



BROOKS RECYCLED WATER PUMP STATION UPGRADES PROJECT
Solicitation Number: CO-00657
Job No.: 21-8601

ADDENDUM 2
September 27, 2023

To Bidder of Record:

This addendum, applicable to the work referred to above, is an amendment to the bid proposal, plans, and specifications, and as such will be a part of and included in the Contract Documents. Acknowledge receipt of this addendum by entering the Addendum number and issue date on the space provided in submitted copies of the bid proposal.

RESPONSES TO QUESTIONS

1. Question: Does this Brooks Recycled Pump Station Project require a Field Office?

Response: A field office will not be required for this project. Please refer to Changes to the Specifications No. 4 of this Addendum.

2. Question: Is a detail for the Transformer Foundation available?

Response: Please refer to Detail 2 on Sheet C15.

3. Question: Is a location and number of required bollards available?

Response: Six (6) bollards are required. Please refer to Sheet C3 for bollard locations.

4. Question: General Condition 5.3.1 is requiring that “All test reports and shop drawings shall be signed and sealed by a Texas Registered Professional Engineer” – this is not typical of what we see on past SAWS projects and other municipalities. Please confirm this is needed on all geotesting reports submitted?

Response: Section 5.3.1 of the General Conditions shall remain as written. However, reports and shop drawings shall only be required to be signed and sealed if specifically indicated in the project plans and technical specifications. Should the contractor propose something different than what is shown in the project plans and technical specifications, which would be subject to review for approval by the Owner and Engineer, then signed and sealed documents would also be required.

5. Question: Does existing tank have a flange for the new level probes to be mounted or is one needing to be added?

Response: The tank has an existing flange on the dome adjacent to the ladder.

6. Question: Multiple sheets call for a containment pit at the transformer pad. The transformer pad detail on Sheet C15 does not include a containment pit. Please advise and/or provide additional details.

Response: An oil containment pit will not be required for this project. Please refer to Changes to the Plans No. 6 of this Addendum.

- 7. Question: Existing pavement and entrance at site have asphalt paving, drawings are calling for concrete paving. Please confirm this is desired?**

Response: Pavement at entrance will be concrete pavement. Existing asphalt pavement will be milled and overlaid. Please refer to Changes to the Plans Nos. 3 and 5 of this Addendum.

- 8. Question: Can asphalt paving detail be provided for repairs need in the parking lot after SS installation?**

Response: Thickness of the parking lot asphalt pavement and subgrade are identified in the corresponding pay items in the bid form. Refer to SAWS Specification 804 for payment limits for sanitary sewer backfill and pavement installation over sanitary sewer. All pavement cuts are to be neat sawcut lines and all pavements shall be sawcut prior to excavation per item 56 of the General Notes on sheet G3.

- 9. Question: Does parking lot need to be re-striped by the contractor? Please provide specification if so.**

Response: Contractor to restore existing pavement striping per City of San Antonio standards. Please refer to Changes to the Plans No. 12 of this Addendum.

- 10. Question: Does the tank piping that is to be recoated need a blast preparation? If so, please provide degree of blast.**

Response: Tank piping will be blast cleaned. Please refer to Changes to the Specifications No. 5 of this Addendum.

- 11. Question: What flowrate is existing manhole receiving currently?**

Response: Maximum flow rate on existing main is 445 GPM. Please refer to Changes to the Plans No. 4 of this Addendum.

- 12. Question: Sheet G9 states to install a new recycled water control valve and backflow preventer. Sheet C1 points to the same location and states altitude valve and slab to remain. Please advise.**

Response: The altitude valve will be replaced and the slab will remain. Please refer to Changes to the Plans No. 2 of this Addendum.

- 13. Question: There is a unit price for flowable fill, but we have not seen in on the drawings, please clarify where this is to be used.**

Response: Flowable fill is to be installed as secondary backfill between stations 1+00 and 3+65 of the proposed sanitary sewer main. Please refer to Changes to the Plans No. 4 of this Addendum.

- 14. Question: Sheet E-05 – There is an oil containment pit shown and called out at the CPS transformer pad, but is not shown anywhere else. Please verify there is one, and if so, please provide details.**

Response: Please refer to the response for question 6.

- 15. Question: There is a lot of asphalt replacement but no asphalt section details to go off of (ex. A stone layer, tie in, etc.) Please provide details for the asphalt.**

Response: Clarification has been added to Sheets C3 and C12 regarding asphalt replacement and the existing pavement section. Please refer to Changes to the Plans Nos. 3 and 5 of this Addendum.

- 16. Question: There are discrepancies between 1-line diagram E08, SWBD-P-2 showing 4 - (3) 500KCMIL + #1/0 AWG (GND), 3" C and ductbank section 5, 4, 2 & 1 on E06 showing to have (2) 4" conduit with (2) 4" spares. Please review and revise.**

Response: Sheet E-08 cable/conduit description has been changed to a 4-inch conduit. Ductbank sections 1, 2, 4, & 5 will replace the SPARE 4-inch conduits to read SWBD1-P-2C and SWBD-P-2D. Please refer to Changes to the Plans No. 9 of this Addendum.

- 17. Question: It has been our experience that SAWS normally require intrusion detection for the electrical rooms, the plans do not reflect any. Please review and revise if required.**

Response: Intrusion detection will not be a requirement for this project.

- 18. Question: Sheet E-09 conduit DP-BAR-1 from transformer XMFR-BAR-1 to panel DP-BAR-1 is showing to be in a 1-1/4" conduit, this does not meet the conduit fill requirement. Please review and revise.**

Response: This conduit should be a 2-inch C. Please refer to Changes to the Plans No. 10 of this Addendum.

- 19. Question: Circuit from TIT-051 to PLC is not shown on the plans or interconnect diagram. Please review and revise.**

Response: Furnish and install 1 - #16TSP in 3/4"-inch C from TIT-051 to PLC-BAR. Please refer to Changes to the Plans No. 8 of this Addendum.

- 20. Question: Please provide electric heat tracing specifications.**

Response: 40 41 00 – Electrical Heat Trace has been added to the Specifications and attached to this Addendum. Please refer to Changes to the Specifications No. 6 of this Addendum.

- 21. Question: HSP-101-P-1 feeder shown on E09 does not specify the wiring required. Please review and revise.**

Response: The required wiring is 3/3C #10 AWG + #10 AWG (GND). Please refer to Changes to the Plans No.10 of this Addendum.

- 22. Question: What size Temporary Generator will be required?**

Response: This question will be addressed in the next addendum.

- 23. Question: Referencing E-06 and E-16 through E-18: The ductbank schedules do not match the interconnect diagrams. Please verify and revise. i.e., DB 3 is missing conduit/circuit C-E-18-H1 from the GST.**

Response: This question will be addressed in the next addendum.

- 24. Question: Would SAWS consider making the Cathodic Protection an allowance since the design has not been done and the materials/installation requirements are still unknown until approved design?**

Response: This question will be addressed in the next addendum.

- 25. Question: What is SAWS wanting protected by the cathodic protection, the specifications do not give specifics on start/stop locations?**

Response: This question will be addressed in the next addendum.

CHANGES TO THE SPECIFICATIONS

1. Revision to Invitation to Bidders

- a. Replace first paragraph with the following:

“Sealed bids are requested by the San Antonio Water System for the rehabilitation of the ground storage tank and pump station located at Brooks City Base as included in the Contract Documents for the Brooks Recycled Water Pump Station Upgrades Project, SAWS Job No. 21-8601.”
- b. Revise the first sentence of the 7th paragraph to read as follows:

“**Bids will be received either Electronically or through Sealed bids, until 10:00 AM (CDT), October 12, 2023.**”
- c. Revise the last paragraph to read as follows:

“If Bidders intend to submit bids electronically, Bidders will need to submit a request by **October 11, 2023 at 10:00 AM (CDT)** to receive access to the File Transfer Protocol (FTP) site via email to Janie.Powell@saws.org. Bidder’s email requesting access to the FTP site shall provide the legal name of Bidder’s company and the intended recipient’s email address and phone number. No requests for FTP site access will be accepted after **October 11, 2023 at 10:00 AM (CDT).**”

2. Revision to Electronic Bid Opening Instructions

- a. Revise the header to read:

“**October 12, 2023 at 10:00 am**”
- b. Revise the 1st paragraph to read:

“In order to receive electronic bids for this project, SAWS will utilize a SAWS secured File Transfer Protocol (FTP) site. Only Bidders bidding as Prime Contractors will need to submit their request prior to 10:00 a.m. (CDT) **October 11, 2023**, to receive access to the FTP site via email to Janie.Powell@saws.org. Bidder’s email shall provide the legal name of the Bidder’s company and the intended recipient’s email address and phone number. No requests for FTP site access will be accepted after **10:00 a.m. (CDT) October 11, 2023**. Once a Bidder is approved for access, an email with a hyperlink to the FTP site and a unique password for the Bidder will be provided to the Bidder’s email recipient.”
- c. Revise the 2nd paragraph to read:

“Once access is received, Bidders may upload the required documents per the Bid Proposal checklist any time before **10:00 am (CDT), October 12, 2023**. Please ensure to allow sufficient time should Bidder’s experience technical difficulties in uploading the required documents. No changes to the Bid nor bid price can be made once the Bid has been received by SAWS.”

3. Revision to Technical Specification 01120 Sequence of Construction

- a. 3.04.A, Phase I, Part K. – Remove and replace as follows:

“k. Construct transformer slab.”

4. Revision to Technical Specification 01500 Construction Facilities and Temporary Controls

- a. 1.09.A – Remove and replace as follows:

“A. A field office is not required for this project.”

5. Revision to Technical Specification 09902 Pipe Coatings

- a. 3.02.J – Add new section J as follows:

“J. Steel and Ductile Iron Piping: Commercial Blast Cleaning per SSPC-SP6, NACE 3.”

6. Insert Technical Specification 40 41 00 Electrical Heat Trace as attached (5 Pages)

7. Revision to Technical Specification 40 61 21 (Process Control System – Testing)

- a. Article 1.01-J, add paragraph “7.” as follows:
“7. Test Procedures.”
- b. Article 3.02-L, remove and replace the last sentence with the following:
“Prior to the ORT, the PCSI shall submit updated PLC and HMI programs to SAWS for review and loading into the “Sandbox” a minimum of 2 weeks prior to the requested ORT date(s).”
- c. Article 3.04-F, add paragraph “14.” as follows:
“14. Test all alarm and historian points to verify proper functionality.”
- d. Add Attachment 40 61 21 A.2 - SAWS Standard Test Procedure as attached. (4 pages)

8. Revision to Technical Specification Section 40 61 93 (Process Control System – Input/Output List).

- a. Add Attachment 40 61 93A - Attachment A - Input Output List as attached. (4 pages)

9. Revision to Technical Specification Section 40 63 00 (PLC Hardware and Software)

- a. Article 2.01-H.9, delete without replacement.
- b. Article 2.02-B.1, remove and replace with the following: 1. Allen Bradley 5069 CompactLogix.”
- c. Article 2.02-C, remove the entire table and replace with the following:

Description	Manufacturer	Part Number
Power Supply Module	Allen Bradley	5069 (Integrated)
CPU (Processor)	Allen Bradley	5069-L330ERM & 5069-RTB64-SCREW (minimum, CPU shall be sized by CONTRACTOR)
16 Channel Digital Input Module	Allen Bradley	5069-IB16 & 5069-RTB18-SCREW
16 Channel Digital Output Module	Allen Bradley	5069-OB16 & 5069-RTB18-SCREW
8 Channel Analog Input Module	Allen Bradley	5069-IF8 & 5069-RTB18-SCREW
4 Channel Analog Input Module	Allen Bradley	5069-IY4 & 5069-RTB18-SCREW
8 Channel Analog Output Module	Allen Bradley	5069-OF8 & 5069-RTB18-SCREW
Ethernet module for distributed I/O	Allen Bradley	5069-AENTR

- d. Article 2.02-D, remove the entire table and replace with the following:

Description	Manufacturer	Part Number
Feed-Through 32 Ch. Discrete IFM	Allen Bradley	1492-IFM40F
Feed-Through 8 Ch. Analog IFM	Allen Bradley	1492-AIFM8-3
Modbus/RS232/RS485 to Ethernet IP converter (Gateway Unit)	Red Lion	DA30D 0F 000000 000 SDxxxxxx SD Card CBLxxxxx Communications Cable and Adapter CRM0000 xxxxx xxxxx Expansion Module CRA000 BT3V0 00000 Replacement Battery

10. Revision to Technical Specification Section 40 67 63 - Uninterruptible Power Supplies

- a. Remove in its entirety and replace with the revised version attached. (14 pages)

11. Insert Technical Specifications Section 40 68 00 Applications Engineering Services as attached. (12 pages)

12. Revision to Technical Specification Section 40 70 00 (Field Instruments)

- a. Add Attachment 40 70 00 A, Field Instrument Schedule as attached. (2 pages)

CHANGES TO THE PLANS

1. Sheet G9 – Proposed Sequencing Plan

Remove and replace in its entirety with the attached sheet G9 – Proposed Sequencing Plan.

2. Sheet C1 – Civil & Mechanical Demolition Plan

Remove and replace in its entirety with the attached sheet C1 – Civil & Mechanical Demolition Plan.

3. Sheet C3 – Dimension Control, Paving, & Fencing Plan

Remove and replace in its entirety with the attached sheet C3 – Dimension Control, Paving, & Fencing Plan.

4. Sheet C9 – Sanitary Sewer Plan and Profile Sta. 1+00 to 4+00

Remove and replace in its entirety with the attached sheet C9 – Sanitary Sewer Plan and Profile Sta. 1+00 to 4+00.

5. Sheet C12 – General Details (Sheet 2 of 3)

Remove and replace in its entirety with the attached sheet C12 – General Details (Sheet 2 of 3)

6. Sheet E-05 – Electrical Site Plan

Remove and replace in its entirety with the attached sheet E-05 – Electrical Site Plan

7. Sheet E-06 – Electrical Ductbank Section Details

Remove and replace in its entirety with the attached sheet E-06 – Electrical Ductbank Section Details

8. Sheet E-07 – Electrical Room Power Plan

Remove and replace in its entirety with the attached sheet E-07 – Electrical Room Power Plan

9. Sheet E-08 – One Line Diagram I

Remove and replace in its entirety with the attached sheet E-08 – One Line Diagram I

10. Sheet E-09 – One Line Diagram II

Remove and replace in its entirety with the attached sheet E-09 – One Line Diagram II

11. Sheet E-17 – Interconnect II

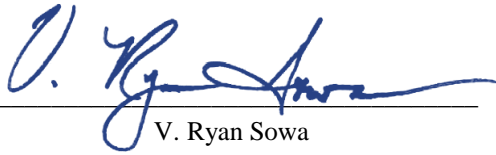
Remove and replace in its entirety with the attached sheet E-17 – Interconnect II

12. Sheet TCP1 – Parking Lot Traffic Sequencing

Remove and replace in its entirety with the attached sheet TCP1 – Parking Lot Traffic Sequencing.

END OF ADDENDUM

This Addendum, including these seven (7) pages, is sixty (60) pages with attachments in its entirety.



V. Ryan Sowa
Kimley-Horn & Associates



Attachments:

- 40 41 00 – Electrical Heat Trace
- 40 61 21 A – SAWS Standard Test Procedure
- 40 61 93A – Attachment A – Input Output List
- 40 67 63 – Uninterruptible Power Supplies
- 40 68 00 – Applications Engineering Services
- 40 70 00A – Attachment A – Field Instrument Schedule
- Sheet G9 – Proposed Sequencing Plan
- Sheet C1 – Civil & Mechanical Demolition Plan
- Sheet C3 – Dimension Control, Paving, & Fencing Plan
- Sheet C9 – Sanitary Sewer Plan and Profile Sta. 1+00 to 4+00
- Sheet C12 – General Details (Sheet 2 of 3)
- Sheet E-05 – Electrical Site Plan
- Sheet E-06 – Electrical Ductbank Section Details
- Sheet E-07 – Electrical Room Power Plan
- Sheet E-08 – One Line Diagram I
- Sheet E-09 – One Line Diagram II
- Sheet E-17 – Interconnect II
- Sheet TCP1 – Parking Lot Traffic Sequencing

SECTION 40 41 00
ELECTRICAL HEAT TRACING

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required to design, furnish, and install electrical heat trace systems on the piping as shown on the Drawings and as specified herein.
- B. The manufacturer shall design and supply the entire heating system, including the schematic arrangements, heating cable, junction boxes, thermostats, and other equipment necessary to complete the system, as shown on the Drawings and as specified herein.
- C. The Engineer's piping drawings, piping line list, equipment list, instrument list, and insulation schedule constitute, in conjunction with this Section, the design parameters of the heat tracing system. The Drawings are intended only to give a general layout of the heat tracing system. Circuit layouts are not intended to show the number of fittings or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation a complete electric heat tracing system, based on the actual piping installation, the manufacturer's installation drawings, and recommendations for operating temperature settings.

1.2 RELATED WORK

- A. Section 26 00 00, Electrical General Provisions.
- B. Section 26 05 29, Hangers and Supports for Electrical Systems.
- C. Section 26 05 33.13, Conduit for Electrical Systems.
- D. Section 26 05 33.16, Pull and Junction Boxes for Electrical Systems.
- E. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables.
- F. Mechanical Division Piping.
- G. Mechanical Division Pipe Hangers and Supports.

1.3 SUBMITTALS

- A. Submit to the Engineer, in accordance with Division 1, Section 26 00 00 and as specified herein, the following calculations and information:
 - 1. Heat loss and operating power calculations.
 - 2. Heat tracing circuit design and loading schedule.
 - 3. Bill of materials.
 - 4. Catalog data sheets for all components.
 - 5. Typical installation details.
- B. Submit the heat tracing system's power requirements for the design condition (extreme minimum ambient at required maintain temperature) and for the normal operating temperature (normally expected minimum ambient).
- C. Submit the heat tracing system's GFCI breaker rating for overcurrent and ground fault protection.
- D. Provide literature detailing routine maintenance requirements (if any) for each heat trace design including the following.
 - 1. System specifications.
 - 2. Application considerations.

3. Assembly and installation procedures.
4. Power-up and Power-down procedures.
5. Recommended spare parts list.

1.4 REFERENCE STANDARDS

- A. All products and components shown on the Drawings and listed in this specification shall be designed and manufactured according to latest revision of the following standards (unless otherwise noted):
 1. NFPA 70 – National Electrical Code (NEC).
 2. NFPA 70E – Standard for Electrical Safety in the Workplace.
 3. American National Standards Institute (ANSI).
 4. Institute of Electrical and Electronics Engineers (IEEE).
 5. American Society for Testing and Materials (ASTM).
 6. National Fire Protection Association (NFPA).
 7. National Electric Code (NEC).
 8. Factory Mutual (FM).
 9. Underwriters Laboratories (UL).
 10. National Electrical Manufacturers Association (NEMA).
 11. Occupational Safety and Health Administration (OSHA).
- B. All equipment components and completed assemblies specified in this section of the Specifications shall bear the appropriate label of Underwriters Laboratories.

1.5 QUALITY ASSURANCE

- A. The manufacturer of this equipment shall have produced similar equipment for a minimum period of five years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided, demonstrating compliance with this requirement.
- B. All heat tracing equipment furnished under this Section shall be supplied by a single manufacturer.
- C. All components and material shall be new and of the latest field-proven design and in current production. Obsolete components or components scheduled for immediate discontinuation shall not be used.
- D. Acceptable Manufacturers
 1. Raychem.
 2. Emerson
 3. TPC Wire and Cable
 4. Chromalox
 5. King-Electric
- E. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features, and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prior to jobsite delivery, the Contractor shall have successfully completed all submittal requirements, and present to the Owner/Engineer upon delivery of the equipment, an approved copy of all such submittals. Delivery of incomplete constructed equipment, on-site factory work, or failed factory tests will not be permitted.

- B. Protect equipment during shipment, handling, and storage by suitable means. Protect equipment from exposure to the elements and keep thoroughly dry.
- C. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Repaint damaged painted surfaces to the satisfaction of the Owner/Engineer.
- D. Where space heaters are provided in equipment, provide temporary electrical power and operate space heaters during storage, and after equipment is installed in permanent location, until equipment is placed in service.

1.7 WARRANTY

- A. Provide warranty per Division 01, Warranties and Bonds, and as specified herein.
- B. The Manufacturer shall warrant the equipment and design to be free from defects in material and workmanship for two years from and after the date of the Conditional Letter of Acceptance. Within such period of warranty, the Manufacturer shall promptly furnish all material and labor necessary to return the equipment to new operating condition. Any warranty work requiring shipping or transporting of the equipment shall be performed by the Contractor at no expense to the Owner.

1.8 AREA CLASSIFICATION

- A. Supply a heat trace system that is suitable for the specified industrial and electrical area classification and shall be designed and installed in accordance with the latest local and/or NEC regulations.

1.9 DESIGN REQUIREMENTS

- A. Provide a heating system capable of maintaining the specified temperature during the lowest extreme of ambient temperature.
- B. Design Parameters
 - 1. Maintain a minimum temperature for the pipe as recommended and/or specified within other Divisions; if not specified, use 50-degree F.
 - 2. Use a minimum ambient temperature as specified within other Divisions; if not specified, use 10-degree F.
 - 3. Refer to the piping Drawings and equipment lists for insulation types and thicknesses in the Mechanical Division and on the Drawings.
- C. Heat losses shall be calculated using the manufacturer's standard procedure in conjunction with the insulation requirements and equipment schedules. The design heat output of the tracing shall include a 10 percent factor of safety. Contractor is encouraged to suggest changes in insulation thickness to optimize total system economy.
- D. Instrumentation sample lines located outdoor shall be heat traced. Drain lines are to be heat traced only when indicated on the Drawings.

PART 2 - PRODUCTS

2.1 GENERAL

Only Self-Regulating types of heat tracing will be approved by the Engineer/Owner. The self-regulating heat trace cable shall be capable of operational temperature ranges over 150 degrees F, be energy efficient, very reliable, and have built-in power characteristics that allow power consumption to decrease as the ambient temperature or fluid temperature increases.

- A. Cable Outer Jacket
 - 1. The outer jacket of the heat trace cable shall be rated for exposure to organic chemicals and strong corrosives.

B. Electrical Ratings

1. The cable shall operate on the voltage indicated on the Drawings; if not indicated on Drawings, then 120 volts AC shall be used. Line voltage fluctuations shall not appreciably affect the cable wattage output.
2. The self-regulating cable wattage per foot (W/Ft) ratings shall be rated between 10 W/Ft to 20 W/Ft.

C. Self-Regulating Cable - General

1. The heat trace design shall be such that it can vary its output in response to temperature variations along a pipe due to heat sinks such as fittings or pipe supports, or changes in ambient conditions such as those occurring on pipes passing into or out of buildings or process areas. This variable output feature shall apply to each increment of the heat trace independent of each other increment.
2. Heat tracing shall be of a type which can be field cut to length without any cold spots and can be overlapped at all power outputs without burning out.
3. The heat tracing shall be capable of continuous reliable operation when hanging loose in free air during equipment removal or replacement.
4. The cable shall not require the use of heat transfer cement or compounds.
5. Heat tracing shall be a type which can be field designed to accommodate changes in field piping without compromising its FM or UL approvals.

D. Heat Trace Components

1. Power Connection
 - a. Supply a NEMA 4X, 316 stainless steel heat trace junction box in close proximity to the pipe (sample line) to be heat traced. The heat trace junction box shall contain necessary devices (terminals, DIN, end anchors, etc.) rated for the voltage and amperage of the heat trace design.
 - 1) The enclosure supports for the heat trace junction box shall be in accordance with Section 26 05 29, Hangers, and Supports for Electrical Systems.
 - b. Supply necessary cord grip for the type TC-ER power cable to be connected to the heat trace junction box.
 - c. Supply an insulation entry kit to allow the type TC-ER power cable to enter the insulation clad material, such as Raychem IEK-25-04 or equal.
 - d. Supply a low-profile power connection kit to connect the type TC-ER power cable to the heat trace circuit, such as Raychem C-150-E part #073704-000 or equal.
2. Supply an End Seal to terminate the heat trace cable, low profile such as Raychem E-150-E part #979099-000 or equal.
3. Heat Trace Temperature Switch
 - a. Supply and install an adjustable temperature switch, with watertight aluminum enclosure, epoxy coating, and with external sensor. The external sensor shall be connected to the enclosure via a 1/2" NPT connection, the sensor shall be made from nickel plated metal.
 - b. The switch shall be SPDT and shall have a minimum rating of 15 amps for 125/250/480 Volts, for resistive loads.
 - c. The adjustable temperature shall be a minimum of 0 degree F to 100 degrees F. The division scale shall be at most 10 degrees F.
 - d. The manufacturer be United Electric Controls, model B100-120 or equal.
4. Splices and Tees are prohibited without written permission from the Engineer and Owner.
5. Pipe Straps

- a. Pipe straps are used to fix components such as heat trace cable, end seals, and other components to the pipe.
 - b. Pipe straps shall be 316 stainless steel and sized according to the pipe diameter and device to connect.
6. Fixing Tape
- a. Use standard glass cloth tape for carbon steel pipes such as Raychem GT-66 part #C77220-000 or equal.
 - b. Use glass cloth tape with low halogen content for stainless steel pipes such as Raychem GS-54 part #C77221-000 or equal.
7. Protective grommet shall be used to protect the heating cable from mechanical damage, sharp edges and other hazards, such as Raychem G-02 part #412549-000 or equal.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Provide temporary wiring, connections, and services to maintain existing systems in service during construction.
- B. When work must be performed on energized equipment, circuits, or panels, use personnel experienced in such operations. Proper PPE, procedures, and signoffs must be obtained prior to beginning work; each facility may have unique requirements for working energized equipment.
- C. For all existing electrical services, maintain the existing system in service until new system is complete and ready for service. Disable the system only to make switchovers and connections. Obtain permission from Owner/Engineer at least one week in advance before partially or completely disabling any system.

