AUGUST 8, 2025

CONTRACT NO. 1800

WET WEATHER PUMP STATION

ADDENDUM NO. 8

All bidders bidding **Contract No. 1800** shall read and take note of this **Addendum No. 8.** 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. 8

The Acknowledgement attached to **Addendum No. 8** 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 8

FIRM NAME: _____

SIGNATURE: _____

TITLE: _____

DATE: _____

August 8, 2025

CONTRACT NO. 1800

WET WEATHER PUMP STATION

ADDENDUM NO. 8

ADDENDUM NO. 8

ALLEGHENY COUNTY SANITARY

AUTHORITY

PITTSBURGH, PENNSYLVANIA

CONTRACT NO. 1800

WET WEATHER PUMP STATION PROJECT

August 8, 2025

ATTENTION

BID OPENING DATE

WEDNESDAY, SEPTEMBER 17, 2025

11:00 A.M.

DEADLINE FOR QUESTIONS IS FRIDAY, AUGUST 15, 2025

This Addendum No. 8 consists of 23 pages and the following attachments:

Attachment A - Addendum No. 8 Specifications (33 pages)
Attachment B - Addendum No. 8 Drawings – 22” x 34” (5 pages)
Attachment C - Addendum No. 8 Prevailing Minimum Wage Pre-Determination - (5 pages)

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 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. 8 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 3 of 5, Specification Section 07 10 50 Shaft Membrane Waterproofing System, **REPLACE** this Section in its entirety.

1.2 In Volume 3 of 5, Specification Section 07 26 00 Vapor Retarders, Paragraph 2.02.A.9 **DELETE** the following:

"b. Use on exterior walls on inside face of framing."

"d. Use under concrete slabs, under aggregate fill."

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

1.4 In Volume 3 of 5, Specification Section 31 63 33 Drilled Micropiles, Paragraph 2.02.D **ADD** the following:

"2. Type 1L cement, manufactured according to ASTM C150 and as specified in PennDOT Publication 408, Section 701 may be used in lieu of Type II cement provided the mix design provides similar corrosion resistance as Type II cement."

1.5 In Volume 2 of 5, Specification Section 01 35 20 Escrow Bid Documents, on page 9, **CHANGE** Escrow Agent contact information to:

"Access
651 Mansfield Avenue
Pittsburgh, PA 15205
Attn: Brandi McElroy"

1.6 In Volume 1 of 5, Article 7 Prevailing Minimum Wage Pre-Determination, **REPLACE** this Section in its entirety. Refer to Attachment C.

2. CHANGES TO THE DRAWINGS

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

2.2 **REPLACE** Sheet 430-SOE-15 with Sheet 430-SOE-15 Rev. 01, refer to Attachment B.

2.3 **REPLACE** Sheet 430-SD-03 with Sheets 430-SD-03 Rev. 01, refer to Attachment B.

2.4 **REPLACE** Sheet 430-S-49 with Sheets 430-S-49 Rev. 01, refer to Attachment B.

3. QUESTIONS AND ANSWERS

Q1: Specification Section 31 23 00 2.01 (B) states "Vehicles shall not impose loads that will damage existing utilities and structures." Please confirm the sensitivity of the existing utilities and structures and associated surcharge limitations.

A1: Contractor is required to field verify existing utilities and provide protection per 01 52 00, par 1.05.B. Surcharge limitations related to existing river wall structure are provided in the Contract Drawings.

Q2: Drawing 430-S-49, General Note 4 states "Provide ASTM 108 Hex Nuts and ASTM F413 Washers."
Drawing 430-S-49, General Note 12 states "Piles shall be cut back to an elevation to achieve 12" embedment into piles cap / slab."
Drawing 430-S-49, Micropile Detail 1 shows a #6 bar (Fy=60kdsi) 6" below the top of the pile. It also appears that there may be a plate on top of the pile, though not called out as such.

Question 1- Please provide a detail(s) of how the top of the pile is to be completed including any plates, #20 bar extensions, hex nuts, washers, etc.

Question 2 - If the Contractor bids on and builds the micropile design shown on this Drawing, who is responsible for the performance of the Micropile under Verification and Proof Testing - the Owner or the Contractor?

A2: 1. The detail for attachment of the micropile to the building foundation is provided on the drawing. The No. 6 rebar is to pass through the micropile casing and be able to be connected to the footing rebar mat. The contractor is responsible for designing and detailing the connections of their testing apparatus to the rebar for the verification and proof tests. The ASTM 108 Hex

Nuts and ASTM F413 Washers stated in General Note 4 on Drawing 430-S-49 are referring to splices of the threadbar if it is not full length and material requirements for testing apparatus to be attached. The plate shown on top of the micropile casing was removed from Drawing 430-S-49, refer to Item 2.4 Addendum No. 8.

2. Contractor is responsible for the design of the testing system and workmanship of the micropile construction. The Verification Test is actually a continuation of the design process to verify the grout/rock bond strength used in design. In accordance with the Micropile Specification, the micropile dimensions may be modified by the designer based on the results of the Verification Tests. Once the final micropile design is finalized, the Proof Tests will be performed and the contractor will be responsible if it is determined that Proof Test Results are not acceptable based on the contractor's workmanship and/or construction techniques.

Q3: Specification 31 63 33 Section 1.05.A.3.b states " Retain an Design Professional who is a licensed Professional Engineer registered in the Commonwealth of Pennsylvania, with at least 5 years of experience in the design and construction of micropiles and pile load test systems, who is to design the system, verify the proper construction of the testing system and the piles, and certify the test results . "

Question 1 - Is the PA. P.E. responsible of the design of the Micropile or just the pile load test system?

Question 2 - If the Contractor is supposed to bid an and build the pile design shown on Drawing 430-S-49, why does the Contractor have to have PA. P.E. perform a Micropile design?

A3: 1. Contractor's micropile design professional is responsible for design of the load test system, oversight of the installation of the test system, oversight of the performance of the load tests, and certification of the load test results. The Contractor's micropile design professional is not responsible for design of the micropile.

2. See Response to Item 1, this question.

Q4: Specification 31 63 33, Section 2.02.D- Can the Contractor use Type 1L cement for the neat-cement grout?

A4: Type 1L would be acceptable if the mix design contains additives that achieves corrosion resistance equivalent to Type II cement. See Item 1.4 in Addendum No. 8.

Q5: Specification 31 63 33 Section 3.02.E.7 states " If excessive grout loss into subsurface voids prevents a fully-grouted pile, allow the first stage of primary grout to set a minimum of 18 hours before redrilling the grouted zone to the bottom of the pile. Take measures to minimize quantities of both grout loss and

redrilling. Redrill to a diameter equal to the nominal inside diameter of the micropile casing."
Question 1- This language requires tremie grouting the hole before placement of the #20 bar. Is this the Engineer's intent?
Question 2 - How will the Contractor be compensated for the first stage of primary grout and the redrilling of the first stage of grout?

A5: 1. It is the Contractor's discretion to insert the #20 bar prior to grouting. However, the intent of 3.02.E.7 is to require grout levels to be monitored during grouting. If grout levels cannot be maintained after initial grouting and voids are suspected to be present, the #20 bar shall be removed prior to redrilling. The #20 bar will need to be cleaned to "like new" condition prior to reuse. Additional Payment would not be made if the #20 rebar is damaged during this process.
2. Refer to Pay Item 2 in Section 01 22 00 for measurement and payment for micropile grouting. The Contractor is responsible for interpretation of the boring logs to determine the amount of redrilling of micropiles anticipated that will not be compensated by Pay Item 2."

Q6: Specification 31 63 33 Section 3.03.A.2.i states "If a verification-tested micropile fails to meet the acceptance criteria, modify the construction procedure. Modifications may include, but are not limited to, modifying the installation method, installation equipment, or installed material as required to achieve acceptable verification tests. Submit proposed modifications of the accepted Work Plan to the Engineer for review and acceptance."
Question - If the Contractor installs the Owner's design as shown on Drawing 430-S-49 and per the approved Work Plan and is required to modify the installation, method, equipment or materials how will they be paid for these changes?

A6: See response to questions #2 and #5. The Contractor is responsible for the design of the testing system and workmanship of the micropile construction. The Verification Test is actually a continuation of the design process to verify the grout/rock bond strength used in design. In accordance with the Micropile Specification, the micropile dimensions may be modified by the designer based on the results of the Verification Tests.
The Contractor would be paid for micropile design adjustments based on the bid unit prices. Once the final micropile design is finalized, the Proof Tests will be performed and the contractor payment for piles that do not meet acceptance criteria will be subject to review by the Owner. Piles that do not meet criteria due to poor workmanship or other reasons under the Contractor's control as determined by the Owner will not be considered for payment.

Q7: Reference spec section 07 10 50 Shaft Membrane Waterproofing System, paragraph 2.01.B.1 : One of the two specified PVC waterproofing membrane manufacturers, Don Construction Products Inc., is based in the country of Jordan and does not offer the complete system products in the United States. Please provide an appropriate

pre-approved second manufacturer (to Sika) or confirm that Sika is the only approved manufacturer that offers this system.

A7: A second manufacturer has been added to the specifications. Refer to Item 1.1 in Addendum No. 8.

Q8: Reference spec section 07 26 00 Vapor Retarders, paragraph 2.02.A.9.b : This states that a reinforced vapor retardant is to be used on the exterior walls inside the face of framing, but there are no framed walls in this project. However, it is indicated on the backside of the masonry parapet wall. Please confirm that this is the only condition that it applies to.

A8: No metal stud frames walls are included in this project. Metal furring is required at insulated metal panels. Refer to Item 1.2 in Addendum No. 8. At parapet, both sides of the parapets shall receive dampproofing coating (cavity walls).

Q9: Reference spec section 07 26 00 Vapor Retarders, paragraph 2.02.A.9.c&d : c) calls for reinforced vapor retardant to be applied "over" aggregate fill while d) calls for it to be applied "under" the aggregate fill. Is the vapor retardant required above and below the aggregate fill or is it an either-or option ?

A9: Vapor retarder to be installed on top of aggregate. Refer to Item 1.2 in Addendum No. 8.

Q10: Reference specification 03 10 00 paragraphs 1.03.A.4.c & 2.01.C : Please confirm that, in addition to steel-faced form systems, wood-faced form systems are also acceptable if they have a "true radius" (not chorded) and have a "sufficient strength and smoothness to produce specified finish".

A10: Wood forms are not permitted for curved surfaces for shaft construction.

Q11: Reference specification section 01 45 33 Special Inspections and Testing Program paragraph 1.04.B.1 : States "Independent testing company retained by the Owner and approved by the Building Official, not affiliated or hired by the Contractor, which is responsible for the materials testing requirements of the project including but not limited to concrete cylinder breaks, soils testing, and masonry materials testing." And reference specification section 03 30 00 Cast-In-Place Concrete paragraph 1.05.B.2 : States "Contractor is responsible for retaining and employing the independent laboratory that conducts Pre-Production Concrete Testing and Production Concrete Field Tests. Contractor is responsible for scheduling, ordering, and coordinating all pre-production and production testing with the independent laboratory." Please clarify if the Owner or the Contractor is responsible for paying for concrete testing. And confirm that the Owner is responsible for paying for soils and masonry testing. And provide a specification listing the remaining testing that the Contractor is to pay for.

A11: The Contractor is responsible for all testing required for materials submitted for approval, concrete mix pre-production testing all concrete material constituents,

masonry testing and soil testing to be used on the project. Owner will pay for Independent Testing performed for work that is associated with Special Inspections as defined by the IBC. Owner paid special inspection testing does not relieve the Contractor required testing specified and required for review and approval of materials, mixes etc.

Q12: Addendum #3 added sheet 500-ET-01. Please confirm all work associated with this sheet will be the responsibility of the Electrical Prime Contractor.

A12: Sheet 500-ET-01 was added as part of Section 5I to Reference Information Volume 1 of 1. Refer to Question 34 of Addendum No. 3.

