Members of the Board

Shannah Tharp-Gilliam, Ph.D.
Chair Person

Emily Kinkead
Sylvia Wilson
Harry Readshaw
Darrin Kelly
Theresa Kail-Smith
Patrick J. Catena

Arletta Scott Williams
Executive Director

Douglas A. Jackson, P.E.
Director
Operations & Maintenance

Michelle M. Buys, P.E.
Director
Environmental Compliance

Kimberly N. Kennedy, P.E.
Director
Engineering & Construction

Karen Fantoni, CPA, CGMA
Director
Finance

Michael Lichte, P.E.
Director
Regional Conveyance

Jeanne K. Clark
Director
Governmental Affairs

Julie Motley-Williams
Director
Administration

Erica LaMar Motley
Director
Scholastic Programs

JULY 18, 2025

CONTRACT NO. 1800

WET WEATHER PUMP STATION

ADDENDUM NO. 4

All bidders bidding **Contract No. 1800** shall read and take note of this **Addendum No. 4.** The Procurement Documents for **Contract No. 1800 WET WEATHER PUMP STATION** are hereby revised and/or clarified as stated below.

Acknowledgement of Contract No. 1800 Addendum No. 4

The Acknowledgement attached to **Addendum No. 4** is to be signed and returned immediately via email at **contract.clerks@alcosan.org** and acknowledged with Bidder's Proposal.

Kimberly Kennedy

Kimberly Kennedy, P.E.

Director – Engineering and Construction

ACKNOWLEDGEMENT OF

CONTRACT NO. 1800 G, E, H, P – WET WEATHER PUMP STATION

ADDENDUM NUMBER 4

FIRM NAME: _____

SIGNATURE: _____

TITLE: _____

DATE: _____

July 18, 2025

CONTRACT NO. 1800

WET WEATHER PUMP STATION

ADDENDUM NO. 4

ADDENDUM NO. 4

ALLEGHENY COUNTY SANITARY

AUTHORITY

PITTSBURGH, PENNSYLVANIA

CONTRACT NO. 1800

WET WEATHER PUMP STATION PROJECT

July 18, 2025

BID OPENING

DATE

WEDNESDAY,

AUGUST 19,

2025

11:00 A.M.

This Addendum No. 4 consists of 25 pages and the following attachments:

Attachment A – Addendum No. 4 Specifications (40 pages)
Attachment B – Addendum No. 4 Drawings – 22" x 34" (8 pages)
Attachment C – Addendum No. 4 Volume 1 of 1 Reference Information – Revised Table of Contents and New Sections 5J and 5K – (12 pages)

Also see additional item: CAD Files Zip

ATTENTION BIDDERS

The following additions to and modifications of the Contract Documents will be included in and become part of the Contract for the Allegheny County Sanitary Authority (ALCOSAN) – Wet Weather Pump Station Improvements Project. Bidders are instructed to take the following into account in rendering any Bid for this work

The Bidder is responsible for verifying that he/she has received and reviewed all of the pages of the Contract Documents as well as all of the pages and attachments of all addenda. The Bidder shall verify all pages with the table of contents in the Contract Documents and the first page of all Addenda. Receipt of this Addendum No. 4 must be noted on the Bid Form. These items modify the portions of the documents specifically noted; all other provisions of the Contract Documents shall remain in effect

1. CHANGES TO THE SPECIFICATIONS

1.1 In Volume 1 of 1, Article 1, on Page 1-26G, Paragraph 2 **ADD** the following after the first sentence.

"Shaft construction as defined in this Article shall include the following elements: installation of support of excavation systems, excavation and removal of soil and rock, installation of rock support, pre-excavation or cutoff grouting, and construction of shaft final concrete lining."

ADD the following after the last sentence.

"Qualifying subcontractor experience shall only be acceptable if the same subcontractor is responsible for shaft construction on the proposed Work for the WWPS."

1.2 In Volume 1 of 1, Article 1, on Page 1-27G, Paragraph 3.b **DELETE** "slurry/diaphragm wall or secant pile" and **ADD** ",installation of rock support, and construction of shaft final concrete lining." to the last sentence.

1.3 In Volume 3 of 5, Specification Section 01 50 00 Construction Facilities and Temporary Controls, Paragraph 1.04, **ADD** the following:

A. "C. Contractor may use the riverwall area along the load limit boundaries shown on Drawing 000-G-007 for barging provided the following conditions are met.
   1. Obtain written approval from the Owner.
   2. Intended water access and riverwall uses must conform to the load limits defined on Drawing G-007 at all times.
   3. Mooring of barges or otherwise imposing loads to the riverwall from the river side is not allowed.
   4. Dredging outboard of the riverwall is not allowed.

5. Equipment that can be used for lifting, hoisting, conveying, excavating and trucking associated with barge operations cannot be placed on the riverwall.
6. Contractor is solely responsible for obtaining all permits for water access, river navigation, and temporary storage of barges along the river from authorities and agencies having jurisdiction. Contractor must provide all navigational controls and protection measures in compliance with permits.
7. The Contractor must engage a qualified Professional Engineer licensed in the Commonwealth of Pennsylvania to:
   a. Perform pre- and post- construction condition surveys of the riverwall in conformance with Specification 02 20 00.
   b. Prepare an engineering report and supporting calculations demonstrating that the Contractor's intended access points and riverwall uses maintain imposed loads below the limits defined on Drawing 000-G-007.
   c. Prepare a work plan detailing barge locations, access points, load locations, and protective measures during all work.
   d. Submit all surveys, reports and work plans sealed by Contractor's Professional Engineer for review by the Owner prior to start of work.
   e. Submit qualifications demonstrating that the Contractor's Professional Engineer is specialized in the design and analysis of cellular cofferdams, river walls, and waterfront structures, with a minimum of five years of recent experience and analysis of three cellular cofferdams projects of similar scale and complexity, where the Contractors' Engineer was the engineer-of-record in responsible charge.
8. Contractor must conform to the Geotechnical Monitoring requirements and limits defined on Drawing 430-GT-02 and Specification 31 09 13
9. Contractor is responsible for providing their own water side access equipment. No use of the Owner's ladders, gang ways or other equipment is acceptable.
10. Contractor shall repair any damage to the riverwall caused by barge storage, water side access, or coffer cell use for site access or work.
11. Contractor access to the riverwall shall be limited to 2-years from NTP.
12. Contractor shall remove the barge within 2-weeks if requested in writing by Owner."

1.4 In Volume 3 of 5, Specification Section 07 10 50 Shaft Membrane Waterproofing System, **REPLACE** this Section in its entirety.

1.5 In Volume 3 of 5, Specification Section 26 05 33 Raceways and Boxes for Electrical Systems,

Paragraph 3.08.Q.2, **DELETE** paragraph a.

Paragraph 3.08.Q.3.a, **DELETE** "or PVC coated cast aluminum."

1.6 In Volume 3 of 5, Specification Section 26 13 26 Medium-Voltage Metal-

Cad Switchgear, Paragraph 2.10.B, **ADD** the following:

"1. Provide any additional current or potential transformers, miscellaneous equipment and wiring required to accommodate relaying per the manufacturer's recommendations. Relay system configurations and requirements vary depending on manufacturer."

1.7 In Volume 3 of 5, Specification Section 26 13 26 Medium-Voltage Metal-Cad Switchgear, Paragraph 2.13, **ADD** the following:

"H. Optic Arc Flash Relays:

1. Provide an integrated Optical Arc Flash Relay Detection System for high speed tripping of all breakers on the switchgear bus.
2. Provide an Optical Relay for each switchgear bus.
3. Provide an optic sensor in each compartment or cubicle to detect an arc flash"

1.8 In Volume 3 of 5, Specification Section 31 09 13 Geotechnical Instrumentation and Monitoring, Paragraph 3.01.E.1, **DELETE** "Prior to drilling at each location, vacuum excavation will be performed at all borings to verify no existing utilities, prior to drilling at each location" in the last sentence and **REPLACE** with "Where drilled boreholes are located within five feet horizontally of existing underground utilities, use vacuum excavation methods to excavate and clear utilities within the maximum anticipated depth below ground surface."

1.9 In Volume 3 of 5, Specification Section 31 09 13 Geotechnical Instrumentation and Monitoring, Paragraph 3.01.E.1, **ADD** the following:

"a. The vacuum excavation depth may stop at the top surface of the existing utility, if encountered; otherwise, it shall proceed to 2 feet below the top surface of anticipated existing utility."

1.10 In Volume 3 of 5, Specification Section 31 23 20 Pre-Excavation Drilling and Grouting, **REPLACE** this Section in its entirety.

1.11 In Volume 3 of 5, Specification Section 31 33 01 Vertical Rock Reinforcement, **REPLACE** this Section in its entirety.

1.12 In Volume 3 of 5, Specification Section 31 72 13 Rock Initial Support, Paragraph 2.02, **ADD** the following:

"K. Geocomposite Drainage Materials: See Section 31 74 19."

1.13 In Volume 3 of 5, Specification Section 31 72 13 Rock Initial Support, Paragraph 3.03, **ADD** the following:

"F. Geocomposite Drainage Materials: See Section 31 74 19."

1.14 In Volume 3 of 5, Specification Section 31 74 19 Shotcrete, Paragraph

2.01.A.8.a, **DELETE** "Refer to Section 31 23 19 and Section 31 72 13 for requirements" and **REPLACE** with "The geocomposite drainage material shall be Mirafi J-Drain 300 or equivalent."

1.15 In Volume 3 of 5, Specification Section 31 74 19 Shotcrete, Paragraph 3.01.E.2, **ADD** "Weep holes shall be installed at maximum 20-ft spacing." after the last sentence.

1.16 In Volume 3 of 5, Specification Section 40 61 13 Process Control Systems General Requirements, **REVISE** Paragraph 1.05.A.5 to the following:

"5. Each Contractor that is providing wiring for the project, shall develop and furnish Loop Diagram to the Owner. The Loop Diagrams shall be assembled per Owner Loop Standards, which will be supplied to the respective Contractor."

2. CHANGES TO THE DRAWINGS

2.1 On Sheet 000-C-07, **REPLACE** Sheet 000-C-07, with Sheet 000-C-07 Rev. 01, refer to Attachment B.

2.2 On Sheet 430-MD-05, **UPDATE** Detail 4. **REPLACE** Sheet 430-MD-05 with Sheet 430-MD-05 Rev. 01, refer to Attachment B.

2.3 **REPLACE** sheets 430-S-45, 430-S-65, and 430-S-66 with Sheet 430-S-45 Rev. 01, 430-S-65 Rev. 01, and 430-S-66 Rev. 01, refer to Attachment B.

2.4 **REPLACE** Sheets 430-ES-01, 430-ES-13, and 430-ESL-02 with Sheets 430-ES-01 Rev. 01, 430-ES-13 Rev. 01, and 430-ESL-02 Rev. 01, refer to Attachment B.

3. CHANGES TO VOLUME 1 of 1 REFERENCE INFORMATION

3.1 **REPLACE** the Table of Contents with the revised Table of Contents contained in Attachment C.

3.2 At the end of Section 5 Reference Drawings, **ADD** new sections,

Section 5J CONTRACT 1729 EAST HEADWORKS – SHORING

Section 5K CONTRACT 46 UOIT

Refer to Attachment C.

4. QUESTIONS AND ANSWERS

Q1: Is the 1800-G Contractor responsible for developing and providing the Loop Diagrams per the Owners requirements?

A1: Each Contract which provides wiring, is responsible to develop and provide Loop Diagrams per the requirements defined in 40 61 13 1.05 A .5. Refer to Item 1.16 of Addendum No. 4.

Q2: Is the 1800-G Contractor responsible for all of the field Loop Testing?

A2: Contract 1800E and 1800H perform the continuity tests associated with their work, then loop testing of wiring for their respective scope of work as define in 40 61 13 3.02 F. Loop tests will be witnessed by the Construction Manager.

Q3: Is the 1800-G Contractor responsible for providing all the specified requirements of the System Integrator?

A3: 1800 G is responsible for system integration as defined in 40 61 13. The software programming of the DCS is by the Owner as specified in 40 61 13 3.01 C.

Q4: Drawing Sheet 7 of 405 shows an Owner's barge adjacent to a river wall West of the Wet Weather Pump Station Work area. Will the Wet Weather Pump Station Contractor be permitted to stage any barges along the river wall between Coordinates N 10735.162, E 5503.887 and N 11173.344, E 5505.541?

A4: Section 01 50 00 has been revised. Refer to Item 1.3 in Addendum No. 4.

Q5: Drawing Sheet 7 of 405 shows the LOD down the center of the river wall cells and also prohibits vehicular access West of the LOD line. Laydown area is at a premium for this contract. Would Alcosan consider moving the LOD to the face of the river wall and provide water access and barge storage to the Wet Weather Pump Station Contractor? This would reduce the construction traffic on the site.

A5: Section 01 50 00 has been revised. See Item 1.3 in Addendum No. 4.

Q6: Including the 6" mudmat, the bottom elevation of the shaft will be EL 529.70. The core boring logs and core shed visit confirmed the presence of a coal seam ranging from elevations 522.90 (boring FD-70-001) to elevation 530.70 (boring PP-04-001B). In order to reduce water infiltration coming through the bottom of the excavation, please add additional primary pre-excavation grout holes within the shaft diameter.

A6: Note the mudslab is shown as 6"" thick minimum and unreinforced concrete. However, its design by the contractor shall account for contractor means and methods, anticipated equipment, ground conditions, and groundwater inflow. Contractor may elect to perform additional selective grouting per Contractor's means

and methods. Payment for such work would be part of Pay Item 1 - WWPS Construction Lump Sum Work.

Q7: It is assumed that prior to the start of Slurry wall work the site elevation will be 727'. In this case the minimum elevation for pre-trenching would be 717'. Please confirm.

A7: Confirmed. The minimum depth for pre-trenching is 10 feet per Spec Sec 31 56 00.

Q8: Upon completion of the pre-trenching work, the excavated area should be restored in a manner suitable for guide wall installation. Please confirm that backfilling the trench with 150 psi CLSM is acceptable. In addition, please confirm that backfilling operations will not need to meet the requirements of section 31 21 00 since the backfill material will be removed shortly after suring slurry wall excavation.

A8: The approach is acceptable, refer to Section 31 21 00 for acceptable flow fill mix design requirements.

Q9: Article 1, Bidder's Qualification Statement:
Page 1-25G Reference Projects states: Construction work not self-performed (e.g. performed by a subcontractor or by previous JV partner) will not be considered acceptable…
Page 1-26G Paragraph 2 states: ""If a subcontractor is proposed to meet the minimum requirements for shaft construction, indicate the firm. ""
Question - The above two statements appear to be in conflict. Can the work performed by The Bidder's proposed subcontractor(s) be used to meet the Bidder's experience requirements?

A9 Refer to revised Bid Form, Item 1.1 in Addendum No. 4. If a Bidder relies on subcontractor experience to meet qualifying shaft construction experience for the Bidder, the proposed subcontractor shall demonstrate experience with all elements of shaft construction including installation of support of excavation systems, excavation and removal of soil and rock, installation of rock support, pre-excavation or cutoff grouting, and construction of final interior shaft concrete lining.

Q10: Article 1, Bidder's Qualification Statement:
Page 1-27G Paragraph 3 Shaft Superintendents states: "Participation in the capacity of a superintendent on at least one shaft construction project utilizing slurry/diaphragm wall or secant pile support of excavation in soil and controlled blasting in rock."
Question - Can personnel from the Bidder's proposed slurry / diaphragm wall subcontractor be used to meet the Bidder's personnel experience requirements?

A10: Refer to revised Bid Form, Item 1.2 in Addendum No. 4. Shaft superintendent shall demonstrate experience with excavation in soil and controlled blasting in rock, installation of rock support, and construction of shaft final concrete lining.

Q11: "Article 2.01 Defined Terms, Paragraph B states: ""Only ALTERNATES identified in the Bid Form will be considered. Drawing 430-S-49 Pile Details, General Note 11 states: ""ALL CONTRACTOR DESIGNED ALTERNATIVES ARE REQUIRED TO BE TERMINATED AT ELEVATION 654.00 OR HIGHER TO AVOID INTERFERENCE WITH ROCK DOWELS USED IN SHAFT CONSTRUCTION.""
There is no Alternate on the Bid Form for Contractor Alternative Designed Micropiles.
Question - Are Bidders allowed to include a Contractor Designed Alternate Micropile Design in their bid price or must they bid and use the Engineer's micropile design detailed on Drawing 430-S-49?"

A11: Contractor must bid using the design details on Drawing 430-S-49. Contractor alternatives will be considered after award.

Q12: "Specification 01 11 00 - Paragraph 18 states: "". ...all excavations for the Wet Weather Pump Station, including excavations physically connected to the WWPS excavation or extending into bedrock, shall be classified as underground shaft, tunnel, chamber, cut and cover excavations, and passageways in accordance with 29 CFR 1926, Subpart S. Additionally, these excavations shall be classified as “potentially gassy” in accordance with 29 CFR Section 1926.
Question - Is the Slurry/Diaphragm wall excavation and installation governed by the requirements of this paragraph?"

A12: No. Slurry wall excavation is not covered under Subpart S.

Q13: "Specification 01 22 00 - Pay Item 13– Specific Allowance #2 – Stoppage to Slurry Wall Trench Excavations

Question - Is using a mechanical bucket, a steel chisel or a hydromill cutter considered to be ""employment of special tools and/or excavation techniques and procedures, including drilling, excavating, or coring, to remove break up or push aside the obstruction".

A13: Yes, using an alternative tool, regardless of the tool type, is considered employment of special tool and/or excavation technique. See GBR for definition of a stoppage.

Q14: "Specification 01 22 00 - Pay Item 7 – Shaft Pre-Excavation Grouting Exclusive of Grout Materials, Paragraph 4.c. states ""Contractor should anticipate items such as mobilization of specialty Subcontractor(s), water pressure testing of grout holes, batching and filling of grout lines, moving from hole to hole, simultaneous grouting at multiple locations..."",

Question 1-How many locations is the Contractor required to grout simultaneously?
Question 2 - If the Contractor is simultaneously grouting for example on 3

holes simultaneously for an hour, please clarify if the Contractor will be paid for one hour of grout crew time or three hours of grout hole time under this pay item?"

A14: 1. The Contractor is not required to grout simultaneously but is allowed to grout simultaneously. Refer to Specification.

2. Each grout hole is required to have its own grout setup and crew. Therefore, if Contractor is simultaneously grouting on 3 holes for an hour, three hours of grout hole time will be paid under this pay item.

Q15: Drawing 430-SOE-07 appears to show an area where the shotcrete overlaps the shaft slurry walls from EL 654 to Top of Rock Elevation. What is required to support the small sliver of existing rock that is shown to remain in place?

A15: The SOE drawing shows this area of rock to be supported by shotcrete. During rock excavation based on the encountered conditions, the Contractor shall determine if the rock in this area shall be scaled and removed or supported by shotcrete.

Q16: Drawing C-17, "PLAN - WWPS EFFLUENT CONDUIT" indicates an existing tie back SOE system at the end of the WWPS Effluent Conduit Run where it ties into the Main Pump Station. Please provide construction drawings and as-builts from this system.

A16: Shop drawings added to Reference Information Volume 1 of 1. See Attachment C of Addendum No. 4.

Q17: S489_SPC_VOL1_20250514, Article 1 Bid Form, Item 06 and 07 describes GROUTING EXCLUSIVE OF GROUT MATERIALS. Which item should grout material be captured?

A17: Pay Item 24, Specific Allowance #13, is the payment method for Grout Materials used for Pre-Excavation Grouting and Cut-off Grouting.

Q18: S489_SPC_VOL1_20250514, Article 1 Bid Form shows line item for "INITIAL SUPPORT SPOT ROCK DOWELS" This item is not indicated anywhere on the drawing. Could you clarify where and what they are for?

A18: Per the GBR, "In some areas, the pattern of rock reinforcement will need to be supplemented with additional spot rock dowels as necessary to stabilize the mass excavation." Contractor to determine additional spot rock dowel locations during mass excavation.

Q19: Drawing 430-S-06 notes partial demolition of the shaft slurry wall is required to construct the discharge piping floor. Please confirm the slurry wall is designed to withstand the unbalanced loads during this stage of construction.

A19: Confirmed.

Q20: Are there any surcharge loading limitations for the contractor's equipment on the shaft slurry wall at any stage during construction.

A20: See Shaft Support of Excavation (SOE) General Note 3 on 430-SOE-03.

Q21: 16. S489_SPC_VOL2_20250514 Section 07 10 50 2.02 denotes Remedial Grout Pipes and Reinjectable Grout Hose systems as two separate systems. Waterproofing drawings show remedial grout pipes near corners of all waterproofing cells, and reinjectable grout hoses at construction joints. However, the terms remedial grout pipe and reinjectable grout hose seem to be used interchangeably in the drawing details (1/430-S-39) and drawing notes (S-35). Please clarify the difference in scope between two types of grouting indicated, if the grouting is meant during shaft construction (by Contractor) or by future use (by Alcosan), and the specific requirements for regrouting as the specifications to not address.

A21: Remedial grout pipes and reinjectable grout hoses are not interchangeable and are both required. Reinjectable hoses are required at concrete construction joints. Remedial grout pipes are required at membrane waterproofing panels.

Remedial grout pipes and reinjectable grout hoses are meant during shaft construction. The requirements for acceptable performance of the system are given in Section 01 45 25.

Q22: If the contractor respects the mandated surcharge load limits adjacent the existing river wall, could the contractor access these areas and utilize barges for WWPS construction purposes?

A22: See response to Queston 4 in Addendum No. 4

Q23: Are anchor bolts required for the Type KGV support pedestals? Ref. dwgs: 430-M-13 & 430-MD-05.

A23: Anchors bolts are not required. Refer to Item 2.3 revised drawing 430-MD-05 in Addendum No. 4 for the revised Type KGV Support detail.

Q24: S489_SPC_VOL1_20250514 Section 01 11 00 1.02 (B) 34 states "Provide and maintain construction entrance on Tracy Street" by the WWPS contractor, and drawing C-07 to be maintained by Ohio River Tunnel Project Team. Please confirm.

A24: Refer to revised Sheet 000-C-07 in Addendum No. 4. WWPS Contractor to maintain entrance on Tracy Street.

Q25: Drawing 430-SOE-13 details initial support details for the rock excavations. Weep holes and drainage are noted as "as required" and "if required". Please provide Details for Geocomposite drainage, and locations/spacing of weep holes to be assumed.

A25: Weep holes shall be at max spacing of 20'. Specification Section 31 74 19 has been updated to reflect this. The minimum material requirements of the geocomposite drainage strips have been added to this specification as well. Per Part 3.01.E.2, the weep holes and geocomposite drainage strips shall be installed as needed to allow pipes to drain freely after shotcrete installation. Refer to Item 1.15 of Addendum No. 4.

Q26: Please reference the beams labeled FB 1-3, FB 1-4, and FB 1-5 in the beam schedule on drawing 430-S-45 and drawings 430-S-53 and 430-S-54 of the entry level floor plan. Looking at the drawings, there are two of each of the three types of beams for a total of six beams. These six beams are labeled as precast in the beam schedule. These beams look to be integral to the cast-in-place slab. Please confirm that these beams are to be cast-in-place.

A26: The six beams are to be precast and are not integral to the cast-in-place slab. Drawings 430-S-45, 430-S-65, and 430-S-66 have been revised to clarify this. Refer to Attachment B of Addendum No. 4.

Q27: Drawing 430-ER-05 Lighting Control Block Diagram. The Emergency LED Fixture Diagram on Drawings 430-ER-05 details a local control switch to isolate each LED emergency fixture. Will a local switch be required at the location of each emergency LED Fixture A1E, A2E, A7E, B2E, B3E, B4E, H1E, M1E, M2E, M3E, X1, X2, X3?

A27: No, the normal emergency lights that aren't on the inverter will be circuited with the switch(es) indicated on the lighting plans. Similarly, the local control switches shown on 430-ER-05 are the same switches shown on lighting plans associated with the emergency lights.

Q28: Drawing 430-ER-05 Lighting Control Block Diagram. The Emergency Inverter Wiring Diagram For Hazardous Location Lighting details local control light switches for the Odor Control Room, Dumpster Area and Screen Rooms. What is the proposed location for these switches. Are the Lighting Switches detailed on Drawing 430-ER-05 in addition of the Lighting Switches detailed on Drawings 430-ELP-01through 430-ELP-14?

A28: Switch locations are shown on the lighting plans, drawings 430-ELP-01 through 430-ELP-14 . Lighting switches shown on 430- ER-05 are the same switches that appear in the lighting plans.

Q29: GFCI Welding Outlets Drawings 430-ELP-07 and 430-ELP-08. The Screening Room on Drawing 430-ELP-07 and the Dumpster Room on Drawing 430-ELP-08 details the requirement to install 480V 3Phase GFCI Protected Welding Outlets. Can a Specification or manufacturers model number be provided for these proposed GFCI Protected Welding Outlets inclusive of the current rating of these devices?

A29: The welding circuits can be protected using a GFCI breaker in the panelboard to supply the welding receptacles. Refer to revised panel schedules per Item 2.4 of Addendum No. 4.

Q30: Section 26 27 26 Wiring Devices- Device Mounting Boxes 26 27 26-3 C. Switches for Outdoor and Corrosive Areas 1. States that Switches shall be mounted in FS type cooper-free aluminum or PVC Mounting Boxes. 26 05 00 -3 1.04 Project/Site Conditions D. Enclosure Material and Rating states that all Indoor Process and Corrosive Areas and Outdoor Corrosive and Non-Corrosive Areas shall be NEMA 4X 316 S. Steel. 26 05 33-17 Q Boxes states that Outdoor Device Boxes shall be FD PVC Coated Cast Aluminum or NEMA 4X and Corrosive Areas shall ne NEMA 4X or PVC Coated Aluminum. Which of the above is the correct mounting back boxes for wiring devices in Outdoor and Corrosive Areas?

A30: All outdoor enclosures should be NEMA-4X stainless steel #316. Refer to Item 1.5 of Addendum No. 4.

Q31: 26 13 26 Medium Voltage Switchgear/ Drawing 430-ESL-02

Specification Section 26 13 26 Part 2.13 details the requirements for Arc Flash Mitigation and Note 3 on Drawing 430-ESL-02 states: Provide An Optic Arc Relay (AFD) With Sensors In Each Compartment And Integrated To Trip All Breakers On The Bus. Are Point Sensors required for each relay to have Arc Flash Detection/Mitigation?

The Specifications and Drawings for the Medium Voltage require Buss Differential Protection, but Drawing 430-ESL-02 does not detail appropriate CT's shown for a Bus Differential Scheme. If Bus Differential Protection required and if so what are the Bus CT requirements?"

A31: 1. For the optic detection, the intent is to provide one optic relay per bus and optic sensors in each compartment or cubicle to detect an arc flash. The number and locations of the sensors are manufacturer specific.
2. Bus differential protection is required. The configuration and number of CT's required is manufacturer specific, additional relays and CT's maybe required if the associated relays are not multi-function or networked.

Refer to Item 1.6 and Item 1.7 and Item 2.4 of Addendum No. 4.

Q32: Keynote 17 on sheet 000-CDM-02 Below Grade Demolition Plan states to remove abandoned retaining wall footing as required to perform work. Approximately 151 LF in length. Can the owner provide information concerning the existing footing? Such as depth, thickness, width, etc.

A32: No additional record information is available.

Q33: As per section 1.09 of the Specification - we are requesting access to the Underground Utility Record Drawings.

A33: See Response to Queston 47 in Addendum 3.

Q34: Keynote #1 on Sheet 000-EDM-01 Site Electrical Demolition states to demolish the abandoned 5KV substation structures, building ,fencing and equipment pads. It looks like there are five metal structures that need to be removed. Can the owner provide information concerning these structures?

A34: Available information of the substation is included in Volume 1 of 1 Section 5E.

Q35: Specification Section 31 56 00 - Slurry Walls paragraph 3.01.C.2.a states to perform excavation continuously from the ground surface to the required depth and Specification Section 01 11 20 - Job Conditions paragraph 3.01.B.1 mentions slurry wall construction continuous excavation of the WWPS shaft and initial support. Is it the owners intention for the installation of the slurry wall support of excavation system to be installed in a non-stop 24 hour/day 7 day/week operation.

A35: No. Continuous excavation means that once slurry wall excavation begins on a specific panel, that panel must be fully excavated before proceeding to another panel.

Q36: Drawing 430-ES-13 CABLE SCHEDULE 3 shows cables H-DPU1-800, H-DPU2-800, H-LAN-110-1, and H-LAN 110-2. In the VIA RACEWAY OR CABLE TRAY section for these cables it references SEE DRAWING 430-ER-12. Drawing 430-ER-12 can not be found in the drawing set. Please advise.

A36: This is a incorrect drawing reference. Refer to Item 2.5 in Addendum 4.

Q37: Refer to Section 31 71 16 of the Technical Specifications:

a. Does the design of the shotcrete support comply with the allowable PPV supplied in the Design Criteria Table 1?

b. Were potential explosive magazine studies conducted during the risk assessment or planning phase?"

A37: a. Yes the design of the shotcrete support complies with the allowable PPV in Table 2 given the distance factor.

b. Storage and transportation restrictions for magazines are regulated by CFR, Title 27 and local permit requirements, per Section 31 71 16.

Q38: Specification Section 31 74 19 - 3.01 (E) 2 states: "Drill drain and weep holes through shotcrete as needed to ensure that hydrostatic pressure does not develop. Install drain pipes and/or geocomposite drainage strips as needed and allow pipes to drain freely after shotcrete installation." Provide quantity of weep holes Contractor to assume to be installed per "Typical weep hole detail" and provide detail for geocomposite drainage strips to be

installed and quantity/location to be installed per details on drawing 430-SOE-13.

A38: Weep holes shall be at max spacing of 20'. Specification Section 31 74 19 has been updated to reflect this. The minimum material requirements of the geocomposite drainage strips have been added to this specification as well. Per Part 3.01.E.2, the weep holes and geocomposite drainage strips shall be installed as needed to allow pipes to drain freely after shotcrete installation.

Q39: Specification Section 31 09 13 3.01 (E) states: "Prior to drilling at each location, vacuum excavation will be performed at all borings to verify no existing utilities, prior to drilling at each location." Section 31 63 33 - 3.02 (C)(1) states: "Where drilled boreholes are located within five feet horizontally of existing underground utilities, use vacuum excavation methods to excavate and clear utilities within the maximum anticipated depth below ground surface." Please further clarify the required "maximum anticipated depth" of vacuum excavation at each drilling location so the contractor can confirm feasibility.

A39: Spec Section 31 09 13 updated to reflect requirements from Section 31 63 33.Refer to Items 1.8 and 1.9 of Addendum No. 4. .

Q40: Has any verification been done to determine the location of the UOIT and to what accuracy. What provisions have been made for access to verify the location by the Contractor?

A40: A crosshole seismic tomography survey was performed by ALCOSAN to determine the approximate location of the UOIT. Refer to Appendix E of the Geotechnical Data Report (Vol. 5) for results of this survey including discussion of survey accuracy. No provisions are included in the Contract for accessing the UOIT; however, some work activities in close proximity to the UOIT require precaution and special procedures as identified in the Contract Documents. The UOIT is an active combined sewer with no practical means of diverting or interrupting daily flows. Bidders shall assume physical access to the UOIT will not be available during construction of the WWPS. The concrete crown of the UOIT is however, visible in the drywell portion of the existing Main Pump Station. Refer also to Item 3.2 of Addendum 4 for additional record information of the UOIT and the existing Main Pump Station in Reference Volume 1 of 1, drawings M-47, 48, 51, 52, and 53.

Q41: Reference Spec section 07 10 50 Shaft Membrane Waterproofing System : The specifications calls for protection board to protect membrane along vertical surfaces and at grade membrane terminations. The specification also provides a geotextile material to protect the membrane from sharp projections of the surface to which the membrane is applied, vertically and horizontally. The specification does not specify the type of protection needed for the waterproofing membrane found below the base mat foundation. Drawing 430-S-37 and Detail E on drawing 430-S-38 only

shows the geotextile layer protecting the PVC membrane below the base mat foundation. The Manufacturers recommend that additional protection, preferably some type of typical protection board, be placed between the concrete foundation and the PVC membrane in addition to the geotextile layer, throughout the entire footprint of the foundation. Please provide a detail that indicates an appropriate additional layer of protection above the geotextile fabric.

A41: Refer to section 3.06 of Specification 07 10 50. Details of protection are to be determined by the Contractor's means and methods, please note any accessories used for protection are required to be coordinated with the membrane waterproofing system manufacturer as specified in Section 07 10 50. Minimum requirements for protection board (if used) are already specified. No detail will be issued.

Q42: It is apparent that Revit was used to prepare all Contract Drawings for the project. The Bid Documents included Revit files for all work with the exception of the existing site and existing utility plans. Please consider providing the Contractors with the Revit file associated with the existing site and utility conditions.

A42: Existing site conditions and utilities shown on Drawings 000-C-003 to 000-C-006 were modeled in Civil 3D. The CAD files will be provided.

Q43: SPECIFICATION 07 10 50, IS THE REQUIRED PVC MEMBRANE THICKNESS 0.100 in OR (3mm) AS 0.100" THICKNESS IS ACTUALLY 2.5mm?

A43: Specification has been revised. Refer to Item 1.4 of Addendum No. 4**.**

Q44: SPECIFICATION 07 10 50: REMEDIAL GROUT PIPES ARE LISTED AS 1-1/2" NOMINAL DIAMETER. IS THIS A TYPOGRAPHICAL ERROR AS THE INDUSTRY STANDARD IS 1" NOMINAL DIAMETER?