3.2 APPLICATION

- A. Heat tracing system shall be installed where shown on the Drawings and in accordance with manufacturer's approved shop drawings and recommendations.

3.3 INSTALLATION

- A. Heat trace cables shall be run parallel to the pipe only. Spiral wrapping of the heat cables around the pipes will not be permitted.
- B. Power cables for heat tracing circuits running from the heat trace junction box to the sample pipe shall utilize type TC-ER cable.
- C. Install one "electrically traced line" warning sign along the outer pipe insulation jacket (clad), use Chemelex catalog number "ETL" or equal.

3.4 TESTING

- A. Measure the resistance of heating cable system before and after pipe insulation.
- B. Adjust and seal all openings at the outer pipe insulation jacket to Owner's and Engineer's satisfaction after installation is complete.
- C. With the heat trace over current protection device enabled, using a voltmeter measure the voltage and current at the heat trace junction box, record each reading as well as the outside ambient temperature, time, and date.

END OF SECTION

Project:
Date:

CONTROL SYSTEM AND I/O TEST



Test Procedure: (Step by Step)

Procedure Name: Fail to Start

#Step	Description	Date	Passed	Initial
1	Example: This procedure assumes the equipment is stopped (Tag_equipment_run=0), in Remote (Tag_equipment_remote=1), set point is 25% (Tag_Equipment_SP=25) Comments:			
2	Example: Set the Hardcoded Timer (Tag_Timer) to 30 Sec in PLC Comments:			
3	Example: From the process screen (Screen name) click the equipment symbol to open the equipment pop up. Click the start Push button Comments:			
4	Example: Do not force ON the equipment Run Status (Tag_equipment_run) Comments:			
5	Example: Verify the start contact (Tag_Start=1) is energized in the PLC. in the field, verify the start relay is de-energized Comments:			
6	Example: Verify fail to start time remaining count down from 30 to 0 sec. Comments:			
7	Example: Allow for the hardcoded Fail to start timer to expire in the PLC Comments:			
8	Example: From the equipment Pop up and alarm summary verify the fail to start alarm (Tag_equipment_fail_output) is active Comments:			
9	Example: Verify the Start contact is de-energized (Tag_Start=0) in the PLC. Verify the start relay is de-energized Comments:			
10	Example: From the Process Screen and equipment pop up, verify the equipment is not available for control Comments:			
11	Example: From the process screen click on equipment symbol to open the equipment pop up. Click the reset pushbutton Comments:			
12	Example: From the process screen and equipment pop up, verify the fail to start alarm is no longer active Comments:			
13	Example: from the process screen and equipment pop up, verify the equipment is now available for control Comments:			

Project:
Date:

CONTROL SYSTEM AND I/O TEST



IO Test:

Digital

	Tag name	Type	Description	PLC point			Date	Initial	Passed
				R	S	P			
1	Tag_Equipment_Start	DO	Equipment start command	1	1	1			
	Comment:								
2									
	Comment:								
3									
	Comment:								
4									
	Comment:								

Analog Input

	Tag name	Description	Type	Range	PLC point			Date	Initial	Passed
					R	S	P			
1	Tank_Level	Level of tank	AI	0-40 ft	1	3	1			
	4mA=		8mA=		12mA=		16mA=		20mA=	
	Comment:									
2			AI							
	4mA=		8mA=		12mA=		16mA=		20mA=	
	Comment:									
3			AI							
	4mA=		8mA=		12mA=		16mA=		20mA=	
	Comment:									

Analog Output

	Tag name	Type	Range	Description	PLC point			Date	Initial	Passed
					R	S	P			
1	Pump_Speed_SP	AO	0-2000 rpm	Set point of pump speed	1	4	1			
	Comment:									
2		AO								
	Comment:									
3		AO								
	Comment:									
4		AO								
	Comment:									

Com. (Modbus, RS232, RS 485,...)

	Tag name	R/W	Com. Type	Description	Range	Date	Initial	Passed
1	Flow_Meter_No1	R	M-RS485	Flow meter No.1	0-200 GPM			
	Comment:							
2								
	Comment:							
3								
	Comment:							
4								
	Comment:							

Project:
Date:

CONTROL SYSTEM AND I/O TEST



Comments:

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The results were satisfactory

The results were unsatisfactory

Test Witness:

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Contractor

.....

Owners Representative

.....

Date

Retest Witness: (if original test result were unsatisfactory)

.....

Contractor

.....

Owners Representative

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Date

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DWG No.	Instrument/ Equipment	PLC	IO Type	Description	HIGH		EU	Alarm Information (Priority)					Historical Info	
					On	Off		Alarm / Event	HI HI	HI	LO	LO LO	Update Rate (sec)	Historical Logging
					EU Range									
					Hi	Lo								
I-03	PLC_000	PLC-BAR	DI	PLC 120V POWER FAILURE	ALARM	NORMAL	N/A	Alarm (P3)	N/A	N/A	N/A	N/A	-	Y
I-03	PLC_000	PLC-BAR	DI	PLC 24V POWER SUPPLY 1 FAILURE	ALARM	NORMAL	N/A	Alarm (A1)	N/A	N/A	N/A	N/A	-	Y
I-03	PLC_000	PLC-BAR	DI	PLC 24V POWER SUPPLY 2 FAILURE	ALARM	NORMAL	N/A	Alarm (A1)	N/A	N/A	N/A	N/A	-	Y
I-03	PLC_000	PLC-BAR	AI	PLC CABINET TEMPERATURE	130	0	°F	Event	-	-	-	-	1	Y
I-03	PLC_000	PLC-BAR	DO	PLC COMMUNICATIONS FAILURE FOR DISPLAY	FAULT	NORMAL	N/A	Event	N/A	N/A	N/A	N/A	-	N
I-03	FLV_111	PLC-BAR	DO	GROUND STORAGE TANK POTABLE WATER FILL VALVE OPEN COMMAND	OPEN		N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	FLV_111	PLC-BAR	DO	GROUND STORAGE TANK POTABLE WATER FILL VALVE CLOSE COMMAND	CLOSE		N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	FLV_111	PLC-BAR	DI	GROUND STORAGE TANK POTABLE WATER FILL VALVE COMPUTER STATUS	COMP	MANUAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	INV_500	PLC-BAR	DO	GROUND STORAGE TANK INLET VALVE OPEN COMMAND	OPEN		N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	INV_500	PLC-BAR	DO	GROUND STORAGE TANK INLET VALVE CLOSE COMMAND	CLOSE		N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	INV_500	PLC-BAR	DI	GROUND STORAGE TANK INLET VALVE COMPUTER STATUS	COMP	MANUAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER VOLTS A/B	1000	0	V	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER VOLTS B/C	1000	0	V	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER VOLTS C/A	1000	0	V	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER VOLTS A	1000	0	V	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER VOLTS B	1000	0	V	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER VOLTS C	1000	0	V	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER VOLTS N	1000	0	V	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER VOLTS AVERAGE	1000	0	V	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER UNBALANCE VOLTAGE	100	0	%	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER CURRENT A	1500	0	A	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER CURRENT B	1500	0	A	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER CURRENT C	1500	0	A	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER CURRENT N	1500	0	A	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER CURRENT AVERAGE	1500	0	A	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER UNBALANCE CURRENT	1500	0	A	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER THREE PHASE POWER FACTOR	1	0	λ	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER THREE PHASE K FACTOR	10	0	λ	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER ACTIVE POWER	1000	0	kW	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER REACTIVE POWER	1000	0	kVAR	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER ACTIVE ENERGY	24000	0	kWh	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER REACTIVE ENERGY	24000	0	kVARh	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER APPARENT POWER	1000	0	kVA	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER APPARENT ENERGY	24000	0	kVAh	Event	-	-	-	-	1	N
I-02	PQM_000	PLC-BAR	EAI	BROOKS PUMP STATION POWER QUALITY METER FREQUENCY	60	0	Hz	Event	-	-	-	-	1	N
I-03	PIT_021	PLC-BAR	DO	HIGH SERVICE PUMP STATION DISCHARGE PRESSURE HIGH FOR DISPLAY	HIGH	NORMAL	N/A	Event	N/A	N/A	N/A	N/A	1	N
I-03	PIT_021	PLC-BAR	DO	HIGH SERVICE PUMP STATION DISCHARGE PRESSURE LOW FOR DISPLAY	LOW	NORMAL	N/A	Event	N/A	N/A	N/A	N/A	1	N
I-03	PIT_021	PLC-BAR	AI	HIGH SERVICE PUMP STATION DISCHARGE PRESSURE	120	0	PSI	Alarm (P3)	120	105	85	40	1	Y
I-03	TIT_051	PLC-BAR	AI	ELECTRICAL BUILDING ROOM TEMPERATURE	130	0	DEG F	Event	N/A	N/A	N/A	N/A	1	Y
I-03	DSV_101	PLC-BAR	DI	HIGH SERVICE PUMP 101 DISCHARGE VALVE OPEN STATUS	OPEN	NOT OPEN	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	DSV_101	PLC-BAR	DI	HIGH SERVICE PUMP 101 DISCHARGE VALVE CLOSED STATUS	CLOSED	NOT CLOSED	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	DSV_101	PLC-BAR	DI	HIGH SERVICE PUMP 101 DISCHARGE VALVE COM/MAN STATUS	COMP	MANUAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	DSV_102	PLC-BAR	DI	HIGH SERVICE PUMP 102 DISCHARGE VALVE OPEN STATUS	OPEN	NOT OPEN	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	DSV_102	PLC-BAR	DI	HIGH SERVICE PUMP 102 DISCHARGE VALVE CLOSED STATUS	CLOSED	NOT CLOSED	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	DSV_102	PLC-BAR	DI	HIGH SERVICE PUMP 102 DISCHARGE VALVE COM/MAN STATUS	COMP	MANUAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	DSV_103	PLC-BAR	DI	HIGH SERVICE PUMP 103 DISCHARGE VALVE OPEN STATUS	OPEN	NOT OPEN	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	DSV_103	PLC-BAR	DI	HIGH SERVICE PUMP 103 DISCHARGE VALVE CLOSED STATUS	CLOSED	NOT CLOSED	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	DSV_103	PLC-BAR	DI	HIGH SERVICE PUMP 103 DISCHARGE VALVE COM/MAN STATUS	COMP	MANUAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	DSV_104	PLC-BAR	DI	HIGH SERVICE PUMP 104 DISCHARGE VALVE OPEN STATUS	OPEN	NOT OPEN	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	DSV_104	PLC-BAR	DI	HIGH SERVICE PUMP 104 DISCHARGE VALVE CLOSED STATUS	CLOSED	NOT CLOSED	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	DSV_104	PLC-BAR	DI	HIGH SERVICE PUMP 104 DISCHARGE VALVE COM/MAN STATUS	COMP	MANUAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	DSV_105	PLC-BAR	DI	JOCKEY PUMP 105 DISCHARGE VALVE OPEN STATUS	OPEN	NOT OPEN	N/A	Event	N/A	N/A	N/A	N/A	-	Y

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DWG No.	Instrument/ Equipment	PLC	IO Type	Description	HIGH		EU	Alarm Information (Priority)					Historical Info	
					On	Off		Alarm / Event	HI HI	HI	LO	LO LO	Update Rate (sec)	Historical Logging
					EU Range									
					Hi	Lo								
I-03	DSV_105	PLC-BAR	DI	JOCKEY PUMP 105 DISCHARGE VALVE CLOSED STATUS	CLOSED	NOT CLOSED	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	DSV_105	PLC-BAR	DI	JOCKEY PUMP 105 DISCHARGE VALVE COM/MAN STATUS	COMP	MANUAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_101	PLC-BAR	DI	HIGH SERVICE PUMP 101 RUN STATUS	RUNNING	OFF	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_101	PLC-BAR	DI	HIGH SERVICE PUMP 101 COM/MAN STATUS	COMP	MANUAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_101	PLC-BAR	DI	HIGH SERVICE PUMP 101 FAULT	FAULT	NORMAL	N/A	Alarm (P3)	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_101	PLC-BAR	DI	HIGH SERVICE PUMP 101 VFD BYPASS	BYPASS	NORMAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_101	PLC-BAR	DO	HIGH SERVICE PUMP 101 START COMMAND	START		N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_101	PLC-BAR	DO	HIGH SERVICE PUMP 101 STOP COMMAND	STOP		N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_101	PLC-BAR	AI	HIGH SERVICE PUMP 101 CURRENT FEEDBACK	250	0	Amp	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_101	PLC-BAR	AI	HIGH SERVICE PUMP 101 SPEED FEEDBACK	100	0	%	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_101	PLC-BAR	AO	HIGH SERVICE PUMP 101 SPEED COMMAND	100	0	%	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_102	PLC-BAR	DI	HIGH SERVICE PUMP 102 RUN STATUS	RUNNING	OFF	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_102	PLC-BAR	DI	HIGH SERVICE PUMP 102 COM/MAN STATUS	COMP	MANUAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_102	PLC-BAR	DI	HIGH SERVICE PUMP 102 FAULT	FAULT	NORMAL	N/A	Alarm (P3)	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_102	PLC-BAR	DI	HIGH SERVICE PUMP 102 VFD BYPASS	BYPASS	NORMAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_102	PLC-BAR	DO	HIGH SERVICE PUMP 102 START COMMAND	START		N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_102	PLC-BAR	DO	HIGH SERVICE PUMP 102 STOP COMMAND	STOP		N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_102	PLC-BAR	AI	HIGH SERVICE PUMP 102 CURRENT FEEDBACK	250	0	Amp	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_102	PLC-BAR	AI	HIGH SERVICE PUMP 102 SPEED FEEDBACK	100	0	%	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_102	PLC-BAR	AO	HIGH SERVICE PUMP 102 SPEED COMMAND	100	0	%	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_103	PLC-BAR	DI	HIGH SERVICE PUMP 103 RUN STATUS	RUNNING	OFF	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_103	PLC-BAR	DI	HIGH SERVICE PUMP 103 COM/MAN STATUS	COMP	MANUAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_103	PLC-BAR	DI	HIGH SERVICE PUMP 103 FAULT	FAULT	NORMAL	N/A	Alarm (P3)	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_103	PLC-BAR	DI	HIGH SERVICE PUMP 103 VFD BYPASS	BYPASS	NORMAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_103	PLC-BAR	DO	HIGH SERVICE PUMP 103 START COMMAND	START		N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_103	PLC-BAR	DO	HIGH SERVICE PUMP 103 STOP COMMAND	STOP		N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_103	PLC-BAR	AI	HIGH SERVICE PUMP 103 CURRENT FEEDBACK	150	0	Amp	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_103	PLC-BAR	AI	HIGH SERVICE PUMP 103 SPEED FEEDBACK	100	0	%	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_103	PLC-BAR	AO	HIGH SERVICE PUMP 103 SPEED COMMAND	100	0	%	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_104	PLC-BAR	DI	HIGH SERVICE PUMP 104 RUN STATUS	RUNNING	OFF	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_104	PLC-BAR	DI	HIGH SERVICE PUMP 104 COM/MAN STATUS	COMP	MANUAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_104	PLC-BAR	DI	HIGH SERVICE PUMP 104 FAULT	FAULT	NORMAL	N/A	Alarm (P3)	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_104	PLC-BAR	DI	HIGH SERVICE PUMP 104 VFD BYPASS	BYPASS	NORMAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_104	PLC-BAR	DO	HIGH SERVICE PUMP 104 START COMMAND	START		N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_104	PLC-BAR	DO	HIGH SERVICE PUMP 104 STOP COMMAND	STOP		N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_104	PLC-BAR	AI	HIGH SERVICE PUMP 104 CURRENT FEEDBACK	150	0	Amp	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_104	PLC-BAR	AI	HIGH SERVICE PUMP 104 SPEED FEEDBACK	100	0	%	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_104	PLC-BAR	AO	HIGH SERVICE PUMP 104 SPEED COMMAND	100	0	%	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_105	PLC-BAR	DI	JOCKEY PUMP 105 RUN STATUS	RUNNING	OFF	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_105	PLC-BAR	DI	JOCKEY PUMP 105 COM/MAN STATUS	COMP	MANUAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_105	PLC-BAR	DI	JOCKEY PUMP 105 FAULT	FAULT	NORMAL	N/A	Alarm (P3)	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_105	PLC-BAR	DI	JOCKEY PUMP 105 VFD BYPASS	BYPASS	NORMAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_105	PLC-BAR	DO	JOCKEY PUMP 105 START COMMAND	START		N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_105	PLC-BAR	DO	JOCKEY PUMP 105 STOP COMMAND	STOP		N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_105	PLC-BAR	AI	JOCKEY PUMP 105 CURRENT FEEDBACK	90	0	Amp	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_105	PLC-BAR	AI	JOCKEY PUMP 105 SPEED FEEDBACK	100	0	%	Event	N/A	N/A	N/A	N/A	-	Y
I-03	HSP_105	PLC-BAR	AO	JOCKEY PUMP 105 SPEED COMMAND	100	0	%	Event	N/A	N/A	N/A	N/A	-	Y
I-03	LSL_500	PLC-BAR	DI	GROUND STORAGE TANK LEVEL LOW	ALARM	NORMAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	PSL_101	PLC-BAR	DI	HIGH SERVICE PUMP 101 SUCTION PRESSURE LOW	ALARM	NORMAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	PSL_102	PLC-BAR	DI	HIGH SERVICE PUMP 102 SUCTION PRESSURE LOW	ALARM	NORMAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	PSL_103	PLC-BAR	DI	HIGH SERVICE PUMP 103 SUCTION PRESSURE LOW	ALARM	NORMAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	PSL_104	PLC-BAR	DI	HIGH SERVICE PUMP 104 SUCTION PRESSURE LOW	ALARM	NORMAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y

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DWG No.	Instrument/ Equipment	PLC	IO Type	Description	HIGH		EU	Alarm Information (Priority)					Historical Info	
					On	Off		Alarm / Event	HI HI	HI	LO	LO LO	Update Rate (sec)	Historical Logging
					EU Range									
					Hi	Lo								
I-03	PSL_105	PLC-BAR	DI	JOCKEY PUMP 105 SUCTION PRESSURE LOW	ALARM	NORMAL	N/A	Event	N/A	N/A	N/A	N/A	-	Y
I-03	FIT_101	PLC-BAR	EAI	HIGH SERVICE PUMP 101 DISCHARGE FLOW		0	MGD	Event	1.51	1.44	0.54	0.5	1	Y
I-03	FIT_101	PLC-BAR	EDI	HIGH SERVICE PUMP 101 DISCHARGE FLOW TOTAL	-	0	MG	Event	-	-	-	-	1	Y
I-03	FIT_101	PLC-BAR	EDI	HIGH SERVICE PUMP 101 DISCHARGE FLOWMETER FAULT	ALARM	NORMAL	N/A	Alarm (P3)	N/A	N/A	N/A	N/A	-	Y
I-03	FIT_102	PLC-BAR	EAI	HIGH SERVICE PUMP 102 DISCHARGE FLOW		0	MGD	Event	1.51	1.44	0.54	0.5	1	Y
I-03	FIT_102	PLC-BAR	EDI	HIGH SERVICE PUMP 102 DISCHARGE FLOW TOTAL	-	0	MG	Event	-	-	-	-	1	Y
I-03	FIT_102	PLC-BAR	EDI	HIGH SERVICE PUMP 102 DISCHARGE FLOWMETER FAULT	ALARM	NORMAL	N/A	Alarm (P3)	N/A	N/A	N/A	N/A	-	Y
I-03	FIT_103	PLC-BAR	EAI	HIGH SERVICE PUMP 103 DISCHARGE FLOW		0	MGD	Event	0.61	0.58	0.16	0.14	1	Y
I-03	FIT_103	PLC-BAR	EDI	HIGH SERVICE PUMP 103 DISCHARGE FLOW TOTAL	-	0	MG	Event	-	-	-	-	1	Y
I-03	FIT_103	PLC-BAR	EDI	HIGH SERVICE PUMP 103 DISCHARGE FLOWMETER FAULT	ALARM	NORMAL	N/A	Alarm (P3)	N/A	N/A	N/A	N/A	-	Y
I-03	FIT_104	PLC-BAR	EAI	HIGH SERVICE PUMP 104 DISCHARGE FLOW		0	MGD	Event	0.61	0.58	0.16	0.14	1	Y
I-03	FIT_104	PLC-BAR	EDI	HIGH SERVICE PUMP 104 DISCHARGE FLOW TOTAL	-	0	MG	Event	-	-	-	-	1	Y
I-03	FIT_104	PLC-BAR	EDI	HIGH SERVICE PUMP 104 DISCHARGE FLOWMETER FAULT	ALARM	NORMAL	N/A	Alarm (P3)	N/A	N/A	N/A	N/A	-	Y
I-03	FIT_105	PLC-BAR	EAI	JOCKEY PUMP 105 DISCHARGE FLOW		0	MGD	Event	0.173	0.167	0.036	0.026	1	Y
I-03	FIT_105	PLC-BAR	EDI	JOCKEY PUMP 105 DISCHARGE FLOW TOTAL	-	0	MG	Event	-	-	-	-	1	Y
I-03	FIT_105	PLC-BAR	EDI	JOCKEY PUMP 105 DISCHARGE FLOWMETER FAULT	ALARM	NORMAL	N/A	Alarm (P3)	N/A	N/A	N/A	N/A	-	Y
I-03	PIT_022	PLC-BAR	AI	GROUND STORAGE TANK INLET PRESSURE	150	0	PSI	Alarm (P3)	-	N/A	N/A	-	1	Y
I-03	LIT_500	PLC-BAR	AI	GROUND STORAGE TANK LEVEL GST_500	32	0	FT	Alarm (P2)	-	29	17	-	1	Y

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DWG No.	Instrument/ Equipment	PLC	IO Type	Description	HIGH		EU	Alarm Information (Priority)					Historical Info	
					On	Off		Alarm / Event	HI HI	HI	LO	LO LO	Update Rate (sec)	Historical Logging
					EU Range									
					Hi	Lo								

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SECTION 40 67 63
UNINTERRUPTIBLE POWER SUPPLIES

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This Section includes single-phase, double conversion and DC uninterruptible power supply (UPS) systems to be supplied by Process Control System Integrator (PCSI).
- B. PCSI shall provide labor, equipment, supervision, and materials for the installation, testing and start-up of the Uninterruptible Power Supply (UPS) as shown on the Drawings and as specified herein.
- C. Single Phase UPS
 - 1. Provide complete, factory-assembled, wired and tested, on-line double conversion UPS power system. UPS system(s) shall include, at a minimum, a rectifier, DC bus, inverter, battery charger, batteries, internal automatic bypass switch, external make-before-break maintenance bypass switch, and ancillary components as specified herein and as indicated on the drawings.
- D. DC UPS
 - 1. Provide complete, engineered on-line DC UPS power and battery system. UPS system(s) shall include, at a minimum, a rectifier, DC bus, battery charger, batteries, internal automatic bypass switch, and ancillary components as specified herein and as indicated on the drawings.
- E. Submit UPS sizing and runtime calculations as part of the submittal requirements of Section 40 61 00, Process Control and Instrumentation Systems - General Provisions.
- F. Furnish the following UPS and battery systems within PLC, UPS, and network enclosures as noted. Exact sizing shall be calculated by the PCSI and calculations shall be submitted to the ENGINEER for review and approval prior to equipment procurement.

UPS Tag/ Designation	Minimum Runtime	Input Power	Location
UPS-Brooks Pump Station PLC Panel	2 hours	24VDC	Inside the PLC panel on UPS stand
UPS-Brooks Pump Station Security Panel	2 hours	120VAC	Inside the Security panel (rack-mounted)

- G. The UPS systems shall consist of the following major components:
 - 1. Rectifier and battery charger.
 - 2. Inverter (AC UPS).
 - 3. Sealed maintenance-free batteries and battery disconnect switch.
 - 4. Automatic static bypass switch.
 - 5. Maintenance bypass switch (AC UPS).
 - 6. Integral control and monitoring.
 - 7. SNMP Ethernet port.
 - 8. Accessories needed for installation and electrical connections.
 - 9. Other features as described in this specification and as indicated on the Drawings.

