the electronic equipment provided to protect against damage by the specified atmospheric contaminants and specific evidence that similarly protected electronic equipment has operated in similar environments for a period of not less than five years without failure due to corrosion.
- C. Factory calibration: Factory calibration certification for all instruments that cannot be field calibrated (such as flow measurement instrumentation).

1.10 SEISMIC DESIGN

- A. Procedure and submittals: Section 01031.
- B. Structures and equipment shall be braced to prevent damage from specified forces.

1.11 SOURCE QUALITY CONTROL

- A. Un-Witnessed Factory Demonstration Test: Prior to factory demonstration testing, complete the following:
 1. Inspect and test the process instrumentation and control system including the main control panels, PLCs, local control panels, etc., to ensure they are operational.
 2. Ensure that proper materials have been used during manufacture and assembly and parts and materials have been correctly assembled and wired.
 3. Complete an integrated test:
 - a. Interconnect and test the process control and instrumentation system, except for primary elements, final control elements, and small control stations.

- b. Exercise and test functions to ensure proper manufacture and assembly of the completed panel and/or system.
 - c. Test panels.
 - d. Simulate inputs and outputs for primary elements, final control elements, and small control stations excluded from the test.
- B. Factory Demonstration Test: Test and document the following functions:
 - 1. The Project Representative will witness the factory demonstration test.
 - 2. Location: Test shall be conducted at a testing site located within 50 miles of the project site.
 - 3. Submit a test schedule and notify the Project Representative no less than 10 working days prior to the test.
 - 4. Interconnect and test the process control and instrumentation system, except for primary elements, final control elements, and small control stations.
 - 5. All PLC I/O and control panel hardware functions shall be tested.
 - 6. Provide test equipment to simulate discrete and analog inputs and outputs.
 - 7. Provide a testing simulation program to exercise discrete and analog outputs to confirm proper loop operation.
 - 8. Test all specified software functions through their associated PLC systems, facility OITs, facility SCADA and remote SCADA interfaces to display and alarm simulated statuses and confirm system response to operator inputs.
 - 9. Demonstrate that panels and subsystems have the required spare capacity for expansion.
 - a. Include test for I/O storage capacity and program memory capacity.
- C. Have the following at the test for review and use:
 - 1. All applicable Drawings, Specifications, Addenda and Change Orders.
 - 2. Factory test procedure including test forms.
 - 3. Shop drawings and hardware submittals for equipment being tested.
 - 4. Software documentation.
- D. Correct deficiencies and retest prior to shipment of the equipment to the work site.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Shipping:
 - 1. Ship equipment as single units to project site.
 - 2. Anchor and brace equipment weighing 400 pounds or more to resist seismic forces per IBC.
 - 3. No internal wiring shall be disconnected for transportation.
- B. Delivery Inspection: Notify the Project Representative and provide access for inspection upon arrival of any material or equipment to be incorporated into the work. Remove protective covers when required.
- C. Control Panels:
 - 1. Completely wired and tested in the factory prior to being shipped to the job site.
 - 2. Shipped as a single unit to job site after testing is complete.
 - a. Exception for the 3 section MCP which may be shipped as separate sections.
 - b. Only internal interconnecting wiring between sections of the MCP shall be allowed to be disconnected for shipping.

1.13 MATERIALS AND QUALITY

- A. The Instrument Schedule in Section 17901 lists major instruments required for the process instrumentation system.
 - 1. Provide functions specified in the instrument schedule.
 - 2. Provide additional instruments that may be required to complete the instrument loops because of certain characteristics of the particular equipment selected by the Contractor.

3. Provide such additional instruments even though not specified in Section 17901 or indicated in the Drawings.
- B. In some cases, it is possible to combine the functions of two or more instruments specified in the Instrument Schedule into a single instrument.
1. An example of functions that may be ordinarily combined into a single instrument are multiple alarms derived from a common transmission signal.
 2. Alarm or safety functions derived directly from process measurements shall not be combined with instruments operating from transmission signals.
 3. Critical alarms or safety functions shall not be combined into any instrument used for process control, indication, or recording.
- C. Material shall be new, free from defects, and of the quality specified. Each type of instrument, accessory, and device shall be by the same manufacturer.
- D. Unless otherwise specified, electronic equipment shall be of solid-state construction. Components of standard electronic assemblies shall not be replaced with components of different characteristics in order to meet the performance requirements of the specification.
1. Parts shall be as shown in the instruction manuals and shall be replaceable with standard commercial components of the same description without degrading the performance of the completed assembly.
- E. Hardwired Analog Signal Transmission:
1. Unless otherwise specified, signal transmission between electric or electronic instruments not located within a common panel shall be 4 to 20 mA.
 - a. Provide signal isolators for each signal.
 - 1) Loop load capacity: 500 ohms, minimum.
 2. Two-wire loop transmitters shall operate at 24 VDC.
 3. Loop shields shall be grounded at the terminal block located in the area electrical room PLC panel to an isolated instrument panel signal ground bus.
 - a. Separate grounded conductors shall be provided for each loop.
 - b. Daisy chaining of grounded conductors from one loop to another is not allowed.
 - c. Only one end of the shield shall be grounded.
 - d. Grounding shall be as indicated in the Drawings.
 4. Provide isolating amplifiers for field equipment possessing a grounded input or output, or having a common mode voltage other than system ground as specified in Section 17212.
 5. All other transmission systems, such as impulse duration, low frequency pulse rate, and voltage regulated, will not be permitted except where specifically noted in Section 17901.
 - a. When transmitters with nonstandard outputs are specified, their output shall be converted to 4 to 20 mA at the field instrument.
 6. Equipment located in hazardous areas shall be explosion proof or intrinsically safe.
- F. Provide intrinsic safety barriers approved by UL, CSA, or FM, and which meet the requirements of UL 698A.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 INSTALLATION

- A. General:
1. The Contractor shall supervise and coordinate all activities related to the requirements of Division 17.

2. Division 17 equipment shall be located and protected so that it is readily accessible for operation and maintenance as required by NFPA70. Equipment shall be located between 48 and 66 inches above the floor or a permanent work platform.
3. Provide instrument tags for field instruments engraved with the equipment number as identified on the Process and Instrument Diagrams and/or the Instrument Schedule Section 17901. Tags shall be stainless steel and affixed to the field equipment with stainless steel screws or stainless steel wire. Engraved text shall be not less than 0.125 inches high.
4. Use API RP 551 and PR 552 as a guide where installation procedures are not specified herein.
5. Coordinate installation with other work to avoid interference with normal operation of on-line equipment and processes.
6. Provide the services of skilled instrument technicians for testing, calibration, and adjustment activities.
7. Unless otherwise specified, instrumentation support systems shall be constructed of stainless steel.
8. Instrument supports shall not be attached to handrails, process piping, or mechanical equipment unless required in order to perform the measurement function.
9. No instrument shall be mounted directly flush to walls without a minimum of 5/8 inch spacing.
10. Equipment bracing and anchorage shall comply with Section 01031.
11. All transmitters shall be located such that personnel can access and view transmitter displays from floor or permanent platform.

B. Signal Transmission:

1. Unless otherwise specified, signal transmission between electric or electronic instruments not located within a common panel shall be 4 to 20 milliamperes and shall have a loop compliance of at least 500 ohms.
2. Two-wire loop transmitters shall operate at 24 VDC.
3. Unless otherwise shown, milliampere signals from the field shall be converted to 1 to 5 VDC signals at the field terminal block of each panel. Conversion error shall not exceed 0.1%. Instruments within a panel shall be parallel wired with 1-5 VDC signals.
4. Loops shall be grounded at the field terminal block by bonding to the instrument panel signal ground bus. Separate grounded conductors shall be provided for each loop. Daisy chaining of grounded conductors from one loop to another is not allowed.
5. Provide isolating amplifiers for field equipment possessing a grounded input or output, or having a common mode voltage other than system ground.
6. Convert high frequency (greater than 50 Hz) pulse rate signals from field transmitters to analog 1-5 VDC signals at the panel.
7. Convert platinum resistance temperature detector (RTD) outputs to 4-20 milliampere signals at the RTD, or where indicated in the Drawings. The temperature milliampere signal may be brought from the field to the panel and converted to a 1-5 Volt DC signal.
8. All other transmission systems, such as impulse duration, low frequency pulse rate, and voltage regulated, will not be permitted except where specifically noted in the Instrument Schedule, Section 17901. When transmitters with non-standard outputs are specified, their output shall be converted to 4 to 20 milliamperes at the field instrument.
9. Equipment located in classified areas shall be explosion-proof or intrinsically safe. Provide intrinsic safety barriers approved by UL, CSA, or FM.

3.02 FIELD QUALITY CONTROL

A. General Requirements:

1. Meet Section 01660 requirements.
2. All required tests will be witnessed by the Project Representative or County-designated person unless a written exemption is provided.
3. Notify the Project Representative of the test date seven working days prior to the test.
4. Submit a detailed step-by-step test procedure, complete with forms for the recording of test results, testing equipment used, and identification of the technician performing and witnessing the test.

5. Test reports: Conform to the requirements of Forms 17000-A through 17000-K per Section 01999 and ISA S20.
6. The Engineer reserves the right to witness the factory testing. The Contractor shall inform the Project Representative and the Engineer at least 30 days prior to the factory tests

A. Test Equipment:

1. Unless specified otherwise, provide all test equipment to complete all specified tests.
2. Test equipment used to simulate inputs and read outputs shall have a rated accuracy at the point of measurement at least three times greater than the component under test.
3. Each test instrument shall be calibrated prior to the commencement of a testing activity and checked after the completion of a testing activity.
4. Submit dated and certified calibration reports traceable to the National Institute of Standards and Technology (NIST) with the test report. Calibration certification date shall be within three months of date of use on this Contract.
5. Provide buffer solutions and reference fluids for tests of analytical equipment.

B. Test Stages:

1. General:

- a. Test each instrument loop in the following sequence:

Testing sequence	Form
Wiring	17000-A
Piping	17000-B
Individual components	17000-D, F, G through I
Individual loops	17000-J
Loop commissioning	17000-K

2. Testing of piping, wiring, and individual components shall be completed prior to commencement of individual loop testing.
 - a. Submit completed test reports to the Project Representative.
3. Individual component calibration and test:
 - a. Each instrument and final element shall be field calibrated in accordance with the manufacturer's recommended procedure. Instruments shall then be tested in compliance with ISA S51.1 and the data entered on the applicable test form.
 - b. Alarm trips, control trips, and switches shall be set to initial values specified in the Instrument Schedule in Section 17901.
 - c. Final elements shall be checked for range, dead-band, and speed of response.
 - d. Any component that fails to meet the required tolerances shall be repaired or replaced.
 - 1) Repeat above tests until the failed component is within specified performance requirements.
 - e. Submit completed test reports to the Project Representative.
4. Individual Loop test:
 - a. Test each instrument loop as an integrated system. This test shall check operation from transmitter to signal receiving components, and from the main control panel to final control elements.
 - b. Inject signals at the field terminations to simulate primary measuring elements.
 - c. Output of each auto/manual station shall be manually varied from 0 to 100 percent, and correct operation of final control element verified.
 - d. Each alarm circuit shall be manually actuated at the field sensor.
 - e. Verify correct operation of the applicable annunciator window.
 - f. Where alarm contact is connected to the PLC system, and/or the Metrotel system, correct PLC and Metrotel responses shall be monitored and verified.
5. Closed-loop test:
 - a. Test shall demonstrate stable operation of the loop under actual Facility operating conditions. This test includes adjustment of loop tuning parameters and shall be witnessed by the Project Representative.

- b. Unless otherwise specified, adjust tuning parameters (proportional gain, integral time constant, and derivative time constant) for each control loop to provide $\frac{1}{4}$ -amplitude damping or better.
 - c. Prepare a trend graph showing loop response to a step disturbance for each loop.
 - d. Make two trend graphs for cascade loops, one showing the secondary loop response with its set point on manual, and the second showing overall loop response.
 - e. Trend graphs shall be made at sufficient speed and amplitude to clearly show specified amplitude damping and shall be annotated to show loop number and title, and settings of parameters and set point.
6. Existing Off Site SCADA and METROTEL system test:
- a. Coordinate with the Project Representative for the requirements of this test.
 - b. Test both the PLC-to-off site SCADA and the Metrotel communications.
 - 1) Test all signals for both systems, point by point, end-to-end from the field sensor location to the West Point Treatment Plant.
 - c. Test that the equipment is functioning correctly and as specified.
 - d. Test that specified signals are communicated to, and correctly received at the West Point Treatment Plant.
 - e. Test that control signals are communicated correctly from the West Point Treatment Plant control room and the appropriate control action is observed on the field equipment.

END OF SECTION

SECTION 17110

PANELS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies requirements for panels, cabinets, consoles, and racks for instrumentation and communication equipment. Additional requirements are specified in Sections specifying the various instrumentation and communication systems.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following documents. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
FED STD 595A	Federal Standard Colors
IEC 60947	Low Voltage Switchgear and Controlgear
NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
NFPA 79	Electrical Standards for Industrial Machinery
UL 94	Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
UL 508A	Industrial Control Panels – Standard
UL 698A	Industrial Control Panels – Classified Areas

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Dimensioned front view drawings.
- C. Dimensioned internal equipment layout drawings.
- D. Panel assembly drawings shall include sections showing clearances between face and rear mounted equipment and keyed Bills of Materials.
- E. Nameplate engraving schedule showing engraving by line, character size, and nameplate size.
- F. Enclosure manufacturer's drawings.
- G. Panel seismic calculations.
- H. Panel wiring diagrams for each panel. The diagram shall meet the requirements as set forth in the NFPA 79 Electrical standards for industrial machinery.
- I. Calculations of percentage wire fill for wireways including factory wiring and allowance for field wiring.

1.04 DESIGN REQUIREMENTS

A. Enclosures shall be limited to the following NEMA 250 types:

Type	Location
NEMA 12	Electrical Rooms
NEMA 4X SS	All other locations and applications
NEMA 7D	Classified Locations

B. Panel Design:

1. General:

- Section 17901 includes major panels and associated instrumentation.
 - Additional panels may be indicated in the Drawings.
 - Panel size and equipment layout requirements are specified on the Drawings.
- No panel mounted operator interface devices, such as selector switches, shall be mounted greater than 72 inches or less than 42 inches above the finished plant floor, with the exception of annunciators.
 - No panel mounted instruments will be mounted greater than 66 inches or less than 40 inches above the finished plant floor, with the exception of the annunciator panel as described below.
 - Annunciators: unless shown otherwise, each panel containing alarm points shall be provided with one or more annunciators Section 17120. Annunciators shall not be mounted with the top frame in excess of 90 inches above the finished plant floor.
 - Power supplies:
 - The Main Control Panel shall contain dual redundant DC power supply systems as indicated in the Drawings.
 - Other panels containing direct current powered instruments or serving as the termination point for transmission loop powered field instruments shall obtain the DC power from the main control panel's DC power supply systems.
 - The DC power supply systems shall be Section 17130.

C. Labeling:

- Panels shall be manufactured and labeled in accordance with UL 508A and/or UL 698A and shall bear the UL label.
- Design as indicated in the Drawings is for reference and shall be altered as required to make the panels UL 508A and/or UL 698A compliant.

D. Panel Schedule. Refer to Drawings and Divisions 11 through 16 for additional panels which may cross-reference Div. 17 for panel requirements.

ITEM	EQT Number	NEMA Type
Georgetown Regulator EBI and Michigan Trunk Bubbler Panel	PNL854212	NEMA 4X
Georgetown Regulator Diversion Bubbler Panel	PNL854214	NEMA 4X
Georgetown Regulator Hazardous Gas Monitoring Panel	PNL854221A	NEMA 4X
Georgetown Regulator Hazardous Gas Go/No Go Panel	PNL854221B	NEMA 4X
Georgetown Regulator Hazardous Gas Alarm Panel	PNL854221C	NEMA 4X
Georgetown Regulator Control Panel	PNL854281	NEMA 4X
Georgetown Regulator Metrotel Panel	PNL854282	NEMA 4X
Equalization Basin Bubbler Panel	PNL854300	NEMA 4X
Equalization Basin Hazardous Gas Monitoring Panel	PNL854303A	NEMA 4X
Equalization Basin Hazardous Gas Go/No Go Panel 1	PNL854303B	NEMA 4X
Equalization Basin Hazardous Gas Go/No Go Panel 2	PNL854303D	NEMA 4X
Influent Channel Bubbler Panel	PNL854330	NEMA 4X
Influent Sample Room Hazardous Gas Monitoring Panel	PNL854333A	NEMA 4X
Influent Sample Room Hazardous Gas Go/No Go Panel	PNL854333B	NEMA 4X
Influent Sample Room Hazardous Gas Alarm Panel	PNL854333C	NEMA 7
Screen Building Network Panel	PNL854340	NEMA 4X

ITEM	EQT Number	NEMA Type
Influent Screen 1 Bubbler Panel	PNL854341	NEMA 4X
Influent Screen 2 Bubbler Panel	PNL854342	NEMA 4X
Screening Room Hazardous Gas Monitoring Panel	PNL854345A	NEMA 4X
Screening Room Hazardous Gas Go/No Go Panel 1	PNL854345B	NEMA 4X
Screening Room Hazardous Gas Go/No Go Panel 2	PNL854345C	NEMA 4X
Screening Room Hazardous Gas Alarm Panel	PNL854345D	NEMA 7
Ballasted Sedimentation Distribution Channel Bubbler Panel	PNL854411	NEMA 4X
Coagulant Chemical Fill Station Panel	LCP854440	NEMA 4X
Caustic Chemical Fill Station Panel	LCP854450	NEMA 4X
Effluent Sump Bubbler Panel	PNL854505	NEMA 4X
C3 Storage Tank Bubbler Panel	PNL854517	NEMA 4X
Solids Holding Tank Bubbler Panel	PNL854601	NEMA 4X
OCU 1 Hazardous Gas Monitoring Panel	PNL854717A	NEMA 4X
OCU 1 Hazardous Gas Go/No Go Panel	PNL854717B	NEMA 4X
OCU 1 Hazardous Gas Alarm Panel	PNL854717C	NEMA 7
OCU 2 Hazardous Gas Monitoring Panel	PNL854727A	NEMA 4X
OCU 2 Hazardous Gas Go/No Go Panel	PNL854727B	NEMA 4X
OCU 2 Hazardous Gas Alarm Panel	PNL854727C	NEMA 7
Main Control Panel (MCP)	PNL854481	NEMA 12
Process Electrical Room Metrotel Panel	PNL854882	NEMA 12
Multi-Channel Gas Monitor Panel 1	PNL854883	NEMA 12
Multi-Channel Gas Monitor Panel 2	PNL854884	NEMA 12
Operation Electrical Room Control Panel	PNL854981	NEMA 12
Operations Electrical Room Metrotel Panel	PNL854982	NEMA 12

PART 2 PRODUCTS

2.01 MATERIALS AND QUALITY

A. General:

1. Panel work shall be designed for seismic requirements per Section 01030.
2. Cutouts for future equipment shall be blanked off with suitable metal covers.
3. Instrument tag numbers shall be identified on the panel interior per this Section.
4. Nameplates shall identify face-mounted instruments per this Section.
5. Instruments shall be mounted in a manner that allows ease of access to components and ease of removal.
6. Face-mounted instruments that are more than six inches deep, weigh more than 10 pounds, or exert more than a 4 ft-lb moment force on the face of the panel shall be supported underneath at the rear by a 1-inch x 1/8-inch thick steel angle.
7. Face-mounted equipment shall be flush or semi-flush with escutcheons.
8. Floor mounted cabinets less than 60 inches high shall be provided with floor stands to raise the top of the panel to at least 60 inches above the floor or work platform. Or, if panel weighs less than 100 pounds and wall space is available, wall mounting may be used in lieu of a floor stand.

B. Fabrication of NEMA Type 12 Industrial Use, Indoor Cabinets with Front Doors:

1. Enclosure fabricated from 16-gauge minimum thickness sheet steel for enclosures smaller than 24 inch x24 inch, and 14-gauge minimum for larger enclosures. Face-mounted instruments shall be mounted in the door.
2. Interior frame or otherwise formed so as to provide a rigid structure.
3. Doors shall be hung on full-length continuous (piano-type) hinges and equipped with vault-type latch capable of accepting a 3/8-inch-shackle padlock.
4. Three-point latch hardware shall be provided for doors exceeding 48 inches height. Door width shall not exceed 34 inches.

- C. Fabrication of NEMA Type 4X Cabinets:
 - 1. NEMA 250, Type 4X requirements.
 - 2. Fabricated from 14 gauge (minimum thickness) Type 316L stainless steel or fiberglass when specifically specified) and provided with an interior frame or otherwise formed to provide a rigid structure.
 - 3. Where interior-mounted instruments are specified, mount on an interior sub-panel.
 - 4. Doors:
 - a. Vault-type latch and, if greater than 48 inches high, three-point latch hardware.
 - b. Latch shall accept a 3/8-inch shackle padlock.
 - c. Unless shown otherwise, door width shall not exceed 36 inches.
 - d. Where noted, or as indicated in the Drawings, provide gasketed plexiglass window to allow visibility of displays and indicators installed inside the panel.
 - e. Hang doors on full length continuous (piano style) hinges.
 - 5. For cabinets located outdoors, equip with rain and sun shields.
- D. Fabrication of NEMA 7 Cabinets:
 - 1. Comply with NEMA 250, Type 7 suitable for Class I, Division 1, Group D classified area.
 - 2. Assembled and installed to maintain this rating.

2.02 HEATING AND VENTILATING

- A. Provide cooling to maintain the internal panel temperature below 122 degrees °F (50 °C) when all equipment is operating at its maximum heat load and the ambient temperature is 104 degrees °F (40 °C).
 - 1. Calculate heat flow through unmodified enclosure to determine if active cooling is required.
 - 2. Provide filtered forced air ventilation for NEMA 12 cabinets
 - 3. Provide glycol closed loop heat exchange system or a mechanical refrigeration system for NEMA 4X and NEMA 7 enclosures, as required.
- B. Equip fans with UL-approved washable filters and provide at least 240 CFM air flow. Do not exceed 60 dB noise level at three feet from exterior wall of enclosure and 30 degrees off axis.
- C. Do not insulate outdoor or below grade cabinets and provide with thermostatically controlled space heaters.
- D. Provide heater wattage sufficient to maintain the air temperature inside the cabinet above the dew point or 50 degrees F (10 °C), whichever is higher, at all times.
- E. If space heater surface temperature exceeds 122 degrees F (50 °C), provide an expanded metal guard.
- F. When a strip type heater is used, provide a 240 VAC heater and connect to 120 VAC. Size the heater to produce the required heat at 120 VAC.
- G. Thermostat Acceptable Manufacturer:
 - 1. Hoffman Engineering TWR60.
 - 2. Eaton B-Line EST Series.
 - 3. Approved Equal.

2.03 NAMEPLATES AND LABELS

- A. Machine engraved laminated black phenolic nameplates 1/16-inch thick with white lettering shall be provided for panel mounted equipment. Nameplate minimum size: 3/4-inch high by 2.0-inch long.

- B. Nameplate engraving shall be as specified and shall carry the instrument tag number in 3/32-inch (2.4 mm) minimum size lettering on the bottom line, or engraved as indicated in the Drawings.
- C. Nameplates shall be attached to the panel with a minimum of two self-tapping 316 stainless steel screws.
- D. Changes to wording must be approved by the Project Representative prior to commencement of engraving.
- E. Machine-printed laminated adhesive labels shall identify tag number of instruments and equipment inside panels.
- F. Attach nameplates and labels to panel surfaces, not to instruments.
- G. Machine embossed, adhesive backed nameplates shall identify the tag number of equipment inside cabinets.

2.04 WIRING AND ELECTRICAL DEVICES

- A. Wiring:
 - 1. Power, control and signal wiring inside panels:
 - a. Power and control conductors:
 - b. Type MTW, minimum size 16 AWG.
 - c. Conductor insulation rated for 600 volts and 90 degrees C in dry locations.
 - d. All conductors shall be stranded copper.
 - e. Power and control conductors in panels have insulation type MTW, minimum 16 AWG.
 - f. Wiring for instrumentation analog signals:
 - 1) Aluminum foil shielded twisted pairs, minimum 18 AWG, stranded copper conductors with drain.
 - 2) Conductor insulation shall be PE in black and white or clear with overall jacket of grey PVC.
 - 3) Type CM rated 300V and 60 degrees C in dry locations.
 - 4) Belden type 8760, Alpha 2422C or Approved Equal.
 - g. Wiring shall be run continuously from measuring instrument to control cabinet terminal strips without splices.
 - h. Conductor size vs. fuse rating for conductors inside panels:

Wire	Fuse
18 AWG	≤ 1 AMP
16 AWG	≤ 5 AMPS
14 AWG	≤ 15 AMPS
12 AWG	≤ 20 AMPS

- 2. Support wiring independent of terminations by slotted flame retardant plastic wiring channels (wire ways).
- 3. Wiring channels:
 - a. Comply with UL94, Type V.
 - b. Installed wiring channel fill shall not exceed 40 percent.
- B. Wire Naming and Marking:
 - 1. Wiring shall be marked at terminations with machine printed plastic sleeves Section 16000.
 - 2. Wire numbers shall consist of three parts, or as indicated in the Drawings.
 - 3. Unless shown otherwise, the prefix of the wire number shall be the instrument loop number.
 - 4. If an instrument loop number is not available, the lowest mechanical equipment number of all final drives in the circuit shall be used.
 - 5. Following the prefix shall be a code letter. The third part of the wire number shall be a number that identifies wires in a circuit that are electrically identical.

6. Label each control and instrumentation wire as follows:

a. FFFLLL-CC-NNN, Where:

- 1) FFF = facility number or process number.
- 2) LLL = equipment, panel or loop number.
- 3) CC = wire code from table.
- 4) NNN = wire number.
- 5) Note FFF ,facility number, is only required if multiple facilities are involved or within a treatment plant with multiple processes.

C. Color Coding:

1. Color coding of wires within control panels shall be as follows (unless otherwise required by UL 508A and/or UL 698A):

WIRE COLOR CODES				
Code	Type	Color	Use	Volts
S1	TSP	BLACK	SIGNAL (+)	5-24 VDC
S2	TSP	WHITE or CLEAR	SIGNAL (-)	5-24 VDC
SG	TSP	BARE	SHIELD DRAIN	5-24 VDC
S1	TRIAD	BLACK	SIGNAL	0-24 VDC
S2	TRIAD	WHITE	SIGNAL	0-24 VDC
S3	TRIAD	RED	SIGNAL	0-24 VDC
SG	TRIAD	BARE	SHIELD DRAIN	0-24 VDC
24P	SINGLE	BLUE	POWER (+)	24 VDC
24C	SINGLE	WHITE/BLUE	COMMON (-)	24 VDC
D	SINGLE	BLUE	CONTROL	24 VDC
125P	SINGLE	BLUE	POWER	125 VDC
125C	SINGLE	WHITE/BLUE	COMMON	125 VDC
B	SINGLE	BLUE	CONTROL	125 VDC
L	SINGLE	BLACK	POWER	120 VAC
N	SINGLE	WHITE	NEUTRAL	120 VAC
C	SINGLE	BLACK	CONTROL	120 VAC
PG	SINGLE	GREEN	POWER GND	EARTH GND
SG	SINGLE	GREEN/YELLOW	SIGNAL GND	EARTH GND
UL	SINGLE	BLACK/WHT	UPS POWER	120 VAC
UN	SINGLE	WHITE/GREY	UPS NEUTRAL	120 VAC
M	SINGLE	YELLOW	MCC	120 VAC
MN	SINGLE	WHITE/YELLOW	MCC NEUTRAL	120 VAC GND'D
A	SINGLE	BLACK OR BLUE	ANNUNCIATOR	120 VAC/24VDC
IO	SINGLE	BLACK OR BLUE	ISOL I/O	120 VAC/24VDC
R	SINGLE	BLUE	RTU	12 VDC
IS	SINGLE	LIGHT BLUE	INTRINSIC SAFE	<12 VDC

2. Power and control wiring in covered wiring channels separate from low voltage analog signal circuits.

D. Terminal blocks and accessories:

1. UL listed.
2. DIN rail mounted. Compliant with IEC 60947.
3. Compression clamp type terminal rated for 600 volts and 30 Amperes.
4. 22 AWG to 12 AWG copper wire size range.
5. Mark using marker carrier and preprinted marker bars for the terminal numbers.
6. Acceptable Manufacturers:
 - a. Entrelec Series:
 - 1) Typical Entrelec catalog numbers are the following:
 - a) Terminal Block: Type MS 4/6.

- b) Switch Block: Type M 4/6.SNT.
 - c) Fuse Block: Types M 4/8.SFL, M 4/8.SFD, M 4/8.SFD1.
- b. Phoenix Contact Series UK IEC Terminal Blocks.
- c. Allen-Bradley Series 1492 IEC Terminal Blocks.
- d. Approved Equal.
- 7. Field connections shall be to separate terminal blocks. Terminal blocks for field terminations shall be in a separate part of the panel close to where the field cables enter the panel.
- 8. External circuits shall be fused.
- 9. Fuses for 120 VAC: include blown fuse indicator lamps.
- 10. Comply with UL requirements in construction.
- E. Circuit Breakers:
 - 1. Thermal magnetic, miniature case type with the ampere rating as specified.
 - 2. Circuit breaker interrupting rating shall be 10,000 amperes symmetrical minimum for service at 240 volts and below.

2.05 PANEL GROUNDING

- A. Each panel shall be provided with two copper ground bars as indicated in the Drawings. One bar shall be bonded to the panel frame or sheet metal and to the station ground system. The second (signal) ground bar shall be mounted on insulated stand-offs and shall be bonded to the frame ground bar at one point only.
- B. Signal circuits, signal cable shields, and low-voltage DC power supply commons shall be bonded to the signal ground bar.
- C. Surge protectors and separately derived AC power supplies shall be bonded to the frame ground bar.

PART 3 EXECUTION

3.01 GENERAL

- A. Wired as indicated in the wiring diagrams.
- B. Control room cabinets:
 - 1. Mount on channel iron sills as specified.
 - 2. Sills shall be leveled so panel structures will not be distorted.
 - 3. Panels shall be shimmed to precise alignment so doors operate without binding.
 - 4. Sealant shall be provided under panels not located in dry control or electrical equipment rooms.
 - 5. Mount field panels and cabinets in compliance with Section 17000.
 - 6. Floor-mounted cabinets except in dry control rooms or electrical equipment rooms shall be mounted on 3-1/2-inch minimum height concrete pads or grouted bases as specified.
 - 7. Mount record drawings for wiring, connection and interconnection diagrams behind a piece of Plexiglas on the inside of one (or more) door(s).

3.02 COATING

- A. Except for stainless steel and fiberglass panels, all panels and cabinets shall be painted inside and out by the manufacturer in accordance with Sections 09900 and 09901. Exterior finish shall be an enamel meeting ANSI 61 gray. Interior panel finish shall be an enamel meeting Federal Standard 595: 27880 white.
- B. Treat cutouts to prevent corrosion.

- C. Except for stainless steel enclosures, the metal surfaces of panels, cabinets, and consoles, shall be prepared, primed, and finish coated per Section 09900, System J-2.
- D. Except for stainless steel enclosures, the metal edges of cutouts for instruments, switches, lights, etc., in panels, cabinets, and consoles shall be prepared, primed, and finish coated per Section 09900, System J-2.

END OF SECTION

SECTION 17120
ANNUNCIATOR SYSTEM

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies requirements for alarm annunciator systems. Application requirements are specified in the Alarm Schedule, Section 17902, and the Annunciator Connection Diagrams, as indicated in the Drawings.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following documents. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
ISA S18.1	Annunciator Sequences and Specifications

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Dimensioned Layout drawings.
- C. Engraving Window Inscription Schedule.
- D. Test Data.

PART 2 PRODUCTS

2.01 ANNUNCIATOR SYSTEMS

- A. General:
1. The annunciator system shall be flexible and allowing easy field changes of functions. To support that, commonly changed functions such as; operating sequence selection, alarm priority, alarm delays, output relay settings and communication settings shall be configured through a Windows based software application. The software configuration shall be menu driven with the ability to create and save configurations online or offline with the annunciator. It shall be able to upload and download configurations to the annunciator and have provisions to save to a file.
- B. Enclosure:
1. Modular Construction, semi-flush panel mounted with rear cover
 2. Cell size 3.0 inches X 3.0 inches minimum
- C. Display:
1. Windows shall be clear plastic with white light diffuser paper, with a minimum of two white LED for illumination per input.
 2. Windows shall be half size (two per cell) as indicated in the Drawings.
 3. Window legends shall be up to four lines of 16 characters per line, not less than 7/32 inches in height, horizontal orientation.

4. Windows engraved and filled with permanent black ink.
5. Provide not less than 20 percent spare windows complete with input/output (I/O) module and blank window filler.
6. Provide at least one I/O module per window, two inputs per module.

D. Inputs:

1. Each input shall be optically isolated from the logic level circuitry on the input module.
2. Field contact operation for each input, normally open (close for alarm) or normally closed (open to alarm) shall be software configurable or field jumper selectable.
3. Field contact voltage (FCV) shall be externally supplied from the control panel.
4. Each input individually isolated from all other alarm inputs.
5. FCV shall be 120 VAC.
6. Removal of any I/O module shall not affect other input modules.
7. Input Response time: Standard input response time shall be 50 milliseconds. The annunciator input shall be configurable to extend the input time response to 250 seconds.

E. Approvals: UL, CE, FM Class 1, Division 2.

F. Alarm Sequence:

1. Each annunciator system can have up to four different operational sequences, selectable by point through the configuration software.
2. The alarm sequencing shall be per ISA S18.1, sequence M, other sequences shall be software selectable.
3. The annunciator shall have adjustable slow, fast, and intermittent flash rates in 0.1 second increments, using the configuration software.

G. System power: Integral power supply for annunciator logic and LEDs shall be 120 VAC, maximum 2.2 Watts per input point.

H. System Logic Module shall have the following features:

1. Common alarm outputs:
 - a. Two output relays configurable for Critical or Non-critical Horn or Ring back Horn.
 - b. Rated at 3.0 Amps, 24 VDC or 120 VAC.
 - c. Energized or de-energized relay coil, selectable in software.
 - d. Form A (N.O.) or Form B (N.C.) contact, selectable by jumper.
2. Control flashing per selected ISA sequence.
3. Four external pushbutton inputs for Silence, Acknowledge, Test, and Reset. These pushbuttons shall operate from the annunciator power supply. Pushbuttons operation is dependent on the operating sequence selected.

I. Configuration software: Provide one copy in electronic format (non-licensed).

J. Acceptable Manufacturer:

1. Ametek/Panalarm Series 90B.
2. Approved Equal.

2.02 HORN

A. Operating voltage: 120 VAC enclosed buzzer.

B. Sound output: 95 dBA minimum at 10 feet.

C. Mounting: Surface mount type for indoor panel installation. Mounted externally from annunciator.

- D. Acceptable manufacturer:
 - 1. Federal Signal Model 350WB.
 - 2. Edwards Signaling Series 870.
 - 3. Approved Equal.
- E. Provide On/Off switch on the control panel face to turn off the horn during maintenance. The On/Off switch shall energize an indicating light mounted on the face of the control panel. Switch and indicating light shall comply with Section 16175.

PART 3 EXECUTION

3.01 GENERAL

- A. Mounted and connected in the control panel.
 - 1. Test per Section 17000.
 - 2. Provide software configuration in as-built condition in electronic format on a USB flash drive. Flash drive shall be stored in the control panel.

END OF SECTION

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SECTION 17130

POWER SUPPLY AND CONDITIONING EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies requirements for power supply and conditioning equipment required to support the instrumentation and communication systems.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following documents. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
NFPA 70	National Electrical Code (NEC)
UL 1012	Power Units other than Class 2
UL 1283	Electromagnetic Interference Filters
UL 1449	Transient Voltage Surge Suppressors

- B. Labeling: Power supply equipment shall bear a UL or other label acceptable to the inspection authority having jurisdiction for the specified application.

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Dimensional drawings.
- C. Catalog Cuts including performance parameters.
- D. Installation Information.
- E. Wiring Diagrams.
- F. Operations and maintenance information: Section 01730.

1.04 ELECTRICAL SUPPLY SYSTEM

- A. Electric power for instrumentation and communication systems shall be obtained from the power distribution system specified in Division 16. This power is not regulated, waveforms may be distorted, and significant amounts of electrical noise may be present.
- B. Unless otherwise specified, provide all necessary power supply and conditioning equipment for all required voltages and current capacities and of adequate quality to ensure reliable operation of the instrumentation and communication systems.
- C. Unless otherwise specified, assume that the power supply for instrumentation systems is 120 volts plus or minus 15 percent, 60 hertz plus or minus 3 hertz, and 5 percent harmonic distortion.

PART 2 PRODUCTS

2.01 GENERAL

- A. Except for power supply units that form an integral part of an individual piece of equipment.
 - 1. Comply with UL 1012.
 - 2. Approved by UL, CSA, or FM for the application.
- B. Power supply equipment serving multiple instrument loops shall be provided in hot-standby configurations such that failure of a single unit will not disable all or any part of the instrumentation and communication systems.
- C. Provide diode isolation for redundant direct current supply units.
- D. Connect the DC power supply negative output terminal to the signal ground bus at a single point.

2.02 DIRECT CURRENT POWER SUPPLIES

- A. DC Power Supply:
 - 1. UL listed, regulated switching power supply with the following features:
 - 2. Barrier block terminals for all wiring connections.
 - 3. Input voltage: 90-264 VAC, 47-63 Hz.
 - 4. 24 VDC output voltage with accessible adjustment for a minimum of plus or minus 2.0 volts.
 - 5. Input voltage internally fused.
 - 6. Line regulation: Shall not exceed plus or minus 0.5 percent for line voltage variation from 105 to 125 volts.
 - 7. Load Regulation: Shall not exceed plus or minus 1.5 percent for load variation from zero to full load.
 - 8. Noise and ripple: Shall not exceed 200 mV p-p, including switching noise.
 - 9. Minimum efficiency: 80%.
 - 10. Electronic current limiting: 105-110% of full load, with automatic recovery.
 - 11. DC OK relay contact, opens when output voltage exceeds minus 10% of adjusted output voltage.
 - 12. DC OK indicator LED.
 - 13. Enclosure: Fully enclosed and suitable for mounting on DIN rail.
 - 14. Acceptable manufacturers:
 - a. Sola SDN-P Series.
 - b. PULS Q-Series.
 - c. Approved Equal.
- B. Dual Redundancy Module
 - 1. UL listed, redundancy module for 1+1 and N+1 redundant DC power systems.
 - 2. Diode isolation on the output.
 - 3. Output capacity derated >50° C.
 - 4. Input voltage alarm when either voltage input <18V; relay contacts rated <30V maximum.
 - 5. LED indication of each voltage input status.
 - 6. Acceptable manufacturers:
 - a. PULS YRM.
 - b. Delta CliQ DRR.
 - c. Approved Equal.
- C. Uninterruptible Power System (UPS):
 - 1. Single Phase UPS: Section 17132.
 - 2. Three Phase UPS: Section 16926.

- D. Surge Protection:
1. For protection against line generated transients for both normal and common mode protection.
 2. The unit shall be a non-degrading, solid state, series low pass filter with transient protection having the following features:
 - a. UL compliant for UL categories 1283 and 1449.
 - b. Input voltage: 120 VAC single-phase, 47-63 hertz.
 - c. Load current: 20 amperes minimum.
 - d. MCOV: 200V.
 - e. Surge capacity: Line-neutral, line-ground, neutral-ground (8 x 20 usec): 15,000 Amps min.
 - f. Response time: <1 nsec normal mode.
 - g. HF noise suppression: BW: 10kHz – 50 mhz; Attenuation (normal mode): -75 dB at 100 kHz min.
 - h. Transient suppression (per IEEE C62.41):
 - 1) Category A Ringwave (6kV, 200A, 100KHz): Normal mode: 6V.
 - 2) Category B Ringwave (6kV, 500A, 100KHz): Normal mode: <200V.
 - i. Mounting: DIN rail with barrier type terminal blocks for line and load hard-wired connections.
 - j. Operating temperature: -40° C to +45° C.
 - k. Acceptable Manufacturers:
 - 1) Emerson Power Islatrol IE-120.
 - 2) Eaton/Cutler Hammer AEGIS-HW.
 - 3) Approved Equal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Mount and connect in compliance with the manufacturer's instructions.
- B. Provide line side disconnect switches per Section 16175.
- C. Provide line and load side overcurrent protection in compliance with NFPA 70.
- D. Small power supply and conditioning equipment may be mounted in the panel served. Larger units shall be mounted adjacent to the equipment served.
- E. Where unconditioned power is brought into control panels, it shall be enclosed in metallic raceways within the panel.
- F. When larger than 5 KVA load capacity supported from surfaces other than concrete provide with sound isolators.
- G. Final raceway connections shall be a flexible conduit in compliance with Section 16110.
- H. When not designed for exposed mounting, house within enclosures rated for the installation location per Section 17110.

END OF SECTION

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SECTION 17132

SINGLE PHASE UNINTERRUPTIBLE POWER SUPPLY EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies on-line single-phase, continuous duty, split-phase, solid-state uninterruptible power supply (UPS) equipment.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following documents. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
IEEE 485	Recommended Practice for Sizing Lead- Acid Batteries for Stationary Applications
IEC 62040-1-1	Uninterruptible Power Systems (UPS) – Part 1: General and Safety Requirements for UPS
EN 62040-1-1	Uninterruptible Power Systems (UPS) – Part 1.1 General and Safety Requirements for UPS Used in Operator Access Areas
EN 60950	Product Safety Testing Standard for Information Technology Equipment
EN 62040-2	Uninterruptible Power Systems (UPS) – Part 2: Electromagnetic Compatibility (EMC) Requirements
NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
NFPA 70	National Electrical Code (NEC)
UL1778	Uninterruptible Power Supply Equipment

- B. Label: UPS equipment shall bear a UL or other label acceptable to the inspection authority having jurisdiction for the specific application and be UL1778 listed.

1.03 SUBMITTALS

- A. Procedure: Section 01300.
- B. Catalog cuts showing general features of the UPS and batteries.
- C. Battery discharge/recharge calculations.
- D. Dimensions and weights of components including working clearances.
- E. Block diagram depicting functional operation of UPS.
- F. Installation information.
- G. Wiring Diagrams, internal and external.
- H. Operation and maintenance information: Section 01730.

1.04 PERFORMANCE REQUIREMENTS

- A. Equipment output characteristics:
 - 1. Output Voltage (for 10 kVA UPS):
 - a. Output Voltage (Line-Line): 208 VAC, 1 phase.
 - b. Output Voltage (Line-Neutral): 120 VAC, 1 phase.
 - 2. Output Voltage (for 3.1 kVA UPS):
 - a. Output Voltage (Line-Neutral): 120 VAC, 1 phase.
 - 3. Power factor: 1.0 to 0.8 lagging.
 - 4. Wave form: 1.0 to 0.8 lagging.
 - 5. Voltage regulation: $\pm 3\%$ nominal for no load to full load, 1.0 to 0.8 lagging power factor, minimum to maximum DC voltage, or 0 to 40 degrees C ambient.
 - 6. Transient response: $\pm 10\%$ maximum upon application or removal of 50 to 100% load step; recovery to $\pm 5\%$ within 50mS.
 - 7. Voltage unbalance: $\pm 5\%$ with 100% load unbalance.
 - 8. Overload capability (for 10 kVA UPS): 150% for 10 minutes (online); Normal Operation 110% for 10 minutes..
 - 9. Frequency: Synchronized to power source. Automatic disconnect at $\pm 0.5\text{Hz}$; free running $\pm 0.1\%$.
 - 10. Battery charger float voltage: 2.25V/cell; recharge time less than 8 hours.
 - 11. Solid-state transfer switch: Maximum disturbance time, 1/4 cycle; capacity, 11,000A i sq. t.
- B. Equipment input characteristics:
 - 1. Normal source: 208 VAC, 1 phase with neutral (UPS for Area 900 O&M Support Building), and 120VAC, 1 phase (UPS for Area 200 Regulator Building).
 - 2. Input Power Factor: 95% lagging, minimum.
 - 3. Operating voltage range: +15% to -20%.
 - 4. Frequency range: $\pm 5\%$.
 - 5. Battery voltage: 48 VDC-120VDC nominal; discharge cut-off at 1.75V/cell.
- C. Environmental:
 - 1. Operating temperature: 0 – 40 degrees C.
 - 2. Humidity: 5% - 95% RH, non-condensing.
 - 3. Altitude: 0 – 3000 meters.
 - 4. Audible Noise @ 1 meter: 61 dBA maximum (10 kVA tower type) and 51 dBA (3.1 kVA rack-mounted type), A-weighted.
 - 5. Electrostatic Discharge: Withstand 8kV without damage.
- D. The UPS shall be certified to the following safety standards:
 - 1. EN 62040-1-1, IEC 62040-1-1, EN 60950.

PART 2 PRODUCTS

2.01 GENERAL

- A. UPS equipment shall include one rectifier, one inverter, one static bypass, one battery system, and associated meters, controls, indicators and appurtenances.
- B. Provide single-phase UPSs at two locations as indicated in the Drawings:
 - 1. Area 900 O&M Support Building UPS854951 - 10 kVA tower UPS
 - 2. Area 200 Regulator Building UPS854252 – 3 kVA rackmount UPS).
- C. UPSs shall maintain operation of communication equipment, instrumentation equipment, and control equipment located at each of the respective locations as indicated in the Drawings.

- D. UPS and battery shall be housed in a free standing NEMA 250, Type 1, locking caster base enclosure for installation, service, and ventilation.
- E. UPS shall be arranged for rear or top entry of all conduits.
- F. Efficiency at full load under normal operation shall not be less than 86%.

2.02 ACCEPTABLE MANUFACTURERS

- A. Area 900 O&M Support Building
 - 1. Eaton FERRUPS tower type
 - 2. Liebert UPS tower type.
 - 3. Approved Equal.
- B. Area 200 Regulator Building:
 - 1. Eaton FERRUPS rack mount (Powerware).
 - 2. Liebert UPS rack mount.
 - 3. Approved Equal.

2.03 MATERIALS

- A. Battery Charger / Rectifier:
 - 1. Constant-voltage type, capable of supplying the UPS direct current bus with no battery attached.
- B. Inverter:
 - 1. Solid-state pulse-width-modulation type.
- C. Battery:
 - 1. Sealed, Valve Regulated Lead Acid (VRLA), maintenance-free type, high-rate discharge cells. Keep full charged by the battery charger. Have minimum three-year float service life at 25 degrees C.
 - 2. UPS Holdover Time (Runtime) at 0.9 power factor:
 - a. 3.1 kVA: 14 minutes internal (full load) and 35 minutes (half load).
 - 1) Battery type: Manufacturer's standard (internal batteries).
 - 2) Battery replacement: Hot-swappable internal batteries.
 - 3) Battery charger: Standard.
 - b. 10 kVA: 12 minutes internal (full load) and 30 minutes (half load).
 - 1) Battery type: Manufacturer's standard.
 - 2) Battery replacement: Field-replaceable.
 - 3) Battery charger: Standard.
 - 3. Extended Runtime: Each UPS system shall have capability for addition of extra matching battery cabinets to increase the total runtime.
 - 4. Battery Recharge Time: Per manufacturer's standard.
 - 5. Size in accordance with IEEE 485.
 - 6. Start-on-Battery: Allows start of UPS without utility input.
- D. Maintenance Bypass Panel:
 - 1. Automatic on overload or UPS failure.
 - 2. Fully rated for the UPS capacity and make before break contacts.
 - 3. Wall-mounted external to the UPS cabinet to permit completely de-energizing all components within the cabinet during maintenance.
 - 4. Provide with surge protection and provisions for 36 poles of distribution utilizing selected manufacturer breakers.

- E. Instrumentation and Controls:
 - 1. Monitoring Instruments: Provide display panel indicator with the following parameters:
 - a. Percent load.
 - b. Battery reserve.
 - c. Input power.
 - d. Rectifier/charger.
 - e. Output normal status.
 - 2. Alarm Indication :
 - a. AC input failure.
 - b. Battery low.
 - c. Output undervoltage.
 - d. Output overvoltage.
 - e. DC bus overvoltage.
 - f. Bypass on.
 - 3. Alarm Signal Output: Provide normally closed common alarm contact.
- F. Anchor Kit:
 - 1. 10 kVA UPS: Provide an anchor kit for structural slab floor.
 - 2. 3.1 kVA UPS: No anchor kit is required.

2.04 SYSTEM INPUT AND OUTPUT CONNECTIONS AND WIRING

- A. AC Input:
 - 1. UPS units shall be capable of utilizing hardwired input.
 - 2. 3.1 kVA UPS: Provide L5-30P input plug with 6-foot cord.
- B. AC Output:
 - 1. 10 kVA UPS: UPS shall be capable of utilizing hardwired output to power distribution module.
 - 2. 3.1 kVA UPS: UPS enclosure shall be capable of utilizing optional additional receptacle selections: Provide the following output receptacles
 - a. Three L5-15R duplex receptacles.
 - b. One L5-20R receptacle.
 - c. One L5-30R receptacle.
- C. Remote Emergency Power Off (REPO) Connection: The UPS shall provide a built-in landing for field connection of a Remote Emergency Power Off circuit.
- D. Serial (RS-232) Communication Interface: A 9-pin sub-D connector shall provide capability for communication with manufacturer-supplied software package.
- E. Communication Card Slots: The UPS shall provide two communication X-slots in the back of the UPS allowing for additional connectivity options.
- F. Two Programmable Input Connections: The UPS shall provide built-in inputs for field connection.
- G. Internal wiring shall be single-conductor 90 degrees C copper wire UL-listed for panel wiring. Wire size shall be in accordance with NEC.
- H. Wire markers shall comply with Section 16000.
- I. Routing:
 - 1. Use plastic wireway with covers to route groups of wires.
 - 2. Use plastic spiral wrap for exposed wires.
 - 3. Enclose wires that cross door hinges in plastic spiral wrap.

2.05 USER INTERFACE

- A. Front Panel Display: The UPS shall include a front panel display consisting of a graphical LCD display with backlight, four status LEDs, and a four key keypad.
 - 1. Graphical LCD Display: Include English language, display of unit function and operating parameters. Display shall be used to signify the operating state of the UPS, for indicating alarms, for changing operations control parameters and set points.
 - 2. Four status LEDs to indicate:
 - a. Alarms, with a red LED.
 - b. On Battery, with yellow LED.
 - c. On Bypass, with yellow LED.
 - d. Power On, with green LED.
 - 3. Four-Key Multifunction Keypad: UPS shall have keypad to allow user to adjust UPS parameters, view alarm and inverter logs, change UPS operational modes, and turn the UPS on and off.
- B. Power Management Software Package: The UPS shall include serial communications interface that provides the following communication capabilities:
 - 1. Monitor and graphically display input and output voltage and other operating characteristics.
 - 2. Notify Owner in the event of a power anomaly via network, E-Mail or page.
- C. Communication Card Slots:
 - 1. The UPS shall provide two communication X-slots in the back of the UPS allowing for additional connectivity options, including SNMP/Web, AS/400 relays Modbus/Jbus capabilities, etc. Serial communications via RS-232 with manufacturer supplied power management software program.

2.06 NAMEPLATES

- A. Nameplates: Identify external door mounted components and the UPS description with plastic nameplates provided in compliance with Section 17000.

2.07 GROUNDING

- A. Provide a grounding lug for Size No. 2 AWG bare copper conductors.

2.08 WALL-MOUNTED MAINTENANCE BYPASS SWITCH AND POWER DISTRIBUTION MODULE (PDM)

- A. Area 900 O&M Building UPS:
 - 1. Provide external wall-mounted maintenance bypass switch and a power distribution module (PDM) with eight 15A, 120V single-pole circuit breakers, two 15A, two-pole circuit breakers, four 20A single-pole circuit breakers, and two 20A, 2-pole circuit breakers for distributing UPS power to various loads requiring UPS backup .
- B. Area 200 Regulator Building:
 - 1. External make before break maintenance bypass switch is to be mounted on wall near UPS.

2.09 DELIVERY, STORAGE AND HANDLING

- A. Anchor and support against overturning during shipping, handling and installation.
- B. Battery Storage Temperature: Batteries recommended max. -20°C to +60°C.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's recommendations and per NFPA 70.
- B. Provide seismic mounting kit.

3.02 FIELD QUALITY CONTROL

- A. General: Test prior to operational use.
 - 1. 10 kVA tower type UPS Test in compliance with EN62040-2.
 - 2. 3.1 kVA rackmount type UPS: Test in compliance with EN62040-2.
- B. Load Test:
 - 1. Use 0.8 power factor load bank.
 - 2. Disconnect AC input and operate UPS at rated load.
 - 3. Record operating time and battery voltage.
 - 4. Continue operation at rated load battery cut-off.
 - 5. Monitor battery voltage and record value just prior to cut-off.
- C. Battery Re-charge Test: Connect AC power and record battery specific gravity at end of specified recharge duration.

END OF SECTION

SECTION 17211

PROCESS TAPS AND PRIMARY ELEMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies requirements for instrumentation elements that quantitatively convert the measured variable energy into a form suitable for measurement and process measurement accessories.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following documents. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
API RP 551	Process Measurement Instrumentation
ASTM A269	Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
ASTM A276	Specification for Stainless Steel Bars and Shapes
ASTM A479	Specification for Stainless Steel Bars and Shapes for use in Boilers and Other Pressure Vessels
ASTM D1248	Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable
ASME PTC 19.3 TW	Thermowells

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. All submittals shall be per Section 17000.
- C. Flow calculation for each differential-type flow element.

PART 2 PRODUCTS

2.01 VALVES

- A. Isolation Valves:
 - 1. Full port ball valves with ASTM A276, 316 stainless steel trim and body.
 - 2. Teflon seats and packing.
 - 3. Acceptable manufacturer:
 - a. Parker Hannifin.
 - b. Whitey.
 - c. Hoke.
 - d. Approved Equal.
- B. Gage Valves:
 - 1. Machined from ASTM A276 bar stock.
 - 2. Use with 1/2-inch NPT connections and integral bleed valve.

3. Acceptable manufacturer:
 - a. Anderson Greenwood M9530.
 - b. Hoke 6801L8Y.
 - c. Approved Equal.

C. Root Valves:

1. ASTM A276, Type 316 stainless steel bar stock.
2. 1/2-inch NPT male process connection and three 1/2-inch NPT female instrument connections.
3. One instrument connection shall be provided with an ASTM A276, Type 316 stainless steel bleed valve.
4. ASTM A276, Type 316 stainless steel plugs for unused ports.
5. Lagging type units shall be provided for insulated vessels and pipes.
6. Acceptable manufacturer:
 - a. Anderson Greenwood M5 AVS-44.
 - b. Hoke 6802L8Y.
 - c. Approved Equal.

D. Manifolds:

1. Three-valve bar-stock type.
2. Body: machined from ASTM A276, Type 316 stainless steel bar stock.
3. Valves shall be globe configuration with 316 stainless steel ball seats and Teflon stem packing.
4. Designed for direct mounting to differential pressure transmitters in place of the flanges normally furnished.
5. Fabricated manifolds or manifolds employing needle or soft seat valves are not acceptable.
6. Purge taps, 1/8-inch NPT shall be furnished on manifolds where water purge is specified.
7. Acceptable manufacturer:
 - a. Anderson Greenwood M4TVS.
 - b. Hoke 8123F8Y.
 - c. Approved Equal.

2.02 TUBING AND TUBING FITTINGS

A. Instrument tubing:

1. Rigid Tubing: 1/2-inch x 0.065-inch seamless annealed ASTM A269, Type 316 stainless steel between the process connection and instruments.
2. Plastic tubing: Pneumatic tubing within protective enclosures or conduit may be 1/4, 3/8, or 1/2-inch high molecular weight polyethylene or nylon, per ASTM D3350, 0.035 inch minimum wall thickness, and rated for 120 PSIG.

B. Tubing fittings:

1. Type 316 stainless steel.
2. Swage ferrule design with components (nut, body and ferrule system) interchangeable with those of at least one other manufacturer.
3. Flare and ball sleeve compression type are not acceptable.
4. Acceptable manufacturer:
 - a. Parker Hannifin.
 - b. Swagelok.
 - c. Hoke.
 - d. Approved Equal.

2.03 CHEMICAL SEALS

A. Diaphragm:

1. Unless otherwise specified, seal shall be the diaphragm type with flushing connection, Type 316 stainless steel body and Type 316L diaphragm.
2. Unless otherwise specified, fill fluid shall be DC200 silicone oil.

3. Acceptable manufacturer:
 - a. Ashcroft Type 100/101 – No substitutions.
- B. Annular:
 1. Seal shall be the in-line full stream captive sensing liquid type.
 2. Metallic wetted parts shall be 316 stainless steel.
 3. Unless otherwise specified, flexible cylinder shall be Buna-N.
 4. Rated 200 psig with not more than 5-inch WC hysteresis.
 5. Unless otherwise specified, fill fluid shall be DC200 silicone oil.
 - a. Factory filled and assembled.
 6. Acceptable manufacturer:
 - a. Ashcroft Series 80 – No substitutions.

2.04 BUSHINGS AND THERMOWELLS

- A. Comply with SAMA PMC17-10.
- B. Unless otherwise specified, machined from 316 stainless steel bar stock.
- C. On insulated vessels or pipes, temperature taps with 1/2-inch NPT, and lagging extensions.

2.05 PURGE ASSEMBLIES

- A. Air purge assembly:
 1. One rotameter shall be provided for each level-measuring loop.
 2. The rotameter shall have the following features:
 - a. 304 stainless steel body.
 - b. 316 stainless steel end fittings.
 - c. Viton O-rings.
 - d. Removable borosilicate glass metering tube with polycarbonate shield.
 - e. 3-inch meter scale with direct reading etched scale in SCFH, minimum air flow capacity 0.2 to 1.9 SCFH at 70°F and 14.7 psia.
 - f. Minimum operating pressure 14.7 psia plus maximum water level pressure.
 - g. Maximum pressure / temperature rating 250 psig/100°F.
 - h. Integral stainless steel control valve.
 3. Differential pressure regulator shall have the following features:
 - a. Capability to maintain a constant flow rate with varying downstream pressures.
 - b. 316 stainless steel body.
 - c. Viton diaphragm.
 - d. 316 stainless steel ball valve.
 - e. 316 stainless steel springs.
 - f. Stainless steel regulator piping.
 - g. Maximum pressure rating 200 psi.
 - h. Maximum differential pressure rate 100 psi.
 4. Acceptable manufacturer:
 - a. Fischer & Porter Series 10A6100 Purgemaster w/optional d.p. regulator and low flow range needle valve.
 - b. Wallace/Tiernan model 32-A056 flowmeter w/optional low capacity outlet flow regulator.
 - c. Approved Equal.

- B. Water purge assembly:
 - 1. Strainer, constant-differential regulator, needle valve, check valve, and 20 to 200 cc/m rotameter.
 - 2. Acceptable manufacturer:
 - a. Assembly:
 - 1) Moore Products 63BD4A.
 - 2) Fischer & Porter 10A3137N-53BR2110.
 - 3) Approved Equal.
 - b. Strainer: 155 micron wye-type:
 - 1) ASCO 8600A002.
 - 2) Crane.
 - 3) Approved Equal.

2.06 FLOW STRAIGHTENING VANES

- A. Acceptable manufacturer:
 - 1. Apollo Engineering Co.
 - 2. Daniel Industries Model 1106F.
 - 3. Approved Equal.

2.07 FLEXIBLE AIR HOSE AND CLAMPS

- A. Hose:
 - 1. Flexible.
 - 2. Resistant to petroleum oils, kerosene, fuel and lubricating oils.
 - 3. Nonconductive to 1000 volts DC.
 - 4. Temperature rating: -minus 40 to +212 degrees F.
 - 5. Red, modified nitrile cover.
 - 6. Acceptable manufacturer:
 - a. Gates Corporation, Premo Flex®.
 - b. Approved Equal.
- B. Hose Clamps:
 - a. All 300-series stainless steel.
 - b. Lined.
 - c. Liner and mechanical housing mechanically interlocked, no spot welds.
 - d. Designed for use with silicone hose.
 - e. Marine grade.
 - f. 9/16-inch wide band.
 - g. Slotted hex head screw.
 - h. Acceptable manufacturer:
 - a. Grainger series 54235K.
 - b. Approved Equal.

2.08 INSTRUMENTATION SPECIFICATION SHEETS (INSTRUSPEC)

- A. General requirements for primary elements specified in this Section are listed on INSTRUSPEC sheets in this Section.

2.09 INSTRUSPEC SHEETS

The following INSTRUSPEC sheets are included in this Article:

INSTRUSPEC Symbol	Instrument Description	Instrument Function
FVA	Rotameter	Flow Measurement
LBE	Bubbler assembly	Level measurement
PDI	Differential pressure indicator	Pressure differential indication
PG	Pressure gage	Pressure measurement
PLG	Low range pressure gage	Pressure measurement

Instrument Identification:	FVA
Instrument Description:	Rotameter
Instrument Function:	Flow measurement
Power Supply:	N/A
Signal Input:	N/A
Signal Output:	None
Process:	Wastewater
Process Connection:	NPT
Product Requirements:	<ol style="list-style-type: none"> 1. Type: Plain tapered tubes with rod guided float. 2. Tube: Glass. 3. Accuracy: ± 2 percent full scale. 4. Connections: Rotatable 360-degree to 90-degree intervals. 5. Scale: Detachable metal scale. 6. Repeatability: 0.5 percent full scale. 7. Fluid Temperature Limit: 33 to 250 degrees F. 8. Orientation: Vertical. 9. Inlet/Outlet Pipe Size: As indicated in the Drawings. 10. Operating Pressure: Per Instrument Schedule, Section 17901. 11. Operating Temperature: 32 to 250 degrees F, unless otherwise noted. 12. Scale Range: Per Instrument Schedule, Section 17901. 13. Float/Fittings: Type 316 stainless steel. 14. Acceptable Manufacturers: <ol style="list-style-type: none"> a. Brooks; Series 1110. b. Approved Equal.

Instrument Identification:	LBE
Instrument Description:	Bubbler assembly
Instrument Function:	Level measurement
Power Supply:	24VDC, loop powered
Signal Input:	Water column pressure
Signal Output:	4-20 mA DC
Process Connection:	Bubbler pipe assembly
Product Requirements:	
Bubbler Assembly:	Each bubbler system shall consist of a bubbler panel, bubbler pipe assembly and transmission lines as shown.
Bubbler Panel:	<ol style="list-style-type: none"> 1. Each bubbler enclosure shall comply with Section 17110. 2. Each bubbler panel shall include one, two or three level measuring loops as shown. 3. Unless shown otherwise, for each level measuring loop the instruments mounted on the door shall include a pressure gauge, an air purge assembly with a rear-of-door mounted rotameter, and a three-position hand operated air switch. 4. Unless shown otherwise, for each level measuring loop, the instruments mounted on the back panel shall include an adjustable air filter regulator with output gauge, and pressure sensing instrumentation such as a differential pressure transmitter. (See Section 17212)
Pressure Gauge:	<ol style="list-style-type: none"> 1. Minimum 4- inch dial size; ANSI grade A (1.5 percent of span accuracy) Bourdon tube or diaphragm measurement element; wetted materials shall be 316 stainless steel; range shall be zero based and selected to be as close to the maximum water depth measurement range as possible by using a standard gauge range; case shall be black epoxy coated aluminum or stainless steel designed for flush mounting in the door of the bubbler panel with a rear-mounted pressure connection. 2. Special Scale: It shall be a combination type with psig red outer scale and feet of H₂O black inner scale. The inner scale shall be marked with the actual elevation. Refer to Section 17901. The outer scale shall be marked with the actual scale range of the pressure gauge. 3. Acceptable manufacturer: <ol style="list-style-type: none"> a. Tel-Tru Model 4037. b. Winters model P430x. c. WIKA model 232.50. d. Approved Equal.
Constant Differential Air Purge Assembly:	<ol style="list-style-type: none"> 1. Reference the requirements of this Section.

Instrument Identification:	LBE
High Pressure Purge Valve:	<p>One air valve shall be furnished for each level measuring loop. 316 stainless steel. 3-position 4-way valve for normal level measuring, instrument calibration, and bubbler pipe purging. Provide nameplate to define each position. Acceptable Manufacturer: Swagelok. Hoke 71 Series. Whitey 44 Series. Approved Equal.</p>
Filtered Regulator:	<ol style="list-style-type: none"> 1. Consist of service regulator and 10 micron filter of capacity to at least serve 200 percent of the final element load, provided with a 2-inch gauge. 2. Acceptable manufacturer: <ol style="list-style-type: none"> a. Norgren model B38. b. Fairchild model 65AF. c. Approved Equal.
Accessories:	<ol style="list-style-type: none"> 3. Bulkhead fittings. <ol style="list-style-type: none"> a. Acceptable manufacturer: b. Swagelok. c. Parker Hannifin. d. Approved Equal. 4. Shutoff valves: Quarter-turn full-port ball valves with 316 stainless steel body and trim, Teflon seats and seals. <ol style="list-style-type: none"> a. Acceptable Manufacturer: b. Hoke. c. Nupro. d. Approved Equal. 5. Tubing: <ol style="list-style-type: none"> a. Plastic Tubing: Refer to this Section. b. Rigid tubing: Refer to this Section, except the size shall be 1/4" I.D. 6. Fittings: Shall be per the requirements of this Section. 7. Any other accessories not described here shall be 316 stainless steel.
Dip Tube Assembly:	<ol style="list-style-type: none"> 1. All piping and fittings shall be 3/4-inch schedule 40, 316 stainless steel. 2. Provide with one or two pipe tees, as indicated in the Drawings. 3. Top opening of the tee shall be provided with threaded plug for rodding out the bubble pipe. 4. The bottom of the dip tube shall be notched approximately 3/4-inch deep x 1/2-inch wide as indicated in the Drawings.

Instrument Identification:	LBE
Transmission Lines:	<ol style="list-style-type: none"> 1. Transmission lines refer to the tubing between bubbler panels and dip tube assembly. 2. Plastic Tubing: Refer to this Section. No splices shall be allowed within embedded sections. 3. Tubing size for ≤ 100 feet: $\frac{1}{2}$". 4. Tubing size for > 100 feet: Calculate the size according to the pressure drop per the equation below: <ol style="list-style-type: none"> a. pressure drop as follow: $P = (K) (F) (L)$ b. Where: c. P = pressure drop, inches of H₂O d. F = Flow, ACFH e. L = Length of Line in feet/1000 f. $K = 1/(62 \times ID^4)$ [with line ID in inches] g. Pressure drop shall not exceed 0.25 inches of H₂O. 5. Fittings shall be per Accessories Section. 6. Provide pull boxes at exposed ends and at right angle bends to facilitate removal and replacement of embedded flexible tubing sections.
Installation:	Per detail Drawings.
Calibration:	Top of the notch in dip tube shall be set at specified elevation with an accuracy of 0.1 inch or better.

Instrument Identification:	PDI
Instrument Description:	Pressure differential indicator.
Instrument Function:	Differential pressure measurement.
Power Supply:	None.
Process:	Air and noncombustible compatible gases.
Process Connection:	1/8-inch FNPT (two pairs – one side pair and one back pair for multiple style mounting).
Product Requirements:	<ol style="list-style-type: none"> 1. Size: 4-inch dial. 2. Scale: 270 degrees. 3. Scale Range: Per Instrument Schedule, Section 17901. 4. Wetted Material: Factory standard. 5. Housing: Die cast aluminum case and bezel, with acrylic cover. 6. Accuracy: ± 2 percent of full scale. 7. Pressure Limit: <ol style="list-style-type: none"> a. Standard: 20-inch Hg to 15 psig. b. Medium pressure: 20-inch Hg to 35 psig. c. High pressure: 20-inch Hg to 80 psig. 8. Overpressure Protection: Relief plug opens at approximately 25 psig (standard pressure limit only). 9. Temperature Limit: 20 to 140 degrees F. 10. Mounting: As noted on Drawings. 11. Transparent Overlays: Furnished in red and green to highlight and emphasize critical pressure, as noted in Section 17901. 12. Acceptable Manufacturers: <ol style="list-style-type: none"> a. Dwyer, Magnehelic 2000. b. Approved Equal.

Instrument Identification:	PG
Instrument Description:	Pressure gage
Instrument Function:	Pressure measurement
Power Supply:	N/A
Signal Input:	N/A
Signal Output:	N/A
Process Connection:	1/2-inch male NPT
Product Requirements:	
Pressure gages:	<ol style="list-style-type: none"> 1. 4-1/2-inch premium grade, glycerin filled units with bourdon tube element, 270-degree milled stainless steel movement, phenolic case, and shatterproof glass window. 2. Accuracy: ANSI grade 2A (+0.5% of span). 3. The range of the measuring element shall be as shown in the Instrument Schedule, Section 17901. The dial scale shall be equivalent to the measuring element range, but displayed in the engineering units shown as Scale in the instrument index. 4. Acceptable manufacturer: <ol style="list-style-type: none"> a. WIKA model 233.34, no substitutions.
Installation:	<ol style="list-style-type: none"> 1. Install in accordance with manufacturer's instructions and the recommendations of API RP551 to the specified requirements. 2. Root valves shall be provided at all process pressure taps except taps made for safety instruments. 3. Gage valves shall be provided at the instrument where the instrument is not within sight of the root valve or where two or more instruments are connected to a single tap. 4. Unless otherwise specified, pressure instruments shall be located as close as practical to the process tap but shall be positioned to permit observation and maintenance.
Application/Calibration:	<ol style="list-style-type: none"> 1. Pressure gages may be supported from the process tap if this location permits observation from the floor or a permanent work platform. 2. Pressure instruments shall be installed in such a manner that blowout discs are not obstructed. 3. Application, calibration, and set points shall be as specified in Section 17901.

Instrument Identification:	PLG
Instrument Description:	Low range pressure gage
Instrument Function:	Pressure measurement
Power Supply:	N/A
Signal Input:	N/A
Signal Output:	N/A
Process Connection:	1/2-inch male NPT
Product Requirements:	
Pressure Gauges:	<ol style="list-style-type: none"> 1. Gages shall be 4-1/2-inch phenolic turret case construction with shatterproof glass window and 270-degree milled stainless steel movement. 2. Unless otherwise specified, element shall be ASTM A269, Type 316 stainless steel bellows. 3. Accuracy: ANSI Grade A (+2.5% of span). 4. Provide with a porous metal type snubber with ASTM A276, type 303 stainless steel body and type 316 stainless steel filter disc. 5. Acceptable manufacturer: <ol style="list-style-type: none"> a. WIKA model 632.34, no substitutions.
Installation:	<ol style="list-style-type: none"> 1. Install in accordance with manufacturer's instructions and the recommendations of API RP551 to the specified requirements. 2. Root valves shall be provided at all process pressure taps except taps made for safety instruments. 3. Gage valves shall be provided at the instrument where the instrument is not within sight of the root valve or where two or more instruments are connected to a single tap. 4. Unless otherwise specified, pressure instruments shall be located as close as practical to the process tap but shall be positioned to permit observation and maintenance. 5. Pressure gages may be supported from the process tap if this location permits observation from the floor or a permanent work platform. 6. Pressure instruments shall be installed in such a manner that blowout discs are not obstructed.
Application/Calibration:	Application, calibration, and set points shall be as specified in Section 17901.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Process Connections:
 - 1. Unless otherwise specified, process taps shall comply with API RP550.
 - 2. Root valves shall be provided at taps, except temperature taps and pump discharge pressure taps.
 - 3. Arrange, where possible, such that instruments may be readily removed for maintenance without disruption of process units or draining of large tanks or vessels.
 - a. Unions or flange connections shall be provided as necessary to permit removal without rotating equipment.
 - b. Where process taps are not readily accessible from instrument locations, a block valve shall be provided at the instrument. Block valves shall also be provided for each instrument where multiple instruments are connected to one process tap.
- B. Electrical Connections: final connections between rigid raceway systems and instruments shall be made with jacketed flexible conduit with a maximum length of two feet.
- C. Flexible Tubing:
 - 1. Flexible tubing shall not be direct buried. Where flexible tubing is routed underground it shall be installed in a conduit to prevent crushing, kinks, or other impingements which may inhibit flow in the tube.
 - 2. Flexible tubing whether installed in a conduit or not for services other than underground shall not be subjected to damage such as crushing, kinks, or other impingements which may inhibit flow in the tube
 - 3. Where flexible tubing is turned or routed around a corner, it shall be supported such that it will not be crushed, kinked, or impinged upon. Conduits with long radius elbows, or other components subject to the County's approval, may be used for this purpose.
- D. Rigid Tubing:
 - 1. Rigid tubing when installed above ground or when routed around a corner shall not be subject to damage such as crushing, kinks, or other impingements which may inhibit flow in the tube.
 - 2. Flexible or rigid transmission lines:
 - a. Bubbler tubing shall be supported to prevent sagging or other low points that may block flow or prevent drainage.
 - b. Bubbler tubing shall be continuous (e.g. without cuts, breaks, fittings) between the bubbler panel and air discharge point.
 - c. If the transmission lines require routing through manholes, it shall be protected in the manhole with a rigid half open conduit. The half open conduit shall match the contour of manholes.

3.02 TESTING

- A. Testing requirements per Sections 17000 and 01660.

END OF SECTION

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SECTION 17212

TRANSMITTERS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies requirements for transmitters.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following document. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and that of the listed document, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
API RP 551	Process Measurement Instrumentation
ASTM A276	Stainless Steel Bars and Shapes
NEMA 250	Enclosures for Electrical Equipment
ANSI/UL913	Intrinsically Safe Apparatus and Associated Apparatus
ANSI/UL 60079-11	Explosive Atmospheres – Part 11: Equipment Protection by Intrinsic Safety “I”

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Product Data: Section 17000.
- C. Field Quality Control: Section 17000.
- D. Operations and maintenance information: Section 01730.

PART 2 PRODUCTS

2.01 GENERAL

- A. Unless otherwise specified, measuring elements and transmitters shall comply with the following requirements:
- Output indicators complying with this Section:
 - Provide with any transmitter that does not include an integral indicator.
 - Indicators, whether integral or separate, shall be calibrated in process units.
 - The units shall be engraved on the indicator scale plate.
 - The installed orientation of the output indicator shall permit the plant operator to easily read the display from the operating floor.
 - Transmitters:
 - Two-wire type with operating power derived from the signal transmission circuit, unless otherwise specified.
 - Output shall be 4 to 20 milliamperes, current regulated DC.
 - Load variations within the range of 0 to 500 ohms with the power supply at 24 volts DC.
 - Output shall be galvanically isolated.

- e. Time constant of transmitters used for flow or pressure measurement, including level transmitters used for flow measurement, shall be adjustable from 0.0 to 5.0 seconds.
- f. Output shall increase with increasing measurement.
- g. Unless otherwise specified, enclosures shall be rated NEMA 250, Type 4X.
- h. When located outdoors, provide with surge protectors: Rosemount Model 470A, Control Concepts model TMR, or approved equal.
- i. Where two-wire transmitter is located in a classified area, use intrinsic safety barrier per the requirements of this Section.

2.02 OUTPUT INDICATOR

- A. Output indicator shall be a loop powered current-to-digital display indicator.
- B. Input current shall be 4-20 mA and display shall be a 3 1/2 active digit liquid crystal display with black numerals at least 0.35 inches high.
- C. Display scalable with decimal point to read process engineering units.
- D. Enclosed in a conduit body-type housing with glass window, classified as appropriate for the area in which the output indicator is installed.
- E. A diode shall be provided to maintain loop continuity in case of indicator failure or removal.
- F. Accuracy shall be +/- 0.1 percent of reading.
- G. Acceptable Manufacturers:
 - 1. Action Instruments models V561/V565.
 - 2. Precision Digital 600 series.
 - 3. Moore Industries models PSD/SPD.
 - 4. Approved Equal.

2.03 INTRINSIC SAFETY BARRIERS

- A. Intrinsic safety barrier: Two-wire transmitters of the active, isolating, externally powered 24VDC, HART communication compatible. Mounting: DIN rail.
- B. Listings: UL or FM approval for use in Class I, Div. 1&2, Groups A, B, C, D, Class II, Div. 1&2, Groups E, F, G.
- C. Acceptable Manufacturer:
 - 1. Stahl 9160/13-11 series.
 - 2. Approved Equal.

2.04 INSTRUMENTATION SPECIFICATION SHEETS (INSTRUSPEC)

- A. Requirements for instruments specified in this Section are listed on INSTRUSPEC sheets. Installation application requirements are specified in Section 17901, and as indicated in the Drawings.

2.05 INSTRUSPEC SHEETS

A. The following INSTRUSPEC sheets are included in this Section.

INTRUSPEC Symbol	Instrument Description	Instrument Function
AI/AAS	Multi-Channel Receiver	Gas Monitor/Alarms
AD	DO Analyzer	Measure and transmit dissolved oxygen of a liquid
AE/AIT1	Panel-mounted explosive gas analyzer (LEL) Display, and Alarms	Analysis of gas for high levels of combustible hydrocarbons (C1 – C7)
AE/AIT2	Panel-mounted hydrogen sulfide gas analyzer (H2S) Display, and Alarms	Analysis of gas for high levels of hydrogen sulfide (H2S)
AE/AIT3	Panel-mounted oxygen gas analyzer (O2) Display, and Alarms	Analysis of gas for low levels of oxygen, (O2)
AH	pH Analyzer	pH Measurement
FM	Magnetic flowmeter	Flow measurement
LT	Ultrasonic level transmitter	Level measurement
PDT	Differential pressure transmitter	Pressure measurement
PGT	Gage pressure transmitter	Pressure measurement
TT	Temperature Transmitter	Temperature measurement
WS	Chemical tote weigh scale	Weight measurement

B. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	AI/AAS
Instrument Description:	Multi-Channel Receiver
Instrument Function:	Gas Monitoring and alarms
Power Supply:	120VAC
Signal Input:	4-20 mA for each channel
Signal Output:	4-20 mA for each channel
Process:	Waste water or Odor Control atmospheres
Process Connections:	N/A
Product Requirements:	
General:	<p>The receiver shall support the gas detection via continuous simultaneous display of multiple channels.</p> <ol style="list-style-type: none"> 1. Enclosure: NEMA 4X wall mount 2. Temperature Range: 0 degrees C to 50 degrees C 3. Setpoints: 4 setpoints per channel 4. Relays: 4 programmable alarms per chassis card, one fault alarm, SPDT 2A@250 VAC 5. Display: Four digit LED display per channel 6. Alarm Relay Programming: Failsafe/non-failsafe, latching/non-latching 7. Approvals: CSA/FM
Manufacturer & Model:	1. MSA model 9020, No Substitutions
Installation:	Install in accordance with manufacturer's instructions and the recommendations of API RP551

C. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	AD
Instrument Description:	Dissolved Oxygen Analyzer
Instrument Function:	Dissolved oxygen measurement
Power Supply:	120 VAC (Transmitter)
Signal Input:	Process
Signal Output:	4-20 mA
Process:	Wastewater
Process Connections:	Per installation detail
Product Requirements:	
General:	<ol style="list-style-type: none"> 1. Measurement of DO by the sensor is accomplished by immersing the luminescent coated sensor into the process solution. The luminescent material is flashed with a light and the amount of time it takes for the material to respond is based on the DO concentration. 2. Electrolyte-free operation without the requirements of sample conditioning. 3. Measurement Range: 0 to 20.0 mg/L.
Sensor:	<ol style="list-style-type: none"> 1. Sensor: Field replaceable. 2. Accuracy: ± 0.2 percent of span. 3. Repeatability: ± 0.5 percent of span. 4. Response Time at 20°: 90 and in less than 40 seconds and 95 percent in less than 60 seconds. 5. Installation: Pipe tee, Union mount. 6. Sensor Assembly Depth: 350 feet maximum. 7. Operating Pressure: 0 to 150 psig. 8. Operating Temperature: 32 to 122 degrees F. 9. Probe Wetted Materials: Foamed Noryl and 316 stainless steel. 10. Sensor Wetted Material: Polybutyl methacrolate. 11. Rating: Class 1, Division 2.
Transmitter:	<ol style="list-style-type: none"> 1. Enclosure: NEMA 4X/IP66; metal enclosure with corrosion-resistant finish 2. Able to connect up to four sensors that consist of a mix of dissolved oxygen probes and total suspended solids probes. 3. Operating Temperature: -4 to 131 degrees °F. 4. Operating Relative Humidity: 0 to 95 percent, non-condensing. 5. Rating: Class 1, Division 2 6. Display: LCD. 7. All user settings are maintained indefinitely in memory. 8. Mounting Options: Surface, panel, and pipe.
Cable:	<ol style="list-style-type: none"> 1. Provide signal cable of sufficient length for a continuous run between the sensor/probe and transmitter. 2. Maximum Allowable Length: 328 feet.
Manufacturer and Model	Acceptable manufacturer: Hach Series LDO, No Substitutions
Execution:	
Installation:	Install in accordance with manufacturer's instructions and the recommendations of API RP551
Calibration:	Application, calibration and setpoint requirements per Section 17901

D. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	AE/AIT1
Instrument Description:	Panel mounted combustible gas LEL analyzer
Instrument Function:	Analysis of gas for combustible hydrocarbons (C1 – C7)
Power Supply:	24 VDC nominal, 18-27 VDC, 10 VA maximum
Signal Input:	Aspirated ambient air sample
Signal Output:	4-20 mA
Process:	Waste water or Odor Control
Process Connections:	Per installation detail
Product Requirements:	
General:	The gas detector shall be designed for fixed installation and shall include sensor, transmitter and accessories mounted on an open backplane
Sensor:	<ol style="list-style-type: none"> 1. Design: NDIR optical sensor; optimized for CH₄ and combustibles, corrosion resistant contacts 2. Range: 0-100% LEL based on methane 3. Connection: Flow cell with aspirator 4. Temperature limit: -4 degrees to 122 degrees F (-20 to 50 degrees C) 5. Humidity range: 15 to 95% RH, non-condensing
Transmitter:	<ol style="list-style-type: none"> 6. Housing: NEMA 7 7. Housing material: Epoxy-coated aluminum 8. Temperature limit: -4 degrees to 122 degrees F (-20 to 50 degrees C) 9. Calibration: Non-intrusive method, microprocessor based, able to retain configuration settings through power outage 10. Analog output: 4-20 mA into 600 ohms at 24 VDC 11. Response time: <30 seconds to 90% full scale 12. Linearity: +/- 3% LEL below 40% LEL 13. Repeatability: +/- 2% LEL below 40% LEL 14. Display: LCD (% LEL), WARN and HIGH alarm icons 15. Approval: UL/FM/CSA 16. Rating: Class 1, Div 1, Groups B to D
Cable:	3 conductor, shielded plus conforming ground. Maximum separation between sensor and transmitter: 50 feet
Special requirements:	<ol style="list-style-type: none"> 1. Provide aspirated sampling module with flow switch capable of drawing a sample of 2.0 SCFH through analyzer sample chamber 2. Provide ¼ inch diameter 315 SS or Teflon sample tubing and end-of-line filters
Manufacturer and Model	Acceptable manufacturer: MSA Model A-ULTX-Sens-38 sensor, No Substitutions MSA Model ULTIMAX-XP-E-38 transmitter, No Substitutions MSA sample pump assembly, No Substitutions
Execution:	Mount on a tri-gas or single gas panel as shown on Drawings
Installation:	Install in accordance with manufacturer's instructions and the recommendations of API RP551
Calibration:	Application, calibration and setpoint requirements per Section 17901

E. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	AE/AIT2
Instrument Description:	Panel mounted toxic gas H2S analyzer
Instrument Function:	Analysis of gas for toxic H2S
Power Supply:	24 VDC nominal, 18-27 VDC, 10 VA maximum
Signal Input:	Aspirated ambient air sample
Signal Output:	4-20 mA
Process:	Waste water or Odor Control
Process Connections:	Per installation detail
Product Requirements:	
General:	The gas detector shall be designed for fixed installation and shall include sensor, transmitter and accessories mounted on an open backplane
Sensor:	<ol style="list-style-type: none"> 1. Design: Catalytic bead sensor; corrosion resistant contacts 2. Range: 0-50 ppm H2S 3. Connection: Flow cell with aspirator 4. Temperature limit: -4 degrees to 122 degrees F (-20 to 50 degrees C) 5. Humidity range: 15 to 95% RH, non-condensing
Transmitter:	<ol style="list-style-type: none"> 1. Housing: NEMA 7 2. Housing material: Epoxy-coated aluminum 3. Temperature limit: -4 degrees to 122 degrees F (-20 to 50 degrees C) 4. Calibration: Non-intrusive method, microprocessor based, able to retain configuration settings through power outage 5. Analog output: 4-20 mA into 600 ohms at 24 VDC 6. Response time: <30 seconds to 90% full scale 7. Display: LCD (ppm H2S), WARN and HIGH alarm icons 8. Approval: UL/FM/CSA 9. Rating: Class 1, Div 1, Groups B to D
Cable:	<ol style="list-style-type: none"> 1. 3 conductor, shielded plus conforming ground. Maximum separation between sensor and transmitter: 50 feet
Special requirements:	<ol style="list-style-type: none"> 1. Provide electrical sampling module with flow switch capable of drawing a sample of 2.0 SCFH through analyzer sample chamber 2. Provide ¼ inch diameter 315 SS or Teflon sample tubing and end-of-line filters
Manufacturer and Model	Acceptable manufacturer: MSA Model A-ULTX-Sens-16 sensor, No Substitutions MSA Model ULTIMAX-XP-E-16 transmitter, No Substitutions MSA sample pump assembly, No Substitutions
Execution:	Mount on a tri-gas panel as shown on Drawings
Installation:	Install in accordance with manufacturer's instructions and the recommendations of API RP551
Calibration:	Application, calibration and setpoint requirements per Section 17901

F. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	AE/AIT3
Instrument Description:	Panel mounted gas analyzer monitoring oxygen O2
Instrument Function:	Analysis of gas for low O2
Power Supply:	24 VDC nominal, 18-27 VDC, 10 VA maximum
Signal Input:	Aspirated ambient air sample
Signal Output:	4-20 mA
Process:	Waste water or Odor Control
Process Connections:	Per installation detail
Product Requirements:	
General:	The gas detector shall be designed for fixed installation and shall include sensor, transmitter and accessories mounted on an open backplane
Sensor:	<ol style="list-style-type: none"> 1. Design: Catalytic bead sensor; corrosion resistant contacts 2. Range: 0-25% O2 3. Connection: Flow cell with aspirator 4. Temperature limit: -4 degrees to 122 degrees F (-20 to 50 degrees C) 5. Humidity range: 15 to 95% RH, non-condensing
Transmitter:	<ol style="list-style-type: none"> 1. Housing: NEMA 7 2. Housing material: Epoxy-coated aluminum 3. Temperature limit: -4 degrees to 122 degrees F (-20 to 50 degrees C) 4. Calibration: Non-intrusive method, microprocessor based, able to retain configuration settings through power outage 5. Analog output: 4-20 mA into 600 ohms at 24 VDC 6. Response time: <30 seconds to 90% full scale 7. Display: LCD (% O2 Concentration), WARN and HIGH alarm icons 8. Approval: UL/FM/CSA 9. Rating: Class 1, Div 1, Groups B to D
Cable:	<ol style="list-style-type: none"> 1. 3 conductor, shielded plus conforming ground. Maximum separation between sensor and transmitter: 50 feet
Special requirements:	<ol style="list-style-type: none"> 1. Provide electrical sampling module with flow switch capable of drawing a sample of 2.0 SCFH through analyzer sample chamber 2. Provide ¼ inch diameter 315 SS or Teflon sample tubing and end-of-line filters
Manufacturer and Model	Acceptable manufacturer: MSA Model A-ULTX-Sens-14 sensor, No Substitutions MSA Model ULTIMAX-XP-E-14 transmitter, No Substitutions MSA sample pump assembly, No Substitutions
Execution:	Mount on a tri-gas panel as shown on Drawings
Installation:	Install in accordance with manufacturer's instructions and the recommendations of API RP551
Calibration:	Application, calibration and setpoint requirements per Section 17901

G. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	AH
Instrument Description:	pH Analyzer
Instrument Function:	Measure and transmit pH of a liquid
Power Supply:	120 VAC (Transmitter)
Signal Input:	Process
Signal Output:	4-20 mA
Process:	Wastewater
Process Connections:	Immersion (Per Drawings)
Product Requirements:	
General:	Measurement of pH by the sensor is accomplished by immersing a glass or metal electrode, with a reference electrode, into a process solution. pH is related to logarithm of hydrogen ion activity.
Sensor:	<ol style="list-style-type: none"> 1. Sensing Electrode: Flat glass, field replaceable 2. Preamplifier: Integral 3. Installation: Immersion/submersible 4. Compensation: Automatic temperature utilizing platinum RTD 5. Compensation Limit: 5 and 270 degrees F 6. Sensor Assembly Depth: 2 inches minimum; 5 feet maximum 7. Operating Pressure: 0 to 100 psig 8. Operating Temperature: 32 to 212 degrees F 9. Range: 0 to 14 pH 10. Wetted materials: Manufacturers standard, appropriate for the process service 11. Approval: FM 12. Rating: Class 1, Division 1, Groups A, B, C, and D; Class 2, Division 1, Groups E, G and F hazardous locations
Transmitter:	<ol style="list-style-type: none"> 1. Enclosure: NEMA 4X 2. Operating Limit: -4 to 149 degrees F 3. Relative Humidity: 0 to 95 percent, non-condensing 4. Measurement Range: 0 to 14 pH. 5. Accuracy: ± 1 mV at 25 degrees C ± 0.01 pH 6. Repeatability: ± 1 mV at 25 degrees C ± 0.01 pH 7. Mounting: As shown on Drawings and noted in Section 17901 8. Safety Approvals: FM 9. Display: LCD
Cable:	<ol style="list-style-type: none"> 1. Manufacturer provide signal cable between the primary element and transmitter
Manufacturer & Model:	<ol style="list-style-type: none"> 1. Hach; DPD1P1 Sensor with SC200 controller, No Substitutions
Installation:	Install in accordance with manufacturer's instructions and as shown on the Drawings.
Calibration:	Application, calibration and set point requirements per Section 17901.

H. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	FM
Instrument Function:	Flow measurement.
Instrument Description:	Magnetic flow metering system.
Power Supply:	120 VAC (transmitter).
Signal Input:	Process.
Signal Output:	4 – 20 mA DC.
Process Connection:	Flange, ANSI B16.5 Class 150, raised face.
Product Requirements:	
General:	<ol style="list-style-type: none"> 1. Magnetic flow meter shall be provided as a system consisting of a flow tube and remotely mounted converter/transmitter complete with all necessary interconnecting cables for the flow tube to transmitter separation shown. 2. System shall be suitable for measuring raw sewage flow. 3. Provide grounding rings for both upstream and downstream connections with the process piping. 4. Provide mechanical protection for the flow tube flanges and liner during installation or removal of the flow tube. 5. Provide pipe reducer and expander where pipe run size is different from specified flow tube size. The reducer and expander shall be uniformly diverging and converging swages with a total reducing angle not exceeding 8 degrees. Locate per manufacturer's instructions for upstream and downstream obstructions.
Flow Tube:	<ol style="list-style-type: none"> 1. Inside diameter of the flow tube: As specified in Section 17901. 2. Flow tube construction: NEMA 4X construction. Measuring tube material 304 stainless steel; liner material: Hard rubber. 3. Pulsed D.C. field excitation with automatic zero point correction. 4. Field coil insulation class E 5. Electrode material: Suitable for service: Hastelloy-C 6. Grounding ring material: 316 stainless steel 7. Approval rating: Class 1, Division 2 8. Acceptable manufacturer: Krohne OPTIFLUX 2000 Flanged Flowtube. No Substitutions.

Instrument Identification:	
Transmitter:	FM <ol style="list-style-type: none"> 1. Signal converter/transmitter shall be suitable for an adjustable full-scale flow within the limits of from 1 to 30 feet per second. 2. Signal converter / transmitter features: remotely mounted from flow tube; microprocessor based. 3. Bi-directional flow and totalization measurement. 4. Integral high-contrast LCD display; integral control panel. 5. Accuracy of 0.3% of Rate. 6. Signal output 4 – 20 mA DC galvanically isolated and internally powered. Minimum 500 Ohm driving capability. 7. Low-flow cutoff: adjustable from 0% to 20% of range 8. Signal converter shall be compatible with all types and sizes of flowtubes and replaceable without recalibration. Upgradeable to future software and communications versions. 9. Adjustable dampening: 0.2 to 256 seconds 10. Power 120 VAC. 11. Flow rate calibration as per Section 17901, Instrument Index. 12. Digital Communications: Smart transmitter sub-carrier compatibility with Hart protocol. 13. Approval: CSA, FM – Class 1, Division 2. 14. Acceptable Manufacturer: Krohne IFC-100 with 2" pipe mounting hardware. No Substitutions.
Execution:	<ol style="list-style-type: none"> 1. Install in accordance with manufacturer's instructions, API RP551, and the specified functional requirements. 2. Install ground rings upstream and downstream of the flow tube. 3. Install the transmitter on the wall or stanchion near to, but remotely from the flow tube.
Installation:	
Cable:	<ol style="list-style-type: none"> 1. Cables between the primary element and transmitter by the system manufacturer. 2. Install power and signal cables in separate conduits. 3. A sufficient length of cable shall be provided for installation of a continuous run between the primary element and the remotely mounted transmitter.

I. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	LT
Instrument Function:	Level measurement.
Instrument Description:	Ultrasonic level measurement system.
Power Supply:	120 VAC.
Signal Input:	Process.
Signal Output:	4 – 20 mA DC.
Process Connection:	3 inch flange.
Product Requirements:	
General:	<ol style="list-style-type: none"> 1. Function: Continuous non-contacting level measurement, pump control, differential control, open-channel flow monitoring, and volume conversion. 2. Parts: Element, transmitter, interconnecting cable, and accessories as noted in Section 17901 Instrument Schedule. 3. Range: Reference Section 17901, Instrument Schedule. 4. Accuracy: Plus or minus 0.25 percent of maximum range or 6 mm, whichever is greater. 5. Resolution: 0.1 percent of range or 2 mm, whichever is greater. 6. Blanking Distance: Sensor dependent, 1 foot up to 50-foot range.
Sensor:	<ol style="list-style-type: none"> 1. IP 68, fully submersible. 2. Housing: PVDF. 3. Integral Flange. <ol style="list-style-type: none"> a. Size: 3 inch. b. Material: PTFE. 4. Rating: Class 1, Division 1. 5. Beam Angle: 12 degrees or less. 6. Integral temperature compensation.
Transmitter/Controller:	<ol style="list-style-type: none"> 1. Display: 4 inches wide by 1.5 inches high, multiblock LCD with backlighting. 2. Enclosure: NEMA 4X polycarbonate wall mount. 3. Electrically Hazardous Rating: <ol style="list-style-type: none"> a. Class I, Div 2, Groups A, B, C, and D. 4. Power Supply: 115 volts, 50/60 Hz. 5. Isolated Analog Output: 4 mA to 20 mA dc for load impedance of 0 to 750 ohms. 6. Discrete Outputs: <ol style="list-style-type: none"> a. Six relays rated for 5 amps continuous at 230V ac. b. Four SPDT Form A plus two SPDT Form C. c. Assignable. 7. Control of six constant speed pumps. 8. False-echo suppression for fixed obstruction avoidance. 9. Antigrease ring/tide buildup. 10. Programming: Via handheld programmer or via personal computer with SIMATIC PDM software.
Interconnecting Cable	<ol style="list-style-type: none"> 1. Weatherproof, UV protected, length as required, and type as recommended by manufacturer.
Accessories	<ol style="list-style-type: none"> 1. Handheld Programmer: <ol style="list-style-type: none"> a. One per lot of level devices furnished.
Manufacturer and Model:	<ol style="list-style-type: none"> 1. Sensor: Siemens Echomax 2. Transmitter/Controller: Siemens; Hydromanager 200. 3. No Substitution.

J. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	PDT
Instrument Function:	Differential Pressure (Level) Measurement
Instrument Description:	Differential pressure transmitter
Power Supply:	9-30VDC
Signal Input:	Process
Signal Output:	4-20mA
Process Connection:	1/4-inch FNPT traditional flange mount to match manifold (see below)
Product Requirements:	<ol style="list-style-type: none"> 1. Pressure transmitter shall be capacitance or Silicon piezo-resistive bridge type. 2. Wetted parts shall be ASTM A276, type 316 stainless steel 3. Rangeability: 100:1 minimum 4. Stability: +/-0.1% of URL for 7 years 5. Fill fluid shall be DC 200 Silicone oil 6. Adjustable damping: 0.5 to 10 seconds 7. External zero adjustment 8. Accuracy: $\pm 0.055\%$ of span 9. Range: Transmitter shall be available in 10"WC to 600 PSIG ranges. Specific ranges shall be designated in Section 17901, Instrument Index. 10. Provide differential pressure transmitters with a three-valve manifold per Section 17211. 11. Lower housing shall have four 1/4"-inch ports. Two ports shall be provided with bleed valves and other two ports shall be plugged. 12. Static pressure rating shall be 2,000 psig or greater. 13. Provide smart transmitter subcarrier capability compatible with HART protocol. 14. Rating: FM Class 1, Division 1, Groups B, C, and D. 15. Acceptable manufacturers: <ol style="list-style-type: none"> a. Yokogawa EJA110E series, No Substitutions.
Execution:	
Installation:	<ol style="list-style-type: none"> 1. Install in accordance with manufacturer's instructions and the recommendations of API RP551. 2. Provide root valves at all process pressure taps. 3. Locate pressure instruments as close as practical to the process tap and position to permit observation and maintenance from grade or a maintenance platform, unless otherwise specified. 4. Pressure instruments shall not be supported from process piping.

K. INSTRUMENT SPECIFICATION SHEET – INSTRUSPEC:

Instrument Identification:	PGT
Instrument Function:	Pressure measurement.
Instrument Description:	Gage pressure transmitter.
Power Supply:	9-30 VDC
Signal Input:	Process
Signal Output:	4-20 mA with HART digital communications.
Process Connection:	1/2-inch female NPT flange adapter.
Product Requirements:	<ol style="list-style-type: none"> 1. Pressure transmitter shall be capacitance or Silicon piezo resistive bridge type. 2. Wetted parts shall be ASTM A276, type 316 stainless steel, unless otherwise specified 3. Rangeability: 15:1 minimum. 4. Fill fluid shall be DC 200 Silicone oil, unless otherwise specified. 5. Adjustable dampening: 0.5 to 10 seconds 6. External zero adjustment 7. Accuracy: ± 0.1 percent of span. 8. Range: Transmitter shall be available in 10" WC to 600 PSIG ranges. Specific ranges shall be designated in Section 17901, Instrument Index. 9. Provide transmitters with spans less than or equal to 25 psig with one 1/2-inch flanged process connection and two 1/4-inch drain/vent ports, one plugged and one with bleed valve. 10. Atmospheric reference: Provide reference diaphragm with a weatherproof, bug-proof atmospheric vent. 11. Transmitters with spans greater than 25 psig shall be similar to the above except shall be designed for sealed gage pressure service, and overpressure rating shall be greater than the lesser of 2000 psig and 150 percent of maximum range.
Manufacturer and Model:	Yokogawa EJA500 series, No Substitutions
Execution:	
Installation:	<ol style="list-style-type: none"> 1. Install in accordance with manufacturer's instructions and the recommendations of API RP551. 2. Provide root valves at all process pressure taps. 3. Provide gage valves at the instrument where the instrument is not within sight of the root valve or where two or more instruments are connected to a single tap. 4. Locate pressure instruments as close as practical to the process tap and position to permit observation and maintenance from grade or a maintenance platform, unless otherwise specified. 5. DO NOT support pressure instruments from process piping.
Calibration:	Per Section 17901, Instrument Schedule.

L. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	TT
Instrument Function:	Temperature measurement.
Instrument Description:	Temperature transmitter
Power Supply:	24 VDC Two-wire transmitter; 8 VA maximum
Signal Input:	2, 3, or 4-wire RTD 100 Ohm Platinum, or T/C type J, K, E, N, R, S, T, or B, as specified
Signal Output:	4-20 mA DC
Process Connection:	¾" NPT
Product Requirements:	
Sensor:	<ol style="list-style-type: none"> 1. Provide a sensor in accordance with Section 17901 2. Acceptable manufacturer: WEED instruments series 305 w/series H260 thermowell No Substitutions.
Transmitter:	<ol style="list-style-type: none"> 1. Transmitter shall convert the sensor resistance or mV output to a milliampere transmission signal output with an accuracy of ± 0.1 percent of range or better. 2. Input range: As specified in Section 17901 Input Sensitivity: 15 μV or better Input impedance: In excess of 1 MOhm 3. Accuracy and stability: $\pm 0.1\%$ of range or 0.1 °C, whichever is greater, for 2 years with RTD sensor and 1 year with T/C sensor. 4. Isolation: Input/Output/Power 500 VAC minimum 5. Transmitter shall provide output power for sensor or Cold Junction compensation for sensor, as required 6. Display: 3-1/2 digit integral LCD display w/decimal point, minus sign, and °C/°F indicator 7. Approvals: FM Explosion-proof and/or Intrinsically safe, as required 8. Enclosure: Aluminum cast with polyurethane baked enamel coating, NEMA 4X. 9. Max. Dimensions: 4.7 inch (120 mm) diam. x 5.2 inch (132 mm) Depth 10. Environmental: Operating Temperature: -20 °C to 70 °C Humidity: 5% – 85%, non-condensing Altitude: 0 – 500 meters 11. Acceptable Manufacturers: Yokogawa series YTA-300 series. No Substitutions.
Installation:	Install per manufacturer's instructions and recommendations of API RP-551.
Calibration:	Application, sensor, and calibration requirements per Section 17901, Instrument Schedule.

M. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	WS
Instrument Function:	Weight measurement.
Instrument Description:	Weigh scale
Power Supply:	120 VAC
Signal Input:	Load cell
Signal Output:	4-20 mA DC
Process Connection:	N/A
Product Requirements:	
General:	<ol style="list-style-type: none"> Function: Measure the weight of a single IBC chemical storage tote. Type: Load cells on platform scale. Parts: <ol style="list-style-type: none"> Platform scale. Load cells Weight indicating transmitter. Interconnecting cable.
Performance:	<ol style="list-style-type: none"> Range: 0-3000 Lbs. Accuracy: 0.25% of full scale.
Platform Scale:	<ol style="list-style-type: none"> Size: 48" wide by 48" deep (minimum) by 3.5" high (maximum). Welded steel construction. Platform Coating: Resistant to moisture, chemicals, abrasion and UV light.
Transmitter:	<ol style="list-style-type: none"> Transmitter shall convert load cell sensor output to a milliampere transmission signal output. Transmitter shall provide power for sensors. Channels: One. Output: 4-20 mA DC. Display: 5 digit integral LCD display w/decimal point (minimum). Enclosure: NEMA 4X.
Manufacturer and Product:	<ol style="list-style-type: none"> Scaleton, model 4040 scale with model 1020 transmitter. Force Flow, model 54-DR30TB scale with model SOLO-G2 transmitter. Approved equal.
Installation:	Install per manufacturer's instructions and recommendations of API RP-551.
Calibration:	Application, sensor, and calibration requirements per Section 17901, Instrument Schedule.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Installation requirements per Section 17000.

3.02 TESTING

- A. Testing requirements per Section 17000 and as indicated in the Drawings.

END OF SECTION

SECTION 17216
PROCESS SWITCHES

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies requirements for process-activated switches.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following documents. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
API RP551	Process measurement Instrumentation
NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 2	Industrial Control Devices, Controllers and Assemblies
NEMA ICS 6	Industrial Control and Systems: Enclosures
ANSI/UL913	Intrinsically Safe Apparatus and Associated Apparatus
ANSI/UL 60079-11	Explosive Atmospheres – Part 11: Equipment Protection by Intrinsic Safety “I”

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Product Data: Section 17000.
- C. Field Quality Control: Section 17000.
- D. Operation and maintenance information: Section 01730.

PART 2 PRODUCTS

2.01 GENERAL

- A. Unless otherwise specified, switches shall comply with the following requirements:
1. Contact outputs used for alarm actuation shall be ordinarily closed and shall open to initiate the alarm.
 2. Contact outputs used to control equipment shall be ordinarily open and shall close to start the equipment.
 3. Contacts monitored by solid-state equipment such as programmable logic controllers or annunciators shall be designed for switching currents from 20 to 100 mA at 120 VAC.
 4. Contacts monitored by electromagnetic devices such as mechanical relays, contactors and solenoid shall be rated NEMA ICS 2, designation B300.
 5. Double barriers shall be provided between switch elements and process fluids such that failure of one barrier will not permit process fluids into electrical enclosures.
 6. Switch electrical enclosures shall be rated NEMA 250, Type 4X minimum.
 7. Contacts in Class 1, Division 1 areas and monitored by solid-state circuits shall be made safe by suitable intrinsic-safety barriers.

2.02 INTRINSIC SAFETY

- A. Intrinsic safety relays:
1. Isolates field contacts in classified location from control circuits in non-classified location.
 2. Output:
 - a. SPST N.O./N.C.
 - b. Rating: 0.4 A resistive at 24 VDC or 1A at 120 VAC, minimum.
 3. Power: 120 VAC, 50-60 Hz, 4 VA maximum.
 4. Listings: UL or FM approval for use in Class I, Div. 1&2, Groups A, B, C, D, Class II, Div. 1&2, Groups E, F, G.
 5. Acceptable manufacturers:
 - a. Stahl IS Isolator Type 9170.
 - b. Gems SafePak model 54820.
 - c. Approved Equal.

2.03 INSTRUMENTATION SPECIFICATION SHEETS (INSTRUSPEC)

- A. General requirements for instruments specified in INSTRUSPEC sheets in this Section. Application requirements are specified in Section 17901.

2.04 INSTRUSPEC SHEETS

- A. The following INSTRUSPEC sheets are included in this Section.

INSTRUSPEC Symbol	Instrument Description	Instrument Function
FS	Flow Low Switch	Flow/No Flow detection
LFS	Float level switch	Level measurement
LFS1	Float Level Switch Vertical	Level Measurement
LFS2	Float Level Switch Horizontal	Level Measurement
LS	Level Switch	Level Measurement
PS	Pressure switch	Pressure measurement
TS	Temperature switch	Temperature Monitor (Fluid immersion)
VS	Vibration switch	Motor or pump vibration monitor
ZS1	Position Switch	Magnetic Reed Switch

Instrument Identification:	FS
Instrument Function:	Sense low flow of process fluids
Instrument Description:	Flow Switch, Thermal dispersion
Power Supply:	120 VAC, 60 Hz. as specified, 20 VA max.
Signal Input:	Process air flow
Signal Output:	DPDT relay, contacts rated 8A at 120 VAC
Process Connection:	1" NPT
Product Requirements:	<ol style="list-style-type: none"> 1. Sensor (Probe): <ol style="list-style-type: none"> a. Consists of a self-contained heated element and reference thermal element immersed in process flow with processing electronics b. All wetted surfaces: 316 SS c. Probe: Standard, twin tip, Insertion length: Refer to Mechanical Drawings for duct size d. Ambient temperature: -100° to +400°F e. Normal pressure rating: 1850 psig @ 100°F f. FM approved for use in Class I, Division 1 Groups B, C, D; Class II, Division 1, Groups E, F, G. 2. Electronics: <ol style="list-style-type: none"> a. Ambient temperature: -40° to +158°F b. Time delay: 0-100 seconds adjustable c. Set point range: 0.1 to 500 fps d. Set point: Field adjustable e. Repeatability: <1% at constant temperature f. Enclosure: NEMA 4X, IP66, material 316 SS, with 3/4" FNPT dual conduit entry 3. Acceptable Manufacturer: <ol style="list-style-type: none"> a. STI/Magnetrol Thermatel sensor TEC with TD-2 switch, No Substitutions.
Execution:	
Installation:	1. Mount and connect per manufacturer's instructions and as shown in the Contract Drawings.
Application/Calibration:	Application and calibration/set points shall be per Section 17901.

B. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	LFS
Instrument Description:	Float level switch.
Instrument Function:	Level measurement.
Power Supply:	N/A.
Signal Input:	N/A.
Signal Output:	Contacts per Contract Drawings.
Process Connection:	N/A.
Product Requirements:	<ol style="list-style-type: none"> 1. Switch shall consist of a SPST mercury tilt switch enclosed in a 316 stainless steel float housing. 2. 14-AWG wire type SO cable with PVC outer jacket. 3. Mercury tilt switch shall be rated for two amps at 120 VAC. 4. Cable length shall be as specified to meet the application needs. 5. Acceptable manufacturer: <ol style="list-style-type: none"> a. Siemens Model 9G Direct Acting Float Switch (B100). b. Anchor Scientific Roto-Float-SST. c. Approved Equal.
Execution:	
Installation:	Install per manufacturer's instructions and as indicated in the Drawings.
Application/Calibration:	Application and calibration/set points shall be per Section 17901.

C. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	LFS1
Instrument Description:	Float level switch vertical.
Instrument Function:	Level measurement.
Power Supply:	N/A.
Signal Input:	N/A.
Signal Output:	Dry Contacts.
Process Connection:	N/A.
Product Requirements:	<ol style="list-style-type: none"> 1. Switch shall consist of a SPST reed switch enclosed in a teflon housing and a teflon-coated magnetic float concentric with the switch housing. 2. Cable: 22-AWG min. wire teflon outer jacket. 3. Switch contacts shall be rated for 20 VA at 120 VAC 4. Conduit connection: 1/8" NPT 5. Acceptable manufacturer: <ol style="list-style-type: none"> a. GEMS model LS1700TFE or model LS1900TFE b. Omega Engineering model LVK-190 series c. Approved equal
Execution:	
Installation:	Install per manufacturer's instructions and as indicated in the Drawings.
Application/Calibration:	Application and calibration/set points shall be per Section 17901.

D. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	LFS2
Instrument Description:	Float level switch horizontal.
Instrument Function:	Level measurement.
Power Supply:	N/A.
Signal Input:	N/A.
Signal Output:	Dry Contacts.
Process Connection:	N/A.
Product Requirements:	<ol style="list-style-type: none"> 1. Type: Bulkhead side mounted level float switch. 2. Stem Material: PBT 3. Float Material: PBT 4. Fitting: 5/8" – 11 UNC thread. 5. Cable: 22-AWG min. wire Teflon outer jacket. 6. Switch Type: Magnetic reed switch. 7. Switch contacts shall be rated for 30 VA at 240 VAC. 8. Max Temp: 130 Degrees C 9. Acceptable manufacturer: <ol style="list-style-type: none"> a. Madison; Model M7790 b. Approved equal
Execution:	
Installation:	Install per manufacturer's instructions and as indicated in the Drawings.
Application/Calibration:	Application and calibration/set points shall be per Section 17901.

E. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	LS
Instrument Description:	Level Switch
Instrument Function:	Ultrasonic Level measurement
Power Supply:	120 VAC
Process:	Utility Water
Signal Input:	Process
Signal Output:	2-DPDT relay contact outputs
Process Connection:	ANSI B 16.5 Class 150, S.S., 3" raised face flange
Product Requirements:	<p>Electronics:</p> <ol style="list-style-type: none"> 1. Relays: DPDT 5 Amp at 120/240 VAC, or 30 VDC 2. All relays fully programmable for Low-High trip set points and time delay (0 – 45 Sec.). 3. Ambient temperature: -40° to 160° F 4. Mounting: Tank mount 5. Electronic housing shall be NEMA 4X, cast S.S., with ¾" NPT dual conduit entries. 6. Switch shall be UL certified or FM approved <p>Probe:</p> <ol style="list-style-type: none"> 1. Material: 316 S.S. 2. Length: Per mechanical detail tank drawings. 3. Actuation set points per Section 17901. 4. Mounting: Tank top <p>Acceptable manufacturer:</p> <ol style="list-style-type: none"> a. Magnetrol Echotel Model series 962 electronics with probe, No substitutions.
Execution:	
Installation:	Install per manufacturer's instructions and Contract Detail Drawings.
Application/Calibration:	Application and calibration/set points shall be per Section 17901

F. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	PS
Instrument Description:	Pressure switch.
Instrument Function:	Pressure measurement.
Power Supply:	N/A.
Signal Input:	Process.
Signal Output:	Contacts per Contract Drawings..
Process Connection:	1/4-inch female NPT.
Product Requirements:	<ol style="list-style-type: none"> 1. Construction: Pressure element and a precision switch. 2. Pressure element: <ol style="list-style-type: none"> a. Type: Diaphragm type with Buna-N diaphragm. b. Overpressure: Capable of withstanding 10 times without affecting calibration. 3. Switch: <ol style="list-style-type: none"> a. SPDT. b. Contacts rated 10 A at 120 VAC; 0.5 A at 120 VDC, resistive. c. Adjustable set point and adjustable deadband of approximately 10% to 90% of operating range. d. Adjustable dual setpoints of approximately 15% to 100% of nominal range. 4. Range: As specified in Section 17901, Instrument Schedule. <ol style="list-style-type: none"> a. Set point shall be between 30% and 70% of operating range. b. Set point and reset set point shall be indicated on calibration sticker. 5. Accuracy: Setpoint repeatability shall be $\pm 1\%$ of operating range. 6. Switch shall be UL or FM approved. 7. Enclosure: Cast aluminum rated NEMA 4X 8. Acceptable Manufacturers: <ol style="list-style-type: none"> a. Square-D series 9012G. b. Ashcroft L Series. c. Mercoird Series 1000. d. Approved Equal.
Execution:	
Installation:	<ol style="list-style-type: none"> 1. Install per manufacturer's instructions and the Drawings. 2. Provide root valves at all process pressure taps except taps made for safety instruments. 3. Provide gage valves at the instrument where the instrument is not within sight of the root valve or where two or more instruments are connected to a single tap. 4. Unless otherwise specified, locate as close as practical to the process tap and position to permit observation and maintenance.
Application/Calibration:	Application, calibration, and set points shall be per Section 17901.

G. INSTRUMENT SPECIFICATION SWITCH:

Instrument Identification:	TS
Instrument Description:	Temperature switch.
Instrument Function:	Temperature monitor (Capillary-type Fluid immersion).
Power Supply:	N/A.
Signal Input:	Process temperature.
Signal Output:	Contacts per Contract Drawings.
Process Connection:	1/2 IN NPT.
Product Requirements:	<ol style="list-style-type: none"> 1. Construction: Liquid-filled bulb and capillary, pressure sensor, snap action switch. 2. Bulb and capillary: Material, stainless steel. 3. Pressure element: <ol style="list-style-type: none"> a. Type: Bourdon tube, stainless steel. b. Overpressure: Capable of withstanding 300 psi capillary pressure. 4. Switch: <ol style="list-style-type: none"> a. General purpose SPDT. b. Rated 10 A at 120 VAC; 0.5 A at 120 VDC c. Adjustable set-point and deadband of approximately 10% to 90% of operating range. 5. Accuracy: Repeatability and sensitivity shall be +2% of operating range or better. 6. Enclosure: <ol style="list-style-type: none"> a. Cast aluminum rated NEMA 4X, unless otherwise specified in Section 17901. b. 3/4-inch conduit connections. 7. UL/CSA Listed. 8. Acceptable Manufacturers: <ol style="list-style-type: none"> a. Ashcroft series L, 400, 700. b. No Substitutions.
Execution:	
Installation:	Install per manufacturer's instructions and the recommendations of API RP551 to the specified requirements.
Application/Calibration:	Application, calibration, and set points shall be per Section 17901.

H. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC

Instrument Identification:	VS
Instrument Description:	Vibration Switch, Electronic.
Instrument Function:	Sense Vibration of Process Equipment.
Power Supply:	120 VAC, 60 Hz or 24 VDC, as shown on Drawings.
Signal Input:	Acceleration.
Signal Output:	<ol style="list-style-type: none"> 1. AC powered units: Solid-state triac, rated 2 A at 120 VAC. 2. DC powered units: Power FET, rated 3 A at 24 VDC. 3. Analog output: 4-20 mA into 0 to 500 Ohms.
Process Connection:	Machined surface w/fasteners.
Product Requirements:	<ol style="list-style-type: none"> 1. Construction: Consists of a self-contained seismic vibration sensor, electronic signal processing and alarm circuitry with two alarm relays. 2. Operation: <ol style="list-style-type: none"> a. Intended to protect rotating machinery from damage due to mechanical malfunction and vibration. Signal processing electronics shall convert seismic sensor output into velocity signal, test for alarms, and transmit analog velocity signal. b. Include an alarm inhibit feature that prevents the switch from tripping during machine start up, as indicated by contact closure. After the inhibit period, the switch shall function normally. c. Include an alarm delay feature that prevents the switch from tripping during short term transient vibration conditions. Under continued high vibration the switch shall trip after the delay period. Alarm delay period shall be programmable from 3 to 10 seconds. 3. Range: <ol style="list-style-type: none"> a. Danger alarm set-point: 0.15 to 1.5 inches/sec. b. Warning alarm set-point: 10% to 100% of Danger set-point. c. Analog signal: 0 to 150% of Danger set-point. 4. Accuracy: +5% FS. 5. Power: 120 VAC, 5 VA maximum, or as specified in Section 17910. 6. Enclosure: <ol style="list-style-type: none"> a. Cast aluminum or cast iron NEMA 4X unless otherwise specified in Section 17901. b. Conduit fittings: 3/4-inch conduit opening for power and signal wiring. 7. Acceptable Manufacturer: <ol style="list-style-type: none"> a. Robertshaw model 566. b. Balmac Model 500-X. c. Rochester model VT-1215. d. Approved Equal.
Execution:	
Installation:	Mount and connect per manufacturer's instructions and as indicated in the Drawings.
Application/Calibration:	Application, calibration, and set points shall be per Section 17901.

I. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC

Instrument Identification:	ZS1
Instrument Description:	Position Switch.
Instrument Function:	Sense the position of closed door.
Power Supply:	N/A.
Signal Input:	Door closed.
Signal Output:	Contacts per Contract Drawings.
Process Connection:	Inset into door and door frame.
Product Requirements:	<ol style="list-style-type: none"> 1. Provide industrial grade switch suitable for harsh environments. 2. Use magnetic reed switch SPDT Form C for the electrical contacts. 3. Prevent sticking or freezing between the two switch plates that form the magnetic field. 4. Electrical components hermetically sealed. 5. Warranty exceeding 10 years for workmanship, material and factory defects. 6. Acceptable manufacturer: <ol style="list-style-type: none"> a. George Risk Industries, 190 Series. b. General Electric, 1078/1076 Series. c. Approved Equal.
Execution:	
Installation:	<ol style="list-style-type: none"> 1. Provide installation hardware for roll-up door and access gate installations. 2. Install per manufacturer's instructions and as indicated on the Contract Drawings.
Application/Calibration:	Application and calibration/set points shall be per Section 17901.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Unless otherwise specified, installation requirements are specified in Section 17000.

3.02 TESTING

- A. Per Sections 17000 and 01660.

END OF SECTION

SECTION 17271

SIGNAL CONDITIONING MODULES

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies requirements for panel mounted signal conditioning modules.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following documents. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed document, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
EIA RS-310C	Racks, panels, and associated equipment.

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Product Data: Section 17000.
- C. Field Quality Control: Section 17000.
- D. Operations and maintenance information: Section 01730.

PART 2 PRODUCTS

2.01 GENERAL

- A. Unless otherwise specified or shown, signal conditioning modules shall comply with the following requirements:
 - 1. Analog signal inputs shall be 1 to 5 VDC with minimum input impedance of 20M ohms.
 - 2. Analog signal outputs shall be 4 to 20 mA DC with minimum of 600 ohms driving capability.
 - 3. Discrete output contacts shall be SPDT rated 5 amperes at 120 VAC and 24 VDC.
 - 4. Power supply shall be 120 VAC or 24 VDC as shown, plus or minus 10 percent. Power supply effect shall not exceed 0.005 percent per 1.0 percent change.
 - 5. The output contacts of electronic trips shall change state as follows:
 - a. When shown as E>SP, the relay coil shall energize and contacts shall change state when input (E) is greater than or equal to set point (SP).
 - b. When shown as E<SP, the relay coil shall energize and contacts shall change state when input (E) is less than or equal to set point (SP).
 - 6. Modules shall be rated for continuous operation in an ambient temperature of 0 to 80 degrees C. Ambient temperature effect shall not exceed plus or minus 0.01 percent per degree C within that range.
 - 7. Span and zero adjustments shall be made by front accessible multi-turn potentiometers and/or field programmable switches or jumpers.
 - 8. Electronic trip modules shall be provided with LED indicators for relay status.

9. Modules shall withstand 30 volts per meter radio frequency radiation between 200 and 500 MHz with not more than 0.25 percent calibration effect. Modules shall also be provided with traps on the terminals to shunt conducted radio frequency interference to ground.
10. Signal and power supply terminals shall be galvanically isolated from the chassis ground.

- B. Unless otherwise specified, all modules specified in this Section shall be the product of a single manufacturer.

2.02 INSTRUMENTATION SPECIFICATION (INSTRUSPEC) SHEETS

- A. General requirements for instruments specified in this Section are listed on INSTRUSPEC. Application requirements are specified in the instrument schedule in Section 17000, and/or indicated in the Drawings.

2.03 INSTRUSPEC SHEETS

- A. None.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Signal conditioning modules shall be installed in panels per Section 17110 and in compliance to EIA RS-310C.

3.02 TESTING

- A. Testing requirements per Sections 17000 and 01660.

END OF SECTION

SECTION 17272

MISCELLANEOUS PANEL INSTRUMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies requirements for panel mounted devices for operator interface and internal controls.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following documents. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
EIA RS-310C	Racks, Panels, and Associated Equipment
NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
UL 508	Industrial Control Equipment

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Product Data: Section 17000.
- C. Field Quality Control: Section 17000.
- D. Operation and maintenance information: Section 01730.

PART 2 PRODUCTS

2.01 GENERAL

- A. Unless otherwise specified or shown, devices covered by this Section shall comply with all requirements for installation in a control panel bearing the UL 508 label.
- B. Unless otherwise specified, all like equipment specified in this Section shall be the product of a single manufacturer.

2.02 STROBE LIGHTS

- A. Flashing Strobe: 360-degree beam.
- B. Flash Rate between approximately 65 and 90 times per minute.
- C. UL Listed.
- D. Housing: As noted.
 - 1. NEMA 7, explosion-proof.
 - a. Class 1, Divisions 1 and 2.

- 2. NEMA 4X, corrosion resistant:
 - a. Factory sealed.
 - b. Epoxy powder coated.
- E. Indicating Light Color: Per Section 16000 or as noted.
- F. Power: 120 Vac – 60 Hz.
- G. Manufacturer and Model:
 - 1. NEMA 7:
 - a. Edwards, Model 116-EXMST(*)-N5.
 - b. Hubbell, Model ES.
 - c. Approved Equal.
 - 2. NEMA 4X:
 - a. Edwards, Model 117(*)-N5.
 - b. Hubbell, Model ES.
 - c. Approved Equal.

2.03 WARNING HORN

- A. Output: 97 dBa minimum at 10 feet.
- B. UL Listed.
- C. Housing: As noted.
 - 1. NEMA 7, explosion–proof.
 - a. Class 1, Divisions 1 and 2.
 - 2. NEMA 4X, corrosion resistant.
 - a. Factory sealed.
 - b. Epoxy powder coated.
- D. Duty cycle: Continuous operation.
- E. Power: 120 Vac – 60 Hz.
- F. Manufacturer and Model:
 - 1. NEMA 7:
 - a. Edwards, Model 878EX-N5.
 - b. Federal Signal Corp., Model 31X.
 - c. Approved Equal.
 - 2. NEMA 4X:
 - a. Edwards, Model 870P-N5.
 - b. Federal Signal Corp., Model 350.
 - c. Approved Equal.

2.04 INSTRUMENTATION SPECIFICATION (INSTRUSPEC) SHEETS

- A. General requirements for instruments specified in this Section are listed on INSTRUSPEC. Application requirements are specified in Section 17901, and/or indicated in the Drawings.

2.05 INSTRUSPEC SHEETS

A. The following INSTRUSPEC sheets are included in this Section.

INSTRUSPEC Symbol	Instrument Description	Instrument Function
XXS	Selector Switches	Operator Interface

B. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	XXS
Instrument Description:	Selector Switch / Indicating Lights or Indicating Lights Only.
Instrument Function:	Operator Interface.
Power Supply:	120 VAC, 60 Hertz.
Signal Input:	N/A.
Signal Output:	Contact.
Process Connection:	N/A.
Product Requirements:	<ol style="list-style-type: none"> 1. Main Control Panel switches shall be four-quadrant style as described. 2. Up to four control positions that can be configured as: (1) selector switches, (2) selector push-type switches, (3) pushbuttons, and/or (4) segmented indicating light units. 3. Provide up to four separate energized indicating lights with legend plates and colored lenses as indicated in the Drawings. 4. Indicating lights, pushbuttons and selector switches shall be oil tight heavy-duty units. Conforming to NEMA 250 Type 4 or better, as required. 5. Contacts in signal circuits shall be gold, for electronic solid-state dry circuits and rated for 28 VDC one-ampere resistive/125 VAC 0.5-ampere resistive. 6. Contacts in control circuits shall be silver and rated for 125 VDC 5-amperes inductive/120 VAC 5 amperes. 7. Indicating lights for 120 VAC shall be transformer type using a LED lamp. 8. Indicating lights for 24 VDC shall be resistive type using a LED lamp. 9. Lights shall be capable of being changed from the front of the panel without special tools. 10. Unit shall be UL/CSA listed. 11. Acceptable Manufacturer: <ol style="list-style-type: none"> a. Senasys Inc., Series CMC. b. Approved Equal.
Execution:	
Installation:	Mount and connect in panels per Section 17110 and in accordance with manufacturer's instructions to the specified functional requirements.
Application/Calibration:	Application, calibration, and set points shall be per Section 17901.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Relays and control switches and pilot devices shall be installed in panels per Section 17110 and in compliance to EIA RS-310C.

3.02 TESTING

- A. Testing requirements per Section 17000 and 01660.

END OF SECTION

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SECTION 17274

MINIATURE CASE ELECTRONIC PANEL INSTRUMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies requirements for panel mounted electronic instruments.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following documents. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed document, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Product Data: Section 17000.
- C. Field Quality Control: Section 17000.
- D. Operation and maintenance information: Section 01730.

PART 2 PRODUCTS

2.01 GENERAL

- A. Unless otherwise specified, panel instruments shall comply with the following requirements:
 - 1. Analog instruments shall be miniature-case drawout type, standard DIN dimensions, and not more than 20 inches deep.
 - 2. Operator, tuning, and configuration adjustments shall be accessible without disconnecting the instrument from the process.
 - 3. Analog signal indicators shall be solid-state, LED, or gas-discharge type, 4-digit numerical display or bar-graph displays with not less than 100 segments, as specified.
 - 4. Analog signal inputs shall be 1 to 5 VDC into not less than 250K ohms.
 - 5. Analog signal outputs shall be 1 to 5 VDC into >10K ohms except where instrument provides final output signal to field in which case output shall be 4 to 20 mA current regulated into 0 to 600 ohms.
 - 6. Unless otherwise specified, power supply shall be 120 VAC plus or minus 10 percent.
 - 7. Signal and power supply connections shall be isolated from the instrument case.

2.02 INSTRUMENT SPECIFICATION (INSTRUSPEC) SHEETS

- A. General requirements for instruments specified in this Section are listed on INSTRUSPEC.
- B. Application requirements are specified in the instrument schedule in Section 17901, and/or indicated in the Drawings.

2.03 INSTRUSPEC SHEETS

A. The following INSTRUSPEC sheets are included in this Section.

INSTRUSPEC Symbol	Instrument Description	Instrument Function
XI2	Digital Indicator	Digital panel indicator

B. INSTRUMENT SPECIFICATION SHEET—INSTRUSPEC:

Instrument Identification:	XI2
Instrument Description:	Digital Indicator.
Instrument Function:	Digital Indicator.
Power Supply:	120 VAC, 60 hertz.
Signal Input:	4-20 mA DC.
Signal Output:	Process Input.
Process Connection:	N/A.
Product Requirements:	<ol style="list-style-type: none">1. Panel mount digital process meter, scalable in engineering units.2. Display: 4-digits by 0.5" high minimum. LED or back-lighted LCD with adjustable D.P.3. Accuracy: 0.1% +/- 1 digit.4. Display range: -1999 to 9999.5. Relative humidity: 0 to 85%, non-condensing.6. Operating temperature: 32° to 122°F.7. Enclosure: NEMA 4X; Bezel: 1/8 DIN (96.5 mm W x 49.5 mm H); Panel cutout: (92 mm W x 45 mm H).8. Acceptable Manufacturer:<ol style="list-style-type: none">a. Newport model IDP.b. Red Lion controls model PAX.c. Action Instruments model 438.d. Approved Equal.
Execution:	
Installation:	<ol style="list-style-type: none">1. Install in panels per Section 17110 and in accordance with manufacturer's instructions to the specified functional requirements.2. Application, calibration, and setpoints shall be per Section 17901.

PART 3 EXECUTION

3.01 INSTALLATION

A. Operator interface instruments shall be installed on panels per Section 17110.

3.02 TESTING

A. Testing requirements per Section 17000 and 01660.

END OF SECTION

SECTION 17275

MISCELLANEOUS INSTRUMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies requirements for miscellaneous instruments used to provide process control and interface between the operator and the process.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following document. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
UL 508	Industrial Control Equipment
UL 508A	Industrial Control Panels

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Catalog cuts and product data: Section 17000.
- C. Intermediate Software Submittal (60%) including draft coding.
- D. Software programming, testing, and startup.
 - 1. Include I/O, program, and SCADA databases; block diagrams of logic sequence; RTU configuration or program with fully commented logic; and all supporting information necessary for review.
 - 2. Submit in hard copy form as well as on in native format on electronic media. Submitting just on electronic media is unacceptable.
 - 3. All programs shall be submitted to Project Representative for review.
- E. Test Data: Full factory test documentation, signed, and dated.
- F. Operations and maintenance information: Section 01730.

PART 2 PRODUCTS

2.01 INSTRUMENT SPECIFICATION (INSTRUSPEC) SHEETS

- A. General requirements for instruments specified in this Section are listed on INSTRUSPEC sheets.
- B. Application requirements are specified in the MetroTel I/O schedule Section 17904.

2.02 INSTRUSPEC SHEETS

- A. The following INSTRUSPEC sheets are included in this Section.

INSTRUSPEC Symbol	Instrument Description	Instrument Function
RTU	Remote telemetry unit	Telemetry [Metrotel]
RG	Rain Gauge	Rainfall Measurement

Instrument Identification:	RTU
Instrument Description:	Remote Telemetry Unit.
Instrument Function:	Telemetry (MetroTel).
Power Supply:	120 VAC.
Signal Input:	Discrete and Analog.
Signal Output:	N/A.
Product Requirements:	
General:	<ol style="list-style-type: none"> 1. The remote telemetry unit (RTU) shall have sufficient sensitivity and power to communicate with master telemetry unit (MTU) of the specific application. 2. The RTU shall be capable of communicating with the existing MetroTel system at the Treatment Plant utilizing signals over standard voice grade telephone lines.
PLC Controller:	<ol style="list-style-type: none"> 1. Programming Languages: Ladder diagram, Function Block, Structured Text, and Sequential Function Chart. 2. Programming Software: RSLogix 5000, contact Project Representative for acceptable version. 3. Memory: 750K. 4. Operating Environment: <ol style="list-style-type: none"> a. Temperature: -20° to 140° F. b. Humidity: 5 to 95%, non-condensing. 5. Communication Ports: <ol style="list-style-type: none"> a. RS232 Serial, configurable for ASCII, DH-485, DF1, and modem. b. Ethernet/IP10/100 Base-T, RJ45. 6. Communication Protocols: <ol style="list-style-type: none"> a. ASCII, DH-485, DF-1, Modbus Master/Slave and bridging. 7. Manufacturer: Rockwell Automation. <ol style="list-style-type: none"> a. Model: CompactLogix1769-L32E, no substitution.
PLC Power Supply:	<ol style="list-style-type: none"> 1. Input 120/220 VAC. 2. Output 2A @ 5V, 0.8A @ 24V. 3. Manufacturer: Rockwell Automation. <ol style="list-style-type: none"> a. Model 1769-PA2, no substitution.
Input Modules:	<ol style="list-style-type: none"> 1. 4 analog inputs, differential or single-ended. <ol style="list-style-type: none"> a. Input ranges: ±10V, 0-10V, 0-5V, 1-5V, 0-20mA, 4-20mA. b. Manufacturer: Rockwell Automation . c. Model: 1769-IF4, no substitution. 2. 16 discrete inputs, (8points/group): <ol style="list-style-type: none"> a. Input Range: 24V DC sink/source. b. Manufacturer: Rockwell Automation. c. Model 1769-IQ16, no substitution.
Surge Protection:	<ol style="list-style-type: none"> 1. AC Line Power: Phoenix Contact PLT-SEC-T3-120-FM (2905228) or Approved Equal. 2. Telephone: Phoenix Contact MT-2-FM-RJ12 or Approved Equal.
Modem:	<ol style="list-style-type: none"> 1. 300/1200 baud, 2 half duplex or 4-wire full duplex Bell 202T compatible modem, with mounting kit. <ol style="list-style-type: none"> a. Manufacturer: Data Connection Enterprise. b. Model: IG202T-DC, no substitution.
Power Supply:	<ol style="list-style-type: none"> 1. DIN rail mounted, 24 VDC nominal, 30 W, adjustable ±10%. 2. Acceptable Manufacturer: <ol style="list-style-type: none"> a. Sola SDN-P Series. b. Approved Equal.
Enclosure:	NEMA 250 Type 12 or Type 4X, per Section 17110.

Instrument Identification:	RTU
Execution:	
Installation:	<ol style="list-style-type: none"> 1. Install the RTU equipment in accordance with manufacturer's instructions and the Drawings. 2. Obtain 120 VAC power from the UPS at the facility. 3. Connect the RTU to the discrete and analog points specified in 17904.
Configuration/ Programming:	<ol style="list-style-type: none"> 1. Configure the RTU and telephone line to communicate with the Metrotel system at the receiving Treatment Plant. 2. The County will configure the MTU and human machine interface at the receiving Treatment Plant to communicate with the RTU and will work with the Contractor to test all points from the RTU to the MTU. 3. Provide a technician for testing each configured point in the RTU while the County staff is testing the Metrotel system at the receiving Treatment Plant.

Instrument Identification:	RG
Instrument Description:	Rain Gauge.
Instrument Function:	Precipitation Measurement.
Power Supply:	Not Applicable.
Signal Input:	Not Applicable.
Signal Output:	Two independent reed switches.
Product Requirements:	
	<ol style="list-style-type: none"> 1. Receiver: 200 mm powder coated heavy duty cast aluminum. 2. Sensitivity: one tip at 0.01 inches of rainfall. 3. Range and Accuracy: $\pm 2\%$ at 500 mm/hr. 4. Humidity: 0-100%. 5. Temperature: 0° to 70° C. 6. Siphon: <ol style="list-style-type: none"> a. 0.4 mm (12 ml) capacity of rainfall – made from brass with a non hydroscopic outer case. b. Can be dismantled for routine cleaning and servicing. 7. Base: Cast aluminum. 8. Level: bulls eye level adhered to aluminum base. 9. Mounting holes: three 10 mm diameter holes with 117 mm pitch circle diameter cast-in feet attached to outside diameter of base. 10. Pivots: ground sapphire pivots with hard stainless steel shaft. 11. Insect covers: stainless steel mesh on all openings to prevent insects and ants entering gauge. 12. Outer enclosure: keyed to enable the release of the outer enclosure with the need for removal of the three securing screws. 13. Height: 330 mm. 14. Acceptable Manufacturer: <ol style="list-style-type: none"> a. Hydrological Services PTY Ltd, model TB3. b. Campbell Scientific, model CS700. c. Approved Equal.
Execution:	
Installation:	Mount and connect per manufacturer's instructions and as indicated in the Drawings.
Application/Calibration:	Provide calibration per manufacturer instructions.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Instruments shall be installed in UL listed panels per Section 17110.

3.02 TESTING

- A. Testing requirements: Section 17000.

END OF SECTION

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SECTION 17320

MACHINE MONITORING EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the general requirements for stand-alone monitoring equipment to be used on pumps, motors, and other equipment as specified in other Sections. Specific application-dependent requirements are delineated in Section 17901 and the Drawings.
- B. Purpose:
 - 1. The equipment shall monitor each of the mechanical systems for vibration, bearing temperature and/or other critical machine parameters at locations as indicated in the Drawings. The equipment shall warn operators of the following:
 - a. Vibration monitors warn of excessive vibration at the monitor points indicated in the Drawings.
 - b. Temperature monitors warn of lubrication loss, mechanical wear, and/or electrical trouble at the bearings and motor windings indicated in the Drawings.
 - c. Seal Leak monitors warn of contamination of lubrication oil by water leaking through the pump shaft seals of submersible pump assemblies.
- C. Machine Monitoring Equipment:
 - 1. Provide machine monitoring equipment for the following per the Drawings and these Specifications.
 - a. Influent Pump P854311.
 - 1) Vibration.
 - b. Influent Pump P854312.
 - 1) Vibration.
 - c. Influent Pump P854313.
 - 1) Vibration.
 - d. Influent Pump P854321.
 - 1) Vibration.
 - e. Influent Pump P854322.
 - 1) Vibration.
 - f. Influent Pump P854323.
 - 1) Vibration.
 - 2. Provide sensors as indicated in the Drawings and the Instrument Schedule (Section 17901). Locate per the Drawings.
 - 3. Connect monitoring equipment to Annunciators, PLC, and motor drives per the Drawings.
- D. Pump and Motor Disassembly: Do not remove or disassemble pumps or motors during installation of monitoring equipment.

1.02 QUALITY ASSURANCE

- A. Qualifications of Installer:
 - 1. The system shall be supplied and installed by an experienced firm regularly engaged in the installation of similar machine monitoring systems.
 - 2. The installer shall be a qualified factory-trained representative of the equipment manufacturer and shall have a minimum of 5 years experience in design, installation, and testing of machine monitoring systems of similar scope and complexity.
 - 3. The County may reject any proposed installer who cannot show proof of such qualifications.

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Shop drawings of all equipment, including schematic drawings.
- C. Installation drawings.
- D. Manufacturer's catalog or other data confirming conformance to specified design, material, and equipment requirements.
- E. Interconnection diagram for the system. Show the location of each device and the size and type of cables between devices. Show terminal numbers where each conductor is terminated. Show power and ground connections.
- F. Calibration Procedures
- G. Complete step-by-step functional test procedure including forms for recording test results per Section 01660.
- H. Test results for tests specified in this Section.
- I. Operating and maintenance information: Section 01730.
- J. Training Schedule and Course Outline per Section 01660.

1.04 DEFINITIONS

- A. The following terms shall be as defined in ANSI/ISA-51.1:
 - 1. Accuracy.
 - 2. Repeatability.
 - 3. Dead Band.
 - 4. Range.
 - 5. Span.
 - 6. Calibrate.

PART 2 PRODUCTS

2.01 MACHINE MONITORING EQUIPMENT

- A. Codes and Standards:
 - 1. Devices and equipment provided shall be Factory Mutual approved.
- B. Mounting and Power supplies:
 - 1. Provide rack-mounted or DIN-rail mounted monitoring and alarm modules. The modules shall continuously monitor each input device and display real-time data.
 - 2. Monitoring equipment for each pump system shall have power supplies independent from monitoring equipment for other pump systems and from any other control systems at the Facility. AC power may be derived from the pump system being monitored.
- C. Vibration monitoring modules:
 - 1. Single channel vibration monitoring and alarm modules.
 - 2. Inputs: Remotely mounted accelerometer, sensitivity as specified.
 - 3. Range: Velocity, 0.0-1.0 inch/sec RMS, or as specified.
 - 4. Recorder output of 1-5 V or 4-20 mA per channel.

5. Peak or RMS alarm detection.
- D. Alarm modules, General:
 1. User programmable via a Laptop PC.
 2. Programming shall allow setting:
 - a. One DANGER setpoint per channel.
 - b. One WARN setpoint per channel.
 - c. Adjustable time delays for DANGER and WARN alarms.
 - d. Alarm relay function: Latching.
 3. Provide programming software for the alarm modules, as recommended by manufacturer.
- E. Alarm contacts:
 1. Unless otherwise specified, alarm contacts shall comply with the following requirements:
 - a. Contact outputs used for WARN alarms shall be normally closed and shall open on alarm.
 - b. Contact outputs used to DANGER alarms shall be normally closed and shall open on alarm.
 - c. Contact outputs shall be suitable for switching logic-level circuits and shall be rated not less than 100 mA at 120 VAC and 75 VDC.
- F. Environmental:
 1. The machine monitoring equipment shall operate under ambient conditions of 10 to 40 C and 10 to 95 percent relative humidity (non-condensing).
- G. Power: 120 VAC \pm 10% at 10 A maximum.
- H. Acceptable Manufacturers:
 1. Vibration and temperature monitors and alarms:
 - a. Rockwell Automation/Entek Sentinel series.
 - b. Approved Equal.

2.02 MEASURING ELEMENTS

- A. Measuring element and transmitter enclosures shall be rated at a minimum, Type 4 per NEMA ICS-6, or as required by location classification.
- B. Reference Section 11060 for the following:
 1. Seal leak sensors for submersible motors.
 2. Temperature monitoring sensors for motor windings.
- C. Provide vibration sensors as follows:
 1. Accelerometer pickup, 2- or 3-wire connection, excitation current <10mA@12-28VDC
 2. Range: \pm 50 g.
 3. Sensitivity: 100 mV/g.
 4. Frequency response: 1 to 12,000 Hz \pm 3dB.
 5. Environmental temperature range: -50 to 120 C.
 6. Mounting base, connector, and 10m cable assembly.
 7. Standard accelerometers on flywheel and motor bearings, low profile accelerometers on pump top bearing.
 8. Acceptable manufacturers:
 - a. Rockwell/ENTEK model 45890 with model 45533 cable.
 - b. Approved Equal.

2.03 SPARE PARTS

- A. Provide the following spare parts.
 1. Accelerometers: 1 of each type supplied.
 2. Mounting bases: 1 of each type supplied.

3. Vibration modules: 1 of each type supplied.

PART 3 EXECUTION

3.01 GENERAL

- A. Signal Wiring:
 1. Signal wiring shall be carried in raceways in compliance with Division 16 and Section 17000, except that runs of signal cables containing only single pairs or triads shall not be run in trays or other open raceways. Circuits shall be run as individually shielded single twisted pairs or triads, as required. In no case shall a circuit be made up using conductors from different pairs or triads. Triads shall not be formed by using two pairs. Terminal blocks shall be provided at instrument cable junctions, and circuits shall be identified at such junctions unless otherwise specified. Signal circuits shall be run without splices between instruments, terminal boxes, and panels.
- B. Unless otherwise specified, shields shall be bonded to earth ground at a single point and isolated from ground and other shields at other locations. Terminals shall be provided for running signal leads and shield drain wires through junction boxes.

3.02 INSTALLATION

- A. Install equipment as indicated in the Drawings and in accordance with the manufacturer's recommendations and NFPA 70, API RP-550 and API 670.
- B. Install the rack(s), monitor display(s), machine monitor modules, alarm modules and ancillary devices in new machine monitor panel, MCC or VFD per manufacturer's instructions and as indicated in the Drawings.
- C. Sensors:
 1. Install vibration sensor mounts at the locations indicated in the Drawings with epoxy adhesive per MMM-A-134. Thread accelerometers into sensor mounts with torque as specified by the manufacturer. Dress cables so that they do not transmit any strain to the accelerometer due to vibration or flexing.
 2. Install RTD temperature sensors in bearing housing or equipment casing such that the tip of the probe is in intimate contact with the outer bearing race.
 3. Install conductivity probes in lubrication oil housing such that nominal resistance between probes is in excess of 100 K Ohms.
 4. Coordinate with pump/motor manufacturer and County Maintenance personnel for exact location and mounting configuration of accelerometers and RTD sensors.

3.03 CALIBRATION

- A. General:
 1. Calibrate each instrument onsite, except as noted below. Calibration shall be performed by an instrument technician who by virtue of an acceptable training course or documentable experience is qualified to calibrate that instrument. Acceptable training shall include successful completion of the manufacturer's training course or successful completion of applicable training courses in a recognized trade school.
- B. Where field calibration is not feasible, certified laboratory calibration reports may be substituted for field test data subject to prior written authorization of the Project Representative. Certified calibration test data shall be traceable to NIST.
- C. Certified laboratory test data may be submitted for instruments in lieu of individual onsite tests.

- D. Calibration Equipment:
 - 1. Provide all tools and equipment required to calibrate each instrument. Test instruments used to simulate inputs and read outputs shall be suitable for the purpose and shall have a rated accuracy at least 3 times greater than the specified accuracy of the instrument being calibrated. Each test instrument shall be certified by an established calibration laboratory traceable to NIST standards prior to the commencement of testing and shall be re-certified after completion of testing to verify accuracy throughout the testing period.
- E. Calibration Procedure:
 - 1. Calibrate each channel of each monitor/alarm module at 10 percent, 50 percent, and 90 percent of its specified full scale.
 - 2. Calibrate by simulating inputs to monitor modules with an AC signal source (for accelerometers), or precision resistance substitution box (for RTD's and Seal Leak detectors). Simulation signals shall be connected at the field end of the circuit so that field wiring is also tested.
 - 3. Enter all test data on test forms. Deliver a report to the Project Representative containing all instruments listed by instrument number, certifying that each instrument has been calibrated and meets Contract requirements. For each instrument, the report shall include the test form with test data entered, together with a statement of defects noted and corrective actions taken.
- F. Any instrument which fails to meet any Contract requirement or any published manufacturer performance specifications for functional and operational parameters not specified in the Contract shall be repaired or replaced at the discretion of the Project Representative and at no cost to the County.
- G. Test each instrumentation loop and alarm circuit for overall functioning as an integrated system. This test shall verify that all interconnections are properly made and that all elements operate properly.

3.04 FIELD QUALITY CONTROL

- A. After installation is complete, the manufacturer's representative shall test the equipment in the presence of the Project Representative.
- B. Inform the Project Representative of the testing schedule at least one week prior to the test.
- C. Functional tests shall conform to the requirements of this Section.
- D. Acceptable test results shall be in accordance with the manufacturer's recommendation and equipment requirements.
- E. Test each instrumentation loop and alarm circuit for overall functioning as an integrated system. This test shall verify that all interconnections are properly made and that all elements operate properly.

3.05 STARTUP AND TRAINING

- A. Provide 16 hours of Startup assistance.
- B. Provide two separate 2 hour training sessions for the County's personnel on all aspects of operation and maintenance of the machine monitor system.
- C. Provide training at a County facility specified by the Project Representative at a time mutually agreed between the Contractor and the Project Representative.
- D. Notify the Project Representative at least two weeks prior of the proposed training date.

- E. Complete forms 11000A and 11000B included in Section 01999 at the end of Startup and Training. Submit the forms to the Project Representative for approval.
- F. Provide a summary of installed temperature and vibration setup parameters in a table format.
- G. Provide a tabular summary of installed temperature, vibration, and other monitored variable parameters, and alarm and timer setpoints.

END OF SECTION

SECTION 17500

COMMON CONTROL FUNCTIONS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section describes the functional requirements for common Process Control System (PCS) control functions that are used in multiple control strategy documents.
- B. This Section is a supplement to the King County PLC and OIT Installation and Programming Requirements document. Any conflicts between these two documents will be resolved by the Project Representative.

1.02 QUALITY ASSURANCE

- A. Maintain a master set of all control strategies documents.
 - 1. Edit control strategy documents to include all changes.
 - a. Edit using "track changes" mode.
 - b. Include the change directive document title, in brackets, at the end of each edit when applicable.

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. King County PLC and OIT Installation and Programming Requirements document.
 - 1. Obtain the current version of the document from the Project Representative.

1.05 EQUIPMENT

- A. None.

1.06 DEFINITIONS

- A. OIT: Operator Interface Terminal.
- B. SCADA: Supervisory Control and Data Acquisition System.
 - 1. References to SCADA system shall include:
 - a. Facility on-site SCADA.
 - b. Facility off-site SCADA.

1.07 COMMON ANALOG I/O FUNCTIONS

- A. I/O Conditioning:
 - 1. Digital filtering shall be used to smooth out noise that is part of an analog signal where necessary for process control. Where digital filtering is proposed, submit how it is to be implemented, acceptable noise limits, duration of noise, dampening methodology applied, and any other applicable information to the Project Representative for approval prior to programming.
 - 2. Engineering units shall be computed based on the 0 and 100 percent range assigned for each analog signal. Scaling shall be in engineering units for each instrument as specified in Section 17901.

- B. I/O Alarming:
1. All hardwired analog signals and analog signals received by the PCS via Ethernet or serial communication shall be configured with the following alarm functions.
 - a. A loss of signal shall be detected by the PCS and alarmed on the facility OIT and SCADA systems. The PCS shall automatically reset an active alarm when the analog input returns to within a valid signal range of -5 to +105 percent.
 - b. Analog Process Alarms:
 - 1) The PCS shall be configured to provide the following alarms for each analog input.
 - a) High-High alarm.
 - b) High alarm.
 - c) Low alarm.
 - d) Low-Low alarm.
 - 2) All alarms shall be displayed on the facility OIT and SCADA systems.
 - a) All alarms shall be configured for alarm logging on the facility SCADA system.
 - 3) Analog points shall be programmed to initially have their Low-Low limit and Low limit setpoints set to the low engineering units range (0 percent), and the High and High-High limit setpoints shall be set to the high engineering units range (100 percent), unless specified otherwise in the associated control strategy.
 - 4) All alarms shall include a 2 percent deadband and a delay timer to prevent nuisance alarms.
 - 5) Responsible for field verifying all analog alarm setpoints during system testing and commissioning.
- C. Totalization:
1. All "rate" variables (flows, power, etc.) shall be totaled in the PCS on a continuous basis. Totalizers shall be reset through the facility OIT system.
- D. Calculated Values:
1. Values calculated by the PCS shall have the same features as sensor based analog inputs with respect to alarming, totalizing, trending, and historical data.
- E. Historical Logging:
1. All analog signals shall be historically logged by the facility SCADA systems.
 2. All analog signals shall be transmitted to the King County PI data historian.
 - a. Properly format the data in coordination with the Project Representative

1.08 COMMON DISCRETE I/O FUNCTIONS

- A. Alarming:
1. All alarm signals; hardwired discrete signals, discrete signals received by the PCS via Ethernet or serial communication and alarm signals derived by PCS applications programs shall be configured with the following alarm functions.
 - a. All alarms shall be displayed on the facility OIT and SCADA systems.
 - b. All alarms shall be configured for alarm logging on the facility SCADA systems.
 - c. Nuisance Tripping:
 - 1) To prevent nuisance alarms, configure a delay timer in the PCS for each alarm to inhibit the alarm condition until the delay timer expires.
 - a) The default value for the delay timer preset shall be zero.
 - b) Delay timers shall be self resetting.
- B. Equipment run times shall be calculated by the PCS for all equipment:
1. Run times shall be displayed on the facility OIT and SCADA systems.
 2. Run times shall be logged to the facility SCADA system data historian.
 3. Run-time totals shall be operator resettable from the facility OIT system.

1.09 COMMON VALVE AND GATE CONTROL FUNCTIONS

- A. Local / Remote Control: Valve/gate actuators are supplied with OSC/LR (open/stop/close and local/remote) switches. These switches determine whether the valve or gate operator is being controlled from the local OSC switch at the actuator or remotely from the PCS as follows:
1. When in the Local position, the valve/gate cannot be controlled from the PCS. The local controls are independent of the PCS and allows an operator at the actuator to open or close a valve/gate.
 2. When in the Remote position, the valve/gate shall be controlled from selector switches mounted on the Facility Control Panel or from the PCS based on parameters defined in the control strategy.
 - a. If the valve/gate position does not agree with the commanded position for a defined time period (initially set at twice that of the maximum full valve/gate travel period), a Fault condition is energized by the PCS and an alarm is generated.
 - 1) The valve/gate Fault alarm shall be displayed on the facility OIT and SCADA systems.
 - 2) The valve/gate Fault alarm shall be configured for alarm logging on the facility SCADA system.
 - 3) Once energized, the valve/gate Fault alarm shall remain active until the valve/gate is taken out of Remote at the actuator.
 - b. If there is a power failure, the valve/gate operators shall fail in their last position.

1.10 COMMON PUMP AND MOTORIZED EQUIPMENT CONTROL FUNCTIONS

- A. Common Monitoring and Control for All Pumps and Motorized Equipment:
1. All motorized devices are supplied with control capability from multiple locations. Normally the pumps are controlled from the PCS, but they can also be controlled from:
 - a. Local-Off-Remote (LOR) switches and Hand Interface Module (HIM) mounted on each variable frequency drive (VFD enclosure).
 - b. Hand-Off-Remote (HOR) switches located at each constant speed motor.
 - c. Stopped by an emergency stop pushbutton/switch (ESTOP), if applicable.
 - 1) When an emergency stop pushbutton/switch is provided, it shall function so that when pressed the motor is immediately stopped.
 2. Variable Speed Equipment:
 - a. When the LOR switch is in either the Local or Off position the device cannot be started and stopped from the PCS.
 - 1) In Local position, the device shall be started, stopped and speed controlled through the HIM.
 - 2) In Off position, the device shall not operate.
 - 3) In Remote position, the device shall be started, stopped and speed controlled by the PCS based upon parameters defined in the control strategy.
 - b. Min-Max Speed Limits:
 - 1) Minimum and maximum speed limits required to protect the device or the process shall be configured in the VFD.
 - 2) Minimum and maximum speed limits required to meet control strategy operational objectives shall be configured in the PCS.
 - c. Maximum ramp-up and ramp-down rate limits:
 - 1) Maximum ramp rates to protect equipment or process operation shall be configured in the VFD.
 - 2) Maximum ramp rates that are less than the VFD set maximum ramp rate limit shall be configured in the PCS.
 3. Constant Speed Equipment:
 - a. When the LOR switch is in either the Local or Off position the device cannot be started and stopped from the PCS.
 - 1) In Local position, the device shall and operate continuously.
 - 2) In Off position, the device shall not operate.
 - 3) In the Remote position, the device shall be started and stopped by the PCS based upon parameters defined in the control strategy.

4. If a devices on/off or speed state does not agree with the commanded state or speed for a defined time period, a Fault condition is energized by the PCS and an alarm is generated.
 - a. The device Fault alarm shall be displayed on the facility OIT and SCADA systems.
 - b. The device Fault alarm shall be configured for alarm logging on the facility SCADA system.
 - c. Once energized, the device Fault alarm shall remain active until the device is taken out of Remote.
5. Hardwired interlocks override all controls, except an emergency stop pushbutton, regardless of control location (Local or Remote).
6. Software interlocks override all automatic control, but are ignored when devices are controlled locally or a hardwire interlock is active.

1.11 COMMON MOTOR STARTER AND VFD MONITORING FUNCTIONS

- A. The PCS shall monitor each 480 VAC motor starter and VFD through individual Ethernet connections.
 1. Communications Protocol: Ethernet/IP.
 2. Data Parameters:
 - a. Instantaneous power.
 - b. Average voltage.
 - c. Average current.
 3. Data shall be displayed and historically logged on the facility SCADA systems.
 4. Data shall be communicated to and displayed on the facility OIT and SCADA systems as indicated in the Drawings.

1.12 COMMON POWER MONITORING FUNCTIONS

- A. The PCS shall monitor each facility switchgear and MCC power monitor through individual Ethernet connections.
 1. Communications Protocol: Ethernet/TCP.
 2. Data Parameters:
 - a. Instantaneous power.
 - b. Average voltage.
 - c. Average current.
 3. Data shall be displayed and historically logged on the facility SCADA systems.
 4. Data shall be communicated to and displayed on the facility OIT and SCADA systems as indicated in the Drawings.

1.13 COMMON MISCELLANEOUS CONTROL FUNCTIONS

- A. Lead-Follow Pump Control:
 1. Lead-Follow pump control shall be applied when noted in a control strategy.
 2. The pump designated as the lead pump shall be the first pump started and the last pump stopped.
 3. As additional pumping needs are required, additional pumps shall be started in the following order:
 - a. Follow 1.
 - b. Follow 2 (If applicable).
 4. As pumping demand recedes, the pumps shall be stopped in the reverse order of their start.
 5. The assignment of pump sequence position shall be operator selected through selector switches located on the face for the Facility Control Panel.
 6. If an operating pump is detected as being in a Fault condition, the PCS shall operate the next available pump in the selected sequence.
 7. Exceptions to the common Lead-Follow pump control functions are identified in the control strategies.

- B. Lead-Standby Pump Control:
 - 1. Lead-Standby pump control shall be applied when noted in a control strategy.
 - 2. The pump designated as the lead pump shall be the first pump started.
 - 3. The assignment of pump sequence position shall be operator selected through selector switches located on the face for the Facility Control Panel.
 - 4. If an operating pump is detected as being in a Fault condition, the PCS shall operate the next available pump in the selected sequence.
 - 5. Exceptions to the common Lead-Standby pump control functions are identified in the control strategies.
- C. Proportional Integral Derivative (PID) Control:
 - 1. PID control shall only be implemented in PCS Programmable Logic Controllers (PLC).
 - 2. Provide faceplate displays for each configured PID controller on the facility OIT and SCADA systems.
 - a. Faceplate displays shall provide read-only display of PID controller operating parameters.
 - 3. Access to change PID controller tuning parameters shall only be provided through the facility OIT system.

1.14 STANDARD ALARM MANAGEMENT FUNCTIONS

- A. All alarms shall be displayed on the facility OIT and SCADA systems.
- B. All alarms shall be logged on the facility SCADA system.
- C. Sequence Fail Alarms: If a control sequence cannot proceed to the next step because the current step's completion criteria has not been met after a step-specific time delay, an alarm shall be generated. This alarm condition inhibits running the sequence until it is reset by operator action.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 17510

SECURITY AND SAFETY SYSTEMS CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control functions associated with facility security and safety systems:
1. Facility Intrusion.
 2. Fire Monitoring.
 3. CCTV Monitoring.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 400-P008, 500-P015, 800-P001, 800-P002, 900-P102.
- B. Related Control Strategies:
1. Section 17500.
- C. Control Diagrams: None.
- D. Instrument Loop Diagrams: None.
- E. System Description:
1. The PCS monitors the closed status of all facility access gates and doors. The access gates and doors are grouped in the Main Control Panel (MCP) PNL854881. Each set of grouped signals sends a common intrusion signal to the PCS.
 2. Alarm contact signals from the facility fire alarm panels are connected to the PCS at the MCP and PNL854981.
 3. Cameras are installed throughout the facility. The cameras are connected to a DVR installed in the facility Network rack located in the operations electrical room.
 4. The PCS monitors the status of flow switches associated with each eye wash and safety showers in the facility.

1.05 EQUIPMENT

Equipment No.	Equipment Name/Description
CAM 854100A	Site Security Camera 1
CAM 854100B	Site Security Camera 2
CAM 854100C	Site Security Camera 3
CAM 854100D	Site Security Camera 4
CAM 854100E	Site Security Camera 5
CAM 854100F	Site Security Camera 6
CAM 854100G	Site Security Camera 7
CAM 854100H	Site Security Camera 8
CAM 854100I	Site Security Camera 9
CAM 854100J	Site Security Camera 10
CAM 854100K	Site Security Camera 11
CAM 854100L	Site Security Camera 12

Equipment No.	Equipment Name/Description
CAM 854100M	Site Security Camera 13
CAM 854100N	Site Security Camera 14
CAM 854100O	Site Security Camera 15
CAM 854100P	Site Security Camera 16
CAM 854100Q	Site Security Camera 17
FCP854394	Area 300 & 700 Fire Alarm Panel
SFT854401	Polymer Room Eye Wash
SFT854445	Coagulant Feed Room East Eye Wash Safety Shower
SFT854446	Coagulant Fill Station Eye Wash Safety Shower
SFT854447	Coagulant Storage Eye Wash Safety Shower
SFT854455	Caustic Feed Room West Eye Wash Safety Shower
SFT854456	Caustic Fill Station Eye Wash Safety Shower
SFT854457	Caustic Storage Eye Wash Safety Shower
SFT854501	UV Pump Room Eye Wash Safety Shower
SFT854502	UV Deck Eye Wash Safety Shower
FCP854294	Georgetown Regulator Fire Alarm Panel
FCP854894	Process Electrical Fire Alarm Panel
FCP854994A	O&M Support Fire Alarm Panel
FCP854994B	Generator Room Fire Alarm Panel

1.06 ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.07 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.08 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.10 INTERLOCKS

- A. None.

1.11 CONTROL OPERATION

- A. Facility Intrusion Alarms:
 1. The PCS monitors the grouped access gate and door signals.
 2. When the PCS detects an intrusion signal, the PCS:
 - a. Energizes an alarm on the facility OIT and SCADA systems.

- b. Energizes an alarm on the receiving control panel's annunciator (if applicable).
 - c. Energizes an alarm to the Metrotel PLC system.
- B. Fire Alarms:
 - 1. The PCS monitors the alarm signals from the fire alarm panels.
 - 2. When the PCS detects a fire alarm signal, the PCS:
 - a. Energizes an alarm on the facility OIT and SCADA systems.
 - b. Energizes an alarm on the receiving control panel's annunciator (if applicable).
 - c. Energizes an alarm to the Metrotel PLC system.
- C. CCTV Camera System:
 - 1. The CCTV camera system monitors the outdoor facility areas.
 - a. The PCS has no interface to the CCTV system.
 - 2. Reference Section 13701.
- D. Eye Wash and Safety Showers:
 - 1. The PCS monitors the status of the flow switches associated with each eye wash and safety showers in the facility.
 - 2. When the PCS detects a fire alarm signal, the PCS:
 - a. Energize a device specific alarm on the facility OIT and SCADA systems.
 - b. Energizes a common alarm on the PNL854881 annunciator.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 17511

FACILITY OPERATING SEQUENCE CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. The Process Control System (PCS) provides fully automated control of all Georgetown Wastewater Treatment Station (GWWTS) process systems.
 - 1. The GWWTS PCS anticipates the need to automatically start, operate, and stop the GWWTS in response to collection system flow conditions.
 - 2. Each of the GWWTS processes include the level of automation required to allow the GWWTS to operate without operator attendance.
 - 3. The three major process systems—pretreatment (screenings), ballasted sedimentation, and ultraviolet (UV) disinfection—each have vendor-provided control systems.
- B. This control strategy defines overall system operations and control coordination for all systems within the GWWTS.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: All.
- B. Related Control Strategies: All.
- C. Control Diagrams: Various.
- D. Instrument Loop Diagrams: Various.

1.05 SYSTEM DESCRIPTION

- A. The PCS shall control the start and stop of GWWTS operations automatically based upon initiation of wastewater flow into the GWWTS from the Georgetown Regulator.
- B. The PCS shall start and stop the GWWTS equipment based on the following criteria:
 - 1. The screening systems shall operate independently of the rest of the downstream treatment systems.
 - a. The PCS shall automatically start both screens upon detection of the following conditions:
 - 1) Either of the two Georgetown Regulator diversion gates, Michigan Gate SLG854212 or EBI Gate SLG954213, is not closed.
 - 2) The level in the influent channel is greater than EL 92.2.
 - b. Once started, the screenings system shall continue to operate until the level in the influent channel falls below EL 92.0.
 - 2. The influent pumps, ballasted sedimentation and UV disinfection systems shall be started and stopped as process treatment trains in a LEAD-FOLLOW sequence.
- C. The PCS shall control the LEAD and FOLLOW treatment trains based upon equalization basin level and GWWTS influent pump flow rates.

- D. Each treatment train shall be configured with the following major PLC systems:
 - 1. Treatment Train Master PLCs.
 - a. PLC854810. (Treatment train 1).
 - b. PLC854820. (Treatment train 2).
 - 2. Ballasted Sedimentation PLCs (Vendor Supplied).
 - a. PLC854410. (Treatment train 1).
 - b. PLC854420. (Treatment train 2).
 - 3. UV Disinfection PLCs (Vendor Supplied).
 - a. PLC854510. (Treatment train 1).
 - b. PLC854520. (Treatment train 2).
 - 4. Each Treatment Train Master PLC system shall control the operation of its associated treatment train.
 - a. Control and status information shall be communicated between each treatment train master PLC and its associated vendor supplied PLC systems over the PCS Ethernet network.

1.06 ANNUNCIATOR ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.07 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.08 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.10 INTERLOCKS

- A. If BTV854308A or BTV854308B is not fully open, the PCS shall initiate a Recycle System NOT READY alarm through the facility OIT and SCADA systems.
 - 1. The PCS shall inhibit the operation of the treatment trains and return the facility treatment train operating sequences to their Home steps when the Recycle System NOT READY condition is detected.

1.11 CONTROL OPERATION

- A. GWWTS Master PLC.
 - 1. Each Treatment Train Master PLC system (PLC854810 and PLC854820) shall be configured to execute the functions of the GWWTS Master PLC.
 - a. The PCS shall logically assign one of the two Treatment Train Master PLC systems as the GWWTS Master PLC.
 - b. Only one of the two Treatment Train Master PLC systems shall actively execute the functions of the GWWTS Master PLC system.
 - c. The ACTIVE GWWTS Master PLC shall be selected by the PCS as the first Treatment Train Master PLC system detected as being in operation.
 - 1) Provide graphic display of which Treatment Train Master PLC is the ACTIVE and STANDBY GWWTS Master PLC.
 - d. Provide a selection function through the facility OIT system that allows operator selection of the GWWTS Master PLC.
 - 1) The selection function shall only be user accessible through OIT854881.

- e. The PCS shall monitor the status of both Treatment Train Master PLC systems.
 - 1) If the PCS detects that the ACTIVE GWWTS Master PLC has failed or is no longer in service, the PCS shall immediately switch the GWWTS Master PLC functions to the STANDBY GWWTS Master PLC system.
 - a) Switchover shall be bumpless and shall not result in any loss of process control functionality.
 2. ACTIVE GWWTS Master PLC Functions:
 - a. The ACTIVE GWWTS Master PLC shall control all facility operational sequences.
 - 1) The ACTIVE GWWTS Master PLC control sequence programming shall communicate equipment commands to the Treatment Train Master PLC systems that controls the I/O associated with each process device.
- B. Lead Treatment Train Start Sequence:
1. The LEAD treatment train shall be selected via a selector switch HS854320 located on PNL854881 (MCP).
 2. The LEAD treatment train start sequence shall require that the following operation pre-requisites are detected before a treatment train can be automatically started.
 - a. All required GWWTS equipment selected to Auto control mode and not failed.
 - b. Ballasted sedimentation system reported as "Ready" by its package control system.
 - c. UV disinfection system reported as "Ready" by its package control system.
 - d. Effluent gate is closed.
 - e. EFR valve FV854308A or FV854308B is Open.
 3. If a pre-requisite is not satisfied, a LEAD TREATMENT TRAIN NOT READY alarm shall be activated through the facility OIT and SCADA systems.
 - a. Provide a graphic display of the train start pre-requisites and their associated status on the facility OIT and SCADA systems.
 4. If the selected LEAD treatment train is not ready, the PCS shall designate the selected FOLLOW treatment train to become LEAD.
 - a. Display the LEAD and FOLLOW treatment train selection and operational status on the HS854320 indicating lights.
 - b. Display the LEAD and FOLLOW treatment train selection and operational status on the facility OIT and SCADA systems.
 5. The PCS shall be configured to provide the following LEAD treatment train start sequence.
 - a. Provide a graphic display of the LEAD train start sequence and its associated statuses on the facility OIT and SCADA systems.
 - 1) Descriptions and status for each step in tabular format.
 - 2) Step timer status.
 - 3) Equalization basin level drawdown rate.
 - 4) Operating setpoints.

Step No.	Step Description	Step Advance Condition(s)
0	Home step	<ul style="list-style-type: none"> Georgetown Regulator gates SLG8542 or SLG854213 not closed and influent channel elevation is greater than 92.2.
1	Issue START command to the influent screens and screenings compactor systems.	<ul style="list-style-type: none"> Level in the EQ basin > operator adjustable IPS start SP, initially set at 77.0. The PCS shall calculate the equalization basin volume between the IPS start level setpoint and the IPS Low-Low level pump shutdown level. If that volume is insufficient to fill the C3 storage tank on process train startup, the PCS shall energize an alarm on the facility OIT and SCADA systems.

Step No.	Step Description	Step Advance Condition(s)
2	Issue START command to the UV disinfection and ballasted sedimentation systems.	<ul style="list-style-type: none"> UV disinfection system reported as ON and READY for service. Ballasted sedimentation system reported as ON and READY for service.
3	Issue START commands to caustic feed and de-foamer feed systems.	Chemical feed systems are in operation.
4	Start the LEAD influent pump and command the pump to operate at its pre-programmed minimum speed setpoint.	Pump started and running at minimum speed.
5	Release LEAD influent pump speed control to maintain the minimum treatment train flow setpoint. Flow control shall be provided by a PID controller. <u>Treatment Train Minimum Flow setpoint:</u> Initially set at 5 MGD. Operator adjustable at the MCP OIT.	Pump flow rate = Treatment Train Minimum Flow setpoint.
6	Operate the LEAD treatment train for an operator adjustable Startup Recirculation Time delay, initially set to 15 minutes, recirculating flow back to the equalization basin. <u>Start Effluent Discharge setpoint:</u> Initially set at 78.25. Setpoints shall be operator adjustable at the MCP OIT.	<ul style="list-style-type: none"> Time delay expires. Level in the Equalization basin > Start Effluent Discharge setpoint. Level in the C3 storage basin is greater than 126.8 feet or C3 storage tank level signal is failed. Treatment train effluent turbidity is less than discharge limit.
7	Open the effluent gate	Effluent gate is open
8	Release the Lead treatment train influent pumps to modulate speed to maintain the level in the equalization basin. See Section 17531.	Lead treatment train is controlling equalization basin level.
9	Sequence End	(PCS maintains the Lead treatment train in One Treatment Train Operation defined below. PCS shall start the Follow treatment train or shut down the Lead treatment train based upon process conditions.)

C. One Treatment Train Operation:

1. During one treatment train operation, the PCS shall coordinate the operation of the Lead treatment train.
 - a. During one treatment train operation, the PCS shall:
 - 1) Control the operation of the influent pumps per Section 17531.
 - 2) Transmit supervisory control commands to the ballasted sedimentation and UV package control systems.
 - 3) Control the injection of caustic per Section 17545.
 - 4) Control the injection of de-foamer per Section 17555.
 - b. Provide a Maximum Train Flow control override that shall limit the flow rate of the Lead treatment train to the lower of:
 - 1) 17 MGD.
 - 2) Maximum UV treatment flow capacity calculated by the Lead treatment train UV control system.
 - 3) Provide the operator the ability to override the maximum flow limit through the MCP OIT.
 - 4) Continuously display each treatment trains flow capacity through the Facility OIT System.

2. Lead Treatment Train at Minimum Flow Rate:

- a. Under this operating condition, the PCS shall provide the following control responses to falling and recovering equalization basin level.

Level Condition	Control Response
Level in the equalization basin falls below the operating level range by an operator adjustable setpoint, initially set at 12 inches.	<ul style="list-style-type: none"> Command the lead treatment train to switch to recirculation mode by closing the train effluent gate.
Level in the equalization basin rises to be within the operating level range by an operator adjustable setpoint, initially set at 12 inches.	<ul style="list-style-type: none"> Resume EQ basin level control to maintain the level range. Command the lead treatment train to return to normal operation mode by opening the train effluent gate.

D. Follow Treatment Train Start Sequence:

1. The Follow treatment train is the train not selected as Lead via selector switch HS854320 located on the MCP. The Follow treatment train start sequence requires that the following operation pre-requisites are satisfied to be ready for operation.
 - a. All required GWWTS equipment selected to Auto control mode and not failed.
 - b. Ballasted sedimentation system reported as "Ready" by its package control system.
 - c. UV disinfection system reported as "Ready" by its package control system.
 - d. Effluent gate closed.
 - e. EFFF valve FV854308A or FV854308B is Open.
2. If a pre-requisite is not satisfied, an alarm shall be activated through the facility OIT and SCADA systems to indicate that a condition is keeping the start sequence from operating.

Step No.	Step Description	Step Advance Condition(s)
0	Home step	<ul style="list-style-type: none"> The PCS shall continuously track the rate of level rise while the Lead treatment train is in operation. When all of the available influent pumps in the Lead treatment train are in operation, The PCS shall calculate the number of minutes before the pumps reach maximum speed based on current pump speed and the rate of level rise in the equalization basin. When the calculated time falls below the operator adjustable Startup Recirculation Time, the PCS shall advance the sequence to Step 1.
1	Issue START command to the UV disinfection and ballasted sedimentation systems	<ul style="list-style-type: none"> UV disinfection system reported as ON and READY for service. Ballasted sedimentation system reported as ON and READY for service.
2	Start the Lead influent pump	Pump started and running at minimum pump speed.
3	Start the required caustic and de-foamer feed systems.	Chemical feed systems are in operation.
4	Ramp pump speed up to obtain the operator adjustable treatment train minimum flow setpoint (initially set at 5 MGD).	Pump flow rate = flow rate SP.
5	Operate the pumping system for an operator adjustable time delay recirculating flow back to the equalization basin	<ul style="list-style-type: none"> Time delay expires. Treatment train effluent turbidity less than discharge setpoint.
6	Open the effluent gate	<ul style="list-style-type: none"> Effluent gate is open

Step No.	Step Description	Step Advance Condition(s)
7	Slowly ramp up the flow rate of the Follow train, initially set at 1% every 2 seconds, to allow the Lead train to reduce flow.	Both treatment trains are operating within 1 MGD of one another.
8	Release the Follow train influent pumps to modulate with the Lead train influent pumps to maintain the level in the equalization basin level control range.	Lead and Follow trains are controlling equalization basin level.
9	Sequence End	(PCS maintains the Lead and Follow treatment trains in Lead and Follow Treatment Train Operation defined below. PCS shut down the Follow treatment train based upon process conditions.)

E. Lead and Follow Treatment Train Operation:

1. During normal operation, the Lead and Follow treatment trains shall operate at the same flow rate. The flow rate shall be controlled by modulating the speed of the train influent pumps to maintain an operator adjustable equalization basin level range.
 - a. Provide a Maximum GWWTS Flow control override that shall limit the flow rate of the Lead and Follow treatment trains to the lower of:
 - 1) 36 MGD.
 - 2) Maximum UV treatment flow capacity calculated by the Lead and Follow treatment train UV control systems.
 - a) UV flow limits shall be implemented on a per treatment train basis.
 - 3) Provide the operator the ability to override the maximum flow limit through the MCP OIT.
 - 4) Continuously display each treatment trains flow capacity through the Facility OIT System.
2. Lead and Follow Treatment Trains at Minimum Flow Rate:
 - a. Under this operating condition, the PCS shall provide the following control responses to falling and recovering equalization basin level.

Level Condition	Control Response
Both treatment trains in level control mode and the level in the equalization basin falls below the level range by an operator adjustable setpoint, initially set at 6 inches.	<ul style="list-style-type: none"> The PCS shall command the follow treatment train to switch to recirculation mode by closing the train effluent gate. The PCS shall hold the flow rate of the Follow treatment train to the operator adjustable minimum flow setpoint. The PCS shall maintain the Lead treatment train in level control mode.
Lead treatment train in level control mode and follow treatment train in recirculation mode and level in the equalization basin continues falling below the level control range by an operator adjustable setpoint, initially set at 12 inches.	<ul style="list-style-type: none"> The PCS shall command the lead treatment train to switch to recirculation mode by closing the train effluent gate. The PCS shall hold the flow rate of the Lead treatment train to the operator adjustable minimum flow setpoint.
Lead treatment train in level control mode and Follow treatment train in recirculation mode and level in the equalization basin rises within the level range by an operator adjustable setpoint, initially set at 12 inches.	<ul style="list-style-type: none"> The PCS shall command the Follow treatment train to resume discharging to the outfall by opening the train effluent gate. The PCS shall release the Follow treatment train to adjust pump speed to maintain the equalization basin level control range.

Level Condition	Control Response
Lead and Follow treatment trains in recirculation mode and level in the equalization basin rises within the level range by an operator adjustable setpoint, initially set at 6 inches.	<ul style="list-style-type: none"> The PCS shall command the Lead treatment train to resume discharging to the outfall by opening the train effluent gate. The PCS shall release the Lead treatment train to adjust pump speed to maintain the equalization basin level control range.

F. Follow Treatment Train Stop Sequence:

- When the Follow treatment train is in recirculation mode and the Follow treatment train UV water quality alarm is not active, the PCS shall initiate an operator adjustable time delay. If the operating condition remains unchanged after the time delay expires, the PCS shall initiate a shutdown of the Follow treatment train using the following control sequence.

Step No.	Step Description	Step Advance Condition(s)
0	Home step	<ul style="list-style-type: none"> Follow treatment train shutdown delay timer has expired. PCS issues Follow treatment train stop command.
1	Stop all operating Follow treatment train influent pumps.	All Follow treatment train influent pumps stopped.
2	Stop all operating chemical feed systems.	Chemical feed systems stopped.
3	Issue STOP commands to the Follow treatment train ballasted sedimentation and UV disinfection systems.	Ballasted sedimentation and UV disinfection systems reported as STOPPED by their package control systems.
4	Sequence end	

G. Lead Treatment Train Stop Sequence.

- When the Lead treatment train is in recirculation mode, the Lead treatment train UV water quality alarm is not active, and PCS has closed the following Georgetown Regulator gates, which halts flow into the GWWTS, the PCS shall initiate an operator adjustable time delay, initially set at 60 minutes.
 - Georgetown Regulator Michigan Gate SLG854212.
 - Georgetown Regulator EBI Gate SLG854213.
- If the operating condition remains unchanged after the time delay expires, the PCS shall initiate a shutdown of the Lead treatment train using the following control sequence.

Step No.	Step Description	Step Advance Condition(s)
0	Home step	PCS issues Lead treatment shutdown.
1	If the Follow treatment train was in operation but was subsequently shut down due to reduced treatment flow conditions, restart the Follow treatment train in recirculation mode with its associated effluent gate closed.	Follow train re-started (if required)
2	Initiate a shutdown recirculation time delay.	Delay timer started.
3	Operate in recirculation mode.	Shutdown recirculation time delay expires.
4	Stop all operating influent pumps.	Pump stopped.
5	Stop all operating chemical feed systems.	Chemical feed systems stopped.
6	Issue STOP commands to the treatment train ballasted sedimentation and UV disinfection systems.	Ballasted sedimentation and UV disinfection systems reported as STOPPED by their package control systems.
7	Sequence end	(PCS waits for detection of Lead treatment train start conditions.)

H. Water Quality Monitoring:

1. The PCS shall continuously monitor the following water quality parameters:
 - a. Ballasted sedimentation treatment train 1 effluent turbidity.
 - b. Ballasted sedimentation treatment train 2 effluent turbidity.
 - c. UV disinfection treatment train 1 influent UVT.
 - d. UV disinfection treatment train 1 applied dose.
 - e. UV disinfection treatment train 2 influent UVT.
 - f. UV disinfection treatment train 2 applied dose.
2. The PCS shall continuously compare each treatment trains water quality parameters with operator adjustable setpoints for the following conditions:
 - a. High ballasted sedimentation effluent turbidity.
 - b. Low UV disinfection influent UVT.
 - c. Low UV disinfection applied dose, initially set at 50 mJ/cm².
 - d. Setpoints shall be adjustable from the MCP OIT.
3. If a water quality parameter exceeds its setpoint for 10 seconds, initiate an alarm through the facility OIT and SCADA systems and initiate an operator adjustable time delay.
 - a. If the water quality condition remains in alarm after the time delay expires, the PCS shall initiate the following control response:
 - 1) Simultaneously reduce the treatment train flow rate to the train minimum flow setpoint and close the treatment train effluent gate to place the treatment train in Recirculation Mode.
 - 2) Maintain the treatment train in Recirculation Mode until one of the following conditions is active.
 - a) The water quality alarm condition has returned to normal for 2 minutes.
 - b) The operator initiates the water quality shutdown override function.
 - 3) If the facility is operating in one treatment train mode, the PCS shall start the Follow treatment train.
4. Provide a water quality shutdown override function for each treatment train.
 - a. The override function shall be accessible at the MCP OIT.
 - b. When initiated, the PCS shall energize an alarm through the facility OIT and SCADA systems.
 - c. When initiated, the treatment train shall be returned to normal operation.

I. Ballasted Sedimentation and UV System Monitoring:

1. The PCS shall continuously monitor the ballasted sedimentation and UV systems for Fault conditions:
2. If a Fault condition is detected for 10 seconds, initiate an alarm through the facility OIT and SCADA systems and initiate an operator adjustable time delay.
 - a. If the Fault condition remains in alarm after the time delay expires, the PCS shall initiate the following control response:
 - 1) Simultaneously reduce the treatment train flow rate to the train minimum flow setpoint and close the treatment train effluent gate to place the treatment train in Recirculation Mode.
 - 2) Maintain the treatment train in Recirculation Mode until one of the following conditions is active.
 - a) The Fault alarm condition has returned to normal for 2 minutes.
 - b) The operator initiates the Fault condition shutdown override function.
 - 3) If the facility is operating in one treatment train mode, the PCS shall start the Follow treatment train.
3. Provide a Fault condition shutdown override function for each treatment train.
 - a. The override function shall be accessible at the MCP OIT.
 - b. When initiated, the PCS shall energize an alarm through the facility OIT and SCADA systems.
 - c. When initiated, the treatment train shall be returned to normal operation.

- J. Ballasted Sedimentation and UV System Treatment Train Flow Signals:
 - 1. The PCS shall calculate the discharge flow rate for each treatment train as follows:
 - a. (The sum of all 3 treatment train influent pump flow meters) – (The sum of all 3 treatment train sand pump flow meters).
 - b. The PCS shall transmit the calculated treatment train flows to the ballasted sedimentation and UV treatment package control systems via hard-wired analog signals.
- K. Treatment Train Startup/Shutdown Recirculation Override.
 - 1. Provide an override function for each treatment trains startup and shutdown recirculation time period.
 - a. The override function shall be accessible at the MCP OIT.
 - b. When initiated, the PCS shall bypass the delay time and move to the next step in the control sequence.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 17512

POWER FAILURE AND RECOVERY CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control functions associated with facility power failure and recovery.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: All.
- B. Related Control Strategies:
1. Section 17500.
 2. Section 17511.
- C. Control Diagrams: All.
- D. Instrument Loop Diagrams: All.
- E. System Description:
1. The facility power system is configured as a split system.
 - a. Power feeder 1 feeds power to the treatment train 1 equipment.
 - b. Power feeder 2 feeds power to the treatment train 2 equipment.
 2. The loss of one feeder will cause the loss of power for the equipment associated with that feeder.
 3. The loss of both feeders will cause the loss of power for the entire facility.
 4. The facility switchgear is equipped with an Automatic Throwover System that senses the loss of power in a feeder and switches the power feed to the operating utility feeder.
 5. The PCS shall respond to the loss and recovery of power to automatically restart the process systems.

1.05 EQUIPMENT

Equipment No.	Equipment Name/Description
ATO854930	Auto Throwover System
SWGR854931	Main Switchgear 1
SWGR854932	Main Switchgear 2

1.06 ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.07 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.08 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.10 INTERLOCKS

- A. None.

1.11 CONTROL OPERATION

- A. Auto Throwover System Not in Auto:
 - 1. If the PCS detects that the Auto Throwover System is not in Auto, The PCS shall energize alarms to the following:
 - a. Facility OIT and SCADA systems.
 - b. PNL854982 Metrotel PLC.
- B. Power Failure Response:
 - 1. When power loss is detected, the PCS shall:
 - a. Turn off all run commands to equipment associated with the failed power feeder.
 - 1) If both power feeder fail, the PCS shall turn off all run commands to facility equipment.
 - b. Energize power failure alarms to the following:
 - 1) Facility OIT and SCADA systems.
 - 2) PNL854981 annunciator.
 - 3) PNL854982 Metrotel PLC.
- C. Power Recovery Response:
 - 1. When power is detected as recovered, the PCS shall:
 - a. Reset all equipment failure alarms caused by the power failure.
 - b. Reset to "Home Step" all operating sequences effected by the power failure.
 - c. Release all equipment to operate in response to PCS operating sequence commands.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17513

ARCHITECTURAL LIGHTING CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control functions associated with the architectural lighting system.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 200-P001, 900-P102.
- B. Related Control Strategies:
1. Section 17500.
 2. Section 17511.
- C. Control Diagrams: None.
- D. Instrument Loop Diagrams: None.
- E. System Description:
1. The PCS sends hard-wired control signals to the architectural lighting system control panel LP854992. The control signals are energized and de-energized based on treatment station operational status.

1.05 EQUIPMENT

Equipment No.	Equipment Name/Description
LP854992	Architectural Lighting Control Panel

1.06 ALARMS

- A. None.

1.07 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.08 METROTEL I/O POINTS

- A. None.

1.09 SCADA SIGNALS

- A. None.

1.10 INTERLOCKS

A. None.

1.11 CONTROL OPERATION

- A. The PCS energizes PLC outputs in PNL954981 when the following facility operation conditions exist.
 - 1. Architectural Lighting Output 1 Condition:
 - a. Georgetown Regular gate SLG854212 is NOT closed or Georgetown Regular gate SLG854213 is NOT closed.
 - 2. Architectural Lighting Output 2 Condition:
 - a. PCS issues facility start sequence command.
 - b. Once energized, the PCS shall latch the output on until unlatched by output 3.
 - 3. Architectural Lighting Output 3 Condition:
 - a. PCS issues facility shutdown sequence command.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17514

GWWTS RAIN GAUGE CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section contains the Process Control System (PCS) functions associated with the facility rain gauge.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 900-P102.
- B. Related Control Strategies:
1. Section 17500.
- C. Control Diagrams: None.
- D. Instrument Loop Diagrams: None.

1.05 SYSTEM DESCRIPTION

- A. A rain gauge is installed on the roof of the operations building. The rain gauge is a tipping bucket style unit. The PCS counts the number of bucket tips.

1.06 EQUIPMENT

Equipment No.	Equipment Name/Description
RG854912	GWWTS Rain Gauge

1.07 ANNUNCIATOR ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.08 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.09 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.10 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.11 INTERLOCKS

- A. None.

