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Addendum No. 3
TRUCKEE CANYON WATER SYSTEM EXPANSION
PWP Bid No. WA-2016-094
March 16, 2016

The following information, clarifications, changes and modifications are by reference incorporated into the bid documents for the above referenced project. Any work item or contract provision not changed or modified will remain in full force and effect. The bid date and time and construction schedule remain the same.

QUESTIONS AND RESPONSES

Question No. 1: There does not appear to be a specification section for the 400amp transfer switch. Can you please supply this spec section?

Response to Question No. 1: Manual transfer switch shall be as noted on one-line diagram, provide GE Zenith Controls MX150 to match existing or approved equal.

Question No. 2: Who supplies the heat trace panel #2?

Response to Question No. 2: The new heat trace panel shall be contractor provided.

Question No. 3: Will the bid date be pushed back?

Response to Question No. 3: Time is of the essence for the Truckee Canyon Water System Expansion; therefore, the bid date will not be extended.

Question No. 4: After discussing the specifications from section 13416, Chemical Storage Tanks, our supplier has some comments regarding the tanks. Can you please address each of his/our concerns.

1) Section 1.3B will never be agreed to by a manufacturer on two small tanks. Will this warranty time frame be adjusted according to your approved vendor?
2) Section 2.5A Calls out a minimum of a 24" Manway, but tanks this size come with 14" and 18" manways. Will the size of this manway be adjusted to meet the approved vendor specs.?
3) Section 2.5H calls for ladders - on a 100 gallon and 250 gallon tank (~ 3' and 4' tall). For these small of storage tanks are the ladders required?

4) Section 2.5D calls out 3" fittings, but that's probably too large for these specific tank sizes. Will the size of these fittings be adjusted according to the approved vendor specs.?

Response to Question No. 4:

1) **Recognizing that every tank manufacturer will have some variation of their specific warranty, Specification 14416.1.3B states, "Warranty: Dependent upon the specific service application, the manufacturer shall provide a 5 year on-site service and full replacement warranty against tank failure due to workmanship, and chemical, sunlight, temperature, or normal operating stress related damage." It is expected that, "dependent upon the specific service application" there may be some variation due to tank configuration or type in the warranties from different manufacturers. However, the goal is the 5-yr. warranty as stated if possible for both tanks.**
2) **Yes, the size of the manway may be adjusted to meet vendor specs.**
3) **No, ladders are not required for the chemical tanks.**
4) **Yes, the size of the fittings may be adjusted to meet vendor specs.**

Question No. 5: Will the pump supplier (sodium hypochlorite and ferric chloride) be supplying the local control panel PNL -600 and PNL-700

Response to Question No. 5: Yes. These are meant to be integral to the chemical duplex pumping systems to be provided.

Question No. 6: There is no DWR on the new pipe schedule nor was it addressed in addendum #2 question #9. Please clarify what the DWR line is.

Response to Question No. 6: Decant water return (DWR) pipe shall use the same material as the backwash return (BWR) pipe listed in the Pipe Material Schedule in specification section 15010.

Question No. 7: No spec was provided for SS Ball Valves.

Response to Question No. 7: See attached paragraph E of Material 2.9 Ball Valves added to specification section 15100.

Question No. 8: No spec provided for the motor operators for any type of ball valve.

Response to Question No. 8: Please see specification section 15100 2.5.H.2.C.

Question No. 9: Per addendum #2 question #9 the 3" WS lines are to be HDPE. Does this apply to be both buried and exposed 3" WS lines? The plans show flanged fittings inside of the Automated WS Valve Vault (B/M103) and Automated Valve Vault (A/M107).

Response to Question No. 9: Underground WS line shall be HDPE. Exposed WS, such as the WS line in the Automated Valve Vault, shall be FEL&C steel.

Question No. 10: Please clarify note 2 on drawing M104. How can the new system be tested and warranted when using existing valves and flow meters associated with the existing filter?

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Response to Question No. 10: Delete note 2 on sheet M104. All piping, valves, and flow meters, associated with the existing filter shall be new and provided by the contractor/vendor as part of this project.

Question No. 11: What is the make and model of the PLC that the filter supplier has to write the control program for?

Response to Question No. 11: Schneider Modicon M340 (BMXP342000). The current TMWA programming software standard is Unity Pro XL version 8.0.

Question No. 12: Section 11405 1.06 A. and B. refers to sections 16050 and 16910 that are not listed in the table of contents.

Response to Question No. 12: See changes to specification section 11405 below.

FILTRATION SYSTEM VENDOR REVIEW

No. 1: Loprest is an acceptable filter vendor based upon the system description provided for review.

TECHNICAL SPECIFICATIONS

Section	Page(s)	Description of amendment
11405	11405-5	Replace paragraph A of Part 1.06 Coordination with "Coordination as required in Section 16010, Part 1.10 – COORDINATION MEETINGS." Replace paragraph B of Part 1.06 Coordination with "Coordination as required in Section 16910, Part 1.5 – SOFTWARE MEETINGS."
15100	15100-10, 15100-11	Add attached paragraph E to Part 2.9 – Ball Valves (PBV) and (BV) in specification section 15100.
16010	16010-3, 16010-4	Add attached Part 1.10 – Coordination Meetings to specification section 16010.
16910	all	Add attached section 16910 to the technical specifications.

NOTE: QUESTION CUT-OFF DATE WAS MARCH 14, 2015 AT 5:00 P.M.