1.2 RELATED DOCUMENTS

- A. Refer to Section 40 61 00, Process Control and Instrumentation Systems - General Provisions.
- B. Refer to Section 40 66 00, Network Equipment
- C. Refer to Section 40 67 00, Control Panels and Components.
- D. Refer to Section 28 20 00, Video Surveillance System for Security System requirements.

1.3 QUALITY ASSURANCE

- A. The manufacturer shall comply with ISO 9001 standards for "Quality Systems- Model for Quality Assurance in Design/Development, Production, Installation, and Servicing."
- B. UPS systems shall utilize a field-proven design. The UPS manufacturer shall demonstrate at least 5 years of continuous field operating experience with equipment of similar size and design.
- C. A factory-authorized service and parts organization shall be located within 300 miles of the project location. Submit the name and address of the factory-authorized service and parts organization. The manufacturer shall have a complete selection of service options that may include on-site service by factory-employed service engineers and factory depot quick-return service plan options.
- D. Equipment shall be UL or ETL labeled.
- E. The system shall meet or exceed the following theoretical Mean-Time-Between-Failures (MTBF):
 - 1. Single module UPS operation (represents UPS module operation only): 140,000 MTBF hours.

1.4 SUBMITTALS

- A. Refer to Division 01 for general submittal requirements.
- B. Refer to Section 40 61 00, Process Control and Instrumentation Systems - General Provisions.
- C. Product Data: For each type of UPS, include shop drawings and product data for the following:
 - 1. Product brochure.
 - 2. Bill of materials listing all components provided.
 - 3. Deviation list indicating all proposed exceptions.
 - 4. Power single-line and control schematics drawings of the proposed UPS system. All components, external connections, and their terminal block locations shall be fully detailed. All internal wiring shall include terminal numbers and color coding.
 - 5. Drawings of UPS mounting details, including stands, trays, or other required components for installation of each UPS unit.
 - 6. UPS performance specifications as follow:
 - a. kVA rating.
 - b. Input and output voltage and phase.
 - c. Run time at full and half load.
 - d. Voltage (output regulation, input tolerance, unbalance, transfer/retransfer voltage, etc.).
 - e. Heat rejection.
 - 7. Instruction and replacement parts manuals.
 - 8. Name, address, and telephone number of the nearest service facility.
 - 9. Battery specifications and warranty.

10. Battery sizing calculations.
- D. Operation and Maintenance Data: Provide literature detailing routine maintenance requirements (if any) for each UPS system.
1. System specifications.
 2. Electrical power requirements.
 3. Application considerations.
 4. Assembly and installation procedures.
 5. Power-up procedures.
 6. Programming procedures.
 7. Explanation of internal fault diagnostics.
 8. Shut-down procedures.
 9. Recommended spare parts list.
 10. Bill of Material and wiring schematics and components of each system
 11. Provide list of all configuration parameters and final settings

1.5 JOB CONDITIONS

- A. Not used.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver UPS components in packaging designed to prevent damage from static electricity and physical damage.
- B. Store UPS equipment according to manufacturer requirements. At a minimum, store indoors in clean, dry space with uniform temperature to prevent condensation. Protect PLCs from exposure to dirt, fumes, water, corrosive substances, moisture, chemicals, and physical damage. Also, protect the UPS from all forms of electrical and magnetic energy that could reasonably cause damage. Do not install the equipment in its final location until the facilities are permanently weather tight. Furnish, install, and wire temporary electric space heaters in the equipment until the permanent heating equipment is operational.

1.7 WARRANTY

- A. Battery: In addition to the basic warranty, the UPS manufacturer shall warrant the batteries for a period of 36 months from the date of equipment start-up or 42 months from date of receipt by end user, whichever occurs first.

1.8 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)
 1. C62.41/IEEE 587 - Surge Voltages In Low-voltage AC Power Circuits.
- B. Federal Communications Commission (FCC)
 1. FCC Part 15, Class A.
 2. FCC Part 15, Class B.
- C. International Electrotechnical Commission (IEC)
 1. IEC 62040-1: General and safety requirements for UPS.
 2. IEC 62040-2: Electromagnetic compatibility (EMC) requirements.
 3. IEC 62040-3: Method of specifying the performance and test requirements.

4. EN 60529: Equipment Protection.
- D. Institute of Electrical and Electronic Engineers (IEEE)
 1. 519 – IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.
 2. 1184 – IEEE Guide for Batteries for Uninterruptible Power Supply Systems.
 3. C62.41 – IEEE Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- E. International Organization for Organization (ISO)
 1. ISO 9001: Quality Management.
- F. National Fire Protection Association (NFPA)
 1. National Electric Code (NFPA-70).
- G. Underwriters Laboratories, Inc. (UL)
 1. UL 1778 – Standard for Uninterruptible Power Supply Systems and Equipment.

PART 2 - PRODUCTS

2.1 GENERAL

- A. External Battery Enclosure: A separate enclosure shall be provided for housing the additional batteries required to provide the minimum run time as specified. The battery enclosure shall match the main UPS enclosure in style and color. Additionally, external battery enclosures may be required by the Engineer, and shown on the Drawings.
- B. All cabling required to interconnect all components of the UPS system (including but not limited to the Maintenance Bypass Switch, external battery enclosure, etc.) shall be provided.
- C. Battery protection shall be provided an internal circuit breaker disconnect. Battery cabinets shall be protected by an internal circuit breaker.
- D. Current limiting circuitry shall protect the inverter output under any load condition. High speed semiconductor fusing shall protect the static bypass in the event of an output short circuit.
- E. The AC output neutral shall be electrically isolated from the UPS chassis. The UPS chassis shall have an equipment ground terminal. Provisions for installation of a bonding connector shall be provided.
- F. The UPS shall be suitable for installation at the location as shown on the Drawings.

2.2 AC DOUBLE CONVERSION UPS

- A. Performance Requirements
 1. Ratings
 - a. Output power: 120 VAC.
 - b. Battery runtime: Minimum of two hours at 100 percent connected load, unless listed otherwise on the UPS schedule.
 2. The UPS shall comply with the following requirements:
 - a. Environment
 - 1) Ambient temperature: 0 to 50 degrees C.
 - 2) Elevation: Up to 500 feet above mean sea level.

- 3) Relative humidity: 0 to 95 percent non-condensing.
 - 4) All UPS equipment shall be housed in a freestanding NEMA 1 enclosure(s). The enclosures shall line up and match in style and appearance.
 - 5) UPS shall be equipped with a forced air cooling fan system.
- b. System Input – Primary Source
- 1) Single input: 120 VAC or 240 VAC as listed in the UPS schedule.
 - 2) Frequency: 60 Hertz plus or minus 5 percent.
 - 3) Input Power Factor: 0.96 lag minimum, 50 to 100 percent load.
 - 4) Input Current Total Harmonic Distortion (THD) : <33 percent.
 - 5) Input Surge Withstandability: Per IEEE 587/ANSI C62.41. Category A and B, (6 kV).
 - 6) Crest Factor : 3:1.
- c. System Output
- 1) 120 VAC, 60 Hertz plus or minus 3 Hertz.
 - 2) AC output voltage distortion: Maximum 2 percent @ 100 percent linear load; maximum 5 percent @ 100 percent non-linear load.
 - 3) AC output static voltage regulation: +/-1 percent.
 - 4) AC output dynamic voltage regulation: +/- 8 percent maximum for 100 percent load step at less than 10 ms recovery time.
 - 5) Overload Rating:
 - a) Online: 105 percent - infinite; 125 percent - 1 minute; 150 percent - 30 seconds.
 - b) In bypass: Overload is limited by the UPS input circuit breaker.
 - 6) Output Power Factor Rating: 0.2-1.0 lagging, nominal: 0.7 lagging.
 - 7) Unless hardwired output connections are required by the UPS schedule or shown on the drawings, provide the following output receptacles (at a minimum):
 - a) 700-2,500 VA units: Provide a minimum of four NEMA Type 5-15R or Type 5-20R receptacles.
 - b) 3,000 VA units: Provide a minimum of four NEMA Type 5-20R receptacles. Provide at least one NEMA Type L5-30R receptacle.
 - c) Greater than 3,000 VA units: Provide a minimum of four NEMA Type 5-20R receptacles. Provide at least one NEMA Type L14-30R receptacle.
 - 8) Acoustical Noise: Noise generated by the UPS under normal operation shall not exceed 65 dBA (60 dBA typical) at 1 meter from any surface, measured at 25 degrees C (77 degrees F) and full load.
 - 9) EMI Suppression: The UPS shall meet FCC Rules and Regulation 47, Part 15, Subpart J, for Class A devices.
3. Controls
- a. UPS shall be equipped with the following minimum front-panel control pushbuttons:
 - 1) LCD Display
 - 2) UPS startup, shutdown, and manual bypass (for automatic bypass).
 - 3) Testing.
 - 4) Visual/audible alarms reset.

- b. Locally displayed system indicators shall include the following audible alarms during abnormal conditions:
 - 1) UPS fault or overload condition.
 - 2) Battery on.
 - 3) Low battery.
 - 4) Automatic bypass on/off.
 - 5) Input power on.
 - 6) Battery testing mode.

B. Modes of Operation

- 1. The UPS shall operate as a double conversion on-line, fully automatic system in the following modes:
 - a. Normal: The critical load shall be continuously supplied with filtered and regulated AC power by the inverter. The rectifier/battery chargers shall derive power from the preferred AC source and supply DC power to the inverter while simultaneously floats charging the batteries.
 - b. Emergency: Upon failure of the preferred AC power source, the critical load shall continue to be supplied by the inverter. Inverter power shall be supplied without switching from the storage battery. There shall be no interruption to the critical load upon failure or restoration of the preferred AC sources. If neither AC source can be restored before the battery discharges to its low voltage dropout value, the UPS shall automatically shut itself down in an orderly manner.
 - c. Recharge: Upon restoration of the preferred AC source, the rectifier/battery charger shall power the inverter and simultaneously recharges the batteries. This shall be an automatic function causing no interruption to the critical load.
 - d. Bypass Mode: The automatic bypass shall transfer the critical load to the commercial AC source, bypassing the UPS' inverter/rectifier, in the case of an overload, load fault, or internal failure.
 - e. Downgrade: If the batteries alone are taken out of service, they shall be disconnected by battery circuit breakers. The UPS shall continue to function and meet all of the performance criteria specified herein, except for the reserve time capability.

C. Components

- 1. Rectifier/Charger
 - a. The rectifier/charger shall recharge batteries to 90 percent in less than six hours.
 - b. The term rectifier/charger shall denote the solid-state equipment and controls necessary to convert incoming AC power to regulated DC power for input to the inverter and for battery charging. The rectifier/charger shall be a solid-state SCR/IGBT power transistor type with constant voltage/current limiting control circuitry
- 2. Inverter
 - a. The pulse-width AC output voltage shall be maintained to within plus or minus 4 percent.

- b. The inverter shall include all solid-state equipment and controls to convert DC power from the rectifier/charger or battery to a regulated AC power for powering the critical load. The inverter shall use Insulated Gate Bipolar Transistors (IGBTs) in a phase-controlled, pulse width modulated (PWM) design capable of providing the specified AC output.
 - c. The inverter shall be capable of supplying current and voltage for overloads exceeding 100 percent. The inverter is to provide 150 percent of full load for 1 second, 125 percent of full load for 10 seconds, and 110 percent of full load for two minutes. The UPS shall transfer the load to bypass when overload capacity is exceeded.
 - d. The output voltage total harmonic distortion shall not be greater than 5 percent for all loads. For 100 percent rated load of 3:1 crest factor nonlinear loads, the output voltage total harmonic distortion shall not be greater than 4 percent. The output rating shall not be derated in kVA or kW due to the 100 percent nonlinear load with 3:1 crest factor.
 - e. The inverter shall use software control to adjust the output voltage from plus or minus 5 percent of the nominal value.
3. Batteries and Runtime
- a. The batteries shall be Lithium-Ion or VRLA (valve-regulated lead-acid), sealed, maintenance-free, high-rate discharge, suitable for use indoors with no off gas emissions or water addition requirements. Batteries shall not require special ventilation. The battery shall consist of one or more battery banks with the number of cells required to meet the requirements of the rest of these specifications.
 - b. Battery Design Life: Five years.
 - c. Run time operation of the UPS shall be accomplished using batteries mounted within the UPS enclosure and supplemented as required with an external battery enclosure to provide the battery runtime specified.
4. Remote Alarms and Connectivity
- a. Remote alarm and status indication: Isolated SPDT Form C dry contacts shall be provided to indicate UPS status for remote monitoring. Contacts shall be rated for 250 VAC @ 5 A or 30 VDC @ 5 A. Individual contacts shall be provided for separate annunciation of the following alarm and status conditions:
 - 1) UPS On Battery Power.
 - 2) UPS Malfunction Alarm.
 - 3) UPS Low Battery Alarm.
 - b. Provide Ethernet port for remote monitoring and configuration.

D. Static Transfer Switch

- 1. A static transfer switch and bypass circuit shall be provided as an integral part of the UPS. The static switch shall be a naturally commutated high-speed static (SCR-type) device rated to conduct full load current continuously. The switch shall have an overload rating adequate to clear a 20-ampere load branch circuit breaker.
- 2. The static transfer switch control logic shall contain an automatic transfer control circuit that senses the status of the inverter logic signals and operating and alarm conditions. This control circuit shall provide an uninterrupted transfer of the load to an alternate bypass source, without exceeding the transient limits specified herein, when an overload or malfunction occurs within the UPS, or for bypassing the UPS for maintenance.

3. The transfer control logic shall automatically turn on the static transfer switch, transferring the critical AC load to the bypass source, after the transfer logic senses any of the following conditions:
 - a. Inverter overload.
 - b. Critical AC load over voltage or under voltage.
 - c. Battery protection period expired.
 - d. UPS fault condition.
 4. The transfer control logic shall inhibit an automatic transfer of the critical load to the bypass source if any of the following conditions is present:
 - a. Inverter/bypass voltage difference exceeding pre-set limits.
 - b. Bypass frequency out of limits.
 - c. Bypass out-of-synchronization range with inverter output.
 5. Retransfer of the critical AC load from the bypass source to the inverter output shall be automatically initiated unless inhibited by manual control. The transfer control logic shall inhibit an automatic retransfer of the critical load to the inverter if one of the following conditions exists:
 - a. Bypass out of synchronization range with inverter output.
 - b. Inverter/bypass voltage difference exceeding pre-set limits.
 - c. Overload condition exists in excess of inverter full load rating.
 - d. UPS fault condition present.
- E. The UPS shall be manufactured by one of the following:
1. Newmar
 2. Tripp Lite – SmartOnline.
 3. No Others Approved.
- F. Maintenance Bypass Switch (MBPS)
1. A two-position manual maintenance bypass switch shall be provided. The MBPS switch shall be used for UPS maintenance and test purposes. The switch shall include “UPS” and “Bypass” positions to ensure that the switch can properly bypass the loads, while performing maintenance on the UPS and battery modules. The switch shall be closed transition (Make-Before-Break) to allow bypassing, without removing power from the critical load.
 2. Refer to the Drawings for further details for Maintenance Bypass Switch requirements.

2.3 UPS DIGITAL COMMUNICATIONS AND SYSTEM SOFTWARE

- A. Remote monitoring and computer system shutdown software shall be included as part of the UPS system. This software will allow display of UPS status on RJ45 Ethernet connected computer equipment. This software shall also provide minimal unit control functions. This software shall be suitable for use with the Microsoft Windows operating systems. SNMP software shall also be provided to allow network-connected systems using SNMP to communicate to the UPS system.
- B. All internal UPS communication hardware shall be furnished to connect the UPS to an SNMP Network. SNMP adapters shall provide a communications interface between the UPS module and SNMP-compatible network management systems. This capability shall allow the unit to be monitored remotely over an Ethernet network.

- C. A communication method to allow the user to view UPS information via a standard Web Browser shall be provided.
- D. As a minimum, the UPS Digital Communications network and software shall provide complete functionality of all control, metering, diagnostic alarming, and remote status and alarming functions listed above.

2.4 NETWORKED SWITCHING POWER DISTRIBUTION UNIT

- A. Power distribution unit with two 120V inputs. Input in use automatically switches to the secondary source when the primary source becomes unavailable or unstable. Where installed, this shall take the place of the manual bypass switch.
- B. Ethernet and USB remote monitoring via web application.
- C. The PDU shall be manufactured by one of the following:
 - 1. Tripp Lite.
 - 2. No Others Approved.

2.5 48VDC UPS BACKUP POWER SYSTEM

- A. 12V Batteries
 - 1. Batteries shall be 12V, 99.9% pure lead.
 - 2. Amp hours sized to provide specified runtime requirements.
 - 3. Operation temperature range: -40°C to +65°C (-40°F to 149°F)
 - 4. Design Life: 15 years at 20°C (68°F)
 - 5. Housing:
 - a. Designed to withstand extended elevated operating temperatures and maintain high battery compression essential for reliable operation
 - b. Non-halogenated, thermally sealed plastic casing
 - c. Flame retardant (UL 94 VO) and LOI of at least 28%
 - d. Approved as non-hazardous cargo for ground, sea, and air transport - DOT 49CFR173.159(d), (i) and (ii)
 - 6. The batteries shall be manufactured by one of the following:
 - a. NorthStar.
 - b. No Others Approved.
- B. Rectifier
 - 1. 1 RU rackmounted rectifier with 120VAC input and 54-58VDC output. Connect to batteries such that rectifier charges batteries under normal operation, and draws from the batteries when utility power fails.
 - 2. Positive Ground.
 - 3. Ethernet remote monitoring via web application.
 - 4. Rectifier shall have multiple separate DC output buses as required by wiring diagrams as they appear on the drawings.
 - 5. The rectifier shall be manufactured by one of the following:
 - a. Vertiv Netsure 2100 CA .
 - b. No Others Approved.
- C. Inverter

1. 1 RU rackmounted inverter with 48VDC input and 120VAC output. Connect to rectifier to provide battery insulated power to 120V power distribution.
2. Ethernet remote monitoring via web application.
3. Operation temperature range: -20°C—50°C
4. The inverter shall be one of the following:
 - a. Samlex America PSR-1200-48.
 - b. No Others Approved.

2.6 24VDC UPS BACKUP POWER SYSTEM

A. Batteries

1. Batteries system shall be assembled using 12V, 99.9% pure lead batteries.
2. Amp hours sized to provide specified runtime requirements.
3. Operation temperature range, minimum: -25°C to +60°C (-13°F to 140°F)
4. Design
 - a. Very long life design: 15 years at 20°C (68°F)
 - b. High operating temperature design
5. Housing:
 - a. Designed to withstand extended elevated operating temperatures and maintain high battery compression essential for reliable operation
 - b. Non-halogenated, thermally sealed plastic casing
 - c. Flame retardant (UL 94 VO) and LOI of at least 28%
 - d. Approved as non-hazardous cargo for ground, sea, and air transport - DOT 49CFR173.159(d), (i) and (ii)
6. The batteries shall be manufactured by one of the following:
 - a. NorthStar.
 - b. No Others Approved.

B. Rectifier

1. Rectifier shall be DIN rail mounted, with 24VDC input and VDC output. Connect to batteries such that rectifier charges batteries under normal operation, and draws from the batteries when utility power fails.
2. Ethernet RJ45 remote monitoring via EtherNet IP.
3. Configuration Software: Provide UPS-configuration software to parameterize manufacturer-specific battery charging parameters of connected batteries.
4. Data Cable: Provide USB data cable for connecting UPS to PC USB port.
5. Memory Stick: Provide USB configuration stick
6. The rectifier shall be manufactured by one of the following:
 - a. Phoenix Contact, Quint EIP.
 - b. Approved Equal.

C. Battery Tray and Stand

1. Provide battery stand designed and constructed to the installation application conditions and to support the weight and orientation of the UPS battery system.

- a. Removable cover that protects and provides a physical barrier about battery terminal connections and exposed wire/lugs.
- b. Liquid holding battery tray or compartment to contain any battery leakage. Tray shall have a minimum of 2" lip with a minimum of 2" gap between lip and batteries, including any airspace gaps required between batteries by the manufacturer.
- c. Rack Stand Application: Minimum of four leg stands to hold batteries and tray above enclosure floor at least 2". Depending on installation conditions, legs may need to be longer to provide clearance above conduit penetrations, cabling, structural components, or other objects.
- d. Shelf Application: For applications not optimal for rack stand, Contractor shall design and install shelf structure to support battery tray and batteries.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. The OWNER reserves the right to relocate enclosures within 30 feet of the locations identified in the Contract Drawings at no additional cost to the OWNER
- B. Install and connect the equipment in accordance with the manufacturer's instructions.
- C. Remove temporary lifting angles, lugs, and shipping braces.
- D. Touch up damaged paint finishes.
- E. Do not utilize extension cords, adapters, or other electrical connectors for UPS input.

3.2 24VDC UPS

- A. Configure all 24VDC UPS unit settings and parameters for remote interface and interface/functionality between the UPS and battery systems.
 1. Reporting
 2. Time Settings
 3. Service
 4. Battery charging
 5. Temperature compensation and temperature shutdown
 6. Buffer time
 7. Place of installation - The text entered here is displayed in the device information area of the User interface
 8. Initial charging current - The battery is charged with this current, when the power supply is available.
 9. Absorption charging end voltage - An equalizing charge, that increases charging voltage to a higher value than the nominal capacity for a short period. This prevents battery stratification and reduces sulfation. When the battery is fully loaded, this voltage is tolerated as a maximum, before the voltage level gets a stable end value.
 10. Float charging end voltage - The charger adjusts the end voltage based upon battery temperature. During high temperature periods, the actual battery voltage will be reduced and during low temperature periods it will be increased.

11. Temperature compensation - High ambient temperatures have a negative impact on the service life of the battery. Therefore, the charging voltage should be lower with higher ambient temperatures. The adjustable values relate to one battery cell each
 12. Wire distance to battery unit (mm)
 13. Wire cross section to the battery unit (qmm)
 14. Fast battery charging – on/off
 15. Dynamic backup threshold - This parameter can be defined additionally to the overvoltage and undervoltage related parameters, see below. If set to On the voltage increase or decrease within a certain time period is watched (dynamically). The UPS switches to battery mode, if the relative increase/decrease is too much. In contrast the overvoltage and undervoltage parameters have static values. They can become active regardless the dynamic backup threshold did not trigger, because the voltage was alright.
 16. Undervoltage backup threshold - When the DC voltage falls under this threshold (undervoltage), the system switches to battery mode.
 17. Overvoltage backup threshold - When the DC voltage exceeds this threshold (overvoltage), the system switches to battery mode.
 18. Return to mains time - After this time the system returns to mains, when it is in battery mode and the power supply is available again.
 19. Discharging end voltage - The battery voltage may not sink below this voltage value, otherwise it would be deeply discharged and become defective.
 20. Signaling time after battery low cutoff - When the battery low status has arrived, the UPS cuts off and the status of the power source firstly switches to "UPS off. After the time set here no more power or battery status is displayed, but only the Connection to UPS is offline.
 21. Signaling time after time cutoff - When the buffer time has elapsed, the UPS cuts off and the status of the power source firstly switches to "UPS off. After the time set here no more power or battery status is displayed, but only the Connection to UPS is offline.
 22. Battery type
 23. Nominal capacity of battery
- B. Setup UPS monitoring software interface on Owner computer system for remote monitoring and administration. This includes remote alarming, local alarming, emails, etc.

3.3 FIELD TESTING

- A. Perform the following minimum test and checks:
1. Operational Readiness Testing (ORT)
 - a. Verify that all connections are completed in accordance with shop drawings.
 - b. Verify supply voltage and phase sequence are correct.
 - c. Check mechanical interlocks for proper operation.
 - d. Test ground connections for continuity and resistance.
 - e. Check control circuit interlocking and continuity.
 - f. Verify operations – normal power
 - g. Verify operations – loss of input power
 - h. Verify operations – low of battery
 - i. Verify operations – loss of battery

- j. Verify remote communications
 - k. Verify remote monitoring and alarming
 - l. Verify battery charging parameters and functionality
2. Functional Demonstration Testing (FDT) – witnessed by the Engineer and/or Owner of ORT items.

B. Submit the test plan for review and approval.

C. In the event of an equipment fault, notify the ENGINEER and OWNER immediately. After the cause of the fault has been identified and corrected, a joint inspection of the equipment shall be conducted by the PCSI, the Construction Manager and the equipment manufacturer's factory service technician. Repair or replace the equipment as directed by the Construction Administrator.

3.4 ADJUSTMENT

A. Make all UPS adjustments necessary for manual and automatic operation of the entire system.

3.5 CLEANING

A. Remove all rubbish and debris from inside and around the equipment. Remove dirt, dust, or concrete spatter from the interior and exterior of the equipment using brushes, vacuum cleaner, or clean, lint-free rags. Do not use compressed air.

3.6 TRAINING

A. Provide one 2-hour training session at the Owners facility for 24VDC UPS configuration, operation, maintenance, and troubleshooting.

B. Provide one 2-hour training session at the Owners facility for 48VDC UPS configuration, operation, maintenance, and troubleshooting.