Q13: Specification Section 03 21 00 - Concrete Steel Reinforcement Section 3.04C States that the use of mechanical couplers in lieu of lap splices requires written approval from the Owner. Due to the complexity of the shaft concrete forming and rebar details please consider the use of rebar mechanical couplers and dowel bar replacement couplers (form savers).

A13: As indicated, mechanical couplers and dowel bar replacement couplers (formsavers) are permitted and require prior written approval.

Q14: Specification 03 30 00 Cast-In-Place Concrete section 1.03 states that Mass Concrete is as defined by ACI 207.1. ACI 207.1 states that Mass Concrete is defined as "any volume of concrete with dimensions large enough to require that measures be taken to cope with generation of heat from hydration of the cement and attendant volume change to minimize cracking." Please provide the minimum thickness that would be considered mass concrete.

A14: Contractor and their temperature control professional may use any methodology permitted by ACI for designating placements as mass concrete activities. Methodology shall be identified in the Temperature Control Plan submitted for review and approval.

Q15: Note C2.9 on contract drawing 000-S-01 indicates that welded reinforcing steel is not allowed without written approval from the engineer. Means and methods will change depending if we will tie rebar or weld rebar. Will the engineer allow for welding of reinforcing steel?

A15: As specified, field welding of reinforcement requires prior written approval.

Q16: Reference specification 40 05 02.43 Piping System Schedules – Pressurized Wastewater and Drainage : For RSW, both ductile iron and carbon steel are to be fusion bonded Epoxy as shown on page 2. Drawing M-01, shows (6) 48" carbon steel epoxy coated pipe x 11' long going thru wall penetration type k using a weep ring. Can a wall sleeve be used in lieu of a weep ring in order to preserve the epoxy coating ?

A16: Type K pipe penetrations are required at these locations.

Q17: Reference Spec Section 07 10 50 Shaft Membrane Waterproofing System paragraph 1.05.B : Daily field sampling is not per the industry standard and will consume both time and material. Minimum experience requirements are already included to ensure an acceptable level of performance and field testing of every seam ensures an acceptable final product. Installers suggest eliminating the daily sampling requirement or at least minimizing it, based on the established pattern of performance. Please confirm if this sampling is required.

A17: Contract requirements to remain. Alternatives will be considered after award.

Q18: Reference Spec Section 07 10 50 Shaft Membrane Waterproofing System paragraph 2.01.A.2 : The geotextile accessory of the PVC Waterproofing Membrane requires a minimum thickness. Alternative geotextile layers exist that achieve all performance criteria with thickness below the minimum requirement. Please confirm the elimination of a thickness requirement for the Geotextile layer.

A18: Contract requirements to remain.

Q19: Reference Spec Section 07 10 50 Shaft Membrane Waterproofing System paragraph 2.01.B : The "Low Temperature Impact" physical property appears to originate from a TDS copy / paste of one specific product and will unnecessarily limit approved equals. Please confirm that the low temperate impact is based on a standard design requirement.

A19: Contract requirements to remain.

Q20: Reference Spec Section 07 10 50 Shaft Membrane Waterproofing System paragraph 2.01.B : The "Chemical Resistance" physical property corresponds to a PH value of 2-13. Please confirm the ASTM Method for the chemical resistance.

A20: Refer to Item 1.1 in Addendum No. 8.

Q21: Reference Spec Section 07 10 50 Shaft Membrane Waterproofing System paragraph 2.01.B : The "Flammability" physical property denotes an ASTM Test Method of D568. Most waterproofing membranes are tested to class E requirements of the EN ISO 11925. Requirements for ASTM D568 will have large cost impacts and limited supply for the installers. Please confirm if membranes with EN 11925-2 Class E ratings will be accepted.

A21: Refer to Item 1.1 in Addendum No. 8.

Q22: Reference Spec Section 07 10 50 Shaft Membrane Waterproofing System paragraph 2.01.B : The physical property "Mechanical Puncture Resistance" ASTM test method refers to DIN 16726-5.12 when it should refer to EN 12236. Please provide an equivalent value to the EN test standard.

A22: Refer to Item 1.1 in Addendum No. 8.

Q23: Reference Spec Section 07 10 50 Shaft Membrane Waterproofing System paragraph 2.01.B : The physical property "Dielectric Strength" is not a typical test requirement. It will warrant additional testing and result in very limited product selection. Please confirm that the Dielectric Strength is related to a standard or Design need.

A23: Refer to Item 1.1 in Addendum No. 8.

Q24: Reference Spec Section 07 10 50 Shaft Membrane Waterproofing System paragraph 2.02.A : Steel Washers are not typically embedded in the attachment discs per the manufacturers. Instead, they are generally left to the discretion of a qualified installer. Please confirm if steel washers can be eliminated

A24: Refer to Item 1.1 in Addendum No. 8. Steel washers are required.

Q25: Reference Spec Section 07 10 50 Shaft Membrane Waterproofing System paragraph 2.02.B.2 : Water Barrier Intersections are not typically prefabricated by the manufacturer. Instead, they are fabricated onsite by a qualified installer, due to minute alignment issues or changes in angles. This is because the prefabricated units do not always fit, resulting in quality control Issues. Please confirm if the qualified installer will prefabricate and install the water barrier intersections onsite.

A25: Contract requirements to remain.

Q26: Reference Spec Section 07 10 50 Shaft Membrane Waterproofing System paragraph 3.03.J : The section states that each membrane is to be sealed at each waterproofing section but does not clarify whether it means the zone being waterproofed or each compartment within the membrane. Please clarify what defines the waterproofed section.

A26: Each compartment. Refer to Item 1.1 in Addendum No. 8.

Q27: Reference Spec Section 07 10 50 Shaft Membrane Waterproofing System paragraph 3.03.J : The section requires the installer to seal the membrane at the ends of each waterproofed section but does not state methods by which it needs to be sealed. Qualified installers recommend using epoxy tape rather than a mechanical fixation. Please clarify what method is required to seal each section.

A27: Means and methods shall be by the Contractor.

Q28: Reference Spec Section 07 10 50 Shaft Membrane Waterproofing System paragraph 3.03.K : The section states that the membrane is to be installed to preclude the ingress of grout during concreting but does not state the alternative relating to back grouting operations that are planned or required. This method is not typically combined with loose laid membrane. Please clarify how the membrane is to be installed to preclude the ingress of grout during concreting.

A28: Refer to Item 1.1 in Addendum No. 8.

Q29: Can grout hole installation locations be modified from outside the slurry wall to within the slurry wall cage using embedded casing?

A29: Contractor must bid using the design details on Drawing 430-SOE-15 in their bid price. Contractor alternatives will be considered after award.

Q30: Item H requires static water level measurements prior to testing. In low permeability formations, this can be impractical. Will the Owner accept alternate methods to determine hydrostatic conditions in these cases?

A30: Yes.

Q31: Please confirm whether Owner-directed cross-hole flushing (if grout or wash water flows between holes) is a paid item or considered incidental to other work.

A31: Incidental to the work.

Q32: The spec requires holes to be grouted within 72 hours of drilling. For practical sequencing, particularly with Friday drilling, can this requirement be extended to 96 hours to allow Monday grouting?

A32: Yes. Refer to Item 1.3 in Addendum No. 8.

Q33: Section 3.05.O The spec states that grout must be set before drilling adjacent holes. Please clarify whether this refers to initial or final set.

A33: Initial.

Q34: If the Contractor proposes to substitute a reinforced grouting program in lieu of vertical rock reinforcement in a particular zone, would geologic logging of the rock still be required?

A34: Yes.

Q35: Section 3.02.B.4 requires downhole surveys every 5 feet when within 20 feet of the UOIT. Given the redundancy and cost, would the Owner consider reducing this frequency?

A35: Contract stands as written.

Q36: 1.01B - Scope of Work - "Begin grouting operations within the rock mass, a maximum of 10 ft. below the top of rock" contradicts with Section 3.05.F.1 "with instrumented packer assembly from the bottom of the hole to the top of rock". Please clarify if treatment should be to top of rock.

A36: A maximum of 10 feet below the top of rock. Refer to Item 1.3 of Addendum No. 8.

Q37: 1.03.A.4 and 3.05H - With regards to descending stage grouting - please confirm or clarify that redrill footage associated with descending stage grouting will be paid for under the drilling pay item.

A37: Descending stage grouting will be paid under Pay Item #5.

Q38: 1.03.A.16 - Definition of a stage - clarify or confirm what a typical stage length is intended to be - a range of 5, 10, 20, and sometimes up to 40 ft. is described in the specification. What is the minimum stage length to start with?

A38: Minimum stage is 5 feet.

Q39: 1.03.A.18 - Verification Hole - is verification hole scope of work paid under the same drilling and grouting items as described in the pay items? Are verification holes going to require grouting similar to Primary 1, 2, and 3 pre-excavation grout holes?

A39: Yes, verification holes are paid under the same drilling and grouting item as described in Pay Items #4, #5, #7, and #24. Yes, verification holes require same grouting operations as Primary 1, 2, and 3 grout holes. See 430-SOE-15 for verification hole requirements after Primary 3 grout holes.

Q40: 1.07.B - "The maximum hole deviation shall be one percent of the total hole depth" - Is this hole deviation requirement intended for holes that encorach the 20 ft (horizontal and vertical) zone of the UOIT? Due to the presence of highly fractured rock per the GBR/GDR, we anticipate 1% may be very hard to acheive. We would request a 2% deviation tolerance along the depth of all holes. Alternatively, a 1% deviation tolerance for the holes that encorach the 20 ft (horizontal and vertical) zone of the UOIT and 2% for all other holes.

A40: Refer to Item 1.3 in Addendum No. 8.

Q41: 2.02.A.5 - "The use of air during drilling will not be allowed in any form" contradicts with the next line in 2.02.B.1 that allows the use of air or water. Is the use of air or water in overburden soil drilling acceptable? Section 2.02.C also asks to use a water powered down-the-hole hammer - Suggest to clarify and unify document.

A41: Refer to Item 1.3 in Addendum No. 8.

Q42: 2.02.C - Addendum No. 4 adds "core drill rigs" - is coring required outside of the two holes closest to the existing tunnel?

A42: No.

Q43: 2.02.E.1 states "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" - Is the washout bit required if we elect to flush the hole using the same water hammer used for drilling?

A43: No.

Q44: 2.05.C.1 states "Provide pressure transducers with a range appropriate for the pressure encountered, accurate to +/- 2% and capable of operation in temperatures between 30 and 120 degrees Fahrenheit"
Question - For pressure transducers compared with calibrated master gauges, a 2%

accuracy at low pressures (10-50psi) can have a range of accuracy between 0.2-1.0 psi, which is extremely strict - we suggest an accuracy of 5% to a calibrated master analog gauge.

A44: Contractor must bid using the Bid documents in their bid price. Contractor alternatives will be considered after award.

Q45: 2.05.D.2 - "Provide variable lengths of the central pipe resulting in intervals of 5, 10, and 20 ft between inflated bladders", whereas 3.05.F.3 indicates an maximum stage length of 40 ft.
Question - Please confirm max stage length are intended to be 40 ft?

A45: Yes.

Q46: 2.06.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"
Question - are pressure transducers and displays required on the header gauge if an instrumented packer is being used to record the effective pressure at the injection point?

A46: Yes.

Q47: 2.08.E - Grout Mixes - do lab testing and design grout mixes get paid for under the allowance for materials? Please clarify where this falls under pay items**.**

A47: Design of grout mixes and lab testing are incidental to the work.

Q48: 3.01.G states "Concurrent grouting at multiple locations is permitted, subject to Owner's approval and provided that all requirements for quality, sequencing, and coordination are met. Each hole receiving grout shall have its own grout setup, which includes grout pumps, header, mixer, and other pertinent equipment for each grout setup"
Question - Do we need individual batch plants/mixers for each hole or can an agitator tank with its own pump feed each header or hole?

A48: Individual batch plants/mixers are required for each hole.