2.9 BALL VALVES (PBV) AND (BV)

A. Plastic Ball Valves (PBV) - sizes 3-inch and small

B. r: double union design, PVC Type 1, Grade 1, Teflon seats and Viton or EPDM "O" rings, full ports, 150 psi at 730 F water, flanged, socket, or threaded ends. Chemtrol TU series, Hills-McCanna "McCannaplast", or equal.

C. Bronze Ball Valves (BV) - sizes 2-inch and smaller: shall have full ports and screwed ends. Bronze body. TFE seats and seals. Type 316 stainless steel trim. Jamesbury; Hills-McCanna "McCannaflo", or equal.

D. Three-Way Bronze Diversion Ball Valves (BV) – size 2-inch and smaller: shall have bronze body, chrome plated ball, reinforced TFE seats and seals with blow-out proof stem design. Apollo series 70-600; Watts B-6780-MI, or equal.

E. Stainless steel Ball Valves (BV) 2" or Larger: **Addendum 3**

1. Ball: Full port, single piece, solid. Solid 316, or 17-4 PH stainless steel conforming to requirements of ASTM A 351 Grade CF8M, or ASTM A 351 Grade CB7CU.

2. Stem: Blow-out proof (when assembled) using T-shaped configuration for positive retention. 304, 316, or 17-4 PH stainless steel.

3. Body: Three-piece, vertically split, end entry. Cast 316 stainless steel conforming to requirements of ASTM A 351 Grade CF8M.

4. Seat: Cartridge design consisting of a seat ring with reinforced teflon or PEEK seat insert, and body seal. Spring loaded seats to assure ball/seat contact at low pressure.

5. Stem Seat: Thrust washer packing ring, two-rings for tight seal.

6. Jamesbury; Hills-McCanna "McCannaflo", Worcester, or equal.

Addendum 3

1.8 COORDINATION MEETINGS

A. Electrical contractor and system supplier shall jointly schedule a meeting between the general contractor, owner, engineer and software programmer.

B. This meeting shall be held prior to the first hardware submittal (other than basic materials such as conduit and pull boxes).

C. The purpose of the meeting is to coordinate all electrical and instrumentation aspects of the project. At a minimum the following topics shall be covered:

1. Contractor's contract relationship, e.g. is the system supplier under the general contractor or the electrical contractor.

2. 2. System supplier's detailed project understanding including at a minimum the following topics:

a. General responsibilities.

b. Instrumentation on the project.

c. Networks on this project including Ethernet, fiber, DeviceNet, Modbus, Wireless and others (as applicable).

d. Interconnection requirements and responsibility.

e. Equipment delivery and testing.

f. Substitutions.

g. Submittal requirements including specification check-offs.

h. Issues.

3. Electrical contractor's detailed project understanding including at a minimum the following topics:

a. General conduit routing, pull box sizes and adjustments desired.

b. Power system including stationary emergency generators.

4. General discussion of the project, potential problems, schedule and alternatives and other items that will impact the project deliverables' successful completion.

SECTION 16910

PROCESS CONTROL NARRATIVES

PART 1 GENERAL

1.1 SUMMARY

This section describes the process control logic for the upgraded treatment plant operations of the Truckee Meadows Water Authority's (TMWA) Truckee Canyon Water System (TCWS). The Process Control Narratives (PCNs) contained herein, the Process and Instrument Diagrams (P&IDs), and other related Specifications form the basis for the operational programming and process control configuration requirements. The owner will provide the software-based programming and configuration of the plant PLC and SCADA computer(s) to fully implement the intentions of the Process Control Narratives (package PLCs and local OI are the responsibility of the vendor). The Contractor shall coordinate with the owner representative for performing any factory acceptance testing or site acceptance testing that involves the plant PLC or SCADA computer(s). Final acceptance of the programming and configuration requirements and functionality described herein shall be arranged between the Design Engineer and the Owner.

All references to SCADA equipment, programming, and SCADA contained herein refer to functionality provided by the owner. The Contractor's scope of work under this contract is to furnish, install and configure for test (to demonstrate equipment functionality) the PLC/HMI equipment and related appurtenances. These process control narratives are included to allow for a better understanding of system functionality and to serve as the basis for the requirements for the system programming .

The following improvements will be completed as part of the Truckee Canyon Water System Expansion Project:

- Equipping Well #3 and install raw water line and connection to the WTP.
- Increasing the pumping rate of Well #1 from 40 GPM to 80 GPM by adjusting the existing Variable Frequency Drive (VFD)
- Installing a pump-to-waste assembly for Well #1.
- Rehabilitating the existing filter by replacing existing media with new manganese dioxide media. Add two new 48-inch diameter filters containing manganese dioxide (or have a similar manganese dioxide surface to facilitate manganese removal) media. The WTP is to remain functioning throughout the construction period.
- Expanding the existing building (towards southeast) to provide additional space for chemical storage and dosing equipment. Install larger sodium hypochlorite and ferric chloride storage tanks. Building expansion includes space for future sodium hydroxide or corrosion inhibitor storage and dosing equipment.
- Replacing the existing distribution system booster pump with a 200 GPM pumping system (duplex for redundancy).
- Installing a new, larger solids backwash recycle tank and installing a decant system between the existing backwash recycle tank and new backwash recycle tank.

- Installing an additional decant pump to increase pumping capacity and redundancy.
- Updating the system's controls and telemetry.

Several different treatment processes are needed to treat the raw water before distribution.

1.2 PROCESS DESIGN

The process design for the treatment plant will include:

A. Oxidation/Disinfection –Sodium hypochlorite will be injected into the raw water supply to oxidize the arsenic (As III to As V) and other constituents prior to treatment. In natural groundwaters, arsenic normally occurs as the relatively stable arsenic III, compound, and needs to be oxidized to the more reactive arsenic V compound to react with the ferric chloride to form the ferro-arsenate particulate that can be filtered. Sodium hypochlorite dose control will occur through flow pacing.