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SECTION 40 68 00

APPLICATIONS ENGINEERING SERVICES

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. The ASP shall furnish all Production Control System (PCS) programming work required to achieve a fully integrated and operational system as specified herein and in other Division 40 Specification Sections.
- B. ASP is responsible to obtain and provide any and all information required from other Divisions, as listed in the related work below, to complete the work under this Section.
- C. Provide all PLC process controller programming utilizing PlantPAX logic blocks and modify and configure the existing Human Machine Interface (HMI), according to the SAWS HMI and PLC programming standards, to bring PlantPAX functionality through from PLC to the HMI including database(s), control logic programs, graphics, communications links, and historical archiving as specified herein:
 - 1. Configuring new PLC modules, providing PLC/HMI/OIT programming, PCS HMI graphics modifications to include all PCS monitoring and controls associated with the modifications within this project.
 - 2. Provide any programming required for remote PLCs, gateways and network devices to maintain peer-to-peer and data collection functionality.
 - 3. Provide any programming required for to maintain communications to the HMI and peer-to-peer data transfer.
 - 4. Implementation of OWNER PlantPax tag naming standards.
- D. Auxiliary and accessory programming structures necessary for proper system operation and performance shall be included whether or not they are shown on the Drawings.
 - 1. All equipment shall be controlled in full conformity with the existing PLC programs, process control descriptions, specifications, engineering data, instructions, and SAWS programming standards.
 - 2. All work shall be coordinated with plant operating personnel to minimize impacts on daily operation. Delays caused by any reason shall be noted and formally submitted to the OWNER/ENGINEER in the form of a letter.
 - 3. To facilitate the OWNER's future operation and maintenance, all applications programming shall utilize system software standards and conventions as agreed upon by the OWNER/ENGINEER.
 - 4. Existing HMI and OIT display screens will be modified to incorporate work defined in the Contract Documents.

5. The ASP shall comply with all OWNER Cyber Security requirements for programming, testing, and network access.

E. The ASP is responsible for the following:

1. HMI and PLC system configuration, testing, startup, and training.
2. Configuration of the SCADA Historian Software, including configuration of offsite data transfer to the office-wide network.
3. Provide for and test communications and functionality between all connected devices such as PLCs, RTUs, and the HMI software packages as depicted on the system architecture drawings.
4. Configure and test data collection and interactivity between all software packages, PCs, UPS units, and SNMP devices in order to provide a comprehensive working system of data collection and storage.
5. All Applications Software Development and Programming shall be performed in accordance with the OWNER's pre-established programming conventions.
6. All Applications Software Development and Programming (i.e., screens, configurations, and associated attributes) shall be performed at the PCSI/ASP facility before being loaded in the field on the existing system.
7. All Applications Software Development and Programming shall be performed by ASP approved personnel.
8. The PCSI/ASP shall coordinate and schedule all testing procedures with the General CONTRACTOR, OWNER's Representative, and OWNER.
9. The PCSI/ASP shall coordinate and schedule all testing procedures for the PLC and SCADA HMI of existing facilities with the OWNER.

1.02 RELATED DOCUMENTS:

- A. Refer to Section 40 61 00, Process Control and Instrumentation Systems - General Provisions, for additional submittal, meeting, coordination and functional requirements.
- B. Refer to Section 40 61 21, Process Control System – Testing, for testing requirements of the ASP/PCSI.
- C. Refer to Section 40 61 26, Process Control System – Training, for training requirements of the ASP/PCSI.
- D. Refer to Section 40 61 96, Process Control Descriptions, for programming requirements of the ASP.
- E. Refer to Section 40 66 00, Network Equipment, for requirements of network equipment to be provided by the PCSI.
- F. Refer to Section 40 67 00, Control Panels and Components, for control and network panels to be provided by the PCSI.

G. SAWS Programming Standards:

1. HMI Programming Standards
2. PLC Programming Standards

1.03 DEFINITIONS:

- A. ASP – Application Services Provider.
- B. PCSI – Process Control System Integrator.
- C. HMI – Human Machine Interface (Plant HMI, HVAC, PMCS, OIT).
- D. I/O – Input/Output.
- E. IP – Internet Protocol.
- F. MAC – Media Access Control.
- G. OIT – Operator Interface Terminal.
- H. PCS – Production Control System.
- I. PID – Proportional, Integral, Derivative.
- J. P&ID – Piping and Instrumentation Diagram.
- K. PLC – Programmable Logic Controller.
- L. RTU – Remote Telemetry Unit.
- M. SCADA – Supervisory Control and Data Acquisition.
- N. VLAN – Virtual Local Area Network.

1.04 QUALITY ASSURANCE:

- A. The Contractor shall provide an Application Services Provider (ASP) for application software programming for Programmable Logic Controllers (PLC) and Human Machine Interface (HMI) computers and other equipment as specified in Section 40.
- B. Qualifications
 1. The ASP shall perform all work necessary to configure, customize, debug, install, connect, and place into operation all HMI and PLC software specified within this Division and other related divisions. The ASP shall coordinate with the PCSI all scheduling, installation, and startup services.
 2. The ASP shall meet the following qualification and/or submit the following documentation as specified:
 - a. Shall secure an independent performance bond and provide documentation of same from a bonding agency.
 - b. Shall present an adequate Certificate of Insurance.

- c. Shall submit resumes of team members who have completed training and certifications within the last three (3) years.
- d. Shall submit a team organization chart.
- e. The Programmer Shall have completed five (5) projects of this size or larger in dollar value and shall provide project names, Owner name, and valid and recently verified reference contacts name and contact information for each project.
- f. Shall demonstrate five (5) years of experience working on projects in water or wastewater plant work.
- g. Shall provide project name, Owner name, time period of work and valid and recently verified reference contacts for each project.
- h. Proposed staff shall have the following certifications:
 - 1) Allen-Bradley CompactLogix PLCs and programming.
 - 2) The programmer, not the company, has worked with Studio 5000 version 32 or higher.
 - 3) The programmer, not the company, has worked with PlantPAX version 4.5 or higher.

1.05 SUBMITTAL REQUIREMENTS:

A. General

- 1. Refer to Division 01 for general submittal requirements.
- 2. Refer to Division 40, Section 40 61 00, Process Control and Instrumentation Systems – General Provisions.

B. Submittal List: Separate submittals shall be supplied as listed below for each group of sites.

Item	Submittal Title	Submittal Number	Specification Number
1.	I/O List Submittal	40 68 00-01	40 68 00
2.	Process Graphics and Detailed Control Narratives	40 68 00-02	40 68 00
3.	Controller Program	40 68 00-03	40 68 00
4.	Historical Data	40 68 00-04	40 68 00
5.	Software Maintenance Documentation	40 68 00-05	40 68 00
** Refer to indicated Specification Section or associated paragraph in this Section for details of submittal requirements and quantities.			

C. I/O List Submittal

- 1. Provide documentation of the I/O list, including ranges, alarm setpoints, and historical data collection information.
 - a. PLC: The identifier of the PLC.
 - b. IO MODULE NAME: The identifier of the name of module.

- c. IO MODULE VOLTAGE: Module voltage rating.
- d. IO MODULE RACK/SLOT/CHANNEL: The identifier of rack/slot/channel for each point.
- e. IO MODULE ADDRESS: The identifier of module address.
- f. IO TYPE: Analog In (AI), Analog Output (AO), Discrete Input (DI), or Discrete Output (DO).
- g. TAG NUMBER: The identifier assigned to a device or variable that performs a function in the control system. Tag numbering shall follow SAWS Tag Naming Standards.
- h. DESCRIPTION: A description of the function of the device or variable (text that includes signal source, control function, etc.).
- i. ENGINEERING RANGE/STATE: The range in engineering units corresponding to an analog 4-20 mA signal or scalable variable (LO/HI), or the text description corresponding to each state of a discrete point (ON/OFF).
- j. ENGINEERING UNITS (EU): The engineering units associated with the Analog I/O or scalable variable.
- k. ALARM/EVENT: Designation of the data point as an Alarm or an Event.
- l. ALARM PRIORITY: Priority level of the alarm (P3 – low, P2 – medium, P3 – high, A1 – alert) (if applicable).
- m. ALARM LIMITS: Include alarm limits based on the existing HMI database settings. These values will be verified by the system programmer during startup and commissioning.
- n. HI HI: Assignment of the High-High alarm limit and priority (if applicable).
- o. HI: Assignment of the High alarm limit and priority (if applicable).
- p. LO: Assignment of the Low alarm limit and priority (if applicable).
- q. LO LO: Assignment of the Low - Low alarm limit and priority (if applicable).
- r. HISTORICAL INFO: Designation of the point to be placed into the historian. The actual points to be placed into the Historian will be finalized in coordination with the OWNER.
- s. UPDATE RATE: Rate at which a historically collected data point is to be collected by the historian.
- t. HISTORICAL LOGGING: Designation if the data point is to be historically collected.

2. Allow for up to a two-week review cycle of the I/O List Submittal.

D. Detailed Control Narratives Submittal

1. This submittal shall cover all of the application programs developed to implement the control functions specified herein and in the Contract Documents.
2. The process control schemes shall be developed based on information from the specifications. This submittal shall include the following, as a minimum:
 - a. A brief scope of the control function.
 - b. List of all scanned inputs to the control function.
 - c. A short narrative of the control strategy.
 - d. Any assumptions made in developing the program.
 - e. I/O database list showing all inputs and outputs (i.e., AI, DI, AO, DO), calculated points and pseudo points associated with the control function.
 - f. PLC communication and hardware monitoring.
 - g. List of all operator inputs/outputs to and from the control function. A description of the operation of any panels shall be described as it relates to the control function.
 - h. List of all Add-On Instructions and faceplates utilized for developing the control program.
3. All anticipated failure contingencies shall be described in detail.
4. All applications programs shall be developed in a structured manner and shall follow an intuitive arrangement. Programs shall utilize standard program templates or subroutines for repetitive logic such as equipment control, flow total calculations, and equipment runtime calculations. All applications programs shall be submitted in 8.5-inch x 11-inch format. All programs shall be fully annotated throughout to facilitate diagnosis by instrumentation technicians with basic programming knowledge.
5. This submittal shall also include copies of the PLC I/O configuration tables and I/O reference usage table. In addition, any special switch settings or hardware configuration requirements, such as communications port configurations, shall be described in detail and submitted.

E. Process Graphics Submittal:

1. Submit all proposed graphic displays, trends, alarms, and logs to support the control strategy narratives.
2. Submitted graphic displays and trends shall be no less than 8.5 inch x 11 inch full-color prints.
3. Quantity of graphic displays to be provided shall be as required to depict all monitoring and control requirements defined herein and in the Contract Documents. All processes and equipment shown on the drawings shall be shown in a similar manner. The graphic displays shall represent all process flow paths and all associated equipment units, pumps, meters, valves, gates, feed systems, and auxiliary systems, whether monitored or not.

4. Pre-defined trend displays shall be developed for easy recall using index display or standard display recall buttons. Pre-defined trends shall be developed for all analog inputs. Grouping of analog inputs shall be as defined by the OWNER/ENGINEER. A maximum of eight points shall be assigned to a trend.
5. For graphics that will be duplicated several times for similar equipment or purposes, submit for only the first equipment as a typical display.
6. Each HMI process operation function, such as operation button and alarm acknowledge functions, shall be configured with the proper operation security privileges to prevent unauthorized operation. Each HMI process operation function such operation button and alarm acknowledge functions shall be configured with operation security to prevent unauthorized operation.
7. Allow for up to a two-week review cycle of the Process Graphics Submittal.

F. Controller Program Submittal:

1. Submit software logic programs and documentation for function block language used for the application engineering effort.
2. Program documentation shall include all function blocks, individual rungs, network, and/or command descriptions with abundant comments to clearly identify function and intent of each code segment. Link between “coil” and “contact” shall be clearly presented, the function of each timer described, the purpose of each subroutine call labeled and defined, etc. Program documentation shall be sufficiently clear to allow determination of compliance with the process control requirements included in the Process Control Descriptions.
3. The submittal shall demonstrate that all logic provided under this project follows the same structure and format and reflects a common programming approach. Any custom subroutines or function blocks shall be described in detail and shall include all inputs with allowable ranges, the outputs, and the internal logic of the block.
4. Submit details of control system communication. Submit hardware and software configuration information in sufficient detail to verify performance of the communication system as detailed herein and on the Drawings. Include description of drivers and impact of drivers on controller memory configuration. Any specific communication block memory addresses shall be defined.
5. Submit a memory usage report for the controller. This report shall indicate both used and unused memory addresses. Include constant and variable memory assignment records that tabulate area, location, number, and description of each numeric constant or variable stored in memory.
6. Method and logic for special housekeeping programs and routines including redundancy, clock synchronization, value scaling, alarm handling, archiving, etc. Submit information for all digital systems including controllers and HMI equipment.
7. Submit cross reference index of I/O allocation, controller memory address, HMI graphic systems address, and HMI graphic screen where the I/O point will appear. Every physical I/O

point, as well as calculated or virtual I/O required for the implementation of the process scheme, shall be included.

8. Make additional changes to the software configuration, beyond those identified in the initial draft submittal, based on comments during the factory and field tests and during the commissioning process as required.
9. Allow for up to a two week review cycle of the Controller Program Submittal.

G. ASP Testing Plan Submittal:

1. ASP Testing Plan shall be incorporated into the Testing & Training Plan Submittal required within Section 40 61 00.
 - a. Refer to Section 40 61 21 – Process Control System Testing.
2. This submittal will outline the approach to testing the various components of the system to validate that the HMI and PLC programming meets the requirements. In addition, sample test forms and procedures will be included to allow the OWNER/ENGINEER an opportunity to comment on format and content prior to the PCSI developing the detailed test procedures. Additional components of this submittal shall include test approval and punch list procedures.
3. Test Procedure: Submit the procedures proposed to be followed for each test. Procedures shall include test descriptions, forms, and checklists to be used to control and document the required tests. Include sign-off forms for each testing phase or loop with sign-off areas for the PCSI and OWNER/ENGINEER. Refer to PART 3 for specific testing requirements, and submit separate procedures for each specified test phase.

H. ASP Training Plan Submittal:

1. ASP Training Plan shall be incorporated into the Testing & Training Plan Submittal required within Section 40 61 00.
2. Refer to Section 40 61 26 - Process Control System Training.
3. This submittal shall provide an overview of the proposed ASP training for the OWNER'S operations and maintenance staff. The training program shall be coordinated with the OWNER'S staff so that the schedule and content meet their needs. The approved submittal shall be used as the basis for development of training manuals that will be provided to all attendees.
4. Submit outlines of the specific training, resumes of trainers, pre-requisite requirements for each class, and general samples of handouts for review. The training plan shall also include:
 - a. Definitions of each course.
 - b. Specific course attendance.
 - c. Schedule of training courses including dates, duration, and locations of each class.
 - d. Complete copy of all proposed handouts and training materials. Training information shall be logically arranged in a three-ring binder with all materials reduced to a

maximum size of 11 inch x 17 inch, then folded to 8.5 inch x 11 inch for inclusion into the binder.

5. Refer to PART 3 for specific training requirements.

I. Historical Data

1. ASP shall provide a Historical Data submittal including the following:
 - a. List of existing equipment tags to be modified by this Contract shall be submitted.
 - b. List of all new signals to be historically collected and stored, including sampling rate and duration for which data will be immediately accessible through the system.

J. Software O&M Manual Submittal

1. At the conclusion of the commissioning activities but prior to final acceptance of the system, operations and maintenance manuals covering all operations and maintenance procedures for the applications software and system configuration shall be furnished.
2. All software applications, programs, and configuration files shall be provided on electronic media disks independent of computer hard disk files. Files shall be provided on machine-loadable media capable of being used by a technician to restore the installed software using the existing hardware and software programs.
3. The manuals shall contain operating and maintenance data written specifically for this project.
4. At a minimum, the following information shall be provided in the manuals:
 - a. A comprehensive index.
 - b. All documentation from previous submittals updated to reflect the as-built system.
 - c. Detailed service, maintenance, and operation instructions for each item supplied, including procedures for backing up files and archiving historical data.
 - d. List of personnel to be contacted for warranty and emergency services, including name, address, telephone number, pager or cell phone number, fax number, and email address.
 - e. Printouts of every graphic display with all dynamic points referenced.
 - f. Printouts of all configuration files.
 - g. Printouts of all documented PLC programs.
 - h. Electronic media disks containing all HMI, PLC, and other custom-configured files used on the Project.
 - i. Final PID Loop Tuning Parameters for all associated control loops.

1.06 REFERENCE STANDARDS:

- A. Refer to Division 40, Section 40 61 00, Process Control and Instrumentation Systems – General Provisions.

1.07 DELIVERY, STORAGE, AND HANDLING:

- A. Refer to Division 40, Section 40 61 00, Process Control and Instrumentation Systems – General Provisions, for project/site requirements.

1.08 NOMENCLATURE AND IDENTIFICATION:

- A. Refer to Division 40, Section 40 61 00, Process Control and Instrumentation Systems – General Provisions.

1.09 PROJECT/SITE REQUIREMENTS:

- A. Refer to Division 40, Section 40 61 00, Process Control and Instrumentation Systems – General Provisions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL:

- A. The ASP shall support the CONTRACTOR and suppliers to aid in the installation requirements of the Process Control System defined in Division 40.
- B. The ASP shall coordinate the overall implementation of the control system components defined within the Contract Documents.
- C. The ASP shall be familiar with the existing HMI configuration and configuration standards before start of HMI configuration.
- D. All HMI configurations including main screens, pop-up screens, screen displays, equipment global objects, screen navigation, alarm and event configurations, security, database, screen scripts, I/O drivers, and historian shall conform to the existing HMI configuration without any exception.
- E. The ASP shall be familiar with the existing PLC configuration and configuration standards before start of PLC configuration.
- F. The ASP is responsible for providing all applications programming and configuration services to accomplish the control and monitoring functions as described herein and in the Contract Documents.

3.02 DISPLAY LAYOUT:

- A. The ASP shall not change the HMI display layout or screen Navigation Toolbar.

- B. All displays shall contain and continuously update the displayed process variables, date, and time of day. All process values shall be displayed in engineering units. All displays shall incorporate references to both instrumentation tag numbers and plant equipment numbers.
- C. The system shall allow the operator to control equipment such as pumps and valves as defined in the control loop drawings and control loop descriptions. All control actions require a two-step action.
- D. Unless specifically noted, all timers, setpoints, alarm actuation levels, etc., shall be adjustable from the operator interface.
- E. Hierarchical Structure
 - 1. CONTRACTOR shall not change graphic display hierarchical structure.
 - 2. Color Convention and Animation
 - a. Color conventions and animation are referred to HMI Display and Equipment Global Objects that include analog valve displays, digital point status displays, setpoint entry, equipment animations, equipment color, equipment popup screen, alarm and event display, and trend screens.
 - 3. ASP shall use standard HMI displays and equipment global objects for instruments and equipment.
 - 4. All developed HMI displays and equipment shall be in compliance with existing HMI color conventions and animations.
- F. Security
 - 1. All HMI process operational functions, such as an operation button or alarm acknowledgement, shall be configured with user-level security to prevent unauthorized operation. ASP shall configure the security areas and functions to points and displays.

END OF SECTION

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SECTION 40 70 00A
ATTACHMENT A - FIELD INSTRUMENTATION SCHEDULE

P&ID No.	Tag No.	Instrument Description / Location	Instrument Type	Spec Section	Detail Drawings	Component Options	Set Point/ Range	Engineering Units	Supplied By	Note
I-03	FIT-101	HIGH SERVICE PUMP 101 DISCHARGE FLOW	FLOW METER - ELECTROMAGNETIC TYPE - FLANGED	40 70 00, 2.05	I-06, E23	8 INCH, 120 V. REMOTE TRANSMITTER, NEMA 4X, 150 # CARBON STEEL FLANGES, MOUNTING ON THE 316SS RACKSTAND WITH SUNSHIELD	0-1.75	MGD	PCSI	
I-03	FIT-102	HIGH SERVICE PUMP 102 DISCHARGE FLOW	FLOW METER - ELECTROMAGNETIC TYPE - FLANGED	40 70 00, 2.05	I-06, E23	8 INCH, 120 V. REMOTE TRANSMITTER, NEMA 4X, 150 # CARBON STEEL FLANGES, MOUNTING ON THE 316SS RACKSTAND WITH SUNSHIELD	0-1.75	MGD	PCSI	
I-03	FIT-103	HIGH SERVICE PUMP 103 DISCHARGE FLOW	FLOW METER - ELECTROMAGNETIC TYPE - FLANGED	40 70 00, 2.05	I-06, E23	6 INCH, 120 V. REMOTE TRANSMITTER, NEMA 4X, 150 # CARBON STEEL FLANGES, MOUNTING ON THE 316SS RACKSTAND WITH SUNSHIELD	0-1.10	MGD	PCSI	
I-03	FIT-104	HIGH SERVICE PUMP 104 DISCHARGE FLOW	FLOW METER - ELECTROMAGNETIC TYPE - FLANGED	40 70 00, 2.05	I-06, E23	6 INCH, 120 V. REMOTE TRANSMITTER, NEMA 4X, 150 # CARBON STEEL FLANGES, MOUNTING ON THE 316SS RACKSTAND WITH SUNSHIELD	0-1.10	MGD	PCSI	
I-03	FIT-105	JOCKEY PUMP 105 DISCHARGE FLOW	FLOW METER - ELECTROMAGNETIC TYPE - FLANGED	40 70 00, 2.05	I-06, E23	4 INCH, 120 V. REMOTE TRANSMITTER, NEMA 4X, 150 # CARBON STEEL FLANGES, MOUNTING ON THE 316SS RACKSTAND WITH SUNSHIELD	0-0.45	MGD	PCSI	
I-03	LIT-500	GROUND STORAGE TANK GST_500 LEVEL	HYDROSTATIC PRESSURE SENSING LEVEL TRANSMITTER	40 70 00, 2.06	I-06, I-07	3-VALVE MANIFOLD, TRANSMITTER TO BE MOUNTED ON A RACKSTAND INSIDE A 316SS NEMA 4X ENCLOSURE.	0-32	FT	PCSI	REPLACING THE EXISTING INSTRUMENT
I-03	LSL-500	GROUND STORAGE TANK GST_500 LEVEL LOW	LEVEL SWITCH - SUSPENDED LEVEL ELECTRODE	40 70 00, 2.13	I-06	ROPE PROBE. MOUNTED TO THE TOP OF THE TANK, MATCHING THE EXISTING INSTALLATIONS.	4	FT	PCSI	
I-03	PIT-021	HIGH SERVICE PUMP STATION DISCHARGE PRESSURE	PRESSURE INDICATING TRANSMITTER	40 70 00, 2.07	I-06, I-07, E23	2-VALVE MANIFOLD, REMOTE MOUNT TRANSMITTER AND ELEMENT ABOVE GROUND ON THE HSP1 RACKSTAND INSIDE A 316SS NEMA 4X ENCLOSURE. ISOLATION BALL VALVES ON ALL CONNECTIONS. ADJUST THE TRANSMITTER ZERO ELEVATION FOR THE APPLICATION.	0-150	PSI	PCSI	
I-03	PI-101	HIGH SERVICE PUMP 101 INLET PRESSURE	PRESSURE INDICATOR	40 70 00, 2.09, 2.10	I-06	2-VALVE MANIFOLD, DIAPHRAGM SEAL	-20-60	PSI	PCSI	
I-03	PSL-101	HIGH SERVICE PUMP 101 INLET PRESSURE LOW	PRESSURE SWITCH - LOW	40 70 00, 2.08	I-06	2-VALVE MANIFOLD, DIAPHRAGM SEAL	0	PSI	PCSI	
I-03	PI-102	HIGH SERVICE PUMP 102 INLET PRESSURE	PRESSURE INDICATOR	40 70 00, 2.09, 2.10	I-06	2-VALVE MANIFOLD, DIAPHRAGM SEAL	-20-60	PSI	PCSI	
I-03	PSL-102	HIGH SERVICE PUMP 102 INLET PRESSURE LOW	PRESSURE SWITCH - LOW	40 70 00, 2.08	I-06	2-VALVE MANIFOLD, DIAPHRAGM SEAL	0	PSI	PCSI	
I-03	PI-103	HIGH SERVICE PUMP 103 INLET PRESSURE	PRESSURE INDICATOR	40 70 00, 2.09, 2.10	I-06	2-VALVE MANIFOLD, DIAPHRAGM SEAL	-20-60	PSI	PCSI	
I-03	PSL-103	HIGH SERVICE PUMP 103 INLET PRESSURE LOW	PRESSURE SWITCH - LOW	40 70 00, 2.08	I-06	2-VALVE MANIFOLD, DIAPHRAGM SEAL	0	PSI	PCSI	
I-03	PI-104	HIGH SERVICE PUMP 104 INLET PRESSURE	PRESSURE INDICATOR	40 70 00, 2.09, 2.10	I-06	2-VALVE MANIFOLD, DIAPHRAGM SEAL	-20-60	PSI	PCSI	
I-03	PSL-104	HIGH SERVICE PUMP 104 INLET PRESSURE LOW	PRESSURE SWITCH - LOW	40 70 00, 2.08	I-06	2-VALVE MANIFOLD, DIAPHRAGM SEAL	0	PSI	PCSI	
I-03	PI-105	JOCKEY PUMP 105 INLET PRESSURE	PRESSURE INDICATOR	40 70 00, 2.09, 2.10	I-06	2-VALVE MANIFOLD, DIAPHRAGM SEAL	-20-60	PSI	PCSI	
I-03	PSL-105	JOCKEY PUMP 105 INLET PRESSURE LOW	PRESSURE SWITCH - LOW	40 70 00, 2.08	I-06	2-VALVE MANIFOLD, DIAPHRAGM SEAL	0	PSI	PCSI	
I-03	TIT-051	ELECTRICAL BUILDING ROOM TEMPERATURE	TEMPERATURE INDICATING TRANSMITTER - ROOM	40 70 00, 2.11	I-06	WALL MOUNTED	0-130	DEG F	PCSI	

SECTION 40 70 00A
ATTACHMENT A - FIELD INSTRUMENTATION SCHEDULE

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SEQUENCING NOTES

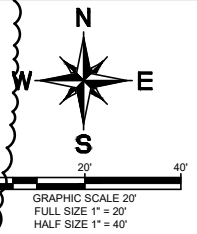
- CONTRACTOR SHALL MINIMIZE SHUTDOWN TIME OF PUMP STATION SERVICE THROUGHOUT CONSTRUCTION TO ONLY AS NEEDED WHEN CONNECTING THE NEW PUMP STATION TO SERVICE. CONTRACTOR SHALL COORDINATE WITH SAWS BEFORE EXISTING PUMP STATION IS TAKEN OFFLINE.
- CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS WHILE WORKING AROUND FACILITIES IN OPERATION AS NOT TO ADVERSELY IMPACT THE OPERATIONS OF THOSE FACILITIES OR IMPEDE ACCESS TO THOSE FACILITIES BY SAWS OPERATIONS PERSONNEL.
- CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO EXISTING FACILITIES OR INFRASTRUCTURE TO REMAIN AND SHALL REPAIR, IF DAMAGED, TO EXISTING CONDITION OR BETTER.
- CONTRACTOR IS RESPONSIBLE FOR MAINTAINING, SUPPORTING, AND PROTECTING THE INTEGRITY OF UNDERGROUND UTILITIES, THRUST BLOCKING AND POWER POLES DURING CONSTRUCTION. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO EXCAVATE OVER, UNDER AND AROUND SUCH UTILITIES AND IF NECESSARY, PROVIDE A TEMPORARY BRIDGING DURING CONSTRUCTION SO AS TO MAINTAIN CONTINUOUS SERVICE WHILE CONSTRUCTING THE PROPOSED FACILITIES.
- CONTRACTOR SHALL SUBMIT A SEQUENCING PLAN FOR REVIEW BY OWNER AND CONSULTANT. THE SEQUENCING PLAN SHALL BE APPROVED BY SAWS PRIOR TO STARTING ANY DEMOLITION ACTIVITIES. THE SEQUENCING PLAN SHOWN IS SUGGESTED AND MAY BE ALTERED BASED ON THE CONTRACTOR'S MEANS AND METHODS.
- ALL WORK ASSOCIATED WITH STAGING, PHASING, AND SEQUENCING THE PROJECT SHALL BE AT NO ADDITIONAL COST TO SAWS. NO SEPARATE PAY ITEM.

