

SECTION 406000 - ATTACHMENT A- CONTROL NARRATIVE

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PART 1 - INTRODUCTION

1.01 SUMMARY

- A. This document defines the controls sequences for the Pump House SCADA system. The facility PCS is comprised of a PLC-based control panel located in the Pump House Pump Room.

1.02 ACRONYMS, ABBREVIATIONS, AND DEFINITIONS

- A. HMI: Human Machine Interface.
- B. Operator HMI: Touch panel screen located on the enclosure door of PLC-01.
- C. PCS: Process Control System.
- D. SCADA: Supervisory Controls and Data Acquisition.
- E. UPS: Uninterruptible Power Supply.

PART 2 - GENERAL

2.01 OPERATOR INTERFACE

- A. Operator interface with the Pump House SCADA system shall be through a touch panel HMI screen located on the enclosure door of PLC-01 (located in the pump room). This touch panel HMI will be called the Operator HMI.
- B. The Operator HMI will provide an overall view of the Pump House process and will allow an Operator to control all equipment connected to the SCADA system.
- C. The Operator HMI shall display equipment status and process variables for the Pump House booster pumps, recirculation pump, water storage tank, water distribution piping, standby generator, automatic transfer switch (ATS), and other Pump House systems as described in the control sequences section.
- D. The Operator will have the ability to control all functions and equipment from the Operator HMI.
- E. The Operator will have the ability to view, silence, and acknowledge all alarms from the Operator HMI.

2.02 REMOTE ACCESS

- A. Remote access to the Pump House SCADA system shall be via an Ethernet connection at SCADA panel PLC-01. A secure backhaul link will be established between the Pump House and the Utility's head end.
- B. Remote users will have the ability to view all process data and equipment status at the Pump House.

- C. Remote users with the correct access controls will have the ability to control all equipment at the Pump House.
- D. Remote access shall be implemented using industry-standard operations technology (OT) and information technology (IT) cybersecurity practices.

2.03 USER ACCESS CONTROL

- A. Access to restricted functionality shall be through password-protected user access control. The SCADA system shall have two types of user access accounts.
- B. Operator level accounts shall have the following permissions:
 - 1. View all HMI screens locally at the Pump House and remotely from the Utility's head end control room.
 - 2. Execute commands locally at the Pump House HMI.
 - 3. Acknowledge and silence alarms locally at the Pump House HMI.
- C. Supervisor level accounts shall have the following permissions:
 - 1. All permissions listed under Operator level accounts.
 - 2. Execute commands remotely from the Utility's head end control room.

2.04 ALARM HANDLING

- A. The Pump House SCADA system monitors the process for alarm conditions. Alarms will notify Operators of equipment malfunction, process deviation, or abnormal conditions requiring prompt Operator response to prevent an impending loss of containment, equipment damage, or hazardous situation.
- B. There are four states associated with an alarm. These states are:
 - 1. Normal (NORM): The normal alarm state is defined as the state in which the process is operating within normal specifications, the alarm is not active, and the previous alarm occurrences have been acknowledged.
 - 2. Unacknowledged (UNACK): This is the initial state of an alarm becoming active due to abnormal conditions. In this state, the alarm is unacknowledged.
 - 3. Acknowledged (ACKED): This is the state in which the alarm is active (abnormal process condition) and the Operator has acknowledged the alarm.
 - 4. Return to Normal Unacknowledged (RTNUN): This is the state in which the process is within normal limits and the alarm becomes not active before an Operator has acknowledged the alarm.
- C. Unacknowledged Alarm State (UNACK)
 - 1. Upon detecting an alarm condition, the system will transition the alarm from the "Normal" state to the "Unacknowledged Alarm" (UNACK) state. An alarm notification will flash on the HMI. The alarm is then added to the Alarm List screen. The alarm status shall be displayed as UNACK and the alarm event will be logged to the data historian. Alarms can trigger additional actions.
 - 2. If the Operator acknowledges the alarm, the alarm transitions to the "Acknowledged" (ACKED) state
 - 3. If the alarm condition returns to normal before the Operator acknowledges it, the alarm transitions to the "Return to Normal Unacknowledged" (RTNUN) state.
- D. Acknowledge Alarm State (ACKED)

1. Upon transitioning to the “Acknowledged Alarm” state, the system will change the status of the alarm to ACKED on the Alarm List. The alarm acknowledge event will be logged to the data historian. Acknowledging an alarm will also silence any audible alarm notification devices.
 2. The ACKED alarm will remain on the Alarm List until the process condition returns to normal.
 3. If the alarm condition returns to normal, the alarm transitions to the “Normal” (NORM) state. The alarm is removed from the Alarm List screen. This event will be logged to the data historian.
- E. Return to Normal Unacknowledged Alarm State (RTNUN)
1. If the alarm condition returns to normal before an Operator acknowledges the alarm, the system transitions the alarm to the “Return to Normal Unacknowledged Alarm” (RTNUN) state. The alarm status will be displayed as RTNUN on the Alarm List. This event will be logged to the data historian. The alarm will remain on the Alarm List until the Operator acknowledges the alarm or the process condition transitions to abnormal status.
 2. If the operator acknowledges the alarm, the alarm transitions to the “Normal” state. The system will remove the alarm from the Alarm List screen and will log this event in the data historian.
 3. If the abnormal condition occurs again, the system will transition the alarm to the “Unacknowledged Alarm” (UNACK) state as described above.