B. Primary Coagulant –Ferric chloride will be injected immediately following the sodium hypochlorite to form a ferro-arsenate precipitate (iron floc). This floc will absorb the arsenic V that is present, and a portion of any remaining arsenic III. The iron floc will then be removed by the manganese dioxide filter media. Ferric Chloride dose control will occur through flow pacing.

C. Manganese Dioxide Pressure Filters – There will be two new 48-inch diameter filters and one existing 32-inch diameter filter containing manganese dioxide filter media. These filters will remove the various filterable particles of iron, manganese, and arsenic that have been created by the reactions from the oxidation disinfection and primary coagulant discussed above.

1. Filter Monitoring Control – Rate of flow (flux rate) control through the filters will be accomplished with flow control valves and individual filter effluent flow meters. The target filter flux rate is 5.2 gpm per square foot. The filtration rate will be determined by dividing the sum of the well flow rates by the total filter area. The filter effluent valves will be adjusted utilizing a flow feedback loop from the individual filter effluent flow meters to maintain a constant flow rate through the filters until the control valve is fully open, at which time a backwash cycle may be initiated.

2. The new and existing filters will be backwashed using treated water from the distribution system. A backwash cycle will be initiated by the PLC, which will have a pre- programmed operator-entered filter run time or a pre-determined head loss across the filter, which ever occurs first. The filter vessels will be equipped with pressure differential transmitters to measure head loss within each vessel. When the filter media is 'clean', head loss (HL) in each vessel is expected to measure approximately 1 foot. When the head loss measures up to a maximum of 10 feet and the filter effluent flow control valves are nearing 100% open, an automatic filter backwash cycle will be initiated. In this process, the expected backwash rate is 12.5 gpm/sq. ft., or as required by the filter manufacturer. The PLC will be programmed with the desired backwash duration time to adequately clean the filters per filter manufacturers recommendation. The backwash water will be discharged to a new backwash holding tank where the solids are allowed to settle. The backwash waste water line will be equipped with a flow meter for monitoring flow.

1.3 RESIDUALS HANDLING

A. Recycle Tank – A new 20,000 gallon backwash water recycling tank (T-400) will be installed as part of the TCWS Expansion Project. The backwash water will be discharged to T-400 to allow the solids to settle, and the decanted water from T-400 will be decanted by a new duplex decant pumps to the filter influent. Decanted water from T-300 will be returned by the new decant pumps to T-400. The decant pumps will be automatically controlled via the PLC, which will be programmed to run on a timer based on the required solids settling time criteria.

B. Existing Solids Handling Equipment - Solids from the bottom of T-400 will be pumped utilizing the existing solids pump to T-300 for further solids separation and dewatering. The sludge from T-300 will be pumped to the existing filter bottom dumpster. The sludge pump(s) is controlled manually by the operator who monitors a clear section of pipe to monitor clarity of the pumped solids. The operator turns off the sludge pump when the pumped sludge begins to clear. After pumping the sludge from the recycle tank, the operator manually activates the flushing system to clear the sludge conveyance piping which will also provide solids mixing in T-400. Drainage from the filter bottom dumpster flows by gravity to the existing lined evaporation pond. Dewatered solids in the bin will be periodically taken to the landfill for disposal.

1.4 RELATED WORK SPECIFIED ELSEWHERE

A. Divisions 11: Equipment

B. Division 16: Electrical

1.5 SOFTWARE MEETINGS

A. Software supplier shall schedule a meeting between software supplier's PLC and SCADA Programmer(s), Owner, Engineer, Filtration Vessel supplier and system supplier (reference Specification Section 16931) within 90 days of Notice to Proceed, and prior to beginning any programming. This meeting is expected to last approximately 4 hours and will be held at location as determined by Owner.

B. The purpose of the meeting is to discuss the Process Control Narratives and ensure that all parties understand system requirements for operation. During this meeting, the programmer and others shall discuss details of the control strategies to ensure there are no unanswered questions or concerns.

C. A second meeting will be held after programming is in progress, and prior to factory testing. This meeting will provide a method for resolution of any programming issues, concerns or alternatives. Additionally, coordination of factory testing between hardware and software will be discussed.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

3.1 GENERAL LOGIC REQUIREMENTS

A. Manual SCADA/HMI start/stop/auto and open/close/auto capabilities shall be provided for all equipment interfaced with the PLC as indicated on the Contract Drawings. The functionality of these commands might not be indicated in the individual control narrative. Manual SCADA/HMI control commands shall not override PLC safety interlocks. Equipment commanded to start or open in SCADA/HMI manual mode which is then selected to SCADA/HMI auto shall remain in the commanded selection until the auto stop or close setpoints are achieved. Current equipment status in SCADA/HMI auto, i.e. pump running, shall remain in the same status when switching from SCADA/HMI auto to SCADA/HMI manual until selected otherwise.

B. If the PLC is reset, the default should be in auto mode.

C. PLC control programs with pumping unit(s) will contain adjustable delays (seconds) for start, start after stop (backspin), minimum runtime, and stop. PLC control programs with multiple pumping units shall also provide for separate adjustable sequential start and stop delays (seconds) that parallel normal start and stop delays, and sequence/alternation selection.

D. "Available" equipment status will be provided when the associated H-O-A hardware switch is in auto position and there are no control lockout alarms, for all controlled equipment interfaced with the PLC. The available signal shall not be provided if any lockout alarms are present.