1.12 CONTROL OPERATION

- A. The PCS shall monitor the operation of the facility rain gauge.
 - 1. The rain gauge is a tipping bucket style unit.
- B. The PCS shall count the number of bucket tips and perform the following calculations.
 - 1. Multiply the number of bucket tips by the bucket volume (inches of water).
 - a. Sum the calculated rain fall into the following totalization periods.
 - 1) Today.
 - 2) Yesterday.
 - 3) Last 7 days.
 - b. Sum the number of bucket tips for the following totalization periods.
 - 1) Today.
 - 2) Yesterday.
 - 3) Last 7 days.
- C. The PCS shall display the totalized rain fall and bucket tips on the facility OIT and SCADA systems.
- D. The PCS shall historically log the totalized rain fall and bucket tips on the facility SCADA system.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17520

GEORGETOWN REGULATOR CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This section specifies the PCS control functions associated with the Georgetown Regulator with equipment summarized as follows:
 - 1. Georgetown Regulator Gate (SLG854211).
 - 2. Georgetown Regulator Michigan Gate (SLG854212).
 - 3. Georgetown Regulator EBI Gate (SLG854213).
 - 4. Georgetown Regulator, EBI and Michigan Trunk Level Dual Bubbler Panel (PNL854212).
 - 5. Georgetown Regulator Diversion Level Bubbler Panel (PNL854214).
- B. The Georgetown Regulator will allow water to flow from South Michigan Street Trunk (MST) to the Elliot Bay Interceptor (EBI) or divert flow from MST and EBI to the Georgetown Wet Weather Treatment Station (GWWTs) by operation and control of three Georgetown Regulator slide gates. Slide gate operations will be based on three existing level indicators and level settings. There are two existing EBI level indicators which are located in the EBI near the Brandon Trunk and in the EBI at the Michigan Regulator. The existing MST level indicator is located in the MST at the Michigan Regulator. The operation and position of each slide gate will be based on existing level indicators' level readings and assigned level settings as described herein.
- C. The Georgetown Regulator will be equipped with an EBI and Michigan Dual Bubbler Panel. The panel will indicate water level at the EBI pipeline and MST pipeline connections to the Georgetown Regulator. The level bubblers will monitor level and but do not control the Georgetown Regulator slide gates except in the case of communication or primary level sensor failure.
- D. The Georgetown Regulator will be equipped with a Diversion Level Bubbler Panel. The Georgetown Regulator Diversion Level Bubbler Panel will indicate water level at the 96-inch Georgetown Regulator outlet (GWWTs influent pipeline) and be installed to indicate and protect from a backflow condition generated by flows entering the equalization basin by closing the Michigan Gate.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 200-P001.
- B. Related Control Strategies:
 - 1. Section 17500.
 - 2. Section 17511.
 - 3. Section 17530.
- C. Control Diagrams: 200-EL211, 200-EL212, 200-EL213.
- D. Instrument Loop Diagrams: 200-IL212, 200-IL214.

1.05 SYSTEM DESCRIPTION

- A. There are three gates in the Georgetown Regulator. Each gate is equipped with a continuous duty rated electric actuator. The position of each gate will be modulated by the PCS to control the operating levels in the Elliot Bay Interceptor (EBI) and South Michigan Street Trunk (MST) based on three existing level indicators. There are two existing EBI level indicators. One is located near the Brandon Regulator (LIT809250). The other is located at Michigan (LIT810260B). The MST level indicator (LIT810260A) is located in the MST at the Michigan Regulator.
 - 1. The Georgetown Regulator Gate (SLG854211) controls the level in the EBI by restricting tributary flow from the MST.
 - 2. The Georgetown Regulator Michigan Gate (SLG854212) allows MST flows into the GWWTS.
 - 3. The Georgetown Regulator EBI Gate (SLG854213) allows EBI flows into the GWWTS.
- B. Georgetown Regulator Gate SLG854211:
 - 1. The Georgetown Gate (3 ft W x 3 ft H) invert is set at 99.4 ft metro and is intended to control EBI level by allowing or restricting flow from the MST to the EBI. The gate will be normally open, and will modulate to close as water levels in the EBI rises.
- C. Georgetown Regulator Michigan Gate SLG854212:
 - 1. The Michigan Regulator Gate (8 ft W x 4 ft H) invert is set at 100.2 ft metro and is intended to allow excess flow from the MST into GWWTS. The gate is normally closed, opening as the MST level rises.
 - 2. The MST water level is measured by an existing level sensor (LIT810260A) installed at the existing Michigan Regulator Station. The level signal is transmitted to the Georgetown Regulator PLC system by a dedicated leased-line telephone telemetry link. The PCS will continually track the controlled MST level signals at the Michigan Regulator and Georgetown Regulator. If the remote Michigan Regulator level signal is lost, the PCS will switch the control level signal to the MST level at the Georgetown Regulator with a level setpoint equal to the current MST level at the Georgetown Regulator.
 - 3. When flows exceed the GWWTS capacity and fill the equalization basin, the Michigan Regulator gate is closed by the PCS to prevent the equalization basin level to rise above the EBI level. This condition could result in surcharging of the EBI.
- D. Georgetown Regulator EBI Gate SLG854213:
 - 1. The EBI Regulator Gate (8 ft W x 3 ft H) invert is set at 100.2 ft metro that is intended to divert excess flow from the EBI into GWWTS. The gate is normally closed, opening as the EBI level at Brandon begins to rise above the level that closes the Georgetown Regulator gate. The gate modulates based on the EBI level at Brandon.
 - 2. The gate is controlled by a PI controller programmed in the Georgetown Regulator Station PLC system. The PI controller modulates the gate to maintain the water level in the EBI to a setpoint of 101.2 to maintain a water level below the Brandon overflow weir at 101.9 ft metro.
 - 3. The EBI level at Brandon is measured by an existing level sensor (LIT809250) installed at the existing Brandon Regulator Station. The level signal will be transmitted to the Georgetown Regulator PLC system by a dedicated leased-line telephone telemetry link. The PCS will continually track the controlled EBI levels at Brandon and the Georgetown Regulator. If the remote Brandon EBI level signals are lost, the PCS will switch the control level signal to the EBI level at the Michigan Regulator (LIT810260B) with a level setpoint equal to the current EBI level at the Michigan Regulator.
- E. Gate Interdependencies:
 - 1. The existing EBI level indicator at Brandon (LIT809250) and Georgetown Regulator Gate operation has a direct impact to water level in the MST and EBI pipelines. The table below is intended to summarize interdependency between EBI level at Brandon (LIT809250) and corresponding impact to Georgetown Regulator gate set points and typical gate positions.

Flow Condition	Typical EBI Level at Brandon (LIT809250)	Typical Georgetown Gate Position	Typical Georgetown/ MST Gate Position	Typical Georgetown/EBI Gate Position	Remarks
Low Flow	<100.5	OPEN	CLOSED	CLOSED	Low Flow Normal operation.
Smaller wet weather flow	100.5 - 101.2	OPEN (Modulates to close)	OPEN (Modulates)	CLOSED	Georgetown Gate modulates to restrict MST flow. MST level will rise. Georgetown-MST Gate modulates open to maintain MST level below overflow weir
Larger wet weather flow	101.2 – 101.3	CLOSED	OPEN (Modulates)	CLOSED	Georgetown Gate fully closed
Larger wet weather flow	≥101.3	CLOSED	OPEN (Modulates)	OPEN (Modulates)	Brandon flows exceeding EBI capacity. EBI Gate modulates to maintain EBI level

[1] The intent of Georgetown Regulator gate setpoint is to modulate the gate to achieve the level setting indicated for EBI level sensor at Michigan (LIT810360B).

[2] Control system should interpolate between setpoints

F. Michigan Regulator Slide Gate:

1. An existing Michigan Regulator gate is installed at the existing Michigan Regulator Station. The gate does impact water level in the MST and EBI. The gate is controlled by the existing level sensor (LIT810260A) installed at the existing Michigan Regulator Station. The gate will open at a water level below 102.8 and close at a water level above 103.2 ft (traditional dead band control). Gate position will continue to be controlled by the existing Michigan Regulator PLC system. The PCS shall be configured to receive the gate position signals from the Michigan Regulator PLC system.

1.06 EQUIPMENT

Equipment No.	Equipment Name/Description
PNL854212	Georgetown Regulator Trunk Level Dual Bubbler Panel
PNL854214	Georgetown Regulator Diversion Level Bubbler Panel
SLG854211	Georgetown Regulator Gate
SLG854212	Georgetown Regulator Michigan Gate
SLG854213	Georgetown Regulator EBI Gate

1.07 ANNUNCIATOR ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.08 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.09 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.10 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings

1.11 INTERLOCKS

- A. The PCS shall close the following gates under the following conditions:
1. The Georgetown Regulator Michigan Gate will close when the Equalization Basin level in the GWWTS, or the Georgetown Regulator Diversion Level exceeds a high level setpoint. Reference Section 17530.

1.12 CONTROL OPERATION

- A. Georgetown Regulator Gate.
1. The Georgetown Regulator Gate is normally open. The PCS shall determine the desired level (setpoint) for the EBI level at Michigan (810260B) by piecewise linear interpolation from a lookup table and the EBI level at Brandon (LIT809250). Initial values for the lookup table are given below.

EBI Level at Brandon (LIT809250)*	Setpoint for EBI level at Michigan	Notes
≤ 100.5	102.0	normally open
101.0	101.0	
≥ 101.2	100.0	normally closed

* relative to pipe invert of 97.15

2. The PID controller calculates a gate velocity proportional to the EBI level at Michigan (LIT810260B) above the setpoint and to the rate the EBI level at Michigan is increasing. The PCS integrates the calculated gate velocity and provides the desired gate position to the gate controller.
 3. Initial independent gain PID coefficients are: $K_p = 0.002$ (1/s) , $K_i = 0.0$ (s^{-2}), $K_d = 0.5$ (-) based on input error in feet and output in ft/s.
 4. The Gate is modulated based on the level signal at the existing Michigan Regulator and transmitted to the PCS at the Georgetown Regulator.
 - a. If this signal is lost, the PCS shall activate an alarm on the facility OIT and SCADA systems and switch to the signal for the level of the Michigan Trunk at the Georgetown Regulator (LIT854212).
- B. Georgetown Regulator Michigan Gate.
1. The Georgetown Regulator Michigan Gate is normally closed. The PID controller calculates a gate velocity proportional to the MST Level (LIT810260A) above the setpoint and to the rate the MST level is increasing. The PCS integrates the calculated gate velocity and provides the desired gate position to the gate controller.
 2. Initial setpoint value is 105.2 relative to pipe invert of 101.19 at LIT810260A.
 3. Initial independent gain PID coefficients are: $K_p = -0.0036$ (1/s) , $K_i = 0.0$ (s^{-2}), $K_d = -2.8$ (-) based on input error in feet and output in ft/s.
 4. The Gate is modulated based on the level signal at the existing Michigan Regulator and transmitted to the PCS at the Georgetown Regulator.
 - a. If this signal is lost, the PCS shall activate an alarm on the facility OIT and SCADA systems and switch to the signal for the level of the Michigan Trunk at the Georgetown Regulator (LIT854212).

5. The PCS shall activate an alarm on the facility OIT and SCADA systems and the gate shall close if either of the following conditions is detected:
 - a. The Equalization Basin level exceeds a high level setpoint. Reference Section 17530.
 - 1) Setpoint adjustable through the MCP and Georgetown Regulator OIT systems.
 - b. The Georgetown Regulator Diversion Level (LIT854214) exceeds a high level setpoint.
 - 1) Setpoint adjustable through the MCP and Georgetown Regulator OIT systems.
- C. Georgetown Regulator EBI Gate.
 1. The Georgetown Regulator EBI Gate is normally closed. The PID controller calculates a gate velocity proportional to the EBI Level at Brandon (LIT809250) above the setpoint and to the rate the EBI level at Brandon is increasing. The PCS integrates the calculated gate velocity and provides the desired gate position to the gate controller.
 2. Initial setpoint value 101.3 relative to pipe invert at 97.15 at LIT809250
 3. Initial independent gain PID coefficients are: $K_p = -0.0008$ (1/s), $K_i = 0.0$ (s⁻²), $K_d = -0.82$ (-) based on input error in feet and output in ft/s.
 4. The Gate is modulated based on the EBI level at Brandon (LIT809250) and transmitted to the PCS at the Georgetown Regulator.
 - a. If this signal is lost, the PCS shall activate an alarm on the facility OIT and SCADA systems and switch to the signal for the level of the EBI level at the Michigan Regulator (LIT810260B).

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 17522

GEORGETOWN REGULATOR HAZARDOUS GAS DETECTION CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control functions associated with the Georgetown Regulator hazardous gas detection system.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 200-P004.
- B. Related Control Strategies:
1. Section 17500.
 2. Section 17526.
- C. Control Diagrams: None.
- D. Instrument Loop Diagrams: 200-IL221.
- E. System Description:
1. The Gas Monitoring System measures the combustible gas concentration (%LEL levels in the classified spaces of the Georgetown Regulator underground diversion structure.
 2. The classified spaces air is pulled through the gas analyzers using compressed instrument air.
 3. Alarm contacts for combustible gas concentration high level are sent to the PCS.

1.05 EQUIPMENT

Equipment No.	Equipment Name/Description
PNL854221A	Gas Monitoring Sample Draw Panel

1.06 ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.07 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.08 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.10 INTERLOCKS (NOT USED)

1.11 CONTROL OPERATION

A. Gas Sample Flow Low.

1. If the flow switch indicates loss of sample gas flow, the PCS shall provide a local alarm on the Regulator Control Panel (PNL854281) and activate the alarm on the GWWTS facility Operator Interface Terminal (OIT) and SCADA systems. The sample draw panel operates continuously.

B. High Gas LEL Concentration

1. If the LEL concentration goes above 10 % (the LEL concentration is measured from 0-100%), the PCS shall activate an alarm signal to Metrotel Panel (PNL854282), and activate the alarm on the GWWTS facility OIT and SCADA systems.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17524

GEORGETOWN REGULATOR ELECTRICAL SYSTEM CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the PCS control functions associated with the electrical and miscellaneous equipment in the Regulator Electrical Room.
 - 1. Motor Control Center.
 - 2. UPS.
 - 3. Door Closed Position (Intrusion Switch).
 - 4. PLC Fail.
 - 5. Metrotel Test.
 - 6. 24 VDC Power Supply.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 200-P005.
- B. Related Control Strategies:
 - 1. Section 17500.
- C. Control Diagrams: None.
- D. Instrument Loop Diagrams: None.
- E. System Description:
 - 1. The PCS monitors devices within the regulator electrical building.

1.05 EQUIPMENT

Equipment No.	Equipment Name/Description
MCC854241	Motor Control Center 854241
TVSS854241	Transient Voltage Surge Suppressor
UPS854252	Uninterruptable Power Supply
FCP854294	Regulator Building Fire Alarm Panel

1.06 ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.07 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.08 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.10 INTERLOCKS (NOT USED)

1.11 CONTROL OPERATION

- A. Motor Control Center (MCC854241):
 - 1. The PCS monitors the power monitor in the MCCs.
 - 2. Average current, average voltage and instantaneous power are monitored.
- B. TVSS854241:
 - 1. The PCS monitors the operational status of the TVSS.
 - a. If a TVSS failure condition is detected, the PCS shall activate alarms through the facility OIT and SCADA systems.
- C. UPS (UPS854252):
 - 1. The UPS Trouble signal is monitored by the PCS.
 - a. If a UPS Trouble condition is detected, the PCS shall activate alarms through the facility OIT and SCADA systems.
 - b. If a UPS Trouble condition is detected, the PCS shall activate an alarm through the Metrotel system.
- D. Intusion Swtich (ZS854293):
 - 1. A Regulator Building Intrusion is alarmed on the PCS and in the Metrotel system.
- E. Fire Alarm:
 - 1. The Fire Alarm is alarmed on the PCS and in the Metrotel system.
- F. PLC Fail (YXD 854281):
 - 1. The PCS monitors the operational status of PLC854281.
 - a. If a PLC failure is detected, the PCS shall activate alarms through the facility OIT and SCADA systems.
 - b. If a PLC failure is detected, the PCS shall activate an alarm through the Metrotel system.
- G. Metrotel Test (HX 854282):
 - 1. HS854282 on the Metrotel Control Panel is a switch that activates an input on the Metrotel PLC to test the Metrotel back to the Central Control Station.
- H. 24 VDC Power:
 - 1. The PCS monitors the operational status of the 24 VDC power supply system installed within PNL854281.
 - a. If a 24VDC power failure condition is detected, the PCS shall activate alarms through the facility OIT and SCADA systems.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 17526

REGULATOR FACILITY MECHANICAL SYSTEMS CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control functions associated with the Regulator Facility Mechanical Systems.
 - 1. Instrument Air.
 - 2. Service Air.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 200-P002, 200-P003.
- B. Related Control Strategies:
 - 1. Section 17500.
- C. Control Diagrams: None.
- D. Instrument Loop Diagrams: None.
- E. System Descriptions:
 - 1. Instrument Air: Instrument Air is received from the Equalization Basin Instrument Air System in an Air Receiver (PVL854261).
 - 2. Service Air: Service Air is received from the Equalization Basin Service Air System in an Air Receiver (PVL854262).

Equipment No.	Equipment Name/Description
PVL854261	Georgetown Regulator Instrument Air Receiver
PVL854262	Georgetown Regulator Service Air Receiver

1.05 ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.06 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.07 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.08 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.09 INTERLOCKS

- A. None.

1.10 CONTROL OPERATION

- A. Instrument Air Low Pressure:
 - 1. The PCS monitors the pressure in the instrument air receiver.
 - a. If a low air pressure condition is detected, the PCS shall activate alarms through the facility OIT and SCADA systems.
 - b. If a low air pressure condition is detected, the PCS shall activate an alarm through the Metrotel system.
- B. Service Air Low Pressure:
 - 1. The PCS monitors the pressure in the instrument air receiver.
 - a. If a low air pressure condition is detected, the PCS shall activate alarms through the facility OIT and SCADA systems.
 - 2. If a low air pressure condition is detected, the PCS shall activate an alarm through the Metrotel system.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17527

EBI LEVEL AT BRANDON REGULATOR CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control functions associated with Brandon Regulator Elliott Bay Interceptor (EBI) Level Measurement:
1. Existing PLC.
 2. Existing Bubbler Level Panel.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 200-P001.
- B. Related Control Strategies:
1. Section 17500.
 2. Section 17520.
- C. Control Diagrams: None.
- D. Instrument Loop Diagrams: None.
- E. System Description:
1. The existing Brandon Regulator PLC Panel monitors the level of the EBI at the Brandon Regulator. The Contractor shall install a communication card to the existing Brandon Regulator PLC Panel and connect to the Georgetown Regulator Control Panel via a leased-line telephone link. This will allow the GWWTS PCS to monitor the EBI Level at the Brandon Regulator.

1.05 EQUIPMENT

Equipment No.	Equipment Name/Description
N/A	Existing Brandon Regulator PLC Panel

1.06 ALARMS

- A. None.

1.07 PLC/DCS I/O POINTS

- A. None.

1.08 METROTEL I/O POINTS

- A. None.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.10 INTERLOCKS (NOT USED)

1.11 CONTROL OPERATION

- A. The PCS at the Georgetown Regulator shall monitor the EBI level measured by the Brandon Regulator Control System via telemetry link. See Section 17520.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17528

SOUTH MICHIGAN TRUNK AND EBI LEVEL CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control functions associated with South Michigan Regulator Trunk and EBI Level Measurement as measured at the South Michigan Street Regulator Station:
1. Existing South Michigan PLC.
 2. Existing South Michigan Bubbler Level Panel.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 200-P001.
- B. Related Control Strategies:
1. Section 17500.
 2. Section 17520.
- C. Control Diagrams: None.
- D. Instrument Loop Diagrams: None.
- E. System Description:
1. The existing South Michigan Regulator PLC Panel monitors the level in the South Michigan Street Trunk (MST) and the EBI at the South Michigan Regulator. The Contractor shall install a communication card to the existing South Michigan Regulator PLC Panel and connect to the Georgetown Regulator Control Panel via a leased-line telephone link. This will allow the GWWTS PCS to monitor the South Michigan Street Trunk Level and EBI Level at the South Michigan Regulator.

1.05 EQUIPMENT

Equipment No.	Equipment Name/Description
N/A	Existing Michigan Regulator PLC Panel

1.06 ALARMS

- A. None.

1.07 PLC/DCS I/O POINTS

- A. None.

1.08 METROTEL I/O POINTS

- A. None.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.10 INTERLOCKS (NOT USED)

1.11 CONTROL OPERATION

- A. The PCS at the Georgetown Regulator shall monitor the South Michigan Street Trunk (MST) level and EBI level measured by the South Michigan Regulator Control System via telemetry link. See Section 17520.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17530

EQUALIZATION BASIN CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control functions associated with the Equalization Basin.
 - 1. Equalization Basin Level.
 - 2. Equalization Basin Flushing System.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 300-P008, 300-P019, 300-P019A.
- B. Related Control Strategies:
 - 1. Section 17500.
 - 2. Section 17531.
 - 3. Section 17553.
- C. Control Diagrams. 300-EL304, 300-EL305, 300-EL306, 300-EL307, 300-EL314, 300-EL315, 300-EL316, 300-EL317.
- D. Instrument Loop Diagrams: 300-IL300.

1.05 SYSTEM DESCRIPTION:

- A. The level in the equalization basin is monitored by a dual bubbler system. Only one of the two bubblers will be used for facility operation.

1.06 EQUIPMENT

Equipment No.	Equipment Name/Description
PNL854300	Equalization Basin Bubbler Panel
ACT854304	Equalization Basin Flushing Valve 1 Actuator
BTV854304	Equalization Basin Flushing Valve 1
ACT854305	Equalization Basin Flushing Valve 2 Actuator
BTV854305	Equalization Basin Flushing Valve 2
ACT854306	Equalization Basin Flushing Valve 3 Actuator
BTV854306	Equalization Basin Flushing Valve 3
ACT854307	Equalization Basin Flushing Valve 4 Actuator
BTV854307	Equalization Basin Flushing Valve 4
ACT854308A	EFFR to EQ Basin Valve Actuator

Equipment No.	Equipment Name/Description
BTV854308A	EFFR to EQ Basin Valve
ACT854308B	EFFR to GT Regulator Valve Actuator
BTV854308B	EFFR to GT Regulator Valve
ACT854314	Equalization Basin Flushing Valve 5 Actuator
BTV854314	Equalization Basin Flushing Valve 5
ACT854315	Equalization Basin Flushing Valve 6 Actuator
BTV854315	Equalization Basin Flushing Valve 6
ACT854316	Equalization Basin Flushing Valve 7 Actuator
BTV854316	Equalization Basin Flushing Valve 7
ACT854317	Equalization Basin Flushing Valve 8 Actuator
BTV854317	Equalization Basin Flushing Valve 8

1.07 ANNUNCIATOR ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.08 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.09 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.10 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.11 INTERLOCKS

- A. If the level in the equalization basin exceeds an operator adjustable HIGH-HIGH level setpoint, the PCS shall:
 1. Activate an alarm on the facility OIT and SCADA systems.
 2. Command the Georgetown Regulator Michigan gate to close.
 3. The HIGH-HIGH level setpoint shall be operator adjustable through the MCP OIT.

1.12 CONTROL OPERATION

- A. Equalization Basin Level Measurement.
 1. Redundant bubblers are used by the PCS to measure Equalization Basin level.
 2. Level Signal Selection:
 - a. Bubbler selector switch HS854300C 1-Auto-2 (1A2) located on the Main Control Panel (MCP) PNL854881 allows the operator to manually select either level transmitter (1) or level transmitter (2).
 3. Automatic control – (Normal Mode):
 - a. Selector switch HS854300C is in AUTO position.
 - b. PCS shall utilize the last level transmitter selected (herein referred to as the “primary level transmitter”) by an operator via the bubbler selector switch.

4. Bubbler transmitter failure:
 - a. If a level transmitter fail condition is detected, the PCS shall switch control to the other level transmitter (herein referred to as "back-up level transmitter").
 - 1) Level transmitter operating out of range shall determine the failure condition.
 - b. Bubbler level transmitter conflict (Discrepancy):
 - a) If the primary level transmitter output varies from the back-up level transmitter output by ± 0.2 feet.
 - b) This condition shall be alarmed as a Bubbler Discrepancy.
 - (1) Bubbler Discrepancy alarm shall be displayed on the facility OIT and SCADA systems.
- B. Equalization Basin Level Alarms.
 1. If the level in the equalization basin exceeds operator adjustable High, High-High, Low and Low-Low level setpoint, the PCS shall activate alarms through the facility OIT and SCADA systems.
 - a. Alarm setpoints shall be adjustable through the MCP OIT.
- C. Equalization Basin Flushing System.
 1. The equalization basin flushing system operates in a programmed sequence.
 - a. The flushing sequence shall be enabled when MCP selector switch HS854304B (AUTO-OFF) is placed in the AUTO position.
 - b. The flushing sequence shall be initiated by depressing the HS854304B START pushbutton when MCP selector switch HS854304B (AUTO-OFF) is in the AUTO position and the solids storage tank flushing system is not in operation.
 - c. The flushing sequence shall be reset to Step 0 when MCP selector switch HS854304B (AUTO-OFF) is placed in the OFF position.
 - d. Any flushing valve not selected to AUTO control mode shall be skipped by the flushing sequence.
 2. The flushing sequence shall operate as follows:

Step No.	Step Description	Step Advance Condition(s)
0	Home step.	Operator initiates the flushing sequence.
1	PCS checks that there is adequate volume of C3 water for the flushing sequence by calculating the water volume required based upon the following calculation: (Sum of the operator entered time setpoints for the flushing valves selected to AUTO) x 700 GPM.	Adequate C3 volume is present. (Energize sequence FAIL alarm NAD854304 if adequate C3 volume is not present)
2	PCS checks that at least one C3 pump is available, (Pump in AUTO and not FAILED)	C3 pump(s) are detected as available. (Energize sequence FAIL alarm NAD854304 if a C3 pump is not available)
3	PCS checks that the following valves are closed. BTV854304 (EQ Zone 1 flushing valve) BTV854305 (EQ Zone 2 flushing valve) BTV854306 (EQ Zone 3 flushing valve) BTV854307 (EQ Zone 4 flushing valve) BTV854314 (EQ Zone 5 flushing valve) BTV854315 (EQ Zone 6 flushing valve) BTV854316 (EQ Zone 7 flushing valve) BTV854317 (EQ Zone 8 flushing valve) BTV854519 (Train 1 recirculation valve) BTV854529 (Train 2 recirculation valve) BTV854621 (Solids Tank Zone 1 flushing valve)	All valves closed.

Step No.	Step Description	Step Advance Condition(s)
	BTV854622 (Solids Tank Zone 2 flushing valve) BTV854623 (Solids Tank Zone 3 flushing valve) BTV854624 (Solids Tank Zone 4 flushing valve)	
4	Command zone 1 flushing valve BTV854304 to open.	BTV854304 is open.
5	Start the LEAD C3 pump. Operate the LEAD C3 pump at 700 GPM.	LEAD C3 pump is in operation.
6	Operate zone 1 for an operator adjustable zone 1 flushing time period. (Adjustable at the MCP OIT)	Time period expires
7	Command zone 2 flushing valve BTV854305 to open. Command zone 1 flushing valve BTV854304 to close.	Valves are at their commanded positions.
8	Operate zone 2 for an operator adjustable zone 2 flushing time period. (Adjustable at the MCP OIT)	Time period expires.
9	Command zone 3 flushing valve BTV854306 to open. Command zone 2 flushing valve BTV854305 to close	Valves are at their commanded positions.
10	Operate zone 3 for an operator adjustable zone 3 flushing time period. (Adjustable at the MCP OIT)	Time period expires.
11	Command zone 4 flushing valve BTV854307 to open. Command zone 3 flushing valve BTV854306 to close	Valves are at their commanded positions.
12	Operate zone 4 for an operator adjustable zone 4 flushing time period. (Adjustable at the MCP OIT)	Time period expires.
13	Command zone 5 flushing valve BTV854314 to open. Command zone 4 flushing valve BTV854307 to close	Valves are at their commanded positions.
14	Operate zone 5 for an operator adjustable zone 5 flushing time period. (Adjustable at the MCP OIT)	Time period expires.
15	Command zone 6 flushing valve BTV854315 to open. Command zone 5 flushing valve BTV854314 to close	Valves are at their commanded positions.
16	Operate zone 6 for an operator adjustable zone 6 flushing time period. (Adjustable at the MCP OIT)	Time period expires.

Step No.	Step Description	Step Advance Condition(s)
17	Command zone 7 flushing valve BTV854316 to open. Command zone 6 flushing valve BTV854315 to close	Valves are at their commanded positions.
18	Operate zone 7 for an operator adjustable zone 7 flushing time period. (Adjustable at the MCP OIT)	Time period expires.
19	Command zone 8 flushing valve BTV854317 to open. Command zone 7 flushing valve BTV854316 to close	Valves are at their commanded positions.
20	Operate zone 8 for an operator adjustable zone 8 flushing time period. (Adjustable at the MCP OIT)	Time period expires.
21	Command the LEAD C3 pump to stop. Command zone 8 flushing valve BTV854317 to close.	LEAD C3 pump is stopped. Zone 8 flushing valve BTV854317 is closed.
22	Sequence end	Sequence returns to Step 0

3. The electrically actuated valves and the C3 pumps shall be monitored for failure to respond to PCS control commands.
 - a. If a valve fails to open, the PCS shall energize the associated valve FAIL alarm and shall advance the flushing sequence to the next valve in the sequence.
 - b. If a valve fails to close, the PCS shall:
 - 1) Energize SEQUENCE FAIL alarm NAD854304.
 - 2) Stop the LEAD C3 pump.
 - 3) Suspend the sequence.
 - a) The sequence can be resumed by the operator re-initiating the sequence at the MCP.
 - c. If the LEAD C3 pumps fails, the PCS shall replace the LEAD C3 pump with the STANDBY C3 pump.
 - d. If the LEAD C3 pump fails and the STANDBY C3 pump is not available, the PCS shall:
 - 1) Energize SEQUENCE FAIL alarm NAD854304.
 - 2) Suspend the sequence.
 - a) The sequence can be resumed by the operator re-initiating the sequence at the MCP.
4. Provide a flushing sequence monitoring chart on the facility OIT and SCADA systems that indicates the following:
 - a. Current sequence step.
 - b. Highlighting of the active step description within the chart.
 - c. Display of time remaining in each step.

D. Effluent Recycle Valves

1. If BTV854308A or BTV854308B is not fully open, the PCS shall initiate a Recycle System NOT READY alarm through the facility OIT and SCADA systems.
 - a. The PCS shall inhibit the operation of the treatment trains and return the facility treatment train operating sequences to their Home steps when the Recycle System NOT READY condition is detected.
 - 1) Reference Section 17511.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17531

INFLUENT PUMP STATION CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control and monitoring functions associated with the Influent Pump Station.
1. Treatment Train 1 Influent Pumps.
 2. Treatment Train 2 Influent Pumps.
 3. Equalization Basin Drain Pumps.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 300-P008, 300-P011, 300-P009, 300-P010, 300-P012, 300-P013, 300-P014, 300-P015, 300-P016, 300-P017.
- B. Related Control Strategies:
1. Section 17500.
 2. Section 17511.
- C. Control Diagrams: 300-EL301, 300-EL302, 300-EL311, 300-EL312, 300-EL313, 300-EL321, 300-EL322, 300-EL323.
- D. Instrument Loop Diagrams: 300-IL300, 300-IL301, 300-IL311, 300-IL312, 300-IL313, 300-IL321, 300-IL322, and 300-IL323.

1.05 SYSTEM DESCRIPTION

- A. Influent Pumping:
1. Each treatment train has two 10 MGD pumps and one 16 MGD pump. The pumps in each treatment train shall operate as a pumping unit. Each set of treatment train influent pumps shall be commanded by the PCS to operate in response to facility flow demand.
- B. Equalization Drain Pumping:
1. Following a high-flow event where wastewater is stored in the equalization basin, the PCS shall operate the drain pumps to transfer the stored wastewater to the EBI at the Georgetown Regulator Station.

1.06 EQUIPMENT

Equipment No.	Equipment Name/Description
PNL854300	Equalization Basin Bubbler Panel
P854301	Equalization Basin Drain Pump 1
P854302	Equalization Basin Drain Pump 2
P854311	Train 1 – Influent Pump 1
P854312	Train 1 – Influent Pump 2
P845313	Train 1 – Influent Pump 3
P854321	Train 2 – Influent Pump 1

Equipment No.	Equipment Name/Description
P854322	Train 2 – Influent Pump 2
P854323	Train 2 – Influent Pump 3

1.07 ANNUNCIATOR ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.08 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.09 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.10 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.11 INTERLOCKS

- A. Equalization basin Low level pump override.
 - 1. See Article Control Operation in this Section.
- B. Equalization basin Low-Low level pump override.
 - 1. See Article Control Operation in this Section.
- C. Facility High-High level pump shutdown.
 - 1. The PCS shall stop all influent pumps upon continuous detection for 2 seconds of any of the following conditions:
 - a. Ballasted sedimentation influent channel High-High level.
 - b. UV disinfection influent channel High-High level.
 - c. C3 storage tank High-High level.
 - 2. Pump High-High vibration shutdown.
 - a. See Article Control Operation in this Section.

1.12 CONTROL OPERATION

- A. Influent Pumping:
 - 1. Each treatment train has two 10 MGD pumps and one 16 MGD pump. The pumps in each treatment train shall operate as the influent pumps for their treatment train. Each set of treatment train influent pumps shall be commanded by the PCS to operate in response to facility flow demand.
 - 2. Pump Operation:
 - a. Each set of treatment train influent pumps shall operate in a Lead/Follow 1/Follow 2 pump control sequence. Only pumps selected to Remote control at each pumps VFD panel shall be used in the pumping sequence.
 - 1) The operator selects the pump sequence by positioning selector switches on the Main Control Panel (MCP) PNL854881.
 - 2) Each treatment train influent pump set has three selector switched for pump sequence selection.
 - a) Treatment train 1.
 - (1) HS854311E (L-F1-F2).
 - (2) HS854312E (L-F1-F2).

- (3) HS854313E (L-F1-F2).
 - b) Treatment train 2.
 - (1) HS854311E (L-F1-F2).
 - (2) HS854312E (L-F1-F2).
 - (3) HS854313E (L-F1-F2).
 - 3) If the pump selection made at the MCP results in a pump not in Auto or duplicate pumps selected to the same operating position, the PCS shall activate an MCP annunciator alarm. Delay the alarm to allow the operator to make the selections.
 - a) The alarm shall be displayed on the facility OIT and SCADA systems.
 - b. The PCS shall sequence the number of operating pumps in each treatment train and their operating speed based upon the selected pump sequence and the treatment train flow demand required to maintain the operating level in the equalization basin.
3. Pump Speed Control:
- a. The speed of the operating pumps shall be modulated by the PCS through use of a proportional level controller. The level controller shall modulate treatment train flow linearly over an operator adjustable level range, initially set between elevations 75 and 83, for the sum of the flow from all three influent pumps.
 - 1) The lower and upper limits (minimum and maximum treatment train flow) of the operating level band shall be operator adjustable through the MCP Operator Interface Terminal (OIT) OIT854881.
 - b. Both Treatment Train Master PLC systems (PLC854810 and PLC854820) shall have the same proportional level controller configured in their programs.
 - 1) The Train Master PLC system selected as the Facility Master shall have its proportional level controller set to operate. The Standby level proportional controller shall track the operation of the Master level controller.
 - c. The Facility Master proportional level controller shall equally modulate the flow rate of the operating treatment train influent pumps to maintain the level in the equalization basin.
 - d. The PCS shall determine the VFD speed range for each pump by including the minimum and maximum speed limits configured in the VFD.
 - 1) The PCS shall operate each pump over a 0-100% speed range.
 - a) 0% equals each pumps VFD minimum speed limit.
 - b) 100% equals each pumps VFD maximum speed limit.
4. Pump Sequencing:
- a. Pump Sequencing - Increasing Flow.
 - 1) When the speed of the operating treatment trains pump(s) is greater than 90% of VFD speed range, the PCS shall add the next pump in the pumping sequence for each operating treatment train.
 - b. Pump Sequencing - Decreasing Flow:
 - 1) When Follow pumps in a treatment train are in operation and the speed of the operating treatment trains pumps is less than 20% of VFD speed range, the PCS shall remove the last Follow pump started in the pumping sequence for each operating treatment train.
5. Pump Transition Control:
- a. 1 treatment train operation to 2 treatment trains operation.
 - 1) The PCS shall maintain the same number of operating influent pumps in each treatment train when both treatment trains are in operation.
 - a) On initial start of the Follow treatment train, the PCS shall determine the number of Follow treatment train influent pumps to start based on the following criteria:
 - (1) 3 Lead treatment train influent pumps are in service: Start Follow treatment train Lead and Follow 1 influent pumps.
 - (2) 2 Lead treatment train influent pumps are in service: Start Follow treatment train Lead and Follow 1 influent pumps.
 - (3) 1 Lead treatment train influent pump is in service: Start Follow treatment train Lead influent pump.

- 2) After the Follow treatment train startup recirculation period and the Follow treatment train effluent gate is open:
 - a) The PCS shall ramp up the speed of the Follow treatment trains influent pump(s).
 - (1) If 3 Lead train influent pumps are in service the PCS shall simultaneously ramp down the speed of the Lead treatment trains Follow 2 influent pump.
 - (2) Reference Section 17511 for ramp rate value.
 - b) When the individual flow rate of the Follow treatment train pump(s) is within 0.5 MGD of the flow rate command by the equalization basin level controller, the PCS shall release the Follow treatment trains influent pump(s) to be controlled by the equalization basin level controller.
 - (1) If 3 Lead treatment train influent pumps are in service the PCS shall stop the Lead treatment trains Follow 2 influent pump.
 - b. Adding a pump to a treatment train:
 - a) The PCS shall slowly ramp up the speed of the pump.
 - (1) Reference Section 17511 for ramp rate value.
 - b) When the flow rate of the newly started pump(s) is within 0.5 MGD of the flow rate commanded by the equalization basin level controller, the PCS shall release the newly started pump(s) to be controlled by the equalization basin level controller.
 - c. Removing a pump from a treatment train.
 - a) The PCS shall slowly ramp down the speed of the pump(s) until the pump speed(s) equals 0% of its speed range.
 - (1) Reference Section 17511 for ramp rate value.
 - b) When the pump speed(s) equals zero % of its speed range, the PCS shall stop the pump(s).
6. Pump Failure:
 - a. Each influent pump shall be monitored for failure to respond to control commands.
 - b. If a pump is detected as failed, the PCS shall activate an alarm through the facility OIT and SCADA systems and replace the failed pump with the next available pump in the sequence.
 7. The PCS shall decrease the number of pumps in operation in the operating treatment trains by one pump if more than one equalization pump in each operating treatment train is in service and the equalization basin Low level alarm is activated.
 - a. If two influent pumps remain in operation in each operating treatment train after a delay time from the first pump reduction, and if the Low level alarm is detected, the PCS shall decrease the number of pumps in operation by the next pump in the sequence.
 - b. If only the Lead pump is in operation in each operating treatment train and the Low-Low level condition is detected, the PCS shall shut down pump operation.
 - 1) If pumping is suspended due to a Low-Low level condition, the PCS shall monitor system operation and re-start the pumping system with the Lead treatment train as defined in Section 17511.
 8. Treatment Train Maximum Flow Limit:
 - a. The PCS shall limit each treatment train to a maximum flow rate of 36 MGD.
 9. Pump Vibration Monitoring.
 - a. The continuous vibration of each pump is monitored by the PCS.
 - b. The PCS monitors the signal from each pumps High vibration switch.
 - 1) Upon detection of a High vibration condition, the PCS shall:
 - a) Energize an alarm through the MCP annunciator.
 - b) Energize alarms through the facility OIT and SCADA systems.
 - c. The PCS monitors the signal from each pumps High-High vibration switch.
 - 1) Upon detection of a High-High vibration condition, the PCS shall:
 - a) Energize an alarm through the MCP annunciator.
 - b) Energize alarms through the facility OIT and SCADA systems.
 - c) Command the pump to stop and activate its Fail alarm.
 10. Pump Discharge Flow:
 - a. The flow rate from each treatment train influent pump shall be monitored by their associated pump discharge flow meters.
 - 1) The flow rate of each flow meter shall be totalized by the PCS.

- 2) The flow rate and flow total for each flow meter shall be displayed on the facility OIT and SCADA system.
 - b. The PCS shall sum the flow rates of each treatment train.
 - 1) Reference Section 17511 for treatment train flow calculation requirements.
 - 2) The totalized flow for each treatment train shall be transmitted to that treatment trains associated ballasted sedimentation and UV disinfection package control systems via hardwired PLC outputs.
 - c. The PCS shall also calculate the flow from each influent pump based upon a calculation that uses the level in the equalization basin, pump speed and pump curve performance data.
 - 1) The flow calculation shall be tuned during facility system testing against the flow measurements from the pump discharge flow meters.
 - 2) If the PCS detects a pump discharge flow meter as failed, the PCS shall activate an alarm through the facility OIT and SCADA systems and replace the failed flow meter signal with the calculated flow rate.
- B. Equalization Basin Drain Pumps:
1. Following a high-flow event where wastewater is stored in the equalization basin, the PCS shall operate the drain pumps to transfer the stored wastewater to the EBI at the Georgetown Regulator Station.
 2. The pumps shall operate in a Lead/Standby control configuration.
 - a. The Lead pump is selected at the MCP through selector switch HS854301C.
 3. The PCS shall call for the Lead drain pump to operate when the following station conditions exist:
 - a. Flow into the equalization basin from the Georgetown Regulator Station has stopped.
 - b. Both treatment process trains have completed their shutdown sequences.
 - c. The level in the EBI, measured at Brandon, is below a programmed level setpoint.
 4. The pumps shall be monitored by the PCS for failure conditions.
 - a. If the Lead pump fails to respond to control commands, the PCS shall activate a pump failure alarm through the facility OIT and SCADA systems and shall transfer the pump operation to the Standby pump.
 5. The pump discharge flow rate shall monitored.
 - a. The flow rate shall be totalized by the PCS.
 - b. The flow rate and flow total shall be displayed on the facility OIT and SCADA systems.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 17533

PRELIMINARY TREATMENT CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control and monitoring functions associated with the preliminary treatment system.
 - 1. Influent Channel.
 - 2. Influent Screens 1 and 2.
 - 3. Screenings Compactors 1 and 2.
 - 4. Influent Sample Pumps 1 and 2.
 - 5. Influent Sampler.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 300-P001, 300-P002, 300-P003, 300-P004, 300-P005.
- B. Related Control Strategies:
 - 1. Section 17500.
 - 2. Section 17520.
- C. Control Diagrams: 300-EL331, 300-EL332, 300-EL341, 300-EL341A, 300-EL342, 300-EL342A, 300-EL343, 300-EL344.
- D. Instrument Loop Diagrams: 300-IL330, 300-IL334, 300-IL335, 300-IL341, 300-IL342.

1.05 SYSTEM DESCRIPTION:

- A. Flow from the Georgetown Regulator enters the screening influent channel. The level in the influent channel is measured by a bubble panel PNL854330.
- B. The flow is split to two parallel screens that remove rags and other debris from the flow stream. The screened influent then passes to the equalization basin.
 - 1. Both screens will operate continuously while flow is being diverted into the GWWTS.
 - 2. Each influent screen has an associated vendor supplied Local Control Panel (LCP). The LCP controls the operation of the screening system in response to hard-wired command signals from the PCS.
- C. The collected debris is raked off the face of each screen and deposited into a screenings compactor for dewatering and compaction. Each screen has a dedicated screenings compactor.
 - 1. Each screenings compactor has an associated vendor supplied LCP. The LCP controls the operation of the screenings compactor system in response to hard-wired command signals from its associated influent screen LCP.
 - 2. The processed screenings are deposited into a bagger over a dumpster.

- D. Two influent sample pumps are installed in the screening influent channel. Both pumps are installed in the influent channel. One pump is duty while the other is standby.
 - 1. The sample pump continuously transfers sample water into the influent sample box while the facility is operating. The influent composite sampler draws sample water from the sample box when a sample is taken.
 - a. The sample box is equipped with an overflow that allows excess sample water to be returned to the screening influent channel.
- E. The influent composite sampler will automatically operate while flow is being diverted into the equalization basin as detected by the Michigan or EBI regulator gate not being closed.
 - 1. The influent sampler is a dual sampler that will take flow proportioned samples in response to the calculated Georgetown Regulator diversion flow rate.
 - a. The flow rate is calculated by the Georgetown Regulator PLC system, PLC854281.

1.06 EQUIPMENT

Equipment No.	Equipment Name/Description
PNL854330	Influent Channel Bubbler Panel
SCN854341	Influent Screen 1
PNL854341	Influent Screen 1 Bubbler Panel
LCP854341	Influent Screen 1 Local Control Panel
VFD854341	Influent Screen 1 VFD
LCS854341	Influent Screen 1 Local Control Station
SCN854342	Influent Screen 2
PNL854342	Influent Screen 2 Bubbler Panel
LCP854342	Influent Screen 2 Local Control Panel
VFD854342	Influent Screen 2 VFD
LCS854342	Influent Screen 2 Local Control Station
ME854343	Screenings Compactor 1
LCP854343	Screenings Compactor 1 Local Control Panel
LCS854343	Screenings Compactor 1 Local Control Station
ME854344	Screenings Compactor 2
LCP854344	Screenings Compactor 2 Local Control Panel
LCS854344	Screenings Compactor 2 Local Control Station
P854331	Influent Sample Pump 1
LCS854331	Influent Sample Pump 1 Local Control Station
P854332	Influent Sample Pump 2
LCS854332	Influent Sample Pump 2 Local Control Station
ME854334	Influent Sample Box
LSL854334	Influent Sample Box Low Level Switch
SMP854335	Influent Composite Sampler
SMP854337	Influent Priority Pollutant Sampler
PNL854340	Screenings Network Panel

1.07 ANNUNCIATOR ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.08 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.09 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.10 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.11 INTERLOCKS

- A. If the level in the influent channel exceeds an operator adjustable HIGH level setpoint, the PCS shall:
 - 1. Activate an alarm on the facility OIT and SCADA systems.
 - 2. Limit the flow rate from that treatment trains associated influent pump system to prevent over flowing the channel.
 - 3. The High level setpoint shall be operator adjustable through the Main Control Panel (MCP) Operator Interface Terminal (OIT).
- B. If the level in the influent channel falls below an operator adjustable LOW level setpoint while its associate treatment train is in service, the PCS shall:
 - 1. Activate an alarm on the facility OIT and SCADA systems.
 - a. Delay the LOW level alarm detection until the level in the influent channel rises above the LOW level setpoint after the start of its associated treatment train.
 - 2. The LOW level setpoint shall be operator adjustable through the MCP OIT.

1.12 CONTROL OPERATION

- A. Screening Influent Channel:
 - 1. The influent channel level shall be continuously monitored by the PCS through bubbler panel PNL854330.
- B. Influent Screens SCN854341 and SCN854342:
 - 1. Each screen system LCP shall control the operation of its associated screen based upon vendor operating requirements.
 - a. Each screen system shall operate in response to hard-wired commands from the PCS.
 - b. Control setpoints for each screen system shall be accessible for modification only at the vendor supplied LCP OITs.
 - 2. The PCS shall command an influent screen system to operate under the following conditions.
 - a. Screen system is selected to AUTO.
 - b. Screen system ESTOP is not activated.
 - c. Screen system FAIL signal is not activated.
 - d. Flow is being diverted into the treatment station as detected by the Michigan or EBI regulator gate not being closed.
 - e. Level in the influent channel is greater than elevation 92.2.
 - 3. The PCS shall command an influent screen system to stop under the following conditions:
 - a. The level in the influent channel falls below elevation 92.
 - b. Screen FAIL alarm signal is activated.
 - 4. The PCS shall monitor and display all influent screen status and alarm conditions.
 - a. Hard-wired signals connected between the influent screen LCPs and the MCP PLC systems.
 - b. Signals communicated via Ethernet between the influent screen PLC systems and the MCP PLC systems.
 - c. Coordinate all status and alarm signal interfaces with the influent screen supplier.
 - 5. A failure of one or both screen systems shall NOT cause a suspension of facility treatment operations.
- C. Screenings Compactors ME854343 and ME854344:
 - 1. Each screenings compactor system LCP shall control the operation of its associated screenings compactor based upon vendor operating requirements.
 - a. Each screenings compactor system shall operate in response to hard-wired commands from its associated influent screen system.

- b. Control setpoints for each screenings compactor system shall be accessible for modification only at the vendor supplied LCPs.
 - 2. The PCS shall monitor and display all screenings compactor status and alarm conditions.
 - a. Hard-wired signals connected between the screenings compactor LCPs and the MCP PLC systems.
 - b. Signals communicated via Ethernet between the screenings compactor PLC systems and the MCP PLC systems.
 - c. Coordinate all status and alarm signal interfaces with the screenings compactor supplier.
 - 3. A failure of one or both screenings compactor systems shall NOT cause a suspension of facility treatment operations.
- D. Influent Sample Pumps P854331 and P854332:
 - 1. The influent sample pumps shall operate in a Lead/Standby operating sequence.
 - a. The PCS shall assign the LEAD pump status to the first influent sample placed into AUTO control mode at its associated local control station.
 - 2. The PCS shall command the LEAD sample pump to operate under the following conditions.
 - a. Any of the Georgetown Regulator gates listed below being not closed.
 - 1) Michigan Gate SLG8542212.
 - 2) EBI Gate SLG854213.
 - b. Level in the screening influent channel is above the channel LOW level alarm setpoint.
 - 3. The PCS shall monitor the operation of the LEAD sample pump for failure to respond to control system operating commands.
 - a. If a LEAD sample pump failure is detected, the PCS shall:
 - 1) Activate a pump FAULT alarm through the facility OIT and SCADA systems.
 - 2) Start the STANDBY influent sample pump.
 - b. Failure of the both influent sample pumps shall NOT cause a suspension of facility operations.
- E. Influent pH Monitoring AE/AIT854334:
 - 1. The PCS shall continuously monitor the pH of the influent sample water.
 - a. If the measured pH exceeds an operator adjustable HIGH pH setpoint, the PCS shall activate an alarm through the facility OIT and SCADA systems.
 - b. If the measured pH falls below an operator adjustable LOW pH setpoint, the PCS shall activate an alarm through the facility OIT and SCADA systems.
- F. Influent Sample Box
 - 1. The level in the influent sample box is monitored by LSL854334.
 - 2. If the level falls below the switch low level setpoint, the PCS shall initiate an alarm on the facility OIT and SCADA systems.
- G. Influent Sampling System.
 - 1. The influent sampling system will automatically operate while a treatment train is in operation. The influent sampler is a dual sampler that will take samples in response to the measured effluent flow rate.
 - 2. System Operating Sequence:
 - a. Each of the two sampler units will configured to operate in flow proportional mode at the sampler control panel.
 - b. The PCS shall transmit individual time proportioned pulse signals to each sampler unit that are proportional to the measured effluent flow rate.
 - 1) Controls integral to each sampler unit will monitor the flow rate signal and automatically take samples based upon operator entered flow proportion settings.
 - c. The flow signals shall be provided to the sampler units when:
 - 1) At least one treatment train is in service and that train's effluent drop box gate is not closed.

- 2) Flow is detected by the calculated Georgetown Regulator diversion flow rate entering the screening inlet channel.
 - a) Reference Section 17520.
 - d. Each sampler unit is monitored for failure conditions detected by the sampler unit's internal controllers.
 - 1) If a sampler alarm is detected, the PCS shall annunciate an alarm on the facility OIT, SCADA systems and Metrotel system.
 - e. Failure of a sampler unit will not require suspension of facility operations.
- H. Influent Priority Pollutant Sampler:
 - 1. The influent priority pollutant sampler will automatically operate while a treatment train is in operation. The priority pollutant sampler is a single sampler that will take samples in response to the measured effluent flow rate.
 - 2. System Operating Sequence:
 - a. The sampler will be configured to operate in flow proportional mode at the sampler control panel.
 - b. The PCS shall transmit a time proportioned pulse signal to the sampler that is proportional to the measured effluent flow rate.
 - 1) Controls integral to the sampler unit will monitor the flow rate signal and automatically take samples based upon operator entered flow proportion settings.
 - c. The flow signal shall be provided to the sampler when:
 - 1) At least one treatment train is in service and that train's effluent drop box gate is not closed.
 - 2) Flow is detected by the calculated Georgetown Regulator diversion flow rate entering the screening inlet channel.
 - a) Reference Section 17520.
 - d. The sampler unit is monitored for failure conditions detected by the sampler unit's internal controller.
 - 1) If the sampler alarm is detected, the PCS shall annunciate an alarm on the facility OIT, SCADA systems.
 - 2) Failure of the sampler will not require suspension of facility operations.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 17534

PRELIMINARY TREATMENT HAZARDOUS GAS DETECTION CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control and monitoring functions associated with the preliminary treatment hazardous gas detection systems.
 - 1. Screenings Room.
 - 2. Equalization Basin.
 - 3. Influent Sampling Room.
- B. Each hazardous gas detection system consists of:
 - 1. Hazardous Gas Detection Sample Draw Panels.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 300-P006, 300-P018.
- B. Related Control Strategies:
 - 1. Section 17500.
 - 2. Section 17526.
- C. Control Diagrams: None.
- D. Instrument Loop Diagrams: 300-IL303, 300-IL303A, 300-IL333, 300-IL333A, 300-IL345, and 300-IL345A.

1.05 SYSTEM DESCRIPTION:

- A. The Gas Monitoring System measures the combustible gas concentration (%LEL), Hydrogen Sulfide (H₂S) and Oxygen (O₂) levels in the classified spaces of the screenings room, influent sampling room and equalization basin.
- B. The classified spaces air is pulled through the gas analyzers using compressed instrument air.
- C. Alarm contacts for combustible gas concentration high level, H₂S gas concentration high level and Oxygen O₂ gas concentration low level are sent to the PCS.

1.06 EQUIPMENT

Equipment No.	Equipment Name/Description
PNL854345	Screenings Room Gas Monitoring Sample Draw Panel.
PNL854303	Equalization Basin Gas Monitoring Sample Draw Panel.
PNL854333	Influent Sampler Room Gas Monitoring Sample Draw Panel.
PNL854374	Preliminary Treatment HVAC Panel

1.07 ANNUNCIATOR ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.08 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.09 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.10 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.11 INTERLOCKS

- 1. None

1.12 CONTROL OPERATION

- A. Gas Sample Flow Low.
 - 1. If a low sample flow switch alarm signal is detected, the PCS shall:
 - a. Energize the alarm on the Main Control Panel (PNL854881) annunciator.
 - b. Activate the alarm on the facility OIT and SCADA systems.
- B. High Gas LEL Concentration:
 - 1. If the LEL concentration goes above 10 % the PCS shall:
 - a. Activate the alarm on the Main Control Panel (PNL854881) annunciator.
 - b. Activate the alarm signal to Metrotel Panel (PNL854882).
 - c. Activate the alarm on the facility OIT and SCADA systems.
- C. Low Oxygen Level:
 - 1. If the Oxygen concentration fall below 19.5 % the PCS shall:
 - a. Activate the alarm on the Main Control Panel (PNL854881) annunciator.
 - b. Activate the alarm on the facility OIT and SCADA systems.
- D. High H²S Concentration:
 - 1. If the H²S gas concentration rises above 5 PPM the PCS shall:
 - a. Activate the alarm on the Main Control Panel (PNL854881) annunciator.
 - b. Activate the alarm on the facility OIT and SCADA systems.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17536

PRETREATMENT FACILITY MECHANICAL SYSTEMS CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the PCS control functions associated with Pretreatment Facility Mechanical Systems.
 - 1. Air Gap Tank and C2 Pumps.
 - 2. Instrument Air.
 - 3. Screenings Building HVAC.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 300-P007, 300-P021, 300-P024, 300-P025, 300-P027.
- B. Related Control Strategies:
 - 1. Section 17500.
- C. Control Diagrams: 300-EL351, 300-EL352, 300-EL353, 300-EL354, 300-EL374, 300-EL375, 300-EL377.
- D. Instrument Loop Diagrams: None.
- E. System Description:
 - 1. The PCS monitors the mechanical systems in the 300 process area.

1.05 EQUIPMENT

Equipment No.	Equipment Name/Description
LCP854350	C2 System Local Control Panel
PVL854361	Pre Treatment Instrument Air Receiver
PNL854374	Pre Treatment HVAC Panel

1.06 ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.07 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.08 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.10 INTERLOCKS

- A. The PCS shall inhibit the operation of the C2 water pumps under the following conditions:
 - 1. C2 Water Air Gap Tank Level Low.
 - 2. C2 Water Pressure High.

1.11 CONTROL OPERATION

- A. Air Gap Tank and C2 Water Pumps:
 - 1. See Section 11710.
 - 2. Energize the Main Control Panel PNL854881 (MCP) annunciator alarm and activate alarms through the facility OIT and SCADA systems upon detection of the air gap tank level HIGH condition.
 - 3. Energize the MCP annunciator alarm and activate alarms through the facility OIT and SCADA systems upon detection of the air gap tank level LOW condition.
 - 4. Energize the MCP annunciator alarm and activate alarms through the facility OIT and SCADA systems upon detection of the C2 water system FAULT condition.
 - 5. Activate a Metrotel alarm upon detection of the C2 water system FAULT condition.
 - 6. Energize the MCP annunciator alarm and activate alarms through the facility OIT and SCADA systems upon detection of the C2 water pressure HIGH condition.
 - 7. Energize the MCP annunciator alarm and activate alarms through the facility OIT and SCADA systems upon detection of the C2 water pressure LOW condition.
- B. Instrument Air:
 - 1. Energize the MCP annunciator alarm and activate alarms through the facility OIT and SCADA systems upon detection of the instrument air pressure LOW condition.
 - 2. Activate a Metrotel alarm upon detection of the instrument air pressure LOW condition.
- C. HVAC System:
 - 1. Energize alarms through the facility OIT and SCADA systems upon detection of the screen room HVAC FAULT condition.
 - 2. Energize alarms through the facility OIT and SCADA systems upon detection of the C2 room HVAC FAULT condition.
 - 3. Energize alarms through the facility OIT and SCADA systems upon detection of the panel room HVAC FAULT condition.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17540

BALLASTED SEDIMENTATION SYSTEM CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control functions associated with ballasted sedimentation Systems:
1. Ballasted Sedimentation Distribution Channel.
 2. Train 1 and 2 Ballasted Sedimentation Systems.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 400-P001, 400-P002.
- B. Related Control Strategies:
1. Section 17500.
 2. Section 17511.
- C. Control Diagrams: 400-EL412, 400-EL413, 400-EL414, 400-EL415, 400-EL416, 400-EL417, 400-EL418, 400-EL431, 400-EL422, 400-EL423, 400-EL424, 400-EL425, 400-EL426, 400-EL427, 400-EL428, 400-EL432.
- D. Instrument Loop Diagrams: 400-IL411, 400-IL421, 400-IL431, 400-IL432.
- E. System Description:
1. The PCS Treatment Train Master PLC will send supervisory commands to the ballasted sedimentation package control system to sequence the operation of this treatment system with the rest of the treatment station. These supervisory commands include system start/stop and treatment train flow rate.
 2. The PCS will be integrated with each ballasted sedimentation package control system to allow the operators to monitor all of the system operating parameters from the facility SCADA system and any of the facility OITs. The operators will be able to change ballasted sedimentation operating setpoints from the vendor package control system OIT.
 3. Each ballasted sedimentation train will have a dedicated package control system OIT.
 - a. UI854410: Ballasted Sedimentation Train 1 OIT.
 - b. UI854420: Ballasted Sedimentation Train 2 OIT.
 4. Ballasted sedimentation system equipment failure control responses will be managed by the package control system and reported to the PCS via hard wired control signals and the control system Ethernet network.
 5. The PCS monitors ballasted sedimentation system operations and will annunciate an alarm and close that treatment train's associated effluent isolation gate to place that treatment train into recirculation as specified in Section 17511.

1.05 EQUIPMENT

Equipment No.	Equipment Name/Description
PNL854411	Ballasted Sedimentation Distribution Channel Bubbler Panel

Equipment No.	Equipment Name/Description
MX854412	T1-Rapid Mixer
MX854413	T1-Coagulation Mixer
MX854414	T1-Maturation Mixer
ME854415	T1-Settling Rake
P854416	T1-Sand Pump 1
P854417	T1-Sand Pump 2
P854418	T1-Sand Pump 3
P854431	T1 – Polymer Feeder
ME854431A	T1 – Polymer Calibration Column
ME854431B	T1 – Polymer Static Mixer
MEE854431	T1 – Polymer Tote Weigh Scale
P854441	T1-Coagulant Feed Pump 1
P854442	T1-Coagulant Feed Pump 2
MX854422	T2-Rapid Mixer
MX854423	T2-Coagulation Mixer
MX854424	T2-Maturation Mixer
ME854425	T2-Settling Rake
P854426	T2-Sand Pump 1
P854427	T2-Sand Pump 2
P854428	T2-Sand Pump 3
P854432	T2-Polymer Feeder
ME854432A	T2 – Polymer Calibration Column
ME854432B	T2 – Polymer Static Mixer
MEE854432	T2 – Polymer Tote Weigh Scale
P854443	T2-Coagulant Feed Pump 1
P854444	T2-Coagulant Feed Pump 2

1.06 ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.07 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.08 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.10 INTERLOCKS

- A. None.

1.11 CONTROL OPERATION

- A. The PCS shall monitor the level in each treatment train distribution channel.

- B. The PCS shall monitor the weight in each treatment train polymer storage tote.
- C. The ballasted sedimentation control system is a vendor package system supplied by Kruger. It utilizes vendor supplied instruments, equipment and control devices. The control strategy is specific to the package control system supplied by Kruger.
 - 1. Reference Kruger control system submittal information.
- D. The PCS shall exchange status, alarm and control signals with the ballasted sedimentation treatment train PLC system via hard-wired signals and signals transmitted through the PCS Ethernet network.
 - 1. Hard-wired signals:
 - a. Treatment Train Call to Run (PCS command to vendor package control system).
 - b. Treatment Train Flow: (PCS command to vendor package control system).
 - 1) The flow value shall be the sum of the flows from each treatment trains influent pumps.
 - c. Treatment Train Warning: (Vendor package control system alarm to PCS).
 - d. Treatment Train Fault: (Vendor package control system alarm to PCS).
 - 2. Ethernet Signals:
 - a. The PCS shall emulate all system status and alarm functions present on the vendor supplied treatment train operator interfaces.
 - 1) Reference Section 17810.
- E. When the PCS calls a ballasted sedimentation system treatment train to operate and provides a treatment train flow rate signal, the vendor package control system shall start- up the required treatment train and provide a "Ready" signal to the PCS once fully operational.
 - 1. Reference Section 17511.
- F. The ballasted sedimentation Warning alarm shall be annunciated on the MCP annunciator, facility OIT and SCADA systems.
- G. The ballasted sedimentation system vendor package control system will monitor water quality parameters in each treatment train.
 - 1. The PCS shall initiate a treatment train Recirculation Mode and close the treatment train effluent gate if the water quality parameters in a treatment train exceed operational limits.
 - a. Reference Section 17511.
- H. The ballasted sedimentation Fault alarm shall be annunciated on the MCP annunciator, facility OIT and SCADA systems and Metrotel system.
 - 1. The Fault alarm shall cause the PCS to command the entire treatment train into Recirculation Mode by closing the treatment train effluent gate.
 - a. Reference Section 17511.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 17544

COAGULANT STORAGE CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. Coagulant is stored in tank T854440. The storage tank capacity is 6,000 gallons. Coagulant is fed into the ballasted sedimentation system by the ballasted sedimentation control system.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 400-P003, 400-P004.
- B. Related Control Strategies:
 - 1. Section 17500.
- C. Control Diagrams: None.
- D. Instrument Loop Diagrams: 400-IL440.

1.05 SYSTEM DESCRIPTION:

- A. Coagulant is delivered to the storage tank by tanker truck. The Process Control System (PCS) monitors the filling process and initiates a local alarm at the fill station local control panel, LCP854440 if the level in the tank activates LSH854440A.
- B. The PCS continuously monitors the level in the storage tank.
- C. The PCS monitors the coagulant storage containment sump for presence of liquid.

1.06 EQUIPMENT

Equipment No.	Equipment Name/Description
LCP854440	Coagulant Fill Station Local Control Panel
T854440	Coagulant Storage Tank

1.07 ANNUNCIATOR ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.08 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.09 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.10 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.11 INTERLOCKS (NOT USED)

1.12 CONTROL OPERATION

- A. Coagulant Storage Tank Level Monitoring:
 - 1. The PCS shall continuously monitor the level in the coagulant storage tank.
 - a. The PCS shall activate a storage tank HIGH level alarm through the facility OIT and SCADA systems when high level float switch LSH854440A is activated.
 - b. If the measured level falls below the LOW level setpoint, initially set at 2.0 feet, the PCS shall activate a LOW level alarm through the facility OIT and SCADA systems.
- B. Coagulant Storage Containment Level Monitoring:
 - 1. The PCS shall activate a coagulant storage containment HIGH level alarm through the facility OIT and SCADA systems when high level float switch LSH854440B is activated.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17545

CAUSTIC STORAGE AND FEED SYSTEM CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. Caustic is stored in tank T854450. The storage tank capacity is 3,000 gallons. Caustic is fed into the ballasted sedimentation system by the Process Control System (PCS).
- B. Caustic is fed into the treatment process by the PCS in either Dosage Control Mode or Coagulant Ratio Mode.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 400-P003, 400-P005, 400-P006, 400-P007.
- B. Related Control Strategies:
 - 1. Section 17500.
- C. Control Diagrams: 400-EL451, 400-EL452, 400-EL453, 400-EL454.
- D. Instrument Loop Diagrams: 400-IL450.

1.05 SYSTEM DESCRIPTION:

- A. Caustic is delivered to the storage tank by tanker truck. The PCS initiates a local alarm at the fill station local control panel, LCP854450, if the level in the tank activates LSH854450A.
- B. The PCS continuously monitors the level in the storage tank.
- C. The PCS monitors the coagulant storage containment sump for presence of liquid.
- D. Two sets of caustic feed pumps feed caustic into the treatment process.
 - 1. Each set of caustic feed pumps are operated in a LEAD-STANDBY control configuration.
 - 2. Caustic feed pump speed is modulated by the PCS to maintain an operator adjustable flow proportioned feed setpoint.

1.06 EQUIPMENT

Equipment No.	Equipment Name/Description
LCP854450	Caustic Fill Station Local Control Panel
T854450	Caustic Storage Tank
P854451	T1 - Caustic Feed Pump 1
P854452	T1 - Caustic Feed Pump 2
P854453	T2 - Caustic Feed Pump 1
P854454	T2 - Caustic Feed Pump 2

1.07 ANNUNCIATOR ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.08 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.09 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.10 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.11 INTERLOCKS

- A. None.

1.12 CONTROL OPERATION

- A. Caustic Storage Tank Level Monitoring:
 - 1. The PCS shall continuously monitor the level in the caustic storage tank.
 - a. The PCS shall energize the storage tank HIGH level alarm through the facility OIT and SCADA systems when high level float switch LSH854450A is activated.
 - b. If the measured level falls below the LOW level setpoint, initially set at 2.0 feet, the PCS shall activate a LOW level alarm through the facility OIT and SCADA systems.
- B. Caustic Storage Containment Level Monitoring:
 - 1. The PCS shall activate a caustic storage containment HIGH level alarm through the facility OIT and SCADA systems when high level float switch LSH854450B is activated.
- C. Caustic Feed Room Sump Level Monitoring:
 - 1. The PCS shall activate a caustic feed room sump HIGH level alarm through the facility OIT and SCADA systems when high level float switch LSH854451 is activated.
- D. Caustic Feed Pumps:
 - 1. Each treatment train has a dedicated pair of caustic feed pumps.
 - 2. The caustic feed pumps shall be operated in a LEAD-STANDBY control sequence.
 - a. The LEAD pump is selected at the Main Control Panel PNL85481 (MCP) through selector switches:
 - 1) HS854451C for treatment train 1.
 - 2) HS854453C for treatment train 2.
 - 3. The PCS shall operate the LEAD caustic feed pump based on the following criteria.
 - a. LEAD pump is selected to AUTO.
 - b. LEAD pump is not FAILED.
 - c. LEAD pumps associated treatment train is in operation.
 - 4. The caustic feed pumping system shall have two operating modes.
 - a. DOSAGE Mode.
 - b. COAGULANT RATIO Mode.
 - c. The control made shall be selected through the MCP OIT or the associated ballasted sedimentation OIT.
 - 5. When selected to DOSAGE Mode, The PCS shall calculate the caustic feed pump speed based upon the following calculation.

a. Speed Calculation.

$$\text{Caustic feed rate } \left(\frac{\text{gal}}{\text{hr}} \right) = \frac{\text{Dosage} \times \text{Flow rate} \times 8.34}{\text{Concentration} \times 24}$$

$$\text{Speed } (\%) = \frac{\text{Caustic feed rate } \left(\frac{\text{gal}}{\text{hr}} \right)}{\text{Pump Capacity } \left(\frac{\text{gal}}{\text{hr}} \right)} \times 100$$

b. Calculation Variables:

- 1) Dosage Setpoint (mg/l).
 - a) Operator adjustable at the MCP Operator Interface Terminal (OIT) or the associated ballasted sedimentation system OIT.
 - 2) Treatment Train Flow Rate (mgd).
 - 3) Pump Capacity (gal/hr).
 - a) Operator adjustable at the MCP OIT or the associated ballasted sedimentation system OIT.
 - 4) Chemical Concentration (lb/gal).
 - a) Operator adjustable at the MCP OIT or the associated ballasted sedimentation system OIT.
6. When selected to COAGULANT RATIO Mode, The PCS shall calculate the caustic feed pump speed as a ratio to the feed rate of coagulant addition.
- a. The ratio setpoint shall be operator adjustable at the MCP OIT or the associated ballasted sedimentation system OIT. The initial value for the ratio is 0.5. That is, the ratio of caustic feed rate (gal/hr) to coagulant feed rate (gal/hr) is 0.5.

$$\text{Caustic feed rate } \left(\frac{\text{gal}}{\text{hr}} \right) = \text{Coagulant feed rate } \left(\frac{\text{gal}}{\text{hr}} \right) \times \text{ratio}$$

$$\text{Speed } (\%) = \frac{\text{Caustic feed rate } \left(\frac{\text{gal}}{\text{hr}} \right)}{\text{Pump Capacity } \left(\frac{\text{gal}}{\text{hr}} \right)} \times 100$$

7. The caustic feed pumps shall be monitored for failure by the PCS.
- a. If a pump fails to respond to control commands, the PCS shall energize a pump FAULT alarm through the facility OIT and SCADA systems and suspend operation of the failed pump.
 - b. If the LEAD caustic feed pump is detected as FAILED and the STANDBY caustic feed pump is available for operation, the PCS shall start and operate the STANDBY caustic feed pump.
 - c. Once detected as failed, the PCS shall maintain the FAILED status until the pump is taken out of AUTO.
 - d. The failure or unavailability of both treatment train caustic feed pumps shall not require interruption of treatment operations.

E. Caustic Feed Flow:

1. The PCS shall monitor the flow from each treatment trains caustic feed systems.
 - a. The flow signal shall be displayed on the facility OIT and SCADA systems.
 - b. The PCS shall calculate a caustic feed rate in mg/l for each treatment train.
 - 1) Display the feed rate on the facility OIT and SCADA systems.

F. Caustic Feed Sump Level Monitoring:

1. The PCS shall activate a caustic feed sump HIGH level alarm through the facility OIT and SCADA systems when high level float switch LSH854451 is activated.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17546

BALLASTED SEDIMENTATION FACILITY MECHANICAL SYSTEMS CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the PCS control and monitoring functions associated with Ballasted Sedimentation Facility Mechanical Systems.
 - 1. Tepid Water.
 - 2. Polymer and Coagulant Pump Room HVAC.
 - 3. Caustic Pump Room HVAC.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 400-P008, 400-P009, 400-P010.
- B. Related Control Strategies:
 - 1. Section 17500.
- C. Control Diagrams: None.
- D. Instrument Loop Diagrams: None.
- E. System Description:
 - 1. The PCS monitors the operation of mechanical systems in the 400 process area.

1.05 EQUIPMENT (NONE)

1.06 ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.07 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.08 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.10 INTERLOCKS

- A. None.

1.11 CONTROL OPERATION

- A. Tepid Water System:
 - 1. Energize the Main Control Panel PNL854881 (MCP) annunciator alarm and activate an alarm on the facility OIT and SCADA systems upon detection of an eyewash FLOW HIGH alarm.
- B. HVAC System:
 - 1. The PCS shall activate an alarm on the facility OIT and SCADA systems upon detection of the polymer and coagulant pump room HVAC FAULT alarm.
 - 2. The PCS shall activate an alarm on the facility OIT and SCADA systems upon detection of the caustic pump room HVAC FAULT alarm.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17550

UV DISINFECTION CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control functions associated with UV Disinfection Systems:
 - 1. UV Distribution Channel.
 - 2. Train 1 and 2 UV Disinfection.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 500-P001, 500-P002, 500-P003.
- B. Related Control Strategies:
 - 1. Section 17500.
 - 2. Section 17511.
 - 3. Section 17551.
- C. Control Diagrams: None.
- D. Instrument Loop Diagrams: None.
- E. System Description:
 - 1. Each UV disinfection train consists of one channel with 4 banks of lamps and space for a future fifth bank. The UV system is controlled automatically through its package control system.
 - 2. The PCS Treatment Train Master PLC will send supervisory commands to the UV disinfection package control system to sequence the operation of this treatment system with the rest of the treatment station. These supervisory commands include system start/stop and treatment train flow rate.
 - 3. The PCS will be integrated with each UV disinfection package control system to allow the operators to monitor all of the system operating parameters from the station SCADA and any of the station OITs. The operators will be able to change UV disinfection operating setpoints from the vendor package control system OIT.
 - 4. Each UV disinfection train will have a unique package control system OIT.
 - 5. UV disinfection system equipment failure control responses will be managed by the package control system and reported to the PCS via the control system Ethernet network.
 - 6. The PCS monitors UV disinfection system operations and will annunciate an alarm and close that treatment train's associated effluent isolation gate to place that treatment train into Recirculation Mode upon detection of UV disinfection system faults/alarms. Reference Section 17511.
 - 7. The UV disinfection system includes a chemical cleaning tank and associated chemical cleaning power panel. The chemical cleaning power panel is not connected in any way (either power or control) to the UV disinfection train OITs or the PCS. Cleaning of a UV bank is a manual process and the bank, once removed from the channel and inserted into the cleaning tank, is connected to the chemical cleaning power panel using portable cables provided by the UV system manufacturer. Cleaning and air scour in the tank is operated via the local chemical cleaning power panel and the available utility station.

1.05 EQUIPMENT

Equipment No.	Equipment Name/Description
PWR854511	T1-UV Power Supply Unit 1
PWR854512	T1-UV Power Supply Unit 2
PWR854513	T1-UV Power Supply Unit 3 (Future)
UV854511A	T1-UV Bank 1
UV854511B	T1-UV Bank 2
UV854512A	T1-UV Bank 3
UV854512B	T1-UV Bank 4
UV854513	T1-UV Bank 5 (Future)
PNL854504	Chemical Cleaning Power Panel
T854504	UV Chemical Cleaning Tank
PWR854521	T2-UV Power Supply Unit 1
PWR854522	T2-UV Power Supply Unit 2
PWR854523	T2-UV Power Supply Unit 3 (Future)
UV854521A	T2-UV Bank 1
UV854521B	T2-UV Bank 2
UV854522A	T2-UV Bank 3
UV854522B	T2-UV Bank 4
UV854523	T2-UV Bank 5 (Future)

1.06 ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.07 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.08 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.10 INTERLOCKS

- A. None.

1.11 CONTROL OPERATION

- A. The UV disinfection control system is a vendor package system supplied by Suez. It utilizes vendor supplied instruments, equipment and control devices. The control strategy is specific to the package control system supplied by Suez.
- Reference Suez control system submittal information (Volume 18).
- B. The PCS shall exchange status, alarm and control signals with the UV disinfection treatment train PLC system via hard-wired signals and signals transmitted through the PCS Ethernet network.
- Hard-wired signals:
 - Treatment Train Call to Run (PCS command to vendor package control system).
 - Treatment Train Flow: (PCS command to vendor package control system).
 - The flow value shall be the sum of the flows from each treatment trains influent pumps.
 - Treatment Train Applied Dose: (Vendor package control system analog signal to PCS).

- d. Treatment Train Warning: (Vendor package control system alarm to PCS).
 - e. Treatment Train Fault: (Vendor package control system alarm to PCS).
- 2. Ethernet Signals:
 - a. The PCS shall emulate all system status and alarm functions present on the vendor supplied treatment train operator interfaces.
 - 1) Reference Section 17810.
- C. When the PCS calls a UV disinfection system treatment train to operate and provides a treatment train flow rate signal, the vendor package control system shall start- up the required treatment train and provide a "Ready" signal (over Ethernet) to the PCS once fully operational.
 - 1. During the start-up period, the PCS shall maintain the treatment train in Recirculation Mode.
 - 2. Once the "Ready" signal is provided by the vendor package control system, the PCS shall continue to maintain the treatment train in Recirculation Mode for an adjustable time period before permitting the treatment train to initiate effluent discharge.
 - 3. Reference Section 17511.
- D. The UV disinfection Warning alarm shall be annunciated on the MCP annunciator, facility OIT and SCADA systems.
- E. The UV disinfection system vendor package control system will monitor water quality parameters and water level in each treatment train.
 - 1. The PCS shall initiate a treatment train Recirculation Mode and close the treatment train effluent gate if the water quality parameters or water level in a treatment train exceed operational limits as indicated by a signal from the vendor package to the PCS over Ethernet.
 - a. Reference Section 17511.
- F. The UV disinfection Fault alarm shall be annunciated on the MCP annunciator, facility OIT and SCADA systems and Metrotel system.
 - 1. The Fault alarm shall cause the PCS to command the entire treatment train into Recirculation Mode by closing the treatment train effluent gate.
 - a. Reference Section 17511.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 17551

C3 STORAGE AND EFFLUENT DROP BOX CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control functions associated with the C3 Storage and Effluent Drop Box systems:
1. C3 Storage Tank.
 2. C3 Recirculation P-Trap.
 3. Effluent Drop Box.
 4. Effluent Sample Box 1.
 5. Effluent Composite Sampler.
 6. Effluent Priority Pollutant Sampler.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 500-P006, 500-P009.
- B. Related Control Strategies:
1. Section 17500.
 2. Section 17511.
 3. Section 17550.
 4. Section 17553.
- C. Control Diagrams: 500-EL518, 500-EL528, 500-EL538.
- D. Instrument Loop Diagrams: 500-IL517, 500-IL518, 500-IL526, 500-IL533, 500-IL534.
- E. System Description:
1. C3 Storage Tank and Effluent Drop Box Isolation Gates - The UV disinfection system discharges to the effluent drop box through each treatment train effluent isolation gate. Water is diverted to the C3 storage tank by closing the treatment train effluent isolation gates. Any flows that are diverted to C3 storage that exceed the capacity of the C3 storage overflow the C3 storage and are returned to the equalization basin. Effluent isolation gates close to initiate internal facility recirculation and open to initiate effluent discharge.
 2. Recirculation Gate - The recirculation gate will be manually operated to allow for draining of the C3 storage tank.
 3. Effluent Flow -The facility effluent flow to the outfall is measured by FE/FIT854518.
 4. Effluent Sampling - An effluent sampling system will automatically operate while a treatment train is in operation.

1.05 EQUIPMENT

Equipment No.	Equipment Name/Description
PNL854517	C3 Storage Tank Bubbler Panel
SLG854517	C3 Storage Tank Drain Gate
ACT854518	T1 Effluent Isolation Gate Actuator
SLG854518	T1 Effluent Isolation Gate

Equipment No.	Equipment Name/Description
PNL854518	T1 Effluent Isolation Gate Actuator Control Enclosure
ACT854528	T2 Effluent Isolation Gate Actuator
SLG854528	T2 Effluent Isolation Gate
PNL854528	T2 Effluent Isolation Gate Actuator Control Enclosure
ME854533	Effluent Sample Box 1
SMP854534	Effluent Composite Sampler
SMP854535	Effluent Primary Pollutant Sampler
ACT854538	C3 Storage Tank Fill Valve Actuator
BTV854538	C3 Storage Tank Fill Valve

1.06 ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.07 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.08 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.10 INTERLOCKS

- A. The PCS shall inhibit the operation of the C3 pumps should the level of the C3 storage tank fall below the Low-Low level.

1.11 CONTROL OPERATION

- A. C3 Storage Tank Level:
 1. The level in the C3 storage is monitored by a bubbler level sensor. If the level signal is detected as failed, the PCS shall annunciate an alarm on the facility OIT and SCADA systems.
 2. If the level in the C3 storage falls below an operator adjustable Low level setpoint, the PCS annunciates an alarm on the facility OIT and SCADA systems.
 3. If the level in the C3 storage falls below an operator adjustable Low-Low level setpoint, the PCS annunciates an alarm on the facility OIT and SCADA systems and inhibits the operation of the C3 pumps.
- B. Effluent Isolation Gates:
 1. The PCS shall open the effluent isolation gates to initiate treatment train effluent discharge to the effluent drop box and then the outfall.
 - a. Reference Section 17511.
 2. A fault in treatment train operation shall cause the PCS to place that treatment train into Recirculation Mode and close that treatment train effluent gate.
 - a. Reference Section 17511.
- C. Effluent Flow Measurement:
 1. The facility effluent flow to the outfall is measured by FE/FIT854518.

2. The PCS monitors the effluent flow signal for failure. If the flow signal is detected as failed, the PCS shall:
 - a. Annunciate an alarm on the facility OIT and SCADA systems.
 - b. Switch the effluent flow signal functions to the sum of all influent pump flow rates minus the sum of all ballasted sedimentation hydro-cyclone flows for the corresponding train.
- D. Effluent pH Monitoring AE854533B/AIT854533:
1. The PCS shall continuously monitor the pH of the effluent sample water.
 - a. If the measured pH exceeds an operator adjustable HIGH pH setpoint, the PCS shall activate an alarm through the facility OIT and SCADA systems.
 - b. If the measured pH falls below an operator adjustable LOW pH setpoint, the PCS shall activate an alarm through the facility OIT and SCADA systems.
- E. Effluent Sample Box:
1. The level in the effluent sample box is monitored by LSL854533:
 - a. If the level falls below the switch low level setpoint, the PCS shall energize the MCP annunciator alarm and activate an alarm through the facility OIT and SCADA systems.
- F. Effluent DO Monitoring AE854533A/AIT854533:
1. The PCS shall continuously monitor the DO of the effluent sample water.
 - a. If the measured pH falls below an operator adjustable LOW DO setpoint, the PCS shall activate an alarm through the facility OIT and SCADA systems.
- G. Effluent Composite Sampling System.
1. The effluent sampling system will automatically operate while a treatment train is in operation. The effluent sampler is a dual sampler that will take samples in response to the measured effluent flow rate.
 2. System Operating Sequence:
 - a. Each of the two sampler units will configured to operate in flow proportional mode at the sampler control panel.
 - b. The PCS shall transmit individual time proportioned pulse signals to each sampler unit that are proportional to the measured effluent flow rate.
 - 1) Controls integral to each sampler unit will monitor the flow rate signal and automatically take samples based upon operator entered flow proportion settings.
 - c. The flow signals shall be provided to the sampler units when:
 - 1) At least one treatment train is in service and that train's effluent drop box gate is not closed.
 - 2) Flow is detected by effluent flow meter FE/FIT854518.
 - d. Each sampler unit is monitored for failure conditions detected by the sampler unit's internal controllers.
 - 1) If a sampler fault is detected, the PCS shall annunciate an alarm on the facility OIT, SCADA systems and Metrotel system.
 - e. Failure of a sampler unit will not require suspension of facility operations.
- H. Effluent Priority Pollutant Sampler:
1. The effluent priority pollutant sampler will automatically operate while a treatment train is in operation. The priority pollutant sampler is a single sampler that will take samples in response to the measured effluent flow rate.
 2. System Operating Sequence:
 - a. The sampler will be configured to operate in flow proportional mode at the sampler control panel.
 - b. The PCS shall transmit a time proportioned pulse signal to the sampler that is proportional to the measured effluent flow rate.
 - 1) Controls integral to the sampler unit will monitor the flow rate signal and automatically take samples based upon operator entered flow proportion settings.

- c. The flow signal shall be provided to the sampler when:
 - 1) At least one treatment train is in service and that train's effluent drop box gate is not closed.
 - 2) Flow is detected by effluent flow meter FE/FIT854518.
- d. The sampler unit is monitored for failure conditions detected by the sampler unit's internal controller.
 - 1) If the sampler alarm is detected, the PCS shall annunciate an alarm on the facility OIT, SCADA systems.
 - 2) Failure of the sampler will not require suspension of facility operations.
- I. C3 Storage Tank Fill Valve:
 - 1. The PCS shall start a C3 tank fill sequence when the valves MCP selector switch HS854538C is in the Auto position and the pushbutton is pressed.
 - 2. When activated, the PCS execute the following sequence:
 - a. Open BTV854538.
 - b. When the C3 storage tank level exceeds an operator adjustable level setpoint, the PCS shall close BTV854538.
 - 1) Setpoint shall be adjustable through MCP OIT854881.
 - 3. The PCS shall abort the sequence and command BTV854538 closed under the following conditions:
 - a. HS854538C is taken out of the Auto position.
 - b. BTV854538 Fault alarm is detected.
- J. C3 Recirculation P-Trap Level:
 - 1. The PCS monitors the level in the recirculation p-trap.
 - 2. If the level falls below a programmed setpoint (established during system testing) the PCS shall initiate an alarm on the facility OIT and SCADA systems.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17553

C3 PUMPING CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section contains Process Control System (PCS) control functions associated with the C3 pumping system.
- B. The C3 pumping system consists of two C3 pumps and flow distribution valves that are opened and closed based upon the operating mode of the pumping system.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 500-P006, 500-P007, 500-P008.
- B. Related Control Strategies:
 - 1. Section 17500.
 - 2. Section 17530.
 - 3. Section 17560.
- C. Control Diagrams: 500-EL531, 500-EL532, 500-EL519, 500-EL529.
- D. Instrument Loop Diagrams: 500-IL517, 500-IL531.

1.05 SYSTEM DESCRIPTION:

- A. The C3 pumps shall operate in a Lead/Follow control configuration. The Lead pump shall be selected at the Main Control Panel (MCP) through selector switch HS854331. The pumps shall be commanded to operate by the PCS in response to commands from each CIRCULATION or FLUSHING control sequences.

1.06 EQUIPMENT

Equipment No.	Equipment Name/Description
P854331	C3 Pump 1
P854332	C3 Pump 2
BTV854519	Train 1 C3 Recirculation Valve
BTV854529	Train 2 C3 Recirculation Valve

1.07 ANNUNCIATOR ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.08 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.09 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.10 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.11 INTERLOCKS

- A. If the level in the C3 Storage Tank falls below the LOW-LOW level setpoint, initially set at 112.5 feet, the PCS shall:
 - 1. Activate a LOW-LOW level alarm through the facility Operator Interface Terminal (OIT) and SCADA systems.
 - 2. Stop all operating C3 pumps.

1.12 CONTROL OPERATION

- A. FLUSHING Mode:
 - 1. In FLUSHING Mode, the train 1 and train 2 recirculation valves, BTV854519 and BTV854529, shall be commanded closed by the PCS.
 - 2. In FLUSHING Mode, the Lead C3 pump shall start and stop and be speed controlled in response to PCS commands from the equalization basin or solids holding tank Flushing sequences.
 - 3. Flushing Mode shall be inhibited if Recirculation Mode is active.
- B. RECIRCULATION Mode:
 - 1. During idle periods, the recirculation mode allows the operators to circulate C3 water stored in the C3 storage tank through the treatment train back to the C3 storage tank by pumping water from the C3 storage tank to the ballasted sedimentation distribution channel.
 - a. Recirculation Mode shall be inhibited if Flushing Mode is active.
 - 2. MCP selector switch HS854516 [1-2-BOTH-OFF] controls the operation of the recirculation system.
 - a. When selected to 1, treatment train 1 shall be recirculated.
 - b. When selected to 2, treatment train 2 shall be recirculated.
 - c. When selected to BOTH, both treatment trains shall be recirculated.
 - 3. The PCS shall initiate the recirculation cycle when the following conditions are detected:
 - a. The correct number of C3 pumps required to provide the operator entered recirculation flow setpoint are in AUTO mode and not failed.
 - 1) Flow setpoint shall be operator adjustable through the MCP OIT.
 - b. All Recirculation valves are in AUTO.
 - c. All flushing valves are closed.
 - d. The operator pushes selector switch HS854516 pushbutton when the switch is in the desired position.
 - e. If the required conditions are not active when the recirculation cycle is started, the PCS shall activate a recirculation cycle FAIL alarm.
 - 1) The alarm shall be displayed on the facility OIT and SCADA systems.
 - 4. Once initiated, the PCS shall:
 - a. Command valves to the positions listed in the tables below based on the operator selection at HS854516.
 - b. When all valves are in the correct position, start the required C3 pumps.
 - 5. Once a recirculation cycle is initiated, the PCS shall initiate a recirculation cycle timer.
 - a. The cycle timer preset shall be operator adjustable through the MCP OIT.
 - b. The time remaining in the recirculation timer shall be displayed on the facility OIT and SCADA systems.

6. Once initiated, the PCS shall continuously operate the recirculation cycle until one of the following recirculation cycle STOP conditions is detected by the PCS:
 - a. The recirculation cycle timer expires.
 - b. Selector switch HS854516 is in the OFF position.
7. If any of the recirculation cycle permissives is de-activated while a recirculation cycle is active, the PCS shall:
 - a. Activate the recirculation cycle FAIL alarm.
 - 1) The alarm shall be displayed on the facility OIT and SCADA systems.
 - b. Suspend the recirculation cycle.
 - 1) Stop the operating C3 pump(s).
 - 2) Close the recirculation valves.
 - 3) Halt the recirculation cycle timer.
 - a) The operator can re-initiate the recirculation cycle by correcting the detected error and pressing the HS854516 pushbutton.
 - (1) Once re-initiated, the PCS shall restart the cycle timer at its held position.
8. When the recirculation cycle is called to stop, the PCS shall first stop the operating C3 pump(s) and then close all recirculation valves.
9. When selected to RECIRCULATION Mode through MCP selector switch HS854516 [1-2-BOTH-OFF] the PCS shall command valves to operating positions based on the treatment train selected.
 - a. Treatment Train 1:

Valve	Position
Train 1 Recirculation Valve BTV854519	Open
Train 2 Recirculation Valve BTV854529	Closed
Equalization Basin Zone 1 Flushing Valve BTV854304	Closed
Equalization Basin Zone 2 Flushing Valve BTV854305	Closed
Equalization Basin Zone 3 Flushing Valve BTV854306	Closed
Equalization Basin Zone 4 Flushing Valve BTV854307	Closed
Solids Holding Tank Zone 1 Flushing Valve BTV854621	Closed
Solids Holding Tank Zone 2 Flushing Valve BTV854622	Closed
Solids Holding Tank Zone 3 Flushing Valve BTV854623	Closed
Solids Holding Tank Zone 4 Flushing Valve BTV854624	Closed

- b. Treatment Train 2:

Valve	Position
Train 1 Recirculation Valve BTV854519	Closed
Train 2 Recirculation Valve BTV854529	Open
Equalization Basin Zone 1 Flushing Valve BTV854304	Closed
Equalization Basin Zone 2 Flushing Valve BTV854305	Closed
Equalization Basin Zone 3 Flushing Valve BTV854306	Closed
Equalization Basin Zone 4 Flushing Valve BTV854307	Closed

Valve	Position
Solids Holding Tank Zone 1 Flushing Valve BTV854621	Closed
Solids Holding Tank Zone 2 Flushing Valve BTV854622	Closed
Solids Holding Tank Zone 3 Flushing Valve BTV854623	Closed
Solids Holding Tank Zone 4 Flushing Valve BTV854624	Closed

c. Both Treatment Trains:

Valve	Position
Train 1 Recirculation Valve BTV854519	Open
Train 2 Recirculation Valve BTV854529	Open
Equalization Basin Zone 1 Flushing Valve BTV854304	Closed
Equalization Basin Zone 2 Flushing Valve BTV854305	Closed
Equalization Basin Zone 3 Flushing Valve BTV854306	Closed
Equalization Basin Zone 4 Flushing Valve BTV854307	Closed
Solids Holding Tank Zone 1 Flushing Valve BTV854621	Closed
Solids Holding Tank Zone 2 Flushing Valve BTV854622	Closed
Solids Holding Tank Zone 3 Flushing Valve BTV854623	Closed
Solids Holding Tank Zone 4 Flushing Valve BTV854624	Closed

- C. The C3 pumps shall operate in a Lead/Follow control configuration. The Lead pump shall be selected at the MCP through selector switch HS854531D. The pumps shall be commanded to operate by the PCS in response to commands from each CIRCULATION or FLUSHING control sequences.
1. The PCS shall start C3 pumps based upon the required CIRCULATION or FLUSHING flow rate setpoint.
 - a. Operate the LEAD pump if the required flow rate is less than or equal to 700 GPM.
 - b. Operate the LEAD and FOLLOW pumps if the required flow rate is greater than 700 GPM.
 2. The PCS shall modulate the pump(s) speed to maintain the required flow setpoint.
 - a. Speed modulation control through a Proportional Integral controller.
 3. The C3 pumps shall be monitored for failure by the PCS.
 - a. If a pumps fails to respond to control commands, the PCS shall energize a pump FAULT alarm through the facility OIT and SCADA systems and suspend operation of the failed pump.
 - b. If the LEAD C3 pump is detected as FAILED and the FOLLOW C3 pump is available for operation, the PCS shall start and operate the FOLLOW C3 pump.
 - c. Once detected as failed, the PCS shall maintain the FAILED status until the pump is taken out of AUTO.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 17555

DE-FOAMER CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. De-foamer can be added to the UV distribution channel when a treatment train is in operation. The Process Control System (PCS) will command the de-foamer feed system to operate if a treatment train has had its de-foamer feed function enabled through selector switches located on the Main Control Panel (MCP).

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 500-P012.
- B. Related Control Strategies:
 - 1. Section 17500.
- C. Control Diagrams: 500-EL551, 500-EL552.
- D. Instrument Loop Diagrams: 500-IL551, 500-IL552.

1.05 SYSTEM DESCRIPTION:

- A. Each treatment train has a dedicated de-foamer feed pump. When a treatment train requires de-foamer feed, the PCS will operate that train's de-foamer feed pump.

1.06 EQUIPMENT

Equipment No.	Equipment Name/Description
P854551	T1 - De-Foamer Feed Pump
P854552	T2 - De-Foamer Feed Pump

1.07 ANNUNCIATOR ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.08 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.09 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.10 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.11 INTERLOCKS

- A. None.