2.05 DATA HISTORIAN

- A. A data historian shall log data points for all tags in the tag database. The historian shall retain data for the previous one year. Once one year’s worth of data points has been collected, the oldest data points will be overwritten to make space for the most current data points.

PART 3 - PLANT CONTROL SEQUENCES

3.01 RE-CIRCULATION PUMP (RC-01)

- A. The SCADA system modulates the speed of Re-Circulation pump RC-01 to maintain a pressure of 65 PSIG in the distribution line as measured by pressure transmitter PIT-004.
- B. The SCADA system will issue start/stop commands and send a speed modulating signal to the Re-Circulation Pump RC-01 VFD.
- C. The SCADA system will monitor the Re-Circulation Pump RC-01 run status signal, alarm signal, and speed feedback signal. This information shall be displayed on the Operator HMI.
- D. If pressure drops below 63 PSIG in the distribution (as measured by PIT-004), the SCADA system will start the Lead Booster Pump and ramp down Re-Circulation Pump RC-01 as described in paragraph PRESSURE BOOSTER PUMPS (BP-01 AND BP-02). Distribution line pressure control will switch over to the control sequence described in paragraph PRESSURE BOOSTER PUMPS (BP-01 AND BP-02).
- E. The SCADA system will stop pump RC-01 upon detecting LOW LOW PRESSURE from pump suction header pressure transmitter PIT-003. Refer to paragraph PRESSURE BOOSTER PUMPS BP-01 and BP-02 for details on this low low pressure alarm function.

- F. The SCADA system will stop pump RC-01 upon detecting HIGH HIGH PRESSURE or LOW LOW PRESSURE from water distribution pressure transmitter PIT-004. Refer to paragraph PRESSURE BOOSTER PUMPS BP-01 and BP-02 for details on pressure alarm functions.
- G. The SCADA system will monitor the pump RC-01 motor starter fault alarm status contacts and will generate an alarm if it detects a FAULT ALARM (XS-013B). Upon detecting a fault, the SCADA system will display an alarm on the Operator HMI and issue a stop command to pump RC-01.
- H. The SCADA system shall monitor pump elapsed runtime and display this information on the Operator HMI.
- I. The following SCADA system I/O points are used in these control sequences:
 - 1. Booster Pump Suction Header Pressure (PIT-003)
 - 2. Booster Pump Discharge Water Pressure (PIT-004)
 - 3. Re-Circulation pump RC-01 Pump Start/Stop Command (XY-013)
 - 4. Re-Circulation pump RC-01 Speed Command (SY-013)
 - 5. Re-Circulation pump RC-01 Speed Feedback (ST-013)
 - 6. Re-Circulation pump RC-01 Pump Run Status (XS-013A)
 - 7. Re-Circulation pump RC-01 Fault Alarm (XS-013B)
- J. The SCADA system will display the following information on the Operator HMI:
 - 1. Re-Circulation pump RC-01 Run Status (running/stopped)
 - 2. Re-Circulation pump RC-01 Speed Feedback (Hz)
 - 3. Re-Circulation pump RC-01 Elapsed Run Time (hours:minutes:seconds)
 - 4. Re-Circulation pump RC-01 Fault Alarm status

3.02 PRESSURE BOOSTER PUMPS (BP-01 AND BP-02)

- A. The SCADA system will activate the Booster Pumps BP-01 and BP-02 if the distribution line pressure as measured by PIT-004 drops below 63 PSIG. The pumps will operate in a lead/lag configuration.
 - 1. The SCADA system will start the lead booster pump and modulate the pump speed to maintain the water distribution line pressure at 63 PSIG. The SCADA system will ramp down and stop Re-Circulation Pump RC-01.
 - 2. If the pressure (as measured by PIT-004) drops below 63 PSIG for more than 30 seconds, the SCADA system will start the lag booster pump. The SCADA system will modulate the speed on both pumps to maintain pressure at 63 PSIG.
 - 3. If the pressure (as measured by PIT-004) drops to 61 PSIG, the SCADA system will switch to High Flow Mode. Refer to paragraph HIGH FLOW PUMP (BP-03) for details on the high flow pump control sequences.
 - 4. Once the lag booster pump speed drops below 51.5 Hz, the SCADA system will ramp down and stop the lag booster pump. The SCADA system will continue to modulate the lead booster pump speed to maintain distribution line pressure of 63 PSIG.
 - 5. Once lead booster pump speed drops below 52 Hz, the SCADA system will ramp down and stop the lead booster pump and start Re-Circulation Pump RC-01. The re-circulation pump will run to maintain distribution line pressure at 65 PSIG. The SCADA system will switch over to the control sequence described in paragraph RE-CIRCULATION PUMP (RC-01).