E. Command-to-feedback fail alarm will be provided, when the associated H-O-A hardware switch is in auto position, for all controlled equipment interfaced with the PLC. The controller-based fail alarm shall be initiated if an equipment item is commanded to start/stop or open/close by the PLC and the appropriate pump run, valve position status feedback (where available), or flow signal is not received within an adjustable time delay (seconds).

F. In installations with multiple pumps in which a pump becomes unavailable (not in automatic or has failed), the pump shall be tagged unavailable and control shall failover to the next sequence assigned pump. Upon availability being re-established to the unavailable pump, it shall be tagged available with lag pump setpoints and remain off until called to run or the replaced pump has stopped.

G. PLC control programs with pumping unit(s) shall disable all control and control program affiliated alarms during a utility power fail. Upon power fail recovery, controls shall be re-enabled after an adjustable time delay (seconds).

H. PLC control programs with pumping unit(s) which require remotely communicated analog data for control, shall disable all control and control program affiliated alarms during a communication failure, including an adjustable time delay (minutes), unless otherwise noted. Upon communication restoration, controls shall be re-enabled.

I. Controller-based adjustable elapsed time meters (ETM) and number of starts with an adjustable reset will be provided for all motorized equipment interfaced with the PLC.

The PLC shall transmit an alert to the SCADA when a motorized device exceeds a setpoint number of starts within a running 60 minute period of time. Equipment run time and number of starts data shall be transmitted to the SCADA system for indication and reporting.

J. High, low and invalid (out-of-range) alarms for all analog points shall be provided in the PLC whenever setpoint limits are exceeded for an adjustable time delay (seconds), and alarms for all hardwired alarm inputs after an adjustable time delay (seconds). Each associated alarm shall be generated and transmitted to the SCADA for indication.

K. All analog signals shall be constantly processed, by each PLC, to provide minimum, maximum with time stamps and average values. Flows shall be totalized when noted herein or on the P&IDs. Hourly pump runtimes and number of starts, flow totalization, minimum and maximum with time stamp, and average of each analog local and polled shall be placed in hourly holding registers for "today's" 24 hour period (adjustable end of 24 hour period setpoint, e.g. 2:00 am or 0200 hours). Upon reaching the end of the 24 hour period, the data shall be transferred to the "previous" 24 hour holding registers. Today's 24 hour period registers shall be reset to zero. The PLC shall hold the previous 24 hours of daily data, time and date stamped, total flow for the day and the previous 7 days of total daily flow, date stamped, to be retrieved by the SCADA for reports in the event of an extended communication failure.

L. All PLC and SCADA alarm set points, control set points, timer setpoints, and PID settings shall be selectable from a related process graphic control display at the SCADA monitor with the appropriate security password as defined by the OWNER. Provide applicable individual power and communication fail alarms for each PLC. All analog, timer and remaining setpoints shall be selectable.

M. Each PLC shall perform and monitor internal diagnostics, i.e. low battery voltage, module or channel failure, and transmit current status conditions to the SCADA system.

N. All digital and analog alarms shall contain adjustable time delay (seconds) timeouts before alarming, unless otherwise noted.

O. All communicated data in each PLC shall be located in contiguous block registers to optimize data transfer duration. Digital data shall be packed.

3.2 PROCESS CONTROL NARRATIVES

The owner will provide the programming and configuration at the PLC and SCADA computers to fully implement each Process Control Narrative (PCN) listed below and described in the following tables.

A. Standard Control Description

B. Well Pump Controls

C. Filtration System

D. Sodium Hypochlorite Storage & Feed System

E. Ferric Chloride Storage & Feed System

F. Backwash, Recycle & Sludge Disposal System

G. Distribution System Pump Controls

A. System Wide Standard Control Descriptions

The following intentions shall apply throughout the project. It is the intention that the system receives the highest quality product with regard to the plant control system. Thorough communication with the plant operations staff throughout the project is imperative.

Every status and alarm shown on the P&IDs and on the PLC I/O listings shall be displayed on SCADA. The plant operators shall have the final say as to how the data is presented and arranged on the SCADA system.

All of the PLC clocks shall be synchronized with the plant SCADA system (PC) clock. This includes the plant PLCs and the manufacturer provided PLCs.

If the control functions (including displays, indication, alarms or trends) desired are not included in this document, those functions shall be considered as special functions and should be listed in the individual Process Control Descriptions. This system wide control descriptions section is applicable to all controls in the plant; therefore, it should not be changed based on requirements of individual systems or equipment.

Color Standard

☒ Standard Colors	☐ Non-Standard Colors
Green = On, Run, Open	Red = On, Run, Open
Red = Off, Stop, Close	Green = Off, Stop, Close
Amber = Fault, Fail, Traveling, Changing State	Amber = Fault, Fail, Traveling, Changing State

Power: ☒ White ☐ Blue ☐ Other: _____

Standard MCC Functions

Standard MCC Functions include the following:

Controls:	☒ Hand-Off-Auto	☐ Manual/PLC with Start-Stop	☒ Field Control Panel
Reset pushbutton:	☐ None	☐ Red	☐ Black
Runtime:	☐ None	☒ ETM	
☒ Run Indication			
☒ Fail Indication			
Speed Control:	☐ None	☒ HMI on VFD	☐ Speed potentiometer
VFD Real-Time Speed:	☐ None	☐ HMI	☐ Local Indication
VFD Fault:	☐ None	☒ HMI	☐ Local Indication

Standard Field Functions

Standard Field Functions include the following:
(Among one of the "Controls" check boxes, "Field Control Panel" has to be checked in the previous section: "Standard MCC Functions")

Controls:	☒ Hand-Off-Auto	☒ Manual/PLC with Start-Stop	☒ Lockout Stop (LOS)
☐ Runtime			
☐ Run Indication			
☐ Fail Indication			
☐ Speed Control			
☐ VFD Real-Time Speed			
☐ VFD Fault			

A. System Wide Standard Control Descriptions

Standard Discrete Alarms

The following are the control intentions for each alarm. Each alarm shall be programmed consistently within each plant PLC. Each alarm shall have an enable/disable bit and shall be programmed so that a power loss retains the state the enable/disable bit was in prior to the power loss. Each alarm shall have an adjustable time delay in seconds (unless otherwise specified).