PHASING PLAN

- PHASE I:**
- CONTRACTOR TO SUBMIT SWPPP AND OTHER REQUIRED PERMIT DOCUMENTS.
 - DEMOLISH EXISTING FENCE SURROUNDING THE SITE.
 - IMMEDIATELY INSTALL NEW CHAIN-LINK FENCE AROUND PUMP STATION SITE OR PROVIDE TCEQ-COMPLIANT TEMPORARY SECURITY MEASURES UNTIL NEW FENCE IS COMPLETELY INSTALLED. SITE SECURITY MUST BE TCEQ COMPLIANT AT ALL TIMES.
 - INSTALL TEMPORARY CONSTRUCTION ENTRANCE & TEMPORARY GATE.
 - GRADE SITE ACCORDING TO THE GRADING PLAN.
 - CONSTRUCT ELECTRICAL DUCT BANK SECTION CROSSING UNDER PROPOSED SANITARY SEWER.
 - CONSTRUCT PROPOSED 8-INCH SANITARY SEWER.
 - CONSTRUCT ELECTRICAL DUCT BANK SECTION FOR PUMP STATION.
 - CONSTRUCT TRANSFORMER DUCT BANK FROM TRANSFORMER PAD LOCATION UP TO EXISTING TRANSFORMER PRIMARY DUCT BANK (KEEP 10' DISTANCE FROM EXISTING DUCT BANK)
 - CONSTRUCT SLAB FOR ELECTRICAL AND SCADA EQUIPMENT. CONSTRUCT SLAB FOR NEW PUMP STATION. CONSTRUCT FOUNDATIONS FOR SCADA TOWER AND TRANSFORMER PAD.
 - CONSTRUCT TRANSFORMER SLAB.
 - CONSTRUCT UNDERGROUND PIPING AND COMPLETE DUCT BANKS.
 - INSTALL ELECTRICAL BUILDING.
 - ENSURE ALL SITE PREPARATION IS COMPLETE FOR PHASE II TO BEGIN.

- PHASE II:**
- INSTALL AND TEST PLC, NETWORK, ELECTRICAL PANELS, AND CABLING.
 - INSTALL AND TEST NEW PUMP STATION PIPING, PUMPS, CONTROL VALVES, FIELD INSTRUMENTS, AND COMPLETE CABLING. (MAXIMUM TWO-DAY SHUTDOWN TO MAKE PIPING CONNECTIONS.) SEE SHEET G10 FOR SERVICE CONNECTION SEQUENCING.
 - INSTALL AND TEST HEAT TRACE AND INSULATIONS.
 - RECOAT POTABLE WATER INLET PIPE AND TANK OVERFLOW PIPE.
 - REMOVE AND REPLACE FLUSH DRAINPIPE AND GATE VALVE ON TANK OVERFLOW PIPE. (MAXIMUM TWO-DAY SHUTDOWN, POTENTIALLY CONCURRENT WITH PHASE 2B.)
 - BRING PORTABLE GENERATOR TO SITE AND POSITION IN PROPER PLACE NEXT TO EXISTING TRANSFORMER.
 - IN COORDINATION WITH SAWS, SHUT DOWN THE PUMP STATION.
 - DISCONNECT THE SERVICE FROM EXISTING TRANSFORMER IN COORDINATION WITH CPS ENERGY.
 - CONNECT PORTABLE GENERATOR TO EXISTING INCOMING POWER PANEL (NEXT TO EXISTING TRANSFORMER).
 - IN COORDINATION WITH SAWS, START UP THE PUMP STATION.
 - PULL BACK AND REMOVE EXISTING TRANSFORMER PRIMARY CABLE (BY CPS ENERGY).
 - DEMOLISH EXISTING TRANSFORMER PRIMARY DUCT BANK UP TO INTERCEPTING MANHOLE. CONSTRUCT INTERCEPTING MANHOLE AND COMPLETE NEW TRANSFORMER PRIMARY DUCT BANK.
 - INSTALL NEW TRANSFORMER PRIMARY CABLE AND TEST (BY CPS ENERGY).
 - SHUTDOWN THE PUMP STATION. DISCONNECT PORTABLE GENERATOR. (MAXIMUM ONE-DAY SHUTDOWN.)
 - ENERGIZE NEW TRANSFORMER AND START UP PUMP STATION.
 - DEMOLISH EXISTING POWER AND PLC PANELS. DEMOLISH THE CORRESPONDING PADS.
 - INSTALL SCADA TOWER AND TRANSFORMER.
 - TEST NEW PUMP STATION. UPON APPROVAL, TRANSFER SERVICE FROM OLD PUMP STATION TO NEW PUMP STATION.
 - DECOMMISSION AND REMOVE OLD PUMP STATION AND ELECTRICAL EQUIPMENT.
 - ENSURE ALL SITE PREPARATION IS COMPLETE FOR PHASE III TO BEGIN.

- PHASE III:**
- REMOVE AND REPLACE EXISTING DRIVEWAY AND CULVERT BENEATH DRIVEWAY.
 - REMOVE TEMPORARY CONSTRUCTION ENTRANCE & TEMPORARY GATE. REPLACE TEMPORARY GATE WITH FENCING.
 - INSTALL PROPOSED CONCRETE PAVEMENT AT PUMP STATION.
 - REMOVE AND REPLACE EXISTING TANK LADDER AND APPURTENANCES.
 - CLEAN THE EXTERIOR OF THE TANK.
 - REPAIR SIDEWALK NEAR SITE ENTRANCE AND CONSTRUCTION ENTRANCE.
 - PLANT NEW TREES AND CONNECT TO EXISTING IRRIGATION SYSTEM TO ESTABLISH NEW TREES.
 - DEMOLIBLIZE CONSTRUCTION EQUIPMENT AND REMOVE ANY CONSTRUCTION DEBRIS REMAINING ON SITE.



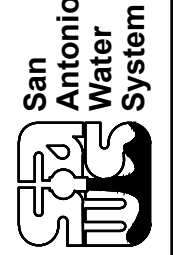
JOB NO.
21-8601

09/12/2023

Revisions	Date	Appr'd
1	9/27/2023	VRS

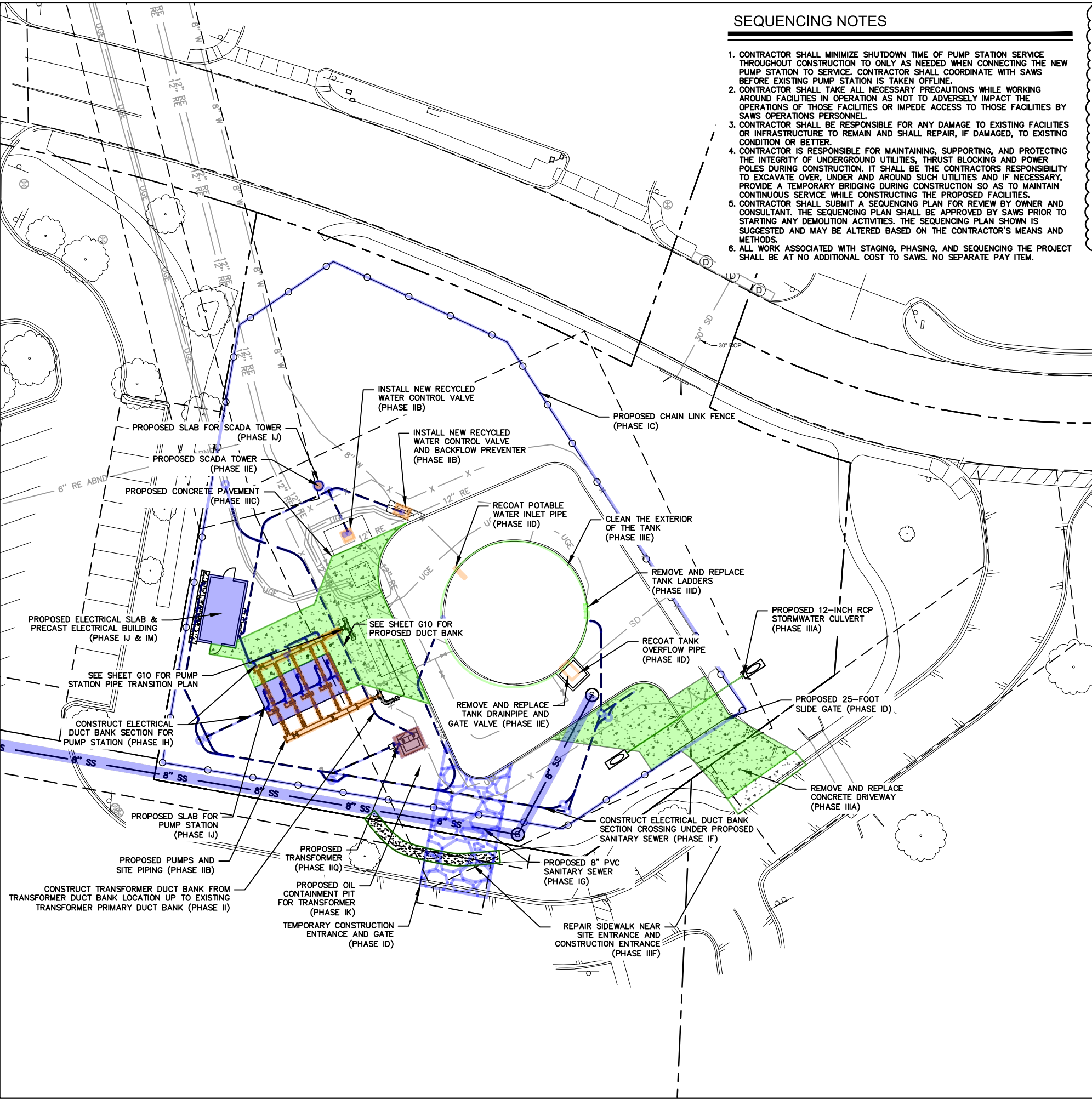
Kimley»Horn
TEXAS REGISTERED FIRM, NO. F-928

Date: SEPTEMBER 2023
Drawn by: VRN
Designed by: CRW
Checked by: VRS
Scale: SHOWN ON SHEET



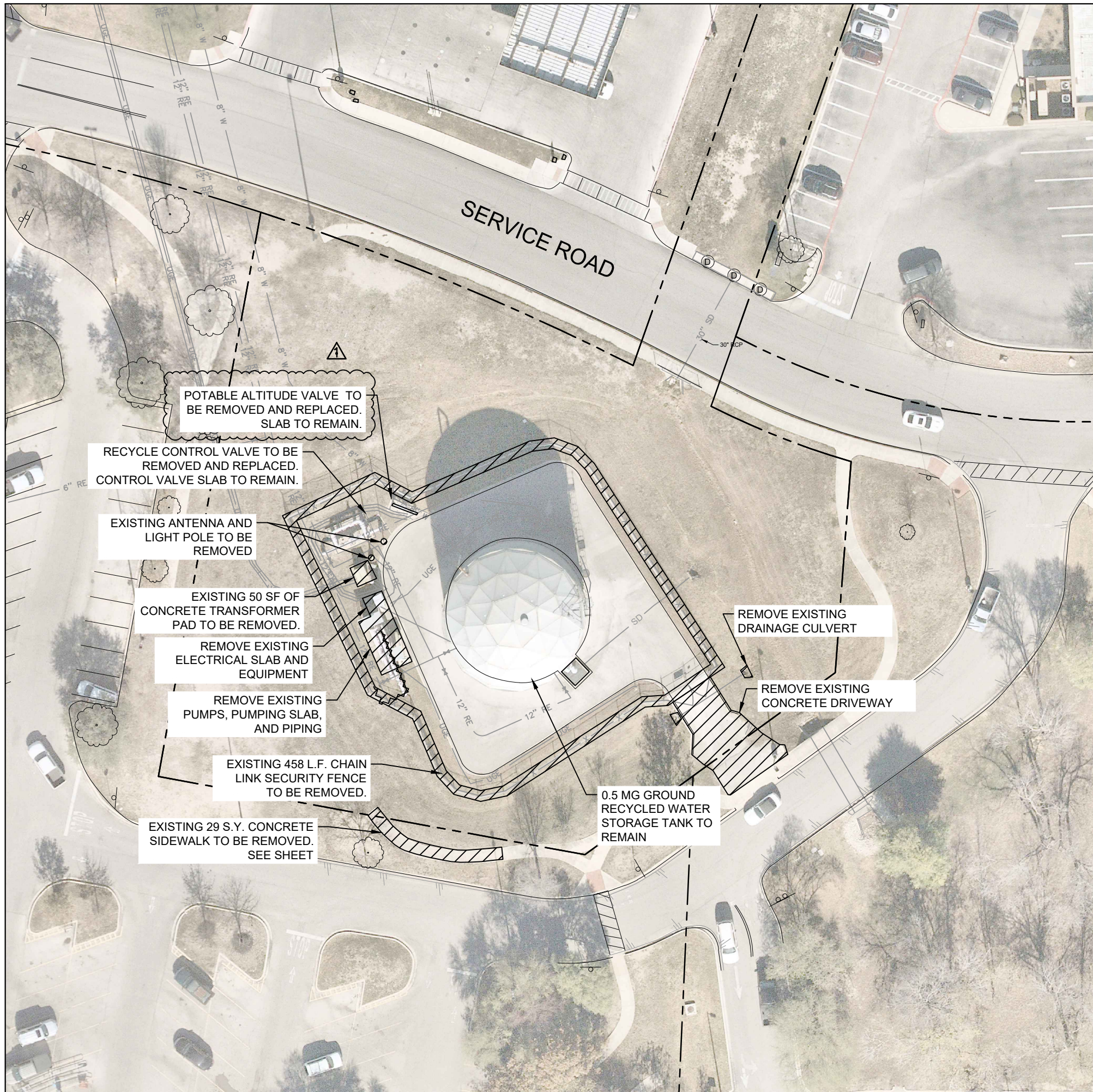
SAN ANTONIO WATER SYSTEM
BROOKS RECYCLED WATER PUMP STATION UPGRADES PROJECT
PROPOSED SEQUENCING PLAN

DRAWING NO.
GO



LEGEND

- X — X — X — EXISTING FENCE
- SD — EXISTING STORM DRAIN
- UGE — EXISTING UNDERGROUND ELECTRIC
- — — — — PROPERTY LINE
- 12" RE — EXISTING RECYCLED WATER LINE
- 8" W — EXISTING WATER LINE
- 8" SS — PROPOSED SANITARY SEWER
- ○ ○ ○ ○ PROPOSED FENCE
- — — — — PROPOSED DUCT BANK
- ■ ■ ■ ■ PROPOSED PAVEMENT
- ■ ■ ■ ■ TEMPORARY CONSTRUCTION ENTRANCE
- ○ ○ ○ ○ EXISTING TREE
- — — — — PHASE I
- — — — — PHASE II
- — — — — PHASE III



NOTES

1. THE TERM DEMOLITION SHALL MEAN THE COMPLETE DEMOLITION, REMOVAL, AND OFFSITE DISPOSAL OF THE ITEM OR FACILITY IDENTIFIED.
2. REFERENCE SHEET G9 FOR PHASING AND SEQUENCING PLANS FOR SEQUENCE OF DEMOLITION AND ABANDONMENT OF FACILITIES.
3. CONTRACTOR SHALL REFER TO ELECTRICAL SHEETS FOR EXTENTS AND EXACT LOCATIONS OF ALL ELECTRICAL DEMOLITION.
4. CONTRACTOR SHALL LOCATE ALL EXISTING DUCT BANKS AND WATER LINES PRIOR TO CONSTRUCTION AND NOTIFY SAWS AND THE ENGINEER OF ANY POTENTIAL CONFLICTS. (N.S.P.I.)
5. CONTRACTOR SHALL RELOCATE ALL UTILITIES THAT MAY INTERFERE WITH THE PROPOSED IMPROVEMENTS (N.S.P.I.)
6. ALL ITEMS INDICATED TO BE REMOVED SHALL BE DISPOSED OF OFF-SITE IN A MANNER ACCEPTABLE TO ALL APPLICABLE REGULATIONS.
7. THE CONTRACTOR SHALL REFERENCE SAWS STANDARD SPECIFICATION NO. 3000 FOR ASBESTOS PIPE HANDLING AND DISPOSAL.
8. THE CONTRACTOR SHALL REFERENCE TREE PROTECTION PLANS SHEETS REGARDING ANY TREE REMOVAL.
9. THE CONTRACTOR SHALL COORDINATE WITH SAWS TO CONFIRM ALL ITEMS TO BE SALVAGED ON SITE BEFORE DEMOLITION.

LEGEND

- DEMOLITION
- EXISTING STORM DRAIN
- UGE EXISTING UNDERGROUND ELECTRIC
- PROPERTY LINE
- 12" RE EXISTING RECYCLED WATER LINE
- 8" W EXISTING WATER LINE
- EXISTING FENCE
- EXISTING TREE
- REMOVE WATER LINE / DUCT BANK

JOB NO.
21-8601

09/17/2023

REVISIONS	No.	Description	Appr. Date
	1	ADDENDUM 2	9/27/2023

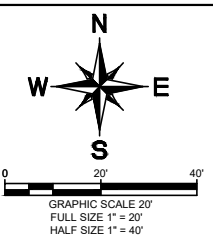
Kimley»Horn
TEXAS REGISTERED FIRM, NO. F-928

Date: SEPTEMBER 2023
 Drawn by: VRN
 Designed by: CRW
 Checked by: VRS
 Scale: SHOWN ON SHEET

San Antonio Water System

SAN ANTONIO WATER SYSTEM
 BROOKS RECYCLED WATER PUMP
 STATION UPGRADES PROJECT
 CIVIL & MECHANICAL
 DEMOLITION PLAN

DRAWING NO.
C1



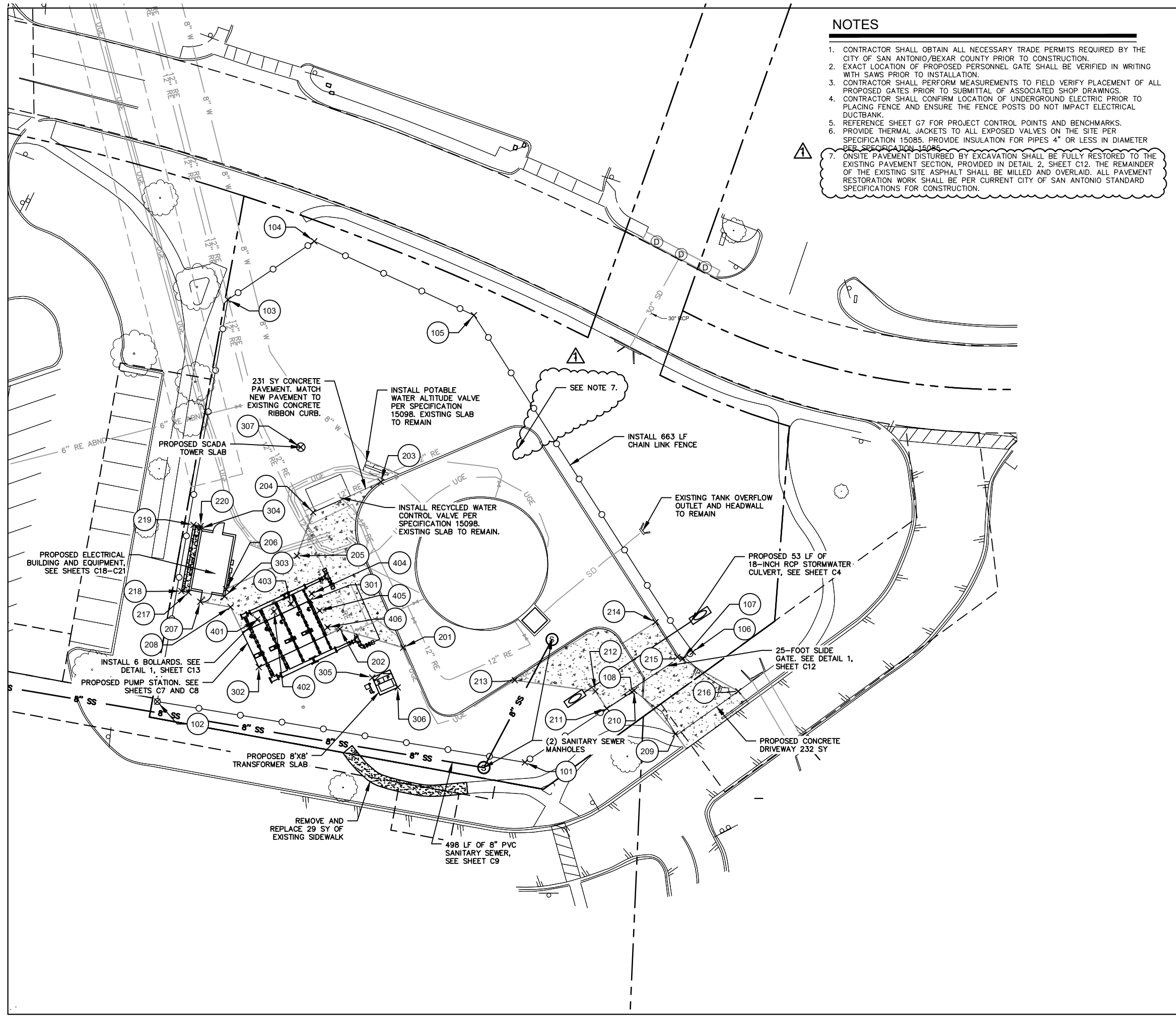
NOTES

- CONTRACTOR SHALL OBTAIN ALL NECESSARY TRADE PERMITS REQUIRED BY THE CITY OF SAN ANTONIO/BEXAR COUNTY PRIOR TO CONSTRUCTION.
- EXACT LOCATION OF PROPOSED PERSONNEL GATE SHALL BE VERIFIED IN WRITING WITH SAWS PRIOR TO INSTALLATION.
- CONTRACTOR SHALL PERFORM MEASUREMENTS TO FIELD VERIFY PLACEMENT OF ALL PROPOSED GATES PRIOR TO SUBMITTAL OF ASSOCIATED SHOP DRAWINGS.
- CONTRACTOR SHALL CONFIRM LOCATION OF UNDERGROUND ELECTRIC PRIOR TO PLACING FENCE AND ENSURE THE FENCE POSTS DO NOT IMPACT ELECTRICAL DUCTBANK.
- REFERENCE SHEET G7 FOR PROJECT CONTROL POINTS AND BENCHMARKS.
- PROVIDE THERMAL JACKETS TO ALL EXPOSED VALVES ON THE SITE PER SPECIFICATION 15085. PROVIDE INSULATION FOR PIPES 4" OR LESS IN DIAMETER PER SPECIFICATION 15085.
- ON-SITE PAVEMENT DISTURBED BY EXCAVATION SHALL BE FULLY RESTORED TO THE EXISTING PAVEMENT SECTION, PROVIDED IN DETAIL 2, SHEET C12. THE REMAINDER OF THE EXISTING SITE ASPHALT SHALL BE MILLED AND OVERLAID. ALL PAVEMENT RESTORATION WORK SHALL BE PER CURRENT CITY OF SAN ANTONIO STANDARD SPECIFICATIONS FOR CONSTRUCTION.