- B. The SCADA system will alternate the lead and lag pumps to equalize pump run time. The SCADA system will switch the lead pump between BP-01 and BP-02 at the start of every week. The lead and lag pumps can also be manually switched by an Operator from the Operator HMI. Each pump's lead/lag status shall be displayed on the HMI.
- C. The SCADA system will issue start/stop commands and send speed modulating signals to the Booster Pump BP-01 and BP-02 VFDs.
- D. The SCADA system will monitor the Booster Pump BP-01 and BP-02 run status signals, alarm signals, and speed feedback signals. This information shall be displayed on the Operator HMI.
- E. The SCADA system will monitor the water distribution pressure via PIT-004.
 - 1. The water distribution pressure reading will be displayed on the Operator HMI.
 - 2. Upon detecting HIGH-HIGH PRESSURE (72 PSIG), the SCADA system will generate a WATER DISTRIBUTION HIGH-HIGH PRESSURE ALARM (PAHH-004) on the Operator HMI and stop Booster Pumps BP-01 and BP-02, Re-Circulation Pump RC-01, and High Flow Pump BP-03.
 - 3. Upon detecting LOW-LOW PRESSURE (50 PSIG; Operator adjustable), the SCADA system will display a WATER DISTRIBUTION LOW-LOW PRESSURE ALARM (PALL-004) on the Operator HMI and stop Booster Pumps BP-01 and BP-02, Re-Circulation Pump RC-01, and High Flow Pump BP-03.
 - 4. The SCADA system shall display HIGH PRESSURE (68 PSIG; Operator adjustable) and LOW PRESSURE (55 PSIG; Operator adjustable) alarms on the Operator HMI. These alarms are for notification only and do not perform any control actions.
- F. The SCADA system will monitor the booster pump suction pressure via PIT-003.
 - 1. The booster pump suction header pressure reading will be displayed on the Operator HMI.
 - 2. Upon detecting LOW-LOW PRESSURE (1.5 PSIG; Operator adjustable) on pump suction header pressure transmitter PIT-003, the SCADA system will stop pumps BP-01 and BP-02 and generate a PUMP SUCTION HEADER LOW-LOW PRESSURE ALARM (PAL-003) on the Operator HMI. This low-low pressure alarm will also stop Re-Circulation Pump RC-01 and High Flow Pump BP-03 (refer to paragraphs control sequences in CIRCULATION PUMP RC-01 and HIGH FLOW PUMP BP-03).
 - 3. The SCADA system will display a LOW PRESSURE (2.0 PSIG; Operator adjustable) alarm on the Operator HMI. This alarm is for notification only and does not perform any control actions.
- G. The SCADA system will monitor the alarm status contacts on the BP-01 and BP-02 VFDs and will generate an alarm if it detects a FAULT ALARM (XS-010B or XS-011B). Upon detecting a fault, the SCADA system will display an alarm on the Operator HMI and issue a stop command to the faulted pump.
- H. The SCADA system will monitor the elapsed runtime on each pump and display this information on the Operator HMI.
- I. The following SCADA system I/O points are used in these control sequences:
 - 1. Booster Pump Discharge Water Pressure (PIT-004)
 - 2. Booster Pump Suction Header Pressure (PIT-003)
 - 3. Booster Pump BP-01 Start/Stop Command (XY-010)
 - 4. Booster Pump BP-01 Speed Command (SY-010)