1.12 CONTROL OPERATION

A. De-foamer Feed Pumps.

1. Each treatment train has a dedicated de-foamer feed pump.
 - a. Train 1 De-foamer Feed Pump (P854551) is dedicated to treatment train 1.
 - b. Train 2 De-foamer Feed Pump (P854552) is dedicated to treatment train 2.
2. The PCS shall operate a de-foamer feed pump when the pump is selected to AUTO and the pumps associated treatment train is in operation.
3. Each de-foamer feed pump will have a constant feed rate corresponding to the spray water flow rate per train (~ 18 gal/min). This feed rate is operator adjustable. The initial value of the de-foamer feed rate is 2 gal/hr for each pump. The pump speed calculation:

$$Speed (\%) = \frac{\text{defoamer feed rate} \left(\frac{\text{gal}}{\text{hr}} \right)}{\text{Pump Capacity} \left(\frac{\text{gal}}{\text{hr}} \right)} \times 100$$

4. The de-foamer feed pumps shall be monitored for failure by the PCS.
 - a. If a pumps fail to respond to control commands, the PCS shall energize a pump FAULT alarm through the facility OIT and SCADA systems and suspend operation of the failed pump.
 - b. Once detected as failed, the PCS shall maintain the FAILED status until the pump is taken out of AUTO.
 - c. The failure or unavailability of a de-foamer feed pump shall not require interruption of treatment operations.

B. De-foamer C2 Water Valves.

1. Each treatment train has a dedicated C2 water valve.
 - a. C2 Water Valve (SV854511) is dedicated to treatment train 1.
 - b. C2 Water Valve (SV854512) is dedicated to treatment train 2.
2. The PCS shall open a C2 water valve when the valves associated treatment train is in operation.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17556

UV DISINFECTION FACILITY MECHANICAL SYSTEMS CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control functions associated with UV Disinfection Facility Mechanical Systems.
 - 1. Instrument Air System.
 - 2. Service Air System and Distribution.
 - 3. Hot Water System.
 - 4. UV Pump Room HVAC.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 500-P013, 500-P014, 500-P015, 500-P016.
- B. Related Control Strategies:
 - 1. Section 17500.
- C. Control Diagrams: 500-EL561, 500-EL562, 500-EL566, 500-EL567, 500-EL569.
- D. Instrument Loop Diagrams: None.
- E. System Description:
 - 1. Instrument Air System – Two instrument air compressors located in the area 500 provide the instrument air for the plant. This is a packaged system consisting of two instrument air compressors, an instrument air receiving tank, instrumentation, air dryer, associated interconnecting equipment and an instrument air control panel that interfaces with owner's motor starters and PCS system.
 - a. Reference Section 11366.
 - 2. Service Air System – Two service air compressors located in the area 500 provide service air for the plant. These are two packaged systems consisting of air compressors, service air receivers, instrumentation, associated interconnecting equipment and service air control panels that interface with owner's motor starters and PCS system.
 - a. Reference Section 11367.
 - 3. Hot Water Distribution – Hot water is produced by a Water Heater, Hot Water Recirculation Pump and a Master Mixing Valve distributed to the plant as a Hot Water Supply system with Hot Water Return. The Hot Water System is a packaged system that interfaces with the Tepid Water System and eyewash/safety showers
- F. UV Pump Room HVAC System - See Section 15901. This is part of the HVAC packaged systems.

1.05 EQUIPMENT

Equipment No.	Equipment Name/Description
CPR854561	Instrument Air Compressor 1
CPR854562	Instrument Air Compressor 2
PVL854561	Instrument Air Receiving Tank
CPR854566	Service Air Compressor 1

Equipment No.	Equipment Name/Description
CPR854567	Service Air Compressor 2
WH854569	Hot Water Heater
P854569	Hot Water Recirculation Pump
TMV854569	Master Mixing Valve

1.06 ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.07 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.08 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated on the drawings.

1.10 INTERLOCKS

- A. None.

1.11 CONTROL OPERATION

- A. Instrument Air System:
1. The PCS monitors the operation of the instrument air system.
 - a. Display the Ready and Running status of each compressor on the facility OIT and SCADA systems.
 - b. Annunciate the instrument air system High pressure alarm on the MCP annunciator.
 - c. Annunciate the instrument air system Low pressure alarm on the MCP annunciator, facility OIT and SCADA systems and Metrotel system.
- B. Service Air System:
1. The PCS monitors the operation of the service air system.
 - a. Display the Ready and Running status of each compressor on the facility OIT and SCADA systems.
 - b. Annunciate the Fault alarm of each compressor on the MCP annunciator and facility OIT and SCADA systems.
 - c. Annunciate the service air system High pressure alarm on the MCP annunciator.
 - d. Annunciate the service air system Low pressure alarm on the MCP annunciator, facility OIT and SCADA systems and Metrotel system.
- C. Hot Water System:
1. Annunciate the eyewash/safety showers on FLOW HIGH on the facility OIT and SCADA systems.
- D. UV Pump Room HVAC System:
1. If the PCS detects the HVAC system UV Pump Room High Room Temperature alarm, the PCS shall activate an alarm on the Metrotel system.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 17557

EFFLUENT SUMP 1 PUMP CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control functions associated with Effluent Sump 1 Pump:
 - 1. Sump Level.
 - 2. Sump Pump Operation.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 500-P010.
- B. Related Control Strategies:
 - 1. Section 17500.
- C. Control Diagrams: 500-EL505.
- D. Instrument Loop Diagrams: 500-IL505.
- E. System Description:
 - 1. The effluent pipeline downstream of the effluent drop box is connected to Effluent Sump 1. The PCS monitors the level in the sump and operates the sump pump to drain the water from the effluent pipeline into the C3 storage tank when commanded by the operator.

1.05 EQUIPMENT

Equipment No.	Equipment Name/Description
PNL854505	Effluent Sump 1 Bubbler Panel
P854505	Effluent Sump 1 Pump

1.06 ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.07 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.08 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.10 INTERLOCKS

- A. The pump will stop when a low sump level condition is detected by LSL854505.

1.11 CONTROL OPERATION

- A. Effluent Sump 1 Level:
 - 1. The PCS shall monitor the level in Effluent Sump 1.
- B. Effluent Sump 1 Pump P854505:
 - 1. The effluent sump 1 pump shall operate under the following conditions:
 - a. Water level in the sump is above the trip setpoint of LSL854505.
 - b. The pump Start pushbutton located on LCS854505 is pushed.
 - c. The pump Start function is selected at the MCP OIT.
 - 2. Once started, the pump shall run continuously until one of the following events are detected.
 - a. The level in the sump falls below the trip setpoint of LSL854505.
 - b. The pump Stop pushbutton located on LCS854505 is pushed.
 - c. The pump Stop function is selected at the MCP OIT.
 - 3. The PCS shall monitor the operation of the pump for failure to respond to control system operating commands. If a pump failure is detected, the PCS shall:
 - a. Activate a pump FAULT alarm through the facility OIT and SCADA systems.
 - 4. Detection of the pump Moisture or High Temperature signals shall be annunciated on the MCP annunciator and the facility OIT and SCADA systems.
 - a. Neither alarm condition shall stop the operation of the sump pump.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17560

SOLIDS HOLDING TANK CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control functions associated with the Solids Holding Tank.
 - 1. Solids Holding Tank Level.
 - 2. Solids Return Pumps.
 - 3. Solids Holding Tank Flushing.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 600-P001, 600-P003, 600-P005.
- B. Related Control Strategies:
 - 1. Section 17500.
 - 2. Section 17553.
- C. Control Diagrams: 600-EL611, 600-EL612, 600-EL621, 600-EL622, 600-EL623, 600-EL624.
- D. Instrument Loop Diagrams: 600-IL601, 600-IL613.

1.05 SYSTEM DESCRIPTION:

- A. The ballasted sedimentation process produces solids which is stored in the solids holding tank.
- B. The level in the solids holding tank is monitored by the PCS. The tank level is used by the PCS for solids return pump control. If the level in the solids holding tank rises above the tanks overflow weir, overflow supernatant is transported by gravity to the equalization basin.
- C. The solids return pumps remove stored solids from the tank.
 - 1. Two operator selectable control modes are configured in the PCS for the operation of the solids return pumps.
 - a. Truck mode.
 - b. EBI mode.
 - 2. The control mode is selected through a selector switch HS854611F located on the Main Control Panel PNL854881 (MCP).
- D. C3 water stored in the C3 channel is used to flush the walls and floor of the solids holding tank.
 - 1. The flushing system consists of four flushing zones. Each flushing zone contains:
 - a. Perforated piping that directs the flushing water to the walls of the tank.
 - b. Electrically actuated control valve.

1.06 EQUIPMENT

Equipment No.	Equipment Name/Description
PNL854610	Solids Holding Tank Bubbler Panel
P854611	Solids Return Pump 1
P854612	Solids Return Pump 2
BTV854621	Solids Holding Tank Flushing Valve 1
BTV854622	Solids Holding Tank Flushing Valve 2
BTV854623	Solids Holding Tank Flushing Valve 3
BTV854624	Solids Holding Tank Flushing Valve 4

1.07 ANNUNCIATOR ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.08 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.09 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.10 SCADA SIGNALS

- A. As specified in Section 17905 and indicated on the Drawings.

1.11 INTERLOCKS

- A. The PCS shall inhibit the operation of the solids return pumps under the following conditions:
 - 1. When selected to EBI mode, the level in the EBI, measured at the Brandon Regulator, is above a level setpoint that will be defined during system testing.
 - a. If the level sensor at the Brandon Regulator is detected as failed, the PCS shall substitute the Brandon Regulator EBI level signal with the EBI level measured at the Georgetown Regulator.
 - 1) Setpoint: (Defined during system testing).
- B. The PCS shall inhibit the operation of the solids return pumps when the level in the solids holding tank falls below elevation 112.

1.12 CONTROL OPERATION

- A. Solids Holding Tank Level.
 - 1. If the level in the solids holding tank exceeds the level of the overflow weir plus 6 inches for ten seconds, the PCS shall:
 - a. Energize MCP annunciator alarm LAH854601.
 - b. Energize the alarm input at Metrotel Panel PNL854882.
 - c. Display the alarm on the facility Operator Interface Terminal (OIT) and SCADA systems.
- B. Solids Return Pumps:
 - 1. The PCS shall have two operator selectable control modes for the operation of the Solids Return Pumps.
 - a. Truck mode.
 - b. EBI mode.
 - c. The control mode shall be selected through selector switch HS854611F located on the MCP.

2. Truck Mode:
 - a. With a pump selected to Auto, the pump is manually started by the operator from LCS854611 located at the truck loadout station.
 - b. The pump shall run continuously.
 - c. The PCS shall energize a READY light on LCS854611 when its associated solids return pump is available for operation from the truck loadout area.
3. EBI Mode:
 - a. The solids return pumps shall operate in a LEAD/FOLLOW control configuration.
 - 1) The LEAD pump shall be selected at the MCP through selector switch HS854611D.
 - 2) The pumping cycle shall be operator initiated by depressing pushbutton HS854611E located on the MCP.
 - 3) The PCS shall start the solids return pumps based upon the required solids return flow rate setpoint.
 - a) Operate the LEAD pump if the required flow rate is less than or equal to 250 GPM.
 - b) Operate the LEAD and FOLLOW pumps if the required flow rate is greater than 250 GPM.
 - c) The required flow rate shall be operator selectable through the MCP OIT.
 - 4) Once initiated, the PCS shall run the solids return pump(s) continuously until one of the following conditions is detected by the PCS:
 - a) The solids return pumps are taken out of EBI Mode.
 - b) The solids holding tank low level interlock is energized.
 - 5) The solids return pumps shall be monitored for failure by the PCS.
 - a) If a pumps fails to respond to control commands, the PCS shall energize a pump FAULT alarm through the facility OIT and SCADA systems and suspend operation of the failed pump.
 - b) If the LEAD solids return pump is detected as FAILED and the FOLLOW solids return pump is available for operation, the PCS shall start and operate the FOLLOW solids return pump.
 - c) Once detected as failed, the PCS shall maintain the FAILED status until the pump is taken out of AUTO.

C. Solids Holding Tank Flushing System:

1. The solids holding tank flushing system operates in a programmed sequence.
 - a. The flushing sequence shall be enabled when MCP selector switch HS854621D (AUTO-OFF) is placed in the AUTO position.
 - b. The flushing sequence shall be initiated by depressing the START pushbutton when MCP selector switch HS854621D (AUTO-OFF) is in the AUTO position and the equalization basin flushing sequence is not in operation.
 - c. The flushing sequence shall be reset to Step 0 when MCP selector switch HS854621D (AUTO-OFF) is placed in the OFF position.
 - d. Any flushing valve not selected to AUTO control mode shall be skipped by the flushing sequence.
2. The flushing sequence shall operate as follows:

Step No.	Step Description	Step Advance Condition(s)
0	Home step.	Operator initiates the flushing sequence.
1	PCS checks that there is adequate volume of C3 water for the flushing sequence by calculating the water volume required based upon the following calculation: (Sum of the operator entered time setpoints for the flushing valves selected to AUTO) x 700 GPM.	Adequate C3 volume is present. (Energize sequence FAIL alarm NAD854621 if adequate C3 volume is not present)
2	PCS checks that at least one C3 pump is available, (Pump in AUTO and not FAILED)	C3 pump(s) are detected as available. (Energize sequence FAIL alarm NAD854621 if a C3 pump is not available)

Step No.	Step Description	Step Advance Condition(s)
3	PCS checks that the following valves are closed. BTV854304 (EQ Zone 1 flushing valve) BTV854305 (EQ Zone 2 flushing valve) BTV854306 (EQ Zone 3 flushing valve) BRV854307 (EQ Zone 4 flushing valve) BTV854519 (Train 1 recirculation valve) BTV854529 (Train 2 recirculation valve) BTV854621 (Solids Tank Zone 1 flushing valve) BTV854622 (Solids Tank Zone 2 flushing valve) BTV854623 (Solids Tank Zone 3 flushing valve) BTV854624 (Solids Tank Zone 4 flushing valve)	All valves closed.
4	Command zone 1 flushing valve BTV854621 to open.	BTV854621 is open.
5	Start the LEAD C3 pump. Operate the LEAD C3 pump at 700 GPM.	LEAD C3 pump is in operation.
6	Operate zone 1 for an operator adjustable zone 1 flushing time period. (Adjustable at the MCP OIT)	Time period expires
7	Command zone 2 flushing valve BTV854622 to open. Command zone 1 flushing valve BTV854621 to close.	Valves are at their commanded positions.
8	Operate zone 2 for an operator adjustable zone 2 flushing time period. (Adjustable at the MCP OIT)	Time period expires.
9	Command zone 3 flushing valve BTV854623 to open. Command zone 2 flushing valve BTV854622 to close	Valves are at their commanded positions.
10	Operate zone 3 for an operator adjustable zone 3 flushing time period. (Adjustable at the MCP OIT)	Time period expires.
11	Command zone 4 flushing valve BTV854624 to open. Command zone 3 flushing valve BTV854623 to close	Valves are at their commanded positions.
12	Operate zone 4 for an operator adjustable zone 4 flushing time period. (Adjustable at the MCP OIT)	Time period expires.
13	Command the LEAD C3 pump to stop. Command zone 4 flushing valve BTV854624 to close.	LEAD C3 pump is stopped. Zone 4 flushing valve BTV854624 is closed.
14	Sequence end	Sequence returns to Step 0

3. When in a solids holding tank flushing sequence, the PCS shall operate the solids return pumps in a Lead/Standby control.
 - a. Apply the same EBI level interlocks specified for operating the pumps in EBI mode.
 - b. Start the Lead solids return pump when the flushing sequence is active and the level in the solids holding tank is greater than 112.2.
4. The electrically actuated valves, solids return pumps and the C3 pumps shall be monitored for failure to respond to PCS control commands.
 - a. If a valve fails to open, the PCS shall energize the associated valve Fail alarm on the facility OIT and SCADA systems and shall advance the flushing sequence to the next valve in the sequence.
 - b. If a valve fails to close, the PCS shall:
 - 1) Energize Sequence Fail alarm NAD854621.
 - 2) Stop the Lead C3 pump.
 - 3) Suspend the sequence.
 - a) The sequence can be resumed by the operator re-initiating the sequence at the MCP.
 - c. If the Lead solids return pump fails, the PCS shall replace the Lead solids return pump with the Standby solids return pump.
 - d. If the Lead C3 pump fails, the PCS shall replace the Lead C3 pump with the Standby C3 pump.
 - e. If the Lead C3 pump fails and the Standby C3 pump is not available, the PCS shall:
 - 1) Energize Sequence Fail alarm NAD854621.
 - 2) Suspend the sequence.
 - a) The sequence can be resumed by the operator re-initiating the sequence at the MCP.
5. Provide a flushing sequence monitoring chart on the facility OIT and SCADA systems that indicates the following:
 - a. Current sequence step.
 - b. Highlighting of the active step description within the chart.
 - c. Display of the time remaining in each step.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 17570

ODOR CONTROL SYSTEMS CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control functions associated with Odor Control.
1. Odor Control Train 1: Screenings Room.
 2. Odor Control Train 2: Equalization Basin and Solids Holding Tank.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 300-P020, 600-P007, 700-P001, 700-P002, 700-P003, 700-P004.
- B. Related Control Strategies:
1. Section 17500.
 2. Section 17536.
- C. Control Diagrams: 700-EL715, 700-EL725.
- D. Instrument Loop Diagrams: None.
- E. System Description:
1. The Odor Control System for the preliminary treatment (screenings room) draws air through balancing dampers in the screenings room through a carbon-bed Odor Control Unit 1 (OCU 1) and discharges to atmosphere via the OCU 1 exhaust fan. The exhaust fan is operated with a variable speed drive (VFD) and a flow switch on the fan discharge monitors the air flow. Air is supplied to the screenings room through forced air ventilation as detailed in Section 17536. The exhaust fan sound attenuating enclosure includes gas monitoring as well as an enclosure exhaust fan to ventilate the space.
 2. The Odor Control System for the equalization basin/solids holding tank draws air from the equalization basin and solids holding tank through a carbon-bed Odor Control Unit 2 (OCU 2) and discharges to atmosphere via the OCU 2 exhaust fan. The exhaust fan is operated with a variable speed drive (VFD) and a flow switch on the fan discharge monitors the air flow. Air is supplied to the equalization basin and solids holding tank through passive inlet dampers. The exhaust fan sound attenuating enclosure includes gas monitoring as well as an enclosure exhaust fan to ventilate the space.

1.05 EQUIPMENT

Equipment No.	Equipment Name/Description
OCU854714	Odor Control Unit 1
EF854715	OCU 1 Exhaust Fan
EF854716	Enclosure Exhaust Fan 1
FSL854715	OCU 1 Exhaust Fan Flow Switch
OCU854724	Odor Control Unit 2
EF854725	OCU 2 Exhaust Fan

Equipment No.	Equipment Name/Description
EF854726	Enclosure Exhaust Fan 2
PNL854374	Preliminary Treatment HVAC Panel

1.06 ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.07 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.08 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.10 INTERLOCKS

- A. The PCS shall inhibit the operation of an OCU exhaust fan on high motor temperature.

1.11 CONTROL OPERATION

- A. Odor Control Areas 1 and 2 (The PCS receives signals from the PNL854374, the Preliminary Treatment HVAC Panel):
 1. Activate the alarm on the facility OIT and SCADA systems when any of the following signals received: OCU Exhaust Fan Motor Temp High, OCU Fan Enclosure Temp High.
 2. Activate the alarm on the facility OIT and SCADA systems, Energize the alarm on the Main Control Panel MCP (PNL854881) and activate the alarm on the Metrotel system when signal is received from the HVAC Panel (PNL854374) for OCU Exhaust Fan Fault, OCU Exhaust Fan Air Flow Low.
 3. Activate the indication status on the facility OIT and SCADA systems when signal received for OCU Exhaust Fan Running, OCU Exhaust Fan Ready and OCU Exhaust Fan in Auto.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17572

ODOR CONTROL HAZARDOUS GAS DETECTION CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control and monitoring functions associated with the odor control hazardous gas detection systems.
 - 1. Odor Control Unit 1.
 - 2. Odor Control Unit 2.
- B. Each hazardous gas detection system consists of:
 - 1. Hazardous Gas Detection Sample Draw Panels.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 700-P005, 700-P006.
- B. Related Control Strategies:
 - 1. Section 17500.
 - 2. Section 17536.
- C. Control Diagrams: None.
- D. Instrument Loop Diagrams: 700-IL717, 700-IL717A 700-IL727, 700-IL727A.

1.05 SYSTEM DESCRIPTION:

- A. The Gas Monitoring System measures the combustible gas concentration (%LEL), and Hydrogen Sulfide (H₂S)) levels in the classified spaces of the Odor Control Units OCU1 and OCU2.
- B. The classified space air is pulled through the gas analyzers using compressed instrument air.
- C. Alarm contacts for combustible gas concentration high level, and H₂S gas concentration high level are sent to the PCS.

1.06 EQUIPMENT

Equipment No.	Equipment Name/Description
PNL854717A	OCU 1 Hazardous Gas Sample Draw Panel.
PNL854727A	OCU 2 Hazardous Gas Sample Draw Panel
PNL854374	Preliminary Treatment HVAC Panel

1.07 ANNUNCIATOR ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.08 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.09 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.10 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.11 INTERLOCKS

- A. There is not interlock from the HVAC system.

1.12 CONTROL OPERATION

- A. Gas Sample Flow Low:
 - 1. If a low sample flow switch alarm signal is detected, the PCS shall:
 - a. Energize the alarm on the Main Control Panel (PNL854881) annunciator.
 - b. Activate the alarm on the facility OIT and SCADA systems.
- B. High Gas LEL Concentration:
 - 1. If the LEL concentration goes above 10% the PCS shall:
 - a. Activate the alarm on the Main Control Panel (PNL854881) annunciator.
 - b. Activate the alarm signal to Metrotel Panel (PNL854882).
 - c. Activate the alarm on the facility OIT and SCADA systems.
- C. High H2S Concentration:
 - 1. If the H2S gas concentration rises above 5 PPM the PCS shall:
 - a. Activate the alarm on the Main Control Panel (PNL854881) annunciator.
 - b. Activate the alarm on the facility OIT and SCADA systems.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17580

PROCESS AREA ELECTRICAL SPACE SYSTEM CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the PCS control and monitoring functions associated with Process Area Electrical Systems.
1. Motor Control Centers.
 2. UPS.
 3. Door Closed Position (Intrusion Switches).
 4. Fire Alarm.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 800-P001, 800-P002.
- B. Related Control Strategies:
1. Section 17500.
- C. Control Diagrams: None.
- D. Instrument Loop Diagrams: None.
- E. System Description:
1. The PCS monitors devices within the process area electrical building.

1.05 EQUIPMENT

Equipment No.	Equipment Name/Description
MCC854841	Ballasted Sedimentation Motor Control Center 1
MCC854842	Ballasted Sedimentation Motor Control Center 2
MCC854843	UV Motor Control Center 1
MCC854844	UV Motor Control Center 2
MCC854845	Process Motor Control Center
SWBD854831	Ballasted Sedimentation Switchboard1
SWBD854831	Ballasted Sedimentation Switchboard2
UPS854851	UPS
FCP854394	Area 300 and 700 Fire Alarm Panel.
FCP854894	Process Fire Alarm Panel
FCP854394	Area 300 and 700 Fire Alarm Panel

1.06 ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.07 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.08 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.10 INTERLOCKS (NOT USED)

1.11 CONTROL OPERATION

- A. Motor Control Centers (MCC854841, MCC854842, MCC854843, MCC854844, MCC854845, SWBD854831, SWBD854832):
 - 1. The PCS monitors the power monitor in the MCCs and switchboards.
 - 2. Average current, average voltage and instantaneous power are monitored.
- B. TVSS854841, TVSS854842, TVSS854843, TVSS854844, TVSS854845, TVSS854831, TVSS854832.
 - 1. The PCS monitors the operational status of the TVSS devices.
 - 2. If a TVSS failure condition is detected, the PCS shall activate alarms through the MCP annunciator, facility OIT and SCADA systems and Metrotel system.
- C. UPS:
 - 1. The PCS monitors the operational status of the UPS system.
 - 2. If a UPS failure condition is detected, the PCS shall activate alarms through the MCP annunciator, facility OIT and SCADA systems and Metrotel system.
- D. Door Intrusion:
 - 1. The PCS monitors the status of doors and gates in the following facility areas:
 - a. Ballasted sedimentation.
 - b. Facility access gates.
 - c. Process deck stairs.
 - d. Screenings building.
 - e. UV pump room.
 - f. Process electrical building.
 - 2. If the PCS detects an open door, the PCS shall energize an alarm associated with the intrusion detection group through the MCP annunciator, facility OIT and SCADA systems and Metrotel system.
 - 3. Provide an intrusion alarm inhibit function through the MCP OIT to prevent repeated alarms when the facility is occupied.
 - a. Initiate an alarm through the facility OIT and SCADA systems when the inhibit function is activated.
- E. Fire Alarm:
 - 1. The PCS monitors the status of fire alarm control panels FCP854394 and FCP854894.
 - 2. If an alarm condition is detected, the PCS shall energize an alarm through the MCP annunciator, facility OIT and SCADA systems and Metrotel system.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 17590

STANDBY GENERATOR SYSTEM CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Process Control System (PCS) control functions associated with Standby Generator Systems:
1. Generator System.
 2. Generator Fuel System.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 900-P003, 900-P004.
- B. Related Control Strategies:
1. Section 17500.
 2. Section 17599.
- C. Control Diagrams: None.
- D. Instrument Loop Diagrams: 900-IL904
- E. System Description:
1. Generator System - The Generator provides standby power to MCCs (Regulator, Generator, Operations and Process) through a Standby Switchboard. Should power be lost to the Standby Switchboard, an Automatic Transfer Switch (ATS) will sense power loss, start the generator and switch the power source to the Generator. The Generator is a packaged system with it's own control panel. This control strategy covers the interface of the generator package with the PCS only. See Section 11083 for the control requirements internal to the Generator Package.
 2. Generator Fuel System - The Generator Fuel System is an outdoor storage system. This control strategy covers the interface of the Generator Fuel System package with the PCS only. See Section 11083 for the control requirements internal to the Generator Fuel System package including the Diesel Fuel Leak Detection and Inventory System and associated Fuel Tank Overfill Alarm Panel and D/A Converter and Isolator Control Panel.

1.05 EQUIPMENT

Equipment No.	Equipment Name/Description
G854901	Generator
E854901	Generator Engine
LCP854901	Engine Generator Control Panel
PNL854904A	Leak Detection and Inventory Control Panel
PNL854904B	D/A Converter and Isolator Control Panel
PNL854904C	Fuel Tank Overfill Acknowledgement Panel
T854904	Engine Generator Fuel Storage Tank

1.06 ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.07 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.08 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.10 INTERLOCKS (NOT USED)

1.11 CONTROL OPERATION

- A. Generator System (P&ID 900-P003):
 1. Activate the alarm on the facility OIT and SCADA and energized the alarm on the Main Control Panel MCP (PNL854981) and activate the alarm on the Metrotel system when any of the following signals received: Generator Running, Generator Failure, Generator Trouble and Generator Not in Auto.
 2. Activate the alarm on the facility OIT and SCADA and activate the alarm on the Metrotel system when any of the following signals received: Generator Ready stopped by the Automatic Transfer Switch. See Electrical Drawings.
 3. Monitor generator power in the facility OIT and SCADA system.
- B. Generator Fuel System (P&ID 900-P004):
 1. Activate the alarm on the facility OIT and SCADA and energized the alarm on the Main Control Panel MCP (PNL854981) and activate the alarm on the Metrotel system when any of the following signals received: Generator Fuel Storage Tank Low.
 2. Activate the alarm on the facility OIT and SCADA and energized the alarm on the Main Control Panel MCP (PNL854981) when any of the following signals received: Generator Fuel Storage Tank Trouble.
 3. Monitor and indicate the Generator Fuel Storage Tank Level on the facility OIT and SCADA system.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17599

OPERATIONS BUILDING ELECTRICAL SYSTEMS CONTROL STRATEGY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the PCS control and monitoring functions associated with the Operations Building Electrical Systems:
1. Switchgear.
 2. Automatic Throwover System.
 3. Standby Power Switchboard.
 4. UPS.
 5. Motor Control Centers.
 6. Door Closed Position (Intrusion Switches).
 7. Fire Alarm.
 8. Automatic Transfer Switch.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCES

- A. P&IDs: 900-P101, 900-P102, 900-P103.
- B. Related Control Strategies:
1. Section 17500.
- C. Control Diagrams: None.
- D. Instrument Loop Diagrams: None.
- E. System Description:
1. The PCS monitors devices within the Operations Building Electrical Room.

1.05 EQUIPMENT

Equipment No.	Equipment Name/Description
ATO854930	Automatic Throwover System
SWGR854931	Switchgear 1
SWGR854932	Switchgear 2
SWBD854934	Standby Power Switchboard
MCC854942	Operations Motor Control Center
MCC854941	Generator Motor Control Center
UPS854951	UPS
FCP854994A	Operations Building Fire Alarm
FCP854994B	Generator Building Fire Alarm

1.06 ALARMS

- A. As specified in Section 17902 and indicated in the Drawings.

1.07 PLC/DCS I/O POINTS

- A. As specified in Section 17903 and indicated in the Drawings.

1.08 METROTEL I/O POINTS

- A. As specified in Section 17904 and indicated in the Drawings.

1.09 SCADA SIGNALS

- A. As specified in Section 17905 and indicated in the Drawings.

1.10 INTERLOCKS (NOT USED)

1.11 CONTROL OPERATION

- A. Switchgear (SWGR854931 and SWGR854932):
 - 1. The PCS monitors the power monitor in the Switchgear.
 - 2. Average current, average voltage and instantaneous power are monitored.
 - 3. The TVSS signals the PCS, and alarms the facility OIT and SCADA systems, when a voltage surge has activated the device.
- B. Automatic Throwover System (ATO854930):
 - 1. Utility A, Utility B and Tie-Breaker positions are signaled to the PCS and indicated on the facility OIT and SCADA systems.
 - 2. Utility power failure is detected by the ATO and signals to the PCS and is alarmed on the facility OIT and SCADA systems and to the Metrotel system.
 - 3. ATO not-in-auto is signaled to the PCS and indicated on the facility OIT and SCADA systems and Metrotel system.
- C. Standby Power Switchboard (SWBD854934):
 - 1. The PCS monitors the power monitor in the Switchboard.
 - 2. Average current, average voltage and instantaneous power are monitored.
 - 3. The TVSS signals the PCS when a voltage surge has activated the device and is alarmed on the facility OIT and SCADA systems.
- D. Motor Control Centers (MCC854941 and MCC854942):
 - 1. The PCS monitors the power monitor in the MCCs.
 - 2. Average current, average voltage and instantaneous power are monitored.
 - 3. The TVSS signals the PCS, and alarms the facility OIT and SCADA systems, when a voltage surge has activated the device.
- E. Operations UPS (UPS854951):
 - 1. The UPS Trouble signal is alarmed on the PCS facility OIT and SCADA systems and in the Metrotel system.
- F. Operations and Generator Building Intrusion:
 - 1. A Process Electrical Intrusion is alarmed on the PCS facility OIT and SCADA systems and in the Metrotel system.
- G. Operations and Generator Building Fire Alarm (FCP854994A & B):
 - 1. A Fire Alarm is alarmed on the PCS facility OIT and SCADA systems and in the Metrotel system.

H. Automatic Transfer Switch (ATS854934):

- 1 The Automatic Transfer Switch (ATS) will signal the PCS facility OIT and SCADA systems to indicate ATS normal position and ATS standby position.
- 2 The ATS will signal the PCS facility OIT and SCADA systems and Metrotel system to alarm ATS not-in-auto and ATS Fail.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 17600

VENDOR-SUPPLIED PACKAGE CONTROL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies requirements for vendor-supplied package control systems (Package Control Systems) and associated process instrumentation, valves, gates, and devices for vendor-supplied package process equipment (Package Equipment). The Package Control System shall include everything required for a complete, fully functional, and integrated control system.
- B. All Package Control Systems shall be provided with Programmable Logic Controller (PLC) based control. A Graphical Operator Interface shall be provided as part of the Package Control System where specified. The Package Control System shall be programmed and configured to provide the monitoring, control, and protection of the Package Equipment, integration into the facility Process Control System (PCS), and execution of the applicable control strategies. Package Control Systems shall be provided in accordance with the applicable Package Equipment specification, referenced Division 16 and Division 17 Specifications, other applicable Specifications, and the Drawings.
- C. The Package Control System shall include fully programmed control strategies, hard-wired and networked points, network interfaces, and data communications.
- D. The Package Equipment for which Package Control Systems are to be provided includes the following:
 - 1. Section 11259.
 - 2. Section 11260.
 - 3. Section 11710.
- E. A Package Control System is to be provided for each of the following Package Equipment or combination of Package Equipment:
 - 1. Influent Screen 1.
 - 2. Influent Screen 2.
 - 3. Screenings Compactor 1.
 - 4. Screenings Compactor 2.
 - 5. C2 Water System.
- F. The Package Control Systems shall be provided with system operation and maintenance manuals, user guides, troubleshooting guidelines, and system configuration documentation. Backup software and software licenses shall also be provided.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revisions of the following documents. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
SBC	Seattle Building Code
NFPA 70	National Electric Code (NEC)
UL 508	Industrial Control Equipment

Reference
UL 508A

Title
Industrial Control Panels
King County PLC and OIT Installation and Programming Requirements
document (Most current version)

B. System Responsibility:

1. Contractor shall provide the required package control system design, installation, integration, and commissioning work that meets the requirements as specified in Division 17, other related and referenced specifications, and as indicated in the Drawings.
2. The package control system design, integration, testing, and commission work shall be provided by the package system vendor that meets the qualifications of this Section.
3. Contractor shall be responsible for all hardware and software configuration to provide the established level of performance, functionality, redundancy, and quality.
4. Contractor shall provide assistance, direction, and coordination of the Package Control Systems during installation, functional check-out, start-up, commissioning and as needed through project closeout.
5. Contractor shall coordinate with the Project Representative to assure seamless integration of each Package Control System with the PCS control strategies, hard-wire discrete and analog points and Ethernet network interface.
 - a. Contractor shall obtain the most current version of the King County PLC and OIT Installation and Programming Requirements document from the Project Representative.

C. Package System Vendor Qualifications:

1. Vendor shall be regularly engaged in the design and installation of the package process control system, and have a local installation and service organization experienced with the specified and submitted equipment.
2. The vendor shall provide a minimum of three references whose package process control systems, of similar complexity, have been designed and installed during the past five years, and are currently in full operation.
3. The vendor qualified staff and support organization shall:
 - a. Provide factory-trained vendor-authorized personnel to furnish technical direction for on-site labor associated with installation of the supplied Package Equipment (e.g., power, control, signal, and network field wiring, grounding, and software configuration).
 - b. Provide a programming manager that has programmed the specified control system equipment for a minimum of five years or has programmed five separate Package Control Systems using the specified control system hardware and software. This experience would include management of the programming and start-up and commissioning of the Package Control System. The vendor programming manager shall administer the vendor's quality assurance program which shall include:
 - 1) Documenting and communicating the Package System control strategies, equipment, and processes based on the Specifications and Drawings.
 - 2) Maintaining an up-to-date status of the programming effort.
 - 3) Updating of the program documentation.
 - 4) Implementing the application program revision control procedures (Section 17800) and software.
 - 5) Attendance at on-site reviews as required by the Project Representative.
 - 6) Coordination with the Project Representative to define factory acceptance testing procedures and factory acceptance test schedule dates for demonstrating the vendor-supplied package system network interface with the PCS.
 - c. Provide programmers, each of with a minimum of three years of programming experience with the specified equipment.
 - d. Provide field service technicians that are capable of supporting the installed vendor package control system for formal acceptance by the Project Representative.
 - e. Provide trainers, each of which has a minimum of three years of classroom training experience with the specified equipment, to provide the required system operations and maintenance training courses.

- D. Shipping:
1. The equipment specified herein shall be factory assembled. The parts and assemblies that are shipped unassembled, out of necessity, shall be packaged and tagged in a manner that will protect the equipment from damage and provide easy identification to facilitate the final assembly in the field. The package control system equipment and instrumentation shall adhere to the shipping and storage requirements of Section 17000.

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Drawings (Electronic Format): Provide complete drawings which include the following:
1. Drawings prepared on a computer-aided drafting (CAD) system and delivered as electronic format, complete with borders and title blocks clearly identifying the project name and scope of the drawings.
 2. Drawings in electronic format provided in ".DWG" file format and submitted via email or on DVD or CD media.
 3. Drawing format in current version of AutoCAD, no older than 2010 version.
- C. Items to be Submitted for each Package Control System for this Specification:
1. Submit the following for each Package Control System:
 - a. Submittal Information as required by the following related Sections:
 - 1) Section 01300.
 - 2) Section 01660.
 - 3) Section 17000.
 - 4) Section 17110.
 - 5) Section 17800.
 - 6) Section 17801 (as applicable).
 - 7) Section 17802.
 - 8) Section 17804.
 - 9) Section 17810.
 2. Submittal information for each Package Control System includes an electronic copy of the following:
 - a. Manufacturer's Representative name, address, and telephone number.
 - b. Manufacturers Catalog Information for all Package Control System components and equipment.
 - c. Dimensioned Control Panel Internal Layout Drawings with a keyed Bill of Materials.
 - d. Dimensioned Control Panel External Layout Drawings with a keyed Bill of Materials.
 - e. Enclosure Manufacture Drawings.
 - f. Panel Assembly Drawings, which include sections showing clearances between face mounted and rear mounted equipment.
 - g. PLC Component Interconnection Drawings showing organization, mounting, and interconnection of the PLC components with a Material List.
 - h. PLC Software including configuration files, logic files, and logic programming software identical to the software used to develop the Package Control System logic program.
 - i. PLC Software Documentation including fully annotated control logic programs.
 - j. Graphical Operator Interface (OIT) Software interface configuration and color screen-shots of all OIT screens.
 - k. Package Control System database including complete IO lists with addresses and field terminal numbers.
 - l. Programming Software Licenses.
 - m. Nameplate Engraving Schedules showing engraving by line, character size, and nameplate size.
 - n. Seismic Calculations for Control Panels including seismic design information and a list of equipment weighing 400 pounds or more.
 - o. Documentation of U.L. 508A control panel label.

- p. Certifications.
- q. Factory Test Schedule and Test Procedure including Test Forms.
- r. Field Test Schedule and Field Test Procedures including Test Forms.
- s. Test Reports.
- t. Elementary Drawings, Interconnection Drawings, and Loop Diagrams.
- u. Control Panel Wiring Diagrams which meets the requirements as set forth in the NFPA 79 Electrical Standards for Industrial Machinery.
- v. Calculations documenting wire fill percentage for each control panel wire way, which includes both factory wiring and field wiring.
- w. Interconnect Drawings required for coordination of the interconnection and communication between the Package Control System and the PCS as specified in this Section and other applicable Specifications.
- x. Documentation of Ethernet network hardware modules, software configuration, jumper positions, and final addressing of all nodes for all communication network interfaces to each Package Control System.
- y. Record control panel drawings, loop sheets, control system hardware bills of material, and wiring diagrams.
- z. Red-Lined and record drawings to reflect implementation of the Package Control System.
- 3. Test procedures for each testing phase as specified in this Section, Section 01660 and all other applicable Sections.
- 4. Critical interlocks that must be hard-wired to the motor control circuit shall be identified as such and submitted to the Project Representative in the form of motor elementary diagram(s).
- 5. Power requirements and space requirements for each Package Control System control panel.
- 6. Plant air (instrument air or service air) requirements for steady-state and transient conditions.
- 7. Package Control System Implementation Plan, which consists of the Contractor's project schedule, listing of key contacts, individuals authorized to make decisions for the Contractor, preferred communication methods, and a list of any potential obstacles to project success.
- 8. Documentation for the required qualifications for the vendor program manager, programmer field service technicians, and trainers as specified in this Section.
- 9. Written confirmation that the Contractor has reviewed the required minimum number of trips to the project site, the minimum duration of those trips, required for field service, testing, integration, and optimization of the Package Control System with any recommended modifications for sufficient hours and trips to meet these requirements.
- 10. Provide as-built schedules formatted like and containing exactly the same type of information as those provided in the Contract Documents:
 - a. Section 17901.
 - b. Section 17903.
 - c. Section 17905.
- 11. List of special tools required for installation, operation, and maintenance.
- 12. List of spare parts for instruments, control system hardware, and control devices as specified in this Section, other Division 17, and all other applicable Sections.
- 13. List of recommended spare parts and material for the first 365 days of system operation and all replaceable parts as specified in this Section, other Division 17, and all other applicable Sections. The list shall cross-reference the manufacturer's spare parts list and include total cost for all recommended spare parts and unit costs for replaceable parts.
- 14. Operation and Maintenance Information per Section 01730.

1.04 WORK BY OTHERS

- A. Environmental conditioning of the Electrical Room.
- B. Plant Network Panel and Network Panel components required to support the Ethernet network interface between each Package Control System and the PCS.

- C. In general, vendor package equipment, valves, instrumentation, and connections are shown on the Process and Instrumentation Diagrams. Items to be provided by the vendor are identified on these drawings by a box and a key note or an asterisk. Installation and interconnection of Package Equipment components (e.g., control panels, control stations, valves, instrumentation, and field devices) will be provided by the Contractor. Installation and interconnection between Package Equipment and electrical power, service air, instrument air, other control panels, control stations, and network panels, which are not provided by the vendor, shall also be provided by the Contractor.
- D. Process data is to be logged and stored for long-term trending in King County's process data historian. The configuration of the process data historian will be provided by others.

1.05 ENVIRONMENTAL CONDITIONS

- A. The environmental conditions for which Package Control System components are to be rated as indicated in the Drawings.

PART 2 PRODUCTS

2.01 PACKAGE CONTROL SYSTEM EQUIPMENT

- A. Package Control System components specified in this and other Sections shall be provided along with any ancillary or incidental equipment or devices, whether identified or not, that are required to support the control, monitoring, protection, and full functionality of the of the Package Equipment through the Package Control System control panel interface and the PCS.

2.02 GENERAL

- A. Complete assembly shall meet all the requirements of the National Fire Protection Associating (NFPA), National Electrical Manufacturer's Associating (NEMA), all applicable state and local codes, and the requirements of Division 16 and Division 17.
- B. Markups of Drawings and Specifications as required reflect the implementation of the Package Control System.
- C. Critical interlocks shall not be derived from analog instruments, but shall be provided by discrete switches that are hard-wired directly to the motor control circuit. Critical interlocks shall not be dependent upon a network connection. These interlocks are to be identified as such and submitted to the Project Representative in the form of motor elementary diagram(s).
- D. Retain all alarms locally until they are manually reset through the PCS HMI.
- E. Provide control and communications capabilities to restart the package control system and the package system equipment as required after loss of power in coordination with and as commanded by the PCS.

2.03 PERFORMANCE REQUIREMENTS

- A. System Integration: Each Package Control System shall include manual and automatic control of all package system process equipment and support supervisory control from the PCS.

2.04 CONTROL PANEL

- A. Provide the Package Control System control panels as listed in the applicable Package Equipment Specifications in accordance with the Drawings, Section 17110, Section 17130 and all applicable Sections.

2.05 PROGRAMMABLE LOGIC CONTROLLERS

A. Reference Section 17800:

1. The equipment requirements may be substituted with the Alternate Programmable Logic Controller equipment specified below.

B. Alternate Programmable Logic Controller - General Requirements:

1. Design and configure the PLC in compliance with the latest revision of the King County "PLC and OIT Installation and Programming Guidelines Manual". Document supplied by Project Representative.
2. Include all hardware required to provide a complete and operable PLC.
3. All hardware shall be fully compatible with the software that is to operate on the hardware.
4. Provide components from the same manufacturer, model, part number and revision for any specified component.
5. Provide products that have integral communications capability compatible with the PLC equipment specified in Section 17800 and the existing Off-Site SCADA (Emerson Ovation DCS) System.
6. All programs shall be written in Ladder Logic. The use of programming techniques other than approved program languages is prohibited without prior written approval by King County.
7. PLC Failure Relay: Provide one Relay Output module in each PLC System to provide a hard-wired indication of PLC failure.
 - a. Locate the relay output card so that it is powered by the same power supply that powers the CPU module.
 - b. Program the PLC and configure the Relay Output module so that the PLC failure relay is normally energized and shall de-energize on detection of:
 - 1) PLC Major Fault.
 - 2) PLC Power Failure.
 - c. Error detection shall include all diagnostics available in the PLC and custom error detection programming as required.
8. Wire spare I/O to control panel field interface terminals.

C. Alternate Programmable Logic Controller - Equipment:

1. The PLC shall be an Allen-Bradley (Rockwell) CompactLogix PLC. No substitutes will be accepted. Provide all appurtenant hardware required to support the installation, operation and maintenance of the PLC.
2. Products:

Item	Model	Description
CPS	1769	Power Supply
CPU	1769-L32E	Central Processing Unit
AI	1769-IFB	8 Point Analog Input
AO	1769-0FBC	8 point Analog Output
DI	1769-IA16	16 Point 120 VAC Input
DO	1769-0W8I	8 point 120 VAC Isolated Output
DO	1769-0A16	16 point 120 VAC Output
DO	1769-0W16	16 point 120 VAC Isolated Output
DI	1769-IQ16	Discrete Input, 24 VDC
DO	1769-0B16	Discrete Output, 24 VDC
DO	1769-0W16	Discrete Output, Relay

3. Provide the quantity of PLC equipment required to meet the Specifications. Install the individual I/O cards, and wiring interfaces per PLC manufacturer requirements.

D. Alternate Programmable Logic Controller - Remote I/O Rack Communications:

1. Remote I/O racks which communicate with the local CPU rack shall utilize ControlNet communications protocol.

2. Provide a coaxial backbone for the ControlNet network with interface modules as required to provide noise-free and reliable network communications.
- E. Programming Software:
1. Rockwell Automation RSLogix 5000 Enterprise Edition Programming Software.
 - a. King County approved version.
 - 1) Obtain approved version information from the Project Representative.
 - 2) No substitution.
- F. Spare Parts:
1. Provide at least 10 percent installed spare I/O points (minimum 1) of each of the following types:
 - a. Analog Inputs (4-20 mA).
 - b. Analog Outputs (4-20 mA).
 - c. Discrete Inputs (120 VAC and/or 24VDC, as required).
 - d. Discrete Outputs (120 VAC, 24 VDC, and/or Relay Outputs, as required).
 2. Spare PLC components:
 - a. Power supply: 1 each type supplied.
 - b. PLC processor: 1.
 - c. Communications module: 1 each type supplied.
 - d. I/O modules: 1 each type supplied.
 - e. Cable connectors: 2 each type supplied.
- G. The PLC shall be fully programmed to provide the functionality specified in the Package Equipment specification, the applicable Division 17 control strategies, and adhere to the County programming standards, Section 17802, and other applicable Sections.

2.06 OPERATOR INTERFACES

- A. Where specified by the Package Equipment Specification for which the Package Equipment Control System is being provided, the Package System control panel shall be provided with a panel-mounted operator interface terminals (OIT) per Section 17801 and other applicable Sections.
- B. The OIT shall include graphics for dynamic representation of the process equipment being controlled, equipment status, control, alarms, alarm logs, trends, and reports in accordance with the Package Equipment Sections, Division 17, and the Drawings.
- C. The OIT shall be an Allen-Bradley (Rockwell) PanelView Plus OIT as specified in Section 17801. No substitutes will be accepted.

2.07 FIELDBUS NETWORKS (NOT USED)

2.08 ETHERNET NETWORK

- A. An Ethernet network interface module for connection between each Package Control System PLC and the PCS, through the Plant PLC Network shall be provided.
- B. Ethernet interface shall use the Ethernet/IP protocol, shall be compatible with and integrated with the PCS, and shall communicate all vendor system hard-wire and virtual points including measured process variables, derived parameters, statuses, alarms, setpoints, and process control functionality.
- C. Provide Ethernet network interface per the Drawings and all applicable Sections.
- D. Ethernet addressing will be assigned by the Project Representative.

2.09 LOCAL CONTROL STATIONS

- A. Provide the Package Control System Local Control Stations as listed in the applicable Package Equipment Sections.
- B. Local Control Stations are to be provided for Package Equipment as part of the Package Control System. Each Local Control Stations will be provided with pushbuttons, selector switches, and indicating lights as indicated on the drawings along with any additional pilot devices as required or recommended by the manufacturer of the Package Equipment.
- C. Local Control Stations shall meet the requirements of Section 16175, Section 17110, the Drawings, and all applicable Sections.

2.10 PLANT AIR SYSTEMS

- A. All instrument air and/or service air required for operation of pneumatic valves, gates, and instrumentation will be available from the plant-wide instrument air and/or service air distribution system. The Contractor shall provide everything required for interface and connection to plant air systems.

2.11 FIELD INSTRUMENTATION

- A. Field instrumentation required for operation of the Package Equipment shall be provided as part of the Package Equipment. All instrumentation shall be in compliance with Division 17, the Drawings, and all other applicable Sections.
- B. Field instrumentation shall be selected and calibrated as defined by the process parameters and shall operate in the 20 to 80 percent range during normal process conditions.

2.12 CONTROL VALVES

- A. Control valves and valve actuators supplied by the Contractor as part of the vendor package system shall be as specified in the appropriate valve specification (Sections 15101, 15103, 15194, 15107, 15110, 15120, and 15124), the Package Equipment specification, Section 15140, and as needed to meet the Package Equipment process application functionality and performance.

2.13 SOLENOID OPERATED VALVES

- A. Solenoid valves supplied by the Contractor as part of the Package Equipment are not included in the solenoid valve schedule in Section 15124, but shall be as specified in Section 15124, and as needed to meet the Package Equipment process application functionality and performance.

2.14 ELECTRICAL

- A. All electrical materials and installation methods shall be in compliance with Division 16.
- B. The 480VAC three-phase power required by Package Equipment is to be provided by feeder circuit breakers within Motor Control Centers (MCCs).
- C. The 120VAC single-phase control power required by Package Equipment gates, valves, and devices, shall be derived by and provided by the associated Package Control System control panel.
- D. The power required by Package Equipment instrumentation shall be provided by the associated Package Control System control panel.

- E. Components mounted on the Package Equipment shall be pre-wired to terminals on terminal strips within a single terminal box which encloses the required terminations for connection of Package Equipment wiring to field wiring. The terminal box shall be located on or near the Package Equipment. Separate terminal strips shall be provided for power, control, and signal wiring. All terminals and terminal strips shall be labeled. All wiring shall be labeled at both ends of each conductor. All Terminal boxes shall enclose and have adequate provisions to support the number and type of control, signal, and power conductors and raceway interfaces as required by the Drawings and Specifications.

2.15 MOTOR STARTERS AND VARIABLE FREQUENCY DRIVES (NOT USED)

2.16 FIRE ALARM SYSTEM

- A. If fire monitoring of Package Equipment is required, the required interface shall be coordinated with the Fire Alarm System (Section 16660), provided as part of the Package Control System, and hard-wired to the fire alarm system.

2.17 SPARE PARTS

- A. Procedures: Section 01750.
- B. Furnish the following spare parts:
 - 1. One set of new and unused special tools required for installation, operation, and maintenance.
 - 2. Spare parts part for instruments, control system hardware, and control devices as specified in this Section, other Division 17, and all other applicable Sections.
- C. Identify all recommended spare parts and material for the first 365 days of system operation and all replaceable parts in the form of a list which cross-references the manufacturer's spare parts list and includes total cost for all recommended spare parts and unit costs for replaceable parts.

PART 3 EXECUTION

3.01 ASSEMBLY

- A. Components, including terminal blocks, termination units, power supplies, cables, wiring, and instruments, shall be tagged per the correct designations as required to make a complete and operational control system as specified within this and other applicable Sections.

3.02 INSTALLATION

- A. Contractor shall install the Package Control System in accordance with vendor's instructions and recommendations.
- B. The vendor shall inspect the Package Control System installation including IO subsystems, data communications systems, hardware configuration, all addressing and switch/jumper settings, and shall approve and certify the completed installation is complete and meets the vendor's requirements.
- C. The Contractor shall monitor all system diagnostic indicators and certify that the system performance meets or exceeds the vendor's published specifications for the package system.
- D. Contractor shall resolve all installation fault or trouble conditions to the satisfaction of the Project Representative after a thorough investigation. Contractor shall document the problem, the actions taken and the solution.

3.03 QUALITY CONTROL

- A. General: The following requirements are in addition to the field quality control requirements specified in Package Equipment Specification for which the Package Control System is being provided.
- B. On-site Installation, Component and System Testing, Commissioning and Training: Qualified vendor personnel shall supervise Contractor activities during installation, functional testing, quality control, quality assurance, and inspection.
- C. Calibration: Following installation of Package Equipment, Contractor shall field calibrate all instruments where possible, including pressure transmitters, process analyzers, flow meters, and switches. Instruments that cannot be field calibrated shall be factory calibrated and supplied with manufacturers calibration certifications. Accuracy shall be checked in the field. Calibrations shall be traceable and stamped as specified in the instrument Specification.

3.04 TESTING

- A. In addition to specified testing, perform all testing for the Package Control System which is consistent with the manufacturer's most current quality assurance program.
- B. Perform all testing specified in this Section, Sections 01660 and 17000, and all other applicable Sections for each Package Control System. Include test plans for a step-by-step procedure with expected results that demonstrate the required integrated Package Control System and PCS functionality as required by Section 17500. General and the following specific Package Equipment control strategies as applicable:
 - 1. Section 17533.
- C. Factory Tests:
 - 1. The Package Control System shall be inspected and tested at the factory before being shipped. The Engineer reserves the right to be present during the factory testing. The Project Representative and the Engineer shall be notified at least 42 days prior to the estimated test date and 21 days prior to the scheduled test date.
 - 2. The integration of Package Control System IO and Network interface with the PCS shall be simulated and tested to the degree possible at the factory.
 - 3. The Contractor shall demonstrate all hardware and software integration and functionality for approval of the Project Representative.
 - 4. Upon completion of the package system factory testing and acceptance of the system by the Project Representative as specified in Section 17000, ship the tested hardware and software from the factory to the Site.
- D. Component Test:
 - 1. The integration of Package Control System IO and Network interface with the PCS shall be jointly simulated and tested by the Vendor and Contractor.
 - 2. The Vendor and Contractor shall jointly demonstrate all hardware and software integration and functionality for approval of the Project Representative.
 - 3. Once written certification of proper installation has been issued, Contractor shall coordinate with the Project Representative to perform component testing of the package control system in conjunction with the preliminary testing of the process equipment.
 - 4. 5. Contractor shall complete all control system component testing for each Package Control System using a reviewed and accepted Component Testing Plan and Component Testing Forms to the satisfaction of the Project Representative and acceptance by the Project Representative, prior to commencing with system testing.

- E. System Test: Following completion of component test including correction of any deficiencies or problems discovered, the Contractor and the Project Representative shall conduct the system test for each Package Control System using a reviewed and accepted System Testing Plan and System Testing Forms. Notice of satisfactory completion of the system test shall be issued upon acceptance and approval of the Project Representative.
- F. Commissioning:
 - 1. Provide the services of experienced and skilled instrument technicians, under direct on-site supervision of the electrical or control system professional engineer, for point by point, loop by loop, unit process by unit process, Package Control System by Package Control System, commissioning of the full Preliminary Treatment Control Systems.
 - 2. Provide the services of a qualified technician on call around the clock (24 hours per day), to assist the Project Representative during Package Control System commissioning.

3.05 SERVICES

- A. Provide manufacturer's services in accordance with Section 01660 and as described herein.
- B. In addition to the minimum on-site time necessary to complete the requirements established elsewhere within these specifications provide qualified individuals to perform the following during construction and testing:
 - 1. Direct work during unloading of control system equipment and components on-site.
 - 2. Program, install, test, start-up, and commission the vendor-supplied package control system.
 - 3. Vendor's on-site manager shall attend:
 - a. One-half day (4-hour) site meeting with the Contractor and Project Representative prior to package system start-up.
 - b. One-half day (4-hour) review of the Package Control System performance and operation 270 days after the Package Equipment has been formally accepted by the Project Representative to identify and correct any problems and to make modifications to fully optimize the package system performance, prior to the expiration of the warranty period specified herein. Service time spent remedying control system equipment deficiencies or problems shall not be chargeable toward this review period.
- C. On-site services do not include travel time to and from the construction Site.
- D. If the required minimum trips and durations are insufficient in the opinion of the Contractor, the Contractor shall indicate the required amount and provided this information in the submittal.
- E. Provide formal operations and maintenance training on each type of Package Control System. Training schedule shall be submitted for approval prior to commencement of training. Conduct each training session twice, on consecutive weeks to accommodate the shift schedules of operation and maintenance staff. Provide each course participant with a complete and customized reference and training manual based on the configured Package Control System supplied and implemented. Provide an electronic copy, in MS Word format, of the reference and training manual to the Project Representative.
- F. Provide a minimum of 40 hours of telephone support for a period of one year following completion of the performance testing.

END OF SECTION

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SECTION 17800

PROGRAMMABLE LOGIC CONTROLLERS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the Programmable Logic Controller (PLC) hardware, programming software and system configuration requirements.
 - 1. Each PLC system shall consist of a PLC and input/output module system complete as per the Drawings.
 - 2. Each PLC system shall receive inputs and transmit output to circuits and components as indicated in the Drawings.
 - 3. Each PLC system shall be programmable in industrial standard relay ladder logic symbols and be delivered fully programmed for the functions required as per Section 17802.
 - 4. Each PLC system shall be delivered fully configured to process bi-directional communication with a SCADA host as per Section 17803.
- B. Section Work includes:
 - 1. Coordinating installation of the PLC equipment installed under this Contract with the existing communication network, the existing SCADA system, and other existing elements of the facility control system.
 - 2. Provide a complete and functional PLC system communicating with the existing SCADA system.
 - 3. Control system startup, testing and commissioning as defined in Section 01660 and Section 17804.
 - 4. Coordinating the Work defined by this Section with other work defined under this Contract.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revisions of the following documents. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
NEMA ICS 1	General Standards for Industrial Controls and Systems
NEMA ICS 1.1	Safety Guidelines for the Application of Industrial Control Systems
NFPA 70	National Electrical Code (NEC)
King County	PLC and OIT Installation and Programming Requirements (Latest version - Obtain from Project Representative)

- B. Listing: Equipment shall be listed for the purpose for which it is used by UL, FM or CSA.

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Manufacturer's catalog information.
- C. Shop drawings and dimensions of PLC System components and back panels.
- D. PLC interconnection drawings: Organization, mounting, and interconnection of the PLC system components with a material list.

- E. Wiring diagrams: Connections of the PLC System to new and existing equipment.
- F. Software submittals: per Section 17802.
- G. Testing submittals: per Sections 01660 and 17804.
- H. Operation and Maintenance information: per Section 01730.

1.04 DESIGN REQUIREMENTS

- A. Each PLC system shall consist of one PLC Central Processing Unit (CPU) and one or more I/O chassis populated with I/O modules as indicated in the Drawings. PLC systems shall be mounted in the control panels as shown.
- B. Each PLC system shall receive inputs and transmit output to circuits and components as shown.
- C. Each PLC system shall be programmed in industry standard relay ladder symbols and shall be delivered fully programmed for the functions required as per Section 17802 and the King County PLC Installation and Programming Guidelines Manual.
- D. Each PLC system shall be fully configured to process bi-directional serial communications with an external SCADA computer as per Section 17803.
- E. Power Supply Requirements: Each PLC I/O rack shall contain a power supply to provide DC power necessary for the CPU, and/or input and output modules. Power shall be from 100 to 130 volts AC, 60 Hz source.
- F. Environmental Requirements:
 - 1. Temperature: 10C to 60C (50 degrees F to 140 degrees F).
 - 2. Humidity: 0 to 95%, non-condensing.
 - 3. Altitude: 0 to 500 feet (0 to 150 m) above Sea Level.

PART 2 PRODUCTS

2.01 PLC HARDWARE

- A. Provide PLC Systems, complete, in accordance with the Contract Documents.
 - 1. Include all hardware required to provide a complete and operable PLC.
 - 2. Ensure hardware is fully compatible with the software that is to operate on the hardware.
 - 3. Provide components from the same manufacturer, model, part number and revision for any specified component.
 - 4. Provide products compatible with existing equipment and the existing SCADA System.
 - 5. Acceptable Manufacturers:
 - a. Allen-Bradley ControlLogix
 - b. No Substitutions.
- B. Programmable Logic Controller Equipment:
 - 1. Provide all appurtenant hardware required to support the installation, operation and maintenance of the PLC.
 - 2. Products:
 - a. The following products have been approved as sole source to be used in this Contract. Provide PLC system components selected from the following list. All equipment provided shall be manufactured by the Allen-Bradley division of Rockwell Automation. No Substitutions.

2.02 EQUIPMENT LIST

Item	Description	Allen-Bradley Model No.
PLC Chassis	13 and 17-slot PLC chassis	1756-A13 and 1756-A17
PS	Power Supply	1756-PA72
CPU	Processor Card	1756-L72
AI	Analog Input	1756-IF8
AO	Analog Output	1756-OF8
DI-120	Discrete Input, 120 VAC	1756-IA16
RO	Discrete Output, Relay	1756-OX8I
CN	ControlNet Interface	1756-CNB (See Section 17803)
EN	Ethernet I/P Interface	1756-EN2T (See Section 17803)
MB	Modbus Serial Interface	Prosoft MVI56E-MCM
MBTCP	Modbus TCP Interface	MVI56E-MNETC

- A. Provide the quantity of PLC equipment required to meet the Specifications. Install the individual I/O cards, wiring arm connectors, wire and cable, and terminal blocks as indicated in the Drawings.
- B. Rack Communications: Provide Allen-Bradley Model 1756-CNB ControlNet interface modules to communicate with the I/O subsystem racks as specified in Section 17803. Provide communications between the PLC and the I/O subsystem racks utilizing Allen-Bradley ControlNet protocol.
- C. Wire spare I/O on installed cards to terminal blocks.
- D. Provide PLC slot covers in all empty slots.

2.03 PROGRAMMING SOFTWARE

- A. Utilize software for programming the Allen-Bradley PLC as specified in Section 17802.
- B. Utilize software for programming operator interface as specified in Section 17801.

2.04 PLC SYSTEM REQUIREMENTS

- A. The processor models, I/O quantities and I/O configurations shall comply with the following general control requirements:
 - 1. PLC CPUs shall not be required to be redundant.
 - 2. Removal of any single I/O card shall not affect pumps or other critical equipment.
 - 3. Failure of any single I/O card shall not affect pumps or other critical equipment.
 - 4. Each station shall have an Operator Interface System as described in Sections 17801 and 17810 for displaying and modifying specific PLC program parameters.
 - 5. All programs loaded into the Allen-Bradley PLCs shall comply with Section 17802 and shall be written in Ladder Logic or other approved program languages. Use of programming techniques other than approved program languages is prohibited without prior written authorization by King County.
- B. Apply the requirements of the latest version of the King County PLC and OIT Installation and Programming Requirements Manual to all parts of the contract that involve PLC based control systems.
 - 1. Manual provided by the Project Representative.
- C. PLC Failure Relay:
 - 1. Provide at least one Relay Output module in each PLC System to provide a hard-wired indication of PLC failure. Locate the relay output card in the rack containing the CPU module as indicated in the Drawings.

2. Program the PLC and configure the Relay Output card so that the PLC failure relay is normally energized and shall de-energize on detection of a fatal PLC error or upon PLC power failure. Fatal error detection shall include all diagnostics available in the PLC and custom error detection programming as required.
3. Submit detailed description of the PLC Fail program functions that will control the contact to the Project Representative for approval. King County may revise selection.

D. Communications Interface:

1. Provide, install and test the communications between the PLC System and the existing Off-Site SCADA system per Section 17803.
2. Coordinate addressing in PLC with the existing SCADA system.
3. Verify bi-directional data communications between the PLC System and the existing SCADA system.

E. I/O Card Connections:

1. Provide connections utilizing cables and wiring arm connectors indicated in the Drawings.
2. Provide all discrete and analog outputs with fuses, as specified. Provide terminal blocks with integral fusing as indicated in the Drawings.

F. Operator Interface Terminal System:

1. Provide an Operator Interface Panel as specified in Section 17801 and indicated in the Drawings. Install as indicated in the Drawings.
2. Utilize Programming Software: Rockwell RSView Studio ME software.

2.05 SPARE PARTS

A. Provide at least 20% spare points of the following types:

1. Analog Inputs (1-5 VDC).
2. Analog Outputs (4-20 mA).
3. Discrete Inputs (120 VAC).
4. Discrete Outputs (Relay Outputs).

2.06 REMOTE I/O SYSTEM

- A. Provide remote I/O racks which communicate with the local CPU rack via ControlNet protocol.
- B. Provide a coaxial backbone for the ControlNet network with interface modules as required to provide noise-free and reliable network communications for the network geometry indicated in the Drawings. See Section 17803 and/or 17805.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install PLC Systems complete with ladder logic programming based on control strategy narratives.
 1. Reference the control strategy listing in Section 17000.
- B. Program the PLC System[s] to provide local equipment monitoring, local equipment control and serve as an interface between the facility systems, the facility OIT system, facility SCADA system and the existing Off-Site SCADA System.

- C. Install all equipment in strict accordance with the manufacturer's recommendations. Installation requirements shall include, but are not limited to, the following:
 - 1. Maintain a minimum 6-inch vertical spacing between the bottom of the enclosure and the bottom-most PLC chassis.
 - 2. Maintain a minimum 6-inch vertical spacing between the top of the enclosure and the top-most PLC chassis.
 - 3. Maintain a minimum 6-inch vertical spacing between PLC chassis.
 - 4. Maintain a minimum 4-inch horizontal spacing between power supply and side of enclosure.
 - 5. Center wiring ducts between the PLC chassis.
 - 6. Provide a grounding wire for each PLC chassis. Connect the grounding wire between one of the chassis grounding screws and the main grounding bus of the power system. This wire shall be green and the AWG rating shall be sized to meet the fuse rating of the supply circuit.
 - 7. Ground each power supply mounted in the PLC chassis to one of the chassis grounding screws.
 - 8. Provide PLC slot covers in all empty slots in all local and remote PCL I/O racks.
- D. Provide secure temporary mounting of the PLC System during the integration phase of the Contract to ensure the PLC System is protected from damage.
- E. Install the PLC equipment in new enclosures as indicated in the Drawings.
- F. Program each Operator Interface panel for local facility monitoring and control as described in latest version of "King County PLC Installation and Programming Guidelines Manual" and in Sections 17802 and 17810.
- G. Install, configure and test the interface to the existing Off-Site SCADA system as specified in Section 17803.

3.02 FIELD QUALITY CONTROL

- A. Verify the correct program is installed in the PLC prior to connecting the PLC System to the field wiring.
- B. Inspect the installed PLC and verify that the PLC System is mounted correctly and all wire polarities and wire terminations are correct.
- C. Make final adjustments and perform preliminary check out to verify proper operation.

3.03 TESTING

- A. Perform testing as specified in Sections 01660, 17000, and 17804.

END OF SECTION

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SECTION 17801

GRAPHICAL OPERATOR INTERFACE

PART 1 GENERAL

1.01 SUMMARY

- A. This Section defines the requirements and the communications options for the Graphical Operator Interface Terminals (OIT):
 - 1. The OIT shall have an Ethernet communications interface.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following documents. These references are a part of the Section as specified and modified. In case of conflict between the requirements of the Section and that of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
NFPA 70	National Electrical Code
UL 508	Industrial Control Equipment

- B. Listing: Equipment shall be listed for the purpose for which it is used by UL, FM or CSA.

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Catalog data sheet, including layout dimensions.
- C. Local manufacturer's representative name, address, and telephone number.
- D. Software programming submittals in accordance with Sections 17802 and 17810.
- E. Operation and maintenance information: Section 01730.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Temperature: 10 degrees C to 55 deg C (50 degrees F to 130 degrees F).
- B. Humidity: 0 to 95%, non-condensing.
- C. Altitude: 0 to 500 feet above Sea Level.

PART 2 PRODUCTS

2.01 ACCEPTABLE PRODUCTS

- A. General:
 - 1. The OIT shall be a single, self-contained, panel-mounted unit capable of meeting all of the required specifications without separate external modules.
 - 2. Enclosure shall be rated NEMA-4 when installed.

- B. The OIT shall consist of the following major components:
1. Color Graphic panel - 640 x 480 pixel min. resolution - 256 colors min.
 2. Touch screen - min. 16 touch sensitive positions.
 3. Function Keypad - min. 12 function keys, 4 arrow keys.
 4. Numeric Entry Keypad - min. 0-9 (d.p.) (-) <ENTER>.
 5. Communications interfaces: Ethernet/IP (IEEE 802.3).
- C. The OIT shall utilize the following support components, provided according to the requirements of the application:
1. Programming Software.
 2. Cables and Connectors.
- D. Acceptable Manufacturer:
1. OIT shall be Rockwell Automation PanelView Plus color graphic panel with touch screen, 22-key Function keypad, and PLC communications interface as specified.
 - a. No Substitutions.
 2. Models shall be as specified below:
- | Screen size, Nominal | PLC Interface | Model No. |
|-----------------------------|---------------|-----------------|
| 15-inch diagonal (MCP Only) | Ethernet/IP | 2711P-B15C22D9P |
| 10-inch diagonal | Ethernet/IP | 2711P-B10C22D9P |
- E. Programming software: Rockwell Automation Factory Talk View Studio Machine Edition software, latest version.

2.02 POWER SUPPLY

- A. The OIT shall operate from 24 VDC (21-27 VDC) power. Power dissipation shall be less than 80 Watts. Provide one power source for each Operator Interface.
- B. A single power source shall power all OIT functions.
1. All additional voltages for communications interfaces, etc., shall be derived from this one power source.
 2. OIT shall be fused for short circuit protection.
- C. OIT shall be UL listed and/or CE certified for use in this application.

2.03 PROGRAMMABLE ACCESSORIES

- A. Programming Software:
1. Utilize software for programming, documentation, and diagnostic tools for the OIT as specified above. Software is capable of uploading and downloading programs to the OIT. Software features used for entering and editing programs includes programming utilities such as graphical "cut and paste" operations, creation and editing of graphic elements, text elements, and touch screen (if used) elements.
 2. Software enables the programmer to create display screens consisting of graphic elements, static and dynamic text displays. Software allows the linkage of status variables to colors and/or video attributes of text or graphic elements. Software has the ability to link keystrokes from the special function keypad or touch screen to the values of status variables and/or to the video attributes of text or graphical elements. Software provides the ability to display and enter numeric variables.
 3. Software has a library of pre-defined graphic elements including: push buttons, indicator lamps, bar graph displays, selector switches, numeric entry panels and dynamic messaging panels.
 4. Software has the ability to navigate to new operator display screens in a tree-shaped architecture based on special function or touch screen keystrokes.

5. Documentation features allow editing of variable names and program comments, and printing or listing to a file of:
 - a. Display screen definitions and/or screen captures.
 - b. Variable linkages, variable names and program comments.
 - c. Version number of the program, version comments, author, and date of last revision.

B. Programming Software operates under the Windows 7 and Windows 10 operating systems.

2.04 TROUBLESHOOTING

- A. The OIT module shall have built-in status checking software.
1. Errors shall be reported via error messages on the display.
 2. Recoverable errors shall be resettable from the front panel.
 3. Non-recoverable errors shall be resettable by cycling power off and on.

2.05 FACTORY TEST

- A. The factory test shall comply with the requirements of Section 17804.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Mounting:
1. The OIT's shall be mounted in control panels as indicated in the Drawings and in compliance with the manufacturer's requirements.
- B. Programming:
1. The OIT systems shall be programmed in compliance with this Section, Section 17810.
 2. The OIT systems shall be programmed in compliance with the latest version of King County PLC and OIT Installation and Programming Requirements document.
 - a. Obtain document from the Project Representative.

3.02 SYSTEM PERFORMANCE TEST

- A. The system test shall comply with the requirements of Sections 01160 17000, 17804 and 17810.

END OF SECTION

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SECTION 17802

PROGRAMMING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the requirements for programming the PLC and On-Site Operator Interface Terminal (OIT) and SCADA systems.
- B. Provide fully operational PLC Systems at each facility. The operation of the facility under PLC control and operation via the SCADA System shall be as per the Drawings and the Control Strategies listed in Section 17000.
- C. Be fully cognizant of Allen-Bradley Ladder Logic programs and include all those functions that are required to operate and monitor the facilities using the PLC.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following document. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and that of a listed document, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
King County	PLC and OIT Installation and Programming Requirements, Latest version (Provided by the Project Representative)

- B. Qualifications:
 - 1. The Contractor responsible for performing the detailed design and programming of the PLC, OIT and on-site facility SCADA systems shall have a minimum of five (5) years' experience in similar projects. Assume full responsibility for systems functionality.

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Programming development schedule.
- C. 30% Software submittal.
- D. 60% Software submittal.
- E. 90% Software submittal.
- F. Software submittal review meeting minutes.
- G. Operational test programs.
- H. Operational programs for O&M manual
- I. Software revision tracking reports.

- J. Software Submittals.
 - 1. All software submittals shall be provided in the following formats:
 - a. RSLogix 5000 and FactoryTalk View Studio electronic format.
 - b. Portable Document Format (pdf).
 - 2. All portions of PLC, facility OIT and facility SCADA systems programs shall be submitted to Project Representative for review.
 - a. Submitting just the ladder logic program on electronic media will not be accepted.

1.04 PROGRAMMING SOFTWARE

- A. Utilize "Rockwell Automation" RSLogix 5000 Standard Edition PLC Programming Software, King County approved version - No substitutions.
- B. Utilize "Rockwell Automation" FactoryTalk View Studio OIT and SCADA Programming Software, King County approved version – No substitutions.

1.05 DOCUMENTATION

- A. Provide complete documentation of all programs.
 - 1. Utilize all of the available documentation services available through the RSLogix and FactoryTalk View Studio Programming Software.
 - 2. All application programs shall be fully commented.
 - 3. Program databases shall be fully expanded and shall include a comments field.
- B. All PLC programs shall be fully documented.
 - 1. Include references to drawings, original rung comments and requirements defined in the King County's latest "PLC and OIT Installation and Programming Requirements" document.

1.06 PROGRAMMING LANGUAGE

- A. King County has standardized on Ladder Logic language for programming the PLC.
 - 1. All programs shall utilize Ladder Logic language and RSLogix 5000 programming software.
 - 2. Sequential Function Charts may only be used with written permission from the Project Representative.
 - 3. Function Block Language may only be used with written Permission from the Project Representative.
 - 4. Structured text language shall not be used.
- B. Time spent by the Contractor to correct programming that is not compliant with the programming software and programming language defined in this Section will be at the Contractor's expense and shall not affect the project schedule or milestone dates.

1.07 SOFTWARE REVISIONS

- A. Provide a formal revision tracking procedure for all software being submitted and delivered to the Project Representative.
 - 1. The revision tracking procedure shall contain information necessary to:
 - a. Track all changes.
 - b. Ensure revisions are properly tested, documented, and incorporated into the final program.
 - 2. The revision tracking procedure shall:
 - a. Track submitted programs.
 - b. Reference Project Representative's comments.
 - c. Show date program was saved.
 - d. Date of all revisions.
 - e. Reference to material used for the program revisions.

- B. The revision tracking procedure shall ensure that only fully tested, fully documented and properly revised software is loaded into the PLC for delivery.
- C. Submit the software tracking report with each software submittal.

1.08 ON-SITE FACILITY OIT AND SCADA COMMUNICATIONS

- A. The PLC system shall communicate with the Facility OIT System and the Facility SCADA system using Ethernet communications. See Section 17803 for specific communication requirements.

1.09 OFF-SITE SCADA COMMUNICATIONS

- A. The PCS shall communicate with the existing West Point Off-Site SCADA system using Ethernet communications. See Section 17803 for specific communication requirements.
- B. All PLC input/output (I/O) points and operational data shall be formatted for transmission to the existing West Point Off-Site SCADA system whether they are utilized or not.
- C. Organize the SCADA registers as defined in King County's latest "PLC and OIT Installation and Programming Requirements" document.
 - 1. Coordinate data addresses with the Project Representative.

1.10 METROTEL SCADA COMMUNICATIONS

- A. The PCS shall communicate with the existing West Point Metrotel SCADA system using serial RS-232 communications over leased telephone lines and modems. See Section 17803 for specific communication requirements.
- B. All Metrotel PLC input/output (I/O) points and operational data shall be formatted for transmission to the existing West Point Metrotel SCADA system whether they are utilized or not.
- C. Organize the SCADA registers as defined in King County's latest "PLC and OIT Installation and Programming Requirements" document.
 - 1. Coordinate data addresses with the Project Representative.

1.11 SOFTWARE FUNCTIONS

- A. Provide common functions and software structures among programs for the facilities.
 - 1. Reference Section 17500.
- B. Provide PLC programs capable of performing the following functions at a minimum:
 - 1. Analog input processing and conversion to engineering units.
 - 2. Discrete input processing for alarms and interlocks.
 - 3. Discrete output processing for Alarm generation to local annunciators and other equipment.
 - 4. Treatment system sequence of operation control.
 - 5. Pump Sequence selection (Lead, 1st Follow, 2nd Follow, etc.).
 - 6. Pump Start/Stop and Speed control.
 - 7. Proportional + Integral + Derivative (PID) control algorithm processing, with setpoints entered locally or transmitted from the SCADA system.
 - 8. Analog Output processing for control loop outputs.
 - 9. Real-time clock for scheduling of control functions and tasks.
 - 10. Display of process data on Operator Interfaces.
- C. Provide Operator Interface Terminal programming that allows adjustment of loop setpoints, timer and counter presets, and loop tuning parameters.
 - 1. Reference Section 17810.

- D. Provide On-Site Facility SCADA programming that emulates the graphic displays, data monitoring and alarm display functions of the Facility OIT system.
 - 1. The Facility SCADA system shall be configured as a "Monitor Only" system.
 - 2. Configure the Facility SCADA system to historically log:
 - a. All facility analog I/O signals.
 - b. All treatment process setpoints.
 - c. All PID loop tuning parameters.
 - d. All treatment process equipment On/Off or Open/Close status.

PART 2 PRODUCTS

2.01 PROGRAMS

- A. Provide fully functioning programs that are without error, do not perform abnormal stops or actions, and is fully documented.

2.02 OIT PROGRAM DEVELOPMENT

- A. Provide a minimum of six types of OIT display screens for each facility, including the following:
 - 1. Facility Overview.
 - 2. System Overview & Equipment Status Graphic screens.
 - 3. Setpoint and Data Entry screen(s).
 - 4. Alarm History screen, with time/date stamp.
 - 5. Control Mode & Equipment Status Screen(s) (Discrete and Analog Variables).
 - 6. Maintenance screen(s) (password protected).
- B. The OIT systems shall include sufficient screens to provide full control of the GWWTS.
 - 1. Coordinate with the Project Representative to ensure the requirement of full-control are provided.
 - 2. OIT graphic displays shall include both text and simple graphical representations of the facility. Refer to Appendix D of King County's latest "PLC and OIT Installation and Programming Requirements" document for structure of screen displays and color standards.
 - 3. Reference Section 17810.

2.03 PLC PROGRAM DEVELOPMENT

- A. Submit a schedule showing program development tasks including milestones. The schedule shall include the following steps as a minimum:
 - 1. Preliminary Software Submittal (30%).
 - 2. Intermediate Software Submittal (60%).
 - 3. Operational Software Submittal (90%).
 - 4. Final Software Submittal (100%) with O&M manuals.
 - 5. A software development coordination meeting shall be conducted after the submission of each software development submittal.
- B. Submit a Preliminary Software Submittal (30%) including:
 - 1. Detailed database and program structure information:
 - 2. Variables List and I/O configuration printouts: Shows organization of memory usage.
 - 3. Complete List of Tags and Descriptors for I/O points, internal variables, and SCADA communications data.
 - 4. Key to program sections in the long comments of the Main Task.
 - 5. Program Block diagram - with keyed long comments on Sub-tasks and Routines.
 - 6. List of proposed display screens for Operator Interface panel and sketches of layout for display screens.
 - 7. Submit in electronic media format compatible with Microsoft Word/Excel 2003®.

8. Develop basic program organization, structure and documentation, including block diagram, using the "PLC and OIT Installation and Programming Requirements document", latest version.
 9. Draft Functional Descriptions.
- C. Submit an Intermediate Software Submittal (60%) including draft coding all of the following items:
1. Discrete Alarms and Interlocks.
 2. Analog inputs and alarms.
 3. PID loops.
 4. Equipment sequencing and control logic.
 5. Runtime accumulators and flow integrators.
 6. SCADA Interface logic.
 7. Watchdog timer and Facility controls failover logic.
 8. Power-fail and Power-on restart logic.
 9. Draft of Operator Interface Terminal and Facility SCADA display screens.
 10. 100% Functional Descriptions.
- D. Submit program and documentation when 90% complete. Documentation shall be in accordance with this Section and include:
1. Final draft of the PLC programs, OIT configuration and Facility SCADA configuration.
 2. Proposed test plan for Factory Acceptance Test of PLC program and Operator Interface graphics in electronic media.
- E. Review the facility programming in meetings with the Project Representative after each software development submittal. Prepare and submit minutes of meetings that documents the meeting, the answers provided by the Contractor to the Project Representative's questions, and all decisions reached pertaining to program development.
- F. Incorporate revisions and submit Operational Test programs.
- G. Submit programs and documentation incorporating modifications from Operational Testing as part of O&M manuals.

2.04 PLC PROGRAM DOCUMENTATION

- A. Program documentation shall be in accordance with King County's PLC Installation and Programming Guidelines Manual.
- B. Provide complete descriptors for all elements used in the programs. This includes:
1. Inputs.
 2. Outputs.
 3. Coils.
 4. Contacts.
 5. Tasks and Routines.
 6. Data Structures.
 7. Tables and Arrays.
 8. Sections.
- C. Fully utilize all descriptor fields provided by the programming software, including:
1. Tags and Aliases.
 2. Descriptions.
 3. Comments.
 4. Titles.
- D. Provide clear and concise tags for all active components within a rung of logic. Tags shall be descriptive in nature. Provide narrative in Rung, Task, and Routine comments fields for complex rungs of logic or where the function is not readily understood without clarification.

- E. Use cross-references. Label all coils with descriptive tag names. Label rungs according to function and equipment tag name. Label all input contacts with the equipment tag name.
- F. Programs shall be fully documented and an electronic copy shall be provided to the Project Representative as a submittal demonstrating compliance to the full documentation requirements. Electronic copy shall include:
 - 1. Log Book of revisions and their authors.
 - 2. Tags.
 - 3. Descriptors.
 - 4. Program, Task and Routine Comments.
 - 5. Titles.
 - 6. CPU Memory Configuration.
 - 7. I/O Rack configuration.
 - 8. Communications Interface Configurations.
 - 9. Listing of Data structures and ASCII message tables.

PART 3 EXECUTION

3.01 PROGRAM INSTALLATION

- A. Install the application program as defined in Section 17800.
- B. Edits by the Contractor to software installed in a PLC operating a facility shall comply with the following:
 - 1. Coordinate the changes, edits or reloading of the programs with the Project Representative. Make changes to the program to correct deficiencies or incorrect operation.
 - 2. The Project Representative shall approve all changes before loading the program into the control system device.
 - 3. The Project Representative shall be present at the facility when changes are downloaded to the control system device.
 - 4. All programming changes shall be downloaded locally at the control system device.
 - 5. Install electrical equipment or devices together with all required interconnections.
 - 6. All documentation, drawings, copies of the program and narratives shall be revised by the Contractor to reflect the edits to the program.

3.02 PROGRAM TESTING

- A. Test programs in accordance with Section 01660 and 17804.

3.03 TRAINING

- A. Provide twenty-four (24) hours of training for the County's personnel on all aspects of design, operation and maintenance of the PLC and Operator interface applications programs. Conduct each training session twice, on consecutive weeks, to accommodate the shift schedules of operation and maintenance staff.
- B. Provide training at a County facility specified by the Project Representative at a time mutually agreed between the Contractor and the Project Representative.
- C. Notify the Project Representative at least two weeks prior of the proposed training date.
- D. Complete forms 01660-B and 01660-C included in Section 01999 at the end of Startup and Training. Submit the forms to the Project Representative for approval.

END OF SECTION

SECTION 17803

COMMUNICATIONS INTERFACES

PART 1 GENERAL

1.01 SUMMARY

- A. This Section defines the requirements for the network communications systems and interfaces associated with the GWWTS.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 LISTING AND LABELING

- A. Communication equipment and material shall be listed and labeled for the purpose for which it is used by Underwriters Laboratories, Factory Mutual, CSA, or equivalent nationally recognized testing laboratory.
 - 1. The installation of a communications device within a control panel shall not void the control panels UL508A or UL698A labeling.

1.04 SUBMITTALS

- A. Procedures: Section 01300.
- B. Product Data sheets and catalog cuts.
- C. Communications drawing per this Section.
- D. Operation and Maintenance information per Section 01730.

1.05 OFF-SITE SCADA INTERFACES

- A. The GWWTS PLC systems shall communicate information to the following existing remote SCADA systems located at the West Point WWTP.
 - 1. Metrotel SCADA system.
 - 2. Off-Site SCADA system.
- B. The County will provide the computer hardware, operating system software and modify the configuration of the existing Metrotel and Off-Site SCADA computer systems to incorporate the new GWWTS functions.
- C. Be responsible for the following:
 - 1. Coordination with County staff regarding data parameters to be communicated between the GWWTS PLC systems and the existing SCADA systems.
 - 2. Programming of all GWWTS PLC systems to provide data to the existing SCADA systems.
 - 3. Installation of the new Metrotel and Off-Site SCADA workstations.
 - 4. Testing, in coordination with County staff, of all data parameters communicated to the existing SCADA systems.
- D. The County will be responsible for ordering all required telecommunications circuits from the local utility.
 - 1. The Project Representative will provide the required information acquired from the telecommunications utility to the Contractor.
 - 2. Incorporate the information provided into drawing(s).

1.06 DRAWINGS

- A. Provide drawings and schematics diagrams showing:
 - 1. All connections.
 - 2. All junction boxes.
 - 3. All communication cables, including spares.
 - 4. Associated circuit ID information for each connection from the telecommunications utility.
 - 5. Show how a component is connected to other unit components or systems.
 - 6. Show how systems or units are connected to each other.
 - 7. In each case, every conductor and terminal shall be identified.
- B. The County will be responsible for ordering all required telecommunications circuits from the local utility.
 - 1. The Project Representative will provide information acquired from the telecommunications utility during construction.
 - 2. The Contractor shall incorporate the information into drawing(s) showing components as defined above.
- C. The communication drawings shall contain information commencing with the telecommunication utility demarcation point to the connection to each end device in the GWWTS.

PART 2 PRODUCTS

2.01 SERIAL COMMUNICATION INTERFACES

- A. Communications systems shall use dedicated leased telephone circuits using Bell 202 compatible modems.
 - 1. Georgetown Regulator Off-Site SCADA.
 - 2. Georgetown Regulator to Brandon Regulator communications.
 - 3. Georgetown Regulator to Michigan Regulator communications.
- B. County Furnished Equipment:
 - 1. Modems.
 - 2. Surge suppression device.
 - a. Install, configure and test the County furnished equipment.
- C. Provide the following components:
 - 1. SCADA Interface modules: Prosoft Model MVI56E-MCM, No Substitutions.
 - 2. RS-232 compatible cables with appropriate connectors, to connect from the serial port on the PLC Interface to the modem.
 - 3. The cable and conduit required to connect the modem to the telecommunications utility demarcation point.
 - a. The distance between the modem and the demarcation point shall be determined for each station, but shall not be more than fifty cable feet from the PLC.
 - 4. Internal four-wire telephone cable with a RJ-11 plugs to connect from the TEL LINE socket on the modem to the telecommunication utility demarcation panel.

2.02 CONTROLNET NETWORK DEVICES

- A. Provide ControlNet interface modules: Allen-Bradley model 1756-CNB, No Substitutions.
- B. Provide for the connection of the remote I/O racks and one future local device to the ControlNet Network interface on the PLC.

- C. The remote I/O rack(s) shall be the first device(s) on the ControlNet Network, followed by the future device.
 - 1. The I/O rack(s) shall be permanently connected to the PLC.
 - 2. The future device shall be considered to be temporary.
 - a. The network connection shall be configured for easy insertion and removal of its network cable connector.
 - b. The network cable extending to the future device shall be not more than fifty feet and it shall not be necessary to disconnect the permanent ControlNet devices to connect or use the future device.
- D. Provide ControlNet backbone cables, network taps, and terminators as required to meet the network requirements.

2.03 ETHERNET NETWORKS AND DEVICES

- A. Ethernet/IP Interfaces:
 - 1. PLC Communications: Each PLC system shall be connected to the facility control system network through a PLC rack mounted Ethernet/IP communications module.
 - a. Allen-Bradley, model 1756-EN2T, No Substitutions.
 - 2. Device Level Ring Communications:
 - a. Four device level rings shall be installed within the GWWTS.
 - b. Each ring network shall use fiber-optic media.
 - c. Each drop location in each ring network shall include an Ethernet/IP tap device.
 - 1) Allen-Bradley, model 1783-ETAP2F, No Substitutions.
 - 2) Each ETAP shall be connected to an Ethernet switch for local network communications distribution.
 - d. The four ring networks shall be patched together through an Ethernet switch installed in the center section of the Main Control Panel, PNL854881.
- B. Modbus/TCP Interfaces:
 - 1. Power Meter Communications: Each PLC system shall be connected to facility power meters through a PLC rack mounted Modbus/TCP communications module.
 - a. Prosoft, model MVI56E-MNET, No Substitutions.
- C. Provide for the connection of all required local drop devices to the Ethernet Network.
- D. Provide Ethernet cables, and 10/100 Mb Ethernet switches, as required, to meet network requirements.
 - 1. Each network switch shall have a minimum of 2 unused ports after network installation.
- E. A 16-port Un-managed 10/100 Mb Ethernet switch as required to meet the above specifications.
 - 1. Ethernet Switch:
 - a. Protocols: IEEE-802.3, 802.3u, 802.3x, 802.1D, latest.
 - b. Line: 10BaseT/100BaseT, Full- or half-duplex, auto-generated.
 - c. Ports:
 - 1) 10/100BaseTX: Sixteen (16) RJ-45 Copper Ports.
 - 2) ESD and surge protection on all ports.
 - 3) Auto Sensing 10/100BaseTX, Duplex, and MDIX.
 - d. Environmental:
 - 1) Temperature: -40°C to 70°C Operating temperature.
 - 2) Humidity: 5%-95% RH, non-condensing.
 - e. Power: 10-30 VDC (Regulated), Input Current (max): 520mA max. @24VDC.
 - f. Regulatory Approvals:
 - 1) FCC Title 47, Part 15, Subpart B - Class A.
 - 2) UL listed, ANSI/ISA-12.12.01-2007, Class I, Div 2, Groups A, B, C, and D.

- g. Acceptable Manufacturers:
 - 1) N-tron model 516TX.
 - 2) Hirschmann RS20.
 - 3) Approved Equal.

PART 3 EXECUTION

3.01 COMMUNICATIONS INSTALLATION

- A. Metrotel Networks:
 - 1. Install the telephone cable within the Georgetown Regulator electrical building. The telephone service panel shall be within 50 feet of Metrotel panel, PNL854282. Extend the telephone cable from the telephone service panel to PLN854282.
 - 2. Install the telephone cable within the GWWTS Operations and Maintenance building (Facility 900). The telephone service panel shall be within 50 feet of Metrotel panel, PNL854982. Extend the telephone cable from the telephone service panel to PLN854982.
 - 3. Test the communications between the Metrotel panels and the existing Metrotel SCADA system.
 - a. Verify proper communications before commencing the tests associated with installation at the facility.
 - b. Reference Section 17804.
- B. Serial Communications Systems:
 - 1. Included Communication Systems:
 - a. Georgetown Regulator to Off-Site SCADA communications.
 - b. Georgetown Regulator to Brandon Regulator communications.
 - c. Georgetown Regulator to Michigan Regulator communications.
 - 2. Install the telephone cables and connections at each facility.
 - a. The telephone service panel shall be within 50 feet of each facility PLC panel.
 - b. Extend the telephone cable from the telephone service panel to each facility PLC panel.
 - 3. Test the communications between each paired system.
 - a. Verify proper communications of each connection before commencing the tests associated with the installation at each facility.
 - b. Reference Section 17804.
- C. Install the ControlNet network cables, taps, and terminators to connect all ControlNet devices as specified above. Configure and test the ControlNet connection to all devices in accordance with Section 17804.
- D. Install the Ethernet/IP network cables and an Ethernet switches to connect all Ethernet/IP devices as specified above. Configure and test the Ethernet/IP connection to all devices in accordance with Section 17804.

END OF SECTION

SECTION 17804

PLC TESTING

PART 1 GENERAL

1.01 SUMMARY

- A. All PLC installations shall be tested in accordance with the requirements of this Section.
- B. Demonstrate that each PLC system has fully tested during development and installation and is a functioning, integrated, reliable, control system as defined in the Contract Document.
- C. Conduct a comprehensive series of tests.
 - 1. Tests shall be witnessed by the Project Representative.
- D. Provide tests for all equipment and software.
 - 1. If equipment or software does not have specific tests defined in the Contract, develop testing procedures.
 - 2. All software and all equipment related to the PLC shall be tested.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Test Schedules: Per this Section and Section 01660.
- C. Test Plans: Per this Section and Section 01660.
- D. Test Documentation: Per this Section and Section 01660.

1.04 DOCUMENTATION

- A. Provide complete documentation of all tests as defined in this Section.

PART 2 PRODUCTS

2.01 TEST PLANS AND REPORTS

- A. Prepare and submit for review and approval:
 - 1. Factory Acceptance Test Plan and procedures.
 - 2. Site Acceptance Test Plan and procedures.
 - 3. Test Schedules.
 - 4. Test Reports.
 - 5. PLC program documentation.
- B. Prepare and document the following test plans:
 - 1. Factory Acceptance Test.
 - 2. Site Acceptance Test.