Q49: 3.02.C.3 - states "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."
Question - please clarify or confirm that only 1 survey will be completed once the hole is within 20 ft distance from the UOIT and that surveying does not need to be repeated in 1 ft. increments

A49: Yes.

Q50: 3.05.K - "Provide equipment and personnel capable to grout up to two connected holes simultaneously as directed by the Owner"

Question - with the possibility of concurrent grouting does this mean we must provide equipment and personnel to man up to 4 holes simultaneously? In the event that 2 locations have connections to other holes?

A50: No, only provide equipment and grouting setups for how many holes to be grouting simultaneously.

Q51: 3.06 Mix Designs
Question 1 - Mix A apparent (Marsh) viscosity has a considerably tighter window of 3 seconds when compared to the other mixes B, C and D - please consider increasing this requirement to "32 to 36 sec"
Question 2 - Gel times and set times appear to be reversed on the table
Question 3 - Achieving set times with PLC may be harder to achieve as defined in our experience - should Mix tables be revised to incorporate different limits for Type III, PLC, and ultrafine cements?

A51: Question 1. Refer to Item 1.3 in Addendum No. 8.
Question 2. Refer to Item 1.3 in Addendum No. 8.
Question 3. Contractor alternatives will be considered after award.

Q52: In section 3.06.B.1 - the 2 hour test for uniformity/repeatability states the SG must stay within 0.01 of design which does not match 3.08 Table 2 where allowance is +/- 0.02

A52: We believe the question is referring to 3.06.D.1. Refer to Item 1.3 in Addendum No. 8.

Q53: In section 3.08.B.2. "Calibrate flow meters, pressure transducers, and scales used to measure grout materials and pressures at least once per week…"
Does scales refer to the scales on the silos or batch plants which are typically checked and calibrated upon setup by a third party? Or are they referring to something else? Please clarify

A53: Calibrate equipment weekly. Weekly calibration can include double check flow, weights, etc., under actual conditions.

Q54: How is payment for trial and error on mixes and different types of grouting during installation handled or compensated when working with the Owner to troubleshoot mixes based on encountered conditions?

A54: Design of grout mixes and lab testing are incidental to the work.

Q55: Drawing 430-SOE-15 shows 40 primary holes evenly distributed around the slurry wall shaft, approximately 5' off its outside diameter. The drawing also shows that the typical spacing between two Primary 3 holes or a Primary 1 and Primary 2 hole is 20'. These dimensions appear to be incompatible.
o For holes located 5' outside the outer edge of the slurry wall, 43 holes would be necessary to maintain about 20' spacing between holes.

o For 40 EA holes and 20' spacing between holes, the diameter of the circle would be need to be 127'-4". This would fall directly inside the slurry wall.
o To maintain the 40 EA holes located 5' outside the outer diameter of the slurry wall, hole spacing would need to be increased to 21'-9". Please clarify.

A55: Contractor must bid using the design details on Drawing 430-SOE-15 in their bid price. Actual distances may be adjusted in the field during construction upon agreement from Owner.

Q56: Micropile detail shows a compression plate at the top of the casing. Please give details for size and steel grade required.

A56: The plate shown on top of the micropile casing was removed from Drawing 430-S-49, refer to Item 2.4 in Addendum No. 8.

Q57: Specification 31 63 33 Section 3.03.2.H- States that "the test results must be reviewed and accepted by the Engineer before beginning the construction of any production piles represented by the test pile"
Question- Can you please advise the number of days it will take for this review process to be completed so that the micropile installer can incorporate downtime for crews while waiting for approval to start production piles.

A57: Refer to Section 01 33 00, Part 1.07.B.1.

Q58: Specification 31 33 01 Section 3.02.B.3.C- States that "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."
Question- At what increments should downhole surveying be performed?

A58: Once at the top of the 20 feet.

Q59: Specification 31 33 01 Section 3.02.B.3.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."
Question- Section 31 09 13 does not specify what diameter the holes should be cored to, please advise core hole size.

A59: Contractor to decide based on means and methods.

Q60: Specification 31 33 01 - Question- If holes can be cored to a smaller size than final requirements can the hole be opened to the final diameter using a down the hole hammer, water, and air?

A60: Yes.

Q61: Specification 31 33 01 - Question- For the 2 holes that are to be cored drilled will the entire hole need to be logged /inspected or just the rock from elevation 640-615 as indicted in spec section 31 09 13?

A61: Coring is only required in the elevation ranges stated in the specification.

Q62: My name is Boyd with Mazzella lifting companies.
We have had a few different companies reach out to us with requests to quote your new building's crane requirements.

However we have drawings for the radial cranes, they do not provide us enough information to quote them.

What is the capacity?
How much cantilever is needed on the extended bridge?
The span between the runways is 20'?
What is the curve radius for these runways?
How many feet in total length are the inner and outer runways?
What will the support spans be for each runway?
What will the runways be mounted to?

A62: Refer to reissued Section 41 22 13.13 provided in Addendum No. 6 for additional information on the radial crane requirements. 430-M-01 and 430-M-02 show the total length of crane runways. Radial crane runway mounting is shown on 430-S-16.

Q63: Replacement of Existing 1494 and 1500 Control Cables Drawing 430-ES-08
The 1800-E Contractor will be responsible for the loop drawings, loop testing for all new and replaced control cable. Will the 1800-E Contractor be responsible for functional testing of the existing medium voltage equipment and controls in the 650 Building and the 500 Building? As an example, the control interconnection between existing SWG008-650 and the existing 5kV Benchboard in Building 500 and the 125VDC control cables from 650 to the 125VDC controls in the 500 Building. Will the 1800-E Contract be responsible for the functional testing for remote operability of the 650 Medium Voltage equipment that is controlled by the Building 500 Benchboard?

A63: 1800-E Contractor will be responsible for functional testing of existing medium voltage equipment and controls in building 650 and 500.

Q64: Reference specification section 41 22 13.13 Radial Bridge Cranes and Hoists :
There is no Span, Capacity, or Hook Height indicated, and it appears that the paragraph 2.03 Operating Requirements table is missing or incomplete. Based on our communication so far, with the many crane and hoist contractors that typically work in this area and on these types of projects, we are unlikely to receive any bids for these two radial cranes. And telling them it's a delegated design isn't going to change their minds. Please consider providing some specifications for these radial bridge cranes

A64: Refer to reissued Section 41 22 13.13 provided in Addendum No. 6 for additional

information on the radial crane requirements.

Q65: Reference Geotechnical Baseline Report (GBR) Section 6.1.2 : Please provide clarification regarding application of the plus/minus percentages included in Table 6-1. Are these percentages to be applied to the total depth (or volume) of rock or to the expected proportional quantities of the individual material types? Further, please clarify how "…interbeds, laminations, nodules or stringers of the other primary rock types…" will be included in the proportional quantities of the individual material types provided in Table 6-1.

A65: Table 6-1 represents the baseline volume of each type of rock that will be encountered during the shaft excavation as a percentage of the total excavation.

Q66: Reference GBR Tables 6-2 to 6-5 : This table includes baseline values for various soil and rock engineering properties. Please confirm that the minimum, average and maximum values are to be understood as triangular probability distributions whereby the baseline will not be interpreted to represent that all material could exhibit characteristics at (or near) the maximum or minimum values.

A66: Contractor is responsible for formulating its bid based on the baselines provided in the GBR and the data provided in the GDR.

Q67: Reference GBR Section 6 : Baselines rock mass quality using the Rock Mass Rating (RMR) system for 10-foot intervals of depth with 85% of the rock classified as Fair to Very Good Rock and 15% classified as Poor or Very Poor Rock. Please clarify the percentages of material within the Fair, Good and Very Good Rock categories as these will influence estimates of productivity.

A67: Contractor is responsible for formulating its bid based on the baselines provided in the GBR and the data provided in the GDR.

Q68: Reference GBR Section 6 : Baselines rock mass quality using the Rock Mass Rating (RMR) system for 10-foot intervals of depth. Please clarify how the RMR will be defined in the field if conditions are alleged to be different than baselined given that RMR utilizes subjective definitions in the factors leading to a final RMR judgement

A68: RMR will be determined using industry standards.

Q69: Reference GBR Section 6.4.3 : This provides a baseline rock mass hydraulic conductivity ranging from less than 1x10-7 cm/sec to 1x10-1 cm/sec. This baseline range is unusable for pricing and planning purposes with respect to water flow and grouting requirements, given that it spans 6 orders of magnitude. Please confirm that the provisional quantities or allowances for crew hours and grout volumes are intended to address the uncertainties related to grout volumes related to cut-off of the bedrock discontinuities that will contribute to groundwater flow

A69: Inflows are baselined in GBR, Section 7.3. Grout material is paid for under

Specific Allowance #13. Pre-excavation and cutoff grouting criteria are included in Specification Section 31 23 20.

Q70: Reference GBR Section 7.1 : This includes a table of the expected interface elevations for the various baseline strata. Please confirm that the average values can be used for pricing and that bidders are not expected to price conditions where the interface elevation is entirely at (or close to) the minimum or maximum values defined by the plus/minus values

A70: Contractor is responsible for formulating its bid based on the baselines provided in the GBR and the data provided in the GDR.

Q71: Reference GBR Section 7.2.1 : This states that 5%, by volume, of the slurry wall panels within the Fill, Alluvium and Residuum will consist of obstructions. Section 7.2.2 defines "stoppages" based on an advance rate and duration for attempting to clear the obstruction and notes that after the criteria have been met, an allowance will be used to address costs. However, the GBR also states that the Fill can include steel. Encountering large steel objects (e.g., beams, railroad track pieces, buried machinery) are unlikely to be broken by mechanical means and could severely damage the diaphragm wall equipment, especially if continued attempts are made for the criterion of 4 hours used in the stoppages definition. Please quantify expectations for downtime and equipment damage associated with encountering steel or other metallic obstructions.

A71: The Contractor is responsible for selection of proper equipment/tooling. The causes of damages will be reviewed should an event occur.

Q72: Reference GBR Section 7.3 : This includes a baseline groundwater steady state inflow rate of 1,500 GPM, with additional transient inflows of up to 250 GPM for two weeks. The GBR does not, however, clarify how many transient inflows might occur over any given depth of excavation. Please confirm that the maximum flow rate for steady state and transient flows at any time would be 1750 GPM.

A72: Contractor shall be responsible for additional transient flows of up to 250 GPM.

Q73: Reference GBR Section 7.3 : Please confirm that the baseline inflow rate represents inflow rates after pre-excavation grouting. The GBR does not provide rationale for this number as compared to the range of hydraulic conductivity nor the expected effectiveness of pre-excavation grouting

A73: The baseline inflow rate of 1,500 is after pre-excavation and cutoff grouting as indicated in GBR Section 7.3.

Q74: Reference GBR : It is silent regarding in situ rock stresses. Please confirm that adverse rock behavior related to in situ stresses is not of concern for bidders.

A74: No change to the GBR. Values are as provided.

Q75: How will the verification holes listed in Specification Section 31 23 20.1.08.A.d and in Note 5.5 on Sheet 430-SOE-15 be paid?

A75: Yes, verification holes are paid under the same drilling and grouting item as described in Pay Items #4, #5, #7, and #24. See 430-SOE-15 for verification hole requirements after Primary 3 grout holes.

Q76: Reference specification section 43 23 03 paragraphs 1.07.B.2.a & 1.07.B.2.c : These paragraphs indicate reduced speed tests are required. We can plot Condition B and C from section 43 23 16 1.01.E by using the Affinity Laws. We cannot test with 13,800volt VFD. Will this be acceptable ?

A76: Plotting reduced speed conditions based on the certified performance curve through Affinity Laws is acceptable instead of reduced speed factory performance tests.

Q77: Reference drawing 430-SD-03, detail S37003 : Lifting Eye. How many are required ? Where are they located ?

A77: No lifting eyes are required. Refer to Item 2.3 in Addendum No. 8.