5. Booster Pump BP-01 Speed Feedback (ST-010)
 6. Booster Pump BP-01 Run Status (XS-010A)
 7. Booster Pump BP-01 Fault Alarm (XS-010B)
 8. Booster Pump BP-02 Start/Stop Command (XY-011)
 9. Booster Pump BP-02 Speed Command (SY-011)
 10. Booster Pump BP-02 Speed Feedback (ST-011)
 11. Booster Pump BP-02 Run Status (XS-011A)
 12. Booster Pump BP-02 Fault Alarm (XS-011B)
- J. The SCADA system will display the following information on the Operator HMI:
1. Booster Pump Suction Header Pressure reading from PIT-003 (psig)
 2. Booster Pump Suction Header LOW-LOW and LOW pressure alarms from PIT-003 (alarm)
 3. Water Distribution Header Pressure reading from PIT-004 (psig)
 4. Water Distribution Header LOW-LOW, LOW, HIGH, AND HIGH-HIGH pressure alarms from PIT-004 (alarm)
 5. Booster Pump BP-01 Run Status (running/stopped)
 6. Booster Pump BP-01 Speed Feedback (Hz)
 7. Booster Pump BP-01 Elapsed Run Time (hours:minutes:seconds)
 8. Booster Pump BP-01 Fault Alarm status (alarm)
 9. Booster Pump BP-01 Lead/Lag Status (lead/lag)
 10. Booster Pump BP-02 Run Status (running/stopped)
 11. Booster Pump BP-02 Speed Feedback (Hz)
 12. Booster Pump BP-02 Elapsed Run Time (hours:minutes:seconds)
 13. Booster Pump BP-02 Fault Alarm status (alarm)
 14. Booster Pump BP-02 Lead/Lag Status (lead/lag)

3.03 HIGH FLOW PUMP BP-03

- A. The SCADA system will activate high flow pump BP-03 if the lead and lag pumps are unable to maintain pressure in the line. This will happen when a high flow demand condition occurs. Once the water distribution line pressure as measured by PIT-004 drops to 61 PSIG (Operator adjustable), the SCADA system will start high flow pump BP-03. The SCADA system will set the speed of booster pumps BP-01 and BP-02 to 60 Hz and will control the speed of high flow pump BP-03 to maintain a pressure of 61 PSIG in the line.
- B. The SCADA system will ramp down and stop high flow pump BP-03 once the water distribution line pressure (as measured by PIT-004) rises above 63 PSIG (Operator adjustable; this setpoint cannot be set to less than 2 PSIG above the BP-03 start pressure). The SCADA system shall transition to maintaining the distribution line pressure via the lead and lag booster pumps (BP-01 and BP-02) as described in paragraph BOOSTER PUMPS (BP-01 and BP-02 and BP-03).
- C. The SCADA system will issue start/stop commands and send speed modulating signals to the High Flow Pump BP-03 VFD.
- D. The SCADA system will monitor the high flow pump BP-03 run status signal, alarm signal, and speed feedback signal. This information shall be displayed on the Operator HMI.
- E. Upon detecting HIGH HIGH FLOW from Airport Supply Line Flow Meter FIT-006 (650 gpm), the SCADA system will generate an AIRPORT SUPPLY LINE HIGH HIGH FLOW

ALARM (FAHH-006) and will modulate the speed of high flow pump BP-03 so that the flow as measured by FIT-006 does not exceed 650 gpm.

- F. The SCADA system will stop pump BP-03 upon detecting LOW LOW PRESSURE from pump suction header pressure transmitter PIT-003. Refer to paragraph PRESSURE BOOSTER PUMPS BP-01 and BP-02 for details on this low low pressure alarm function.
- G. The SCADA system will stop pump BP-03 upon detecting HIGH HIGH PRESSURE or LOW LOW PRESSURE from water distribution pressure transmitter PIT-004. Refer to paragraph PRESSURE BOOSTER PUMPS BP-01 and BP-02 for details on pressure alarm functions.
- H. The SCADA system will monitor the alarm status contact on the BP-03 VFD and will generate an alarm if it detects a FAULT ALARM (XS-012B). Upon detecting a fault, the SCADA system will display an alarm on the Operator HMI and stop pump BP-03.
- I. The SCADA system will monitor the elapsed runtime on each pump and display this information on the Operator HMI.
- J. The following SCADA system I/O points are used in these control sequences:
 - 1. Booster Pump Discharge Water Pressure (PIT-004)
 - 2. Booster Pump Suction Header Pressure (PIT-003)
 - 3. Airport Water Supply Line Flowmeter (FIT-006)
 - 4. Booster Pump BP-03 Start/Stop Command (XY-012)
 - 5. Booster Pump BP-03 Speed Command (SY-012)
 - 6. Booster Pump BP-03 Speed Feedback (ST-012)
 - 7. Booster Pump BP-03 Run Status (XS-012A)
 - 8. Booster Pump BP-03 Fault Alarm (XS-012B)
- K. The SCADA system will display the following information on the Operator HMI:
 - 1. Booster Pump BP-03 Run Status (running/stopped)
 - 2. Booster Pump BP-03 Speed (Hz)
 - 3. Booster Pump BP-03 Elapsed Run Time (hours:minutes:seconds)
 - 4. Booster Pump BP-03 Fault Alarm status (alarm)
 - 5. Booster Pump BP-03 Lead/Lag Status (lead/lag)