- C. The test procedures shall be a formal submittal delivered to the project representative for review.
 - 1. Testing shall not be conducted without a test plan that has been reviewed and accepted by the Project Representative.
- D. Structure the test procedures in a step-by-step, building block manner with checkpoints at critical steps. The procedures shall facilitate the reporting of test results and the re-creation of error conditions.
- E. Test data sheets shall be used to record applicable drawing numbers, test equipment, discrepancies, corrective action(s) required, and test data. Data entries shall be referenced to the applicable procedures and allowable limits for each entry shall be indicated on the data sheets.
- F. Develop, maintain, and update Test Reports of all test results and conditions that were recorded during the course of the testing. The test results shall include:
 - 1. Identification of test being conducted.
 - 2. Applicable drawing numbers.
 - 3. Applicable control strategy.
 - 4. Operating setpoints.
 - 5. Date and time of test; Tester name, Witness name.
 - 6. Prerequisite tests and demonstrations.
 - 7. Brief statement of test objective(s) and scope.
 - 8. Brief test description.
 - 9. List of test and monitoring equipment required to perform test.
 - 10. Test results.
 - 11. List of test deficiencies and their resolutions.
 - 12. Retesting requirements (if required).
 - 13. Failure events.
 - 14. Contractor's certification (as applicable).

PART 3 EXECUTION

3.01 FACTORY ACCEPTANCE TEST

- A. Factory Acceptance Test (FAT) and verification for all deliverable equipment, programs, and associated documentation shall be performed prior to shipment of the system to the site.
 - 1. The tests shall verify:
 - a. Control panels and associated PLC equipment is manufactured and assembled in accordance with the Contract Documents.
 - b. Systems operate as designed, and is in compliance with the contractual requirements.
 - 2. The tests shall verify that the software and hardware meet the functional and performance requirements of the project.
- B. The Factory Acceptance Test shall include the following test and verification activities:
 - 1. System Configuration Verification:
 - a. Prior to beginning of the Factory Acceptance testing, the system shall be subjected to system deliverable configuration verification.
 - b. A copy of the configuration and record of quantities of part numbers shall to be included in the Factory Acceptance Test Report.
 - c. No equipment replacement or substitutions shall be permitted without approval of the Project Representative.
 - 2. Equipment Inspection:
 - a. All hardware enclosures shall be inspected to verify that the equipment is assembled in accordance with the Contract Documents.
 - 1) Equipment installation and arrangement.
 - 2) Mounting configuration.

- 3) Structural integrity.
- 4) Equipment finish.
- 5) Paint finish.
- 6) Dimensions.
3. Wiring Inspections:
 - a. Wire in terminal blocks, including correct connection and labeling, wiring installation and wire stripping.
 - b. Cable runs, including correct connection and labeling, supports, routing, shielding, wire-way design, and terminal security.
 - c. Fuse and breakers for correct rating and placement.
 - d. Grounding strips, including layout, cables, connection security, and correct size.
4. PLC Installation Inspections:
 - a. I/O card wiring support.
 - b. I/O rack clearances.
 - c. I/O and equipment labeling.
 - d. I/O card type verification.
 - e. I/O card layout.
 - f. Power supply mounting.
 - g. Power cable routing.
 - h. Data cable routing.
5. Functional Test: Exercise all specified control system functions.
 - a. Stage and interconnect the Facility OIT system, Facility SCADA system, Metrotel workstation and Off-Site SCADA workstation at the testing site.
 - b. Demonstrate all PLC inputs through the facility OIT and Facility SCADA systems.
 - c. Demonstrate all PLC outputs to control panel field terminals using a multi-meter.
 - d. Demonstrate analog input and analog output accuracy.
 - e. Test all facility OIT and Facility SCADA system functions.
 - f. Demonstrate all control system software functions to verify they result in the correct sequence of operation through the PLC.
 - g. Simulate PLC communication error conditions and demonstrate error detection and handling.
 - h. Demonstrate PLC power supply failure and recovery.
 - i. Demonstrate correct calculation of totalized quantities.
 - j. Demonstrate proper operation of all application programs and control strategies.
 - 1) Provide simulation methods to demonstrate responses of equipment not connected to the PLC systems.
- C. The Project Representative will witness the Factory Acceptance Test. Inform the Project Representative at least 30 days prior to the Factory Acceptance Test.
- D. Equipment shall be shipped to the site only after the Factory Acceptance Test has been completed and accepted by the Project Representative.

3.02 SYSTEM TEST PHASE - SITE ACCEPTANCE TESTING

- A. System Test: Demonstrate the following:
 1. Conformance with system configuration Drawings.
 2. Proper connection and labeling of field wiring.
 3. Analog Inputs: Calibrated monitoring of all analog inputs.
 4. Control Outputs: Exercise each facility component through PLC control outputs (valve, motor, etc.) and demonstrate PLC or manual control and correct status indication on the Facility OIT system, Metrotel system and SCADA systems.
 5. Status Inputs: Exercise each individual facility system component connected to the PLCs (motors, valves, etc.) and demonstrate correct status indication on the Facility OIT system, Metrotel system and SCADA systems.
 6. Alarm Inputs: Exercise each alarm input to the PLCs from the field device and demonstrate correct indication on the Facility OIT system, Metrotel system, and SCADA systems.

7. Alarm Outputs: Exercise each alarm output from the PLCs and demonstrate correct indication on Annunciators, Facility OIT system, Metrotel system and SCADA systems.
 8. Computed Alarms: Demonstrate computed alarms in the PLCs and correct indication on Facility OIT system, Metrotel system and SCADA systems.
- B. Operational Test: Following accepted System Testing, conduct stepwise testing of all specified hardware and software control functions.
1. Tests shall be conducted using the installed control system.
 - a. Provide simulation for devices that cannot be operated during each test.
 2. PLC Automatic control as specified in the Control Strategies.
 3. Hard-wired control functions.
 4. PLC / SCADA communications failure and recovery.
 5. PLC controlled systems shutdown and re-start on Utility Power Failure.
 6. PLC Major and Minor Error detection and reporting.
 7. Manual and automatic operation of PID loops.
 8. Stability and tuning of PID loops.
 9. Password-protected adjustment of operation setpoints and PID loop tuning parameters from Facility OIT System.
 - a. Reference Section 17810.

END OF SECTION

SECTION 17805

OPTICAL FIBER CABLES

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies optical fiber cables used for signal, and communications circuits.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following documents. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
NFPA 70	National Electrical Code (NEC).
ICEA S-104-696	Indoor-Outdoor Optical Fiber Cable
IEEE	Qualifying Class 1E Electric Cables and Field Splices for Nuclear Power Generating Stations
ISO 9001	Quality Management Systems – Requirements
QF TL 9000	Quality Management Systems
NFPA 262	Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces
TIA/EIA-598-B	Optical Fiber Cable Color Coding
TIA/EIA 604-2	FOCIS-2 Fiber Optic Connector Intermateability Standard, Type ST
TIA/EIA 604-3	FOCIS-3 Fiber Optic Connector Intermateability Standard, Type SC and SC-APC
TIA/EIA 604-1	FOCIS-12 Fiber Optic Connector Intermateability Standard, Type MT-RJ

- B. Qualifications:

1. Installer:
 - a. Certified by the Fiber Optic Association and Building Industry Consulting Services International.
 - b. Minimum of three years of experience in similar installations in compliance with TIA 568-C.3.
 - c. Minimum of three consecutive years recent experience with all aspects of the fiber optic cable system as specified, including the installation of cable and testing of fiber optics and the installation and testing of all components.
 - d. Minimum of three projects with installation and testing of no less than 5,000 feet of continuous fiber optic cable.
2. Manufacturer:
 - a. Cable:
 - 1) ISO 9001 or QF TL 9000 registered, whichever applies to the material.
 - 2) Minimum of 20 years manufacturing optical fiber cable.
 - b. Housing: ISO 9001 or QF TL 9000 registered.
 - c. Connector:
 - 1) ISO 9001 or QF TL 9000 registered.
 - 2) Minimum 10-year history of manufacturing and supporting connector technology that does not require epoxy or polishing in field.
 - d. Jumper Cable: ISO 9001 and QF TL 9000 registered.
3. Tester:
 - a. Minimum of three years with projects utilizing fiber optic cable in compliance with TIA 568-C.3.

- b. Technician:
 - 1) Successfully completed training program, which includes testing with an Optical Time Domain Reflectometer (OTDR).
 - 2) Certificate of completion of training issued by one of the following organizations.
 - a) Manufacturer of fiber optic cable and fiber optic connectors.
 - b) Manufacturer of test equipment used for field certification.

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Qualifications.
- C. Layout drawing for fiber optic cable, conduit, and handholes.
- D. Product data:
 - 1. Fiber optic cable.
 - 2. Mounting hardware.
 - 3. Testing equipment.
- E. Written procedures outlining the steps and methods that shall be used for the various tests the cable shall undergo during and after installation. Include a sample copy of each test form to be used in the test procedure.

PART 2 PRODUCTS

2.01 GENERAL

- A. Provide connectors/couplings, splicing enclosures, mounting hardware, and miscellaneous accessories for fibers by same manufacturer.
- B. Optical fiber cables shall be marked and listed for the application required.
- C. Optical fiber cable Specification Sheets (FIBERSPEC): General requirements for fibers and cables specified.

2.02 FIBER OPTIC CABLE

- A. General:
 - 1. Flame-retardant, UV-resistant outer jacket material.
 - 2. Each fiber individually color coded per manufacturer's standard.
 - 3. Operating temperature: -40°C to 70°C.
 - 4. Maximum tensile strength: Short term 300 lbf and long term 90 lbf.
 - 5. Cable and fiber manufacturer shall be the same company.
 - 6. Optic fiber cable Specification Sheets (FIBERSPEC) included in this Section: Provide Cable System SM.
- B. Single Fiber cable:
 - 1. For interconnections within panels and enclosures.
 - 2. Terminated as required by utilization equipment.
 - 3. Maximum length: 10 m (33 ft.).
 - 4. Unless otherwise indicated, provide in accordance with FIBERSPEC "MM62.5".

- C. Optical Multi-fiber Cable:
 - 1. Used for communication between enclosures within a facility routed in cable tray.
 - 2. Approvals and Listings: NEC, OFNP, CSA FT-6.
 - 3. The construction, type, number, and size of optical fibers shall be as specified.
 - 4. Unless otherwise indicated, provide optical multifiber cable in accordance with FIBERSPEC "MM62.5".
- D. Optical Fiber Trunk Cables:
 - 1. Used for communication between buildings within a facility or between facilities.
 - 2. Unless otherwise indicated, optical fiber trunk cables shall be optical multifiber cables in accordance with FIBERPEC "MM62.5".

2.03 COLOR CODING AND TAGGING

- A. Communication fibers: Communications fiber color coding shall be manufacturer's standard.
- B. Multi-fiber cable colors shall be manufacturer's standard.
- C. Tag at terminations and in pull boxes and handholes.

2.04 CONNECTORS AND BREAKOUT KITS

- A. Connectors:
 - 1. General:
 - a. Comply with TIA/EIA 604-2, TIA/EIA 604-3, TIA/EIA 504-12, and TIA 568-C.3.
 - b. Type ST, SC and LC connectors.
 - c. Pull Strength: 0.04 lbf minimum.
 - d. Durability: Sustain minimum 500 mating cycles without violating other requirements.
 - 1) Ferrules: Free-floating low loss ceramic.
 - 2) Polarizing key on duplex connector systems.
 - e. Attenuation:
 - 1) In accordance with TIA 568-C.3.
 - 2) Maximum of 0.75 dB per connector pair.
 - 2. Connectors shall be tool-affixed and listed for the specific application as recommended by the utilization equipment manufacturer.
 - 3. Acceptable manufacturers:
 - a. Siemens.
 - b. Corning.
 - c. Amp.
 - d. Amphenol.
 - e. Approved Equal.
- B. Breakout Kits:
 - 1. Heat-shrinkable, polymeric insulating material over the connection area and a high dielectric strength mastic to seal the ends against ingress of moisture and contamination.
 - 2. Accommodate a range of cable sizes for both in-line and stub-type configurations.
 - 3. Independent of cable manufacturer's tolerances.
 - 4. Acceptable manufacturers:
 - a. Belden.
 - b. Alpha.
 - c. Approved Equal.

2.05 SEPARATELY MOUNTED ENCLOSURE (IF REQUIRED)

- A. Function: Provides physical and visual protection of fiber optic patch panel.
- B. Features:
 - 1. Enclosure Type: NEMA 4.
 - 2. Materials: Steel.
 - 3. Metal thickness: 16 gauge, minimum.
 - 4. Door:
 - a. Rubber gasketed with continuous hinge.
 - b. Stainless steel lockable quick-release clamps.
 - 5. Minimum size: 16-inch (H) x 12-inch (W) x 6-inch (D).
 - 6. Manufacturers:
 - a. Hoffman Pentair.
 - b. Corning.
 - c. H.F. Cox.
 - d. Approved Equal.

2.06 FIBER OPTIC PATCH PANEL

- B. DIN rail-mounted patch panel:
 - 1. Function: Provides secure place to terminate fiber optic cables.
 - 2. Features:
 - a. Connectors: 6SC duplex connectors for single mode applications.
 - b. Size: Maximum 1.97 IN by 5.04 IN by 5.22 IN.
 - c. Construction: Power-coated steel sheet.
 - d. Mountings: Suitable for DIN rail mounting.
 - 3. Acceptable Manufacturers:
 - a. METZ-Connect, 15024S10S-E (Housing) and 1502AC206-D (Front Cover).
 - b. Corning: SPH-01P (Housing) and CCH-CP-12-59 (Panel).
 - c. Approved Equal.

2.07 PATCH CORDS

- A. General:
 - 1. In accordance with TIA 568-C.3.
 - 2. Function: Connect fiber centers to network nodes.
 - 3. Fiber Characteristics: In accordance with requirements for fiber optic cable.
 - 4. Cable configuration:
 - a. Individual tight bugged thermoplastic, fibers single, top match fibers being jumpered on.
 - b. Protected with Kevlar strength members and enclosed in thermoplastic jacket.
 - 5. Length: Standard, to meet requirements shown.
 - 6. Connectors:
 - a. As required by application.
 - b. On-axial Pull Strength: 7.42 lbf.
 - c. Normal-to-Axial Pull Strength: 4.95 lbf.
 - 7. Cable Rating: OFNR or OFNP.
 - 8. Color: Per manufacturer's standards.
 - 9. Measured for insertion loss with the following values for each conductor.
 - a. Typical of 0.3 dB and maximum of 0.5 dB (LC typical of 0.1 dB and maximum of 0.3 dB).

2.08 CONDUIT AND INNER-DUCT

- A. Section 16110.

2.09 ACCESSORIES

- A. Hardware: Provide cable clamps, strain reliefs, blocking and grommet kits, closures, and fan outs for complete installation.

PART 3 EXECUTION

3.01 GENERAL

- A. Identify each optical fiber at each terminal to which it is connected. The marking system shall comply with Section 17000.
- B. Cable Pulling:
 - 1. Complete the pulling of optical fiber cable into conduit or trays without damaging or putting undue stress on the cable insulation.
 - 2. Soapstone, talc or UL listed pulling compounds are acceptable lubricants for pulling optical fiber cable.
 - 3. Grease is not acceptable.
 - 4. Raceway construction shall be complete, cleaned, and protected from the weather before cable is placed.
- C. Whenever a cable leaves a raceway, provide a cable support.

3.02 CABLE INSTALLATION

- A. Install cable in accordance with the manufacturer's recommendations at locations indicated in the Drawings.
- B. Do not allow cable to be bent or twisted into a radius less than 13 inches or to the limit recommended by the manufacturer.
- C. Provide bull wheels, blocks, split wheels, cable feeders, and necessary equipment required to provide a clean and safe operation.
- D. Install fiber optic cable in conduit as indicated in the Drawings.

3.03 CABLE TERMINATIONS

- A. In accordance with TIA 568-C.3.
- B. Fan out fiber cable to allow direct connectorization of connectors.
 - 1. Sleeve over individual fibers with transparent furcation tubes.
 - 2. At point of convergence of furcation tubes, provide strain relief with metal or high density plastic fan-out collar.
- C. Breakout Kits:
 - 1. Terminate cables using manufacturer supplied breakout kits.
 - 2. Terminate in accordance with manufacturer's recommendations.
- D. Slack:
 - 1. Fiber Centers, Hubs, and Switches: Minimum, 3-meter slack fiber at each end, coiled neatly in cable management equipment.
 - 2. Communications Management Outlets: Minimum, 1-meter slack fiber, coiled neatly in outlet box.

- E. Connectors:
 - 1. Terminate 100 percent fibers in each cable to specified connector.
 - 2. Connect into fiber management system.

3.04 FIBER OPTIC PATCH PANELS

- A. Install securely in main control panels or enclosures as indicated in the Drawings.

3.05 CABLE DRESSING

- A. Lacing and Bundling:
 - 1. Lace and bundle individual optical fiber cables in panels and electrical equipment at intervals not greater than 6 inches, spread into trees and connected to their respective terminals.
 - 2. Lacing shall be made up with plastic cable ties.
 - 3. Lacing is not necessary in plastic panel wiring duct.
 - 4. Bundle individual optical fiber cables crossing hinges into groups not exceeding eight fibers and arrange so that they will be protected from chafing when the hinged member is moved.
- B. Slack:
 - 1. Provide slack in junction and pull boxes and handholes.
 - 2. Slack shall be sufficient to allow cables to be routed along the walls of the box.
 - 3. Amount of slack shall be equal to largest dimension of the box.
 - 4. Where plastic panel wiring duct is provided for wire runs, lacing is not required.
 - 5. Do not use plastic panel wiring duct in handholes.
- C. Individual Fibers:
 - 1. Break out individual fibers from multi-fiber cables utilizing Breakout Kits as specified by cable manufacturer.
 - 2. Terminate individual fibers with connectors as required by the utilization equipment
 - 3. Install connectors using manufacturer's recommended tools.
- D. Unless otherwise indicated, bond armoring of multi-fiber cables to the chassis ground bus at the control panel or per NEC at other locations. Provide terminals for running grounding wires through junction boxes.
- E. Install and terminate cable in compliance with the manufacturer's recommendations.

3.06 SPLICE LOCATIONS

- A. Splice locations shall not be planned. If they are needed, they are only permitted at transitions (i.e., handholes) as approved by the Project Representative.

3.07 CABLE DAMAGE DURING INSTALLATION

- A. If a cable becomes damaged during installation, notify the Project Representative immediately.
- B. A cable is considered damaged based on exceeding the manufacturer's recommended maximum pull force, failure of OTDR test, or excessive nicking, deformation, or kinking to the cable jacket.
- C. If any cable is considered damaged or failed, install a new fiber optic cable.

3.08 SCHEDULES

- A. Optical fiber cables are scheduled in the Conduit and Cable Schedules.

3.09 FIELD QUALITY CONTROL

- A. Field tests shall be performed on each fiber at each location of the testing.
- B. Test all fibers for breaks, abnormalities, and overall attenuation characteristics to ensure that the dB loss is in conformance with the requirements specified herein.
- C. Optical Time Domain Reflectometer (OTDR) Testing:
 - 1. Perform an end-to-end OTDR trace for each fiber at both 1310 and 1550 nm wavelengths, using the proper index of refraction for that fiber. These traces shall identify the total optical length. An average optical attenuation measurement (dB) shall be made for each fiber at both 1310 and 1550 nm wavelengths with the OTDR. Testing shall be conducted from both ends of the fiber.
 - 2. As a minimum, each cable shall be tested at the following stages of construction:
 - a. After delivery to the site, but before start of installation. Any cable delivered containing fiber that does not meet the minimum dB loss specified herein shall be rejected and replaced.
 - b. Within ten days of Substantial Completion. Any fiber that does not meet the minimum dB loss specified herein or shows macro or micro bend damage shall be reported to the Project Representative. Any cable with failed fibers shall be considered damaged and shall be replaced.

3.10 OPTICAL FIBER SPECIFICATION SHEETS (FIBERSPEC)

- A. General:
 - 1. Optical fiber cable types for different locations, service conditions and raceway systems are specified on individual specification sheets (FIBERSPECS).
 - 2. Install scheduled and unscheduled optical fiber cables in accordance with the FIBERSPECS.
- B. FIBERSPEC SHEETS: FIBERSPEC sheets follow.

3.11 OPTICAL FIBER SPECIFICATION SHEET-FIBERSPEC

Cable System Identification:	MM62.5 - SM
Description:	Single-mode (OS2) optical fiber cable, single or multiple fiber construction.
Optical Fiber Material:	<ul style="list-style-type: none">1. Glass, graded index, 62.5 µm fiber, 250 µm color-coded fibers, and polyethylene outer jacket.2. Attenuation: 0.4 dB/km max. at 1310 nm, 0.4 dB/km max. at 1383 nm, and 0.3 dB/km max. at 1550 nm.3. Bandwidth: 100 MHz-km min.4. Fiber Count: 6.
Buffer tubing:	6 fibers per tube.
Assembly:	Fully waterblocked loose tube all-dielectric gel-free design; rugged, durable and easy to strip while providing superior protection against UV radiation, fungus, abrasion and environmental factors.
Jacket:	<ul style="list-style-type: none">1. Water-swellable dielectric strength members.2. Outer Jacket: Flame-Retardant, UV-Resistant; black.
Flame Rating:	Plenum (OFNP).
Manufacturer(s):	Corning FREEDM LST TM Loose Tube, Gel-Free Cable, 6 F, Single-mode (OS2), All-Dielectric Construction; Belden or Approved Equal.
Uses Permitted:	Aerial, direct buried, duct, general purpose horizontal, vertical riser, plenum.

Cable System Identification: MM62.5 - SM	
Execution:	
Installation:	Install in accordance with this Section.
Testing:	Test in accordance with this Section.

END OF SECTION

SECTION 17810

OIT INTEGRATION

PART 1 GENERAL

1.01 SUMMARY

- A. This Section defines the requirements for integrating the Package System Vendors supplied OIT units with the Facility OIT System provided by the Contractor.
- B. Integration of Package System Vendors OIT applications into the Contractor supplied Facility OIT System application is a critical component of this project. The goal of the integrated Facility OIT system is to have a common OIT application installed on all facility OITs. The integrated Facility OIT System shall provide operations staff:
 - 1. Read-only access to all facility operations data from any OIT.
 - 2. Read-write access from an OIT shall be limited based upon requirements defined in this Section.
- C. Be responsible for implementing and coordinating the integration of Package System Vendor's supplied OIT system applications into the Facility OIT System application. The Package System Vendors shall be responsible for coordination with the Contractor and installation of the integrated Facility OIT System application into their supplied OITs.

1.02 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following document. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
King County	PLC and OIT Installation and Programming Requirements. (Latest version)

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Facility OIT System Tag name database listing in Excel format.
 - 1. Include the following information with the tag name database listing.
 - a. Scope of OIT tag name supply:
 - 1) Package System Vendors or Contractor.
 - b. Read-write access OIT location for each tag name.
 - c. All fields required to fully define/document each tag name.
 - d. Comment field.
- C. Facility OIT System navigation structure.
 - 1. Graphic display navigation tree diagram that illustrates system navigation paths.
 - 2. Graphic display color printouts, complete with supporting dynamic functionality descriptions summarizing the functionality that doesn't appear in the printouts.
 - a. Main facility overview.
 - b. Template, symbols (library), graphic displays to be used by Package System Vendors for integration of their graphic displays.
 - c. Symbols library.
 - d. OIT navigation graphics.

- D. Facility OIT System data access plan.
 - 1. Document defining the methods to be used to restrict OIT read-write access to the local processes associated with each OIT.
- E. Facility OIT System Integration Plan.
 - 1. Document defining the process proposed to plan, execute and complete the integration of the Facility OIT System. The plan shall include:
 - a. Schedule and milestones.
 - b. Identify key resources, roles, and responsibilities.
 - c. Package System Vendors coordination activities.
 - d. Package System Vendors integration points.
- F. Testing, Commissioning and Startup Plan.
 - 1. Schedule and milestones.
 - 2. Identify key resources, roles, and responsibilities.
 - 3. Reference Section 01660.
- G. Fully annotated electronic version of PLC control programs. Annotation to include clear indication of OIT communications interface points.
- H. OIT configuration files in native format.
- I. As-built configuration, tag name database, and all other configuration and applications files developed for this project.

1.04 DEFINITIONS

- A. OIT- Operator Interface Terminal.
- B. Contractor- General Contractor.
- C. Package System Vendor- Vendors responsible for single source supply of the ballasted sedimentation and ultraviolet disinfection treatment systems, including control components and OITs.
- D. Facility OIT System- A system comprised of Package System Vendors supplied and Contractor supplied OITs.
- E. PLC- Programmable Logic Controller.

PART 2 PRODUCTS

2.01 FACILITY OIT SYSTEM TAG NAME DATABASE

- A. Develop and manage the Facility OIT System tag name database. The database shall be developed to adhere to the equipment identification tags listed in the Contract Documents and County asset management equipment identification requirements.
- B. Be responsible for integrating all Package System Vendor supplied tag names into the Facility OIT System tag name database.
 - 1. The Package System Vendors shall provide a tag name database for their OIT application that fully complies with County tag name requirements as coordinated by the Contractor.

2.02 FACILITY OIT SYSTEM INTEGRATION

- A. Each Facility OIT shall be integrated to include all system graphic displays that encapsulate all facility and Package System Vendor's functions:
 - 1. All Facility OITs shall be configured to provide read-only access to all facility operations data and alarms.
 - 2. Each Facility OIT shall be restricted to providing read-write access only for set points and control functions that are specifically associated to each OITs unit process location or scope of control supply.
 - a. Access shall require user access authentication.
 - 3. Configure three OIT graphic displays with read-write access. The displays shall be populated with County selected facility control setpoint variables.
 - a. The setpoint graphic displays shall be installed on all OITs in the Facility OIT System.
- B. Be responsible for the configuration and integration of the Facility OIT System.
 - 1. All graphic displays and associated OIT functions shall be configured in compliance with the standards and conventions defined in the PLC and OIT Installation and Programming Requirements document.
 - 2. Develop graphic display layout templates for use by the Package System Vendors.
 - a. The Package System Vendors shall develop all of their graphic displays based on the Contractor supplied templates.
 - 1) All Package System Vendor's supplied graphic displays shall be configured in compliance with the standards and conventions defined in the PLC and OIT Installation and Programming Requirements document.
 - 3. Develop OIT alarm annunciation function templates for use by the Package System Vendors.
 - a. The Package System Vendors shall develop their alarm annunciation functions based on the Contractor supplied templates.
- C. The Package System Vendors shall be responsible for providing the Contractor with their package specific OIT configuration files.
 - 1. The Package System Vendors shall be responsible for the complete and correct operation of their package OIT functions.
- D. Supply the Package System Vendors with the integrated Facility OIT System application files.
 - 1. The Package System Vendors shall be responsible for loading the Contractor supplied integrated Facility OIT System application onto their supplied OIT units.
- E. OIT manufacturer-trained programmers shall be provided by the Package System Vendors to support the Contractors Facility OIT System integration.
- F. The Facility OIT System integration shall not void nor limit any required Package System Vendor's system warranty.

PART 3 EXECUTION

3.01 TAG NAME DATABASE DEVELOPMENT

- A. The Package System Vendors shall develop and coordinate, with the Contractor, a complete tag name database for their OIT applications prior to proceeding with the final configuration of their OIT applications.
- B. All Package System Vendor's modifications to the tag name database shall be reviewed and approved by the Contractor prior to implementation.

- C. Coordinate the Facility OIT System tag name database with the Package System Vendors and the County.

3.02 TESTING, STARTUP AND COMMISSIONING

- A. Provide a completely integrated Facility OIT System application for the Package System Vendor's installations prior to startup and commissioning of the Package System Suppliers' treatment systems.
 - 1. The Package System Vendor shall perform all of their required system testing using the Contractor supplied integrated Facility OIT System application.
- B. The Package System Vendors shall provide their OIT manufacturer-trained programmer to support all testing, startup, and commissioning efforts (Their own and the Contractors).
 - 1. The Package System Vendors shall be responsible for all modifications and updates to their package OIT applications during facility testing and commissioning.
- C. The Package System Vendors shall coordinate with and provide assistance to the Contractor to resolve all problems associated with the Facility OIT System applications associated with the Facility OIT supply.

END OF SECTION

SECTION 17900

SCHEDULES

PART 1 GENERAL

1.01 SUMMARY

- A. This Section describes the purpose and content of the following schedules contained in Sections 17901 through 17905:
 - 1. Section 17901 – Instrument Schedule.
 - 2. Section 17902 – Alarm Schedule.
 - 3. Section 17903 – PLC/DCS I/O Schedule.
 - 4. Section 17904 – Metrotel Schedule.
 - 5. Section 17905 – Off-Site SCADA Signal Schedule.
- B. Information on equipment with identification numbers and other attributes which may relate to and may require coordination with items in these schedules is found in Section 11009 and in the Drawings.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

PART 2 PRODUCTS

2.01 SCHEDULES

- A. General:
 - 1. These schedules briefly describe major discrete devices required by the control system. Scheduled devices shall be provided as described in the schedules and in the referenced Specification paragraph.
 - 2. These schedules shall not be interpreted as a set of complete data sheets for the devices but only as a listing of instruments with certain salient features described. Additional elements such as power supplies, current repeaters or isolators, mounting hardware, cord sets, and other such elements as may be required by a particular vendor in order to complete the system shall be provided even though not listed. Create complete ordering information for all instruments and submit this information to the Project Representative for review prior to manufacture.
- B. Schedule column descriptions:
 - 1. Description: Defines application of the loop or identifies the type of individual instrument within the loop.
 - 2. Specification number: Numbers refer to specification requirements for new instruments which shall be provided.
 - 3. Process drawing: Numbers refer to the P&ID drawing showing the schematic locations of primary measuring elements, annunciator alarms, PLC I/O interfaces and final control devices within the process.
 - 4. Installation drawing: Numbers refer to installation details for individual field mounted instruments.
 - 5. PLC drawing: Numbers refer to PLC I/O card drawings showing the terminations of PLC I/O points.
 - 6. Instrument / Electrical drawing: Numbers refer to the instrument loop (IL) or electrical loop (EL) drawing associated with an instrument or device.

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17901
INSTRUMENT SCHEDULE

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies the instrument schedule.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 SCHEDULE

Tag	No.	Description	Range	Setpoint	Engr Units	Specification	Instr. ID	P&ID Dwg	Elec/Inst Wiring Dwg	Inst Detail Dwg / Detail	Application Notes
RG	854110	SITE IRRIGATION RAIN GAUGE	BY MFR	BY MFR	BY MFR	02810	---	---	VENDOR	---	IRRIGATION SUPPLIER
LE	854212	GT REGULATOR MICH LEVEL ELEMENT	0-15	---	FEET	17211	LBE	200-P001	200-IL212	I104 / 170322	
LIT	854212	GT REGULATOR MICH TRUNK LVL XMTR	0-15	---	FEET	17212	PDT	200-P001	200-IL212	---	
LE	854213	GT REGULATOR EBI LEVEL ELEMENT	0-15	---	FEET	17211	LBE	200-P001	200-IL213	I104 / 170322	
LIT	854213	GT REGULATOR EBI LEVEL XMTR	0-15	---	FEET	17212	PDT	200-P001	200-IL213	---	
LE	854214	GT REGULATOR DIVERSION LVL ELMNT	0-15	---	FEET	17211	LBE	200-P001	200-IL214	I103 / 170321	
LIT	854214	GT REGULATOR DIVERSION LVL XMTR	0-15	---	FEET	17212	PDT	200-P001	200-IL214	---	
PSL	854261	GT REG INST AIR LO PRESS SWITCH	0-150	<50	PSI	17216	PS	200-P002	200-I231	I104 / 170402	
PI	854261A	GT REGULATOR INST AIR PRESS IND	0-150	---	PSI	17211	PG	200-P002	---	I104 / 170402	
PI	854261B	GT REGULATOR INST AIR PRESS IND	0-150	---	PSI	17211	PG	200-P002	---	I104 / 170402	
PI	854262	GT REGULATOR SERV AIR PRESS IND	0-150	---	PSI	17211	PG	200-P003	---	I104 / 170402	
PSL	854262	GT REG SERV AIR LOW PRESS SWITCH	0-150	<50	PSI	17216	PS	200-P003	200-I231	I104 / 170402	
FSL	854221	GT REG HAZ GAS SAMPLE LOW FLOW SWITCH	BY MFR	< 3	CFH	17212	AE/AIT1	200-P004	200-IL221	I101 / 170013	
AE	854221A	GT REGULATOR LEL ELEMENT	0-100	---	PCT	17212	AE/AIT1	200-P004	200-IL221	I102 / 170101	
AIT	854221A	GT REGULATOR LEL INDICATING XMTR	0-100	---	PCT	17212	AE/AIT1	200-P004	200-IL221	I101 / 170013	
ASH	854221A	GT REGULATOR HIGH LEL SWITCH	0-100	> 10	PCT	17212	AE/AIT1	200-P004	200-IL221	I101 / 170013	
ZS	854293	GT REGULATOR DOOR SWITCH	---	---	---	17216	ZS1	200-P005	200-I231	I101 / 170015	
LE	854330	INF CHANNEL LEVEL ELEMENT	0-25	---	FEET	17211	LBE	300-P001	300-IL330	I103 / 170321	
LIT	854330	INFLUENT CHANNEL LEVEL XMTR	0-25	---	FEET	17212	PDT	300-P001	300-IL330	---	
DLIT	854341	INF SCREEN 1 DIFF LEVEL XMTR	0-20	---	FEET	17212	PDT	300-P002	300-IL341	---	

Tag	No.	Description	Range	Setpoint	Engr Units	Specification	Instr. ID	P&ID Dwg	Elec/Inst Wiring Dwg	Inst Detail Dwg / Detail	Application Notes
LE	854341	INF SCREEN 1 INLET LEVEL ELEMNT	0-25	---	FEET	17211	LBE	300-P002	300-IL341	I103 / 170321	
LE	854341	INF SCREEN 1 OUTLET LEVEL ELEMNT	0-25	---	FEET	17211	LBE	300-P002	300-IL341	I103 / 170321	
WSH	854341	INF SCREEN 1 HIGH TORQUE SWITCH	BY MFR	BY MFR	BY MFR	11260	---	300-P002	300-EL341A	---	SCREEN SUPPLIER
DLIT	854342	INF SCREEN 2 DIFF LEVEL XMTR	0-20	---	FEET	17212	PDT	300-P003	300-IL342	---	
LE	854342	INF SCREEN 2 INLET LEVEL ELEMNT	0-25	---	FEET	17211	LBE	300-P003	300-IL342	I103 / 170321	
LE	854342	INF SCREEN 2 OUTLET LEVEL ELEMNT	0-25	---	FEET	17211	LBE	300-P003	300-IL342	I103 / 170321	
WSH	854342	INF SCREEN 2 HIGH TORQUE SWITCH	BY MFR	BY MFR	BY MFR	11260	---	300-P003	300-EL342A	---	SCREEN SUPPLIER
PI	854343	SCREEN COMPACTOR 1 C2 PRESS IND	BY MFR	---	PSI	17211	PG	300-P004	---	I104 / 170402	COMPACTOR SUPPLIER
SE	854343	SCREEN COMPACTOR 1 SPD ELEMNT	BY MFR	---	RPM	11259	---	300-P004	300-EL343A	---	COMPACTOR SUPPLIER
SSL	854343	SCREEN COMPACTOR 1 LOW SPD SWITCH	BY MFR	BY MFR	RPM	11259	---	300-P004	300-EL343A	---	COMPACTOR SUPPLIER
PI	854344	SCREEN COMPACTOR 2 C2 PRESS IND	BY MFR	---	PSI	17211	PG	300-P004	---	I104 / 170402	COMPACTOR SUPPLIER
SE	854344	SCREEN COMPACTOR 2 SPD ELEMNT	BY MFR	---	RPM	11259	---	300-P004	300-EL344A	---	COMPACTOR SUPPLIER
SSL	854344	SCREEN COMPACTOR 2 LOW SPD SWITCH	BY MFR	BY MFR	RPM	11259	---	300-P004	300-EL344A	---	COMPACTOR SUPPLIER
MSH	854331	INF SAMP PMP 1 LEAK SWITCH	BY MFR	BY MFR	---	11060	---	300-P005	300-EL331	---	PUMP SUPPLIER
TSH	854331	INF SAMP PMP 1 HIGH TEMP SWITCH	BY MFR	BY MFR	---	11060	---	300-P005	300-EL331	---	PUMP SUPPLIER
MSH	854332	INF SAMP PMP 2 LEAK SWITCH	BY MFR	BY MFR	---	11060	---	300-P005	300-EL332	---	PUMP SUPPLIER
TSH	854332	INF SAMP PMP 2 HIGH TEMP SWITCH	BY MFR	BY MFR	---	11060	---	300-P005	300-EL332	---	PUMP SUPPLIER
AE	854334	INFLUENT CHANNEL PH ELEMENT	0-14	---	PH	17212	AH	300-P005	300-IL334	500-M503	
AIT	854334	INFLUENT CHANNEL PH TRANSMITTER	0-14	---	PH	17212	AH	300-P005	300-IL334	I101 / 170016	
LSL	854334	INF SAMPLE BOX LOW LEVEL SWITCH	---	---	---	17216	LFS2	300-P005	800-I825	I103 / 170313	
FSL	854345	SCREEN ROOM GAS DET AIR LOW FLOW SWITCH	BY MFR	<3	CFH	17212	AE/AIT1	300-P006	300-IL345	I101 / 170013	
AE	854345A	SCREEN ROOM LEL ELEMENT	0-100	---	PCT	17212	AE/AIT1	300-P006	300-IL345	I102 / 170101	
AI	854345A	SCREEN ROOM LEL INDICATOR	0-100	---	PCT	17212	AI/AAS	300-P006	300-IL345	I101 / 170013	
AIT	854345A	SCREEN ROOM LEL TRANSMITTER	0-100	---	PCT	17212	AE/AIT1	300-P006	300-IL345	I101 / 170013	
ASH	854345A	SCREEN ROOM HIGH LEL SWITCH	0-100	> 10	PCT	17212	AI/AAS	300-P006	300-IL345	I101 / 170013	
AE	854345B	SCREEN ROOM O2 ELEMENT	0-25	---	PCT	17212	AE/AIT3	300-P006	300-IL345	I102 / 170101	
AI	854345B	SCREEN ROOM O2 INDICATOR	0-25	---	PCT	17212	AI/AAS	300-P006	300-IL345	I101 / 170013	
AIT	854345B	SCREEN ROOM O2 TRANSMITTER	0-25	---	PCT	17212	AE/AIT3	300-P006	300-IL345	I101 / 170013	
ASL	854345B	SCREEN ROOM LOW O2 SWITCH	0-25	< 19.5	PCT	17212	AI/AAS	300-P006	300-IL345	I101 / 170013	

Tag	No.	Description	Range	Setpoint	Engr Units	Specification	Instr. ID	P&ID Dwg	Elec/Inst Wiring Dwg	Inst Detail Dwg / Detail	Application Notes
AE	854345C	SCREEN ROOM H2S ELEMENT	0-50	---	PPM	17212	AE/AIT2	300-P006	300-IL345	I102 / 170101	
AI	854345C	SCREEN ROOM H2S INDICATOR	0-50	---	PPM	17212	AI/AAS	300-P006	300-IL345	I101 / 170013	
AIT	854345C	SCREEN ROOM H2S TRANSMITTER	0-50	---	PPM	17212	AE/AIT2	300-P006	300-IL345	I101 / 170013	
ASH	854345C	SCREEN ROOM HIGH H2S SWITCH	0-50	> 5	PPM	17212	AI/AAS	300-P006	300-IL345	I101 / 170013	
A	854345D	SCREENING ROOM HAZ GAS BEACON	---	---	---	17272	---	300-P006	300-IL345A	I101 / 170013	
HRN	854345D	SCREENING ROOM HAZ GAS HORN	---	---	---	17272	---	300-P006	300-IL345A	I101 / 170013	
LS	854350	C2 AIR GAP TANK LEVEL SWITCH	BY MFR	BY MFR	INCHES	17216	LS	300-P007	VENDOR	I103 / 170322	C2 SYSTEM SUPPLIER
TSH	854351	C2 PUMP 1 HIGH TEMP SWITCH	BY MFR	BY MFR	---	11060	---	300-P007	300-EL351	---	PUMP SUPPLIER
TSH	854352	C2 PUMP 2 HIGH TEMP SWITCH	BY MFR	BY MFR	---	11060	---	300-P007	300-EL352	---	PUMP SUPPLIER
TSH	854353	C2 PUMP 3 HIGH TEMP SWITCH	BY MFR	BY MFR	---	11060	---	300-P007	300-EL353	---	PUMP SUPPLIER
TSH	854354	C2 PUMP 4 HIGH TEMP SWITCH	BY MFR	BY MFR	---	11060	---	300-P007	300-EL354	---	PUMP SUPPLIER
PI	854355	C2 SYSTEM PRESS INDICATOR	BY MFR	---	PSI	17211	PG	300-P007	---	I104 / 170402	C2 SUPPLIER
PSH	854355	C2 SYSTEM HIGH PRESS SWITCH	BY MFR	BY MFR	PSI	17216	PS	300-P007	800-I826	I104 / 170402	C2 SYSTEM SUPPLIER
PSL	854355	C2 SYSTEM LOW PRESS SWITCH	BY MFR	BY MFR	PSI	17216	PS	300-P007	800-I826	I104 / 170402	C2 SYSTEM SUPPLIER
PS	854355A	C2 PUMPS STOP PRESS SWITCH	BY MFR	BY MFR	PSI	17216	PS	300-P007	VENDOR	I104 / 170402	C2 SYSTEM SUPPLIER
PS	854355B	C2 PUMPS LEAD PRESS SWITCH	BY MFR	BY MFR	PSI	17216	PS	300-P007	VENDOR	I104 / 170402	C2 SYSTEM SUPPLIER
PS	854355C	C2 PUMPS FOLLOW 1 PRESS SWITCH	BY MFR	BY MFR	PSI	17216	PS	300-P007	VENDOR	I104 / 170402	C2 SYSTEM SUPPLIER
PS	854355D	C2 PUMPS FOLLOW 2 PRESS SWITCH	BY MFR	BY MFR	PSI	17216	PS	300-P007	VENDOR	I104 / 170402	C2 SYSTEM SUPPLIER
PS	854355E	C2 PUMPS FOLLOW 3 PRESS SWITCH	BY MFR	BY MFR	PSI	17216	PS	300-P007	VENDOR	I104 / 170402	C2 SYSTEM SUPPLIER
LE	854300A	EQUALIZATION BASIN LVL ELEMENT A	0-40	---	FEET	17211	LBE	300-P008	300-1L300	I104 / 170322	
LIT	854300A	EQUALIZATION BASIN LEVEL XMTR A	0-40	---	FEET	17212	PDT	300-P008	300-IL300	---	
LE	854300B	EQUALIZATION BASIN LVL ELEMENT B	0-40	---	FEET	17211	LBE	300-P008	300-IL300	I104 / 170322	
LIT	854300B	EQUALIZATION BASIN LEVEL XMTR B	0-40	---	FEET	17212	PDT	300-P008	300-IL300	---	
FE	854311	T1 - INF PUMP 1 FLOW ELEMNT	0-10	---	MGD	17212	FM	300-P011	300-IL311	I102 / 170206	16 INCHES
FIT	854311	T1 - INF PUMP 1 FLOW XMTR	0-10	---	MGD	17212	FM	300-P011	300-IL311	I101 / 170013	
TSH	854311	T1 - INFLUENT PUMP 1 TSH	BY MFR	BY MFR	---	11060	---	300-P011	300-EL311	---	PUMP SUPPLIER
VT	854311	T1 - INF PUMP 1 VIBRATION XMTR	MFR	MFR	MFR	17320	---	300-P011	300-EL311	---	PUMP SUPPLIER
FE	854312	T1 - INF PUMP 2 FLOW ELEMNT	0-10	---	MGD	17212	FM	300-P012	300-IL312	I102 / 170206	16 INCHES
FIT	854312	T1 - INF PUMP 2 FLOW XMTR	0-10	---	MGD	17212	FM	300-P012	300-IL312	I101 / 170013	
TSH	854312	T1 - INFLUENT PUMP 2 TSH	BY MFR	BY MFR	---	11060	---	300-P012	300-EL312	---	PUMP SUPPLIER

Tag	No.	Description	Range	Setpoint	Engr Units	Specification	Instr. ID	P&ID Dwg	Elec/Inst Wiring Dwg	Inst Detail Dwg / Detail	Application Notes
VT	854312	T1 - INF PUMP 2 VIBRATION XMTR	MFR	MFR	MFR	17320	---	300-P012	300-EL312	---	PUMP SUPPLIER
FE	854313	T1 - INF PUMP 3 FLOW ELEMNT	0-16	---	MGD	17212	FM	300-P013	300-IL313	I102 / 170206	20 INCHES
FIT	854313	T1 - INF PUMP 3 FLOW XMTR	0-16	---	MGD	17212	FM	300-P013	300-IL313	I101 / 170013	
TSH	854313	T1 - INFLUENT PUMP 3 TSH	BY MFR	BY MFR	---	11060	---	300-P013	300-EL313	---	PUMP SUPPLIER
VT	854313	T1 - INF PUMP 3 VIBRATION XMTR	MFR	MFR	MFR	17320	---	300-P013	300-EL313	---	PUMP SUPPLIER
FE	854321	T2 - INF PUMP 1 FLOW ELEMNT	0-10	---	MGD	17212	FM	300-P014	300-IL321	I102 / 170206	16 INCHES
FIT	854321	T2 - INF PUMP 1 FLOW XMTR	0-10	---	MGD	17212	FM	300-P014	300-IL321	I101 / 170013	
TSH	854321	T2 - INFLUENT PUMP 1 TSH	BY MFR	BY MFR	---	11060	---	300-P014	300-EL321	---	PUMP SUPPLIER
VT	854321	T2 - INF PUMP 1 VIBRATION XMTR	MFR	MFR	MFR	17320	---	300-P014	300-EL321	---	PUMP SUPPLIER
FE	854322	T2 - INF PUMP 2 FLOW ELEMNT	0-10	---	MGD	17212	FM	300-P015	300-IL322	I102 / 170206	16 INCHES
FIT	854322	T2 - INF PUMP 2 FLOW XMTR	0-10	---	MGD	17212	FM	300-P015	300-IL322	I101 / 170013	
TSH	854322	T2 - INFLUENT PUMP 2 TSH	BY MFR	BY MFR	---	11060	---	300-P015	300-EL322	---	PUMP SUPPLIER
VT	854322	T2 - INF PUMP 2 VIBRATION XMTR	MFR	MFR	MFR	17320	---	300-P015	300-EL322	---	PUMP SUPPLIER
FE	854323	T2 - INF PUMP 3 FLOW ELEMNT	0-16	---	MGD	17212	FM	300-P016	300-IL323	I102 / 170206	20 INCHES
FIT	854323	T2 - INF PUMP 3 FLOW XMTR	0-16	---	MGD	17212	FM	300-P016	300-IL323	I101 / 170013	
TSH	854323	T2 - INFLUENT PUMP 3 TSH	BY MFR	BY MFR	---	11060	---	300-P016	300-EL323	---	PUMP SUPPLIER
VT	854323	T2 - INF PUMP 3 VIBRATION XMTR	MFR	MFR	MFR	17320	---	300-P016	300-EL323	---	PUMP SUPPLIER
FE	854301	EQ BASIN DRAIN PUMP FLOW ELEMENT	1750	---	GPM	17212	FM	300-P017	300-IL301	I102 / 170206	6 INCHES
FIT	854301	EQ BASIN DRAIN PUMP FLOW XMTR	1750	---	GPM	17212	FM	300-P017	300-IL301	I101 / 170016	
MSH	854301	EQ BASIN DRAIN PUMP 1 LEAK SWITCH	BY MFR	BY MFR	---	11060	---	300-P017	300-EL301	---	PUMP SUPPLIER
TSH	854301	EQ BASIN DRAIN PUMP 1 MOTOR TSH	BY MFR	BY MFR	---	11060	---	300-P017	300-EL301	---	PUMP SUPPLIER
MSH	854302	EQ BASIN DRAIN PUMP 2 LEAK SWITCH	BY MFR	BY MFR	---	11060	---	300-P017	300-EL302	---	PUMP SUPPLIER
TSH	854302	EQ BASIN DRAIN PUMP 2 MOTOR TSH	BY MFR	BY MFR	---	11060	---	300-P017	300-EL302	---	PUMP SUPPLIER
FSL	854303	HAZ GAS SAMPLE PNL LOW AIR FLOW SWITCH	BY MFR	< 3	CFH	17212	AE/AIT1	300-P018	300-IL303	I101 / 17013	
FSL	854333	INF SAM ROOM HAZ GAS SAM LO FLOW	BY MFR	<3	CFH	17212	AE/AIT1	300-P018	300-IL333	I101 / 17013	
AE	854303A	EQ BASIN LEL ELEMENT	0-100	---	PCT	17212	AE/AIT1	300-P018	300-IL303	I102 / 170101	
AI	854303A	EQ BASIN LEL INDICATOR	0-100	---	PCT	17212	AI/AAS	300-P018	300-IL303	I101 / 17013	
AIT	854303A	EQ BASIN LEL INDICATING XMTR	0-100	---	PCT	17212	AE/AIT1	300-P018	300-IL303	I101 / 17013	
ASH	854303A	EQ BASIN HIGH LEL SWITCH	0-100	> 10	PCT	17212	AI/AAS	300-P018	300-IL303	I101 / 17013	
AE	854303B	EQ BASIN O2 ELEMENT	0-25	---	PCT	17212	AE/AIT3	300-P018	300-IL303	I102 / 170101	
AI	854303B	EQ BASIN O2 INDICATOR	0-25	---	PCT	17212	AI/AAS	300-P018	300-IL303	I101 / 17013	
AIT	854303B	EQ BASIN O2 INDICATING XMTR	0-25	---	PCT	17212	AE/AIT3	300-P018	300-IL303	I101 / 17013	
ASL	854303B	EQ BASIN LOW O2 SWITCH	0-25	< 19.5	PCT	17212	AI/AAS	300-P018	300-IL303	I101 / 17013	
AE	854303C	EQ BASIN H2S ELEMENT	0-50	---	PPM	17212	AE/AIT2	300-P018	300-IL303	I102 / 170101	
AI	854303C	EQ BASIN H2S INDICATOR	0-50	---	PPM	17212	AI/AAS	300-P018	300-IL303	I101 / 17013	
AIT	854303C	EQ BASIN H2S INDICATING XMTR	0-50	---	PPM	17212	AE/AIT2	300-P018	300-IL303	I101 / 17013	
ASH	854303C	EQ BASIN HIGH H2S SWITCH	0-50	> 5	PPM	17212	AI/AAS	300-P018	300-IL303	I101 / 17013	

Tag	No.	Description	Range	Setpoint	Engr Units	Specification	Instr. ID	P&ID Dwg	Elec/Inst Wiring Dwg	Inst Detail Dwg / Detail	Application Notes
AE	854333A	INF SAMPLER ROOM LEL ELEMENT	0-100	---	PCT	17212	AE/AIT1	300-P018	300-IL333	I102 / 170101	
AI	854333A	INF SAMPLER ROOM LEL INDICATOR	0-100	---	PCT	17212	AI/AAS	300-P018	300-IL333	I101 / 17013	
AIT	854333A	INF SAMPLER ROOM LEL TRANSMITTER	0-100	---	PCT	17212	AE/AIT1	300-P018	300-IL333	I101 / 17013	
ASH	854333A	INF SAMPLER ROOM HIGH LEL SWITCH	0-100	> 10	PCT	17212	AI/AAS	300-P018	300-IL333	I101 / 17013	
AE	854333B	INF SAMPLER ROOM O2 ELEMENT	0-25	---	PCT	17212	AE/AIT3	300-P018	300-IL333	I102 / 170101	
AI	854333B	INF SAMPLER ROOM O2 INDICATOR	0-25	---	PCT	17212	AI/AAS	300-P018	300-IL333	I101 / 17013	
AIT	854333B	INF SAMPLER ROOM O2 TRANSMITTER	0-25	---	PCT	17212	AE/AIT3	300-P018	300-IL333	I101 / 17013	
ASL	854333B	INF SAMPLER ROOM LOW O2 SWITCH	0-25	< 19.5	PCT	17212	AI/AAS	300-P018	300-IL333	I101 / 17013	
A	854333C	INF SAMPLE ROOM HAZ GAS BEACON	---	---	---	17272	---	300-P018	300-IL333A	I101 / 170013	
AE	854333C	INF SAMPLER ROOM H2S ELEMENT	0-50	---	PPM	17212	AE/AIT2	300-P018	300-IL333	I102 / 170101	
AI	854333C	INF SAMPLER ROOM H2S INDICATOR	0-50	---	PPM	17212	AI/AAS	300-P018	300-IL333	I101 / 17013	
AIT	854333C	INF SAMPLER ROOM H2S TRANSMITTER	0-50	---	PPM	17212	AE/AIT2	300-P018	300-IL333	I101 / 17013	
ASH	854333C	INF SAMPLER ROOM HIGH H2S SWITCH	0-50	> 5	PPM	17212	AI/AAS	300-P018	300-IL333	I101 / 17013	
HRN	854333C	INF SAMPLE ROOM HAZ GAS HORN	---	---	---	17272	---	300-P018	300-IL333A	I101 / 170013	
PI	854361	PRELIM TREAT INST AIR PRESS IND	0-150	---	PSI	17211	PG	300-P021	---	I104 / 170402	
PSL	854361	PRELIM TREAT I/A LOW PRESS SWITCH	0-150	<50	PSI	17216	PS	300-P021	800-I825	I104 / 170402	
PI	854362A	PRELIM TREAT INST AIR PRESS IND	0-150	---	PSI	17211	PG	300-P021	---	I104 / 170402	
PI	854362B	PRELIM TREAT INST AIR PRESS IND	0-150	---	PSI	17211	PG	300-P021	---	I104 / 170402	
PI	854363A	PRELIM TREAT INST AIR PRESS IND	0-150	---	PSI	17211	PG	300-P021	---	I104 / 170402	
PI	854363B	PRELIM TREAT INST AIR PRESS IND	0-150	---	PSI	17211	PG	300-P021	---	I104 / 170402	
PI	854365A	PRELIM TREAT INST AIR PRESS IND	0-150	---	PSI	17211	PG	300-P021	---	I104 / 170402	
PI	854365B	PRELIM TREAT INST AIR PRESS IND	0-150	---	PSI	17211	PG	300-P021	---	I104 / 170402	
PI	854366A	PRELIM TREAT INST AIR PRESS IND	0-150	---	PSI	17211	PG	300-P021	---	I104 / 170402	
PI	854366B	PRELIM TREAT INST AIR PRESS IND	0-150	---	PSI	17211	PG	300-P021	---	I104 / 170402	
PI	854367	EQ BASIN SERV AIR PRESS IND	0-150	---	PSI	17211	PG	300-P022	---	I104 / 170402	
FSL	854374	SCREEN ROOM SUPPLY AIR FSL	BY MFR	BY MFR	BY MFR	15835	---	300-P024	VENDOR	I101 / 170014	HVAC SUPPLIER
PDI	854374	SCREEN ROOM SUPPLY AIR FLT DPI	BY MFR	---	INCHES	15835	---	300-P024	---	I105 / 170403	HVAC SUPPLIER
TSH	854374	SCRN RM SPLY FAN MTR HI TEMP SWITCH	BY MFR	BY MFR	---	11060	---	300-P024	300-EL374	---	HVAC SUPPLIER
TIT	854374A	SCREEN ROOM AIR DUCT TEMP XMTR	BY MFR	---	DEG F	15901	---	300-P024	VENDOR	---	HVAC SUPPLIER
TIT	854374B	SCREEN ROOM TEMP XMTR	BY MFR	---	DEG F	15901	---	300-P024	VENDOR	---	HVAC SUPPLIER
PDI	854375	C2 ROOM SUPPLY AIR FILTER DPI	BY MFR	---	INCHES	15901	---	300-P025	---	I105 / 170403	HVAC SUPPLIER
TIT	854375	C2 ROOM TEMPERATURE XMTR	BY MFR	---	DEG F	15901	---	300-P025	VENDOR	---	HVAC SUPPLIER

Tag	No.	Description	Range	Setpoint	Engr Units	Specification	Instr. ID	P&ID Dwg	Elec/Inst Wiring Dwg	Inst Detail Dwg / Detail	Application Notes
ZS	854375A	C2 ROOM SUPPLY AIR DPR POS SWITCH	---	---	---	15911	---	300-P025	VENDOR	---	DAMPER SUPPLIER
ZS	854375B	C2 ROOM EXHST AIR DPR POS SWITCH	---	---	---	15911	---	300-P025	VENDOR	---	DAMPER SUPPLIER
FSL	854376	SAMPLE ROOM EXHAUST AIR FSL	BY MFR	BY MFR	BY MFR	15835	---	300-P026	VENDOR	I101 / 170014	HVAC SUPPLIER
PDI	854376	SAMPLE ROOM SUPPLY AIR FLT DPI	BY MFR	---	INCHES	15901	---	300-P026	---	I105 / 170403	HVAC SUPPLIER
PDI	854377	PNL ROOM SUPPLY AIR FILTER DPI	BY MFR	---	INCHES	15901	---	300-P027	---	I105 / 170403	HVAC SUPPLIER
TIT	854377	PNL ROOM TEMPERATURE XMTR	BY MFR	---	DEG F	15901	---	300-P027	VENDOR	---	HVAC SUPPLIER
ZS	854377A	PNL ROOM SUPPLY AIR DPR POS SWITCH	---	---	---	15911	---	300-P027	VENDOR	---	
ZS	854377B	PNL ROOM EXHST AIR DPR POS SWITCH	---	---	---	15911	---	300-P027	VENDOR	---	
LE	854411	T1 - BALL SED DIST CHNL LVL ELEM	0-10	---	FEET	17211	LBE	400-P001	400-IL411	I104 / 170322	
LIT	854411	T1 - BALL SED DIST CHNL LVL XMTR	0-10	---	FEET	17212	PDT	400-P001	400-IL411	---	
LE	854421	T2 - BALL SED DIST CHNL LVL ELEM	0-10	---	FEET	17211	LBE	400-P001	400-IL421	I104 / 170322	
LIT	854421	T2 - BALL SED DIST CHNL LVL XMTR	0-10	---	FEET	17212	PDT	400-P001	400-IL421	---	
AIT	854411	T1 - BALL SED DIST CHNL PHT XMTR	---	---	PH / NTU	11801	---	400-P002	VENDOR	I101 / 170016	KRUGER
AIT	854415	T1 - BALL SED EFF PH TRANSMITTER	---	---	PH / NTU	11801	---	400-P002	VENDOR	I101 / 170016	KRUGER
FE	854416	T1 - HYDROCYCLONE 1 FLOW ELEMENT	0-4600	---	GPM	11801	FM	400-P002	VENDOR	I102 / 170206	KRUGER
FIT	854416	T1 - HYDROCYCLONE 1 FLOW XMTR	0-4600	---	GPM	11801	FM	400-P002	VENDOR	I101 / 170016	KRUGER
PIT	854416	T1 - MICROSAND PUMP 1 PRESSURE	BY MFR	---	PSI	11801	---	400-P002	VENDOR	I104 / 170402 I101 / 170003	KRUGER
FE	854417	T1 - HYDROCYCLONE 2 FLOW ELEMENT	0-4600	---	GPM	11801	---	400-P002	VENDOR	I102 / 170206	KRUGER
FIT	854417	T1 - HYDROCYCLONE 2 FLOW XMTR	0-4600	---	GPM	11801	---	400-P002	VENDOR	I101 / 170016	KRUGER
PIT	854417	T1 - MICROSAND PUMP 2 PRESSURE	BY MFR	---	PSI	11801	---	400-P002	VENDOR	I104 / 170402 I101 / 170003	KRUGER
FE	854418	T1 - HYDROCYCLONE 3 FLOW ELEMENT	0-4600	---	GPM	11801	---	400-P002	VENDOR	I102 / 170206	KRUGER
FIT	854418	T1 - HYDROCYCLONE 3 FLOW XMTR	0-4600	---	GPM	11801	---	400-P002	VENDOR	I101 / 170016	KRUGER
PIT	854418	T1 - MICROSAND PUMP 3 PRESSURE	BY MFR	---	PSI	11801	---	400-P002	VENDOR	I104 / 170402 I101 / 170003	KRUGER
AIT	854421	T2 - BALL SED DIST CHNL PHT XMTR	---	---	PH / NTU	11801	---	400-P002	VENDOR	I101 / 170016	KRUGER
AIT	854425	T2 - BALL SED EFF PH TRANSMITTER	---	---	PH / NTU	11801	---	400-P002	VENDOR	I101 / 170016	KRUGER
FE	854426	T2 - HYDROCYCLONE 1 FLOW ELEMENT	0-4600	---	GPM	11801	---	400-P002	VENDOR	I102 / 170206	KRUGER

Tag	No.	Description	Range	Setpoint	Engr Units	Specification	Instr. ID	P&ID Dwg	Elec/Inst Wiring Dwg	Inst Detail Dwg / Detail	Application Notes
FIT	854426	T2 - HYDROCYCLONE 1 FLOW XMTR	0-4600	---	GPM	11801	---	400-P002	VENDOR	I101 / 170016	KRUGER
PIT	854426	T2 - MICROSAND PUMP 1 PRESSURE	BY MFR	---	PSI	11801	---	400-P002	VENDOR	I104 / 170402 I101 / 170003	KRUGER
FE	854427	T2 - HYDROCYCLONE 2 FLOW ELEMENT	0-4600	---	GPM	11801	---	400-P002	VENDOR	I102 / 170206	KRUGER
FIT	854427	T2 - HYDROCYCLONE 2 FLOW XMTR	0-4600	---	GPM	11801	---	400-P002	VENDOR	I101 / 170016	KRUGER
PIT	854427	T2 - MICROSAND PUMP 2 PRESSURE	BY MFR	---	PSI	11801	---	400-P002	VENDOR	I104 / 170402 I101 / 170003	KRUGER
FE	854428	T2 - HYDROCYCLONE 3 FLOW ELEMENT	0-4600	---	GPM	11801	---	400-P002	VENDOR	I102 / 170206	KRUGER
FIT	854428	T2 - HYDROCYCLONE 3 FLOW XMTR	0-4600	---	GPM	11801	---	400-P002	VENDOR	I101 / 170016	KRUGER
PIT	854428	T2 - MICROSAND PUMP 3 PRESSURE	BY MFR	---	PSI	11801	---	400-P002	VENDOR	I104 / 170402 I101 / 170003	KRUGER
FE	854441	T1 - COAG FEED PUMP FLOW ELMNT	0-88	---	GPM	11801	---	400-P002	VENDOR	I102 / 170206	KRUGER
FIT	854441	T1 - COAG FEED PUMP FLOW XMTR	0-88	---	GPM	11801	---	400-P002	VENDOR	I101 / 170013	KRUGER
PI	854441	T1 - COAG FEED PUMP 1 PRESS IND	BY MFR	---	PSI	11801	---	400-P002	---	I104 / 170402	KRUGER
PI	854442	T1 - COAG FEED PUMP 2 PRESS IND	BY MFR	---	PSI	11801	---	400-P002	---	I104 / 170402	KRUGER
FE	854443	T2 - COAG FEED PUMP FLOW ELMNT	0-88	---	GPM	11801	---	400-P002	VENDOR	I102 / 170206	KRUGER
FIT	854443	T2 - COAG FEED PUMP FLOW XMTR	0-88	---	GPM	11801	---	400-P002	VENDOR	I101 / 170013	KRUGER
PI	854443	T2 - COAG FEED PUMP 1 PRESS IND	BY MFR	---	PSI	11801	---	400-P002	---	I104 / 170402	KRUGER
PI	854444	T2 - COAG FEED PUMP 2 PRESS IND	BY MFR	---	PSI	11801	---	400-P002	---	I104 / 170402	KRUGER
AE	854411A	T1 - BALL SED DIST CHNL PH ELMNT	0-14	---	PH	11801	---	400-P002	VENDOR	---	KRUGER
AE	854411B	T1 - BALL SED INLET TURB ELMNT	BY MFR	---	NTU	11801	---	400-P002	VENDOR	---	KRUGER
AE	854415A	T1 - BALL SED EFF PH ELEMENT	0-14	---	PH	11801	---	400-P002	VENDOR	---	KRUGER
AE	854415B	T1 - BALL SED EFF TURB ELEMENT	BY MFR	---	NTU	11801	---	400-P002	VENDOR	---	KRUGER
AE	854421A	T2 - BALL SED DIST CHNL PH ELMNT	0-14	---	PH	11801	---	400-P002	VENDOR	---	KRUGER
AE	854421B	T2 - BALL SED INLET TURB ELMNT	BY MFR	---	NTU	11801	---	400-P002	VENDOR	---	KRUGER
AE	854425A	T2 - BALL SED EFF PH ELEMENT	0-14	---	PH	11801	---	400-P002	VENDOR	---	KRUGER
AE	854425B	T2 - BALL SED EFF TURB ELEMENT	BY MFR	---	NTU	11801	---	400-P002	VENDOR	---	KRUGER
PI	854431A	T1 - POLY CARRIER WTR PRESS IND	BY MFR	---	PSI	17211	PG	400-P002	---	I104 / 170402	KRUGER
PI	854431B	T1 - POLY FEED PUMP 1 PRESS IND	BY MFR	---	PSI	17211	PG	400-P002	---	I104 / 170402	KRUGER
PI	854432A	T2 - POLY CARRIER WTR PRESS IND	BY MFR	---	PSI	17211	PG	400-P002	---	I104 / 170402	KRUGER

Tag	No.	Description	Range	Setpoint	Engr Units	Specification	Instr. ID	P&ID Dwg	Elec/Inst Wiring Dwg	Inst Detail Dwg / Detail	Application Notes
PI	854432B	T2 - POLY FEED PUMP 2 PRESS IND	BY MFR	---	PSI	17211	PG	400-P002	---	I104 / 170402	KRUGER
WE	854431	T1 – POLYMER TOTE WEIGHT ELMNT	0-3000	---	LBS	17212	WS	400-P003	400-IL431	---	
WIT	854431	T1 – POLYMER TOTE WEIGHT XMTR	0-3000	---	LBS	17212	WS	400-P003	400-IL431	---	
WE	854432	T2 – POLYMER TOTE WEIGHT ELMNT	0-3000	---	LBS	17212	WS	400-P003	400-IL432	---	
WIT	854432	T2 – POLYMER TOTE WEIGHT XMTR	0-3000	---	LBS	17212	WS	400-P003	400-IL432	---	
LSH	854441	COAG PUMP ROOM SUMP HI LEVEL	---	(NOTES)	EL	17216	LFS	400-P003	800-I820	I103 / 170312	6" BELOW FINISHED FLOOR
LSH	854451	CAUSTIC PUMP ROOM SUMP HI LEVEL	---	(NOTES)	EL	17216	LFS	400-P003	800-I871	I103 / 170312	6" BELOW FINISHED FLOOR
LIT	854440	COAGULANT STOR TANK LEVEL XMTR	0-12	---	FEET	17212	LT	400-P004	400-IL440	I103 / 170322	
LSH	854440A	COAG STOR TANK HI-HI LEVEL SWITCH	---	(NOTES)	EL	17216	LFS1	400-P004	400-IL440	I103 / 170311	6" BELOW OVERFLOW INVERT
LSH	854440B	COAG STOR CONTAIN HI LVL SWITCH	---	(NOTES)	EL	17216	LFS	400-P004	400-IL440	I103 / 170312	6" BELOW FINISHED FLOOR
LIT	854450	CAUSTIC STOR TANK LEVEL XMTR	0-10	---	FEET	17212	LT	400-P005	400-IL450	I103 / 170320	
LSH	854450A	CAUSTIC STOR TANK HI-HI LVL SWITCH	---	(NOTES)	EL	17216	LFS1	400-P005	400-IL450	I103 / 170311	6" BELOW OVERFLOW INVERT
LSH	854450B	CAUSTIC CONTAIN HIGH LVL SWITCH	---	(NOTES)	EL	17216	LFS	400-P005	400-IL450	I103 / 170312	6" BELOW FINISHED FLOOR
FE	854451	T1 - CAUST FEED PMP FLOW ELMNT	0-88	---	GPM	17212	FM	400-P006	400-IL451	I102 / 170206	KRUGER
FI	854451	T1 - CAUST FEED PMP C2 FLOW IND	0-5	---	GPM	15095	---	400-P006	---	---	
FIT	854451	T1 - CAUST FEED PMP FLOW XMTR	0-88	---	GPM	17212	FM	400-P006	400-IL451	I101 / 170013	KRUGER
PI	854451A	T1 - CAUS FEED PUMPS PRESS IND	BY MFR	---	PSI	17211	PG	400-P006	---	I104 / 170402	KRUGER
PI	854451B	T1 - CAUS FEED C2 WTR PRESS IND	0-150	---	PSI	17211	PG	400-P006	---	I104 / 170402	
FE	854453	T2 - CAUST FEED PMP FLOW ELMNT	0-88	---	GPM	17212	FM	400-P007	400-IL453	I102 / 170206	KRUGER
FI	854453	T2 - CAUST FEED PMP C2 FLOW IND	0-5	---	GPM	15095	---	400-P007	---	---	
FIT	854453	T2 - CAUST FEED PMP FLOW XMTR	0-88	---	GPM	17212	FM	400-P007	400-IL453	I101 / 170013	KRUGER
PI	854453	T2 - CAUST FEED PUMPS PRESS IND	BY MFR	---	PSI	17211	PG	400-P007	---	I104 / 170402	KRUGER
FSH	854401	POLYMER ROOM EYE WASH HIGH FLOW	BY MFR	BY MFR	BY MFR	15442	---	400-P008	800-I825	---	EWSS SUPPLIER
FSH	854445	COAG FEED SAFETY SHOWER FSH	BY MFR	BY MFR	BY MFR	15442	---	400-P008	800-I825	---	EWSS SUPPLIER
FSH	854446	COAG FILL SAFETY SHOWER FSH	BY MFR	BY MFR	BY MFR	15442	---	400-P008	800-I825	---	EWSS SUPPLIER
FSH	854447	COAG STOR SAFETY SHOWER FSH	BY MFR	BY MFR	BY MFR	15442	---	400-P008	800-I825	---	EWSS SUPPLIER
FSH	854455	CAUST FEED SAFETY SHOWER FSH	BY MFR	BY MFR	BY MFR	15442	---	400-P008	800-I825	---	EWSS SUPPLIER
FSH	854456	CAUST FILL SAFETY SHOWER FSH	BY MFR	BY MFR	BY MFR	15442	---	400-P008	800-I825	---	EWSS SUPPLIER
FSH	854457	CAUST STOR SAFETY SHOWER FSH	BY MFR	BY MFR	BY MFR	15442	---	400-P008	800-I825	---	EWSS SUPPLIER
FSL	854474	EAST POLY ROOM EXHAUST AIR FSL	BY MFR	BY MFR	BY MFR	15835	---	400-P009	VENDOR	I101 / 170014	HVAC SUPPLIER
PDI	854474	EAST POLY ROOM SUPPLY FLT PDI	BY MFR	BY MFR	BY MFR	15901	---	400-P009	---	I105 / 170403	HVAC SUPPLIER
FSL	854475	WEST POLY ROOM EXHAUST AIR FSL	BY MFR	BY MFR	BY MFR	15835	---	400-P009	VENDOR	I101 / 170014	HVAC SUPPLIER

Tag	No.	Description	Range	Setpoint	Engr Units	Specification	Instr. ID	P&ID Dwg	Elec/Inst Wiring Dwg	Inst Detail Dwg / Detail	Application Notes
FSL	854476	CAUST ROOM SUPPLY AIR FSL	BY MFR	BY MFR	BY MFR	15835	---	400-P010	VENDOR	I101 / 170014	HVAC SUPPLIER
PDI	854476	CAUST ROOM SUPPLY AIR DPI	BY MFR	BY MFR	BY MFR	15901	---	400-P010	---	I105 / 170403	HVAC SUPPLIER
FSL	854477	CAUST ROOM EXHAUST AIR FSL	BY MFR	BY MFR	BY MFR	15835	---	400-P010	VENDOR	I101 / 170014	HVAC SUPPLIER
PI	854430	POLYMER FEED C2 PRESS IND	0-150	---	PSI	17211	PG	400-P011	---	I104 / 170402	
PI	854434	BALL SED DECK EAST C2 PRESS IND	0-150	---	PSI	17211	PG	400-P011	---	I104 / 170402	
PI	854435A	BALLASTED SED DECK C2 PRESS IND	0-150	---	PSI	17211	PG	400-P011	---	I104 / 170402	
PI	854435B	BALLASTED SED DECK C2 PRESS IND	0-150	---	PSI	17211	PG	400-P011	---	I104 / 170402	
PI	854435C	BALLASTED SED DECK C2 PRESS IND	0-150	---	[SI	17211	PG	400-P011	---	I104 / 170402	
PI	854435D	BALLASTED SED DECK C2 PRESS IND	0-150	---	PSI	17211	PG	400-P011	---	I104 / 170402	
PI	854435E	BALLASTED SED DECK C2 PRESS IND	0-150	---	PSI	17211	PG	400-P011	---	I104 / 170402	
AE	854513	T1 - UV LAMP BANK 5 UVI ELEMENT	BY MFR	---	BY MFR	11301	---	500-P002	VENDOR	---	OZONIA (FUTURE)
AIT	854513	T1 - UV LAMP BANK 5 UVI XMTR	BY MFR	---	BY MFR	11301	---	500-P002	VENDOR	---	OZONIA (FUTURE)
AE	854514	T1 - UV DISIN CHANNEL UVT ELMNT	BY MFR	---	BY MFR	11301	---	500-P002	VENDOR	---	OZONIA
AIT	854514	T1 - UV DISINF CHANNEL UVT XMTR	BY MFR	---	BY MFR	11301	---	500-P002	VENDOR	---	OZONIA
LSH	854514	T1 - UV DISIN CHANNEL LVL SWITCH HI	BY MFR	BY MFR	BY MFR	11301	---	500-P002	VENDOR	---	OZONIA
LSL	854515	T1 - UV DISIN CHNL LEVEL SW LOW	BY MFR	BY MFR	BY MFR	11301	---	500-P002	VENDOR	---	OZONIA
AE	854511A	T1 - UV LAMP BANK 1 UVI ELEMENT	BY MFR	---	BY MFR	11301	---	500-P002	VENDOR	---	OZONIA
AIT	854511A	T1 - UV LAMP BANK 1 UVI XMTR	BY MFR	---	BY MFR	11301	---	500-P002	VENDOR	---	OZONIA
AE	854511B	T1 - UV LAMP BANK 2 UVI ELEMENT	BY MFR	---	BY MFR	11301	---	500-P002	VENDOR	---	OZONIA
AIT	854511B	T1 - UV LAMP BANK 2 UVI XMTR	BY MFR	---	BY MFR	11301	---	500-P002	VENDOR	---	OZONIA
AE	854512A	T1 - UV LAMP BANK 3 UVI ELEMENT	BY MFR	---	BY MFR	11301	---	500-P002	VENDOR	---	OZONIA
AIT	854512A	T1 - UV LAMP BANK 3 UVI XMTR	BY MFR	---	BY MFR	11301	---	500-P002	VENDOR	---	OZONIA
AE	854512B	T1 - UV LAMP BANK 4 UVI ELEMENT	BY MFR	---	BY MFR	11301	---	500-P002	VENDOR	---	OZONIA
AIT	854512B	T1 - UV LAMP BANK 4 UVI XMTR	BY MFR	---	BY MFR	11301	---	500-P002	VENDOR	---	OZONIA
AE	854523	T2 - UV LAMP BANK 5 UVI ELEMENT	BY MFR	---	BY MFR	11301	---	500-P003	VENDOR	---	OZONIA (FUTURE)
AIT	854523	T2 - UV LAMP BANK 5 UVI XMTR	BY MFR	---	BY MFR	11301	---	500-P003	VENDOR	---	OZONIA (FUTURE)
LSL	854525	T2 - UV DISINF CHNL LEVEL SWITCH LOW	BY MFR	BY MFR	BY MFR	11301	---	500-P003	VENDOR	---	OZONIA
AE	854521A	T2 - UV LAMP BANK 1 UVI ELEMENT	BY MFR	---	BY MFR	11301	---	500-P003	VENDOR	---	OZONIA
AIT	854521A	T2 - UV LAMP BANK 1 UVI XMTR	BY MFR	---	BY MFR	11301	---	500-P003	VENDOR	---	OZONIA
AE	854521B	T2 - UV LAMP BANK 2 UVI ELEMENT	BY MFR	---	BY MFR	11301	---	500-P003	VENDOR	---	OZONIA
AIT	854521B	T2 - UV LAMP BANK 2 UVI XMTR	BY MFR	---	BY MFR	11301	---	500-P003	VENDOR	---	OZONIA
AE	854522A	T2 - UV LAMP BANK 3 UVI ELEMENT	BY MFR	---	BY MFR	11301	---	500-P003	VENDOR	---	OZONIA
AIT	854522A	T2 - UV LAMP BANK 3 UVI XMTR	BY MFR	---	BY MFR	11301	---	500-P003	VENDOR	---	OZONIA
AE	854522B	T2 - UV LAMP BANK 4 UVI ELEMENT	BY MFR	---	BY MFR	11301	---	500-P003	VENDOR	---	OZONIA
AIT	854522B	T2 - UV LAMP BANK 4 UVI XMTR	BY MFR	---	BY MFR	11301	---	500-P003	VENDOR	---	OZONIA
LE	854517	C3 STORAGE TANK LEVEL ELEMENT	0-18	---	FEET	17211	LBE	500-P006	500-IL517	I104 / 170322	
LIT	854517	C3 STORAGE TANK LEVEL XMTR	0-18	---	FEET	17212	PDT	500-P006	500-IL517	---	
LE	854526	C3 RECIRC P-TRAP LEVEL ELEMENT	0-3	---	FEET	17211	LBE	500-P006	500-IL526	I104 / 170322	
LIT	854526	C3 RECIRC P-TRAP LEVEL XMTR	0-3	---	FEET	17212	PDT	500-P006	500-IL526	---	

Tag	No.	Description	Range	Setpoint	Engr Units	Specification	Instr. ID	P&ID Dwg	Elec/Inst Wiring Dwg	Inst Detail Dwg / Detail	Application Notes
FE	854531	C3 PUMP FLOW ELEMENT	0-1600	---	GPM	17212	FM	500-P007	500-IL531	I102 / 170206	8 INCHES
FIT	854531	C3 PUMP FLOW TRANSMITTER	0-1600	---	GPM	17212	FM	500-P007	500-IL531	I101 / 170016	
PE	854531	C3 PUMP 1 PRESS DIAPHRAGM SEAL	0-50	---	PSI	17211	---	500-P007	---	I104 / 170402	
PI	854531	C3 PUMP 1 PRESSURE INDICATOR	0-50	---	PSI	17211	PG	500-P007	---	I104 / 170402	
TSH	854531	C3 PUMP 1 TEMP SWITCH HIGH	BY MFR	BY MFR	---	11060	---	500-P007	500-EL531	---	PUMP SUPPLIER
PE	854532	C3 PUMP 2 PRESS DIAPHRAGM SEAL	0-50	---	PSI	17211	---	500-P007	---	I104 / 170402	
PI	854532	C3 PUMP 2 PRESSURE INDICATOR	0-50	---	PSI	17211	PG	500-P007	---	I104 / 170402	
TSH	854532	C3 PUMP 2 TEMP SWITCH HIGH	BY MFR	BY MFR	---	11060	---	500-P007	500-EL532	---	PUMP SUPPLIER
FE	854518	FACILITY EFFLUENT FLOW ELEMENT	0-80	---	MGD	17212	FM	500-P009	500-IL518	I102 / 170206	
FIT	854518	FACILITY EFFLUENT FLOW XMTR	0-80	---	MGD	17212	FM	500-P009	500-IL518	I101 / 170016	
AIT	854533	EFFLUENT PH TRANSMITTER	0-14	---	PH	17212	AH	500-P009	500-IL533	I101 / 170016	
LSL	854533	EFF SAMPLE BOX LEVEL SWITCH LOW	---	---	---	17216	LFS2	500-P009	800-I874	I103 / 170313	
AE	854533A	EFFLUENT DO ELEMENT	0-20	---	PPM	17212	AD	500-P009	500-IL533	500-M503	CONNECTED TO AIT854533
AE	854533B	EFFLUENT PH ELEMENT	0-14	---	PH	17212	AH	500-P009	500-IL533	500-M503	CONNECTED TO AIT854533
LE	854505	EFFLUENT SUMP 1 LEVEL ELEMENT	0-10	---	FEET	17212	LBE	500-P010	500-IL505	I103 / 170321	
LIT	854505	EFFLUENT SUMP 1 LEVEL XMTR	0-10	---	FEET	17212	PDT	500-P010	500-IL505	---	
LSL	854505	EFFLUENT SUMP 1 LOW LEVEL SWITCH	---	EL 98.5	---	17216	LFS	500-P010	500-EL505	---	PUMP SUPPLIER
MSH	854505	EFF SUMP PUMP SEAL LEAK SWITCH	BY MFR	BY MFR	---	11060	---	500-P010	500-EL505	---	PUMP SUPPLIER
TSH	854505	EFF SUMP PUMP HI TEMP SWITCH	BY MFR	BY MFR	---	11060	---	500-P010	500-EL505	---	PUMP SUPPLIER
FE	854551	T1 DEFOAM FEED PUMP FLOW ELEM	0-88	---	GPM	17212	FM	500-P012	500-IL551	I102 / 170206	KRUGER
FI	854551	T1 DEFOAM FEED PMP C2 FLO IND	0-20	---	GPM	15095	---	500-P012	---	---	
FIT	854551	T1 DEFOAM FEED PUMP FLO XMTR	0-88	---	GPM	17212	FM	500-P012	500-IL551	I101 / 170013	KRUGER
FE	854552	T2 DEFOAM FEED PUMP FLOW ELEM	0-88	---	GPM	17212	FM	500-P012	500-IL552	I102 / 170206	KRUGER
FI	854552	T2 DEFOAM FEED PMP C2 FLO IND	0-20	---	GPM	15095	---	500-P012	---	---	
FIT	854552	T2 DEFOAM FEED PUMP FLOW XMTR	0-88	---	GPM	17212	FM	500-P012	500-IL552	I101 / 170013	KRUGER
PI	854552	T2 DEFOAM FEED PUMP PRESS IND	BY MFR	---	PSI	17211	PG	500-P012	---	I104 / 170402	KRUGER
PI	854551A	T1 DEFOAM FEED PUMP PRESS IND	BY MFR	---	PSI	17211	PG	500-P012	---	I104 / 170402	KRUGER
PI	854551B	DEFOAM PUMP C2 WATER PRESS IND	0-150	---	PSI	17211	PG	500-P012	---		
PSH	854561	INST AIR SYSTEM HIGH PRESS SWITCH	BY MFR	BY MFR	PSI	17216	PS	500-P013	800-I809	I104 / 170402	IA SUPPLIER
PSL	854561	INST AIR SYSTEM LOW PRESS SWITCH	BY MFR	BY MFR	PSI	17216	PS	500-P013	800-I825	I104 / 170402	IA SUPPLIER
PI	854561A	INST AIR SYSTEM PRESS IND	BY MFR	---	PSI	17211	PG	500-P013	---	I104 / 170402	IA SUPPLIER

Tag	No.	Description	Range	Setpoint	Engr Units	Specification	Instr. ID	P&ID Dwg	Elec/Inst Wiring Dwg	Inst Detail Dwg / Detail	Application Notes
PS	854561A	INST AIR SYSTEM LEAD PRESS SWITCH	BY MFR	BY MFR	PSI	17216	PS	500-P013	500-EL563	I104 / 170402	IA SUPPLIER
PI	854561B	INST AIR SYSTEM PRESS IND	BY MFR	---	PSI	17211	PG	500-P013	---	I104 / 170402	IA SUPPLIER
PS	854561B	INST AIR SYSTEM LAG PRESS SWITCH	BY MFR	BY MFR	PSI	17216	PS	500-P013	500-RL563	I104 / 170402	IA SUPPLIER
PI	854561C	INST AIR SYSTEM PRESS IND	0-150	---	PSI	17211	PG	500-P013	---	I104 / 170402	
PI	854562A	INSTRUMENT AIR PRESS IND	0-150	---	PSI	17211	PG	500-P013	---	I104 / 170402	
PI	854562B	INSTRUMENT AIR PRESS IND	0-150	---	PSI	17211	PG	500-P013	---	I104 / 170402	
PI	854563A	INSTRUMENT AIR PRESS IND	0-150	---	PSI	17211	PG	500-P013	---	I104 / 170402	
PI	854563B	INSTRUMENT AIR PRESS IND	0-150	---	PSI	17211	PG	500-P013	---	I104 / 170402	
PI	854564A	INSTRUMENT AIR PRESS IND	0-150	---	PSI	17211	PG	500-P013	---	I104 / 170402	
PI	854564B	INSTRUMENT AIR PRESS IND	0-150	---	PSI	17211	PG	500-P013	---	I104 / 170402	
PI	854565A	INSTRUMENT AIR PRESS IND	0-150	---	PSI	17211	PG	500-P013	---	I104 / 170402	
PI	854565B	INSTRUMENT AIR PRESS IND	0-150	---	PSI	17211	PG	500-P013	---	I104 / 170402	
PSH	854566	SERV AIR SYSTEM HIGH PRESS SWITCH	BY MFR	BY MFR	PSI	17216	PS	500-P014	800-I859	I104 / 170402	SA SUPPLIER
PSL	854566	SERV AIR SYSTEM LOW PRESS SWITCH	BY MFR	BY MFR	PSI	17216	PS	500-P014	800-I874	I104 / 170402	SA SUPPLIER
PI	854567	SERV AIR CPRSR 2 PRESS IND	BY MFR	---	PSI	17211	PG	500-P014	---	I104 / 170402	SA SUPPLIER
PI	854566A	SERV AIR SYS C2 WTR PRESS IND	0-150	---	PSI	17211	PG	500-P014	---	I104 / 170402	
PS	854566A	SERV AIR PRESS SWITCH	BY MFR	BY MFR	PSI	17216	PS	500-P014	500-EL568	I104 / 170402	SA SUPPLIER
PI	854566B	SERV AIR CPRSR 1 PRESS IND	BY MFR	---	PSI	17211	PG	500-P014	---	I104 / 170402	SA SUPPLIER
PS	854566B	SERV AIR PRESS SWITCH	BY MFR	BY MFR	PSI	17216	PS	500-P014	500-EL568	I104 / 170402	SA SUPPLIER
FSH	854501	UV PUMP ROOM SAFETY SHOWER FSH	BY MFR	BY MFR	BY MFR	15442	---	500-P015	800-I825	---	EWSS SUPPLIER
FSH	854502	UV DECK SAFETY SHOWER FSH	BY MFR	BY MFR	BY MFR	15442	---	500-P015	800-I825	---	EWSS SUPPLIER
TSL	854569	HOT WTR RECIRC LOWTEMP SWITCH	BY MFR	---	DEG F	17216	TS	500-P015	VENDOR	---	HOT WATER SUPPLIER
TI	854569A	HOT WTR SYSTEM TEMP IND 1	BY MFR	---	DEG F	15440	---	500-P015	---	---	HOT WATER SUPPLIER
TI	854569B	HOT WTR SYSTEM TEMP IND 2	BY MFR	---	DEG F	15440	---	500-P015	---	---	HOT WATER SUPPLIER
PDI	854572	PUMP ROOM SUPPLY AIR PDI	BY MFR	---	BY MFR	15901	---	500-P016	---	I105 / 170403	HVAC SUPPLIER
TIT	854572	PUMP ROOM TEMPERATURE XMTR	BY MFR	---	DEG F	15901	---	500-P016	VENDOR	---	HVAC SUPPLIER
TSH	854572	UV PMP RM SUPPLY AIR FAN HI TEMP	BY MFR	BY MFR	---	11060	---	500-P016	500-EL572	---	HVAC SUPPLIER
ZS	854572	UV PMP RM SUPPLY AIR DPR OPEN	---	---	---	15901	---	500-P016	VENDOR	---	DAMPER SUPPLIER
TSH	854573	UV PMP RM EXHAUST FAN HI TEMP	BY MFR	BY MFR	---	11060	---	500-P016	500-EL573	---	HVAC SUPPLIER
ZS	854573	UV PMP RM EXHAUST AIR DPR OPEN	---	---	---	15911	---	500-P016	VENDOR	---	DAMPER SUPPLIER
PI	854560	UV CLEANING STATION PRESS IND	0-150	---	PSI	17211	PG	500-P018	---	I104 /	

Tag	No.	Description	Range	Setpoint	Engr Units	Specification	Instr. ID	P&ID Dwg	Elec/Inst Wiring Dwg	Inst Detail Dwg / Detail	Application Notes
										170402	
FI	854504A	UV CHEM CLEAN TANK AIR FLOW IND	BY MFR	---	BY MFR	17211	FVA	500-P019	---	---	OZONIA
FI	854504B	UV CHEM CLEAN TANK AIR FLOW IND	BY MFR	---	BY MFR	17211	FVA	500-P019	---	---	OZONIA
FI	854504C	UV CHEM CLEAN TANK AIR FLOW IND	BY MFR	---	BY MFR	17211	FVA	500-P019	---	---	OZONIA
FI	854504D	UV CHEM CLEAN TANK AIR FLOW IND	BY MFR	---	BY MFR	17211	FVA	500-P019	---	---	OZONIA
PI	854568A	SERV AIR TO I/A PRESS IND	0-150	---	PSI	17211	PG	500-P019	---	I104 / 170402	
PI	854568B	SERV AIR TO I/A PRESS IND	0-150	---	PSI	17211	PG	500-P019	---	I104 / 170402	
PI	854568C	SERVICE AIR TO UV PRESS REG	0-150	---	PSI	17211	PG	500-P019	---	I104 / 170402	
AE	854524	T2 - UV DISINF CHNL UVT ELMNT	BY MFR	---	BY MFR	11301	---	500-P503	VENDOR	---	OZONIA
AIT	854524	T2 - UV DISIN CHNL UVT XMTR	BY MFR	---	BY MFR	11301	---	500-P503	VENDOR	---	OZONIA
LSH	854524	T2 - UV DISINF CHNL LEVEL SWITCH HI	BY MFR	BY MFR	BY MFR	11301	---	500-P503	VENDOR	---	OZONIA
LE	854601	SOLIDS TANK LEVEL ELEMENT	0-15	---	FEET	17211	LBE	600-P001	600-IL601	I103 / 170321	
LIT	854601	SOLIDS TANK LEVEL TRANSMITTER	0-15	---	FEET	17212	PDT	600-P001	600-IL601	---	
PE	854611	SOLIDS RETURN PMP 1 PRESS ELEMNT	0-50	---	PSI	17211	---	600-P003	---	I104 / 170402	FILLED SYSTEM PE/PI/PSH
PI	854611	SOLIDS RETURN PMP 1 PRESS IND	0-50	---	PSI	17211	PG	600-P003	---	I104 / 170402	FILLED SYSTEM PE/PI/PSH
PSH	854611	SOLIDS RETURN PMP 1 PRESS SWITCH HI	0-50	30	PSI	17216	PS	600-P003	600-EL611	I104 / 170402	FILLED SYSTEM PE/PI/PSH
PE	854612	SOLIDS RETURN PMP 2 PRESS ELEMNT	0-50	---	PSI	17211	---	600-P003	---	I104 / 170402	FILLED SYSTEM PE/PI/PSH
PI	854612	SOLIDS RETURN PMP 2 PRESS IND	0-50	---	PSI	17211	PG	600-P003	---	I104 / 170402	FILLED SYSTEM PE/PI/PSH
PSH	854612	SOLIDS RETURN PMP 2 PRESS SWITCH HI	0-50	30	PSI	17216	PS	600-P003	600-EL612	I104 / 170402	FILLED SYSTEM PE/PI/PSH
FE	854613	SOLIDS TANK RETURN FLOW ELEMENT	0-600	---	GPM	17212	FM	600-P003	600-IL613	I102 / 170206	
FIT	854613	SOLIDS TANK RETURN FLOW XMTR	0-600	---	GPM	17212	FM	600-P003	600-IL613	I101 / 170013	
PDI	854723	OCU 2 MIST ELIMINATOR 1 PDI	0-5	---	INCHES WC	17211	PDI	700-P001	---	I105 / 170403	
PDI	854726	OCU 2 MIST ELIMINATOR 2 PDI	0-5	---	INCHES WC	17211	PDI	700-P001	---	I105 / 170403	
PDI	854724A	OCU 2 CELL 1 PRES DIFF IND	0-10	---	INCHES WC	17211	PDI	700-P001	---	I105 / 170403	
PDI	854724B	OCU 2 CELL 2 PRES DIFF IND	0-10	---	INCHES WC	17211	PDI	700-P001	---	I105 / 170403	
FSL	854725	OCU 2 EXHAUST FAN LOW FLOW SWITCH	---	<40	FPS	17216	FS	700-P002	VENDOR	I101 / 170014	
PDI	854725	OCU 2 EXHAUST FAN PRESS DIFF IND	0-20	---	INCHES WC	17211	PDI	700-P002	---	I105 / 170403	
TSH	854725A	OCU 2 EXHAUST FAN HIGH TEMP SWITCH	BY MFR	BY MFR	---	11060	---	700-P002	700-EL725	---	FAN SUPPLIER
TSH	854725B	OCU 2 ENCLUSURE HIGH TEMP SWITCH	BY MFR	BY MFR	DEG F	15858	---	700-P002	VENDOR	---	FAN SUPPLIER
PDI	854713	OCU 1 MIST ELIMINATOR PDI	0-5	---	INCHES WC	17211	PDI	700-P003	---	I105 / 170403	
PDI	854714A	OCU 1 CELL 1 PRESS DIFF IND	0-10	---	INCHES WC	17211	PDI	700-P003	---	I105 / 170403	