A44: Specification has been revised to require remedial grout pipes in accordance with Manufacturer's Requirements. Refer to Item 1.4 of Addendum No. 4

Q45: SPECIFICATION 07 10 50, 3.05 REPAIR AND RESTORATION E.2. ARE THE RE-INJECTABLE GROUT HOSES INJECTED WITH GROUT ONLY WHEN THERE IS AN ADJACENT LEAK? OR ARE THEY ALL REQUIRED TO BE INJECTED AFTER CONCRETE HAS ATTAINED 28-DAY COMPRESSIVE STRENGTH?

A45: Use of reinjectable grout hoses is not mandatory. Reinjectable grout hoses shall be used to achieve acceptable watertightness as specified in Section 01 45 25. The specification has been clarified, Refer to Item 1.4 of Addendum No. 4.

Q46: "SPECIFICATION 07 10 50, 3.06 PROTECTION, A. ""WHERE REINFORCED CONCRETE AND/OR EMBEDDED STEELWORK IS TO BE PLACED AGAINST THE WATERPROOFING MEMBRANE

PROVIDE A SIGNALING LAYER ON THE EXPOSED WATERPROOFING SURFACE, TO GIVE A VISUAL INDICATION OF ANY MECHANICAL DAMAGE. INSTALL SIGNALING LAYER IN ACCORDANCE WITH THE RECOMMENDATIONS OF THEWATERPROOFING MEMBRANE MANUFACTURER.""THE WATERPROOFING MEMBRANE SPECIFIED HAS A SIGNAL LAYER INCORPORATED INTO THE MEMBRANE SHEET. WAS THE INTENT OF THIS REQUIREMENT TO ENSURE THAT THE SIGNAL LAYER IS FACING THE REINFORCED CONCRETE?"

A46: The specification indicates to install the signal layer (whether it is integral with the PVC membrane system itself or a separate product) on the "exposed surface". Yes, the intent is to visually identify possible mechanical damage to the membrane from steelwork or reinforcement placement adjacent.

Q47: Specification 07 10 50, paragraph 2.01.B.1 list the acceptable products for the Shaft Membrane Waterproofing System. Sikaplan 1130 is a fiberglass reinforced PVC membrane that is typically used in roofing applications. Sika does manufacture an unreinforced PVC membrane, Sikaplan WP 1100-25 HL2, that has been used on many similar deep shafts in the US, contains no recycled content, and has been extensively tested to ensure 120 year durability. Please consider adding Sikaplan WP 1100-25 HL2 to the list of acceptable PVC membrane materials.

A47: The specification already allows for alternative products. Products meeting all the requirements given in the Table under Paragraph 2.01.B of Section 07 10 50 will be acceptable.

Q48: Bid item #13 is the allowance for Stoppage of Slurry Wall Trench Excavation. It is applied when it takes more than 4 hours to drill, excavate, core through an obstruction. GBR7.2.2 defines stoppage is the excavation rate is less than 6 vertical inches over a 4-hour period. Please confirm the 4-hour period is a part of the allowance time.

A48: The 4-hour period is excluded from the allowance time. Payment for this bid item begins only after the initial 4 hours has elapsed.

Q49: GBR7.3 indicates steady state groundwater infiltration rate of 1500 GPM in the shaft after grouting. Also, the same article states "To control or reduce groundwater inflow from rock mass, pre-ex grouting is required, In addition, cutoff grouting will be required." It is contradictory statement. Please confirm 1500 GPM inflow is after or before the cutoff grouting.

A49: Contractor shall prepare for groundwater inflow of up to 1,500 gpm after pre-excavation and cutoff grouting operations. GBR will be updated in a future addendum.

Q50: Spec 31 23 20 describes pre-excavation grouting from the surface and cutoff grouting in the shaft. Based on our experience, it is difficult to reduce groundwater inflow with cutoff grouting (post-excavation grouting). Most of time, grout leak from the shaft wall or bottom and we cannot seal off the water infiltration efficiently. Instead, we suggest to spend time for pre-exc grouting and build robust grout curtain in the ground. For the purpose, we recommend eliminating max grout volume (10 gal/ft) from the split spacing criteria and apply the conventional grouting process (change grout mix from thin to thick, pump grout until the grout flow is zero with refusal pressure and hold the pressure for 10 min). also, we recommend drilling verification holes after grouting the primary holes and conducting water test to confirm the performance of pre-ex grouting.

A50: Contractor must include the design detailed on Spec 31 23 00 and Drawing 430-SOE-15 in their bid price. Contractor alternatives will be considered after award.

Q51: Spec 31 23 20-3.05.Q.3 states "Coordinate with the owner on existing flow conditions within the UOIT. Stop grouting operation if UOIT flow conditions changes, per direction from the owner." We would like to confirm a contractor has no responsibility of such grout communication event to UOIT or the River.

A51: The causes for communication will be reviewed should an event occur. The Contractor shall remain responsible for appropriate execution of its means and methods.

Q52: There is no offset distance between the shaft and the UOIT in the bid document. Since we drill rock reinforcement, rock dowels, pre-ex grouting and cutoff grouting, we need to have accurate as-built information. Please provide the as-built information. If the information is not available, please consider the allowance to perform the as-built survey after the award.

A52: Available as-built information will be provided. See Attachment C of Addendum No. 4.

Q53: GBR 8.2 states "Placement of initial support shall begin within 1 hour following excavation to minimize the potential for rockfall". Since we can only work from 7am to 5pm, it may be difficult to finish installing the tunnel support every time in the work hour. Please allow us to install temporary support such as flashcrete or spiling in such case.

A53: Contractor shall remain responsible for scheduling and appropriate execution of its means and methods. No change to requirements.

Q54: Specification 31 33 01 Section 1.04.B.4.a.3 requires submittals for ""Other records of performance tests...."".
Section 1.05.A.1.a - states ""Retain foreman on crews testing rock dowels who have performed similar tests on at least one other project.""

Section 1.05.B.1- states ""Factory Calibration: Conduct a factory calibration on testing equipment... ""
Despite the above reference there is no language in this specification or on Drawing 430-SOE-14 that requires testing, stressing, preloading , etc. of the Vertical Rock Reinforcement dowels.
Question - Please confirm that the Vertical Rock Reinforcement dowels are passive elements that do not need to be preloaded, torqued, stressed or tested in any way.

A54: Confirmed the vertical rock reinforcement dowels are passive elements that do not need to be preloaded, torqued, stressed, or tested in any way. Refer to Item 1.11of Addendum No. 4.

Q55: Drawing 430-S0E-14 Detail A shows an 1'-11"" x 1'-11"" ASTM A36 plate and hex nut installed at the top of the Vertical Rock Reinforcement (VRR) dowels. It also shows the top of the VRR dowels being encapsulated in lean concrete.
Question - Since the Vertical Rock Reinforcement dowels are passive elements that do not need to be preloaded, torqued, stressed or tested what is the purpose of this plate, nut and lean concrete encapsulation?

A55: Contractor must include the design detailed on Drawing 430-SOE-14 in their bid price. Contractor alternatives will be considered after award.

Q56: Specification 31 33 0 Section 1.04.A.5.b - states ""Provide procedures, means and methods, and equipment for drilling and installing the vertical rock reinforcement. Include drilling equipment, hole size, and procedures for installation.""
Question - Will using a down-the-hole-hammer with air flush (and some water for dust suppression) be an acceptable drilling method for installing the Vertical Rock Reinforcement dowels?

A56: Yes; however, see updates to Spec Section 31 33 01, Article 3.02.B.3 for additional drilling requirements. Refer to Item 1.11 of Addendum No. 4**.**

Q57: Specification 31 33 01 Section 2.02A states "" Use method to produce holes to depths and of size and quality required for rock dowel installation in accordance with the manufacturer's recommendations and Contract Documents. Use equipment and bits of the condition and capacity to accomplish work at which will not result in delays.""
Question - As written it would appear that the Vertical Rock Reinforcement dowels will consist of regular rebar installed in a drilled hole filled with grout. As such there will be no ""manufacturer's recommendation"" to follow. Please confirm if this the case.

A57: Confirmed.

Q58: Specification 31 33 01 Section 2.01 Material Paragraph B states "" Rock Dowel: See Section 31 72 13.
Specification 31 72 13 Material, Paragraph D.1 states "" Use dowels which are standard deformed reinforcing steel bars conforming to the requirements of ASTM A615, Grade 75.""
Drawing 430-SOE -03, Materials Note #5 states "" Vertical Rock Reinforcement dowels shall conform to requirements of ASTM A615, Grade 60 (fY= 60 KSI)""
Question-Are the Vertical Rock Reinforcement dowels to be Gr. 60 or Gr. 75?

A58: 60 ksi. Refer to Item 1.12 of Addendum No. 4**.**

Q59: Specification 31 33 00 Section 1.04.A.6.c states "" Procedures for confirming that grouted rock dowels as installed are fully encapsulated with grout or resin.""
Section 3.02.C.1 states "" Fully encase rock dowels installed for the vertical rock reinforcement with non-shrink cement grout. ""
Drawing 430-SOE -03, Materials Note #6 states "" Cement grout for spiles and vertical rock reinforcement shall have a 28-day minimum compressive strength (fc') of 4,000 psi.""
Drawing 430-SOE -14, Detail states ""Grout in accordance with Section 31 72 13.""
Specification 31 72 13, Section 2.02.F.1.b states ""Grout shall be composed of proven, non-shrink pumpable neat mixture of cement and water that is stable (bleeds less than two percent), fluid, and provides a minimum 28-day compressive strength of at least 4000 pounds per square inch (psi) measured in accordance with ASTM C109 at time of stressing.""
Question - Can the Contractor use a neat-cement grout with a 28-day minimum compressive strength (fc') of 4,000 psi in the Vertical Rock Reinforcement dowels?

A59: Yes.

Q60: Specification 31 33 01 Section 3.02.B.3 states "" When within 20 feet, horizontally and vertically, advance the drill equipment by 1-foot increments. Provide special care when drilling nearby the UOIT and document cuttings to confirm the drill hole does not interfere with the existing UOIT. Stop drilling immediately if a changed condition is encountered during drilling. ""
Section 3.02.B.4 states "" When within 20 feet, horizontally and vertically, downhole survey every 5 feet vertically to confirm verticality of the hole.""
Drawing 430-SOE -14: Based on Detail 1 on this Drawing it appears that all of the Vertical Rock Reinforcement dowels will fall within 20 feet horizontally of the UOIT.
Drawing 430-SOE -14: Based on Detail 2 on this Drawing it appears that

the top of the UOIT is at approx. El. 628 +/- and the bottom of the UOIT is at approx. El. 614 +/-.

Question - Based on the above it would appear that the drill cuttings check at 1 foot increments (Section 3.02.B.3) and the verticality checks at 5 ft. increments (3.02.B.4) will occur in all 25 Vertical Rock Reinforcement dowels between approx. El. 648 +/- to approx. El. 594 +'/-. Please confirm if this is the correct interpretation of this specification.

A60: Updated Spec Section 31 33 01, Articles 3.02.B.3.b and c to be horizontally and vertically until the UOIT invert elevation for both 1-foot increments and downhole deviation checks. Refer to Item 1.11 of Addendum No. 4**.**

Q61: Specification 31 23 20 Section 1.04.A.6.5 for submittals states to provide ""Expected grout volume injection rates, pressures, thickening tables and proposed grouting refusal criteria and split spacing criteria for all planned mixes" Effective Pressure calculation is defined in the specification in Section 1.03.A.6 Grouting refusal criteria is defined in the specification in Section 1.03.A.11 Split spacing criteria is defined in the specification in Section 1.08.A.1.c

Please confirm Contractor is not expected to provide any proposed pressures, refusal criteria, and split spacing outside of what is defined in the specification".

A61: Confirmed.

Q62: Specification 31 23 20 Section 2.02.B.1 states ""Rotary sonic, rotary percussive, double head duplex or alternative method approved by Owner following an acceptable demonstration. The use of air or water is precluded.""

Please clarify if water or air use is acceptable - precluding air or water removes rotary percussive, double head duplex and other methods as a drilling method and implies only sonic drilling is acceptable.

A62: Water or air use is acceptable for installation of standpipes through soil and rock socket. Spec Section 31 23 20, Article 2.02.B.1 updated. Refer to Item 1.10 of Addendum No. 4**.**

Q63: Specification 31 23 20 Section 3.05.I. states ""Monitor grout takes for each stage. Make available real-time, continuous, computer-based readouts of time, pressure, and grout volume to the grouting operators.""

This section is the only time a computer based readout is mentioned or defined within the specification - and does not appear a requirement for submittal documents. Please confirm this is a requirement for grouting.

A63: Removed from specification. Refer to Item 1.10 of Addendum No. 4**.**.

Q64: Specification 31 23 20 Section 3.10.E. states ""Staining of any surfaces due to grout leak or other sources is unacceptable. Immediately and thoroughly

clean any grout leaks or spills.
Specification 31 23 20 Section 3.05.L. states ""During the grouting of any hole, if grout is found to flow from exposed rock, plug or caulk such flows or leaks using wood wedges, oakum, lead wool, or other materials as approved by the Owner. Owner may also direct grouting to temporarily pause
Please clarify that staining resulting from management of grout through plugging or caulking does not fall under Section 3.10.E

A64: Confirmed.

Q65: Specification 01 22 00 Section 3.1.G.4.b ""Attempts to grout where no grout takes, or limited grout takes will still be considered time grouting if executed in good faith and with concurrent(ce) of the Owner.""
Except for extreme cases of failures, breakdowns, repairs - all grouting efforts are executed in good faith. Please clarify this section as it implies that payment for grouting can be measured by subjective interpretations.

A65: The Owner shall retain discretion for determining acceptability of work performed and whether it has met the intent of the Contract. Please refer to Spec Section 31 23 20 for refusal criteria time limit for grouting.

Q66: Specification 31 33 0 Section 1.05.A.3.a - states ""Employ a PennDOT certified drilling inspectors with....."
Section 3.02.B.5 - states ""Drill logs: during installation of vertical rock reinforcement, a PennDOT certified drilling inspectors shall be on site to identify the top of rock and top of rock elevations for each hole""
Question 1 - Typically top of rock/competent rock is called by the drill rig operator, is a certified drilling inspector required? What parameters will be used to determine top of rock?
Question 2 - If a certified drilling inspector is required what parameters will be used to determine top of rock?

A66: Question 1. Yes, certified drilling inspector is required for core drilling. See updates to Spec Section 31 33 01 which requires two holes be core drilled. Top of rock to be determined by drilling inspector. Refer to Item 1.11 of Addendum No. 4**.**
Question 2. Top of rock to be determined by drilling inspector.

Q67: Drawing 430-SOE-14, Detail A - Is the 7.0" diameter X 0.408" wall casing shown permanent or can it be withdrawn during grouting of the Vertical Rock Reinforcement dowel?

A67: Casing may be withdrawn.

Q68: Geotechnical Baseline Report , Table 6-4 titled ""Baseline Unconfined Compressive Strength and Splitting Tensile Strength of Rock"" lists the maximum baseline UCS strength for Sandstone and Limestone as 17,000 psi.

See Geotechnical Data Report, Table 5 titled Summary of Laboratory Test Results - Rock. The highest actual USC values listed are 14,629 psi in a Sandstone layer in Boring PP-04-001B and 14,499 psi in a Sandstone layer in Boring FD-70-003. However the GBR in Section 7.2.1 states that the Contractor's means and methods must be able to construct slurry wall panels "" ... through soil, obstructions and bedrock with strengths up to 25,000 psi."
Question 1: Is the 25,000 psi strength quoted meant to be an UCS value? Where does this value come from as it appears to be arbitrary?
Question 2: Practically speaking soil cannot have a UCS of 25,000 psi. Given that the highest USC value for the bedrock samples found in the GDR was slightly less than 15,000 psi, the maximum UCS value of 17,000 psi listed in Table 6-4 seems reasonable. Why does Section 7.2.1 then require the Contractor to be capable of penetrating obstruction and/or bedrock up to 25,000 psi?
Question 3: Cutting through obstructions and / or bedrock with a UCS of 25,000 psi is at or above the current capability / industry practice with diaphragm wall mill or claming equipment. Can the 25,000 psi listed in Section 7.2.1 be reduced to 17,000 psi?

A68: Question 1. Yes the 25,000 psi is a UCS value.
Question 2. Contractor shall be prepared with alternative equipment for material strengths up to these conditions. GBR will be updated in a future addendum.
Question 3. Contractor shall provide additional equipment, other than just diaphragm wall mill and claming equipment, to be able to go through obstructions that could be up to 25,000psi. No the value will not be reduced.

Q69: Rock Dowel Detail on Drawing 430-SOE-13 depicts "Geocomposite drainage (if required)". What criteria will be used to determine if Geocomposite Drainage is required behind shotcrete?

A60: Per 31 74 19 Part 3.01.E.2, the weep holes and geocomposite drainage strips shall be installed as needed to allow pipes to drain freely after shotcrete installation. Contractor to determine in the field where geocomposite drainage strips are needed to meet this groundwater control criteria.

END OF ADDENDUM No. 4

ATTACHMENT – A

Addendum No. 4 Specifications

SECTION 07 10 50
SHAFT MEMBRANE WATERPROOFING SYSTEM

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This section includes requirements for the shaft waterproofing system.

B. Furnishing and install a Poly Vinyl Chloride (PVC) membrane waterproofing system including all components and appurtenances required to provide a complete, watertight waterproofing system, including management, diversion, or control of groundwater.

1.02 RELATED SECTIONS

A. This section contains specific references to the following related sections. Additional related sections may apply that are not specifically listed below.
   1. Section 03 15 00 Concrete Joints and Accessories.
   2. Section 03 30 00 Cast-In-Place Concrete.

B. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
ASTM	ASTM D149, Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.
	ASTM D374, Test Method for Thickness of Solid Electrical Insulation.
	ASTM D568, Test Method for Rate of Burning and/or Extent and Time of Burning of Flexible Plastics in a Vertical Position.
	ASTM D638, Standard Test Method for Tensile Properties of Plastics.
	ASTM D1593, Standard Specification for Nonrigid Vinyl Chloride Plastic Film and Sheeting.
	ASTM D1777, Standard Test Method for Thickness of Textile Materials.
	ASTM D1785, Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
	ASTM D3776, Standard Test Methods for Mass per Unit Area (Weight) of Fabric.
	ASTM D3786, Standard Test Method for Bursting Strength of Textile Fabrics: Diaphragm Bursting Strength Tester Method.
	ASTM D4533, Standard Test Method of Trapezoid Tearing Strength of Geotextiles.

Reference	Title
	ASTM D4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
	ASTM D4716, Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.

1.03 DEFINITIONS

A. Terminology used in this Section conforms to the following definitions:
   1. Attachment Disk: PVC Discs used for anchorage of the system to the geotextile and substrate.
   2. Double Weld: Machine welded seams achieved by use of automatic hot double-wedge welding equipment.
   3. Single Weld: Hand weld seam consisting of tack welding and sealing the seam with liquid synthetic membrane.
   4. Geotextile: Material that provides a groundwater channel and protection of the membrane from sharp projections of the surface to which the membrane is applied.
   5. Membrane: Membrane comprised of specially plasticized PVC.
   6. Re-injectable hose: Grouting hoses made of synthetics equipped with a valve system, which precludes grout return flow from outside into the grouting hose and allows for multiple grouting passes.
   7. Remedial Grouting Pipes: Pipes installed near the intersection of water barriers used for re-grouting to control the watertightness of a section if leakage occurs.
   8. Sectioning: Strategically placed water barriers to create watertight sections of the waterproofing system. Water barrier intersections close off a section.
   9. Water Barrier: Base seal waterstop profile welded to the membrane to seal off individualized membrane compartments.
   10. Waterproofing System: Layered system consisting of geotextile, PVC membrane, protection layer (where required), water barriers and grouting pipes used to improve the watertightness of the structure.
   11. Protective Concrete: Concrete mud slab placed over invert membrane as means of protection to avoid damage.
   12. Patent Strip: Channel shaped stainless-steel bar with pre-punched holes for attachment to achieve a tight fit at waterproofing terminations.
   13. Hydrophilic Waterstop: Expansive swelling gasket strip applied in conjunction with patent strips at waterproofing terminations.
   14. Protection Board: Pressure treated plywood used to protect membrane along vertical surfaces and at grade membrane terminations.

1.04 SUBMITTALS

A. Action Submittals:
   1. Procedures: Section 01 33 00.
   2. Shop Drawings: Include plans, sections and details showing as a minimum:

a. Sequencing of waterproofing installation relative to construction sequence.
b. Typical sheet layout for the shaft, base slab, tunnel junction chamber and discharge piping floor slab. Including splice locations and types of welds.
c. Developed plan layout of water barriers along vertical shaft walls.
d. Waterproofing terminations at surfaces.
e. Waterproofing termination at interfaces.
f. Waterproofing at all penetrations.
g. Waterproofing at corners.
h. Remedial grout pipe assembly.
i. Protection of remedial grout pipes during construction activities.
j. Attachment assembly.
k. Waterproofing/membrane details at slurry wall
l. Layout of temporary construction drainage in shaft base in connection with temporary sumps and procedures during construction.

3. As-built Drawings and Installation Records:
   a. Remedial grouting pipes.
   b. Water barriers: location and elevation of water barriers and size of panel section.
   c. Re-injectable grouting hoses:
      1) Location and elevation of junction boxes and service ports.
      2) Labelling system.
      3) Location and elevation of re-injectable grout hose.
   d. Any areas of repair.
   e. Documentation of membrane damage and repair areas.
4. Qualifications including a resume listing applicable project experience installing waterproofing membrane on projects of similar complexity, position held, duration and project description for:
   a. Waterproofing installer.
   b. Waterproofing supervisor.
   c. Remedial grout supervisor.
5. Product data for all products used in the Work, including, catalogue cuts, MSDS sheets, certification of compliance, manufacturer's recommendation for storage, handling, installation and protection, testing, welding, detection of damage and repair.
6. Submit the following material samples:
   a. PVC Waterproofing Membrane – One square foot.
   b. Double Weld Seam – One-foot length.
   c. Geotextile – One square foot.
   d. Water Barrier – one-foot length welded to membrane.
   e. Membrane attachment disc – two (2) disks welded to membrane.
   f. Waterstop/Flashing – one-foot length.
   g. Remedial Grout Pipe Assembly – one foot in length (including flange) with threaded end, welded to membrane and protection cap to prevent clogging.

h. Re-injectable grout hose assembly – two foot in length with protection cap to prevent clogging.

i. Remedial grout – two four-ounce jars.
j. Patent Termination Strip – one foot in length with fasteners.
k. Hydrophilic waterstop – one foot in length.
l. Protection board – one square foot.

7. Submit a Method Statement for installation, equipment used and materials that include plastic caps, solid tape or heat shrink wrap over exposed cut ends or flat bottomed plastic circular spaces to isolate steel and ensure watertight integrity and protection of waterproofing membrane.
8. Waterproofing protection plan and details describing the intended procedures to prevent damage during construction operations such as, installation of formwork, reinforcement and embedded items and placement of concrete.

B. Informational Submittals
1. Procedures: Section 01 33 00.
2. Waterproofing installer certification and qualifications.
3. Reports/Records/Forms: Surface acceptance form completed and signed prior to start of welding.
4. Waterproofing and Remedial Grouting Pipes Protection Plan, narrative and details describing the procedures to prevent damage during construction operations such as installation of form work, reinforcement and placement of concrete.

1.05 QUALITY ASSURANCE

A. Qualifications
1. Manufacturer: Fifteen minimum years of experience in production of waterproofing systems for application in shafts/tunnel structures.
2. Successful installation of the waterproofing system on at least three projects as the type proposed for this project.
3. Personnel Qualifications
a. Installer: Five years minimum experience on projects of similar size and complexity. Trained by the waterproofing system manufacturer prior to beginning installation.
b. A manufacturer's representative to be present at least during the first ten working days of installation and later as often as required.
c. Installation and testing to be performed under the direct supervision of an individual having at least five years' experience on projects of similar size and complexity.

B. Field Samples and Testing
1. Double weld samples, three-foot long, from each welding machine and welder, prior to start of daily shift.
2. Single weld samples, three-foot long, from each welding machine and welder, prior to start of each shift.

3. Waterstop Butt weld samples- One butt welded sample consisting of two 12" waterstops from each welder prior to start of any daily shift where waterstop welding will take place.

C. Pre-Installation Conferences.

1.06 DELIVERY, STORAGE AND HANDLING

A. Procedures: Section 01 65 50.

1.07 WARRANTY

A. Provide Manufacturer's Standard Warranties in accordance with 01 78 36. Manufacturer shall warrant against defects in materials and workmanship from the date of substantial completion.

1.08 PROJECT CONDITIONS

A. The surface of the support of excavation system will require some restoration to prepare it for proper installation of the membrane waterproofing system.

PART 2 PRODUCTS

2.01 MATERIALS

A. Geotextile:
1. A 100 percent non-woven polypropylene consisting of long chain polymetric filaments, or fiber formed into a stable network of uniform thickness and surface texture.
2. non-woven polypropylene having uniform thickness and surface texture with the following properties ant test methods:

Physical Properties	Values	ASTM Test Method
Thickness	285 mils	DI777
Unit Weight	22 oz/sy	D3776
Grab Tensile Strength	285 lbs.	D4632
Elongation	85 %	D4632
Trapezoidal Tear Strength	135 lbs.	D4533
Burst Strength	400 lb./sq.-in	D3786
Chemical Resistance	pH 2 -13	-

B. Membrane: Flexible, homogeneous, unreinforced PVC of uniform thickness, surface texture and dual color to assist in detecting damage with the following properties and test methods:

Physical Properties	Values	ASTM Test Method
Thickness	0.100 in (2.5 mm)	D374
Ultimate Tensile Strength	1600 psi	D638
Ultimate Elongation	230%	D638
Low Temperature Impact	Pass at -20° F	D1593
Chemical Resistance	pH value 2 - 13	-
Flammability	Self-extinguishing	D568
Mechanical Puncture Resistance	65 in	DIN 16726-5.12
Dielectric Strength	544 V/mil	D149

ADD. NO. 4

1. PVC membrane to be as follows:
   a. SikaPlan WP 1130 by SIKA Coorporation
   b. DonProof PT by Don Construction Products Inc
   c. Approved equal

2.02 ACCESSORIES

A. Attachment Disks: Discs are to be manufactured of PVC, minimum three (3") inch diameter, with (1) steel washer imbedded in the disc. The disc is to be attached with 1 11/4" steel nails to the geodrains/ geotextile. Adjust nail length for disk fixation as required. The discs shall be compatible with the membrane and installed in accordance with the manufacturer's recommendations.

B. Water Barrier: PVC strip weldable to membrane with embedment ribs and the following dimensions:
   1. 16-inch minimum width with 6 ribs of l-inch minimum height.
   2. Water barrier intersections must be prefabricated by manufacturer.
   3. Thickness shall be comparable to the thickness of the PVC membrane.

C. Remedial Grout Pipes: Remedial Grout Pipes: ~~1 ½ inch nominal size~~ PVC pipe, schedule 40, ASTM D1785, length as determined by the Contractor with threaded end and plug or ~~1 ½ inch nominal size,~~ flexible high-pressure PVC braided reinforced clear tube with end pieces threaded ends and plug. Diameter shall be in accordance with manufacturer's requirements.

ADD. NO. 4

D. Remedial Grout: Water soluble, hydrophilic, acrylate-ester resin grout or approved equal and compatible with remedial grout tube.

E. Reinjectable Grout Hose: System shall include tough flexible and chemically inert tubes with a minimum internal hole diameter of 3/8-inch, connecting tubes, junction boxes, grout, pumps and all other items required for their installation and use. The system shall be suitable for resinous or cementitious grout and be capable of re-injection to seal joints.

F. Junction Box: Heavy duty plastic box with removable cover compatible with the reinjectable grout hose system and sized to accommodate injection and

G. Protection Board: 3/8-inch-thick pressure treated plywood sheets.

H. All accessories shall be coordinated with the approved manufacturer of the PVC membrane.

PART 3 EXECUTION

3.01 DELIVERY, STORAGE AND HANDLING

A. Store and handle materials and products in strict accordance with manufacturer's instructions, recommendations, and material safety data sheets.

B. Handle all materials to prevent damage. Place material, when off-loaded, on a smooth surface free of rocks, debris or other protrusions which may damage the waterproofing materials.

C. Keep membrane under cover to protect from potential ultraviolet radiation.

D. Provide storage space to protected materials from theft, vandalism and passage of vehicles. Mark applicable primers, cements, coatings and sealants with date of manufacture and show a date of shelf life. Do not use products beyond shelf-life dates. Do not dilute primes, roofing cements, adhesive coatings, or sealants. Keep containers closed except when removing materials from them.

E. Store all flammable materials in a cool, dry area away from sparks and open flames. Follow precautions outlined on container or supplied by material manufacturer or supplier.

F. Promptly remove from the site any materials that are damaged or rejected.

3.02 SURFACE PREPARATION

A. Prepare surfaces to receive membrane in accordance with manufacturer’s recommendations and as follows:
   1. Clean all surfaces free of oils, grease, and gasoline.
   2. Repair all joints, offsets, voids, cracks, and spalled areas which are greater than one half inch in width or depth with quick setting grout shotcrete, mortar, or approved equal.
   3. Remove all loose concrete and debris.

B. Surface inspection and acceptance:
   1. Inspect all surfaces to receive waterproofing in the presence of the Waterproofing Installer, Engineer, the Owner
   2. Correct deficiencies identified during inspection and re-inspect after corrective action has been taken.

3. Complete Surface Acceptance Forms to release an area for waterproofing installation, and obtain signatures of the waterproofing supervisor, waterproofing installer, Engineer, and Owner.
4. Install 2" by 2" chamfers at all exposed concrete comers.
5. Provide overall smoothness of support of excavation and shotcrete surface as required by the waterproofing manufacturer.

C. Groundwater Management
1. Provide means of diverting, controlling, or managing groundwater inflows on surfaces to receive waterproofing system.
2. Means or methods of diverting, controlling, or managing groundwater inflows shall not result in additional loading on the initial support or interfere with or infringe upon the Permanent Work.

3.03 INSTALLATION

A. Install waterproofing only after the Surface Acceptance form has been signed as specified above.

B. All surfaces to receive the waterproofing systems are installed are to be clean, free from loose aggregate, sharp projections, or any edges, projecting tying wire, release agents and other substances which are likely to damage or affect the waterproofing system.

C. Remove temporary supports and hangers installed for construction purposes. Cover any protrusions of more than 1/2 inch with quick setting grout or mortar such that no sharp edges remain. Ensure the allowable roughness of the support of excavation meets the manufacturer's minimum requirements to achieve proper installation and operation of the waterproof membrane.

D. Survey the profile of the support of excavation system and shotcrete to confirm it is to the correct profile and meets the smoothness requirements of the membrane prior to fixing either a separation layer of geotextile or waterproofing membrane.

E. Install penetrations and using proprietary products by the membrane manufacturer. . Seal penetrations and membrane anchorage as recommended by the membrane manufacturer.

F. Install the waterproofing membrane closely against the geotextile drainage and protective layer.

G. Attach the membrane sheets at all the nailing discs around the nails by spot heat welding. Alternative methods of fixing the waterproofing membrane may be used subject to approval by the Engineer and the Owner. Do not penetrate the membrane with nails, welding tools or any other object not in accordance with the approved fixing details.

H. Carry out welding of the membrane sheet edges by experienced personnel and with equipment to form a flat double weld seam.

I. Provide welds 1/4-inch minimum wide spaced between at l-inch maximum. Repairs and T -joints may have solid welds up to 1-1/4- inch wide as recommended by the manufacturer.

J. Seal the membrane at the ends of each waterproofed section against the surface to prevent ingress of concrete or grout between the membrane and the surface.

K. Install method of fixing the membrane to a base slab to preclude the ingress of grout during concreting and any back-grouting operations. Install fixing methods in accordance with the manufacturer.

L. Install the waterproofing membrane when the ambient air temperature is higher than 40 °F or in accordance with the manufacturer's recommendations.

M. Supply and maintain fire-fighting equipment in the shaft for the whole period that membrane material is exposed.

3.04 FIELD QUALITY CONTROL

A. During installation of the waterproofing system, the following inspect the following for conformance:
   1. Use of specified materials.
   2. Proper storage and handling of material.
   3. Ambient temperature.
   4. Seam directions and layouts.
   5. Attachments.
   6. Proper membrane overlaps at seams for welding.
   7. Weld application.
   8. Location of water barriers.
   9. Location of remedial grout pipes.
   10. Correct face of geotextile facing inwards.

3.05 REPAIR AND RESTORATION

A. Protection and Placement inspection.
   1. Check the integrity of the waterproofing system during and after the installation of reinforcing steel, formwork and during concrete pours.
   2. Check for watertightness and leaks within the membrane.
   3. Protect membrane from damage during post-installation work.

B. Test all completed double seam welds by the application of air pressure to the space between the two seams. Apply the test pressure, at one end of the seams and measure at the other end to test the integrity of the whole joint. Perform test in the presence of the Engineer and the Owner. Provide at least 12 hours' notice to the Engineer and the Owner prior to performing seam testing.

C. Perform all testing in accordance with the requirements of the waterproofing manufacturer.

D. Repair or replace any areas failing to achieve the watertightness requirements in accordance with the manufacturer's recommendations. Record areas which have been repaired and submit repair details to the Engineer.