FAIL TO START

If the equipment motor is called to start and the run indication is not received within an adjustable time delay, a fail to start alarm shall be generated.

FAIL TO POSITION

If a valve is commanded to open and the valve analog feedback or open position indicator does not agree within an operator adjustable time delay, a fail to open alarm shall be generated.

If a valve is commanded to close and the valve analog feedback or close position indicator does not agree within an operator adjustable time delay, a fail to close alarm shall be generated.

Analog position failure alarms shall have an adjustable position deadband (1%-4%).

DISCRETE ALARMS/LOCKOUTS

Alarms not designated as lockouts shall be automatically reset when the alarm condition clears. Alarms designated as lockouts shall require the operator to press the alarm reset pushbutton on the SCADA screens. Each PLC has a master alarm reset pushbutton. The appropriate alarm reset button(s) shall be included on the appropriate SCADA screen displays. The P&IDs provide general guidance for which alarms are lockouts; however, the programmer shall work with the operations staff to identify which alarms are to be set up as lockouts.

Standard Analog Alarms

INSTRUMENTATION

Each analog instrument shall have alarm programming setup to provide the alarming shown on the P&IDs. Each alarm setpoint and time delay shall be operator adjustable. At the request of the engineer or operations staff, additional analog alarming for specific instrumentation may be added during startup.

TRANSDUCER FAILURE ALARMS

Transducer failure alarms are provided to alert the operators of a broken wire or over current condition for each instrument. Enable/disable selections shall be available for each transducer failure alarm.

Standard Equipment Data

EQUIPMENT RUNTIMES

Equipment runtimes shall be calculated based on the presence of the equipment's run status. Anytime the run status is present, the runtime(s) registers shall be incremented. The runtime registers shall be paused when the run signal is removed. The runtimes shall be presented in hours and reside in floating point data type registers. The following runtime accumulators shall exist for each piece of equipment:

1. Non-resettable (ETM)
2. Resettable
3. Daily (reset at the same time of day across the entire plant)
4. Previous Day

A. System Wide Standard Control Descriptions

NUMBER OF STARTS

The number of starts shall be incremented upon a positive transition detected from the equipment's run status. The number of starts shall reside in floating point data type registers. The following number of starts registers shall exist for each piece of equipment:

1. Non-resettable (ETM)
2. Resettable
3. Daily (reset at the same time of day across the entire plant)
4. Previous Day

Standard Flow Totals

FLOW TOTALS

Every plant flow meter shall be totalized in the PLC and displayed on SCADA. The flow totalizer units shall vary based on the flow meter (Mgal, gpm, etc.) and the specific presentation of each total shall be agreed upon by the operations staff.

The current day total and the previous day totals shall be organized and presented on the plant flow totals screen.

Standard VFD Configuration

MINIMUM SPEED SETTINGS

Each VFD shall be configured with the appropriate minimum speed setting. The settings for each pump shall be determined at startup. The manual speed range (adjustable from SCADA) shall match the settings in the VFD

Standard SCADA Displays and Indications

Standard SCADA Display and Indication include the following:

(Standard display/indication shall be based on actual I/O and standard colors)

☒ Auto Indication
☒ Run/Stop Indication
☒ Runtime
☒ Real-Time Speed
☒ Real-Time Flow
☒ Fault or Failure
☒ Open Position
☒ Closed Position
☒ Traveling

Standard SCADA Alarms

Standard SCADA alarms include the following:

☒ Device Failure	Priority: __ (Blank = low priority = Priority 3)
☒ Fail to Run	Priority: __ (Blank = low priority = Priority 3)
☒ Overload	Priority: __ (Blank = low priority = Priority 3)
☒ Transducer Failure	Priority: __ (Blank = low priority = Priority 3)
☒ High/Low Analog Alarms	Priority: __ (Blank = low priority = Priority 3)

Standard SCADA Trends

All analogs shall be available to trend. Standard trends shall be provided by areas such as pressure, flow, level, measured analytical variable, etc. (whichever is checked in individual process control descriptions).

B. Well Pump Controls	
PROJECT NAME	**Truckee Canyon Water System Expansion Project**
EQUIPMENT NAMES	**Well 1 and Well 3**
EQUIPMENT NUMBERS	**P-001 P-003**
LOCATION	**Well 1 is on WTP parcel; Well 3 is 800 feet west**
SPECIFICATION SECTION	**11145**
P&ID DRAWING	**I100**

Process Description

The submersible well pumps, based on a call from SCADA, energize and pump water to the WTP or to waste.

Motor Controls

☒ VFD ☐ Soft Starter ☐ Across the Line Starter ☐ Chemical Pump
(None)

Instrumentation

☐ Suction Pressure (psi)	☒ Discharge Pressure (psi)	☐ Temperature (°F)	
☒ Level (ft)	☐ Moisture	☐ Speed (%)	
☐ Position (Open/Close)	☐ DO (mg/L)	☐ ORP (mV)	
☐ Sludge Density	(%)	☐ Turbidity (NTU)	☐ Chlorine (mg/L)
☐ UVT (%)	☐ pH	☐ Other:	
☒ Flow:			

Local Field Controls

Interlocks

If a low level indication is provided by the well level transducer, the pump shall be disabled. If a failure in the filtration system or chemical feed systems, the pump shall be disabled.