Q78: Reference drawings 430-S-05&07 : The first lift of the outer one-sided shaft wall is indicated as a 4-foot-high starter wall. Can this be taller ?

A78: The requirements for minimum starter wall and maximum construction joint (CJ) spacing as specified on the Contract Drawings. Alternate CJ layouts proposed by the Contractor are subject to review and approval by the Engineer.

Q79: Reference the outer one-sided shaft wall : Please confirm that it is acceptable to break each 10-foot-high circumferential placement lift into four sections utilizing four vertical construction joints within each lift.

A79: Vertical construction joints are permitted. Constraints on locations of construction joints are indicated in the Contract Documents. Contractor may propose additional construction joint locations subject to review and approval of Engineer.

Q80: Referring to Vol. 1, Art. 3, Sec 3.29b-TIME FOR COMPLETION, MILESTONE DATES- Schedule, the specifications reference that the Contract Schedule must demonstrate the Contractor's ability to meet "Project Milestones," but no specific Project Milestones appear to be identified in the Contract Documents provided to date.

a. Can you please advise if there are any defined Project Milestones required for this project?

b. Can you please confirm where the specification states "Where the achievement of a Project Milestone is dependent upon the Contractor's completion of all or any portion of the Work to be performed under this Contract, a "Construction Milestone" applicable to the Contractor's Work will be established

by the Owner and incorporated by the Contractor into the Contract Schedule." That the only two Construction Milestones required to be incorporated into the Project Schedule are, Substantial Completion and Final Completion, as referenced in the Contract Agreement?.

A80: The Project Milestones for this project are the Construction Milestones defined in the tables on page 4-2 of Article 4 (Contract Agreements) for the respective contracts.

Q81: Referring to Vol. 1, EXHIBIT "A-3SC"-INSURANCE-Property Insurance (4) - "Include Coverage for loss of use or time delay"
b. Please provide a daily cost for the "loss of use" beyond the contractual completion date as well as the coverage duration this policy should be in place through so our Insurance Broker can responsibly provide us with quote for this Builders Risk Insurance requirement. .

A81: Refer to responses to Question 10 and Question 28 in Addendum No. 7.

Q82: Where these areas overlap the slurry wall footprint of the proposed WWPS, the surcharge limitations are an order of magnitude lower than standard slurry wall construction equipment. Has the Owner's consultant verified that industry standard equipment can construct the slurry wall given the geometry proposed location since accurate dimensions have not been provided? Have provisions for working platform/ working bridge foundations been made in this area to allow construction given the overlap with the proposed shaft?.

A82: Adjacent to the river wall, heavy equipment may be positioned inside of the shaft footprint (east of the slurry wall panels) or other methods of distributing pressures may be used as needed. The surcharge limits (that is, 300 psf and 600 psf) refer to the average pressure of construction equipment over its footprint.

Q83: 1800-E Quality Control Representative
Will the 1800-E Contractor be responsible for having a full-time Quality Control Representative on project site whenever 1800-E Contract work is in progress in the field in accordance with 01 11 00-14 1.15 2. Quality Control Representative.

A83: Yes.

Q84: 1800-E Safety and Protection Representative
Will the 1800-E Contractor be responsible for having a full-time Safety and Protection Representative on the project site whenever 1800-E Contract work is in progress in the field in accordance with 01 11 00-15 3. Safety and Protection Representative.

A84: Yes.

END OF ADDENDUM No. 8

ATTACHMENT – A

Addendum No. 8 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.~~	ADD. NO. 8
	ASTM D374, Test Method for Thickness of Solid Electrical Insulation.	
	ASTM D543, Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.	ADD. NO. 8
	~~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.	

Reference	Title
	ASTM D4533, Standard Test Method of Trapezoid Tearing Strength of Geotextiles.
	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.
	ASTM D5602, Standard Test Method for Static Puncture Resistance of Roofing Membrane Specimens
	ASTM D5635, Standard Test Method for Dynamic Puncture Resistance of Roofing Membrane Specimens
European Standard	EN 1847, Flexible Sheets for Waterproofing – Plastic and Rubber Sheets for Roof Waterproofing – Methods for Exposure to Liquid Chemicals, Including Water
	EN 14415, Geosynthetic Barriers – Test Method for Determining the Resistance to Leaching

ADD. NO. 8

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. A copy of this specification section with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. ADD. NO. 8
   3. Check-marks (✓) shall denote full compliance with a paragraph as a whole. Deviations shall be underlined and denoted by a number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Include a detailed, written justification for each deviation. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration. ADD. NO. 8
   4. 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.
   5. 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.

6. 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.
7. 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.
8. 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.
9. 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.
10. 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	*See Footnote
~~Flammability~~	~~Self-extinguishing~~	~~D568~~
Puncture Resistance		
Static	Pass, 50 lbf	ASTM D5602
Dynamic	Pass, 5 J	ASTM D5635
~~Mechanical Puncture Resistance~~	~~65 in~~	~~DIN 16726 5.12~~
~~Dielectric Strength~~	~~544 V/mil~~	~~D149~~

ADD. NO. 4

ADD. NO. 8

Footnote: Chemical resistance may be demonstrated using any combination of the following procedures: ASTM D543, EN 1847, and/or EN 14415.

1. PVC membrane to be as follows:
   a. SikaPlan WP 1130 or WP 1125 – HL2 by SIKA Corporation
   b. T100-NR by CETCO
   ~~c. DonProof PT by Don Construction Products Inc~~
   d. Approved equal

ADD. NO. 8

2.02 ACCESSORIES

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

ADD. NO. 8

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 compartment ~~section~~ against the surface to prevent ingress of concrete or grout between the membrane and the surface. ADD. NO. 8

~~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.~~ ADD. NO. 8

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~~ two percent of the total hole depth. ADD. NO. 8

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.~~

ADD. NO. 8

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~~.
   2. Use casing through soil subsurface materials for all grout holes advanced from the surface.

ADD. NO. 4

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~~ a maximum of 10 feet below the top of rock, per requirements herein.
   2. Perform water pressure test and inject grout into holes within ~~72~~ 96 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.

ADD. NO. 8

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~~ 96 hours of initial drilling.

ADD. NO. 8

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~~ 36	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)	>4	>4	>4	>4
Final Gel Time (hours)	>6	>6	>5	>4
Initial set time (hours)	< 12	< 8	< 6	< 4
Final set time (hours)	< 18	< 12	< 10	< 8

ADD. NO. 8

ADD. NO. 8

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~~ 0.02 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.

ADD. NO. 8

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.

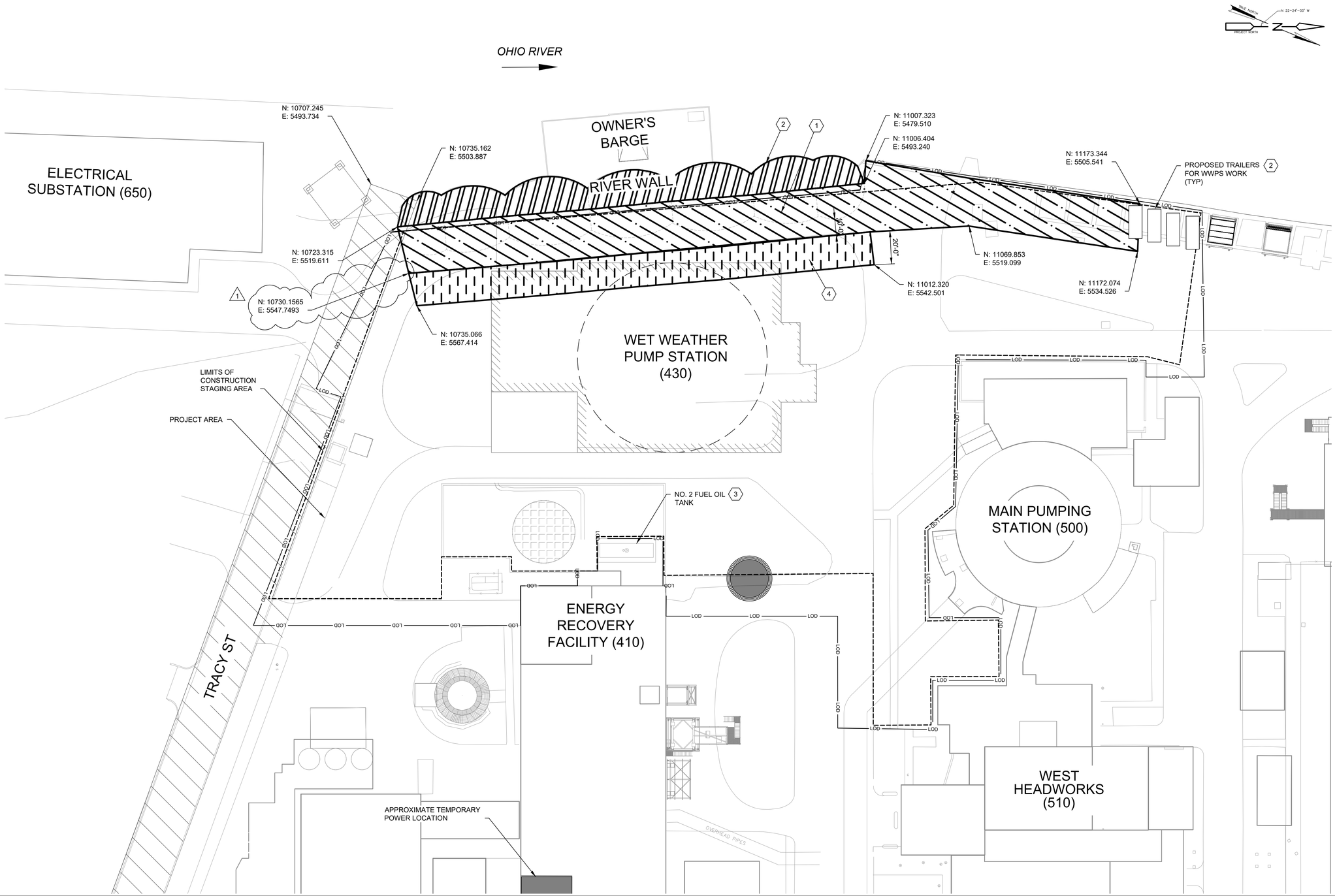
END OF SECTION

ATTACHMENT – B

Addendum No. 8 Drawings

KEYNOTES:

1. WITHIN LIMITED LOADING ACCESS AREA, THE MAXIMUM LOADING OF 300 PSF SHALL NOT BE EXCEEDED.
2. WITHIN THE NO VEHICULAR TRAFFIC ACCESS AREA, THE MAXIMUM LOADING OF 100 PSF SHALL NOT BE EXCEEDED AND NO VEHICLES ARE PERMITTED. AREA SHALL REMAIN FREE OF OBSTRUCTION FOR ALCOSAN STAFF EGRESS.
3. OWNER ACCESS TO NO. 2 FUEL OIL TANK SHALL REMAIN FULLY ACCESSIBLE.
4. WITHIN LIMITED LOADING ACCESS AREA THE MAXIMUM LOADING OF 600 PSF SHALL NOT BE EXCEEDED.