E. Leak Remediation

1. Maintain observation of CIP concrete liner and remedial grout pipes and reinjectable grout hoses ~~tubes~~ for water infiltration. If water infiltration occurs, implement the following measures: ADD. NO. 4

   a. In the section indicating a leak, grout through remedial grout ~~tubes~~ pipes and/or reinjectable grout hoses to seal and provide a second layer of waterproofing. ADD. NO. 4

   b. Clean pipes and/or hoses after grouting and repeat operation if leak persists. ADD. NO. 4

   c. Ensure grout injection pressure does not exceed capacity.

   d. Do not penetrate or puncture membrane except for permanent purposes using proven approved water-tightness techniques.

2. Inject grout through the re-injectable grout hoses or remedial grout tubes only after the Cast-in-Place (CIP) concrete has attained its 28-day compressive strength. Fill any voids between the barrier and concrete and achieve a proper tie-in of water barriers into the CIP concrete. ADD. NO. 4

3. Injection of grout of reinjectable grout hoses and/or remedial grout pipes is not mandatory. Reinjectable grout hoses and/or remedial grout pipes are to be used, as required, to achieve the performance criteria for watertightness specified in Section 01 45 25. ADD. NO. 4

3.06 PROTECTION

A. Where reinforced concrete and/or embedded steelwork is to be placed against the waterproofing membrane provide a signaling layer on the exposed waterproofing membrane surface, to give a visual indication of any mechanical damage. Install signaling layer in accordance with the recommendations of the waterproofing membrane manufacturer.

B. Provide protection to steel reinforcement when it is installed adjacent to the waterproofing membrane. Provide details of l the protection method in the method statement and can include plastic caps, solid tape or heat shrink wrap over exposed reinforcing steel cut ends and plastic flywheel or flat bottomed plastic circular spaces to ensure suitable separation of the steel from the membrane. No burning or welding of steel reinforcing will be permitted without approval of the Engineer.

C. Pipe water percolating outside the membrane to avoid the formation of water-filled blisters. Provide "lay-flat" type or small diameter polypropylene pipe for disposal of water. Provide pipes that are suitable for removal and membrane patching prior to CIP concrete placement. Where this is not possible, provide a proprietary system, in accordance with the recommendations of the waterproofing manufacturer, which allows the formation of a hole in the membrane and the sealing of a drainpipe.

D. Spot weld strips of membrane at least 20 inches wide to the waterproofing at the formwork stop ends to protect the installed membrane from being damaged.

E. Upon completion of waterproofing installation, all exposed waterproofing elements, and terminations to be protected from damage using protection boards or similar barriers.

END OF SECTION

SECTION 31 23 20
PRE-EXCAVATION DRILLING AND GROUTING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Section includes the minimum requirements for pre-excavation drilling, pre-excavation grouting, probe drilling, and cutoff grouting of the rock mass to control water inflows in advance of excavation.

B. Perform pre-excavation drilling and grouting:
   1. Perform Primary 1, 2, and 3 pre-excavation drilling and grouting prior to shaft excavation as shown on the Contract Drawings. Begin grouting operations within the rock mass, a maximum of 10 feet below the top of rock.
   2. Perform probe drilling and cutoff grouting concurrently with shaft excavation in rock at the locations and spacing shown on the Contract Drawings.

C. Grouting type, locations, minimum number, spacing, depths of holes, grout mixes, and required pressures are shown on the Contract Drawings and are specified herein. The actual number, spacing, depth of the holes, inclination of the holes, pressures, and grout mixes to be used will vary, depending upon the nature of the rock as disclosed by the excavation, water tests, and the results of actual grouting operations.

D. Refer to Section 31 23 19 for discharge requirements for control of groundwater and construction water.

1.02 RELATED SECTIONS

A. This section contains specific references to the following related sections. Additional related sections may apply that are not specifically listed below.
   1. Section 01 33 00 Submittals.
   2. Section 01 45 00 Contractor Quality Control.
   3. Section 01 50 00 Construction Facilities, Temporary Controls and Utilities.
   4. Section 31 23 19 Control of Groundwater and Construction Water.
   5. Section 31 56 00 Slurry Walls.
   6. Section 31 71 21 Rock Excavation.

B. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
American Petroleum Institute (API)	API RP 13A, Specification from Drilling Fluid Materials
	API RP 13B-1, Recommended Practice for Field Testing Water-based Drilling Fluids
ASTM	ASTM C 31, Standard Practice for Making and Curing Concrete Test Specimens in the Field
	ASTM C 39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
	ASTM C 109, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50 mm Cube Specimens)
	ASTM C 117, Test Method for Material Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
	ASTM C 136, Method for Sieve Analysis of Fine and Coarse Aggregates
	ASTM C 150, Specification for Portland Cement
	ASTM C 191, Test Method for Time of Setting of Hydraulic Cement by Vicat Needle
	ASTM C 204, Test Method for Fineness of Portland Cement by Air Permeability Apparatus
	ASTM C 940, Test Method for Bleeding of Cement Pastes and Mortars
	ASTM C 494, Specification for Chemical Admixtures for Concrete
	ASTM C 595, Specification for Blended Hydraulic Cements
	ASTM C 618, Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
	ASTM C 989, Specification for Ground Iron Blast-Furnace Slag for use in Concrete and Mortars
	ASTM C 1240, Standard Specifications for Silica Fume for Use in Hydraulic-Cement Concrete and Mortar
	ASTM C 1602, Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
U.S. Army Corps of Engineers	EM 1110-2-3506, Grouting Technology
	CRD-C 61, Test Method for Determining the Resistance of Freshly Mixed Concrete to Washing Out in Water
	CRD-C 614, Methods of Test for Time of Setting of Grout Mixtures
	CRD-C 661, Specification for Antiwashout Admixtures for Concrete

1.03 DEFINITIONS

A. Terminology used in this Section conforms to the following definitions:

1. Additive: Any natural or chemical product added to the grout mix to reduce admixture bleed water, lower mix viscosity and cohesion, increase penetrability, or otherwise enhance performance of the grout.

2. Ascending Stage Grouting: A procedure where a grout hole is drilled to the full planned depth, or to such depth in response to subsurface conditions, then water tested and grouted in packer isolated stages that are sequenced from the bottom to the top of the hole.
3. Cutoff Grouting: Injection of a cementitious grout mix under controlled pressure through grout pipes placed at locations needed to fill voids or water-bearing fissures, joints, discontinuities or fractures from within the shaft excavation to reduce or eliminate local water inflows into the excavation.
4. Descending Stage Grouting: A procedure wherein a grout hole is advanced by stages from the top to the bottom of the hole. Each stage is water tested and grouted, and the grout is allowed to obtain initial set before deepening the hole through the next stage. Use packer grouting, where each stage is isolated by a packer, water tested and grouted as in the ascending stage grouting method.
5. Discontinuity: Structural features that separate rock blocks within a rock mass.
6. Effective Pressure: The effective pressure is calculated based on pressures in the grout stage. The effective pressure at the instrumented packer is determined by subtracting the initial water pressure from the measured total pressure. The target effective pressure for grouting and water pressure testing shall be determined as described in Article 1.08.
7. Grout Hole: A hole drilled for the purpose of injection of grout for water cutoff.
8. Pre-Excavation Grouting: Injection of a cementitious grout mix under controlled pressure through grout pipes placed at locations needed to fill voids or water-bearing fissures, joints, discontinuities or fractures through holes arranged around the perimeter of the shaft excavation as shown on the Contract Documents to reduce water inflows.
9. Primary Holes 1, 2, and 3: Mandatory minimum grout holes drilled, tested and grouted per the requirements of this Section.
10. Probe Hole: An exploratory hole drilled ahead of the excavation face to investigate ground and/or groundwater infiltration conditions.
11. Refusal: The point at which grouting is stopped within a specified stage of a grout hole. It is defined as a grout injection rate of 1/2 gallon of grout per minute or less, as measured each minute for 5 consecutive minutes at 100 percent of the required grouting pressure and constant grout consistency.
12. Sack of cement: 94 lbs, approximately one cubic foot.
13. Secondary Grout Holes: Grout holes drilled after all primary holes are grouted and if Split Spacing Criteria was exceeded for Primary 3 holes. To be drilled, flushed, water tested, and grouted per the requirements of this Section.
14. Split Spacing: The procedure of drilling and grouting an additional grout hole midway between two previously drilled and grouted holes.
15. Split Spacing Criteria for Pre-excavation Grout Holes: Criteria used to determine whether it is necessary to drill secondary holes.
16. Stage: A partial or intermediate depth of grout hole within the pre-excavation grout zone.
17. Water Pressure Test: Test consisting of measuring water take over a set time interval for a particular stage or hole length at specified pressures. The purpose of water

pressure tests is to determine the ground/rock mass permeability and assist in selection of appropriate grout mixes compatible with the measured permeability.

18. Verification Hole: Drilled hole to full depth and water tested which is used to determine if the rock mass was sufficiently treated in comparison with previous water tests from Primary 1, 2, and 3 pre-excavation grout holes. See Contract Drawings for requirements of verification holes.

1.04 SUBMITTALS

A. Action Submittals:
   1. Procedures: Section 01 33 00.
   2. Qualifications: Submit personnel qualifications in accordance with the requirements of this Section.
   3. Pre-Submittal Meeting: Prior to submittal of the Pre-excavation Grouting Work Plan, meet with the Owner to discuss the project requirements and coordination issues.
   4. Pre-Excavation Grouting Work Plan:
      a. Submit at least 30 days prior to the start of construction. Include plans for pre-excavation grouting and probing hole drilling and cutoff grouting, which includes the following:
         1) Layout, size, orientation, spacing, proposed grout stage depths, sequence of grouting, and length of grout holes that clearly describe the grouting to be performed. Include criteria for selection of materials and initial mix designs, and criteria for modifying mix designs.
         2) Installation sequence of grout holes and identification of sequencing constraints.
         3) Provide sections showing the layout of the grout holes relative to existing utilities and demonstrate the holes will meet the clearance criteria as required in the Contract Documents.
         4) Provide sections showing the layout of the grout holes relative to the slurry wall and vertical rock reinforcement and demonstrate there are no conflicts with any of the systems, depending on the sequence of work.
         5) Detailed descriptions of proposed equipment to be used, including soil and rock drilling equipment, flushing of grout holes, water pressure testing, grout batching, and mixing equipment, grout pumps, ground line hook up/port details, and air compressors (including pump rating curves, line loss curves, and mixer details), and packers.
         6) Detailed descriptions on contingency measures for collapsing of boreholes.
         7) Method of verifying the holes are drilled within the prescribed tolerances.
         8) Initial grout mix designs for each of the required grout mixes, including, at a minimum, the following:
            a) Types and quantities of materials to be used in each mix, yield volume, and the following ratios (by weight): water-to-cement, water-to-cementitious, and sand-to-cement. See Table 1 for properties to be tabulated.
            b) Procedure for mixing including order of mixing of materials and mix time for each component.

c) Proposed means and methods for field verifying grout mix proportions and accurately measuring the grout at the mixer.

d) Project sheets for all material components.

e) Expected grout volume injection rates, pressures, thickening tables and proposed grouting refusal criteria and split spacing criteria for all planned mixes.

9) Description of the proposed system to be use, anticipated injection pressure, packer spacing, injection rate, and grouting pattern.

10) Details of the proposed sequence of grouting and proposed methods to integrate into excavation and support and other concurrent work. Coordinate this with other submittals provided under Section 31 56 00, Section 31 71 21, and Section 31 72 13.

11) Details of proposed field testing to confirm that the grouting extent and performance complies with the minimum design criteria.

12) Details of proposed quality control procedures for grout production, including methods and equipment for measurement and recording of grouting installation parameters.

13) Details for proposed site access and staging plans including, location of pump, compressor, support equipment, and access into and out of the site.

14) Details of the placement of standpipes to be installed to the top of rock and retrieved once rock grouting is completed at each borehole location.

15) Sample Daily Grouting Log.

5. Drilling and Grouting Waste Management Plan

a. Submit at least 30 days prior to the start of grouting operations. The plan shall address and incorporate the following project requirements and constraints, including, but not limited to, a narrative describing how the plan will coincide with the site permits and address the following:

1) Plan view drawings showing quantity, types, and location of measures for containing and transporting spoils, cuttings, drilling water, grout waste, wash water, and any other waste from drilling and grouting activities.

2) Method for cleaning, collecting, containing, and disposing of water and waste from the grout mixing and supply equipment from entering in the adjoining waters.

3) Method for containing, filtering, treating, and infiltrating drilling or coring flush water and rock cuttings. Provide separate procedures for re-drilling through previously placed grout.

6. Final Mix Design Submittal

a. Following completion of on-site mix design testing, submit the following for each of the required grout mixes:

1) Types and quantities of materials to be used in each mix, yield volume, and the following ratios (by weight): water-to-cement, water-to-cementitious, and sand-to-cement. See Table 1 herein for properties to be tabulated.

2) Procedure for mixing including order of mixing of materials and mix time for each component.

3) Proposed method for field verifying grout mix proportions.

4) Project sheets for all material components.
5) Expected grout volume injection rates, pressures, thickening tables and proposed grouting refusal criteria and split spacing criteria for all planned mixes.
6) Temperature of water and all raw materials during the mix testing.

B. Informational Submittals:
1. Procedures: Section 01 33 00
2. Certifications and calibrations:
a. Copy of factory calibrations for each instrument, in particular on high-precision calibration gauges to be used for regular calibration of production-type gauges used during grouting.
b. Calibration certificates, procedures, and results on a weekly basis or as directed by the Owner, for gauges and meters to be used for grouting.
c. Certifications that all materials satisfy potable water standards in accordance with ASTM C1602.
d. Certifications that all admixtures are noncorrosive.
e. Certificates of chloride content for accelerating admixtures.
3. Quality Control:
a. Submit the results of laboratory testing within three days after each test completed.
b. Submit the results of field testing within three days of each test completed.
4. Monitoring Reports
a. Daily grouting logs: to be signed by the Grouting Supervisor during grout production. Include the following information:
1) Date, time of the beginning and end of the work shift; all workers' names associated with each grouting rig; and a list of major equipment items used during the shift.
2) Drill logs, record the following information, at a minimum:
a) Hole name.
b) Inclination and location.
c) Top and bottom lengths of all materials encountered during drilling, in particular the top of rock elevations for each hole.
d) Typical penetration rate and notable changes in penetration rate.
e) Zone of increased water inflows, water loss, color of return drill water, drill changes, binding of drill bit, and any unusual or notable features and obstructions.
3) Time of beginning and completion of grout hole installed during the work shift. Location and reference number of each completed hole.
4) Water level in the hole prior to placement of testing or grouting equipment.
5) Flushing activities including hole name, interval washed, date, start and stop time, and notes for amount of water and color of return, communication, loss of wash water, and other noteworthy events.

6) Water-cement ratios, cement type, brand, compound composition, cement grout injection pressures, packer inflation pressures, rates, and volumes, other pertinent cement grout mix data, and installation sequence.

7) Other pertinent observations include, but are not limited to: cement grout escapes, communication to other grout holes, any unusual behavior of any equipment during the grouting process, and other noteworthy events.

8) Date, time, plan location, sample designation and elevation, and other details of grout sampling, water pressure testing, and other quality control and field testing.

9) Summary of any unproductive time, including start and end time, duration, and reason.

C. Closeout Submittals:

1. Procedures: Section 01 33 00.
2. Record Documentation: Submit as-built plan of the grouted zone at a scale acceptable to the Owner. Show all treatment points with elevations, and locations and types of tests carried out.

1.05 QUALITY ASSURANCE

A. Qualifications

1. Grouting Subcontractor
   a. The Work of this Section is specialized. Employ a Grouting Subcontractor for the design and execution of the grouting program having not less than five successful similar projects of equal type, size, and complexity. The Grouting Subcontractor experience shall include at least one project with depths of 100 feet or greater with similar conditions.
2. Grouting Supervisor
   a. Employ a Grouting Supervisor having not less than five successful similar projects of equal type, size, and complexity. The Grouting Supervisor shall have experience including at least one project utilizing real-time, continuous, computerized monitoring of grout pressures and flows.
   b. All grouting work shall be under the direct field supervision of the Grouting Supervisor. The Grouting Supervisor shall direct the performance of the Work of the Contractor's personnel in compliance with the Contract Documents.
3. Grouting Driller and Equipment Operators
   a. Employ qualified grouting drillers and equipment operators with a minimum of three years of similar projects of equal type, size, and complexity.

B. Pre-Construction Testing

1. Factory Calibration: Conduct a factory calibration on all instruments prior to shipment. Provide certification to indicate the test equipment used for this purpose is calibrated and maintained in accordance with the test equipment manufacturer’s calibration requirements.
2. Make a final quality assurance inspection prior to shipment. During the inspection, complete a checklist to indicate each inspection and test detail. Supply a completed copy of the checklist with each instrument.

3. Have spare gauges available at the work site.

C. Pre-Construction Meetings
   1. Hold meetings at least five days but not more than 30 days prior to the start of pre-excavation drilling and grouting operations.
   2. Review and discuss the following items at each meeting:
      a. Means and methods to be used to achieve the mandatory requirements established in the Contract Documents,
      b. Review Submittal requirements.
      c. Review proposed equipment.
      d. Review safety concerns and emergency procedures.
      e. Review QC and reporting requirements.
      f. Other topics as necessary.

1.06 DELIVERY, STORAGE AND HANDLING

A. Procedures: Section 01 65 50.

1.07 TOLERANCES

A. Location and orientation for grout holes as shown in the approved Pre-Excavation Work Plan and as described herein.

B. The maximum hole deviation shall be one percent of the total hole depth.

1.08 DESIGN AND PERFORMANCE CRITERIA

A. Grouting Criteria
   1. Pre-excavation grouting from the ground surface:
      a. Perform water pressure tests and pre-excavation grouting within Primary 1, Primary 2, and Primary 3 drilled grout holes, from the ground surface at locations and sequences provided on the Contract Drawings.
      b. Perform Secondary Grout Holes if Split Spacing Criteria is exceeded from the Primary 3 grouting results. Split space the Secondary grout holes to a targeted depth per results from the Primary 1, 2, and 3 grouting operations. Perform water pressure tests and secondary grouting within Secondary grout holes.
      c. Split spacing criteria is based on grout take at the allowable pressures for the depth of hole grouted and shall be defined as 10 gallons of injected grout per foot of stage, or as directed by Engineer.
      d. Perform verification holes as per the requirements on the Contract Drawings.
   2. Shaft probe hole drilling and cutoff grouting performed from inside shaft during shaft excavation:
      a. Perform probe hole drilling at locations and angles provided on the Contract Drawings.
      b. Perform water pressure tests for entire length of probe hole.

c. Perform cutoff grouting within the probe holes in the event that sustained water test results exceed 0.2 gpm per foot of length of any probe hole. Grout at own expense if flows are less than the water pressure test results specified.

d. Contractor, with Owner's approval, to determine the Split Spacing Criteria for Cut-off Grouting based on grouting results.

B. Apply the following injection pressures and criteria for both water pressure testing and grouting operations:

1. Pre-excavation grouting from the ground surface:

a. No grouting within 10 feet of the edge of the UOIT.

b. Within 20 feet of the edge of the UOIT:

1) Target effective pressure of 0.5 psi/ft of soil plus 0.5 psi/ft of rock.

2) Maximum grout volume of 10 gallons per foot of hole for each mix type is pumped into a single stage.

c. All other locations:

1) Target effective pressure of 0.5 psi/ft of soil plus 1.0 psi/ft of rock

2) Maximum grout volume of 200 gallons per foot of hole of the thickest approved mix is pumped into a single stage.

2. Shaft probe hole drilling and cutoff grouting performed from inside shaft during shaft excavation:

a. No grouting within 20 feet of the edge of the UOIT.

b. All other locations:

1) Target effective pressure of 15 psi above hydrostatic pressure as measured during the back pressure test for each hole.

2) Maximum grout volume of 10 gallons per foot of hole of the thickest approved mix is pumped.

C. Refer to Section 31 23 19 for discharge requirements for control of groundwater and construction water.

1.09 PROJECT CONDITIONS

A. Applicable ground and groundwater conditions are described in the Geotechnical Baseline Report (GBR).

PART 2 PRODUCTS

2.01 GENERAL

A. Provide materials that are new and free from defects that impair their properties.

B. Provide and maintain all drilling, water pressure testing, and grouting equipment capable of continuous and efficient performance during any related grouting operation.

C. Provide adequate standby equipment to ensure continuous, uninterrupted grouting operations.

D. Do not include toxic or other poisonous substances in the grout mix or otherwise injected into the ground in conjunction with grouting operations. Proprietary or undisclosed ingredients in drilling fluids or any material placed in the borehole are prohibited.

E. Use materials only meeting the requirements of these specifications and reviewed by the Owner. Materials may be subjected to inspection or test at any time during their preparation for use.

F. Calibrate all measuring devices used to perform the Work specified in this Section including, but not limited to, load cells, scales, pressure gauges, pressure transducers, sensors, and flow meters, no more than two months prior to mobilization by a company specializing in the calibration of the type of instrument being calibrated. All calibration certificates shall be traceable to the National Institute of Standards and Technology (NIST).

G. Use only equipment that meets the noise and vibration limits specified in Section 31 71 16. If equipment exceeds the specified levels, immediately remove from service or take remedial action to achieve compliance with the Contract Documents.

2.02 DRILLING, FLUSHING, AND SAMPLING EQUIPMENT

A. General Drilling Equipment Requirements:
   1. Provide drilling equipment capable of accessing and drilling pre-excavation grout holes, secondary grout holes, and probe holes to lengths and angles shown on the Contract Drawings.
   2. Rod dope, grease, and other solid or liquid lubricants are allowed only on internal threads of casing, rods, or sampling equipment.
   3. The drilling fluid used for drilling in rock shall be clean, clear, fresh water.
   4. Provide pumps and drill tooling capable of removing all drill cuttings for the entire hole length with the water circulated through the drill tools.
   5. The use of air during drilling will not be allowed in any form.

B. Allowable drilling methods to advance through soil and rock socket to install standpipes:
   1. Rotary sonic, rotary percussive, double head duplex or other alternative method approved by Owner following an acceptable demonstration. The use of air or water is acceptable.~~precluded~~. ADD. NO. 4
   2. Use casing through soil subsurface materials for all grout holes advanced from the surface.

C. Utilize water-powered down-the-hole hammer on rock drill rig(s) and core drill rig(s) to create a 3.5-inch nominal diameter hole. Utilize drills and tooling to achieve drill hole tolerance requirements and provide sufficient uphole annulus velocity to remove drill cuttings. ADD. NO. 4

D. Use drilling equipment that have the capability to be advanced by 1-foot increments.

E. Hole flushing equipment

1. Provide a washout bit that is at least 1-inch smaller in diameter than the borehole with 1/8-inch diameter side-discharge holes and not more than three 1/8-inch diameter bottom-discharge holes.
2. Pump capacity: 25 gpm minimum through washout bit.

F. Furnish and install mechanical packers or expandable plugs to seal holes during the grouting work. Store a sufficient quantity of plugs on site so that open holes awaiting pressure testing or grouting may be temporarily plugged.

2.03 GROUT PIPES AND CONNECTIONS

A. Provide grout pipes, packers and other ancillary equipment required to perform the grouting operations. Use all embedded pipe, pipe wrappings and plugs which are strong enough to withstand the grouting operations.

B. Use pipe with a 1-3/4-inches minimum inside diameter, unless noted otherwise on the Contract Documents. One end shall be threaded to take the grout hose. Protect threads.

2.04 OVERBURDEN STANDPIPE

A. The Contractor may elect to use either standpipes or drill-through packers, depending upon their suitability in the existing ground conditions. Where applicable, set standpipes with a fast setting, non-shrink grout or other means approved by the Owner.

B. Standpipes shall consist of a minimum of 4-inch, PVC, keyed into rock by a minimum of 2 feet. Coordinate standpipe diameter with drill equipment, tooling, and soil drill casing.

2.05 INSTRUMENTED PACKER ASSEMBLIES

A. Instrumented packers for water testing and grouting: Minimum nominal inside pipe diameter of 1 inch surrounded by 2 foot long rubber bladders with accessories for operation, including inert gas (e.g., compressed air, nitrogen, etc.) supply, tubing, gauges, regulators, and valves. The uninflated packer outer diameter shall be at least 1 inch less than the diameter of the drilled hole.

B. Design packers so that they can be expanded to seal the drill holes at the specified depths and, when expanded, capable of withstanding, without leakage, pressure equal to the maximum target pressures to be applied for the entire period of time in which the packer is in use.

C. Packer Instrumentation:
1. Include pressure transducers for single and double packer assemblies such that the insitu pressure can be measured in the stage being water pressure tested or pressure grouted. Provide pressure transducers with a range appropriate for the pressures encountered, accurate to ± 2%, and capable of operation in temperatures between 30- and 120-degrees Fahrenheit.
2. Capable of transmitting pressure data in real time.
3. Provide a length of steel casing outfitted with an external and replaceable pressure gauge for checking the calibration of the instrumented packers. The calibration casing gauge shall be accurate to ±1% full scale or better with a sensitivity, range,

and scale appropriate for anticipated pressure for respective operations. The instrumented casing shall provide the ability to test the calibration of any downhole transducer at any pressure between 0 psi and 250 psi. Perform calibration on a weekly basis and submit per requirements herein.

D. Double Packer Assemblies (for vertical pre-excavation grouting only):
   1. Maintain a minimum of two operational double packer assemblies available for used at all times throughout the Work.
   2. Provide packers and instrumentation as described herein. The central pipe between packers must provide sufficient strength and stiffness such that the assembly can be inserted to the bottom of any grout hole. Provide variable lengths of the central pipe resulting in intervals of 5, 10 and 20 feet between inflated bladders.
   3. Provide ¼- to ⅜-inch perforations equally spaced along the central pipe such that the total area of the perforations equal or exceed two times the inside cross-sectional area of the pipe (e.g., 32 equally spaced, ¼-inch-diameter holes in a 10-foot-long 1-inch ID pipe.

2.06 PUMPING AND HEADER EQUIPMENT

A. Provide all accessories necessary for supplying, circulating, and controlling pressure applied to the grout hole. One grout pump and header shall be used for the grouting of each hole receiving grout

B. Limit the distance between the agitator tank and the grout header to 300 feet unless otherwise approved by the Owner.

C. Grout pumps: progressive capacity, screw-type pumps (similar or equal to a Moyno pump), with a minimum capacity of 25 gpm at a pressure of 200 psi.

D. Configure equipment to circulate grout between the grout header and the grout supply. Provide a magnetic flow meter, electronic pressure transducer, and pressure gauge with gauge saver and a quick-connector union for the grout hose to the hole. Orient so that flow through the meter will travel in an upward direction (in accordance with the manufacturer's direction) to avoid cavitation. Equip each header with a bleed-off valve and fitting between the pressure gauge and the hole, for use in sampling the grout and for verifying that the system is not clogged.

E. Magnetic flow meters: capable of measuring water or grout flow rates from 0 to 25 gpm, accurate to 0.1 gpm, and total volume (gallons), includes a digital readout.

F. Electronic pressure transducers: measure pressure, in psi, at the header and within the water test or grout stage. Include visible digital readout with readout resolution of 0.1 psi.

G. Mechanical pressure gauges: minimum 4-inch diameter face, glycerin filled, plain case gauges, with pressures indicated in psi, accurate to within 2% over the range of the pressure gauge, clearly marked serial numbers and equipped with gauge savers. The full-scale reading of the gauge shall be no more than 130 percent of the maximum pressure to be used. Install mechanical pressure gauges in line and adjacent to the electronic pressure transducers.

H. Provide calibrated master pressure gauge set for checking the accuracy of all gauges and transducers of each type used in the grouting operations at the request of the Owner. Each master gauge set shall be accurate within 1% of its full-scale reading over the full range of the gauge. Store in a protective enclosure at the grout plant when not used.

I. Mount data sampling and transmission equipment on the grout header so data from the instrumented packer, header pressure transducer, and flow meter can be monitored in real-time. Sample, record, and display data at 1 second intervals.

2.07 MIXING AND AGITATING EQUIPMENT:

A. Provide a cement grout mixer, colloidal type, capable of providing a homogenized grout mix with an impeller speed of not less than 1,500 rpm. Equip the mixer with a suitable water measuring device calibrated to read in cubic feet and tenths and can be reset to zero after each delivery of grout.

B. Provide a minimum of two mechanically driven grout agitator tanks capable of effectively stirring all grout mixes to be used for the grouting operation. The outlet from these tanks shall not be less than 2-inches in diameter. Place a 40-mesh per inch screen between the mixer discharge and holding tanks to trap any oversized particles.

C. Provide a means of clearing the grout line that transmits grout to the agitator tanks such that no grout is left in the line. Additionally, if water is used to transfer grout, provide means to clear the transmission line of water so that transferred grout is not contaminated with water.

2.08 GROUT MATERIALS

A. The grout may consist of a homogeneous mixture of any of the following materials:
   1. Cement:
      a. ASTM C 150, Type III Portland cement or
      b. ASTM C 150, Ultrafine cement or
      c. ASTM C 595, Portland Limestone Cement
   2. Pozzolan:
      a. Fly ash, Class F meeting ASTM C618.
   3. Water:
      a. Clean, free from injurious amounts of oil, acid, organic matter, or other deleterious substances, conforming to the chemical limit requirements in Table 2 of ASTM C1602, and having a turbidity of less than 10 NTU. Provide an instrument for measuring turbidity and provide the Owner with verification that water meets the turbidity requirement as requested.
      b. River and stream water are prohibited.
   4. Bentonite:
      a. Powdered 90 BBL yield natural Wyoming sodium montmorillonite and meeting the most current requirements of API Specification 13A. Hydrate bentonite into a slurry for at least 12 hours prior to use.
   5. Admixtures: Meet the requirements of ASTM C494 and CRD-C 661 as applicable. Add to the grout during its mixing in accordance with the manufacturer's

recommendations. Admixtures may consist of viscosity modifiers, high-range water reducer (superplasticizer), silica fume, accelerators, anti-washout agents, or other additives approved by the Owner to meet the performance requirements of the grouts.

a. Viscosity Modifier: Soluble, high molecular weight biopolymer that is stable over the anticipated range of pH and temperatures, such as Welan Gum or Diutan Gum.
b. High-Range Water-Reducing Admixture (HRWRA): Naphthalene-based and uniform in consistency, quality, and strength of solution

B. Store a sufficient quantity of cement at or near the site of the work to ensure that grouting operations will not be delayed by shortage of cement. Store the cement properly and protect it from moisture.

C. Ultrafine cement shall have 95 percent of the particles less than 8 microns with an average particle size of less than 4.5 microns. The ultrafine cements shall be Ultracem, as manufactured by Fosroc, Inc., 150 Carley Court, Georgetown, Kentucky 40324, or approved equal.

D. Where applicable, set standpipes with a fast-setting, non-shrink grout, or other means approved by the Owner.

E. Grout Mixes
1. Design grout mixes by the Grouting Subcontractor and approved by the Owner, in conjunction with Table 1 herein.

F. Propose the ratios of the material components, and review and confirm during the test program. Once confirmed, do not change the grout slurry composition unless requested in writing by the Grouting Subcontractor and reviewed by the Owner.

PART 3 EXECUTION

3.01 GENERAL

A. Conduct all Work in accordance with all applicable codes, standards, and permits.

B. Conduct all Work to avoid interference with operations of existing facilities.

C. Complete the Work based on the reviewed and approved Pre-excavation Grouting Work Plan.

D. Maintain all equipment in fully functional state.

E. Consider existing structures and facilities with the hole layouts and orientations.

F. Prepare a Daily Grouting Log as reviewed by the Owner.

G. Concurrent grouting at multiple locations is permitted, subject to the Owner's approval and provided that all requirements for quality, sequencing, and coordination are met. ADD. NO. 4

Each hole receiving grout shall have its own grout setup, which includes grout pumps, header, mixer, and other pertinent equipment for each grout setup.

H. Maintain grout temperatures between 40- and 90-degrees Fahrenheit, as measured from the agitator tank. The Owner may suspend grouting operations if grout temperatures in this required range are not maintained.

I. Measure the water level in each hole prior to the performance of water pressure testing with the goal of obtaining a static water level.

3.02 DRILLING

A. Use drilling procedures and techniques that do not erode the hole and that aid in preventing hole collapse. These may include perforated casing advancement techniques and limiting water flushing pressures in weak ground to prevent erosion.

B. The actual extent of drilling and grouting shall be adjusted, beyond the minimum requirements shown on the Contract Documents, through the use of Secondary grout holes, as needed to achieve the objectives of the Contract.

C. Drilling at the UOIT:

1. For two (2) of the holes closest to the UOIT, core drill per the requirements from Section 31 09 13. Provide submittals per Section 31 09 13 for drilling qualifications, borehole logs, and equipment used.

ADD. NO. 4

2. When within 20 feet, horizontally and vertically, advance the drill equipment by 1-foot increments. Provide special care when drilling nearby the UOIT and document cuttings to confirm the drill hole does not interfere with the existing UOIT. Stop drilling immediately if a changed condition is encountered during drilling.
3. When within 20 feet, horizontally and vertically, stop drilling and perform a downhole deviation survey to confirm the hole deviation will not interfere with the existing UOIT. If hole is determined to be within 5 feet of the UOIT, abandon and re-drill a new grout hole. If not, continue drilling at increments discussed herein.

3.03 WATER FLUSHING

A. In all holes perform water flushing.

B. Raise and lower the washout bit in increments of 5 feet or less until the return water is clear.

C. If wash water is observed flowing from another grout hole, the Owner may require cross-hole flushing in an attempt to flush materials from the connecting discontinuity.