Tag	No.	Description	Range	Setpoint	Engr Units	Specification	Instr. ID	P&ID Dwg	Elec/Inst Wiring Dwg	Inst Detail Dwg / Detail	Application Notes
PDI	854714B	OCU 1 CELL 2 PRESS DIFF IND	0-10	---	INCHES WC	17211	PDI	700-P003	---	I105 / 170403	
FSL	854715	OCU 1 EXHAUST FAN LOW FLOW SWITCH	---	<40	FPS	17216	FS	700-P004	VENDOR	I101 / 170014	
PDI	854715	OCU1 EXHAUST FAN PDI	0-20	---	INCHES WC	17211	PDI	700-P004	---	I105 / 170403	FAN SUPPLIER
TSH	854715A	OCU 1 EXHAUST FAN HIGH TEMP SWITCH	BY MFR	BY MFR	---	11060	---	700-P004	700-EL715	---	FAN SUPPLIER
TSH	854715B	OCU 1 FAN ENCLOSURE HIGH TEMP SWITCH	BY MFR	BY MFR	DEG F	15858	---	700-P004	VENDOR	---	FAN SUPPLIER
FSL	854717	OCU 1 FAN ENCL SAMP LOW FLOW SWITCH	BY MFR	<3	CFH	17212	AI/AAS	700-P005	700-IL717	I101 / 170013	
AE	854717A	OCU 1 FAN ENCLOSURE LEL ELEMENT	0-100	---	PCT	17212	AE/AIT1	700-P005	700-IL717	I102 / 170101	
AI	854717A	OCU 1 FAN ENCLOSURE LEL IND	0-100	---	PCT	17212	AI/AAS	700-P005	700-IL717	I101 / 170013	
AIT	854717A	OCU 1 FAN ENCLOSURE LEL XMTR	0-100	---	PCT	17212	AE/AIT1	700-P005	700-IL717	I101 / 170013	
ASH	854717A	OCU 1 FAN ENCLOSURE HI LEL SWITCH	0-100	> 10	PCT	17212	AI/AAS	700-P005	700-IL717	I101 / 170013	
AE	854717C	OCU 1 FAN ENCLOSURE H2S ELEMENT	0-50	---	PPM	17212	AE/AIT2	700-P005	700-IL717	I102 / 170101	
AI	854717C	OCU 1 FAN ENCLOSURE H2S IND	0-50	---	PPM	17212	AI/AAS	700-P005	700-IL717	I101 / 170013	
AIT	854717C	OCU 1 FAN ENCLOSURE H2S XMTR	0-50	---	PPM	17212	AE/AIT2	700-P005	700-IL717	I101 / 170013	
ASH	854717C	OCU 1 FAN ENCLOSURE HI H2S SWITCH	0-50	>5	PPM	17212	AI/AAS	700-P005	700-IL717	I101 / 170013	
A	854717D	OCU 1 FAN ENCLOS HAZ GAS BEACON	---	---	---	17272	---	700-P005	700-IL717A	I101 / 170013	
HRN	854717D	OCU 1 FAN ENCLOS HAZ GAS HORN	---	---	---	17272	---	700-P005	700-IL717A	I101 / 170013	
FSL	854727	OCU 2 FAN ENCL SAMP LOW FLOW SWITCH	BY MFR	<3	CFH	17212	AI/AAS	700-P006	700-IL727	I101 / 170013	
AE	854727A	OCU 2 FAN ENCLOSURE LEL ELEMENT	0-100	---	PCT	17212	AE/AIT1	700-P006	700-IL727	I102 / 170101	
AI	854727A	OCU 2 FAN ENCLOSURE LEL IND	0-100	---	PCT	17212	AI/AAS	700-P006	700-IL727	I101 / 170013	
AIT	854727A	OCU 2 FAN ENCLOSURE LEL XMTR	0-100	---	PCT	17212	AE/AIT1	700-P006	700-IL727	I101 / 170013	
ASH	854727A	OCU 2 FAN ENCLOSURE HI LEL SWITCH	0-100	> 10	PCT	17212	AI/AAS	700-P006	700-IL727	I101 / 170013	
AE	854727C	OCU 2 FAN ENCLOSURE H2S ELEMENT	0-50	---	PPM	17212	AE/AIT2	700-P006	700-IL727	I102 / 170101	
AI	854727C	OCU 2 FAN ENCLOSURE H2S IND	0-50	---	PPM	17212	AI/AAS	700-P006	700-IL727	I101 / 170013	
AIT	854727C	OCU 2 FAN ENCLOSURE H2S XMTR	0-50	---	PPM	17212	AE/AIT2	700-P006	700-IL727	I101 / 170013	
ASH	854727C	OCU 2 FAN ENCLOSURE HI H2S SWITCH	0-50	>5	PPM	17212	AI/AAS	700-P006	700-IL727	I101 / 170013	
A	854727D	OCU 2 FAN ENCLOS HAZ GAS BEACON	---	---	---	17272	---	700-P006	700-IL727A	I101 / 170013	
HRN	854727D	OCU 2 FAN ENCLOS HAZ GAS HORN	---	---	---	17272	---	700-P006	700-IL727A	I101 / 170013	

Tag	No.	Description	Range	Setpoint	Engr Units	Specification	Instr. ID	P&ID Dwg	Elec/Inst Wiring Dwg	Inst Detail Dwg / Detail	Application Notes
ZS	854102	MICH ST PERSONNEL GATE CL SWITCH	---	---	---	17216	ZS1	800-P001	800-I826	---	GATE MOUNT HARDWARE
ZS	854103	PLANT W ROAD VEHICLE GATE CL SWITCH	---	---	---	17216	ZS1	800-P001	800-I826	---	GATE MOUNT HARDWARE
ZS	854104	PLANT E ROAD VEHICLE GATE CL SWITCH	---	---	---	17216	ZS1	800-P001	800-I826	---	GATE MOUNT HARDWARE
ZS	854336	INFLUENT SAMPLE ROOM DOOR SWITCH	---	---	---	17216	ZS1	800-P001	800-I874	I101 / 170015	
ZS	854348	SCREENINGS PANEL ROOM DOOR SWITCH	---	---	---	17216	ZS1	800-P001	800-I874	I101 / 170015	
ZS	854406	BALL SED PROCESS STAIR DOOR SWITCH	---	---	---	17216	ZS1	800-P001	800-I874	---	GATE MOUNT HARDWARE
ZS	854433	POLYMER STORAGE ROLL-UP DOOR SWITCH	---	---	---	17216	ZS1	800-P001	800-I825	---	ROLL-UP MOUNT HARDWARE
ZS	854506	UV PROCESS STAIR DOOR SWITCH	---	---	---	17216	ZS1	800-P001	800-I874	---	GATE MOUNT HARDWARE
ZS	854101A	4TH AVE VEHICLE GATE CLOSED SWITCH	---	---	---	17216	ZS1	800-P001	800-I825	---	GATE MOUNT HARDWARE
ZS	854101B	4TH AVE PERSONNEL GATE CLOSED SWITCH	---	---	---	17216	ZS1	800-P001	800-I826	---	GATE MOUNT HARDWARE
ZS	854105A	REG ROAD VEHICLE GATE CLOSED SWITCH	---	---	---	17216	ZS1	800-P001	800-I826	---	GATE MOUNT HARDWARE
ZS	854105B	REG ROAD PERSONNEL GATE CL SWITCH	---	---	---	17216	ZS1	800-P001	800-I826	---	GATE MOUNT HARDWARE
ZS	854347A	SCREENINGS ROOM WEST DOOR SWITCH	---	---	---	17216	ZS1	800-P001	800-I874	I101 / 170015	
ZS	854347B	SCREENINGS ROOM ROLL-UP DOOR SWITCH	---	---	---	17216	ZS1	800-P001	800-I874	I101 / 170015	ROLL-UP MOUNT HARDWARE
ZS	854347C	SCREENINGS ROOM NORTH DOOR SWITCH	---	---	---	17216	ZS1	800-P001	800-I874	I101 / 170015	
ZS	854356A	C2 ROOM EAST DOOR SWITCH	---	---	---	17216	ZS1	800-P001	800-I874	I101 / 170015	
ZS	854356C	C2 ROOM ROLL-UP DOOR SWITCH	---	---	---	17216	ZS1	800-P001	800-I874	I101 / 170015	ROLL-UP MOUNT HARDWARE
ZS	854448A	COAGULANT STORAGE DOOR SWITCH	---	---	---	17216	ZS1	800-P001	800-I825	I101 / 170015	
ZS	854448B	COAG / POLY PUMP ROOM DOOR SWITCH	---	---	---	17216	ZS1	800-P001	800-I825	I101 / 170015	
ZS	854448C	COAGULANT STORAGE DOOR SWITCH	---	---	---	17216	ZS1	800-P001	800-I825	I101 / 170015	
ZS	854458A	CAUSTIC STORAGE DOOR SWITCH	---	---	---	17216	ZS1	800-P001	800-I825	I101 / 170015	
ZS	854458B	CAUSTIC PUMP ROOM DOOR SWITCH	---	---	---	17216	ZS1	800-P001	800-I825	I101 / 170015	
ZS	854458C	CAUSTIC STORAGE DOOR SWITCH	---	---	---	17216	ZS1	800-P001	800-I825	I101 / 170015	
ZS	854537A	UV PUMP ROOM EAST DOOR SWITCH	---	---	---	17216	ZS1	800-P002	800-I-826	I101 / 170015	
ZS	854537B	UV PUMP ROOM WEST DOOR SWITCH	---	---	---	17216	ZS1	800-P002	800-I-826	I101 / 170015	
ZS	854537C	UV PUMP ROOM NE ROLL-UP DOOR SWITCH	---	---	---	17216	ZS1	800-P002	800-I-826	---	ROLL-UP MOUNT HARDWARE
ZS	854537D	UV PUMP ROOM SE ROLL-UP DOOR SWITCH	---	---	---	17216	ZS1	800-P002	800-I-826	---	ROLL-UP MOUNT HARDWARE
ZS	854893A	PROCESS ELECT NORTH DOOR SWITCH	---	---	---	17216	ZS1	800-P002	800-I874	I101 / 170015	
ZS	854893B	PROCESS ELECT SOUTH DOOR SWITCH	---	---	---	17216	ZS1	800-P002	800-I874	I101 / 170015	
ZS	854893C	PROC ELECT BLDG ALLEY N DOOR SWITCH	---	---	---	17216	ZS1	800-P002	800-I874	I101 / 170015	GATE MOUNT HARDWARE
ZS	854893D	PROC ELECT BLDG ALLEY S DOOR SWITCH	---	---	---	17216	ZS1	800-P002	800-I874	I101 / 170015	GATE MOUNT HARDWARE
ZS	854874	PROCESS ELECT RELIEF DPR OPEN	---	---	---	15911	---	800-P003	VENDOR	---	DAMPER SUPPLIER

Tag	No.	Description	Range	Setpoint	Engr Units	Specification	Instr. ID	P&ID Dwg	Elec/Inst Wiring Dwg	Inst Detail Dwg / Detail	Application Notes
TIT	854875	PROCESS ELECT TEMP XMTR	BY MFR	---	DEG F	15901	---	800-P003	VENDOR	---	HVAC SUPPLIER
ZS	854872A	PROCESS ELECT SUPPLY AIR DPR OPN	---	---	---	15911	---	800-P003	VENDOR	---	DAMPER SUPPLIER
ZS	854872B	PROCESS ELECT RTN AIR DPR OPEN	---	---	---	15911	---	800-P003	VENDOR	---	DAMPER SUPPLIER
TSH	854875	PROCESS ELECT ROOM HIGH TEMP SWITCH	BY MFR	BY MFR	DEG F	15901	---	800-P004	VENDOR	---	HVAC SUPPLIER
PI	854962	MAINT SHOP SERV AIR PRESS IND	0-150	---	PSI	17211	PG	900-P001	---	I104 / 170402	
PI	854961A	MAINT SHOP SERV AIR PRESS IND	0-150	---	PSI	17211	PG	900-P001	---	I104 / 170402	
PI	854961B	MAINT SHOP SERV AIR PRESS IND	0-150	---	PSI	17211	PG	900-P001	---	I104 / 170402	
FI	854965	IRRIGATION WATER FLOW INDICATOR	(NOTES)	---	GPM	02810	---	900-P002	---	---	RANGE BY SPRINKLER SUPPLIER
FS	854966	FIRE SPRINKLER FLOW SWITCH	BY MFR	BY MFR	GPM	16660	---	900-P002	VENDOR	---	FIRE PROTECT SUPPLIER
ZS	854966	SPRINKLER PILOT VALVE OPEN	---	---	---	16660	---	900-P002	VENDOR	---	FIRE PROTECT SUPPLIER
LSL	854904	E-G FUEL STOR TANK LOW LEVEL SW	BY MFR	BY MFR	BY MFR	16621	---	900-P004	900-IL904	---	DIESEL FUEL SYS SUPPLIER
LT	854904	E-G FUEL STOR TANK LEVEL XMTR	BY MFR	---	BY MFR	16621	---	900-P004	900-IL904	---	DIESEL FUEL SYS SUPPLIER
LD	854904A	E-G FUEL STOR TANK LEAK DETECTOR	BY MFR	BY MFR	BY MFR	16621	---	900-P004	900-IL904	---	DIESEL FUEL SYS SUPPLIER
PI	854904A	E-G FUEL SUPPLY PRESS IND	BY MFR	---	PSI	17211	PG	900-P004	---	I104 / 170402	DIESEL FUEL SYS SUPPLIER
LD	854904B	E-G ROOM MONTR SMP LEAK DETECTOR	BY MFR	BY MFR	BY MFR	16621	---	900-P004	900-IL904	---	DIESEL FUEL SYS SUPPLIER
PI	854904B	E-G FUEL RETURN PRESS IND	BY MFR	---	PSI	17211	PG	900-P004	---	I104 / 170402	DIESEL FUEL SYS SUPPLIER
TIT	854973A	OUTSIDE AIR TEMP XMTR	BY MFR	---	DEG F	15901	---	900-P007	VENDOR	---	HVAC SUPPLIER
TIT	854973B	MEETING ROOM AIR TEMP XMTR	BY MFR	---	DEG F	15901	---	900-P007	VENDOR	---	HVAC SUPPLIER
TIT	854975	CONTROL ROOM AIR TEMPERATURE	BY MFR	---	DEG F	15901	---	900-P008	VENDOR	---	HVAC SUPPLIER
ZS	854975A	CONTROL ROOM INLET DPR OPEN SWITCH	---	---	---	15911	---	900-P008	VENDOR	---	DAMPER SUPPLIER
ZS	854975B	CONTROL ROOM RETURN DPR OPEN SWITCH	---	---	---	15911	---	900-P008	VENDOR	---	DAMPER SUPPLIER
ZS	854975C	CONTROL ROOM RELIEF DPR OPEN SWITCH	---	---	---	15911	---	900-P008	VENDOR	---	DAMPER SUPPLIER
TIT	854976A	SHOP TEMPERATURE ZMTR	BY MFR	---	DEG F	15901	---	900-P008	VENDOR	---	HVAC SUPPLIER
ZS	854976A	SHOP INLET AIR DAMPER OPEN SWITCH	---	---	---	15911	---	900-P008	VENDOR	---	DAMPER SUPPLIER
TIT	854976B	MEZZANINE TEMPERATURE XMTR	BY MFR	---	DEG F	15901	---	900-P008	VENDOR	---	HVAC SUPPLIER
ZS	854976B	SHOP EXHAUST DAMPER OPEN SWITCH	---	---	---	15911	---	900-P008	VENDOR	---	DAMPER SUPPLIER
TIT	854977	O&M ELECTRICAL ROOM TEMP XMTR	BY MFR	---	DEG F	15901	---	900-P009	VENDOR	---	HVAC SUPPLIER
ZS	854977	O&M ELECT ROOM RELIEF DPR O/C SWITCH	---	---	---	15911	---	900-P009	VENDOR	---	DAMPER SUPPLIER
TIT	854978	GENERATOR ROOM AIR TEMPERATURE	BY MFR	---	DEG F	15901	---	900-P009	VENDOR	---	HVAC SUPPLIER
ZS	854978	GEN ROOM EXHAUST DPR O/C SWITCH	---	---	---	15911	---	900-P009	VENDOR	---	DAMPER SUPPLIER
RG	854912	GWWTs RAIN GAUGE	0-1	---	TIP	17275	RG	900-P102	900-I910	---	
ZS	854993A	ELECT ROOM NW DOOR SWITCH	---	---	---	17216	ZS1	900-P102	900-I915	I101 / 170015	
ZS	854993B	ELECT ROOM SW DOOR SWITCH	---	---	---	17216	ZS1	900-P102	900-I915	I101 / 170015	
ZS	854993C	SHOP ROLL-UP DOOR SWITCH	---	---	---	17216	ZS1	900-P102	900-I915	---	ROLL-UP MOUNT HARDWARE
ZS	854993D	SHOP DOOR SWITCH	---	---	---	17216	ZS1	900-P102	900-I915	I101 / 170015	
ZS	854993E	CONTROL AREA DOOR SWITCH	---	---	---	17216	ZS1	900-P102	900-I915	I101 / 170015	
ZS	854993F	MEETING ROOM WEST DOOR SWITCH	---	---	---	17216	ZS1	900-P102	900-I915	I101 / 170015	
ZS	854993G	MEETING ROOM SOUTH DOOR SWITCH	---	---	---	17216	ZS1	900-P102	900-I915	I101 / 170015	
ZS	854900A	GENERATOR BUILDING SOUTH DOOR SWITCH	---	---	---	17216	ZS1	900-P103	900-I915	I101 /	

Tag	No.	Description	Range	Setpoint	Engr Units	Specification	Instr. ID	P&ID Dwg	Elec/Inst Wiring Dwg	Inst Detail Dwg / Detail	Application Notes
										170015	
ZS	854900B	GENERATOR BUILDING WEST DOOR SWITCH	---	---	---	17216	ZS1	900-P103	900-I915	I101 / 170015	
PLC	854281	GT REGULATOR PLC	---	---	---	17800	---	MULTIPLE	---	---	
UI	854281	GT REGULATOR OIT	---	---	---	17801	---	MULTIPLE	---	---	
PLC	854282	GT REGULATOR METROTEL PLC	---	---	---	17800	---	MULTIPLE	---	---	
PLC	854410	T1 - BALLASTED SEDIMENTATION PLC	---	---	---	17800	---	MULTIPLE	---	---	KRUGER
UI	854410	T1 - BALLASTED SED OIT	---	---	---	17801	---	MULTIPLE	---	---	KRUGER
PLC	854420	T2 - BALLASTED SEDIMENTATION PLC	---	---	---	17800	---	MULTIPLE	---	---	KRUGER
UI	854420	T2 - BALLASTED SED OIT	---	---	---	17801	---	MULTIPLE	---	---	KRUGER
PLC	854510	T1 - UV DISINFECTION PLC	---	---	---	17800	---	MULTIPLE	---	---	OZONIA
UI	854510	T1 - UV DISINFECTION OIT	---	---	---	17801	---	MULTIPLE	---	---	OZONIA
PLC	854520	T2 - UV DISINFECTION PLC	---	---	---	17800	---	MULTIPLE	---	---	OZONIA
UI	854520	T2 - UV DISINFECTION OIT	---	---	---	17801	---	MULTIPLE	---	---	OZONIA
PLC	854810	T1 - MASTER PLC SYSTEM	---	---	---	17800	---	MULTIPLE	---	---	
PLC	854820	T2 - MASTER PLC SYSTEM	---	---	---	17800	---	MULTIPLE	---	---	
UI	854881	MAIN CONTROL PANEL OIT	---	---	---	17801	---	MULTIPLE	---	---	
PLC	854882	GWWTS METROTEL PLC	---	---	---	17800	---	MULTIPLE	---	---	
PLC	854981	O&M ELECTRICAL PLC	---	---	---	17800	---	MULTIPLE	---	---	
UI	854981	GWWTS ELECTRICAL BUILDING OIT	---	---	---	17801	---	MULTIPLE	---	---	
PLC	854982	O&M ELECTRICAL METROTEL PLC	---	---	---	17800	---	MULTIPLE	---	---	

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 17902
ALARM SCHEDULE

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies the alarm schedule.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 SCHEDULE

Tag	No.	Legend	Annunciator	Field Contact Alarm Cond	P&ID Dwg	Annun Dwg	Inst/Elec Dwg	Row/ Col/ Card
ZA	854101	FACILITY GATE INTRUSION	854881A	OPEN ON ALARM	800-P001	800-I810	800-I826	R4 / C5 / C2
MAH	854301	EQ BASIN DRAIN PUMP 1 SEAL LEAK	854881A	OPEN ON ALARM	300-P017	800-I808	300-EL301	R4 / C2 / C2
TAH	854301	EQ BASIN DRAIN PUMP 1 MOTOR WINDING TEMP HIGH	854881A	OPEN ON ALARM	300-P017	800-I808	300-EL301	R3 / C2 / C1
FAL	854303	EQ BASIN SAMPLE AIR FLOW LOW	854881A	OPEN ON ALARM	300-P018	800-I809	300-IL303	R1 / C4 / C1
NAD	854304	EQUALIZATION BASIN FLUSHING SEQUENCE FAIL	854881A	CLOSE ON ALARM	300-P019	800-I810	800-I816	R5 / C6 / C1
HA	854310	TRAIN 1 INFLUENT PUMP SELECT ERROR	854881A	CLOSE ON ALARM	300-P009	800-I808	800-I816	R7 / C1 / C1
NAD	854311	T1 INFLUENT PUMP 1 VFD FAULT	854881A	OPEN ON ALARM	300-P011	800-I808	300-EL311	R9 / C1 / C1
TAH	854311	T1 INFLUENT PUMP 1 MOTOR WINDING TEMP HIGH	854881A	OPEN ON ALARM	300-P011	800-I808	300-EL311	R10 / C1 / C2
VAH	854311	T1 - INF PUMP 1 VIBRATION HIGH	854881A	CLOSE ON ALARM	300-P011	800-I810	300-EL311	R9 / C5 / C1
VAHH	854311	T1 - INF PUMP 1 VIBRATION HIHI	854881A	CLOSE ON ALARM	300-P011	800-I810	300-EL311	R10 / C5 / C2

Tag	No.	Legend	Annunciator	Field Contact Alarm Cond	P&ID Dwg	Annun Dwg	Inst/Elec Dwg	Row/ Col/ Card
NAD	854312	T1 INFLUENT PUMP 2 VFD FAULT	854881A	OPEN ON ALARM	300-P012	800-I808	300-EL312	R11 / C1 / C1
TAH	854312	T1 INFLUENT PUMP 2 MOTOR WINDING TEMP HIGH	854881A	OPEN ON ALARM	300-P012	800-I808	300-EL312	R12 / C1 / C2
VAH	854312	T1 - INF PUMP 2 VIBRATION HIGH	854881A	CLOSE ON ALARM	300-P012	800-I810	300-EL312	R11 / C5 / C1
VAHH	854312	T1 - INF PUMP 2 VIBRATION HIHI	854881A	CLOSE ON ALARM	300-P012	800-I810	300-EL312	R12 / C5 / C2
NAD	854313	T1 INFLUENT PUMP 3 VFD FAULT	854881A	OPEN ON ALARM	300-P013	800-I808	300-EL313	R1 / C2 / C1
TAH	854313	T1 INFLUENT PUMP 3 MOTOR WINDING TEMP HIGH	854881A	OPEN ON ALARM	300-P013	800-I808	300-EL313	R2 / C2 / C2
VAH	854313	T1 - INF PUMP 3 VIBRATION HIGH	854881A	CLOSE ON ALARM	300-P013	800-I809	300-EL313	R5 / C4 / C1
VAHH	854313	T1 - INF PUMP 3 VIBRATION HIHI	854881A	CLOSE ON ALARM	300-P013	800-I809	300-EL313	R6 / C4 / C2
MAH	854331	INFLUENT SAMPLE PUMP 1 SEAL LEAK	854881A	OPEN ON ALARM	300-P005	800-I808	300-EL331	R4 / C1 / C2
TAH	854331	INFLUENT SAMPLE PUMP 1 TEMPERATURE HIGH	854881A	OPEN ON ALARM	300-P005	800-I808	300-EL331	R3 / C1 / C1
LAL	854334	INFLUENT SAMPLE BOX LEVEL LOW	854881A	CLOSE ON ALARM	300-P005	800-I808	800-I825	R12 / C2 / C2
NAD	854341	INFLUENT SCREEN 1 FAULT	854881A	CLOSE ON ALARM	300-P002	800-I808	800-I825	R1 / C1 / C1
NAD	854343	SCREENINGS COMPACTOR 1 FAULT	854881A	CLOSE ON ALARM	300-P004	800-I808	800-I825	R2 / C1 / C2
FAL	854345	SCREENINGS ROOM SAMPLE AIR FLOW LOW	854881A	OPEN ON ALARM	300-P006	800-I808	300-IL345	R7 / C2 / C1
LAH	854350	C2 AIR GAP TANK LEVEL HIGH	854881A	CLOSE ON ALARM	300-P007	800-I809	800-I825	R9 / C3 / C1
LAL	854350	C2 AIR GAP TANK LEVEL LOW	854881A	CLOSE ON ALARM	300-P007	800-I809	800-I825	R10 / C3 / C2
PAH	854355	C2 WATER PRESSURE HIGH	854881A	CLOSE ON ALARM	300-P007	800-I810	800-I826	R2 / C6 / C2
PAL	854355	C2 WATER PRESSURE LOW	854881A	CLOSE ON ALARM	300-P007	800-I810	800-I826	R1 / C6 / C1

Tag	No.	Legend	Annunciator	Field Contact Alarm Cond	P&ID Dwg	Annun Dwg	Inst/Elec Dwg	Row/ Col/ Card
PAL	854361	PRELIM TRTMT INSTR AIR PRESSURE LOW	854881A	CLOSE ON ALARM	300-P021	800-I808	800-I825	R6 / C2 / C2
ZA	854433	BALLASTED SED INTRUSION	854881A	OPEN ON ALARM	800-P001	800-I810	800-I825	R3 / C5 / C1
FAH	854440	BALL SED EYEWASH STATION FLOW HIGH	854881A	CLOSE ON ALARM	400-P008	800-I809	800-I825	R3 / C3 / C1
NAD	854451	T1 CAUSTIC FEED PUMP 1 VFD FAULT	854881A	CLOSE ON ALARM	400-P006	800-I808	400-EL451	R5 / C1 / C1
NAD	854452	T1 CAUSTIC FEED PUMP 2 VFD FAULT	854881A	CLOSE ON ALARM	400-P006	800-I808	400-EL452	R6 / C1 / C2
NAD	854518	T1 EFFLUENT GATE ACTUATOR FAULT	854881A	CLOSE ON ALARM	500-P009	800-I808	500-EL518	R8 / C1 / C2
NAD	854531	C3 PUMP 1 VFD FAULT	854881A	OPEN ON ALARM	500-P007	800-I809	500-EL531	R1 / C3 / C1
TAH	854531	C3 PUMP 1 MOTOR WINDING TEMP HIGH	854881A	OPEN ON ALARM	500-P007	800-I809	500-EL531	R2 / C3 / C2
ZA	854537	UV PUMP ROOM INTRUSION	854881A	OPEN ON ALARM	800-P002	800-I810	800-I826	R8 / C5 / C2
NAD	854551	TRAIN 1 DEFOAMER FEED PUMP VFD FAULT	854881A	CLOSE ON ALARM	500-P012	800-I808	500-EL551	R5 / C2 / C1
PAH	854561	INSTRUMENT AIR PRESSURE HIGH	854881A	CLOSE ON ALARM	500-P013	800-I809	---	R11 / C4 / C1
PAL	854561	INST AIR SYSTEM PRESSURE LOW	854881A	CLOSE ON ALARM	500-P013	800-I809	800-I825	R11 / C3 / C1
FAL	854715	OCU 1 EXHAUST FAN AIR FLOW LOW	854881A	OPEN ON ALARM	700-P004	800-I810	800-I825	R12 / C6 / C2
NAD	854715	OCU 1 EXHASUT FAN FAULT	854881A	CLOSE ON ALARM	700-P004	800-I810	800-I825	R11 / C6 / C1
FAL	854717	OCU 1 SAMPLE AIR FLOW LOW	854881A	OPEN ON ALARM	700-P005	800-I810	700-IL717	R6 / C6 / C2
YA	854810	PLC854810 FAILURE	854881A	CLOSE ON ALARM	800-P003	800-I809	800-I815	R12 / C4 / C2
NAD	854831	BALLASTED SED SWBD 1 SURGE PROTECT DEVICE FAIL	854881A	CLOSE ON ALARM	800-P001	800-I810	800-I825	R2 / C5 / C2
NAD	854841	BALLASTED SED MCC 1 SURGE PROTECT DEVICE FAIL	854881A	CLOSE ON ALARM	800-P001	800-I810	800-I825	R1 / C5 / C1

Tag	No.	Legend	Annunciator	Field Contact Alarm Cond	P&ID Dwg	Annun Dwg	Inst/Elec Dwg	Row/ Col/ Card
NAD	854843	UV MCC 1 SURGE PROTECT DEVICE FAIL	854881A	CLOSE ON ALARM	800-P002	800-I809	800-I825	R5 / C3 / C1
NAD	854845	PROCESS MCC SURGE PROTECT DEVICE FAIL	854881A	CLOSE ON ALARM	800-P002	800-I809	800-I825	R6 / C3 / C2
NAD	854851	PROCESS ELECTRICAL UPS TROUBLE	854881A	CLOSE ON ALARM	800-P002	800-I809	800-I825	R7 / C3 / C1
AAH	854303A	EQ BASIN LEL HIGH	854881A	OPEN ON ALARM	300-P018	800-I809	300-IL303	R2 / C4 / C2
AAL	854303B	EQ BASIN O2 LOW	854881A	OPEN ON ALARM	300-P018	800-I809	300-IL303	R3 / C4 / C1
AAH	854303C	EQ BASIN H2S HIGH	854881A	OPEN ON ALARM	300-P018	800-I809	300-IL303	R4 / C4 / C2
AAH	854345A	SCREENINGS ROOM LEL HIGH	854881A	OPEN ON ALARM	300-P006	800-I808	300-IL345	R8 / C2 / C2
AAL	854345B	SCREENINGS ROOM O2 LOW	854881A	OPEN ON ALARM	300-P006	800-I808	300-IL345	R9 / C2 / C1
AAH	854345C	SCREENINGS ROOM H2S HIGH	854881A	OPEN ON ALARM	300-P006	800-I808	300-IL345	R10 / C2 / C2
NAD	854410A	T1 BALLASTED SED SYSTEM FAULT	854881A	CLOSE ON ALARM	400-P001	800-I809	800-I826	R9 / C4 / C1
NAD	854410C	T1 BALLASTED SED SYSTEM WARNING	854881A	CLOSE ON ALARM	400-P001	800-I809	800-I826	R10 / C4 / C2
NAD	854511A	T1 UV DISINFECTION SYSTEM FAULT	854881A	CLOSE ON ALARM	500-P002	800-I809	800-I826	R7 / C4 / C1
NAD	854511C	T1 UV DISINFECTION SYSTEM WARNING	854881A	CLOSE ON ALARM	500-P002	800-I809	800-I826	R8 / C4 / C2
AAH	854717A	OCU 1 LEL HIGH	854881A	OPEN ON ALARM	700-P005	800-I810	700-IL717	R7 / C6 / C1
AAH	854717C	OCU 1 H2S HIGH	854881A	OPEN ON ALARM	700-P005	800-I810	700-IL717	R9 / C6 / C1
MAH	854302	EQ BASIN DRAIN PUMP 2 SEAL LEAK	854881C	OPEN ON ALARM	300-P017	800-I858	300-EL302	R4 / C2 / C2
TAH	854302	EQ BASIN DRAIN PUMP 2 MOTOR WINDING TEMP HIGH	854881C	OPEN ON ALARM	300-P017	800-I858	300-EL302	R3 / C2 / C1
HA	854320	TRAIN 2 INFLUENT PUMP SELECT ERROR	854881C	CLOSE ON ALARM	300-P010	800-I858	800-I867	R7 / C1 / C1

Tag	No.	Legend	Annunciator	Field Contact Alarm Cond	P&ID Dwg	Annun Dwg	Inst/Elec Dwg	Row/ Col/ Card
NAD	854321	T2 INFLUENT PUMP 1 VFD FAULT	854881C	OPEN ON ALARM	300-P014	800-I858	300-EL321	R9 / C1 / C1
TAH	854321	T2 INFLUENT PUMP 1 MOTOR WINDING TEMP HIGH	854881C	OPEN ON ALARM	300-P014	800-I858	300-EL321	R10 / C1 / C2
VAH	854321	T2 - INF PUMP 1 VIBRATION HIGH	854881C	CLOSE ON ALARM	300-P014	800-I860	300-EL321	R3 / C5 / C1
VAHH	854321	T2 - INF PUMP 1 VIBRATION HIHI	854881C	CLOSE ON ALARM	300-P014	800-I860	300-EL321	R4 / C5 / C2
NAD	854322	T2 INFLUENT PUMP 2 VFD FAULT	854881C	OPEN ON ALARM	300-P015	800-I858	300-EL322	R11 / C1 / C1
TAH	854322	T2 INFLUENT PUMP 2 MOTOR WINDING TEMP HIGH	854881C	OPEN ON ALARM	300-P015	800-I858	300-EL322	R12 / C1 / C2
VAH	854322	T2 - INF PUMP 2 VIBRATION HIGH	854881C	CLOSE ON ALARM	300-P015	800-I860	300-EL322	R5 / C5 / C1
VAHH	854322	T2 - INF PUMP 2 VIBRATION HIHI	854881C	CLOSE ON ALARM	300-P015	800-I860	300-EL322	R6 / C5 / C2
NAD	854323	T2 INFLUENT PUMP 3 VFD FAULT	854881C	OPEN ON ALARM	300-P016	800-I858	300-EL323	R1 / C2 / C1
TAH	854323	T2 INFLUENT PUMP 3 MOTOR WINDING TEMP HIGH	854881C	OPEN ON ALARM	300-P016	800-I858	300-EL323	R2 / C2 / C2
VAH	854323	T2 - INF PUMP 3 VIBRATION HIGH	854881C	CLOSE ON ALARM	300-P016	800-I860	300-EL323	R7 / C5 / C1
VAHH	854323	T2 - INF PUMP 3 VIBRATION HIHI	854881C	CLOSE ON ALARM	300-P016	800-I860	300-EL323	R8 / C5 / C2
MAH	854332	INFLUENT SAMPLE PUMP 2 SEAL LEAK	854881C	OPEN ON ALARM	300-P005	800-I858	300-EL332	R4 / C1 / C2
TAH	854332	INFLUENT SAMPLE PUMP 2 TEMPERATURE HIGH	854881C	OPEN ON ALARM	300-P005	800-I858	300-EL332	R3 / C1 / C1
FAL	854333	INFLUENT SAMPLE ROOM SAMPLE AIR FLOW LOW	854881C	OPEN ON ALARM	300-P018	800-I858	300-IL333	R8 / C2 / C2
ZA	854336	SCREENINGS BUILDING INTRUSION	854881C	OPEN ON ALARM	800-P001	800-I859	800-I874	R5 / C4 / C1
NAD	854342	INFLUENT SCREEN 2 FAULT	854881C	CLOSE ON ALARM	300-P003	800-I858	800-I874	R1 / C1 / C1
NAD	854344	SCREENINGS COMPACTOR 2 FAULT	854881C	CLOSE ON ALARM	300-P004	800-I858	800-I874	R2 / C1 / C2

Tag	No.	Legend	Annunciator	Field Contact Alarm Cond	P&ID Dwg	Annun Dwg	Inst/Elec Dwg	Row/ Col/ Card
YA	854394	SCREENING BUILDING FIRE ALARM	854881C	OPEN ON ALARM	800-P002	800-I859	800-I874	R2 / C4 / C2
ZA	854406	PROCESS DECK STAIR INTRUSION	854881C	OPEN ON ALARM	800-P001	800-I859	800-I874	R10 / C3 / C2
NAD	854453	T2 CAUSTIC FEED PUMP 3 VFD FAULT	854881C	CLOSE ON ALARM	400-P007	800-I858	400-EL453	R5 / C1 / C1
NAD	854454	T2 CAUSTIC FEED PUMP 4 VFD FAULT	854881C	CLOSE ON ALARM	400-P007	800-I858	400-EL454	R6 / C1 / C2
MAH	854505	EFF SUMP 1 PUMP SEAL LEAK	854881C	OPEN ON ALARM	500-P010	800-I860	500-EL505	R12 / C5 / C2
TAH	854505	EFF SUMP 1 PUMP MOTOR WINDING TEMPERATURE HIGH	854881C	OPEN ON ALARM	500-P010	800-I860	500-EL505	R11 / C5 / C1
NAD	854528	T2 EFFLUENT GATE ACTUATOR FAULT	854881C	CLOSE ON ALARM	500-P009	800-I858	500-EL528	R8 / C1 / C2
NAD	854532	C3 PUMP 2 VFD FAULT	854881C	OPEN ON ALARM	500-P007	800-I859	500-EL532	R1 / C3 / C1
TAH	854532	C3 PUMP 2 MOTOR WINDING TEMP HIGH	854881C	OPEN ON ALARM	500-P007	800-I859	500-EL532	R2 / C3 / C2
LAL	854533	EFFLUENT SAMPLE BOX LEVEL LOW	854881C	CLOSE ON ALARM	500-P009	800-I858	800-I874	R12 / C2 / C2
NAD	854552	TRAIN 2 DEFOAMER FEED PUMP VFD FAULT	854881C	CLOSE ON ALARM	500-P012	800-I858	500-EL552	R5 / C2 / C1
PAH	854566	SERVICE AIR SYSTEM PRESSURE HIGH	854881C	CLOSE ON ALARM	500-P014	800-I859	---	R5 / C3 / C1
PAL	854566	SERVICE AIR SYSTEM PRESSURE LOW	854881C	CLOSE ON ALARM	500-P014	800-I859	800-I874	R6 / C3 / C2
LAH	854601	SOLIDS HOLDING TANK LEVEL HIGH	854881C	CLOSE ON ALARM	600-P001	800-I860	800-I818	R3 / C6 / C1
NAD	854621	SOLIDS TANK FLUSH SEQUENCE FAIL	854881C	CLOSE ON ALARM	600-P005	800-I860	800-I817	R5 / C6 / C1
FAL	854725	OCU 2 EXHAUSR FAN AIR FLOW LOW	854881C	OPEN ON ALARM	700-P002	800-I860	800-I874	R12 / C6 / C2
NAD	854725	OCU 2 EXHAUST FAN FAULT	854881C	OPEN ON ALARM	700-P002	800-I860	800-I874	R11 / C6 / C1
FAL	854727	OCU 2 SAMPLE AIR FLOW LOW	854881C	OPEN ON ALARM	700-P006	800-I860	700-IL727	R6 / C6 / C2

Tag	No.	Legend	Annunciator	Field Contact Alarm Cond	P&ID Dwg	Annun Dwg	Inst/Elec Dwg	Row/ Col/ Card
YA	854820	PLC854820 FAILURE	854881C	OPEN ON ALARM	800-P003	800-I859	800-I865	R12 / C4 / C2
NAD	854832	BALLASTED SEDIMENTATION SWBD 2 SURGE PROTECT DEVICE FAIL	854881C	CLOSE ON ALARM	800-P001	800-I859	800-I874	R12 / C3 / C2
NAD	854842	BALLASTED SEDIMENTATION MCC 2 SURGE PROTECT DEVICE FAIL	854881C	CLOSE ON ALARM	800-P001	800-I859	800-I874	R11 / C3 / C1
NAD	854844	UV MCC 2 SURGE PROTECT DEVICE FAIL	854881C	CLOSE ON ALARM	800-P002	800-I860	800-I874	R1 / C5 / C1
ZA	854893	PROCESS ELECT BLDG INTRUSION	854881C	OPEN ON ALARM	800-P002	800-I859	800-I874	R6 / C4 / C2
YA	854894	PROCESS ELECT FIRE ALARM	854881C	OPEN ON ALARM	800-P002	800-I859	800-I874	R7 / C3 / C1
AAH	854333A	INFLUENT SAMPLE ROOM LEL HIGH	854881C	OPEN ON ALARM	300-P018	800-I858	300-IL333	R9 / C2 / C1
AAL	854333B	INFLUENT SAMPLE ROOM O2 LOW	854881C	OPEN ON ALARM	300-P018	800-I858	300-IL333	R10 / C2 / C2
AAH	854333C	INFLUENT SAMPLE ROOM H2S HIGH	854881C	OPEN ON ALARM	300-P018	800-I858	300-IL333	R11 / C2 / C1
NAD	854420A	T2 BALLASTED SED SYSTEM FAULT	854881C	CLOSE ON ALARM	400-P001	800-I859	800-I874	R9 / C4 / C1
NAD	854420C	T2 BALLASTED SED SYSTEM WARNING	854881C	CLOSE ON ALARM	400-P001	800-I859	800-I874	R10 / C4 / C2
NAD	854521A	T2 UV DISINFECTION SYSTEM FAULT	854881C	CLOSE ON ALARM	500-P003	800-I859	800-I874	R7 / C4 / C1
NAD	854521C	T2 UV DISINFECTION SYSTEM WARNING	854881C	CLOSE ON ALARM	500-P003	800-I859	800-I874	R8 / C4 / C2
AAH	854727A	OCU 2 LEL HIGH	854881C	OPEN ON ALARM	700-P006	800-I860	700-IL727	R7 / C6 / C1
AAH	854727C	OCU 2 H2S HIGH	854881C	OPEN ON ALARM	700-P006	800-I860	700-IL727	R9 / C6 / C1
ZA	854900	GENERATOR INTRUSION	854981	OPEN ON ALARM	900-P103	900-I906	900-I915	R6 / C2 / C2
HA	854901B	GENERATOR NOT IN AUTO	854981	CLOSE ON ALARM	900-P003	900-I906	900-I915	R5 / C3 / C1
NAD	854901A	GENERATOR FAILURE	854981	CLOSE ON ALARM	900-P003	900-I906	900-I915	R3 / C3 / C1

Tag	No.	Legend	Annunciator	Field Contact Alarm Cond	P&ID Dwg	Annun Dwg	Inst/Elec Dwg	Row/ Col/ Card
NAD	854901B	GENERATOR TROUBLE	854981	CLOSE ON ALARM	900-P003	900-I906	900-I915	R4 / C3 / C2
NAJ	854901	GENERATOR RUNNING	854981	CLOSE ON ALARM	900-P003	900-I906	900-I915	R4 / C1 / C2
LAL	854904	GENERATOR FUEL STORAGE TANK LEVEL LOW	854981	CLOSE ON ALARM	900-P004	900-I906	900-I915	R2 / C1 / C2
NAD	854904	GENERATOR FUEL STORAGE TANK TROUBLE	854981	CLOSE ON ALARM	900-P004	900-I906	900-I915	R3 / C2 / C1
NAD	854931A	UTILITY A FAIL	854981	CLOSE ON ALARM	900-P101	900-I906	900-I915	R5 / C1 / C1
NAD	854931B	SURGE PROTECT DEVICE A FAIL	854981	CLOSE ON ALARM	900-P101	900-I906	900-I915	R3 / C4 / C1
NAD	854932A	UTILITY POWER B FAIL	854981	CLOSE ON ALARM	900-P101	900-I906	900-I915	R6 / C1 / C2
NAD	854932B	SURGE PROTECT DEVICE B FAIL	854981	CLOSE ON ALARM	900-P101	900-I906	900-I915	R4 / C4 / C2
NAD	854934	STANDBY POWER SWITCHBOARD SURGE PROTECT DEVICE FAIL	854981	CLOSE ON ALARM	900-P102	900-I907	900-I915	R1 / C5 / C1
NAD	854941	MCC SURGE PROTECT DEVICE FAIL	854981	CLOSE ON ALARM	900-P103	900-I906	900-I915	R3 / C1 / C1
NAD	854942	OPERATIONS SURGE PROTECT DEVICE FAIL	854981	CLOSE ON ALARM	900-P102	900-I907	900-I915	R2 / C5 / C2
NAD	854951	OPERATIONS UPS TROUBLE	854981	CLOSE ON ALARM	900-P102	900-I906	900-I915	R2 / C2 / C2
NAD	854981	PLC854981 FAILURE	854981	CLOSE ON ALARM	900-P103	900-I906	900-I911	R1 / C4 / C1
ZA	854993	OPERATIONS BUILDING INTRUSION	854981	OPEN ON ALARM	900-P102	900-I906	900-I915	R5 / C2 / C1
FA	854994A	OPERATIONS FIRE ALARM	854981	OPEN ON ALARM	900-P102	900-I906	900-I915	R5 / C4 / C1
FA	854994B	GENERATOR FIRE ALARM	854981	OPEN ON ALARM	900-P103	900-I906	900-I915	R6 / C4 / C2

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 17903
PLC I/O SCHEDULE

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies the PLC I/O schedule.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 SCHEDULE