LEGEND

- SD ——— EXISTING STORM DRAIN
- UGE ——— EXISTING UNDERGROUND ELECTRIC
- PROPERTY LINE
- 12" RE ——— EXISTING RECYCLED WATER LINE
- 8" W ——— EXISTING WATER LINE
- (Tree Symbol) EXISTING TREE
- 8" SS ——— PROPOSED SANITARY SEWER
- (Circle with X) PROPOSED FENCE
- (Stippled Area) PROPOSED CONCRETE PAVEMENT
- (Dashed Line) PROPOSED SIDEWALK REPAIR

COORDINATE POINTS			
POINT #	NORTHING	EASTING	DESCRIPTION
101	13677482.70	2149752.35	FENCE CORNER
102	13677507.83	2149600.24	FENCE CORNER
103	13677674.17	2149629.50	FENCE CORNER
104	13677698.27	2149665.20	FENCE CORNER
105	13677667.71	2149731.29	FENCE CORNER
106	13677528.37	2149821.77	FENCE CORNER
107	13677525.56	2149817.50	FENCE CORNER
108	13677511.82	2149796.61	FENCE CORNER
201	13677530.16	2149701.96	EDGE OF PAVEMENT
202	13677537.79	2149675.78	EDGE OF PAVEMENT
203	13677598.74	2149692.73	EDGE OF PAVEMENT
204	13677586.17	2149664.72	EDGE OF PAVEMENT
205	13677568.12	2149658.07	EDGE OF PAVEMENT
206	13677554.36	2149628.71	EDGE OF PAVEMENT
207	13677549.13	2149618.10	EDGE OF PAVEMENT
208	13677546.93	2149630.62	EDGE OF PAVEMENT
209	13677494.41	2149814.61	EDGE OF PAVEMENT
210	13677512.36	2149797.47	EDGE OF PAVEMENT
211	13677504.95	2149786.17	EDGE OF PAVEMENT
212	13677512.07	2149781.49	EDGE OF PAVEMENT
213	13677516.67	2149748.16	EDGE OF PAVEMENT
214	13677540.70	2149806.32	EDGE OF PAVEMENT
215	13677526.31	2149815.40	EDGE OF PAVEMENT
216	13677512.10	2149840.58	EDGE OF PAVEMENT
217	13677553.03	2149613.22	EDGE OF PAVEMENT
218	13677553.57	2149610.27	EDGE OF PAVEMENT
219	13677580.96	2149615.25	EDGE OF PAVEMENT
220	13677580.42	2149618.20	EDGE OF PAVEMENT
301	13677549.75	2149663.54	PUMP SLAB
302	13677522.07	2149642.30	PUMP SLAB
303	13677551.34	2149628.15	ELECTRICAL SLAB
304	13677579.44	2149618.02	ELECTRICAL SLAB
305	13677517.77	2149689.18	TRANSFORMER SLAB
306	13677513.66	2149699.72	TRANSFORMER SLAB
307	13677613.07	2149659.59	CENTER OF SCADA TOWER PIER
401	13677541.81	2149641.58	BOLLARD
402	13677545.07	2149648.51	BOLLARD
403	13677548.34	2149655.45	BOLLARD
404	13677552.42	2149664.12	BOLLARD
405	13677545.48	2149667.39	BOLLARD
406	13677538.55	2149670.65	BOLLARD



REVISIONS

No.	Description	Date	Appr'd
1	ADDENDUM 2	9/27/2023	

INFORMATION

Date: SEPTEMBER 2023
 Drawn by: VRN
 Designed by: CRW
 Checked by: VRS
 Scale: SHOWN ON SHEET

San Antonio Water System

Kimley»Horn
TEXAS REGISTERED FIRM, NO. F-928

SAN ANTONIO WATER SYSTEM
 BROOKS RECYCLED WATER PUMP STATION UPGRADES PROJECT
 DIMENSION CONTROL, PAVING, & FENCING PLAN

DRAWING NO.
C3

REVISIONS	Date	Appr. VRS
1	9/27/2023	

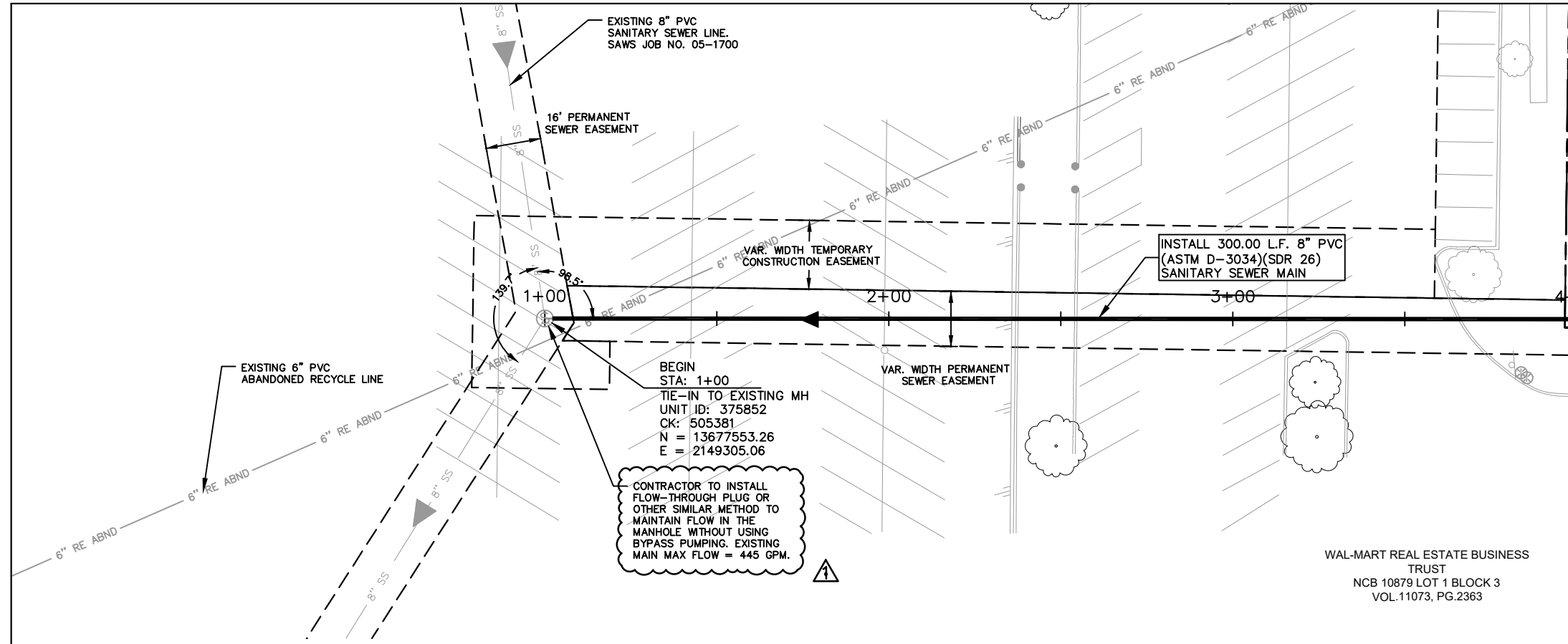
Kimley»Horn
TEXAS REGISTERED FIRM, NO. F-928

Date: SEPTEMBER 2023
Drawn by: VRN
Designed by: CRW
Checked by: VRS
Scale: SHOWN ON SHEET

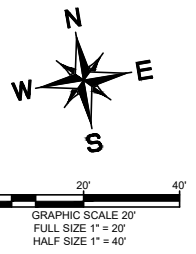
San Antonio Water System

SAN ANTONIO WATER SYSTEM
BROOKS RECYCLED WATER PUMP STATION UPGRADES PROJECT
SANITARY SEWER PLAN AND PROFILE STA. 1+00 TO 4+00

DRAWING NO.
C9



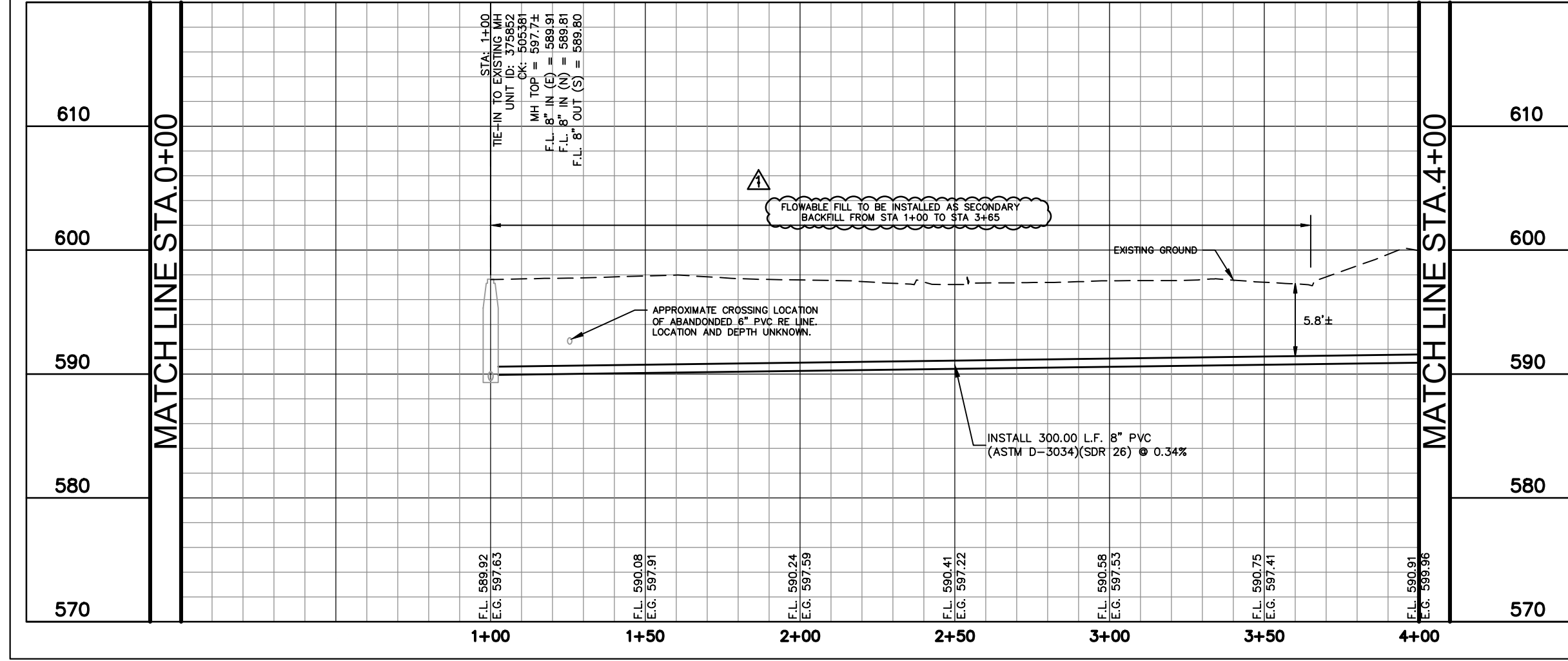
MATCH LINE STA 4+00
SEE SHEET C10



LEGEND

* NO SEPARATE PAY ITEM (NSPI)	
DESCRIPTION	SYMBOL
PROPOSED SANITARY SEWER LINE	
EXISTING SANITARY SEWER LINE	
EXISTING WATER LINE	
EXISTING GAS LINE	
PROPERTY LINE	
EXISTING FENCE	
EFFECTIVE 100-YR FLOOD PLAIN	
EDGE OF ASPHALT	
EXISTING EASEMENT LINE	
PROPOSED EASEMENT LINE	
EXISTING OVERHEAD ELECTRIC LINE & POLE	
EXISTING WATER METER	
EXISTING FIRE HYDRANT	

WAL-MART REAL ESTATE BUSINESS TRUST
NCB 10879 LOT 1 BLOCK 3
VOL.11073, PG.2363



ESTIMATED QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
1	REMOVE CONCRETE CURB	LF	48
2	TACK COAT (COSA SPEC)	Gal	19
3	HOT MIX ASPHALT PAVEMENT, TYPE B (10" COMP. DEPTH)	SY	147
4	HOT MIX ASPHALT PAVEMENT, TYPE C (2" COMP. DEPTH)	SY	183
6	FLOWABLE FILL (LOW STRENGTH)	CY	32
7	CONCRETE CURB	LF	48
8	TOPSOIL (4-INCH DEPTH)	CY	23
9	HYDROMULCHING	SY	68
10	TRENCH EXCAVATION SAFETY PROTECTION	LF	300
11	8" PVC GRAVITY SANITARY SEWER PIPE (SDR-26-3034, 115 PSI)	LF	300
12	EXISTING MANHOLE ADJUSTMENTS	EA	1
16	POST-CONSTRUCTION SANITARY SEWER MAIN TELEVISION INSPECTION (8"-15")	LF	300

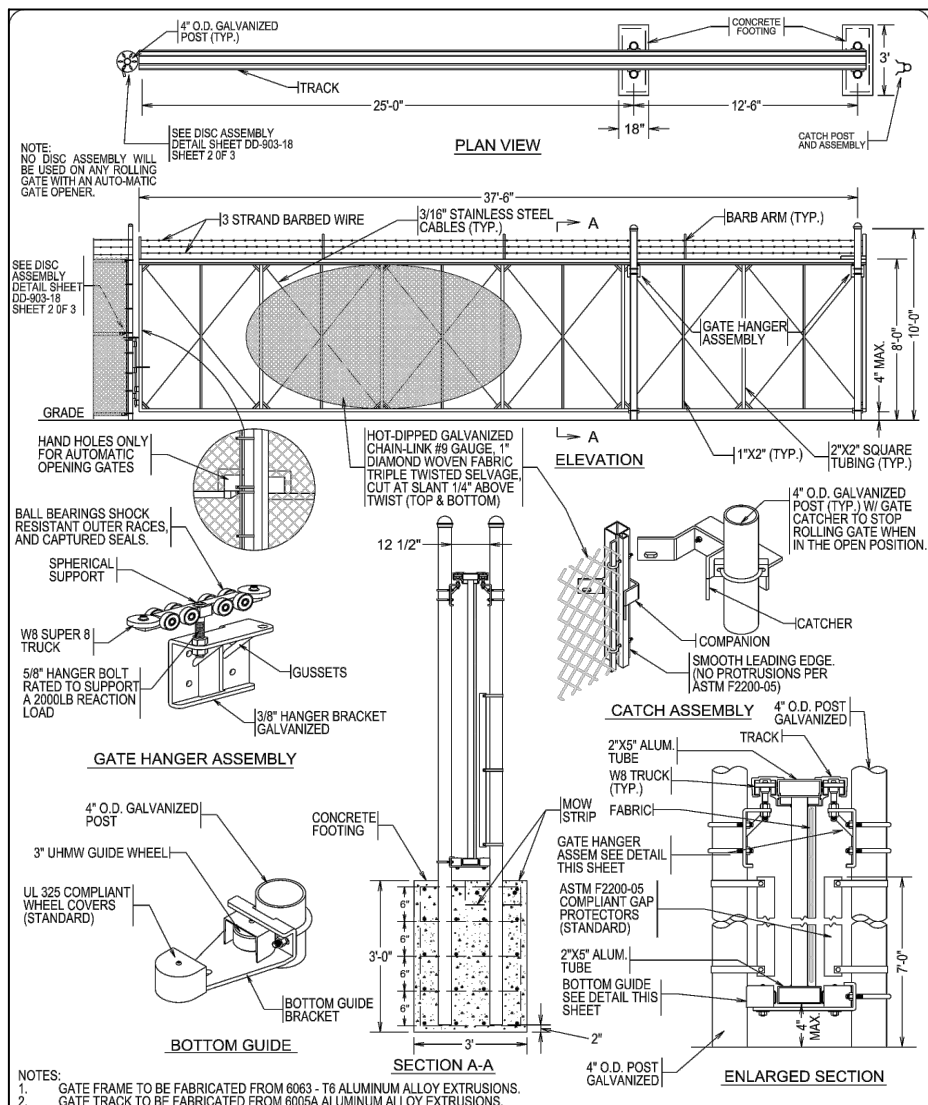
STA: 1+00
TIE-IN TO EXISTING MH
UNIT ID: 375852
CK: 505381
MH TOP = 597.7±
F.L. 8" IN (E) = 589.91
F.L. 8" IN (N) = 589.81
F.L. 8" OUT (S) = 589.80

FLOWABLE FILL TO BE INSTALLED AS SECONDARY BACKFILL FROM STA 1+00 TO STA 3+65

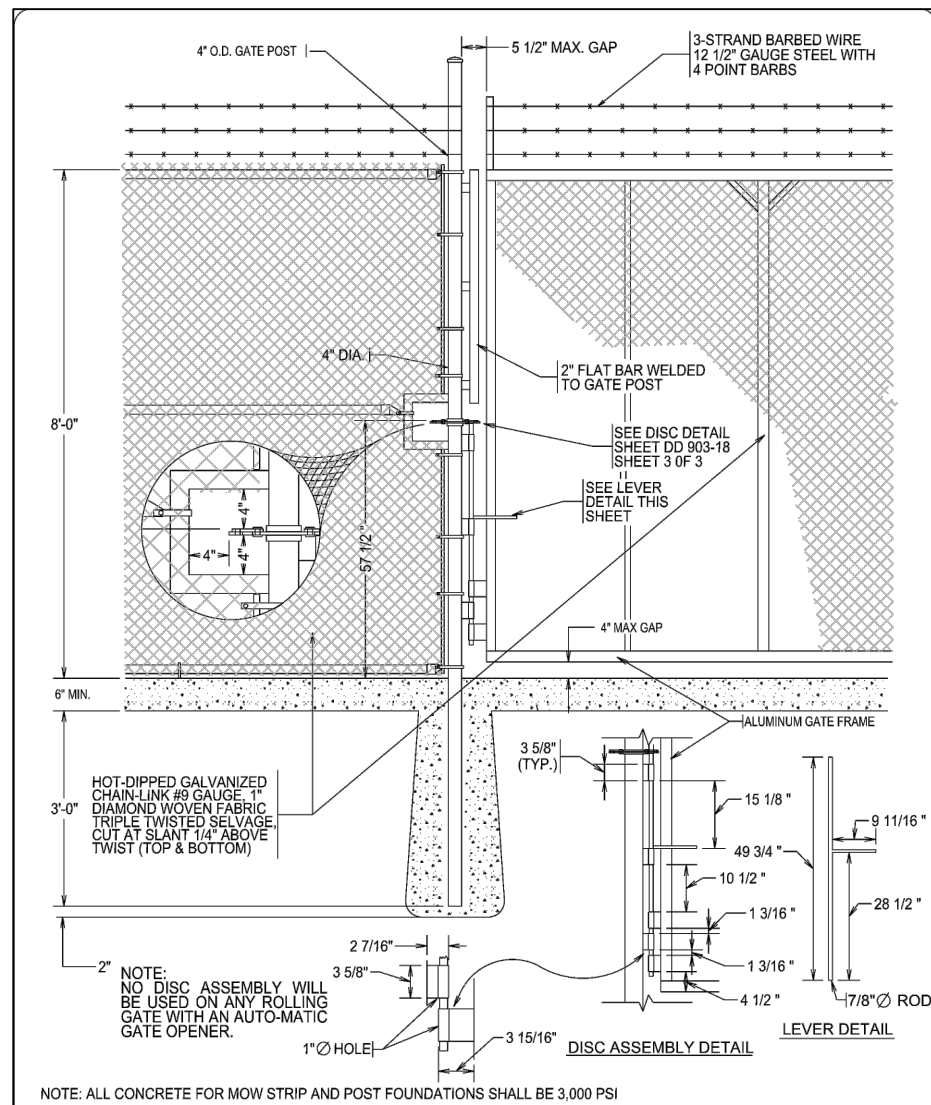
APPROXIMATE CROSSING LOCATION OF ABANDONED 6" PVC RE LINE. LOCATION AND DEPTH UNKNOWN.

INSTALL 300.00 L.F. 8" PVC (ASTM D-3034)(SDR 26) @ 0.34%

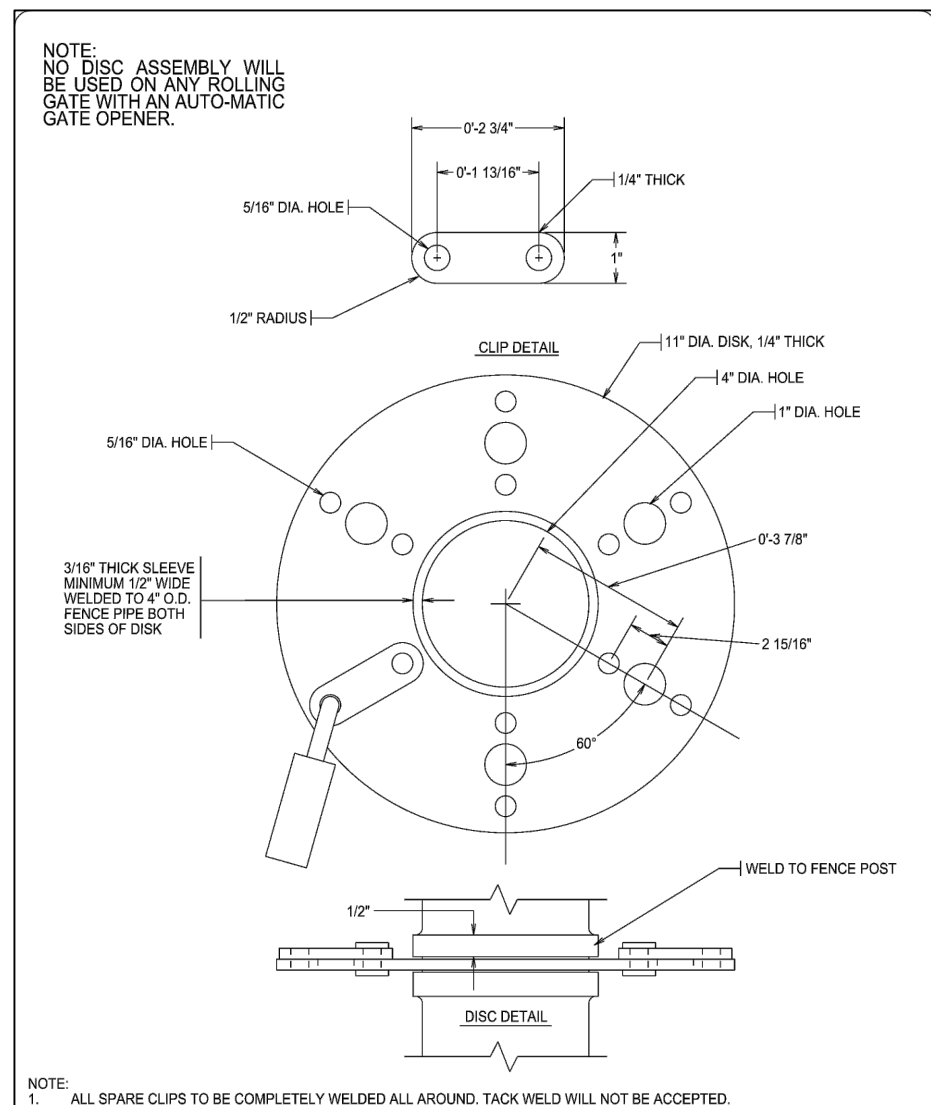
STA	F.L.	E.G.
1+00	589.92	597.63
1+50	590.08	597.91
2+00	590.24	597.59
2+50	590.41	597.22
3+00	590.58	597.53
3+50	590.75	597.41
4+00	590.91	599.96