3.04 WATER PRESSURE TESTING

A. In all holes perform water pressure testing.

B. Perform water pressure testing in the same method to be used for the pressure grouting depending on the pre-excavation grouting and probing and cutoff grouting operations.

Measure water take at the pressures provided in Article 1.08 herein for a 5-minute interval, after stabilization of pressure.

C. Remove air from the system prior to beginning water pressure testing by running water through the system with the packer uninflated in the hole at the test interval. Close feed valve while setting the packer to avoid draining water from the lines.

D. Provide sufficient water volume and pump capacity to develop the desired target pressure.

3.05 PRESSURE GROUTING

A. Mix production grout using the constituents, equipment, and methods from the approved Pre-Excavation Grout Work Plan and approved mix design testing.

B. Provide continuous agitation of grout.

C. Coordinate grouting operations with other aspects of the Work. Install grout in a manner to not create obstructions or other hindrances to subsequent aspects of the Work.

D. Remediate unacceptable injection holes at no additional cost to the Owner. Unacceptable injection holes to be determined by the Owner and remediation methods shall be submitted and approved by the Owner.

E. After each batch is mixed and pumped to the agitator tanks, clear the grout supply line with approved methods.

F. For Pre-excavation Grouting:
   1. Drill grout holes to their full depth, water flush each hole, perform water pressure testing, and grout in ascending stages with instrumented packer assembly from the bottom of the hole to the top of rock, per requirements herein.
   2. Perform water pressure test and inject grout into holes within 72 hours of initial drilling.
   3. If water test indicates no take, it shall be acceptable to combine the grouting of that and the adjacent stage, up to a 40-foot maximum interval.
   4. After all grout stages are complete, immediately tremie backfill the standpipe to the surface.

G. For Cutoff Grouting:
   1. Prior to commencing excavation of rock within the shaft, drill probe holes from the top of rock surface, pressure wash each hole, perform water pressure testing, and if water pressure testing criteria is exceeded, grout entire hole to refusal with single packer assembly. If water pressure testing criteria is not exceeded, tremie backfill probe holes to the rock surface.
   2. Perform water pressure test and inject grout into holes within 72 hours of initial drilling.
   3. Rock excavation shall not commence for the next phase of excavation until all probe hole drilling and cutoff grouting has been completed for that elevation, as shown on the Contract Drawings.

H. If the grout holes do not stay open during drilling or if drill return is lost, then stop drilling and use a descending stage grouting method, as approved by the Owner. After descending stage grouting is completed for that zone, re-drill and proceed with standard grouting operations.

I. Monitor grout takes for each stage. ~~Make available real time, continuous, computer based readouts of time, pressure, and grout volume to the grouting operators.~~ ADD. NO. 4

J. Once injection of the design mix of any stage has begun, continue injection until one of the following termination criteria is satisfied, unless otherwise directed by the Owner:
   1. Refusal.
   2. Max volume of the thickest approved mix as stated herein. For grouting within 20 feet of the UOIT, see requirements herein.
   3. Grout connection to the river or ground surface.
   4. Maximum pressure cannot be achieved because of grout leaks.
   5. If any criterion other than refusal is met follow direction of Owner, which may include:
      a. flushing the stage and re-grouting the next day
      b. re-drill the stage and re-grout

K. If, during the grouting of a hole, grout is found to flow from adjacent grout hole(s) in sufficient quantity to interfere with the grouting operation or to cause appreciable loss of grout, the connected holes shall be grouted simultaneously. Provide equipment and personnel capable to grout up to two connected holes simultaneously as directed by the Owner. Any holes which show evidence of a grout connection, in addition to the ones being grouted, shall be temporarily plugged with inflatable or mechanical bladders or similar equipment. Where such temporary plugging is not essential as determined by the Owner, leave open ungrouted holes to facilitate the escape of air and water. Immediately following the completion of the initial hole, pressure grout additional connected holes at the specified pressures as directed by the Owner. When grouting multiple holes simultaneously, the highest stage and/or lowest target pressure will govern, unless otherwise directed by Owner.

L. During the grouting of any hole, if grout is found to flow from exposed rock, plug or caulk such flows or leaks using wood wedges, oakum, lead wool, or other materials as approved by the Owner. Owner may also direct grouting to temporarily pause.

M. If artesian or excess head conditions are encountered, grouting pressures may change per instructions of the Owner. The Owner may require that a packer with an attached pressure gauge be used to seal the hole at ground surface to measure artesian pressure. After the grouting of artesian holes or connections is completed, maintain the pressures by means of stopcocks or other suitable valve devices, until the grout has set sufficiently so that it will be retained in the holes or connections being grouted.

N. Waste grout that has not been injected within two hours after mixing. The Owner may increase the length of time based on grouting conditions and the observed apparent (marsh) viscosity and temperature of the grout. No payment will be made for wasted grout.

O. The drilling of any grout holes shall not start until the grout in the holes on either side has had time to set.

P. After grouting or probe drilling, immediately abandon all holes not grouted by backfilling with left over grout mix.

Q. Grouting within 20 feet of the UOIT:
   1. Refer herein for reduced pressures when grouting near the UOIT.
   2. Refer herein for maximum grout volume limits.
   3. Coordinate with the Owner on existing flow conditions within the UOIT. Stop grouting operations if UOIT flow conditions change, per direction from the Owner.

3.06 MIX DESIGNS

A. Design a suite of cement-based grout mixes and submit to Owner for approval.

B. Develop the grout mixes within a range of water/cement ratios of 2:1 to 0.8:1 (by weight) with no more than 5% bentonite (by weight). The grout mixes shall exhibit the characteristics in the following table over an ambient temperature range of 40 to 90 degrees Fahrenheit.

TABLE 1. GROUT MIX DESIGNS

Mix Property	Mix Designs			
	Mix A	Mix B	Mix C	Mix D
Apparent (Marsh) Viscosity (sec)	32 to 34	45 to 50	60 to 70	85 to 95
Specific Gravity	To Be Determined by Contractor			
Bleed (%)	<1%	<1%	<1%	<1%
Pressure Filtration Coefficient K_{pf} ($min^{-½}$)	<0.05	<0.05	<0.04	<0.04
Unconfined Compressive Strength (psi at 28 days)	>400	>500	>600	>600
Initial Gel Time (hours)	< 12	< 8	< 6	< 4
Final Gel Time (hours)	< 18	< 12	< 10	< 8
Initial set time (hours)	>4	>4	>4	>4
Final set time (hours)	>6	>6	>5	>4

C. Conduct final grout mix development and testing on site using approved equipment and proposed water source.

D. Perform the mix design testing using the materials, equipment and procedures stated in the Pre-excavation Grouting Work Plan, including the following 2-hour hold test:

1. For each mix, after a batch has satisfied the requirements for apparent viscosity and specific gravity, transfer the batch to an agitator tank and at 30-minute intervals for no less than 2 hours, test the apparent viscosity, specific gravity, and temperature. If the measured marsh viscosity extends outside the specified range or the specific gravity varies by more than 0.01 during the 2-hour monitoring period, then mix additional batches or revise the proportion and test again until a mix with the required characteristics has been produced and approved. Obtain a sample from the agitator sometime during the 2-hour period for testing of bleed, unconfined compressive strength, gel times, and set times.

E. If stored mixing water quality fails to meet requirements, purge tanks of water in a controlled manner and replace with water meeting specified requirements before continuing with grout mixing.

3.07 DRILLING AND GROUTING WASTE MANAGEMENT

A. Make all necessary provisions for collection and control of water, grout, and waste materials in accordance with all local, state, and federal laws, Contract Documents, and permit requirements.

3.08 FIELD QUALITY CONTROL

A. Perform grouting operations and field quality control testing in the presence of the Owner, who shall be allowed unrestricted access.

B. Perform the required quality control tests using trained and experienced personnel. Measure, record, and evaluate the test results in accordance with the reviewed submittals to meet the required performance criteria.
   1. Calibrate pH meters weekly.
   2. Calibrate flow meters, pressure transducers, and scales used to measure grout materials and pressures at least once per week and at any time the Owner believes the equipment does not meet specifications.
   3. Grout Testing Summary, see Table 2.

TABLE 2. GROUT TESTING SUMMARY

Test	Method	Criteria	Frequency*
Apparent Viscosity	Marsh Cone per ASTM D6910	See Table 1	First bath of every mix each day, and every 5th batch
Specific Gravity	ASTM D4380	±0.02	Once daily per grout mix
Bleed	Graduated cylinder per ASTM C940	See Table 1	Once per week per grout mix

Pressure Filtration Coefficient	API filter press per API 13B-1	See Table 1	Once per week per grout mix
Unconfined Compressive Strength	Cylinders prepared using ASTM C31 and tested in accordance with ASTM C39	See Table 1	Each mix during mix design only
Initial and Final Set Time	Vicat needle per ASTM C191	See Table 1	Each mix during mix design only. Note ambient temperature.
Gel Time	Described herein	See Table 1	Each mix during mix design only. Note ambient temperature.
Water Quality	ASTM C1602	Table 2 in ASTM method	Once prior to mix design. Monthly during production
Water Turbidity	ASTM C1602	<10 NTU	Once per week (and after large precipitation event if using open water source)
Temperature	Thermometer per ASTM C1064	40-90 °F	Once daily per grout mix. Note rate water temperature used for mixing

* Owner may increase or decrease frequency of tests based on performance.

3.09 MAINTENANCE

A. Maintain a sufficient quantity of materials throughout the conduct of the Work, for installation, protection of the Work, or in cases of accident or emergency to prevent delays.

3.10 REPAIR AND RESTORATION

A. Repair all damage to adjacent properties, structures, or utilities and restore surfaces and finishes to the original state or better.

B. Remove and dispose of all excavated material, grout spoils, and other construction debris and waste in accordance with all local, state, and federal law, Contract Documents, and permit requirements.

C. Keep the site clean and do not obstruct access to equipment.

D. Cover and protect any borehole that will remain open more than 24 consecutive hours to prevent foreign material and surface water from entering the borehole.

E. Staining of any surfaces due to grout leaks or other sources is unacceptable. Immediately and thoroughly clean any grout leaks or spills.

END OF SECTION

SECTION 31 33 01
VERTICAL ROCK REINFORCEMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Section includes the minimum requirements for furnishing, delivering, installing, maintaining, and abandoning the vertical rock reinforcement to act as a shield wall between the shaft and existing UOIT utility.

1.02 RELATED SECTIONS

A. This section contains specific references to the following related sections. Additional related sections may apply that are not specifically listed below.
   1. Section 01 33 00 Submittals.
   2. Section 01 45 00 Contractor Quality Control.
   3. Section 01 50 00 Construction Facilities, Temporary Controls and Utilities.
   4. Section 01 65 50 Product Delivery, Storage and Handling.
   5. Section 31 09 13 Geotechnical Instrumentation and Monitoring.
   6. Section 31 72 13 Rock Initial Support.
   7. Section 31 75 00 Shaft Construction.

B. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
ASTM	ASTM A 36, Standard Specification for Carbon Structural Steel.
	ASTM C 109, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.
	ASTM C150, Standard Specification for Portland Cement.
PTI	Post-Tensioning Institute Manual.

1.03 DEFINITIONS

A. Terminology used in this Section conforms to the following definitions:
   1. Rock Dowel: See Section 31 72 13.

1.04 SUBMITTALS

A. Action Submittals:
   1. Procedures: Section 01 33 00.
   2. Qualifications: Submit personnel qualifications in accordance with the requirements of this Section.
   3. Product Data: Manufacturer's product data for all materials required to be incorporated in the Work.
   4. Shop Drawings: Indicate the complete geometry, details, materials requirements, and dimensions for proposed rock dowels:
      a. Provide details including type of dowel, size and length, grout type and mix details.
   5. Working Drawings and Methods Statements:
      a. Detailed vertical rock reinforcement in relation to the shaft excavation and existing UOIT by providing profiles, cross sections, and details showing pertinent dimensions, spacings, and clearances. Include plans, elevations, sections and details showing the arrangement and method of installation and assembly.
      b. Provide procedures, means and methods, and equipment for both drilling methods ~~drilling~~ and installing the vertical rock reinforcement. Include drilling equipment, hole size, and procedures for installation. ADD. NO. 4
      c. Sequence of installation of vertical rock reinforcement.
   6. Quality Control Plans:
      a. Methods for assuring that production of vertical rock reinforcement will not critically impact shaft excavation.
      b. Methods for assuring that the fabrication and installation of vertical rock reinforcement will meet specified tolerances and design criteria.
      c. Procedures for confirming that grouted rock dowels as installed are fully encapsulated with grout ~~or~~ resin~~~~. ADD. NO. 4
      d. Coordination with the rock reinforcement for the initial support of the shaft excavation.

B. Informational Submittals:
   1. Procedures: Section 01 33 00
   2. Certifications and calibrations:
      a. Copy of factory calibrations.
   3. Permits
   4. Monitoring Reports
      a. Recordkeeping: Submit daily reports no later than the beginning of the following workday. Include:
         1) Records of installed vertical rock reinforcement, including locations, spacing, lengths, types, and number.
         2) Drill logs.
         ~~3) Other records of performance tests required by the Contractor.~~ ADD. NO. 4

5. Notifications
    a. Immediately upon discovering deformation, distress, obstructions, or damage to existing structures and/or the vertical rock reinforcement elements.

C. Closeout Submittals:
1. Procedures: Section 01 33 00.
2. As-built records of vertical rock reinforcement within one month of completion, including:
    a. Vertical rock reinforcement identification
    b. Vertical rock reinforcement locations, dimensions, and depths
    c. Description of ground encountered, obstructions, and excavation problems, if any.

1.05 QUALITY ASSURANCE

A. Qualifications
1. Rock Dowel ~~testing~~ foreman
    a. Retain foreman on crews ~~testing~~ installing rock dowels who have performed similar ~~tests~~ installations on at least one other project. ADD. NO. 4
2. Drillers
    a. Employ drillers for drilling boreholes with a minimum of five years of direct field experience in drilling boreholes. Each drill rig operator and all drill crew shall have 40-hour Hazardous waste (HAZWOPER) and OSHA 10-hour health and safety training.
    b. Perform vacuum excavations by a firm with a minimum of five years of experience in non-destructive vacuum excavation methods.
3. Core Drilling Inspectors ADD. NO. 4
    a. Employ a PennDOT certified drilling inspectors with a minimum of two years of similar experience, including rock coring and rock classification. Responsibilities of the drilling inspector includes inspection of all drilling, sampling, in-situ testing, backfilling, site restoration, logging, field classification, photo documentation, record keeping, sample labeling, packaging, transfer and storage and other activities associated with drilling and logging of boreholes. Each drilling inspector shall have 40-hour Hazardous waste (HAZWOPER) and OSHA 10-hour health and safety training.

B. Pre-Construction Testing
1. Not Used. ~~Factory Calibration: Conduct a factory calibration on testing equipment and apparatuses for testing. Provide certification to indicate the test equipment used for this purpose is calibrated and maintained in accordance with the test equipment manufacturer's calibration requirements.~~ ADD. NO. 4

C. Pre-Construction Meetings
1. Hold meetings at least five days but not more than 30 days prior to installation of vertical rock reinforcement.
2. Review and discuss the following items at each meeting:

a. Construction methods and constraints to be considered in executing the work.
b. Equipment operating parameters.
c. Safety procedures.
d. Quality Control procedures and Quality Assurance requirements.
e. Reporting requirements.

1.06 DELIVERY, STORAGE AND HANDLING

A. Procedures: Section 01 65 50

1.07 TOLERANCES

A. Install vertical rock reinforcement boreholes within two degrees of vertical for the entire length.

B. Notify the Owner if actual field conditions prohibit installation at the location and elevations specified on the Contract Documents.

1.08 PROJECT CONDITIONS

A. Applicable ground conditions are described in the Geotechnical Baseline Report (GBR).

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide materials that are new and free from defects that impair their performance.

B. Vertical rock reinforcement dowels shall conform to requirements of ASTM A615, Grade 60 (Fy=60ksi).~~Rock Dowel: See Section 31 72 13~~. ADD. NO. 4

C. Cement grout for vertical rock reinforcement shall have a 28-day minimum compressive strength (fc') of 4,000 psi. ADD. NO. 4

2.02 EQUIPMENT

A. Use method to produce holes to depths and of size and quality required for rock dowel installation in accordance with the ~~manufacturer's recommendations and~~ Contract Documents. Use equipment and bits of the condition and capacity to accomplish work ate which will not result in delays. ADD. NO. 4

PART 3 EXECUTION

3.01 GENERAL

A. Be solely responsible for the safety of the work and the protection of personnel and property in the performance of the work.

3.02 INSTALLATION

A. Existing Conditions: Locate conduits and underground utilities in all areas where vertical rock reinforcement is to be drilled and installed. Notify all Utility Owner's prior to instrumentation installation below ground surface. If necessary, propose modifications to locations of vertical rock reinforcement to avoid interference with the existing conduits and utilities. Repair damage to existing utilities resulting from vertical rock reinforcement installations at no additional cost to the Owner.

B. Drilled Boreholes

1. Drill holes to the required depth and diameter shown on the Contract Drawings in accordance with the appropriate rock dowel manufacturer's recommendations. Drill holes generally perpendicular to the excavated surface. Clean holes of drill cuttings, sludge and debris before installing dowels.
2. Where drilled boreholes are located within five feet horizontally of existing underground utilities, use vacuum excavation methods to excavate and clear utilities within the maximum anticipated depth below ground surface.
3. Drilling at the UOIT:
   a. For two (2) of the holes closest to the UOIT, core drill per the requirements from Section 31 09 13. Provide submittals per Section 31 09 13 for drilling qualifications, borehole logs, and equipment used.

ADD. NO. 4

   b. When within 20 feet, horizontally and vertically until the UOIT invert elevation, advance the drill equipment by 1-foot increments. Provide special care when drilling nearby the UOIT and document cuttings to confirm the drill hole does not interfere with the existing UOIT. Stop drilling immediately if a changed condition is encountered during drilling.
   c. When within 20 feet, horizontally and vertically until the UOIT invert elevation, stop drilling and perform a downhole deviation survey to confirm the hole deviation will not interfere with the existing UOIT. If hole is determined to be within 5 feet of the UOIT, abandon and re-drill a new hole. If not, continue drilling at increments discussed herein.

~~4. When within 20 feet, horizontally and vertically, advance the drill equipment by 1 foot increments. Provide special care when drilling nearby the UOIT and document cuttings to confirm the drill hole does not interfere with the existing UOIT. Stop drilling immediately if a changed condition is encountered during drilling.~~

~~5. When within 20 feet, horizontally and vertically, downhole survey every 5 feet vertically to confirm verticality of the hole.~~

6. Drill logs: during installation of vertical rock reinforcement, a PennDOT certified drilling inspectors shall be on site to identify the top of rock and top of rock elevations for each hole. This information may be utilized during the design adjacent support of excavations. Also log any zones of increased water inflows, water loss, increased drilling rates, drill changes, and obstructions, if any.

C. Rock Dowels

1. Fully encase rock dowels installed for the vertical rock reinforcement with non-shrink cement grout.
2. Rock dowels may be other types subject to the approval of the Owner.
3. Install rock dowels in accordance with manufacturers' instructions.
4. Prevent floatation during installation of rock dowels.
5. It is expected that all drilled boreholes to receive vertical rock dowels will contain groundwater and/or require drilling mud to maintain an open hole. Perform grouting using the tremie method placing grout at the bottom of the borehole and raising the tremie pipe as grout fills the hole.

3.03 FIELD QUALITY CONTROL

A. Testing
   1. Use field sample testing to verify the water cement ratio of the mix injected matches the mix specified for that stage of grouting. Perform laboratory testing only if there is some question related to the grout performance.

3.04 REPAIR/RESTORATION

A. Demolish reinforcement within discharge basement and other near surface excavation to within four feet of excavation subgrade after final shaft liner is installed.

B. Repair and/or replace damaged existing structures and utilities as a result of the vertical rock reinforcement at no additional cost to the Owner.

C. Remove reinforcement within four feet below ground surface after final shaft liner is installed. Fill open holes with cement grout using tremie method.

D. Restore pavement, sidewalks, and landscaped areas in kind or better than existing adjacent conditions.

END OF SECTION

ATTACHMENT – B

Addendum No. 4 Drawings

Path: S:\CLIENTS AND PROJECTS\214 - BROWN AND CALDWELL\22-21416 ALCOSAN WWPS\C - CADD\75% COMMENTS DRAWINGS FILENAME: 000-C-07_RECOVER000_RECOVER.DWG PLOT DATE: 7/9/2025 3:07 PM CAD USER: BRUNO STANISZEWSKI

OHIO RIVER NORMAL POOL ELEVATION = 710

REGULATORY FLOODWAY

ELECTRICAL SUBSTATION 650

100-YEAR FLOODPLAIN

1 CONSTRUCTION ENTRANCE TO BE MAINTAINED BY WWPS CONTRACTOR

12-INCH CFS-A

12-INCH CFS-B

12-INCH CFS-C

12-INCH CFS-D

12-INCH CFS-E

12-INCH CFS-F

12-INCH CFS-G

12-INCH CFS-H

12-INCH CFS-I

12-INCH CFS-J

INLET PROTECTION

WET WEATHER PUMP STATION (430)

CONTRACTOR SHALL INSTALL JERSEY BARRIERS TO PROTECT TANK AND ALLOW ALCOSAN ACCESS DURING CONSTRUCTION.

CONSTRUCTION ENTRANCE

ENERGY RECOVERY FACILITY 410

CONCRETE WASHOUT WATER AVAILABLE FOR CONCRETE WASHOUT FROM CLOSEST HYDRANT 130 FEET TO THE EAST

DISTURBANCE EAST OF THE LOD SHALL NOT IMPACT EARTH BELOW PAVEMENT SUBBASE

EXCAVATED MATERIAL STOCKPILE

CONSTRUCTION ENTRANCE

MAIN PUMP STATION ELECTRIC/GENERATOR BUILDING 501

MAIN PUMP STATION 500

TEMPORARY ACCESS DURING CONSTRUCTION. CONTRACTOR TO REMOVE EXISTING CURB TO THIS AREA TO ALLOW PASSAGE OF VEHICLES. ACCESS TO BE MIN 8" AASHTO #1 STONE PLACED ON TOP OF GEOTEXTILE LINER.

EXISTING WEST HEADWORKS 510

LEGEND

- FLP — 100 YEAR FLOODPAIN
- FW — REGULATORY FLOODWAY
- CFS — COMPOST FILTER SOCK
- CONCRETE WASHOUT
- INLET PROTECTION
- LOD — LIMIT OF DISTURBANCE
- ROCK CONSTRUCTION ENTRANCE / TEMPORARY ACCESS
- EXCAVATED MATERIAL STOCKPILE

0 10' 20' 40'
SCALE: 1"=20'

Designed by:	REVISION			
B. STANISZEWSKI	REV No.	DATE	DESCRIPTION	APPV
Drawn by:	0	5/16/25	ISSUED FOR BID	CC
B. STANISZEWSKI	1	7/9/25	Add. 4 - Change WWPS contractor to maintain RCE	CC
Checked by:				
C. CASADEI				

Brown AND Caldwell

Draft Print
07/17/2025 10:02:30 AM

ARLETTA SCOTT WILLIAMS
EXECUTIVE DIRECTOR, ALCOSAN

3300 PREBLE AVE.
PITTSBURGH, PA 15233
(412) 766 - 4810

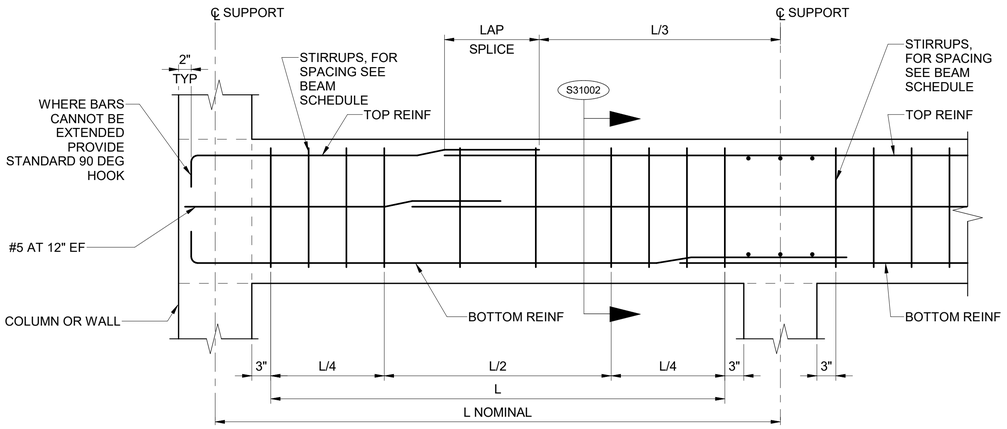
www.alcosan.org

ALLEGHENY COUNTY SANITARY AUTHORITY
WASTEWATER TREATMENT PLANT
WET WEATHER PUMP STATION

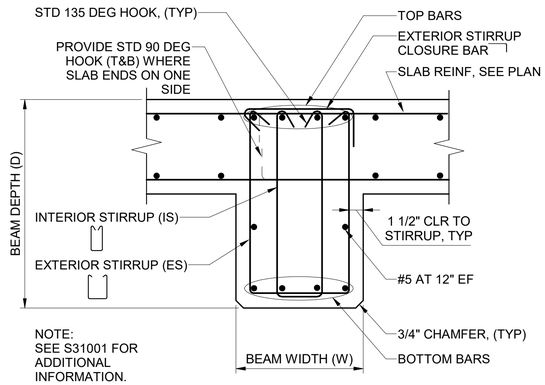
000-C-07
EROSION AND SEDIMENT CONTROL PLAN

Contract:	1800
CAD File Name:	000-C-07.dwg
Date:	5/16/2025
Sheet:	

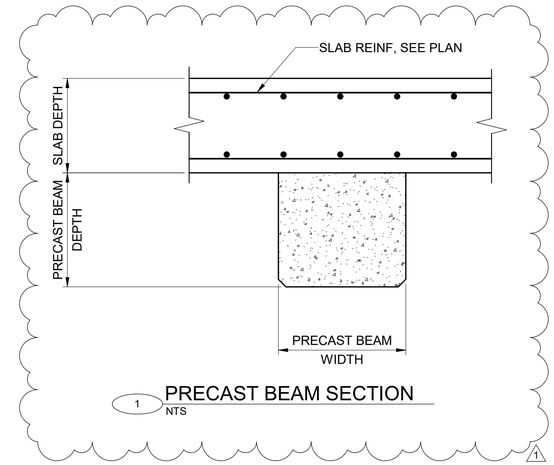
BEAM SCHEDULE										
MARK	SIZE (IN.)		REINFORCING					STIRRUPS		REMARKS
	WIDTH	DEPTH	TOP			BOTTOM		SIZE	SPACING	
			ADD'L LEFT	CONT	ADD'L RIGHT	CONT	ADD'L			
FB1-1	24	36	-	6 - #7	-	5 - #7	-	#4	12"	-
FB1-2	24	48	-	7 - #7	-	7 - #7	-	#4	12"	-
FB1-3	24	TBD	-	-	-	-	-	-	-	PRECAST BEAM BY PRECAST VENDOR
FB1-4	24	24	-	-	-	-	-	-	-	PRECAST BEAM BY PRECAST VENDOR
FB1-5	24	24	-	-	-	-	-	-	-	PRECAST BEAM BY PREAST VENDOR. BEAM DESIGN SHALL INCLUDE CONCENTRATED COLUMN REACTIONS SHOWN BELOW: DEAD = 317.32 KIP (UNFACTORED) FLOOR LIVE = 184.67 KIP (UNFACTORED) ROOF LIVE = 12.23 KIP (UNFACTORED) SNOW = 68.19 KIP (UNFACTORED) WIND (DOWNWARD) = 1.49 KIP (UNFACTORED)
FB1-6	24	24	-	4 - #6	-	5 - #6	-	#4	10"	-
FB1-7	24	78	-	12 - #7	-	12 - #7	-	#4	5"	GRADE BEAM. T&B STEEL IS IN TWO LAYERS.
B-1	24	24		11 - #7		6 - #7		#4	10"	-
FB2-1	24	44	-	14 - #8	-	9 - #8	-	#4	5"	TOP STEEL IS IN TWO LAYERS.COORDINATE WITH REMOVABLE PRECAST CONCRETE PLANKS.
RB-1	24	24	-	10 - #7	-	6 - #7	-	#4	12 @ 2", BAL @ 10"	SPACING AT EACH END



S31001 BEAM ELEVATION
NTS



S31002 BEAM SECTION
NTS



1 PRECAST BEAM SECTION
NTS

Path: BIM 360://170064 - ALCOSAN Wet Weather PS/170064-S-430V21.rvt

Plot Date: 7/15/2025 12:24:22 PM

Designed by:	REVISION			
A.KEARNS	REV No.	DATE	DESCRIPTION	APPV
Drawn by:	0	5/16/25	ISSUED FOR BID	JM
R.BARKER	1	7/17/25	ADD. 4 - ADD PRECAST BEAM SECTION DETAIL	JM
Checked by:				
J.MINADEO				

Brown AND Caldwell

Draft Print
07/17/2025 10:02:57 AM

alcosan allegheny county sanitary authority

ARLETTA SCOTT WILLIAMS
EXECUTIVE DIRECTOR, ALCOSAN

3300 PREBLE AVE.
PITTSBURGH, PA 15233
(412) 766 - 4810

www.alcosan.org

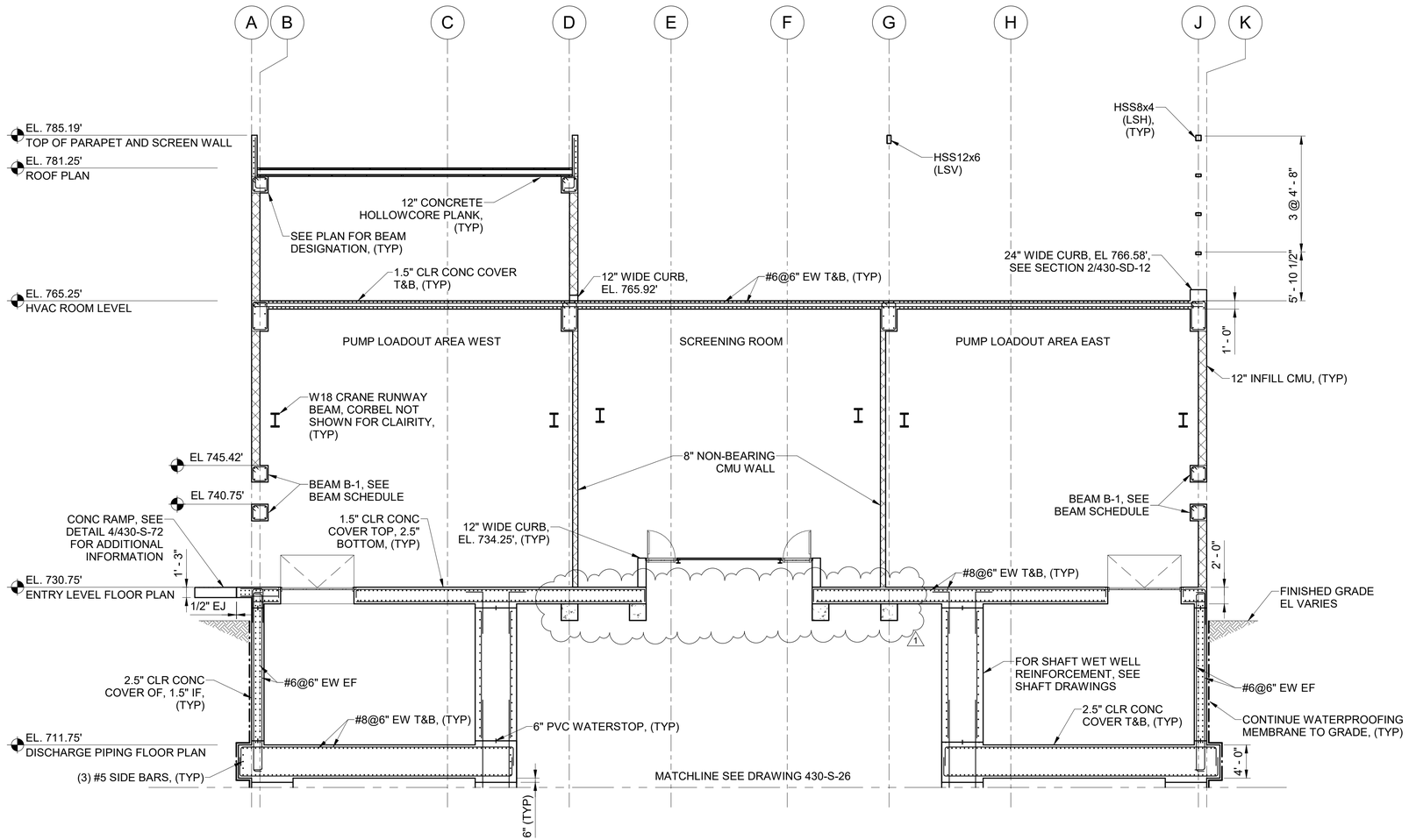
ALLEGHENY COUNTY SANITARY AUTHORITY
WASTEWATER TREATMENT PLANT
WET WEATHER PUMP STATION

430-S-45
CONCRETE BEAM SCHEDULE AND DETAILS

Contract:	1800
CAD File Name:	
Date:	5/16/2025
Sheet:	173 of 405

GENERAL NOTES:

1. FOR STANDARD STRUCTURAL DETAILS, SEE DRAWINGS 430-SD-01 TO 430-SD-12.
2. BRICK VENEER SCREEN WALL NOT SHOWN, SEE ARCHITECTURAL DRAWINGS.
3. LSH = LONG SIDE HORIZONTAL
   LSV = LONG SIDE VERTICAL
4. REINFORCING STEEL IS SHOWN INDICATIVELY AND SHALL NOT BE SCALED FROM THE DRAWINGS. REINFORCING SIZE, SPACING, QUANTITY, EXTENTS, AND LENGTH SHALL BE BASED ON THE ANNOTATIONS ON THE DRAWINGS.
5. REFER TO DRAWING 430-S-45 FOR BEAM SCHEDULE AND REFER TO DETAIL S31001.
6. PRECAST CONCRETE PANEL CONNECTION TO STRUCTURE NOT SHOWN. PRECAST CONCRETE PANEL CONNECTION SHALL BE DESIGNED BY PRECAST MANUFACTURER. CONTRACTOR SHALL COORDINATE COLUMN/BEAM/WALL CONSTRUCTION WITH THE PRECAST MANUFACTURER.
7. PROVIDE MUD MAT UNDER DISCHARGE PIPING SLAB, REFERENCE DETAIL C/430-S-38



11 SECTION
430-S-51 SCALE: 1/8" = 1'-0"

0 4' 8' 16'
SCALE : 1/8" = 1'-0"

Path: BIM 360://170064 - ALCOSAN Wet Weather PS/170064-S-430V21.rvt
Plot Date: 7/15/2025 12:24:23 PM

Designed by:	REVISION			
A.KEARNS	REV No.	DATE	DESCRIPTION	APPV
Drawn by:	0	5/16/25	ISSUED FOR BID	JM
T.WIBLE	1	7/17/25	ADD. 4 - REVISED PRECAST BEAMS	JM
Checked by:				
J.MINADEO				

Brown AND Caldwell

Draft Print
07/17/2025 10:02:57 AM

ARLETTA SCOTT WILLIAMS
EXECUTIVE DIRECTOR, ALCOSAN
3300 PREBLE AVE.
PITTSBURGH, PA 15233
(412) 766 - 4810
www.alcosan.org

ALLEGHENY COUNTY SANITARY AUTHORITY
WASTEWATER TREATMENT PLANT
WET WEATHER PUMP STATION

430-S-65
SECTIONS 1

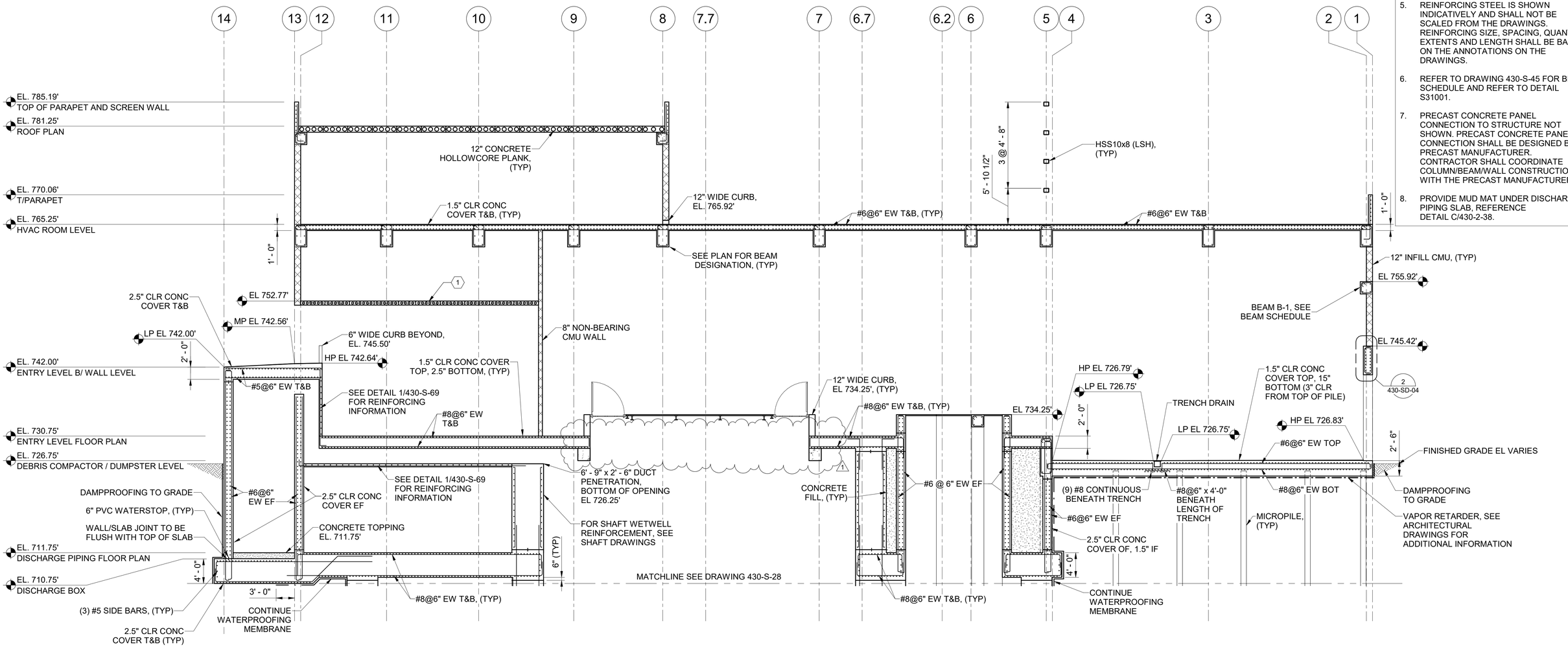
Contract:	1800
CAD File Name:	
Date:	5/16/2025
Sheet:	189 of 405

KEYNOTES:

1 4HC8 HOLLOW CORE SLAB PANELS, (TYP). REFERENCE SPECIFICATION SECTION 03 41 13.

GENERAL NOTES:

1. FOR STANDARD STRUCTURAL DETAILS, SEE DRAWINGS 430-SD-01 TO 430-SD-12.
2. BRICK SCREEN WALL NOT SHOWN, SEE ARCHITECTURAL DRAWINGS.
3. LSH = LONG SIDE HORIZONTAL.
4. REFER TO PLUMBING DRAWINGS FOR COORDINATION OF TRENCH DRAIN/ADDITIONAL INFORMATION.
5. REINFORCING STEEL IS SHOWN INDICATIVELY AND SHALL NOT BE SCALED FROM THE DRAWINGS. REINFORCING SIZE, SPACING, QUANTITY, EXTENTS AND LENGTH SHALL BE BASED ON THE ANNOTATIONS ON THE DRAWINGS.
6. REFER TO DRAWING 430-S-45 FOR BEAM SCHEDULE AND REFER TO DETAIL S31001.
7. PRECAST CONCRETE PANEL CONNECTION TO STRUCTURE NOT SHOWN. PRECAST CONCRETE PANEL CONNECTION SHALL BE DESIGNED BY PRECAST MANUFACTURER. CONTRACTOR SHALL COORDINATE COLUMN/BEAM/WALL CONSTRUCTION WITH THE PRECAST MANUFACTURER.
8. PROVIDE MUD MAT UNDER DISCHARGE PIPING SLAB, REFERENCE DETAIL C/430-2-38.



12 SECTION
430-S-50 SCALE: 1/8" = 1'-0"

0 4' 8' 16'
SCALE : 1/8" = 1'-0"

Plot Date: 7/15/2025 12:24:24 PM Path: BIM 360://170064 - ALCOSAN Wet Weather PS/170064-S-430V21.rvt

Designed by:	REVISION			
A.KEARNS	REV No.	DATE	DESCRIPTION	APPV
Drawn by:	0	5/16/25	ISSUED FOR BID	JM
T.WIBLE	1	7/17/25	ADD. 4 - REVISED PRECAST BEAMS	JM
Checked by:				
J.MINADEO				

Brown AND Caldwell

Draft Print
07/17/2025 10:02:58 AM

alcosan allegheny county sanitary authority

ARLETTA SCOTT WILLIAMS
EXECUTIVE DIRECTOR, ALCOSAN

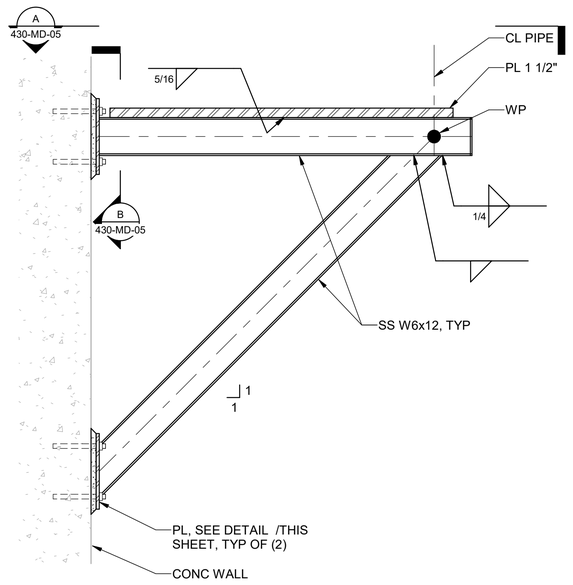
3300 PREBLE AVE.
PITTSBURGH, PA 15233
(412) 766 - 4810

www.alcosan.org

ALLEGHENY COUNTY SANITARY AUTHORITY
WASTEWATER TREATMENT PLANT
WET WEATHER PUMP STATION

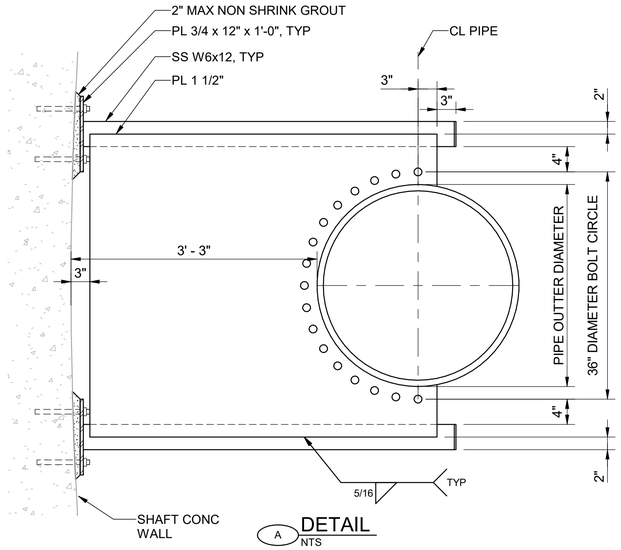
430-S-66
SECTIONS 2

Contract:	1800
CAD File Name:	
Date:	5/16/2025
Sheet:	190 of 405

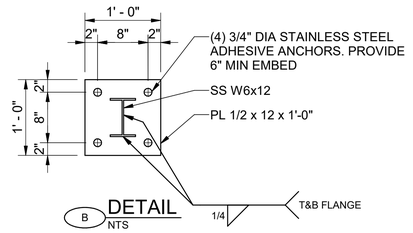


NOTES:
1. COMPONENTS OF PIPE SUPPORT SHALL BE STAINLESS STEEL.
2. SEE MECHANICAL DRAWINGS FOR LOCATIONS AND ADDITIONAL INFORMATION. COORDINATE WITH SHAFT DRAWINGS.

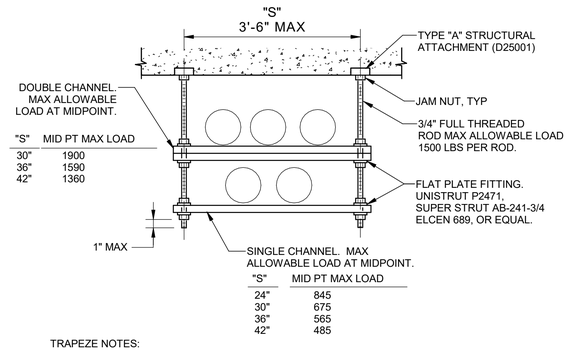
5 TYPE V-B SUPPORTS
NTS



A DETAIL
NTS



B DETAIL
NTS



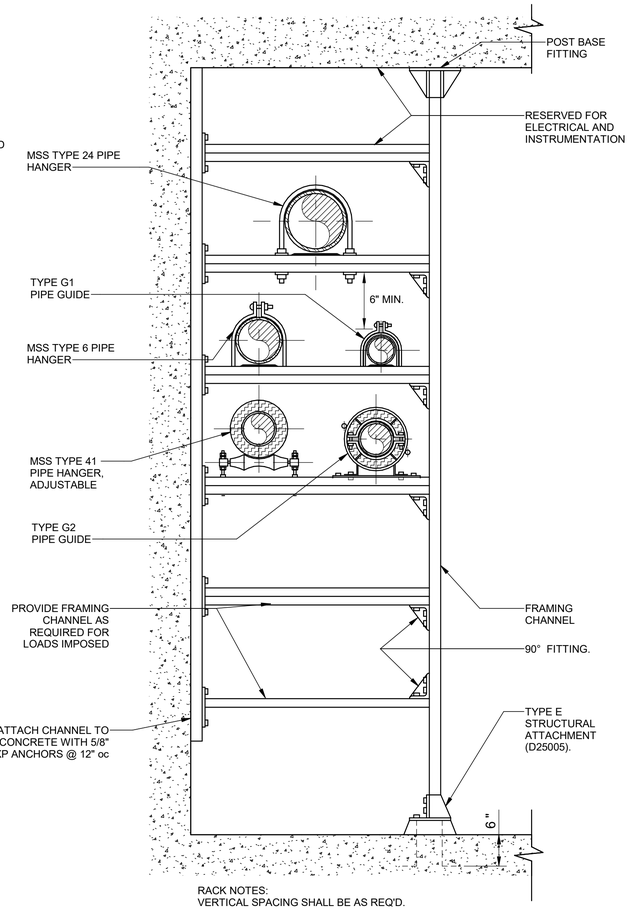
"S"	MID PT MAX LOAD
30"	1900
36"	1590
42"	1360

"S"	MID PT MAX LOAD
24"	845
30"	675
36"	565
42"	485

TRAPEZE NOTES:

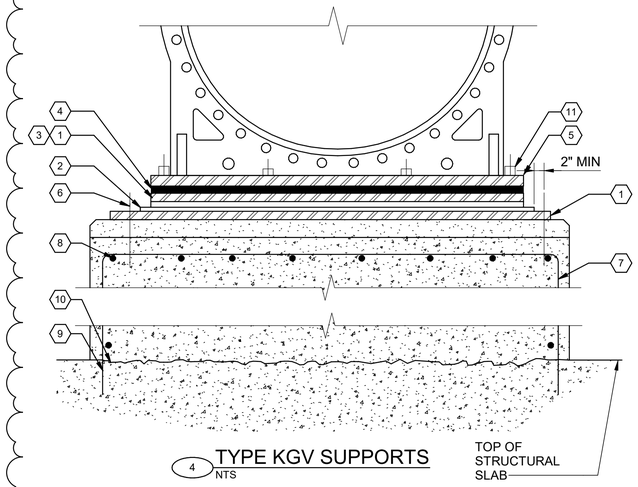
1. SPACING SHALL BE AS SPECIFIED IN TABLE A. SEE TABLE A, NOTE 2 (D20001).
2. MAX DESIGN WEIGHTS SHALL BE AS FOLLOWS: 3/8" TO 1 1/4" PIPE - 100% OF DESIGN WEIGHT, TABLE A. 1 1/2" TO 12" PIPE - 50% OF DESIGN WEIGHT. SEE TABLE A (D20001).
3. TOTAL LOADS ON END CONNECTIONS SHALL NOT EXCEED 1/2 THE MAX ALLOWABLE LOAD AT MID-POINT.
4. VERTICAL SPACING SHALL BE AS REQ'D.

D23020 TYPE 20 TYPICAL TRAPEZE PIPE SUPPORT
NTS



RACK NOTES:
VERTICAL SPACING SHALL BE AS REQ'D.

D23021 TYPE 21 TYPICAL PIPE RACK SUPPORT
NTS



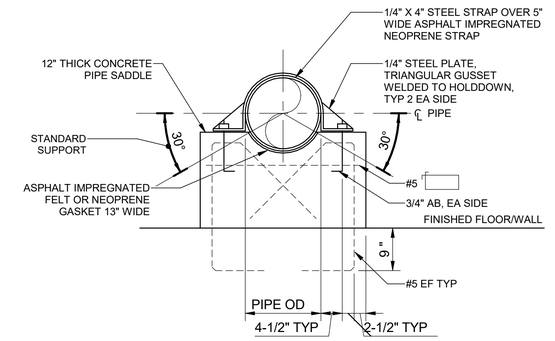
4 TYPE KGV SUPPORTS
NTS

KEYNOTES:

1. 3/4" 316 STAINLESS STEEL BACKING PLATE.
2. 25% GLASS FILLED PTFE SLIDE PLATES. SLIDE PLATES SHALL BE BONDED TO BACKING PLATES IN THE FACTORY. SLIDE PLATE AND BACKING PLATES SHALL BE PIPING TECHNOLOGY & PRODUCTS, INC, OR APPROVED EQUAL. BOTTOM PTFE SLIDE PLATE SURFACE SHALL EXTEND 1/2" BEYOND TOP PTFE SLIDE PLATE SURFACE.
3. TOP BACKING PLATE DIMENSIONS SHALL MATCH INTEGRAL VALVE BASE PLATE DIMENSIONS. WELD 5/8" THREADED STUDS TO THE TOP OF THE SLIDE BACKING PLATE FOR ATTACHMENT TO INTEGRAL VALVE BASEPLATE. STUD SPACING SHALL BE 18" MAXIMUM.
4. 1/2" THICK ISOLATION PAD BETWEEN PLATES, UNISORB OR EQUAL. LIMIT BEARING STRESS OF VALVE BASE ON PAD TO 12 PSI. SUBMIT CALCULATIONS TO ENGINEER FOR REVIEW.
5. INTEGRAL VALVE BASE PLATE. DRILL BASE PLATE TO MATCH SLIDE PLATE BACKING PLATE STUD PATTERN.
6. EVENLY SPACED 3/4" ANCHOR BOLTS. MAXIMUM SPACING BETWEEN BOLTS SHALL BE 18". CONCRETE SUPPORT EDGE DISTANCE AND EMBEDMENT PER DETAIL D01002.

KEYNOTES:

7. 2" MINIMUM BETWEEN REBAR AND EDGE OF CONCRETE (TYP).
8. #6 @ 6" O/C EF, EW.
9. EPOXY DOWELS, 6" MIN EMBEDMENT.
10. ROUGHEN SURFACE AND APPLY EPOXY BONDING AGENT IMMEDIATELY PRIOR TO PLACING PEDESTAL CONCRETE.
11. INSTALLATION SEQUENCE:
    (1) HAND-TIGHTEN NUTS TO ATTACH TOP SLIDE PLATE TO INTEGRAL VALVE BASE PLATE. SUSPEND VALVE, FULLY ALIGN VALVE TO UPSTREAM AND DOWNSTREAM PIPING. ENSURE THAT PIPING UPSTREAM AND DOWNSTREAM OF THE VALVE ARE NOT CONNECTED TO ALLOW VALVE TO REST FREELY ON SUPPORT.
    (2) LEVEL BOTTOM BASEPLATE PER DETAIL D01000.
    (3) WAIT 1 HOUR TO ALLOW INITIAL COMPRESSION OF ISOLATION PAD.
    (4) SNUG-TIGHTEN BOLTS BETWEEN TOP SLIDE PLATE AND INTEGRAL VALVE BASEPLATE.
    (5) IF REQUIRED, RE-LEVEL BOTTOM BACKING PLATE TO RE-ALIGN VALVE FLANGES WITH ADJOINING PIPE FLANGES.
    (6) PERFORM FINAL CONNECTION OF PIPING UPSTREAM AND DOWNSTREAM OF VALVE.



D23024 TYPE 24 CONCRETE SADDLE PIPE SUPPORT
NTS

Designed by:	REVISION			
A.JUERGENS	REV No.	DATE	DESCRIPTION	APPV
Drawn by:	0	5/16/25	ISSUED FOR BID	AJ
R.PAVLISICH	1	7/17/25	ADD. 4 - REVISE TYPE KGV SUPPORT	AJ
Checked by:				
C.MICHALOS				

Brown AND Caldwell

Draft Print
07/17/2025 10:02:58 AM

ARLETTA SCOTT WILLIAMS
EXECUTIVE DIRECTOR, ALCOSAN

alcosan allegheny county sanitary authority
3300 PREBLE AVE.
PITTSBURGH, PA 15233
(412) 766 - 4810
www.alcosan.org

ALLEGHENY COUNTY SANITARY AUTHORITY
WASTEWATER TREATMENT PLANT
WET WEATHER PUMP STATION

430-MD-05
STANDARD DETAILS 5

Contract: 1800
CAD File Name:
Date: 5/16/2025
Sheet: 247 of 406

Plot Date: 7/11/2025 1:38:20 PM
Path: BIM 360://170064 - ALCOSAN Wet Weather PS/170064-M-430V21.rvt

KEYNOTES:

1 PROVIDE A GFC1 BREAKER FOR WELDING RECEPTACLE CIRCUIT

PPB001-430

LOCATION: ELECTRICAL ROOM
MOUNTING: SURFACE
***NOTES:** PROVIDE INTEGRAL SPD

VOLTAGE: 480V, 3Ø, 3W
BUS: 800A
MAIN: 800A MCB
SCCR: 65 kA

CKT	TRIP /POLE	LOAD DESCRIPTION	LOAD KVA	PHASE A	PHASE B	PHASE C	LOAD KVA	LOAD DESCRIPTION	TRIP /POLE	CKT
1			11.33	32.66			21.33			2
3	50/3	MAKE UP AIR UNIT #1 (MUW001-430)	11.33		32.66		21.33	MAKE UP AIR UNIT #3 (MUW003-430)	100/3	4
5			11.33			32.66	21.33			6
7			3.00	3.00			0.00			8
9	15/3	MAKE UP AIR UNIT #5 (MUW005-430)	3.00		3.00		0.00	SPARE	60/3	10
11			3.00			3.00	0.00			12
13			6.67	20.00			13.33			14
15	40/3	RADIAL BRIDGE CRANE #1 (CRN001-430)	6.67		20.00		13.33	STANDARD BRIDGE CRANE #1 CONTROL PANEL (CRN003-430)	60/3	16
17			6.67			20.00	13.33			18
19			20.00	20.00			0.00			20
21	90/3	STANDARD BRIDGE CRANE #3 CONTROL PANEL (CRN005-430)	20.00		20.00		0.00	SPARE	40/3	22
23			20.00			20.00	0.00			24
25			2.67	5.34			2.67			26
27	20/3	SUCTION GATE VALVE WWP #1 (PWW001-430IV)	2.67		5.34		2.67	SUCTION GATE VALVE WWP #3 (PWW003-430IV)	20/3	28
29			2.67			5.34	2.67			30
31			2.67	4.34			1.67			32
33	20/3	SUCTION GATE VALVE WWP #5 (PWW005-430IV)	2.67		4.34		1.67	SIPHON BREAK VALVE #1 (PWW001-430SCV)	15/3	34
35			2.67			4.34	1.67			36
37			1.67	3.34			1.67			38
39	15/3	SIPHON BREAK VALVE #3 (PWW003-430SCV)	1.67		3.34		1.67	SIPHON BREAK VALVE #5 (PWW005-430SCV)	15/3	40
41			1.67			3.34	1.67			42
43			0.43	0.86			0.43			44
45	15/3	DISCHARGE CONTROL ROTARY CONE VALVE #1 (PWW001-430RCV)	0.43		0.86		0.43	DISCHARGE CONTROL ROTARY CONE VALVE #3 (PWW003-430RCV)	15/3	46
47			0.43			0.86	0.43			48
49			0.43	0.43			0.00			50
51	15/3	DISCHARGE CONTROL ROTARY CONE VALVE #5 (PWW005-430RCV)	0.43		0.43		0.00	SPARE	20/3	52
53			0.43			0.43	0.00			54
55			0.00	3.33			3.33			56
57	90/3	SPARE	0.00		3.33		3.33	ELECTRIC UNIT HEATER #5 (EUH005-430)	15/3	58
59			0.00			3.33	3.33			60
61			0.00	1.23			1.23			62
63	50/3	SPARE	0.00		1.23		1.23	ELECTRIC UNIT HEATER #9 (EUH009-430)	15/3	64
65			0.00			1.23	1.23			66
67			0.00	11.67			11.67			68
69	175/3	SPARE	0.00		11.67		11.67	UPS #1 (UPS001-430)	60/3	70
71			0.00			11.67	11.67			72
73			16.63	33.26			16.63			74
75	75/3	MOTOR FLOOR WELDING RECEPTACLE ⟨1⟩	16.63		33.26		16.63	SCREENING ROOM WELDING RECEPTACLE ⟨1⟩	75/3	76
77			16.63			33.26	16.63			78
79			16.63	33.26			16.63			80
81	75/3	PUMP LOADOUT AREA WEST WELDING RECEPTACLE ⟨1⟩	16.63		33.26		16.63	DISCHARGE PIPING FLOOR SOUTH WELDING RECEPTACLE ⟨1⟩	75/3	82
83			16.63			33.26	16.63			84
		TOTAL KVA	172.72	172.72	172.72					
		TOTAL AMPS	623.54	623.54	623.54					

MAXIMUM LOAD (AMPS) = 622.5 A

PPB002-430

LOCATION: ELECTRICAL ROOM
MOUNTING: SURFACE
***NOTES:** PROVIDE INTEGRAL SPD

VOLTAGE: 480V, 3Ø, 3W
BUS: 800A
MAIN: 800A MCB
SCCR: 65 kA

CKT	TRIP /POLE	LOAD DESCRIPTION	LOAD KVA	PHASE A	PHASE B	PHASE C	LOAD KVA	LOAD DESCRIPTION	TRIP /POLE	CKT
1			31.33	46.13			14.80			2
3	150/3	MAKE UP AIR UNIT #2 (MUW002-430)	31.33		46.13		14.80	MAKE UP AIR UNIT #4 (MUW004-430)	70/3	4
5			31.33			46.13	14.80			6
7			6.67	20.00			13.33			8
9	40/3	RADIAL BRIDGE CRANE #2 CONTROL PANEL (CRN002-430)	6.67		20.00		13.33	STANDARD BRIDGE CRANE #2 CONTROL PANEL (CRN004-430)	60/3	10
11			6.67			20.00	13.33			12
13			2.67	5.34			2.67			14
15	15/3	SUCTION GATE VALVE WWP #2 (PWW002-430IV)	2.67		5.34		2.67	SUCTION GATE VALVE WWP #4 (PWW004-430IV)	15/3	16
17			2.67			5.34	2.67			18
19			2.67	4.34			1.67			20
21	15/3	SUCTION GATE VALVE WWP #6 (PWW006-430IV)	2.67		4.34		1.67	SIPHON BREAK VALVE #2 (PWW002-430SCV)	15/3	22
23			2.67			4.34	1.67			24
25			1.67	3.34			1.67			26
27	15/3	SIPHON BREAK VALVE #4 (PWW004-430SCV)	1.67		3.34		1.67	SIPHON BREAK VALVE #6 (PWW006-430SCV)	15/3	28
29			1.67			3.34	1.67			30
31			0.43	0.86			0.43			32
33	15/3	DISCHARGE CONTROL ROTARY CONE VALVE #2 (PWW002-430RCV)	0.43		0.86		0.43	DISCHARGE CONTROL ROTARY CONE VALVE #4 (PWW004-430RCV)	15/3	34
35			0.43			0.86	0.43			36
37			0.43	0.43			0.00			38
39	15/3	DISCHARGE CONTROL ROTARY CONE VALVE #6 (PWW006-430RCV)	0.43		0.43		0.00	SPARE	15/3	40
41			0.43			0.43	0.00			42
43			3.33	6.66			3.33			44
45	15/3	ELECTRIC UNIT HEATER #2 (EUH002-430)	3.33		6.66		3.33	ELECTRIC UNIT HEATER #4 (EUH004-430)	15/3	46
47			3.33			6.66	3.33			48
49			1.23	2.46			1.23			50
51	15/3	ELECTRIC UNIT HEATER #6 (EUH006-430)	1.23		2.46		1.23	ELECTRIC UNIT HEATER #8 (EUH008-430)	15/3	52
53			1.23			2.46	1.23			54
55			1.23	1.23			0.00			56
57	15/3	ELECTRIC UNIT HEATER #10 (EUH010-430)	1.23		1.23		0.00	SPARE	75/3	58
59			1.23			1.23	0.00			60
61			0.00	0.00			0.00			62
63	60/3	SPARE	0.00		0.00		0.00	SPARE	60/3	64
65			0.00			0.00	0.00			66
67			11.67	36.67			25.00			68
69	60/3	UPS #2 (UPS002-430)	11.67		36.67		25.00	SHORE POWER TRANSFORMER (XRM005-430) (75KVA)	125/3	70
71			11.67			36.67	25.00			72
73			16.63	33.26			16.63			74
75	75/3	DUTY PUMP FLOOR WELDING RECEPTACLE ⟨1⟩	16.63		33.26		16.63	DISCHARGE PIPING FLOOR NORTH WELDING RECEPTACLE ⟨1⟩	75/3	76
77			16.63			33.26	16.63			78
79			0.00	16.63			16.63			80
81	75/3	SPARE	0.00		16.63		16.63	PUMP LOADOUT AREA EAST WELDING RECEPTACLE ⟨1⟩	75/3	82
83			0.00			16.63	16.63			84
		TOTAL KVA	177.35	177.35	177.35					
		TOTAL AMPS	640.25	640.25	640.25					

MAXIMUM LOAD (AMPS) = 639.2 A

Path: C:\BCPW\D3328382 FILENAME: 430-ES-01.DWG PLOT DATE: 7/15/2025 2:31 PM CAD USER: PAMELA STRAKER

Designed by:	REVISION			
P.STRAKER	REV No.	DATE	DESCRIPTION	APPV
Drawn by:	0	5/16/25	ISSUED FOR BID	RF
P.STRAKER	1	7/14/25	ADD. 4 - ADD GFCI BREAKER	RF
Checked by:				
R.FRYE				

Brown AND Caldwell

Draft Print
07/17/2025 10:02:58 AM

alcosan allegheny county sanitary authority
ARLETTA SCOTT WILLIAMS
EXECUTIVE DIRECTOR, ALCOSAN
3300 PREBLE AVE.
PITTSBURGH, PA 15233
(412) 766 - 4810
www.alcosan.org

ALLEGHENY COUNTY SANITARY AUTHORITY
WASTEWATER TREATMENT PLANT
WET WEATHER PUMP STATION

430-ES-01
PANEL SCHEDULES 1

Contract: 1800
CAD File Name: 430-ES-01.dwg
Date: 5/16/2025

GENERAL NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFICATION OF ALL MISSING INFORMATION ON THE CONDUIT AND CABLE SCHEDULES, INCLUDING BUT NOT LIMITED TO CONDUIT TAG NUMBERS, SIZES, COUNTS, AND SPARES IN ACCORDANCE WITH SECTION 01 52 00.