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
ZX	854211	GT REGULATOR G-TOWN GATE POS	---	17800	854281	AI	200-P001	200-I226	200-EL211	R1 : S7 : P0	
ZX	854212	GT REGULATOR MICH GATE POSITION	---	17800	854281	AI	200-P001	200-I226	200-EL212	R1 : S7 : P3	
ZX	854213	GT REGULATOR EBI GATE POSITION	---	17800	854281	AI	200-P001	200-I226	200-EL213	R1 : S8 : P1	
LX	854212A	GT REGULATOR MICH TRUNK LEVEL	---	17800	854281	AI	200-P001	200-I226	200-IL212	R1 : S7 : P1	
LX	854213A	GT REGULATOR EBI LEVEL	---	17800	854281	AI	200-P001	200-I226	200-IL212	R1 : S8 : P0	
LX	854214A	GT REGULATOR DIVERSION LEVEL	---	17800	854281	AI	200-P001	200-I226	200-IL214	R1 : S7 : P4	
AX	854221A	GT REGULATOR LEL	---	17800	854281	AI	200-P004	200-I226	200-IL221	R1 : S7 : P2	
AX	854221B	GT REGULATOR O2 ELEMENT	---	17800	854281	AI	200-P004	200-I226	200-IL221	R1 : S8 : P2	
AX	854221C	GT REGULATOR H2S ELEMENT	---	17800	854281	AI	200-P004	200-I226	200-IL221	R1 : S8 : P3	
HXR	854211	GT REGULATOR G-TOWN GATE REMOTE	REMOTE:LOCAL	17800	854281	DI	200-P001	200-I228	200-EL211	R1 : S12 : P3	
WXH	854211	GT REGULATOR G-TOWN GATE HI TOR	HI TOR:NORM	17800	854281	DI	200-P001	200-I228	200-EL211	R1 : S12 : P4	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
ZXC	854211	GT REGULATOR G-TOWN GATE OPENED	CLOSED:N/A	17800	854281	DI	200-P001	200-I228	200-EL211	R1 : S12 : P1	
ZXO	854211	GT REGULATOR G-TOWN GATE CLOSED	OPEN:N/A	17800	854281	DI	200-P001	200-I228	200-EL211	R1 : S12 : P0	
HXR	854212	GT REGULATOR MICH GATE REMOTE	REMOTE:LOCAL	17800	854281	DI	200-P001	200-I228	200-EL212	R1 : S12 : P11	
WXH	854212	GT REGULATOR MICH GATE HI TOR	HI TOR:NORM	17800	854281	DI	200-P001	200-I228	200-EL212	R1 : S12 : P12	
ZXC	854212	GT REGULATOR MICH GATE OPENED	CLOSED:N/A	17800	854281	DI	200-P001	200-I228	200-EL212	R1 : S12 : P9	
ZXO	854212	GT REGULATOR MICH GATE CLOSED	OPEN:N/A	17800	854281	DI	200-P001	200-I228	200-EL212	R1 : S12 : P8	
HXR	854213	GT REGULATOR EBI GATE REMOTE	REMOTE:LOCAL	17800	854281	DI	200-P001	200-I228	200-EL213	R1 : S13 : P3	
WXH	854213	GT REGULATOR EBI GATE HI TORQUE	HI TOR:NORN	17800	854281	DI	200-P001	200-I228	200-EL213	R1 : S13 : P4	
ZXC	854213	GT REGULATOR EBI GATE OPENED	CLOSED:N/A	17800	854281	DI	200-P001	200-I228	200-EL213	R1 : S13 : P1	
ZXO	854213	GT REGULATOR EBI GATE CLOSED	OPEN:N/A	17800	854281	DI	200-P001	200-I228	200-EL213	R1 : S13 : P0	
FXL	854221	GT REG HAZ GAS SAMPLE LOW FLOW	LOW FLOW:NORM	17800	854281	DI	200-P004	200-I228	200-IL221	R1 : S13 : P7	
NXD	854241	GT REG SURGE PROTECTOR FAIL	FAIL:NORM	17800	854281	DI	200-P005	200-I228	200-I228	R1 : S13 : P11	
ZXD	854293	GT REGULATOR INTRUSION	CLOSED:OPEN	17800	854281	DI	200-P005	200-I228	200-I231	R1 : S13 : P13	
NXD	854211A	GT REG G-TOWN GATE ACT FAULT	FAULT:NORM	17800	854281	DI	200-P001	200-I228	200-EL211	R1 : S12 : P2	
NXD	854212A	GT REGULATOR MICH GATE ACT FAULT	FAULT:NORM	17800	854281	DI	200-P001	200-I228	200-EL212	R1 : S12 : P10	
NXD	854213A	GT REGULATOR EBI GATE ACT FAULT	FAULT:NORM	17800	854281	DI	200-P001	200-I228	200-EL213	R1 : S13 : P2	
AXH	854221A	GT REGULATOR LEL HIGH	HIGH LEL:NORM	17800	854281	DI	200-P004	200-I228	200-IL221	R1 : S13 : P8	
AXL	854221B	GT REGULATOR O2 LOW	LOW O2:NORM	17800	854281	DI	200-P004	200-I228	200-IL221	R1 : S13 : P9	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
AXH	854221C	GT REGULATOR H2S HIGH	HIGH H2S:NORM	17800	854281	DI	200-P004	200-I228	200-IL221	R1 : S13 : P10	
NXD	854252A	GT REGULATOR UPS FAIL	FAIL:NORM	17800	854281	DI	200-P005	200-I228	200-I231	R1 : S13 : P12	
PXL	854261A	GT GEORGETOWN REG INST AIR PSL	LO PRESS:NORM	17800	854281	DI	200-P002	200-I228	200-I231	R1 : S12 : P7	
PXL	854262A	GT REGULATOR SERV AIR PSL	LO PRESS:NORM	17800	854281	DI	200-P003	200-I228	200-I231	R1 : S12 : P15	
NXD	854281B	GT REG PLC PNL DC PWR SPLY OK	NORM:FAIL	17800	854281	DI	200-P005	200-I229	200-I224	R1 : S14 : P0	
YXD	854294A	GT REGULATOR FIRE	FIRE:NORM	17800	854281	DI	200-P005	200-I228	200-I231	R1 : S13 : P14	
NYC	854211	GT REGULATOR G-TOWN GATE CLOSE CMD	CLOSE:N/A	17800	854281	DO	200-P001	200-I230	200-EL211	R1 : S15 : P2	
NYO	854211	GT REGULATOR G-TOWN GATE OPN CMD	OPEN:N/A	17800	854281	DO	200-P001	200-I230	200-EL211	R1 : S15 : P1	
NYC	854212	GT REGULATOR MICH GATE CLOSE CMD	CLOSE:N/A	17800	854281	DO	200-P001	200-I230	200-EL212	R1 : S15 : P4	
NYO	854212	GT REGULATOR MICH GATE OPEN CMD	OPEN:N/A	17800	854281	DO	200-P001	200-I230	200-EL212	R1 : S15 : P3	
NYC	854213	GT REGULATOR GATE POS CLOSE CMD	CLOSE:N/A	17800	854281	DO	200-P001	200-I230	200-EL213	R1 : S16 : P2	
NYO	854213	GT REGULATOR GATE POS OPEN CMD	OPEN:N/A	17800	854281	DO	200-P001	200-I230	200-EL213	R1 : S16 : P1	
NYD	854281	GT REGULATOR PLC FAIL	FAIL:NORM	17800	854281	DO	200-P005	200-I230	---	R1 : S16 : P0	
JX	854241	GT REGULATOR MCC POWER MONITOR	---	17800	854281	ENET	200-P005	200-I225	---	---	
LX	807260A	MICHIGAN REGULATOR MST LEVEL	---	17800	854281	ENET	200-P001	200-I225	---	---	
LY	807260A	MICHIGAN REGULATOR MST LEVEL	---	17800	854281	ENET	260-P001	200-I225	---	---	
LX	807260B	MICHIGAN REGULATOR EBI LEVEL 3	---	17800	854281	ENET	200-P001	200-I225	---	---	
LY	807260B	MICHIGAN REGULATOR EBI LEVEL 3	---	17800	854281	ENET	250-P001	200-I225	---	---	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
LX	809250A	BRANDON REGULATOR EBI LEVEL 1	---	17800	854281	ENET	200-P001	200-I225	---	---	
LY	809250A	BRANDON REGULATOR EBI LEVEL 1	---	17800	854281	ENET	250-P001	200-I225	---	---	
FX	854311	T1 - INFLUENT PUMP 1 FLOW	---	17800	854810	AI	300-P011	800-I811	300-IL311	R1 : S6 : P3	
SX	854311	T1 - INFLUENT PUMP 1 SPEED	---	17800	854810	AI	300-P011	800-I811	300-EL311	R1 : S6 : P2	
VX	854311	T1 - INF PUMP 1 VIBRATION	---	17800	854810	AI	300-P011	800-I811	300-IL311	R1 : S6 : P0	
FX	854312	T1 - INFLUENT PUMP 2 FLOW	---	17800	854810	AI	300-P012	800-I812	300-IL312	R1 : S8 : P7	
SX	854312	T1 - INFLUENT PUMP 2 SPEED	---	17800	854810	AI	300-P012	800-I812	300-EL312	R1 : S8 : P6	
VX	854312	T1 - INF PUMP 2 VIBRATION	---	17800	854810	AI	300-P012	800-I813	300-IL312	R1 : S9 : P7	
FX	854313	T1 - INFLUENT PUMP 3 FLOW	---	17800	854810	AI	300-P013	800-I812	300-IL313	R1 : S7 : P4	
SX	854313	T1 - INFLUENT PUMP 3 SPEED	---	17800	854810	AI	300-P013	800-I812	300-EL313	R1 : S7 : P3	
VX	854313	T1 - INF PUMP 3 VIBRATION	---	17800	854810	AI	300-P013	800-I811	300-IL313	R1 : S5 : P7	
AX	854334	INFLUENT PH	---	17800	854810	AI	300-P005	800-I811	300-IL334	R1 : S5 : P2	
LX	854341	INFLUENT SCREEN 1 DIFFERENTIAL LEVEL	---	17800	854810	AI	300-P002	800-I811	300-IL341	R1 : S5 : P1	
WX	854431	T1 - POLYMER TOTE WEIGHT	---	17800	854810	AI	400-P003	800-I811	400-IL431	R1 : S6 : P6	
LX	854440	COAG STORAGE TANK LEVEL	---	17800	854810	AI	400-P004	800-I812	400-IL440	R1 : S8 : P1	
FX	854451	T1 - CAUST FEED FLOW	---	17800	854810	AI	400-P006	800-I811	400-IL451	R1 : S6 : P7	
SX	854451	T1 - CAUSTIC FEED PUMP 1 SPEED	---	17800	854810	AI	400-P006	800-I812	400-EL451	R1 : S7 : P7	
SX	854452	T1 - CAUST FEED PUMP 2 SPEED	---	17800	854810	AI	400-P006	800-I812	400-EL452	R1 : S8 : P0	
LX	854505	EFFLUENT SUMP 1 LEVEL	---	17800	854810	AI	500-P010	800-I812	500-IL505	R1 : S7 : P5	
AX	854511	T1 - UV SYSTEM APPLIED DOSE	---	17800	854810	AI	500-P002	800-I811	VENDOR	R1 : S6 : P5	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
ZX	854518	T1 - EFFLUENT GATE POSITION	---	17800	854810	AI	500-P009	800-I812	500-EL518	R1 : S8 : P3	
FX	854531	C3 PUMP FLOW	---	17800	854810	AI	500-P007	800-I812	500-IL531	R1 : S8 : P5	
SX	854531	C3 PUMP 1 SPEED	---	17800	854810	AI	500-P007	800-I812	500-EL531	R1 : S8 : P4	
FX	854551	T1 DEFOAM FEED PUMP FLOW	---	17800	854810	AI	500-P012	800-I813	500-IL551	R1 : S9 : P0	
SX	854551	T1 DEFOAM FEED PUMP SPEED	---	17800	854810	AI	500-P012	800-I813	500-EL551	R1 : S9 : P3	
LX	854601	SOLIDS HOLDING TANK LEVEL	---	17800	854810	AI	600-P001	800-I813	600-IL601	R1 : S9 : P1	
FX	854613	SOLIDS RETURN PUMP FLOW	---	17800	854810	AI	600-P003	800-I813	600-IL613	R1 : S9 : P2	
LX	854300AA	EQ BASIN LEVEL SIGNAL 1	---	17800	854810	AI	300-P008	800-I811	300-IL300	R1 : S6 : P1	
AX	854303A	EQ BASIN LEL	---	17800	854810	AI	300-P018	800-I812	300-IL303	R1 : S7 : P0	
AX	854303B	EQ BASIN O2 CONCENTRATION	---	17800	854810	AI	300-P018	800-I812	300-IL303	R1 : S7 : P1	
AX	854303C	EQ BASIN H2S CONCENTRATION	---	17800	854810	AI	300-P018	800-I812	300-IL303	R1 : S7 : P2	
LX	854330A	INFLUENT CHANNEL LEVEL	---	17800	854810	AI	300-P001	800-I811	300-IL330	R1 : S5 : P0	
AX	854345A	SCREEN ROOM LEL	---	17800	854810	AI	300-P006	800-I811	300-I345	R1 : S5 : P3	
AX	854345B	SCREEN ROOM O2	---	17800	854810	AI	300-P006	800-I811	300-I345	R1 : S5 : P4	
AX	854345C	SCREEN ROOM H2S	---	17800	854810	AI	300-P006	800-I811	300-I345	R1 : S5 : P5	
LX	854411A	T1 - BALLASTED SED DISTRIBUTION CHANNEL LEVEL	---	17800	854810	AI	400-P001	800-I811	300-IL411	R1 : S6 : P4	
LX	854517A	C3 STORAGETANK LEVEL	---	17800	854810	AI	500-P006	800-I812	500-IL517	R1 : S8 : P2	
AX	854717A	OCU 1 FAN ENCLOSURE LEL	---	17800	854810	AI	700-P005	800-I813	700-IL717	R1 : S9 : P4	
AX	854717C	OCU 1 FAN ENCLOSURE H2S	---	17800	854810	AI	700-P005	800-I813	700-IL717	R1 : S9 : P6	
SY	854311	T1 - INFLUENT PUMP 1 SPEED REFERENCE	---	17800	854810	AO	300-P011	800-I814	300-EL311	R1 : S11 : P0	
SY	854312	T1 - INFLUENT PUMP 2 SPEED REFERENCE	---	17800	854810	AO	300-P012	800-I814	300-EL312	R1 : S12 : P4	
SY	854313	T1 - INFLUENT PUMP 3 SPEED REFERENCE	---	17800	854810	AO	300-P013	800-I814A	300-EL313	R1 : S13 : P0	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
FY	854410	T1 - BALLASTED SED FLOW RATE	---	17800	854810	AO	400-P001	800-I814	VENDOR	R1 : S12 : P5	
SY	854451	T1 - CAUSTIC FEED PUMP 1 SPEED REFERENCE	---	17800	854810	AO	400-P006	800-I814	400-EL451	R1 : S11 : P3	
SY	854452	T1 - CAUST FEED PUMP 2 SPEED REFERENCE	---	17800	854810	AO	400-P006	800-I814	400-EL452	R1 : S12 : P0	
FY	854511	T1 - UV TRAIN FLOW RATE	---	17800	854810	AO	500-P002	800-I814	VENDOR	R1 : S11 : P6	
ZY	854518	T1 - EFFLUENT GATE POSITION COMMAND	---	17800	854810	AO	500-P009	800-I814	500-EL518	R1 : S12 : P3	
SY	854531	C3 PUMP 1 SPEED REFERENCE	---	17800	854810	AO	500-P007	800-I814	500-EL531	R1 : S12 : P1	
SY	854551	T1 DEFOAM FEED PUMP SPEED REFERENCE	---	17800	854810	AO	500-P012	800-I814	500-EL551	R1 : S12 : P2	
ZXD	854102	MICH ST PERSONNEL GATE CLOSED	CLOSED : OPEN	17800	854810	DI	800-P001	800-I823	---	R2 : S15 : P14	
ZXD	854103	PLANT W ROAD VEHICLE GATE CLOSED	CLOSED : OPEN	17800	854810	DI	800-P001	800-I823	---	R2 : S15 : P15	
ZXD	854104	PLANT E ROAD VEHICLE GATE CLOSED	CLOSED : OPEN	17800	854810	DI	800-P001	800-I823	---	R2 : S16 : P5	
HXA	854301	EQ BASIN DRAIN PUMP 1 AUTO	AUTO : N/A	17800	854810	DI	300-P017	800-I820	300-EL301	R2 : S10 : P8	
MXH	854301	EQ BASIN DRAIN PUMP 1 SEAL LEAK	SEAL LEAK : NORM	17800	854810	DI	300-P017	800-I820	300-EL301	R2 : S10 : P11	
NXG	854301	EQ BASIN DRAIN PUMP 1 READY	READY : N/A	17800	854810	DI	300-P017	800-I820	300-EL301	R2 : S10 : P10	
NXJ	854301	EQ BASIN DRAIN PUMP 1 RUNNING	RUNNING : OFF	17800	854810	DI	300-P017	800-I820	300-EL301	R2 : S10 : P9	
TXH	854301	EQ BSN DRAIN PMP 1 MTR TEMP HIGH	TEMP HIGH : NORM	17800	854810	DI	300-P017	800-I820	300-EL301	R2 : S10 : P12	
FXL	854303	EQ BASIN HAZ GAS SAMPLE FLOW LOW	FLOW LOW : NORM	17800	854810	DI	300-P018	800-I820	300-IL303	R2 : S10 : P13	
HXR	854304	EQ BASIN FLUSHING VLV 1 REMOTE	REMOTE:LOCAL	17800	854810	DI	300-P019	800-I821	300-EL304	R2 : S11 : P1	
NXD	854304	EQ BASIN FLUSHING VLV 1 FAULT	FAULT : NORM	17800	854810	DI	300-P019	800-I821	300-EL304	R2 : S11 : P4	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
ZXC	854304	EQ BASIN FLUSHING VLV 1 CLOSED	CLOSED : N/A	17800	854810	DI	300-P019	800-I821	300-EL304	R2 : S11 : P3	
ZXO	854304	EQ BASIN FLUSHING VLV 1 OPENED	OPENED : N/A	17800	854810	DI	300-P019	800-I821	300-EL304	R2 : S11 : P2	
HXA	854306	EQ BASIN FLUSH VLV 3 AUTO	AUTO : N/A	17800	854810	DI	300-P019	800-I824A	300-EL306	R3 : S4 : P1	
HXR	854306	EQ BASIN FLUSHING VLV 3 REMOTE	REMOTE:LOCAL	17800	854810	DI	300-P019	800-I824A	300-EL306	R3 : S4 : P3	
NXD	854306	EQ BASIN FLUSHING VLV 3 FAULT	FAULT : NORM	17800	854810	DI	300-P019	800-I824A	300-EL306	R3 : S4 : P6	
ZXC	854306	EQ BASIN FLUSHING VLV 3 CLOSED	CLOSED : N/A	17800	854810	DI	300-P019	800-I824A	300-EL306	R3 : S4 : P5	
ZXO	854306	EQ BASIN FLUSHING VLV 3 OPENED	OPENED : N/A	17800	854810	DI	300-P019	800-I824A	300-EL306	R3 : S4 : P4	
HXA	854311	T1 - INFLUENT PUMP 1 AUTO	AUTO : N/A	17800	854810	DI	300-P011	800-I820	300-EL311	R2 : S9 : P7	
NXG	854311	T1 - INFLUENT PUMP 1 READY	READY : N/A	17800	854810	DI	300-P011	800-I820	300-EL311	R2 : S9 : P9	
NXJ	854311	T1 - INFLUENT PUMP 1 RUNNING	RUNNING : OFF	17800	854810	DI	300-P011	800-I820	300-EL311	R2 : S9 : P8	
TXH	854311	T1 - INFLUENT PUMP 1 MTR TEMP HIGH	TEMP HIGH : NORM	17800	854810	DI	300-P011	800-I820	300-EL311	R2 : S9 : P11	
VXH	854311	T1 - INF PUMP 1 VIBRATION WARNING	VIB WARN : NORM	17800	854810	DI	300-P011	800-I824A	300-EL311	R3 : S3 : P1	
VXHH	854311	T1 - INF PUMP 1 VIBRATION ALARM	VIB ALARM : NORM	17800	854810	DI	300-P011	800-I824A	300-EL311	R3 : S3 : P2	
HXA	854312	T1 - INFLUENT PUMP 2 AUTO	AUTO : N/A	17800	854810	DI	300-P012	800-I820	300-EL312	R2 : S10 : P2	
NXG	854312	T1 - INFLUENT PUMP 2 READY	READY : N/A	17800	854810	DI	300-P012	800-I820	300-EL312	R2 : S10 : P4	
NXJ	854312	T1 - INFLUENT PUMP 2 RUNNING	RUNNING : OFF	17800	854810	DI	300-P012	800-I820	300-EL312	R2 : S10 : P3	
TXH	854312	T1 - INFLUENT PUMP 2 MTR TEMP HIGH	TEMP HIGH : NORM	17800	854810	DI	300-P012	800-I820	300-EL312	R2 : S10 : P1	
VXH	854312	T1 - INF PUMP 2 VIBRATION WARNING	VIB WARN : NORM	17800	854810	DI	300-P012	800-I822	300-EL312	R2 : S14 : P8	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
VXHH	854312	T1 - INF PUMP 2 VIBRATION ALARM	VIB ALARM : NORM	17800	854810	DI	300-P012	800-I822	300-EL312	R2 : S14 : P9	
HXA	854313	T1 - INFLUENT PUMP 3 AUTO	AUTO : N/A	17800	854810	DI	300-P013	800-I821	300-EL313	R2 : S11 : P11	
NXG	854313	T1 - INFLUENT PUMP 3 READY	READY : N/A	17800	854810	DI	300-P013	800-I821	300-EL313	R2 : S11 : P13	
NXJ	854313	T1 - INFLUENT PUMP 3 RUNNING	RUNNING : OFF	17800	854810	DI	300-P013	800-I821	300-EL313	R2 : S11 : P12	
TXH	854313	T1 - INFLUENT PUMP 3 MTR TEMP HIGH	TEMP HIGH : NORM	17800	854810	DI	300-P013	800-I821	300-EL313	R2 : S11 : P15	
VXH	854313	T1 - INF PUMP 3 VIBRATION WARNING	VIB WARN : NORM	17800	854810	DI	300-P013	800-I822	300-EL313	R2 : S13 : P3	
VXHH	854313	T1 - INF PUMP 3 VIBRATION ALARM	VIB ALARM : NORM	17800	854810	DI	300-P013	800-I822	300-EL313	R2 : S13 : P4	
HXA	854314	EQ BASIN FLUSH VLV 5 AUTO	AUTO : N/A	17800	854810	DI	300-P018A	800-I824B	300-EL314	R3 : S5 : P0	
HXR	854314	EQ BASIN FLUSHING VLV 5 REMOTE	REMOTE:LOCAL	17800	854810	DI	300-P019A	800-I824B	300-EL314	R3 : S5 : P1	
NXD	854314	EQ BASIN FLUSHING VLV 5 FAULT	FAULT : NORM	17800	854810	DI	300-P019A	800-I824B	300-EL314	R3 : S5 : P4	
ZXC	854314	EQ BASIN FLUSHING VLV 5 CLOSED	CLOSED : N/A	17800	854810	DI	300-P019A	800-I824B	300-EL314	R3 : S5 : P3	
ZXO	854314	EQ BASIN FLUSHING VLV 5 OPENED	OPENED : N/A	17800	854810	DI	300-P019A	800-I824B	300-EL314	R3 : S5 : P2	
HXA	854316	EQ BASIN FLUSH VLV 7 AUTO	AUTO : N/A	17800	854810	DI	300-P019A	800-I824B	300-EL316	R3 : S6 : P0	
HXR	854316	EQ BASIN FLUSHING VLV 7 REMOTE	REMOTE:LOCAL	17800	854810	DI	300-P019A	800-I824B	300-EL316	R3 : S6 : P1	
NXD	854316	EQ BASIN FLUSHING VLV 7 FAULT	FAULT : NORM	17800	854810	DI	300-P019A	800-I824B	300-EL316	R3 : S6 : P4	
ZXC	854316	EQ BASIN FLUSHING VLV 7 CLOSED	CLOSED : N/A	17800	854810	DI	300-P019A	800-I824B	300-EL316	R3 : S6 : P3	
ZXO	854316	EQ BASIN FLUSHING VLV 7 OPENED	OPENED : N/A	17800	854810	DI	300-P019A	800-I824B	300-EL316	R3 : S6 : P2	
HXA	854331	INFLUENT SAMPLE PUMP 1 AUTO	AUTO : N/A	17800	854810	DI	300-P005	800-I819	300-EL331	R2 : S8 : P9	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
MXH	854331	INF SAMPLE PUMP 1 LEAK	LEAK : NORM	17800	854810	DI	300-P005	800-I819	300-EL341A	R2 : S8 : P12	
NXJ	854331	INFLUENT SAMPLE PUMP 1 RUNNING	RUNNING : OFF	17800	854810	DI	300-P005	800-I819	300-EL341A	R2 : S8 : P10	
TXH	854331	INF SAMPLE PUMP 1 MTR TEMP HIGH	TEMP HIGH : NORM	17800	854810	DI	300-P005	800-I819	300-EL341A	R2 : S8 : P11	
LXL	854334	INFLUENT SAMPLE BOX LEVEL LOW	LEVEL LOW : NORM	17800	854810	DI	300-P005	800-I821	---	R2 : S11 : P6	
NXD	854337	INF PRI POLLUTANT SAMPLER FAULT	FAULT : NORM	17800	854810	DI	300-P005	800-I820	300-IL335	R2 : S9 : P2	
NXD	854340	PNL854340 DC PS NOT TROUBLE	NORM : TROUBLE	17800	854810	DI	300-P009	800-I823	---	R2 : S16 : P14	
HXA	854341	INFLUENT SCREEN 1 AUTO	AUTO : N/A	17800	854810	DI	300-P002	800-I819	300-EL341A	R2 : S8 : P0	
NXK	854341	INFLUENT SCREEN 1 ESTOP	ESTOP : NORM	17800	854810	DI	3000-P002	800-I819	300-EL341A	R2 : S8 : P3	
HXA	854343	SCREENINGS COMPACTOR 1 AUTO	AUTO : N/A	17800	854810	DI	300-P004	800-I819	300-EL343A	R2 : S8 : P5	
NXK	854343	SCREENINGS COMPACTOR 1 E-STOP	ESTOP : NORM	17800	854810	DI	300-P004	800-I821	300-EL343A	R2 : S12 : P3	
FXL	854345	SCREEN ROOM GAS DET AIR FLOW LOW	FLOW LOW : NORM	17800	854810	DI	300-P006	800-I819	300-IL345	R2 : S8 : P14	
LXH	854350	C2 AIR GAP TANK LEVEL HIGH	LEVEL HIGH : NORM	17800	854810	DI	300-P007	800-I823	---	R2 : S16 : P12	
LXL	854350	C2 AIR GAP TANK LEVEL LOW	LEVEL LOW : NORM	17800	854810	DI	300-P007	800-I823	---	R2 : S16 : P13	
PXH	854355	C2 SYSTEM HIGH PRESSURE	PRESS HIGH : NORM	17800	854810	DI	300-P007	800-I824	---	R3 : S1 : P6	
PXL	854355	C2 SYSTEM LOW PRESSURE	PRESS LOW : NORM	17800	854810	DI	300-P007	800-I824	---	R3 : S1 : P5	
NXD	854374	SCREEN ROOM HVAC FAULT	FAULT : NORM	17800	854810	DI	300-P024	800-I821	---	R2 : S11 : P8	
FXH	854401	POLY FEED SFTY SHOWER FLOW HIGH	FLOW HIGH : NORM	17800	854810	DI	400-P008	800-I821	---	R2 : S12 : P9	
LXH	854441	COAG PUMP ROOM SUMP HI LEVEL	LEVEL HIGH : NORM	17800	854810	DI	400-P003	800-I820	---	R2 : S9 : P15	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
FXH	854445	COAG FEED SFTY SHOWER FLOW HIGH	FLOW HIGH : NORM	17800	854810	DI	400-P008	800-I821	---	R2 : S12 : P8	
FXH	854446	COAG FILL SFTY SHOWER FLOW HIGH	FLOW HIGH : NORM	17800	854810	DI	400-P008	800-I821	---	R2 : S12 : P7	
FXH	854447	COAG STOR SFTY SHOWER FLOW HIGH	FLOW HIGH : NORM	17800	854810	DI	400-P008	800-I821	---	R2 : S12 : P6	
HX	854451	T1 - CAUST FEED PUMP 1 LEAD SEL	1 LEAD : 2 LEAD	17800	854810	DI	400-P006	800-I820	---	R2 : S12 : P5	
HXA	854451	T1 - CAUSTIC FEED PUMP 1 AUTO	AUTO : N/A	17800	854810	DI	400-P006	800-I821	400-EL451	R2 : S12 : P0	
NXJ	854451	T1 - CAUSTIC FEED PMP 1 RUNNINIG	RUNNING : OFF	17800	854810	DI	400-P006	800-I821	400-EL451	R2 : S12 : P1	
HXA	854452	T1 - CAUST FEED PUMP 2 AUTO	AUTO : N/A	17800	854810	DI	400-P006	800-I822	400-EL452	R2 : S13 : P0	
NXJ	854452	T1 - CAUST FEED PMP 2 RUNNINIG	RUNNING : OFF	17800	854810	DI	400-P006	800-I822	400-EL452	R2 : S13 : P1	
FXH	854455	CAUST FEED SFTY SHOWER FLOW HIGH	FLOW HIGH : NORM	17800	854810	DI	400-P008	800-I821	---	R2 : S12 : P10	
FXH	854456	CAUST FILL SFTY SHOWER FLOW HIGH	FLOW HIGH : NORM	17800	854810	DI	400-P008	800-I821	---	R2 : S12 : P12	
FXH	854457	CAUST STOR SFTY SHOWER FLOW HIGH	FLOW HIGH : NORM	17800	854810	DI	400-P008	800-I821	---	R2 : S12 : P11	
NXD	854474	POLY ROOM HVAC FAULT	HVAC FAULT : NORM	17800	854810	DI	400-P009	800-I824	---	R3 : S1 : P0	
FXH	854501	UV PMP ROOM SFTY SHWR HI FLOW	FLOW HIGH : NORM	17800	854810	DI	500-P015	800-I822	---	R2 : S14 : P10	
FXH	854502	UV DECK SFTY SHWR HI FLOW	FLOW HIGH : NORM	17800	854810	DI	500-P015	800-I822	---	R2 : S14 : P11	
ZXC	854518	T1 - EFFLUENT GATE CLOSED	CLOSED : N/A	17800	854810	DI	500-P009	800-I822	500-EL518	R2 : S14 : P3	
ZXO	854518	T1 - EFFLUENT GATE OPENED	OPENED : N/A	17800	854810	DI	500-P009	800-I822	500-EL518	R2 : S14 : P2	
HXA	854519	T1 - C3 RECIRC VALVE AUTO	AUTO : N/A	17800	854810	DI	500-P008	800-I824	---	R3 : S2 : P4	
HXR	854519	T1 - C3 RECIRC VALVE REMOTE	AUTO : N/A	17800	854810	DI	500-P008	800-I824	500-EL519	R3 : S1 : P1	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NXD	854519	T1 - C3 RECIRC VALVE FAULT	FAULT : NORM	17800	854810	DI	500-P008	800-I824	500-EL519	R3 : S1 : P4	
ZXC	854519	T1 - C3 RECIRC VALVE CLOSED	CLOSED : N/A	17800	854810	DI	500-P008	800-I824	500-EL519	R3 : S1 : P3	
ZXO	854519	T1 - C3 RECIRC VALVE OPENED	OPENED : N/A	17800	854810	DI	500-P008	800-I824	500-EL519	R3 : S1 : P2	
HX	854531	C3 PUMP 1 LEAD SELECT	1 LEAD : 2 LEAD	17800	854810	DI	500-P007	800-I822	---	R2 : S13 : P11	
HXA	854531	C3 PUMP 1 AUTO	AUTO : N/A	17800	854810	DI	500-P007	800-I822	500-EL531	R2 : S13 : P6	
NXG	854531	C3 PUMP 1 READY	READY : NOT READY	17800	854810	DI	500-P007	800-I822	500-EL531	R2 : S13 : P8	
NXJ	854531	C3 PUMP 1 RUNNING	RUNNING : OFF	17800	854810	DI	500-P007	800-I822	500-EL531	R2 : S13 : P7	
TXH	854531	C3 PUMP 1 MTR TEMP HIGH	TEMP HIGH : NORM	17800	854810	DI	500-P007	800-I822	500-EL531	R2 : S13 : P10	
HXA	854538	C3 STOR TANK C1 FILL VALVE AUTO	AUTO : N/A	17800	854810	DI	500-P006	800-I824A	500-EL538	R3 : S3 : P3	
HXR	854538	C3 STOR TANK C1 FILL VALVE REMOTE	REMOTE : N/A	17800	854810	DI	500-P006	800-I824A	500-EL538	R3 : S3 : P12	
NXD	854538	C3 STOR TANK C1 FILL VALVE FAULT	FAULT : NORM	17800	854810	DI	500-P006	800-I824A	500-EL528	R3 : S3 : P15	
ZXC	854538	C3 STOR TANK C1 FILL VLV CLOSED	CLOSED : N/A	17800	854810	DI	500-P006	800-I824A	500-EL528	R3 : S3 : P14	
ZXO	854538	C3 STOR TANK C1 FILL VALVE OPENED	OPENED : N/A	17800	854810	DI	500-P006	800-I824A	500-EL528	R3 : S3 : P13	
HXA	854551	T1 DEFOAM FEED PUMP AUTO	AUTO : N/A	17800	854810	DI	500-P012	800-I882	500-EL551	R2 : S13 : P12	
NXJ	854551	T1 DEFOAM FEED PUMP 1 RUNINIG	RUNNING : OFF	17800	854810	DI	500-P012	800-I882	500-EL551	R2 : S13 : P13	
PXL	854561	INST AIR SYSTEM PRESSURE LOW	PRESS LOW : NORM	17800	854810	DI	500-P013	800-I822	---	R2 : S14 : P6	
NXD	854572	UV PUMP ROOM HVAC FAULT	HVAC FAULT : NORM	17800	854810	DI	500-P016	800-I824	---	R3 : S2 : P5	
HX	854611	SOLIDS RETURN PMP LEAD SELECT	1 LEAD : 2 LEAD	17800	854810	DI	600-P003	800-I823	---	R2 : S15 : P0	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
HXA	854611	SOLIDS RETURN PMP 1 AUTO	AUTO : N/A	17800	854810	DI	600-P003	800-I822	600-EL611	R2 : S14 : P12	
HXP	854611	SOLIDS RETURN PMP 1 STOP	STOP : N/A	17800	854810	DI	600-P003	800-I823	600-EL611	R2 : S15 : P5	
HXS	854611	SOLIDS RETURN PMP 1 START	START : N/A	17800	854810	DI	600-P003	800-I823	600-EL611	R2 : S15 : P6	
HXY	854611	SOLIDS TRUCK LOADOUT ENABLE	ENABLE : DISABLE	17800	854810	DI	600-P003	800-I824	---	R3 : S2 : P9	
NXG	854611	SOLIDS RETURN PMP 1 READY	READY : NOT READY	17800	854810	DI	600-P003	800-I822	600-EL611	R2 : S14 : P14	
NXJ	854611	SOLIDS RETURN PMP 1 RUNNING	RUNNING : OFF	17800	854810	DI	600-P003	800-I822	600-EL611	R2 : S14 : P13	
HXA	854621	SOLIDS TANK FLUSH SEQ AUTO	AUTO : N/A	17800	854810	DI	600-P005	800-I822	---	R2 : S16 : P8	
HXR	854621	SOLIDS TANK FLUSH VLV 1 REMOTE	REMOTE : N/A	17800	854810	DI	600-P005	800-I823	600-EL621	R2 : S15 : P1	
NXD	854621	SOLIDS TANK FLUSH VLV 1 FAULT	FAULT : NORM	17800	854810	DI	600-P005	800-I823	600-EL621	R2 : S15 : P4	
ZXC	854621	SOLIDS TANK FLUSH VLV 1 CLOSED	CLOSED : N/A	17800	854810	DI	600-P005	800-I823	600-EL621	R2 : S15 : P3	
ZXO	854621	SOLIDS TANK FLUSH VLV 1 OPENED	OPENED : N/A	17800	854810	DI	600-P005	800-I823	600-EL621	R2 : S15 : P2	
HXA	854623	SOLIDS TANK FLUSH VLV 3 AUTO	AUTO : N/A	17800	854810	DI	600-P005	800-I821	600-EL623	R2 : S11 : P9	
HXR	854623	SOLIDS TANK FLUSH VLV 3 REMOTE	REMOTE : N/A	17800	854810	DI	600-P005	800-I824	---	R3 : S2 : P11	
NXD	854623	SOLIDS TANK FLUSH VLV 3 FAULT	FAULT : NORM	17800	854810	DI	600-P005	800-I824	---	R3 : S2 : P14	
ZXC	854623	SOLIDS TANK FLUSH VLV 3 CLOSED	CLOSED : N/A	17800	854810	DI	600-P005	800-I824	---	R3 : S2 : P13	
ZXO	854623	SOLIDS TANK FLUSH VLV 3 OPENED	OPENED : N/A	17800	854810	DI	600-P005	800-I824	---	R3 : S2 : P12	
HXA	854715	OCU 1 EXHAUST FAN AUTO	AUTO : N/A	17800	854810	DI	700-P004	800-I824A	---	R3 : S4 : P14	
HXG	854715	OCU 1 EXHAUST FAN READY	READY : NOT READY	17800	854810	DI	700-P004	800-I824A	---	R3 : S4 : P13	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NXD	854715	OCU 1 EXHAUST FAN FAULT	FAULT : NORM	17800	854810	DI	700-P002	800-I824A	---	R3 : S4 : P8	
NXJ	854715	OCU 1 EXHAUST FAN RUNNING	RUNNING : OFF	17800	854810	DI	700-P004	800-I824A	---	R3 : S4 : P12	
TXH	854715	OCU 1 EXHAUST FAN MTR TEMP HIGH	TEMP HIGH : NORM	17800	854810	DI	700-P002	800-I824A	700-EL715	R3 : S4 : P11	
FXL	854717	OCU 1 FAN ENCL LOW SAMP FLOW	FLOW LOW : NORM	17800	854810	DI	700-P005	800-I824A	700-IL717	R3 : S3 : P7	
NXD	854831	BALL SED SWBD 1 SURGE PROT FAIL	FAIL:NORM	17800	854810	DI	800-P001	800-I823	---	R2 : S15 : P8	
NXD	854841	BALL SED MCC 1 SURGE PROT FAIL	FAIL:NORM	17800	854810	DI	800-P001	800-I823	---	R2 : S15 : P7	
NXD	854843	UV MCC 1 SURGE PROTECTOR FAIL	FAIL:NORM	17800	854810	DI	800-P002	800-I823	---	R2 : S15 : P12	
NXD	854845	PROCESS MCC SURGE PROTECTOR FAIL	FAIL:NORM	17800	854810	DI	800-P002	800-I823	---	R2 : S15 : P13	
ZXD	854101A	4TH AVE VEHICLE GATE CLOSED	CLOSED : OPEN	17800	854810	DI	800-P001	800-I823	---	R2 : S15 : P11	
ZXD	854101B	4TH AVE PERSONNEL GATE CLOSED	CLOSED : OPEN	17800	854810	DI	800-P001	800-I823	---	R2 : S15 : P10	
ZXD	854105A	REG ROAD VEHICLE GATE CLOSED	CLOSED : OPEN	17800	854810	DI	800-P001	800-I823	---	R2 : S16 : P10	
ZXD	854105B	REG ROAD PERSONNEL GATE CLOSED	CLOSED : OPEN	17800	854810	DI	800-P001	800-I824	---	R3 : S2 : P15	
HX	854300A	EQ BASIN LVL SIG 1 SELECT	1 SELECT : N/A	17800	854810	DI	300-P008	800-I820	---	R2 : S9 : P4	
HX	854300B	EQ BASIN LVL SIG AUTO SELECT	AUTO : N/A	17800	854810	DI	300-P008	800-I820	---	R2 : S9 : P5	
HX	854300C	EQ BASIN LVL SIG 2 SELECT	2 SELECT : N/A	17800	854810	DI	300-P008	800-I820	---	R2 : S9 : P6	
HX	854301A	EQ BASIN DRAIN PUMP 1 LEAD SEL	1 LEAD : 2 LEAD	17800	854810	DI	300-P017	800-I820	---	R2 : S10 : P7	
AXH	854303A	EQ BASIN HIGH LEL	LEL HIGH : NORM	17800	854810	DI	300-P018	800-I820	300-IL303	R2 : S10 : P14	
AXL	854303B	EQ BASIN LOW O2 CONCENTRATION	O2 LOW : NORM	17800	854810	DI	300-P018	800-I820	300-IL303	R2 : S10 : P15	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
AXH	854303C	EQ BASIN HIGH H2S CONCENTRATION	H2S HIGH : NORM	17800	854810	DI	300-P018	800-I820	300-IL303	R2 : S11 : P0	
HXA	854304A	EQ BASIN FLUSHING SEQ AUTO	AUTO : N/A	17800	854810	DI	300-P019	800-I824	---	R3 : S2 : P6	
HXS	854304A	EQ BASIN FLUSHING SEQ START	START : N/A	17800	854810	DI	300-P019	800-I824	---	R3 : S2 : P7	
HXA	854304B	EQ BASIN FLUSHING VLV 1 AUTO	AUTO : N/A	17800	854810	DI	300-P019	800-I821	300-EL304	R2 : S11 : P5	
HXS	854304B	EQ BASIN FLUSHING SEQ STOP	STOP : N/A	17800	854810	DI	300-P019	800-I824	---	R3 : S2 : P8	
ZXC	854308A	EFF RECYCLE TO EQ BSN VLV CLOSED	CLOSED : N/A	17800	854810	DI	300-P008	800-I823	300-EL308A	R2 : S16 : P3	
ZXO	854308A	EFF RECYCLE TO EQ BSN VLV OPEN	OPEN : N/A	17800	854810	DI	300-P008	800-I823	300-EL308A	R2 : S16 : P3	
HXS	854311A	T1 - INF PUMP 1 LEAD SEL	LEAD : N/A	17800	854810	DI	300-P009	800-I823	---	R2 : S16 : P0	
NXD	854311A	T1 - INFLUENT PUMP 1 VFD FAULT	FAULT : NORM	17800	854810	DI	300-P011	800-I820	300-EL311	R2 : S9 : P10	
HXS	854311B	T1 - INF PUMP 1 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854810	DI	300-P009	800-I823	---	R2 : S16 : P1	
HXS	854311C	T1 - INF PUMP 1 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854810	DI	300-P009	800-I823	---	R2 : S16 : P2	
HXS	854312A	T1 - INF PUMP 2 LEAD SEL	LEAD : N/A	17800	854810	DI	300-P009	800-I824	---	R3 : S1 : P13	
NXD	854312A	T1 - INFLUENT PUMP 2 VFD FAULT	FAULT : NORM	17800	854810	DI	300-P012	800-I820	300-EL312	R2 : S10 : P0	
HXS	854312B	T1 - INF PUMP 2 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854810	DI	300-P009	800-I824	---	R3 : S1 : P14	
HXS	854312C	T1 - INF PUMP 2 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854810	DI	300-P009	800-I824	---	R3 : S1 : P15	
HXS	854313A	T1 - INF PUMP 3 LEAD SEL	LEAD : N/A	17800	854810	DI	300-P009	800-I824	---	R3 : S2 : P0	
NXD	854313A	T1 - INFLUENT PUMP 3 VFD FAULT	FAULT : NORM	17800	854810	DI	300-P013	800-I821	300-EL313	R2 : S11 : P14	
HXS	854313B	T1 - INF PUMP 3 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854810	DI	300-P009	800-I824	---	R3 : S2 : P1	
HXS	854313C	T1 - INF PUMP 3 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854810	DI	300-P009	800-I824	---	R3 : S2 : P2	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
HXS	854320A	TREATMENT TRAIN 1 LEAD SELECT	TRAIN 1:NORM	17800	854810	DI	300-P008	800-I820	---	R2 : S9 : P3	
NXD	854335A	INFLUENT SAMPLER 1 FAULT	FAULT : NORM	17800	854810	DI	300-P005	800-I819	300-IL335	R2 : S8 : P13	
NXD	854335C	INFLUENT SAMPLER 2 FAULT	FAULT : NORM	17800	854810	DI	300-P005	800-I821	300-IL335	R2 : S12 : P4	
NXD	854341A	INFLUENT SCREEN 1 FAULT	FAULT : NORM	17800	854810	DI	300-P002	800-I819	300-EL341A	R2 : S8 : P4	
NXJ	854341A	INFLUENT SCREEN 1 RUNNING FOR	FORWARD : N/A	17800	854810	DI	300-P002	800-I819	300-EL341A	R2 : S8 : P1	
NXJ	854341B	INFLUENT SCREEN 1 RUN REV	REVERSE : N/A	17800	854810	DI	300-P002	800-I819	300-EL341A	R2 : S8 : P2	
NXD	854343A	SCREENINGS COMPACTOR 1 FAULT	FAULT : N/A	17800	854810	DI	300-P004	800-I819	300-EL341A	R2 : S8 : P8	
NXJ	854343A	SCREENINGS COMPACTOR 1 RUNNING FORWARD	FORWARD : N/A	17800	854810	DI	300-P004	800-I819	300-EL341A	R2 : S8 : P6	
NXJ	854343B	SCREENINGS COMPACTOR 1 RUNNING REVERSE	REVERSE : N/A	17800	854810	DI	300-P004	800-I819	300-EL341A	R2 : S8 : P7	
AXH	854345A	SCREEN ROOM LEL HIGH	LEL HIGH : NORM	17800	854810	DI	300-P006	800-I819	300-IL345	R2 : S8 : P15	
AXL	854345B	SCREEN ROOM O2 LOW	O2 LOW : NORM	17800	854810	DI	300-P006	800-I820	300-IL345	R2 : S9 : P0	
AXH	854345C	SCREEN ROOM H2S HIGH	H2S HIGH : NORM	17800	854810	DI	300-P006	800-I820	300-IL345	R2 : S9 : P1	
PXL	854361A	PRELIM TREAT INST AIR PRESS LOW	PRESS LOW : NORM	17800	854810	DI	300-P021	800-I821	---	R2 : S11 : P7	
NXD	854410A	T1 - BALLASTED SED SYS FAULT	FAULT : NORM	17800	854810	DI	400-P001	800-I822	VENDOR	R2 : S13 : P15	
NXD	854410C	T1 - BALLASTED SED SYS WARNING	WARNING : NORM	17800	854810	DI	400-P001	800-I822	VENDOR	R2 : S14 : P15	
ZXD	854433A	BALLASTED SED INTRUSION	INTRUSION : NORM	17800	854810	DI	800-P001	800-I823	---	R2 : S15 : P9	
LXH	854440A	COAG STORAGE TANK LEVEL HIGH	LEVEL HIGH : NORM	17800	854810	DI	400-P004	800-I820	400-IL440	R2 : S10 : P5	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
LXH	854440B	COAG STORAGE CONTAINMENT LEVEL HIGH	LEVEL HIGH : NORM	17800	854810	DI	400-P004	800-I820	400-IL440	R2 : S10 : P6	
NXD	854451A	T1 - CAUSTIC FEED PUMP 1 FAULT	FAULT : NORM	17800	854810	DI	400-P006	800-I821	400-EL451	R2 : S12 : P2	
NXD	854452A	T1 - CAUSTIC FEED PUMP 2 FAULT	FAULT : NORM	17800	854810	DI	400-P006	800-I822	400-EL452	R2 : S13 : P2	
NXD	854511A	T1 - UV SYSTEM FAULT	FAULT: NORM	17800	854810	DI	500-P002	800-I824	VENDOR	R3 : S1 : P8	
NXD	854511C	T1 - UV SYSTEM WARNING	WARN : NORM	17800	854810	DI	500-P002	800-I824	VENDOR	R3 : S1 : P7	
HXS	854516A	T1 RECIRC START	T1 RECIRC START : N/A	17800	854810	DI	500-P008	800-I824A	---	R3 : S3 : P8	
HXS	854516B	T2 RECIRC START	T2 RECIRC START : N/A	17800	854810	DI	500-P008	800-I824A	---	R3 : S3 : P9	
HXS	854516C	BOTH RECIRC START	BOTH REVIRC START : N/A	17800	854810	DI	500-P008	800-I824A	---	R3 : S3 : P10	
HXS	854516D	RECIRC OFF	RECIRC OFF : N/A	17800	854810	DI	500-P008	800-I824A	---	R3 : S3 : P11	
NXD	854518A	T1 - EFFLUENT GATE FAULT	FAULT : NORM	17800	854810	DI	500-P009	800-I822	500-EL518	R2 : S14 : P4	
NXD	854518C	T1 - EFFLUENT GATE ACT WARN	WARNING : NORM	17800	854810	DI	500-P009	800-I822	500-EL518	R2 : S14 : P0	
NXD	854531A	C3 PUMP 1 VFD FAULT	FAULT : NORM	17800	854810	DI	500-P007	800-I822	500-EL531	R2 : S13 : P9	
ZXS	854537A	UV PUMP ROOM INTRUSION	INTRUSION : NORM	17800	854810	DI	800-P002	800-I824A	---	R3 : S3 : P0	
NXD	854551A	T1 DEFOAM FEED PUMP FAULT	FAULT : NORM	17800	854810	DI	500-P012	800-I882	500-EL551	R2 : S13 : P14	
HXS	854611E	EBI SOLIDS RETURN SEQ START	START : N/A	17800	854810	DI	600-P003	800-I824	---	R3 : S2 : P10	
HXS	854611G	EBI SOLIDS RETURN SEQ STOP	STOP : N/A	17800	854810	DI	600-P003	800-I824	---	R3 : S2 : P3	
HXS	854621A	SOLIDS TANK FLUSH SEQ START	START : N/A	17800	854810	DI	600-P005	800-I823	---	R2 : S16 : P9	
HXA	854621B	SOLIDS TANK FLUSH VLV 1 AUTO	AUTO : N/A	17800	854810	DI	600-P005	800-I820	600-EL621	R2 : S9 : P13	
HXS	854621B	SOLIDS TANK FLUSH SEQ STOP	STOP : N/A	17800	854810	DI	600-P005	800-I824A	---	R3 : S4 : P10	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
TXH	854715B	OCU 1 EXHAUST FAN ENCLOSURE TEMP HIGH	TEMP HIGH : NORM	17800	854810	DI	700-P004	800-I824A	---	R3 : S4 : P15	
AXH	854717A	OCU 1 FAN ENCLOSURE HI LEL	LEL HIGH : NORM	17800	854810	DI	700-P005	800-I824A	700-IL717	R3 : S3 : P4	
AXH	854717C	OCU 1 FAN ENCLOSURE HI H2S	H2S HIGH : NORM	17800	854810	DI	700-P005	800-I824A	700-IL717	R3 : S3 : P6	
NXD	854810C	MCP SECT 1 DC PS NOT TROUBLE	NORM : TROUBLE	17800	854810	DI	300-P009	800-I823	---	R2 : S16 : P7	
NXD	854810D	MCP SECT 2 DC PS NOT TROUBLE	NORM : TROUBLE	17800	854810	DI	300-P009	800-I823	---	R2 : S16 : P11	
NXD	854851A	PROCESS ELECTRICAL UPS TROUBLE	TROUBLE:NORM	17800	854810	DI	800-P002	800-I823	---	R2 : S16 : P6	
NXD	854875A	PROCESS ELECT HVAC FAULT	HVAC FAULT : NORM	17800	854810	DI	800-P003	800-I824A	---	R3 : S3 : P5	
NYJ	854301	EQ BASIN LEAD DRAIN PUMP RUN CMD	RUN : OFF	17800	854810	DO	300-P017	800-I817	800-I829	R2 : S3 : P7	
NYC	854304	EQ BASIN FLUSHING VLV 1 CLOSE CMD	CLOSE : N/A	17800	854810	DO	300-P019	800-I816	300-EL304	R2 : S2 : P7	
NYD	854304	EQ BASIN FLUSHING SEQUENCE FAIL	FAIL : NORM	17800	854810	DO	300-P019	800-I816	800-I810	R2 : S2 : P3	
NYJ	854304	EQ BASIN FLUSHING SEQUENCE ON	ON : OFF	17800	854810	DO	300-P019	800-I816	---	R2 : S2 : P2	
NYO	854304	EQ BASIN FLUSHING VLV 1 OPEN CMD	OPEN : N/A	17800	854810	DO	300-P019	800-I816	300-EL304	R2 : S2 : P6	
NYC	854306	EQ BASIN FLUSHING VLV 3 CLOSE CMD	CLOSE : N/A	17800	854810	DO	300-P019	800-I819	300-EL306	R2 : S7 : P6	
NYO	854306	EQ BASIN FLUSHING VLV 3 OPEN CMD	OPEN : N/A	17800	854810	DO	300-P019	800-I819	300-EL306	R2 : S7 : P5	
HYD	854310	T1 - INFLUENT PUMP SELECT ERROR	ERROR : NORM	17800	854810	DO	300-P009	800-I816	800-I808	R2 : S2 : P5	
NYJ	854311	T1 - INFLUENT PUMP 1 RUN CMD	RUN : OFF	17800	854810	DO	300-P011	800-I815	300-EL311	R1 : S16 : P4	
NYJ	854312	T1 - INFLUENT PUMP 2 RUN CMD	RUN : OFF	17800	854810	DO	300-P012	800-I816	300-EL312	R2 : S1 : P4	
NYJ	854313	T1 - INFLUENT PUMP 3 RUN CMD	RUN : OFF	17800	854810	DO	300-P013	800-I818	300-EL313	R2 : S6 : P3	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NYC	854314	EQ BASIN FLUSHING VLV 5 CLOSE CMD	CLOSE : N/A	17800	854810	DO	300-P019A	800-I815	300-EL314	R1 : S15 : P1	
NYO	854314	EQ BASIN FLUSHING VLV 5 OPEN CMD	OPEN : N/A	17800	854810	DO	300-P019A	800-I815	300-EL314	R1 : S15 : P0	
NYC	854316	EQ BASIN FLUSHING VLV 7 CLOSE CMD	CLOSE : N/A	17800	854810	DO	300-P019A	800-I818	300-EL316	R2 : S5 : P1	
NYO	854316	EQ BASIN FLUSHING VLV 7 OPEN CMD	OPEN : N/A	17800	854810	DO	300-P019A	800-I818	300-EL316	R2 : S5 : P0	
NYJ	854331	INFLUENT SAMPLE PUMP 1 RUN CMD	RUN : OFF	17800	854810	DO	300-P005	800-I816	300-EL331	R2 : S1 : P1	
FY	854337	INF PRI POLLUTANT SAMPLER FLOW PACING	COUNT : N/A	17800	854810	DO	300-P005	800-I817	300-IL335	R2 : S4 : P6	
NYJ	854341	INFLUENT SCREEN 1 RUN CMD	RUN : OFF	17800	854810	DO	300-P002	800-I816	300-EL341	R2 : S1 : P0	
NYJ	854410	T1 - BALLASTED SED SYS RUN CMD	RUN : OFF	17800	854810	DO	400-P001	800-I817	VENDOR	R2 : S3 : P5	
NYJ	854451	T1 - LEAD CAUSTIC FEED PUMP RUN CMD	RUN : OFF	17800	854810	DO	400-P006	800-I817	800-I829	R2 : S3 : P0	
NYJ	854452	T1 - STANDBY CAUSTIC FEED PUMP RUN CMD	RUN : OFF	17800	854810	DO	400-P006	800-I815	800-I829	R1 : S16 : P5	
NYJ	854511	T1 - UV SYSTEM RUN CMD	RUN : OFF	17800	854810	DO	500-P002	800-I818	VENDOR	R2 : S5 : P2	
NYC	854519	T1 - C3 RECIRC VALVE CLOSE CMD	CLOSE : N/A	17800	854810	DO	500-P008	800-I817	500-EL519	R2 : S4 : P3	
NYO	854519	T1 - C3 RECIRC VALVE OPEN CMD	OPEN : N/A	17800	854810	DO	500-P008	800-I817	500-EL519	R2 : S4 : P2	
NYJ	854531	LEAD C3 PUMP RUN CMD	RUN : OFF	17800	854810	DO	500-P007	800-I817	800-I878	R2 : S3 : P4	
NYC	854538	C3 STOR TANK C1 FILL VALVE CLOSE CMD	CLOSE : N/A	17800	854810	DO	500-P006	800-I818	500-EL538	R2 : S4 : P5	
NYO	854538	C3 STOR TANK C1 FILL VALVE OPEN CMD	OPEN : N/A	17800	854810	DO	500-P006	800-I818	500-EL538	R2 : S6 : P4	
NYJ	854551	T1 DEFOAM FEED PUMP RUN CMD	RUN : OFF	17800	854810	DO	500-P012	800-I817	500-EL551	R2 : S4 : P0	
LYH	854601	SOLIDS HOLDING TANK LEVEL HIGH	HIGH : NORM	17800	854810	DO	600-P001	800-I818	---	R2 : S5 : P4	
NYG	854611	SOLIDS RETURN PMP 1 READY	READY : NOT READY	17800	854810	DO	600-P003	800-I818	---	R2 : S5 : P6	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NYC	854621	SOLIDS TANK FLUSH VLV 1 CLOSE CMD	CLOSE : N/A	17800	854810	DO	600-P005	800-I817	600-EL621	R2 : S3 : P2	
NYD	854621	SOLIDS TANK FLUSH SEQUENCE FAIL	FAIL : NORM	17800	854810	DO	600-P005	800-I817	800-I810	R2 : S4 : P1	
NYO	854621	SOLIDS TANK FLUSH VLV 1 OPEN CMD	OPEN : N/A	17800	854810	DO	600-P005	800-I817	600-EL621	R2 : S3 : P3	
NYC	854623	SOLIDS TANK FLUSH VLV 3 CLOSE CMD	CLOSE : N/A	17800	854810	DO	600-P005	800-I817	600-EL623	R2 : S4 : P4	
NYO	854623	SOLIDS TANK FLUSH VLV 3 OPEN CMD	OPEN : N/A	17800	854810	DO	600-P005	800-I817	600-EL623	R2 : S4 : P5	
NYD	854810	PLC 854810 FAILURE RELAY	NORM : FAIL	17800	854810	DO	800-P003	800-I815	---	R1 : S16 : P0	
ZY	854300A	EQ BASIN LVL SIG A SELECT IND	1 : N/A	17800	854810	DO	300-P008	800-I816	---	R2 : S1 : P2	
ZY	854300B	EQ BASIN LVL SIG B SELECT IND	2 : N/A	17800	854810	DO	300-P008	800-I816	---	R2 : S1 : P3	
ZYL	854311A	T1 - INF PUMP 1 LEAD SEL	LEAD : N/A	17800	854810	DO	300-P009	800-I815	---	R1 : S16 : P1	
ZYL	854311B	T1 - INF PUMP 1 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854810	DO	300-P009	800-I815	---	R1 : S16 : P2	
ZYL	854311C	T1 - INF PUMP 1 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854810	DO	300-P009	800-I815	---	R1 : S16 : P3	
ZYL	854312A	T1 - INF PUMP 2 LEAD SEL	LEAD : N/A	17800	854810	DO	300-P009	800-I816	---	R2 : S1 : P5	
ZYL	854312B	T1 - INF PUMP 2 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854810	DO	300-P009	800-I816	---	R2 : S1 : P6	
ZYL	854312C	T1 - INF PUMP 2 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854810	DO	300-P009	800-I816	---	R2 : S1 : P7	
ZYL	854313A	T1 - INF PUMP 3 LEAD SEL	LEAD : N/A	17800	854810	DO	300-P009	800-I818	---	R2 : S6 : P0	
ZYL	854313B	T1 - INF PUMP 3 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854810	DO	300-P009	800-I818	---	R2 : S6 : P1	
ZYL	854313C	T1 - INF PUMP 3 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854810	DO	300-P009	800-I818	---	R2 : S6 : P2	
ZYL	854320A	TREATMENT TRAIN 1 LEAD	T1 LEAD:N/A	17800	854810	DO	300-P008	800-I819	---	R2 : S7 : P3	
ZYL	854320B	TREATMENT TRAIN 1 RUNNING	T1 RUNNING:OFF	17800	854810	DO	300-P008	800-I819	---	R2 : S7 : P4	
FY	854335A	INFLUENT SAMPLER 1 FLOW PACING	COUNT : N/A	17800	854810	DO	300-P005	800-I815	300-IL335	R1 : S16 : P7	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
FY	854335B	INFLUENT SAMPLER 2 FLOW PACING	COUNT : N/A	17800	854810	DO	300-P005	800-I816	300-IL335	R2 : S2 : P0	
YYL	854516A	T1 - RECIRCULATION RUNNING INDICATOR	T1 RECIRC : N/A	17800	854810	DO	300-P008	800-I819	---	R2 : S7 : P0	
YYL	854516B	T2 - RECIRCULATION RUNNING INDICATOR	T2 RECIRC : N/A	17800	854810	DO	300-P008	800-I819	---	R2 : S7 : P1	
YYL	854516C	BOTH - RECIRCULATION RUNNING INDICATOR	BOTH RECIRC : N/A	17800	854810	DO	300-P008	800-I819	---	R2 : S7 : P7	
NYJ	854611A	LEAD SOLIDS RTN PMP RUN CMD	RUN : OFF	17800	854810	DO	600-P003	800-I817	800-I878	R2 : S3 : P6	
YYL	854611A	EBI SOLIDS RETURN SEQUENCE RUNNING	EBI RETURN : N/A	17800	854810	DO	300-P008	800-I819	---	R2 : S7 : P2	
EX	854301	EQ BASIN DRAIN PUMP 1 AVG VOLTS	---	17800	854810	ENET	300-P017	800-I801	---	---	
IX	854301	EQ BASIN DRAIN PUMP 1 AVG CURR	---	17800	854810	ENET	300-P017	800-I801	---	---	
JX	854301	EQ BASIN DRAIN PUMP 1 INST POWER	---	17800	854810	ENET	300-P017	800-I801	---	---	
EX	854311	T1 - INFLUENT PUMP 1 AVG VOLTAGE	---	17800	854810	ENET	300-P011	800-I801	---	---	
IX	854311	T1 - INFLUENT PUMP 1 AVG CURRENT	---	17800	854810	ENET	300-P011	800-I801	---	---	
JX	854311	T1 - INFLUENT PUMP 1 INST POWER	---	17800	854810	ENET	300-P011	800-I801	---	---	
EX	854312	T1 - INFLUENT PUMP 2 AVG VOLTAGE	---	17800	854810	ENET	300-P012	800-I801	---	---	
IX	854312	T1 - INFLUENT PUMP 2 AVG CURRENT	---	17800	854810	ENET	300-P012	800-I801	---	---	
JX	854312	T1 - INFLUENT PUMP 2 INST POWER	---	17800	854810	ENET	300-P012	800-I801	---	---	
EX	854313	T1 - INFLUENT PUMP 3 AVG VOLTAGE	---	17800	854810	ENET	300-P013	800-I801	---	---	
IX	854313	T1 - INFLUENT PUMP 3 AVG CURRENT	---	17800	854810	ENET	300-P013	800-I801	---	---	
JX	854313	T1 - INFLUENT PUMP 3 INST POWER	---	17800	854810	ENET	300-P013	800-I801	---	---	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
EX	854331	INF SAMPLE PUMP 1 AVG VOLTAGE	---	17800	854810	ENET	300-P005	800-I801	---	---	
IX	854331	INF SAMPLE PUMP 1 AVG CURRENT	---	17800	854810	ENET	300-P005	800-I801	---	---	
JX	854331	INFLUENT SAMPLE PMP 1 INST POWER	---	17800	854810	ENET	300-P005	800-I801	---	---	
EX	854341	INFLUENT SCREEN 1 AVG VOLTAGE	---	17800	854810	ENET	300-P002	800-I801	---	---	
IX	854341	INFLUENT SCREEN 1 AVG CURRENT	---	17800	854810	ENET	300-P002	800-I801	---	---	
JX	854341	INFLUENT SCREEN 1 INST POWER	---	17800	854810	ENET	300-P002	800-I801	---	---	
EX	854343	SCREEN COMPACTOR 1 AVG VOLTAGE	---	17800	854810	ENET	300-P004	800-I801	---	---	
IX	854343	SCREEN COMPACTOR 1 AVG CURRENT	---	17800	854810	ENET	300-P004	800-I801	---	---	
JX	854343	SCREEN COMPACTOR 1 INST POWER	---	17800	854810	ENET	300-P004	800-I801	---	---	
EX	854351	C2 PUMP 1 AVG VOLTAGE	---	17800	854810	ENET	300-P007	800-I801	---	---	
IX	854351	C2 PUMP 1 AVERAGE CURRENT	---	17800	854810	ENET	300-P007	800-I801	---	---	
JX	854351	C2 PUMP 1 INST POWER	---	17800	854810	ENET	300-P007	800-I801	---	---	
EX	854353	C2 PUMP 3 AVG VOLTAGE	---	17800	854810	ENET	300-P007	800-I801	---	---	
IX	854353	C2 PUMP 3 AVERAGE CURRENT	---	17800	854810	ENET	300-P007	800-I801	---	---	
JX	854353	C2 PUMP 3 INST POWER	---	17800	854810	ENET	300-P007	800-I801	---	---	
EX	854374	SCRN RM SUPPLY FAN AVG VOLTAGE	---	17800	854810	ENET	300-P024	800-I801	---	---	
IX	854374	SCRN RM SUPPLY FAN AVG CURRENT	---	17800	854810	ENET	300-P024	800-I801	---	---	
JX	854374	SCRN RM SUPPLY FAN INST POWER	---	17800	854810	ENET	300-P024	800-I801	---	---	
EX	854377	PNL ROOM SUPPLY FAN AVG VOLTAGE	---	17800	854810	ENET	300-P027	800-I801	---	---	
IX	854377	PNL ROOM SUPPLY FAN AVG CURRENT	---	17800	854810	ENET	300-P027	800-I801	---	---	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
JX	854377	PNL ROOM SUPPLY FAN INST POWER	---	17800	854810	ENET	300-P027	800-I801	---	---	
EX	854531	C3 PUMP 1 AVG VOLTAGE	---	17800	854810	ENET	500-P007	800-I801	---	---	
IX	854531	C3 PUMP 1 AVG CURRENT	---	17800	854810	ENET	500-P007	800-I801	---	---	
JX	854531	C3 PUMP 1 INST POWER	---	17800	854810	ENET	500-P007	800-I801	---	---	
EX	854561	INST AIR CPRSR 1 AVG VOLTAGE	---	17800	854810	ENET	500-P013	800-I801	---	---	
IX	854561	INST AIR CPRSR 1 AVG CURRENT	---	17800	854810	ENET	500-P013	800-I801	---	---	
JX	854561	INST AIR CPRSR 1 INST POWER	---	17800	854810	ENET	500-P013	800-I801	---	---	
EX	854566	SERV AIR CPRSR 1 AVG VOLTAGE	---	17800	854810	ENET	500-P014	800-I801	---	---	
IX	854566	SERV AIR CPRSR 1 AVG CURRENT	---	17800	854810	ENET	500-P014	800-I801	---	---	
JX	854566	SERV AIR CPRSR 1 INST POWER	---	17800	854810	ENET	500-P014	800-I801	---	---	
EX	854572	UV PMP RM AIR SPLY FAN AVG VOLTS	---	17800	854810	ENET	500-P016	800-I801	---	---	
IX	854572	UV PMP RM AIR SPLY FAN AVG CURR	---	17800	854810	ENET	500-P016	800-I801	---	---	
JX	854572	UV PMP RM AIR SPLY FAN INST PWR	---	17800	854810	ENET	500-P016	800-I801	---	---	
EX	854573	UV PMP RM AIR EXHS FAN AVG VOLTS	---	17800	854810	ENET	500-P016	800-I801	---	---	
IX	854573	UV PMP RM AIR EXHST FAN AVG CURR	---	17800	854810	ENET	500-P016	800-I801	---	---	
JX	854573	UV PMP RM AIR EXHST FAN INST PWR	---	17800	854810	ENET	500-P016	800-I801	---	---	
EX	854611	SOLIDS RETURN PMP 1 AVG VOLTAGE	---	17800	854810	ENET	600-P003	800-I801	---	---	
IX	854611	SOLIDS RETURN PMP 1 AVG CURRENT	---	17800	854810	ENET	600-P003	800-I801	---	---	
JX	854611	SOLIDS RETURN PMP 1 INST POWER	---	17800	854810	ENET	600-P003	800-I801	---	---	
EX	854715	OCU 1 EXHAUST FAN AVG VOLTAGE	---	17800	854810	ENET	700-P002	800-I801	---	---	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
IX	854715	OCU 1 EXHAUST FAN AVG CURRENT	---	17800	854810	ENET	700-P002	800-I801	---	---	
JX	854715	OCU 1 EXHAUST FAN INST POWER	---	17800	854810	ENET	700-P002	800-I801	---	---	
QX	854831	BALLASTED SED SWBD 1 PWR METER	---	17800	854810	ENET	800-P001	800-I801	---	---	
QX	854841	BALLASTED SED MCC 1 PWR MONITOR	---	17800	854810	ENET	800-P001	800-I801	---	---	
QX	854843	UV MCC 1 POWER MONITOR	---	17800	854810	ENET	800-P002	800-I801	---	---	
QX	854845	PROCESS MCC POWER MONITOR	---	17800	854810	ENET	800-P002	800-I801	---	---	
FX	854301	EQ BASIN DRAIN PUMP FLOW	---	17800	854820	AI	300-P017	800-I861	300-IL301	R1 : S6 : P0	
FX	854321	T2 - INFLUENT PUMP 1 FLOW	---	17800	854820	AI	300-P014	800-I861	300-IL321	R1 : S6 : P3	
SX	854321	T2 - INFLUENT PUMP 1 SPEED	---	17800	854820	AI	300-P014	800-I861	300-EL321	R1 : S6 : P2	
VX	854321	T2 - INF PUMP 1 VIBRATION	---	17800	854820	AI	300-P014	800-I861	300-IL321	R1 : S6 : P6	
FX	854322	T2 - INFLUENT PUMP 2 FLOW	---	17800	854820	AI	300-P015	800-I862	300-IL322	R1 : S8 : P7	
SX	854322	T2 - INFLUENT PUMP 2 SPEED	---	17800	854820	AI	300-P015	800-I862	300-EL322	R1 : S8 : P6	
VX	854322	T2 - INF PUMP 2 VIBRATION	---	17800	854820	AI	300-P015	800-I862	300-IL322	R1 : S8 : P5	
FX	854323	T2 - INFLUENT PUMP 3 FLOW	---	17800	854820	AI	300-P016	800-I862	300-IL323	R1 : S7 : P4	
SX	854323	T2 - INFLUENT PUMP 3 SPEED	---	17800	854820	AI	300-P016	800-I862	300-EL323	R1 : S7 : P3	
VX	854323	T2 - INF PUMP 3 VIBRATION	---	17800	854820	AI	300-P016	800-I862	300-IL323	R1 : S7 : P5	
LX	854342	INFLUENT SCREEN 2 DIFFERENTIAL LEVEL	---	17800	854820	AI	300-P003	800-I861	300-IL342	R1 : S5 : P1	
WX	854432	T2 - POLYMER TOTE WEIGHT	---	17800	854820	AI	400-P003	800-I861	400-IL432	R1 : S5 : P5	
LX	854450	CAUSTIC STORAGE TANK	---	17800	854820	AI	400-P005	800-I862	400-IL450	R1 : S7 : P6	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
		LEVEL									
FX	854453	T2 - CAUST FEED FLOW	---	17800	854820	AI	400-P007	800-I861	400-IL453	R1 : S6 : P7	
SX	854453	T2 - CAUST FEED PUMP 3 SPEED	---	17800	854820	AI	400-P007	800-I862	400-EL453	R1 : S7 : P7	
SX	854454	T2 - CAUSTIC FEED PUMP 4 SPEED	---	17800	854820	AI	400-P007	800-I862	400-EL454	R1 : S8 : P0	
FX	854518	FACILITY EFFLUENT FLOW	---	17800	854820	AI	500-P009	800-I861	500-IL518	R1 : S5 : P2	
AX	854521	T2 - UV SYSTEM APPLIED DOSE	---	17800	854820	AI	500-P003	800-I861	VENDOR	R1 : S6 : P5	
LX	854526	C3 RECIRC P-TRAP LEVEL	---	17800	854820	AI	500-P006	800-I812	500-IL528	R1 : S7 : P6	
ZX	854528	T2 - EFFLUENT GATE POSITION	---	17800	854820	AI	500-P009	800-I861	500-EL528	R1 : S5 : P7	
SX	854532	C3 PUMP 2 SPEED	---	17800	854820	AI	500-P007	800-I862	500-EL532	R1 : S8 : P4	
FX	854552	T2 DEFOAM FEED PUMP FLOW	---	17800	854820	AI	500-P012	800-I863	500-IL552	R1 : S9 : P0	
SX	854552	T2 DEFOAM FEED PUMP SPEED	---	17800	854820	AI	500-P012	800-I863	500-EL552	R1 : S9 : P3	
PX	854566	SERV AIR SYSTEM PRESSURE	---	17800	854820	AI	500-P014	800-I862	500-IL566	R1 : S8 : P1	
LX	854300BA	EQ BASIN LEVEL SIGNAL 2	---	17800	854820	AI	300-P008	800-I861	300-IL300	R1 : S6 : P1	
AX	854333A	INF SAMP RM LEL	---	17800	854820	AI	300-P018	800-I862	300-IL333	R1 : S7 : P0	
AX	854333B	INF SAMP RM O2 CONCENTRATION	---	17800	854820	AI	300-P018	800-I862	300-IL333	R1 : S7 : P1	
AX	854333C	INF SAMP RM H2S CONCENTRATION	---	17800	854820	AI	300-P018	800-I862	300-IL333	R1 : S7 : P2	
LX	854421A	T2 - BALLASTED SED DISTRIBUTION CHANNEL LEVEL	---	17800	854820	AI	400-P001	800-I861	400-IL421	R1 : S6 : P4	
AX	854533A	EFFLUENT DO	---	17800	854820	AI	500-P009	800-I861	500-IL533	R1 : S5 : P3	
AX	854533B	EFFLUENT PH	---	17800	854820	AI	500-P009	800-I861	500-IL533	R1 : S5 : P0	
AX	854727A	OCU 2 FAN ENCLOSURE LEL	---	17800	854820	AI	700-P006	800-I861	700-IL727	R1 : S5 : P4	
AX	854727C	OCU 2 FAN ENCLOSURE H2S	---	17800	854820	AI	700-P006	800-I861	700-IL727	R1 : S5 : P6	
SY	854321	T2 - INFLUENT PUMP 1 SPEED REFERENCE	---	17800	854820	AO	300-P014	800-I864	300-EL321	R1 : S11 : P0	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
SY	854322	T2 - INFLUENT PUMP 2 SPEED REFERENCE	---	17800	854820	AO	300-P015	800-I864	300-EL322	R1 : S12 : P6	
SY	854323	T2 - INFLUENT PUMP 3 SPEED REFERENCE	---	17800	854820	AO	300-P016	800-I864A	300-EL323	R1 : S13 : P0	
FY	854420	T2 - BALLASTED SED FLOW RATE	---	17800	854820	AO	400-P001	800-I864	VENDOR	R1 : S11 : P7	
SY	854453	T2 - CAUST FEED PUMP 3 SPEED REFERENCE	---	17800	854820	AO	400-P007	800-I864	400-EL453	R1 : S11 : P3	
SY	854454	T2 - CAUSTIC FEED PUMP 4 SPEED REFERENCE	---	17800	854820	AO	400-P007	800-I864	400-EL454	R1 : S12 : P0	
FY	854521	T2 - UV TRAIN FLOW RATE	---	17800	854820	AO	500-P003	800-I864	VENDOR	R1 : S11 : P6	
ZY	854528	T2 - EFFLUENT GATE POSITION COMMAND	---	17800	854820	AO	500-P009	800-I864	500-EL528	R1 : S12 : P2	
SY	854532	C3 PUMP 2 SPEED REFERENCE	---	17800	854820	AO	500-P007	800-I864	500-EL532	R1 : S12 : P1	
SY	854552	T2 DEFOAM FEED PUMP SPEED REFERENCE	---	17800	854820	AO	500-P012	800-I864	500-EL552	R1 : S12 : P3	
HXA	854302	EQ BASIN DRAIN PUMP 2 AUTO	AUTO : N/A	17800	854820	DI	300-P017	800-I870	300-EL302	R2 : S10 : P7	
MXH	854302	EQ BASIN DRAIN PUMP 2 LEAK	SEAL LEAK : NORM	17800	854820	DI	300-P017	800-I870	300-EL302	R2 : S10 : P10	
NXG	854302	EQ BASIN DRAIN PUMP 2 READY	READY : N/A	17800	854820	DI	300-P017	800-I870	300-EL302	R2 : S10 : P9	
NXJ	854302	EQ BASIN DRAIN PUMP 2 RUNNING	RUNNING : OFF	17800	854820	DI	300-P017	800-I870	300-EL302	R2 : S10 : P8	
TXH	854302	EQ BSN DRAIN PMP 2 MTR WINDING TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	300-P017	800-I870	300-EL302	R2 : S10 : P11	
HXA	854305	EQ BASIN FLUSH VLV 2 AUTO	AUTO : N/A	17800	854820	DI	300-P019	800-I870	300-EL305	R2 : S9 : P1	
HXR	854305	EQ BASIN FLUSHING VLV 2 REMOTE	REMOTE:LOCAL	17800	854820	DI	300-P019	800-I871	300-EL305	R2 : S11 : P1	
NXD	854305	EQ BASIN FLUSHING VLV 2 FAULT	FAULT : NORM	17800	854820	DI	300-P019	800-I871	300-EL305	R2 : S11 : P4	
ZXC	854305	EQ BASIN FLUSHING VLV 2 CLOSED	CLOSED : N/A	17800	854820	DI	300-P019	800-I871	300-EL305	R2 : S11 : P3	
ZXO	854305	EQ BASIN FLUSHING VLV 2	OPENED : N/A	17800	854820	DI	300-P019	800-I871	300-EL305	R2 : S11 :	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
		OPENED								P2	
HXA	854307	EQ BASIN FLUSH VLV 4 AUTO	AUTO : N/A	17800	854820	DI	300-P019	800-I870	300-EL307	R2 : S10 : P0	
HXR	854307	EQ BASIN FLUSHING VLV 4 REMOTE	REMOTE:LOCAL	17800	854820	DI	300-P019	800-I871	300-EL307	R2 : S11 : P5	
NXD	854307	EQ BASIN FLUSHING VLV 4 FAULT	FAULT : NORM	17800	854820	DI	300-P019	800-I871	300-EL307	R2 : S11 : P8	
ZXC	854307	EQ BASIN FLUSHING VLV 4 CLOSED	CLOSED : N/A	17800	854820	DI	300-P019	800-I871	300-EL307	R2 : S11 : P7	
ZXO	854307	EQ BASIN FLUSHING VLV 4 OPENED	OPENED : N/A	17800	854820	DI	300-P019	800-I871	300-EL307	R2 : S11 : P6	
HXA	854315	EQ BASIN FLUSH VLV 6 AUTO	AUTO : N/A	17800	854820	DI	300-P019A	800-I873A	300-EL315	R3 : S1 : P0	
HXR	854315	EQ BASIN FLUSHING VLV 6 REMOTE	REMOTE:LOCAL	17800	854820	DI	300-P019A	800-I873A	300-EL315	R3 : S1 : P1	
NXD	854315	EQ BASIN FLUSHING VLV 6 FAULT	FAULT : NORM	17800	854820	DI	300-P019A	800-I873A	300-EL315	R3 : S1 : P4	
ZXC	854315	EQ BASIN FLUSHING VLV 6 CLOSED	CLOSED : N/A	17800	854820	DI	300-P019A	800-I873A	300-EL315	R3 : S1 : P3	
ZXO	854315	EQ BASIN FLUSHING VLV 6 OPENED	OPENED : N/A	17800	854820	DI	300-P019A	800-I873A	300-EL315	R3 : S1 : P2	
HXA	854317	EQ BASIN FLUSH VLV 8 AUTO	AUTO : N/A	17800	854820	DI	300-P019A	800-I873A	300-EL317	R3 : S2 : P0	
HXR	854317	EQ BASIN FLUSHING VLV 8 REMOTE	REMOTE:LOCAL	17800	854820	DI	300-P019A	800-I873A	300-EL317	R3 : S2 : P1	
NXD	854317	EQ BASIN FLUSHING VLV 8 FAULT	FAULT : NORM	17800	854820	DI	300-P019A	800-I873A	300-EL317	R3 : S2 : P4	
ZXC	854317	EQ BASIN FLUSHING VLV 8 CLOSED	CLOSED : N/A	17800	854820	DI	300-P019A	800-I873A	300-EL317	R3 : S2 : P3	
ZXO	854317	EQ BASIN FLUSHING VLV 8 OPENED	OPENED : N/A	17800	854820	DI	300-P019A	800-I873A	300-EL317	R3 : S2 : P2	
HXA	854321	T2 - INFLUENT PUMP 1 AUTO	AUTO : N/A	17800	854820	DI	300-P014	800-I870	300-EL321	R2 : S9 : P7	
NXG	854321	T2 - INFLUENT PUMP 1 READY	READY : N/A	17800	854820	DI	300-P014	800-I870	300-EL321	R2 : S9 : P9	
NXJ	854321	T2 - INFLUENT PUMP 1 RUNNING	RUNNING : OFF	17800	854820	DI	300-P014	800-I870	300-EL321	R2 : S9 : P8	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
TXH	854321	T2 - INFLUENT PUMP 1 MTR WINDING TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	300-P014	800-I870	300-EL321	R2 : S9 : P11	
VXH	854321	T2 - INF PUMP 1 VIBRATION WARNING	WARNING : NORM	17800	854820	DI	300-P014	800-I873A	300-EL321	R3 : S1 : P5	
VXHH	854321	T2 - INF PUMP 1 VIBRATION ALARM	ALARM : NORM	17800	854820	DI	300-P014	800-I873A	300-EL321	R3 : S1 : P6	
HXA	854322	T2 - INFLUENT PUMP 2 AUTO	AUTO : N/A	17800	854820	DI	300-P015	800-I872	300-EL322	R2 : S13 : P12	
NXG	854322	T2 - INFLUENT PUMP 2 READY	READY : N/A	17800	854820	DI	300-P015	800-I872	300-EL322	R2 : S13 : P14	
NXJ	854322	T2 - INFLUENT PUMP 2 RUNNING	RUNNING : OFF	17800	854820	DI	300-P015	800-I872	300-EL322	R2 : S13 : P13	
TXH	854322	T2 - INFLUENT PUMP 2 MTR WINDING TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	300-P015	800-I871	300-EL322	R2 : S12 : P8	
VXH	854322	T2 - INF PUMP 2 VIBRATION WARNING	WARNING : NORM	17800	854820	DI	300-P015	800-I869	300-EL322	R2 : S7 : P2	
VXHH	854322	T2 - INF PUMP 2 VIBRATION ALARM	ALARM : NORM	17800	854820	DI	300-P015	800-I869	300-EL322	R2 : S7 : P3	
HXA	854323	T2 - INFLUENT PUMP 3 AUTO	AUTO : N/A	17800	854820	DI	300-P016	800-I870	300-EL323	R2 : S10 : P2	
NXG	854323	T2 - INFLUENT PUMP 3 READY	READY : N/A	17800	854820	DI	300-P016	800-I870	300-EL323	R2 : S10 : P4	
NXJ	854323	T2 - INFLUENT PUMP 3 RUNNING	RUNNING : OFF	17800	854820	DI	300-P016	800-I870	300-EL323	R2 : S10 : P3	
TXH	854323	T2 - INFLUENT PUMP 3 MTR WINDING TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	300-P016	800-I870	300-EL323	R2 : S10 : P6	
VXH	854323	T2 - INF PUMP 3 VIBRATION HIGH	WARNING : NORM	17800	854820	DI	300-P016	800-I872	300-EL323	R2 : S14 : P8	
VXHH	854323	T2 - INF PUMP 3 VIBRATION HIHI	ALARM : NORM	17800	854820	DI	300-P016	800-I872	300-EL323	R2 : S14 : P9	
HXA	854332	INFLUENT SAMPLE PUMP 2 AUTO	AUTO : N/A	17800	854820	DI	300-P005	800-I869	300-EL332	R2 : S8 : P9	
MXH	854332	INF SAMPLE PUMP 2 LEAK	SEAL LEAK : NORM	17800	854820	DI	300-P005	800-I869	300-EL332	R2 : S8 : P12	
NXJ	854332	INFLUENT SAMPLE PUMP 2 RUNNING	RUNNING : OFF	17800	854820	DI	300-P005	800-I869	300-EL332	R2 : S8 : P10	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
TXH	854332	INF SAMPLE PUMP 2 MTR WINDING TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	300-P005	800-I869	300-EL332	R2 : S8 : P11	
FXL	854333	INF SAMP RM HAZ GAS SAMPLE FLOW LOW	FLOW LOW : NORM	17800	854820	DI	300-P018	800-I-870	300-IL370	R2 : S10 : P12	
HXA	854342	INFLUENT SCREEN 2 AUTO	AUTO : N/A	17800	854820	DI	300-P003	800-I869	300-EL342A	R2 : S8 : P0	
NXK	854342	INFLUENT SCREEN 2 ESTOP	ESTOP : NORM	17800	854820	DI	3000-P003	800-I869	300-EL342A	R2 : S8 : P3	
HXA	854344	SCREENINGS COMPACTOR 2 AUTO	AUTO : N/A	17800	854820	DI	300-P004	800-I869	300-EL344A	R2 : S8 : P5	
NXK	854344	SCREENINGS COMPACTOR 2 E-STOP	ESTOP : NORM	17800	854820	DI	300-P004	800-I869	300-EL344A	R2 :S8 : P8	
NXD	854375	SCREENINGS BUILDING C2 ROOM HVAC FAULT	HVAC FAULT : NORM	17800	854820	DI	300-P025	800-I870	---	R2 : S9 : P4	
NXD	854377	SCREENINGS BLDG PNL ROOM HVAC FAULT	HVAC FAULT : NORM	17800	854820	DI	300-P027	800-I870	---	R2 : S9 : P3	
LXH	854451	CAUSTIC PUMP ROOM SUMP LEVEL HIGH	LEVEL HIGH : NORM	17800	854820	DI	400-P003	800-I871	---	R2 : S11 : P15	
HX	854453	T2 - CAUST FEED PUMP 3 LEAD SEL	1 LEAD : 2 LEAD	17800	854820	DI	400-P007	800-I871	400-EL453	R2 : S11 : P12	
HXA	854453	T2 - CAUST FEED PUMP 3 AUTO	AUTO : N/A	17800	854820	DI	400-P007	800-I871	400-EL453	R2 : S12 : P0	
NXJ	854453	T2 - CAUSTIC FEED PMP 3 RUNNINIG	RUNNING : OFF	17800	854820	DI	400-P007	800-I871	400-EL453	R2 : S12 : P1	
HXA	854454	T2 - CAUSTIC FEED PUMP 4 AUTO	AUTO : N/A	17800	854820	DI	400-P007	800-I872	400-EL454	R2 : S14 : P10	
NXJ	854454	T2 - CAUSTIC FEED PMP 4 RUNNINIG	RUNNING : OFF	17800	854820	DI	400-P007	800-I872	400-EL454	R2 : S14 : P11	
NXD	854476	CAUST ROOM HVAC FAULT	FAULT : NORM	17800	854820	DI	400-P010	800-I871	---	R2 : S12 : P6	
MXH	854505	EFF SUMP PUMP SEAL LEAK	SEAL LEAK : NORM	17800	854820	DI	500-P010	800-I873	500-EL505	R2 : S15 : P10	
NXJ	854505	EFFLUENT SUMP PUMP 1 RUNNING	RUNNING : OFF	17800	854820	DI	500-P010	800-I873	500-EL505	R2 : S15 : P8	
TXH	854505	EFF SUMP PUMP MTR WINDING TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	500-P010	800-I873	500-EL505	R2 : S15 : P9	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
ZXC	854528	T2 - EFFLUENT GATE CLOSED	CLOSED : N/A	17800	854820	DI	500-P009	800-I872	500-EL528	R2 : S14 : P3	
ZXO	854528	T2 - EFFLUENT GATE OPENED	OPENED : N/A	17800	854820	DI	500-P009	800-I872	500-EL528	R2 : S14 : P2	
HXA	854529	T2 - C3 RECIRC VALVE AUTO	AUTO : N/A	17800	854820	DI	500-P008	800-I873	500-EL529	R2 : S16 : P5	
HXR	854529	T2 - C3 RECIRC VALVE REMOTE	REMOTE : N/A	17800	854820	DI	500-P008	800-I872	500-EL529	R2 : S13 : P2	
NXD	854529	T2 - C3 RECIRC VALVE FAULT	FAULT : NORM	17800	854820	DI	500-P008	800-I872	500-EL529	R2 : S13 : P3	
ZXC	854529	T2 - C3 RECIRC VALVE CLOSED	CLOSED : N/A	17800	854820	DI	500-P008	800-I872	500-EL529	R2 : S13 : 1	
ZXO	854529	T2 - C3 RECIRC VALVE OPENED	OPENED : N/A	17800	854820	DI	500-P008	800-I872	500-EL529	R2 : S13 : P0	
HXA	854532	C3 PUMP 2 AUTO	AUTO : N/A	17800	854820	DI	500-P007	800-I872	500-EL532	R2 : S13 : P4	
NXG	854532	C3 PUMP 2 READY	READY : NOT READY	17800	854820	DI	500-P007	800-I872	500-EL532	R2 : S13 : P6	
NXJ	854532	C3 PUMP 2 RUNNING	RUNNING : OFF	17800	854820	DI	500-P007	800-I872	500-EL532	R2 : S13 : P5	
TXH	854532	C3 PUMP 2 MTR WINDING TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	500-P007	800-I872	500-EL532	R2 : S13 : P8	
LXL	854533	EFFLUENT SAMPLE BOX LEVEL LOW	LEVEL LOW : NORM	17800	854820	DI	500-P009	800-I871	---	R2 : S12 : P5	
NXD	854535	EFF PRI POLLUTANT SAMPLER FAULT	FAULT : NORM	17800	854820	DI	500-P009	800-I869	500-IL534	R2 : S7 : P0	
HXA	854552	T2 DEFOAM FEED PUMP AUTO	AUTO : N/A	17800	854820	DI	500-P012	800-I872	500-EL552	R2 : S13 : P9	
NXJ	854552	T2 DEFOAM FEED PUMP RUNNINIG	RUNNING : OFF	17800	854820	DI	500-P012	800-I872	500-EL552	R2 : S13 : P10	
HXA	854612	SOLIDS RETURN PMP 2 AUTO	AUTO : N/A	17800	854820	DI	600-P003	800-I873	600-EL612	R2 : S16 : P8	
HXP	854612	SOLIDS RETURN PMP 2 STOP	STOP : N/A	17800	854820	DI	600-P003	800-I869	600-EL612	R2 : S8 : P13	
HXS	854612	SOLIDS RETURN PMP 2 START	START : N/A	17800	854820	DI	600-P003	800-I869	600-EL612	R2 : S8 : P14	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NXG	854612	SOLIDS RETURN PMP 2 READY	READY : NOT READY	17800	854820	DI	600-P003	800-I873	600-EL612	R2 : S16 : P10	
NXJ	854612	SOLIDS RETURN PMP 2 RUNNING	RUNNING : OFF	17800	854820	DI	600-P003	800-I873	600-EL612	R2 : S16 : P9	
HXA	854622	SOLIDS TANK FLUSH VLV 2 AUTO	AUTO : N/A	17800	854820	DI	600-P005	800-I870	600-EL622	R2 : S9 : P2	
HXR	854622	SOLIDS TANK FLUSH VLV 2 REMOTE	REMOTE : N/A	17800	854820	DI	600-P005	800-I873	600-EL622	R2 : S15 : P1	
NXD	854622	SOLIDS TANK FLUSH VLV 2 FAULT	FAULT : NORM	17800	854820	DI	600-P005	800-I873	600-EL622	R2 : S15 : P0	
ZXC	854622	SOLIDS TANK FLUSH VLV 2 CLOSED	CLOSED : N/A	17800	854820	DI	600-P005	800-I873	600-EL622	R2 : S15 : P3	
ZXO	854622	SOLIDS TANK FLUSH VLV 2 OPENED	OPENED : N/A	17800	854820	DI	600-P005	800-I873	600-EL622	R2 : S15 : P2	
HXA	854624	SOLIDS TANK FLUSH VLV 4 AUTO	AUTO : N/A	17800	854820	DI	600-P005	800-I870	600-EL624	R2 : S10 : P1	
HXR	854624	SOLIDS TANK FLUSH VLV 4 REMOTE	REMOTE : N/A	17800	854820	DI	600-P005	800-I873	600-EL624	R2 : S16 : P11	
NXD	854624	SOLIDS TANK FLUSH VLV 4 FAULT	FAULT : NORM	17800	854820	DI	600-P005	800-I873	600-EL624	R2 : S16 : P14	
ZXC	854624	SOLIDS TANK FLUSH VLV 4 CLOSED	CLOSED : N/A	17800	854820	DI	600-P005	800-I873	600-EL624	R2 : S16 : P13	
ZXO	854624	SOLIDS TANK FLUSH VLV 4 OPENED	OPENED : N/A	17800	854820	DI	600-P005	800-I873	600-EL624	R2 : S16 : P12	
FXL	854725	OCU 2 EXHAUST FAN AIR FLOW LOW	FLOW LOW : NORM	17800	854820	DI	700-P002	800-I871	700-EL725	R2 : S11 : P0	
HXA	854725	OCU 2 EXHAUST FAN AUTO	AUTO : N/A	17800	854820	DI	700-P002	800-I870	700-EL725	R2 : S9 : P15	
HXG	854725	OCU 2 EXHAUST FAN READY	READY : NOT READY	17800	854820	DI	700-P002	800-I870	700-EL725	R2 : S9 : P14	
NXD	854725	OCU 2 EXHAUST FAN FAULT	FAULT : NORM	17800	854820	DI	700-P004	800-I870	700-EL725	R2 : S9 : P12	
NXJ	854725	OCU 2 EXHAUST FAN RUNNING	RUNNING:OFF	17800	854820	DI	700-P002	800-I870	700-EL725	R2 : S9 : P13	
FXL	854727	OCU 2 FAN ENCL SAMPLE FLOW LOW	FLOW LOW : NORM	17800	854820	DI	700-P006	800-I873	700-IL727	R2 : S15 : P4	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NXD	854832	BALL SED SWBD 2 SURGE PROT FAIL	FAIL:NORM	17800	854820	DI	800-P001	800-I871	---	R2 : S12 : P14	
NXD	854842	BALL SED MCC 2 SURGE PROT FAIL	FAIL:NORM	17800	854820	DI	800-P001	800-I871	---	R2 : S12 : P15	
NXD	854844	UV MCC 2 SURGE PROTECTOR FAIL	FAIL:NORM	17800	854820	DI	800-P002	800-I873	---	R2 : S16 : P6	
YXD	854894	PROCESS ELECT BUILDING FIRE	FIRE : NORM	17800	854820	DI	800-P002	800-I873	---	R2 : S16 : P3	
ZXC	854308B	EFF RECYCLE TO REGULATOR VLV CLS	CLOSED : N/A	17800	854820	DI	300-P008	800-I871	300-EL308B	R2 : S12 : P4	
ZXO	854308B	EFF RECYCLE TO REGULATOR VLV OPN	OPENED : N/A	17800	854820	DI	300-P008	800-I871	300-EL308B	R2 : S12 : P3	
HXS	854320B	TREATMENT TRAIN 2 LEAD SELECT	TRAIN 2:NORM	17800	854820	DI	300-P008	800-I871	---	R2 : S11 : P9	
HXS	854321A	T2 - INF PUMP 1 LEAD SEL	LEAD : N/A	17800	854820	DI	300-P010	800-I873	---	R2 : S16 : P0	
NXD	854321A	T2 - INFLUENT PUMP 1 VFD FAULT	FAULT : NORM	17800	854820	DI	300-P014	800-I870	300-EL321	R2 : S9 : P10	
HXS	854321B	T2 - INF PUMP 1 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854820	DI	300-P010	800-I873	---	R2 : S16 : P1	
HXS	854321C	T2 - INF PUMP 1 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854820	DI	300-P010	800-I873	---	R2 : S16 : P2	
HXS	854322A	T2 - INF PUMP 2 LEAD SEL	LEAD : N/A	17800	854820	DI	300-P010	800-I873	---	R2 : S15 : P13	
NXD	854322A	T2 - INFLUENT PUMP 2 VFD FAULT	FAULT : NORM	17800	854820	DI	300-P015	800-I872	300-EL322	R2 : S13 : P15	
HXS	854322B	T2 - INF PUMP 2 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854820	DI	300-P010	800-I873	---	R2 : S15 : P14	
HXS	854322C	T2 - INF PUMP 2 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854820	DI	300-P010	800-I873	---	R2 : S15 : P15	
HXS	854323A	T2 - INF PUMP 3 LEAD SEL	LEAD : N/A	17800	854820	DI	300-P010	800-I872	---	R2 : S14 : P13	
NXD	854323A	T2 - INFLUENT PUMP 3 VFD FAULT	FAULT : NORM	17800	854820	DI	300-P016	800-I870	300-EL323	R2 : S10 : P5	
HXS	854323B	T2 - INF PUMP 3 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854820	DI	300-P010	800-I872	---	R2 : S14 : P14	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
HXS	854323C	T2 - INF PUMP 3 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854820	DI	300-P010	800-I872	---	R2 : S14 : P15	
AXH	854333A	INF SAMP ROON LEL HIGH	LEL HIGH : NORM	17800	854820	DI	300-P018	800-I-870	300-IL370	R2 : S10 : P13	
AXL	854333B	INF SAMP ROOM O2 CONCENTRATION LOW	O2 LOW : NORM	17800	854820	DI	300-P018	800-I-870	300-IL370	R2 : S10 : P14	
AXH	854333C	INF SAMP ROOM H2S CONCENTRATION HIGH	H2S HIGH : NORM	17800	854820	DI	300-P018	800-I-870	300-IL370	R2 : S10 : P15	
ZXD	854336A	SCREENINGS BUILDING INTRUSION	NORM : INTRUSION	17800	854820	DI	800-P001	800-I871	---	R2 : S12 : P9	
NXD	854342A	INFLUENT SCREEN 2 FAULT	FAULT : NORM	17800	854820	DI	300-P003	800-I869	300-EL342A	R2 : S8 : P4	
NXJ	854342A	INFLUENT SCREEN 2 RUNNING FOR	FORWARD : N/A	17800	854820	DI	300-P003	800-I869	300-EL342A	R2 : S8 : P1	
NXJ	854342B	INFLUENT SCREEN 2 RUNNING REV	REVERSE : N/A	17800	854820	DI	300-P003	800-I869	300-EL342A	R2 : S8 : P2	
NXD	854344A	SCREENINGS COMPACTOR 2 FAULT	FAULT	17800	854820	DI	300-P004	800-I869	300-EL344A	R2 : S8 : P15	
NXJ	854344A	SCREENINGS COMPACTOR 2 RUNNING FORWARD	FORWARD : N/A	17800	854820	DI	300-P004	800-I869	300-EL344A	R2 : S8 : P6	
NXJ	854344B	SCREENINGS COMPACTOR 2 RUNNING REVERSE	REVERSE : N/A	17800	854820	DI	300-P004	800-I869	300-EL344A	R2 : S8 : P7	
YXD	854394A	SCREENING BLDG FIRE ALARM	FIRE : NORM	17800	854820	DI	800-P002	800-I873	---	R2 : S16 : P4	
ZXD	854406A	PROCESS DECK STAIR INTRUSION	NORM : INTRUSION	17800	854820	DI	800-P001	800-I871	---	R2 : S12 : P10	
NXD	854420A	T2 - BALLASTED SED SYS FAULT	FAULT : NORM	17800	854820	DI	400-P001	800-I871	VENDOR	R2 : S11 : P13	
NXD	854420C	T2 - BALLASTED SED SYS WARNING	WARNING : NORM	17800	854820	DI	400-P001	800-I871	VENDOR	R2 : S11 : P14	
LXH	854450A	CAUSTIC STORAGE TANK LEVEL HIGH	LEVEL HIGH : NORM	17800	854820	DI	400-P005	800-I871	400-IL450	R2 : S11 : P10	
LXH	854450B	CAUSTIC STORAGE CONTAINMENT LEVEL HIGH	LEVEL HIGH : NORM	17800	854820	DI	400-P005	800-I871	400-IL450	R2 : S11 : P11	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NXD	854453A	T2 - CAUSTIC FEED PUMP 3 FAULT	FAULT : NORM	17800	854820	DI	400-P007	800-I871	400-EL453	R2 : S12 : P2	
NXD	854454A	T2 - CAUSTIC FEED PUMP 4 FAULT	FAULT : NORM	17800	854820	DI	400-P007	800-I872	400-EL454	R2 : S14 : P12	
NXD	854521A	T2 - UV SYSTEM FAULT	FAULT : NORM	17800	854820	DI	500-P003	800-I871	VENDOR	R2 : S12 : P11	
NXD	854521C	T2 - UV SYSTEM WARNING	WARNING : NORM	17800	854820	DI	500-P003	800-I871	VENDOR	R2 : S12 : P7	
NXD	854528A	T2 - EFFLUENT GATE FAULT	FAULT : NORM	17800	854820	DI	500-P009	800-I872	500-EL528	R2 : S14 : P4	
NXD	854528C	T2 - EFFLUENT GATE ACT WARN	WARNING : NORM	17800	854820	DI	500-P009	800-I872	500-EL528	R2 : S14 : P0	
NXD	854532A	C3 PUMP 2 VFD FAULT	FAULT : NORM	17800	854820	DI	500-P007	800-I872	500-EL532	R2 : S13 : P7	
NXD	854534A	EFFLUENT SAMPLER 1 FAULT	FAULT : NORM	17800	854820	DI	500-P009	800-I870	500-IL534	R2 : S9 : P5	
NXD	854534C	EFFLUENT SAMPLER 2 FAULT	FAULT : NORM	17800	854820	DI	500-P009	800-I870	500-IL534	R2 : S9 : P6	
NXD	854552A	T2 DEFOAM FEED PUMP FAULT	FAULT : NORM	17800	854820	DI	500-P012	800-I872	500-EL552	R2 : S13 : P11	
PXL	854556A	SERVICE AIR SYSTEM PRESSURE LOW	PRESS LOW : NORM	17800	854820	DI	500-P014	800-I872	---	R2 : S14 : P6	
TXH	854725A	OCU 2 EXHAUST FAN MTR WINDING TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	700-P004	800-I872	700-EL725	R2 : S14 : P1	
TXH	854725B	OCU 2 FAN ENCLOSURE TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	700-P002	800-I873	700-EL725	R2 : S15 : P11	
AXH	854727A	OCU 2 FAN ENCLOSURE LEL HIGH	LEL HIGH : NORM	17800	854820	DI	700-P006	800-I873	700-IL727	R2 : S15 : P5	
AXH	854727C	OCU 2 FAN ENCLOSURE H2S CONCENTRATION HIGH	H2S HIGH : NORM	17800	854820	DI	700-P006	800-I873	700-IL727	R2 : S15 : P7	
NXD	854810A	PLC854810 FAILURE	FAIL:NORM	17800	854820	DI	800-P003	800-I870	---	R2 : S9 : P0	
NXD	854820C	MCP SECT 3 DC PS NOT TROUBLE	NORM : TROUBLE	17800	854820	DI	300-P010	800-I873	---	R2 : S16 : P7	
ZXS	854893A	PROCESS ELECT BLDG INTRUSION	NORM : INTRUSION	17800	854820	DI	800-P002	800-I873	---	R2 : S16 : P15	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NYJ	854302	EQ BASIN FOLLOW DRAIN PUMP RUN CMD	RUN : OFF	17800	854820	DO	300-P017	800-I866	800-I829	R2 : S1 : P6	
NYC	854305	EQ BASIN FLUSHING VLV 2 CLOSE CMD	CLOSE : N/A	17800	854820	DO	300-P019	800-I866	300-EL305	R2 : S2 : P5	
NYO	854305	EQ BASIN FLUSHING VLV 2 OPEN CMD	OPEN : N/A	17800	854820	DO	300-P019	800-I866	300-EL305	R2 : S2 : P4	
NYC	854307	EQ BASIN FLUSHING VLV 4 CLOSE CMD	CLOSE : N/A	17800	854820	DO	300-P019	800-I866	300-EL307	R2 : S2 : P7	
NYO	854307	EQ BASIN FLUSHING VLV 4 OPEN CMD	OPEN : N/A	17800	854820	DO	300-P019	800-I866	300-EL307	R2 : S2 : P6	
NYC	854315	EQ BASIN FLUSHING VLV 6 CLOSE CMD	CLOSE : N/A	17800	854820	DO	300-P019A	800-I865	300-EL315	R1 : S15 : P1	
NYO	854315	EQ BASIN FLUSHING VLV 6 OPEN CMD	OPEN : N/A	17800	854820	DO	300-P019A	800-I865	300-EL315	R1 : S15 : P0	
NYC	854317	EQ BASIN FLUSHING VLV 8 CLOSE CMD	CLOSE : N/A	17800	854820	DO	300-P019A	800-I868	300-EL317	R2 : S6 : P1	
NYO	854317	EQ BASIN FLUSHING VLV 8 OPEN CMD	OPEN : N/A	17800	854820	DO	300-P019A	800-I868	300-EL317	R2 : S6 : P0	
HYD	854320	T2 - INFLUENT PUMP SELECT ERROR	ERROR : NORM	17800	854820	DO	300-P010	800-I867	800-I858	R2 : S3 : P7	
NYJ	854321	T2 - INFLUENT PUMP 1 RUN CMD	RUN : OFF	17800	854820	DO	300-P014	800-I865	300-EL321	R1 : S16 : P4	
NYJ	854322	T2 - INFLUENT PUMP 2 RUN CMD	RUN : OFF	17800	854820	DO	300-P015	800-I866	300-EL322	R2 : S2 : P3	
NYJ	854323	T2 - INFLUENT PUMP 3 RUN CMD	RUN : OFF	17800	854820	DO	300-P016	800-I868	300-EL323	R2 : S5 : P4	
NYJ	854332	INFLUENT SAMPLE PUMP 2 RUN CMD	RUN : OFF	17800	854820	DO	300-P005	800-I866	300-EL332	R2 : S1 : P1	
NYJ	854342	INFLUENT SCREEN 2 RUN CMD	RUN : OFF	17800	854820	DO	300-P003	800-I866	300-EL342	R2 : S1 : P0	
NYJ	854420	T2 - BALLASTED SED SYS RUN CMD	RUN : OFF	17800	854820	DO	400-P001	800-I865	VENDOR	R1 : S16 : P5	
NYJ	854453	T2 - LEAD CAUSTIC FEED PUMP RUN CMD	RUN : OFF	17800	854820	DO	400-P007	800-I866	800-I878	R2 : S1 : P3	
NYJ	854454	T2 - STANDBY CAUSTIC FEED PUMP RUN CMD	RUN : OFF	17800	854820	DO	400-P007	800-I867	800-I878	R2 : S4 : P7	
NYJ	854521	T2 - UV SYSTEM RUN CMD	RUN : OFF	17800	854820	DO	500-P003	800-I867	VENDOR	R2 : S3 : P3	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NYC	854529	T2 - C3 RECIRC VALVE CLOSE CMD	CLOSE : N/A	17800	854820	DO	500-P008	800-I867	500-EL529	R2 : S4 : P3	
NYO	854529	T2 - C3 RECIRC VALVE OPEN CMD	OPEN : N/A	17800	854820	DO	500-P008	800-I867	500-EL529	R2 : S4 : P2	
NYJ	854532	FOLLOW C3 PUMP RUN CMD	RUN : OFF	17800	854820	DO	500-P007	800-I868	800-I878	R2 : S5 : P2	
FY	854535	EFF PRI POLLUTANT SAMP PACING	COUNT : N/A	17800	854820	DO	500-P009	800-I867	500-IL534	R2 : S3 : P2	
NYJ	854552	T2 DEFOAM FEED PUMP RUN CMD	RUN : OFF	17800	854820	DO	500-P012	800-I867	500-EL552	R2 : S4 : P0	
NYG	854612	SOLIDS RETURN PMP 2 READY	READY : NOT READY	17800	854820	DO	600-P003	800-I867	---	R2 : S3 : P6	
NYC	854622	SOLIDS TANK FLUSH VLV 2 CLOSE CMD	CLOSE : N/A	17800	854820	DO	600-P005	800-I867	600-EL622	R2 : S4 : P4	
NYO	854622	SOLIDS TANK FLUSH VLV 2 OPEN CMD	OPEN : N/A	17800	854820	DO	600-P005	800-I867	600-RL622	R2 : S4 : P5	
NYC	854624	SOLIDS TANK FLUSH VLV 4 CLOSE CMD	CLOSE : N/A	17800	854820	DO	600-P005	800-I867	600-EL624	R2 : S3 : P0	
NYO	854624	SOLIDS TANK FLUSH VLV 4 OPEN CMD	OPEN : N/A	17800	854820	DO	600-P005	800-I867	600-EL624	R2 : S3 : P1	
NYD	854820	PLC 854820 FAILURE RELAY	NORM : FAIL	17800	854820	DO	800-P003	800-I865	---	R1 : S16 : P0	
ZYL	854320C	TREATMENT TRAIN 2 LEAD	T2 LEAD:N/A	17800	854820	DO	300-P008	800-I865	---	R1 : S15 : P3	
ZYL	854320D	TREATMENT TRAIN 2 RUNNING	T2 RUNNING:OFF	17800	854820	DO	300-P008	800-I865	---	R1 : S15 : P4	
ZYL	854321A	T2 - INF PUMP 1 LEAD SEL	LEAD : N/A	17800	854820	DO	300-P010	800-I865	---	R1 : S16 : P1	
ZYL	854321B	T2 - INF PUMP 1 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854820	DO	300-P010	800-I865	---	R1 : S16 : P2	
ZYL	854321C	T2 - INF PUMP 1 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854820	DO	300-P010	800-I865	---	R1 : S16 : P3	
ZYL	854322A	T2 - INF PUMP 2 LEAD SEL	LEAD : N/A	17800	854820	DO	300-P010	800-I866	---	R2 : S2 : P0	
ZYL	854322B	T2 - INF PUMP 2 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854820	DO	300-P010	800-I866	---	R2 : S2 : P1	
ZYL	854322C	T2 - INF PUMP 2 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854820	DO	300-P010	800-I866	---	R2 : S2 : P2	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
ZYL	854323A	T2 - INF PUMP 3 LEAD SEL	LEAD : N/A	17800	854820	DO	300-P010	800-I868	---	R2 : S5 : P5	
ZYL	854323B	T2 - INF PUMP 3 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854820	DO	300-P010	800-I868	---	R2 : S5 : P6	
ZYL	854323C	T2 - INF PUMP 3 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854820	DO	300-P010	800-I868	---	R2 : S5 : P7	
NYJ	854505A	EFFLUENT SUMP PUMP 1 START CMD	RUN : N/A	17800	854820	DO	500-P010	800-I866	500-EL505	R2 : S1 : P2	
NYK	854505B	EFFLUENT SUMP PUMP 1 STOP CMD	STOP : N/A	17800	854820	DO	500-P010	800-I866	500-EL505	R2 : S1 : P4	
FY	854534A	EFFLUENT SAMPLER 1 PACING	COUNT : N/A	17800	854820	DO	500-P009	800-I865	500-IL534	R1 : S16 : P7	
FY	854534B	EFFLUENT SAMPLER 2 PACING	COUNT : N/A	17800	854820	DO	500-P009	800-I866	500-IL534	R2 : S1 : P7	
NYJ	854611B	STDBY SOLIDS RETURN PMP RUN CMD	RUN : OFF	17800	854820	DO	600-P003	800-I865	800-I878	R1 : S16 : P6	
EX	854302	EQ BASIN DRAIN PUMP 2 AVG VOLTS	---	17800	854820	ENET	300-P017	800-I851	---	---	
IX	854302	EQ BASIN DRAIN PUMP 2 AVG CURR	---	17800	854820	ENET	300-P017	800-I851	---	---	
JX	854302	EQ BASIN DRAIN PUMP 2 INST POWER	---	17800	854820	ENET	300-P017	800-I851	---	---	
EX	854321	T2 - INFLUENT PUMP 1 AVG VOLTAGE	---	17800	854820	ENET	300-P014	800-I851	---	---	
IX	854321	T2 - INFLUENT PUMP 1 AVG CURRENT	---	17800	854820	ENET	300-P014	800-I851	---	---	
JX	854321	T2 - INFLUENT PUMP 1 INST POWER	---	17800	854820	ENET	300-P014	800-I851	---	---	
EX	854322	T2 - INFLUENT PUMP 2 AVG VOLTAGE	---	17800	854820	ENET	300-P015	800-I851	---	---	
IX	854322	T2 - INFLUENT PUMP 2 AVG CURRENT	---	17800	854820	ENET	300-P015	800-I851	---	---	
JX	854322	T2 - INFLUENT PUMP 2 INST POWER	---	17800	854820	ENET	300-P015	800-I851	---	---	
EX	854323	T2 - INFLUENT PUMP 3 AVG VOLTAGE	---	17800	854820	ENET	300-P016	800-I851	---	---	
IX	854323	T2 - INFLUENT PUMP 3 AVG CURRENT	---	17800	854820	ENET	300-P016	800-I851	---	---	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
JX	854323	T2 - INFLUENT PUMP 3 INST POWER	---	17800	854820	ENET	300-P016	800-I851	---	---	
EX	854332	INF SAMPLE PUMP 2 AVG VOLTAGE	---	17800	854820	ENET	300-P005	800-I851	---	---	
IX	854332	INF SAMPLE PUMP 2 AVG CURRENT	---	17800	854820	ENET	300-P005	800-I851	---	---	
JX	854332	INFLUENT SAMPLE PMP 2 INST POWER	---	17800	854820	ENET	300-P005	800-I851	---	---	
EX	854342	INFLUENT SCREEN 2 AVG VOLTAGE	---	17800	854820	ENET	3000-P003	800-I851	---	---	
IX	854342	INFLUENT SCREEN 2 AVG CURRENT	---	17800	854820	ENET	3000-P003	800-I851	---	---	
JX	854342	INFLUENT SCREEN 2 INST POWER	---	17800	854820	ENET	300-P003	800-I851	---	---	
EX	854344	SCREEN COMPACTOR AVG VOLTAGE	---	17800	854820	ENET	300-P004	800-I851	---	---	
IX	854344	SCREEN COMPACTOR 2 AVG CURRENT	---	17800	854820	ENET	300-P004	800-I851	---	---	
JX	854344	SCREEN COMPACTOR 2 INST POWER	---	17800	854820	ENET	300-P004	800-I851	---	---	
EX	854352	C2 PUMP 2 AVG VOLTAGE	---	17800	854820	ENET	300-P007	800-I851	---	---	
IX	854352	C2 PUMP 2 AVERAGE CURRENT	---	17800	854820	ENET	300-P007	800-I851	---	---	
JX	854352	C2 PUMP 2 INST POWER	---	17800	854820	ENET	300-P007	800-I851	---	---	
EX	854354	C2 PUMP 4 AVG VOLTAGE	---	17800	854820	ENET	300-P007	800-I851	---	---	
IX	854354	C2 PUMP 4 AVERAGE CURRENT	---	17800	854820	ENET	300-P007	800-I851	---	---	
JX	854354	C2 PUMP 4 INST POWER	---	17800	854820	ENET	300-P007	800-I851	---	---	
EX	854375	C2 ROOM SUPPLY FAN AVG VOLTAGE	---	17800	854820	ENET	300-P025	800-I851	---	---	
IX	854375	C2 ROOM SUPPLY FAN AVG CURRENT	---	17800	854820	ENET	300-P025	800-I851	---	---	
JX	854375	C2 ROOM SUPPLY FAN INST POWER	---	17800	854820	ENET	300-P025	800-I851	---	---	
EX	854532	C3 PUMP 2AVG VOLTAGE	---	17800	854820	ENET	500-P007	800-I851	---	---	
IX	854532	C3 PUMP 2 AVG CURRENT	---	17800	854820	ENET	500-P007	800-I851	---	---	
JX	854532	C3 PUMP 2 INST POWER	---	17800	854820	ENET	500-P007	800-I851	---	---	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
EX	854562	INST AIR CPRSR 2 AVG VOLTAGE	---	17800	854820	ENET	500-P013	800-I851	---	---	
IX	854562	INST AIR CPRSR 2 AVG CURRENT	---	17800	854820	ENET	500-P013	800-I851	---	---	
JX	854562	INST AIR CPRSR 2 INST POWER	---	17800	854820	ENET	500-P013	800-I851	---	---	
EX	854567	SERV AIR CPRSR 2 AVG VOLTAGE	---	17800	854820	ENET	500-P014	800-I851	---	---	
IX	854567	SERV AIR CPRSR 2 AVG CURRENT	---	17800	854820	ENET	500-P014	800-I851	---	---	
JX	854567	SERV AIR CPRSR 2 INST POWER	---	17800	854820	ENET	500-P014	800-I851	---	---	
EX	854612	SOLIDS RETURN PMP 2 AVG VOLTAGE	---	17800	854820	ENET	600-P003	800-I851	---	---	
IX	854612	SOLIDS RETURN PMP 2 AVG CURRENT	---	17800	854820	ENET	600-P003	800-I851	---	---	
JX	854612	SOLIDS RETURN PMP 2 INST POWER	---	17800	854820	ENET	600-P003	800-I851	---	---	
EX	854725	OCU 2 EXHAUST FAN AVG VOLTAGE	---	17800	854820	ENET	700-P004	800-I851	---	---	
IX	854725	OCU 2 EXHAUST FAN AVG CURRENT	---	17800	854820	ENET	700-P004	800-I851	---	---	
JX	854725	OCU 2 EXHAUST FAN INST POWER	---	17800	854820	ENET	700-P004	800-I851	---	---	
QX	854832	BALLASTED SED SWBD 2 PWR METER	---	17800	854820	ENET	800-P001	800-I851	---	---	
QX	854842	BALLASTED SED MCC 2 PWR MONITOR	---	17800	854820	ENET	800-P001	800-I851	---	---	
QX	854844	UV MCC 2 POWER MONITOR	---	17800	854820	ENET	800-P002	800-I851	---	---	
LX	854904	GENERATOR FUEL TANK LEVEL	---	17800	854981	AI	900-P004	900-I908	900-IL904	R1 : S5 : P0	
ZXS	854900	GENERATOR BUILDING INTRUSION	CLOSED:OPEN	17800	854981	DI	900-P103	900-I909	900-I915	R1 : S13 : P11	
LXL	854904	GENERATOR FUEL TANK LOW LEVEL	LOW LEVEL:NORM	17800	854981	DI	900-P004	900-I909	900-I915	R1 : S12 : P6	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NXD	854904	GENERATOR FUEL TANK TROUBLE	TROUBLE:NORM	17800	854981	DI	900-P004	900-I909	900-I915	R1 : S12 : P8	
YX	854912	RAIN GAUGE COUNT	COUNT:NORM	17800	854981	DI	900-P102	900-I910	---	R1 : S14 : P6	
ZX	854931	MAIN BREAKER A POSITION	CLOSED:OPEN	17800	854981	DI	900-P101	900-I909	---	R1 : S12 : P13	
ZX	854932	MAIN BREAKER B POSITION	CLOSED:OPEN	17800	854981	DI	900-P101	900-I909	---	R1 : S13 : P1	
ZX	854933	TIE BREAKER POSITION	CLOSED:OPEN	17800	854981	DI	900-P101	900-I909	---	R1 : S12 : P12	
NXD	854934	STANDBY SWBD SURGE PROTECT FAIL	FAIL:NORM	17800	854981	DI	900-P102	900-I909	900-I915	R1 : S13 : P5	
NXD	854941	GEN MCC SURGE PROTECTOR FAIL	FAIL:NORM	17800	854981	DI	900-P103	900-I909	900-I915	R1 : S13 : P10	
NXD	854942	OPERAT MCC SURGE PROTECT FAIL	FAIL:NORM	17800	854981	DI	900-P102	900-I909	900-I915	R1 : S13 : P6	
EXL	854981	ELECT BLDG PLC PNL 24VDC FAULT	FAULT:NORM	17800	854981	DI	900-P103	900-I910	900-I904	R1 : S14 : P5	
NXD	854901A	GENERATOR FAIL	FAIL:NORM	17800	854981	DI	900-P003	900-I909	900-I915	R1 : S12 : P4	
NXG	854901A	GENERATOR READY	READY:NOT READY	17800	854981	DI	900-P003	900-I909	900-I915	R1 : S12 : P3	
NXJ	854901A	GENERATOR RUNNING	RUNNING:OFF	17800	854981	DI	900-P003	900-I909	900-I915	R1 : S12 : P2	
NXD	854901C	GENERATOR TROUBLE	TROUBLE:NORM	17800	854981	DI	900-P003	900-I909	900-I915	R1 : S12 : P5	
HXA	854930A	AUTO THROEOVER SYS NOT IN AUTO	NOT AUTO:NORM	17800	854981	DI	900-P101	900-I909	900-I915	R1 : S12 : P11	
NXD	854931A	UTILITY POWER SUPPLY A FAIL	FAIL:NORM	17800	854981	DI	900-P101	900-I909	900-I915	R1 : S12 : P10	
NXD	854931C	SWITCHGEAR 1 SURGE PROTECT FAIL	FAIL:NORM	17800	854981	DI	900-P101	900-I909	900-I915	R1 : S13 : P2	
NXD	854932A	UTILITY POWER SUPPLY B FAIL	FAIL:NORM	17800	854981	DI	900-P101	900-I909	900-I915	R1 : S13 : P0	
NXD	854932C	SWITCHGEAR 2 SURGE PROTECT FAIL	FAIL:NORM	17800	854981	DI	900-P101	900-I909	900-I915	R1 : S13 : P3	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NXD	854934A	ATS FAIL	FAIL:NORM	17800	854981	DI	900-P102	900-I910	900-I915	R1 : S14 : P1	
ZXS	854934A	ATS IN UTILITY POSITION	NORM:N/A	17800	854981	DI	900-P102	900-I910	900-I915	R1 : S14 : P3	
NXD	854934C	ATS NOT IN AUTO	NOT AUTO: NORM	17800	854981	DI	900-P102	900-I910	900-I915	R1 : S14 : P2	
ZXS	854934C	ATS IN STANDBY POSITION	STANDBY:N/A	17800	854981	DI	900-P102	900-I910	900-I915	R1 : S14 : P4	
NXD	854951A	OPERATIONS UPS TROUBLE	TROUBLE:NORM	17800	854981	DI	900-P102	900-I909	900-I915	R1 : S13 : P4	
NXD	854974A	OPERATIONS BLDG HVAC TROUBLE	TROUBLE:NORM	17800	854981	DI	900-P007	900-I909	900-I915	R1 : S13 : P13	
NXD	854974B	OPERATIONS BLDG HVAC FAIL	FAIL:NORM	17800	854981	DI	900-P007	900-I909	900-I915	R1 : S13 : P14	
ZXS	854993A	OPERATIONS BUILDING INTRUSION	CLOSED:OPEN	17800	854981	DI	900-P102	900-I909	900-I915	R1 : S13 : P8	
YXD	854994A	OPERATIONS FIRE ALARM	FIRE:NORM	17800	854981	DI	900-P102	900-I909	900-I915	R1 : S13 : P9	
YXD	854994B	GENERATOR FIRE ALARM	FIRE:NORM	17800	854981	DI	900-P103	900-I909	900-I915	R1 : S13 : P12	
NYD	854981	OPERATIONS ELECTRICAL PLC FAIL	NORM:FAIL	17800	854981	DO	900-P103	900-I911	---	R1 : 15 : P0	
NYJ	854991A	ARCH LIGHTING COMMAND 1	ON :OFF	17800	854981	DO	900-P102	900-I911	---	R1 : S15 : P1	
NYJ	854991B	ARCH LIGHTING COMMAND 2	ON :OFF	17800	854981	DO	900-P102	900-I911	---	R1 : S15 : P2	
NYJ	854991C	ARCH LIGHTING COMMAND 3	ON :OFF	17800	854981	DO	900-P102	900-I911	---	R1 : S15 : P3	
QX	854901	GENERATOR POWER MONITOR	---	17800	854981	ENET	900-P003	900-I905	---	---	
QX	854931	SWITCHGEAR 1 POWER MONITOR	---	17800	854981	ENET	900-P101	900-I905	---	---	
QX	854932	SWITCHGEAR 1 POWER MONITOR	---	17800	854981	ENET	900-P101	900-I905	---	---	
QX	854934	STANDBY SWBD POWER MONITOR	---	17800	854981	ENET	900-P102	900-I905	---	---	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
QX	854941	GENERATOR MCC POWER MONITOR	---	17800	854981	ENET	900-P103	900-I905	---	---	
QX	854942	OPERATIONS MCC POWER MONITOR	---	17800	854981	ENET	900-P102	900-I905	---	---	
EX	854973	MTG ROOM RELIEF FAN AVG VOLTAGE	---	17800	854981	ENET	900-P007	900-I905	---	---	
IX	854973	MTG ROOM RELIEF FAN AVG CURR	---	17800	854981	ENET	900-P007	900-I905	---	---	
JX	854973	MTG ROOM RELIEF FAN INST POWER	---	17800	854981	ENET	900-P007	900-I905	---	---	

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 17904
METROTEL SCHEDULE

PART 1 GENERAL (NOT USED)

1.01 SUMMARY

A. This Section specifies Metrotel schedule.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 SCHEDULE

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NXD	854211B	GT REGULATOR G-TOWN GATE FAULT	NORM : FAULT	17275	854282	DI	200-P001	200-I242	200-EL211	R1 : S3 : P2	
LX	854212B	GT REGULATOR MICH TRUNK LEVEL	---	17275	854282	AI	200-P001	200-I242	200-IL212	R1 : S2 : P1	
NXD	854212B	GT REGULATOR MICH GATE FAULT	NORM : FAULT	17275	854282	DI	200-P001	200-I242	200-EL212	R1 : S3 : P3	
LX	854213B	GT REGULATOR EBI LEVEL	---	17275	854282	AI	200-P001	200-I242	200-IL213	R1 : S2 : P2	
NXD	854213B	GT REGULATOR EBI GATE FAULT	NORM : FAULT	17275	854282	DI	200-P001	200-I242	200-EL213	R1 : S3 : P4	
LX	854214B	GT REGULATOR DIVERSION LEVEL	---	17275	854282	AI	200-P001	200-I242	200-IL214	R1 : S2 : P0	
PXL	854261B	GT REGULATOR INST AIR PRESS LOW	PRESS LOW : NORM	17275	854282	DI	200-P002	200-I242	200-I231	R1 : S3 : P5	
PXL	854262B	GT REGULATOR SERV AIR PRESS LOW	PRESS LOW : NORM	17275	854282	DI	200-P003	200-I242	200-I231	R1 : S3 : P6	
AXH	854221B	GT REGULATOR LEL HIGH	LEL HIGH : NORM	17275	854282	DI	200-P004	200-I242	200-IL221	R1 : S3 : P7	
HX	854282	GT REGULATOR METROTEL TEST	TEST : NORM	17275	854282	DI	200-P005	200-I242	---	R1 : S3 : P0	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
YXD	854282	GT REGULATOR POWER FAIL	NORM : FAIL	17275	854282	DI	200-P005	200-I242	200-I231	R1 : S3 : P8	
ZXD	854293	GT REGULATOR INTRUSION	NORM : INTRUSION	17275	854282	DI	200-P005	200-I242	200-I231	R1 : S3 : P9	
NXD	854252B	GT REGULATOR UPS TROUBLE	TROUBLE : NORM	17275	854282	DI	200-P005	200-I242	200-I231	R1 : S3 : P12	
NXD	854281A	GT REGULATOR PLC FAIL	NORM : FAIL	17275	854282	DI	200-P005	200-I242	200-I230	R1 : S3 : P1	
YXD	854294B	GT REGULATOR FIRE	FIRE : NORM	17275	854282	DI	200-P005	200-I242	200-I231	R1 : S3 : P11	
LX	854330B	INFLUENT CHANNEL LEVEL	---	17275	854882	AI	300-P001	800-I882	300-IL330	R1 : S1 : P2	
NXD	854341B	INFLUENT SCREEN 1 FAULT	FAULT : NORM	17275	854882	DI	300-P002	800-I882	800-I825	R1 : S2 : P2	
NXD	854342B	INFLUENT SCREEN 2 FAULT	FAULT : NORM	17275	854882	DI	300-P003	800-I884	800-I874	R1 : S6 : P0	
NXD	854343B	SCREENINGS COMPACTOR 1 FAULT	FAULT : NORM	17275	854882	DI	300-P004	800-I882	800-I825	R1 : S2 : P3	
NXD	854344B	SCREENINGS COMPACTOR 2 FAULT	FAULT : NORM	17275	854882	DI	300-P004	800-I884	800-I847	R1 : S6 : P1	
NXD	854331	INF SAMPLE PUMP 1 TROUBLE	FAULT : NORM	17275	854882	DI	300-P005	800-I883	300-EL331	R1 : S3 : P12	
NXD	854332	INF SAMPLE PUMP 2 TROUBLE	FAULT : NORM	17275	854882	DI	300-P005	800-I884	300-EL332	R1 : S6 : P4	
NXD	854335B	INFLUENT SAMPLER 1 FAULT	FAULT : NORM	17275	854882	DI	300-P005	800-I882	300-IL335	R1 : S2 : P4	
NXD	854335D	INFLUENT SAMPLER 2 FAULT	FAULT : NORM	17275	854882	DI	300-P005	800-I883	300-IL335	R1 : S5 : P4	
AXH	854345B	SCREEN ROOM LEL HIGH	LEL HIGH : NORM	17275	854882	DI	300-P006	800-I882	300-IL345	R1 : S2 : P5	
LX	854300AB	EQ BASIN LEVEL SIGNAL 1	---	17275	854882	AI	300-P008	800-I882	300-IL300	R1 : S1 : P0	
LX	854300BB	EQ BASIN LEVEL SIGNAL 2	---	17275	854882	AI	300-P008	800-I884	300-IL300	R1 : S7 : P0	
NXD	854311B	T1 - INFLUENT PUMP 1 FAULT	FAULT : NORM	17275	854882	DI	300-P011	800-I882	300-EL311	R1 : S2 : P8	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NXD	854312B	T1 - INFLUENT PUMP 2 FAULT	FAULT : NORM	17275	854882	DI	300-P012	800-I882	300-EL312	R1 : S2 : P9	
NXD	854313B	T1 - INFLUENT PUMP 3 FAULT	FAULT : NORM	17275	854882	DI	300-P013	800-I882	300-EL313	R1 : S2 : P10	
NXD	854321B	T2 - INFLUENT PUMP 1 FAULT	FAULT : NORM	17275	854882	DI	300-P014	800-I884	300-EL321	R1 : S6 : P5	
NXD	854322B	T2 - INFLUENT PUMP 2 FAULT	FAULT : NORM	17275	854882	DI	300-P015	800-I884	300-EL322	R1 : S6 : P6	
NXD	854323B	T2 - INFLUENT PUMP 3 FAULT	FAULT : NORM	17275	854882	DI	300-P016	800-I884	300-EL323	R1 : S6 : P7	
NXD	854301	EQ BASIN DRAIN PUMP 1 TROUBLE	TROUBLE : NORM	17275	854882	DI	300-P017	800-I882	300-EL301	R1 : S2 : P11	
NXD	854302	EQ BASIN DRAIN PUMP 2 TROUBLE	TROUBLE : NORM	17275	854882	DI	300-P017	800-I884	300-EL302	R1 : S6 : P8	
AXH	854303B	EQ BASIN LEL HIGH	LEL HIGH : NORM	17275	854882	DI	300-P018	800-I882	300-IL303	R1 : S2 : P12	
AXH	854333B	INF SAMPLE ROOM LEL HIGH	HIGH : NORM	17275	854882	DI	300-P018	800-I885	300-IL333	R1 : S9 : P5	
PXL	854361B	PRELIM TREAT INST AIR PRESS LOW	PRESS LOW : NORM	17275	854882	DI	300-P021	800-I883	800-I825	R1 : S5 : P5	
NXD	854374	SCREEN ROOM HVAC FAULT	HVAC FAULT : NORM	17275	854882	DI	300-P024	800-I882		R1 : S2 : P6	
NXD	854375	C2 ROOM HVAC FAULT	HVAC FAULT : NORM	17275	854882	DI	300-P025	800-I882		R1 : S2 : P7	
NXD	854377	PANEL ROOM HVAC FAULT	HVAC FAULT : NORM	17275	854882	DI	300-P027	800-I883		R1 : S3 : P0	
NXD	854410B	T1 - BALLASTED SED SYS FAULT	BAL SED 1 FAULT : NORM	17275	854882	DI	400-P001	800-I883	800-I826	R1 : S5 : P1	
LX	854411B	T1 - BALLASTED SED DIST CHANNEL LEVEL	---	17275	854882	AI	400-P001	800-I882	400-IL411	R1 : S1 : P3	
NXD	854420B	T2 - BALLASTED SED SYS FAULT	BAL SED 2 FAULT : NORM	17275	854882	DI	400-P001	800-I884	800-I874	R1 : S6 : P2	
LX	854421B	T2 - BALLASTED SED DIST CHANNEL LEVEL	---	17275	854882	AI	400-P001	800-I884	400-IL421	R1 : S7 : P2	
NXD	854451B	T1 - CAUSTIC FEED PUMP 1 FAULT	FAULT : NORM	17275	854882	DI	400-P006	800-I882	400-EL451	R1 : S2 : P14	
NXD	854452B	T1 - CAUSTIC FEED PUMP	FAULT : NORM	17275	854882	DI	400-P006	800-I882	400-	R1 : S2 :	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
		2 FAULT							EL452	P15	
NXD	854453B	T2 - CAUSTIC FEED PUMP 3 FAULT	FAULT : NORM	17275	854882	DI	400-P007	800-I884	400- EL443	R1 : S6 : P11	
NXD	854454B	T2 - CAUSTIC FEED PUMP 4 FAULT	FAULT : NORM	17275	854882	DI	400-P007	800-I884	400- EL444	R1 : S6 : P12	
NXD	854474	POLY / COAG PUMP ROOM HVAC FAULT	HVAC FAULT : NORM	17275	854882	DI	400-P009	800-I883		R1 : S3 : P2	
NXD	854476	CAUSTIC PUMP ROOM HVAC FAULT	HVAC FAULT : NORM	17275	854882	DI	400-P010	800-I883		R1 : S3 : P8	
NXD	854511B	T1 - UV SYSTEM FAULT	UV 1 FAULT : NORM	17275	854882	DI	500-P002	800-I883	800-I826	R1 : S5 : P0	
NXD	854521B	T2 - UV SYSTEM FAULT	UV 2 FAULT : NORM	17275	854882	DI	500-P003	800-I884	800-I874	R1 : S6 : P15	
LX	854517B	C3 STORAGE TANK LEVEL	---	17275	854882	AI	500-P006	800-I882	500-IL517	R1 : S1 : P1	
NXD	854531B	C3 PUMP 1 FAULT	FAULT : NORM	17275	854882	DI	500-P007	800-I883	500- EL531	R1 : S3 : P4	
NXD	854532B	C3 PUMP 2 FAULT	FAULT : NORM	17275	854882	DI	500-P007	800-I885	500- EL532	R1 : S9 : P1	
FX	854518B	FACILITY EFFLUENT FLOW	---	17275	854882	AI	500-P009	800-I884	500-IL518	R1 : S7 : P1	
NXD	854518B	T1 - EFFLUENT GATE FAULT	FAULT : NORM	17275	854882	DI	500-P009	800-I882	500- EL518	R1 : S2 : P1	
NXD	854528B	T2 - EFFLUENT GATE FAULT	FAULT : NORM	17275	854882	DI	500-P009	800-I885	500- EL528	R1 : S9 : P2	
NXD	854534B	EFFLUENT SAMPLER 1 FAULT	FAULT : NORM	17275	854882	DI	500-P009	800-I885	500-IL534	R1 : S9 : P9	
NXD	854534D	EFFLUENT SAMPLER 2 FAULT	FAULT : NORM	17275	854882	DI	500-P009	800-I885	500-IL534	R1 : S9 : P3	
NXD	854551B	T1 DEFOAM FEED PUMP FAULT	FAULT : NORM	17275	854882	DI	500-P012	800-I883	500- EL551	R1 : S3 : P7	
NXD	854552B	T2 DEFOAM FEED PUMP FAULT	FAULT : NORM	17275	854882	DI	500-P012	800-I885	500- EL552	R1 : S9 : P4	
PXL	854561B	INST AIR SYSTEM PRESSURE LOW	PRESS LOW : NORM	17275	854882	DI	500-P013	800-I882	800-I825	R1 : S2 : P13	
PXL	854566B	SERV AIR SYSTEM PRESSURE LOW	LOW : NORM	17275	854882	DI	500-P014	800-I885	800-I874	R1 : S9 : P15	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NXD	854572	UV PUMP ROOM HVAC FAULT	HVAC FAULT : NORM	17275	854882	DI	500-P016	800-I885		R1 : S9 : P0	
LXH	854601A	SOLIDS HOLDING TANK LEVEL HIGH	LEVEL HIGH : NORM	17275	854882	DI	600-P001	800-I883	800-I818	R1 : S3 : P1	
NXD	854725B	OCU 2 EXHAUST FAN FAULT	FAULT : NORM	17275	854882	DI	700-P002	800-I885	800-I874	R1 : S9 : P7	
NXD	854715B	OCU1 EXHAUST FAN FAULT	FAULT : NORM	17275	854882	DI	700-P004	800-I883	800-I825	R1 : S3 : P5	
AXH	854717B	OCU 1 FAN ENCLOSURE LEL HIGH	LEL HIGH : NORM	17275	854882	DI	700-P005	800-I883	700-IL717	R1 : S3 : P3	
AXH	854727B	OCU 2 FAN ENCLOSURE LEL HIGH	LEL HIGH : NORM	17275	854882	DI	700-P006	800-I884	700-IL727	R1 : S6 : P10	
HX	854882	PROCESS ELECT METROTEL TEST	TEST : NORM	17275	854882	DI	800-P001	800-I882	---	R1 : S2 : P0	
ZXD	854101C	FACILITY GATE INTRUSION	NORM : INTRUSION	17275	854882	DI	800-P001	800-I883	800-I826	R1 : S5 : P11	
ZXD	854336B	SCREENINGS BUILDING INTRUSION	INTRUSION : NORM	17275	854882	DI	800-P001	800-I885	800-I874	R1 : S9 : P13	
ZXD	854406B	PROCESS DECK STAIR INTRUSION	INTRUSION : NORM	17275	854882	DI	800-P001	800-I885	800-I874	R1 : S9 : P14	
ZXD	854433B	BALLASTED SED INTRUSION	NORM : INTRUSION	17275	854882	DI	800-P001	800-I883	800-I825	R1 : S5 : P14	
YXD	854894	PROCESS ELECT BUILDING FIRE	FIRE : NORM	17275	854882	DI	800-P002	800-I885	800-I874	R1 : S9 : P12	
YXD	854394B	SCREENING BLDG FIRE ALARM	FIRE : NORM	17275	854882	DI	800-P002	800-I885	800-I874	R1 : S9 : P10	
ZXS	854537B	UV PUMP ROOM INTRUSION	NORM : INTRUSION	17275	854882	DI	800-P002	800-I883	800-I826	R1 : S5 : P15	
NXD	854851B	PROCESS ELECTRICAL UPS TROUBLE	UPS TROUBLE : NORM	17275	854882	DI	800-P002	800-I883	800-I825	R1 : S3 : P11	
ZXS	854893B	PROCESS ELECT BLDG INTRUSION	INTRUSION : NORM	17275	854882	DI	800-P002	800-I885	800-I874	R1 : S9 : P11	
NXD	854810B	PLC 854810 FAILURE	NORM : FAIL	17275	854882	DI	800-P003	800-I883	800-I815	R1 : S3 : P9	
NXD	854820B	PLC 854820 FAILURE	NORM : FAIL	17275	854882	DI	800-P003	800-I885	800-I865	R1 : S9 : P6	
NXD	854875B	PROCESS ELECTRICAL	HVAC FAULT :	17275	854882	DI	800-P004	800-I883	800-I825	R1 : S3 :	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
		BLDG HVAC FAULT	NORM							P6	
NXG	854901	GENERATOR READY	READY : NOT READY	17275	854982	DI	900-P003	900-I922	900-I915	R1 : S3 : P4	
NXJ	854901	GENERATOR RUNNING	RUNNING : OFF	17275	854982	DI	900-P003	900-I922	900-I915	R1 : S3 : P3	
HX	854901B	GENERATOR NOT IN AUTO	NOT IN AUTO : AUTO	17275	854982	DI	900-P003	900-I923	900-I915	R1 : S3 : P12	
NXD	854901B	GENERATOR FAIL	FAIL : NORM	17275	854982	DI	900-P003	900-I922	900-I915	R1 : S3 : P5	
NXD	854901D	GENERATOR TROUBLE	TROUBLE : NORM	17275	854982	DI	900-P003	900-I922	900-I915	R1 : S3 : P6	
LXL	854904B	GENERATOR FUEL TANK LEVEL LOW	LOW LEVEL : NORM	17275	854982	DI	900-P004	900-I922	900-I915	R1 : S3 : P7	
NXD	854978	GENERATOR ROOM HVAC FAULT	HVAC FAULT : NORM	17275	854982	DI	900-P009	900-I922	---	R1 : S3 : P9	
HXA	854930B	AUTO THROWOVER SYS NOT IN AUTO	NOT AUTO : AUTO	17275	854982	DI	900-P101	900-I922	900-I915	R1 : S3 : P11	
NXD	854931B	UTILITY POWER SUPPLY A FAIL	FAIL : NORM	17275	854982	DI	900-P101	900-I922	900-I915	R1 : S3 : P14	
NXD	854932B	UTILITY POWER SUPPLY B FAIL	FAIL : NORM	17275	854982	DI	900-P101	900-I922	900-I915	R1 : S3 : P15	
NXD	854934B	ATS FAIL	FAIL : NORM	17275	854982	DI	900-P102	900-I923	900-I915	R1 : S4 : P5	
NXD	854934D	ATS NOT IN AUTO	NOT AUTO : AUTO	17275	854982	DI	900-P102	900-I923	900-915	R1 : S4 : P0	
NXD	854951B	OPERATIONS UPS TROUBLE	TROUBLE : NORM	17275	854982	DI	900-P102	900-I923	900-I915	R1 : S4 : P1	
ZXA	854993B	OPERATIONS BUILDING INTRUSION	OPEN : NORM	17275	854982	DI	900-P102	900-I923	900-I915	R1 : S4 : P2	
YXD	854994B	OPERATIONS FIRE ALARM	FIRE : NORM	17275	854982	DI	900-P102	900-I923	900-I915	R1 : S4 : P3	
ZXA	854900	GENERATOR BUILDING INTRUSION	OPEN : NORM	17275	854982	DI	900-P103	900-I922	900-I915	R1 : S3 : P8	
NXD	854981	OPERATIONS ELECTRICAL PLC FAIL	FAIL : NORM	17275	854982	DI	900-P103	900-I922	900-I911	R1 : S3 : P10	
HX	854982	O&M ELECT METROTEL TEST	TEST : NORM	17275	854982	DI	900-P103	900-I922	---	R1 : S3 : P0	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
YXD	854994D	GENERATOR FIRE ALARM	FIRE : NORM	17275	854982	DI	900-P103	900-I923	900-I915	R1 : S4 : P4	

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 17905

OFF-SITE SCADA SIGNAL SCHEDULE

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies Off-Site SCADA signal schedule.
1. This schedule lists all PLC system analog and digital inputs.
 2. Provide additional data per Section 17802 and Sections 17500 through 17599.