Automatic Controls (PLC)

SEQUENCE OF OPERATION:

The wells shall be controlled for start/stop by the T-100 level indication provided for the system storage tank. When the well pump is called, either by automatic or manual means, the following sequence begins:

The pump-to-waste valve should already be open, while the time-delay pump-run relay begins timing.

B. Well Pump Controls
If no interlocks are present, the pump-call time delay relay has expired, the pump is started, and shall pump to waste. After the pump has been running for an adjustable amount of time, the pump-to-waste valve timer relay expires and the valve closes and the pump starts pumping to the treatment plant. When the flow meter registers flow to the treatment plant, the sodium hypochlorite pumps and ferric chloride metering pumps shall start pumping at the preset dose. **AUXILLARY EQUIPMENT** The PLC shall totalize flow based on a 1KGAL pulse from the flow transmitter.
SCADA
The status and alarms shown on the P&IDs and described within this narrative are the minimum to be displayed on SCADA. An alarm/indication shall be shown on SCADA for data transmission failures (data passed from PLC to PLC over the Ethernet or radio network).

C. Filtration System	
PROJECT NAME	**Truckee Canyon Water System Expansion Project**
EQUIPMENT NAMES	**Filtration Vessels 1, 2, 3 & 4, Flow Control Valves 1, 2, 3, & 4**
EQUIPMENT NUMBERS	**FLT001, FLT002, FLT003, MOV10213, MOV110313**
LOCATION	**Water Treatment Plant**
SPECIFICATION SECTION	
P&ID DRAWING	**I101, I102, I103**

Process Description

The flux rate through each filter vessel is controlled by a flow control valve and flow feedback control loop from the filter effluent flow meter on the effluent line of each filter.

The PLC shall totalize filtration flow through each vessel based on a GPM pulse from each flow transmitter and the following equation:

Filtration Rate (GPM/ft^2) = (Well 1 Flow + Well 3 Flow)/(In-Service Filter Area)

The optimal operating flux rate for each vessel is up to 4 GPM/ft^2. The maximum flux rate is 10 GPM/ft^2.

Each filter vessel shall be equipped with a pressure differential transmitter from the manufacturer. When the adjustable differential pressure (DP) through the filter is "High" (~10 ft) and/or the filter effluent valve is fully open, or a preset BW timer requests a BW, the PLC shall signal for backwash. The pressure differential transmitter may be used to establish a configurable high pressure setting determined by the operator.

One turbidimeter shall be installed to monitor treatment plant effluent.

Backwash shall occur for one filter vessel at a time, but all filters shall be backwashed sequentially with each backwash sequence.

Backwash water is supplied to the filter vessels by the BW control valve from the distribution system. The backwash flow rate for each vessel is expected to be 12 to 18 GPM/ft^2, or as required by the filter media supplier. The PLC shall totalize backwash flow through each vessel based on a GPM pulse from the BW flow meter transmitter(s) and the following equation:

Backwash Rate (GPM/ft^2) = (Flow)/(In-Service Filter Area)

Upon the backwash cycle initiation, the filter influent and effluent valves shall be closed, and the filtration process shall stop for the filter being backwashed. If there is sufficient filtration capacity, the well feed shall be switched to one or more of the other two filters if the filtration rate <10 GPM/ft^2.

The filter backwash supply and BW waste valves shall open, and the BW supply pumping cycle will be initiated. After backwashing, the filter shall filter-to-waste to T-400 for approximately two minutes. A filter-to-waste control valve on the filter-to-waste (FTW) line from the filters to the reclaim tank shall be set according to filter-to-waste rates for each filter, to match the filtration rate.

Filter controls, including backwash sequence programming, timing sequences, etc. shall be provided by the

C. Filtration System
filtration vessel manufacturer, as stated in Specification 11405.
Motor Controls
☐ VFD ☐ Soft Starter ☐ Across the Line Starter ☐ Chemical Pump
Instrumentation
☐ Suction Pressure (psi) ☒ Pressure Differential Transmitter (psi) ☐ Temperature (°F) ☐ Level (ft) ☐ Moisture ☒ Speed (%) ☒ Position (%) ☐ DO (mg/L) ☐ ORP (mV) ☐ Sludge Density (%) ☒ Turbidity (NTU) ☐ Chlorine (mg/L) ☐ UVT (%) ☐ pH ☒ Other: Discharge Pressure ☒ Flow:
Local Field Controls
Interlocks
If a high-high level indication is provided by the reclaim tank, the backwash shall be aborted. If an incorrect valve position indication is provided, the backwash or well pumps and chemical dosing systems shall be disabled.
Automatic Controls (PLC)
SCADA MANUAL CONTROL In manual mode, all filters shall be adjusted to be in service in normal filter mode. **AUTOMATIC OPERATIONS – PLC CONTROL MODE** In automatic mode operation of the filters shall be controlled by the filtration PLC as described above. **ALARMS** Filter high head loss. High filtered water turbidity. High discharge pressure. Hi/low decant tank s. Hi/low storage tank. Hi/low chemical tanks. Chemical pump failure.
SCADA
The status and alarms shown on the P&IDs and described within this narrative are the minimum to be displayed on SCADA. An alarm/indication shall be shown on SCADA for data transmission failures (data passed from PLC to PLC over the Ethernet network).