LEGEND

- NO VEHICULAR TRAFFIC ACCESS AREA
- RESTRICTED VEHICLE ACCESS AREA
- LIMITED LOADING ACCESS AREA (MAX 300 PSF)
- LIMITED LOADING ACCESS AREA (MAX 600 PSF)
- LIMITS OF CONTRACTOR STAGING AREA
- LIMITS OF DISTURBANCE

0 30' 60'
SCALE: 1"=30'

Designed by:	REVISION			
D.SIGLER	REV No.	DATE	DESCRIPTION	APPV
Drawn by:	0	5/16/25	ISSUED FOR BID	DS
D.SIGLER	1	8/8/25	ADD. 8 LOADING ZONE NORTHING AND EASTING	DS
Checked by:				
J.IFFT				

Brown AND Caldwell

Signer Name: DeAnna Sigler
Signing Reason: I approved this document.
Signing Time: 2025-08-05 17:36:13(EDT)

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DEANNA SIGLER
ENGINEER
PE094121

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

000-G-07
WWPS SITE LAYDOWN, STORAGE AND ACCESS PLAN

Contract:	1800
CAD File Name:	000-G-07.dwg
Date:	5/16/2025
Sheet:	7 of 405

Path: C:\BCPW\D3328365 FILENAME: 000-G-07.DWG PLOT DATE: 8/5/2025 8:58 AM CAD USER: DEANNA SIGLER

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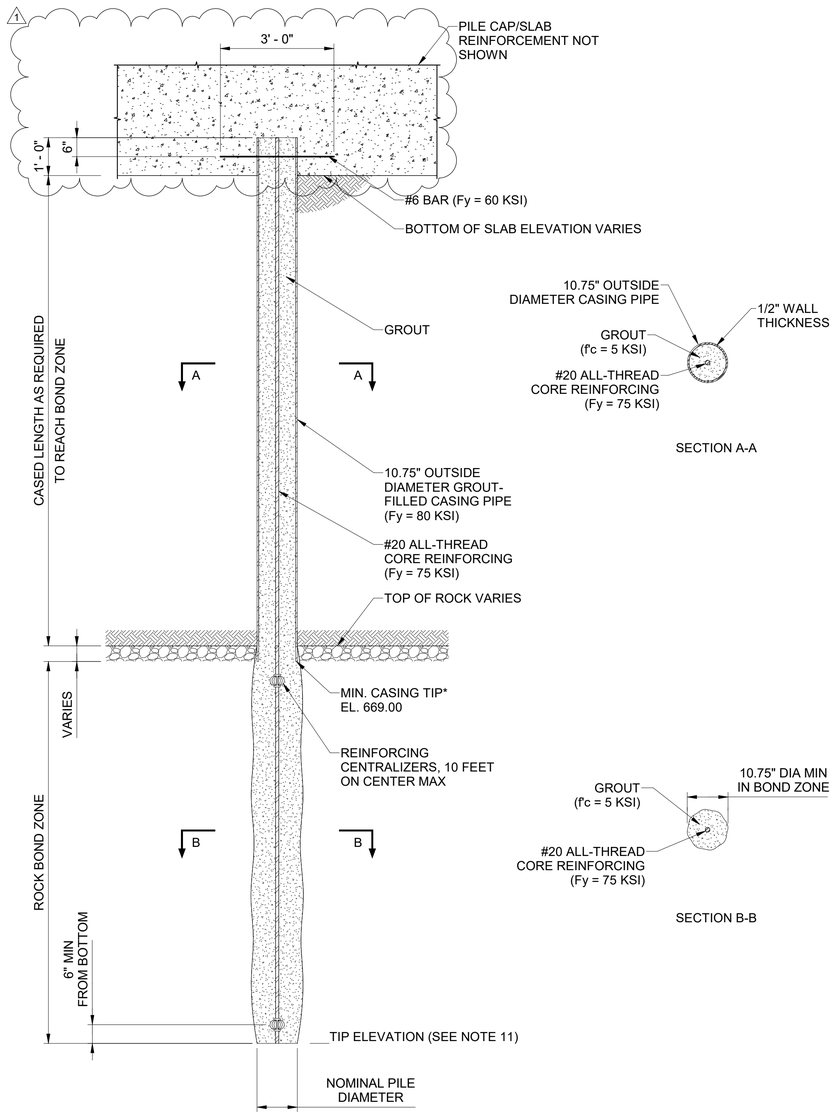


* ANY CONTRACTOR DESIGNED ALTERNATIVES ARE REQUIRED TO BE SUPPORTED AT ELEVATION 669.00 OR LOWER.

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

NORTH SIDE MICROPILE ELEVATIONS (FT.)

BOREHOLE NO.	BOTTOM OF SLAB	APPROX. TOP OF ROCK	ESTIMATED TOP OF BOND ZONE	NON-BEARING STRATA		ESTIMATED TIP ELEVATION
				TOP OF ALLUVIUM LAYER	TOP OF RESIDUUM LAYER	
FD-70-001	707.75/706.75	677.71	669.00	697.81	681.81	654.00
FD-70-002	707.75/706.75	676.25	669.00	696.65	680.55	654.00
FD-70-003	707.75/706.75	677.36	669.00	689.46	680.66	654.00
PP-04-001B	707.75/706.75	677.95	669.00	695.45	686.05	654.00

SOUTH SIDE MICROPILE ELEVATIONS (FT.)

BOREHOLE NO.	BOTTOM OF SLAB	APPROX. TOP OF ROCK	ESTIMATED TOP OF BOND ZONE	NON-BEARING STRATA		ESTIMATED TIP ELEVATION
				TOP OF ALLUVIUM LAYER	TOP OF RESIDUUM LAYER	
FD-70-001	724.25'	677.71	669.00	697.81	681.81	654.00
FD-70-002	724.25'	676.25	669.00	696.65	680.55	654.00
FD-70-003	724.25'	677.36	669.00	689.46	680.66	654.00
PP-04-001B	724.25'	677.95	669.00	695.45	686.05	654.00

OVERALL FOUNDATION PARAMETERS

STATIC LOADS: (KIPS)	
MAXIMUM DESIGN AXIAL PILE LOAD (DL)	= 258.00
MINIMUM DESIGN AXIAL PILE LOAD	= 0.00
MAXIMUM DESIGN LATERAL PILE LOAD	= 0.20
MAXIMUM AXIAL PILE LOAD[1]	= 516.00

[1] DESIGN LOAD FOR MICROPILE STATIC VERIFICATION LOAD TEST.

GENERAL NOTES:

1. INSTALL 10.75 INCH DIAMETER MICROPILES WITH AN ALLOWABLE DESIGN LOAD (DL) OF 258.00 KIPS IN AXIAL COMPRESSION AND 0.19 KIPS LATERAL. ALL PILES SHALL ACHIEVE CAPACITY IN BEDROCK BELOW EL. 669.00.
2. PERFORM MICROPILE INSTALLATION AND TESTING IN ACCORDANCE WITH SECTION 31 63 33.
3. PROVIDE MICROPILE CASING MEETING ASTM A-252 GRADE 3 WITH A MINIMUM YIELD STRENGTH OF 80 KSI.
4. PROVIDE GRADE 75 ALL-THREAD REINFORCING STEEL BARS FOR MICROPILE CORE REINFORCING MEETING THE REQUIREMENTS OF ASTM A615. PROVIDE ASTM A108 HEX NUTS AND ASTM F413 WASHERS.
5. USE NEAT CEMENT GROUT WITH f'c = 5,000 PSI FOR MICROPILES.
6. BOND ZONE LENGTHS ARE ESTIMATED TO BE 15.00 FEET INTO ROCK. ACTUAL BOND ZONE ELEVATIONS SHALL BE BASED ON LOAD TEST DATA.
7. PERFORM TWO AXIAL VERIFICATION LOAD TESTS IN COMPRESSION IN ACCORDANCE WITH SECTION 31 63 33, AT LOCATIONS ON THE PLAN. TEST VERIFICATION PILES TO 2.0DL.
8. PERFORM AXIAL PROOF LOAD TESTS ON THE PROOF TEST PILES SHOWN ON DRAWINGS IN ACCORDANCE WITH SECTION 31 63 33. TEST PROOF PILES TO 1.6DL.
9. THE ESTIMATED MICROPILE TIP ELEVATION IS 654.00. THE ESTIMATED TIP ELEVATION IS ESTIMATED FOR BID PURPOSE ONLY. THE FINAL TIP ELEVATION SHALL BE DETERMINED BASED ON INSTALLATION METHOD AND VERIFICATION TEST RESULTS.
10. FINAL MICROPILE LAYOUT SHALL BE COORDINATED WITH THE AS-BUILT LOCATION OF THE SLURRY WALL AND SHAFT INITIAL SUPPORT.
11. 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.
12. PILES SHALL BE CUT BACK TO AN ELEVATION TO ACHIEVE 12" EMBEDMENT INTO PILE CAP/SLAB.

0 1' 2' 4'
SCALE : 1/2 = 1'-0"

Path: BIM 360://170064 - ALCOSAN Wet Weather PS/170064-S-430V21.rvt
Plot Date: 8/5/2025 11:32:39 AM

Designed by:	A.KEARNS
Drawn by:	T.WIBLE
Checked by:	J.MINADEO

REVISION

REV No.	DATE	DESCRIPTION	APPV
0	5/16/25	ISSUED FOR BID	JM
1	8/8/25	ADD. 8 - REMOVE PLATE AT TOP OF MICROPILE	JM

Brown AND Caldwell

Signer Name: Justin Minadeo
Signing Reason: I approved this document.
Signing Time: 2025-08-05 17:39:18(EDT)

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL JUSTIN C MINADEO ENGINEER PE082048

alcosan allegheny county sanitary authority

ARLETTA SCOTT WILLIAMS
EXECUTIVE DIRECTOR, ALCOSAN

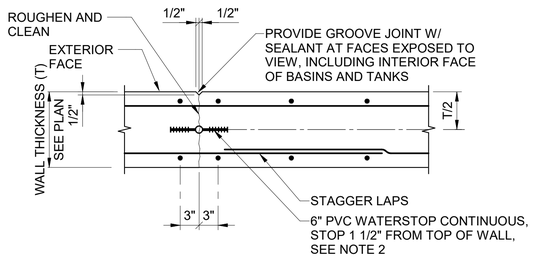
3300 PREBLE AVE.
PITTSBURGH, PA 15233
(412) 766 - 4810

www.alcosan.org

ALLEGHENY COUNTY SANITARY AUTHORITY
WASTEWATER TREATMENT PLANT
WET WEATHER PUMP STATION

430-S-49
PILE DETAILS

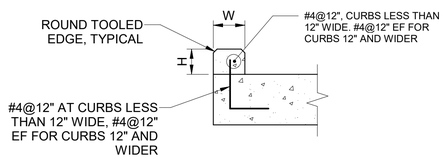
Contract:	1800
CAD File Name:	
Date:	5/16/2025
Sheet:	177 of 405



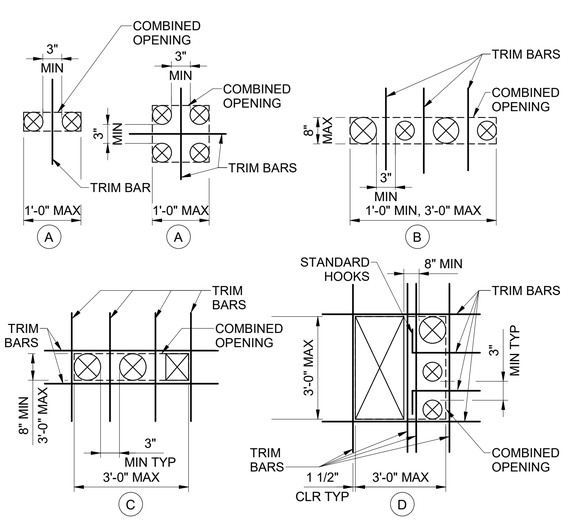
NOTES:

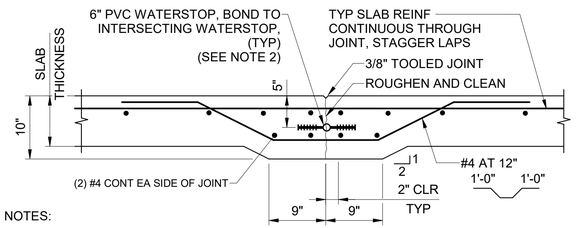
1. ALL REINFORCING SHALL BE CONTINUOUS THROUGH JOINT.
2. WATERSTOP REQUIRED AT LIQUID HOLDING BASINS AND TANKS, AND BELOW GRADE WALLS.