CABLE ROUTING SCHEDULE

REV NO.	CABLE NUMBER	FROM	TO	CABLE TYPE	CABLE DESCRIPTION	VIA RACEWAY OR CABLE TRAY	REMARKS
	C-SWG001-65101	SWG001-650	13.8KV BENCHBOARD		1-8/C #14 600V TC RATED	SWG001-650, P-100224, P-100278. SWG004-650 (A2), P-100347, C-04-650, C-100359, PBC10047-651, C-100309, EMH-044-000, C-430000, EMH-216-000, C-430020, EMH-217-000, C-430040, EMH-218-000, C-430070, EMH-222-000, C-430090, EMH-046-000, C-100354, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG002-65101	SWG002-650	13.8KV BENCHBOARD		1-8/C #14 600V TC RATED	SWG002-650, P-100225, P-100279. SWG005-650 (B2), P-100348, C-04-650, C-100359, PBC10047-651, C-100309, EMH-044-000, C-430000, EMH-216-000, C-430021, EMH-217-000, C-430041, EMH-218-000, C-430071, EMH-222-000, C-430091, EMH-046-000, C-100355, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG003-65101	SWG003-650	13.8KV BENCHBOARD		1-8/C #14 600V TC RATED	SWG003-650, P-100226, P-100280. SWG006-650 (C2), P-100349, C-04-650, C-100359, PBC10047-651, C-100309, EMH-044-000, C-430000, EMH-216-000, C-430022, EMH-217-000, C-430042, EMH-218-000, C-430072, EMH-222-000, C-430092, EMH-046-000, C-100356, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG004-65100	SWG004-650 (A1)	13.8KV BENCHBOARD		1-12/C #10 600V TC RATED	SWG004-650 (A1), SWG004-650 (A2), C-100347, C-04-650, C-100359, PBC10047-651, C-100309, EMH-044-000, C-430001, EMH-216-000, C-430021, EMH-217-000, C-430041, EMH-218-000, C-430071, EMH-222-000, C-430091, EMH-046-000, C-100354, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG004-65101	SWG004-650 (A1)	13.8KV BENCHBOARD		1-8/C #14 600V TC RATED	SWG004-650 (A1), SWG004-650 (A2), C-100347, C-04-650, C-100358, PBC10047-651, C-100308, EMH-044-000, C-430001, EMH-216-000, C-430021, EMH-217-000, C-430041, EMH-218-000, C-430071, EMH-222-000, C-430091, EMH-046-000, C-100354, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG004-65104	SWG004-650 (A4)	13.8KV BENCHBOARD		1-15/C #14 600V TC RATED	SWG004-650 (A1), SWG004-650 (A2), C-100345, C-04-650, C-100359, PBC10047-651, C-100309, EMH-044-000, C-430001, EMH-216-000, C-430021, EMH-217-000, C-430041, EMH-218-000, C-430071, EMH-222-000, C-430091, EMH-046-000, C-100354, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG004-65105	SWG004-650 (A5)	13.8KV BENCHBOARD		1-15/C #14 600V TC RATED	SWG004-650 (A1), SWG004-650 (A2), C-100344, C-04-650, C-100359, PBC10047-651, C-100309, EMH-044-000, C-430001, EMH-216-000, C-430021, EMH-217-000, C-430041, EMH-218-000, C-430071, EMH-222-000, C-430091, EMH-046-000, C-100354, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG004-65106	SWG004-650 (A6)	13.8KV BENCHBOARD		1-15/C #14 600V TC RATED	SWG004-650 (A1), SWG004-650 (A2), C-100343, C-04-650, C-100359, PBC10047-651, C-100309, EMH-044-000, C-430001, EMH-216-000, C-430021, EMH-217-000, C-430041, EMH-218-000, C-430071, EMH-222-000, C-430091, EMH-046-000, C-100354, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG004-65107	SWG004-650 (A7)	13.8KV BENCHBOARD		1-15/C #14 600V TC RATED	SWG004-650 (A1), SWG004-650 (A2), C-100342, C-04-650, C-100359, PBC10047-651, C-100309, EMH-044-000, C-430001, EMH-216-000, C-430021, EMH-217-000, C-430041, EMH-218-000, C-430071, EMH-222-000, C-430091, EMH-046-000, C-100354, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG004-65108	SWG004-650 (A8)	13.8KV BENCHBOARD		1-8/C #14 600V TC RATED	SWG004-650 (A1), SWG004-650 (A2), C-100341, C-04-650, C-100359, PBC10047-651, C-100309, EMH-044-000, C-430001, EMH-216-000, C-430021, EMH-217-000, C-430041, EMH-218-000, C-430071, EMH-222-000, C-430091, EMH-046-000, C-100354, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG005-65100	SWG005-650 (B1)	13.8KV BENCHBOARD		1-12/C #10 600V TC RATED	SWG005-650 (B1), SWG005-650 (B2), C-100347, C-04-650, C-100359, PBC10047-651, C-100309, EMH-044-000, C-430002, EMH-216-000, C-430022, EMH-217-000, C-430042, EMH-218-000, C-430072, EMH-222-000, C-430092, EMH-046-000, C-100355, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG005-65101	SWG005-650 (B1)	13.8KV BENCHBOARD		1-8/C #14 600V TC RATED	SWG005-650 (B1), SWG005-650 (B2), C-100348, C-04-650, C-100359, PBC10047-651, C-100309, EMH-044-000, C-430002, EMH-216-000, C-430022, EMH-217-000, C-430042, EMH-218-000, C-430072, EMH-222-000, C-430092, EMH-046-000, C-100355, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG005-65104	SWG005-650 (B4)	13.8KV BENCHBOARD		1-15/C #14 600V TC RATED	SWG005-650 (B1), SWG005-650 (B2), C-100353, C-04-650, C-100359, PBC10047-651, C-100309, EMH-044-000, C-430002, EMH-216-000, C-430022, EMH-217-000, C-430042, EMH-218-000, C-430072, EMH-222-000, C-430092, EMH-046-000, C-100355, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG005-65105	SWG005-650 (B5)	13.8KV BENCHBOARD		1-15/C #14 600V TC RATED	SWG005-650 (B1), SWG005-650 (B2), C-100352, C-04-650, C-100359, PBC10047-651, C-100309, EMH-044-000, C-430002, EMH-216-000, C-430022, EMH-217-000, C-430042, EMH-218-000, C-430072, EMH-222-000, C-430092, EMH-046-000, C-100355, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG005-65106	SWG005-650 (B6)	13.8KV BENCHBOARD		1-15/C #14 600V TC RATED	SWG005-650 (B1), SWG005-650 (B2), C-100351, C-04-650, C-100359, PBC10047-651, C-100309, EMH-044-000, C-430002, EMH-216-000, C-430022, EMH-217-000, C-430042, EMH-218-000, C-430072, EMH-222-000, C-430092, EMH-046-000, C-100355, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG005-65107	SWG005-650 (B7)	13.8KV BENCHBOARD		1-15/C #14 600V TC RATED	SWG005-650 (B1), SWG005-650 (B2), C-100350, C-04-650, C-100359, PBC10047-651, C-100309, EMH-044-000, C-430002, EMH-216-000, C-430022, EMH-217-000, C-430042, EMH-218-000, C-430072, EMH-222-000, C-430092, EMH-046-000, C-100355, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG005-65108	SWG005-650 (B8)	13.8KV BENCHBOARD		1-8/C #14 600V TC RATED	SWG005-650 (B1), SWG005-650 (B2), C-100346, C-04-650, C-100359, PBC10047-651, C-100309, EMH-044-000, C-430002, EMH-216-000, C-430022, EMH-217-000, C-430042, EMH-218-000, C-430072, EMH-222-000, C-430092, EMH-046-000, C-100355, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG006-65100	SWG006-650 (C1)	13.8KV BENCHBOARD		1-12/C #10 600V TC RATED	SWG006-650 (C1), SWG006-650 (C2), C-100349, C-04-650, C-100359, PBC10047-651, C-100308, EMH-044-000, C-430003, EMH-216-000, C-430023, EMH-217-000, C-430043, EMH-218-000, C-430073, EMH-222-000, C-430093, EMH-046-000, C-100356, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG006-65101	SWG006-650 (C2)	13.8KV BENCHBOARD		1-8/C #14 600V TC RATED	SWG006-650 (C1), SWG006-650 (C2), C-100349, C-04-650, C-100358, PBC10047-651, C-100308, EMH-044-000, C-430003, EMH-216-000, C-430023, EMH-217-000, C-430043, EMH-218-000, C-430073, EMH-222-000, C-430093, EMH-046-000, C-100356, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG006-65104	SWG006-650 (C4)	13.8KV BENCHBOARD		1-15/C #14 600V TC RATED	SWG006-650 (C1), SWG006-650 (C2), C-100358, C-04-650, C-100358, PBC10047-651, C-100308, EMH-044-000, C-430003, EMH-216-000, C-430023, EMH-217-000, C-430043, EMH-218-000, C-430073, EMH-222-000, C-430093, EMH-046-000, C-100356, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG006-65105	SWG006-650 (C5)	13.8KV BENCHBOARD		1-15/C #14 600V TC RATED	SWG006-650 (C1), SWG006-650 (C2), C-100357, C-04-650, C-100358, PBC10047-651, C-100308, EMH-044-000, C-430003, EMH-216-000, C-430023, EMH-217-000, C-430043, EMH-218-000, C-430073, EMH-222-000, C-430093, EMH-046-000, C-100356, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG006-65106	SWG006-650 (C6)	13.8KV BENCHBOARD		1-15/C #14 600V TC RATED	SWG006-650 (C1), SWG006-650 (C2), C-100356, C-04-650, C-100358, PBC10047-651, C-100308, EMH-044-000, C-430003, EMH-216-000, C-430023, EMH-217-000, C-430043, EMH-218-000, C-430073, EMH-222-000, C-430093, EMH-046-000, C-100356, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG006-65107	SWG006-650 (C7)	13.8KV BENCHBOARD		1-15/C #14 600V TC RATED	SWG006-650 (C1), SWG006-650 (C2), C-100355, C-04-650, C-100358, PBC10047-651, C-100308, EMH-044-000, C-430003, EMH-216-000, C-430023, EMH-217-000, C-430043, EMH-218-000, C-430073, EMH-222-000, C-430093, EMH-046-000, C-100356, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SWG006-65108	SWG006-650 (C8)	13.8KV BENCHBOARD		1-8/C #14 600V TC RATED	SWG006-650 (C1), SWG006-650 (C2), C-100354, C-04-650, C-100358, PBC10047-651, C-100308, EMH-044-000, C-430003, EMH-216-000, C-430023, EMH-217-000, C-430043, EMH-218-000, C-430073, EMH-222-000, C-430093, EMH-046-000, C-100356, C-01-125VDC (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED

CABLE ROUTING SCHEDULE

REV NO.	CABLE NUMBER	FROM	TO	CABLE TYPE	CABLE DESCRIPTION	VIA RACEWAY OR CABLE TRAY	REMARKS
	C-008010-500	SWG008-650 (MA)	5KV BENCHBOARD (BLDG-500)		1-9/C-#12	SWG008-650 (MA), C-106006, 13.8KV SUB VAULT, C-107001, EMH-044-000, C-430006, EMH-216-000, C-430026, EMH-217-000, C-430046, EMH-218-000, C-430060, EM1, **C-XXXXXX**, 5KV BENCHBOARD (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-008011-500	SWG008-650 (MB)	5KV BENCHBOARD (BLDG-500)		1-9/C-#12	SWG008-650 (MB), C-106008, 13.8KV SUB VAULT, C-107001, EMH-044-000, C-430006, EMH-216-000, C-430026, EMH-217-000, C-430046, EMH-218-000, C-430060, EM1, **C-XXXXXX**, 5KV BENCHBOARD (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-008012-500	SWG008-650 (T)	5KV BENCHBOARD (BLDG-500)		1-9/C-#12	SWG008-650 (T), C-106009, 13.8KV SUB VAULT, C-107001, EMH-044-000, C-430006, EMH-216-000, C-430026, EMH-217-000, C-430046, EMH-218-000, C-430060, EM1, **C-XXXXXX**, 5KV BENCHBOARD (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-008013-500	SWG008-650 (A1)	5KV BENCHBOARD (BLDG-500)		1-9/C-#12	SWG008-650 (A1), C-106010, 13.8KV SUB VAULT, C-107001, EMH-044-000, C-430006, EMH-216-000, C-430026, EMH-217-000, C-430046, EMH-218-000, C-430060, EM1, **C-XXXXXX**, 5KV BENCHBOARD (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-008014-500	SWG008-650 (A2)	5KV BENCHBOARD (BLDG-500)		1-9/C-#12	SWG008-650 (A2), C-106011, 13.8KV SUB VAULT, C-107001, EMH-044-000, C-430006, EMH-216-000, C-430026, EMH-217-000, C-430046, EMH-218-000, C-430060, EM1, **C-XXXXXX**, 5KV BENCHBOARD (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-008015-500	SWG008-650 (A3)	5KV BENCHBOARD (BLDG-500)		1-9/C-#12	SWG008-650 (A3), C-106011, 13.8KV SUB VAULT, C-107001, EMH-044-000, C-430006, EMH-216-000, C-430026, EMH-217-000, C-430046, EMH-218-000, C-430060, EM1, **C-XXXXXX**, 5KV BENCHBOARD (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-008016-500	SWG008-650 (B1)	5KV BENCHBOARD (BLDG-500)		1-9/C-#12	SWG008-650 (B1), C-106012, 13.8KV SUB VAULT, C-107001, EMH-044-000, C-430006, EMH-216-000, C-430026, EMH-217-000, C-430046, EMH-218-000, C-430060, EM1, **C-XXXXXX**, 5KV BENCHBOARD (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-008017-500	SWG008-650 (B2)	5KV BENCHBOARD (BLDG-500)		1-9/C-#12	SWG008-650 (B2), C-106012, 13.8KV SUB VAULT, C-107001, EMH-044-000, C-430006, EMH-216-000, C-430026, EMH-217-000, C-430046, EMH-218-000, C-430060, EM1, **C-XXXXXX**, 5KV BENCHBOARD (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-008018-500	SWG008-650 (B3)	5KV BENCHBOARD (BLDG-500)		1-9/C-#12	SWG008-650 (B3), C-106013, 13.8KV SUB VAULT, C-107001, EMH-044-000, C-430006, EMH-216-000, C-430026, EMH-217-000, C-430046, EMH-218-000, C-430060, EM1, **C-XXXXXX**, 5KV BENCHBOARD (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-00819-500	SWG008-650 (MA)	5KV BENCHBOARD (BLDG-500)		1-4/C-#10	SWG008-650 (MA), C-106006, 13.8KV SUB VAULT, C-107002, EMH-044-000, C-430007, EMH-216-000, C-430027, EMH-217-000, C-430047, EMH-218-000, C-430061, EM1, **C-XXXXXX**, 5KV BENCHBOARD (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-00820-500	SWG008-650 (MA)	5KV BENCHBOARD (BLDG-500)		1-4/C-#10	SWG008-650 (MA), C-106014, 13.8KV SUB VAULT, C-107002, EMH-044-000, C-430007, EMH-216-000, C-430027, EMH-217-000, C-430047, EMH-218-000, C-430061, EM1, **C-XXXXXX**, 5KV BENCHBOARD (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-08021-500	SWG008-650 (MB)	5KV BENCHBOARD (BLDG-500)		1-4/C-#10	SWG008-650 (MB), C-106008, 13.8KV SUB VAULT, C-107002, EMH-044-000, C-430007, EMH-216-000, C-430027, EMH-217-000, C-430047, EMH-218-000, C-430061, EM1, **C-XXXXXX**, 5KV BENCHBOARD (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-08022-500	SWG008-650 (MB)	5KV BENCHBOARD (BLDG-500)		1-4/C-#10	SWG008-650 (MB), C-106014, 13.8KV SUB VAULT, C-107002, EMH-044-000, C-430007, EMH-216-000, C-430027, EMH-217-000, C-430047, EMH-218-000, C-430061, EM1, **C-XXXXXX**, 5KV BENCHBOARD (BLDG 500)	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	I-PNL002-500	PBC10047-651	PBI10001-500		2-BELDEN #9463	PBC10047-651, I-100009, EMH-044-000, C-430014, EMH-216-000, C-430034, EMH-217-000, C-430054, EMH-218-000, C-430078, EMH-222-000, C-430098, EMH-046-000, I-100022, PBI1001-500	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	C-SSC001-651	SCC001-651	DPU001-500		1-7/C-#14	SCC001-651, C-100307, PBC10047-651, C-100308, EMH-044-000, C-430011, EMH-216-000, C-430031, EMH-217-000, C-430051, EMH-218-000, C-430076, EMH-222-000, C-430096, EMH-046-000, C-100314, PB110001-500	EXISTING CABLE TO BE REPLACED WITH NEW ROUTING, EXISTING CONDITIONS TO BE FIELD VERIFIED
	H-DPU1-800	DPU1 (BLDG-800)	FIBER OPTIC PATCH PANEL (BLDG-430)		H-430001	~~SEE DRAWING 430-ER-06~~	SECTION 21
	H-DPU2-800	DPU2 (BLDG-800)	FIBER OPTIC PATCH PANEL (BLDG-430)		H-430002	SEE DRAWING 430-ER-06	SECTION 21
	H-LAN-110-1	LAN FIBER PATCH (BLDG-110)	FIBER OPTIC PATCH PANEL (BLDG-430)		H-430003	SEE DRAWING 430-ER-06	SECTION 21
	H-LAN-110-2	LAN FIBER PATCH (BLDG-110)	FIBER OPTIC PATCH PANEL (BLDG-430)		H-430004	SEE DRAWING 430-ER-06	SECTION 21
	C-PWW001-430SOV	PWW001-430SOV	PWW001-430VF		4 #14, 14 GND	C-430110	PUMP 1, SEAL WATER SOLENOID
	C-PWW001-430IV	PWW001-430IV	DPU-33/83-430		16 #14, 14 GND	C-430111	PUMP 1, SUCTION VALVE
	C-F430PWW001A	F430PWW001A	PWW001-430VF		4 #14, 14 GND	C-430112	PUMP 1, FLOW SWITCH LOW
	C-P430PWW001A	P430PWW001A	DPU-33/83-430		2-1 PR#16S	C-430113	PUMP 1, INLET PRESSURE TRANSMITTER
	C-S430PWW001A	S430PWW001A	PWW001-430VF		1-1 PR#16S	C-430113A	PUMP 1, MOTOR TACHOMETER
	C-T430PWW001A	PWW001-430MO	PWW001-430VF		1-1 TR#16S	C-430114	PUMP 1, TEMPERATURE ELEMENT/TRANSMITTER A
	C-T430PWW001B	PWW001-430MO	PWW001-430VF		1-1 TR#16S	C-430114	PUMP 1, TEMPERATURE ELEMENT/TRANSMITTER B
	C-T430PWW001C	PWW001-430MO	PWW001-430VF		1-1 TR#16S	C-430114	PUMP 1, TEMPERATURE ELEMENT/TRANSMITTER C
	C-T430PWW001D	PWW001-430MO	PWW001-430VF		1-1 TR#16S	C-430114	PUMP 1, TEMPERATURE ELEMENT/TRANSMITTER D
	C-T430PWW001E	PWW001-430MO	PWW001-430VF		1-1 TR#16S	C-430114	PUMP 1, TEMPERATURE ELEMENT/TRANSMITTER E
	C-T430PWW001F	PWW001-430MO	PWW001-430VF		1-1 TR#16S	C-430114	PUMP 1, TEMPERATURE ELEMENT/TRANSMITTER F
	C-T430PWW001G	PWW001-430MO	PWW001-430VF		1-1 TR#16S	C-430114	PUMP 1, TEMPERATURE ELEMENT/TRANSMITTER G
	C-T430PWW001H	PWW001-430MO	PWW001-430VF		1-1 TR#16S	C-430114	PUMP 1, TEMPERATURE ELEMENT/TRANSMITTER H
	C-V430PWW001A	PWW001-430MO	PWW001-430VF		1-1 PR#16S	C-430114	PUMP 1, VIBRATION SENSOR/TRANSMITTER A
	C-V430PWW001B	PWW001-430MO	PWW001-430VF		1-1 PR#16S	C-430114	PUMP 1, VIBRATION SENSOR/TRANSMITTER B
	C-Z430PWW001A	PWW001-430MO	PWW001-430VF		2 #14, 14 GND	C-430114A	PUMP 1, SHAFT POSITION SWITCH
	C-T430PWW00IJ	PWW001-430	PWW001-430VF		1-1 TR#16S	C-430115	PUMP 1, TEMPERATURE ELEMENT/TRANSMITTER J
	C-T430PWW001K	PWW001-430	PWW001-430VF		1-1 TR#16S	C-430115	PUMP 1, TEMPERATURE ELEMENT/TRANSMITTER K
	C-V430PWW001C	PWW001-430	PWW001-430VF		1-1 PR#16S	C-430115	PUMP 1, VIBRATION SENSOR/TRANSMITTER C
	C-V430PWW001D	PWW001-430	PWW001-430VF		1-1 PR#16S	C-430115	PUMP 1, VIBRATION SENSOR/TRANSMITTER D
	C-P430PWW001B	P430PWW001B	DPU-33/83-430		2-1 PR#16S	C-430116	PUMP 1, DISCHARGE PRESSURE TRANSMITTER
	C-MFM001A-430	F430PWW001A	DPU-33/83-430		2-1 PR#16S	C-430117	PUMP 1, DISCHARGE FLOW TRANSMITTER
	C-MFM001B-430	F430PWW001B	F430PWW001A		VND CABLE	C-430118	PUMP 1, DISCHARGE FLOW ELEMENT
	C-PWW001-430SCV	PWW001-430SCV	DPU-33/83-430		16 #14, 14 GND	C-430119	PUMP 1, BYPASS TO WET WELL
	C-PWW001-430RCVA	PWW001-430RCV	DPU-33/83-430		16 #14, 14 GND	C-430120	PUMP 1, BYPASS TO DISCHARGE CHAMBER
	C-PWW001-430RCVB	PWW001-430RCV	DPU-33/83-430		4-1 PR#16S	C-430121	PUMP 1, BYPASS TO DISCHARGE CHAMBER
	C-PWW001-430VF1	PWW001-430VF	DPU-33/83-430		24 #14,#14 GND	C-430122	PUMP 1 VFD TO DPU
	C-PWW001-430VF2	PWW001-430VF	DPU-33/83-430		17-1 PR#16S	C-430123	PUMP 1 VFD TO DPU
	C-PWW001-430VF3	PWW001-430VF	DPU-33/83-430		3-CAT6	C-430123	PUMP 1 VFD TO DPU
	C-PWW002-430SOV	PWW002-430SOV	PWW002-430VF		4 #14, 14 GND	C-430200	PUMP 2, SEAL WATER SOLENOID
	C-PWW002-430IV	PWW002-430IV	DPU-33/83-430		16 #14, 14 GND	C-430201	PUMP 2, SUCTION VALVE

Designed by:	REVISION			
P.STRAKER	REV No.	DATE	DESCRIPTION	APPV
Drawn by:	0	5/16/25	ISSUED FOR BID	RF
P.STRAKER	1	7/14/25	ADD. 4 - REVISE DWG REF TO 430-ER-06	RF
Checked by:				
R.FRYE				

Brown AND Caldwell

Draft Print
07/17/2025 10:02:58 AM

ARLETTA SCOTT WILLIAMS
EXECUTIVE DIRECTOR, ALCOSAN

3300 PREBLE AVE.
PITTSBURGH, PA 15233
(412) 766 - 4810

www.alcosan.org

ALLEGHENY COUNTY SANITARY AUTHORITY
WASTEWATER TREATMENT PLANT
WET WEATHER PUMP STATION

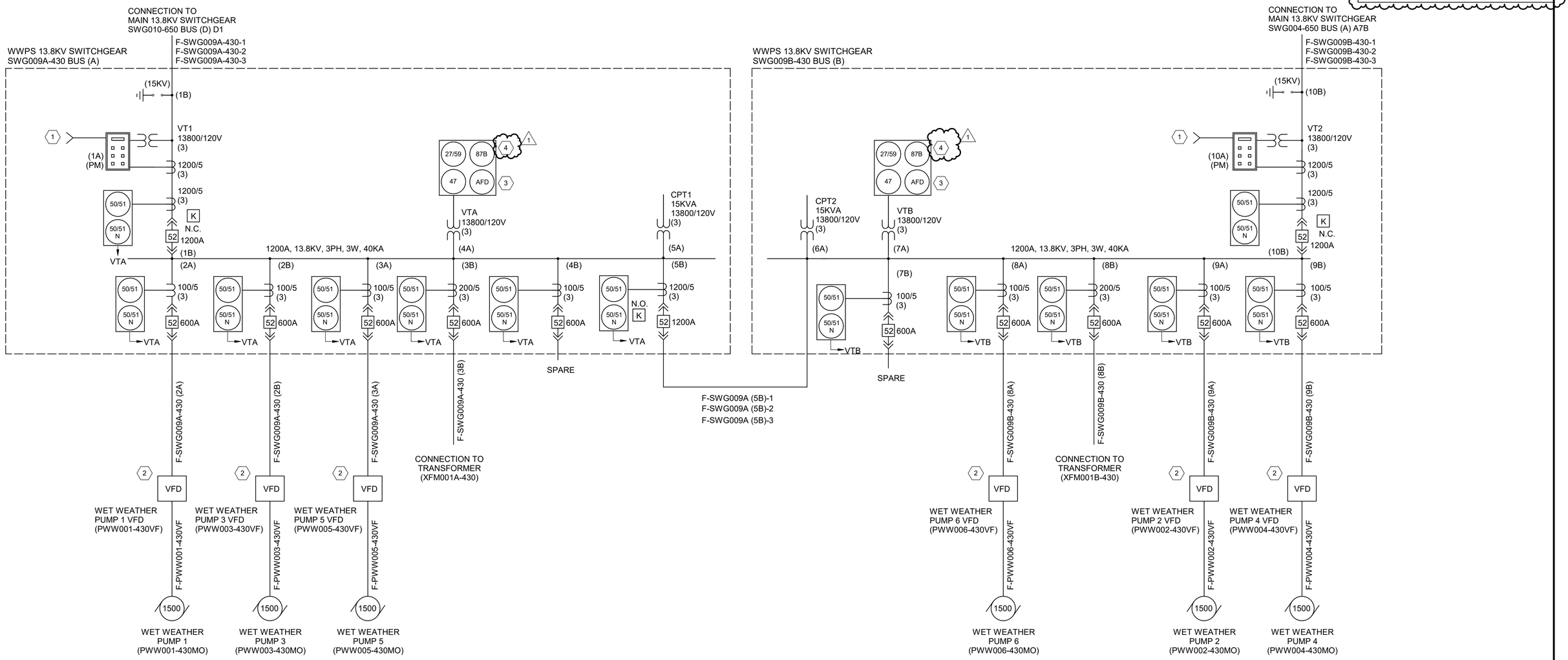
430-ES-13
CABLE SCHEDULE 3

Contract:	1800
CAD File Name:	430-ES-13.dwg
Date:	5/16/2025
Sheet:	379 of 405

Path: C:\BCPW\D03328382 FILENAME: 430-ES-13.DWG PLOT DATE: 7/15/2025 12:41 PM CAD USER: PAMELA STRAKER

KEYNOTES:

1. PROVIDE A HARDWIRED LOSS OF POWER SIGNAL TO SCADA.
2. VFD INPUT VOLTAGE 13.8KV, OUTPUT VOLTAGE TO MOTOR 4160V.
3. PROVIDE AN OPTIC ARC FLASH RELAY (AFD) WITH SENSORS IN EACH COMPARTMENT AND INTEGRATED TO TRIP ALL BREAKERS ON THE BUS.
4. PROVIDE ADDITIONAL CURRENT TRANSFORMERS, MISCELLANEOUS EQUIPMENT, AND WIRING FOR BUS DIFFERENTIAL RELAYING PER MANUFACTURER'S RECOMMENDATIONS.



Designed by:	REVISION			
P.STRAKER	REV No.	DATE	DESCRIPTION	APPV
Drawn by:	0	5/16/25	ISSUED FOR BID	RF
P.STRAKER	1	7/14/25	ADD. 4 - CLARIFY BUS DIFFERENTIAL AND OPTIC RELAY PROTECTION	RF
Checked by:				
R.FRYE				

Brown AND Caldwell

Draft Print
07/17/2025 10:02:58 AM

ARLETTA SCOTT WILLIAMS
EXECUTIVE DIRECTOR, ALCOSAN
3300 PREBLE AVE.
PITTSBURGH, PA 15233
(412) 766 - 4810
www.alcosan.org

ALLEGHENY COUNTY SANITARY AUTHORITY
WASTEWATER TREATMENT PLANT
WET WEATHER PUMP STATION

430-ESL-02
WWPS MAIN 13.8KV (SWG009A_B-430)
SINGLE LINE DIAGRAM

Contract: 1800
CAD File Name:
Date: 5/16/2025
Sheet: 347 of 413

Plot Date: 7/15/2025 12:45:52 PM Path:BIM 360://170064 - ALCOSAN Wet Weather PS/170064-E-430V21.rvt

ATTACHMENT – C

Addendum No. 4 Reference Information

TABLE OF CONTENTS

Section 5J: Contract 1729 East Headworks - Shoring

RICHARD GOETTLE INC.

AREA B

SEE 21049_PH2_TER-4 & 5

FACILITIES 515 & 516

EX. BLDG.707

EX. PIPE GALLERY TUNNEL

EX. BLDG.701

EX. OVERHEAD PIPING

0+85

0+00

EX. PIPE GALLERY TUNNEL

EX. PIPE GALLERY TUNNEL

EX. BLDG.717

EX. BLDG.711

EX. BLDG.716

EX. BLDG.712

AREA A

SEE 21049_PH2_TER-2 & 3

FACILITY 536

EX. WEST HEADWORKS BLDG.

EX. MAIN PUMP STATION

AREA C

SEE 21049_PH2_TER-6 & 7

FACILITIES 500 & 509

EAST HEADWORKS BLDG. (UNDER CONSTRUCTION)

EX. OVERHEAD PIPING

PROP. 120"Ø INFLUENT PIPE

EX. PIPE GALLERY TUNNEL

EX. BUILDING

EX. BUILDING

EX. BUILDING

OVERALL PLAN

SCALE - 1/16" = 1'-0"

N

0 8 16 24 32 48

SCALE: 1/16" = 1'-0"

PENNSYLVANIA ONE CALL SYSTEM, INC. 1-800-242-1776 STOP! CALL BEFORE YOU DIG!

UTILITY NOTE:
BASED UPON INFORMATION PROVIDED BY THE GENERAL CONTRACTOR, REASONABLE CARE HAS BEEN TAKEN TO AVOID INTERFERENCE BETWEEN THE EARTH RETENTION SYSTEM AND THE EXISTING UTILITIES. THE GENERAL CONTRACTOR AND/OR THE UTILITY OWNER ARE TO VERIFY AND LOCATE ALL UNDERGROUND LINES AND STRUCTURES PRIOR TO SOLDIER PILE AND TIEBACK INSTALLATION.

RICHARD GOETTLE INC.

REVISIONS			
	00	4-5-22	ISSUED FOR SUBMITTAL AND APPROVAL

SCALE: AS NOTED
DRAWN BY: PETE COOK
CHECKED BY: AARON KLINGSHIRN (CL)
DATE: 04-05-2022
OWNER: ALLEGHENY Co. SANITARY AUTHORITY
GEN. CONTR.: PJ DICK - TRUMBULL - LINDY PAVING

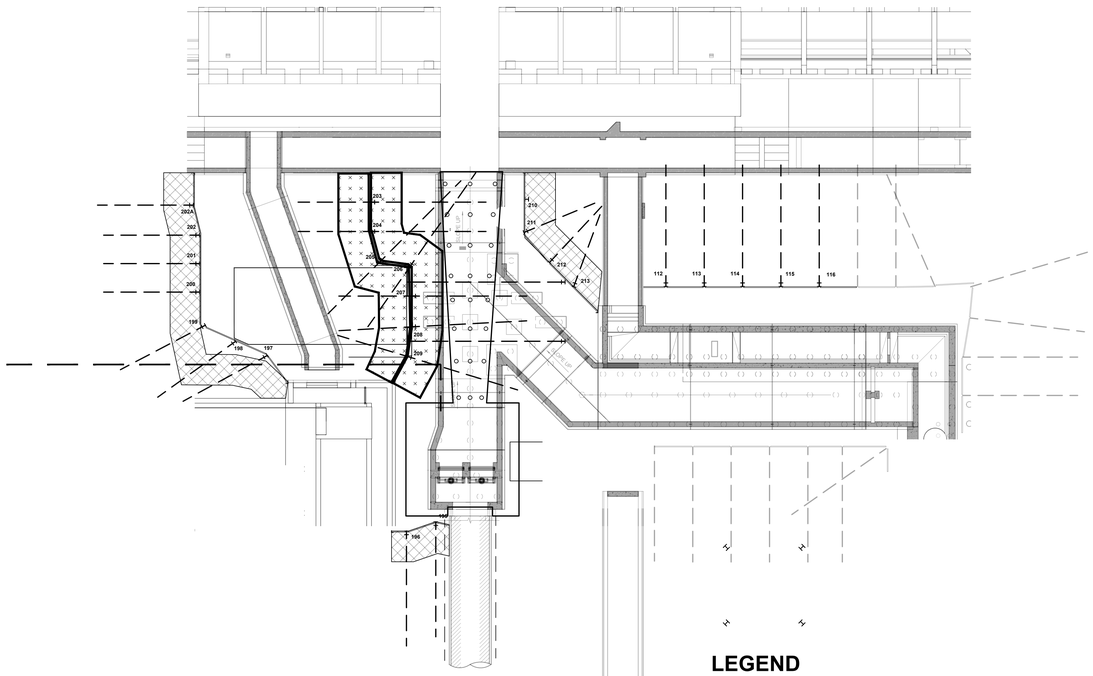
OVERALL PLAN

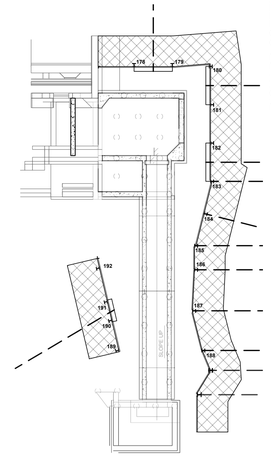
COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER AARON MATTHEW KLINGSHIRN NO. PE085373

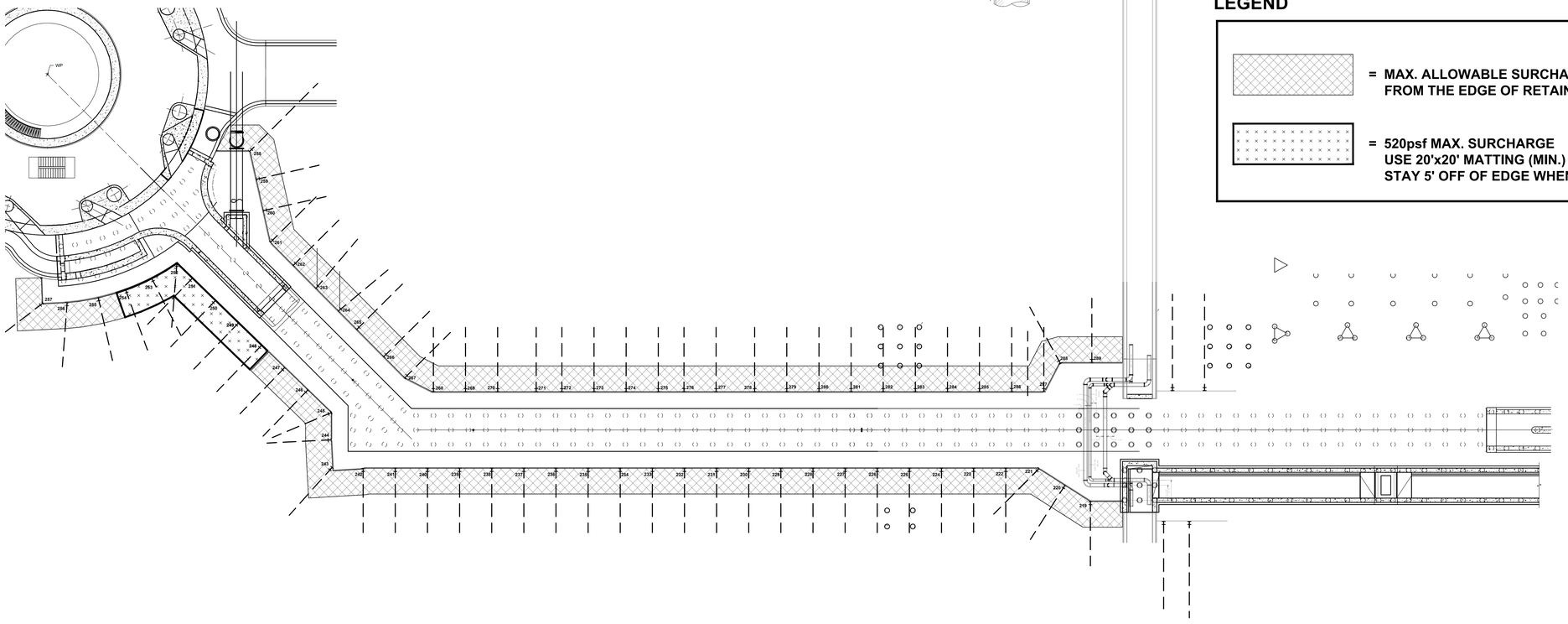
RICHARD GOETTLE, INC.
12071 Hamilton Avenue
Cincinnati, Ohio 45231
Phone: (513)-825-8100
ENGINEERING CONSTRUCTORS IN GEO-SUPPORT SYSTEMS FOR OVER 60 YEARS

ALLEGHENY COUNTY SANITARY AUTHORITY
EAST HEADWORKS
PITTSBURGH, PA
TEMPORARY EARTH RETENTION

DWG. No.: 21049_PH2_TER - 1 REV: 02







LEGEND

= MAX. ALLOWABLE SURCHARGE = 300psf @ 5' FROM THE EDGE OF RETAINING WALL

= 520psf MAX. SURCHARGE
USE 20'x20' MATTING (MIN.)
STAY 5' OFF OF EDGE WHEN POSSIBLE

SURCHARGE PLAN

SCALE - 1/16" = 1'-0"

0 8 16 24 32 48

SCALE: 1/16" = 1'-0"

RICHARD GOETTLE INC.