D. Sodium Hypochlorite Storage and Feed System	
PROJECT NAME	**Truckee Canyon Water System Expansion Project**
EQUIPMENT NAMES	**NaOCl Tank, NaOCl Metering Pumps 1 and 2**
EQUIPMENT NUMBERS	**P-600, P-601**
LOCATION	**Chemical Storage Room**
SPECIFICATION SECTION	**11240, 13416**
P&ID DRAWING	**I110**

Process Description

The NaOCl metering pump(s) shall turn on when the well pump(s) flow meter registers flow and shall pump at a configurable rate per unit flow (GPM).

Dosage control shall be manually set and adjusted through flow pacing. Dose setpoint is 0.5 to 3.0 mg/L for disinfection, oxidation; and arsenic treatment.

The NaOCl Tank is filled manually as required by a delivery truck. The NaOCl storage tank level shall be provided locally and on SCADA, with high/low alarm set points.

Motor Controls

☐ VFD ☐ Soft Starter ☐ Across the Line Starter ☒ Chemical Pump

Instrumentation

☐ Suction Pressure (psi)	☒ Discharge Pressure (psi)	☐ Temperature (°F)
☒ Tank Level (ft)	☐ Moisture	☒ Speed (%)
☐ Position (%)	☐ DO (mg/L)	☐ ORP (mV)
☐ Sludge Density (%)	☐ Turbidity (NTU)	☐ Chlorine (mg/L)
☐ UVT (%)	☐ pH	☒ Other: Leak Detection
☒ Flow:		

Local Field Controls

Field controls are provided on the pump control panel.

Interlocks

If a leak is detected in a metering pump or a chemical tank low-low level is detected, pump operation shall cease until the leak is repaired or the chemical tank is refilled.

D. Sodium Hypochlorite Storage and Feed System

Automatic Controls (PLC)

SCADA MANUAL CONTROL

The metering pumps shall be controlled through the local PLC/SCADA system with the use of a SCADA Auto/Manual control. When in 'Manual', the operator can run the pumps and control the pumps' speed individually through SCADA.

AUTOMATIC OPERATIONS – PLC CONTROL MODE

When the metering pumps' SCADA Auto/Manual control is placed in 'Auto', the pumps shall pump at a configurable rate at the pre-set dose – as determined by the operator, and proportional to the amount of flow registered by the operating wells' flow meters.

ALARMS

If a metering pump registers a fail status, or the secondary containment flood switch is active, an alarm shall be raised. If neither metering pump can be brought online, the active well pump(s) shall be shut down.

The chemical storage tank shall be equipped with level monitoring and local display. Alarms shall be on low-low, low, high, high-high.

SCADA

The status and alarms shown on the P&IDs and described within this narrative are the minimum to be displayed on SCADA. An alarm/indication shall be shown on SCADA for data transmission failures (data passed from PLC to PLC over the Ethernet network).

E. Ferric Chloride Storage and Feed System	
PROJECT NAME	**Truckee Canyon Water System Expansion Project**
EQUIPMENT NAMES	**$FeCl_3$ Tank, $FeCl_3$ Metering Pumps 1 and 2**
EQUIPMENT NUMBERS	**P-700, P-701**
LOCATION	**Chemical Storage Structure**
SPECIFICATION SECTION	**11240, 13416**
P&ID DRAWING	**I111**

Process Description

The $FeCl_3$ metering pump(s) shall turn on when the well pump(s) flow meter registers flow and shall pump at a configurable rate per unit flow (GPM).

Dosage control shall be manually set and adjusted through flow pacing. Dose setpoint is 1.0 to 5.0 mg/L;

The $FeCl_3$ Tank is filled manually as required by a delivery truck. The FeCl3 storage tank level shall be provided locally and on SCADA, with high/low alarm set points.

Motor Controls

☐ VFD ☐ Soft Starter ☐ Across the Line Starter ☒ Chemical Pump

Instrumentation

☐ Suction Pressure (psi)	☐ Discharge Pressure (psi)	☐ Temperature (°F)
☒ Tank Level (ft)	☐ Moisture	☒ Speed (%)
☐ Position (%)	☐ DO (mg/L)	☐ ORP (mV)
☐ Sludge Density (%)	☐ Turbidity (NTU)	☐ Chlorine (mg/L)
☐ UVT (%)	☐ pH	☒ Other: Leak Detection
☒ Flow:		

Local Field Controls

Field controls are provided on the pump control panel.

Interlocks

If a leak is detected in a metering pump or a tank low-low level is detected, pump operation shall cease until the leak is repaired or chemical tanks refilled.

E. Ferric Chloride Storage and Feed System

Automatic Controls (PLC)

SCADA MANUAL CONTROL

The metering pumps shall be controlled through the local PLC/SCADA system with the use of a SCADA Auto/Manual control. When in 'Manual', the operator can run the pumps and control the pumps' speed individually through SCADA.

AUTOMATIC OPERATIONS – PLC CONTROL MODE

When the metering pumps' SCADA Auto/Manual control is placed in 'Auto', the pumps shall pump at a configurable rate proportional to the amount of flow registered by the operating well's flow meter.

ALARMS

If a metering pump registers a fail status, or the secondary containment flood switch is active, an alarm shall be raised. If neither metering pump can be brought online, the active well pump(s) shall be shut down.

The chemical storage tank shall be equipped with level monitoring and local display. Alarms shall be on low-low, low, high, high-high.

SCADA

The status and alarms shown on the P&IDs and described within this narrative are the minimum to be displayed on SCADA. An alarm/indication shall be shown on SCADA for data transmission failures (data passed from PLC to PLC over the Ethernet network).