S34004 VERTICAL WALL CONSTRUCTION JOINT
NTS



S39004 CONCRETE CURB
NTS

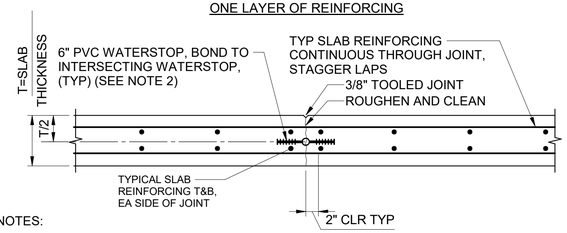




NOTES:

1. 10" THICKENED SLAB AND ADDITIONAL #4 REQUIRED ONLY AT JOINTS WITH WATERSTOPS.
2. FOR SLABS 10" THICK OR GREATER, NO THICKENING REQUIRED.

ONE LAYER OF REINFORCING



NOTES:

1. ALL REINFORCING SHALL BE CONTINUOUS THROUGH JOINT.
2. WATERSTOP REQUIRED AT LIQUID HOLDING BASINS AND TANKS, AND BELOW GRADE SLABS.
3. FOR SHAFT BASE SLAB CONSTRUCTION JOINT DETAIL, SEE DRAWING 430-SD-10.

DOUBLE MAT OF REINFORCING

S34008 SLAB CONSTRUCTION JOINTS
NTS

TRIM BAR NOTES:

1. OPENINGS IN CONCRETE WHICH ARE CLOSER TO ONE ANOTHER THAN THE DIAMETER OR SHORTER SIDE OF THE LARGER OF THE TWO ARE CONSIDERED TO FORM A COMBINED OPENING.
2. THESE DIAGRAMS ARE FOR COMBINED OPENINGS WHOSE LARGER DIMENSION DOES NOT EXCEED 3'-0". SEE DRAWINGS FOR "ADDITIONAL REINFORCING AT OPENINGS" DETAIL FOR LARGER COMBINED OPENINGS
3. TRIM BAR SIZE IS SELECTED TO MATCH TYPICAL WALL OR SLAB REINFORCING IN EACH DIRECTION. PLACE TRIM BARS AT EACH FACE OR LAYER OF TYPICAL REINFORCING.
4. TRIM BAR EXTENSION PAST EDGES OF COMBINED OPENINGS SHALL BE 1'-0" FOR #4 BARS, 1'-6" FOR #5 BARS, AND ONE DEVELOPMENT LENGTH FOR LARGER BARS.
5. DISPLACE PRINCIPAL REINFORCEMENT TO EACH SIDE OF COMBINED OPENING OR PLACE BETWEEN INDIVIDUAL OPENINGS. DO NOT CUT PRINCIPAL REINFORCEMENT.
6. SEE " ADDITIONAL REINFORCING AT OPENINGS" DETAIL FOR TRIM BARS FOR INDIVIDUAL OPENINGS.
7. SUBMIT SPECIAL SITUATIONS TO ENGINEER FOR REVIEW.

TRIM BAR REQUIREMENTS:

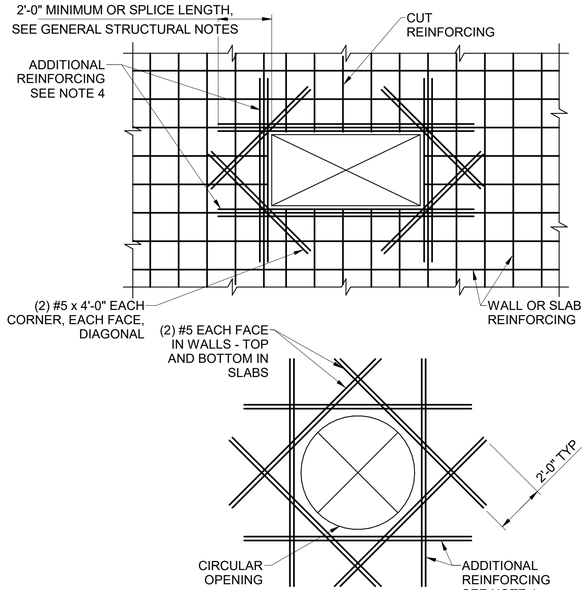
(A) IF THE COMBINED OPENING IS SMALLER THAN 1'-0", PROVIDE (1) #5 EACH FACE BETWEEN OPENINGS.

(B) IF THE LARGER DIMENSION OF A COMBINED OPENING EXCEEDS 1'-0" BUT THE SMALLER DIMENSION IS LESS THAN OR EQUAL TO 8", AND PROVIDED THE COMBINED OPENING IS ALIGNED WITH THE PRINCIPAL REINFORCEMENT, PROVIDE (1) #5 EACH FACE BETWEEN OPENINGS.

(C) IN OTHER CASES WHERE OPENINGS ARE ARRANGED IN A SINGLE LINE, PROVIDE (1) #5 EACH FACE BETWEEN OPENINGS AND (1) #5 EACH FACE AROUND PERIMETER OF COMBINED OPENING.

(D) WHERE INDIVIDUAL OPENINGS OF A COMBINED OPENING FORM TWO OR MORE ROWS, SEPARATE THE ROWS BY AT LEAST 8" OF CONCRETE. PROVIDE (2) #5 EACH FACE BETWEEN ROWS OF OPENINGS, (1) #5 EACH FACE BETWEEN OPENINGS IN THE PERPENDICULAR DIRECTION, AND (1) #5 EACH FACE AROUND THE PERIMETER OF COMBINED OPENINGS. PROVIDE STANDARD HOOKS WHERE BARS TERMINATE WITHIN THE COMBINED OPENING.

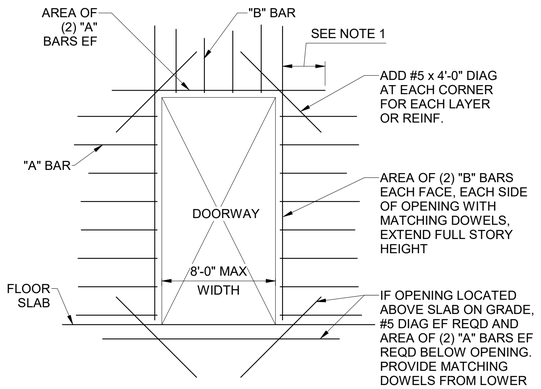
S35003 COMBINED OPENING TRIM BARS
NTS



ADDITIONAL REINFORCING NOTES:

1. THIS DETAIL APPLIES TO OPENINGS UP TO 3'-0" MAXIMUM DIMENSION, UNLESS OTHERWISE SHOWN ON THE DRAWINGS. AT OPENINGS 12" OR LESS, NO ADDITIONAL #5 DIAGONAL REINFORCING IS REQUIRED UNLESS OTHERWISE NOTED. REINFORCING SHALL BE OFFSET, STILL MAINTAINING REQUIRED SPACING, TO ALLOW FOR OPENING WHERE PRACTICAL, OR CUT AT THE OPENING AND ADDITIONAL REINFORCING ADDED PER NOTE 4.
2. OPENINGS ARE NOT ALL SHOWN ON STRUCTURAL DRAWINGS. PROVIDE OPENINGS IN ACCORDANCE WITH ARCHITECTURAL, MECHANICAL, AND OTHER CONTRACT DRAWINGS.
3. ADDITIONAL REINFORCEMENT MAY BE OMITTED WHERE OPENING IS FRAMED BY BEAMS OR WALLS.
4. ADDITIONAL REINFORCING (4) SIDES OF OPENING, EACH FACE, EQUAL TO NUMBER AND SIZE OF CUT REINFORCING. WHERE AN ODD NUMBER OF REBAR ARE CUT, PROVIDE (ODD NO. +1)/2 EACH SIDE OF OPENING (MIN 2 ADDITIONAL BARS EACH SIDE).
5. MINIMUM SPACING BETWEEN OPENINGS TO BE 2X MAXIMUM OPENING SIZE.
6. OPENINGS SPACED CLOSER THAN THE MINIMUM SPACING SHALL BE REINFORCED AS A SINGLE OPENING.
7. OPENINGS LARGER THAN ALLOWED ON THIS DETAIL REQUIRE CONSULTATION WITH THE STRUCTURAL ENGINEER.

S35001 ADDITIONAL REINFORCING AT OPENINGS
NTS



NOTES:

1. PROVIDE MINIMUM LAP, SEE GENERAL STRUCTURAL NOTES.
2. TYPICAL FOR ALL DOORWAY OPENINGS IN ABOVE GROUND BUILDING CONCRETE WALLS UNLESS INDICATED OTHERWISE ON PLANS. TYPICAL FOR ALL DOORWAY OPENINGS IN BUILDINGS AND UTILIDORS AT GALLERY LEVEL UNLESS INDICATED OTHERWISE ON PLANS.

S35005 DOORWAY OPENING REINFORCING
NTS

1

Designed by: A.KEARNS	REVISION			
	REV No.	DATE	DESCRIPTION	APPV
Drawn by: T.WIBLE	0	5/16/25	ISSUED FOR BID	JM
	1	8/8/25	ADD. 8 - REMOVE LIFTING EYE DETAIL	JM
Checked by: J.MINADEO				

Brown AND Caldwell

Signer Name: Justin Minadeo
Signing Reason: I approved this document.
Signing Time: 2025-08-05 17:39:18(EDT)

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL JUSTIN C MINADEO ENGINEER PE082048