DD-903-18 SAN ANTONIO WATER SYSTEM SAN ANTONIO, TEXAS
 SHEET 1 OF 3 HEAVY DUTY CANTILEVER SLIDE GATE
 APPROVED: MARCH 2011
 REVISED: NOV 2018

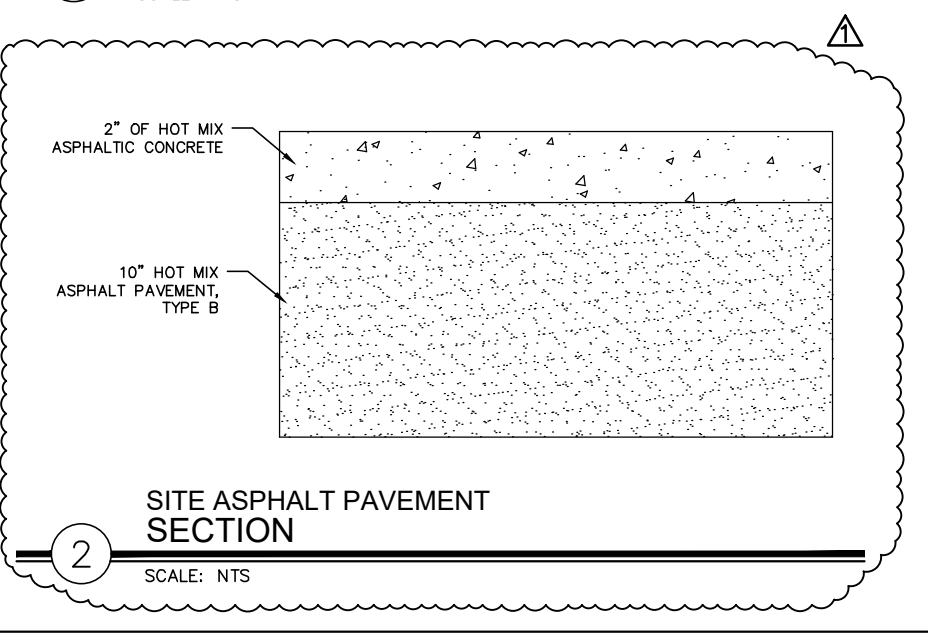


DD-903-18 SAN ANTONIO WATER SYSTEM SAN ANTONIO, TEXAS
 SHEET 2 OF 3 HEAVY DUTY CANTILEVER SLIDE GATE
 APPROVED: MARCH 2011
 REVISED: FEB 2017



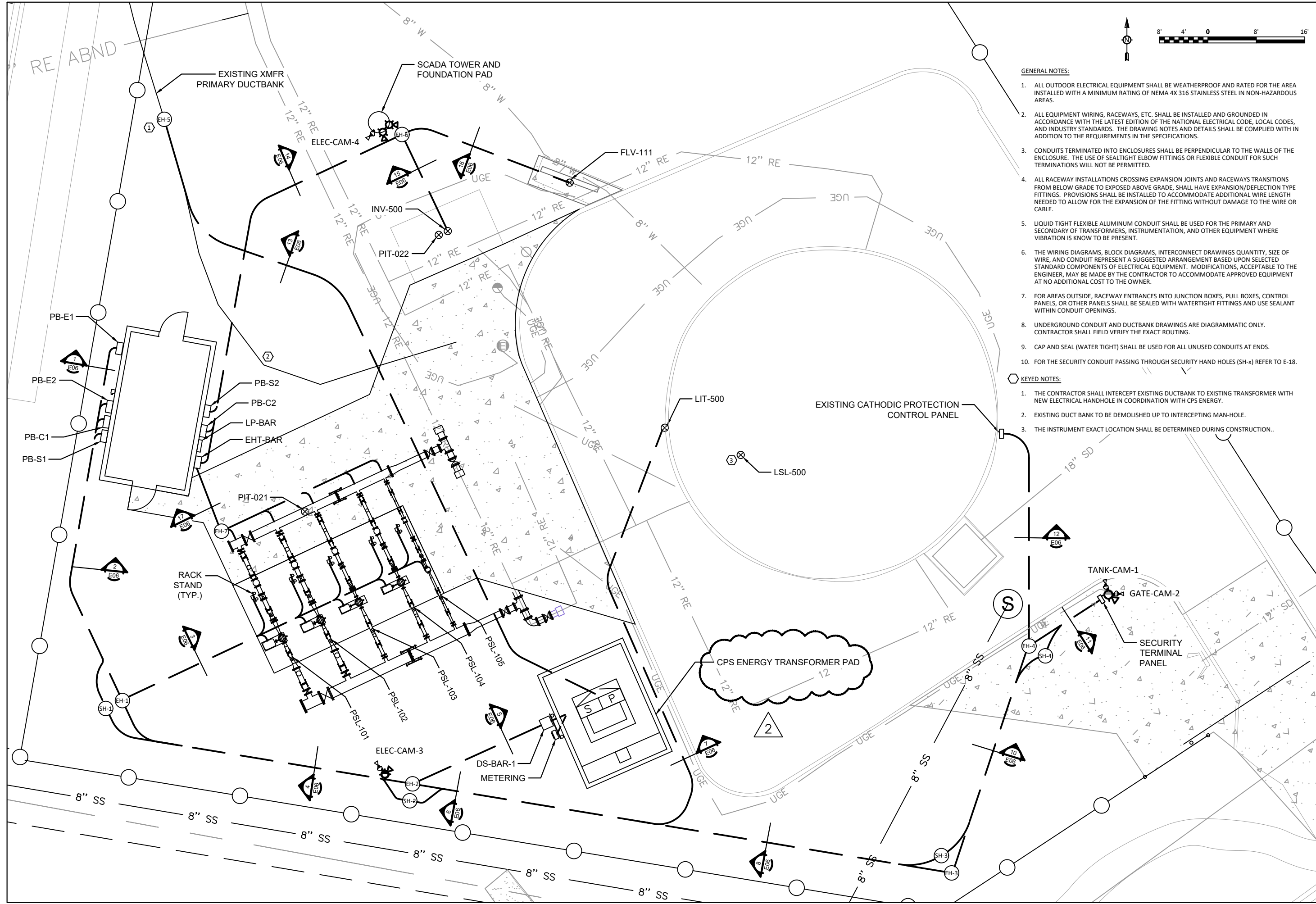
DD-903-18 SAN ANTONIO WATER SYSTEM SAN ANTONIO, TEXAS
 SHEET 3 OF 3 HEAVY DUTY CANTILEVER SLIDE GATE - DISC DETAIL
 APPROVED: MARCH 2011
 REVISED: FEB 2017

1 HEAVY CANTILEVER SLIDE GATE DETAIL
 SCALE: NTS



2 SITE ASPHALT PAVEMENT SECTION
 SCALE: NTS

JOB NO. 21-8601
 09/12/2023
 REVISIONS: No. 1 Description: ADDENDUM 2 Date: 9/27/2023
 INFORMATION: Kimley-Horn TEXAS REGISTERED FIRM, NO. F-928
 Date: SEPTEMBER 2023 Drawn by: VRN Designed by: CRW Checked by: VRS Scale: SHOWN ON SHEET
 SAN ANTONIO WATER SYSTEM BROOKS RECYCLED WATER PUMP STATION UPGRADES PROJECT GENERAL DETAILS (SHEET 2 OF 3)
 DRAWING NO. C12



GENERAL NOTES:

1. ALL OUTDOOR ELECTRICAL EQUIPMENT SHALL BE WEATHERPROOF AND RATED FOR THE AREA INSTALLED WITH A MINIMUM RATING OF NEMA 4X 316 STAINLESS STEEL IN NON-HAZARDOUS AREAS.
2. ALL EQUIPMENT WIRING, RACEWAYS, ETC. SHALL BE INSTALLED AND GROUNDED IN ACCORDANCE WITH THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE, LOCAL CODES, AND INDUSTRY STANDARDS. THE DRAWING NOTES AND DETAILS SHALL BE COMPLIED WITH IN ADDITION TO THE REQUIREMENTS IN THE SPECIFICATIONS.
3. CONDUITS TERMINATED INTO ENCLOSURES SHALL BE PERPENDICULAR TO THE WALLS OF THE ENCLOSURE. THE USE OF SEALTIGHT ELBOW FITTINGS OR FLEXIBLE CONDUIT FOR SUCH TERMINATIONS WILL NOT BE PERMITTED.
4. ALL RACEWAY INSTALLATIONS CROSSING EXPANSION JOINTS AND RACEWAYS TRANSITIONS FROM BELOW GRADE TO EXPOSED ABOVE GRADE, SHALL HAVE EXPANSION/DEFLECTION TYPE FITTINGS. PROVISIONS SHALL BE INSTALLED TO ACCOMMODATE ADDITIONAL WIRE LENGTH NEEDED TO ALLOW FOR THE EXPANSION OF THE FITTING WITHOUT DAMAGE TO THE WIRE OR CABLE.
5. LIQUID TIGHT FLEXIBLE ALUMINUM CONDUIT SHALL BE USED FOR THE PRIMARY AND SECONDARY OF TRANSFORMERS, INSTRUMENTATION, AND OTHER EQUIPMENT WHERE VIBRATION IS KNOW TO BE PRESENT.
6. THE WIRING DIAGRAMS, BLOCK DIAGRAMS, INTERCONNECT DRAWINGS QUANTITY, SIZE OF WIRE, AND CONDUIT REPRESENT A SUGGESTED ARRANGEMENT BASED UPON SELECTED STANDARD COMPONENTS OF ELECTRICAL EQUIPMENT. MODIFICATIONS, ACCEPTABLE TO THE ENGINEER, MAY BE MADE BY THE CONTRACTOR TO ACCOMMODATE APPROVED EQUIPMENT AT NO ADDITIONAL COST TO THE OWNER.
7. FOR AREAS OUTSIDE, RACEWAY ENTRANCES INTO JUNCTION BOXES, PULL BOXES, CONTROL PANELS, OR OTHER PANELS SHALL BE SEALED WITH WATERTIGHT FITTINGS AND USE SEALANT WITHIN CONDUIT OPENINGS.
8. UNDERGROUND CONDUIT AND DUCTBANK DRAWINGS ARE DIAGRAMMATIC ONLY. CONTRACTOR SHALL FIELD VERIFY THE EXACT ROUTING.
9. CAP AND SEAL (WATER TIGHT) SHALL BE USED FOR ALL UNUSED CONDUITS AT ENDS.
10. FOR THE SECURITY CONDUIT PASSING THROUGH SECURITY HAND HOLES (SH-x) REFER TO E-18.

KEYED NOTES:

1. THE CONTRACTOR SHALL INTERCEPT EXISTING DUCTBANK TO EXISTING TRANSFORMER WITH NEW ELECTRICAL HANDHOLE IN COORDINATION WITH CPS ENERGY.
2. EXISTING DUCT BANK TO BE DEMOLISHED UP TO INTERCEPTING MAN-HOLE.
3. THE INSTRUMENT EXACT LOCATION SHALL BE DETERMINED DURING CONSTRUCTION..

JOB NO.
21-8601

REVISIONS	No.	Description	Drn.	Approved	Date
	2	ADDENDUM NO. 2	BDH	AVS	09/26/23

Kimley-Horn
Automation
TEXAS REGISTERED FIRM, NO. F-928
TPBE FIRM REGISTRATION NO. F-14711

Date: MAY 2023
Drawn by: EDIAZ
Designed by: M.KASHIKI
Checked by: A.SCUDIERI
Scale: NTS

San Antonio Water System

SAN ANTONIO WATER SYSTEM
BROOKS RECYCLED WATER PUMP STATION UPGRADE PROJECT
ELECTRICAL SITE PLAN

DRAWING NO.
E-05

MIN. SIZE	NO.	CONDUIT NAME
4"	①	SWBD1-P-2A
4"	②	SWBD1-P-2B
4"	③	SWBD1-P-2C
4"	④	SWBD1-P-2D

SECTION 1
SWITCHBOARD INCOMING
E06

MIN. SIZE	NO.	CONDUIT NAME
4"	①	SWBD1-P-2A
4"	②	SWBD1-P-2B
4"	③	SWBD1-P-2C
4"	④	SWBD1-P-2D
4"	⑤	P-LP-(X)
4"	⑥	P-DP-(X), EHT-P-6
4"	⑦	FO-E18-D1
4"	⑧	I-E17-C1
4"	⑨	C-E17-I1
4"	⑩	SPARE

SECTION 4
EH2/SH2 TO EH1/SH1
E06

MIN. SIZE	NO.	CONDUIT NAME
4"	①	SWBD1-P-2A
4"	②	SWBD1-P-2B
4"	③	SWBD1-P-2C
4"	④	SWBD1-P-2D

SECTION 5
SWITCHBOARD INCOMING
E06

MIN. SIZE	NO.	CONDUIT NAME
1"	①	FO-E18-C1
1"	②	P-LP-1, P-DP-4
1"	③	P-DP-36

SECTION 8
EH3/SH3 TO EH2/SH2
E06

MIN. SIZE	NO.	CONDUIT NAME
1"	①	P-DP-4

SECTION 12
CATHODIC PROT. PANEL
E06

MIN. SIZE	NO.	CONDUIT NAME
1"	①	C-E17-E2
1"	②	I-E17-E1
1"	③	EHT-P-7
1"	④	SPARE

SECTION 15
INV-500 VALVE
E06

MIN. SIZE	NO.	CONDUIT NAME
4"	①	SWBD1-P-2A
4"	②	SWBD1-P-2B
4"	③	SWBD1-P-2C
4"	④	SWBD1-P-2D
4"	⑤	HSP10(X)-P-1
4"	⑥	DSV10(X)-P-1, P-LP-(X)
4"	⑦	EC-E16-(X), EC-E17-(X)
4"	⑧	C-E16-D1
4"	⑨	FO-E18-E1
4"	⑩	P-DP-(X), EHT-P-6
4"	⑪	C-E17-I1
4"	⑫	SPARE

SECTION 2
EH1/SH1 TO ELEC. ROOM
E06

MIN. SIZE	NO.	CONDUIT NAME
2"	①	C-E16-B1
2"	②	HSP101-P-1
2"	③	HSP102-P-1
4"	④	C-E16-B2, C-E16-B3
2"	⑤	HSP103-P-1
2"	⑥	P-DP-BAR-1-(X)
4"	⑦	C-E17-B4, C-E17-B5
4"	⑧	HSP104-P-1, HSP105-P-1
2"	⑨	C-E16-D(X), C-E17-D(X)

SECTION 3
HIGH SERVICE PUMPS
E06

MIN. SIZE	NO.	CONDUIT NAME
1"	①	I-E17-D1
1"	②	EHT-P-6
1"	③	C-E17-H1
1"	④	P-DP-36
1"	⑤	FO-E18-C1
1"	⑥	P-LP-1, P-DP-4

SECTION 6
EH3/SH3 TO EH2/SH2
E06

MIN. SIZE	NO.	CONDUIT NAME
1"	①	FO-E18-G1
1"	②	P-LP-1, P-DP-4
1"	③	P-DP-36

SECTION 10
EH4/SH4 TO EH3/SH3
E06

MIN. SIZE	NO.	CONDUIT NAME
4"	①	CPSXMFR-P-1
4"	②	SPARE
4"	③	SPARE
4"	④	SPARE

SECTION 13
TRANSFORMER PRIMARY
(TO BE APPROVED BY CPS)
E06

MIN. SIZE	NO.	CONDUIT NAME
1"	①	C-E17-E1
1"	②	EHT-P-8

SECTION 16
FLV-111 VALVE
E06

MIN. SIZE	NO.	CONDUIT NAME
2"	①	I-E16-A4
2"	②	EC-E16-(X), EC-E16-(X)

SECTION 3
HIGH SERVICE PUMPS
E06

MIN. SIZE	NO.	CONDUIT NAME
1"	①	I-E17-D1
1"	②	EHT-P-6
1"	③	C-E17-H1

SECTION 7
GST-500 LEVEL TRANSMITTER
E06

MIN. SIZE	NO.	CONDUIT NAME
1"	①	P-LP-1
1"	②	FO-E18-B1
1"	③	P-DP-36
1"	④	SPARE

SECTION 11
SITE LIGHTING AND CCTV
E06

MIN. SIZE	NO.	CONDUIT NAME
1"	①	EC-E18-A1
1"	②	C-E17-F1
1"	③	LP-P-3, EHT-P-(X)
1"	④	I-E17-F1

SECTION 14
EH7 TO ELECTRICAL ROOM
E06

MIN. SIZE	NO.	CONDUIT NAME
1"	①	EHT-P-(X)
1"	②	SPARE

SECTION 17
ELECTRICAL HEAT TRACE
E06

(X) DENOTES NUMBERS
(X): 1,2,...

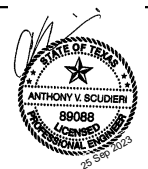
REVISIONS	No.	Description	Drn.	Approved	Date
	2	ADDENDUM NO. 2	BDH	AVS	09/26/23

Kimley-Horn
INFORMATION
DESIGNED BY: MKASHKI
CHECKED BY: A.SCUDDIERI
SCALE: AS SHOWN
DATE: MAY 2023

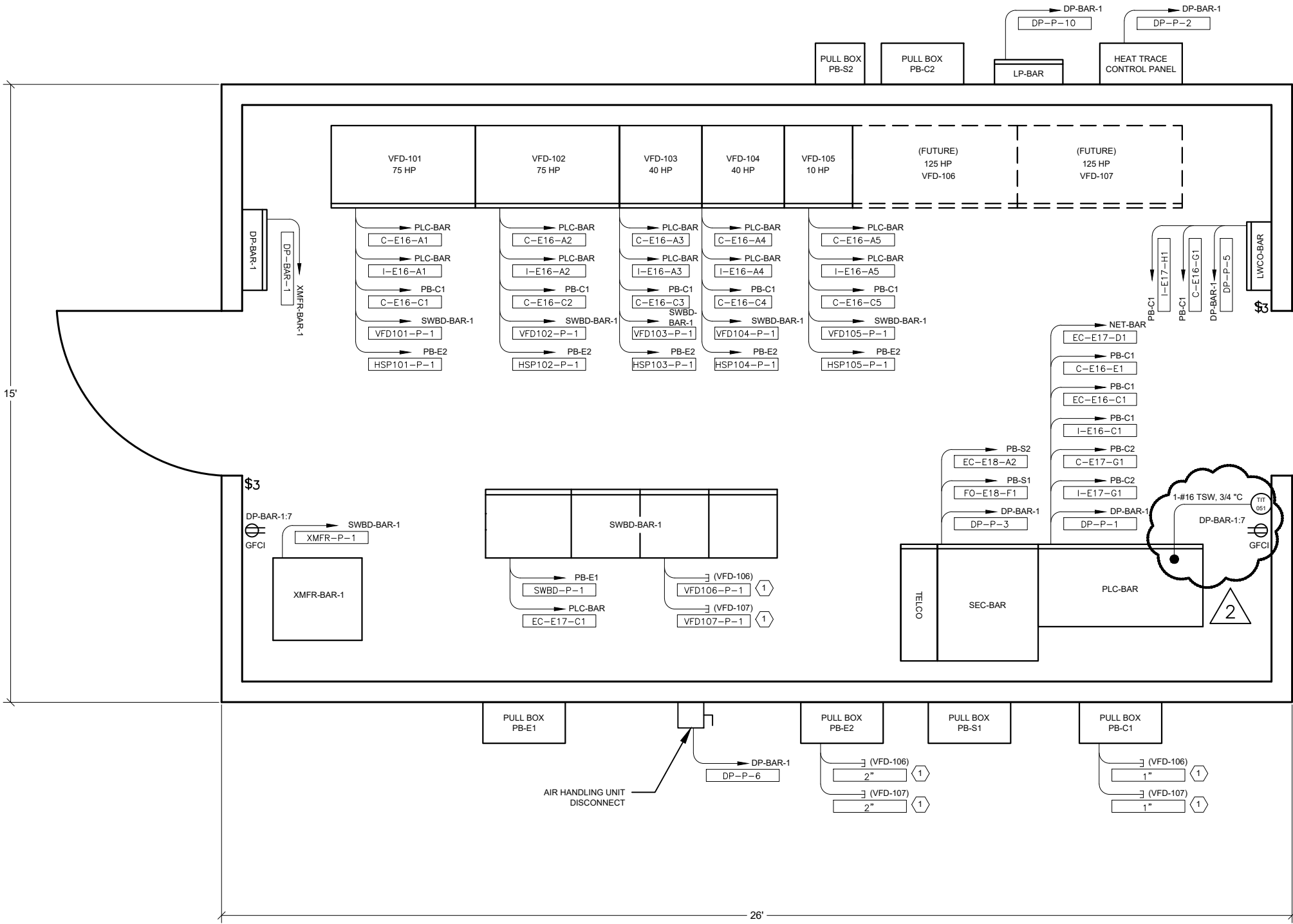
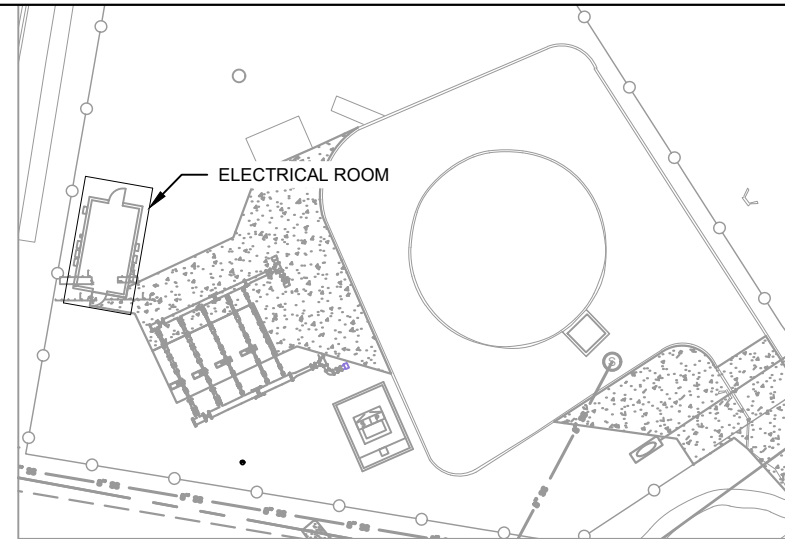
San Antonio Water System
SAN ANTONIO WATER SYSTEM
BROOKS RECYCLED WATER PUMP STATION UPGRADE PROJECT
ELECTRICAL DUCTBANK SECTION DETAILS

TEPE FIRM REGISTRATION NO. F-14711

DRAWING NO.
E-06



REVISIONS	No.	Description	Drn.	Approved	Date
	2	ADDENDUM NO. 2	BDH	AVS	09/26/23



KEYED NOTES:

1. THE CONDUITS SHALL BE INSTALLED AND WATERTIGHT CAPPED TO PROXIMITY OF THE FUTURE VFD PANELS.

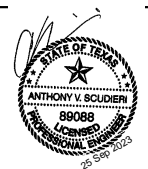
Kimley-Horn
 INFORMATION
 TEXAS REGISTERED FIRM, NO. F-928
 Automation
 REGISTRATION NO. F-14711

Date: MAY 2023
 Drawn by: EDIAZ
 Designed by: M.KASHIKI
 Checked by: A.SCUDIERI
 Scale: NTS



SAN ANTONIO WATER SYSTEM
 BROOKS RECYCLED WATER PUMP
 STATION UPGRADE PROJECT
**ELECTRICAL ROOM
 POWER PLAN**



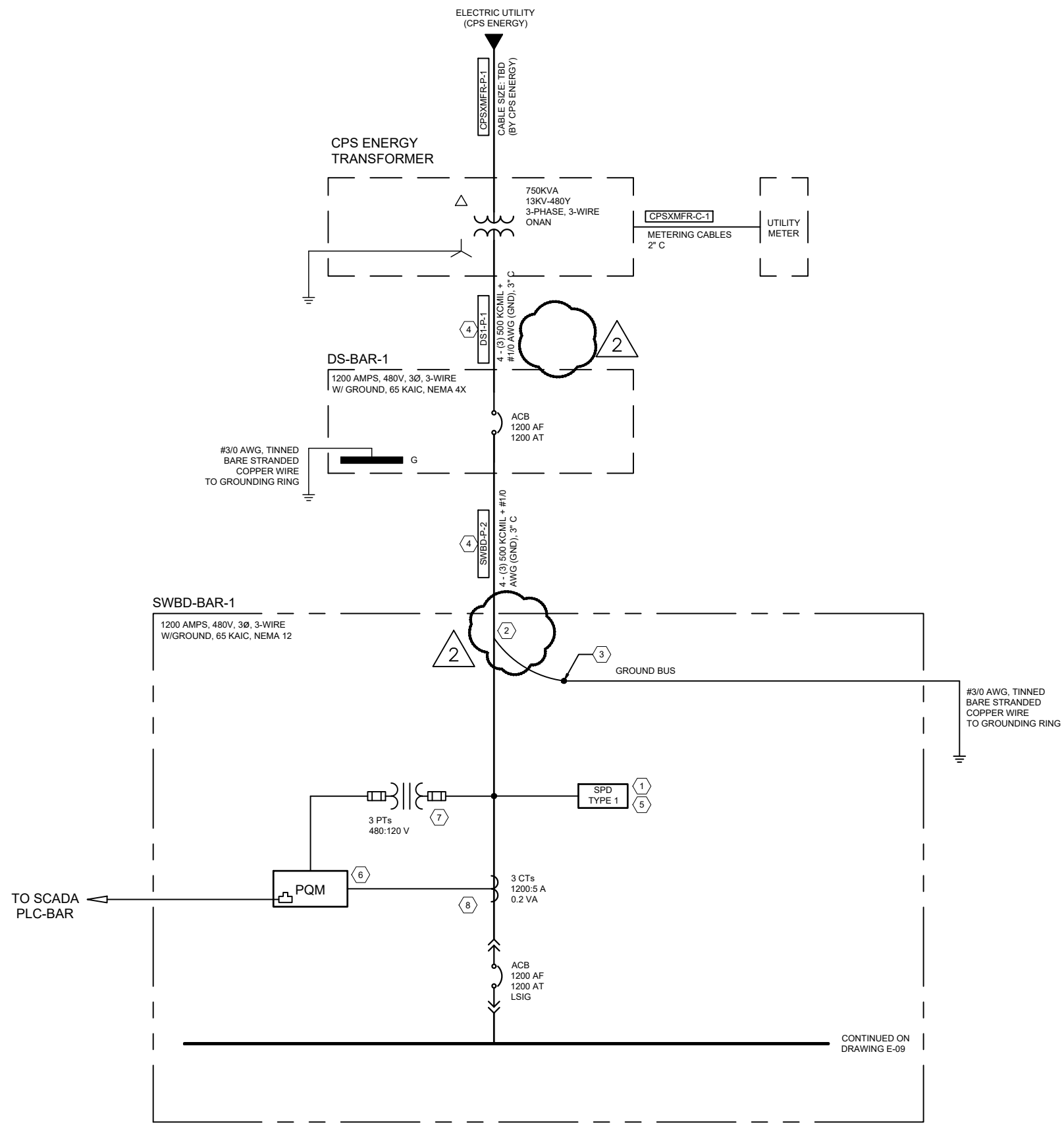


GENERAL NOTES:

- CONDUIT SMALLER THAN 3/4" SHALL NOT BE USED UNLESS OTHERWISE NOTED.
- CONDUIT INSTALLATIONS SHALL BE DONE IN A MANNER TO PREVENT CONFLICTS WITH EQUIPMENT AND STRUCTURAL CONDITIONS. EXPOSED CONDUITS SHALL BE INSTALLED PARALLEL AND PERPENDICULAR TO BEAMS AND WALLS.
- ALL ABOVE GRADE CONDUIT AND CONDUIT WITHIN MANHOLES SHALL BE RIGID ALUMINUM CONDUIT.