RICHARD GOETTLE INC.

REVISIONS			
	00	4-5-22	ISSUED FOR SUBMITTAL AND APPROVAL

SCALE:	AS NOTED
DRAWN BY:	PETE COOK
CHECKED BY:	AARON KLINGSHIRN (CL)
DATE:	04-05-2022
OWNER:	ALLEGHENY Co. SANITARY AUTHORITY
GEN. CONTR.:	PJ DICK - TRUMBULL - LINDY PAVING

SURCHARGE PLAN

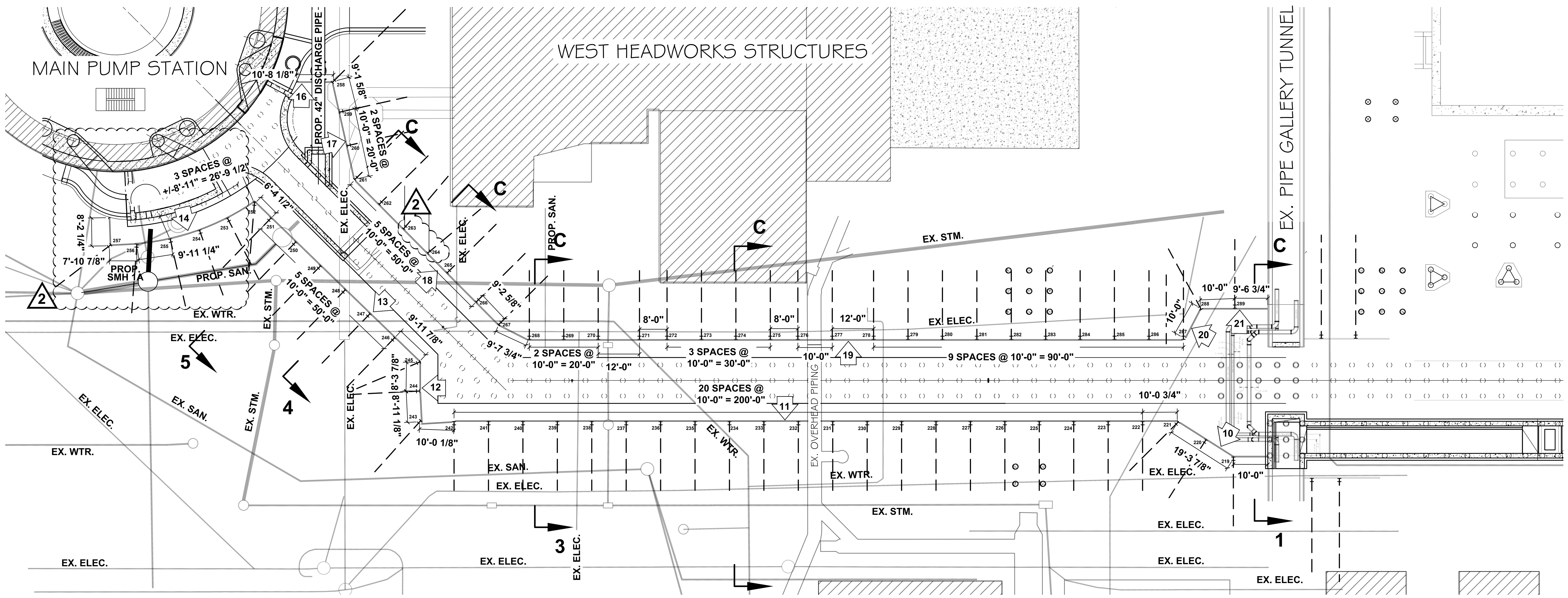
COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL AARON MATTHEW KLINGSHIRN ENGINEER NO. PE088377

RICHARD GOETTLE, INC.
12071 Hamilton Avenue
Cincinnati, Ohio 45231
Phone: (513)-825-8100
ENGINEERING CONSTRUCTORS IN GEO-SUPPORT SYSTEMS FOR OVER 60 YEARS

ALLEGHENY COUNTY SANITARY AUTHORITY
EAST HEADWORKS
PITTSBURGH, PA
TEMPORARY EARTH RETENTION

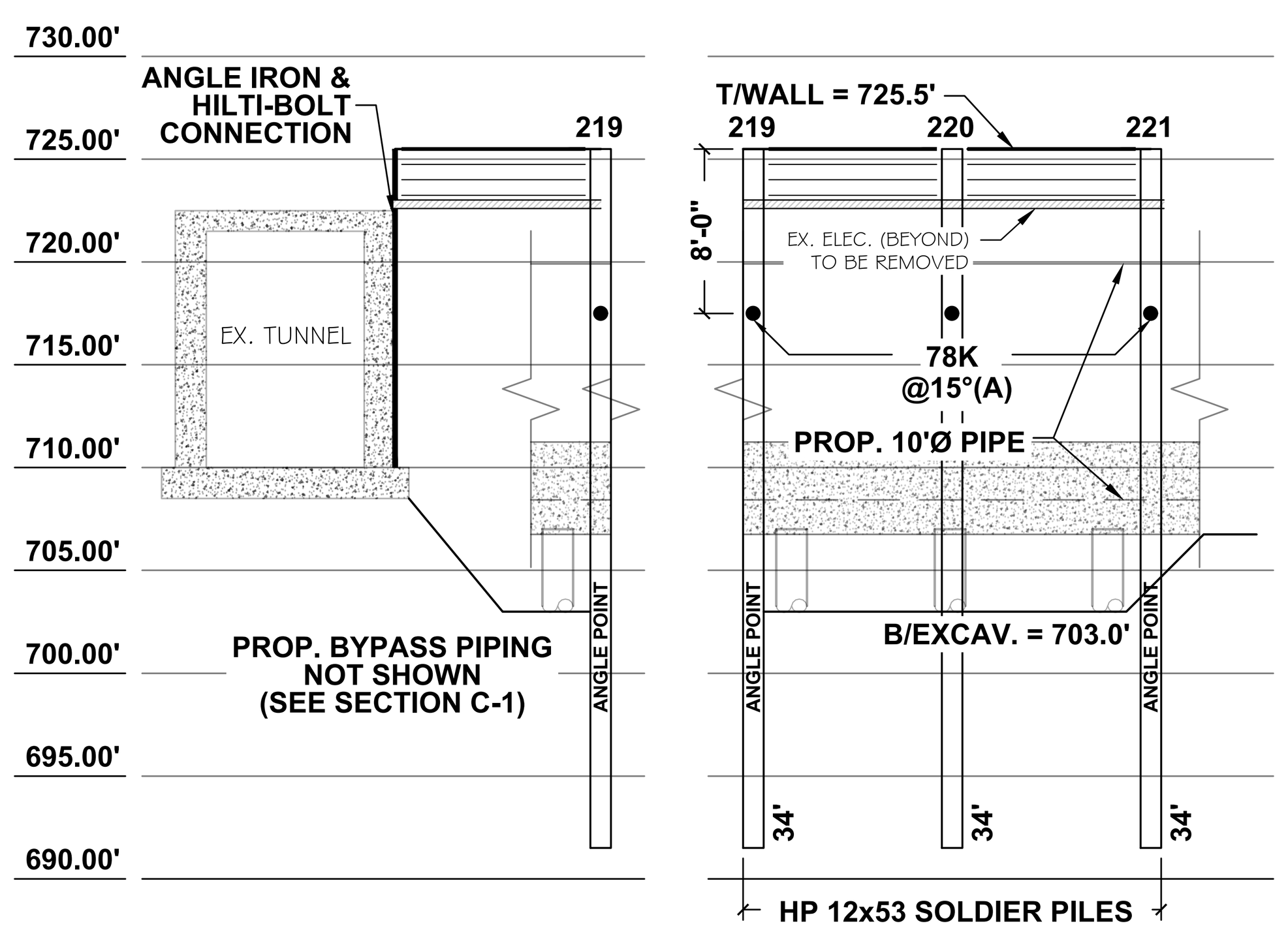
DWG. No.:21049_PH2_TER - 1A REV: 02

RICHARD GOETTLE INC.



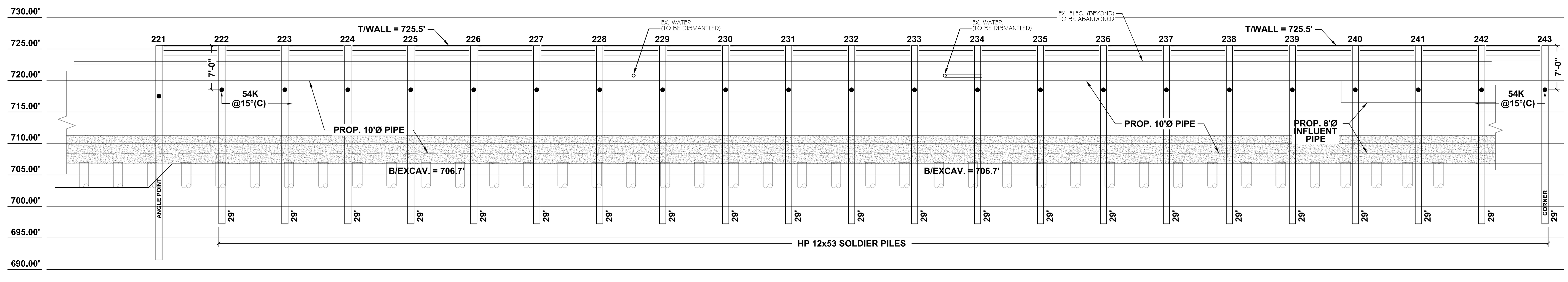
"AREA C" PLAN

SCALE: 1/16" = 1'-0"



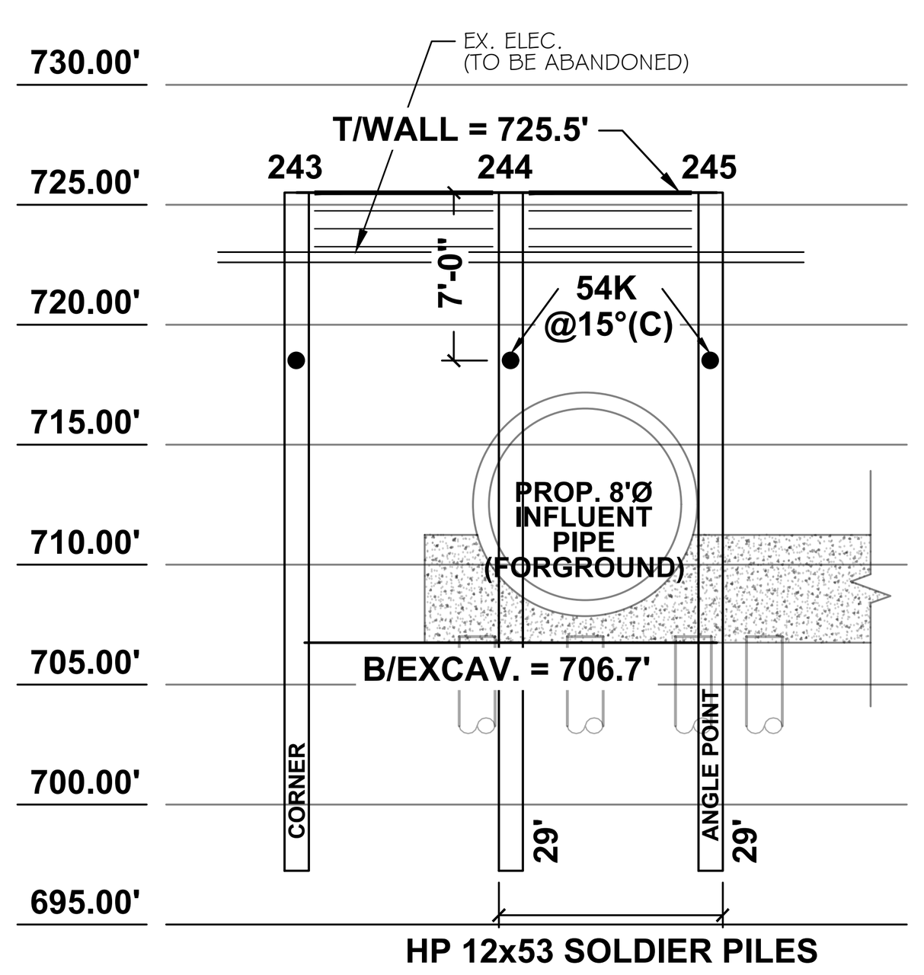
ELEVATION 10

SCALE: 1/8" = 1'-0"



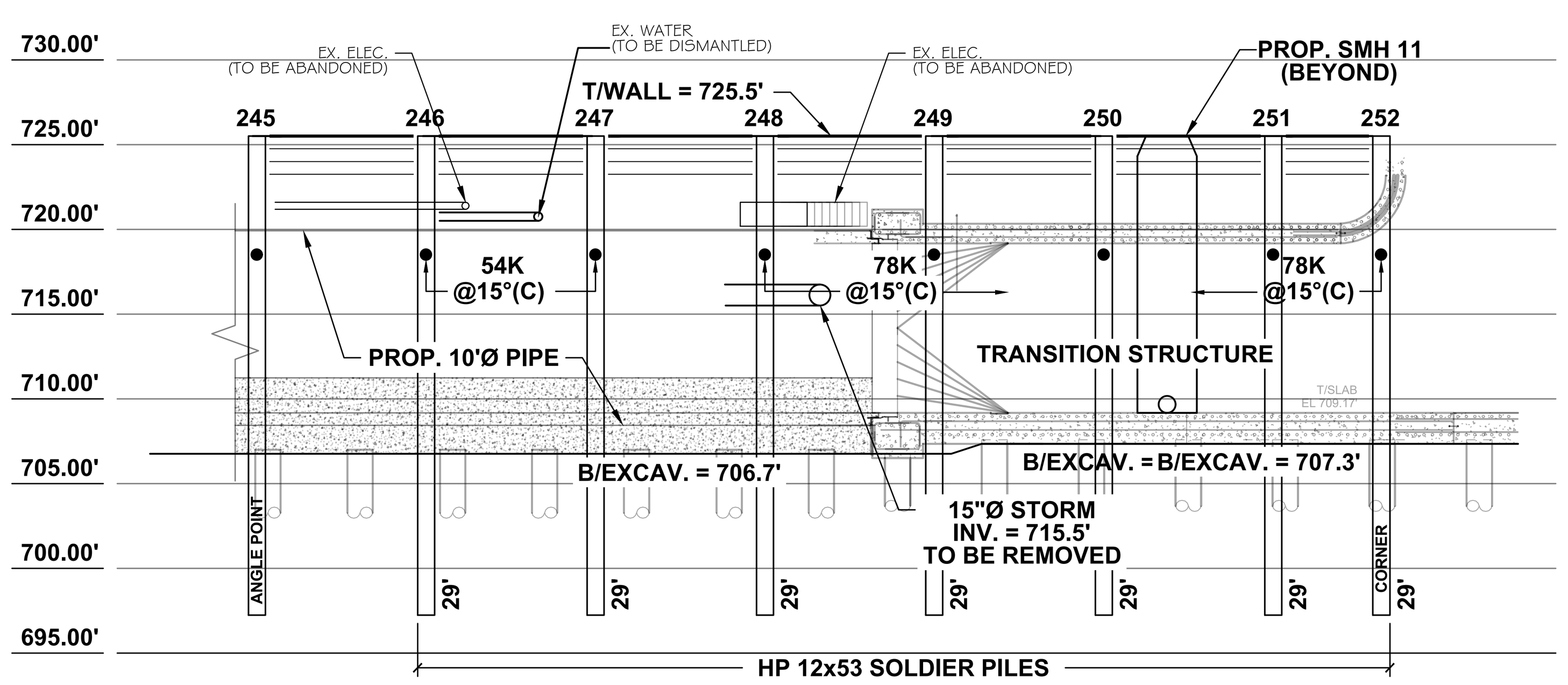
ELEVATION 11

SCALE: 1/8" = 1'-0"



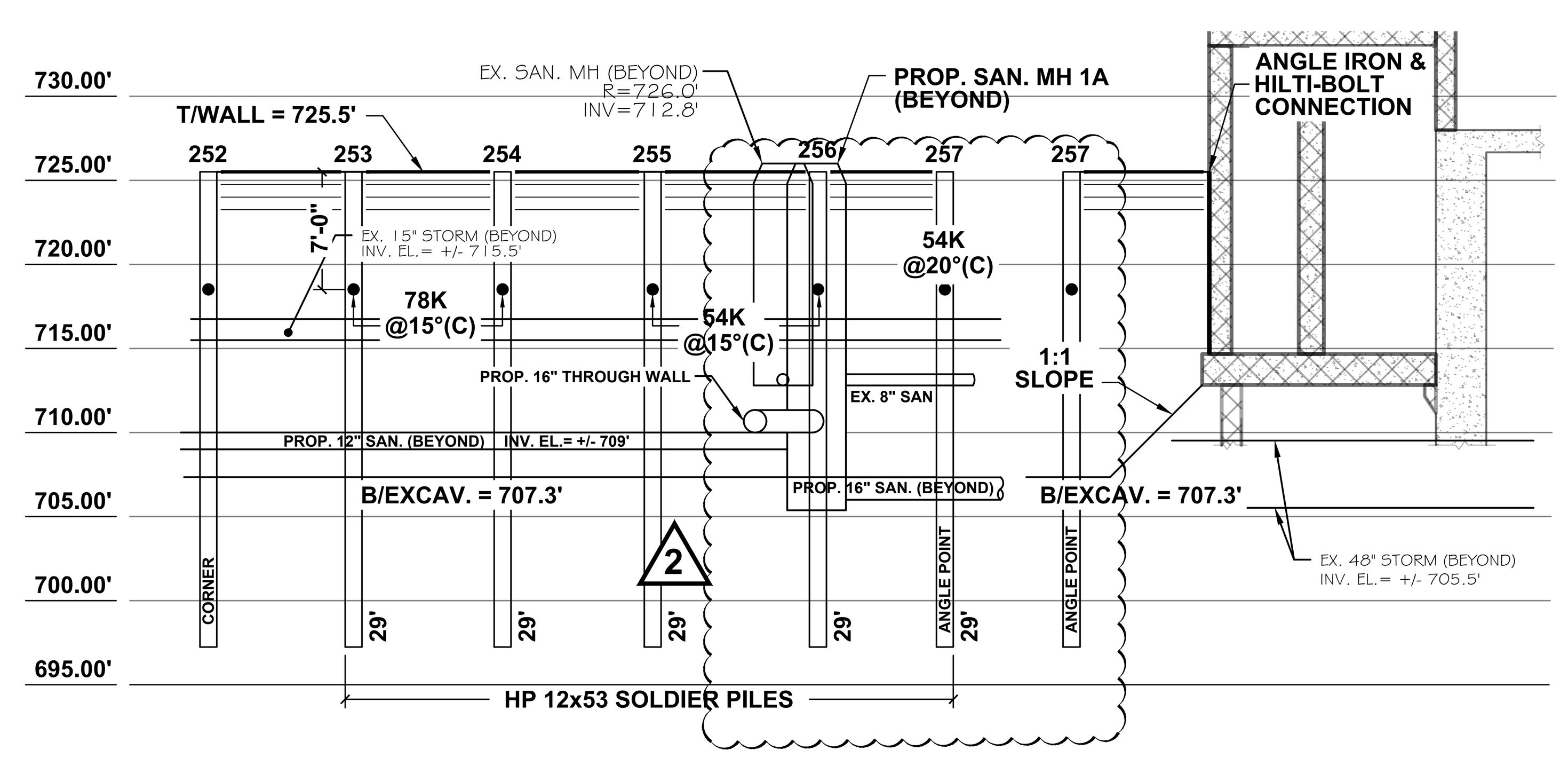
ELEVATION 12

SCALE: 1/8" = 1'-0"



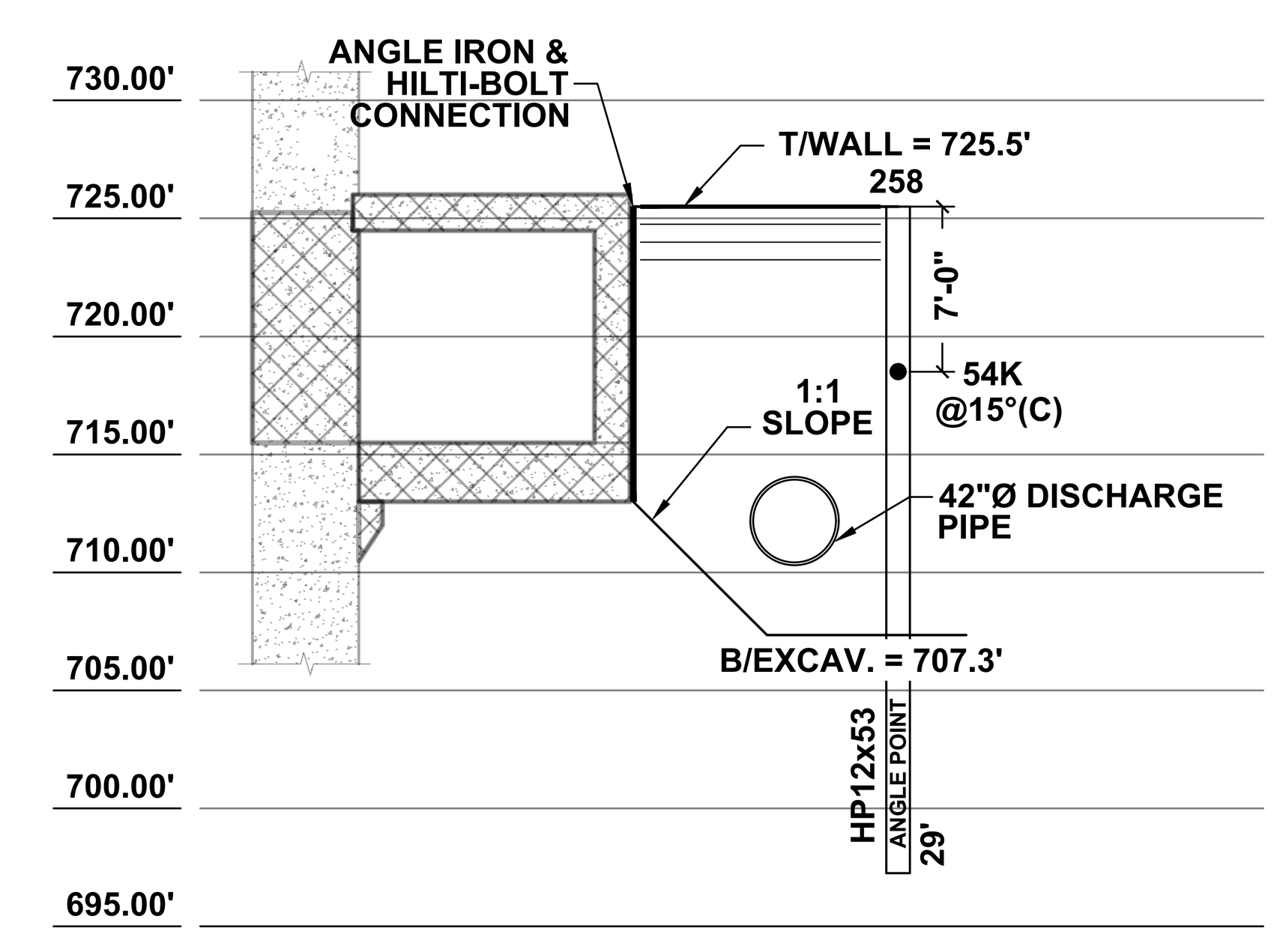
ELEVATION 13

SCALE: 1/8" = 1'-0"



ELEVATION 14

SCALE: 1/8" = 1'-0"



ELEVATION 16

SCALE: 1/8" = 1'-0"

RICHARD GOETTLE INC.

ISSUE	REVISIONS		
	00	4-5-22	ISSUED FOR SUBMITTAL AND APPROVAL
	01	4-11-22	MISC. CHANGES
	02	4-18-22	PILE ROTATE

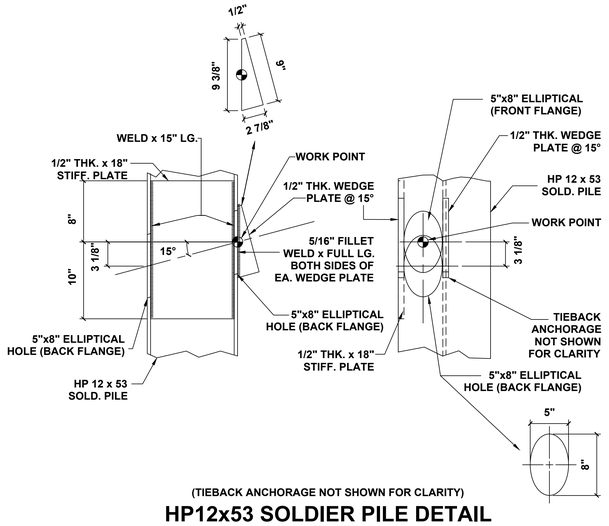
SCALE: AS NOTED
DRAWN BY: PETE COOK
CHECKED BY: AARON KLINGSHIRN (CL)
DATE: 04-05-2022
OWNER: ALLEGHENY Co. SANITARY AUTHORITY
GEN. CONTR.: PJ DICK - TRUMBULL - LINDY PAVING

"AREA C" PLAN & ELEVATIONS FACILITIES 500 & 509

RICHARD GOETTLE, INC.
12071 Hamilton Avenue
Cincinnati, Ohio 45231
Phone: (513)-825-8100
ENGINEERING CONSTRUCTORS IN GEO-SUPPORT SYSTEMS FOR OVER 60 YEARS

ALLEGHENY COUNTY SANITARY AUTHORITY
EAST HEADWORKS
PITTSBURGH, PA
TEMPORARY EARTH RETENTION

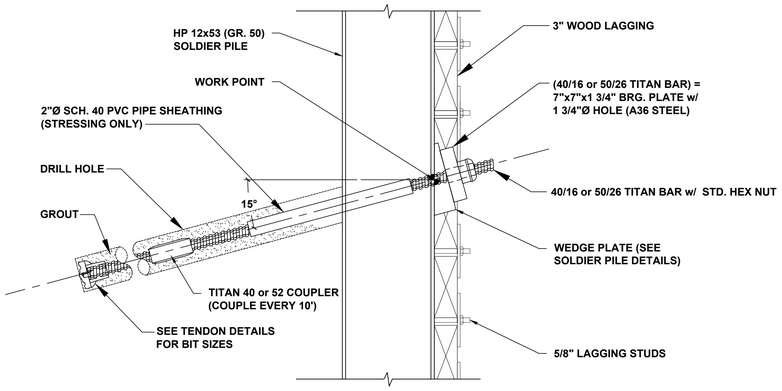
DWG. No.: 21049_PH2_TER - 6 REV: 02



(TIEBACK ANCHORAGE NOT SHOWN FOR CLARITY)

HP12x53 SOLDIER PILE DETAIL w/ 15° TIEBACK

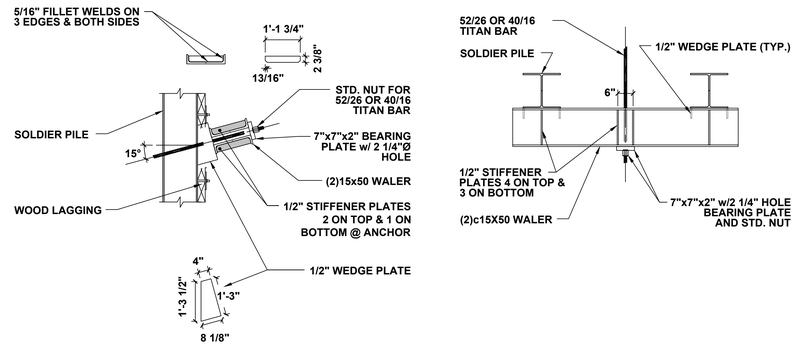
SCALE: 1 1/2" = 1'-0"



(TIEBACK ANCHORAGE NOT SHOWN FOR CLARITY)

HP12x53 SOLDIER PILE DETAIL w/ 15° TIEBACK

SCALE: 1 1/2" = 1'-0"



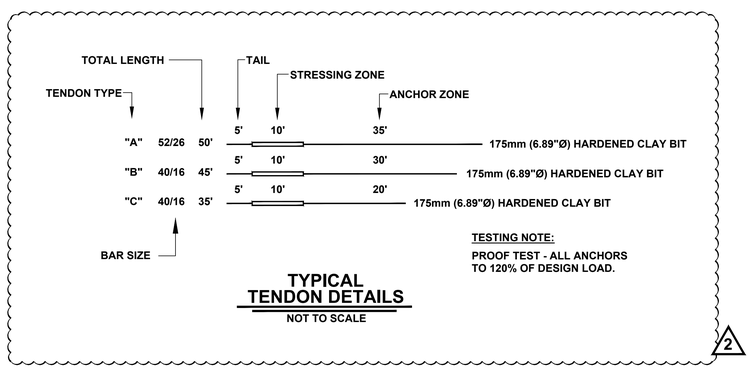
TYPICAL 15° ANCHOR FOR (2)C15x50 WALER

SCALE: 1/2" = 1'-0"

SLEEVE SECTION

TIEROD DETAILS

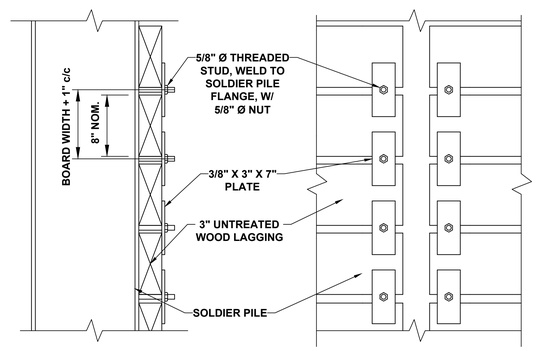
SCALE: 1 1/2" = 1'-0"



TYPICAL TENDON DETAILS

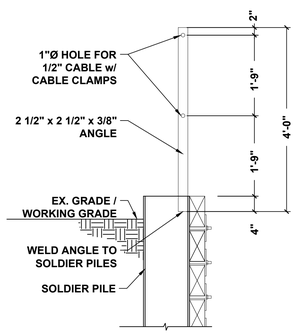
NOT TO SCALE

2



LAGGING STUD DETAIL

SCALE: N.T.S.



HAND RAIL DETAIL

SCALE: N.T.S.

RICHARD GOETTLE INC.

RICHARD GOETTLE INC.