3.04 WATER STORAGE TANK LEVEL CONTROL

- A. The SCADA system monitors the level of the water storage tank via a submersible pressure type level transducer (LT-200). High-high and low-low level float switches (LSHH-201 and LSL-201) provide backup tank high and low level alarm point monitoring. A tank fill valve (LV-002) modulates to fill the water storage tank.
- B. The SCADA system will display the tank level on the Operator HMI.
- C. Water Storage Tank Filling Operation: The SCADA system starts the tank filling operation when the level in the tank (as measured by LT-200) drops below tank fill start setpoint LSL-200 (5 feet; Operator adjustable). This Operator adjustable setpoint cannot be set within 12 inches above the LOW-LOW LEVEL setpoint or within 12 inches below the tank fill stop level LSH-100 setpoint.
 - 1. Upon starting the tank fill operation, the SCADA system will open valve LV-002 and modulate the valve position to maintain 200 GPM (Operator adjustable) flow from flow transmitter FIT-001. The valve actuation speed will be configured with a

- minimum travel speed of 15 seconds from fully closed to full open, and vice versa. The SCADA system will display the water tank status as FILLING on the Operator HMI.
2. Once the tank level rises above the tank fill stop setpoint (23 feet above tank floor, Operator adjustable), the SCADA system will close valve LV-002 and end the tank fill operation. The SCADA system will display the water tank status as IDLE on the Operator HMI. The Operator adjustable setpoint LSHH-200 cannot be adjusted to within 12 inches above tank fill start setpoint LSLL-200 and cannot be adjusted above 23 feet.
 3. If the level in the tank rises above the HIGH-HIGH LEVEL setpoint (23 feet 8 inches; Operator adjustable), the SCADA system will end the tank fill operation by closing valve LV-002. A WATER STORAGE TANK HIGH-HIGH LEVEL SHUTDOWN ALARM will be displayed on the Operator HMI. The high-high level alarm LAHH-200 cannot be adjusted above 23 feet 8 inches, which is the actuation elevation of float switch LSHH-202.
 4. If the level in the tank falls below the LOW-LOW LEVEL setpoint (3 feet 6 inches; Operator adjustable), the SCADA system will end the tank fill operation by closing valve LV-002 and stopping water tank mixer (MXR-01). A WATER STORAGE TANK LOW-LOW LEVEL SHUTDOWN ALARM will be displayed on the Operator HMI. The low-low level alarm LALL-200 setpoint cannot be adjusted below 3 feet 6 inches, which is the actuation elevation of float switch LSLL-201.
 5. The SCADA system will display HIGH LEVEL (23 feet 4 inches PSIG; Operator adjustable) and LOW LEVEL (4 feet; Operator adjustable) alarms on the Operator HMI. These alarms are for notification only and do not perform any control actions.
 6. An Operator can manually initiate the tank fill operation from the Operator HMI as long as the tank level is below the tank fill stop setpoint (LSH-200).
- D. Water storage tank high-high level float switch LSHH-201 is mounted at an elevation of 23 feet 8 inches. It provides backup tank fill shutdown capability in the event of a malfunction in level sensor LT-200. Upon activation of LSHH-201, the SCADA system will close tank fill valve FV-001 and will display a WATER STORAGE TANK HIGH-HIGH LEVEL FLOAT SWITCH ALARM on the Operator HMI.
- E. Water storage tank low-low level float switch LSLL-201 is mounted at an elevation of 3 feet 6 inches. It provides backup tank shutdown capability in the event of a malfunction in level sensor LT-200. Upon activation of LSLL-201, the SCADA system will close tank fill valve LV-002, stop water storage tank mixer MXR-01, and display a WATER STORAGE TANK LOW-LOW LEVEL FLOAT SWITCH ALARM on the Operator HMI.
- F. The SCADA system will compare the tank fill valve feedback position signal ZT-002 to the valve position command signal LV-002. If the deviation between the two position values exceeds 5% for more than 1 minute, the SCADA system will display a LV-002 VALVE POSITION MISMATCH alarm on the HMI. This alarm is for notification only and does not perform any control actions.
- G. The following SCADA system I/O points are used in these control sequences:
1. Water Storage Tank Level (LT-200)
 2. Water Storage Tank High-High Level Switch (LSHH-201)
 3. Water Storage Tank Low-Low Level Switch (LSLL-201)
 4. Water Tank Fill Line Flow (FIT-001)
 5. Water Tank Fill Valve Position Command (LV-002)
 6. Water Tank Fill Valve Position Feedback (ZT-002)