CODED NOTES:

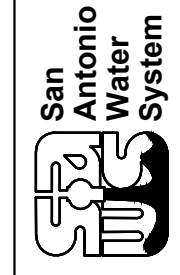
- SWITCHGEAR MANUFACTURER SHALL SIZE COMPONENTS INCLUDING THE SURGE PROTECTION DEVICE (SPD) TYPE-1 AND CIRCUIT BREAKERS.
- BOND GSC (N) TO NEUTRAL BUS INSIDE SWITCHBOARD AT MAIN SECTION.
- CONNECT SUPPLY-SIDE BONDING CONDUCTORS (SSBC) TO GROUND BUS INSIDE SWITCHBOARD AT MAIN SECTION.
- SINGLE CONDUCTORS ARE USED FOR EACH PHASE AND GROUND OF EACH RACEWAY. IF CONTRACTOR WISHES TO USE SE CABLE, THEN CONTRACTOR MAY NEED TO INCREASE SIZE OF RACEWAYS TO MEET NEC REQUIREMENTS.
- SPD SHALL HAVE INDICATION SHOWING THE STATUS OF THE SPD.
- THE POWER QUALITY MONITOR (PQM) SHALL BE GE MULTILIN PQM II.
- MAIN PTs SHALL BE INSTALLED IN THE MAIN OR IN THE ADJACENT SECTIONS.
- THE CTs SHALL BE EQUIPPED WITH SHORTING TERMINALS INSIDE MAIN SECTION.



REVISIONS		Date
No.	Description	09/26/23
2	ADDENDUM NO. 2	

Kimley»Horn
 INFORMATION
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 Automation
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Date: MAY 2023
 Drawn by: EDIAZ
 Designed by: M.KASHIKI
 Checked by: A.SCUDIERI
 Scale: NTS



SAN ANTONIO WATER SYSTEM
 BROOKS RECYCLED WATER PUMP
 STATION UPGRADE PROJECT
ONE LINE DIAGRAM I



REVISIONS	No.	Description	Drn.	Approved	Date
	2	ADDENDUM NO. 2	BDH	AVS	09/26/23

Kimley-Horn
INFORMATION
DESIGNED BY: M.KASHKI
CHECKED BY: A.SCUDIERI
SCALE: NTS
TEXAS REGISTERED FIRM, NO. F-928
Automation
REGISTRATION NO. F-14711

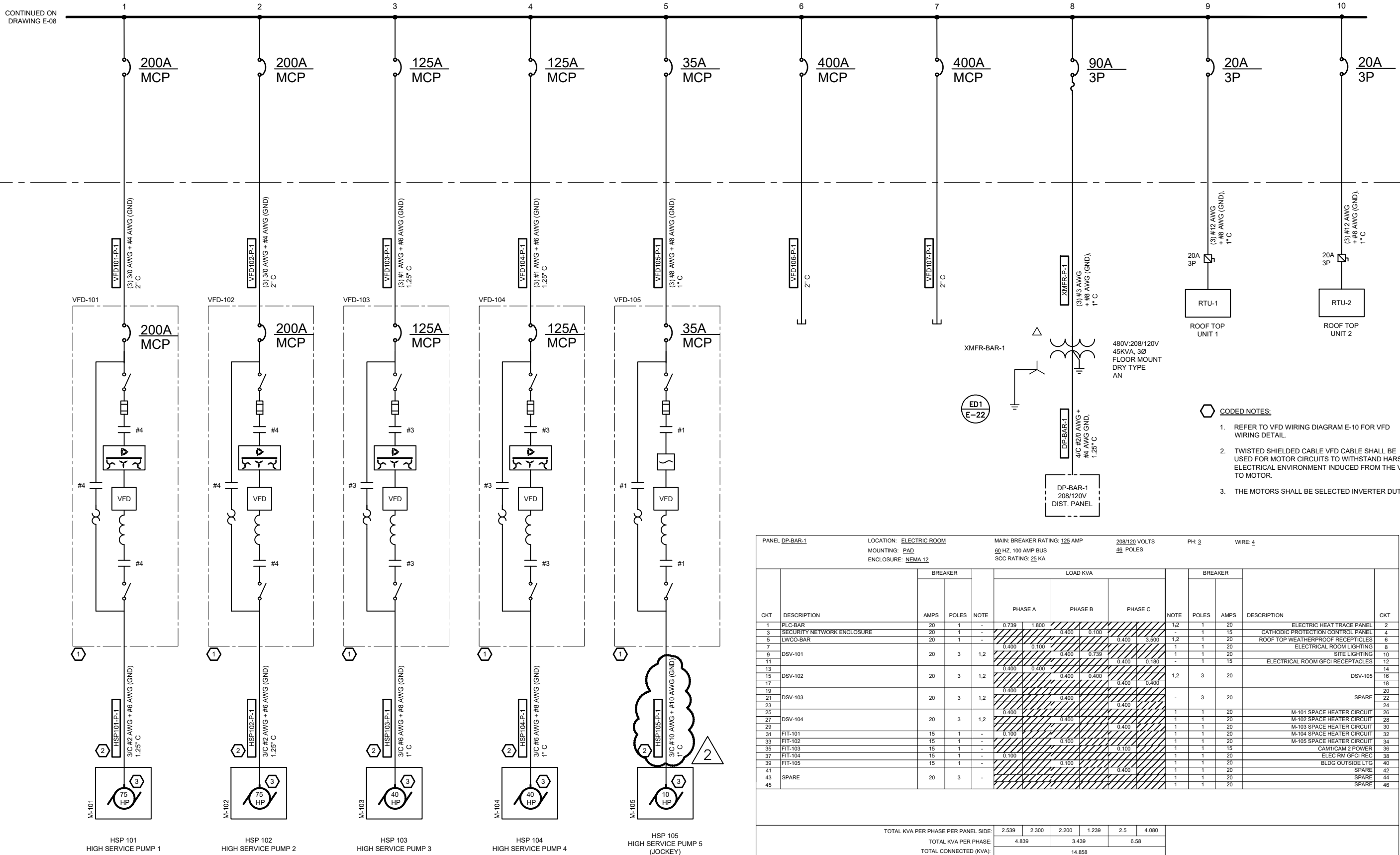
Date: MAY 2023
Drawn by: EDIAZ
Designed by: M.KASHKI
Checked by: A.SCUDIERI
Scale: NTS



SAN ANTONIO WATER SYSTEM
BROOKS RECYCLED WATER PUMP
STATION UPGRADE PROJECT
ONE LINE DIAGRAM II

SWBD-BAR-1

LV SWITCHBOARD
1200 AMPS, 480V, 3Ø, TIN PLATED COPPER, 3-WIRE
WIGROUND, 40 KAIC, NEMA 1

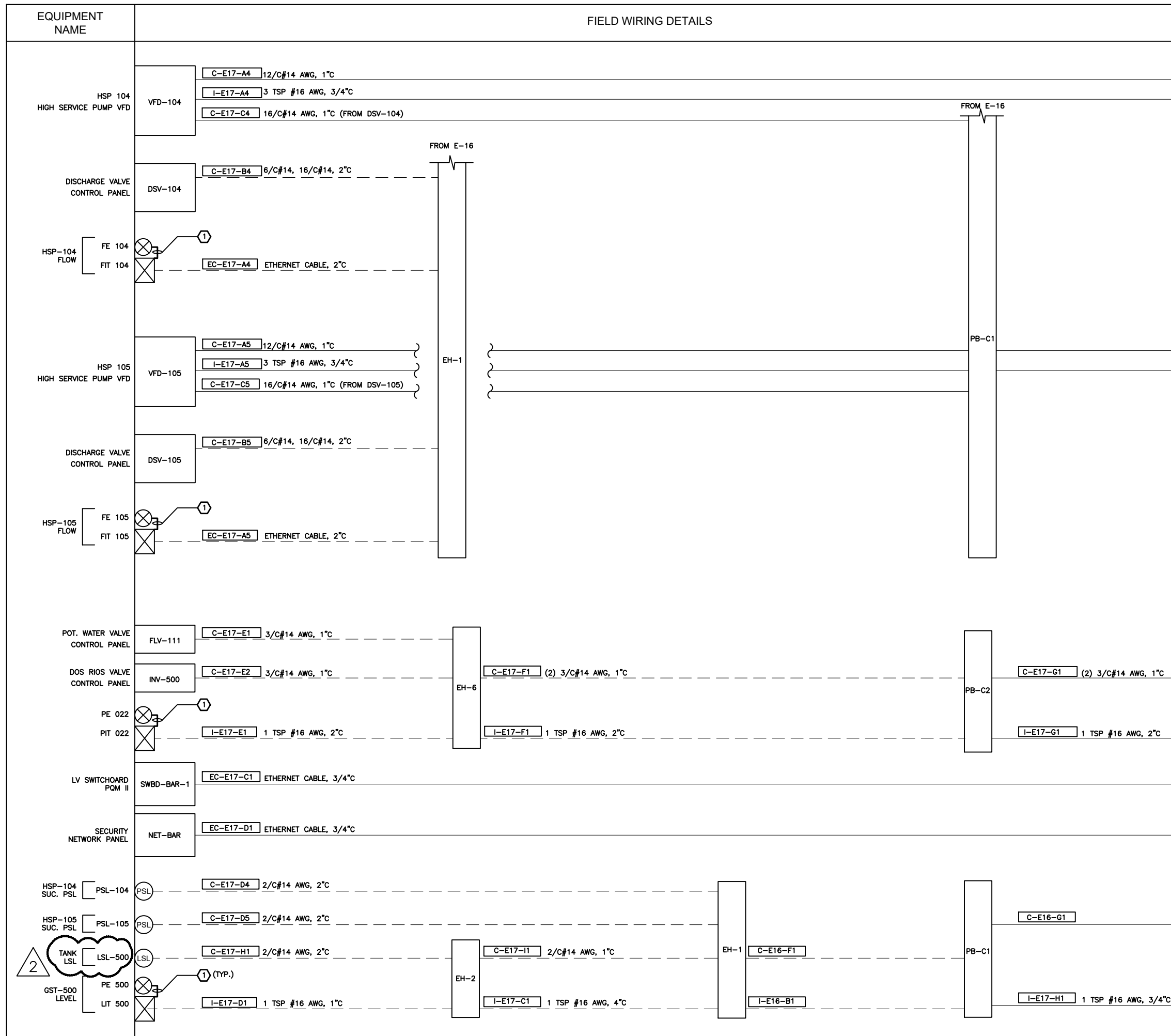


PANEL DP-BAR-1 LOCATION: ELECTRIC ROOM MAIN: BREAKER RATING: 125 AMP 208/120VOLTS PH: 3 WIRE: 4
MOUNTING: PAD 60 HZ, 100 AMP BUS 48 POLES
ENCLOSURE: NEMA 12 SCC RATING: 25 KA

CKT	DESCRIPTION	BREAKER		NOTE	LOAD KVA			NOTE	BREAKER		DESCRIPTION	CKT		
		AMPS	POLES		PHASE A	PHASE B	PHASE C		POLES	AMPS				
1	PLC-BAR	20	1	-	0.739	1.800			1,2	1	20	ELECTRIC HEAT TRACE PANEL	2	
3	SECURITY NETWORK ENCLOSURE	20	1	-			0.400	0.100		1	15	CATHODIC PROTECTION CONTROL PANEL	4	
5	LWCO-BAR	20	1	-			0.400	3.500	1,2	1	20	ROOF TOP WEATHERPROOF RECEPTILES	6	
7					0.400	0.100				1	1	20	ELECTRICAL ROOM LIGHTING	8
9	DSV-101	20	3	1,2			0.400	0.739		1	1	20	SITE LIGHTING	10
11					0.400	0.400				1	1	15	ELECTRICAL ROOM GFCI RECEPTILES	12
15	DSV-102	20	3	1,2			0.400	0.400	1,2	3	20		16	
17								0.400					18	
19					0.400								20	
21	DSV-103	20	3	1,2			0.400			3	20		22	
23													24	
25					0.400			0.400		1	1	20	M-101 SPACE HEATER CIRCUIT	28
27							0.400			1	1	20	M-102 SPACE HEATER CIRCUIT	28
29								0.400		1	1	20	M-103 SPACE HEATER CIRCUIT	30
31	FIT-101	15	1	-	0.100					1	1	20	M-104 SPACE HEATER CIRCUIT	32
33	FIT-102	15	1	-		0.100				1	1	20	M-105 SPACE HEATER CIRCUIT	34
35	FIT-103	15	1	-				0.100		1	1	15	CAM1/CAM 2 POWER	36
37	FIT-104	15	1	-	0.100					1	1	20	ELEC RM GFCI REC	38
39	FIT-105	15	1	-		0.100				1	1	20	BLDG OUTSIDE LTG	40
41								0.400		1	1	20	SPARE	42
43	SPARE									1	1	20	SPARE	44
45	SPARE	20	3	-						1	1	20	SPARE	46

TOTAL KVA PER PHASE PER PANEL SIDE: 2.539 2.300 2.200 1.239 2.5 4.080
TOTAL KVA PER PHASE: 4.839 3.439 6.58
TOTAL CONNECTED (KVA): 14.858

NOTES:
1. BREAKER TO BE GFCI RATED.
2. SUPPLY NECESSARY HARDWARE TO ALLOW BREAKER TO BE LOCKED IN THE "OFF" POSITION.



CODED NOTES:

- VENDOR SUPPLIED CABLE FROM EQUIPMENT MANUFACTURER, CONTRACTOR TO SIZE AND INSTALL CONDUIT FOR CABLE.

GENERAL NOTES:

- LOCATION OF INSTRUMENTS MAY CHANGE, CONTRACTOR TO COORDINATE WITH PROCESS CONTRACTOR FOR INSTRUMENT AND DEVICE LOCATIONS.
- POWER CONDUIT AND WIRING HAS BEEN EXCLUDED FOR CLARITY; REFERENCE ONE LINE-LINE DIAGRAMS, BUILDING DRAWINGS, AND POWER AND INSTRUMENTATION FOR MORE DETAILS.
- FOR CLARITY, NOT ALL PULL BOXES AND HANDHOLES ARE SHOWN.

JOB NO.
21-8601

REVISIONS

No.	Description	Drn.	Approved	Date
2	ADDENDUM NO. 2	BDH	AVS	09/26/23

INFORMATION

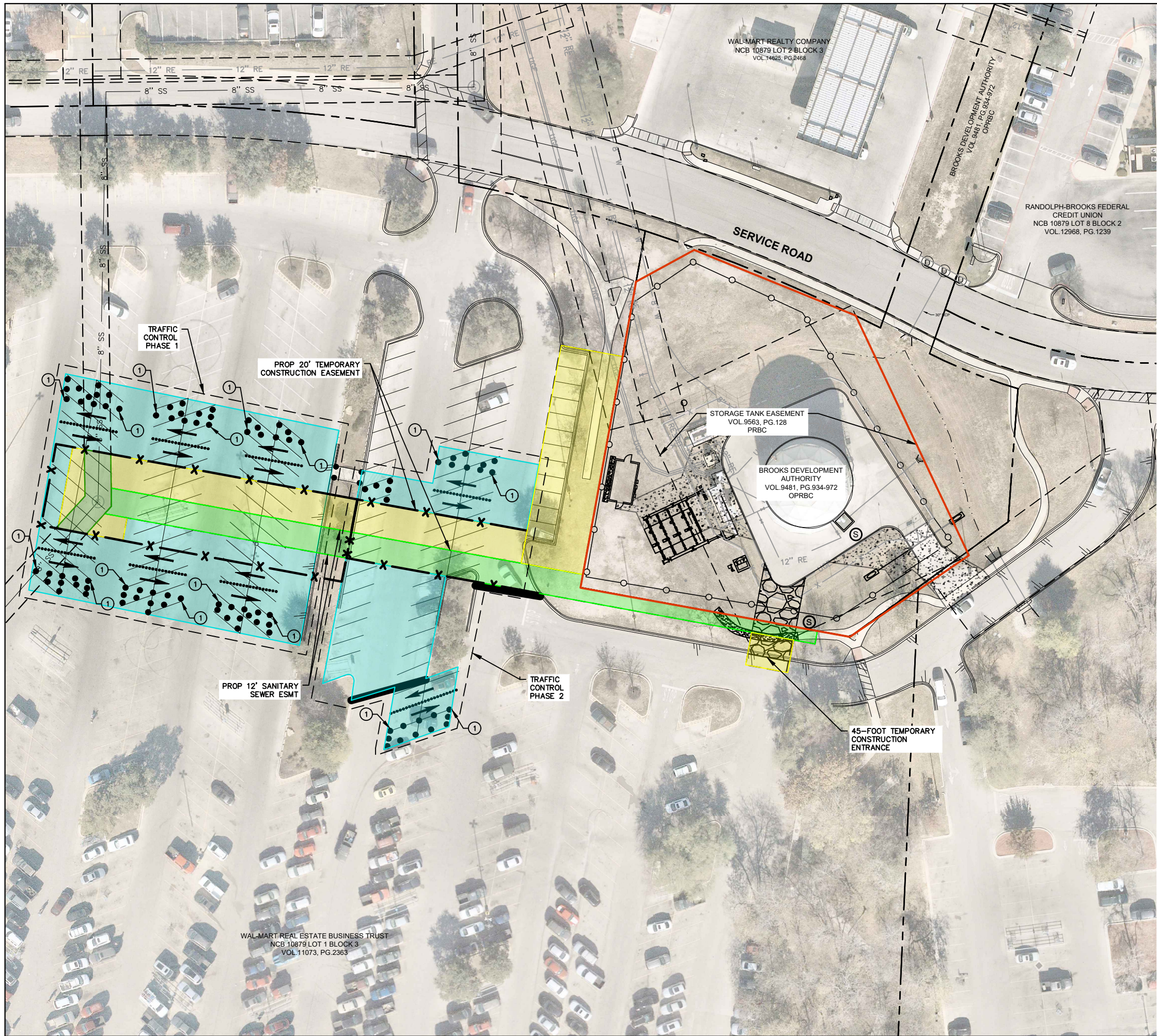
Kimley»Horn
 TEXAS REGISTERED FIRM, NO. F-928
 Automation
 TPE FIRM REGISTRATION NO. F-14711

Date: MAY 2023
 Drawn by: EDIAZ
 Designed by: M.KASHKI
 Checked by: A.SCUDIERI
 Scale: NTS

San Antonio Water System

SAN ANTONIO WATER SYSTEM
 BROOKS RECYCLED WATER PUMP STATION UPGRADE PROJECT
 INTERCONNECT II

DRAWING NO.
E-17

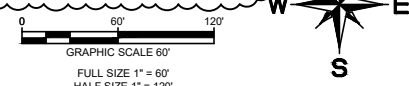


LEGEND

- X — X — EXISTING FENCE
- UGE — EXISTING UNDERGROUND ELECTRIC
- 12" RE — EXISTING RECYCLED WATER LINE
- 8" W — EXISTING WATER LINE
- 8" SS — EXISTING SANITARY SEWER
- - - - - EXISTING DRAINAGE CHANNEL
- ⊙ EXISTING SANITARY SEWER MANHOLE
- — — — — PROPERTY LINE
- ○ ○ ○ ○ PROPOSED FENCE
- - - - - PROPOSED SANITARY SEWER EASEMENT
- - - - - PROPOSED TEMPORARY CONSTRUCTION EASEMENT
- ▭ STAGING AREA
- ◻ TEMPORARY CONSTRUCTION ENTRANCE
- X — CONSTRUCTION FENCE
- PLASTIC DRUM
- TRAFFIC BUTTONS (TXDOT DMS-4300)(YELLOW) (2' SPACING)
- ▭ EXISTING PERMANENT EASEMENT
- ▭ PROPOSED PERMANENT EASEMENT
- ▭ PROPOSED TEMPORARY CONSTRUCTION EASEMENT
- ▭ TRAFFIC CONTROL AREA
- ①
- ↔ TXDOT TWO DIRECTION LARGE ARROW SIGN
- W1-7

NOTES

1. ALL BARRICADES AND SIGNAGE SHALL COMPLY WITH TXDOT BARRICADE AND CONSTRUCTION STANDARDS AND THE CURRENT TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
2. TRAFFIC BUTTONS SHALL BE SPACED 2 FEET ON CENTER.
3. CONSTRUCTION FENCING SHALL BE USED TO PROTECT WORK ZONE.
4. TRAFFIC CONTROL SHALL BE IMPLEMENTED IN THE TWO PHASES SHOWN. PHASE 1 AND PHASE 2 OF THE TRAFFIC CONTROL CANNOT BE IMPLEMENTED CONCURRENTLY.
5. NO WORK REQUIRING LOT CLOSURES AS SHOWN IN PHASES 1 AND 2 SHALL OCCUR BETWEEN NOVEMBER 1 AND JANUARY 31. PHASES 1 AND 2 SHALL NOT BE IN PLACE ON WEEKENDS THROUGHOUT THE ENTIRE YEAR, OR HOLIDAYS.
6. WHEN THE PARKING LOT IS TEMPORARILY OPENED FOR CUSTOMER USE, TRENCH EXTENTS SHALL BE COVERED BY TRAFFIC-RATED STEEL PLATES UNTIL COMPLETE PAVEMENT REPAIR HAS BEEN PERFORMED.
7. BARRELS SHALL BE MOVED TO IMMEDIATELY SURROUND TRAFFIC BUTTONS TO PROTECT BUTTONS DURING WEEKENDS.
8. CONTRACTOR TO REFERENCE SPECIAL CONDITIONS FOR ADDITIONAL REQUIREMENTS FOR WORK WITHIN THE EASEMENTS.
9. CONTRACTOR TO RESTORE EXISTING PAVEMENT STRIPING. STRIPING SHALL MEET REQUIREMENTS OF THE LATEST CITY OF SAN ANTONIO STANDARD SPECIFICATIONS FOR CONSTRUCTION.



JOB NO.
21-8601

09/17/2023

REVISONS	Description	Dm.	Approved	Date
1	ADDENDUM 2	VRS		9/27/2023

Kimley»Horn
TEXAS REGISTERED FIRM, NO. F-928

Date: SEPTEMBER 2023
Drawn By: VRN
Designed by: GRW
Checked by: VRS
Scale: SHOWN ON SHEET

San Antonio Water System

SAN ANTONIO WATER SYSTEM
BROOKS RECYCLED WATER PUMP STATION UPGRADES PROJECT
PARKING LOT TRAFFIC SEQUENCING

DRAWING NO.
TCP1