1.02 QUALITY ASSURANCE (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 SCHEDULE

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
ZX	854211	GT REGULATOR G-TOWN GATE POS	---	17800	854281	AI	200-P001	200-I226	200-EL211	R1 : S7 : P0	
ZX	854212	GT REGULATOR MICH GATE POSITION	---	17800	854281	AI	200-P001	200-I226	200-EL212	R1 : S7 : P3	
ZX	854213	GT REGULATOR EBI GATE POSITION	---	17800	854281	AI	200-P001	200-I226	200-EL213	R1 : S8 : P1	
LX	854212A	GT REGULATOR MICH TRUNK LEVEL	---	17800	854281	AI	200-P001	200-I226	200-IL212	R1 : S7 : P1	
LX	854213A	GT REGULATOR EBI LEVEL	---	17800	854281	AI	200-P001	200-I226	200-IL212	R1 : S8 : P0	
LX	854214A	GT REGULATOR DIVERSION LEVEL	---	17800	854281	AI	200-P001	200-I226	200-IL214	R1 : S7 : P4	
AX	854221A	GT REGULATOR LEL	---	17800	854281	AI	200-P004	200-I226	200-IL221	R1 : S7 : P2	
AX	854221B	GT REGULATOR O2 ELEMENT	---	17800	854281	AI	200-P004	200-I226	200-IL221	R1 : S8 : P2	
AX	854221C	GT REGULATOR H2S ELEMENT	---	17800	854281	AI	200-P004	200-I226	200-IL221	R1 : S8 : P3	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
HXR	854211	GT REGULATOR G-TOWN GATE REMOTE	REMOTE:LOCAL	17800	854281	DI	200-P001	200-I228	200-EL211	R1 : S12 : P3	
WXH	854211	GT REGULATOR G-TOWN GATE HI TOR	HI TOR:NORM	17800	854281	DI	200-P001	200-I228	200-EL211	R1 : S12 : P4	
ZXC	854211	GT REGULATOR G-TOWN GATE OPENED	CLOSED:N/A	17800	854281	DI	200-P001	200-I228	200-EL211	R1 : S12 : P1	
ZXO	854211	GT REGULATOR G-TOWN GATE CLOSED	OPEN:N/A	17800	854281	DI	200-P001	200-I228	200-EL211	R1 : S12 : P0	
HXR	854212	GT REGULATOR MICH GATE REMOTE	REMOTE:LOCAL	17800	854281	DI	200-P001	200-I228	200-EL212	R1 : S12 : P11	
WXH	854212	GT REGULATOR MICH GATE HI TOR	HI TOR:NORM	17800	854281	DI	200-P001	200-I228	200-EL212	R1 : S12 : P12	
ZXC	854212	GT REGULATOR MICH GATE OPENED	CLOSED:N/A	17800	854281	DI	200-P001	200-I228	200-EL212	R1 : S12 : P9	
ZXO	854212	GT REGULATOR MICH GATE CLOSED	OPEN:N/A	17800	854281	DI	200-P001	200-I228	200-EL212	R1 : S12 : P8	
HXR	854213	GT REGULATOR EBI GATE REMOTE	REMOTE:LOCAL	17800	854281	DI	200-P001	200-I228	200-EL213	R1 : S13 : P3	
WXH	854213	GT REGULATOR EBI GATE HI TORQUE	HI TOR:NORN	17800	854281	DI	200-P001	200-I228	200-EL213	R1 : S13 : P4	
ZXC	854213	GT REGULATOR EBI GATE OPENED	CLOSED:N/A	17800	854281	DI	200-P001	200-I228	200-EL213	R1 : S13 : P1	
ZXO	854213	GT REGULATOR EBI GATE CLOSED	OPEN:N/A	17800	854281	DI	200-P001	200-I228	200-EL213	R1 : S13 : P0	
FXL	854221	GT REG HAZ GAS SAMPLE LOW FLOW	LOW FLOW:NORM	17800	854281	DI	200-P004	200-I228	200-IL221	R1 : S13 : P7	
NXD	854241	GT REG SURGE PROTECTOR FAIL	FAIL:NORM	17800	854281	DI	200-P005	200-I228	200-I228	R1 : S13 : P11	
ZXD	854293	GT REGULATOR INTRUSION	CLOSED:OPEN	17800	854281	DI	200-P005	200-I228	200-I231	R1 : S13 : P13	
NXD	854211A	GT REG G-TOWN GATE ACT FAULT	FAULT:NORM	17800	854281	DI	200-P001	200-I228	200-EL211	R1 : S12 : P2	
NXD	854212A	GT REGULATOR MICH GATE ACT FAULT	FAULT:NORM	17800	854281	DI	200-P001	200-I228	200-EL212	R1 : S12 : P10	
NXD	854213A	GT REGULATOR EBI GATE ACT FAULT	FAULT:NORM	17800	854281	DI	200-P001	200-I228	200-EL213	R1 : S13 : P2	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
AXH	854221A	GT REGULATOR LEL HIGH	HIGH LEL:NORM	17800	854281	DI	200-P004	200-I228	200-IL221	R1 : S13 : P8	
AXL	854221B	GT REGULATOR O2 LOW	LOW O2:NORM	17800	854281	DI	200-P004	200-I228	200-IL221	R1 : S13 : P9	
AXH	854221C	GT REGULATOR H2S HIGH	HIGH H2S:NORM	17800	854281	DI	200-P004	200-I228	200-IL221	R1 : S13 : P10	
NXD	854252A	GT REGULATOR UPS FAIL	FAIL:NORM	17800	854281	DI	200-P005	200-I228	200-I231	R1 : S13 : P12	
PXL	854261A	GT GEORGETOWN REG INST AIR PSL	LO PRESS:NORM	17800	854281	DI	200-P002	200-I228	200-I231	R1 : S12 : P7	
PXL	854262A	GT REGULATOR SERV AIR PSL	LO PRESS:NORM	17800	854281	DI	200-P003	200-I228	200-I231	R1 : S12 : P15	
NXD	854281B	GT REG PLC PNL DC PWR SPLY OK	NORM:FAIL	17800	854281	DI	200-P005	200-I229	200-I224	R1 : S14 : P0	
YXD	854294A	GT REGULATOR FIRE	FIRE:NORM	17800	854281	DI	200-P005	200-I228	200-I231	R1 : S13 : P14	
JX	854241	GT REGULATOR MCC POWER MONITOR	---	17800	854281	ENET	200-P005	200-I225	---	---	
FX	854311	T1 - INFLUENT PUMP 1 FLOW	---	17800	854810	AI	300-P011	800-I811	300-IL311	R1 : S6 : P3	
SX	854311	T1 - INFLUENT PUMP 1 SPEED	---	17800	854810	AI	300-P011	800-I811	300-EL311	R1 : S6 : P2	
VX	854311	T1 - INF PUMP 1 VIBRATION	---	17800	854810	AI	300-P011	800-I811	300-IL311	R1 : S6 : P0	
FX	854312	T1 - INFLUENT PUMP 2 FLOW	---	17800	854810	AI	300-P012	800-I812	300-IL312	R1 : S8 : P7	
SX	854312	T1 - INFLUENT PUMP 2 SPEED	---	17800	854810	AI	300-P012	800-I812	300-EL312	R1 : S8 : P6	
VX	854312	T1 - INF PUMP 2 VIBRATION	---	17800	854810	AI	300-P012	800-I813	300-IL312	R1 : S9 : P7	
FX	854313	T1 - INFLUENT PUMP 3 FLOW	---	17800	854810	AI	300-P013	800-I812	300-IL313	R1 : S7 : P4	
SX	854313	T1 - INFLUENT PUMP 3 SPEED	---	17800	854810	AI	300-P013	800-I812	300-EL313	R1 : S7 : P3	
VX	854313	T1 - INF PUMP 3 VIBRATION	---	17800	854810	AI	300-P013	800-I811	300-IL313	R1 : S5 : P7	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
AX	854334	INFLUENT PH	---	17800	854810	AI	300-P005	800-I811	300-IL334	R1 : S5 : P2	
LX	854341	INFLUENT SCREEN 1 DIFFERENTIAL LEVEL	---	17800	854810	AI	300-P002	800-I811	300-IL341	R1 : S5 : P1	
WX	854431	T1 – POLYMER TOTE WEIGHT	---	17800	854810	AI	400-P003	800-I811	400-IL431	R1 : S6 : P6	
LX	854440	COAG STORAGE TANK LEVEL	---	17800	854810	AI	400-P004	800-I812	400-IL440	R1 : S8 : P1	
FX	854451	T1 - CAUST FEED FLOW	---	17800	854810	AI	400-P006	800-I811	400-IL451	R1 : S6 : P7	
SX	854451	T1 - CAUSTIC FEED PUMP 1 SPEED	---	17800	854810	AI	400-P006	800-I812	400-EL451	R1 : S7 : P7	
SX	854452	T1 - CAUST FEED PUMP 2 SPEED	---	17800	854810	AI	400-P006	800-I812	400-EL452	R1 : S8 : P0	
LX	854505	EFFLUENT SUMP 1 LEVEL	---	17800	854810	AI	500-P010	800-I812	500-IL505	R1 : S7 : P5	
AX	854511	T1 - UV SYSTEM APPLIED DOSE	---	17800	854810	AI	500-P002	800-I811	VENDOR	R1 : S6 : P5	
ZX	854518	T1 - EFFLUENT GATE POSITION	---	17800	854810	AI	500-P009	800-I812	500-EL518	R1 : S8 : P3	
FX	854531	C3 PUMP FLOW	---	17800	854810	AI	500-P007	800-I812	500-IL531	R1 : S8 : P5	
SX	854531	C3 PUMP 1 SPEED	---	17800	854810	AI	500-P007	800-I812	500-EL531	R1 : S8 : P4	
FX	854551	T1 DEFOAM FEED PUMP FLOW	---	17800	854810	AI	500-P012	800-I813	500-IL551	R1 : S9 : P0	
SX	854551	T1 DEFOAM FEED PUMP SPEED	---	17800	854810	AI	500-P012	800-I813	500-EL551	R1 : S9 : P3	
LX	854601	SOLIDS HOLDING TANK LEVEL	---	17800	854810	AI	600-P001	800-I813	600-IL601	R1 : S9 : P1	
FX	854613	SOLIDS RETURN PUMP FLOW	---	17800	854810	AI	600-P003	800-I813	600-IL613	R1 : S9 : P2	
LX	854300AA	EQ BASIN LEVEL SIGNAL 1	---	17800	854810	AI	300-P008	800-I811	300-IL300	R1 : S6 : P1	
AX	854303A	EQ BASIN LEL	---	17800	854810	AI	300-P018	800-I812	300-IL303	R1 : S7 : P0	
AX	854303B	EQ BASIN O2	---	17800	854810	AI	300-P018	800-I812	300-IL303	R1 : S7 :	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
		CONCENTRATION								P1	
AX	854303C	EQ BASIN H2S CONCENTRATION	---	17800	854810	AI	300-P018	800-I812	300-IL303	R1 : S7 : P2	
LX	854330A	INFLUENT CHANNEL LEVEL	---	17800	854810	AI	300-P001	800-I811	300-IL330	R1 : S5 : P0	
AX	854345A	SCREEN ROOM LEL	---	17800	854810	AI	300-P006	800-I811	300-I345	R1 : S5 : P3	
AX	854345B	SCREEN ROOM 02	---	17800	854810	AI	300-P006	800-I811	300-I345	R1 : S5 : P4	
AX	854345C	SCREEN ROOM H2S	---	17800	854810	AI	300-P006	800-I811	300-I345	R1 : S5 : P5	
LX	854411A	T1 - BALLASTED SED DISTRIBUTION CHANNEL LEVEL	---	17800	854810	AI	400-P001	800-I811	300-IL411	R1 : S6 : P4	
LX	854517A	C3 STORAGETANK LEVEL	---	17800	854810	AI	500-P006	800-I812	500-IL517	R1 : S8 : P2	
AX	854717A	OCU 1 FAN ENCLOSURE LEL	---	17800	854810	AI	700-P005	800-I813	700-IL717	R1 : S9 : P4	
AX	854717C	OCU 1 FAN ENCLOSURE H2S	---	17800	854810	AI	700-P005	800-I813	700-IL717	R1 : S9 : P6	
ZXD	854102	MICH ST PERSONNEL GATE CLOSED	CLOSED : OPEN	17800	854810	DI	800-P001	800-I823	---	R2 : S15 : P14	
ZXD	854103	PLANT W ROAD VEHICLE GATE CLOSED	CLOSED : OPEN	17800	854810	DI	800-P001	800-I823	---	R2 : S15 : P15	
ZXD	854104	PLANT E ROAD VEHICLE GATE CLOSED	CLOSED : OPEN	17800	854810	DI	800-P001	800-I823	---	R2 : S16 : P5	
HXA	854301	EQ BASIN DRAIN PUMP 1 AUTO	AUTO : N/A	17800	854810	DI	300-P017	800-I820	300-EL301	R2 : S10 : P8	
MXH	854301	EQ BASIN DRAIN PUMP 1 SEAL LEAK	SEAL LEAK : NORM	17800	854810	DI	300-P017	800-I820	300-EL301	R2 : S10 : P11	
NXG	854301	EQ BASIN DRAIN PUMP 1 READY	READY : N/A	17800	854810	DI	300-P017	800-I820	300-EL301	R2 : S10 : P10	
NXJ	854301	EQ BASIN DRAIN PUMP 1 RUNNING	RUNNING : OFF	17800	854810	DI	300-P017	800-I820	300-EL301	R2 : S10 : P9	
TXH	854301	EQ BSN DRAIN PMP 1 MTR TEMP HIGH	TEMP HIGH : NORM	17800	854810	DI	300-P017	800-I820	300-EL301	R2 : S10 : P12	
FXL	854303	EQ BASIN HAZ GAS SAMPLE	FLOW LOW :	17800	854810	DI	300-P018	800-I820	300-IL303	R2 : S10 :	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
		FLOW LOW	NORM							P13	
HXR	854304	EQ BASIN FLUSHING VLV 1 REMOTE	REMOTE:LOCAL	17800	854810	DI	300-P019	800-I821	300-EL304	R2 : S11 : P1	
NXD	854304	EQ BASIN FLUSHING VLV 1 FAULT	FAULT : NORM	17800	854810	DI	300-P019	800-I821	300-EL304	R2 : S11 : P4	
ZXC	854304	EQ BASIN FLUSHING VLV 1 CLOSED	CLOSED : N/A	17800	854810	DI	300-P019	800-I821	300-EL304	R2 : S11 : P3	
ZXO	854304	EQ BASIN FLUSHING VLV 1 OPENED	OPENED : N/A	17800	854810	DI	300-P019	800-I821	300-EL304	R2 : S11 : P2	
HXA	854306	EQ BASIN FLUSH VLV 3 AUTO	AUTO : N/A	17800	854810	DI	300-P019	800-I824A	300-EL306	R3 : S4 : P1	
HXR	854306	EQ BASIN FLUSHING VLV 3 REMOTE	REMOTE:LOCAL	17800	854810	DI	300-P019	800-I824A	300-EL306	R3 : S4 : P3	
NXD	854306	EQ BASIN FLUSHING VLV 3 FAULT	FAULT : NORM	17800	854810	DI	300-P019	800-I824A	300-EL306	R3 : S4 : P6	
ZXC	854306	EQ BASIN FLUSHING VLV 3 CLOSED	CLOSED : N/A	17800	854810	DI	300-P019	800-I824A	300-EL306	R3 : S4 : P5	
ZXO	854306	EQ BASIN FLUSHING VLV 3 OPENED	OPENED : N/A	17800	854810	DI	300-P019	800-I824A	300-EL306	R3 : S4 : P4	
HXA	854311	T1 - INFLUENT PUMP 1 AUTO	AUTO : N/A	17800	854810	DI	300-P011	800-I820	300-EL311	R2 : S9 : P7	
NXG	854311	T1 - INFLUENT PUMP 1 READY	READY : N/A	17800	854810	DI	300-P011	800-I820	300-EL311	R2 : S9 : P9	
NXJ	854311	T1 - INFLUENT PUMP 1 RUNNING	RUNNING : OFF	17800	854810	DI	300-P011	800-I820	300-EL311	R2 : S9 : P8	
TXH	854311	T1 - INFLUENT PUMP 1 MTR TEMP HIGH	TEMP HIGH : NORM	17800	854810	DI	300-P011	800-I820	300-EL311	R2 : S9 : P11	
VXH	854311	T1 - INF PUMP 1 VIBRATION WARNING	VIB WARN : NORM	17800	854810	DI	300-P011	800-I824A	300-EL311	R3 : S3 : P1	
VXHH	854311	T1 - INF PUMP 1 VIBRATION ALARM	VIB ALARM : NORM	17800	854810	DI	300-P011	800-I824A	300-EL311	R3 : S3 : P2	
HXA	854312	T1 - INFLUENT PUMP 2 AUTO	AUTO : N/A	17800	854810	DI	300-P012	800-I820	300-EL312	R2 : S10 : P2	
NXG	854312	T1 - INFLUENT PUMP 2 READY	READY : N/A	17800	854810	DI	300-P012	800-I820	300-EL312	R2 : S10 : P4	
NXJ	854312	T1 - INFLUENT PUMP 2 RUNNING	RUNNING : OFF	17800	854810	DI	300-P012	800-I820	300-EL312	R2 : S10 : P3	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
TXH	854312	T1 - INFLUENT PUMP 2 MTR TEMP HIGH	TEMP HIGH : NORM	17800	854810	DI	300-P012	800-I820	300-EL312	R2 : S10 : P1	
VXH	854312	T1 - INF PUMP 2 VIBRATION WARNING	VIB WARN : NORM	17800	854810	DI	300-P012	800-I822	300-EL312	R2 : S14 : P8	
VXHH	854312	T1 - INF PUMP 2 VIBRATION ALARM	VIB ALARM : NORM	17800	854810	DI	300-P012	800-I822	300-EL312	R2 : S14 : P9	
HXA	854313	T1 - INFLUENT PUMP 3 AUTO	AUTO : N/A	17800	854810	DI	300-P013	800-I821	300-EL313	R2 : S11 : P11	
NXG	854313	T1 - INFLUENT PUMP 3 READY	READY : N/A	17800	854810	DI	300-P013	800-I821	300-EL313	R2 : S11 : P13	
NXJ	854313	T1 - INFLUENT PUMP 3 RUNNING	RUNNING : OFF	17800	854810	DI	300-P013	800-I821	300-EL313	R2 : S11 : P12	
TXH	854313	T1 - INFLUENT PUMP 3 MTR TEMP HIGH	TEMP HIGH : NORM	17800	854810	DI	300-P013	800-I821	300-EL313	R2 : S11 : P15	
VXH	854313	T1 - INF PUMP 3 VIBRATION WARNING	VIB WARN : NORM	17800	854810	DI	300-P013	800-I822	300-EL313	R2 : S13 : P3	
VXHH	854313	T1 - INF PUMP 3 VIBRATION ALARM	VIB ALARM : NORM	17800	854810	DI	300-P013	800-I822	300-EL313	R2 : S13 : P4	
HXA	854314	EQ BASIN FLUSH VLV 5 AUTO	AUTO : N/A	17800	854810	DI	300-P018A	800-I824B	300-EL314	R3 : S5 : P0	
HXR	854314	EQ BASIN FLUSHING VLV 5 REMOTE	REMOTE:LOCAL	17800	854810	DI	300-P019A	800-I824B	300-EL314	R3 : S5 : P1	
NXD	854314	EQ BASIN FLUSHING VLV 5 FAULT	FAULT : NORM	17800	854810	DI	300-P019A	800-I824B	300-EL314	R3 : S5 : P4	
ZXC	854314	EQ BASIN FLUSHING VLV 5 CLOSED	CLOSED : N/A	17800	854810	DI	300-P019A	800-I824B	300-EL314	R3 : S5 : P3	
ZXO	854314	EQ BASIN FLUSHING VLV 5 OPENED	OPENED : N/A	17800	854810	DI	300-P019A	800-I824B	300-EL314	R3 : S5 : P2	
HXA	854316	EQ BASIN FLUSH VLV 7 AUTO	AUTO : N/A	17800	854810	DI	300-P019A	800-I824B	300-EL316	R3 : S6 : P0	
HXR	854316	EQ BASIN FLUSHING VLV 7 REMOTE	REMOTE:LOCAL	17800	854810	DI	300-P019A	800-I824B	300-EL316	R3 : S6 : P1	
NXD	854316	EQ BASIN FLUSHING VLV 7 FAULT	FAULT : NORM	17800	854810	DI	300-P019A	800-I824B	300-EL316	R3 : S6 : P4	
ZXC	854316	EQ BASIN FLUSHING VLV 7 CLOSED	CLOSED : N/A	17800	854810	DI	300-P019A	800-I824B	300-EL316	R3 : S6 : P3	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
ZXO	854316	EQ BASIN FLUSHING VLV 7 OPENED	OPENED : N/A	17800	854810	DI	300-P019A	800-I824B	300-EL316	R3 : S6 : P2	
HXA	854331	INFLUENT SAMPLE PUMP 1 AUTO	AUTO : N/A	17800	854810	DI	300-P005	800-I819	300-EL331	R2 : S8 : P9	
MXH	854331	INF SAMPLE PUMP 1 LEAK	LEAK : NORM	17800	854810	DI	300-P005	800-I819	300-EL341A	R2 : S8 : P12	
NXJ	854331	INFLUENT SAMPLE PUMP 1 RUNNING	RUNNING : OFF	17800	854810	DI	300-P005	800-I819	300-EL341A	R2 : S8 : P10	
TXH	854331	INF SAMPLE PUMP 1 MTR TEMP HIGH	TEMP HIGH : NORM	17800	854810	DI	300-P005	800-I819	300-EL341A	R2 : S8 : P11	
LXL	854334	INFLUENT SAMPLE BOX LEVEL LOW	LEVEL LOW : NORM	17800	854810	DI	300-P005	800-I821	---	R2 : S11 : P6	
NXD	854337	INF PRI POLLUTANT SAMPLER FAULT	FAULT : NORM	17800	854810	DI	300-P005	800-I820	300-IL335	R2 : S9 : P2	
NXD	854340	PNL854340 DC PS NOT TROUBLE	NORM : TROUBLE	17800	854810	DI	300-P009	800-I823	---	R2 : S16 : P14	
HXA	854341	INFLUENT SCREEN 1 AUTO	AUTO : N/A	17800	854810	DI	300-P002	800-I819	300-EL341A	R2 : S8 : P0	
NXK	854341	INFLUENT SCREEN 1 ESTOP	ESTOP : NORM	17800	854810	DI	3000-P002	800-I819	300-EL341A	R2 : S8 : P3	
HXA	854343	SCREENINGS COMPACTOR 1 AUTO	AUTO : N/A	17800	854810	DI	300-P004	800-I819	300-EL343A	R2 : S8 : P5	
NXK	854343	SCREENINGS COMPACTOR 1 E-STOP	ESTOP : NORM	17800	854810	DI	300-P004	800-I821	300-EL343A	R2 : S12 : P3	
FXL	854345	SCREEN ROOM GAS DET AIR FLOW LOW	FLOW LOW : NORM	17800	854810	DI	300-P006	800-I819	300-IL345	R2 : S8 : P14	
LXH	854350	C2 AIR GAP TANK LEVEL HIGH	LEVEL HIGH : NORM	17800	854810	DI	300-P007	800-I823	---	R2 : S16 : P12	
LXL	854350	C2 AIR GAP TANK LEVEL LOW	LEVEL LOW : NORM	17800	854810	DI	300-P007	800-I823	---	R2 : S16 : P13	
PXH	854355	C2 SYSTEM HIGH PRESSURE	PRESS HIGH : NORM	17800	854810	DI	300-P007	800-I824	---	R3 : S1 : P6	
PXL	854355	C2 SYSTEM LOW PRESSURE	PRESS LOW : NORM	17800	854810	DI	300-P007	800-I824	---	R3 : S1 : P5	
NXD	854374	SCREEN ROOM HVAC FAULT	FAULT : NORM	17800	854810	DI	300-P024	800-I821	---	R2 : S11 : P8	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
FXH	854401	POLY FEED SFTY SHOWER FLOW HIGH	FLOW HIGH : NORM	17800	854810	DI	400-P008	800-I821	---	R2 : S12 : P9	
LXH	854441	COAG PUMP ROOM SUMP HI LEVEL	LEVEL HIGH : NORM	17800	854810	DI	400-P003	800-I820	---	R2 : S9 : P15	
FXH	854445	COAG FEED SFTY SHOWER FLOW HIGH	FLOW HIGH : NORM	17800	854810	DI	400-P008	800-I821	---	R2 : S12 : P8	
FXH	854446	COAG FILL SFTY SHOWER FLOW HIGH	FLOW HIGH : NORM	17800	854810	DI	400-P008	800-I821	---	R2 : S12 : P7	
FXH	854447	COAG STOR SFTY SHOWER FLOW HIGH	FLOW HIGH : NORM	17800	854810	DI	400-P008	800-I821	---	R2 : S12 : P6	
HX	854451	T1 - CAUST FEED PUMP 1 LEAD SEL	1 LEAD : 2 LEAD	17800	854810	DI	400-P006	800-I820	---	R2 : S12 : P5	
HXA	854451	T1 - CAUSTIC FEED PUMP 1 AUTO	AUTO : N/A	17800	854810	DI	400-P006	800-I821	400-EL451	R2 : S12 : P0	
NXJ	854451	T1 - CAUSTIC FEED PMP 1 RUNNINIG	RUNNING : OFF	17800	854810	DI	400-P006	800-I821	400-EL451	R2 : S12 : P1	
HXA	854452	T1 - CAUST FEED PUMP 2 AUTO	AUTO : N/A	17800	854810	DI	400-P006	800-I822	400-EL452	R2 : S13 : P0	
NXJ	854452	T1 - CAUST FEED PMP 2 RUNNINIG	RUNNING : OFF	17800	854810	DI	400-P006	800-I822	400-EL452	R2 : S13 : P1	
FXH	854455	CAUST FEED SFTY SHOWER FLOW HIGH	FLOW HIGH : NORM	17800	854810	DI	400-P008	800-I821	---	R2 : S12 : P10	
FXH	854456	CAUST FILL SFTY SHOWER FLOW HIGH	FLOW HIGH : NORM	17800	854810	DI	400-P008	800-I821	---	R2 : S12 : P12	
FXH	854457	CAUST STOR SFTY SHOWER FLOW HIGH	FLOW HIGH : NORM	17800	854810	DI	400-P008	800-I821	---	R2 : S12 : P11	
NXD	854474	POLY ROOM HVAC FAULT	HVAC FAULT : NORM	17800	854810	DI	400-P009	800-I824	---	R3 : S1 : P0	
FXH	854501	UV PMP ROOM SFTY SHWR HI FLOW	FLOW HIGH : NORM	17800	854810	DI	500-P015	800-I822	---	R2 : S14 : P10	
FXH	854502	UV DECK SFTY SHWR HI FLOW	FLOW HIGH : NORM	17800	854810	DI	500-P015	800-I822	---	R2 : S14 : P11	
ZXC	854518	T1 - EFFLUENT GATE CLOSED	CLOSED : N/A	17800	854810	DI	500-P009	800-I822	500-EL518	R2 : S14 : P3	
ZXO	854518	T1 - EFFLUENT GATE OPENED	OPENED : N/A	17800	854810	DI	500-P009	800-I822	500-EL518	R2 : S14 : P2	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
HXA	854519	T1 - C3 RECIRC VALVE AUTO	AUTO : N/A	17800	854810	DI	500-P008	800-I824	---	R3 : S2 : P4	
HXR	854519	T1 - C3 RECIRC VALVE REMOTE	AUTO : N/A	17800	854810	DI	500-P008	800-I824	500-EL519	R3 : S1 : P1	
NXD	854519	T1 - C3 RECIRC VALVE FAULT	FAULT : NORM	17800	854810	DI	500-P008	800-I824	500-EL519	R3 : S1 : P4	
ZXC	854519	T1 - C3 RECIRC VALVE CLOSED	CLOSED : N/A	17800	854810	DI	500-P008	800-I824	500-EL519	R3 : S1 : P3	
ZXO	854519	T1 - C3 RECIRC VALVE OPENED	OPENED : N/A	17800	854810	DI	500-P008	800-I824	500-EL519	R3 : S1 : P2	
HX	854531	C3 PUMP 1 LEAD SELECT	1 LEAD : 2 LEAD	17800	854810	DI	500-P007	800-I822	---	R2 : S13 : P11	
HXA	854531	C3 PUMP 1 AUTO	AUTO : N/A	17800	854810	DI	500-P007	800-I822	500-EL531	R2 : S13 : P6	
NXG	854531	C3 PUMP 1 READY	READY : NOT READY	17800	854810	DI	500-P007	800-I822	500-EL531	R2 : S13 : P8	
NXJ	854531	C3 PUMP 1 RUNNING	RUNNING : OFF	17800	854810	DI	500-P007	800-I822	500-EL531	R2 : S13 : P7	
TXH	854531	C3 PUMP 1 MTR TEMP HIGH	TEMP HIGH : NORM	17800	854810	DI	500-P007	800-I822	500-EL531	R2 : S13 : P10	
HXA	854538	C3 STOR TANK C1 FILL VALVE AUTO	AUTO : N/A	17800	854810	DI	500-P006	800-I824A	500-EL538	R3 : S3 : P3	
HXR	854538	C3 STOR TANK C1 FILL VALVE REMOTE	REMOTE : N/A	17800	854810	DI	500-P006	800-I824A	500-EL538	R3 : S3 : P12	
NXD	854538	C3 STOR TANK C1 FILL VALVE FAULT	FAULT : NORM	17800	854810	DI	500-P006	800-I824A	500-EL528	R3 : S3 : P15	
ZXC	854538	C3 STOR TANK C1 FILL VLV CLOSED	CLOSED : N/A	17800	854810	DI	500-P006	800-I824A	500-EL528	R3 : S3 : P14	
ZXO	854538	C3 STOR TANK C1 FILL VALVE OPENED	OPENED : N/A	17800	854810	DI	500-P006	800-I824A	500-EL528	R3 : S3 : P13	
HXA	854551	T1 DEFOAM FEED PUMP AUTO	AUTO : N/A	17800	854810	DI	500-P012	800-I882	500-EL551	R2 : S13 : P12	
NXJ	854551	T1 DEFOAM FEED PUMP 1 RUNINIG	RUNNING : OFF	17800	854810	DI	500-P012	800-I882	500-EL551	R2 : S13 : P13	
PXL	854561	INST AIR SYSTEM PRESSURE LOW	PRESS LOW : NORM	17800	854810	DI	500-P013	800-I822	---	R2 : S14 : P6	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NXD	854572	UV PUMP ROOM HVAC FAULT	HVAC FAULT : NORM	17800	854810	DI	500-P016	800-I824	---	R3 : S2 : P5	
HX	854611	SOLIDS RETURN PMP LEAD SELECT	1 LEAD : 2 LEAD	17800	854810	DI	600-P003	800-I823	---	R2 : S15 : P0	
HXA	854611	SOLIDS RETURN PMP 1 AUTO	AUTO : N/A	17800	854810	DI	600-P003	800-I822	600-EL611	R2 : S14 : P12	
HXP	854611	SOLIDS RETURN PMP 1 STOP	STOP : N/A	17800	854810	DI	600-P003	800-I823	600-EL611	R2 : S15 : P5	
HXS	854611	SOLIDS RETURN PMP 1 START	START : N/A	17800	854810	DI	600-P003	800-I823	600-EL611	R2 : S15 : P6	
HXY	854611	SOLIDS TRUCK LOADOUT ENABLE	ENABLE : DISABLE	17800	854810	DI	600-P003	800-I824	---	R3 : S2 : P9	
NXG	854611	SOLIDS RETURN PMP 1 READY	READY : NOT READY	17800	854810	DI	600-P003	800-I822	600-EL611	R2 : S14 : P14	
NXJ	854611	SOLIDS RETURN PMP 1 RUNNING	RUNNING : OFF	17800	854810	DI	600-P003	800-I822	600-EL611	R2 : S14 : P13	
HXA	854621	SOLIDS TANK FLUSH SEQ AUTO	AUTO : N/A	17800	854810	DI	600-P005	800-I822	---	R2 : S16 : P8	
HXR	854621	SOLIDS TANK FLUSH VLV 1 REMOTE	REMOTE : N/A	17800	854810	DI	600-P005	800-I823	600-EL621	R2 : S15 : P1	
NXD	854621	SOLIDS TANK FLUSH VLV 1 FAULT	FAULT : NORM	17800	854810	DI	600-P005	800-I823	600-EL621	R2 : S15 : P4	
ZXC	854621	SOLIDS TANK FLUSH VLV 1 CLOSED	CLOSED : N/A	17800	854810	DI	600-P005	800-I823	600-EL621	R2 : S15 : P3	
ZXO	854621	SOLIDS TANK FLUSH VLV 1 OPENED	OPENED : N/A	17800	854810	DI	600-P005	800-I823	600-EL621	R2 : S15 : P2	
HXA	854623	SOLIDS TANK FLUSH VLV 3 AUTO	AUTO : N/A	17800	854810	DI	600-P005	800-I821	600-EL623	R2 : S11 : P9	
HXR	854623	SOLIDS TANK FLUSH VLV 3 REMOTE	REMOTE : N/A	17800	854810	DI	600-P005	800-I824	---	R3 : S2 : P11	
NXD	854623	SOLIDS TANK FLUSH VLV 3 FAULT	FAULT : NORM	17800	854810	DI	600-P005	800-I824	---	R3 : S2 : P14	
ZXC	854623	SOLIDS TANK FLUSH VLV 3 CLOSED	CLOSED : N/A	17800	854810	DI	600-P005	800-I824	---	R3 : S2 : P13	
ZXO	854623	SOLIDS TANK FLUSH VLV 3 OPENED	OPENED : N/A	17800	854810	DI	600-P005	800-I824	---	R3 : S2 : P12	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
HXA	854715	OCU 1 EXHAUST FAN AUTO	AUTO : N/A	17800	854810	DI	700-P004	800-I824A	---	R3 : S4 : P14	
HXG	854715	OCU 1 EXHAUST FAN READY	READY : NOT READY	17800	854810	DI	700-P004	800-I824A	---	R3 : S4 : P13	
NXD	854715	OCU 1 EXHAUST FAN FAULT	FAULT : NORM	17800	854810	DI	700-P002	800-I824A	---	R3 : S4 : P8	
NXJ	854715	OCU 1 EXHAUST FAN RUNNING	RUNNING : OFF	17800	854810	DI	700-P004	800-I824A	---	R3 : S4 : P12	
TXH	854715	OCU 1 EXHAUST FAN MTR TEMP HIGH	TEMP HIGH : NORM	17800	854810	DI	700-P002	800-I824A	700-EL715	R3 : S4 : P11	
FXL	854717	OCU 1 FAN ENCL LOW SAMP FLOW	FLOW LOW : NORM	17800	854810	DI	700-P005	800-I824A	700-IL717	R3 : S3 : P7	
NXD	854831	BALL SED SWBD 1 SURGE PROT FAIL	FAIL:NORM	17800	854810	DI	800-P001	800-I823	---	R2 : S15 : P8	
NXD	854841	BALL SED MCC 1 SURGE PROT FAIL	FAIL:NORM	17800	854810	DI	800-P001	800-I823	---	R2 : S15 : P7	
NXD	854843	UV MCC 1 SURGE PROTECTOR FAIL	FAIL:NORM	17800	854810	DI	800-P002	800-I823	---	R2 : S15 : P12	
NXD	854845	PROCESS MCC SURGE PROTECTOR FAIL	FAIL:NORM	17800	854810	DI	800-P002	800-I823	---	R2 : S15 : P13	
ZXD	854101A	4TH AVE VEHICLE GATE CLOSED	CLOSED : OPEN	17800	854810	DI	800-P001	800-I823	---	R2 : S15 : P11	
ZXD	854101B	4TH AVE PERSONNEL GATE CLOSED	CLOSED : OPEN	17800	854810	DI	800-P001	800-I823	---	R2 : S15 : P10	
ZXD	854105A	REG ROAD VEHICLE GATE CLOSED	CLOSED : OPEN	17800	854810	DI	800-P001	800-I823	---	R2 : S16 : P10	
ZXD	854105B	REG ROAD PERSONNEL GATE CLOSED	CLOSED : OPEN	17800	854810	DI	800-P001	800-I824	---	R3 : S2 : P15	
HX	854300A	EQ BASIN LVL SIG 1 SELECT	1 SELECT : N/A	17800	854810	DI	300-P008	800-I820	---	R2 : S9 : P4	
HX	854300B	EQ BASIN LVL SIG AUTO SELECT	AUTO : N/A	17800	854810	DI	300-P008	800-I820	---	R2 : S9 : P5	
HX	854300C	EQ BASIN LVL SIG 2 SELECT	2 SELECT : N/A	17800	854810	DI	300-P008	800-I820	---	R2 : S9 : P6	
HX	854301A	EQ BASIN DRAIN PUMP 1 LEAD SEL	1 LEAD : 2 LEAD	17800	854810	DI	300-P017	800-I820	---	R2 : S10 : P7	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
AXH	854303A	EQ BASIN HIGH LEL	LEL HIGH : NORM	17800	854810	DI	300-P018	800-I820	300-IL303	R2 : S10 : P14	
AXL	854303B	EQ BASIN LOW O2 CONCENTRATION	O2 LOW : NORM	17800	854810	DI	300-P018	800-I820	300-IL303	R2 : S10 : P15	
AXH	854303C	EQ BASIN HIGH H2S CONCENTRATION	H2S HIGH : NORM	17800	854810	DI	300-P018	800-I820	300-IL303	R2 : S11 : P0	
HXA	854304A	EQ BASIN FLUSHING SEQ AUTO	AUTO : N/A	17800	854810	DI	300-P019	800-I824	---	R3 : S2 : P6	
HXS	854304A	EQ BASIN FLUSHING SEQ START	START : N/A	17800	854810	DI	300-P019	800-I824	---	R3 : S2 : P7	
HXA	854304B	EQ BASIN FLUSHING VLV 1 AUTO	AUTO : N/A	17800	854810	DI	300-P019	800-I821	300-EL304	R2 : S11 : P5	
HXS	854304B	EQ BASIN FLUSHING SEQ STOP	STOP : N/A	17800	854810	DI	300-P019	800-I824	---	R3 : S2 : P8	
ZXC	854308A	EFF RECYCLE TO EQ BSN VLV CLOSED	CLOSED : N/A	17800	854810	DI	300-P008	800-I823	300-EL308A	R2 : S16 : P3	
ZXO	854308A	EFF RECYCLE TO EQ BSN VLV OPEN	OPEN : N/A	17800	854810	DI	300-P008	800-I823	300-EL308A	R2 : S16 : P3	
HXS	854311A	T1 - INF PUMP 1 LEAD SEL	LEAD : N/A	17800	854810	DI	300-P009	800-I823	---	R2 : S16 : P0	
NXD	854311A	T1 - INFLUENT PUMP 1 VFD FAULT	FAULT : NORM	17800	854810	DI	300-P011	800-I820	300-EL311	R2 : S9 : P10	
HXS	854311B	T1 - INF PUMP 1 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854810	DI	300-P009	800-I823	---	R2 : S16 : P1	
HXS	854311C	T1 - INF PUMP 1 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854810	DI	300-P009	800-I823	---	R2 : S16 : P2	
HXS	854312A	T1 - INF PUMP 2 LEAD SEL	LEAD : N/A	17800	854810	DI	300-P009	800-I824	---	R3 : S1 : P13	
NXD	854312A	T1 - INFLUENT PUMP 2 VFD FAULT	FAULT : NORM	17800	854810	DI	300-P012	800-I820	300-EL312	R2 : S10 : P0	
HXS	854312B	T1 - INF PUMP 2 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854810	DI	300-P009	800-I824	---	R3 : S1 : P14	
HXS	854312C	T1 - INF PUMP 2 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854810	DI	300-P009	800-I824	---	R3 : S1 : P15	
HXS	854313A	T1 - INF PUMP 3 LEAD SEL	LEAD : N/A	17800	854810	DI	300-P009	800-I824	---	R3 : S2 : P0	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NXD	854313A	T1 - INFLUENT PUMP 3 VFD FAULT	FAULT : NORM	17800	854810	DI	300-P013	800-I821	300-EL313	R2 : S11 : P14	
HXS	854313B	T1 - INF PUMP 3 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854810	DI	300-P009	800-I824	---	R3 : S2 : P1	
HXS	854313C	T1 - INF PUMP 3 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854810	DI	300-P009	800-I824	---	R3 : S2 : P2	
HXS	854320A	TREATMENT TRAIN 1 LEAD SELECT	TRAIN 1:NORM	17800	854810	DI	300-P008	800-I820	---	R2 : S9 : P3	
NXD	854335A	INFLUENT SAMPLER 1 FAULT	FAULT : NORM	17800	854810	DI	300-P005	800-I819	300-IL335	R2 : S8 : P13	
NXD	854335C	INFLUENT SAMPLER 2 FAULT	FAULT : NORM	17800	854810	DI	300-P005	800-I821	300-IL335	R2 : S12 : P4	
NXD	854341A	INFLUENT SCREEN 1 FAULT	FAULT : NORM	17800	854810	DI	300-P002	800-I819	300-EL341A	R2 : S8 : P4	
NXJ	854341A	INFLUENT SCREEN 1 RUNNING FOR	FORWARD : N/A	17800	854810	DI	300-P002	800-I819	300-EL341A	R2 : S8 : P1	
NXJ	854341B	INFLUENT SCREEN 1 RUN REV	REVERSE : N/A	17800	854810	DI	3000-P002	800-I819	300-EL341A	R2 : S8 : P2	
NXD	854343A	SCREENINGS COMPACTOR 1 FAULT	FAULT : N/A	17800	854810	DI	300-P004	800-I819	300-EL341A	R2 : S8 : P8	
NXJ	854343A	SCREENINGS COMPACTOR 1 RUNNING FORWARD	FORWARD : N/A	17800	854810	DI	300-P004	800-I819	300-EL341A	R2 : S8 : P6	
NXJ	854343B	SCREENINGS COMPACTOR 1 RUNNING REVERSE	REVERSE : N/A	17800	854810	DI	300-P004	800-I819	300-EL341A	R2 : S8 : P7	
AXH	854345A	SCREEN ROOM LEL HIGH	LEL HIGH : NORM	17800	854810	DI	300-P006	800-I819	300-IL345	R2 : S8 : P15	
AXL	854345B	SCREEN ROOM O2 LOW	O2 LOW : NORM	17800	854810	DI	300-P006	800-I820	300-IL345	R2 : S9 : P0	
AXH	854345C	SCREEN ROOM H2S HIGH	H2S HIGH : NORM	17800	854810	DI	300-P006	800-I820	300-IL345	R2 : S9 : P1	
PXL	854361A	PRELIM TREAT INST AIR PRESS LOW	PRESS LOW : NORM	17800	854810	DI	300-P021	800-I821	---	R2 : S11 : P7	
NXD	854410A	T1 - BALLASTED SED SYS FAULT	FAULT : NORM	17800	854810	DI	400-P001	800-I822	VENDOR	R2 : S13 : P15	
NXD	854410C	T1 - BALLASTED SED SYS WARNING	WARNING : NORM	17800	854810	DI	400-P001	800-I822	VENDOR	R2 : S14 : P15	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
ZXD	854433A	BALLASTED SED INTRUSION	IMTRUSION : NORM	17800	854810	DI	800-P001	800-I823	---	R2 : S15 : P9	
LXH	854440A	COAG STORAGE TANK LEVEL HIGH	LEVEL HIGH : NORM	17800	854810	DI	400-P004	800-I820	400-IL440	R2 : S10 : P5	
LXH	854440B	COAG STORAGE CONTAINMENT LEVEL HIGH	LEVEL HIGH : NORM	17800	854810	DI	400-P004	800-I820	400-IL440	R2 : S10 : P6	
NXD	854451A	T1 - CAUSTIC FEED PUMP 1 FAULT	FAULT : NORM	17800	854810	DI	400-P006	800-I821	400-EL451	R2 : S12 : P2	
NXD	854452A	T1 - CAUSTIC FEED PUMP 2 FAULT	FAULT : NORM	17800	854810	DI	400-P006	800-I822	400-EL452	R2 : S13 : P2	
NXD	854511A	T1 - UV SYSTEM FAULT	FAULT: NORM	17800	854810	DI	500-P002	800-I824	VENDOR	R3 : S1 : P8	
NXD	854511C	T1 - UV SYSTEM WARNING	WARN : NORM	17800	854810	DI	500-P002	800-I824	VENDOR	R3 : S1 : P7	
HXS	854516A	T1 RECIRC START	T1 RECIRC START : N/A	17800	854810	DI	500-P008	800-I824A	---	R3 : S3 : P8	
HXS	854516B	T2 RECIRC START	T2 RECIRC START : N/A	17800	854810	DI	500-P008	800-I824A	---	R3 : S3 : P9	
HXS	854516C	BOTH RECIRC START	BOTH REVIRC START : N/A	17800	854810	DI	500-P008	800-I824A	---	R3 : S3 : P10	
HXS	854516D	RECIRC OFF	RECIRC OFF : N/A	17800	854810	DI	500-P008	800-I824A	---	R3 : S3 : P11	
NXD	854518A	T1 - EFFLUENT GATE FAULT	FAULT : NORM	17800	854810	DI	500-P009	800-I822	500-EL518	R2 : S14 : P4	
NXD	854518C	T1 - EFFLUENT GATE ACT WARN	WARNING : NORM	17800	854810	DI	500-P009	800-I822	500-EL518	R2 : S14 : P0	
NXD	854531A	C3 PUMP 1 VFD FAULT	FAULT : NORM	17800	854810	DI	500-P007	800-I822	500-EL531	R2 : S13 : P9	
ZXS	854537A	UV PUMP ROOM INTRUSION	INTRUSION : NORM	17800	854810	DI	800-P002	800-I824A	---	R3 : S3 : P0	
NXD	854551A	T1 DEFOAM FEED PUMP FAULT	FAULT : NORM	17800	854810	DI	500-P012	800-I882	500-EL551	R2 : S13 : P14	
HXS	854611E	EBI SOLIDS RETURN SEQ START	START : N/A	17800	854810	DI	600-P003	800-I824	---	R3 : S2 : P10	
HXS	854611G	EBI SOLIDS RETURN SEQ STOP	STOP : N/A	17800	854810	DI	600-P003	800-I824	---	R3 : S2 : P3	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
HXS	854621A	SOLIDS TANK FLUSH SEQ START	START : N/A	17800	854810	DI	600-P005	800-I823	---	R2 : S16 : P9	
HXA	854621B	SOLIDS TANK FLUSH VLV 1 AUTO	AUTO : N/A	17800	854810	DI	600-P005	800-I820	600-EL621	R2 : S9 : P13	
HXS	854621B	SOLIDS TANK FLUSH SEQ STOP	STOP : N/A	17800	854810	DI	600-P005	800-I824A	---	R3 : S4 : P10	
TXH	854715B	OCU 1 EXHAUST FAN ENCLOSURE TEMP HIGH	TEMP HIGH : NORM	17800	854810	DI	700-P004	800-I824A	---	R3 : S4 : P15	
AXH	854717A	OCU 1 FAN ENCLOSURE HI LEL	LEL HIGH : NORM	17800	854810	DI	700-P005	800-I824A	700-IL717	R3 : S3 : P4	
AXH	854717C	OCU 1 FAN ENCLOSURE HI H2S	H2S HIGH : NORM	17800	854810	DI	700-P005	800-I824A	700-IL717	R3 : S3 : P6	
NXD	854810C	MCP SECT 1 DC PS NOT TROUBLE	NORM : TROUBLE	17800	854810	DI	300-P009	800-I823	---	R2 : S16 : P7	
NXD	854810D	MCP SECT 2 DC PS NOT TROUBLE	NORM : TROUBLE	17800	854810	DI	300-P009	800-I823	---	R2 : S16 : P11	
NXD	854851A	PROCESS ELECTRICAL UPS TROUBLE	TROUBLE:NORM	17800	854810	DI	800-P002	800-I823	---	R2 : S16 : P6	
NXD	854875A	PROCESS ELECT HVAC FAULT	HVAC FAULT : NORM	17800	854810	DI	800-P003	800-I824A	---	R3 : S3 : P5	
JX	854301	EQ BASIN DRAIN PUMP 1 INST POWER	---	17800	854810	ENET	300-P017	800-I801	---	---	
JX	854311	T1 - INFLUENT PUMP 1 INST POWER	---	17800	854810	ENET	300-P011	800-I801	---	---	
JX	854312	T1 - INFLUENT PUMP 2 INST POWER	---	17800	854810	ENET	300-P012	800-I801	---	---	
JX	854313	T1 - INFLUENT PUMP 3 INST POWER	---	17800	854810	ENET	300-P013	800-I801	---	---	
JX	854331	INFLUENT SAMPLE PMP 1 INST POWER	---	17800	854810	ENET	300-P005	800-I801	---	---	
JX	854341	INFLUENT SCREEN 1 INST POWER	---	17800	854810	ENET	300-P002	800-I801	---	---	
JX	854343	SCREEN COMPACTOR 1 INST POWER	---	17800	854810	ENET	300-P004	800-I801	---	---	
JX	854351	C2 PUMP 1 INST POWER	---	17800	854810	ENET	300-P007	800-I801	---	---	
JX	854353	C2 PUMP 3 INST POWER	---	17800	854810	ENET	300-P007	800-I801	---	---	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
JX	854374	SCRN RM SUPPLY FAN INST POWER	---	17800	854810	ENET	300-P024	800-I801	---	---	
JX	854377	PNL ROOM SUPPLY FAN INST POWER	---	17800	854810	ENET	300-P027	800-I801	---	---	
JX	854531	C3 PUMP 1 INST POWER	---	17800	854810	ENET	500-P007	800-I801	---	---	
JX	854561	INST AIR CPRSR 1 INST POWER	---	17800	854810	ENET	500-P013	800-I801	---	---	
JX	854566	SERV AIR CPRSR 1 INST POWER	---	17800	854810	ENET	500-P014	800-I801	---	---	
JX	854572	UV PMP RM AIR SPLY FAN INST PWR	---	17800	854810	ENET	500-P016	800-I801	---	---	
JX	854573	UV PMP RM AIR EXHST FAN INST PWR	---	17800	854810	ENET	500-P016	800-I801	---	---	
JX	854611	SOLIDS RETURN PMP 1 INST POWER	---	17800	854810	ENET	600-P003	800-I801	---	---	
JX	854715	OCU 1 EXHAUST FAN INST POWER	---	17800	854810	ENET	700-P002	800-I801	---	---	
QX	854831	BALLASTED SED SWBD 1 PWR METER	---	17800	854810	ENET	800-P001	800-I801	---	---	
QX	854841	BALLASTED SED MCC 1 PWR MONITOR	---	17800	854810	ENET	800-P001	800-I801	---	---	
QX	854843	UV MCC 1 POWER MONITOR	---	17800	854810	ENET	800-P002	800-I801	---	---	
QX	854845	PROCESS MCC POWER MONITOR	---	17800	854810	ENET	800-P002	800-I801	---	---	
FX	854301	EQ BASIN DRAIN PUMP FLOW	---	17800	854820	AI	300-P017	800-I861	300-IL301	R1 : S6 : P0	
FX	854321	T2 - INFLUENT PUMP 1 FLOW	---	17800	854820	AI	300-P014	800-I861	300-IL321	R1 : S6 : P3	
SX	854321	T2 - INFLUENT PUMP 1 SPEED	---	17800	854820	AI	300-P014	800-I861	300-EL321	R1 : S6 : P2	
VX	854321	T2 - INF PUMP 1 VIBRATION	---	17800	854820	AI	300-P014	800-I861	300-IL321	R1 : S6 : P6	
FX	854322	T2 - INFLUENT PUMP 2 FLOW	---	17800	854820	AI	300-P015	800-I862	300-IL322	R1 : S8 : P7	
SX	854322	T2 - INFLUENT PUMP 2 SPEED	---	17800	854820	AI	300-P015	800-I862	300-EL322	R1 : S8 : P6	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
VX	854322	T2 - INF PUMP 2 VIBRATION	---	17800	854820	AI	300-P015	800-I862	300-IL322	R1 : S8 : P5	
FX	854323	T2 - INFLUENT PUMP 3 FLOW	---	17800	854820	AI	300-P016	800-I862	300-IL323	R1 : S7 : P4	
SX	854323	T2 - INFLUENT PUMP 3 SPEED	---	17800	854820	AI	300-P016	800-I862	300-EL323	R1 : S7 : P3	
VX	854323	T2 - INF PUMP 3 VIBRATION	---	17800	854820	AI	300-P016	800-I862	300-IL323	R1 : S7 : P5	
LX	854342	INFLUENT SCREEN 2 DIFFERENTIAL LEVEL	---	17800	854820	AI	300-P003	800-I861	300-IL342	R1 : S5 : P1	
WX	854432	T2 – POLYMER TOTE WEIGHT	---	17800	854820	AI	400-P003	800-I861	400-IL432	R1 : S5 : P5	
LX	854450	CAUSTIC STORAGE TANK LEVEL	---	17800	854820	AI	400-P005	800-I862	400-IL450	R1 : S7 : P6	
FX	854453	T2 - CAUST FEED FLOW	---	17800	854820	AI	400-P007	800-I861	400-IL453	R1 : S6 : P7	
SX	854453	T2 - CAUST FEED PUMP 3 SPEED	---	17800	854820	AI	400-P007	800-I862	400-EL453	R1 : S7 : P7	
SX	854454	T2 - CAUSTIC FEED PUMP 4 SPEED	---	17800	854820	AI	400-P007	800-I862	400-EL454	R1 : S8 : P0	
FX	854518	FACILITY EFFLUENT FLOW	---	17800	854820	AI	500-P009	800-I861	500-IL518	R1 : S5 : P2	
AX	854521	T2 - UV SYSTEM APPLIED DOSE	---	17800	854820	AI	500-P003	800-I861	VENDOR	R1 : S6 : P5	
LX	854526	C3 RECIRC P-TRAP LEVEL	---	17800	854820	AI	500-P006	800-I812	500-IL528	R1 : S7 : P6	
ZX	854528	T2 - EFFLUENT GATE POSITION	---	17800	854820	AI	500-P009	800-I861	500-EL528	R1 : S5 : P7	
SX	854532	C3 PUMP 2 SPEED	---	17800	854820	AI	500-P007	800-I862	500-EL532	R1 : S8 : P4	
FX	854552	T2 DEFOAM FEED PUMP FLOW	---	17800	854820	AI	500-P012	800-I863	500-IL552	R1 : S9 : P0	
SX	854552	T2 DEFOAM FEED PUMP SPEED	---	17800	854820	AI	500-P012	800-I863	500-EL552	R1 : S9 : P3	
PX	854566	SERV AIR SYSTEM PRESSURE	---	17800	854820	AI	500-P014	800-I862	500-IL566	R1 : S8 : P1	
LX	854300BA	EQ BASIN LEVEL SIGNAL 2	---	17800	854820	AI	300-P008	800-I861	300-IL300	R1 : S6 :	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
										P1	
AX	854333A	INF SAMP RM LEL	---	17800	854820	AI	300-P018	800-I862	300-IL333	R1 : S7 : P0	
AX	854333B	INF SAMP RM O2 CONCENTRATION	---	17800	854820	AI	300-P018	800-I862	300-IL333	R1 : S7 : P1	
AX	854333C	INF SAMP RM H2S CONCENTRATION	---	17800	854820	AI	300-P018	800-I862	300-IL333	R1 : S7 : P2	
LX	854421A	T2 - BALLASTED SED DISTRIBUTION CHANNEL LEVEL	---	17800	854820	AI	400-P001	800-I861	400-IL421	R1 : S6 : P4	
AX	854533A	EFFLUENT DO	---	17800	854820	AI	500-P009	800-I861	500-IL533	R1 : S5 : P3	
AX	854533B	EFFLUENT PH	---	17800	854820	AI	500-P009	800-I861	500-IL533	R1 : S5 : P0	
AX	854727A	OCU 2 FAN ENCLOSURE LEL	---	17800	854820	AI	700-P006	800-I861	700-IL727	R1 : S5 : P4	
AX	854727C	OCU 2 FAN ENCLOSURE H2S	---	17800	854820	AI	700-P006	800-I861	700-IL727	R1 : S5 : P6	
HXA	854302	EQ BASIN DRAIN PUMP 2 AUTO	AUTO : N/A	17800	854820	DI	300-P017	800-I870	300-EL302	R2 : S10 : P7	
MXH	854302	EQ BASIN DRAIN PUMP 2 LEAK	SEAL LEAK : NORM	17800	854820	DI	300-P017	800-I870	300-EL302	R2 : S10 : P10	
NXG	854302	EQ BASIN DRAIN PUMP 2 READY	READY : N/A	17800	854820	DI	300-P017	800-I870	300-EL302	R2 : S10 : P9	
NXJ	854302	EQ BASIN DRAIN PUMP 2 RUNNING	RUNNING : OFF	17800	854820	DI	300-P017	800-I870	300-EL302	R2 : S10 : P8	
TXH	854302	EQ BSN DRAIN PMP 2 MTR WINDING TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	300-P017	800-I870	300-EL302	R2 : S10 : P11	
HXA	854305	EQ BASIN FLUSH VLV 2 AUTO	AUTO : N/A	17800	854820	DI	300-P019	800-I870	300-EL305	R2 : S9 : P1	
HXR	854305	EQ BASIN FLUSHING VLV 2 REMOTE	REMOTE:LOCAL	17800	854820	DI	300-P019	800-I871	300-EL305	R2 : S11 : P1	
NXD	854305	EQ BASIN FLUSHING VLV 2 FAULT	FAULT : NORM	17800	854820	DI	300-P019	800-I871	300-EL305	R2 : S11 : P4	
ZXC	854305	EQ BASIN FLUSHING VLV 2 CLOSED	CLOSED : N/A	17800	854820	DI	300-P019	800-I871	300-EL305	R2 : S11 : P3	
ZXO	854305	EQ BASIN FLUSHING VLV 2	OPENED : N/A	17800	854820	DI	300-P019	800-I871	300-EL305	R2 : S11 :	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
		OPENED								P2	
HXA	854307	EQ BASIN FLUSH VLV 4 AUTO	AUTO : N/A	17800	854820	DI	300-P019	800-I870	300-EL307	R2 : S10 : P0	
HXR	854307	EQ BASIN FLUSHING VLV 4 REMOTE	REMOTE:LOCAL	17800	854820	DI	300-P019	800-I871	300-EL307	R2 : S11 : P5	
NXD	854307	EQ BASIN FLUSHING VLV 4 FAULT	FAULT : NORM	17800	854820	DI	300-P019	800-I871	300-EL307	R2 : S11 : P8	
ZXC	854307	EQ BASIN FLUSHING VLV 4 CLOSED	CLOSED : N/A	17800	854820	DI	300-P019	800-I871	300-EL307	R2 : S11 : P7	
ZXO	854307	EQ BASIN FLUSHING VLV 4 OPENED	OPENED : N/A	17800	854820	DI	300-P019	800-I871	300-EL307	R2 : S11 : P6	
HXA	854315	EQ BASIN FLUSH VLV 6 AUTO	AUTO : N/A	17800	854820	DI	300- P019A	800- I873A	300-EL315	R3 : S1 : P0	
HXR	854315	EQ BASIN FLUSHING VLV 6 REMOTE	REMOTE:LOCAL	17800	854820	DI	300- P019A	800- I873A	300-EL315	R3 : S1 : P1	
NXD	854315	EQ BASIN FLUSHING VLV 6 FAULT	FAULT : NORM	17800	854820	DI	300- P019A	800- I873A	300-EL315	R3 : S1 : P4	
ZXC	854315	EQ BASIN FLUSHING VLV 6 CLOSED	CLOSED : N/A	17800	854820	DI	300- P019A	800- I873A	300-EL315	R3 : S1 : P3	
ZXO	854315	EQ BASIN FLUSHING VLV 6 OPENED	OPENED : N/A	17800	854820	DI	300- P019A	800- I873A	300-EL315	R3 : S1 : P2	
HXA	854317	EQ BASIN FLUSH VLV 8 AUTO	AUTO : N/A	17800	854820	DI	300- P019A	800- I873A	300-EL317	R3 : S2 : P0	
HXR	854317	EQ BASIN FLUSHING VLV 8 REMOTE	REMOTE:LOCAL	17800	854820	DI	300- P019A	800- I873A	300-EL317	R3 : S2 : P1	
NXD	854317	EQ BASIN FLUSHING VLV 8 FAULT	FAULT : NORM	17800	854820	DI	300- P019A	800- I873A	300-EL317	R3 : S2 : P4	
ZXC	854317	EQ BASIN FLUSHING VLV 8 CLOSED	CLOSED : N/A	17800	854820	DI	300- P019A	800- I873A	300-EL317	R3 : S2 : P3	
ZXO	854317	EQ BASIN FLUSHING VLV 8 OPENED	OPENED : N/A	17800	854820	DI	300- P019A	800- I873A	300-EL317	R3 : S2 : P2	
HXA	854321	T2 - INFLUENT PUMP 1 AUTO	AUTO : N/A	17800	854820	DI	300-P014	800-I870	300-EL321	R2 : S9 : P7	
NXG	854321	T2 - INFLUENT PUMP 1 READY	READY : N/A	17800	854820	DI	300-P014	800-I870	300-EL321	R2 : S9 : P9	
NXJ	854321	T2 - INFLUENT PUMP 1 RUNNING	RUNNING : OFF	17800	854820	DI	300-P014	800-I870	300-EL321	R2 : S9 : P8	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
TXH	854321	T2 - INFLUENT PUMP 1 MTR WINDING TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	300-P014	800-I870	300-EL321	R2 : S9 : P11	
VXH	854321	T2 - INF PUMP 1 VIBRATION WARNING	WARNING : NORM	17800	854820	DI	300-P014	800-I873A	300-EL321	R3 : S1 : P5	
VXHH	854321	T2 - INF PUMP 1 VIBRATION ALARM	ALARM : NORM	17800	854820	DI	300-P014	800-I873A	300-EL321	R3 : S1 : P6	
HXA	854322	T2 - INFLUENT PUMP 2 AUTO	AUTO : N/A	17800	854820	DI	300-P015	800-I872	300-EL322	R2 : S13 : P12	
NXG	854322	T2 - INFLUENT PUMP 2 READY	READY : N/A	17800	854820	DI	300-P015	800-I872	300-EL322	R2 : S13 : P14	
NXJ	854322	T2 - INFLUENT PUMP 2 RUNNING	RUNNING : OFF	17800	854820	DI	300-P015	800-I872	300-EL322	R2 : S13 : P13	
TXH	854322	T2 - INFLUENT PUMP 2 MTR WINDING TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	300-P015	800-I871	300-EL322	R2 : S12 : P8	
VXH	854322	T2 - INF PUMP 2 VIBRATION WARNING	WARNING : NORM	17800	854820	DI	300-P015	800-I869	300-EL322	R2 : S7 : P2	
VXHH	854322	T2 - INF PUMP 2 VIBRATION ALARM	ALARM : NORM	17800	854820	DI	300-P015	800-I869	300-EL322	R2 : S7 : P3	
HXA	854323	T2 - INFLUENT PUMP 3 AUTO	AUTO : N/A	17800	854820	DI	300-P016	800-I870	300-EL323	R2 : S10 : P2	
NXG	854323	T2 - INFLUENT PUMP 3 READY	READY : N/A	17800	854820	DI	300-P016	800-I870	300-EL323	R2 : S10 : P4	
NXJ	854323	T2 - INFLUENT PUMP 3 RUNNING	RUNNING : OFF	17800	854820	DI	300-P016	800-I870	300-EL323	R2 : S10 : P3	
TXH	854323	T2 - INFLUENT PUMP 3 MTR WINDING TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	300-P016	800-I870	300-EL323	R2 : S10 : P6	
VXH	854323	T2 - INF PUMP 3 VIBRATION HIGH	WARNING : NORM	17800	854820	DI	300-P016	800-I872	300-EL323	R2 : S14 : P8	
VXHH	854323	T2 - INF PUMP 3 VIBRATION HIHI	ALARM : NORM	17800	854820	DI	300-P016	800-I872	300-EL323	R2 : S14 : P9	
HXA	854332	INFLUENT SAMPLE PUMP 2 AUTO	AUTO : N/A	17800	854820	DI	300-P005	800-I869	300-EL332	R2 : S8 : P9	
MXH	854332	INF SAMPLE PUMP 2 LEAK	SEAL LEAK : NORM	17800	854820	DI	300-P005	800-I869	300-EL332	R2 : S8 : P12	
NXJ	854332	INFLUENT SAMPLE PUMP 2 RUNNING	RUNNING : OFF	17800	854820	DI	300-P005	800-I869	300-EL332	R2 : S8 : P10	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
TXH	854332	INF SAMPLE PUMP 2 MTR WINDING TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	300-P005	800-I869	300-EL332	R2 : S8 : P11	
FXL	854333	INF SAMP RM HAZ GAS SAMPLE FLOW LOW	FLOW LOW : NORM	17800	854820	DI	300-P018	800-I-870	300-IL370	R2 : S10 : P12	
HXA	854342	INFLUENT SCREEN 2 AUTO	AUTO : N/A	17800	854820	DI	300-P003	800-I869	300-EL342A	R2 : S8 : P0	
NXK	854342	INFLUENT SCREEN 2 ESTOP	ESTOP : NORM	17800	854820	DI	3000-P003	800-I869	300-EL342A	R2 : S8 : P3	
HXA	854344	SCREENINGS COMPACTOR 2 AUTO	AUTO : N/A	17800	854820	DI	300-P004	800-I869	300-EL344A	R2 : S8 : P5	
NXK	854344	SCREENINGS COMPACTOR 2 E-STOP	ESTOP : NORM	17800	854820	DI	300-P004	800-I869	300-EL344A	R2 : S8 : P8	
NXD	854375	SCREENINGS BUILDING C2 ROOM HVAC FAULT	HVAC FAULT : NORM	17800	854820	DI	300-P025	800-I870	---	R2 : S9 : P4	
NXD	854377	SCREENINGS BLDG PNL ROOM HVAC FAULT	HVAC FAULT : NORM	17800	854820	DI	300-P027	800-I870	---	R2 : S9 : P3	
LXH	854451	CAUSTIC PUMP ROOM SUMP LEVEL HIGH	LEVEL HIGH : NORM	17800	854820	DI	400-P003	800-I871	---	R2 : S11 : P15	
HX	854453	T2 - CAUST FEED PUMP 3 LEAD SEL	1 LEAD : 2 LEAD	17800	854820	DI	400-P007	800-I871	400-EL453	R2 : S11 : P12	
HXA	854453	T2 - CAUST FEED PUMP 3 AUTO	AUTO : N/A	17800	854820	DI	400-P007	800-I871	400-EL453	R2 : S12 : P0	
NXJ	854453	T2 - CAUSTIC FEED PMP 3 RUNNINIG	RUNNING : OFF	17800	854820	DI	400-P007	800-I871	400-EL453	R2 : S12 : P1	
HXA	854454	T2 - CAUSTIC FEED PUMP 4 AUTO	AUTO : N/A	17800	854820	DI	400-P007	800-I872	400-EL454	R2 : S14 : P10	
NXJ	854454	T2 - CAUSTIC FEED PMP 4 RUNNINIG	RUNNING : OFF	17800	854820	DI	400-P007	800-I872	400-EL454	R2 : S14 : P11	
NXD	854476	CAUST ROOM HVAC FAULT	FAULT : NORM	17800	854820	DI	400-P010	800-I871	---	R2 : S12 : P6	
MXH	854505	EFF SUMP PUMP SEAL LEAK	SEAL LEAK : NORM	17800	854820	DI	500-P010	800-I873	500-EL505	R2 : S15 : P10	
NXJ	854505	EFFLUENT SUMP PUMP 1 RUNNING	RUNNING : OFF	17800	854820	DI	500-P010	800-I873	500-EL505	R2 : S15 : P8	
TXH	854505	EFF SUMP PUMP MTR WINDING TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	500-P010	800-I873	500-EL505	R2 : S15 : P9	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
ZXC	854528	T2 - EFFLUENT GATE CLOSED	CLOSED : N/A	17800	854820	DI	500-P009	800-I872	500-EL528	R2 : S14 : P3	
ZXO	854528	T2 - EFFLUENT GATE OPENED	OPENED : N/A	17800	854820	DI	500-P009	800-I872	500-EL528	R2 : S14 : P2	
HXA	854529	T2 - C3 RECIRC VALVE AUTO	AUTO : N/A	17800	854820	DI	500-P008	800-I873	500-EL529	R2 : S16 : P5	
HXR	854529	T2 - C3 RECIRC VALVE REMOTE	REMOTE : N/A	17800	854820	DI	500-P008	800-I872	500-EL529	R2 : S13 : P2	
NXD	854529	T2 - C3 RECIRC VALVE FAULT	FAULT : NORM	17800	854820	DI	500-P008	800-I872	500-EL529	R2 : S13 : P3	
ZXC	854529	T2 - C3 RECIRC VALVE CLOSED	CLOSED : N/A	17800	854820	DI	500-P008	800-I872	500-EL529	R2 : S13 : 1	
ZXO	854529	T2 - C3 RECIRC VALVE OPENED	OPENED : N/A	17800	854820	DI	500-P008	800-I872	500-EL529	R2 : S13 : P0	
HXA	854532	C3 PUMP 2 AUTO	AUTO : N/A	17800	854820	DI	500-P007	800-I872	500-EL532	R2 : S13 : P4	
NXG	854532	C3 PUMP 2 READY	READY : NOT READY	17800	854820	DI	500-P007	800-I872	500-EL532	R2 : S13 : P6	
NXJ	854532	C3 PUMP 2 RUNNING	RUNNING : OFF	17800	854820	DI	500-P007	800-I872	500-EL532	R2 : S13 : P5	
TXH	854532	C3 PUMP 2 MTR WINDING TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	500-P007	800-I872	500-EL532	R2 : S13 : P8	
LXL	854533	EFFLUENT SAMPLE BOX LEVEL LOW	LEVEL LOW : NORM	17800	854820	DI	500-P009	800-I871	---	R2 : S12 : P5	
NXD	854535	EFF PRI POLLUTANT SAMPLER FAULT	FAULT : NORM	17800	854820	DI	500-P009	800-I869	500-IL534	R2 : S7 : P0	
HXA	854552	T2 DEFOAM FEED PUMP AUTO	AUTO : N/A	17800	854820	DI	500-P012	800-I872	500-EL552	R2 : S13 : P9	
NXJ	854552	T2 DEFOAM FEED PUMP RUNNINIG	RUNNING : OFF	17800	854820	DI	500-P012	800-I872	500-EL552	R2 : S13 : P10	
HXA	854612	SOLIDS RETURN PMP 2 AUTO	AUTO : N/A	17800	854820	DI	600-P003	800-I873	600-EL612	R2 : S16 : P8	
HXP	854612	SOLIDS RETURN PMP 2 STOP	STOP : N/A	17800	854820	DI	600-P003	800-I869	600-EL612	R2 : S8 : P13	
HXS	854612	SOLIDS RETURN PMP 2 START	START : N/A	17800	854820	DI	600-P003	800-I869	600-EL612	R2 : S8 : P14	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NXG	854612	SOLIDS RETURN PMP 2 READY	READY : NOT READY	17800	854820	DI	600-P003	800-I873	600-EL612	R2 : S16 : P10	
NXJ	854612	SOLIDS RETURN PMP 2 RUNNING	RUNNING : OFF	17800	854820	DI	600-P003	800-I873	600-EL612	R2 : S16 : P9	
HXA	854622	SOLIDS TANK FLUSH VLV 2 AUTO	AUTO : N/A	17800	854820	DI	600-P005	800-I870	600-EL622	R2 : S9 : P2	
HXR	854622	SOLIDS TANK FLUSH VLV 2 REMOTE	REMOTE : N/A	17800	854820	DI	600-P005	800-I873	600-EL622	R2 : S15 : P1	
NXD	854622	SOLIDS TANK FLUSH VLV 2 FAULT	FAULT : NORM	17800	854820	DI	600-P005	800-I873	600-EL622	R2 : S15 : P0	
ZXC	854622	SOLIDS TANK FLUSH VLV 2 CLOSED	CLOSED : N/A	17800	854820	DI	600-P005	800-I873	600-EL622	R2 : S15 : P3	
ZXO	854622	SOLIDS TANK FLUSH VLV 2 OPENED	OPENED : N/A	17800	854820	DI	600-P005	800-I873	600-EL622	R2 : S15 : P2	
HXA	854624	SOLIDS TANK FLUSH VLV 4 AUTO	AUTO : N/A	17800	854820	DI	600-P005	800-I870	600-EL624	R2 : S10 : P1	
HXR	854624	SOLIDS TANK FLUSH VLV 4 REMOTE	REMOTE : N/A	17800	854820	DI	600-P005	800-I873	600-EL624	R2 : S16 : P11	
NXD	854624	SOLIDS TANK FLUSH VLV 4 FAULT	FAULT : NORM	17800	854820	DI	600-P005	800-I873	600-EL624	R2 : S16 : P14	
ZXC	854624	SOLIDS TANK FLUSH VLV 4 CLOSED	CLOSED : N/A	17800	854820	DI	600-P005	800-I873	600-EL624	R2 : S16 : P13	
ZXO	854624	SOLIDS TANK FLUSH VLV 4 OPENED	OPENED : N/A	17800	854820	DI	600-P005	800-I873	600-EL624	R2 : S16 : P12	
FXL	854725	OCU 2 EXHAUST FAN AIR FLOW LOW	FLOW LOW : NORM	17800	854820	DI	700-P002	800-I871	700-EL725	R2 : S11 : P0	
HXA	854725	OCU 2 EXHAUST FAN AUTO	AUTO : N/A	17800	854820	DI	700-P002	800-I870	700-EL725	R2 : S9 : P15	
HXG	854725	OCU 2 EXHAUST FAN READY	READY : NOT READY	17800	854820	DI	700-P002	800-I870	700-EL725	R2 : S9 : P14	
NXD	854725	OCU 2 EXHAUST FAN FAULT	FAULT : NORM	17800	854820	DI	700-P004	800-I870	700-EL725	R2 : S9 : P12	
NXJ	854725	OCU 2 EXHAUST FAN RUNNING	RUNNING:OFF	17800	854820	DI	700-P002	800-I870	700-EL725	R2 : S9 : P13	
FXL	854727	OCU 2 FAN ENCL SAMPLE FLOW LOW	FLOW LOW : NORM	17800	854820	DI	700-P006	800-I873	700-IL727	R2 : S15 : P4	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NXD	854832	BALL SED SWBD 2 SURGE PROT FAIL	FAIL:NORM	17800	854820	DI	800-P001	800-I871	---	R2 : S12 : P14	
NXD	854842	BALL SED MCC 2 SURGE PROT FAIL	FAIL:NORM	17800	854820	DI	800-P001	800-I871	---	R2 : S12 : P15	
NXD	854844	UV MCC 2 SURGE PROTECTOR FAIL	FAIL:NORM	17800	854820	DI	800-P002	800-I873	---	R2 : S16 : P6	
YXD	854894	PROCESS ELECT BUILDING FIRE	FIRE : NORM	17800	854820	DI	800-P002	800-I873	---	R2 : S16 : P3	
ZXC	854308B	EFF RECYCLE TO REGULATOR VLV CLS	CLOSED : N/A	17800	854820	DI	300-P008	800-I871	300-EL308B	R2 : S12 : P4	
ZXO	854308B	EFF RECYCLE TO REGULATOR VLV OPN	OPENED : N/A	17800	854820	DI	300-P008	800-I871	300-EL308B	R2 : S12 : P3	
HXS	854320B	TREATMENT TRAIN 2 LEAD SELECT	TRAIN 2:NORM	17800	854820	DI	300-P008	800-I871	---	R2 : S11 : P9	
HXS	854321A	T2 - INF PUMP 1 LEAD SEL	LEAD : N/A	17800	854820	DI	300-P010	800-I873	---	R2 : S16 : P0	
NXD	854321A	T2 - INFLUENT PUMP 1 VFD FAULT	FAULT : NORM	17800	854820	DI	300-P014	800-I870	300-EL321	R2 : S9 : P10	
HXS	854321B	T2 - INF PUMP 1 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854820	DI	300-P010	800-I873	---	R2 : S16 : P1	
HXS	854321C	T2 - INF PUMP 1 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854820	DI	300-P010	800-I873	---	R2 : S16 : P2	
HXS	854322A	T2 - INF PUMP 2 LEAD SEL	LEAD : N/A	17800	854820	DI	300-P010	800-I873	---	R2 : S15 : P13	
NXD	854322A	T2 - INFLUENT PUMP 2 VFD FAULT	FAULT : NORM	17800	854820	DI	300-P015	800-I872	300-EL322	R2 : S13 : P15	
HXS	854322B	T2 - INF PUMP 2 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854820	DI	300-P010	800-I873	---	R2 : S15 : P14	
HXS	854322C	T2 - INF PUMP 2 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854820	DI	300-P010	800-I873	---	R2 : S15 : P15	
HXS	854323A	T2 - INF PUMP 3 LEAD SEL	LEAD : N/A	17800	854820	DI	300-P010	800-I872	---	R2 : S14 : P13	
NXD	854323A	T2 - INFLUENT PUMP 3 VFD FAULT	FAULT : NORM	17800	854820	DI	300-P016	800-I870	300-EL323	R2 : S10 : P5	
HXS	854323B	T2 - INF PUMP 3 FOLLOW 1 SEL	FOLLOW 1 : N/A	17800	854820	DI	300-P010	800-I872	---	R2 : S14 : P14	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
HXS	854323C	T2 - INF PUMP 3 FOLLOW 2 SEL	FOLLOW 2 : N/A	17800	854820	DI	300-P010	800-I872	---	R2 : S14 : P15	
AXH	854333A	INF SAMP ROON LEL HIGH	LEL HIGH : NORM	17800	854820	DI	300-P018	800-I-870	300-IL370	R2 : S10 : P13	
AXL	854333B	INF SAMP ROOM O2 CONCENTRATION LOW	O2 LOW : NORM	17800	854820	DI	300-P018	800-I-870	300-IL370	R2 : S10 : P14	
AXH	854333C	INF SAMP ROOM H2S CONCENTRATION HIGH	H2S HIGH : NORM	17800	854820	DI	300-P018	800-I-870	300-IL370	R2 : S10 : P15	
ZXD	854336A	SCREENINGS BUILDING INTRUSION	NORM : INTRUSION	17800	854820	DI	800-P001	800-I871	---	R2 : S12 : P9	
NXD	854342A	INFLUENT SCREEN 2 FAULT	FAULT : NORM	17800	854820	DI	300-P003	800-I869	300-EL342A	R2 : S8 : P4	
NXJ	854342A	INFLUENT SCREEN 2 RUNNING FOR	FORWARD : N/A	17800	854820	DI	300-P003	800-I869	300-EL342A	R2 : S8 : P1	
NXJ	854342B	INFLUENT SCREEN 2 RUNNING REV	REVERSE : N/A	17800	854820	DI	300-P003	800-I869	300-EL342A	R2 : S8 : P2	
NXD	854344A	SCREENINGS COMPACTOR 2 FAULT	FAULT	17800	854820	DI	300-P004	800-I869	300-EL344A	R2 : S8 : P15	
NXJ	854344A	SCREENINGS COMPACTOR 2 RUNNING FORWARD	FORWARD : N/A	17800	854820	DI	300-P004	800-I869	300-EL344A	R2 : S8 : P6	
NXJ	854344B	SCREENINGS COMPACTOR 2 RUNNING REVERSE	REVERSE : N/A	17800	854820	DI	300-P004	800-I869	300-EL344A	R2 : S8 : P7	
YXD	854394A	SCREENING BLDG FIRE ALARM	FIRE : NORM	17800	854820	DI	800-P002	800-I873	---	R2 : S16 : P4	
ZXD	854406A	PROCESS DECK STAIR INTRUSION	NORM : INTRUSION	17800	854820	DI	800-P001	800-I871	---	R2 : S12 : P10	
NXD	854420A	T2 - BALLASTED SED SYS FAULT	FAULT : NORM	17800	854820	DI	400-P001	800-I871	VENDOR	R2 : S11 : P13	
NXD	854420C	T2 - BALLASTED SED SYS WARNING	WARNING : NORM	17800	854820	DI	400-P001	800-I871	VENDOR	R2 : S11 : P14	
LXH	854450A	CAUSTIC STORAGE TANK LEVEL HIGH	LEVEL HIGH : NORM	17800	854820	DI	400-P005	800-I871	400-IL450	R2 : S11 : P10	
LXH	854450B	CAUSTIC STORAGE CONTAINMENT LEVEL HIGH	LEVEL HIGH : NORM	17800	854820	DI	400-P005	800-I871	400-IL450	R2 : S11 : P11	
NXD	854453A	T2 - CAUSTIC FEED PUMP 3 FAULT	FAULT : NORM	17800	854820	DI	400-P007	800-I871	400-EL453	R2 : S12 : P2	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NXD	854454A	T2 - CAUSTIC FEED PUMP 4 FAULT	FAULT : NORM	17800	854820	DI	400-P007	800-I872	400-EL454	R2 : S14 : P12	
NXD	854521A	T2 - UV SYSTEM FAULT	FAULT : NORM	17800	854820	DI	500-P003	800-I871	VENDOR	R2 : S12 : P11	
NXD	854521C	T2 - UV SYSTEM WARNING	WARNING : NORM	17800	854820	DI	500-P003	800-I871	VENDOR	R2 : S12 : P7	
NXD	854528A	T2 - EFFLUENT GATE FAULT	FAULT : NORM	17800	854820	DI	500-P009	800-I872	500-EL528	R2 : S14 : P4	
NXD	854528C	T2 - EFFLUENT GATE ACT WARN	WARNING : NORM	17800	854820	DI	500-P009	800-I872	500-EL528	R2 : S14 : P0	
NXD	854532A	C3 PUMP 2 VFD FAULT	FAULT : NORM	17800	854820	DI	500-P007	800-I872	500-EL532	R2 : S13 : P7	
NXD	854534A	EFFLUENT SAMPLER 1 FAULT	FAULT : NORM	17800	854820	DI	500-P009	800-I870	500-IL534	R2 : S9 : P5	
NXD	854534C	EFFLUENT SAMPLER 2 FAULT	FAULT : NORM	17800	854820	DI	500-P009	800-I870	500-IL534	R2 : S9 : P6	
NXD	854552A	T2 DEFOAM FEED PUMP FAULT	FAULT : NORM	17800	854820	DI	500-P012	800-I872	500-EL552	R2 : S13 : P11	
PXL	854556A	SERVICE AIR SYSTEM PRESSURE LOW	PRESS LOW : NORM	17800	854820	DI	500-P014	800-I872	---	R2 : S14 : P6	
TXH	854725A	OCU 2 EXHAUST FAN MTR WINDING TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	700-P004	800-I872	700-EL725	R2 : S14 : P1	
TXH	854725B	OCU 2 FAN ENCLOSURE TEMP HIGH	TEMP HIGH : NORM	17800	854820	DI	700-P002	800-I873	700-EL725	R2 : S15 : P11	
AXH	854727A	OCU 2 FAN ENCLOSURE LEL HIGH	LEL HIGH : NORM	17800	854820	DI	700-P006	800-I873	700-IL727	R2 : S15 : P5	
AXH	854727C	OCU 2 FAN ENCLOSURE H2S CONCENTRATION HIGH	H2S HIGH : NORM	17800	854820	DI	700-P006	800-I873	700-IL727	R2 : S15 : P7	
NXD	854810A	PLC854810 FAILURE	FAIL:NORM	17800	854820	DI	800-P003	800-I870	---	R2 : S9 : P0	
NXD	854820C	MCP SECT 3 DC PS NOT TROUBLE	NORM : TROUBLE	17800	854820	DI	300-P010	800-I873	---	R2 : S16 : P7	
ZXS	854893A	PROCESS ELECT BLDG INTRUSION	NORM : INTRUSION	17800	854820	DI	800-P002	800-I873	---	R2 : S16 : P15	
JX	854302	EQ BASIN DRAIN PUMP 2 INST POWER	---	17800	854820	ENET	300-P017	800-I851	---	---	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
JX	854321	T2 - INFLUENT PUMP 1 INST POWER	---	17800	854820	ENET	300-P014	800-I851	---	---	
JX	854322	T2 - INFLUENT PUMP 2 INST POWER	---	17800	854820	ENET	300-P015	800-I851	---	---	
JX	854323	T2 - INFLUENT PUMP 3 INST POWER	---	17800	854820	ENET	300-P016	800-I851	---	---	
JX	854332	INFLUENT SAMPLE PMP 2 INST POWER	---	17800	854820	ENET	300-P005	800-I851	---	---	
JX	854342	INFLUENT SCREEN 2 INST POWER	---	17800	854820	ENET	300-P003	800-I851	---	---	
JX	854344	SCREEN COMPACTOR 2 INST POWER	---	17800	854820	ENET	300-P004	800-I851	---	---	
JX	854352	C2 PUMP 2 INST POWER	---	17800	854820	ENET	300-P007	800-I851	---	---	
JX	854354	C2 PUMP 4 INST POWER	---	17800	854820	ENET	300-P007	800-I851	---	---	
JX	854375	C2 ROOM SUPPLY FAN INST POWER	---	17800	854820	ENET	300-P025	800-I851	---	---	
JX	854532	C3 PUMP 2 INST POWER	---	17800	854820	ENET	500-P007	800-I851	---	---	
JX	854562	INST AIR CPRSR 2 INST POWER	---	17800	854820	ENET	500-P013	800-I851	---	---	
JX	854567	SERV AIR CPRSR 2 INST POWER	---	17800	854820	ENET	500-P014	800-I851	---	---	
JX	854612	SOLIDS RETURN PMP 2 INST POWER	---	17800	854820	ENET	600-P003	800-I851	---	---	
JX	854725	OCU 2 EXHAUST FAN INST POWER	---	17800	854820	ENET	700-P004	800-I851	---	---	
QX	854832	BALLASTED SED SWBD 2 PWR METER	---	17800	854820	ENET	800-P001	800-I851	---	---	
QX	854842	BALLASTED SED MCC 2 PWR MONITOR	---	17800	854820	ENET	800-P001	800-I851	---	---	
QX	854844	UV MCC 2 POWER MONITOR	---	17800	854820	ENET	800-P002	800-I851	---	---	
LX	854904	GENERATOR FUEL TANK LEVEL	---	17800	854981	AI	900-P004	900-I908	900-IL904	R1 : S5 : P0	
ZXS	854900	GENERATOR BUILDING INTRUSION	CLOSED:OPEN	17800	854981	DI	900-P103	900-I909	900-I915	R1 : S13 : P11	
LXL	854904	GENERATOR FUEL TANK LOW LEVEL	LOW LEVEL:NORM	17800	854981	DI	900-P004	900-I909	900-I915	R1 : S12 : P6	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NXD	854904	GENERATOR FUEL TANK TROUBLE	TROUBLE:NORM	17800	854981	DI	900-P004	900-I909	900-I915	R1 : S12 : P8	
YX	854912	RAIN GAUGE COUNT	COUNT:NORM	17800	854981	DI	900-P102	900-I910	---	R1 : S14 : P6	
ZX	854931	MAIN BREAKER A POSITION	CLOSED:OPEN	17800	854981	DI	900-P101	900-I909	---	R1 : S12 : P13	
ZX	854932	MAIN BREAKER B POSITION	CLOSED:OPEN	17800	854981	DI	900-P101	900-I909	---	R1 : S13 : P1	
ZX	854933	TIE BREAKER POSITION	CLOSED:OPEN	17800	854981	DI	900-P101	900-I909	---	R1 : S12 : P12	
NXD	854934	STANDBY SWBD SURGE PROTECT FAIL	FAIL:NORM	17800	854981	DI	900-P102	900-I909	900-I915	R1 : S13 : P5	
NXD	854941	GEN MCC SURGE PROTECTOR FAIL	FAIL:NORM	17800	854981	DI	900-P103	900-I909	900-I915	R1 : S13 : P10	
NXD	854942	OPERAT MCC SURGE PROTECT FAIL	FAIL:NORM	17800	854981	DI	900-P102	900-I909	900-I915	R1 : S13 : P6	
EXL	854981	ELECT BLDG PLC PNL 24VDC FAULT	FAULT:NORM	17800	854981	DI	900-P103	900-I910	900-I904	R1 : S14 : P5	
NXD	854901A	GENERATOR FAIL	FAIL:NORM	17800	854981	DI	900-P003	900-I909	900-I915	R1 : S12 : P4	
NXG	854901A	GENERATOR READY	READY:NOT READY	17800	854981	DI	900-P003	900-I909	900-I915	R1 : S12 : P3	
NXJ	854901A	GENERATOR RUNNING	RUNNING:OFF	17800	854981	DI	900-P003	900-I909	900-I915	R1 : S12 : P2	
NXD	854901C	GENERATOR TROUBLE	TROUBLE:NORM	17800	854981	DI	900-P003	900-I909	900-I915	R1 : S12 : P5	
HXA	854930A	AUTO THROEOVER SYS NOT IN AUTO	NOT AUTO:NORM	17800	854981	DI	900-P101	900-I909	900-I915	R1 : S12 : P11	
NXD	854931A	UTILITY POWER SUPPLY A FAIL	FAIL:NORM	17800	854981	DI	900-P101	900-I909	900-I915	R1 : S12 : P10	
NXD	854931C	SWITCHGEAR 1 SURGE PROTECT FAIL	FAIL:NORM	17800	854981	DI	900-P101	900-I909	900-I915	R1 : S13 : P2	
NXD	854932A	UTILITY POWER SUPPLY B FAIL	FAIL:NORM	17800	854981	DI	900-P101	900-I909	900-I915	R1 : S13 : P0	
NXD	854932C	SWITCHGEAR 2 SURGE PROTECT FAIL	FAIL:NORM	17800	854981	DI	900-P101	900-I909	900-I915	R1 : S13 : P3	

Tag	No.	Description	Set:Reset	Specification	PLC	Card Type	P&ID Dwg	PLC Dwg	Inst/Elec Dwg	Rack: Slot: Point	Application Notes
NXD	854934A	ATS FAIL	FAIL:NORM	17800	854981	DI	900-P102	900-I910	900-I915	R1 : S14 : P1	
ZXS	854934A	ATS IN UTILITY POSITION	NORM:N/A	17800	854981	DI	900-P102	900-I910	900-I915	R1 : S14 : P3	
NXD	854934C	ATS NOT IN AUTO	NOT AUTO: NORM	17800	854981	DI	900-P102	900-I910	900-I915	R1 : S14 : P2	
ZXS	854934C	ATS IN STANDBY POSITION	STANDBY:N/A	17800	854981	DI	900-P102	900-I910	900-I915	R1 : S14 : P4	
NXD	854951A	OPERATIONS UPS TROUBLE	TROUBLE:NORM	17800	854981	DI	900-P102	900-I909	900-I915	R1 : S13 : P4	
NXD	854974A	OPERATIONS BLDG HVAC TROUBLE	TROUBLE:NORM	17800	854981	DI	900-P007	900-I909	900-I915	R1 : S13 : P13	
NXD	854974B	OPERATIONS BLDG HVAC FAIL	FAIL:NORM	17800	854981	DI	900-P007	900-I909	900-I915	R1 : S13 : P14	
ZXS	854993A	OPERATIONS BUILDING INTRUSION	CLOSED:OPEN	17800	854981	DI	900-P102	900-I909	900-I915	R1 : S13 : P8	
YXD	854994A	OPERATIONS FIRE ALARM	FIRE:NORM	17800	854981	DI	900-P102	900-I909	900-I915	R1 : S13 : P9	
YXD	854994B	GENERATOR FIRE ALARM	FIRE:NORM	17800	854981	DI	900-P103	900-I909	900-I915	R1 : S13 : P12	
QX	854901	GENERATOR POWER MONITOR	---	17800	854981	ENET	900-P003	900-I905	---	---	
QX	854931	SWITCHGEAR 1 POWER MONITOR	---	17800	854981	ENET	900-P101	900-I905	---	---	
QX	854932	SWITCHGEAR 1 POWER MONITOR	---	17800	854981	ENET	900-P101	900-I905	---	---	
QX	854934	STANDBY SWBD POWER MONITOR	---	17800	854981	ENET	900-P102	900-I905	---	---	
QX	854941	GENERATOR MCC POWER MONITOR	---	17800	854981	ENET	900-P103	900-I905	---	---	
QX	854942	OPERATIONS MCC POWER MONITOR	---	17800	854981	ENET	900-P102	900-I905	---	---	
JX	854973	MTG ROOM RELIEF FAN INST POWER	---	17800	854981	ENET	900-P007	900-I905	---	---	

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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