7. Water Storage Tank Mixer Start/Stop Command (XY-203)
- H. The SCADA system will display the following information on the Operator HMI:
 1. Water storage tank level reading from LT-100 (inches, and % full)
 2. Water storage tank LOW-LOW, LOW, HIGH, and HIGH-HIGH level alarms from LT-200 (alarms)
 3. Water storage tank LOW-LOW alarm from LSLL-201 (alarm)
 4. Water storage tank HIGH-HIGH alarm from LSHH-201 (alarm)
 5. Water storage tank mode (fill/idle)
 6. Water storage tank fill operation manual start button (touchscreen command)
 7. Water storage tank fill valve position (% open)
 8. Water storage tank fill valve LV-002 VALVE POSITION MISMATCH alarm (alarm)

3.05 CHLORINE MONITORING AND DOSING

- A. The SCADA system will monitor the chlorine content in the distribution line via chlorine analyzer AIT-007. The chlorine concentration will be displayed on the Operator HMI.
- B. If chlorine levels drop below the low concentration setpoint ASL-007 (0.2 ppm), the SCADA system will start chlorine dosing pump CP-01. The SCADA system will adjust the speed of dosing pump CP-01 using a flow-pacing control scheme. The dosing pump speed will be adjusted proportionately to the pump house discharge flow rate as measured by flowmeter FIT-006. Once the chlorine concentration rises to 0.4 ppm for 10 minutes (Operator adjustable), the SCADA system will stop the chlorine dosing pump.
- C. The SCADA system will display HIGH CHLORINE CONCENTRATION (0.5 ppm, Operator adjustable) and LOW CHLORINE CONCENTRATION (0 ppm, Operator adjustable) alarms on the Operator HMI. These alarms are notification only and will not initiate any actions.
- D. The SCADA system will monitor the fault alarm status output from chlorine dosing pump CP-01 and will generate an alarm if it detects a FAULT ALARM from alarm contacts XS-014B. Upon detecting a fault, the SCADA system will display an alarm on the Operator HMI and stop pump CP-01.
- E. The following SCADA system I/O points are used in these control sequences:
 1. Free Chlorine Concentration (AIT-007)
 2. Airport Supply Line Flow (FIT-006)
 3. Chlorine Dosing Pump Speed Control (SY-014)
 4. Chlorine Dosing Pump Start/Stop Command (XY-014)
 5. Chlorine Dosing Pump Speed Feedback (ST-014)
 6. Chlorine Dosing Pump Run Status Contact (XS-014A)
 7. Chlorine Dosing Pump Fault Alarm (XS-014B)
- F. The SCADA system will display the following information on the Operator HMI:
 1. Free chlorine concentration from AIT-007 (ppm)
 2. Chlorine dosing pump speed feedback (% speed)
 3. Chlorine dosing pump fault alarm (alarm)

3.06 WATER LINE FLOW MONITORING

- A. The SCADA system will monitor the incoming flow from the potable water distribution network via flowmeter FIT-001.

1. The flow rate readings will be displayed on the Operator HMI.
 2. The SCADA system will display a HIGH FLOW (400 gpm; Operator adjustable) alarm on the Operator HMI. This alarm is for notification only and does not perform any control actions.
- B. The SCADA system will monitor flow through the pump house intertie line via flowmeter FIT-005.
1. The flow rate readings will be displayed on the Operator HMI.
 2. The SCADA system will display a HIGH FLOW (400 gpm; Operator adjustable) alarm on the Operator HMI. This alarm is for notification only and does not perform any control actions.
- C. The SCADA system will monitor flow to the airport supply line via flowmeter FIT-006.
1. The flow rate readings will be displayed on the Operator HMI.
 2. Refer to paragraph HIGH FLOW PUMP BP-03 for details on HIGH HIGH FLOW alarm condition (FAHH-006).
 3. The SCADA system will display a HIGH FLOW (600 gpm; Operator adjustable) alarm on the Operator HMI. This alarm is for notification only and do not perform any control actions.
- D. The SCADA system will monitor return flow from the airport supply line via flowmeter FIT-008.
1. The flow rate readings will be displayed on the Operator HMI.
 2. The SCADA system will display a HIGH FLOW (35 gpm; Operator adjustable) alarm on the Operator HMI. This alarm is for notification only and does not perform any control actions.
- E. The following SCADA system I/O points are used in these control sequences:
1. Water Tank Fill Line Flow (FIT-001)
 2. CBY Intertie Line Flow (FIT-005)
 3. Airport Supply Line Flow (FIT-006)
 4. Re-circulation Line Flowmeter (FIT-008)
- F. The SCADA system will display the following information on the Operator HMI:
1. Water tank fill line flow rate from FIT-001 (gpm)
 2. HIGH flow alarms from FIT-001 (alarm)
 3. CBY intertie line flow rate from FIT-005 (gpm)
 4. HIGH flow alarms from FIT-005 (alarm)
 5. Airport supply line flow rate from FIT-006 (gpm)
 6. HIGH flow alarm from FIT-006 (alarm)
 7. Re-circulation line flow rate from FIT-008 (gpm)
 8. HIGH flow alarm from FIT-008 (alarm)

3.07 FUEL SYSTEM

- A. The fuel system consists of an above ground fuel storage tank and a day tank located in the generator room.
- B. The SCADA system will not be performing any monitoring or control functions on the above ground fuel storage tank.