ARLETTA SCOTT WILLIAMS
EXECUTIVE DIRECTOR, ALCOSAN

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

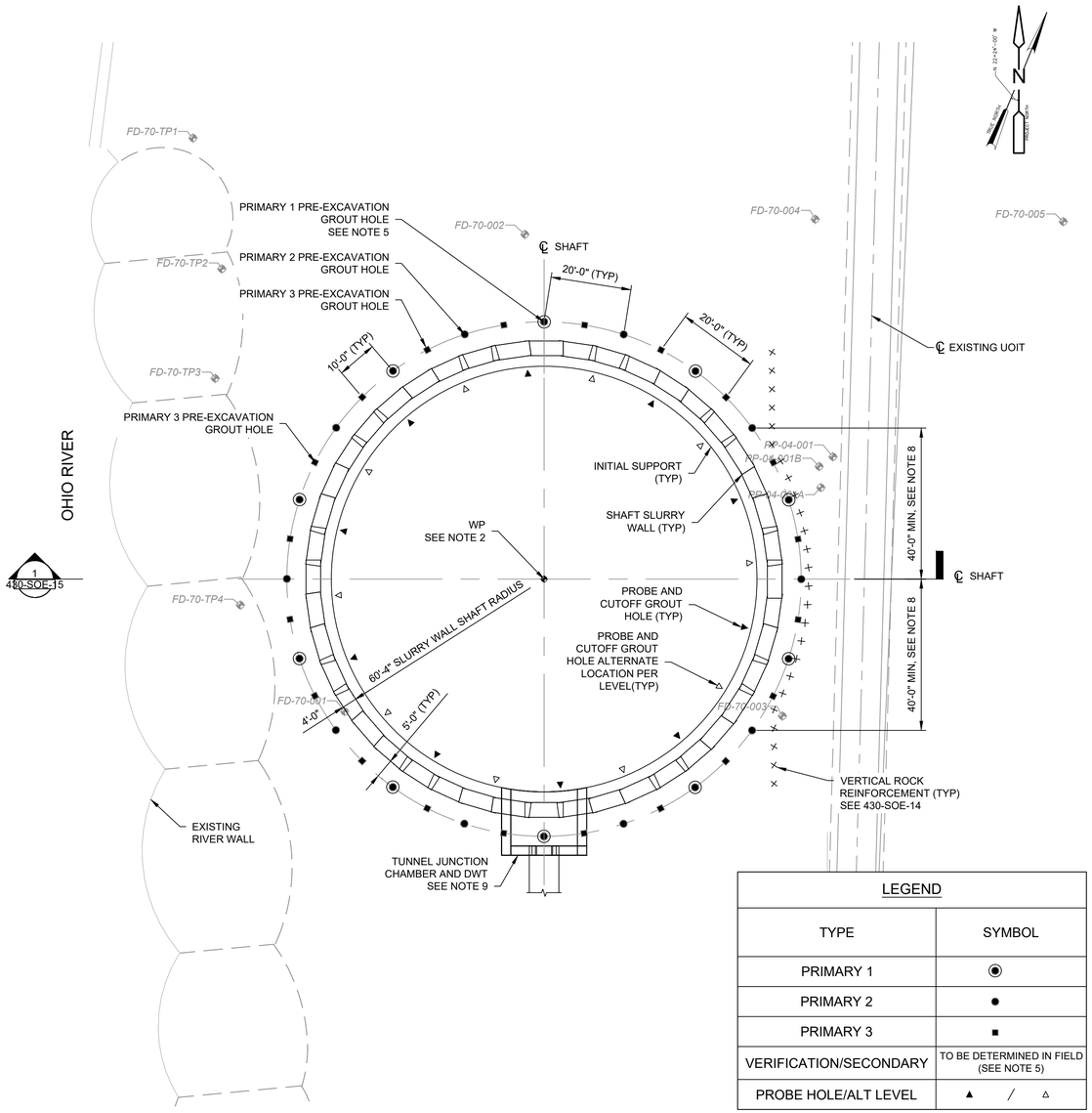
www.alcosan.org

ALLEGHENY COUNTY SANITARY AUTHORITY
WASTEWATER TREATMENT PLANT
WET WEATHER PUMP STATION

430-SD-03
DETAILS 3

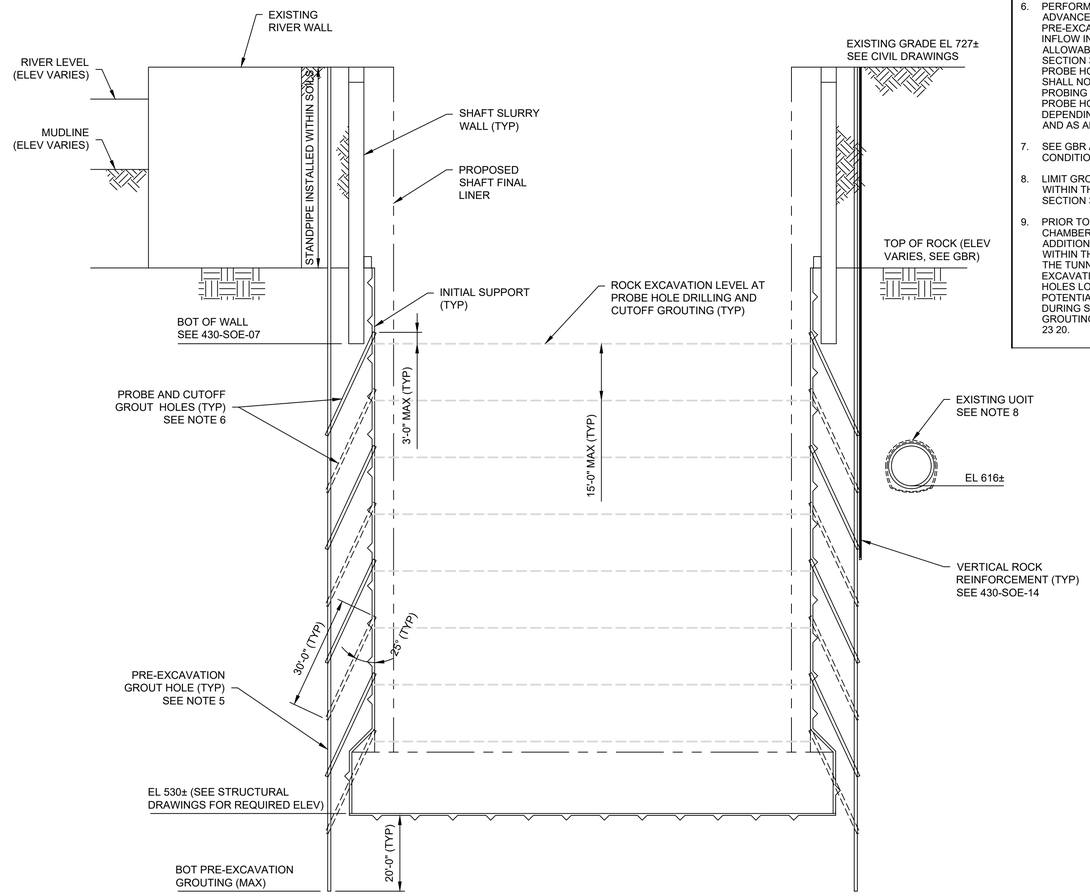
Contract:	1800
CAD File Name:	
Date:	5/16/2025
Sheet:	199 of 405

Path: BIM 360://170064 - ALCOSAN Wet Weather PS/170064-S-430V21.rvt
Plot Date: 8/5/2025 11:32:38 AM



LEGEND	
TYPE	SYMBOL
PRIMARY 1	◉
PRIMARY 2	●
PRIMARY 3	■
VERIFICATION/SECONDARY	TO BE DETERMINED IN FIELD (SEE NOTE 5)
PROBE HOLE/ALT LEVEL	▲ / △

1 PRE-EXCAVATION GROUTING PLAN



1 SECTION VIEW
1 430-SOE-15

GENERAL NOTES:

1. REFER TO SPECIFICATION SECTION 31 23 20 FOR DETAILS.
2. FOR COORDINATES ASSOCIATED WITH THE WORKING POINT SEE CIVIL DRAWINGS.
3. ROCK INITIAL SUPPORT NOT SHOWN FOR CLARITY.
4. PRE-EXCAVATION GROUTING TO BE PERFORMED PRIOR TO SHAFT EXCAVATION. PRE-EXCAVATION GROUTING SHALL BE LOCATED A MINIMUM OF 2 FEET FROM THE EXISTING BORINGS.
5. REQUIRED PRE-EXCAVATION GROUTING SEQUENCE:
   1. DRILL,TEST, AND GROUT ALL PRIMARY 1 HOLES
   2. DRILL,TEST, AND GROUT ALL PRIMARY 2 HOLES
   3. DRILL,TEST, AND GROUT ALL PRIMARY 3 HOLES
   4. IF REQUIRED, DRILL, TEST AND GROUT SECONDARY HOLES PER CONTRACT SPECIFICATION REQUIREMENTS.
   5. PERFORM VERIFICATION HOLES. PROVIDE A MINIMUM OF 10 VERIFICATION HOLES, SPLIT SPACE AND LOCATE AT PRIMARY HOLES WITH HIGHER GROUT TAKES.
6. PERFORM PROBING AS ROCK EXCAVATION IS ADVANCED TO CONFIRM PERFORMANCE OF PRE-EXCAVATION GROUTING. IF GROUNDWATER INFLOW INTO THE PROBE HOLES EXCEEDS THE ALLOWABLE LIMIT SPECIFIED IN SPECIFICATION SECTION 31 23 20, PERFORM CUTOFF GROUTING IN PROBE HOLES AS SPECIFIED. ROCK EXCAVATION SHALL NOT BE ADVANCED TO THE NEXT LEVEL UNTIL PROBING AND CUTOFF GROUTING IS COMPLETED. PROBE HOLE LOCATIONS MAY BE ADJUSTED DEPENDING ON ANTICIPATED GROUND CONDITIONS AND AS APPROVED BY OWNER.
7. SEE GBR AND GDR FOR ANTICIPATED GROUND CONDITIONS.
8. LIMIT GROUTING PRESSURES ADJACENT TO THE UOIT WITHIN THIS ZONE AS SPECIFIED IN SPECIFICATION SECTION 31 23 20.
9. PRIOR TO EXCAVATION OF THE TUNNEL JUNCTION CHAMBER AND DWT, PERFORM A MINIMUM OF TWO ADDITIONAL PROBE AND CUTOFF GROUT HOLES FROM WITHIN THE SHAFT AND WITHIN THE ENVELOPE OF THE TUNNEL JUNCTION CHAMBER AND DWT EXCAVATION. CONTRACTOR TO ADJUST THESE PROBE HOLES LOCATIONS AND ANGLES TO INTERSECT POTENTIAL WATER BEARING FEATURES AS OBSERVED DURING SHAFT EXCAVATION. PERFORM CUTOFF GROUTING PER THE REQUIREMENTS OF SECTION 31 23 20.

Phaidra Campbell

Signer Name: Phaidra Campbell
Signing Reason: I approved this document.
Signing Time: 2025-08-05 17:45:58(EDT)

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

Designed by:	REVISION			
G. ASPIRAS	REV No.	DATE	DESCRIPTION	APPV
Drawn by:	0	5/16/25	ISSUED FOR BID	PC
P. CAMPBELL	1	8/8/25	ADD. 8 UPDATES	PC
Checked by:				
P. CAMPBELL				

Brown AND Caldwell

J|C|K UNDERGROUND
A SCHNABEL ENGINEERING COMPANY

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL PHAIDRA CAMPBELL ENGINEER PE095271 8/8/2025

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-SOE-15

SHAFT PRE-EXCAVATION GROUTING 1

Contract:	S489
CAD File Name:	430-SOE-15.dwg
Date:	5 / 16 / 2025
Sheet:	

ATTACHMENT – C

Addendum No. 8 Prevailing Minimum Wage Pre-Determination

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

ADD. NO. 8

Project Name:	ALCOSAN Contract 1800 - Wet Weather Pump Station Project
General Description:	The creation of a new wet weather pump station that will complement the current main pump station, support an increased plant capacity, and act as the hub for the new underground wastewater collection tunnels in a separate project.
Project Locality	Allegheny County
Awarding Agency:	Alcosan
Contract Award Date:	9/17/2025
Serial Number:	25-07538
Project Classification:	Building/Heavy/Highway
Determination Date:	8/4/2025
Assigned Field Office:	Pittsburgh
Field Office Phone Number:	(412)565-5300
Toll Free Phone Number:	(877)504-8354
Project County:	Allegheny County

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 25-07538 - Building	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Asbestos & Insulation Workers	8/1/2024		$43.40	$29.51	$72.91
Boilermakers	6/1/2016		$40.90	$27.61	$68.51
Bricklayer	12/1/2024		$41.00	$25.59	$66.59
Bricklayer	6/1/2025		$41.50	$26.09	$67.59
Carpenters - Piledriver/Welder	1/1/2025		$43.38	$22.72	$66.10
Carpenters - Piledriver/Welder	1/1/2026		$44.63	$23.47	$68.10
Carpenters, Drywall Hangers, Framers, Instrument Men, Lathers, Soft Floor Layers	6/1/2024		$41.49	$19.93	$61.42
Carpenters, Drywall Hangers, Framers, Instrument Men, Lathers, Soft Floor Layers	6/1/2025		$43.34	$19.93	$63.27
Cement Masons	7/1/2024		$34.57	$25.09	$59.66
Cement Masons	6/1/2025		$35.52	$25.64	$61.16
Drywall Finisher	6/1/2024		$34.01	$24.63	$58.64
Drywall Finisher	6/1/2025		$35.16	$25.98	$61.14
Electricians & Telecommunications Installation Technician	12/27/2024		$50.86	$32.69	$83.55
Electricians & Telecommunications Installation Technician	12/26/2025		$54.16	$32.69	$86.85
Elevator Constructor	1/1/2024		$58.55	$43.87	$102.42
Elevator Constructor	1/1/2025		$61.07	$40.05	$101.12
Glazier	9/1/2024		$37.06	$31.89	$68.95
Iron Workers	6/1/2024		$39.89	$36.47	$76.36
Iron Workers	6/1/2025		$41.50	$37.36	$78.86
Laborers (Class 01 - See notes)	1/1/2024		$26.82	$19.46	$46.28
Laborers (Class 01 - See notes)	1/1/2025		$27.32	$19.96	$47.28
Laborers (Class 01 - See notes)	1/1/2026		$27.82	$20.46	$48.28
Laborers (Class 02 - See notes)	1/1/2024		$26.97	$19.46	$46.43
Laborers (Class 02 - See notes)	1/1/2025		$27.47	$19.96	$47.43
Laborers (Class 02 - See notes)	1/1/2026		$27.97	$20.46	$48.43
Laborers (Class 03 - See notes)	1/1/2024		$29.97	$19.46	$49.43
Laborers (Class 03 - See notes)	1/1/2025		$30.47	$19.96	$50.43
Laborers (Class 03 - See notes)	1/1/2026		$30.97	$20.46	$51.43
Laborers (Class 04 - See notes)	1/1/2021		$23.57	$19.32	$42.89
Landscape Laborer (Skilled)	1/1/2025		$25.79	$18.78	$44.57
Landscape Laborer (Skilled)	1/1/2026		$26.79	$19.03	$45.82
Landscape Laborer (Tractor Operator)	1/1/2025		$26.09	$18.78	$44.87
Landscape Laborer (Tractor Operator)	1/1/2026		$27.09	$19.03	$46.12
Landscape Laborer	1/1/2025		$25.37	$18.78	$44.15
Landscape Laborer	1/1/2026		$26.37	$19.03	$45.40
Millwright	6/1/2020		$41.68	$20.32	$62.00
Operators (Class 01 - see notes)	6/1/2024		$41.69	$24.39	$66.08
Operators (Class 01 - see notes)	6/1/2025		$42.72	$24.79	$67.51
Operators (Class 01 - see notes)	6/1/2026		$43.74	$25.29	$69.03
Operators (Class 02 -see notes)	6/1/2024		$35.62	$24.39	$60.01
Operators (Class 02 -see notes)	6/1/2025		$36.67	$24.79	$61.46
Operators (Class 02 -see notes)	6/1/2026		$37.67	$25.29	$62.96