REVISIONS

00	4-5-22	ISSUED FOR SUBMITTAL AND APPROVAL
01	4-11-22	MISC. CHANGES
02	4-29-22	PILE ANCHOR REDESIGN

SCALE: AS NOTED
DRAWN BY: PETE COOK
CHECKED BY: AARON KLINGSHIRN (CL)
DATE: 04-05-2022
OWNER: ALLEGHENY Co. SANITARY AUTHORITY
GEN. CONTR.: PJ DICK - TRUMBULL - LINDY PAVING

DETAILS

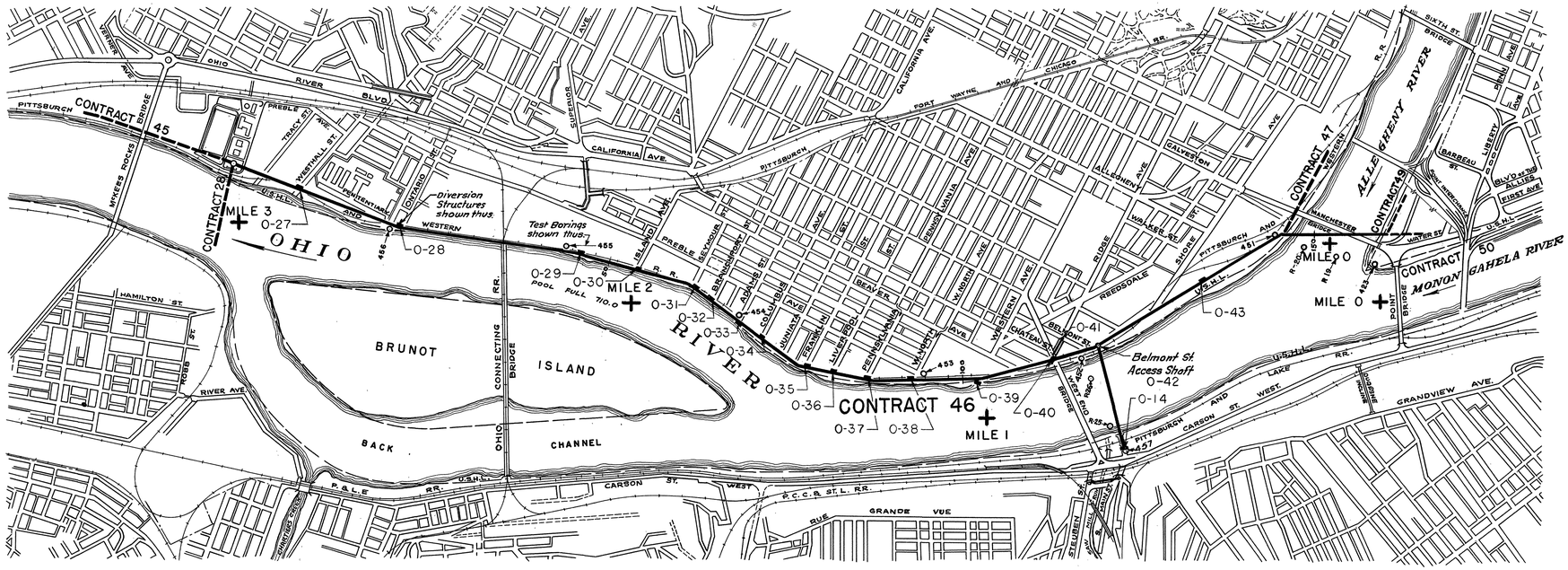
COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL AARON MATTHEW KLINGSHIRN ENGINEER

RICHARD GOETTLE, INC.
12071 Hamilton Avenue
Cincinnati, Ohio 45231
Phone: (513)-825-8100
ENGINEERING CONSTRUCTORS IN GEO-SUPPORT SYSTEMS FOR OVER 60 YEARS

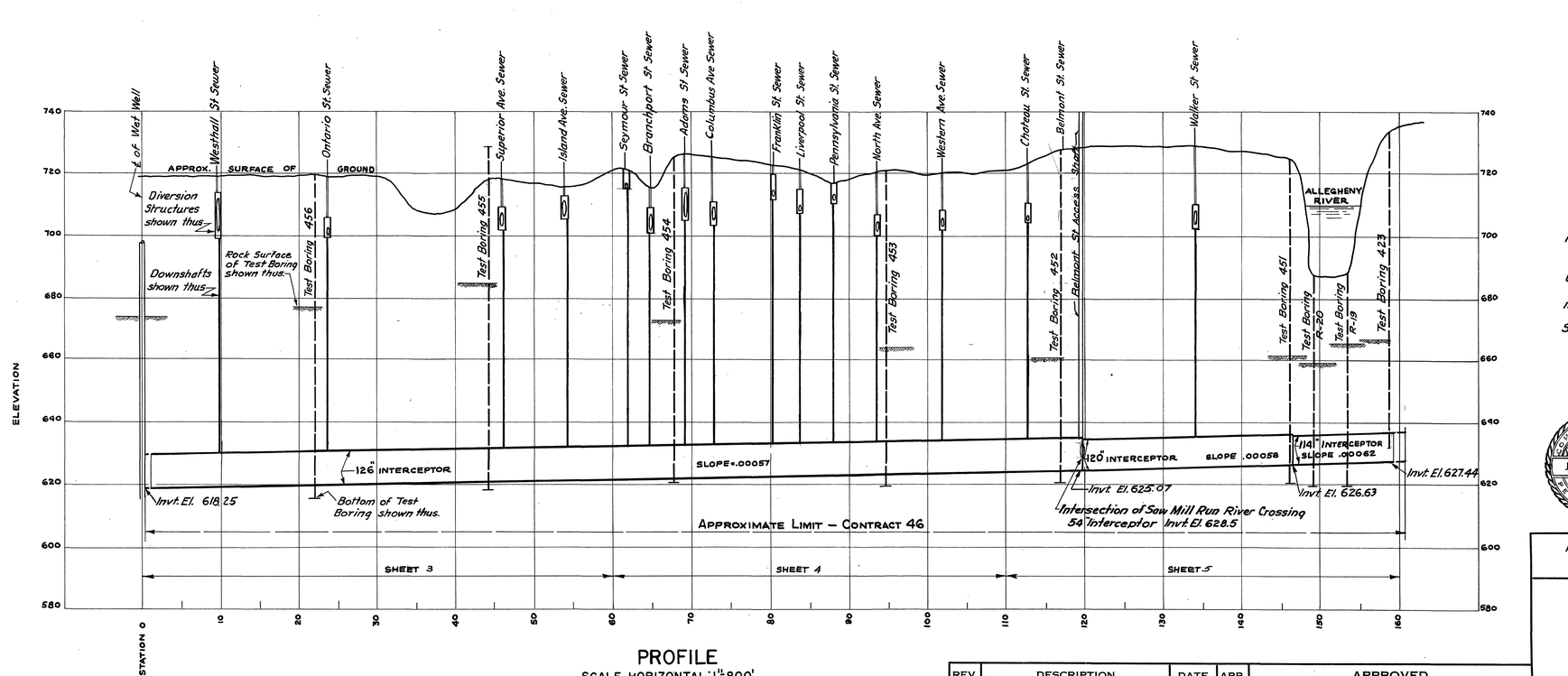
ALLEGHENY COUNTY SANITARY AUTHORITY
EAST HEADWORKS
PITTSBURGH, PA
TEMPORARY EARTH RETENTION

DWG. No.: 21049_PH2_TER-8 REV: 02

Section 5K: Contract 46 UOIT



PLAN
SCALE: 1"= 800'



PROFILE
SCALE HORIZONTAL: 1"= 800'
SCALE VERTICAL 1"= 20'

Notes:
Elevations are referred to the U.S.C.& G.S. datum. The coordinate system is that adopted by the U.S. Engineer Corps, Pittsburgh District.
For Test Boring data, see Sheets G11 to G26 inclusive.
For Plan and Profile of River Crossing from Saw Mill Run Sewer Diversion Structure See Sheet 6

REGISTERED PROFESSIONAL ENGINEER
JOHN F. LABOON
ENGINEER #433
PENNSYLVANIA

REV.	DESCRIPTION	DATE	APP.	APPROVED	
1	Structure Code No. Added	3-15-78		Stanley M. Dore	AUG. 26, 1952
2				DEPUTY CHIEF ENGINEER REG. PROF. ENGR. PA. NO. 701-E	DATE
3				J. F. Laboon	OCT. 5, 1953
4				CHIEF ENGINEER REG. PROF. ENGR. PA. NO. 433	DATE

DRAWN BY V.J.G. & M.V.R.
TRACED BY M.V.R.
CHECKED BY V.J.G.
EXAMINED BY G.T.G.

ALLEGHENY COUNTY SANITARY AUTHORITY
PITTSBURGH, PENNSYLVANIA

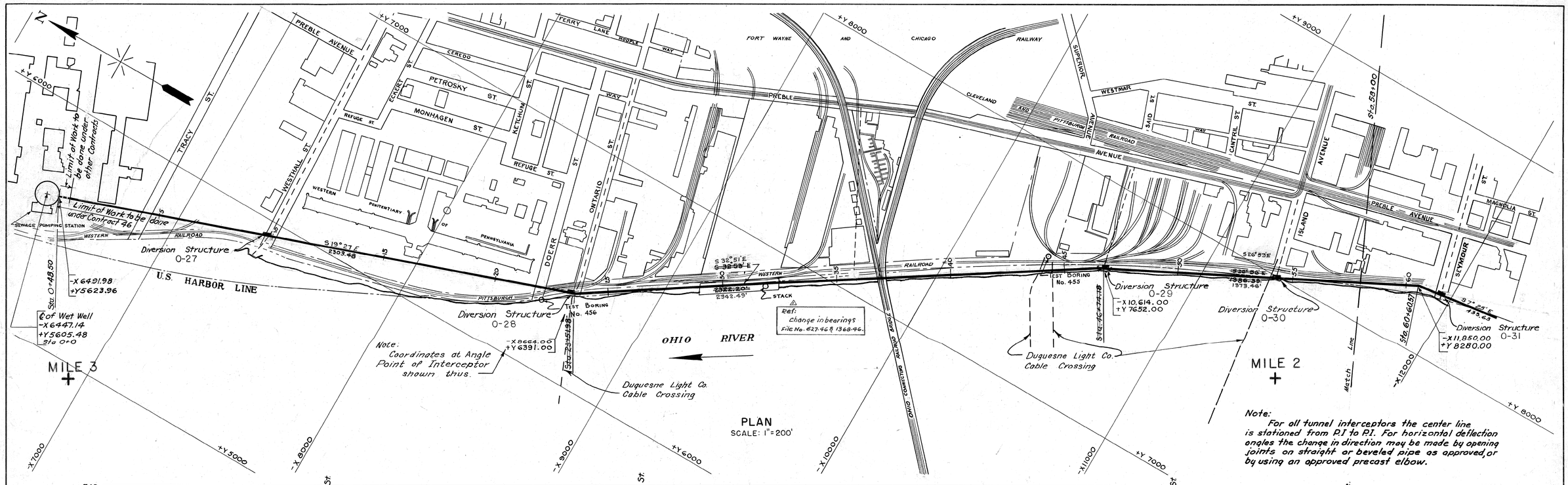
INTERCEPTING SEWERS

OHIO RIVER TREATMENT PLANT TO POINT GENERAL PLAN AND PROFILE

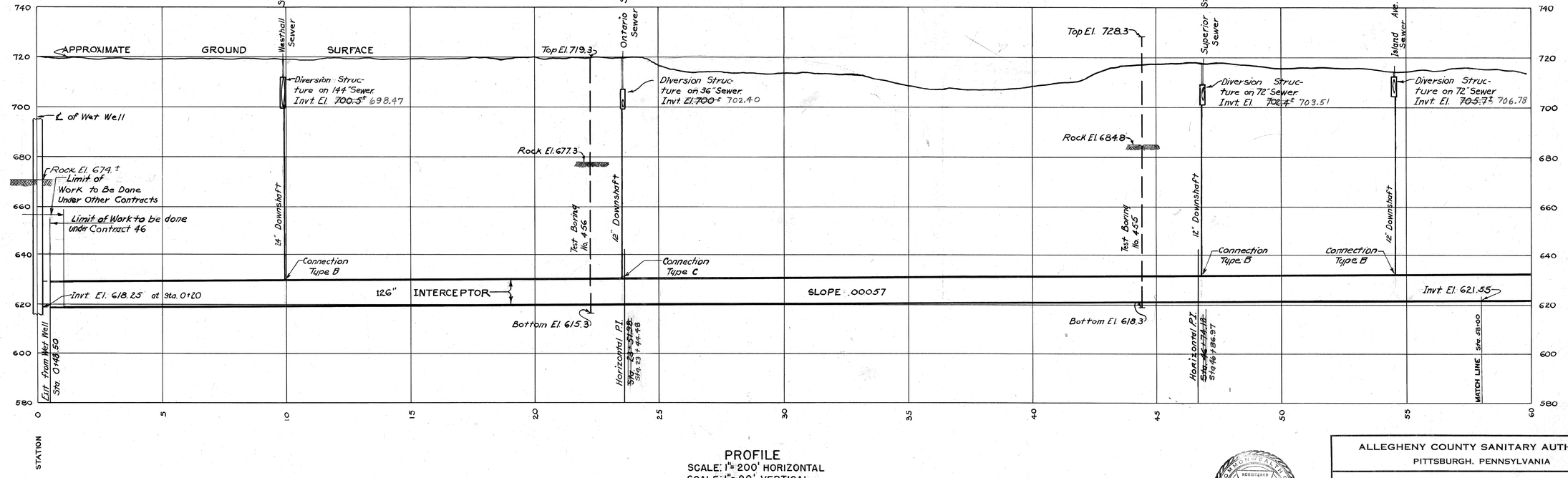
SCALES: AS NOTED

CONTRACT 46 SHEET 2 OF 36

ATE BLUEPRINTING INC., PITTSBURGH, PA.



PLAN
SCALE: 1"=200'



PROFILE
SCALE: 1"= 200' HORIZONTAL
SCALE: 1"= 20' VERTICAL

DRAWN BY V.J.G. & R.S.M.
TRACED BY J.W.W.
CHECKED BY V.J.G.
EXAMINED BY G.T.G.

REV.	DESCRIPTION	DATE	APP.
1	Ref. Note added.		
2	Structure Code No. Added	3-15-78	
3			
4			

APPROVED
Stanley M. Dore — AUG. 26, 1952 DATE
DEPUTY CHIEF ENGINEER
REG. PROF. ENGR. PA. NO. 701-E
J. F. Laboon — OCT. 5, 1953 DATE
CHIEF ENGINEER
REG. PROF. ENGR. PA. NO. 433

REGISTERED PROFESSIONAL ENGINEER JOHN F. LABOON ENGINEER #433 PENNSYLVANIA

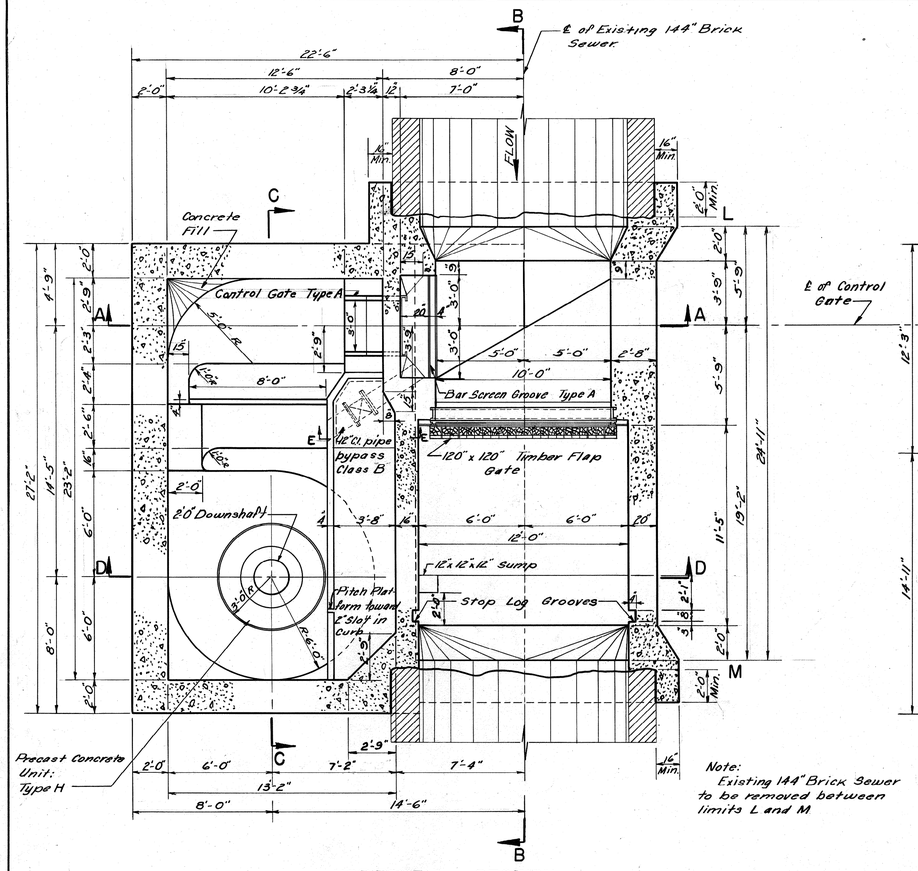
ALLEGHENY COUNTY SANITARY AUTHORITY
PITTSBURGH, PENNSYLVANIA

INTERCEPTING SEWERS

OHIO RIVER
TREATMENT PLANT TO POINT
PLAN AND PROFILE
STA. 0 TO 58

SCALES: AS NOTED 1953

AS BUILT CONTRACT 46 SHEET 3 OF 36



DRAWN BY J.P.E. R.F.S.
TRACED BY J.N.W.
CHECKED BY V.J.G.
EXAMINED BY G.T.G.

REV.	DESCRIPTION	DATE	APP.
1	Location Plan revised. As built ref. added, as built elevations shown thus [717.76]		
2			
3			
4			

APPROVED

Laurence M. Gentleman — SEPT. 30, 1953
DEPUTY CHIEF ENGINEER — DATE
REG. PROF. ENGR. PA. NO. 1562-E

J. F. Ladoon — OCT. 5, 1953
CHIEF ENGINEER — DATE
REG. PROF. ENGR. PA. NO. 433

REGISTERED PROFESSIONAL ENGINEER JOHN F. LADOON ENGINEER #433 PENNSYLVANIA

ALLEGHENY COUNTY SANITARY AUTHORITY
PITTSBURGH, PENNSYLVANIA

INTERCEPTING SEWERS — 0-27

OHIO RIVER

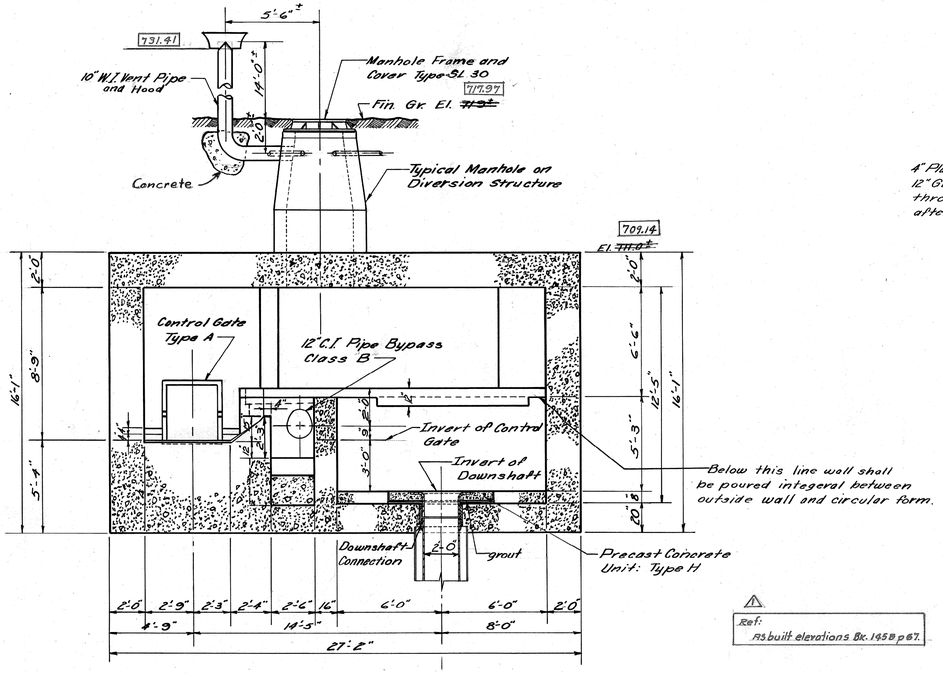
TREATMENT PLANT TO POINT

DIVERSION STRUCTURE ON WESTHALL STREET SEWER

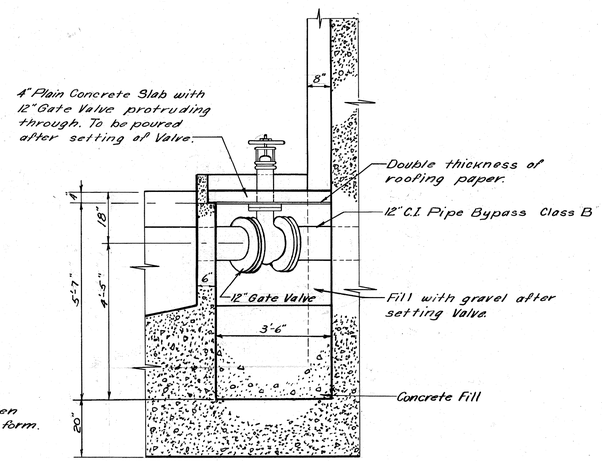
PART 1

SCALE: 1/4" = 1'-0" — 1953

CONTRACT 46 — SHEET 9 OF 36

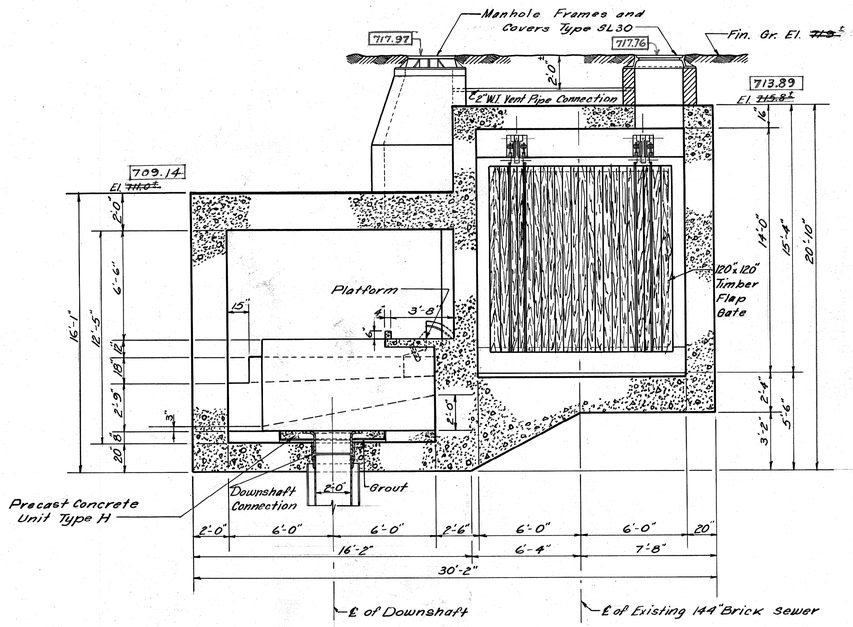


SECTION C-C



E-E

SCALE: $\frac{1}{2}$" = 1'-0"



D-D

DRAWN BY J.P. & R.F.S.
TRACED BY J.W.W.
CHECKED BY V.J.G.
EXAMINED BY G.T.G.

⚠1 Ref: As built elevations Bk. 1458 p 67.

REV.	DESCRIPTION	DATE	APP.	APPROVED
⚠1	As built elevations shown thus 717.82			Lawrence M. Smitherman — DEPUTY CHIEF ENGINEER, REG. PROF. ENGR. PA. NO. 1562-E — SEPT. 30, 1953 DATE
2				
3				J. F. Laboon — CHIEF ENGINEER, REG. PROF. ENGR. PA. NO. 433 — OCT. 5, 1953 DATE
4				

REGISTERED PROFESSIONAL ENGINEER JOHN F. LABOON ENGINEER #433 PENNSYLVANIA

ALLEGHENY COUNTY SANITARY AUTHORITY
PITTSBURGH, PENNSYLVANIA

INTERCEPTING SEWERS — 0-27

OHIO RIVER

TREATMENT PLANT TO POINT

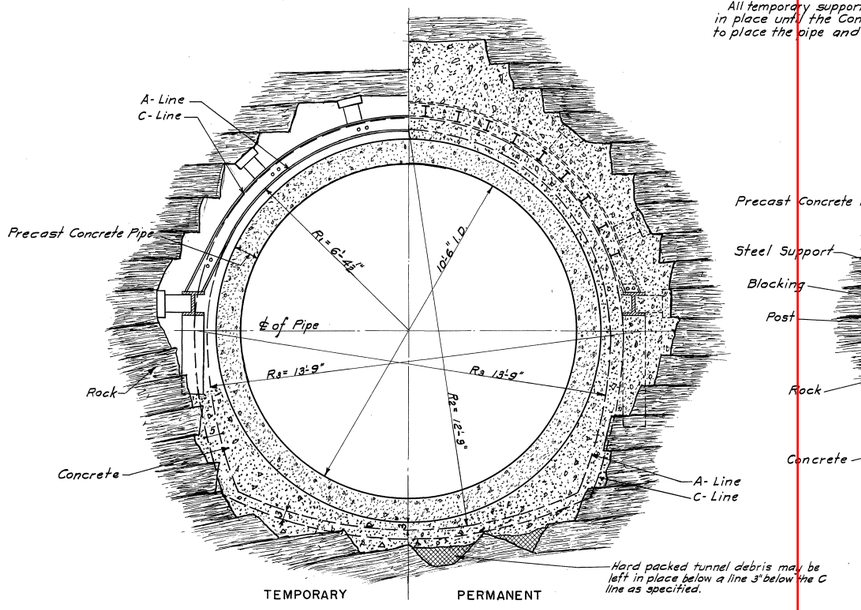
DIVERSION STRUCTURE ON WESTHALL STREET SEWER

PART 2

SCALE: $\frac{1}{4}$" = 1'-0" 1953

Figure 3.2 - General Tunnel Details - Steel Supported

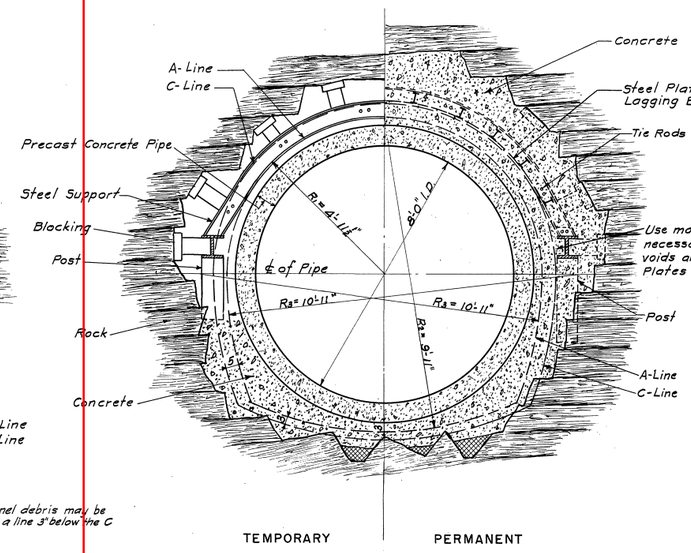
Note:
All temporary supports are to be left in place until the Contractor is ready to place the pipe and concrete backing.



TEMPORARY PERMANENT

126" DIAMETER INTERCEPTOR

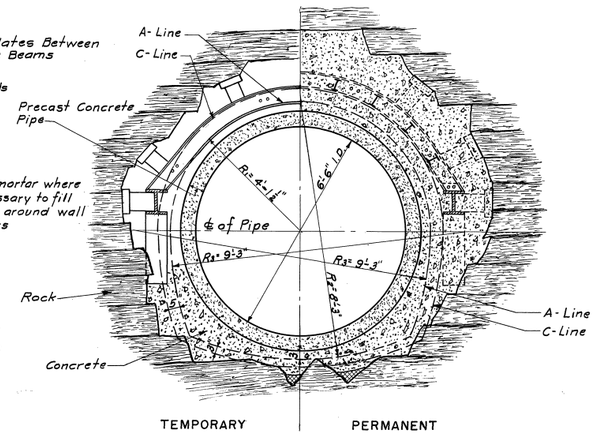
Note:
All notes in regard to steel supports apply to all sections.



TEMPORARY PERMANENT

96" DIAMETER INTERCEPTOR

Note:
Additional excavation shall be made as necessary to provide any space required for ventilating ducts, air lines, electrical cables, tracks, drainage, etc.



TEMPORARY PERMANENT

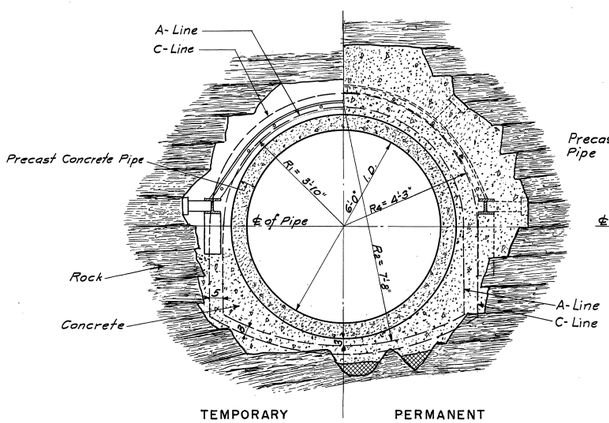
78" DIAMETER INTERCEPTOR

TYPICAL STEEL SUPPORTED TUNNEL SECTIONS IN ROCK FOR 78" DIAMETER INTERCEPTOR AND LARGER

Note:
Dimensions to the A and C lines as listed in these tables are for pipe thicknesses as tabulated in the specifications.
If pipe of greater thickness is approved the dimensions to the A and C lines shall be correspondingly increased.

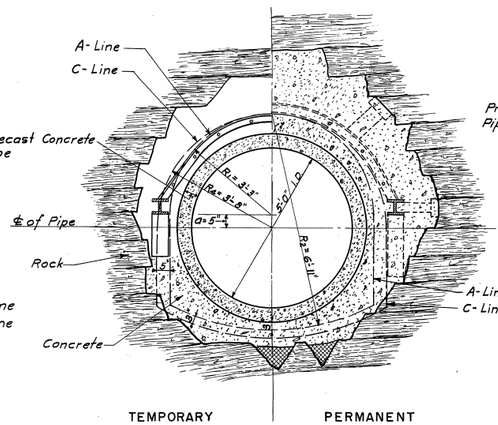
DIMENSIONS FOR STEEL SUPPORTED TUNNEL SECTIONS IN ROCK FOR 78" DIAMETER INTERCEPTOR AND LARGER

DIA. OF INTERCEPTOR	DIMENSIONS		
	R_1	R_2	R_3
126"	6'-4½"	12'-9"	13'-9"
120"	6'-1"	12'-2"	13'-2"
114"	5'-8½"	11'-7"	12'-7"
108"	5'-6"	11'-0"	12'-0"
102"	5'-2½"	10'-5"	11'-5"
96"	4'-11½"	9'-11"	10'-11"
90"	4'-8"	9'-4"	10'-4"
84"	4'-5"	8'-10"	9'-10"
78"	4'-1½"	8'-3"	9'-3"



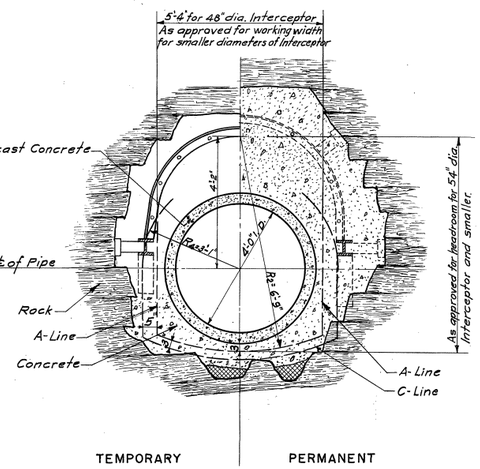
TEMPORARY PERMANENT

72" DIAMETER INTERCEPTOR



TEMPORARY PERMANENT

60" DIAMETER INTERCEPTOR



TEMPORARY PERMANENT

48" DIAMETER INTERCEPTOR

DIMENSIONS FOR STEEL SUPPORTED TUNNEL SECTIONS IN ROCK FOR 72" DIAMETER INTERCEPTOR AND SMALLER.

DIA. OF INTERCEPTOR	DIMENSIONS			
	R_1	R_2	R_4	C
72"	3'-10"	7'-8"	4'-3"	0
66"	3'-6½"	7'-1"	3'-11½"	0
60"	3'-3"	6'-11"	3'-9"	5
54"	2'-11½"	6'-9"	3'-4½"	
48"		6'-9"	3'-1"	
42"		6'-9"		
36"		6'-9"		
33"		6'-9"		
30"		6'-9"		

TYPICAL STEEL SUPPORTED TUNNEL SECTIONS IN ROCK FOR 72" DIAMETER INTERCEPTOR AND SMALLER

DRAWN BY
TRACED BY F.K.
CHECKED BY
EXAMINED BY

REV.	DESCRIPTION	DATE	APP.
1			
2			
3			
4			

APPROVED

Stanley M. Dore — AUG. 26, 1952
DEPUTY CHIEF ENGINEER
REG. PROF. ENGR. PA. NO. 701-E — DATE

J. P. Nelson — APRIL 14, 1954
CHIEF ENGINEER — DATE
REG. PROF. ENGR. PA. NO. 433

ALLEGHENY COUNTY SANITARY AUTHORITY
PITTSBURGH, PENNSYLVANIA

INTERCEPTING SEWERS

CONTRACTS 45 TO 52, INCLUSIVE

TYPICAL TUNNEL SECTIONS IN ROCK
STEEL SUPPORTED

SCALE: ½" = 1'-0"

1953