G. Backwash, Decant & Sludge Disposal System	
PROJECT NAME	**Truckee Canyon Water System Expansion Project**
EQUIPMENT NAMES	**Backwash Tank, Decant Pumps 1 and 2**
EQUIPMENT NUMBERS	**T-300, T-400, P-100, P-200, P-300**
LOCATION	**Water Treatment Plant**
SPECIFICATION SECTION	**11317, 15200**
P&ID DRAWING	**I109**

Process Description

The T-400 recycle tank receives and stores backwash water from the filter vessels. The backwash cycle shall be initiated by the filtration system.

The decant pump(s) shall turn on when the well pumps are running and shall operate in one of three ways, as directed by SCADA. They shall pump decant water from T-400 to the influent piping manifold. They shall pump decant water from T-300 to T-400.

Sludge from T-300 shall be manually pumped to the solids separating dumpster via the existing solids pump.

A BW tank effluent turbidimeter shall monitor turbidity levels in the decant water being returned to the plant influent.

When decant pump is called, either by automatic or manual means, one of the following modes shall begin:

1) The appropriate valves shall open/close to allow the pump to recycle decanted water from T-400.

2) The appropriate valves shall open/close to allow the pump to recycle decanted water from T-300 to T-400.

Motor Controls

☒ VFD ☐ Soft Starter ☐ Across the Line Starter ☐ Chemical Pump

Instrumentation

☐ Suction Pressure (psi)	☐ Discharge Pressure (psi)	☐ Temperature (°F)
☒ Tank Level (ft)	☐ Moisture	☒ Speed (%)
☐ Position (%)	☐ DO (mg/L)	☐ ORP (mV)
☐ Sludge Density (%)	☒ Turbidity (NTU)	☐ Chlorine (mg/L)
☐ UVT (%)	☐ pH	☒ Other: Suspended Solids Level
☒ Flow:		

G. Backwash, Decant & Sludge Disposal System

Local Field Controls

Interlocks

Automatic Controls (PLC)

MANUAL SCADA/HMI CONTROL

The backwash and decant pumps shall be controlled through PLC with the use of a SCADA/HMI Auto/Manual control. When in 'Manual', the operator can run the pumps individually through SCADA.

AUTOMATIC OPERATIONS – PLC CONTROL MODE

When the reclaim water decant pump's SCADA/HMI Auto/Manual control is placed in 'Auto', the pump and associated valves shall operate accordingly based upon the needed function (i.e. decant, pump-to-waste or settled sludge mixing). Reference Sheet I018, Backwash Storage Tank P&ID, of the Contract Drawings.

ALARMS

If a decant pump registers a fail status, an alarm shall be raised.

Tank level monitoring shall occur and be displayed locally and on SCADA. Tank alarms shall be low, high, high-high. The decant pumps shall be automatically shut down utilizing an adjustable tank level set point.

SCADA

The status and alarms shown on the P&IDs and described within this narrative are the minimum to be displayed on SCADA. An alarm/indication shall be shown on SCADA for data transmission failures (data passed from PLC to PLC over the Ethernet network).

H. Distribution System Pump Controls	
PROJECT NAME	**Truckee Canyon Water System Expansion Project**
EQUIPMENT NAMES	**Booster Pumps 1 & 2, Distribution Supply Flow Meter**
EQUIPMENT NUMBERS	**P-400, P-500**
LOCATION	**Booster Water Pump Station**
SPECIFICATION SECTION	**11145**
P&ID DRAWING	**I108**

Process Description

Two new booster pumps shall be added to the existing water booster pump station. These new pumps shall be configured to pump water from the T-100 storage reservoir to the distribution system and T-200.

The booster pump(s) shall be controlled for start/stop by the T-200 level indication provided for the main distribution system storage tank.

Motor Controls

☐ VFD ☒ Soft Starter ☐ Across the Line Starter ☐ Chemical Pump

Instrumentation

☐ Suction Pressure (psi)	☐ Discharge Pressure (psi)	☐ Temperature (°F)
☐ Level (ft)	☐ Moisture	☐ Speed (%)
☐ Position (%)	☐ DO (mg/L)	☐ ORP (mV)
☐ Sludge Density (%)	☐ Turbidity (NTU)	☐ Chlorine (mg/L)
☐ UVT (%)	☐ pH	☒ Other: Distribution Tank Level
☒ Flow:		

Local Field Controls

Each booster pump has a Hand/Off/Auto selector switch. In 'Hand', the corresponding booster pump shall start and run. Barring any interlocks, operation in 'Hand' shall run the booster pump indefinitely. In 'Auto' the booster pump starts and stops automatically.

Interlocks

Each booster pump shall be interlocked with the water level in the ground level treated water storage tank such that while in Auto mode, a low level alarm in the ground level tank will disable the pump.

Automatic Controls (PLC)

SCADA MANUAL CONTROL

H. Distribution System Pump Controls
The booster pumps shall be controlled through SCADA with the use of a SCADA Auto/Manual control. When in 'Manual', the operator can run the pumps individually through SCADA. **AUTOMATIC OPERATIONS – PLC/SCADA CONTROL MODE** When the booster pumps' SCADA Auto/Manual control is placed in 'Auto', the booster pumps shall pump to the distribution system. **ALARMS** If a booster pump registers a fail status, an alarm shall be raised.
SCADA
The status and alarms shown on the P&IDs and described within this narrative are the minimum to be displayed on SCADA. An alarm/indication shall be shown on SCADA for data transmission failures (data passed from PLC to PLC over the Ethernet network).

END OF SECTION