- C. The day tank contains an integral fuel oil supply control valve and fuel pump controlled by the integral day tank controller.
 - 1. Refer to Section 263213.13 “Diesel-Engine-Driven Generator Sets” for information on day tank.
 - 2. The SCADA system shall monitor the day tank’s LOW LEVEL ALARM and HIGH LEVEL ALARM contacts. These alarms will be displayed on the Operator HMI. These alarms are for notification only and will not initiate any control actions.
- D. The following SCADA system I/O points are used in these control sequences:
 - 1. Day Tank DT-1 LOW LEVEL contact (LSL-101)
 - 2. Day Tank DT-1 HIGH LEVEL contact (LSH-101)
- E. The SCADA system will display the following information on the Operator HMI:
 - 1. Day Tank DT-1 low level alarm (alarm)
 - 2. Day Tank DT-1 high level alarm (alarm)

3.08 PUMP ROOM AMBIENT TEMPERATURE MONITORING

- A. The SCADA system will monitor the ambient temperature inside the pump room via temperature transmitter TT-021. Upon detecting a LOW AMBIENT TEMPERATURE condition (40 deg F; Operator adjustable), the SCADA system will generate an alarm on the Operator HMI. This alarm is for notification only and will not initiate any control actions.
- B. The following SCADA system I/O points are used in these control sequences:
 - 1. Pump Room Ambient Temperature Transmitter (TT-021)
- C. The SCADA system will display the following information on the Operator HMI:
 - 1. Pump room ambient temperature reading from TT-021 (deg F)
 - 2. LOW temperature alarm from TT-021 (alarm)

3.09 CHLORINE ROOM CHLORINE GAS ALARM

- A. Chlorine Gas Detector Panel AIT-020 monitors the ambient concentration of chlorine gas inside the Chlorine Room. The Chlorine Gas Detector Panel controls the exhaust fan and activates an alarm upon detecting high chlorine gas concentration. Refer to Section 230993 “Sequence of Operations for HVAC Controls” for information on how the Chlorine Gas Detector Panel controls Exhaust Fan EF-1 and activates audible alarms in the pump room and inside the Chlorine Room.
- B. The SCADA system will monitor the HIGH CHLORINE GAS CONCENTRATION alarm contacts ASH-020. Upon detecting an alarm condition, the SCADA system will display a CHLORINE ROOM HIGH CHLORINE GAS ALARM on the Operator HMI.
- C. The following SCADA system I/O points are used in these control sequences:
 - 1. Chlorine Gas Detector Panel Alarm Contact (ASH-020)
- D. The SCADA system will display the following information on the Operator HMI:
 - 1. HIGH chlorine gas concentration alarm from ASH-020 (alarm)

3.10 WATER STORAGE TANK MIXER

- A. A VFD-controlled tank mixer MXR-01 circulates water in the Water Storage Tank. The mixer speed will be manually set by the Operator from the tank mixer panel. The speed will remain set until the Operator changes the speed at the tank mixer panel.
- B. The SCADA system will command the tank mixer to run while the water level in the Water Storage Tank is within normal operating boundaries.
- C. The SCADA system will stop the tank mixer whenever it detects LOW LOW LEVEL in the Water Storage Tank. Refer to paragraph WATER STORAGE TANK LEVEL CONTROL for a full description on how the SCADA system turns off tank mixer on low low level.
- D. The SCADA system will monitor the trouble alarm status contact on the MXR-01 VFD and will generate an alarm if it detects a TROUBLE ALARM (XS-203B). Upon detecting a trouble alarm, the SCADA system will display an alarm on the Operator HMI and stop tank mixer MXR-01.
- E. The Operator can manually start and stop the tank mixer from the Operator HMI. The tank mixer cannot be manually started if the water level is below the LOW LOW LEVEL setpoint or if the tank mixer TROUBLE ALARM is active.
- F. The following SCADA system I/O points are used in these control sequences:
 - 1. Water Storage Tank Level (LT-200)
 - 2. Water Storage Tank Low Low Level Switch (LSLL-201)
 - 3. Water Storage Tank Mixer MXR-01 start/stop command (XY-203)
 - 4. Water Storage Tank Mixer MXR-01 run status contact (XS-203A)
 - 5. Water Storage Tank Mixer MXR-01 trouble alarm (XS-203B)
- G. The SCADA system will display the following information on the Operator HMI:
 - 1. Water storage tank mixer run status (on/off)
 - 2. Water storage tank trouble alarm (alarm)
 - 3. Water storage tank manual start/stop button (touchscreen command)