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 25-07538 - Building	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Operators (Class 03 - See notes)	6/1/2024		$32.83	$24.39	$57.22
Operators (Class 03 - See notes)	6/1/2025		$33.88	$24.79	$58.67
Operators (Class 03 - See notes)	6/1/2026		$34.88	$25.29	$60.17
Painters Class 6 (see notes)	6/1/2024		$32.14	$24.93	$57.07
Painters Class 6 (see notes)	6/1/2025		$34.16	$25.81	$59.97
Piledrivers	1/1/2025		$41.88	$22.72	$64.60
Piledrivers	1/1/2026		$43.13	$23.47	$66.60
Plasterers	6/1/2024		$33.14	$21.04	$54.18
plumber	6/1/2024		$51.75	$25.87	$77.62
plumber	6/1/2025		$54.95	$25.87	$80.82
plumber	6/1/2026		$58.05	$25.87	$83.92
plumber	6/1/2027		$61.15	$25.87	$87.02
Pointers, Caulkers, Cleaners	12/1/2024		$39.69	$21.61	$61.30
Pointers, Caulkers, Cleaners	6/1/2025		$40.66	$21.99	$62.65
Roofers	6/2/2024		$38.00	$20.67	$58.67
Roofers	6/1/2025		$39.91	$20.76	$60.67
Sheet Metal Workers	7/1/2024		$43.00	$33.96	$76.96
Sheet Metal Workers	7/1/2025		$45.00	$35.16	$80.16
Sign Makers and Hangars	7/15/2024		$32.32	$25.82	$58.14
Sign Makers and Hangars	7/15/2025		$33.48	$26.41	$59.89
Sprinklerfitters	7/1/2024		$45.38	$26.46	$71.84
Sprinklerfitters	1/1/2025		$44.79	$27.05	$71.84
Steamfitters	6/1/2024		$48.15	$29.57	$77.72
Steamfitters	6/1/2025		$50.20	$31.02	$81.22
Stone Masons	12/1/2024		$43.10	$24.22	$67.32
Stone Masons	6/1/2025		$43.60	$24.72	$68.32
Terrazzo Finisher	12/1/2024		$41.04	$18.72	$59.76
Terrazzo Finisher	6/1/2025		$41.73	$19.03	$60.76
Terrazzo Mechanics	12/1/2024		$40.39	$21.02	$61.41
Terrazzo Mechanics	6/1/2025		$41.13	$21.28	$62.41
Tile Finisher	12/1/2024		$32.51	$17.99	$50.50
Tile Finisher	6/1/2025		$33.24	$18.36	$51.60
Tile Setter	12/1/2024		$39.41	$22.44	$61.85
Tile Setter	6/1/2025		$40.15	$22.80	$62.95
Truckdriver class 1(see notes)	1/1/2025		$36.43	$23.21	$59.64
Truckdriver class 1(see notes)	1/1/2026		$37.93	$23.71	$61.64
Truckdriver class 2 (see notes)	1/1/2025		$36.89	$23.52	$60.41
Truckdriver class 2 (see notes)	1/1/2026		$38.39	$24.02	$62.41
Window Film / Tint Installer	10/1/2019		$25.00	$2.63	$27.63

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 25-07538 - Heavy/Highway	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Carpenter	1/1/2025		$41.35	$22.09	$63.44
Carpenter	1/1/2026		$42.60	$22.84	$65.44
Carpenter Welder	1/1/2025		$42.85	$22.09	$64.94
Carpenter Welder	1/1/2026		$44.10	$22.84	$66.94
Carpenters - Piledriver/Welder	1/1/2025		$43.38	$22.72	$66.10
Carpenters - Piledriver/Welder	1/1/2026		$44.63	$23.47	$68.10
Cement Finishers	1/1/2024		$35.14	$26.30	$61.44
Cement Finishers	1/1/2025		$35.94	$27.50	$63.44
Cement Masons	1/1/2020		$32.84	$21.10	$53.94
Electric Lineman	6/3/2024		$53.97	$31.05	$85.02
Electricians & Telecommunications Installation Technician	12/27/2024		$51.76	$31.80	$83.56
Electricians & Telecommunications Installation Technician	12/26/2025		$54.16	$32.69	$86.85
Iron Workers (Bridge, Structural Steel, Ornamental, Precast, Reinforcing)	6/1/2024		$39.89	$36.47	$76.36
Iron Workers (Bridge, Structural Steel, Ornamental, Precast, Reinforcing)	6/1/2025		$41.50	$37.36	$78.86
Laborers (Class 01 - See notes)	1/1/2024		$32.20	$25.50	$57.70
Laborers (Class 01 - See notes)	1/1/2025		$33.70	$26.00	$59.70
Laborers (Class 01 - See notes)	1/1/2026		$34.70	$27.00	$61.70
Laborers (Class 02 - See notes)	1/1/2024		$32.36	$25.50	$57.86
Laborers (Class 02 - See notes)	1/1/2025		$33.86	$26.00	$59.86
Laborers (Class 02 - See notes)	1/1/2026		$34.86	$27.00	$61.86
Laborers (Class 03 - See notes)	1/1/2024		$32.75	$25.50	$58.25
Laborers (Class 03 - See notes)	1/1/2025		$34.25	$26.00	$60.25
Laborers (Class 03 - See notes)	1/1/2026		$35.25	$27.00	$62.25
Laborers (Class 04 - See notes)	1/1/2024		$33.20	$25.50	$58.70
Laborers (Class 04 - See notes)	1/1/2025		$34.70	$26.00	$60.70
Laborers (Class 04 - See notes)	1/1/2026		$35.70	$27.00	$62.70
Laborers (Class 05 - See notes)	1/1/2024		$33.61	$25.50	$59.11
Laborers (Class 05 - See notes)	1/1/2025		$35.11	$26.00	$61.11
Laborers (Class 05 - See notes)	1/1/2026		$36.11	$27.00	$63.11
Laborers (Class 06 - See notes)	1/1/2024		$30.45	$25.50	$55.95
Laborers (Class 06 - See notes)	1/1/2025		$31.95	$26.00	$57.95
Laborers (Class 06 - See notes)	1/1/2026		$32.95	$27.00	$59.95
Laborers (Class 07 - See notes)	1/1/2024		$33.20	$25.50	$58.70
Laborers (Class 07 - See notes)	1/1/2025		$34.70	$26.00	$60.70
Laborers (Class 07 - See notes)	1/1/2026		$35.70	$27.00	$62.70
Laborers (Class 08 - See notes)	1/1/2024		$34.70	$25.50	$60.20
Laborers (Class 08 - See notes)	1/1/2025		$36.20	$26.00	$62.20
Laborers (Class 08 - See notes)	1/1/2026		$37.20	$27.00	$64.20
Millwright	6/1/2024		$47.59	$23.72	$71.31
Millwright	6/1/2025		$49.72	$23.72	$73.44
Operators (Class 01 - see notes)	1/1/2024		$38.59	$24.03	$62.62
Operators (Class 01 - see notes)	1/1/2025		$40.39	$24.23	$64.62

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 25-07538 - Heavy/Highway	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Operators (Class 01 - see notes)	1/1/2026		$41.96	$24.66	$66.62
Operators (Class 02 -see notes)	1/1/2024		$38.33	$24.03	$62.36
Operators (Class 02 -see notes)	1/1/2025		$40.13	$24.23	$64.36
Operators (Class 02 -see notes)	1/1/2026		$41.70	$24.66	$66.36
Operators (Class 03 - See notes)	1/1/2024		$34.68	$24.03	$58.71
Operators (Class 03 - See notes)	1/1/2025		$36.48	$24.23	$60.71
Operators (Class 03 - See notes)	1/1/2026		$38.05	$24.66	$62.71
Operators (Class 04 - See notes)	1/1/2024		$34.22	$24.03	$58.25
Operators (Class 04 - See notes)	1/1/2025		$36.02	$24.23	$60.25
Operators (Class 04 - See notes)	1/1/2026		$37.59	$24.66	$62.25
Operators (Class 05 - See notes)	1/1/2024		$33.97	$24.03	$58.00
Operators (Class 05 - See notes)	1/1/2025		$35.77	$24.23	$60.00
Operators (Class 05 - See notes)	1/1/2026		$37.34	$24.66	$62.00
Operators Class 1-A	1/1/2024		$41.59	$24.03	$65.62
Operators Class 1-A	1/1/2025		$43.39	$24.23	$67.62
Operators Class 1-A	1/1/2026		$44.96	$24.66	$69.62
Operators Class 1-B	1/1/2024		$40.59	$24.03	$64.62
Operators Class 1-B	1/1/2025		$42.39	$24.23	$66.62
Operators Class 1-B	1/1/2026		$43.96	$24.66	$68.62
Painters Class 1 (see notes)	6/1/2022		$34.45	$22.82	$57.27
Painters Class 2 (see notes)	6/1/2024		$38.09	$24.93	$63.02
Painters Class 2 (see notes)	6/1/2025		$40.36	$25.81	$66.17
Painters Class 3 (see notes)	6/1/2024		$40.66	$24.93	$65.59
Painters Class 3 (see notes)	6/1/2025		$43.68	$25.81	$69.49
Painters Class 4 (see notes)	6/1/2019		$28.20	$20.06	$48.26
Painters Class 5 (see notes)	6/1/2019		$22.91	$20.06	$42.97
Pile Driver Divers (Building, Heavy, Highway)	1/1/2025		$62.82	$22.72	$85.54
Pile Driver Divers (Building, Heavy, Highway)	1/1/2026		$64.70	$23.47	$88.17
Piledrivers	1/1/2025		$41.88	$22.72	$64.60
Piledrivers	1/1/2026		$43.13	$23.47	$66.60
Steamfitters (Heavy and Highway - Gas Distribution)	5/1/2022		$48.43	$40.28	$88.71
Truckdriver class 1(see notes)	1/1/2025		$36.43	$23.21	$59.64
Truckdriver class 1(see notes)	1/1/2026		$37.93	$23.71	$61.64
Truckdriver class 2 (see notes)	1/1/2025		$36.89	$23.52	$60.41
Truckdriver class 2 (see notes)	1/1/2026		$38.39	$24.02	$62.41