3.11 WATER STORAGE TANK INTRUSION MONITORING

- A. The SCADA system will monitor intrusion switch ZSC-202 mounted on the top hatch of the water storage tank. An INTRUSION DETECTED alarm will be generated if the hatch is opened. To minimize nuisance alarms, a bypass function button will be provided at the SCADA system PLC. Once pressed, the intrusion alarm function will be disabled for 30 minutes. An alarm will be generated if the hatch remains open after the bypass duration expires. The hatch position will be displayed on the Operator HMI.
- B. The following SCADA system I/O points are used in these control sequences:
 - 1. Water Storage Tank Hatch Intrusion Switch (ZSC-202)
- C. The SCADA system will display the following information on the Operator HMI:
 - 1. Water storage tank hatch position from ZSC-202 (open/closed position)
 - 2. INTRUSION DETECTED alarm from ZSC-202 (alarm)
 - 3. INTRUSION ALARM BYPASS function button (touchscreen command)

3.12 STANDBY GENERATOR

- A. The SCADA system will monitor the standby generator for the following conditions:
 - 1. Generator auto/hand status
 - 2. Generator run status
 - 3. GENERATOR FAULT alarm (notification only, no control actions)
- B. The following SCADA system I/O points are used in these control sequences:
 - 1. Generator Auto/Hand Status Contact (XS-103A)
 - 2. Generator Run Status Contact (XS-103B)
 - 3. Generator Fault Alarm Contact (XS-103C)
- C. The SCADA system will display the following information on the Operator HMI:
 - 1. Generator auto/hand status (auto/hand)
 - 2. Generator run status (running/off)
 - 3. Generator fault alarm (alarm)

3.13 AUTOMATIC TRANSFER SWITCH

- A. The SCADA system will monitor the automatic transfer switch (ATS) for the following conditions:
 - 1. Connected to utility power
 - 2. Connected to Generator power
 - 3. UTILITY POWER FAILURE alarm: This is a notification only alarm, it will not initiate any control actions
 - 4. FAILURE TO SWITCH TO GENERATOR alarm: This is a notification only alarm, it will not initiate any control actions
- B. The following SCADA system I/O points are used in these control sequences:
 - 1. Connected to Utility Power Status Contact (XS-102A)
 - 2. Connected to Generator Power Status Contact (XS-102B)
 - 3. Utility Power Failure Alarm Contact (XS-102C)
 - 4. Failure to Switch to Generator Alarm Contact (XS-102D)
- C. The SCADA system will display the following information on the Operator HMI:
 - 1. ATS connection status from XS-102A and XS-102B (Utility/Generator)
 - 2. UTILITY POWER FAILURE (alarm)
 - 3. FAILURE TO SWITCH TO GENERATOR (alarm)

3.14 WATER STORAGE TANK CATHODIC PROTECTION PANEL

- A. The SCADA system will monitor the cathodic protection panel for the following conditions:
 - 1. On/off Status
 - 2. Trouble alarm
- B. The following SCADA system I/O points are used in these control sequences:
 - 1. Cathodic Protection System Status Contacts (XS-204A)
 - 2. Cathodic Protection System Trouble Alarm Contacts (XS-204B)
- C. The SCADA system will display the following information on the Operator HMI:
 - 1. Cathodic protection system status (on/off)
 - 2. Cathodic protection system trouble alarm (alarm)

3.15 SCADA PANEL PLC-01 DIAGNOSTICS

- A. The SCADA system will monitor the following status conditions on the PLC UPS.
 - 1. UPS On Battery Status (XS-300A): The SCADA system will display the UPS connection status (on main power or on battery power) on the Operator HMI.
 - 2. UPS LOW BATTERY alarm (XS-300B): Upon a low battery condition, the SCADA system will display a LOW BATTERY alarm on the Operator HMI. This alarm is for notification only. It will not initiate any control actions.
- B. The SCADA system will monitor the communications connectivity between the Pump House and the SCADA Head End. The SCADA system will generate a LOSS OF COMMS alarm upon detecting a network outage exceeding 1 minute. This alarm is for notification only. It will not initiate any control actions.
- C. The following SCADA system I/O points are used in these control sequences:
 - 1. UPS On Battery status contacts (XS-300A)
 - 2. UPS Low Battery alarm contacts (XS-300B)
- D. The SCADA system will display the following information on the Operator HMI:
 - 1. UPS On Battery status (on primary/on battery)
 - 2. UPS Low Battery alarm (alarm)
 - 3. LOSS OF COMMS alarm (alarm)

END OF SECTION